

BKG/DGFI Combination Center Annual Report 2009

Wolfgang Schwegmann, Robert Heinkelmann, Michael Gerstl

Abstract

This report summarizes the activities of the BKG/DGFI Combination Center in 2009 and outlines the planned activities for the year 2010. The main goal in 2009 was to perform the operational combination of the IVS Rapid EOP series (R1 and R4 sessions). Since October 1, 2009 these combinations have been performed at the BKG/DGFI Combination Center. In 2010 the responsibility for the operation of the IVS quarterly solutions should also be taken over from the IVS Analysis Coordinator.

1. General Information

The BKG/DGFI Combination Center was established in October 2008 as a joint effort of the Federal Agency for Cartography and Geodesy (Bundesamt für Kartographie und Geodäsie, BKG) and the German Geodetic Research Institute (Deutsches Geodätisches Forschungsinstitut, DGFI). The participating institutions, as well as the tasks and the structure of the IVS Combination Center, have been described in [3]. The tasks comprise quality control and a timely combination of the session-based intermediate results of the IVS Analysis Centers into a final combination product (e.g., Earth Orientation Parameters, EOP). After consultation with the IVS Analysis Coordinator, the combination results will be released as official IVS products. The Combination Center is also expected to contribute to the generation of the official IVS input to any ITRF activities. These tasks should be performed on an operational basis.

2. Component Description

The BKG/DGFI Combination Center performs a combination of session-based results of the IVS Analysis Centers on an operational basis. The strategy for the combination has been adapted from the combination process developed and performed by the IVS Analysis Coordinator (cf. [1], [2]). In 2009 the responsibility for the combination of the two IVS EOP series (rapid and quarterly solutions) on the basis of datum-free normal equations in SINEX format has been taken over by the Combination Center.

At BKG the following Combination Center functions are performed:

- Ensuring quality control of the Analysis Center results: Checking the format of the results and their suitability for combination, performing identification and reduction of outliers, comparing the Analysis Centers' results against each other, and comparing the results w.r.t. external time series, e.g. from IERS or IGS.
- Providing feedback to the Analysis Centers: Quality control results will be available at the BKG/DGFI IVS Combination Center Web page [4]. If preferred by the Analysis Centers, the results will be provided by e-mail, too.
- Creating high quality combination products and performing timely archiving and distribution: Combination products will be created using the DGFI DOGS software package, which operates by combining of unconstrained (free) normal equations.

- Submitting official IVS combination products to the IERS: The produced official IVS combination products will be submitted to the responsible IERS components as requested by the IERS. This will be supported by the staff of the IERS Central Bureau at BKG.
- Placing final results in IVS Data Centers: Final results will be placed in the BKG Data Center. This will be assisted by the staff of the BKG Data Center in Leipzig.
- Generating official IVS input to the ITRF: Official IVS input to the ITRF will be created as combined weekly solutions in SINEX format.

DGFI will be in charge of the following Combination Center functions:

- Developing state-of-the-art combination procedures: State-of-the-art combination procedures will be developed mainly at DGFI. This work, as well as the following item, is also related to DGFI's efforts as an IERS Combination Research Center and an IERS ITRS Combination Center.
- Performing software development and documentation: At DGFI the DOGS software package will be continuously updated by implementing the developed state-of-the-art combination procedures.
- Adhering to IERS Conventions: The DGFI DOGS software package is continuously updated to be in accordance with the IERS Conventions, as much as possible.

3. Staff

The list of the staff members of the BKG/DGFI Combination Center in 2009 is given in Table 1.

Table 1. Staff members of the BKG/DGFI Combination Center.

Name	Affiliation	Function	E-Mail
Michael Gerstl	DGFI	Software maintenance	gerstl@dgfi.badw.de
Robert Heinkelmann	DGFI	Combination strategies	heinkelmann@dgfi.badw.de
Alexander Lothhammer	BKG	Hardware maintenance	alexander.lothhammer@bkg.bund.de
Wolfgang Schwegmann	BKG	Combination	wolfgang.schwegmann@bkg.bund.de

4. Current Status and Activities

In 2009 the software packages necessary for the combination process were installed and tested. Extensive test combination runs were performed in cooperation with Sarah Böckmann from the IVS Analysis Coordinator's team. Operational combination of the IVS Rapid EOP series (R1 and R4 sessions) was taken over from the IVS Analysis Coordinator's team on October 1, 2009. Also, as described in [2], in 2009 six IVS Analysis Centers (BKG, DGFI, GSFC, IAA, OPA, and USNO) contributed to the IVS combined products. The rapid solutions contain only R1 and R4 sessions,

and new data points are added twice a week as soon as the SINEX files of at least four IVS Analysis Centers are available. The results of the combination process are placed in the BKG Data Center in Leipzig. The combined rapid EOP series, as well as the results of the quality control of the Analysis Center results, are also available at the BKG/DGFI Combination Center Web page [4]

To prepare the operational combination of the IVS quarterly solutions, test runs were performed in 2009. Starting in 2010 these quarterly solutions should be performed by the BKG/DGFI Combination Center, too.

5. Plans for 2010

In 2010 the work of the BKG/DGFI Combination Center will focus on the following:

- Taking over responsibility for the combination of the IVS quarterly solutions and performing these combinations on an operational basis.
- Performing quality control of improved Analysis Center solutions and using these solutions in the routine combination.
- Including a new Analysis Center solution based on the GEOSAT software and provided by Halfdan Pascal Kierulf from the Geodetic Institute, Norwegian Mapping Authority (STATKART), Honefoss, Norway.
- Maintaining and extending available information on the combination procedure and combination results available at the Combination Center Web page [4].

Acknowledgements

The establishment of the BKG/DGFI Combination Center has been strongly supported by the IVS Analysis Coordinator's team, respectively Sarah Böckmann. Without her extensive help in installing the software and performing the combination process, the operational combination would not have been possible in such a short time at the BKG/DGFI Combination Center.

References

- [1] Nothnagel, A., Böckmann, S., Artz, T., Analysis Coordinator Report, In: International VLBI Service for Geodesy and Astrometry 2007 Annual Report, NASA/TP-2008-214162, D. Behrend and K. D. Baver (eds.), 16–17, 2008.
- [2] Nothnagel, A., Böckmann, S., Artz, T., Analysis Coordinator Report, In: International VLBI Service for Geodesy and Astrometry Annual Report 2008, NASA/TP-2009-214183, D. Behrend and K. D. Baver (eds.), 80–82, 2009.
- [3] Schwegmann, W., Gerstl, M., Heinkelmann, R., BKG/DGFI Combination Center Annual Report 2008, In: International VLBI Service for Geodesy and Astrometry Annual Report 2008, NASA/TP-2009-214183, D. Behrend and K. D. Baver (eds.), 250–252, 2009.
- [4] <http://ida.bkg.bund.de/IVS/index.html>
BKG/DGFI Combination Center Web page.