

**MERIT REPORT OF A LAUREATE
TEAM PROGRAMME**

Project title:	Mars: another planet to approach geoscience issues		
Reporting period:	from 01.05.2012 to 31.10.2012	Period no.	3
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

Research task 1 was initially entitled "Rheology of the Martian lithosphere". This task was undertaken by a PhD student, Mr. Fionn Cullen, whose contract had to be resigned on May 31, 2012 (letter to FNP dated June 13, 2012). On August 1st Mr. Krzysztof Dębniak was hired as the new PhD student (recruitment report dated July 26, 2012). As explained in that report, because of the problem of getting appropriate candidates for this topic during the first recruitment procedure (Novembre 2011), the task was reoriented.

- The rheology of the Martian lithosphere had initially to be studied in the Valles Marineris region of Mars. The new task still focuses on processes in this region, but indirectly addresses rheology.
- Below is a summary of this task and the expected output, taken from an abstract submitted to the 2013 annual meeting of the International Association of Geomorphologists:

"The Valles Marineris giant trough system opens an up to 10-km deep window into the geology of the Martian crust. Tectonic, volcanic, sedimentary, and erosional

processes spanning a range of ~4 g.y. have been recorded along the trough walls and on their floor. They testify to a succession of paleo-environments and paleoclimates which have been a matter of debates since the Viking era. Far from being closed, these debates have been enriched and complexified by the accumulation of the subsequent datasets obtained by the Mars Global Surveyor (MGS), Mars Odyssey, Mars Express (MEx), and Mars Reconnaissance Orbiter (MRO) spacecrafts. The abundance of datasets, their diversity, very high resolution of visible imagery, as well as the small number of researchers involved in Valles Marineris exploration, contributed to thematic and geographic dispersion of studies to such a point that synthesis and correlation of previous works are necessary. From this point, new views and a new coherent framework for Valles Marineris evolution can emerge.

The undertaken study consists in the realization of a GIS of Valles Marineris that will include mosaics of selected datasets (MRO/CTX VIS images, Mars Odyssey/Themis night-time IR images, MGS/MOLA PEDR and DEM, MEx/HRSC images and DEMs, MRO/HiRISE images and DEMs), existing regional maps (MEx/OMEGA and MRO/CRISM mineral maps, gravity and magnetic maps), new regional or local maps (CTX DEMs, climate/paleoclimate models), basic geomorphologic description layers (in which geomorphology is not interpreted in terms of processes and environments), and advanced geomorphologic and geologic interpretation layers (in which processes and paleoenvironmental interpretations are proposed by the authors). The state of the art of this project, expected to be completed in 2015, will be presented."

- In addition to the datasets mentioned above, we are investigating the possibility of including subsurface data (vertical cross sections) obtained from orbital ground-penetrating radars (MEx/MARSIS, MRO/SHARAD) through collaboration with the Italian National Institute of Astrophysics. This is truly a challenge because of radar signal scattering at the Martian surface produced by the complex topography of the Valles Marineris area. This issue may be solved if the topography of Valles Marineris is better known, in which case the scattering effects can be modelled and subtracted from the useful (subsurface) radar signal. It will be investigated by using high-accuracy topographic models produced by collaborator Antoine Lucas in Caltech.

The GIS resulting from achievement of this task will be made available online and as a DVD in 2015. Updates are planned to be published regularly after that.

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

- The methodological developments conducted during Period 2 aimed at achieving the high-level of polish for surfaces of natural rocks required by Atomic Force Microscopy. Period 3 has been mainly devoted to applying these methods to solid rock surfaces, and rock powders, and to their interpretation.
- Additional methods are required for mineralogical interpretation of AFM results, among which Scanning Electron Microscopy (SEM). SEM analyses were not expected at the initiation of the project; we applied to the INTER programme of FNP to this end. Application was not successful; a new project will be submitted at the next call, or another funding source will need to be identified for the required SEM analyses.

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

This task is twofold:

- Quantification of gravitational spreading of topographic ridges on Mars from orbital imagery (Mars) and study of terrestrial analogues from field work,
- Numerical simulations of the geologic processes involved.

Quantification of topographic ridge spreading - The terrestrial aspects of ridge spreading dominated over the Martian aspects. Data were collected in the field between September 3 and 15 in the Tatra Mountains, a historic and one of the most interesting areas to study such processes on Earth.

- Gravitational spreading features have been measured in the field using classic geological methods, such as fault attitude measurements using a compass.
- Topographic profiles across the topographic ridges, which is necessary to characterize gravitational strain, were obtained using Wide-Area Differential GPS (WADGPS) measurements, coupled to hand or laser tape measurements for some of the profiles in order to provide independent information on WADGPS accuracy.

