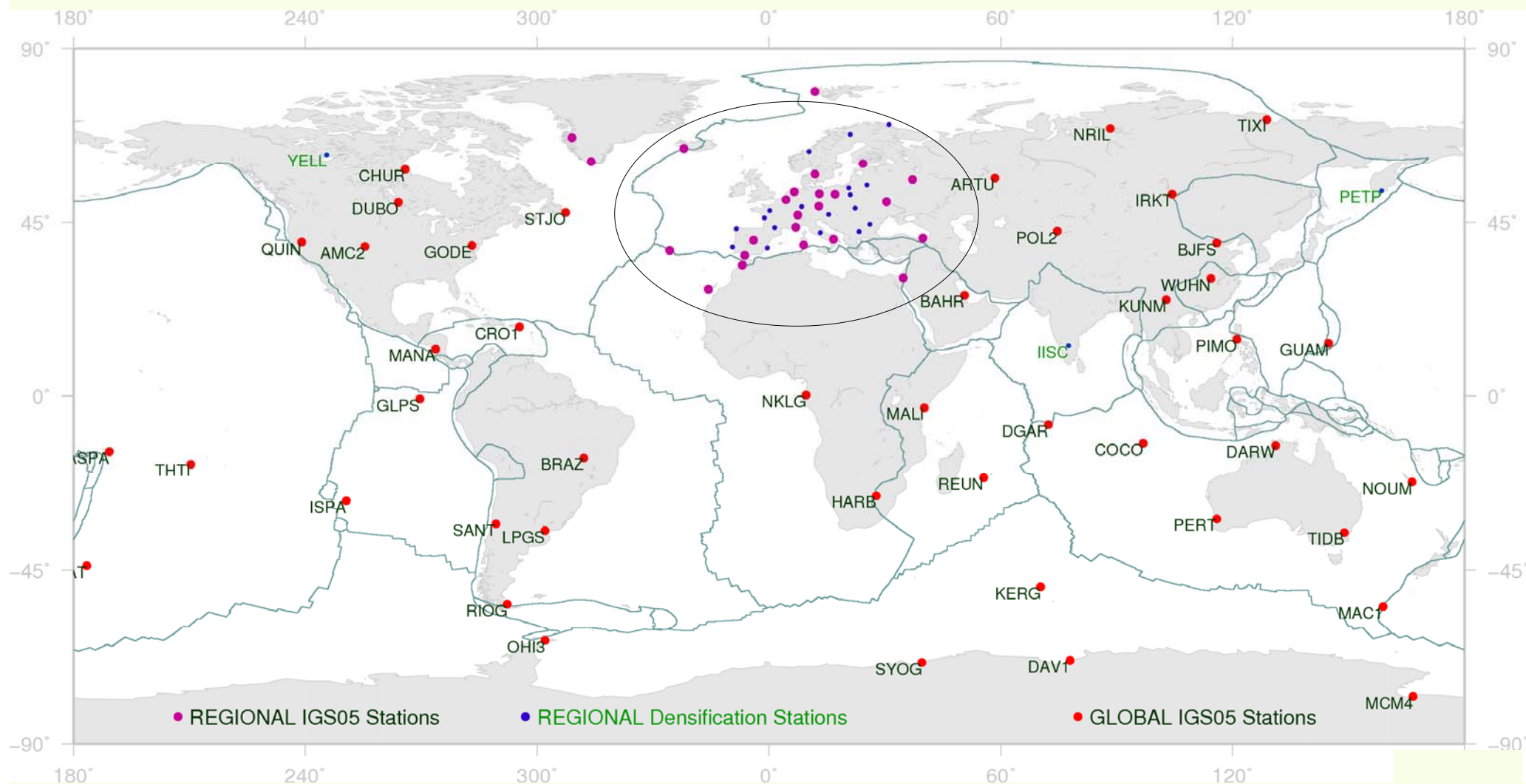


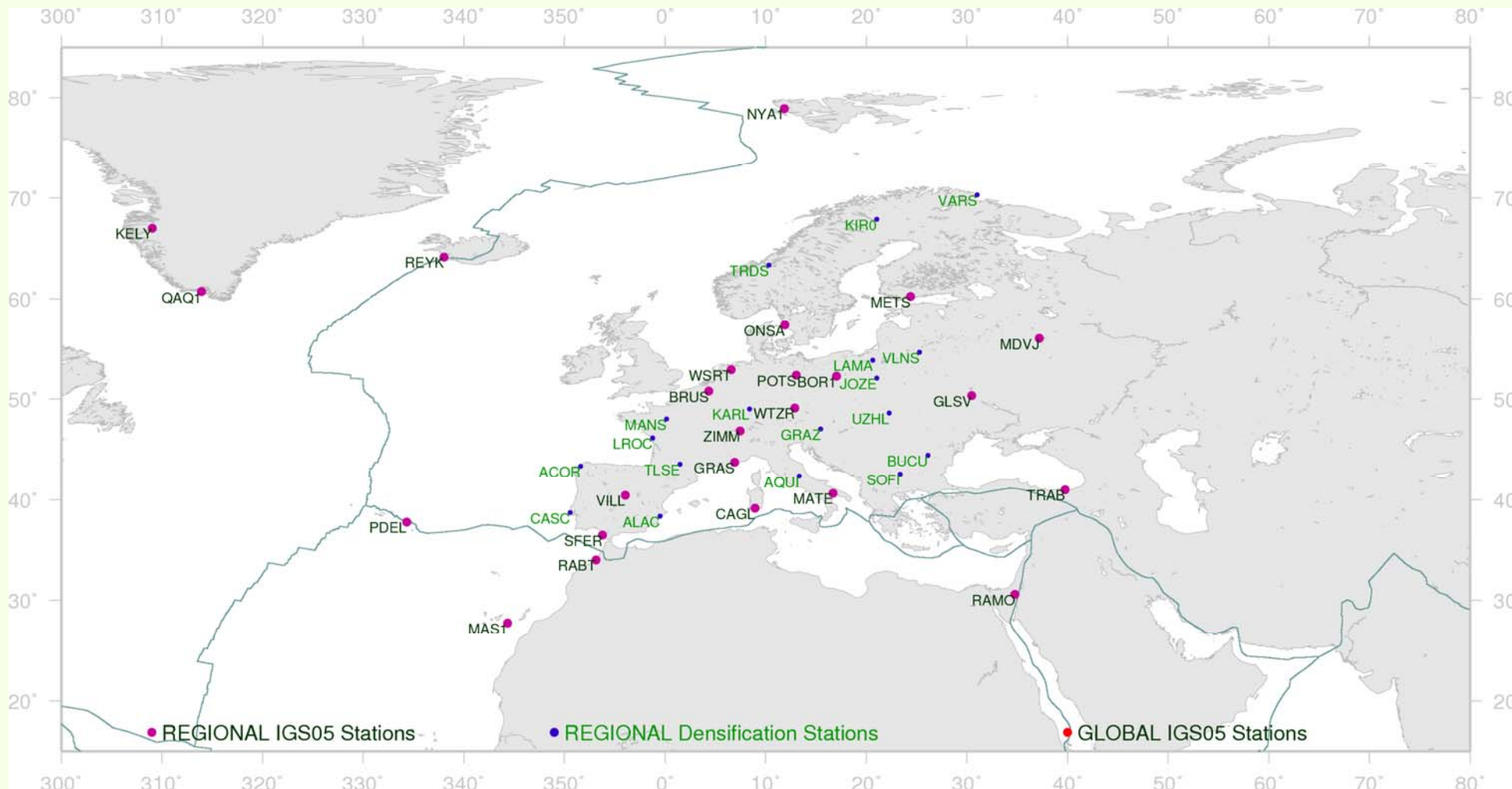
# EPN Reference Frame Fixing

J. Legrand & C. Bruyninx  
AGU Fall Meeting 2008

# FREE NETWORK SOLUTION

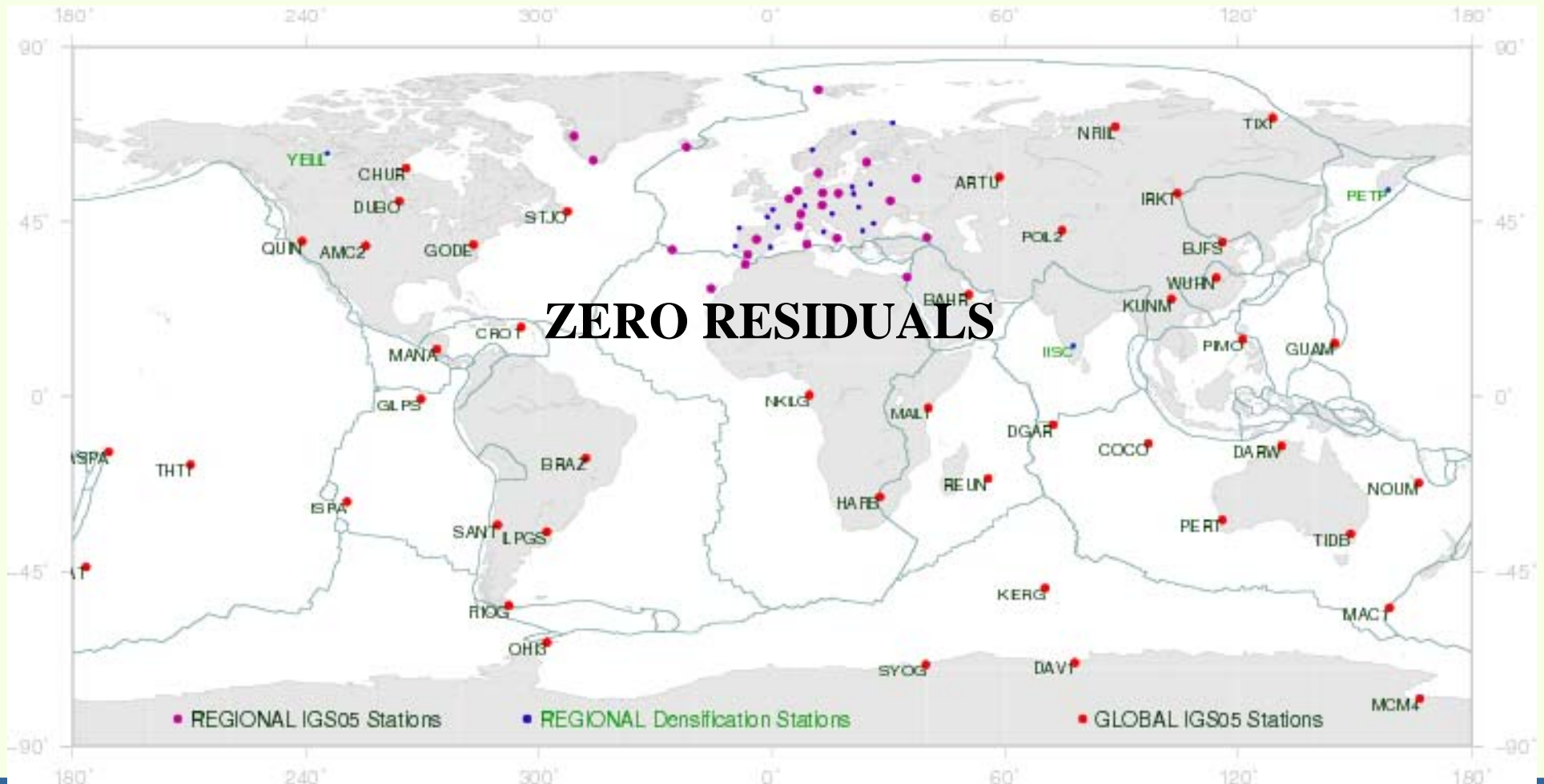


# FREE NETWORK SOLUTION



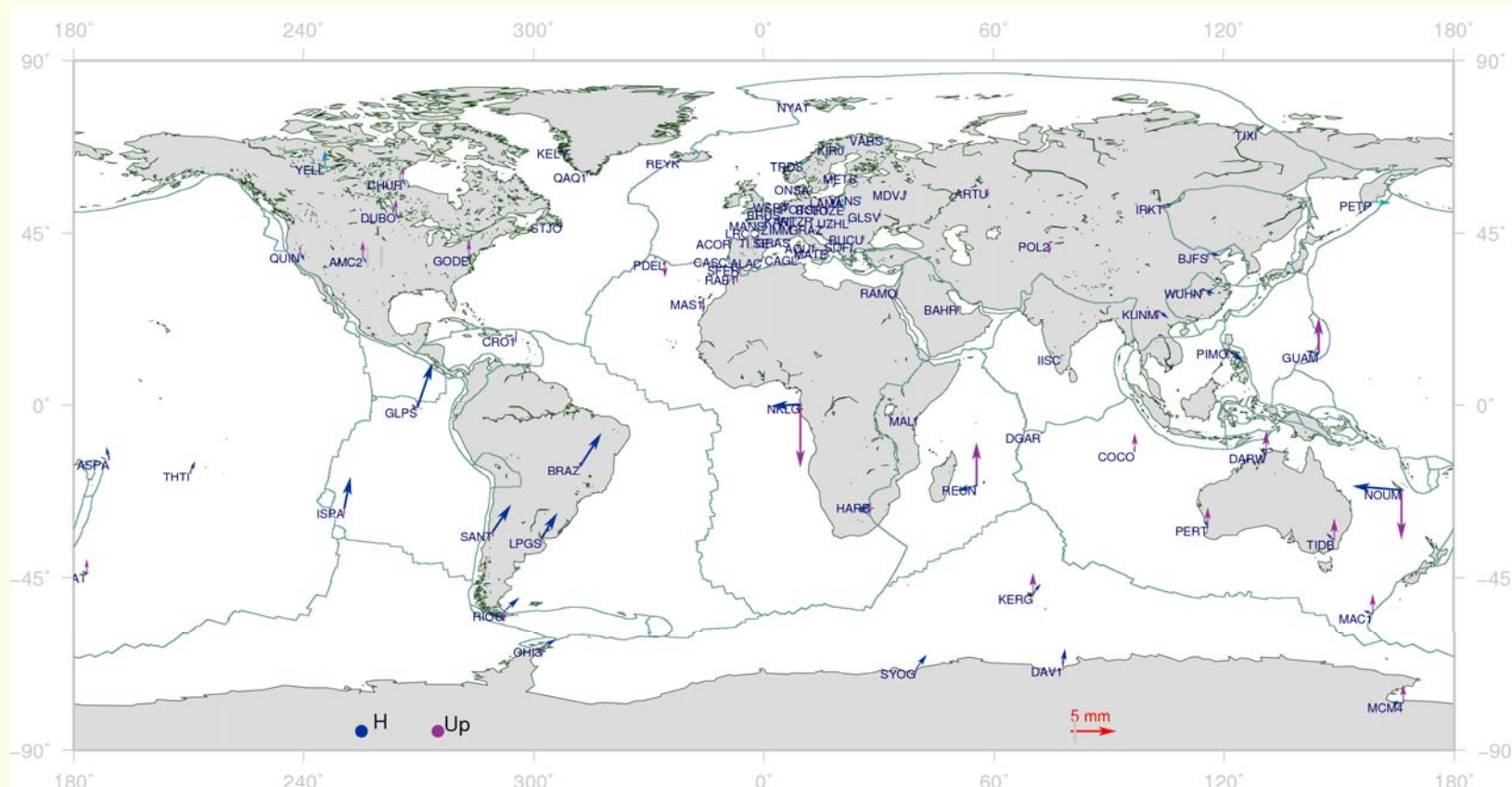
