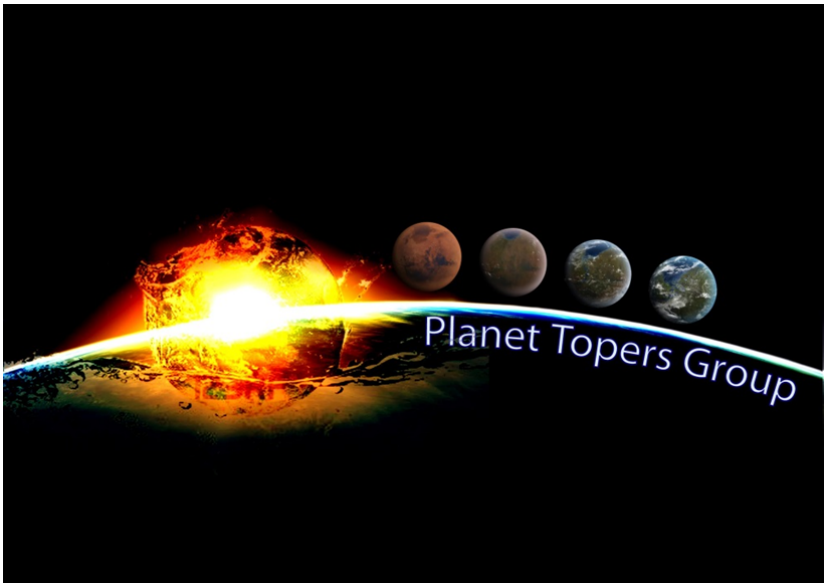
Planet Topers

Interuniversity attraction poles - phase VII

Annual Scientific Report
October 2013 – September 2014

P7-15 Planet TOPERS

Planets: Tracing the Transfer, Origin, Preservation, and Evolution of their ReservoirS



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List of abbreviations

3GM	Gravity and Geophysics of Jupiter and the Galilean Moons
AbGradCon	Astrobiology Graduate Conference
AbGradE	Astrobiology Graduates in Europe Network
ACE	Advanced Composition Explorer
AGU	American Geophysical Union
ALVL	Azimuth Lidort VLidort
AMELIA	Atmospheric Mars Entry and Landing Investigation and Analysis
AOTF	Acousto-Optical Tunable Filter
ASIMUT-ALVL	Radiative transfer modelling and spectrum retrieval in a non-scattering atmosphere (ASIMUT) and scattering atmosphere ((V)LIDORT)
BELA	BEpicolombo Laser Altimetry experiment
BELSPO	BELgian Science POlitics
BC	BepiColombo
BIF	Banded Iron Formation
BISA	Belgian Institute for Space Aeronomy
BX	BoXcar
CHUR	CHondritic Uniform Reservoir
Co-I	Co-Investigator
CLUPI	CLose-UP Photograph Imager
CHIC	Code for Habitability, Interior and Crust
CNES	Centre National d'Etudes Spatiales
Co-I	Co-Investigator
Co-PI	Co- Principal Scientist
COST	European Cooperation in Science and Technology
CLUPI	CLose-UP Imager
CrossDrive	Collaborative Rover Operations and Satellites Science in Distributed Remote and Interactive Virtual Environments.
DLR	Deutsche Zentrum für Luft- und Raumfahrt
DREAMS	Dust characterization, Risk assessment and Environment Analyzer on the Martian Surface
EANA	European Astrobiology Network Association
EC	European Commission
EDM	ExoMars Entry Descend Module
EGU	European Geoscience Union
EMTGO	ExoMars Trace Gas Orbiter
EPSC	European Planetary Science Congress
ERC	European Research Council
ESA	European Space Agency
ET	ExtraTerrestrial
EU	European Union
EUV	Extreme Ultraviolet
FIB	Focused Ion Beam
FNRS	Fonds National de la Recherche Scientifique
FoV	
FRIA	Fonds pour la formation à la Recherche dans l'Industrie et dans l'Agriculture
FRS	Fonds de la Recherche Scientifique
FTS	Fourier Transform Spectrometer
FUNDP	Facultés Universitaires Notre-Dame de la Paix
Ga	Giga-annum (billion years)

GAIA	Name for mantle convection code developed at DLR
GCM	General/Global Circulation Model
GEM	Global Environmental Multiscale
GaLA	Galilean moons Laser Altimeter
GSA	Geological Society of America
GSA	Geological Society of America Annual Meeting
HED	Howardite - Eucrite - Diogénite
HITRAN	HIgh-resolution TRANsmission molecular absorption)
HR	High Resolution
HRTEM	High Resolution Transmission Electron Microscopy
H-type	High iron abundance ordinary chondrite
IAG	International Association of Geodesy
IAGA	International Association of Geomagnetism and Aeronomy
IAP	Interuniversity Attraction Pole
IASI	Infrared Atmospheric Sounding Interferometer
IAU	International Astronomical Union
ICDP	International Continental Drilling Project/program
ICP	Inductively Coupled Plasma
ICP-MS	Inductively Coupled Plasma Mass Spectrometry/Spectrometer
ISEM	Infrared Spectrometer for ExoMars
JUICE	JUpiter ICy moons Explorer;
IM	Instrument Manager
IMCCE	Institut de Mécanique Céleste et de Calculs des Ephémérides
InSIGHT	Mars Interior exploration using Seismic Investigations, Geodesy, and Heat Transport
IR	InfraRed
ISRO	Indian Space Research Organization
ISSI	International Space Science Institute
J-MAG	JUICE Magnetometer
KOM	Kick-Off Meeting
KT	Cretaceous-Tertiary
LA	Laser Ablation
LHB	Late Heavy Bombardment
LIDORT	Linearized Discrete Ordinate Radiative Transfer
LoD	Limit of Detection
LPSC	Lunar and Planetary Science Conference
Ma	Mega-annum (million years)
MAGIE	Mars Atmospheric Global Imaging Experiment
MAJIS	Moons And Jupiter Imaging Spectrometer
MAVEN	Mars Atmosphere and Volatile EvolutioN
MC	Multi-Collector
MC-ICP-MS	Multi-Collector -Inductively Coupled Plasma - Mass Spectrometry/Spectrometer
MER	Mars Exploration Rover
MEX	Mars Express
MGS	Mars Global Surveyor
MIR	Modular IR spectrometer
MORE	Mercury Orbiter Radioscience Experiment
MRO	Mars Reconnaissance Orbiter
MS	Mass Spectrometry
MSL	Mars Science Laboratory
NASA	National Aeronautics and Space Administration

NEXAFS	Near Edge X-Ray Absorption Fluorescence Synchrotron
NIPR	National Institute of Polar Research
NOMAD	Nadir and Occultation for MArs Discovery
NMI	Non-Magmatic Iron
OC	Ordinary Chondrite
ODY	Mars Odyssey
PE	Princess Elizabeth
PGE	Platinum Group Element
PI	Principle Investigator
PLATO	PLAnetary Transits and Oscillations of stars
PRIDE	Planetary Radio Interferometry and Doppler Experiment
PS	Participating Scientist
REE	Rare Earth Elements
RISE	Rotation and Interior Structure Experiment
ROB	Royal Observatory of Belgium
ROSINA	ROsetta Spectrometer for Ion and Neutral Analysis
SAMBA	Search and Study of Antarctica Meteorites
SEIS	InSIGHT SEISmometer
SEM	Scanning Electron Microscopy
SIMBIO-SYS	Spectrometers and Imagers for MPO BepiColombo Integrated Observatory SYStem
SIMS	Secondary Ion Mass Spectrometry
SIROCCO	Synergetic SWIR and IR retrievals of near-surface concentrations of CH4 and CO for Earth and Planetary Atmospheres
SNC	Shergottite, Nakhlite, and Chassignite
SOIR	Solar Occultation in the Infra-Red
SPICAM	Spectroscopy for Investigation of Characteristics of the Atmosphere of Mars
SPICAV	Spectroscopy for Investigation of Characteristics of the Atmosphere of Venus
SSAC	Solar System Advisory Committee
SWIR	Short-Wavelength InfraRed
SZA	Solar Zenith Angle
TEM	Transmission Electron Microscopy
TGO	Trace Gas Orbiter
TIR	Thermal Infrared
TIRVIM	Thermal Infrared V-shape Interferometer Mounting
TOPERS	Tracing the Transfer, Origin, Preservation, and Evolution of their ReservoirS
TTG	Tonalite-Trondhjemite-Granodiorite)
UCL	Université Catholique de Louvain
UGent	Universiteit Gent
ULB	Université Libre de Bruxelles
ULg	Université de Liège
UPB	Ureilite Parent Body
UV	Ultraviolet
VEX	Venus Express
VMR	Volume Mixing Ratio
VUB	Vrije Universiteit Brussel
WG	Working Group
WP	Work Package
XANES	X-ray Absorption Near Edge Structure

1. General information:

Composition of the network, the name of all the partners of the network with their institution and their research unit.

Coordinator: Partner 1 (**P1**) Name: Dehant Véronique Institution: Royal Observatory of Belgium Institution's abbreviation: ROB
Partner 2 (**P2**) Name: Vandaele Ann Carine Institution: Belgian Institute for Space Aeronomy Institution's abbreviation: BISA
Partner 3 (**P3**) Name: Claeys Philippe Institution: Vrije Universiteit Brussel Institution's abbreviation: VUB
Partner 4 (**P4**) Name: Vanhaecke Frank Institution: Universiteit Gent Institution's abbreviation: UGent
Partner 5 (**P5**) Name: Javaux Emmanuelle Institution: Université de Liège Institution's abbreviation: ULg
Partner 6 (**P6**) Name: Debaille Vinciane Institution: Université Libre de Bruxelles Institution's abbreviation: ULB
International Partner (**INT**) Name: Spohn Tilman Institution: Deutsche Zentrum für Luft- und Raumfahrt Berlin Institution's abbreviation: DLR Country: Germany

2. Introduction:

Brief overview of the main scientific results

See list of publications; the full report is only accessible for IUAP Members.

Most important activities of networking

Activities organized as part of the IAP network

Planet TOPERS members have organized their first year meeting together with the Helmholtz Alliance meeting in Berlin; an additional executive meeting with presentations of the WPs has been held in BISA on 29 November 2013; on November 3d 2014 there was a meeting of the Consortium as part of the Astrobiology FNRS Contact Group, and another meeting of the executive meeting has been organized as well on November 4th.

Planet TOPERS members attended several international meetings to present the work of the Consortium, and establish its scientific presence within the community.

They also organized Sessions at Congress or conferences themselves (see Meeting organization below)

Website and Ftp

The planet TOPERS have a website at http://planet-topers.oma.be/ and a private ftp site at https://planet-topers.oma.be/index_library.php where all information necessary for the group is provided.

