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Abstract:

The main goal of TA2 (Distributed Planetary Simulation Facility–DPSF) is to give European and international scientist access to seven world-leading laboratory facilities to study planetary analogue materials. The urgent requirement for access to these facilities is that Europe is operating, preparing and planning a fleet of spacecraft to investigate the surface and atmospheric environments and compositions of Mercury, Venus, comets, Mars, Jupiter, Titan and Europa. These disparate bodies are made up of remarkably diverse environments, many totally incomparable to terrestrial conditions. The expanding planetary exploration programme is generating an increasing demand for simulation facilities from European scientific and industrial communities to aid with key mission goals; instrument design; validation of instrument performance; to obtain a better understanding of the physical-geological processes that formed specific planetary environments and the biogeochemical processes that control the likelihood that life could evolve or survive.

All seven facilities have hosted researchers this year. A total of 41 visits representing over 64 working weeks of facility access. A selection of case studies are presented in this report to highlight the high quality and impact of the work that has been undertaken. Of particular note has been a variety of Mars related studies that are associated with the launch next year of NASA Mars2020 and ESA ExoMars2020 missions to the planet.

WP3 - TA 2: Distributed Planetary Simulation Facility - DPSF

1.1 Explanation of the work carried out by the beneficiaries and Overview of the progress

The main aim of the WP3 facilities is to guarantee that TA access is organised and implemented efficiently. The overall goal is to provide the facilities and technical support to generate new data that ultimately results in high quality publications in peer reviewed journals as well as being disseminated to the general public and policy makers. For full details of facilities, please refer to the First Periodic Report.

The seven TA host institutions have all contributed to publicising TA calls at international conferences and through dedicated planetary science and geochemical e-mail forums. Full details of the individual calls completed can be found at the Europlanet2020 RI website along with reports submitted and approved at the completion of each TA2 visit. One funded visit did not take place and a note has been taken of the research group who failed to take up the time that they were allotted.

While it is not possible to include details from all 41 TA2 visits in this summary report, we include a case study from each of the facilities, which gives an overview of the range of research carried out. Comments are made on the expected impact but for details of presentations and publications of results, see section 1.3. Impact.

Note that EPN2020-RI issued a fifth TA call during RP3, here 12 visits were funded to TA 2 facilities led by researchers (8 male and 4 female) from 5 countries (Botswana, Belgium, Germany, Italy and Switzerland) took place to TA 2 DPSF laboratories.

Task 3.1- Planetary Emissivity Laboratory (PEL), Institute for Planetary Research, DLR, Berlin, Germany

There were ten visits to the Planetary Emissivity Laboratory at DLR during RP3, with 5 female/5 male lead applicants, from six countries (Italy, Turkey, Germany, UK, Czech, Botswana).

Table 1 : Visits to PEL facility at DLR during RP3

Proposal number	Access site	Date of visit	Name of visitors	Project Title
18-EPN4-014	PEL/DLR	1-5 Apr 2019	Mehmet Yesiltas, Kirklareli University, Turkey	Thermal Emissivity Of The Tagish Lake Meteorite Under Extreme Temperatures: Implication For The Martian Moon Phobos
18-EPN4-020	PEL/DLR	4-8 Mar 2019	Claudia Pacelli, University of Tuscia, Italy	Fungal Biomarkers Detection By Infrared Analysis
18-EPN4-021	PEL/DLR	29 Oct – 2 Nov 2019	Ashley King, Natural History Museum, UK	Linking CO carbonaceous chondrite meteorites to asteroid parent bodies
18-EPN4-040	PEL/DLR	8-18 Apr 2019	Zucchini Azzurra, University of Perugia, Italy	Carbonates and hydrated carbonates: new insights on the Ceres bright spots.
18-EPN4-062	PEL/DLR	26-30 Nov 2019	Sara Port, Arkansas Center Space and Planetary Sciences, USA	The Effect Of Temperature, Grain Size, And A Loaded Dielectric On Emissivity
18-EPN4-082	PEL/DLR	8-12 Oct 2018	Veronika Kopackova, Czech Geological Survey, Czech Republic	Performance tests on an Optical Particle Counter in Martian environmental conditions
18-EPN4-089	PEL/DLR	11-15 Feb 2019	Jacopo Nava, University of Padua, Italy	Spectral and mineralogical characterisation of laboratory made cryo-material analogues and comparison with spectra of the asteroid Ceres acquired by the NASA-Dawn space mission.
18-EPN5-017	PEL/DLR	13-24 May 2019	Pierre Beck, INAF-IAPS, France	Emissivity Of Hyperfine Particles With Application To Primitive Small Bodies

18-EPN5-028	PEL/DLR	3-7 June 2019	Fulvio Franchi, Botswana International University	Characterization Of The Botswana Meteorites From The Asteroid 2018la
18-EPN5-030	PEL/DLR	24-28 June 2019	Sabrina Ferrari, University of Padova	Graphite Effects On Vis-Tir Spectral Properties Of Silicastic Material Under Hermean Conditions

TA 2 Planetary Emissivity Laboratory Case Study

To provide an example of the quality and impact of just one of the projects at PEL, one of the visits is discussed in detail.

