
XXXXIInd Meeting of the EUREF Technical Working Group in Frankfurt a.M., 6 – 7. November 2006

Next events:

- TWG 2007 Spring Meeting: Lisbon, Monday, 5 – Tuesday 6 March 2007, Portuguese Geographic Institute, two full days.
- TWG 2007 Symposium Meeting: 5. June 2007, Royal Institute of Chartered Engineers Surveyors, London.
- Symposium 2007: 6.-8. (9. = technical excursion to the Royal Observatory Greenwich) June 2007: Royal Institute of Chartered Engineers Surveyors, London.

Meeting place: Bundesamt für Kartographie und Geodäsie (BKG), Richard-Strauss-Allee 11, D - 60598 Frankfurt a.M., Germany, Meeting Room in Building B1

Time schedule: November 6, 2006 – 10:00-18:00
November 7, 2006 – 09:00-17:00

Agenda

1. Opening
2. Minutes & action items of the 41th TWG Meeting in Riga
3. EUREF presentation at the IUGG 2007 General Assembly
4. EUREF – EUMETNET MoU
5. TOPO-EUROPE
6. AFREF – Short Report on Technical Workshop-Cape Town
7. WEGENER – Short report on last symposium
8. Short presentation on WEGENER/GEODAC activities
9. Short report on First ICG Meeting of the UN
10. EPN status report
11. EUREF-IP, status and white paper
12. Monitoring of real-time data streams
13. Update of EPN guidelines
14. Absolute antenna calibrations and ITRF2005
15. Discussion on intra-plate deformation and Post Glacial Rebound
16. ITRF2005 and consequence for ETRF2005
17. Status analysis reports
 - a) EPN long-term solution for ITRF2005 densification
 - b) EPN rapid analysis proposal
 - c) ESEAS cooperation
18. Filtering and predicting time series
19. Status of EVRS (UELN, ECGN, IAG ICP1.2)
20. Short status report on EUVN_DA

21. Enhancing EUREF

- a) Integration of geodetic systems and techniques (GNSS/Height/Gravity)
- b) New products/fields within EUREF
- c) Link to other geo-disciplines
- d) Policy aspects

22. Next TWG meeting

23. 2007 EUREF Symposium

23. Summary and action items

Participants

ZUHEIR ALTAMIMI, Paris (Chairman)

Carine Bruyninx, Brussels

JAAKKO MÄKINEN, Helsinki

HANS VAN DER MAREL, Delft

ALESSANDRO CAPORALI, Padova

PAUL CRUDDACE, Southampton (guest) (6.11.)

DENISE DETTMERUNG, Frankfurt a.M.(guest)

WERNER GURTNER, Berne

MARK GREAVES, Southampton (guest)+ (6.11.)

HEINZ HABRICH, Frankfurt a.M. (perm. guest)

HELMUT HORNIK, Munich (Subcomm. Secretary)

JOHANNES IHDE, Frankfurt a.M.

AMBRUS KENYERES, Budapest

JAAKKO MÄKINEN, Helsinki

HANS VAN DER MAREL, Delft

RUI MANUEL DA SILVA FERNANDES, Lisbon

WOLFGANG SÖHNE, Frankfurt a.M.;

GEORG WEBER, Frankfurt a.M..

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

JAROSLAV SIMEK, Prague

GÜNTER STANGL, Graz (perm. guest)

JOAO AGRIA TORRES, Lisbon (Subcomm. President)

GEORG WEBER, Frankfurt

apologized: CLAUDE BOUCHER, Paris; ELMAR BROCKMANN, Berne

Minutes

Remark: The presented papers and view graphs are published, as far as available, on the EUREF homepage (http://www.euref-iag.net/TWG/EUREF%20TWG%20minutes/Agenda_2006_Frankfurt/TWG_Frankfurt2006.html).

1. Opening

Z. ALTAMIMI as chairman of the TWG opens the XXXXIIth Meeting of the EUREF Technical Working Group and expresses his cordial thanks to the colleagues from the German Federal Agency of Cartography and Geodesy (Bundesamt für Kartographie und Geodäsie – BKG) for the invitation to hold this meeting in Frankfurt a.M. As guest Z. ALTAMIMI welcomes R. M. DA SILVA FERNANDES, Lisbon, as representative of WEGENER.

