



Reconstruction of mean sea level and polar ice periodical variations by Earth rotation observations

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The global water redistribution between continental ice sheets and oceans, due to climatic and weather conditions, leads to significant changes of the main axial inertial moment of the Earth. These changes are compensated by corresponding variations of the angular velocity of the Earth, according to the law of angular momentum conservation. The Earth rotation variations are determined by monitoring of the rotational angle and angular velocity changes, so-called Universal Time (UT1) and Length of Day (LOD) observations. The modern astronomical and space-based observational techniques provide high-accurate UT1 and LOD solutions since 1962. Long time series of UT1 and LOD variations since 1623 are determined on the base of historical astronomical observations of star occultations. These time series are useful to determine Earth rotation response to the solar activity cycles with periods of 11, 22, 45 and more years. The solar activity cycles, represented by Wolf's numbers and Total Solar Irradiance (TSI) variations, are synchronized with the corresponding oscillations of the Earth rotation, drought indices and Mean Sea Level (MSL), determined from maregraph data. The empirical model of global water redistribution between the oceans and continental ice, due to variations of the TSI and additional water evaporation during the sunspot cycles, is the only explanation of the observed common oscillations of TSI, MSL, drought indices, UT1 and LOD. The amplitude of 1mm of the mean sea level oscillation with periods 11, 22 and 45 years corresponds to UT1 oscillations with the same periods and amplitudes 12.5ms, 25ms and 50ms, according to the model. This model allows backward reconstruction of the MSL, continental and sea ice periodical variations for the last 4 centuries, synchronized with the solar cycles, by means of the existing Earth rotation data.