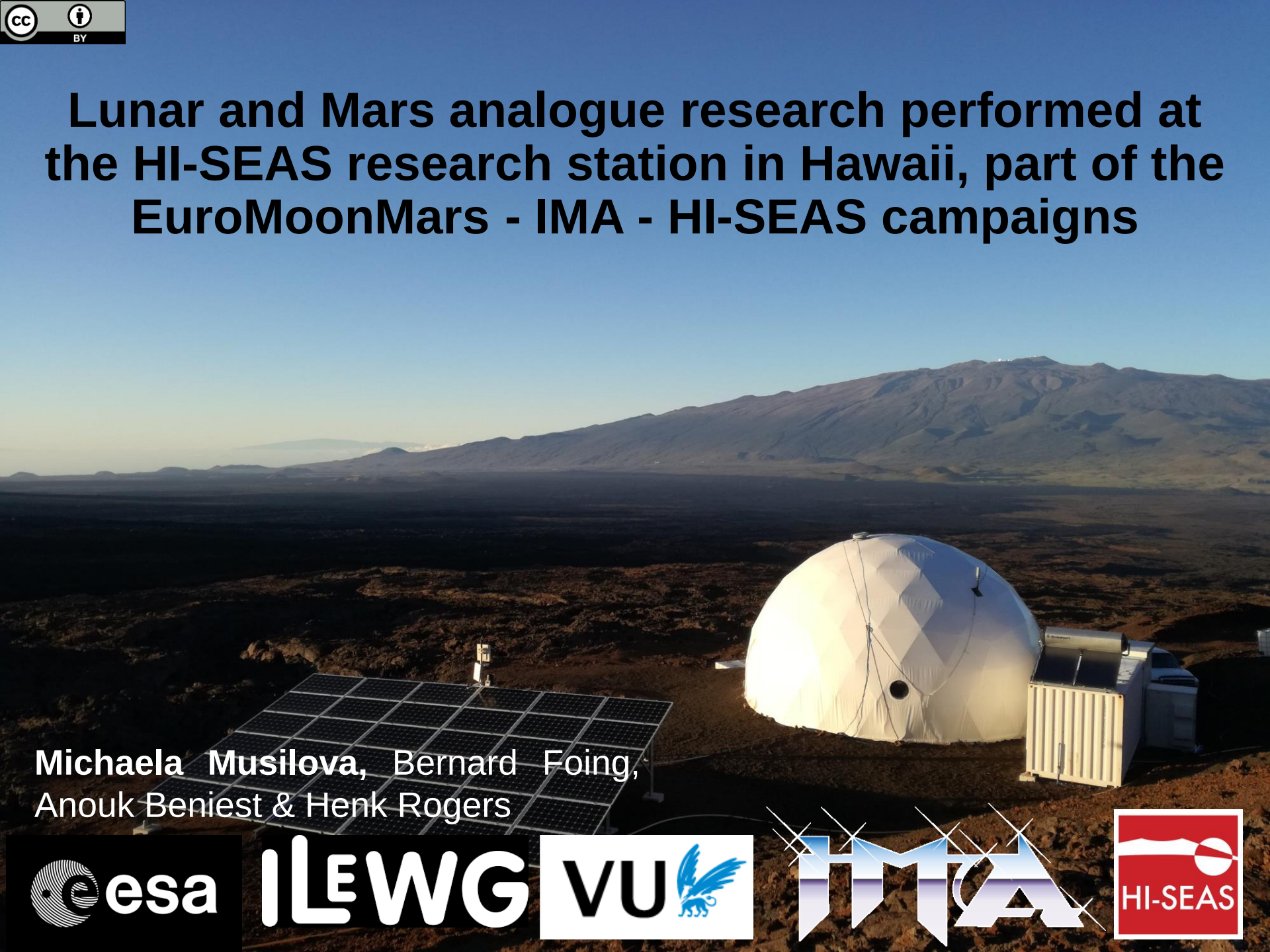
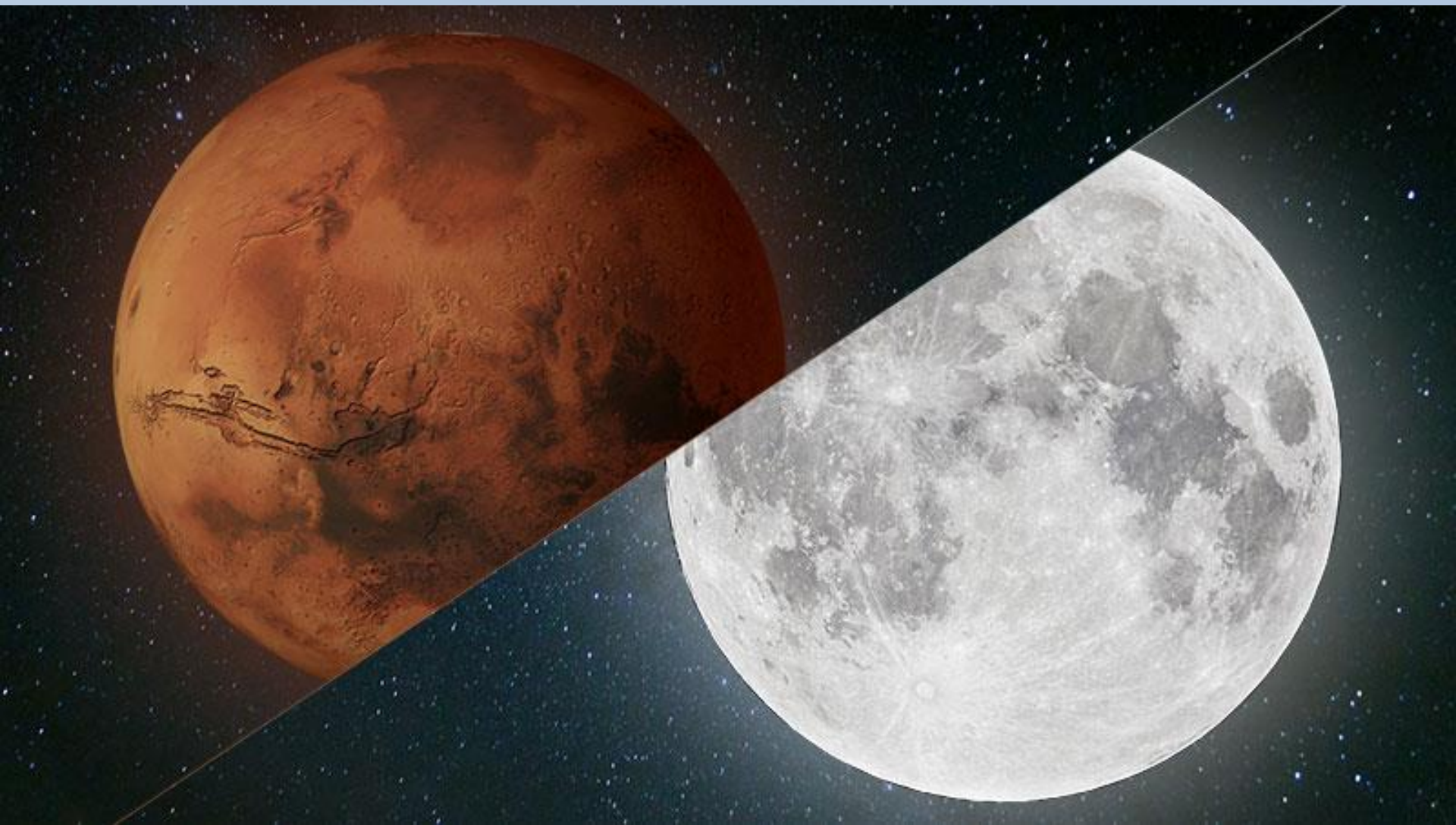
Lunar and Mars analogue research performed at the HI-SEAS research station in Hawaii, part of the EuroMoonMars - IMA - HI-SEAS campaigns