The agenda was distributed among the TWG members by e-mail and is adopted by the plenary.

2. Minutes & action items of the 41th TWG Meeting in Riga

The minutes and action items of the 41th TWG Meeting in Riga, June 13, 2006, were distributed by the EUREF

Secretary among the TWG members. The text is adopted after some corrections and will be put into the web (<http://www.euref.eu/TWG/EUREF%20TWG%20minutes/41-Riga2006/TWG-Riga2006.html>).

3. EUREF presentation at the IUGG 2007 General Assembly

J. TORRES mentions the call for papers for the XXIV. General Assembly of the IUGG from 2.-13.7.2007 in Perugia. It is agreed to prepare a contribution on the work of EUREF within the respective time period 2003 – 2007 as well as the future scopes. J. TORRES will prepare a text to be discussed.

4. EUREF – EUMETNET MoU

J. TORRES presents a Memorandum of Understanding (MoU) between EUREF and the Danish Meteorological Institute (DMI), acting on behalf of the members of the Network of European Meteorological Services (EUMETNET). The MoU is based on resolution 2 of the recent EUREF Symposium in Riga, 14-17 June 2006, and was developed by E. BROCKMANN, H. V. D. MAREL, J. TORRES and H.

VEDEL. The purpose of the MoU aims on a mutual benefit by a free data exchange. EUREF will receive from E-GVAP/EUMETNET meteorological data for GNSS data processing and analysis (in particular pressure, radiosonde, and WVR data for validation and scientific studies, and near real-time pressure for the GNSS sites) and will provide to the meteorological community EPN raw data (hourly and daily satellite observation files in RINEX format) for the determination of ZTD, IWV and other meteorological applications.

Basing on the MoU, a set of practical guidelines on the further cooperation clearly defining the obligations and activities will be formulated (E. BROCKMANN, C. BRUYNINX, H. V. D. MAREL) till 01/2007 and be reported to next TWG.

5. TOPO-EUROPE

C. BRUYNINX explains shortly the organisation of the project TOPO-EUROPE – 4D Topography Evolution in Europe: Uplift, Subsidence and Sea Level Rise (<http://www.geo.vu.nl/~topo/>) in the frame of the International Lithosphere Programme (ILP). J. TORRES adds that considerably many countries are participating, the representatives mostly are geophysicists. In his property as EUREF President, J. TORRES wrote a letter to the President of TOPO-EUROPE, S. CLOETINGH, Amsterdam, with an offer of EUREF for cooperation, Especially the EPN with its about 200 GPS permanent stations covering homogeneously the European continent and there in particular those sites co-located with tide gauges and other geodetic instrumentation suitable for geodynamics analysis which could contribute to the project. An answer was not yet received.

Z. ALTAMIMI emphasizes that everybody should feel free to cooperate with TOPO-EUROPE, however should report to the TWG in this matter. It has to be considered that possibly some funds from the EU could be got by contributing to this project.

6. AFREF – Short Report on Technical Workshop-Cape Town

The AFREF Technical Workshop took place in Cape Town in July 2006, The event was co-sponsored by several organizations such as IAG, UNAVCO and UNOOSA. As representatives of EUREF, Z. ALTAMIMI and G. WEBER participated and presented some contributions. Z. ALTAMIMI explains that besides the financing a fundamental problem is the careful selection of stations and their maintenance to build up a long term reference network for the African continent. R. M. DA SILVA FERNANDES adds that several individual initiatives are already running, however, up to now practically neither an efficient cooperation nor clear plans do exist. Therefore this workshop was an useful attempt in this direction of a coordinated initiative. G. WEBER describes the numerous, partially simply looking but in reality severe problems. There are pure technical difficulties, the availability of permanent power supply, communication and the long term operation of observatories. In the moment merely in South Africa a good progress can be seen. E.g. under the umbrella of the UN

some projects were started successfully, however were not continued long enough to produce any realistic benefit.

