Contribution of the S1 thermal tide to Earth rotation: comparison of geophysical models and geodetic observations

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The atmospheric thermal tide S1 occurring at exactly the frequency of 1 cycle per solar day causes diurnal variation of the global atmospheric angular momentum (AAM). The corresponding surface atmospheric pressure variation induces mass redistribution in the oceans, the S1 ocean tide, which is also manifested by the diurnal component of the ocean angular momentum (OAM). The S1 signals in AAM and OAM contribute at measurable level to all components of Earth rotation: to nutation - contribution to prograde annual term, with amplitude larger than 100 microarcseconds, to prograde polar motion and to UT1, in both cases the 24-hours harmonic with amplitude up to 40 microarcseconds. Brzezinski et al. (2004, JGR, Vol.109, No.B11, doi: 10.1029/2004JB003054) estimated the S1 contributions to nutation and polar motion using a consistent pair of the subdaily estimates of AAM and OAM. Here we extend this estimation using the available alternative solutions of AAM and OAM with subdiurnal resolution.
We also compute the excitation of Earth rotation using the hydrodynamic model of the S1 ocean tide developed by Ray and Egbert (2004, J. Phys. Oceanogr., Vol.34, 1922-1935). The estimated geophysical contributions are compared to the S1 parameters derived from the geodetic observations of Earth rotation.