

11th Workshop on High Pressure, Planetary and Plasma Physics (11HP4)
and
Final Colloquium of DFG Research Unit FOR 2440 “Matter at Planetary Interior Conditions”

Monday, September 25

9:00 | Ronald Redmer (University of Rostock)
Welcome

Session 1: Metals at high pressure

Chair: *Gerd Steinle-Neumann (Bayerisches Geoinstitut)*

9:10 | Dario Alfé (University College London), A. Wilson, C. Davies & M. Pozzo (invited)
The Earth's inner core nucleation paradox

9:40 | Maximilian Schörner & Uwe Kleinschmidt (University of Rostock)
Ab initio and machine learning methods for aluminum, copper and iron

10:10 | Sandro Scandolo (ICTP Trieste) & Zhi Li (invited)
Iron at Earth's core conditions from deep-learning atomistic simulations

10:40 | Coffee

Session 2: Planetary structure

Chair: *Doris Breuer (DLR Berlin)*

11:10 | Attilio Rivoldini (Royal Observatory of Belgium) et al. (invited)
Mars interior structure and spin state from InSight's RISE radio-science experiment

11:40 | Philipp Baumeister (DLR Berlin) & N. Tosi
ExoMDN – Rapid characterization of exoplanet interiors with mixture density networks

12:00 | Szilárd Csizmadia (DLR Berlin) & L. Bernabo
Recent estimates and measurements of the Love-number

12:20 | Lunch

Session 3: Gas giants and molecular systems I

Chair: *Nadine Nettelmann (University of Zürich)*

13:50 | Saburo Howard (Observatoire de la Côte d'Azur) (invited)
Jupiter's interior: the importance of equations of state

14:20 | Samuel Schumacher (University of Rostock) et al.
First Measurement of the opacity of warm dense hydrogen using the National Ignition Facility

14:40 | Carlo Pierleoni (University of L'Aquila)
Progress in high-pressure hydrogen from Quantum Monte Carlo methods – phase diagram and energy gaps

15:00 | Coffee

Session 4: Gas giants and molecular systems II

Chair: *Ronald Redmer (University of Rostock)*

15:30 | Johannes Wicht (MPI Solar System Research), U. R. Christensen & M. Preising (invited)
Dynamo action of the zonal winds in Jupiter and Saturn

16:00 | Divyanshu Ranjan (HZDR Dresden) et al.
Characterizing C-H demixing and hydrogen metallization in warm dense matter conditions

16:20 | Kushal Ramakrishna (HZ Dresden-Rossendorf)
Applying an explicit temperature-dependent generalized gradient approximation to warm dense matter: Thermal PBE

16:40 | Martin Preising (University of Rostock) et al.
Material properties of matter in Saturn's interior from ab initio simulations

17:00 | Posters

Tuesday, September 26	
Session 5: Silicates at high pressure	
Chair: <i>Hanns-Peter Liermann (DESY Hamburg)</i>	
9:00	<u>Thomas Duffy</u> (Princeton University) (invited) Novel mineralogy in deep interior of terrestrial exoplanets
9:30	<u>Karen Appel</u> (European XFEL) et al. In-situ X-ray diffraction study of shock and release dynamics of SiO ₂
9:50	<u>Sarah Figowy</u> (University of Oslo), <i>R. Caracas & C. Mohn</i> Diffusion of noble gases in silica polymorphs at Earth's mantle conditions
10:10	Coffee
Session 6: Planetary processes	
Chair: <i>Nicola Tosi (DLR Berlin)</i>	
10:40	<u>Razvan Caracas</u> (IPG Paris) (invited) Condensation of planets and formation of atmospheres from protolunar disks after giant impacts
11:10	<u>Adrien Saurety</u> (IPG Paris) & <i>R. Caracas</i> Behavior of multi-component silicate system under shock in the protoplanetary disk
11:30	<u>Anne H. Davis</u> (University of Oslo) & <i>R. Caracas</i> Degassing of CO ₂ triggers large-scale loss of He from the magma ocean
11:50	<u>T. Rückriemen-Bez</u> (DLR Berlin) et al. Differentiation in Fe-S and Fe-C cores of small planetary bodies
12:10	Lunch
Session 7: Progress in high energy experiments and computations	
Chair: <i>Ulf Zastra (European XFEL)</i>	
13:40	<u>K. Appel</u> (European XFEL) et al. (invited) First high repetition rate dynamic compression experiments with DiPOLE100-X at the HED scientific instrument at European XFEL
14:10	<u>Julian Lüttger</u> (University of Rostock) et al. Towards a temperature and graphitization measurement of ion heated diamond samples using X-rays
14:30	<u>Adrien Descamps</u> (Queens University Belfast) et al. Evidence for phonon hardening in laser-excited gold using x-ray diffraction at a hard X-ray free electron laser
14:50	<u>R. Stewart McWilliams</u> (University of Edinburgh) (invited) New windows on transport properties of deep planetary interiors
15:10	Coffee
15:40	<u>Tilo Doeppner</u> (LLNL) Measurement of thermal conductivity in warm dense matter
16:00	<u>Tobias Dornheim</u> (HZ Dresden-Rossendorf) Evidence of free-bound transitions in warm dense matter
16:20	<u>Roi Baer</u> (The Hebrew University of Jerusalem) (invited) Stochastic vector techniques in electronic structure
16:50	Break
Session 8: Ice giants	
Chair: <i>Florian Trybel (Linköping University)</i>	
17:00	<u>Ludwig Scheibe</u> (TU Berlin), <i>R. Redmer & N. Nettelmann</i> Thermal evolution of Uranus and Neptune
17:20	<u>Nadine Nettelmann</u> (University of Zürich), <i>Marina Cano (DLR Berlin) & N. Tosi</i> Atmospheric abundances from H ₂ /H ₂ O and H/He phase separation in the Ice Giants
19:00	Dinner at "Trotzenburg", Tiergartenallee 6, 18059 Rostock

