GOP re-processing of EUREF sub-network

J. Douša and P. Václavovic

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Geodetic observatory Pecný
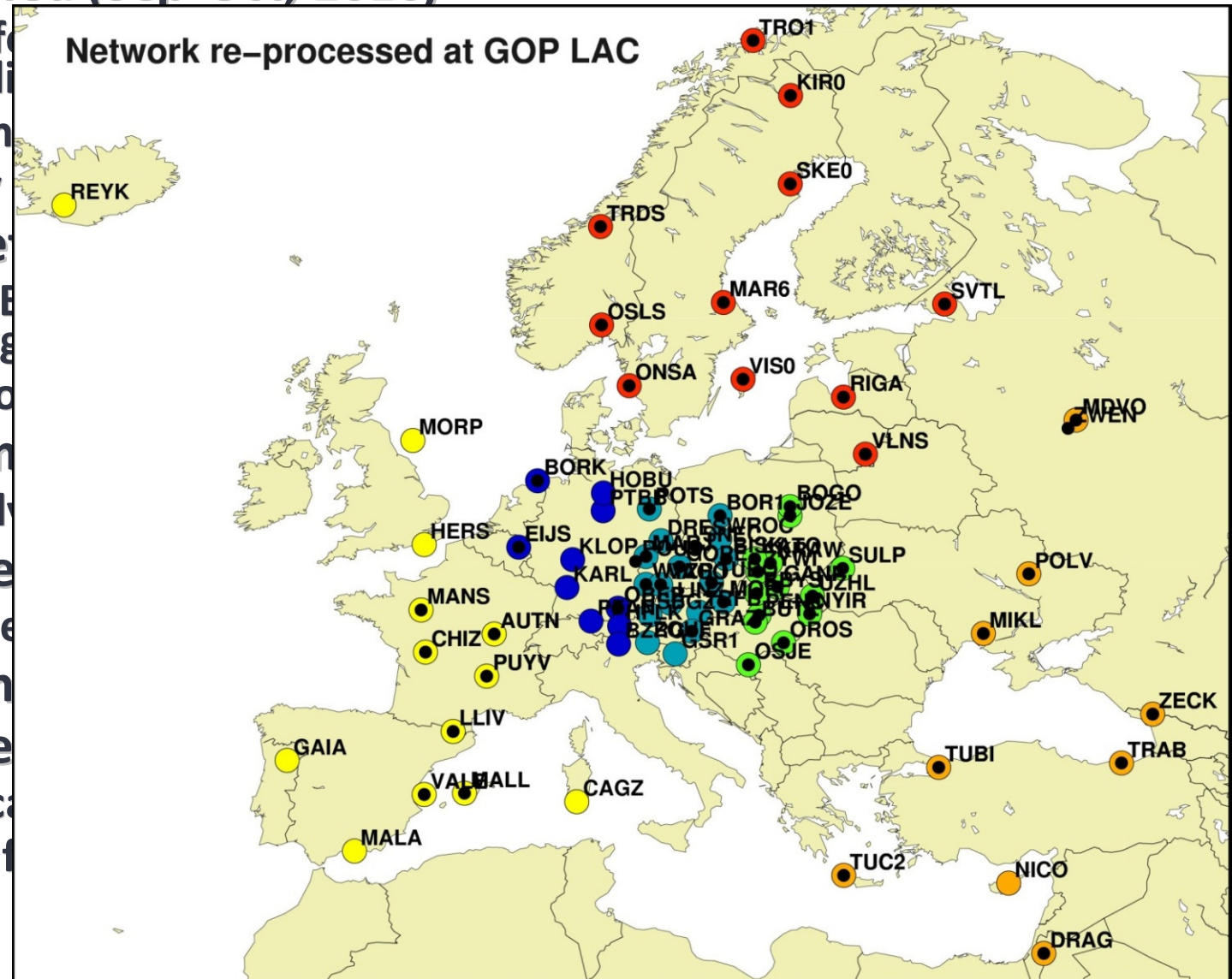*Research Institute of Geodesy, Topography and Cartography*

EUREF Symposium, May25-27, 2011, Chisinau

Introduction to GOP-repro1

- **Reprocessing system setup (Sep, 2010)**
- **1st run completed (Sep-Oct, 2010)**
  - Initial checks for the routine settings, data and products availability, solution stability
  - Some problems resolved
  - First raw daily time-series
- **2nd run completed (Nov-Dec, 2010)**
  - Improved RINEX data handling according to minimize data removal (problem using old version of teqc software)
  - Weekly solution implemented and provided, submitted
- **Benchmark campaign (Jan, 2011)**
  - Processed daily, weekly for CRD+TRP, submitted
- **2nd run for weekly re-combination (Mar, 2011)**
  - Fixed outlier rejection in weekly combination, re-submitted
- **Long-term combination – crd+vel (Mar, 2011)**
- **3rd run expected (Apr-May, 2011 ?)**
  - Some 'historical' stations with short-term period included
  - Considering a full EPN or globally referenced solution

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  - **Weekly solutio...**
- **Benchmark can...**
  - **Processed daily...**
- **2nd run for wee...**
  - **Fixed outlier re...**
- **Long-term com...**
- **3rd run expecte...**
  - **Some 'historica...**
  - **Considering a f...**

Network re–processed at GOP LAC

April 4-8, 2011

Results and their applications

- **some problems identified**
- **daily/weekly raw time-series generated**
- **used for testing EPN cummulative solution datum**
- **a multi-year combination generated**
- **applied in discontinuity plots and their comparisons**
- **evaluation of tropospheric parameter time-series**

# Some characteristics

Ambiguity solution using QIF strategy:

Number of Integer Resolved Ambiguities in QIF
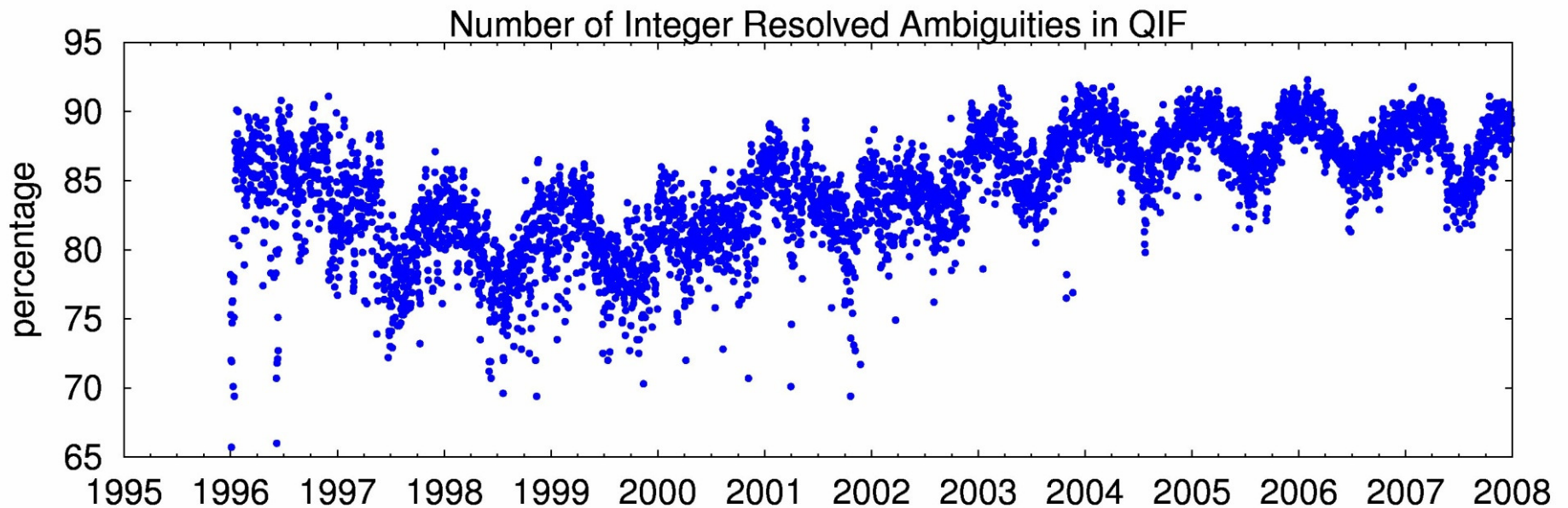
Two specific problems causing crash in GOP-repro1 (solved):

1999:266 …   >50% obs removed -> irrelevant drif in IG1 clocks

2004:101 … RXOB3 setup wavelength factor 2/1 for G10, but crashed in MAUPRP for station GRAZ (RINEX file corrected).

Raw ETRS time-series (1)

For daily solution, GOP applies iterative datum definition, thus daily raw coordinate time-series clearly reveals all the issues

- **JOZE & POTS – continuous smooth time-series**
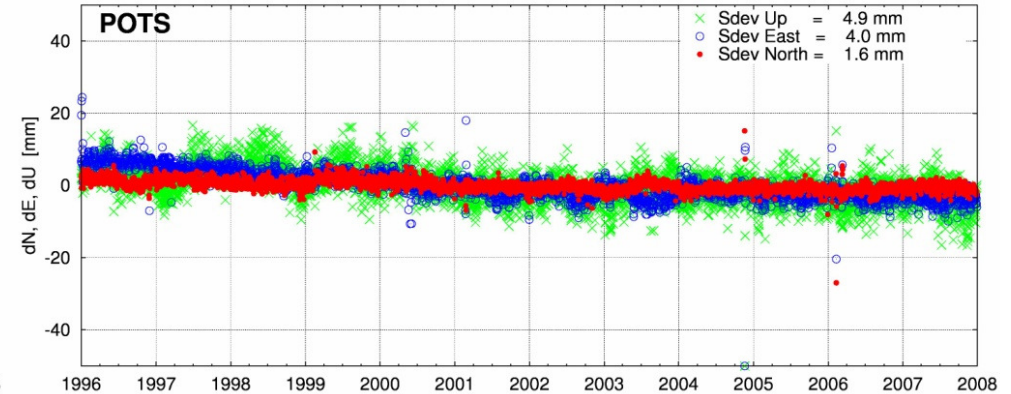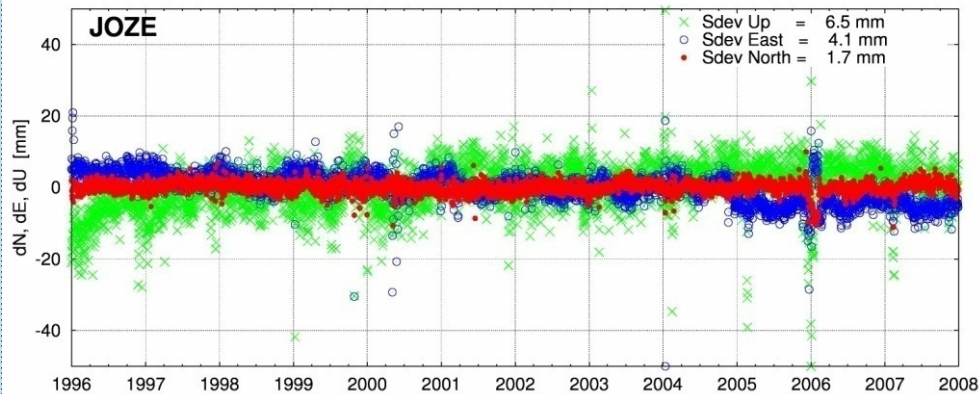
- **TUBI – postseismic movement, MAR6 – postglacial uplift**
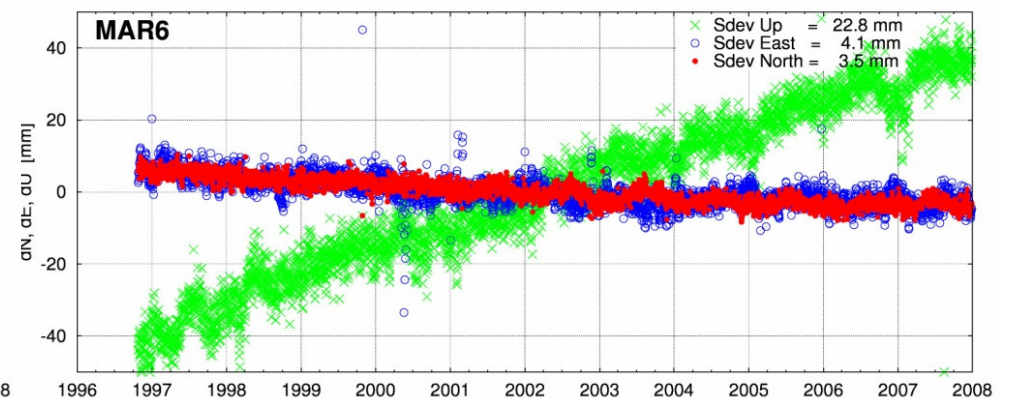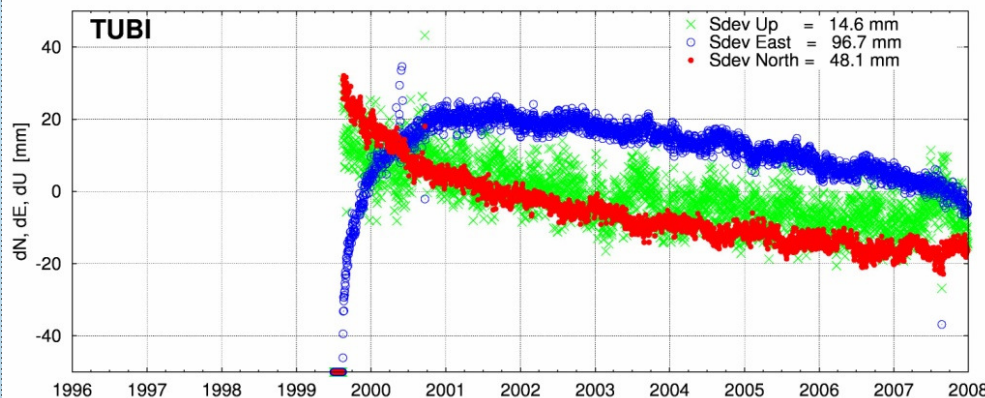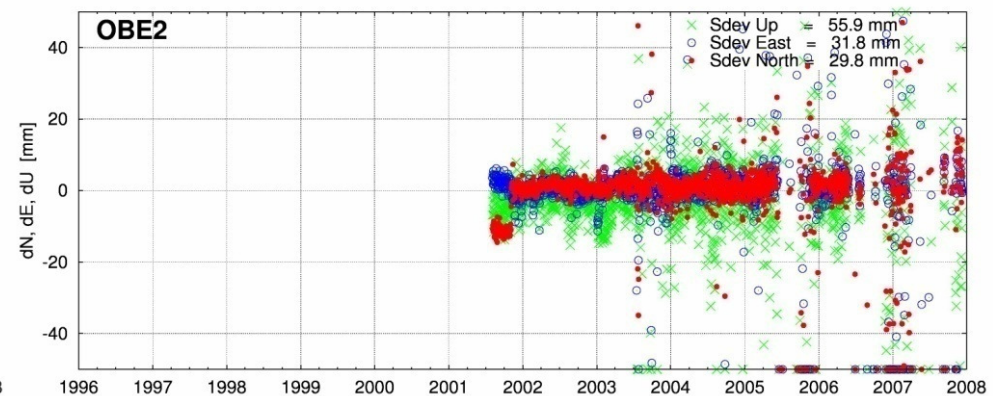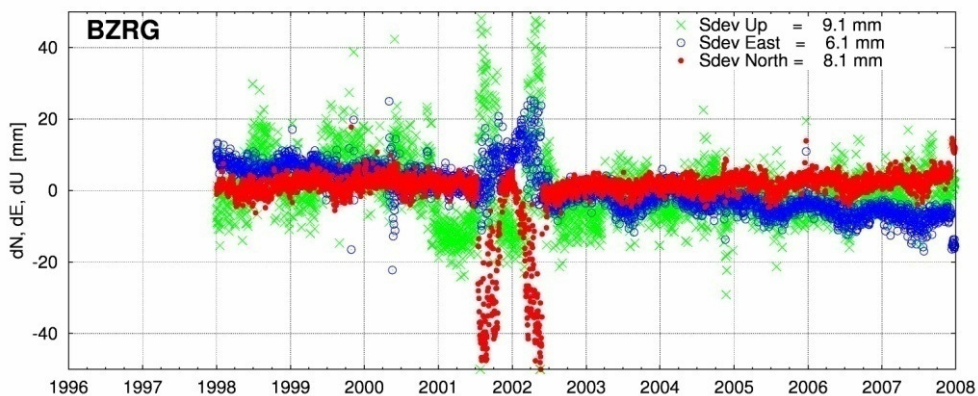
Raw ETRS time-series (2)

HFLK, WTZR – snow/ice problem

DRAG – other seasonal problem
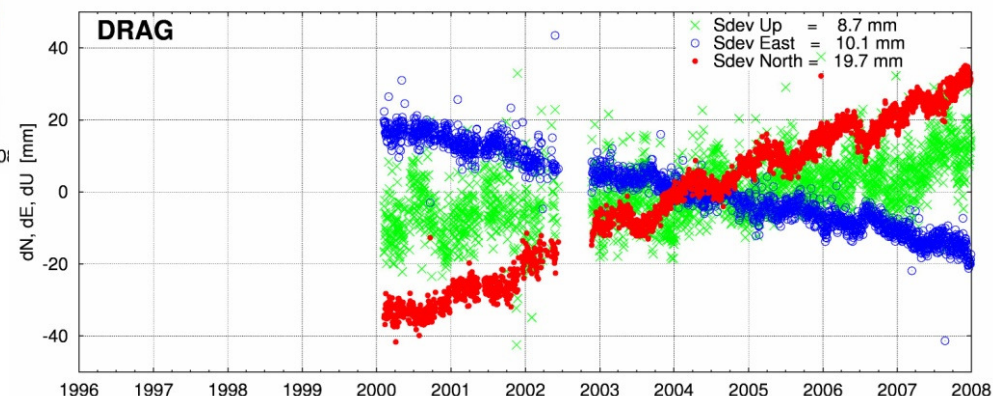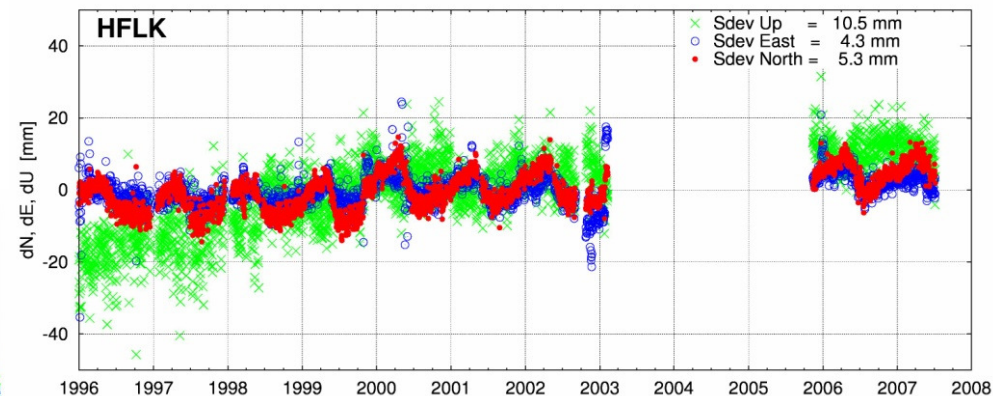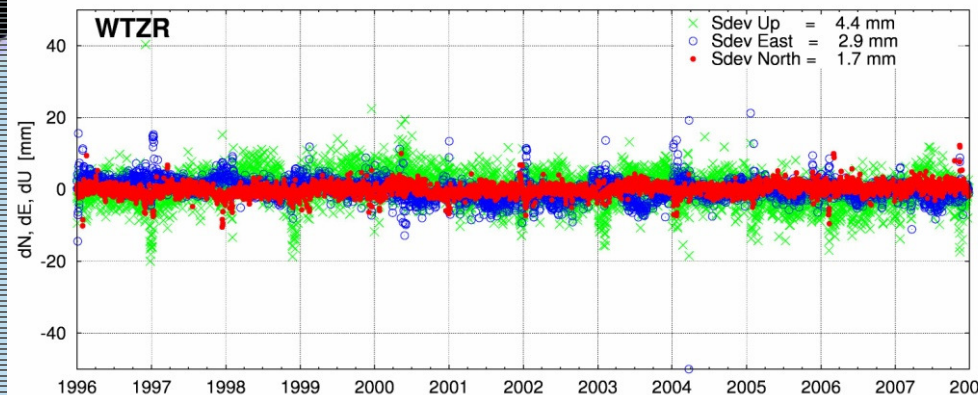
BZRG – occasional data problem
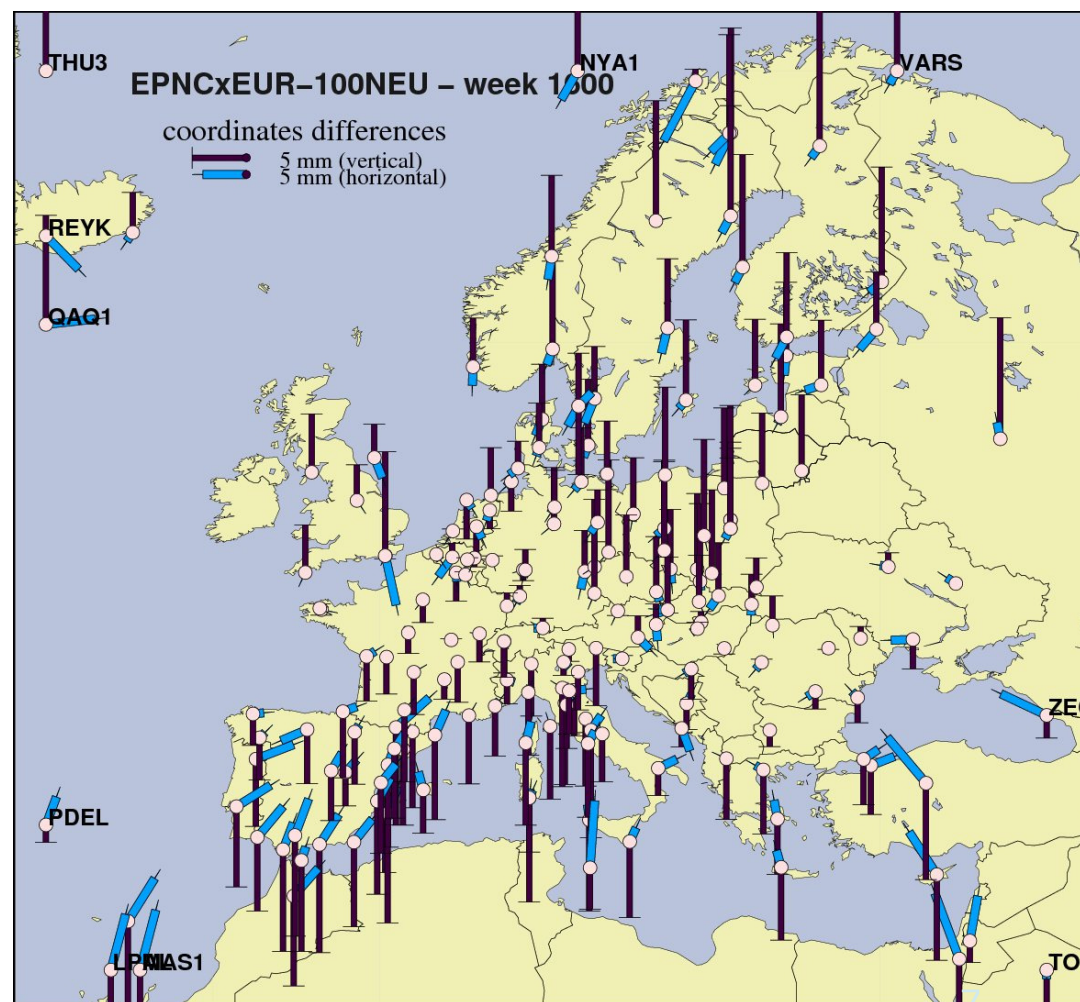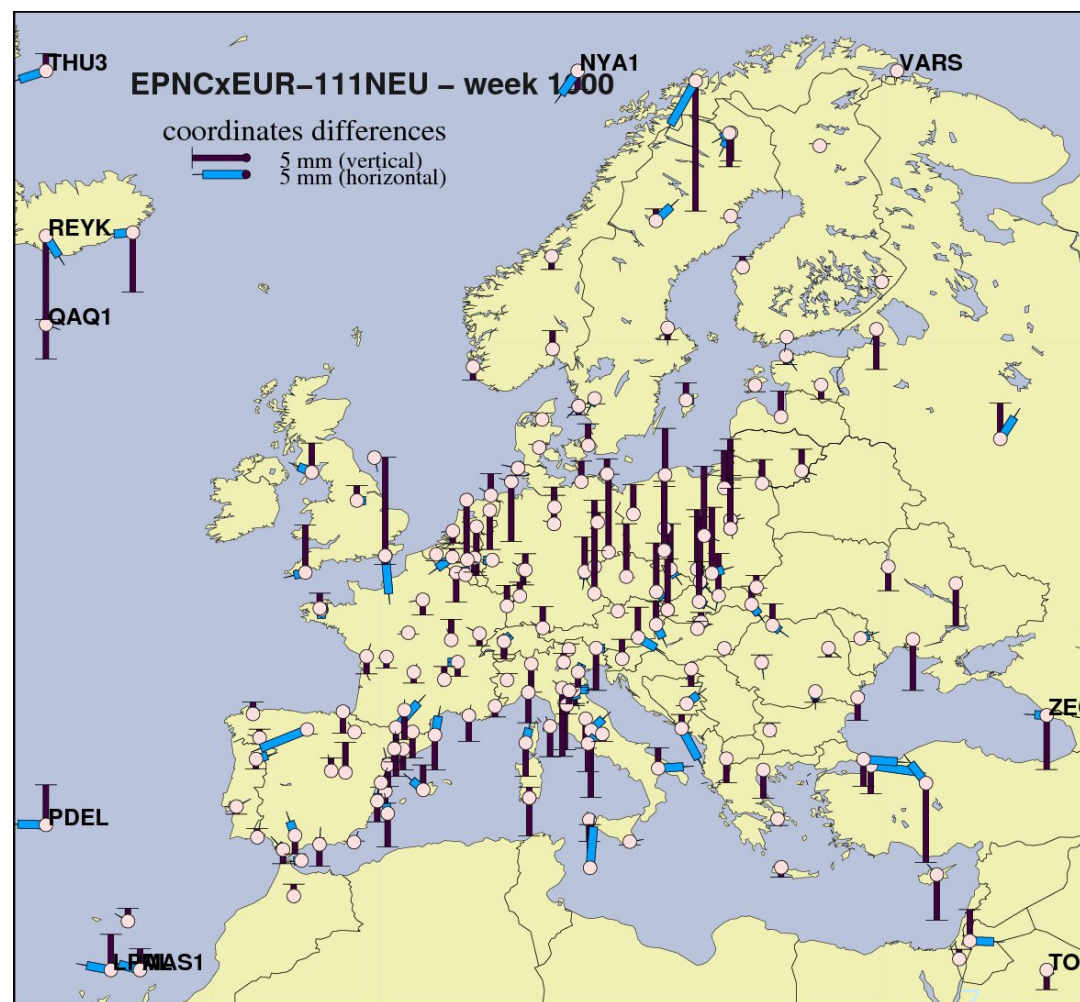
OBE2 – low quality data

Testing datum of EPN cummulative solution

- **Observed N-S tilt between recent EUREF AC weekly combinations (or EUREF campaigns) and the EPN cumulative solution combination**

- **GOP repro-1 provides a 'homogenious' weekly results to look into history**

- **Compared CRD on weekly basis:**
  - 1a-set EPNC_1300 (CRD+VEL)
  - 1b-set EPNC_1600 (CRD+VEL)
  - 1b-set ITRF2005 (CRD+VEL)
  - 1c-set ITRF2008 (CRD+VEL)

  - 2a-set EUREF AC (weekly CRD)
  - 2b-set GOP repro1 (weekly CRD)

- **Helmert transformations:**
  - NEU / XYZ (on weekly basis)
  - 3-TRA / 3-TRA + 3-ROT + 1-SCL

- **Datum definition assessed by:**
  - All common stations set as fiducial
  - Iteratively select the 'consistent' set
  - Solution numbers per sites applied

Research Institute of Geodesy, Topography and Cartography
Geodetic Observatory Pecný (GOP)

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Helmert parameters (XYZ)
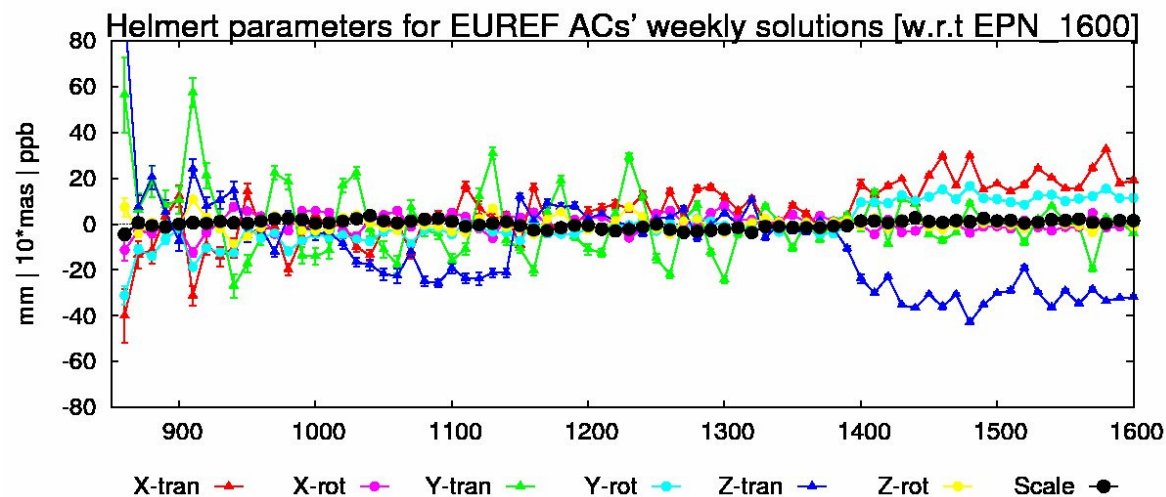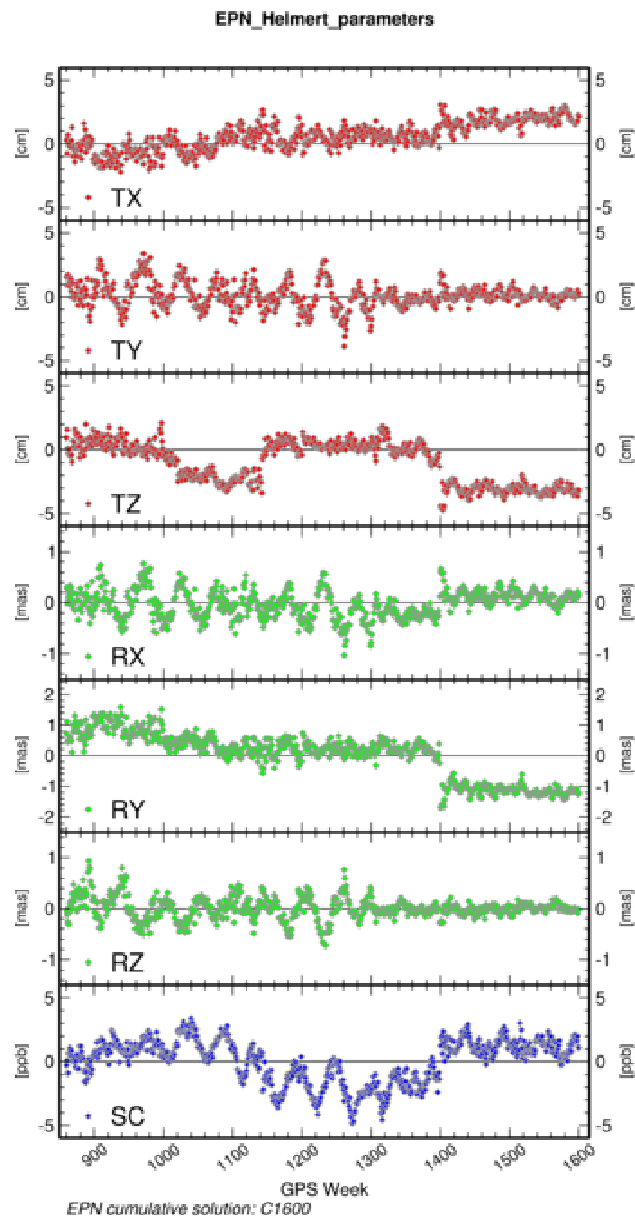
Helmert parameters (XYZ)
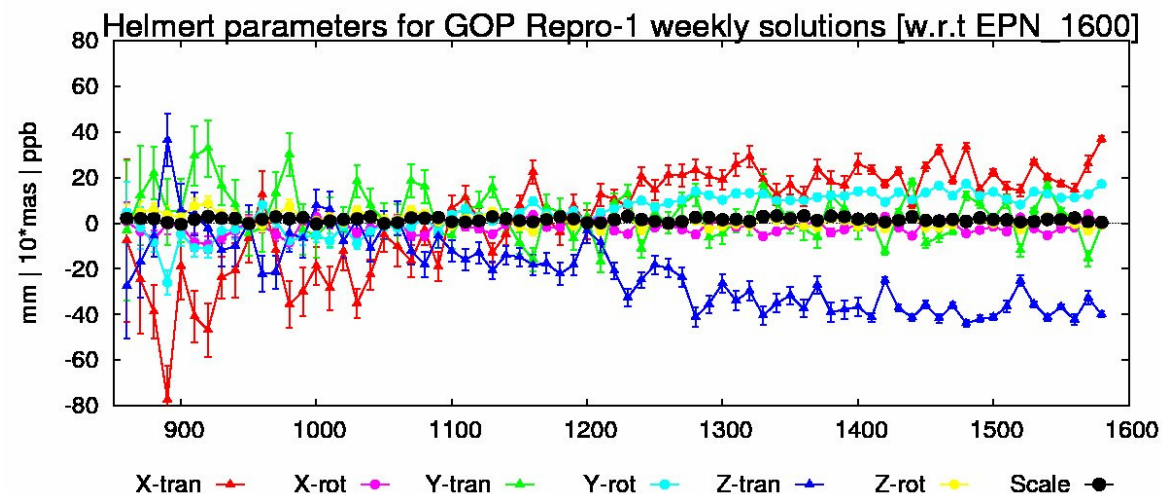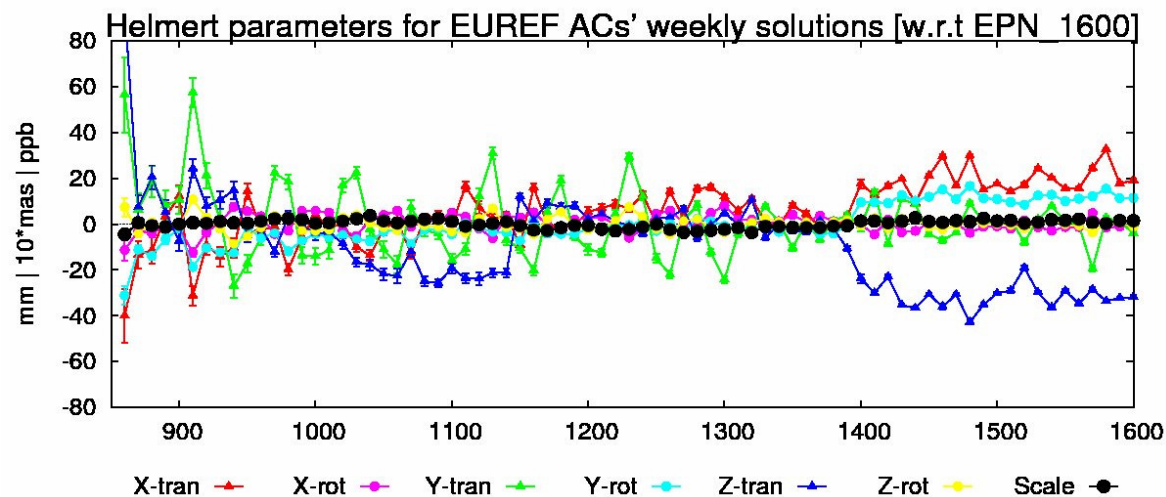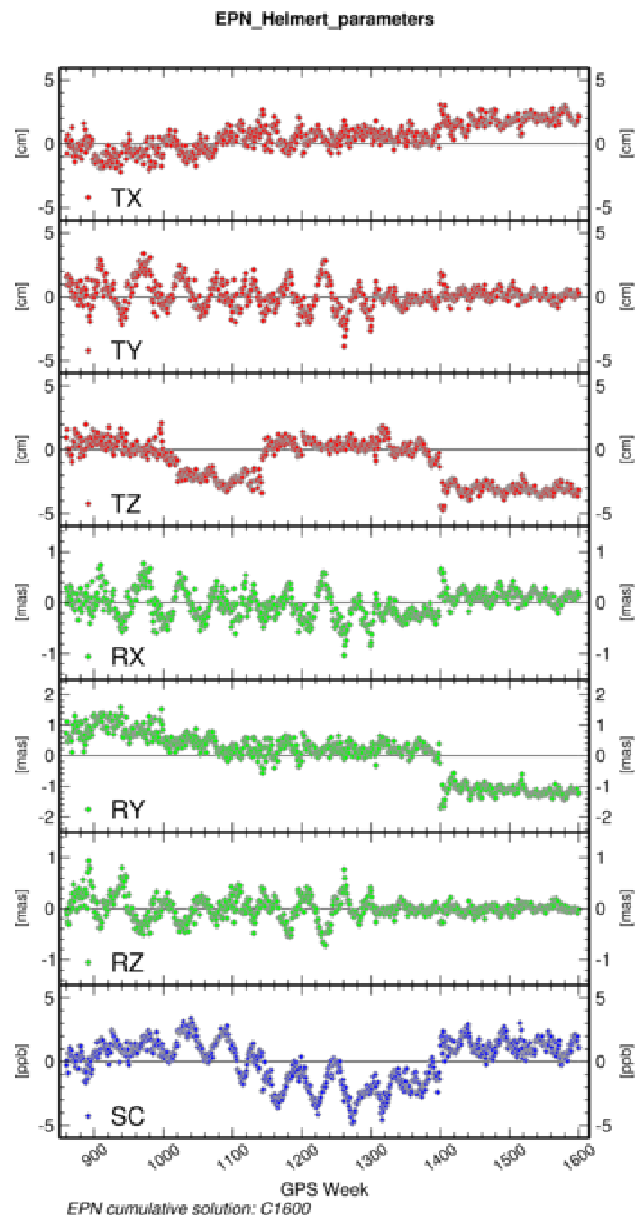
Helmert parameters (NEU)

GOP-repro1

x

EPN_1600, EPN_1355, ITRF2005, ITRF2008

N, E, U - translations
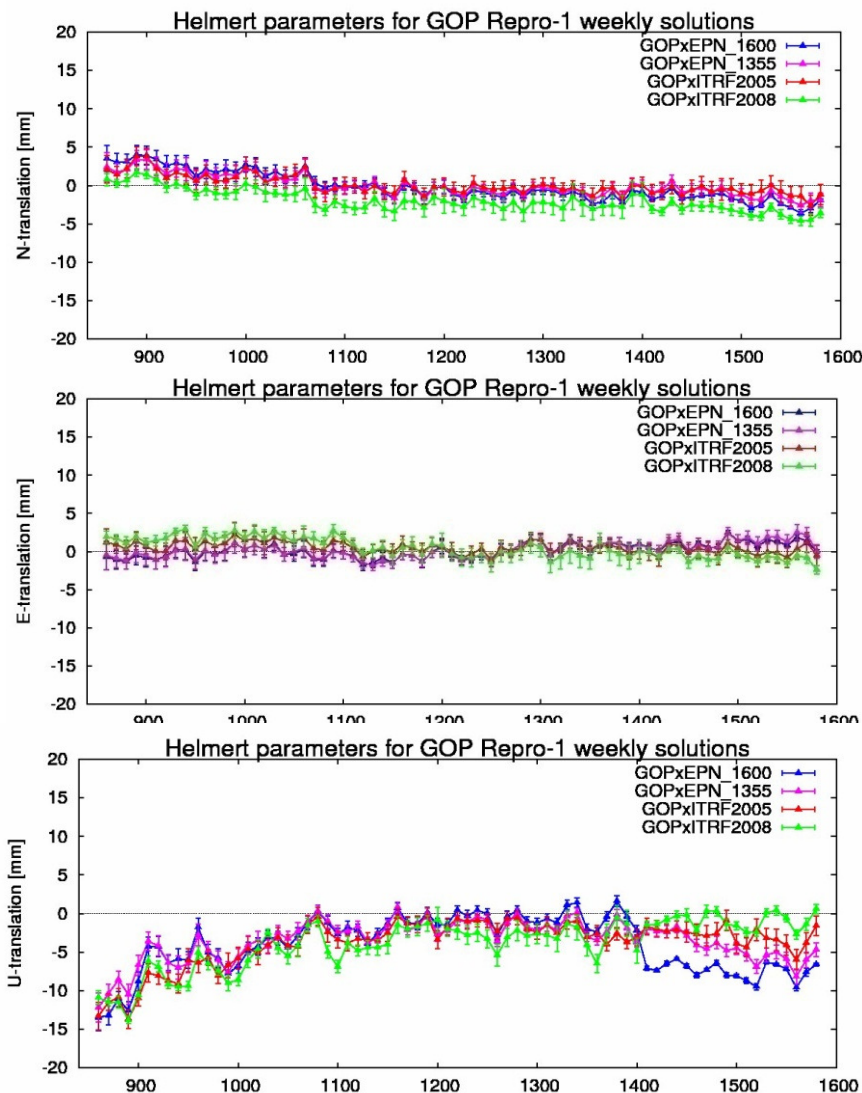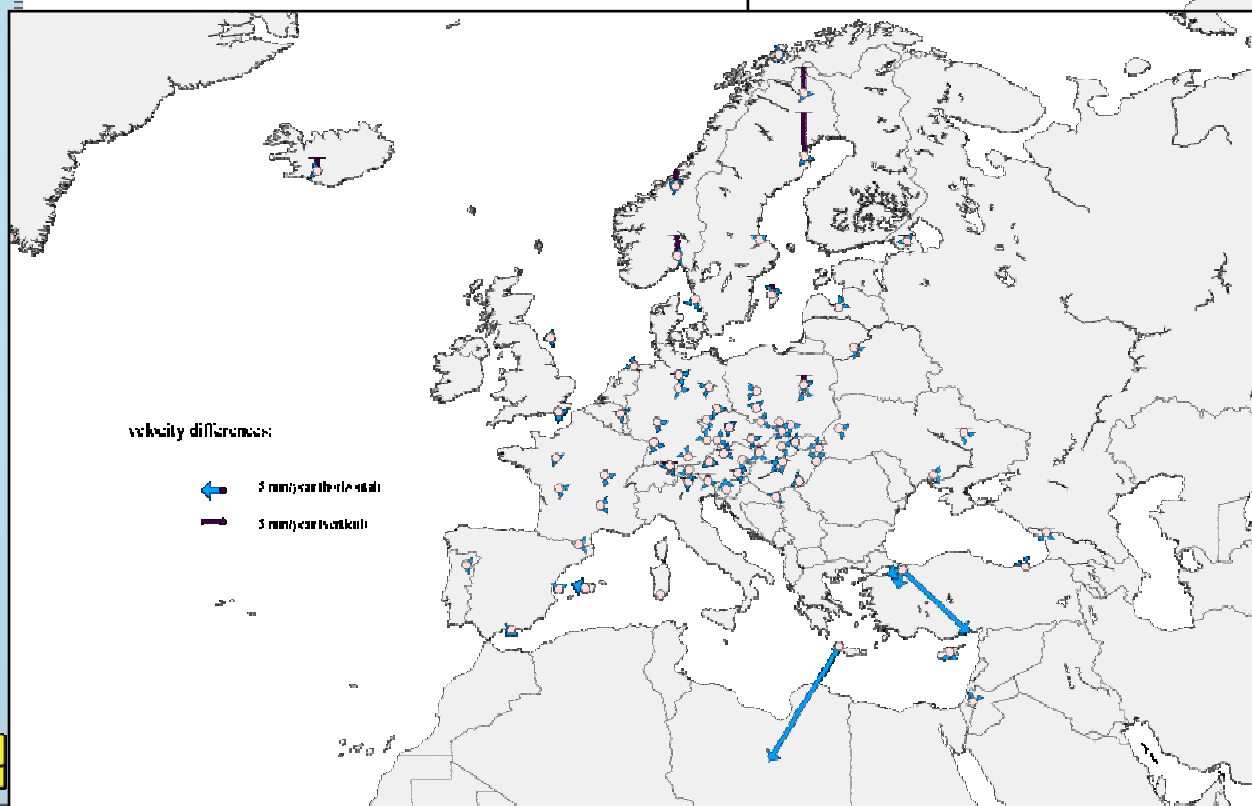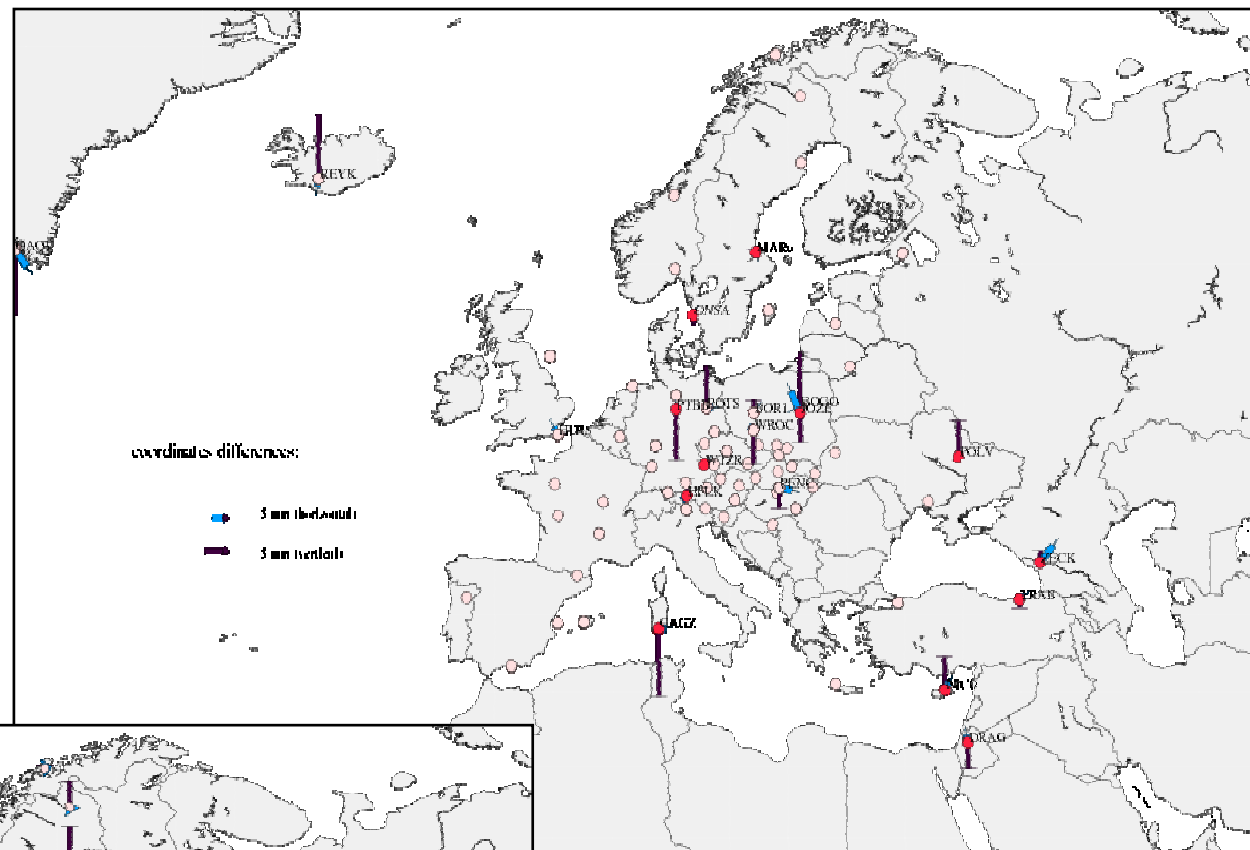
N, E, U, rotations + scale
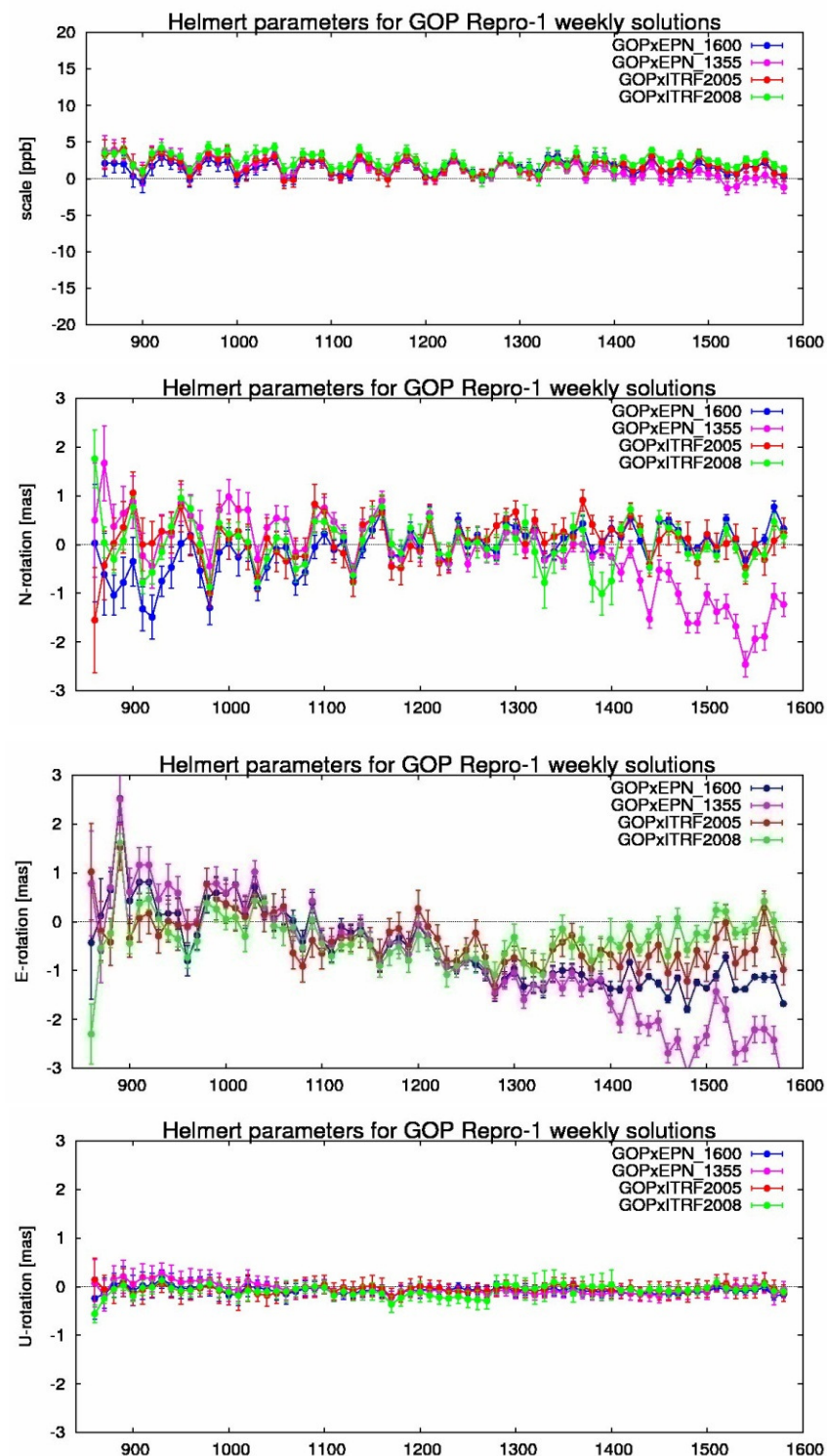
Long-term combination

- **Combination based on weekly solutions**
- **Setup coordinate/velocity intervals iteratively, but started without any discontinuities**
- **NNT MC for 17 fiducial stations [w.r.t. ITRF2005/ITRF2008]**
- **Initially used all fiducial stations, in case of discontinuities we kept only the latest solution numbers as fiducial**
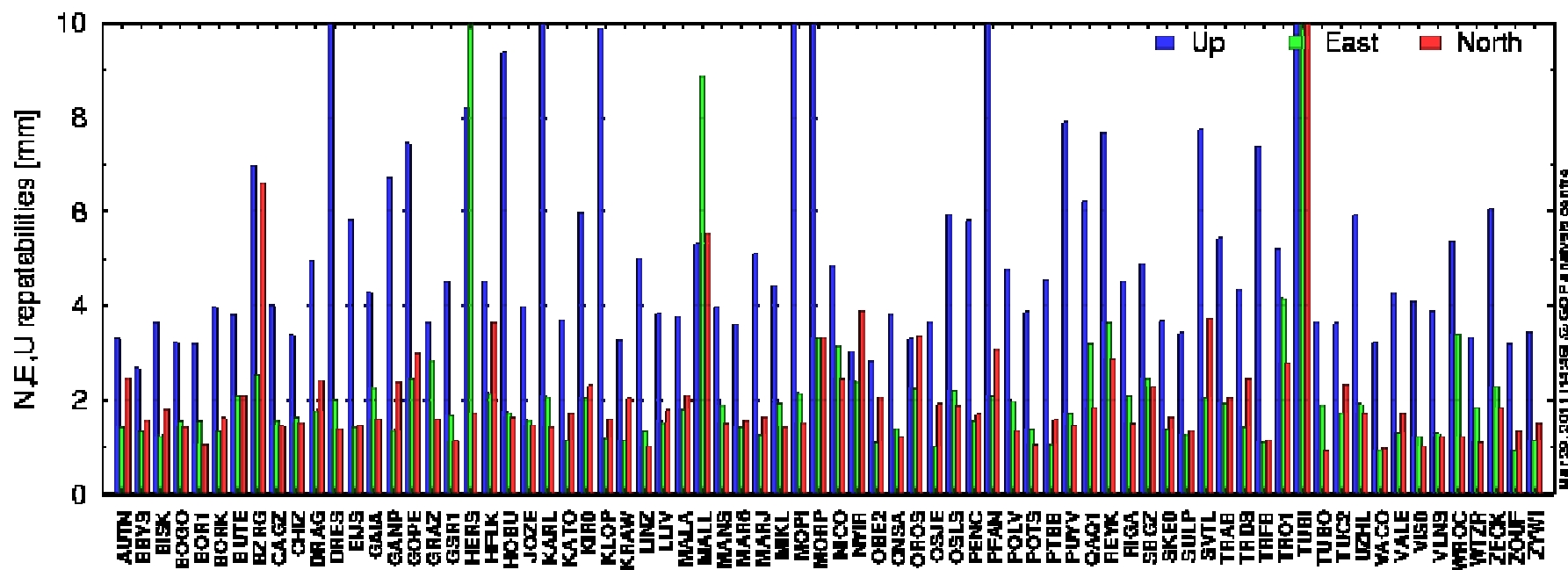
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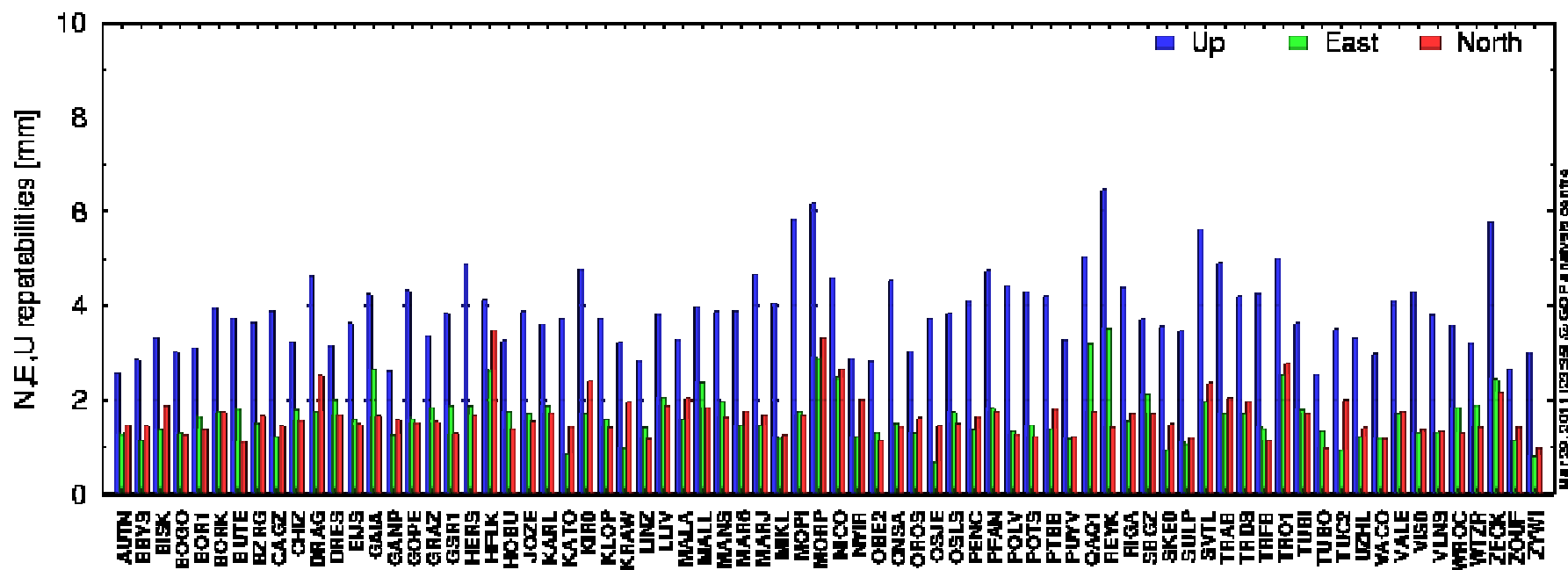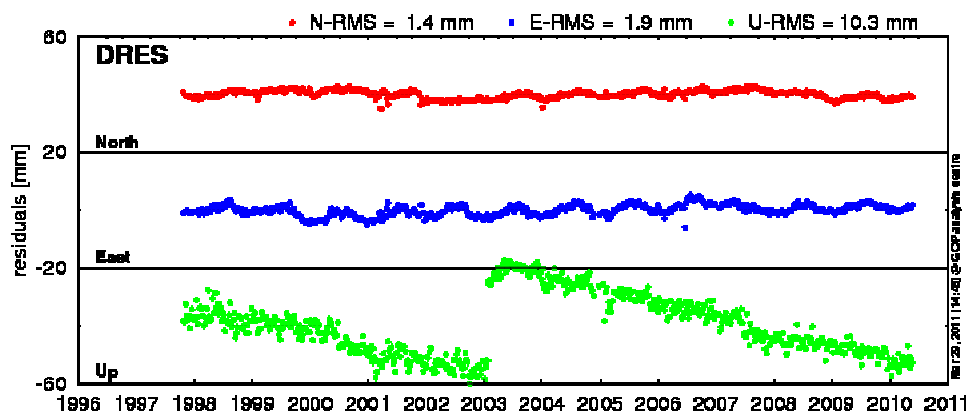
Combination

NEU residuals from the Helmert tranformation
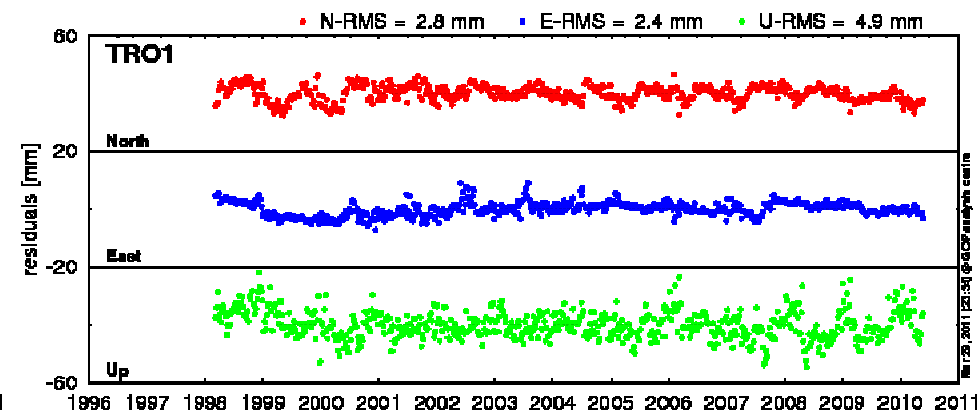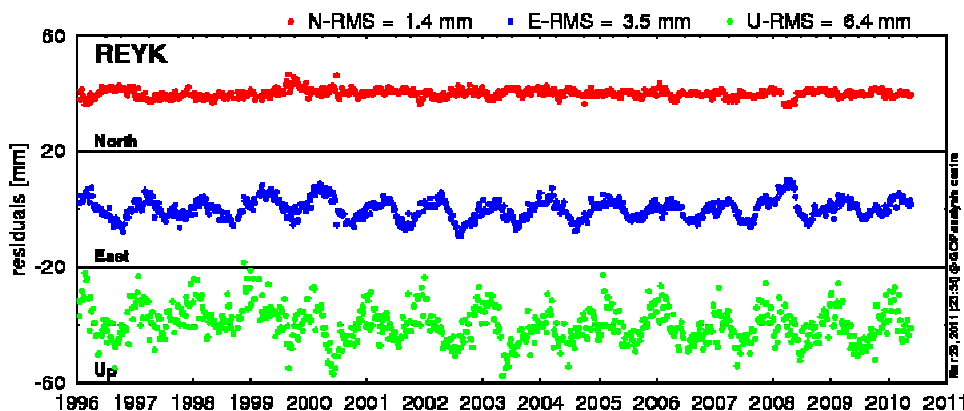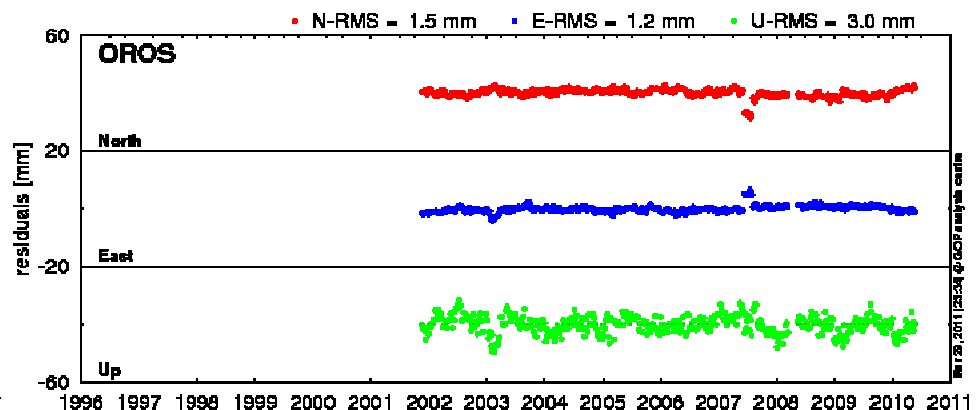
3 translations [mm] ->

17 fiducial stations

coordinates differences:

3 mm horizontal

3 mm vertical

velocity differences:

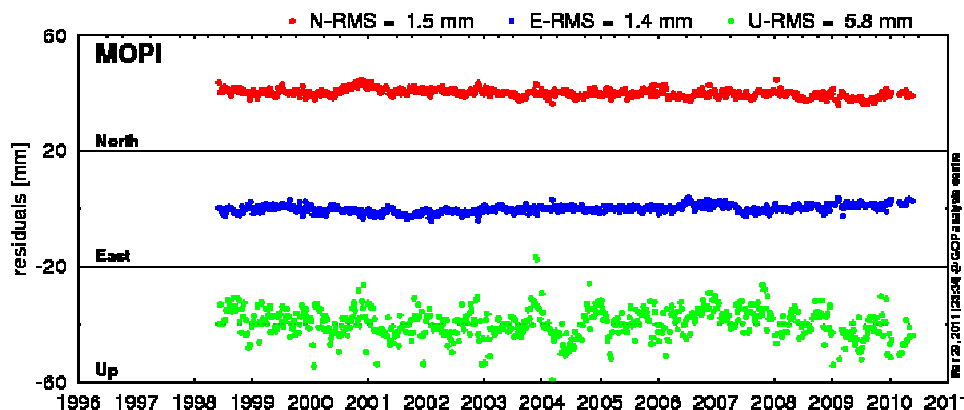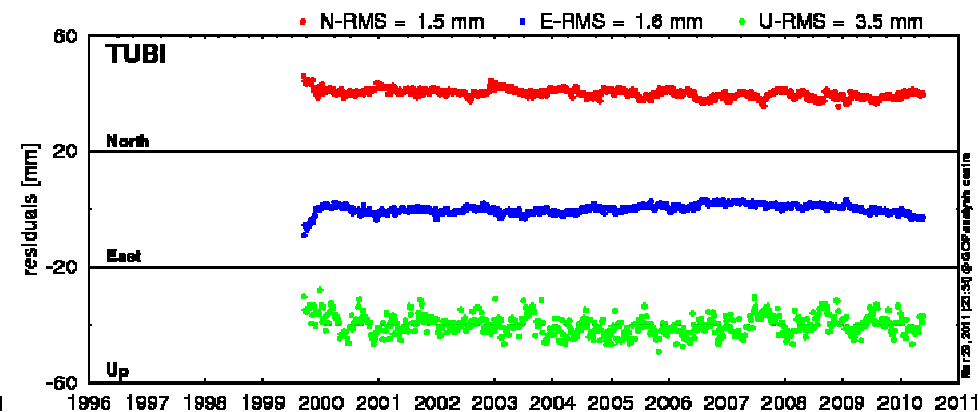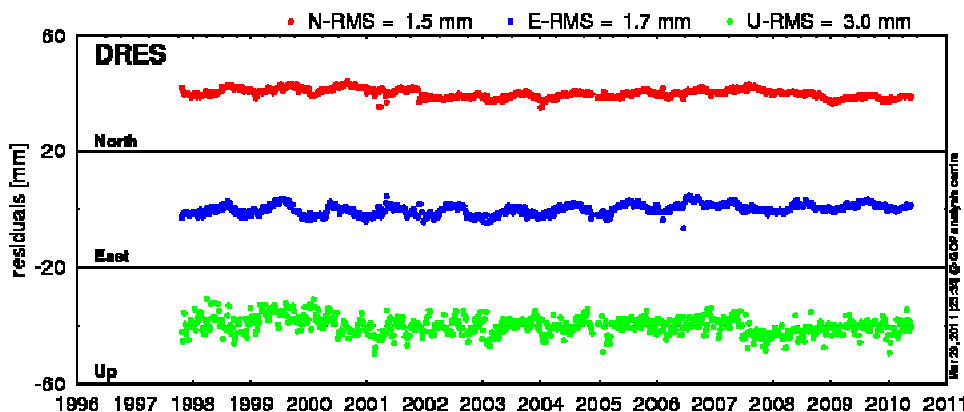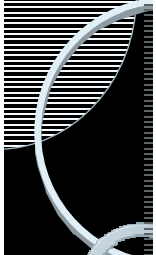3 mm/year horizontal

3 mm/year vertical

<- estimated horizontal and vertical velocities w.r.t. ITRF2005 [mm/year]
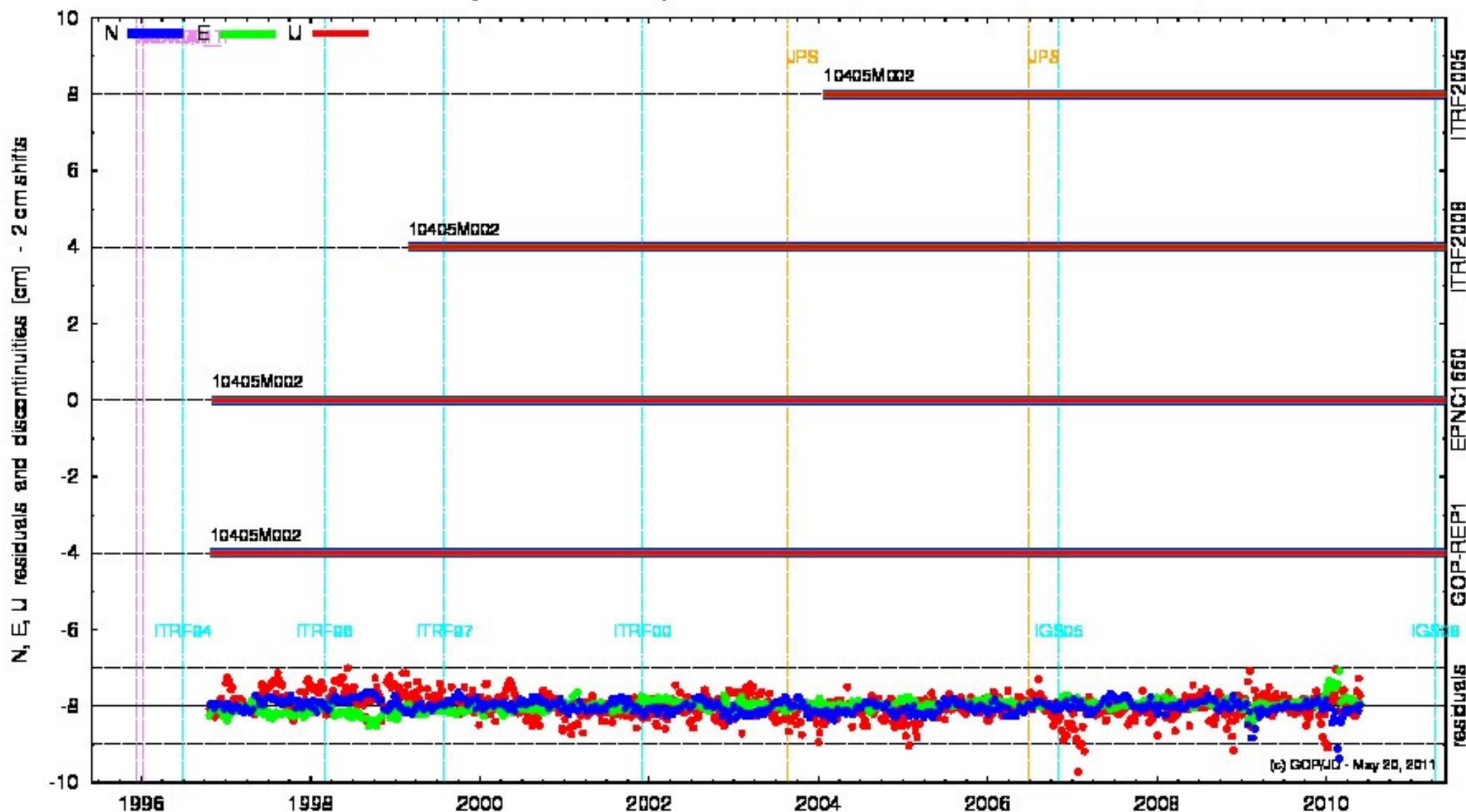
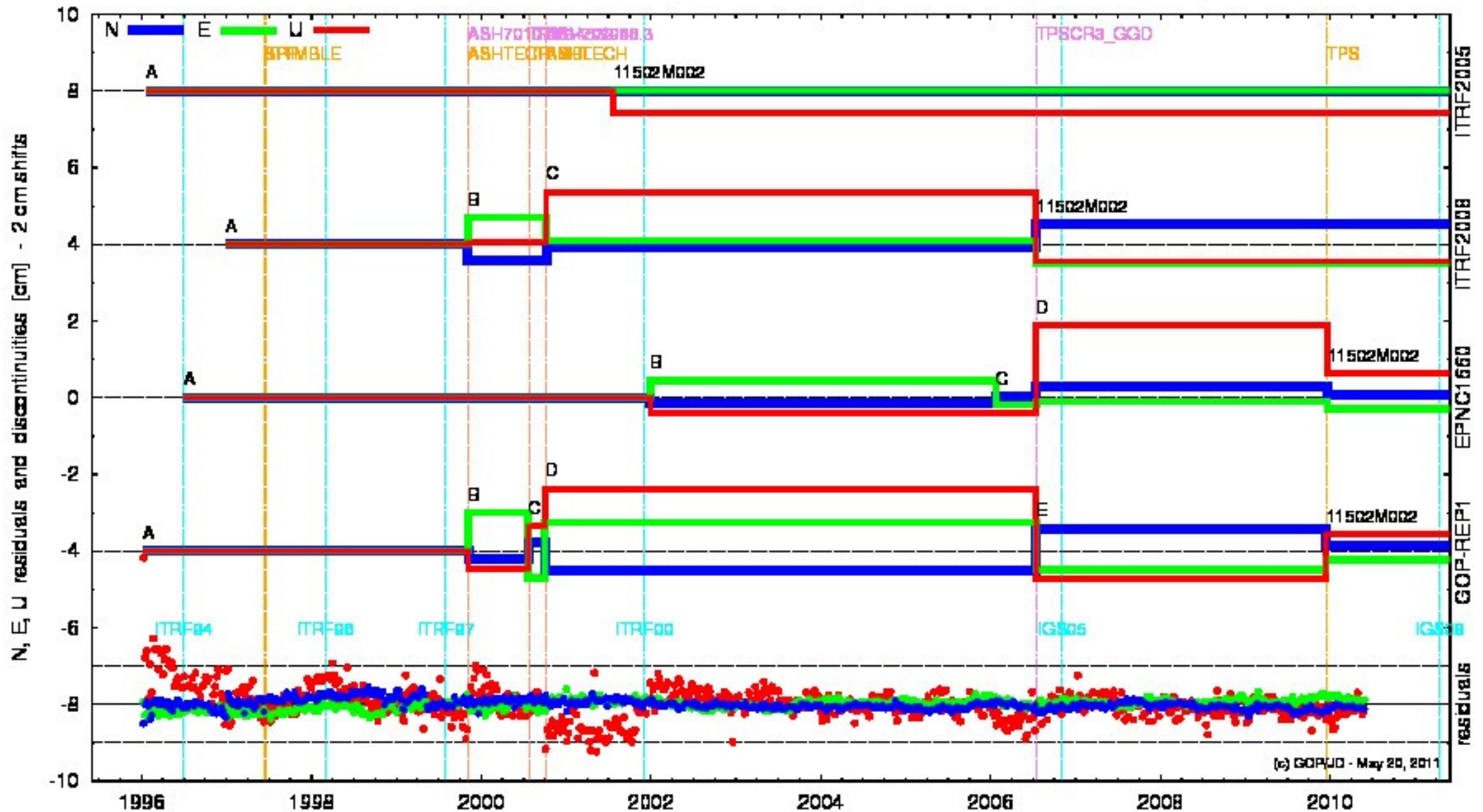# CRD time-series – before/after
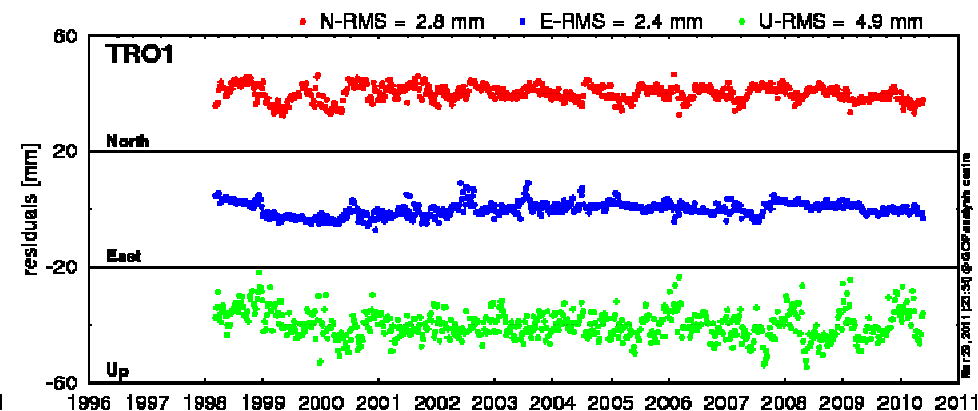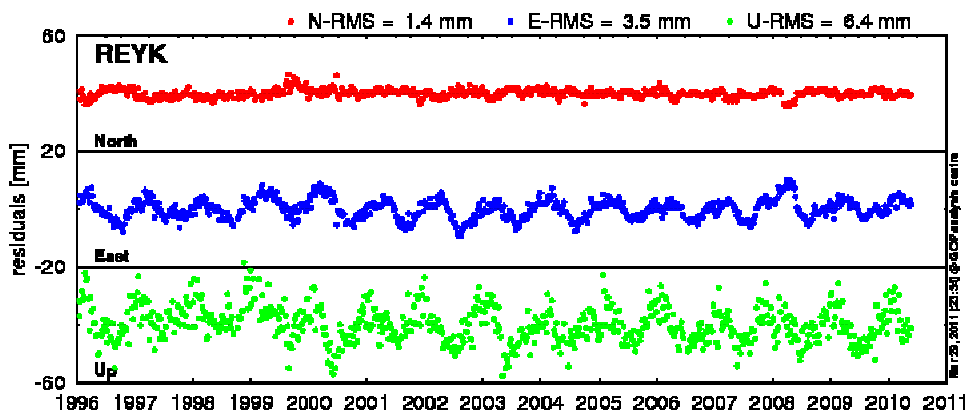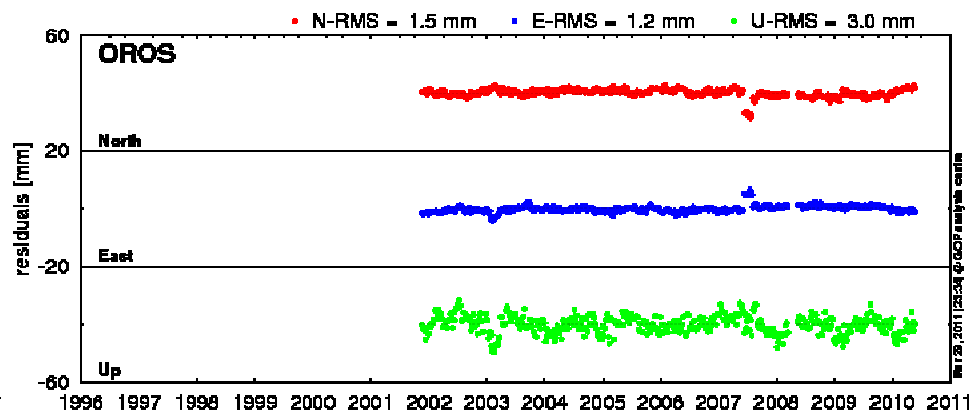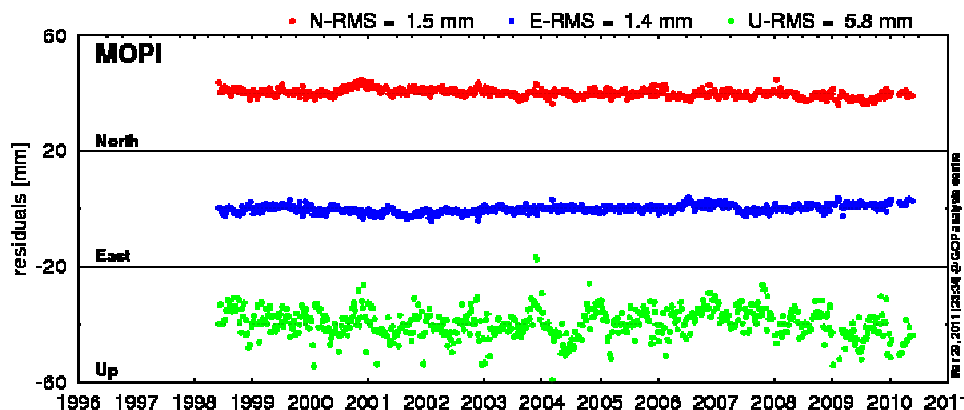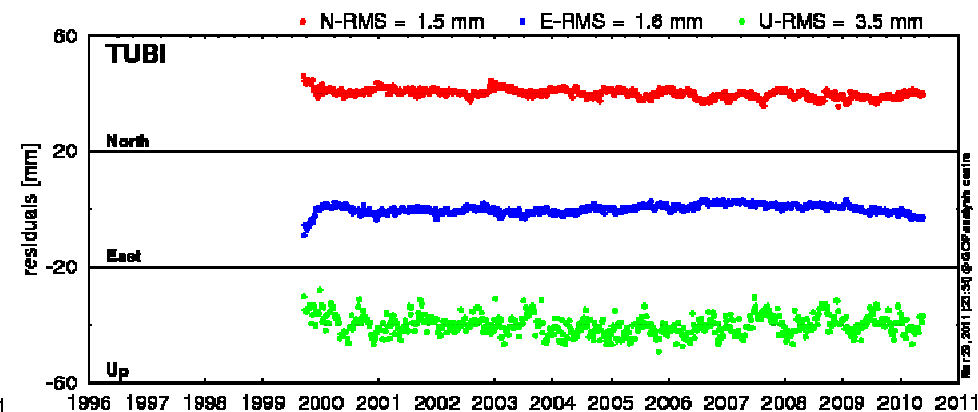
CRD time-series – before/after

Discontinuity plots

MAR6 discontinuities (and residuals) - ITRF2005, ITRF2008, EPNC1600, GOP-REP1

Discontinuity plots

KARL discontinuities (and residuals) - ITRF2005, ITRF2008, EPNC1600, GOP-REP1
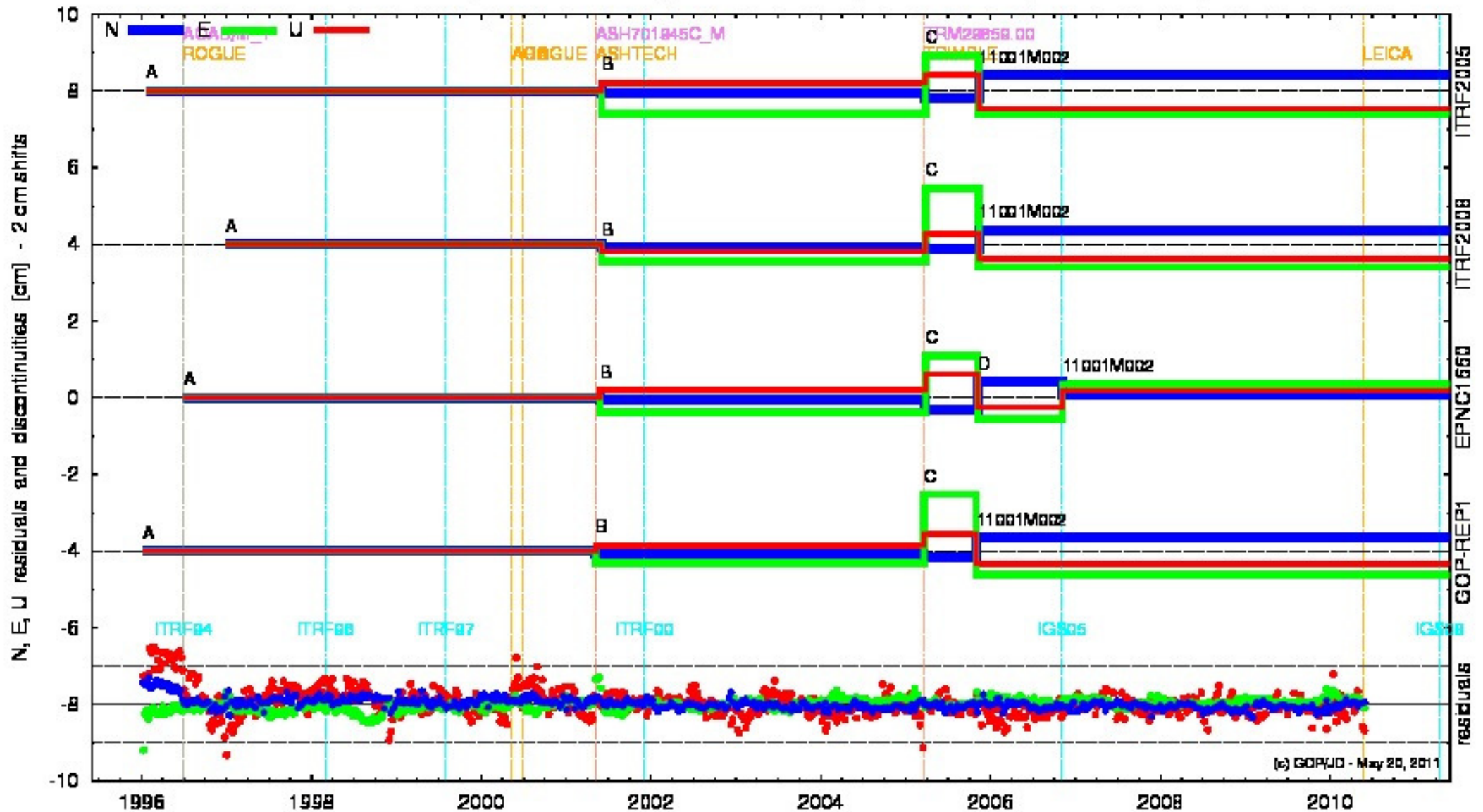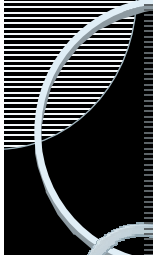
Discontinuity plots

GOPE discontinuities (and residuals) - ITRF2005, ITRF2008, EPNC1600, GOP-REP1
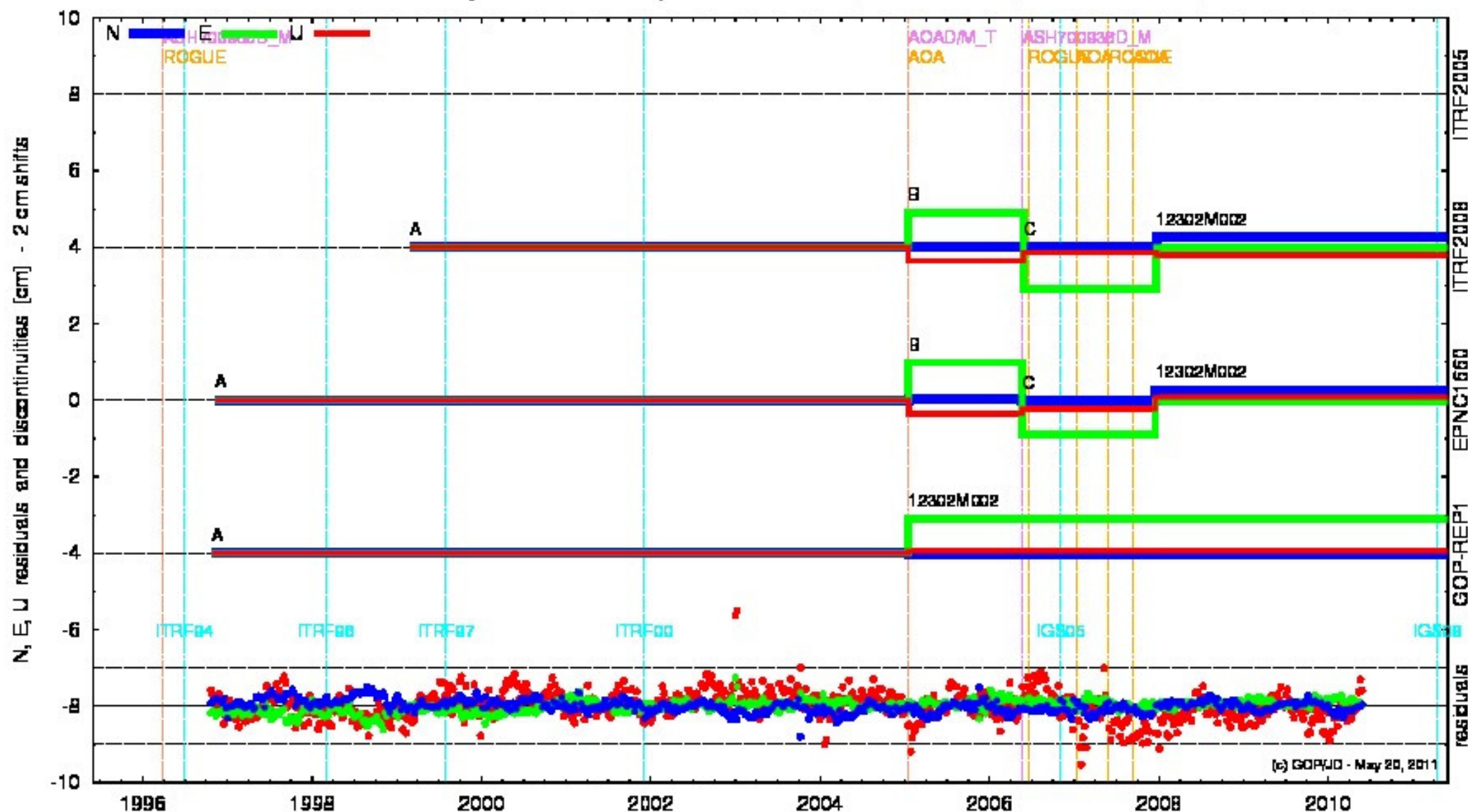
Discontinuity plots

GRAZ discontinuities (and residuals) - ITRF2005, ITRF2008, EPNC1600, GOP-REP1
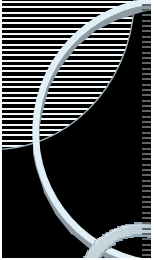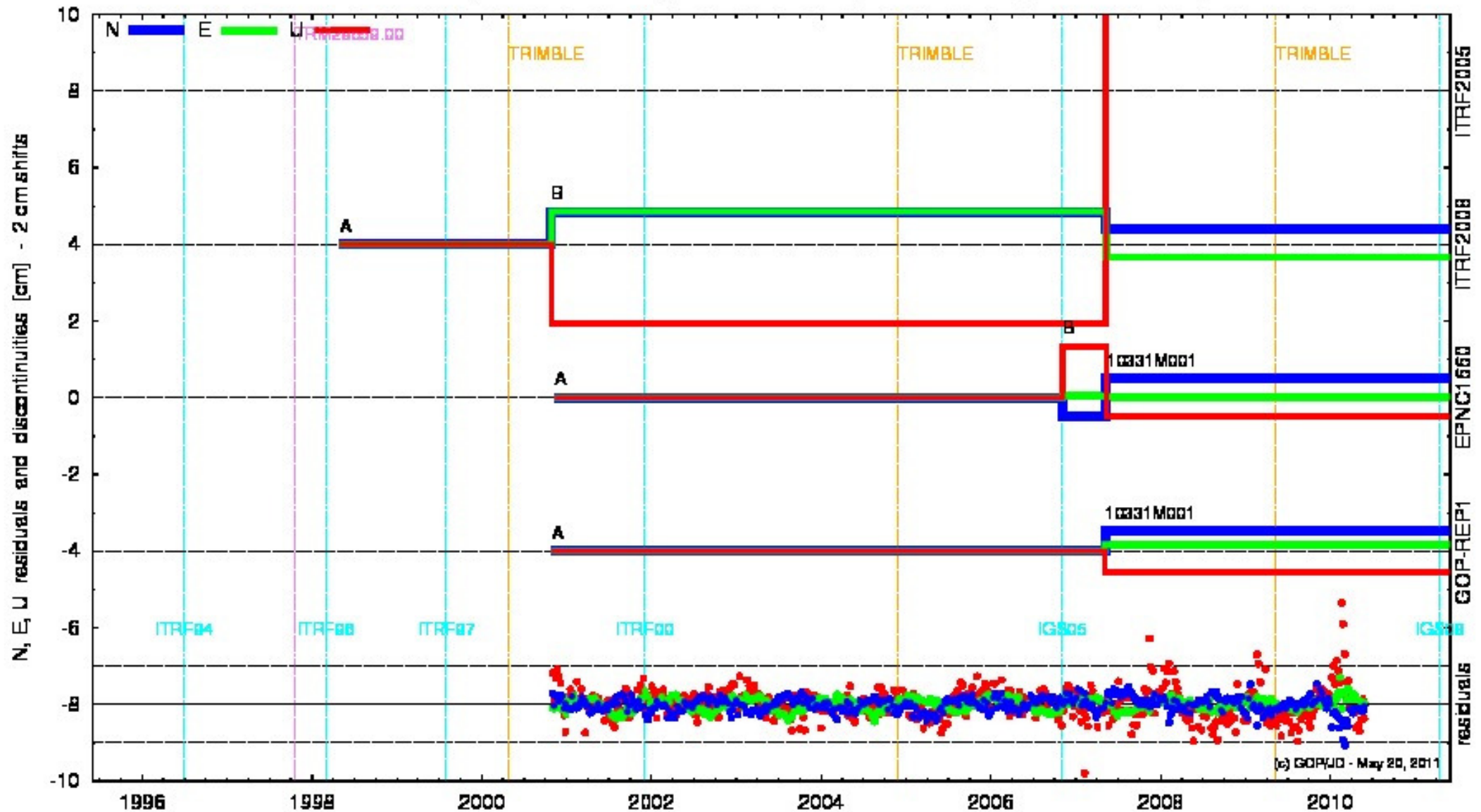
Discontinuity plot

RIGA discontinuities (and residuals) - ITRF2005, ITRF2008, EPNC1600, GOP-REP1
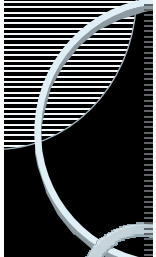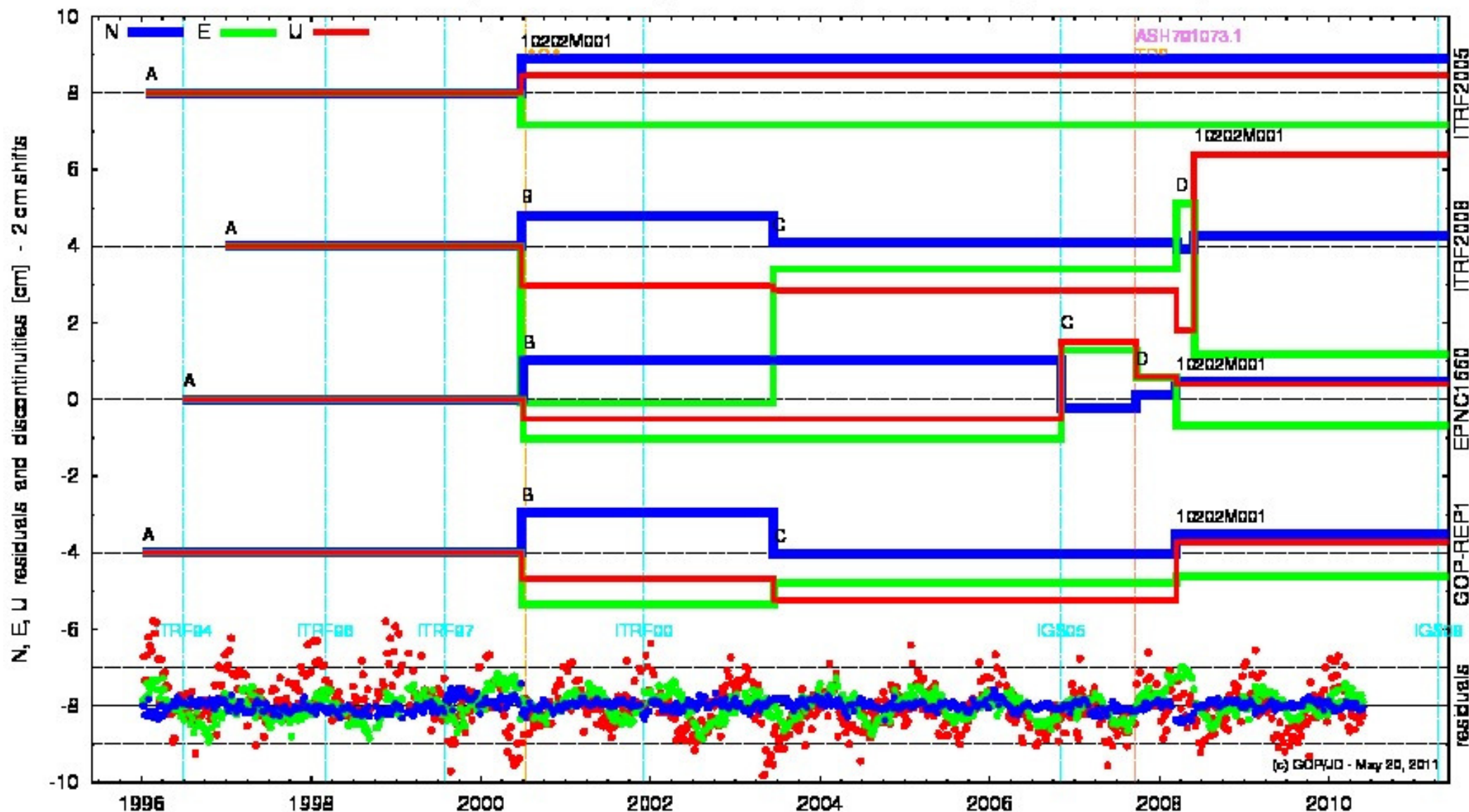
Discontinuity plot – ITRF2008 ?

