MERIT REPORT OF A LAUREATE
TEAM PROGRAMME

Project title:	**Mars: another planet to approach geoscience issues**		
Reporting period:	from **01.11.2013** to **30.04.2014**	**Period no.**	6
Agreement No.:	**TEAM/2011-7/9**	from **01.09.2011** to **30.06.2015**	
Laureate:	**Daniel MEGE**		

ATTENTION: the information given below should regard only the realization of the project in the reporting period indicated above.

1) INFORMATION CONCERNING THE PROGRESS OF THE RESEARCH (from 1000 to 5000 words)

a) The progress of the research tasks

Research Task 1 – A Valles Marineris synthesis

After the background CTX mosaic of Valles Marineris has been completed (see report 5), geologic mapping has started in the western part of Valles Marineris (Ius and Tithonium chasmata plus the western Melas Chasma). The layers include the spurs from the so-called "spur-and-gully morphology" (alpine-type mountain landform), landslide morphologic types, and dune fields. Dune field has been time-consuming, as two thousands fields have been identified so far.

Research task 2 – Diagnostic climate signatures of basalt alteration on Earth and Mars

As expected, the first Scanning Electron Microscopy (SEM) analysis of the basalt samples have been conducted during Period 6 in order to complement the AFM analyses in terms of rock structure, as well as for local identification of rock mineralogy because the images obtained in BSE and using AFM differ considerably in resolution. It was critical that the sample areas studied by AFM and SEM are the same: only this way can the nanoscale information provided by AFM be compared to alteration features reported in the literature from observations from conventional methods, and interpreted. The sample areas studied in AFM were marked with a diamond stylus for easy identification with SEM. AFM studies were conducted under atmospheric pressure at room temperature in the contact mode. BSE images were taken under low pressure (30 Pa), at an accelerating voltage of 30 kV.

Research task 3 – Deep-seated gravitational spreading on Mars and Earth

This task is twofold: (1) Quantification of gravitational spreading of topographic ridges on Mars from orbital imagery (Mars) and study of terrestrial analogues from field work; (2) Numerical simulations of the geologic processes involved.

- ***Quantification of topographic ridge spreading*** **–** This period was devoted to statistical analysis of the GPS and WADGPS data obtained on spreading topographic ridges in the Tatra Mountains during the field work conducted in the Tatra mountains during Period 5, and writing a research article on the use of such data for quantitative geomorphology purposes. During field work, in addition to topographic measurements of gravitationally unstable ridges, a test topographic across one of the Tatra mountain ridges was measured 16 times in order to evaluate measurement reproducibility using different GPS configuration settings: GPS vs WADGPS, influence of GPS disconnection, satellite configuration, and changing weather on measurement accuracy.

- ***Numerical simulations*** **–** Modelling of gravitational spreading was performed in Wrocław and in Montpellier, using the finite element code ADELI. Three possible slope destabilization factors have been considered that may contribute to gravitational spreading: (1) Glacier loading then unloading; (2) Activation of pre-existing faults, joints, pore water pressure; (3) rock anisotropy by layering.

Research task 4 – Landslides on Mars and Earth

At the end of Period 6, the first draft of the article started by PhD student Timur Borykov during Period 5 has been completed. It is now in the hands of the co-authors. The article presents a 3D discrete element simulation (DEM) of the axisymmetric and planar (sidewalls) spreading of initially vertical granular columns, in which the runout of the grains and their dynamic motion are continuously monitored during the course of collapse, in order to understand better detailed processes of landslide propagation on Earth and Mars.

Research task 5 – Thermal properties of Martian landforms

This task has been redefined in order to account for the field of expertise of Marta Kubiak, the FNP postdoc that was recruited in November 2013 to replace Antoine Séjourné.

The other research tasks focus on interpretations of geological mechanisms and processes operating on Earth and Mars. The recruitment of Marta Kubiak gives the group the opportunity of complementing these approaches by studying the thermal properties of the same rocks from orbital thermal sensors. These properties depend on rock composition and porosity. Porosity is here defined as any void in the rock that favours heat loss: it includes pores as well as fractures and microfractures. It gives access to independent evaluation of rock strength and rheology, to be used in addition to other types of observations and measurements to characterize geological processes. The study area for this task is Valles Marineris on Mars, an area also studied in the other research tasks using other approaches.

Marta Kubiak has expertise on orbital terrestrial thermal data. During Period 6 she has learnt how to process orbital data from the Mars-orbiting thermal instruments, especially Themis, onboard the Mars Odyssey spacecraft. More details are given in Marta Kubiak's Team member report.

Research task 6 – Ice processes and landforms

This task has been redefined in order to account for the field of expertise of Luigi Castaldo, the FNP postdoc that was recruited in November 2013 to replace Marion Massé.

Luigi Castaldo was a member of the Italian SHARAD Team, in charge of the SHARAD radar of the Mars Reconnaissance Orbiter spacecraft (still in operation). SHARAD is a sounding radar that can penetrate the subsurface of Mars and help identify the structure of subsurface rocks (such as layering). It also provides information on some surface properties such as its dielectric constant (or permissivity) and its rugosity. The value of the dielectric constant of pure water ice is lower (3.14) than for rocks (4-20), which makes water ice and ice-rich rocks a series of material that can be rather easily distinguished from pure rocks using SHARAD. During Period 6, two series of works have started: Global Mapping of the dielectric constant of the surface of Mars, and analysis of the Valles Marineris subsurface on SHARAD profiles.

b) Summary of the results of the research tasks

Research Task 1 – A Valles Marineris synthesis

This work has allowed new geomorphological observations to be made (Figure 1), as illustrated by the two examples below.

