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Geosynergetic Approach for Analyze of Rock State, Theoretical and Experimental Redlts

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It is known that the most geological systems are open and non equilibrium, which can long exist only in the regime of energy through circulation. The closing of the energy flow leads to the system transfer to a conservation stage, when the duration of its existence depends on its energy potential due to accumulated energy on the previous stage [1-2]. On a certain stage of open dynamical system evolution, exchanging by matter and energy with the surrounding medium, decays on a set of subsystems, which in their turn can decay on smaller systems. The criterion of defining boundaries of these systems is one of synergetic law: macroscopic processes in the systems, which exist in a non linear area with a self organization processes, are performed cooperative, coordinated and coherent. The base of the processes of self organization in the open non equilibrium geological systems is the energetic origin. If the energy potential does not achieve its threshold value, the processes of self organization do not begin, if it is sufficient for compensate losses to the outer medium, in the system will begin the processes of self organization and form space-time or time structures. The transition from chaos to a structure is performed by a jump. If the income of the energy is too much, the structurization of the medium finishes and the transition to the chaos begins.
The analyses of the phase portrait of dynamical system allow us to make a conclusion about the system state during the period of observation. So, in conservative systems attracting sets do not exist. The set of phase space [U+F052]N is named attracting; to which trajectories tend with time, which begin in some its neighborhood. If in conservative system a periodical movement exists, thus such movements are infinitely many and they are defined by the initial value of energy. In dissipative systems the attracting sets can exist. Stationary oscillations for dissipative dynamical systems are not typical one. But in nonlinear systems a periodic asymptotic stable movement can exist, for which we have a mathematical image as a limited cycle, which is represented in the phase space as a closed line, to which all trajectories from some neighborhood of that line tend in time. We can conclude about the characteristic behavior of the system analyzing the form of phase portrait, by the way the "smooth" deformations of the phase space do not lead to quality changes of the system dynamics. That property is named as topologic equivalence of phase portraits. It allows analyzing the behavior of different dynamical systems from the unique point of view: on that base the set of dynamical systems can be divided on classes, inside of which the systems show an identical behavior. Mathematically "smooth deformation" of phase portrait is one-to-one and bicontinuous transformation of phase coordinates, for which new singular points can not occur, from the other hand – singular points can not vanish.
We had analyzed the seismological detailed information of space-time oscillations of state features of rock massive from the point of the theory of open dynamical systems [3-4]. We had revealed some synergetic features of the massive response on heavy man-made influences, which are before a very intensive rock shock in the mine. We defined a typical morphology of phase trajectories of the massive response, which is in a local time in a stable state: on the phase plane we see a local area as a ball of twisted trajectories and small overshots from that ball with energies not more, than 10E+05 joules. In some periods of time these overshots can be larger, than 10E+06 joules up to 10E+09 joules . Because the researched massive volume is one and the same and we research the process of it's activation and dissipation, we obviously see two mutual depending processes: the energy accumulation in phase trajectories attracting area and resonant releasing of the accumulated energy. It is interesting to notice, that after the releasing the system returns to the same phase trajectory attracting area. That is confirmed by detailed analyze of phase trajectories of seismic massive response before and after high energetic rock burst.
In the book [5] is developed a new mathematical method for modeling of processes in local active continuum, which are energetically influenced from an outer energy source. The common cause of chaotization and stochastization of dynamical system movements are its losses of stability and exponential recession of near located phase trajectories together with its common boundedness and its common compression. The mathematical result

coincides as a whole with the practical result: in the phase area the smaller attracting phase trajectories area exists where can occur an exponential recession of them, then the movement character changes and the further movement of phase points lead to return to the same attracting area. These movements can occur in resonance or spontaneous mood. The work was supported by the grant RFBR 10-05-00013.

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