3.6.2.3 Forschungseinrichtung Satellitengeodäsie, Technical University of Munich (FESG)

Introduction

At the FESG as a Combination Research Centre (CRC) mainly the following four research topics were covered during 2002:

- Analyses of EOP series from the IERS Campaign to align EOPs to ICRF/ITRF2000,
- Studies for the IERS SINEX Combination Campaign,
- Determination of the local tie between VLBI and GPS at Wettzell,
- Analyses of subdaily ERPs and nutation offsets/rates from VLBI and GPS.

The emphasis of the work performed was put on the two campaigns, the IERS SINEX Combination Campaign and the IERS EOP Alignment Campaign.

IERS Campaign to Align EOPs to ICRF/ITRF2000

Quite some effort of the FESG CRC was put into analyses of the EOP time series available through the IERS Campaign to Align EOPs to the ICRF/ITRF2000. The campaign itself is described in more detail in section 3.3 of this Annual Report and on the Internet (<http://alpha.fesg.tu-muenchen.de/iers/eop/campaign.html>). The Web pages also contain all the major results achieved by the FESG in the course of the analyses.

IERS SINEX Combination Campaign

The campaign itself started in May 2002 (see section 3.3, this volume) and the analysis and research related to this campaign is still going on. After some modifications, the Bernese GPS Software can now process not only the variance-covariance information but also the files with normal equation blocks, an option made possible by the new version 2.00 of the SINEX format. For such solution series, a matrix inversion for retrieving the normal equation systems is not necessary. We started testing the VLBI SINEX solutions from DGFI, because these are the only solutions that directly include the normal equations. To see if a solution can be exactly reproduced, the coordinates were fixed on ITRF2000 coordinate values and the resulting EOPs were compared to the results from the EOP Alignment Campaign, because both results, being produced from exactly the same normal equation information, should be identical. The generation of GPS solutions was already implemented in the course of a diploma thesis. The next step will be the incorporation of SLR solutions and thorough tests of the combination algorithms that handle both, station coordinates and EOPs. A first presentation of combination results will be given at the EGS General Assembly 2003 in Nice.

Local Tie Between VLBI and GPS at Wettzell

The local tie between the VLBI reference point (intersection of axes) and the GPS reference point called WTZA (Ashtech), at Wettzell, was analysed. The data for this analysis were obtained from a GPS antenna that was installed on the top of the radio telescope (above the secondary reflector). Measurements were performed with different azimuth and elevation positions of the radio telescope. Afterwards, the L1 and L2 baselines to the permanent point WTZA - the Ashtech antenna point WTZA was chosen, because it is equipped with exactly the same antenna type as the one put onto the radio telescope - were used to determine the local tie. The results for the baseline vector between the GPS point WTZA and the VLBI reference point were compared to the terrestrial survey results and show an agreement for the local tie on the 1 mm level, giving an additional confirmation of the quality of the local tie in Wettzell. This type of experiments and checks are extremely important in view of the fact, that today, the accuracy of the global ITRF reference frame is mainly limited by the accuracy of the local tie information for the co-location sites (and systematic biases between the individual space geodetic techniques).

Analyses of Subdaily ERPs and Nutation Offsets/Rates from VLBI and GPS

Detailed analyses of the subdaily ERP series from VLBI, generated by the Goddard Space Flight Center, and from GPS, generated by the CODE Analysis Center of the IGS, have shown that both, the VLBI and GPS series, are dominated by the noise of the subdaily ERP estimates after removing the low-frequency part and the variations due to ocean tides (e.g. using the model of Ray, 1996, given in the IERS Conventions 1996). Therefore, it should be possible to obtain an improved subdaily ERP time series by combining the VLBI and GPS results. At present, the program, that allows the combined estimation of the amplitudes for the ERP variations due to ocean tides, is modified to also generate a combined subdaily ERP series. Before a combined subdaily ERP series can be routinely generated as a new IERS (research) product, however, the two analysis centres (GSFC and CODE) presently generating subdaily ERP solutions have to agree to a routine production and delivery of these solutions. It is clear that in the long run, the combination of the subdaily solutions should be performed on the SINEX level, i.e. also including the site coordinates.

Not much work was dedicated in 2002 to the analysis of nutation offsets and rates from VLBI and GPS. A new analysis of the complete series of nutation rates from GPS (CODE Analysis Center) over the last 8 years and comparisons/combinations with VLBI results is foreseen for the IUGG General Assembly in 2003.

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