This work was achieved by 4 to 6 field participants from the TEAM group (Krzysztof Dębniak, Olga Kromuszczyńska, Magdalena Makowska, Marion Massé, Daniel Mège, Antoine Séjourné).

Numerical simulations – Parameters required for numerical simulations have been investigated by TEAM PhD student M. Makowska.

Research task 4 – Landslides on Mars and Earth

One of the main issue in understanding the propagation of landslide materials (debris flows), which is studied in this task, has been the understanding of the mechanisms by which the landslide material loses friction during propagation. Evidence of losing friction is the distance of landslide propagation (runout distance) on Earth and Mars, which is systematically higher in natural landslides than in models. Granular code is being developed to understand the details of the physics behind at the scale of the landslide mass/rock substratum interface processes (mm to cm). Granular code development is in nominal progress, in spite of the unavailability of an efficient software for visualization of results, such as Matlab®, who could not be purchased during Period 3 (see section 6). Efforts have been oriented toward:

- Increasing the number of grains in the initial granular code in order for results to be meaningful in application to landslides (currently ~15000, i.e., 2-3 times more than in the initial code)
- Performing 2D simulations of the spreading of a rectangular column on a horizontal plane, and 3D simulations of an axisymmetric granular column, using an optimized molecular dynamics algorithm
- Comparing with results obtained using macroscopic-scale landslide propagation models (*Shaltop* code, developed by PhD co-advisor Anne Mangeney)
- Code optimizing for future parallel computing

- Establishing cooperation with the Wrocław Centre for Networking and Supercomputing at Wrocław University of Technology, Wrocław, for parallel computing during the next project implementation periods.

Research task 5 – Evolution of periglacial landforms on Earth and Mars related to global climate changes

- This task, conducted by TEAM postdoc Antoine Séjourné (see his merit report), has been the topic of paper writing.
- In October 2012, field work in Yakutia, eastern Siberia, was conducted in order to investigate the thermal and geomorphologic evolution of permafrost under climate variations. Field work was supported by equipment and staff provided by the Yakutsk Permafrost Institute. Similar features are observed on Mars.

Research task 6 – Ice processes and landforms

The present work is in part focused on narrow, short-lived surface flows observed on Mars to develop near the top of high cliffs and called *Recurrent Slope Lineae (RSL)*. No analogues of RSL appear to have been identified to date on Earth.

- Analysis of near-infrared spectra of RSL and comparison with sub-metric orbital images has continued during this period, with continuing collaboration with University of Arizona and University of Nantes.
- The results obtained on RSL so far (corresponding to the two bullet points above) now deserve publication. An article is being written with collaborators from University of Arizona and University of Grenoble.
- RSL have been experimentally studied during 2 weeks in June at the Institute of Planetology and Astrophysics in Grenoble, France. New near-infrared spectra of damp basalts on which brines of known composition have flown were obtained in temperature and humidity controlled atmosphere.

b) Summary of the results of the research tasks.

Research Task 1 – A Valles Marineris synthesis

- Since August 1st, Krzysztof Dębniak is reading the scientific literature relevant to this task and has shown a lot of motivation to do so.
- Preparation of some of the datasets mentioned in section 1a for integration into the Valles Marineris GIS has started in parallel, especially a mosaic of several hundreds of high-resolution Mars Reconnaissance Orbiter/CTX images of the surface of Mars in the study area. These images will be reprojected, histogram-balanced, and mosaicked during Period 4.

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

The major problem for interpretation of AFM data in the case of heterogeneous materials such as rocks is that minor surface irregularities on the samples can lead to artefacts in the signal that are difficult to distinguish from the sample response.

- Using several sample preparation methods has revealed a helpful method to separate sample response and artefacts.
- There are, however, interpretation details that need to be discussed with other AFM specialists and these will be discussed at ATM/AFM 2012 conference during Period 4 (Zakopane, 28.11 to 02.12.2012).

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

Quantification of topographic ridge spreading in the Tatra Mountains

- Topographic profiles across the mountain ridges and associated geological measurements were made at 31 sites, for a total of more than 50 individual profiles.
- The WADGPS data are being analysed. A code for produce scientifically usable topographic profiles from the WADGPS data is being written by M. Makowska (October 2012).

- In spite of the unexpectedly huge quantity of data collected in the field (due to a good distribution of field tasks and enthusiasm of the participants), the field work conducted in September 2012 was mainly viewed as a reconnaissance work allowing the group to (1) visualize what gravitational spreading of topographic ridges looks like when in the field compared to their counterparts viewed on orbital images of Mars, and (2) appreciate the diversity of forms that gravitational spreading can take in the Tatras. Complementary field work is therefore planned, and will be conducted during Period 5. It will focus on a small number of topographic ridges that will be studied in greater detailed.

