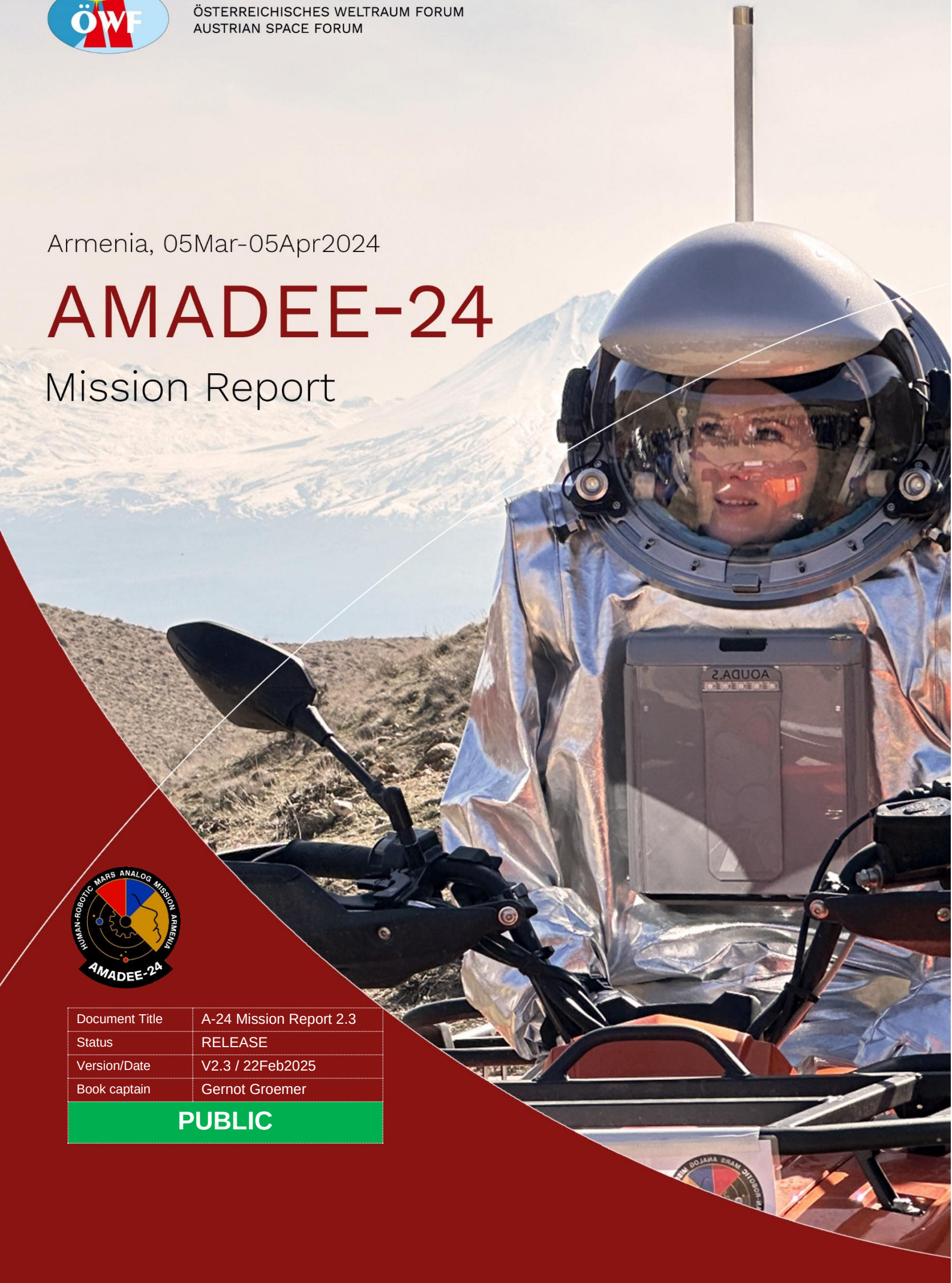
ÖSTERREICHISCHES WELTRAUM FORUM
AUSTRIAN SPACE FORUM

Armenia, 05Mar-05Apr2024

AMADEE-24

Mission Report



Document Title	A-24 Mission Report 2.3
Status	RELEASE
Version/Date	V2.3 / 22Feb2025
Book captain	Gernot Groemer

PUBLIC

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The AMADEE-24 Mission Patch Heraldic

The mission emblem was designed by Sarah Feilmayr/OeWF media team (visuals). It symbolizes the flag colors of Armenia as the AMADEE-24 host country in red-blue-gold, forming a spacesuit helmet with its visor and a human silhouette.
The central symbol of the spur gear stands for the engineering heritage of Armenia, particularly the first Mars rover as well as the missions' many robotics experiments. The orbits represent Earth and Mars with their respective Moons.

1. Mission key personnel

Do not share this contact information outside the project – especially do NOT pass on this information to media representatives, private individuals, or other organizations without prior consulting the leadership.

We kindly request to channel any inquiry between Armenia and Austria via the OeWF leadership team to ensure a single point of contact.
Important postal addresses

- **OeWF (Austrian Space Forum) Suitlab:** Etrichgasse 18, 6020 Innsbruck, Austria
- **OeWF Mission Support Center:** Stachegasse 16, 1120 Vienna, Austria
- **A-24 National Steering Ctte:** c/o National Center for Innovation and Entrepreneurship, 49, 3 Komitas Ave, Yerevan, Armenia, Tel. +374 10 236774

Mission website: **amadee24.oewf.org**

1. A-24 leadership

Name	Affiliation	Email
Gernot Groemer	OeWF	Gernot.groemer@oewf.org
Reinhard Tlustos	OeWF	Reinhard.tlustos@oewf.org
Sophie Gruber (Logistics)	OeWF	Sophie.gruber@oewf.org

2. OeWF key personnel

Name	Position	Email
Willibald Stumptner (tbc) Reinhard Tlustos (tbc)	Lead Flight Directors	willibald.stumptner Reinhard.tlustos@oewf.org
Anika Mehlis Dpty: Robert Wild	CDR Flight Crew	
Gal Yoffe Dpty: Eleonore Poli, Lukas Plazovnik, Judith Kuemmel	CDR GOST	Gal.yoffe@oewf.org eleonorepoli27@gmail.com
Nina Sams Dpty: Laura Bettiol	MSC/Flight Plan Lead	
Seda Oezdemir Dpty: Julia Knie	MSC/RSS Team lead	
Dpty: Lucas Rehnberg Sec: Andreas Zoller	BME Team lead	
Alexandra De Carvalho Dpty: Sylwia Kaduk	Human Factors Lead	
Monika Fischer Dpty: Reinhard Tlustos	Media Team Lead	
Olivia Haider	Social Media Lead	
Lukas Gradl	OeWF IT Teamlead	

3. Armenian National Steering Ctte Key personnel (contact via A-24 leadership)

Name	Affiliation	contact
Hayk Aslanyan	Coordinator Nat. Steering Ctte	hayk.aslan@gmail.com,
Mher Mehrabyan	Armenian Aerospace Agency	
Hayk Margarian	CEO NCIE	
Arman Darbinyan	Russian-Armenian University, Head of Dep. Mathematical Modeling	
Gaiane Hakobian	Project manager A-24 / Armenia	
Ani Grigoryan	A-24 Coordinator in Armenia | ArmSpaceForum	

4. Diplomatic representations

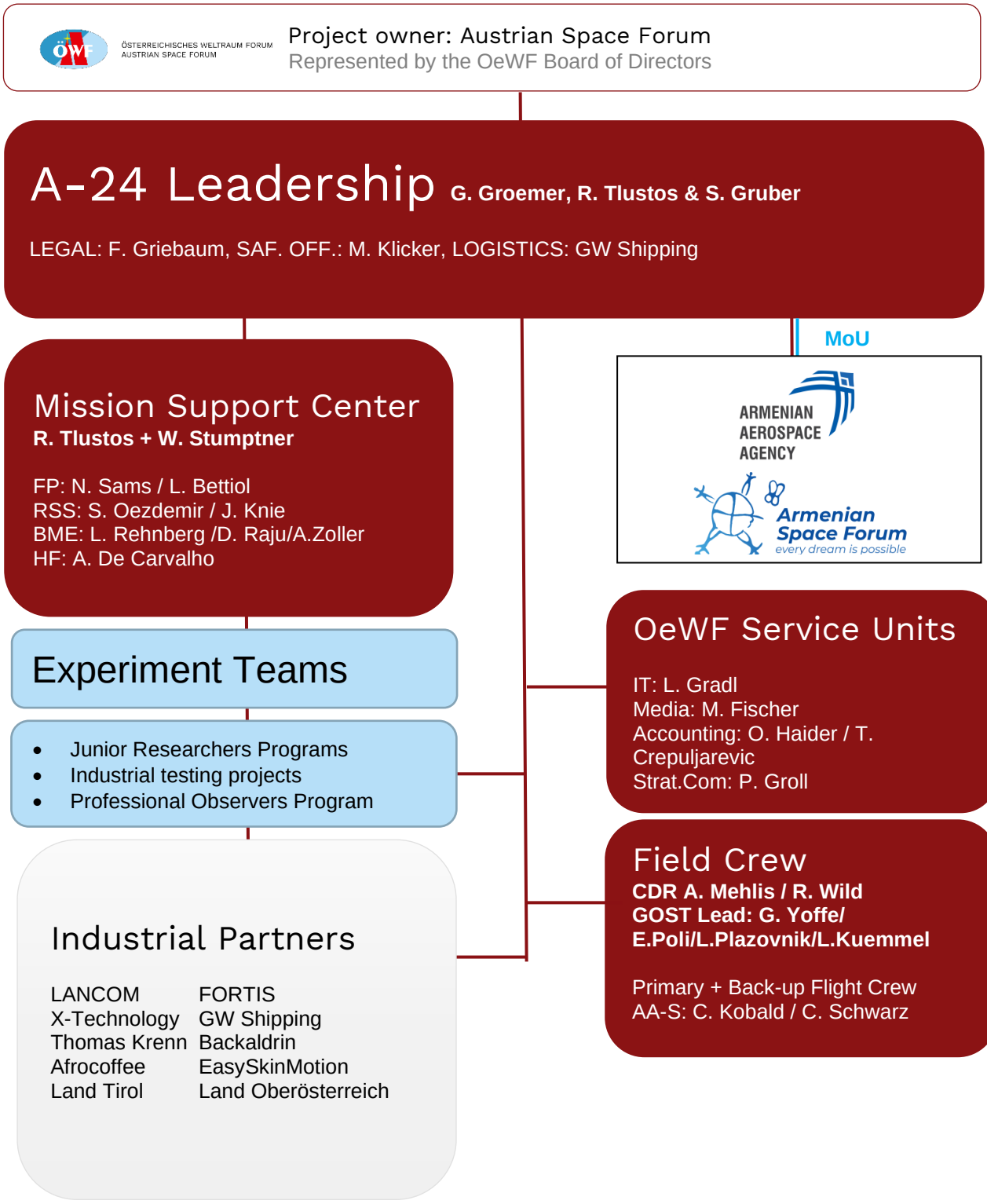
Austria

- Austrian Ambassador to Armenia and Georgia (based in Tiflis/Georgia): Thomas Mühlmann
- Mr. Rudolf LUKAVSKY, Commercial Counsellor, Austrian Embassy
- Mr. Aram Marutyan - Honorary Consul of Austria in Yerevan
- Colonel Thomas Ahammer, Austrian Ministry of Defense
- Markus Ritter: Head of European Union Mission to Armenia (EUM)
- Ambassador Franziska Honsowitz, Austrian Ministry for Foreign and European Affairs, Department for Science Diplomacy and Dialogue of Cultures:

Armenia

- Armenian Embassy to Austria:
  - Armen Papykian
  - Tigran Zakaryan, 3rd Secretary and Attaché for Science and Technology at the Armenian Embassy
- Hayk Chobanyan, Ex-officio Minister for High Tech Industries

2. AMADEE-24 Organizational Chart



3. AMADEE-24 aims

"AMADEE-24 was a Mars analog simulation in Armenia, managed by the Austrian Space Forum hosted by the Armenian Aerospace Agency, Republic of Armenia"

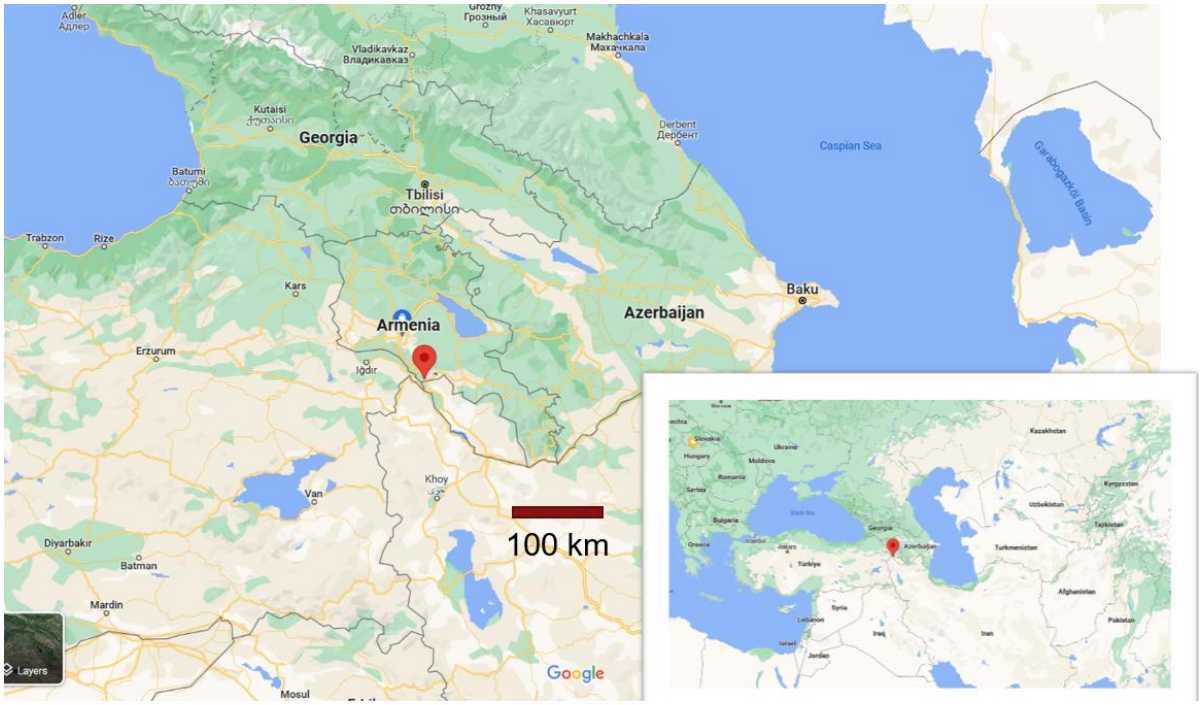
Simulating Mars Human-robotic surface activities in terrestrial analogs had evolved into an efficient tool for developing exploration mission architectures. They facilitate to understand the advantages and limitations of future Human planetary missions, becoming an added value for the development of remote science operations, helping to understand the constraints and opportunities of the technology and workflows.

The test site was selected for its geological and topographic similarity to Mars. The AMADEE-24 mission presented an opportunity to:

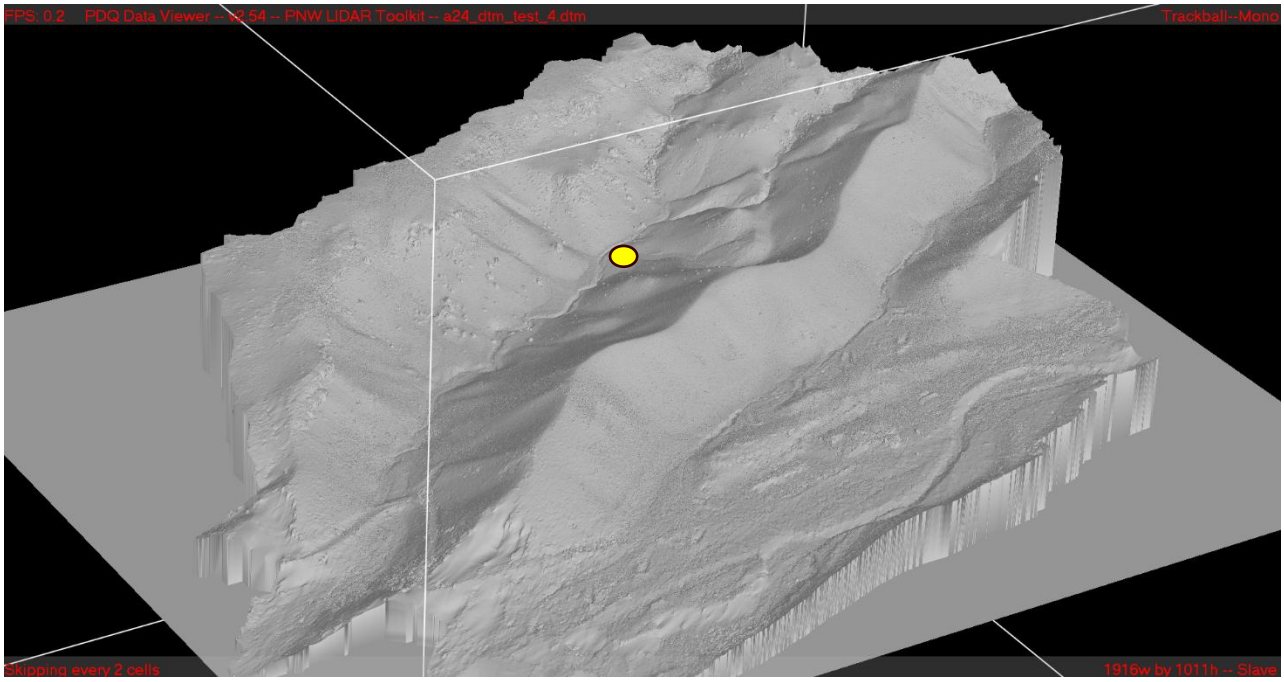
- Study equipment behavior involving the simultaneous usage of instruments with the option of humans-in-the-loop (via two high-fidelity spacesuit simulators, portable system, etc.)
- The development of platforms for testing life-detection or geoscience techniques, robotic support tools for human missions and concepts for high situational awareness of remote support teams.
- Studying the analog as a model region for their Martian counterparts.
- Serving as a catalyst to increase the visibility of planetary sciences and human exploration.
- Evolving the know-how of managing human mission to Mars deploying a realistic model for Mission Support center – Astronaut actions and the encompassing decision-making framework.

4. The AMADEE-24 test site

The test site was located near a water dam in the Armenian province of Ararat. The location was >50 km from Iran, Turkey and Azerbaijan enclave border (across the mountain). The border to Turkey was along the river Aras. Elevation was about 1100 m.



DEM Model of the test site



The elevation of the surrounding hills was typically a few dozen to 100 meters.

4.1. Geography of the primary site (waterdam Armash)

Climate

The climate in the region of Ararat was generally semi-arid with hot summers (June-August) and cold winters (December-Febuary). Most precipitation falls around May, with an average annual precipitation of about 550 mm. In March the average precipitation was 34mm. Snowfall was to be expected during the winter period. Temperature and sunshine hours per day increased towards the end of the mission. The average minimum temperature in March was around 5-10 °C, the average maximum temperature around 20° C towards early April; with sunshine for up to 8 hrs/d.

Logistics

Armash was the nearest village with 2500+ inhabitants and was located south of the test site. The nearest village with a medical center open 24/7 was Ararat (20 km northwest). Ararat can be reached in about 30 minutes by car via route E117, which passes through Armash. Route E177 also leads to Yerevan where the Erebuni Medical Center was located (60 km northwest). Along the E177 to Yerevan, there are some accommodation options, cafés and fast food options in the villages of the region. From Armash the nearest supermarket was 5 km south on the E177.

Medical safety

The Astghik Medical Center in Yerevan is the first in Armenia to receive the gold standard of international certification of medical centers - JCI qualification. Its emergency ambulance service operates according to European protocols. The distance to Armash was about one hour by ambulance.

4.2. Geology of the primary test site (Waterdam Armash)

Note: Research teams were reminded, that we maintain an artificial blinding of the geoscience teams. That means, that we discouraged studying the literature about the test site and only use materials that would be available in an equivalent form on Mars.

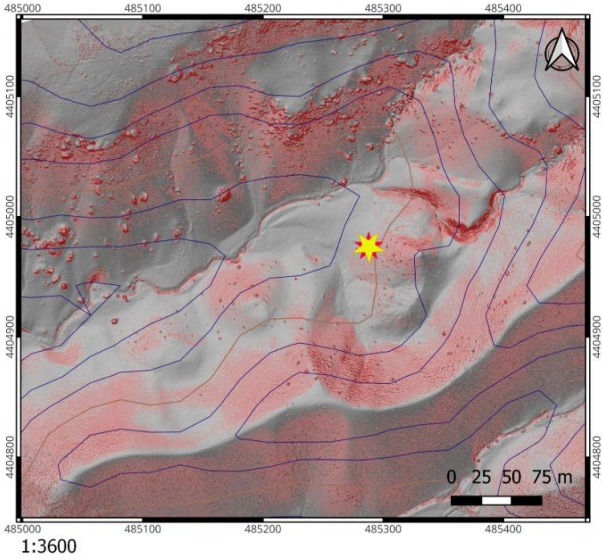
Geological genesis

The site was located in the Ararat Basin of the Lesser Caucasus mountains where the Eurasian tectonic plate collides with the Arabian tectonic plate. In Armenia's history there were two geological important plate collisions: The first one in late Cretaceous to early Eocene where the South Armenian Block collided with the Eurasian continental margin. The second during Paleogene when the Arabian plate collided with the South Armenian Block, which caused a long-lasting period of magmatic activity. The South Armenian Block was now part of the Eurasian margin.

Rock composition

The rocks at the test site consisted of limestone, sandstone, slate and quartzite. They were formed in the Devonian period; their age can be dated back to 354 to 417 million years. The rocks directly near Armash and in the Ararat Basin in general were formed in a younger age; they consist of alluvial deposits from the Quaternary period.

Danger Map



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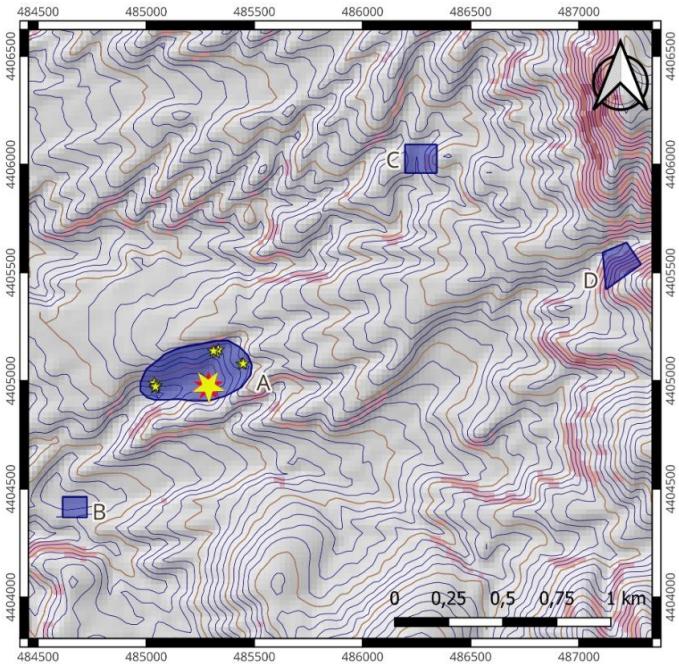
Pre-mission Phase



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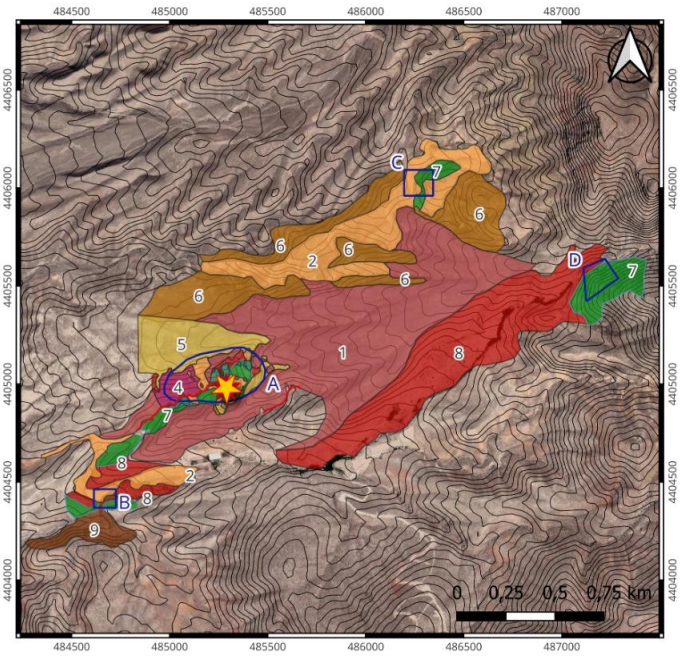
Habitat
POI
Contours 50 m
Contours 10 m
ROI
Slope Classification
Steep (25° - 37°)
Very steep/cliff (>37°)

Rock-Colour-Map

Pre-mission Phase



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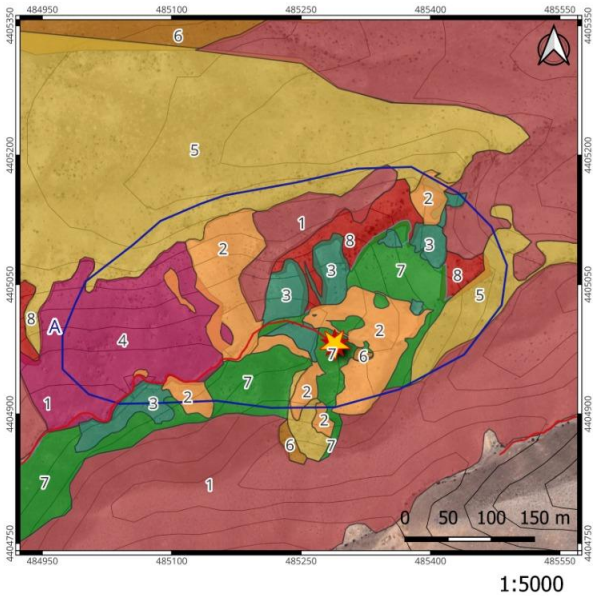

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Habitat
Roads - Inferred
ROI
Rock colour map
Lithology 1
Lithology 2
Lithology 3
Lithology 4
Lithology 5
Lithology 6
Lithology 7
Lithology 8
Lithology 9

5. Representative photos of the test site

5.1. Grain size and basic optical documentation: pre-mission overview

During the November scouting mission, a number of sand samples were taken to provide a first insight into the surface properties. This was a summary of the analysis, conducted via laser diffraction on a Malvern Panalytical MasterSizer 3000 at the Department of Geology, University of Innsbruck. Grain size data were analyzed and visualized with GRADISTAT v 9.1 (Blott & Pye, 2001). Optical images were taken on sediment petrographic smear slides of the size fraction < 2 mm, using a Zeiss AxioImager petrographic microscope (Dept. of Geology, Univ. of Innsbruck)

General notes

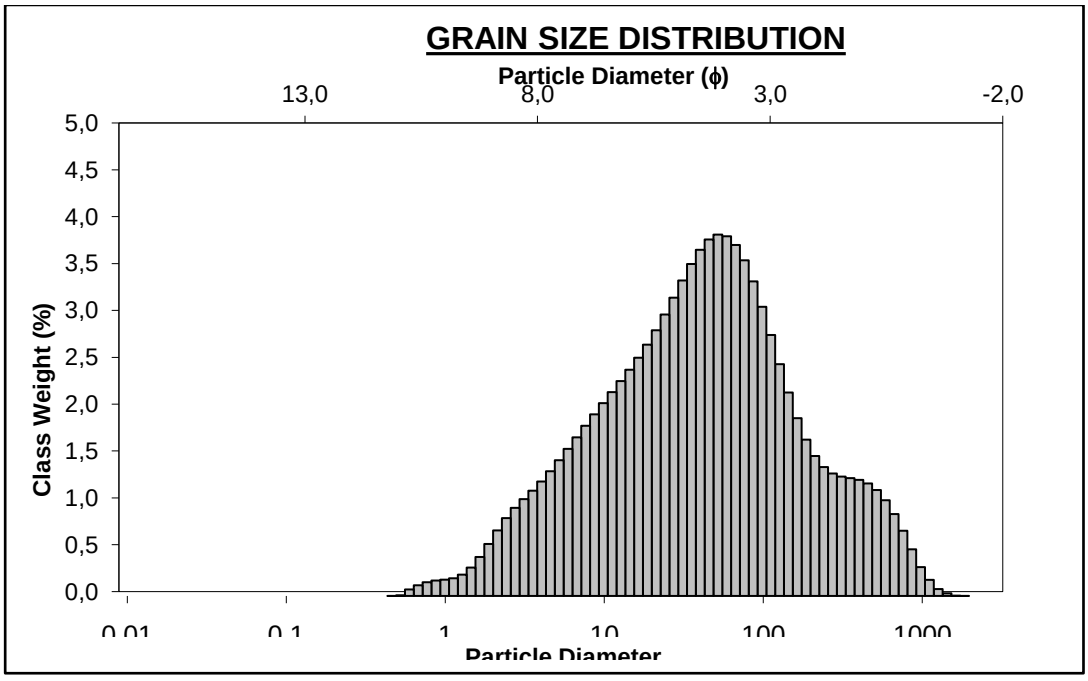
- **Very important: only the size fraction < 2 mm was considered**, i.e. no data regarding gravel-sized particles and larger were generated
- Both grain size and optical analyses were conducted on a single sample for each site. It could not be tested whether they are representative of the general sediment cover of the respective location.

Grain size summary

Sample #9, collected at site 6 (designated backup site), was composed of sandy mud, with a unimodal, fine skewed distribution (Fig. 1). Sorting was poor. Grain sizes range from clay to sand; the mode lies in the medium silt size range (24 µm). Note that, although the sample was sieved to remove gravel before measurement, a very low gravel content was measured. This observation should be discarded as an artefact.

Sample #11, site 7 (designated primary site), consists of sandy mud. The distribution was unimodal and symmetrical, sorting was very poor. Measured grain sizes range from clay to coarse sand, with a mode was in the coarse silt range (52 µm). The sample's grain size distribution was displayed in Fig. 2.

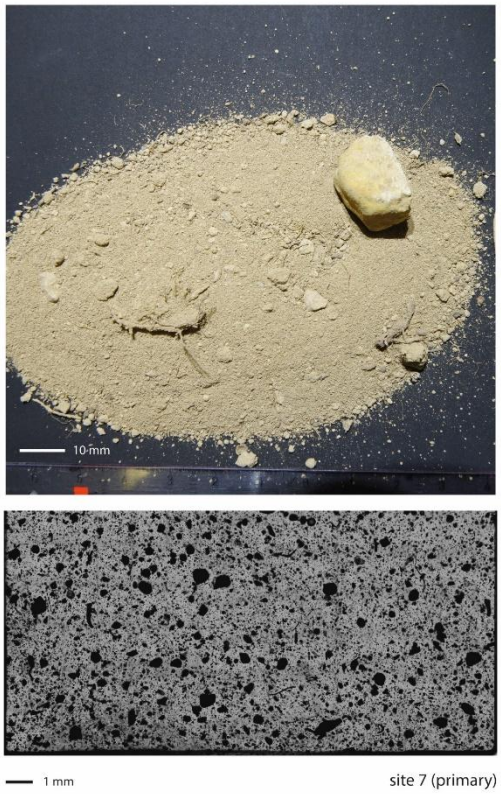
Both samples are dominated by fine grained (i.e., clay and silt) material, making up 91 % of sample 9 (site 6, backup) and 61.9 % of sample 11 (site 7, primary). In accordance with the general grain size trend, sample 9 (backup site) exhibits a significantly higher clay content than sample 11 (primary), with 7.2 % and 2.2 %, respectively.



Grain size distribution sample #11, site 7 (primary site)

Optical description summary
Sample #9 (site 6, backup) was of light brown color and was largely composed of gravel-sized pieces of loosely agglomerated finer sediment (i.e., it can be easily broken into smaller pieces manually). Organic material (roots) can be found with the unaided eye (Fig. 3).
Sample #11 (site 7, primary) exhibits a light brown color. Agglomerates are present (but less and smaller than in sample #9). Likewise, organic material was readily found mixed in with the sediment (Fig. 4).

Optical petrography of smear slides was of limited use, due to the mostly agglomerated fine particles of clay and silt. This results in largely opaque grains, which cannot be further characterized optically. The differences in the degree of agglomeration also lead to the seemingly larger grain sizes of sample #9 compared to sample #11 (see Fig. 3 vs Fig. 4, bottom), although grain size measurements show the opposite (see grain size distributions Fig. 1 and 2).



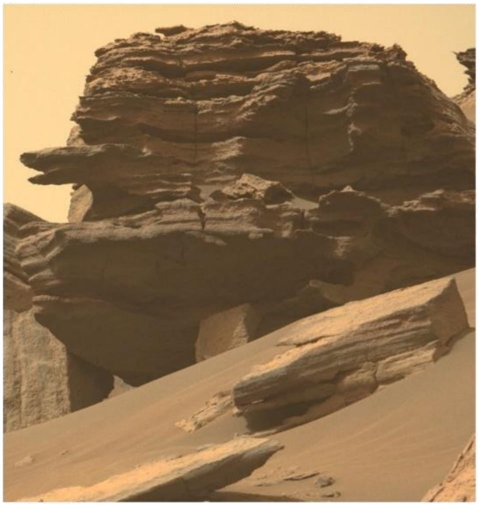
Sample #11, site 7 (primary). Optical image of bulk sediment (top) and petrographic smear slide (bottom)

Preliminary assessment
Samples from both sites exhibit properties consistent with a sediment cover largely composed of in-situ weathering (in combination with incipient soil formation, as evidenced by plant roots and other, unidentified organic material). Based on the high content of fine grained material, aeolian transport was possible, although this also depends on local conditions such as vegetation cover and the formation of aggregates. Protective measures of equipment against the infiltration of sediment grains should therefore be taken, especially in windy conditions and/or if the sediment cover was expected to be disturbed. Depending on sediment cover's thickness and degree of agglomeration, vehicles might be at risk of getting stuck. Likewise, moisture might affect traction considerably.
Based on the preliminary data presented here, conditions on site are unlikely to be excessively aggressive (e.g. because of the amount of fine grained sediment, excessively small particle sizes, or highly abrasive grain shapes and minerals). However, further investigation of the mineralogical composition and geotechnical properties was necessary to make truly reliable predictions of the expected sediment cover properties.

Reference GRADISTAT:
Blott, S.J. and Pye, K. (2001) GRADISTAT: a grain size distribution and statistics package for the analysis of unconsolidated sediments. *Earth Surface Processes and Landforms* 26, 1237-1248. (https://doi.org/10.1002/esp.261)

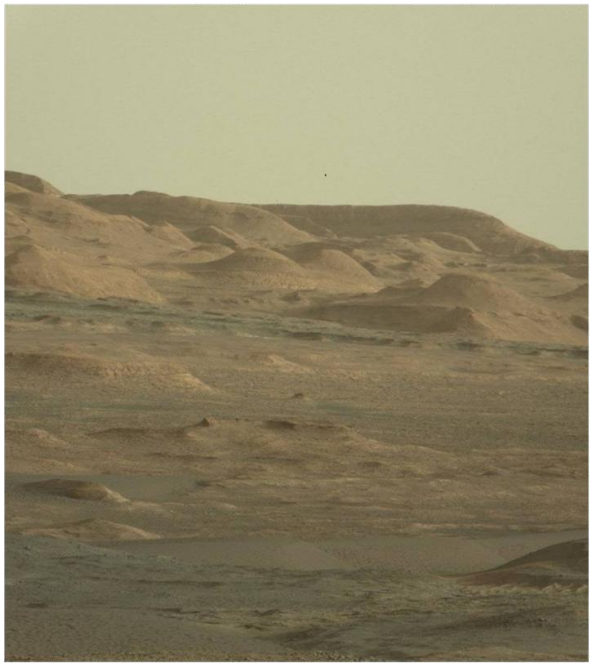
5.2. Visual similarities to Mars

A noteworthy similarity lies in the convergence patterns of the slopes, indicating a consistent geomorphic process at play in both locations. Additionally, the comparable steepness of the hillsides suggests uniform geological influences shaping these features, which offer insights into the dynamic forces shaping landscapes on Mars and Earth.
(Mars photo: NASA/Perserverance Rover, Image taken west to Belva Crater, Mars Region Jezero Crater Longitude: 77.36869069° Latitude:18.48280163° (Sol 784)



Source: https://mars.nasa.gov/mars2020/multimedia/raw-images/; Scouting ÖWF 2023

The displayed resemblances, particularly in the rugged characteristics of certain areas and layering, suggests potential similarities in the geological processes contributing to the formation and erosion of these rock features.
(Mars photo: NASA Perserverance Rover, Mars Region Jezero Crater, Longitude: 77.40600745° Latitude: 18.45879835° (Sol 466))



The shared features suggest a comparable geological context, which implies the similar underlying processes shaping these mountainous terrains.
(Mars photo: NASA Curiosity Rover, Mars Region Gale Crater, Base of Mount Sharp, Longitude: 137.36913767° Latitude: ":-4.673087126129127 ° (Sol 1144))

6. Dress Rehearsal 1 – Peuerbach, Austria

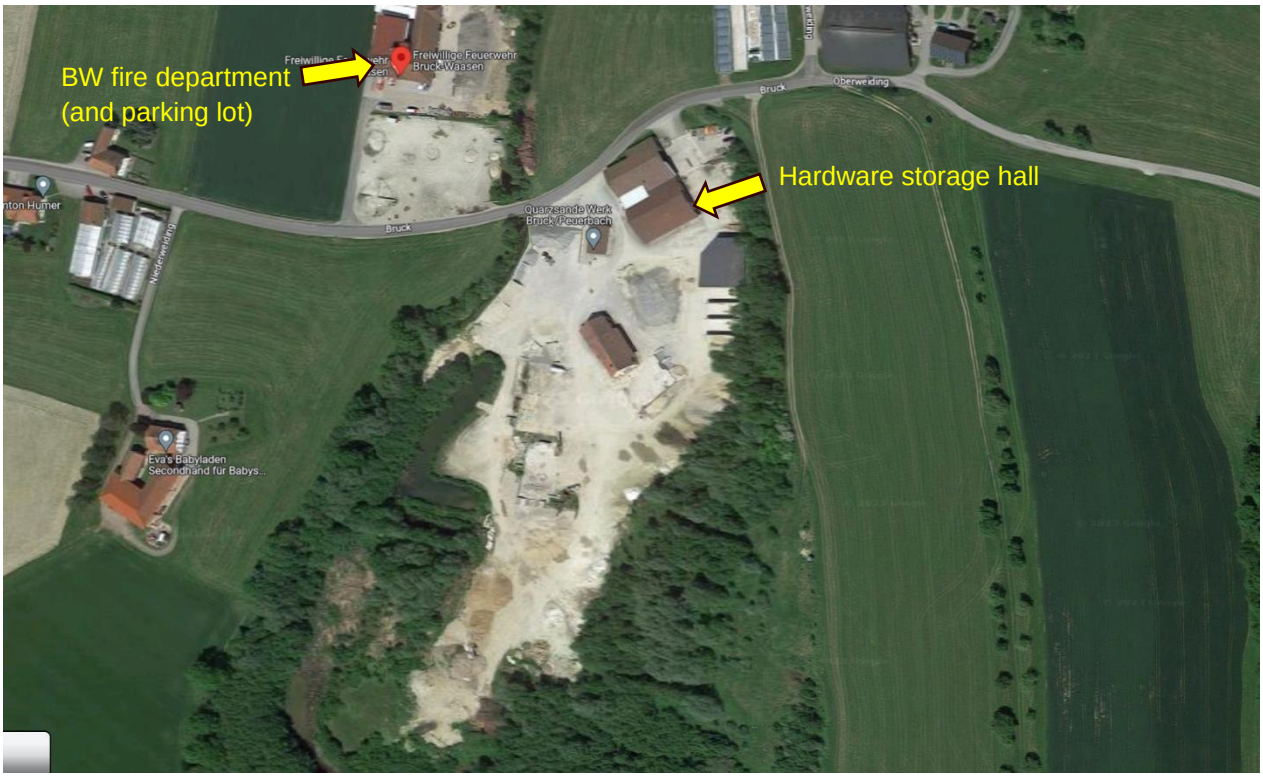
The DR 1 was scheduled from 31Aug2023, 14:00 CEST to 03Sep2023, 16:00 CEST in the community of Peuerbach, Upper Austria (about 1 hour driving west of Linz). It was the first out of two Dress Rehearsals allowing for team-specific training, procedure rehearsals, integrated sim-sims.
DR 1 Location:

- **Registration & Mission Support Center:** Bruck-Waasen (BW) Fire Department - Bruck an der Aschach 50, 4722 Bruck an der Aschach
- "Field site": Quarz sand pit „Sandgrube Fa. Ecklmair" Niederweiding 7, 4722 Peuerbach

The DR 1 was preceded by a 5-day build-up periode and the AMAT 2023 course for OeWF AMBT-graduates. Shipments from Innsbruck to and from Peuerbach were organized via the A-24 logistics. The OeWF arranged accommodation for all participants. Lunches were a simple cold buffet (bread & spreads, cheese/sausages, drinks, vegetables & fruits etc

Experiment staging area & Infrastructure

The field test area was a ca 100 x 200 m sand quarry, offering a range of sandy and rocky terrains. The range was a 2min walk from the fire department. Large hardware items (rovers etc) were stored indoor in a hall at the field site, where 230 V AC and freshwater was available.



