WANG Qin, 2016. Fabrics and Seismic Properties of Ophiolites: Implications for Mantle Flow. *Acta Geologica Sinica* (English Edition), 90(supp. 1): 244.

Fabrics and Seismic Properties of Ophiolites: Implications for Mantle Flow

WANG Qin

School of Earth Sciences and Engineering, Nanjing University, Nanjing 210046, China

Based on ophiolite sequences, seismic velocities of rocks and seismic profiles of ocean basins, the oceanic crust-mantle boundary can be defined as the contact between the solid, ductile deformed mantle and the oceanic crust formed from magmatic rocks (i.e., the mafic-ultramafic stratiform plutonic complex). Meanwhile, the seismic Moho constrains the chemical boundary between the ultramafic upper mantle and the mafic lower crust. Sharpness of the seismic Moho depends on the sharpness of petrologic transition from olivine-rich to olivine-poor compositions. Because chrysotile has extremely low seismic velocities, serpentinization at low temperature (<400 ˚C) by intergrowth of chrysotile and lizardite will significantly reduce seismic velocities of peridotites, resulting in the diffuse Moho reflection or a deeper seismic Moho than the petrologic Moho.

Previous deformation experiments and fabric analysis of ophiolites indicated the [100](010) slip system (A-type fabric) in olivine becomes dominant at high temperature, low strain rate and low stress in the upper mantle. Because seismic anisotropy of the upper mantle is controlled by the lattice preferred orientation of olivine, a highly anisotropic mantle is expected beneath the petrologic Moho, and the fastest P-wave velocity and the polarization direction of the fast S-wave velocity can be used to trace the mantle flow direction. However, high water content, partial melting and high stress may induce other fabric types of olivine, especially in mantle shear zones. Here I compare two contrasting oceanic detachments above the oceanic core complex at slow spreading ridges. The Atlantis Massif in the Mid-Atlantic Ridge represents the oceanic core complex with a “cold” and thin detachment restricted to brittle deformation under greenschist facies conditions. In contrast, the Atlantis Bank in southwest Indian Ridge capped by a “hot” and thick detachment with extensive ductile deformation from near-solidus condition (>800 ˚C) to subgreenschist facies. Both localities have a thick gabbroic pluton in the domal core, and the detachments were formed in gabbroic rocks. The IODP core samples show that impregnation of melt can reduce the fabric strength or modify the original fabric of olivine. Hence seismic anisotropy in the oceanic core complex will be relatively weak and complex.In addition, because serpentinization can remarkably reduce viscosity of peridotites, serpentinized peridotites could also become detachments and contribute to the development of oceanic core complexes.

* Corresponding author. E-mail: qwang@nju.edu.cn