VLBI と南極昭和基地の超伝導重力計のデータを用いた長周期潮汐パラメータの計算

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Long-period tidal parameters determined from VLBI data and SG at Syowa Staion, Antarctica

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We present a observed results for dUT1 (UTC-UT1) variations induced by the zonal part of the tide generating potential. The periodic change of the principal memonts of inertia associated with the tidal deformation induces a periodic change in rotation rate and a periodic change in the lengh of the day (lod) and dUT1 due to conservation of angular momentum. Geodetic observations by very long baseline interferometry (VLBI) and superconducging gravimeter (SG) allow the detection of fluctations induced by the response of the Earth to thezonal part of the tidal graviational potential.

First, we used the EOP Combined Series C04 consistent with ITRF 2008 for dUT1 and LOD time series including zonal tidal terms. These time series of dUT1 and LOD data should be subtracted by the variations from atmospheric, hydrologic, and oceanic angular momentum estimated from ERA Interim analysis (1989-2010) data (http://www.gfz-potsdam.de/portal/gfz/Struktur/Departments/Department+1/sec13/servuces/eam functions). Prior to the correction for geophysical effect from atmospheric, hydrologic, and oceanic angular momentum, we could obtained the amplitudes induced from dUT1 are 0.83 ms (Mf) and 0.79 ms (Mm). For the transformation of these continuous time series to frequency domain, we used BAYTAP-L, which is a special version of BAYTAP-G of tidal analysis program (Tamura et al., 1991). In the presentation, we show the effect of each effect of geophysical angular momentum function on the Earth rotation variation. VLBI data from 1989 to 2010 was also processed for the estimation time series of ERP (Earth Rotation Parmameters) and VieVs (Vienna VLBI Software, http://vievs.geo.tuwien.ac.at/) program was used.

Meanwhile, recently, new two ocean tide models (FES2012 and TPXO8-atlas) were developed, which provide long-period ocean tide information. We reanalyzed the gravity data of Syowa Station using these new ocean tide models for ocean loading correction, and evaluated the gravimetric factors (δ). The estimated gravimetric factors are 1.15822 (FES2012) and 1.15541 (TPXO8-atlas) for Mm and 1.15396 and 1.15405 for Mf. Sato et al. (1995) and Iwano et al. (2005) analyzed the data of the gravity observations using superconducting gravimeter (SG) at Syowa Station in Antarctica. However, they concluded that the residuals are mainly due to the inaccurate ocean models for ocean tidal loading correction. The effects of ocean tides, a fluid core and mantle inelasticity of the earth cause the frequency dependence on zonal tidal signals. In particular, because inelastic effects of the medium of the Earth become larger for lower frequencies (Wahr, 1985) and the long-periods tides have their maximum values at the poles, tidal observations and analysis of long-period at high latitudes is advantageous for studying the dissipative properties in the Earth.

In the end, the values of κ, the zonal response coefficient defined by Agnew and Farrell (1978) and gravimetric delta factros were considered in terms of the frequency dependency of long period tidal factors.

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