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Enhancing of seismic signal using anisotropic diffusion algorithm

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Nowadays the search for hydrocarbons requires the use of precise techniques of imaging geological structures. The application of the digital image processing for enhancing 3D seismic surveys in areas where geological structures are very complicated is very useful. The presented research shows results of using anisotropic diffusion algorithm for post-stack processing of seismic 3D data collected in Carpathian overlap region and miocene reservoir rocks of southern Poland.

Anisotropic diffusion is an iterative image processing algorithm that removes noise by modifying the data by solving partial differential equations. Moreover, it can reduce image noise without blurring the edges between regions of different chrominance or brightness. This filter preserves edges, lines or other features relevant to the seismic structural and stratigraphic interpretation of reservoir rocks. The algorithm also enables noise reduction without removing significant information from seismic section even for high dips values. For better estimation of anisotropic diffusion structure tensor the parameterization is done using depth field and the calculations in two-way travel time field.

Anisotropic diffusion can be used for advanced seismic signal processing. It allows for an improvement of seismic data quality and for more accurate interpretation by the recovery of a significant amount of structural information in the form of a correlating seismic reflections. It is also the tool which allows searching for more subtle geological structures.