EUMETNET
EUROPEAN METEOROLOGICAL SERVICES NETWORK

E-GVAP-II

The EIG EUMETNET GNSS Water Vapour Programme

3rd expert teams meeting
October 20 to 21, 2011, Météo France, Toulouse

September 11, the 1 million’th Costfile was uploaded to the UKMO ftp-server, cost_2011091120_xxxx_rob_.dat.gz!

Agenda, E-GVAP-II 3nd expert teams meeting Météo France, Toulouse

Start of meeting October 20 9:00

- **Status and updates on processing and/or use by each expert**

- **Information from the E-GVAP team, including**
  - **Status**
  - **Active quality control, status, discussion, plans**
  - **Collaboration with EUCOS**
  - **Sub hourly processing.**
  - **Global processing and global data**
  - **Minimum requirement for GNSS data processing document**
  - **Future of E-GVAP**

End Thursday at 16

Possibly Friday morning:

- **COST action application on ground-based GNSS meteorology**
- **Format and time of next expert teams meeting**
- **Any other matter**

Finish of meeting no later than October 21 12:00

Reporting from experts and members

Belgium, Croatia, Iceland, Finland, Rep. of Ireland, Serbia: Nothing new relative to Oslo meeting

Hungary: A nationally funded project between geodesists and meteorologists have now been set up. This follows a contacts over several years between Ambrus Kenyeres and Henrik. Inclusion of data in E-GVAP database is expected later this year, starting with upload to the ”test” directory. Contacts:

Ambrus Kenyeres from the Geodetic Observatory, Institute of Geodesy, Cartography and Remote Sensing in Budapest.
Szabolcs Rozsa, Budapest University of Geodesy and Economics.
Boloni Gergely and Balint Varga, OMSZ.

See: http://gpsmet.agt.bme.hu/indexen.php

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BME-ÁFGT 1777

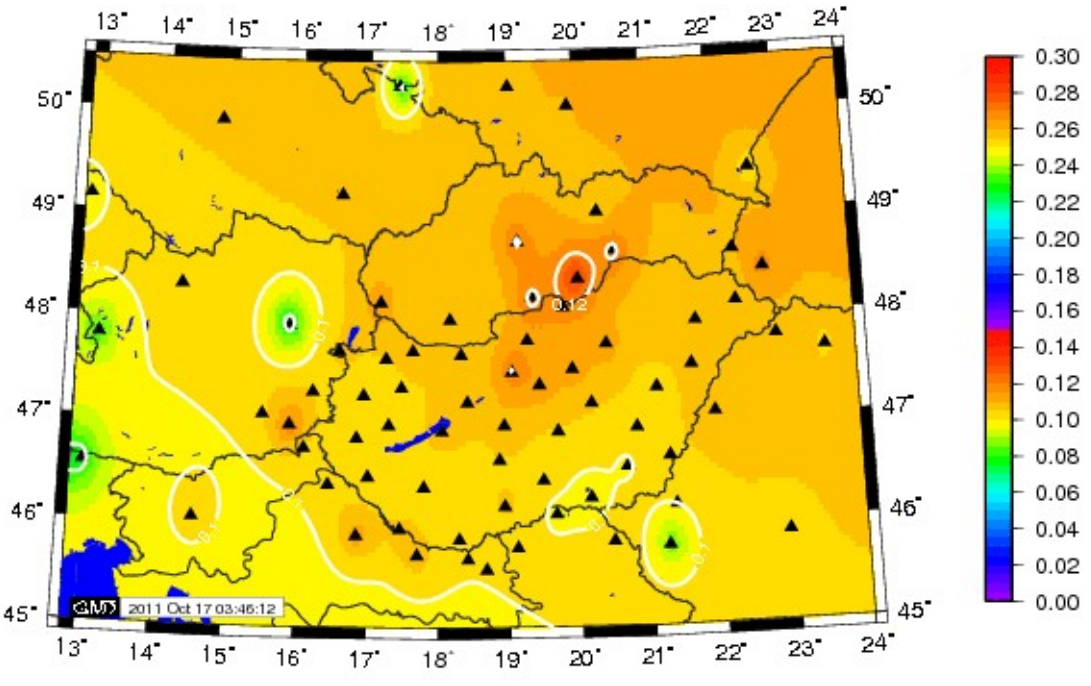
This site is under construction. Additional information will be posted soon.

The estimation of actual tropospheric zenith wet delays based on GNSS observations.

- Kezdőoldal
- GNSS és a vízgőz
- Archív térképek
- GNSS Adatok
- Partnerek
- Linkek
- Kapcsolat

MTA - BME
FGG
Fizikai Geodézia és Geodinamikai Kutatócsoport
BME Általános és Felsőgeodézia Tanszék
FÖMI Kozmikus Geodéziai Obszervatórium

Zenith Wet Delay [m] (11–10–17(00h)



Bulgaria

Agreement being made about access to data from Bulgiarian Bulipos GNSS sites. Will be processed either at METO or GOP.

Contacts

- Guergana Guerova, Department of Meteorology and Geophysics, Sofia University
- Prof. Milev, director of the Bulipos network.

Dear Mr. Vedel,

Herewith I would like to inform you that the question about thecollaboration of EUPOS Central and Eastern countries and EUMETNET on GNSS meteorology application has got some progress at the International Symposium on Global Navigation Satellite Systems, Space-Based andGround-Based Augmentation Systems and Applications, Berlin, Germany, 10-- 11 October 2011 and at the Meeting of EUPOS Steering Committee.

An item of the Symposium Resolutions (attached) is the collaboration between EUPOS and EUMETNET. / / At the Meeting of International EUPOSSteering Committee the Head of International EUPOS Steering CommitteeOffice (ISCO) -- Mr. Gerd Rosenthal was authorized to contact you and to precise the form and scope of the collaboration between two institutions and to achieve agreement.

I hope the collaboration between two parts will start and developsuccessfully.On our part we will contribute to the cooperation if it is necessary.

Related to the integration of 7 BULiPOS--LEICA GNSS stations from Bulgaria our collaborators will contact with the presented by you representatives of EUROMETNET for specifying of the details for data transfer.

With best regards Georgi Milev

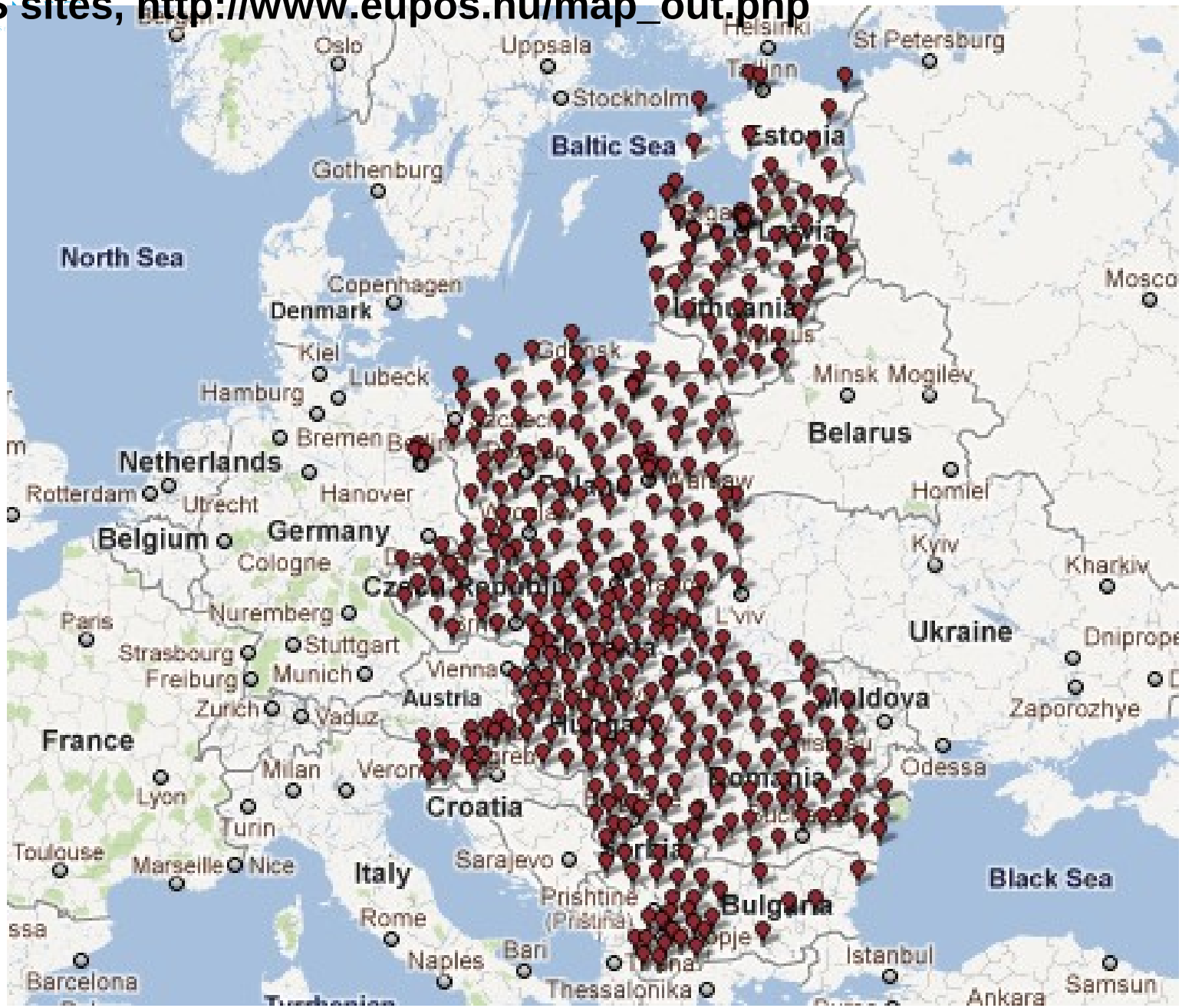
Prof. Dr. Eng. Georgi MilevCorresponding Member of Bulgarian Academy of Sciences Bulgaria

EUPOS sites

Last week on the EUPOS Steering Committee (ISC) meeting we discussed the possible cooperation of E-GVAP and EUPOS.

EUPOS is a cooperation of GNSS service providers, mostly covering Central- and East-European countries. This is the region with low representation in the GNSS network E-GVAP.

EUPOS sites, http://www.eupos.hu/map_out.php



EUPOS sites

Some EUPOS countries are already contributing (e.g. Czech R.), some will contribute soon (e.g. Hungary) and some may think on this.

In our discussion we expressed that the current situation should be improved and we concluded that a general MoU may be prepared between E-GVAP and EUPOS, where EUPOS expresses its willingness to support the cooperation in general, but then the actual contribution should be organized in bilateral agreements.

In the MoU we should clarify also that the commercial services running in the countries are ready to support scientific activities, until the point that those research results are not becoming commercial.

Henrik, you may discuss this issue in your meeting and then please contact Gerd Rosenthal, Head of the EUPOS ISC to start the official preparation of the MoU. I am also ready to help you in the preparatory phase.

Wishing you a successful meeting, Ambrus

Denmark, DMI

Ground-based GNNS data. Access and processing.

- DMI is colaborating with the NRT GPS processing centre NGAA at SMHI, such that Danish GPS data are processed at SMHI.
- The Danish GPS data come from 2 sources:
    1. The national Danish mapping agency.
    2. A private network called GPSnet.
- The access is based on agreements between the data providers and Chalmers Space Observatory.
- Potential for more Danish data, as a second private network operator exits.
- Currently there is no direct interaction between DMI and the two private networks.
- Considering starting GNSS data processing at DMI (similar to and in collaboration with NGAA at SMHI and planned processing at met.no).

GPSnet (green, names) + Trimble network (red, numbers)

DMI

- Extraction of O-B site&AC specific statistics from passive assimimilation of all data uploaded data to E-GVAP as ”operational” (though only one per AC per assimilation cycle). Calculation of offset statistics. Continously since July 2007
- Derived preprocessing/data selection algorithms enabling selection of ”good and robust” ZTD data with Gaussian O-B distribtutions for assimilation resulting in whitelists.
  - Both processing centre and station dependent investigation.
  - Long term bias correction (more than a month of data).
  - Obserror from above statistics.

DMI

- Doing active assimilation in parallel to operational runs, at 10 and 3 km resolution, using new whitelists.
- Now using GNSS data operationally in the setup running the ”Slippery Road Model”
- To include assimilation of ZTDs in other operational models. Probably end of 2011
- *Timeliness is critical to our short cutoff runs* (order 95 min past NWP starttime). The data selection is different in our short and long cutoff runs.
- NGAA performance is important to DMI. The types of intermittent quality problems which NGAA sometimes suffer, have been found to be very well detected by the AQC.

Status and outlook.

Homepage updated

Need info about data owners and extra links to AC homepages

EGVAP contact
EGVAP team

EGVAP members
EGVAP advisory bodies
GPS/geodetic partners

Programme plan
Calendar
Workshop presentations

E-GVAP meetings
E-GVAP mail lists

Reports
Publications

Support
Documents, restricted

Links

For the moment the E-GVAP network consists of more than 1500 GNSS sites. Mainly in Europe, but recently processing and distribution of global GNSS data has started, since many E-GVAP members run global NWP models. For the same reason E-GVAP welcomes collaboration with both European and non European institutions, in order to densify the GNSS meteorological observing network.

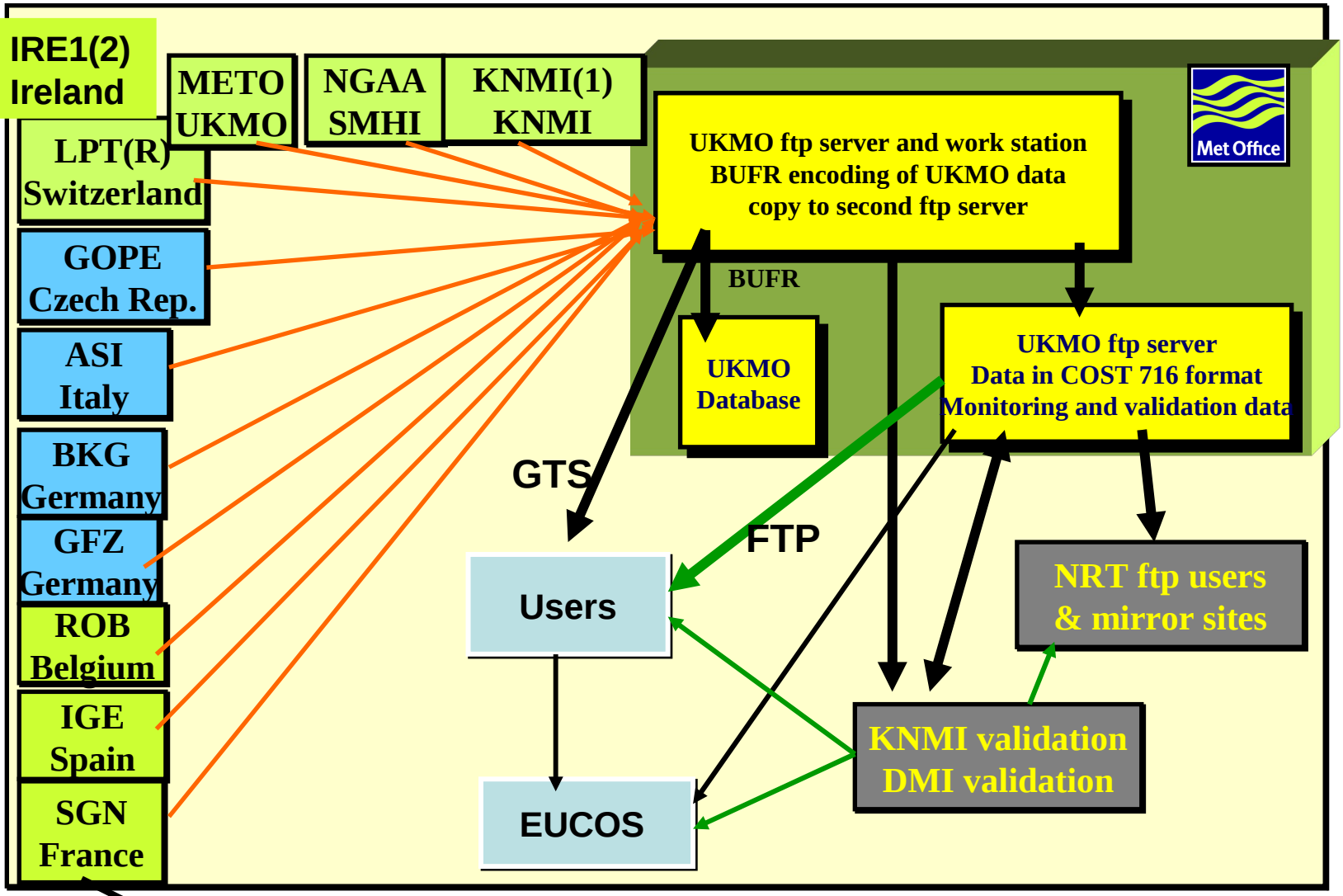
Usage of ground based GNSS delay data in NWP has proven to improve forecast skill.