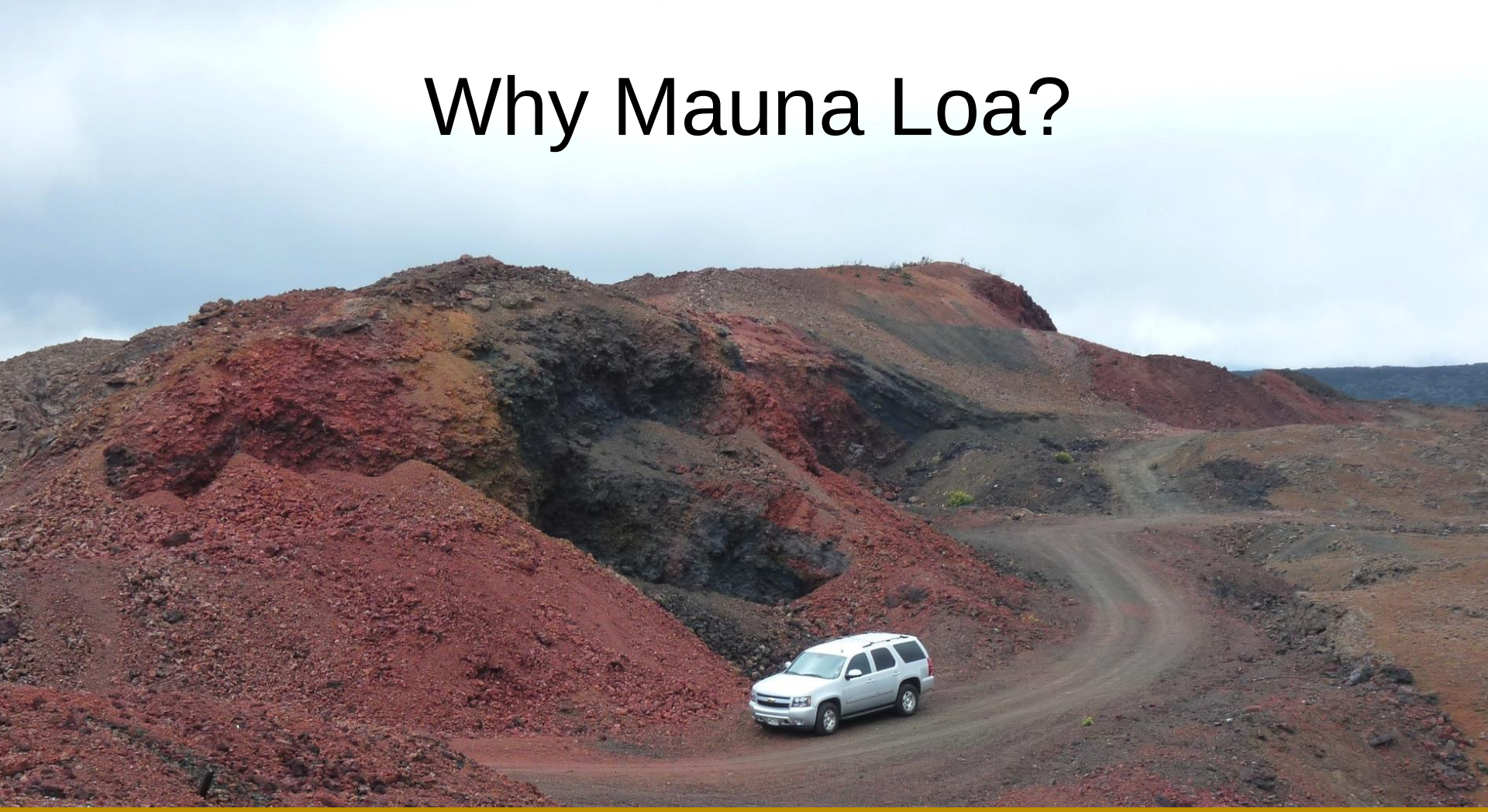


Michaela Musilova, Bernard Foing, Anouk Beniest & Henk Rogers

The International MoonBase Alliance (**IMA**) has been organizing regular simulated missions to the Moon & Mars at the Hawaii Space Exploration Analog and Simulation (HI-SEAS) habitat. **HI-SEAS** is an analog space research station located on the active volcano Mauna Loa, Hawaii. Missions at HI-SEAS can be from several days to several months long, depending on the needs of the researchers.

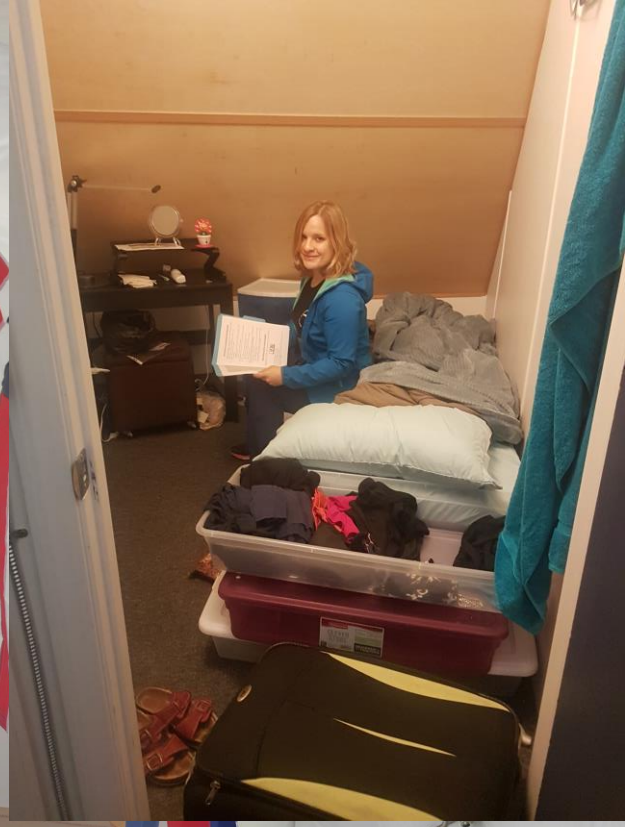


Why Mauna Loa?