All colleagues are asked to undertake all possible initiatives to help Africa to set up a continental reference network which is the basis for numerous aspects of economical development. G. WEBER emphasizes the urgent need of education of local people in technical aspects in order to enable them to keep their work independent of permanent assistance from outside. In this context it is mentioned that the strong limitations for security reasons often prevent an efficient work. It also occurs that countries which give help to Africa are acting without any arrangement with the others in order to keep their influence for their own and do not cooperate among themselves.

Z. ALTAMIMI emphasizes again the need of help for Africa on the geodetic sector. All offers for help as well as the practical actions are to be organized such that the work cannot be interpreted as neo-colonialism but shows clearly the intention to give help for independent development.

7. WEGENER – short report on last symposium

The WEGENER Board Meeting took place in Nice, France, on Sept. 7, 2006. The EUREF TWG was presented by Z. ALTAMIMI and C. BRUYNINX. Several common points between WEGENER and EUREF can be seen and the WEGENER community explained its interest in using the products of EUREF. Moreover common actions are planned for helping to install an AFREF network and to contribute to the education of African geodesists.

It was concluded that C. BRUYNINX and R. M. DA SILVA FERNANDES shall work together to ensure that the EUREF and GEODAC (Geodynamic Data and Analysis Center) web sites do not duplicate information/data/results. They shall ensure that both two sites provide the links where the information can be retrieved.

A joint symposium EUREF – WEGENER is proposed. Considering the already existing plans for the next WEGENER conferences this action has to be planned asap. J. A. TORRES will write a formal letter to S. ZERBINI in this matter.

8. Short presentation on WEGENER/GEODAC activities

R. M. DA SILVA FERNANDES describes the activities of WEGENER/GEODAC (<http://www.geodac.net>). The GEODAC mission is primarily to serve the WEGENER community especially to create velocity field maps derived both from permanent or campaign data on a high accurate level. GEODAC should serve as a nucleus for the development and implementation of the latest analysis techniques to provide the best possible products for the needs of the Earth science community. The contact with EUREF refers the computation and analysis of time-series of GPS data (permanent and campaign stations). Relating the requests of WEGENER, the collected data are not restricted to positions but also include other geophysical parameters.

At present an Iberian Network is developed consisting of 72 permanent stations, 26 of them EUREF sites. The sites

are mainly located on the Iberian Peninsula but also in the surrounding area. As data positions, precipitable water vapour, atmospheric loading and regular analysis of power spectra of GPS residuals as well are collected.

Summarizing R. M. DA SILVA FERNANDES states that through GEODAC, WEGENER is willing to fully cooperate with EUREF by providing and/or integrating services in these different fields. Z. ALTAMIMI proposes to set up a joint working group chaired by WEGENER. Before starting the practical work, well defined topics of interest are to be formulated for clear standards in processing and products. The interests of both groups are to be defined. A joint WG (from EUREF: Z. ALTAMIMI, C. BRUYNINX, A. CAPORALI, H. HABRICH, A. KENYERES, G. STANGL) is installed to formulate topics of interest for the practical work. It has to be made clear that identical standards in processing and for products will be used. Z. ALTAMIMI will write a letter to S. ZERBINI till Nov. 10, 2006 announcing this activity.

The topic will be discussed further on.

9. Short report on First ICG meeting of the UN

Referring to the conclusion of the last TWG Meeting, J. TORRES has sent a letter to Q. SULTAN, Associate Programme Officer, United Nations Office for Outer Space Affairs (OOSA), concerning the membership in the International Committee on Global Navigation Satellite Systems (ICG) as an international committee on GNSS under the umbrella of the UN.

G. STANGL attended the first ICG meeting on 31.10.2006 in Vienna. At the meeting a draft of Terms of Reference and work plan were designed and accepted. As actions

- the compatibility of reference systems,
- a message design of natural disaster alarms,
- the collecting and testing of models (ionosphere, troposphere, multipath, electromagnetic interference),
- possibilities of indoor navigation,
- educational information (books, courses, dictionary)
- promotion (web portal, conferences, web forum)
- support of regional reference systems (AFREF, EUPOS, EUREF, SIRGAS, etc.)

were formulated. Experts for actions should be nominated within 2 weeks.