Analysis centres contributing NRT GNSS delays to E-GVAP

AC Name	Name of organisation	Links
ASI	e-geos/Telespazio, Italy	ASI_ ASIC
BKG	Federal Agency for Cartography & Geodesy, Germany	BKG_ BKGH
GFZ	Helmholz Centre Potsdam GFZ German Reseach Centre for Geosciences	GFZ_
GOP	Geodetic Observatory Pecny Czech Republic	Home GOP1 GOP2 GOPG GOPX
IES	Institute of Engineering, Surveying and Space Geodesy, Univ. of Nottingham, UK	IES2
IGE	Instituto Geografico National, Spain	IGE_ IGE2
IRE	Met Éireann, Rep. Ireland	IRE2
KNMI	Royal Meteorological Inst. of the Netherlands	KNMI KNM1 KNM2
LPT	SwissTopo	Agnes network LPT_ LPTR
METO	UK Metoffice	METO METG
NGAA	Chalmers Tecnical University and Swedish Meteorological and Hydrological Inst	NGAA
SGN	Institut Geographique National, France	SGN_ SGN1
ROB	Royal Observatory of Belgium	EUREF Network ROB_

OBS system overview

NRT GNSS ZTD data flow Today



Analysis centres (ACs), each processing raw GNSS data from many sites. In many cases only national AC can get access to the raw data.

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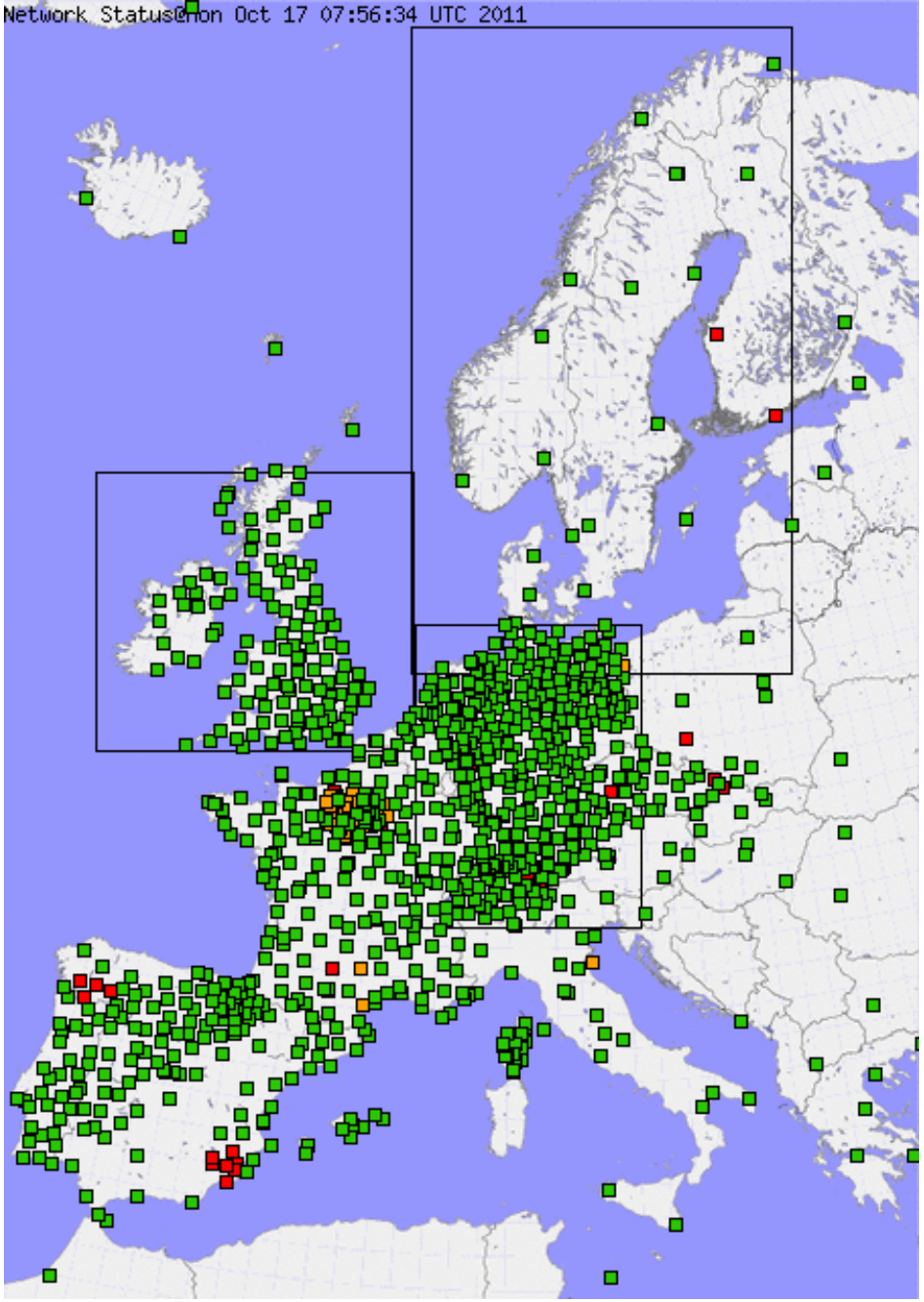
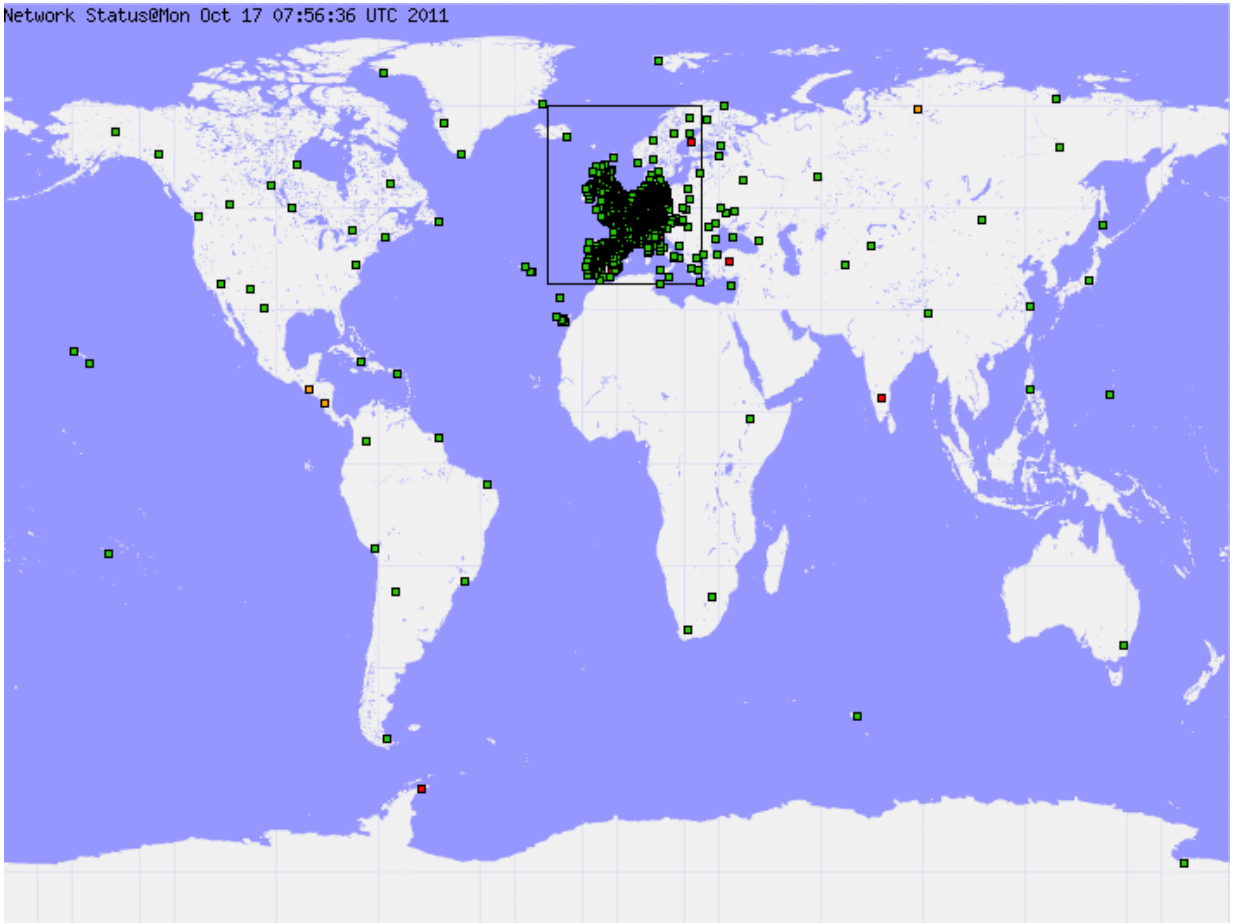
DATA COVERAGE

From validation link at homepage.

A click on a square/site opens a window with graphical and statistical monitoring and validation material

That Scandinivia is depleted is a transient phenomenon!





Global processing now at two ACs, products GOPG and METG. GOPG has just been moved to ”operational”.

Negotiating access to North Amr. ZTD/IWV data (many 100 of sites), and collaboration on real time quality control and data processing with NOAA.

Negotiating for a long time access to North Amr. ZTD/IWV data (many 100 of sites), and collaboration on real time quality control and data processing with NOAA.

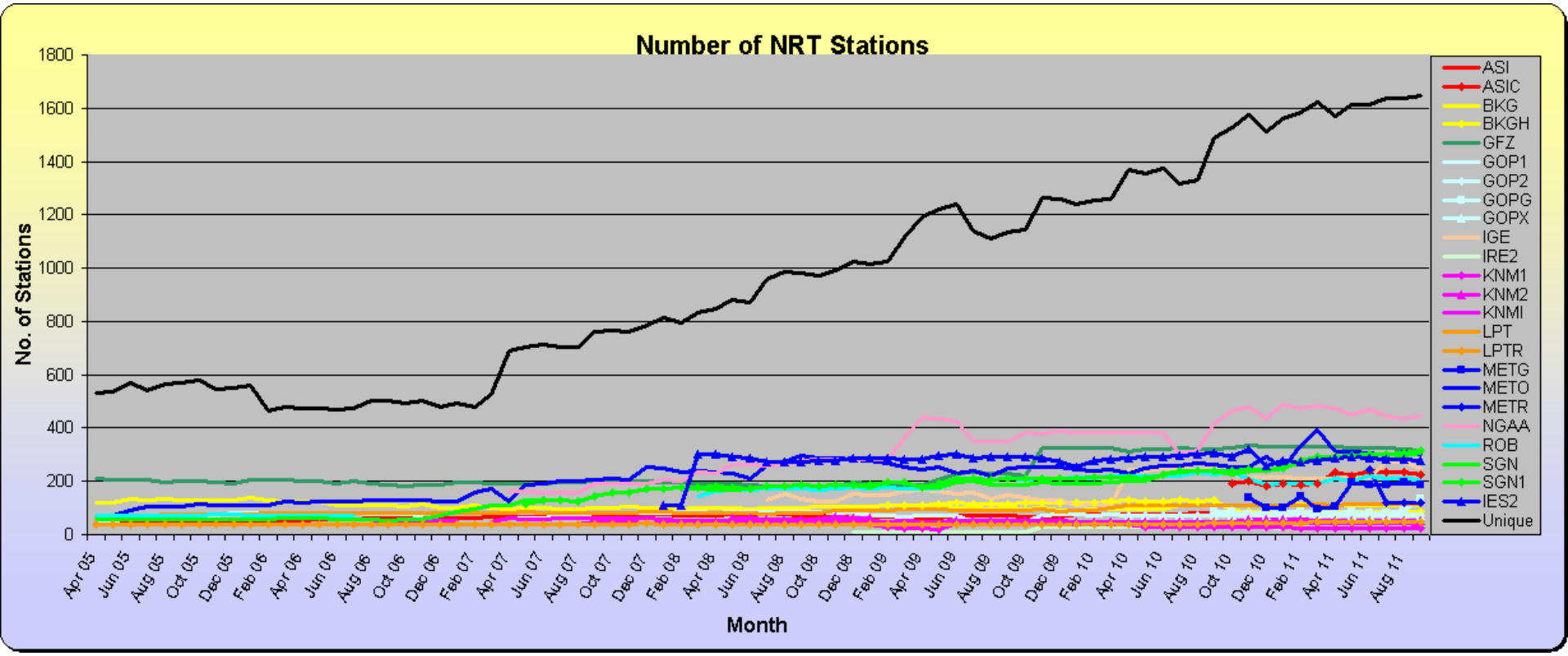
At the ESA Galileo Conference primo September Seth Gutman from NOAA and Henrik met.

Production of GNSS delays is currently in research mode at NOAA. There is a ressource problem in moving to operational mode, which prevents NOAA from engaging in an MoU based formal operational collaboration right now.

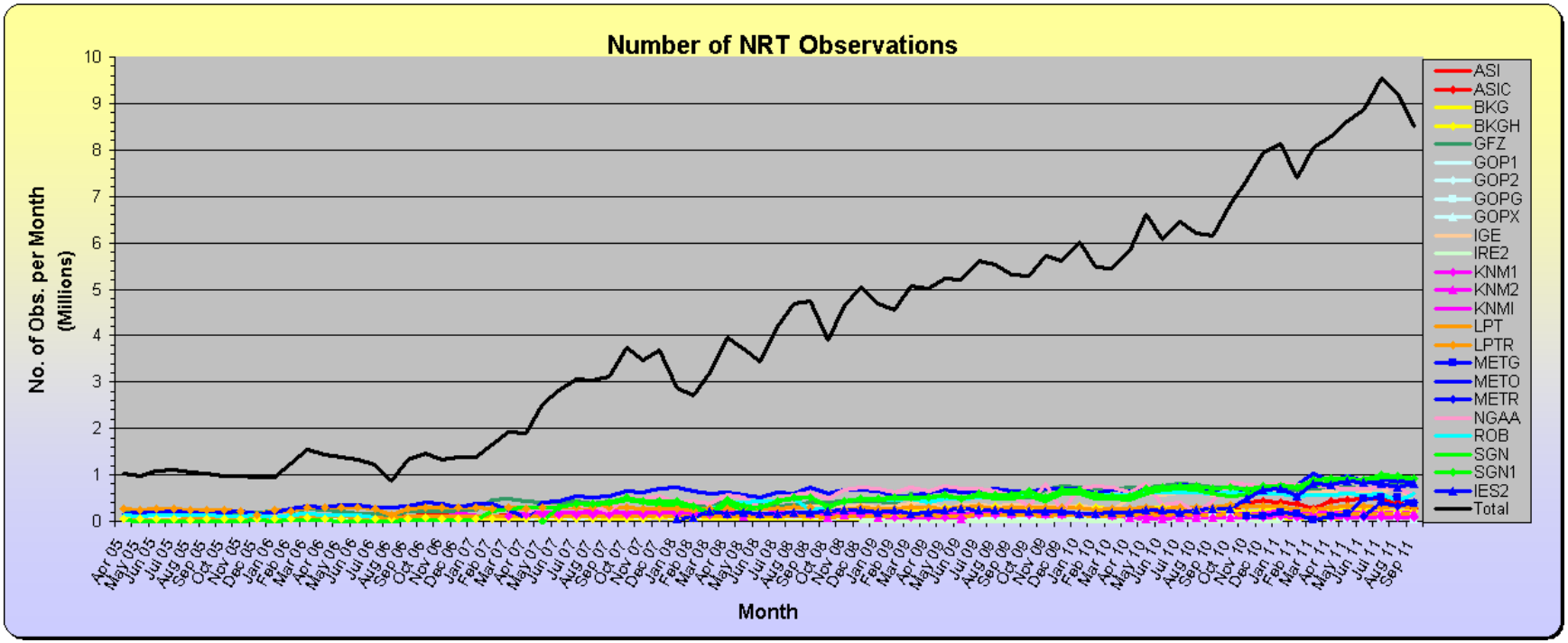
Recently NOAA has started formulation of a bussiness case, for operational production of GNSS delays.

On the E-GVAP side we have just become allowed to start collaboration with NOAA, *without* first making an MoU. The approach could be to to setup fetch the NOAA data via ftp ourselves, and convert them to the formats we use our side of the Atlantic.

Contacts have be made now also to Environment Canada, to gain access to Canadian GNSS delay data.

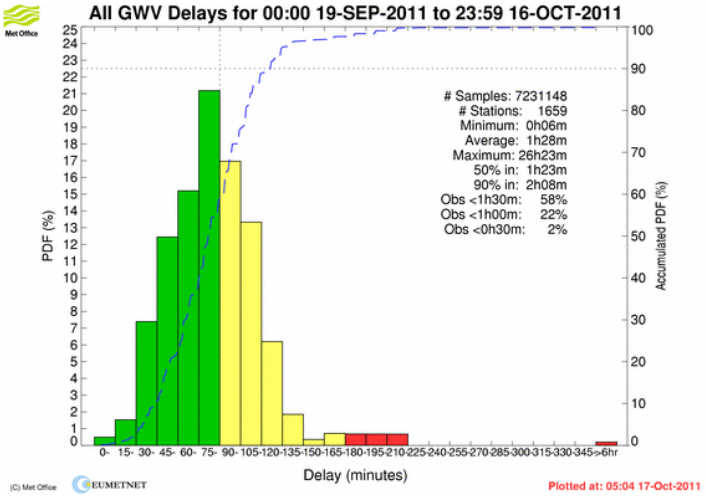


Number of unique GNSS sites versus time.