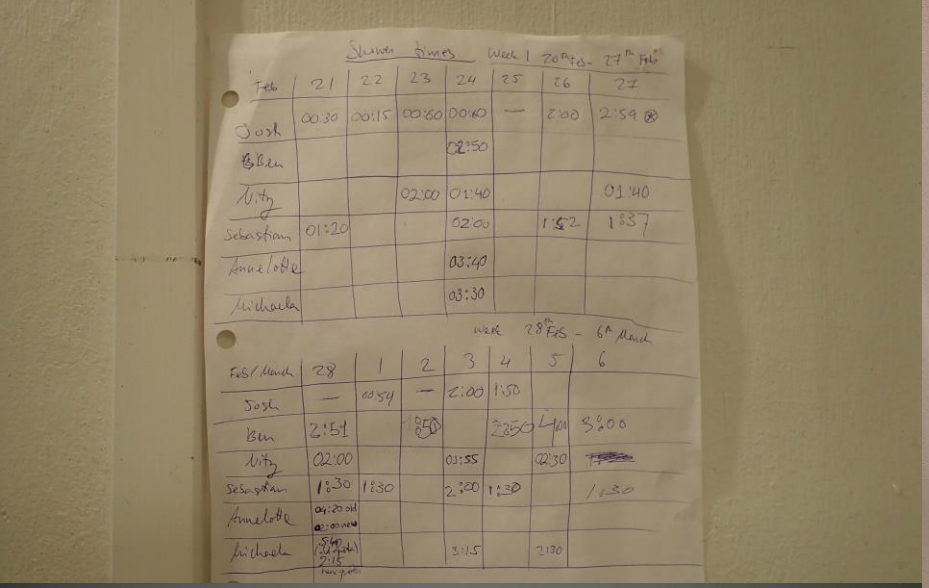
- HI-SEAS is located on an isolated, yet accessible site year-round
- High elevation (2’500 m): little vegetation & poses physical challenges
- Disused quarry site: no further damage to the land
- Geology similar in composition to Martian/lunar rock & in terms of geological features: skylights, lava tubes & lava flows

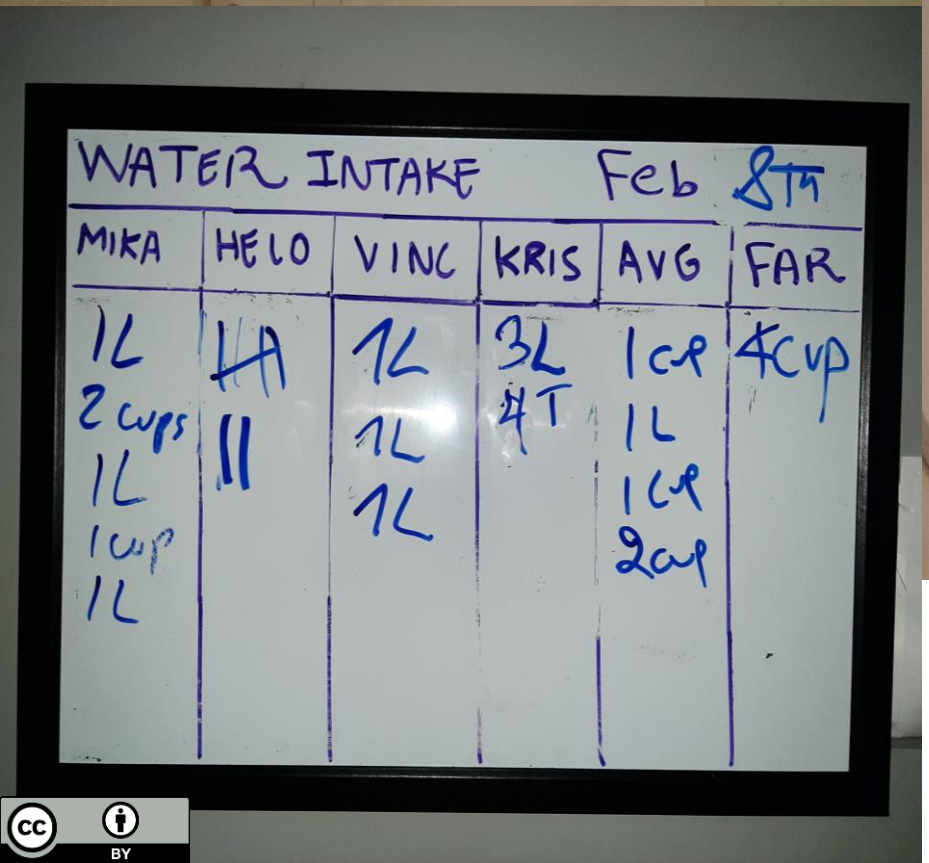
Restricted space inside the habitat (12 meters in diameter): almost no privacy & mostly shared living/working space



Credit: HI-SEAS

Restricted amounts of freeze-dried food available for the duration of the mission

