

3.6.2.8 Groupe de Recherches de Géodésie Spatiale (GRGS)

In the framework of the IERS Combination Research Centres, the “Groupe de Recherches de Géodésie Spatiale” (GRGS) has proposed from year 2000 to study the combination of five techniques (SLR, LLR, VLBI, GPS and DORIS) at the observation level. The goal is to obtain a global and homogeneous solution of the Earth Orientation Parameters (EOPs): universal time UT1, pole motion, nutation corrections in longitude and obliquity, as well as station coordinates.

The adopted strategy consists in combining with the GRGS's DYNAMO software the normal equations resulting from processing the GRGS's GINS orbitography software for individual techniques, except for LLR which is processed by the CAROL software. The optimal relative weights between each technique are obtained by using the Helmert's optimal variance-covariance method.

A first approach was done by Ph. Yaya in his doctorate work until 2002. He could reach promising results over a 3 month test period which has incited us to persevere in this approach.

In order to study more thoroughly the merits of such a technique we decided to perform an complete analysis over a full year, 2002. Hence the main activity in 2003 was:

- at first to check and to improve if necessary the processing of SLR, DORIS, VLBI and GPS observations in the GINS software in order to get at least as good results compared to those ones from the international services;
- then to define the parameterization: 6 h resolution for all series of orientation parameters, weekly station solutions (from Sunday to Saturday);
- at last to process all available 2002 data: SLR on Lageos, Lageos2, Starlette and Stella, DORIS on SPOT2/4/5, Topex, Jason1 and Envisat satellites, GPS from 80 stations and VLBI. LLR data from the Grasse and McDonald stations were processed separately by the CAROL software.

In summary, individual technique number of observations and mean residuals are for:

- VLBI: from 100 to 10000, 0.02 to 0.08 ns for VLBI, depending on the type of sessions;
- SLR: a few thousands/week, 1 cm to 3 cm depending on satellites,
- DORIS: 0.4 to 0.5 mm/s,
- GPS: around 1 cm phase and 60 cm range,
- LLR: 30 obs./month, 40 cm.

The combination processing started already end of 2003 and goes on in 2004.

All normal matrices have been also converted in SINEX format so that they could be exported to be treated by other software, like for instance by the CATREF software at IGN.

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