



Date: November 4<sup>th</sup> – 7<sup>th</sup>, 2015

#### Background:

The goal of this workshop is to explore the question of structure, composition, and evolution of Earth's interior in light of recent advances in experimental and observational data. The topics we plan addressing are the origin of the core and mantle, the evolution from the magma ocean to the solid mantle and then to the present Earth, its bulk composition, the extent and scale of its heterogeneities, and innovations in exploratory research. This workshop is co-sponsored by Earth-Life Science Institute and MEXT Grant-in-Aid for Scientific Research on Innovative Areas "Interaction and Coevolution of the Core and Mantle: Toward Integrated Deep Earth Science".

Venue: Dogo Prince Hotel (Matsuyama, Ehime)



The meeting will be hosted this autumn at a Japanese hot-spring resort (<http://www.dogoprince.co.jp/>) located in Matsuyama, on the island of Shikoku.

The facility is a traditional inn with a hot spring that will facilitate interactions in the official sessions and spare unscheduled time. There will also be opportunity for short excursions to nearby touristical sights in Matsuyama.

# Programme

Day 1, November 4 <sup>th</sup>	
8:15	Registration open
9:00	Welcome Message and Introductory Remarks by Tetsuo Irifune and George Helffrich
Session 1: Terrestrial Planet Formation	Chair: George Helffrich
9:15	A revised chronology of the inner solar system <b>Ramon Brasser</b> (ELSI, Tokyo Institute of Technology)
9:35	Giant Impacts and Terrestrial Planet Formation <b>Hidenori Genda</b> (ELSI, Tokyo Institute of Technology)
9:55	★ Keynote Lecture: Stable Isotope Evidence for Planetary Differentiation. <b>Anat Shahar</b> (Geophysical Laboratory, Carnegie Institution of Washington)
10:30	<b>Coffee Break</b>
Session 2: From Magma Ocean to Solid Earth	Chair: M. Satish-Kumar
10:55	Invited Talk: Crystallization of magma oceans and implications for mantle convection <b>Stéphane Labrosse</b> (ENS de Lyon )
11:15	Early evolution and dynamics of Earth from a molten initial stage <b>Diogo Lourenço</b> (Institute of Earth Sciences, ETH Zurich)
11:35	Metal-silicate partitioning of chlorine: Implications for the origin of terrestrial missing chlorine. <b>Hideharu Kuwahara</b> (The University of Tokyo)
11:55	Geochemical evidence for the temporal evolution of the mantle redox state: implications for the volatile outgassing <b>Vincenzo Stagno</b> (GRC/ELSI, Ehime University)
12:15	<b>Lunch Break</b>
Session 3: Core-Mantle interactions	Chair: Taku Tsuchiya
14:30	★ Keynote Lecture: Conductivity and correlations at High Pressure in Fe and FeO. <b>Ronald Cohen</b> (Geophysical Laboratory, Carnegie Institution for Science)

15:05	Core Neon <b>Andrew Jephcoat</b> (ISEI, Okayama University)
15:25	★ Keynote Lecture: Transport and Storage of Volatiles in the Mantle and Core <b>Eiji Ohtani</b> (Dept. of Earth Sciences, Tohoku University)
16:00	<b>Coffee Break</b>
16:25-18:00	<b>Poster Session 1</b>
D1-1	From Star to Stone: What Really Makes an Exoplanet "Earth-like?" <b>Cayman Unterborn</b> (School of Earth Sciences, The Ohio State Univ.)
D1-2	Linear analysis on the onset of thermal convection of highly compressible fluids with variable physical properties: Implications for the mantle convection of super-Earths <b>Masanori Kameyama</b> (GRC, Ehime University)
D1-3	Melting of the Sahara 97072 meteorite (EH3 Chondrite) at 12GPa and variable temperatures <b>Wei Du</b> (GRC/ELSI, Ehime University)
D1-4	Effective temperature condition in the separation process of the core and mantle <b>Hiroki Ichikawa</b> (GRC/ELSI, Ehime University)
D1-5	Effect of a Stratified Basal Magma Ocean on the Geodynamo <b>Matthieu Laneuville</b> (ELSI, Tokyo Institute of Technology)
D1-6	Major element composition of the Early Enriched Reservoir: Constraints from <sup>142</sup> Nd/ <sup>144</sup> Nd isotope systematics in the early Earth and high-pressure melting experiments of primitive peridotite <b>Nozomi Kondo</b> (Kyoto university)
D1-7	<i>Ab initio</i> electrical resistivity of hcp iron at earth's inner core conditions <b>Haruhiko Dekura</b> (GRC, Ehime University)
D1-8	Hugoniot and temperature measurements of H <sub>2</sub> O up to 260 GPa under laser-driven shock loading <b>Tomoaki Kimura</b> (GRC, Ehime University)
D1-9	High-pressure <i>in situ</i> x-ray laminography using diamond anvil cell <b>Ryuichi Nomura</b> (ELSI, Tokyo Institute of Technology)
D1-10	Phase relations of FeH at Earth's core pressure <b>Chie Kato</b> (Dept. of Earth and Planetary Sciences, Tokyo Institute of Technology)
D1-11	The eutectic liquid composition in the Fe-Fe <sub>3</sub> S binary system at the core pressure range <b>Yuko Mori</b> (Dept. of Earth and Planetary Sciences, Tokyo Institute of Technology)
D1-12	Some thermodynamic properties of larnite ( $\beta$ -Ca <sub>2</sub> SiO <sub>4</sub> ) constrained by high <i>T/P</i> experiment and/or theoretical

