

Evaluating future consistency between AFREF and EUREF

Towards the computation of the AFREF solution

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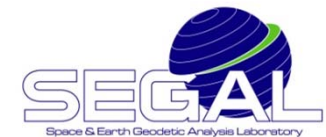
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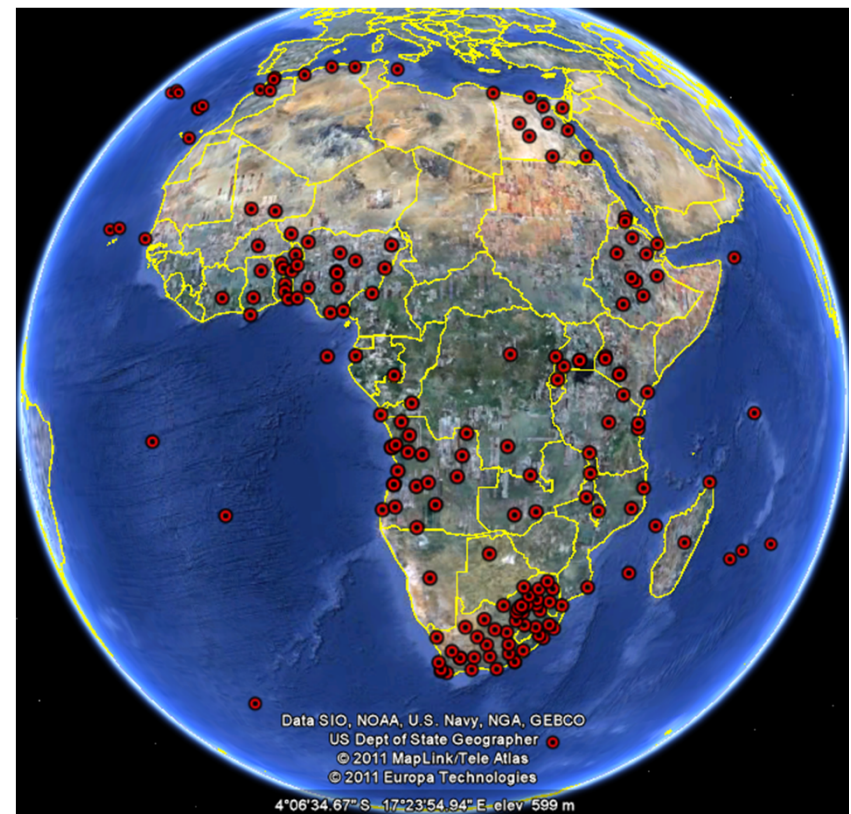
H. Khalil



AFREF Solution

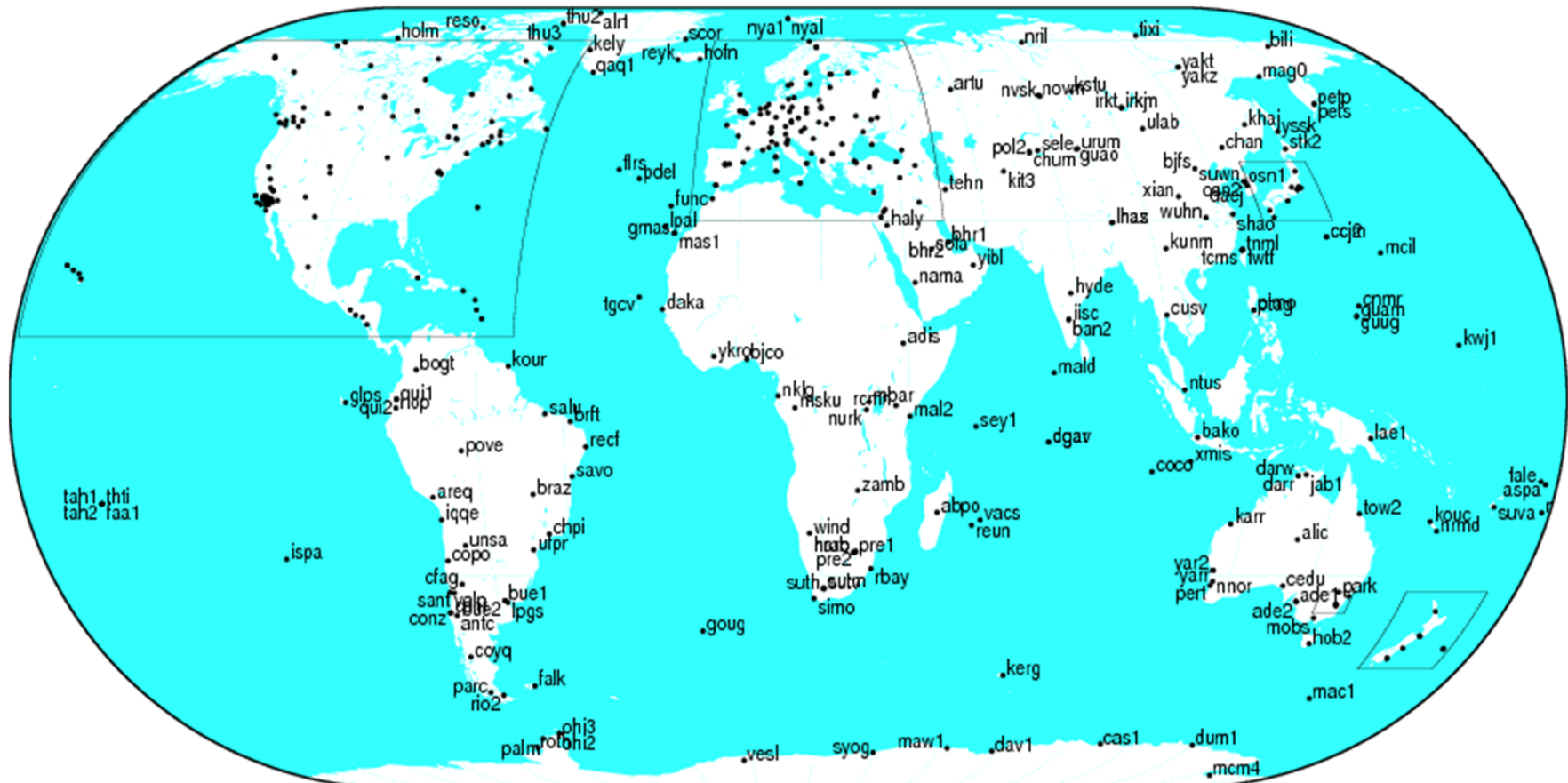
- Set of coordinate positions for a number of GNSS stations distributed by the entire African continent
- AFREFxx will be linked to ITRF2008 for a certain epoch. Consequently, the coordinates will not change with time[‡]

