

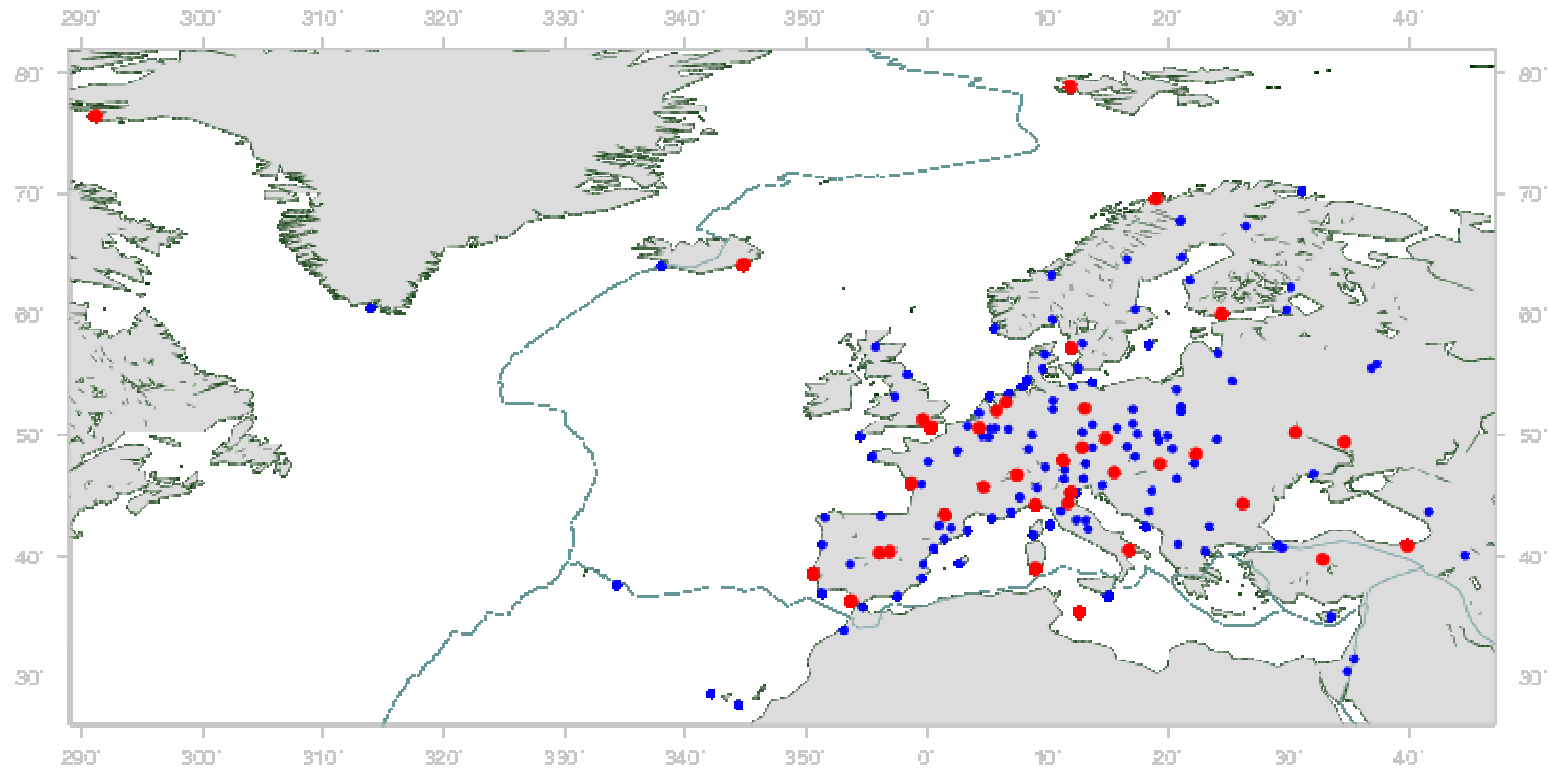
ITRF2005 Densification

Summary

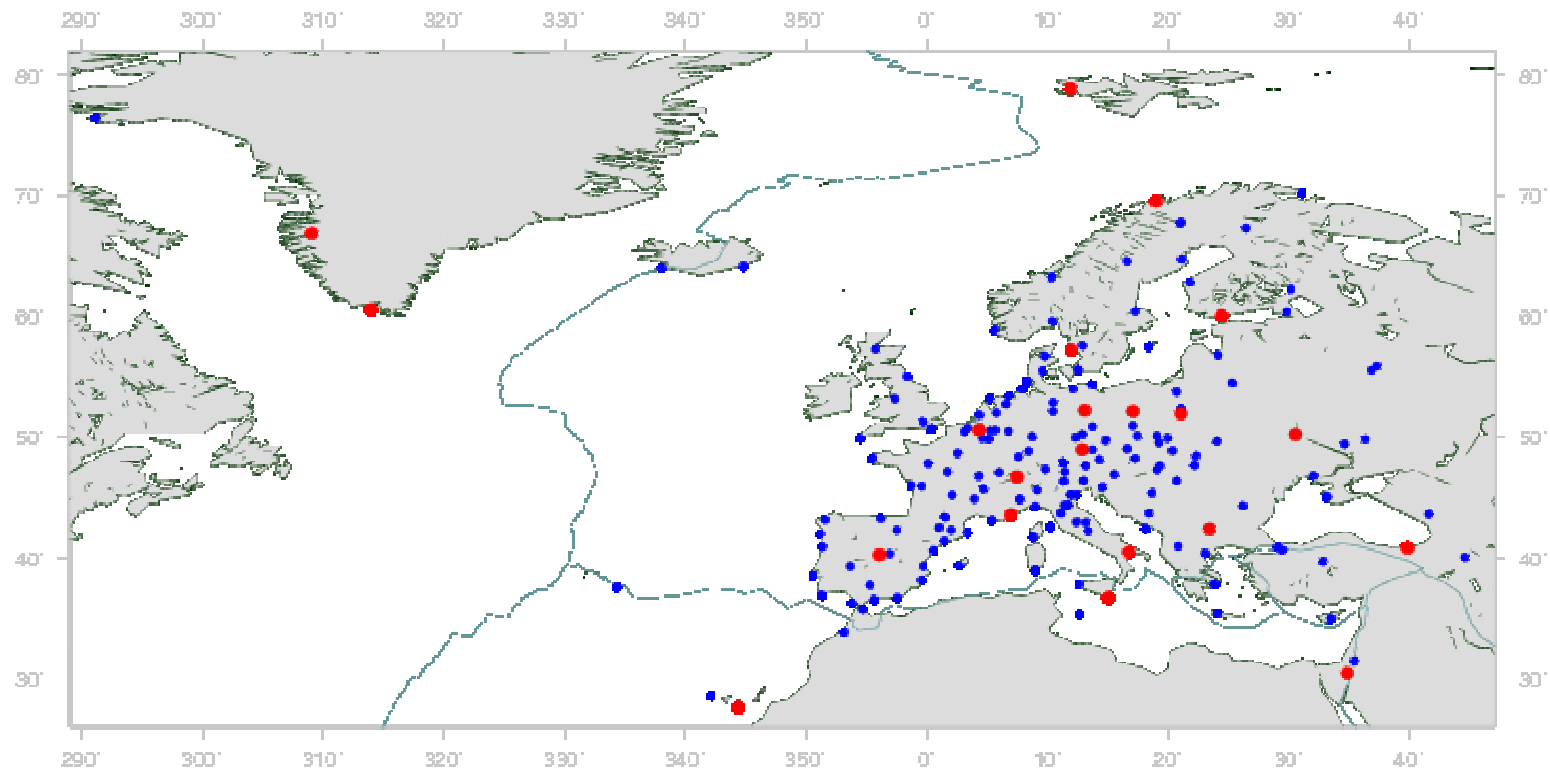
Comparison of Input and Methodology

- Input files:
 - EPN weekly from 860 to 1355
 - TSP: elimination of ± 40 weekly solutions
- Datum definition
 - ITRF2005 reference stations