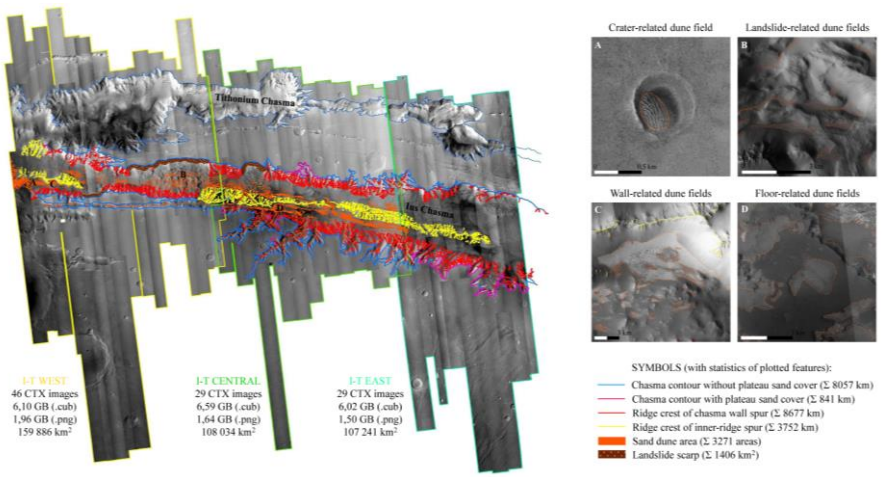

Figure 1. Current stage of development of the western Valles Marineris map. *Right*: Examples of different types of dune fields (right A-D).

Dune areas are characterized by different sand source [5], dune type (barchans, transverse dunes, longitudinal dunes), exposure size (from ~100 m2 to ~100 km2), and lithology (bright and dark dunes). The preliminary investigation based on 20 largest dune fields on the Ius Chasma floor, shows that average dune spacing (measured between crests) is 50 m and the predominant facing direction of dune slopes is W-E. In vast, open floor areas a dune type

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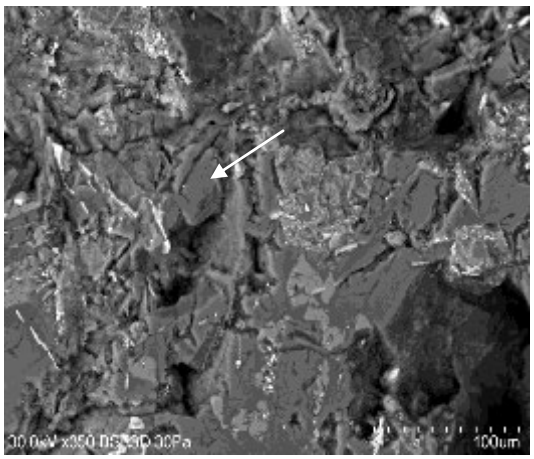
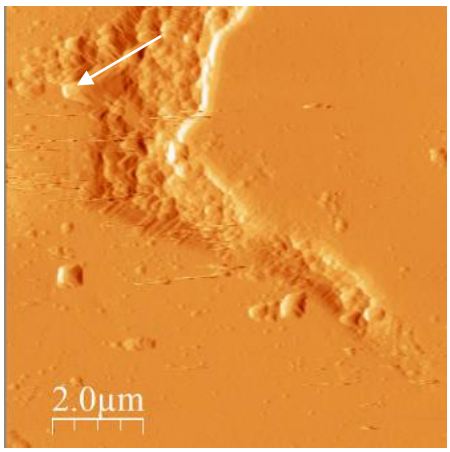
(transverse, longitudinal) is dependent only on predominant wind direction inside chasma. Dune sands in western chasmata are delivered from intra-chasma main sources (landslides, walls) and secondary sources (interior layered deposits (ILDs), floors and craters) (Fig. 1A-D). Floor source is a stratigraphically homogeneous unit observed in the southern Ius trough, probably of detrital origin, in which dunes (Fig. 1D) occupy erosional hollows. They are thought to form in situ. Landslide-related dunes dominate in the northern trough. Dunes from wall sources are widespread.

Spur and gully morphology analysis has revealed three different types of gully morphology: active (with a visible evidence of modern sediment transport; common), inactive (with a lack of transport; rare) and grooved (displaying up to 100-meter wide shallow flat-floored linear grooves parallel or oblique to the local slope; common on the central Ius inner ridge). The grooves might result from a creeping process of viscous surface material.

Research task 2 – Diagnostic climate signatures of basalt alteration on Earth and Mars

Mineralogical analysis based on backscattered electron spectra (BSE) from SEM was carried out in selected areas of the samples (e.g., Figure 2, a). Structures examined by AFM were assigned to specific mineral phases. Using AFM, it is possible to perceive details of structures that may result from weathering. Even very subtle alteration features may be observed.





