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Spatial variations of coda wave attenuation in Andaman-Nicobar subduction zone

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We investigate the spatial variations of coda attenuation (Q_c) structure in the tectonically complex Andaman–Nicobar subduction zone (ANSZ), which is one of the most seismically active subduction zones on the Earth. The region constitutes the northernmost part of the Sunda subduction zone, where the Indian plate disappears beneath the Burmese plate along the Burma and Andaman arcs to the east. This is probably the first attempt to map the Q_c variations across the whole ANSZ. In a seismically active area, the spatial distribution of Q_c is important to evaluate the seismic hazard in relation to tectonics and seismicity.

A total of 289 high-quality events recorded at a network of broad-band stations operational since 2009 are considered for the analysis. The variations in attenuation characteristics at different frequencies reveal a marked contrast from the northern to the southern Andaman region, consistent with the geotectonic diversity of the region. At low frequencies, low Q_c values are observed in the northern part of ANSZ in the vicinity of the Narcondum volcanic island, which does not appear in the high-frequency image. The low values are in agreement with the 3-D tomogram, which suggests a distinct low-velocity structure below this volcanic island. The Andaman trench also exhibits a relatively low Q_c , which is well correlated with the low- V_p zone. The spatial distributions of Q_0 (Q_c at 1 Hz) structure of the region are further projected onto three east–west profiles to capture the detailed attenuation characteristics from north to south. Results show that the northernmost part of ANSZ is more attenuative than the southern part, which may be indicative of the changes in physical properties of the crust. The frequency relation parameter (n) shows an inverse correlation with the observed Q_0 values. Furthermore, we have observed a good correlation between the Q_0 variation and the seismicity pattern of the area that enables us to enhance our understanding about the role of crustal heterogeneity in the earthquake occurrence in this area.