

NEW DATA ON GEODYNAMICAL PROCESSES IN THE ANOMALOUS ZONE OF THE NORTH TIEN SHAN: POSSIBLE PREPARATION OF A STRONG EARTHQUAKE

¹Yu.F. Kopnichev, ²N.N. Mikhailova, ²N. Sokolova, ²I.L. Aristova

¹*Institute of Earth Physics, RAS*

²*Institute of Geophysical Research NNC RK, Kurchatov, Kazakhstan*

Earlier the anomalous zone has been picked out in the North Tian Shan region, to the south-east of Bishkek city, based on an analysis of seismic data – shear wave attenuation field and variations of seismicity parameters. This zone was characterized by very high S wave attenuation during 1998-2000, which testifies to a presence of a notable fluid portion. The analysis of various seismicity parameters shows, that during a few hundred years no strong earthquakes with $M \sim > 6.5$ have occurred in the region of anomalous attenuation. Data on weak and moderate events show that during last period (until 2003) seismicity characteristics changed sharply here. The present work is devoted to studying a dynamics of these anomalies, based on the analysis of spatio-temporal variations of the attenuation field, and also seismicity during 2004-2006 periods.

We have been considering recordings of deep-focus hindukush earthquakes and local events, obtained by Kyrgyz seismic array KNET (the anomalous zone is located in the north-eastern part of the array). The analysis of recordings of hindukush earthquakes with focal depths of $h=190-230$ km shows, that S wave attenuation strongly increased in the eastern part of the array, between stations KZA and TKM2. According to data from events with $h=70-110$ km, attenuation increased considerably in the westernmost part of the array, between stations AML and USP. Using the analysis of S coda we have established, that during 2000-2005 attenuation increased sharply to the south of station TKM2 within the depth range of $\sim 35-85$ km, and to the north of station KZA – at depths of $\sim 25-55$ km. At the same time, to the east of station KBK attenuation strongly increased in the depth range of $\sim 20-35$ km and simultaneously decreased in the range of $\sim 35-75$ km. The data obtained testify to an active juvenile fluids ascent into the uppermost mantle and lower and middle crust in the anomalous zone.

Analysis of seismicity shows, that since 1999 in the region of the North Tian Shan number of recorded earthquakes is growing permanently, simultaneously a portion of relatively deep ($h > 15$ km) events is increasing. The portion of deep earthquakes within the anomalous zone increased especially strongly. Note, epicenters of such events are forming a circle structure, within which a level of deep seismicity is very low (approximately between 42.0 and 42.6 N).

It's essential, that this structure is outlined also by epicenters of earthquakes with mechanisms of normal faulting type, though as a whole, reverse faulting and oblique reverse faulting events predominate in the North Tian Shan region.

The above analysis allows us to conclude, that active geodynamical processes, connected with mantle fluids ascending, occur in the anomalous zone. The manifestations of these processes are similar to that found prior to the Zhalanash-Tyup and Baisorun earthquakes, which may testify to a preparation for the strong seismic event ($M \sim > 6.5$) in the anomalous zone.