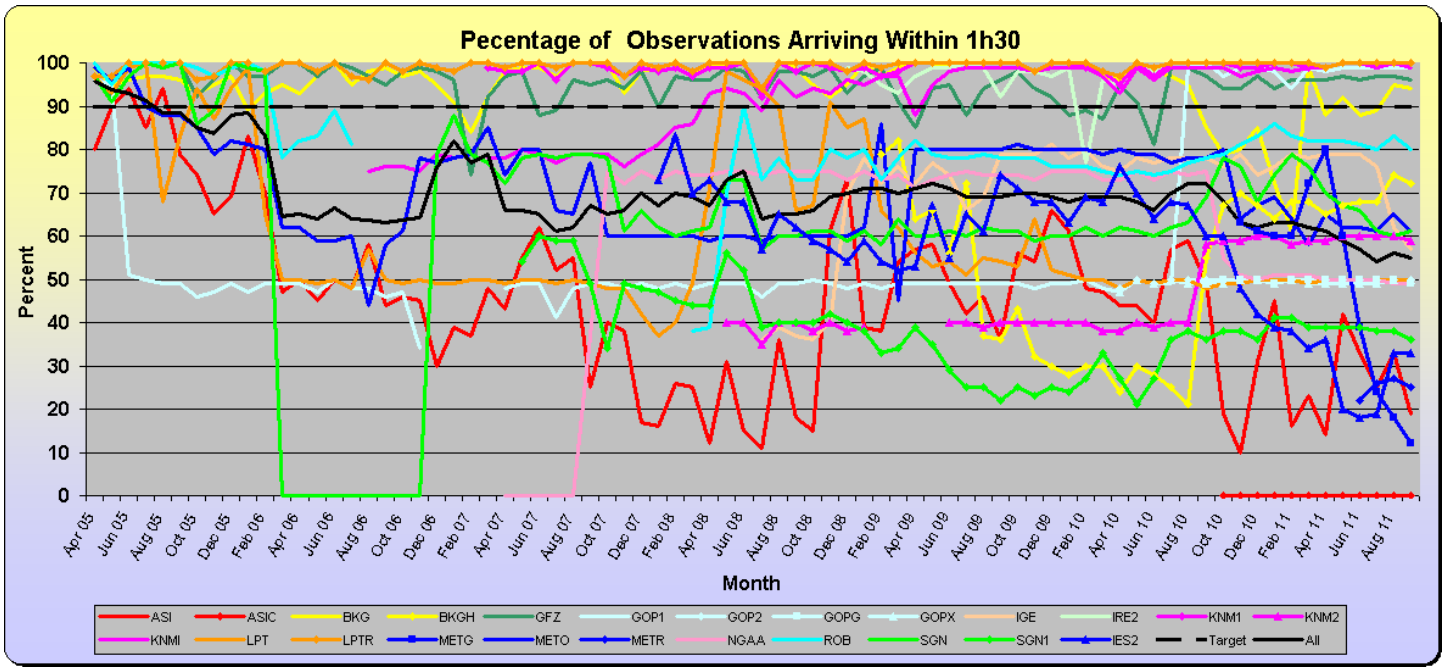


Number of observations versus time.
From E-GVAP homepage.

Delivery timeliness



- Most (non-TEST) ACs providing data with good timeliness – on average, 90% of all ZTD obs arrive within 1h50m (*target 1h30m*)
- Future trends to shorter NWP model cut-off times will demand reduced latency



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Subhourly processing

Supersite processing, biases (one week)

Bias

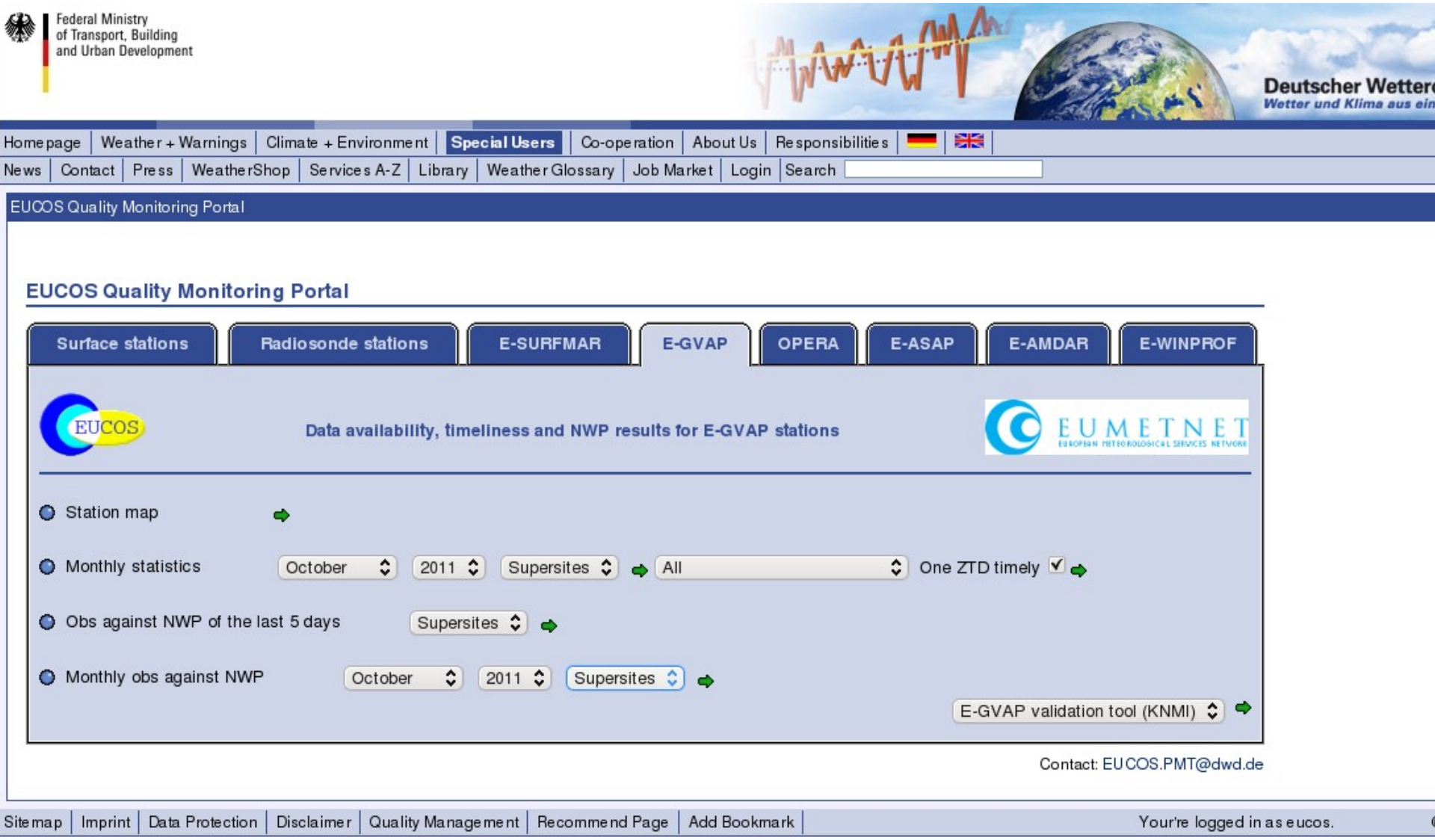
AC	BRST	CABW	CAGL	CAMO	GOPE	IZAN	LDB2	M0SE	MEDI	MILO	ONSA	PAYE	SMNE	YEBE	ZIMM
ASI_	-5.85		-2.42		13.81		24.99	22.65	-6.01	3.42	30.44		-12.63	2.30	1.07
ASIC	-4.26	0.21	-1.00	-0.96	15.26		20.15	22.60	-5.63	1.02	31.70	2.73	-2.66	1.38	5.45
BKG_			-2.41		11.90		23.42		-8.27		29.69			-1.43	4.00
GFZ_	8.36		-4.83		25.41		12.39		2.55		37.32			13.27	37.16
GOP1	-4.90	-0.96	0.37		12.91		19.16	23.77	-6.81		31.65		-0.09	2.04	9.13
IGE_	-4.33		1.28		14.76			23.93		1.14	32.46		-1.31	0.70	9.29
KNM1	-4.68				18.38						33.22				
KNMI	-2.01	1.38	-10.83					14.03	-4.46					5.79	9.63
LPT_	-5.91	0.36	-0.23		15.99		22.59	22.17	-7.67	0.23	30.70	3.93	-1.23	0.85	7.19
LPTR												3.82			
METO	-6.78		20.71	-2.68	18.76		20.09	21.97	-5.35	0.46	31.84	-0.52		-0.67	4.98
METR	-5.05			-2.36				21.89		2.04			-2.07		
ROB_	-4.22	-0.23	0.56	1.18	11.71		19.09	21.40	-7.91	0.76	28.83		-5.42	-0.45	4.72
ROBT															
SGN_	-3.90	0.53	0.05	-1.19	13.71		20.86	20.25	-5.47	1.28	31.13	4.10	-0.37	0.49	6.08
SGN1	-3.99	1.18	0.48	-0.98	14.07		20.82	20.23	-4.98	1.46	31.10	4.04	-0.11	-0.57	5.91

Supersite processing, standard deviations (one week)

Standard Deviation

AC	BRST	CABW	CAGL	CAMO	GOPE	IZAN	LDB2	M0SE	MEDI	MILO	ONSA	PAYE	SMNE	YEBE	ZIMM
ASI_	8.83		15.98		9.24		9.79	9.57	8.89	13.01	4.95		8.70	7.72	6.53
ASIC	9.22	6.74	12.06	9.81	8.07		8.50	8.87	7.94	12.00	4.82	6.83	8.27	5.81	6.17
BKG_			11.67		8.56		7.71		7.68		4.75			7.17	5.28
GFZ_	8.08		11.55		8.81		7.31		9.46		3.90			7.95	8.29
GOP1	8.79	8.16	11.85		7.06		8.31	10.38	8.24		4.86		8.59	5.65	5.68
IGE_	9.20		13.51		8.04			9.82		11.67	7.12		8.27	5.80	6.64
KNM1	11.64				9.78						9.63				
KNMI	13.49	14.53	24.81					19.62	9.31					7.31	18.38
LPT_	8.76	8.00	12.81		8.63		8.52	8.41	8.52	12.54	4.44	5.87	8.11	5.41	7.00
LPTR												9.92			
METO	7.54		25.61	9.03	16.27		9.24	9.63	10.73	13.70	7.91	5.66		6.91	6.49
METR	8.55			12.08				8.00		12.12			9.64		
ROB_	7.41	4.45	11.37	8.98	8.92		11.89	11.96	8.62	14.61	4.84		9.71	6.73	7.38
ROBT															
SGN_	8.63	6.82	11.67	10.61	9.35		8.92	10.92	7.64	11.79	5.44	6.37	9.47	6.54	7.69
SGN1	8.37	6.80	11.18	10.46	9.34		9.50	10.86	8.16	12.20	5.84	6.38	9.29	5.68	7.72

EUCOS Quality Monitoring Portal (QMP)
To obtain uid and pw, ask per email!



EUCOS Quality Monitoring Portal

Surface stations | Radiosonde stations | E-SURFMAR | E-GVAP | OPERA | E-ASAP | E-AMDAR | E-WINPROF

EUCOS

Monthly statistic of E-GVAP data *(09/2011)*
Analysing Centre: METO one ZTD timely: true

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Legend

, Export as CSV

291 stations found.

Identifier	Station	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	Σ / Ø	%
ABEP	METO	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	23	24	24	24	23	24	24	24	24	24	24	24	24	24	718	100
		49	51	55	55	55	55	54	52	52	53	53	50	51	52	52	52	50	52	51	53	52	51	52	51	52	53	50	53	53	52	52	100
ABYW	METO	-	-	-	-	-	-	12	-	-	-	-	-	-	-	23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	35	5
		-	-	-	-	-	-	54	-	-	-	-	-	-	-	52	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	53	100
ACOR	METO	23	24	24	24	24	24	24	23	24	24	24	24	24	24	24	24	23	23	23	24	23	23	24	24	23	24	24	24	24	23	711	99
		49	51	55	55	55	55	54	52	52	53	53	50	51	52	52	52	50	52	51	53	52	51	52	51	52	53	50	53	53	52	52	100
ADAR	METO	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	23	24	24	24	23	24	24	24	24	24	24	24	24	24	718	100
		49	51	55	55	55	55	54	52	52	53	53	50	51	52	52	52	50	52	51	53	52	51	52	51	52	53	50	53	53	52	52	100
AILT	METO	6	9	13	12	13	16	13	15	17	17	21	22	21	23	23	24	17	21	24	24	23	22	23	23	23	22	20	24	24	23	578	80
		53	52	55	56	56	55	53	52	52	53	53	51	51	52	52	52	50	52	51	53	52	51	52	51	52	53	51	53	53	52	52	100
ALDB	METO	24	24	24	24	24	24	24	24	24	24	23	24	24	24	24	24	23	24	24	24	23	24	24	24	24	24	24	24	24	24	717	100
		49	51	55	55	55	55	54	52	52	53	53	50	51	52	52	52	50	52	51	53	52	51	52	51	52	53	50	53	53	52	52	100
ALME	METO	24	22	24	23	24	23	23	23	24	24	23	23	23	21	24	22	23	23	24	22	22	22	24	23	23	23	23	23	23	23	691	96
		49	51	55	55	55	55	53	52	52	53	53	50	51	52	52	52	50	52	51	53	52	51	52	51	52	53	50	53	53	52	52	100
AMBE	METO	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	23	24	24	24	23	24	24	24	24	24	24	24	24	24	718	100
		49	51	55	55	55	55	54	52	52	53	53	50	51	52	52	52	50	52	51	53	52	51	52	51	52	53	50	53	53	52	52	100
AMER	METO	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	23	24	24	24	23	24	24	24	24	24	24	24	24	24	718	100
		49	51	55	55	55	55	54	52	52	53	53	50	51	52	52	52	50	52	51	53	52	51	52	51	52	53	50	53	53	52	52	100
ANKR	METO	-	-	-	-	-	-	-	-	1	-	3	-	2	3	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	11	2
		-	-	-	-	-	-	-	-	53	-	51	-	52	53	-	-	-	-	-	-	-	-	-	-	-	-	-	52	-	51	52	79
ANLX	METO	24	24	24	24	24	24	24	24	24	24	24	23	24	24	24	24	23	24	24	24	23	24	24	24	24	24	24	24	24	24	717	100
		49	51	55	55	55	55	54	52	52	53	53	50	51	52	52	52	50	52	51	53	52	51	52	51	52	53	50	53	53	52	52	100
APPL	METO	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	23	24	24	24	23	24	24	24	24	24	24	24	24	24	718	100

EUCOS

E-GVAP monthly obs against NWP selection (09/2011)
Analysing Centre: METO

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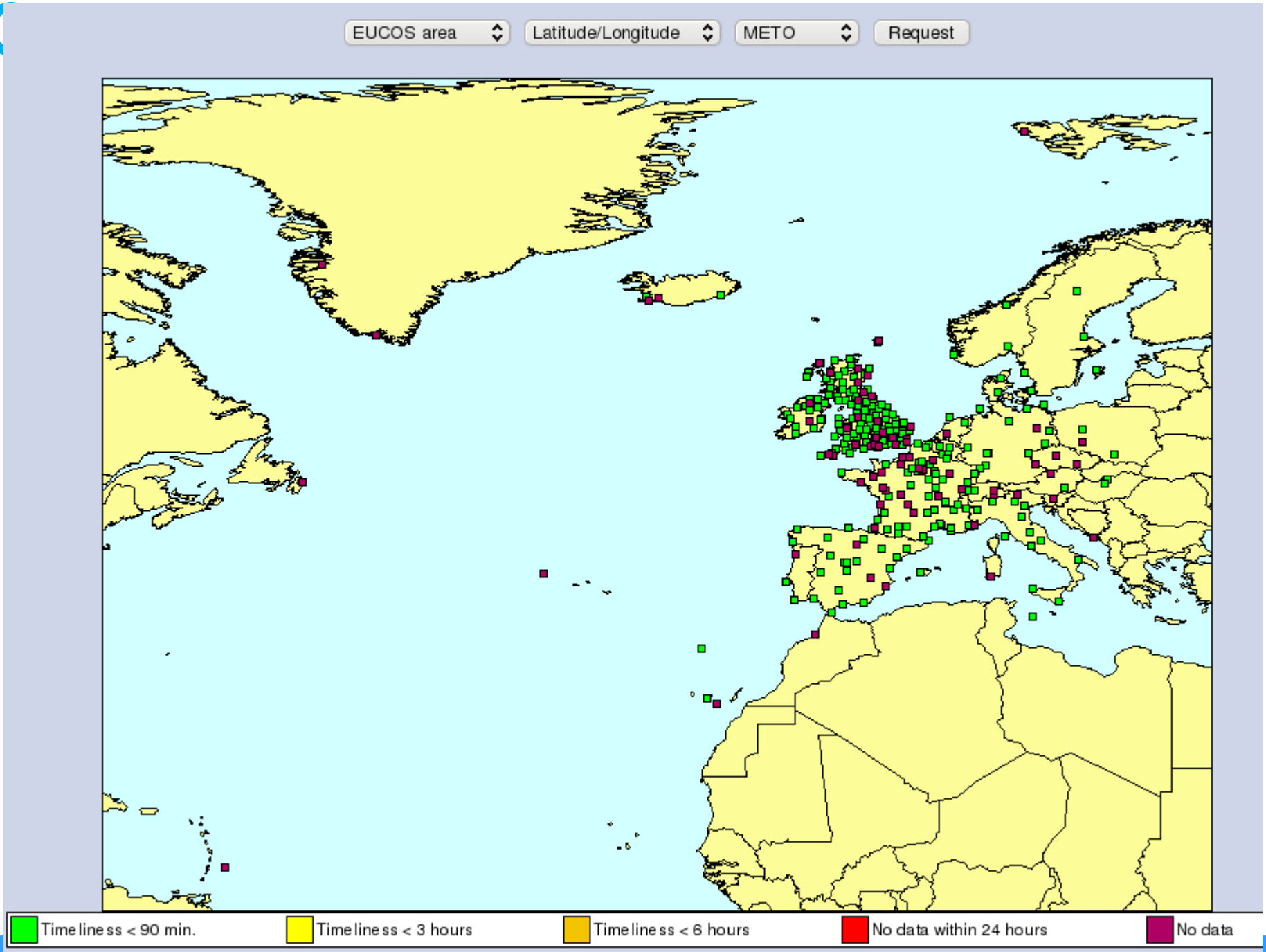
Legend

, Export as CSV

288 stations found.