Numerical simulations

- The FEM simulation code to be used for the work, developed by M. Makowska's co-advisor Fred Gueydan in Montpellier, has been completed during Period 3.
- The first test models will be run during Period 4.

Research task 4 – Landslides on Mars and Earth

- Comparison between the 2D and 3D simulations and numerical results obtained using *Shaltop*, and also with some physical experiments, show quite good agreement, allowing us to start investigation of the mechanics that may be at the origin of the unexpeted long runout distance.
- The design of parallel algorithms for molecular dynamics simulations has been improved. Contact with WCSS for parallel computing has been established, and hardware/software requirements at WCSS are being discussed with the WCSS researchers.

Research task 5 – Evolution of periglacial landforms on Earth and Mars related to global climate changes

- Evolution of thermokarst troughs in the Yakutsk area since a campaign conducted in 2011 has been assessed during the fieldwork conducted during Period 3. The permafrost active zone could be drilled and studied in the field; implications will be studied during Period 4.
- Interpretation of satellite images of the same area in Yakutia obtained during Spring 2011 and Fall 2012 is ongoing. The image obtained in Fall 2012 had acquisition problems that resulted in degraded image reflectance. Image processing tests have been undertaken to mitigate this issue.
- One of the articles written during periods 2 and 3 has been accepted for publication in the French Periglacial Bulletin.

Research task 6 – Ice processes and landforms

- Experimental results obtained at University of Grenoble were not as successful as expected due to technical issues regarding the humidity control probe.
- New measurements are therefore required. They will be undertaken at the beginning of Period 4 (November 2012).

2) AWARDS AND DISTINCTIONS

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

1. Dawson College, Department of Geography, Montreal, Canada

- *Researchers from foreign partner:* Richard J. Soare
- *Researchers from TEAM project:* Antoine Séjourné
- *Topic of cooperation:* Interpretation of permafrost features in northeastern Canada

- *New or established cooperation*: established
- *Type of cooperation during this reporting period*: Article writing.

2. Division of Geological and Planetary Sciences, Caltech, Pasadena, CA, USA

- *Researchers from foreign partner*: Antoine Lucas
- *Researchers from TEAM project*: Olga Kromuszczyńska, Timur Borikov, Daniel Mège
- *Topic of cooperation*: High resolution stereo-derived digital topography of Mars
- *New or established cooperation*: established (2005)
- *Type of cooperation during this reporting period*: Lab work, has continued to provide digital elevation models Valles Marineris for PhD work and topographic corrections during radar data processing (see cooperation with Istituto Nazionale di Astrofisica in Rome), and also benchmark examples for modelling of Martian landslides by Timur Borikov.

3. Institut de physique du globe de Paris, France

- *Researchers from foreign partner*: Anne Mangeney
- *Researchers from TEAM project*: Timur Borikov, 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 Caltech)
- *Type of cooperation during this reporting period*: End of a 2-months stay of Timur Borikov in April-May 2012, email exchanges about Timur Borikov's PhD work, conference abstract writing.

4. Istituto Nazionale di Astrofisica, Rome, Italy

- *Researchers from foreign partner*: Roberto Orosei
- *Researchers from TEAM project*: Daniel Mège, Olga Kromuszczyńska, Joanna Gurgurewicz, Krzysztof Dębniak
- *Topic of cooperation*: 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*: First contacts (June 2012), submission of coordinates of areas of interest for processing radar profiles

5. Lunar and Planetary Laboratory, Arizona State University, USA

- *Researchers from foreign partner*: Alfred McEwen
- *Researchers from TEAM project*: Marion Massé
- *Topic of cooperation*: Stability and mineralogical signature of brines on Mars under present conditions
- *New or established cooperation*: established (April 2011)

- *Type of cooperation during this reporting period:* Science article writing, research proposal writing (to be submitted by LPL to US funding agencies).

6. Permafrost Institute, Yakutsk, Russia

- *Researchers from foreign partner:* Alexander Fedorov
- *Researchers from TEAM project:* Antoine Séjourné
- *Topic of cooperation:* Characterization of periglacial features and processes in Yakutia, Siberia
- *New or established cooperation:* established for several years
- *Type of cooperation during this reporting period:* Field work collaboration and logistics in eastern Siberia (October 2012), article writing.

