

# KTU-GEOD IVS Analysis Center Annual Report 2014

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**Abstract** This report summarizes the activities of the KTU-GEOD IVS Analysis Center (AC) in 2014 and outlines the planned activities for 2015. Determination of optimal weights of constraints on VLBI auxiliary parameters as well as estimation intervals is our specific interest in 2015.

**Table 1** Staff.

Name	Working Location
Emine Tanır Kayıkçı	Karadeniz Technical University, Dept. of Geomatics Engineering, Trabzon, Turkey.
Kamil Teke	Hacettepe University, Dept. of Geomatics Engineering, Ankara, Turkey.

## 1 General Information

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

## 2 Staff at KTU-GEOD Contributing to the IVS Analysis Center

The staff who contributed to the research at the KTU-GEOD IVS Analysis Center (AC) in 2014 are listed in Table 1 with their working location.

## 3 Current Status and Activities

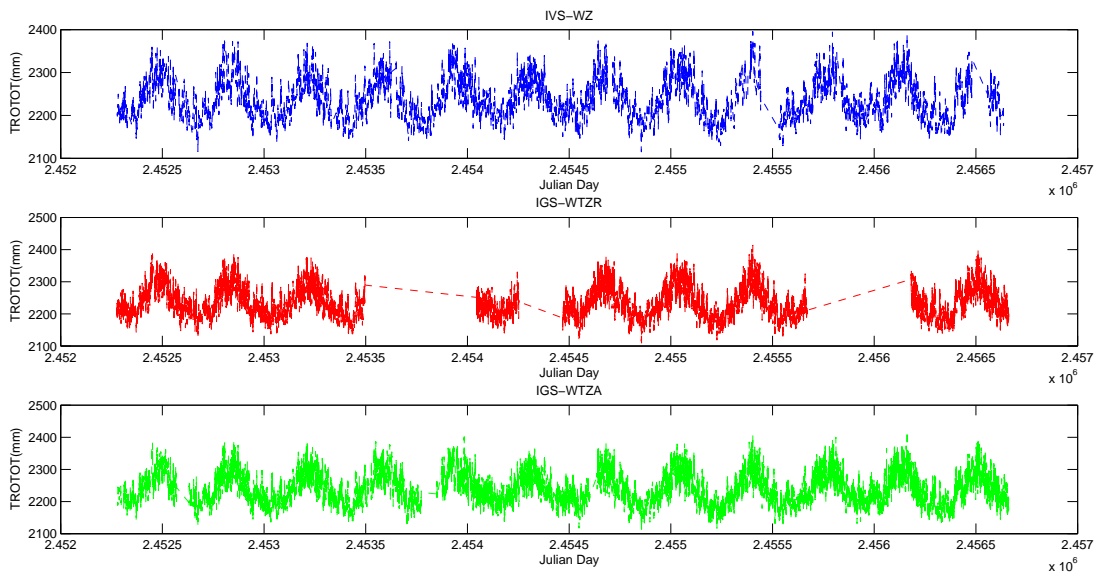
During 2014, we focused on inter-technique comparisons of different parameters estimated from the

1. Karadeniz Technical University, Department of Geomatics Engineering

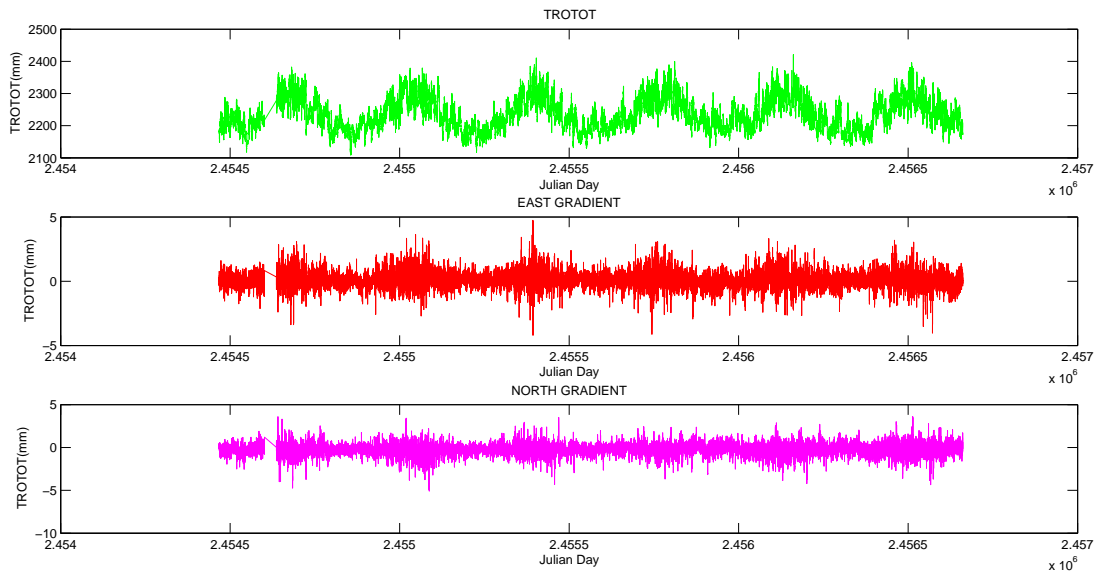
2. Hacettepe University, Department of Geomatics Engineering

observations of the space/satellite geodetic techniques i.e. VLBI (Very Long Baseline Interferometry), GNSS (Global Navigation and Satellite Systems), and DORIS (Doppler Orbitography and Radio Positioning Integrated by Satellite). The zenith tropospheric delays (ZTD) and horizontal total gradients derived from IGS [1] and IVS [2] of the co-located site Wettzell between 2002—2013 are shown in Figures 1 and 2 [3].