Outreach

The planet TOPERS have, in addition to the website and the blog on Antarctica, several press releases, TV interviews, radio interviews, paper press, and have given several public conferences (see below).

"Snow-ball effect"

Planet TOPERS Members participate in several calls and obtained several new contracts (see Section New contracts between October 2013 and September 2014 below).

Planet TOPERS Members have obtained new international responsibilities.

3. Description of the research completed

The work of the Planet TOPERS Consortium has been organized in WPs and the first results are here described in subdivisions corresponding to the different WPs. This separation is however more and more difficult as we are integrating our results all together and interacting between the groups and/or between the WPs.

WP 1: Internal Geophysics and Interaction with Atmosphere

WP 1.1: Interior modelling and consequences on thermal state and convection – WP 1.2: Interior modelling and consequences on the magnetic field

Early thermal evolution: Magma ocean Crystallization and Heat pipe mechanism
Mars: present thermal state and abundance of radiogenic heat sources
Formation of continents
Ocean planet

WP 1.3: Internal and external volatile content in particular Carbon Dioxide (CO_2), Sulfur dioxide (SO_2), methane (CH_4) and water (H20) and planetary evolution

Atmospheric evolution

(i) Hydrodynamic escape
(ii) Coupled atmosphere/mantle simulations
(iii) Effects of large impacts
(iv) Planetesimal volatile contents

Planetary atmospheres – trace gases

WP 1.4: Clathrates and methane in the atmosphere of Mars

Methane on Mars
Modeling clathrate hydrates stability
Experimental measurements of the effect of ammonia on the stability of clathrate hydrates and implications for outgassing on Titan
NOMAD

WP 2: Atmosphere and interaction with surface, hydrosphere, cryosphere, and space

WP 2.1: Solar illumination, solar wind, magnetosphere and atmosphere interactions for determining the net loss of atmospheric material

Modeling of the interaction between the surface and the atmosphere
Modelling of the interaction between solar radiation and the atmosphere
Mass and energy transport at the magnetopause
Magnetospheric mass circulation
Polar cap arcs and ionospheric ion outflow

WP 2.2: Sources of abiotic atmospheric gases: volcanism and impacts

See WP 1.3: Internal and external volatile content in particular Carbon Dioxide (CO2), Sulfur dioxide (SO2), methane (CH4) and water (H20) and planetary evolution

WP 2.3: Relation between atmosphere and cryosphere

Long term atmosphere evolution with temperature allowing a cryosphere is also treated in WP1.3.

WP 3: Identification of life tracers, and interactions with planetary evolution

WP 3.1: Identification and Preservation of life tracers in early Earth and analog extreme environments

Modern analogs
Early Earth-Proterozoic
Early Earth-Archean

WP 3.2: Implication of life tracers preservation for in situ detection on Earth and other planets

Antarctic habitat
Radiation environments
Influence of life on atmospheric evolution and vice versa

WP 4: Accretion and evolution of planetary systems

WP 4.1: Isotope cosmochemistry

Elemental composition of iron meteorites
LA-ICP-MS elemental mapping of iron meteorites
Two-dimensional mapping of element distributions via laser ablation – ICP-mass spectrometry

WP 4.2: Role/effects of meteorites and comets impacts

Petrography/geochemistry of ejecta material

WP 4.3: Chronology of differentiation processes (core segregation, magma ocean, mantle overturn and early to recent volcanism) in the Solar System

Planetesimals
Achondrites
Non-magmatic iron meteorites
Geochronometers
Comet activities

WP 4.4: Onset of plate tectonics and recycling of the crust and possible implication for life sustainability

Plate tectonics, mantle overturn, and isotopic measurements
Plate tectonics and evolution

4. Network organization and operation

Activities organized as part of the IAP network (Oct. 1st, 2013 to Sept. 31st, 2014)

The research and interactions between the teams were built during the kick-off meeting as well as the first annual joint meeting organized at DLR with the Helmholtz Alliance "Planetary Evolution and Life". There was **an Executive meeting on November 29, 2013**, organized at BISA, where the WP leaders have all presented their work. There were as well several WP specific or subgroup meetings (**WG meetings**).
Minutes of these meetings are available on the Planet TOPERS ftp site.

The Planet TOPERS Members benefit from the **Astrobiology FNRS Contact Group** with Emmanuelle Javaux as President and Véronique Dehant as Secretary. The annual meeting 2014 was held at Liege University **on November 3d**. We invited Lucas Stal to talk about "Microbial mats: a living entity" and Dennis Höning (DLR) to present his work on "A Thermal Evolution Model of the Earth Including the Biosphere, Continental Growth and Mantle Hydration". We also took this opportunity to have an Executive meeting for a complete day after that (on November 4th 2014) where again all PLs presented the work done.

Figure 1: Contact Group meeting at Liege University on November 3d 2014. more than 50 people attended the workshop!

Figure 2: Invited speaker of contact Group meeting at Liege University on November 3d 2014. Lucas Stal, NIOZ, the Netherlands, expert in microbial mats (shown in the slide).

Informal meetings were also organized to discuss specific questions or to celebrate some of the medals and prizes awarded to Planet TOPERS members (see below), such as a drink for the visit of Ana Catalina Plesa, breakfast between members of the executives, etc.

Activities organized at International level (from Oct. 1st, 2013 to Sept. 31st, 2014)

Planet TOPERS members attended **several international meetings** to present the work of the Consortium, and establish its scientific presence within the community.

Lunar and Planetary Science Meeting in Houston (March 2014); 36th National Institute of Polar Research Symposium on Antarctic Meteorites (November 2013 Tokyo, Japan), Geolocial Society of America Annual Meeting held in Vancouver (October 2014), Meteoritical Society Meeting in Casablanca, in August 2014, and Goldschimdt Conference that took place in Sacramento, California in June 2014.

There were several presentations at Geological Society of America Annual Meeting (November 4-7, 2012, Charlotte NC, USA), at the 35th National Institute of Polar Research Symposium on Antarctic Meteorites (November 29-30, 2012, Tokyo, Japan), at the American Geophysical Union Meeting (December 3-7, 2013, San Francisco, USA), at the International Continental Scientific Drilling Project work in Barberton Drilling Project: “Peering into the Cradle of Life” (February 18-25, 2013, Johannesburg, South Africa), at the Lunar and Planetary Science Conference (March 18-22, 2013, The Woodlands, Texas, USA), at European Geoscience Union Meeting (April 7-12, 2013, in Vienna, Austria), at the International Venus Workshop (June 10-14, 2013, in Catania, Italy), at the Goldschmidt conference (August 25-30, 2013, Florence, Italy), at European Planetary Science Congress (September 8-13, 2013, University College London, United Kingdom), at the ESF-EMBO Symposium Biology of Plastids (Pulstusk, Poland, 21-06-2014 to 26-06-2014), at the ISSOL & BIOASTRONOMY meeting (5-11 July 2014, Nara, Japan), at the IMA (Johannesburg, August 2014), at the PALASS (Sept.-Oct. 2014 Mendoza Argentina), at the German Swiss Geodynamics Workshop (October 5-8, 2014, Bad Münster am Stein, Germany), AbGradE 2014 (October 8-10, 2014), EANA 2014 (October 13-16, 2014, Edinburgh),…

Planet TOPERS members were invited as lecturers to **several international thematic school**: on (Exo)planet Global Climate Models (April 15-16, 2013, Leuven), on Spectroscopy and Planetology (June 3-7, 2013, in Frejus, France), on Astrobiology [The First Educational Workshop on Astrobiology] (June 6-9, 2013, Höör, Sweden), on Astrobiology [AbGradCon 2013] (June 10-14, 2013, Montreal, Canada), on Origin, Evolution and Future of the Biosphere (August 19-30, 2013, Banyuls, France).

International radiancy (from October 1st, 2013 to September 31st, 2014)

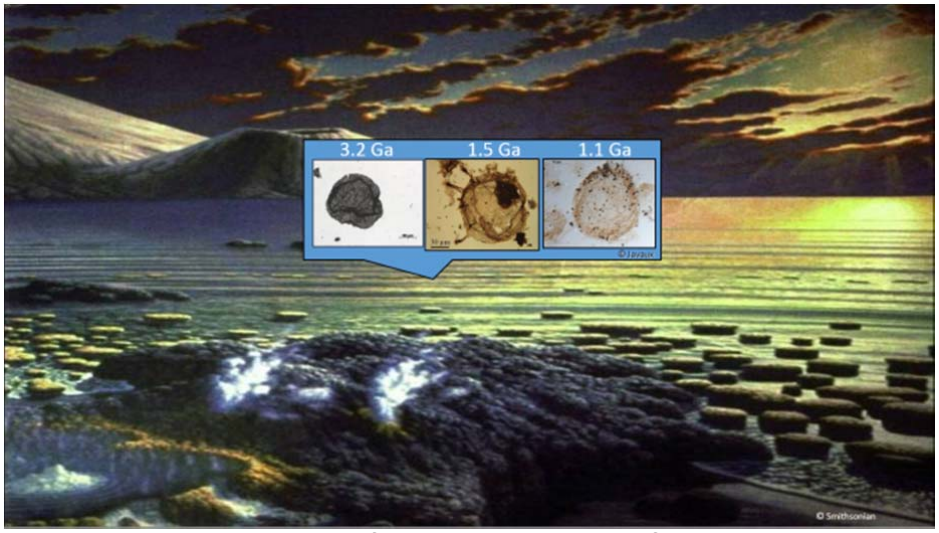
Meeting Organization

Planet TOPERS members were responsible for the organization of a complete session at EGU (European Geosciences Union) 2014, PICO Session PS8.1/BG8.2 “Evolution of planetary habitability: conditions for the origin of life on Earth and beyond Earth”, Convener: Emmanuelle Javaux, Co-Conveners: Doris Breuer, Véronique Dehant, Özgür Karatekin, Lena Noack, Tilman Spohn, Ann Carine Vandaele (all from Planet TOPERS) and the PICO session BG 8.1 “Evidence and Habitats for Life on the Archean-Proterozoic Earth”, Conveners: Nicola McLoughlin, co-conveners: Emmanuelle J. Javaux, Dan Asael, Noah Planavsky. Thanks to three Planet TOPERS members, Özgür Karatekin, being President of the Planetary and Solar System Sciences division, Lena Noack, being the new Young Scientists Representative of the Planetary and Solar System Sciences Section of EGU, and Emmanuelle J. Javaux, being Secretary of EGU Biogeosciences section “Early life and astrobiology”, we had much visibility.

