Geophysical Research Abstracts
Vol. 17, EGU2015-9879, 2015
EGU General Assembly 2015

Statistics of topography : from the planet scale down to 1 m

Francois Landais (1), Frederic Schmidt (1), and Shaun Lovejoy (2)

(1) GEOPS, Univ. Paris Sud, CNRS, France (francois.landais@u-psud.fr), (2) Dep. Physics, McGill University, Canada

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 multiscaling 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 multiscaling or 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). For the first time, we conducted a comprehensive analysis from the planet scale, down to several 100m with a global dataset and local analysis down to 1m. We test a modern formalism, the universal multifractal theory, that predicts a general form for the moment scaling function depending on only three parameters. The realism of such approach to describe the topography will be discussed.