

E-GVAP

The EUMETNET GPS Water Vapour Programme

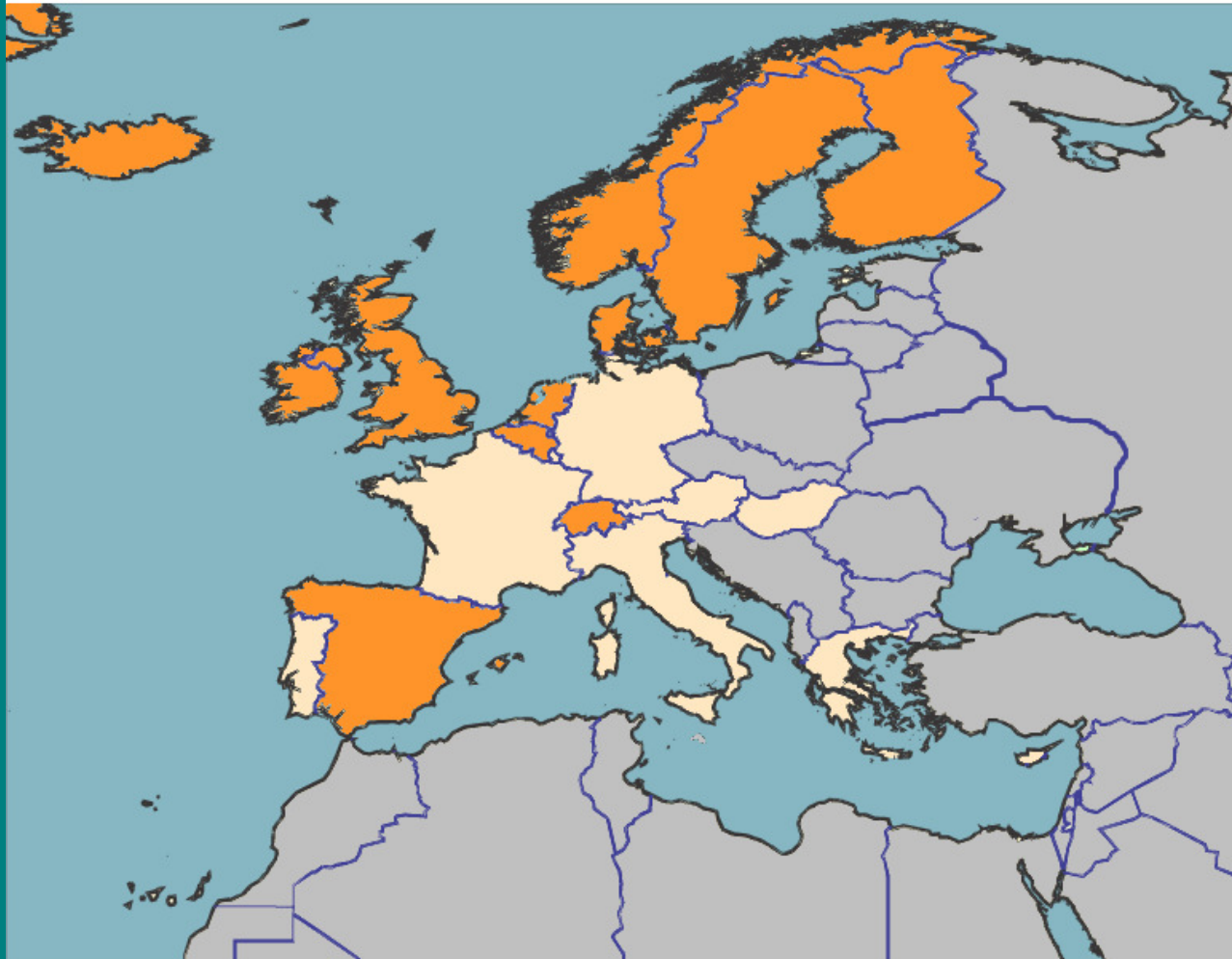
Purpose of E-GVAP

1. Provide quality checked ground based GPS delay and integrated water vapour data (ZTDs and IWVs) in near real time (NRT) for use in **operational** numerical weather prediction (NWP) models and in now-casting to the participating EUMETNET members.
2. To improve on the data quality and enlarge data coverage
3. To assist in utilising the data for weather forecasting.

