EUREF TWG meeting: February 27, 2012 13:00 – 18:00
February 28, 2012 09:00 – 12:00
Location: Meridiaanzaal, Royal Observatory of Belgium

Next Events:

a. EUREF TWG 2012 Summer Meeting: , 05-06-2012, Saint Mandè

b. EUREF Symposium 2012 06-08/06/2012 in Saint Mandè

AGENDA

1. Opening (Bruyninx)
2. Minutes of the 57th TWG meeting in Frankfurt (all)
3. Review of Action Items of 57th TWG meeting in Frankfurt (all)
4. EUREF BE/2011 (De Doncker, Voet)
5. Assessment of ITRF2008 and its densification in Europe (Dousa, Kenyeres, Bruyninx)
6. EPN real-time analysis (Söhne)
7. Updates of EPN web site (Bruyninx)
8. Launch of IGS M-GEX, status at the BKG M-GEX data center and first inspection of RINEX files (Habrich)
9. IGS TIGA Working Group and EPN global extension for next re-processing (Habrich)
10. ECGN pilot project in Nordic Geodetic Commission (Poutanen)
11. Proposal for new EUREF WG on Geodynamics (Lidberg)
12. ISO standardization related to geodetic references. Organization of SC 1.3 (Torres)
13. INSPIRE Transformation services and CRS metadata (ISO19111 / registry) (Brockmann, Ihde)
14. Relationship between EUREF and EuroGeographics (Ihde)
15. EUREF themes for the next 4-8 years (Ihde)
16. EUREF TWG membership/elections (Caporali, all)
17. EUREF contribution to the IAG WG "Integration of dense velocity fields into the ITRF" (Kenyeres)
18. Deliverables from reprocessed CEGRN campaigns 1994-2011 (Stangl, Caporali)
19. EUREF symposium 2012
    a. Organisation (Duret)
    b. Best student poster award (Torres)
    c. Organisation of the sessions (Ihde)
    d. GNSS session at the symposium (Brockmann)
    e. Deadlines (all)
20. Proceedings of previous EUREF symposia (Ihde)
21. Divers :
    a. Information about new COST Action pre-proposal on GNSS meteorology and climatology (Dousa)
    b. IGS bias workshop Berne (Jan. 18-19): Short summary (Brockmann)
    c. Report from UNOOSA Workshop on GNSS applications, Dec. 2011, Vienna (Habrich)
    d. EUREF campaigns - status of deliverables and web pages (Stangl)
22. Next TWG Meeting (All)

23. Action Items (all)

Participants

TWG members:
Z. Altamimi
E. Brockmann
C. Bruyninx
A. Caporali
J. Dousa
R. Fernandes unable to attend
H. Habrich
J. Ihde
A. Kenyeres
J. Makinen unable to attend
M. Lidberg
M. Poutanen
W. Söhne
G. Stangl
J. Torres
Guests:

F. De Doncker
A. Duret
P. Voet

Minutes

1. Opening (Bruyninx)

In her property as chairwoman of the EUREF Technical Working Group (TWG), C. BRUYNINX opens the 58th meeting of the EUREF TWG and welcomes the participants. A draft of the agenda has been distributed among the TWG. The participants accept the agenda after some minor corrections.

2. Minutes of the 57th TWG meeting in Frankfurt (all)

The minutes of the 57th TWG Meeting in Frankfurt a.M., 27-28.11.2011, were distributed among the TWG members. The final text is published in the EUREF homepage.

