日周/半日周帯域の海洋潮汐角運動量と地球の回転

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Oceanic tidal angular momentum and Earth's rotation for diurnal/semidiurnal bands

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Luni-solar tides cause the variation of Earth's rotation for sub-diurnal bands by direct external tidal torques and by the tides in the ocean tides as an internal excitation source (Chao and Ray, 1998). Under the conservation of angular momentum, this excitation process in Earth involves two mechanisms of mass redistribution that changes the Earth's inertia tensor and of motion that evokes relative angular momentum (Munk and MacDonald, 1960).

In the case of ocean tides, the tidal height variations and the tidal currents represent the mass and motion terms, respectively. They are called oceanic tidal angular momentum (OTAM). In this study, OTAM has been estimated using the methods in Seiler (1991) and Ray et al. (1994) for diurnal (O1, K1) and semidiurnal (M2, S2) bands. These values are derived from recent ocean tide models, TPXO7-atlas developed by OSU tidal data inversion group (http://volkov.oce.orst.edu/tides/atlas.html); this model is an upgraded version of TPXO7.2 with improvements for shallow water. The estimated mass parts of OTAM using TPXO7-atlas are 0.4549 (329.04), 0.4565 (307.51), 0.5134 (8.86), and 0.1257 (38.99) for O1, K1, M2, and S2 waves, respectively, where unit is 10^25 kg m^2/s and degree in parenthesis. The equatorial components (X, Y) of OTAM are used to compute for polar motion and polar components (Z) of OTAM for length-of-day (LOD).

This study also suggests the observed Earth's rotation parameters by the space geodetic technique of very-long-baseline interferometry (VLBI) during the intensive campaign CONT11 (http://ivscc.gsfc.nasa.gov/program/cont11/); this campaign was carried out 15-29 September, 2011, at total 14 VLBI stations. Earth rotation parameters (ERP) with hourly resolution estimated from VLBI during CONT11 are compared to the recommended IERS model for sub-diurnal ERP variations based on an ocean tide model.

References

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