	simulation <b>Zhihua Xiong</b> (GRC/ELSI, Ehime University)
--	--

Day 2, November 5 <sup>th</sup>	
Session 1: Mantle Structure and Composition	Chair: Tetsuo Irifune
9:00	★ Keynote Lecture: The Lower Mantle: A seismological perspective <b>Brian Kennett</b> (RSES, Australian National University)
9:35	Persistence of Strong Silica-Enriched Domains in the Earth's Lower Mantle <b>John Hernlund</b> (ELSI, Tokyo Institute of Technology)
9:55	Discovery of new iron oxide $\text{Fe}_7\text{O}_9$ and its solid solution, $(\text{Mg},\text{Fe}^{2+})_3\text{Fe}^{3+}_4\text{O}_9$ <b>Ryosuke Sinmyo</b> (ELSI, Tokyo Institute of Technology)
10:15	Invited Talk: Helium Diffusion in Mantle Minerals From First Principles <b>John Brodholt</b> (Dept. of Earth Sciences, Univ. College London)
10:35	<b>Coffee Break</b>
Session 2: Mantle dynamics	Chair: Takashi Yoshino
11:00	★ Keynote Lecture: Modes of slab behavior: From the Transition Zone to the Mid-Lower Mantle <b>Craig Bina</b> (Northwestern University)
11:35	Invited Talk: Multiscale Seismic Tomography and Mantle Dynamics <b>Dapeng Zhao</b> (Tohoku University)
11:55	Three-dimensional analysis of pore effect on composite elasticity by means of finite element method <b>Akira Yoneda</b> (ISEI, Okayama University)
12:15	Semi analytical model for the effective grain size profile in the mantle of the Earth <b>Antoine Rozel</b> (Institute of Earth Sciences, ETH Zurich)
12:35	<b>Lunch Break</b>
Session 3: The Deep Lower Mantle	Chair: Shigehiko Tateno
14:30	Invited Talk: The relationship of crystallographic orientation between perovskite and post-perovskite during phase transformation <b>Daisuke Yamazaki</b> (ISEI, Okayama University)
14:50	Temperature of the Lower Mantle <b>Christine Houser</b> (ELSI, Tokyo Institute of Technology)

