

COSPAR Planetary Protection Panel

Open Session

VIC, Vienna, 23-24 January 2019

MEETING NOTES

Attending:

Athena COUSTENIS, Panel Chair
Gerhard KMINEK, Panel Vice-Chair
Niklas HEDMAN, Panel Vice-Chair
Akiko NAKAMURA, Panel Member
Alex HAYES, Panel Member
Eleonora AMMANNITO, Panel Member
Francois RAULIN, Panel Member
James GREEN, Panel Member
María-Paz ZORZANO MIER, Panel Member
Masaki FUJIMOTO (representing S. TSUNETA,
Panel Member, at the meeting)
Michel VISO, Panel Member
Olivier GRASSET, Panel Member
Peter DORAN, Panel Member
Petra RETTBERG, Panel Member
Lei LI, Panel Member (call-in)
Olga PRIETO BALLESTEROS, Panel Member
(call-in)
Jean-Louis FELLOUS, COSPAR

Emmanouil DETSIS, ESF
Nicolas WALTER, ESF
Patricia CABEZAS, ESF
Robin PUTZAR, ESF
Akihiko YAMAGISHI, JAXA
Kazuhisa, FUJITA, JAXA
Yasuhiro KAWAKATSU, JAXA
David EVANS, Open University
David SUMMERS, Open University
Manish PATEL, Open University
Abigail FRAEMAN, USA
David SMITH, USA
Kalia RAMESH, USA
Michael DALY, USA (call-in)
Colleen HARTMAN, NAS
Andy SPRY, SETI
John RUMMEL, SETI
Romain DARDE, Blue Origin
Alberto RUEDA, UNOOSA

Apologies:

Elena DESHEVAYA, Panel Member
Maxim ZAITSEV, Panel Member

P. SREEKUMAR, Panel Member

NOTE: All presentations can be requested from Niklas Hedman (niklas.hedman@un.org).

Introduction to the meeting

The Open Session of the COSPAR Planetary Protection Panel meeting opened with introductory words from the Chair, Athena Coustenis, giving an overall presentation of the re-constituted Panel and the tasks at hand for the Panel.

This general introduction was followed by a presentation on planetary protection given by Vice-Chair Gerhard Kminek. The presentation aimed to give a broad insight to the work of the Panel on the basis of planetary protection objectives from the scientific angle.

The second introductory presentation was delivered by Jean-Louis Fellous, Executive Director of COSPAR, on the structure of the Panel, the Terms of Reference of the Panel, the decision-making procedures of the COSPAR Bureau on the basis of recommendations given by the Panel.

The decision-making procedures of Panel meetings was discussed, and it followed that these should be further clarified in the Terms of Reference of the Panel. Likewise, the meeting structure with open sessions and closed sessions, as recommended by the Panel, should be clearly stipulated to give the necessary structure for the optimization of the work of the Panel in service to the interest of the broader scientific community. In an effort to maintain openness and transparency in the work of the Panel and at the same time promote efficiency in the formal work of the Panel, it was decided that open sessions should strive for a broad exchange of views among all experts and interested community representatives and help to prepare the closed sessions and any conclusions and recommendations from the Panel to be presented to the COSPAR Bureau for consideration. These proceedings would then be presented to the broader COSPAR community.

Introduction of participants

All attendants introduced themselves, stating also their affiliation and professional background.

Adoption of the agenda

The agenda was adopted unanimously (see Annex).

Phobos and Deimos sample return categorization for the JAXA Martian Moons eXploration (MMX) mission

The MMX mission was presented to the participants by its project manager. The presentation comprised inter alia an overview of the mission objectives and profile, spacecraft configuration, sampling system, operation scenario and storage/transfer mechanism. International collaboration with NASA, ESA, CNES, DLR as well as development schedule plan.

In order for the Panel to make a recommendation on the categorization of the sample return part of the mission, three studies were formally presented to the COSPAR Panel on Planetary Protection by: 1) JAXA in its capacity as operator for the planned mission; 2) by the Sterilization Limits “SterLim” Team (represented by Open University); and 3) by a joint committee of the National Academies of Science, Engineering and Medicine and the European Science Foundation as an independent review.

The JAXA presentation covered a statistical analysis of microbial contamination probability for sample return from the Martian moons, including microbial density on Martian surface, impact sterilization models, comprehensive statistical analysis, influence of radiation, ejecta and crater events.

The SterLim study provided a scientific assessment for inter alia sterilization and radiation exposure, involving modelling, impact tests, and Mars crater estimations.

The third study, which was a result of the work of the Committee on Planetary Protection Requirements for Sample-Return Missions from Martian Moons, provided an independent review on whether missions returning samples from Phobos and/or Deimos should be classified as “restricted” or “unrestricted” Earth returns in the framework of the COSPAR Planetary Protection Policy. Data submitted by JAXA and SterLim were reviewed and analyzed.

At the Open Session, there was a long discussion and a session of Q/A following the presentations. Among others, the analysis of any possible microbial contamination and probability for sample return from Martian moons, including possible radiation sources, was discussed and on what basis the JAXA and SterLim studies had arrived at their conclusions. The use of SterLim impact test data in the JAXA impact sterilization model was presented and discussed. The amount of samples to be returned as well as its source was discussed. The data presented had some variances which called for further comparative assessment. The JAXA and SterLim Teams made a joint comparative review of their respective data and findings and presented a concerted evaluation as the basis for review by the Panel. All three studies recommended unrestricted Earth return for this mission.