Set up and Approach

- E-GVAP was started April 2005 and runs for 4 years.
- Build on results and collaboration established in COST716, TOUGH, and other fora.
- Arrangements on the European level mainly to be made between EUREF and E-GVAP.
- Arrangements on national level mainly to be made between National Met Services (NMSs) and national GPS site/data owners
- Planned to transfer into EUCOS (coordinating programme for "permanent" meteorological observing systems) at the end of E-GVAP.

Memberships: E-GVAP / EUMETNET / none



(Meteo-France appears to plan joining E-GVAP)

E-GVAP

EUREF symposium, Riga 2006-06

Relationship with EUREF Community

EUREF to E-GVAP

- Continue with 'free access'= access for all interested meteorological institutes, institutes receiving GTS data, and for individuals declaring their use of the data is for scientific purposes only.
- No RINEX data will not distributed without prior consent.
- GPS positions are only distributed in the form of long term means, e.g. monthly mean.

E-GVAP to EUREF

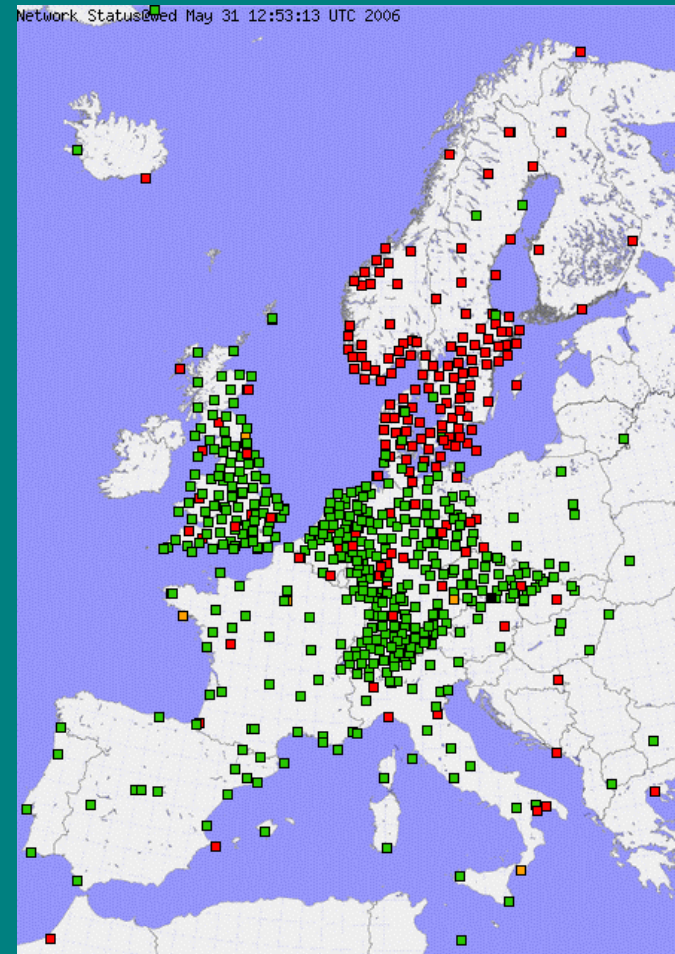
- A database containing met data (e.g., pressure, temperature, humidity) will be created for scientific studies. The relevant content [observations/NWP] will be determined in a working group with people from EUREF and E-GVAP (could be the current E-GVAP liaison group).
- Real time access to NWP data (e.g. pressures at GPS sites) by EUREF for the EUREF permanent network shall be sought by the same working group.

