

Crustal Structure Beneath Taiwan Using Frequency-band Inversion of Receiver Function Waveforms

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Abstract—Receiver function analysis is used to determine local crustal structure beneath Taiwan. We have performed preliminary data processing and polarization analysis for the selection of stations and events and to increase overall data quality. Receiver function analysis is then applied to data from the Taiwan Seismic Network to obtain radial and transverse receiver functions. Due to the limited azimuthal coverage, only the radial receiver functions are analyzed in terms of horizontally layered crustal structure for each station. In order to improve convergence of the receiver function inversion, frequency-band inversion (FBI) is implemented, in which an iterative inversion procedure with sequentially higher low-pass corner frequencies is used to stabilize the waveform inversion. Frequency-band inversion is applied to receiver functions at six stations of the Taiwan Seismic Network. Initial 20-layer crustal models are inverted for using prior tomographic results for the initial models. The resulting 20-layer models are then simplified to 4 to 5 layer models and input into an alternating depth and velocity frequency-band inversion. For the six stations investigated, the resulting simplified models provide an average estimate of 38 km for the Moho thickness surrounding the Central Range of Taiwan. Also, the individual station estimates compare well with the recent tomographic model of RAU and WU (1995) and the refraction results of MA and SONG (1997).

Key words: Taiwan, crustal structure, receiver functions.

Introduction

Taiwan is located in a complex, tectonically active region at the western margin of the Philippine Sea plate. Collision of the Luzon Arc with the Asian continental margin starting around 5 Ma produced an orogeny which created the island of Taiwan (TENG, 1990). The island can be divided into four general geologic provinces that are shown in Figure 1. Detailed descriptions of the geologic terrains in Taiwan are given by HO (1979), TENG, (1990), and HSU (1990).

The physical mechanisms for the Taiwan orogeny has been long debated. SUPPE (1981, 1987) applied the “thin-skinned” tectonic model to the Taiwan orogeny based on detailed mapping of the fold and thrust belt in western Taiwan, as well as

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