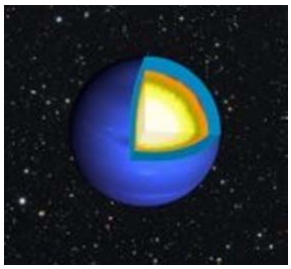
During EGU, we participated as main interveners in a Press Conference on "Fingerprints of life: from the early Earth to outer space" related to the two scientific sessions BG8.1 and PS8.1/BG8.2. The content was highlighted in several journals. IUAP Planet TOPERS members Emmanuelle

Javaux (University of Liège) and Lena Noack (Royal Observatory of Belgium), together with a colleague from the Canada (Kurt Konhauser, University of Alberta) gave a press conference at the EGU (European Geophysical Union) in Vienna (at the Press Centre, located in the Austria Center Vienna) on Thursday, 1st May 2014, at 11:00 on "Fingerprints of life: from the early Earth to outer space".

On the EGU website one can now find an advertisement video for PICO presentations. The video used this year's PICO session PS8.1/BG8.2 “Evolution of planetary habitability: conditions for the origin of life on Earth and beyond Earth” and PICO session BG8.1 “Evidence and Habitats for Life on the Archean-Proterozoic Earth” organized by several Planet Topers as mentioned above. This is a great advertisement for our work: see http://www.egu2015.eu/pico.html. If you look at the video, you see for instance Lena for PICO PS8.1/BG8.2 then you can listen to Kurt Konhauser, invited speaker in the other PICO BG8.1.



Billions of years ago, cyanobacteria transformed the chemistry of our planet, a period known as the Great Oxidation Event. This episode was a pivotal point in Earth’s history, opening the evolutionary door to oxygen-breathing animals. Until recently, the event was thought to have taken place 2.3-2.4 billion years ago. But recent results have pushed this milestone back, resetting the date for the origin of oxygen-releasing photosynthesis and highlighting the long-lasting and dynamic nature of the transition from an oxygen-poor to an oxygen-rich world. This press conference explores new research on when and how Earth came to have an oxygen-rich atmosphere, and discusses what the conditions for life in our planet can tell us about the possible habitability of other worlds, particularly of ocean-bearing planets. The press conference was streamed online. The video of the press conference is available at this link (http://media.egu.eu/press-conferences-2014/#habitability).



We have also organized a complete session at EPSC (European Planetary Science Congress) 2014, Session AB2 “Planetary Habitability in the Solar System and Beyond”, Convener: V. Dehant, Co-Conveners: L. Noack, T. Spohn, and D. Breuer (all from Planet TOPERS).

Planet TOPERS Members participated in the organization of the Astrobiology Graduate Conference (AbGradCon) 2014 meeting, L. Noack is a founding member of the European Astrobiology network for young scientists AbGradE and was an organizer for its first symposium in October 2014.

Planet TOPERS members (Vandaele A.C., Mahieux A., and Wilquet V.) are participating to 3 ISSI International Teams as experts (SO_2 on Venus, Venus Cloud and Venus Temperature). AC Vandaele is coordinator of the ISSI team on SO_2 on Venus.

Maggiolo R. is member of the ISSI international team "Heavy Ions: Their Dynamical Impact on the Magnetosphere", coordinated by E. Kronberg (MPS, Germany).

Maggiolo R. is coordinator of the ISSI international team "Polar Cap Arcs: Understanding Magnetosphere-Ionosphere Coupling and Magnetospheric Topology during Periods of Northward IMF".

In summary the **5 ISSI workshops where Planet TOPERS is involved are**:

- "Venus SO_2": investigation of the role of SO_2 in the Venusian atmosphere - PI: Vandaele A.C. and O. Korablev, 12 international experts - expert from Planet TOPERS: Mahieux A. - http://www.issibern.ch/teams/venusso2/ - meetings in November 2013 and in June 2014 – next one in Feb 2015;
- "Venus Atmos": towards a self-consistent model of the thermal structure of the Venus atmosphere - PI: S. Limaye - experts from Planet TOPERS: Vandaele A.C. and Mahieux A. - http://www.issibern.ch/teams/venusatmos/ - meetings in November 2013 and in June 2014 – next one in Feb 2015;
- "Venus Clouds": investigating the role of clouds in the Venusian atmosphere - PI: C. Wilson and E. Marcq, expert from Planet TOPERS: Wilquet V. - http://www.issibern.ch/teams/venusclouds/ - meetings in November 2013 and in June 2014 – next one in Feb 2015,
- "Polar Cap Arcs": understanding magnetosphere-ionosphere coupling and magnetospheric topology during periods of northward IMF - PI: Maggiolo R. (from Planet TOPERS) - http://www.issibern.ch/teams/polarcap/ - Meetings on 4-8 Feb. 2013, 21-25 Oct. 2013;
- "Heavy Ions: Their Dynamical Impact on the Magnetosphere" - PI: E. Kronberg - expert from Planet TOPERS: Maggiolo R. - http://www.issibern.ch/teams/ionmagneto/ - meetings 11-15 Feb 2013 and 21-25 Oct 2013.

Medals, Prizes, Awards

Several Members of Planet TOPERS have received Prizes or Awards between October 2013 and September 2014:

- IUAP Planet TOPERS members Emmanuelle Javaux (University of Liège) became Member of the Royal Academy of Belgium. Also Alessandro Morbidelli, Member of the Scientific Advisory Committee of Planet TOPERS, has been nominated as Associate Member. The ceremony was held on May 17th:
  for more information, click here
  (http://www.academieroyale.be/cgi?lg=fr&pag=774&tab=87&rec=1757&frm=0)
  and for the photo gallery, click here
  (http://www.academieroyale.be/cgi?lg=fr&pag=774&tab=87&rec=1788&frm=0).
  Interview of Emmanuelle Javaux on the Royal Academy website
  (http://www.academieroyale.be/mailingDetail/Cmu2c1830f4dK4j1491165fqkRM41491227fkc4et1248f4igtm)
- Véronique Dehant received the "Doctorat Honoris Causa" of Paris Observatory. The ceremony is 13 November 2014.
- Vinciane Debaille received the price Atomia 2014 for the Brussels Capital region rewarding a young female scientist for her innovative ideas.
- PhD student J Beghin (ULg) received the EGU young scientist award support for his abstract to the EGU session BG8.1.
- Emmanuelle Javaux became member of the Belgian Royal Academy of Literature, Fine Arts, and Sciences, Class of Sciences.
- Emmanuelle Javaux received a Francqui Foundation Research Professorship (2013-2016).

- Philippe Claeys received the Prix Adolphe Wetrems" 2013, given by the Académie Royale des Sciences, des Lettres et des Beaux-Arts de Belgique, for major contribution in Natural Sciences.

Website and Ftp

The planet TOPERS website is at http://planet-topers.oma.be/. It contains:

- Home (where the latest news are displayed)
- Objectives
- Partners
- Definition of Habitability
- Scientific Concept and Overall Planning
- Useful Links (including the Astrobiology Contact Group and the Helmholtz Alliance)
- Outreach (with all press released, interviews etc.)
- News (the archive of all news)
- Planet TOPERS Meetings (with the details and the agendas)
- Other Conferences-Events (of interest for the group)
- Publications (will be updated after this report)
- Annual reports (will be updated after this report)
- Jobs
- Ftp (this is a private ftp as explained below; it requires a password).

The content of our ftp is the following: https://planet-topers.oma.be/index_library.php

- Acknowledgements - logos
- Action item list
- Administration documents (each institute = one directory)
- CVs
- Executive meetings
- Helmholtz Alliance
- Internal (WG) meetings
- Kickoff meeting
- Reports - Lists publications & presentations
- Outreach
- Project
- WP1 2 3 4 5: This is and will be the most active part of our ftp.

Visitors

In addition to several short-term visitors in each institutions, ULG had several lon-term visitors: Oct 2013-March 2014: Prof. S. Golubic, Univ. Boston (FRS-FNRS sabbatical stay), 6 months; Prof A Bekker, Univ. California, Riverside (US), one week in Sept. 2014; Prof N. Planavsky (Yale Univ., US) in march 2014; Prof P. Mason, Utrecht Univ. in March 2014.

Outreach

Website

The coordinator is maintaining a website where all activities and results are mentioned.

Press releases

- ESA News - 8 November 2013: "ExoMars lander module named Schiaparelli"
- BISA News - 8 November 2013: "ExoMars lander module named Schiaparelli"
- IASB News - 8 November 2013: "L'atterrisseur de ExoMars est baptisé Schiaparelli"
- BIRA News - 8 November 2013: "ExoMars-lander is Schiaparelli gedoopt"
- BISA News - 1 March 2014: "New laboratory measurement of CH_4 lines" and the complete article
- BISA News - 10 April 2014: "Venus Express: 8 years in orbit !"
- IASB News - 10 April 2014: "Venus Express: 8 années en orbite !"
- BIRA News - 10 April 2014: "Venus Express: 8 jaren in orbit !"
- BISA News - 17 July 2014: "Planetary Aeronomy Team paper highlighted: Venus Express took a plunge into the Venus atmosphere"
- IASB News - 17 July 2014: "Venus Express a fait un plongeon dans l'atmosphère de Vénus"
- BIRA News - 17 July 2014: "Venus Express nam een duik in de atmosfeer van Venus"
- Science Direct - Press release/Highlights - August 2014: "Biological enhancement of weathering and erosion as discovered by DLR team of researchers modeling early Earth"
- IRSNB - 4 November 2014: "La météorite antarctique de retour au Muséum"
- KBIN - 4 November 2014: "Antarctische meteoriet keert terug naar Museum"
- RBINS - 4 November 2014: "Antarctic Meteorite Returns to Our Museum"
- The work of the DLR team on biological enhancement of weathering and erosion has been the object of a press release and several press articles. When the DLR team of researchers modeled early Earth's mantle and crust with and without the potential added erosion caused by roots, bacteria, lichens and other biological agents of erosion, they found that the planet evolves with less continental area. The role of water in the Earth's mantle is critical to the model. The scientific article appeared in the scientific literature (in Planetary and Space Science) under the headline "Life gave Earth its continents". See http://www.newscientist.com/article/mg22029443.100#.Up7WWuIlhJ2 which appeared on 25 November 2013 and http://news.discovery.com/earth/rocks-fossils/did-early-life-build-earth-continents-131114.htm which appeared on 14 November 2013.

