EPN DENSIFICATION OF ITRF2008 / IGS08

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DENSIFICATION REPORT
**** 3 in 1 ****

(1) EPN REPRO-1 **ITRF2008 / *epn*_05.atx**

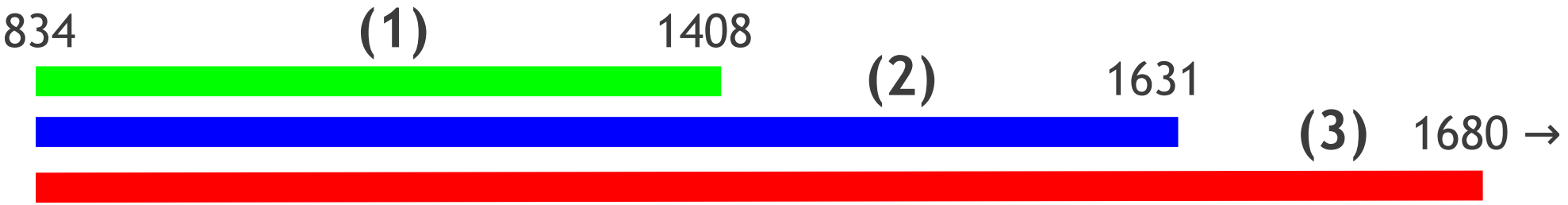
GPS week 0834 – 1408 (1996-2006)
Appreciated effort of the 16 LACs
New historic data were involved as well

(2) EPN DENSIFICATION **ITRF2008 / *epn*_05.atx**

(1) + *GPS week 1409 –* ***1631*** *(1996-2010 April)*
EPN Repro-1 + routine EPN

(3) ETRS89 MAINTENANCE ***IGS08 / epn_08.atx***

(2) + *GPS week 1632 –* ***1680*** *(+n*15 weeks)*
EPN_05 to EPN_08 PCV correction (Quentin Baire, ROB)



DATUM DEFINITION

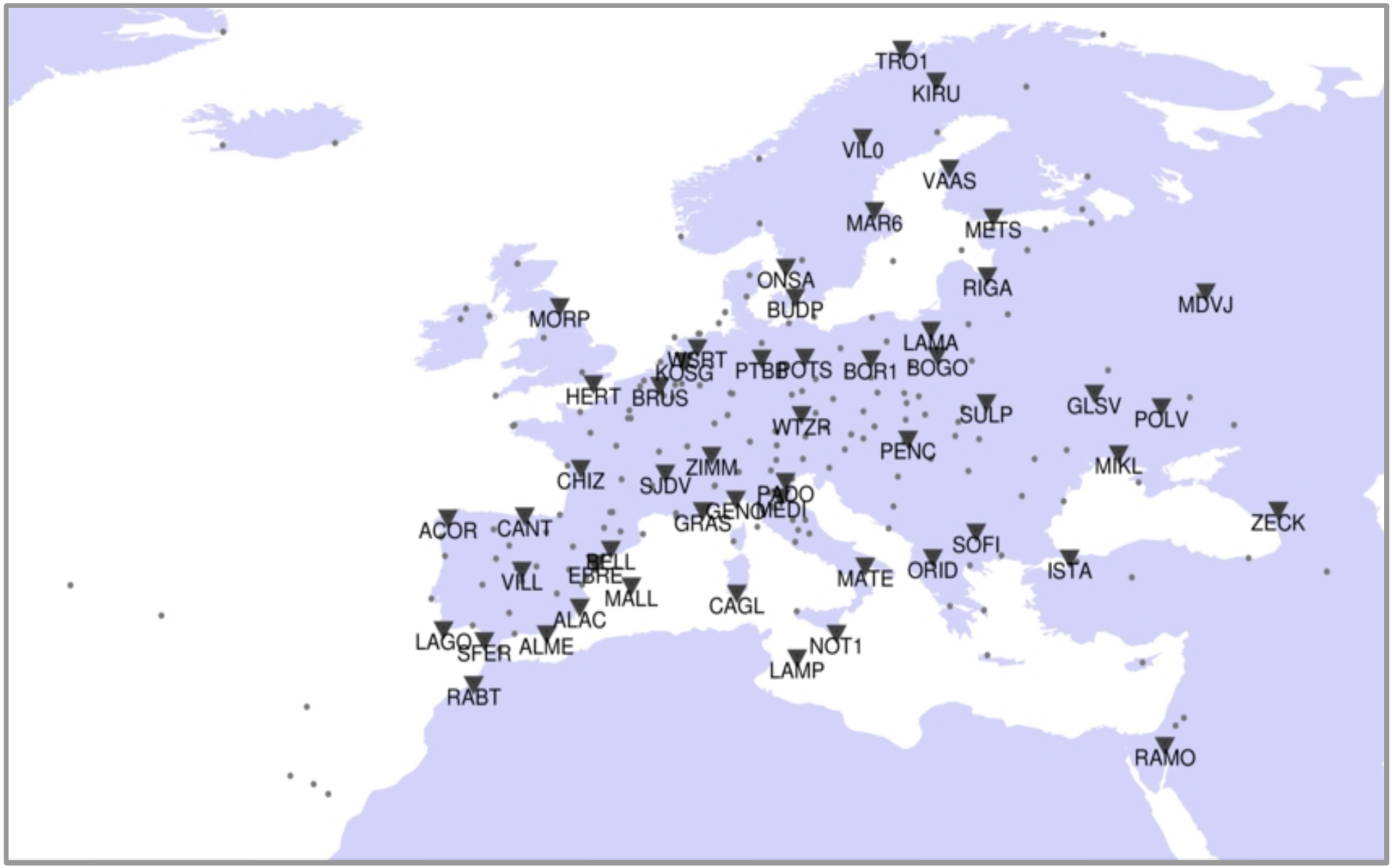
- ***ITRF2008 / IGS08 REFERENCE NETWORK***
  55 sites, 101 solution numbers
- ***CAREFULLY SELECTED SET OF DATUM SITES***
  outliers rejected (Pos <3&5 mm; Vel <0.5 mm/y)
- ***MINIMUM CONSTRAINED DATUM REALIZATION***
  7(14) Translation_Rotation_Scale (TRS)
  or 4 (8) Translation_Scale (TS)

***TRS vs TS**: comparable results (2 mm POS, 0.2 mm/y VEL),*

but for TS

- *10% higher weekly WRMS*
- *noisier residual time series (dependence on **RadDist**)*
- *small tilt due to the trend in RX series*

ITRF2008 / IGS08 datum sites



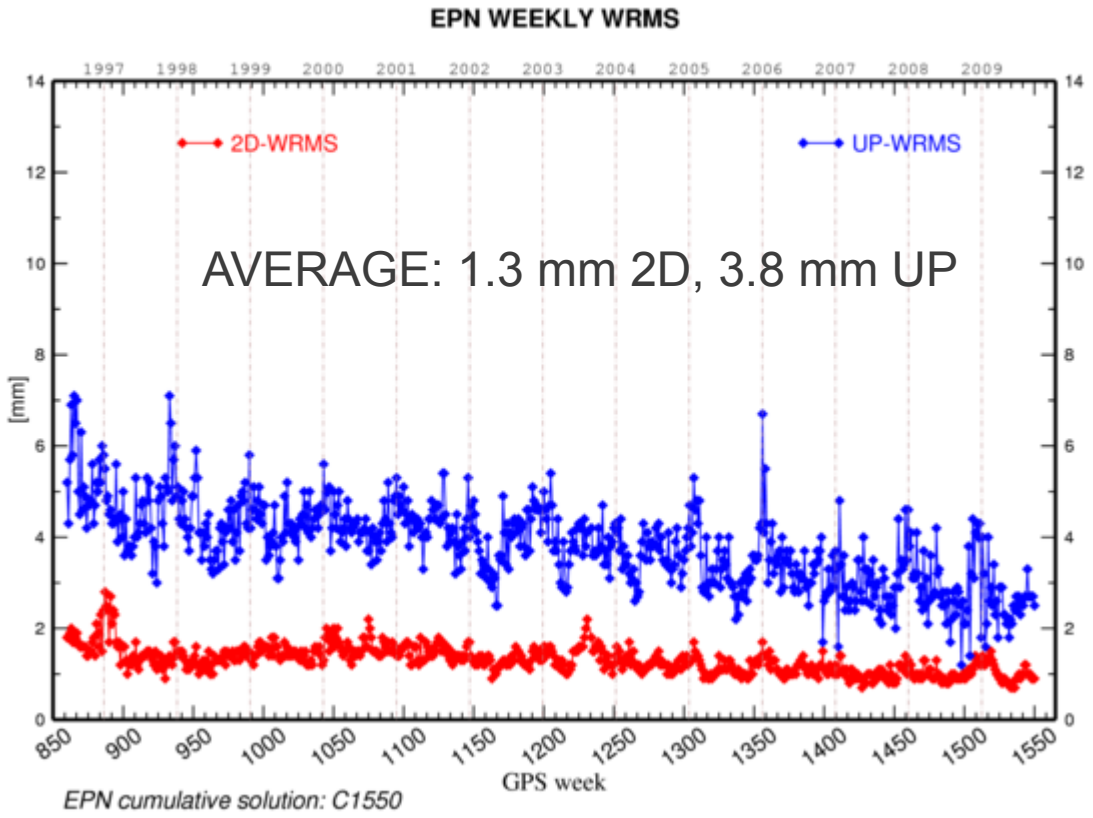
DATUM VALIDATION

7 parameter transformation between frame and results ***over the datum defining site subset*** *(55)*

Should be all zero in case of MC!