The next ICG meeting will be hold in June 2007 in India, first results of working groups and actions are expected.

G. STANGL reports that EUREF is accepted as member association besides IAG, IGS, EUPOS etc. in the ICG. Originally only those organizations which are operating satellites in the space were designed to become members, however, this strong restriction had to be lowered for keeping the ICG efficient. W. GURTNER recommends that EUREF should prove all topics carefully for consistence before getting involved and limit itself to those items for which a special expertise is available.

Finally J. A. TORRES is nominated as delegate for the period at least till the 2007 Symposium. It will be waited till the ToR of ICG are published, then the proposals of EUREF

for a possible cooperation basing on these ToR will be formulated.

10. EPN status report

C. BRUYNINX presents her traditional EPN CB report. At present the EPN is formed by 193 stations, 5 of them are inactive. Since the last TWG meeting 3 new stations were accepted as new EPN stations (Chernihiv/Ukraine, Tallinn/Estonia, Zaragoza/Spain), no sites had to be withdrawn.

4 other stations (each one in Slovakia, Israel, Spain and Greenland) are proposed to be included into the EPN, however, they are not yet sufficiently working according to the EPN guide lines and thus their data records have still to be proved for accuracy and consistence.

The EPN website (<http://www.epncb.oma.be/>) has totally been renewed and includes now also GLONASS data. The updated specifications for EPN stations are now demonstrated more clearly.

Finally it is concluded that W. GURTNER will write to the IGS requesting to change the procedures for the use of RINEX 2.11 as standard format. (Nov. 10, 2006).

11. EUREF-IP, status and white paper

G. WEBER has distributed a white paper *Real-Time GNSS in Routine EPN Operations* asking the TWG members for comments. The comments are discussed chapter by chapter.

As first item the idea to switch from a pilot project of EUREF-IP to an established system is discussed. For the realization some additional elements of EUREF are to be installed, i.e. an internet broadcaster, high rate data centers, monitoring and validation in real time and a central board. All activities are to be carried out in connection with already established elements. At present 40 to 50 sites are delivering real time data. At the end all sites should be adapted to this work. The EUREF Broadcaster Networks should be subdivided into

- streams from EPN stations;
- streams from stations not part of the EPN;
- streams made temporarily available (e.g. candidate EPN stations);
- streams suspected to contain corrupt data.

Local and regional broadcasters should collect the data of the individual sites and then send it to the central broadcaster.

Concerning the selection of corrupted data, W. SÖHNE mentions that also data records with obvious deviations lower than the critical limit will be withdrawn to be analysed in detail. C. BRUYNINX mentions the advantage to have also hourly, daily and long-term data records for comparing and investigating the real time data. It is emphasized that all data made available officially must have a reliable and high accuracy standard.

G. WEBER states that the equivalent software to create 15 minutes data records and put it into a data centre for common use is available. It is concluded to start now with an evaluation phase, for the access to the data a password

has to be used. The findings will be presented at the next EUREF symposium in detail and then hopefully the full operation can be started.

It is reported that L. MERVART has installed different software packages for RTCM data and seeks for collaboration to form a common initiative for a couple of years. J. IHDE means that there would be a great chance to produce good software comparable to the Bernese Software which is in permanent development. As soon as GALILEO will be really operational, an adequate software then would be available for use.

Concerning the reference for real time data, it has to be considered that e.g. Sweden is using an own reference which deviates from the ETRS89 with some centimetres. However, as accurate transformation parameters are available, the data can be transformed from one system to the other.

Concluding the TWG asks G. WEBER to update the presented white paper asap upon the discussed item and distribute it again among the TWG members.

Referring the free access to data in general, J. A. TORRES and W. GURTNER will send a letter together with the updated paper to J. Dow/ESA asking for an open data policy concerning IGS data and ESA data in particular and announce that W. WEBER will participate at the IGS Strategic Planning Meeting in December 2006.

