EUMETNET
EUROPEAN METEOROLOGICAL SERVICES NETWORK

E-GVAP-II

The EIG EUMETNET GNSS Water Vapour Programme, phase II

4th expert teams and plenary meetings
November 15-16, 2012, AEMET, Madrid, Spain

EUMETNET
EUROPEAN METEOROLOGICAL SERVICES NETWORK

Draft agenda Expert Teams meeting Thursday Nov 15, 9:00 to 17 and Friday Nov. 16, 8 to 10:50 at AEMET, Madrid

Practicalities

Information from the E-GVAP team.

Status and updates on processing and/or use by each expert.

Status and updates of GNSS meteorology at inst. by each present plenary member.

Sub-hourly processing. New naming format for COST-Format files, small changes to COST Format. On the naming of GNSS sites.

Active quality control. Status, discussion, plans.

On the MoU being made between EUPOS and EUMETNET and expansion of network in in Eastern Europe.

Global processing.

On the finish of E-GVAP-II and start of E-GVAP-III.

On the proposed EU COST action GNSS4SWEC

Friday, November 16, 9 to 10: Overview presentations on data processing and data usage for non specialists

Date, format and place of next meeting

Other

Draft agenda Plenary Meeting, Friday Nov 16, 11:30 to max 15 at AEMET, Madrid

Practicalities

Presentations from plenary members (if not already given at the expert team meeting).

Information from the E-GVAP team on items not relevant for Expert team meeting.

Outlook, discussion of work in coming programme phase, including the role of the plenary panel and its interaction with the E-GVAP team.

Other

Draft agenda Expert Teams + plenary meeting Thursday Nov 15, 10:30 to 16 and Friday Nov. 16, 9 to 12, at AEMET, Madrid

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Outlook, discussion of work in coming programme phase Date, format and place of next meeting

The role of the plenary panel and its interaction with the E-GVAP team and Expert teams.

Date and time of next meeting

Other

= change of times, cancelation of separate plenary meeting

Reporting from experts, members, and E-GVAP team

Belgium, Croatia, Iceland, Finland, Rep. of Ireland, Serbia

Nothing new from NMSes relative to Toulouse meeting

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.

Data exchange and processing status?

Hungary A nationally funded project between geodesists and meteorologists have been set up.
Ambrus Kenyeres from the Geodetic Observatory, Institute of Geodesy, Cartography and Remote Sensing in Budapest. Szabolcs Rozsa, Budapest University of Geodesy and Economics. Gergely Boloni and Balint Varga, OMSZ.
See: http://gpsmet.agt.bme.hu/indexen.php

OMSZ very keen to start using ground based GNSS data in NWP.

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

EUPOS sites

From EUPOS steering committee, last year

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.

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

Current status

A draft MoU between EUPOS and EIG EUMETNET was made by spring 2012.

It is almost identical to the MoU between EUREF and EUMETNET

It has been submitted to EUMETNET, and has so far been recommended by STAC for acceptance.

Next week it will be on the table of EUMETNET Assembly, and hopefully accepted.

Then it can be signed by both sides, and subsequently local agreements made (between NMS and AC or E-GVAP and ACs) on data exchange.

Interest in E-GVAP data from ”LACE” consortium

- **The LACE consortium runs a common data server (at Hungarian met. inst.), from where they obtain observations for NWP data assimilation.**
- **Negotiations about inclusion of E-GVAP data in LACE database.**

- **The E-GVAP viewpoint is that it is OK for LACE to use their own common server for data distribution of E-GVAP data, but:**
  - **The same regulations apply as for download of data directly of E-GVAP data. Meaning that,**
    1. **The individual institutes should obtain E-GVAP acceptance of access (= ask for it and agree to conditions of usage).**
    2. **When usage of data becomes operational, the institute in question should become a member of E-GVAP.**
    3. **The institute should help provide ACs/geodesy with meteorological data**

