XXVIth Meeting of the EUREF Technical Working Group in Dubrovnik, May 15, 2001

Meeting place: International University Centre Dubrovnik

Begin: 15.05.2001, 9.00 a.m., end: 18.00 p.m.

Agenda

1. Protocol of the XXVth TWG Meeting in Munich (Hornik)
2. Campaign presentations and validations
   – Croatia (Bacic)
   – Russia (Kaftan)
3. EUVN, status of final report (Ihde)
4. "Transformation Group" (Adam, Gubler, Harsson, Ihde, Torres)
   – Future Steps
   – Status of the home page
5. Permanent network
   – Data Flow Improvements (Bruyninx, Stangl)
   – EUREF Troposphere Solutions (Bruyninx, Weber)
   – Analysis Coordination, AC Workshop (Habrich)
6. Open issues regarding the EUREF Web site
   – General (Torres)
   – Campaigns (v. d. Marel)
   – Documentations, guidelines, links (Hornik, Simek)
   – Vertical network (Ihde)
   – ETRS89 (Altamimi)
7. ITRS2000 and ETRS89 (Altamimi)
8. EUREF Trademark / Name and logo protection (Harsson)
9. Guidelines concept (Simek, Harsson)
10. Galileo Meeting (Gurtner, Bruyninx)
11. ESEAS: Interface with EUREF (Plag)
12. EUREF Symposium Dubrovnik (Rasic)
13. Realtime Activities (Weber)
14. IAG Scientific Assembly in Budapest: Papers to be presented (all)
15. Guidelines (Simek)
16. Galileo
17. ESEAS interface with EUREF
18. Symposium EUREF Dubrovnik
19. Future financing and publication of the EUREF proceedings (Hornik)
20. Varia
    – COST 716 (vdMarel)
    – AFREF Meeting, 13 March 2001, Cape Town (Weber)

Participants

JÓZSEF ÁDÁM, Budapest
ZUHEIR ALTAMIMI, Paris (guest)
WOLFGANG AUGATH, Dresden
ZELJKO BACIC, Zagreb (guest)
TOMISLAV BASIC, Zagreb (guest)
CARINE BRUYNINX, Brussels
ALESSANDRO CAPORALI, Padova
ERICH GUBLER, Berne-Wabern (delegate of CERCO)
WERNER GURTNER, Berne (Chairman)
HEINZ HABRICH, Frankfurt (perm. guest)
BJØRN HARSSON, Honefoss
HELMUT HORNIK, Munich (Subcomm. Secretary)
JOHANNES IHDE, Leipzig (guest)
VLADIMIR KAFTAN, Moscow (guest)
AMBRUS KENYERES, Budapest
HANS VAN DER MAREL, Delft
MARIJAN MARJANOVIC, Zagreb (guest)
HANS-PETER PLAG, Honefoss (guest)
LJERKA RASIC, Zagreb (guest)
HERMANN SEEGER, Bad Neuenahr - Ahrweiler (perm. guest)
JAROSLAV SIMEK, Prague
GÜNTER STANGL, Graz (perm. guest)
JOAO AGRIA TORRES, Lisbon (Subcomm. President)
GEORG WEBER, Frankfurt (perm. guest)

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 XXVIth meeting of the EUREF TWG and thanks the State Geodetic Administration of the Republic of Croatia for hosting this meeting. He welcomes the guests as well as the Croatian hosts of this meeting and the following EUREF symposium. On behalf of the State Geodetic Administration, the director of this institution, Z. BACIC, welcomes the TWG in Dubrovnik.

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

1. Protocol of the XXVth TWG Meeting in Munich

The minutes of the last TWG meeting in Munich, February 15 - 16, 2001, have been distributed. Some details are to be corrected.

2. Campaign presentations and validations

Croatia

Z. BACIC gives an introduction on the new official *Computation of the Combined Solution of EUREF GPS Campaigns 1994-1996 in the Republic of Croatia,* followed by a detailed report by M. MARJANOVIC. The three campaigns were observed in 1994, 1995 and 1996 and cover not exactly the same areas and refer to different epochs. The number of Croatian sites amounts 10, 14 and76, additional sites are located in neighbouring countries. In order to use all results in a best possible way, a common recomputation was carried out in cooperation with the BKG and the Slovenian agencies. The station velocities were derived from the NUVEL1A-NNR model. The yielded results were carefully compared with those of the EUVN in 1997 as well as the 1996 campaign in the Former Yugoslav Republic of Macedonia (FYROM). This new solution is referred to the ITRF92 at the epoch 1994.4 and comprises at all 105 sites, 10 of which are now proposed to be considered as official Croatian EUREF stations.

