The 22nd Global-COE International Frontier Seminar

～No. 293 Geodynamics Seminar～

April 15th, 2011, from 16:30, at the meeting room (#486) 4F

Indoor vs. Outdoor Geophysics

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Research in mineral physics is essential for interpreting observational data from many other disciplines in the Earth Sciences, from geodynamics to seismology to geochemistry to petrology to geomagnetism to planetary science, and extending also to materials science and climate studies. The field of high-pressure mineral physics is highly interdisciplinary. Mineral physicists do not always study minerals nor use only physics; they study the science of materials which comprise the Earth and other planets and employ the concepts and techniques from chemistry, physics, and materials science. Observations from geochemistry and geophysics studies lead to the development of petrologic, seismic and geodynamic models of the Earth's deep interior. The goal of mineral physics is to interpret such models in terms of variations of pressure, temperature, mineralogy/crystallography, and/or chemical composition with depth. The discovery in 2004 of the post-perovskite phase of $MgSiO_3$ at pressures in excess of 120 GPa and high temperatures has led to an explosion of both complimentary experimental and theoretical work in mineral physics and remarkable synergy between mineral physics and the disciplines of seismology, geodynamics and geochemistry. Similarly, the observation of high-spin to low-spin transitions in Fe-bearing minerals at high pressures has important implications for the lower mantle of the Earth. We focus in this talk on the use of experimental physical acoustics to conduct "indoor seismology" experiments to measure sound wave velocities of minerals under the pressure and temperature conditions of the Earth's mantle. This field of research has a long history dating back at least to the studies of Francis Birch in the 1950s. The techniques include ultrasonic interferometry, resonant ultrasound spectroscopy, and Brillouin spectroscopy. Many of these physical acoustic experiments are now performed in conjunction with synchrotron X-radiation sources at national and international facilities. The role of mineral physics research is to provide experimental data and theoretical computations to allow interpretation of observational data from other branches of geosciences in terms of the chemical and thermal state of the Earth's interior and its evolution over geological time.

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Room486, meeting room 4F
Science Research Bldg I
Ehime University

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