

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

11 June 2018

Reading Terrestrial Planet Evolution in Isotopes and Element Measurements

Convenors

Helmut Lammer, Austrian Academy of Sciences, Graz, Austria

Michel Blanc, UPS-CNRS, Toulouse, France

Thorsten Kleine, Universität Münster, Münster, Germany

Bernard Marty, Nancy Université, Nancy, France

Hugh O'Neill, Australian National University Canberra, Canberra, Australia

Aubrey L. Zerkle, University of St. Andrews, St. Andrews, United Kingdom

Local organisation

Alexandra Lehmann, ISSI, lehmann@issibern.ch

Phone: +41 31 631 48 96, Fax: +41 31 631 48 97

Date: 22-26 October 2018

Objectives and Contents of the Workshop

That chondrites are the building blocks of terrestrial planets has been the dominant paradigm on terrestrial planet formation. Chondrites are geologically undifferentiated meteorites, whose compositional diversity reflects the complexities of processes in the solar nebula. However, more recently, different processes are investigated that produce chemical compositional changes AFTER the solar nebula/chondrite stage. Two main processes stand out:

i.) collisional erosion, but also ii.) post-nebula volatilization, including possible escape and fractionation of elements and isotopes. The latter affects noble gases (isotopes), atmospheric gases and “moderately volatile elements”, including the radiogenic heat-producing element potassium. Collisional erosion is also critical to the eventual budget of the three heat-producing elements (Th, U and K) in terrestrial planets. In turn, the heat-producing elements determine the planet's subsequent evolution. The formation scenarios of the young protoplanets, their impact history, the Moon forming impact in the case of Earth as well as possible nebular-based protoatmospheres in relation to the activity history (X-ray, EUV, wind) of the young Sun will be discussed in the Workshop. Isotope and Elemental ratios can also be used for constraining the time-scale of accretion, the volatile delivery and the origin of the Moon. Further planetary evolution in relation to the formation of plate tectonics and the influence of life on the origin of Earth's nitrogen atmosphere will also be addressed. The emergence of life and their relation to the origin of this secondary atmosphere will be discussed within the framework of comparative planetology between the Earth, Venus, Mars and Saturn's large moon Titan. Consequences for the evolution of Earth-like habitats on other stars will be addressed. Finally, the Workshop will conclude with future space missions that are important for enhancing our understanding in terrestrial planet evolution related to the science cases discussed in this Workshop.

The topics covered in the Workshop

- 1) Formation of terrestrial solar system planets and the Moon
- 2) Collisional erosion/delivery and fractionation of elements in planetary interiors
- 3) Atmospheric fractionation of isotopes and elements
- 4) Origin and Evolution of Nitrogen-dominated atmospheres and $\delta^{15}\text{N}$ through time
- 5) Biological influence on stable isotope fractionation
- 6) Future missions and implications to habitability in general

Product of the Workshop

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 a Topical Collection in Space Science Reviews. It is expected that a total of up to 15 high-quality topical review papers will result, to be submitted to the usual refereeing process and published in the book. The papers will be based on talks presented at the Workshop and will reflect the discussions that are encouraged to be held among the participants during the Workshop, with emphasis on interdisciplinarity.

Location

The Workshop will be held at the International Space Science Institute, Hallerstrasse 6, 3012 Bern, Switzerland. More information on: www.issibern.ch.

Attendance

By invitation only, ~ 40 participants maximum.

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 charge for the Workshop.

Hotel reservations

Block bookings have been made for the Workshop. All participants at the Workshop are requested to contact the ISSI secretary, Alexandra Lehmann (Tel. +41-31-631-4896, Fax: +41-31-631-4897, email: alexandra.lehmann@issibern.ch), to indicating their arrival and departure dates and times, as well as any special requests they may have (e.g. double room). Please note that all hotel reservations have to be made by the ISSI Secretariat. The invitation letters for visas etc can also be obtained from the ISSI Secretariat.

Schedule

Formal invitations and First Circular	11 June 2018
Registration deadline	
Second Circular and final program	
Workshop	22-26 October 2018