

ASI Analysis Center E-GVAP Report



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- ASI E-GVAP AC Processing Status:
ASI_, ASIC and ASIS solutions
- GNSS Tropo Grid Creator

ASI delivers 3 solutions to E-GVAP

ASI:

- **Gradients are included in the cost files**
- **More Italian sites are processed through ASI agreements with Italian regional institutions.**
- **I'm working to include other regional networks, it takes time but I hope to have them for the next year report.**

ASIC:

- **It's important for us to coordinate the switch to the new format/naming convention because,**
 - **1) for the time being file with the new naming convention are not recognized**
 - **2) for each site the header section is copied from the first AC in the list used for the combination so we risk to mix different format in one cost file.**

ASIS:

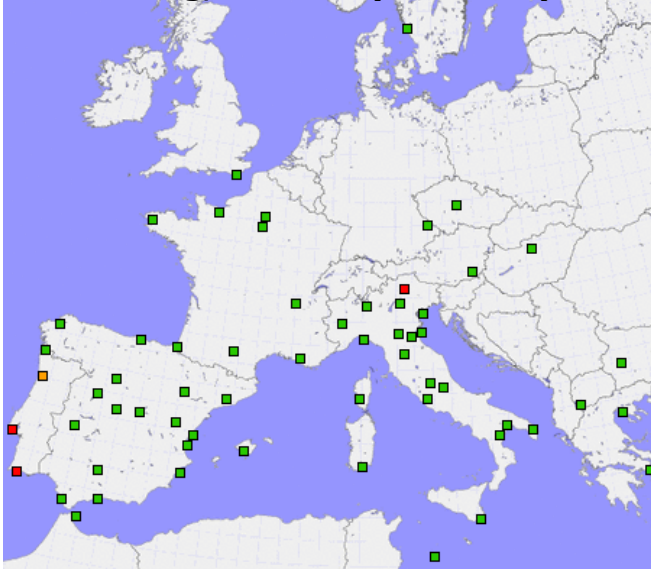
- **Even if I started sending them officially at the beginning of Aug, I must admit that till the November 14 their quality is not good. I don't know exactly if I mixed up something in the bnc configuration file when I switched from Bnc28 to Bnc29 so I decided to go back to Bnc28 and, starting from 14nov, everything is ok.**
- **The ASIS network has been chosen in collaboration with W. Shone (BKG), the stations we are processing are the EPN/IGS stations BKG is using in the global processing for the generation of the IGS RT products.**
- **Nevertheless I'm willing to cooperate with someone from the meteo community who want to tests these sub-hourly solutions in their NWP model.**

Tropo Grid Creator:

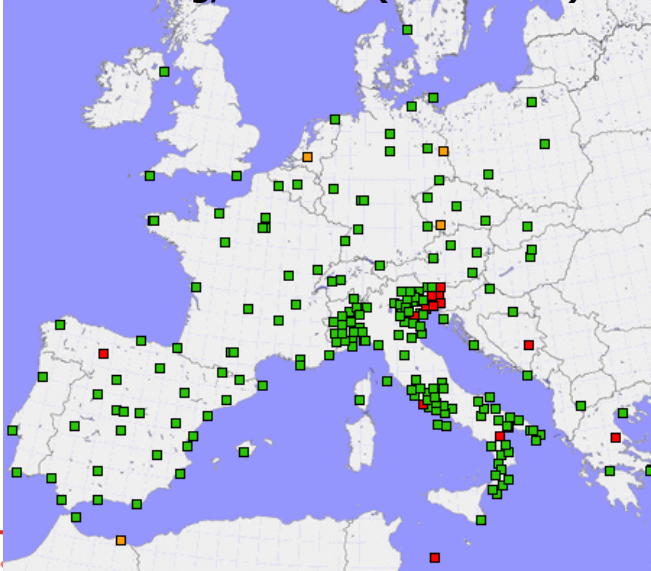
**It's running on routine basis and we are willing to evaluate it against NWP data
ZTD**

ASI_Solution (November 2013)

ASI Operational E-GVAP sub network
till Aug, 1° 2013 (~60 sites)



