ITRF2014 densification with EPN REPRO_2: first experiences

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based on the work of the REPRO_2 team:

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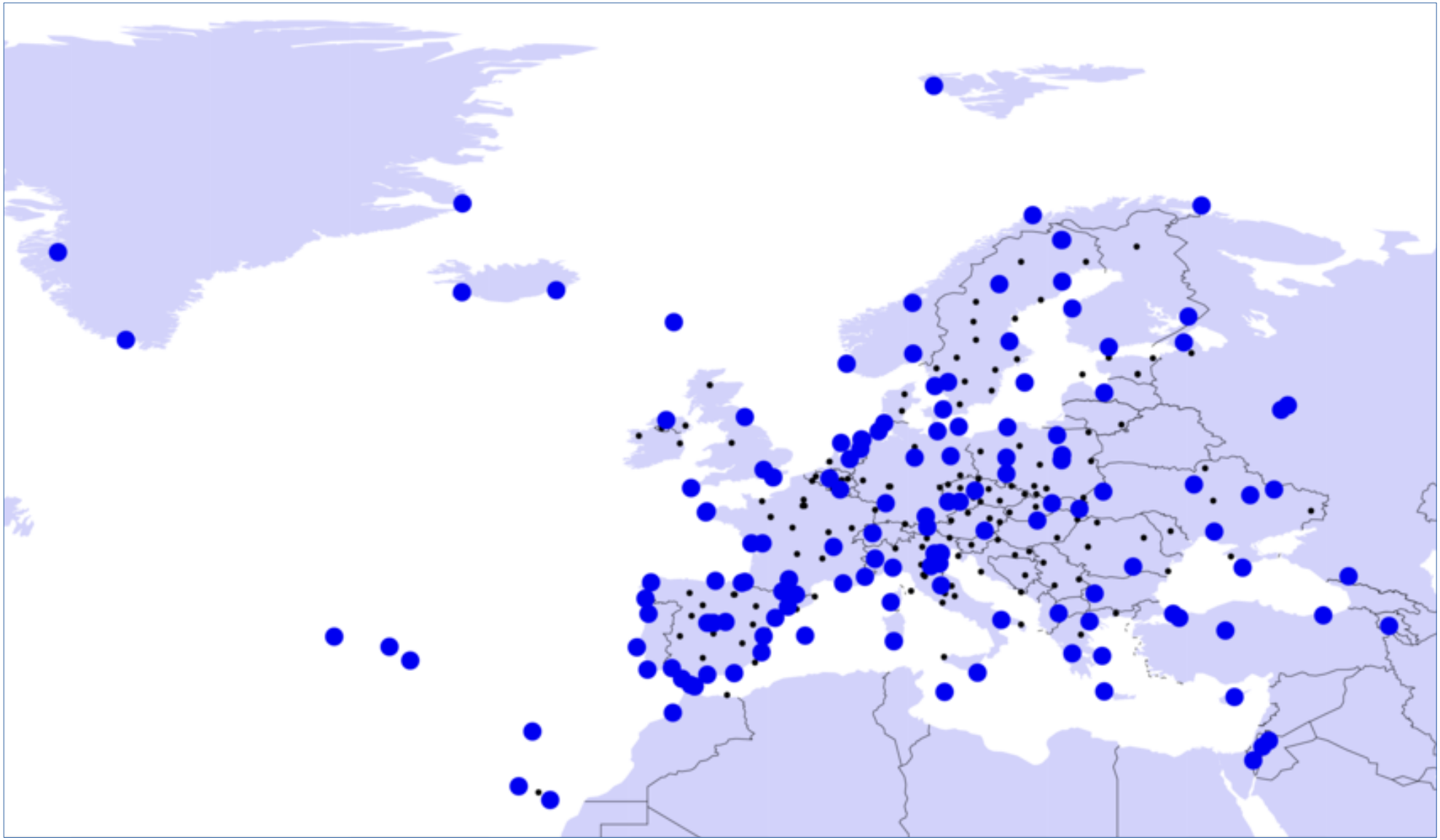
Donostia - San Sebastian
May 25th - 27th, 2016

EPN stations included in ITRF2014
154/324



EPN REPRO_2 OVERVIEW

- use all available RINEX data 1996 – 2013* (GPSwk 834-1772) from routine and historic data repositories
- only 3+2 Analysis Centres with 3 different software, but complete EPN solutions
  - GIPSY 6.2 (ASI)
  - Bernese 5.2 (GOP and LPT* + IGN Spain*)
  - GAMIT (MUT)
- various processing strategies were tested before
- strategy harmonized with IGS repro_2, **individual PCVs** were used where available (except ASI)
- weekly combination by the EPN ACC
- chance of conflict with routine analysis

* the 2014 submission is not considered as two submissions do not cover the entire year

EPN REPRO_2 TEST COMBINATION

- same combination strategy as in current routine combination (CATREF, MC)
- up to GPSweek 1772 (end of 2013)

BUT

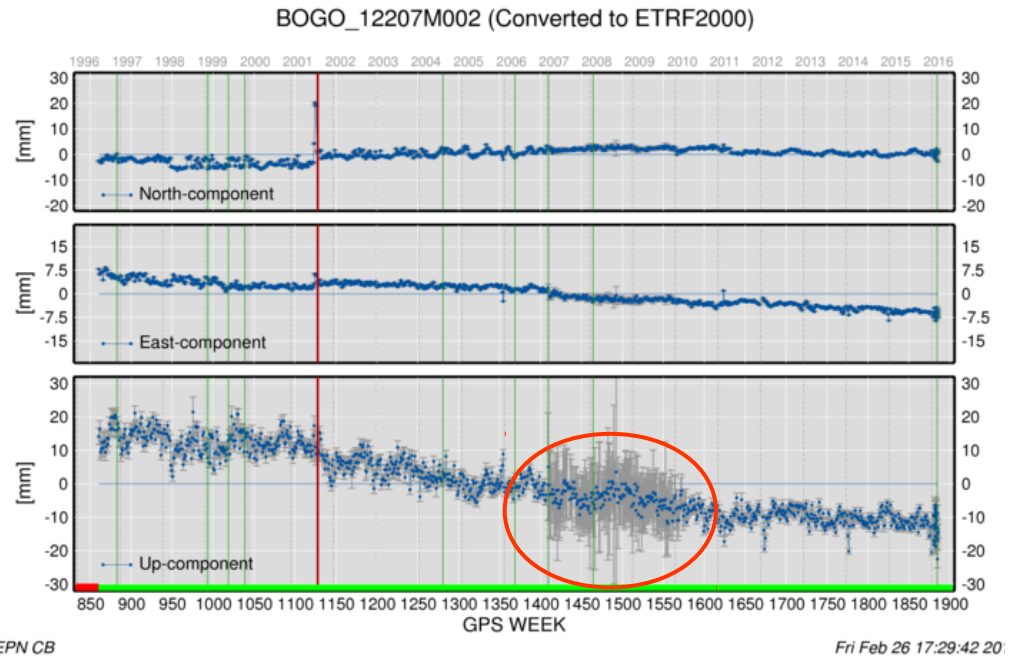
- updated discontinuity table and reference network
- new ITRF2014 features (seasonal & PSD) are implemented

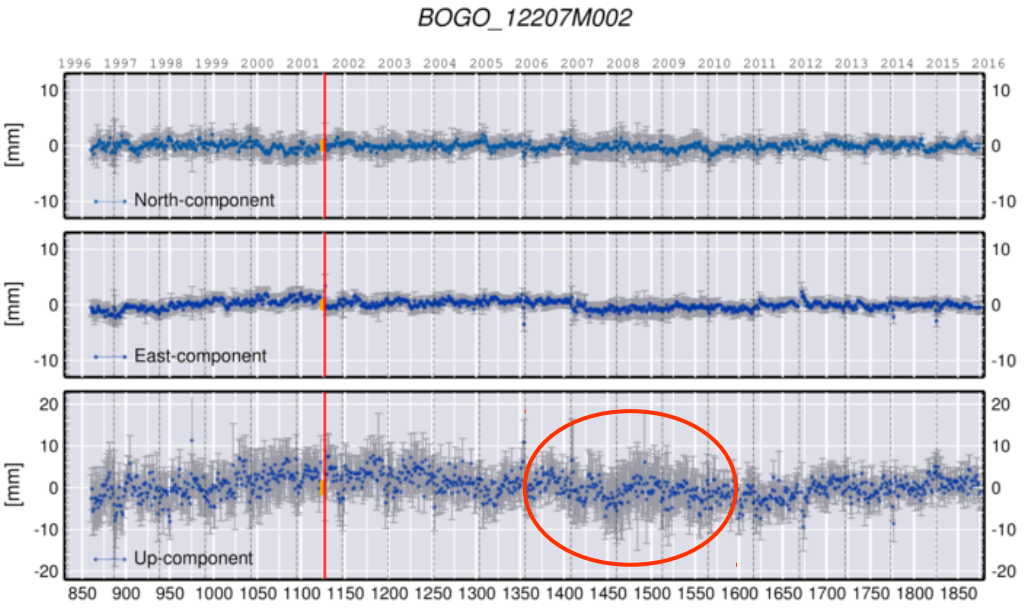
FIRST IMPRESSIONS

- **GENERAL IMPROVEMENT IS OBSERVABLE, REPRO_2 CAN BE PROPOSED AS EPN PRODUCT**
- **REMAINING DATA ISSUES: … DE JA VU …**