ACC Datum Definition



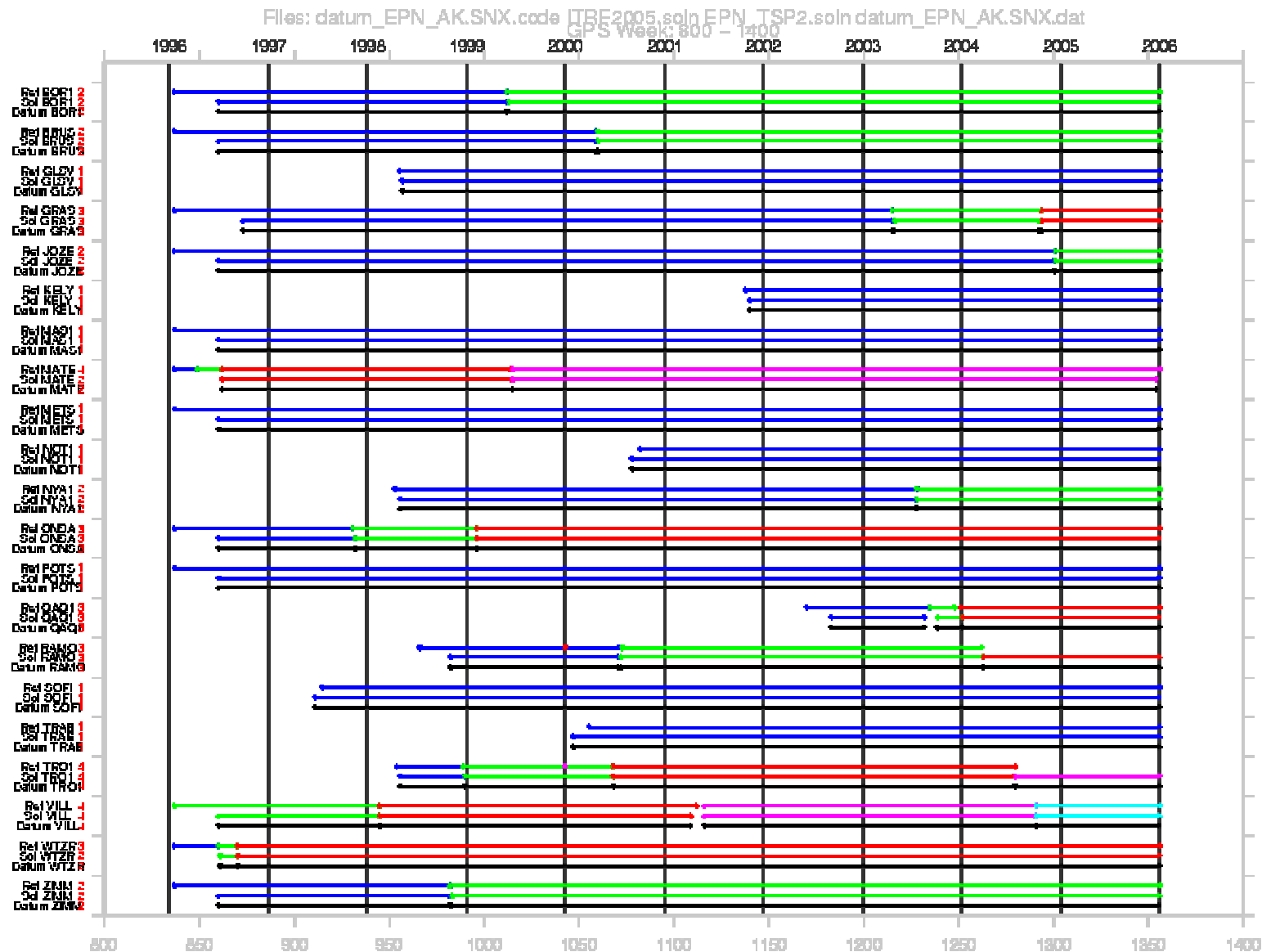
TSP Datum Definition



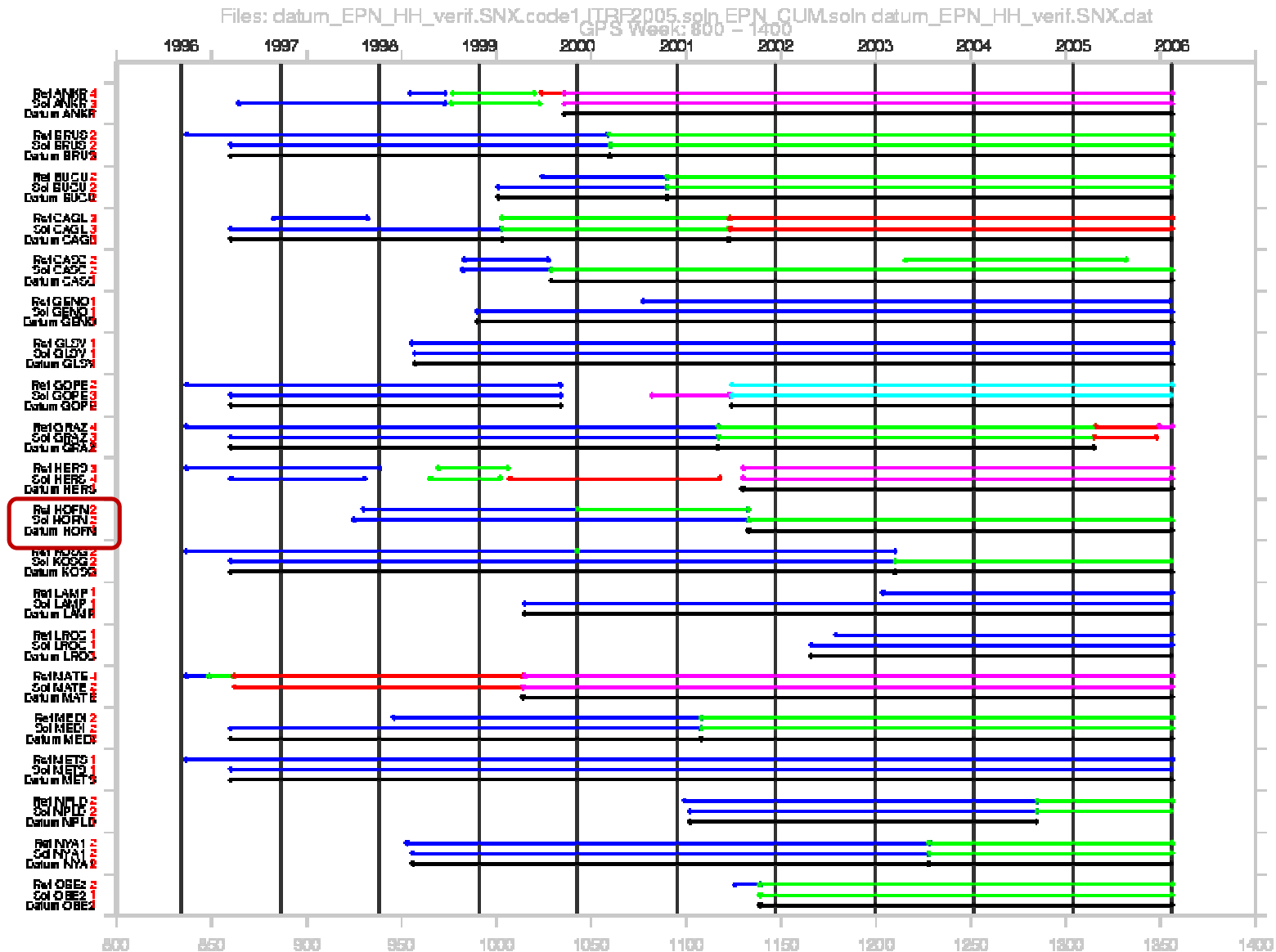
Comparison of Input and Methodology

- Input files:
 - EPN weekly from 860 to 1355
 - TSP: elimination of ± 40 weekly solutions
- Datum definition
 - ITRF2005 reference stations
 - Solution numbers