Impressions from the DR-2

DR-1 Schedule

	FCT	RSS	Media	FP	GS/IT & SDO	BME & HF	CRW & AA-S
Until 13:45	*Registration*						
Thu/31Aug2023	*dress code: casual*						
14:00	**ALL Welcome, logistics & admin, mission status briefings**						
15:00	Team SOP's Trng						Aouda fam/Upgrade
16:00	Team SOPTrng	Realsim 3d trng		Realsim 3d trng	Exp.setup assistance	SOP Trng	Exp/Geoprep
17:00	Exp.familiarization				Exp.setup assistance		Exp/MEROP
18:00							
	Teambuilding / Belbin for CRW						
Fri/01Sep2023	*dress code: casual*						
8:00	Day briefing & Safety intro Klicker						
9:00	Team SOP's Trng				Get ATV's / IT sup.	Med.checks GOST	Exp.tr/IAQHab + 2 AA Farside
10:00	Team SOP's Trng				Get ATV's / IT sup.	Med.checks GOST	Exp.tr/EIEE
11:00	Team SOP's Trng				Exp.setup ass.	Team SOP's Trng	Exp.tr/ ALIVE (AM), S Raman Trng)
12:00	Exp.fam & Break						BUFFER/RESERVED
13:00	Team SOP's Trng				Exp.set ass	hum.fac exp.meet	Donning prep
14:00	Team SOP's Trng				Exp.set ass.	Prep.med training	Donning Aoudas (AA: SP& AM)/ RW: Hum.-Trng
15:00	Team SOP's Trng				Exp.set ass.	Med.trng GOST	Donning Aoudas (AA: SP& AM)/ RW: Hum.-Trng
16:00	EVA Sim	EVA Sim		EVA Sim	EVA Sim	EVA Sim	EVA Sim / RW/IM: Raman Training
17:00	Debrief/SOP Trng				Debrief/SOP Trng	Med.checks CRW	Doffing / Med.checks part A
18:00	Housekpng/Debrief						EVAprep 02Sep
Sat/02Sep2023	*dress code: poloshirt/overalls*						
8:00	Prep MSC for visitors				GS: clean-up	Med.evac trng / Med Check Part B	Photoshooting / Video /Med.Checks
9:00							Donning & Stage (RW

10:00							Donning/EVA demo
11:00	Audience Mingling	RSS/GOSTsession			GS: Prep meals		Doffing
12:00				Audience Mingling			Audience Mingling
13:00		Audience Mingling		FP for 03rd			Audience Mingling
14:00	Audience Mingling			FP for 03rd		Med.evac trng	Donning & Stage (AA: IM)
15:00				Audience Mingling		Med.evac review	Donning/EVA demo
16:00		Audience Mingling				Audience Mingling Med.Checks CRW	Doffing / Med.Checks
17:00	Flightplan check				GS: clean-up	Flightplan check	Audience Mingling
18:00	Public Day Demob.						Prep.EVA for Sunday
18:30	Group Photo						
19:00	Joint Pizza						
Sun/03Sep2023	*dress code: poloshirt/overalls*						
8:00	Mini-Sim briefing						
9:00	Mini-Sim prep						Donning CK+SP /AM: Hum. Trng
10:00	Mini-Sim						Donning CK+SP /AM: Hum. Trng
11:00							
12:00	Mini-Sim						
13:00	Team debrief					Med.evac Training	
14:00	Discuss next steps & Packing MSC					Med.evac Debrief	
15:00	Internal itvs	Discuss next steps					Packing Aouda&Ops
16:00	Close-Out & Farewell						

	GOST	
	Squad 1	**Squad 2**
Until 13:45		
Thu/31Aug2023		
14:00	**Welcome**	
15:00	WIFI Setup trng	Exp.tr/Ramses
16:00	Exp.tr/Ramses	WIFI Setup trng
17:00	IT & Starlink training	IT & Starlink training
18:00	Teambuilding	Teambuilding
	Teambuilding	Teambuilding
Fri/01Sep2023		
8:00		Day briefing & Safety intro Klicker
9:00	Med.check	Electr. basics
10:00	Electr.basics	Med.check
11:00	ATV/Quadtrng	Fire training
12:00	ATV/Quadtrng	Fire training
13:00	Fire training	ATV/Quadtrng
14:00	Fire training	ATV/Quadtrng
15:00	Med.trng GOST	Med.trng GOST
16:00	EVA Sim	Media/Security trng
17:00	Media/Security trng	Adapt WIFI network
18:00	Houskeeping/Debrief	Exp.tr/iROCS
Sat/02Sep2023		
8:00	Prep for security	Med.evac trng
9:00	Prep staging area	Med.evac trng
10:00	EVA demo security	AVAWT training (virtual)
11:00	RSS/GOST session	RSS/GOST session
12:00	Security	
13:00	Med.evac trng	AA Sec. + Com trng
14:00	Med.evac trng	
15:00	AVAWT training (virtual)	EVA demo security
16:00		WIFI setup/trng

17:00	AA Sec. + Com trng	WIFI setup/trng
18:00	Public Day Demob.	Public Day Demob.
18:30	Group Photo	Group Photo
19:00	Joint Pizza	Joint Pizza
Sun/03Sep2023		
8:00	Mini-Sim briefing	Mini-Sim briefing
9:00	Mini-Sim prep	Mini-Sim prep
10:00		
11:00	Mini-Sim Support	AVAWT Training virtual
12:00	AVAWT Training virtual	Mini-Sim Support
13:00	Med.evac Training	Demob WIFI
14:00	Med.evac Debrief	Med.evac Debrief
15:00	Compile shipping list	Packing
16:00	Close-Out & Farewell	Close-Out & Farewell

Sat/02Sep2023 - Public Day

Saturday was dedicated to the general public, VIP-visits, as well outreach and media activities. This day was the largest space-related outreach activity in Austria for 2023, formally as part of the “communale Peuerbach”, a space related exhibition in Peuerbach Jun-Oct 2023. We registered ca 2000 visitors, some of them travelling several hours.

Each team and experiment group presented what they are doing, it was also a great training opportunity for the GOST and media teams to handle larger crowds. The infrastructure was be provided by our regional and local partners (invitations, catering, stage, security & traffic management, hygiene, moderator etc), OeWF provided the “content”.

For research entities and industrial partners, this was an excellent opportunity to reach out to the community, enthusiastic youngsters, present technologies and products, job opportunities, mingle with the general public and make space research approachable and offer first-hand insights into your work. It was also our way to say a big thank you to the community of Peuerbach for hosting the Dress Rehearsal 1.


Public Day Layout
Bruck
RK
FF
Welcome
area
INDOOR
Hort3Space
StayingAlive
IAQHabitat
WC
Catering
Quarzsande Werk
Bruck/Peuerbach
GW Container
Stage
Geoprep/Raman
Hum.factors
Exoskelett/FarSide
Aug.Reality/Realsim
FF Drehleiter/Ladder
Kein Zugang
Water
rockets
Children spacesuits
Children Mars Rover Dignity
Kein Zugang
Rover &
Drone
driving/flying
Drone/RAMSES
Rover/ALIX
Rover/iROCS
Robotics/MEROP
Rover/Mercator
10 m
Google

7. Dress Rehearsal 2 – Vienna & Maria Lanzendorf

Approximately 150 team members gathered for training purposes and media activities. The DR-2 was scheduled from 26Jan2024, 08:00 CET (UTC+1h) to 28Jan2024, 16:00 CET both at the Mission Support Center in Vienna and the "field site" in Maria Lanzendorf next to Vienna. It was the final Dress Rehearsal, immediately followed by the hardware shipping to Armenia.

Depending on the team members specialization, there were two locations:

- **Mission Support Center "MSC":** OeWF Vienna, Stachegasse 16, 1120 Vienna
  - → for: MSC teams, incl. FCT, RSS, FP, IT, GS, Experiment liaisons for RSS during the mission
- "Field site" "MLD": Maria Lanzendorf, Logistics Campus of Gebrueder Weiss, Wiener Straße 26, 2326 Maria Lanzendorf
  - → for: CRW, GOST, Experiments with hardware in the field and/or training slots for AAs/ GOST

The "field site" at Maria Lanzendorf was the logistics hub for Gebrueder Weiss, including a ca 500 m² hall that was reserved for us, plus a parking lot (we tried to keep hardware clean this time). The GOST "field office" was be in a seminar room on-site. Large hardware items (rovers etc) were stored indoor in a hall at the field site, where 230 V AC and connectivity will be available.

PUBLIC SLOT Sun/28Jan2023

350 people, including a 30 students group from the University of Innsbruck as part of the Junior Researchers Program joined the DR-2 for a 3-hr public slot. The experiment teams introduced their science, there was a small EVA, as well as numerous company presentations, including the Fortis Space Container, EasyMotionSkin, Afrocoffee, GMV and others.

Preceeding the DR-2 there was a diplomatic reception at the Embassy of Armenia in Vienna as well as a afternoon reception at the Austrian Ministry for European and Foreign Affairs.

DR-2 Master Schedule

	FCT	RSS	Media	FP
Fri/26Jan2024	*dress code: poloshirt/overalls*			
8:00	Morning Briefing		Press Conference	Morning Briefing
12:00	EVA	EVA		
13:00				
14:00				
15:00		HUMANISE RSS		
16:00				HUMANISE
17:00			Live Link Tech Training	
19:00	Transfer Meeting hall			
20:00	Dinner Debriefing			
Sat/27Jan2024	*dress code: poloshirt/overalls*			
8:00	Morning Briefing			
12:00	EVA		Live Link	
13:00	EVA	UIBK Students	Live Link	
14:00		UIBK Students	Briefing Media	
15:00				
16:00				UIBK Students
17:00	Staying Alive!			Staying Alive!
20:00	Joint Dinner			
Sun/28Jan2024	*dress code: poloshirt/overalls*			
8:00	Morning Briefing			
9:00			Public Day Prep	
10:00		MEROP		
11:00				
12:00	EVA			
13:00	EVA		Public Day	
16:00	Close-Out & Farewell			

Unassigned slots were used for team-individual trainings and meetings.

DR-2 Master Schedule

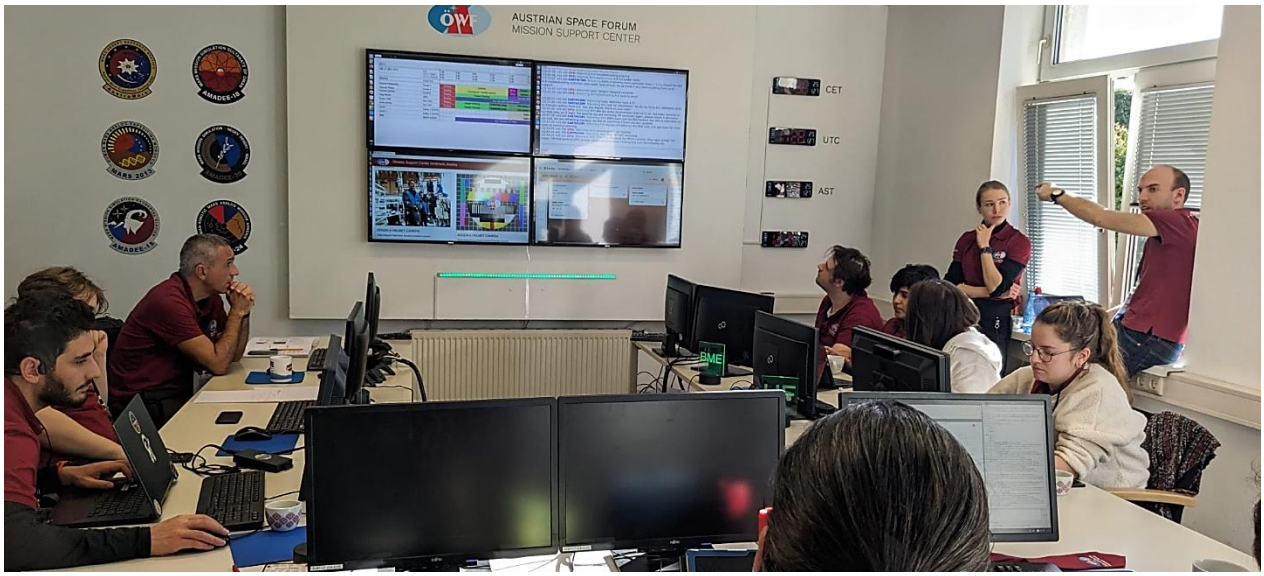
	CREW		GOST	
	CRW	CRW	Squad 1	Squad 2
Fri/26Jan2024				
8:00	Morning Briefing			
9:00	Consent Forms	IT Troubleshooting		
10:00	Simplified Donning AA - RW/AM			
11:00				Staying Alive!
12:00	Show EVA (Press)		EVA Safety	
13:00	Doffing AA - RW/AM			EVA Safety
14:00	EVA Prep for next day		First Aid Training	
15:00	FARSIDE-A (Group1)	RW/AM Blood taking training		
16:00				
17:00		IT Troubleshooting	Live Link Tech Training	
18:00	FARSIDE-A (Group2)	RAMAN Training		
19:00	Transfer Meeting hall			
20:00	Dinner Debriefing			
Sat/27Jan2024				
8:00	Morning Briefing			
9:00	Donning AA SP/TW	IT Troubleshooting		
11:00		AM/RW - HUMANISE	HUMANISE GOST Members	
12:00	EVA	IAQ Habitat (AM, +)	EVA Safety	Live-Link
13:00			Live-Link	EVA Safety
14:00	Doffing AA SP/TW		Medical Checks	
15:00	MEROP	HORT3SPACE		HORT3SPACE Setup
16:00				
17:00				
18:00	FARSIDE-B			
19:00		EVA Prep for next day		
20:00	Joint Dinner			

Sun/28Jan2024				
8:00	Morning Briefing			
9:00	Simplified Donning AA IM/CK		MEROP	
10:00				
11:00				
12:00	EVA + Public		EVA Safety	
13:00	Doffing AA IM/CK	IT Troubleshooting		EVA Safety
14:00	GEOS	GEOPREP		
15:00	Packing Suit			
16:00	Close-Out & Farewell			

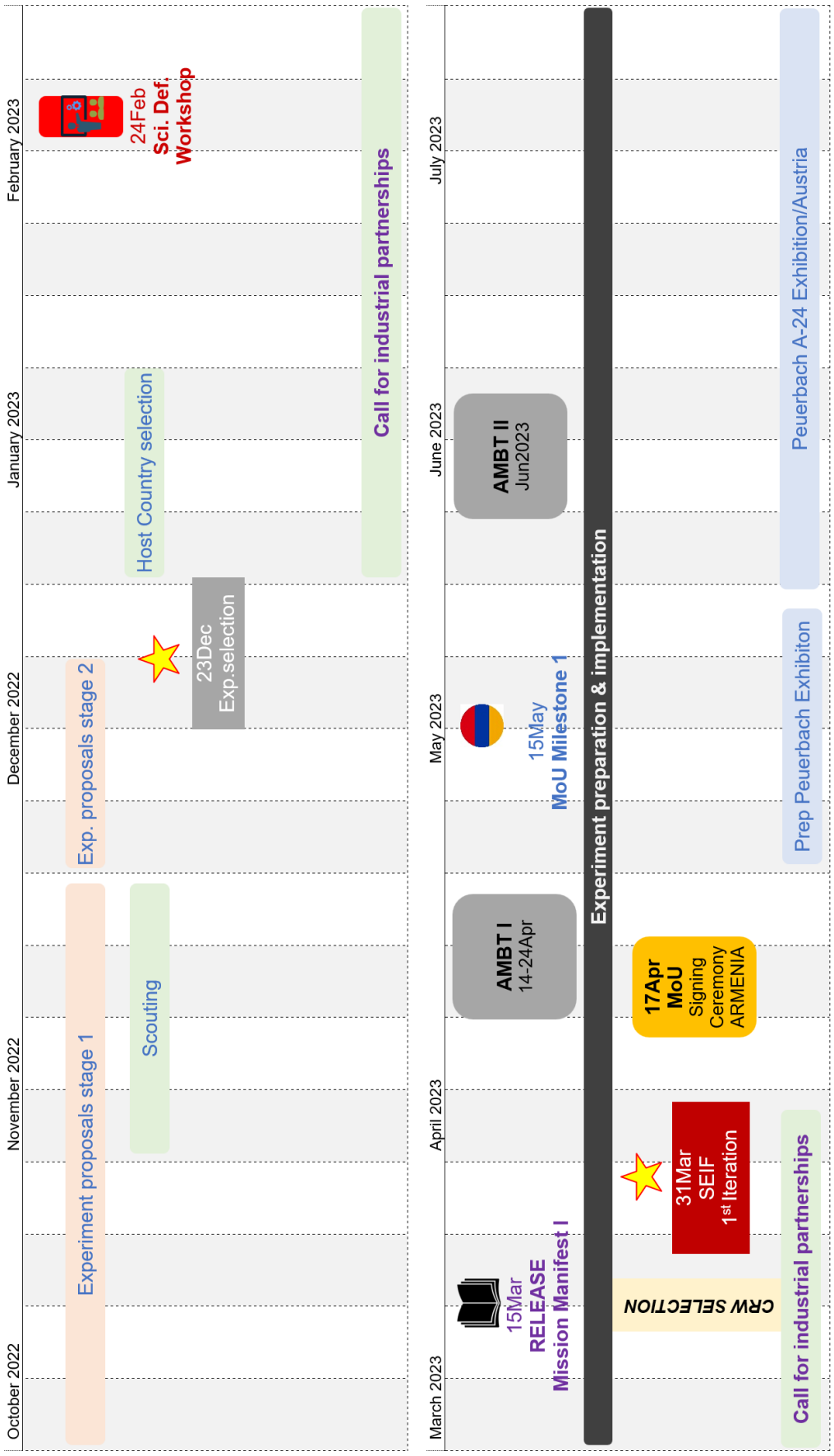
Impressions from the DR-2 (Photos courtesy of Florian Voggeneder and others)

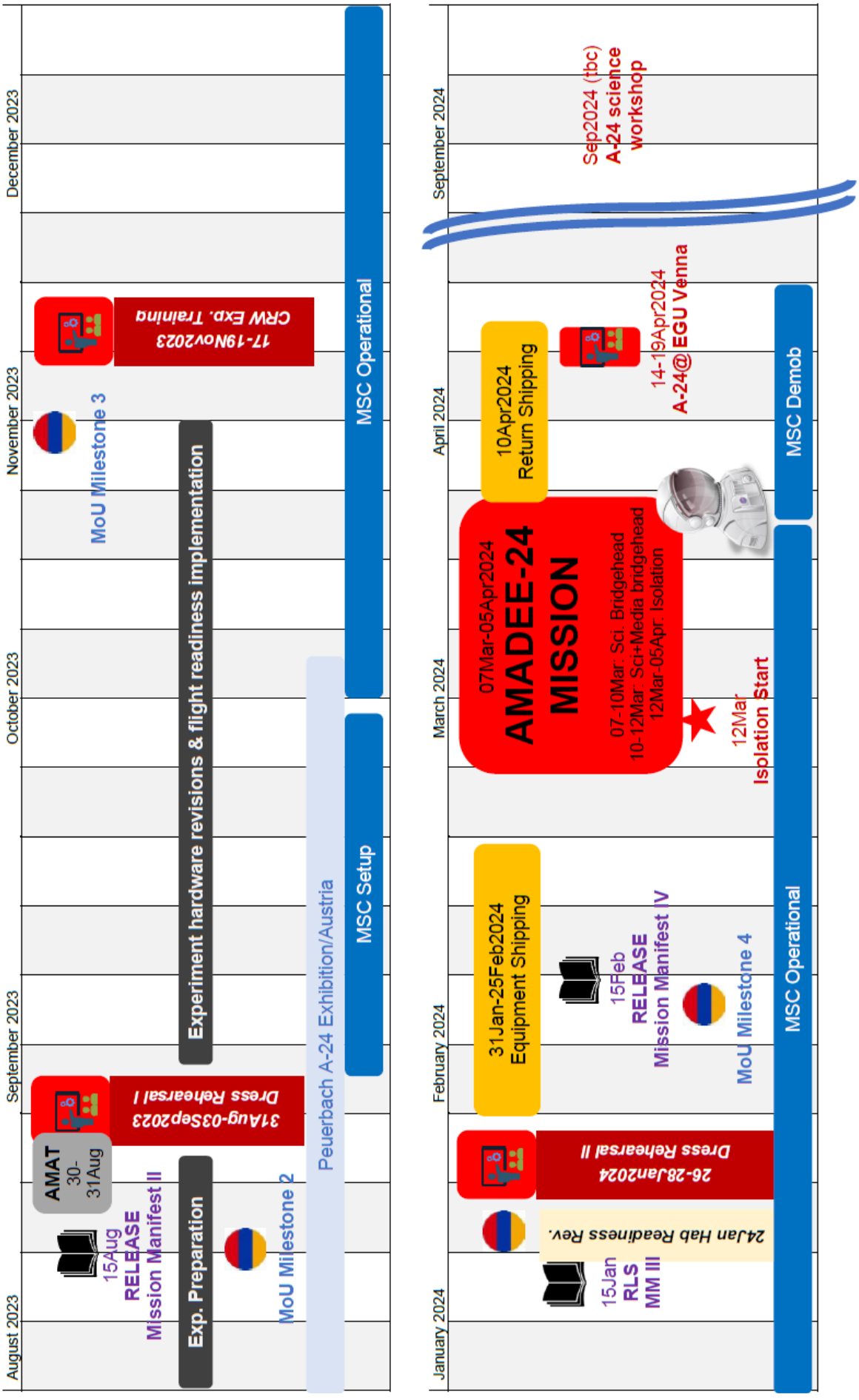

Österreichisches Weltraum Forum


RIEGL


AUSTRIAN SPACE FORUM
MISSION SUPPORT CENTER
CET
UTC
AST
BME

8. AMADEE-24 Roadmap




August 2023
September 2023
October 2023
November 2023
December 2023
January 2024
February 2024
March 2024
April 2024
September 2024
AMAT 30-31Aug
15Aug RELEASE Mission Manifest II
Exp. Preparation
31Aug-03Sep2023 Dress Rehearsal I
MoU Milestone 2
Peuerbach A-24 Exhibition/Austria
MSC Setup
Experiment hardware revisions & flight readiness implementation
MoU Milestone 3
17-19Nov2023 CRW Exp. Training
MSC Operational
15Jan RLS MM III
24Jan Hab Readiness Rev.
26-28Jan2024 Dress Rehearsal II
31Jan-25Feb2024 Equipment Shipping
15Feb RELEASE Mission Manifest IV
MoU Milestone 4
MSC Operational
07Mar-05Apr2024 AMADEE-24 MISSION
07-10Mar: Sci. Bridgehead
10-12Mar: Sci+Media bridgehead
12Mar-05Apr: Isolation
12Mar Isolation Start
10Apr2024 Return Shipping
14-19Apr2024 A-24@ EGU Vienna
MSC Demob
Sep2024 (tbc) A-24 science workshop

Note/post-mission tour

Right after the field operations have concluded and the base station had been demobilized, a lecture and education/outreach tour was conducted in the host country.

Lecture day 09Apr2024

10:00	Receiving at Instigate, Meeting with Real School students and teachers, summarizing the experience and the project takeaway, handing certificates of participation
10:40	Tour at Instigate
11:00	Leave office: drive to Sevan-Ijevan
12:00	Lunch at Sevan, Yasaman
13:00	Leave Yasaman: drive to Ijevan Real School
14:00	Arrive at Ijevan, Real School. Onsite tour.

Other meetings included visits to industrial sponsors and selected media interviews.

There was a dedicated AMADEE-24 session (“Town hall meeting”) at the European Geophysical Union congress in Vienna 14-19Apr2024.

Project end

The formal end of the AMADEE-24 project was defined by the conclusion of the A-24 Science Workshop in September 2024 at the Salzburg Science Museum “Haus der Natur”, Austria.

9. Mission architecture

Science Bridgehead phase (07-12Mar2024)

Before the crew arrives, several preparatory measures were taken, like breaking the customs seal on-site of the shipping containers etc. Starting with a small shakedown team of 2 OeWF team members, supported by an Armenian team, the arrival of the bridgehead crew, including experiment team members and media crews was on 07Mar2024 .

The flight crew arrived on 08Mar2023 at the field station.

During that period the basic infrastructure was established, CRW trained at the base station and GOST rendered operational. This period offered an opportunity for guest researchers to be present on site.

Station condition upon arrival

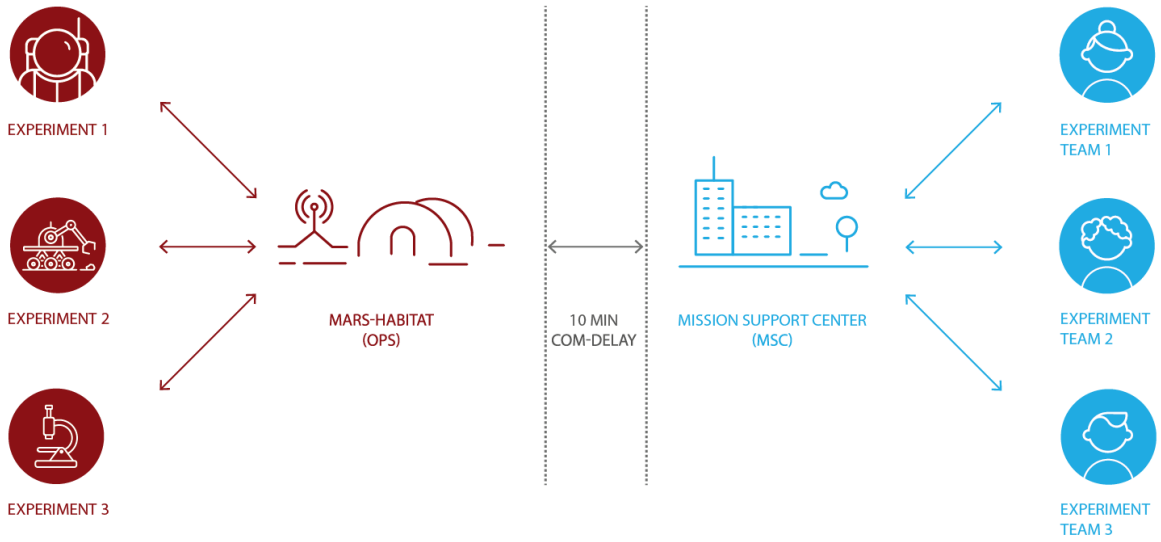
Due to delays in the construction operations of the habitat, the mission could not start as planned, aggregated by rainfall, making a safe operation impossible.

Media Bridgehead phase (10-12Mar2024) and delayed isolation start

The majority of the media teams was allowed to arrive during this 3-day period, the preparatory activities and experiment setups continued weather permitting. At one point very heavy rain damaged the roof and it was leaking and that heavy rain also caused the generator to fail, so the habitat was without electricity. Per our prime rule our priorities are: Safety, Science, Simulation. So for safety reasons we moved the AAs out of the habitat for a couple of days to fix things

On the 12Mar2024, the mission started with a public event and media day. Isolation started on 15Mar2024, ending on 05Apr2024 in the late morning.

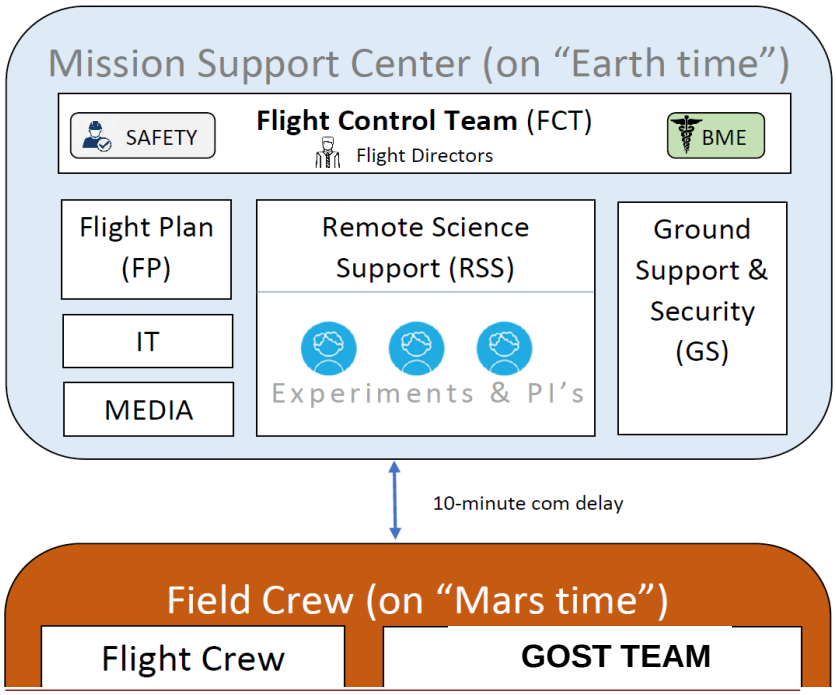
Due to heavy rainfall, the roof condition of the station deteriorated, combined with a failure of the main power supply. Therefore, in observance of the 3S-principle (Safety-Science-Simulation), the crew left the habitat for 2 days, before a recertification of the power grid and technical adjustments allowed for a safe continuation of the mission.



Conceptual architecture of the AMADEE-24 expedition: A 10min time delay reflects the signal travel time between Earth and Mars. The MSC in Innsbruck/Austria was the single-line-of-contact between "Earth" and "Mars".

Isolation phase (12Mar-05Apr2024)

By 12Mar2024 evening, external media and research teams leftthe site, the Mission Support Center (MSC) Vienna/Austria now directed crew who were to conduct experiments according to a mission plan. The analog astronauts were supported by a small On-Site Support-team (GOST), performing activities necessary for the simulation, but not available on Mars (e.g. Safety, managing local W-LAN infrastructure etc). GOST did mostly not directly interact with analog astronauts. The field data were monitored and discussed in near-real time by the remote science support team at the MSC Vienna in cooperation with the experimenters' teams. A 10-minutes time-delay between "Earth" and "Mars" mimicked the signal travel time between Earth and Mars.



Conclusion of the field phase (05-09Apr2024) & Demobilization

On 05Apr2024, the crew concluded their isolation phase with a "walk-out" ceremony, accompanied with a public day and media interactions.

On 06Apr2024, the habitat demobilization started; with the help of ca 15 people, the experiments were dismantled and prepared for shipping in two containers. These were retrieved from the test site on 18Apr2024 to be brough back to Hall/Austria near Innsbruck for further dissemination of the hardware.

10. Artificial Intelligence Application

Carmen Köhler, Lukas Plazovnik

Artificial intelligence (AI) is now an integral part of every sector. Naturally, it is also finding its way into the space industry. Its ability to process and analyze large amounts of data, learn from patterns, and make autonomous decisions makes it an indispensable tool in the complex and resource-limited environment of Mars simulation missions and space exploration.

Examples of AI in other (analog) Mars Missions:

- NASA's Mars Rovers: AI is used in rovers like Curiosity and Perseverance for navigation, data analysis, and autonomous decision-making.
- ESA's ExoMars Mission: Incorporates AI for autonomous navigation and scientific data analysis.
- Analog Missions: Organizations like HI-SEAS (Hawaii Space Exploration Analog and Simulation) and Mars Society's MDRS (Mars Desert Research Station) use AI to simulate and manage habitat systems, monitor health, and analyze data.

Within the AMADEE-24 mission, there have been various experiments applying different AI techniques for, e.g, data processing and analyzing, for rovers and we also had the experiment 'Staying Alive' which evaluated within a specific experiment environment how analog astronauts make use of a chatbot in contrast to asking help with time delay to the Mission Support Center or using no external sources. We are looking forward to the findings of this study.

Additionally to the experiments conducted during the AMADEE-24 mission, we also wanted to optimise our workflow within the OeWF team, which is always one of the rationales of every Mars simulation mission. Thus, within AMADEE-24 we internally focused on the application of Generative Artificial intelligence (GenAI) as a tool to facilitate the information flow of the content of the 13 different experiments conducted within the mission on-site in Armenia. GenAI refers to artificial intelligence that can create new content, such as text, images, or music, by learning patterns from existing data. What we tested was to use and create our own costume Generative Pre-training Transformer (GPT) by using ChatGPT version 4.0 and we named it 'Hal' with a reference to the movie '2001: A Space Odyssey' where HAL was a Heuristically Programmed Algorithmic Computer.

The GPT was created with the following prompts for the GPT Builder :

- I would like to build a GPT that is an AI expert for analog Mars Simulation Missions and the Experiments conducted.
- Can we call it 'Hal'
- Guidance and information: Experiment information provided, support, mission specific information

- Formal, enthusiastic and friendly tone
- Avoid medical and legal advice

We fed the necessary information needed for the mission experiments and made the created ‘HAL’ available to some of the GOST members and the analog astronauts for testing. ‘HAL’ could be used on the laptop and moreover also via Application on the personal mobile.

‘HAL’ was accepted very easily, as nowadays almost everyone is well acquainted with the use of ChatGPT and ‘HAL’ has the same user interface, the use was very straightforward. Often raised questions targeted questions regarding multiple experiments. One example for this is the question, how much energy is needed in total for all the experiments and ‘HAL’ provided a listing with the energy budget of all the experiments. More challenging was the building of trust for the results. Whereas some chats and information were flawless, other chat replies were clearly error-prone. Thus the use was limited. The underlying reason for a lot of the errors was the provided data to the GPT. The number, size and format of the documents to be used was limited. Thus, experiments with more power points and various separate files were disadvantaged. In the mission version of ‘HAL’ we were not able to change these issues.

However, it was valuable to understand the importance of not only large language models but also the need for image detection when it comes to mission procedures. Often also the remark was made, that voice control would be helpful, as during the execution of experiments the hands are often occupied. With all of these technical related challenges, the human side is not to be forgotten and ethics as well as trust are crucial. These results also highlight how feedback from analogue missions can be instrumental in refining GenAI for future Mars missions.

AI and its capacities are constantly evolving. Thus the challenges that we encountered regarding the uploading and handling of input data will soon be overcome within the next versions of ChatGPT or other AI softwares. We are thus excited to continue our testing and development of our digital experiment assistant ‘HAL’ to create further trust by consistently correct answers during the upcoming missions. In these, the GenAI assistant will not only be made available to the field crew but also also the whole of the Mission Support Center to further learn the optimised implementation of this promising tool.

Overall, AI is crucial for future Mars simulation missions and space exploration because it enhances efficiency, safety, and decision-making. This enables more complex and successful space exploration endeavours, always keeping the ethics and explainability of the AI in mind.

11. Mission Risk Profile / Mission Safety

A detailed mission risk analysis was conducted and consolidated in a safety work plan. The OeWF safety officer (Michael Klicker) was authorized to inquiry any mission element for its risk profile and may issue a No-Go on experiments, infrastructure use or even the entire mission.

This section provides a table of general relevance for all AMADEE-24 team members, combining projected initial managerial/administrative risks and environmental influences. This matrix does not cover scientific, financial, legal or mission-sim risks, numbers for severity and probability are only indicative. Severity was observed from the perspective of mission success, not from an individuals' perspective. Also, the list of lessons learned from the previous missions, especially from AMADEE-18 & AMADEE-20 were addressed in a structured manner.

Risk-Group	**Severity** 1/low - 5/high	**Probability** *1/low – 5/high*	**Mitigation measure**
Unfavorable weather, including flash floods and thunderstorms	3	2	Weather monitoring; habitat at elevated position; considering alternative access routes for evacuation; definition of abort parameters
Regulatory issues: • Land use restrictions • customs clearances, incl. biosample shipments, shipment delays	2	1	Detailed agreement on land use, trafficability restrictions and access rules. Detailed planning of shipment and involvement of customs authorities well in advance. Professional shipment handling team, early shipping dates with >2 weeks margin.
Aggressive/dangerous Flora & Fauna; crew medical incidents, risk of hygiene problems emerging	3	2	Awareness measures for crews and GOST. Definition of medical response workflows and involvement of local health services and medevac to country of origin, proper insurance contracts. Hygiene monitoring.
Aggressive visitors or acts of violence incl. terrorism	5	1	Restricted access to test site and continuous background monitoring of risk, involving Embassy of Austria and other institutions
Habitat and GOST facility readiness, incl. power and comm provisions	4	2	Close follow-up on habitat development, incl. design, implementation, testing and documentation; habitat design support where necessary; definition of pwr fallback solutions
MSC readiness, incl. IT infrastructure, staffing, SOP readiness and training level	3	2	Incremental readiness established well before the mission starts; staffing starts for MSC, GOST and CRW in early 2020. Three preceding AMBT and 1 additional AMBT course scheduled in advance
Experiment readiness not at level required for an efficient conduct during the mission	2	2	Exp.-specific support by RSS, FP and FCT liaisons since selection; hard deadline implementation for milestones, flagging system for experiment readiness

The safety program for AMADEE24 was governed by a safety program plan (SSPP) agreed with leadership for the whole series of AMADEE analog missions (Ref: SSPP AMADEE Program V1.4), implementing MIL STD 882E mandated activities, tailoring risk analysis parameters and the safety process.

The mission safety was assessed by Michael Klicker, OeWF Safety Officer.

For any mission under this SSPP, a mission specific safety work plan was created and maintained through the mission preparation, execution and wrap-up. Important key elements were:

- Risk analysis and monitoring for ÖWF-provided equipment
- Risk analysis and monitoring of experiments being conducted during the mission with regard to technical risks
- Operational risk management in the sense that procedures, trade-offs and mission execution constraints are defined beforehand, but rest on leadership implementation during the mission (including deployment of safety shadows and similar measures)

This process was summarized as follows:

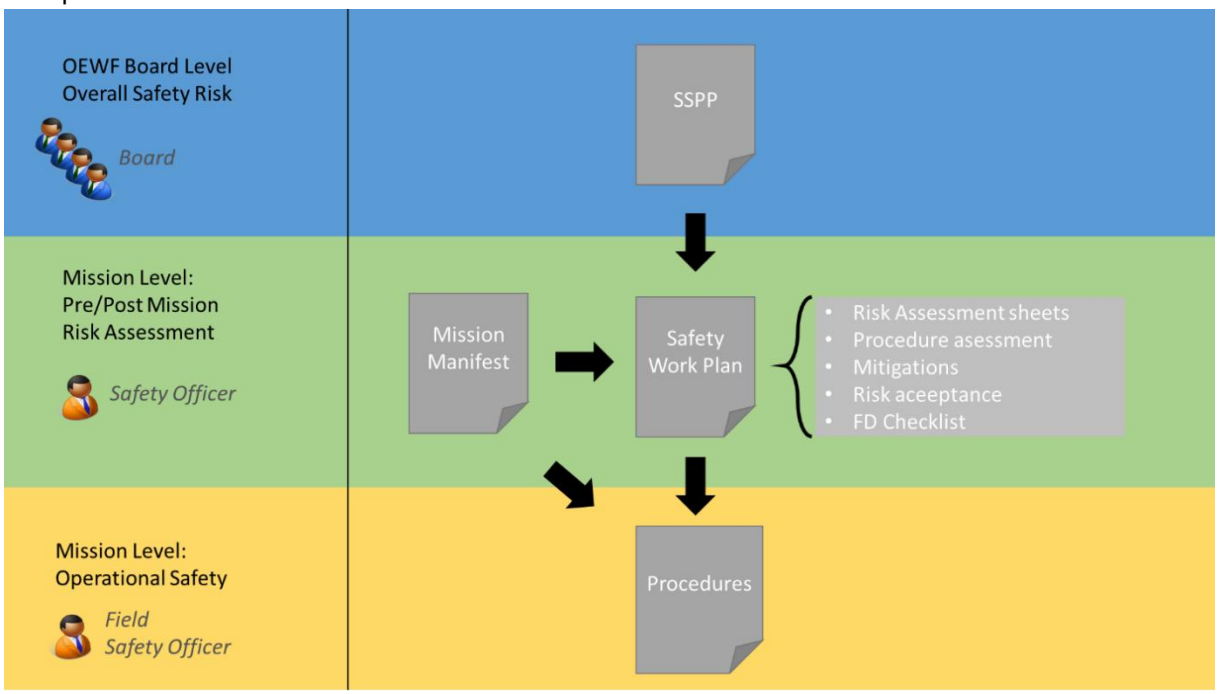


Figure 1: Safety Process AMADEE Program

The primary use of the process was to make sure that safety was actively managed throughout the mission but (following the definitions laid out in MIL STD 882E) balanced against mission goal achievement. This implies that safety of analog missions was NOT maintained at the „armchair residual risk“ level that would be expected for example under EU product safety laws. Rather, it provided leadership with clear basis for operational decisions akin to the tolerable risk level of extreme sports or other voluntary risk taking activities.

Following state of the art model based system engineering with embedded safety arguments, for AMADEE24 it was attempted for the first time to give a model based overview over the whole analog mission endeavor using the NATO Architecture Framework v4 for high-level mission description and a corresponding tool making a plausible safety argument in parallel. The following figures give a brief overview over the model used:

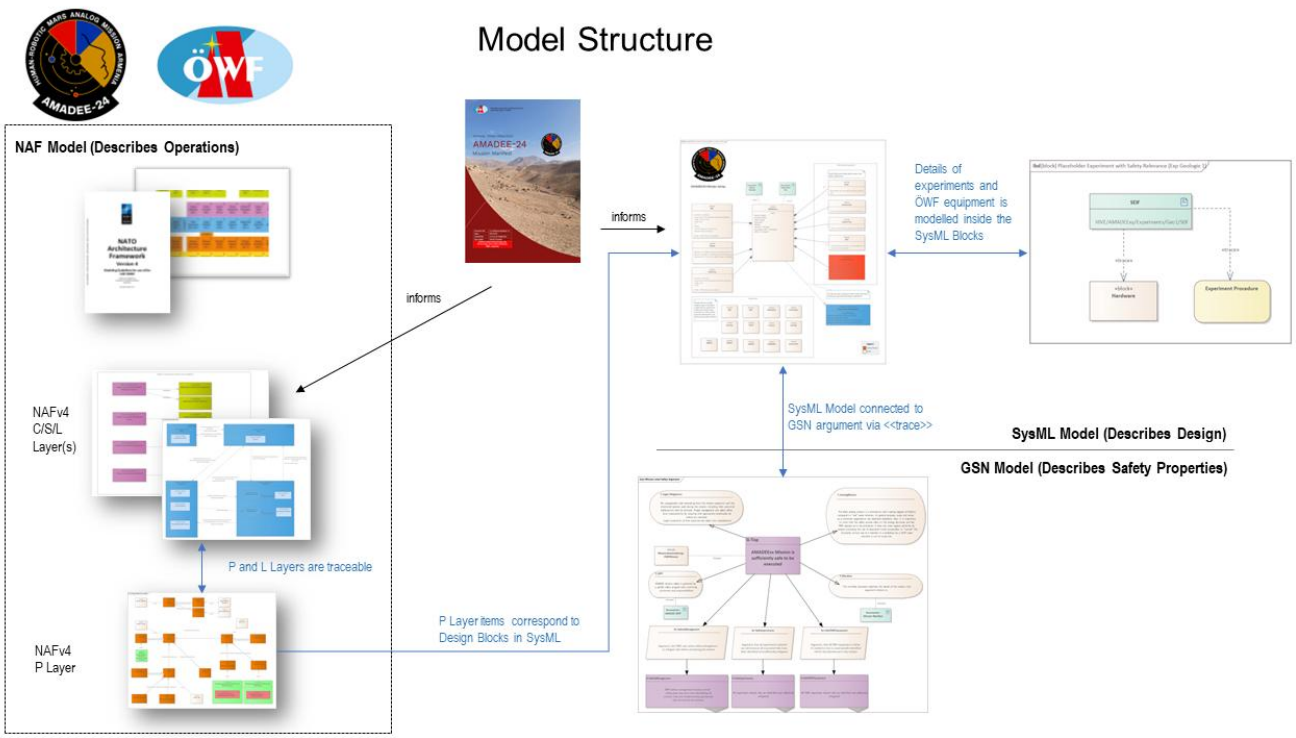


Figure 2: Structure/Relationship of Mission Manifest, Mission Model and Safety Argument

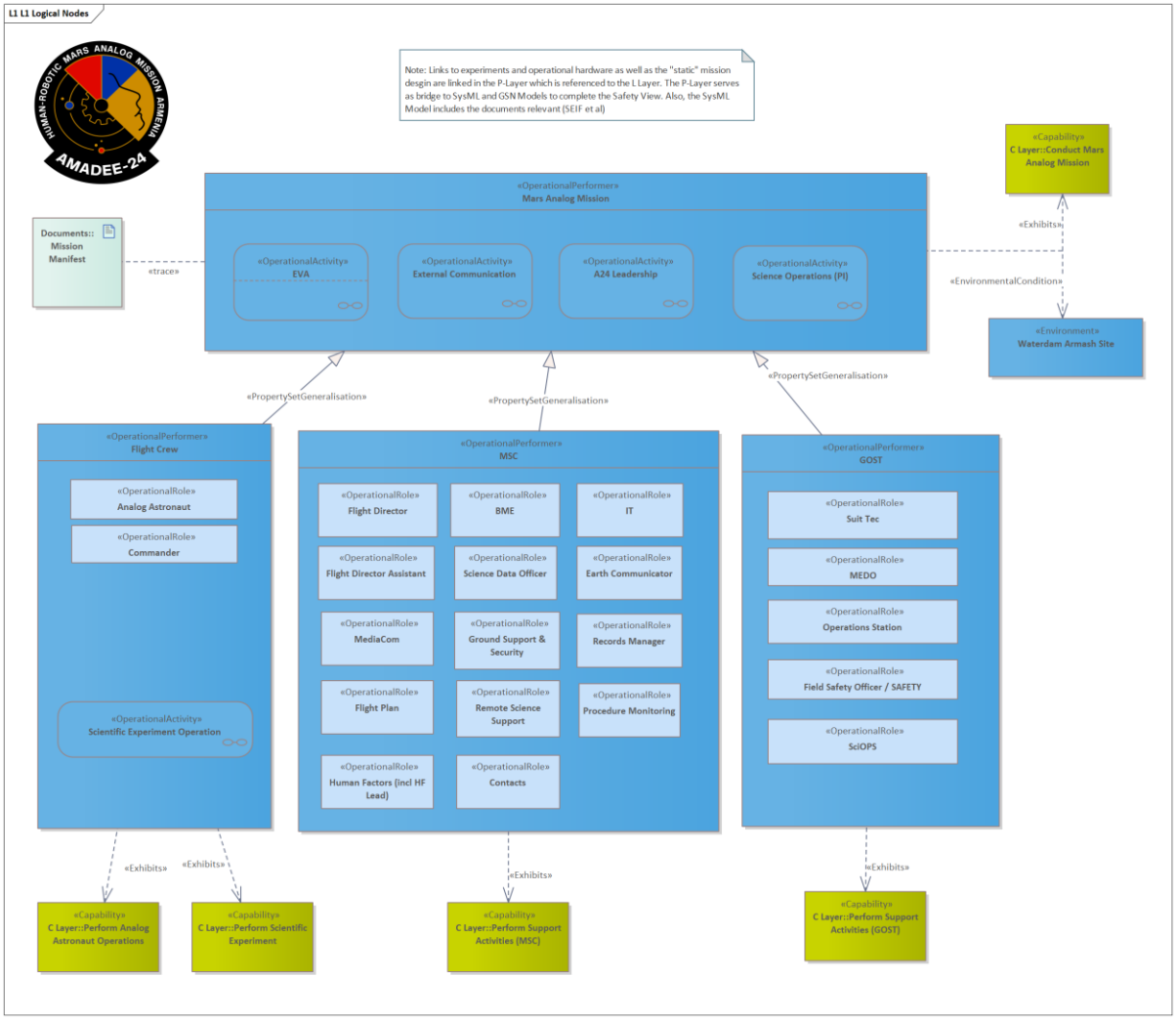


Figure 3: Mission Layout in Logical View according to NAFv4

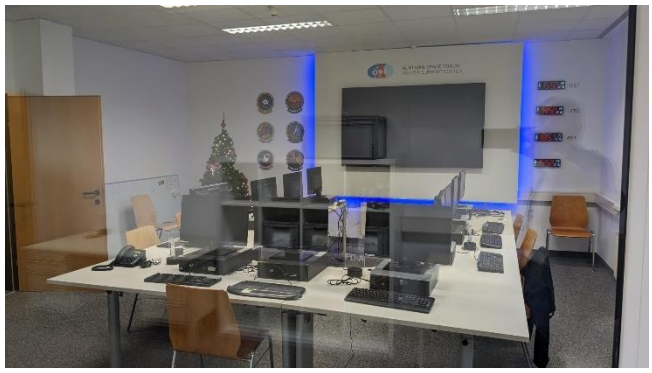
12. Mission Support Center

The Mission Support Center, located in Vienna/Austria comprised the core element of the "Ground Segment" of the mission, interacting with numerous external organizations. It was the single point of contact for the field crew.

