

## **XXVII<sup>th</sup> Meeting of the EUREF Technical Working Group in Padova, October 1 – 2, 2001**

Meeting place: Department of Geology, Palaeontology and Geophysics, University of Padova

Begin: 1.10.2001, 14.00 p.m., end: 2.10.2001, 12.15 p.m.

### **Agenda**

1. Minutes of the XXVI<sup>th</sup> TWG Meeting in Dubrovnik
2. Campaign presentations and validations
  - Great Britain
3. EUREF troposphere product
  - Status
  - Official solution, policy
  - GFZ Combination with IGS
4. Draft of final EUVN report
5. "Transformation Group": Proposals for European map projections
6. European Geoid
7. Contribution of EUREF to IGS and ITRF
8. Status on data flow improvements
9. Guideline update status
10. EUREF/GALILEO working group: Status
11. ESEAS: Status
12. Realtime activities
13. IAG Scientific Assembly: Conclusions, activities for EUREF?
14. Varia

### **Participants**

JÓZSEF ÁDÁM, Budapest

ZUHEIR ALTAMIMI, Paris (perm. guest)

WOLFGANG AUGATH, Dresden

CARINE BRUYNINX, Brussels

ALESSANDRO CAPORALI, Padova

COLIN FANE, guest

MARK GREAVES, guest

ERICH GUBLER, Berne-Wabern (delegate of EuroGeographics)

WERNER GURTNER, Berne (Chairman)

HEINZ HABRICH, Frankfurt (perm. guest)

BJØRN HARSSON, Honefoss

HELMUT HORNIK, Munich (Subcomm. Secretary)

JOHANNES IHDE, Frankfurt (perm. guest)

AMBRUS KENYERES, Budapest

HANS VAN DER MAREL, Delft

HERMANN SEEGER, Bad Neuenahr – Ahrweiler (perm. guest)

JAROSLAV SIMEK, Prague

GÜNTER STANGL, Graz (perm. guest)

JOAO AGRIA TORRES, Lisbon (Subcomm. President)

GEORG WEBER, Frankfurt (guest)

Apologized: CLAUDE BOUCHER, Paris

## Minutes

Remark: The presented papers and view graphs can be received, as far as available, on request from the EUREF secretary.

The TWG chairman, W. GURTNER, opens the XXVIIth meeting of the EUREF TWG and thanks the Department of Geology, Palaeontology and Geophysics, University of Padova for hosting this meeting. On behalf of the hosts, Prof. Domenico Rio, director of this institution, welcomes the TWG in Padova.

The agenda was distributed among the TWG members by mail and is adopted by the auditorium.

### 1. Minutes of the XXVIth TWG Meeting in Dubrovnik

The minutes of the last TWG meeting in Dubrovnik, May 15, 2001, have been distributed. Some details are to be corrected.

### 2. Campaign presentations and validations

#### Great Britain<sup>1</sup>

M. GREAVES explains the reason for this new campaign. EUREF GB 01 replaces the previous GB92 which comprised no permanent but only passive stations. The new network OS.COGR includes 32 GPS sites, 12 of which are proposed to be regarded as official EUREF sites, these are all identical to previous ones. 6 Stations are IGS stations, too.

The campaign was observed for 2 weeks, the EUREF EPN guide lines were followed. Comparisons with former GPS campaigns show a general a coordinate recovery of 10 mm or better. Station OS06 shows up to now not explicable relatively large discrepancies.

The TWG discusses the question how to proceed with the already existing stations of previous campaigns (EUREF'89, GB92, Irish campaign) stored in the EUREF data base. It is recommended to delete old sites which are no more really maintained from the EUREF data base. Here also a change in the strategy has to be considered. In the beginning of EUREF the sites were kept fixed, meanwhile station velocities are attached and coordinate values are considered as time variant. In this context M. GREAVES adds that as far as possible links to the old triangulations ground stations were installed, however, few efforts are made to maintain these sites. So many of these will more or less disappear with time. The current strategy includes the easy access to official network stations.

The results are accepted by the TWG as part of EUREF. According to the guidelines concerning the maximum number of sites per country, the number of the presented 12 sites could be enlarged to 16 ("official limit"): As this limit is

not to be considered too strict, no objections exist to include all 19 observed sites into the list of EUREF points.

