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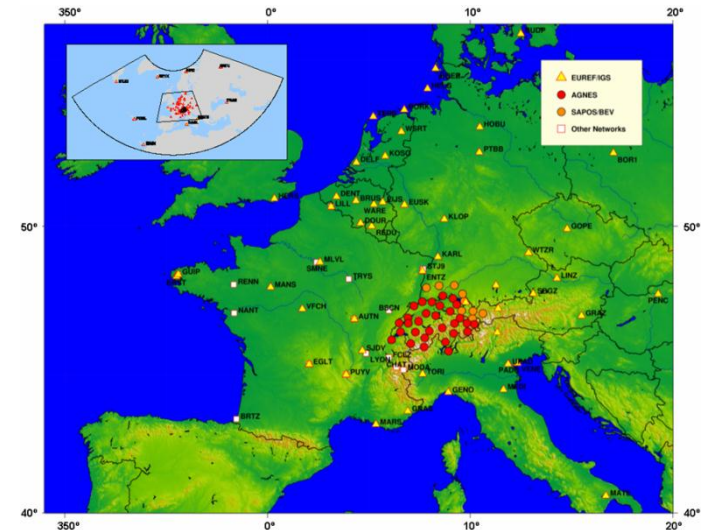
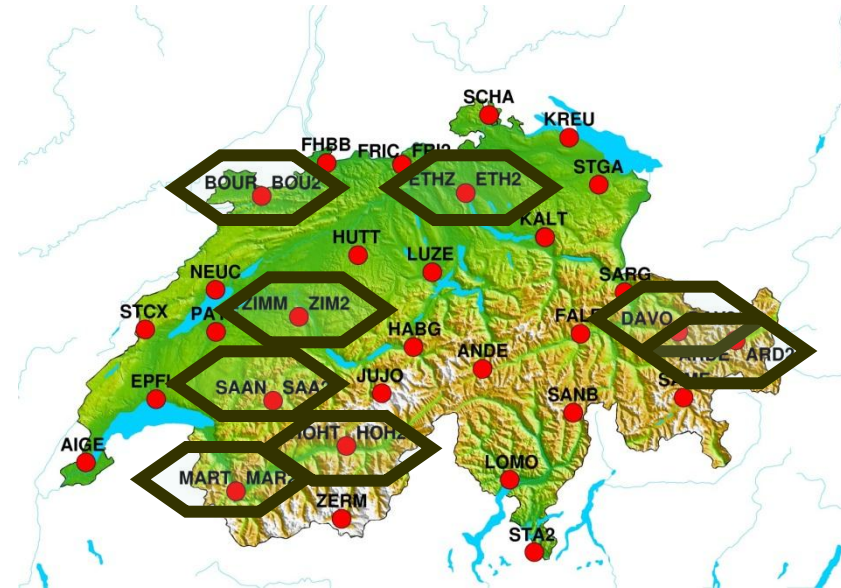
# **swisstopo Report for EGVAP 2013**

E. Brockmann



# Swiss Permanent Network AGNES

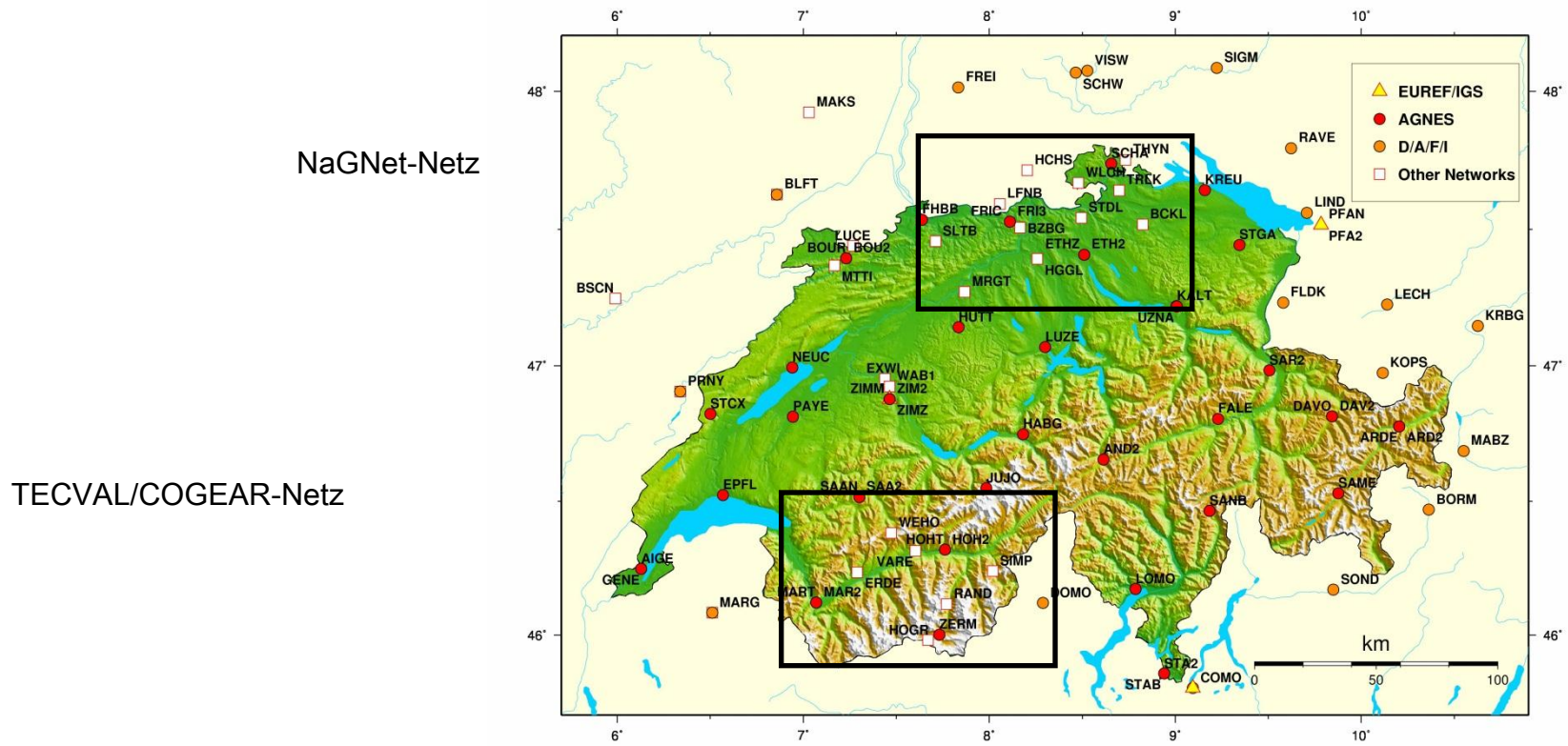
- 30 stations
- since 1998 operational
- 50 km spacing
- GNSS since 2007.5  
(22 antenna changed +  
but 8 double stations for  
reference frame monitoring)
- Nested in IGS+EPN permanent  
networks
- Provider of a positioning service
- Submission to EGVAP: LPT\_  
(Bernese) + LPTR (realtime,  
Trimble) contribution