ASI Operational E-GVAP sub network
from Aug, 1° 2013 (~200 sites)



Starting from June 2001 in COST V2.0 format
Network Adjustment

Hourly Update

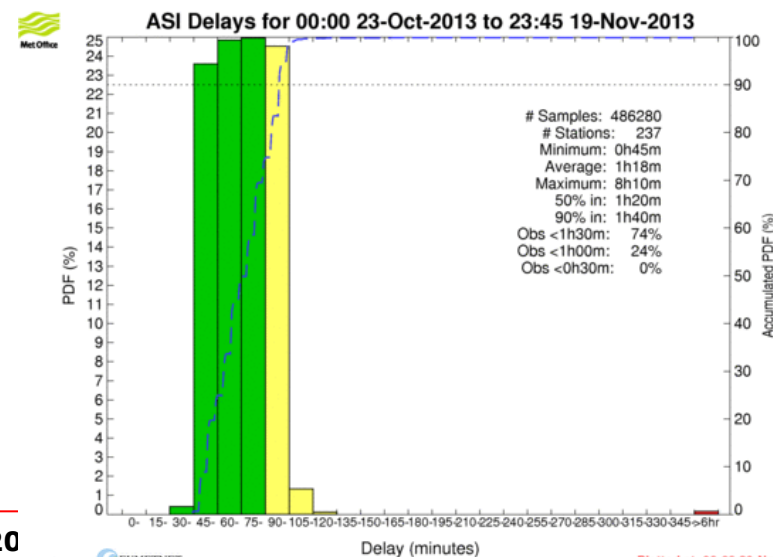
4 scores per hour, every 15 min

Changes since the last meeting:

- GIPSY 6.1.2
- 4 h sliding window, 1 h forward step for data handling
- Gradients estimated along with ZTD
- Network densification
- CAGL removed because the facility closed

Plans for the next year:

- Switch to GIPSY 6.2
- Switch to GMF
- Network densification (including other Italian stations)
- COST V2.2 format



ASIC Solution (November 2013)

ASIC hourly **combined ZTD solution** in COST V2.0 format made by a statistical combination of a number (at least 3) of individual ZTD estimates [*Pacione et al., JASR 47 (2011) 323–335*]

ASIC officially available from November 2008 (pre-operational phase June-Nov 2008) with about 1h:30 delay w.r.t. the last hourly solutions covering the interval [-1h:h]