7. Planetology and Astrophysics Institute, Joseph Fourier University, Grenoble, France

- *Researchers from foreign partner:* Bernard Schmitt, Pierre Beck
- *Researchers from TEAM project:* Marion Massé
- *Topic of cooperation:* Experimental modelling of ice stability and spectral signature on Mars
- *New or established cooperation:* new
- *Type of cooperation during this reporting period:* Experimental modelling (two-weeks stay of M. Massé in Grenoble in June 2012).

8. 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:* new
- *Type of cooperation during this reporting period:* End of a 2-months stay of Magdalena Makowska in April-May 2012, Skype meetings and email exchanges about models to be developed by PhD student Magdalena Makowska.

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

- *Researchers from foreign partner:* O. Bourgeois, V. Carrère, A. Gaudin, S. Le Mouélic, Y. Morizet
- *Researchers from TEAM project:* Joanna Gurgurewicz, Marion Massé, Daniel Mège, and Marta Skiścim
- *Topic of cooperation:* on geology and mineralogy of Mars, as well as various issues relating to processing and interpretation of remote sensing datasets
- *New or established cooperation:* This partnership is established for many years.
- *Type of cooperation during this reporting period:* During this period collaboration was mainly in the form of frequent e-mail email exchanges of ideas and data, and stays at University of Nantes by Marion Massé (October-November 2012) and Daniel Mège (July

2012, September 2012) one week each. The Nantes lab has organized, participated, and funded field trip in Iceland to study glacial tunnel valleys, as well as participation of Marion Massé.

10. University of Paris-Sud, Orsay, France

- *Researchers from foreign partner:* François Costard, Julien Gargani, Chiara Marmo
- *Researchers from TEAM project:* Antoine Séjourné, Marion Massé, Daniel Mège
- *Topic of cooperation:* periglacial morphology
- *New or established cooperation:* established for many years
- *Type of cooperation during this reporting period:* article writing, collaboration through frequent e-mail exchanges, fieldwork

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

1. ABM Space Education, Toruń

- *Researchers from Polish partner:* Mateusz Józefowicz, Sebastian Meszyński
- *Researchers from TEAM project:* Joanna Gurgurewicz, Antoine Séjourné, Daniel Mège
- *Topic of cooperation:* Development of scientific payload onboard Martian rover; public outreach
- *New or established cooperation:* new
- *Type of cooperation during this reporting period:* Exhibition at the XV **Lower Silesian Science Festival** on September 21-22, 2012. Skype meeting in October for discussing development of a resistivity instrument onboard award-winning *Magma White* Martian rover developed at ABM Space Education, to be placed onboard a Mars exploration spacecraft.

2. Institute of Geography and Regional Development, Faculty of Earth Sciences and Environmental Management, University of Wrocław

- *Researchers from Polish partner:* Piotr Migoń
- *Researchers from TEAM project:* All TEAM members
- *Topic of cooperation:* geomorphological processes and landforms on Earth and Mars
- *New or established cooperation:* started in Period 1
- *Type of cooperation during this reporting period:* Series of lectures for the TEAM PhD students at Wrocław University.

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

- *Researchers from Polish partner:* Joanna Kostylew, Wojciech Bartz
- *Researchers from TEAM project:* Joanna Gurgurewicz, Marta Skińcim, Daniel Mège
- *Topic of cooperation:* Petrographic and chemical analysis of basalt samples, public outreach
- *New or established cooperation:* established for several years

- *Type of cooperation during this reporting period:* Laboratory work, article writing, preparation of the XV **Lower Silesian Science Festival** on September 21-22, 2012.

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

- *Researchers from Polish partner:* Leszek Jurczyszyn, Leszek Markowski
- *Researchers from TEAM project:* Marta Skiścim, Joanna Gurgurewicz, Daniel Mège
- *Topic of cooperation:* nanoscale characterization of basalt alteration
- *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. Space Research Centre, Polish Academy of Sciences, Warsaw

- *Researchers from Polish partner:* Karol Seweryn, Marek Banaszekiewicz, and others
- *Researchers from TEAM project:* all the TEAM group members
- *Topic of cooperation:* development of science payload for future exploration mission on Mars; public outreach
- *New or established cooperation:* established (2010) but evolving starting from Period 3
- *Type of cooperation during this reporting period:* frequent visits to SRC PAN (J. Gurgurewicz is also employed at SRC PAN, 1 week/month), joint presentations at an international planetology conference in Hungary during Period 3, basis for discussing the design of a new Mars exploration instrument to be placed onboard a spacecraft for a future mission. This instrument would make use of the skills of the SRC engineers and the TEAM group scientists. It will be identified after meetings to be held during Period 4.