The topic will be put again on the agenda of the next TWG meeting.

12. Monitoring of real-time data streams

In continuation of the last topic, C. BRUYNINX describes the present situation of real time data handling in the EPN. The respective software packages are mostly still in development. In delivered data are permanently automatically checked for errors. The use of absolute antenna phase centres will be introduced in the next future. After that it officially will be declared which kind of coordinates will be put into the files. In order to avoid confusion among the users, C. BRUYNINX warns to include too much different data into the data bank.

As described in topic 11, some countries use slightly different references within their country, so it has to be reflected whether different sets of real time data according to these national systems should be created, too. It is mentioned that already now different data sets exist e.g. with/without GLONASS observations. In any case all accessible data have to be labelled clearly to exclude misunderstandings.

The TWG asks C. BRUYNINX to generate a RINEX skeleton files till Nov. 10, 2006.

13. Update of EPN guidelines

Since the creation of the EUREF EPN at the EUREF Symposium in Budapest 1993 (Resolution No. 4) the guidelines have been updated from time to time according to the changing requirements and conditions. A detailed overview is documented in http://www.epncb.oma.be/_organisation/

[guidelines/index.php](#). In order to adapt the present guidelines for

- real-time data streams
- promotion of multi-GNSS equipment
- recommendations for new antenna/radomes or antenna/radome replacements

a new version has been prepared. C. BRUYNINX emphasizes the need for a long-term vision to hold for the next future.

At present partly different calibrations for EPN and IGS exist. C. BRUYNINX explains that the data within the EPN and IGS urgently should be consistent. It has to be reflected whether exceptions can be made e.g. for the case that absolute calibrations for antenna/radome are included in the EPN, but not in IGS. H. v. D. MAREL states that the occurring differences can reach amounts up to one centimetre. W. GURTNER adds that the EPN is related to regional networks and analysis which may be more accurate than the IGS within the respective region. In order to optimize the accuracy up to the best possible level, the best available input data should be used. The IGS includes a global data set with an enormous amount of data which compensates possible regionally referred disadvantages.

After a detailed discussion on the advantages and disadvantages the TWG asks C. BRUYNINX to update the guidelines and distribute them among the TWG members. The TWG members should send their comments on the distributed paper to C. BRUYNINX within one month. Then the paper will be updated and distributed again.

The text for the “proposed approach” is re-formulated immediately and accepted, it will be put into the guidelines in the next month. Further C. BRUYNINX will set up asap a table of stations with all available antenna calibrations at the EPN stations and distribute this list for further discussion at the next TWG meeting.

14. Absolute antenna calibrations and ITRF2005

C. BRUYNINX presents her thoughts worked out together with E. BROCKMANN and S. SCHAER. The new ITRF2005 solution which has been released in October 2006 uses an IGS cumulative solution computed with relative antenna phase centre (APC) models. With GPS week 1400 (Nov. 5, 2006), however, the IGS will introduce absolute APC models and align its orbits with ITRF2005 (IGS05). As there are slight coordinate differences between these two models, it has to be discussed whether EUREF should tie its solutions in future to the ITRF2005 or IGS05.

In IGS mail 5547 (Oct 19, 2006) R. FERLAND proposes a procedure to determine station-dependent corrections corresponding to the change from relative to absolute APCs by a computation of two simultaneous solutions for 12 months. To investigate these effects for EUREF in detail, a transformation from IGS05 to ETRF2005 could be determined and the station-dependent offsets between the absolute and relative APC for the remaining EPN stations be derived.

In order to get a realistic impression of the quantitative effects, H. HABRICH is asked to compute the coordinates

of the EPN stations as far as they are included in the ITRF2005 both in ITRF2005 and IGS05 and check the differences for a period of a few weeks. The LACs should be urged to do the same procedure. The results will then be discussed at the next TWG meeting.