Identifier	21	22	23	24	25	26	27	28	29	30	Ø
ABEP-METO	115.0	120.0	120.0	120.0	90.0	120.0	120.0	115.0	120.0	120.0	106.2
	-8.8	-4.9	-2.9	0.4	-4.9	-10.5	-6.9	-11.2	6.1	-9.3	-6.9
	12.3	8.2	8.2	5.7	10.8	16.6	11.0	13.2	14.6	17.4	12.3
ABYW-METO	-	-	-	-	-	-	-	-	-	-	31.0
	-	-	-	-	-	-	-	-	-	-	-0.2
	-	-	-	-	-	-	-	-	-	-	6.1
ACOR-METO	115.0	120.0	115.0	120.0	90.0	120.0	120.0	115.0	120.0	115.0	105.2
	-6.9	-7.3	7.6	-8.9	-3.7	2.0	-15.6	-12.7	-16.1	-7.7	-8.6
	10.9	9.8	12.4	17.6	8.7	8.1	25.5	15.5	17.2	14.6	16.0
ADAR-METO	115.0	120.0	120.0	120.0	90.0	120.0	120.0	115.0	120.0	120.0	106.2
	-2.4	-4.8	-3.1	1.9	-6.7	-8.0	-12.0	-8.1	-0.4	-2.9	-5.2
	9.6	11.6	7.5	18.5	17.0	14.3	13.4	11.2	12.6	13.1	12.0
AILT-METO	115.0	110.0	120.0	120.0	85.0	120.0	85.0	115.0	120.0	115.0	91.6
	3.8	-2.5	-1.8	-7.6	-3.8	1.5	-1.4	-4.0	0.4	-2.3	-2.9
	7.9	7.4	5.2	10.2	10.1	9.2	5.6	7.8	7.5	5.4	10.7
ALDB-METO	115.0	120.0	120.0	120.0	90.0	120.0	120.0	115.0	120.0	120.0	106.0
	-4.8	-9.6	-5.4	-6.7	-6.6	-2.6	-4.8	-7.3	-8.6	-5.0	-6.9
	11.3	12.5	7.5	9.8	10.5	8.4	7.7	9.1	11.5	9.7	10.7
ALME-METO	110.0	110.0	120.0	115.0	85.0	115.0	115.0	110.0	120.0	115.0	101.4
	-16.5	2.3	-4.2	-7.5	-10.6	-14.8	-15.9	-7.5	-20.1	-16.6	-11.5
	19.4	11.6	20.6	13.9	13.3	20.5	17.7	12.5	22.8	18.7	17.1
	115.0	120.0	120.0	120.0	90.0	120.0	120.0	115.0	120.0	120.0	106.2


EUCOS area
Latitude/Longitude
METO
Request
Timeliness < 90 min.
Timeliness < 3 hours
Timeliness < 6 hours
No data within 24 hours
No data

The EUCOS and E-GVAP monitoring and validation is supplementary.

The EUCOS monitoring provides members a QM product that is as similar to the the monitoring done by EUCOS of other obs programmes as possible, given the differences between the different observing systems.

Monthly extracts of EUCOS monitoring?

Expert team on data processing

The primary contact point between the meteorological and geodetic side.

Team involves both the real processing experts, and people from institutes starting to process GNSS data for delivery to E-GVAP.

Rosa Pacione/Brigida Pace, e-geos, Italy
Jan Dousa, GOP, Czeck Republic.
Elmar Brockmann, Swisstopo, Switzerland
Galina Dick, GFZ, Germany
Jan Johansson, Chalmers Tech. Univ., Sweden
Marcelino Valdes/Miquel Angel Cano, IGE, Spain
Romain Fages/Sylvain Dauriach, SGN/IGN, France.
Eric Pottiaux/Carine Bruyninx, ROB, Belgium
Wolfang Soehne, BKG, Germany

Ambrus Kenyeres /Szabolcs Rozsa, Hungary

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

Inter European scale (EUREF)

- Joao Agria Torres, Chairman of EUREF.
- Elmar Brockmann, Swisstopo
- Hans van der Marel, Tech. Univ. Delft.
- Carine Bruyninx, Roy. Obs. Belgium, EUREF coordinator
- Henrik Vedel E-GVAP, DMI
- Jonathan Jones E-GVAP, UK Metoffice
- Siebren de Haan E-GVAP, KNMI

Responsible person: Henrik Vedel.

Very fine collaboration with both above geodesists.

Ambrus to replace Hans?

National scale.

- E-GVAP team.

Responsible person: Henrik Vedel.

- EUMETNET directors prefer national arrangements.
- Practical matters, e.g. national GPS data obtained by a national mapping agency also points to national arrangements.
- A changing liaison group, involving persons from currently active partners
- Database with examples of agreements/contracts between data owners and met. inst.
- EUMETNET Council: Agreements made between met. Offices and GPS providers
- Formally each E-GVAP member institute is responsible for making available GPS data from that country for E-GVAP, or trying to, depending on the current level of national GPS meteorological collaboration. Help in this process can be provided from the E-GVAP team.

Expert team on GNSS observation usage

Purpose: To further the use of gb GNSS data in NWP and now-casting through sharing of results and expertise, to provide guidance material for others, and to provide feedback to processing centres.

Gemma Bennitt & Dave Officer, UKMO,
(Daniel Leuenberger, MeteoSwiss, not working on GNSS usage currently)
Jana Sanchez Arriola, AEMET, Spain
Patrick Moll, Meteo-France.
Klaus Stephan, DWD.
Henrik Vedel, DMI and E-GVAP
Jonathan Jones, UKMO and E-GVAP
Siebren de Haan, KNMI and E-GVAP.

Responsible person: Henrik Vedel.

Operational status:

- Three institutes, assimilate E-GVAP data in their operational models.
  - Météo France in Arpege (global), Aladin (regional) and Arome (meso scale, at 2.5 km).
  - UKMO in NAE (regional) and UK4 (meso scale).
  - DMI in “Slippery Road Model” setup.
- A positive impact from the use of the E-GVAP data is reported.
- Assimilation is done of NRT ZTD using variational data assimilation systems (3 and 4DVar). Besides there are significant differences.
- MF and DMI uses a white list for selection of sites&processing centres to be included in the data assimilation. The list is determined based on the O-B statistics. Site&processing centre specific bias correction (from month long offset averages) and observation errors.
- UKMO uses available data from a subset of the E-GVAP processing centres. Bias correction based on month long offset averages.
- Many HIRLAM/HARMONIE countries are close to operational assimilation (KNMI, AEMET, SMHI).
- Beginning now-casting use at AEMET, Barcelona. Research in this at UKMO and KNMI.

Timeline and members

E-GVAP started 2005-04-01, ran for 4 years, from April 2005 to March 2009.

E-GVAP-II started April 1´st 2009.

To run for 4 years 9 months, however with a midterm review at 2 years 9 months, considering whether it has matured to become a EUCOS programme.

Currently 15 members:

Belgium, Croatia, Denmark, Iceland, Ireland, Finland, France, Hungary, Netherlands, Norway, Serbia, Spain, Sweden, Switzerland, United Kingdom

E-GVAP economy

The ordinary yearly E-GVAP-II budget is:

•Project manager	43.0 k€	DMI
•Contract to support hub/central processing	25.5 k€	UK Metoffice
•Contract to quality control facility	25.5 k€	KNMI
•Expert teams, liaison and project travel	25.0 k€	
•Total	119.0 k€	

(10 k€ less than E-GVAP-I)

The payment from members is less these years, due to the use of surplus money from previous years.

The surplus money is handled by the EUMETNET Secretariat in Brussels.

This limits somewhat our flexibility to utilise the full amount of travel money, since the possibility of over spending one year versus under spending is uncertain.

Details in pdf-file.

E-GVAP primary contact and information points

- Email address: egvap@dmi.dk
- Web address: http://egvap.dmi.dk
- Uid and pw at website: egvap, gps2user. Site links to validation site and dataserver.
- Access to database is institute specific, password protected.
  - Contact Jonathan Jones or Dave Offiler for access.

E-GVAP goals

1. Ensure the system built up in E-GVAP-I is maintained and continue to run, to make available for assimilation and now-casting data from the sites currently available in E-GVAP-I beyond March 2009.
2. Continue the established, fruitful close collaboration with the geodetic community. Thereby increase the number of sites, in particular in regions with poor coverage and data, and increase the homogeneity and quality of the NRT ZTDs.
3. Further and improve the construction of IWV maps and animations for use in now-casting.
4. Ensure that data server and data monitoring facilities have backups in case of failure, minimising the risk of a complete lack of ZTD/IWV data.
5. In collaboration with the geodetic community, and possibly EUMETSAT, attempt to improve quality and security of access to so-called “satellite orbit and clock estimates”, which are used in the data processing by the processing centres.

Milestones year 2011

- Workshop on the production and use of gb GNSS delay data. In connection with expert team meeting or an international conference.
- Reports from expert, liaison and E-GVAP teams.
- Common E-GVAP and EUCOS report on the prospects of immediate implementation into EUCOS.

Milestones year 2012

- A review/discussion of the future route for European ground based GNSS observations for meteorology
- Draft proposal for the future of E-GVAP.
- Reports from expert, liaison and E-GVAP teams.
- Nominal start of operations under EUCOS

Milestones year 2013

- Review of processing, utilisation, and impact of ground based GNSS data at European meteorological services.
- Workshop on the production and use of gb GNSS delay data. In connection with expert team meeting or with international conference.
- Reports from expert, liaison and E-GVAP teams.
- Final report
- Formal hand-over of operations to EUCOS

Past meetings and near future meetings.

- **E-GVAP joint expert team meeting, Oslo, 23 Sept 2010**
- **E-GVAP plenary meeting, Oslo 24 Sept. 2010.**
- COST EG_CLIMET meeting, Køln/Cologne, Nov 17, 2010
- EUMETNET PM meeting, Budapest, December 2010.
- EUCOS PM meeting, Météo France, Brest, 26-27/1, 2011.
- ESAT meeting, ECMWF, primo March 2011
- **EGU session on "Atmospheric Water Vapour Retrieval by Space Geodetic Tehcniques",** April 3-8, 2011.
- **EUREF annual symposium, Moldova, mid May 2011-05-28**
- EIG EUMETNET Obs. Roadmap drafting meeting, DWD primo July.
- EUCOS PM meeting, Copenhagen, 29/8 – 30/9 2011
- EIG EUMETNET Obs. Roadmap drafting meeting, Copenhagen, 2011-08-31
- **ESA Galileo Workshop, Copenhagen, 2011-08-31 to 2011-09-02**.
- EUMETNET Observation Roadmap drafting team, Copenhagen, 31/8 2011.
- **E-GVAP joint expert team meeting and E-GVAP plenary meeting** combined, Météo France, Toulouse, 1 ½ and ½ respectively, Oct. 20-21, 2011.
- **AGU meeting**, San Francisco, Dec. 2011
- EUMETNET PM meeting, Dec 2011
- EMS meeting, US, Jan. 2012 (possibly).

EUMETNET EIG restructuring and the future of E-GVAP

- The members of EUMETNET have formed an entity which has it own legal and economic status, thus can make contracts, take loans, etc. This is called the **EUMETNET EIG**.
- One purpose is to make it more easy for the members in common to take part in collaborations with for example the EU and other large organisations.
- For the current goals of E-GVAP, this has little consequence.
- For the administration of E-GVAP it has significant consequences.
- New MoUs above national level will be with EIG EUMETNET on the EUMETNET side

EUMETNET has further reorganized itself regarding advisory boards. Two bodies, STAC and PFAC now advice Assembly on scientific and technical matters, on and economic matters, respectively.

These bodies 3 have decided to review ALL programmes under EUMETNET, and asked for plans for their future, until 2020. For observations this is called the EUMETNET Observation Roadmap. Also roadmaps for Climate and SRNWP (short range forecasting) have been made.

For E-GVAP this part is positive. There is a high interest in ground based GNSS products, including also interest in “next generation products”, such as GNSS ZTD gradients, slants and tomographic reconstruction of water vapour fields.

The discussions about selecting between the options in the roadmaps takes place at a time when the majority of the met offices suffer heavy cuts in governmental funding.

Right now the three bodies advice a max spending of 6 M Euro for all the common programmes.

Selecting based on members ranking E-GVAP is in, if keeping the four main programmes, E-GVAP is out.

The current advice from STAC&PFAC is to have proposals for the four major, common programmes for a next phase. When the cost of the bids is known, EUMETNET will consider the future of the other programmes.

For the moment all other programmes in EUMETNET have to await the outcome regarding the 4 big programmes.

Since E-GVAP is an optional and small programme (not including all EUMETNET members) it is a possibility that E-GVAP can continue as an optional programme, even if EUMETNET as whole is not supporting it.

For the moment we should not worry too much. I am optimistic we can navigate E-GVAP through to a next phase. It may be beneficial that EUMETNET first considers the very big programmes, then concentrate on finding solutions for the small programmes. It is too difficult to solve everything in one go.

Meanwhile we enter a phase, where, on the meteorological side, it is important that we consistently inform within the met-officies about the highly collaborative inter diciplinary nature of the ground-based GNSS observing meteorological observing system. Such that when finally a decision about E-GVAP prolongation has to be bade, management at large is aware of the particular construction. And aware of the good impact of the observations on NWP forecasting skill.

De-central data dissemination and naming

- Purpose is to establish a more robust distribution system, with reduced impact in case of single point failure.
- For the majority of the ACs it should be simple to accomplish, since COST 716 ascii format to BUFR conversion software made by Dave Offiler is available, and the ACs can either distribute to the GTS themselves (UKMO, KNMI, and SMHI/NGAA) or via their NMS.
- Actual setup has been awaiting setup of active quality control and a workable solution to the “naming/identifier”, now also outcome of NOAA negotiations, in which format and site name issues are on the table.

- It is not realistic that all GNSS sites will be named according to the needs of meteorology. Only the “higher level” GNSS sites have unique names. Opting to use only such sites in E-GVAP will limit the number of sites from which we can use ZTDs ☹
- It has been accepted now, within E-GVAP ACs, to not upload new sites names without prior consultance of an E-GVAP master name file.
- Needs in the longer run also to be solved also on a global level.

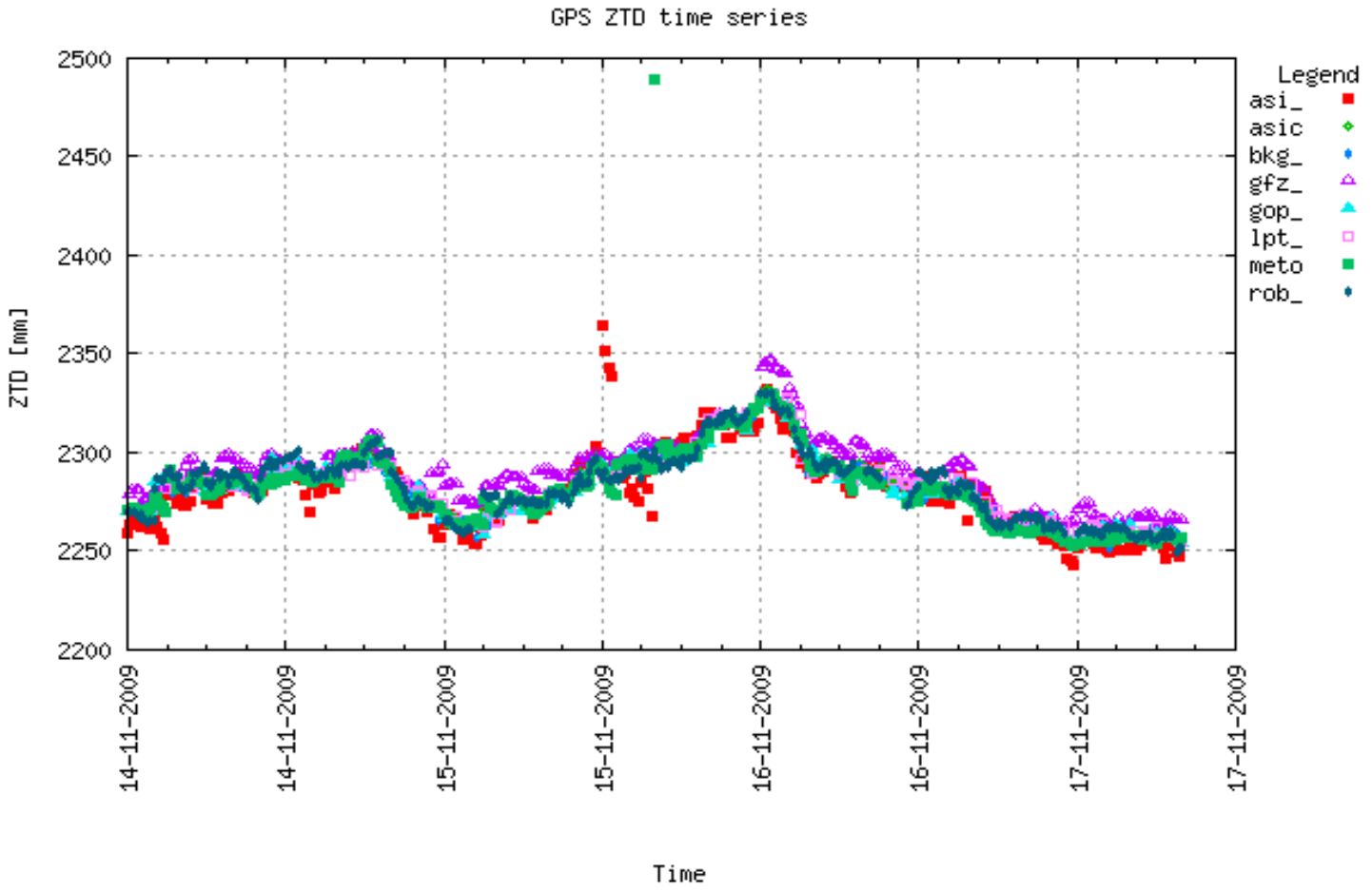
Active quality control, AQC

A central aspect of E-GVAP-II

Why active quality control?

