EVOLUTION OF EARTH ORIENTATION MONITORING AT IERS

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ABSTRACT. The dramatic improvement in the accuracy of Earth Orientation Parameters (EOP) over the last decades have lead to the requirement of new concepts and new models in the softwares used to perform time series combinations (McCarthy and Petit, 2004). These softwares themselves have been improved to take advantage of the quality of series independently derived from the various geodetic techniques. However, if the level of precision of combined EOP solutions is now reaching unprecedent values, i.e. 40 μas for polar motion and 8 ms for UT1, the overall accuracy reflecting inconsistencies between EOP and reference frames is significantly larger, 300 μas for polar motion and 20 μs for UT1. This is now not acceptable for various applications needing a high level of consistency. We summarize here the state-of-art concerning the current EOP monitoring and address the new procedure to be applied in order to yield a better consistency between Earth orientation parameters and Reference frames, celestial (CRF) and terrestrial (TRF). For a detailed description of the reference solution IERS Bulletin b and C04 see Gambis (2002, 2004, 2005), Gambis and Wooden (2005).

1. CURRENT CHARACTERISTICS OF EOP ESTIMATES

Precision gives an estimation of the agreement of various individual solutions with respect to other combined solutions, it can be seen as a short-term stability. The current values derived from the internal comparisons are the following:

- Polar motion: 40 μas
- Universal Time: 4 - 10 ms
- Nutation offsets: 70 μas

Accuracy reflects the real uncertainties of the solutions. It takes into account systematic errors of the EOP system with respect to the terrestrial and celestial frames; it is more critical than precision:

- Polar motion: 200-300 μas
- Universal Time: 15-20 ms
- Nutation offsets: 70 μas

2. INCONSISTENCY OF IERS EOP SERIES WITH RESPECT TO ITRF AND ICRF REALIZATIONS

Individual EOP series determined from the analyses of the various techniques present mutually systematic errors, generally limited to biases and drifts which can be attributed to the adoption of different references frames and models. The consistency between EOP and reference frames characterizes the "closure" when making the transformation between CRF and TRF via EOP. Due to the separate computation of EOPs and TRF, it is not surprising that inconsistencies arise after several years. (Altamimi et al., 2005, Gambis et al., 2006). Monitoring inconsistencies is a main task of the EOP Center (Gambis et al. 2002, Gambis and Bizouard, 2003)

At 2006.0 inconsistencies are at the level of 250 μas which is small but significant at the present level of precision brought by the various geodetic techniques (Figure 1). Rigorous methods based on a simultaneous determination of EOP and reference frames TRF and CRF will replace the current combination procedure in the future (Rothacher, 2002) . But it is urgent now to re-align the present reference solution Bulletin B and C04 to the ITRF frame. This will be done in the course of 2006 as soon as the new realisation of ITRF, i.e ITRF2005 will be available to the community. Over 2000 to 2005 C04 polar motion will be adjusted to ITRF2005 System. Corrections consist mainly in a bias which is at 2006.0 in the range of -60 μas. and 250 μas in respectively X and Y-Pole.

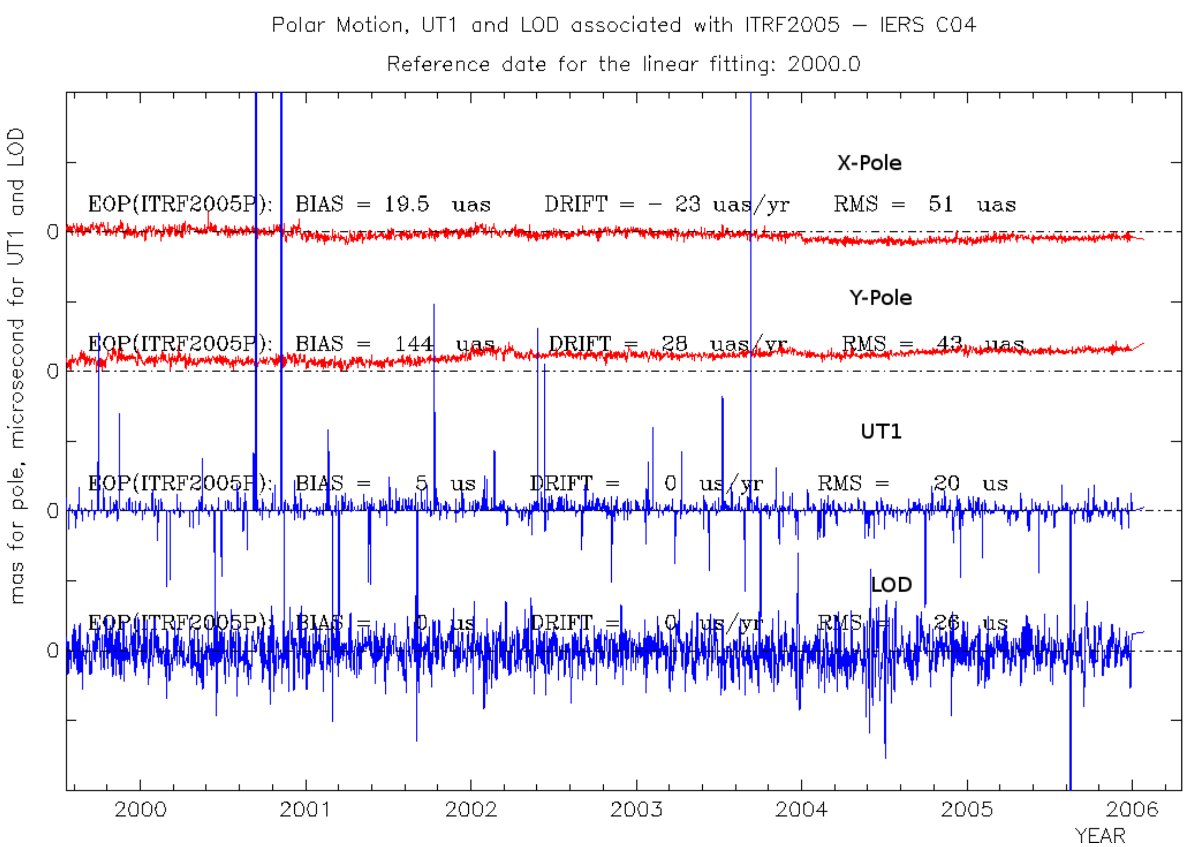

Figure 1: Due to the separate determination of EOP and the International Terrestrial Reference Frame of which the last realization is ITRF2005, small but significant discrepancies appear between the IERS C04 and the EOP solution associated with the ITRF2005. At 2006.0, the values reach - 60 μas and 300 μas in respectively X and Y-Pole.

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