Japan Geoscience Union Meeting 2010
(May 23-28 2010 at Makuhari, Chiba, Japan)
©2009. Japan Geoscience Union. All Rights Reserved.

SIT042-02 Room: 101 Time: May 25 09:15-09:30

Effect of pressure on the deformation fabrics of olivine

Haemyeong Jung[1*]

[1]Seoul National University

Seismic anisotropy (SA) in the upper mantle is widely observed and considered to be caused by deformation-induced lattice-preferred orientation (LPO) of olivine. SA within oceanic lithosphere is attributed to LPO of dry olivine induced by large strains. Previous study showed that flow under high H2O fugacity induces a change in olivine LPO that explains the SA in the mantle wedge above subducting lithospheric slabs. Whether changes in olivine LPO are unique to fH2O effects has become controversial and is critical to resolve. Here, I report low-stress, high strain, experiments on dry harzburgite (96% olivine) at T = 1300 degree C and P = 2.5 - 3.6 GPa. At about 3 GPa, pressure induces the same profound transition in olivine LPO that is produced by high fH2O at 1 - 2 GPa. One important consequence for global tectonics is that trench-parallel SA of the fast S-wave beneath subducting slabs probably reflects entrainment of asthenospheric mantle beneath the slab in the direction of subduction rather than trench-parallel flow. The variety of olivine LPOs in both experiments and natural rocks suggest that, in addition to the pressure-induced change in olivine slip systems implied here, there are likely further changes in slip systems at higher pressure and temperature. Recent study on the LPOs of olivine from the deep upper mantle will be also discussed.

Keywords: olivine, lattice preferred orientation, pressure, seismic anisotropy, high pressure experiment, deformation