

3.7.2 Working Group on Combination

The major three items that will be addressed in this report are (1) the follow-up on the GGOS/IERS Unified Analysis Workshop of December 2007, (2) the research going on in the German GGOS-D project and similar projects, and (3) the new IERS Working Group on the “Combination on the Observation Level”.

A huge amount of combination work was also done for the preparation of the new ITRF2008, but this is part of the reports of the ITRS Center and the ITRF CCs, see Sections 3.5.5 and 3.6.1.

Follow-up on the Unified Analysis Workshop 2007

This section will give a summary of some of the major action items that were discussed and agreed upon during the GGOS/IERS UAW in December 2007:

- **Role of the IERS Combination Research Centers (CRC):** as discussions during the UAW 2007 made evident, the role of the IERS CRC was not well-defined. Not many of them actually contributed to the development of strategies for a rigorous combination of the space geodetic techniques, but were rather concentrating on their own specific research field. As a consequence of these and other discussions the IERS CRC were discontinued as of January 2009.
- **Need of a IERS WG on Combination on the Observation Level:** This IERS WG has since been established, see below.
- **SINEX extension for more flexible parameterizations:** Two proposals were made at the UAW 2007, but there was no consensus on how to proceed. Since then, as an action item of the second UAW in 2009 (see Section 4.3) an IERS WG for the “SINEX Format” has been established that is now dealing with these issues.
- **Generation of a SINEX meta data block:** A SINEX meta data block has been defined by Wolfgang Schwegmann (BKG) to be used for meta data exchange for solutions. A proposal for a meta data XML file has also been prepared. Meta data information is very important for the GGOS Portal.
- **Unique format for Earth gravity field coefficients:** A unique format for the exchange of gravity field coefficients has been agreed upon by the GOCE High-Level Processing Facility (HPF) and the International Center for Global Earth Models (ICGEM). This format has international acceptance and should be used. The format description may be found at the ICGEM: <<http://icgem.gfz-potsdam.de/>>.

- **Recommendation to fundamental stations:** at a fundamental station (co-location sites of more than one technique) at least 2 (better 3 GNSS receivers) with 2 resp. 3 antennas should be operated in parallel to be able to monitor any discontinuities due to antenna and receiver changes. Not too much progress has been made here.
- **Unique documentation of Analysis Center (AC) modeling and parameterization standards for all space geodetic techniques:** A unique standard has not yet been achieved. This is certainly a task for the GGOS Bureau on Standards and Conventions.

A short report on the meeting that followed the UAW of 2007 at the EGU 2008 is given in Section 4.1.

GGOS-D project and similar activities

The GGOS-D project, running from 1 September 2005 to 31 August 2008, was one of the major activities aiming at a rigorous combination of the different space geodetic techniques. Four institutions were involved: GeoForschungsZentrum (GFZ) Potsdam, Deutsches Geodätisches Forschungsinstitut (DGFI), Bundesamt für Kartographie und Geodäsie (BKG), and the Institute of Geodesy and Geoinformation (IGG) at the University of Bonn. An overview of the major results of the GGOS-D project may be found in Rothacher et al. (2011). Further information is available at <http://www.ggos-d.de> and in some of the papers listed at the end of this report.

A similar activity is taking place in the Group de Recherche Géodésie Spatiale (GRGS), a group formed by about 10 institutions, among them CNES, IGN, OP, etc. This group mainly works on the software packages GINS and CATREF and the combination on the observation level. More information may be found at <http://grgs.obs-mip.fr/>.

New IERS Working Group “Combination on the Observation Level”

During the Unified Analysis Workshop in December 2007 in Monterey, Richard Biancale made the proposition to establish a new IERS Working Group on “Combination on the Observation Level”. There was a general agreement and therefore the new WG was installed in with Richard Biancale as the chair. The kick-off meeting of the WG took place on October 22, 2009. Since it did not make any sense to have two WGs working on the topic of combination, the old IERS WG on Combination was resolved at the same time.

Meetings and Workshops

See Section 3.3 “Analysis Coordinator” (this volume) for a detailed list.

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