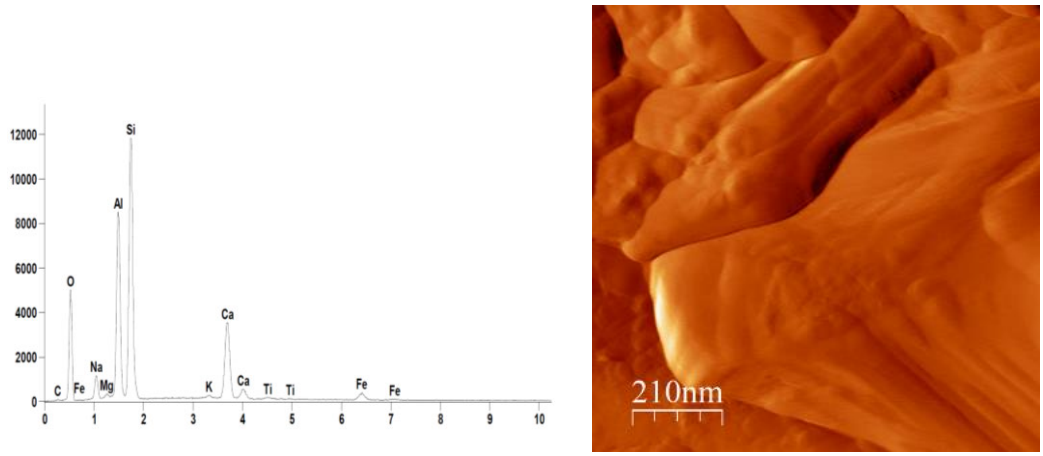


Figure 2. Top left: SEM (BSE) image of the internal part of Udokan basalt. An arrow indicates a cavity formed in a plagioclase crystal; Bottom left: elemental composition of the plagioclase; Right: Topography images obtained using AFM in the so-called deflection mode; Top right: the arrow indicates the edge of a cavity formed in the plagioclase crystal; Lower right: close-up to the edge of the cavity.

In Figure 2, images of a selected area of the internal part of basalt sample from the Udokan volcanic field are shown as an example. An L-shape cavity on the plagioclase crystal indicated on the BSE image, not only can be seen in a better resolution, but also the details of its topography can be recognized. Both the granular internal part of the cavity and crystal structure of its edges are imaged.

Research task 3 – Deep-seated gravitational spreading on Mars and Earth

- ***Quantification of topographic ridge spreading*** **–** A statistical criterion of GPS profile similarity has been developed by Luigi Castaldo, and used by Olga Kromuszczyńska to evaluate the factors that control GPS and WADGPS accuracy within the framework of geomorphological analysis. Half of the article draft on GPS use for quantitative geomorphology analysis has been written during Period 6.

- ***Numerical simulations*** **–** The influence of asymmetric profiles on strain distribution within topographic ridges has been studied (Figure 3). In the models presented here, the topographic ridge is strongly fractured and jointed basaltic rock, and was subject to glacial loading by valley glacier, and unloading. Slope angles were taken between 20° and 35°, which are common values in studied Valles Marineris gravitational spreading cases. The results show that instabilities develop differently depending on symmetry of the slope and the slope angle values. In case of symmetric slopes (Figure 3a, c, e), accumulation of plastic strain focuses in the middle of the ridge. Two curved failure planes generate vertical displacement parallel to the mountain slopes, resulting bulging at the toe of the slope. The vertical thickness of the sliding units scales with height of the mountain. In case of an asymmetric slope (Figure 3b, d, f), a single curved failure plane develops, producing bulging at the toe of on one side of the mountain. The vertical thickness of the sliding unit scales with the slope height

too. All the models presented here, shows plastic strain accumulation in the upper part of the slope, leading to ridge-top splitting, one of the most characteristic features of observed deep-seated gravitational spreading.

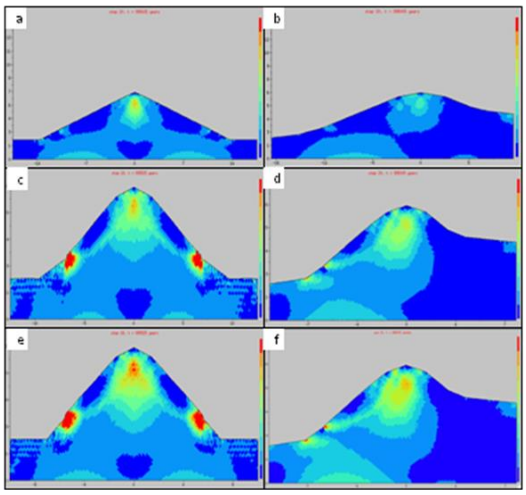


Figure 3. Finite element modelling of gravitational deformation of a topographic ridge. The parameter displayed in this series of models is accumulation of plastic strain. a: symmetric slopes, α=20°; b: asymmetric slopes, α=20°; c: symmetric slopes, α=30°; d: asymmetric slopes, α=30°; e: symmetric slopes, α=35°; f: asymmetric slopes, α=35°.