Project: 18-EPN4-021 - Linking CO carbonaceous chondrite meteorites to asteroid parent bodies
Applicant: Ashley J. King, Department of Earth Sciences, Natural History Museum, London, UK
Date of visit: 29 October - 2 November 2018

Carbonaceous chondrite meteorites provide a detailed record of the geological processes and events that have shaped our solar system over the last 4.5 billion years. The CO ("Ornans-like") carbonaceous chondrites experienced varying degrees of thermal metamorphism due to the decay of radiogenic elements accreted into their parent asteroid(s).
In this TNA visit ultraviolet (UV), visible, near- and mid-infrared (IR) reflectance spectra were collected from 12 CO carbonaceous chondrites that experienced varying degrees of thermal metamorphism. These meteorites have been linked to the rare K-type asteroids, or might be good analogues for the types of material found on the surfaces of primitive C-type asteroids. In order to relate spectral features to mineralogical and chemical properties, spectra (0.4 – 25 μm) were collected from the same meteorite powders for which the bulk modal mineralogy had previously been determined. To allow direct comparison to observations of asteroids by current and upcoming space missions, each meteorite was analysed at a range of phase angles.
The visible and near-IR spectra of CO chondrites are generally featureless. However, there are variations in the spectral slope that can be related to a combination of parent body thermal metamorphism and terrestrial weathering. This observation is further supported by differences in the intensity of the 3 μm band depth that we attribute to variations in the abundance of –OH/H2O in the CO chondrites. In the mid-IR there are strong absorption bands from silicates. The effects of weathering are less significant in this region and the features are largely caused by thermal metamorphism. Work is underway to correlate these features to the known properties of the meteorites, which will enable the nature and degree of alteration on the surfaces of primitive asteroids to be inferred remotely, and provide context for spectra collected by the Dawn, Hayabusa-2 and OSIRIS-REx missions.

Results will be presented in future conferences, among them the Hayabusa-2/OSIRIS-Rex Workshop in November 2019. At least one publication is planned.

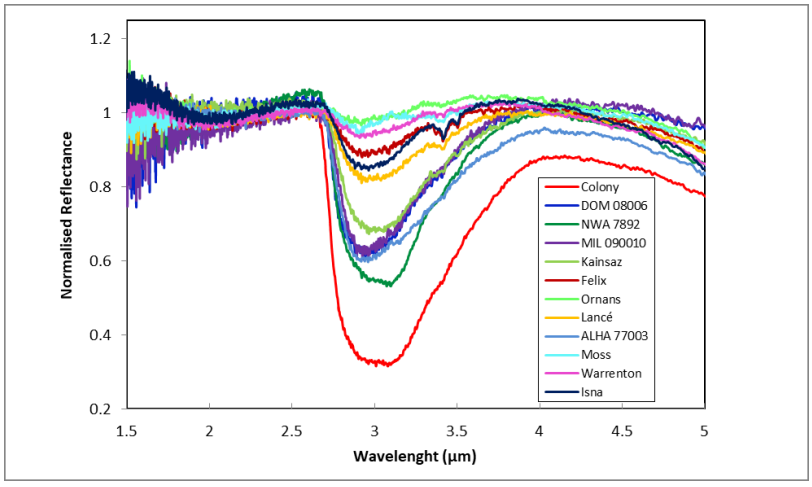

Figure 1 Reflectance spectra showing the 3 μm feature, which is attributed to the presence of –OH/H2O in these meteorites.

Almost all of the recent visits to PEL have produce high quality data that will result in a dedicated publication with 8 papers currently in preparation. There have been numerous presentations at LPSC, EPSC, AGU and other more specialist meetings, and future presentations are planned at conferences/workshops, including the forthcoming EPSC.

Task 3.2- Interactive Microbiome Research Facility (IMRF) Medical University Graz (MUG), Centre for Medical Research (ZMF), Graz, Austria.

There were eleven visits to the Interactive Microbiome Research Facility at MUG during RP3, with 6 female/5 male lead applicants, from 8 countries (Italy, Finland, Sweden, Germany, Poland, Spain, Portugal, USA).