The British colleagues are asked to prepare a condensed report to be submitted to the next EUREF symposium 2002.

### 3. EUREF troposphere product

#### Status

G. WEBER explains the development of this project. At the beginning (GPS week 1110) the computation started with 4 local analysis centers, meanwhile 12 LACs are taking part processing 141 sites. The majority of them uses the Saastamoinen troposphere model and the Bernese software. The sampling rate amounts 3600 sec. or 7200 sec. respectively.

The original task of EUREF is to provide accurate coordinates. Tasks, however, can be changed or enlarged if useful and necessary, moreover some sites are sufficiently equipped with good instrumentation for meteorological registrations. So it should be tried to collect the meteorological records which are available anyway into a common file on a (public) data base for any concerning research. For practical use, the data have to be available as long-term-data reliably, accurately and in time. This work could be organized commonly by EUREF and COST 716, especially by colleagues engaged in both projects (e.g. J. DOUSA, A. KENYERES). It is proposed to support the meteorological community, especially COST 716, by the submission of these data as far as possible.

For convincing the operators of the permanent GPS stations to contribute to this task it has to be formulated explicitly that this project is not only a collection of data but a research activity under the umbrella of EUREF. A feedback could be the improved analysis of e.g. coordinate variations. Besides the pure data the colleagues should also be asked to contribute by new own ideas, proposals and useful instructions.

#### Official solution, policy

It is discussed in detail whether the current computation of 2 more or less similar combinations of the data by the BKG as well as the GFZ can be considered as useful. The GFZ produces a solution on IGS level, the results agree with those of the BKG on mm level. It is pointed out that in the near future this parallel work might give interesting insights when after a starting phase more sophisticated methods such as the use of covariances or different procedures will be introduced. So far the current situation should be regarded as a test phase and the decision how to proceed further on be postponed.

<sup>1</sup> M. GREAVES, C. FANE: *EUREF GB 01 Final Report – Final Report on the Processing and Analysis of the Ordnance Survey Great Britain EUREF GB 01 Campaign*

#### 4. Draft of final EUVN report

J. IHDE presents a paper<sup>2</sup> compiled by G. WOPPELMANN on the present state of the tide gauge part within the EUVN. The situation now has considerably improved in comparison to the state at the time of the Dubrovnik symposium. In the eastern part of the EUVN, however, up to now practically no tide gauges are available. It is discussed extensively how to urge the respective countries to deliver the requested data or finalize the computation basing on the current data level as decided already before. It is agreed that written letters will not give any useful impact. Finally it is concluded that colleagues working in this project should try by telephone contacts to urge in a "last-call" to all countries which have not yet delivered the data relating the connection of their tide gauges to the EUVN to submit the data immediately. Then the final solution will then be completed then basing on the available data and independently also if some stations are not included. The now possible solution covers a considerable part of Europe. The available data should be listed clearly and gaps be shown. The solution could be improved and enlarged later if useful similarly to the addition of various EUREF campaigns after the observation of EUREF'89.

The final publication comprising all detailed information for the heights and tide gauges is planned to be submitted to the 2002 symposium (a draft should be presented to the next TWG meeting) comprising the height as well as tide gauge part of the EUVN. Similarly to the GPS part this publication should be issued as a separate volume besides the usual symposium proceedings.

#### 5. "Transformation Group": Proposals for European map projections

E. GUBLER gives a presentation on the European Coordinate Reference Systems (European CRS), a detailed review is to be found in the homepage <http://crs.ifag.de/>. The ETRS89 has been recommended by the Spatial Reference Workshop, Marne-la-Vallée, 29-30.11.1999 as general reference system for the whole of Europe. The majority of the European countries (29 of altogether 38) have delivered their relevant data to compute the needed transformation parameters. It can be hoped that in the near future the complete set of countries will be gathered in this project.

On behalf of EuroGeographics expresses thanks to the BKG and especially J. IHDE for the tremendous help and support to enable the verification of this goal.

Moreover MEGRIN held a workshop in Paris in December 2000 and recommended as European map projections the Transverse Mercator Projection for large scale maps and the Conic Lambert Projection for scales  $\leq 1 : 500\,000$ . This recommendation has been submitted to national mapping agencies in Europe, some of which already have answered and more or less accepted the proposal.

