The 77th GRC & The 22nd MEXT Shin-Gakujutsu "Core-Mantle Coevolution"

International Frontier Seminar

On the large-scale geochemical anomalies in the deep mantle inferred from the hydrous mantle convection simulations

Dr. Takashi Nakagawa

(Professor, Dept. of Earthy Science, The University of Hong Kong)

Date: 3.27.2019 (Wed.) 16:30 –

Venue: Meeting Room #486, Science Research Bldg 1, Ehime Univ.

The traditional mantle geochemistry has been concerned with the vertical structure of the deep mantle associated with the origin of mantle plumes. However, the recent geochemical analysis of basaltic rocks as 'Blood Test' of the Earth's deep interior is suggested that the lateral heterogeneity of geochemical anomalies seems to be correlated with the large-scale seismic anomalies (Iwamori and Nakamura, 2015). This geochemical heterogeneity called 'East-West hemispherical structure' would be related to the distribution of water in the deep mantle. Here, I investigate the spatial correlation between geochemical and seismic anomalies in deep mantle using the hydrous mantle convection model tracking with ~20 species of trace elements in the mantle rocks partitioned between solid and melt components (U-Th-Pb-He, Nd-Sm, Rb-Sr and Re-Os systems). As a result of numerical simulations, the Re-Os system can be only correlated with the distribution of thermo-chemical structure in deep mantle because the partition coefficient of Os is much larger than the unity. In addition, to get the large-scale anomalies in deep mantle, the viscosity dependence of water is essentially important. The scale of hydrous mantle convection can assess the reference mantle water content that starts being effective to reduce the viscosity with the mantle water content rather than the value of the exponent of the prefactor of hydrous mantle viscosity associated with the mantle water content, which may be required to have ~0.2 wt. percent to find the large-scale thermo-chemical structure in the deep mantle. In this seminar talk, I will also argue the potential issues on the evolution of surface seawater and habitability of the rocky planets as a result of the coupled evolution model of ocean-plate-mantle-core.

CoreMantle Evolution

Contact: Prof. Taku Tsuchiya

tsuchiya.taku.mg@ehime-u.ac.jp

EHIME UNIVERSITY GRC GEODYNAMICS RESEARCH CENTER