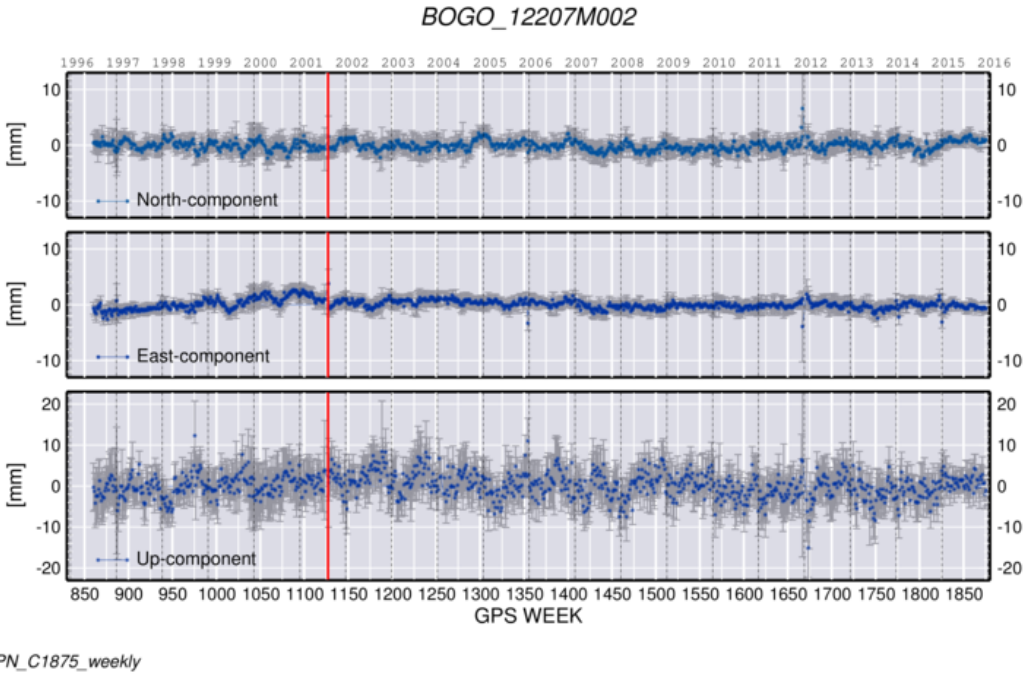
  BAD QUALITY PERIODS AND NON-EPN STATIONS WERE ALSO INCLUDED
- INDICATION OF SENSITIVITY TO HOMOGENEOUS "SUBNETWORKING"

