

Seismic monitoring of explosions in the Central site of the Kumtor deposit, Tien Shan

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Abstract Seismic monitoring of explosions was carried out at the local area of the Central site of the Kumtor deposit for January 2017 - January 2018. Velocities of seismic longitudinal and transverse waves, their ratios (V_p , V_s , V_p/V_s), maximum amplitudes and their ratios (A_p , A_s , A_s/A_p) were studied, and average values with standard deviation values were determined, and hierarchies of cycles are distinguished in their variations in time. It is noted that the ratios of V_p , V_s , V_p/V_s reflect the state of the crust medium, small values of V_p , V_s , V_p/V_s express possible manifestation of fluids, and large value of the ratio V_p/V_s – possible manifestation of partial melting, large values of V_p , V_s – possible manifestation of relatively high pressures. Physical parameters of the medium are estimated: seismic parameter Φ , Poisson's ratio, shear modulus, and bulk modulus. It is established that these physical parameters are dynamic parameters that depend on the frequency of geodynamic processes, namely, in cycles, for example, of the third order with a relatively high frequency, relatively small values of modules (physical parameters of the medium) are observed, and in cycles of the second and first orders with a relatively low frequency, relatively large values of modules are observed. Changes in the values of A_p , A_s , A_s/A_p , and the degree of seismic waves' absorption are predetermined by physical parameters and the state of the medium. Change in the penetration depth of seismic waves from an explosion is noted in the range of about 8-35 km.

Keywords Explosion, longitudinal and transverse waves, velocity of seismic waves, cycle variations of seismic waves parameters, hierarchy of cycles, seismic parameter, Poisson's ratio, shear modulus (modulus of rigidity), bulk modulus, seismic waves' absorption.

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