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New monitoring geophysical systems by oil deposits extraction.

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The processes of oil deposit development are linked with the movement of multi-phase multi-component media, which are characterized by non-equilibrium and non-linear rheological features. The real behavior of layered systems is defined by the complexity of the rheology of moving fluids and the morphology structure of the porous medium, and also by the great variety of interactions between the fluid and the porous medium [Hasanov and Bulgakova, 2003]. It is necessary to take into account these features in order to informatively describe the filtration processes due to the non-linearity, non-equilibrium and heterogeneity that are features of real systems. In this way, new synergetic events can be revealed (namely, a loss of stability when oscillations occur, and the formation of ordered structures). This allows us to suggest new methods for the control and management of complicated natural systems that are constructed on account of these phenomena. Thus the layered system, from which it is necessary to extract the oil, is a complicated dynamical hierarchical system.

To construct the mathematical model of a real object, as a priori information it is necessary to use data from active and passive monitoring, which we can obtain during exploitation of the object. The solution of inverse problems has great significance for the oil industry, because the oil layer refers to a number of natural systems that cannot be observed as a whole by direct measurements. The results of last year's research showed that in the evolution of dynamic systems, non-stabilities and their origin play a role in the theory of self organization or synergetic studies. Information about their manifestation in the oil reservoir from its extraction can only be obtained using monitoring data, which is sensitive to its hierarchical structure. It should be noted that, to study the thin structure of the discrete hierarchical media, geophysical fields are more sensitive, depending on spatial, time or frequency parameters – namely, electromagnetic and seismic fields. In addition, these fields, excited by local sources due to the geometry of the normal field, have a focusing or localization property that allows the given resolution to be distinguished. For the new methods of wave monitoring is constructed a new theory of distribution wave fields in a medium of hierarchical structure with different physical features.