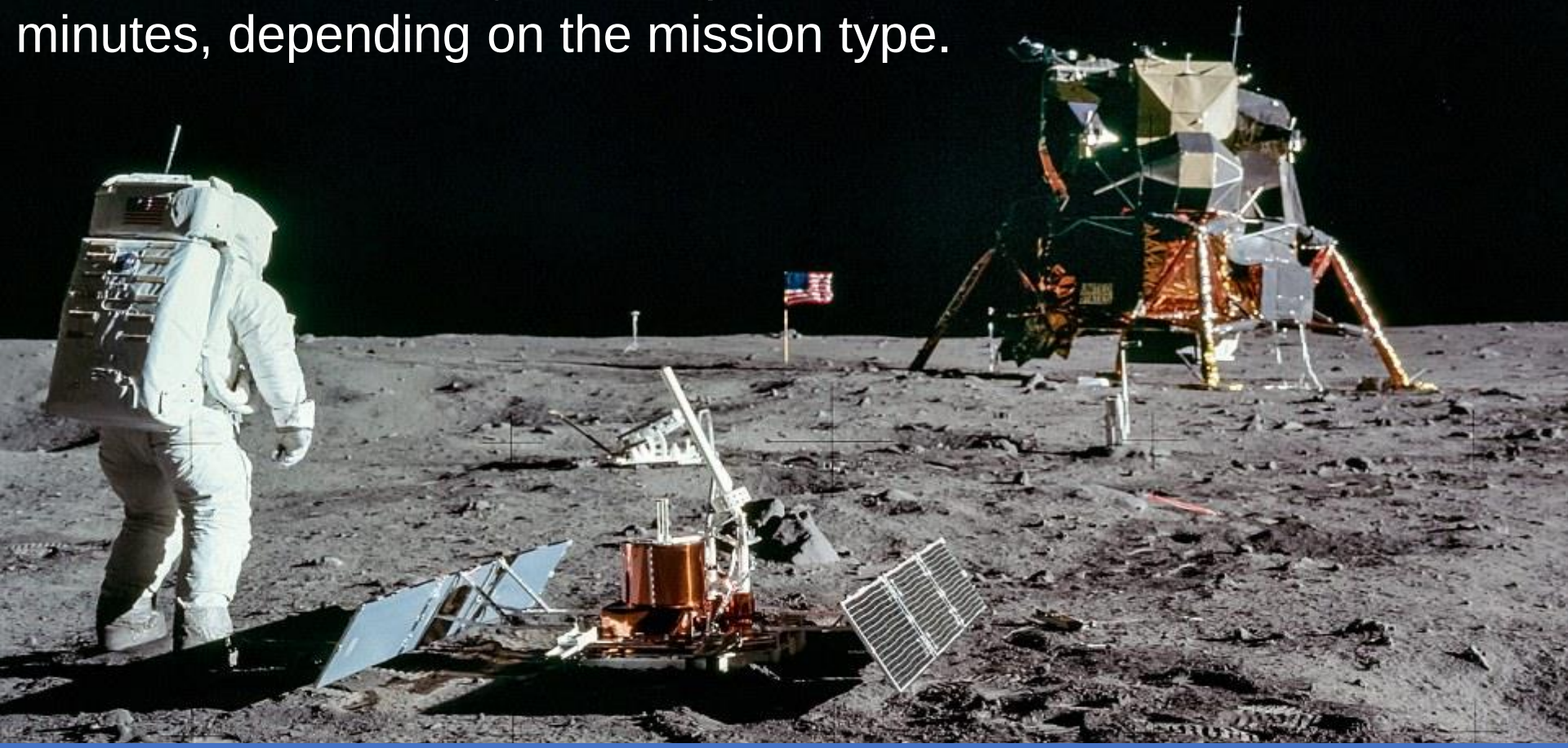


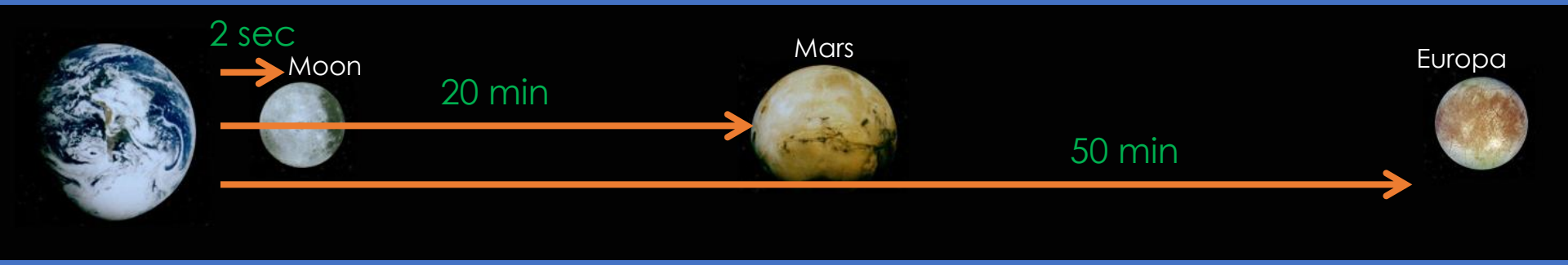


Restricted amounts of water available for the duration of the mission, including <8 min of shower time per week

A Mission Control Center (MCC) is located in Hawaii & Remote support (RS) is provided by volunteers around the world (e.g. ESTEC & ILEWG members).

Communication delays are imposed from several seconds to 20 minutes, depending on the mission type.