Table 2: Visits to IMRF facility at MUG during RP3

Proposal number	Access site	Date of visit	Name of visitors	Project Title
18-EPN3-031	IMRF/MUG	25-27 Apr 2018, and 10- 18 Apr 2019 (10)	Jenni Hultman (PI), visitors: Igor Pessi, Sirja Viitamaki, University of Helsinki, Finland	Microbial diversity and selection of key members for single cell sequencing from arctic soils
18-EPN3-077	IMRF/MUG	22 Jul – 2 Aug 2019 (10)	Natuschka Lee (PI), visitors: Stephanie Pierce, Payraudeau Simon, Umeå University, Sweden	The Microbiome And The Role Of Symbiosis In Photot
18-EPN4-016	IMRF/MUG	1-9 Apr 2019 (5)	Ana Miller, IRNAS-CSIC, Spain-Portugal	Halophiles From Mars-Analogue Salt Caves In The Atacama Desert
18-EPN4-051	IMRF/MUG	8 – 19 Oct 2018 (10)	Rychert Krzysztof, Pomeranian University in Slups, Poland	Microbial Community In Dune Sand Of Low Organic Content
18-EPN4-054	IMRF/MUG	25 Feb – 1 Mar 2019 (5)	Sirio Consani, and Alessio Borello, University of Genoa, Italy	Microbial and fungal composition of secondary loose precipitate related to Acid Mine Drainage
18-EPN4-066	IMRF/MUG	25 Feb – 1 Mar 2019, and 1-5 July (10)	Ralf Moeller (PI), visitor: Erika Muratov, Institute of Aerospace Medicine, Germany	Determination of the human skin microbial diversity during the long-term bed rest study AGBRESA
18-EPN4-072	IMRF/MUG	25 Feb – 1 Mar 2019 (5)	Parag Vaishampayan, NASA, USA	from ultra-deep subsurface Boulby Mine, UK: implications for biosignature detection on Mars.
18-EPN4-081	IMRF/MUG	26-30 Aug 2019 (5)	Gregory Farrant (PI), visitor: Pauline Vannier, MATIS, Iceland	Astronomes: Genomes From Volcanic Subglacial Lakes
18-EPN4-088	IMRF/MUG	25 Feb – 1 Mar 2019 (5)	Ilenia Maria D'angeli (PI), visitor: Daniele Ghezzi,, University of Bologna, Italy	Metagenomic Analysis On Acidophilic Biofilms Found In Santa Cesarea Terme, A Peculiar Still Active Sulfuric Cave System (Apulia, Italy)
18-EPN5-022	IMRF/MUG	20-28 May 2019 (7)	Martina Cappelletti, University of Bologna, Italy	Metagenomic analysis of speleothems from the quartz-sandstone cave Imawarí Yeuta to unveil microbial functions and genome features associated to silica solubilization processes
18-EPN5-031	IMRF/MUG	20-23 May 2019 (4)	Ilenia D'angeli (PI), visitor: Daniele Ghezzi, University of Bologna, Italy	Microbial Diversity Within Snottites Collected From Different Hypogene And Epigene H2s-Rich Caves

TA 2 Interactive Microbiome Research Facility Case study

To provide an indication of the work conducted at the Interactive Microbiome Research Facility, one of the visits is discussed in detail.

Project: 18-EPN4-088 - Metagenomic Analysis On Acidophilic Biofilms Found In Santa Cesarea Terme, A Peculiar Still Active Sulfuric Cave System (Apulia, Italy)
Applicant: Ilenia D'Angeli, Department of Biological, Geological and Environmental Sciences, Bologna, Italy
Date of visit: 25 February -1 March 2019

Fetida Cave is an active sulfuric acid cave influenced by seawater, situated in the Adriatic coastline of the Apulia region, in Italy. This cave hosts abundant microbial communities that organize themselves in collective structures within three types of microbial-rich deposit, i.e. white filaments, vermiculations and moonmilk. White filaments are located both on the water surface and settled in the bottom of the water ponds, whereas vermiculations and moonmilk mostly develop on the walls and ceiling of the cave. There were strong differences in pH and mineralogical composition among these deposits. In particular, moonmilk was completely composed of gypsum and showed extremely acidic pH (0-1), whereas vermiculations contain high amounts of different chemical elements that were correlated with their colour.
The present Europlanet project was aimed at performing shotgun metagenomics sequencing on samples belonging to the three different deposits collected from Fetida Cave in October 2018. In parallel, MiSeq Illumina sequencing targeting V4 region of 16S rRNA gene was performed in order to combine the metagenomics data with the taxonomy of the microbial communities. This approach will provide insights into the role of sulfur-oxidizing and sulfur-reducing bacteria and archaea in the speleogenesis of Fetida cave, with clues in the processes of development of the peculiar sulphur-rich biodeposits. Further analyses will be performed in order to associate the 16S rRNA gene analysis with the metagenomics data.
A publication is currently being prepared that incorporates all the results of this visit.