TV Interviews

- RTBF Journal Télévisé, De Keyser J., Contribution concerning Rosetta, 12 March 2014.
- RTL TVI television interview, De Keyser J., on air in the 19:00 evening news, 5 August 2014.
- RTL television, De Keyser J., Dhooghe F., Maggiolo R., E. Equeter, Interview about Rosetta's arrival at 67P for the News, 6 August 2014.
- VTM television, De Keyser J. and E. Equeter. Interview about Rosetta's arrival at 67P for the News, 6 August 2014.
- VRT television, De Keyser J., E. Equeter, Dhooghe F., Interview about Rosetta's arrival at 67P for the News, 6 August 2014.
- RTBF television, De Keyser J., E. Equeter, Dhooghe F., Maggiolo R., Interview about Rosetta's arrival at 67P for the News, 6 August 2014.
- RTBF TV La Une JT 19h30 - 11 November 2014: Interview of Maggiolo R., "Atterrissage de Philae"
- RTBF TV La Une JT 19h30 - 12 November 2014: Interview of E. Javaux, Maggiolo R., E. Neefs, "Atterrissage de Philae"
- VRT television, De Keyser J., Live commentary and interview by L. Scheire and B. Van Peer for Nerdland, parts of which were shown during Terzake, during the landing of Philae on 67P/Churyumov-Gerasimenko, organized by ESERO Belgium and University of Gent, Gent, 12 November 2014.

- VTM television, De Keyser J., Interview about the landing of Philae on 67P/Churyumov-Gerasimenko for the News, 12 November 2014.
- VTM television, De Keyser J., Interview about the survival possibilities of Philae on 67P/Churyumov-Gerasimenko for the News, 14 November 2014.

Radio Interviews

- RTBF radio, De Keyser J., Interview about Rosetta's arrival at 67P for the News, 6 August 2014.
- Radio 1 (Flemish radio), De Keyser J., Interview about Rosetta's arrival at 67P for the News, 6 August 2014.
- Radio 1 (Flemish radio), De Keyser J., Dhooghe F., D. Devisscher, Interviews about Rosetta's arrival at 67P for "Vandaag", 6 August 2014.
- RTBF La Première radio, De Keyser J., R. Boninsenga, and E. Jehin, Panel discussion aired live during the RTBF La Première radio program "Le Forum du Midi" about Rosetta's arrival at 67P, the role of space research, and the upcoming Perseid meteor shower, 7 August 2014.
- RTBF La première “Forum du midi” 12-13h - 12 November 2014: Interview of Emmanuelle Javaux, J.P. Swings, and E. Jehin, “Philae : comètes, histoire du système solaire et origine de la vie”

Paper press

- BIOFUTUR spéciale édition - Juillet-août 2013: Interview of Emmanuelle Javaux, “Les premières traces de vie”
- DeltaNews - 14 November 2013: Interview of D. Höning, “Did Early Life Build Earth's Continents?”
- NewScientist - 25 November 2013: Interview of D. Höning, “Early life built Earth's continents”
- Science Connection - May 2014: Interview of Véronique Dehant concerning the IUAP, in English, in French, in Dutch
- LeSoir - 16 June 2014: Interview of Vinciane Debaille, “La Lune viendrait de la Terre… et de Theia”
- La Libre Belgique - 4 August 2014, De Keyser J., Interview with La Libre Belgique newspaper about Rosetta and BIRA-IASB's role.
- BELGA news agency - 4 August 2014, De Keyser J., Dhooghe F., and Maggiolo R., Press release concerning Rosetta's arrival at 67P/Churyumov-Gerasimenko and BIRA-IASB's role in the science, sent out to the Belgian press. Picked up by the BELGA news agency, who combined our story with the ESA press release, and published in several newspapers (Het Laatste Nieuws, Het Belang van Limburg, Le Soir, Het Nieuwsblad, De Standaard).
- METRO newspaper - 5 August 2014, De Keyser J., Dhooghe F., Maggiolo R., Short press story in the METRO newspaper (Dutch and French), “België staat voor ontmoeting met komeet” / “La Belgique a rendez-vous avec une comète”.
- Bruxelles News - 14 August 2014, De Keyser J., Short press story in "Bruxelles News" about Rosetta's arrival at 67P, and BIRA-IASB'sd role.
- Newsletter of the European Low Gravity Research Association - 7 November 2014, De Keyser J., Interview for the Newsletter of the European Low Gravity Research Association about Rosetta and the landing of Philae on 67P/Churyumov-Gerasimenko.

- Het Laatste Nieuws - 12 November 2014, De Keyser J. Interview for newspaper "Het Laatste Nieuws" about the landing of Philae on 67P/Churyumov-Gerasimenko.
- LaLibre - 12 October 2014: Interview of Véronique Dehant by Sophie Devillers, "Quand notre Terre perd la boussole…"
- LeSoir - 12 and 13 November 2014: Interview of Emmanuelle Javaux, "Philae on Rosetta : comètes, histoire du système solaire et origine de la vie".
- Magazine d'Uccle - 17 November 2014, De Keyser J., Interview concerning Rosetta and Philae's landing by Chr. Du Brulle for the Magazine d'Uccle.

Public Conferences

- Debaille V., 2013, "Sciences en Antarctique", Institut Sainte Marie d'Arlon, 6 December 2013.
- De Keyser J., "Les comètes, Rosetta, et l'Institut d'Aéronomie Spatiale de Belgique.", Presentation given at the press conference on the inauguration of a special Rosetta exhibit at the Euro Space Center, Redu, Belgium, 27 February 2014.
- Javaux EJ, "Des nouvelles de la planète Mars.", Université du 3ème âge, ULg, 27 February 2014.
- Javaux EJ, "Des nouvelles de la planète Mars. Chênée", AGAB. 7 March 2014.
- Javaux EJ, "A la recherche des premières traces de vie Université de Liège, 12 March 2014. (WEBTV)
- Dehant V., 2014, "Planètes ou lunes habitables dans le système solaire.", conference for Connaissance et Vie, Namur, 11 March 2014.
- Jehin E., Javaux E.J., Magain P., Gillon M., "L'eau dans l'univers.", Grande conférence Liégeoise, Verviers, 26 March 2014.
- Aerts C., and Dehant V., 2014, "Planètes Habitables dans notre Système Solaire et dans la Galaxie: connection avec l'Astérosismologie? / Leefbare planeten in ons Zonnestelsel en in de Melkweg: Verband met Asteroseismologie?", conference for Fondations Universitaires, March 31, 2014.
- Dehant V., 2014, "Mars est-elle une planète habitable? L'a-t-elle été? Y a-t-il d'autres planètes ou lunes habitables?", conference for Association des Anciens Saint-Boniface-Parnasse, May 15, 2014.
- De Keyser J., Presentation to secondary school groups of the Rosetta exhibit for the Open Doors of the Space Pole, Brussels, 10 October 2014.
- Debaille V., la conquête de la Lune, in the frame of the exhibition "Tous vers la Lune avec Tania" http://www.expolune.be/ à Parentville 11 October 2014.
- De Keyser J., Dhooghe F., and Maggiolo R., "Een komeet ontdekken met Rosetta.", Public lecture during the Open Doors of the Space Pole, Brussels, 11-12 October 2014.
- Javaux E., Conférence au collège Belgique "Origine et évolution des eucaryotes : informations du registre fossile", October 2014.
- Dehant V., 2014, "Planètes ou lunes habitables dans le système solaire.", conference for the Rotary Club, Namur, 27 October 2014.
- Dehant V. and Morbidelli A., "Évolution et habitabilité du système solaire.", Cours Collège Belgique, Académie des Sciences, Palais des Académies, 4 November 2014.
- De Keyser J., Dhooghe F., Maggiolo R., "Rosetta at the Belgian Institute for Space Aeronomy.", Presentation during the Philae landing event organized by ESERO Belgium and University of Ghent, 12 November 2014.
- Debaille V and E. Javaux, "Tectonique des plaques dans le système solaire : implications pour l'évolution de la Terre et pour l'origine et la diversification de la vie.", Cours Collège Belgique, Académie des Sciences, Palais des Académies, 13 November 2014.

- Dehant V., 2014, "`Challenges and opportunities for women leadership in Europe and USA: View of a Scientific Researcher.", Speech for the joint meeting of Women In Aerospace WIA-Europe and the International Aviation Womens Association IAWA, November 6, 2014.
- Debaille V., "Hisotry of Belgian meteorites and history of meteorites in Belgium", national Symposium organised in the frame of the Belspo BELAM project, 14 November 2014.
- Javaux E., "Pause café" with Emmanuelle Javaux, lLe lungo, December 2014.

Other/New contracts between October 2013 and September 2014

Three Planet TOPERS Members participate in a new **COMPET 8 of H2020**. Vinciane Debaille is co-PI of the EURO-CARES COMPET 8 H2020 project dedicated to create a roadmap for the implementation of a European Extra-terrestrial Sample Curation Facility (ESCF). Ann Carine Vandaele (BISA) and Özgür Karatekin (ROB) are Co-I of UPWARDS (Understanding Planet Mars With Advanced Remote-sensing Datasets and Synergistic studies) COMPET 8 H2020 project dedicated to the understanding planet Mars with advanced remote-sensing datasets and synergistic studies of which the PI is Agencia Estatal Consejo Superior de Investigaciones Científicas (CSIC).

Emmanuelle Javaux is PI of a 2014 **ULg equipment grant** (40.000 euros + TVA, laser for micro-Raman spectrometer) and partner of a 2014 ULg large equipment grant (contribution to 1 of the 4 robotic telescopes for the project SPECULOOS: searching for the first habitable terrestrial exoplanets amenable for biosignatures detection, PI: Gillon M., co-I: Van Grootel V., partners: Jehin E., Lendl M., Dupret M.A., Absil O., Grodent D., Javaux E.J.).

Johan De Keyser is involved in a new FNRS project that supports the work on ionospheric and cometary chemistry. The PI is N. Vaeck of the ULB : N. Vaeck, De Keyser J., X. Urbain, P. Quinet. Modeling of atmospheric and cometary erosion processes - Production of missing atomic and molecular data. FNRS project (Research Project T.107314, 205 kEUR, 2 FTE-year, involving ULB, BIRA-IASB, UCL, UMons), 1 July 2014 - 30 June 2016

Four planet TOPERS Members, Emmanuelle Javaux, Philippe Claeys, Véronique Dehant, and Lena Noack are part of a new FP7 TransDisciplinary Project TDP 1308 **COST Action: ORIGINS** "Origin and Evolution of Life on Earth and in the Universe" (PI: M Gargaud, Univ. Bordeaux; 54 proposers, 24 countries). Emmanuelle Javaux and Philippe Claeys are the Belgian representatives in the managing committee and Véronique Dehant is suppliant. E Javaux and V. Dehant are also working group leaders (Early and extreme life, and Planetary habitability, respectively). V. Dehant is Monitoring Process Coordinator for ORIGINS.

Vinciane Debaille started her **ERC** Stg Grant IsoSyc in March 2014.

Planet TOPERS Members have obtained **brain-be projects**:

- Brain Network project COME-IN (COnstraining MErcury's INterior structure and evolution), PI: Tim Van Hoolst (ROB), partners: ULg, UGent, VU University Amsterdam, Leibniz University Hannover
- Brain Network project SCOOP (Towards a SynergistiC study Of the atmOsphere of terrestrial Planets), PI: Valérie Wilquet (BISA), partners: ULg and ROB
- Brain pioneer project LOTIDE (Localized Tidal Heating on Enceladus), PI: Mikael Beuthe (ROB).