As next step for the support of geodetic reference an European Terrestrial Management Information Infrastructure (ETeMII) is planned. Summarizing E. GUBLER points out that these activities really help the European Community and really should be continued.

The TWG chairman appeals to all colleagues to put technical reports and documents, especially those concerning the public use of EUREF, into the EUREF homepage. Especially the paper *What is ETRS89?* by Z. ALTAMIMI is mentioned. The papers are to be provided with adequate keywords. Files to be put into the EUREF homepage are to be sent to the webmaster JULIA CARDOSO (jcardoso@ipcc.pt).

#### 6. European Geoid

A discussion paper *The Role of EUREF in the European Geoid Development and the Future Impact of the Continental Geoid in the EUREF Activities* by A. KENYERES and H. DENKER is distributed. Basing on this paper A. KENYERES explains the actual situation. The EGG97 is available on dm level for large areas of Europe. Although geoids are not strictly related to EUREF activities, it has to be considered that geoids and reference frames (especially for heights) are linked to each other. Therefore resolution 4 of the EUREF symposium 2001 in Dubrovnik recommends to generate a European geoid model of decimetre accuracy consistent with ETRS89 and EVRS. On occasion of the IAG Assembly 2001 in Budapest, the IAG Geoid Commission decided to start for such a work, the completion is planned for 2004. The major input for this project will come without any doubt from the new special satellite missions such as GOCE and GRACE. However, also EUREF could contribute considerably with a dense GPS levelling network (line distance 50 – 100 km) as well as accurate national GPS networks. A. KENYERES proposes to start a EUREF action for the densification of the EUVN network to be used as valuable input. Moreover, the EUVN connects new GPS data with older levelling data and help to relate accurate national geoids to each other.

In the following discussion it is emphasized that this project will need efforts and cannot be solved by a small group of people. On the other hand the data are to be provided soon if they should be combined with those of the satellite missions.

A working group (W. AUGATH, J. IHDE, A. KENYERES (chairman), J. SIMEK, R. MOLENDIJK, a representative from Switzerland and Norway) is installed to develop plans to organize this EUREF action concerning the new observations within EUVN also connected to existing levelling networks as well as think about adequate methods to estimate existing data. Moreover the European national agencies have to be convinced to collect and deliver their already existing data for this project.

<sup>2</sup> EUVN tide gauge data collection and analysis – Report to the EUREF TWG (Oct. 1, 2001)

## 7. Contribution of EUREF to IGS and ITRF

H. HABRICH presents a summarized development of the definition of the International GPS Service (IGS) and International Terrestrial Reference Frame (ITRF). As input data for the IGS only global solutions are used, so EUREF is not contributing because it does not represent a global solution. However, EUREF is used for the ITRF via the accurately checked and high quality EPN data. It is discussed whether the EUREF data should be adapted to the IGS guidelines and be constrained to a global solution and thus be included into the input for IGS. It is mentioned that a selection of sites in Northern America is simultaneously used for the regional network as well as for IGS by this method. It is emphasized that the goal of EUREF is to define a European densified reference. On the other hand the inclusion into the IGS might be a benefit for EUREF. It is proposed to submit a relevant paper to the next IGS workshop at which some TWG members presumably will participate. As far as possible the paper should be circulated among the TWG before being presented at the workshop.

## 8. Status on data flow improvements

G. STANGL gives some explanations to his written contribution *EPN Data Flow*. In contrary to the carefully checked daily data hourly files cannot be tested adequately due to the pressure of time although the automatic checking is rather good. Presently the OLG in Graz archives 100 days for daily and 1 week for hourly data. Other large archives are kept at the BKG, ASI and in Pecny. The archiving of the data requires enormous storage. So it should be thought over how long data files should be stored. G. STANGL is asked to work out relevant guidelines for station managers and customers what to do in case of problems and put these guidelines into the web to be found by everybody to whom it may concern.