[‡] *this will be further discussed in this presentation...*



Relation with IGS

IGS stations will be the backbone of the AFREFxx realization by providing the link to ITRF2008



GMT 2011 Apr 30 16:45:39

Site distribution

Political constraints

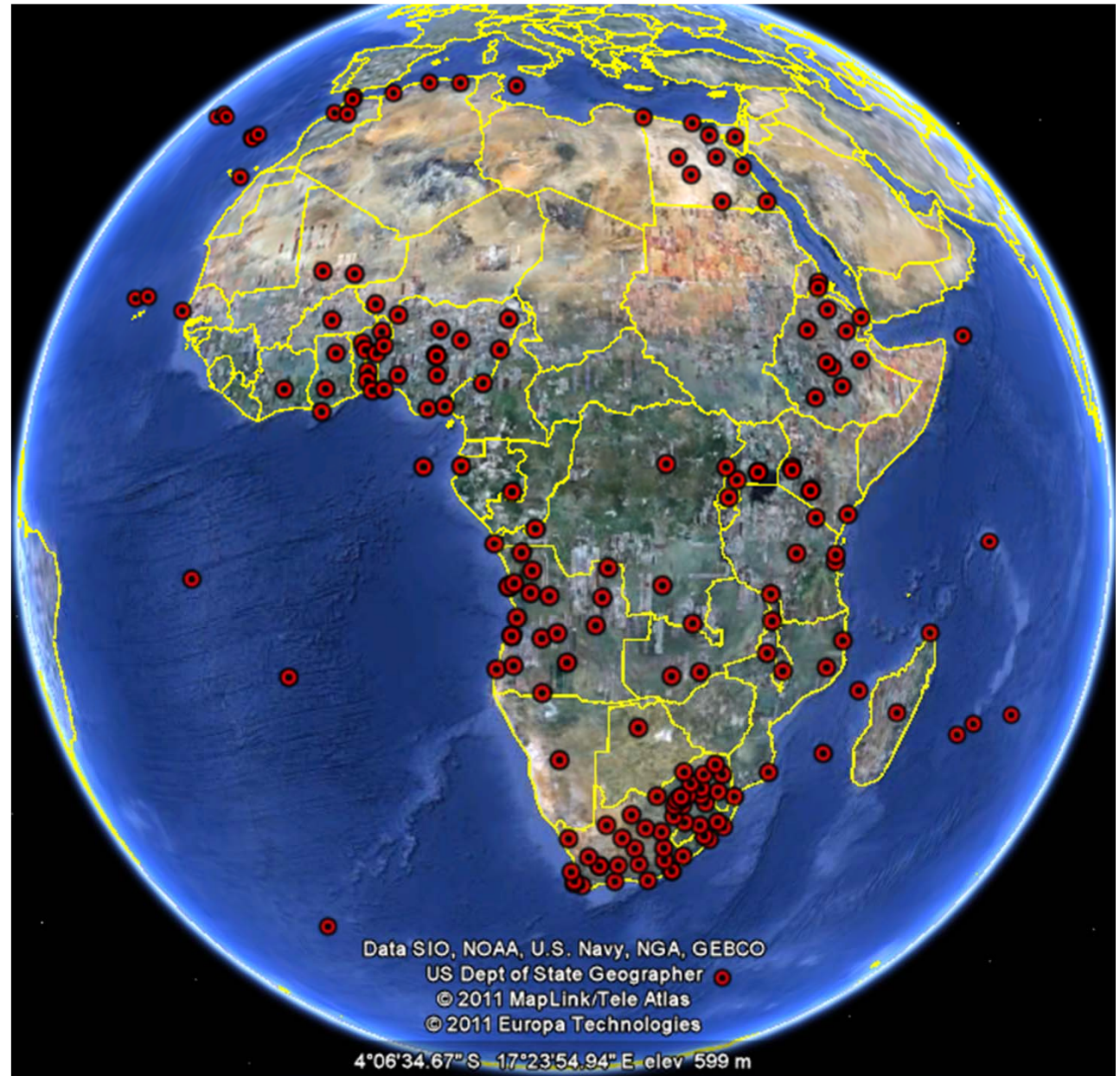
- 61 Territories
- Largest:
Sudan (2 505 810 Km²)
- Smallest:
Melilla, Spain (12 Km²)
Gambia (11 300 Km²)

