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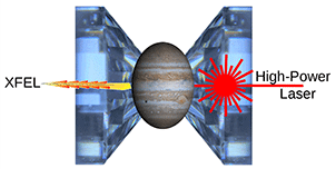

9th Joint Workshop on High Pressure, Planetary and Plasma Physics (HP4)

Purpose and Goals

The generation and diagnostics of extreme states of matter as appearing in the interior of planets, brown dwarfs and stars is one of the key scientific challenges in a number of scientific fields. These include:

- Generation of such conditions at FLASH and the future free electron laser facility (European XFEL)
- Generation of higher pressures in static experiments both in the laboratory and at synchrotron facilities (PETRA III)
- Development of new diagnostic tools
- Predictions of high pressure and temperature properties of materials from ab-initio methods
- Application of such results to the study of interior of planetary and astrophysical bodies

To bring together researchers from these different fields in the physical sciences a workshop series has been established by DESY, XFEL GmbH, DLR Berlin, the University of Rostock and Bayerisches Goinstitut to discuss related topics and problems. Earlier workshops were held at DESY Hamburg (2012), DLR Berlin (2013/2018), University of Rostock (2014), Bayerisches Geoinstitut at the University of Bayreuth (2015), European XFEL/DESY in Hamburg (2016), Göttingen (2017) and Helmholtz-Zentrum Dresden (2019).

The aim of the upcoming workshop is to continue the discussion of scientific questions with relevance for extreme planetary environments in terms of high pressure (HP) and high temperature (HT). The conditions prevalent in the deep interiors and atmospheric envelopes of solar system planets, their satellites as well as massive solid and gas giant extrasolar planets, respectively, and are not fully accessible by conventional experimental and theoretical methods. New and enabling techniques to be used in the HP/HT regime are based on the combination of intense pulsed x-ray sources with pulsed sample excitation, in particular but not exclusively related to high energy optical lasers. Simultaneously, ab initio simulations for matter under extreme conditions provide a more and more predictive data set for planetary interiors in this HP/HT regime.

The following topics will be part of the workshop:

- Evolution and structure of giant planet interiors
- Interior structure, bulk composition, and internal geodynamics of solid planets
- Deep volatile cycles and exchange processes between geochemical reservoirs
- Physics and chemistry of impact processes
- Equations of state, petrology, and geochemistry of planetary materials
- Melting relations and phase transformations of materials at extreme states
- Dynamic and ultrafast processes in strongly excited solids or similar
- Compression experiments using high-power optical and free electron lasers
- Laboratory experiments using multi-anvil and diamond-anvil cells
- Ab-initio simulation studies for matter under extreme conditions

Time and Location

The workshop will start on September 9th and end on September 10th 2021.
It will be held at WWU Münster, Johannisstraße 4, JO1.

Keynote Speakers

Edwin Kite, The University of Chicago
Cayman Unterborn, Southwest Research Institute
Florian Trybel, Linköping University
Tomoaki Kimura, Gifu University
Michael Stevenson, Universität Rostock

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