~ 250 sites every hour

4 scores per hour, every 15 min

No solutions in test/nrt directory used in the combination

Hourly QC test based on

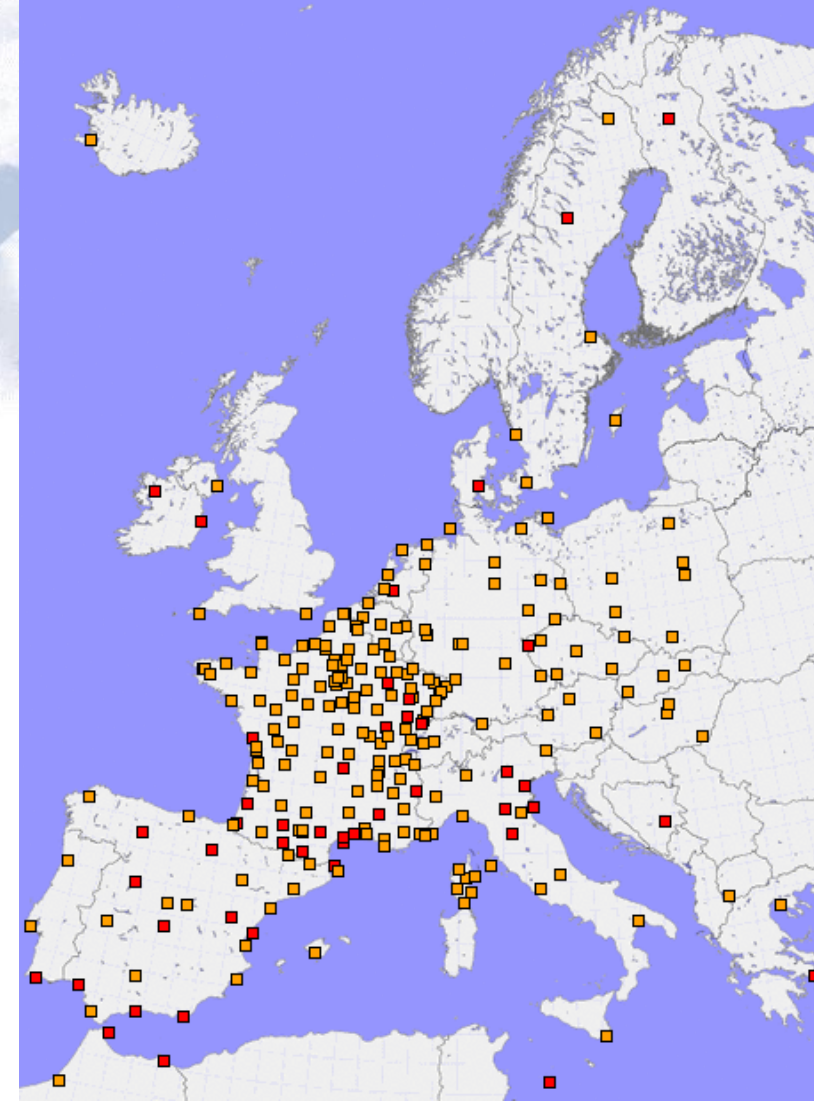
-15mm < (combi-estimates) < 15mm

http://geodaf.mt.asi.it/ad_ATM_NRT_gpsqc_pub.php

Plans for the next year:

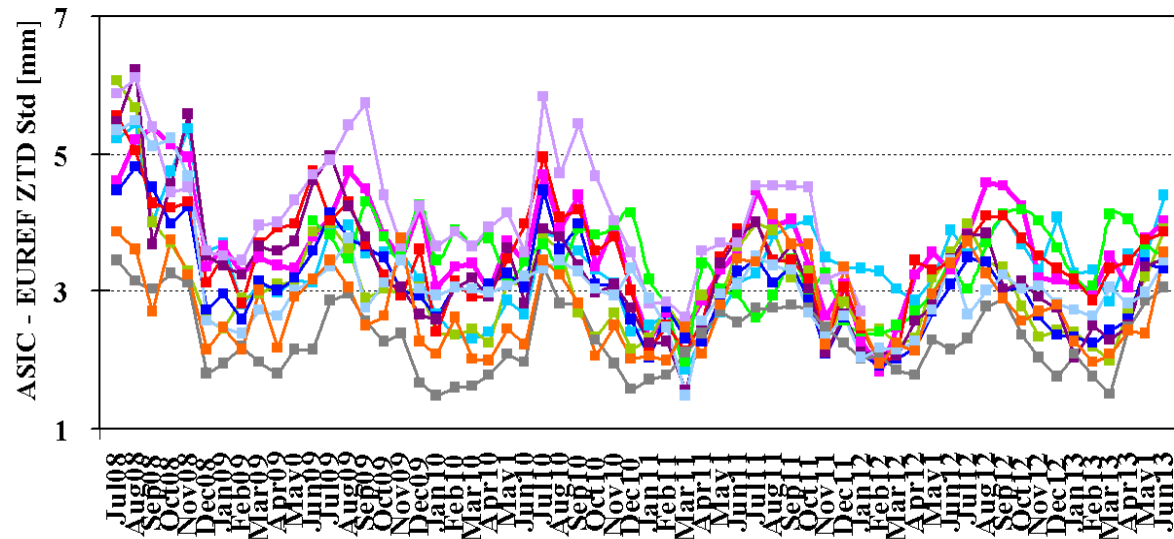
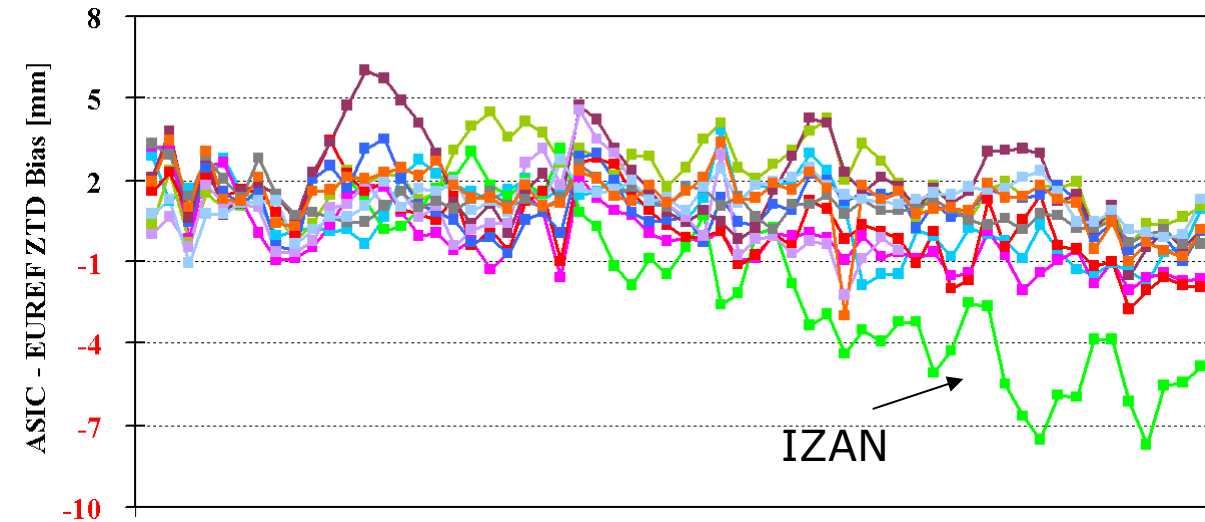
- Reduce the latency
- COST V2.2 format (**Needs to be coordinated among all the ACs!!!**)