6. Wrocław Centre for Networking and Supercomputing (WCSS), Wrocław University of Technology

- *Researchers from TEAM project:* Timur Borikov
- *Topic of cooperation:* Access to supercomputing facility for granular modelling of landslides and debris flows.
- *Type of cooperation during this reporting period:* Formal agreement found for access to supercomputers. Collaboration expected to start during Period 4.

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 :

Project implementation requires the purchase of software. Some had to be purchased during Period 2 and the remaining during Period 3. Although the Unit started the procedure in December 2011 (early Period 2), on October 30, 2012 (end of Period 3), it was not yet completed and the project is running since the beginning without any commercial software. Some freewares can sometimes be temporarily used, but cannot be always avoided. Task 4 includes development of pieces of code written in Matlab© language and requires Matlab© visualization capabilities. Task 4 realization is therefore significantly disturbed until the software acquisition procedure is completed (probably during the first half of Period 4?) Similarly, processing of huge satellite datasets in tasks 1 and 3, as well as analysis of other datasets and results obtained by the laureate over the last decade, require the use of ERDAS ER Mapper©. This software will probably not be made available to the project before the middle (optimistic) or the end of Period 4 (realistic). Some important material required by the TEAM members working on tasks 1 and 3 is therefore not available although it was planned to be used starting from Period 3. Additional funding requests for studying terrestrial analogues of geologic processes operating on Mars are also delayed because of impossible access to these science data.

7) ADDITIONAL INFORMATION

Other important information relevant to the project

XV Lower Silesian Science Festival 2012 - On September 21-22, under the coordination of TEAM member Joanna Gurgurewicz, the TEAM group participated to the XV Lower Silesian

Science Festival in Wrocław. The group prepared lectures, a 3D (anaglyph) exhibition on Mars landscapes, a rocket launch activity, an impact cratering booth including a poster and cratering experiments. In collaboration with the Space Research Centre PAN, a prototype of the *CHOMIK* instrument onboard the Phobos-Grunt spacecraft built by SRC PAN was on display. In collaboration with ABM Space Education in Toruń, the award-winning Martian rover prototype *MAGMA WHITE* was displayed and his capabilities explained and illustrated. More details are given below:

Zespół geologów planetarnych WROONA z Instytutu Nauk Geologicznych PAN, przy współudziale inżynierów z Centrum Badań Kosmicznych PAN oraz zespołu z firmy ABM Space Education, przygotował w ramach XV Dolnośląskiego Festiwalu Nauki dwudniowy cykl wykładów i pokazów z elementami happeningu oraz wystawę, przybliżające uczestnikom planetę Mars. Imprezy odbyły się w dniach 21–22 września w ramach „Weekendu z geologią”.

Cykl imprez rozpoczął się prezentacją multimedialną „Mars na Ziemi – Ziemia na Marsie”(1). Na początku wykładu omówione zostały różnice między Ziemią i Marsem pod względem ich wielkości, budowy wewnętrznej, właściwości fizycznych oraz panujących na nich warunków atmosferycznych. Porównano także ich naturalne satelity. Następnie mowa była o procesach geologicznych zachodzących na obu planetach i podobieństwie form ukształtowania terenu oraz o ich skali. Kolejną częścią wykładu było przybliżenie słuchaczom historii poznawania i eksploracji Czerwonej Planety – od obserwacji nieba gołym okiem do marsjańskich misji kosmicznych. Uczestnicy dowiedzieli się, za pomocą jakich metod i instrumentów ją badamy oraz jak wykorzystać wiedzę o ziemskich procesach geologicznych do zdalnych badań Marsa. Na koniec przedstawiono przykładowe dane, z których korzysta się podczas geologicznych analiz Marsa.

W trakcie wykładu zaproponowano uczestnikom quiz - rozpoznawanie zdjęć z Marsa i Ziemi. Zabawa ta budziła dużo emocji. Najlepszych nagrodzono plakatami (oryginalne materiały HiRISE/University of Arizona), a dodatkowo każdy uczestnik otrzymał pocztówkę z Marsa (materiały WROONA/ING PAN). Zgodnie z programem wykład miał odbyć się czterokrotnie (dwa razy w piątek i dwa razy w sobotę), zainteresowanie było jednak tak duże, że zdecydowano się przeprowadzić dodatkowy odczyt w sobotę.

Uzupełnieniem wykładu był pokaz urządzeń zbudowanych na potrzeby misji kosmicznych. Pierwszym z urządzeń był penetrator geologiczny CHOMIK z misji Fobos-Grunt, prezentowany przez inżynierów z Centrum Badań Kosmicznych PAN. Pokaz wzbudził dość duże zainteresowanie. Łącznie w ciągu dwóch dni CHOMIKA obejrzało około 200 osób. Większość stanowiła młodzież szkolna w zorganizowanych grupach (uczestnicy wykładów), ale nie zabrakło też innych zainteresowanych. Najwięcej pytań dotyczyło mechanizmu wbijania manipulatora oraz planowanego powtórzenia misji Fobos-Grunt.

