Geophysical Research Abstracts
Vol. 15, EGU2013-4494, 2013
EGU General Assembly 2013

Detection of common oscillations in centre of mass of the Earth determined from SLR, GNSS and DORIS observations

Agnieszka Wnęk (1), Wiesław Kosek (1,2), Maria Zbylut (1), and Waldemar Popiński (3)

(1) Environmental Engineering and Land Surveying Department, Agriculture University of Krakow, Poland, (2) Space Research Centre, Planetary Geodesy, Warsaw, Poland, (3) Central Statistical Office of Poland, Warsaw, Poland

Geocenter motion is the motion of the centre of mass with respect to the centre of figure of the Earth, which is defined as the origin of International Terrestrial Reference Frame (ITRF). Actually, geocenter time series with the sampling interval of 1 week can be computed from Satellite Laser Ranging (SLR), Global Navigation Satellite System (GNSS) and Doppler Orbitography and Radiopositioning Integrated by Satellite (DORIS) observations. The discrete wavelet transform based on the Shannon wavelet functions was applied to transform the Earth centre of mass time series computed by these techniques into time – frequency domain. In the wavelet based semblance filtering algorithm the semblance between the wavelet transform coefficients of the considered time series was computed. Assuming a fixed semblance threshold, zero values were assigned to wavelet transform coefficients of both time series, for which the semblance was below this threshold. The common signal in the considered time series was then computed using the inverse discrete wavelet transform of the thresholded coefficients. The model data which are similar to geocenter time series were also examined. The noise level in the model data was similar as the standard deviation of the error corresponding to individual techniques. Analyses of the observed and model data have shown that it is possible to determine common signals in the relevant time series when the threshold is equal to 0.95. The common retrograde oscillation with amplitude of about 5 mm in the equatorial plane was detected in the annual frequency band in the SLR and GNSS geocenter time series. The coordinates of the center of mass of the Earth computed from DORIS observations are much more noisy and differ significantly from those of other techniques.