Österreichisches Weltraum Forum

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Dachstein Mars Simulation 2012

Mission Report

Status: internal, 28Jun2012, gg

Between 27Apr - 01May2012, a five day Mars analog field test took place at the Mammoth cave and the Giant Ice cave at the Dachstein region in Upper Austria coordinated by the Austrian Space Forum. During this test, the Aouda.X spacesuit simulator and selected geophysical and life-science related experiments were conducted.

This mission report provides a comprehensive summary of all activities, including experiments, partners involved and infrastructure.

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Book captain	Gernot Groemer

PUBLIC VERSION

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Foreword

The Dachstein Mars Simulation brought together more than 100 researchers, engineers, technicians, medical doctors, mission planners and flight controllers to immerse 5 days in the mystical underworlds of the Dachstein Giant Ice Caves. It was a glimpse of what could happen on another world within our lifetimes: In principle, Ice Caves are possible on Mars, too, and would be a natural retreat for life if it ever arose on the Red Planet.

This field test was an extraordinary mission for all of us, because it had a very special blend of classical instrument testing, astrobiology experiments, operational research and human spaceflight tests as well as a strong outreach element: Being featured on the "Bild" (the largest german newspaper, comparable to the british "Sun") and showing up 2 weeks later in the journal Science demonstrates a bandwidth not many field campaign can claim.

It was a privilege to work with so many bright, enthusiastic and inspiring people, sharing hard working days, long nightly meetings and chasing a dense flight plan as well as moments of magic when the glittering ice reflected the light of the spacesuit, the teams ovations when the exhausted suit-testers returned to the base with the soil samples and the wearied, but happy faces of the rover teams when going back to "Earth" with lots of dirt on the wheels.

All this is history now: this report documents the actual timeline of events, the team compositions and other aspects of the mission as well as the "flavor" of this field test seen through the eyes of our photographers, Katja Zanella-Kux and Andreas Köhler.

Enjoy!

Gernot Groemer,

OeWF Programme Officer, Dachstein EXLEAD

1. Aims of the field test

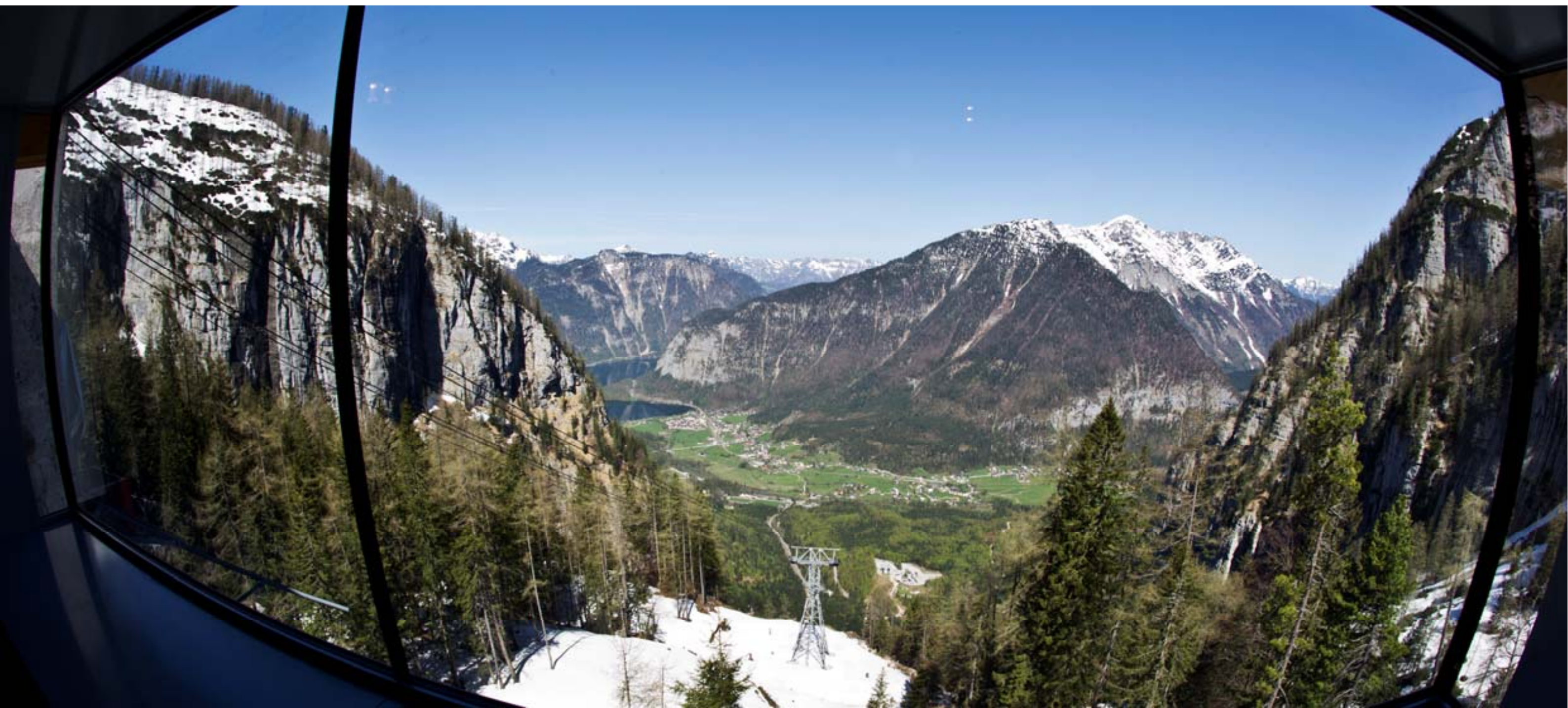
Martian caves are considered one of the hotspots for astrobiology on the planet. Besides studying contamination vectors during human missions, the Austrian Space Forum is investigating operational issues related to (sub)surface operations in a Mars analog environment. After preparatory cave tests we now increased the complexity and fidelity of the tests by including external experiments (e.g. robotic rovers) and expanding the support infrastructure like communication from within the cave to a rudimentary Mission Support Center and international partners.

Preparing for a large OeWF field mission in February 2013 in Northern Africa, the Dachstein test was...

- a full systems check-out for the spacesuit simulator Aouda.X in its most recent configuration,
- an opportunity for external teams to study equipment behaviour involving the simultaneous usage of different instruments with the option of a human-in-the-loop,
- a platform for performing ground validations and terrain tests for experiments, including rovers and study concepts of enhancing the situational awareness of remote support teams.

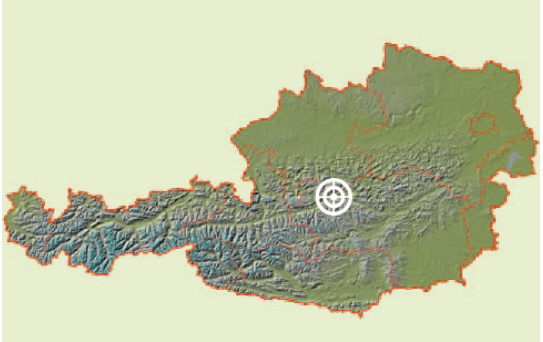
Secondary aims included

- studying the Dachstein caves as a model region for Martian caves and extreme life,
- serving as a platform for outreach activities to enhance the visibility of planetary sciences



2. Site Geology

(Compiled by Sandra Hutterer / OeWF Sci-team)



The central Dachstein massif on the southern edge of the Northern Calcareous Alps is, compared to the surrounding area, geological quite simple. The Dachstein is from the touristic and scientific point of view very important because of its giant cave system. Two of the most important caves are the mammoth cave (65 km) and the giant ice cave (2 km). Both of them are easily accessible commercial caves and allow a visit to the Dachstein plateau. [1]

Some 10 million years ago, when the Northern Calcareous Alps were formed, large cave systems, which are located a few hundred meters below the present surface and connected with shaft, were developed. Due to the shape of the walls, researchers found out, that the caves were completely filled with water. The youngest section of the cave formation began about 5 million years ago, when the present valleys were already formed. Apart from the ‘Dachstein Südwandhöhle‘, the biggest caves are located on the northern edge of the Dachstein massif.

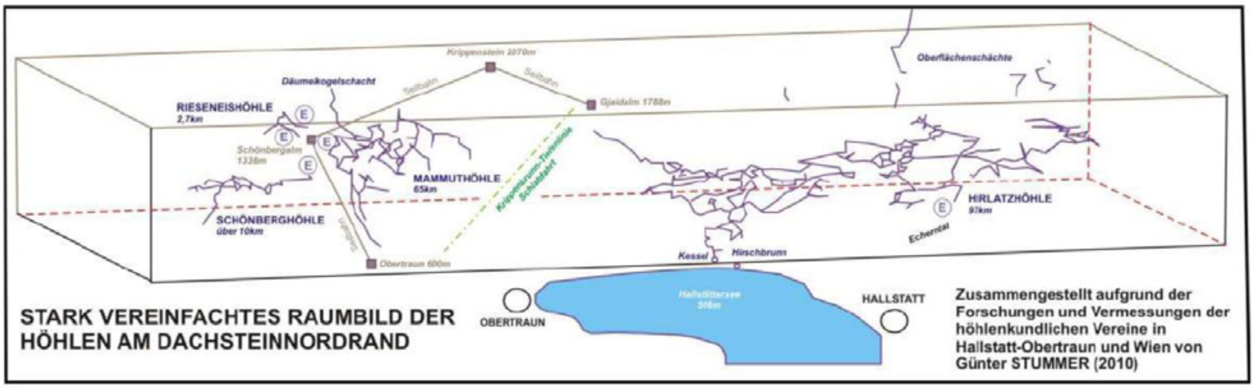


Figure 1: simplified projection of the caves at the northern edge

2.1. Giant Ice Caves

Ice caves are natural cavities with the occurrence of ice which persists for at least several years. Age, formation, development, conservation and degradation of the “underground ice” attracted scientific interest since the beginning of the 20th century. Based on the fact that the ice exists for at least several years, it can be classified as a permafrost phenomenon. Variation in the physical properties depends on liquid water content, air content, ice chemistry, and temperature conditions during permafrost genesis. GPR (ground penetrating radar) can be successfully used to map the thickness and structure of the ice. [2]

The giant ice cave is located close to mammoth cave. Its passage length is only 2.7 km, but ice covers almost half of the cave. The elevation of this location is 1460 m a.s.l. The maximum ice thickness is 15 m (location Tristandom). [1] The artificial entrance to the ice caves is at an elevation of 1421m a.s.l. and the natural cave can be seen after a few meters. After passing the

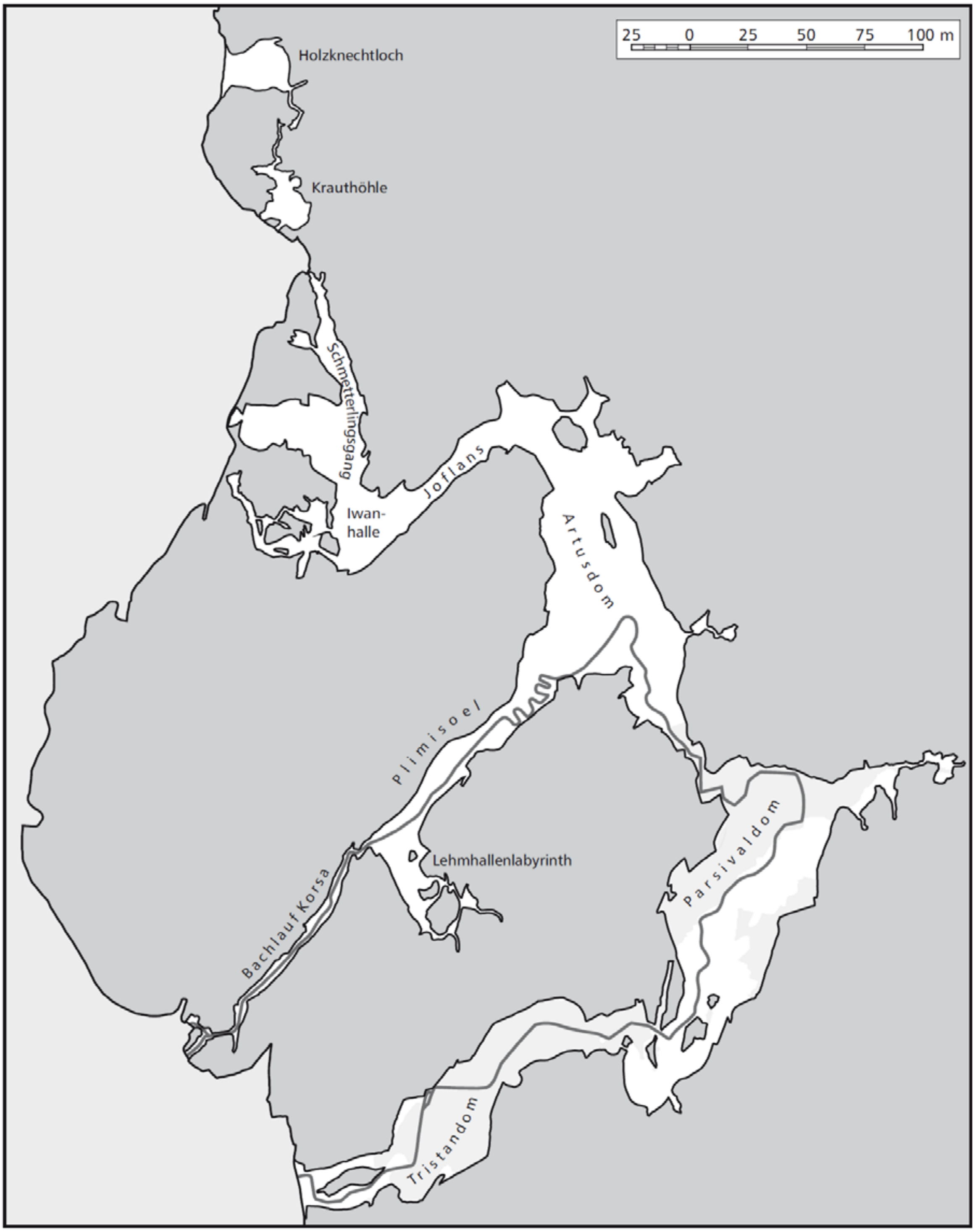


Figure 2: overview Dachstein ice cave

'Lehmhallenlabyrinth', the 'Plimisoel' and the 'König-Artus-Dom', the 'Parsivaldom' can be reached. Its north western part is covered with a glacier which looks like an iceberg. [1] An outcrop in the anterior part gives a first idea of the possible ice thickness, as debris is partly exposed on the base and the maximum overall cave height is 20 m. [2] Several caves in high elevated alpine regions host up to several meters thick ice. The age of the ice may exceed some hundreds or thousands of years. However, structure, formation and development of the ice are not fully understood and are subject to relatively recent investigation.

Occurrence of ice in caves results mainly from water which enters through the porous rock. If the temperature is below zero, ice starts to form. Due to isolation by the surrounding rocks, the air temperature inside a cave is rather constant throughout the year. It equals to the annual average of the outside air temperature and therefore depends mainly on the elevation and geographic region. Additionally, most caves have more than one entrance and are ventilated. In summer, the relatively cold and dense cave air sinks down and flows out at the lower entrances. In winter, this regime changes and relatively warm cave air of lower density leaves through the upper entrances. For compensation, cold outside air is sucked into the cave at the lower entrances. [3]

Ice grows therefore close to the lower entrances in winter and early spring when the outside temperature still is low and water enters the cave. On the other hand, the ice degrades in summer and autumn. Heat exchange with the surrounding rock and air, and sublimation are other factors controlling the dynamic behavior of the ice. [4] It is obvious that growth and degradation are very sensitive to (micro-) climatic changes.

Ice caves can be considered as environmental markers as the presence of ice is controlled by specific climatic conditions (e.g. winter precipitation, number of freezing days, mean annual air temperature). Despite these various influences, we know from direct observation that massive ice bodies can be related for at least hundred years. It is important to stress out the difference between seasonal ice (which completely disappears in summer and autumn and starts to form again in winter) and occurrences of ice bodies which exist for at least several years. [2]

References

[1] Stummer G., Greger W. Karst- und höhlenkundliche Exkursionen im UNESCO-Welterbegebiet Dachstein: Festschrift und Exkursionsführer zur Jahrestagung in Obertraun (2010)

[2] Hausmann H., Behm M. Imaging the structure of cave ice by ground-penetrating radar, The Cryosphere, 5, 329-340 (2011)

[3] Cigna, A. A.: Climate of caves, in: Encyclopedia of caves and karst science, edited by: Gunn, J., Fitzroy Dearbon, New York, 229–230 (2004)

[4] Yonge, C. J.: Ice in caves, in: Encyclopedia of caves and karst science, edited by: Gunn, J., Fitzroy Dearbon, New York, 435–437 (2004)

[5] Kern Z., Fórizs I., Pavuza R., Molnár M., Nagy B.:Isotope hydrological studies of the perennial ice deposit of Saarhalle, Mammuthöhle, Dachstein Mts, Austria, (2011)

3. Location & Setting

The caves are settled within the UNESCO world heritage region of the Salzkammergut / Hallstatt in Austria (47°28′32.5″N 13°36′23.2″E), the next major city with airport is Salzburg. The geology of the Dachstein massif is dominated by the so-called *Dachstein-Kalk* ("Dachstein limestone"), dating from Triassic times. In common with other karstic areas, the Dachstein is permeated by a rich cave system, including some of the largest caves in Austria. The Dachstein is also famous for its fossils, including megalodonts.

The test sites are located at roughly 1600 m in both the dry Mammoth cave and the Ice caves – both can be accessed via cable car and a 10 min walk on paved ways.

Operating hours of the cable car were between 08:30 – 17:00 daily.

3.1. Environmental conditions

At the time of the tests, the caves had a typical temperature between -2 to +2 °C, with a humidity of up to 100% - inside the cave it was be humid, cold and dirty (the limestone sticking very well to equipment surfaces).

At the end of April, most of the snow was be gone, compared to up to 6 meters of snow a few weeks before. Hence, the water melt will be in progress leading to sparse water drips and slippery surfaces within the cave on some days.

The Giant Ice Cave is covered with ice on many locations inside, having an ice sheet cover between 0 and several meters, either starting at the surface or buried under limestone – the exact conditions are unknown after each winter. The Mammoth cave is dry and dusty. We will release a more detailed geological information notice in the upcoming weeks.

3.2. Test sites

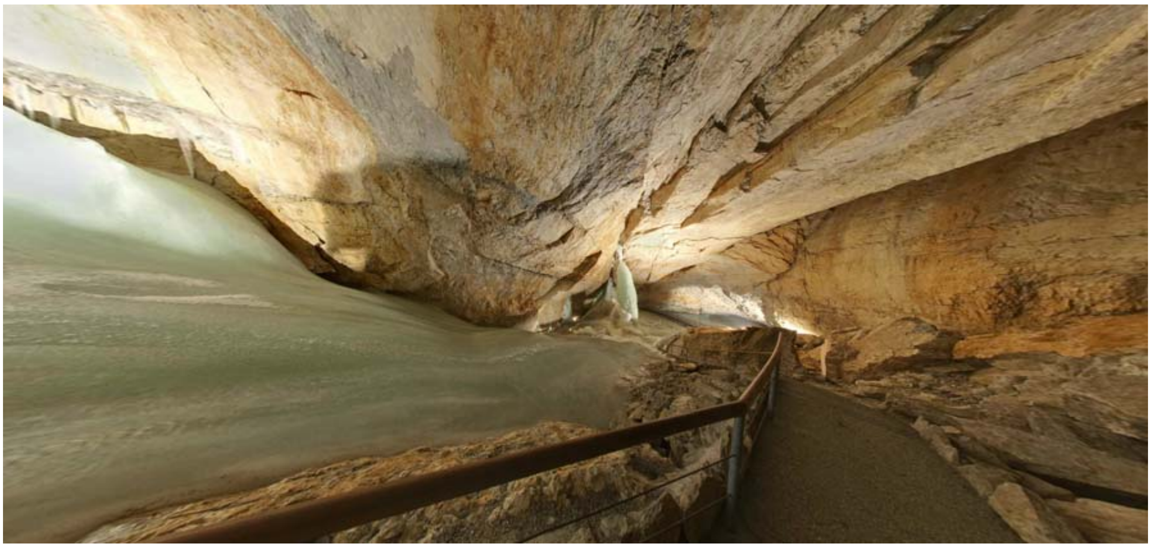
Three major sites have been identified which were accessible with the equipment and allow the provision of power, light and communication with the infrastructure available. On Friday, 27Apr, there was a walk-through for all experiment teams to have a first hand-experience of the simulation areas.

During the activities, a webcam transmitted a video stream from the test region.

Originally, it was planned to work also in the Mammoth Cave next to the Giant Ice Cave. However, due to the strong melting of the residual snow walls, the access paths were blocked and the snow wall stability estimated as being too instable. Hence, it was decided for safety reasons not to use the Mammoth cave at all.

Ice Cave / „Parsivaldome“

http://www.foto360.at/vr_panorama_fotos_dyn/fullscreen/vollbild_qtvr_panorama_photo.php?id=398



Ice Cave / „Kind Arthur Dome“

http://www.foto360.at/vr_panorama_fotos_dyn/fullscreen/vollbild_qtvr_panorama_photo.php?id=395

4. Infrastructure available

4.1. Location property

The caves belong to the National Forrestal Services (Österreichische Bundesforste) and are operated under license by the company Dachstein Tourismus AG. We had permits from all parties, although with restrictions due to environmental protection issues, these include the limitation of the team size (no more than 30 people inside the caves at the test site at any time).

The cable car station just below the cave entry points offered a restaurant, restrooms, storage areas, electricity and Internet access. Note that the weekend was also the first time, parts of the cave were accessible to the public again, so we had some sparse visitors.

Inside the cave there were many 230V power outlets for servicing activities, however due to the humidity, any electrical appliances had to be designed to survive the potentially high water vapour content.

There was a limited amount of media allowed to accompany us during the test, including two photographers of the Austrian Space Forum. We also conducted the first Austrian spacetweetup.

4.2. Accomodation

Rooms have been reserved according to the feedback from the experiment teams at the National Sports and Recreation Center, Obertraun for a price of 50 €/person-night.

The address was: **Winkl 49, A-4831 Obertraun**, Phone: +43/6131/239-0, Fax: +43/6131/239-423

Website: http://www.obertraun.bsfz.at/e_index.html

Daily evening debriefing at the Bundessportzentrum Obertraun & LANCOM wireless router in Tristan.

