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High-resolution 3-D S-wave Tomography of upper crust structures in Yilan Plain from Ambient Seismic Noise

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The Yilan Plain (YP) in NE Taiwan locates on the western YP of the Okinawa Trough and displays high geothermal gradients with abundant hot springs, likely resulting from magmatism associated with the back-arc spreading as attested by the offshore volcanic island (Kueishantao). YP features NS distinctive characteristics that the South YP exhibits thin top sedimentary layer, high on-land seismicity and significant SE movements, relative those of the northern counterpart.

A dense network (∼2.5 km station interval) of 89 Texan instruments was deployed in Aug. 2014, covering most of the YP and its vicinity. The ray path coverage density of each 0.015 degree cells are greater than 150 km that could provide the robustness assessment of tomographic results. We analyze ambient noise signals to invert a high-resolution 3D S-wave model for shallow velocity structures in and around YP. The aim is to investigate the velocity anomalies corresponding to geothermal resources and the NS geological distinctions aforementioned. We apply the Welch's method to generate empirical Rayleigh wave Green's functions between two stations records of continuous vertical components. The group velocities of thus derived functions are then obtained by the multiple-filter analysis technique measured at the frequency range between 0.25 and 1 Hz. Finally, we implement a wavelet-based multi-scale parameterization technique to construct 3D model of S-wave velocity. Our first month results exhibit low velocity in the plain, corresponding existing sediments, those of whole YP show low velocity offshore YP and those of high-resolution south YP reveal stark velocity contrast across the Sanshin fault.

Key words: ambient seismic noises, Welch's method, S-wave, Yilan Plain