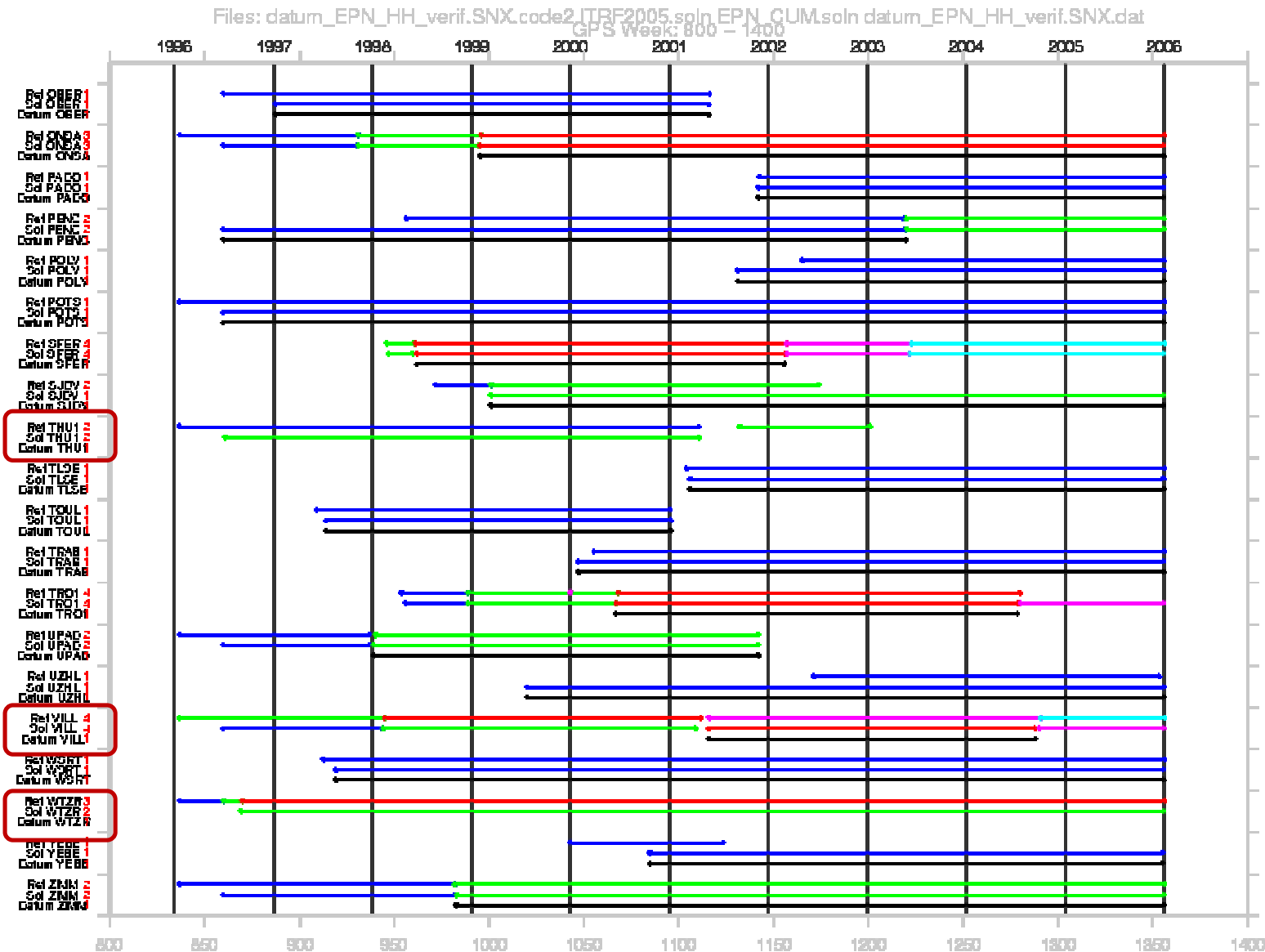
Solution Numbers – TSP



Solution Numbers – AAC (1)



Solution Numbers – AAC (2)



Comparison of Input and Methodology

- Input files:
 - EPN weekly from 860 to 1355
 - TSP: elimination of ± 40 weekly solutions
- Datum definition
 - ITRF2005 reference stations
 - Solution numbers
 - Method:
 - ACC: heavily constrained
 - TSP: minimal constrained, 7 parameters

Comparison of Results

- In ITRF2005 (= No Helmert) ?
 - Problem: correlation of transformation parameters

	TX	TY	TZ	S	RX	RY
TY	-0.048					
TZ	-0.231	-0.085				
S	-0.540	-0.081	-0.649			
RX	-0.021	0.872	-0.177	0.000		
RY	-0.813	-0.006	0.723	0.000	-0.033	
RZ	0.153	-0.758	0.034	0.000	-0.378	-0.033

- Interpretation difficult
- Check significance level & rms

Helmert – 3 T - Coordinates only

ITRF2005/AAC

NUMBER OF PARAMETERS : 3
NUMBER OF COORDINATES : 360
RMS OF TRANSFORMATION : 4.1 MM

PARAMETERS:

TRANSLATION IN X	:	1.0	+-	0.4	MM
TRANSLATION IN Y	:	-0.8	+-	0.4	MM
TRANSLATION IN Z	:	1.7	+-	0.4	MM

NUMBER OF ITERATIONS : 2

ACCEPTED STATIONS : 120

REJECTED STATIONS : 5

LIST OF REJECTED STATIONS

STATION	RESIDUALS (MILLIMETERS)		
	N	E	U
THU1 43001M001	-0.4	-5.7	-22.0
SFER 13402M004B	-3.3	11.3	-2.5
REDU 13102M001	3.5	-2.0	-20.6
OBET 14208M004	1.5	-0.3	-33.5
TRO1 10302M006	1.8	12.3	1.5

ITRF2005/TSP

NUMBER OF PARAMETERS : 3
NUMBER OF COORDINATES : 372
RMS OF TRANSFORMATION : 3.4 MM

PARAMETERS:

TRANSLATION IN X	:	0.3	+-	0.3	MM
TRANSLATION IN Y	:	-0.4	+-	0.3	MM
TRANSLATION IN Z	:	0.1	+-	0.3	MM

NUMBER OF ITERATIONS : 2

ACCEPTED STATIONS : 124

REJECTED STATIONS : 7

LIST OF REJECTED STATIONS

STATION	RESIDUALS (MILLIMETERS)		
	N	E	U
KELY 43005M001	-1.8	2.8	24.5
HOFN 10204M002A	0.6	-1.4	21.7
QAQ1 43007M001A	0.4	-0.8	-22.8
REDU 13102M001	2.1	-2.2	-20.6
SFER 13402M004	2.4	10.4	1.3
OBET 14208M004	3.0	-1.3	-26.3
QAQ1 43007M001	1.4	-1.4	-34.2

Computed using all ITRF2005 stations

Helmert - 3 T – Crd. + Vel.

AAC/ITRF2005

		TX (cm)	TY (cm)	TZ (cm)
PV	T	0.037	0.104	0.000
PS	T	0.021	0.021	0.021

		TX (cm/yr)	TY (cm/yr)	TZ (cm/yr)
PV	T	0.050	-0.062	-0.156
PS	T	0.021	0.021	0.021

RMSX 1.71
RMSV 0.99

TSP/ITRF2005

		TX (cm)	TY (cm)	TZ (cm)
PV	T	0.000	0.000	0.000
PS	T	0.064	0.064	0.064

		TX (cm/yr)	TY (cm/yr)	TZ (cm/yr)
PV	T	0.003	0.002	0.016
PS	T	0.064	0.064	0.064

RMSX 5.68
RMSV 1.61

Computed using only stations in reference datum

Helmert transformations

AAC/ITRF2005

	TX (cm)	TY (cm)	TZ (cm)	S (10 ⁻⁹)	RX (mas)	RY (mas)	RZ (mas)
PVTSR	-0.207	0.134	0.136	0.084	0.087	0.107	0.082
PSTSR	0.113	0.146	0.109	0.151	0.044	0.040	0.037
	TX (cm/yr)	TY (cm/yr)	TZ (cm/yr)	S (10 ⁻⁹ /yr)	RX (mas/yr)	RY (mas/yr)	RZ (mas/yr)
PVTSR	0.229	-0.087	0.043	-0.421	-0.043	-0.007	-0.020
PSTSR	0.113	0.146	0.109	0.151	0.044	0.040	0.037
RMSX	1.6 MM						
RMSV	0.9 MM/Y						

