On the use of meteo data

or

How to raise the value of EPN's ZTD product?

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Introduction

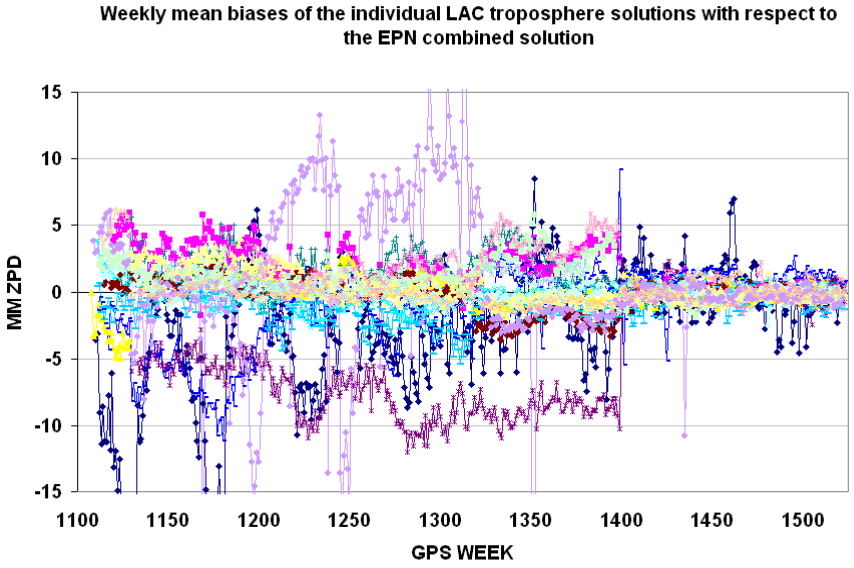
- **Last TWG (Jan Dousa's presentation):**
  - **“Towards more intensive exploitation of meteo data”**
  - **Presented data base at GOP**
  - **Presented NRT results, comparisons, etc.**
  - **Raised the question of use and benefit for EPN**
- **Action Items:**
  - **“common proposal on the use of meteo data”**
  - **“provide to EPN CB input for EPN”**
- **Today: attempt for a catalogue of possible “sources” and their benefit for the EPN**

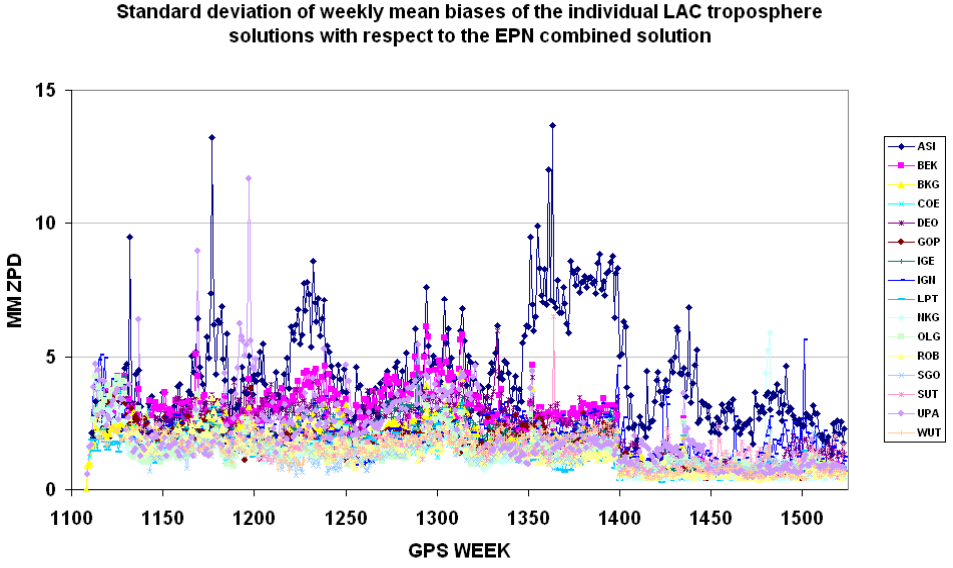
Introduction

- **Combination: several input solutions (intra-, inter-technique), one output solution**
- **Comparison: differences (intra-, inter-technique)**
- **Validation:**
  - **Comparison with solution of “higher” accuracy**
  - **Using solution in same environment**
- **Assimilation: using the solution in a different environment (e.g. meteorology)**

EPN combined solution

- 16 individual solutions as input
- 14 BSW, 1 Gipsy, 1 MicroCosm
- Combination by Perl scripts and Fortran program
- Major improvement with GPS week 1400
- Weekly mean bias over all stations +/- 2-3 mm, standard deviation +/- 2-3 mm (internal precision)





Comparison: GNSS-NRT

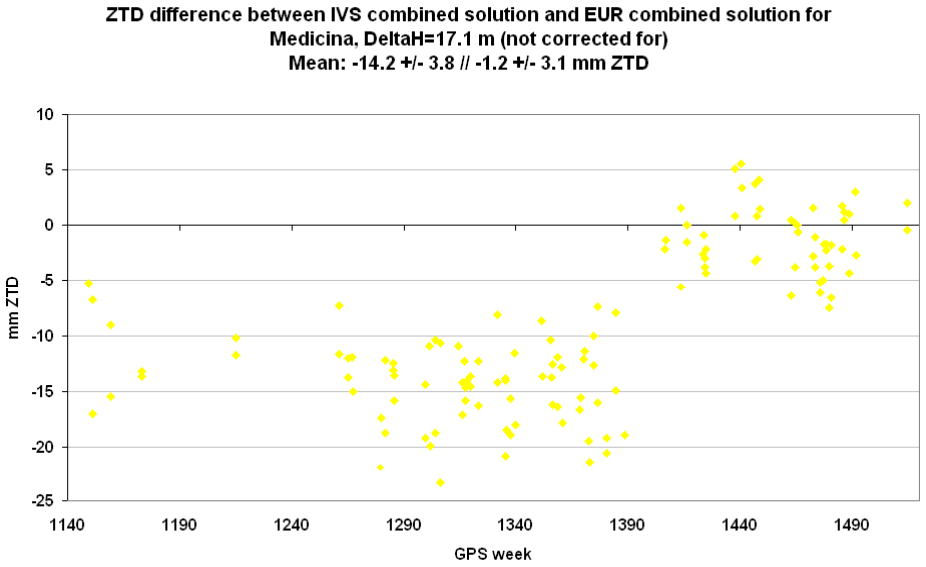
- **Almost all EPN stations available (+)**
- **“wrong way round”: comparing the “good” solution with the “less good” solution (-)**
- **Currently, hourly computation not in the scope of the EPN (o)**

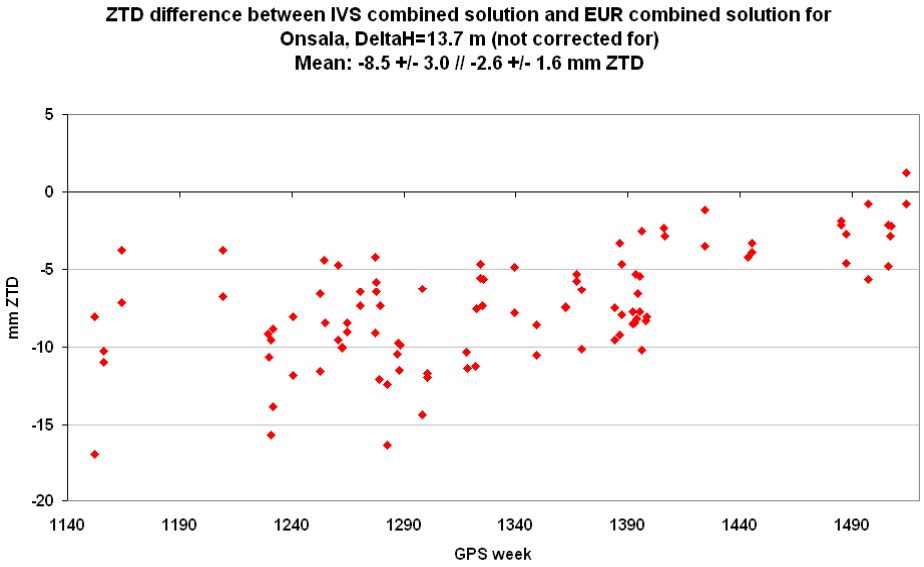
Comparison: GNSS Post-Processing

- **Against IGS combined product**
  - **Station coverage (i.e., IGS stations within the EPN) ~ 45 (o)**
  - **Until GPS week 1399 only (-)**
  - **EPN solution contained from 1203-1399 (-)**
- **Against IGS PPP solution**
  - **Station coverage ~ 75 (+)**
  - **Only periodically available? – weekly, fortnightly, delay < EPN combination**
  - **Higher noise level (5 minutes interval) (-)**
- **Within EPN**
  - **Site-specific, LAC-specific analyses (new pages)**
  - **Time series analyses, monthly biases, etc.**
  - **Poster presentations of M. Kruszyk (LAC workshop 2008, EUREF symposium 2009)**

Comparison: VLBI

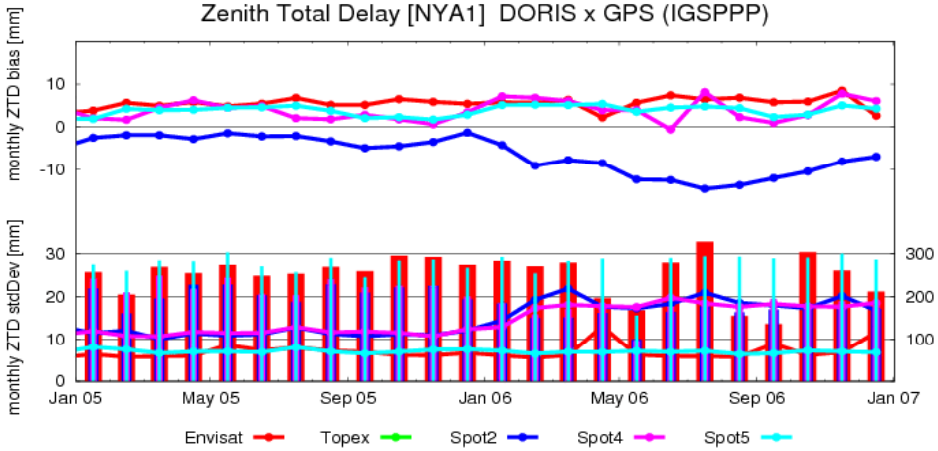
- Other, independent geodetic technique (+)
- SINEX TRO files available (easy comparison) (+)
- Only sparse network in Europe available (~ 6 stations (NYAL, ONSA, METS, WTZR, SVTL, MATE (NOTO?, YEBE?)) (-)
- Only weak temporal coverage (24 hrs session, over day boundaries) (-)

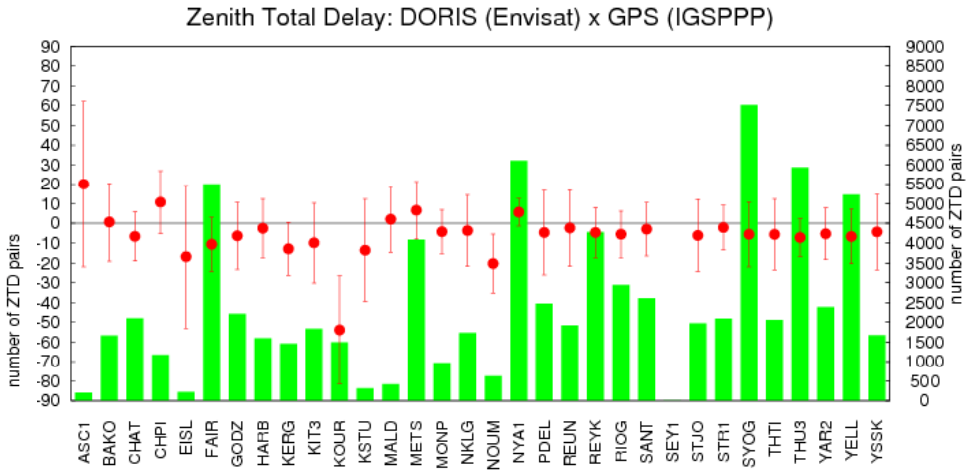




Comparison: DORIS

- Independent geodetic technique (+)
- Only sparse network in Europe available (~ 7 stations (NYAL, METS, REYK, TOUL, PDEL, two stations in Greece)) (-)
- Low accuracy (-)





