50th Meeting of the EUREF Technical Working Group in Florence, 26. May 2009

Next events:

- EUREF 2009 Fall Meeting: Padova, Tuesday October 13, 2009 full day
- EUREF 2010 TWG Spring Meeting: Vienna, date not yet fixed
- EUREF 2010 TWG Symposium Meeting: Gävle, 01.06.2010 (full day)
- EUREF 2010 Symposium: Gävle, 02.-05.06.2010

Meeting place: Istituto Geografico Militare (IGM), Florence, Via Battisti

Time schedule: Tuesday, 26.05.2009, 09:00 – 18:30

Agenda

1. Opening (Bruyninx)
2. Minutes of the 49th TWG meeting in Budapest (all)
3. EUREF2009
   a) Organization (Maseroli)
   b) Final program (Ihde, session chairs)
   c) Best student poster award (Torres)
   d) Resolution Committee (Bruyninx)
4. EUREF Permanent Network
   a) EPN past and future (Bruyninx)
   b) Status of warning messages from rapid daily solutions (Habrich)
   c) Report on the RT SP (Söhne)
   d) EPN ZTD product /use of meteo data (Dousa, Söhne)
   e) The EPN station AQUI and the April 6 2009 earthquake (Caporali)
5. Monitoring of official national ETRF coordinates on EPN web (Brockmann)
6. EPN/ETRS89 maintenance (Kenyeres, Bruyninx)
7. INSPIRE (Torres, Altamimi, Mäkinen)
8. Guidelines for EUREF Densifications (Bruyninx)
9. ETRS89 Working Group status report (Lidberg)
10. Status of the ITRF2008 development (Altamimi)
11. ECGN progress report (Poutanen)
12. EUVN_DA final report (Kenyeres)
13. EUREF home page (Hornik, Ihde, Vasconcelos)
14. EUREF campaigns web page prototype (Stangl)
15. AFREF (Fernandes)
16. EUREF Symposium 2010 (Ihde)
17. Next TWG Meeting (All)
18. Action Items (all)

Participants

ZUHEIR ALTAMIMI, Paris
WOLFGANG AUGATH, Springe (guest)
ELMAR BROCKMANN, Berne
CARINE BRUYNINX, Brussels (Chair)
ALESSANDRO CAPORALI, Padova
JAN DOUSA, Prague
RUI FERNANDES, Covilhã
HEINZ HABRICH, Frankfurt a.M.
HELMUT HORNIK, Munich (Sub-comm. Secretary)
JOHANNES IHDE, Frankfurt a.M. (Sub-comm. Chair)
AMBRUS KENYERES, Budapest
MARTIN LIDBERG, Gävle
JAAKKO MÄKINEN, Helsinki
RENZO MASEROLI, Florence (guest)
MARKKU POUTANEN, Helsinki
HERMANN SEEGER, Bad Neuenahr-Ahrweiler (hon. member)
WOLFGANG SÖHNE, Frankfurt a.M.
GÜNTER STANGL, Graz
JOAO AGRIA TORRES, Lisbon
Manuela Vasconcelos, Lisbon (guest)

apologized: WERNER GURTNER, Berne;

Minutes

1. Opening

C. BRUYNINX opens the meeting of the EUREF TWG and welcomes the participants. She remembers that the first EUREF Symposium at all has been held at the same place in Florence 19 years ago. Further this TWG Meeting is the 50th since the creation of this group 1992 in Berne. In this context C. BRUYNINX also mentions the 400th anniversary of Galileo Galilei and appreciates this anniversary as an extraordinary occasion to meet in Florence. Finally she expresses her thanks to the Istituto Geografico Militare for hosting this TWG Meeting as well as the EUREF Symposium 2009.

On behalf of the hosts, General C. COLELLA, Commander of the Italian Geographic Military Institute, expresses his delight to host the EUREF community in Florence. With a summarizing overview on the long and remarkable history of the activities of the IGM he states that on this 2009 Symposium the results of the new *Italian Rete Dinamica Nazionale (RDN) of Istituto Geografico Militare Italiano and its alignment to ETRF2000* will be presented as an important achievement in the geodetic work of Italy and its participation in international geodesy.