Research task 4 – Landslides on Mars and Earth

The article in progress reports scaling laws for landslide runout distance and final deposit height as a function of the initial aspect ratio. The dependence of final deposit shape on the column's initial aspect ratio is confirmed. Inter-particle frictional effects play a significant role in the dynamics of spreading. Several different patterns were observed, dependent on the initial aspect ratio, particle-wall, inter-particle and rolling friction. Collisional motions dominate, and the runout mechanics is sensitive to the coefficient of restitution. Our analysis of axisymmetric and planar granular flows reveal the subdivision into three regimes of flow behaviour dependent on the initial aspect ratio. An intermediate situation is characterized by its upper moving free surface and the lower static interface which delineates the growing deposit.

Research task 5 – Thermal properties of Martian landforms

Apparent thermal inertia has been calculated in a test area (275.2°E, –7.4°N) of Valles Marineris (Figure 4).

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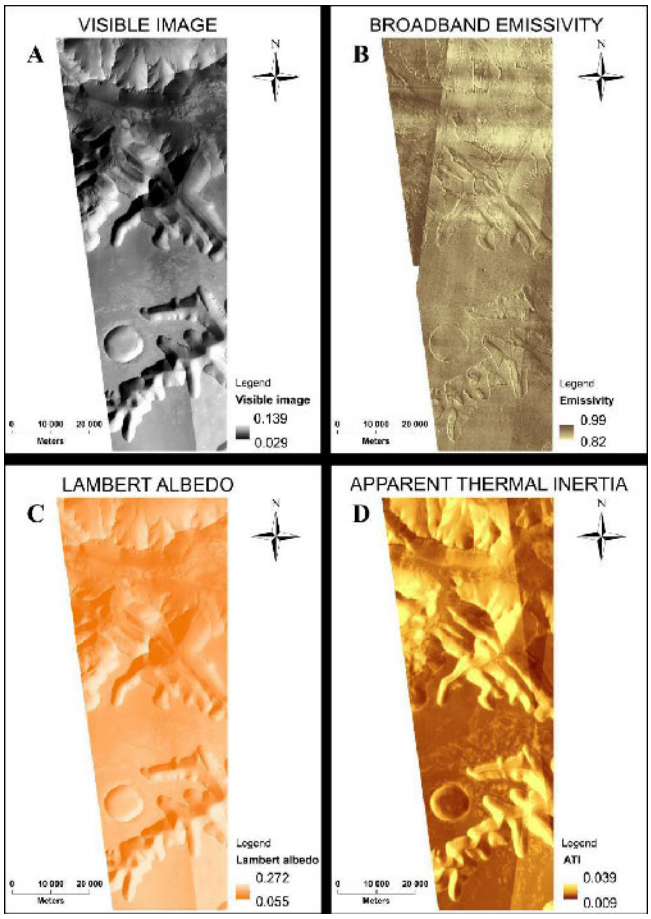


Figure 4. Preliminary apparent thermal inertia (ATI) map (D) calculated for the selected test surface in Valles Marineris (275.2°E, -7.4°N), broadband emissivity map (B), Lambert albedo map (C), and CTX visible light image in irradiance/solar flux (A). The dominant ATI values (0.13-0.15) indicate the presence of sand. The areas with higher values are correlated with the northward and eastward looking slopes, which probably results from higher real incident angle. That has to be verified and taken into account in the further investigations.

The albedo values were estimated based on the CTX images (Figure 4C). They have been acquired using PILOT (http://pilot.wr.usgs.gov/), and processed online following the ISIS procedures *spiceinit* (update camera pointing information), *ctxcal* (apply radiometric calibration), *ctxevenodd* (remove even odd detector striping from MRO/CTX) and *cam2map* (project from camera space to map space). After the PILOT processing, CTX images represent the ratio of reflected energy to incoming energy (irradiance/solar flux, often simply called I/F). In order to convert I/F factor into Lambert albedo, the I/F values were divided by the co-sine of the solar incidence angle. In the calculations, one average value of incident angle was adopted for the whole CTX image. In the Valles Marineris test area, the obtained values are within the ranges cited in the literature.

The high-resolution apparent thermal inertia map will be calculated for other selected Martian landforms in Valles Marineris. The methodology will be verified and the results compared to the existing thermal inertia maps. The transparency of the atmosphere and the topographic relief will be also included in the calculation.

Research task 6 – Ice processes and landforms

- ***Global Mapping of the dielectric constant of the surface of Mars*** – Maps showing the distribution of ice on Mars have been computed (Figures 5 and 6). During Period 7 an article presenting and discussing these results will be prepared.