During the bridgehead-phase, it was connected to the field in real-time. During simulations starting after the mission start day, a 10min time delay was introduced, to account for the average signal travel time between Earth and Mars.

MSC rooms

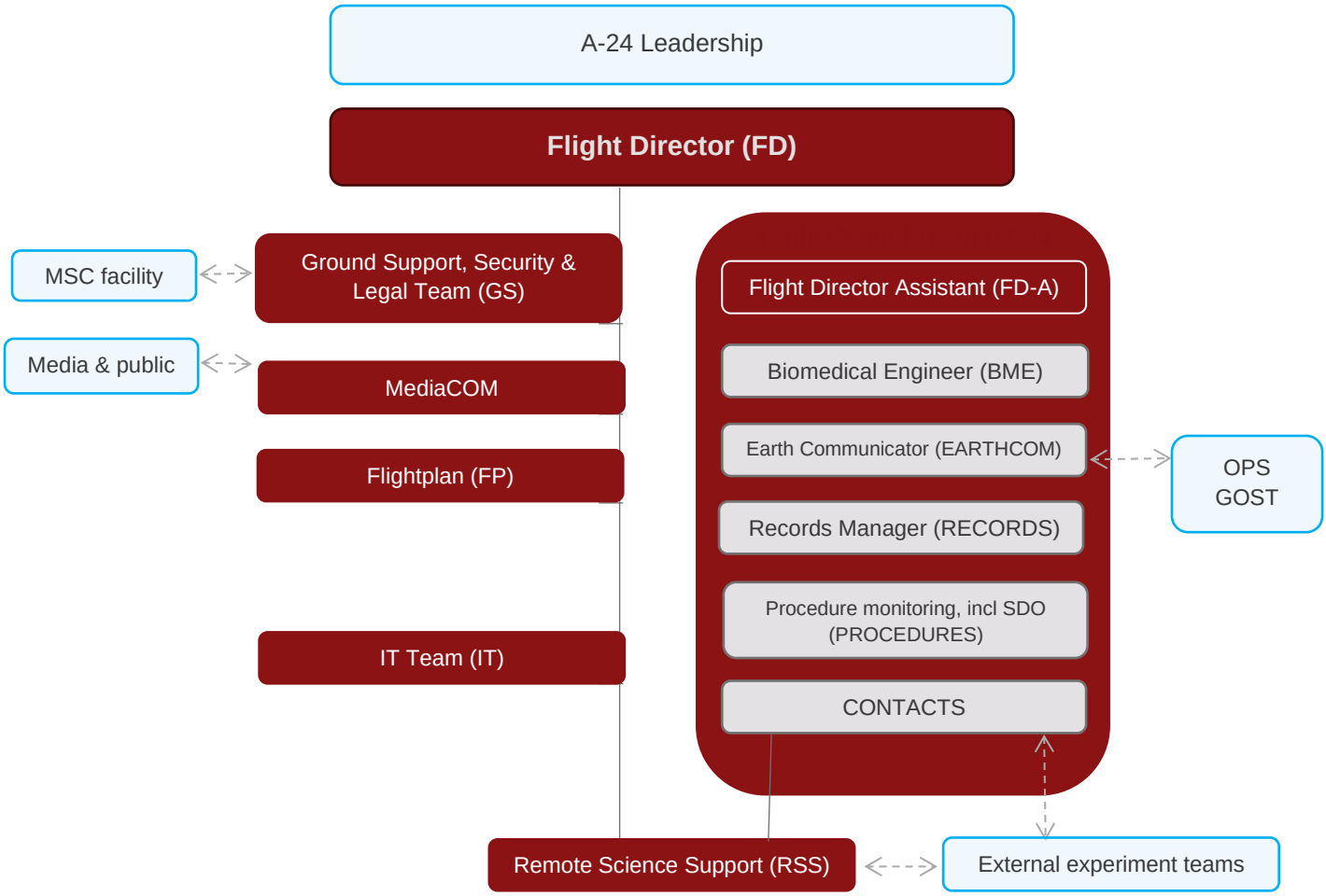
- **Entry point / registration desk:** Every visitor or MSC team member was required to register at the registration desk when entering the MSC building. After that he or she would receive a badge, allowing that person to enter.
- **Flight Control Team Room:** The heart of the Mission Support Center was the Flight Control Team Room ("FCT"), where the Flight Controllers managed the mission. Also located in the FCT room, the Science Data Officer was responsible for the data pipeline between the field and the MSC, including the management of the data archive.



- **Ground Support, IT:** These two rooms hosted the team managing the facility and security aspects, ensuring the access control and handling logistics, including transportation. The IT team was responsible for operating the IT infrastructure (also remotely from Innsbruck/Austria), assisted with trouble shooting at the consoles, ensured IT security and interacted with the Science Data Archive team. The IT server infrastructure including the science data archive was located in a secure facility of the Austrian Space Forum spacesuit laboratory as well as the MSC itself..
- **Flight plan:** Based upon input from the RSS, operational needs, safety considerations and external requests, the Flight plan team scheduled the activities for the field crew, authorized by the Flight Director.
- **RSS:** These two rooms were the center of the scientific operations, where the science data was received, analyzed, and interpreted in near real-time.
- **MediaCOM:** This room housed the traditional and social media teams and was the gateway to the public, also used as a seminar room for visiting groups. The teams' duties include image or text releases, blogs, video editing and the management of media and visitor inquiries.
- Social room / Cafeteria

MSC organization and positions (preliminary)

The figure below represents the MSC configuration; designations are given in full and their abbreviation (e.g. Flight Director (FD) as “FLIGHT”, which was also his/her call-sign). Boxes in blue represent external parties not present in the MSC together with their point of contact in the MSC respectively.



Flight Director (FD, call sign “FLIGHT”)

The Flight Director (FLIGHT) was responsible for the overall AMADEE-24 mission operation. (Some responsibilities was shared with the Crew Commander). During mission/simulation preparation, the FLIGHT was responsible for ensuring (at a management-level) that the resources of the MSC and the supporting operational ground segment are adequate to conduct mission operations. A designated Flight Director was on call 24 hours every day throughout the mission.

Flight Director Assistant (FD-A)

The FD-A acted as the “first officer” to FLIGHT. In principle, FLIGHT could delegate any task to the FD-A. However, the final responsibility and decision-making authority stayed with FLIGHT. During the mission, the Flight Director Assistant was responsible for updating the daily reports as part of the outreach activities of the MSC and ensured situational awareness.

Biomedical Engineer (BME)

The Biomedical Engineer (BME) had the overall responsibility at the MSC for crew health related issues. The BME provided support for all issues related to crew health and medical data

management, including monitoring of medical data, pre-flight preparation and post-flight rehabilitation. The BME also assisted in medical policy making.

Earth Communicator (EARTHCOM)

The Earth Communicator (EARTHCOM) was responsible for coordinating the communications between the MSC and the field crew (via chat during the time delayed mission phase and optionally also via voice during the preparatory phases). The position gave the communications a necessary comradely touch amongst all the pressures of mission schedule. EARTHCOM also conveyed to the field crew or MSC staff the respective point of view of the other groups.

CONTACTS

The science console and contact manager (CONTACTS) was responsible for the communication between the FCT and the PIs and researchers (supported by the RSS team). During ongoing experiments, CONTACTS supervised the connectivity and ensure readiness and a high level of situational awareness of the external parties. The decision on allowing external parties who were not experiment teams to access the telemetry stream beyond the public stream was taken by the Flight Director and the MediaCom.

Records Manager (RECORDS), incl. Science Data Officer

The Records Manager (RECORDS) ensured a continuous log file of what was happening in the field as well as in the Mission Support Center. This position was vital for the recording of the “as run flight plan”, which in turn was an element of the science data archive (maintained by SDO). The position also provides the input for updating the PIs on the progress of their activities. Biomedical recordings were NOT part of the RECORDS logfiles but are maintained by the BME due to their personal and sensitive nature.

The science data officer's (SDO, as part of the RECORDS positions) long-term responsibility ensured that all data collected during a mission (both experimental and operational) was archived to keep it safe and accessible to as many people as possible whilst maintaining controlled access. The SDO hence played a crucial role in transferring, managing and preserving the data acquired in the field, which might be relevant for future generations of researchers and students.

Procedure monitoring (PROCEDURES)

The procedure monitoring position (PROCEDURES) maintained the compilation of the standard operating procedures as well as experiment procedures to ensure that the field crew as well as the MSC has, at any time, access to the most recent editions. During the simulation, PROCEDURES observed if the sequence of events was according to the given procedures and informs FLIGHT in case any deviations (both time- or procedure-wise) occur that might endanger the operations.

Human Factors (HF)

Human Factors (HF). The Human Factors Team had the responsibility of supporting the Analog Astronauts and the Mission Support Center. During mission, operational data addressing well-being, mental health, performance, attention and sleep from the field, but also data related to intergroup communication and stress management in the Mission Support Center was analyzed and processed. HF provided support for all issues related to crew mental health and cooperates with BME on a daily basis. HF assisted the MSC in briefings and debriefings, especially in terms of conflict management. HF also assisted in conducting psychological experiments.

Remote Science Support (RSS)

The Remote Science Support (RSS) Team had the responsibility of supporting the experiments being conducted in the field as well as to represent research teams not present in the MSC. During missions, scientific data from the field was analyzed in near real-time and checked for

their completeness and accuracy. Based on that analysis, RSS also provided input to the FP Team and served as the first point of contact for the CONTACTS position in case questions about the experiments arise.

In the preparatory phase of the mission, the RSS Team was responsible for the communication of the mission to the scientific community, via the Announcement of Opportunity, and was part of the experiment proposal reviewing process.

After the mission, the RSS Team also ensured the scientific dissemination of the mission and its experiments through workshops, publications in peer reviewed journals and conference participations.

Flightplan Team (FP)

The Flightplan (FP) Team scheduled the activities to be conducted in the field, based on the input from the Remote Science Support Team, external experiment teams and the Media Communication Team.

The pre-mission planning included getting in touch with the Principal Investigators of the selected experiments. FP then compiled operational requirements relevant for the experiment conduct. Based on that information FP created the Mission Plan (MP), a rough schedule of all Field activities for the entire mission.

In-mission operations refined the activity plan to a more detailed schedule based on the Mission Plan. For scheduled EVA experiments a Traverse Plan (TP) was developed, specifying where experiments are to be conducted and the optimal route to get there. Together with auxiliary information, these plans were sent to the field crew. For AMADEE-24, a 3-day-in-advance planning strategy was used, i.e. the planning products were developed three days prior to the day they were intended to be executed.

Ground Support & Security (GS & IT)

The Ground Support and Security (GS) Team was responsible for managing the MSC facility and ensuring a high level of security, necessary to support mission operations. GS also supported MediaCom in public outreach activities and visitor receptions. The GS team was responsible staffing the entrance gate and handling access-control in the MSC.

The IT section was responsible for the operations of the IT infrastructure. Their tasks include server and electronic communication maintenance, security and defense from cyber-attacks, user account management and the administration of hardware assets.

Media Communication (MediaCOM)

The Media Communication Team (MediaCom) was responsible for the coordination of media activities and the management of media inquiries. They generally handle the communication of the mission to the general public via social media channels and traditional press, together with the generation of imagery by the Visuals Team. MediaCom was also responsible for event planning, especially involving interaction with VIPs.

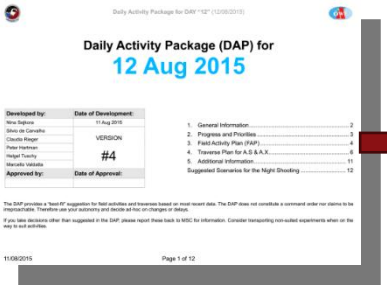
MSC Standard Operating procedures

All major workflows of the mission were defined via the OeWF Standard Operating Procedures (SOP), substantiated by experiment procedures and supported by background workflow documents of the respective science teams.

Several teams had extensions to the SOP's, such as the Biomedical Engineering Team or the Flight Directors, which also comprised to privileged information (such as confidential medical records, or security-related matters).

The SOP's were developed internally at the Austrian Space Forum and are documented in the AMADEE-24 SOP compendium, together with the experiment procedures, as well as the field crew rules and procedures.

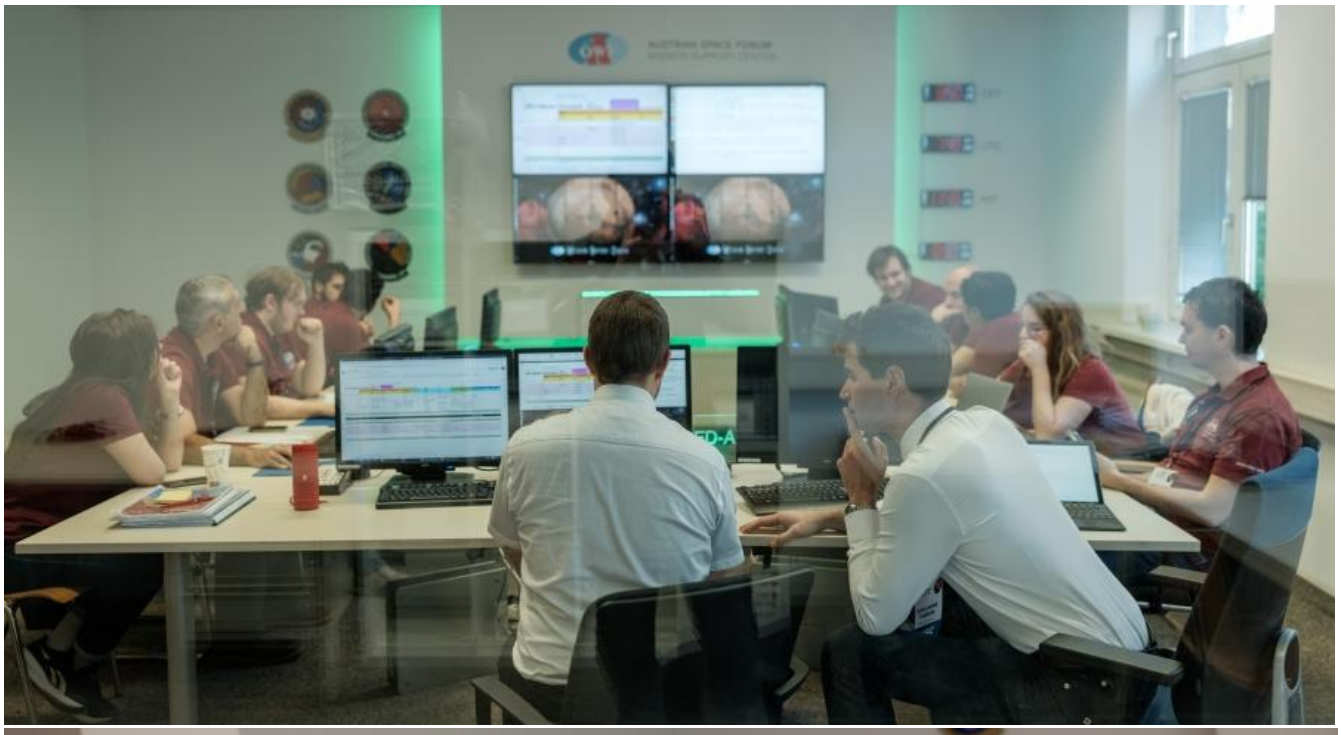
The procedural sequence was as follows:

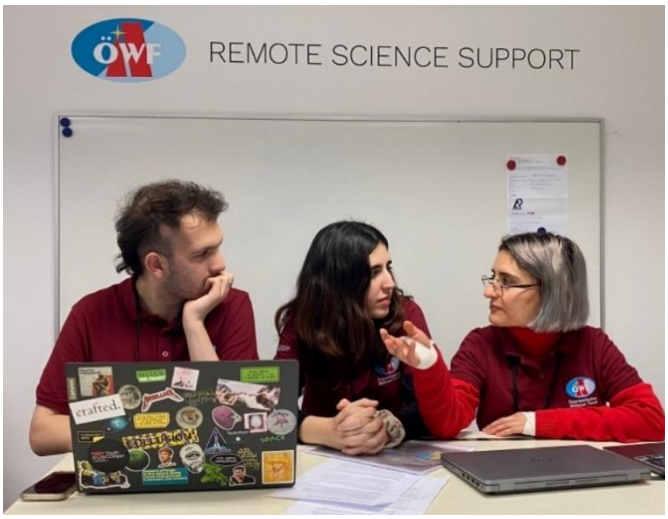


Mission Plan/Daily Activity Plan

Standard Operating Procedures
Who was <u>responsible?</u>

Experiment procedures
<u>How</u> to do it



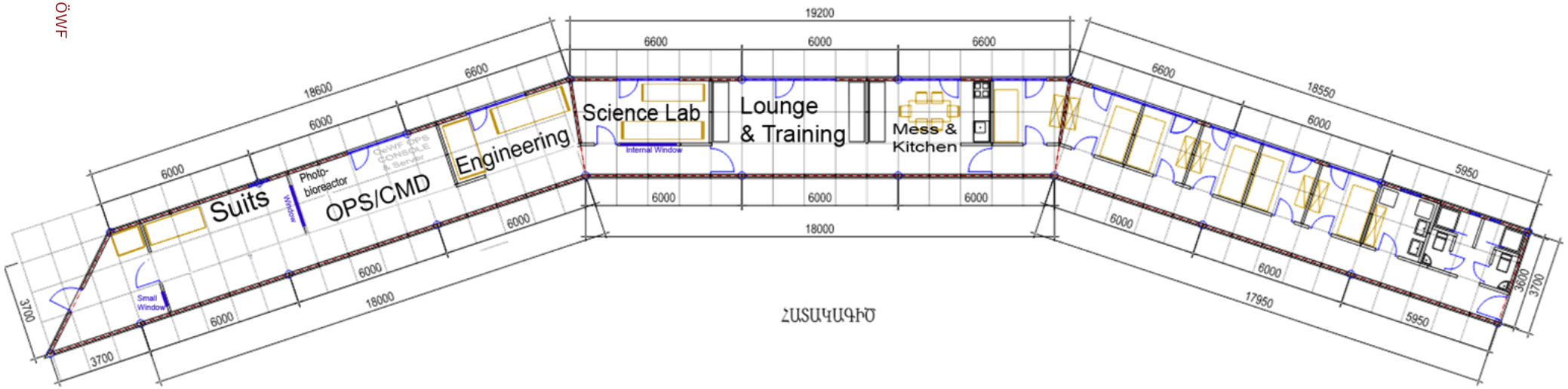

REMOTE SCIENCE SUPPORT


AUSTRIAN SPACE FORUM
MISSION SUPPORT CENTER
CET
BME

13. AMADEE-24 Base Station

All crew modules had illumination, windows, power outlets and air condition.

- **Command module:** for operations & space for donning/doffing the spacesuits.
- **Engineering/Science container** for science and engineering operations
- **Crew quarters** for 6 people
- **Storage space container** for storing engineering equipment, samples etc
- **Mess:** kitchen & cantina space, including tables/chairs for 6 people and kitchen cutlery.
- **Hygiene module:** field shower, toilets, sinks and water provisions



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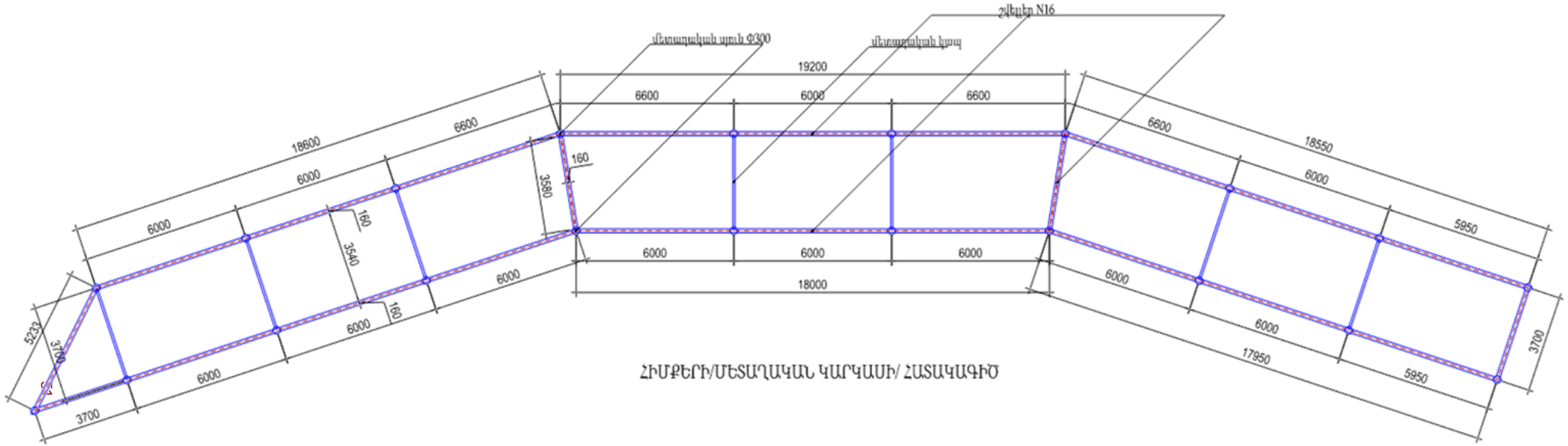

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Aerial view of the AMADEE-24 habitat and surroundings

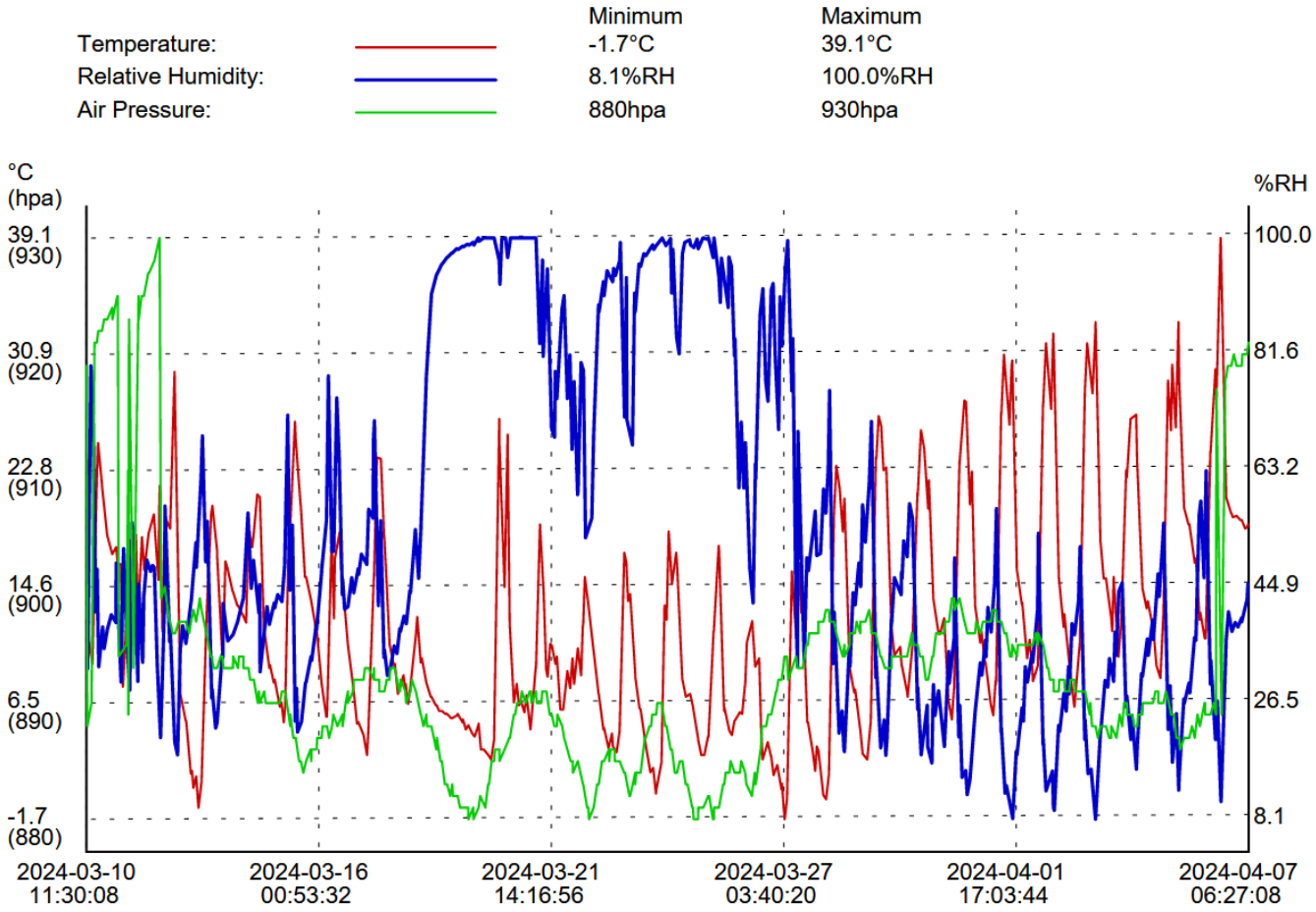


Dirt road construction for truck access to the test site in Armash (above) and hab life (below)






Environmental profile at the Habitat (location: roof of the station)



14. A-24 GOST Field office

GOST on-site personnel were trained from a variety of disciplines to perform in the field operations and support the experiments. They were divided into three tiers based on their level of training and experience.

The GOST team was located in the nearby village of Armash with basic commodities for accommodation, office / workshop etc rooms. The size of the GOST team was typically around a dozen individuals, in a mix of OeWF and Armenian team members.

COORDINATES

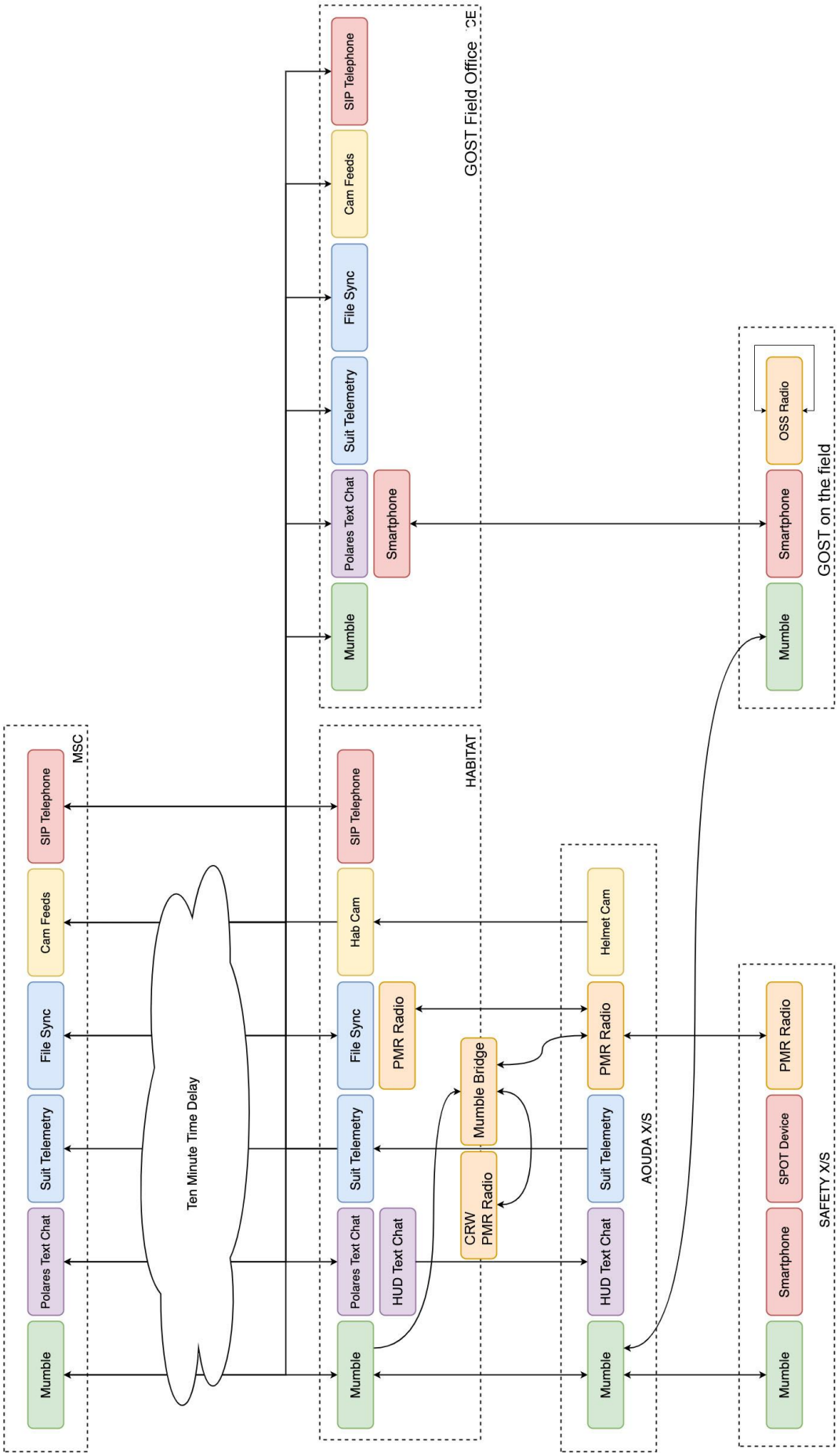
Habitat Coordinates: 39°47'40.7"N 44°49'40.9"E

(https://maps.app.goo.gl/nvkLsMPNMzV7VZXx8)

GOST Station Coordinates:

39°45'52.6"N 44°48'37.7"E
(https://maps.app.goo.gl/41iVsQR5gyqvtzAn9)

Communication with/within the field



15. Site Security and Checkpoint

As per the Memorandum of Understanding, due to the highly internation character of the mission, the AMADEE-24 site has restricted access to the actual test area. Only persons with proper authorization were allowed to enter the site. This security architecture was realized by Instigate, a technical college (“real school”) based in Yerevan, deploying teams 24/7 for the site protection. The protection of the AMADEE-24 mission area perimeter was performed by Real School, a high school offering vocational education through involving the students into real life projects. Technical facilities were supported by Instigate Robotics, and Angx NGO.

Area protection was implemented through

- 24/7 checkpoint service
- 24/7 video surveillance and monitoring
- daily and nightly UAV flights

Led by a senior (the teacher), teams of 6 students were on duty every day during the mission and stayed onsite for 24 hours until replaced by the next shift. The overall number of the students having participated in the area protection mission was 40. At every point in time there were 2 people in each group responsible for checkpoint service, i.e. letting the visitors in and out, 2 people for video monitoring, and two people for drone operation and other tasks.

One of the tents provided “workspace” for those responsible for daily surveillance and the other tent served as a living space where students could eat and have the night rest in shifts.

Checkpoint service

The team was notified through radio connection about the expected arrivals or exits for implementing the entrance control. Also, MSC and GOST notified about the Daily Activity plans via email, and if the plan contained an EVA, the team made clarifications about the possible need for convoy.

Video surveillance and command center

To have the full video coverage of the area, Instigate Robotics team installed 3 cameras powered by solar panels which provided a full day power supply during sunny days. During cloudy days the on-duty team used the power generators. The team used the Command Control Center SW developed by Instigate Robotics which allowed utilizing the area map while viewing the live streams.

Drone monitoring

Scheduled drone flights were operated twice a day to scan the entire area. To be able to implent this, Angx NGO organized a drone operation course for the Real School students and the best graduates were permitted to be operators during the mission. Night flights were planned to be operated upon emergency. Luckily, none was needed during the mission.

3D mapping

3D map of the area was used throughout the whole mission for EVAs.
The 3D map was made by Instigate team well before the mission start. After getting the video footages of the area shot by a drone the team used the Pix4d tool to get the high precision 3D map: 1 cm horizontal, and 2 cm vertical.

16. Field Crew (Flight & GOST)

The field crew was split into two teams

- Analog Astronaut-only **flight crew** (6 crewmembers)
- **Ground Operations & Support Team** ("GOST", ca 12 crew members, supporting the flight crew with activities, not to be conducted on Mars (eg SAFETY, or relocating WLAN infrastructure)

The flight crew was also subject to a rigorous nutritional and fitness training starting several months before the mission to ensure a physiological performance required on analog missions.

- **Exercise specialist: Guillermo Rojo**, Spanish athlete and sports & training professional, guillermorojogil@gmail.com

All analog astronaut activities, including public appearances, science trainings etc were managed by the Analog Astronaut Support team (AA-S)

- **AA-S teamlead: Claudia Kobald,** Claudia.kobald@oewf.org (Dpty: Christian Schwarz)

Flight Crew / Commander (CDR) AA Anika Mehlis (Dpty: AA Robert Wild)

The Crew Commander (CDR) had overall responsibility for all simulation field operations. That includes overall activity planning and scheduling task, the GOST was managed independently by the GOST commander. This position was in direct contact with the Flight Director outside simulation, e.g. during contingency situations or for managing policy or administrative issues. The CDR had final authority on all decisions to be taken at in the field, especially in the case of contingency situations. The CDR was responsible for maintaining contact with local authorities and media on-site.

Operations Station (OPS)

OPS (red jacket) coordinates –similar to the FD-A at the MSC- the operational activities as directed by the CDR and EARTHCOM. This position was the counterpart of the MSC EARTHCOM, usually communicating in time-delay mode via text protocol. Off-Sim and during emergencies, OPS can switch to real-time audio communication. This position represents the "extended eyes and ears" of the MSC, providing MSC with a continuous update on field activities.

SciOPS

As an "extended arm", the RSS had a liaison function available in the field. This position, called "SCIOPS", managed the scientific hardware in the field and procures the samples obtained. SCIOPS was aware of all scientific activities carried out at any given moment, including what had actually been accomplished, where the samples were obtained, what instruments were in which condition etc. SCIOPS assists the SDO in maintaining the science data flow.

FLIGHT CREW

CDR: Dr. Anika Mehlis (Germany, Class of 2019)

Born in 1981 in Germany, Anika Mehlis studied biology with a focus on Microbiology at the Free University of Berlin, as well as Engineering for Environmental Technology and Recycling at the University of Applied Sciences Zwickau. During her second university degree, she worked as chemical-technical assistant at an environmental lab and as lecturer for Biology at the Univ. of Cooperative Education Plauen. She spent several years as a team lead in a public health department. After finishing her PhD studies recently in Public Health at Bielefeld University, she works as a scientific officer in “infection protection and environmental medicine” for the Academy of Public Health Services Düsseldorf, Germany. Mrs. Mehlis was fluent in German and English and had basic knowledge of French and Spanish.

Deputy CDR: Dr. Robert Wild (Austria, Class of 2019)

Born in 1982, from Innsbruck, he completed his BSc in Physics at the University of Arizona and his PhD in Physics at the University of Colorado. Dr. Wild’s research topics have included matter wave diffraction, the quantum mechanics of ultracold atoms, and laser-based trace gas detection. Currently, his focus was on laboratory studies of interstellar ions as a senior scientist at the University of Innsbruck. He had published in numerous scientific journals – including Nature, was a trained Wilderness First Responder and Advanced Open Water Diver, He fluently speaks English and German and had good command of Spanish.

Dr. Carmen Köhler (Germany, Class of 2015)

Carmen Köhler was born in 1980 in Berlin, Germany. After training as a hairdresser, Dr. Carmen Köhler studied math and earned her doctorate in physics. Today, she worked as a project manager at the Fraunhofer Institute for Intelligent Analysis and Information Systems IAIS and was primarily concerned with the topic of artificial intelligence. As part of the project "AI in Vocational Training", she teaches trainers and trainees how AI can be introduced into training and numerous professions. She was also the founder and CEO of P³R GmbH, which provides weather and earth observation data services, and conducts research as an analog astronaut in Mars-like regions on Earth for future Mars missions. Köhler was fluent in German, English and Italian and speaks Spanish and French.

Dr. Simone Paternostro (Italy, Class of 2019)

Born in 1986 and originally from Italy, Dr. Paternostro holds a bachelor’s degree in Aerospace Engineering, a master’s degree in Space Engineering as well as a 2nd level master’s degree in Space Transportation Systems, and a PhD in Engineering Surveying and Space Geodesy. Initially, he worked as an AOCS/GNC intern at EADS Astrium (now Airbus Group), followed by a research position at the Institute for Aerospace Technology, Univ. of Nottingham, UK. He was currently employed as a Payload Integration Manager in ESA’s Space Research and Technology Centre (ESTEC) where he supports the development and integration of payloads on board of the ISS (International Space Station). Dr. Paternostro speaks Italian and English fluently and had a basic knowledge of German and Dutch.

Iñigo Muñoz Elorza (Spain, Class of 2015)

Iñigo Muñoz Elorza was born in Spain in 1979. He studied aerospace engineering at the UPM in Madrid, Spain and Astrophysics at the Valencian International University, Spain. He was linked to operations, as Operation Engineer at E-USOC, Madrid, for the Columbus module (ISS), and as an Astronaut Instructor at the European Astronaut Center in Cologne. Mr. Muñoz Elorza worked at HE Space Operations GmbH, serving as Galileo Mission Operations Preparation Engineer at DLR GfR (Galileo Control Centre) in Weßling. Currently he was the Training Manager at the Galileo Control Centre in Oberpfaffenhofen, Germany. Mr Muñoz Elorza was fluent in Spanish, German, English and speaks Italian. He was a certified skydiver, paraglider pilot, and diver.

Dr. Thomas Wijnen (The Netherlands, Class of 2019)

Born in the Netherlands in 1986, Dr. Wijnen completed his bachelor's degrees in mathematics and Physics & Astronomy at the University of Utrecht, the Netherlands. Followed by a research internship at the Universidad de Valparaiso, Chile, a master's degree with distinction, and a PhD in Astrophysics, he had been captain in the Royal Netherlands Air Force Reserve and engages in projects on space situational awareness for the Dutch Space Security Center. He works as instrumentation coordinator for NOVA, Netherlands Research School for Astronomy, coordinating the many instrumentation projects in which the Dutch astronomical community was involved. Dr. Wijnen holds a PADI scuba-diving and a parachute license and was fluent in Dutch and English. His language skills include intermediate Spanish as well as basic French and German.

On-Site Support (GOST)

GOST CDR: Gal Yoffe (remote participation)

GOST Leadership:

- Eleonore POLI, Team and Science coordination
- Judith KUEMMEL: Quartermaster & Transportation logistics
- Lukas PLAZOVNIK: IT & Communication

This team was a mix of analog astronauts, experienced field crew members and representatives of Armenia to support the flight crew. They were coordinated via the Mission Support Center and usually did not interact with the flight crew. GOST was synchronized with the flight crew (time-delay wise they are on Mars-time), except for interaction with local partners (eg for logistics interactions).

Their responsibilities included maintaining safety, communication infrastructure, site security, conducting scientific experiments and coordinating visitors during the bridgehead phase.
Crew isolation protocol

Aims of the isolation protocol

To provide a realistic platform for the experiments, observing isolation protocols was enacted, ensuring the best scientific output. As some of the experiments were conducted by both CRW and GOST, a separate protocol addressed the joint usage of experiment hardware. From a simulation

perspective, the GOST team reflected future capabilities representing e.g. autonomous, robotic or AI systems during an actual Mars mission.

Assumptions

- **Isolation enacted: 08Mar-12Mar2024**: bridgehead phase with no isolation protocol enacted, visitors on-site; 12Mar-05Apr2024: sim-days
- **TEAM SIZE:** 6 analog astronauts as CRW inside the base station, 10-20 persons GOST, coordinated via the MSC/FP, 20-60 persons MSC
- **In-Sim**:
    - time delay 10min one-way between Field & MSC, no time delay between GOST & CRW (both GOST and CRW are operating in “Mars time”).
    - 2-way text chat communication between Field & MSC; MSC & GOST was passively listening in into voice loop(s)

Protocol applicability

- The isolation protocol applied to the CRW only, i.e. GOST and MSC implemented the isolation protocol only with respect to the CRW
- In case of emergencies affecting CRW or GOST members, including those back home, the isolation protocol was immediately terminated

Basic rules

- Emergencies back home or at the station were excluded and messages were to be relayed as soon as reasonably possible
- AA’s were only allowed to leave the base station whilst wearing a spacesuit during EVA’s. Overall-suited walk-outs were only allowed if directed my MSC (eg emergency retrieval of a hardware item), but never used.
- In-Sim: defined by sim-start/end according to SOPs (“mostly” during daylight, night-time EVA’s possible); no 24/7 simulation (Out-of-sim communication nevertheless was limited as it definitely impacts in-sim operations during the day; the balance was tbd and might be varying on the type of duty station affected)
- Maintenance, servicing and minor repairs were first attempted by the CRW as trained and directed by MSC, before GOST support was activated. Base station’s IT was physically accessible from the outside.

CRW Limitations

SERVICE / Comm-Channel	In-Sim ("Day")	Out-of-Sim ("Night")	Black-Day
Time-delayed chats	Yes, 10min one-way delay	Not active/not required (except immediately before going in/out of sim as per SOP)	No
Real-time chats for private use (eg Whatsapp-chat) & Email	No	Yes	Yes
Spacesuit telemetry	Yes, 10min one-way delay	Yes, eg for maintenance	Yes (if suit was activated)
Experiments: data to MSC (except for regular daily data dumps)	Yes, as foreseen by experiment planning (eg automated time-delayed transfers)	Yes, eg for maintenance	No, unless specifically planned for eg long running updates)
Telephone & Internet-based voice communication in real-time (Mumble, Skype, VoIP, Whatsapp, etc)	No	Yes, but some technical restrictions might apply (bandwidth limitation etc)	Yes
Being able to access the web (eg for news)	No, unless authorized by CRW CDR (eg in case of LoS with MSC for checking weather)	Guideline/Recommendation: 30min/personday	Yes

GOST – FLIGHT CRW Interaction

- In case of emergency (eg code-red situation), the isolation protocol was to be terminated
- In general, no direct physical, verbal or gesture interaction between GOST and CRW in the field (GOST might be in sight (not hiding out), but not interacting unless planned)
- CRW communicated with GOST via text chat only.