TSP/ITRF2005

	TX (cm)	TY (cm)	TZ (cm)	S (10 ⁻⁹)	RX (mas)	RY (mas)	RZ (mas)
PVTSR	0.000	0.000	0.000	0.000	0.000	0.000	0.000
PSTSR	0.282	0.313	0.243	0.332	0.094	0.102	0.083
	TX (cm/yr)	TY (cm/yr)	TZ (cm/yr)	S (10 ⁻⁹ /yr)	RX (mas/yr)	RY (mas/yr)	RZ (mas/yr)
PVTSR	-0.123	0.039	0.076	0.038	0.008	0.046	-0.012
PSTSR	0.282	0.313	0.243	0.332	0.094	0.102	0.083
RMSX	5.7 MM						
RMSV	1.6 MM/Y						

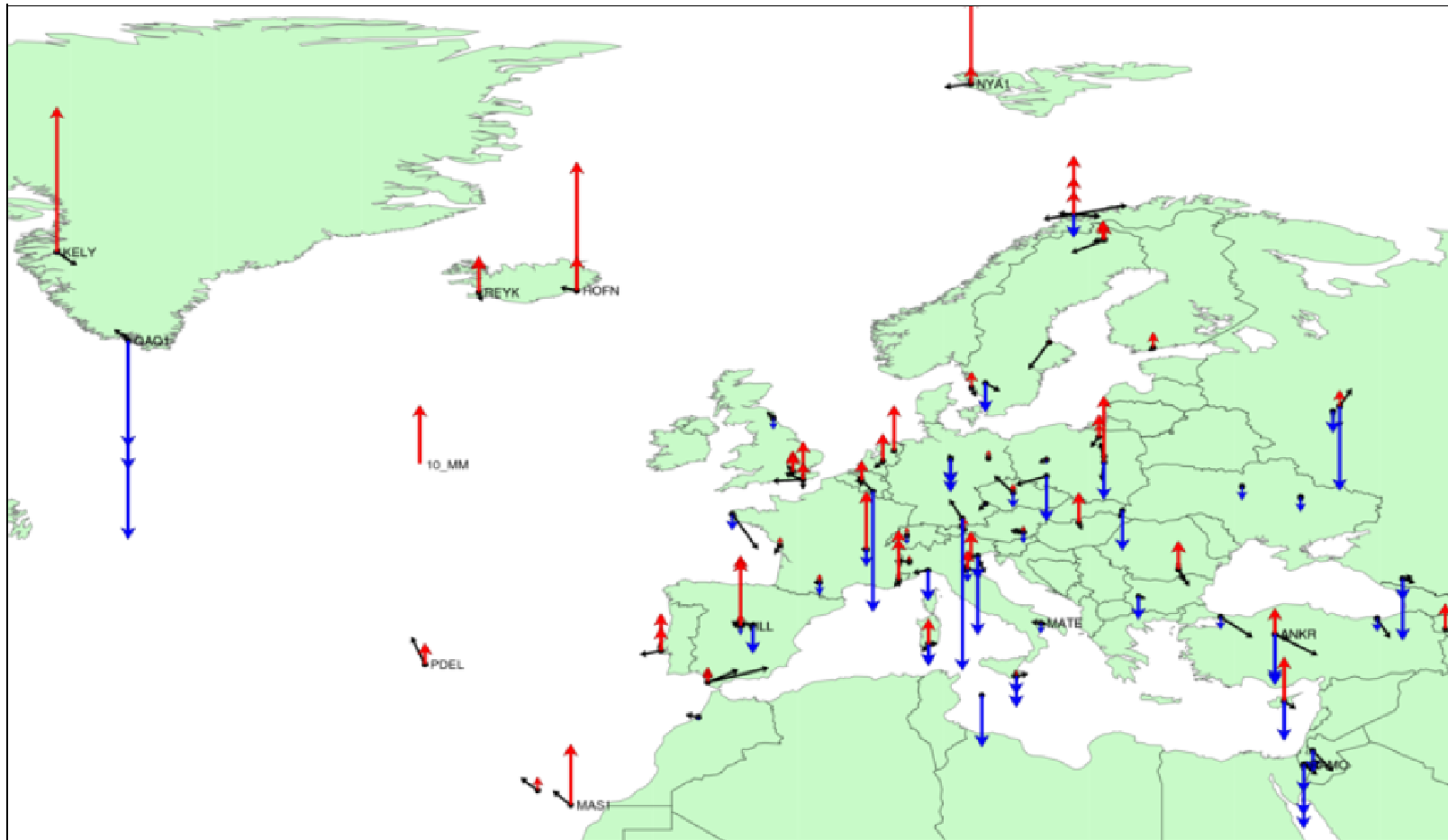
Computed using only stations in reference datum

