XXIII[rd] Meeting of the EUREF Technical Working Group in Tromsø, June 21, 2000

Meeting place: Polarmiljøsenteret, Tromsø

Begin: 21.06.2000, 9.00 p.m., end: 18.15 a.m.

Agenda

1. Protocol of the TWG meeting in Brussels, March 20-21, 2000
2. Campaign Validation
   - Official solution for Croatia (Weber)
   - The Balear98 Project: Additional Information (Pujol)
   - Moldavia. Additional Information (Hugentobler/Gurtner)
   - Swedish ETRS89 Introduction (Jivall)
3. Activities of the "transformation group" (Gubler, Ihde, Boucher, Torres)
4. Status of the EUREF Data Base (Boucher)
5. EUREF Web site (Torres, Bruyninx)
6. Trademark EUREF (Harsson)
7. Permanent network:
   - Status (Bruyninx)
   - Reorganisation (Bruyninx)
   - Data flow coordinator (Bruyninx, Stangl)
8. EUREF guidelines (Harsson, Simek)
9. GALILEO/GALA/EGNOS (Boucher)
10. Requirements for European Height System (Augath)
11. Status of EUVN, tide gauge connections (Ihde)
12. Report on the workshop in Tunisia for the adoption of a common reference frame for Northern Africa (Torres)
13. WEGENER Invitation (Torres)
14. Tromsø Symposium (Harsson)
    - Agenda
    - Resolution committee
15. EUREF Symposium 2001: Proposals (Adam, Torres)
16. GPS and leveling database (Kenyeres)
17. Geophysical Interpretation of the EUREF time series (Kenyeres)
18. Varia

Participants

JÓZSEF ÁDÁM, Budapest
MATTHIAS BECKER, Frankfurt (guest)
WOLFGANG AUGATH, Dresden
CLAUDE BOUCHER, Paris
CARINE BRUYNINX, Brussels
ALESSANDRO CAPORALI, Padova
WALTER EHRNSPERGER, Munich (guest)
BJØRN ENGEN, Honefoss (guest)
WERNER GURTNER, Berne (Chairman)
ERICH GUBLER, Berne-Wabern (delegate of CERCO)
LOTTI JIVALL, Gävle (guest)
BJØRN HARSSON, Honefoss
HELMUT HORNIK, Munich (Subcomm. Secretary)
JOHANNES IHDE, Leipzig (guest)
AMBRUS KENYERES, Budapest
ONUR LENK, Ankara (guest)
HANS VAN DER MAREL, Delft
HANS-PETER PLAG, Honefoss (guest)
ENRIQUE PUJOL, Madrid (guest)

HERMANN SEEGER, Bad Neuenahr – Ahrweiler (guest)
MARTINA SACHER, Leipzig (guest)
JAROSLAV SIMEK, Prague
GÜNTER STANGL, Graz (guest)
JOAO AGRIA TORRES, Lisbon (Subcomm. President)
GEORG WEBER, Frankfurt (guest)
GUY WÖPPELMANN, Paris (guest)

Minutes

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

Topic 0: On behalf of the Polarmiljøsenteret, director ARE JOHNSEN welcomes the EUREF TWG members to this session in Tromsø, the northernmost city in the World (70°N). He outlines the history and tasks of polar research and the necessarily close cooperation with other disciplines such as geodesy within a broad field of applications. W. GURTNER, chairman of the TWG, thanks for the heartily welcome and opens the session.

The agenda was distributed by mail, some topics are reordered.

Topic 1: The minutes of the last TWG meeting in Brussels, March 20-21, 2000, have been distributed. Some details are to be corrected.

Topic 2: The Croatian colleagues have asked to discuss the definition of an *Official solution for Croatia.* In the past several campaigns were performed and various solutions computed and presented e.g. by Y. ALTINER (cf. the minutes of previous meetings). The TWG has expressed its opinion to consider the last version which represents a combination of the previous ones, an official resolution, however, was not formulated due to the fact that a limited number of stations which are to be considered as official EUREF sites and be included into the EUREF data base, should be defined before. G. WEBER and H. SEEGER are asked to discuss this item with the Croatian colleagues and report then in order to come to the desired resolution.