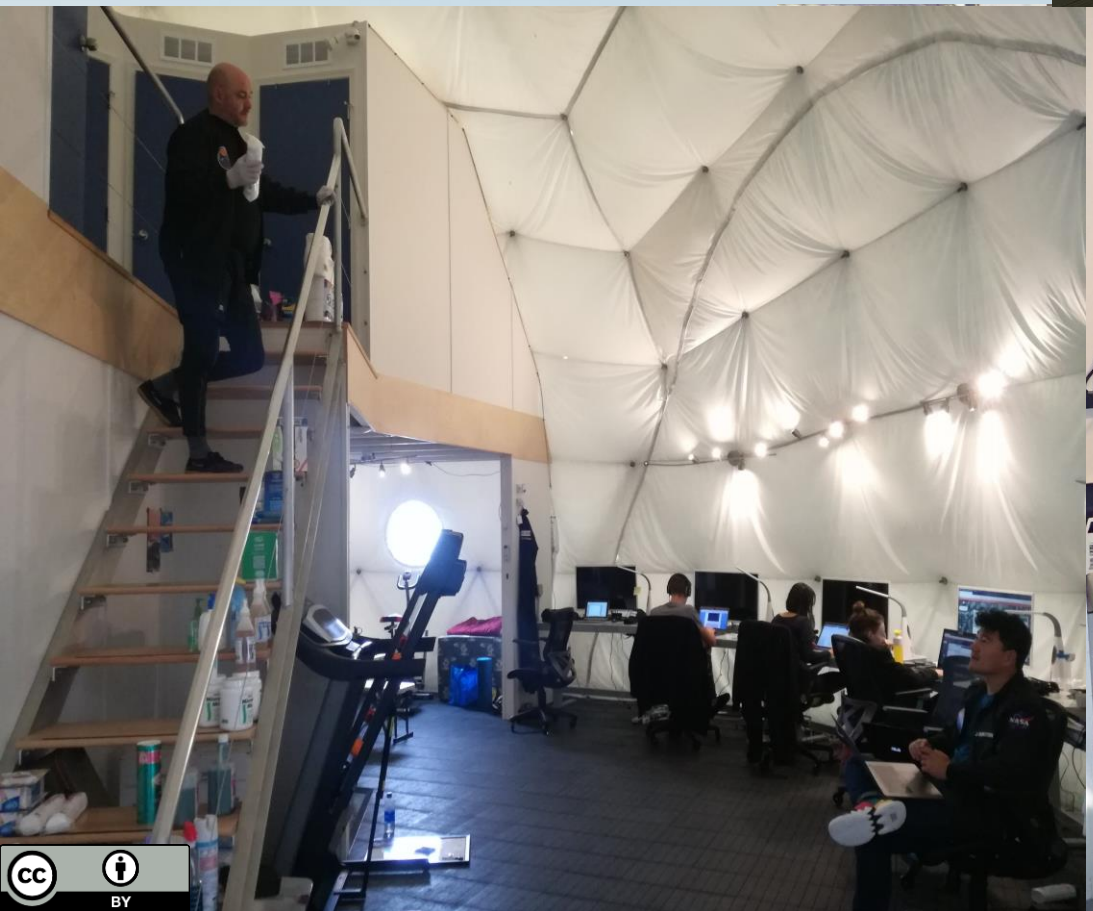




Credit: NASA

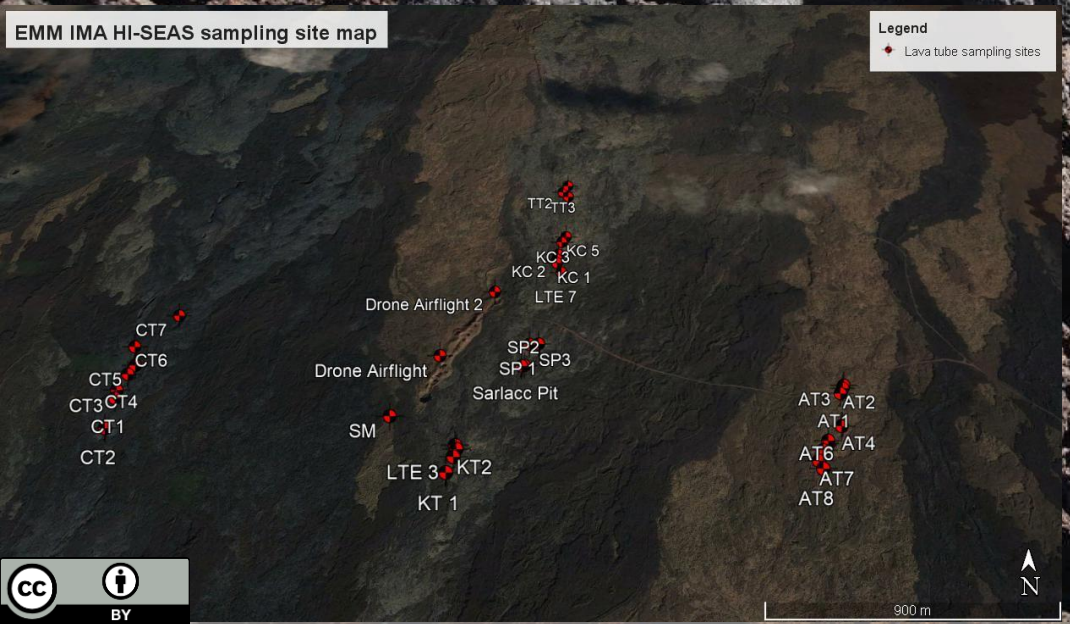
EuroMoonMars IMA HI-SEAS Mission 1 (EMMIHS I) in 2019

