GFZ and DWD Report for E-GVAP

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E-GVAP Expert Teams and Plenary Meeting

28-29 November 2017, KNMI, De Bilt

GFZ Helmholtz-Zentrum Potsdam

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Overview of GNSS Processing at GFZ for ATMO

NRT processing (EPOS8, COST V2.2 format):

- GF1R "rapid" solution for E-GVAP (about 360 stations)
- GF1G "global" solution for E-GVAP (about 460 stations)
- GRUAN processing (delay > 1h)

NRT processing (EPOS6, COST V2.1 format):

- old E-GVAP GFZ_ product (about 290 stations)
- will run as long as required

RT processing (EPOS-RT):

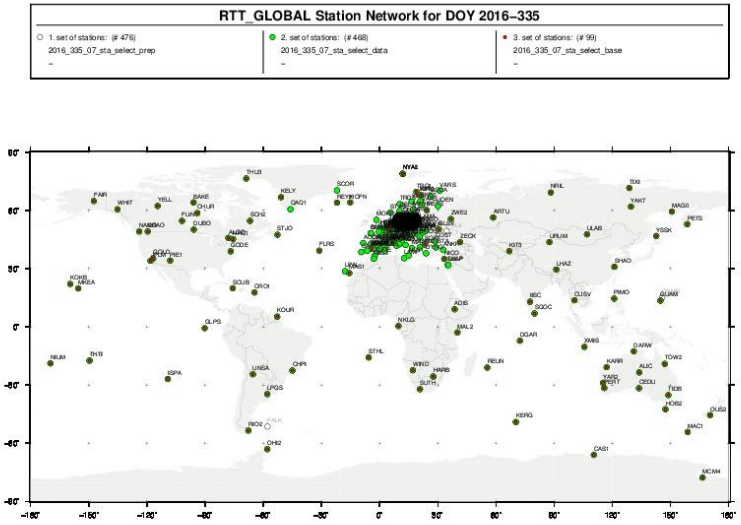
- GPS only, run for RT DEMO Campaign of COST GNSS4SWEC
- multi-GNSS, test processing in simulated mode

Reprocessing (e.g. for climate applications, on-going):

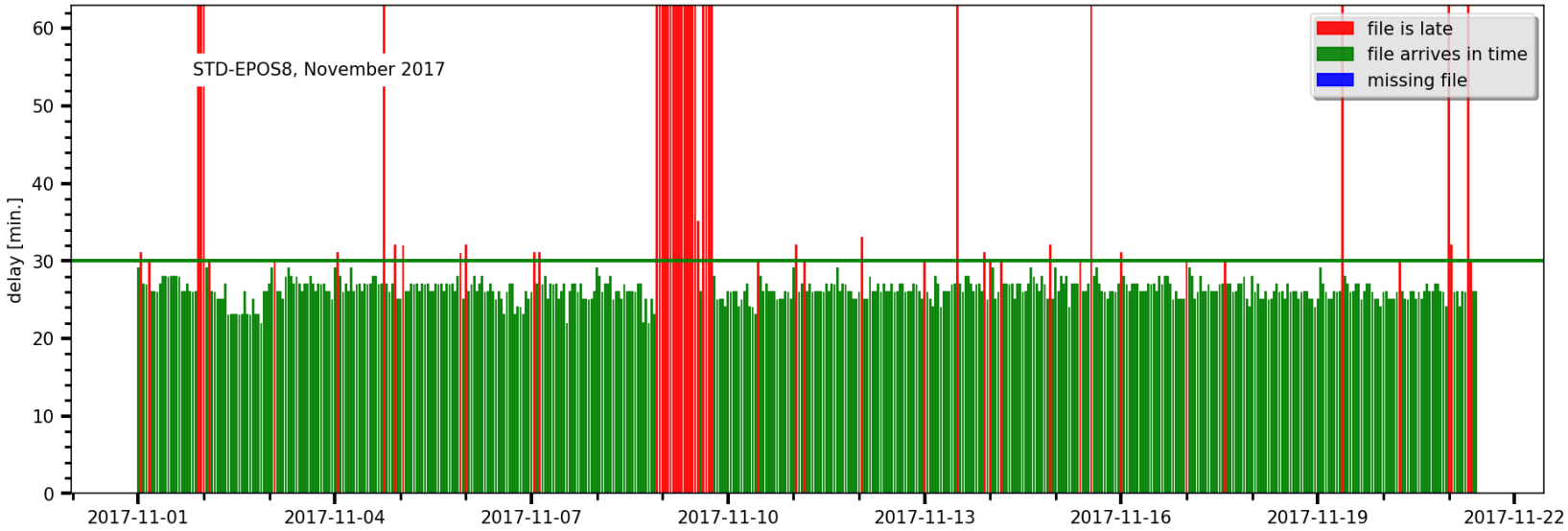
- German SAPOS + global IGS + EUREF + GRUAN networks
- about 700 stations in processing
- 2011-2016 ready, 2010 and years before are in processing
- ZTD/IWV/gradients/slants are available at GFZ ftp

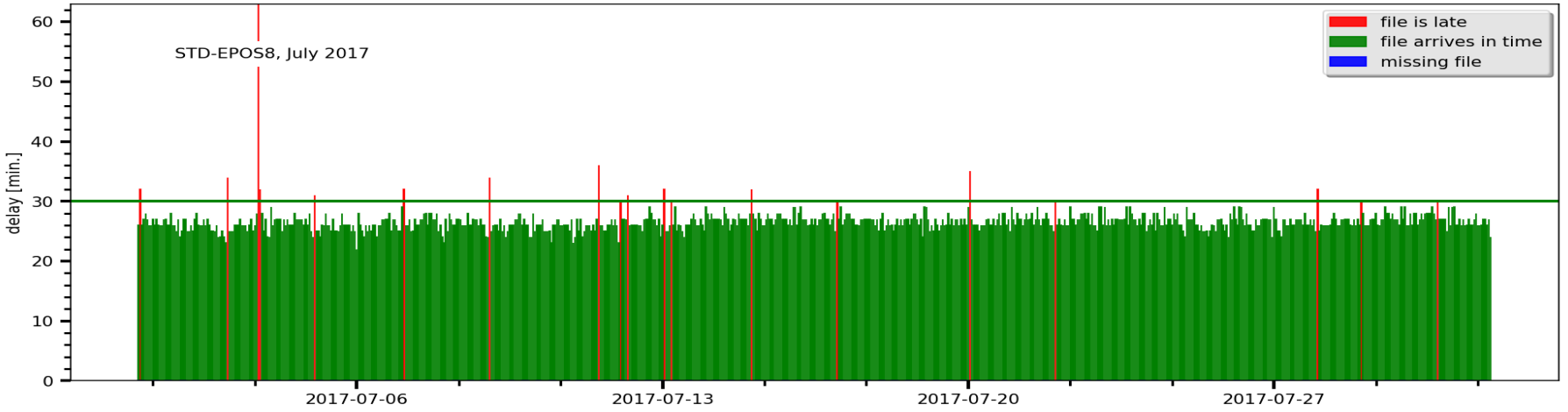
GFZ GF1R ("rapid") and GF1G ("global") solutions

- EPOS8 software (updated models, IERS/IGS standards), PPP strategy
- ZTD/IWV/STD products, GPS only, GLONASS in preparation
- ~360/~460 stations in processing (German SAPOS + EUREF + global IGS + GRUAN stations)
- ready at ~25/~58 minutes after the end of each hour
- upload to E-GVAP as "TEST" solution since November 2016
- 'operational' since March 2017
- open issues: replacement of GFZ_ with GF1R/GF1G in E-GVAP monitoring/validation and in UKMO warning system



Monitoring Statistics of STD-EPOS8 (GF1R)





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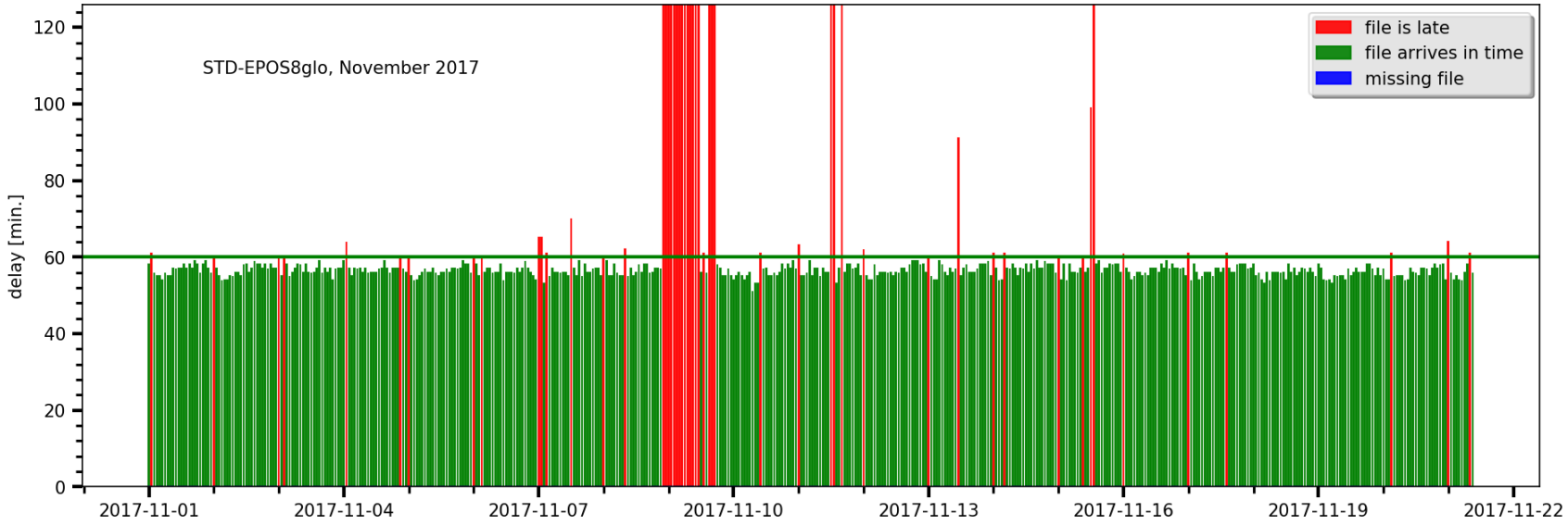
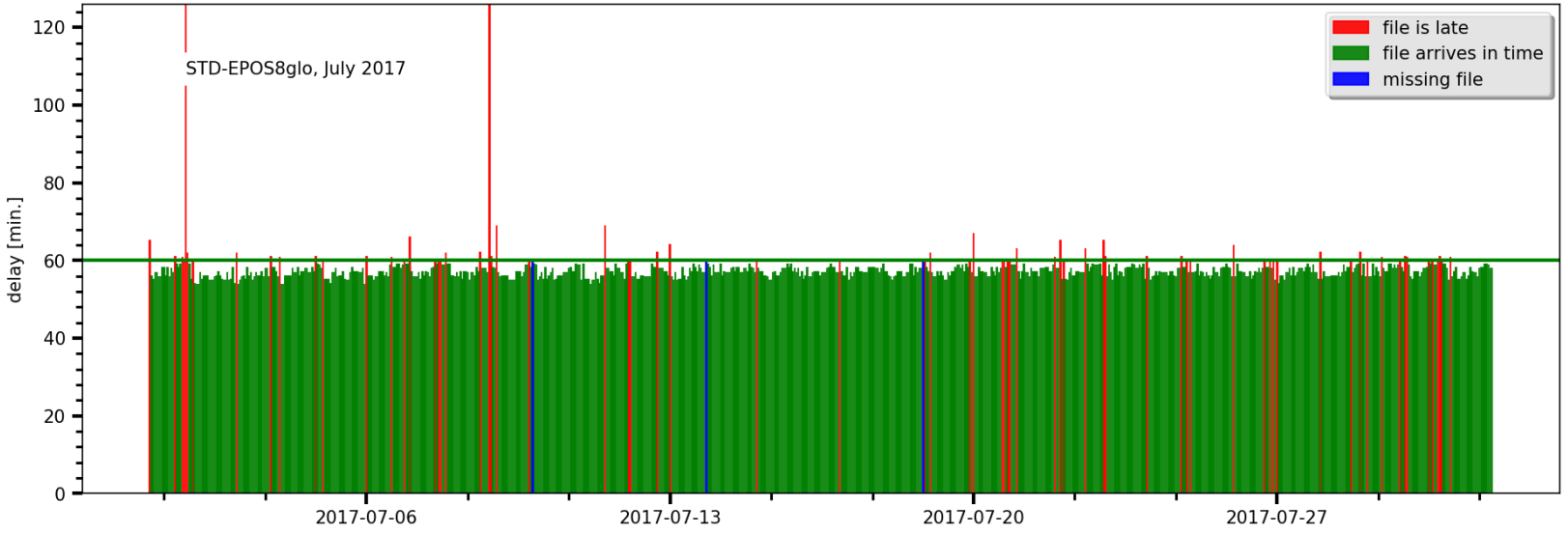
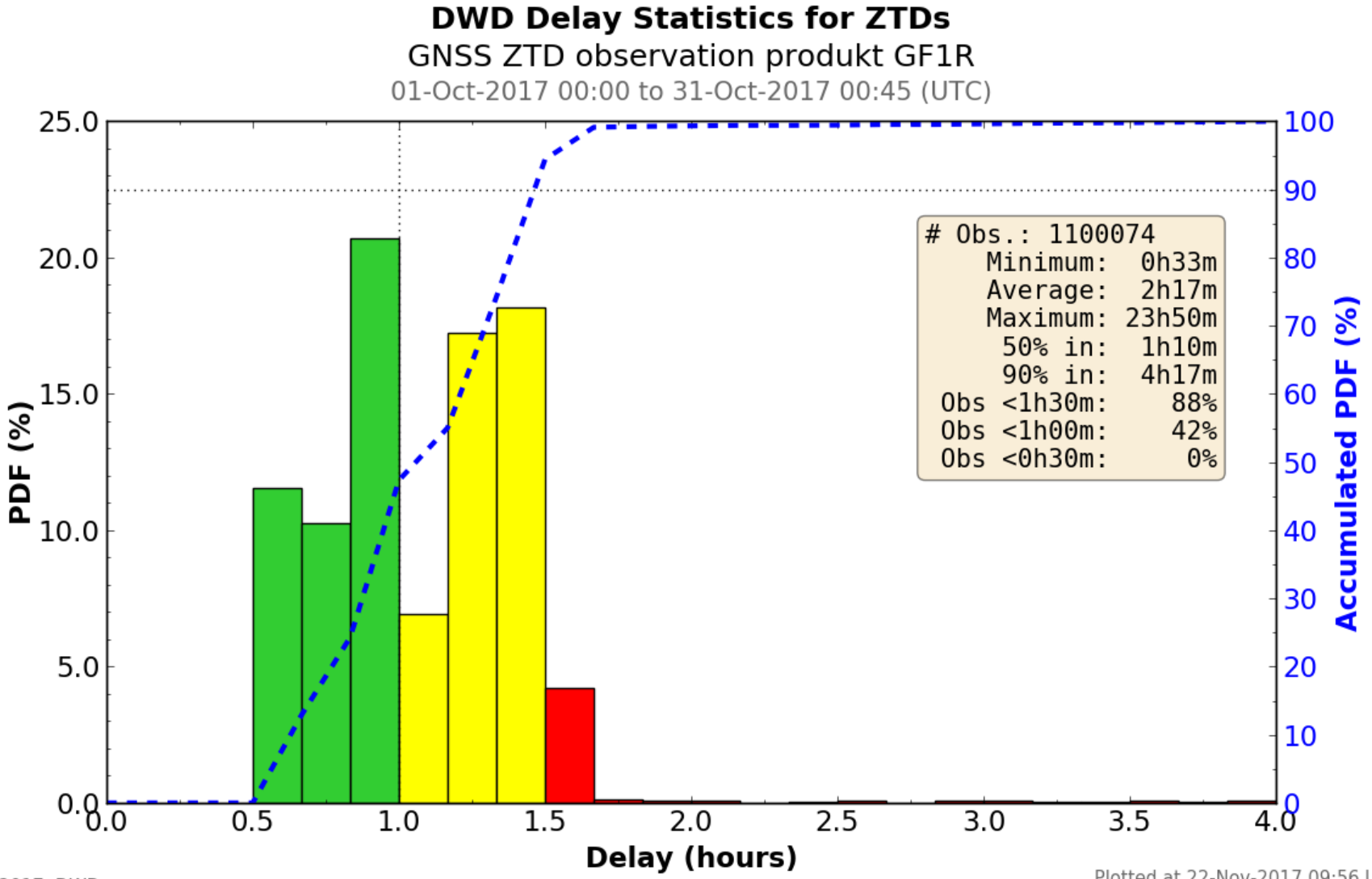
Monitoring Statistics of STD-EPOS8 (GF1G)





Monitoring Statistics of ZTD-EPOS8 (GF1R)



Plotted at 22-Nov-2017 09:56 UTC

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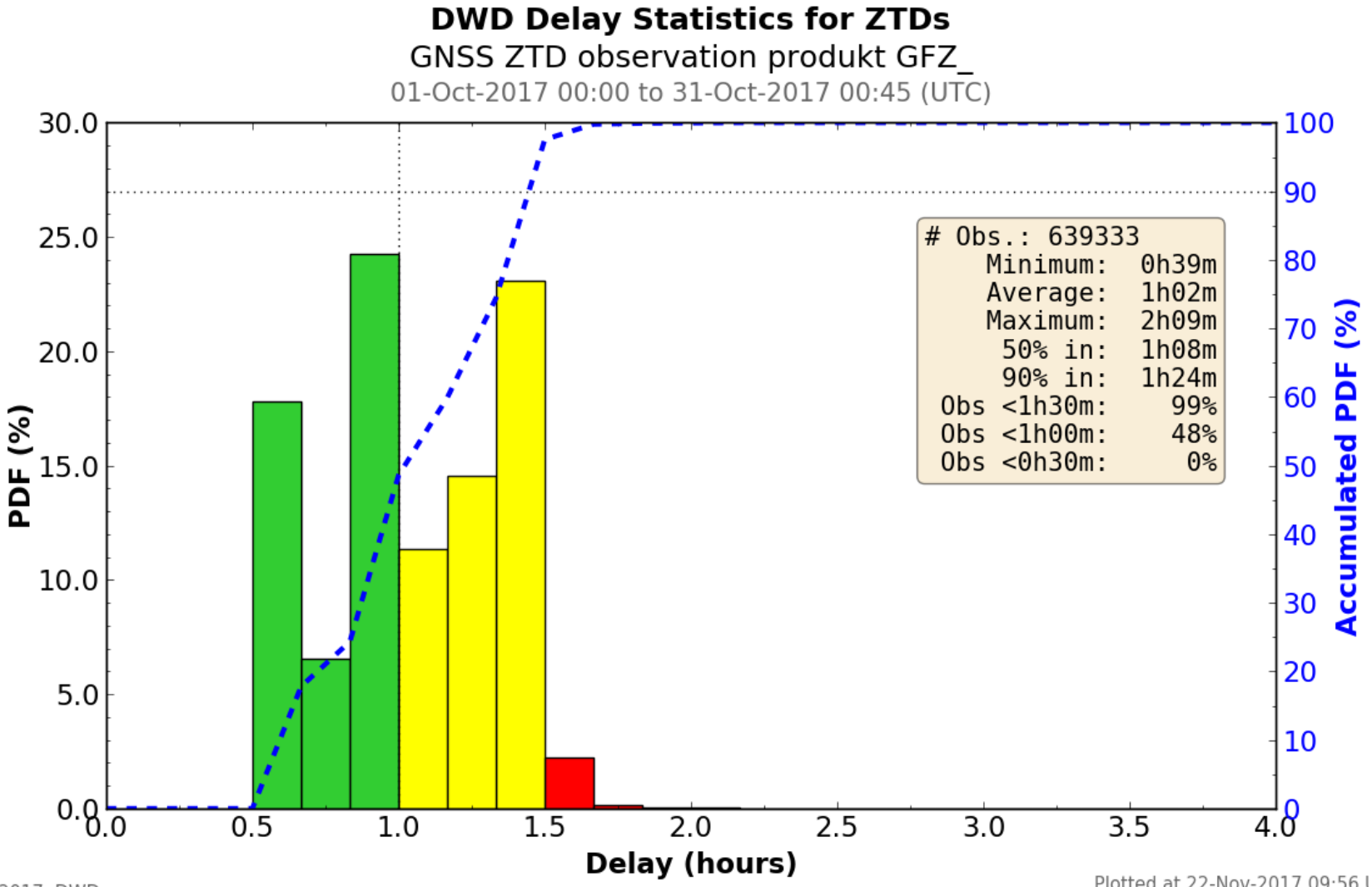
Monitoring Statistics of ZTD-EPOS6 (GFZ_)



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DWD: Current State of STD/ZTD assimilation

ZTD assimilation in ICON/En-Var (global model)
Development of a self-contained ZTD operator
Results of several ZTD assimilation experiments encouraging but still some open questions

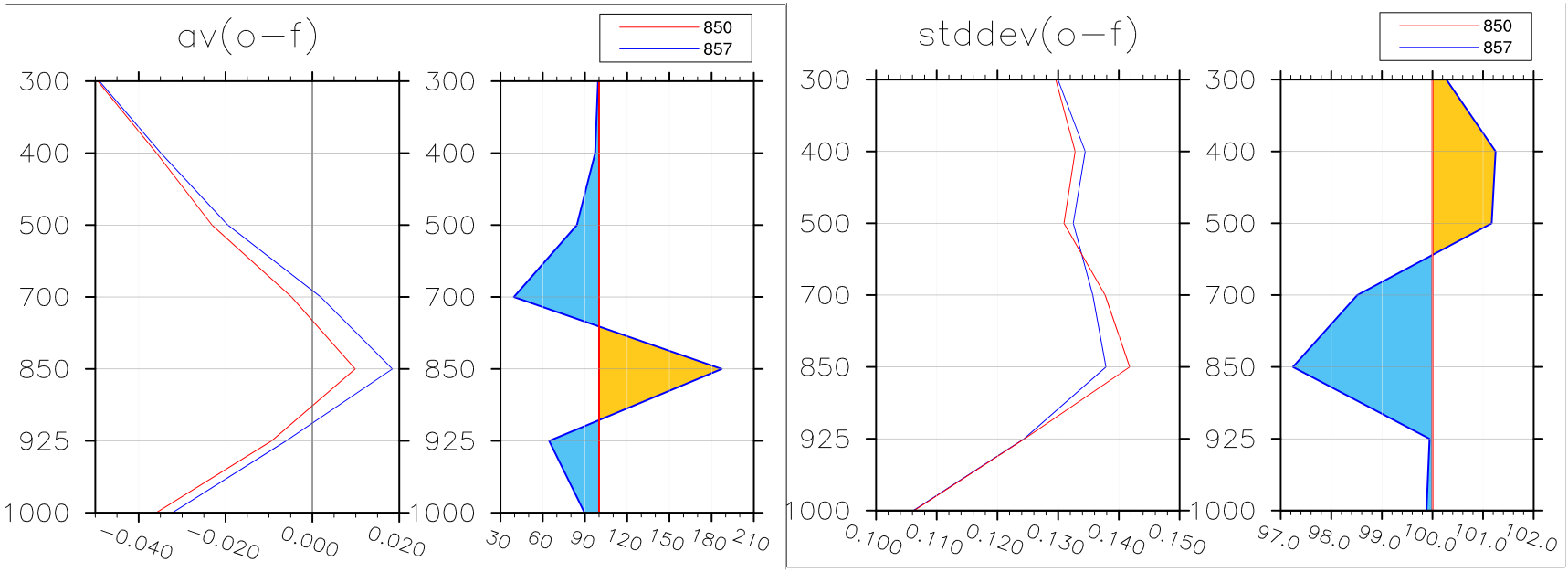
STD assimilation in COSMO-DE/LETKF (regional model)
Ongoing assimilation experiments
Localisation of STDs for the Local Ensemble Transform Kalman Filter (LETKF) is still an issue

Preparations for operational GNSS data assimilation
Improved monitoring of processed GNSS data
Ranking/selection of GNSS products which lead to best results with a given model
Black-/Whitelisting per GNSS product and station

ICON: ZTD Assimilation

ZTD assimilation experiment with ICON: 5.2.2017 – 28.2.2017
Operational setup plus ZTDs, 144 h forecasts (6 days)