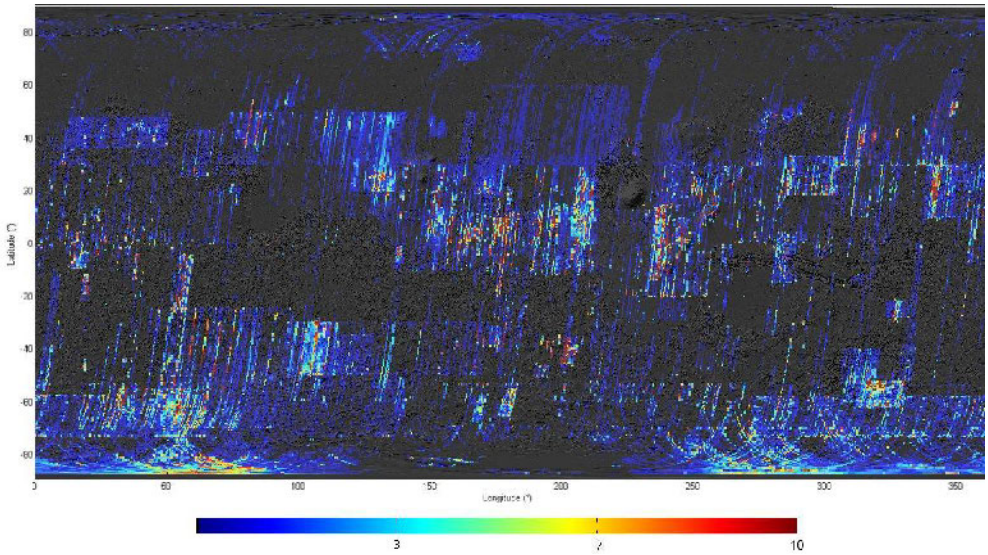


Figure 15. Global map of the standard deviation of the dielectric constant for the whole Mars model using the SHARAD orbital ground-penetrating radar onboard Mars Reconnaissance Orbiter. A dielectric constant value of 3.14 indicates pure ice at a maximum depth of 15 m.

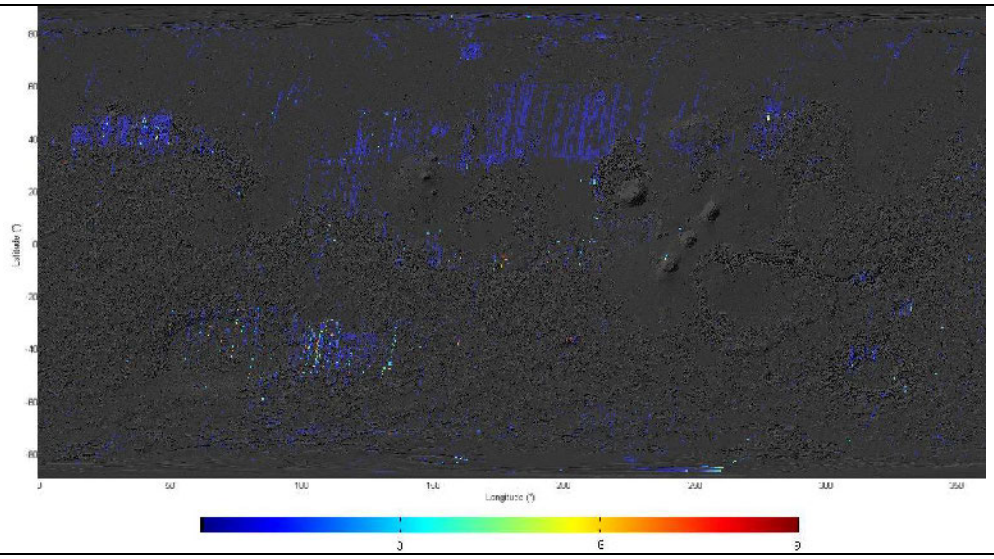


Figure 6. Global map of the standard deviation of the dielectric constant in the ice-rich regions identified on Figure 5.

- Analysis of the subsurface of Mars in the Valles Marineris region – Investigating the Valles Marineris region using a ground-penetrating radar is a challenge because of the very uneven topography. The radar backscatter signal of the areas on both sides of the place where the radar ray hits the ground vertically (nadir) results in many artefacts and radar power loss that makes interpretations of the radar signal possible only locally. More than 50 SHARAD profiles have been selected in Valles Marineris,

and their modelling and interpretations will be investigated in depth during Period 7. The objective is to find evidence of geological structures witnessing the geological evolution of Valles Marineris (rifting, sedimentation, erosion…) below the surface.

- ***Recurring Slope Linae (RSL)*** – Following the work done by Marion Massé while she was a FNP postdoc, an article was published in the journal Icarus in March 2014 (Ojha et al. 2014, Icarus 231, 365-376, doi: 10.1016/j.icarus.2013.12.021).
- ***KBO ices*** – The results obtained during Period 5 have been presented during Period 6 in 3 presentations in 2 international conferences:

  - Nna Mvondo, D., Singh, S., Mège, D., Chevrier, V., Tobie, G., and McKay, C.P., 2014. Laboratory infrared spectroscopy of Titan's tholins in liquid methane and liquid ethane: can complex organics in Titan's likes be detected? Workshop on the Habitability of Icy Worlds, Pasadena, California, February 5-7, 2014, Abstract 4018

  - Mège D., Singh S., Nna-Mvondo D., Chevrier, V., Tobie G., McKay C.P., 2014. Near-infrared reflectance of tholins in methane ice: preliminary results and implications for interpretation of New Horizons LEISA data. Lunar and Planetary Science Conference 45, Lunar and Planetary Institute, Houston, Texas, Abstract 1264.pdf

  - Singh, S., Nna-Mvondo, D., Mège, D., Chevrier, V., Tobie, G., McKay, C.P., 2014. Infrared properties of Titan tholins in liquid methane and ethane: can complex organics in Titan's lakes be detected? Lunar and Planetary Science Conference 45, Lunar and Planetary Institute, Houston, Texas, Abstract 2819.pdf

  These results were designed to study the feasibility of near-infrared measurements of organic matter frozen in various types of ices at low temperature in order to design a new experimental simulation chamber located in the Arkansas Center for Planetary and Space Science, Fayetteville. It was decided that they must be complemented by further results before submission of a publication. These new experiments are anticipated to be conducted during fall 2014 (Period 7). The Arkansas Centre is being moved to another location of the campus of University of Arkansas, and meeting this agenda requires that no delay occurs in the move of the simulation equipment and the subsequent operational tests.