The Balear98 Project, already presented at the last EUREF symposium, was principally accepted as by the TWG[1], however, some items should be investigated or changed. As the updated version, presented by E. PUJOL, shows, the results are somewhat stabilized after these improvements. The relatively large differences to the EUREF'89 can be explained by the not necessarily correct handling of the antennae and a large loss of data in the first campaign, now the considerably improved experience allows to yield more accurate and reliable results. The TWG accepts this update now as class B standard (about 1 cm at the epoch of observations)[2].

W. GURTNER gives some additional information on *the EUREF campaign 1999 in Moldavia.* 4 sites of this campaign are located in Ukraine, 3 are also part of the EUVN, but were not originally used for comparison. The results show an excellent precision in the horizontal, however up to 4 cm difference compared with the EUVN results. A comparison whether the constraint to station Kiev could induce this deviation gave no satisfying result. G. STANGL mentions that the long time series being available for the Ukrainian station Uzhgorod show some unexplained problems with the antenna height, so this insecurity might also cause this difference. According to W. GURTNER also the tie between the Laser and permanent GPS markers show similar problems. U. HUGENTOBLER who was engaged in the analysis of this campaign is asked to collect all available data and report later on his findings.

The TWG decides to accept the 5 sites of this campaign located within Moldavia as class B and to consider the Ukrainian sites as test sites which are no part of the official solution.

L. JIVALL presents her report on the u*pdated EUREF – realisation for Sweden (EUREF-SWEREF-99 campaign).* Although a EUREF solution for Sweden already existed this new solution was arranged in order to fulfil the new guidelines and offer an improved modern GPS based reference system.

The campaign was carried out involving 6 GPS weeks, for the data analysis the Bernese software package was used. The final solution is fitting with the ETRS89 solutions for Denmark, Norway and Finland and is related to a specific epoch with respect to the considerable land uplift in Scandinavia.

H. V. D. MAREL remembers that much confusion is caused by the not clearly defined classification of different epochs or campaigns and urges to be very clear in using names to allow all other users to distinguish the various data sets. In general the individual campaigns are to be regarded as part of the ETRS related to the ITRF. In this context W. GURTNER emphasizes the recommendation to deliver not only coordinate sets but additional to these all other information (radomes, change of minimum elevation angle etc.) as valuable input for the computation of the following ITRF's. O. LENK comments that in some tectonically active areas, e.g. parts of Turkey, rather large terrain movements can

[1] Cf. EUREF Proceedings, Vol. 8, pp 35.

[2] Resolution no. 1 of the EUREF Symposium in Tromsø, 22 – 24 June 2000, p. 340 this vol.

occur, so especially in such cases it is urgently necessary to document the sites as far as possible in order to enable the interpretations of large unpredictable movements in the case of earthquakes. C. BOUCHER adds that for some sites already long time series are available which in some cases show considerable coordinate jumps. Considering the meanwhile high accuracy of GPS-derived coordinates, these sudden coordinate variations should not be neglected but investigated and documented in detail to avoid to spoil the possible accuracy but to yield the best possible data as later input for a reliable reference frame.

In the presented solution station Onsala was excluded due to some problems which could not be solved at the time of observation. Therefore it is recommended to the Swedish colleagues to install a small secondary network around Onsala to connect this station to the SWEREF-99. It can be assumed that the inclusion of Onsala will not change the existing coordinates, however, it would be useful if this internationally important site would be included within the newest Swedish reference network.

Finally the TWG decides to accept the presented EUREF-SWEREF-99 solution as contribution to EUREF on level B, however, the present number of 21 sites has to be reduced according to the EUREF guidelines. L. JIVALL and H. V. D. MAREL are asked to take over this task and to report to the next meeting on their conclusion.