4.3. Communication infrastructure / Internet

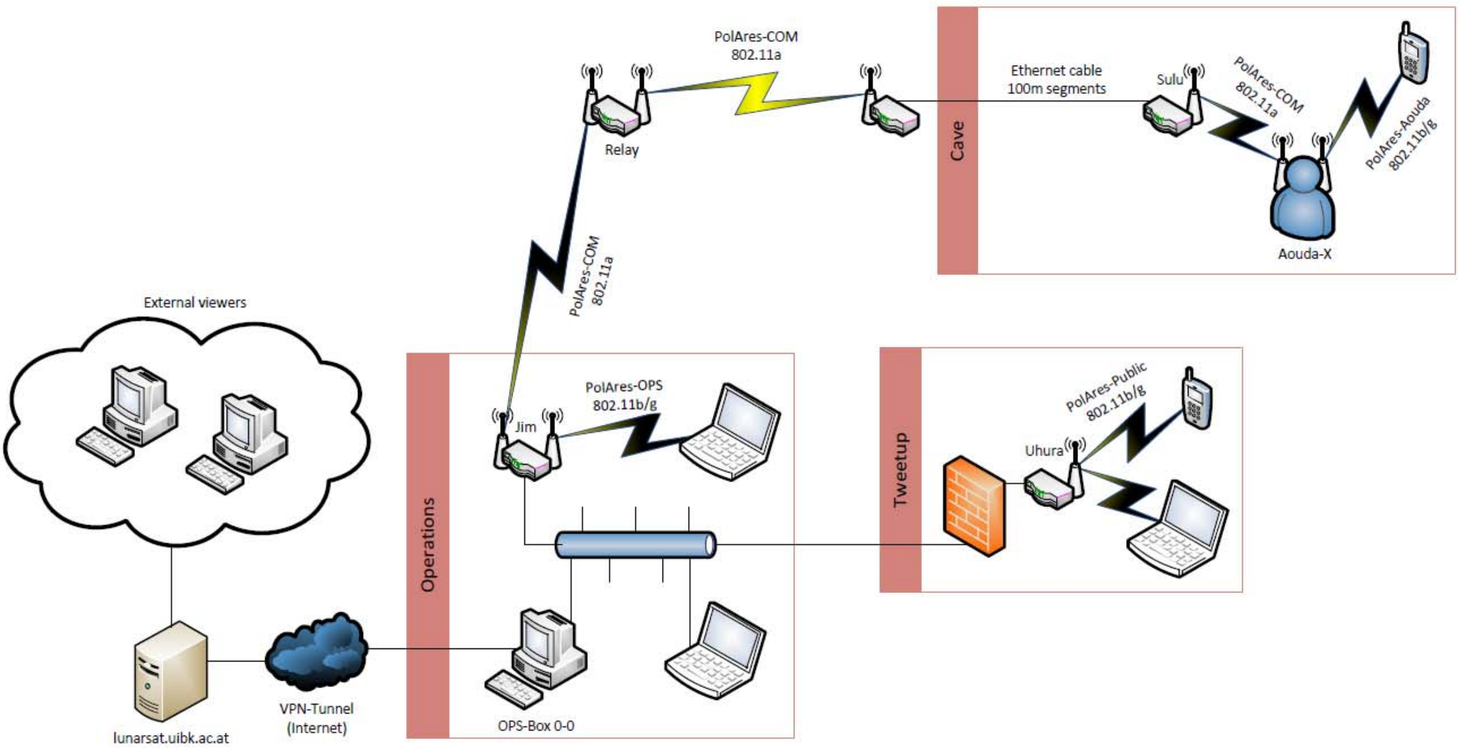
Via the Aouda.X OPS-Box, a W-LAN infrastructure was provided to the participants including the Tweet-up guests. This hardware also relayed the telemetry stream to a dedicated server at the OeWF Innsbruck facility ("Earth"), form where it was distributed to the Internet.

Telemetry configuration

Within the cave, a local access port was established with an autonomous power source. Local communication with Aouda.X within was enabled via a mumble-application between the suit and Android or iOS-based smartphones.

The data were relayed to the OPS ("operations") station at the cable car station, they were being monitored by the CapCom, biomedical engineer (BME) and the Tracking, Telemetry and Control (TT/C)-controller. The OPS also hosted a firewall-protected server for the media and the Marstweet-up.

Finally, the data have been sent to the Lunarsat-Server at the OeWF Innsbruck facility and were distributed to the remote science teams outside the Dachstein. This server also managed the data for the webstream.



5. Media activities

5.1. MarsTweetup

For 28th of April 2012 the Austrian Space Forum (OEWF) invited 20 Twitter followers to the Dachstein Mars simulation. This was a unique opportunity for Twitter users to experience live a real space mission simulation, get the chance to look behind the scenes of a Mars analog field test and meet other Twitter users who are sharing the same interest.

Program MarsTweetup:

09:00 – 09:15	Registration participants *Talstation Krippensteinbahn*
09:00 – 09:30	Ascent to Schönbergalm & setting-up *Restaurant Schönbergalm*
09:30 – 09:35	Welcome message by Olivia Haider (OEWF Social Media Manager) & Gernot Grömer (OEWF president & Dachstein Mars simulation lead) *Restaurant Schönbergalm*
09:35 – 10:0	Introduction round of MarsTweeps *Restaurant Schönbergalm*
10:00 – 10:15	Ascent to cave
10:15 – 10:45	Watching spacesuit donning & explanation Just outside giant ice cave
10:45 – 11:00	Descent to Schönbergalm restaurant
11:00 – 11:30	Keynote analog sciences by Alexander Soucek (20 min presenation, 10 min Q&A) *Restaurant Schönbergalm*
11:30 – 12:00	MAGMA Rover (10 min) WISDOM rader (10 min) Q&A (10 min) *Restaurant Schönbergalm*
12:00 – 12:30	Part-Time-Scientists (10 min) ERAS C3 simulator (10 min) Q&A (10 min) *Restaurant Schönbergalm*
12:30 – 13:30	Lunch
13:30 – 16:00	Splitting in 2 groups for OPS & cave visit Group A with Olivia, starts at cave Group B with Alexander, starts at OPS *Restaurant Schönbergalm & giant ice cave*
16:00 – 16:20	Live-link to JPL *Restaurant Schönbergalm*
16:30 – 16:50	Live-link to Kiwi-Space @ MDRS *Restaurant Schönbergalm*
16:50 – 17:15	Packing & descent with cable car *Restaurant Schönbergalm*

5.2. Media Schedule

Friday, 27Apr2012

14:30:00	15:00:00	15:30:00	16:00:00	16:30:00	17:00:00	17:30:00
Photoshooting for Press kit				**Prepare Press Kit** **Prepare Tweetup Room**		
Greetings Lange Nacht der Forschung & Catalysts						

Saturday, 28Apr2012 – Media activities

08:00:00	08:30:00	09:00:00	09:30:00	10:00:00	10:30:00	11:00:00
Ascent	Setup Press Con				Press conference	Accent to Dachstein Cave for Photoshootings with Media

11:30:00	12:00:00	12:30:00	13:00:00	13:30:00	14:00:00	14:30:00	15:00:00	15:30:00
Photoshooting with Media				**Timeslots for individual Photoshooting/Interviews esp. with international media & VIP media**				
				Servus TV				
				Spiegel TV				
						Live Link NASA/JPL and MDRS Utah		

Saturday, 28Apr2012, Tweet-up planning

09:00:00	09:30:00	10:00:00	10:30:00	11:00:00	11:30:00	12:00:00	12:30:00	13:00:00
Ascent Tweeps	setup computer & wifi introduction round	Press conference	Keynote A. Soucek / ESA	Presentations or discussion	Donning & Ops	Presentations or discussion	lunch break	lunch break

13:30:00	14:00:00	14:30:00	15:00:00	15:30:00	16:00:00	16:30:00	17:00:00
lunch break	cave visit	cave visit	cave visit	cave visit	JPL Link	Closing round	Descent

Responsibilities were:	
Olivia Haider	Social Media Assistent: Luca Forresta
Monika Fischer	Supervision PC, Preparation, Execution, Post-processing, Guest list, Press Kit Assistents: Susanne Hoffmann, Isabella Achorner
Alexander Soucek	Media services, assistance/coordination press conference
Petra Groll	VIP press service & policy liaison

6. Schedule

2011

Mid December: Geological overview sent to all interested parties

20Dec: Firm deadline for partners confirming participation

2012

(13-15Jan or 20-22Jan: Austrian Space Forum / Board meeting – approval of activities)

Feb/Mar: hardware training field crew (OeWF Suitlab Innsbruck)

23-25Mar: geology and life science training for field crew (Vienna)

26Apr: arrival of bridgehead crew, site inspection / h/w-setup

27Apr: 13:00 arrival, cave tour, communication/pwr/safety set-up, final briefings

28Apr: 08:15: set-up within cave, telemetry tests, experiment check-out, media activities

29-30Apr: integrated testing, 08:15 -17:15 each day

01May, 08:15-15:00: individual experiments, boxing & return

01June: experiment reports due

29June: field test report released

The daily schedule was based upon a flight plan managed by the OeWF to ensure a proper allocation of limited resources, like illumination, power, broadband and suit tester time.

Flight plan management:

- Sebastian Hettrich
- Alejandra Sans

Following the 3S-principle of priorities (Safety-Science-Simulation), suit tester-related activities, or experiments deemed unsafe by the EXLEAD, BME (Biomedical Engineer) or SAFETY were authorized to stop, interrupt or cancel any activity at any time. This was never necessary, no code red was declared during the mission.

6.2. “As-Was” Flight Plan

While the Giant Ice Cave system consisting of Lehmhallenlabyrinth (rocky), King Arthur Dome (rocky), Parsivaldome (rocky and icy) and Tristandome (icy) showed every of the required features for the planned experiments. We changed the time step size from 30 minutes to 15 minutes to ensure a more detailed planning. The walking times from OPS (middle station/restaurant) to the entrance of the cave was approximated with 15 minutes as well the time needed from the entrance of the caves to one of the deeper domes was ca. 15 minutes.

Color Coding

No Suit	Gloves	Suit	
			Parsivaldome
			Tristandome
			King Arthur
			Lehmhallenlabyrinth
			OPS (Middle Station)
			Registration (Valley station)
			Ascent (Valley Station)
			Tweet-Up (Mountain)
			Press Conf. (Restaurant)

Operations

ATC	Arrive to Cave
H	Hold
IC	Initial Conditions
Prep	Preparation
PWR	Power
RTO	Return to OPS
RL	relocate
SU	Set Up
XT	Extend
load	Gondola load
< >	Optional
-	Indicates an Action
+	and additional
[ ]	Max. Num. of People Allowed

Experiments

AP1	Antipodes 1
AP2	Antipodes 2
AP3	Antipodes 3
C3	ERAS Experiment
EMM	Euro-Moon-Mars
GEO.X	Geosampling
MAT	Medical Attention and Telemedicine
O.Sal	Oasis Sal (A-C)
SCS	Sterile Collection of Samples
TbBeCon	Terbium Bead Contamination
TCS	Thermal Control System
TT/C	Tracking, Telemetry and Command
VS	Viable Spores (JPL)
W	WISDOM

Locations

KA	King Arthur Dome
TD	Tristandome
PD	Parsivaldome
OPS	Operations

Roles

BB	Best Boy/Girl
BME	Biomedical Engineer
CapCom	Capsule Communicator
COMM	Communication Team
DT	Dismount Team
FD	Flight Director
FT	Flag Team
IT	Information Technology
PI	Principal Investigator
ST	Suit-Tester
TL	Suit Tech Lead
T	Suit Tech

Friday / 27Apr2012

Fri, 27Apr DAY 0 / Friday, 27Apr	Fri, 27Apr 08:00-08:15	Fri, 27Apr 08:15-08:30	Fri, 27Apr 08:30-08:45	Fri, 27Apr 08:45-09:00	Fri, 27Apr 09:00-09:15	Fri, 27Apr 09:15-09:30	Fri, 27Apr 09:30-09:45	Fri, 27Apr 09:45-10:00	Fri, 27Apr 10:00-10:15	Fri, 27Apr 10:15-10:30
Experiment teams					Arrivals, Hotel check-ins, Transfer to Ground station					Arrivals, Hotel che
COMM/PWR	Ascent	Ascent	Build of infrastructure						Build of infrastructure	
Suit team										
COMM / Innsbruck ("*Earth*")					Set-up server & COMM-Check, Bandwidth load test					Set-up server & C(

Fri, 27Apr 10:30-10:45	Fri, 27Apr 10:45-11:00	Fri, 27Apr 11:00-11:15	Fri, 27Apr 11:15-11:30	Fri, 27Apr 11:30-11:45	Fri, 27Apr 11:45-12:00	Fri, 27Apr 12:00-12:15	Fri, 27Apr 12:15-12:30	Fri, 27Apr 12:30-12:45	Fri, 27Apr 12:45-13:00	Fri, 27Apr 13:00-13:15	Fri, 27Apr 13:15-13:30
ck-ins, Transfer to Ground station				Arrivals, Hotel check-ins, Transfer to Ground station						Safety Briefing	Safety Briefing
				COMM CHECK		COMM CHECK					
OMM-Check, Bandwidth load test											

Fri, 27Apr 13:30-13:45	Fri, 27Apr 13:45-14:00	Fri, 27Apr 14:00-14:15	Fri, 27Apr 14:15-14:30	Fri, 27Apr 14:30-14:45	Fri, 27Apr 14:45-15:00	Fri, 27Apr 15:00-15:15	Fri, 27Apr 15:15-15:30	Fri, 27Apr 15:30-15:45	Fri, 27Apr 15:45-16:00	Fri, 27Apr 16:00-16:15
Ascent	Ascent	Site visit	Site visit	Site visit	Site visit	Site visit	Site visit	Site visit	Site visit	Equipment check-out
		Donning/Doffing Training					Donning/Doffing Training			

Fri, 27Apr 16:15-16:30	Fri, 27Apr 16:30-16:45	Fri, 27Apr 16:45-17:00	Evening (30min)
		Descent	
		Descent	
		Descent	ST GEO.X Briefing

Saturday / 28Apr2012

Sat, 28Apr DAY 1 / Saturday, 28Apr / DS	Sat, 28Apr 08:00-08:15 23:00-23:15 27Apr JPL 00:00-00:15 28Apr MDRS 18:00-18:15 28Apr WT	Sat, 28Apr 08:15-08:30 23:15-23:30 27Apr JPL 00:15-00:30 28Apr MDRS 18:15-18:30 28Apr WT	Sat, 28Apr 08:30-08:45 23:30-23:45 27Apr JPL 00:30-00:45 28Apr MDRS 18:30-18:45 28Apr WT	Sat, 28Apr 08:45-09:00 23:45-00:00 27Apr JPL 00:45-01:00 28Apr MDRS 18:45-19:00 28Apr WT	Sat, 28Apr 09:00-09:15 00:00-00:15 28Apr JPL 01:00-01:15 28Apr MDRS 19:00-19:15 28Apr WT	Sat, 28Apr 09:15-09:30 00:15-00:30 28Apr JPL 01:15-01:30 28Apr MDRS 19:15-19:30 28Apr WT	Sat, 28Apr 09:30-09:45 00:30-00:45 28Apr JPL 01:30-01:45 28Apr MDRS 19:30-19:45 28Apr WT	Sat, 28Apr 09:45-10:00 00:45-01:00 28Apr JPL 01:45-02:00 28Apr MDRS 19:45-20:00 28Apr WT	Sat, 28Apr 10:00-10:15 01:00-01:15 28Apr JPL 02:00-02:15 28Apr MDRS 20:00-20:15 28Apr WT	Sat, 28Apr 10:15-10:30 01:15-01:30 28Apr JPL 02:15-02:30 28Apr MDRS 20:15-20:30 28Apr WT	Sat, 28Apr 10:30-10:45 01:30-01:45 28Apr JPL 02:30-02:45 28Apr MDRS 20:30-20:45 28Apr WT
Parsivaldome		ATC + Prep for Donning (outside)		Donning	Donning	Donning	Donning	Donning	Donning	Donning	Donning
Parsivaldome											
OPS							OPS Operational	OPS Operational	OPS Operational	OPS Operational	OPS Operational
Tweet- Up							Welcome message	& Introduction	Ascent to cave	Watching Donning	Watching Donning
Restaurant									Press Conference	Press Conference	Press Conference
Registration	SU	SU	open	open	open	open	open	open	open	open	open
Ascent	1st load: Suit tester, suit tech, suit tech lead, safety, Ex.lead, FD, BME, Comm lead, OPS TT/C, Capcom, Techn. Fotographer	2nd load: Flight plan team, data officer, IT support, Backup-suit tester, Rest of the ÖWF team	3rd load: science teams	4th load: Science teams, External Media	5th load: Tweet-Up-People, ÖWF Media team, External Media	6th load: Tweet-Up-People, ÖWF Media team External Media	7th load: Science teams, External Media	8th load: Science teams, External Media			

Sat, 28Apr 10:45-11:00 01:45-02:00 28Apr JPL 02:45-03:00 28Apr MDRS 20:45-21:00 28Apr WT	Sat, 28Apr 11:00-11:15 02:00-02:15 28Apr JPL 03:00-03:15 28Apr MDRS 21:00-21:15 28Apr WT	Sat, 28Apr 11:15-11:30 02:15-02:30 28Apr JPL 03:15-03:30 28Apr MDRS 21:15-21:30 28Apr WT	Sat, 28Apr 11:30-11:45 02:30-02:45 28Apr JPL 03:30-03:45 28Apr MDRS 21:30-21:45 28Apr WT	Sat, 28Apr 11:45-12:00 02:45-03:00 28Apr JPL 03:45-04:00 28Apr MDRS 21:45-22:00 28Apr WT	Sat, 28Apr 12:00-12:15 03:00-03:15 28Apr JPL 04:00-04:15 28Apr MDRS 22:00-22:15 28Apr WT	Sat, 28Apr 12:15-12:30 03:15-03:30 28Apr JPL 04:15-04:30 28Apr MDRS 22:15-22:30 28Apr WT	Sat, 28Apr 12:30-12:45 03:30-03:45 28Apr JPL 04:30-04:45 28Apr MDRS 22:30-22:45 28Apr WT	Sat, 28Apr 12:45-13:00 03:45-04:00 28Apr JPL 04:45-05:00 28Apr MDRS 22:45-23:00 28Apr WT	Sat, 28Apr 13:00-13:15 04:00-04:15 28Apr JPL 05:00-05:15 28Apr MDRS 23:00-23:15 28Apr WT	Sat, 28Apr 13:15-13:30 04:15-04:30 28Apr JPL 05:15-05:30 28Apr MDRS 23:15-23:30 28Apr WT	Sat, 28Apr 13:30-13:45 04:30-04:45 28Apr JPL 05:30-05:45 28Apr MDRS 23:30-23:45 28Apr WT	Sat, 28Apr 13:45-14:00 04:45-05:00 28Apr JPL 05:45-06:00 28Apr MDRS 23:45-00:00 28Apr WT	Sat, 28Apr 14:00-14:15 05:00-05:15 28Apr JPL 06:00-06:15 28Apr MDRS 00:00-00:15 29Apr WT
Donning	Donning	Donning	Media Photos	Media Photos	Media Photos	Media Photos	Media Photos	Media Photos	Media Photos	Media Photos	BREAK	BREAK+ walk to KA	Exclusive TV-Shots
									BB-BRINGS CHARGERS		PWR-CHARGE	PWR-CHARGE	
								Presentation of Rovers and Experiments					
								<COMM>	<COMM>				
								Rover Parade	Rover Parade	Rover Parade	Rover Parade		
									BB-BRINGS CHARGERS				
OPS Operational	OPS Operational	OPS Operational	OPS Operational Exh. Check	OPS Operational	OPS Operational	OPS Operational	OPS Operational Exh. Check	OPS Operational	OPS Operational	OPS Operational	OPS Operational Exh. Check	OPS Operational	OPS Operational
								h					
Descent to Restaurant	Key-Note by A.Soucek	Key-Note by A.Soucek	Magma / WISDOM presentations		Asimov / C3 presentations		lunch	lunch	lunch	lunch	Cave and OPS tours	Cave and OPS tours	Cave and OPS tours
Press Conference	Press Conference	Press Conference & Ascent to cave											
open	open	open	open	open									

Sat, 28Apr 14:15-14:30 05:15-05:30 28Apr JPL 06:15-06:30 28Apr MDRS 00:15-00:30 29Apr WT	Sat, 28Apr 14:30-14:45 05:30-05:45 28Apr JPL 06:30-06:45 28Apr MDRS 00:30-00:45 29Apr WT	Sat, 28Apr 14:45-15:00 05:45-06:00 28Apr JPL 06:45-07:00 28Apr MDRS 00:45-01:00 29Apr WT	Sat, 28Apr 15:00-15:15 06:00-06:15 28Apr JPL 07:00-07:15 28Apr MDRS 01:00-01:15 29Apr WT	Sat, 28Apr 15:15-15:30 06:15-06:30 28Apr JPL 07:15-07:30 28Apr MDRS 01:15-01:30 29Apr WT	Sat, 28Apr 15:30-15:45 06:30-06:45 28Apr JPL 07:30-07:45 28Apr MDRS 01:30-01:45 29Apr WT	Sat, 28Apr 15:45-16:00 06:45-07:00 28Apr JPL 07:45-08:00 28Apr MDRS 01:45-02:00 29Apr WT	Sat, 28Apr 16:00-16:15 07:00-07:15 28Apr JPL 08:00-08:15 28Apr MDRS 02:00-02:15 29Apr WT	Sat, 28Apr 16:15-16:30 07:15-07:30 28Apr JPL 08:15-08:30 28Apr MDRS 02:15-02:30 29Apr WT	Sat, 28Apr 16:30-16:45 07:30-07:45 28Apr JPL 08:30-08:45 28Apr MDRS 02:30-02:45 29Apr WT	Sat, 28Apr 16:45-17:00 07:45-08:00 28Apr JPL 08:45-09:00 28Apr MDRS 02:45-03:00 29Apr WT
Exclusive TV-Shots	Exclusive TV-Shots	Exclusive TV-Shots	Exclusive TV-Shots	Exclusive TV-Shots	Exclusive TV-Shots	Exclusive TV-Shots	Doffing (inside)	Doffing	Doffing & Packing	Descent
OPS Operational	OPS Operational	OPS Operational	OPS Operational	OPS Operational	OPS Operational	OPS Operational	OPS Operational	OPS Operational	OPS Operational	
	Exh. Check				Exh. Check					
							Establish Contact to MDRS		Live Link to Kiwi Space	
						Establish Contact to JPL		Live Link to JPL		
Cave and OPS tours	Cave and OPS tours	Cave and OPS tours	Cave and OPS tours	Cave and OPS tours	Cave and OPS tours	Cave and OPS tours	Live Link to JPL	Live Link to JPL	Live Link to Kiwi Space	Descent
							Science teams, External Media	Last option for: Science teams, External Media	Penultimate load: OPS TT/C, Capcom, Techn. Fotographer, FD, BME, Rest of ÖWF team	last load: Suit tester, suit tech, suit tech lead, safety, Ex.lead, Comm lead, Tweet-up-people