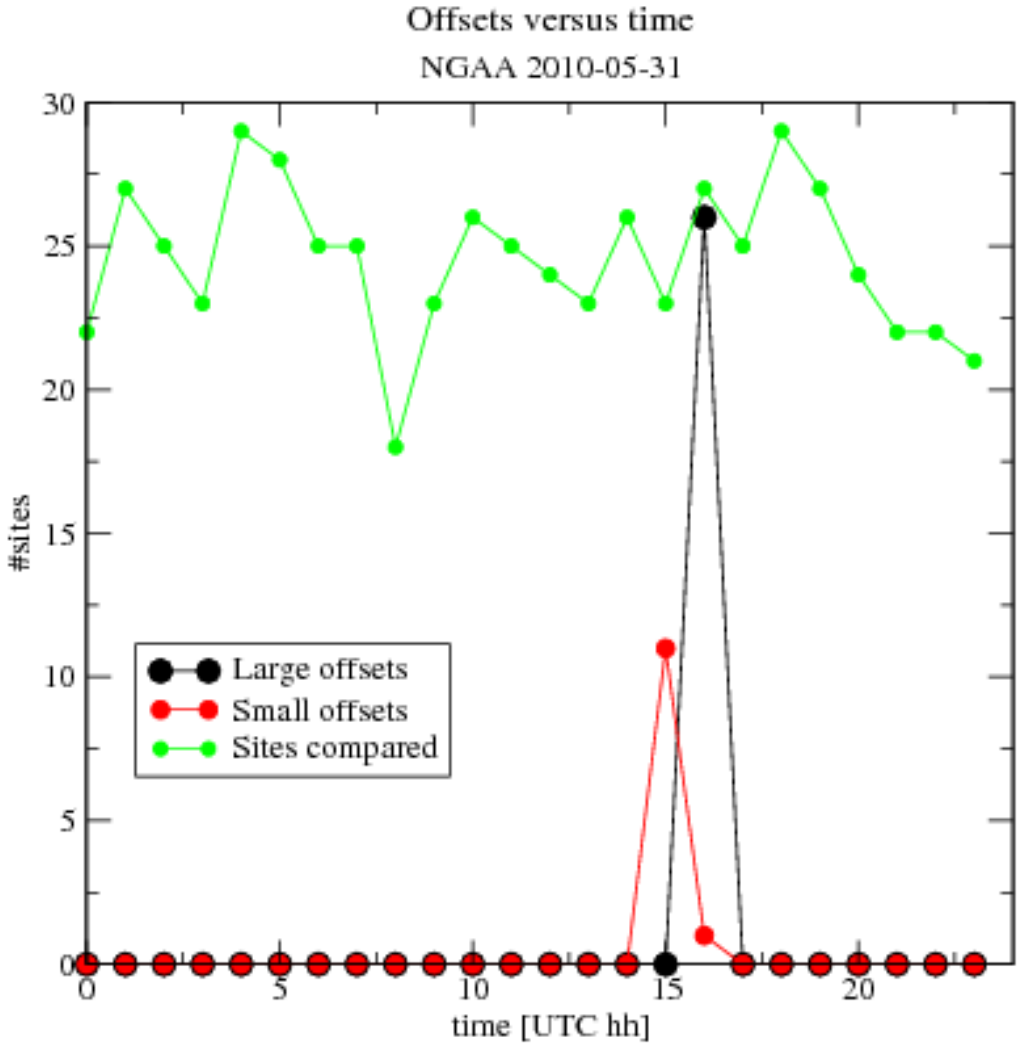
- Only by combining many different pieces of information, from different sources, can the ZTDs be estimated, with the use of quite complex analysis software. Different software exist for this. While they give almost similar results with the right input, they behave differently when there are problems with the quality of the input.
- The NRT processing is very time critical. In particular when done hourly.
- It is not conceivable that all ACs (analysis centres) in E-GVAP use the same software. Some of the ACs are involved in the development of GNSS processing software, it is central to them to use their own software.
- Certain types of errors in the input can lead to heavily correlated, systematic errors in the estimated ZTDs. This is very dangerous to a data assimilation system. Such systems can deal well with a few incorrect observations here and there, but systematically incorrect errors in a whole region can lead to drastic errors in the data assimilation, and hence the forecasts. Use of such data must be avoided. Avoiding the odd forecast with big forecast errors can be more important to an NWP centre, than the small, but regular benefit of the observations in normal periods.
- Examples. If a satellite position or a satellite clock error estimate is wrong, yet still used, it will effect all results at an AC using the ppp-solution. If the assumed position of a GNSS receiver is wrong at an AC doing a network solution, it will effect the ZTD of all the sites in the network.

A combined solution is a ZTD estimate made by statistical combination of a number (at least 3) of individual ZTD estimates. ASIC is a combined solution made by ASI. Plot shows NRT solutions from 7 ACs versus ASIC. Notice very transient problem at ASI and METO. In the future KNMI and ASI will each deliver combined solutions, derived using different statistical methods.



Active quality control, method tested and proposed for for offset counting and assessment of eventual widespread problems at an AC

1. Data from all available costfiles with data valid in a certain period are extracted, e.g. one hour, yyyymmddhh to yyyymmddh+1, and loaded into the comparison program.
2. Only data from GNSS sites processed by a minimum number of ACs are selected for intercomparison (tested with 4). Can be reduced to contain only supersites, but there is no reason not to include additional sites processed by enough ACs.
3. For each site
   - Determine median of ZTDs from each AC.
   - Determine median of medians (MoM).
   - For each AC, check whether some ZTDs have offsets larger than certain predefined sizes wrt MoM.
1. For each AC, sum up the number of sites with devations of certain sizes = ACdev_size. Large ACdev = large risk of general error at AC.
2. Write results to flagging file, including info about # sites compared, etc.

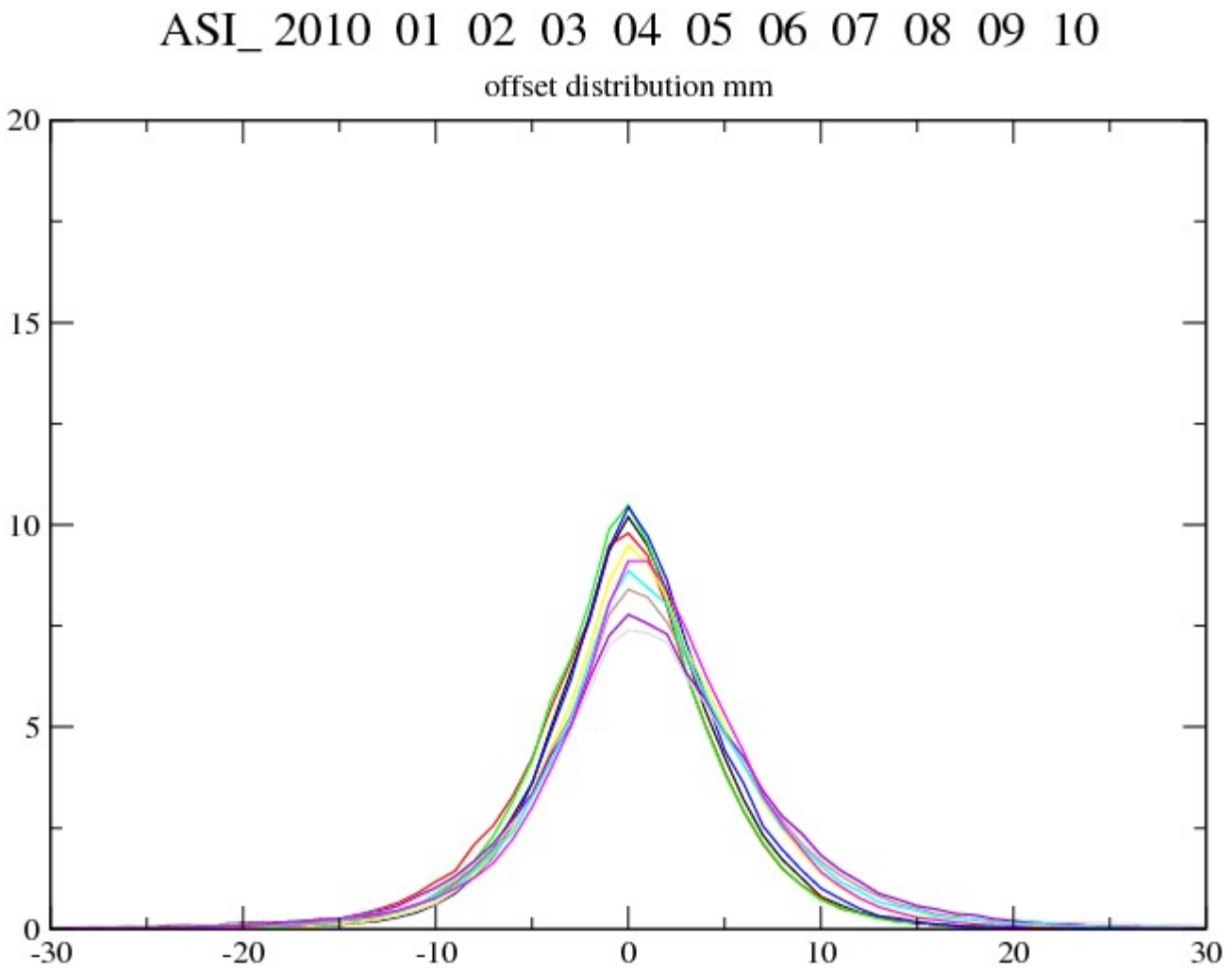


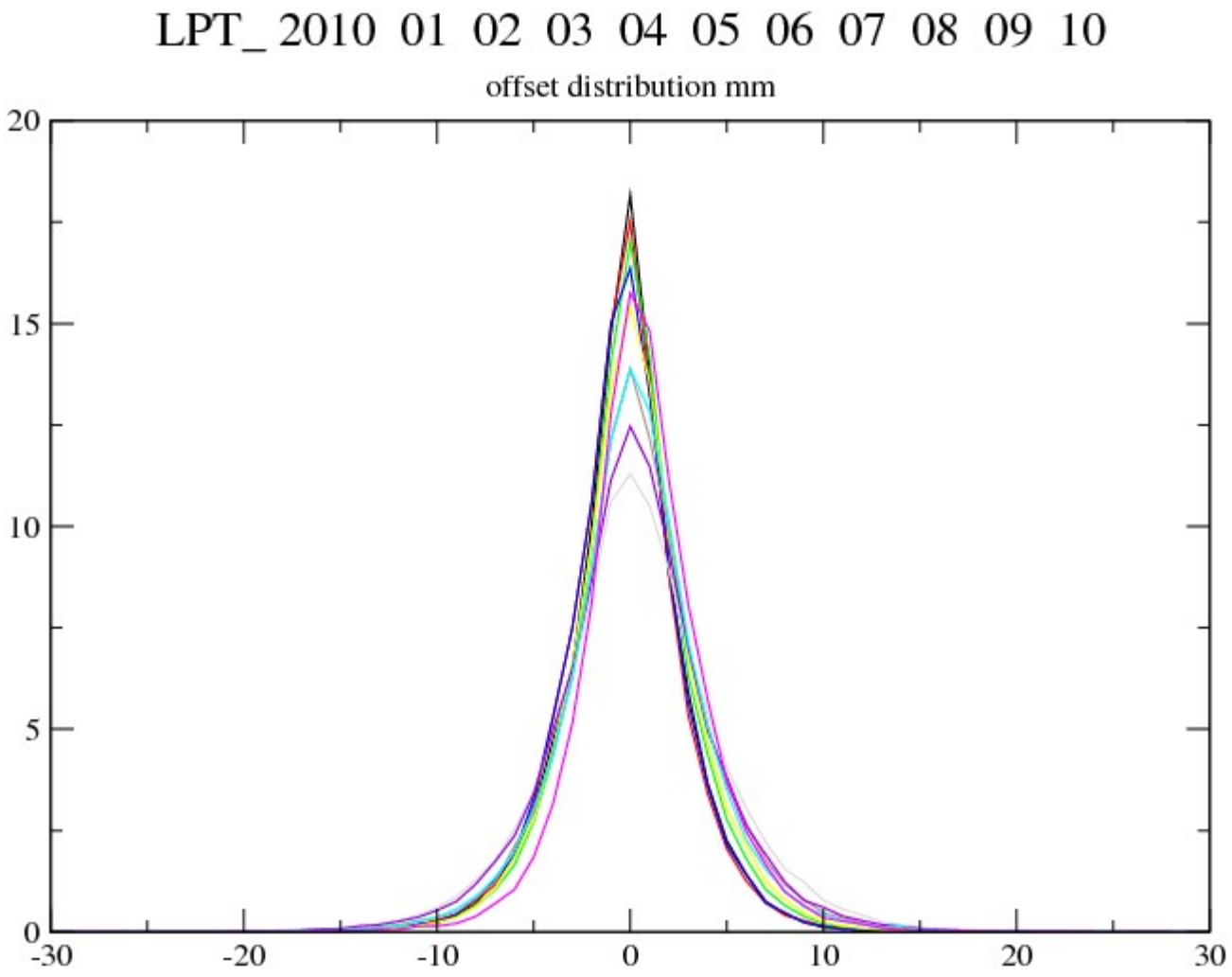
An example of a **transient** error at an AC.
Based on this data in the NGAA files stamped 2010053115 and 2010053116 should not be used in assimilation, but there is no reason to disregard NGAA data from other timebins.

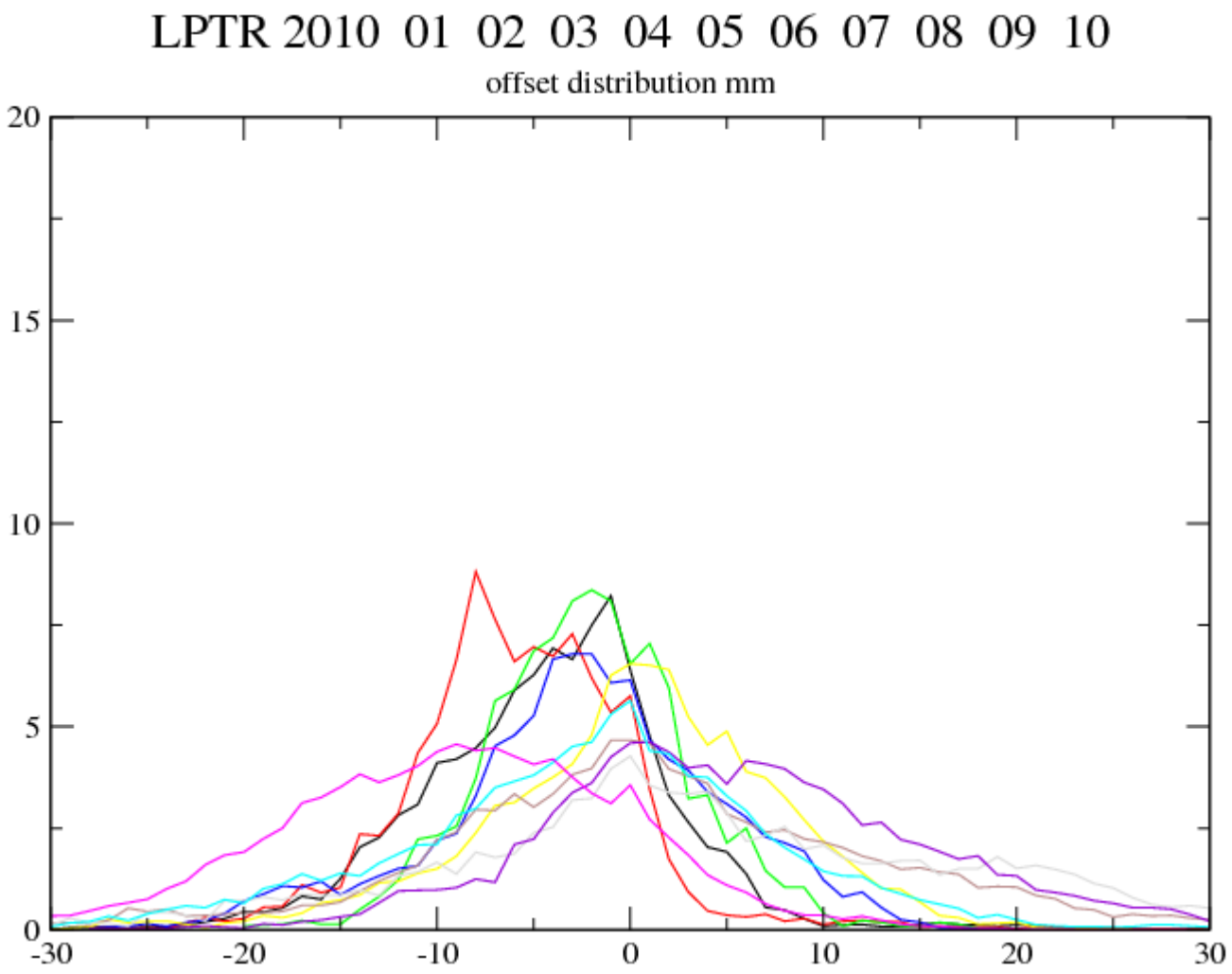
- The distributions per AC of ZTD offsets relative to the MoM (median of medians) for sites processed by at least 4 ACs have been studied. Based on that, thresholds of 20 and 40 mm for “small”, respectively, “large” outliers have been found to be useful in AQC outlier detection.