2. Minutes of the 49th TWG meeting in Budapest

The minutes of the last TWG Meeting in Budapest, 26.-27.03.2009, were distributed among the TWG members. Some few corrections are to be attached. The final text is published in the EUREF homepage.

3. EUREF2009

a) Organization

R. MASEROLI warmly welcomes the participants of the TWG meeting. He expresses his delight about the great number of participants for the coming EUREF 2009 Symposium in Florence – altogether 105 non-Italian colleagues representing 27 countries have registered, for the first time even from Jordan. R. MASEROLI informs on the organizational structure, the TWG thanks for the excellent work of the LOC.

b) Final program

J. IHDE informs on the scientific programme as well on the time schedule and the nominated session chairs. Up to now oral 39 presentations are planned. Comments or additional presentations should be submitted immediately in order to enable the hosts to arrange the necessary work as well as to print the final programme for being distributed at the symposium. Some minor changes in the programme are adapted to the programme.

On behalf of the EUREF TWG, C. BRUYNINX thanks the hosts for their excellent work and expresses her hope for a successful symposium.

c) Best student poster award

C. CALVERT has offered again a best student poster award. As J. TORRES informs, only two applications have been submitted. A committee consisting of C. CALVERT, E. BROCKMANN and J. TORRES will evaluate the relevant publications and then make a decision to be announced to the Symposium.

d) Resolution Committee

The TWG nominates the members of the Resolution Committee: Z. ALTAMIMI, C. BRUYNINX, A. CAPORALI, L. ENGBERG, M. GREAVES, J. IHDE and CH. VÖLKSEN.

4. EUREF Permanent Network

a) EPN past and future

The traditional report on the EPN CB is presented by C. BRUYNINX. Since the last TWG Meeting the number of EPN stations has been increased by 14, one station has been

removed from the network. Meanwhile 93% of all stations provide hourly data and 46% real time. 47% of the sites are equipped with GPS and GLONASS receivers.

The majority of antenna/radome combinations used in the EPN has now true absolute antenna calibration, improving the reliability of the estimated EPN site coordinates.

C. BRUYNINX warns to change antennae if not really necessary as each manipulation induces significant jumps in the data records. The greatest deviations normally are observed in the height component, however, also the East-West and even the North-South component may be influenced significantly.

The EPN guidelines are going to be updated, the general publication is planned not before next year.

M. POUTANEN asks whether the problem of antennae replacements might be less severe if for a certain time span two antennae would operate parallel. C. BRUYNINX states that by this method a usable link between the records before and after the manipulation would exist, but the jump in the time series would occur anyway.

The new data centre containing all historical EPN observation data suitable for the EPN Re-processing is installed now at ROB and is working.

b) Status of warning messages from rapid daily solutions

At the last TWG Meeting an action item to update the hourly combination of rapid solutions submitted by the EPN analysis centres was pointed out to be of prior importance in order to install a rapid "daily alarm". H. HABRICH informs that progress has been made. Following the call for participation, 9 LACs had announced to contribute, but in reality only 5 – 6 contribute to the project. Various experiments were carried out by comparing rapid daily versus post processed weekly solutions in order to select the most reliable solutions to be used for warning messages etc. For GPS Week 1515 e.g. many stations were rejected, therefore significance tests were carried out, showing insufficient results for the daily combined solutions. The comparison of rapid daily versus weekly solutions gave good results, therefore it is recommended to continue the combination of weekly (and possibly daily) solutions. H. HABRICH announces to continue the investigations further on.

In the discussion to this report H. HABRICH mentions the plan to send out the warning messages to the respective stations, however, it is intended to develop a general warning system accessible for everybody and thus to distribute the messages to the public. In order to make the results as reliable as possible, the station managers are to be urged to response quickly to provide the analysis centres with detailed information and correct the problem

c) Report on the RT SP

W. SÖHNE presents an overview on new or changed EPN RT data streams since last TWG.

At the last TWG an action item was formulated to work out a more detailed webpage for the EPN Real-Time Special Project and circulate the draft among the SP-WG as well as the TWG members. Several concerning EUREF Mails have been distributed. A call for participation has been sent out by EUREF Mail for the

– re-dissemination of GNSS real-time data and products in Europe via NTRIP Broadcasters,
– validation of clock and orbit corrections to Broadcast Ephemeris,
– backup for all critical real-time service components.

