Geophysical interpretation of the geocenter motion stochastic model

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The geocenter coordinates time series represent the variations of the instantaneous center of mass of the whole Earth (CM) with respect to the center of figure (CF) considered as the origin of the International Terrestrial Reference Frame (ITRF). The motion of the CM is driven by the mass redistribution in the Earth fluid layers, therefore it can be referred to the changes of the first degree gravity coefficients.

In analyses the geocenter coordinate time series were used determined form observations of space geodetic techniques i.e. Satellite Laser Ranging (SLR), Global Navigation Satellite System (GNSS) and Doppler Orbitography and RadiopositionigIntegrated on Satellite (DORIS) as well as the first degree gravity coefficients determined from Gravity Recovery and Climate Experiment (GRACE) ocean and atmospheric models and coefficients of degrees 2 and higher.

The wavelet based semblance filtering was applied to these geocenter time series from space geodetic techniques to compute a common signal in pairs of two time series. These common signals between the pairs of geocenter time series were then used to compute the weighted common model of the geocenter motion. The weights for particular techniques were assumed as inversely proportional to the variances of the corresponding filtered geocenter signals. Then the time-frequency wavelet semblance function was computed between the first degree gravity coefficients and the geocenter motion model to find geophysical interpretation of the geocenter motion. This function showed agreement in the phase and amplitude of the annual oscillation in projections of the 3D common geocenter motion model on to the planes of the ITRF.