# GLOBAL: MINIMAL CONSTRAINTS IN CATREF

Global (Free Network Solution) – (Minimally Constrained Solution)  
Helmert residuals



# GLOBAL : MINIMAL CONSTRAINTS IN BERNESE

Global (Free Network Solution) – (Minimally Constrained Solution) – 1401/5  
Helmert residuals



Size of network deformation depends on precision of estimated coordinates





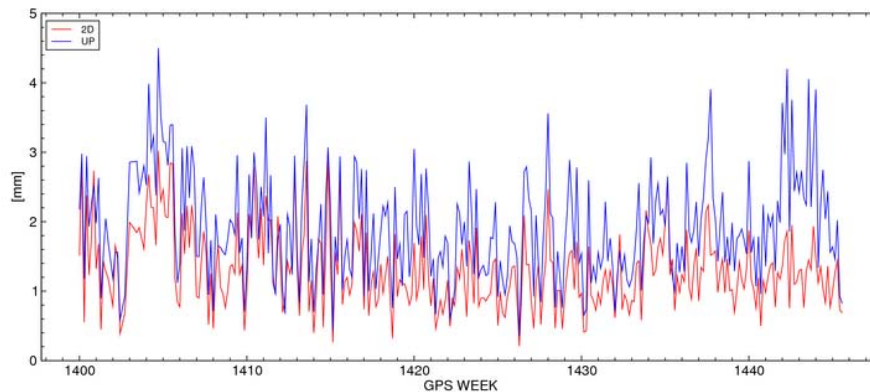
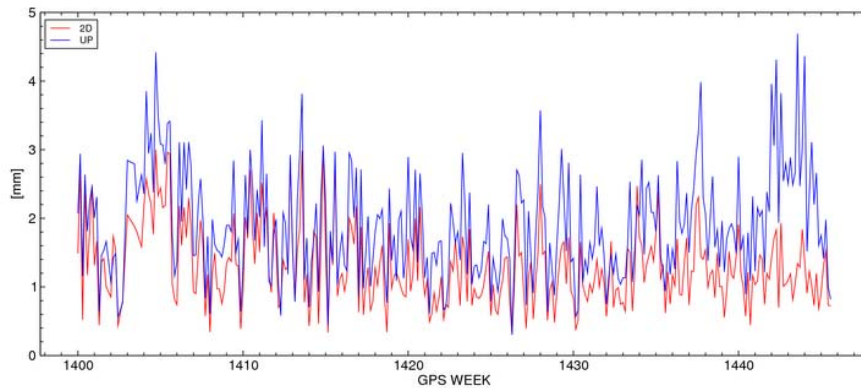
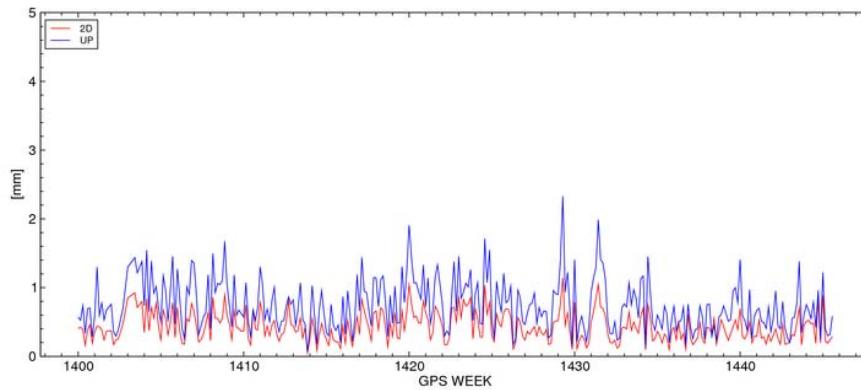
## Bernese, **Global network**