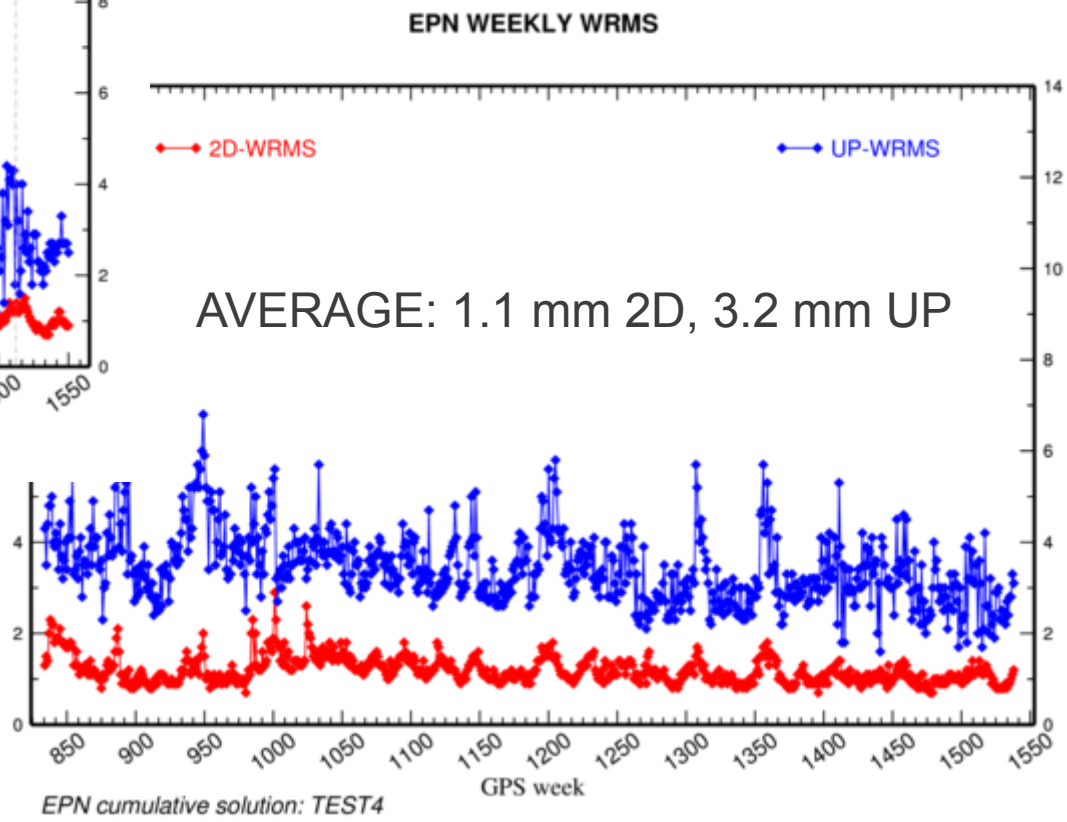
position				**ppb**		**mas**	
		mm					
T	**0.00**	**0.00**	**0.00**	**0.000**	**0.000**	**0.000**	**0.000**
+/-	**0.05**	**0.06**	**0.05**	**0.007**	**0.018**	**0.018**	**0.016**
velocity							
VT	**0.01**	**0.00**	**0.01**	**-0.003**	**0.001**	**0.000**	**-0.001**
+/-	**0.05**	**0.06**	**0.05**	**0.007**	**0.018**	**0.018**	**0.016**