Sunday, 29Apr 2012

Sun, 29Apr DAY 2 / Sunday, 29Apr / DF	Sun, 29Apr 08:00-08:15	Sun, 29Apr 08:15-08:30	Sun, 29Apr 08:30-08:45	Sun, 29Apr 08:45-09:00	Sun, 29Apr 09:00-09:15	Sun, 29Apr 09:15-09:30	Sun, 29Apr 09:30-09:45	Sun, 29Apr 09:45-10:00	Sun, 29Apr 10:00-10:15	Sun, 29Apr 10:15-10:30	Sun, 29Apr 10:30-10:45
	23:00-23:15 28Apr JPL 00:00-00:15 29Apr MDRS 18:00-18:15 29Apr WT	23:15-23:30 28Apr JPL 00:15-00:30 29Apr MDRS 18:15-18:30 29Apr WT	23:30-23:45 28Apr JPL 00:30-00:45 29Apr MDRS 18:30-18:45 29Apr WT	23:45-00:00 28Apr JPL 00:45-01:00 29Apr MDRS 18:45-19:00 29Apr WT	00:00-00:15 29Apr JPL 01:00-01:15 29Apr MDRS 19:00-19:15 29Apr WT	00:15-00:30 29Apr JPL 01:15-01:30 29Apr MDRS 19:15-19:30 29Apr WT	00:30-00:45 29Apr JPL 01:30-01:45 29Apr MDRS 19:30-19:45 29Apr WT	00:45-01:00 29Apr JPL 01:45-02:00 29Apr MDRS 19:45-20:00 29Apr WT	01:00-01:15 29Apr JPL 02:00-02:15 29Apr MDRS 20:00-20:15 29Apr WT	01:15-01:30 29Apr JPL 02:15-02:30 29Apr MDRS 20:15-20:30 29Apr WT	01:30-01:45 29Apr JPL 02:30-02:45 29Apr MDRS 20:30-20:45 29Apr WT
Tristandome / Parsivaldome				ATC +Prep Donning [7] (outside)		Donning [7]	Donning [7]	Donning [7]	Donning [7]	Donning [7]	Donning [7]
Parsivaldome				MAGMA-ATC[3]	MAGMA[3]	MAGMA[3]	MAGMA[3]	MAGMA[3]	MAGMA[3]	MAGMA[3]	MAGMA[3]
Parsivaldome Tristandome				FT-ATC [4] WISDOM-ATC[5]	Flag -SU [4] WISDOM-SU[5]	Flag -SU [4] WISDOM [5]	Flag -SU [4] WISDOM [5]	Flag -SU [4] WISDOM [5]	Flag -SU [4] WISDOM [5]	FT-RTO [4] WISDOM [5]	FT-RTO [4] WISDOM [5]
										Cliffbot team-ATC[3]	Cliff bot-IC1[3]
				EMM O.sal-ATC[1]	EMM O.sal-ATC[1]	EMM O.sal-SU[1]	EMM O.sal-SU[1]	EMM O.sal-SU[1]	EMM O.sal-SU[1]	EMM O.sal-SU[1]	EMM O.sal-SU[1]
Lehmhallenlabyrinth											
OPS					OPS Operational	OPS Operational	OPS Operational	OPS Operational	OPS Operational	OPS Operational	OPS Operational
					Establish Contact to MDRS		MDRS <standby>	MDRS <standby>	AP2	AP2	AP2
Number of People in Cave	0	0	0	20	20	20	20	20	25	27	27
Ascent	1st load: Suit tester, suit tech, suit tech lead, safety, Ex.lead, FD, BME, Comm lead, OPS TT/C, Capcom, Techn. Fotographer	2nd load: Flight plan team, data officer, IT support, Backup-suit tester, Rest of the ÖWF team	3rd load: science teams	4th load: Science teams							

Sun, 29Apr 10:45-11:00	Sun, 29Apr 11:00-11:15	Sun, 29Apr 11:15-11:30	Sun, 29Apr 11:30-11:45	Sun, 29Apr 11:45-12:00	Sun, 29Apr 12:00-12:15	Sun, 29Apr 12:15-12:30	Sun, 29Apr 12:30-12:45	Sun, 29Apr 12:45-13:00	Sun, 29Apr 13:00-13:15	Sun, 29Apr 13:15-13:30	Sun, 29Apr 13:30-13:45	Sun, 29Apr 13:45-14:00	Sun, 29Apr 14:00-14:15
01:45-02:00 29Apr JPL 02:45-03:00 29Apr MDRS 20:45-21:00 29Apr WT	02:00-02:15 29Apr JPL 03:00-03:15 29Apr MDRS 21:00-21:15 29Apr WT	02:15-02:30 29Apr JPL 03:15-03:30 29Apr MDRS 21:15-21:30 29Apr WT	02:30-02:45 29Apr JPL 03:30-03:45 29Apr MDRS 21:30-21:45 29Apr WT	02:45-03:00 29Apr JPL 03:45-04:00 29Apr MDRS 21:45-22:00 29Apr WT	03:00-03:15 29Apr JPL 04:00-04:15 29Apr MDRS 22:00-22:15 29Apr WT	03:15-03:30 29Apr JPL 04:15-04:30 29Apr MDRS 22:15-22:30 29Apr WT	03:30-03:45 29Apr JPL 04:30-04:45 29Apr MDRS 22:30-22:45 29Apr WT	03:45-04:00 29Apr JPL 04:45-05:00 29Apr MDRS 22:45-23:00 29Apr WT	04:00-04:15 29Apr JPL 05:00-05:15 29Apr MDRS 23:00-23:15 29Apr WT	04:15-04:30 29Apr JPL 05:15-05:30 29Apr MDRS 23:15-23:30 29Apr WT	04:30-04:45 29Apr JPL 05:30-05:45 29Apr MDRS 23:30-23:45 29Apr WT	04:45-05:00 29Apr JPL 05:45-06:00 29Apr MDRS 23:45-00:00 29Apr WT	05:00-05:15 29Apr JPL 06:00-06:15 29Apr MDRS 00:00-00:15 30Apr WT
Donning [7]	Donning [7]	ST-Walk To Site [6]	ST-Walk To Site [6]	ST-Walk To Site [6]	Cliff bot [8] Cliff bot-IC2[2] <Terrain>	Cliff bot [8] <Terrain>	Cliff bot [8] MAT <Terrain>	<Cliff bot >[8] <Terrain>	<Cliff bot >[8] <Terrain>	ST-Walk to PD[6] MAT <TCS>	BREAK[6] BREAK BREAK	BREAK[6] BREAK BREAK	EMM O.Sal[7] MAT
									BB-BRINGS CHARGERS [1]		PWR-CHARGE[1]	PWR-CHARGE[1]	PWR-CHARGE[1]
MAGMA[3]	MAGMA[3]	MAGMA[3]	MAGMA[3]	MAGMA[3]	MAGMA[3]	MAGMA[3]	MAGMA[3]	MAGMA[3]	MAGMA[3]	MAGMA[3]	MAGMA[3]	MAGMA[3]	MAGMA[3]
		T RTO[1]							EMM-ATC[3]	EMM-ATC[3]	<EMM-Standby>[3]	EMM O.Sal-SU[3]	EMM SCS-SU[2]
WISDOM [5]	WISDOM [5]	WISDOM [5]	WISDOM [5]	WISDOM [5]	WISDOM [5]	WISDOM [5]	WISDOM [5]	WISDOM [5]	WISDOM-RTO[5]				
<Cliffbot Standby>[3]	<Cliffbot Standby>[3]	Cliffbot PI- RTO [1]							Cliffbot PI -ATC[1]	Cliffbot (normal)[1]	Cliffbot (normal)[1]	Cliffbot (normal)[1]	Cliffbot (normal)[1]
EMM O.sal-RTO[1]	EMM O.sal-RTO[1]										<Cliffbot +W -ATC[3]>	<Cliffbot +W -ATC[3]>	<Cliffbot +W -ATC[3]>
	Asimov-ATC [5]	Asimov-ATC [5]	Asimov [5]	Asimov [5]	Asimov [5]	Asimov [5]	Asimov [5]	Asimov [5]	Asimov [5]	Asimov [5]	Asimov [5]	Asimov [5]	Asimov [5]
OPS Operational	OPS Operational	OPS Operational	OPS Operational C3	OPS Operational C3	OPS Operational C3	OPS Operational C3	OPS Operational C3	OPS Operational C3	OPS Operational C3	OPS Operational C3	OPS Operational C3	OPS Operational C3	OPS Operational C3
23	23	23	21	21	21	21	21	21	26	19	22	22	22

Sun, 29Apr 14:15-14:30	Sun, 29Apr 14:30-14:45	Sun, 29Apr 14:45-15:00	Sun, 29Apr 15:00-15:15	Sun, 29Apr 15:15-15:30	Sun, 29Apr 15:30-15:45	Sun, 29Apr 15:45-16:00	Sun, 29Apr 16:00-16:15	Sun, 29Apr 16:15-16:30	Sun, 29Apr 16:30-16:45	Sun, 29Apr 16:45-17:00
05:15-05:30 29Apr JPL 06:15-06:30 29Apr MDRS 00:15-00:30 30Apr WT	05:30-05:45 29Apr JPL 06:30-06:45 29Apr MDRS 00:30-00:45 30Apr WT	05:45-06:00 29Apr JPL 06:45-07:00 29Apr MDRS 00:45-01:00 30Apr WT	06:00-06:15 29Apr JPL 07:00-07:15 29Apr MDRS 01:00-01:15 30Apr WT	06:15-06:30 29Apr JPL 07:15-07:30 29Apr MDRS 01:15-01:30 30Apr WT	06:30-06:45 29Apr JPL 07:30-07:45 29Apr MDRS 01:30-01:45 30Apr WT	06:45-07:00 29Apr JPL 07:45-08:00 29Apr MDRS 01:45-02:00 30Apr WT	07:00-07:15 29Apr JPL 08:00-08:15 29Apr MDRS 02:00-02:15 30Apr WT	07:15-07:30 29Apr JPL 08:15-08:30 29Apr MDRS 02:15-02:30 30Apr WT	07:30-07:45 29Apr JPL 08:30-08:45 29Apr MDRS 02:30-02:45 30Apr WT	07:45-08:00 29Apr JPL 08:45-09:00 29Apr MDRS 02:45-03:00 30Apr WT
EMM SCS standby[9]	EMM SCS standby[9]	EMM SCS[9]		<walk back>[6]	EMM O.Sal[9]	Doffing[6] (outside)	Doffing[6] (outside)	Doffing & Packing[6]	Descent[6]	Descent[6]
			MAT <CATALYSTS>		<COMM>					
BB-RTO[1]	BB-RTO[1]									
MAGMA[3]	MAGMA[3]	MAGMA[3]	MAGMA[3]	MAGMA[3]	MAGMA-RTO [3]	MAGMA-RTO [3]				
			EMM O.Sal-SU[1]		EMM-RTO[3]	EMM-RTO[3]				
	WISDOM -ATC[5]	WISDOM [5]	WISDOM [5]	WISDOM [5]	WISDOM-RTO[5]	WISDOM-RTO[5]				
Cliffbot (normal)[1] <Cliffbot +W -ATC[3]>	Cliffbot (normal)[1] Cliffbot +W -ATC[3]	Cliffbot (normal)[1] Cliffbot +W [3]	Cliffbot (normal)[1] Cliffbot +W [3]	Cliffbot (normal)[1] Cliffbot +W [3]	Cliffbot (normal)-ATC[1] Cliffbot+W- RTO[3]	Cliffbot (normal)-ATC [1] Cliffbot+W- RTO[3]				
Asimov [5]	Asimov [5]	Asimov [5]	Asimov- RTO[5]	Asimov- RTO[5]						
OPS Operational C3	OPS Operational	OPS Operational	OPS Operational	OPS Operational	OPS Operational	OPS Operational	OPS Operational Rover Parade	OPS Operational Rover Parade	OPS Operational	Descent
22	27	26	26	26	21	21	6	6	6	6
							Science teams,	Last option for: Science teams	Penultimate load: OPS TT/C, Capcom, Techn. Fotographer, FD, BME, Rest of ÖWF team	last load: Suit tester, suit tech, suit tech lead, safety, Ex.lead, Comm lead,

Monday, 30Apr 2012

Mon, 30Apr DAY 3 / Monday, 30Apr / DS		Mon, 30Apr 08:00-08:15	Mon, 30Apr 08:15-08:30	Mon, 30Apr 08:30-08:45	Mon, 30Apr 08:45-09:00	Mon, 30Apr 09:00-09:15	Mon, 30Apr 09:15-09:30	Mon, 30Apr 09:30-09:45	Mon, 30Apr 09:45-10:00	Mon, 30Apr 10:00-10:15	Mon, 30Apr 10:15-10:30	Mon, 30Apr 10:30-10:45
		23:00-23:15 29Apr JPL 00:00-00:15 30Apr MDRS 18:00-18:15 30Apr WT	23:15-23:30 29Apr JPL 00:15-00:30 30Apr MDRS 18:15-18:30 30Apr WT	23:30-23:45 29Apr JPL 00:30-00:45 30Apr MDRS 18:30-18:45 30Apr WT	23:45-00:00 29Apr JPL 00:45-01:00 30Apr MDRS 18:45-19:00 30Apr WT	00:00-00:15 30Apr JPL 01:00-01:15 30Apr MDRS 19:00-19:15 30Apr WT	00:15-00:30 30Apr JPL 01:15-01:30 30Apr MDRS 19:15-19:30 30Apr WT	00:30-00:45 30Apr JPL 01:30-01:45 30Apr MDRS 19:30-19:45 30Apr WT	00:45-01:00 30Apr JPL 01:45-02:00 30Apr MDRS 19:45-20:00 30Apr WT	01:00-01:15 30Apr JPL 02:00-02:15 30Apr MDRS 20:00-20:15 30Apr WT	01:15-01:30 30Apr JPL 02:15-02:30 30Apr MDRS 20:15-20:30 30Apr WT	01:30-01:45 30Apr JPL 02:30-02:45 30Apr MDRS 20:30-20:45 30Apr WT
King Arthur	Parsivaldome			ATC+Prep Donning[7]	Donning[7]	Donning[7]	Donning[7]	Donning[7]	Donning[7]	Donning[7]	Donning[7]	Donning[7]
Parsivaldome									Cliffbot[1] (normal)-AT(	Cliffbot [1]	Cliffbot [1]	Cliffbot [1]
Parsivaldome					WISDOM[5]-ATC EMM SCS-ATC [2]	WISDOM[5]-ATC EMM SCS [2]	WISDOM[5]-SU EMM SCS [2]	WISDOM[5] EMM SCS [2]	WISDOM[5] EMM SCS [2]	WISDOM[5] EMM SCS [2]	WISDOM[5] EMM SCS [2]	WISDOM[5] EMM SCS -RTO [2]
King Arthur					Flag -ATC [4]	Flag -RL to KA [4]	Flag -RL to KA [4]	Flag -RL to KA [4]	MAGMA-ATC [3] Flag -RL to KA [4]	MAGMA-ATC [3] FT-RTO[4]	MAGMA-SU [3] FT-RTO[4]	<MAGMA Standby> [3]
Tristandome					Cliffbot+W-ATC[3]	Cliffbot+W[3]	Cliffbot+W[3]	Cliffbot+W[3] ProVisG-ATC[2]	Cliffbot+W[3] ProVisG[2]	Cliffbot+W[3] ProVisG[2]	Cliffbot+W[3] ProVisG[2]	Cliffbot+W[3] ProVisG[2]
OPS						OPS Operational	OPS Operational	OPS Operational	OPS Operational	OPS Operational	OPS Operational	OPS Operational Establish Contact to Wellin
Number of People in Cave		0	7	7	21	21	21	24	27	27	27	23
		Ascent	1st load: suit tester, suit tech, suit tech lead, safety, Ex.lead, FD, BME, Comm lead, OPS TT/C, Capcom, Techn. Fotographer	2nd load: Flight plan team, data officer, IT support, Backup-suit tester, Rest of the ÖWF team	3rd load: science teams	4th load: Science teams						

Mon, 30Apr 10:45-11:00	Mon, 30Apr 11:00-11:15	Mon, 30Apr 11:15-11:30	Mon, 30Apr 11:30-11:45	Mon, 30Apr 11:45-12:00	Mon, 30Apr 12:00-12:15	Mon, 30Apr 12:15-12:30	Mon, 30Apr 12:30-12:45	Mon, 30Apr 12:45-13:00	Mon, 30Apr 13:00-13:15	Mon, 30Apr 13:15-13:30	Mon, 30Apr 13:30-13:45	Mon, 30Apr 13:45-14:00	Mon, 30Apr 14:00-14:15
01:45-02:00 30Apr JPL 02:45-03:00 30Apr MDRS 20:45-21:00 30Apr WT	02:00-02:15 30Apr JPL 03:00-03:15 30Apr MDRS 21:00-21:15 30Apr WT	02:15-02:30 30Apr JPL 03:15-03:30 30Apr MDRS 21:15-21:30 30Apr WT	02:30-02:45 30Apr JPL 03:30-03:45 30Apr MDRS 21:30-21:45 30Apr WT	02:45-03:00 30Apr JPL 03:45-04:00 30Apr MDRS 21:45-22:00 30Apr WT	03:00-03:15 30Apr JPL 04:00-04:15 30Apr MDRS 22:00-22:15 30Apr WT	03:15-03:30 30Apr JPL 04:15-04:30 30Apr MDRS 22:15-22:30 30Apr WT	03:30-03:45 30Apr JPL 04:30-04:45 30Apr MDRS 22:30-22:45 30Apr WT	03:45-04:00 30Apr JPL 04:45-05:00 30Apr MDRS 22:45-23:00 30Apr WT	04:00-04:15 30Apr JPL 05:00-05:15 30Apr MDRS 23:00-23:15 30Apr WT	04:15-04:30 30Apr JPL 05:15-05:30 30Apr MDRS 23:15-23:30 30Apr WT	04:30-04:45 30Apr JPL 05:30-05:45 30Apr MDRS 23:30-23:45 30Apr WT	04:45-05:00 30Apr JPL 05:45-06:00 30Apr MDRS 23:45-00:00 30Apr WT	05:00-05:15 30Apr JPL 06:00-06:15 30Apr MDRS 00:00-00:15 01May WT
Donning[7]	Donning[7]	walking to KA[7]	walking to KA[7] MAT	<MAGMA standby[10]: FILMING -ATC [3]	MAGMA[10] FILMING [3] BB-BRINGS CHARGERS [1]	ST-walk to PD[6] MAT FILMING [3]	BREAK[6] BREAK FILMING [3] PWR-CHARGE[1]	BREAK[6] BREAK FILMING [3] PWR-CHARGE[1]	BREAK[6] MAT FILMING [3] BB-RTO[1]	TbBeCon [7] FILMING [3] BB-RTO[1]	TbBeCon [7] FILMING [3] <Terrain>	TbBeCon [7] FILMING [3] <Terrain>	TbBeCon [7] MAT FILMING [3] <Terrain>
Cliffbot [1]	Cliffbot [1]	Cliffbot [1]	Cliffbot [1]	Cliffbot [1]	Cliffbot [1]	Cliffbot [1]	Cliffbot [1]	Cliffbot [1]	Cliffbot [1]	Cliffbot [1]	Cliffbot [1]	Cliffbot [1]	Cliffbot [1]
WISDOM[5] EMM SCS _RTO[2]	WISDOM[5]	WISDOM[5]	WISDOM[5]	WISDOM[5]	WISDOM[5]	WISDOM[5]	WISDOM[5]	WISDOM[5]	WISDOM[5] EMM SCS-ATC [2]	WISDOM[5] EMM SCS [2]	WISDOM[5] EMM SCS [2]	WISDOM[5] EMM SCS [2]	WISDOM[5] EMM SCS [2]
<MAGMA Standby> [3]	<MAGMA Standby> [3	<MAGMA Standby> [3	<MAGMA Standby> [3]			MAGMA[3]	MAGMA[3] TbBeCon-ATC[1]	MAGMA[3] TbBeCon ATC[1]	MAGMA[3] TbBeCon ATC[1]	MAGMA[3]	MAGMA[3]	MAGMA[3]	MAGMA[3]
Cliffbot+W[3] ProVisG[2]	Cliffbot+W[3] ProVisG[2]	Cliffbot+W[3] ProVisG[2]	Cliffbot+W[3] ProVisG[2]	Cliffbot+W[3] ProVisG[2]	Cliffbot+W[3] ProVisG[2]	Cliffbot+W[3] ProVisG[2]	Cliffbot+W[3] ProVisG[2]	Cliffbot+W[3] ProVisG[2]	Cliffbot+W[3] ProVisG[2]	Cliffbot+W[3] ProVisG[2]	Cliffbot+W[3] ProVisG[2]	Cliffbot+W[3] ProVisG[2]	Cliffbot+W[3] ProVisG[2]
OPS Operational gton	OPS Operational Wellington <Standby>	OPS Operational Wellington <Standby>	OPS Operational C3 Wellington <Standby>	OPS Operational C3 AP1	OPS Operational C3 AP1 Establish Contact to JPL	OPS Operational C3	OPS Operational JPL <standby>	OPS Operational JPL <standby>	OPS Operational TbBeCon	OPS Operational TbBeCon	OPS Operational TbBeCon	OPS Operational TbBeCon	OPS Operational TbBeCon
23	23	23	24	24	25	24	25	25	27	27	26	26	26

