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Temporal variations of S wave attenuation field structure in the region of Zaili Alatay ridge: possible correlation with solar activity and large earthquakes

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We consider investigation results of spatio-temporal variations of S wave attenuation field in the lithosphere of the North Tien Shan.

It was shown that essential temporal variations of the attenuation field are observed in the middle and lower crust. We studied variations of Qs value for the period of 1985-2017 using data of stations TLG and MDO, situated near Almaty city. We have been analyzing recordings of explosions, conducted at the Kotur-Bulak quarry. It is essential, that lines cross large Zaili deep fault zone for the both stations.

We studied variations of Qs values in the middle and lower crust using coda wave envelopes at frequency of ~1 Hz. Note, that the lowest Qs values (~60-100) are observed in 1990-1995 for the both stations. It is important that the largest earthquakes in the North Tien Shan region for the last 40 years occurred in this time interval: Baisorun one (1990, Mw=6.4) and Suusamyr one (1992, Mw=7.3). It's possible to suggest that especially sensitive areas exist within zones of large regional faults. These areas can react on changes of the stress conditions within the crust sections, connected with large earthquake preparation, even located at considerable distances from such areas. (In the case of the Suusamyr earthquake such distances were about 250 km). The data on the attenuation field variations suggest that supersensitivity of such areas can be explained by active migration of deep-seated fluids in the middle and lower crust, which makes easier due to existence of large deep fault zones.

We found that a tendency of Qs growth in the years of the low solar activity exists in comparison with the years of high solar activity. This can testify to influence of solar activity variations on fluid migration in the earth's crust of the region under investigation.

A comparison of the attenuation data with the location of the seismic activity zones shows that, as a whole, high attenuation corresponds to Zaili and Kemin zones. We found the most dangerous strips of these zones, where the lowest values of effective Qs values are observed. First of all, such areas are located to the south-west and south-east of station MDO.