H. V. D. MAREL remarks that the EUREF-CRO/SLO94 campaign has already been accepted as part of EUREF on class B level (EUREF symposium Helsinki, 1995, res. 1). So the question arises how to handle the double coordinate sets. The TWG decides to consider the presented new EUREF-CRO-94/95/96 solution as the final one as class B standard (about 1 cm at the epoch of observations) and recommends that all old Croatian points should be deleted from the EUREF database and replaced by the subset of the new solution. However, for checking the hypothetical point velocities the results of the individual campaigns should be investigated still more in detail.

Moreover, it is recommended that Slovenia should compute its own points basing on the new Croatian solution. The TWG offers to assist Slovenia in this work.

Russia

On behalf of EuroGeographics, E. GUBLER has written a circular to the mapping agencies of all European countries asking to make available the relevant transformations parameters for referring the national systems to a common European reference frame. V. KAFTAN, representative of Russia, explains the organization of geodesy and mapping in Russia and asks the EUREF Subcommission for cooperation with other institutions which are experienced in the analysis of GPS campaigns to help to join Russia to EUREF. In the recent period Russia has carried out two GPS campaigns covering almost the complete part of this country on the European continent. The average site distance is about 300 km, Belorussia is included in the campaigns, too. All GPS sites are linked carefully to the traditional control. Unfortunately at present official restrictions obstruct the publication of coordinates and the relevant transformation parameters. In June 2001 a decision of the Russian administration on this item can be expected, then a practical decision on the further steps will hopefully be possible.

The TWG recommends that Russia should write an official letter to the EUREF Subcommission in which the relevant problems as well as the request for help are clearly formulated. Then a clear decision could hopefully be found.

3. EUVN, status of final report

J. IHDE informs on the progress of the project. G. WOPPELMANN had taken up the responsibility for the sea level part of the EUVN, however, up to now unfortunately the work did not proceed. Meanwhile G. WOPPELMANN has announced to complete the work in cooperation with the BKG. The data set comprises at present 30 of altogether originally 70 tide gauges, some countries (Bulgaria, Greece, Romania, Turkey) have no tide gauges in the data set at all. This problem has already been discussed in detail and it had been decided no to wait any longer but to finish the project in time. For the final publication it is proposed to arrange the documentation similar to the GPS part, i.e. one page for each station showing all relevant data.

The TWG asks J. IHDE to present a draft of the final report to the next TWG meeting to be discussed there and prepared for the final publication.

4. "Transformation Group"

The *Transformation Group* has met the day before and discussed the topics transformation. problems, definition for ETRS89, map projection for European countries as well as the European Community as a whole.

J. IHDE remembers the decision of the *Spatial Reference Workshop 1999* in Paris which decided to use the ETRS89 as reference system for the EC. The national control networks can be referred to ETRS89 by a 7 parameter transformation according to the IAG documents. All European countries are asked to compute these values and make the parameters available for publication in a public domain.

The European height system shall be defined by the EVRS and shall be realized by the EVRF 2000, and the national systems accurately related to this common reference.

The Map Projection Workshop 2000 in Paris recommends that the European Commission:

- Adopts ellipsoidal coordinates (geodetic latitude, geodetic longitude, and if appropriate ellipsoidal height) for expressing positions of vector data;
- Adopts the UTM projection system for topographic maps with scales larger than 1 : 500 000;
- Adopts the Lambert conformal projection (LCC) with two parallels for cartographic maps with scales equal 1 : 50 00 or less;
- Includes the above coordinate systems in the future specifications of the products to be delivered to the EC, within projects, contracts, etc;
- Further promotes the wider use of the above coordinate systems within all member states, by appropriate means (recommendations, official statements, ...)