Mon, 30Apr 14:15-14:30	**Mon, 30Apr 14:30-14:45**	**Mon, 30Apr 14:45-15:00**	**Mon, 30Apr 15:00-15:15**	**Mon, 30Apr 15:15-15:30**	**Mon, 30Apr 15:30-15:45**	**Mon, 30Apr 15:45-16:00**	**Mon, 30Apr 16:00-16:15**	**Mon, 30Apr 16:15-16:30**	**Mon, 30Apr 16:30-16:45**	**Mon, 30Apr 16:45-17:00**
05:15-05:30 30Apr JPL 06:15-06:30 30Apr MDRS 00:15-00:30 01May WT	05:30-05:45 30Apr JPL 06:30-06:45 30Apr MDRS 00:30-00:45 01May WT	05:45-06:00 30Apr JPL 06:45-07:00 30Apr MDRS 00:45-01:00 01May WT	06:00-06:15 30Apr JPL 07:00-07:15 30Apr MDRS 01:00-01:15 01May WT	06:15-06:30 30Apr JPL 07:15-07:30 30Apr MDRS 01:15-01:30 01May WT	06:30-06:45 30Apr JPL 07:30-07:45 30Apr MDRS 01:30-01:45 01May WT	06:45-07:00 30Apr JPL 07:45-08:00 30Apr MDRS 01:45-02:00 01May WT	07:00-07:15 30Apr JPL 08:00-08:15 30Apr MDRS 02:00-02:15 01May WT	07:15-07:30 30Apr JPL 08:15-08:30 30Apr MDRS 02:15-02:30 01May WT	07:30-07:45 30Apr JPL 08:30-08:45 30Apr MDRS 02:30-02:45 01May WT	07:45-08:00 30Apr JPL 08:45-09:00 30Apr MDRS 02:45-03:00 01May WT
TbBeCon [7]	TbBeCon [7]	TbBeCon [7]	TbBeCon [7]	TbBeCon [7]	<walk back>[6]	Doffing[7] (outside EXIT)	Doffing[7] (outside EXIT)	Doffing[7]	Doffing & Packing[7]	Descent[7]
			MAT							
FILMING [3]	FILMING [3]	FILMING -RTO [3]	FILMING -RTO [3]							
<Terrain>	<Terrain>	<Terrain>	<Terrain>	<Terrain>						
Cliffbot [1]	Cliffbot [1]	Cliffbot [1]	Cliffbot [1]	Cliffbot-RTO [1]	Cliffbot-RTO [1]					
WISDOM[5]	WISDOM[5]	WISDOM[5]	WISDOM[5]	WISDOM-RTO[5]	WISDOM-RTO[5]					
EMM SCS [2]	EMM SCS [2]	EMM SCS [2]	EMM SCS [2]	EMM SCS _RTO[2]						
MAGMA[3]	MAGMA[3]	MAGMA[3]	MAGMA[3]	MAGMA-RTO[3]	MAGMA-RTO[3]					
					TbBeCon Sampler-RTO[1]					
Cliffbot+W[3]	Cliffbot+W[3]	Cliffbot+W[3]	Cliffbot+W[3]	Cliffbot+W-RTO[3]	Cliffbot+W -RTO[3]					
ProVisG[2]	ProVisG[2]	ProVisG[2]	ProVisG[2]	ProVisG[2]	ProVisG-RTO[2]	ProVisG-RTO[2]				
OPS Operational	OPS Operational	OPS Operational	OPS Operational	OPS Operational	OPS Operational	OPS Operational				
TbBeCon	TbBeCon	TbBeCon	TbBeCon	TbBeCon						
26	26	26	26	23	21	9	7	7	7	7
							Science teams,	Last option for: Science teams	Penultimate load: OPS TT/C, Capcom, Techn. Fotographer, FD, BME, Rest of ÖWF team	last load: Suit tester, suit tech, suit tech lead, safety, Ex.lead, Comm lead,

Tuesday, 01May2012

Tue, 01May DAY 4 / Tuesday, 01May /DF		Tue, 01May 08:00-08:15 23:00-23:15 30Apr JPL 00:00-00:15 01May MDRS 18:00-18:15 01May WT	Tue, 01May 08:15-08:30 23:15-23:30 30Apr JPL 00:15-00:30 01May MDRS 18:15-18:30 01May WT	Tue, 01May 08:30-08:45 23:30-23:45 30Apr JPL 00:30-00:45 01May MDRS 18:30-18:45 01May WT	Tue, 01May 08:45-09:00 23:45-00:00 30Apr JPL 00:45-01:00 01May MDRS 18:45-19:00 01May WT	Tue, 01May 09:00-09:15 00:00-00:15 01May JPL 01:00-01:15 01May MDRS 19:00-19:15 01May WT	Tue, 01May 09:15-09:30 00:15-00:30 01May JPL 01:15-01:30 01May MDRS 19:15-19:30 01May WT	Tue, 01May 09:30-09:45 00:30-00:45 01May JPL 01:30-01:45 01May MDRS 19:30-19:45 01May WT	Tue, 01May 09:45-10:00 00:45-01:00 01May JPL 01:45-02:00 01May MDRS 19:45-20:00 01May WT	Tue, 01May 10:00-10:15 01:00-01:15 01May JPL 02:00-02:15 01May MDRS 20:00-20:15 01May WT	Tue, 01May 10:15-10:30 01:15-01:30 01May JPL 02:15-02:30 01May MDRS 20:15-20:30 01May WT	Tue, 01May 10:30-10:45 01:30-01:45 01May JPL 02:30-02:45 01May MDRS 20:30-20:45 01May WT
Parsivaldome	Tristandome			ATC + Prep for Donning[7] (outside)		Donning[7]	Donning[7]	Donning[7]	Donning[7]	Donning[7]	Donning[7]	Donning[7]
Parsivaldome			MAGMA+W-ATC[3+4]	MAGMA+W-ATC[3+4]	MAGMA+W[3+4]	MAGMA+W[3+4]	MAGMA+W[3+4]	MAGMA+W[3+4]	MAGMA+W[3+4]	MAGMA+W[3+4]	MAGMA+W[3+4]	MAGMA+W[3+4]
Tristandome						Cliffbot-ATC[1]	Cliffbot[1]	Cliffbot[1]	Cliffbot[1]	Cliffbot[1]	Cliffbot[1]	Cliffbot[1]
Parsivaldome										EMM-ATC[2]	EMM-ATC[2]	EMM SCS-SU[2]
			Flag -ATC [2]	Flag -RL to PD [2]	Flag -RL to PD [2]	Flag -RL to PD [2]	Flag -RL to PD [2]	Flag -RL to PD [2]	FT-RTO [2]			
							ProVisG-ATC[2]	ProVisG[2]	ProVisG[2]	ProVisG[2]	ProVisG[2]	ProVisG[2]
			WISDOM-ATC[5]	WISDOM[5]	WISDOM[5]	WISDOM[5]	WISDOM[5]	WISDOM[5]	WISDOM[5]	WISDOM[5]	WISDOM[5]	WISDOM[5]
OPS					OPS Operational	OPS Operational	OPS Operational	OPS Operational	OPS Operational	OPS Operational	OPS Operational	OPS Operational
Number of People in Cave		0	14	23	21	22	24	24	24	24	24	24
Registration								SU	SU	open	open	open
Ascent		1st load: Suit tester, suit tech, suit tech lead, safety, Ex.lead, FD, BME, Comm lead, OPS TT/C, Capcom, Techn. Fotographer,	2nd load: Flight plan team, data officer, IT support, Backup-suit tester, Rest of the ÖWF team	3rd load: science teams	4th load: Science teams							

Tue, 01May 10:45-11:00 01:45-02:00 01May JPL 02:45-03:00 01May MDRS 20:45-21:00 01May WT	Tue, 01May 11:00-11:15 02:00-02:15 01May JPL 03:00-03:15 01May MDRS 21:00-21:15 01May WT	Tue, 01May 11:15-11:30 02:15-02:30 01May JPL 03:15-03:30 01May MDRS 21:15-21:30 01May WT	Tue, 01May 11:30-11:45 02:30-02:45 01May JPL 03:30-03:45 01May MDRS 21:30-21:45 01May WT	Tue, 01May 11:45-12:00 02:45-03:00 01May JPL 03:45-04:00 01May MDRS 21:45-22:00 01May WT	Tue, 01May 12:00-12:15 03:00-03:15 01May JPL 04:00-04:15 01May MDRS 22:00-22:15 01May WT	Tue, 01May 12:15-12:30 03:15-03:30 01May JPL 04:15-04:30 01May MDRS 22:15-22:30 01May WT	Tue, 01May 12:30-12:45 03:30-03:45 01May JPL 04:30-04:45 01May MDRS 22:30-22:45 01May WT	Tue, 01May 12:45-13:00 03:45-04:00 01May JPL 04:45-05:00 01May MDRS 22:45-23:00 01May WT	Tue, 01May 13:00-13:15 04:00-04:15 01May JPL 05:00-05:15 01May MDRS 23:00-23:15 01May WT	Tue, 01May 13:15-13:30 04:15-04:30 01May JPL 05:15-05:30 01May MDRS 23:15-23:30 01May WT	Tue, 01May 13:30-13:45 04:30-04:45 01May JPL 05:30-05:45 01May MDRS 23:30-23:45 01May WT	Tue, 01May 13:45-14:00 04:45-05:00 01May JPL 05:45-06:00 01May MDRS 23:45-00:00 01May WT	Tue, 01May 14:00-14:15 05:00-05:15 01May JPL 06:00-06:15 01May MDRS 00:00-00:15 02May WT
Donning[7]	Donning[7]	Donning[7]	Donning[7]	Donning[7]	CATALYSTS[7]	OS drilling and screwing[7	BREAK+CATALYSTS[7]	ST- walk to TD[8]	VS[8]	VS[8]	VS[8]	VS[8]	VS + AP3[8]
			MAT			MAT	BREAK	BREAK	MAT				MAT
							BREAK	BREAK					
				BB-BRINGS CHARGERS [1]		PWR-CHARGE[1]	PWR-CHARGE[1]	PWR-CHARGE[1]	BB-RTO[1]	BB-RTO[1]			
MAGMA+W[3+4]	MAGMA+W[3+4]	MAGMA+W[3+4]	MAGMA+W[3+4]	MAGMA+W[3+4]	MAGMA+W[3+4]	MAGMA+W[3+4]	MAGMA+W[3+4]	MAGMA+W[3+4]	MAGMA+W[3+4]	MAGMA+W[3+4]	MAGMA+W[3+4]	MAGMA+W[3+4]	MAGMA+W[3+4]
Cliffbot[1]	Cliffbot[1]	Cliffbot[1]	Cliffbot[1]	Cliffbot[1]	Cliffbot[1]	Cliffbot[1]	Cliffbot[1]	Cliffbot[1]	Cliffbot[1]	Cliffbot[1]	Cliffbot[1]	Cliffbot[1]	Cliffbot[1]
EMM SCS-SU[2]	EMM SCS-SU[2]	EMM SCS-SU[2]	EMM SCS-Cancelled[2]		EMM-RTO[2]	EMM-RTO[2]							
					VS-ATC[1]	VS-ATC[1]	VS-RTO[1]						
ProVisG[2]	ProVisG[2]	ProVisG[2]	ProVisG[2]	ProVisG[2]	ProVisG[2]	ProVisG[2]	ProVisG[2]	ProVisG[2]	ProVisG -RTO[2]	ProVisG -RTO[2]			
WISDOM[5]	WISDOM[5]	WISDOM[5]	WISDOM[5]	WISDOM[5]	WISDOM[5]	WISDOM[5]	WISDOM[5]	WISDOM[5]	WISDOM[5]	WISDOM[5]	WISDOM[5]	WISDOM[5]	WISDOM[5]
OPS Operational	OPS Operational	OPS Operational	OPS Operational	OPS Operational	OPS Operational	OPS Operational	OPS Operational	OPS Operational	OPS Operational	OPS Operational	OPS Operational	OPS Operational	OPS Operational
			C3	C3	C3	C3	Establish Contact to Wellington		Establish Contact to Wellington		Establish Contact to Wellington		AP3
									Establish Contact to MDRS		MDRS <standby>	MDRS <standby>	AP3
								Establish Contact to JPL		JPL VS	JPL VS	JPL VS	JPL VS
24	24	24	24	25	26	26	24	24	24	24	21	21	21
open	open	open	open	open	open	open	open	open	open	open	open	open	open

Tue, 01May 14:15-14:30 05:15-05:30 01May JPL 06:15-06:30 01May MDRS 00:15-00:30 02May WT	Tue, 01May 14:30-14:45 05:30-05:45 01May JPL 06:30-06:45 01May MDRS 00:30-00:45 02May WT	Tue, 01May 14:45-15:00 05:45-06:00 01May JPL 06:45-07:00 01May MDRS 00:45-01:00 02May WT	Tue, 01May 15:00-15:15 06:00-06:15 01May JPL 07:00-07:15 01May MDRS 01:00-01:15 02May WT	Tue, 01May 15:15-15:30 06:15-06:30 01May JPL 07:15-07:30 01May MDRS 01:15-01:30 02May WT	Tue, 01May 15:30-15:45 06:30-06:45 01May JPL 07:30-07:45 01May MDRS 01:30-01:45 02May WT	Tue, 01May 15:45-16:00 06:45-07:00 01May JPL 07:45-08:00 01May MDRS 01:45-02:00 02May WT	Tue, 01May 16:00-16:15 07:00-07:15 01May JPL 08:00-08:15 01May MDRS 02:00-02:15 02May WT	Tue, 01May 16:15-16:30 07:15-07:30 01May JPL 08:15-08:30 01May MDRS 02:15-02:30 02May WT	Tue, 01May 16:30-16:45 07:30-07:45 01May JPL 08:30-08:45 01May MDRS 02:30-02:45 02May WT	Tue, 01May 16:45-17:00 07:45-08:00 01May JPL 08:45-09:00 01May MDRS 02:45-03:00 02May WT
VS + AP3[8]	VS + AP3[8]	VS + AP3[8]	<walk back>[7]	Doffing[7] (inside)	Doffing[7] (inside)	Doffing[7] (inside)	Doffing[7] (inside)	Doffing[7]	Doffing + Packing[7]	Descent[7]
MAGMA+W[3+4]	MAGMA+W[3+4]	MAGMA+W-RTO[3+4]								
Cliffbot[1]	Cliffbot[1]	Cliffbot[1]	Cliffbot-RTO[1]	Cliffbot-RTO[1]						
					VS Sampler RTO[1]					
					DT-ATC[10]	DT-ATC[10]	Dismount[10]	Dismount[10]	Dismount[10]	Descent[10]
WISDOM[5]	WISDOM[5]	WISDOM[5]	WISDOM-RTO[5]	WISDOM-RTO[5]						
OPS Operational	OPS Operational	OPS Operational	OPS Operational	OPS Operational	OPS Operational	OPS Operational	Dismount OPS	Dismount OPS	Dismount OPS	Dismount OPS
AP3	AP3	AP3								
AP3	AP3	AP3								
JPL VS	JPL VS	JPL VS	JPL VS	JPL VS	<JPL VS>	<JPL VS>				
21	21	21	21	21	19	17	17	17	17	17
open	open	open	open	open	open	open	open	open	open	open
							Science teams,	Last option for: Science teams	Penultimate load: OPS TT/C, Capcom, Techn. Fotographer, FD, BME, Rest of ÖWF team	last load: Suit tester, suit tech, suit tech lead, safety, Ex.lead, Comm lead,

6.3. Team members on-site

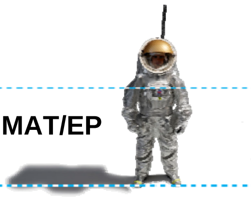
	Th / 26Apr	Fr / 27Apr	Sa / 28Apr	Su / 29Apr	Mo / 30Apr	Tu / 01Apr
Alexander Soucek		COMM-build up	Media / Tweet-up	**Flight director**	TT/C Trng	
Alexandra Sans	Build-up	Suit tech	Flightplan	Flightplan	Flightplan	Flightplan
Andreas Köhler			Photographer			
Bianca Neureiter			Tripolar Liaison	1		
Christian Agerer			Safety	Suit tech		
Csilla Orgel			1	1	1	Reporting
Daniel Föger			Back-up Suit/Antpds	Suit tester	Suit tester	Safety
Daniel Schildhammer		1	Suit tester	Capcom		Suit tester
Egon Winter		OPS TT/C	OPS TT/C	BME	BME	Dismounting
Eva Hauth		Back-up suit / Build-up	Suit tech	Suit tech lead	CapCom	Dismounting
Gerhard Grömer				1	1	Dismounting
Gernot Grömer	EXLEAD	EXLEAD	EXLEAD	**EXLEAD**	**EXLEAD**	**EXLEAD**
Götz Nordmeyer			BME	BME	BME	BME
Harald Fuchs		IT support	IT support	Data officer	Data officer	Data officer
Isabella Achorner		1	Ass. Monika Fischer	1	1	Reporting
Julia Neuner	Build-up	COMM-build up	Ass. Petra Groll	1	Suit tech	Suit tech lead
Katja Zanella-Kux		Photographer	Photographer	**Photographer**	**Photographer**	
Luca Forresta		1	Ass. Olivia Haider	1	WISDOM/Prov	CapCom
Marc Rodriguez	Build-up	Registration/Valley	Registration/Valley	1	1	Registration
Mathias Hettrich		**Photographer**	**Photographer**	**Photographer**	**Photographer**	Reporting
Monika Fischer		Media / Press	Media / Press			
Norbert Frischauf		**Flight director**	**Flight director**	1	TT/C Trng	OPS-TT/C / **FD**
Olivia Haider	Build-up	Media / Tweet-up	Media / Tweet-up	Social Media	Social Media	Suit tech
Petra Groll		Media / Policy	Media / Policy			
Reinhard Tlustos		CapCom	CapCom	TT/C Trng	**FD Ass.**	**FD Ass.**
Roberta Paternesi		Data officer	Data officer	IT-support	IT-support	
Sandra Hutterer		WISDOM	WISDOM	WISDOM	WISDOM/Prov	WISDOM
Sebastian Hettrich	Build-up	COMM-build up	Flightplan	Flightplan	Flightplan	Flightplan
Sebastian Sams	Build-up	COMM-Lead	COMM-Lead	Suit tech	Suit tech lead	Antipodes support
Stefan Hauth		Suit tech lead	Suit tech lead	OPS TT/C	OPS TT/C	Suit-T/Dismounting
Ulrich Luger		1	1	Safety	MAT/EP	Antipodes support
Vanessa Tischler			Registration Valley	Suit tech	Safety	Dismounting

Name	Th, 26.04.	Fr, 27.04.	*Sa, 28.04.*	Su, 29.04.	Mo, 30.04.	Tu, 01.05.
	20	46	121	60	43	48
Alexander Soucek		1	1	1	1	
Alexandra Sans	1	1	1	1	1	1
Andreas Köhler			1			
Bianca Gubo			1			
Bianca Neureiter			1	1		
Christian Agerer			1	1		
Christoph Köhler			1	1	1	1
Csilla Orgel			1	1	1	1
Daniel Föger			1	1	1	1
Daniel Schildhammer			1	1		1
Egon Winter		1	1	1	1	1
Eva Hauth		1	1	1	1	1
Gerhard Grömer				1	1	1
Gernot Grömer	1	1	1	1	1	1
Götz Nordmeyer			1	1	1	1
Harald Fuchs		1	1	1	1	1
Isabella Achorner		1	1	1	1	1
Jan Klauck						
Julia Neuner	1	1	1	1	1	1
Katja Zanella-Kux	1	1	1	1	1	1
Lara Vimercati	1	1	1	1	1	1
Luca Forresta		1	1	1	1	1
Marc Rodriguez	1	1	1	1	1	1
Mathias Hettrich		1	1	1	1	1
Monika Fischer		1	1			
Norbert Frischauf		1	1	1	1	1
Oliver Simonsen						
Olivia Haider	1	1	1	1	1	1
Petra Groll		1	1			
Reinhard Tlustos		1	1	1	1	1
Roberta Paternesi		1	1	1	1	
Sandra Hutterer		1	1	1	1	1
Sebastian Hettrich	1	1	1	1	1	1
Sebastian Sams	1	1	1	1	1	1
Stefan Hauth		1	1	1	1	1
Florian Schirg			1	1	1	
Ulrich Luger		1	1	1	1	1
Vanessa Tischler			1	1	1	1
Barbara Imhof			1			
LATMOS Steve Clifford	1	1	1	1	1	1
LATMOS Benjamin Lustrement	1	1	1	1	1	1
LATMOS R. Hassen-Khodja	1	1	1	1	1	1
LATMOS O. Humeau	1	1	1	1	1	1

LATMOS Dirk Plettermeier	1	1	1	1	1	1
LATMOS A. Galic	1	1	1	1	1	1
LATMOS intern / Sophie Dorizon	1	1	1	1	1	1
ILWEG / Rai Balwant	1	1	1	1	1	1
ILWEG / Jasdeep Kaur	1	1	1	1	1	1
ILWEG / Luisa Rodrigues	1	1	1	1	1	1
ILWEG / Bernard H. Foing		1	1			
Kathrin Sander, Joanneum Research			1	1		
Joachim Juhart			1	1		
Alain Souchier APM	1	1	1	1	1	1
Susanne Hoffmann / Univ. of Hildesheim		1	1	1		
Pascal Gilles / European Space Agency			1			
Mateusz Jozefowicz/ Polish Mars Society			1			
Rafał Zieliński / Polish Mars Society			1			
Sebastian Meszyński / Polish Mars Society			1			
Part Time Scientists Alex Adler		1	1	1	0	1
Part Time Scientists Henning Holm		1	1	1	0	1
Part Time Scientists Robert Böhme		1	1	1	0	1
Part Time Scientists Immanuel Gfall		1	1	1	0	1
Part Time Scientists Daniel Ziegenberg				1	0	1
Part Time Scientists Jürgen Brandner		1	1	1	0	1
PTS Film team / Martin Gasch		1	1	1	0	1
PTS Film team / Karl Hofmann		1	1	1	0	1
Siegfried Freinberger / Tripolar			12			
TECHCOS			8			
Ursula Federspiel / Catalysts			1			
Paul Federspiel / Catalysts			1			
Christian Federspiel / Catalysts			1			
Christoph Steindl / Catalysts			1			
Bernadette Emsenhuber / Catalysts			1			
Gian Gabriele Ori / IRSPS			1	1	1	
Franz Schickermüller /Catalsysts				1		
Peter Frech / Catalysts				1		
Tweet-up			20			
Servus TV			3			
Spiegel Online			4			
AKG / Walter Rührig & Team			3			
Lara Vimercati / Italian Mars Society		1	1	1	1	1
Angeliki Kapoglou / Italian Mars Society			1	1		
Franco Carbognani / Italian Mars Society		1	1	1	1	1

7. Experiment descriptions

Overview

Experiment / Hardware	Organisation	Description
Aouda.X spacesuit 	Austrian Space Forum	Suit-subsystems check-out, field test of telemetry receiving station – subsystem commissioning & voice recognition.
A.X MAT/EP	Medical Univ. of Innsbruck	Medical monitoring tool – continuation of the Rio Tinto 2011 medical survey protocol
PRoVisG Cave 3D Reconstruction	Joanneum Research, Austria	3d TOF-camera for surveying parts of the cave with a high-resolution SLR camera
EXOMARS/WISDOM	LATMOS/IPSL, France	Ground validation for the ESA EXOMARS georadar under varying terrains
Asset planning	Univ. of Innsbruck, Austria	Field testing of a planning algorithm for traverse, consumables and hardware planning
CRV / Cliffbot	Association Planète Mars	Concept rover for studying steep terrain and cliffs
Terbium luminescence assay	NASA/Jet Propulsion Lab	Studying contamination vectors and germination rates of water/soil samples within the cave.
Asimov Jr. R3	Part Time Scientists (Google Lunar X-Prize)	Chassis and drive-train tests for the GLXP lunar rover prototype.
MAGMA 2	Polish Mars Society	Operational tests and demonstration of the winning rover of the University Rover Challenge
ILEWG EuroMoonMars Dachstein	Vrije Universiteit Amsterdam	Support to human factor studies, following protocol tested during ILEWG EuroMoonMars campaign in Utah as well as sterile collection of samples for PCR and phylogenetic analysis
Antipodes	Kiwispace	Simulation of a two-landing teams on Mars scenario – command handover for a remote science experiment.
ERAS C3 Simulator	Mars Society Italy	A Mars-analog Command, Control and Communication (C3) infrastructure providing processing and communications capabilities

7.1. Aouda.X spacesuit

Synopsis:	Test series with the most recent configuration oft he Aouda.X spacesuit simulator, focussing on Thermal Control System, the upgraded On-Board Data Handling and telemetry relay ("OPS-Box")
Institution (PI):	Austrian Space Forum (Gernot Groemer)
Responsible on-site:	Gernot Groemer
Contact coordinates:	Technikerstr. 25/8, 6020 Innsbruck Austria +43 (0)676 6168 336

The Austrian Space Forum has developed the spacesuit simulator "Aouda" which is able to mimic border conditions a real Mars spacesuit would provide during a surface EVA, like weight, pressure, limited sensory input etc…

Purpose

The suit is designed to study contamination vectors in planetary exploration analogue environments and create limitations depending on the pressure regime chosen for a simulation. An advanced human-machine interface, a set of sensors and a purpose designed software act as a local virtual assistant to the crewman. It is designed to interact with other field components like the rover and instruments.