15:10	Waveform inversion for 3D structure in D" <b>Kenji Kawai</b> (The University of Tokyo)
15:30	Adjacent High- and Low-velocity regions around the Western Edge of the Pacific Large-Low Shear Velocity Province <b>Satoru Tanaka</b> (D-EARTH, JAMSTEC)
15:50	<b>Coffee Break</b>
16:15-18:00	<b>Poster Session 2</b>
D2-1	Technical developments on acoustic emissions monitoring at high pressures <b>Tomohiro Ohuchi</b> (GRC, Ehime University)
D2-2	Creep behavior of Fe-bearing olivine under hydrous conditions <b>Miki Tasaka</b> (Dept. of Geology, Niigata University)
D2-3	Stability region of the (K,Na)AlSi <sub>3</sub> O <sub>8</sub> hollandite solid solution <b>Youmo Zhou</b> (GRC, Ehime University)
D2-4	Direct sound velocity measurements of pyrolite across the mantle transition region <b>Steeve Gréaux</b> (GRC/ELSI, Ehime University)
D2-5	Effects of the subducted slab on dynamics of the lowermost mantle <b>Takeo Kaneko</b> (Hiroshima University)
D2-6	Single crystal elasticity of the lower mantle minerals using inelastic X-ray scattering <b>Hiroshi Fukui</b> (Graduate School of Material Science, University of Hyogo)
D2-7	Thermal equation of state of MgSiO <sub>3</sub> post-perovskite <b>Takeshi Sakai</b> (GRC, Ehime University)
D2-8	Experimental identification of a new pyrite-type hydroxide at multimegabar pressures <b>Masayuki Nishi</b> (GRC, Ehime University)
D2-9	Technical developments in high temperature generation with sintered diamond anvils <b>Takeshi Arimoto</b> (GRC, Ehime University)
D2-10	Over 3000 °C generation in the Kawai-Cell by boron-doped diamond cylinder <b>Longjian Xie</b> (ISEI, Okayama University)
18:30	<b>Banquet</b> at Dogo Prince Hotel Kanpai by Kei Hirose

<b>Day 3, November 6<sup>th</sup></b>	
Session 1: Composition of the core	Chair: Kei Hirose

9:00	Invited Talk: Properties of liquid iron alloys under extreme conditions <b>Guillaume Morard</b> (IMPMC, Université Pierre et Marie Curie)
9:20	Liquid iron alloys with hydrogen at outer core conditions by first-principles <b>Koichiro Umemoto</b> (ELSI, Tokyo Institute of Technology)
9:40	Core Liquids: Fact and fiction <b>George Helffrich</b> (ELSI, Tokyo Institute of Technology)
10:00	Crystallization of SiO <sub>2</sub> in Earth's core after high-temperature core formation <b>Kei Hirose</b> (ELSI, Tokyo Institute of Technology)
10:20	<b>Coffee Break</b>
Session 2: A look into the deep Core	
Chair: Satoru Tanaka	
10:45	Invited Talk: Linking seismic observations of Earth's inner core boundary to deeper structure <b>Lauren Waszek</b> (Dept. of Geophysics, Univ. of Maryland)
11:05	Freezing and melting above the inner core boundary <b>Marine Lasbleis</b> (ELSI, Tokyo Institute of Technology)
11:25	Thermal structure of the inner core boundary in numerical dynamos <b>Matsui Hiroaki</b> (Univ. California Davis)
11:45	Lattice preferred orientation of hcp-iron induced by shear deformation <b>Yu Nishihara</b> (GRC, Ehime University)
12:05	<b>Lunch Break</b>  <b>Shin-Gakujutsu steering Committee meeting</b>
14:00	<b>Excursion to Matsuyama Castle or Labo Tour</b>

Day 4, November 7 <sup>th</sup>	
Session 1: New insights from the Geo-neutrinos	Chair: Suzuki Katz
9:00	★ Keynote Lecture: View and perspectives on the lower mantle from the Geo-neutrinos <b>Stephen Dye</b> (Dept. of Physics and Astronomy, Univ. of Hawaii/Dept. of Natural Sciences, Hawaii Pacific University)
9:35	Geo-neutrino measurement with KamLAND and future prospects. <b>Hiroko Watanabe</b> (Research Center for Neutrino Science, Tohoku University)
9:55	Core and Mantle compositions: Neutrino geophysics insights <b>William McDonough</b> (Geology, University of Maryland)
10:20	<b>Coffee Break</b>
Session 2: Round Table	Chair: John Hernlund
10:45	
12:00	Concluding remarks by Taku Tsuchiya
12:10	The end

## Science Organizing Committee

Scientific chair	
George Helffrich	Earth Life Science Institute (Tokyo Tech.)
Tetsuo Irifune	Geodynamics Research Center (Ehime Univ.)
Organizers (GRC/ELSI)	
Hiroki Ichikawa	Chair
Steeve Gréaux	Co-chair
Haruhiko Dekura	
Masayuki Nishi	
Vincenzo Stagno	
Wei Du	
Zhihua Xiong	