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Seismic discontinuities beneath the Tatun volcano group in northern Taiwan from teleseismic receiver functions

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The Tatun volcano group (TVG) is located in northern Taiwan, near the capital city Taipei and two nuclear power plants on the northern coast. The TVG was built up mainly during the last 0.8 to 0.2 Ma, and its last eruption occurred ∼6000 years ago. The TVG is composed of ∼20 volcanic composites, cones and domes. Post volcanic activities, such as hot springs and gas fumaroles, are abundant and active, and small earthquakes are frequent in this region. These observations indicate that a magma chamber may still exist beneath the TVG. However, the extent and depth of the potential magma chamber and associated crustal structures beneath TVG remain elusive. Although numerous seismic studies have been dedicated to illuminating the crustal structure beneath Taiwan, the resolution is insufficient for imaging small-scale features such as TVG, mainly due to the available spacing of seismic stations. To increase the capacity of monitoring TVG activities, the Taiwan Volcano Observatory at Tatun (TVO) has been deploying a dense broadband seismic network in the TVG region. In this study, we analyze waveform data recorded at 16 TVO seismic stations from 140 magnitude>6.0 teleseismic events during 2012-2013, generating receiver functions (RF) to detect seismic velocity discontinuity in the crust and upper mantle beneath TVG. Our preliminary results show that the crustal structure in this region is likely highly heterogeneous, and the Moho discontinuity presents significant lateral variation. The crust is thinnest in the central TVG, manifest in RF with positive pulses (indicating downward velocity increase) at 1.5-2.5 s. The crust thickens outward to the margins of TVG, as the times of positive pulses increase to 3-4 s. In addition, pronounced negative pulses (downward velocity decrease) are observed at times of ∼1-2 s, corresponding to mid- to lower-crustal depths, which appear to represent a low velocity layer that dips southeasterly across the TVG region. We further invert the RF signals for velocity models to investigate the nature and spatial distribution of the low velocity layer beneath the TVG.