Comparison of Results

- Differences wrt ITRF2005
 - Coordinates
 - Velocities

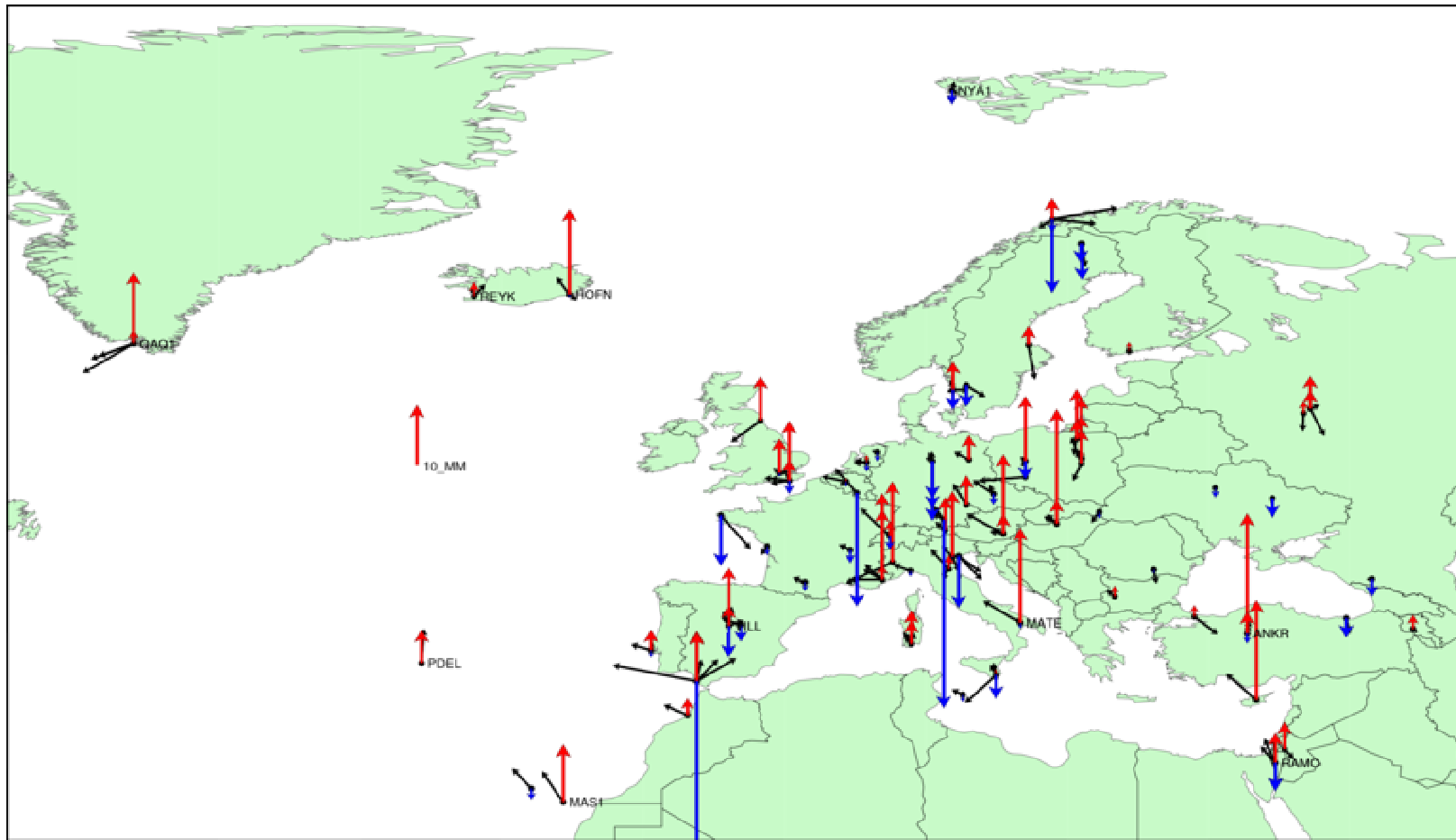
Coordinate Differences wrt ITRF2005

TSP / ITRF2005



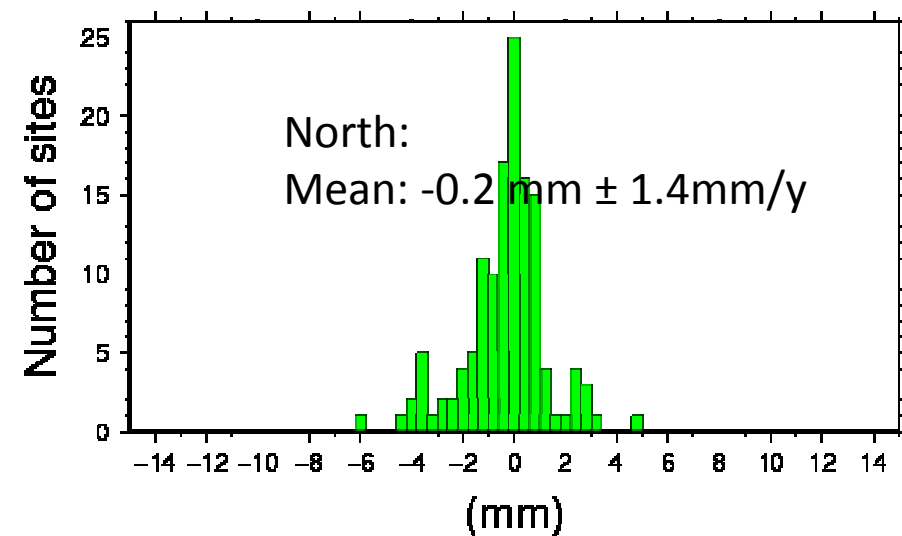
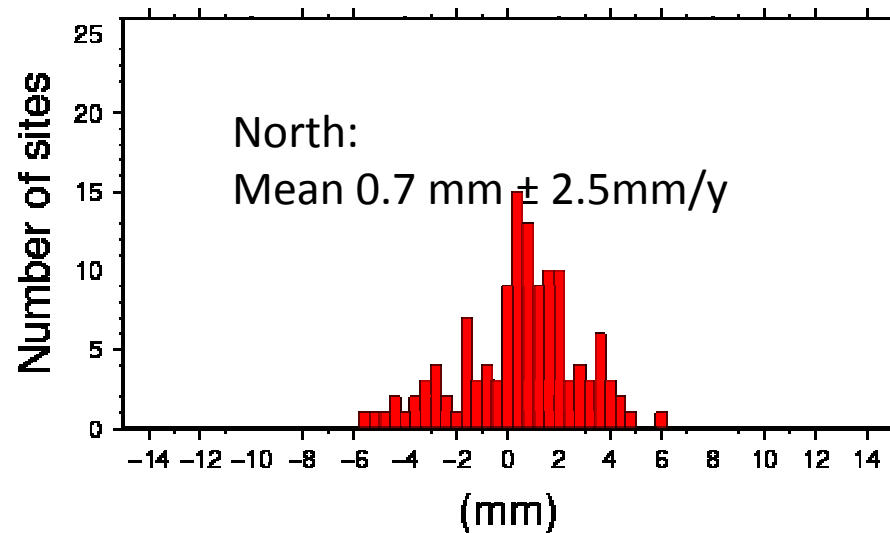
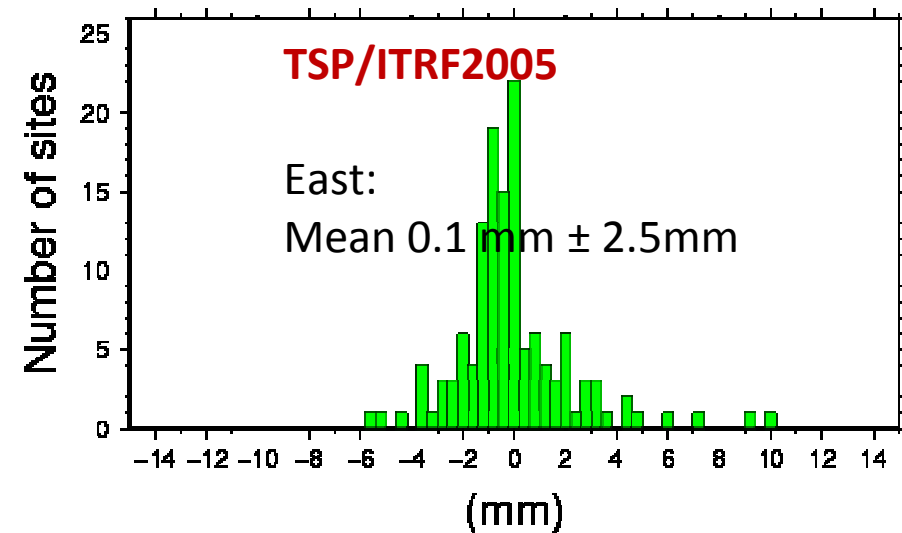
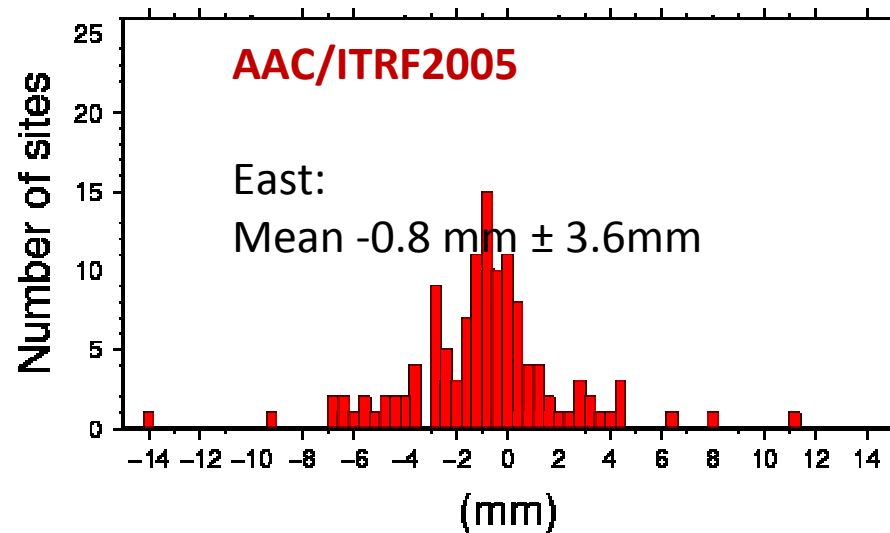
Coordinate Differences wrt ITRF2005