Topic 3: E. GUBLER reports on the workshop of the European Commission in Marne-la-Vallée 27 – 30 November 1999, on spatial referencing. The workshop came to the conclusion to propose the ETRS89 as reference for Europe wide georeferencing. For the practical application, however, the already several times discussed need for clearly defined transformation parameters between the continental reference and the national networks arises again. The TWG asks the nominated colleagues (P. DUNKLEY, B. FARRELL, E. GUBLER, J. IHDE, C. BOUCHER,J. TORRES) to continue their efforts for defining these requested parameters. On the field of aircraft navigation, EUROCONTROL already has reached this level. Basing on these encouraging example E. GUBLER and J. IHDE have formulated a letter and distributed in June 2000 to all national agencies asking them to define a representative data set and compute the relevant transformation parameters. J. IHDE remembers the long history of similar efforts starting with the ED50 and all following systems. Meanwhile the need for these data became much more urgent due to newly arising field of Geographical information systems (GIS), the continuing use of electronic data bases and the fortunately increasing cooperation between the individual countries. In some countries, e.g. Germany, it also has to be considered that the national reference is not based on a homogeneous network but on several partial networks. So it may be useful to investigate whether the accuracy of the derived transformations parameters could be improved by introducing these partial networks. B. HARSSON mentions the efforts of the ISO group to define a standard for geographical and geodetic coordinates.

In September 2000 another workshop will take place, the relevant working group is asked to report at the next autumn TWG meeting on their findings.

In context to this topic G. WEBER reports on *the European North-South-East (ENSE).* With the European Datum 1950 (ED50) a first global network had been installed for Europe. Although, compared to modern standards, the accuracy was rather low, this network presented an enormous success. The ED50 was not adjusted as a whole but firstly the Central European Network (CEN) was computed and later the other parts connected to this fist one. The CEN was computed in 1948/49 by the former Institut für Erdmessung in Bamberg which later became the Institut für Abgewandte Geodäsie (IfAG), now Bundesamt für Kartographie und Geodäsie (BKG) in Frankfurt a.M. The input data for the ED50 are based on a data collection of about 100 years, so naturally various inhomogeneities and discrepancies among these data occur. Nevertheless the relative accuracy of the ED50 is considerably good in some of its parts, especially where still today no better alternative exists. As example G. WEBER mentions Romania for which a detailed data archive exists. By the help of a regional high precise modern GPS reference network reliably connected to the old sites transformation parameters could be derived and accurate coordinates for all other stations be computed. J. ÁDÁM mentions that this method has been successfully applied for Hungary. C. Boucher adds that similar ideas have been investigated in France, a big problem, however, occurs with the identification of the old markers which often cannot be sufficiently identified or eve have gone lost. Moreover the installation of a dense accurate GPS network may be less time consuming than the collection and analysis of the old data. On the other hand the proposed method can give very interesting scientific insights e.g. in terrain movements if the old data are really accurate.

Topic 4, 5: Relating on the decision of the last TWG meting J. TORRES reports on the installation of a *EUREF homepage* (http://www.euref-iag.org). The homepage is not yet ready and naturally has to be completed continuously. The originally intended contents has been revised, now the man topics are

- what is EUREF? (J. TORRES)
- ETRS (C. BOUCHER)
- Permanent Network (C. BRUYNINX)
- GPS campaigns (H. V. D. MAREL)
- vertical networks (J. IHDE)
- symposia, resolutions (J TORRES)
- documentations, guidelines (C. BRUYNINX et al.)
- links, e-mail to the secretary

Concerning te definition of the ETRS W. Gurtner mentions that according to the modern demands each few years an update has to be computed which should clearly be described in the homepage.

It is discussed whether the whole data set of the EUREF homepage should be stored on one computer or only the main part and then the user be lead via links to other computers on which subdirectories are stored. The latter method might be psychologically preferable because the user can see that a multinational community is handling the project.

All TWG members are urgently asked to contribute to the completion of the homepage and to check the other parts.

Topic 6: B. HARSSON informs that a *trademark of EUREF* induces costs of 2000 ℵ (not 200 as adopted previously) for a time span of 10 years. I is discussed whether such a trademark is really necessary or not. H. SEEGER adds that presently many names get this label, so the plan should be followed to avoid a possible restriction to use the term EUREF further on. B. HARSSON and M. VERMEER are asked to try to collect the amount of 2000 ℵ to trademark the term EUREF.