WRMS of the operational and ITRF2008 cumulative solutions



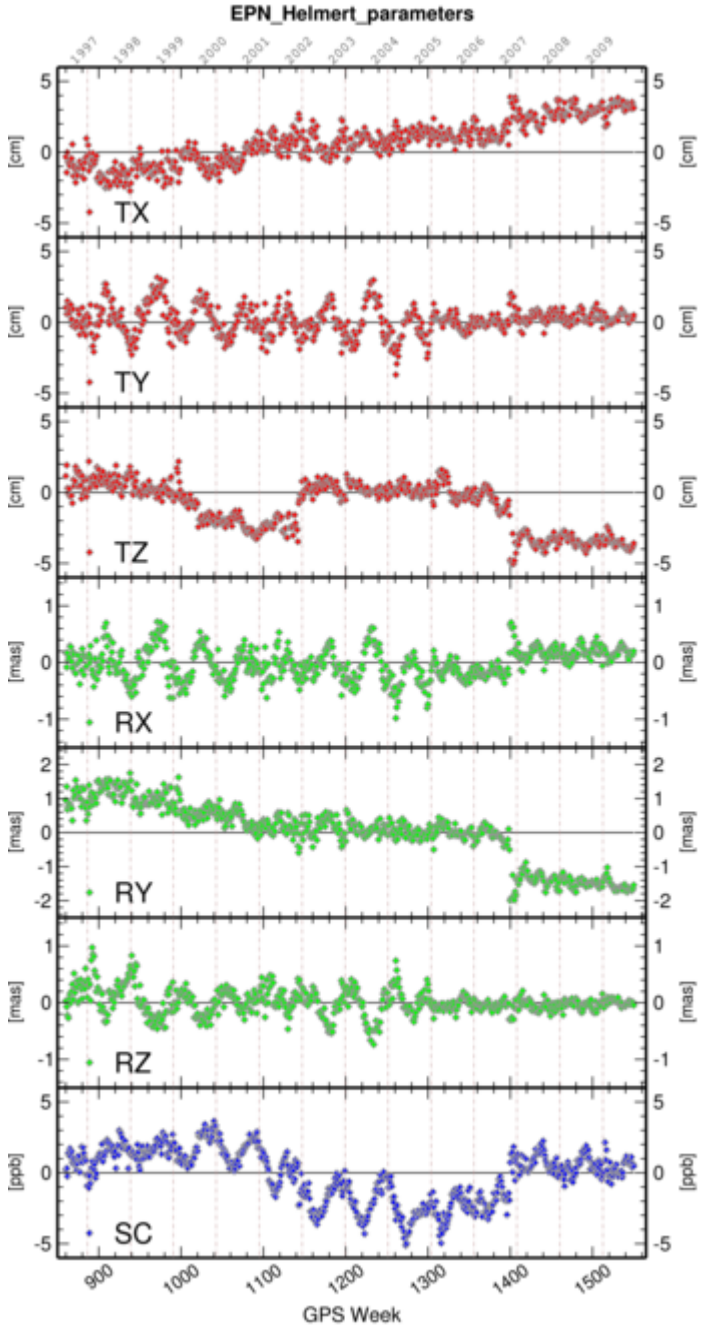
OPERATIONAL

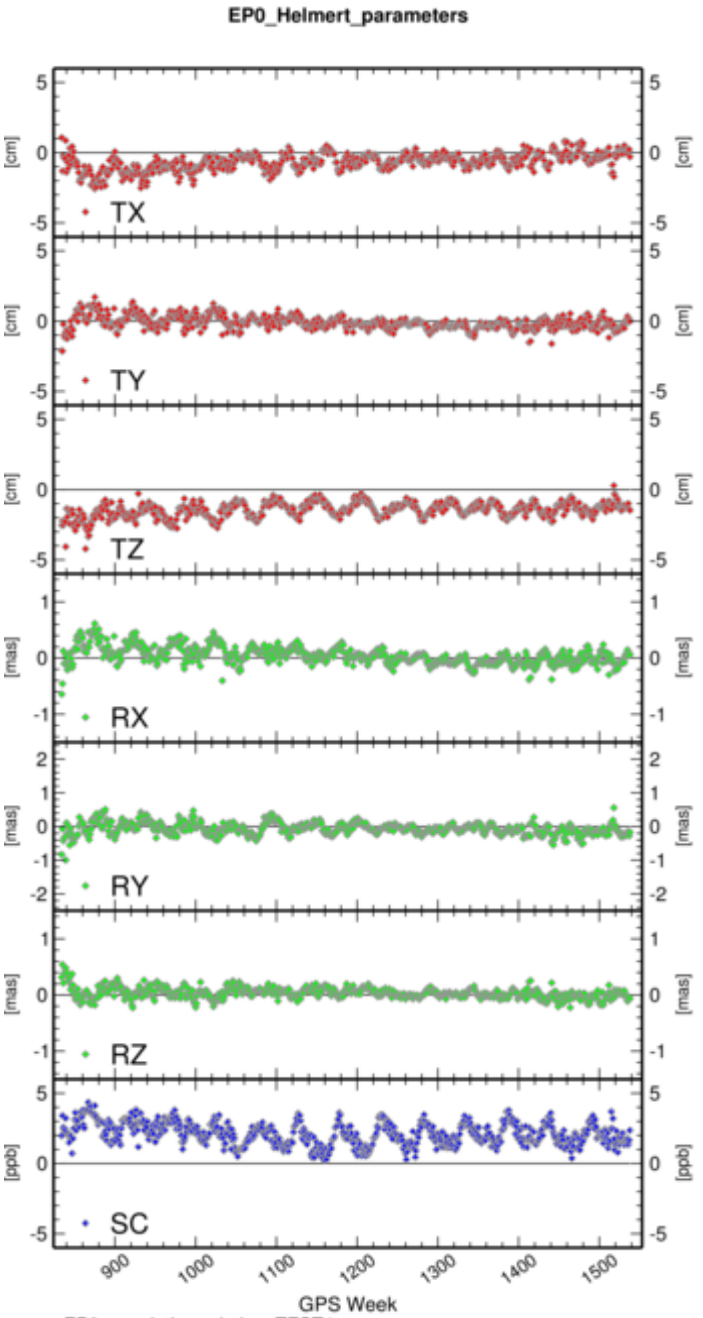
ITRF2008 DENSIFICATION



Helmert-parameters

operational EPN vs ITRF2008 densification





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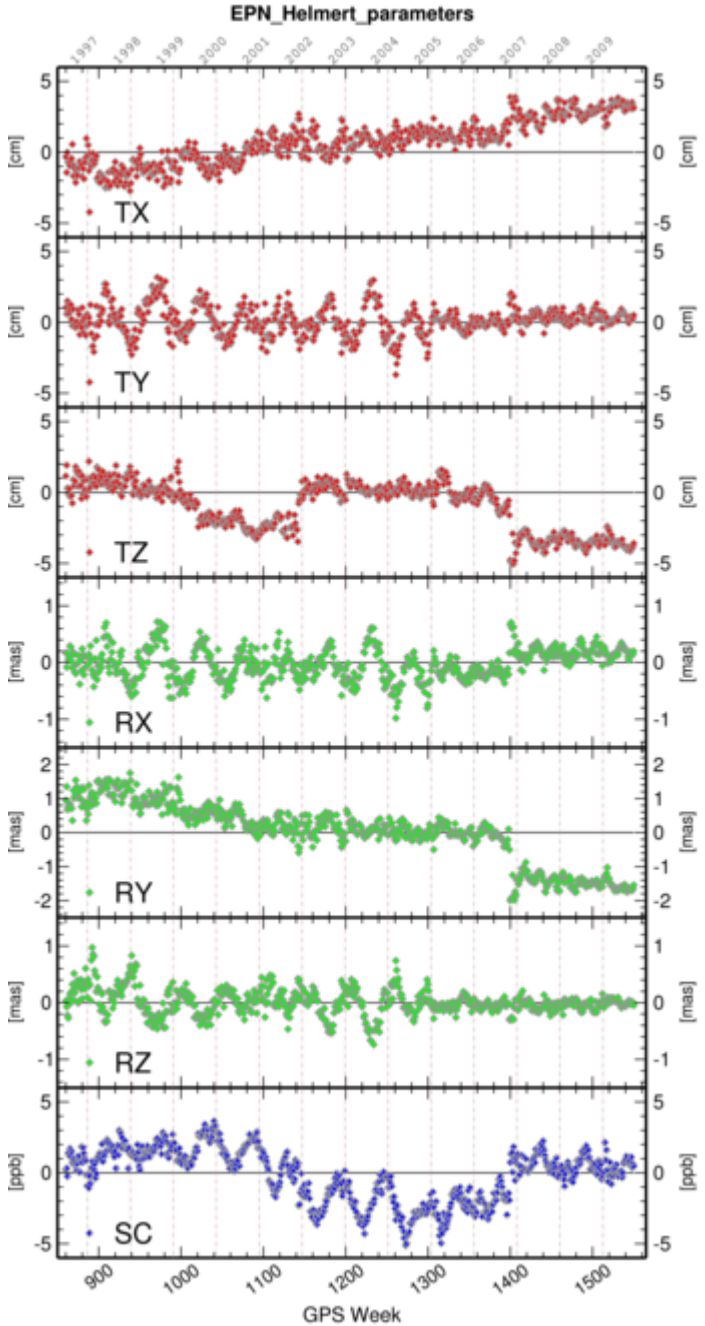
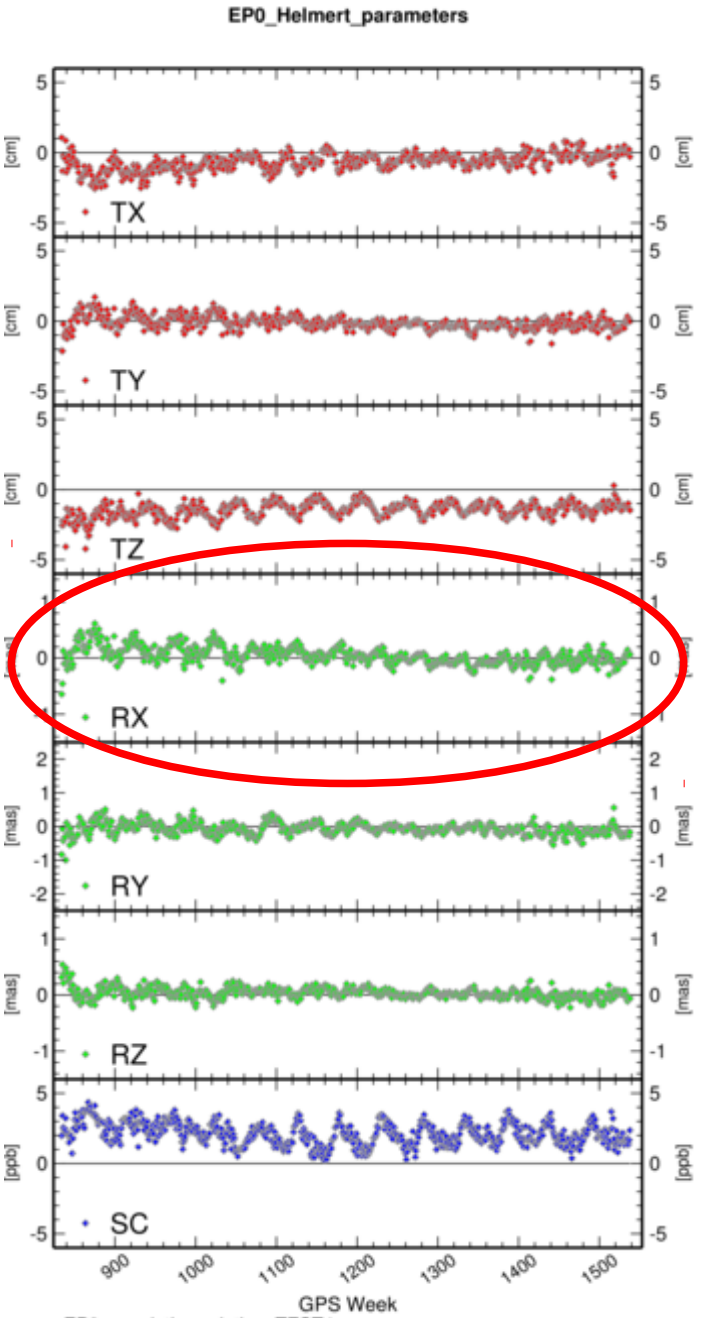
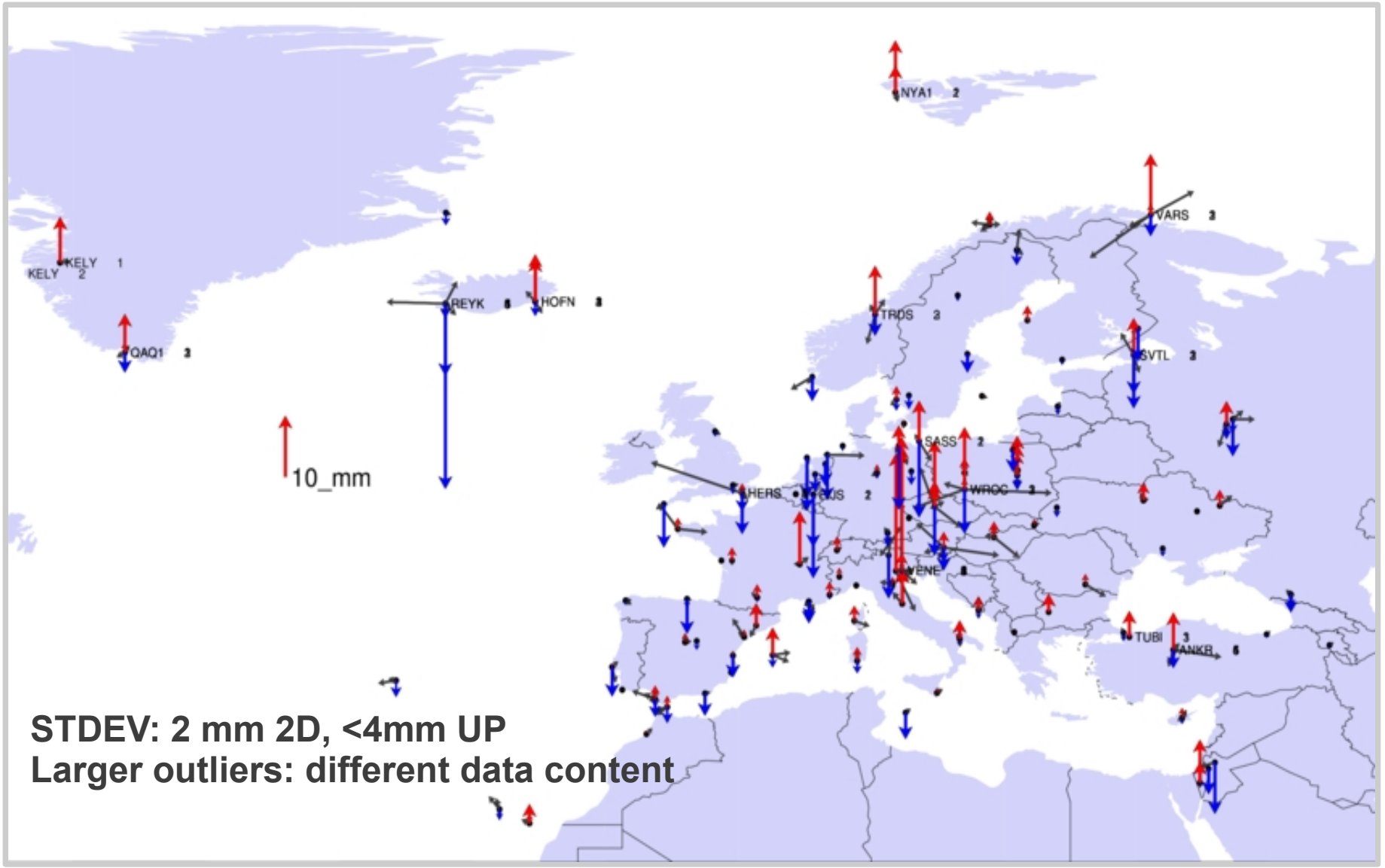