RMS of helmert residuals between Free  
Network and Minimally constrained network

No net translation wrt IGS05

No net translation and rotation

No net translation, rotation and scale



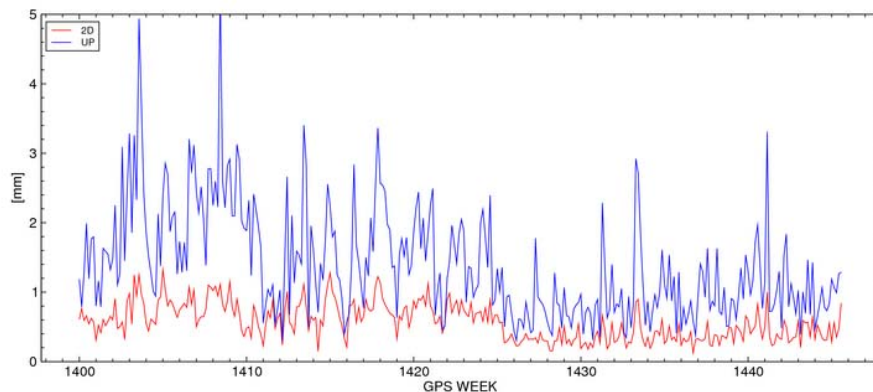
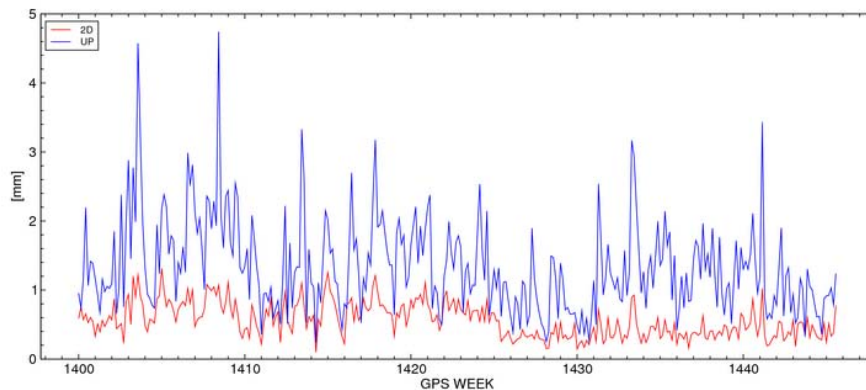
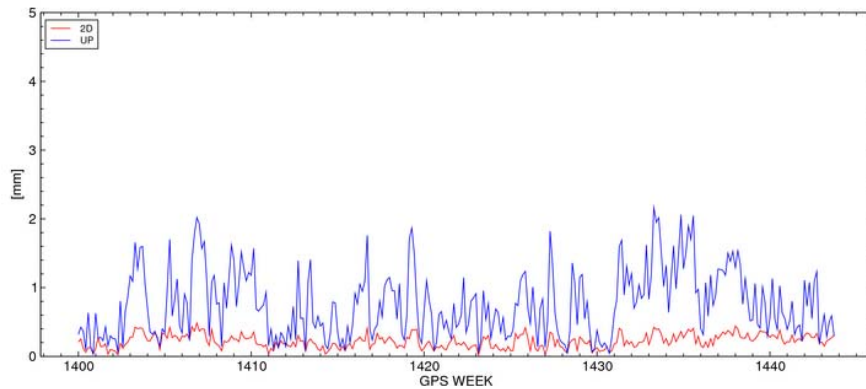
## Bernese, **Regional network**

