The global S1 tide and Earth's nutation

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Diurnal S1 atmospheric oscillations induced by the cyclic heating of air masses through solar radiation exert small contributions to Earth's prograde annual nutation at a level of 0.1 mas (milliarcseconds). This study reviews the thermal excitation mechanisms and global distribution of the S1 tide, highlighting characteristics of its seasonal modulation as well as local-scale features that are of major relevance for an accurate prediction of celestial Earth rotation variations. We retrieve numerical values of in- and out-of-phase nutation corrections for S1 and its side lobes from three, previously unavailable global atmospheric reanalyses and indicate how model advances, e.g. in terms of temporal and spatial resolution, lead to different estimates with respect to now dated predecessor reanalyses. Motion term forcing of nutation exhibits a clear stability across all probed datasets, whereas the agreement among the mass term excitation seems to be impaired by an unfavorable dependency on local tidal oscillations. Diurnal oceanic angular momentum changes – forced by the S1 air pressure variations at the water surface – act as an additional driving agent of the prograde annual nutation, and we investigate to which extent oceanic excitation terms from various sources can be superposed to the deduced atmospheric estimates. The combined influence of the principal diurnal tide on Earth's nutation, related to both atmosphere and ocean dynamics, is found to yield a rough agreement with its observational evidence from geodetic VLBI (Very Long Baseline Interferometry) measurements.

The full presentation is available from the author on request