2) AWARDS AND DISTINCTIONS

- New Horizons experiment, Space Scientific Research Proposal, from the French National Centre for Space Studies (CNES), 2014 (one year). Researcher in charge of the project in the TEAM group: Daniel Mège

3) INFORMATION ON MASTER'S THESES AND OTHER SCHOLARLY DEGREES OR TITLES EARNED BY RESEARCHERS INVOLVED IN THE PROJECT as a result of the realization of the project (concerning team members who are not stipendees).

4) INFORMATION ABOUT PARTNERS

a) Description of the cooperation with foreign partners

Only the partners with which cooperation was active during Period 6 are mentioned below.

1. CO.RI.S.T.A., Napoli, Italy

- *Researchers from foreign partner*: Giovanni Alberti
- *Researchers from TEAM project*: Luigi Castaldo, Daniel Mège, Joanna Gurgurewicz
- *Topic of cooperation*: (1) Dielectric constant mapping of Mars; (2) Interpretation of the deep structure of the Valles Marineris region on Mars from ground penetrating radars (Mars Express/MARSIS, Mars Reconnaissance Orbiter/SHARAD)
- *New or established cooperation*: new
- *Type of cooperation during this reporting period*: SHARAD radar data processing

2. IFSTTAR Bouguenais, France

- *Researchers from foreign partner*: Patrick Richard
- *Researchers from TEAM project*: Timur Borykov, Daniel Mège
- *Topic of cooperation*: Molecular dynamics modeling
- *Type of cooperation during this reporting period*: Development of molecular dynamics code for landslide propagation investigations within the framework of T. Borykov's PhD thesis

3. Institut de physique du globe de Paris, France

- *Researchers from foreign partner*: Anne Mangeney
- *Researchers from TEAM project*: Timur Borykov, Daniel Mège
- *Topic of cooperation*: co-supervision of 1 PhD student
- *New or established cooperation*: Cooperation started in 2006 with co-supervision of another PhD student by A. Mangeney and D. Mège, Antoine Lucas (currently at AIM laboratory, see item #8). With MW and PL: new cooperation (Period 4)
- *Type of cooperation during this reporting period*: Paper writing with A. Mangeney.

4. Istituto Nazionale di Astrofisica, Bologna, Italy

- *Researchers from foreign partner*: Roberto Orosei
- *Researchers from TEAM project*: Luigi Castaldo, Daniel Mège, Joanna Gurgurewicz
- *Topic of cooperation*: (1) Dielectric constant mapping of Mars; (2) Interpretation of the deep structure of the Valles Marineris region on Mars from ground penetrating radars (Mars Express/MARSIS, Mars Reconnaissance Orbiter/SHARAD)
- *New or established cooperation*: since TEAM Period 3
- *Type of cooperation during this reporting period*: Scientific task for new TEAM postdoc Luigi Castaldo, SHARAD radar data processing

5. Paris–Diderot University, AIM Laboratory (Astrophysique, Interactions, Multi-échelles), Paris, France

- *Researchers from foreign partner*: Antoine Lucas
- *Researchers from TEAM project*: Olga Kromuszczyńska, Timur Borykov, Daniel Mège
- *Topic of cooperation*: High resolution stereo-derived digital topography of Mars
- *New or established cooperation*: since 2005
- *Type of cooperation during this reporting period*: Computation of digital elevation models of Valles Marineris for PhD work

6. University of Arkansas, Fayetteville, AR, USA

- *Researchers from foreign partner*: Vincent Chevrier, Sandeep Singh
- *Researchers from TEAM project*: Daniel Mège
- *Topic of cooperation*: Future interpretation of data from the New Horizons mission in 2015
- *New or established cooperation*: new
- *Type of cooperation during this reporting period*: Presentation of results obtained during Period 5 in international conferences. Preparation of the design of a new Pluto simulation chamber at University of Arkansas

7. University of Montpellier, Géosciences Montpellier Lab, France

- *Researchers from foreign partner*: Frédéric Gueydan
- *Researchers from TEAM project*: Magda Makowska, Daniel Mège
- *Topic of cooperation*: co-supervision of 1 PhD student
- *New or established cooperation*: since TEAM Period 2
- *Type of cooperation during this reporting period*: Co-advising of PhD student Magdalena Makowska, especially during her two-month stay in Montpellier