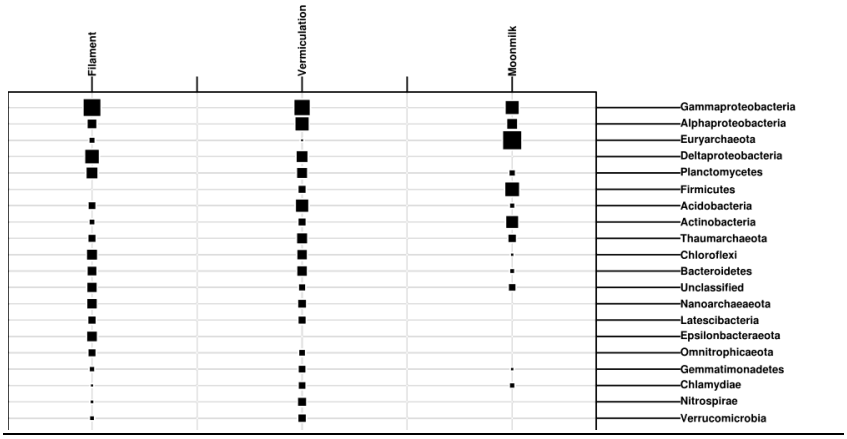

Figure 2 Shows the main microbial phyla or classes that compose the different biodeposits collected from Fetida cave.

Task 3.3- Planetary Environment Facilities (PEF) at Aarhus University, Denmark

There were Five visits to the Planetary Environment Facilities at Aarhus during RP3, with two female/three male lead applicants, from four countries (France, Switzerland, Italy, USA). To provide an indication of the work conducted at PEF, one of the visits is discussed in detail.

Table 3 : Visits to PEF facility at Aarhus during RP3

Proposal number	**Access site**	**Date of visit**	**Name of visitors**	**Project Title**
18-EPN4-007	PEF /AU	7-11 Jan 2019 (5 days)	Philippe Claudin, Bruno Andreotti, PMMH - ESPCI – CNRS, France	The Dynamics Of Sand Transport (saltation) Under Martian Conditions
18-EPN4-012	PEF /AU	15-24 Oct 2018 (8 days)	Zurine Yoldi, Clemence Herny, Bern University, CH	Wind Tunnel Experimentation Of Ice Particle transport in a Martian-like environment
18-EPN4-068	PEF /AU	4-8 Mar 2019 (5 days)	Professor Laurence Stuart, Shaun Skinner, Arun Mangalam, University of Maryland, USA	Calibration of hot- and cold-wire probes for Martian and high-altitude terrestrial applications
18-EPN4-006	PEF /AU	8-12 Apr 2019 (5 days)	Naomi Murdoch, Baptiste Chide, Anthony Sournac, Université de Toulouse, France	Characterisation Of The Mars Microphone For atmospheric studies on the Mars 2020 mission
18-EPN4-084	PEF /AU	20-23 May 2019 (5 days)	Giuseppe Mongelluzzo, Cesare Molfese, Gabriele Franzese, Alberto Martin Ortega Rico,	Performance tests on an Optical Particle Counter in Martian environmental conditions

			INAF-IAPS, Italy	

TA 2 Planetary Environment Facility Case Study

Project: 18-EPN4-006 - Characterisation of the Mars Microphone For atmospheric studies on the Mars 2020 mission

Applicant: Naomi Murdoch, Baptiste Chide, Anthony Sournac, Université de Toulouse, France

Date of visit: 8-12 April 2019

The Mars 2020 mission will launch a single Rover that will land on, and explore, the surface of Mars as part of the NASA Mars Exploration Program. The SuperCam instrument suite on board the Mars2020 rover will include the Mars Microphone (provided by ISAE-SUPAERO in France) to support the Laser Induced Breakdown Spectroscopy (LIBS) investigation of soils and rocks on Mars. In addition to supporting the LIBS investigation, the Mars Microphone will also contribute to basic atmospheric science studies such as studying the Martian wind properties, convective vortices and dust devils.
The Aarhus Mars chamber AWTSII was used to: (1) study the low Reynolds number incompressible flow generated by the Martian wind in the immediate environment of the SuperCam instrument and, in doing so: (2) calibrate the Mars Microphone for making wind speed and direction measurements on the surface of Mars.