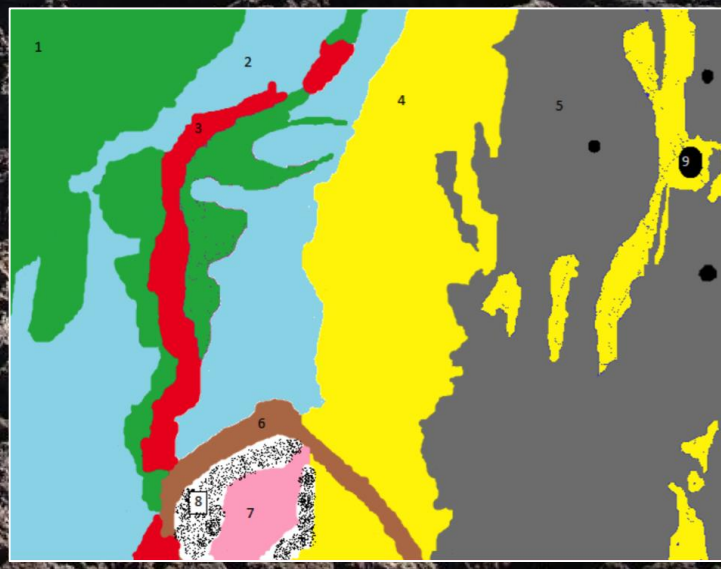
Busy schedule: the analog astronauts have a packed schedule every day, filled with research, technology testing, maintenance work, exercising & limited free time. Their progress is monitored by the MCC & RS.



Daily detailed mission reporting to MCC & RS

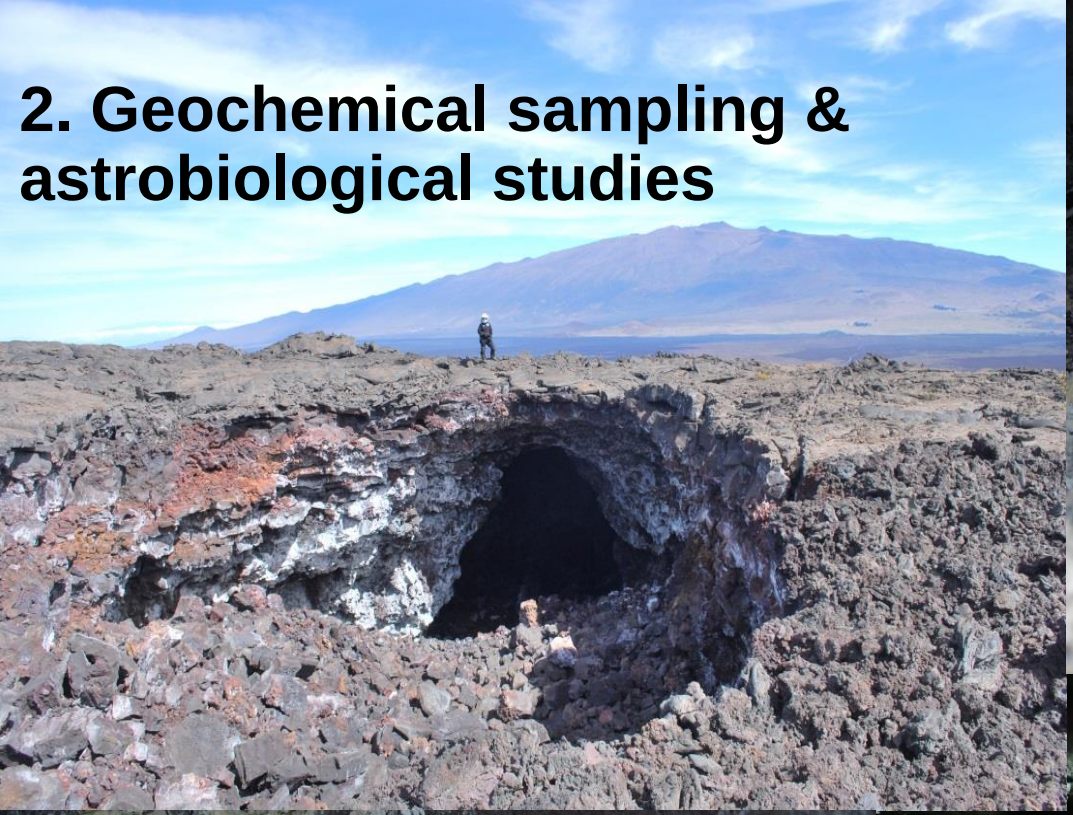
Examples of research performed:
1. Geological research & mapping