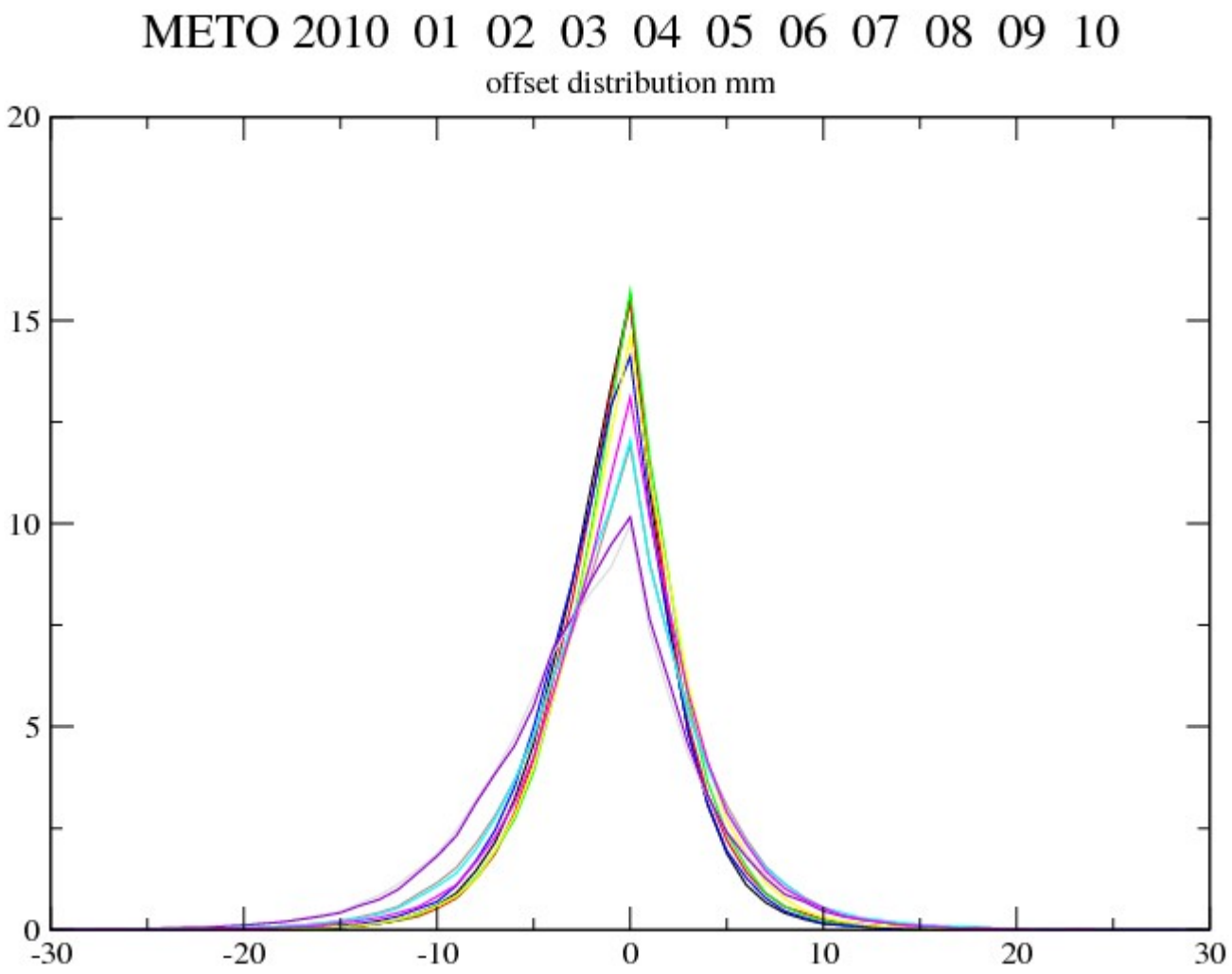
- It is planned to run the AQC for the entire E-GVAP database, to provide a “cleaned” NRT ZTD dataset.
- This set will be converted to IWV as well. But IWV is less well determined, since distance to nearest SYNOP data available to us, can be very very large! And offset in time too.

- A cleaned dataset was made for Sofus for 2*2 sites in Norway, for a special study.

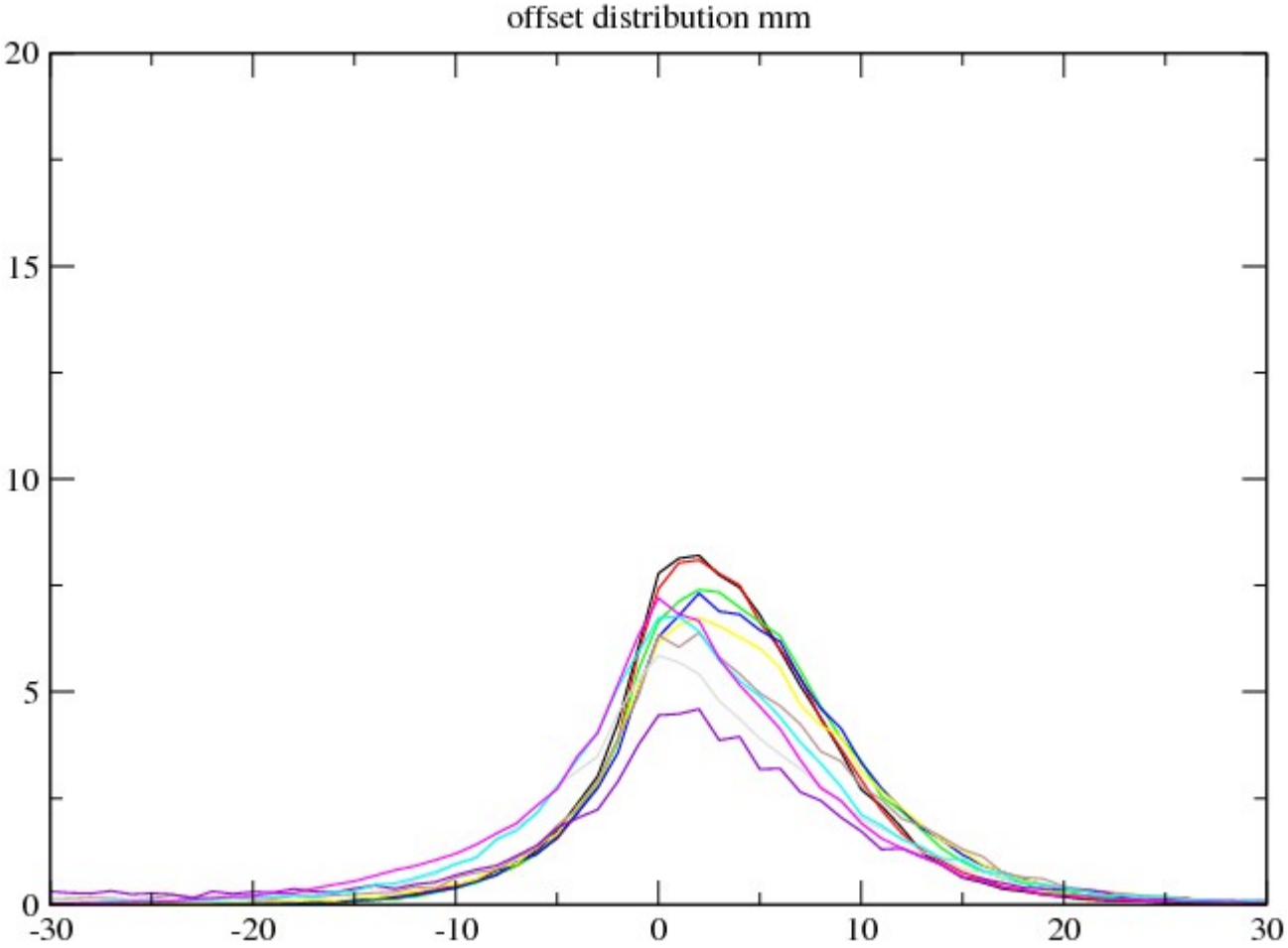

ASI_ 2010 01 02 03 04 05 06 07 08 09 10
offset distribution mm
20
15
10
5
0
-30
-20
-10
0
10
20
30

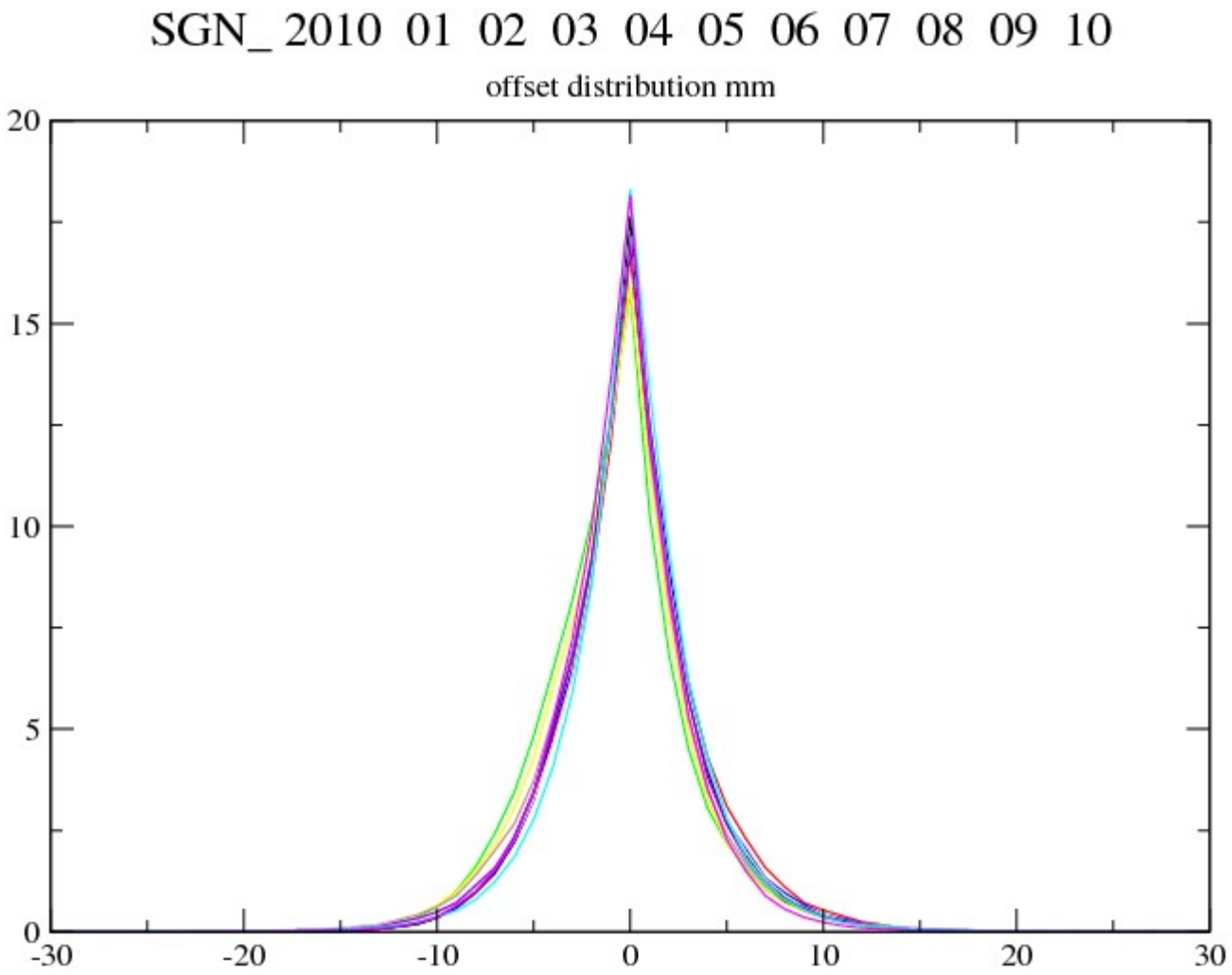

LPT_ 2010 01 02 03 04 05 06 07 08 09 10
offset distribution mm
20
15
10
5
0
-30
-20
-10
0
10
20
30

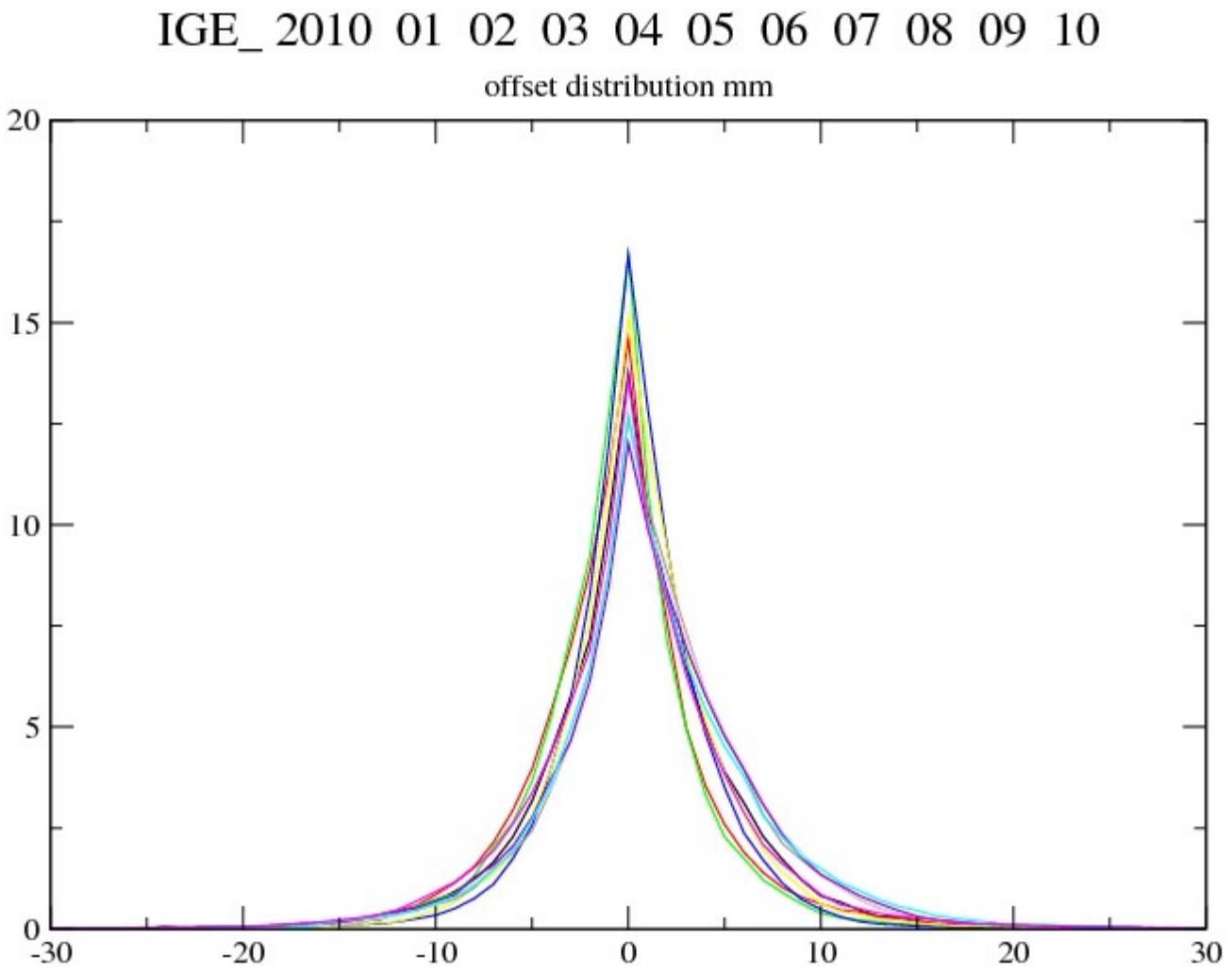

LPTR 2010 01 02 03 04 05 06 07 08 09 10
offset distribution mm
20
15
10
5
0
-30
-20
-10
0
10
20
30