ASIC Network Status@Wed Nov 20 11:54:25 GMT 2013

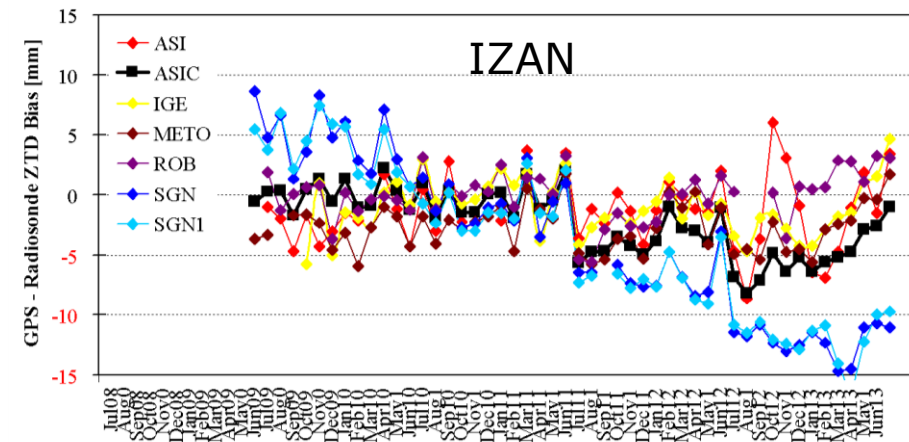


ASI combined E-GVAP network

ASIC versus EUREF (July 2008 - June 2013)



BRST CAGL GOPE IZAN MATE M0SE
MEDI MILO ONSA YEBE ZIMM



ASIS Solution (November 2013)