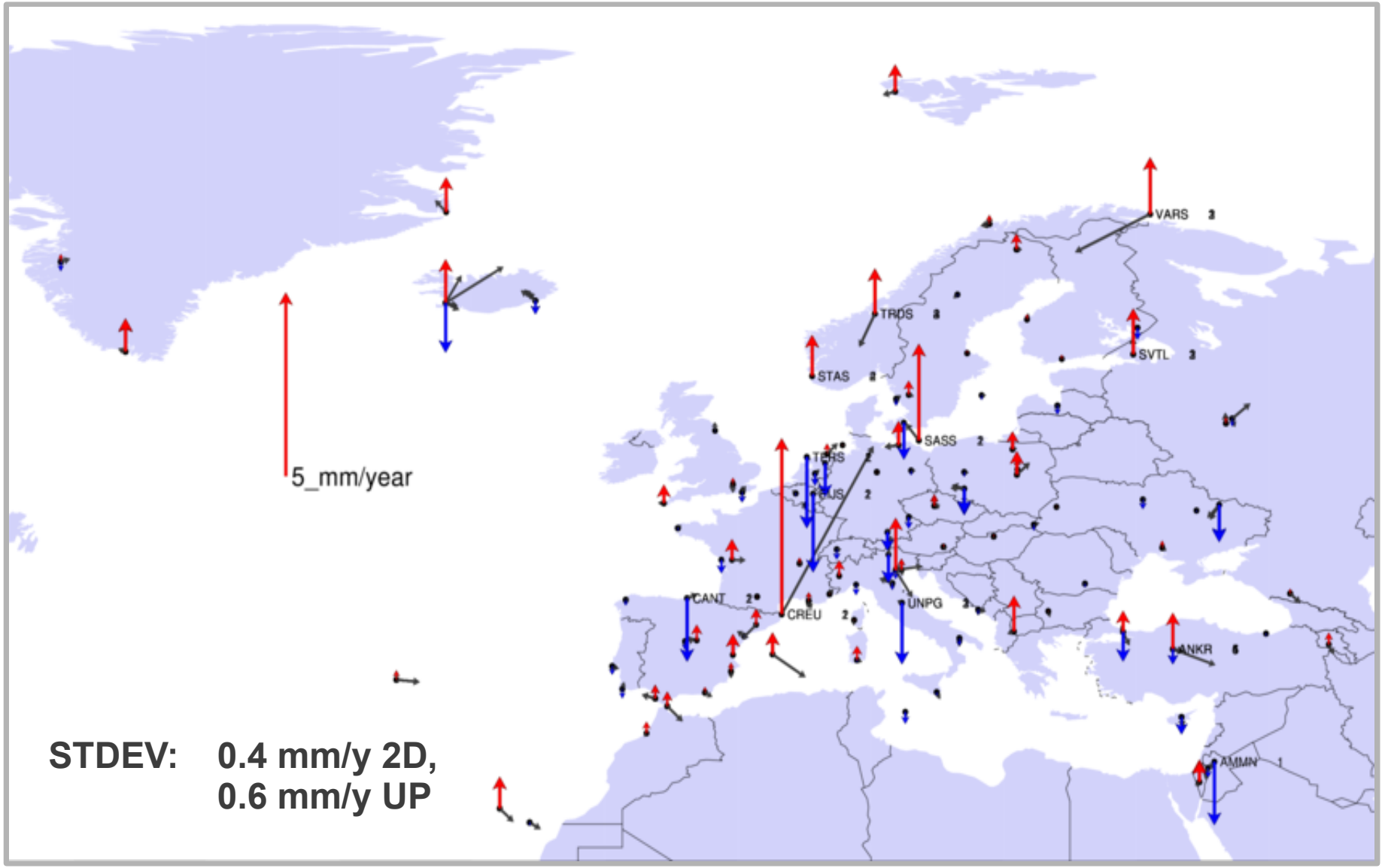


ITRF2008 vs ITRF2008 densification

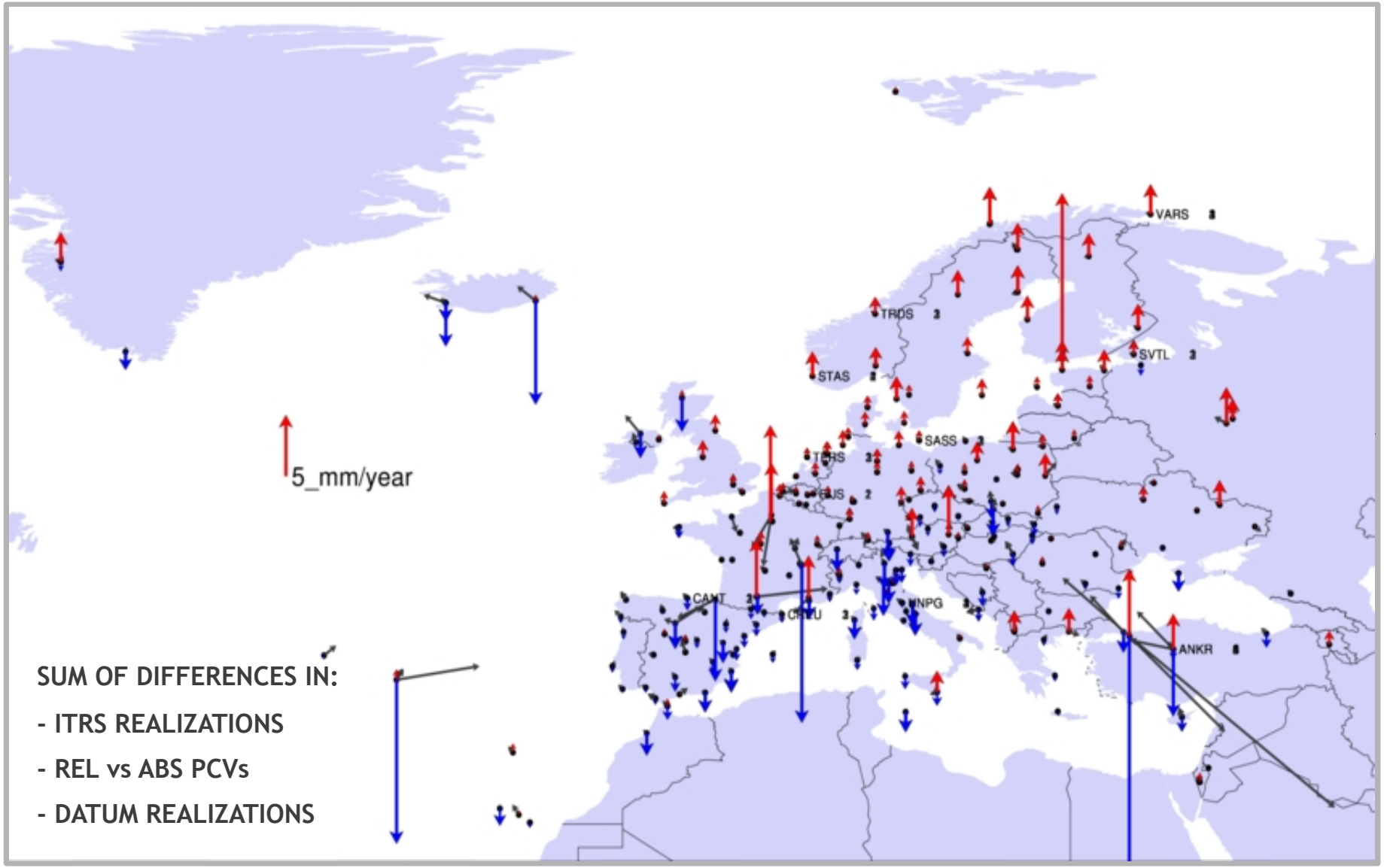
positions (ep. 2005.0)



ITRF2008 vs ITRF2008 densification
velocities



ITRF2005_dens vs ITRF2008_dens
velocities (C1600-C1631 - ep.2005.0)