RMS of helmert residuals between Free Network and Minimally constrained network

No net translation wrt IGS05

No net translation and rotation

No net translation, rotation and scale



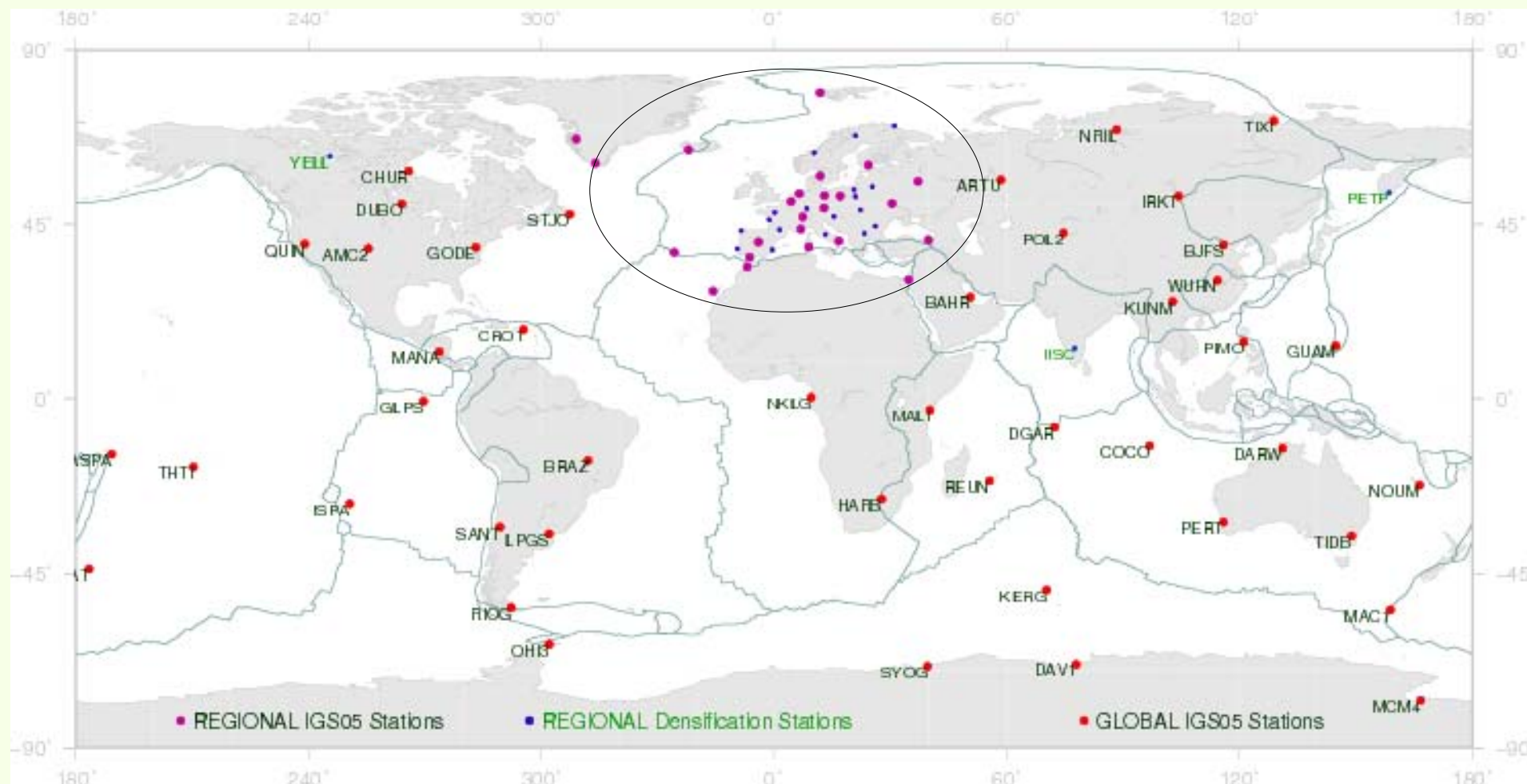
## First set of CONCLUSIONS

Bernese minimal constraints cause small deformation of network:

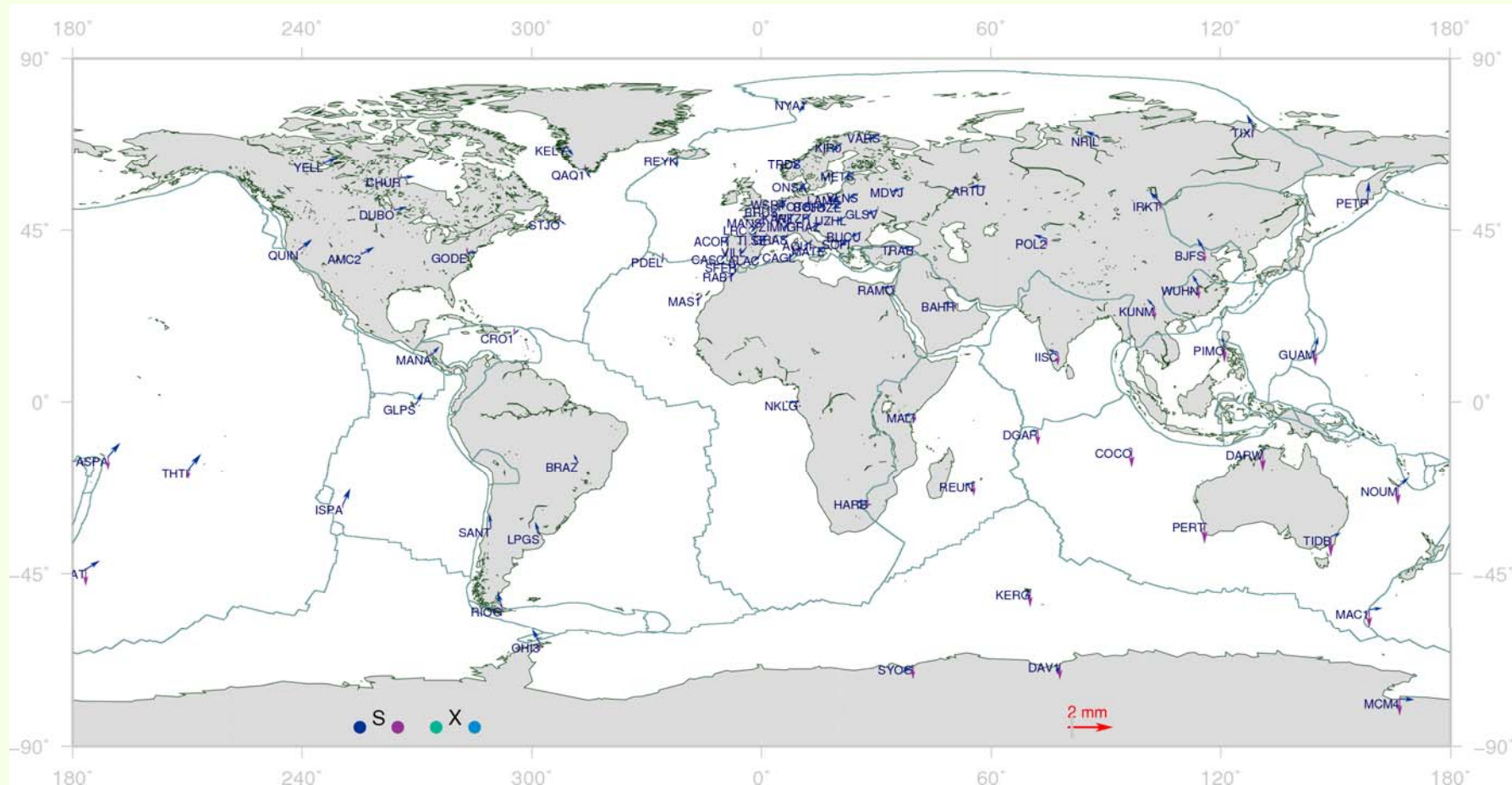
- Largest deformation is introduced as soon as No Net Rotation and Scale are used to realize frame
- Size of the deformation depends on precision of estimated site coordinates (less for yearly solution)
- MC in Bernese is not recommended for fixing frame of daily solutions



