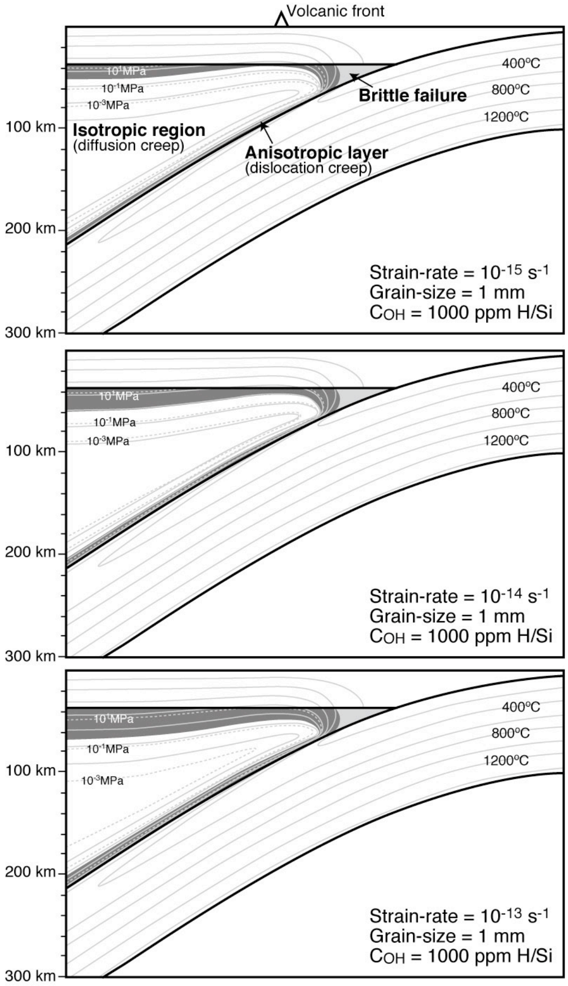
The kinematic-dynamic model of non-Newtonian rheology (Kneller et al. 2005) showed that most of the mantle wedge have strain rate of orders of 10^{-14} s^{-1} with some variations depending on the slab-wedge coupling and the age of subducting lithosphere. Hall et al. (2000) calculated the viscous 3-D asthenospheric flow in the mantle wedge and showed strain rate ranging 10^{-13} to 10^{-14} s^{-1}. These estimates are nearly consistent with that inferred from naturally deformed peridotites in the plate-convergent regions (Katayama et al., 2005; Skemer et al., 2006). Therefore, we calculated the deformation mechanism transition in the mantle wedge assuming a strain rate of 10^{-14}. I also tested different strain rates on the mechanism boundary, but results show that the region of dislocation creep (development of LPO) is always limited to a thin layer in the mantle wedge (Ap Fig 1). This is a contrast to the Hall's model, in which they assumed that dislocation creep is dominant and LPO develops in the whole upper 400 km mantle, although the dominant deformation mechanism varies with stress and temperature as shown in our calculation. My model suggests that the mantle anisotropy is limited in the active region where stress level is as high as appropriate for the dislocation creep. Although long-wavelength surface wave analyses show a global anisotropy in the upper mantle (e.g., Montagner, 2002), the heterogeneous anisotropy is difficult to be detected by the low-frequency data and future analysis using local events is needed to test the distribution of anisotropy in the deep upper mantle.



Hall, C.E., Fischer, K.M., Parmentier, E.M., and Blackman, D.K., 2000, The influence of plate motions on three-dimentional back arc mantle flow and shear wave splitting:Journal of Geophysical Research, v. 105, p. 28009-28033.

Katayama, I., Karato, S., and Brandon, M., 2005, Evidence of high water content in the deep upper mantle inferred from deformation microstructures: Geology, v. 33, p. 613-616.

Kneller, E.A., van Keken, P.E., Karato, S., and Park, J., 2005, B-type fabric in the mantle wedge: Insights from high-resolution non-Newtonian subduction zone models: Earth and Planetary Science Letters, v. 237, p. 781-797.

Montagner, J.P., 2002, Upper mantle low anisotropy channels below the Pacific Plate: Earth and Planetary Science Letters, v. 202, p. 263-274.

Skemer, P., Katayama, I., and Karato, S., 2006, Deformation fabrics of the Cima di Gagone peridotite massif, central Alps, Switzerland: Evidence of deformation under water-rich conditions at low temperatures: Contribution to Mineralogy and Petrology, v. 152, p. 43-51.