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Research the dynamical characteristics of slow deformation waves as a rock massif response to explosions during its outworking

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Abstract The use of additional parameter-velocity of slow deformation wave propagation allowed us with use method of phase diagrams identify their hierarchic structure, which allow us to use that information for modeling and interpretation the propagation seismic and deformation waves in hierarchic structures. It is researched with use of that suggested processing method the thin structure of the chaotic area for two responses of the massif on a high energetic explosion in the northern and southern parts of it. The results are significant for understanding the high energetic rock shock and evaluation a criterion for massif stability estimation.

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Keywords: massif response, slow deformation waves, seismic mine catalogue, analyze of observed data, phase diagrams, massif stability

1. Introduction

As a result of generalization of the long time natural geomechanical and geophysical measurements data on the mines of polymetallic rocks it was established a nonlinear rocks reaction on heavy dynamical influence and also

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distribution waves of pendulum type, which are created by geoblocks of different hierarchic rank [1]. Their velocities differ from the velocities of seismic waves by their lower values [2, 3]. The research of the rock shock massif state of the Tashtagol mine with the approaches of the theory of dynamical systems [2, 3] had been provided to reveal the criterions of changes the dissipative regimes for real rock massive, which are heavy technogenic influenced .For realization of that research it had been used the data of seismic catalogue of the Tashtagol mine during two years: from June 2006 up to June 2008. It had been used the space-time coordinates of all dynamical responses of the massif, which occur during that period inside the mining field, and also of explosions, which had been arranged for massif mining and of values of the fixed by the seismic station energy. [8]. The phase portraits of the massif state from the northern and southern areas are constructed in the coordinates $E(Ev)(t)$ and $d(E(Ev)(t))/dt$, t-time expressed in the parts of 24 hours, Ev-released by the massif seismic energy in joules. Here we had analyzed the morphology of phase trajectories of the seismic response on explosion action during different subsequent time intervals of the southern mines area. In the papers, for instance, [8, 9] for the first time it had been analyzed the seismological detailed mines information from the point of view of synergetic and theory of open dynamical systems. Using the quality analysis of phase trajectories [5] it had been shown the repeating regularities that represent the transitions of the massif state from the chaotic state to the ordered state and reverse. It had been formulated a new physical statement of the problem for modeling the state of the rock massive, which are under heavy action. If in other statements of the general theory of open dynamical systems [10, 11] the problem of the system transition from the ordered state to the chaotic state had been researched in our case for our system the chaotic state of the given level (parameter) is from one side a stable state for our system. From the other side that parameter is a control parameter for the system transition to the state with another parameter that is for the system catastrophic. After realization of that catastrophe the system creates again the chaotic area with the parameter value near to the initial. In the paper [12] the further research of the detailed seismic catalogue was devoted to space-time oscillatory peculiarities of synergetic features of the rock shock massif by its outworking using explosion methods.