# FREE NETWORK SOLUTION



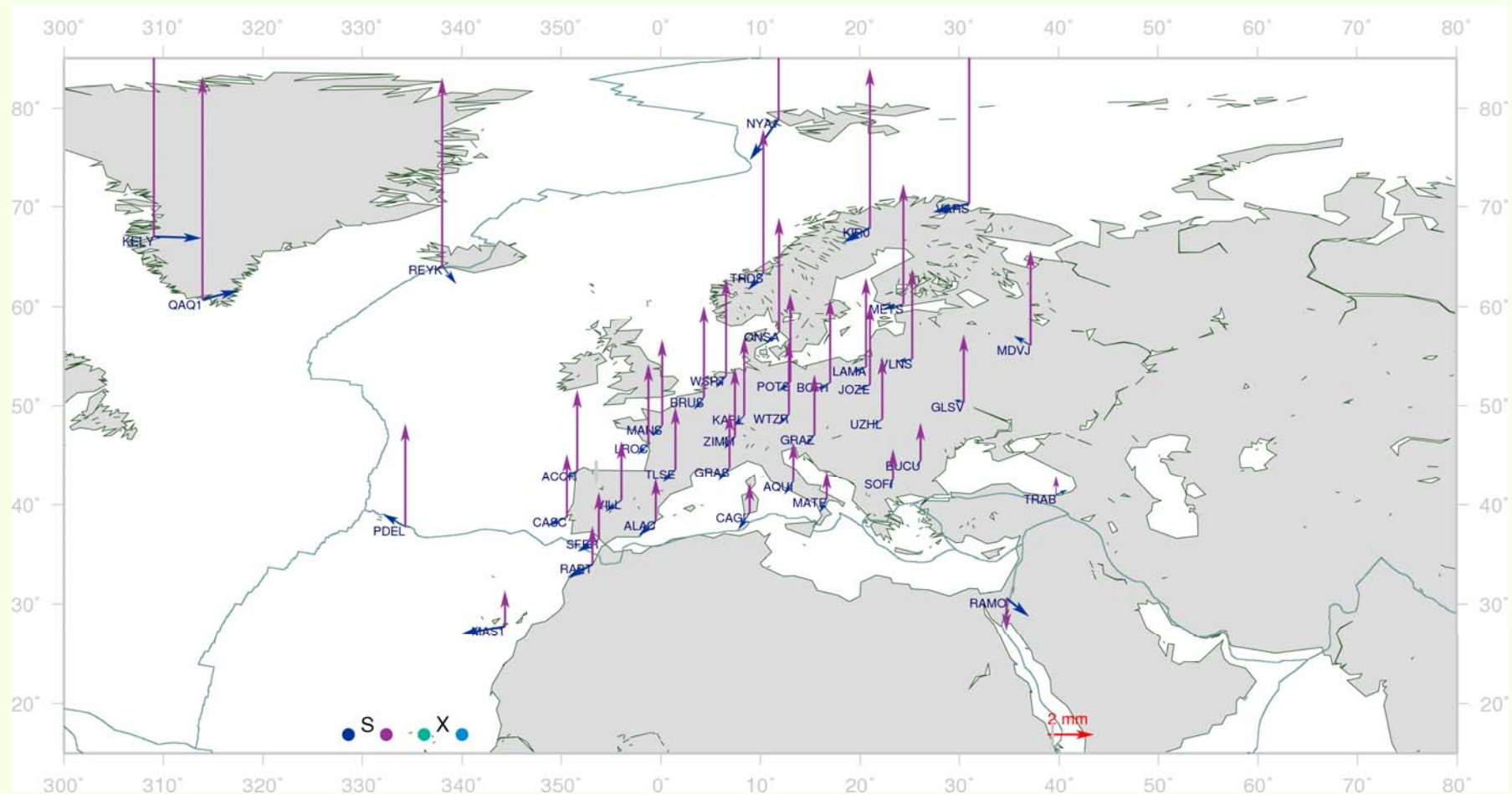
# MC (CATREF) to IGS05 – MC (CATREF) to ITRF2005



Because:

- MC (CATREF) keeps original network geometry
- IGS05 and ITRF2005 are globally aligned

# MC (CATREF) to IGS05 – MC (CATREF) ITRF2005



Because :

- MC (CATREF) keeps original network geometry
- IGS05 and ITRF2005 differ over Europe