8. University of Nantes, Planetology and Geodynamics Lab, France

- *Researchers from foreign partner*: O. Bourgeois, V. Carrère, A. Gaudin, Y. Morizet, D. Nna-Mvondo
- *Researchers from TEAM project*: Joanna Gurgurewicz, Daniel Mège, and Marta Skiścim
- *Topic of cooperation*: (1) geology and mineralogy of Mars, as well as various issues relating to processing and interpretation of remote sensing datasets; (2) ice dynamics of polar dunes; (3) spectral signature of tholins
- *New or established cooperation*: This partnership is established for many years.
- *Type of cooperation during this reporting period*: Work on glacial postglacial geomorphology of the Valles Marineris canyons on Mars (revision of an article which is now in press); laboratory measurements of tholin spectra

9. University of Paris-Sud, Orsay, France: Géosciences Orsay

- *Researchers from foreign partner*: François Costard, Antoine Séjourné (former TEAM postdoc)
- *Researchers from TEAM project*: Daniel Mège, Joanna Gurgurewicz
- *Topic of cooperation*: periglacial geomorphology
- *New or established cooperation*: established for many years
- *Type of cooperation during this reporting period*: Organization of the 2nd Martian Cryosphere Wrocshop in Wrocław

10. University of Paris-Sud, Orsay, France: Institut d'Astrophysique Spatiale, Orsay

- *Researchers from foreign partner*: Marion Massé (former TEAM postdoc)
- *Researchers from TEAM project*: Daniel Mège, Joanna Gurgurewicz
- *Topic of cooperation*: Glacial processes on Earth and Mars
- *New or established cooperation*: new
- *Type of cooperation during this reporting period*: Organization of the 2nd Martian Cryosphere Wrocshop in Wrocław

b) Description of the cooperation with Polish partners – if applicable

1. Polish Academy of Sciences, Space Research Centre, Warsaw

- *Researchers from Polish partner*: Jerzy Grygorczuk, Łukasz Wiśniewski, Hans Rickman, Karol Seweryn, Marek Banaszkiewicz, and others
- *Researchers from TEAM project*: all the TEAM group members
- *Topic of cooperation*: (1) similar to Astronika (SRC PAS is another Highland Terrain Hopper Project subcontractant); (2) environment conditions on early Mars
- *New or established cooperation*: established (2010)
- *Type of cooperation during this reporting period*: similar to Astronika

2. University of Wrocław, Faculty of Earth Sciences and Environmental Management, Institute of Geological Sciences

- *Researchers from Polish partner*: Joanna Kostylew, Wojciech Bartz
- *Researchers from TEAM project*: Joanna Gurgurewicz, Marta Skiścim, Daniel Mège
- *Topic of cooperation*: (1) Lower Silesia Festival of Science; (2) Petrographic and chemical analysis of rock samples
- *New or established cooperation*: established for several years
- *Type of cooperation during this reporting period*: Training of M. Skiścim in petrography of igneous rocks (W. Bartz)

3. University of Wrocław, Faculty of Physics and Astronomy, Institute of Experimental Physics

- *Researchers from Polish partner*: Leszek Jurczyszyn, Leszek Markowski
- *Researchers from TEAM project*: Marta Skiścim, Joanna Gurgurewicz, Daniel Mège

- *Topic of cooperation*: nanoscale characterization of surfaces, specifically altered basalt
- *New or established cooperation*: started in Period 1
- *Type of cooperation during this reporting period*: Daily cooperation through PhD student M. Skiścim, who is doing another PhD in this institute

5) IS THE PROJECT COMPATIBLE WITH THE HORIZONTAL POLICIES SPECIFIED IN ARTICLES 16 AND 17 OF COUNCIL REGULATION (EC) NO. 1038/2006 (I.E. THE POLICY OF EQUAL OPPORTUNITIES AND ENVIRONMENTAL PROTECTION, AND WHETHER THE PROJECT IS CARRIED OUT IN COMPLIANCE WITH THE PRINCIPLE OF SUSTAINABLE DEVELOPMENT)?

YES ☒ NO ☐

If Community policies are not being followed, please provide an explanation as to what irregularities there have been and what remedial action has been planned and undertaken.

6) IS THE PROJECT BEING REALIZED ACCORDING TO THE SCHEDULE ATTACHED TO THE CONTRACT ?

YES ☒ NO ☐

If the answer is NO, please provide an explanation :

7) ADDITIONAL INFORMATION

Other important information relevant to the project

7.1. TEAM Group activities for space exploration

- ***Galago: the Highland Terrain Hopper project.*** Following the postponement of evaluation of the Galago project by the European Space Agency (ESA), during Period 6 this project has been dormant. Another proposal for the development of this planetary exploration platform maybe submitted to another institution during Period 7.

7.2. Organisation of conferences

- **Organisation of the Second European Martian Cryosphere Wrocshop**

The second Martian Cryosphere Wrocshop was organized at ING PAN in Wrocław by Marion Massé, Antoine Séjourné (former TEAM postdocs), Anna Łosiak (NCN postdoc at ING PAN in Wrocław) and Daniel Mège on February 10-12, 2014, with 40 participants from 5 European countries. The first conference had been organized by our TEAM group in January 2013.