Assumptions:

- GOST was in the same loop as CRW; MEDO also listening to Back-up radio
- SAFETY was part of GOST
- GOST-specific maintenance necessary (eg spacesuit technical problem):
    - If h/w was to be moved to the airlock, GOST retrieved it to shipping container or equivalent, where pwr, comm and basic workshop were provided, and h/w could be serviced
    - If h/w could not be moved and physical repair inside the station was required: GOST accessed e.g. during AAs out-of-sim hours or a simulated radiation alert (e.g. AAs restricted to sleeping quarters)

17. Media Activities

The OeWF was coordinating the media and outreach efforts based upon a communication plan, detailing the media milestones, key messages and workflows as well as the management of crisis situations. The media plan had been developed in close coordination with the Armenian Aerospace Agency representative. The official wording was:

> *"AMADEE-24 was a Mars analog simulation in Armenia, managed by the Austrian Space Forum hosted by Armenian Aerospace Agency."*

Both the AMADEE-24 partners and the OeWF and their respective partners may communicate to the public, using mission-specific items such as mission insignia, training- and mission-specific photography and videos, authorized statements from key personnel, sponsoring agencies, research entities and industrial partners, also after the mission.

The media team had prepared supplementary material and, until the start of the mission, press photos from previous missions were available from: https://oewf.org/en/press/photos/

In communicating to the public, the following applied:

1. Any communication would have to be authorized by an AMADEE-24 media team, in case of a dispute, the AMADEE-24 leadership would take a final decision.
2. All public communication (press releases, social media activities, photos/videos etc.) as well as media clippings was recorded in a media archive managed by the OeWF.
3. The OeWF compiled a set of press releases in German and English, including mission description, partner listings, quotable statements and contact staff members both from the Armenian and Austrian side.

Social media hashtags were **#simulateMars, #AMADEE24** and **#դեպիՄարս #դեպիԱպագա**
The mission tagline was **"Exploring tomorrow. Exploring Mars."**

Facebook: spaceforum | Twitter: @oewf | YouTube: oewf | Instagram: oewf_org | Flickr: oewf

Media authorization

Any communication regarding the AMADEE-24 mission and the Austrian Space Forum had to be authorized by the AMADEE-24 media team. The content had to be sent prior to the OeWF Media Team lead Monika Fischer (monika.fischer@oewf.org), with cc to the AMADEE-24 leadership Gernot Grömer (Gernot.groemer@oewf.org) and Reinhard Tlustos (reinhard.tlustos@oewf.org).

In order to approve the content, the following information was needed:

- When would it be published?
- When was the approval deadline?
- Where and through which media would it be published?
- In case the content was neither in English nor in German, a description in either of those languages had to be attached.

Media milestones

Date	Event	Description	OeWF Media Activity
April 2023	Mission badge release	Communication of A-24 mission insignia	Social Media with blog post
01Mar2023	Crew announcement	Information regarding Analog Astronaut crew (flight crew and back-up crew) released	Social Media Coverage, Press release (international, tbc)
Starting Sept2023			Presentation of experiments via social media
August 2023	Crew training starts	Mission specific training for Analog Astronauts	Pre-production (pre-mission interview series, group photos etc.)
02Sep2023	Dress Rehearsal I – Public Day	1st Dress Rehearsal, qualification test of experiment hardware, Team familiarization; MSC first operational test	Social Media Coverage Preproduction (videos + photos + PI interviews); start of weekly release of experiment videos
Jan2024	Dress Rehearsal II	2nd Dress Rehearsal, PIs, AA s and Team members @ Vienna, experiment hardware ready	Press conference on 26Jan2024 Social Media Coverage
Jan2024	Mission GO announcement		Release of mission trailer, press release announcing mission GO and upcoming shipment
31Jan2024	Shipment AUT→ARM	Hardware containers leave Vienna	
05-12Mar2024	Start of Bridgehead phase	Preproduction, B-roll shoots, Sponsor shootings, shooting with film production companies	
12Mar2024	Mission start	Start of the Isolation phase, from then on: interaction with AAs only via MSC Innsbruck	Press release, Live-coverage both at Mission Support Center and Armenia, press conference at MSC?
12Mar2024 - 04Apr2024	Isolation Phase		Social media coverage: i.e. Release of Reel of the Day; posts about sponsors and partners, wake up call, re-post of experiment-videos; take-overs of social media accounts by sponsors and partners
05Apr2024	Return to Earth	Crew leaves station; celebrates return & reflects on mission	Social Media Coverage Post-mission press conference Armenia + Start of student lectures across Israel – tbc, post mission press release Austria + international

A-24 Media Day 12Mar2024 and 05Apr2024

The AMADEE-24 media day was open to both the general media (complementing the TV crews already onsite for the major TV productions) and VIP visitors, such as members of the Armenian ministries, academic institutions, and regional attendees.

The idea was to showcase the station under controlled conditions to a general public, whilst the international media would be informed about the start of the mission. To avoid too many media crews taking too much crew time, there was a “media bucket” of media materials for free usage made available in high quality. Hence, on-site media teams only needed their channel specific snippets, but not the beauty shots (habitat fly-over, astronauts exiting airlock etc).

MARCH 12

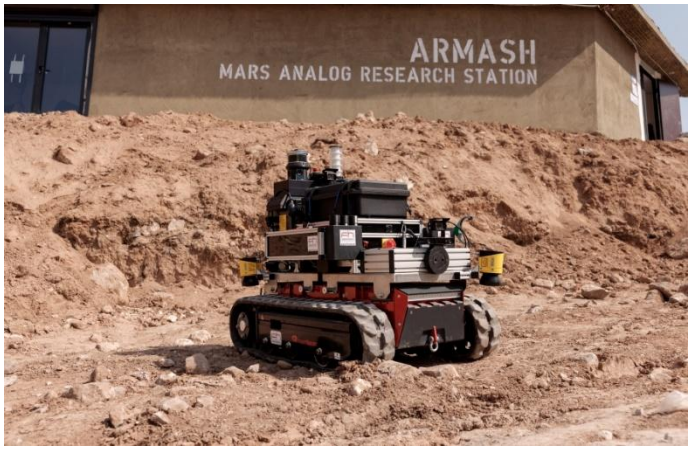
Agenda

AMADEE-24 Mars Analog Mission Start | Public Day

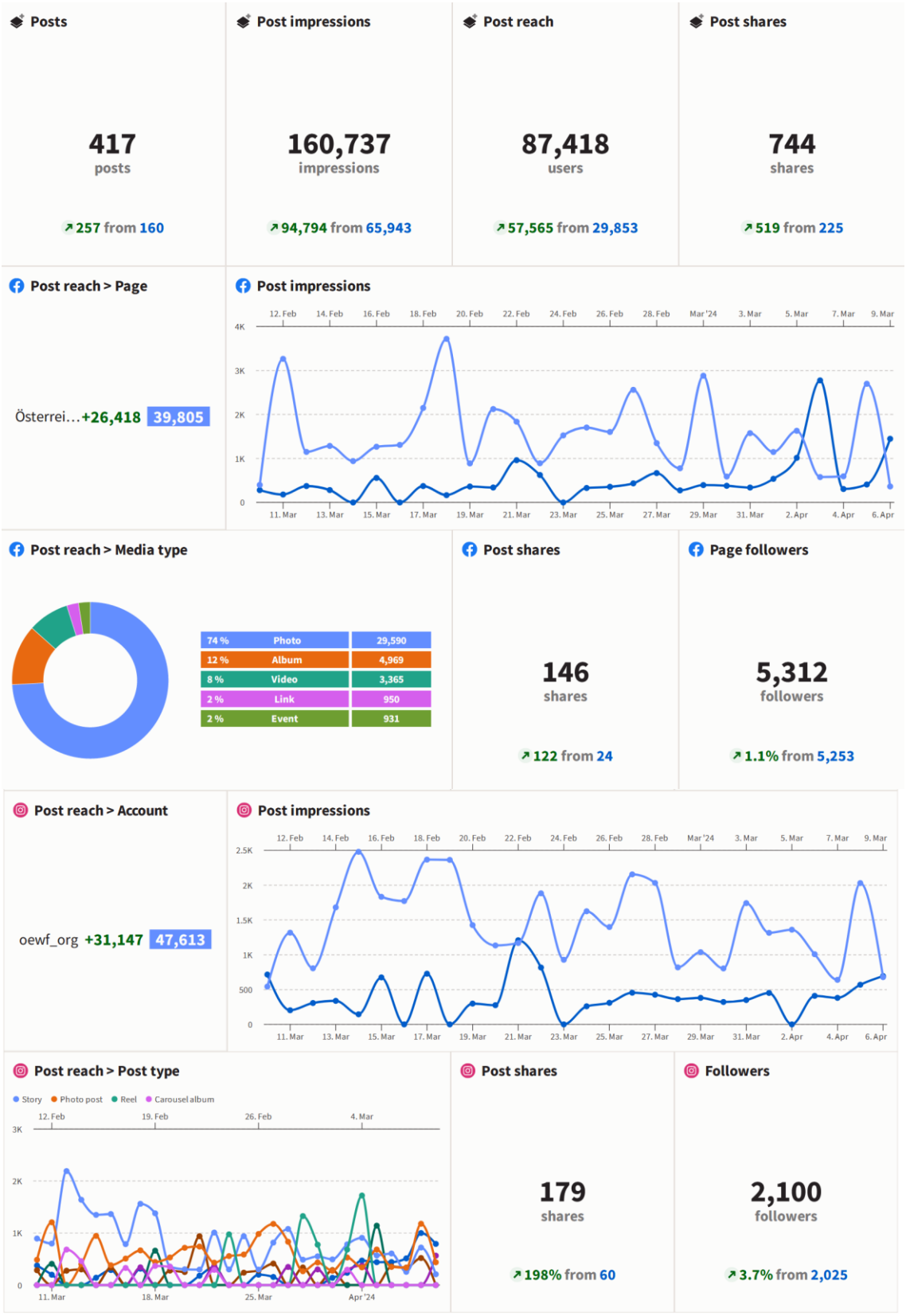
14:15	Field operations for local and international media representatives: Video recordings and interviews.
14:30	Arrival of Government representatives, AMADEE-24 partners, academic, technology representatives
15:00	Opening speech from organizers and key partners
15:30	**Press Conference** with the representatives of the Austrian Space Forum, Armenian Space Forum and AMADEE-24 Astronauts
17:10	**Start of the isolation phase:** Analog astronauts walk enter the habitat.
17:30	Closing


ARMASH
MARS ANALOG RESEARCH STATION


AMADEE-24
AUSTRIAN SPACE FORUM


ARMASH
MARS ANALOG RESEARCH STATION

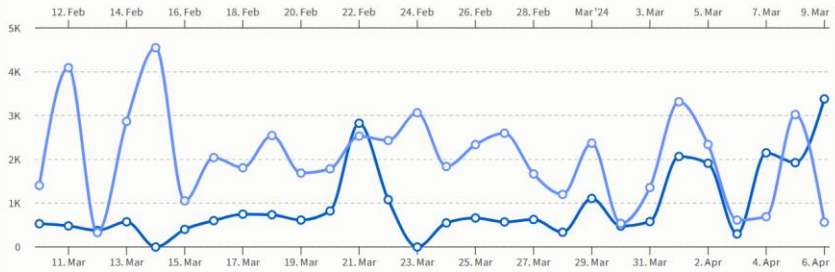
Social Media Statistics



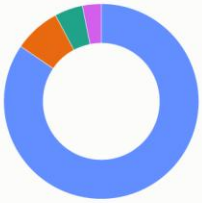
Post shares > Page

Austrian Space ... +111 199

Post impressions



Post impressions > Post type



85 %	Photo	47,985
8 %	Status	4,321
5 %	Video	2,611
3 %	Link	1,725

Page shares

65
shares

↗ 306% from 16

Followers

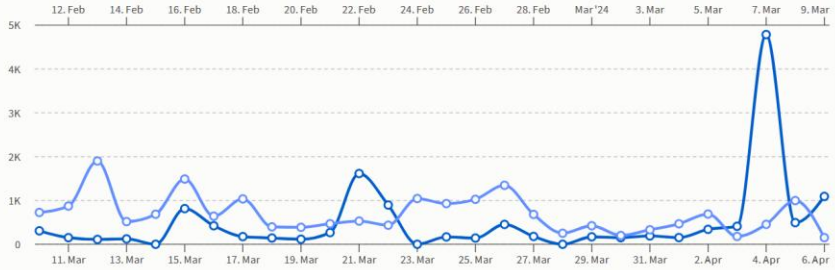
3,645
followers

↗ 6.8% from 3,413

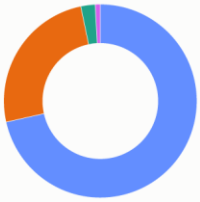
Post retweets > Account

@oewf +83 130

Post impressions



Post key interactions > Type



72 %	Likes	369
25 %	Retweets	130
2 %	Quote tweets	12
1 %	Replies	4

Mentions

72
mentions

↗ 227% from 22

Followers

4,960
followers

↗ 0.2% from 4,950

Page engagements

478
engagements

↗ 431% from 90

Post watch time

1d 6h

↗ 1.3K% from 2h 13m

Post video views

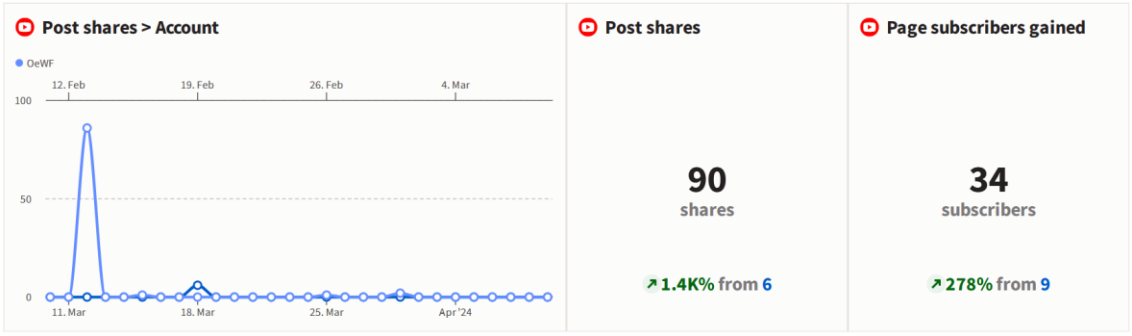
1,713
views

↗ 343% from 387

Page engagements

478
engagements

↗ 431% from 90



Report sources

Analytics

YouTube

OeWF

Twitter

@oewf

LinkedIn Pages

Austrian Space Forum (OeWF)

Facebook Pages

Österreichisches Weltraum Forum / Austrian…

Instagram Business

oewf_org

Livestream Mission Start Day AMADEE-24

	Youtube	LinkedIn *	Facebook	Twitter/X	TOTAL
OeWF	1.400	?	415	913	**2.728**
Gebr. Weiß		399			**399**
Fortis	950				**950**
EasyMotion		?	112		**112**
WBA		364			**364**
Lunares			57		**57**
TOTAL	**2.350**	**763**	**584**	**913**	**4.610**

Status: 26Mar2024 (19Mar2024)*

18. European industrial & marketing partners

Name of partner	Short description of partner	Contribution to A-24
AMADEE-24 experiment teams	We consider all external experiment teams as partners as well. However, those teams might have further partnerships with e.g. technology manufacturers on which the OeWF does not have any influence or relationship.	
Afrocoffee	Producer of fair trade coffee and tea	Provision of MSC amenities
EasyMotionSkin	Provider of electro-myostimulation its for physical AA training	Provision of training equipment for CRW
Fair-rescue	Local distributor of medical equipment (https://www.fairrescue.at/news/index.php)	Provision of medical equipment
Fortis	Manufacturer of luxury watches (https://www.fortis-swiss.com/space-collection/)	"Official timekeeper" supporting with creation of the A-24 watch
Gebrueder Weiss (GW)	Globally working transport and logistic company from Austria (https://www.gw-world.com/)	"Shipment and logistic partner" providing the hardware transport to and from Armenia
Governments Tyrol & Upper Austria	Dep. of Health and Sciencen (Tyrol) + the Dep. of Social & Health (Upper Austria)	Financial support for Outreach activities in schools & MSC
Thomas Krenn AG	German provider of IT hardware	OeWF server hardware
Realsim AG	Augemented Reality solutions	AR DEM model with telemetry display for MSC
LANCOM	Provider for IT solutions and manufacturer of W-LAN hardware (https://www.lancom-systems.com)	Provision of W-LAN equipment, Polo shirts and a training
Manastech, Argentina	Software engineering for unconventional prototypes, https://manas.tech/	Software support for the Aouda Head-Up Display
PBS Swiss Tools	Manufacturer of mechanical precision tools (https://pbs.swisstools.com)	Provision of mechanical tools like screwdrivers
TesPack	Manufacturer of portable solar panels and power banks (https://www.tespack.com/)	Marketing cooperation
X-Technology	Manufacturer of high-performance sports garment (https://www.x-bionic.com/en)	Provision of high-function undergarment for AAs

19. Science Strategy Overview

Exploration Cascade

The AMADEE-24 expedition focussed on the interplay of the respective instruments and experiments relevant for human-robotic Mars missions. Based upon the research question of how to identify biomarkers, which in turn was traditionally based upon the characterization of the (paleo-)geoscientific environment, the experiments were choosen to reflect a realistic sequence of activities.

This strategy was based upon the "exploration cascade", an algorithm defining an efficient deployment sequence, providing the framework for the following question: "*which instrument needs to be active where and when, leading to what kind of data sets, leading to what kind of knowledge, leading to which type of input for the tactical flight planning*"

As suggested by Neveu et al. (2018) life-detection measurements must be sensitive, contamination-free regarding the absence of interfering signals, and reproducible; one or more features must be detectable, preserved, reliable, and compatible with life on Earth. Experiments will be scheduled according to a flight plan defining the resources, location and timing as well as considering the processing pipeline between data acquisition in the field, data transfer and integrity checks and the subsequent near-real time interpretation to formulate a hypothesis. This than translates into a scientific input into the tactical flight planning for the field crew.

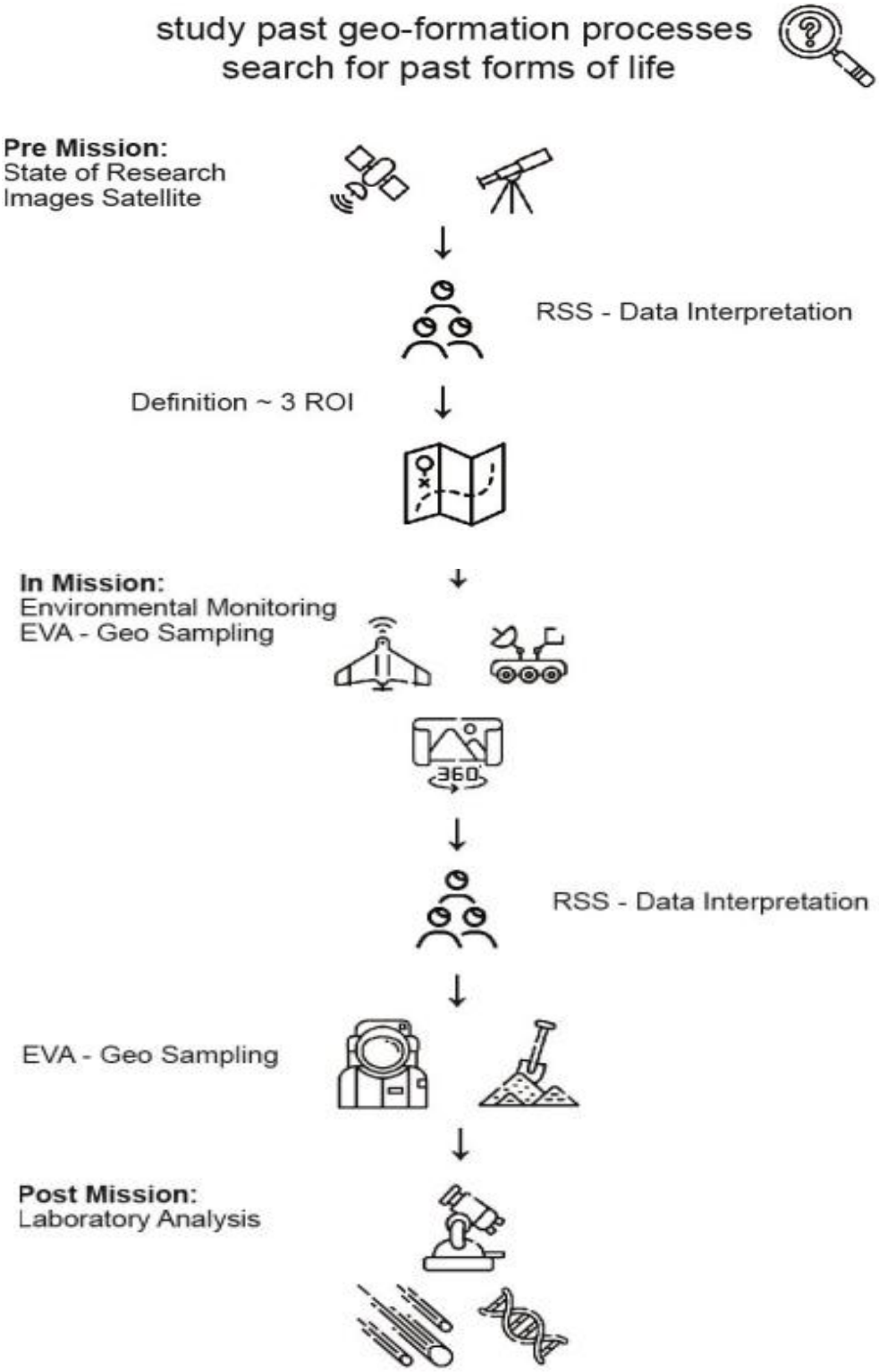
For details we refer to the BSc work of Stefanie Garnitschnig from 2018 on the Exploration Cascade (available via www.oewf.org → Research → Academic theses).

Besides the search for life and the preceding characterization of the (sub)surface and aeolian environment, robotic elements such as copters, rovers or human-operated tools are considered as an enabler to perform the science. Therefore, robotic experiments are selected according to their enabling potential (such as mapping, carrying an instrument or rock sample), and not on their engineering maturity or engineering demonstration alone.

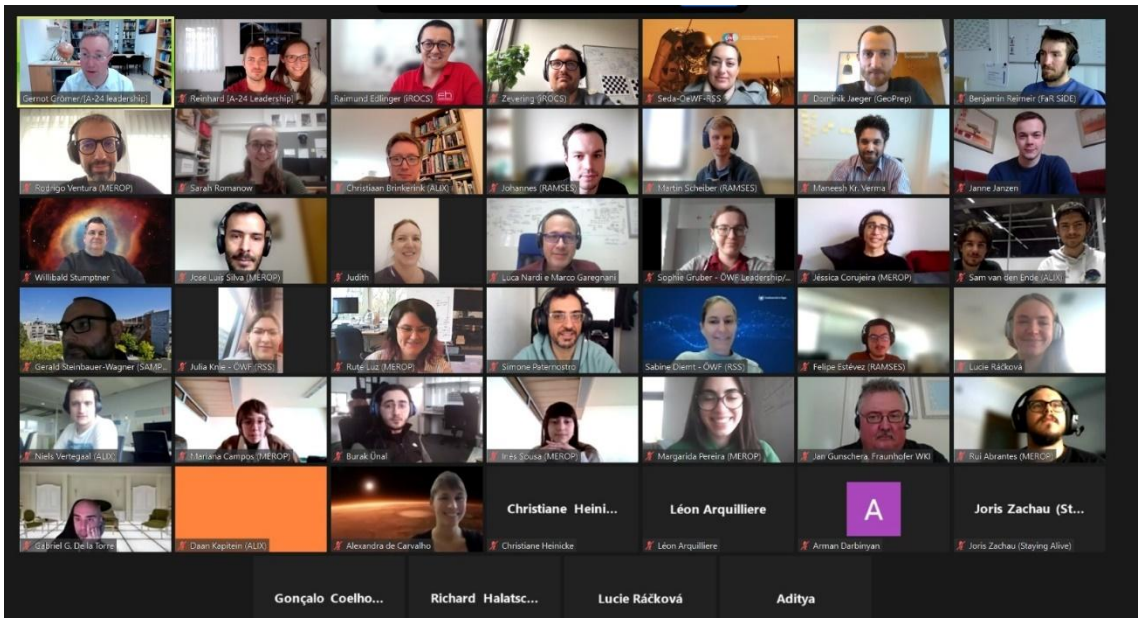
ROI = Region of Interest

Exploration Cascade Workflow

The Exploration Cascade constitutes an algorithm defining an efficient deployment sequence, providing the framework for the following question: “which instrument needs to be active where and when, leading to what kind of data sets, leading to what kind of knowledge, leading to which type of input for the tactical flight planning”



20. Experiment Descriptions & Contacts



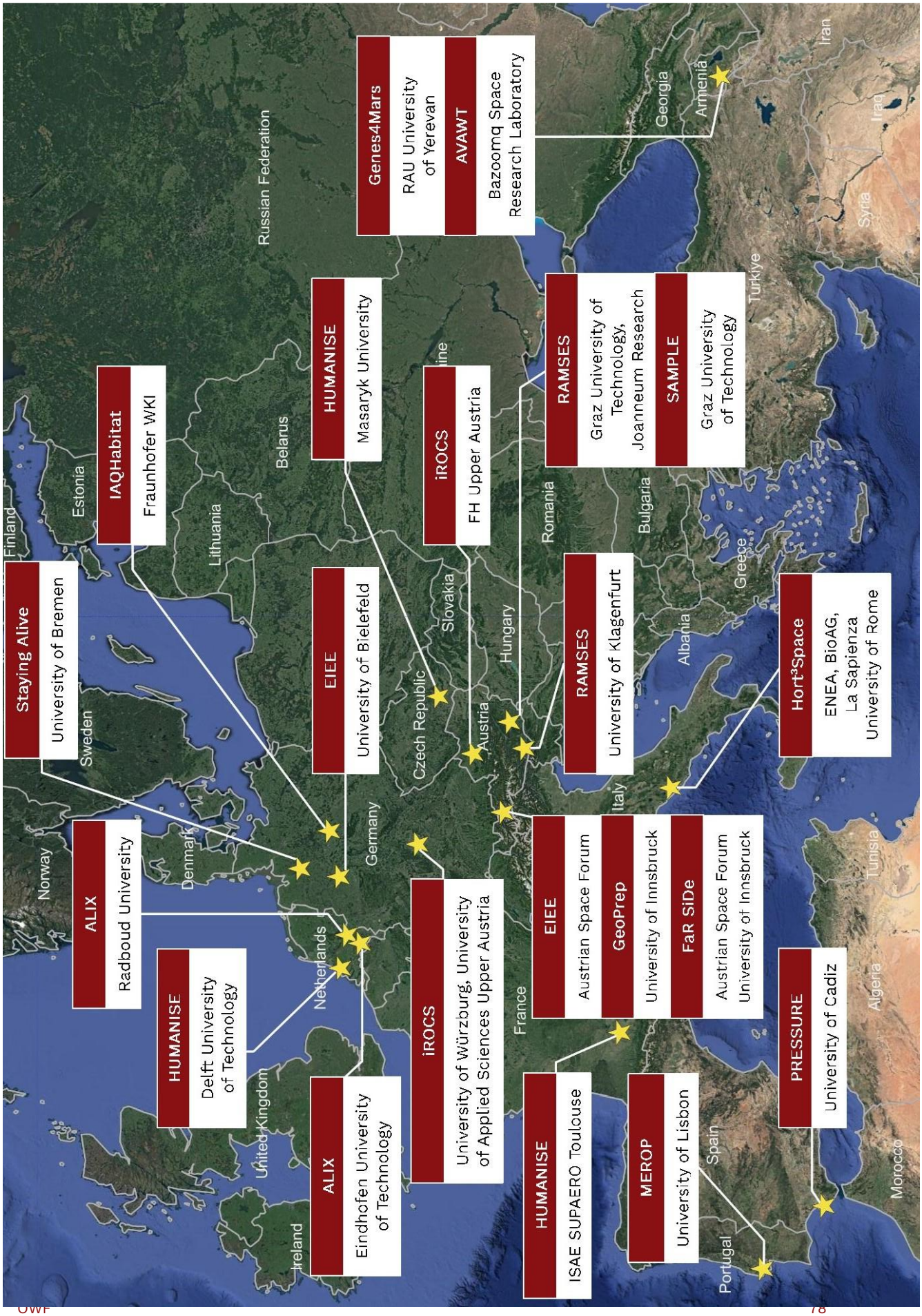
Principal investigators meeting during the AMADEE-24 Sci. Def. Workshop in Feb2024.

This was a listing of the experiments scheduled for AMADEE-24. However, in addition, there were several science experiments planned which are not affecting the field operations as they were purely passive or based upon science data archive analysis or are solely engineering tests.

Experiment Overview

Name	Category	Institution	Description
IAQHabitat	Engineering / Habitat	Fraunhofer WKI Germany	Habitat indoor air quality measurement.
Emotions in Extrem Environments	Human Factors / Psychology	ÖWF / Human Factors, Austria Bielefeld University, Germany	AA intrinsic/extrinsic emotion regulation strategies, using CERQ questionnaire + audio recordings, emotion listing and logbook in the evening.
FaR SiDe	Human Factors / Medical	ÖWF / Aouda Austria Institute of Mechatronics University of Innsbruck, Austria	Biomech model verification of estimations of skeletal muscular and cardiovascular fatigue, using motion capture, force sensors, EMG/ECG, NIR, spirometry.
GeoPrep	Geoscience	Institute of Geology, Mineralogy and Petrology University of Innsbruck, Austria	Geo-sampling selection and curation within habitat; performing a petrological analysis with simple tools (incl. cutting / polishing samples), microscopy optical/Raman/IR; post mission lab analysis.
iROCS	Robotics	Forschungs & Entwicklungs GmbH FH Upper Austria, Austria Julius-Maximilians-University Würzburg, Germany	Robotic scene-understanding/obstacle evaluation, sample collection and identification, semantic mapping and terrain modeling in desert environments with mobile, spherical robots or with handheld devices.

		University of Applied Sciences Würzburg-Schweinfurt, Germany	
MEROP	Human Factors	Instituto Superior Técnico University of Lisbon, Portugal	Human-robotic multimodal teleoperation interface for AA teleoperations and MSC t/m visualization; this shall allow AA's to switch between semi-autonomous teleoperation and direct control.
Staying Alive	Engineering / Habitat	ZARM - Center of Applied Space Technology and Microgravity University of Bremen, Germany	A photobioreactor as the air revitalization component of the Hab life support system, equipped with a situationally aware and interactive sensor network. The study also assesses the psychological impact, reactor control from Earth and crew interfacing.
ALIX	Engineering	Radboud University, The Netherlands Eindhoven Univ. of Technology, NL	Radio interferometry-based location tracking using room-scale antenna setups to investigate cm-scale tracking, as well as ground receiver stations for km-resolution.
SAMPLE	Robotics	Institute of Software Technology Institute of Geodesy University of Technology Graz, AT	Rover traversability, teleoperations for sample acquisition and transport to Hab using semi-autonomous traverse finding rover.
RAMSES	Robotics	University of Klagenfurt, Austria Institute for Production Science University of Technology, Graz, AT Joanneum Research, Graz, Austria	Fully autonomous multi-sensor-based helicopter system capable of taking off from a charging dock atop a Mars rover, then conducting aerial reconnaissance for operator-requested POI inspection or autonomous terrain mapping before landing back on the rover to recharge.
Hort3Space	Life Science	ENEA Biotechnology Laboratory, Casaccia Research Center, Italy BIOAG (Biotechnology and Agroindustry Division) La Sapienza University of Rome DIMA (Department of Mechanical and Aerospace Engineering), Italy	An automated multilevel cultivation prototype, equipped with cultivation specific full spectrum LED lights placed inside a sterile grow room in an inflatable self-erecting tent to evaluate cultivation performances, supporting the diet of the crew.
HUMANISE	Human Factors / Robotics	Delft University of Technology Lunar Zebro team, The Netherlands Institute for Environmental Physiology Masaryk University, Kamenice, CZ ISAE SUPAERO, University of Toulouse, France	Teleoperations comparison using brain computer interaction, augmented reality,and gamepad for comparison to reduce overall mission workload on astronauts.
PRESSURE	Human Factors	Neuropsychology and Experimental Psychology Lab University of Cádiz, Spain	Crew stress simulation - emergency situation (technical/medical type) where teams will have to organize and execute a rescue operation during an EVA. The emergency scenario will consist of a combined technical and not serious medical condition. The technical problem will be simulated by time constrained problem-solving tasks.
GENES4MARS	Human Factors	Institute of Biomedicine and Pharmacy Russian-Armenian University Institute of Molecular Biology NAS RA, Armenia	Astronaut performance and health monitoring with automated ECG and investigation of the changes in health-risk-associated gene expression patterns in blood and urine samples of astronauts.
GEOS-24	Geoscience	Austrian Space Forum & Univ. of Innsbruck, Austria	Application of the Exploration Cascade & Sampling strategy, geomapping & IR/RAMAN spectroscopy
AVAWT (Independent experiment)	Engineering	Bazoomq Space Research Laboratory, Armenia	Power generation and measurement of wind velocity with a wind turbine. Testing a structural improvement to the turbine to increase the efficiency.


Staying Alive
University of Bremen
IAQHabitat
Fraunhofer WKI
HUMANISE
Masaryk University
Genes4Mars
RAU University of Yerevan
AVAWT
Bazoomq Space Research Laboratory
EIEE
University of Bielefeld
iROCS
FH Upper Austria
RAMSES
Graz University of Technology, Joanneum Research
SAMPLE
Graz University of Technology
ALIX
Radboud University
HUMANISE
Delft University of Technology
RAMSES
University of Klagenfurt
Hort³Space
ENEA, BioAG, La Sapienza University of Rome
iROCS
University of Würzburg, University of Applied Sciences Upper Austria
EIEE
Austrian Space Forum
GeoPrep
University of Innsbruck
FaR SiDe
Austrian Space Forum
University of Innsbruck
ALIX
Eindhofen University of Technology
HUMANISE
ISAE SUPAERO Toulouse
MEROP
University of Lisbon
PRESSURE
University of Cadiz
Finland
Estonia
Sweden
Norway
Denmark
Ireland
United Kingdom
Netherlands
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Italy
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EIEE – Emotions in Extreme Environment

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Description

The focus of space psychological studies mostly was on stress processing or performance-related measures. Emotions were not investigated properly. Even in astronautical spaceflight they have not played a major role yet. However, dealing with emotions, especially on long-term missions and extreme environments, was crucial to one's performance, well-being, and interpersonal relationships.

EIEE aimed to investigate what emotions analog astronauts experience and what strategies they use to deal with them. It also investigated if and how those strategies changed over time in stressful situations. The analysis of emotion regulation strategies can help to work out programs and trainings for future Mars missions to mitigate emerging problems.

The study provided insights into the emotional experience and regulation strategies applied by analog astronauts during a mission in an extreme environment.

Before the mission, analog astronauts completed the "Cognitive Emotion Regulation Questionnaire" (CERQ) and open questions related to the upcoming mission. During the mission, the analog astronauts kept a structured daily diary or audio log that asks about emotions and emotion regulation strategies. They also used an emotion list daily to name which emotions they have experienced and to what intensity. After the mission, the CERQ was to be completed again by the analog astronauts.

GEOS-24 - Geological Exploration and Observation System

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The GEOS-24 (Geological Exploration and Observation System-2024) experiment focused on geologic surveying at a simulated Martian landing site. Inspired by the Apollo lunar field surveys simulates the study of the Martian geology, combing classical and advances technologies. AAs and rovers collaboratively survey, with mapping providing a foundation, sampling offering ground truth, and compositional measurements delving into the detailed characteristics of Martian rocks and terrain. This experiment comprised mapping, sampling, and compositional measurements as integral components.

Geomapping: Pre-Mission: Geomapping established a preliminary geological map through orbital remote sensing, creating large-scale maps, incorporating terrain hazards, and providing a guide for subsequent activities. These maps served as guides for Analog Astronauts and rovers, outlining optimised transects and key sampling locations based on remote sensing observations. Syn-Mission Operation: During the mission, AAs contributed to refining the geological map using real-time data from drones, rovers, and their own observations, ensuring adaptability to the dynamic Martian landscape. Post-Mission Output**:** The final cartographic output synthesizes the spatial distribution of scientific observations.

Geosampling: AAs and rovers undertook rock and terrain sampling along predefined transects outlined on base maps provided by RSS and FP for EVAs. Geosampling involved collecting rock and soil samples to understand the history and composition of the Martian surface as well as the sequence of events and mineralogy. Some of the samples were returned to the simulated Martian habitat, while others were earmarked for more advanced laboratory analyses.

GeoSpectro (IR and RAMAN): In-situ and In-habitat compositional sample analysis offer initial insights into the mineralogy and geochemistry. IR (Infrared): An Infrared (IR) spectrometer was mounted on the rover, enhancing the GeoSpectro phase, enabling the real-time analysis of the mineral composition of surface materials, without the need for physical sample collection. Unfortunately, due to technical difficulties with the Mercator Rover, the IR spectrometer was not used. RAMAN: In habitat identification and characterization of the chemical composition of samples added a layer of detail to the understanding of Martian materials.

The GEOS-24 experiment has marked a significant leap forward in our understanding of the geology and potential habitability. Leveraging a blend of classical methodologies and technologies, this experiment, conducted within the framework of AMADEE24, has successfully simulated geologic surveying at a simulated Martian landing site.
Through meticulous mapping activities, both pre- and syn-mission, utilising data from drones, rovers, and satellites, we have constructed detailed geological maps and identified regions of interest for scientific exploration. During the mission, our Analog Astronauts have undertaken EVAs to verify critical points and collect samples, shedding light on the surface's composition and history. The integration of advanced spectroscopic techniques, such as RAMAN spectrometer measurements, has enabled us to delve deeper into the chemical components of these samples, further enhancing our understanding of the exploration area’s materials. As we eagerly await the results from the post-mission mapping phase, which will synthesise our findings into comprehensive mapping products, we anticipate uncovering even more insights into geologic formations.

ALIX – Astronaut Location Interferometry experiment

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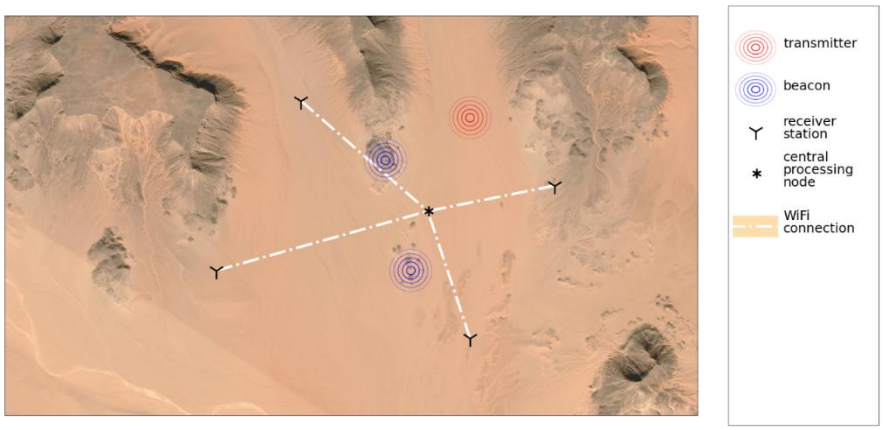
Description

On Mars, no satellite systems are available that would facilitate navigation. Alternative methods of electronic navigation are therefore required. A local system, independent on larger-scale infrastructures, was of particular interest. It was to be centrally deployed from a landing site and could be scaled up along with the area in which it was meant to operate.
The Astronaut Location Interferometry eXperiment (ALIX) aimed to perform (live) location tracking of astronauts or mobile platforms using a compact mobile radio transmitter, a set of reference beacons, and a small network of receiver stations.
The location tracking operated over several 100 meters at meter-scale accuracy. Comparing the ALIX tracking results to positions reconstructed by other systems (e.g. GNSS) should improve this technology. Ultimately, ALIX shall be developed into a reliable system for limited-range location tracking, using minimal number of resources and infrastructure.



ALIX used a mobile transmitter that emits a radio signal. At various stationary receiver stations, the phase of this signal was measured at regular intervals. With two receiver stations each, the phase difference at the corresponding measurement time was be calculated, hence the position of the suit-mounted transmitter could be tracked. To aid in synchronization of the receiver stations, the use of stationary transmitter beacons was planned. They transmitted at slightly different frequencies than the mobile transmitter, thus providing reference measurements to perform phase corrections.

IAQHabitat – Indoor air quality and material emissions in habitats

designed to be used on extra-terrestrial locations

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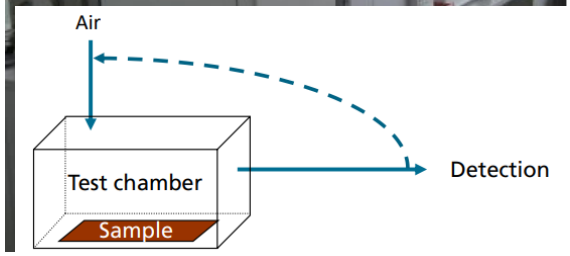
Description

Air quality is an important factor for terrestrial indoor environments, such as buildings, individual or public traffic, and others. In space, stays of astronauts in space will become longer, especially when considering astronautic missions to and on Mars. Therefore, indoor air quality (IAQ) in extra-terrestrial environments like spaceships or habitats had attracted notice.



Investigations on the indoor air quality (IAQ) of spaceships are rare and were mainly performed on the ISS, mostly using online methods directly in the station. But one must consider that for longer trips and stays an astronaut's stress level was increased. Therefore, aspects like well-being will play a major role. Consequently, long-term investigations on emissions from materials and indoor air quality (IAQ) will be necessary in the future to ensure astronauts' healths.

The aim of IAQHabitat was to estimate the relevance of indoor air quality (IAQ) and the applicability of today's assessment methods concerning IAQ on long term missions.

For one week, air samples were taken in the habitat to measure the concentrations of volatile organic compounds (VOC), very volatile organic compounds (VVOC), short chained aldehydes and organic acids. Samples were taken twice per day on sorbents and sent to WKI for further analysis. Additionally, reference measurements in the outdoor air to look for potential influences were performed.

GeoPrep- Astro-geological sample preparation for field-based analytics and return prioritization

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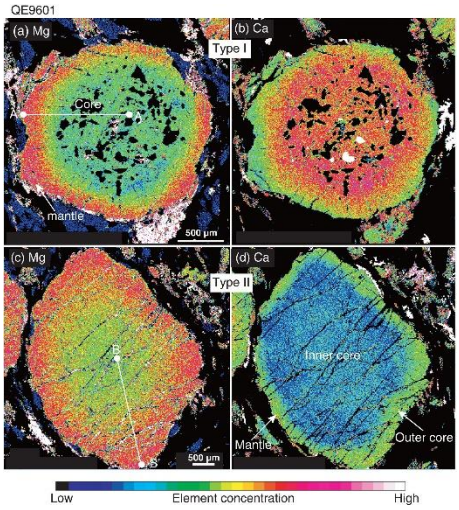
Description

The analysis of rock samples allows us to unravel the history of a terrestrial planet. This includes its accretion, the tectonic and magmatic processes that shape its interior, and the processes that shape its surface morphological features. In addition, rock samples can preserve information about the evolution of a planet's atmosphere and hold clues to the former presence of a biosphere, the nature of its various ecosystems and possible causes of its demise. In case of Mars, the planet's major surface morphological features testify to an extensive history of volcanic activity and provide strong evidence for the former presence of large bodies of liquid water.

