MEMORANDUM OF UNDERSTANDING

between

A: EUREF, the Reference Frame Sub-Commission for Europe of the International Association of Geodesy (IAG)

and

B: EUMETNET, the Network of European Meteorological Services.

1. Parties

A: EUREF (www.euref-iag.eu) is the Reference Frame Sub-commission for Europe of the International Association of Geodesy (IAG).

EUREF is responsible for the definition, realization and maintenance of the European Reference Systems, to be used Europe-wide in all scientific and practical activities related to precise geo-referencing and navigation, Earth Sciences research and multidisciplinary applications.

B: EUMETNET (www.eumetnet.eu.org) is a network of European national meteorological services, facilitating committing inter-European collaboration within meteorology. **E-GVAP**, the EUMETNET GPS Water Vapour Programme (egvap.dmi.dk) is a programme under EUMETNET. The purpose of E-GVAP is the establishment of an inter-European observing system for delivering of near real-time GNSS zenith delay estimates for operational meteorology.

2. Background

One of the main projects included in the EUREF activities is the EUREF Permanent Network (EPN) that covers homogeneously the European continent. This project deals with the maintenance, data collection, archiving, processing and analysis of a GNSS network.

The EPN data are processed in order to obtain the best achievable accuracy. For that, the computations need the modelling of a considerable number of geo-dependent effects, some of them requiring accurate and reliable atmosphere parameters.

The EPN sites are used within many projects in order to make zenith total delay estimates usable for meteorological applications such as numerical weather prediction and climate change, and many of the EPN Analysis Centres are also involved in GPS meteorology related projects.

There is already a close collaboration between EUREF, European GNSS Analysis Centres and European national meteorological institutes (represented by E-GVAP/EUMETNET) for the near real-time determination of Zenith Total Delay (ZTD) and Integrated Water Vapour (IWV).

3. Purpose

Considering

- that EUREF needs to access meteorological data provided by the national meteorological institutes;

- that the European national meteorological institutes, represented by E-GVAP/EUMETNET, need to have continued access to EPN data and products;

- the importance of cooperation between the meteorological and geodetic communities in Europe,

the purpose of this Memorandum of Understanding is to create the conditions to facilitate the data exchange and to promote the increase in the cooperation between the two parties, for the benefit of both.

4. Responsibilities

The responsibilities of the parties are as follows:

- EUREF will provide to E-GVAP/EUMETNET free access to the EPN raw data for the determination of ZTD, IWV and other meteorological applications. The data and conditions of use are more precisely specified in annex 1.

- E-GVAP/EUMETNET will provide to EUREF free access to meteorological data for GNSS data processing, analysis, and validation. The data and conditions of use are specified more precisely in annex 1.

- EUREF and E-GVAP/EUMETNET will create common guidelines for the exchange of data.

Furthermore,

- EUREF will contact the European GNSS network operators inviting them to collaborate with European national meteorological institutes on co-located observations (GNSS and meteorological observations) and support GNSS data processing from dense national networks to contribute to meteorological applications.

- E-GVAP/EUMETNET will contact the European national meteorological institutes inviting them to collaborate with the responsible for national GNSS networks and/or EPN stations to provide the necessary meteorological data for GNSS data processing and analysis.

- Use of data exchanged under this MoU for publications must be acknowledged by citation to the relevant data providing party (EUREF or EUMETNET).

5. Amendments

This Memorandum of Understanding may be revised or cancelled by initiative of any of the parties by a written agreement.

Date:

_____   _____

The Chairman of EUREF   The Chairman of EUMETNET

João Agria Torres   Fritz Neuwirth

Annex 1 to MoU between EUREF and EUMETNET

On the data to be exchanged between EUREF and E-GVAP/EUMETNET and the conditions of use

Purpose
To describe the data to be exchanged between EUREF and E-GVAP/EUMETNET and conditions of use.

Background
The European permanent network of EUREF (EPN) consists of GNSS permanent tracking stations distributed over almost all European countries. The contribution of the data follows specific technical guidelines, but happens on a voluntary basis of the responsible station manager. The data can freely be used for all scientific and practical activities related to precise geo-referencing and navigation, Earth science research and multidisciplinary applications.