Planet TOPERS Members have obtained **Supplementary Researchers**;

- "Rotation and tides of icy moons", PI: Tim Van Hoolst, for Antony Trinh (ROB)
- "Mars Atmospheric Entry Descent Landing Radio Link Analysis for ExoMars' AMELIA investigation", PI: V. Dehant/O. Karatekin, for Nicolas Gerbal (ROB)

Emmanuelle Javaux became collaborator of a selected team of the **NAI** (NASA Astrobiology Institute) of which the PI is Tim Lyons of the University of California, "mission to early Earth" http://astrobiology.nasa.gov/articles/2014/10/7/nais-new-teams-a-preview-of-the-research/

Contracts that have been obtained in the frame of Planet TOPERS previously and still running

During the first year of the IUAP, two Planet TOPERS Members have obtained an **ERC Starting Grants** from the European Research Council. Close to a total of 3 million Euros are being invested in the two researchers' very high level research projects, exploring unexpected and audacious pathways in the study fields of the early evolution of life on Earth (E. Javaux, ULg) and initial composition of the solar system and terrestrial planets (V. Debaille, ULB). The extremely selective process (a 12% success rate) only retains the best researchers and very high level research projects, known as high gain, high risk, in other words projects in which the researchers demonstrate both their skills and their audacity in tackling very new research pathways which are likely to, should they prove successful, greatly enrich knowledge of the area concerned. In summary:

- Emmanuelle Javaux got an **ERC** (ELITE, for Early Life Traces, Evolution & Implications for Astrobiology), on early evolution of life on Earth, 2013-2018)
- Vinciane Debaille got an **ERC** called ISoSyc: Initial solar system composition

Planet TOPERS Members (O. Karatekin, V. Dehant, Vandaele A.C., and Ph. Claeys) have obtained a budget for **networking with Russian science institutions** (Space Research Institute (IKI) and Russian Academy of Sciences (RAS)) for working on planetary and solar system sciences. In particular, the objectives are to better understand the meteorite and comet impacts on the atmosphere evolution of a planet and the influence on habitability, and to prepare the next missions for Mars exploration as well as for the exploration of the icy moons of the solar system. 15 October 2013-14 October 2016.

Planet TOPERS members are part a **bi-lateral project** between Belgium (BISA) and **India** (ISRO and other research centers). In the frame of this project, Belgian and Indian researchers collaborate for the different space missions to Mars.

We have a new Planet TOPERS member: Dr. Bernard Charlier. Bernard is a geologist and who obtained his PhD at the Université de Liège. He went in postdoc at MIT in the US with a Marie Curie Fellowship before going to the Leibniz Universität Hannover in Germany. His research interests focus on magmatic processes that have led to the chemical differentiation of the Earth and other terrestrial planets, and to the formation of ore deposits. He has been awarded a '**Back to Belgium Grant**' of the Federal Science Policy to rejoin our research network.

Several EU projects submitted by Planet TOPERS (BISA) members are running:

(1) FP7 'CrossDrive': to create a virtual environment to better merge data from different missions to Mars
(2) FP7 'EuroVenus': to better exploit the Venus Express results and ground-based observations of Venus
(3) FP7 'ESPaCE': to build ephemerides of moons in the solar system
(4) H2020-UPWARDS: to prepare the next missions to Mars.

Planet TOPERS Members (E. Javaux, Ph. Claeys, V. Dehant, L. Noack, D. Breuer) are involved (Secondary proposers) in EU **COST action** ORIGINS (Origins and Evolution of Life on Earth and in the Universe).

One Planet TOPERS Member (BISA) has obtained the SIROCCO project in **answer to the ESA AO**/1-7019/12/NL/AF: Synergetic SWIR and IR retrievals of near-surface concentrations of CH_4 and CO for Earth and Planetary atmospheres.

Planet TOPERS do also participate into **several ISSI workshops** as mentioned in the paragraph on Meeting Organization.

Two Planet TOPERS Members (V. Dehant and E. Javaux) have obtained an **FNRS-FRFC** on Extensive study of the orbital dynamics of extrasolar systems to improve the habitability definition (name: ExtraOrDynHa) together with Univ. Namur (A. Lemaître, A.S. Libert) (1 July 2013-December 2016). Similarly, two other Planet TOPERS Members (De Keyser J. and Vandaele A.C.) have obtained an **FNRS-FRFC** on laboratory and model comparison for spectroscopy calibration and comparative study of atmospheric erosion, with Univ. Namur and ULB (Nathalie Vaeck, PI). ULB does also participate in an **FNRS-New equipment** on analytical/isotopic analysis (PI: N. Mattielli from ULB Planet TOPERS team). Name: AIMS: Advanced Isotopic Multitracing Spectrometry.

Planet TOPERS Members Ph. Claeys has obtained **FWO funding** (2015-2018) for the development of µXRF and high resolution elemental mapping. He also became lid of the Science Advisory Board of the International Scientific Drilling Program (ICDP). Former Planet Toper Dr. Janos Kodolanyi moved to the Max Plank Institute for Chemistry, Mainz, Germany. This opens a new avenue of collaboration and guarantee access to the NanoSIMS instrument at the MPI. Dr. Seann McKibbin received a 3 years FWO Post-doctoral fellowship. Seann will continue to work on Planet Toper related topics.

Dr. Arnaud Mahieux (BISA) has received a **post-doctoral grant from the FNRS** (Chargé de Recherches - 2013-2015).

Planet TOPERS Members (Ph. Claeys and E. Javaux) have succeeded to be elected with their project within the **ICDP** (International Continental Scientific Drilling Program).

A **new course** entitled “Physique et sondage de l’atmosphère” has been created at the Université de Namur and is given by Vandaele A.C.

Other/New International Responsibilities since IAP

Özgür Karatekin (ROB) is President of Planetary Science Section of EGU. Lena Noack (ROB) is the new Young Scientists Representative of the Planetary and Solar System Sciences Section of EGU. Cédric Gillmann and Elodie Gloesener take also part of the Planetary Science outreach activities. Emmanuelle J. Javaux is Secretary of EGU Biogeosciences section “Early life and astrobiology”.

Lena Noack (ROB) is the AbGradE representative within the EANA network.

Véronique Dehant (ROB) is Member of the SSAC.

New international responsibilities (PI, co-PI, Co-I, PS, IM levels) in present and future missions.

Planet TOPERS in almost all presently active ESA missions and many NASA missions in Solar System (ESA: MEX, VEX, Cassini-Huygens in the Saturnian system, Rosetta (to comet 67P/Churyumov–Gerasimenko), Cluster (quartet of satellites as a space plasma microscope); NASA: MGS, Pathfinder Rover on Mars, ODY, MRO, MER, MSL, ACE);

Planet TOPERS in almost all future ESA missions and many NASA missions in Solar System (ESA: ExoMars (TGO (instrument NOMAD), EDM (experiments AMELIA and DREAMS), Rover (instruments ISEM and CLUPI), BepiColombo to Mercury (experiments MORE, BELA, and

SIMBIO-SYS), JUICE (experiments 3GM, MAJIS, GaLA, J-MAG, and PRIDE); NASA: MAVEN, InSIGHT (experiments SEIS and RISE), MSL2020).

5. Publications

List of publications from each team

ROB

PEER REVIEWED

Yseboodt M., Rivoldini A., Van Hoolst T., and Dumberry M, 2013, “Influence of an inner core on the long-period forced librations of Mercury.”, Icarus, 226(1), pp. 41-51, DOI: 10.1016/j.icarus.2013.05.011.

Noack L., and and Breuer D., 2013, “First- and second-order Frank-Kamenetskii approximation applied to temperature-, pressure- and stress-dependent rheology.”, Geophys. J. Int. 195, 27-46, DOI: 10.1093/gji/ggt248.

Noack L., Godolt M., von Paris P., Plesa A.-C., Stracke B., Breuer D., and Rauer H., 2014, “Constraints on planetary habitability from interior modeling.”, Planetary and Space Science, special issue ‘Planetary evolution and life’, doi: 10.1016/j.pss.2014.01.003, 98, 14-29.

Noack L., and Breuer D., 2014, “Plate tectonics on rocky exoplanets: Influence of initial conditions and rheology.”, Planetary and Space Science, special issue ‘Planetary evolution and life’, doi: 10.1016/j.pss.2013.06.020, 98, 41-49.

Rauer H., Catala C., Aerts C., Appourchaux T., Benz W., Brandeker A., Christensen-Dalsgaard J., Deleuil M., Gizon L., Goupil M.-J., Güdel M., Janot-Pacheco E., Mas-Hesse M., Pagano I., Piotto G., Pollacco D., Santos C., Smith A., Suárez J.-C., Szabó R., Udry S., Adibekyan V., Alibert Y., Almenara J.-M., Amaro-Seoane P., Ammer-von Eiff M., Asplund M., Antonello E., Barnes S., Baudin F., Belkacem K., Bergemann M., Bihain G., Birch A. C., Bonfils X., Boisse I., Bonomo A. S., Borsa F., Brandão I. M., Brocato E., Brun S., Burleigh M., Burston R., Cabrera J., Cassisi S., Chaplin W., Charpinet S., Chiappini C., Church R. P., Csizmadia Sz., Cunha M., Damasso M., Davies M. B., Deeg H. J., Díaz R. F., Dreizler S., Dreyer C., Eggenberger P., Ehrenreich D., Eigmüller P., Erikson A., Farmer R., Feltzing S., Oliveira Fialho F. de, Figueira P., Forveille T., Fridlund M., García R. A., Giommi P., Giuffrida G., Godolt M., Gomes da Silva J., Granzer T., Grenfell J. L., Grotsch-Noels A., Günther E., Haswell C. A., Hatzes A. P., Hébrard G., Hekker S., Helled R., Heng K., Jenkins J. M., Johansen A., Khodachenko M. L., Kislyakova K. G., Kley W., Kolb U., Krivova N., Kupka F., Lammer H., Lanza A. F., Lebreton Y., Magrin D., Marcos-Arenal P., Marrese P. M., Marques J. P., Martins J., Mathis S., Mathur S., Messina S., Miglio A., Montalban J., Montalto M., Monteiro M. J. P. F. G., Moradi H., Moravveji E., Mordasini C., Morel T., Mortier A., Nascimbeni V., Nelson R. P., Nielsen M. B., Noack L., Norton A. J., Ofir A., Oshagh M., Ouazzani R.-M., Pápics P., Parro V. C., Petit P., Plez B., Poretti E., Quirrenbach A., Ragazzoni R., Raimondo G., Rainer M., Reese D. R., Redmer R., Reffert S., Rojas-Ayala B., Roxburgh I. W., Salmon S., Santerne A., Schneider J., Schou J., Schuh S., Schunker H., Silva-Valio A., Silvotti R., Skillen I., Snellen I., Sohl F., Sousa S. G., Sozzetti A., Stello D., Strassmeier K. G., Svanda M., Szabó Gy. M., Tkachenko A., Valencia D., Van Grootel V., Vauclair S. D., Ventura P., Wagner F. W., Walton N. A., Weingrill J., Werner S. C., Wheatley P. J., and Zwintz K., 2014, “The PLATO 2.0 mission.”, Experimental Astronomy, 38(1-2), pp. 249-330, DOI: 10.1007/s10686-014-9383-4.

