

KTU-GEOD IVS Analysis Center Annual Report 2012

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Abstract

This report summarizes the activities of the KTU-GEOD IVS Analysis Center (AC) in 2012 and outlines planned activities for the year 2013. The analysis of European VLBI Network sessions is one of our specific interests, and the combination of different AC solutions for continuous VLBI campaign, e.g. CONT11 will be investigated.

1. General Information

KTU-GEOD IVS Analysis Center (AC) is located at the Department of Geomatics Engineering, Karadeniz Technical University, Trabzon, Turkey.



Figure 1. KTU-GEOD staff at Vienna State Opera.

2. Staff at KTU-GEOD

The staff who are contributing to the researches at KTU-GEOD IVS Analysis Center (AC) in 2012 are listed in Table 1 by their main focus of research and working location.

3. Current Status and Activities

In 2012, we investigated sub-daily (3 hourly) antenna TRF coordinates estimated from the VLBI observations of the continuous 24h sessions of the CONT11 campaign [8]. We analysed VLBI observations using the Vienna VLBI Software (VieVS) which is developed at the Department of Geodesy and Geoinformation at the Vienna University of Technology [2]. Troposphere zenith wet delays (ZWD) and total gradients (east and north) were estimated as piece-wise linear offsets at one hour and 6 hours, respectively. Clock errors were estimated as hourly piece-wise linear offsets in addition to a quadratic polynomial. Source coordinates were fixed to ICRF2 [3]. The

Table 1. Staff members of KTU-GEOD ordered alphabetically.

Name	Working location	Main focus of res.	Contact
Emine Tanır Kayıkçı	Karadeniz Technical University, Dept. of Geomatics Engineering, Trabzon, Turkey	Responsibility for the Analysis Center and data processing	etanir@ktu.edu.tr
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IERS C04 08 series [1] was taken as a priori values of Earth Orientation Parameters, and high frequency ocean tidal corrections were modeled as recommended by the IERS Conventions 2010 [5]. Earth orientation parameter residuals were estimated as one offset per 24 hour VLBI session. An a