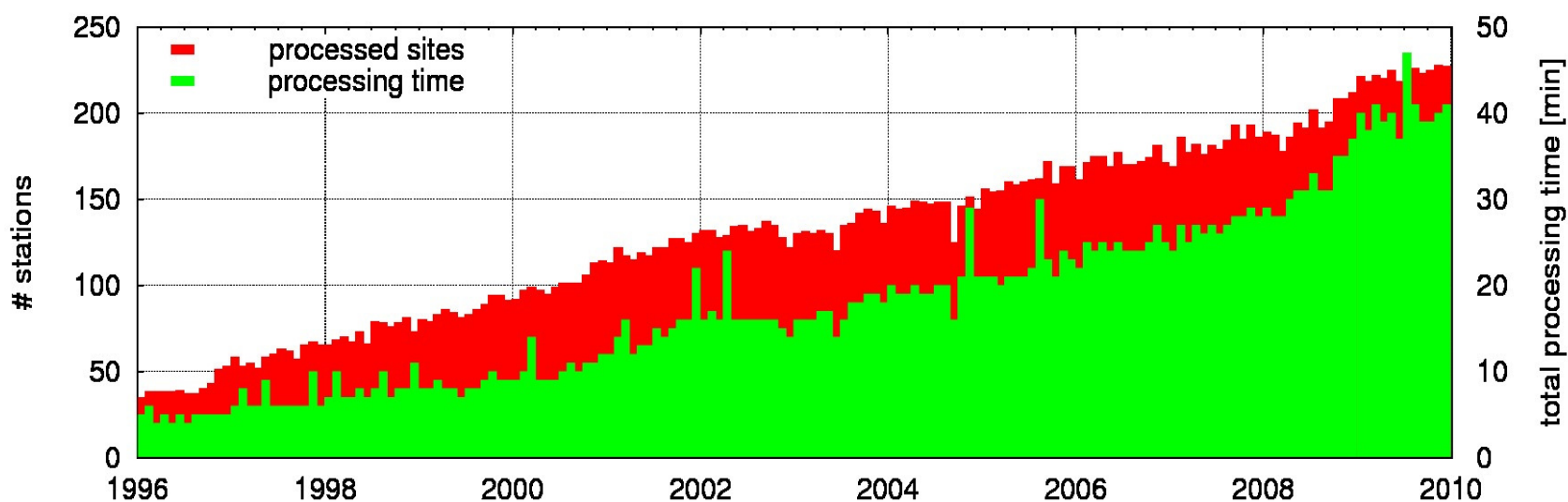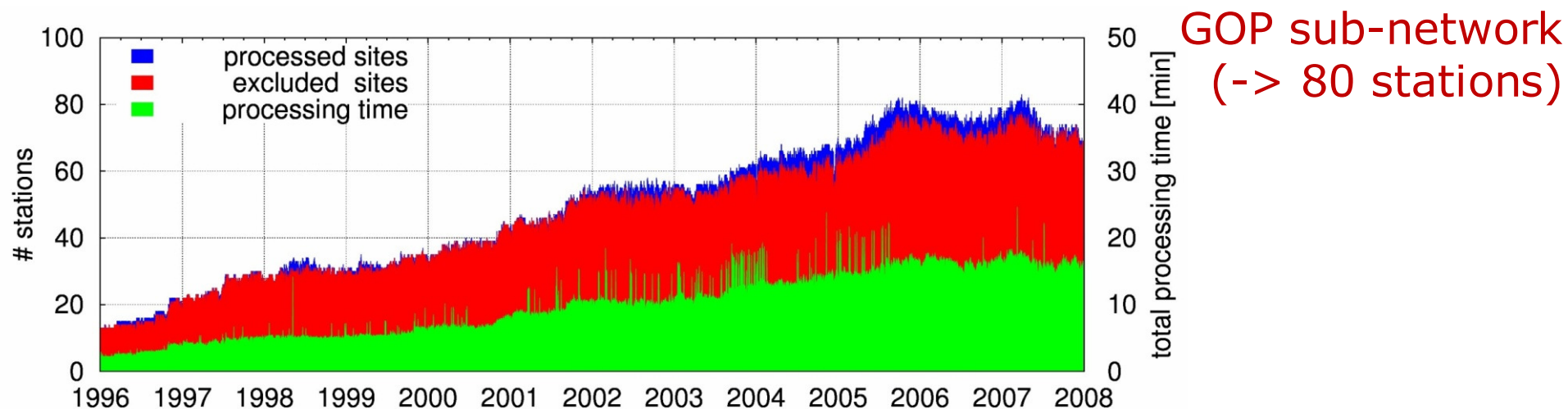TRDS discontinuities (and residuals) - ITRF2005, ITRF2008, EPNC1600, GOP-REP1
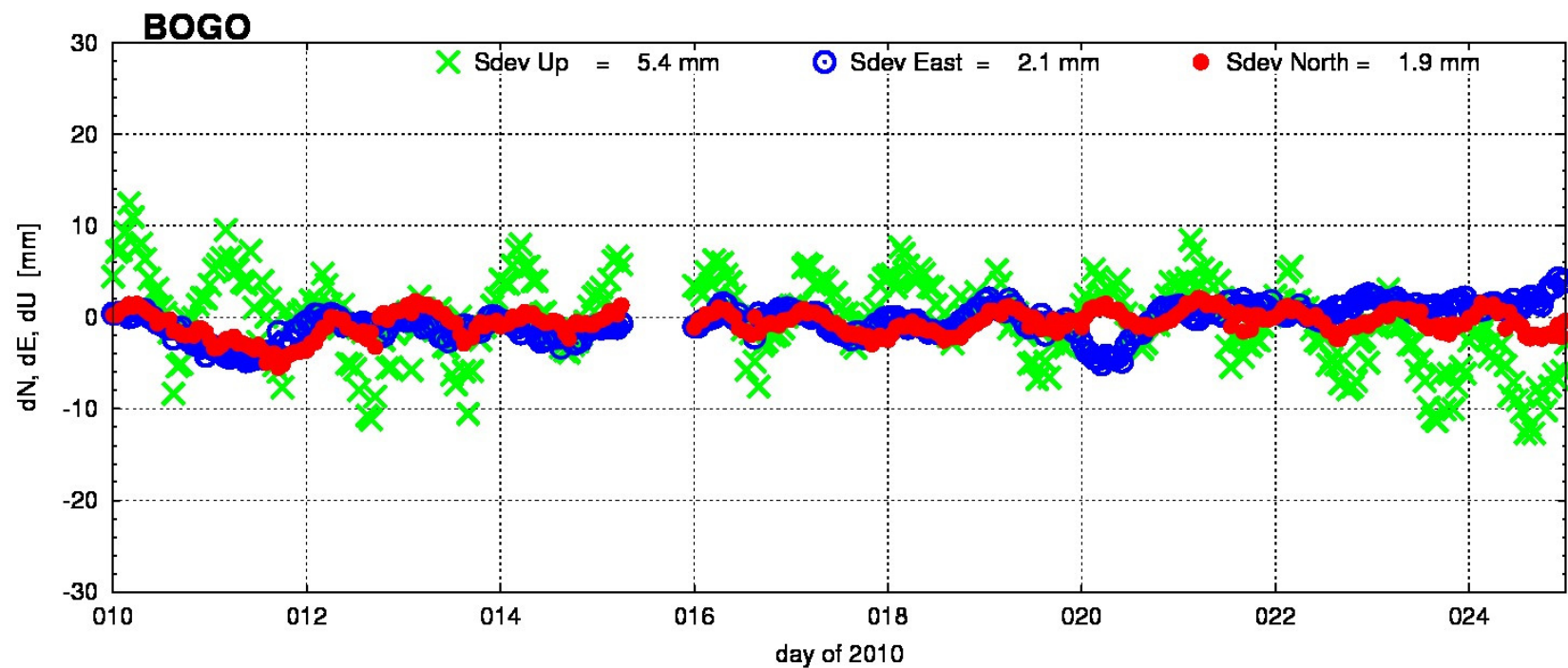
Discontinuity plot – ITRF2008 ?

REYK discontinuities (and residuals) - ITRF2005, ITRF2008, EPNC1600, GOP-REP1
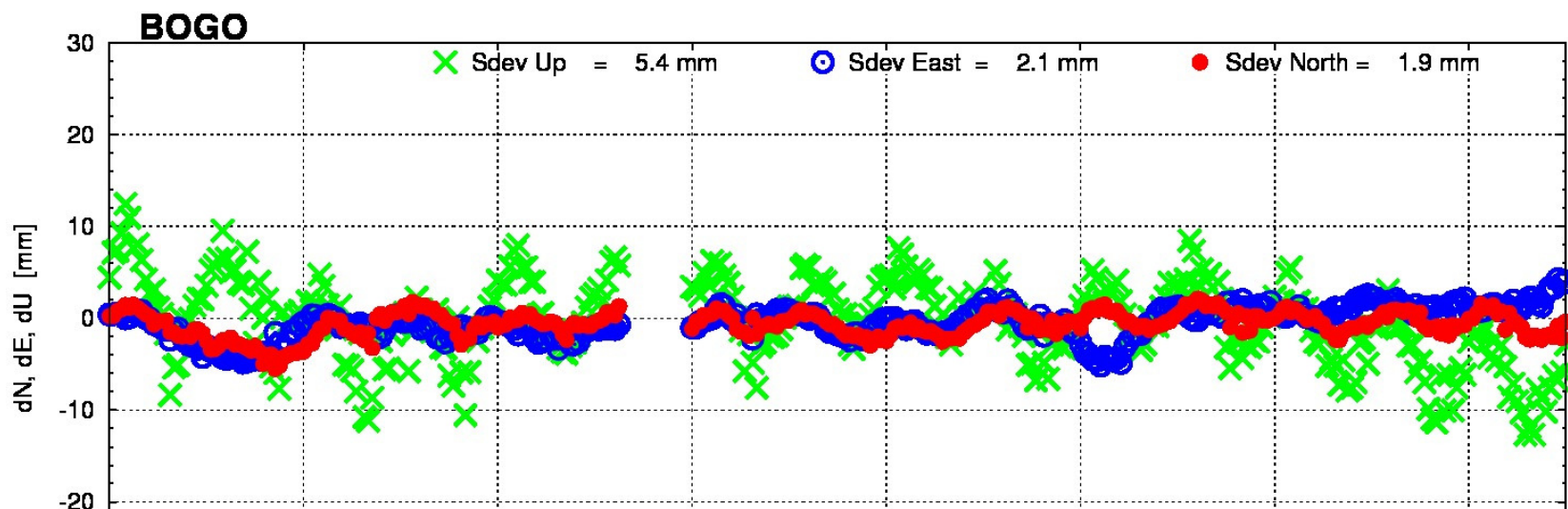
Number of stations x CPU

GOP sub-network
(-> 80 stations)

All EPN stations
(-> 232 stations)

Testing sub-daily solutions

Testing sub-daily solutions

BOGO

Sdev Up = 5.4 mm   Sdev East = 2.1 mm   Sdev North = 1.9 mm

Coordinate precision dependence on processing window [ambiguity fixed]
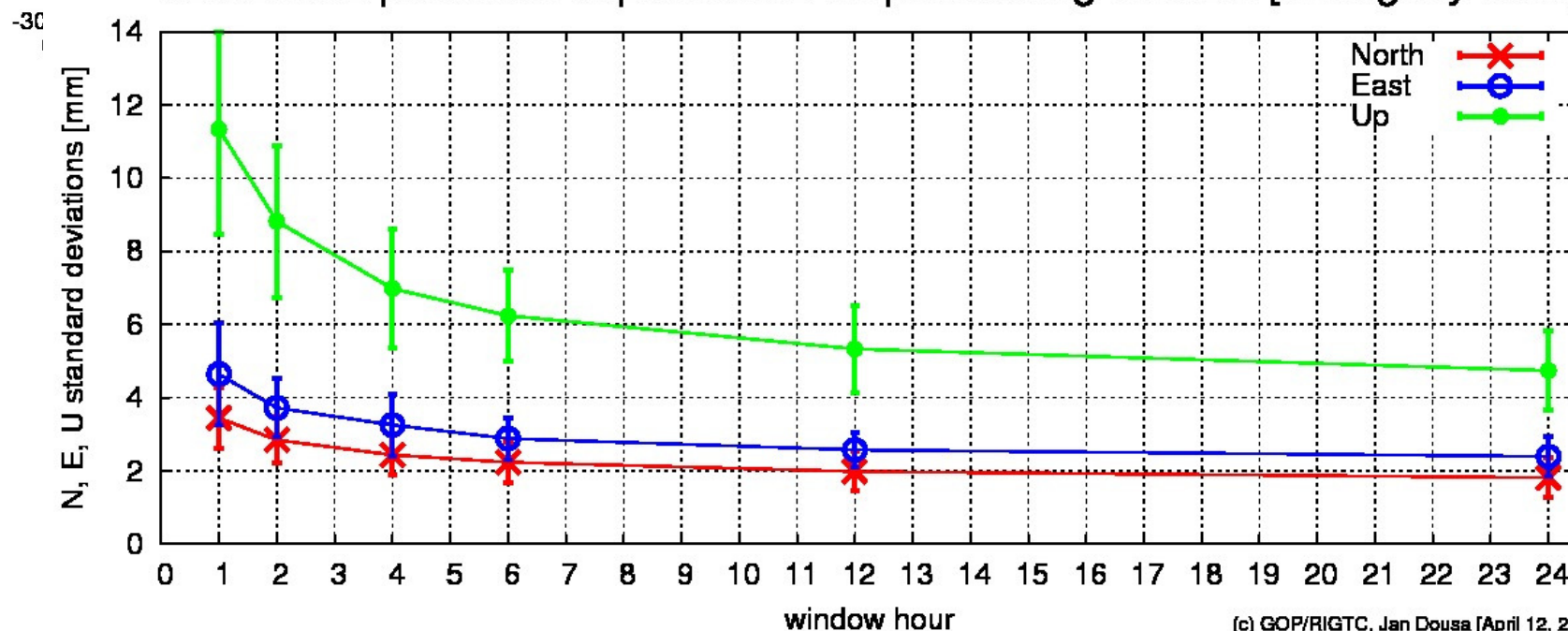
(c) GOP/RIGTC, Jan Dousa [April 12, 2011]

Summary

- **GOP EPN repro-1 solution developed and data processed**
- **benchmark dataset processed and uploaded in time**
- **weekly SNX+SUM and daily SNX+TRO uploaded in time to BKG**
- **capability of processing a full network tested**

- **raw weekly time-series of GOP repro-1 used for the assessment of the EPN cumulative solution reference datum definition**
- **a long-term combination provided (coord+vel)**
- **discontinuities plotted, compared to logged events and to ITRF2005, ITRF2008 and EPN cummulative discontinuities**