Geophysical Research Abstracts
Vol. 18, EGU2016-16074-1, 2016
EGU General Assembly 2016

Attenuation Characteristics of the Armutlu Peninsula (NW Turkey) Using Coda Q

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Attenuation characteristic of seismic waves was determined using coda Q in the frame of MARsite (MARsite has received funding from the European Union's Seventh Programme for research, technological development and demonstration under grant agreement No 308417). Data from 82 earthquakes recorded in 2013-2014 in the Armutlu Peninsula and its vicinity by 9 ARNET seismic stations were used for processing. The earthquake magnitudes (Ml) and depths vary from 1.5 to 3.7 and 1.2-16.9 km, respectively. Epicentral distances closer than 90 km were selected to ensure better signal-to-noise ratios. Lapse times between 20 seconds and 40 seconds at intervals of 5 seconds were used for the calculation of the coda wave quality factor. The coda windows were filtered at central frequencies of 1.5, 3, 6, 9 and 12 Hz bandpass filter. To obtain reliable results, only data with signal-to-noise ratios greater than 5 and correlation coefficents higher than 0.7 were used. The SEISAN software and one of its subroutines (CODAQ) were used for data processing and analyses.

In the whole study area, Q_c=(51±4)f^(0.91 ± 0.04) for 20 seconds, Q_c=(77±7)f^(0.80 ± 0.04) for 30 seconds and Q_c=(112±13)f^(0.72 ± 0.06) for 40 seconds lapse times are obtained for coda wave quality factor. The observed quality factor is dependent on frequency and lapse time. The results indicate that the upper lithosphere is more heterogeneous and seismically more active than the lower lithosphere as expected in the region which is tectonically complex refering to the effects of the North Anatolian Fault Zone.

By considering earthquake clusters and recorded stations, the scattering area was drawn. The intersection of the scattered areas for 20 seconds lapse time is covering all stations. Quality factor in 1 Hz and frequency dependent values were calculated separately and for the intersection of all scattered areas. Calculated Q_o and n values of the intersection area are 50 and 0.89, respectively. Hence, the Q_o and n values which are calculated using all stations and both values of the intersection area are very close to each other. Additionally, in the detailed review of TRML station which located in Yalova Province Termal District; Q_c=(46±3)f^(0.97 ± 0.04) for 20 seconds, Q_c=(61±6)f^(1.03 ± 0.06), for 30 seconds and Q_c=(74±6)f^(1.06 ± 0.05) for 40 seconds lapse times are obtained for coda wave quality factor. With these results, both the lower Q_o values increasing with lapse times demonstrate high tectonic activity. Furthermore, the increasing n value with lapse times is conformable with the geothermal sources, next to the TRML station.