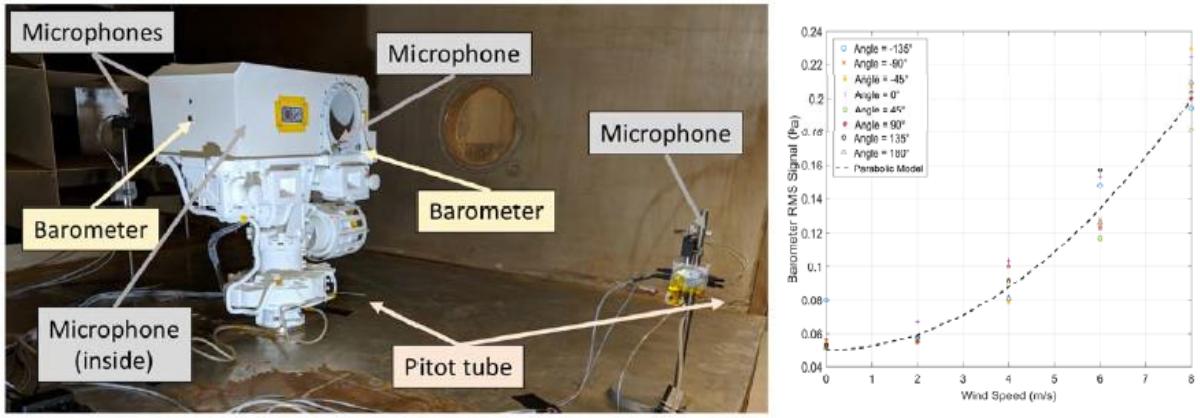

Figure 3- Photograph (left) of the Mars2020 Supercam instrument within the AWTSII facility being calibrated/tested. Plot (right) shows RMS measurements of the front pressure sensors for varying wind speed in a Martian atmosphere at several SuperCam angles.

The preliminary results show that both the absolute pressure (measured by the barometers) and RMS pressure (measured by the barometers and microphones) increase with the square of the wind speed. Also at high frequencies (microphone measurements) the RMS pressure is sensitive to the wind incidence angle.

This work will be initially presented at the EPSC-DPS2019; "Studying the Martian Winds using the Influence of the Supercam Wake Flow Regimes on the Mars2020 Microphone", Yannick Bury, Baptiste Chide, Naomi Murdoch, Alexandre Cadu, David Mimoun, and Sylvestre Maurice. The work is expected to be part of a publication associated with the completion of the instrument design and delivery for the Mars 2020 mission.

Task 3.4- Cold Surfaces spectroscopy facility (CSS), Institut de Planétologie et d'Astrophysique de Grenoble (IPAG), Grenoble, France

There were 7 visits to Cold Surfaces Spectroscopy facility at Grenoble, France, during RP3, with 3 female/4 male lead applicants, and a total of 17 visitors from four countries (France, Germany, Italy, UK). To provide an indication of the work conducted at CSS, one of the visits is discussed in detail below.

Table 4: Visits to CSS facility at IPAG/CNRS during RP3

Proposal	Access site	Date of visit	Name of visitors	Project Title

number				
18-EPN4-033	CSS /IPAG	15-26 Oct 2018	Mauro Ciarniello, INAF-IAPS, Italy Gianrico Filacchione, INAF-IAPS, Italy Vassilissa Vinogradoff, Aix-Marseille University, France Ljuba Moroz, Univ. of Postdam, Germany	Spectral Analysis Of Mixtures With Pyrrhotite-Ice-Kerite (SAMPIK) As Analogues For Cometary Surface Composition
18-EPN4-039	CSS /IPAG	18-22 Feb 2019	Anna Galiano, INAF-IAPS, Italy Fabrizio Dirri, INAF-IAPS, Italy	Vis-Nir Reflectance Analysis Of Ceres Analogue Mixture At Different Grain Size To Characterize The Physical Properties Of Crater Central Peak Material (ccp) On Ceres
18-EPN4-056	CSS /IPAG	21-25 Jan 2019	Alessandro Maturilli, DLR, Germany Tanja Michalik, DLR, Germany Katharina Otto, DLR, Germany	The Dependence of Spectral Features on Ice Content and Temperature for Vesta and Ryugu
18-EPN4-070	CSS /IPAG	12-16 Nov 2018	Jacqueline Campbell, UCL, UK	Laboratory analysis of Martian Recurring Slope Lineae (RSL)analogues for comparison with CRISM observations for detection of polycyclic aromatic hydrocarbons
18-EPN5-040	CSS /IPAG	5-10 May 2019	Federico Tosi, INAF-IAPS, Italy Simone de Angelis, INAF-IAPS, Italy	Characterization of Hydrated Na-Sulfates at Cold Planetary Conditions
18-EPN5-049	CSS /IPAG	18-28 Mar 2019	Katrin Stephan, DLR, Germany Mauro Ciarniello, INAF-IAPS, Italy David Haack, DLR, Germany Andrea Raponi, INAF-IAPS, Italy	Spectral Analysis Of H2O Ice Samples Depending On Particle Size And Temperature For Icy Satellites' Physical Surface Properties
18-EPN5-057	CSS /IPAG	15-26 Apr 2019	Stefan Schroder, DLR, Germany	An Experimental Investigation Of The Nature Of Ceres Blue Material Using A Ceres Surface Analogue