## 9. Guideline update status

B. HARSSON presents a review of the existing guidelines presented to the various EUREF symposia and TWG meetings since 1993. Summarizing these experiences the guideline group (B. HARSSON, J. SIMEK) is asked again to complete an updated set of guidelines concerning the topics:

- permanent networks
- densification of EUREF, densification stations
- combination of solutions
- analysis reports of campaigns
- EUREF database
- EUREF sites reports
- site/station numbering
- transformation from current epoch to ETRS89
- heights
- deliverables for EUREF campaigns
- guidelines for users to explain what is happening with the data.

## 10. EUREF/GALILEO working group: Status

W. GURTNER remembers the plan to formulate a short paper to support the definition for, unfortunately this paper is not yet written. However, the paper *What is ETRS* by Z. ALTAMIMI could be used for this purpose. Furthermore, a common working group within the ESA under the chairmanship of C. BOUCHER was proposed. The group is not yet fixed, but the EUREF Subcommission should be prepared to be engaged. It is emphasized that Galileo aims at a navigation system is so no obvious overlap with EUREF occurs, however, EUREF has to keep the contact anyway to this new system.

## 11. ESEAS: Status

H. HABRICH explains the current status of European Sea Level Service (ESEAS) project. Up to now a series of circulars and calls for participation were distributed, practical work, however, is still in the phase of planning. W. GURTNER proposes to offer a EUREF solution including all EPN sites allied to tide gauges. The request for altogether 50 sites, however, exceeds the possibilities of EUREF. C. BRUYNINX is asked to take care for this information. J. IHDE comments that such data are submitted to the GPS Tide Gauge Benchmark Monitoring Pilot Project (TIGA - PP), ESEAS and TIGA are already connected. He offers to write a note relating the data which EUREF could submit and on the other hand which data provided by ESEAS could be possibly used for EUREF, especially the EUVN. In any case a cooperation between both groups would be welcome.

## 12. Realtime activities

G. WEBER describes the activities in the BKG on this field and demonstrates the data flow with a receiver installed directly near the meeting room. The processed data enormously much storage:

- raw GPS data: 2000 Mbyte/month and station
- RTCM-2.0 (DGPS data): 90 Mbyte/month and user (40 byte/sec)
- RTCM-2.1 (RTK service): 1300 Mbyte/month and user (500 byte/sec)

Detailed information can be got by *euref-ip.ifag.de*. A relevant paper will be presented to the IGS Network, Data and Analysis Center Workshop, Ottawa, Oct 15-18, 2001, likewise he is asked to report on this workshop at the next TWG meeting.

A planned pilot project with 10 reference stations for DGPS in the Veneto region is presented. The Italian colleagues are asked to report on their experiences after the starting phase to the interested community such as geologists or geophysicists.

### **13. IAG Scientific Assembly: Conclusions, activities for EUREF?**

J. ADAM reports on the IAG Scientific Assembly, Budapest, September 2-7, 2001. 449 participants from 53 countries attended this conference, 379 papers were submitted, 126 of them oral in 23 sessions. A Selection of papers will be in the Springer series, all others on CD. Altogether seven contributions relating EUREF were presented.

J. TORRES explains the plans for a new structure of the IAG to be realized after the next IUGG General Assembly in 2003. The current large number of Sections, Commissions, Special Commissions, Subcommission, and Special Study Groups will be restricted to a small number of Commissions as well as IAG Services and Projects. The EUREF Subcommission will also need to adapt to the new structure. W. Gurtner mentions that EUREF fulfills the task of a commission for Europe which could run a service for Europe. The colleagues J. TORRES (chair), W. GURTNER, H. HORNIK, E. GUBLER, Z. ALTAMIMI/ C. BOUCHER and J. IHDE are asked to work out ideas on the future structure and function of the EUREF Subcommission.

### **14. Varia**

A. CAPORALI mentions the earth quake near Merano (Alto Adige region) on 17.7.2001. The analysis of the permanent site data Bolzano by E. BROCKMANN show interesting results, a detailed report will be presented to the next EUREF symposium.

G. STANGL adds that the data checks of the permanent sites located in Northern Tirol not far from this place show no significant movements, so this earthquake obviously does not result from a general Alpine but merely regional movements.

The Swiss colleagues invite the TWG to hold the next meeting in Berne from Thursday, 14 – Friday 15.3.2002. As usual the meeting will start at noon and be finished at noon.

The 2002 fall meeting will take place in Delft, the date is not yet fixed.