Shear velocity structure of the crust and lithospheric mantle beneath Taiwan from teleseismic Rayleigh-wave tomography

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The interaction of two opposite-verging subduction systems of the Eurasian Plate (EP) and Philippine Sea Plate (PSP) and consequent collision between the Luzon arc of the PSP and Eurasian continental margin resulted in a lithotectonically complex orogen in Taiwan. To reveal its structural complexity associated with the plausible orogenic process and dynamic mechanism, numerous tomographic studies of crustal structures beneath Taiwan and the surrounding region have been conducted extensively. However, the crust-mantle boundary (Moho) and lithospheric mantle structure which potentially provide clues to unravel the tectonic model responsible for the Taiwan orogeny remains less explored. In this study, we analyze vertical-component Rayleigh wave data from teleseismic earthquakes recorded by a totally ~160 broadband on-land and ocean-bottom seismometer stations distributed across Taiwan and offshore islands and at seafloor offshore eastern Taiwan during the years of 2007-2017. A wavelet-based, two-station method that properly characterizes the time-varying spectral properties of earthquake signals is employed to measure dispersive phase velocities or travel times of fundamental-mode Rayleigh waves propagating between station pairs in the periods of 13-81 s. The obtained frequency-dependent traveltimes are then used to invert for a 3-D shear-wave velocity model. The preliminary resulting model indicates that the crust is thickest beneath the mid-western flank of the Western Central Range or Backbone Range Slate Belt and shallowest beneath the Huatung basin (HB) under the oceanic PSP. More detailed and robust features of shear velocity heterogeneities will be explored through the advanced probability inversion technique.

Keywords: phase velocity, Rayleigh wave , two-station method, Taiwan orogen, subduction zone