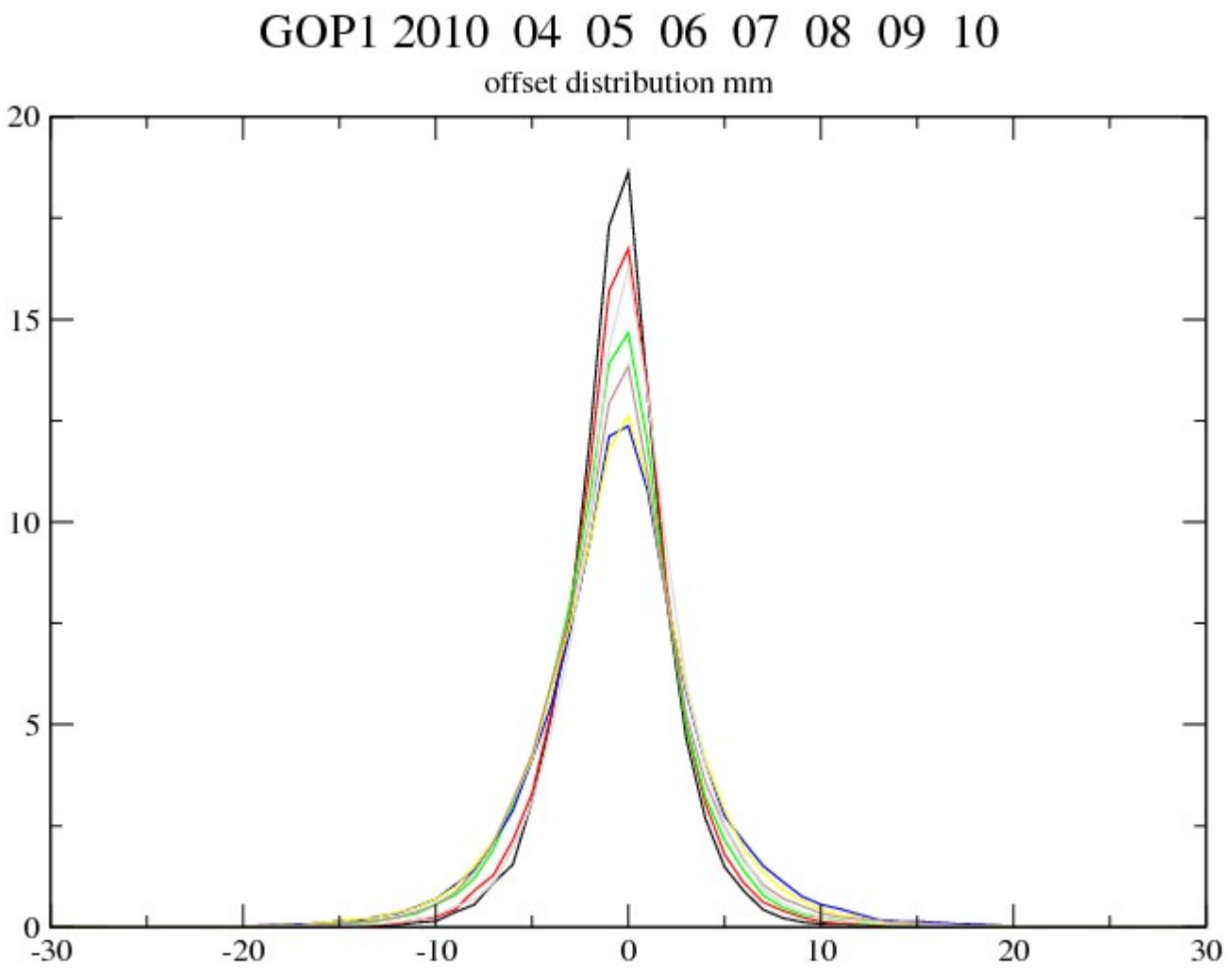

METO 2010 01 02 03 04 05 06 07 08 09 10
offset distribution mm
20
15
10
5
0
-30
-20
-10
0
10
20
30

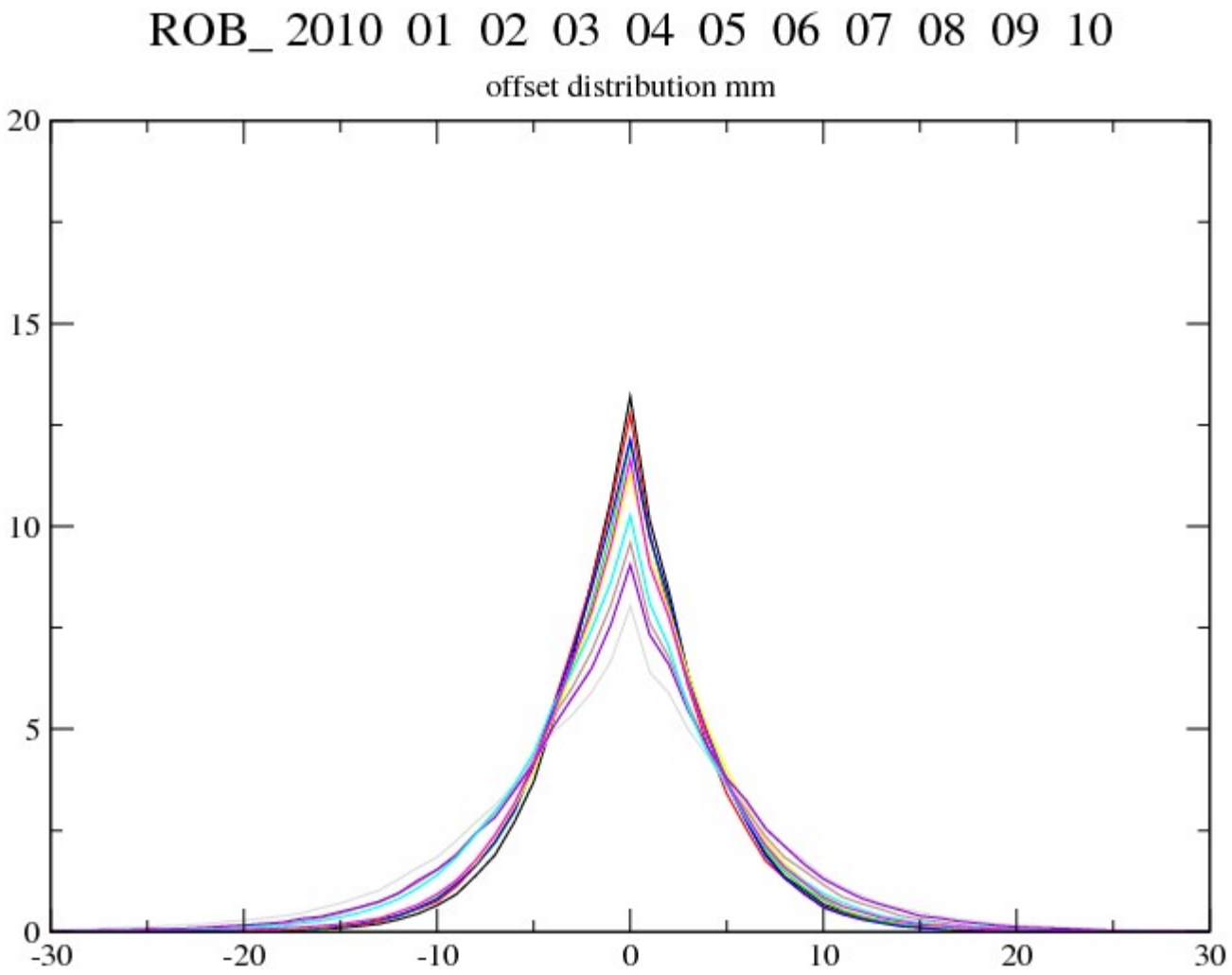
NGAA 2010 01 02 03 04 05 06 07 08 09 10




SGN_ 2010 01 02 03 04 05 06 07 08 09 10
offset distribution mm
20
15
10
5
0
-30
-20
-10
0
10
20
30


IGE_ 2010 01 02 03 04 05 06 07 08 09 10
offset distribution mm
20
15
10
5
0
-30
-20
-10
0
10
20
30

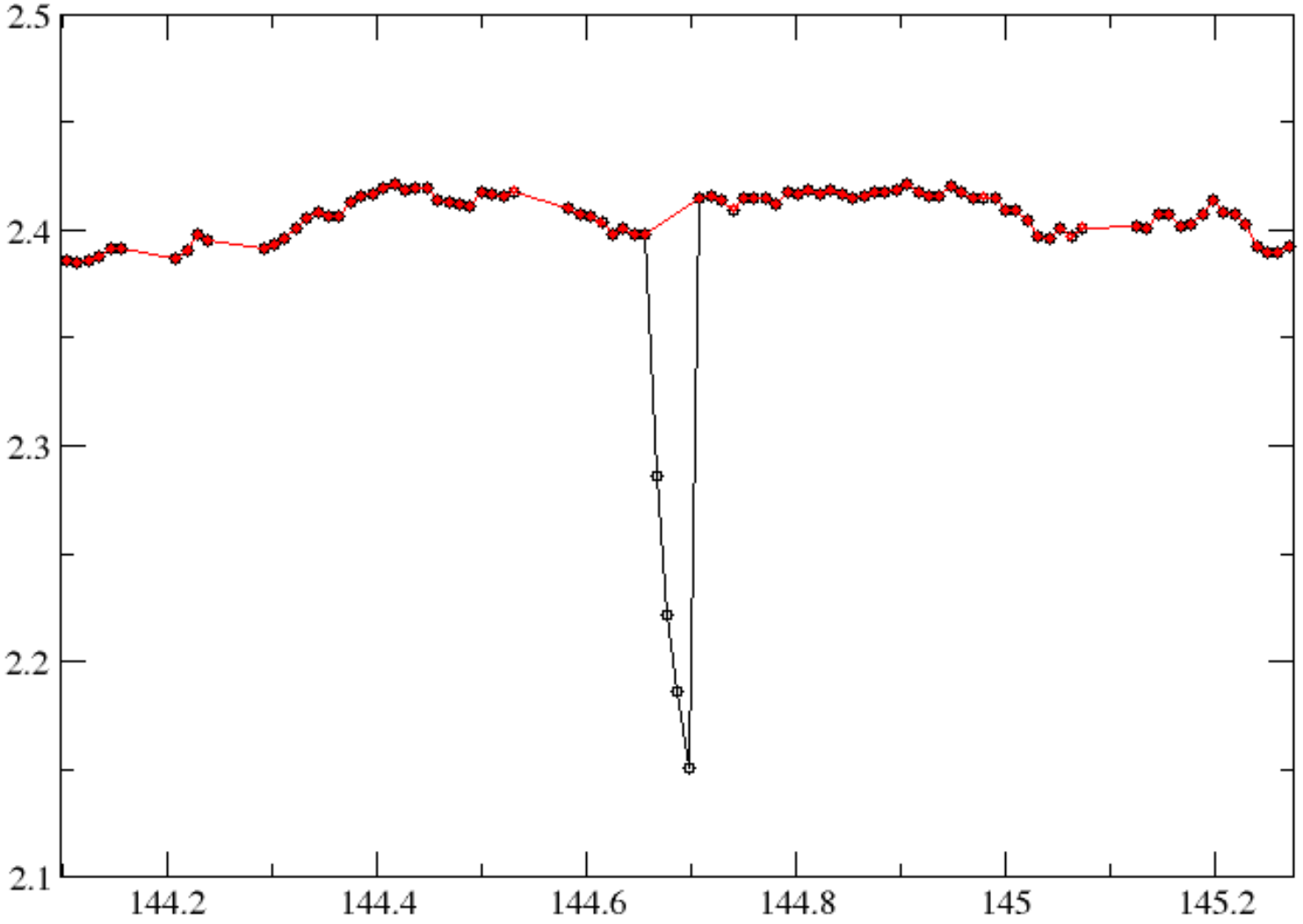

GOP1 2010 04 05 06 07 08 09 10
offset distribution mm
20
15
10
5
0
-30
-20
-10
0
10
20
30


ROB_ 2010 01 02 03 04 05 06 07 08 09 10
offset distribution mm
20
15
10
5
0
-30
-20
-10
0
10
20
30

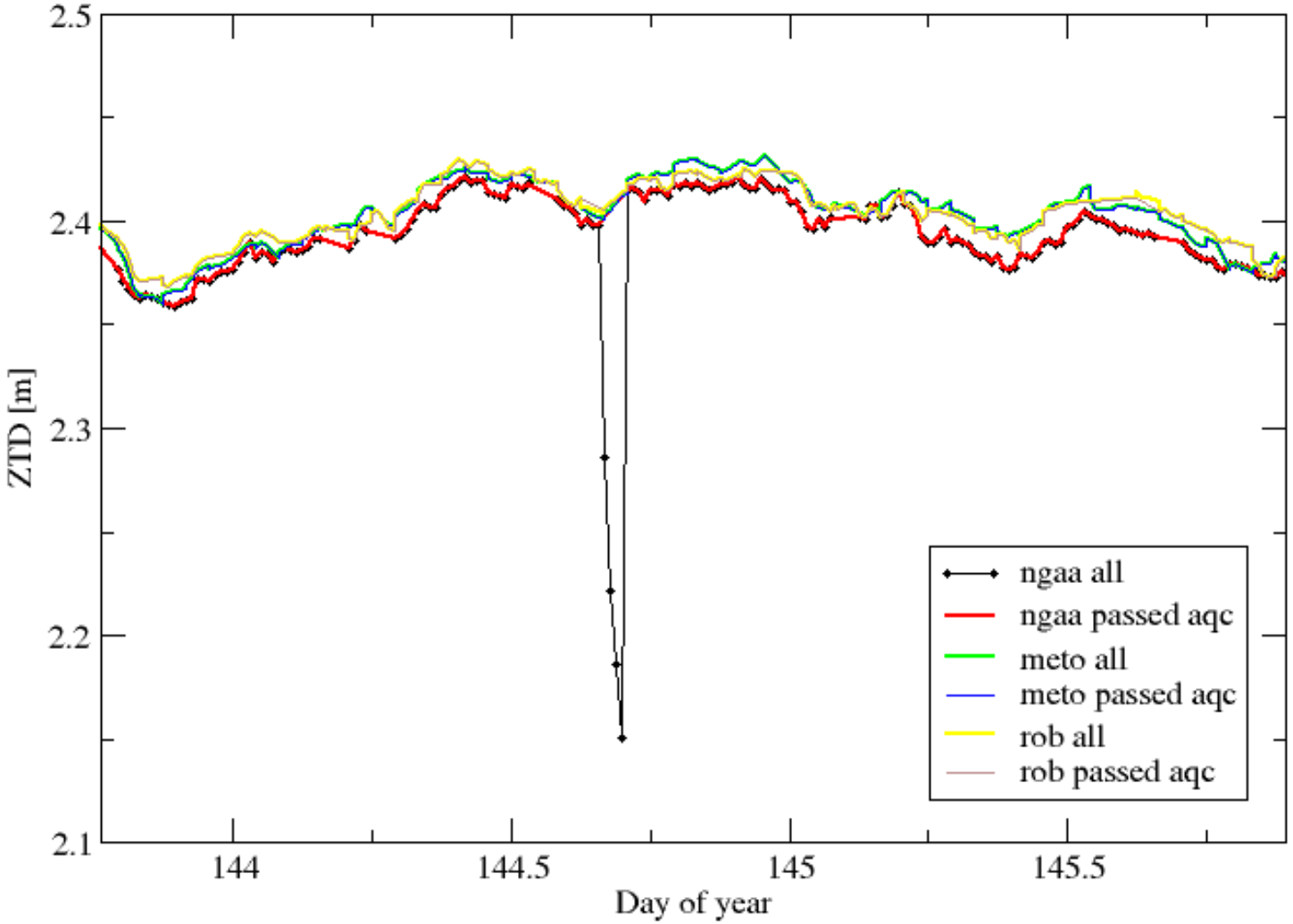
AC rms versus ZTD offset, see separate pdf-file

Conclusion. AC rms estimate is not a secure way of identifying dubious NRT ZTDs.

