



Tidal signals in data from the Earth rotation sensor “G”, Wettzell, Germany

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The large ring laser “G” located in an underground facility at the Geodetic Observatory Wettzell, Germany, is currently the only rotation sensor that is continuously recording variations of the rotation speed of the Earth and the orientation of its axis. In the diurnal and semidiurnal tidal band different sources were identified in the data of the ring laser. Beside signals caused by Earth rotation like retrograde polar motion and the effect of the ocean tides on polar motion and length-of-day, tidal effects enter the ring laser signal by variations in the local orientation of the platform. Such effects comprise pure geometric tilts caused by the tides of the solid Earth and ocean loading tides.

In a previous work it was theoretically derived that, when correcting the ring laser data for the orientation effect using tiltmeters, the tidal change of the latitude has to be taken into account. Based on a careful data analysis of different data sets from the “G” ring laser and several high resolution tiltmeters placed on top of the ring, we show in this work that when neglecting this term, a difference in the tidal tilt parameters of the ring laser and the tiltmeter of roughly 10 % of the rigid Earth tide occurs. This difference is about the magnitude of the degree 2 Love number L_2 .

The improved tidal tilt reduction allows a more accurate determination of polar motion and length-of-day variations in the diurnal and semidiurnal tidal band.