

**Gregor Möller**

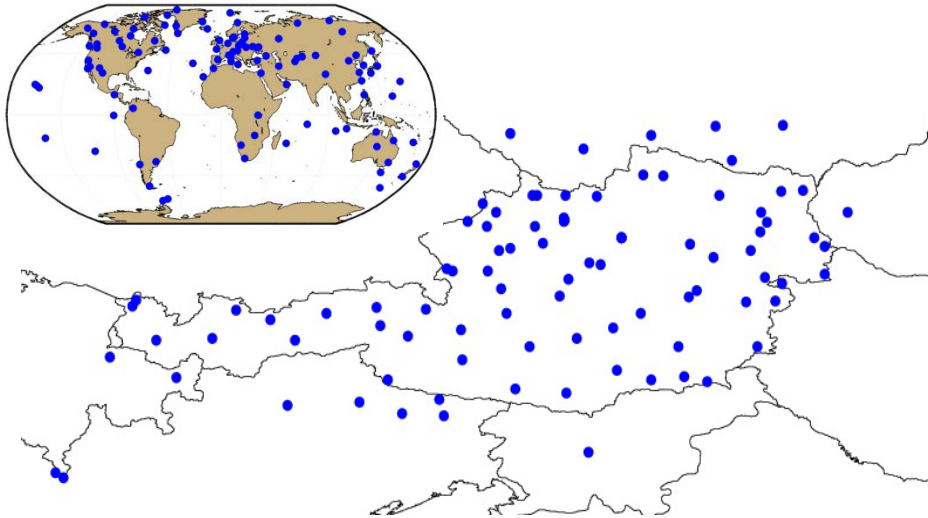
Vienna University of Technology



**Xin Yan**

Central Institution for Meteorology  
and Geodynamics





Access to GNSS observations  
of about 90 Austrian sites  
in near real-time

ZTDs, Gradients, ZWDs and SWDs for  $\sim 90^*$  regional and  $\sim 150^*$  global GNSS sites

VMF1 mapping coefficients and ray-traced ZHDs and ZWDs on a global  $2.5^\circ \times 2.0^\circ$  grid and for all GNSS sites of the IGS

\* ZWD and SWD depends on the available meteo data



VARBC (variational bias correction) is a new method to replace the old static method to calculate the bias in the NWP system where the ZTD has been assimilated.

Old way: bias is fixed for different seasons

New way: bias is estimated during the assimilation process together with the model variables and is updated after every forecast run

GNSS-ATom (10/2013 – 09/2015)



Find „best“ approach to obtain SWD (differenced / undifferenced)

Reconstruct wet refractivities ( $N_{\text{wet}}$ ) from SWD ( $x = A^{-1} m$ )





Assimilation of  $N_{\text{wet}}$  into high-resolution weather model AROME

*Gregor Möller, Robert Weber, Johannes Böhm: GNSS Tomography of the Atmosphere – Expectation from Galileo FOC, Conference Paper, 4th International Colloquium, Prague, Czech Republic, 4-6 Dec 2013*

The assimilation of the 3D tomography wet refractivity index into the high resolution AROME model is conducted in collaboration with Meteo France

So far the forward observation operator has been developed. More work is undergoing for the pre-processing part.

Simple equation (Smith and Weintraub 1953) for refractivity calculation is used for writing the operator:  $N_{\text{wet}} = k_3(e/T^2)$




**TROPSY (01/2013 – 09/2014)**    

Troposphere model GPT2w – operable in blind mode / with data reflecting the actual state of the troposphere.

GPT2w provides mean, annual and semiannual terms of  $p$ ,  $T$ ,  $T_m$ ,  $dT$ ,  $Q$ ,  $\lambda$ ,  $a_h$ ,  $a_w$  on a global  $1^\circ$  grid

*Johannes Böhm, Gregor Möller, Michael Schindelegger, Gregory Pain, Robert Weber: Development of an improved empirical model for slant delays in the troposphere (GPT2w), GPS Solution, DOI 10.1007/s10291-014-0403-7, Aug 2014*

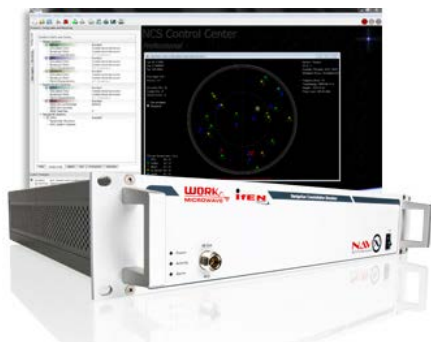
*Gregor Möller, Robert Weber, Johannes Böhm: Improved Troposphere Blind Models Based on Numerical Weather Data, NAVIGATION: Journal of The Institute of Navigation, Vol.61, No. 3, Sept 2014*

**ISR-Atmosphere (10/2014 – 09/2015)**   

Use of Galileo two frequency Inter-Satellite Ranges (ISR) in K-Band for Troposphere Tomography and Ionosphere Monitoring

**RADIATE VLBI (05/2013 – 04/2016)**  

Improved VMF1 with higher spatial resolution and gradients



## **GNSS signal generator**

Providing GPS L1 and Galileo E1/E5 signals of a full GPS / Galileo constellation

Thank You



Gregor Möller

[gregor.moeller@tuwien.ac.at](mailto:gregor.moeller@tuwien.ac.at)