Data Coverage

Status map from 20060531 from the E-GVAP validation site. (www.egvap.dmi.dk)

12 1/2 processing centres are providing the data.

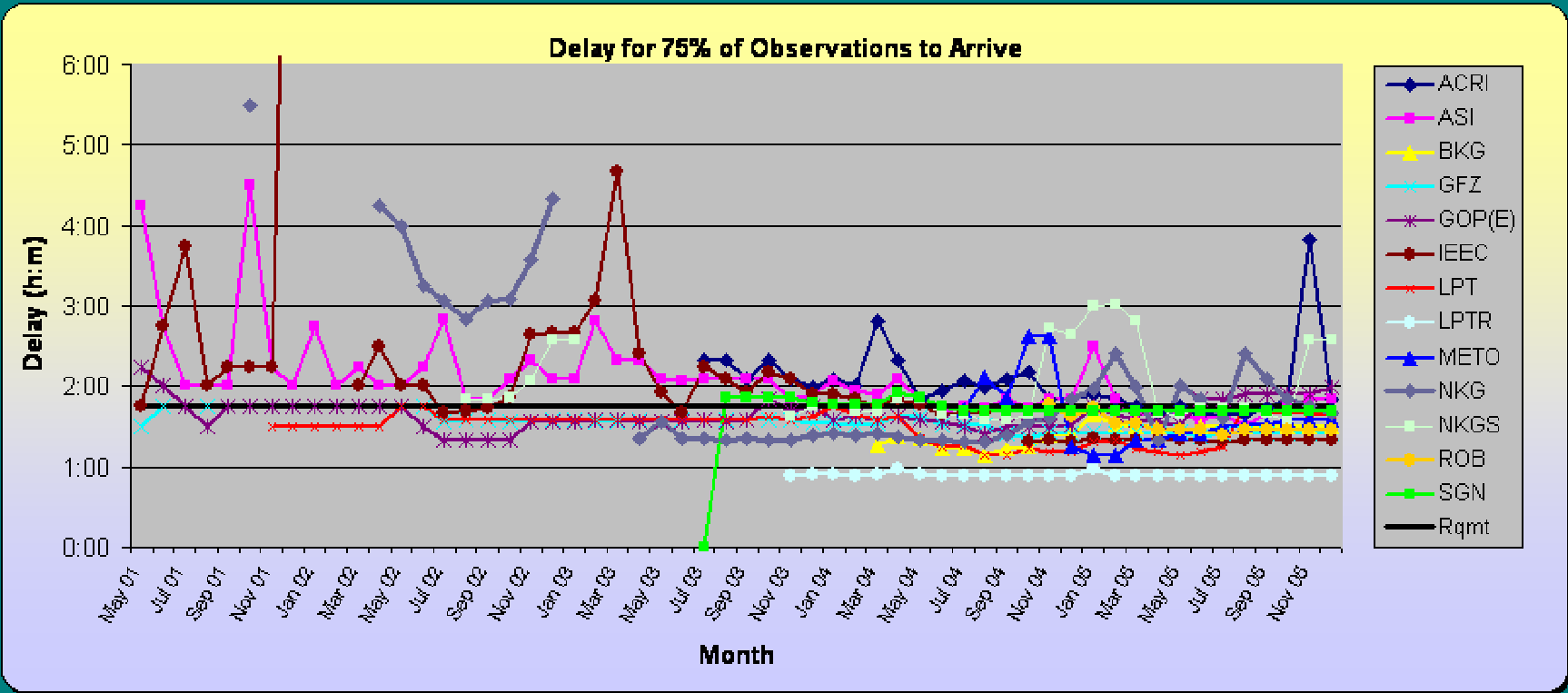
Data available at ftp-server at MetO: [thorn.meto.gov.uk](ftp://thorn.meto.gov.uk)