Tajeddine R., Rambaux N., Lainey V., Charnoz S., Richard A., Rivoldini A., and Noyelles B., 2014, “Constraints on Mimas’interior from Cassini ISS libration measurements.”, Science, 346(6207), pp. 322-324, DOI: 10.1126/science.1255299.

Van Hoolst T., and Rivoldini A., 2014, “Interior Structure and Evolution of Mars.”, in: Encyclopedia of the Solar System, chapter 18, Eds. Tilman Spohn, Doris Breuer, and Torrence V. Johnson, pp. 379-396, Elsevier Inc., 3d edition, DOI: 0.1016/B978-0-12-415845-0.00018- 9.

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System, chapter 8, Eds. Tilman Spohn, Doris Breuer, and Torrence V. Johnson, pp. 159-184, Elsevier Inc., 3d edition, DOI: 0.1016/B978-0-12-415845-0.00018- 9.

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Pätzold M., Andert T., Jacobson R., Rosenblatt P., and Dehant V., 2014, "Phobos: Observed bulk properties.", Planetary and Space Science, 102, pp. 86-94, DOI: 10.1016/j.pss.2014.01.004.

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Lilensten J., Coates A.J., Dehant V., Dudok de Wit T., Horne R.B., Leblanc F., Luhmann J., Woodfield E., and Barthélemy M., 2014, "What characterizes planetary space weather?", Astron. Astrophys. Rev., 22, Id. 79, 39 pages, DOI: 10.1007/s00159-014-0079-6.

Vu T.H., Gloesener E., Choukroun M., Ibourichene A., and Hodyss R., 2014, "Experimental study on the effect of ammonia on the phase behavior of tetrahydrofuran clathrates.", J. Phys. Chem. B, 118(47), pp. 13,371-13,377, DOI: 10.1021/jp5042487.

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Sohl, F. and G. Schubert (2014): Interior Structure, Composition and Mineralogy of the Terrestrial Planets. In: Treatise on Geophysics (Editor-in-Chief G. Schubert), 2nd edition, Vol. 10, Planets and Moons (Ed. T. Spohn), in press.

Breuer, D. and B. Moore (2014): Dynamics and Thermal History of the Terrestrial Planets, the Moon, and Io. In: Treatise on Geophysics (Editor-in-Chief G. Schubert), 2nd edition, Vol. 10, Planets and Moons (Ed. T. Spohn), in press.

INVITED ABSTRACTS – COMMUNICATIONS

Breuer, D. (2013): Interior structure and magnetism on Mars (invited talk). In: Mars Workshop, 20.-25. Oktober 2013, Les Houches, France.

Spohn T. (2013): Thermal History of Planetary Objects: From Asteroids to Super Earths, from Plate-Tectonics to Life (invited talk), August 2013 SETI Institute, Palo Alto

Spohn T. (2013): Exploration of the Solar System (invited talk), November 2013 Space World Frankfurt

Breuer, D. (2014): Interior structure and magnetic fields (invited Talk). In: Alpbach Summer school 2014, Space Missions for Geophysics of the Terrestrial Planets 15.-24. July, Alpbach/Tyrol, Austria.

Breuer, D. (2014): Some new findings on the deep interiors of terrestrial planets and moons (Invited Talk). In: 14th symposium of SEDI, 3.-8. August 2014, Kanagawa, Japan.

Breuer, D., Plesa, A.-C., Grott, M., and Morschhauser A. (2014) Mantle dynamics, early reservoir formation and degassing of the Martian Interior (invited talk), Workshop on 'Volatiles in the Martian interior', November 3-4, 2014, Houston, Texas.

Breuer, D., Plesa, A.-C. and Tosi N. (2014) Enigmatic martian mantle reservoirs: Can dynamic models help? (invited talk) College de France, Symposium: 'Structure and Dynamics of Earth-like Planets', November 20-21, 2014, Paris.

Grott, M. (2014): Mars as an igneous system: Our changing view from orbit, ground, meteorite (Invited Talk). In: 8th International conference on Mars, 14.-18. July 2014, Pasadena, California, USA.

Spohn, T. (2014): The terrestrial planets (invited Talk). In: Alpbach Summer school 2014, Space Missions for Geophysics of the Terrestrial Planets 15.-24. July, Alpbach/Tyrol, Austria.

Spohn, T. (2014): „Planetary Evolution and Life"(invited Talk). Earth and Life Science Institute, Chiba Institute of Technology, Japan, August 2014,: A DLR-lead Research Alliance in Germany.

Spohn, T. (2014): „Thermal Histories of Planetary Objects: From Asteroids to super-Earths, from plate-tectonics to Life"(invited Talk). Center of Planetary Studies, University of Toronto, Canada, September 2014.

Spohn, T. (2014): "Future Space Missions of Interest to the HP4 Community" (invited Talk). High Pressure, Plasma and Planetary Physics Workshop, University Rostock, Germany, October 2014.

Spohn, T. (2014): "Geophysics of the Earth and Rocky Exoplanets"(invited Talk). Center for Space and Habitability, University of Berne, Switzerland, October 2014.

Spohn, T. (2014): "Continents and Life and the Evolution of the Earth's Interior"(invited Talk). Weizmann Institute of Technology, Rehovot, Israel, November 2014.

NORMAL ABSTRACTS - COMMUNICATIONS

Grott, M., A.-C. Plesa, and D. Breuer (2013): How can we constrain the amount of heat producing elements in the interior of Mars? (Poster). In: 2013 Fall Meeting, AGU, 9-13 December 2013, San Francisco, California, USA.

Höning, D., and T. Spohn (2013): Modelling the Impact of Life on Continental Growth – Mechanisms and Results (Talk). In: American Geophysical Conference (AGU), 09.-13. December 2013, San Francisco, USA.

Morschhauser, A., V. Lesur and M. Grott (2013): A spherical harmonic model of the Martian lithospheric magnetic field based on Mars Global Surveyor (MGS) data (Poster). In: Mars Workshop, 20.-25. Oktober 2013, Les Houches, France.

Neumann, W., D. Breuer and T. Spohn (2013): Constraints against a porous CI chondritic Ceres (Poster). In: Joint Workshop on High Pressure, Planetary, and Plasma Physics, 23.-25. October 2013, Berlin, Germany.

Neumann, W., D. Breuer and T. Spohn (2013): Differentiation and shallow magma ocean formation on Vesta (Talk). In: Workshop on Planetesimal formation and differentiation, 27.-29.October, Washington, DC, USA.

Neumann, W., D. Breuer and T. Spohn (2013): Magma ocean in planetesimals – the case of Vesta (Talk). In: Joint meeting "Paneth Kolloquium", "The first 10 million years of the solar system" (DFG SPP 1385), 21.-23. October 2013, Nördlingen, Germany.

Neumann, W., D. Breuer and T. Spohn (2013): Thermo-chemical evolution of ice-silicate bodies: Application to Ceres (Poster). In: Joint meeting "Paneth Kolloquium", "The first 10 million years of the solar system" (DFG SPP 1385), 21.-23. Oct. 2013, Nördlingen, Germany.

Plesa, A.-C., N. Tosi and D. Breuer (2013): Crystallization of a deep magma ocean and its consequence for planetary thermal evolution (Talk). In: Joint Workshop on High Pressure, Planetary and Plasma Physics, 23.-25. October 2013, Berlin, Germany.

Plesa, A.-C., N. Tosi and D. Breuer (2013): Formation of stable geochemical reservoirs: Implications for the thermo-chemical evolution of Mars (Poster). In: Joint Workshop on High Pressure, Planetary and Plasma Physics, 23.-25. October 2013, Berlin, Germany.

Plesa, A.-C., N. Tosi, and D. Breuer (2013): Magma Ocean Cumulate Overturn and its Implications for the Thermo-chemical Evolution of Mars (Talk). In: 2013 Fall Meeting, AGU, 9-13 December 2013, San Francisco, California, USA.

Rückriemen, Tina, D. Breuer and T. Spohn (2013): Key characteristics of the iron snow regime in planetary cores (Poster). In: Joint Workshop on High Pressure, Planetary and Plasma Physics, 23.-25. October 2013, Berlin, Germany.

Sohl F., H. Hussmann, and F. W. Wagner (2013): Subsurface water oceans on icy Solar system bodies (Talk). In: Joint Workshop on High Pressure, Planetary, and Plasma Physics, 23.-25. October 2013, Berlin, Germany.

Spohn T. (2013): The workings of rocky planet interiors, October 2013 High Pressure and Plasma Physics Workshop, Berlin

Tosi, N, A.-C. Plesa, M. Laneuville, C. Hüttig and D. Breuer (2013): Thermo-chemical evolution of terrestrial bodies (Poster). In: Geo.X Jahresversammlung 17. October, 2013, Berlin, Germany.

Tosi, N., M. Grott, A.-C. Plesa, and D. Breuer (2013): Thermo-chemical evolution of Mercury's interior (Poster). In: 2013 Fall Meeting, AGU, 9-13 December 2013, San Francisco, California, USA.

Wagner, F. W. (2013): Mantle rheology, internal dynamics and tidal heating of massive rocky exoplanets (Talk). In: Helmholtz Research Seminar, 30. October, Berlin, Germany.

Wagner, F. W. (2013): Mantle rheology, internal dynamics and tidal heating of massive rocky exoplanets (Talk). In: Joint Workshop on High Pressure, Planetary, and Plasma Physics, 23.-25. October 2013, Berlin, Germany.

Wagner, F. W., F. Sohl, and H. Hussmann (2013): Physical Structure and Tidal Distortion of Ganymede: Implications for the JUICE mission (Poster). In: Geo.X Jahresversammlung 2013, 17. October, Berlin, Germany.

Breuer, D. and T. Spohn (2014): Dynamics and plate tectonics on rocky exoplanets (Talk). In: 3rd Joint Workshop on High Pressure, Planetary, and Plasma Physics, 24.-26. September 2014, Rostock, Germany.