**Every territory
(definitively, every country)
should have a station part
of AFREF**

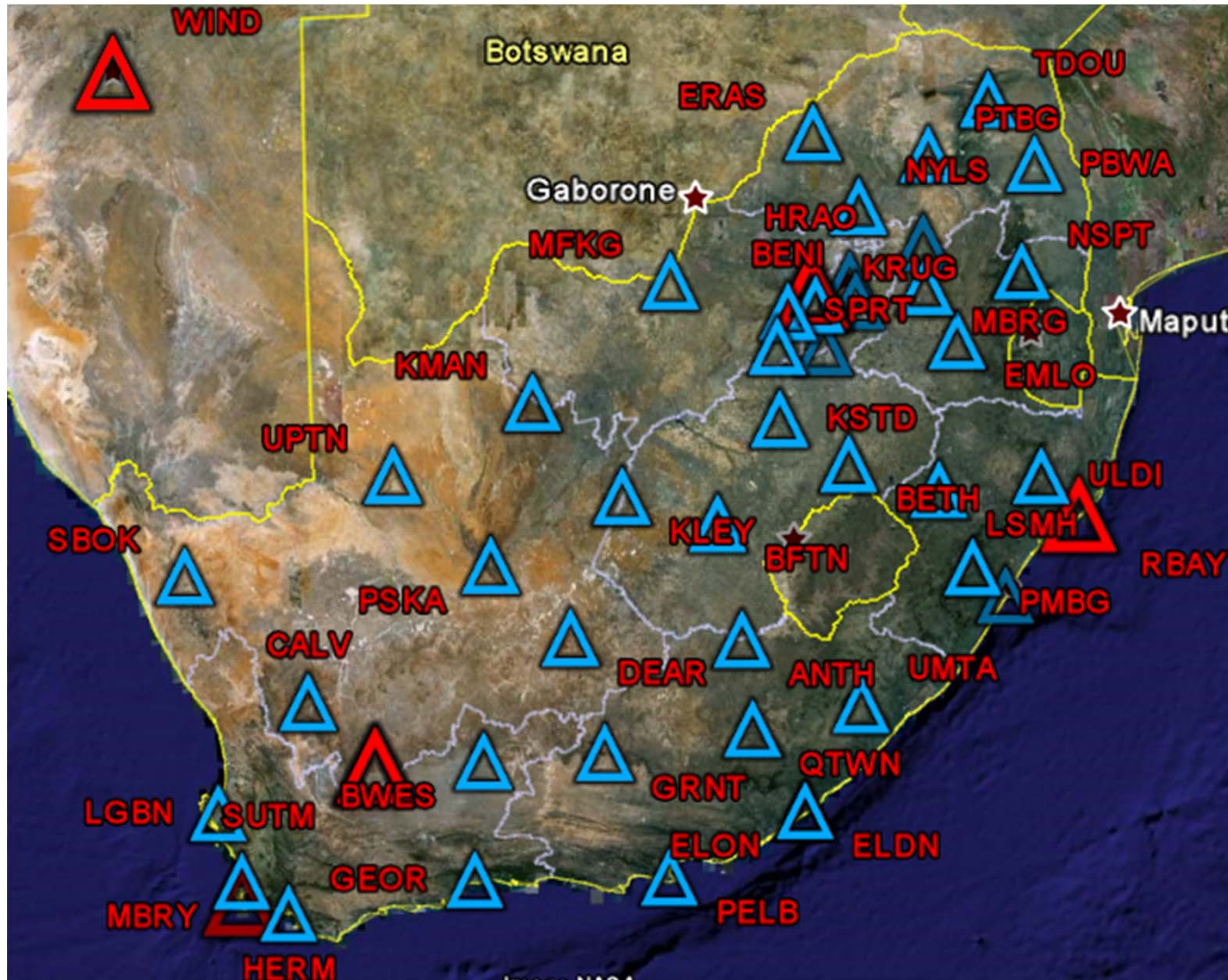


Current Situation

*Survey of CGPS sites:
> 130*

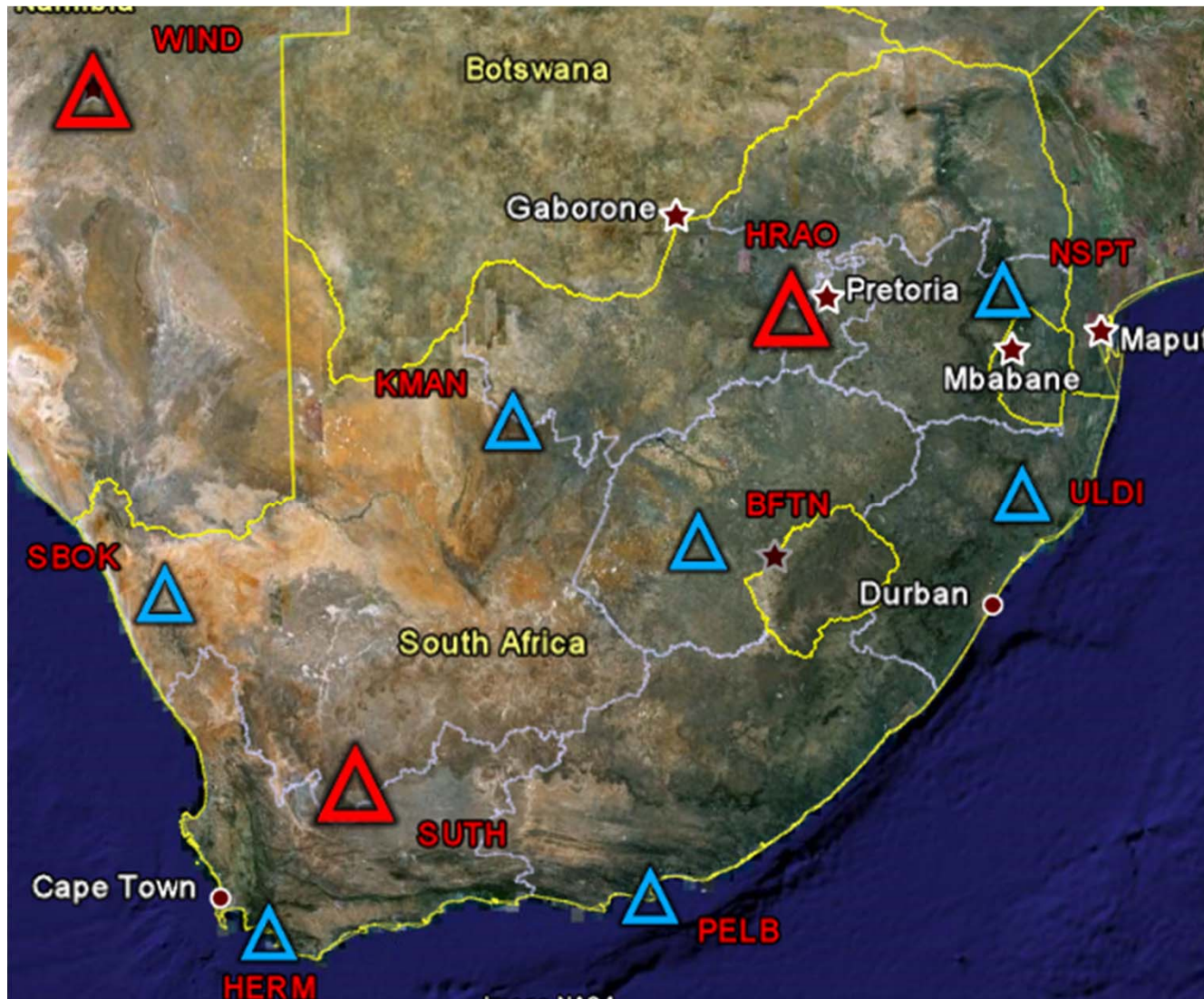


South Africa Trignet + IGS



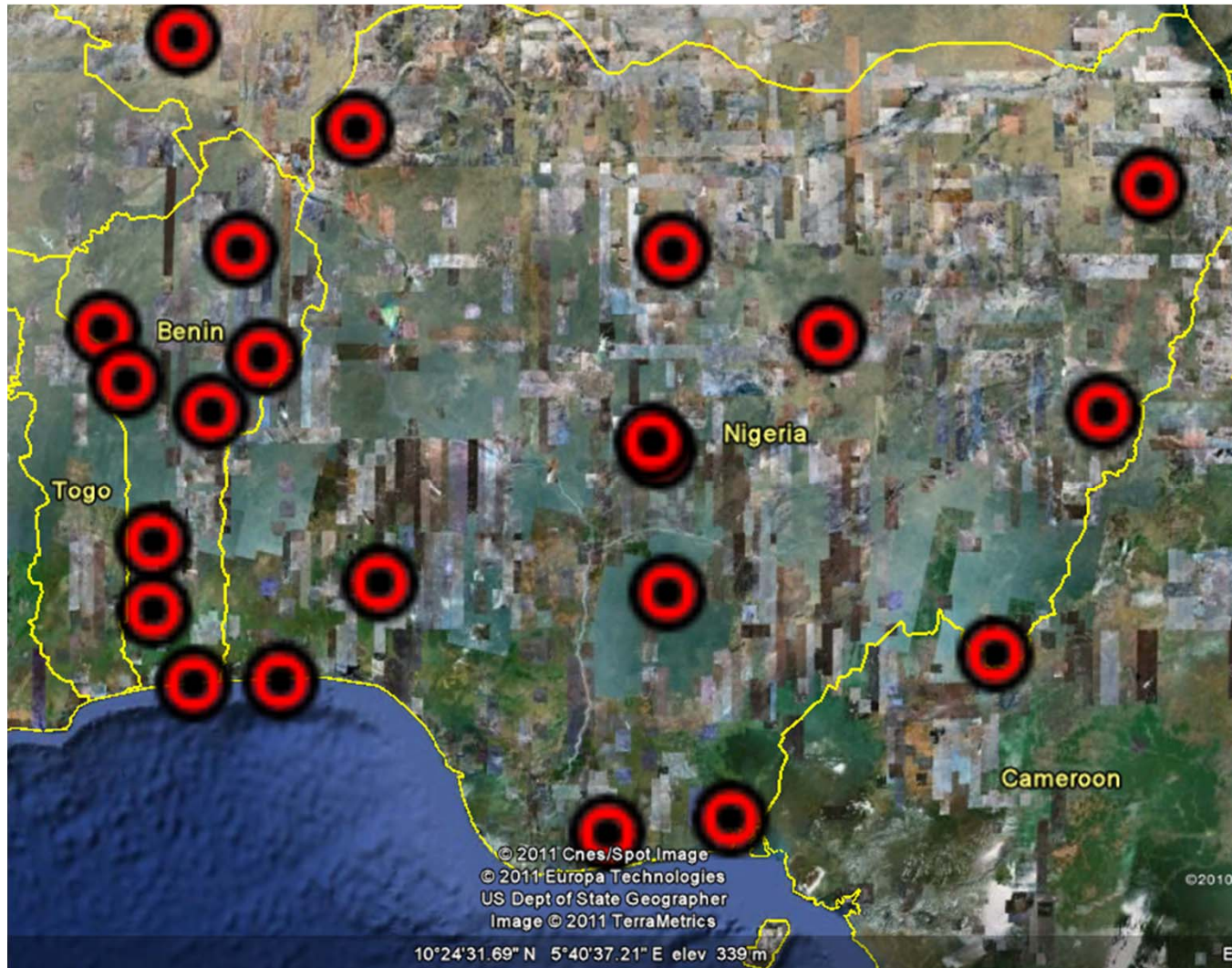
Too many fiducial stations at continental scale...