First-guess verification of relative humidity with radiosondes for Europe



bias

standard deviation

Experiment 650 – reference, no ZTDs
Experiment 657 – ZTD assimilation experiment

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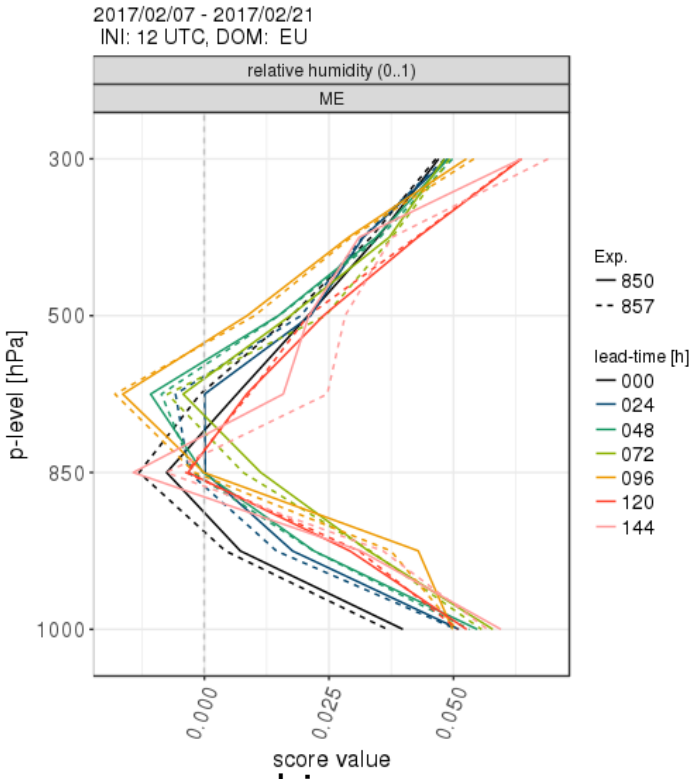
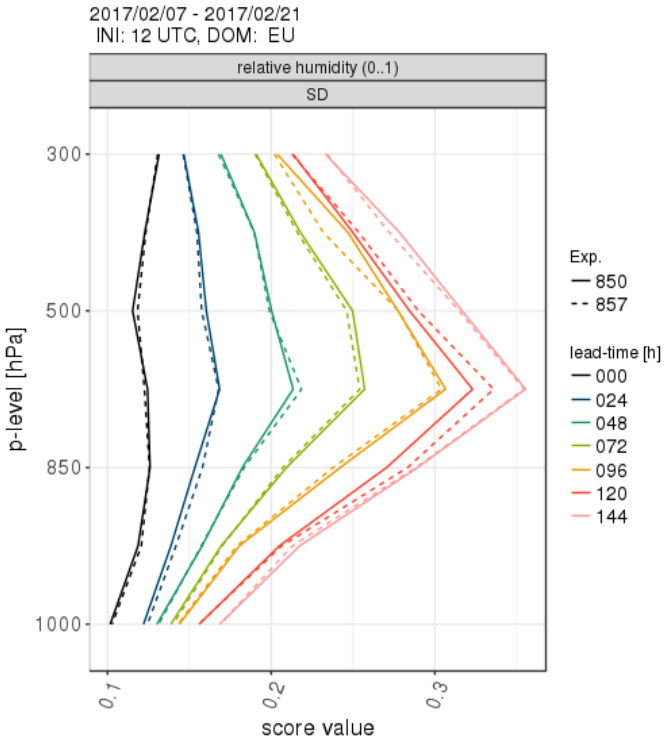
ICON: ZTD Assimilation

ZTD assimilation experiment with ICON: 5.2.2017 – 28.2.2017
Operational setup plus ZTDs, 144 h forecasts (6 days)

Forecast verification of relative humidity with radiosondes for Europe
Result: Small impact, neutral/positive, depending on lead time and height



bias



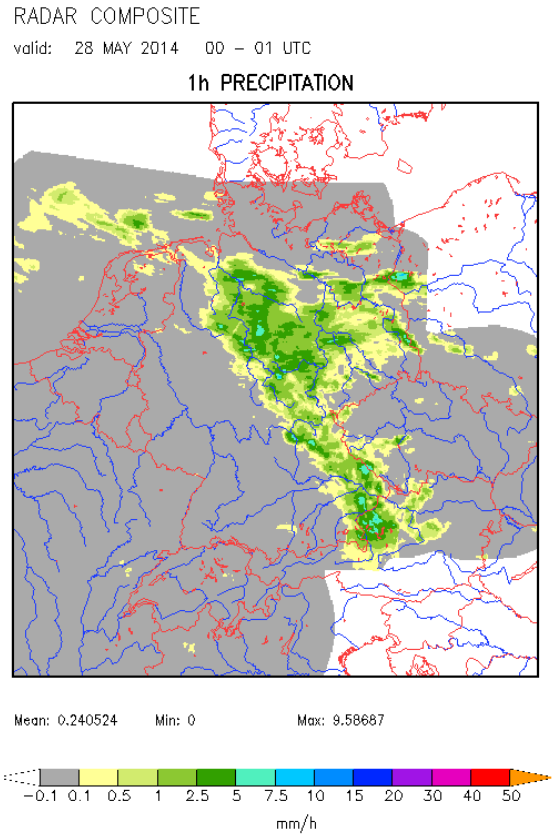
standard deviation

dashed lines – ZTD experiment

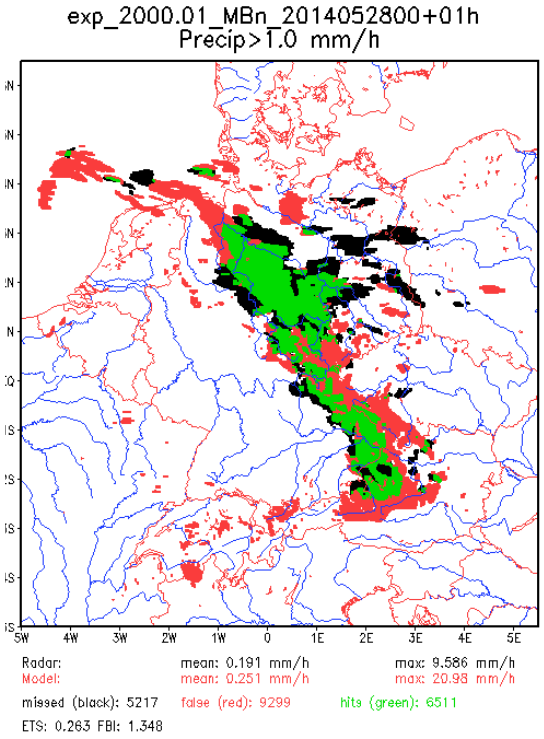
Positive Impact of Slants Assimilation on Rain Forecast