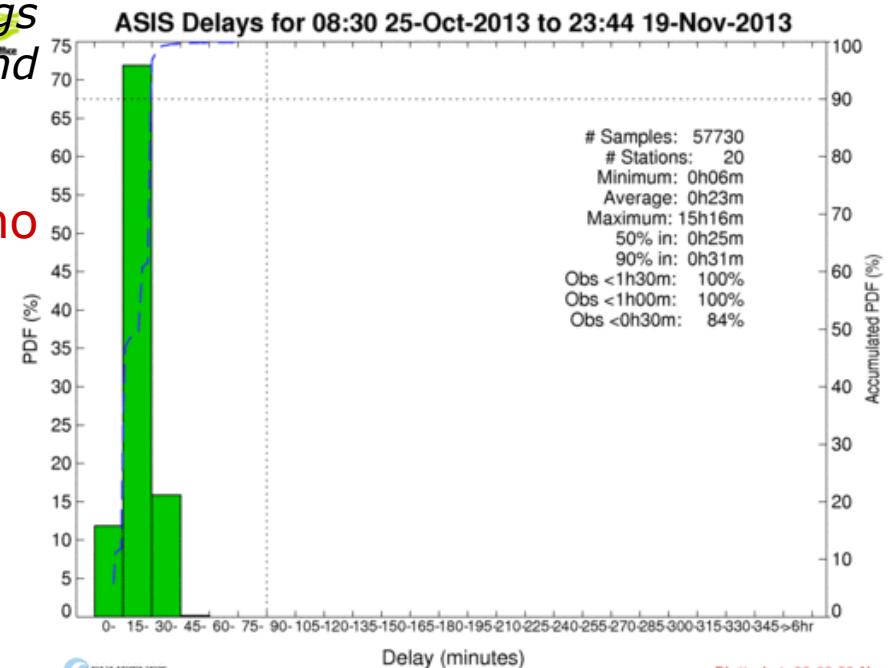
Starting from August 2013 in COST V2.2 format
Sub-Hourly (15 min) update
PPP processing
2 scores every 15 min
GNSS data: RT streams converted into RNX via BNC
Orb&Clk: IGS RT streams converted into SP3/CLK via BNC
ZTD + Gradients