# Network – densification in Switzerland

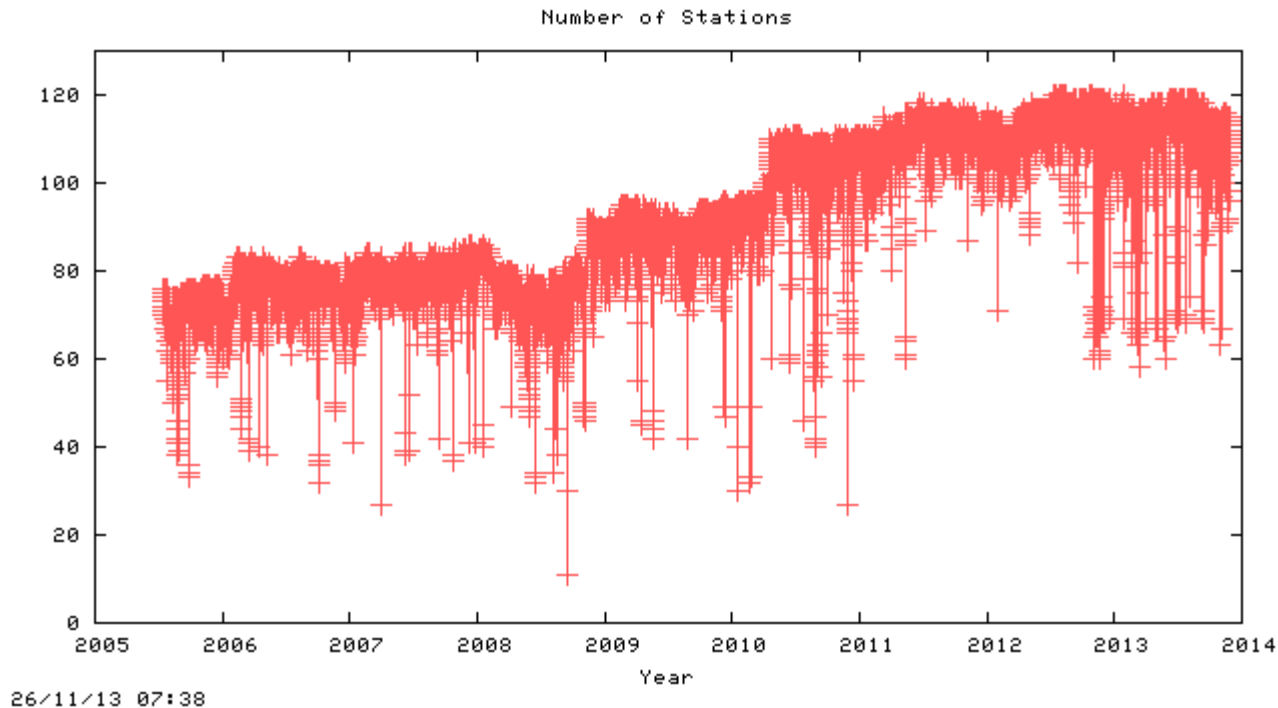
- included denser Swiss networks (mainly for tectonic purposes, but also with Tropo contribution)