South Africa Trignet + IGS



Example of final selection

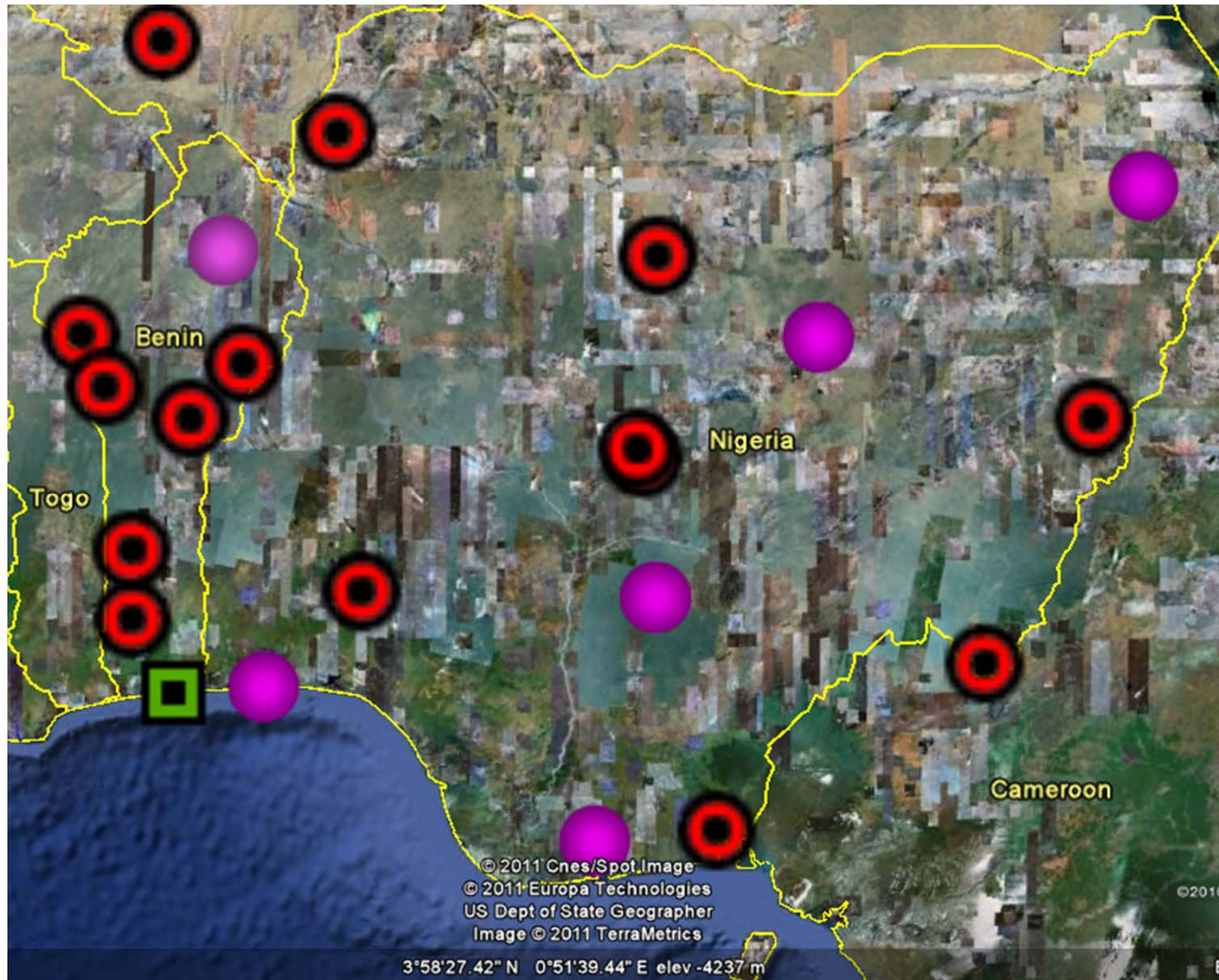
West Africa Nigeria & Benin



2 National Networks

*But only 5-6 stations
will be necessary*

West Africa Nigeria & Benin



Final Selection will depend of the assessment of individual stations e.g., reliability

and also "political considerations" e.g., Cotonou?

