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Seismic attenuation of the Eastern Himalayan and Indo-Burman plate boundary systems, Northeast India

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We use local waveform data from 707 source–receiver pairs (single trace) to estimate the coda quality factor (Q_c) for charactarizing the seismic attenuation in Eastern Himalayan and Indo-Burman plate boundary systems. Coda waves are modeled as a composite of single-backscattered S-wave energy sampling an elliptical area. We measure the temporal decay of coda amplitude to estimate Q_c at frequencies between 1 and 14 Hz. From these measurement we abstract Q_c at 1 Hz (Q_0) and its frequency dependence (η). Single-trace measurement results reveal simlar Q_0 across the region with strong lateral variation in η, distinguishing the Indo-Burman subduction zone ($\eta \sim$1.06) from the intra-plate region of the Brahmaputra Valley and Shillong Plateau ($\eta \sim$0.76). The single trace Q_c measurements at each frequency are combined in a back-projection algorithm to compute 2-D Q_c tomographic maps. These coda-Q maps are plotted as purturbations from the average Q value for a given frequency and reveal strong correlation with the tectonic setting across the region. At low frequencies (1–5 Hz) we observe relatively lower Q in the Eastern Himalaya, southern Tibetan Plateau and the Bengal Basin, while the intra-plate regions of the Shillong Plateau and Brahmaputra Valley, and the Indo-Burman subduction zone has higher Q. At higher frequencies ($>$5 Hz) we observe pronounced low Q beneath Sikkim Himalaya, relatively lower Q in the intra-plate region surrounding the Kopilli Fault Zone and relatively higher Q in the Bengal Basin and Indo-Burman subduction zone. Interpretation of our results is done by comparing the Q maps with S-wave velocity tomography to show that at shallow depth the low Q and intermediate vs in the Himalaya is due to structural heterogeneity and deformation in the Himalayan wedge. However, the low Q and low vs in the southern Tibetan Plateau is controlled by anelastic effects due to elevated temperatures (and partial melts) within the crust. High Q and intermediate-to-high vs in the intra-plate region is due to the stable Shield lithosphere. The low Q and low vs in the Bengal Basin is due to the thick pile of sediments overlying a rift-faulted transitional crust. At greater depth the Bengal Basin and Indo-Burman subduction zone has high Q and high vs due to sampling of the colder elastic subducted lithosphere.