ITRF2005_dens vs ITRF2008_dens
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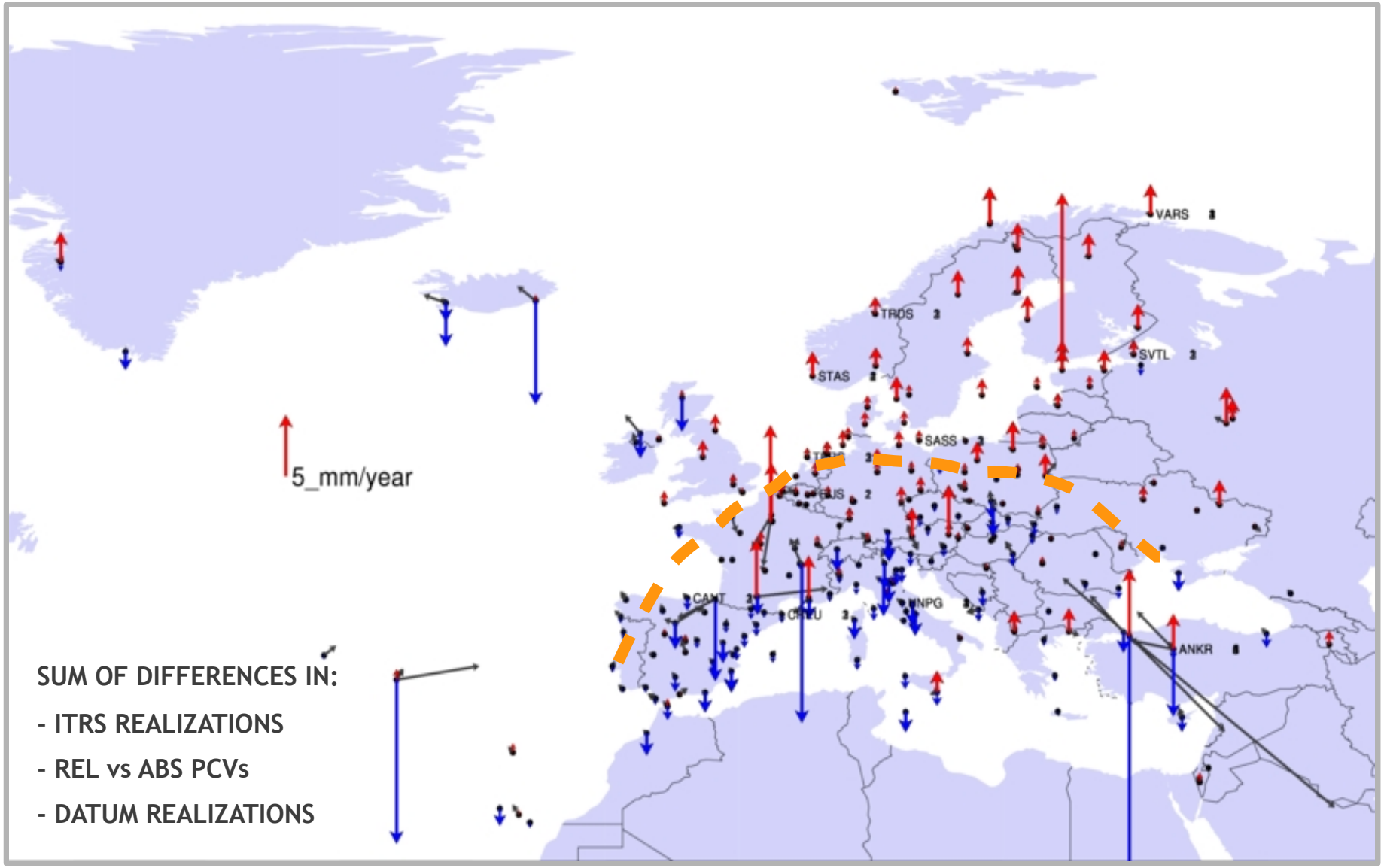
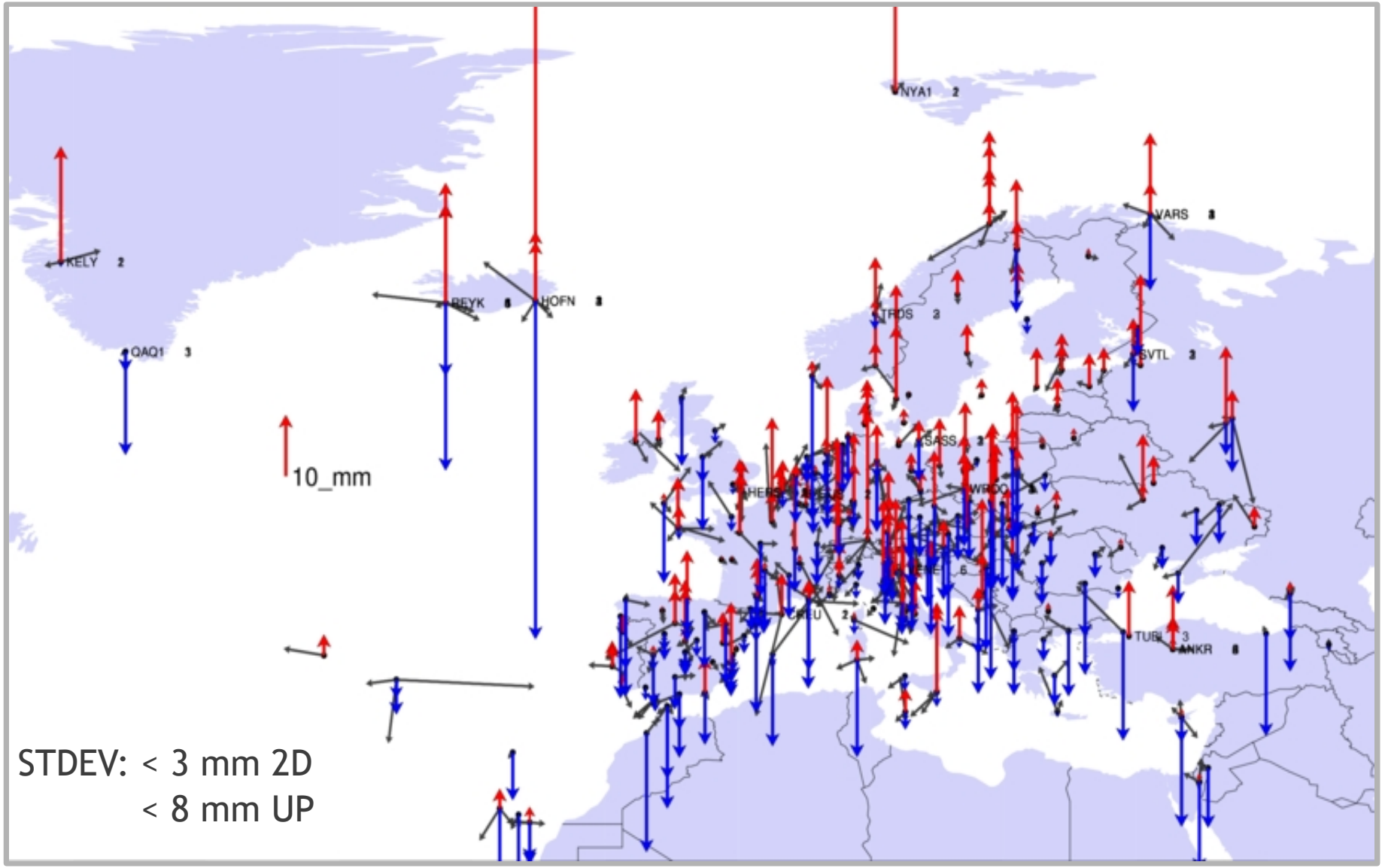


ITRF2005_dens vs ITRF2008_dens

positions (C1600 vs C1631 - ep. 2005.0)



ITRF2008 DENSIFICATION →
→ IGS08 MAINTENANCE

HISTORY REPEATS?

2006: ITRF2005, followed by IGS05 frame and PCV (epn_05.atx)

Relative to absolute PCVs

unknown time series offsets at week 1400

IGS05.SNX – single solution numbers, datum discontinuity,

2011: ITRF2008, followed by IGS08 frame and PCV (epn_08.atx)

Updated type-mean **absolute** PCVs,

BUT

Estimated or modeled offsets,

IGS08.SNX – multiple solution numbers, datum continuity

ITRF2008 DENSIFICATION →

→ IGS08 MAINTENANCE

STEP ONE

EPN weekly combined SINEX solutions before week 1632 must be converted to be conform with epn_08.atx

HOW? - general conversion solution provided by IGS

(R Schmid, IGSmail 6355, P Rebischung et al 2011)

- individual, site-by-site estimation of the correction

PPP processing of a selected week for ALL EPN stations using epn_05.atx and epn_08.atx PCV sets

Correction of all SINEX files before week 1632

Quentin Baire, ROB

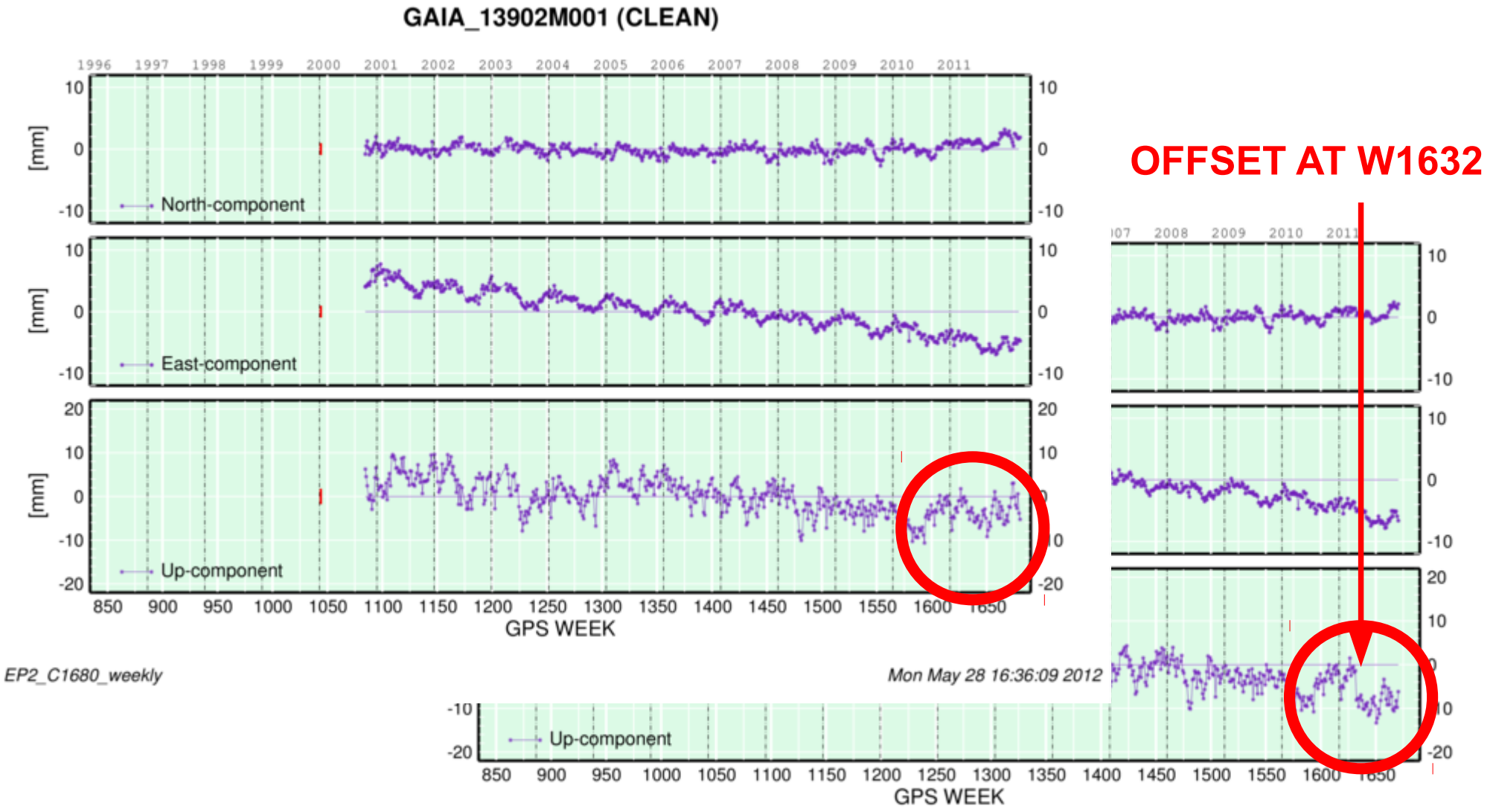
ITRF2008 DENSIFICATION →
→ IGS08 MAINTENANCE

STEP TWO+

- **The standard combination procedure should be followed using**
  - the updated weekly EPN SINEX solutions
  - IGS08 as datum (with same approach as at ITRF2008_dens
- **General tests of the IGS08 EPN densification should be performed**
- **The 15-weeks update series should be created for the ETRF2000 maintenance**