## Second set of CONCLUSIONS

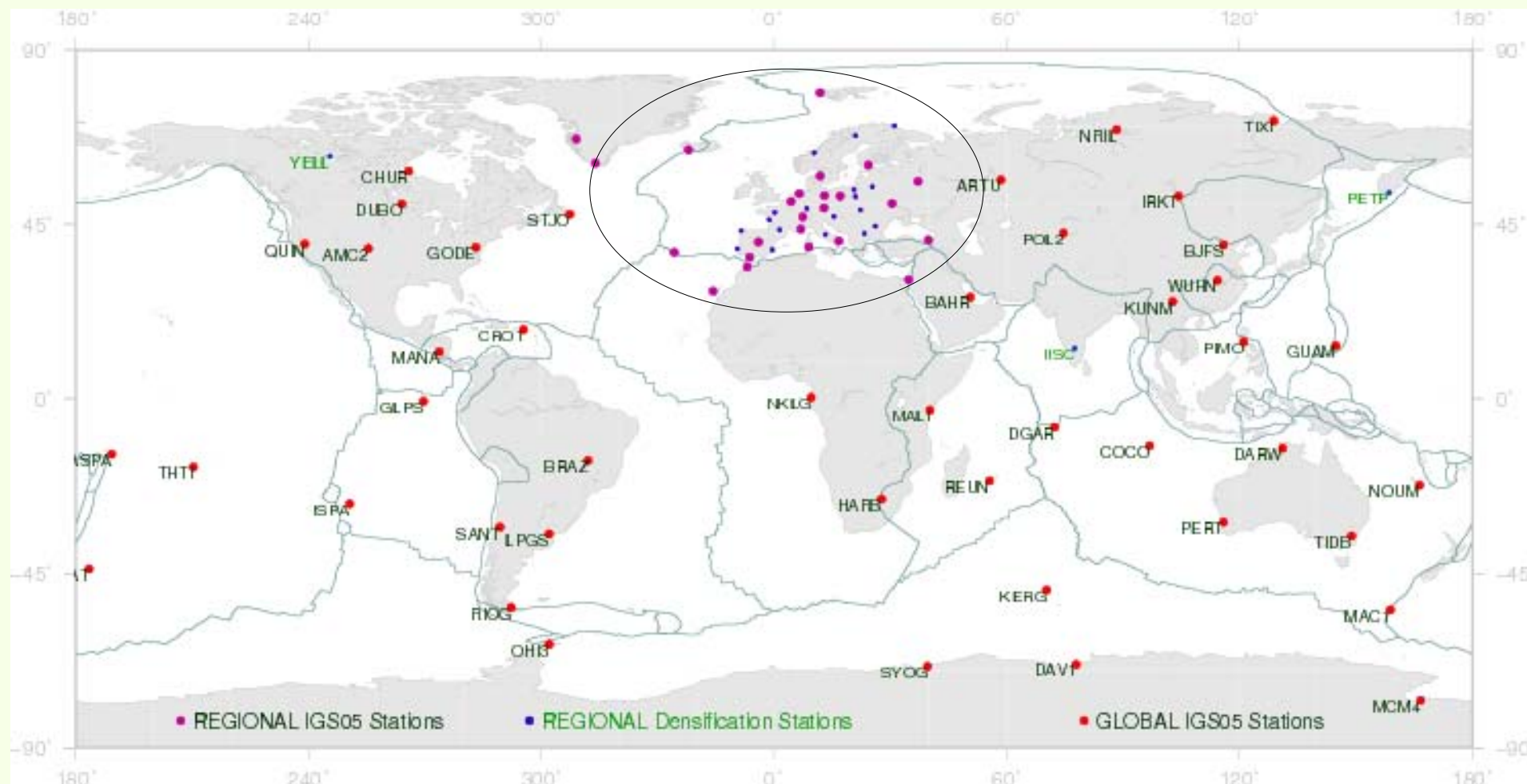
On global level, no difference between IGS05 or ITRF2005,

BUT

On regional level, there is a bias of about 3 mm in the vertical between both solutions