J. IHDE mentions that in most of the European countries the transverse Mercator projection is used.

However, about 10 different versions are used and are thus not really identical. Moreover, different UTM and Gauss Krüger systems with varying scales are in use. This enormous variety needs to be documented carefully and published in the internet to enable users to refer their data correctly to the right system.

In all it has to be stated that this problem is treated already a long time, but still much work has to be done. The further steps are to be discussed at the symposium together with the representative of EuroGeographics, J. LEONARD. The *Transformation Group* is asked to proceed in its activities as fast as possible and to prepare a documentation in the EUREF homepage. The information has to be distributed European wide (EUROCONTROL, FIG, IAG) and permanently checked and updated.

The TWG thanks the group, especially J. IHDE, for its great engagement.

5. Permanent network

Data Flow Improvements

At present the BKG, Graz and Matera are operating as central data centers. W. Gurtner mentions the dangerous situation that a teach time some event can lead to a break down of a center. For the possible case that one center fails it has to be assured that the others can replace this one within one hour. Therefore all centers are to operate within the same scheme and data sets.

The responsible analysis center coordinators are asked to prove the worst case and to report about their ideas to the next TWG. Considering the fact that Frankfurt is practically the main center it has to be assured that this center can be replaced by others for a certain time. Frankfurt as well as the other centers are handling a large number of other sites besides those of EUREF, so it should be tried to install backup procedures for the EUREF data only to enable an exchange in the case of a breakdown.

It is emphasized that these strategies should profoundly be checked and tested so that the data input and output is not influenced and users do not become worried. W. Gurtner asks the representatives of the data centers urgently to discuss this topic and to work out a strategy for the case of a break down.

EUREF Troposphere Solutions (Bruyninx, Weber)

C. BRUYNINX mentions that within the IGS an increasing interest exists in the products of EUREF mainly concerning the results of the troposphere analysis as well as the participation in the projects of IGS relating this field of research. C. BRUYNINX has organized already a working group within the EPN, investigating the different strategies such as post processing or real time processing. These activities, however, at least presently do not directly relate the tasks of EUREF to provide coordinates and maintain a frame, but can be considered as a welcome by-product. In future, of course, these results will more and more refer the entire tasks of EUREF, too.

W. GURTNER describes the idea to use the existing capabilities to generate troposphere parameters as it is already done in the IGS which sends the data to G. GENDT/GFZ to treat this topic similarly to EUREF. The procedures for dandling and analysing the data could be used by all groups and must not be developed again.

C. BRUYNINX emphasizes that the tasks of the EUREF troposphere coordinator, G. WEBER, are independent of this project. G. WEBER himself expresses the opportunity to take over this work on a long term basis, the necessary staff is also guarantee. Finally he mentions that such topics are to be handled very carefully and over long periods to derive reliable results. Moreover the effort to install all programs and routines is considerable, so a change of groups increases the organizational work considerably. The BKG also cooperated with other institutions such as ASI and LTP for data exchange. G. WEBER explicitly expresses his opinion that an engagement of other groups is not necessary within the EUREF group.

H. V. D. MAREL mentions that such a project could be treated by different groups for good reason because within the EPN a limited number of really long term permanent GPS sites is considered, but not an enormous number of e.g. 500 sites which are registrating for a certain period. It is mentioned that within the EPN the strategy is to restrict the number of sites to a limited number according to the EUREF guidelines whereas in projects for meteorology a maximum number of registrating stations is welcome, although also there the site distribution is rather important. However, the limitation of official EPN sites does not exclude other sites to be analyzed following the procedures used in the EPN analysis.

W. GURTNER summarizes that the troposphere solution done by post processing should further on remain an original task of the concerning EPN group. The data management for handling the hourly data flow is treated by another group within EUREF under the chairmanship of G. STANGL. The GFZ has expressed its interest to take part in this project and offered its capabilities. The BKG will need at least in a few months to install the necessary infrastructure to fulfil sufficiently such a great task, but would be ready to do this work for a longer time.

G. WEBER proposes that the interested colleagues should meet in the next future to work out a plan for the next steps to be done. The data naturally are free and can be analyzed by anybody. So it should be taken care to optimize the efforts on this field and avoid double work. H. V. D. MAREL adds that parallel analyzes may also be useful to compare the reliability and significance of the yielded results and reveal errors or wrong assumptions in the programs and data.