HYMEX

- E-GVAP has been in ”contact with HYMEX” for a long time, via Olivier Bock, IGN, France. (= SGN processing centre in E-GVAP)
- The E-GVAP team met with Olivier and geodesists from Spain, Marocco, Tunesia, and Algeria, in connection with the EUREF annual symposium, June 2012, to discuss HYMEX and other issues.
- The amount of extra GNSS data from the HYMEX campaigns is modest, and it is straight forward for E-GVAP to support HYMEX as regards facilities for upload of data and inter comparison (quality control) with other ACs and with NWP.
- E-GVAP only distributes data considered of ”operational quality” via normal GTS. This does not include HYMEX campaign data.
- But download of HYMEX data via E-GVAP ftp, and distribution of HYMEX data via an extra GTS service for experimental data (different header messages), can be used to access HYMEX GNSS data.
- It is our hope, that some of the providers of HYMEX campaign data will continue as data providers also outside HYMEX campaign periods!

G-VAP
(GEWEX water vapour assessment)

- **G-VAP is a project on validation of satellite based water vapour retrievals, with the purpose of identifying and making available satellite water vapour products useful for climate monitoring.**

- **Ground-based GNSS data are highly useful for this type of validation. GNSS data are much more precise, and less subject to calibration problems than satellite data. On the other hand ground based GNSS data cover only a small part of the Earth.**

- **G-VAP workshop ultimo September at DWD.**

SMHI and NGAA

Météo France

Please find attached a few slides coming from Maroc-Météo which is implementing a GNSS network. It may be very useful to help them and then try to use the data in a near future. Perhaps you can contact them directly

GPS station implementation project at DMN (Maroc)

Implementation of a GNSS network : 10 stations (ASHTECH).

Each station has a multi constellation multi signal type Choke Ring antenna.

BERNESE software for the ZTD computation

Stations will be referenced following IGS standard.

Maroc-Météo has a Hymex Project partnership.

Data exchange partnership with ANCFCC.

Location of the GPS stations

Oujda station

Maroc-Météo expectations

Intégrate ZTD and humidity data of the other stations over the domains of DMN models

Recomputation and comparison of the ZTD by some EGVAP analysis centers

Météo France

Concerning Meteo-France, the next operational models will use 25% more GNSS data.

I have rewritten the screening of the data. It works now with an extended white list which accepts "redundant" observations coming from several analysis centres. The final selection is dynamic (done inside the screening). The obs std errors have been tuned according to our monitoring.

The global weight of GNSS has been roughly multiplied by 2.

We are still working on the variational unbiasing. It will be in the pre-operational suite at the begining of 2013.

I'm very sorry to miss the meeting. Kind regards, Patrick

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

- Now using GNSS data operationally in the setup running the ”Slippery Road Model”, but currently very few Danish sites available.
- Currently strong focus on nowcasting.

- To include assimilation of ZTDs in other operational models, early 2013
- *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.

-

E-GVAP status and outlook.

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.

E-GVAP GNSS stations in Europe (1678)

Plotted at 06:39ut 25-Oct-2012

© 2012, Met Office

Met Office

EUMETNET

All active E-GVAP GNSS stations (1919)

>1 ASI1 BKG BKGH GFZ GOP3 GOPG IES2 IGE LPT LPTR METG NGAA ROBH ROBQ ROBT SGN1 SGNC UL01

Plotted at 06:27ut 12-Nov-2012

© 2012, Met Office

Number of unique GNSS sites versus time.

Number of non unique sites

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

Delivery timeliness

- Most (non-TEST) ACs providing dat
good timeliness – on average, 90% o
obs arrive within 1h50m (*target 1h30*

- Future trends to shorter NWP mode
times will demand reduced latency

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

EUCOS

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

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Back

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
APPI	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

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?

NORTH AMERICAN DATA

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.

Due to lack of manpower in the US there has been a long standstill.
More activity duing last 2 months.

- Demonstrated that ”we” cannot read NOAA GPS BUFR data because they do not conform to WMO requirements.

- Plan to download NOAA data in other format and convert to COST Format as well as BUFR.

- Possible that NOAA will do that themselves.

Subhourly processing

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.