TA 2 Cold Surfaces Spectroscopy Facility Case study

Project: 18-EPN4-056 - The Dependence of Spectral Features on Ice Content and Temperature for Vesta and Ryugu

Applicant: Alessandro Maturilli, Tanja Michalik, German Aerospace Center, Germany

Date of visit: 21-25 Jan 2019

The aim of the TA visit was to see how optical-IR reflectance spectra change with temperature, abundance and degree of sublimation of the ice to explain observed colour anomalies of ice related to morphologic features on asteroid Vesta.

Spectra were measured (0.4 -4 μm) at different temperatures (100 K – 270 K) for different mixtures of ice (grain size 67 μm) and hypersthene (grain size 63-125 μm) as analogue for Vesta surface. Additionally, some of the measurements were repeated with MMX Phobos analogue material instead of hypersthene. The results show, that the temperature has an effect on the appearance of the spectra, as well as the degree of sublimation.

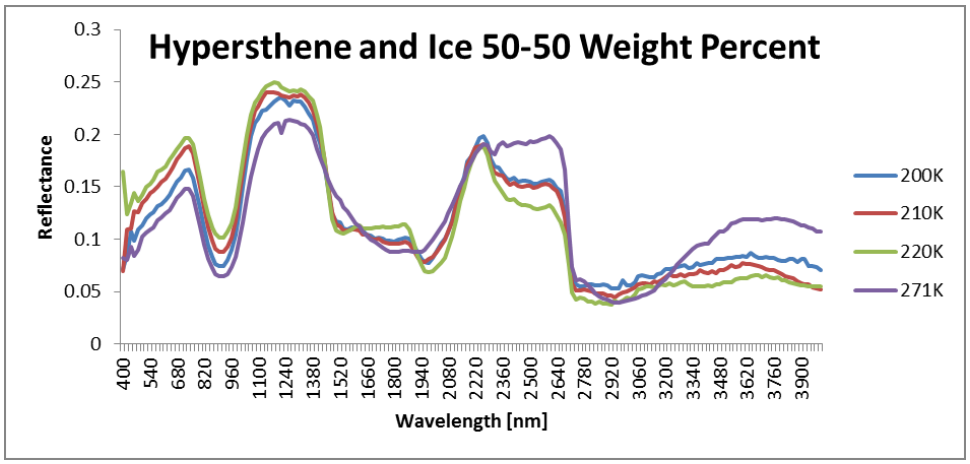

Figure 4- Reflectance spectra taken at different cryogenic temperatures for a 50:50 mixture of hypersthene ice (63-125 μm) and dust.

This work was presented at the 50th Lunar and Planetary Science Conference, March 2019, and will be at the upcoming EPSC-DPS joint meeting in September. A publication with the results of this TA visit is foreseen.

Task 3.5- High-Pressure, High-Temperature Laboratory (HPHTL), Geology and Geochemistry, VU University Amsterdam.

There was one visit to the High-Pressure, High-Temperature Facility at VUA during RP3, a male guest from Belgium. His visit is outlined below.

TA 2 VUA HPHT Facility Case Study

Project: 18-EPN5-009 - The role of sulfur on the magmatic differentiation of Mercury
Applicants: Bernard Charlier, Hadrien Pirotte, University of Liege, Belgium
Date of visit: 13th May to 4th June 24 days; Note that due to the long duration of the laboratory experiments, the laboratory is required to operate full time (24/7), including weekends.

Mercury is rich in sulfur (~3% on the surface). During the early history of the planet, sulfur had an important effect on its differentiation. One of the key effects of S concerns the partitioning of heat producing elements U, Th and K between sulfides and silicate melt. Under the reducing conditions of Mercury, sulfur forms sulfides (MgS, CaS, FeS,…) in the mantle. In addition, a layer of FeS could be present between the outer core and the mantle. It is therefore of great importance to know where these heat producing elements were stored in order to understand the thermal evolution of the planet.

As the pressure of the mantle-core boundary should be around 6 GPa, the multi-anvil apparatus at HPHTL was used to gather data at this pressure. Seven experiments were carried out at 6 GPa and 1700°C, with different oxygen fugacity. Four of them succeeded. All the successful experiments show quenched silicate melts, FeSi and FeS globules. These experimental results will be used to complete an existing low-pressure data set of the partitioning of heat producing elements on Mercury, and help understand the geological evolution of the planet in preparation for the interpretation of Bepi-Colombo mission data.

