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Application of GIS in interpretation of the results of multistage hydraulic fracturing monitoring by surface microseismic method

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Abstract

Currently, the problem of interpretation of microseismic monitoring data is a critical task. Along with the improvement of field survey technologies and data processing, as well as with the development of realtime hydraulic fracturing monitoring by microseismic methods there are several problems to solve, such as objectivity of geological data, the data reference with the local and regional stress-strain state of the rock massif. The aim of this work is the post-processing of surface microseismic monitoring results with the use of geographic information systems. An analytical basis of data processing is spatial statistics set of tools of ArcGIS ESRI software, which is traditionally used to identify the patterns in the spatial distribution of any point events containing georeference component. The paper shows an approach to process an interpretation in complex situations, such as fracking pump failure, when the cloud of microseismic events shows a random distribution. Main attention in the work was paid for geological interpretation of the results obtained and their relation with the results of regional stress-strain state investigation. Significant convergence is detected for the orientation of natural fractures defined by surface seismic surveys, microseismic monitoring of hydraulic fracture propagation and regional lineament analysis basing on satellite images.

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