Since the last TWG Meeting 60 new users for Real Time data have registered at the BKG. The continuously disseminated data streams have reached an enormous size, therefore new concepts and guidelines are in development. In order to manage these challenges, the work has to be distributed among several data centres. W. SÖHNE appeals to support the project.

d) EPN ZTD product /use of meteo data

Referring to the presentation of J. DOUSA at the last TWG Meeting and the action items to formulate a common proposal on the use of meteo data as well as to provide to EPN CB input for EPN, W. SÖHNE explains his viewgraphs "on the use of meteo data or How to raise the value of EPN's ZTD product?".

Altogether 16 different solutions to compare GNSS with NRT were tested, almost all EPN stations could be included. For test purposes the results were compared with the data of other techniques, too, e.g. VLBI, DORIS, radiosondes and water vapour radiometer. W. SÖHNE mentions that in general a lot of data of each technique is available, however, the precise co-locations mostly are missing.

As next steps intensive contacts to other groups working in this field should be sought and a regular exchange of software and data should be organized.

The TWG asks J. DOUSA and W. SÖHNE to contact players involved in the comparison of tropospheric ZTD (zenith total delay) with external sources to outline the setup of an on-line tool to compare ZTD. In a first step, they will focus on the development of a prototype. A report on the development of the work should be presented to the next TWG Meeting.

e) The EPN station AQUI and the April 6, 2009 earthquake

A. CAPORALI explains his investigations on the heavy earthquake in the area of Aquila in April. The station AQUI operated by the ASI is part of the EPN and IGS as well and is located directly in the affected earthquake area. Further the records of several other sites rather nearby to the epicentre could be analyzed. The data are collected and analy-

zed by the UPA Local Analysis Centre (LAC) of EUREF. The LAC carries out the routine analysis of 130 CGPS (Continuous Global Positioning System) stations in Italy. A series of smaller earthquakes were recorded before and after the big event on April 6, 2009. Therefore it is useful to analyse all the available data to receive a reliable time series of vertical and horizontal displacements. The maximum vertical displacement amount about 25 cm. The GPS results correspond to a certain extend to those from DInSAR records, however, exact conclusions cannot yet be drawn as the modelling of the data is not yet sufficiently mature.

Answering the question of C. BRUYNINX about the status of the EPN site AQUI, A. CAPORALI explains that the station is operating as usual, but with respect to the large displacements is should be treated after the earthquake like a new station.

5. Monitoring of official national ETRF coordinates on EPN web

At the last TWG Meeting E. BROCKMANN was asked to formulate a draft of a letter to all National Geodetic Survey Agencies with the request to present in their National Report to the Florence Symposium an overview on the use of national ETRF coordinates of EPN stations in the respective countries. A questionnaire has been distributed. 15 countries responded and explained to have no objections against the publication of the relevant data.

In the discussion it is requested to put the national ETRF coordinates for the EPN stations on the EPN Website to make the object public. E. BROCKMANN remarks that in various countries the official coordinates cannot be just changed but are considered to be stable. He warns to change and publish new coordinates too often because the users then will not accept such changes so often..

6. EPN/ETRS89 maintenance

The main target for the EPN as well as the ETRS89 is to provide highly reliable and consistent station coordinates and velocities. The accuracy should be comparable to the ITRF. A. KENYERES explain the EPN cumulative solutions he is producing. In this solution, the involved EPN sites are distinguished in class A and B, depending on the length of the available time series and the precision of the position/velocity estimation. C. BRUYNINX explains that the EPN class A stations have an ETRS89 coordinates accuracy to be better than 1 cm similar to the traditional classification for usual EUREF sites. The repeatability for the station velocities should be better than 0.5 mm/year over the last 45 weeks. The minimum permanent observation length is at least 1 year. Every 15 weeks A. KENYERES will produce a update of the EPN cumulative solution, the classifications for the involved stations will then also be adapted to the yielded results.