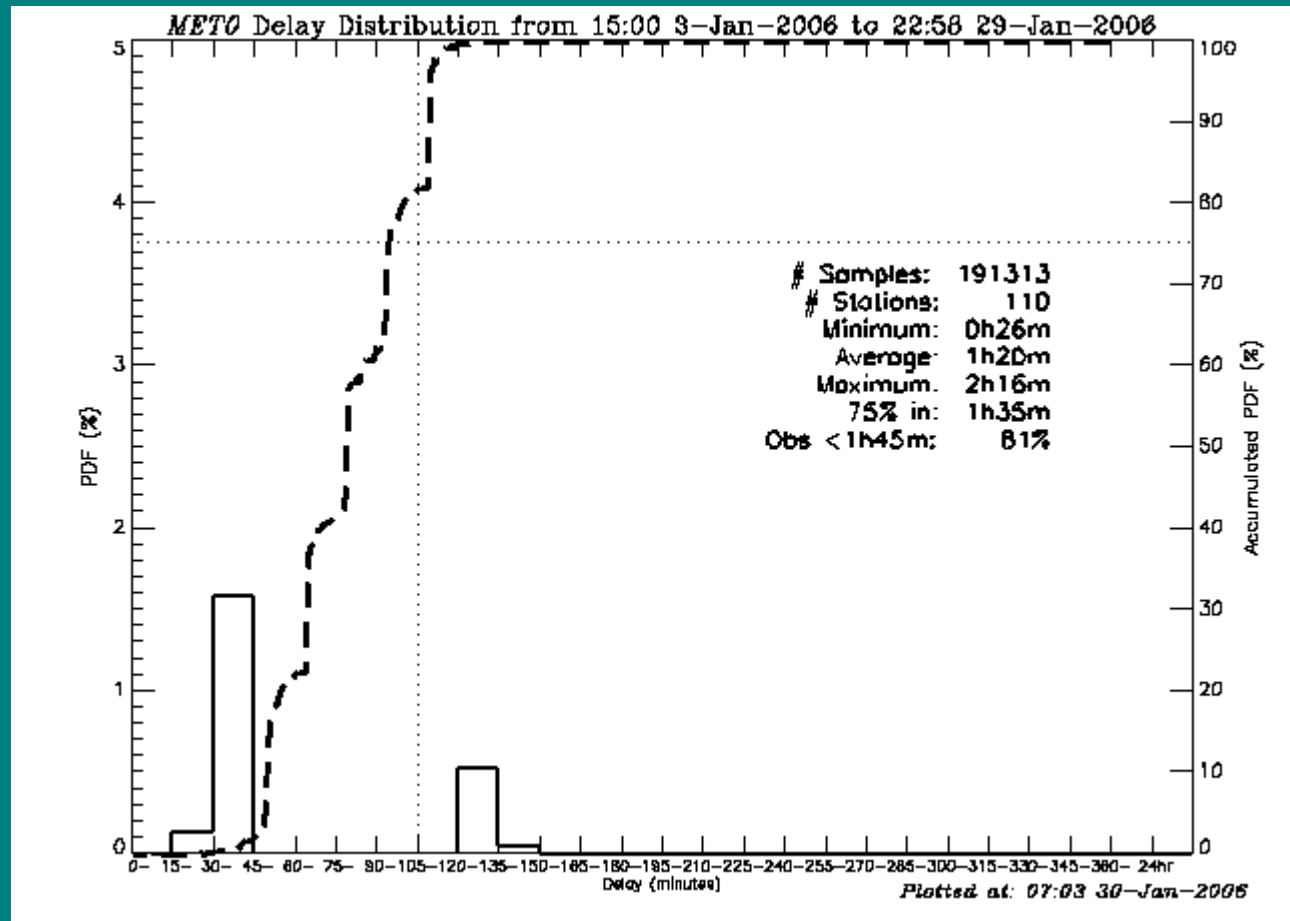
Timeliness and Quality Monitoring

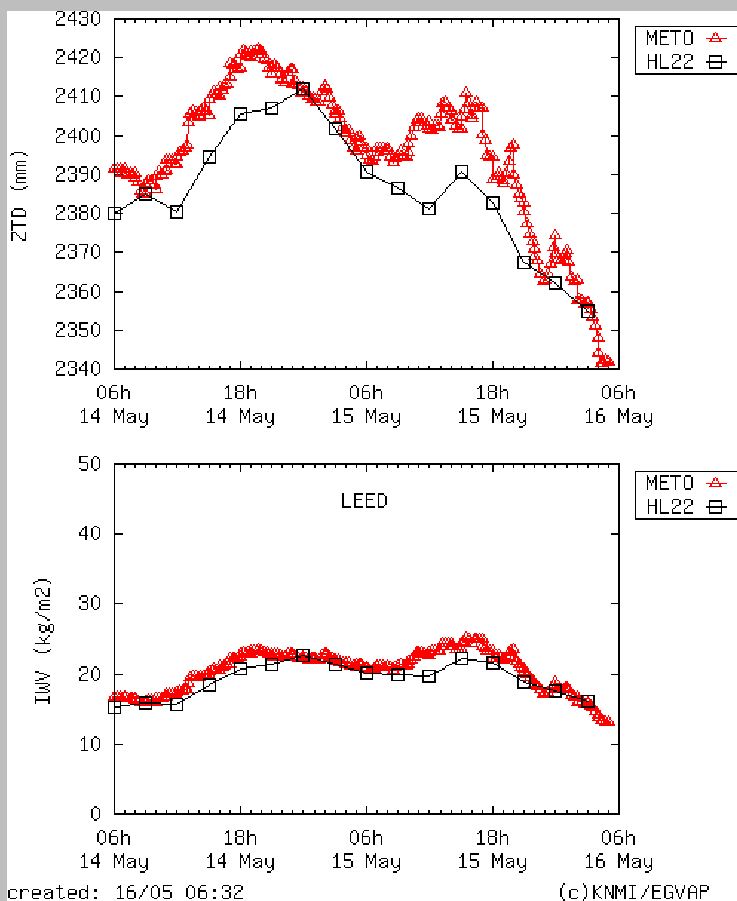
- Continuous monitoring is performed and shown at the E-GVAP validation site. Quality monitoring is against NWP HIRLAM data and operational radiosonde data.
- Will be updated with automatic flagging of deviating data and automatic feedback to processing centres/site owners in case of detected problems.
- Statistics are now compiled for the NWP-GPS offsets and presented at the E-GVAP validation site.
- Periodic reports on performance of all stations/ACs against NWP and other data (e.g. RS) will be made. These can be used to assess the quality of various processing methods.

Timeliness monitoring



ZTD Observation Arrival Time Monitoring





HIRLAM(KNMI) AN - GPS ZTD

7day stat. 2006/05/09 - 2006/05/15

AC	num	bias	RMS	stddev
METO	51	-5.5	13.1	11.9

Notes

- Statistics are updated daily
- GPS ZTD are interpolated to NWP analysis time

HIRLAM(KNMI) FC - GPS ZTD

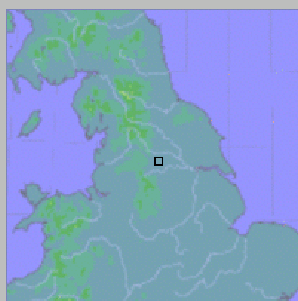
Latest Obs. vs NWP-forecast

AC	Obs.time	FC.time (sec)	HIRLAM-GPS
METO	08:00	7200	0.0
METO	08:15	8100	-1.6
METO	08:30	9000	-2.4
METO	08:45	9900	-0.3
METO	08:59	10740	2.2