DWD results for 28 May 2014, 1:00 UTC, 0:00 UTC forecast, 1 mm/h threshold

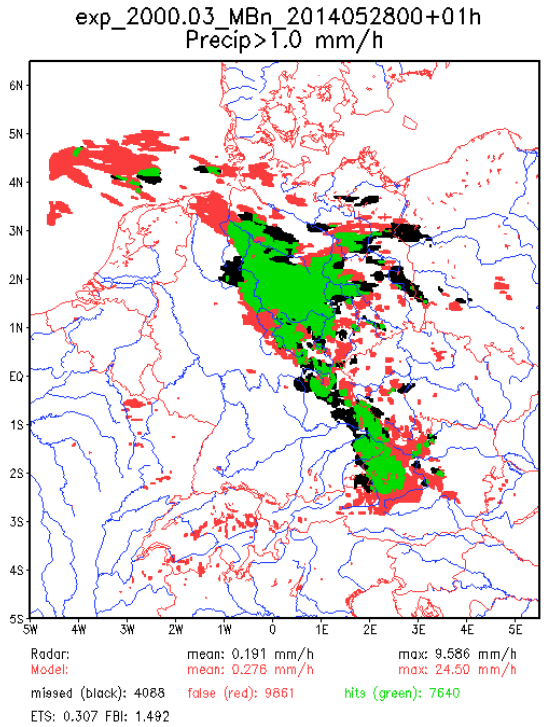
radar observations



control experiment



'slants' assimilation



	hit	miss	false	ETS
control experiment	**6511**	**5217**	**9299**	**0.283**
'slants' assimilation	**7640**	**4088**	**9861**	**0.307**

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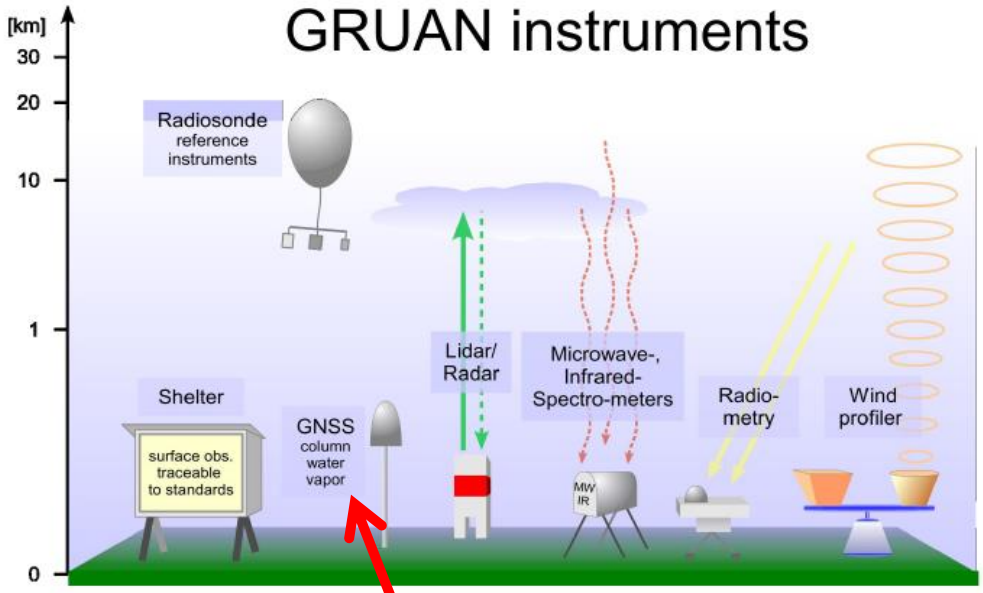
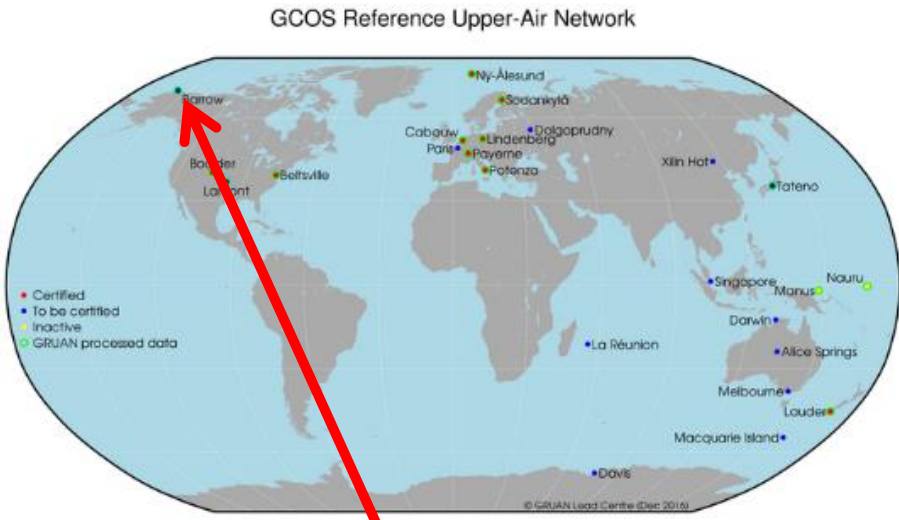
GNSS for Global Climate Observing System (WMO)