“Final” Selection – AFREF08



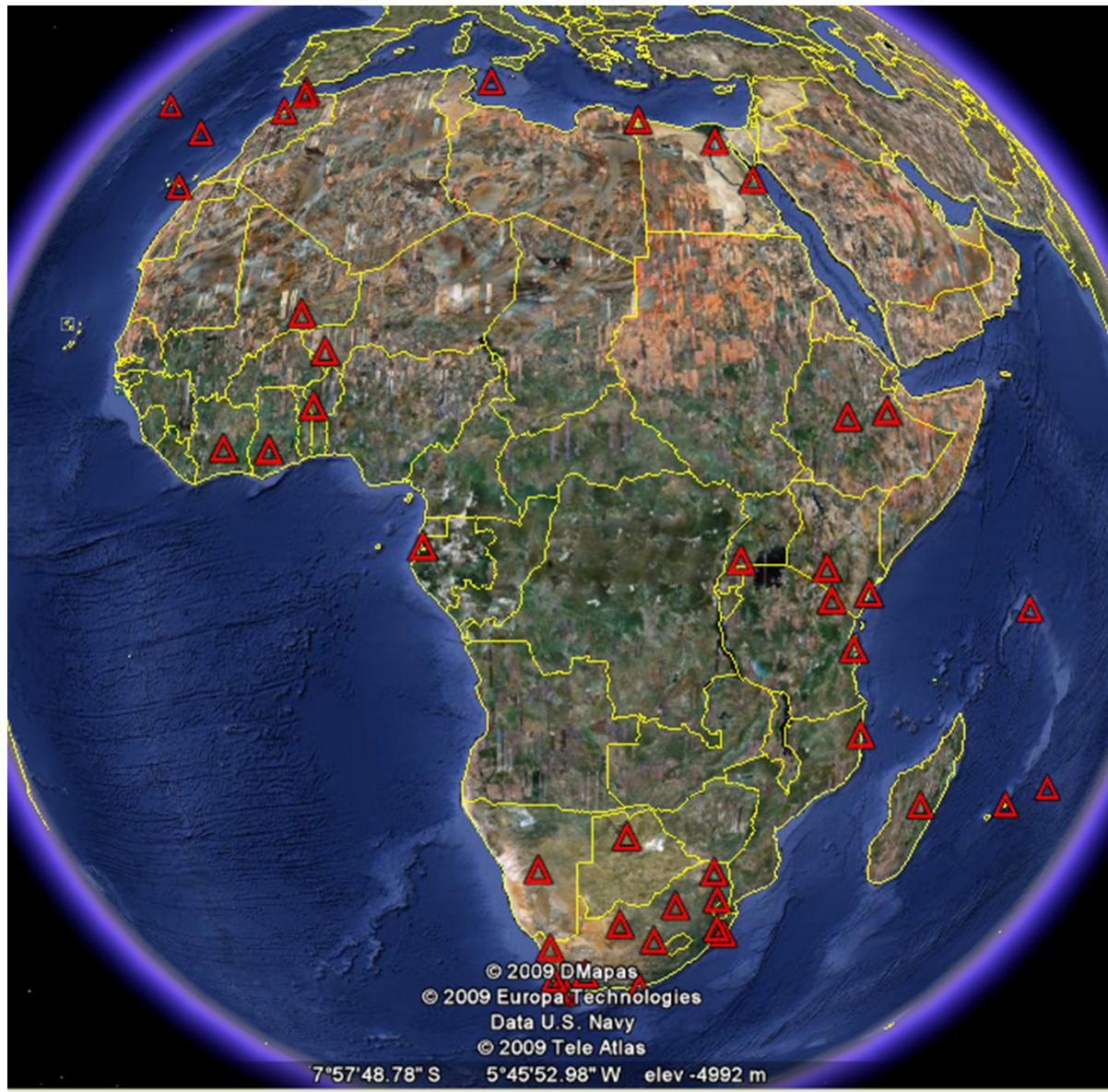
Position solutions was computed for a total of 47 stations.

“Final” Selection – AFREF09



Some new additions but also ...

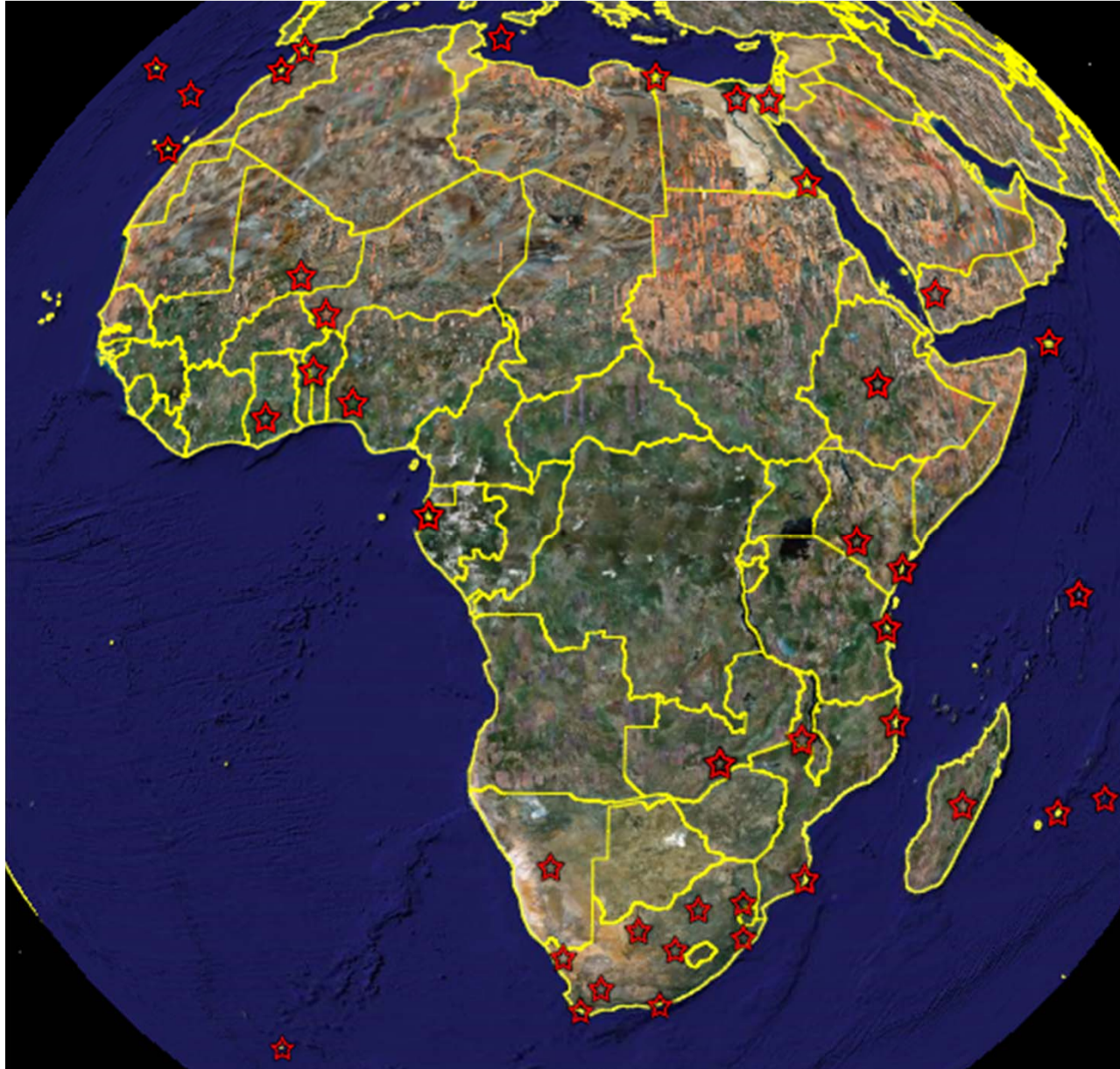
“Final” Selection – AFREF09



*Some stations
not available.*

*Position
solutions was
computed for a
total of
43 stations.*

Case Study: "Final" Selection



Position solutions was computed for a total of 37 stations.

AFREF08 & AFREF09 solutions

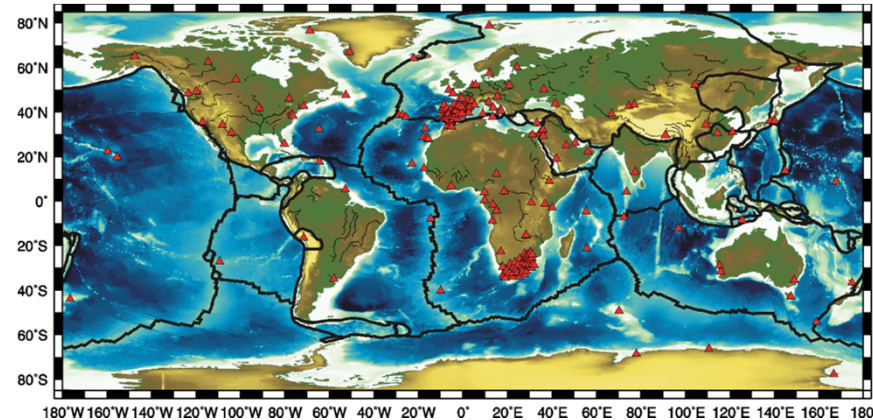
4 Independent Solutions using 4 Different Software Packages

- *RCMRD (Kenya) & IDL (Portugal) used GIPSY*
 - *Precise Point Positioning strategy*
 - *JPL precise orbits (no fiducial) + clock corrections*
 - *Use of ambizap algorithm to solve for ambiguities*
- *CGC (Canary Islands) used NAPEOS*
 - *Precise Point Positioning strategy*
 - *IGS final Orbits (aligned to ITRF05) and clocks*
- *NRIAG (Egypt) & TUD (Germany) used BERNESE*
- *HartRAO (South Africa) used GAMIT (only AFREF08)*
 - *Network Batch strategy – simultaneous processing of all stations*
 - *a-priori IGS orbits (adjusted)*