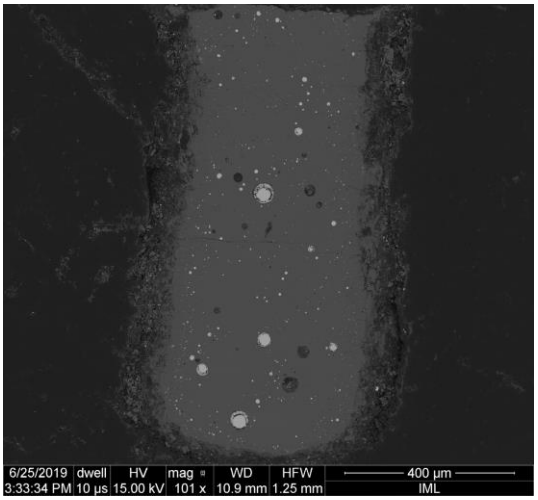

Figure 5- Experiment A046, produced during the TA visit. The quenched silicate melt is filled with FeSi globules (white) surrounded by FeS. The dark material surrounding the sample is the graphite capsule.

Results of the TA visit are currently being incorporated in a peer-reviewed paper as well as a PhD thesis, and are to be presented at the 2020 EPSC conference and a September 2019 international Mercury meeting in Brussels.

Task 3.6- Large Mars Chamber Facility (LMCF), Open University, Milton Keynes, United Kingdom

There were 3 visits to the Large Mars Chamber Facility at the Open University during RP3, with two female/one male lead applicants, from 3 countries (France, Switzerland, Czech). To provide an indication of the work conducted at LMCF, one of the visits is discussed in detail below.

Table 6: Visits to LMCF facility at the OU during RP3

Proposal number	Access site	Date of visit	Name of visitors	Project Title
18-EPN4-018	LMCF/OU	12 Nov – 7 Dec 2018	Petr Broz, Czech Academy of Science, Czech	Behaviour And Propagation Of Mud On The Surface Of Mars
18-EPN4-025	LMCF/OU	11 Jan – 15 Feb 2019	Susan Conway, Université de Nantes, France	Sediment Transport By Metastable Brines On Mars
18-EPN5-051	LMCF/OU	17 Jun – 12 Jul 2019	Clemence Herny, Bern University, CH	Microbial Community In Dune Sand Of Low Organic Content

TA 2 Large Mars Chamber Facility Case Study

Project: 18-EPN4-018 - Behaviour and propagation of mud on the surface of Mars
Applicant: Petr Brož, Ondřej Krýza, Institute of Geophysics of the Czech Academy of Science, Czech republic
Date of visit: 12 Nov – 7 Dec 2018 (20 days)

The aim of this visit was to reveal how mud would behave and propagate on the surface of Mars and hence help to answer the question whether the mud volcanism could actually operate on the red planet, in the past or today. To achieve this goal analogue experiments were performed with a mud in the large Mars chamber at the Open University (UK) in several parameters that affect the ability of the mud to move were varied systematically. This approach led to a better understanding of the behaviour of such mixtures in the Martian environment.

The obtained results showed that mud would behave very differently in the environment compared to the mud extruded on the surface of Earth. The specific Martian environment, namely the low pressure and low temperatures, would cause the activation of several processes which are not commonly present on Earth during mud flow. These processes significantly affect the ability of the mud to move over the

Martian surface and also change the way mud would move. The results suggest that these variations in the mud propagation may also affect the final morphologies on the larger-scale and therefore Martian mud volcanoes may actually vary in morphology compared to their terrestrial counterparts. Therefore this study showed again that care must be taken in comparing a surface topology features formed under different environments.

Figure 6: Simulated viscous flow under Mars conditions.

This work has been presented at the Lunar and Planetary Sciences Conference 2019 (https://www.hou.usra.edu/meetings/lpsc2019/pdf/1511.pdf and https://www.hou.usra.edu/meetings/lpsc2019/pdf/1769.pdf), and will be presented at the 2019 joint EPSC/DPS conference as both a talk (EPSC-DPS2019-122) and a poster presentation (EPSC-DPS2019-123). The TA visit has also recently been submitted as a paper to *Nature Geosciences* and is currently under review.

Task 3.7- Petrology-Mineralogy Characterisation Facility (PMCF), Mineral and Planetary Sciences Division, Natural History Museum, London, UK

There were 4 visits to the Petrology-Mineralogy Characterisation Facility at the Natural History Museum during RP3, with 3 female/1 male lead applicants, from 3 countries (Italy, Switzerland, and Germany). To provide an indication of the work conducted at PMCF, one of the visits is discussed in detail below.