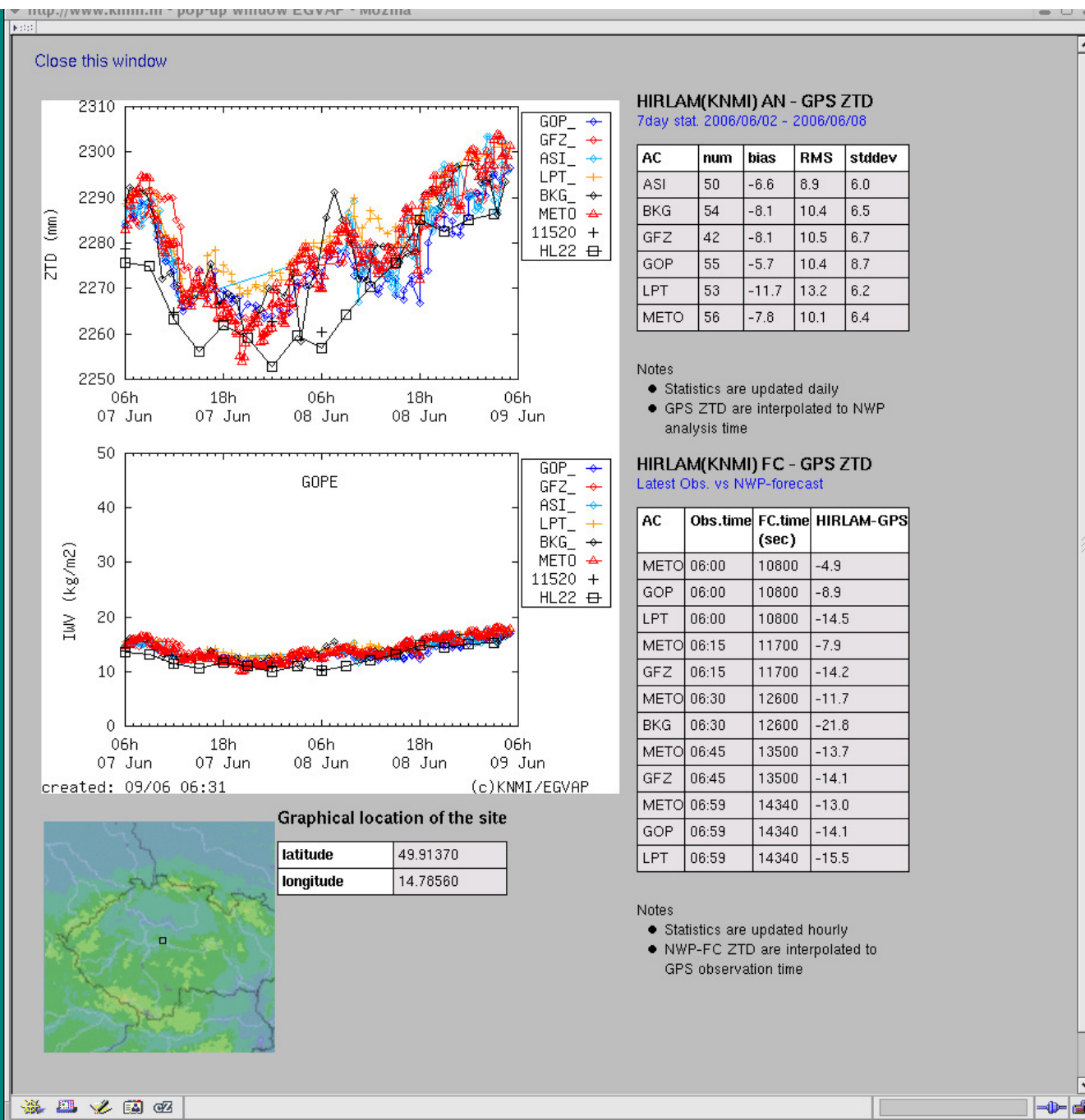
Notes

- Statistics are updated hourly
- NWP-FC ZTD are interpolated to GPS observation time

