Seismic attenuation tomography using body-wave energy normalised by the heterogeneous coda

Panayiota Sketsiou¹, Luca De Siena¹,², Simona Gabrielli¹, and Ferdinando Napolitano³
¹University of Aberdeen, Geology and Petroleum Geology, Aberdeen, United Kingdom of Great Britain and Northern Ireland (panayiota.sketsiou@abdn.ac.uk)
²Institute of Geosciences, Johannes Gutenberg University, Mainz, Germany
³Dipartimento di Fisica "E.R.Caianiello", Università degli Studi di Salerno, Fisciano (SA), Italy

Seismic waves lose energy during propagation in heterogeneous Earth media. Their decrease of amplitude, defined as seismic attenuation, is central in the description of seismic wave propagation. The attenuation of coherent waves can be described by the total quality factor, \( Q \), and it is defined as the fractional energy lost per cycle, controlling the decay of the energy density spectrum with lapse time. The coda normalization (CN) method is a method to measure the attenuation of P- or S-waves by taking the ratio of the direct wave energy and late coda wave energy in order to remove the source and site effects from P- and S-wave spectra. One of the main assumptions of the CN method is that coda attenuation, i.e. the decay of coda energy with lapse time measured by the coda quality factor \( Q_c \), is constant. However, several studies showed that \( Q_c \) is not uniform in the crust for the lapse times considered in most attenuation studies. In this work, we propose a method to overcome this assumption, measuring coda attenuation for each source-station path and evaluating the effect of different scattering regimes on the corresponding imaging. The data consists of passive waveforms from the fault network in the Pollino Area (Southern Italy) and Mount St. Helens volcano (USA).