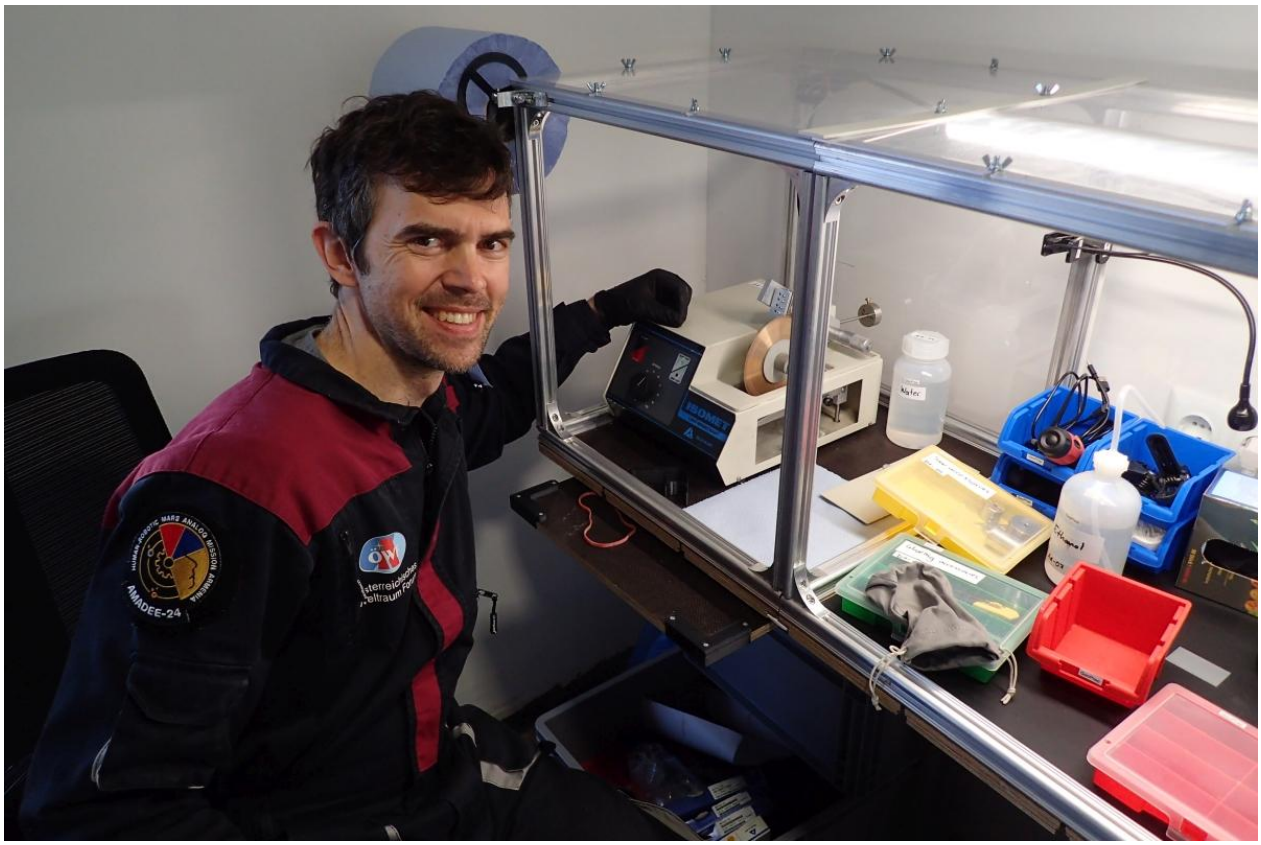


Enami et al., 2018

The GeoPrep experiment was designed to prepare a rock sample for a first microscopic examination. This will improve the selection process of samples on other planets which will be sent back to Earth by integrating the results into a decision-making process aimed at selecting the suitable samples.

GeoPrep investigated whether it was possible to set up a rock sample preparation facility in a Martian field lab using as simple a technical and operational approach as possible to produce thin sections of different materials. The experiment showed if this facility can be operated by an analog astronaut with no previous knowledge about rock sample preparation.

To realize this experiment, a sample of appropriate size was collected in an inflatable glove bag, to avoid contamination. After cleaning, a piece of that sample would be cut off and examined using a petrographic microscope. The quality of the sample as well as to what extent it can be analyzed using different techniques was also studied.


AMADEE-24

iROCS- Intuitive Robot Operation and Collecting Samples

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Description

As previous AMADEE missions have shown, robotic systems can support astronauts very well during extra-vehicular activities (EVAs). Therefore, human-robot operations will be an essential tool in future Mars missions.

The iROCS experiment was looking into how the terrain in a desert can be properly mapped with mobile robots and what intuitive operating concepts need to be developed for remote control access. The trafficability of the terrain was to be investigated and possible obstacles analyzed. After all, these could have an impact on the following tasks, the accessibility for astronauts and the design of spacesuits with mobility restrictions. Furthermore, it tested how a robotic system can support analogue astronauts in terms of sample collection, identification, and analysis.

3 robots were used during this experiment: Intelligent Robot for Mapping Applications in 3D (Irma3D), robot Charlie, and the RTE (Rosenbauer Technical Equipment) robot. Equipped with different technologies, they performed the following tasks:

• sample identification and analysis with selected wavelengths and appropriate filters for cameras and LiDARs to enable both the search for water and rock analysis.

• manipulation tasks (e.g. sampling) with a collaborative robot arm

• transportation tasks between two locations

• robotic map building using Simultaneous Localization and Mapping (SLAM)

• power provider for external devices and support for astronaut field work

"Thank you to the AMADEE24 team for an incredible experience! My first participation in this simulation was

nothing short of amazing. The dedication, innovation, and collaboration displayed by everyone involved were truly inspiring. Looking forward to contributing even more in the future! “
"Our rover performed flawlessly in the field during AMADEE24, showcasing its robust design and reliability. The remote-control system proved to be intuitive and easy to use, enabling precise manoeuvring and efficient exploration. This seamless integration of technology and usability significantly enhanced our mission's success.”

Pressure - Under Pressure

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Description

Astronauts are often exposed to an extreme environment, several health risks, and stressors. They all influence the astronaut's performance including neurocognitive, mood and behavioral problems. Extra-vehicular activities (EVA) are one of the most dangerous tasks. Therefore, it was important to identify and mitigate the risks and challenges associated with EVAs.

The terrestrial 'Golden Period' emergency concept was one that will also be applicable to planetary EVA emergencies. Training and practicing this concept are crucial for space mission success. These emergencies may happen as a result technical malfunctions, medical circumstances, environmental danger, etc.

This experiment established emergency simulation scenarios during EVAs where cognitive, emotional, and psychosocial skills will be relevant. The performances of the analog astronauts as well as their teamwork was studied and emergency protocols for EVA emergencies tested.

During simulated EVA emergency scenarios different aspects of response to these emergencies by the crew (psychological, cognitive, problem solving, team dynamics) were studied. Special focus was on emergencies where fast, accurate problem solving, and calculation may be needed to solve some strategic or vital equipment. In order to solve those problems in a timely manner, cognitive processing, task solving, and teamwork were essential.

Hort^3 Space- HORTiculture in an inflatable facility for SPACE production of high nutritional plants

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Description

Future long-term space missions and human habitation on other planets such as Mars require a controlled ecological life-support system. Its purpose was to basically re-create a proper atmosphere, purify water and possibly sow seeds for astronauts to eat. These processes are ensured by photosynthetic algae and higher plants in a so-called “biological life support system” (BLSS).

Since the AMADEE-24 mission site mimics the harsh space environment, it was the perfect location to test such systems. Here, productive plant species were grown considering factors such as the absence of soil, shortage of water, limited space available.
The experiment Hort^3 Space was therefore focusing on “microgreens” - leafy vegetables harvested as seedlings, highly acceptable by consumers as “Ready-To-Eat” (RTE) food. They are highly nutritious, hence an excellent source of vitamins and antioxidants.

The aim of this experiment was to develop and test innovative and autonomous cultivation systems that can grow fresh food with the minimum human intervention. This way, supply transportation for long-term missions can be reduced.

To realize this experiment, a sterile grow room in an inflatable self-erecting tent was used to evaluate cultivation performances in extreme environments, simulating a planetary biological life support system (BLSS). It will be able to support the diet of the crew members of the analogue mission with fresh and highly nutritious, ready-to-eat vegetables. Additionally, the use of automated processes shall reduce analogue astronaut’s time required for cultivation task.

The microgreens grew up, not exactly as expected due to unpredictable events, but they did it. The oxymoron is that unexpected events are common while conducting such a complex mission, so we are happy anyway about the results.
Now it's time to come back to the laboratory to analyze the collected data, to digest the lessons learned and to transform them into future experiment updates and improvements.

FaR SiDE- Simulation-System for Fatigue, Recovery and physical Stress in Demanding Environments

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Description

Extra-vehicular activities (EVAs) play an important role in astronautic missions and pose higher demands and health risks to astronauts. They are facing many physical challenges such as living and working in extreme environments or moving around in heavy, pressurized space suits. Especially surface EVAs might pose additional risks due to deconditioning in many physiological systems after prolonged interplanetary travelling in microgravity. Therefore, health monitoring of astronauts was of increased relevance.

The Far SiDE experiment developped models and systems to improve the safety of astronauts during extra-vehicular activities (EVAs). Through biomechanical and physiological models, estimators for muscle activations, joint loads, metabolic and cardiovascular demands shall be computed. Evaluation of the validity of physiological predictions and motion adaptations was assessed and the cumulative fatigue over the course of the mission investigated.
Furthermore, a qualitative and quantitative evaluation of the usability of the simulation system was done and if successful, it can be used as a decision-supporting tool for flight planners and the BME team.

During the first days of the mission, experiments on the heart rate, O2 consumption, muscle activity, CO2 concentration, and more were conducted. Further measurements were gained when performing EVAs. Subject of those measurements were the respective analog astronauts in the AoudaS and AoudaX spacesuit simulators. Methods to record the relevant data included sensor data, kinetic measurements, near infrared spectroscopy, electrocardiogram, or spirometry.

Unfortunately, the prolonged bridgehead phase led to a shortened isolation time and hence reduced number of EVAs. Original research question regarding the effects of short-term (within an EVA) and long-term fatigue (over the whole mission) on human motor control and task precision therefore cannot be investigated and an alternative research question focusing on movement analysis with the space suit simulator will be proposed.

Regarding the experiment itself, analog astronauts were well prepared and capable of performing all preparations and tasks precisely and almost equivalent to expert researchers in the field leading to better than expected data quality. A steep learning curve could be seen regarding the time duration needed for preparation and conduction of the experiment.
In order to maximize scientific output and minimize interference with natural movement behaviour of the astronauts, for future missions we plan on developing a fully integrated sensor system (for motion capture and muscle activity analysis) which can be worn by the astronauts like underwear. Data handling should be integrated in either an accompanying robot or the suit itself to reduce preparation complexity and enable passive recordings of full EVAs to supplement and support different other experiments.

MEROP – More Effective Remote OPerations using multimodal interfaces

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Description

Effective interaction between the analog astronaut and a remote rover was essential to take full advantage of the supporting asset and to ensure a successful exploration during a mission. A rover was teleoperated via the Operator Control Unit (OCU). The physical distance from the operator and the robotic vehicle leads to poor situation awareness and may cause inadequate decision-making. The OCU must be designed wisely to ensure proper human-robot interaction.

MEROP improved the teleoperation of rovers by providing a problem-solving toolbox to the OCU. It addressed two major issues: situation awareness and communication. Unexpected, autonomous action of the robot may cause operator insecurity and influences situation awareness in a negative way. The second challenge dealt with communication and communication reliability between the operator and the robot. Issues concerning bandwidth or loss of communication impose constant risks, which need to be mitigated.

The expected outcome of the MEROP experiment was an improved teleoperation of robotic vehicles and the implementation of an effective visualization tool that support the flight planning team in the decision-making process.

To achieve experiment objectives, the MEROP team implemented a teleoperation interface, where the analog astronaut could choose between two interaction levels: Semi-autonomous teleoperation and direct teleoperation. Semi-autonomous teleoperation featured indirect control of the robot using a virtual avatar and interface augmentation techniques. Direct teleoperation allowed for the direct control of the robot to enhance situation awareness.

During the AMADEE-24 mission, the 8 experimental runs of the MEROP experiment were executed. This is an experiment that provided a teleoperation console to the astronaut, such that they could remotely operate the rover from inside the habitat while allowing them to explore different remote "Mars" areas. With the MEROP teleoperation interface, Astronauts were able to visualize mission goals (regions of interest to explore) using augmented reality on the image stream. With the provided interface they could operate the rover using semi-autonomous or direct teleoperation. Analysis in the upcoming months of the recorded metrics and videos in the field will provide valuable insights of such a approaches in Mars analog environment, as well as their advantages and shortcomings. Initial observations from the field show that, after the system was updated to cope with the challenging communication infrastructure, the AAs were able to remotely operate the rover and provide geo-tagged annotations from the field to the MSC.

RAMSES - Rover Aerial Mars Support and Exploration System

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Description

In 2021, the first Uncrewed Aerial Vehicle (UAV) performed its first flight on Mars. With this flight, Ingenuity developed by NASA, proved that VTOL aircraft can operate under Martian conditions. However, further research and development was necessary to take out full advantage of flying vehicles during a Mars mission.

The Rover Aerial Mars Support and Exploration System (RAM-

SES) was a technology system for future UAVs using an AI-based network to autonomously detect landing sites in Mars-like environments. With participation in AMADEE-24, RAMSES's novel approach demonstrates the process of detecting visual points of interest, either scientifically or for safe UAV navigation.

The expected outcome was to utilize an AI-based network to generate a heat map for successfully detecting landing sites in the mission area. Additionally, the system contains generated pixel-wise maps and provided comprehensive and detailed depictions of scientific points of interest in Mars-like environments. RAMSES evaluated data gathered by other robotic vehicles to create the aforementioned heat map and points of interest, all of this post-mission in the A-24 context. In turn, this data could enhance the mission capabilities of other teams to further demonstrate collaboration between experiments.

To achieve the defined experiment objectives within AMADEE-24, RAMSES focused on evaluating data gathered by the SAMPLE experiment. With the help of the ground truth of the mission area data, the team compared the system's pixel-wise map coordinates and improve the precision of the location of notable features for scientific research in order to contribute to the advancement of scientific knowledge about the environment. In the context of collaborative experimentation, RAMSES was subject to proof-of-concept tests that aim to exhibit its capabilities in supporting AMADEE-24 and future missions.

HUMANISE - Human Machine Interaction, Stress, and Performance

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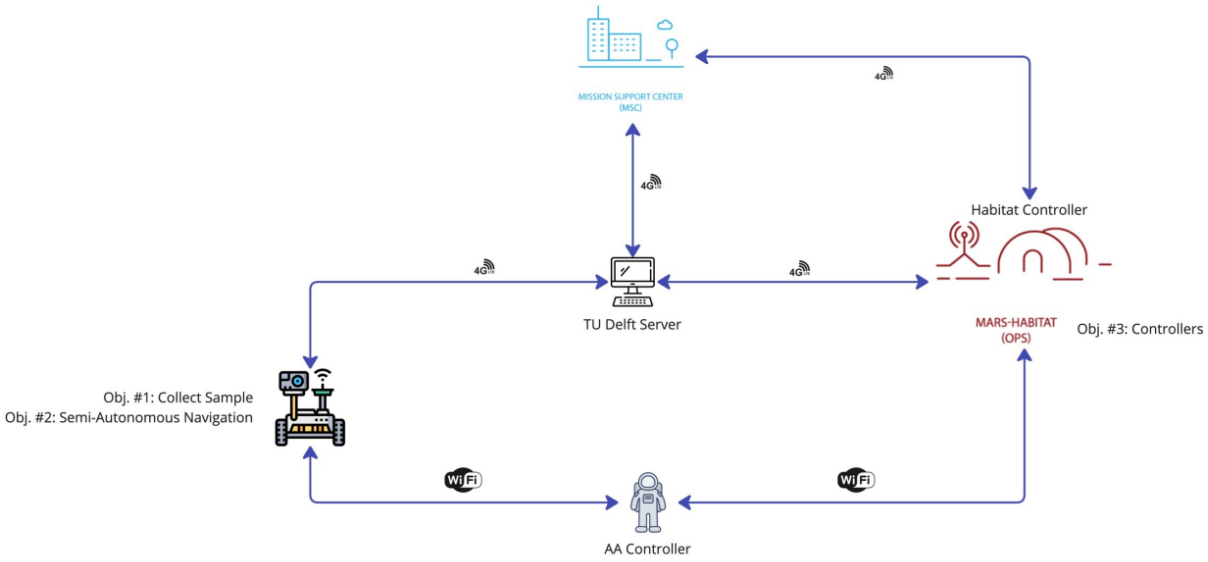
Description

The use of remote-controlled robots may increase the safety, effectiveness, and efficiency of Martian exploration. Complex control was frustrating and distractive for the operator and negatively affects efficiency and outcome of a task. To ensure the first mentioned attributes, HUMANISE (Human Machine Interaction, Stress, and Performance) addresses design, user experience and usability of rover controllers.

The expected goal of HUMANISE was to gather information about the usability of rover controllers which contribute to the future design of such controllers.

Due to logistics and administrative problems, this project was removed from the A-24 experiment complement and shall be conducted in a reduced version post-mission.



Staying Alive - Life support tasks under autonomous operation and under Earth-Mars joint operation

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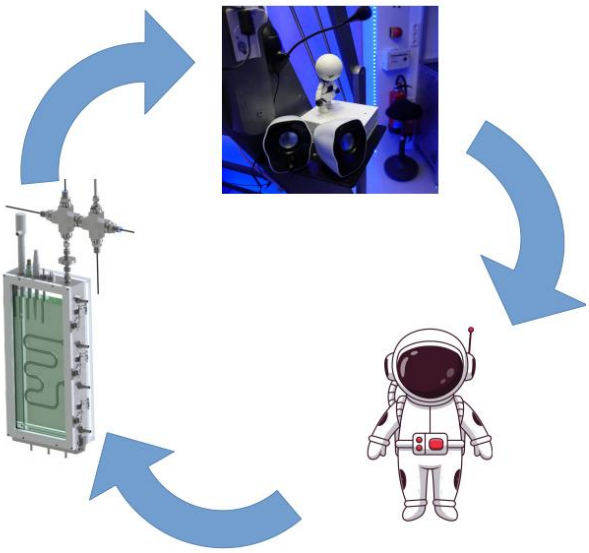
Description

Astronauts experience psychological challenges during a planetary mission caused by isolation from other human beings. Moreover, astronauts are dependent on the Life Support System (LSS) to withstand the rough, Martian environmental conditions. A proper, human centered LSS, which was controlled and understood easily by the astronaut was essential for a successful Mars mission.



Staying Alive dealt with the revitalizing component of the LSS in a habitat in form of a photobioreactor (PBR). PBRs have already been researched in the past, however, only a scientific basis. Staying Alive comprised three aspects of the PBR:

- Communication and operation
- The user interface
- Contribution to the crew's mental health

The aim of Staying Alive was to investigate the interaction between the astronaut and the PBR. Additionally, a highly interactive sensor system was tested. The sensor network was able to communicate with humans to learn from experience and new data, to explain its decisions and thus become a team member rather than a mere data source.

For the mission experiment, a small and simplified PBR was used in the AMADEE-24 habitat. It used non-toxic photosynthetic organisms to produce oxygen from ambient air and was equipped with sensor and a user interface for interaction. During the experiment the crew performed tasks once fully autonomously and once jointly with the Mission Support Center (MSC). The tasks to be performed included set-up, maintenance, repair, and science activities. Pre- and post-mission questionnaires as well as video recording were used to obtain data.

During the AMADEE-24 mission a total of 18 runs were conducted by the analog astronauts with support of the experiment team in Vienna. Throughout the mission, the experiment team received

multiple points of feedback and improvement, and learnt a great deal from the experience. In particular, the importance of testing and retesting can not be emphasised enough for analog missions. The analog astronaut crew also indicated that they would have preferred a voice assistant over a text-based AI assistant. From the experience of running the mission and the questionnaires gathered from the crew it was also indicated that familiarity with technology and software interfaces is quite important when it comes to productivity. Another lesson learnt was to always explain the obvious! This was seen when the astronaut crew had frequently occurring questions regarding the Photobioreactor GUI. Additionally, the crew would have benefitted from training to use the AI chat bot to extract more helpful answers.

Overall, the experiment was a great success achieving all the various run scenarios planned throughout the mission. Described as a “science experiment meets mystery escape room” by one of the analogue astronauts, the experiment was very positively received by the analogue astronaut crew and the mission support centre.

SAMPLE - Semi-Autonomous Robot Assistance for Planetary Exploration

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Description

Rover systems used in planetary exploration, for example Curiosity and Perseverance, have already proven successful in past missions. However, the time delay between the Martian exploration site and the Mission Support Center (MSC) on earth as well as safety issues constitute limiting factors in the autonomy of a rover. Semi-Autonomous Robot Assistance for Planetary Exploration (SAMPLE) addresses this issue.

Based on the MERCATOR experiment in AMADEE-20, SAMPLE expanded the area of use and autonomy of rovers. SAMPLE investigated robot capabilities such as photogrammetry, in-situ instrument placing, and sample collection combined with improved semi-autonomous robot control and the integration into the exploration cascade for supporting geological hypotheses.

The expected outcome of the SAMPLE project was to provide data products like 3D maps, images, or special measurements shortly after the exploration task of a robot. Moreover, SAMPLE aimed to provide sophisticated visualization and tools for better integration of the scientific capabilities of the rover into the daily exploration routine of the remote science support and the analog astronauts.

To meet the experiment objectives, in-situ measurements and data collection were improved by implementing a robotic arm. The level of autonomy was adjustable by the analog astronaut. Implementing machine learning algorithms allowed for improving the long-range navigation skills of the rover. To provide detailed insights on remote locations of interest to the analog astronauts and the remote science team, SAMPLE applied methods from photogrammetry and mapping.

Deployment during the bridgehead phase with some pitfalls due to broken equipment. Terrain was first proving ground of new hardware improvements. The difficulty of the terrain was surprising once we were in teh field. In order to allow real long range autonomous travers in the future better scouting and improved navigation skills that can better cope with rough terrain are needed. New improved communications pipeline was a step in the right direction, as bandwidth limitations were no problem for the new system. The newly developed interface proved to be a suitable addition to the system, as it presented the obtained data on a previously created map of the surroundings. This allowed for intuitive control of the robot and allowed it to explore multiple points of interest in the surroundings of the habitat. A new addition to our robot was the robotic arm, which included a high resolution webcam, a spectrometer and a laser scanner on the end effector. The provided data products included close-up images of geological samples and panorama images for situational awareness. For the first time we had a spectrometer added to the suite of available instruments, but due to technical problems with it there was no scientific output possible, although we gathered new insights on how to deploy such an instrument in the future.

Genes4Mars – ECG analysis and searching the biomarkers for astronaut health and performance monitoring

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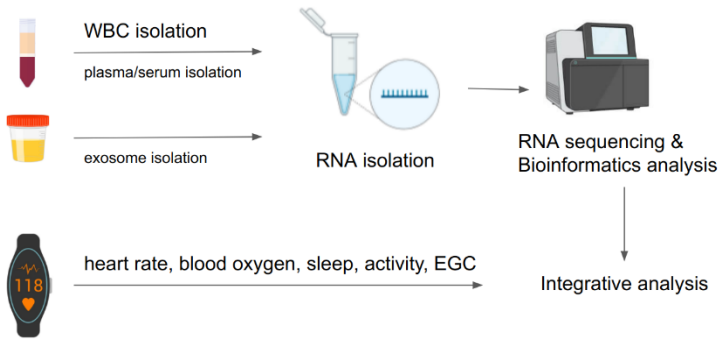
Description



Long-term space missions are subject to health risks to astronauts because of environmental factors, such as radiation, microgravity, and lasting isolation. These risks could be more aggravating during space exploration missions, e.g. to Mars, especially with limited access to healthcare facilities. It was suspected that space flights and planetary missions could have performance degradation and negative effects on the cardiovascular health of the crew. Therefore, the development of biomarker-based and physiological predictors of health risks for the assessment of physiological conditions was of vital importance.

The main objective of Genes4Mars was a retrospective investigation of changes in risk-associated gene expression patterns in blood and urine samples from the Analog Astronauts. The samples were collected from each participant at multiple time points pre-, during and past-mission and were analysed after the mission was completed. RNA was extracted from the samples immediately upon their transfer to the lab and analysed for up- or downregulated genes. Additionally, 12-lead and single-lead ECGs of each participant were taken one week prior to the start of the mission and each day before and after field assignments outside the habitat. After the end of the mission, the data were analysed using deep learning methods and pre-trained models to detect heart pathologies. Correlation and regression analysis was used to find the association between gene expression and physiological parameters.

AVAWT – Advanced Vertical Axes Wind Turbine
INDEPENDENT EXPERIMENT

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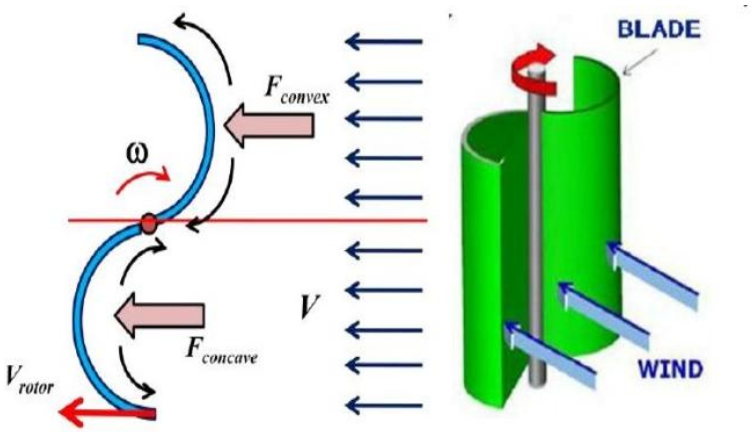
Description

Harvesting energy locally on Mars during crewed Mars missions will be very important for supporting the power systems of the future Mars habitats. Delivering energy resources from Earth to Mars will be too expensive, meaning that usage of any energy source available in the Mars environment will be very useful. In addition to solar energy, wind energy could also be considered as a potential source of energy. Martian surface winds, with a wind velocity that would correspond to about 3m/s on Earth, are not a particularly powerful mean for harvesting energy on Mars, but they could still serve as an auxiliary source.

AVAWT therefore measured the power generation and wind velocity at the test site with a Savonius VAWT style wind turbine during the mission. These turbines are lightweight, have a simple construction and can be easily deployed and mounted on a nearby small hill or even at the top of the habitable module. To increase efficiency, a new structural improvement of the turbines was also tested: rectangular openings are made in both blades and covered with flexible patches. These patches bent with the wind and allowed the air to flow through the openings on the side where the wind blows on the blade's convex surface. This reduced the dynamic pressure on the convex side of the turbine, thus increasing the difference between the dynamic pressures on the turbine's two sides and generating greater rotational momentum. With this improvement the maximum torque of the wind turbine could increase up to 60%.



Independent Experiment:

- No allocation of GOST/CRW resources or inclusion in mission plan
- Under supervision of GOST CDR
- Eligible for site access

21. Team and Equipment Shipping Logistics

Shipment

The shipment logistics was managed by Gebrueder Weiss; this industrial partner was also providing a shipment logistics team who will coordinate the customs and shipment formalities and consult on packing of the experimental hardware.

The port of entry was via Tiflis/Georgia.

22. Educational activities

Junior Researchers Program

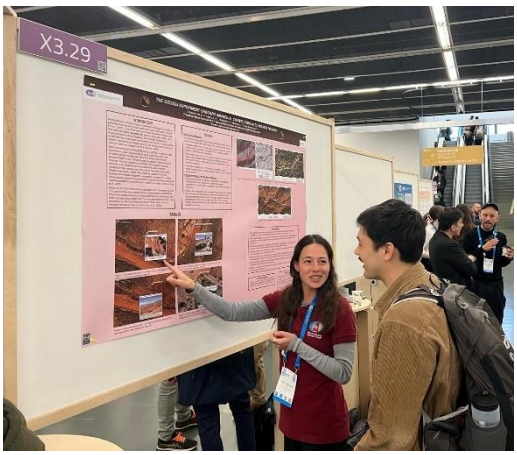
In cooperation with the Austrian Federal States of Tyrol and Upper Austria high school students engage in the AMADEE-24 mission via classroom lectures, laboratory visits and an excursion to the Mission Support Center.

Student engagement

As part of a lecture program of the University of Innsbruck, a class of geoscience students will learn about analog research and conduct an excursion to the second Dress Rehearsals as well as the Mission Support Center

Communale Peuerbach

The Austrian federal State of Austria's Culture Management Cooperation (OÖ Landeskultur-GmbH) celebrated 600 years of Geog von Peuerbach, a medevial astronomer. As such, a major exhibition was implemented in the city of Peuerbach (ca 2,5 driving hours west of Vienna) under the Motto "Cosmos" ,which both reflects on the AMADEE-20 expedition in Israel, as well as the A-24 expedition.



Poster session at the European Geophysical Union General Assembly and the OeWF delegation at the EGU (above) and student groups visiting the Mission Support Center (below).

23. Closing Ceremony 05Apr2024

until 11:00	H3S Harvest	
	CRW prepare habitat for walk-out, blinds closed in rooms	
	GOST prepares rovers, at least one to drive/preferrably tracked iROCS rover	
	CRW does a light donning /unpowered suit (no OPS or MEDHOC required)	
11:00-12:00	ORF Austria filming EVA & habitat inside & H3S	
12:15	General public & media arrive (Check-in start)	
12:45	VIP's arrive	
13:00	**Welcome adresses**	
		Mission overview talk / Gernot Groemer
		VIP adresses /Hayk Aslanyan & Dignitaries
		Thank you's to stakeholders
13:30	**Walk-Out of CRW / "single person half suited" AA + 4 AA**	
		Welcome-back adresses: Groemer/Aslanyan/Mehlis 5 min each
		Photo opp for general public (continuous until end)
		Tiuterra Ceremony
14:00	Group photo CRW & suited AA & VIP's	
		VIP's rover & H3S demo
		"Doffing" of halfsuited AA (GOST-assisted)
14:30	Interviews	
till 16:00		Robert Wild + ORF (30 min)
		after ORF: VIP-group Habitat walk-through
	General Public interaction with rovers, demo of experiments	
15:00	Habitat opens to selected public	
16:00	End of event	
	Wrap-up of site	

24. AMADEE-24 as-was Mission Plan

11Mar2024: Media Day

Activities

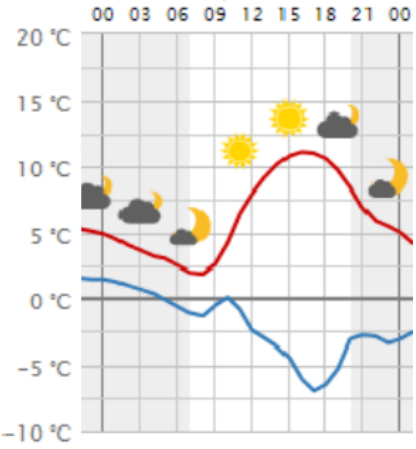
Media presence all day long. An EVA was performed by Inigo Munoz Elorza (Aouda.X) and Carmen Köhler (Aouda.S) in full view of the media from 11:21 to 13:57. The duration was 2:36. Today's EVA was successful with a few mishaps (radio problems, damaged shoes, heating, and ventilation not working). After repairs, everything worked. Continued preparation of the habitat and hardware electronics.

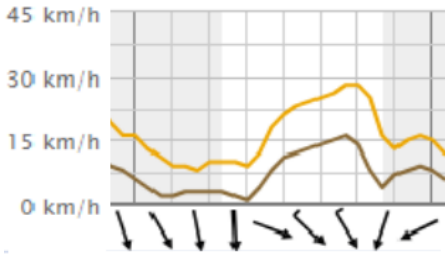
Experiments

- SAMPLE: GOST training on rovers.
- iROCS: Working on their experiments.
- AVAWT: Installed, missing item.
- GeoPrep: Finished.

Weather

Sunset time (UTC+4)	19:03
Complete darkness (UTC+4)	20:34





GOST Report

Both AAs and GOST were tired yet in cheery mood. Definitive lack of sleep as well as lack of structure about media handling and as well as operations within the habitat made it difficult.

MSC Report

From yesterday: the habitat is still not ready for ops, move in, or to support general electronics. ÖWF equipment has still not been powered for safety reasons. The hope is to install adequate grounding and have a functioning mobile network (for data transfer) set up by tomorrow afternoon (Armenian time), nothing MSC can do to support before that. (Note: there was a misunderstanding about the location of the grounding entry point to avoid the grounding to be connected to the generator cooling system.) The current focus is to aesthetically finalise at least those rooms which will be filmed by media, ie. the donning and ops areas. A limited or partial EVA may take place if all the resources are in place in time.
MSC to be staffed by 11:00 for potential EVA start.

The mission start day remains unchanged on the 12 March.
MERCATOR may be used over the next few days, but we are not authorised by the PIs to recharge it. It is considered a NO-GO for usage after drops below 40% charge until the PIs return to the field for further repairs to the charging station. RSS is working on a new exploration cascade accordingly.

There have been delays with preparing the habitat in Armenia. At this time, there is only basic power available for lighting the habitat, and no confirmed network connectivity for data transmission.
Very limited science operations have been performed and remain ongoing, but science objectives for the bridgehead phase have been significantly impacted by the habitat's readiness and the occupation of our field teams.
The bridgehead phase has been extended to ensure everything is properly prepared, leading to a reduction in the duration of the isolation phase.
Most equipment is still in storage to keep it safe, until the habitat is ready for full operation.
Damage has been reported to the Mercator charging station and iROCS power supply. This leads to delays for iROCS, RAMSES, SAMPLE, GEOS, GeoPrep, and FaR SiDe, which are being replanned accordingly. iROCS is expected to replace the MERCATOR's role in the exploration cascade for the first half of the mission, limiting EVAs and surface exploration and experiments to the area near the habitat for now. All other experiments are considered safe, intact, and ready to be performed as soon as the crew become available.
Nominal mission start is still planned for tomorrow, only the start of isolation is delayed.

Field Activity Plan

Mon, 11-Mar-2024	UTC	03:00	04:00		05:00	06:00	07:00
	UTC+1 (MSC)	04:00	05:00		06:00	07:00	08:00
	UTC+4 (Field)	07:00	08:00		09:00	10:00	11:00
PERSON:	POSITION:						
Iñigo Muñoz Elorza	Aouda.X		BF	Briefing	Donning X		
Carmen Köhler	Aouda.S		BF	Briefing	Donning S		
Robert Wild	OPS		BF	Briefing	Suit Ops and Communication		
Anika Mehlis	SciOPS		BF	Briefing	Support Donning		
Simone Paternostro	AA 5		BF	Briefing	Support Donning		
Thomas Wijnen	AA 6		BF	Briefing	Support Donning		
Dominik Jaeger	Safety.X		BF	Briefing			
Christian Schwarz	Safety.S		BF	Briefing			
	GOST iROCS		BF	Briefing			
	Legend:	BF... Breakfast					

Mon, 11-Mar-2024	UTC	08:00	09:00	10:00	11:00	12:00
	UTC+1 (MSC)	09:00	10:00	11:00	12:00	13:00
	UTC+4 (Field)	12:00	13:00	14:00	15:00	16:00
PERSON:	POSITION:					
Iñigo Muñoz Elorza	Aouda.X	Lunch	Setup ALIX	Media	iRocs GeoSama / Media	Doffing	Briefing
Carmen Köhler	Aouda.S	Lunch	Setup ALIX	Media	iRocs GeoSama / Media	Doffing	Briefing
Robert Wild	OPS	Lunch	Suit Ops and Communication				Briefing
Anika Mehlis	SciOPS	Lunch	Suit Ops and Communication			Doffing	Briefing
Simone Paternostro	AA 5	Lunch		Setup iROCS		Doffing	Pack iROCS	Briefing
Thomas Wijnen	AA 6	Lunch	Hort3Space			Doffing	Briefing
Dominik Jaeger	Safety.X	Lunch	Safety.X				Briefing
Christian Schwarz	Safety.S	Lunch	Safety.S				Briefing
	GOST iROCS	Lunch		Spotter iROCS			Briefing
	Legend:					

12Mar2024: Mission Start Day

Activities

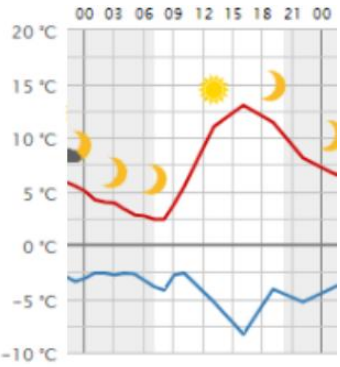
Day of inauguration of the habitat. No experiments were performed on this day as it was Media Day on field with the official mission start. The visits, press conference and live stream have been well handled by the Media team.

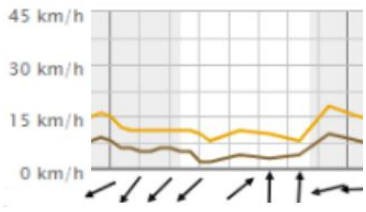
Experiments

- MERCATOR/SAMPLE: Used for the parade.
- Staying Alive: Removed of the container and place in the habitat.
- Hort3Space: Moved at the exit of the habitat and was covered to protect from rain and humidity.
- GeoPrep: Put in a cleaned room and ready to be used.

Weather

Sunset time (UTC+4)	19:04
Complete darkness (UTC+4)	20:34





Field Activity Plan

Tue, 12-Mar-2024	UTC	08:00	09:00	10:00	11:00	12:00
	UTC+1 (MSC)	09:00	10:00	11:00	12:00	13:00
	UTC+4 (Field)	12:00	13:00	14:00	15:00	16:00
PERSON:	POSITION:					
Simone Paternostro	Aouda.X	Lunch	FARSIDE	GEOS [0]	FARSIDE	Doffing	Briefing
Anika Mehlis	Aouda.S	Lunch	iROCS Cosmo (Support FARS. + GEOS)			Doffing	Briefing
Carmen Köhler	OPS	Lunch	Suit Ops and Communication				Briefing
Simone Paternostro	SciOPS	Lunch	Suit Ops and Communication			Doffing	Briefing
Iñigo Muñoz Elorza	AA 5	Lunch	iROCS Cosmo	GEOS [0]	iROCS Cosmo	Doffing	GEOS Breakdown	Briefing
Thomas Wijnen	AA 6	Lunch	MEROP			Doffing	GEOS Breakdown	Briefing
Christian Schwarz	Safety.X	Lunch	Safety.X					Briefing
Lukas Plazovnik	Safety.S	Lunch	Safety.S					Briefing
	GOST MEROP	Lunch	MEROP					Briefing
	GOST iROCS	Lunch	Spotter iROCS					Briefing
Legend:	BF=Breakfast						

Tue, 12-Mar-2024	UTC	03:00	04:00	05:00	06:00	07:00
	UTC+1 (MSC)	04:00	05:00	06:00	07:00	08:00
	UTC+4 (Field)	07:00	08:00	09:00	10:00	11:00
PERSON:	POSITION:					
Simone Paternostro	Aouda.X		BF	Briefing	Donning X - FARSIDE Procedure	
Anika Mehlis	Aouda.S		BF	Briefing	Donning S	
Carmen Köhler	OPS		BF	Briefing	Suit Ops and Communication	
Simone Paternostro	SciOPS		BF	Briefing	Support Donning	
Iñigo Muñoz Elorza	AA 5		BF	Briefing	Support Donning (incl FARSIDE 1x Setup)	
Thomas Wijnen	AA 6		BF	Briefing	Support Donning (incl FARSIDE 1x Setup)	
Christian Schwarz	Safety.X		BF	Briefing		
Lukas Plazovnik	Safety.S		BF	Briefing		
	GOST MEROP		BF	Briefing		
	GOST iROCS		BF	Briefing		
Legend:	BF=Breakfast					

GOST Report

The water reserves arrived (tank of 1500L) but there was a leak in the pipes as the pump was not connected. The insulation for the WC/bathroom and two ceilings for the room were done. Blinds are all plugged, and the controllers are working well. Concerning the internet, the server and vpn have been reconfigured and are working now. There were some problems getting rides and there was also interference which mean that all volunteers were shipped off at the right time. However,

the MEDHOC was brought in at the last minute and, in addition, he was not fully satisfied with the drugs. Creation of a checklist for GOST including generator and water level check-up, at giving times. Media day went well but we will need more images for the sponsors.

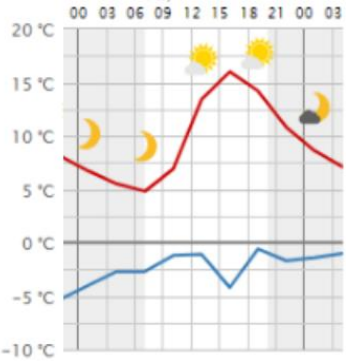
MSC Report

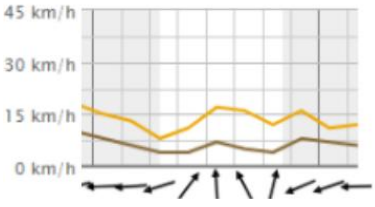
Today is the Mission Start Day and the inauguration of the habitat! The Field teams and our Armenian partners have worked long and hard, and we will have a big event in Armenia! The time has come.
Mars will activate the OPS Console and we in the MSC can start our part of AMADEE-24 properly!
Today's planning :
AAs plan to start donning at 08:30, a radio station will visit MSC at 10:30.
At 11:30 the AAs should be EVA ready and walk around the habitat. They expect five Armenian Media Stations + BR/Arte film crew + 200 civilian visitors + all our teams on site. It will be quite exciting, and the weather forecasts say it will be a nice and sunny day with high temperatures at almost 20°C.
At 12:30 there will be a press conference on site in Armenia, then the AAs doff the suits.
At 13:30 we have the live stream (our Media Live Stream coordinator Ira will remind us about that tomorrow).

13Mar2024: Maintenance Day

Activities

Maintenance day where experiments are getting into place. The habitat is getting more and more ready. The first in-sim day was planed for maintenance to catch up with the infrastructure preparation.





Experiments

- Staying Alive: Experiment transported to the habitat.
- EIEE: Links provided.
- GeoPrep: Stations set up inside the habitat.