GENERAL TIME SERIES IMPROVEMENT



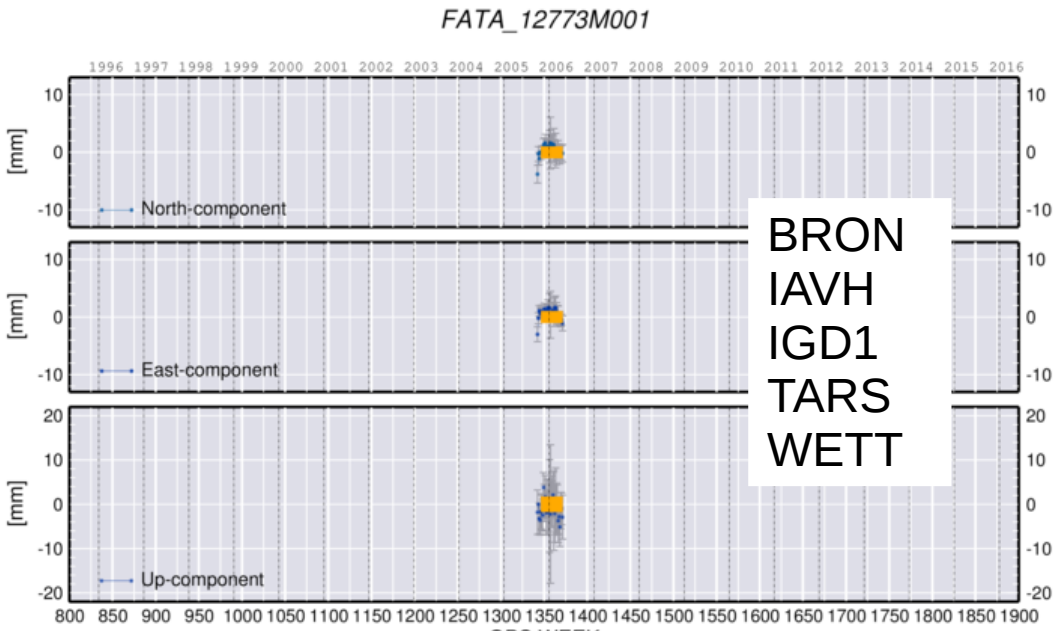


RAW AND CUMULATIVE ROUTINE

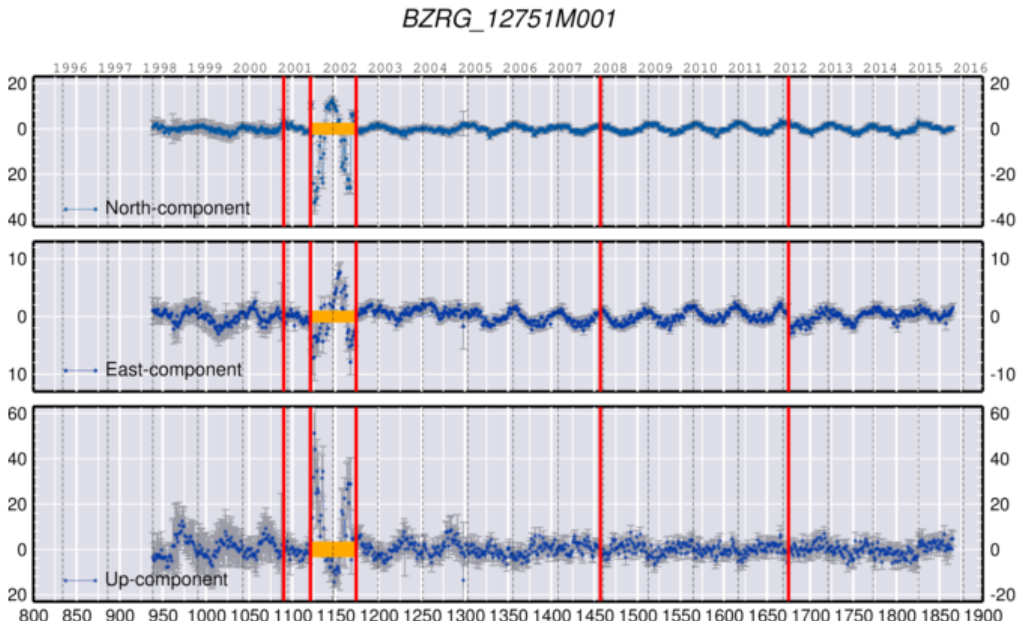


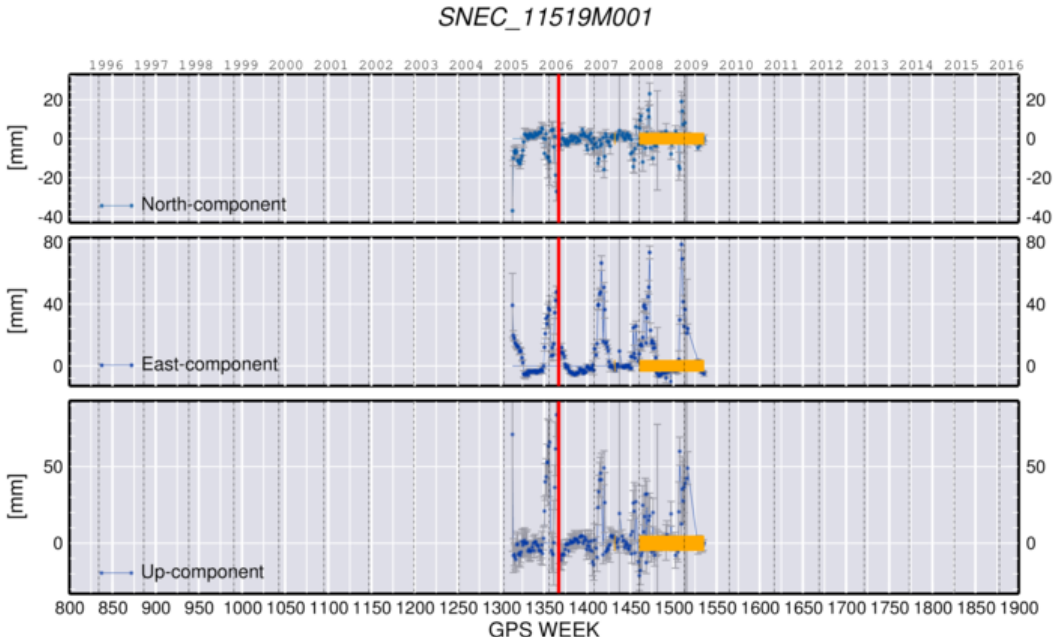
REPRO_2

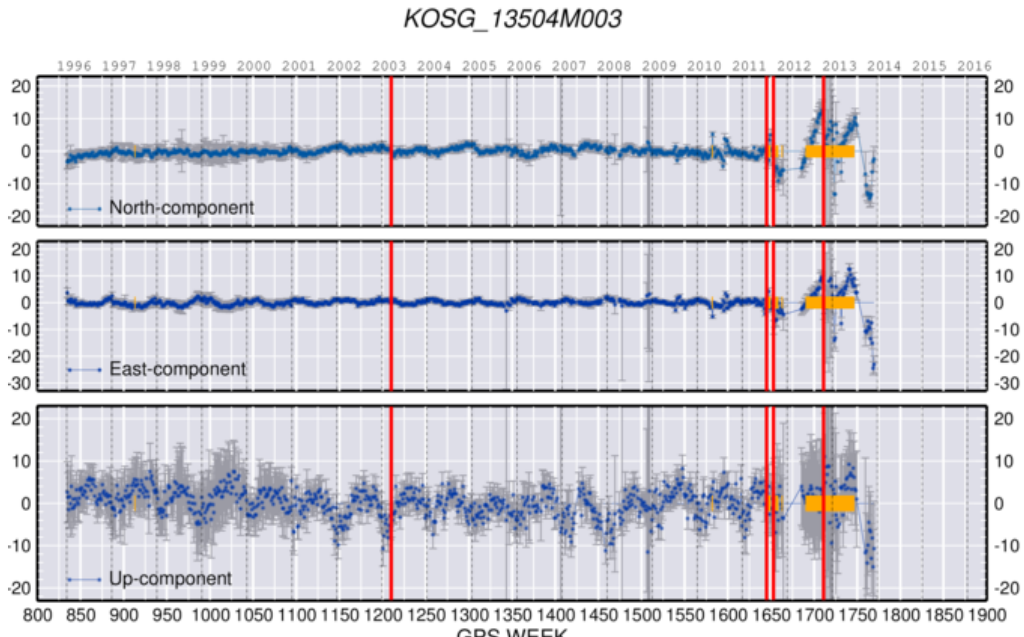
SHORT AND BAD DATA STILL INCLUDED



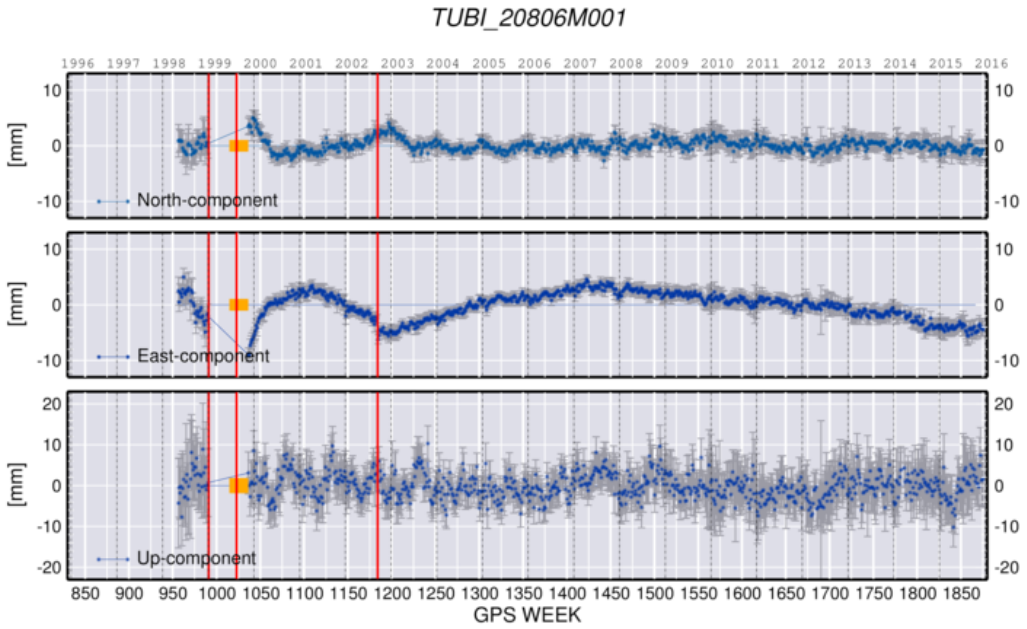
BRON
IAVH
IGD1
TARS
WETT





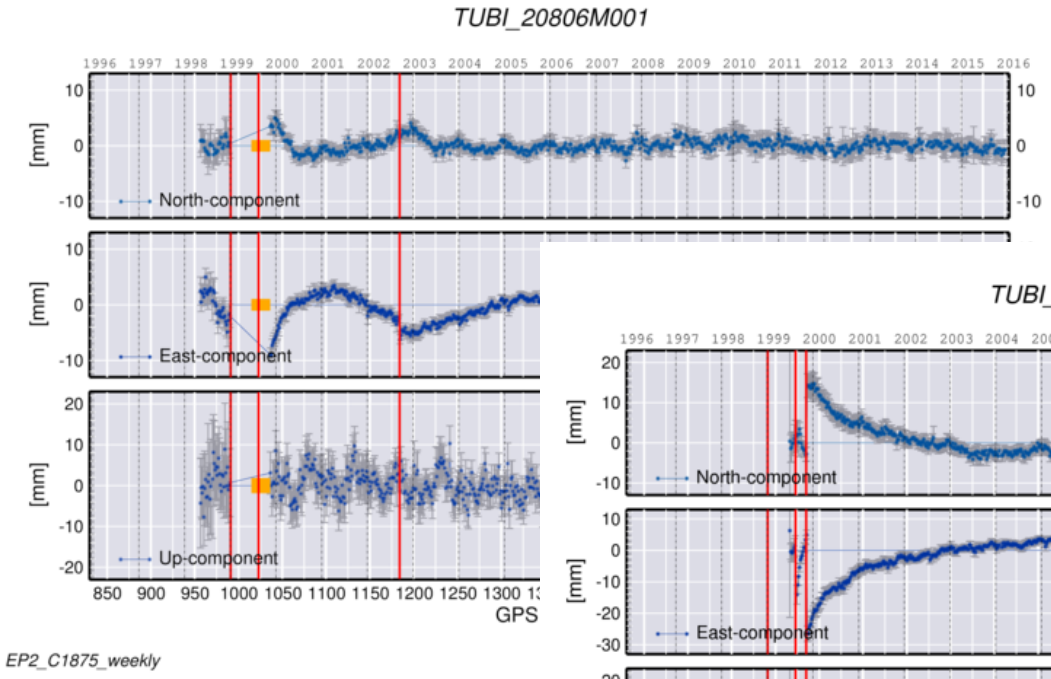


HANDLING OF POST-SEISMIC DEFORMATION



CURRENT ROUTINE ANALYSIS

HANDLING OF POST-SEISMIC DEFORMATION



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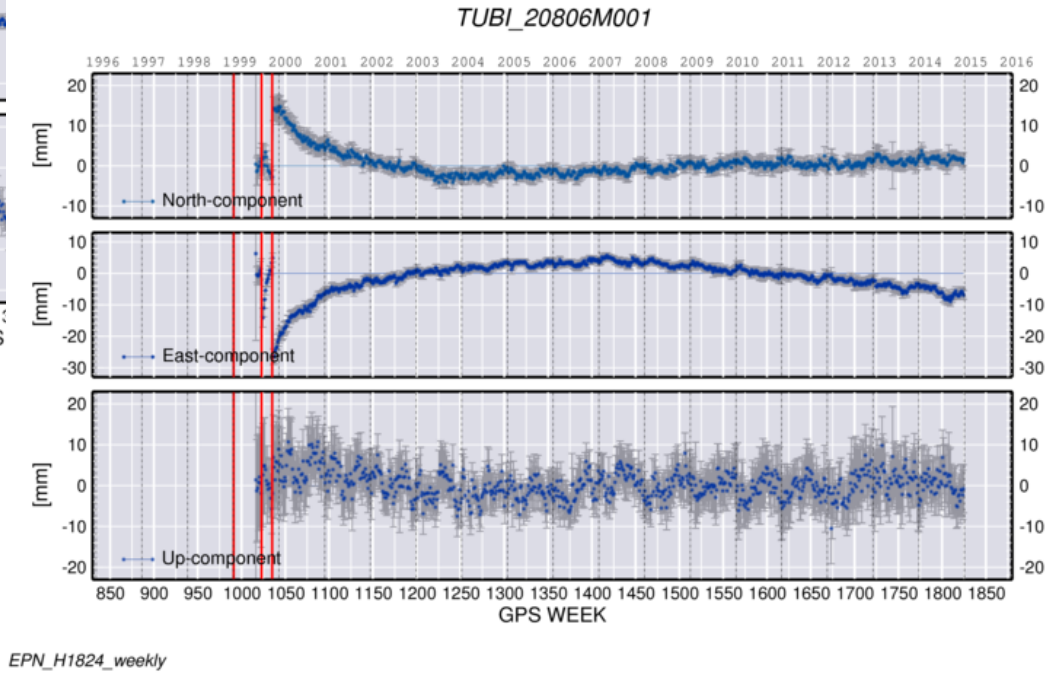