15. Discussion on intra-plate deformation and post glacial rebound

J. MÄKINEN rises the question whether and how the post-glacial rebound (PGR) is to be taken into account in EUREF. The EUREF height products contains a PGR Model from the beginning (UELN-60), continued with UELN-73/86, UELN-95/98 till EVRF2000. In these considerations country-wise PGR models for correcting precise levelling to a certain epoch were used. Now in 2005/06 a Nordic model NKG2005LU for submitting new Finnish, Norwegian, Swedish levellings to UELN200x in epoch 2000.0 is available. This model can be used both for correcting levellings and 3-D campaigns to the period 2000.0 for submission to EUVN_DA.

Alternatively to such empirical models, a geophysical model of Glacial Isostatic Adjustment (GIA) may be considered. The introduced components comprise ice history and Earth rheology. As observations typically geological rebound data like relative sea level RSL since the last deglaciation as well as contemporary data e.g. geodetic rebound data (tide gauges, precise levelling, vertical and 3-D from GPS etc.) are used as input. Such a model may be consistent not only for Fennoscandia but for the whole of the European continent. In this context it should be reflected whether a geographically unequal geodetic sampling of Eurasian plate motions might influence the accuracy and consistency of the ITRF. Therefore it should be analysed whether the data may become more consistent if the GIA model would be extended to all Europe.

16. ITRF2005 and consequence for ETRF2005

Z. ALTAMIMI describes the consequences for ETRF2005 by the new solution for the ITRF2005 datum definition. Referring to the discrepancies between VLBI and SLR, Z. ALTAMIMI means that between SLR and VLBI differences occur as well and there exist up to now no sufficient objective means on the accuracy estimate.

According to the new findings it seem to be useful to update the well known *Memo: Specifications for reference frame fixing in the analysis of a EUREF GPS campaign* by C. BOUCHER and Z. ALTAMIMI (<http://lareg.ensg.ign.fr/EUREF/memo.pdf>). Z. ALTAMIMI declares to formulate an update and put into the web asap. The update will include a SINEX file and a table of stations coordinates. Further Z. ALTAMIMI will send a letter to all sub-commissions (EUREF, SIRGAS, ...) asking to adapt their system to ITRF2005 and compute their densification stations with respect to ITRF2005 till end of 2006. Further H. HABRICH will compute within the next two weeks a long-term EPN solution for ITRF2005 densification.

From the yielded velocity field of the ITRF2005 altogether 15 plates can be derived. Concerning the Eurasian plate, a significant rotation to the ETRF can be seen.

Especially in the southern parts of the ETRF2005 large velocity vectors occur while in the central stable part the differences are rather small. In all, about 40 core sites of the ITRF2005 can be put into the EPN. So the new derived velocity vectors should be used and the mentioned memo be adapted to the new results. A. KENYERES is asked to provide a long-term solution expressed in the ETRS89 (ETRF2005). The validation should be done in cooperation with Z. ALTAMIMI. The list of coordinates will contain also their history, e.g. jumps. The new coordinates should be used further on as best available values for the moment. A. KENYERES will adapt his investigations on time series to the ITRF2005, too. The findings will be discussed at the next TWG meeting.

17. Status Analysis Reports

a) EPN long-term solution for ITRF2005 densification

H. HABRICH explains the objectives for this initiative within *IAG Sub-Commission 1.3 Regional Reference Frames* chaired by Z. ALTAMIMI. All 6 regional Sub-Commissions have been inquired to produce time-integrated solutions (positions and velocities). By the computation of a corresponding multi-year solution, the EPN contributes to regional European network. For this project the EPN weekly SINEX files of weeks 860 (30 Jun 1996) – 1355 (31 Dec 2005), i.e. 9 ½ years, are combined. Inconsistency files from IGS and EPN Time Series Special Project are considered as well as the setup of stations velocities. A draft SINEX is expected to be available during next 2 weeks.

b) EPN Rapid Analysis proposal

In another contribution H. HABRICH presents a status report on a proposal for near real-time (NRT) monitoring. The objectives of this activity are the establishment of a NRT processing for monitoring the EPN station coordinates and the cooperation with dense national GPS networks, e.g. for meteorological projects.