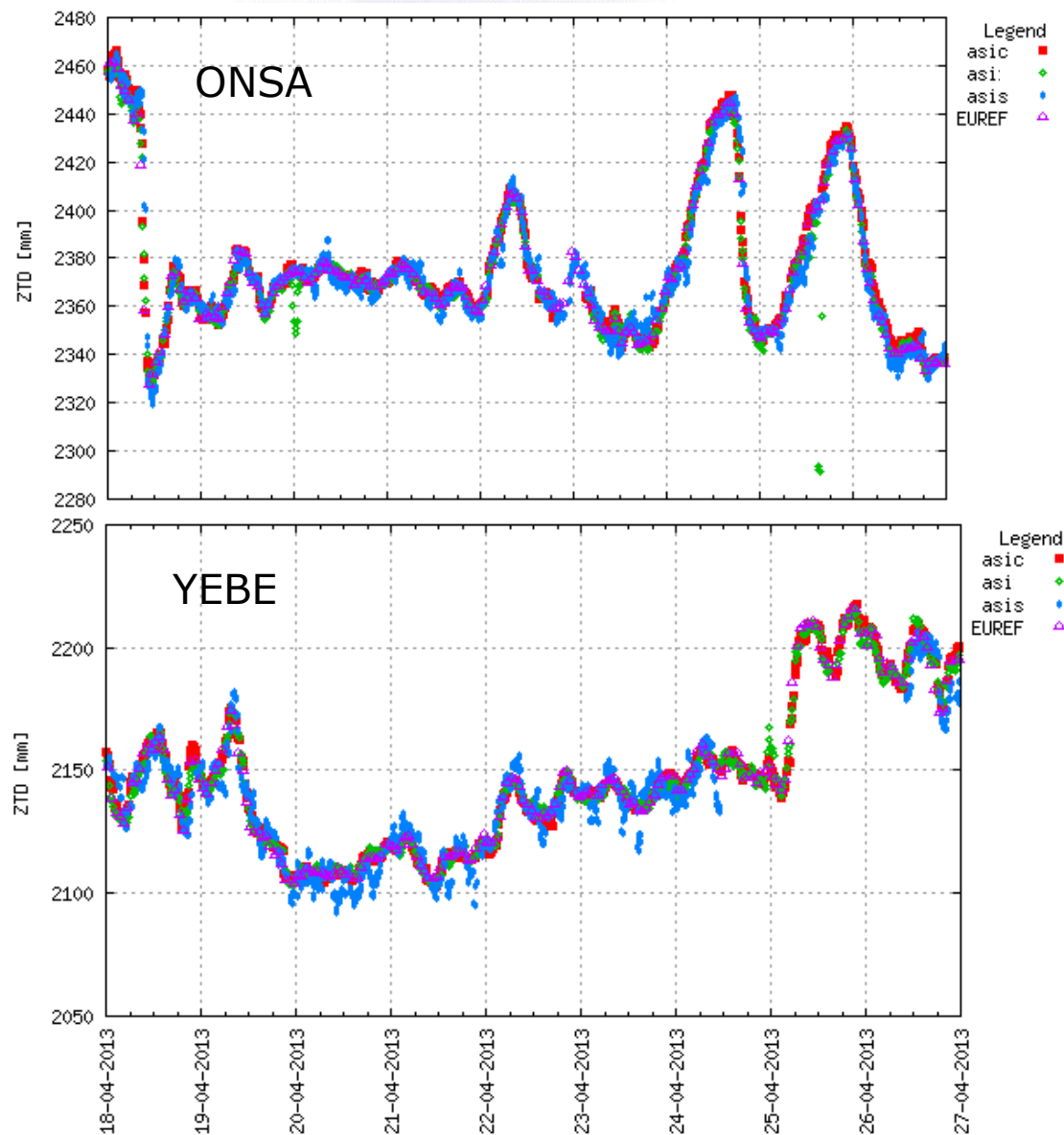
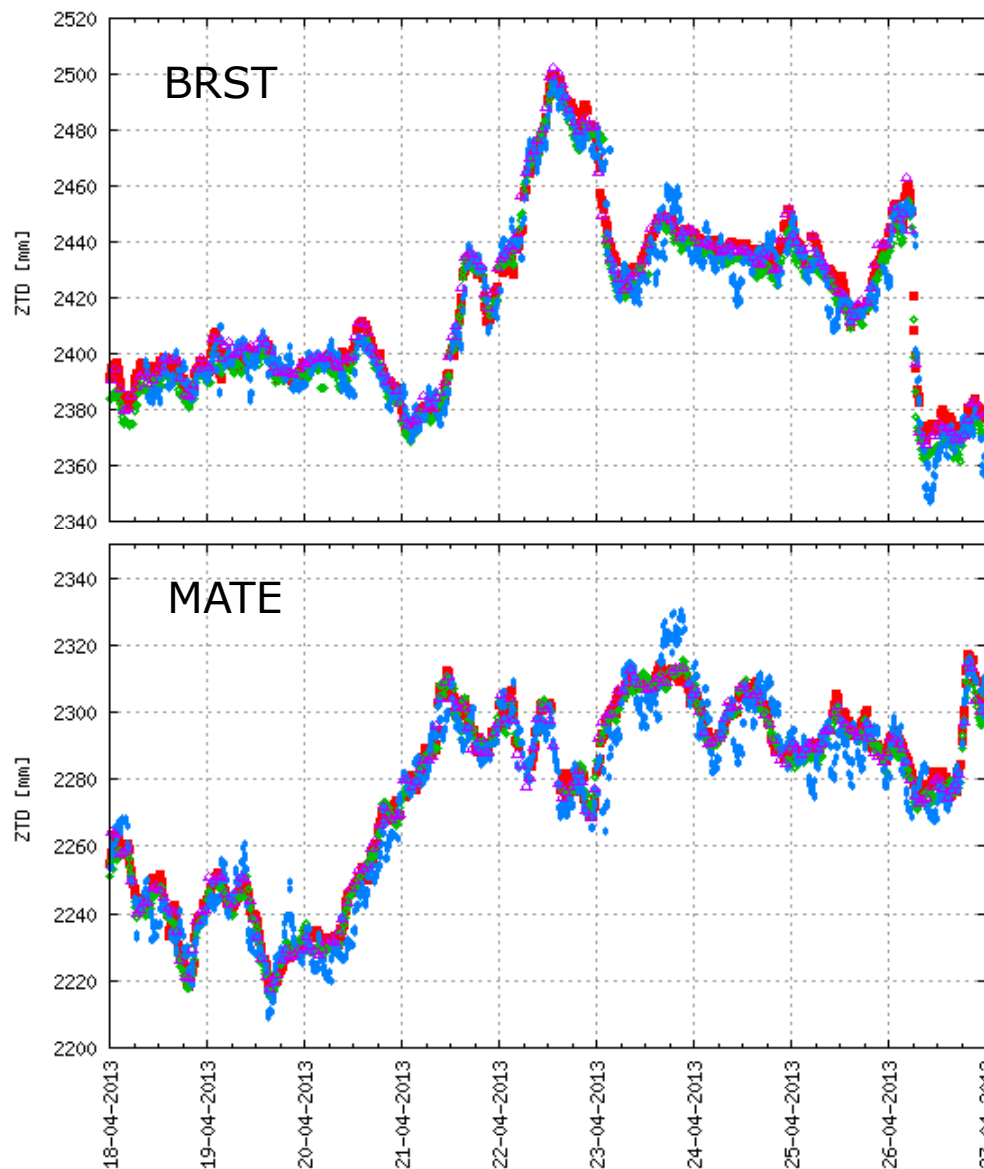
R. Pacione and W. Shone "Exploitation of the new IGS Real-Time Products for GNSS Meteorology", proceedings of the 4th International Colloquium on Scientific and Fundamental Aspects of the Galileo Programme.

