# Constraints on Average Taiwan Reference Moho Discontinuity Model – Receiver Function Analysis using BATS Data

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By analyzing teleseismic waveform data, we propose a large-scale Taiwan Reference Moho Discontinuity Model (TRMDM) through coherent stacking and H-$\kappa$ analysis of receiver functions. Tectonic structural features are determined from accurate crustal thickness (H) and reliable Vp/Vs ratio ($\kappa$) (consequently Poisson's ratio, $\sigma$) estimations for Taiwan. The best estimated regional average Moho depth is $33.5 \pm 2.9$ km. Noted is a westward crustal thinning from $39 \pm 3.0$ km in eastern Taiwan to $30 \pm 1.5$ km in southeastern China. The averaged Moho depth is $23.0 \pm 2.5$ km in northern Taiwan and increases to $33.5 \pm 2.0$ km in the south. The markedly thin crust and high Vp/Vs ratio in northern Taiwan are mainly associated with back-arc opening and magmatic activities. Based on H-$\kappa$ estimations and associated seismicity patterns beneath Suang-Long (SSLB) and adjacent four stations, we propose two Moho reference models that exhibit distinctive crustal thickening in central Taiwan. The spatial variations of crustal thickness models show strong lateral change in the Moho topography. The thick crust in the south, thin crust in the north, and transition in central Taiwan mark the different tectonic units between the subduction wedge and the collision prism onshore. In view of the following list of constraints: thicker crust in the south than in the north; eastward crust thickening; significant Moho depth changes; clear 9- to 11- second sub-crustal boundaries from five stations; the compelling thickening of crust and upper mantle beneath the central mountain belt; seismicity patterns with the absence of mantle earthquake in the Wadati-Benioff zone; regional geological features; the occurrence of the inland Chi-Chi earthquake; the compelling low $\kappa$ at YULB ($1.58 \pm 0.13$) that may extend to central Taiwan at SSLB ($1.59 \pm 0.23$); relatively thick crust at YULB ($39.5 \pm 1.6$ km) and SSLB ($40.5 \pm 1.3$ km or $52.5 \pm 1.5$ km), and lastly, the apparent horizontal offset between highest Yu Shan Mountain and the deepest Moho at SSLB, we are able to suggest that the initial subduction of the Eurasian Plate occurred in southern Taiwan and most likely extended to the transition zone in central Taiwan. Although the current receiver function study is limited by large inter-station distance, our analysis provides more notable constraints than previous studies to explicitly determine the characteristic features of Moho discontinuity. This detailed approach means that rather than treating the tectonic framework as a whole heterogeneous lithospheric

feature, clear Moho boundary geometry variations indicate that active orogenic processes and differential tectonic stress loading create separate and complex crustal and sub-crustal-to-upper-mantle structural features caused by the arc-continent collision.