Credit: HI-SEAS

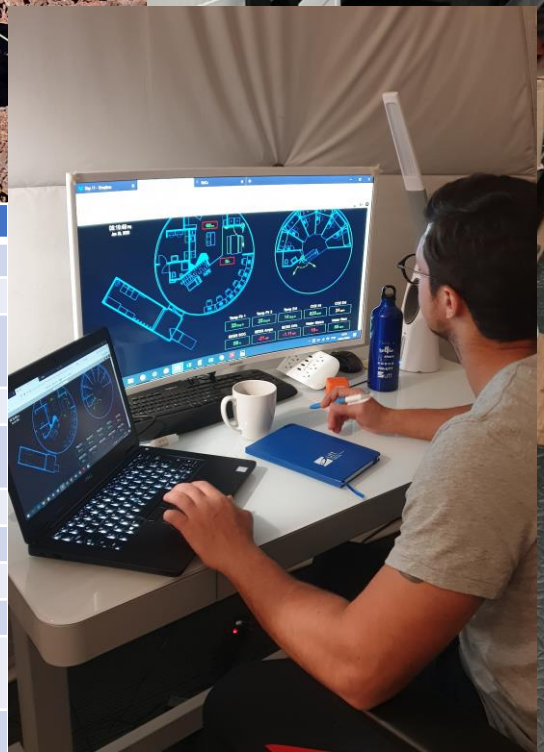
2. Geochemical sampling & astrobiological studies



3. Physiological, psychological & sociological research

Technology testing (including drone, rover and other relevant space mission equipment).

Engineering maintenance performed by the crew engineer(s), such as habitat system monitoring & repairs.



STATUS OF EVA EQUIPMENT (04 MAR 2019 at 20:25 local time):						
Item/Unit	A	B	C	D	E	F
Helmet	Nominal	Nominal	Nominal	Nominal	Nominal	Nominal
SENA headset	Nominal	Nominal	Nominal	Nominal	Nominal	Nominal
Flashlight	Nominal	Nominal	Nominal	Nominal	Nominal	Nominal
EVA suit	Nominal	Nominal	Nominal	Nominal	Nominal	Nominal
Backpack	Nominal					
Phones	Nominal	Nominal	Nominal	Nominal	Nominal	Nominal
Beartooth	Nominal	Nominal	Nominal	Nominal	Nominal	Nominal
	Issue with setup of beartooth group messaging					
EVA Network	Antenna replaced with EVA-NODE1 and functioning. (Ref. EVA-19)					
WiFi	EVA-NODE1			EVA-NODE2		

EMMIHS missions have included a number of student, media & art projects, which have led to the creation of films, TV series & student competitions, etc.

SPACEDROP Episode I: How to Space Quarantine

The research data & findings from HI-SEAS missions are used to help build a prototype Moon base in Hawaii in the near future, and one day an international settlement on the Moon.

Credit: ESA

Mahalo!

Contact information:
Dr. Michaela Musilova
musilova@moonbasealliance.com

Credit: HI-SEAS

References & relevant links

- Hawaii Space Exploration Analog and Simulation, https://hi-seas.org
- International MoonBase Alliance, https://moonbasealliance.com
- Musilova, M., Rogers, H., Foing, B., Sirikan, N., Weert, A., Mulder, S., Pothier, B., Burstein, J., (2019) EMM IMA HI-SEAS campaign February 2019. EPSC Abstracts, EPSC-DPS Joint Meeting 2019, Vol. 13, EPSC-DPS2019
- Rogers, H. and Musilova, M. (2019) How to Live Sustainably on the Moon. Proceedings of the 70th International Astronautical Congress (IAC) by the International Astronautical Federation (IAF), 21-25 October 2019 in Washington DC, USA. Paper IAC-19,A3,2C,11,x52856
- Foing, B. H.; EuroMoonMars 2018-2019 Team, EuroMoonMars Instruments, Research, Field Campaigns, and Activities 2017-2019; 2019LPI....50.3090
- Sirikan, N., Foing, B., Musilova, M., Weert, A., Pothier, B., Burstein, J., Mulder, S., Cox, A., and Rogers, H. (2019) EuroMoonMars IMA HI-SEAS 2019 Campaign: An Engineering Perspective on a Moon Base. Proceedings of the 70th International Astronautical Congress (IAC) by the International Astronautical Federation (IAF), 21-25 October 2019 in Washington DC, USA. Paper IAC-19,A3,2C,9,x54636
- HI-SEAS missions trailer: https://vimeo.com/327837822
- Space Drop film: http://spacedrop.org/