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Receiver Functions for Three-layer Media

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Abstract—We have extended the H-k stacking method of receiver functions applicable to a three-layer model, which is useful in studying detailed crustal structures. We have demonstrated its application with two sample sites in Taiwan, making use of travel times of converted phases from the direct P waves of teleseismic events as the P reflects and refracts at different discontinuities in the crust. This three-layer extension allows a closer examination on the crust, as well as the relationship between crustal layers and the associated V_p/V_s ratios. Data were processed using the multiple-taper correlation technique to obtain the radial receiver functions (RRFs). The relative time delays of the converted phases measured from the RRFs were used to estimate the depths of the crustal discontinuities. Results not only yield the depths to principal crustal layers, including the Moho, but also give the corresponding ranges of V_p/V_s ratio which are comparable with findings from other tomographic studies.

Key words: Receiver function, three-layer media.

1. Introduction

Since the first paper by PHINNEY (1964), teleseismic body waves are often used to investigate the structure of crust. In recent years, the method of receiver function has been successfully applied to studies of the structure of the crust, especially to the estimation of the Moho depth. Among others, receiver functions are used to map the Moho depth in several areas around the world (ZHU and KANAMORI, 2000; LEVIN *et al.*, 2002; PARK and LEVIN, 2000; LEVIN and PARK, 1997a, b, 1998, 2000; OWENS and CROSSON, 1988, to name a few). However, these studies mostly focused on estimating only the crustal thickness. There have been comparatively few studies devoted to a layered crustal structure. In this study, we noticed the complexities generally involved in the direct P waves that give rise to clear multiple phases on the radial receiver functions (RRFs) profiles. We then have extended the stacking method which was developed by ZHU and KANAMORI (2000) to a three-layer crustal model for the delineation of a layered crustal structure as well as the Moho depth. This is essentially an interpretation of multiple P-S converted phases which

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