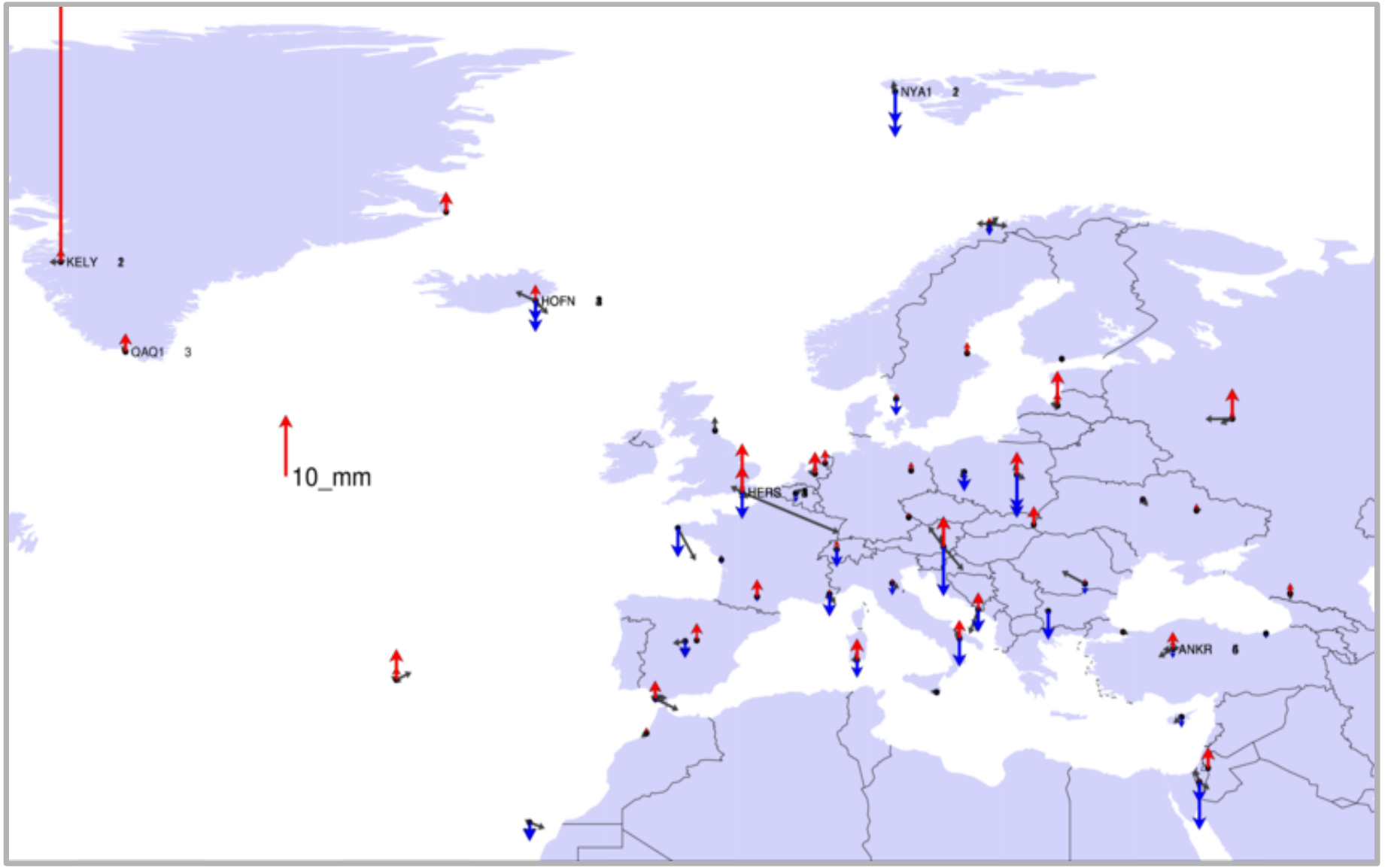
IGS08_dens vs ITRF2008_dens

coordinate time series



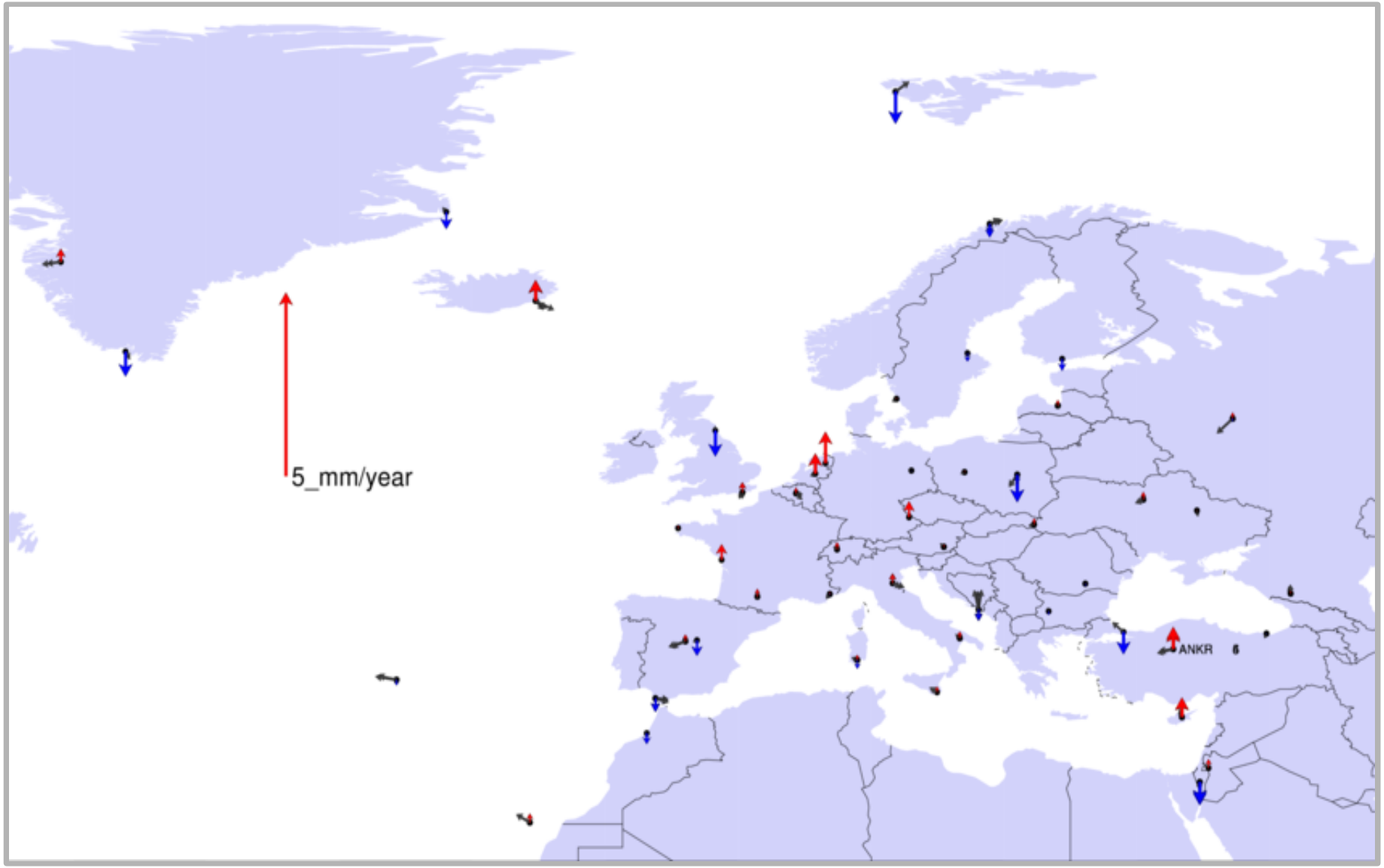
IGS08 vs IGS08_densification

positions (ep. 2005.0)