The necessity to provide clear information for the users is strongly emphasized. The EPN website has to be structured clearly and the number of published solutions be restricted to avoid possible confusion of the users. C. BRUYNINX will propose a new scheme for the EPN coordinates web pages to the TWG.

7. INSPIRE

J. A. TORRES explains his contribution which will be presented to the adjacent EUREF Symposium. The principles and terminology of INSPIRE are explained with special regard on the development since the Brussels 2008 EUREF Symposium. J. IHDE states that in INSPIRE various groups are active with rather different points of view. Thus all definitions have to be formulated as clear and strict as possible. The EVRS description has to be included similar to the ETRS description.

The TWG asks J. IHDE and J. MÄKINEN to prepare a document on the heights to be used for INSPIRE and send it to J. A. TORRES. Further Z. ALTAMIMI will inform A. TORRES on activities of the IAG Commission on Terminology and provide a draft document to be involved into the principles to INSPIRE. Finally transformation programs for the conversions between ETRS89 and ITRS (and vice versa), including some numerical examples will be put into the EPN Website.

8. Guidelines for EUREF Densifications

The EPN implies a two-step approach, i.e. the densification of the ITRF2005 and to keep the densification permanently up-to-date. In the first step EPN data until Dec. 2005 are used. In order to keep the data up-to-date, the inclusion of new data is considered to be useful. Therefore the TWG decided on its meeting from Feb. 26-27, 2009 in Budapest to release an EPN update each five weeks, taking into account the most recent EPN results. At this meeting, it was decided to reduce the frequency of the updates to 15 weeks. The stations are classified into 2 groups, Class A and B (see also topic 6).

9. ETRS89 Working Group status report

M. LIDBERG gives a summarizing review of the meeting of the ETRS89 Working Group on the day before. A *Charter for the EUREF Working Group on Future Development of ETRS89* has been distributed by circular among the TWG, this report will be presented to the adjacent EUREF Symposium. A resolution of the Symposium on the ETRS WG has to be prepared by M. LIDBERG and the Resolution Committee. A progress report will be given to the next TWG Meeting.

10 .Status of the ITRF2008 development

Z. ALTAMIMI gives a review on his presentation for the adjacent EUREF Symposium. With respect to the ITRF2008 solution, the new solution comprises additionally about 150 GPS-sites and altogether 140 EPN sites. The origin of the new ITRF2008 is defined by SLR, the scale mainly by VLBI data. The computation of ETRF2005 and ETRF2008 solutions is not planned, but instead the ITRF2008 results will be converted to the ETRF2000.

The presentation of the final ITRF2008 solution is planned for the IAG Scientific Assembly 2009 "Geodesy for Planet Earth" from Aug. 31 – Sept. 4, 2009 in Buenos Aires.

11. ECGN progress report

As M. POUTANEN informs, a query has been sent out to the members of the ECGN WG to confirm their membership further-on or to retire from the WG. Up to now several answers are missing. M. POUTANEN asks for proposals especially for younger colleagues to join the WG.

M. POUTANEN gives a summarizing review on the objectives of the ECGN and its relation to GGOS as present "flagship" of the IAG. Special interest is directed to the recent and future satellite missions CHAMP, GRACE and GOCE, but also other data such as precise levelling, tide gauge records, gravity observations, and Earth and ocean tides. Supplementary data being important to guarantee the requested highest accuracy are meteorological parameters, surrounding information of the stations, e.g. eccentricities and ground water level, etc. All stations involved into the ECGN should be part of the EPN as well.

As next steps it is proposed to

- review the objectives, tasks and guidelines of the ECGN and prepare necessary updates,
- based on the updated guidelines, prepare a query to the suggested ECGN stations to update their status and to submit a query for additional candidates for an ECGN station,
- install an inventory of data and metadata banks,
- renew the metadata bases.

