MASE - Mars Analogues for Space Exploration Newsletter

December 2016

From Earth to Mars, towards understanding better the red planet habitability

Assessing the habitability of Mars and detecting life, if it was ever there, depends on knowledge of whether the combined environmental stresses experienced on Mars are compatible with life and whether a record of that life could ever be detected. However, our current ability to make these assessments is hampered by a lack of knowledge of how the combined effect of different environmental stresses influence the survival and growth of organisms. In particular, many combinations of stress, such as high radiation conditions combined with high salt and low temperature, relevant for early Mars, have not been investigated.

> Editorial: in the final stage of the MASE project

2016 has been such a busy year for MASE. The consortium has been very active attending a variety of scientific events, preparing two fieldwork campaigns and submitting the first publications.

Next year will be an exciting and occupied time for MASE since it will officially reach its end. Upcoming activities will encompass a press conference at CNRS Orléans with a focus on fossilisation of microorganisms and how this helps to search for extraterrestrial life. Furthermore, a workshop will be organized in collaboration with the European Astrobiology Network Association (EANA) in Aarhus which will address life from extreme environments and its use in analog studies.

So far, MASE has successfully achieved its objectives, disseminating their activities and results through a variety of communication platforms, establishing new collaborations within the European astrobiology community and leveraging a huge amount of science that it is in the process of being published.

Primarily to serve the scientific community, the MASE team will deliver fundamental information about how analog environments provide focus for sound science, technology testing, and protocol development.

Prof. Charles Cockell
MASE Coordinator

> Earth Analogue Workshop

Last October the MASE project was invited to attend an Earth Analogue Workshop at the Research Executive Agency in Brussels (Belgium).

The high level goal of this Earth Analogue Workshop was to bring together a community that shares common interests, fostering the sharing of best practices and lessons learnt but also exploring the exploitation potential of the projects.

The EAC (ESA European Astronaut Centre) was also invited to this workshop to present their activities and their plans for the expansion of their site but also to explore potential synergies with the invited projects.

Eight European projects were invited:

- Habitat: **SHEE** (Self-deployable Habitat for Extreme Environments) and **REGOLIGHT**
- Human space flight: **EDEN ISS** and **MOONWALK**
- In situ characterisation: **PTAL** (Planetary Terrestrial Analogues Library), **UPCD** (Ultrasonic Planetary Core Drill) and **MASE** (Mars Analogues for Space Exploration)
- Sample curation: **EURO-CARES**

European Commission
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> European Astrobiology Network Association Meeting EANA16

The MASE team attended the EANA 16 meeting in Athens, Greece between 27-30 September 2016 with 6 MASE-related presentations:

- Detecting biochemical evidence for life with the signs of life detector (SOLID)
- Mars Analogues for space exploration - from anaerobic field site to culture collection
- Assessing the habitability of the MASE Mars analogue sites
- Potential for fossilization of an extremotolerant bacterium isolated from a past Mars analog environment
- Metabolic response of Yersinia MASE-LG1 to osmotic stress and ionizing radiation
- MASE isolates refute the supposed correlation between desiccation and radiation tolerance of microorganisms

> Connect with the MASE project

Website
www.mase.esf.org

MASE website is meant at providing information and updates on the project and its progress. This platform also intends to provide news and information on relevant scientific events.

Social media platforms

Research Gate

MASE project is featured on Research Gate , the social networking site for scientists and researchers that allow to share publications and find potential collaborators.

Facebook MASE @MarsAnalogues

MASE project can be followed on the Facebook platform, where project progress is reported along with relevant information to research on life in extreme environments, scientific events and funding opportunities.

Twitter @MarsAnalogues

MASE related events can be followed in Twitter in real time.

> MASE project outlined in the H2020 European Research & Innovation Magazine

Last March, the MASE project was highlighted in the H2020 Research & Innovation Magazine. Our scientific coordinator, Professor Charles Cockell, explained the importance of studying Mars-analogues environments on Earth to better understand habitability in other planets. Read the full article here.

> Upcoming events

- *Astrobiology Introductory Course* from 5-11 March 2017 in Bordeaux, France. Further information.
- *Astrobiology Science Conference (AbSciCon)* from 24-28 April 2017 in Arizona, USA. Further information.
- International interdisciplinary workshop on *"Accretion, differentiation and early evolution of the terrestrial planets"* from 29 May - 3 June in Nice, France. Further information.
- *Earth's Cryosphere: Past, Present and Future* from 4-8 June 2017 in Pushchino, Russia. Further information.
- *International Symposium on Astronomy and Astrobiology Education: theory, methods, impacts and future directions* from 3—8 July 2017 in Utrech, Netherlands. Further information.

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> MASE fieldwork - 1.1 kilometers below Earth's surface at Boulby Mine (UK)

Last July, a team of MASE astrobiologists descended 1.1 kilometers below Earth's surface to the Mars-like environment of the Boulby Mine in the UK looking for answers about life on other planets. This effort was part of a UK Centre for Astrobiology initiative called MINAR (Mine Analogue Research), and took six members of the MASE team to the Boulby mine on the North East coast of England to study ancient formations of honey-comb like hexagonal patterns that were formed 250 million years ago. Similar geological formations have been observed in Mars and the analysis of these rocks will help future space missions to better identify potentially habitable regions.

The objective of the MINAR IV campaign to Boulby Mine was to collect solid samples to study their composition whilst at the same time testing different life-detection instruments that can be used to study salt deposits on Earth and elsewhere.