We are willing to cooperate with those of you who want to test these solutions.
Let us know the stations you are interested in!

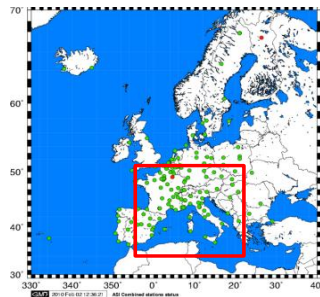
ASI sub-hourly E-GVAP network



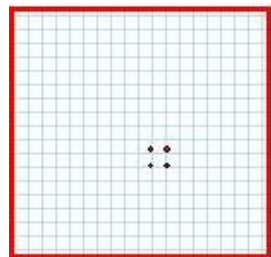
ASI_ ASIC and ASIS ZTD time series



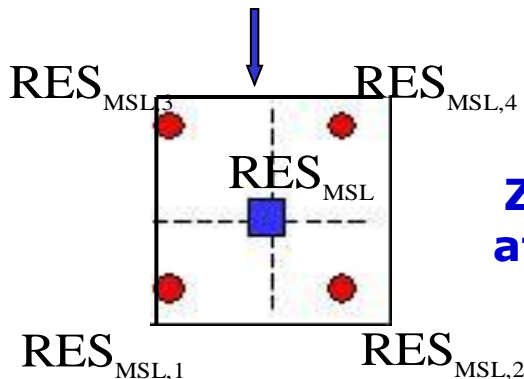
GNSS Tropo Grid Creator (GTGC)



GNSS Data Collection & Processing

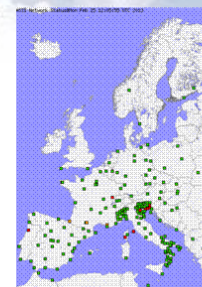


**ZTD residual grids
0.5°x0.5°**

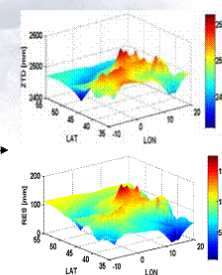


**ZTD correction
at user location**

Number of GNSS sites	>200
GNSS data	<ul style="list-style-type: none"> GPS L1/L2 phase/code pseudorange hourly batches RINEX format 1h latency
Ancillary data	IGS UR products
GPS data analysis SW	NASA/JPL GIPSY/OASIS
E-GVAP ZTD product	<ul style="list-style-type: none"> Hourly batches 15' ZTD estimates for each site COST format 90min nominal latency



GTGC



GTGC Product (Ordinary Kriging)	<ul style="list-style-type: none"> UNB3M reference model ZTD grids at 0-height layer ZTD residual grids [35°,55°] lat, spacing: 0.5° [-10°,20°]lon, spacing: 0.5° IONEX modified format <2h latency
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We are willing to evaluate this product against NWP data for positioning applications