System Overview

- <45 kg, Hard-Upper-Torso suit, ambient air ventilation
- Outer hull: Panox/Kevlar tissue with aluminium coating
- Modifiable exoskeleton able to simulate various pressure regimes for all major human joints including fingers
- Biomedical and engineering telemetry with W-Lan (including continuous video & audio, various temperatures, O_2, CO_2, GPS, pressure, humidity, acceleration,…), human waste mgmt.

Performance envelope

- 4-6 hours (incl. donning/doffing) field operations
- Temperature limits: -110°C and +35°C (tested)
- >1 km W-Lan range (can be extended with directional W-Lan)

Test cases

- Verification of Thermal Control System & Ventilation
- Verification of biomedical and engineering telemetry, including broadband transmission of video signal
- Verification of ergonomics upgrade
- Terrain trafficability test
- Operations training for suit testers

Test case	Content	Duration	Exclusive	Priority
Catalysts speech recognition	Verbal command test	1 h	0	1
Technical & Media Fotoshooting	Technical fotoshooting	2 h	1	2
TCS & Ventilation	Ventilation sufficiency tests under various workload conditions	1 h	0,5	1
Comm set-up	Verification, that A.X can establish W-Lan infrastructure	1 h	1	3
A.X mobility	Terrain trafficability test	1	1	2

7.2. A.X MAT/EP

Synopsis:	Medical data acquisition under various physical workload conditions & demonstration of biomedical telemetry
Institution (PI):	Medical University Innsbruck (Thomas Luger)
Responsible on-site:	Ulrich Luger
Contact coordinates:	+43 (0)676 83144 503

Team: Ulrich Luger, Thomas Luger, MD, Goetz Nordmeyer, MD, Oliver Simonsen

Test sequence 1 – emergency biomedical telemetry

The test subjects underwent a sequence of well-defined physiological workload patternsm, whilst the routine monitoring data stream was relayed to the biomedical engineering team (BME).

Group 1: continuous data recording (verum group)

Group 2: cont. recording via cable telemetry (control group)

Group 3: sporadic recording of data, including voice transmissions (back-up group)

Group 4: sporadic rec. of data locally (back-up control group)

Testsequence 2 – environmental parameters

Biomedical telemetry data will be recorded in the closed suit using a data generator without the suit tester inside. A data transfer will be demonstrated between the suit, OPS and MSC server.

Group 1: data rec. & transfer over large distances (verum)

Group 2: data recording with cables in-situ (control group)

Group 3: sporadic data recording with voice comm (backup)

Group 4: sporadic data recording in-situ (backup control group)

All tests are performed on a daily basis before and after the EVA's on all test subjects.

- Basic biomedical monitoring: RR, HR, SpO2, Capnometry, temperature)
- Suit in-situ monitoring: Humidity, O2, CO2, temperature.

Sporadic recording

- Questionnaire „well being" scale on various subjective parameters
- Comparison monitoring with hemodynamical parameters.

Recording of accidents and near-accidents:

Input for the long-term medical emergency database of the Austrian Space Forum for field tests.

7.3. PRoVisG Cave 3D Reconstruction

Synopsis:	Camera data from the PRoVisG system will be used to generate a 3D reconstruction of (parts of) the cave, with a rendered fly-through video as ultimate result.
Institution (PI):	Gerhard Paar, Institute for Information and Communication Technologies, Joanneum Research
Responsible on-site:	Kathrin Sander, Institute for Information and Communication Technologies, Joanneum Research
Contact coordinates:	Steyrergasse 17, 8010 Graz, Austria +43-316-876-5008, fax +43-316-876-95008 Mobile: +43-650-5541279

The FP7-SPACE Project PRoVisG aims at optimum exploitation of vision data taken from the surface of planetary bodies. To verify the capability of 3D vision processing tools developed in PRoVisG it is of utmost importance to use images taken in representative environment for testing, in particular environment that represents extreme conditions on other planets and moons. The cave is a complex surrounding in many aspects, such as morphology and illumination dynamics.

For *PRoVisG Cave 3D Reconstruction* it was intended to capture a major part of the cave from different viewpoints by a high-resolution SLR camera. One single tripod was used to enable different exposure times of the same image to cope with the large illumination differences to be encountered. Complementary exposures may be taken making use of a flash.

The data were used to generate a 3D reconstruction of (parts of) the cave, with a rendered fly-through video as ultimate result. It is intended to do some processing still during the ongoing tests to verify the usability & completeness of the captured images.

Duration of experiment: 1-4 hours, depending on the size of area to be covered. During some time in this period parts of the cave should be empty. It is preferred if illumination conditions will not change during that time.

The major aim of the participation in the Dachstein Cave Test was to capture data for:

- **the external tracking of the WISDOM unit (mounted on a rover) while performing soundings,**
- **the 3D reconstruction of the cave segment where the WISDOM unit was tracked,**
- **the localization of the WISDOM soundings & data fusion.**

Figure 1 to Figure 4 show the test setup as well as first results.

Figure 1: Test scene in Parcival cave with a reference co-ordinate frame definition by reference points (targets) distributed in the scene and mounted on the Rover

Figure 2: External tracking of the WISDOM unit by a stereo camera setup

Figure 3: Monoscopic high resolution hand-held image sequence of the test scene for generating 3D surface data

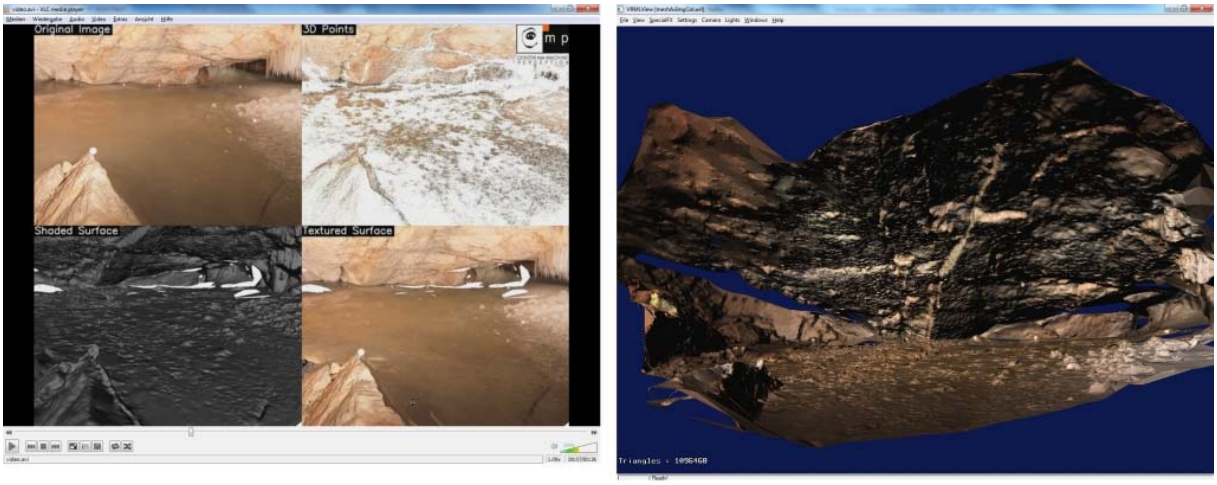


Figure 4: 3D reconstruction results computed by the CMP SfM Web Service (left: *.avi, right: *.wrl)

- *Collect / capture data for:*
  - *3D reconstruction of the cave segment where the WISDOM unit is tracked (100%)*
  - *external tracking of WISDOM unit on Magma rover (100%).*
- *Data evaluation until August 2012:*
  - *cave 3D reconstruction using JR algorithms*
  - *external localization of WISDOM radar mounted on Magma rover and data fusion with 3D cave model.*
- *Multiply your estimated time effort by two.*
- *One camera mounted on a stand on the ice field showed some movements / shifts in the images, due to visitors / tourists entering the stairs nearby, while images were taken (no stable underground – higher effort for post-processing).*
- *The flash reloading time was longer than the time interval for capturing the stereo image sequences (not all images are well illuminated).*

→ We have to pay attention to such circumstances next time.

7.4. EXOMARS/WISDOM

Synopsis:	Ground validation tests for the EXOMARS-mission ground penetrating radar WISDM
Institution (PI):	LATMOS / Valérie Ciarletti
Responsible on-site:	Dirk Plettemeier
Contact coordinates:	

The ground penetration Radar WISDOM has been designed to investigate the shallow subsurface of Mars down to a depth of ~2-3 m, commensurate with the sampling capabilities of the mission's drill onboard the rover. The information provided by WISDOM will assist in understanding the large-scale geology and history of the landing site, as well as selecting the most appropriate locations where to drill and collect sub surface samples for further analysis.

The instrument is still under validation and tests. Nevertheless measurements that have been initiated in various natural environments (glacier, sand, pyroclastic deposits,…) show that, as expected, the penetration depth is highly dependent on the kind of environment (fractured, conductive,…). Additional field investigations, conducted in a wide variety of simulated and natural Mars analogue environments, are planned to make further improvement in the instrument's signal-to-noise ratio and to build a database of well-characterized terrestrial geologic environments for comparison with the data ultimately returned from Mars. The experiment in Dachstein will be part of this series of measurements performed in a variety of natural environments.

Duration of experiment (from opening to closing experiment box): 1 hour to get ready. 1 meter full polarimetric measurements (with soundings each 10 cm) takes approx. 5 minutes. Half hour to put everything back into the boxes

The WISDOM GPR used with the following carriers: pull-cart (WIDSOM), MAGMA rover), Cliffbot

WISDOM Team on-site

- **Stephen Clifford(lead)**
- Rafik Hassen-Khodja(Dpty.lead)
- Olivier Humeau,
- Dirk Plettemeier,
- Benjamin Lustrement,
- Alexandre Galic, LATMOS / AP-AQ manager,

Primary objectives:

To get a set of soundings on a realistic soil (in particular, icy soils are interesting)

Evaluate the radar performance in natural and real environment

Develop algorithms for data processing (3D representation of radar data)

Secondary objectives

To initiate collaborations with scientific teams (Magma, ProvisG-3D)

The main goal during a Wisdom test campaign is to get a maximum of data. Several organization points were problematic:

We expected to have more time on Saturday to operate/test/set up some hardware in order to get ready for science measurements the next days

The hour imposed to leave the caves were really too early (3.30pm for example whereas the last gondola is at 5.30pm).

Our goals for this test campaign were to operate Wisdom and to get data. The schedule should have been defined with respect to experiments constraints, not otherwise.

In the Wisdom case, the operations and test sites have to be defined on the field. It was not possible to define it in details before coming into the caves. This constraint imposes a high flexibility of the planning. At the beginning, we had some difficulties to change the Wisdom plan with flight plan team, but finally we found a compromise for each day which was compatible with other experiments.

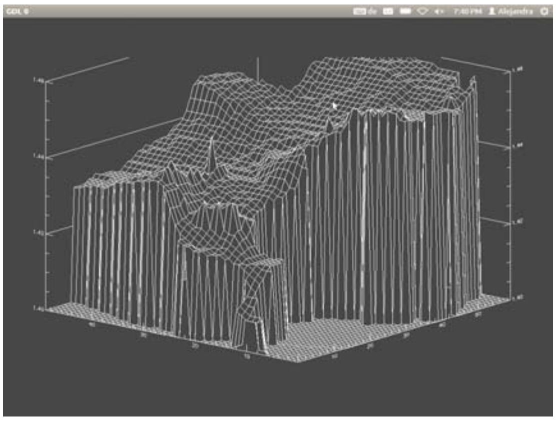
7.5. Mission Asset and Resource Simulation

Synopsis:	Data acquisition for the traverse planning and asset management tool
Institution (PI):	Austrian Space Forum (Gernot Groemer)
Responsible on-site:	Sebastian Hettrich & Alejandra Sans
Contact coordinates:	Technikerstr. 25/8, 6020 Innsbruck Austria +43 (0)681 20408 402

MARS (Mission Asset and Resource Simulation) is a mission planning software tool, based upon proper mapping and digitalising of the regions of interest and a GDL based software for the optimisation of EVAs.

This software was designed to calculate the optimised path through various types of terrain, the time needed, to verify if the target point is accessible and if the total EVA time is still in the range of the lifetime of the on-board consumables like power and water supply. It used the digitalised altitude maps, terrain features and a catalogue of physical parameters as an input together with the starting point and the experiment locations. The algorithm then calculated the fastest and safest path between two points on the map under consideration of taking the easiest traversable terrain, the smallest incline and the minimal distance while also calculating the length of the path and the time needed to walk along that path.

This allowed to avoid difficult or dangerous locations as well as to ensure a better estimation on the total EVA time needed in order to a more frictionless course of action and enabling a maximum of time to the each of the experiments done during the EVA. The software was tested for the first time at the Dachstein Cave Mission. We tested the code itself via comparing theoretical calculated values with the actual experimental ones and to gain additional experimental data for a further improvement of the software tool.



Digital Elevation Model of the Parcival-Dome & Position markers in Tristan-Dome

7.6. CRV / Cliffbot

Synopsis:	The CRV cliffbot objective is to acquire data, starting by photo or video pictures on slopes between 30° and vertical where a crew member in space suit cannot operate safely.
Institution (PI):	Alain Souchier, Association Planete Mars, FRANCE
Responsible on-site:	Alain Souchier
Contact coordinates:	+33.6.07.28.96.30

Reference for cliffbot: VRP 3-2 ASSEMBLY DESCRIPTION AND USERS MANUAL

The CRV cliffbot objective is to acquire data, starting by photo or video pictures on slopes between 30° and vertical where a crew member in space suit cannot operate safely.

The experiment assumes that several slots of utilization by the crew will have been planned with vertical or near-vertical surfaces inside Dachstein caves to be visited by the crew with the Ancillary Scouting Cliffbot.

A camera or video camera is mounted on a mechanical structure with two large wheels that can be transported and manually operated by the crew. Its mass is around 4.2 kg. The structure is driven down along vertical walls, which implies that the operator has access to the upper part of the slope or cliff. One digital camera with on board self recording and one analogical camera are on board the vehicle. One or the other video is sent wireless real time to a TV monitor up the hill to help assess the vehicle situation. The sent video signal may be registered (system not yet provided with the experiment). The covered vertical distance has reached 20 meters in previous test campaigns in Utah/USA and in France.

The experiment is self autonomous in power providing that a 220 V power source is available some hours before in order to load the different batteries.

- Duration of experiment:

  -transportation time on the experiment location

  -final preparation (small mechanical assembly –anti roll rods-, powering the different systems, installing a safety pole as an anchoring for the rope): 20 mn

  -rolling down and up the hill:10 mn

  -shutting systems and small mechanical disassembly for transportation:10mn

  -transportation back to storage

- Storage overnight: (e.g. 3 boxes 100x50x50 cm):

  The vehicle dimensions without anti roll rods are: 80x80x90 cm. It may be stored overnight in the car which will be used to bring the vehicle in Dachstein.

The experiment is operated from the upper part of a slope or hill and the operator has to be cautious in order to avoid falling. Dachstein caves condition may be more hazardous than the situation experimented to date (ice, obscurity, slippery soils,…)

Also to allow the operator to stop the on-going operations and rest or deal with a problem, a pole has to be stuck in the ground up hill to tie the rope and secure the vehicle already located on the slope or cliff. This could be impossible on a rock soil where a heavy boulder may be used as anchoring point.

Safety-related considerations

The experiment was operated from the upper part of a slope or hill and the operator had to be cautious in order to avoid falling.

Roughly more than 80% objectives were reached. The objectives before the Dachstein campaign were not totally defined by lack of knowledge on the cave topography (even if rather detailed maps were available).

***First objective** was to assess what could be the usefulness of the CRV to explore non reachable areas by a man in space suit in a cave. This implies typically a vertical hole. Also steep to medium ice slopes would fall in this category of non reachable slopes. It appeared during the campaign that Tristan dome was a good representation of vertical non accessible hole but I had no certainty before the campaign that such a hole would be available for experimentation.*

***Second objective** was to operate the vehicle with the Aouda spacesuit and to find what are the difficulties linked to operations in a spacesuit. This test has been done numerous times in Utah with the Mars Society simulated spacesuits but these are rather easy to operate (no simulation of internal pressure for example). It was clear before the campaign that Aouda spacesuit would be operated by an ÖWF crewmember.*

***Third objective** was to operate the vehicle with the Aouda spacesuit gloves, test which could be done by the cliffbot APM participant.*

***Fourth objective** was to document the difficulties encountered on various all terrain configuration by the vehicle on the way down or up.*

***Fifth objective** was to use the pictures sent by cliffboat on board hazcam to control the vehicle operations.*

***Sixth objective** was to acquire nice pictures of the vehicle in the spectacular ice cave environment.*

1 The vehicle has demonstrated its ability to be recovered from difficult situations twice, demonstrating again an all terrain capability..

2 The photo mapping of a typical non accessible hole (in this case the lower part of Tristan dome) was possible because of a favorable slope configuration (overhanging and vehicle suspended to the rope). This configuration allowed rotation of the vehicle and landscape swapping. The vehicle was designed to conduct cliffs strata imaging and not 360° panorama. Exploring a hole in a cave requests more 360° views than strata close up views. The vehicle could have been used 180° from its nominal orientation, with the camera oriented opposite to the wall in order to acquire general views in the rides where it was rolling on a slope and not suspended. But a multiple camera configuration or a rotating camera configuration would be best adapted to a cave hole mapping than the present configuration.

3 Guiding and controlling the vehicle without direct view and using only the picture transmitted by the hazcam has proved nearly impossible. There, also, a multi camera (or camera swapping the landscape) would be necessary or at minimum a front view and rear view availability. Also the video signal transmission is a problem in complicated slopes where obstacles can preclude the picture reception up hill.

4 For the first time a cliffbot was demonstrated using another instrument than a camera when the LATMOS laboratory used the CRV 5 for the Exomars ground sounding radar experimentation. The use of other than camera instruments was foreseen since the beginning of the vehicle design but had never been conducted before by lack of Planete Mars association capability to field more complicated and costly devices than a camera. The CRVs test objectives till now were always more focused on the vehicle all terrain capability than on scientific measurements.

The availability of a voice link to the operation center would have been comfortable to indicate the status of the on going experimentation and locations to ops planning. But no difficulties arose from this absence of communication.

Although I had from ÖWF and from Internet maps and photos of the cave, it was rather difficult to have a 3D pre-mission mental representation of the cave. The first visit on Friday was interesting to define the cliffbot possible fields of experimentation. But it would have been interesting to have a more detailed look the same day, because some time was taken the 29 th of april, before the cliffbot experiment with Aouda, to find an acceptable non risky slope for the test. And this led to a modification compared to what was the nominal solution selected during the Friday visit.

7.7. Terbium bead and spore viability assay

Synopsis:	Testing contamination vectors (pilot experiment for MARS2013)
Institution (PI):	Adrian Ponce, Jet Propulsion Laboratory
Responsible on-site:	Lara Vimercati, Austrian Space Forum (tbc) Aaron Noell via remote-science / teleoperated
Contact coordinates:	Aaron Noell, Jet Propulsion Laboratory, 213-618-2346 or Adrian Ponce, Jet Propulsion Laboratory, 818-653-8572

Our instrument is able to detect the long lifetime luminescence from both Terbium (Tb) microbeads and from the chemical complex of Tebrium with dipicolinic acid (DPA), a bacterial spore specific marker. The instrument is composed of UV LEDs as an excitation light source, a time gated CCD camera for elimination of interfering short lifetime fluorescence, and an automated stage for multiple sample processing.

