Geophysical Research Abstracts
Vol. 15, EGU2013-2012-1, 2013
EGU General Assembly 2013

A Noise-Robust Differentiator in the Framework of Long-Wavelength Gravity Field Recovery from GOCE

Hu Wu, Phillip Brieden, and Jürgen Müller
Institute of Geodesy, Leibniz Universität Hannover, Hannover, Germany (wuhu@ife.uni-hannover.de)

To achieve a pure GOCE (Gravity field and steady-state Ocean Circulation Explorer) global gravity field model, the gradiometry data has to be supplemented by the SST-hl (Satellite-to-Satellite Tracking high-low) observations for the long-wavelength part of the gravity field. Two major approaches for the SST-hl data recovery are the Energy Balance Approach and the Acceleration Approach, both of which involve the derivation of the velocity or acceleration from the precise kinematic orbit. However, such numerical differentiation process amplifies the high-frequency noise at the same time. Currently, the 9-point Taylor differentiator is considered as the best differentiator, but it also suffers from its poor noise suppression capabilities. Here, we introduce a new smooth differentiator, called Noise-Robust Differentiator. It possesses some preferred properties: a) Exactness on polynomials; b) Preciseness at low frequencies; c) Smoothness and guaranteed suppression of high-frequency noise; and d) A computationally favorable structure. The errors of velocity and acceleration derived by the Noise-Robust Differentiator are compared with that from the other methods. Additionally, we calculate the geo-potential coefficients based on the derived velocities and accelerations, and present a comparison of our results with the official solutions.