3. Review of Action Items of 57th TWG meeting in Frankfurt (all)

4. EUREF BE/2011 (De Doncker, Voet)

P.VOET describes the recomputation of the 77 RTK points in the North part of the Country one week oct. 2011. Helmert transformation residuals for the eight fiducials are 2.6 mm in the horizontal and 3.9 in the vertical, with Herstmonceux and Zimmerwald somewhat higher than the others, for known reasons. The comparison with the EUR16567.SNX is at submillimetre level in the horizontal and somewhat biased of 2 mm in the vertical. The SINEX file was corrected relative to an earlier version which had the date incorrect. Different strategies on the selection of the baselines have been tested for the 2011 data. The MOVE3 software based on the Delft TU algorithms was tested leading to <1 mm difference in the horizontal and about 1mm in the vertical, relative to the BSW50. The coordinates of common points in the 2002 campaign differ at most of 10 mm. Comparison with a previous campaign (not validated by the TWG) shows that some common points have coordinates rather different. It is possible that different points have been assigned the same name. H. HABRICH suggests that the comparison to other non EUREF campaign is dropped from the final report. H. HABRICH also proposes that future campaigns consider GLONASS data in addition to GPS and recommends to update the ETRS89 densification guidelines accordingly. The Campaign is accepted as Class B and will be presented to the EUREF Symposium. It is recommended that all the mandatory attachments are submitted to G. STANGL, as prescribed by the Guidelines. However, some minor corrections are necessary to the campaign report. P. VOET and F. De DONCKER will update the report and distribute it to the TWG well before the next TWG meeting so that the TWG can perform a final check of the report.

5. Assessment of ITRF2008 and its densification in Europe (Dousa, Kenyeres, Bruyninx)

A. KENYERES introduces the EPN densification of ITRF2008. EPN repro1 solutions for GPS weeks 834-1408 and EPN operational solutions for GPS weeks 1409-1631 have been used. MC (Minimum Constraints) on TRS (Translation Rotation Scale) vs. TS vs. T were tested. The datum was based on the 92 points used by H. HABRICH's routine weekly solution but were edited down to 56 with 101 solution numbers. Datum for position and velocity has been validated by showing that the 7 parameters transformation yields zero values, within their formal uncertainties (1 σ). ETRF2000(R05)_C1600 vs. ETRF2000(R08)_C1631 positions at epoch 2005 are compared. They still show differences at the several mm level in the three components. A. KENYERES suggests that they could be related to the accumulation of discrepancies coming from the differences in the ITRS realizations, antenna PCV changes and the weakening of the datum definition behind the ITRF2005 densification solutions. As the differences in the coordinate and velocity products of the TRS and TS solutions do not differ the TWG recommends that the datum of the ITRF2008 densification is defined by MC on TS. Z. ALTAMIMI comments that this can only be done as the TRS solution has shown almost zero rotations. A. KENYERES will do further comparisons of the TRS and TS solutions on the individual time series level to finalize the right choice of datum definition.

H. HABRICH proposes that the repro1 product including position, velocities and time series is published as an end product. However, in view of upcoming changes and corrections it is concluded that the final repro1 report will contain tables and figures, but no numerical values which will become obsolete as soon as the IGS08 densification solution is available. The coordinates of the cumulative solution published on the EPN web will be published (and updated every 15 weeks) as soon as all necessary combinations (based on repro1 and the routine EPN contributions) are realized. These coordinates will be expressed in the IGS08. According to A. KENYERES the "gap" of missing EPN densification solutions of almost 1.5 years could be filled before the next symposium. J. DOUSA reports on the GOP repro1+ based on daily, weekly and combined analyses of the complete EPN network (data available from EPN CB historical data archive). GOP Repro1+ thus provides an independent combination over GPS weeks 836-1631 to the official EPN densification, while based on the Bernese GPS software v5.0. Eighty-six fiducial stations with 159 solution numbers were used in the cumulative solution. The datum definition was realized for MC combinations of T, TS and TRS. The solution involving MC on T proved to be the only one viable. Imposing MC on the Scale with ADDNEQ2 apparently causes a 1 cm shift of the vertical coordinate of the stations. The problem was notified to the Bern group who is investigating the causes. The existence of about 2 ppb scale difference between the original ITRF2008 and its European densification (identified also by A. KENYERES) resulted in slightly different coordinates between official and GOP Repro1+ solutions (on mm-level). How this result is affected by the above mentioned software problem remains to be investigated. Only a limited number of discrepancies between both combined coordinates and velocities occurred and they mainly correlate with the available data time spans. J. DOUSA reports several problems of EPN stations included in ITRF2008 and existing inconsistencies in PCVs applied in various reprocessing groups for some stations. In general, GOP Repro1+ proves a good agreement with the official EPN ITRF2008 densification by A. KENYERES. It is recommended that a) EPN data validity according to individual data existence and its quality is thoroughly reviewed (see proposal by C. BRUYNINX below), and b) that in future 'repro' activities the contributing Analysis Centers follow more strictly the prescriptions on temporal validities for individual stations, PCV data etc.