# Number of stations processed in NRT

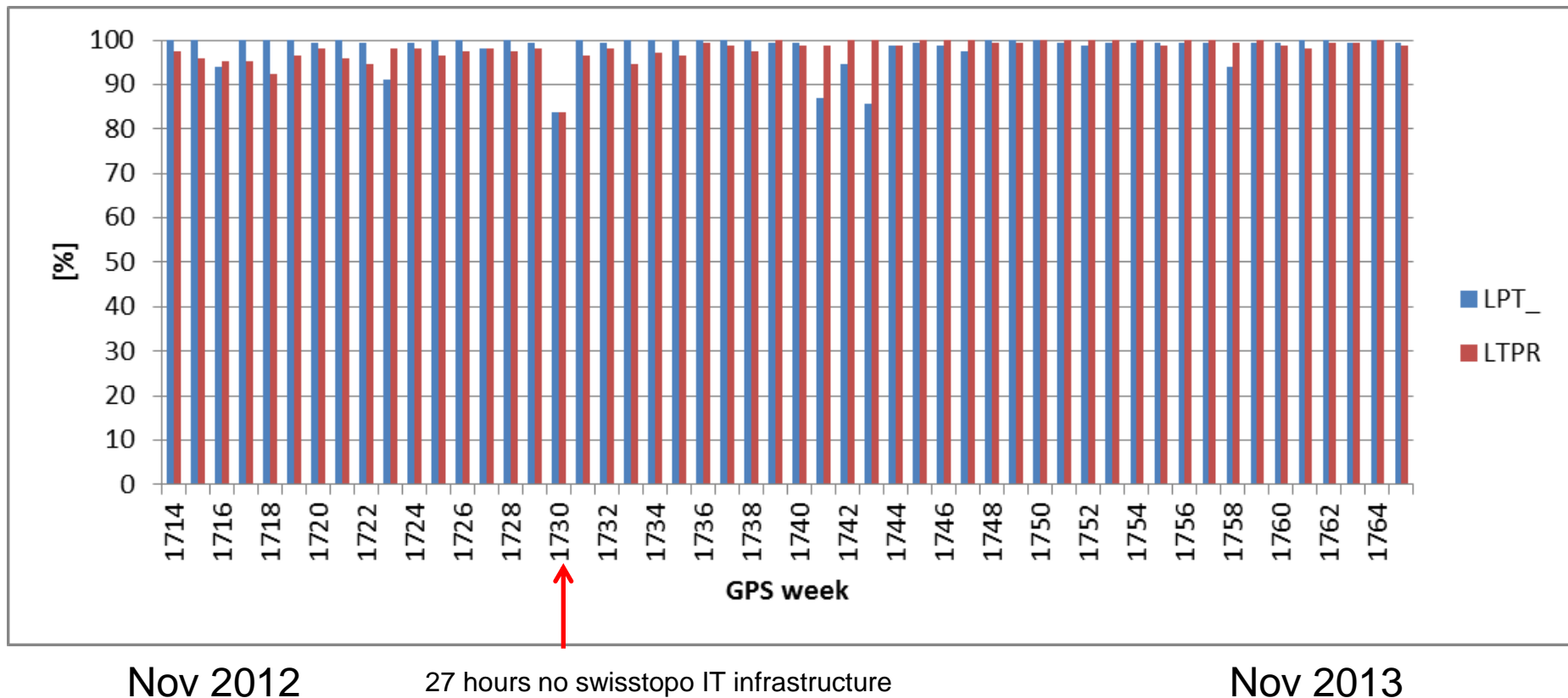
- # stations almost constant since 2012 – still improvements necessary in the European station data flow





# Availability

- Last 52 weeks: Availability: LPT: 98.30 % LPTR: 98.00 % (almost identical as last year)





# BSW5.0 to BSW5.2: Approach

BSW5.0 BPEs transferred to BSW5.2 (no use of RNX2SNX, to keep some specifics of the previous processing procedure)

Two step approach:

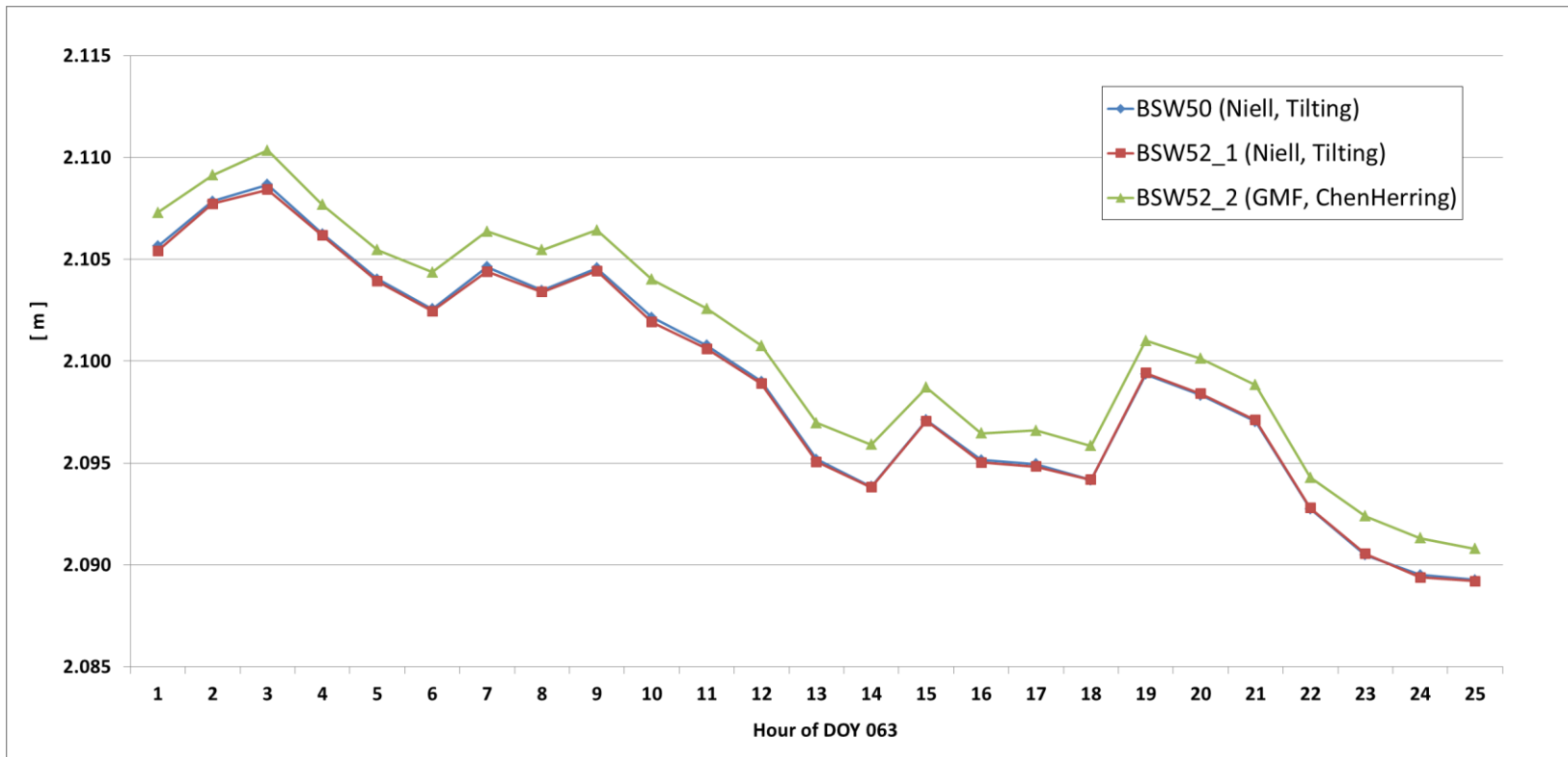
- Step 1: BSW5.0 to BSW5.2 with options as close as possible to “old” processing with BSW5.0
- Step 2: Activate new options, amongst others:
  - Troposphere GMF / Chen Herring for gradients
  - Antenna calibration values for GLONASS
  - IERS2010 conventions
  - Higher order ionosphere
  - Moderate handling of potential GPS quarter cycle phase biases
  - (Intersystem translation parameters and troposphere bias for GLONASS set up, but deleted for final solution)



# BSW5.0 -> BSW5.2: Troposphere

## Influence of new modelling (GMF)

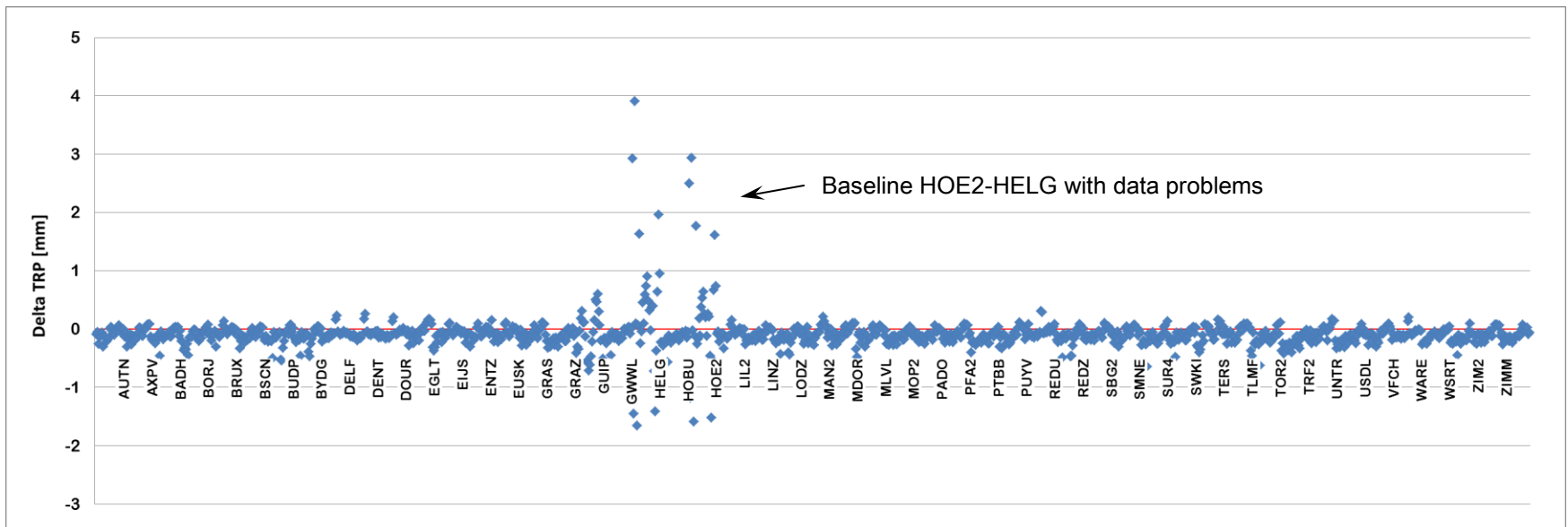
- Site ZIM2, DOY 063 2013, 24 hourly troposphere parameters