Weather

Sunset time (UTC+4)	19:05
Complete darkness (UTC+4)	20:35

Field Activity Plan

Wed, 13-Mar-2024	UTC	03:00	04:00	05:00	06:00	07:00	08:00
	UTC+1 (MSC)	04:00	05:00	06:00	07:00	08:00	09:00
	UTC+4 (Field)	07:00	08:00	09:00	10:00	11:00	12:00
PERSON:	POSITION:						
Simone Paternostro	AA 1		BF	Briefing	G4M	other Experiment 1-time prep, if not yet done	Lunch
Anika Mehlis	AA 2		BF	Briefing	G4M G4M	other Experiment 1-time prep, if not yet done	Lunch
Carmen Köhler	AA 3		BF	Briefing	G4M	other Experiment 1-time prep, if not yet done	Lunch
Robert Wild	AA 4		BF	Briefing	G4M G4M	other Experiment 1-time prep, if not yet done	Lunch
Iñigo Muñoz Elorza	AA 5		BF	Briefing	G4M	other Experiment 1-time prep, if not yet done	Lunch
Thomas Wijnen	AA 6		BF	Briefing	G4M	other Experiment 1-time prep, if not yet done	Lunch
	GOST Hort3space (x3)		BF	Briefing	Hort3space setup (Priority!)		Lunch
	GOST		BF	Briefing	other Experiment 1-time prep, if not yet done		Lunch
Legend:	BF=Breakfast						
	G4M = Genes4Mars						

Wed, 13-Mar-2024	UTC	08:00	09:00	10:00	11:00	12:00
	UTC+1 (MSC)	09:00	10:00	11:00	12:00	13:00
	UTC+4 (Field)	12:00	13:00	14:00	15:00	16:00
PERSON:	POSITION:					
		Maintenance Day				
Simone Paternostro	AA 1	Lunch	other Experiment 1-time prep, if not yet done			Briefing
Anika Mehlis	AA 2	Lunch	other Experiment 1-time prep, if not yet done			Briefing
Carmen Köhler	AA 3	Lunch	other Experiment 1-time prep, if not yet done			Briefing
Robert Wild	AA 4	Lunch	other Experiment 1-time prep, if not yet done			Briefing
Iñigo Muñoz Elorza	AA 5	Lunch	other Experiment 1-time prep, if not yet done			Briefing
Thomas Wijnen	AA 6	Lunch	other Experiment 1-time prep, if not yet done			Briefing
	GOST Hort3space (x3)	Lunch	Hort3space setup (Priority!)			Briefing
	GOST	Lunch	other Experiment 1-time prep, if not yet done			Briefing
Legend:	BF=Breakfast					
	G4M = Genes4Mars					

GOST Report

GOST crew fatigue was high as well as social battery very low. ECP tried to relieve the pressure by letting different crew members have a change of pace (sent for scouting on the quads to have a beautiful view, left alone to get their social batteries recharged). There also was a pizza night to change the type of food eaten as 2 crew members (including AAs) had digestion problems due to the food and to relieve the FO personnel for a night. MEDHOC need to be briefed by BME. They were briefed by GOST upon arrival to ameliorate their understanding and overview of the mission.
Car incident occurred (MSC briefed). ECP driving with AAs AM / CK / IME / RW at roughly 22h00 when the car started sliding towards a ravine. The slide caused the car to disable the brakes, so they had to turn the wheel and were able to reengage the brakes just before impacting a wall. The bumper under the car is slightly damaged. No AAs nor driver injured, was checked right away, as the collision was at very low speed. However, debriefing and safety discussion was scheduled and conducted on the matter, and decision to drive very slowly at night and in the middle of the road (where there is less gravel) was made.

MSC Report

Experiments are getting into place, so we expect more and more questions about the experiments set up.
The habitat is getting more and more ready.
Google Form to retrieve information from the MSC people has been created and shared.
FCT (what has been done):

- Experiment review: what is done, what is left to be done.
- Human Factor.
- Generator refuelling issue: assign a GOST member at checkpoint + Armenian coordination.
- SOP review.
- “FCT/MSC people faces” document.

14Mar2024: Welcome of the BME

Activities

Welcoming BME at the MSC. Isolation Phase start has been scheduled for the 15th of March. Some radio journalist and ORF filming came to the MSC. The experiments planning will need to be updated and adjusted to consider on-site risks (dogs). In this way, there may be some limitations on the Traverse Plan.

Experiments

- Hort3Space: Tent was pumped, but the rest need to be installed.
- Staying Alive: Set-up and tested.
- ALIX: Crew part installed but not the GOST part.
- HUMANISE: Cancelled.
- AVAWT: Not official experiment anymore, but conducted as an independent experiment.

iROCS: Charged.
MEROP: Needs to be checked by GOST.
SAMPLE/MERCATOR: Left at 43% charge after Media Day.
RAMSES: Needs to be worked on.
FaR SiDe & PRESSURE & IAQHabitat: Need to be installed.

Field Activity Plan

##########	UTC	03:00	04:00	05:00	06:00	07:00	08:00	09:00	10:00	11:00	12:00	13:00	14:00
	UTC+1 (MSC)	04:00	05:00	06:00	07:00	08:00	09:00	10:00	11:00	12:00	13:00	14:00	15:00
	UTC+4	07:00	08:00	09:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00
PERSON:	POSITION:												
Robert Wild	Aouda.X		BF Briefing	Donning X - FARSIDE Procedure			Lunch	FARSIDE GEOS [0]	FARSIDE	Doffing	Setup experiments	EIEE Briefing	
Thomas Wijnen	Aouda.S		BF Briefing	Donning S			Lunch	iROCS Cosmo (Support FARS. + GEOS)		Doffing	Setup experiments	EIEE Briefing	
Anika Mehlis	OPS		BF Briefing	Suit Ops and Communication			Lunch	Suit Ops and Communication			Setup experiments	EIEE Briefing	
Simone Paternostro	SciOPS		BF Briefing	Support Donning			Lunch	Suit Ops and Communication		Doffing	Setup experiments	EIEE Briefing	
Iñigo Muñoz Elorza	AA 5		BF Briefing	Support Donning (incl FARSIDE 1x Setup)			Lunch	iROCS Cosmo GEOS [0] iROCS Cosmo		Doffing	Setup experiments	EIEE Briefing	
Carmen Köhler	AA 6		BF Briefing	Support Donning (incl FARSIDE 1x Setup)			Lunch	Hort3space (plant seeds)		Doffing	Setup experiments	EIEE Briefing	
Christian Schwarz	Safety.X		BF Briefing				Lunch	Safety.X				EIEE Briefing	
Judith Kuemmel	Safety.S		BF Briefing				Lunch	Safety.S				EIEE Briefing	
	GOST iROCS		BF Briefing				Lunch	Spotter iROCS				EIEE Briefing	
	GOST Checkpoint		BF Briefing	Checkpoint			Lunch	Checkpoint				EIEE Briefing	
Legend:	BF=Breakfast												

GOST Report

A debrief with the MSC was conducted about the scouting issue as well as the car incident. Safety trainings were conducted for the ECP and will be conducted for the rest of GOST to relieve the main Safeties. The zipper of shoe size 44 of Aouda was repaired. Ventilation in the bathroom is partially installed. All ceilings have been installed except for one corridor missing. The emergency lamps and lamps on top of the letters were installed.
Roof has been covered to be protected from rain. Everyone accepted that some construction work would need to be done by all and started working as a proper team once that fact was accepted. This increased considerably the number of hands and helpers and efficiently led to significantly improved habitat almost unrecognizable compared to the habitat a few days ago.

MSC Report

The isolation Phase is postponed to tomorrow.

- Welcoming BME at the MSC.
- Hort3Space seems to be solved: pump is supposed to arrive on field in 2 hours.

Media :

- 7:35am: Radio journalist coming to the MSC.
- 11 am: ORF filming crew.
    - Clean the FCT before.
    - OeWF t-shirts.
- 1pm: Livestream update (by Flight Director).

FCT :

- 6-7 am: FD/EARTHCOM expected.
- 7:30am: BME.

15Mar2024: Isolation phase

Activities

No EVA scheduled today, as there are no MEDO available on field. Begin of the isolation phase. RSS is working on mapping the habitat region of interests. Presentation given to the MSC during the afternoon.

Experiments

- iROCS: Charged.
- FaR SiDe: Set up.
- Hort3Space: Finalized.
- ALIX: Waiting for the beacon’s precise locations.
- PRESSURE: Waiting for inputs from field.
- Staying Alive: Experiment transported to the habitat.

16Mar2024: Black Day

Activities

No activities because of the Black Day.

GOST Report

Mobile antenna setup in attic pending (planned for 18/19th March). Today's LAN connection attempt between FO router and current mobile antenna has been unsuccessful. The water pump has been repaired. Geoserver has been set up, but the Traverse layers are pending.

17Mar2024: EVA during Isolation

Activities

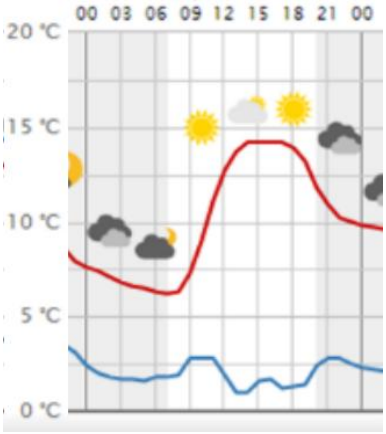
An EVA was performed today by Thomas Wijnen (Aouda.X) and Inigo Munoz Elorza (Aouda.S) from 11:38 to 14:59. The duration was 3:21 with some pauses due to loss of telemetry and loss of signal, which required the EVA to be aborted. Today's EVA main activity was FaR SiDe and GEOS-24.

Experiments

- FaR SiDe: Running today.
- GEOS: Running today.
- iROCS: Cosmo rover charged and parked, data transmission.

Weather

Sunset time (UTC+2)	19:10
Complete darkness (UTC+2)	20:41



Field Activity Plan

Sun, 17-Mar-2024	UTC	03:00	04:00	05:00	06:00	07:00
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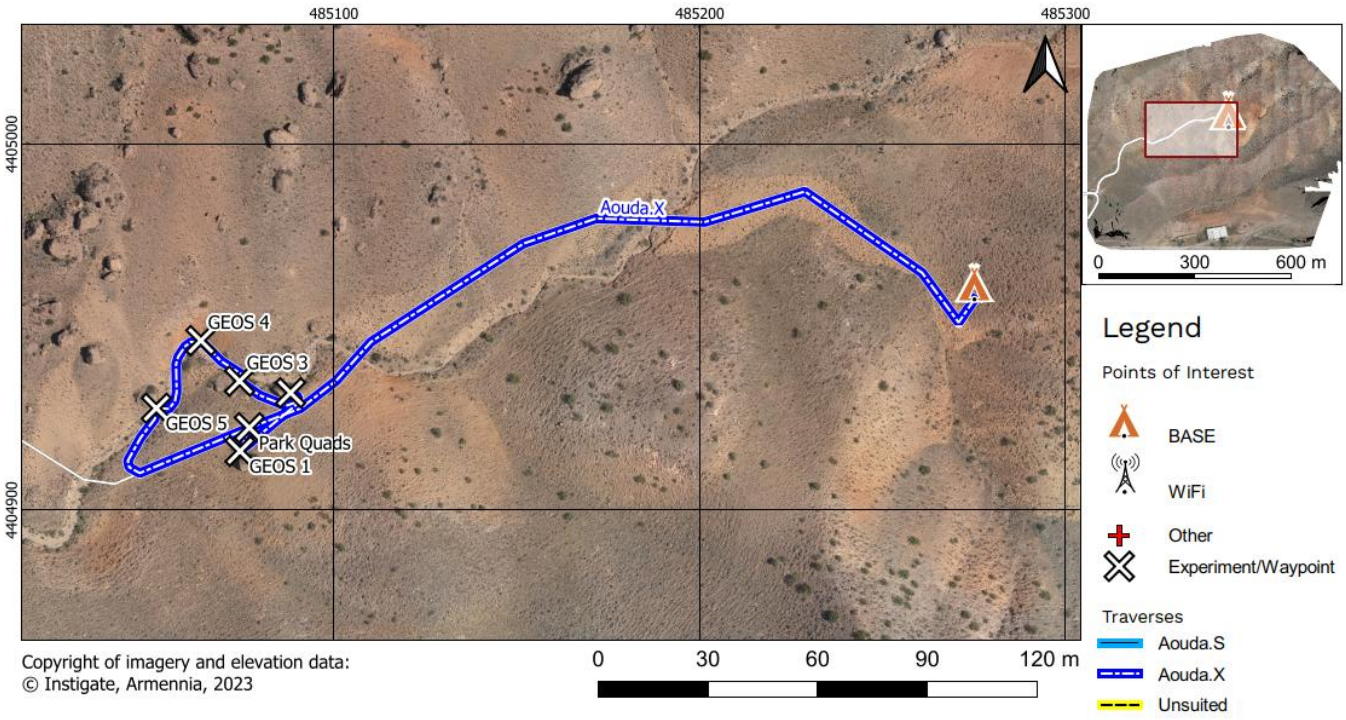
	UTC+4 (Field)	07:00	08:00	09:00	10:00	11:00
PERSON:	POSITION:					
Thomas Wijnen	Aouda.X		BF Briefing	Donning X - FARSIDE Procedure		
Robert Wild	Aouda.S		BF Briefing	Donning S		
Anika Mehlis	OPS		BF Briefing	Suit Ops and Communication		
Carmen Köhler	SciOPS		BF Briefing	Support Donning		
Iñigo Muñoz Elorza	Experimenter		BF Briefing	Support Donning (incl FARSIDE 1x Setup)		
Simone Paternostro	Experimenter		BF Briefing	Support Donning (incl FARSIDE 1x Setup)		
Christian Schwarz	Safety.X		BF Briefing			
Judith Kuemmel	Safety.S		BF Briefing			
Karen Petrosyan	MEDHOC		Briefing	MEDHOC		
Liliya Tadevosyan	MEDHOC		Briefing	MEDHOC		
	GOST IAQHabitat		BF Briefing			
	GOST iROCS		BF Briefing			Setup iROCS
	GOST Checkpoint		BF Briefing	Checkpoint		
Legend:	BF=Breakfast					
	H3S=hort3space					
	Brfg+HF = briefing + human factors questionnaire					

Sun, 17-Mar-2024	UTC	08:00	09:00	10:00	11:00	12:00	13:00
	UTC+1 (MSC)	09:00	10:00	11:00	12:00	13:00	14:00
	UTC+4 (Field)	12:00	13:00	14:00	15:00	16:00	17:00
PERSON:	POSITION:						
Thomas Wijnen	Aouda.X	Lunch	FARSIDE	GEOS [0]	FARSIDE	Doffing	GEOS EEE Brfg+HF
Robert Wild	Aouda.S	Lunch	iROCS Cosmo (Support FARS. + GEOS)			Doffing	iROCS question EEE Brfg+HF
Anika Mehlis	OPS	Lunch	Suit Ops and Communication				IAQ Habitat setup EEE Brfg+HF
Carmen Köhler	SciOPS	Lunch	Suit Ops and Communication			Doffing	EEE Brfg+HF
Iñigo Muñoz Elorza	Experimenter	Lunch	H3S setup	Hort3space		Doffing	EEE Brfg+HF
Simone Paternostro	Experimenter	Lunch	H3S setup	Hort3space		Doffing	EEE Brfg+HF
Christian Schwarz	Safety.X	Lunch	Safety.X				EEE Brfg+HF
Judith Kuemmel	Safety.S	Lunch	Safety.S				EEE Brfg+HF
Karen Petrosyan	MEDHOC	MEDHOC					
Liliya Tadevosyan	MEDHOC	MEDHOC					
	GOST IAQHabitat					IAQ Hab	EEE Brfg+HF
	GOST iROCS	Lunch	Spotter iROCS			Pack/clean iROCS	EEE Brfg+HF
	GOST Checkpoint	Lunch	Checkpoint				EEE Brfg+HF
Legend:	BF=Breakfast						
	H3S=hort3space						
	Brfg+HF = briefing + human factors questionnaire						

Traverse



GOST Report

Mobile antenna setup in attic pending, planned for 18/19th March. Wrong assumption about identical location of ROI and checkpoint was not verified but communicated as fact. Easy verification was not possible due to lack of digital GPS coordinates of ROI and traverse.

Connection problems with Mumble, troubleshooting in progress.
Only 1 antenna setup necessary before EVA. It would be much preferred to know the ROI one day earlier to have time to set up.

MSC Report

Test of the new GOST EVA procedures.
Journalists were present at the MSC at 9am.

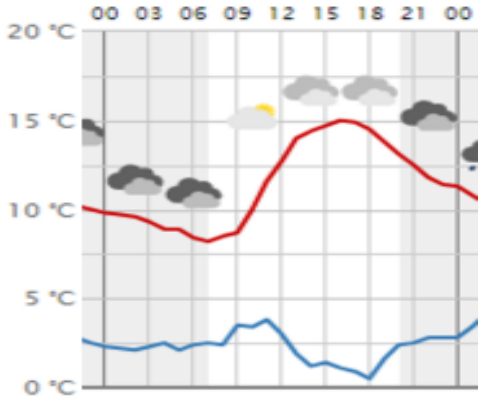
18Mar2024: EVA delayed by the rain

Activities

The EVA was performed today by Simone Paternostro (Aouda.X) and Inigo Munoz Elorza (Aouda.S) from 12:48 to 15:43. The duration was 2:55 and the EVA has been delayed by 3 hours due to the weather conditions. There were also some quads testing and journalists came to the MSC.

Experiments

- ALIX: Suit antenna set up on Aouda.X, outside antenna placement pending, power banks charged.
- FaR SiDe: Planned run today not performed.
- GENES4MARS: PI to provide cooling box to FO, otherwise all needed materials at the habitat.
- GeoPrep: Setup complete.
- GEOS-24: Run today GEOS 2.
- IAQHabitat: Outside control run planned after isolation.
- iROCS: Cosmo rover charged and parked ready for EVA, today's run cancelled due to rain.
- SAMPLE: MERCATOR parked at the habitat with 40% charge, broken charging supply unit, replacement pending.
- PRESSURE: Questionnaire in Safety backpack, file upload to OPS computer pending to be done by MSC IT.
- Staying Alive: Setup complete, pre-experiment questionnaire started today.



Weather

Sunset time (UTC+2)	19:10
Complete darkness (UTC+2)	20:41

Field Activity Plan

Mon, 18-Mar-2024	UTC	03:00	04:00		05:00	06:00	07:00
	UTC+1 (MSC)	04:00	05:00		06:00	07:00	08:00
	UTC+4 (Field)	07:00	08:00		09:00	10:00	11:00
PERSON:	POSITION:						
Simone Paternostro	Aouda.X		BF	Briefing	Donning X - FarSide Procedure		
Carmen Köhler	Aouda.S		BF	Briefing	Donning S		
Robert Wild	OPS		BF	Briefing	Suit Ops and Communication		
Thomas Wijnen	SciOPS		BF	Briefing	Support Donning (incl. FarSide 1x setup)		
Anika Mehlis	Experimenter		BF	Briefing	Support Donning (incl. FarSide 1x setup)		
Iñigo Muñoz Elorza	Experimenter		BF	Briefing	Support Donning (incl. FarSide 1x setup)		
Christian Schwarz	Safety.X		BF	Briefing			
Dominik Jaeger	Safety.S		BF	Briefing			
Anneta River	MEDHOC			Briefing	MEDHOC		
Liliya Tadevosyan	MEDHOC			Briefing	MEDHOC		
Artur Alaverdyan	MEDHOC			Briefing	MEDHOC		
	GOST iROCS		BF	Briefing			Setup iRocs COSMO
	GOST Checkpoint		BF	Briefing	Checkpoint		

Mon, 18-Mar-2024	UTC	08:00	09:00	10:00	11:00	12:00	13:00
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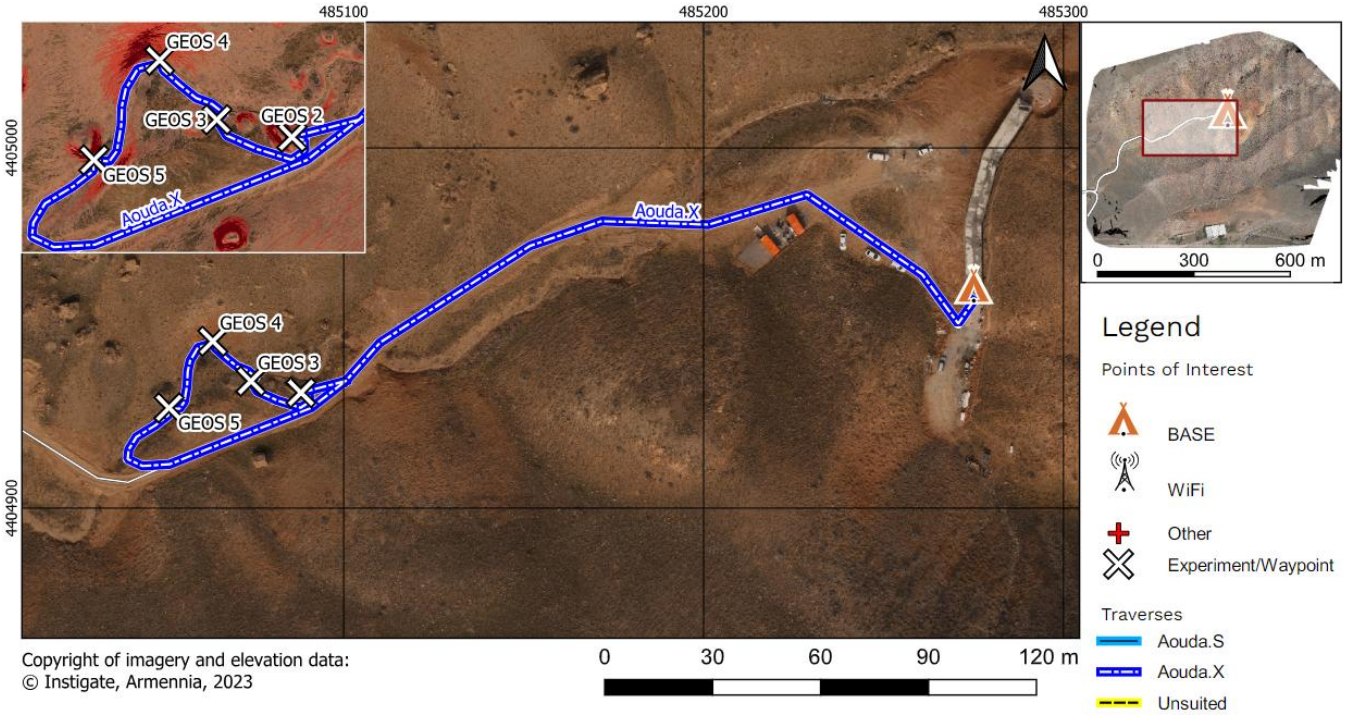
	UTC+4 (Field)	12:00	13:00	14:00	15:00	16:00	17:00
PERSON:	POSITION:						
Simone Paternostro	Aouda.X	Lunch	FarSide	GEOS [0]	FarSide	Doffing	GEOS (samples processing)	SA quest	Brfg+HF
Carmen Köhler	Aouda.S	Lunch	iROCS Cosmo (support FarSide + GEOS)			Doffing	SA quest	Brfg+HF
Robert Wild	OPS	Lunch	Suit Ops and Communication				SA quest	Brfg+HF
Thomas Wijnen	SciOPS	Lunch	Suit Ops and Comms			Doffing	SA quest	Brfg+HF
Anika Mehlis	Experimenter	Lunch	SA quest	Hort3space		Doffing	Brfg+HF
Iñigo Muñoz Elorza	Experimenter	Lunch	SA quest	Hort3space		Doffing	Brfg+HF
Christian Schwarz	Safety.X	Lunch	Safety.X				Brfg+HF
Dominik Jaeger	Safety.S	Lunch	Safety.S				Brfg+HF
Anneta River	MEDHOC	Lunch	MEDHOC				
Liliya Tadevosyan	MEDHOC	Lunch	MEDHOC				
Artur Alaverdyan	MEDHOC	Lunch	MEDHOC				
	GOST iROCS	Lunch	Spotter iROCS		Park/recharge iRocs Cosmo		Brfg+HF
	GOST Checkpoint	Lunch	Checkpoint				Brfg+HF

Traverse



GOST Report

Leaking roof in the suit and kitchen area so the floor there is covered in water. The roof covered in tarp has his front and back edge that folded over. The generator shutdown due to an “Overcurrent error”. The circuit breakers did not turn off and had to be turned off manually. All the suits, OPS and experiments have been securely stored in the locked habitat.
Concerning the suits and EVA, the decision tree and information flow were unclear: there was very limited situational awareness of the rain situation. Aouda.X kept having repeated loss of telemetry while Aouda.S had an empty battery towards end of EVA and its backup-radio push-to-talk was non-functional. Moreover, the comm on a backup radio while driving a quad is not hearable for Safety. There also was an unexpected OPS shutdown. With all of this, the EVA has been delayed by 3 hours.

MSC Report

Journalists present at MSC at 9am.
Tasks to be done by FCT:

- EVA procedure iteration
- Gas and Water tracking

Tasks to be done by RSS:

- IAQ missing procedures
- File size of rover data gathered is around 200GB and exceeds the FO's current upload bandwidth. After consulting with the IT service, we would suggest delivering the data to the PIs on SSD at the end of the mission. Should the FO's upload bandwidth change in the future, we are happy to reconsider.

Today, there seems to have been some uncertainty among the MEDHOCs on when to arrive at the FO on EVA days.
Weather situation drizzling rain, windy, cold temperature.
Near miss issue due a cascade effect of a long EVA (low battery) and an unexpected shutoff of the OPS Console resulting in a loss of situational awareness.
After debriefing with GOST and AAs: NO EVA IF IT IS RAINING.
Decision tree and information flow were unclear - very limited situational awareness of rain situation at MSC, GOST (eyes of MSC, even if it belongs to MSC to decide for the EVA), OPS sides.

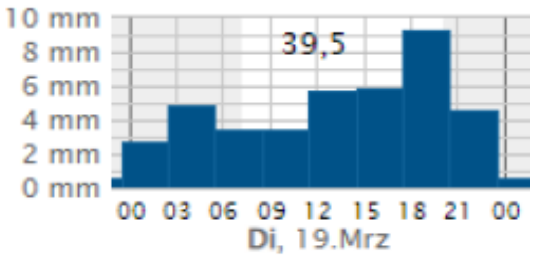
19Mar2024: Rain issues

Activities

First rainy day since the beginning of the mission. Discussion was required for a potential EVA. The latter successfully occurred during the afternoon with Simone Paternostro and Inigo Munoz Elorza.
The habitat has waterproofing problems. Indeed, water leaked everywhere and must be fixed quickly. Experiments and hardware are protected and safe. A lot of experiments have been put pending due to this problem.

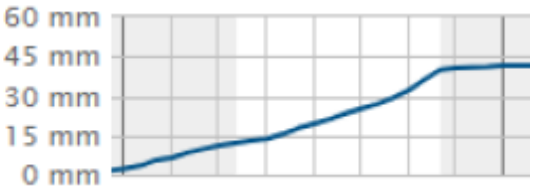
Experiments

- ALIX: Suit antenna set up on Aouda.X, outside antenna placement pending.
- GENES4MARS: Cancelled.
- GeoPrep: Pending, setup complete.
- GEOS-24: Pending.
- Hort3Space: Unattended, no power available.
- IAQHabitat: No power available.
- iROCS: Cosmo Rover ready for EVA.
- SAMPLE: Broken charging supply unit, replacement pending.
- PRESSURE: Questionnaire in Safety backpack.
- Staying Alive: Pending, setup complete, pre-experiment questionnaire started.



Weather

Light rain day.



Sunset time (UTC+2)	19:11
Complete darkness (UTC+2)	20:42

Field Activity Plan

Tue, 19-Mar-2024	UTC	03:00	04:00	05:00	06:00	07:00
	UTC+1 (MSC)	04:00	05:00	06:00	07:00	08:00
	UTC+4 (Field)	07:00	08:00	09:00	10:00	11:00
PERSON:	POSITION:					
Simone Paternostro	Experimenter	G4M	BF / Briefing			RAMAN (apprentice)
Carmen Köhler	Experimenter	G4M	BF / Briefing			RAMAN (apprentice)
Robert Wild	Experimenter	G4M / G4M	BF / Briefing	GeoPrep		
Thomas Wijnen	Experimenter	G4M	BF / Briefing	Staying Alive		RAMAN (main)
Anika Mehlis	Experimenter	G4M / G4M	BF / Briefing	H3S check		Staying Alive
Iñigo Muñoz Elorza	Experimenter	G4M	BF / Briefing	GeoPrep		
	GOST Checkpoint		BF / Briefing	Checkpoint		
Legend:	BF=Breakfast					
	Brfg+HF= briefing + human factors questionnaire					
	SA = Staying Alive					
	H3S = Hort3space					
	G4M = Genes4Mars					

Tue, 19-Mar-2024	UTC	08:00	09:00	10:00	11:00	12:00	
	UTC+1 (MSC)	09:00	10:00	11:00	12:00	13:00	
	UTC+4 (Field)	12:00	13:00	14:00	15:00	16:00	
PERSON:	POSITION:						
Simone Paternostro	Experimenter	Lunch	Staying Alive			EIEE	Brfg+HF
Carmen Köhler	Experimenter	Lunch	RAMAN (main)	Staying Alive	SA upload	EIEE	Brfg+HF
Robert Wild	Experimenter	Lunch	RAMAN (apprentice)		RAMAN upload	EIEE	Brfg+HF
Thomas Wijnen	Experimenter	Lunch	GeoPrep		GEOS upload	EIEE	Brfg+HF
Anika Mehlis	Experimenter	Lunch	GeoPrep		H3S check	EIEE	Brfg+HF
Iñigo Muñoz Elorza	Experimenter	Lunch	RAMAN (apprentice)			EIEE	Brfg+HF
	GOST Checkpoint	Lunch	Checkpoint				Brfg+HF
Legend:	BF=Breakfast						
	Brfg+HF= briefing + human factors questionnaire						
	SA = Staying Alive						
	H3S = Hort3space						
	G4M = Genes4Mars						

GOST Report

Poor transmission quality to the habitat. Habitat re-valuation: roof leaking in large parts of the habitat. The habitat has disconnected from generator. Fast reestablishment of the habitat necessary. Fuel tank leaking slowly, to be monitored. The generator has shut down due to overcurrent, but the cause remains to be investigated.

MSC Report

AAs :

- Donning duration length clarification ;
- Quad Test ;
- Quad situational awareness: Quads 1 and 2 are 2-seat, Quad 3 is 1-seat. Need to know which is where.

GOST :

- EVA procedure to discuss with GOST;
- IT and GOST investigating the data transfer of 200GB for iROCS;
- Wi-Fi location.

Roads:

- Road until the Checkpoint is ok;
- Road from the Checkpoint to the habitat is challenging as expected given the geology with mud, lost rocks and under heavy rain;
- Large rocks have been displaced and rolled into the road making it more difficult to navigate. Some are “head-sized”.

Habitat:

- All rooms are flooded but the science room and a couple of AAs staterooms;
- All electrical equipment were unplugged;
- Personal belongings brought to FO;
- Electrical safety of habitat unclear - circuit breakers did not switch off in initial event;
- All experiments and mission-critical hardware are protected and safe. Tarps seem to have protected all equipment well - suit cases were additionally put on wooden blocks;
- Disconnected from the generator (container too);
- Generator turned OFF because of overcurrent (according to the message displayed);
- Generator switched ON again on 18/03/2024;
- Mobile network available as the generator is running;
- WIFI antennas still in place.

Outside:

- Heavy rain, mud, very slippery;
- Entire roof flooded: tarp cannot be the cause of the leakages noticed in the habitat;
- Doesn’t match the leak pattern inside.

Official Communication:

- ‘Due to heavy rainfall the habitat in Armenia must undergo maintenance work which is currently in progress. For the duration of the maintenance the experiments are on hold. We expect return to nominal operation in the following days. Crew and equipment are safe.’ To be communicated to PIs and Media on request.

Depending on the weather conditions, the habitat restoration shall take 4 to 5 days. With margins we consider a full week of work before being back to isolation mode

Field well-being:

- AAs and GOST need to decrease the pressure: visiting Erevan, to restore morale;
- Difficulties with the language barrier to stay at FO;
- Psychological report

Polares Chat: Test conducted successfully with the time delayed server.
Science Management: RSS Meeting.

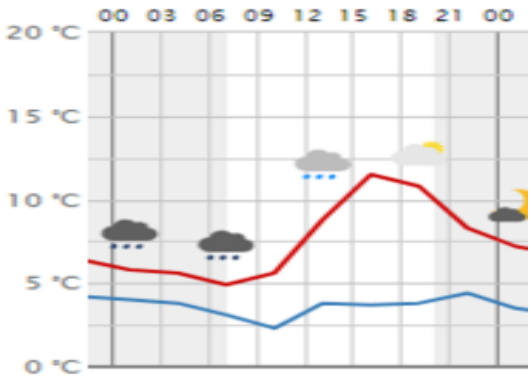
20Mar2024: Maintenance on the HAB

Activities

No EVA on this day. Meeting with the AAs and GOST concerning the hierarchy, HAB status and power outage. An announcement has been made by the Armenian PM Pashniyan on territorial claims by Azerbaijan.

Experiments

- ALIX: Suit antenna set up on Aouda.X, outside antenna placement pending, power banks charged.
- EIEE: Complete run yesterday.
- GENES4MARS: Tbc in isolation, PI to provide cooling box to FO.
- GeoPrep: Pending, setup complete.
- GEOS-24: Pending, tool and samples brought to FO.
- Hort3Space: Trays and nutrients brought to FO.
- IAQHabitat: Currently no power available.
- iROCS: Cosmo rover charged and parked ready for EVA.
- SAMPLE: MERCATOR parked at the habitat with 40% charge, broken charging supply unit, replacement pending.
- PRESSURE: Questionnaire in Safety backpack, file upload to OPS computer pending to be done by MSC IT.
- Staying Alive: Pending, setup complete, laptop @ FO, pre-experiment questionnaires completed.



Weather

Sunset time (UTC+2)	19:10
Complete darkness (UTC+2)	20:41

Field Activity Plan

No planning due to issues with the time management (too many unforeseen events).

GOST Report

There was a power outage of about 1,5h today that started at 09:07 CET. Our congregation point in case of evacuation is the German embassy Yerevan.
Some work on the roof was done overnight and continued today. It should be completely covered with metal sheets by tonight. The inside situation and road status improved. Hort3Space has been rebuilt because it had partially deflated. The habitat also disconnected from the generator.
Electrical safety report followed
The WIFI antennas are still in place.

MSC Report

Human Factors:

- Meeting to be planned on Thursday with the AAs;
- RSS Science Program.

Meeting with the AAs and GOST:

- Power outage at 09:07 CET and restored at 10:30 CET.

Habitat status :

- Roof completed except half of the airlock during the overnight;
- Upon new material reception, construction can resume. Expected deadline: today or tomorrow;
- Inside: Drying up, need of an extensive cleaning and drying after the construction work;
- Roadmap to simulation:
    - Reconnect the habitat to the Generator and only switch ON the AC + use of humidifiers to dry up the habitat;
    - After inspection, no short circuit detected but the small fridge at airlock.
    - After electrical check, equipment can be plugged back, and experiments can be resumed.

- Science status (see Table ‘Experiment Status Overview’);
- Need readable GPS files for mobile devices displaying POI, …

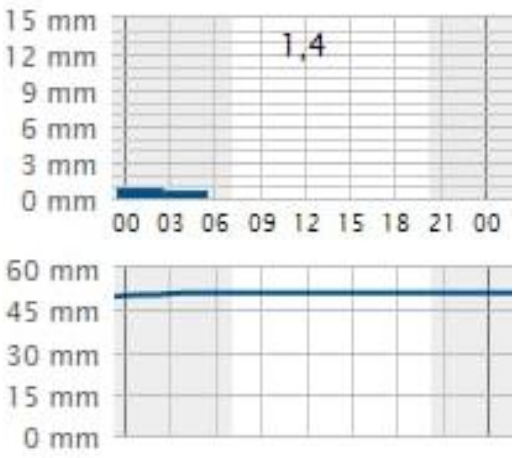
21Mar2024: Habitat restoration

Activities

A necessary electrical evaluation with the field team was quite positive. The cleaning of the habitat is quite advanced. The experiments are progressing in parallel.

Experiments

- ALIX: Suit antenna set up on Aouda.X, outside antenna placement pending.
- EIEE: Run today.
- GeoPrep: Still pending.
- GEOS-24: Still pending.
- IAQHabitat: Pending.
- iROCS: Cosmo Rover ready for EVA, SSC data transfer commenced.
- SAMPLE: Same status.
- PRESSURE: Same status.
- Staying Alive: One run today, setup complete.



Weather

Sunset time (UTC+2)	19:15
Complete darkness (UTC+2)	20:46

GOST Report

It's likely that a short circuit in one of the outdoor cable drums we have placed is the cause of the generator shutdown. Indeed, the habitat circuit breakers appear to be working and didn't trip during the initial event. Situation inside the habitat improved.

MSC Report

Habitat update:

- Road conditions improved, only some residual puddles and muddy parts;
- Roof done 95%, surroundings unchanged. Tarp between containers ripped off on one side.

Inside it is still very moist with very wet areas on the ceiling but no more dripping. No more standing water on the floor either. Tarps underneath the ceiling were removed except for the kitchen. Some furniture shows signs of water damage. The last wet can be wiped off and the floor is very dirty.

- Pedros the electrician came and started doing something without talking:
    - We lost comms because he disconnected the antenna from the generator, but now back up again;
    - AA Robert Wild is monitoring him, and he is basically doing what we were planning to do. Checking circuit breaker by circuit breaker and socket by socket and turning things back on. The first AC is running already.

Habitat status :

The assessment with the field crew showed that there was no direct water on the breakers as they are in separate housings. Moist surroundings and/or a drop of water here and there is no problem. A real showstopper would have been them residing under water for some time or muddy/sandy water on/in them.
This was the specialists main concern - as this was not the case he suggested to check them for mechanical problems by switching them off and on - this just to be really sure and to remove last traces of possible moisture from the contacts.
He gave a clear go to outlets and clamps having gotten water as long as they are more or less dry now.
Then he suggested in unplugging everything that can easily be unplugged, switch on the generator and then replug it step by step.
This way he was sure that there is no danger to the crew - it just could happen that some of the breakers blow - but that's what they are there for.

22Mar2024: Quiet Day

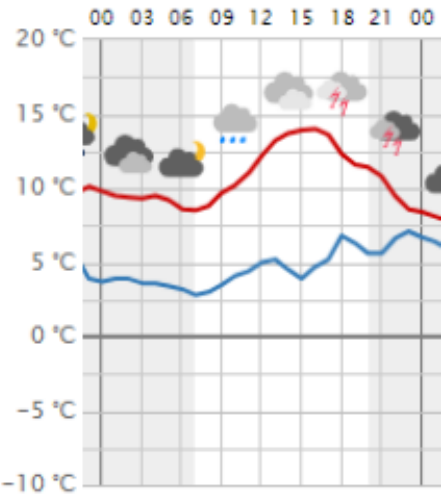
Activities

No EVA on this day. Mostly cleaning and maintaining the habitat.

Experiments

- ALIX: Suit antenna set up on Aouda.X, outside antenna placement done today, power banks charged, one monopole antenna missing coax adapter.
- GENES4MARS: Tbc in isolation, PI to provide cooling box to FO.
- GeoPrep: Pending, setup complete.
- GEOS-24: Pending, laptop, tools, and samples back at the habitat.
- Hort3Space: Trays and nutrients back at the habitat.
- IAQHabitat: Pending.
- iROCS: Cosmo rover charged and parked ready for EVA, SSD back at rover.
- SAMPLE: MERCATOR parked at the habitat with 40% charge, broken charging supply unit, replacement pending, PI arrival anticipated for 24.03.

- PRESSURE: Questionnaire in Safety backpack, file upload to GEOS laptop.
- Staying Alive: Multiple runs today, missing parts found.



Weather

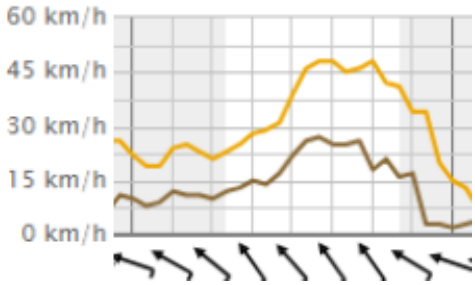
Sunset time (UTC+4)	19:16
Complete darkness (UTC+4)	20:47

Field Activity Plan

Out-of-sim maintenance day without DAP.

GOST Report

Mobile antenna setup in attic pending. After a re-evaluation, the interior's habitat is cleaned and mostly dry. It is habitable from this day on. The water tank has also been refilled.



MSC Report

Habitat :

- Thorough cleaning;
- Get the Wi-Fi up and running;
- Check if the habitat is still safe under rainy conditions.
- Power issue reported: the last update is "In the morning we noticed significant voltage changes depending on the load of the power network: e.g. turning on the 3 ACs resulted in dropping of the voltage from 222V to 210V, resulting in power outages and damaging equipment".
  After the electrician was here, we were able to confirm a stable current of 230V.
  We then continued turning on devices to do a load test.
  We turned on as much as we could: all antennas, washing machine, oven, fridges, H3S heater, charging a car battery as well as the usual portable devices.
  As of now, no change of the voltage was detected!!!!
  We are optimistic now the power generator provides a stable power network for the habitat.

HF presentation at 11:30AM CET.
RSS/FD: Status about SAMPLE? => Coming to MSC on Saturday and fly to Armenia on Sunday.
FP: To provide a non-EVA (maintenance day) DAP for Saturday.
FD: Upload new version of the Staying Alive procedure on the hive before the first run.
FCT: EARTHCOM tutorial FCT Members.

Weather update:

- Low-pressure system in the west causing unstable weather in Armash region;
- Low-pressure area to slowly shift east, affecting Armenia through the weekend;
- Moderate to high chance of short rain showers in the next few days;

- Accurate forecasts are difficult; observing the sky may be more reliable for short-term predictions;
- Weather to stabilize and improve from Tuesday as high pressure becomes more dominant;
- Caution advised against relying too heavily on precise weather predictions due to current atmospheric conditions.

23Mar2024: Experiments resume

Activities

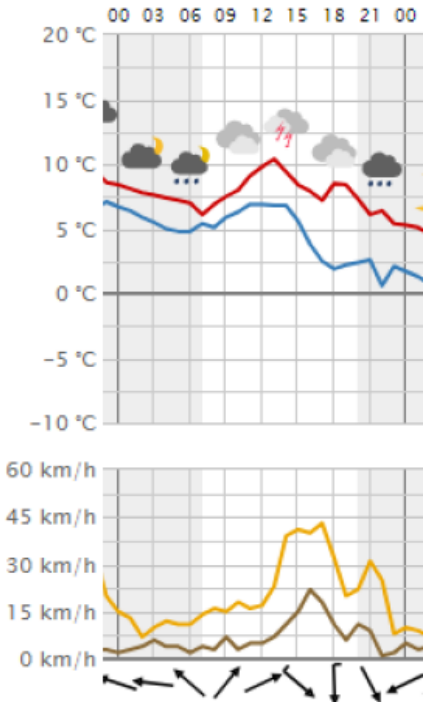
Experiments are progressing after the incident in the habitat. MEROP presentation occurred.

Experiments

- ALIX: Unsuited EVA combined with GEOS, outside antenna placement done, location sent to MSC.
- EIEE: Run today.
- FaR SiDe: Run tomorrow.
- GeoPrep: First run today, unsuccessful but rescheduled.
- GEOS-24: GEOS 3-5 today.
- iROCS: Cosmo Rover ready for EVA, SSC back at rover.
- RAMAN: Not working but the cause of the failure is normally known.
- SAMPLE: Same status.
- PRESSURE: Same status.
- Staying Alive: Runs today.

Weather

Sunset time (UTC+4)	19:16
Complete darkness (UTC+4)	20:47



Field Activity Plan

Sat, 23-Mar-2024	UTC	03:00	04:00		05:00	06:00	07:00	08:00	
	UTC+1 (MSC)	04:00	05:00		06:00	07:00	08:00	09:00	
	UTC+4 (Field)	07:00	08:00		09:00	10:00	11:00	12:00	
PERSON:	POSITION:								
Simone Paternostro	Experimenter		BF	Briefing	Move to habitat		RAMAN		Lunch
Carmen Köhler	Experimenter		BF	Briefing	Move to habitat		H3S check		Lunch
Robert Wild	Experimenter		BF	Briefing	Move to habitat		Staying Alive (+)		Lunch
Anika Mehlis	Experimenter		BF	Briefing	Move to habitat		RAMAN		Lunch
Iñigo Muñoz Elorza	Experimenter		BF	Briefing	Move to habitat				Lunch
	GOST Checkpoint		BF	Briefing	Checkpoint				Lunch
	GOST ALIX		BF	Briefing			Setup ALIX (batteries)		Lunch
Legend:	BF=Breakfast								
	Brfg+HF= briefing + human factors questionnaire								
	SA = Staying Alive								
	*staying alive data transfer (upload to server)								
	H3S = Hort3space								

Sat, 23-Mar-2024	UTC	09:00	10:00	11:00	12:00	13:00
	UTC+1 (MSC)	10:00	11:00	12:00	13:00	14:00
	UTC+4 (Field)	13:00	14:00	15:00	16:00	17:00
PERSON:	POSITION:					
Simone Paternostro	Experimenter			GeoPrep		EIEE Brfg+HF
Carmen Köhler	Experimenter	GeoPrep		RAMAN	H3S check	EIEE Brfg+HF
Robert Wild	Experimenter	GeoPrep		RAMAN		EIEE Brfg+HF
Anika Mehlis	Experimenter	Staying Alive (+)		GeoPrep		EIEE Brfg+HF
Iñigo Muñoz Elorza	Experimenter	ALIX	Staying Alive (-)		SA upload	EIEE Brfg+HF
	GOST Checkpoint	Checkpoint				Brfg+HF
	GOST ALIX		Pack ALIX (batteries)			Brfg+HF
Legend:	BF=Breakfast					
	Brfg+HF= briefing + human factors questionnaire					
	SA = Staying Alive					
	*staying alive data transfer (upload to server)					
	H3S = Hort3space					

GOST Report

One car currently out of operations at the habitat because of a broken ignition key, repair pending. Water tank refilled and food for three days provided today. Oil tank changed today, Analog astronauts moved back to the habitat after cleaning and putting back most ceiling tiles.