ACC / ITRF2005



Coordinate Differences wrt ITRF2005

Horizontal - Summary

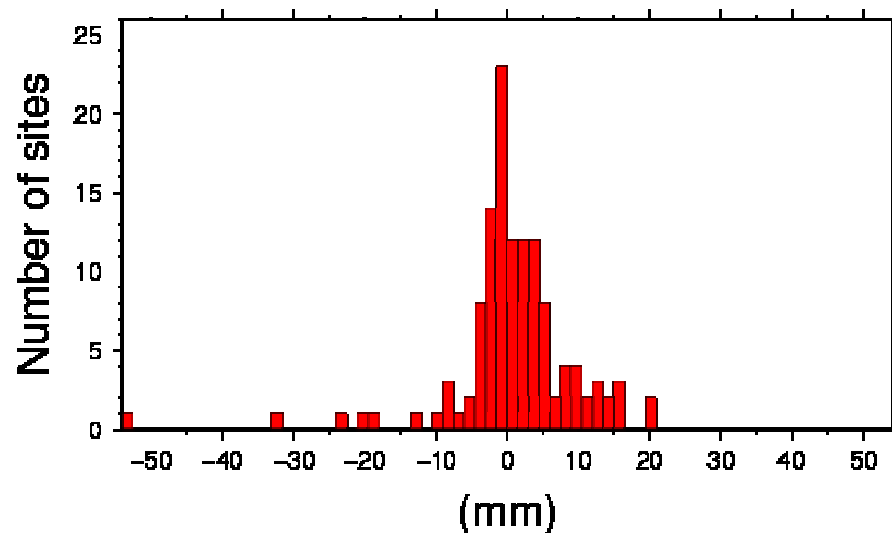


Velocity Differences wrt ITRF2005

Vertical - Summary

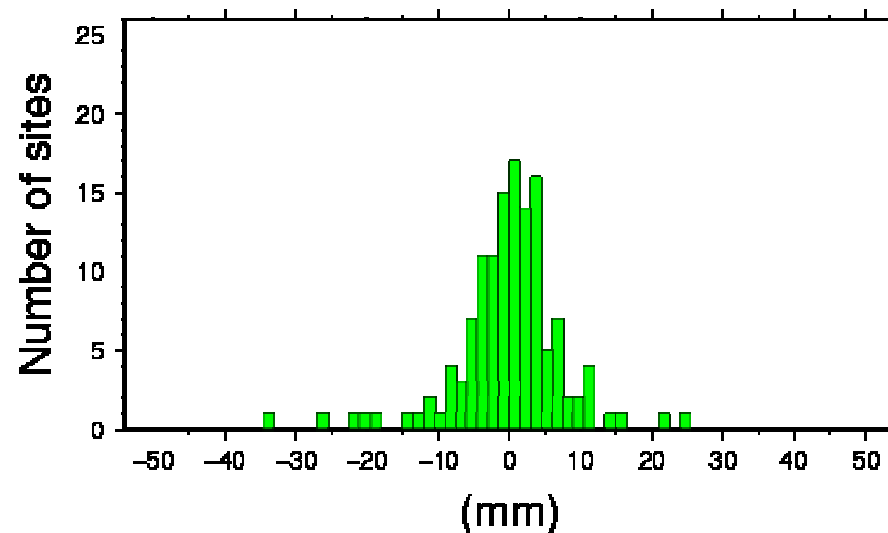
AAC/ITRF2005

Mean: $0.6 \text{ mm} \pm 9.8 \text{ mm/y}$



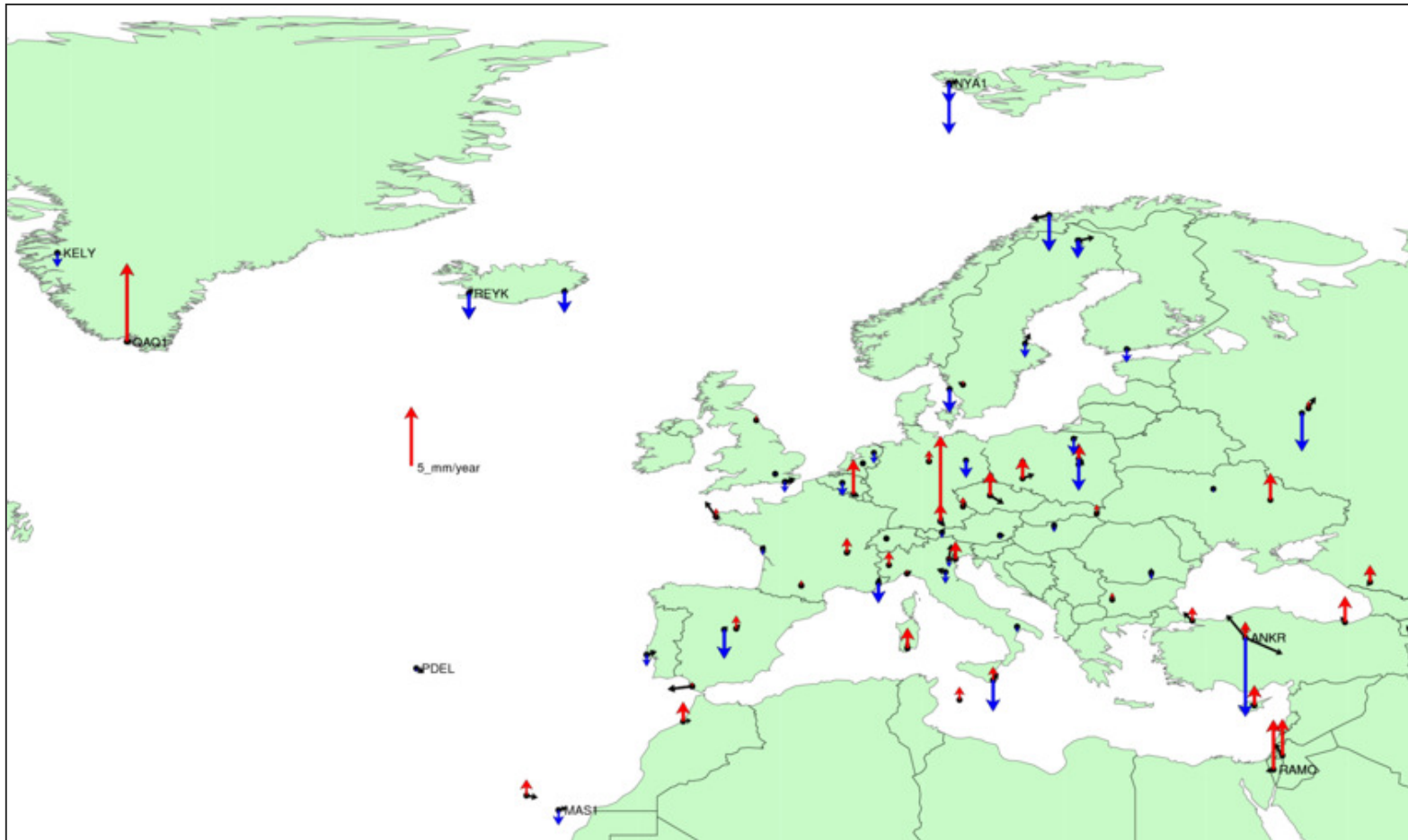
TSP/ITRF2005