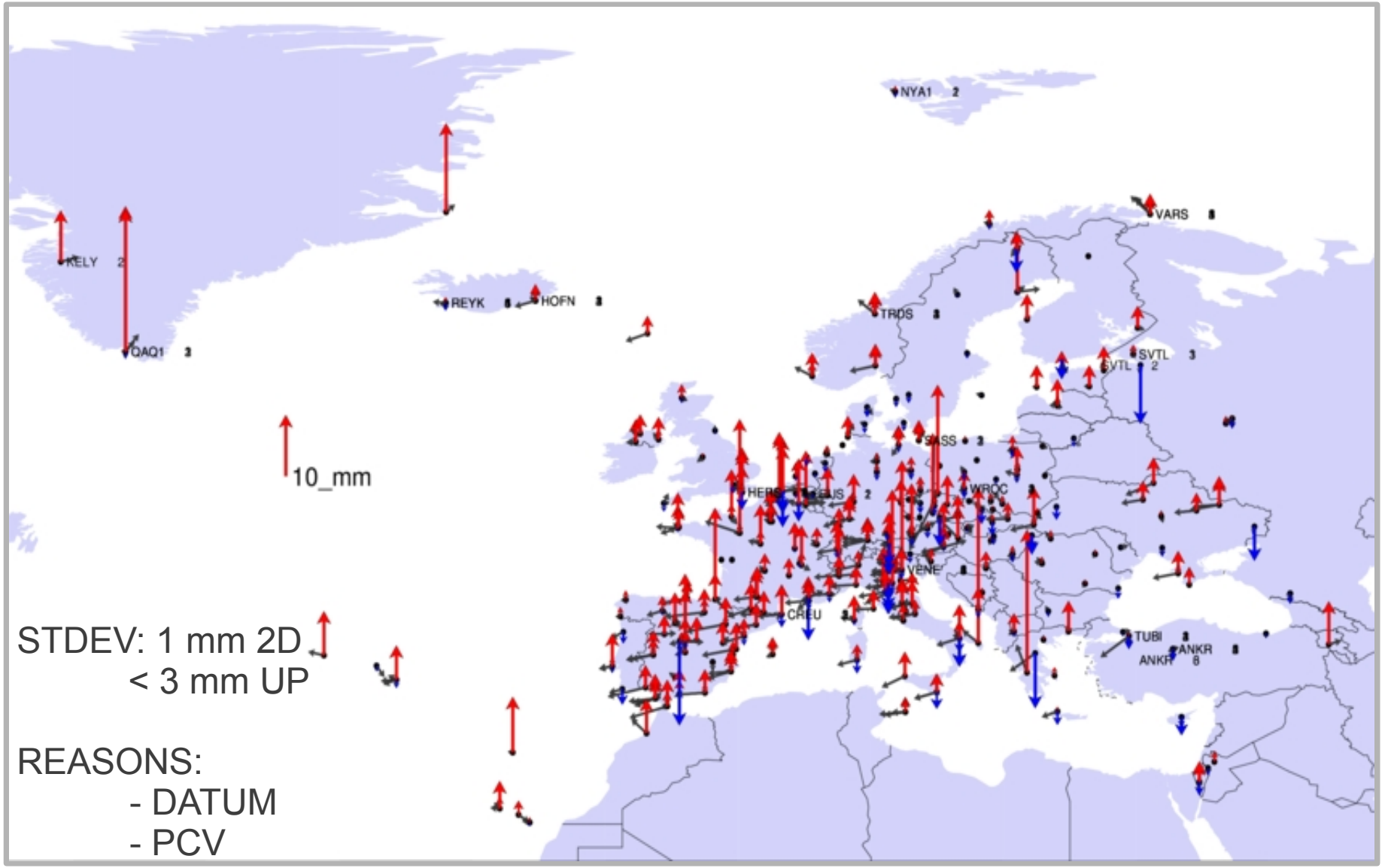
IGS08 vs IGS08_densification

velocities



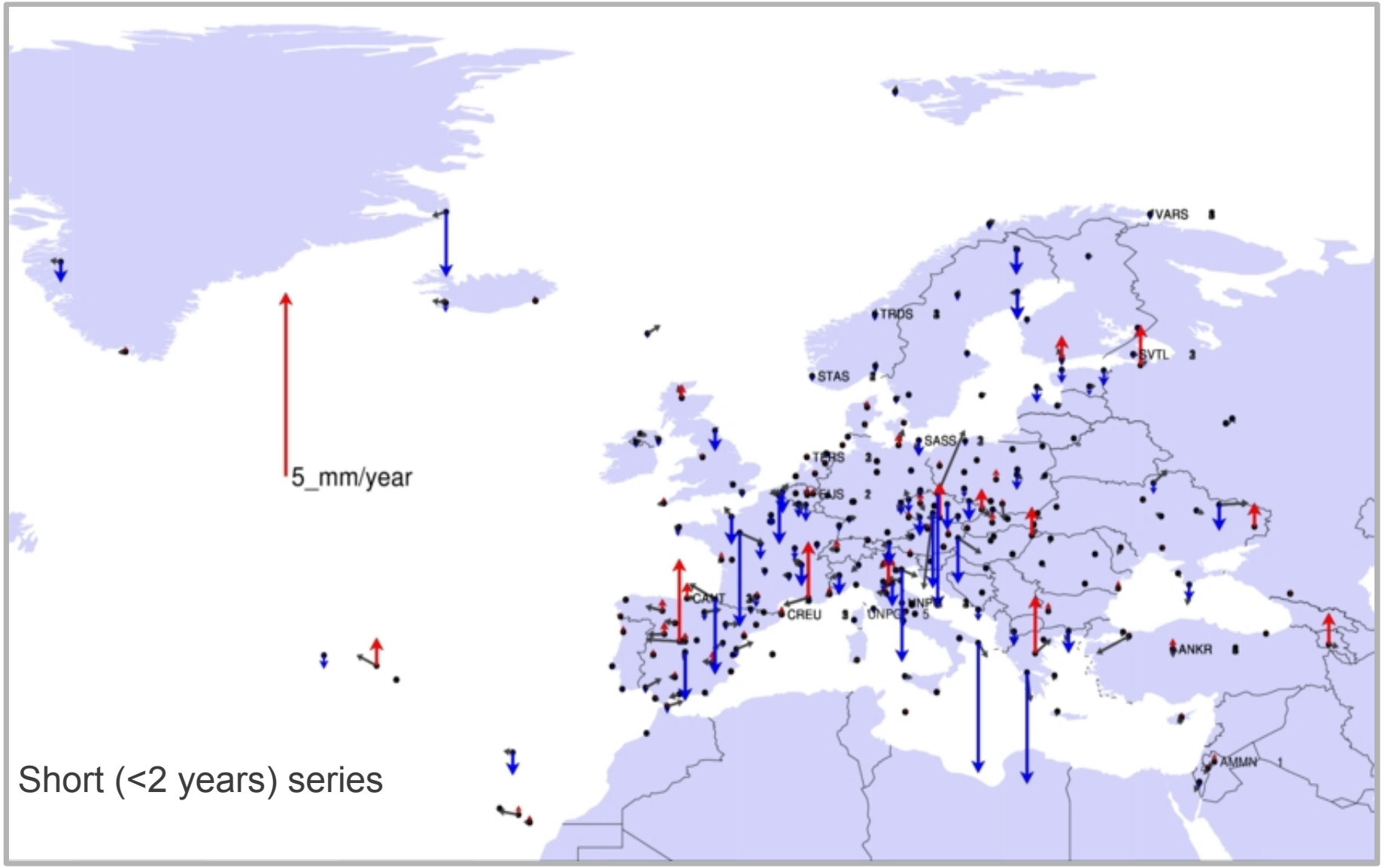
IGS08_dens vs ITRF2008_dens

positions (ep. 2005.0)



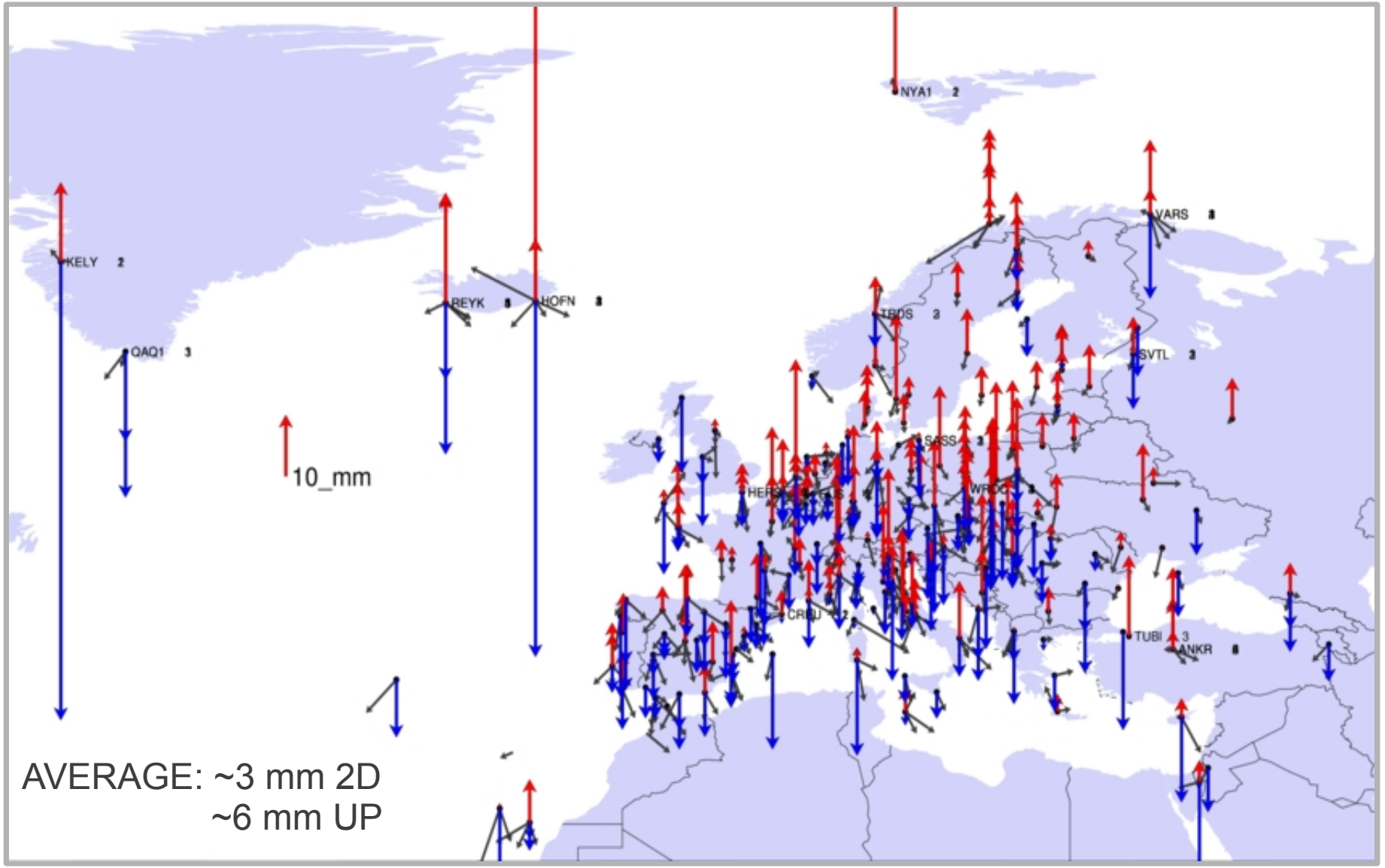
IGS08_dens vs ITRF2008_dens

velocities



IGS08_dens vs EPN_C1600

coordinates (ep. 2005.0)



ETRF2000 MAINTENANCE
BASED ON THE EPN IGS08 DENSIFICATION

SITE CATEGORIZATION BASED ON DATA QUALITY

STATIONS WITH SUFFICIENT LENGTH OF OBSERVATIONS AND HAVING HIGH QUALITY VELOCITIES SHOULD BE DISTINGUISHED FROM 'YOUNGER' SITES.