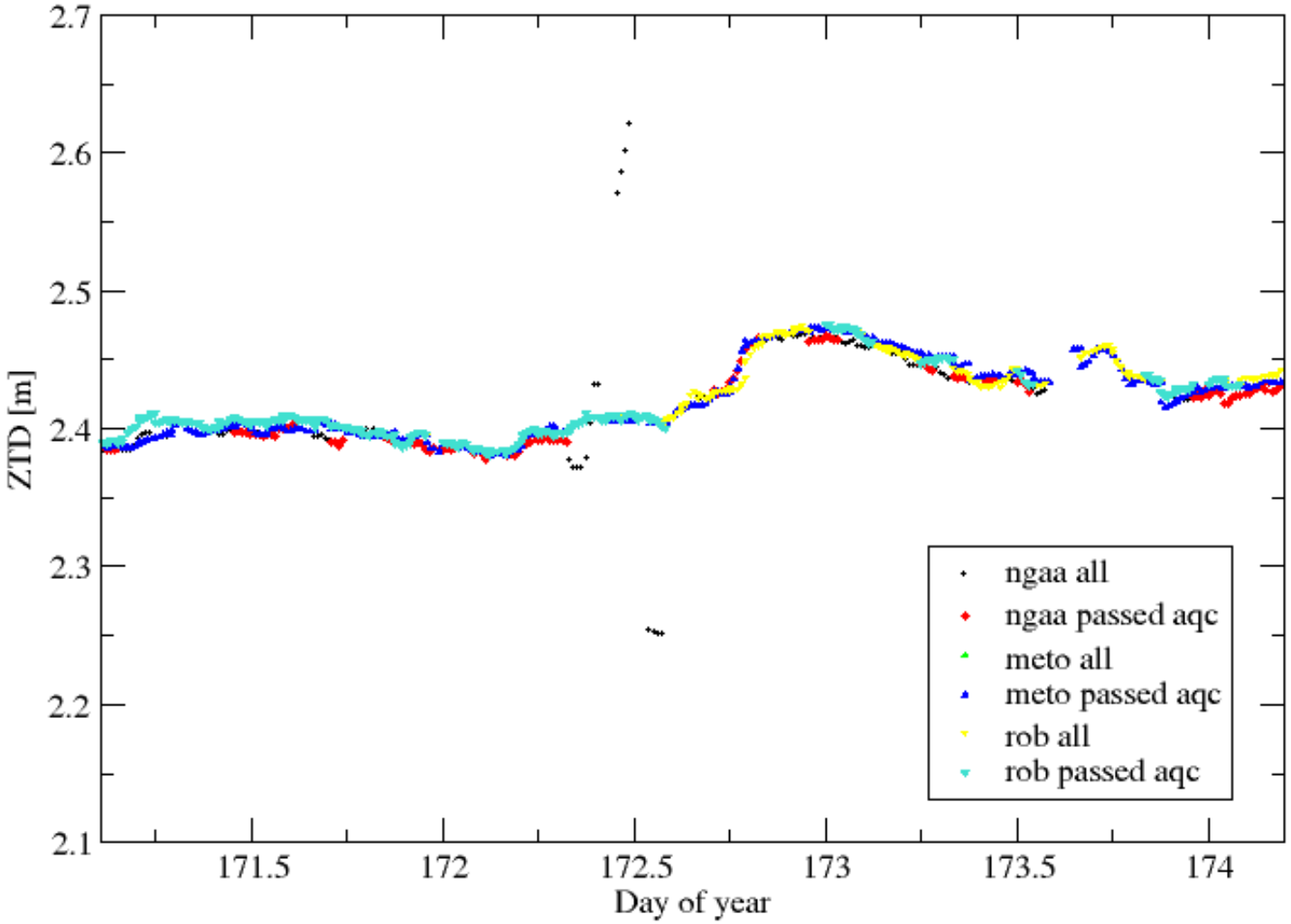
STAS, NGAA



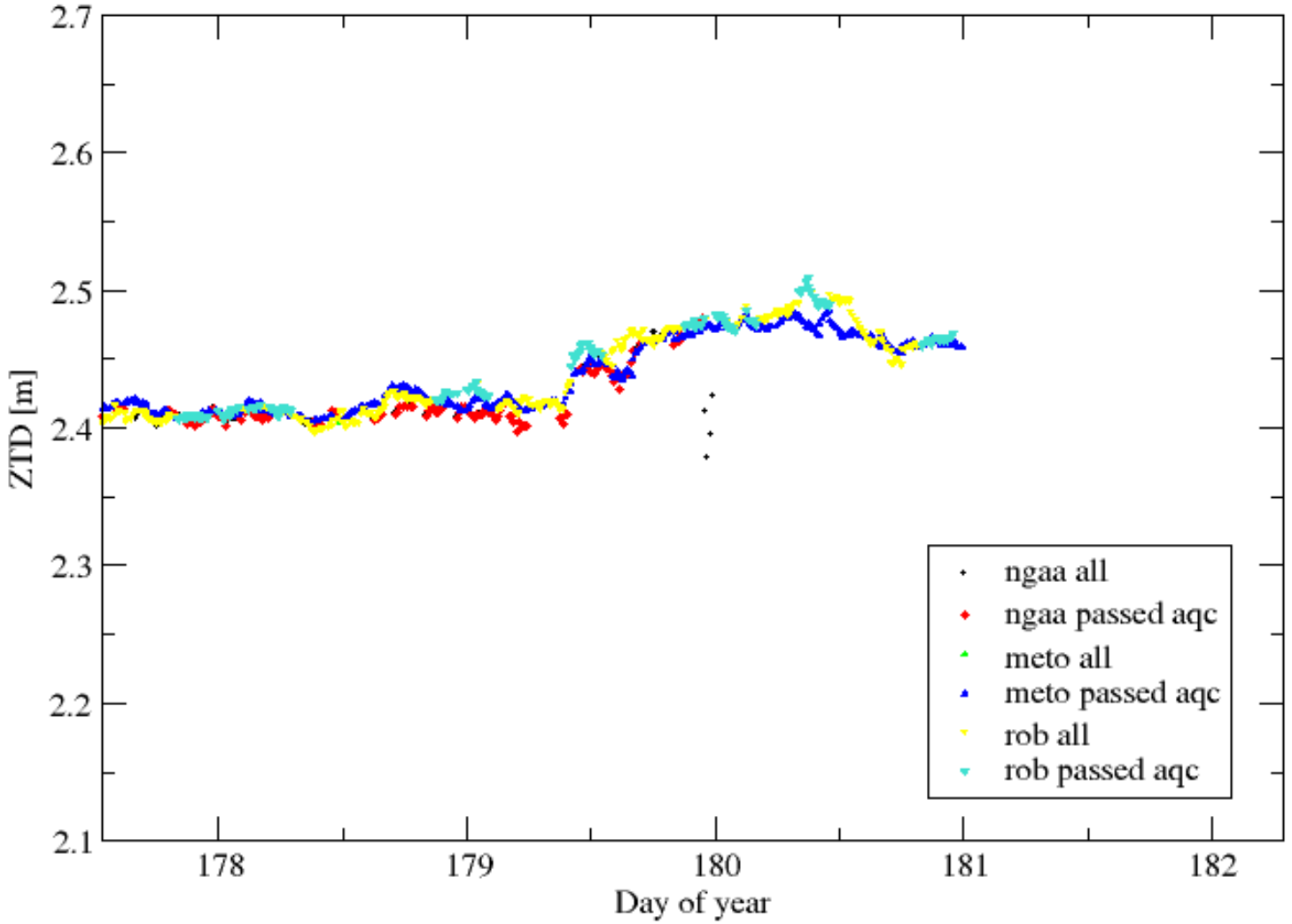
STAS, NGAA


2.5
2.4
2.3
2.2
2.1
ZTD [m]
144
144.5
145
145.5
Day of year
ngaa all
ngaa passed aqc
meto all
meto passed aqc
rob all
rob passed aqc

STAS


2.7
2.6
2.5
2.4
2.3
2.2
2.1
ZTD [m]
171.5
172
172.5
173
173.5
174
Day of year
ngaa all
ngaa passed aqc
meto all
meto passed aqc
rob all
rob passed aqc

STAS


2.7
2.6
2.5
2.4
2.3
2.2
2.1
ZTD [m]
178
179
180
181
182
Day of year
ngaa all
ngaa passed aqc
meto all
meto passed aqc
rob all
rob passed aqc

Active quality control, method tested proposed

Issues for discussion

- **It is clear that AQC is effective in catching transient errors effecting multiple sites.**
- **However, if an AC is using sub network solutions,**
  - **we need to know about subnet works (possibly in a rough sense is enough) in order to identify precisely the sites not to use,**
  - **or we need to agree that it is OK to warn against the entire dataset from that AC in the problematic period.**
  - **Possibly the latter option is only one which is sufficiently easy to work with at the user end, for it to be helpful.**
- **Having decided on this, AQC can be quickly implemented.**

- **Notice. Nobody is forced to use AQC and it will not withhold data. It is an option. Essentially it works as an on/off AC black-list.**
- **At DMI we certainly plan to use the AQC filter.**

aqc-2009073020-210.log

2009073020 201107151650 Timestamp-costfiles Time-of-compar [UTC yyyymmddhhmm]

0 #ACs WITH OFFSETS

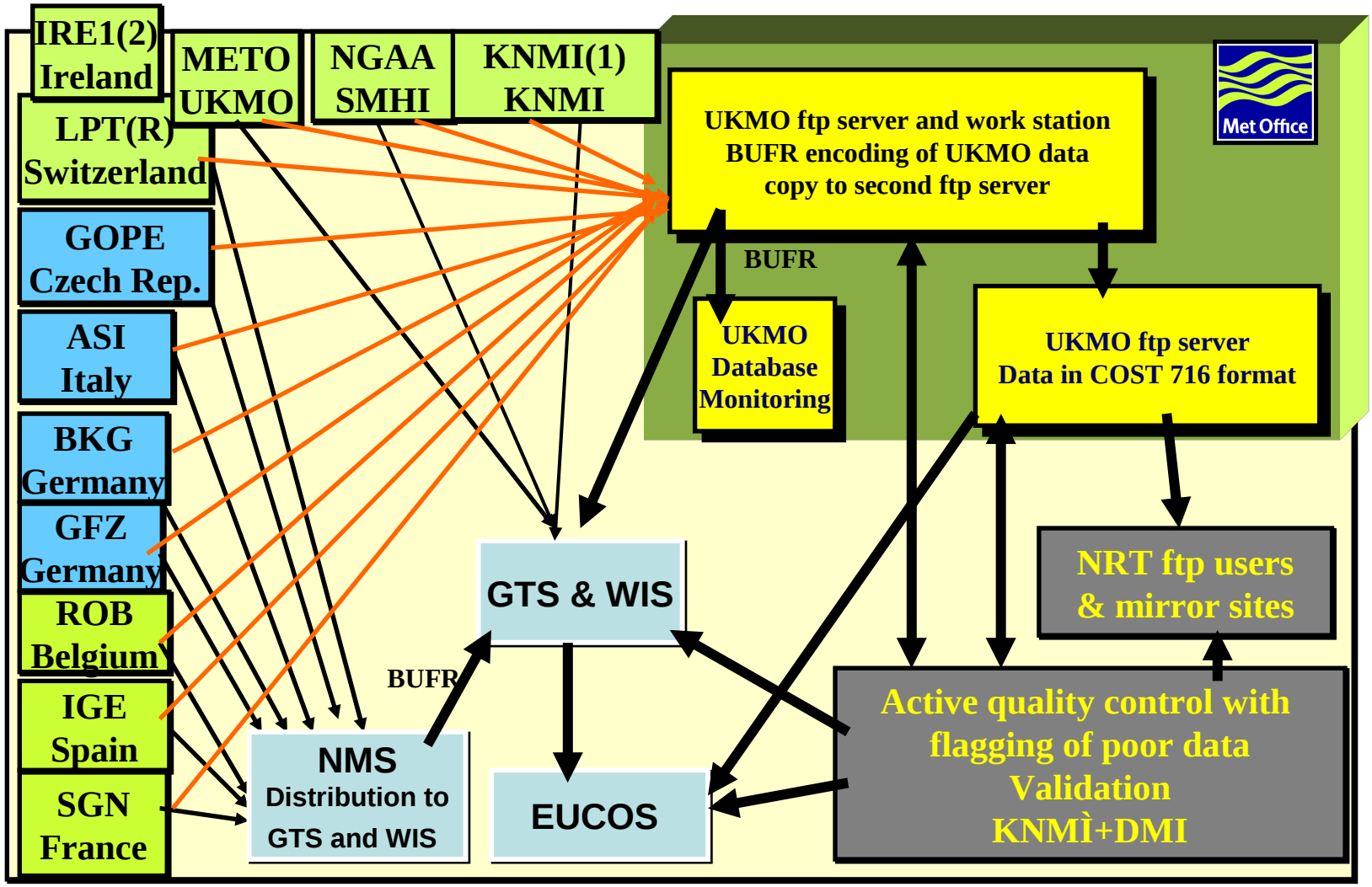
2009073020 totals: Analysed 12 ACs of 13, 65 sites of 706, 1485 ZTDs of 5776

ACs and #sites: BKG_ 42 GFZ_ 41 GOP_ 27 IGE_ 21 KNM1 9 KNMI 17 LPTR 1 LPT_ 23 METO 36 ROB_ 59 SGN1 46 SGN_ 46

aqc-2009073116-211.log

2009073116 201107151652 Timestamp-costfiles Time-of-compar [UTC yyyymmddhhmm]
2 #ACs WITH OFFSETS
ASI_ 0 8 0 3 37 0 4 148 (AC %Lsite %Ssite #Lsite #Ssite #sites #Lztd #Sztd #ztd)
Large offset sites:
Small offset sites: DRES UNPG WTZR
ROB_ 0 1 0 1 69 0 1 345 (AC %Lsite %Ssite #Lsite #Ssite #sites #Lztd #Sztd #ztd)
Large offset sites:
Small offset sites: TLSE
DRES 0 20 0 1 5 0 1 19 (Site %L_AC %S_AC L-offs S-offs #ACs #Loffztd #Soffztd #ztd)
Large offset ACs:
Small offset ACs: ASI_
TLSE 0 16 0 1 6 0 1 26 (Site %L_AC %S_AC L-offs S-offs #ACs #Loffztd #Soffztd #ztd)
Large offset ACs:
Small offset ACs: ROB_
UNPG 0 25 0 1 4 0 1 18 (Site %L_AC %S_AC L-offs S-offs #ACs #Loffztd #Soffztd #ztd)
Large offset ACs:
Small offset ACs: ASI_
WTZR 0 12 0 1 8 0 2 28 (Site %L_AC %S_AC L-offs S-offs #ACs #Loffztd #Soffztd #ztd)
Large offset ACs:
Small offset ACs: ASI_
2009073116 totals: Analysed 13 ACs of 13, 77 sites of 708, 1795 ZTDs of 6298ACs and #sites: ASI_ 37 BKG_ 49 GFZ_ 42 GOP_ 31 IGE_ 26 KNM1 9 KNMI 20 LPTR 1 LPT_ 31 METO 39 ROB_ 69 SGN1 48 SGN_ 48

NRT GNSS ZTD data flow Future



ACs which are not at an NMS, will have to transmit BUFR via NMS to GTS and WIS

A new EU Cost Action on ground-based GNSS meteorology?

1) transfer of knowledge West-East, extending the legacy of COST 716 to East (E) and Southeast (SE) Europe; aiming at filling the gap of the GNSS stations contributing to EGVAP
2) application of GNSS data for Numerical Weather Prediction (NWP) in E and SE Europe; aiming at model validation and assimilation
3) demonstration of GNSS potential in now-casting; aiming at case studies for extreme events like floods etc..
4) exploiting the potential of reprocessed GNSS (15+ years) in long term monitoring
5) responding to the strong interest in the community for application of GNSS for climate research; aiming at data consistency/errors in the reprocessed data
6) GNSS gradients; aiming at validating GNSS gradients with independent IWV/ZTD measurements
7) GNSS tomography; aiming at demonstration of concept of slant path delays application in operational NWP as well as dedicated tomography campaign

Interested? Contact

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See separate list of current backup

Proposal for a new COST action on ground-based GNSS Meteteorology

Rationale The Global Navigation Satellite Systems (GNSS), a new technology that revolutionised the navigation, is becoming an indispensable part of our daily life with millions of chips installed in portable car navigation devices and mobile phones. Beside the numerous civilian and commercial applications, GNSS proved to be an accurate sensor of the most abundant greenhouse gas, namely atmospheric water vapour. Application of GNSS in Meteorology is a well established research field in Europe and GNSS data from 1,600 stations are available (EGVAP project) for model validation and assimilation in state-of-the-art models used for operational weather prediction by the National Meteorologic Services. Advances in GNSS data processing is making possible to also use the GNSS data for climatic trend analysis, an emerging new area of research that is both attractive and important.The prosed here COST action aims at:GNSS

Proposal for a new COST action on ground-based GNSS Meteteorology

-1) application of GNSS for climate in particular:- IWV trend analysis employing the synergy between GNSS and other techniques (pilot study by Prof Elgered's group) - synergy between GPS and GLONASS in estimation of IWV in the polar regions and in particular Greenland (not sure how many sites are capable to do GLONASS tracking but may be this can be addressed) - exploiting the potential of reprocessed (12+ years) GNSS data in long term global/regional monitoring (IGS 1995-2007 product + Onsala reprocessing + other Centers plan to do this next year)- intercomparison of GNSS with the ECMWF ERA Interim (1989-2013) reanalysis product and IPCC AR4 climate ensemble products- responding to the strong interest in the community for application of GNSS for climate research; aiming at data consistency/errors in the reprocessed data

2) application of GNSS for now-casting particular:- aiming at case studies for extreme events like floods, convection- linking to Global Monitoring for Environment and Security (GMES) by suggesting to set-up an operational monitoring product for emergency respond- demonstration of ultra fast real-time GNSS product (1-?? min after observation) using the PPP processing

Proposal for a new COST action on ground-based GNSS Meteteorology

3) transfer of knowledge West-East, extending the legacy of COST 716 to East (E) and Southeast (SE) Europe; filling the gap of the GNSS stations contributing to EGVAP

4) application of GNSS data for Numerical Weather Prediction (NWP) in E and SE Europe; model validation and assimilation

5) GNSS gradients; aiming at validating GNSS gradients with independent IWV/ZTD measurements + ???

6) GNSS tomography; demonstrating the potential of single frequency receivers as a budget alternative (pilot study by J. Wickert)

7) GALILEO: please suggestMet -> GNSS1) application of NWP products in PPP processing: aiming at improving the position estimates in case with data gaps (pilot study by J. Dousa) 2) GALILEO & GLONASS 3) other applications: please suggestDraft by G. Guerova 15/09/2011

Next meeting?

In connection with another meeting?

Change of format?

Any other matter?

FIN

Many thanks to Florence, her team, and Météo France for organising the meeting!

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