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On a contribution of fractal geometry methods to the precise geoid determination

Hilda Šťastná (1), Juraj Janák (2), Katarína Mészárosová (3), and Zuzana Minarechová (4)

(1) Brno University of Technology, Brno, Czech Republic (djhildush@gmail.com), (2) Slovak University of Technology, Faculty of Civil Engineering, Department of Theoretical Geodesy, Bratislava, Slovakia (juraj.janak@stuba.sk), (3) Slovak University of Technology, Faculty of Civil Engineering, Department of Mathematics and Descriptive Geometry, Bratislava, Slovakia (katarina@math.sk), (4) Slovak University of Technology, Faculty of Civil Engineering, Department of Mathematics and Descriptive Geometry, Bratislava, Slovakia (faskova@math.sk)

Although gravity data do not represent fractal, we have borrowed methods of fractal geometry to study their relative roughness. As a testing domain we have chosen an area in Western Europe around the Auvergne test region. This data set contains the surface free-air gravity anomalies with more than 200,000 irregularly distributed points. For our solution we have prepared the regular grid of free-air gravity anomalies with 3'×3' resolution by computing the refined Bouguer gravity anomalies and applying backward transformation into free-air gravity anomalies using the SRTM3 digital elevation model. Then a three dimensional box counting method has been applied to calculate the values of fractal dimensions in the whole domain as well as several smaller subdomains. We have showed that since gravity data do not represent fractals, i.e. they do not display self-similar patterns and they are not strictly self-similar, this approach has to be applied very carefully and under certain conditions. Finally, we discuss strong and weak points of this approach.