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Then C. BRUYNINX reports. Prior to the start of repro1, no general rules have been agreed upon on the inclusion of non EPN stations, data from EPN stations from before their inclusion in the EPN or bad quality EPN data in the repro1 activities. Consequently the repro1 results contain data that deteriorate the solution. She proposes to update the historical data archived maintained by the EPN CB taking into account the problems encountered in the repro1 and successive combination. RINEX files that have been identified to include observations of bad quality may be moved to separate directories or specific file extensions may be used so that the analysis centers will not use them anymore in future repro activities. It is also recommended that the analysis centers then strictly use the data provided in the historical data archive for all future repro activities. Both J. DOUSA and A. KENYERES will provide to C. BRUYNINX the necessary information to update the EPN historical data archive.

6. EPN real-time analysis (Söhne)

W. SÖHNE presents the additional web pages for proposed EUREF real-time products that he would like to add the EPN CB. W. SÖHNE will provide all the necessary information in an internally available Web page. TWG members are asked to review these web pages prior including them in the EPN CB web site. C. BRUYNINX welcomes detailed information on the meaning of the broadcast messages that are proposed to become a new EUREF product, so that proper validation is possible. Main concern is given to the ETRS89-related corrections. He highlights that there will be only very few clearly defined products available for the user. As for example in IGS orbit products or in other EPN products, the number of Analysis Centres contributing to the combination may vary, the user will be faced with one regular combination product. The ultimate goal is to enable users of BNC and other software to obtain PPP coordinates in the ETRS89 in real-time.

He shows an example about the accuracy to be reached with the ETRS89-related correction streams. SP3 and CLK files including the ETRS89-related orbits and clocks can be stored in the SP3 format and used within post-processing software for comparison.

Finally, W. SÖHNE reports shortly about the RTCM meeting hold in Berne on January, 16-17 this year. The procedure for "RTCM Multi

Signal Messages" (RTCM MSM) to become an RTCM standard has been complicated due to a few different perceptions of the manufacturers and software providers to some fundamental questions. It is expected to come to a final decision (voting) before the next RTCM meeting in May. He emphasises the importance of RTCM MSM for, e.g. the IGS M-GEX project and the new GNSS signals.

7. Updates of EPN Web site (Bruyninx)

C. BRUYNINX illustrates proposed new/improved features of the EPN Web page. The individual station web page will soon provide complete information on individual antenna calibrations (including all frequencies contained in the original calibration files).

- Routine RINEX 2.11 files supplied by certain stations contain e.g. L5 data or C2 but not P2. A new web page is proposed to check this. So one can track new GNSS signals in each station.
- Site picture submission can now be done interactively.
- EPN products (tropospheric zenith path delays, residual position time series, positions/velocities) shown at the EPN web site will need to be updated for including results from repro1,. C. BRUYNINX will do this gradually with the help of W. SÖHNE and A. KENYERES, who are responsible for the affected products.

8. Launch of IGS M-GEX, status at the BKG M-GEX data center and first inspection of RINEX files (Habrich)

The IGS Multi-GNSS Experiment (M-GEX) has been launched on February 1st, 2012. BKG acts as one of the M-GEX data centers and created for this purpose a new project-directory at its data center http://igs.bkg.bund.de. H. HABRICH showed the current list of M-GEX stations, which provide RINEX version 3 files as daily, hourly or high-rate files to BKG. A first inspection of available RINEX files shows that the creation of such files remains a critical issue. Different methods applied for the creation of RINEX files, e.g., operation of a firmware that stores the RINEX files directly within the receiver or conversion of data streams to RINEX, may result in different header and data records. Some station operators could not yet manage to track and store Galileo satellites; even it should be possible according to the receiver specifications. H. HABRICH summarized the multi-GNSS data availability for various receiver types and file creation methods. RINEX 2.11 files are reported to contain in several cases more GNSS data than expected