GCOS Reference Upper Air Network (GRUAN, 24 sites)



GNSS is standard technique for IWV monitoring



New GFZ GNSS station Barrow, Alaska

GFZ stations: Ny Alesund, Lindenberg, Boulder, Barrow, Sodankyla, Lauder

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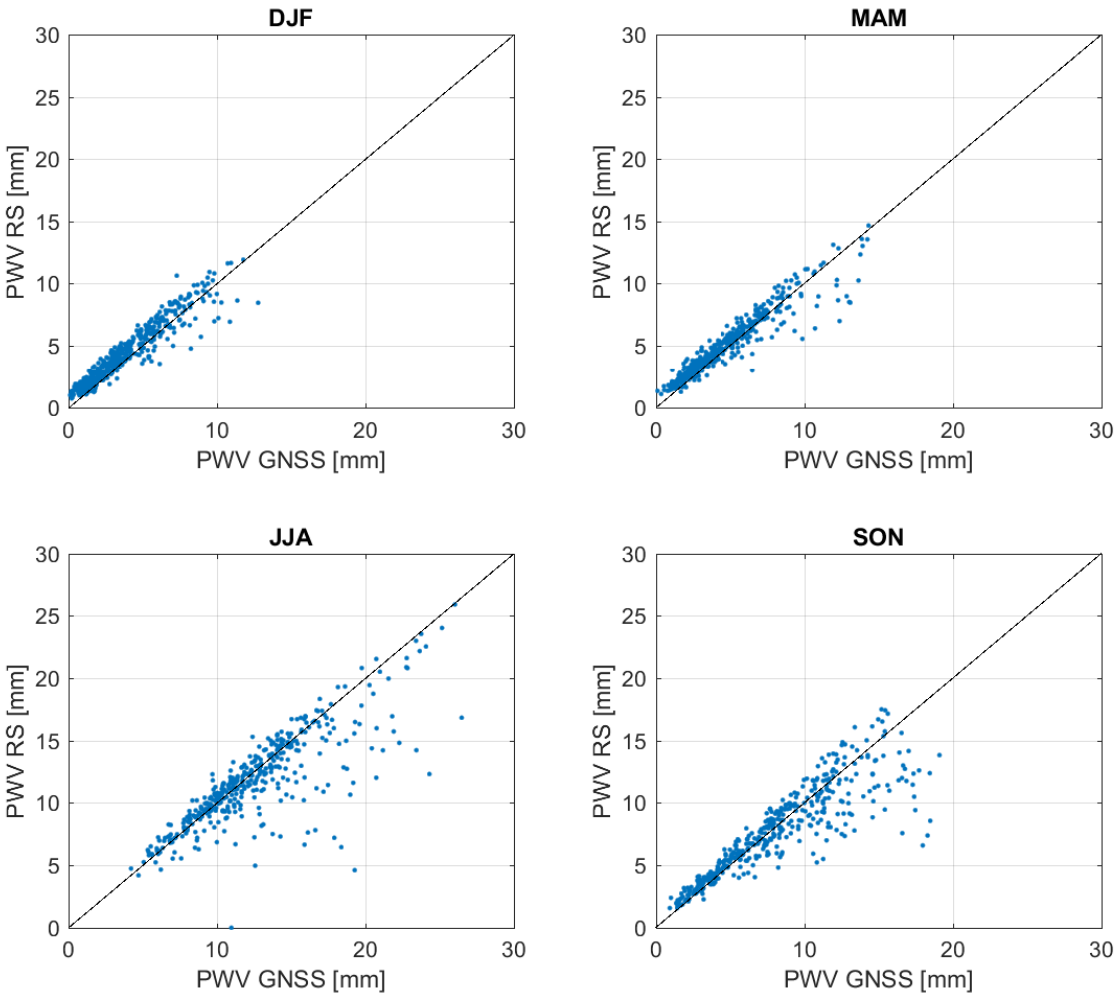
IWV Validation with Radiosonde for Ny Alesund



IWV results from GNSS data for 2011-2016 compared seasonally with RS at Ny Alesund GRUAN site

Courtesy: F. Alshawaf (GFZ)

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GFZ Products on FTP

ftp ftp.gfz-potsdam.de

user: anonymous

NRT:
cd /GNSS/products/nrttrop/product_COST_EPOS8/y****/m**
cd /GNSS/products/nrttrop/product_COST_GLOBAL_EPOS8/y****/m**

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Many thanks for your attention!