



Geocenter motion stochastic model determined by the wavelet semblance filtering and its geophysical interpretation

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The variations of centre of mass (CM) of the whole Earth including atmosphere, oceans and continental waters, caused by mass redistributions of these fluid layers, can be now determined from observations of space geodetic techniques such as Satellite Laser Ranging (SLR), Global Navigation Satellite System (GNSS) and Doppler Orbitography and Radiopositioning Integrated by Satellite (DORIS). The geocenter coordinates are determined in the International Terrestrial Reference Frame (ITRF) with a fixed origin defined as the center of figure (CF). These 3D geocenter time series obtained from observations of these three independent techniques were projected onto OXY, OYZ and OZX planes of the Terrestrial Reference Frame (TRF).

Next, these three complex-valued projections of the considered observation techniques were used to determine 3D stochastic models of geocenter motion using wavelet based semblance filtering which enables detection of a common signal in two time series. In the applied Discrete Wavelet Transform (DWT) the Shannon wavelet function was used. The determined common signals in the pairs the SLR-DORIS, SLR-GNSS and GNSS-DORIS geocenter time series were used to compute weighted common model of the geocenter motion by taking into account their mutual agreement and assuming that weights for particular techniques are inversely proportional to the variances of the corresponding geocenter coordinates in the TRF. The retrograde annual oscillation in the equatorial plane with amplitude of about 2-3 mm was detected in the geocenter motion model.

In order to find geophysical interpretation of the geocenter motion model the first degree gravity coefficients determined from ocean and atmospheric models and GRACE coefficients of degrees 2 and higher were examined. The wavelet semblance functions between such first degree gravity coefficients and the geocenter coordinates corresponding to the GNSS, SLR and DORIS techniques together with their common signal estimated by the wavelet semblance filtering were computed.