9. IGS TIGA Working Group and EPN global extension for next re-processing (Habrich)

H. HABRICH reports about a TIGA Workshop held from November 8 to 9, 2011 in Paris and a TIGA Working Group meeting held on November 9, 2011 at the same place. Results of the recent TIGA re-processing of a global network of reference and GPS@tide gauge stations have been presented. The final combination of 3 global and 3 regional solutions includes the operational weekly EPN solutions from week 1400 to 1600. Deficiencies of regional contributions were pointed out by D. Thaller and she emphasized to accept only global solutions for further TIGA re-processing actions.

The importance of applying GPS time series of the vertical station components to correct tide gauge measurement was demonstrated for selected stations and the findings were compared to geophysical models, e.g. GIA models.

The work plan for the next few years has been discussed during the Working Group meeting. Five proposals for TIGA Analysis Centers (TACs) have currently been accepted, where a sixth proposal from Geoscience Australia is pending. Two re-processing actions are planned within the next 4 years. It is mandatory for all TACs to use the IGS08 core network to reach global coverage. Where most TACs perform orbit and clock estimation, it has been accepted that EUREF and DGFI apply reprocessed CODE orbits.

Seven EPN LACs indicated so far their willingness to participate in the next TIGA re-processing that is planned for 2012; two of them agreed to expand the network by global stations. To date there is no fixed schedule for the processing.

C. BRUYNINX asks if EPN LAC's could be enough motivated for the extra effort which is required. In Europe the University of La Rochelle is probably already doing the job.

Contributions are expected by July 2012 and the combination by October, but the required BSW5.2 and appropriate orbits may not be available in time. H. HABRICH is going to inquire again with the LAC's and possibly assign global sites for routine processing. H. HABRICH addressed the question, whether non-EPN permanent GPS sites located at tide gauges in Europe should be included. Z. ALTAMIMI proposed to compile an inventory of candidate stations before fixing this issue.

10. ECGN pilot project in Nordic Geodetic Commission (Poutanen)

M. POUTANEN briefly described the status of the ECGN Pilot Project which was accepted as a project in Nordic Geodetic Commission. The title is "NCGN – NKG Combined Geodetic Network. Understanding the Sea Level Variation in the Fennoscandian area". The goal of the pilot project is to demonstrate use and need of combined data sets and existing data bases in a geodynamical topic. The project will be planned in more detailed in the next NKG presidium meeting and workshop in April.

11. Proposal for new EUREF WG on Geodynamics (Lidberg)

M. LIDBERG explains some ideas on how the knowledge of velocities can help in improving the knowledge of coordinates while keeping the concept of ETRS89. A denser GNSS network than the EPN would be required, therefore the inclusion of the dense national permanent networks should be considered. Local motions can be isolated on a scale proportional to the density of stations. Geodynamics is involved in the GIA in Nordic Countries. Near plate boundaries the velocities also have collective anomalies. M. POUTANEN suggests that the WG is called 'Geokinematics'. J. IHDE points out that experts should be called to participate and contribute, also in relation to other areas where vertical deformation is taking place. A. KENYERES points out that the WG should be synergistic with the dense velocity field activities of EUREF. J. IHDE remarks that EUREF can recommend procedures on updating and maintaining the coordinates, but eventually NMA's are responsible for the national systems. C. BRUYNINX recommends that overlaps with other WG activities, particularly the one on ITRF2008 densifications, are kept to the level required to avoid duplications.

12. ISO standardization related to geodetic references (Torres)

ITRS should be an international ISO standard. This is the charter of a group led by C. Boucher. ISO TC211 is the proper framework. This includes several geodetic items. Also the registry of national reference systems is an important aspect. J. TORRES will contribute to the Working Group, representing the EPN. J. TORRES reports that the new Chair of Commission 1 is T. van Dam (Luxembourg) and G. Johnston from Australia as VP. Many Joint study groups are active, as well as Joint Working Groups, with a more limited time relative to JSG. WG1.3.2 'Deformation models for reference frames' is particularly relevant to the WG proposed by M. LIDBERG.