Moreover the co-operation with other regional GOSs (e.g. NGOS) should be intensified. As topics for special research the detailed analysis of the different observation types, differences between the applied techniques, correction models to be used in a combined analysis are mentioned. In this context J. IHDE mentions the German project *Massentransporte und Massenverteilung im System Erde <http://www.massentransporte.de/>* which is working rather well. Several items of this project are similar to the objectives of the ECGN. Further J. IHDE emphasizes the time and personnel consuming work with collecting, archiving and analyzing the data. Thus the WG should take care for finding adequate colleagues or groups who would be willing to take over these tasks for a longer time period.

The TWG asks M. POUTANEN to finalize the nomination of members of the ECGN WG till the next meeting. The ECGN WG should revise its guidelines and station criteria. Based on this a questionnaire is to be send to all authorities involved in the stations. The ECGN web site should be extended with an example of long-term time series from different techniques at a few stations.

12. EUVN_DA final report

A. KENYERES has distributed a text describing the completion of the EUVN_DA project as a continental GPS/leveling network. A final report is in preparation. The data of a considerable number of countries participating in the EUVN has been investigated (25 countries; 1505 GPS/leveling points). The originally planned completion of the EUVN_DA has been postponed in 2008 due to the expected acceptance of EVRF2007 and the updated version of the European geoid solution EGG2008. A. KENYERES shows a graphic demonstrating the improvement for a comparison of the EUVN_DA and the EGG97 and EGG08 respectively especially in Middle and Southern Europe. The connection of Great Britain is still not yet solved sufficiently. The analysis further shows a possible tilt in the French height network, the lack of new data in Spain, the still weak geoid database on the Balkan Peninsula and an unsolved discrepancy in Italy. An accurate height reference surface will be created in cooperation with the EGGP.

Concerning the future plans A. KENYERES announces that the EUVN_DA database will be available from the EVRS website, academic users will get free access. The database will be periodically updated and maintained.

In the discussion J. IHDE empathizes that intensive investigation in the EUVN computations have proved that in many cases the data are quite alright, however, the nodal points may not be accurately identical or incorrect links be used. Thus the data should be checked again before the publication.

The TWG recommends to prepare a final decision concerning the open issues related to the EUVN_DA, especially to clear the discrepancies in the Italian block. A. KENYERES is asked to report on the progress to the next TWG Meeting.

13. EUREF home page

M. VASCONCELOS presents a draft for the updated EUREF home page. The TWG asks M. VASCONCELOS to continue this work and circulate the new version among the TWG for comments.

It is requested to complete the webpage permanently by all kinds of useful links, external links are to be maintained by responsible persons. An e-mail to the EUREF community should be sent out to collect contact information from those who agree to be included in a new EUREF contact database which will l be put on-line. MV will continue the development of the EUREF web site. A search function should be included.

14. EUREF campaigns web page prototype

G. STANGL informs the EUREF campaign web page prototype has been distributed to the TWG by mail and up to now no complaints have been received. The decision on the final denomination will be made at the end of June, 2009. The updated EUREF campaign web site and data base should completed for the next TWG Meeting.

15. AFREF

R. FERNANDES reports on the last meeting for AFREF held in Addis Ababa. The European Community has formulated a proposal for the development of the African countries and consequent co-operation. This plan explicitly includes the installation of a modern geodetic continental reference system for Africa.

16. EUREF Symposium 2010

J. IHDE informs that Sweden has offered to host the 2010 EUREF Symposium. Due to misunderstandings another application by Moldova already offered at the 2007 Symposium in London had not been considered. Thus now two offers are available. The TWG discusses intensively the aspects concerning the two places. Finally it is decided to hold the 2010 EUREF Symposium in

Gävle/Sweden, 02.-05.06.2010

and the 2011 Symposium in Moldova. The involved colleagues will be informed.

17. Next TWG Meeting

As already announced, A. CAPORALI will host the 2009 Fall TWG Meeting in Padova, Tuesday, 13.10.2009 (full day).

On behalf of the Austrian colleagues in Vienna, G. STANGL invites the TWG to hold its 2010 Spring Meeting in Vienna. The date will be fixed later.

The 2010 TWG Symposium Meeting will take place in Gävle as usual the day before the beginning of the Symposium, i.e. Tuesday, 01.06.2010 (full day).

18. Action Items

C. BRUYNINX and H. HORNIK will complete the action items and distribute them among the TWG by circular in the next days.