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OCA/GEMINI-GRGS BECOMING AN OFFICIAL ILRS ANALYSIS CENTER

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Abstract. OCA/GEMINI-GRGS is currently moving from its status of an associate ILRS analysis center to an official ILRS analysis center. The ILRS (International Laser Ranging System) is one of the nine services of the International Association of Geodesy (IAG). This new status should permit to GRGS to validate and, especially, enlighten in an easy way its scientific results coming from SLR data, within this international organization.

1 Introduction

The generation of a number of scientific data products, based on Satellite Laser Ranging (SLR) and Lunar Laser Ranging (LLR) observations, is the prime objective of the International Laser Ranging System (ILRS). These products include station positions, site velocities, Earth Orientation Parameters (EOP), geocenter coordinates and many others.The ILRS is one of the nine services of the International Association of Geodesy (IAG), which also includes the International Earth Rotation and Reference Systems Service (IERS). As such, the ILRS is responsible for the generation of operational and scientific, quality-controlled products, for inclusion in various official IERS products. The ILRS, its Analysis Working Group (AWG) in particular, is in the process of developing such a unique and quality controlled official ILRS product (for various parameters). There are for the moment six analysis centers in the world belonging to this Analysis Working Group: Bundesamt fur Kartographie und Geodaesie (BKG), Germany ; Deutsches Geodatisches ForschungsInstitut (DGFI), Germany ; GeoForschungsZentrum Potsdam (GFZ), Germany ; Centro de Geodasia Spaziale "G. Colombo" (CGS), Italy ; NERC Space Geodesy Facility (NSGF), United Kingdom ; Joint Center for Earth System Technology/Goddard Space Flight Center (JCET/GSFC), Greenbelt, Maryland, USA. OCA/GEMINI-GRGS is currently becoming a new analysis center, thanks to its participation to a pilot project named "benchmarking and orbits".

2 The benchmark

As explained on the ILRS website, the ILRS officially solicits the operational production of daily Earth orientation parameters (x/y-pole and LOD) and 28-day global station positions, based on SLR measurements on the LAGEOS satellites. The analysis groups are required to process the observations in intervals of 28 days. In each analysis, the contributors are to generate a loosely-constrained solution for EOPs and station coordinates. The EOPs must include x-pole, y-pole and excess Length-Of-Day (LOD), all computed on a daily basis, where the intervals encompass one complete day (the reference epoch is the midpoint of each day).

To reach the announced goal, participation in this project and passing the required benchmark is mandatory for any associate analysis center, which will provide station position and EOP solutions for inclusion into an ILRS combination solution.

On a practical point of view, we have computed an orbital arc of LAGEOS-1 over a given period of time, derived the expected geodetic associated products, and ILRS compares them to their own reference.

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3 Result of the benchmark

Figures (1) and (2) show the differences between our LAGEOS-1 orbit, and the orbit performed over the same period by BKG. Both are expressed in the inertial reference frame (J2000). It is satisfactory to note that there is no significant difference (in particular : no bias) between the two orbits, on the semi-major axis in particular. The agreement between the two rapid variables is excellent (at the level of a few centimeters).

The 4-day windows which appear on each variable come from the fact that the empirical modeling is not the same: we have chosen to adjust a set of empirical parameters every 4 days, corresponding to a total of 7 sets over the whole period.

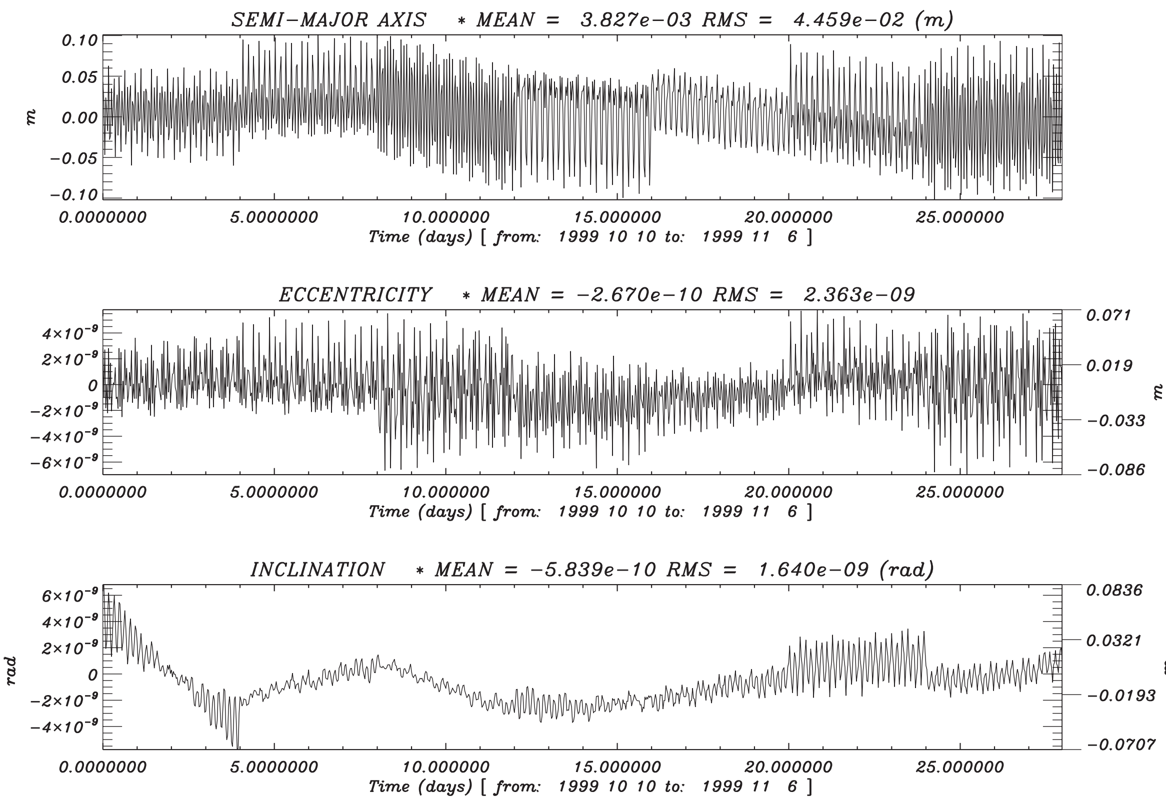

Fig. 1. Differences between BKG and GRGS orbit of LAGEOS-1: metric elements.

As a result, the comparison between GRGS estimation and standard estimation for the Universal Time is very good (Figure (3)).

4 Conclusion

This benchmark is made up of different interesting steps. One of them consists in comparing the accuracy of orbits carried out by various groups, with different modelings, different reference frames. More details about it can be asked to each author of that paper. One of the next challenges in space geodesy will consist in ensuring that there is no bias neither systematic difference between the same geodetic products (which is essential in metrology, geophysics, ...) performed by different technique or different combinations of techniques. Inside the laser community, is it already always the case ? By the way, following the example given here, the answer is YES.

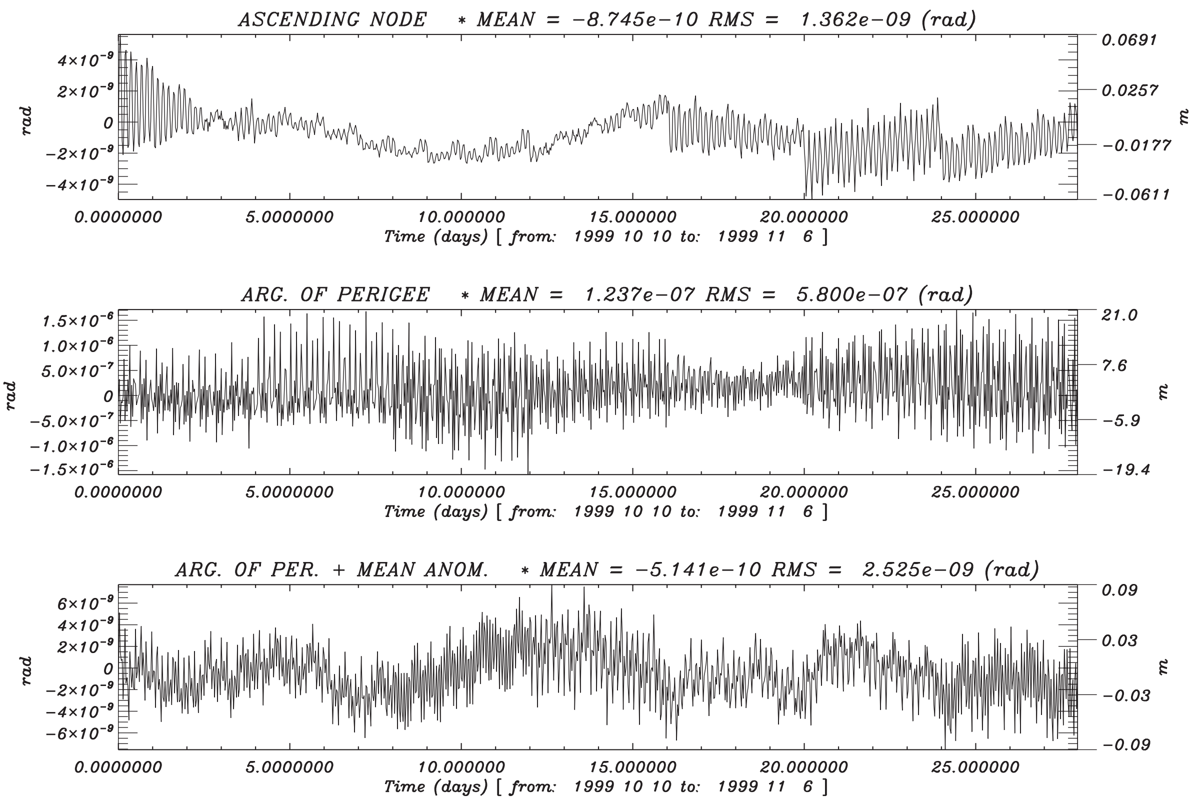

Fig. 2. Differences between BKG and GRGS orbit of LAGEOS-1: angular elements.

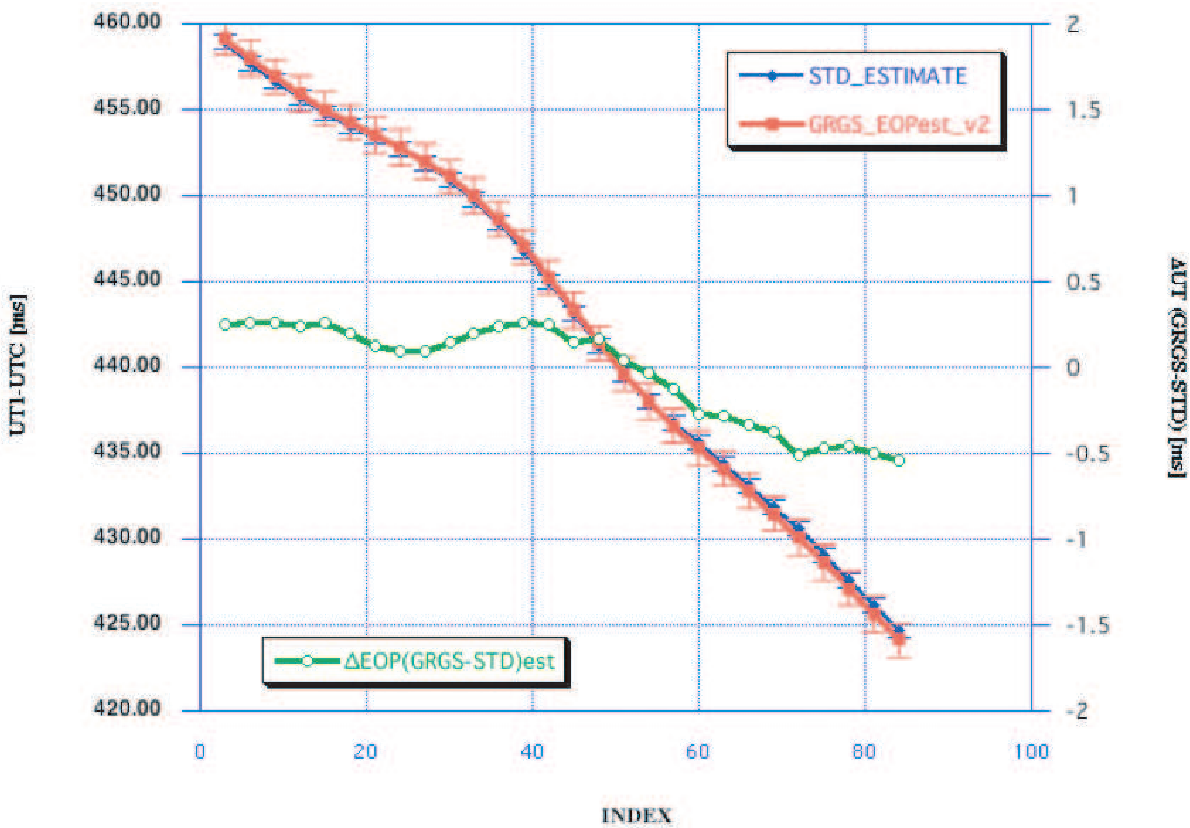

Fig. 3. Universal Time: comparisons between GRGS estimation and standard estimation.