Wednesday, September 27	
Session 9: Ice and ices	
Chair: <i>Dominik Kraus (University of Rostock)</i>	
9:00	<i>Florian Trybel (Linköping University), T. Meier & G. Steinle-Neumann</i> The O-H-O hydrogen bond symmetrization at high pressure
9:20	<i>Michael Stevenson (University of Rostock) et al.</i> Dynamic compression of water to ice giant conditions
9:40	<i>Anshuman Mondal (WWU Münster) et al.</i> Novel ammonia hydrates in mid-mantle layers of icy (exo)planets
10:00	<i>Martin French (University of Rostock)</i> Ab initio simulations for thermophysical properties of molecular H-C-N-O mixtures
10:20	Coffee
Session 10: (Mg,Fe)O, a not-so simple oxide and final issues	
Chair: <i>Razvan Caracas (IPG Paris)</i>	
10:50	<i>Tim Bögels (IPG Paris) & R. Caracas</i> Studying extreme conditions at large scales using ML potentials
11:10	<i>Hauke Marquardt (University of Oxford) et al.</i> Bulk modulus softening of ferropicrinite across the iron spin crossover at high temperatures, measured by time-resolved X-ray diffraction in a resistively-heated dynamic diamond-anvil cell
11:30	<i>Khachiwan Buakor (European XFEL) et al.</i> Shock compression of (Fe,Mg)O towards megabar pressure
11:50	<i>Ronald Redmer (University of Rostock)</i> Matter under planetary interior conditions – summary of the research unit
12:20	<i>G. Steinle-Neumann (Bayerisches Geoinstitut)</i> Summary and Farewell
12:30	Lunch

Posters	
1	<i>Razvan Caracas (IPG Paris) et al.</i> MAGMATOMIX: a highly efficient post-processing tool for analyzing molecular dynamics simulations
2	<i>Ana Anzulovic (University of Oslo) & R. Caracas</i> The effect of volatiles CO ₂ and H ₂ O on the mechanical properties of kimberlite melts
3	<i>Xi Zhu (China University of Geosciences Wuhan) & R. Caracas</i> Shock-induced devolatilization of a hydrous silicate melt
4	<i>G. Steinle-Neumann (Bayerisches Geoinstitut), D. Langhammer & D. Di Genova</i> Viscosity of volcanic melts from artificial neural networks
5	<i>G. Steinle-Neumann (Bayerisches Geoinstitut) & L. Yuan</i> Hydrogen distribution between the Earth's inner and outer core from large-scale molecular dynamics simulations
6	<i>Ludwig Scheibe (TU Berlin) et al.</i> Distant new worlds – exploring the diversity of extrasolar planets
7	<i>Tina Rückriemen-Bez (DLR Berlin), A.-C. Plesa & J. Maia</i> To move or not to move: Influence of depth-dependent thermodynamic parameters on thermal convection in Europa's ice shell
8	<i>Florian Trybel (Linköping University), D. Laniel & I. A. Abrikosov</i> Ultra-high complexity of synthesized meta-stable nitrides
9	<i>Efrat Hadad (The Hebrew University of Jerusalem)</i> Stochastic density functional theory for warm dense matter
10	<i>Armin Bergermann (University of Rostock), M. French & R. Redmer</i> Ab initio simulation for hydrogen-water mixtures
11	<i>Peter Cooke (University of Cambridge)</i>

	Simulating materials at high-pressure with ephemeral data derived potentials
12	<u>Dmitrii Bepalov</u> (<i>European XFEL</i>) <i>et al.</i> Target design for high-pressure temperature matter using inelastic X-ray scattering at the HED instrument at the European XFEL
13	<u>Hanns-Peter Liermann</u> (<i>DESY Hamburg</i>) & <i>K. Glazyrin</i> Present and future extreme conditions research at low (PETRA III) & ultra-low (PETRA IV) emittance synchrotron sources at DESY
14	<u>Chongbing Qu</u> (<i>University of Rostock</i>) <i>et al.</i> Using XRTS to probe K-shell ionization of CH and crystalline melting of diamond under warm dense matter conditions
15	<u>Philipp May</u> (<i>University of Rostock</i>) Equation of state and diamond formation kinetics of C-H-O mixtures under ice giant interior conditions
16	<u>Mylaine Holin</u> (<i>University of Edinburgh</i>) <i>et al.</i> Analysis of ammonia-methane mixtures under high pressure and high temperature