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Statistics of topography : multifractal approach to describe planetary topography

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In the last decades, a huge amount of topographic data has been obtained by several techniques (laser and radar altimetry, DTM. . .) for different bodies in the solar system. In each case, topographic fields exhibit an extremely high variability with details at each scale, from millimeters to thousands of kilometers. In our study, we investigate the statistical properties of the topography. Our statistical approach is motivated by the well known scaling behavior of topography that has been widely studied in the past. Indeed, scaling laws are strongly present in geophysical field and can be studied using fractal formalism. More precisely, we expect multifractal behavior in global topographic fields. This behavior reflects the high variability and intermittency observed in topographic fields that can not be generated by simple scaling models. In the multifractal formalism, each statistical moment exhibits a different scaling law characterized by a function called the moment scaling function. Previous studies were conducted at regional scale to demonstrate that topography present multifractal statistics (Gagnon et al., 2006, NPG). We have obtained similar results on Mars (Landais et al. 2015) and more recently on different body in the the solar system including the Moon, Venus and Mercury. We present the result of different multifractal approaches performed on global and regional basis and compare the fractal parameters from a body to another.