W. GURTNER asks C. BRUYNINX, G. WEBER and H. V. D. MAREL to sit together and work out a proposal to ne circulated in the next week by e-mail among the EUREF TWG.

Analysis Coordination, AC Workshop

H. HABRICH informs on the Analysis Centers meeting which will be held in Warsaw from May 31 - June 1, organized by J. Sledzinski. Main topics will be special projects such as troposphere or kinematic aspects, then processing strategies as well as height and antennae problems.

6. Open issues regarding the EUREF web site

J. TORRES reports on the recent completion of the web site. The ETRS89 part is not yet complete, but will be available soon cf. topic 7). H. V. D. MAREL explains that the sub site *GPS campaigns* has been reorganized. The colleagues responsible for GPS campaigns are asked to prepare and deliver the relevant information to be put into the data base and made available for the public. All colleagues are urgently asked for permanent care and help to maintain and update all information as good as possible. Furthermore, it has to be tried to make the EUREF web site generally known to the interested geodetic community. Special care has to be given to the definition of relevant keywords since all experiences show that the great majority of potential users is not surfing within the internet looking for a special site but is searching with general keywords for any relevant information.

7.ITRS2000 and ETRS89

Z. ALTAMIMI informs that a new web page has been installed by the IGN, the link to the EUREF web page will be made as soon as possible. All ETRF 1998 - 1993 are presented, but it should be discussed whether it is useful to publish also all later ones. The general meaning is to publish all solutions in order to document the development and to show the differences between the various solutions to the public. Moreover the information may be used for the analysis of regional campaigns. The documentation should also include an explicit hint for the users to take care not to mix the systems but to refer clearly the observations to the relevant frame.

It is pointed out that EUREF contributes considerably to the IGS especially via the EPN, on the other hand the ETRF solutions are derived as subset from the respective ITRS‘s, so both provide a benefit to the other one. Furthermore it is stated that at the beginning of EUREF the data sets gained from the campaigns defined the system, however, meanwhile the EPN takes over this role more and more. Nevertheless, new campaigns are still useful to cover areas which were not yet included or to improve the existing results. It has to be considered that within the 12 years since the start of EUREF the ideas and knowledge have been partly modified and improved. When EUREF had been initiated, a global system was not yet available, the IGS did not exist. EUREF was thought to replace ED87 and represent a stable system on a plate which was considered to be stable within itself. Meanwhile all sited are considered as moving with an adopted certain velocity relative to some defined system. So a observations have to be de referred to a defined epoch to make them comparable. EUREF represents the community of the European countries as a whole and can be used for mapping, GIS and other purposes.

In the following Z. ALTAMIMI explains the newly computed ITRF2000. This new system is derived from a set of primary core stations, regional GPS networks (e.g. EUREF, SIRGAS) and individual solutions, altogether about 800 sites. The origin of the ITRF2000 is defined by SLR, the scale by VLBI and the orientation by a selected set of ITRF sites which are continuously observing at least since three years. The TWG discusses how to derive station velocities in future especially considering the fact that also small errors accumulate to a considerable amount over the time difference of 12 years since the definition of the ERTS89. Finally te TWG decides to replace the NNR-NUVEL-1A rotation rate values by the ones derived from ITRF2000 in the transformation formula linking ETRS89 to ITRS cf. res. 2 of the symposium).

8. EUREF Trademark / name and logo protection

informs that now the label *EUREF* is protected for mapping, surveying and geodesy within altogether 26 European nations which have signed the *Madrid convention*. The price amounted 200 ♓ for Norway, the total costs are not yet known.

The TWG thanks B. G. HARSSON for his successful efforts and engagement to trademark the label EUREF.

9. Guidelines concept

J. SIMEK reports that the concept to formulate new guidelines needs much more work as expected before. Nevertheless, this work will be continued and hopefully be completed soon.

It is mentioned that Z. ALTAMIMI has given a presentation to the FIG congress in Malta, this paper could contribute considerably to the planned guidelines, so it should be published immediately on the EUREF homepage.

Generally the guidelines are to be formulated such that misunderstandings are avoided as far as possible. The target group are not only geodesists but also people who are interested in reference systems in general.

