



Multiscale Feature Extraction of Potential Fields Using Poisson Wavelets

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The existence and origin of geoid undulations in various oceanic areas, first evidenced by satellite altimetry measurements, is still a debated topic. The presence of 200 km scale undulations, that have been related to different processes including secondary convection patterns in the Earth mantle, is now well established. Altimetric data also suggest the possible presence of undulations at longer wavelengths, in the 400-1300 km range, which still need to be confirmed and could reflect geodynamic processes operating inside the Earth's mantle. With the advent of satellite gravity missions GRACE and GOCE, new geoid models are available with unprecedented precision at those spatial scales. In this context, the aim of our study is to confirm the presence of long wavelength geoid undulations over the oceans, to describe their characteristics and study their implications in terms of geodynamic processes in the mantle. For that, we developed a continuous wavelet analysis method using directional Poisson wavelets on the sphere. It allows to investigate the presence of structures in the geoid in different scales and directions. We applied our method to the GRACE geoid models provided by different teams, to satellite altimetry derived gravity anomalies maps, and to bathymetric data. We evidence large-scale undulations in the geoid that are particularly clear in the Pacific ocean and discuss their possible origins.