Pace B., R. Pacione, C. Sciarretta, G. Bianco "Computation of Zenith Total Delay Correction Fields using Ground-Based GNSS", accepted for publications in the IAG Symposia Series, VIII Hotine-Marussi Symposium.

http://geodaf.mt.asi.it/gps_NRT_comb_solution.html



The screenshot shows the GeoDAF website interface. At the top, there is a header with the ASI logo (agenzia spaziale italiana) and the text "GeoDAF Data&Products" next to a globe icon. Below the header is a navigation bar with links: Home, Techniques, Data&Products, Educational, About us, Staff only, and a Search box. The main content area is titled "NRT Combined ZTD Solution". It contains three paragraphs of text discussing GNSS data processing, the E-GVAP project, and the current status of data processing by 12 Analysis Centres. A list of four links is provided at the bottom of the main content area. On the left side, there is a sidebar with a list of "ASI/CGS products" including EUREF Final SNX, EUREF Rapid SNX, EUREF TRO SNX, NRT Combined ZTD Solution, ASI Broadcaster registration, Integrated Water Vapour Field, and External Links. The External Links section lists IGS (International GNSS Service), EUREF, EUREF IP Project, EGVP, RINEX Specification, HATANAKA Compression SW, SINEX tropo format, and COST format.

ASI/CGS products

- EUREF Final SNX
- EUREF Rapid SNX
- EUREF TRO SNX
- NRT Combined ZTD Solution
- ASI Broadcaster registration
- Integrated Water Vapour Field

External Links:

- IGS (International GNSS Service)
- EUREF
- EUREF IP Project
- EGVP
- RINEX Specification
- HATANAKA Compression SW
- SINEX tropo format
- COST format

NRT Combined ZTD Solution

Recent developments in GNSS data processing have allowed the estimation of ZTD with a high degree of accuracy using continuously operating GNSS networks. From this delay, integrated water vapour can be derived by means of additional meteorological information, in particular observed pressure or numerical weather prediction model pressure.

E-GVAP ([The EUMETNET GPS Water Vapour Programme](#)) is an inter-European project tasked with taking GPS meteorology in Europe to an operational status and to deliver high quality GPS ZTD observations to the meteorological community in Europe. Within the project, started in April 2005, European national met offices are in collaboration with geodetic institutes and GNSS network providers. Today UK Met Office and Meteo France uses Near-Real Time (NRT) GPS ZTD in their operational forecasts, many other European met offices plan to start utilizing them in their operations.

Currently 12 E-GVAP Analysis Centres are processing raw GNSS data and sending NRT ZTD products hourly to a common ftp-server at the UK Met Office: ASI (Italy), BKG (Germany), GFZ (Germany), GOP (Czech Republic), IGE(Spain), KNMI (Netherlands), LTP (Switzerland), METO (UK), NGAA (Sweden), ROB (Belgium), and SGN (France).

ASI/CGS is an E-GVAP Analysis Center but it is also working as an E-GVAP Combination Center. The number of operational GNSS sites used in E-GVAP has steadily increased to more than 1000 sites. Of these about 200 are analyzed by 3 Analysis Centres. A combined solution is a ZTD estimate made by a statistical combination of a number (at least 3) of individual ZTD estimates. For details refer to: Combination Methods of Tropospheric Time Series, R.Pacione, B. Pace, S. de Haan; H.Vedel, F. Vespe, Adv. Space Res., 47(2), 323-335, 2011, Doi: 10.1016/j.asr.2010.07.021

Combining different solutions of the atmospheric signal is a good way to detect problems in a single ACs and to provide a quality indicator for each solution. In addition comparisons with other independent techniques, as radiosonde observations or numerical weather prediction model, must be performed to evaluate the quality of atmospheric parameters directly estimated or retrieved from the GPS system.

- 1) [ASI Combined Network Status](#)
- 2) [NRT GPS Zenith Total Delay Time Series](#)
- 3) [NRT GPS Quality Control Evaluation](#)
- 4) [Integrated Water Vapour Field](#)