13. INSPIRE Transformation services and CRS metadata (ISO19111 / registry) (Brockmann, Ihde)

E. BROCKMANN introduces a topic very important particularly to NMAs, since INSPIRE is introduced in national laws. There must be transformation services available, to ensure interoperability. A technical guidance document from the INSPIRE drafting team "network services" explains how the transformation services should work. The Open Geoservice Consortium of 444 Institutions, Companies and Organizations is leading the way. A standard of a Web Processing Service v.1.0.0 is defined and a deadline for the availability of an operational transformation service within INSPIRE is set to the date 28.12.2012, which is probably a too tight deadline for EUREF. ESRI is defining a sort of standard which is meant for internal use. Another important aspect is the registry. An unofficial registry very popular is the CRS maintained at BKG and the EPSG which is the reference for many world-wide national coordinate systems. A registry for 17 German states is already operational in a beta version via WEB and could be used as a model for EUREF. J. IHDE points out that a registry is needed to store the parameters of transformation between the National Systems and those foreseen by INSPIRE (3D). ISO 19135:2005 describes how to handle registries. The ISO Control Body for the Geodetic

Registry Network should be participated by national representatives. This is an important step forward from metadata to actual data.

14. Relationship between EUREF and EuroGeographics (Ihde)

J. IHDE reports that according to the Executive Director of EG, EG has little to do with geodesy. J. IHDE points out that there are many products and initiatives of EUREF that are used by members of EG. J. IHDE will report at the next EUREF Symposium. A meeting at BKG with D. Lovell is scheduled for March 12.

15. EUREF themes for the next 4-8 years (Ihde)

The discussion was initiated at the 2007 TWG in Lisbon. Duration of EUREF pillars; policy, EUREF modernization in a general and technical sense would be addressed in a discussion paper. Should EUREF be enhanced by gravity matters as a necessary supplement to the vertical? A stable group of persons involved in gravity is difficult to keep together, experience shows. A second theme is the one related to new GNSS product areas, particularly Galileo introduction, and combination of multiple GNSS. A third theme is the link to other geodisciplines, e.g atmosphere. Also the structural organization of EUREF should be discussed, in particular Promotion and Outreach. Working groups (Geokinematics and M-GNSS) and network of Partners is also an issue. It is proposed to organize a 1 or 2-day retreat to reflect on all these themes. J. IHDE will take care of the organization of this retreat.

16. EUREF TWG membership/elections (Caporali, all)

The status of regular membership is the following:

Regular Members:

- Carine Bruyninx, Brussels elected 1996 Symposium Ankara; confirmed 1999 Symposium Prague; confirmed 2003 Symposium Toledo; TWG-Chairwoman elected 2007 Symposium London, re-elected 2011 Symposium Chisinau
- Zuheir Altamimi, Paris Permanent Guest since 2001; elected as TWG Chairman 2003 Symposium Toledo; 2007 Symposium London: Honorary Member as former TWG-Chairman
- Elmar Brockmann, Berne elected 2003 Symposium Toledo; confirmed 2008 Symposium Brussels
- Alessandro Caporali, Padova elected Symposium Prague 1999; confirmed Symposium 2003 Toledo; confirmed 2008 Symposium Brussels: elected Secretary 2011 Symposium Chisinau
- Jan Dousa, Prague elected 2008 Symposium Brussels.
- Rui Fernandes, Covilhã elected 2008 Symposium Brussels.
- Heinz Habrich, Frankfurt Permanent Guest since 2001; appointed in charge of special task, 2008 Symposium Brussels.
- Helmut Hornik, Munich ex-officio member as Sub-commission Secretary since 1st TWG Meeting Paris 1992 till EUREF Symposium 2011 in Chisinau.
- Johannes Ihde, Frankfurt elected 2003 Symposium Toledo as EuroGeographics Delegate; since 2007 Symposium London ex-officio member as Sub-commission Chair, re-elected 2011 Symposium Chisinau .
- Ambrus Kenyeres, Budapest elected 2000 Symposium Tromsø; confirmed 2003 Symposium Toledo; appointed in charge of special task, 2008 Symposium Brussels.
- Martin Lidberg, Gävle elected 2008 Symposium Brussels
- Jaakko Mäkinen, Helsinki elected 2003 Symposium Toledo; confirmed 2008 Symposium Brussels.
- Markku Poutanen, Helsinki elected 2008 Symposium Brussels.
- Wolfgang Söhne, Frankfurt Permanent Guest since 2001; appointed in charge of special task, 2008 Symposium Brussels.
- Guenter Stangl, Graz Permanent Guest since 2001; appointed in charge of special task, 2008 Symposium Brussels.
- João Agria Torres, Lisbon ex-officio member as Sub-commission Chair 1999 Symposium Prague; Honorary Member as former Sub-