Grott, M.; A.-C. Plesa, N. Tosi, and D. Breuer (2014): Constraining the amount of radiogenic elements in the interior of Mars from the HP3 heat flow measurement (Talk). In: EGU General Assembly 2014, 28. April - 2. May 2014, Vienna, Austria.

Grott, M. (2014): Mars as an igneous system: Our changing view from orbit, ground, meteorite (Invited Talk). In: 8th International conference on Mars, 14.-18. July 2014, Pasadena, California, USA.

Hüttig, C.; A.-C. Plesa, N. Tosi, and D. Breuer (2014): Can we approximate non-Newtonian rheology to model mantle convection? (Poster). In: EGU General Assembly 2014, 28. April - 2. May 2014, Vienna, Austria.

Morschhauser, A.; V. Lesur and M. Grott (2014): A high-resolution model of the lithospheric magnetic field of Mars (Talk). In: 45th Lunar and Planetary Science Conference, 17.-21. March 2014, The Woodlands, Texas.

Morschhauser, A.; V. Lesur and M. Grott (2014): A spherical harmonic model of the Martian

lithospheric field (Talk). In: 4th PlanetMag Meeting, 23.-24. January 2014, Potsdam, Germany.

Neumann, W.; Breuer, D., and T. Spohn (2014): Controls on the differentiation of Vesta (Talk). In: Asteroids, Comets, Meteors 2014, 30. June-04. July 2014, Helsinki, Finland.

Neumann, W.; Breuer, D., and T. Spohn (2014): Core and crust formation on Vesta: Controlling factors (Poster). In: EPSC 2014, 7.-12. September, Cascais, Portugal.

Neumann, W.; Breuer, D., and T. Spohn (2014): Creep related compaction of initially porous planetesimals (Poster). In: EPSC 2014, 7.-12. September, Cascais, Portugal.

Neumann, W.; Breuer, D., and T. Spohn (2014): Differentiation of Vesta: Implications for a shallow magma ocean (Talk). In: Dawn Science Team Meeting, 19.-22. May 2014, Berlin, Germany.

Neumann, W.; Breuer, D., and T. Spohn (2014): Internal state of Lutetia as a function of the macroporosity (Talk). In: Asteroids, Comets, Meteors 2014, 30. June-04. July 2014, Helsinki, Finland.

Neumann, W.; Breuer, D., and T. Spohn (2014): Internal structure of Ceres: The fate of pores (Talk). In: Dawn Science Team Meeting, Berlin, 19.-22. May 2014, Germany.

Neumann, W.; Breuer, D., and T. Spohn

(2014): Modelling of compaction via hot pressing in initially porous planetesimals (Talk). In: MUPUS / Rosetta Modellers Meeting, 27. June 2014, Berlin, Germany.

Neumann, W.; Breuer, D., and T. Spohn (2014): Modelling of planetesimal compaction by hot pressing (Poster). In: Asteroids, Comets, Meteors 2014, 30. June-04. July 2014, Helsinki, Finland.

Neumann, W.; D. Breuer and T. Spohn (2014): Modelling of Ceres: Predictions for Dawn. In: EGU General Assembly 2014, 28. April-2. May 2014, Vienna, Austria.

Neumann, W.; D. Breuer and T. Spohn (2014): Modelling of the thermo-chemical evolution of Ceres. In: 45th Lunar and Planetary Science Conference, 17.-21. March 2014, The Woodlands, Texas.

Neumann, W.; D. Breuer and T. Spohn (2014): Shallow magma ocean on Vesta and implications for the HEDs. In: 45th Lunar and Planetary Science Conference, 17.-21. March 2014, The Woodlands, Texas.

Neumann, W.; D. Breuer and T. Spohn (2014): Shallow magma ocean on Vesta and implications for the HEDs. In: EGU General Assembly 2014, 28. April - 2. May 2014, Vienna, Austria.

Plesa, A.-C.; C. Hüttig, N. Tosi, and D. Breuer (2014): Thermo-chemical Mantle Convection Simulations using Gaia (Talk). In: The 17th Results and Review Workshop of the HLRS, 29.-30. September, 2014, Stuttgart, Germany.

Plesa, A. C.; D. Breuer, M. Grott and N. Tosi (2014): Constraining the Amount of Radiogenic Elements in the Interior of Mars from the HP3 Heat Flow Measurement (Poster). In: 45th Lunar and Planetary Science Conference (LPSC), 17.-21. March 2014, The Woodlands, Texas, USA.

Plesa, A.-C.; M. Grott, N. Tosi, and D. Breuer (2014): Thermal Evolution and the Urey Ratio of Mars (Poster). In: 8th International conference on Mars, 14.-18. July 2014, Pasadena, California, USA.

Plesa, A.-C.; N. Tosi, and D. Breuer (2014): How to Build Stable Geochemical Reservoirs on Mars? (Talk). In: 8th International conference on Mars, 14.-18. July 2014, Pasadena, California, USA.

Plesa, A.-C.; N. Tosi, and D. Breuer (2014): How to build stable geochemical reservoirs on Mars? (Talk). In: EGU General Assembly 2014, 28. April - 2. May 2014, Vienna, Austria.

Sohl, F. (2014): Structural models of terrestrial planet interiors (Invited Talk). In: Planet Formation & Evolution 2014, 08.-10. September 2014, Christian-Albrechts-Universität zu Kiel, Germany.

Sohl, F.; F.W. Wagner, and H. Rauer (2014): The mass-radius relation for rocky/terrestrial planets (Talk). In: PLATO 2.0 Planet Formation and Theory Workshop, 04.-05. September 2014, Queen Mary University of London, United Kingdom.

Solomonidou, A.; A. Coustenis, T. Encrenaz, F. Sohl, H. Hussmann, G. Bampasidis, F.W. Wagner, F. Raulin, D. Schulze-Makuch, and R. Lopes (2014): Habitability potential of icy moons: a comparative study (Pico). In: EGU General Assembly 2014, 27. Apr. - 02. May 2014, Vienna, Austria.

Solomonidou, A.; A. Coustenis, T. Encrenaz, F. Sohl, H. Hussmann, G. Bampasidis, F.W. Wagner, F. Raulin, D. Schulze-Makuch, and R.M.C. Lopes (2014): Habitability potential of icy moons: a comparative study (Poster). In: Workshop on the Habitability of Icy Worlds, 05.-07. Feb. 2014, Pasadena, California, USA.

Spohn, T. (2014): Future space missions of potential interest to the high pressure, planetary, and plasma physics (HP4) community (Talk). In: 3rd Joint Workshop on High Pressure, Planetary, and Plasma Physics, 24.-26. September 2014, Rostock, Germany.

Wagner, F. W. and F. Sohl (2014): Modelling the interior structure, composition, and mass-radius relationships of solid exoplanets (Talk). In: 3rd Joint Workshop on High Pressure, Planetary, and Plasma Physics, 24.-26. September 2014, Rostock, Germany.

Wagner, F. W. (2014): Plate tectonics on Earth-like exoplanets (Poster). In: 3rd Joint Workshop on High Pressure, Planetary, and Plasma Physics, 24.-26. September 2014, Rostock, Germany.

List of co-publications

ROB – BISA – VUB – ULB – UGhent – ULg – DLR

PEER REVIEWED

2013 (not yet in the previous report)

Martin C., Debaille V., Lanari P., Goderis S., Vandendael I., Vanhaecke F., Vidal O., and Claeys P., 2013, "REE and Hf distribution among mineral phases in the CV-CK clan: a way to explain present-day Hf isotopic variations in chondrites.", Geochimica Cosmochimica Acta, 120, 496-513. → VUB – ULB – UGhent

Noack, L. and Breuer D., 2013, "Interior and surface dynamics of terrestrial bodies and their implications for the habitability.", In: "Habitability on other planets and satellites: The quest for extraterrestrial life", eds. J.-P. de Vera and F. Seckbach, Springer, pp. 203-233, ISBN: 978-94-007-6545-0. → ROB – DLR

Noack L., Godolt M., von Paris P., Plesa A.-C., Stracke B., Breuer D., and Rauer H., 2013, "Constraints on planetary habitability from interior modeling.", Planetary and Space Science, special issue 'Planetary evolution and life', accepted. → ROB + DLR

Noack L., and Breuer D., 2013, "First- and second-order Frank-Kamenetskii approximation applied to temperature-, pressure- and stress-dependent rheology.", Geophysical Journal International 2013, doi: 10.1093/gji/ggt248. → ROB + DLR

Wittmann A., Zaiss J., Elburg M., Ravizza G., Vanhaecke F., Deutsch A., Claeys P., and Goderis S., 2013, "Testing the ureilite projectile hypothesis for the El'gygytgyn impact: Determination of siderophile element abundances and Os isotope ratios in ICDP drill core samples and melt rocks.", Meteoritics and Planetary Science, 48, 1296-1324. → VUB – UGhent

2014

Chernonozhkin S.M., Goderis S., Bauters S., Vekemans B., Vincze L., Claeys Ph., and Vanhaecke F., 2014, "Evaluation of pneumatic nebulization and ns-laser ablation ICP-MS for bulk elemental analysis and 2-dimensional element mapping of iron meteorites.", Journal Analytical Atomic Spectrometry, 29, 1001-1016, DOI: 10.1039/c3ja50387a. → VUB – UGhent

Noack L., Godolt M., von Paris P., Plesa A.-C., Stracke B., Breuer D., and Rauer H., 2014, "Constraints on planetary habitability from interior modeling.", Planetary and Space Science, special issue 'Planetary evolution and life', doi: 10.1016/j.pss.2014.01.003, 98, 14-29. → ROB – DLR

Noack L., and Breuer D., 2014, "Plate tectonics on rocky exoplanets: Influence of initial conditions and rheology.", Planetary and Space Science, special issue 'Planetary evolution and life', doi: 10.1016/j.pss.2013.06.020, 98, 41-49. → ROB – DLR

