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Seismoacoustic Emission and Lunar-Solar Tidal Deformation Processes in the Geo-Environment Volume

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The deformation processes in the Earth's crust are various, but the lunar–solar tidal deformation process, which is the most notable and controlled (relative deformations are 10–6 to 10–8), attracts great attention.
The investigation of the correlation between the tidal deformation processes and Seismoacoustic response of the geo-environment is a timely problem due to many reasons. Firstly, it is related to the discovery of the modulation effect of the high-frequency noise by the long-period deformation processes including tidal processes [L. N. Rykunov, O. B. Khavroshkin, and V. V. Tsyplakov, 1980]. The possibility appeared to distinguish similar periods in the variations of the amplitude level of the seismic acoustic emission (SAE) based on the known periodicities of the deformation processes. Secondly, the level of the Seismoacoustic response of the geo-environment to the influence of the tidal deformation processes allows us to estimate the physic-mechanical properties of the rocks composing the massif and their variation in time. Thirdly, the dependence of some geodynamic processes on the lunar–solar tides can be used to estimate the dynamic activity of different geo-structures.
The investigation of the deformation processes is a complicated problem because the majority of currently applied methods give us information about deformations in the surface layer. In the conditions of the hierarchical block structure of the Earth's crust; such observations do not sufficiently reveal the distribution of deformations related to the accumulation and relaxation of stresses in the internal points of the medium. Therefore, the spatiotemporal distribution of the SAE in the boreholes carries significant information about the deformation processes in the Earth's crust directly reflecting the actual stresses and the structure of the investigated rock massif [B. P. Dyakonov, A. K. Troyanov, A. N. Nazarov, 1989].
The borehole version of the observations as the most noise resistant was used in the investigations of the SAE presented here. A set of equipment with a frequency band of 20–5000 Hz was used in the measurements. It included the borehole instrument with accelerometer sensors for measuring three components of elastic oscillations (along the borehole and in the plane normal to its axis) [Yu. G. Astrakhantsev, A. K. Troyanov, 1998]. The transition to the measurements in the boreholes was caused by the necessity to get rid of the noise of different natures appearing at the Earth's surface.
The influence of the lunar–solar tidal deformation processes causes the appearance of diurnal and semidiurnal periods in the time variations of the SAE at large depths. The modulation phenomenon of the acoustic noises by the tidal deformation processes [L. N. Rykunov, O. B. Khavroshkin, V. V. Tsyplakov, 1980] is not manifested equally in different places but depends on the geological and tectonic processes of the geo-environment.
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