CONTROL OF TRIGGER EFFECTS BY MONITORING THE INTERNAL STRESSES OF MOUNTAIN MASSIFS IN THE PART OF ELASTIC LAYERED BLOCK MODELS WITH INCLUSIONS OF THE HIERARCHICAL STRUCTURE OF THE L-TH RANK

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This paper presents an overview of works in which new models of continuum mechanics are intensively developing, generalizing classical theories of elasticity. These models are used to describe composite and statistically heterogeneous media, new structural materials, as well as for complexly constructed massifs in mine and ground conditions, as well as in the study of phenomena occurring in permafrost under the action of thawing processes. A characteristic difference of the theory of media with a hierarchical structure is the presence of explicit or implicit scale parameters, i.e. explicit or implicit nonlocality of the theory. The paper focuses on the study of the effects of nonlocality and internal degrees of freedom reflected in internal stresses that are not described by the classical theory of elasticity and which can be potential harbingers of the development of a catastrophic process in a mountain range.

In recent years, new physical and mathematical models of material media have been intensively developed, which can be considered as far-reaching generalizations of classical theories of elasticity. The science of plasticity and strength of solids is undergoing a paradigm shift. For a long time, the description of plastic deformation and destruction of solids has been developed within the framework of linear approximations of continuum mechanics (macroscale level) and physics of deformation defects in a loaded solid (microscale level). However, in recent decades it has become obvious that a deformable solid is a multilevel hierarchically organized system that should be described within nonlinear mechanics and nonequilibrium thermodynamics. The fundamental problems arising when applying the second law of thermodynamics to the analysis of systems at the macroscopic and microscopic levels are considered. It is shown that the disequilibrium of the state of the system can cause the emergence of order in it and that irreversible processes can lead to the emergence of a new type of dynamic states of matter, called "dissipative structures".

Keywords: hierarchical environment, acoustic field, electromagnetic field, iterative modeling algorithm, nonlocal elasticity theory, monitoring of anomalous stress zones, determination of their position and development of catastrophic risk.