MSC Report

A few deviations from the DAP (check experiments):

- EARTHCOM: iROCS status: charging status? 3D printed part repair?
- EARTHCOM: iROCS camera to be turned off to save data;
- EARTHCOM: FaR SiDe, sensors charging overnight to be prepared for Sunday's EVA;
- FaR SiDe: To provide P1-P4 locations to FP;
- FP/FD: Clarify EVA plans for Sunday. => To be communicated to FaR SiDe;
- AAs/GOST provided detailed report to EVA under rainy conditions. Need further actions from the Flight Director to implement the suggestion in the Flight Rules/SOPs.

FCT:

- Communication test with the black phone at 10:36 CET;
- MEROP presentation at 16:30 CET;
- FCT Members getting proper training at the EARTHCOM console: ready to take.

24Mar2024: Normal EVA Day

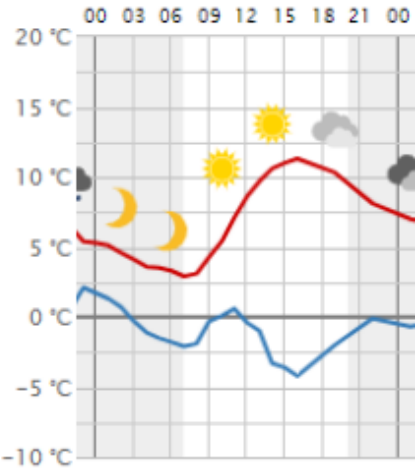
Activities

An EVA has been performed today by Robert Wild (Aouda.X) and Carmen Köhler (Aouda.S) from 10:41 to 14:57. The duration was 4:16. EVA's main activity was FaR SiDe at the Habitat Roi and GEOS at the Donau Roi.

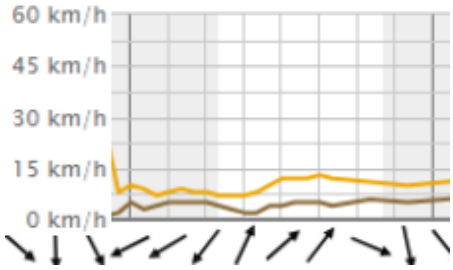
Experiments

- FaR SiDe: Software issues, team viewer was needed during EVA, GOST had to open FaR SiDe box during EVA several times to forward IP. address and PW.
- GEOS-24: Cancelled.
- FaR SiDe#2: Cancelled.
- iROCS#2: Cancelled.
- PRESSURE: Performed (completed in 24 minutes).
- Staying Alive: Performed.
- Hort3Space: Performed.
- ALIX: Performed.
- GeoPrep: Performed.
- IAQHabitat: Performed.
- EIEE: Performed.

Weather



Sunset time (UTC+4)	19:17
Complete darkness (UTC+4)	20:48

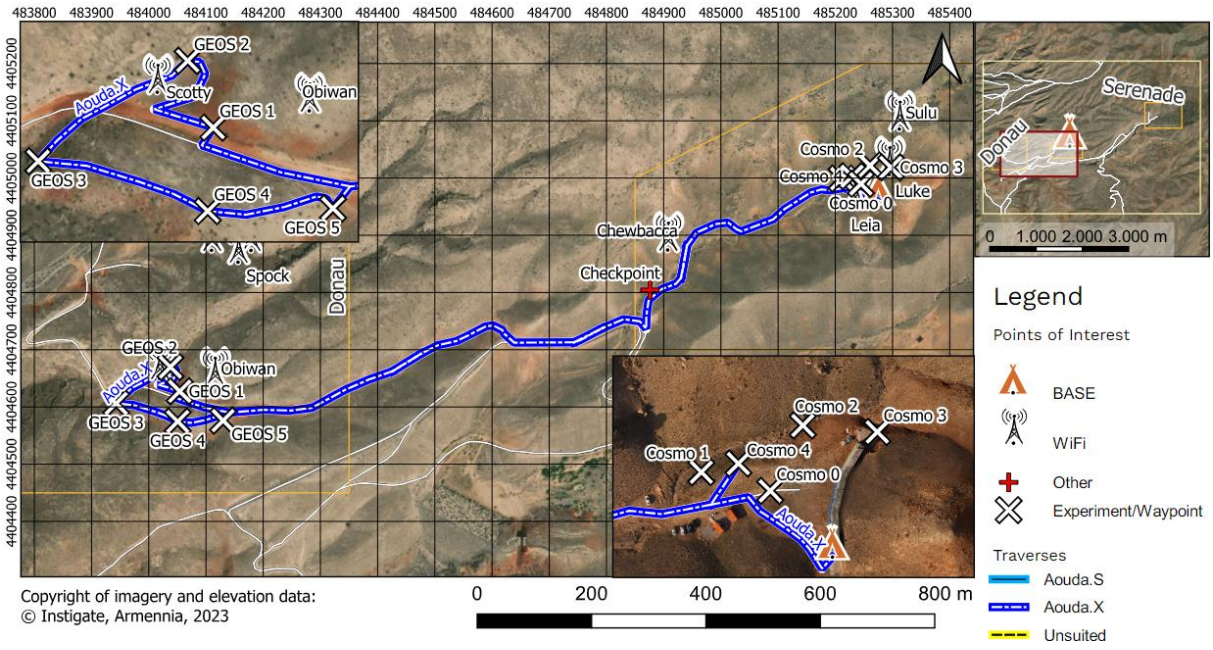


Field Activity Plan

Sun, 24-Mar-2024	UTC	03:00	04:00	05:00	06:00	07:00
	UTC+1 (MSC)	04:00	05:00	06:00	07:00	08:00
	UTC+4 (Field)	07:00	08:00	09:00	10:00	11:00
PERSON:	POSITION:					
Robert Wild	Aouda.X		BF Briefing	Donning X		
Carmen Köhler	Aouda.S		BF Briefing	Donning S - FarSide Procedure		
Anika Mehlis	OPS		BF Briefing	Suit Ops and Communication		
Iñigo Muñoz Elorza	SciOPS		BF Briefing	Support Donning (incl. FarSide 1x setup)		
Simone Paternostro	Experimenter		BF Briefing	H3S	Support Donning (incl. FarSide 1x setup)	
Adrian Belli	Safety.X		BF Briefing			
Vera Karner	Safety.S		BF Briefing			
Sevan Iritsyan	MEDHOC		Briefing	MEDHOC		
Liliya Tadevosyan	MEDHOC		Briefing	MEDHOC		
	GOST iROCS		BF Briefing			Setup iRocs COSMO
	GOST Checkpoint		BF Briefing	Checkpoint		

Sun, 24-Mar-2024	UTC	08:00	09:00	10:00	11:00	12:00	13:00	14:00
	UTC+1 (MSC)	09:00	10:00	11:00	12:00	13:00	14:00	15:00
	UTC+4 (Field)	12:00	13:00	14:00	15:00	16:00	17:00	18:00
PERSON:	POSITION:							
Robert Wild	Aouda.X	Lunch	iROCS Cosmo / TT / GEOS [Donau] / TT / iROCS Cosmo		Doffing	GEOS (samples processing)	GEOS upload	Brfg+HF
Carmen Köhler	Aouda.S	Lunch	FarSide / TT / GEOS [Donau] / TT / FarSide		Doffing	GEOS (samples processing)		Brfg+HF
Anika Mehlis	OPS	Lunch	Suit Ops and Communication					Brfg+HF
Iñigo Muñoz Elorza	SciOPS	Lunch	Suit Ops and Comms		Doffing	Staying Alive	StA upld	Brfg+HF
Simone Paternostro	Experimenter	Lunch	Staying Alive / SA upld		Doffing	RAMAN	RAMAN upld / H3S	Brfg+HF
Adrian Belli	Safety.X	Lunch	Safety.X					Brfg+HF
Vera Karner	Safety.S	Lunch	Safety.S					Brfg+HF
Sevan Iritsyan	MEDHOC	Lunch	MEDHOC					
Liliya Tadevosyan	MEDHOC	Lunch	MEDHOC					
	GOST iROCS	Lunch			Park/recharge iRocs Cosmo			Brfg+HF
	GOST Checkpoint	Lunch	Checkpoint					Brfg+HF

Traverse



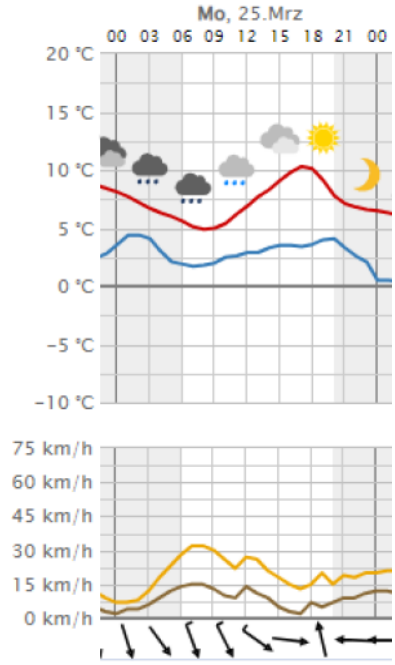
GOST Report

Hort3Space tent has been reinflated by GOST. Concerning the Wi-Fi, staff antennas were swapped with directional at Han-solo and pointed in the direction of Samples. Han-solo was configurated and Obi-wan was used as a receiver and connected with Scotty.
For the EVA, Sci-Ops worked with laptop due to technical issues which could not be fixed before the EVA. Also, OPS kept track of battery voltages (exchanged battery 5 on A.X for battery 1 due to low voltage). Suits had to be rebooted during the EVA by Safety. GEOS, FaR SiDe#2 and iROCS#2 was cancelled.

25Mar2024: Summary

Activities

No EVA scheduled. However, a summary of all experiments is planned. Today, the focus of the crew is made on GeoPrep, MEROP and Staying Alive experiments.



Weather

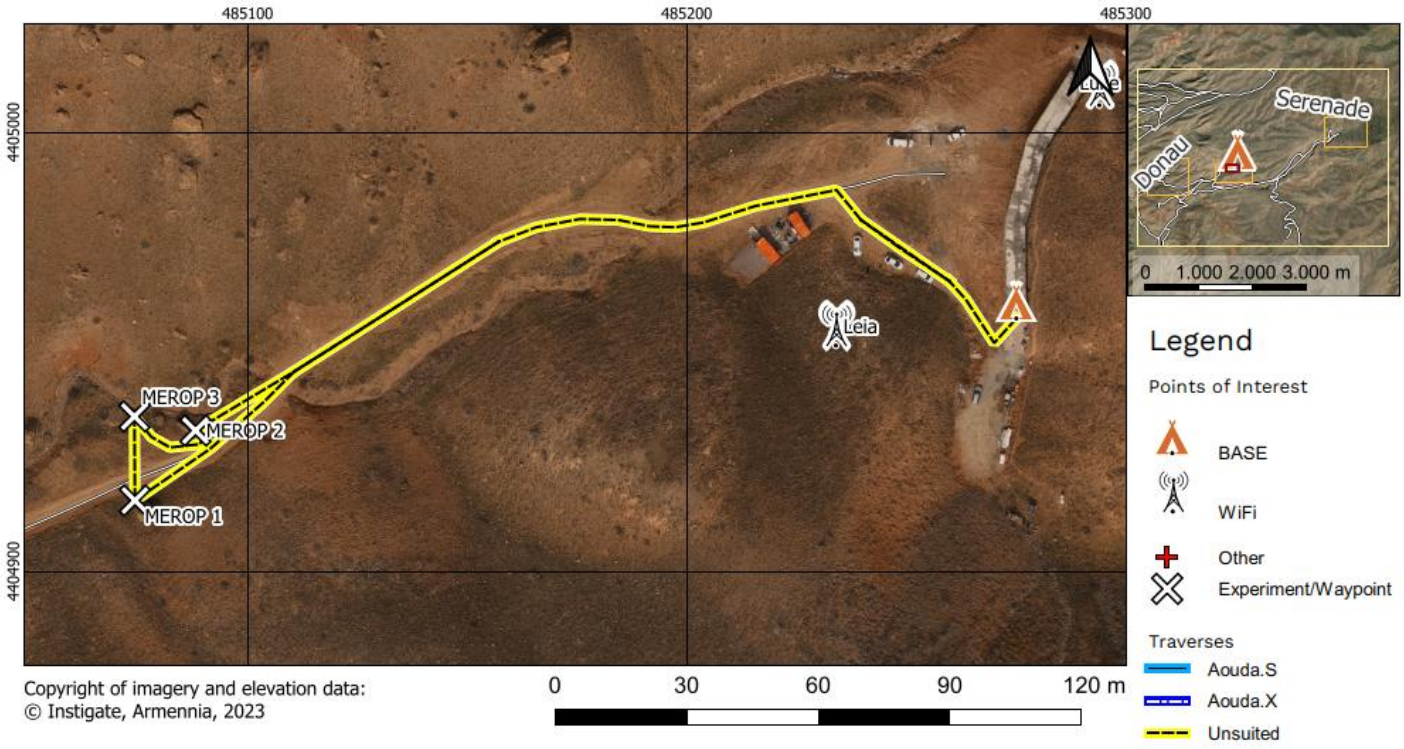
Sunset time (UTC+2)	19:18
Complete darkness (UTC+2)	20:49

Field Activity Plan

Mon, 25-Mar-2024	UTC	03:00	04:00	05:00	06:00	07:00
	UTC+1 (MSC)	04:00	05:00	06:00	07:00	08:00
	UTC+4 (Field)	07:00	08:00	09:00	10:00	11:00
PERSON:	POSITION:					
Simone Paternostro	Experimenter		G4M BF	Briefing	SAMPLE video	SAMPLE trng call
Carmen Köhler	Experimenter		G4M BF	Briefing	SAMPLE video	SAMPLE trng call
Robert Wild	Experimenter	G4M	G4M BF	Briefing	SAMPLE video	SAMPLE trng call
Anika Mehlis	Experimenter	G4M	G4M BF	Briefing	Staying Alive (-) + post quest.	
Iñigo Muñoz Elorza	Experimenter		G4M BF	Briefing	H3S check	
	GOST Checkpoint		BF	Briefing	Checkpoint	
	GOST SAMPLE (x2)		BF	Briefing		SAMPLE Training with PIs
Legend:	BF=Breakfast					
	Brfg+HF= briefing + human factors questionnaire					
	H3S = Hort3space					
	G4M = Genes 4 Mars					
	SAMPLE trng call = videocall with PIs for training					

Mon, 25-Mar-2024	UTC	08:00	09:00	10:00	11:00	12:00
	UTC+1 (MSC)	09:00	10:00	11:00	12:00	13:00
	UTC+4 (Field)	12:00	13:00	14:00	15:00	16:00
PERSON:	POSITION:					
Simone Paternostro	Experimenter	Lunch	GeoPrep		EIEE	Brfg+HF
Carmen Köhler	Experimenter	Lunch	MEROP setup / MEROP	Staying Alive (-)	EIEE	Brfg+HF
Robert Wild	Experimenter	Lunch	GeoPrep		EIEE	Brfg+HF
Anika Mehlis	Experimenter	Lunch			EIEE	Brfg+HF
Iñigo Muñoz Elorza	Experimenter	Lunch	Staying Alive (-)		H3S check / EIEE	Brfg+HF
	GOST Checkpoint	Lunch	Checkpoint			Brfg+HF
	GOST SAMPLE (x2)	Lunch	MEROP			Brfg+HF
Legend:	BF=Breakfast					
	Brfg+HF= briefing + human factors questionnaire					
	H3S = Hort3space					
	G4M = Genes 4 Mars					
	SAMPLE trng call = videocall with PIs for training					

Traverse



26Mar2024: Calm Day

Activities

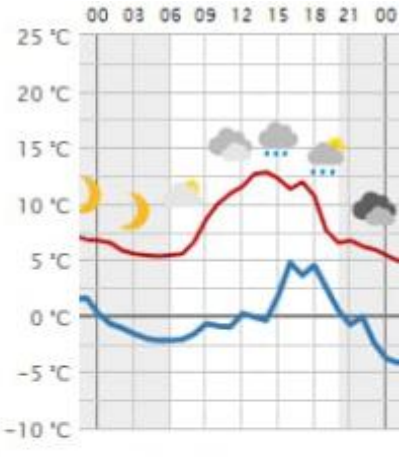
No EVA on this day. Interview in the region of check points.

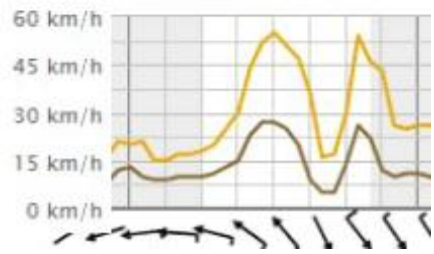
Experiments

- Hort3Space: Checked, tent refilled.
- SAMPLE: Aborted due to weather conditions.
- Staying Alive: 4 Successful runs.
- GeoPrep: Run began successfully until cutting the sample. Final grinding pending.

Weather

Sunset time (UTC+4)	19:19
Complete darkness (UTC+4)	20:50





Field Activity Plan

Tue, 26-Mar-2024	UTC	03:00	04:00	05:00	06:00	07:00
	UTC+1 (MSC)	04:00	05:00	06:00	07:00	08:00
	UTC+4 (Field)	07:00	08:00	09:00	10:00	11:00
PERSON:	POSITION:					
Simone Paternostro	Experimenter		BF Briefing			
Carmen Köhler	Experimenter		BF Briefing	Staying Alive (+)		
Robert Wild	Experimenter		BF Briefing			
Anika Mehlis	Experimenter		BF Briefing	H3S		
Iñigo Muñoz Elorza	Experimenter		BF Briefing		Staying Alive (+)	
	GOST Checkpoint		BF Briefing	Checkpoint		
	GOST MERCATOR (x2)		BF Briefing			Setup MERCATOR
	GOST interview		BF Briefing			

Tue, 26-Mar-2024	UTC	08:00	09:00	10:00	11:00	12:00
	UTC+1 (MSC)	09:00	10:00	11:00	12:00	13:00
	UTC+4 (Field)	12:00	13:00	14:00	15:00	16:00
PERSON:	POSITION:					
Simone Paternostro	Experimenter	Lunch	Staying Alive (+) + questionnaire			Brfg+HF
Carmen Köhler	Experimenter	Lunch	SAMPLE [habitat]			Brfg+HF
Robert Wild	Experimenter	Lunch		Staying Alive (+)		Brfg+HF
Anika Mehlis	Experimenter	Lunch	GeoPrep		H3S	Brfg+HF
Iñigo Muñoz Elorza	Experimenter	Lunch	GeoPrep			Brfg+HF
	GOST Checkpoint	Lunch	Checkpoint			Brfg+HF
	GOST MERCATOR (x2)	Lunch	Spotter MERCATOR (SAMPLE)	Park/recharge MERCATOR		Brfg+HF
	GOST interview	Lunch			Media	Brfg+HF

GOST Report

One of the cars locked itself with the keys inside. A mechanic came to open the car and additionally, made copies of the keys. They were strong and loud winds overnight, but no new leaks were discovered this morning. The Experiment team had again hardware issues do the test run for AA was postponed. Only MPM and PANCAM were done for AA. Concerning the Wi-Fi, the setup was stopped because of rain and wind. There was also the setup of Obi-Wan and Yoda, but the latter had configuration problems (due to gust problems of another antenna). Hort3Space tent was inflated again, the second tent pillar is still the problematic one.

27Mar2024: Short-range EVA

Activities

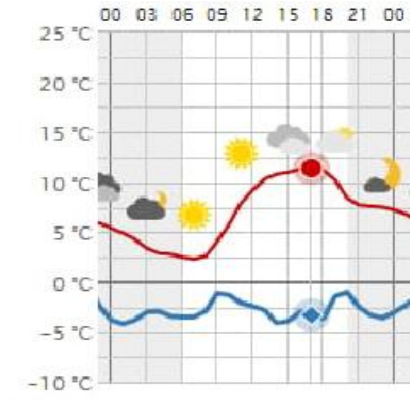
An EVA has been performed by Simone Paternostro (Aouda.X) and Anika Mehlis (Aouda.S) from 12:46 to 15:28. The duration was 2:42 with many breaks due to loss of telemetry in both suits and its main activity was supposed to be FaR SiDe, iROCS and GEOS experiments, but the GEOS has been cancelled for Wi-Fi issues.

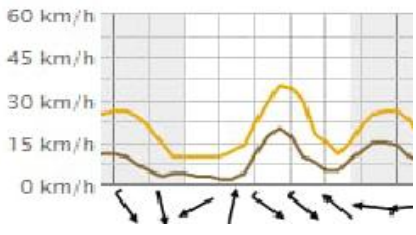
Experiments

- Hort3Space: Progressing despite technical problems with the tent.
- IAQHabitat: Successfully done today.
- SAMPLE: Successful.
- Staying Alive: Rescheduled.

Weather

Sunset time (UTC+2)	19:20
Complete darkness (UTC+2)	20:51





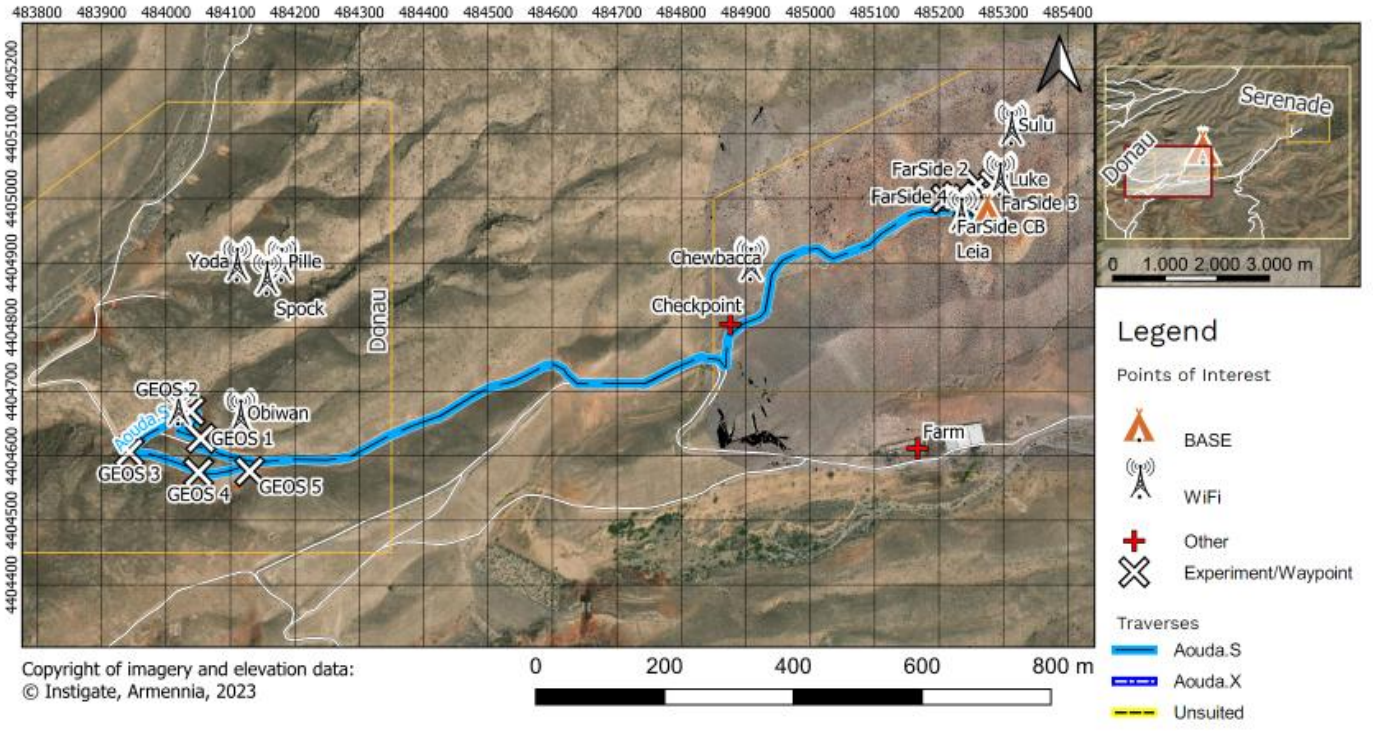
Field Activity Plan

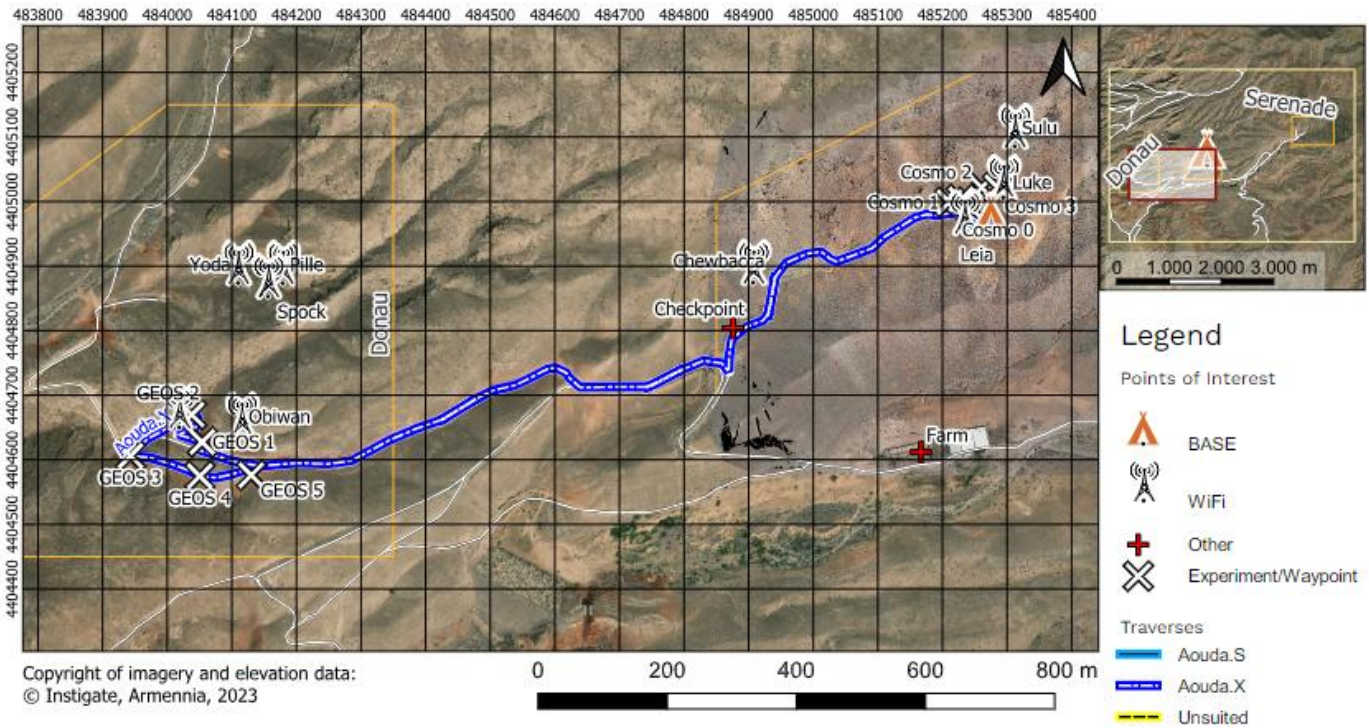
Wed, 27-Mar-2024	UTC	03:00	04:00	05:00	06:00	07:00
	UTC+1 (MSC)	04:00	05:00	06:00	07:00	08:00
	UTC+4 (Field)	07:00	08:00	09:00	10:00	11:00
PERSON:	POSITION:					
Simone Paternostro	Acuda.X		BF Briefing	Donning X		
Anika Mehlis	Acuda.S		BF Briefing	Donning S - FarSide Procedure		
Iñigo Muñoz Elorza	OPS		BF Briefing	Suit Ops and Communication		
Robert Wild	SciOPS		BF Briefing	Support Donning (incl. FarSide 1x setup)		
Carmen Köhler	Experimenter		BF Briefing	H3S	Support Donning (incl. FarSide 1x setup)	IAQ
	Safety.X		BF Briefing			
	Safety.S		BF Briefing			
Liliya Tadevosyan	MEDHOC		Briefing	MEDHOC		
	GOST SAMPLE (x2)		BF Briefing			Setup SAMPLE
	GOST iROCS		BF Briefing			Setup iRocs COSMO
	GOST Checkpoint		BF Briefing	Checkpoint		
Legend:	BF=Breakfast					
	Brfg+HF= briefing + human factors questionnaire					
	H3S= check hort3space					
	GEOS upload = upload files to server					
	IAQ = IAQHabitat discontinuous					

Wed, 27-Mar-2024	UTC	08:00	09:00	10:00	11:00	12:00	13:00
	UTC+1 (MSC)	09:00	10:00	11:00	12:00	13:00	14:00
	UTC+4 (Field)	12:00	13:00	14:00	15:00	16:00	17:00
PERSON:	POSITION:						
Simone Paternostro	Acuda.X	Lunch	iROCS Cosmo / TT / GEOS [Donau] / TT / iROCS Cosmo		Doffing / iROCS Cosmo quest.	GEOS (samples processing)	Brfg+HF
Anika Mehlis	Acuda.S	Lunch	FarSide / TT / GEOS [Donau] / TT / FarSide		Doffing	GEOS (samples processing)	GEOS upload / Brfg+HF
Iñigo Muñoz Elorza	OPS	Lunch	Suit Ops and Communication				Brfg+HF
Robert Wild	SciOPS	Lunch	Suit Ops and Comms		Doffing	Staying Alive	Brfg+HF
Carmen Köhler	Experimenter	Lunch	SAMPLE [habitat/Donau] / IAQ		Doffing		H3S / Brfg+HF
	Safety.X	Lunch	Safety.X				Brfg+HF
	Safety.S	Lunch	Safety.S				Brfg+HF
Liliya Tadevosyan	MEDHOC	Lunch	MEDHOC				
	GOST SAMPLE (x2)	Lunch	Spotter SAMPLE (with PIs)	Parkirecharge SAMPLE			Brfg+HF
	GOST iROCS	Lunch			Parkirecharge iRocs Cosmo		Brfg+HF
	GOST Checkpoint	Lunch	Checkpoint				Brfg+HF
Legend:	BF=Breakfast						
	Brfg+HF= briefing + human factors questionnaire						
	H3S= check hort3space						
	GEOS upload = upload files to server						
	IAQ = IAQHabitat discontinuous						

Traverse

These are the routes initially planned for Aouda.S and Aouda.X before GEOS was cancelled.





GOST Report

Tank refuelled by an external company during EVA. The generator has been refilled. All antennas setup in Donau but there are connecting problems. Wi-Fi connection also lost in front of the habitat in the morning. iROCS experiment successful but the SD card was forgotten to take down to FO, data will be sent the next morning.

28Mar2024: EVA aborted

Activities

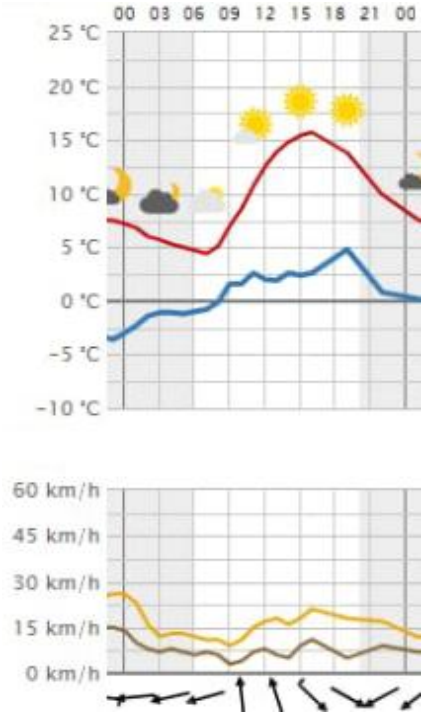
EVA was achieved by Inigo Munoz Elorza (Aouda.X) and Robert Wild (Aouda.S) from 10:23 to 13:23. The duration was 3:00 and had to be aborted because of LOS procedure. The main activity was GEOS-24, MEROP and FaR SiDe but only FaR SiDe succeed before the LOS. Aouda.S CO2 levels were quite high. AAs were able to successfully get samples until the FO lost power.

Experiments

- MEROP: Scrapped due to bandwidth issues.
- GEOS 1: Completed.

Weather

Sunset time (UTC+2)	19:21
Complete darkness (UTC+2)	20:52

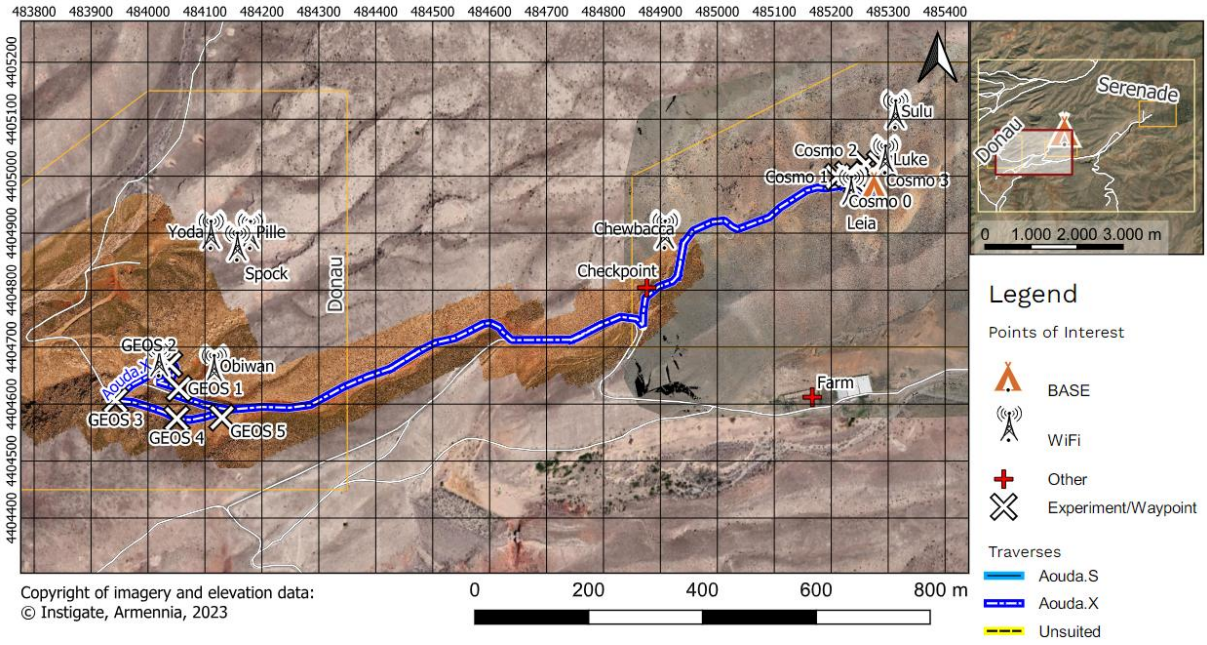


Field Activity Plan

Thu, 28-Mar-2024	UTC	03:00	04:00	05:00	06:00	07:00
	UTC+1 (MSC)	04:00	05:00	06:00	07:00	08:00
	UTC+4 (Field)	07:00	08:00	09:00	10:00	11:00
PERSON:	POSITION:					
Iñigo Muñoz Elorza	Aouda.X		BF Briefing	Donning X		
Robert Wild	Aouda.S		BF Briefing	Donning S - FarSide Procedure		
Carmen Köhler	OPS		BF Briefing	Suit Ops and Communication		
Anika Mehlis	SciOPS		BF Briefing	Support Donning (incl. FarSide 1x setup)		
Simone Paternostro	Experimenter		BF Briefing	H3S	Support Donning (incl. FarSide 1x setup)	
	Safety.X		BF Briefing			
	Safety.S		BF Briefing			
Anneta River	MEDHOC		Briefing	MEDHOC		
Artur Alaverdyan	MEDHOC		Briefing	MEDHOC		
	GOST MEROP (x2)		BF Briefing			MERCATOR
	GOST iROCS		BF Briefing			Setup iRocs COSMO
	GOST Generator		BF Briefing			
	GOST Checkpoint		BF Briefing	Checkpoint		

Thu, 28-Mar-2024	UTC	08:00	09:00	10:00	11:00	12:00	13:00	14:00	15:00
	UTC+1 (MSC)	09:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00
	UTC+4 (Field)	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00
PERSON:	POSITION:								
Iñigo Muñoz Elorza	Aouda.X	Lunch	iROCS Cosmo / TT / GEOS [Donau] / TT / iROCS Cosmo		Doffing / Cosmo quest	Brfg+HF			
Robert Wild	Aouda.S	Lunch	FarSide / TT / GEOS [Donau] / TT / FarSide		Doffing	Brfg+HF			
Carmen Köhler	OPS	Lunch	Suit Ops and Communication			Brfg+HF			
Anika Mehlis	SciOPS	Lunch	Suit Ops and Comms		Doffing	Brfg+HF			
Simone Paternostro	Experimenter	Lunch	MEROP [Habitat]		Doffing / H3S	Brfg+HF			
	Safety.X	Lunch	Safety.X			Brfg+HF			
	Safety.S	Lunch	Safety.S			Brfg+HF			
Anneta River	MEDHOC	Lunch	MEDHOC						
Artur Alaverdyan	MEDHOC	Lunch	MEDHOC						
	GOST MEROP (x2)	Lunch	Spotter MEROP	Park/recharge MERCATOR		Brfg+HF			
	GOST iROCS	Lunch			Park/recharge iRocs Cosmo	Brfg+HF			
	GOST Generator	Lunch				Brfg+HF		Generator oil change	
	GOST Checkpoint	Lunch	Checkpoint			Brfg+HF			

Traverse



GOST Report

The habitat lost Wi-Fi connectivity in the afternoon and it was restored after some time (exact time unknown). The weather is dry so no leaks ongoing in habitat. Photos were taken for Gebrueder Weiss. EVA took place with a large group of GOST. A.X had a loss of telemetry and had to be rebooted. A.S. CO2 levels were quite high. AAS were able to satisfactorily get samples until the FO lost power and EVA had to be aborted. Power ran out during EVA due to regional power grid repairs in Armash and next to FO. Power was out for 1h30, the GOST box was not turned off as per procedure but did turn off after 15 minutes – potential loss of data. In addition, the chat was also not recorded for the afternoon due to the power loss. 75% time of the mission feel very much perceptible in the GOST team, especially for members present for the whole mission. Black day is an absolute necessity. The improved weather and fresh reinforcement are welcome and will hopefully help in reducing fatigue and remotivating. Frustration towards habitat state and suit obsolescence is quite high.

MSC Report

Deviations from the DAP:

- MEROP scrapped due to bandwidth issues;
- Generator oil change postponed to the 30th.

Issues with Communication Loop during power outages in the field, based on today´s experiences.

29Mar2024: EVA with LOS Procedure

Activities

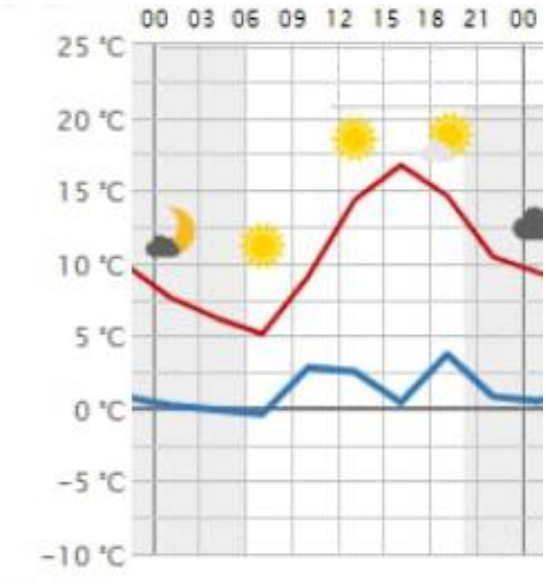
A quite successful EVA has been performed by Simone Paternostro (Aouda.X) and Carmen Köhler (Aouda.S) from 11:02 to 15:18. The duration was 5:16 with a break due to a LOS procedure announced around 13:52. Today's EVA main activity was FaR SiDe, iROCS and GEOS experiments, but GEOS has been cancelled again due to the LOS.

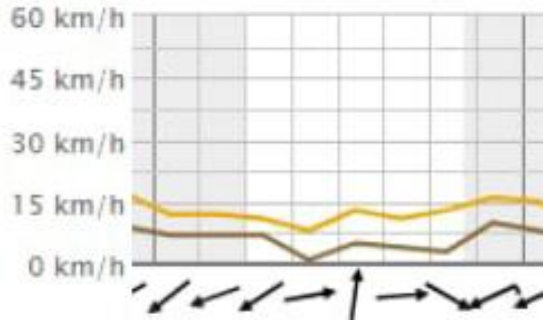
Experiments

- ALIX: Antennas were deployed for the EVA but didn't work.
- Hort3Space: Tent has been re-inflated.
- iROCS: Charged and deployed for the EVA.
- EIEE: Formulas filled.

Weather

Sunset time (UTC+2)	19:22
Complete darkness (UTC+2)	20:54





Field Activity Plan

[$]ven., 29-mars-2024	UTC	3:00	4:00	5:00	6:00	7:00
	UTC+1 (MSC)	4:00	5:00	6:00	7:00	8:00
	UTC+4 (Field)	7:00	8:00	9:00	10:00	11:00
PERSON:	POSITION:					
Simone Paternostro	Aouda.X		BF Briefing	Donning X		
Carmen Köhler	Aouda.S		BF Briefing	Donning S - FarSide Procedure		
Robert Wild	OPS		BF Briefing	Suit Ops and Communication		
Iñigo Muñoz Elorza	Experimenter		BF Briefing	IAQ	Support Donning (incl. FarSide 1x setup)	
Anika Mehlis	SciOPS		BF Briefing	Support Donning (incl. FarSide + ALIX 1x setup)		
	Safety.X		BF Briefing			
	Safety.S		BF Briefing			
Anneta River	MEDHOC		Briefing	MEDHOC		
	GOST iROCS		BF Briefing			Setup iRocs
	GOST ALIX		BF Briefing		Setup ALIX	
	GOST Generator		BF Briefing			
	GOST Checkpoint		BF Briefing	Checkpoint		
Legend:	BF=Breakfast					
	Brfg+HF= briefing + human factors questionnaire					
	GEOS upload = upload files to server					
	IAQ = habitat setup					
	Staying Alive = Staying Alive + Post Quest.					