Various types of meteorological observations are exchanged between the national meteorological institutes, globally, in Europe, and within EUMETNET, under different conditions of use. WMO resolution 40 is the central document governing this.
An important distinction is between the so-called *essential data* and *additional data. Essential data* are exchanged globally. They are observational data that the meteorological institutes must make available to their WMO colleagues; restrictions on furthering and use are limited. *Additional data* are observations that institutes can decide to distribute, or be requested to distribute by individual meteorological institutes. Often it is only done on request and to a limited number of receiving institutes. The conditions on use and furthering are stronger; furthering requires an acceptance from the originating institute. When forwarded on the GTS (Global Telecommunication System between meteorological offices) the data are flagged as being *essential* or *additional*.

Responsibilities
EUREF will provide to E-GVAP/EUMETNET free access to the EPN raw data (hourly and daily satellite observation files in RINEX format) for the determination of ZTD, IWV and other meteorological applications.

E-GVAP/EUMETNET will provide to EUREF the following data:
- Hourly

Observations of pressure, T2m, and RH2m from the nearest SYNOP site to the EUREF GNSS stations. From essential data + additional data from institutes on Annex 2 list.

- Daily

  o Observations of pressure, T2m and RH2m from SYNOP sites, with a time resolution of 3 hours. From essential data + additional data from institutes on Annex 2 list.

- o Radiosonde observations of pressure, temperature and humidity from radiosondes within 50 km of a EUREF GNSS site. From essential data.

- o Water vapour radiometer data from sites located within 50 km of GNSS receiver. Pending agreement with data owner in each case.

The ***Annex 2*** *of the MoU between EUREF and E-GVAP/EUMETNET* is a list of meteorological institutes that have agreed that for extraction of the data mentioned below their *additional data* may be used.

Met.no has stopped discriminating between essential and additional data from Norway and now declares all their data as essential. Therefore signing of annex 2 is not relevant for met.no.

Conditions of use.

For the data exchanged between EUREF and E-GVAP/EUMETNET the conditions of use are:

A: EUREF use of meteorological data
The meteorological data will be used for GNSS data processing, validation of GNSS processing and products, and for scientific studies.

The meteorological data will not be sold or used for any direct economical gain or profit, nor forwarded to third parties, unless a separate written agreement has been made to the contrary.

B: Meteorological use of GNSS data
Raw GNSS data (RINEX format) will not be forwarded to third parties unless specifically agreed with EUREF in advance.

The data will be used solely with the purpose of estimation of atmospheric GNSS delays and further computation of atmospheric water vapour. Actual positions determined in connection with the delay estimation will not be distributed. The GNSS delays will be utilised in numerical weather prediction models and IWV used to assist forecasters to monitor the weather. The goal is to enhance the skill of the meteorological forecasts.

GNSS delay data and associated error estimates will be distributed free of charge within the meteorological community (including EUREF if required) for use in weather forecasting and climate monitoring. The distribution between E-GVAP and the meteorological community will take place via the Global Telecommunication System and password restricted ftp.

The GNSS delays derived from EUREF data or provided by EUREF will not be sold or used for any direct commercial gain or profit unless a separate written agreement has been made to the contrary.

Annex 2 to MoU between EUREF and E-GVAP/EUMETNET

Agreement about EUREF access to *additional* SYNOP data

Background
A MoU between EUREF and E-GVAP/EUMETNET about collaboration and data exchange
has been formulated. In Annex 1 to the MoU the data to be exchanged and the conditions of
use are specified. There is a distinction between *essential* and *additional* data, as defined by
WMO resolution 40 and as marked in the observation reports distributed over the GTS
network.

Purpose
The purpose of Annex 2 is to maintain a list of meteorological institutes that have agreed to
include *additional* data (as specified in Annex 1) in the data exchange between EUREF and
E-GVAP/EUMETNET in cases where these are better suited than *essential* data.

Declaration
We hereby declare that the *additional* data, of the types specified in Annex 1, from our
SYNOP sites may be included in the data exchange between EUREF and E-
GVAP/EUMETNET under the conditions listed in Annex 1.

Institute:

Address:

Name:

Signature:

Stamp: