EPN Analysis Coordinator Report
2011

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Federal Agency for Cartography and Geodesy
Introduction

- EPN Reprocessing 1
  - Benchmark
  - Pilot Reprocessing
  - Full Reprocessing

- IGS08 reference coordinates and velocities for EPN

- 7th LAC Workshop in November 2010

- EUREF Proposal for Tide Gauge Benchmark Monitoring (TIGA)

- New LAC at RGA Serbia

- Outlook
Week 1381:
7 daily solutions
1 weekly solution
13 LACs Already Contributing

A_Q - Italian Space Agency/Centro di Geodesia Spaziale, Matera – Italy
BEQ - Bayerische Kommission fuer die Internationale Erdmessung - Germany
BKQ - Bundesamt fuer Kartographie und Geodaesie - Germany
GOQ - Geodetic Observatory Pecny, Pecny - Czech Republic
IGQ - Instituto Geografico Nacional / Centro de Obs. Geodesicas - Spain
MUQ - Military University of Technology - Poland
M_Q - Military University of Technology - Poland (GAMIT solution)
NKQ - Nordic Geodetic Commission / Lantmaeteriet / Onsala Space Obs. - Sweden
ROQ - Royal Observatory of Belgium, Brussels - Belgium
SUQ - Slovak University of Technology, Bratislava - Slovakia
SGQ - FOEMI Satellite Geodetic Observatory - Hungary
UPQ - University of Padova, Padova – Italy
WUQ - Warsaw University of Technology, Warsaw - Poland
Main Characteristics of Normal Equations

Observations

<table>
<thead>
<tr>
<th>A_Q</th>
<th>BEQ</th>
<th>BKQ</th>
<th>GOQ</th>
<th>IGQ</th>
<th>MUQ</th>
<th>M_Q</th>
<th>NKQ</th>
<th>ROQ</th>
<th>SUQ</th>
<th>SGQ</th>
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Parameters

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<th>M_Q</th>
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LAC vs. Combined Solutions
7 Parameter Helmert Transformation

RMS

Scale

20.05.2011
EUREF Symposium 2011, May 25 – 28, Chisinau, Moldova
Coordinate Differences - Days

EPN Benchmark – A_Q vs. combined

EPN Benchmark – A_Q vs. combined, day 0

EPN Benchmark – A_Q vs. combined, day 1

EPN Benchmark – A_Q vs. combined, day 2
**Weekly Re-Processed Solutions**

Selected time window:
- First session 1996 - 0070 (Week.d 0835.0)
- Last session 2006 - 3640 (Week.d 1407.6)

<table>
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<tr>
<th>LAC</th>
<th>#Sol.</th>
<th>#Gaps</th>
<th>Integrity</th>
<th>Software</th>
<th>Remarks</th>
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<td>100.0%</td>
<td>BSW</td>
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<tr>
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<td>BSW</td>
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<tr>
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<tr>
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<tr>
<td>EU0</td>
<td>573</td>
<td>0</td>
<td>100.0%</td>
<td>BSW</td>
<td>combination result</td>
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20.05.2011  
EUREF Symposium 2011, May 25 – 28, Chisinau, Moldova
6.7 solutions for each station in the mean
Solution: EUR
Type: WEEKLY
Inspected solutions: 106

Median North: 1.035 mm
East: 1.25 mm
Height: 3.76 mm

Solution: EU0
Type: WEEKLY
Inspected solutions: 573

Median North: 0.69 mm
East: 0.70 mm
Height: 2.24 mm
Validation of Reference Site Coordinates - ITRF2005 and ITRF2008 -

- Helmert transformation (3 parameters for shift)
- Estimated vs. reference coordinates (of reference sites only)
- “Case study“ for next EPN-Repro referenced to IGS08
IGS08 Reference Coordinates and Velocities for EPN

- **Scope:**
  - EPN will use IGS08 to reach maximum consistency with IGS products starting with week 1632

- **Remark 1:**
  - IGS08 must be considered as interaction of IGS08.snx and IGS08.atx (satellite and receiver antenna PCOs and PCVs)

- **Remark 2:**
  - IGS08 is essentially a subset of 232 stable, well-performing IGS stations from ITRF2008 (in total 580 stations)
Dense Coverage to Satisfy Regional Users

Full IGS08 network (232 stations)
Homogeneous Sub-Network for Alignment of Global Frames

The 91 primary stations of the IGS08 core network
Update of receiver antenna corrections in IGS08.atx

Impact of calibration update of station coordinates assessed by PPP strategy and applied to ITRF2008 coordinates

a) non-significant impact: IGS08=ITRF2008
b) significant impact: IGS08=ITRF2008+correction

Significant impact for 35 EPN stations belonging to IGS08 detected

Satellite PCO re-estimated consistently with IGS08 scale (~1 ppb difference to IGS05 scale)
ITRF2008 station
- Not included in IGS08
- Consistency with IGS08.atx unclear

ITRF2008 and IGS08 station
- Not affected by update of IGS08.atx
- Identical station coordinates

ITRF2008 and IGS08 station
- Update of IGS08.atx has significant impact
- Coordinate correction applied to ITRF2008
ITRF2008 to IGS08 Coordinate Corrections of Affected EPN Stations
Preparation for Switch to IGS08 in EPN Analysis

Select a proper option:
- Option 1: Use IGS08 stations only
- Option 2: Use IGS08 and unaffected ITRF2008 stations
- Option 3: Use IGS08, unaffected and corrected ITRF2008 stations

Investigation of ITRF2008 stations not included in IGS08 needed for option 3:
- select EPN stations of recent weekly EPN solution, here week 1622
- verify IGS latitude-dependent model correction for known IGS08 stations of EPN
- compute and apply model corrections to ITRF2008 coordinates
ITRF2008 and IGS08

101 ITRF2008 stations
47 IGS08 stations
84 Potential EPN Reference Stations

- 67 unaffected ITRF2008 stations
- 47 IGS08 stations
ITRF2008 to IGS08 Corrections

North

East

Height

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Selected Reference Sites

- In total 97 reference stations proposed:
  - 4 of 101 ITRF2008 reference stations rejected, because of discontinuity involved by equipment change after release of IGS08 (GRAZ, HERS, TLSE, and UZHL)
  - for 47 stations use IGS08 coordinates as provided by IGS
  - for remaining 50 stations corrections of latitude-dependent model computed, where the correction is zero for 33 stations (station not affected by igs08.atx update or computed correction below threshold), for 17 station correction applied to ITRF2008 coordinates
  - active for “daily rapid” and “hourly” EPN combination

- Relevant information:
  - IGS-Mail 6354, 6355, 6356 and 6374
  - EUREF-Mail 5732 and 5734
  - BSW-Mail 0297
Sincere thanks are given to the Military University of Technology for hosting this workshop!

Main activities were reported by the LACs.

Important round table discussion results were:
- the introduction of IGS08 at the same time as IGS changes from IGS05 to IGS08,
- to provide RINEX version 3 observation files in preparation for the future Galileo system,
- and to ask LACs to include GLONASS for routine EPN analysis.

Second day of the workshop was reserved for re-processing issues.

Minutes are available at the EPN-CB.
In 2001 IGS Governing Board accepted proposal for “Tide Gauge Benchmark Monitoring Pilot Project (TIGA-PP)”, EPN contributes since that time by providing weekly EPN operational solutions.

In 2011 transition into a an “IGS Working Group” (a permanent service)
- CfP on February 2, 2011 (IGS-Mail 6341)
- Submission of EUREF Proposal on March 15, 2011
- Review by IGS Governing Board going on

Focus of new EPN proposal on “repeated reprocessing” asked in CfP
EPN-CB contacted in April 2011 by Serbian colleague Zoran Veljkovic

Following “Guidelines for EPN Analysis Centers” RAG submitted a proposal of 20 stations to be analyzed and a LAC description form

EPN Coordination Group added 25 EPN stations that are analyzed by 3 LACs only → RGA provides “added-value”

Weekly test solution RGA16167.SNX successfully combined with other LACs

New LAC accepted by TWG and submission of solution will start with week 1632

Also: Implementation of 4 new EPN stations in Serbia
RGA Sub-Network (44 Stations)
Investigation of benchmark test to reach best possible consistency of all LAC contributions

Computation of final reprocessed weekly solutions

Computation of reprocessed daily solutions

Discussion of further reprocessing as EPN Repro-2 and within the scope of TIGA

Complete and validate the introduction of IGS08 in all analysis steps of EPN

Welcome the new LAC at the Republic Geodetic Authority Serbia (RGA)