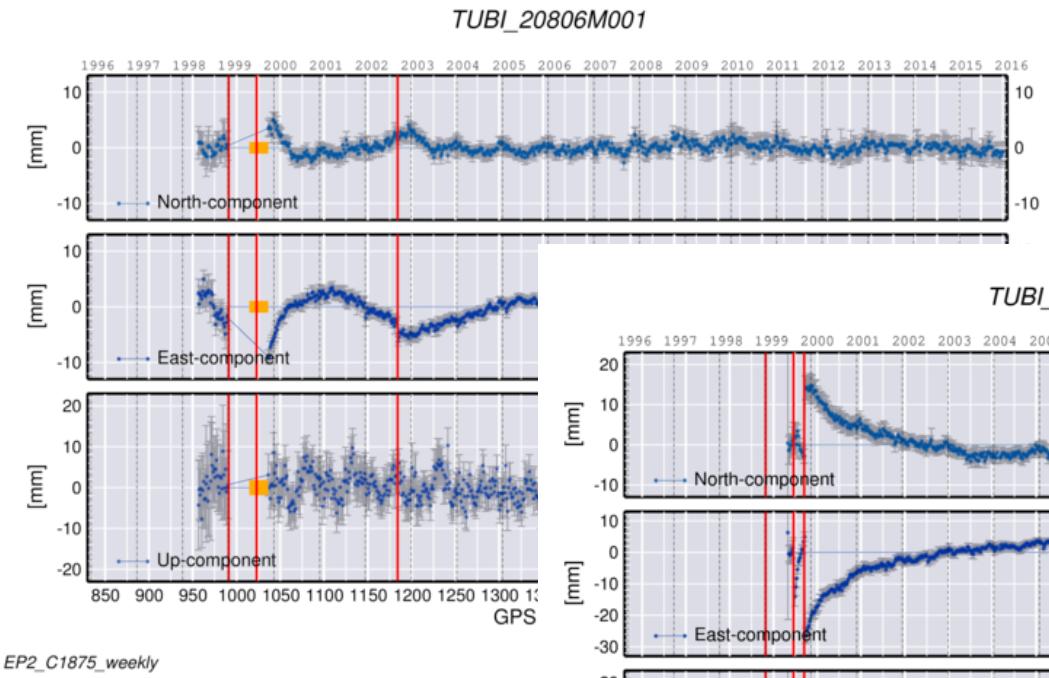


w/o PSD

HANDLING OF POST-SEISMIC DEFORMATION



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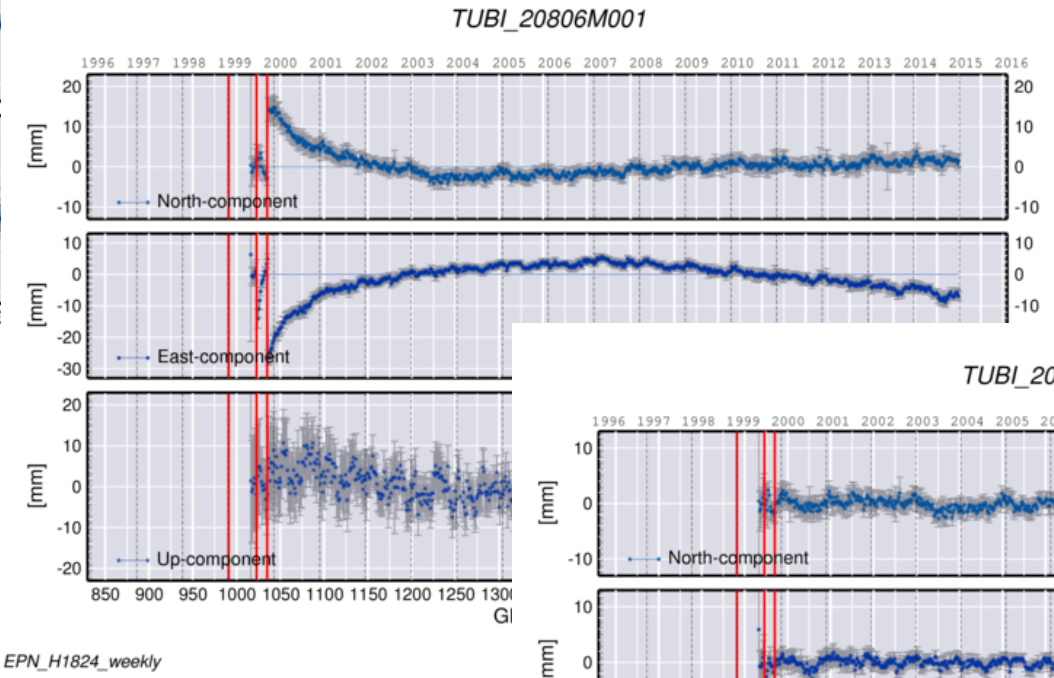
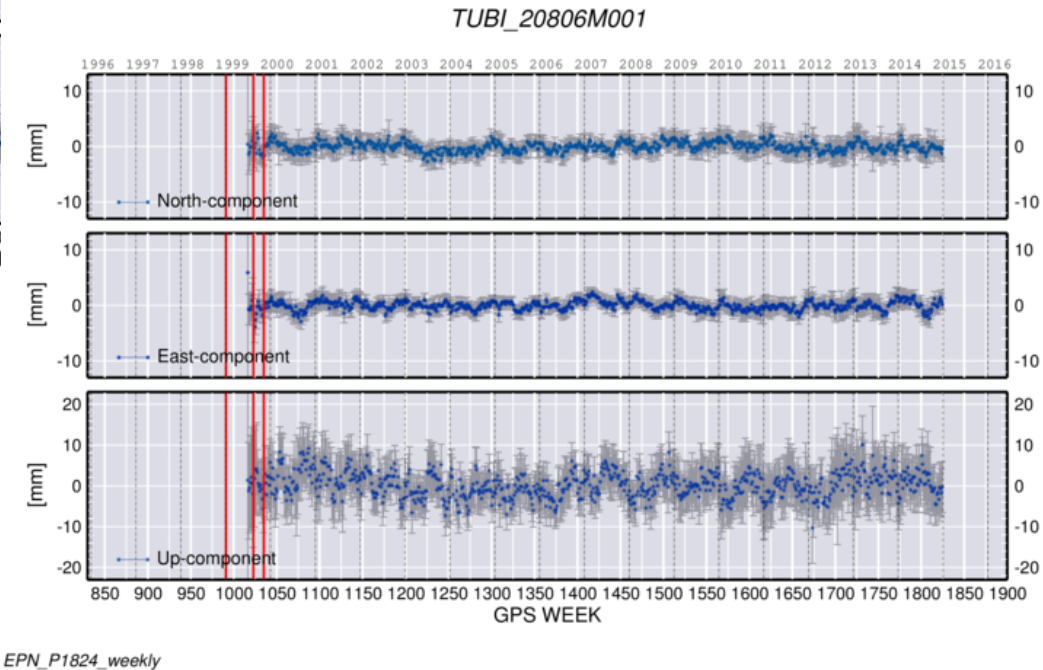
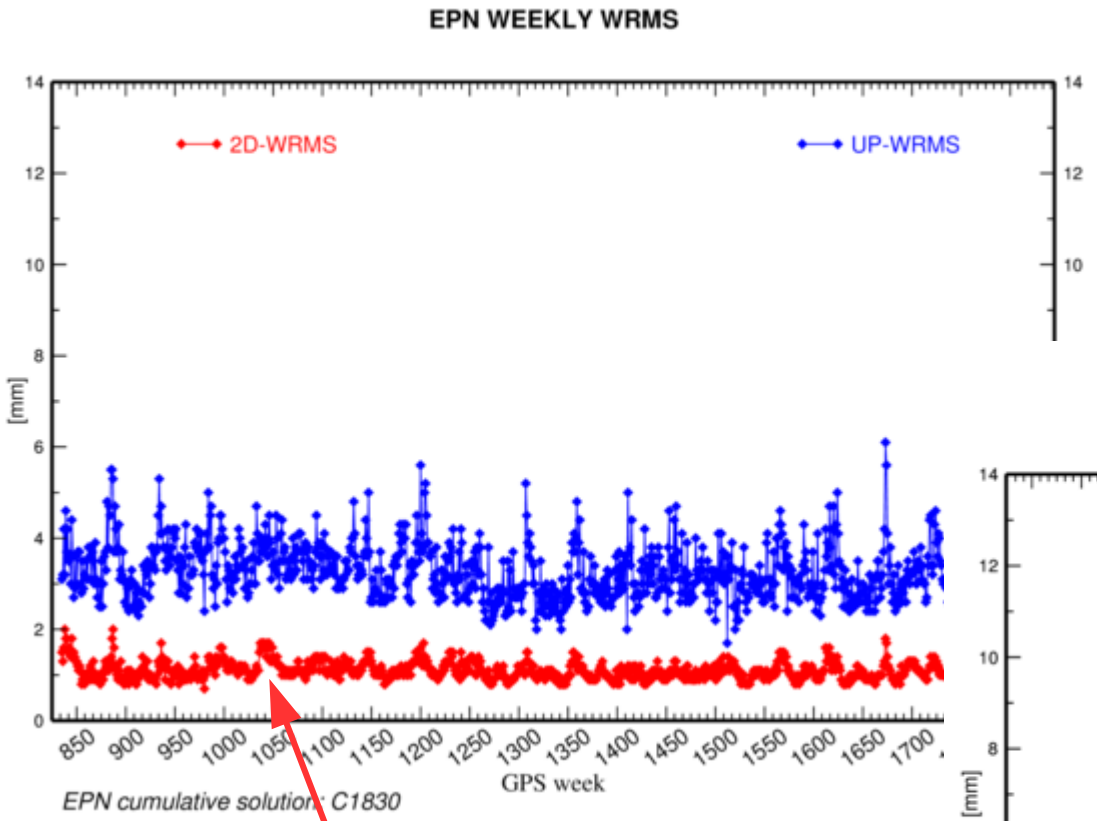