commission-President/-Chairman since 2007 Symposium London.

The following TWG members in charge since 2008 have expressed their willingness to continue to serve for an additional term

- Jan Dousa
- Rui Fernandes
- Heinz Habrich(*)
- Martin Lidberg
- Markku Poutanen
- Wolfgang Soehne(*)
- Guenter Stangl(*)

(*) status of Stangl, Habrich and Soehne. They have not been elected in 2008, but appointed by the TWG in charge of a special task. The difference with being elected is that it is the TWG that can decide about the renewal of their term and they should NOT stand for re-election by the plenary.

Two members of the TWG have already served two terms but they are playing a key role in special projects or could play a key role in future special projects. In such case the ToR foresees a continuation of the membership in the TWG:

- Elmar Brockmann
- Ambrus Kenyeres

Both have expressed their willingness to continue to serve the TWG. It is proposed that A. KENYERES will be appointed as the EPN Reference Frame Coordinator which is better reflecting his responsibility for the official EPN positions/velocities and EPN densification. A more detailed description of the responsibilities and duties of this new position is requested.

After some discussion it is decided that two new positions will be opened: on Galileo and on Heights and Gravity. As to the members due to expire, it is recalled that according to the ToR, Members in charge of specific tasks can be re-appointed by the TWG Chair. It is decided that the other pending members will be proposed for confirmation for an additional 4 year term.

17. EUREF contribution to the IAG WG "Integration of dense velocity fields into the ITRF" (Kenyeres)

The EUREF President J. IHDE should write a letter to NMA's requesting to support the Gavle resolution on supply of SINEX weekly files. (A. KENYERES to write more exactly what he suggests).

18. Deliverables from reprocessed CEGRN campaigns 1994-2011 (Stangl, Caporali)

CEGRN campaigns have been set up since 1994 by the long-term CERGOP project for investigation of tectonic movements in Central Europe. Due to lack of funds presently every second year a campaign is performed for one week (5 days). The stations are tried to keep the same, but the epoch sites changed more and more to permanent stations. A reprocessing was done in 2009 including all former campaigns since 1994 (MDA orbits used) in ITRF2005. The new campaign 2011 used IGS08 orbits and antenna phase corrections. The main products from the campaigns are the station velocities which are available in ITRF2005 in original. Following the cooperation between CEGRN and EUREF a solution will be delivered according to the needs of EUREF. The question is what are the deliverables:

a. SINEX files of station coordinates and velocities in ITRF2005 exist with minimum constraints of up to 10+ EPN stations, any further need?
b. Station coordinates could be transformed from ITRF2005 to ETRF2000 using Boucher-Altamimi general formulas or should they be aligned to the repro1 results of EPN?
c. How velocities should be delivered? Is there an official ITRF2005 velocity for the stable European Plate or should the transformation be
   ITRF2005 velocities -> ITRF2000 velocities (Memo) ->ETRF2000 velocities (Altamimi)?

Which meta-data are needed for non-EPN-stations?

It is decided that G. STANGL delivers to A. KENYERES the available SINEX data of the CEGRN campaigns for combination, following the charter of the MoU with CEGRN.