On a LAC Workshop in Padua from 15.-16.3.2006 it was agreed to establish a near realtime processing. The plan was presented to the TWG on the occasion of the meeting in Riga, 12.6.2006. The Warsaw Military University (MUT) declared to take over rapid analysis tasks. In the following a questionnaire to the EPN LACs asking for contributions to the new project was distributed. In all about 5 LACs declared to participate in the project. C. BRUYNINX describes this initiative to be very important to get more experience how to decrease the often occurring time delays of the data.

The TWG asks H. HABRICH together with all concerned colleagues to prepare a new proposal about what EUREF should intend to generate and publish. The proposal will then be submitted to the LACS and the MUT. At the next TWG meeting this topic will be put on the agenda again. If useful H. HABRICH will invite a colleague from MUT to the next TWG meeting.

c) ESEAS cooperation

H. HABRICH remembers the 3rd Call for Participation in the European Sea Level Service (ESEAS). The proposals were to be submitted till end of 2005. The activities of ESEAS should serve as an European contribution to the UN International Early Warning Programme (IEWP). The Call is based on international initiatives such as the European Unions' Global Monitoring for the Environment and Security (GMES) or the Group on Earth Observation (GEO) and it's 10-year Implementation Plan for the Global Earth Observation System of Systems (GEOSS). At present 21 European countries are participating in ESEAS, about 200 tide gauges are registered.

Based on the 2nd call from Nov. 2001, EUREF submitted its proposal in Sept. 2005 to participate as *Supporting Centre*. The contribution by EUREF could consist in delivering the relevant data (weekly coordinate estimates in SINEX format, station coordinates and velocities from the newest EPN multiyear solution) for all EPN stations close to tide gauges as well as EUVN tide gauge stations. Further the complete EPN network since the beginning of its operation could be re-analysed. For practical work an Ntrip-based infrastructure should be used.

The approval of the EUREF proposal by the Governing Board was communicated personally in Oct. 2006, an official statement did not yet arrive.

As next practical step H. HABRICH will inform ESEAS again which kind of data EUREF can provide and find out what kind of input ESEAS really would like to receive. H. HABRICH will also take part in the next CB ESEAS meeting as official EUREF delegate.

18. Filtering and predicting time series

The investigations of different filtering approaches are presented by A. CAPORALI. After having removed the empiric periodic terms from time series, it was tried to investigate the existence of stochastic signals which may still be inherent in the noise and which may be relevant at improving the TRF and/or detecting a geophysically interesting signal. Further an attempt was made to predict the series in order to improve the understanding of jumps in the time series by a mathematical model. Two options, i.e. the Gauss-Markov (GM) and the least squares collocation (LSQ) methods were used together with the Wiener and Kalman filter (KF) respectively. The results show that by either LSQ or KF filter the analysis turns out to be more effective in filtering the data while the GM seems to amplify the input signal. The rms could significantly be reduced (e.g. from 1.1 to 0.5 mm). KF seems to be superior to LSQ in the detection of jumps (e.g. 5 mm).

19. Status of EVRS (UELN, ECGN, IAG ICPL2)

In continuation of his presentation at the Riga Symposium (<http://www.euref-iag.net/symposia/2006Riga/01-05.pdf>), J. IHDE informs on the need of actual decisions and actions to come to progress. In the period 1999-2006, i.e. after the last UELN adjustment, the UELN was extended by the levelling data of Estonia, Latvia, Lithuania, Romania and

Bulgaria. Furthermore, new data were delivered from Switzerland, the Netherlands, Finland, Norway and Sweden. J. MÄKINEN adds that Finland has got new contacts with Russia for data exchange, however the Russian observations are not yet connected to those from the Baltic countries, so the Baltic Ring unfortunately cannot be closed so far.

