

Nature of the Lithosphere in Alternating Regions of Slow Earthquakes in South America

*POUSALI MUKHERJEE¹, Yoshihiro Ito¹, Takuo Shibutani¹, Emmanuel Soliman M Garcia¹, Raymundo Omar Plata Martinez¹

1. Disaster Prevention Research Institute, Kyoto University

Subduction zones host some of the greatest megathrust earthquakes in the world. Slow earthquakes have been also discovered around the subduction zones of the Pacific rim very close to megathrust earthquakes in several subduction zones in Chile, Cascadia, Mexico, Alaska, and New Zealand (Obara and Kato, 2016). Investigating the lithosphere of the slow earthquake area versus non slow-earthquake areas in subduction zones is crucial in understanding the role of the internal structure to control slow earthquakes. Deep transient slow slip had been detected in the Atacama region in Chile (Klein et al., 2018). Socquet et al. (2017) suggested that aseismic slow slip is one of the potential precursors of the 2014 M_w 8.1 Iquique earthquake. In this study, we investigate the lithospheric structure beneath stations in and around the slow earthquake area in Atacama and Iquique. We also study the non slow-earthquake areas in the South America subduction zone using receiver function analysis and inversion method using teleseismic earthquakes. Here we focus on, especially the V_p/V_s ratios from both the slow and non slow earthquake areas, because the V_p/V_s ratio is sensitive to the fluid distribution in the lithosphere; the fluid distribution possibly controls the potential occurrence of slow earthquakes. Additionally, the nature of the slab can also play a crucial factor. At the boundary of the slab, the V_p/V_s results show variation in the slow earthquake area, and far off from the slow earthquake area. The V_p/V_s ratio results across depth shows significantly higher value in the deeper oceanic slab region beneath the stations in the slow earthquake areas with higher contrast at the boundary. The stations very close to the slow earthquake areas also preserves high V_p/V_s contrast at the boundary of the slab. On the other hand, the V_p/V_s contrast at the slab boundary significantly reduces for the stations in the non slow earthquake area.

Keywords: Receiver function, V_p/V_s ratio, fluids, slow earthquake, slab, South America