Graphical location of the site



latitude	53.80020
longitude	-1.66379

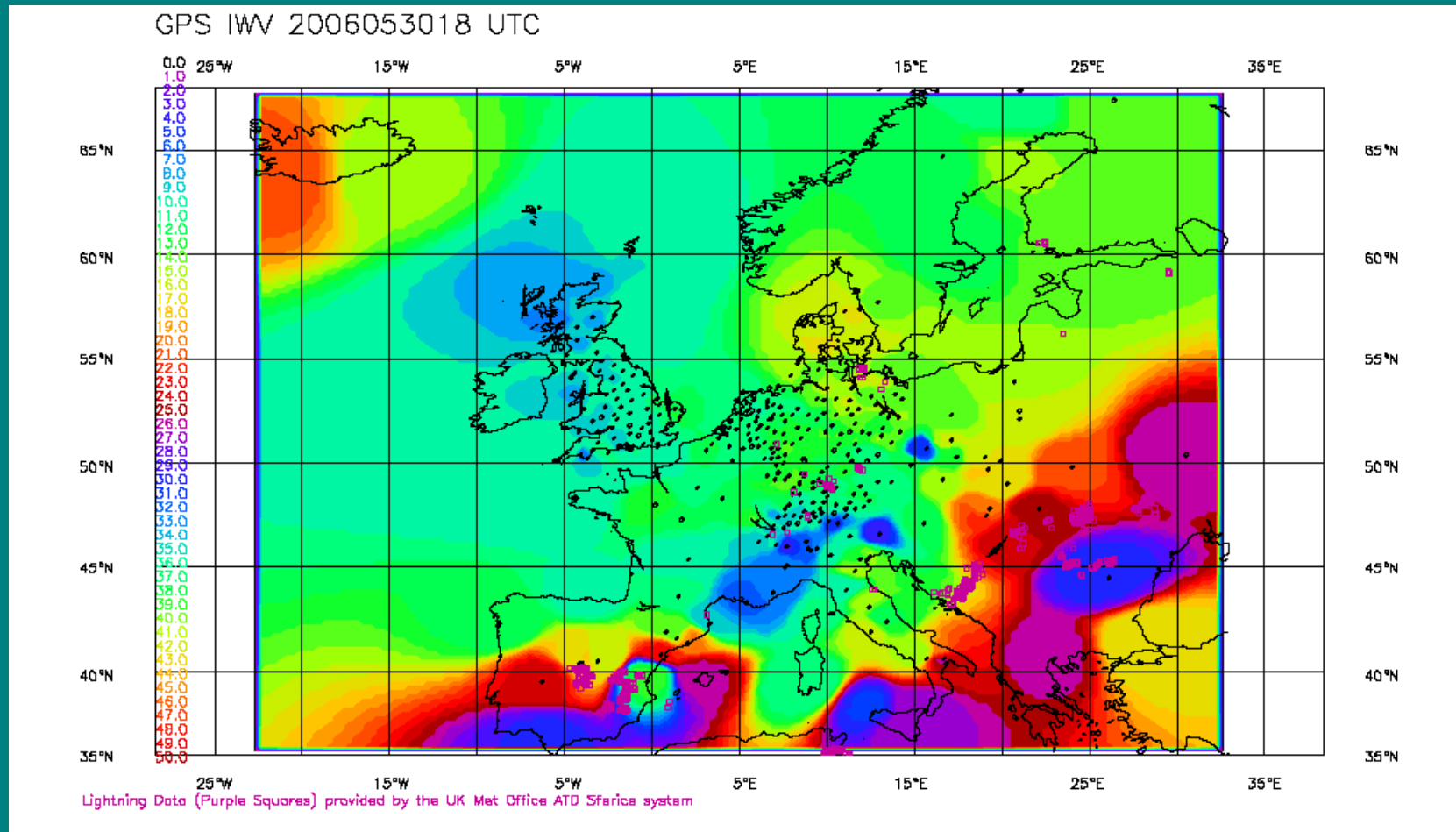


2D NRT IWV maps

- ZTD to IWV conversions based on surface pressures and temperatures.
- Other info added to plot to form integrated observing system (wind and ATD lightning data)
- The IWV point measurements are combined into European IWV maps, currently one per hour, which can be viewed as a film covering the last 24 hours.
- An area of GPS meteorology which is currently minute, but has a great potential (15min processing and plots...)

