

**The  
58th**

# **GRC INTERNATIONAL FRONTIER SEMINAR**

## **Hydrogen-enhanced electrical conductivity in olivine and other minerals**

**Dr. Shun-ichiro Karato (Professor, Yale University)**

**Date : 18.Oct.2016 (Tues.) 16:30 – 18:00**

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

Experimental observations on hydrogen-enhanced electrical conductivity in olivine are reviewed. I show that in almost all experiments, a specimen is super-saturated with hydrogen, and the degree of super-saturation is larger at lower temperatures. Therefore possible hydrogen-loss during an experiment needs to be examined carefully to assess the validity of experimental observations. Hydrogen loss is sensitive to temperature, but also to the frequencies and voltage used in the experiments. It is possible to minimize the hydrogen loss if one uses low voltage and high frequencies. I also show that hydrogen gain can occur during high-pressure experiments in initially dry samples that could lead to orders of magnitude higher conductivity than they should have if a sample is truly dry.

When these technicalities are adequately addressed to select the data, the selected data can be explained by a unified model involving two mechanisms of conduction without invoking concentration-dependent activation energy. Electrical conductivity at relatively low temperatures is due to the migration of interstitial proton whereas conductivity at high temperature is caused by the migration of protons trapped at cation site. This model explains high and highly anisotropic conductivity in the asthenosphere without invoking partial melting. However, reported high conductivity in some regions of the lithosphere is difficult to explain by hydrated olivine. The role of orthopyroxene may be necessary.

**Contact: Prof. Tetsuo Irifune (e-mail: [irifune@dpc.ehime-u.ac.jp](mailto:irifune@dpc.ehime-u.ac.jp))  
<http://www.grc.ehime-u.ac.jp/>**