We instructed remotely the suit testers, who had Tb microbeads applied to their suits, on where to sample in the cave. Ice samples were filtered on site in a clean area at the OPS. The preserved filters were then returned to the lab at the Jet Propulsion laboratory for both spore and bead analysis. Bead analysis will reveal to what extent the suit testers may have contaminated the samples, and the spore analysis will probe the microbiology of the cave.

- Duration of experiment needed: 4 hrs (requested 3)
- Suit tester time requested & needed: 3 hrs

7.8. Asimov Jr. R3

Synopsis:	Driving, telemetry, rover chassis and suspension tests of the GLXP rover Asimov Jr.
Institution (PI):	Part Time Scientists (Karsten Becker)
Responsible on-site:	Robert Böhme, Part-Time Scientists
Contact coordinates:	+43 (0)681 107 52 707

We will conduct extensive driving tests with the rover. A special interest lies in proving our current wheel profile design and in verifying our current remote control concept and program. Therefore we will transmit the video data from the rover with a three second delay to the remote controller and test how the delay has an impact on steering the rover in an actual moon-/ mars-analog environment.

Other tests will concentrate on the active wheel suspension we designed.

Duration of experiment (from opening to closing experiment box): 2 x 4hrs

Video of the rover in operation: http://www.youtube.com/watch?v=puMYjl4dYDY

- Batterielaufzeit: ca. 2 Stunden
- Aufladezeit: ca. 2 Stunde
- Ersatz akkus: ja
- Steigung: 20% sollten absolut machbar sein, 40% wäre sportlich
- Größe: 90cm lang; 70cm breit; 50cm hoch (inkl. Kameraturm)
- Bodenfreiheit: knapp 30cm
- Gewicht ohne Transportbox: 15-20kg

Team

Alex Adler
Henning Holm
Robert Böhme
Immanuel Gfall
Daniel Ziegenberg
Jürgen Brandner
PTS Film team / Martin Gasch
PTS Film team / Karl Hofmann

7.9. MAGMA 2

Synopsis:	Mars analog rover performance and payload test
Institution (PI):	Sebastian Meszyński, ABM Space Education / Polish Mars Society
Responsible on-site:	Mateusz Józefowicz
Contact coordinates:	+48 605 233 470

Mars Analog Rovers Magma2 are undergoing further development into Magma 4 model, to be equipped with artificial intelligence system, among others. Other specialized payloads and testing in various terrain and environments are a part of the development process. Rovers can be adapted to carry and connect other party's payloads, such as GPR. The WISDOM GPR for the EXOMARS mission is going to be tested as Magma' s payload. Compliance of the hardware and integration ability will be tested. Proper survey area will be chosen by both the WISDOM and ABM SE teams to perform the radar probing and capture a geological profile (or profiles). Data from the GPR will be made accessible to the ABM SE team to work over rover control systems for future tests and to analyze rover's potential particularly for GPR payload.

The data will also be used to develop a simulator environment for rover's AI module. WISDOM team agrees to hand over the data under the condition of maintaining the control over the publication schedule.

ABM SE might publish its combined rover/GPR results, but most of all it gathers the data for its internal development process. ABM SE will also write general performance report and make it available to the expedition partners. Apart from the payload tests also communication test of a remote control station outside the cave and Internet transmission to remote receiving stations in Poland will be tested. Also terrain performance tests without the payload can be performed, if the time allows. Establishing of a basic communication between the rover and the Aouda suit is an optional task, depending on the organizational and technical capacities of the parties involved.

Duration of experiment (from opening to closing experiment box, e.g. 3 x 2 hrs): 2 x 4 hrs

Suit tester time requested (actual test time): 2 x 3 hrs

Team on-site

- **Mateusz Józefowicz, (Team lead)**
- Sebastian Meszyński,
- Rafał Zieliński,

The MAGMA rover will be used as the carrier platform for the WISDOM georadar.

The MAGMA-WHITE team and the local control station.

7.10. ILEWG EuroMoonMars Dachstein

Synopsis:	**Experiment A:** Biomedical assessment, obtaining saliva samples from the suit tester **Experiment B:** Sterile collection of soil/ice samples for PCR and phylogenetic analysis
Institution (PI):	Exp. A: Rai Balwant , Vrije Universiteit Amsterdam & JBR Exp. B: Luisa Rodrigues, Vrije Universiteit Amsterdam & Aveiro Univ.
Responsible on-site:	Exp. A: Rai Balwant Exp. B: Luisa Rodrigues
Contact coordinates:	

Team on-site:

- Rai Balwant, raibalwant29@gmail.com, 26 April- 1 May
- Jasdeep Kaur, jasdeep.kor@gmail.com, 26 April- 1 May
- Luisa Rodrigues, rodrigues.luisas@gmail.com, 26 April- 1 May
- Bernard H. Foing, b.h.foing@vu.nl, 28-29 April

Experiment A / Biomedical assessement

Background: Human performance is affected by physiological and psychological factors which can critically affect mission outcome in both spaceflight and other extreme environments.

Materials and Methods:

Saliva experiments: Saliva samples will be taken with specialized saliva collection device from each crew members before and after tasks. Saliva will be preserved for further analysis.

Vital signs. : Heart rate, heart rate variability, pulse rate, blood pressure and respiration rate, Vo2 max will be measured before and after tasks.

Effect of greenish blue light: Saliva samples and vital signs will be taken before and after 5 minutes exposure of light.

List of instruments:

- Gloves
- Vital sign. measuring sensors
- Greenish blue light
- Salivary samples collection device and storing tubes.
- Standardized (medical analysis) software

Resources: 2X/1hour of suit time

Ethical permission: Ethical permission is taken from JBR Ethical committee

Experiment B / Sterile Soil Sampling

DNA extracted from ice were analysed using PCR amplification of both Bacterial, Archaeal 16S-rRNA genes, as well Eukarya (Fungi in particular) 18S-rRNA genes, using specific primers.

METHODS

The study comprised:

(1) ice sampling (about 10 cm depth) of various age (if possible) and chemical composition, in sterile conditions

(2) DNA extraction from liquid water melted from ice,

(3) PCR amplification of 16S-rRNA and 18S-rRNA genes and gene library construction,

(4) eventually, sequencing and phylogenetic analysis of genes of some samples.

During ice sampling it will be taking in consideration the potential microbiological contamination assessment. Below is presented the sampling procedure that will be tested on ice cave.

RESOURCES

2X/1hour of suit time (in the middle of the campaign)

TYPES OF SAMPLES

- Water dripping

- Ice stalactite (if it can not be taken from the wall, it can be any stalactite available in the ground)
- Permafrost
- Core/Superficial ice in a “clean” place and in a “dirty” place
- Algae (if present)

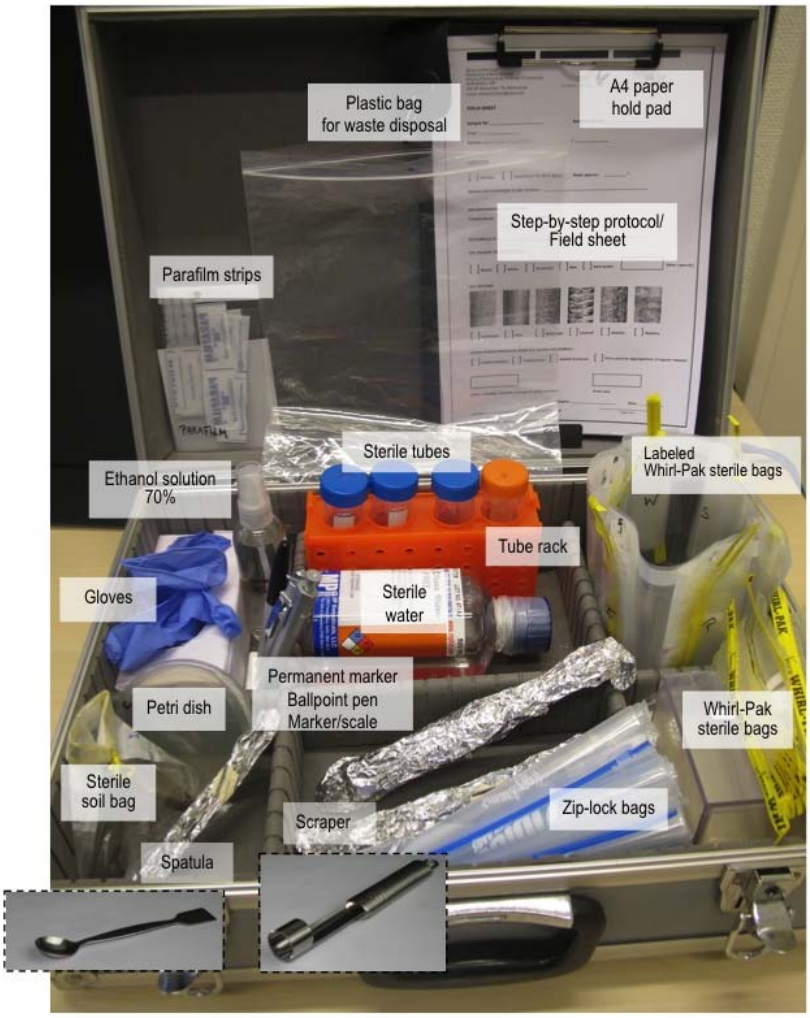
ICE SAMPLING PROCEDURE

(Detailed procedures have been provided with version DC SP/02).

The important consideration in sampling ice, water or permafrost for microbiological characterization is to use only sterile tools and sample containers and to wear nitrile gloves during sampling.

The sample is to be taken was dug with a nonsterile shovel or auger, then the sides of the hole should be scraped “clean” with a sterile stainless steel trowel prior to sampling. This is to eliminate any crosscontamination of the samples from previous holes dug with the same shovel or auger. If the same trowel is to be used for collecting the sample, then it should be resterilized by wiping with rubbing alcohol or, preferentially, flaming it. A composite sample will need to be sampled at collection in order to obtain a sub-sample (ca 100g) for microbiological analysis. Sub-samples were taken taken using a sterile spatula, into 3 sterile 50mL centrifuge tubes. Vials should be numbered by Site No.

The samples had to be kept frozen from the time of sampling until been analyzed.



Lessons Learned

It was planned to get ice, drip water, permafrost samples from Dachstein caves to be analysed by culture-independent methods, as well several contamination controls, all suit performed by the astronaut.

I consider that 50% of the experiment was accomplished because the sampling and contamination control procedures were not done by the astronaut in any of the two pre-defined days due to technical problems concerning the use of the spacesuit or communication.

However I was able to sample by myself using the spacesuit gloves and I also got some samples collected during JPL experiment done by the astronaut.

The culture-independent methods to investigate the microbial diversity have been initiated. We plan to present our data at the 3rd Conference on Terrestrial Mars Analogues, 25 - 27 October 2012 (Marrakech, Morocco).

The step-by-step procedure needed to be simplified. This was done during the field campaign, between the 1st and the 2nd day planned for my experiment.

Some of the material used in sampling procedure and contamination controls is not easily handled by astronaut gloves. Other approach should be implemented on following campaigns using a spacesuit simulator.

The flightplan was a bit too complicated. I would simplify it, e.g. merging the following cells with the same information.

7.11. Antipodes / Kiwispace

Synopsis:	OEWF / KiwiSpace Joint Operations Simulation, a switch of Mission Support between the Dachstein field test, the MDRS Kiwispace mission and their Mission Control Center in Wellington/New Zealand.
Institution (PI):	Kiwispace New Zealand / OeWF (joint operations)
Responsible on-site:	Austria: Gernot Groemer/OeWF; Utah: Haritina Mogosanu/Kiwispace
Contact coordinates:	+64 21 269 2908,

Antipodes is an operations experiment, where we assume a loss of communication between the Mission Support Center on “Earth”, whereas a parallel landing party on the other side of Mars will take over the coordination of an ongoing Extra-Vehicular Activity via their habitat, relayed via a satellite in Martian orbit.

Participants

- Kiwispace crew at the Mars Desert Research Station, Utah
- Kiwispace Mission Control Center, Carter Observatory, Wellington/New Zealand
- OeWF field team, Dachstein caves, Austria

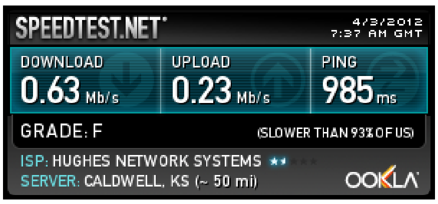
Scenario

- After losing the communication to “Earth” (e.g. satellite is out-of-range), a request is sent to the MDRS and/or MCC Wellington to take over operations for an ongoing experiment within the cave. The telemetry data are relayed to MDRS / MCC Wellington for approximately 30 min.
- In a second step, a similar handover is done, where the Dachstein field OPS coordinates an experiment at the MDRS (either EVA or IVA, tdc).

The details of the experiment are to be defined, most probably it will be related to the biological sampling activities for the University of Amsterdam or, potentially, also the JPLTerbium experiment.

Bandwidth Test MDRS, 07Mar2012, 05:23 AM:

- Download speed: 1,81 Mbps, Upload speed: 220 kbps



Antipodes 0:

Saturday, 28th of April 2012 - CommCheck

The first comcheck between the OPS at Dachstein and KiwiSpace had the video and audio working very well. Due to probably a bandwidth problem the contact was lost towards the end of Antipodes 0 but not before KiwiMars 2012 team got to introduce the project to the media reps at Dachstein.

Antipodes 2:

Sunday, 29th of April 2012

It was not possible to establish contact between the OPS at Dachstein and KiwiSpace for the Antipodes 2 experiment

Antipodes 1:

Monday, 30th of April 2012 – MCC Wellington directing Aouda.X

This experiment was operated from MCC Wellington, who should have directed Aouda.X.

The streamed video had a good quality and a grid was put over the streamed image which was very helpful. Due to a low bandwidth the picture got a little bit blurry when the suit tester and therefore the helmet camera moved fast.

As a result of a communication issue, just before MCC Wellington was supposed to take over the experiment, it was not clear to MCC Wellington what they were supposed to do exactly during this exercice. Even tho the simulation did not go as planned many new valuable lessons were learned.

Antipodes 3:

Tuesday, 1st of May 2012 – KiwiMars Crew directing Aouda.X on samples collection

This experiment was conducted with the KiwiMars crew on location at MDRS as Mission Control directing Aouda.X in the caves of Dachstein where they performed collection of samples from the ice bed.

The simulation was very successful and everything went as planned. MCC Wellington had all the information they needed beforehand and the voice communication was very clear. The video stream was fine as well and only a few times blurry.

Flight Director Wellington

Elf Eldridge, MacDiarmid Institute for Advanced Materials and Nanotechnology

Victoria University of Wellington, PO Box 600, Wellington 6140, New Zealand

Cell: +64 27 352 1358, Email: kaiwhata@gmail.com

7.12. ERAS C3 Simulator

Synopsis:	The ERAS Command, Control and Communication (C3) experiment will provide a test-version of a data processing and communications infrastructure between the suit and a base station.
Institution (PI):	Franco Carbognani
Responsible on-site:	Franco Carbognani
Contact coordinates:	Tel: Office: +39 050 752308 Home: +39 050 936038

Team:

Franco Carbognani
Kapoglou Angeliki
Lara Vimercati
Antonio Del Mastro

Within the **E**uropean Ma**R**s **A**nalog **S**tation for Advanced Technologies Integration Project (**ERAS**), a Command, Control and Communication (C3) subsystem provided the data processing and communications equipment required to:

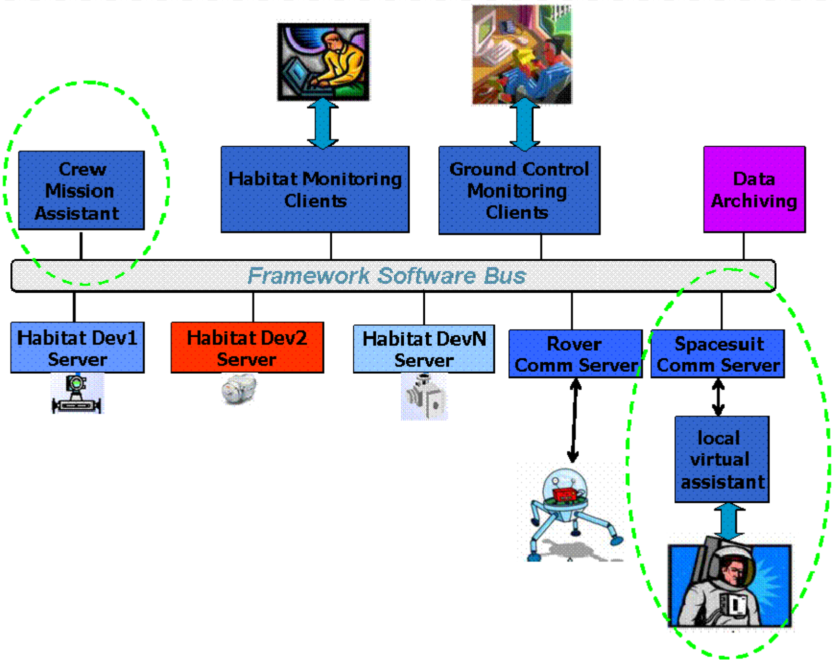
- monitor and control the habitat's environment and subsystems
- monitor and maintain crew health and safety
- communicate with mission support, rovers and EVA crewmembers
- support data processing related to the mission objectives
- host the core part of the crew operations planning and scheduling support system

The ERAS C3 simulator was built using, as a starting point, the Habitat Monitoring and Alarm System which has been implemented during the MDRS Crew 102 mission and will be running on a Linux Ubuntu notebook and based on the MANGO Supervisory Control And Data Acquisition (SCADA) application.

During the experiment the communication with the Aouda.X on-board computer (in particular all main biomedical and engineering telemetry) and the interfacing of the MANGO application to the local virtual assistant was tested.

This was the first step for the implementation of the remote virtual crew mission assistant to be embedded into C3 framework and constituting the "facility" side of the ubiquitous computing environment that will support the crew at any time and place during their simulated missions to Mars.

The functional diagram for the ERAS C3 Subsystem is depicted in the following figure.



For the Dachstein tests a C3 draft simulation ran on a single portable computer on top of the TANGO Distributed Control Software Framework

The tests intended to focus on those components and their interactions:

- The Aouda.X Spacesuit Communication Device Server
- The Crew Mission Assistant.

Our primary science objectives for the Mission were:

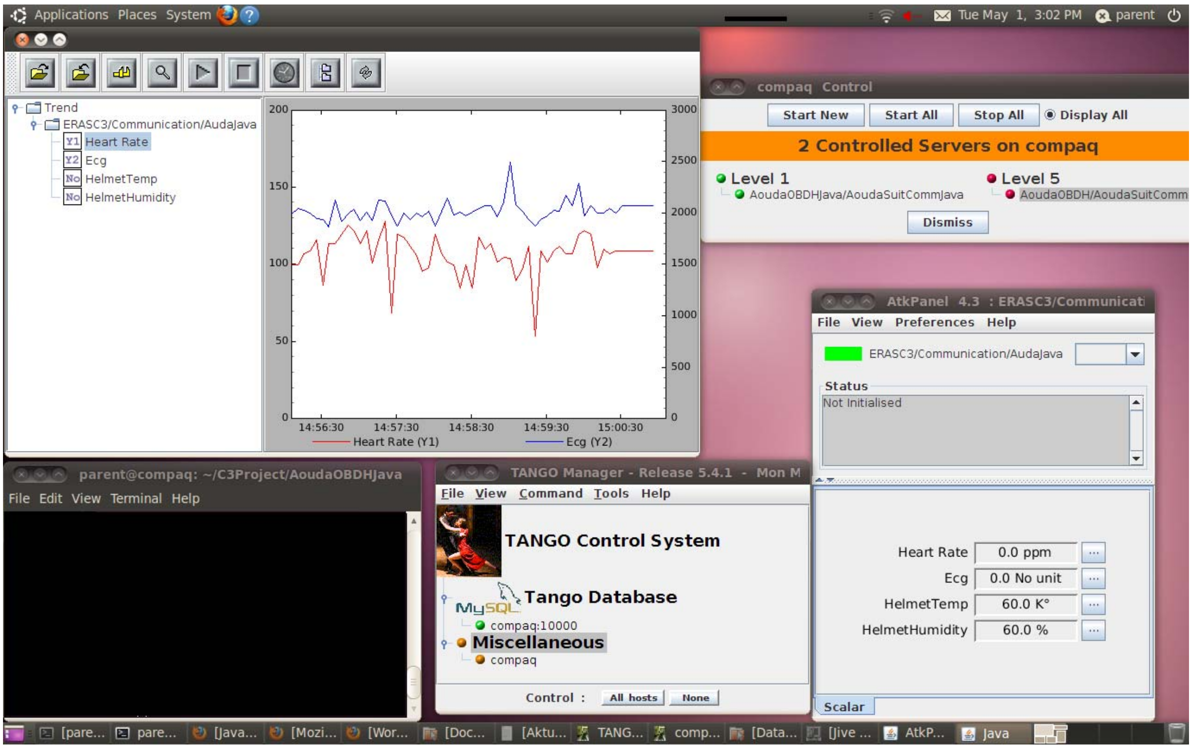
P1. Testing the capability to retrieve the Aouda.X Spacesuit telemetry data stream from a proxy server (Marvin proxy) in polling mode at low frequency (approx: 1 Hz).

P2. Testing the overall functionality of the C3 system

During the tests we were not able to achieve completely those objectives because the relative instability of the Marvin telemetry proxy allowed the possibility for longer tem test only at the end of the mission. Objective P1 could be fully achieved and P2 partially achieved.

But, overall, the field test allowed us to understand the best way of connecting from C3 to the Marvin proxy via the java library provided by the Aouda.X telemetry experts.

So, during the field tests, the communication between ERAS C3 and the Aouda.X Spacesuit (in particular for main biomedical and engineering telemetry data) could be successfully tested.



Screenshot of the Aouda.X Spacesuit ECG and Heart Rate data being acquired

From the software point of view, the activities focused on the development of the Tango Communication Device Server (named AoudaOBDH) which is shown in Figure 2.

