

First Circular – Workshop of the International Space Science Institute (ISSI)

26 August 2019

Surface Bounded Exospheres and Interactions in the Solar System

20-24 January 2020

Conveners

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Objectives and Content of the Workshop

Studying the evolution of the surfaces and atmospheres of bodies in the solar system is fundamental to our understanding of the present state of the Solar System. The workshop focuses on the large subset of planets, moons and small bodies in the inner heliosphere that are not protected by either strong magnetic fields or thick atmospheres. We refer to these cases as surface-bounded exospheres, since the surface release processes supply the exospheric material, and atoms and molecules collide with the surface far more frequently than with each other.

This endeavour entails finding how the rates of the ongoing surface and atmosphere processes vary as a function of the space environment, or, in other words, how the planetary space weather works. Aside from occasional catastrophic events, such as volcanic eruptions and geysers in a few bodies or occasional impacts of comets and asteroids, surface and atmospheric changes are caused predominantly by the continuous bombardment of the bodies by photons, energetic ions and micrometeoroids. In particular, the exospheres are the interfaces between the planetary body and the open space, so that studying the exospheric refilling and loss processes is the way to expand knowledge of the body's evolution.

The alteration of the solid surface and the production of the surface-bounded exospheres by the impacts of meteoroids and of the time-varying solar wind over the last 4.54 Gy constitute an essential manifestation of space weathering of bodies such as Mercury, Moon, and asteroids, directly exposed to the solar wind. The detailed

investigation of this subject is also a paramount element in exo-planetary studies that could be supported by the observations from the new generation of high power telescopes, providing exospheric compositions.

In the last decade, SELENE, Chandrayaan-1, LADEE and LRO have dramatically advanced our understanding of the solar wind's interaction with the lunar surface interaction, and MESSENGER gave many important discoveries about the neutral and ionized Hermean environment. This workshop will review in a comparative way the knowledge on the surface-bounded exosphere conditions, generation, variability and loss processes, from theoretical, observational and experimental points of view. The workshop output will be a comprehensive book to collect the present state of knowledge on this subject and drafting a roadmap for future investigations in view of the next missions, i.e., BepiColombo to Mercury or orbiters and landers to be operated on the Moon.

The Workshop will cover the following main themes:

- Overview surface release processes on regolith surface
- New views of the drivers:
- Exosphere
- Solar system evolution. Exosphere as the boundary between the body and the interplanetary medium;
- Future directions for observations and modeling.

Short presentations by the chapter leads or a designated chapter co-author attending are foreseen. All of those attending have already agreed to contribute to one or more of the chapters.

Product

Following the Workshop, its output will be published as a volume in the Space Science Series of ISSI by Springer, in parallel with the publication of the papers in Space Science Reviews. It is expected that a total of about 8 review style and quality papers, submitted to the usual refereeing process will be published in the book. The papers will be based on talks presented at the Workshop and will reflect the discussions that will be held among the participants during the Workshop.

Location

The Workshop will be held at the International Space Science Institute, Hallerstrasse 6, 3012 Bern, Switzerland.

Attendance

This will be by invitation only with ~ 45 participants maximum including young scientists.

Young scientists

Under its special programme for supporting young scientists, ISSI will invite around four early career scientists, within two years of their PhD, to take part in the Workshop.

Funding

ISSI will provide the subsistence costs (hotel and a per diem to cover meals) to all participants but not the travel costs. There will be no registration fee for the Workshop.

Schedule

Invitations and First Circular:

Registration deadline:

Second Circular and final program:

Hotel deadline:

Workshop:

1st December 2019

3rd January 2020

20-24 January 2020