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Characteristics of Broadband Seismic Noise in Taiwan and Neighboring Islands

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We used seismic waveform data from 115 broad-band stations of BATS (Institute of Earth Science, Academia Sinica) and Central Weather Bureau Seismic Network from 2012 to 2016 for noise-level mapping in Taiwan and neighboring islands. We computed Power Spectral Density (PSD) for each station and analyzed long-term variance of microseism energy and polarizations of noise for severe weather events. The island of Taiwan is surrounded by ocean and the Central Range which has the highest peak Jade Mountain at 3,952 meters height occupies more than 66% of the island and departs it into the east and west coasts. The geographic settings then result in the high population density in the western plain and northern Taiwan. The dominant noise source in the microseism band (periods from 4-20 seconds) is the coupling between the near-coast ocean and sea floor which produces the high noise of averaging -130 dB along the west coastal area. In the eastern volcanic-arc coastal areas, the noise level is about 7% smaller than the west coast due to its deeper offshore water depth. As for the shorter periods (0.1-0.25 seconds) band, the so-called culture noise, an anthropic activity variance with the highest -103 dB can be identified in the metropolitan areas, such as the Taipei city and the noise level in the Central Range area is averaging -138 dB. Moreover, the noise also shows a daily and temporal evolution mainly related to the traffic effect. Furthermore, we determined the noise level for the entire island of Taiwan during 26-28 September, 2016, when the typhoon Megi hit the island and retrieved the enhancement of secondary microseism energy for each stations. Typhoon Megi landed in eastern and central Taiwan and reached the maximum wind speed of 45m/s in the surrounded eyewall. The Central Range, as a barrier, decreased the wind speed in southern Taiwan making an enhancement less than 10 dB, while in northern Taiwan where the direction the typhoon headed to, can reach more than 35 dB.