Fri, 29-Mar-2024	UTC	08:00	09:00	10:00	11:00	12:00
	UTC+1 (MSC)	09:00	10:00	11:00	12:00	13:00
	UTC+4 (Field)	12:00	13:00	14:00	15:00	16:00
PERSON:	POSITION:					
Simone Paternostro	Aouda.X	Lunch	FarSide + ALIX	TT GEOS [Donau] TT	FarSide + ALIX	Doffing EIEE Brfg+HF
Carmen Köhler	Aouda.S	Lunch	iROCS	TT GEOS [Donau] TT	iROCS	Doffing iROCS quest EIEE Brfg+HF
Robert Wild	OPS	Lunch	Suit Ops and Communication			EIEE Brfg+HF
Iñigo Muñoz Elorza	Experimenter	Lunch	Staying Alive	IAQ	Doffing	EIEE Brfg+HF
Anika Mehlis	SciOPS	Lunch	Suit Ops and Comms		Doffing	EIEE Brfg+HF
	Safety.X	Lunch	Safety.X			Brfg+HF
	Safety.S	Lunch	Safety.S			Brfg+HF
Anneta River	MEDHOC	Lunch	MEDHOC			
	GOST iROCS	Lunch			Park/recharge iRocs	Brfg+HF
	GOST ALIX	Lunch			ALIX	Brfg+HF
	GOST Generator	Lunch				Brfg+HF
	GOST Checkpoint	Lunch	Checkpoint			Brfg+HF
Legend:	BF=Breakfast					
	Brfg+HF= briefing + hu					
	GEOS upload = uploa					
	IAQ = habitat setup					
	Staying Alive = Staying					

Traverse

They are the same as those of March 27.

GOST Report

The fuel generator has been refilled in the morning. Another power outage took place at 12:00 for 30 minutes due to problems in Armash. Long EVA and lack of cars restricted movement a bit. MEDHOC needs some pointers as how to communicate within the polares chat.

30Mar2024: Black day

Activities

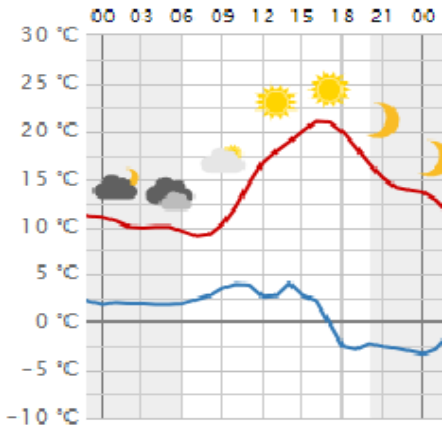
Black day so only housekeeping and maintaining habitat.

Experiments

- Hort3Space: Tent keeps deflating.
- GENES4MARS: Samples extracted by AAs and picked by PI at FO.
- IAQHabitat: Errors meaning it had to be restarted and was only showing 0. AAS believe it might have been affected by the sun and will aim to protect it from the sunrise.

Weather

Sunset time (UTC+2)	19:23
Complete darkness (UTC+2)	20:55



Field Activity Plan

No DAP because of the Black day.

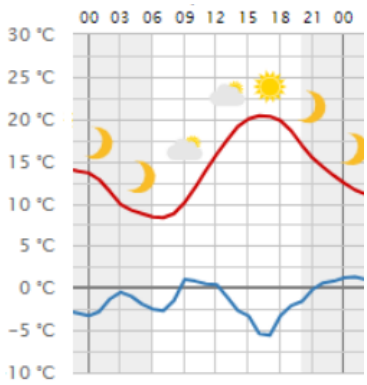
GOST Report

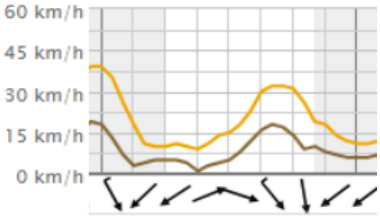
Generator refilled, filters and oil changed. All power was cut during the filter/oil change of the generator, all operations seem nominal. Charging process of batteries was applied on two “bad batteries” (batteries 4 and 8). The batteries were charged for over 2h and were fully charged after 2h49 for battery 4 and 2h19 for battery 8. Voltages of the batteries need to be observed carefully.
The H3S tent keeps deflating, was very deflated at 15h-16h, was successfully reinflated but at 20h30 the pillars were already deflating. The 2nd valve towards the habitat seems to be set in the wrong position/setting, thus as soon as the cover is off it starts deflating. Potential solution could be to cover it with tape, as trying to fix it would mean having the whole tent deflating.

31Mar2024: Easter EVA

Activities

An EVA was performed by Inigo Munoz Elorza (Aouda.X) and Anika Mehliz (Aouda.S) from 12:11 to 15:27. The duration was 3:16. Today's main EVA activity were GEOS 2 to 5 near the habitat with Aouda.X, but GEOS 2 has been rescheduled because of LOS. iROCS and ALIX experiments were partially successful.





Experiments

- ALIX: Partially successful.
- FaR SiDe: 2 runs on the way down and up.
- GENES4MARS: Placed in airlock.
- Hort3Space: Stable.
- iROCS: successfully deployed and used.
- MEROP: Unsuccessful.

Weather

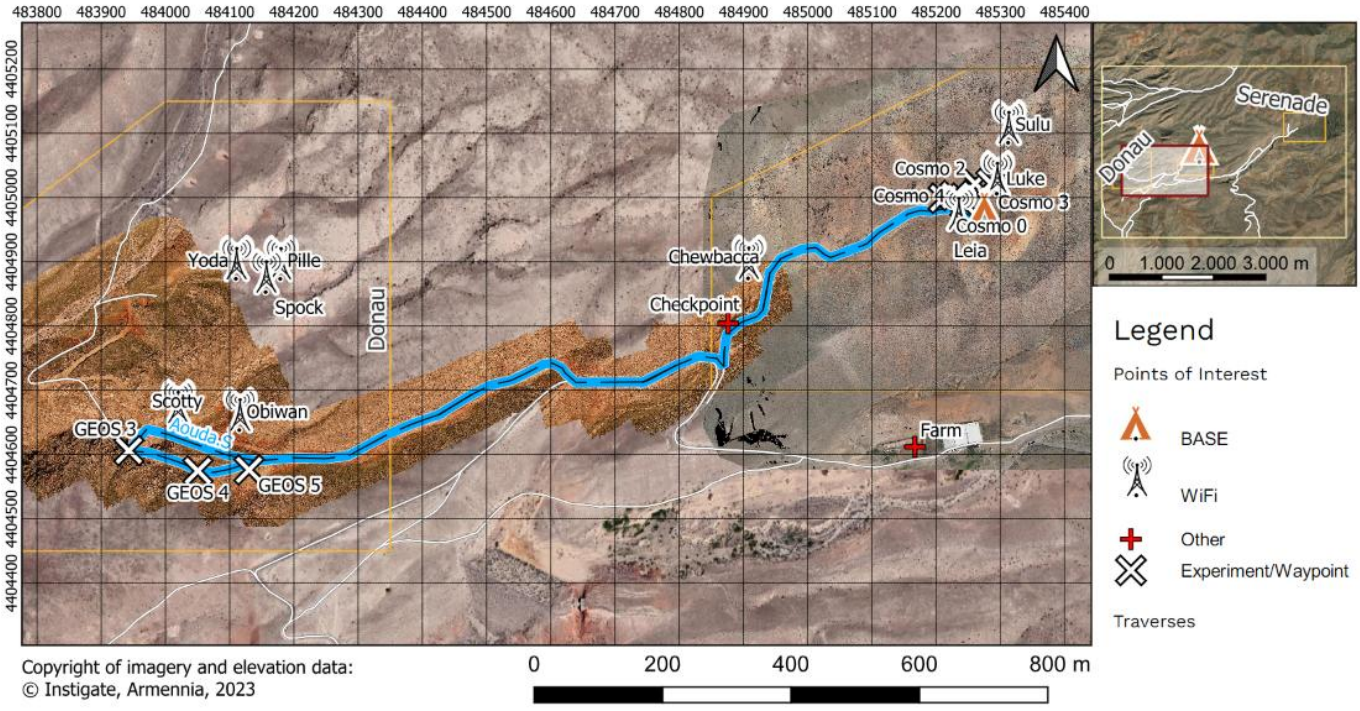
Sunset time (UTC+2)	19:24
Complete darkness (UTC+2)	20:56

Field Activity Plan

Sun, 31-Mar-2024	UTC	03:00	04:00		05:00	06:00	07:00
	UTC+2 (MSC)	05:00	06:00		07:00	08:00	09:00
	UTC+4 (Field)	07:00	08:00		09:00	10:00	11:00
PERSON:	POSITION:						
Iñigo Muñoz Elorza	Aouda.X		BF	Briefing	Donning X - FarSide Procedure		
Anika Mehlis	Aouda.S		BF	Briefing	Donning S		
Simone Paternostro	OPS		BF	Briefing	Suit Ops and Communication		
Carmen Köhler	SciOPS		BF	Briefing	Support Donning (incl. FarSide 1x setup)		
Robert Wild	Experimenter		BF	Briefing	H3S	Support Donning (incl. FarSide 1x setup)	
Christian Schwarz	Safety.X		BF	Briefing	Support Donning (incl. FarSide 1x setup)		
	Safety.S		BF	Briefing			
Karen Petrosyan	MEDHOC			Briefing	MEDHOC		
Adrian Belli	GOST MEROP		BF	Briefing			setup MERCATOR
	GOST ALIX		BF	Briefing			Setup ALIX
	GOST iROCS		BF	Briefing			Setup iRocs
	GOST Checkpoint		BF	Briefing	Checkpoint		
Legend:	BF=Breakfast						
	Brfg+HF= briefing + human factors questionnaire						
	Staying Alive = Staying Alive + Post Quest.						
	MEROP = Troubleshooting test (test new software) with MERCATOR						

Sun, 31-Mar-2024	UTC	08:00	09:00	10:00	11:00	12:00	13:00
	UTC+2 (MSC)	10:00	11:00	12:00	13:00	14:00	15:00
	UTC+4 (Field)	12:00	13:00	14:00	15:00	16:00	17:00
PERSON:	POSITION:						
Iñigo Muñoz Elorza	Aouda.X	Lunch	FarSide / TT / GEOS [Donau] / TT / FarSide		Doffing	GEOS (samples processing)	EIEE / Brfg+HF
Anika Mehlis	Aouda.S	Lunch	iROCS Cosmo + ALIX / TT / GEOS [Donau] / TT / iROCS Cosmo + ALIX		Doffing / iROCS quest	GEOS (samples processing)	EIEE / Brfg+HF
Simone Paternostro	OPS	Lunch	Suit Ops and Communication				EIEE / Brfg+HF
Carmen Köhler	SciOPS	Lunch	Suit Ops and Comms		Doffing	Staying Alive +Q.Post	EIEE / Brfg+HF
Robert Wild	Experimenter	Lunch	Staying Alive + Q.Post		Doffing	H3S	EIEE / Brfg+HF
Christian Schwarz	Safety.X	Lunch	Safety.X		Doffing		Brfg+HF
	Safety.S	Lunch	Safety.S				Brfg+HF
Karen Petrosyan	MEDHOC	Lunch	MEDHOC				
Adrian Belli	GOST MEROP	Lunch	MEROP (troubleshooting)	Park/recharge MERCATOR			Brfg+HF
	GOST ALIX	Lunch			ALIX		Brfg+HF
	GOST iROCS	Lunch			Park/recharge iRocs		Brfg+HF
	GOST Checkpoint	Lunch	Checkpoint				Brfg+HF
Legend:	BF=Breakfast						
	Brfg+HF= briefing + human factors questionnaire						
	Staying Alive = Staying Alive + Post Quest.						
	MEROP = Troubleshooting test (test new software) with MERCATOR						

Traverse



GOST Report

The generator was nearly empty but has been completely refuelled at 19h30. Wi-Fi connection was also unsatisfactory. EVA was successful (but interrupted by multiple connection and telemetry issues). An Easter egg hunt was organised for the astronauts – they melted partially but

astronauts were able to retrieve them. The EVA was also paused at times due to sheep coming unto Donau despite warning the shepherds and the checkpoint. In addition, there was intrusion by a media team which meant we had to coordinate between AAs-GOST and checkpoint to make sure there was no breach. Good day at the office.

01Apr2024: Experiences galore

Activities

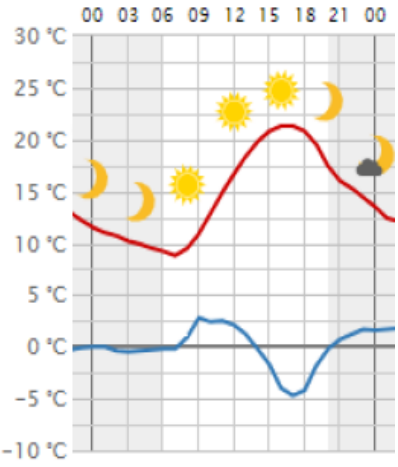
No EVA today. Today is dedicated to GeoPrep, RAMAN and MEROP. Troubleshooting Hort3Space, MEROP and iROCS problems.

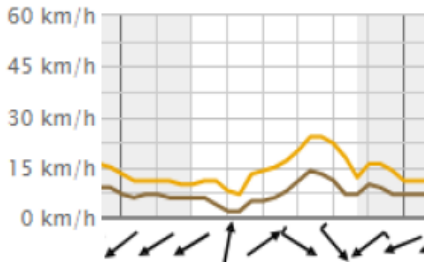
Experiments

- GeoPrep: All run concluded.
- Hort3Space: Water pump issues, troubleshooting.
- IAQHabitat: Run today.
- iROCS: LARS working correctly, CHARLIE fully charged but troubleshooting problems.
- MEROP: Troubleshooting camera problems.
- RAMAN: Run today.

Weather

Sunset time (UTC+2)	19:25
Complete darkness (UTC+2)	20:57





Field Activity Plan

Mon, 01-Apr-2024	UTC	03:00	04:00	05:00	06:00	07:00
	UTC+2 (MSC)	05:00	06:00	07:00	08:00	09:00
	UTC+4 (Field)	07:00	08:00	09:00	10:00	11:00
PERSON:	POSITION:					
Simone Paternostro	Experimenter		BF Briefing			
Carmen Köhler	Experimenter		BF Briefing	IAQ setup	GeoPrep	IAQ brakdown
Robert Wild	Experimenter		BF Briefing		GeoPrep	
Anika Mehlis	Experimenter		BF Briefing		RAMAN	
Iñigo Muñoz Elorza	Experimenter		BF Briefing	H3S	RAMAN	GEOS samples processing (Hab 3-5, Donau 1)
	GOST Checkpoint		BF Briefing	Checkpoint		
	GOST MERCATOR / MEROP (x2)		BF Briefing		Setup MERCATOR	Troubleshooting MEROP
	GOST iROCS Lars / Charlie		BF Briefing	iROCS Lars setup	iROCS Lars SUTerMOD	iROCS Lars post-run
Legend:	BF=Breakfast					
	Brfg+HF= briefing + human factors questionnaire					
	H3S = Hort3space					
	IAQ = IAQ run "next to experiment"					

Mon, 01-Apr-2024	UTC	08:00	09:00	10:00	11:00	12:00	13:00
	UTC+2 (MSC)	10:00	11:00	12:00	13:00	14:00	15:00
	UTC+4 (Field)	12:00	13:00	14:00	15:00	16:00	17:00
PERSON:	POSITION:						
Simone Paternostro	Experimenter	Lunch	IAQ setup	RAMAN	IAQ brakdown	EIEE	Brfg+HF
Carmen Köhler	Experimenter	Lunch		RAMAN		EIEE	Brfg+HF
Robert Wild	Experimenter	Lunch	GEOS samples processing (Hab 1)	MEROP		EIEE	Brfg+HF
Anika Mehlis	Experimenter	Lunch	Staying Alive + questionnaire			EIEE	Brfg+HF
Iñigo Muñoz Elorza	Experimenter	Lunch	MEROP	GEOS samples processing (Hab 3-5, Donau 1)		H3S EIEE	Brfg+HF
	GOST Checkpoint	Lunch	Checkpoint				Brfg+HF
	GOST MERCATOR / ME	Lunch	Spotter MERCATOR (MEROP)	Spotter MERCATOR (MEROP)	Spotter MERCATOR (MEROP)	Park/recharge MERCATOR	Brfg+HF
	GOST iROCS Lars / Cha	Lunch	iROCS Charlie setup	iROCS Charlie Geosama	iROCS Charlie UWBL	iROCS Charlie post-run	Brfg+HF
Legend:	BF=Breakfast						
	Brfg+HF= briefing + human factors questionnaire						
	H3S = Hort3space						
	IAQ = IAQ run "next to experiment"						

GOST Report

Generator quite empty, filled almost to capacity in the evening and water tank is half full. Wi-Fi antennas have been realigned as best as possible. Groceries done and should be sufficient for the next 3-4 days. GOST preparing for the incoming media day. Shuttling for iROCS must start on the 2nd or 3rd April.

02Apr2024: No EVA Day

Activities

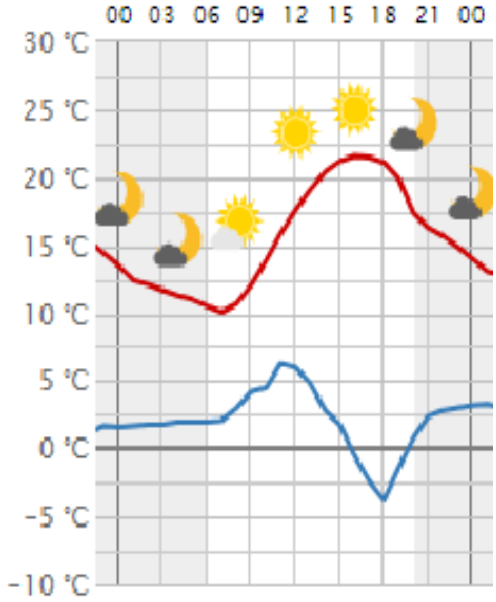
No EVA on this day. As there is not much time to pack right after the media EVA on the 5th, some experiments that have reached the required number of runs will be packed already.

Experiments

GENES4MARS: Picked up by GOST and PI. Last run confirmed for the 5th morning before breakfast.
iROCS: Lars was successfully deployed in the morning, Charlie had to be troubleshooted. Not all runs have been saved for Geosana.
MERCATOR/MEROP: Mostly successfully operated by GOST, but AAs were mostly unable to use MEROP despite extensive troubleshooting from both sides (AAs and GOST).
Staying Alive: In the airlock and ready to be put in the containers as soon as the AAs are finished.
GeoPrep: In the airlock and ready to be put in the containers as soon as the AAs are finished.
IAQHabitat: Runs have been agreed with RSS - 12h run on the 5th evening as well as run outside on the 6th.

Weather

Sunset time (UTC+2)	19:26
Complete darkness (UTC+2)	20:59



GOST Report

Hort3Space tent has been pumped in the morning. New car battery has been bought, charged, and brought up to the habitat. Wi-Fi antennas have been aligned and measured. Experiment images have been preselected and text worked to be printed for the 5th. They will be attached to the containers so that the public can learn about the different experiments. Volunteers will be available for packing on the 6th and 7th.
Crew mood largely improved thanks to a successful day and sunshine. We were better prepared today thanks to a similar DAP as yesterday and better preparation for the hot weather (the ice-cream helps).

Field Activity Plan

Tue, 02-Apr-2024	UTC	03:00		04:00		05:00	06:00	07:00
	UTC+2 (MSC)	05:00		06:00		07:00	08:00	09:00
	UTC+4 (Field)	07:00		08:00		09:00	10:00	11:00
PERSON:	POSITION:							
Simone Paternostro	Experimenter		G4M	BF	Briefing	Pack Staying Alive		
Carmen Köhler	Experimenter		G4M	BF	Briefing	Pack Staying Alive		
Robert Wild	Experimenter	G4M	G4M	BF	Briefing			MEROP
Anika Mehlis	Experimenter	G4M	G4M	BF	Briefing	H3S	Pack Geoprep	
Iñigo Muñoz Elorza	Experimenter		G4M	BF	Briefing		Pack Geoprep	
	GOST Checkpoint			BF	Briefing	Checkpoint		
	GOST MERCATOR (x2)			BF	Briefing	Setup MERCATOR	Troubleshooting MEROP	Spotter MERCATOR (MEROP)
	GOST iROCS Lars / Charlie			BF	Briefing	iROCS Lars setup	iROCS Lars SUTerMOD	iROCS Lars park/charge

Tue, 02-Apr-2024	UTC	08:00	09:00	10:00	11:00	
	UTC+2 (MSC)	10:00	11:00	12:00	13:00	
	UTC+4 (Field)	12:00	13:00	14:00	15:00	
PERSON:	POSITION:					
Simone Paternostro	Experimenter	Lunch	Pack Staying Alive	MEROP	EIEE	Brfg+HF
Carmen Köhler	Experimenter	Lunch	MEROP	Pack Staying Alive	EIEE	Brfg+HF
Robert Wild	Experimenter	Lunch	Pack Staying Alive		EIEE	Brfg+HF
Anika Mehlis	Experimenter	Lunch	RAMAN	H3S	EIEE	Brfg+HF
Iñigo Muñoz Elorza	Experimenter	Lunch	RAMAN		EIEE	Brfg+HF
	GOST Checkpoint	Lunch	Checkpoint			Brfg+HF
	GOST MERCATOR (x2)	Lunch	Spotter MERCATOR (MEROP)	Park/recharge MERCATOR		Brfg+HF
	GOST iROCS Lars / Charlie	Lunch	iROCS Charlie setup	iROCS Charlie Geosama	iROCS Charlie UWBL	iROCS Charlie park/charge	Brfg+HF

03Apr2024: Dynamic & productive EVA

Activities

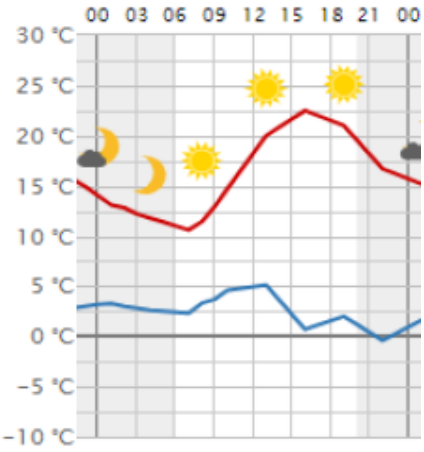
An EVA has been performed by Robert Wild (Aouda.X) and Carmen Köhler (Aouda.S) from 11:21 to 15:31. The duration was 4:10. The main activity was FaR SiDe, GEOS, iROCS and MEROP. GEOS has been successful because the GEOS24 was performed.

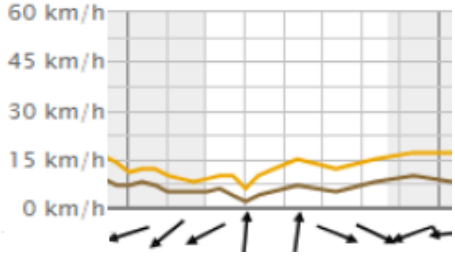
Experiments

- FaR SiDe: Completed.
- GEOS-24: Performed.
- iROCS: Completed.
- MEROP: Successful run but not like it was planned, rescheduled the next day.

Weather

Sunset time (UTC+2)	19.27
Complete darkness (UTC+2)	21.00





GOST Report

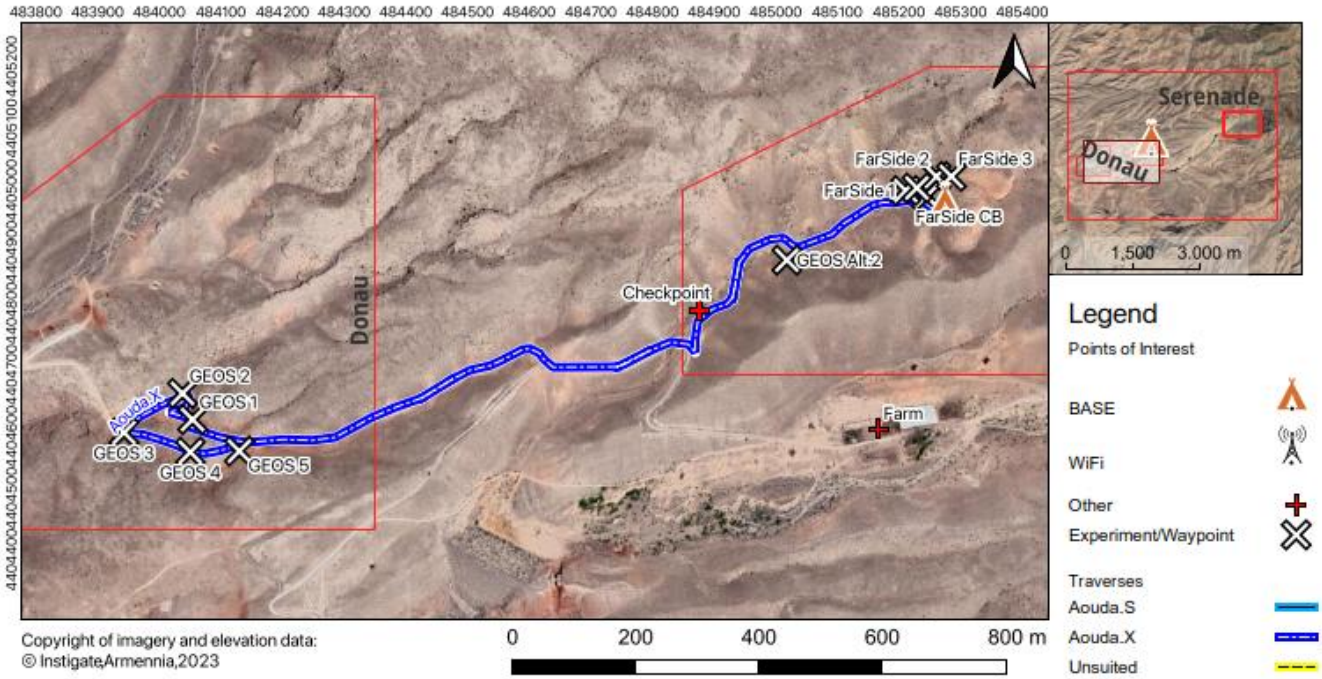
Generator refuelled, water tank refilled, Hort3Space pumped 2 times today. Wi-Fi antennas readjusted and placed for the Donau EVA. Due to a starting EVA with a GO from the GOST, the suited AAs must do a back-up radio check with safety double confirm before EVA. Lack of cars, quads, and hands with a lot of experiments make it really complicated when the EVA is in Donau. A large briefing took place regarding safety in general. There was a lack of synchronisation in the morning followed by a renewed confidence in the afternoon.

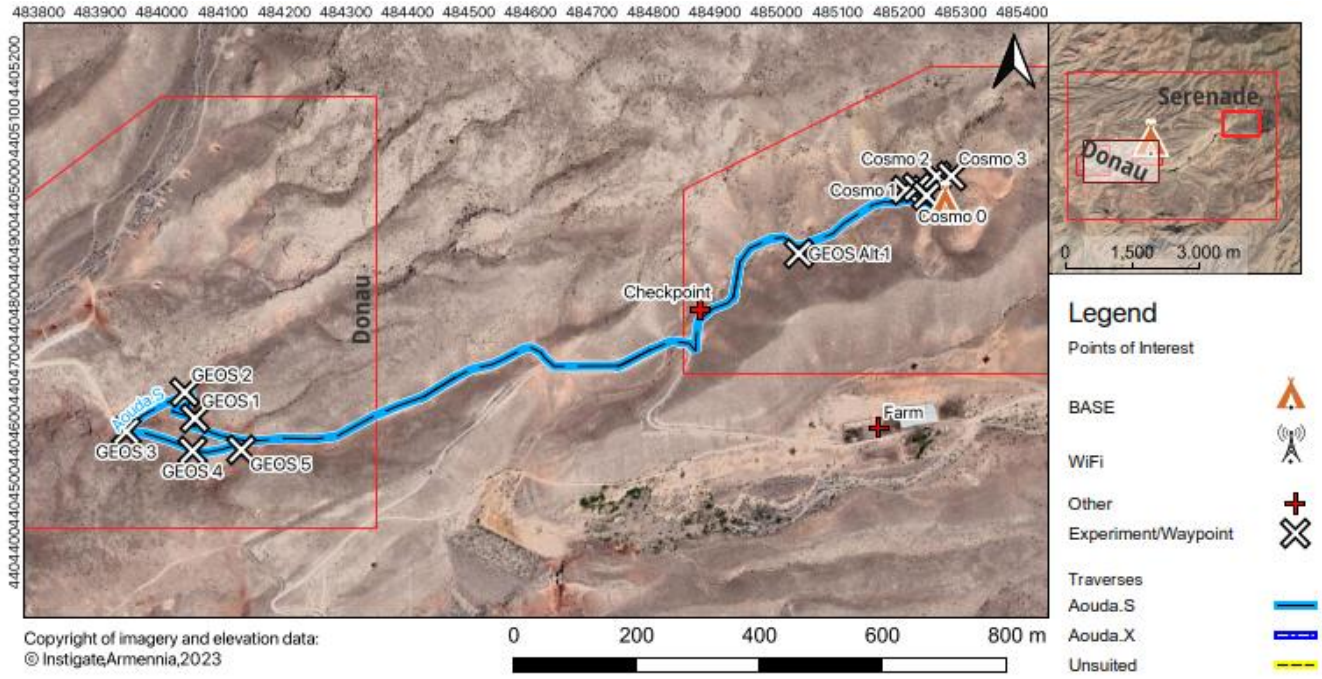
Field Activity Plan

Wed, 03-Apr-2024	UTC	03:00	04:00	05:00	06:00	07:00
	UTC+2 (MSC)	05:00	06:00	07:00	08:00	09:00
	UTC+4 (Field)	07:00	08:00	09:00	10:00	11:00
PERSON:	POSITION:					
Robert Wild	Aouda.X		BF Briefing	Donning X - FarSide Procedure		
Carmen Köhler	Aouda.S		BF Briefing	Donning S		
Anika Mehlis	OPS		BF Briefing	Suit Ops and Communication		
Simone Paternostro	SciOPS		BF Briefing	Support Donning (incl. FarSide 1x setup)		
Iñigo Muñoz Elorza	Experimenter		BF Briefing	H3S	Support Donning (incl. FarSide 1x setup)	
Christian Schwarz	Safety.X		BF Briefing	Support Donning (incl. FarSide 1x setup)		
	Safety.S		BF Briefing			
Karen Petrosyan	MEDHOC		Briefing	MEDHOC		
	GOST MERCATOR (x2)		BF Briefing		Setup MERCATOR	Deploying / Updating MEROP
	GEOS		BF Briefing	TT	GEOS [Serenade]	TT
	GOST iROCS		BF Briefing			Setup iRocs
	GOST Checkpoint		BF Briefing	Checkpoint		
Legend:	BF=Breakfast					
	Brfg+HF= briefing + human factors questionnaire					
	H3S = Hort3space check					

Wed, 03-Apr-2024	UTC	08:00	09:00	10:00	11:00	12:00	13:00
	UTC+2 (MSC)	10:00	11:00	12:00	13:00	14:00	15:00
	UTC+4 (Field)	12:00	13:00	14:00	15:00	16:00	17:00
PERSON:	POSITION:						
Robert Wild	Aouda.X	Lunch	FarSide TT GEOS [Donau] TT FarSide		Doffing	GEOS (samples processing)	EIEE Brfg+HF
Carmen Köhler	Aouda.S	Lunch	iROCS Cosmo TT GEOS [Donau] TT iROCS Cosmo		Doffing iROCS quest	GEOS (samples processing)	EIEE Brfg+HF
Anika Mehlis	OPS	Lunch	Suit Ops and Communication				EIEE Brfg+HF
Simone Paternostro	SciOPS	Lunch	Suit Ops and Comms		Doffing MEROP		EIEE Brfg+HF
Iñigo Muñoz Elorza	Experimenter	Lunch	MEROP		Doffing	H3S	EIEE Brfg+HF
Christian Schwarz	Safety.X	Lunch	Safety.X		Doffing		Brfg+HF
	Safety.S	Lunch	Safety.S				Brfg+HF
Karen Petrosyan	MEDHOC	Lunch	MEDHOC				
	GOST MERCATOR (x	Lunch	Spotter MERCATOR (MEROP)		Spotter MERCATOR (MEROP)	Park/recharge MERCATOR	Brfg+HF
	GEOS	Lunch					Brfg+HF
	GOST iROCS	Lunch			Park/recharge iRocs		Brfg+HF
	GOST Checkpoint	Lunch	Checkpoint				Brfg+HF
Legend:	BF=Breakfast						
	Brfg+HF= briefing + human factors questionnaire						
	H3S = Hort3space check						

Traverse


483800 483900 484000 484100 484200 484300 484400 484500 484600 484700 484800 484900 485000 485100 485200 485300 485400
4404400 4404500 4404600 4404700 4404800 4404900 4405000 4405100 4405200
Donau
GEOS 2
GEOS 1
Aouda.X
GEOS 3
GEOS 4
GEOS 5
Checkpoint
FarSide 2
FarSide 3
FarSide 1
FarSide CB
GEOS Alt-2
Farm
Serenade
Donau
0 1,500 3,000 m
Legend
Points of Interest
BASE
WiFi
Other
Experiment/Waypoint
Traverses
Aouda.S
Aouda.X
Unsuited
Copyright of imagery and elevation data:
© Instigate Armennia, 2023
0 200 400 600 800 m


483800 483900 484000 484100 484200 484300 484400 484500 484600 484700 484800 484900 485000 485100 485200 485300 485400
4404400 4404500 4404600 4404700 4404800 4404900 4405000 4405100 4405200
Donau
GEOS 2
GEOS 1
Aouda.S
GEOS 3
GEOS 4
GEOS 5
Checkpoint
Cosmo 2
Cosmo 3
Cosmo 1
Cosmo 0
GEOS Alt-1
Farm
Serenade
Donau
0 1,500 3,000 m
Legend
Points of Interest
BASE
WiFi
Other
Experiment/Waypoint
Traverses
Aouda.S
Aouda.X
Unsuited
Copyright of imagery and elevation data:
© Instigate Armennia, 2023
0 200 400 600 800 m

04Apr2024: Final Science EVA Day

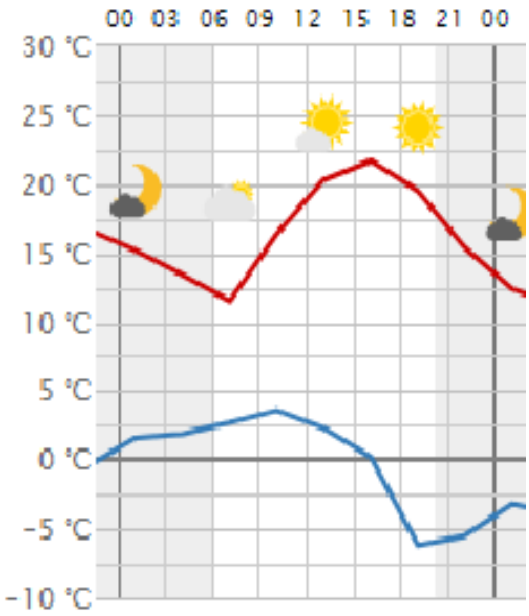
Activities

Today is the final science EVA performed by Inigo Munoz Elorza (Aouda.X) and Anika Mehliz (Aouda.S) from 12:05 to 14:46. The duration was 2:41 and had to be aborted because of a lot of problems: LOS, telemetry problems and allotted time far exceeded. The main experiments were ALIX, FaR SiDe, GEOS and MEROP but only GEOS and MEROP succeeded.

Experiments

- ALIX: Aborted.
- GEOS-24: Successful.
- MEROP: Successful.
- FaR SiDe: Aborted.

Weather



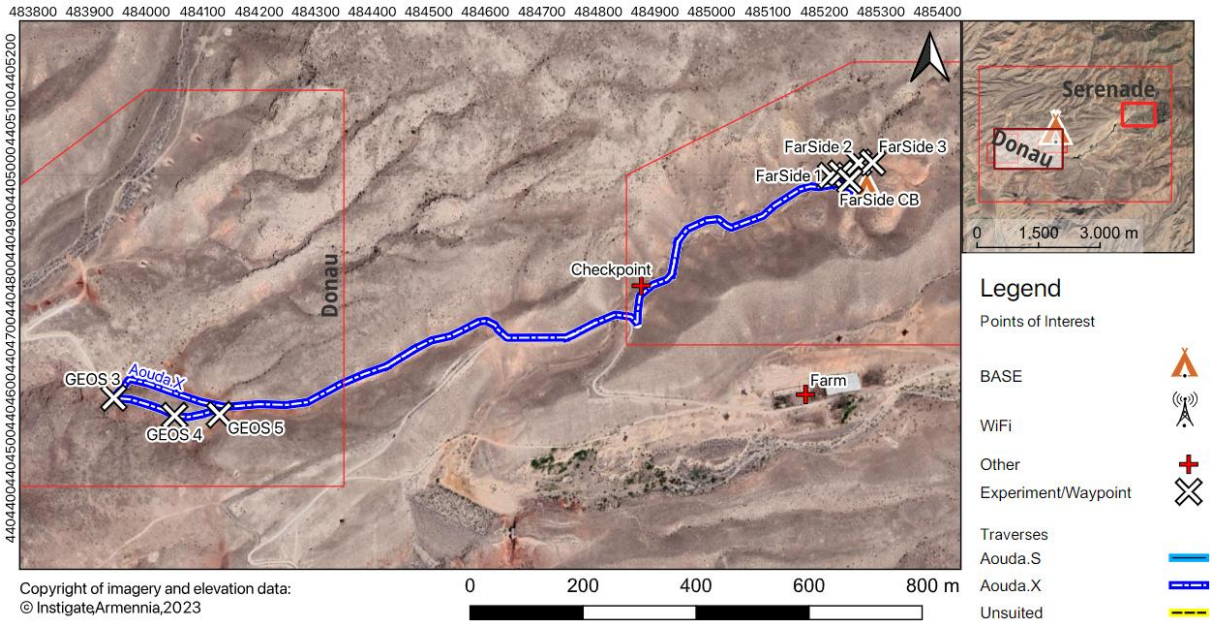
Sunset time (UTC+2)	19.28
Complete darkness (UTC+2)	21.01

Field Activity Plan

Thu, 04-Apr-2024	UTC	03:00	04:00	05:00	06:00	07:00
	UTC+2 (MSC)	05:00	06:00	07:00	08:00	09:00
	UTC+4 (Field)	07:00	08:00	09:00	10:00	11:00
PERSON:	POSITION:					
Iñigo Muñoz Elorza	Aouda.X		BF Briefing	Donning X - FarSide Procedure		
Anika Mehlis	Aouda.S		BF Briefing	Donning S		
Simone Paternostro	OPS		BF Briefing	Suit Ops and Communication		
Robert Wild	SciOPS		BF Briefing	Support Donning (incl. FarSide 1x setup)		
Carmen Köhler	Experimenter		BF Briefing	H3S	Support Donning (incl. FarSide 1x setup)	
Christian Schwarz	Safety.X		BF Briefing	Support Donning (incl. FarSide 1x setup)		
	Safety.S		BF Briefing			
Karen Petrosyan	MEDHOC		Briefing	MEDHOC		
	GOST MERCATOR (x2)		BF Briefing			
	GOST ALIX		BF Briefing			Setup ALIX
	GOST iROCS		BF Briefing			Setup iRocs
	GOST Checkpoint		BF Briefing	Checkpoint		

Thu, 04-Apr-2024	UTC	08:00	09:00	10:00	11:00	12:00	13:00
	UTC+2 (MSC)	10:00	11:00	12:00	13:00	14:00	15:00
	UTC+4 (Field)	12:00	13:00	14:00	15:00	16:00	17:00
PERSON:	POSITION:						
Iñigo Muñoz Elorza	Aouda.X	Lunch	FarSide TT GEOS [Donau] TT FarSide		Doffing	GEOS (samples processing)	EIEE Brfg+HF
Anika Mehlis	Aouda.S	Lunch	ALIX TT GEOS [Donau] TT ALIX		Doffing	iROCS quest GEOS (samples processing)	EIEE Brfg+HF
Simone Paternostro	OPS	Lunch	Suit Ops and Communication				EIEE Brfg+HF
Robert Wild	SciOPS	Lunch	Suit Ops and Comms		Doffing	MEROP H3S	EIEE Brfg+HF
Carmen Köhler	Experimenter	Lunch	Hort3space [harvest MS-L2] MEROP		Doffing		EIEE Brfg+HF
Christian Schwarz	Safety.X	Lunch	Safety.X		Doffing		Brfg+HF
	Safety.S	Lunch	Safety.S				Brfg+HF
Karen Petrosyan	MEDHOC	Lunch	MEDHOC				
	GOST MERCATOR (x2	Lunch	Setup MERCATOR Spotter MERCATOR (MEROP)			Spotter MERCATOR (MEROP) Park/recharge MERCATOR	Brfg+HF
	GOST ALIX	Lunch			ALIX		Brfg+HF
	GOST iROCS	Lunch	iROCS Cosmo	iROCS Cosmo	Park/recharge iRocs		Brfg+HF
	GOST Checkpoint	Lunch	Checkpoint				Brfg+HF

Traverse



GOST Report

No GOST Report.

05Apr2024: Field campaign end

Activities

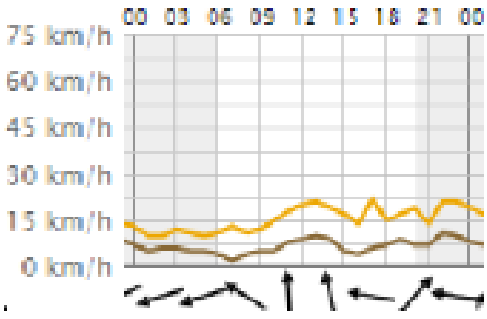
Final day for the AMADEE-24 mission. Taking photos and collecting last samples. Preparing for media and for the walk-out ceremony.

Experiments

GENES4MARS: Samples collected.

Weather

Sunset time (UTC+2)	19.29
Complete darkness (UTC+2)	21.02



Field Activity Plan

Fri, 05-Apr-2024	UTC	03:00		04:00		05:00	06:00	07:00
	UTC+2 (MSC)	05:00		06:00		07:00	08:00	09:00
	UTC+4 (Field)	07:00		08:00		09:00	10:00	11:00
PERSON:	POSITION:							
Robert Wild	Aouda.X	G4M	G4M	BF	Briefing	Prepare for media	Light Donning X	Media in Hab.
Carmen Köhler	Experimentor		G4M	BF	Briefing	Prepare for media.	Support Donning	Media in Hab.
Anika Mehlis	Experimenter	G4M	G4M	BF	Briefing	Prepare for media.	Support Donning	Media in Hab.
Iñigo Muñoz Elorza	Experimenter		G4M	BF	Briefing	Prepare for media.	Support Donning	Media in Hab.
Simone Paternostro	Experimenter		G4M	BF	Briefing	Hort3space [harvest MS-L4]		Media in Hab.
GOST	iROCS Cosmo			BF	Briefing		Setup iROCS Cosmo	
Anneta River	MEDHOC				Briefing		MEDHOC	
Liliya Tadevosyan	MEDHOC				Briefing		MEDHOC	
Artur Alaverdyan	MEDHOC				Briefing		MEDHOC	
	GOST Checkpoint			BF	Briefing	Checkpoint		

Fri, 05-Apr-2024	UTC	08:00	09:00	10:00	11:00	12:00	13:00
	UTC+2 (MSC)	10:00	11:00	12:00	13:00	14:00	15:00
	UTC+4 (Field)	12:00	13:00	14:00	15:00	16:00	17:00
PERSON:	POSITION:						
Robert Wild	Aouda.X	Lunch		Walk out cermony	Doffing	Media / Interviews	EIEE
Carmen Köhler	Experimenter	Lunch		Walk out cermony	Doffing	Media / Interviews	EIEE
Anika Mehlis	Experimenter	Lunch		Walk out cermony	Doffing	Media / Interviews	EIEE
Iñigo Muñoz Elorza	Experimenter	Lunch		Walk out cermony	Media / Interviews		EIEE
Simone Paternostro	Experimenter	Lunch		Walk out cermony	Media / Interviews		EIEE
GOST	iROCS Cosmo	Lunch				Park iROCS COSMO	
Anneta River	MEDHOC		MEDHOC				
Liliya Tadevosyan	MEDHOC	Lunch	MEDHOC				
Artur Alaverdyan	MEDHOC	Lunch	MEDHOC				
	GOST Checkpoint	Lunch	Checkpoint				

GOST Report

No GOST Report.

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