w/o PSD

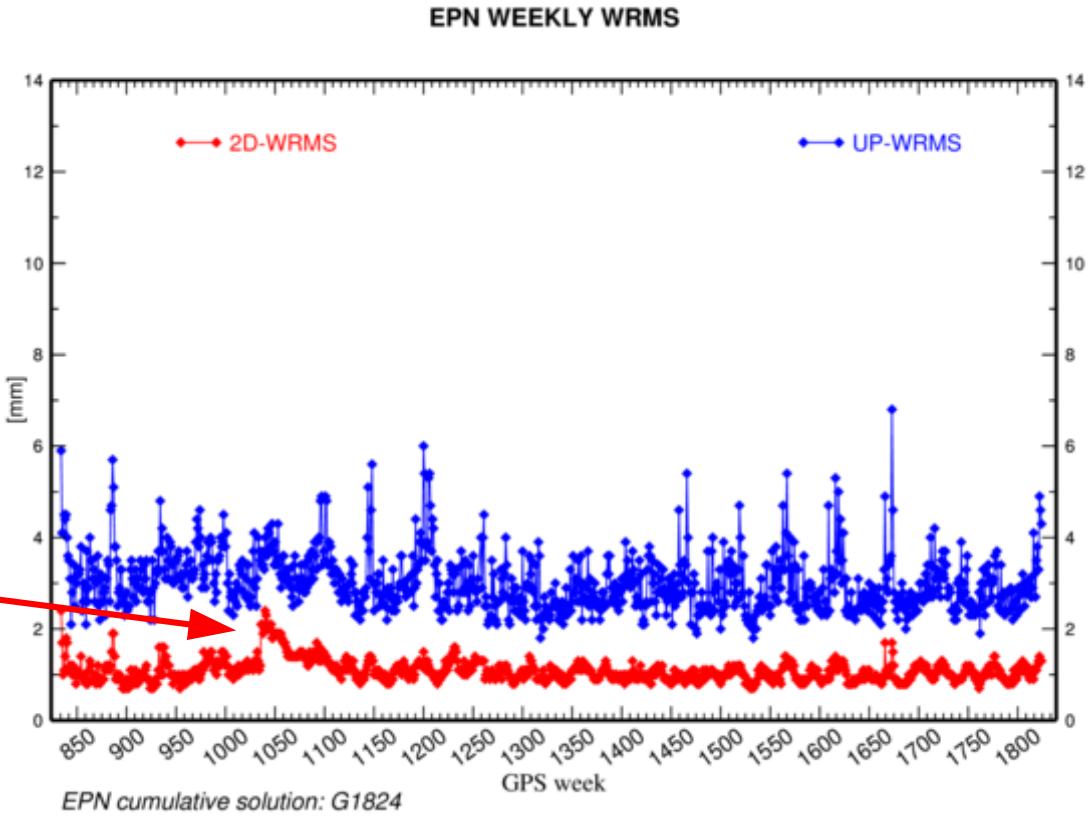


ITRF2014 with PSD MODELLING

ROUTINE AND REPRO_2 WRMS

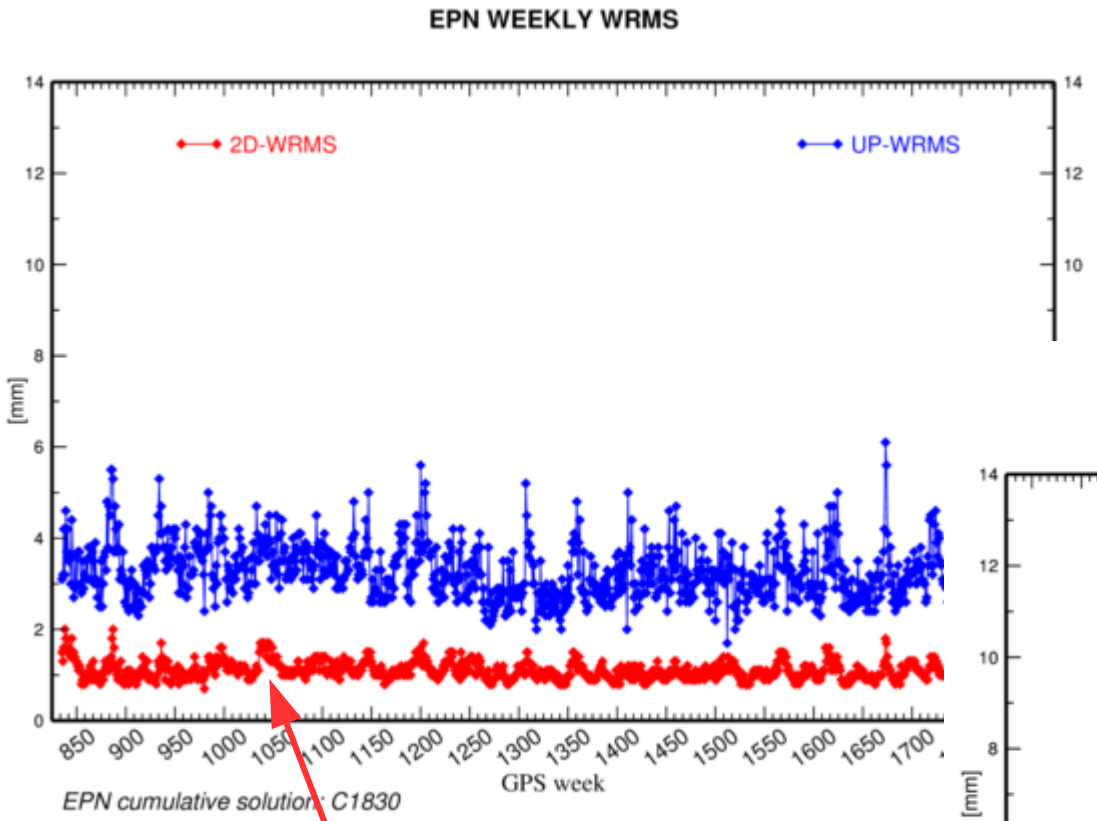


REPRO_2 combination:
no PSD modelling

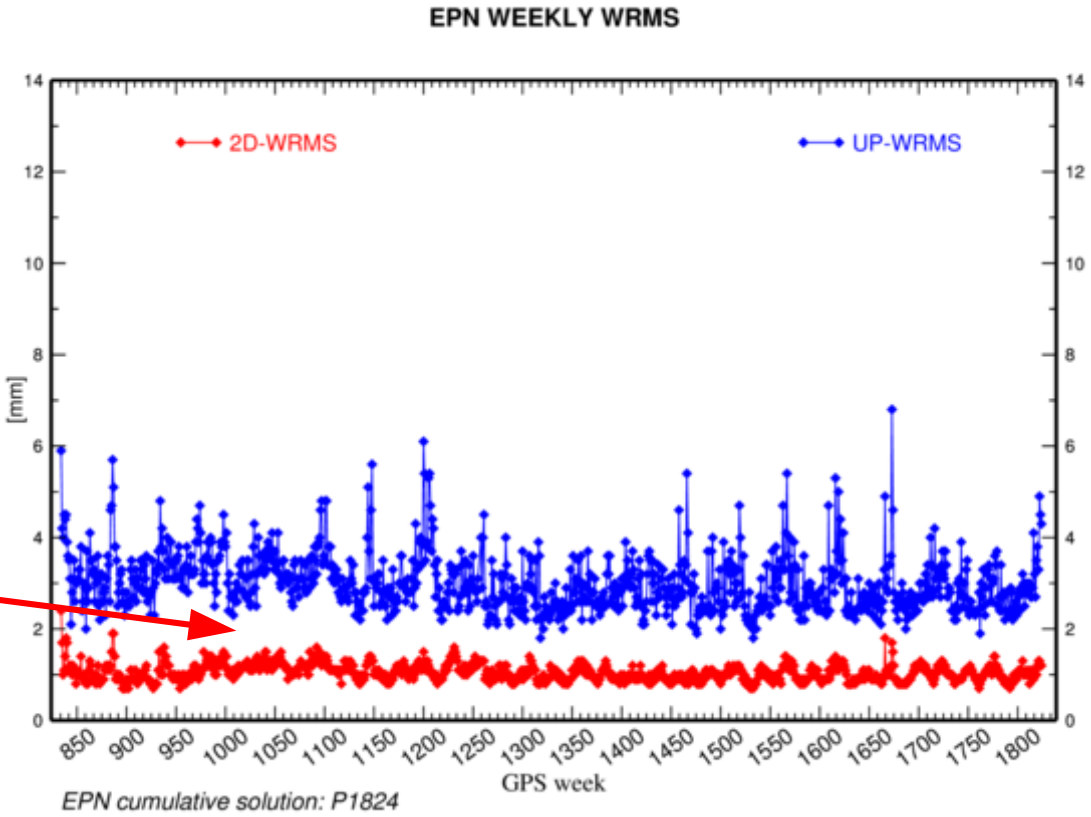


Post-Seismic Deformation (PSD)
of ISTA, TUBI

ROUTINE AND REPRO_2 WRMS



REPRO_2 combination:
with PSD modelled



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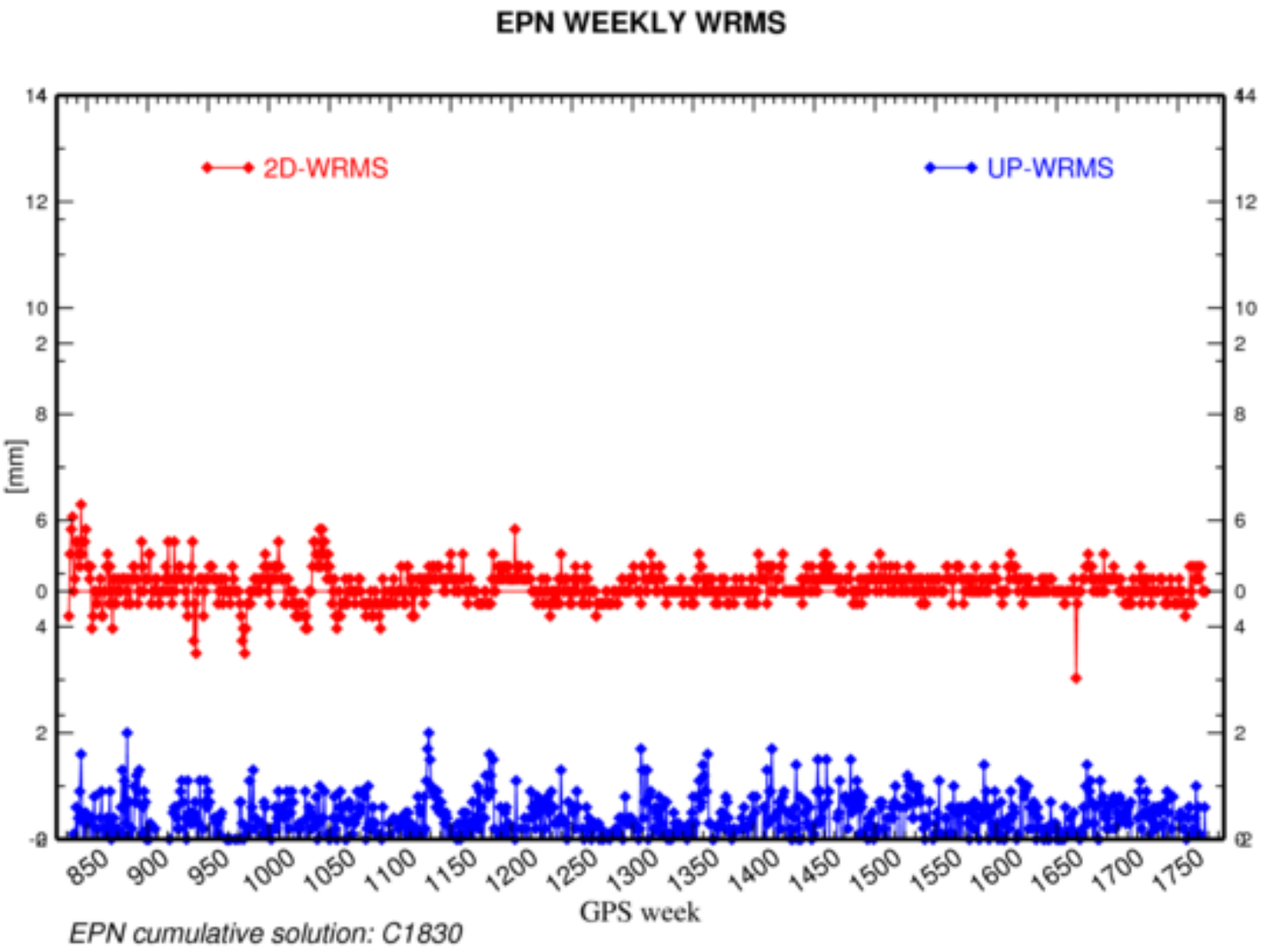
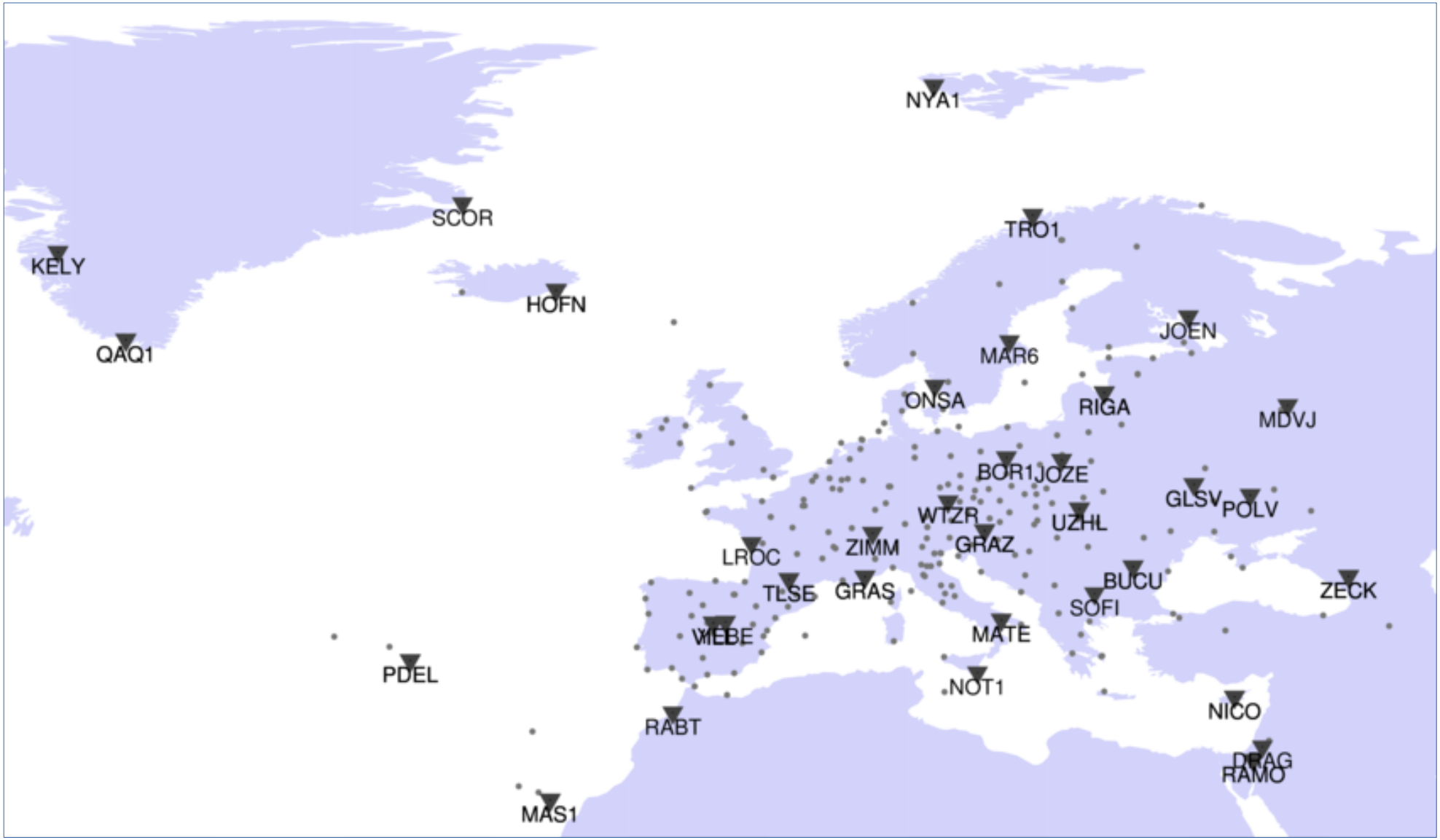
of ISTA, TUBI

