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Spatial Variations in Hysteresis Trend Between Seismic Noise and Hydrological Parameters During the small-to-large Typhoon Events

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Continuous seismic data recorded by seismometers near the river channel can reveal the energy induced by the river sediment transport. During the Typhoon seasons of 2011-2012, we deployed the seismic array (includes short-period and broadband sensors) along the river systems of southern Taiwan, which are relatively high variation of water discharge and high sediment supply. Firstly, we detected the landquake-induced seismic signal during Typhoon seasons and the locations of landquakes determined by a cross-correlation technique that maximizes the coherency of horizontal envelope function among seismic stations to preliminarily understand the situation of sediment supply. Then, we analyzed the relationship between the observed high-frequency (HF, 5-15 Hz) seismic noise levels and the regional meteorological and hydrological parameters (e.g. precipitation, water level, and discharge) recorded by the local weather stations and stream gauging stations. It is found that a hysteresis trend with HF seismic noise level is observed prior to the same hydrological parameters. The spatial variations in hysteresis trend that might suggest two possibilities: (1) the river seismic noise has distance-limitation for small Typhoon events, and/or (2) the spatial variation of river gradient significantly influences the seismic noise level. These observations demonstrate the feasibility of the fluvial seismology as a way to monitor bed load sediment transport over a Typhoon event, which can be regarded as an essential tool to help the hazard prevention.