Drugie z urządzeń, polski łazik marsjański MAGMA WHITE, prezentowany przez zespół z firmy ABM Space Education, obejrzało również około 200 osób, większość z grup zorganizowanych. Wśród osób indywidualnych były także osoby zza granicy i z kadry naukowej. Telewizja festiwalowa nakręciła krótki materiał z wywiadem. Łazik cieszył się największym zainteresowaniem wśród dzieci - ruchomy

robot przyciągał uwagę i był świetnym pretekstem do prowadzenia rozmowy na temat jego środowiska - Marsa. Oprócz samej prezentacji łażnika, prowadzone były rozmowy i "powtórzenie" wiedzy o Marsie z wykładu, z częścią uczniów udało się nawiązać ciekawą dyskusję.

W ramach happeningu „**Mars. W jaki sposób badamy planetę?**” (2) zaprezentowano część poświęconą kraterom impaktowym. Na przygotowanym posterze przedstawiono genezę, rodzaje i cechy geomorfologiczne kraterów uderzeniowych, wraz z ich ziemskimi, księżycowymi i marsjańskimi przykładami. Dodatkowo na plakacie znalazły się geologiczne świadectwa zajścia impaktu oraz ciekawostki z przeszłych uderzeń meteoroidów. Prezentacja zagadnienia obejmowała omówienie plakatu, opisanie podobieństw między uderzeniami meteoroidów i eksplozjami bomb atomowych oraz quiz dotyczący nazewnictwa kraterów na różnych obiektach Układu Słonecznego. Uzupełnieniem wystąpienia było modelowanie kraterów w pojemniku wypełnionym materiałem skalnym imitującym rzeczywiste warunki geologiczne. Modelowanie polegało na tworzeniu kraterów o różnych rozmiarach i cechach, w zależności od użytych obiektów naśladujących meteoroidy: otoczaki o różnych kształtach i wymiarach, szklane kulki, materiały pirotechniczne o różnych siłach wybuchu. Prezentacja cieszyła się znacznie większym powodzeniem niż zakładano pierwotnie. Początkowo wystąpienia w każdym z festiwalowych dni miały być wysłuchane przez dwie 10-osobowe grupy. Jednakże w wyniku dużej liczby chętnych ilość prezentacji zwiększono do pięciu w piątek i trzech w sobotę. Jednocześnie każda z grup uczestniczących w pokazie składała się z większej niż zakładana liczby osób, tj. od 15 do 27. Słuchaczami były w większości dzieci i młodzież. Największe emocje wywoływało wśród nich modelowanie kraterów z użyciem fajerwerków oraz quiz o nazewnictwie tychże obiektów w Układzie Słonecznym. Starsi uczestnicy wykazywali szczególne zainteresowanie możliwością zajścia impaktu w przyszłości oraz podobieństwami między uderzeniami meteoroidów, a ziemskim arsenałem jądrowym.

Powodzeniem cieszyła się również druga z przygotowanych w ramach happeningu atrakcji, model „wodnej rakiety kosmicznej”. Zadaniem dzieci było ozdobienie naklejkami i rysunkami przygotowanych wcześniej przez prowadzących elementów rakiety, a także, po ich złożeniu, nalewanie „paliwa raketowego” i montowanie „części zapłonowej”. Zarówno przygotowanie, jak i moment „odpalania” rakiety (z pomocą osób prowadzących) wzbudzały dużo emocji wśród najmłodszych uczestników. Taka aktywność zainteresowała nie tylko dzieci. W ciągu dwóch dni wystartowało około 15 raket tworzonych indywidualnie oraz w grupach. Przedział wiekowy "konstruktorów" był bardzo szeroki – od 3 do 30 lat.