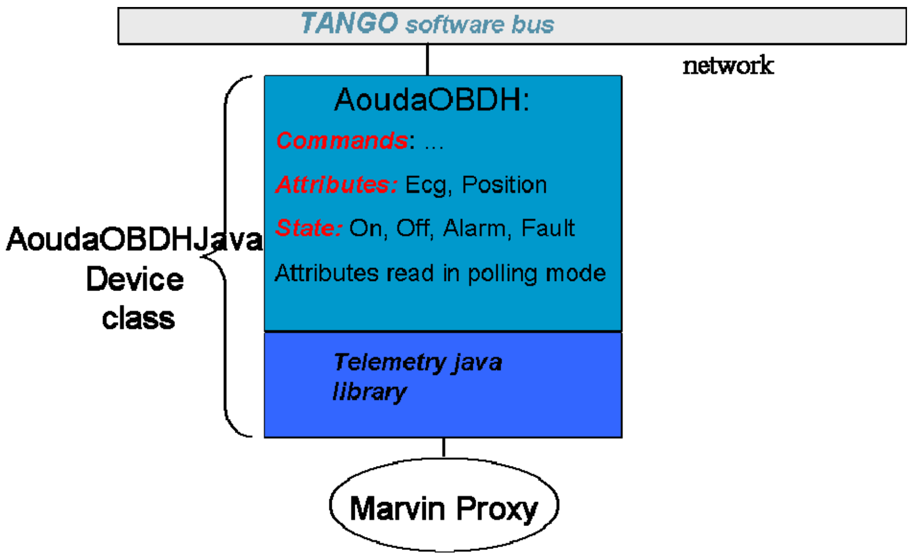


Figure 2: The AoudaOBDH Device Server

The development of the corresponding AoudaOBDHJava class implied modifications to the provided telemetry java library. We are currently reviewing those modifications in order to make them as much generic and robust as possible.

Interaction with the Aouda.X telemetry team will be needed for agreeing on the best possible integration and merging onto the officially released version of such library.

We have not jet targeted a specific conference for publication. What we are planning to do is including those filed tests and associated activities on the C3 system to the presentations of the ERAS Project we are doing (in particular for founds rising). We will make available a short mission report to the ERAS project site (www.erasproject.org).

Lessons learned

1. A very reliable telemetry data proxy server is absolutely essential.

2. A workable solution based on a Java implementation of the Communication Server could be achieved but:

3. The level of abstraction of the telemetry java library which represent the interface for the data proxy communication is too low. An higher level of abstraction interface library should be made available, possibly based on emerging standard as the Data Distribution Service (DDS) http://portals.omg.org/dds/

9. Contact coordinates

Field test coordinator (EXLEAD):

Gernot Groemer, Austrian Space Forum / PolAres Programme Office

c/o University of Innsbruck, Technikerst. 21a, 6020 Innsbruck, Austria

Technical coordinators

- Flight plan coordination:
    - Sebastian Hettrich
    - Alejandra Sans
- Communication & IT Infrastructur:
    - Sebastian Sams, On-site IT
    - Wolfgang Jais, OeWF Innsbruck server
- Media officer:
    - Monika Fischer +43 (0) 699 / 121 34 610

Local Infrastructure

- Dachstein Tourismus AG, Winkl 34, 4831 Obertraun
    - Krippensteinbahn Manager: Franz Schweighofer
    - DAG Site Manager: Wolfgang Steiner / Betriebsleiter, Dachstein Tourismus AG,

- Restaurant Owner Dachstein: Mr. Voglmair,

  We can use the restaurant to the full extent (but not excusively), the tweet-up will be possible, we can use the large monitor, press conference hosting is OK, we should give advance info meal orders.

- IT Company: WeTi.net, Mr. Andreas Limberger

10. Selected Media-Echo

Krone Oberösterreich (print, range: regional)


30 Minuten vor Abschiebung verhaftet:

Kronen Zeitung

Doppelmörder tarnte sich als Flüchtling

Dachstein als Mars-Testlabor

Die Top-Themen der „OÖ-Krone"

100 „Krone"-Fahrräder von KTM gewinnen!


Seite 28

Weltraum-Experten treffen sich, um Raumanzug einem Versuch zu unterziehen ● Rieseneishöhlen perfekt geeignet:

Seite 29

Dachstein als Testlabor für Mars-Expedition

Kulturgenuss und Gaumenfreuden:

Oper „Carmen" als Fest der Sinne

Knödel-Sepp

Interview

24-Jähriger stürzte 70 Meter tief in Traun ● Retter erzählt:

„Ich hab' Hilfeschreie gehört, und dann Verletzten gesucht"

Oberösterreich AKTUELL

Angebot für „Krone"-BonusCard-Besitzer:

„Krone"-Lounge-Package


Seite 32 — 29. APR. 2012 — OBERÖSTERREICH — Seite 33

„Der Marsanzug beißt wie ein Biest"

Internationale Wissenschaftler gehen noch bis Dienstag in den Eishöhlen am Dachstein einer wichtigen Frage nach: „Schafft unser Simulator diesen Test?"

Interview

„Es passiert alles Schritt für Schritt"

Riesiger Medienrummel beim Start der Mars-Simulation


Seite 26 — OBERÖSTERREICH — Freitag, 20. April 2012 — Seite 27

Die Katsdorfer Eva Maria und Stefan Hauth über den Test eines Raumanzugs am Dachstein von 27. April bis 2. Mai, bei dem sie mitarbeiten

„Generalprobe für den Mars"

Interview

STECKBRIEF

Bild Zeitung (print, online; range: national (Germany))

Titel page & half a page (picture of the day) http://www.bild.de/news/foto-des-tages/foto-des-tages/foto-des-tages-oesi-uebt-fuer-mars-mission-23910768.bild.html

NACHRICHTEN Leserbriefe Seite 8

ller im Warnstreik
ıkfurt/M. – Im Tarif-likt der Metallindus-mit 3,6 Millionen Be-iftigten haben in der ht zum Sonntag die en Warnstreiks begon-Die IG Metall fordert Prozent mehr Lohn. Arbeitgeber bieten ozent mehr.

wieder bei 5 Prozent
in – Erstmals seit ıst 2011 erreicht die in der Emnid-Sonn-trend-Umfrage für am SONNTAG fünf ent (plus 1 Prozent-t). Die Union kommt 35 % (+ 1). Die SPD) und die Piraten) verlieren je einen t, Unverändert: Grü-ne (13 %) und Linkspartei (7 %).

Klage gegen Betreuungsgeld?
Hamburg – Hamburgs Erster Bürgermeister Olaf Scholz (SPD) prüft eine Verfassungsklage, um das umstrittene Betreuungsgeld zu stoppen. Wenn eine Klage möglich sei, werde Hamburg diesen Weg gehen, so Scholz zur WELT.

Anschläge auf Christen
Abuja – Bei Terroranschlägen auf Christen in Nigeria und Kenia sind mindestens sieben Menschen getötet worden. Mindestens fünfzehn wurden verletzt.

Zwei Nato-Soldaten getötet
Kabul – Bei zwei Bombenanschlägen in Afghanistan sind zwei Nato-Soldaten getötet worden. Nach Angaben des Militärbündnisses sind im April in Afghanistan 40 Nato-Soldaten ums Leben gekommen.

Gewinnzahlen
Lotto: 11, 17, 20, 33, 37, 47
Zusatzzahl: 36
Superzahl: 0
Spiel 77: 0 5 9 3 0 2 7
Super 6: 4 7 2 9 3 0
(ohne Gewähr)

Winner | Verlierer

Dieter Blechschmidt (50), CDU-Stadtrat von Plauen, hat Homosexualität als „Krankheit“ bezeichnet. In einem Beitrag im Internet schrieb der Politiker, der auch Pressesprecher der Plauener CDU ist, dass Homosexuellen Hilfe zur Heilung angeboten werden müsse.
BILD meint:

FOTO DES TAGES

Kein Witz!
Ösi übt für eine Mars-Mission

Der Weltraum? Unendliche Weiten? Von wegen! Dieser silberne „Astronaut“ ist Physiker Daniel Schildhammer. In den österreichischen Dachsteinhöhlen testet er mit anderen Forschern Raumanzüge für eine „Mars-Mission“. Sein „Aouda.X Raumanzug“ ist 45 Kilo schwer und voller Technik. Start einer echten Mars-Mission: ungewiss.

Foto: BARBARA GINDL/EPA/DPA

Morgen erscheint die BILD am FEIERTAG

EU will „Marshall-Plan“ gegen Krise
Madrid – Die EU-Kommission will einen „Marshall-Plan“ zur Bekämpfung der Wirtschaftskrise in Europa

Mehrheit der
Berlin – Schöne schreckliche Ferien! 58 % der Deutschen streiten sich im Urlaub, 1,3 % verreisen lieber gleich getrennt – um

MONTAG
„Gottschalk Live“
SHOW
Bevor Thomas Gottschal am Mittwoch mit der Akt on „66 Träume“ startet, sentiert er heute ein „Bes of“ aus seiner Talkshow. dabei u. a.: Karl Lagerfel Pamela Anderson und Gü ther Jauch.
ARD, 19.20 Uhr

was g

Weitere Themen:
- Aktion „Ich beweg' mic Wie Sie Ihre Fitness verbesse
- Medizin-Implantate: Warum strenge Kontrollen so wichtig sind
- Taubheitsgefühl: Welche Erkrankungen dahinterstecken
- Schweigepflicht: Wie weit Ihr Arzt daran gebunden ist
- Schöne Sommer-Haut: Pflege-Tipps aus Ihrer Apotheke

Die Presse (print & online (incl. Video); range: national)

Half page; http://diepresse.com/home/panorama/welt/753566/Simulation_Marsmenschen-auf-Dachstein-gelandet

6 WELTJOURNAL

MONTAG, 30. APRIL 2012 DIEPRESSE.COM Die Presse

„Marsmenschen" auf Dachstein gelandet

Raumfahrt. In den Dachstein-Rieseneishöhlen im Salzkammergut (OÖ) simulieren internationale Expertenteams die Erforschung des Roten Planeten.

VON WOLFGANG GREBER (OBERTRAUN)

Es ist kalt. Etwas über null Grad. Es ist eine feuchte Kälte, die bewegungslos und unnachgiebig im Raum steht und ihn ausfüllt wie eine unsichtbare Masse, und langsam, ganz langsam, kriecht sie durchs Gewand.

Von der Decke der gewaltigen Felskaverne hängen Eiszapfenmassen wie umgekehrte Märchenschlösser, Wasser sprüht herab und meterdicke Eiszungen winden sich unten auf dem Grund. Plötzlich bohren sich Lichtstrahlen ins Dunkel, Schatten tanzen über die bräunlichen Felswände, ein metallisch kratzendes Tappen kommt näher, eine Gestalt biegt um die Ecke, silbrig und klobig, seitlich von ihrem Kopf schießen Lichtstrahlen – das Ding aus einer anderen Welt!

Nein, ist es nicht. Es ist Daniel Schildhammer, ein 28-jähriger Physiker aus Oberösterreich, in einem Raumanzug. In den haben ihn die Menschen vom „Österreichischen Weltraumforum" (ÖWF) gesteckt, das sind Raumfahrtexperten mit guten Kontakten zu Nasa und ESA, die eine Weltpremiere geliefert haben: Mit Teams aus zehn anderen Ländern werden seit 27. April und bis 1. Mai Experimente zur Erforschung des Mars durchgeführt, und zwar erstmals an einem unterirdischen Ort: den Mammut- und Rieseneishöhlen im Dachstein oberhalb von Obertraun im Salzkammergut.

Was das vereiste Höhlensystem in ca. 1455 Meter Seehöhe mit dem Roten Planeten zu tun hat, der sich uns maximal auf 56 Millionen Kilometer nähert? „Man weiß, dass es auf dem Mars Höhlen gibt", sagt Astrophysiker und ÖWF-Vorstand Gernot Grömer (*1975) von der Uni Innsbruck. „Dort gibt es stabile Umweltbedingungen und Schutz vor kosmischer Strahlung, ein idealer Rückzugsraum für zumindest bakterielles Leben." Falls auf Mars je so etwas existiert habe, könne man es in den Höhlen eher finden als an der Oberfläche. „Daher sind die Dachsteinhöhlen eine Modellregion für uns", sagt Grömer.

Freilich eine fast mediterrane, verglichen mit dem Mars, denn in den Höhlen dort hat es minus 70 Grad und weniger; allerdings ist das Leben sehr widerstandsfähig, wie man auf der Erde durch Funde von Mikroben in heißen Quellen und antarktischen Eismassen weiß.

Prinzessin als Namensgeberin

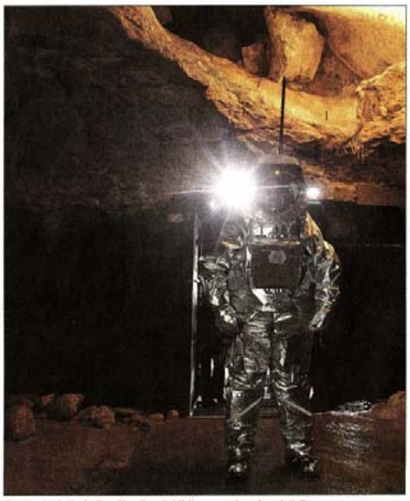
Schildhammer tut sich jedenfalls schwer, wie er im Raumanzug durch die Höhle stapft; der heißt „Aouda", benannt nach einer indischen Prinzessin aus dem Roman „In 80 Tagen um die Welt", und wiegt 45 Kilogramm. Die Leute vom ÖWF haben ihn gebaut, er besteht aus Kevlargewebe und Aluminiumschichten und einem Helm und komme einem „endgültigen" Marsanzug extrem nahe, sagt Grömer. Man könne darin über Sonden essen und trinken (und auch anderes, Unaussprechliches tun), arbeite man, könne man ihn etwa elf Stunden am Stück tragen, und bis zu drei Tagen bei Inaktivität. Er ist mit Sensoren mit der Umwelt verbunden, kann mit anderen Computern und Marsrovern kommunizieren, der Zustand des Trägers wird per Funk an die Kontrollstation übertragen – die sich nicht nur auf dem Dachstein, sondern zeitweise in Neuseeland befindet, weil man Möglichkeiten zur Fernsteuerung und Kontrolle testet.

Zu den anderen Versuchen in den Höhlen zählen solche mit Mars-Rovern, etwa dem dreiachsigen polnischen „Magma White"; er trägt das französische Bodenradarsystem „Wisdom", mit dem man den Untergrund bis in etwa drei Meter Tiefe durchleuchten kann.

Wie sich Keime verbreiten

Mit Aouda testet man auch, wie leicht man unbeabsichtigt irdische Keime auf andere Himmelskörper bringen bzw. zur Erde holen kann. Dazu wird der Anzug mit winzigen, fluoreszierenden Kügelchen verunreinigt; später schaut man nach, wo sich diese Dinger aus einer anderen Welt – jener von draußen, wo der Hallstättersee blau in der Tiefe liegt – in der Höhle wiederfinden.

Und so kommen Schildhammer, ein junger Mann mit gutmütigen braunen Augen und Bart, und seine Kollegen (ein bisserl trainiert müsse man dafür schon sein, heißt es) in der Kälte ziemlich ins Schwitzen. Vielleicht aber weniger als 2013: Dann wird Aouda nämlich in Marokko getestet.



Ganz unterirdisch. Der Physiker Schildhammer im „Aouda"-Raumanzug. [Reuters]

Auf einen Blick

Das ÖWF (Österreichisches Weltraumforum) und ausländische Teams führen bis 1. Mai in den Dachsteinhöhlen diverse Experimente zur Erforschung des Mars durch. Ein Team (die deutsch-österreichischen „Part-Time-Scientists") hat den Rover „Asimov" dabei, der bis 2015 zum Mond gebracht werden könnte.

→ WEITERE INFORMATIONEN UNTER www.oewf.org

Ein freundlich „blickender" Roboter: der Mond-Rover „Asimov". [Wolfgang Greber]

Oberösterreichische Nachrichten (print; range: regional)

OÖN

30. APR. 2012

Land & Leute 29

Marsmenschen in den Dachsteinhöhlen

Experimente zur Vorbereitung einer Mission zum Roten Planeten

OBERTRAUN. In den Dachsteinhöhlen bei Obertraun tummelt sich derzeit eine Art von Marsmenschen: Das Österreichische Weltraum Forum hat Forscher aus zehn Ländern und drei Kontinenten versammelt, die bis morgen insgesamt zwölf mehrtägige Experimente zur Vorbereitung einer bemannten Mars-Mission durchführen. Unter anderem wird ein Raumanzug-Simulator getestet.

Seit einigen Jahren ist bekannt, dass es auch auf dem Mars Höhlensysteme gibt. Falls jemals auf dem Roten Planeten Leben existiert hat, könnte es dort noch zu finden sein. Denn sie bieten Schutz vor kosmischer Strahlung, stabile Umweltbedingungen, hohe Luftfeuchtigkeit und geringe Temperaturschwankungen. Die Versuche in den Dachsteinhöhlen seien nach Angaben von Gernot Grömer, Vorstand des Österreichischen Weltraum Forums, die weltweit ersten unter realistischen Bedingungen.

Getestet wird unter anderem der 45 Kilogramm schwere Prototyp des „Aouda.X Raumanzugs", den der gebürtige Schärdinger Physikstudent David Schildhammer (28) herumzuschleppen hat. Weltweit arbeiten vier Teams an derartigen Bekleidungen. Dabei geht es darum, zu erforschen, welche Anforderungen sie wie erfüllen müssen. Am Dachstein wird auch eine Sprachsteuerung des Anzugs getestet, die selbst dann noch funktionieren muss, wenn sein Träger heiser wird. Auch seine Eignung zur Bedienung anderer Komponenten einer Mission wird überprüft.

Mit diesem „Frack" sollen sich die Astronauten am Mars bewegen. Foto: Hörm.

Spiegel.de (online; range: international)

German: http://www.spiegel.de/wissenschaft/weltall/0,1518,830499,00.html
English: http://www.spiegel.de/international/europe/0,1518,831024,00.html

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SPIEGEL ONLINE WISSENSCHAFT

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Außerirdisches Leben
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Spielen mit Astro-Bildern: Ein kleiner Klick für die Menschheit

VIDEO
Foto-Puzzle: Die genaueste Mars-Karte der Welt

WERTVOLLE ROHSTOFFE
NASA
Bergbau auf Asteroiden: US-Firma verspricht Goldrausch im Weltall

TESTEN SIE IHR WISSEN!

30.04.2012

Drucken | Senden | Feedback | Merken

Spektakulärer Test

Mars-Mann in der Eishöhle

Aus der Dachstein-Rieseneishöhle berichtet Christoph Seidler

Video

Foto: SPIEGEL ONLINE

Glitzernder Raumanzug, ausgefeilte Analysegeräte: Bei einem aufwendigen Feldversuch wird in Österreich die Ausrüstung für bemannte Marsmissionen ausprobiert. Noch machen simple Dinge Probleme - doch die Tester sind überzeugt, dass Menschen zum Roten Planeten fliegen werden. Irgendwann.

Twittern 36 | Empfehlen 59

Die Rufe aus dem Missionskontrollzentrum verhallen ungehört - und schuld ist schon wieder dieser verflixte Kopfhörer! Weil der schon wieder verrutscht ist, steht Astronaut Daniel Schildhammer auf seiner Erkundungsmission reichlich hilflos da. Wohin sich als nächstes wenden? Welche Probe nehmen? Wann zur Basis zurückkehren? Der 28 Jahre alte Materialwissenschaftsstudent aus Innsbruck hat ein ernsthaftes Problem: Sein bulliger Plexiglashelm verhindert, dass er die Ohrhörer wieder in Position bringen kann. Deshalb kann er keine Anweisungen empfangen. Punkt.

Ein echter Außeneinsatz auf dem Mars wäre spätestens an dieser Stelle zu Ende. Doch Schildhammer - er hat mit einer Körpergröße von 178 Zentimetern und Schuhgröße 43 die perfekten Raumanzug-Maße - ist kein echter Astronaut. Also darf er sich ausnahmsweise helfen lassen. Denn statt über den Roten Planeten schlurft er gerade durch eine Höhle im Salzkammergut. Zwei Assistenten können gefahrlos seinen Kopfschutz abnehmen und das Malheur beheben.

FOTOSTRECKE

Test für Marsanzug: (Space) Suit up! 19 Bilder

"Für jedes Problem, das wir hier haben, müssen wir dankbar sein", sagt Gernot Grömer. "Denn wir haben es hier - und nicht auf dem Mars." In der Dachstein-Rieseneishöhle testet das Österreichische Weltraum Forum (ÖWF) gerade die Ausrüstung für eine mögliche bemannte Marsmission. Und Grömer, normalerweise Astrophysiker an der Universität Innsbruck, leitet das Projekt des eingetragenen Vereins ÖWF, der Astroprofis und -Enthusiasten zusammenbringt.

Ein Dutzend Experimente finden gleichzeitig in der Höhle statt. So zuckelt gerade

Der Standard (print + online; range: national)

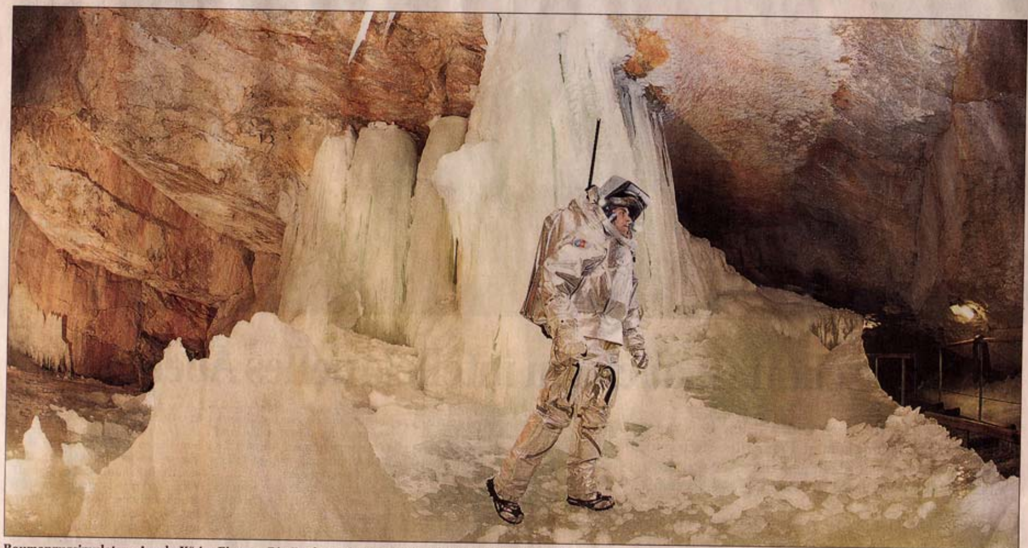
http://derstandard.at/1334796667924/Simulation-Die-Prinzessin-in-der-Eishoehle-traeumt-vom-Mars

JOURNAL FÜR WISSENSCHAFT, TECHNOLOGIE UND ENTWICKLUNG

MI., 2. MAI 2012 **FORSCHUNG SPEZIAL** 11

Woher die kosmische Strahlung kommt S. 12 Wohin die Forschung des Nachts führt S. 15

derStandard.at/Forschung



Raumanzugsimulator „Aouda.X" im Einsatz: Die Dachsteinhöhlen sollen auf den Mars einstimmen. Foto: ÖWF

Die Prinzessin in der Eishöhle träumt vom Mars

Mit den Feldversuchen bei der „Dachstein-Mars-Simulation" bereiteten sich internationale Forscherteams auf bemannte Missionen zum Roten Planeten vor. Star des Events war „Aouda", ein Anzug zur Simulation von Mars-Spaziergängen.

