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Coda waves attenuation for Racha region of Georgia

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Among the seismic areas of Georgia, Racha region is notable for its high level of seismicity. This region is situated in the western Greater Caucasus and is characterized by southward-directed thrusting of folded Paleozoic, Mesozoic, and paleogene volcanic and sedimentary rocks. During the instrumental period, the strongest earthquake in the Caucasus (M 7.0) occurred in Racha in 1991. The historical earthquake of 1350 (M 7.0) is also known. The Georgian catalog of seismicity for 1955 - 1990 shows some sparse activity within Racha range; but after 1991 earthquake the seismic rate increased in this territory, and seismic activity continues into present. Here, from 1991 to the present, small earthquakes occur almost every day.
The main goal of the study was to calculate the quality factor (QC) using the single-scattering model in the frequency range of 1-32 Hz, comparing received results and connecting them to the tectonics and seismicity of the study region. Seventy local earthquakes in 2007-2012 were analyzed and Qc values were estimated by applying three different methods in time and frequency domains. Earthquakes magnitudes varied from 1.2 to 3.7; epicentral distances and depth were smaller than 45 km and 15 km, respectively; coda window ranged from 10 sec to 60 sec. These earthquakes were recorded by five digital seismic stations equipped with broadband Guralp CMG40T and Trillium 40 seismometers.
The QC values were fitted to a power-law, QC (f)= Q0 (f)n , where Q0 is the quality factor at 1Hz and n is the frequency parameter, which depends on the heterogeneity of the medium. In our study QC increases both with respect to lapse time and frequency for all methods. The frequency dependent QC relations obtained for different coda windows are the following estimates:
Qc = (8.2±0.3)f(1.27±0.045) - (10sec); Qc = (20.4±1.6)f(1.24±0.54) - (20sec);
Qc =(32.5±3.6)f(1.16±0.040) - (30sec); Qc = (39.6±4.5)f(1.13±0.053) - (40sec);
Qc =(65.9±4.0)f(0.99±0.062) - (50sec); Qc = (82.4±9.9)f(0.95±0.077) - (60sec).
These empirical relations represent the average attenuation properties of the region obtained by all seismic station data. We also evaluated those volumes of the earth where studied coda waves formed. Observed Qc, Q0 and n values indicate that the studied region is seismic and tectonically active with high heterogeneities.