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Fractal characteristics of drainage network in the Pannonian and Transylvanian basins

E. Dombrádi (1), G. Timár (2), G. Bada (1,3), F. Horváth (3), S. Cloetingh (1)

(1) Netherlands Research Centre for Integrated Solid Earth Science (ISES), Vrije Universiteit, Amsterdam, the Netherlands, (2) Space Research Group, Institute of Geography and Earth Sciences, Eötvös L. University, Budapest, Hungary, (3) Department of Geophysics, Institute of Geography and Earth Sciences, Eötvös L. University, Budapest, Hungary (endre.dombradi@falw.vu.nl)

Drainage pattern is directly influenced by topographic evolution through the processes of landscape development. Both crustal movements and climate effects determine the hydrographic conditions, either attenuating or amplifying each other's influence. Self-similarity and fractal characteristics of river networks indicate that stochastic components of erosional processes also contribute to the evolution of fluvial systems. The study area is part of the Pannonian-Carpathian natural laboratory, a region with complex, poly-phased geodynamic history. Therefore, it is interesting to investigate whether the structural characteristics of the drainage network show significant differences compared to the results from other drainage basins, where such analysis has been done. The analysed river network comprises the main tributaries of the Tisza river, a large meandering river in the Pannonian basin, and covers several local source-to-sink systems with rivers originating in the uplifting areas and flowing across sub-basins still subsiding. Thorough stream ordering has been carried out by two different standard methods using high-resolution digital elevation models. Self affinity was validated by the Tokunaga criterion and fractal dimension was determined through branching ratios. The results and their comparison, and the obtained inferences are presented. The studied rivers clearly show self-similar structure due to the superposition of long-term tectonic processes and climate changes resulting in non-deterministic topography evolution. The calculated fractal dimension substantially differs from the plane-filling D=2 and fits well in the row of the observed values of other basins.