The IVS Analysis Center at the Onsala Space Observatory

Rüdiger Haas, Hans-Georg Scherneck, Tobias Nilsson

Abstract

This report briefly summarizes the activities of the IVS Analysis Center at the Onsala Space Observatory during 2007. Some examples of ongoing work are presented.

1. Introduction

We concentrate on a number of research topics that are relevant for space geodesy and geosciences. These research topics are addressed in connection to data observed with geodetic VLBI and complementing techniques. As in previous years the main focus was on high-frequency Earth orientation, loading phenomena, and atmospheric water vapor. Some topics are briefly presented in the following.

2. hfEOP from VLBI CONT Campaigns

In collaboration with Anna Korbacz from the Space Research Centre of the Polish Academy of Sciences, we continued our work on high-frequency EOP variations from VLBI CONT campaigns [1]. Anna stayed at Onsala for 2 months on a stipend provided by the Descartes-Nutation consortium. During her stay we worked on the application of various spectral analysis techniques on the VLBI CONT data with a focus on the previously detected ter-diurnal signals [2]. One result of this work is that the possibility that the ter-diurnal signals are caused by the actual VLBI data analysis could be ruled out with high probability. Another result is that predicted high-frequency EOP variations based on a recent ocean model with high temporal resolution cannot explain the detected signals either. Further work on this topic is needed.

3. Ocean Tide and Atmospheric Loading

The automatic ocean tide loading service [3] has been maintained. The transition to a new computer described previously [1] was successful and resulted in faster processing speed in 2007 as compared to earlier years.

4. Contributions to VLBI2010 Simulations

We contributed to the VLBI2010 simulation work by determining equivalent zenith wet delays for VLBI2010 simulation schedules [4]. These tropospheric parameters are determined using a turbulence model [5] together with wind data and tropospheric height scale from a numerical weather model [6]. The turbulence parameters are determined from high-resolution radiosonde data, and a global model for turbulence as a function of latitude was developed. Figure 1 gives an example for these simulations for the Station Ny-Ålesund on Spitsbergen, and shows the scale height, wind speed and direction at the 850 hPa level, and the simulated equivalent wet delay values for 25 continuous days.

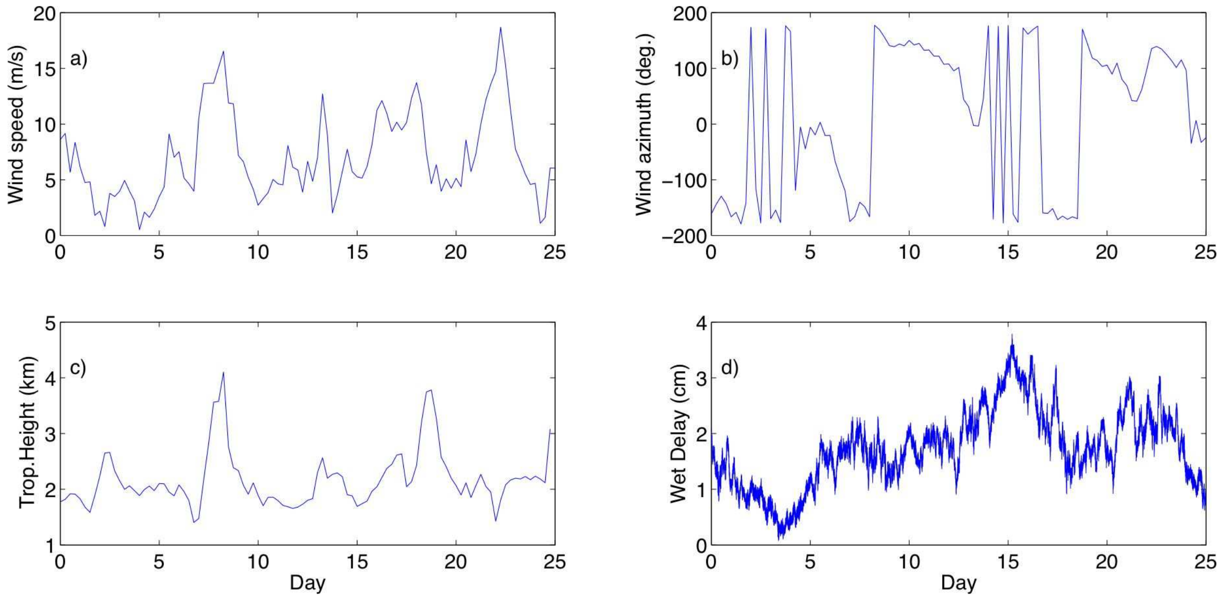

Figure 1. Example of VLBI2010 simulations of equivalent zenith wet delay values for Ny-Ålesund. Shown are a) wind speed, b) wind direction, c) tropospheric height, and d) simulated equivalent zenith wet delays.

5. Contribution to the IVS TROP Project

The submission of solutions of tropospheric parameters of the R1 and R4 experiments was interrupted during 2007 due to the transition of the Calc/Solve analysis from an HP system to a Linux system. We plan to resume participation in this project during 2008.