Validation: Radiosondes

- **Completely different technique and source (+)**
- **Quite good network available (100+ stations) (+), although only ~ 40 “co-locations”**
- **Diff**
  -
  -
  -
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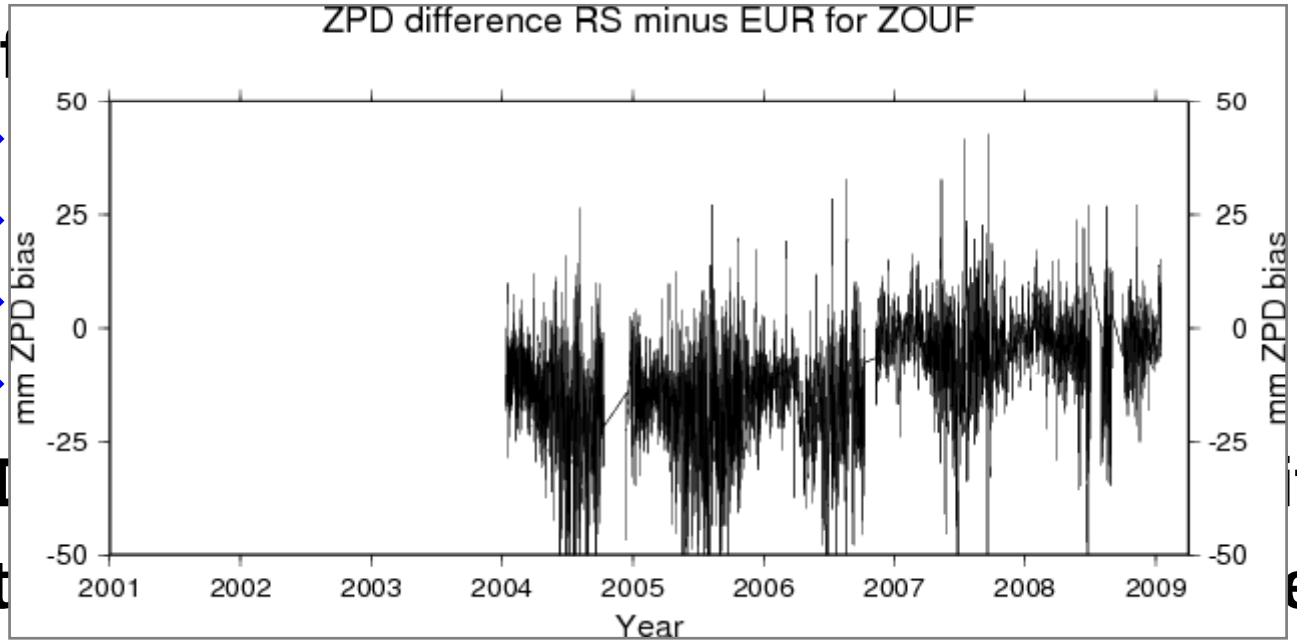
- **ZTD ity**
- **Ort ely**
- **Horizontal distances between EPN stations and radiosonde ascent as source of biases?**
- **Vertical distance as source for biases?**
- **Systematic effects by, e.g., wind directions?**



Validation: Water Vapour Radiometer

- **Independent and very precise technique (+)**
- **Sparse network (how many)? (-)**
- **Processing of raw data by whom?**
- **Installed permanently?**
- **Partly significant biases between both techniques?**

Validation: Numerical Weather Models

- Completely different technique (+)
- Various models available
  - HIRLAM (High Resolution Limited Area Model) used e.g. in E-GVAP
  - ECMWF (European Centre for Medium-Range Weather Forecasts)
  - COSMO (Consortium for Small-Scale Modelling)
  - etc.
- Resolution?
- Coverage?
- Availability?
- Accuracy?

Validation

- **Use of EPN ZTD as input information in GNSS processing, e.g. of regional network solutions**

$\forall \rightarrow$ **M. Meindl et al., “Using IGS-Combined Tropospheric SINEX Data in CODE EUREF Test Analysis”, EUREF symposium 2002**

Assimilation

- **Use of GNSS results / products for numerical weather prediction or climate studies**
  - **For NWP (near) real-time solutions necessary**
  - **For climatology long time series with superior accuracy necessary**

Next steps, suggestions, open questions

- **Working steps:**
  - **Exchange of information**
  - **Catalogue of possible “sources”**
  - **Catalogue of possible applications**
  - **Vision for the future ...**
- **Contacting other people for interest**
- **From EUREF: thinking aloud**
- **TWG expresses its interest**
- **TWG supports the targets, ideas, ...**