Slab-induced Waveform Effects as Revealed by the TAIGER Seismic Array: Evidence of Slab Beneath Central Taiwan

Po-Fei CHEN[1#+], Craig R. BINA[2], Hao KUO-CHEN[3], F. WU[3], Chien-Ying WANG[1], Bor-Shouh HUANG[4], Chau-Huei CHEN[5], Wen-Tzong LIANG[4]

[1]National Central University, Taiwan, [2]Northwestern University, United States, [3]State University of New York at Binghamton, United States, [4]Academia Sinica, Taiwan, [5]National Chung Cheng University, Taiwan

[#]Corresponding author: bob@ncu.edu.tw [+]Presenter

Here we tackle a tectonically important question – the upper mantle velocity structure beneath central Taiwan – with seismically interesting observations – receiver-side slab waveform effects. We use teleseismic P waveforms of the NS broadband array deployed by the TAIGER project to examine patterns of variation in arrival time, pulse width, and amplitude – measuring the first two by Gaussian fitting – and contrast measurements of earthquakes to the southeast (SE earthquakes) with those of one Sumatra earthquake in order to focus on upper mantle heterogeneities. Overall variation patterns as a function of earthquake are compatible with ray-tracing predictions. Relative reduced arrival times and amplitudes at central Taiwan stations suggest the existence of a deep aseismic slab below. From simulations of 2-D wave propagation, we conclude that lateral heterogeneity of crust and uppermost mantle primarily contributes to variations in arrival time and only secondarily to variations in amplitude and pulse width. Furthermore, discrepancies between source-side and receiver-side waveform effects, where the latter are not always amplitude-reduced, are explained by constructive interference between the fast and slow phase. Thus, the use of full waveform information can provide independent constraints to complement results of previous studies. A future extension will be to incorporate S waves and apply waveform inversion to yield quantitative constraints.