A scope for Study of Earth's interior

Eiji Ohtani[1]

[1] Inst. Mineral, Petrol. & Econ. Geol.,Tohoku Univ

In this talk, I will summarize the topics to be studied in the next ten years in the field of study of the earth's interior. One of the major topics in this field is to clarify the nature of the earth's core. The earth's core has been considered to be a major issue to be studied. The seismic study of the core has been studied extensively, and many new observations have been made in the recent ten years. However, it is just a recently that we can achieve the conditions of the earth's CMB conditions. It is still a challenging issue to achieve the pressure and temperature conditions of the inner core. There are various pioneering works on the core by the diamond anvil experiments, although the major understanding in terms of structure, dynamics, and evolution of the core is still poorly achieved. The technical improvement to achieve higher pressure and temperature can expand our targets to be studied into the giant planets, such as Jupiter Saturn, Uranus, and Neptune, and also extra-solar planets.

The recent studies on the earth's interior are essentially concentrated in the solid materials, and the studies of the melt and fluid are still limited compared to those of the solid materials because of the difficulty to study the structure, and physical properties. Since the major planets in our solar system are made of fluid, it is natural to consider that the study of the fluid and melt is a key to the earth's and planetary sciences. The rheological study is of course the basic issues for the Earth's science, and evolution of our planets are essentially based on this interesting physical properties. It is essentially to clarify the rheological properties under the conditions of the whole earth, in order to understand the evolutional processes of the Earth.

New revolutionary tools have been developed for earth's science, such as Geo-neutrino and Muon detectors. Although these studies are still in early stage to get meaningful results, we may expect important results using these tools by making further improvements. Advanced light sources are also important tools for study of the earth's interior. This includes further strong synchrotron X-ray and neutron beams. Combination of these new light sources and ultrahigh pressure will make it possible to achieve the issues given in the above, such as the study of the fluid and melt at extreme conditions and rheological properties of the earth's materials.