Ponadto przez cały czas trwania wyżej opisanych imprez otwarta była wystawa zatytułowana „**Marsjańskie krajobrazy**” (3), przedstawiająca najnowsze wysokorozdzielcze obrazy oraz panoramy Czerwonej Planety, pozyskane przez kamery misji marsjańskich. Ekspozycja składała się z dwóch części. W części pierwszej prezentowane były zdjęcia dwuwymiarowe, natomiast druga część ekspozycji składała się ze zdjęć trójwymiarowych, które oglądane były przy użyciu specjalnych okularów. Obrazy były zgrupowane w pięciu różnych kategoriach: krater uderzeniowy, kaniony, depresje, wyżyny i powierzchnia oraz panoramy. Przy wejściu na wystawę została umieszczona mapa Marsa z zaznaczoną lokalizacją miejsc widocznych na zdjęciach. Wszystkie zdjęcia były wykonane w bardzo wysokiej rozdzielczości, w formacie A0. Wystawa cieszyła się bardzo dużym powodzeniem, szczególne wrażenie robiły zdjęcia trójwymiarowe. Oprócz wycieczek szkolnych, wystawę odwiedziło również sporo osób indywidualnie, głównie rodziny z dziećmi, łącznie około 300 osób. Ekspozycja okazała się być niezwykle interesująca zarówno dla dzieci, jak i dla dorosłych. Padały różne pytania odnośnie geologii Marsa. W sobotę, w związku z niesłabnącym zainteresowaniem, zdecydowano się przedłużyć czas trwania wystawy.

(1) <http://www.festiwal.wroc.pl/2012/index.php?c=events&year=2012&do=detail&id=8237>

(2) <http://www.festiwal.wroc.pl/2012/index.php?c=events&do=detail&id=8239>

(3) <http://www.festiwal.wroc.pl/2012/index.php?c=events&do=detail&id=8238>

Pozostałe adresy:

<http://www.festiwal.wroc.pl/2012/index.php?c=article&id=831>

<http://www.festiwal.wroc.pl/2012/index.php?c=article&id=878>

New partnerships for developing scientific payload for Mars exploration - Collaboration with SRC PAN is now (Period 4) evolving toward a partnership for the development of a Mars exploration scientific payload meeting the expertise of both SRC engineering expertise and the TEAM group. Similarly, collaboration with startup ABM Space Education is evolving toward partnership in the development of a resistivity measurement instrument device to be placed onboard *Magma White* (initially developed by students at University of Białystok as *Magma-1* and *Magma-2*, now developing at ABM Space Education) for a potential Mars exploration mission.

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: November 2, 2012

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 01/05/2012 to 30/10/2012	Period no.: 3	
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.	Joanna Gurgurewicz	MPSE*	Hungary, Budapest	04/06/2012	08/06/2012	Inferring alteration conditions on Mars: Insights from near-infrared spectra of basalts from Siberia and East Africa.	poster
2.	Olga Kromuszyńska	MPSE*	Hungary, Budapest	04/06/2012	08/06/2012	Giant sacking scarps in Valles Marineris	poster**
3.	Magdalena Makoswka	MPSE*	Hungary, Budapest	04/06/2012	08/06/2012	Giant sacking scarps in Valles Marineris (second author)	poster**
4.	Daniel Mège	MPSE*	Hungary, Budapest	04/06/2012	08/06/2012	1. Planetary geosciences in Poland: where do we go 2. Comparative geosciences : the WROONA research group	oral presentation (1) + poster (2)

*MPSE: Mars - Connecting Planetary Scientists in Europe

**The students were sent to this conference not only for the invited lectures but also for attending planetary geology lectures organized for students every morning.

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.	Timur Borikov	Institut de Physique du Globe de Paris	France, Paris	15/03/2012	13/05/2012	Work with PhD co-supervisor Prof. Anne Mangeney, Head of Seismology lab at IPGP. Training to granular modelling with application to Martian and terrestrial landslides.
2.	Fionn Cullen	Géosciences Montpellier, University of Montpellier II	France, Montpellier	25/03/2012	24/05/2012	Work with PhD co-supervisor Prof. Frédéric Gueydan. Training to Finite Element Modelling of the rheology of the Martian lithosphere.
3.	Magdalena Makowska	Géosciences Montpellier, University of Montpellier II	France, Montpellier	25/03/2012	24/05/2012	Work with collaborators Profs. Frédéric Gueydan and Alfredo Taboada. Training to Discrete Element Modelling of slope stability on Mars.
4.	Daniel Mège	Institut de Physique du	France, Paris	02/05/2012	02/05/2012	Discussions with co-supervisor Prof. Anne Mangeney about PhD thesis of Timur Borykov