Topic 7: C. BRUYNINX reports on the *status* of the *Permanent EUREF Network* which has been enlarged by some new stations while some other had to be excluded. G. WEBER informs on the processing, analysis and access to data in the BKG. The pilot project of processing hourly data files additionally to daily files has proved to be rather successful although delays cause many problems. In general the tendency obviously shows the future processing of these hourly files only. Based on these quick results especially meteorological investigations will be promoted considerably.

Referring to the presented paper C. BRUYNINX presents her ideas on the *reorganisation* of the Permanent EUREF Network (cf. p. 381). The increasing number of permanent sites and demands on processing and analysis request a distribution of the work among other institutions, e.g. activities on the field of troposphere research or investigation of terrain movement. Since its beginning the Permanent EUREF Network has developed in direction of an IAG Service. W. GURTNER emphasizes the need of a more organized management due to the increasing demands and responsibilities, however, the number of colleagues in the board should be kept as low as possible to guarantee a really efficient working group with optimal information exchange. A. CAPORALI adds that the application of the yielded data on other fields or use of long time series can give interesting insights and thus induce a worthful input for the improvement of the observation and analysis methods. A. KENYERES states that the permanent network is originally not a tool for geophysical applications, however, the high precise long time series can be used successfully for kinematic networks. W. AUGATH joins these ideas and adds that original intentions can also be changed if new demands or ideas lead to others goals or enlarged applications. H.-P. PLAG adds that the results should be made available for the whole scientific community e.g. for COST projects which deal similar tasks and a close cooperation would benefit all groups. The TWG asks A. KENYERES to care as "special project manager" on such topics.

G. STANGL reports on his experiences as *data flow coordinator*. Presently about 10% of the expected data arrive extremely late or even never due to problems with telephone lines and other causes. The tasks of the data flow coordinator comprise not only the data processing but also the advise of new colleagues, the communication and the development of new strategies.

Topic 8: J. SIMEK gives a detailed review of the EUREF guidelines formulated up to now. Due to the changing demands and possibilities the guidelines have also necessarily been updated. W. GURTNER thanks for this interesting overview and asks the group (B. HARSSON, J. SIMEK) to continue their efforts to formulate clear guidelines and publish them in the EUREF homepage.

Topic 9: W. GURTNER announces to organize a meeting in Paris with representatives of EGNOS, ESA and EUREF, a detailed report on the next TWG meeting will be given.

Topic 10: Referring to the presented paper J. IHDE describes the *requirements for a European Height System.* Such a system is not only needed for geokinematics but even more for GIS applications. Concerning the definition of "zero points" in the various countries it is concluded to use the available EUVN sites and not go back too far to the history and search for old reference points which may be rather insecure. As already before it is stated that the completion of this network has to be pushed forward and the results be published. The TWG asks J. IHDE, E. GUBLER and C. BOUCHER to discuss the presented report in detail and to work out a strategy for the next steps.

Topic 11: J. IHDE informs that the levelling part of the *EUVN* is now completed, the tide gauge solution will hopefully be available next year. The TWG accepts the proposal to consider the levelling part as the finalized. Although some countries did not yet deliver all requested data it makes no sense to wait further on.

Topic 13: J. TORRES informs on the planned WEGENER workshop in Cadiz, Sept. 18.-22., organized by L. BASTOS. M. BECKER or J. IHDE will prepare a report for EUREF.

Topic 14: B. HARSSON explains the programme and the agenda of the EUREF Symposium Tromsø in the following next 3 days. J. TORRES shows a list of announced presentations and their ordering the TWG accepts the proposed list.

Topic 16: A. REINKES presents his ideas to investigate in detail the occurring differences between the EUVN and the Europan Geoid. It is obvious that some distortions influence the geoid and the input of the EUVN data could improve the quality. For this plan an accessible data base is needed. It is discussed whether it might be useful to make a resolution urging all countries to deliver their data to the data base, but national restrictions often forbid the access to such data. On the other hand many data are already available on the UELN data bank in Leipzig wich can be used. The topic will be discussed again at the next TWG meeting.

Topic 18: H.-P. PLAG presents view graphs informing about COST action MOVE. The EUREF subcommission is invited to participate in this project.