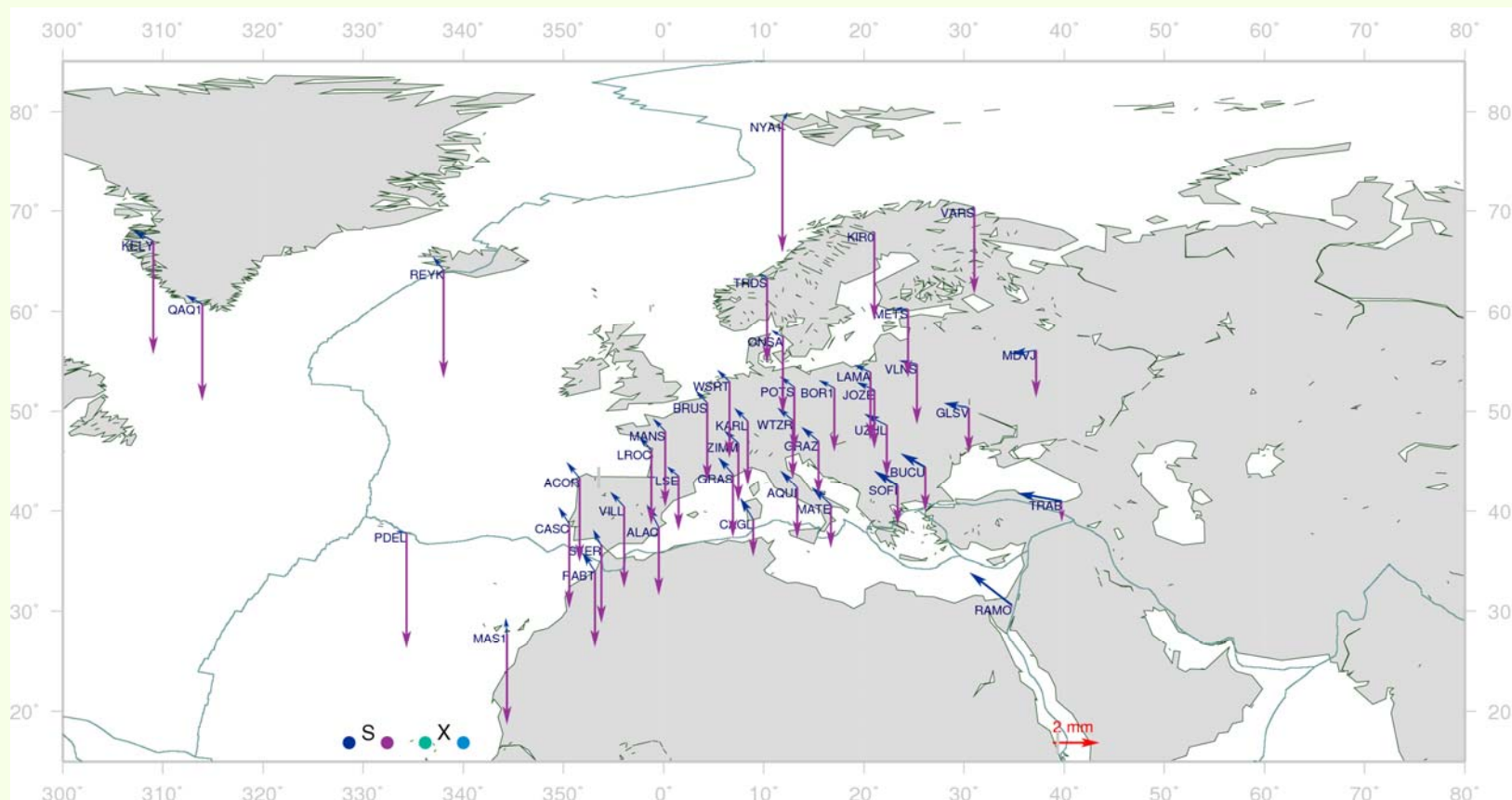
# FREE NETWORK SOLUTION





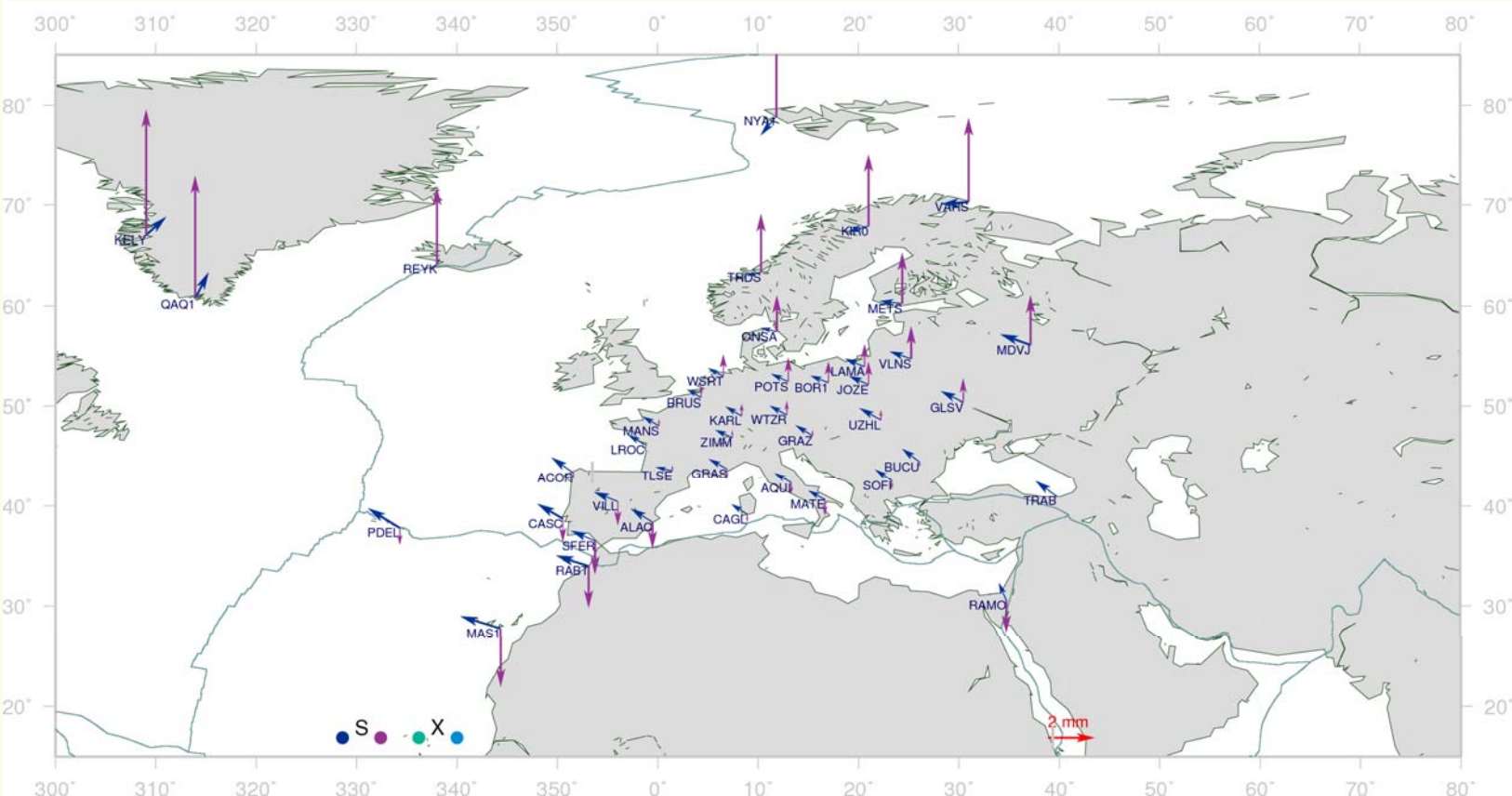
# REGIONAL VERSUS GLOBAL

- Subnetwork of EPN + Global IGS stations
- Bernese 5.0 daily free network solutions
- cumulative 1-year, MC (**IGS05**) using CATREF
- Diff between global and regional MC solutions



## REGIONAL VERSUS GLOBAL

- Subnetwork of EPN + Global IGS stations
- Bernese 5.0 daily free network solutions
- cumulative 1-year, MC (**ITRF2005**) using CATREF
- Diff between global and regional MC solutions



## Last set of CONCLUSIONS

The EPN station coordinates differ when

- Only EPN stations are processed wrt
- EPN stations are complemented with global IGS Stations

Differences depend on frame to which solutions are tied  
(remember : global = , but regional realization of IGS05 and ITRF2005 differs)

IGS05: sub-mm horiz. and 3-mm vert. in regional solution wrt global

ITRF2005: no bias in regional solution wrt global

Both have a tilt in the height component