ROUTINE AND REPRO_2 WRMS
THE DIFFERENCE



REFERENCE STATIONS USED FOR DATUM DEFINITION IN REPRO_2 CUMULATIVE



TEST OF MC REALIZATION FOR DATUM DEFINITION

Helmert-transformation parameters between ITRF2014 and its EPN densification

positions	tx	ty	tz	sc	rx	ry	rz
T	0.00	-0.00	-0.00	-0.000	0.000	-0.000	0.000
+/-	0.04	0.04	0.04	0.005	0.013	0.016	0.012

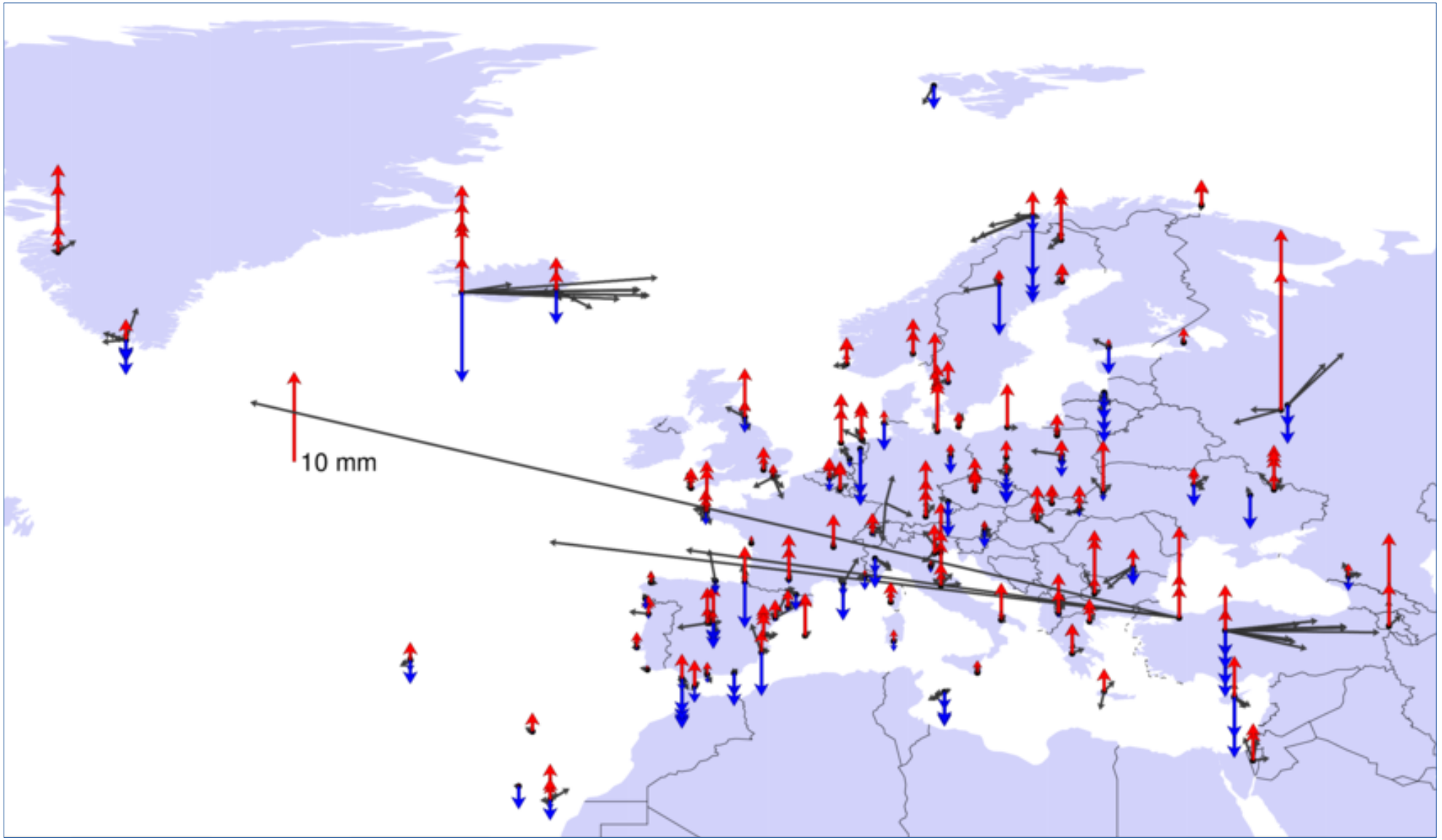
velocities

VT	0.01	0.01	0.02	-0.001	-0.004	0.003	-0.009
+/-	0.04	0.04	0.04	0.005	0.013	0.016	0.012

IN CASE OF CORRECT REALIZATION OF THE MINIMUM CONSTRAINT APPROACH THE TRANSFORMATION PARAMETERS MUST BE ZERO.