Table 7: Visits to PMCF at NHM during RP3

Proposal number	Access site	Date of visit	Name of visitors	Project Title

18-EPN4-019	PMCF/NHM	8-12 Oct 2018	Mara Murri, University of Pavia, Italy	Cathodoluminescence as a tool for unravelling shock features of diamonds from impact craters
18-EPN4-047	PMCF/NHM	17-21 Sep 2018	Daniela Weimer, ETH Zurich, CH	The Effect Of Aqueous Alteration On Primordial Noble gases in CM and other carbonaceous chondrites.
18-EPN4-077	PMCF/NHM	5-14 Mar 2019	Tanja Mohr-Westheide, Museum für Naturkunde Berlin, Germany	Advanced Pre-Characterisation And Quantification of impact generated platinum-group element alloys from Archean spherule Layers
18-EPN5-016	PMCF/NHM	29 Apr- 3 May 2019	Andrea Columbu, University of Bologna, Italy	Silica Stromatolites From Cave Environments And Implications For Silica Subsurface Deposits On Mars

TA 2 Petrology-Mineralogy Characterisation Facility Case Study

Project: 18-EPN5-016: Silica stromatolites from cave environments and implications for silica subsurface deposits on Mars

Applicant: Andrea Columbu, Francesco Sauro, University of Bologna, Italy

Date: 29 Apr – 3 May 2019

The final results of this TA activity, once all data will acquired and processed, will be useful for a better characterization of presumed signals of life-forms from silica deposits already detected on the surface of Mars or that could be found in the subsurface through the ExoMars Drill unit.

The preliminary results of the analyses carried out at the NHM offer an insight on the micromorphology of the stromatolites-like silica deposits from Imawarì Yeuta Cave (Venezuela), and the close relation between microbial activity and silica mobilization.

CT scan analyses have been performed on 8 stromatolite-like amorphous silica speleothems from Imawarì Yeuta Cave (samples ID: AK2, AK10, AK12, AY318, AY400, GC2, IMA, Ror-sur (Figure 6a). This allowed visualizing their 3D mineral/biological assemblage, and interaction between inorganic (e.g. silica) and organic (e.g. microbial community) realms. Indeed, most of the speleothems appear to be composed by layers of microbial mats covered by silica, while some of them indicated preliminary evidence of biological induced silica weathering and re-deposition.

Figure 6a:

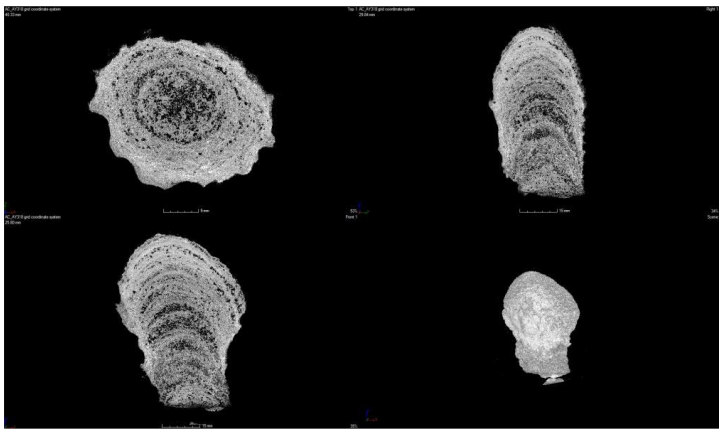

Figure 6b

Figure 6 a: Giant deposits of opaline silica with concentric growth bands completely covering the orthoquartzite walls of the cave (photo La Venta/V. Crobu). 6b b- CT scan preliminary image of AY318. Note the stromatolite-like layering structure.

A paper reporting the findings of this research is in preparation for Sedimentary Geology: Sauro et al: Microbial diversity and biosignatures of amorphous silica deposits in orthoquartzite caves.

1.2 Impact

The international impact of TA2 has been substantial and will be discussed in detail in the final report. There were 28 non EU applications (Botswana, Ethiopia, Israel, India, South Africa, Turkey, US) and 20 applications from Under Represented States (Czech Republic, Greece, Hungary, Poland, Romania). Visits have resulted in many presentations at workshops, conferences and seminars, including Lunar and Planetary Science Conference, EGU. The session LFI2 "The distributed planetary simulation and sample analysis facilities" at EPSC has showcased research enabled through the first three calls of TA2, including six oral presentations and four posters at EPSC 2017. A special session dedicated to presentations of work performed in TA2 program of EPN2020 RI was held at EPSC 2018 in Berlin, including six oral presentations and 11 posters. Multiple presentations are scheduled for a dedicated session on laboratory applications in support of planetary missions at EPSC 2019 in Geneva.
Details of publications arising from the work are on the website and will be discussed and analysed in detail in the final report.