Stress field modeling of the Carpathian Basin based on compiled tectonic maps

Gáspár Albert (1), Zsuzsanna Ungvári (2), and Krisztián Szentpéteri (3)

(1) Dpt. of Cartography and Geoinformatics - Eötvös Loránd University, Budapest, Hungary (albert@ludens.elte.hu), (2) Doctorate School of Earth Sciences - Eötvös Loránd University, Budapest, Hungary, (3) JResources Mining Limited, Indonesia, Jakarta

The estimation of the stress field in the Carpathian Basin is tackled by several authors. Their modeling methods usually based on measurements (borehole-, focal mechanism- and geodesic data) and the result is a possible structural pattern of the region. Our method works indirectly: the analysis is aimed to project a possible 2D stress field over the already mapped/known/compiled lineament pattern. This includes a component-wise interpolation of the tensor-field, which is based on the generated irregular point cloud in the puffer zone of the mapped lineaments. The interpolated values appear on contour and tensor maps, and show the relative stress field of the area.

In 2006 Horváth et al. compiled the 'Atlas of the present-day geodynamics of the Pannonian basin'. To test our method we processed the lineaments of the 1:1 500 000 scale 'Map of neotectonic (active) structures' published in this atlas. The geodynamic parameters (i.e. normal, reverse, right- and left lateral strike-slip faults, etc.) of the lines on this map were mostly explained in the legend. We classified the linear elements according to these parameters and created a geo-referenced mapping database. This database contains the polyline sections of the map lineaments as vectors (i.e. line sections), and the directions of the stress field as attributes of these vectors. The directions of the dip-parallel-, strike-parallel- and vertical stress-vectors are calculated from the geodynamical parameters of the line section. Since we created relative stress field properties, the eigenvalues of the vectors were maximized to one. Each point in the point cloud inherits the stress property of the line section, from which it was derived.

During the modeling we tried several point-cloud generating- and interpolation methods. The analysis of the interpolated tensor fields revealed that the model was able to reproduce a geodynamic synthesis of the Carpathian Basin, which can be correlated with the synthesis of the Atlas published in 2006. The method was primarily aimed to reconstruct paleo-stress fields.

References

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