



Petrofabrics of olivine in a rift axis and rift shoulder and their implications for seismic anisotropy beneath the Rio Grande rift

Munjae Park (1), Haemyeong Jung (1), and Youngwoo Kil (2)

(1) School of Earth and Environmental Sciences, Seoul National University, Seoul, Korea, Republic Of (hjung@snu.ac.kr), (2) Department of Energy and Resources Engineering, Chonnam National University, Gwangju, Korea, Republic Of

Mantle-derived xenoliths associated with continental rifting can provide important information about the mantle structure and the physicochemical properties of deformation processes in the upper mantle. Metasomatized spinel peridotites from Adam's Diggings (AD) at a rift shoulder and Elephant Butte (EB) at a rift axis in the Rio Grande rift (RGR) were investigated to understand the deformation processes and seismic anisotropy occurring in the upper mantle. As determined through analysis of the lattice preferred orientation (LPO) of olivine by using a scanning electron microscope equipped with electron backscatter diffraction (SEM/EBSD), AD peridotites exhibited C-type LPO of olivine indicating a dominant slip system of (100)[001] at the rift shoulder, whereas EB peridotites exhibited A-type LPO indicating a dominant slip system of (010)[100] at the rift axis. Both geochemical data and microstructural observations indicate that the localized mantle enrichment processes, including melts with hydrous fluids, controlled multiple mantle metasomatisms and deformation of rocks under wet conditions (with olivine C-type LPO) at the rift shoulder (AD), whereas mantle depletion by decompression partial melting caused deformation of rocks under dry conditions (with olivine A-type LPO) at the rift axis (EB). These observations provide evidence for localized hydration and physicochemical heterogeneity of the upper mantle in the Rio Grande rift (RGR) zone. Seismic anisotropy observed beneath this zone can be attributed to the transtensional rupture, such as inhomogeneous stretching, and the petrofabrics of olivine beneath the study area.