Rauer H., Catala C., Aerts C., Appourchaux T., Benz W., Brandeker A., Christensen-Dalsgaard J., Deleuil M., Gizon L., Goupil M.-J., Güdel M., Janot-Pacheco E., Mas-Hesse M., Pagano I., Piotto G., Pollacco D., Santos C., Smith A., Suárez J.-C., Szabó R., Udry S., Adibekyan V., Alibert Y., Almenara J.-M., Amaro-Seoane P., Ammer-von Eiff M., Asplund M., Antonello E., Barnes S., Baudin F., Belkacem K., Bergemann M., Bihain G., Birch A. C., Bonfils X., Boisse I., Bonomo A. S., Borsa F., Brandão I. M., Brocato E., Brun S., Burleigh M., Burston R., Cabrera J., Cassisi S., Chaplin W., Charpinet S., Chiappini C., Church R. P., Csizmadia Sz., Cunha M., Damasso M., Davies M. B., Deeg H. J., Díaz R. F., Dreizler S., Dreyer C., Eggenberger P., Ehrenreich D., Eigmüller P., Erikson A., Farmer R., Feltzing S., Oliveira Fialho F. de, Figueira P., Forveille T., Fridlund M., García R. A., Giommi P., Giuffrida G., Godolt M., Gomes da Silva J., Granzer T., Grenfell J. L., Grotsch-Noels A., Günther E., Haswell C. A., Hatzes A. P., Hébrard G., Hekker S., Helled R., Heng K., Jenkins J. M., Johansen A., Khodachenko M. L., Kislyakova K. G., Kley W., Kolb U., Krivova N., Kupka F., Lammer H., Lanza A. F., Lebreton Y., Magrin D., Marcos-Arenal P., Marrese P. M., Marques

J. P., Martins J., Mathis S., Mathur S., Messina S., Miglio A., Montalban J., Montalto M., Monteiro M. J. P. F. G., Moradi H., Moravveji E., Mordasini C., Morel T., Mortier A., Nascimbeni V., Nelson R. P., Nielsen M. B., Noack L., Norton A. J., Ofir A., Oshagh M., Ouazzani R.-M., Pápics P., Parro V. C., Petit P., Plez B., Poretti E., Quirrenbach A., Ragazzoni R., Raimondo G., Rainer M., Reese D. R., Redmer R., Reffert S., Rojas-Ayala B., Roxburgh I. W., Salmon S., Santerne A., Schneider J., Schou J., Schuh S., Schunker H., Silva-Valio A., Silvotti R., Skillen I., Snellen I., Sohl F., Sousa S. G., Sozzetti A., Stello D., Strassmeier K. G., Svanda M., Szabó Gy. M., Tkachenko A., Valencia D., Van Grootel V., Vauclair S. D., Ventura P., Wagner F. W., Walton N. A., Weingrill J., Werner S. C., Wheatley P. J., and Zwintz K., 2014, "The PLATO 2.0 mission.", Experimental Astronomy, 38(1-2), pp. 249-330, DOI: 10.1007/s10686-014-9383-4. → ROB – DLR

Van Hoecke K., Devulder V., Claeys Ph., Degryse P., and Vanhaecke F., 2014, "Comparison of microsublimation and ion exchange chromatography for boron isolation preceding its isotopic analysis via multi-collector ICP-mass spectrometry.", Journal Analytical Atomic Spectrometry, 29, 1819-1826, DOI: 10.1039/C4JA00111G. → VUB – UGhent

Witasse O., Duxbury T., Chicarro A., Altobelli N., Andert T., Aronica A., Barabash S., Bertaux J.-L., Bibring J.-P., Cardesin-Moinelo A., Cichetti A., Companys V., Dehant V., Denis M., Formisano V., Futaana Y., Giuranna M., Gondet B., Heather D., Hoffmann H., Holmström M., Martin P., Matz K.-D., Montmessin F., Morley T., Mueller M., Manaud N., Neukum G., Oberst J., Orosei R., Pätzold M., Picardi G., Pischel R., Plaut J.J., Reberac A., Pardo Voss P., Roatsch T., Rosenblatt P., Remus S., Schmedemann N., Willner K., and Zegers T., 2014, "Mars Express Investigations of Phobos and Deimos.", Planetary and Space Science, 102, pp. 18-34, DOI: 10.1016/j.pss.2013.08.002. → ROB – BISA – DLR

Zaiss J., Ravizza G., Goderis S., Sauvage J., CLaeys Ph., and Johnson K., 2014, "A complete Os excursion across a terrestrial Cretaceous-Paleogene boundary at the West Bijou, Colorado, with evidence for recent open system behavior.", Chemical Geology, 385, 7-16, DOI:10.1016/j.chemgeo.2014.07.010. → VUB – UGhent

BOOK, CHAPTER IN BOOK WITH INTERNATIONAL PEER-REVIEW

2014

Banerdt B., Dehant V., Grimm R., Grott M., Lognonné P., and Smrekar S., 2014, "Probing the Interiors of Planets with Geophysical Tools.", in: Encyclopedia of the Solar System, chapter 55, Eds. Tilman Spohn, Doris Breuer, and Torrence V. Johnson, Elsevier Inc., 3d edition, DOI: 0.1016/B978-0-12-415845-0.00018-9. → ROB – DLR

NON REVIEWED PROCEEDINGS or PUBLICATIONS

2013 (not yet in the previous report)

Dehant V., Breuer D., Claeys P., Debaille V., De Keyser J., Javaux E., Goderis S., Karatekin Ö., Mattielli N., Noack L., Spohn T., Vandaele A.C., Vanhaecke F., Van Hoolst T., Wilquet V., and the PLANET TOPERS group (see http://iuap-planet-topers.oma.be/partners.php), 2013, "PLANET TOPERS: Planets, Tracing the Transfer, Origin, Preservation, and Evolution of their ReservoirS.", European Planetary Science Congress 2013, University College London, London, United Kingdom, September 8-13, 2013, extended abstract, 2 pages. → ROB – BISA – VUB – ULB – UGhent – ULg – DLR

Gloesener E., Karatekin Ö., Dehant V., and Vandaele A.C., 2013, "Martian methane and stability of clathrates in the crust of Mars.", European Planetary Science Congress 2013, University College London, London, United Kingdom, September 8-13, 2013, extended abstract, 2 pages. → ROB – BISA

Gurvits L.I., Bocanegra Bahamon T.M., Cimò G., Duev D.A., Molera Calvés G., Pogrebenko S.V., de Pater I., Vermeersen L.L.A., Rosenblatt P., Oberst J., Charlot P., Frey S., and Tudose V., 2013, "Planetary Radio Interferometry and Doppler Experiment (PRIDE) for the JUICE

mission.", European Planetary Science Congress 2013, University College London, London, United Kingdom, September 8-13, 2013, extended abstract, 2 pages. → ROB – DLR

Hussmann H., Lingenauber K., Michaelis H., Kobayashi M., Thomas N., Lara L., Araki H., Behnke T., Gwinner K., Namiki N., Noda H., Oberst J., Roatsch T., Rodrigo R., Sasaki S., Seiferlin K., Spohn T., Althaus C., Barnouin O., Beck T., Breuer D., Casotto S., Castro J.M., Choblet G., Christensen U., Ferraz-Mello S., Giese B., Kallenbach R., Kimura J., Kurita K., Lainey V., Lichopoj A., Lötzke H.-G., Lüdicke F., Lupovka V., Moore W.B., Rodriguez A., Santovito M.-R., Schreiber U., Schrödter R., Sohl F., del Togno S., Vermeersen B., Wickhusen K., Wieczorek M., and Yseboodt M., 2013, "The Ganymede Laser Altimeter (GALA) as part of the JUICE payload: instrument, science objectives and expected performance.", European Planetary Science Congress 2013, University College London, London, United Kingdom, September 8-13, 2013, extended abstract, 2 pages. → ROB – DLR

Noack L., Godolt M., von Paris P., Plesa A.-C., Stracke B., Breuer D., and Rauer H., 2013, "Constraints on planetary habitability from interior modelling.", European Planetary Science Congress 2013, University College London, London, United Kingdom, September 8-13, 2013, extended abstract, 2 pages. → ROB – DLR

Titov D.V., Dougherty M.K., Grasset O., Erd Ch., Bunce E., Coustenis A., Blanc M., Coates A., Drossart P., Fletcher L., Van Hoolst T., Hussmann H., Jaumann R., Krupp N., Prieto-Ballesteros O., Tortora P., Tosi F., and Wielders A., 2013, "JUpiter Icy moons Explorer: an ESA mission to the Jovian system.", Extended abstract, Third Moscow Solar System Symposium (3M-S3), Space Research Institute Moscow, Russia, October 8-12, 2012, 2 pages. → ROB – DLR

2014

Dehant V., Van Hoolst T., Breuer D., Claeys P., Debaille V., De Keyser J., Javaux E., Goderis S., Karatekin Ö., Mattielli N., Noack L., Spohn T., Vandaele A. C., Vanhaecke F., and Wilquet V., 2014, "Planet TOPERS: Planets, Tracing the Transfer, Origin, Preservation, and Evolution of Their Reservoirs.", The Fifth International Workshop on "Mars Atmosphere: Modelling and Observation", held on January 13-16 2014, in Oxford, U.K., Eds. F. Forget and M. Millour, Id.1208. → ROB – BISA – VUB – ULB – UGhent – ULg – DLR

Dehant V., Breuer D., Claeys P., Debaille V., De Keyser J., Javaux E., Goderis S., Karatekin Ö., Mattielli N., Noack L., Spohn T., Vandaele A.C., Vanhaecke F., Van Hoolst T., Wilquet V. and the Planet Topers group (see http://iuap-planet-topers.oma.be/partners.php), 2014, "PLANET TOPERS: Planets, Tracing the Transfer, Origin, Preservation, and Evolution of their ReservoirS.", The Fifth International Workshop on the Mars Atmosphere: Modelling and Observation, Oxford, UK, January, 13-16, 2014, Eds. F. Forget and M. Millour, Id. 1208. → ROB – BISA – VUB – ULB – UGhent – ULg – DLR

Noack L., Höning D., Lammer H., and Bredehöft J.H., 2014, "Exotic water worlds: how life-friendly is a deep ocean?", in: Proc. EPSC 2014, Cascais, Portugal, 7-12 September, 2014, Vol. 9, EPSC2014-514. → ROB – DLR

Thuillot W., Lainey V., Dehant V., Arlot J.-E., Gurvits L., Hussmann H., Oberst J., Rosenblatt P., Marty J.-C., Vermeersen B., Bauer S., De Cuyper J.-P., Dirkx D., Hestroffer D., Kudryashova M., Meunier L.-E., Pasewaldt A., N. Rambaux, Robert V., Tajeddine R., and Willner K., 2014, Recent activities of the FP7-espace consortium.", Proc. Journées Systèmes de Référence spatio-temporels 2013, Paris, France. → ROB – DLR

Vandaele A.C., Daerden F., Depiesse C., Mahieux A., Neary L., Robert S., Thomas I., Viscardy S., Willame Y., Wilquet V., Gloesener E., Karatekin Ö., Vander Auwera J., Fissiaux L., Lepère M., and Garcia-Munoz A., 2014, "Trace Gases Inventory and Characterization: Improvements in the Spectral Analysis Expected for the Next Mars Missions.", Eighth International Conference on Mars, July 14-18, 2014, Pasadena, California, LPI Contribution No. 1791, Id. 1077. → ROB

– BISA

INVITED ABSTRACTS - COMMUNICATIONS

2013 (not yet in the previous report)

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