6. Results from the Fennoscandian-Japanese Ultra-rapid dUT1 Observations

During 2007 we started a collaboration with colleagues at Metsähovi, Kashima and Tsukuba to observe dUT1 with very low latency. Several ultra-rapid dUT1 experiments were observed in 2007. All of them used real-time e-VLBI data transfer from Fennoscandia to Japan and near real-time data conversion, near real-time or off-line correlation, and preparation of VLBI databases and data analysis. Figure 2 shows the network constellation with the long east-west baselines that are well-suited for earth rotation observations. In the best cases dUT1 results were available within 30 minutes after the end of an observing session. We did a post-processing analysis of the experiments and show in Figure 3 the dUT1 of the Fennoscandian-Japanese experiments together with the final VLBI dUT1 values provided by the USNO. Time series of dUT1 after subtraction of a linear trend and the differences between the two series are shown. With the exception of experiments that had severe technical problems causing loss of observations, e.g. October 2007 and November 2007, the agreement between the two series is within about 60 μs. Further studies focussing on the role of scheduling options, data rate, and analysis strategies are ongoing.

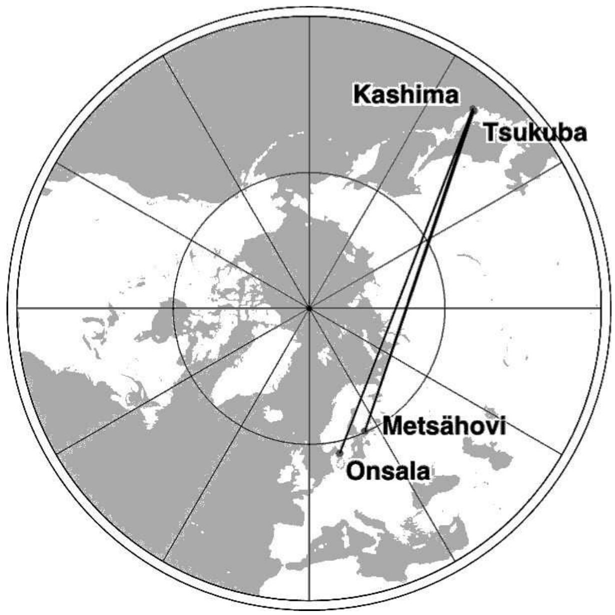

Figure 2. The network configuration for the Fennoscandian-Japanese ultra-rapid dUT1 measurements.

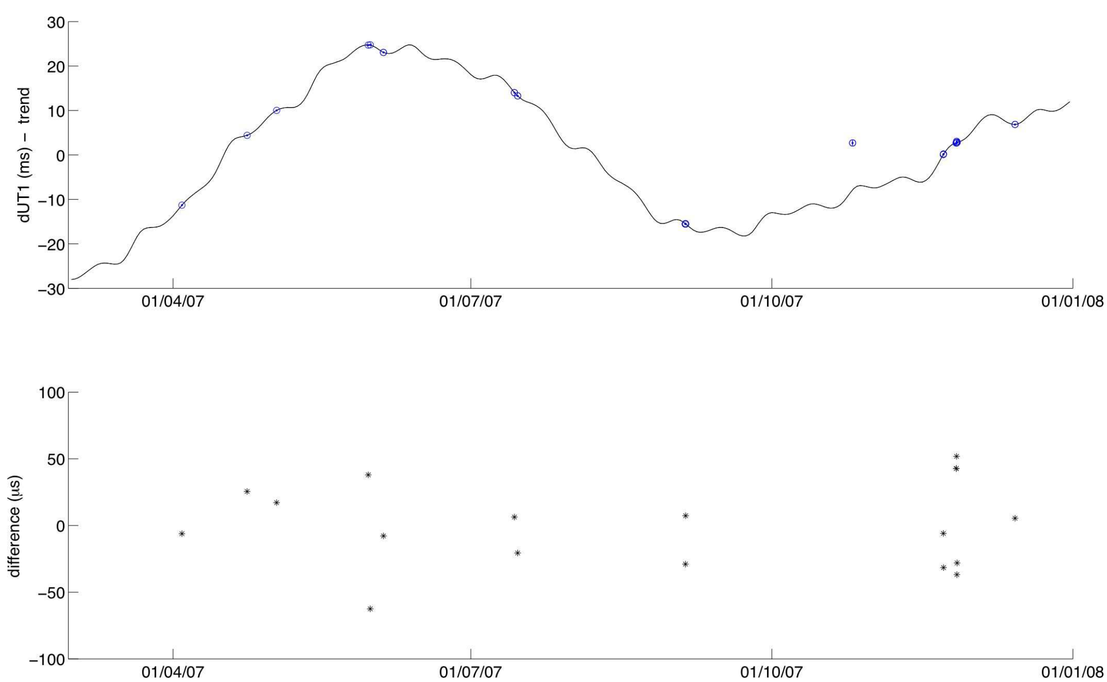

Figure 3. dUT1 values after subrtacting a linear trend. Top: Final UT1 values of the USNO (continuous line) and results of the Fennoscandian-Japanese ultra-rapid dUT1 experiments (circles). Bottom: The corresponding differences.

7. Outlook

The IVS Analysis Center at the Onsala Space Observatory will continue its efforts to work on specific topics relevant for space geodesy and geosciences.

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