10. Galileo Meeting

W. GURTNER reports on a meeting in Brussels in March 2001. The EUREF TWG war represented by C. BOUCHER, C. BRUYNINX and W. GURTNER, Galileo by R. IDIENS. Galileo is still in the phase of planning and needs support. A working group (J. ADAM, Z. ALTAMIMI, E. GUBLER, W. GURTNER, J. IHDE, J. TORRES) is installed and asked to work out a paper describing all relevant items how to support and cooperate with Galileo.

11. ESEAS: Interface with EUREF

On occasion of the 1999 EUREF symposium in Prague, H.-P. PLAG has informed on COST Action 40 *European Sea Level Observing System (EOSS)* within which the establishing of a *European Sea Level Service (ESEAS)* is now in development (http://www.gdiv.statkart.no/eseas/). Possible interfaces between ESEAS and EUREF can be scientific scopes such as the integration of observation techniques or organisational objectives such as long term monitoring activities and data exchange concerning European coastlines. A first test phase is planned for three years, 18 countries have announced their interest to involve altogether about 100 tide gauges. It is stated that this project does not overlap with the PSMSL which collects monthly data. The goal of ESEAS is to generate near real time data.

W. GURTNER proposes that the GPS observations for the ESEAS should follow the EUREF EPN guidelines which are tested since years and proved to be useful. On this basis of uniform processing methods within EUREF and ESEAS a close cooperation might be useful for both projects especially if identical sites are used.

H. HABRICH is asked to keep the contacts to ESEAS and attend the next meeting on July 6 in Koblenz and then report to the TWG.

12. EUREF Symposium Dubrovnik

The representatives of the Local Organizing Committee inform on the time table and events of the Symposium. The TWG approves the agenda proposed by the Subcommission President, J. TORRES.

13. Realtime Activities

G. WEBER remembers the enormous development within the last 10 years from originally single GPS observations for campaigns, then remeasurements within years, one year, then permanent daily files to now hourly and in future near real time data. Hereby the internet has developed to an indispensable tool for the use and exchange of data. The accuracy expected for the near future is on dm level. Possible applications are navigation or GIS, but the spectrum will surely enlarge in future. W. GURTNER points out that this development has to be observed carefully and EUREF has to take care of it, otherwise other groups will engage themselves in this field. The EUREF community has the knowledge and possibility to fulfil such tasks via the EPN very properly and thus could get much interest by the public. Due to the European wide organisation of EUREF such activities possibly might be in conflict with national interests. J. TORRES points out that EUREF should start its activities in any case and, if necessary, skip single countries on request. G. WEBER is asked to collect ideas on the further useful steps and a time schedule and report to the next TWG.

14. IAG Scientific Assembly in Budapest

EUREF will be represented on the coming IAG Scientific Assembly in Budapest, September 2001, by several reports, i.e. a general review (J. TORRES), EUVN and other topics on heights (J. IHDE), EPN (C. BRUYNINX), time series (C. BRUYNINX, A. KENYERES), EPN analysis (H. HABRICH), ITRS2000 (Z. ALTAMIMI).

15. Varia

The TWG chairman, W. GURTNER, informs that W. SCHLÜTER has retired as TWG member and proposes to replace him by G. WEBER. J. IHDE is invited further on as permanent guest. The plenary accepts the proposals. Hereby W. GURTNER expresses the thanks of the EUREF TWG and the Subcommission in all to the *Bundesamt für Kartographie und Geodäsie (BKG)* for the permanent and efficient help in all aspects, but especially personnel, computing facilities and logistical support.

J. IHDE informs that Bulgaria had asked for some financial support to organize its participation in UELN. Meanwhile the request for support was enlarged. It is decided to discuss this problem with the Bulgarian colleagues on the symposium and then to decide on the next steps.

In context with the *Establishing a Continental Reference System for Africa (AFREF)*, G. WEBER has circulated a report on a meeting in South Africa. Z. ALTAMIMI will attend this meeting and represent EUREF. J. TORRES as president of the EUREF Subcommission will send an official address offering support and cooperation. W. GURTNER proposes to offer the inclusion and processing of permanent GPS stations in North Africa within the EPN. This first practical step could be done immediately and without great efforts.