- **Organisation of ESA's MPSE 2014 conference in June 2014**

Following the impulse of the first MPSE meeting (Mars – Connecting Planetary Scientists in Europe) held in Budapest in June 2012, the second MPSE meeting will be organised by the TEAM group and co-organized by the Space Research Centre (CBK PAN) in Warsaw in June 3-6, 2014. This meeting will include long morning invited review lectures on Mars-related topics by leading scientists in their fields, and short afternoon presentations by researchers from eastern and western Europe on Martian scientific issues. The meeting is sponsored by ESA, Astri Polska, ING PAN, and CBK PAN.

Around 60 abstracts have been submitted. At the end of Period 6 the conference agenda is ready. It is now online: http://wroona.ing.pan.pl/MPSE2014/home.html

7.3. Public Outreach

- ***Uniwersytet Dzieci***

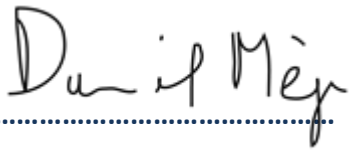
  On March 8, 2014 two TEAM members, Krzysztof Dębniak and Olga Kromuszczyńska, presented a lecture: *„Czy ludzie kiedyś zamieszkają na Marsie?"* at Uniwersytet Dzieci.

I, the undersigned, hereby confirm that the information contained in the merit, periodic report (both electronic and paper version) are true. I am aware of the legal consequences of giving untrue information in a legally significant situation, as stated in article 271 of the Penal Code.

Appendixes to the merit report in the electronic version:
- Project realization indexes (on-line data base),
- Scientific Achievements of the Laureate and Stipendees (on-line data base),
- List of conferences and scientific exchanges,
- merit reports of the Stipendees.

Appendixes to the merit report in the hard copy:
- documents confirming the execution of payments of pension and retirement insurance premiums (for PhD students) – only in paper form.

Date: May 5th, 2014

Laureate Signature  **……**

Institution Stamp…….

TEAM PROGRAMME

LIST OF CONFERENCES AND SCIENTIFIC EXCHANGE ACTIVITIES

Attachment to merit report

Project title:	Mars: another planet to approach geoscience issues		
Reporting period	from 01/11/2013 to 30/04/2014	**Period no.:** 6	
Agreement no.:	TEAM/2011-7/9	holding from 01.09.2011 to 30.06.2015	
LAUREAT:	Daniel MEGE		

ATTENTION: the information given below should regard only the realization of the project in the reporting period indicated above.

1. CONFERENCES

1.1 Participation of persons involved in the realisation of the Project in national and international conferences:

NO.	NAME AND SURNAME	CONFERENCE TITLE	COUNTRY, CITY	DURATION OF STAY (DATES)		TITLE OF THE PRESENTATION	TYPE OF PRESENTATION (ORAL / POSTER)
				FROM	TO		
1.	Luigi Castaldo	The 2nd Martian Cryosphere	Poland, Wrocław	10.02.2014	12.02.2014	SHARAD data mapping over Martian Surface for Ice detection	oral
2.	Krzysztof Dębniak	The 2nd Martian Cryosphere	Poland, Wrocław	10.02.2014	12.02.2014	Landform mapping in Valles Marineris	poster
3.	Timur Borykov	The 2nd Martian Cryosphere Workshop	Poland, Wrocław	10.02. 2014	12.02. 2014	Parameters controlling terrestrial and Martian landslide propagation: a molecular dynamics analysis	poster
4.	Daniel Mège	The 2nd Martian Cryosphere	Poland, Wrocław	10.02.2014	12.02.2014	Exploring the cold surface of Mars and low-gravity solar system bodies with the highland terrain hopper	oral
5.	Daniel Mège	Lunar and Planetary Science Conference 45	USA, Houston	14.03.2014	23.03.2014	(1) Near-infrared reflectance of tholins in methane ice: preliminary results and implications for interpretation of New Horizons LEISA data; (2) The highland terrain hopper: scientific exploration of rugged terrain on low-gravity planetary bodies	two posters

2. SCIENTIFIC EXCHANGE – other than conferences

2.1. Official international trips:

NO.	NAME AND SURNAME	SCIENTIFIC UNIT	COUNTRY, CITY	DURATION OF STAY		AIM OF THE STAY
				FROM	TO	
1.	Magdalena Makowska	Géosciences Montpellier, Université Montpellier 2	France, Montpellier	06.01.2014	28.02.2014	Numerical modelling of deep-seated gravitational slope deformation in Valles Marineris

2.2. Official domestic trips:

NO.	NAME AND SURNAME	SCIENTIFIC UNIT	COUNTRY, CITY	DURATION OF STAY		AIM OF THE STAY
				FROM	TO	
1.	Daniel Mège	Astri Polska	Poland, Warsaw	18.11.2014	20.11.2014	FASTER first demonstration meeting, co-chair for general discussion
2.	Mège Daniel	CBK PAN	Poland, Warsaw	27.11.2013	29.11.2013	Seminar: "Jumping robot - cutting edge planetary locomotion system for scientific applications"

Guests invited in connection with the realization of the Project (national and / or foreign):

NO.	NAME AND SURNAME	SCIENTIFIC UNIT	COUNTRY, CITY	DURATION OF STAY		AIM OF THE VISIT
				FROM	TO	
1.	Marion Massé	Institute of Space Astrophysics	France, Orsay	07.02.2014	13.02.2014	Organisation of TEAM and PAN-sponsored conference and oral presentation at the conference