Update for the outer solar system study

A presentation on the planetary protection of the outer solar system (PPOSS) was delivered by a joint international research Team funded under the European Commission Horizon 2020 Programme.

It was in general concluded that the outer solar system is a pool of high interest within the international scientific community. It is of vital importance to reexamine the planetary protection issues for the icy moons because all of this has relevance to the possible emergence of habitable worlds.

The ESA JUICE (Jupiter Icy moons Explorer) mission scheduled to fly in 2022, has as a science goal to study the planet and its moons, including flybys of Europa and an extended study of Ganymede. The NASA Europa Clipper mission is expected to be launched at about the same time. The next New Frontier call will be in 2023/2024 and will cover a sample return mission to Titan. A Saturn probe mission is being planned, and further-on possible missions to Uranus and Neptune are being discussed. A Europa lander has been studied.

In this context reference was made to the impact of the results from the joint ESA/NASA Cassini-Huygens mission, which had demonstrated that when we think we know things it turns out to be completely different. Cassini-Huygens also demonstrated the importance of international collaboration.

The PPOSS Team main objective is to provide an international forum to consider and approach the specificities of planetary protection for outer Solar system bodies, in the general context of planetary protection guidance and to provide recommendations to the COSPAR Planetary Protection Panel.

The PPOSS study presented a set of five concrete recommendations for review by the Panel in the following areas:

- 1) The COSPAR Planetary Protection Policy guidelines should include a generic definition of the environmental conditions potentially allowing Earth organisms to replicate (proposed definition as per presentation);
- 2) The second paragraph of the Category III/IV/V requirements for Europa and Enceladus text in the COSPAR Planetary Protection Policy's appendix should be more specific on problematic species (proposed updates as per presentation);
- 3) The COSPAR Planetary Protection Policy guidelines should be updated to reflect the period of biological exploration of Europa and Enceladus. Requirements for Europa and Enceladus flybys, orbiters and landers, including bioburden reduction, shall be applied in order to reduce the probability of inadvertent contamination of an European or Enceladan ocean to less than 1×10^{-4} over 1000 years, starting in 1995 for Europa and 2004 for Enceladus (proposed updates as per presentation);
- 4) The COSPAR Planetary Protection Policy should acknowledge the potential existence of Enhanced Downward Transport Zones at the surface of Europa and Enceladus. Facilitating the transport of spacecraft parts, landers or rovers to the subsurface ocean potentially within the period of biological exploration, these zones should be identified, mapped and given some specific attention; and
- 5) Biological contamination of an icy body subsurface ocean should be considered using a combined binary decision tree/probabilistic approach. The former being based on the first four questions put forward in the 2012 NRC report the latter being constrained by both the probability level and the value of the period of biological exploration.

At the Open Session, discussion followed on the proposed recommendations made by the PPOSS Team, in particular on the probability and definition of special regions on the icy moons, covering areas underneath the surface and non-special regions on the surface, and the probability of transport between the regions within a defined scientific period of 1000 years. The nature of mission profiles, gravitational instability over time, and geological data was discussed.

See under Closed Session below the conclusions made by the Panel.

US activities in relation to planetary protection

A presentation was given by Colleen Hartman, Director of the National Academies of Science, Engineering and Medicine Space Studies Board, on NASA Advisory Council activities related to planetary protection. A group will be tasked with studying the current planetary protection requirements taking into account the interest of the commercial space community.

In the discussion it was noted that this is an important international component of planetary protection for which COSPAR should be involved. It was also noted that “planetary protection” is a long-standing and well-established concept encompassing formulation in the scientific community and is not a legal term.

AOB

It was concluded that this meeting represented the first time that representatives of industry and private sector were invited to COSPAR Panel formal meetings and that this practice will now be followed for future meetings. The invitation to these actors was favourably received and a representative from Blue Origin attended. Presentations delivered at the meeting are available and could be uploaded on the COSPAR website. A special issue in LSSR would include articles from the Teams that have done the studies.

John Rummel presented a draft resolution for the COSPAR PPP membership which the Panel Chair and the COSPAR Executive Director explained is a matter for consideration by the COSPAR Bureau who has it on its agenda for the March meeting in Paris.

UNOOSA presented a workshop to be organized by the UN and Jordan, in Amman on 25- 28 March on space exploration and innovation, including a segment on planetary protection.

ANNEX

OPEN SESSION (23-24 January 2019)

23 January

14:00 : Introduction to the meeting (A. Coustenis, G. Kmínek)
14:20 : Presentation of the new PPP members and ToRs (J-L Fellous)
14:40 : Tour de Table of participants (All)
14:50 : Adoption of the agenda
15:00 : Phobos & Deimos sample return categorization

- Introduction to the study
- JAXA presentation
- Open University presentation
- Result of joint NRC-ESF review committee presentation

Open discussion
18:00 Open discussion

24 January

9:30 : Update for outer solar system study

- PPOSS presentation

Open discussion on the study
Open discussion on the exploration of the outer solar system
11:00 : US activities in relation to planetary protection
11:30 : AOB