19. **EUREF symposium 2012**

a. Organisation (Duret)

A. DURET reports on time and location of the next Symposium. Important: entrance will be from 2 Av. Pasteur. Conference room Bldg. A. All information is available at http://euref2012.ign.fr. Link on the EUREF WEB page to be introduced asap by M. VASCONCELOS. Abstract submission until April 30. 2012. Registration deadline is May 1, 2012. Onsite registration is not possible.

b. Best student poster award (Torres)

C. Calvert is willing to contribute again. A committee will be formed to decide on the eligible posters.

c. Organisation of the sessions (Ihde)

Six to seven sessions are foreseen. A report of C. BRUYNINX on the activities of the TWG is foreseen during the opening session. One or two invited presentations should be contacted by the chairpersons for each session. Of these, one should be 'educational', introducing the session. Chairpersons of each session should inform the TWG on the selected invited speakers.

20. **Proceedings of previous EUREF symposia (Ihde)**

Most of the presentations, also for the past Symposia, will be published in the EUREF website. H. Hornik is being contacted for this goal. A. CAPORALI will provide IGN the procedures to submit papers on the BGG on a 'Fast Lane' basis, to be known to the participants to the Symposium.

21. **Divers :**

a. Information about new COST Action pre-proposal on GNSS meteorology and climatology (Dousa)

The proposal was initiated by G. Guerova (Bulgaria). Pre proposal is due by March 30, 2012. 24 out of 36 COST countries have expressed their interest. The following WG's are envisaged: WG1 advanced GNSS processing techniques; WG2 GNSS tropospheric products for severe weather monitoring; WG3 GNSS for climate monitoring. No overlap but complementarity with E-GVAP is underlined as well as a co-operation to various existing organizations or projects.

b. IGS bias workshop Berne (Jan. 18-19): Short summary (Brockmann)

The IGS bias workshop took place on Jan 18-19, 2012 at the University in Berne. Organized by the IGS chair on GNSS biases, S. Schaer, and his colleagues, roughly 35 persons met and exchanged information concerning the various biases in GPS and GLONASS. Additionally, preliminary analysis results from Galileo, Compass and QZSS were given. Further topics concentrated on applications, such as PPP, or new analysis methods, such as ambiguity resolution. The presentations of the fruitful meeting, where persons from science met persons from manufacturers, and where post-processing applications and real-time applications had a common floor, are available under: http://www.biasws2012.unibe.ch/

c. Report from UNOOSA Workshop on GNSS applications, Dec. 2011, Vienna (Habrich)

H. HABRICH reported about the United Nations International Meeting on the Applications of GNSS from December 12 to 16, 2011 at the Uno

City in Vienna, Austria. This meeting was aimed at bringing the results of a series of regional workshops between 2001 and 2011 together. Presentations at in total 7 sessions included beside others reports from GNSS system providers, international initiatives such as the International GNSS Monitoring & Assessment Service (iGMAS) and the IGS M-GEX campaign, regional and national activities, e.g., EGNOS and EUPOS, and the constitution of a 9-months curriculum to obtain a Master degree in GNSS application at the Beihang University in China. H. HABRICH presented the wide range of EUREF activities in his talk entitled "challenges of regional reference frame implementation". All presentations are available at http://www.unoosa.org/oosa/en/SAP/act2011/un-gnss/presentations.html.
Fourfour working groups discussed in parallel sessions und their results were summarized in recommendations. The requirements for a regional reference frame to be applied for the operation of an RTK positioning service were suggested for discussion by several Asian countries.

d. EUREF campaigns - status of deliverables and web pages (Stangl)

The deliverables from Faroer and FYROM are still missing. Because OLG has difficulties to present the campaigns on Google Maps, especially with the new Google politics, ROB will overtake the map presentation at the web. It was agreed that OLG provides and maintains the necessary campaign data while keeping the data stored at OLG and that ROB will prepare and maintain the EUREF campaign web interface.

22. **Next TWG Meeting (All)**

Next TWG will take place Bern on the premises of SwissTopo, accepting the kind invitation of E. BROCKMANN. A Doodle calendar will be set up by E. BROCKMANN and A. CAPORALI to verify the best dates.

23. **Action Items (all)**