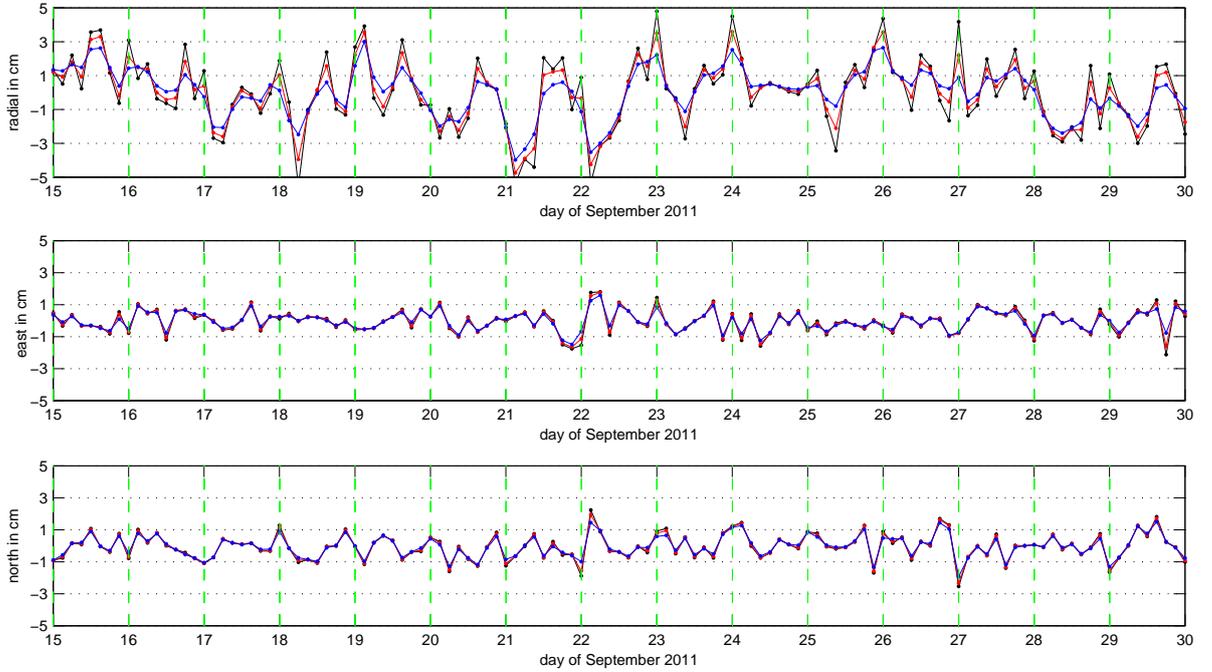


Figure 2. Kokee VLBI antenna piece-wise (pw) coordinate offsets at 3 hour intervals. Weighted mean of pw coordinate offsets were calculated at the overlapping 24h session boundaries. The black, red, and blue dotted lines denote to the pw coordinate estimates when loose relative constraints as 5cm, 2cm, and 1cm after 3 hours were imposed [8].

priori TRF was estimated from a global solution of CONT11 where antenna velocities were fixed to those of VTRF2008. In the global solution, TRF datum condition equations were introduced on the accumulated datum free normal equation system in such a way that the estimated TRF has no-net-translation (NNT) and no-net-rotation (NNR) with respect to VTRF2008. Atmospheric loading

[6] and tidal ocean loading corrections (FES2004, [4]) were introduced to antenna coordinates for each observation before the adjustment. All the antenna coordinates were fixed to the TRF (from global solution) except one antenna of which coordinates were estimated as piece-wise linear offsets at 3 hour intervals. Different loose relative constraints on the coordinate estimates of this one antenna were imposed for each analyses of CONT11 campaign as: 5 cm, 2 cm and 1 cm after 3 hours (see Figure 2). Readers are referred to [7] and [10] to get more information on the analysis of VLBI observations.

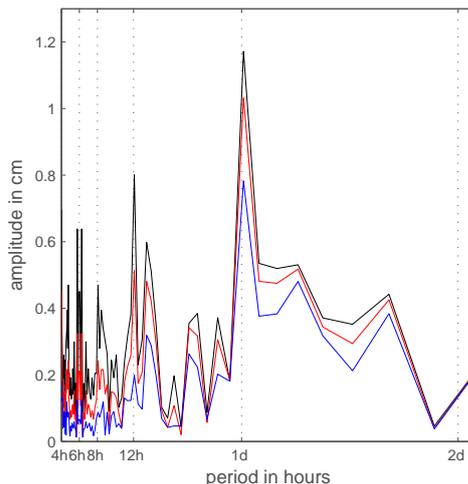


Figure 3. Fourier spectra of piece-wise (pw) coordinate offsets on radial direction at 3 hour intervals at Kokee. The black, red, and blue dotted lines denote to the pw coordinate estimates when loose relative constraints as: 5cm, 2cm, and 1cm after 3 hours were imposed [8].

The reasons of large unrealistic leaps of 3 hourly antenna coordinates, especially on radial components are investigated (e.g. shown for Kokee in Figure 2). One of the possible reasons might be the large correlation between certain parameters (e.g. clock errors, troposphere delays, source coordinates, Earth rotation parameters) and antenna coordinates at sub-daily intervals. One of the possible reasons might be the unreduced tidal effects on the antenna coordinates. In this case, one might ask whether the radial amplitudes of the tidal variations can reach up to e.g. 1 cm (see black and red lines at 1 day period in Figure 3) even though antenna coordinates are corrected at each observation epoch using state-of-the art geodynamic models? The correct answer to this question needs further investigation. In Figure 3, the significant amplitude of 8 mm at 12 hour (black line) vanishes when 1 cm after 3h relative constraint (blue line) was imposed in the analyses. Thus, selecting really loose constraints is essential in order to not to hide the dependencies (shared variances) between parameters in the observation equations. Further investigations are discussed in [8].

4. Future Plans

We will continue to analyse VLBI sessions with different parametrization, focusing on the European VLBI Network by using VieVS. In 2013, we will study on intra-technique combination

of different AC solutions of the continuous VLBI campaigns i.e. CONT02, CONT05, CONT08, and CONT11. Besides, we will do statistical comparisons between certain geodetic parameters e.g. troposphere [9].

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