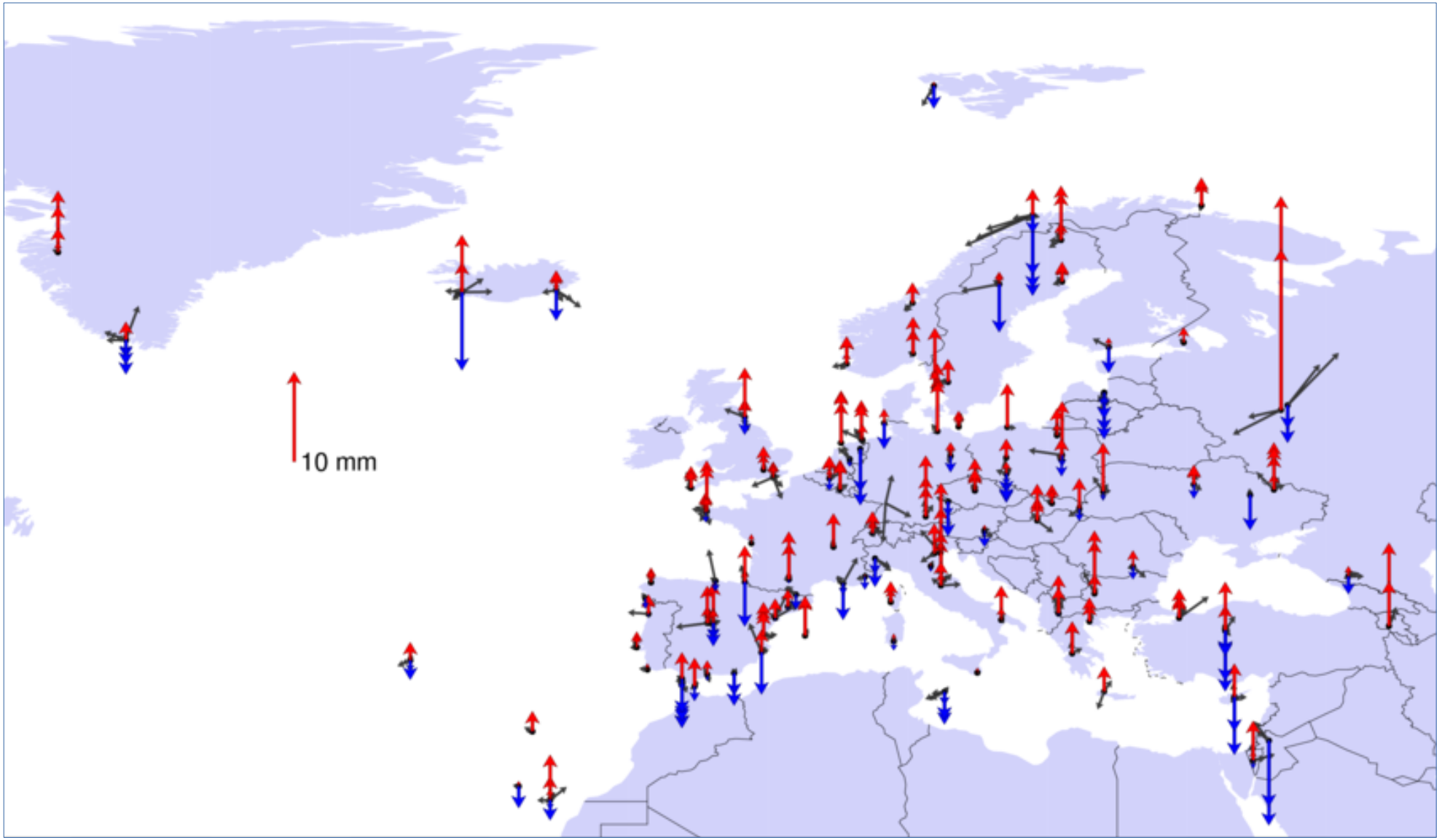
ITRF2014 vs EPN REPRO_2 positions

w/o PSD epoch 2010.0



ITRF2014 vs EPN REPRO_2 positions

with PSD epoch 2010.0



ITRF2014 vs EPN REPRO_2 positions
eliminated stations from the plot

HFLK, KARL, MALL_soln4, BOGO_soln2: much less data in ITRF (should not be part of ITRF!)

MARS_soln5 (21mm): ?

TUC2_soln3 (27mm): antenna height reference issue in EPN

LAMP_soln4,5 (125mm): CRD change in ITRF (antenna reference?)

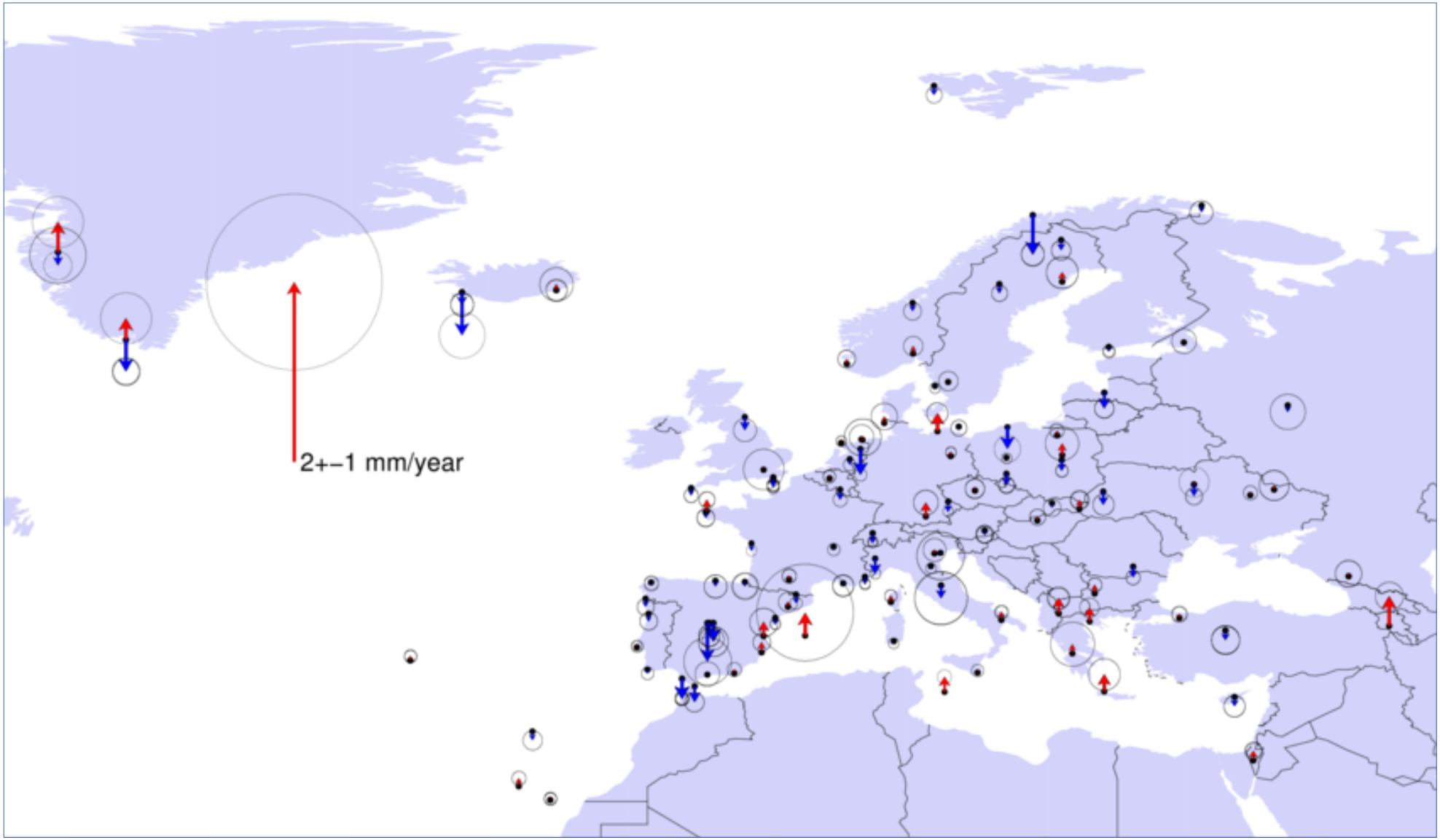
MEDI_soln1, NSSP_soln1: weak in both EPN and ITRF

METS_soln2,3: EPN timeseries disturbed and a part removed

PADO: soln definition disagreement and much less data in ITRF

soln - solution number: section in time series between offsets

ITRF2014 vs EPN REPRO_2 velocities



PRELIMINARY CONCLUSIONS AND RECOMMENDATIONS

- REPRO_2 results can be offered later as EPN product, but some further tests and validation are needed
- All EPN RINEX data (routine, historic) must be revised and bad data must be deleted or well separated to ease the work in future repro_3
  - RINEX quality monitoring (JD)
  - SINEX quality monitoring (ACC on AC level + RFC on combination level)
- REPRO_2 products will be the input for the ETRS89 maintenance, after IGS14 is published