The GNSS-derived Zenith Tropospheric Delays (ZTDs) play an important role in meteorological studies by means of incorporating ZTDs at GNSS sites into numerical weather prediction models. The Trop-NET system (reference) developed at the Geodetic Observatory Pecny (GOP, RIGTC) in order to facilitate near real-time troposphere monitoring using ground-based GNSS data (based on the Bernese GNSS Software, [4]) was installed and has been routinely used at the KTU-GEOD IVS AC since September 2014. KTU-GEOD IVS AC established a cooperation with GOP within the COSTES1206 Action (GNSS4SWEC, WG1). Approximately 33 sites from IGS and EUREF permanent networks in entire Europe were selected for an initial setting and testing [5, 6]. These are ANKR Ankara (Turkey), ARG1 Thorshavn (Faroe Islands), AUT1 Thessaloniki (Greece), BRST Brest (France), BUCU Bucurest (Romania), GLSV Kiev



**Fig. 1** Troposphere ZTD estimates derived from IVS and IGS intra-technique combined solutions at the co-located site Wettzell.



**Fig. 2** Troposphere north and east gradients from IGS intra-technique combined solution at the co-located site Wettzell.

(Ukraine), GOPE Pecny (Czech Republic), HOFN Maspalomas (Spain), MATE Matera (Italy), MEDI Hoefn (Iceland), ISTA Istanbul (Turkey), JOZE Medicina (Italy), METS Metsähovi (Finland), MORP Jozefoslaw (Poland), KIRU Kiruna (Sweden), KTVL Morpeth (UK), NICO Nicosia (Cyprus), ONSA Katzively (Ukraine), M0SE Roma (Italy), MASI Onsala (Sweden), ORID Ohrid (Macedonia), PDEL

Ponta Delgada (Portugal), PENC Penc Budapest (Hungary), POLV Poltava (Ukraine), POTS Potsdam (Germany), PUYV Le Puy en Velay (France), RIGA Riga (Latvia), SOFI Sofia (Bulgaria) VLNS Vilnius (Lithuania), WTZR Wetzell (Germany), YEBE Yebes (Spain), ZECK Zelenchukskaya (Russia), and ZIMM Zimmerwald (Switzerland). Because some of the GNSS core stations are selected as co-located with VLBI antennas and the two techniques mostly share similar models, inter-technique comparisons will be performed between the common parameters of VLBI and GNSS techniques that is one of the interests of the meteorology community.

#### 4 Future Plans

Together with Dr. Vincenza Tornatore as PMD (Politecnico di Milano) AC's team coordinator, Dr. Tanır Kayıkçı plans to perform an inter-technique comparison of certain common parameters and a combination of TRF from the analyses of the DORIS and VLBI observations. The output of this study will be submitted as a paper for the DORIS special issue of the Journal of Advances in Space Research in 2015. One of the members, Kamil Teke, plans to investigate the possibility of improving the accuracy of certain types of VLBI parameters using Vienna VLBI Software, VieVS [7].

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#### References

1. J.M. Dow, R.E. Neilan, C. Rizos, The International GNSS Service in a changing landscape of Global Navigation Satellite Systems, *J. Geod.*, 83, 3-4, 191-198, 2009.
2. H. Schuh, D. Behrend, VLBI: a fascinating technique for geodesy and astrometry, *J. Geodyn.*, 61, 68-80, 2012.
3. N. Mammadaliyev, Analysis of IVS and IGS Combined Tropospheric Time Series and Outlier Detection, Diploma Thesis, Karadeniz Technical University, Department of Geomatics Engineering, Supervisor: E. Tanır Kayıkçı, Trabzon, Turkey, 2014 (in Turkish).
4. R. Dach, U. Hugentobler, P. Fridez, M. Meindl (eds), Bernese GPS Software Version 5.0, Astronomical Institute, University of Bern, 2007.
5. J. Douša, Precise near real-time GNSS analyses at Geodetic observatory Pecný - precise orbit determination and water vapour monitoring, *Acta Geodyn Geomater.*, 7, 157, 1-11, 2010.
6. URL 1: GOP's Trop-NET system for near real-time troposphere monitoring, <http://www.pecny.cz/gop/index.php/trop-net/trop-net-intro>, Date of Access: December 2014.
7. J. Böhm, S. Böhm, T. Nilsson, A. Pany, L. Plank, H. Spicakova, K. Teke, H. Schuh, The new Vienna VLBI Software VieVS, in Proceedings of IAG Scientific Assembly 2009, International Association of Geodesy Symposia Series Vol. 136, edited by S. Kenyon, M. C. Pacino, and U. Marti, p. 1007-1011, 2012.