

STATISTICAL PROCESSING OF INTERPRETATING CROSS-SECTIONS OF DEEP SEISMIC SOUNDING IN THE ARC/INFO PACK

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On solution of various geological problems one often has to process large data files to reveal geochemical or geophysical anomalies and for their following interpretation. We demonstrate means of DSS data processing with tools of GIS ARC/INFO.

The increasing DSS methods' detail enables us to get statistic methods for processing interpreting seismic profiles to receive cross-sections, demonstrating the distribution of concentration of the points of seismic waves' transformations (C_{PSWT}). In the processing of cross-sections obtained during multi-wave DSS data interpretation, refractors, reflectors and bins of conversion were regarded as the points of seismic waves' transformations (PSWT).

To calculate the distribution of C_{PSWT} , we used an applying in GIS data model - GRID. GRID is a set of data situated at a uniform grid, i.e. information is kept in a two-dimensional array. In our case, it reflects the presence or absence of PSWT at a cross-section in each GRID cell with a size of 1 km by 1 km. The cells had values of 1 or 0, corresponding to the presence or absence of PSWT. We choose this model due to its simplicity and compactness, as well as due to numerous algorithms for processing of data situated at a uniform grid. In our case, we used so-called focal function. Focal functions simultaneously realize calculations in a single cell and in a window composed of a great number of cells. In ARC/INFO a window can be shaped as a rectangle, circle, ring, or wedge. In the demonstrated example we calculated a number of PSWT in a circle-shaped sliding window.

To choose a radius of the window, we constructed histograms of distribution of windows' quantity with different PSWTs' numbers for various radiuses - 10, 15, 20, 25, 30 km (Fig.1). The selection criterion of a window's size was the clearest division of C_{PSWT} classes under a sliding step as big as a half of the window's diameter. As result, we get a back-end GRID, which was used as the base for building of C_{PSWT} isolines – a number of refracted and reflected bins per unit of cross-section's area and for detection of polygons with low C_{PSWT} values – zones of seismic zonality.

We hope that the simplicity of the applied method and possibilities for following analysis and use in ARC/INFO- ARC/View environment makes it to be widely adopted.

References

I. Sergei V. Cherkasov, Revelation of Unknown Exciting Geological Features from Non-conventional Usage of Geostatistical Methods; Proceedings of IAMG'05 and Spatial Analysis, Vol.1, 209-214