ESF Press Release: MASE Astrobiologists study Mars-like environments on Earth to better understand extra-terrestrial signs of life

The MASE field campaign at Boulby Mine was featured at the New Scientist and also received broad media coverage in a variety of internet resources:

- New Scientist : Hunting for Mars-like life a kilometer below Earth's surface
- Space.com: Mars-Like Environment Lies Deep Beneath Earth's Surface
- Nature World News: Mars-Like Environment on Earth? Astrobiologist Descend Under for Extra-Terrestrial Studies
- Astrobiology Magazine: MASE Astrobiologists study Mars-like environments on Earth
- UPI: Astrobiologists study Mars on Earth
- Popular Science: What does a mine in England have in common with Mars? Looking for life in weird places
- Space ANSWERS: Mars-like environment on Earth could provide clues in search for life
- Mars Daily: Astrobiologists study Mars on Earth
- Science Newsline-Space & Planetary: MASE Astrobiologists Study Mars-Like Environments on Earth
- Green Area: What's the Mars-like object behing Earth's surface?
- Observatori Astronomic: Los astrobiologos estudian ambientes similares a Marte en la Tierra para comprender major las senales de la vida extraterrestre

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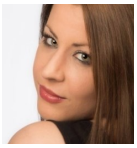
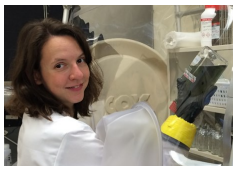
> The MASE growing medium



Alexandra Perras studied Biology in Regensburg and currently she is a PhD candidate at the Medical University of Graz under the supervision of Prof. Christine Moissl-Eichinger. Her focus within the MASE project lies on sampling the Mars analogues sites and cultivating hardy microorganisms. She is also interested in assessing the overall microbial community using bioinformatics and thus revealing potential Mars-analogue candidates. Learn more about Alex's research here.

Euan Monaghan is a postdoc in Pascale Ehrenfreund's astrobiology group at Leiden University. A physicist by training, with a PhD in planetary science, his work focuses on the physicochemical prerequisites of extraterrestrial habitability, as well as the nature and distribution of prebiotic molecules such as amino acids in extreme environments. Within MASE, Euan's work lies on the preparations and implementation of field campaigns to isolate organisms and examine the geological context from which the samples come. Learn more about Euan's research here.

Kristina Beblo-Vranesevic studied Biology at the University of Regensburg (major subject microbiology: focused on the extremophilic microorganisms, mainly heat-loving Bacteria and Archaea). During the experimental part of her diploma thesis she had the possibility to spend some time at the German Aerospace Center (DLR) in Cologne. Afterwards she should be abided by extremophilic microorganisms as well as by space and she did her PhD thesis at the DLR. Since 2011 she works with some breaks at DLR as a scientist, working on different projects. Learn more about Kristina's research here.



Petra Schwendner is a postdoc at the UK Centre of Astrobiology, University of Edinburgh working on the isolation and identification of anaerobic microorganisms in extreme habitats and examining their responses to stress situations. She is also interested in the molecular adaptations of microorganisms to stress and metabolomics. Petra plays a major role in MASE as a scientific coordinator, providing guidance to the consortium members. Learn more about Petra's research here.

Frédéric Gaboyer is a postdoc at the Exobiology team led by F. Westall in the Centre de Biophysique Moléculaire of Orléans. Within MASE, Frederic is leading the artificial microbial fossilization lab experiments, and aims at studying the fossilization process and biosignature preservation and detection using tools such as microscopy (electronic and optical), spectroscopy (RAMAN and Infrared spectroscopy), or mass spectrometry coupled to gas-chromatography. Learn more Frédéric's research here.

Laura García Descalzo is a postdoc in Felipe Gómez´s group at Center for Astrobiology (INTA-CSIC). A biologist by training, Laura obtained a PhD degree in Pharmacy from the University Complutense of Madrid with a major in Microbiology and Parasitology. She studied the molecular adaptation of psycrophiles to changes of temperature and its implication for climate change. Within MASE, Laura is involved in the search and identification of biomarkers in anaerobic samples. Learn more about Laura's research here.

Pauline Vannier is a research scientist in Reykjavík at Matís in the Microbiology group led by Viggó Thór Marteinsson. Her work focuses on the isolation, identification and characterisation of microorganisms and viruses from extreme environments such as hydrothermal vents, subglacial lakes, acidic lakes or polar sea waters. Within MASE, Pauline's work lies on sampling in Icelandic sites and cultivating anaerobic microorganisms. Learn more about Pauline's research here.

Maria Bohmeier studied Biomedical Engineering at the University of Applied Sciences of Aachen, department Jülich. At the German Aerospace Centre (DLR) she had the possibility to do the experimental work for her diploma thesis. Since 2008 she works at DLR as a scientific assistant on different projects. Within MASE, Maria's work lies on the performance and development of different stress tests of hardy microorganisms which were isolated at the different sampling sites during the MASE project. Learn more about Maria's research here.

Moustafa Malki is a postdoc in Molecular Biology Center (CBMSO) in Universidad Autónoma de Madrid and holds a PhD from the same university. His work focuses on molecular microbial ecology and electrochemical techniques to develop microbial fuel cells based on acidophilic bacteria. In the MASE project, Malki's work lies on the isolation of the iron-oxidizing and iron-reducing bacteria from enrichment cultures, physiological characterization of subsurface isolates and the stress analysis of other selected model systems. Learn more about Malki´s research here.

> The MASE natural fossilisation process

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