

Laboratory simulation of deformation of a subducted slab in the mantle transition zone

Authors: Anwar Mohiuddin*, Shun-ichiro Karato and Jennifer Girard

Yale University, Department of Geology and Geophysics, New Haven, CT, USA.

*Correspondence to: anwar.mohiuddin@yale.edu

Abstract: Strength of subducted slabs in the transition zone has strong influence on the style of mantle convection. However, their rheological properties have been poorly constrained because of the difficulties in deformation experiments under these conditions. Using the rotational Drickamer apparatus, we conducted deformation experiments through the olivine to ringwoodite transformation. The results are analyzed using a theory of radial x-ray diffraction. Newly transformed nano-size ringwoodite deforms by diffusion creep and its strength evolves with time. Scaling analysis based on the model of the kinetics of and the grain-size evolution during the phase transformation suggests that a cold slab will be weak while a warm slab is strong providing an explanation of seismological observations on slab deformation in the transition zone.