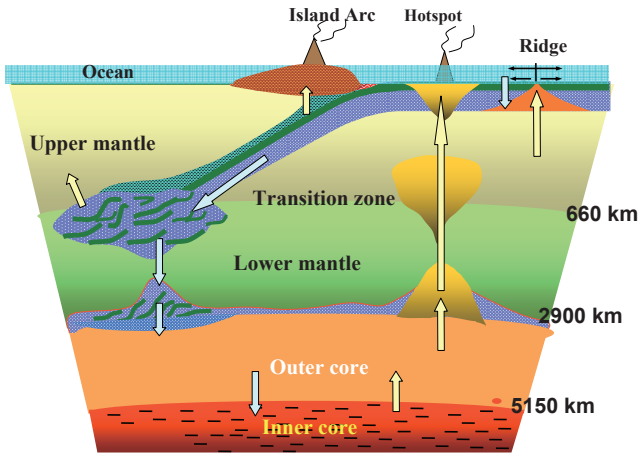
Eiji Ohtani ／ Professor ／ Graduate School of Science

Profile

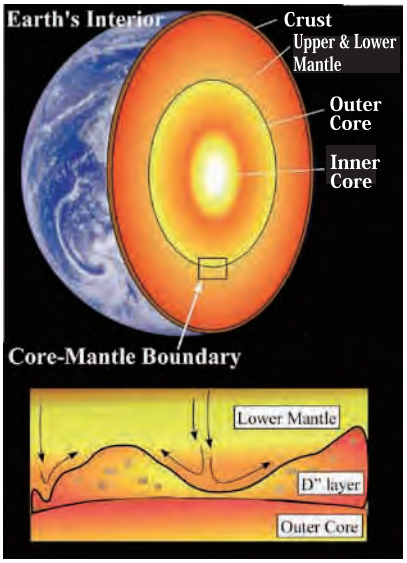
Born 1950; BSc Tohoku University (Mineralogy and Petrology), 1973; DSc Graduate School of Science, Nagoya University (Geophysics), 1979; Assistant Prof. of Ehime Univ., 1980; Research Fellow at Australian National University, 1981-1983, Associate Professor of Ehime Univ., 1988, Associate Professor of Tohoku Univ., 1989; Professor of Tohoku Univ., 1994- present. Awarded Mineralogical Society of Japan Award, 1997; Fellow of American Mineralogical Society, 2002; Fellow of American Geophysical Union (AGU), 2006; Awarded Norman L. Bowen Award from AGU, 2007: Leader of Tohoku Univ. 21st Century COE Earth Science Program, 2004-2008; Leader of Tohoku Univ. Global COE Earth Planetary Science Program, 2008-2012.

Research Activities

The earth and planetary interior is under high pressure and temperature conditions (365 GPa and 5000 K at the center of the earth). Our main research is to simulate the high pressure and temperature conditions in the laboratory and to clarify experimentally various processes working in the deep earth's interiors. We have currently produced the conditions of the earth core-270 GPa-3600K, and 375 GPa-700 K- and clarified the stability of the Fe-Si alloys, a potential candidate for the inner core. We clarified the reactions between molten Fe and silicates, and showed dissolution of O, Si, and K in molten Fe under the core–mantle boundary conditions. These results provide important constraints on the light elements and radioactive energy production in the core. We also clarified the global water circulation in the whole mantle from crust to core. We discovered a hydrous phase that is stable to the core-mantle boundary condition of 120 GPa and 2000 K. Thus, water can be transported into the deep mantle and into the core–mantle boundary region by slab subduction.



Global circulation of hydrogen in the Earth



The core and core-mantle boundary: Research frontier of the Earth Science

Message

As an undergraduate student at Tohoku University, I visited Hokkaido, Japan, in 1972 for a field survey. I was deeply impressed by the beautiful and fresh peridotite outcrops of the deep interior of the Earth's mantle, and I wanted to understand the mystery operating in the earth's deep interior. I was assured that high-pressure works are vital to clarifying the earth's deep interior. This is the reason why I am now working as a professional in studying the earth's deep interior. Since 1972 I struggled to develop high pressure generation techniques and facilities in several institutions in my career, such as Ehime University (Japan), Australian National University (Australia), and Tohoku University. Our experiments to generate ultrahigh pressures can be applied to a deep magma ocean and giant impact phenomena which created the earth and moon in the early solar system. My dream in my research is to reproduce the conditions of the center of the earth in my laboratory by developing the high pressure technology, and to clarify the materials composing the center of the earth. Currently, we have achieved the pressure exceeding the center of the earth, 375 GPa-700 K, 270 GPa-3600 K. Now, I am very close to my dream to achieve the center of the earth. I believe that I am now in one of the most fruitful and enjoyable times in my research career, and I am enjoying research here by intensive discussions with young active graduate students and post-docs. Finally, I would like to work as a program leader to create one of the centers of excellence (COE) in earth and planetary sciences in Tohoku University in the next five years of our global COE program. I am sure that we can achieve successfully our final goal of our global COE program.