		Globe de Paris				
5.	Daniel Mège	Hungarian Academy of Sciences	Hungary, Budapest	09/06/2012	09/06/2012	Discussion with Akos Kereszturi (Hungarian Academy of Sciences) about future cooperation in planetary science between our TEAM group and the Astrophysical and Geochemical Laboratory of the Research Center for Astronomy and Earth Sciences (Hungarian Academy of Sciences), for which is the head.
6.	Joanna Gurgurewicz	Hungarian Academy of Sciences	Hungary, Budapest	09/06/2012	09/06/2012	Discussion with Akos Kereszturi (Hungarian Academy of Sciences) about future cooperation in planetary science between our TEAM group and the Astrophysical and Geochemical Laboratory of the Research Center for Astronomy and Earth Sciences (Hungarian Academy of Sciences), for which is the head.
7.	Marion Massé	Institut de planétologie et d'astrophysique de Grenoble	France, Grenoble	14/06/2012	28/06/2012	Laboratory experiments, acquisition of infrared spectra of wet basalts undergoing brine flow at a controlled temperature range
8.	Marion Massé		Northeast Iceland	12/07/2012	03/07/2012	Field observations of subglacial valleys and measurements using Differential GPS
9.	Olga Kromuszczyńska		Slovakia, Tatra	10/09/2012	15/09/2012	Field observations of gravitational spreading features and measurements (geologic, topographic using Wide Angle Differential GPS and laser tape)

			mountains			
10.	Magdalena Makowska		Slovakia, Tatra mountains	10/09/2012	15/09/2012	Field observations of gravitational spreading features and measurements (geologic, topographic using Wide Angle Differential GPS and laser tape)
11.	Marion Massé		Slovakia, Tatra mountains	10/09/2012	15/09/2012	Field observations of gravitational spreading features and measurements (geologic, topographic using Wide Angle Differential GPS and laser tape)
12.	Daniel Mège		Slovakia, Tatra mountains	10/09/2012	15/09/2012	Field observations of gravitational spreading features and measurements (geologic, topographic using Wide Angle Differential GPS and laser tape)
13.	Antoine Séjourné	Yakutsk Permafrost Institute	Russia, eastern Siberia			Field observations of gravitational spreading features and measurements (geologic, topographic using Wide Angle Differential GPS and laser tape)

2.2. *Official domestic trips:*

NO.	NAME AND SURNAME	SCIENTIFIC UNIT	COUNTRY, CITY	DURATION OF STAY		AIM OF THE STAY
				FROM	TO	

1.	Timur Borikov	ING PAN	Warsaw	31/05/2012	31/05/2012	ING PAN annual Programme conference
2.	Joanna Gurgurewicz	ING PAN	Warsaw	31/05/2012	31/05/2012	ING PAN annual Programme conference
3.	Olga Kromuszczyńska	ING PAN	Warsaw	31/05/2012	31/05/2012	ING PAN annual Programme conference
4.	Magdalena Makowska	ING PAN	Warsaw	31/05/2012	31/05/2012	ING PAN annual Programme conference
5.	Marion Massé	ING PAN	Warsaw	31/05/2012	31/05/2012	ING PAN annual Programme conference
6.	Daniel Mège	ING PAN	Warsaw	31/05/2012	31/05/2012	ING PAN annual Programme conference
7.	Antoine Séjourné	ING PAN	Warsaw	31/05/2012	31/05/2012	ING PAN annual Programme conference
8.	Marta Skiścim	ING PAN	Warsaw	31/05/2012	31/05/2012	ING PAN annual Programme conference
9.	Krzysztof Dębniak		Tatra mountains	03/09/2012	10/09/2012	Field observations of gravitational spreading features and measurements (geologic, topographic using Wide Angle Differential GPS and laser tape)
10.	Olga Kromuszczyńska		Tatra mountains	03/09/2012	10/09/2012	Field observations of gravitational spreading features and measurements (geologic, topographic using Wide Angle Differential GPS and laser tape)
11.	Magdalena		Tatra	03/09/2012	10/09/2012	Field observations of gravitational spreading features and measurements

	Makowska		mountains			(geologic, topographic using Wide Angle Differential GPS and laser tape)
12.	Marion Massé		Tatra mountains	03/09/2012	10/09/2012	Field observations of gravitational spreading features and measurements (geologic, topographic using Wide Angle Differential GPS and laser tape)
13.	Daniel Mège		Tatra mountains	03/09/2012	10/09/2012	Field observations of gravitational spreading features and measurements (geologic, topographic using Wide Angle Differential GPS and laser tape)
14.	Antoine Séjourné		Tatra mountains	03/09/2012	10/09/2012	Field observations of gravitational spreading features and measurements (geologic, topographic using Wide Angle Differential GPS and laser tape)
15.	Olga Kromuszczyńska		Poland, Warsaw	22/10/2012	23/10/2012	Discussion with ESRI Polska conference organizers for future promotional collaboration

2.3. *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	Karol Seweryn	CBK PAN	Poland, Wrocław	22.09.2012	23.12.2012	Presentation of CHOMIK instrument at the XVth Lower Silesian Science Festival
2	Marta Mordalska	CBK PAN	Poland, Wrocław	20.09.2012	23.09.2012	Presentation of CHOMIK instrument at the XVth Lower Silesian Science Festival