Geophysical Research Abstracts,
Vol. 10, EGU2008-A-06820, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-06820
EGU General Assembly 2008

Using VLBI measurements of nutation to estimate Earth internal structure parameters.

L. Koot (1), A. Rivoldini (1), O. de Viron (2) and V. Dehant (1)

(1) Royal Observatory of Belgium, Belgium, (2) Institut de Physique du Globe de Paris and Université Paris VII (associated with CNRS), France.

Among the different variations in the rotational motion of the Earth, nutations are the most appropriate for studying the internal structure of the Earth. The main advantage of nutations with respect to the other rotational variations (such as polar motion or length-of-day variations) is that its forcing, the gravitational torque, can be computed very precisely from ephemerides of the Moon, the Sun and the planets. The response of the Earth to this external torque depends on its internal structure. Because the nutations are observed very precisely with the Very Long Baseline Interferometry (VLBI) technique, nutation data allow to constrain parameters describing the Earth internal structure. Among the parameters of interest are the dynamical ellipticities of the whole Earth and fluid core, the compliances describing the deformability of the whole Earth and fluid core, and coupling constants related to the torques generated by the differential rotation of the mantle, fluid core, and solid inner core. In this paper, we present a new fitting procedure of the IAU2000 nutation model to the most recent observations. Within this procedure the Earth interior parameters are directly estimated from the nutation data time series. This allows to use all the information of the time-domain data and to account for the time variable uncertainties on the data. Finally, we use a probabilistic (Bayesian) inversion method as it does not require the model to be linear and easily allows for the incorporation of model uncertainties. From the resulting inferred probability density, a new set of Earth internal parameters are estimated. In addition to the forced nutations generated by the external gravitational torque, a free oscillation due to the excitation of the Free Core Nutation (FCN) mode by the geophysical fluids can be observed in the VLBI data. We also present an analysis of

this time variable free mode.