# BSW5.0 -> BSW5.2: Troposphere

## Similar options

- All sites, DOY 063 2013, 24 hourly troposphere parameters for each site
- Mean: - 0.1 mm, STD: 0.3 mm

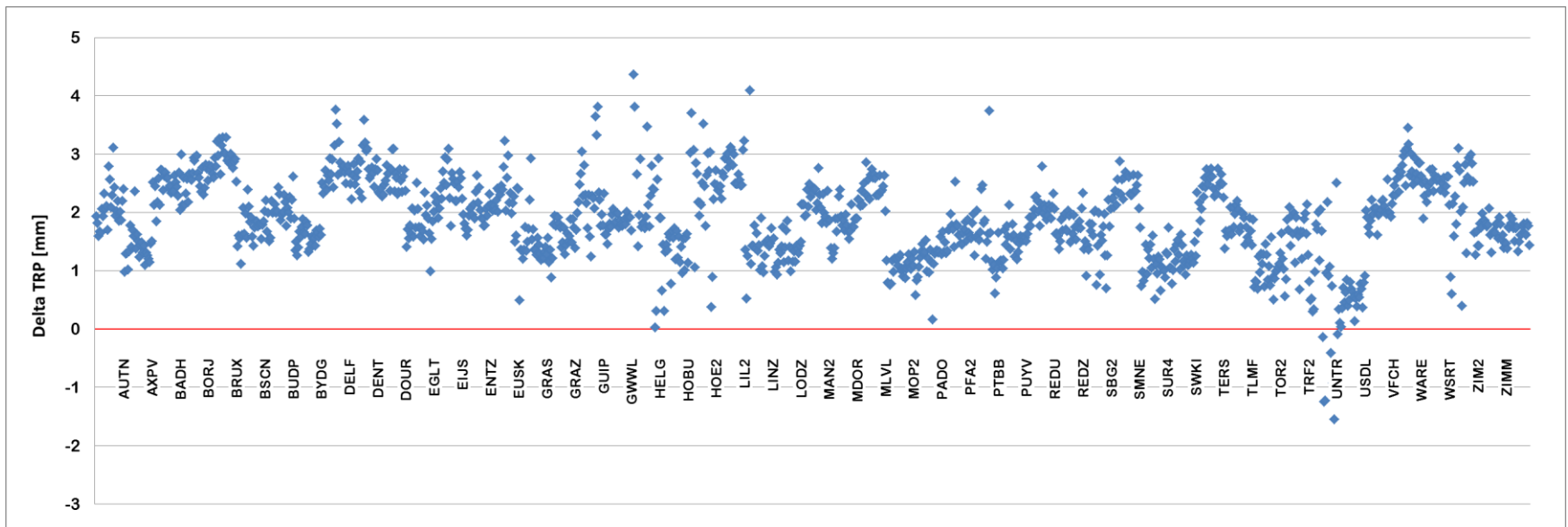






# BSW5.0 -> BSW5.2 Troposphere GMF/ChenHerring (+ other new options)

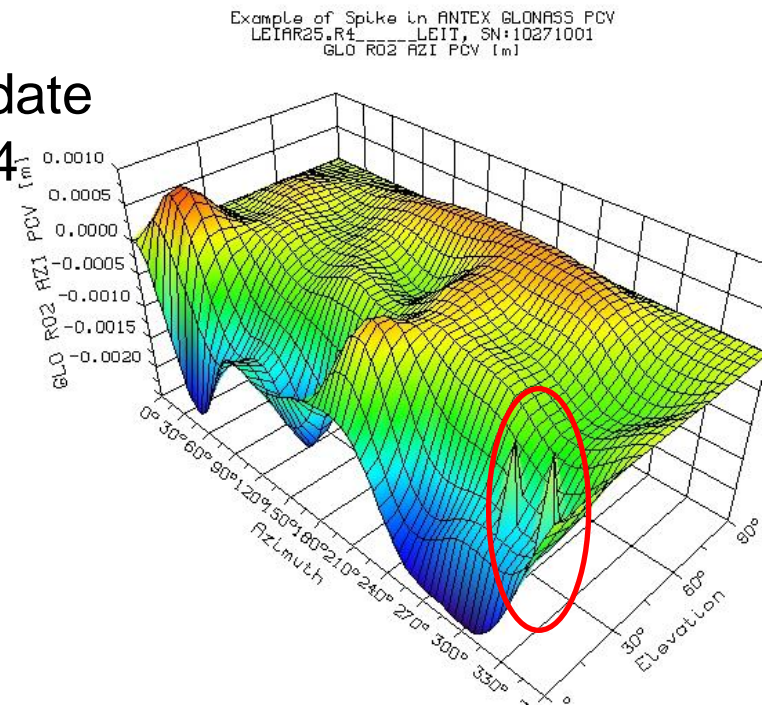
- All sites, DOY 063 2013, 24 hourly troposphere parameters for each site
- Mean: 1.9 mm, STD: 0.7 mm





# Further improvements

- BLQ Update (FES2004)
  - New update due Differences due to a bug correction for the post-processor used for sites situated near coasts
  - Maximum difference of 0.7 mm for site HELG (for M2 amplitude)
- “Spikes” removed in IGS GNSS (GLONASS) PCV model with update from IGS08\_1731 to IGS08\_1734 (nominally to be considered as of 31 March 2013) – effect is tiny ( $< 0.5$  mm on coordinates)





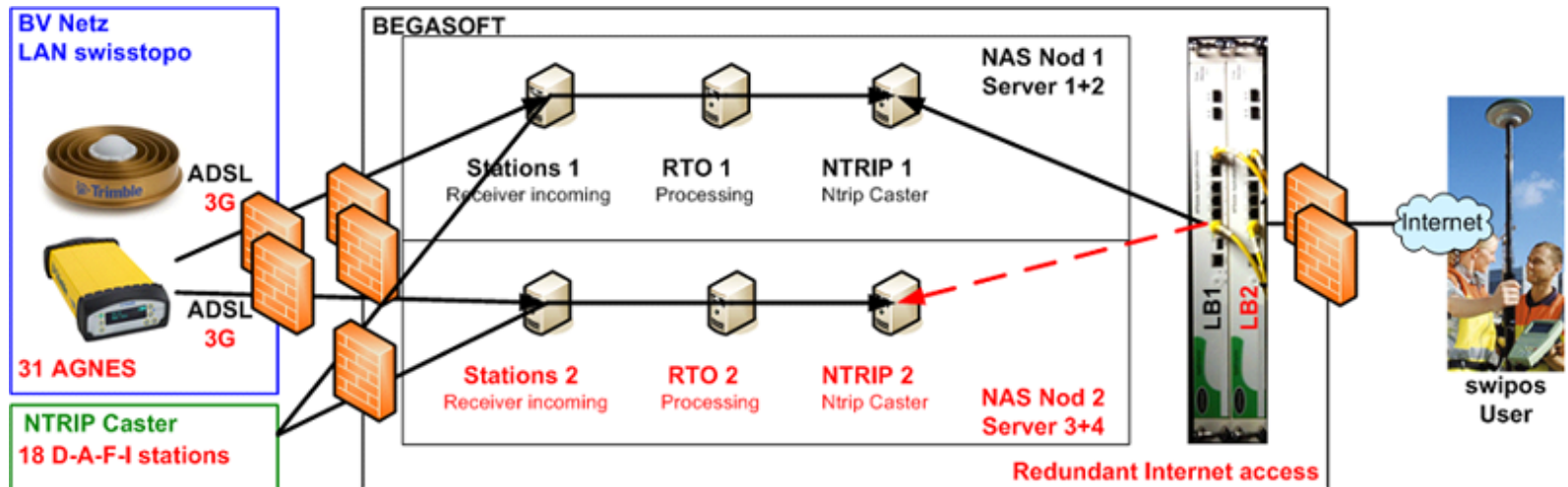
# Processing remarks: LPT\_

- **Summary:** Change from BSW50 to BSW52 and new model changes
  - Scale: -2.3 ppb (-1.0 Shapiro, -0.3 IERS 2010, -1.0 Tropo mod. (GMF))
  - CRD-Differences: max. 2 mm hor., 5.5 mm vertically
  - **Tropo-Differences: mean: 1.9 mm, std: 0.7 mm**
- Detailed tests on the **postprocessing solutions** and change **April 15, 2013** (week 1731) – near-realtime solutions simply switched (2 hours parallel, 2 hours missing due to switching also the data flow): **June 4, 2013** (DOY 155)
- Improvements/errors in BSW52 flew back to Astronomical Institute – Update of Version + Scripts expected very soon.



# Processing remarks: LPT\_

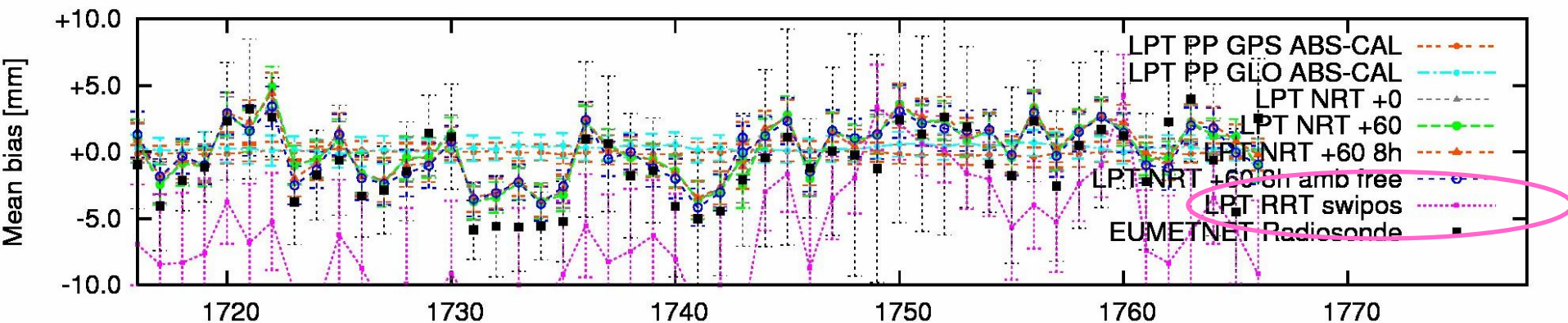
- Software changed from GPSNet <sup>2012.2</sup> → VRS3Net <sup>2013.3 (May 6)</sup> → Pivot (TPP)





# Tropo Bias

- Still a tropo bias (with VRS3Net as well as TPP) – winter > 10 mm ZTD, summer < 5 mm
- Bias was not visible in the old Trimble GPSNet – Trimble developers informed but no explanations



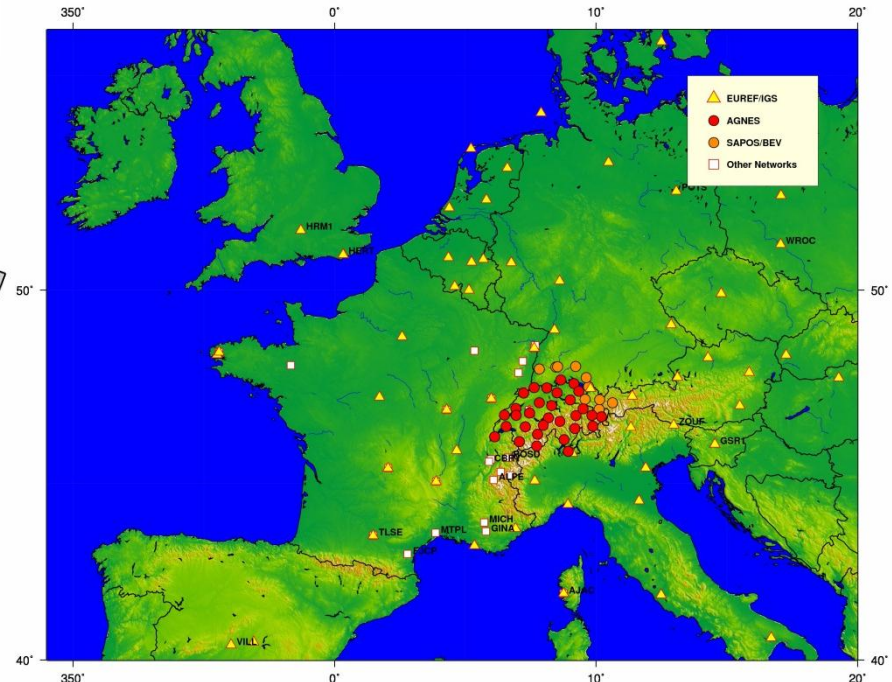
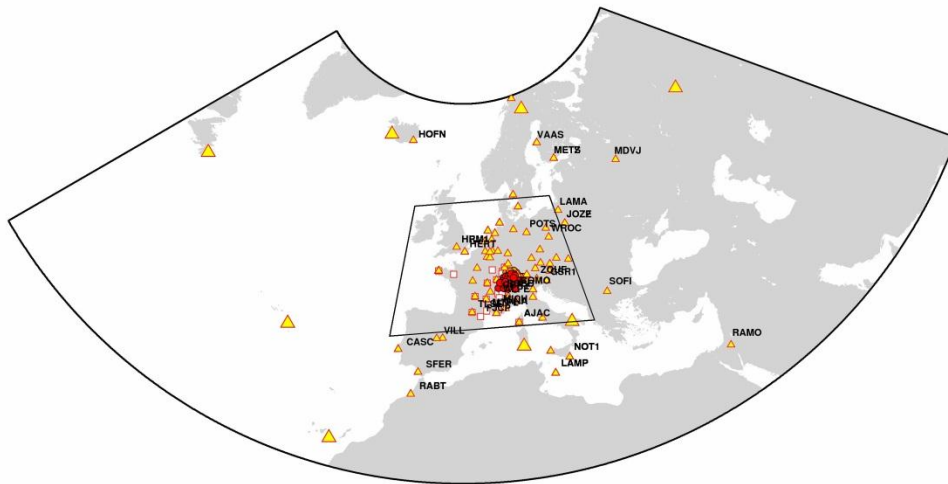
Nov 2012

Nov 2013



# Reprocessing activity ...as contribution to GNSS4SWEC started

- Reprocessing of all (+ additional; with names on plot) stations: max. 164 stations, 11 well-performing from EUREF, 34 additional sites (19 IGS, 25 EUREF, 9 RGP)
- Processing of additional national local permanent sites (11 NaGNet, 6 Tecval/Cogear, 2-3 other sites)







# Reprocessing activity

- Based on CODE products (orbits, clocks, etc.) 1996-2011
- Based on BSW52 (Jan 2013)
- Based on 2 new Linux server, each 32 cores (July 2013)
- Based on an already optimized processing scheme (Sept. 2013)
- Processing activities started September 2013 – bugs in BSW52 already reported back to Uni Bern – updated BSW release is planned – updated CODE products already available
- First run successfully finished in Nov. 2013 – but further finetuning necessary
- EUREF reprocessing activity including test campaign (identical data processed by all EUREF ACs) also started in Nov. 2013



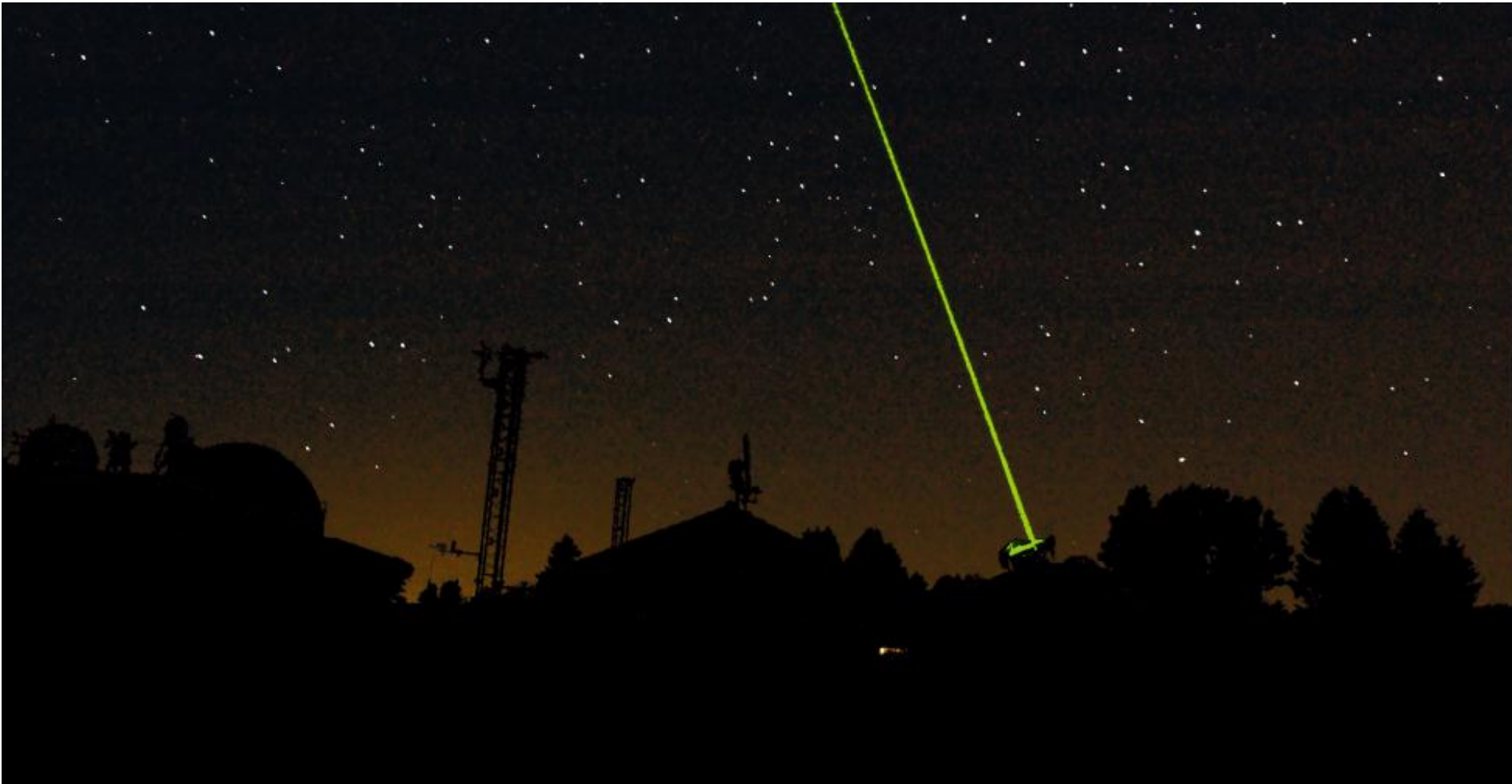
# Further planned activities

- Reprocessing 1996-today: continuation, fine tuning, Validation EUREF participation, EUREF+COST GNSS4SWEC contribution
- Prepare solutions supporting Multi-GNSS
  - collaboration in EUREF – chairing MULTI-GNSS WG, IGS MGEX project
  - Enhancement of the Swiss Permanent Network
  - handling format issues RINEX3, RTCM3+ HP MSM
- Implementing processing tools (Bernese batch processing, evtl. PPP, evaluate real-time methods, first Multi-GNSS processing)
- Personal resources:
  - New permanent position at swisstopo
  - new 3-yr phd at ETHZ (swiss budget for GNSS4SWEC)





# Zimmerwald by night (SLR observations)







# Zimmerwald

- Mounting of a dome on 10.10.13 - crane stabilized itself too close to the fundament of ZIM2
- “success” of the swisstopo double-station monitoring
- New coordinates ZIM2, mails to EUREF, IGS, users; unfortunately interruption of long-term time series; height / tropo, fortunately, not influenced