J. IHDE states that the considerably enlarged and revised data set for altogether 26 countries makes a new adjustment useful. The realization of the EVRS consists of a new (free) adjustment of the UELN by using all currently available levelling and gravity observations reduced to the epoch 2000. As reference the Normaal Amsterdams Peil (NAP) is used. Although this reference is only virtual as the physical marker does not exist anymore, the NAP is used because practically no other better global realization is available at the moment and the results can be referred to any reference later on. The planned UELN07 adjustment will be connected with the UELN95/98 by a couple of selected points which are solidly marked and located in the stable part of the European plate and connected by precise measurements. Altogether 25 ECGN stations distributed over the whole UELN have been selected for the EVRS2007 time evolution control.

As next steps J. IHDE lists the following items:

(1)	Selection of identical levelling points (<i>UELN-DC together with participating countries; Letter to responsible agencies</i>)	<i>Dec. 2006</i>
(2)	Selection of ECGN/EVRS datum points and determination of all measure elements (<i>Letter to responsible agencies</i>)	<i>Dec. 2006</i>
(3)	New adjustment of the UELN (<i>UELN-DC</i>)	<i>March 2007</i>
(4)	Time series analysis of ECGN stations	<i>Beginning Jan. 2007?)</i>
(5)	Decision about the EVRS level, tide system, sets of parameter (<i>EUREF Symposium 2007</i>)	<i>May 2007</i>
(6)	Full parameter determination with EGG07 and IVRS realization	<i>Sep. 2007</i>
(7)	Distribution of results to participating countries	<i>Nov. 2007</i>

20. Short status report on EUVN_DA

On behalf of the EUVN_DA Working Group, A. KENYERES gave a presentation at the IGFS2006 (International Gravity Field Service) Symposium, 28.08 – 01.09 2006, Istanbul. It is hoped to get in contact with Turkey to enlarge the EUVN_DA by some few points which would be a rather interesting experiment. France and the UK agreed to carry out new levelling observations via the Euro-Tunnel, unfortunately there is no progress in these activities up to now.

A. KENYERES gives a short description of the presentation explaining the objectives and the present status of the project. As outlook he mentions the planned completion of a 1st version of EUVN_DA 2007. The solution should serve exclusively for scientific purposes such as to study leveling networks on national and continental level, validate global geopotential models, analyse the follow on EGG solutions and support the realization of an accurate continental height reference surface.

In order to make the EUVN_DA better known to the public, the TWG asks A. KENYERES to update the EUREF website concerning EUVN_DA in the next time.

21. Enhancing EUREF: a) Integration of geodetic systems and techniques (GNSS/Height/Gravity); b) New products/fields within EUREF; c) Link to other geo-disciplines; d) Policy aspects

A file to this topic was circulated by e-mail before the meeting. Due to the lack of time the topic is postponed for the next TWG.

22. Next TWG meeting

The President of the EUREF Sub-Commission, J. TORRES, invites the TWG to hold the 2007 Spring Meeting in Portuguese Geographic Institute in Lisbon. The TWG thanks J. TORRES for the kind invitation.

As date Monday, 5 - Tuesday 6, March 2007 is agreed. With the good experiences of this meeting, i.e. two full days instead as hitherto two half days, the next meeting will also be scheduled for two full days.

23. 2007 EUREF Symposium

M. CRUDDACE reports on the progress in organizing the 2007 EUREF Symposium in the Royal Institution of Chartered Surveyors from 6th to 9th June 2007. The technical excursion on Saturday, 9th June will lead to the Royal Observatory, Greenwich. The TWG will meet as usual the day before the Symposium. i.e. Tuesday, June 5.

The colleagues of the LOC recommend urgently to make the hotel reservations soon but not later than end of March. After this date the prices will be considerably higher as announced now.

The UK LOC will complete the homepage for the 2007 EUREF Symposium in London till December. The TWG, especially H. HORNIK and J. A. TORRES, will check the homepage and submit their possible corrections. Then H. HORNIK will inform immediately the whole EUREF community urging for a soon registration. J. IHDE will check the possibility whether a financial support by Euro-Geographics for colleagues from economical weak countries is possible. The website will be completed also for this item as soon as possible.

24. Summary and action items

The action items of the meeting are projected and discussed. H. HORNIK will distribute the text immediately among the TWG members and participants of this meeting.