Mean: $0.1 \text{ mm} \pm 7.9 \text{ mm/y}$



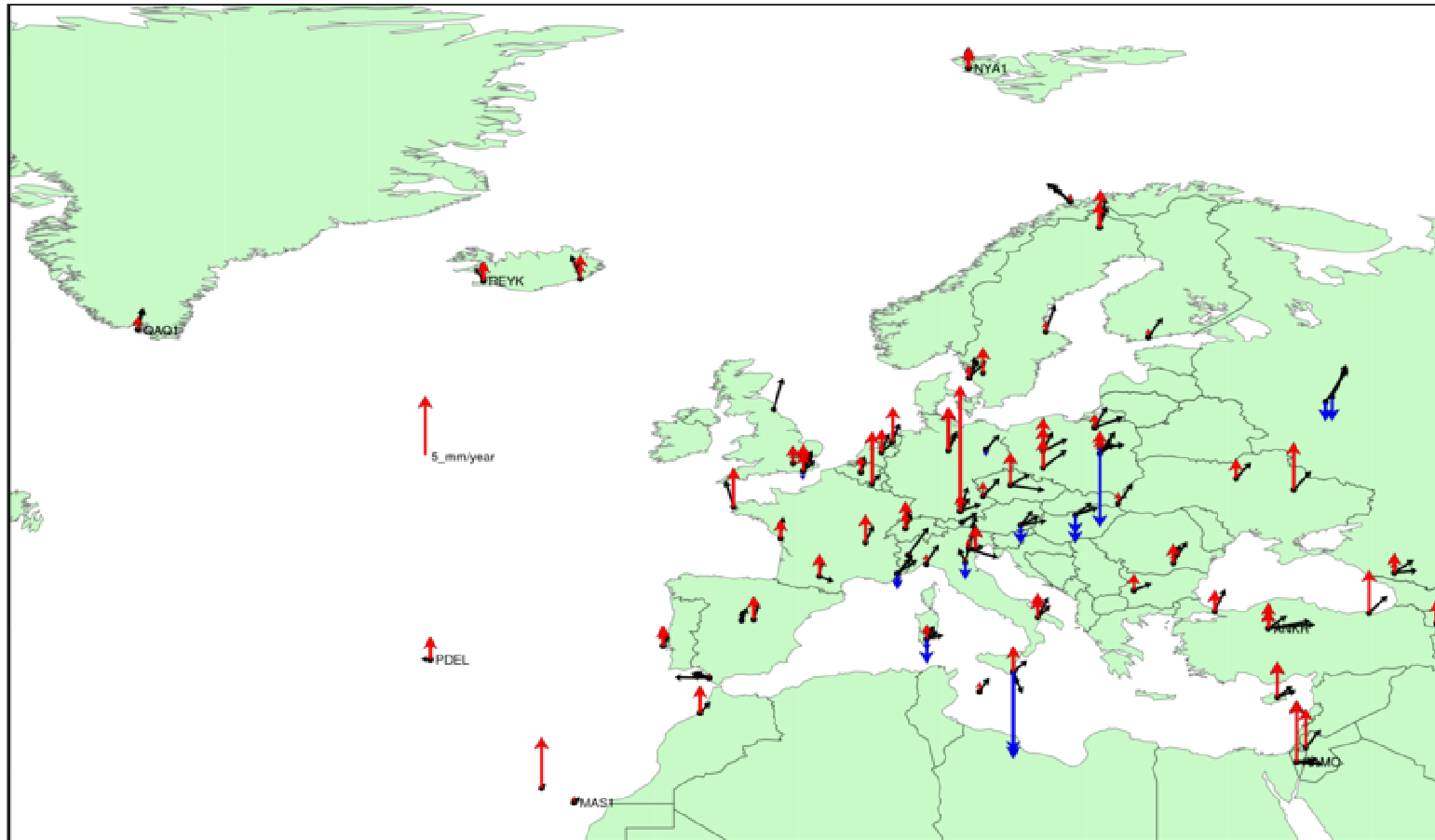
Velocity Differences wrt ITRF2005

TSP / ITRF2005



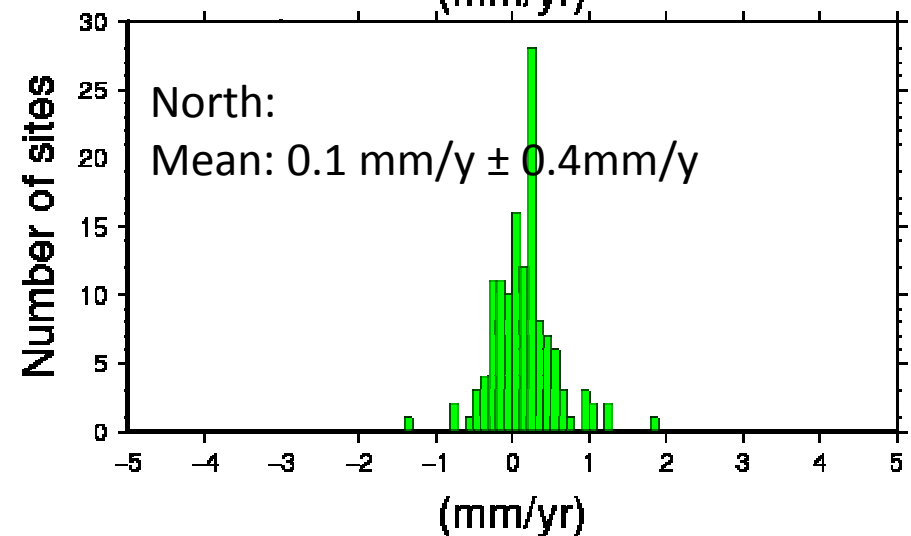
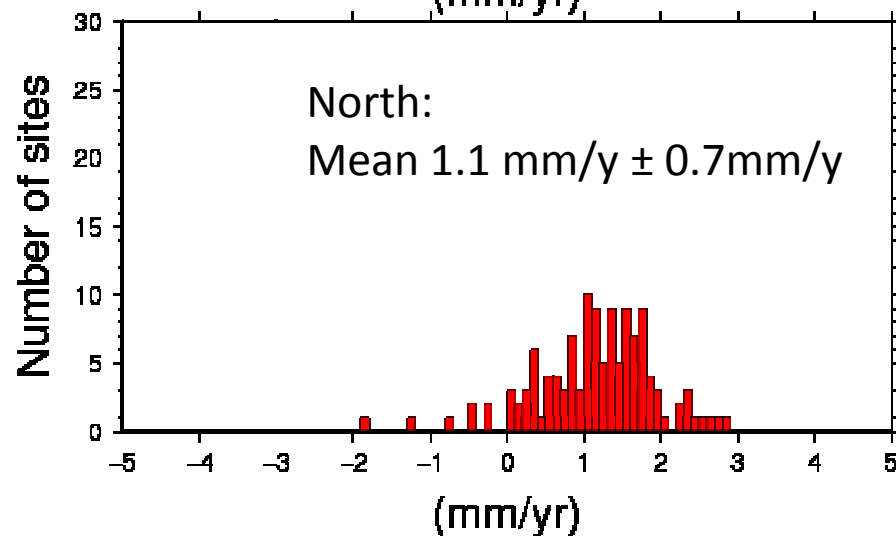
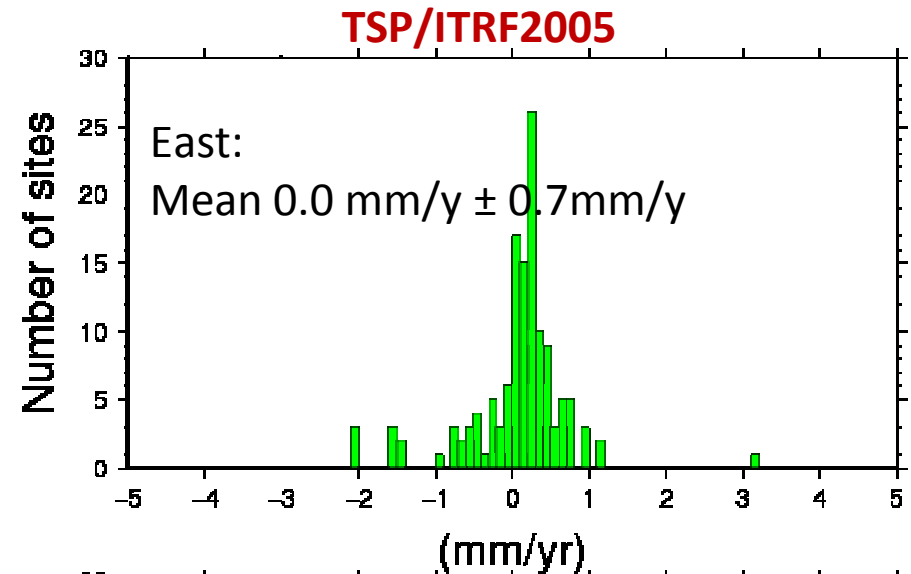
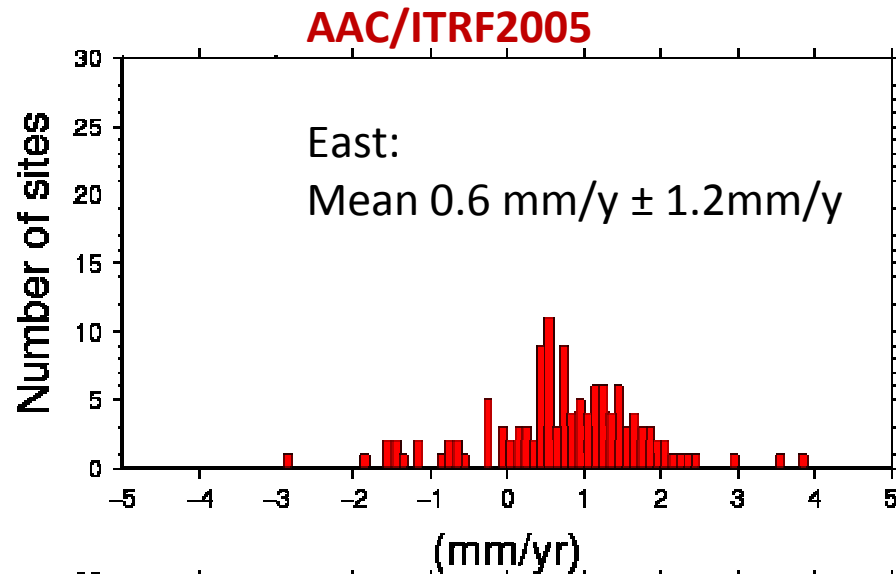
Velocity Differences wrt ITRF2005

ACC / ITRF2005



Velocity Differences wrt ITRF2005

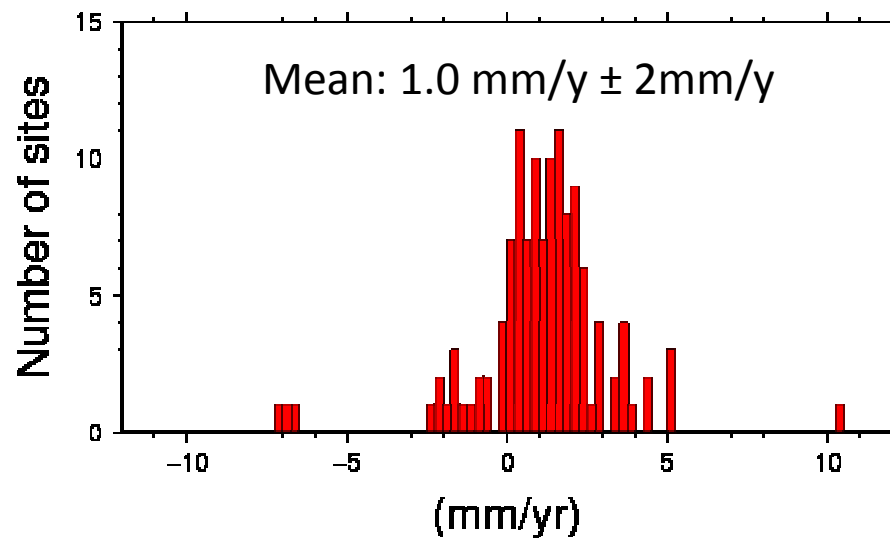
Horizontal - Summary



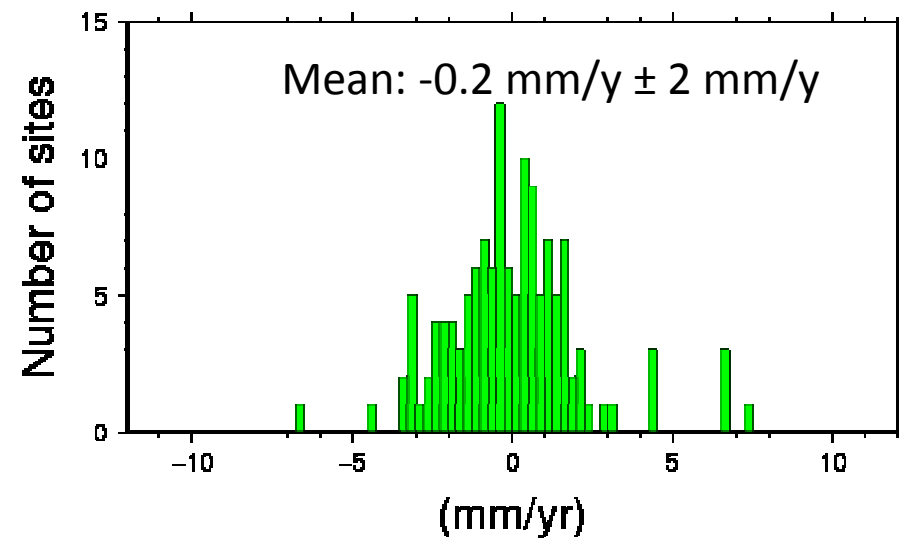
Velocity Differences wrt ITRF2005

Vertical - Summary

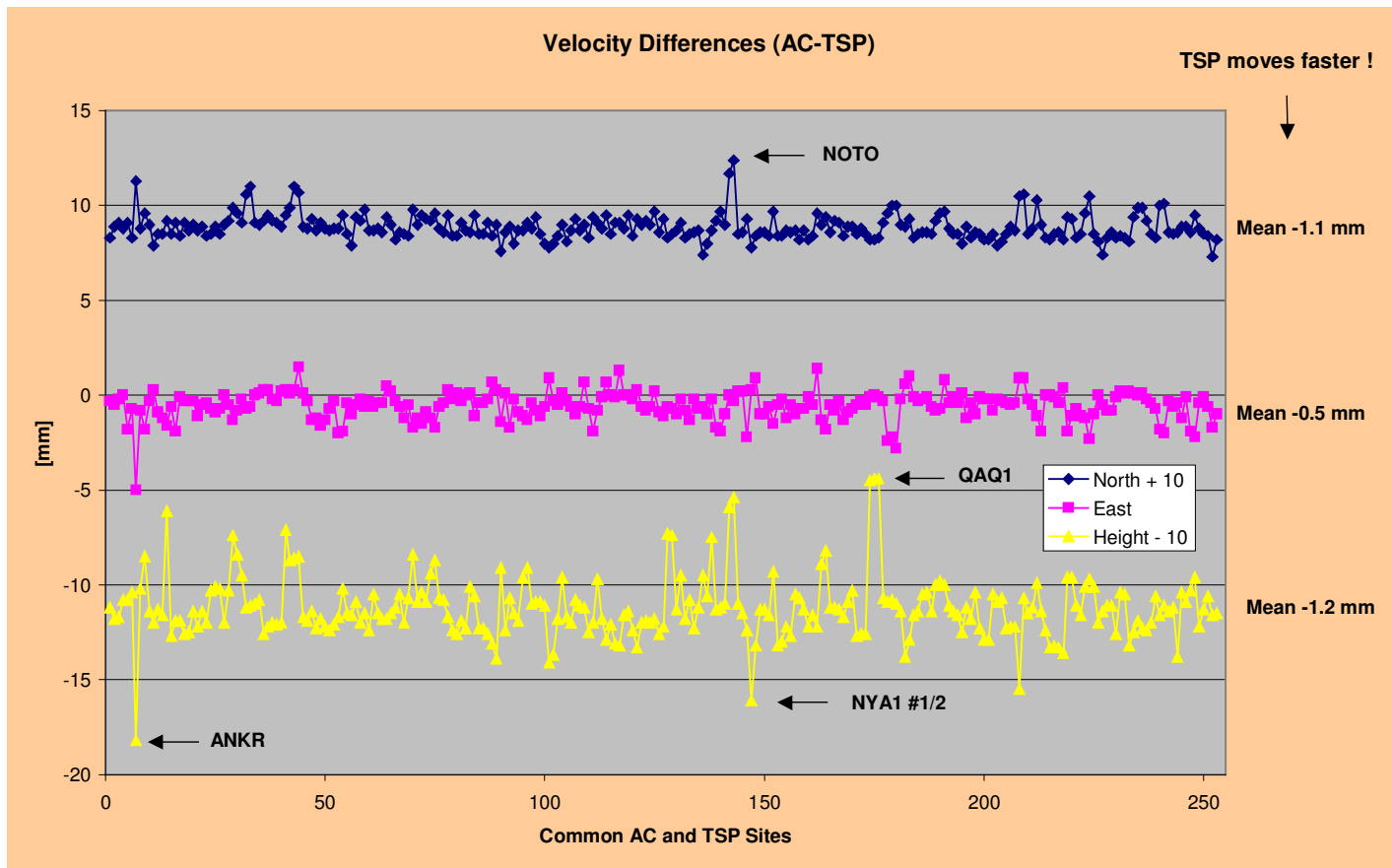
AAC/ITRF2005



TSP/ITRF2005



Velocity Differences TSP/AAC



Summary of Conclusions

- ACC:
 - The AC and TSP solutions may be considered as equivalent.
 - Coordinate differences (ACC/TSP):
 - The RMS of 3.6 mm of the transformed coordinates represents the expected precision.
 - Velocity differences (ACC/TSP): ??
 - The heavily constraint AC solution is proposed as ITRF2005 densification, due to optimal alignment to ITRF2005.
- TSP:
 - Coordinate differences (ACC/TSP):
 - reflect the limit of our actual ability to realize the regional reference frame
 - coordinate rms values about 2 mm for the horizontal and 7 mm for the vertical components.
 - Velocity differences (ACC/TSP):
 - show systematic effect both in the horizontal and the vertical components, which is far above the acceptable level.
 - As we see the same pattern at the ITRF2005-AC and TSP-AC comparison most probably the AC velocity solution is biased.