EUREF ANALOGY:

CLASS_A: <<1 CM ACCURACY ETRS89 POSITION AND
<<1 MM/YEAR VELOCITY AT ANY EPOCH

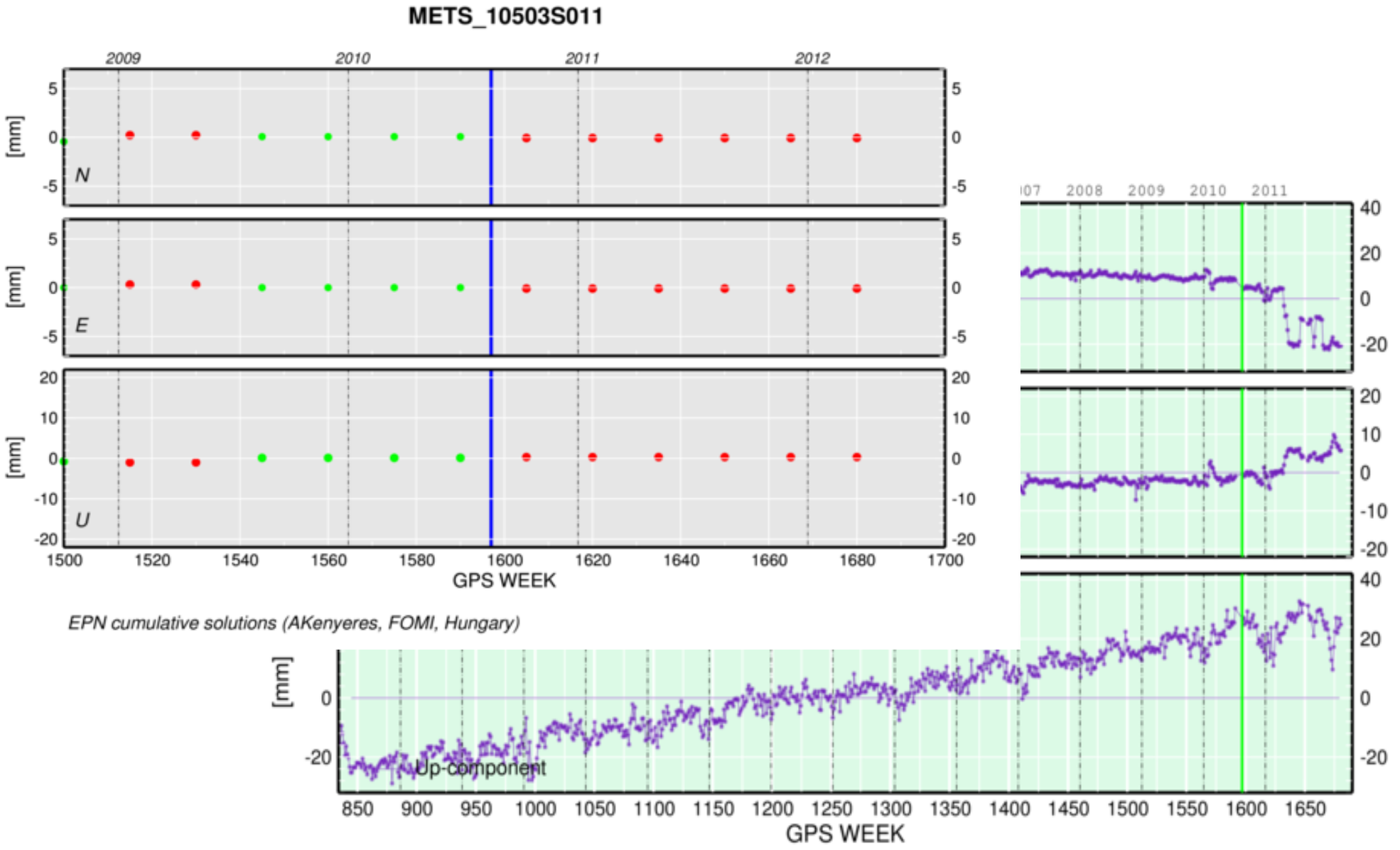
CLASS_B: ~1 CM ACCURACY ETRS89 POSITION AT
EPOCH OF MINIMUM VARIANCE
NO VELOCITY PUBLICATION

ETRF2000 MAINTENANCE
BASED ON THE EPN IGS08 Ddensification

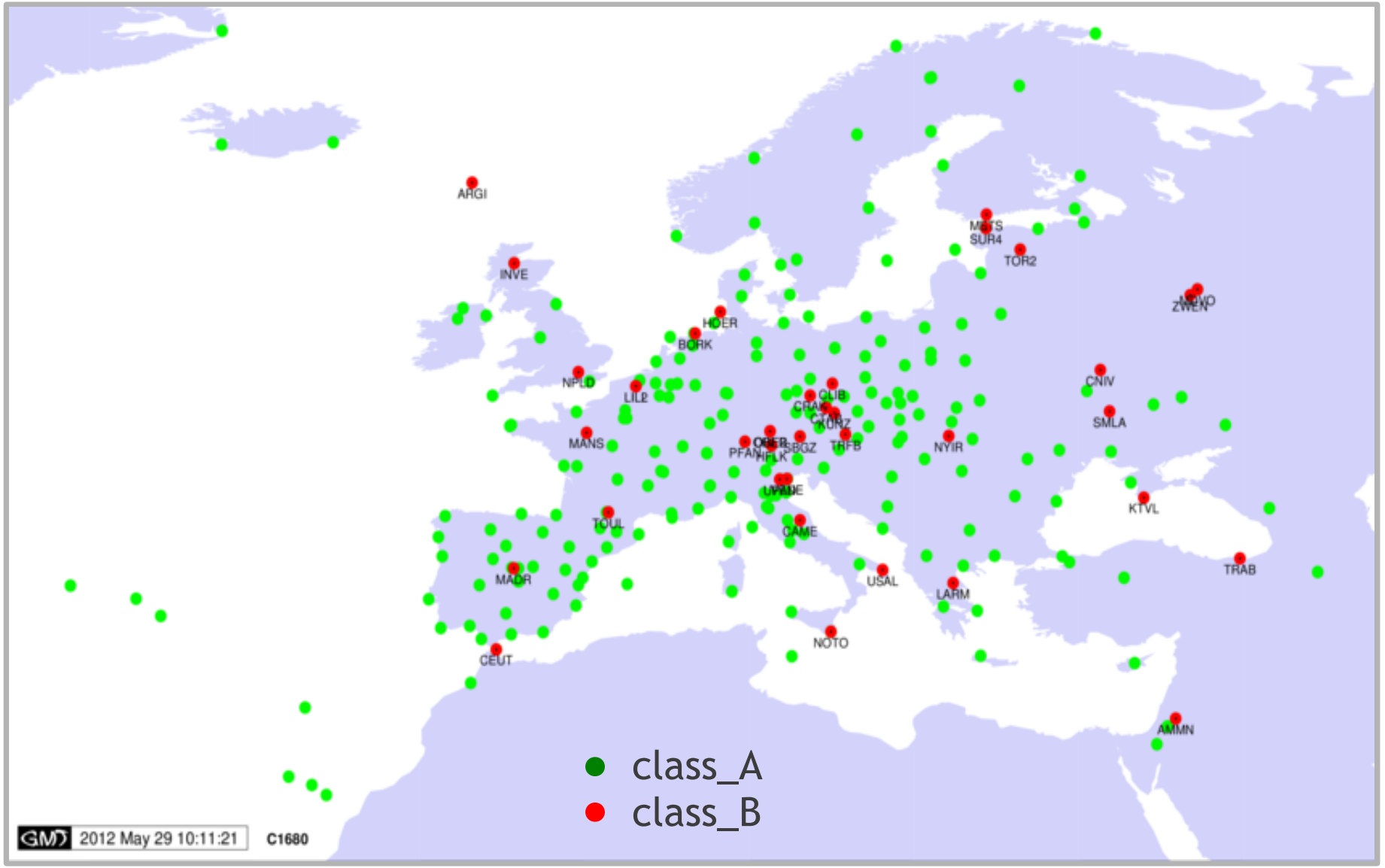
CLASS_A STATION:

- MINIMUM OBSERVATION LENGTH: **ONE** YEAR
- LAST AVAILABLE DATA NOT OLDER THAN 2 YEARS
- VELOCITY 'REPEATABILITY' < **0.5 MM/YEAR** OVER THE LAST YEAR (FROM LAST TEN 5-WEEKLY ESTIMATIONS)
- THE UNCERTAINTY OF THE LAST VELOCITY SOLUTION IS < 0.5 MM/YEAR
- **THE TIME SERIES SCATTER IS LESS THAN 4 MM FOR A GIVEN PERIOD**
- **LOW AMPLITUDE SEASONAL SIGNAL (A <4 MM)**

TEMPORARILY DECREASED QUALITY



EPN CLASSES (C1680)



SUMMARY

- EPN-REPRO1 CUMULATIVE SOLUTION (UP TO WEEK 1408) WAS PREPARED, BUT **NOT** PUBLISHED,
- ITRF2008 / EPN DENSIFICATION SOLUTION WAS PREPARED AND AVAILABLE FOR SCIENTIFIC USE, IF REQUESTED,
- SINEX CONVERSION BEFORE WEEK 1632 (EPN_05 TO EPN_08 PCV) WAS PREPARED BY QUENTIN BAIRE, EPNCB
- HIGH QUALITY IGS08 DENSIFICATION SOLUTION, **C1680** WAS PREPARED AND BEING PUBLISHED,
- NEW SERIES OF THE ETRF2000 MAINTENANCE SOLUTIONS, BASED ON CONSISTENT EPN_08 PCV MODELS WERE CREATED,
- REFINED CATEGORIZATION CRITERIA ARE ADDED,
- ALL RESULTS AND PRODUCTS WILL BE PUBLISHED AFTER FINAL TWG VALIDATION **EARLY JULY**

ACKNOWLEDGEMENTS

- EPN LACs for providing EPN-Repro1,
- Quentin Baire, EPNCB, for providing corrected EPN weekly SINEX solutions,