IWV map

Weather is visible in high density regions, example of few station artefacts seen in some of the data sparse areas.



Case Study of UK Met Office Collaboration

- UK Met Office and mapping agencies have come to mutually beneficial MoU agreements – can be used as templates for other countries in E-GVAP
- UK MetO has contracted external expertise (IESSG, Nottingham) in setting up processing system (BSW50 in DD NRT mode)
- Currently processing 100+ UK stations in NRT
- Project heavily reliant on data from NMAs and geodetic community.
- System to gain operational acceptance in UK by 03/07

Recent developments in regional collaboration and processing

Rep. Ireland

- No Irish GPS delay data in database.
- Negotiations between Ordnance Survey Ireland, Met Eireann and UK Metoffice about processing of OSI data at UK MetO.
- The Irish ZTD data important not only to Rep. of Ireland and Northern Ireland, but also the UK.

Iceland

- Currently the only Icelandic ZTD data being produced is from the two IGS stations on Iceland.
- Data from a number of other Icelandic stations (Icelandic Met and Geodetic Institutes) are now being transferred to UK MetO for processing and results will soon appear on E-GVAP data-server.

Netherlands

- KNMI (Dutch metoffice) started processing GPS ZTD for Dutch sites. System set up with help from H. v.d. Marel, Tech. Univ. Delft.

EGVAP project team

- **Management**

Danish Meteorological Institute (DMI), Henrik Vedel.
Email: egvap@dmi.dk

- **Data processing and database.**

UK Met Office (MetO), Jonathan Jones, John Nash, and Dave Offiler.
Email: jonathan.jones@metoffice.gov.uk

- **Validation.**

Royal Netherlands Meteorological Institute (KNMI), Siebren de Haan.
Email: siebren.de.haan@knmi.nl

- Email address: egvap@dmi.dk

- Web address: <http://egvap.dmi.dk>

Liaison group(s)

Inter European scale (EUREF).

- Elmar Brockmann, Swisstopo
- Hans van der Marel, Tech. Univ. Delft.
- Carine Bruyninx, Roy. Obs. Belgium.
- E-GVAP: Henrik Vedel, Jonathan Jones, Siebren de Haan.

Responsible person: Henrik Vedel.

- The purpose of the liaison groups is to further in practice the geodetic – meteorological collaboration.

Expert team on data processing

- Rosa Pacione, ASI.
- Jan Dousa, GOP.
- Etienne Orliac, Univ. Nottingham
- Elmar Brockmann, Swisstopo
- Galina Dick, GFZ
- Jan Johansson, Chalmers Tech. Univ.

E-GVAP: Jonathan Jones, Siebren de Haan, Henrik Vedel

Responsible person: Jonathan Jones.

- Identify the necessary standards and update user requirements, and report on the success and errors of various data processing techniques and try to establish best practice procedures for GPS processing

Expert team on use of GB GPS data

- Daniel Leuenberger, MeteoSwiss
- Jana Sanchez Arriola, INM (Spain)
- Poul Poli, Meteo France,
- Adrian Jupp/Dave Offiler UK MetO

E-GVAP: Jonathan Jones, Siebren de Haan, Henrik Vedel.
Responsible person: Henrik Vedel.

•Assist the E-GVAP member institutes in utilising the GPS ZTD/IWV data. It will function as a group of experts determining yearly the current state of the art in GPS assimilation and now-casting, providing recommendations to European GPS meteorologists.

Future

- Confident that ground based GPS data have neutral or beneficial impact to meteorology.
- We expect that some of the resources available at European met centres are beneficial to geodesists (e.g. met data, sharing of sites and other facilities)
- We look forward to a tightening of collaboration between geodesy and meteorology - resolution proposed at EUREF `06 so the basic data source for the GPS met observing network appear solid in the long term.