Alois Pumhösel

Ganz langsam arbeitet sich Daniel Schildhammer über die Stege und Stufen der Höhle. Um ihn glänzen die Eisformationen, die der Dachstein in seinem Inneren konserviert. Der Blick des 28-jährigen Physikers richtet sich durch das Visier seines Helms auf den Lichtkegel vor ihm. Es macht ihm Mühe, sich bei niedrigen Durchlässen zu bücken. Die 45 Kilo, die Schildhammer in Form eines bulligen, mit Aluminium beschichteten Anzugs umgeben, fordern ihren Tribut. Unter dem Kevlar-Gewebe verbergen sich Lebenserhaltungssysteme, Kommunikationstechnik und ein schweres Exoskelett. Mehrere Personen eines „Suit Tech"-Teams begleiten den Forscher.

Es hat länger als zwei Stunden gedauert, bis Schildhammer den silbern glänzenden Anzug angelegt hatte. Als Tester des Raumanzugsimulators „Aouda.X", der vom Österreichischen Weltraum-Forum (ÖWF) entwickelt und von der Förderagentur FFG mitfinanziert wurde, hat er lange für den Einsatz trainiert. Aouda wurde nach der indischen Prinzessin in Jules Vernes Klassiker *In 80 Tagen um die Welt* benannt. Der Anzug ist dazu gemacht, die Umweltbedingungen zu simulieren, mit denen Astronauten bei einer bemannten Mars-Mission konfrontiert wären.

Die „Prinzessin", wie das Team den Anzug liebevoll nennt, wäre selbst nicht am Mars einsatzfähig. Aouda soll aber bei der Entwicklung eines Raumanzugs helfen, der den Bedingungen am Roten Planeten gewachsen ist. „Er gibt alle wesentlichen Einschränkungen wieder, die ein Raumanzug real auf dem Mars auch hätte", sagt Astrophysiker Gernot Grömer von der Uni Innsbruck, der als ÖWF-Vorstand auch Projektleiter der Mars-Simulation ist. Der relative Überdruck im Anzug, der auf dem Mars getragen wird, muss genauso berücksichtigt werden wie die körperlichen Bedürfnisse des Trägers: „Essen, trinken, aufs Klo gehen, das kann er alles im Raumanzug machen."

Die „Prinzessin" kam in den vergangenen fünf Tagen bei einem Feldversuch in den Dachstein-Eishöhlen zum Einsatz. Forscher aus zehn Ländern waren an zwölf unterschiedlichen Experimenten rund um die Herausforderungen einer realen Mars-Mission beteiligt. Daten von Anzug und Testperson, beispielsweise Herzfrequenz, CO_2-Ausatmung oder Temperatur, werden laufend an das Kontrollzentrum geschickt. Ein Mediziner überwacht die Werte und verordnet gegebenenfalls Pausen, erklärt Alexander Soucek, einer der Missionsleiter.

„Computer zum Anziehen"

Um die Kommunikation und die Übertragung von Telemetrie-Daten zur Bodenstation sicherzustellen, wurde ein Datenfunknetz in der Höhle etabliert. Es gebe jeweils nur eine Person, die bei den Missionen mit dem Anzugtester in Kontakt ist, so Soucek. Die Kontaktperson müsse ebenfalls Anzugtester sein, um sich in die Situation einfühlen zu können. Auf dem Weg in den Parsifaldom in der Eishöhle ist Schildhammer etwa der Kopfhörer verrutscht. Sobald die Ventilation im Anzug eingeschaltet ist, kann er nur noch über sie hören. Bei einem realen Einsatz dürfte das nicht passieren. „Wir müssen lernen, mit dem Anzug richtig umzugehen", sagt Grömer. Über die Breitbandverbindung nach außen sehen dem Anzugtester Wissenschafter in Utah, in Kalifornien und in Neuseeland über die Schulter. Sie können in Echtzeit Anweisungen geben, etwa zu bestimmten Proben, die entnommen werden sollen.

Die „Prinzessin" sei im Grunde ein „Computer zum Anziehen", sagt Grömer. Ihn zu bedienen sei nicht einfach: Bei den Einsätzen seien Tester einer „hoher physiologischen und kognitiven Arbeitslast ausgesetzt". Der Begriff Weltraumspaziergang sei eigentlich ein krasses Understatement. „Wenn es wirklich ans Eingemachte geht, kann es locker sein, dass er während eines Einsatzes ein Kilo verliert."

Die Testserie ist bis ins Detail durchchoreografiert und soll die vorhandene Zeit optimal ausnutzen. Bei der Entnahme von Proben mittels eines Laborkoffers ist etwa jeder Handgriff genau festgelegt. Für den Umgang mit extraterrestischen Proben gilt ein komplexes Protokoll. Bei einem der Experimente, bei dem auch die Nasa beteiligt ist, konzentrieren sich die Forscher allein auf mögliche Kontaminationswege bei der Probenentnahme.

Eines der zentralen Forschungsfelder widmet sich der Interaktion des Anzugs mit Robotern. Auf einem der Mars-Rover, die bei dem Feldversuch getestet werden, ist eine Gerätschaft namens „Wisdom" montiert. Hinter dem Projektnamen verbirgt sich ein sogenanntes Georadar. Bisherige Bildsysteme waren auf die Untersuchung der Mars-Oberfläche beschränkt. Mit Wisdom, einer französischen Entwicklung, soll sich der Blick auch unter die Oberfläche richten, erklärt Steve Clifford vom Lunar Planetary Institute in Houston. Das Radar kann im Felsen bis in eine Tiefe von drei Metern Objekte von wenigen Zentimetern Größe ausmachen.

Mittels des Georadars sollen auf dem Mars passende Plätze für Bohrungen bis in zwei Meter Tiefe gefunden werden. Die Bohrkerne sollen Spuren von Wasser ausfindig machen und Aufschluss über gegenwärtiges oder früheres Leben geben. Wisdom soll mit der Exomars-Mission der Europäischen Raumfahrtbehörde Esa im Jahr 2018 zum Mars starten.

Etappenziel Arktis

Im Eis der Dachsteinhöhle blickt das Georadar bis in Tiefen von zehn Metern und zeichnet die Übergänge zwischen Eis und Felsen auf. Dem großangelegten Feldversuch in den Dachsteinhöhlen soll im nächsten Jahr ein weiterer in Marokko folgen. Für die Jahre darauf seien Tests in der Arktis geplant, erklärt Missionsleiter Soucek: aber erst, „wenn wir das Geld beieinander haben". Österreichs Chancen liegen in der Nischenforschung, so Projektleiter Grömer. Weltweit würden sich nur vier Teams mit Raumanzugsimulatoren beschäftigen – Aouda ist der einzige, der aus Europa kommt.

„Es ist nicht so, dass die Nasa zu uns kommt, und sagt: Bitte macht uns einen Raumanzug", sagt Grömer. „Aber wir gehen davon aus, dass wesentliche Erfahrungen, die wir hier sammeln, in einen realen Raumanzug einfließen werden." Ein solcher wird frühestens in 20 Jahren auf dem Mars zum Einsatz kommen. Der künftige Anzugträger, so Grömer, sei jetzt schon ein Teenager.

www.oewf.org

WISSEN

Unterirdische Hoffnungen

Auf dem Mars gab es bis vor wenigen hundert Millionen Jahren Vulkanaktivität. Die höchste Erhebung des Planeten, der nur die Hälfte des Erddurchmessers aufweist, ist ein erloschener Vulkan von 28.000 Metern Höhe, der eine Fläche von der Größe Frankreichs einnimmt. Kein fließendes Wasser erodiert hier den Fels wie auf der Erde.

Die mittlere Temperatur auf dem Planeten beträgt etwa –55 Grad Celsius. Der Mars weist eine nur sehr dünne Atmosphäre auf: Sie entspricht dem atmosphärischen Druck der Stratosphäre der Erde, also in etwa 35 Kilometern Höhe.

Seit einigen Jahren ist bekannt, dass auch auf dem Mars Höhlen existieren. Die unterirdischen Systeme, die etwa durch vulkanische Aktivität entstanden sind, bieten stabile Umweltbedingungen, konstante Temperaturen, erlauben hohe Luftfeuchtigkeit und schützen vor kosmischer Strahlung. Sollte auf dem Roten Planeten irgendwann einmal Leben existiert haben, könnten sich Mikroben in diese Höhlensysteme zurückgezogen haben. Auch erste menschliche Siedler auf dem Mars könnten in Zukunft in den Vulkanhöhlen Unterschlupf finden.

Die Eishöhlen im Dachsteinmassiv sind nicht vulkanischen Ursprungs. Sie stellen für die Mars-Forscher aber analoge Bedingungen bereit, um den Einsatz von Geräten, das sterile Entnehmen von Proben und Kommunikations- und andere weltraumtechnische Strategien zu testen. (pum)

NEWSMAKERS

German Research Minister Faces Plagiarism Allegations

German Education and Research Minister **Annette Schavan** is facing allegations that she plagiarized parts of her dissertation, published in 1980. A Web site called schavanplag has listed 56 incidents in which the anonymous accuser says Schavan copied phrasing from improperly cited sources.

Schavan, 56, received her doctorate in educational science in 1980 from the University of Düsseldorf; her dissertation was entitled: "Person and conscience—Studies on conditions, need and requirements of today's consciences."

"The dissertation was written 32 years ago, and I will be happy to give my account to those who are looking into the work; but it is difficult to deal with anonymous allegations," Schavan said at a press conference on 2 May. A ministry spokesperson told the German press agency dpa that the University of Düsseldorf will look into the allegations at Schavan's request.

Schavan's case is the latest in a string of similar accusations against German politicians. Defense Minister Karl-Theodor zu Guttenberg resigned last year after a blogger turned up evidence of extensive plagiarism in his dissertation. Since then, six other German politicians have had their Ph.D.s revoked because of similar offenses. **http://scim.ag/Schavan**

CERN Physicist Gets 5 Years For Plotting Terror

On 4 May, more than a month after his brief, 2-day trial, Franco-Algerian particle physicist **Adlène Hicheur** received a 5-year prison sentence on terrorism charges. But Hicheur, 35, may be released before the end of June, says his lawyer, Patrick Baudouin, because of possible sentence reductions and the time he has already spent in custody.

Hicheur, a former CERN researcher, has been held in "preventive detention" in a high-security jail near Paris since October 2009. The court ruled that Hicheur was guilty of "participation in a criminal organization whose goal was to plan terrorist acts." During the trial, Hicheur acknowledged exchanging e-mails with Mustafa Debchi, an alleged member of al-Qaida in the Islamic Maghreb, and discussing future terrorist actions. Baudouin admitted that words used by Hicheur in the e-mails were "disturbing" but argued that his client never took any concrete steps toward a terrorist act.

Random Sample

That Age-Old Question: What to Wear on Mars?

Deep inside a mountain cave in Dachstein, Austria, on 28 April, an international team of researchers sought to answer this question, showing off a new suit that simulates the challenges that await human visitors to Mars.

Most Mars simulations have taken place in rocky deserts or Antarctica to mimic the planet's cold, arid surface. But martian life could also exist in caves that formed long ago through volcanic activity. "[Caves] provide excellent shielding from cosmic radiation," says Gernot Grömer, Austrian Space Forum (ASF) president and head of the design team, and they also allow for a higher atmospheric water content and a more stable temperature regime. "So if life ever arose on Mars, these would be a natural retreat."

The sartorial challenges of the Red Planet are serious. The atmosphere is a near vacuum, and moving the limbs of a pressurized suit requires constant exertion. A Mars astronaut may need to both eat and use the bathroom inside the suit. And, as radio waves take up to 1 hour roundtrip between Earth and Mars, the suit should be able to provide real-time information on the wearer's health and environment.

To help prepare for these challenges, ASF offers the Aouda.X, its Mars space suit simulator. The 45-kilogram garment includes a computer that monitors the wearer's vital signs and a weighty exoskeleton to mimic the exhausting martian environment. "You really feel like a turtle in a high-tech shell," says Grömer. The suit can also be sterilized and cleaned well enough to not contaminate Martian samples with Earthly biomolecules. "We'd like to break the spell that humans are too dirty for Mars," Grömer says.

The next test of Aouda.X is a field mission in a desert in Morocco in February 2013.

BY THE NUMBERS

10,000 Number of signatures a group called Forecast the Facts gathered to protest the Discovery Channel's self-censorship of climate change issues in their *Frozen Planet* series.

25% Percentage of current Earth-observing capacity that the United States will have by 2020 if aging satellites continue to be replaced by new satellites at the current rate, according to a National Research Council report released 2 May.

12% Rate of premature births in the United States, according to a new World Health Organization report. Most European countries, Canada, and Australia are in the 7% to 9% range.

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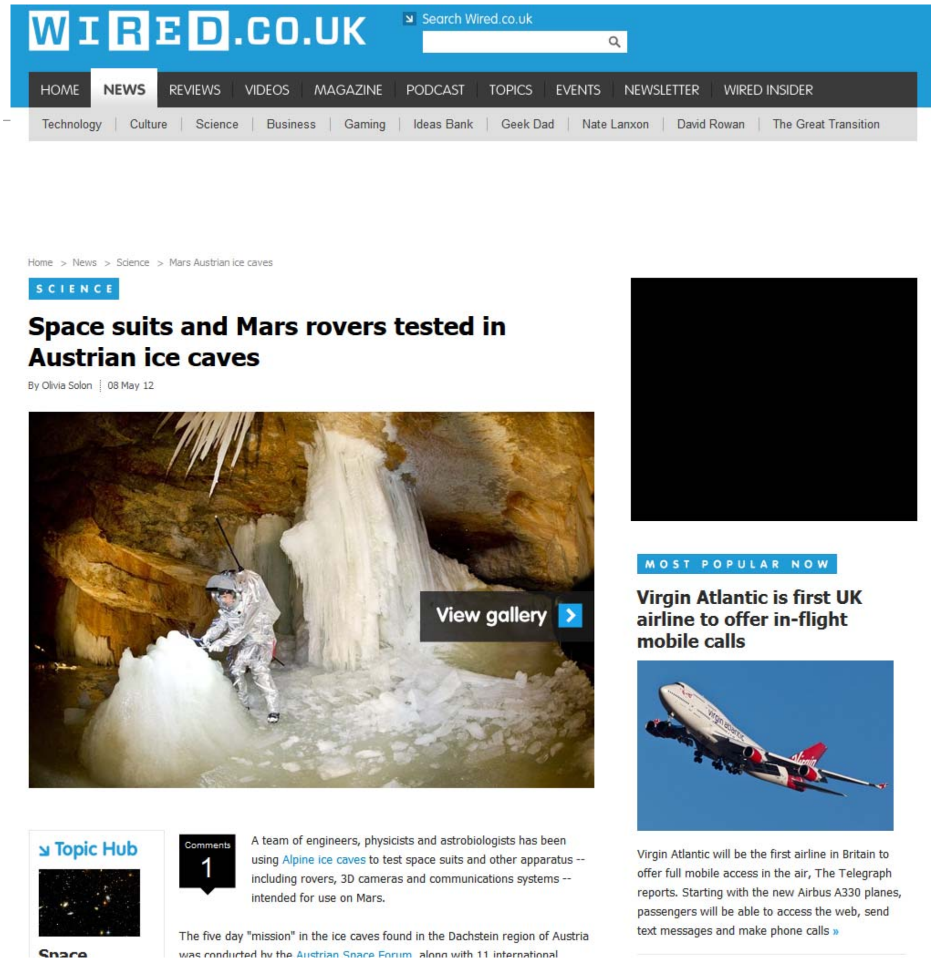
Wired.co.uk (online; range: international, tech, space)

Online with picture gallery
http://www.wired.co.uk/news/archive/2012-05/08/mars-austrian-ice-caves



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SCIENCE

Space suits and Mars rovers tested in Austrian ice caves

By Olivia Solon | 08 May 12

View gallery

Topic Hub

Space

Comments 1

A team of engineers, physicists and astrobiologists has been using Alpine ice caves to test space suits and other apparatus -- including rovers, 3D cameras and communications systems -- intended for use on Mars.

The five day "mission" in the ice caves found in the Dachstein region of Austria was conducted by the Austrian Space Forum, along with 11 international

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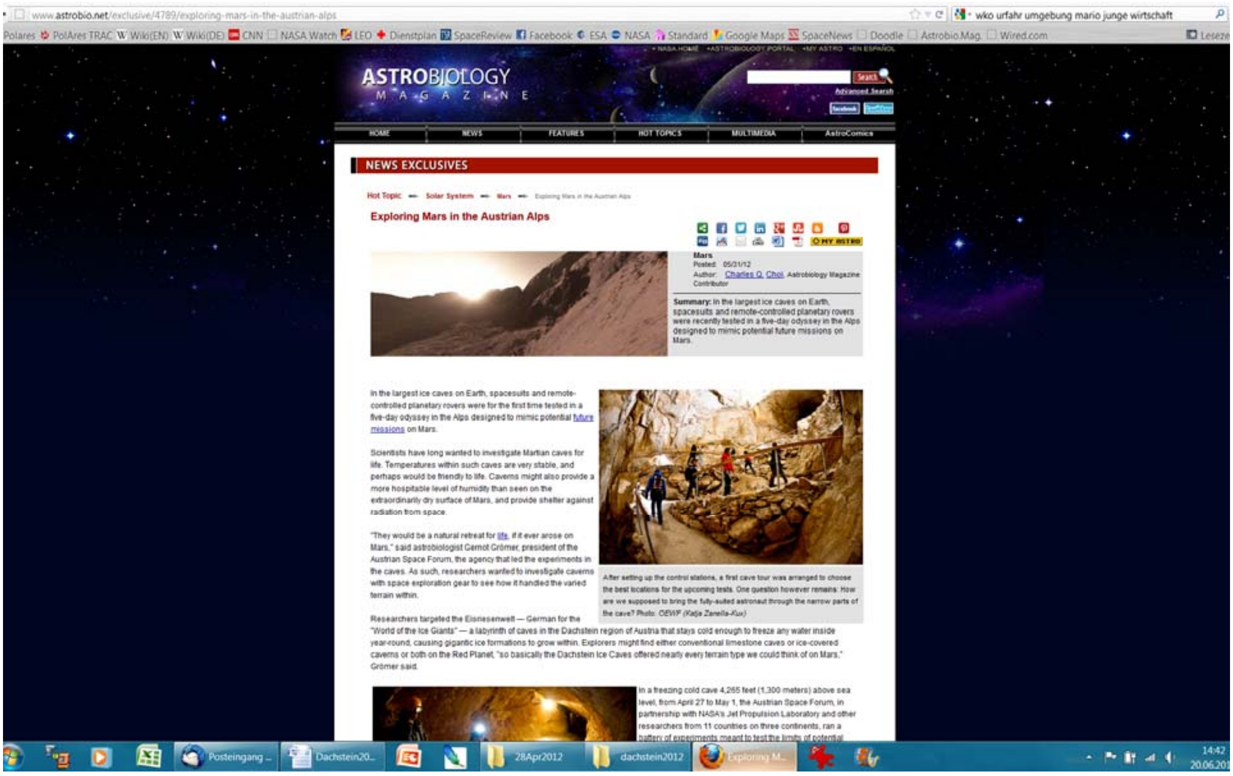
Virgin Atlantic will be the first airline in Britain to offer full mobile access in the air, The Telegraph reports. Starting with the new Airbus A330 planes, passengers will be able to access the web, send text messages and make phone calls »

NASA

Astrobiology-website

http://www.astrobio.net/exclusive/4789/exploring-mars-in-the-austrian-alps



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NEWS EXCLUSIVES

Hot Topic → Solar System → Mars → Exploring Mars in the Austrian Alps

Exploring Mars in the Austrian Alps

Mars
Posted: 05/31/12
Author: Charles Q. Choi, Astrobiology Magazine Contributor

Summary: In the largest ice caves on Earth, spacesuits and remote-controlled planetary rovers were recently tested in a five-day odyssey in the Alps designed to mimic potential future missions on Mars.

In the largest ice caves on Earth, spacesuits and remote-controlled planetary rovers were for the first time tested in a five-day odyssey in the Alps designed to mimic potential future missions on Mars.

Scientists have long wanted to investigate Martian caves for life. Temperatures within such caves are very stable, and perhaps would be friendly to life. Caverns might also provide a more hospitable level of humidity than seen on the extraordinarily dry surface of Mars, and provide shelter against radiation from space.

"They would be a natural retreat for life, if it ever arose on Mars," said astrobiologist Gernot Grömer, president of the Austrian Space Forum, the agency that led the experiments in the caves. As such, researchers wanted to investigate caverns with space exploration gear to see how it handled the varied terrain within.

After setting up the control stations, a first cave tour was arranged to choose the best locations for the upcoming tests. One question however remains: How are we supposed to bring the fully-suited astronaut through the narrow parts of the cave? Photo: OEWF (Katja Zanella-Kux)

Researchers targeted the Eisriesenwelt — German for the "World of the Ice Giants" — a labyrinth of caves in the Dachstein region of Austria that stays cold enough to freeze any water inside year-round, causing gigantic ice formations to grow within. Explorers might find either conventional limestone caves or ice-covered caverns or both on the Red Planet, "so basically the Dachstein Ice Caves offered nearly every terrain type we could think of on Mars," Grömer said.

In a freezing cold cave 4,265 feet (1,300 meters) above sea level, from April 27 to May 1, the Austrian Space Forum, in partnership with NASA's Jet Propulsion Laboratory and other researchers from 11 countries on three continents, ran a battery of experiments meant to test the limits of potential