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

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/Florian Zus, GFZ, Germany
Martin Ridal/Jan Johansson, SMHI/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/Yuksel Altiner, BKG, Germany
Ambrus Kenyeres /Szabolcs Rozsa, Hungary

To add:
Norman Terfele, Univ Luxemburg, Luxemburg
Jaroslaw Bosy, Poland
Guergana Guerova, Univ. Sofia, Bulgaria

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

Liaison

Inter European scale (EUREF)

- Joao Agria Torres, Chairman of EUREF.
- Elmar Brockmann, Swisstopo
- Ambrus Kenyeres, Hungary.
- 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.

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.

Other?

Responsible person: Henrik Vedel.

Meetings

- EIG EUMETNET Obs. Roadmap drafting meeting, DWD primo July 2011.
- 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.
- 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, Dec. 2011
- EUMETNET PM meeting, Dec 8-9, 2011, Helsinki.
- EU COST action drafting meeting, January 2012.
- EUCOS PM meeting, January 2012
- EUCOS E-SAT meeting January 2012
- EUCOS E-SAT meeting, April 2012
- EGU general assembly, Vienna, April 2012
- EUREF annual symposium, Paris, June 2012
- HYMEX coordination meeting,Paris, June 2012
- COST Action on GB GNSS application coordination meeting, Paris, June 2012
- EUCOS PM meeting, Exeter, September 5-7, 2012
- GEWEX water vapour assessment (G-VAP) workshop, Frankfurt, September 26-28, 2012
- GNSS for GEEO and GEOSS on the move (GfG2) workshop, Gothenburg, October 2012
- E-GVAP joint expert teams and plenary meeting, November 7-8/11, 2012, AEMET, Santander. Possibly to be moved to Madrid.
- EUMETNET Assembly meeting, primo November
- AGU meeting, Dec 2012
- Possibly COST GNSS4SWEC kickoff meeting primo 2013
- EUCOS PM meeting, primo 2013
- EGU general assembly, Vienna, April 2013
- EUREF annual symposium, Budapest, May 2013
- Possibly E-GVAP-III ”kickoff” meeting ultimo 2013

Operational status:

- Four 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” 3 km setup.
  - KNMI
- 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.
- Some use 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.
- Some use available data from a subset of the E-GVAP processing centres. Bias correction based on month long offset averages.
- More HIRLAM/HARMONIE institutes are close to operational assimilation AEMET, SMHI), as well as LACE institutes.
- Non-NWP nowcasting research is done 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-II finishing by end of 2012, based on EUMETNET decision.

E-GVAP-II 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

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 knowingly under spending one year versus over spending next year is removed.

The estimated surplus by end of 2012 is of the order 25 k€, based on all the 2012 travelmoney being spent on 2012 travels.

This will transfer into reductions of member payments in 2013, if E-GVAP-III is established.

On the future of E-GVAP

Previously, reported 2011

- 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 (end 2011) 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.

The recommendations from the advising bodies (STAC and PFAC and a separate expert team) have been positive.

The informal answers from the EUMETNET members whether to join E-GVAP-III have also been positive.

Ultimo November EUMETNET Assembly will meet and decide whether to launch E-GVAP-III.

We cannot guaranty the continuation now, but will be really surprised if the programme is not continued.

New todos

- **Start of Bulipos data exchange?** *Jon*
- **Contact Metoffice in Marocco about their GNSS network.** Henrik

- **Formal rule for naming of new AC-products/solutions.** *Proposal to be made by E-GVAP team*
- **Formal rule for requirements and decision taking when moving solutions from ”test” to ”operational” (or ”demonstration”).** *Proposal to be made by E-GVAP team*
- **Formal requirements for inclusion of IWV in E-GVAP data.** *Proposal to be made by E-GVAP team.*
- **Improved access to O-B statistical data.** *NWP-centres to provide data, expert teams to guide on relevant statistical messures, E-GVAP team to do statistics.*

- **ACs to consider possibility of sub-hourly upload of ZTD data**

Next meeting?

In connection with another meeting?

Change of format?

Any other matter?

- Thank you for your participation in E-GVAP-II
- Looking forward to a continued collaboration in E-GVAP-III
- Looking forward also to an expanded collaboration in GNSS4SWEC

FIN

Many thanks to Jana, Bartolome, and AEMET, for hosting the meeting. And for not giving up despite the obstacles with change of location, change of time, and a general strike, none of which were due to you.

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