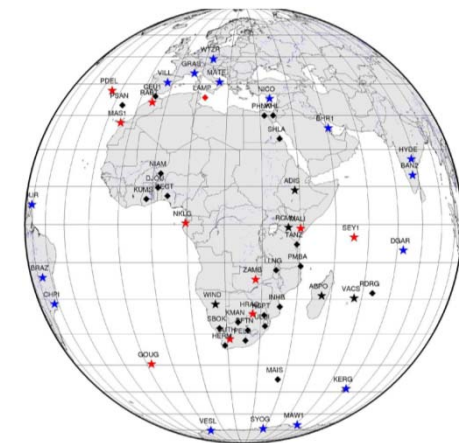
AFREF08 & AFREF09 solutions

3 Different mapping approaches to align to ITRF2005

RCMRD/IDL used a global set of reference mapping stations



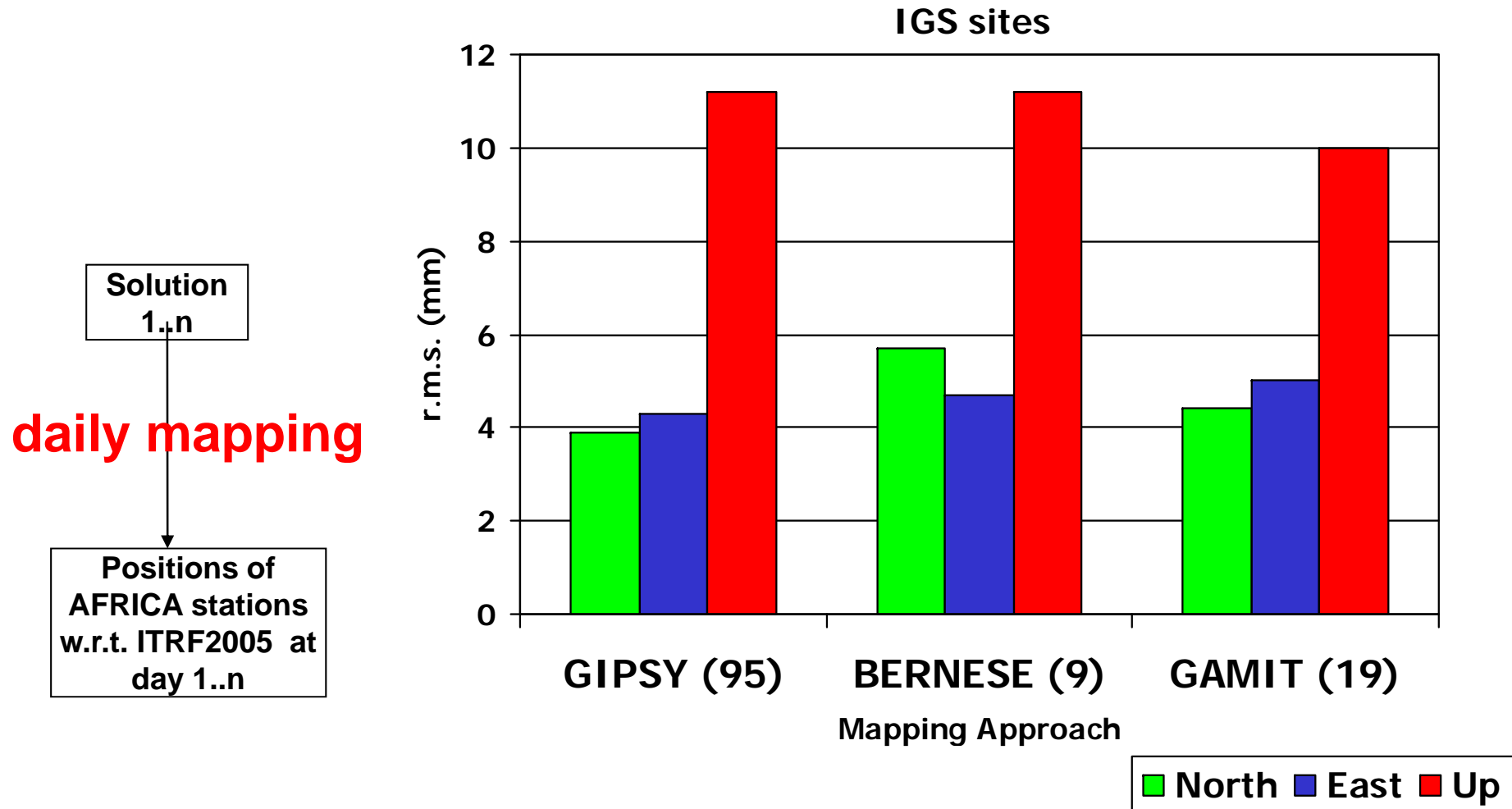
HartRAO and NRIAG/TUD used a regional set of reference mapping stations



CGC only processed the stations of interest (AFREF) using the fiducial IGS orbits (realized in ITRF2005)

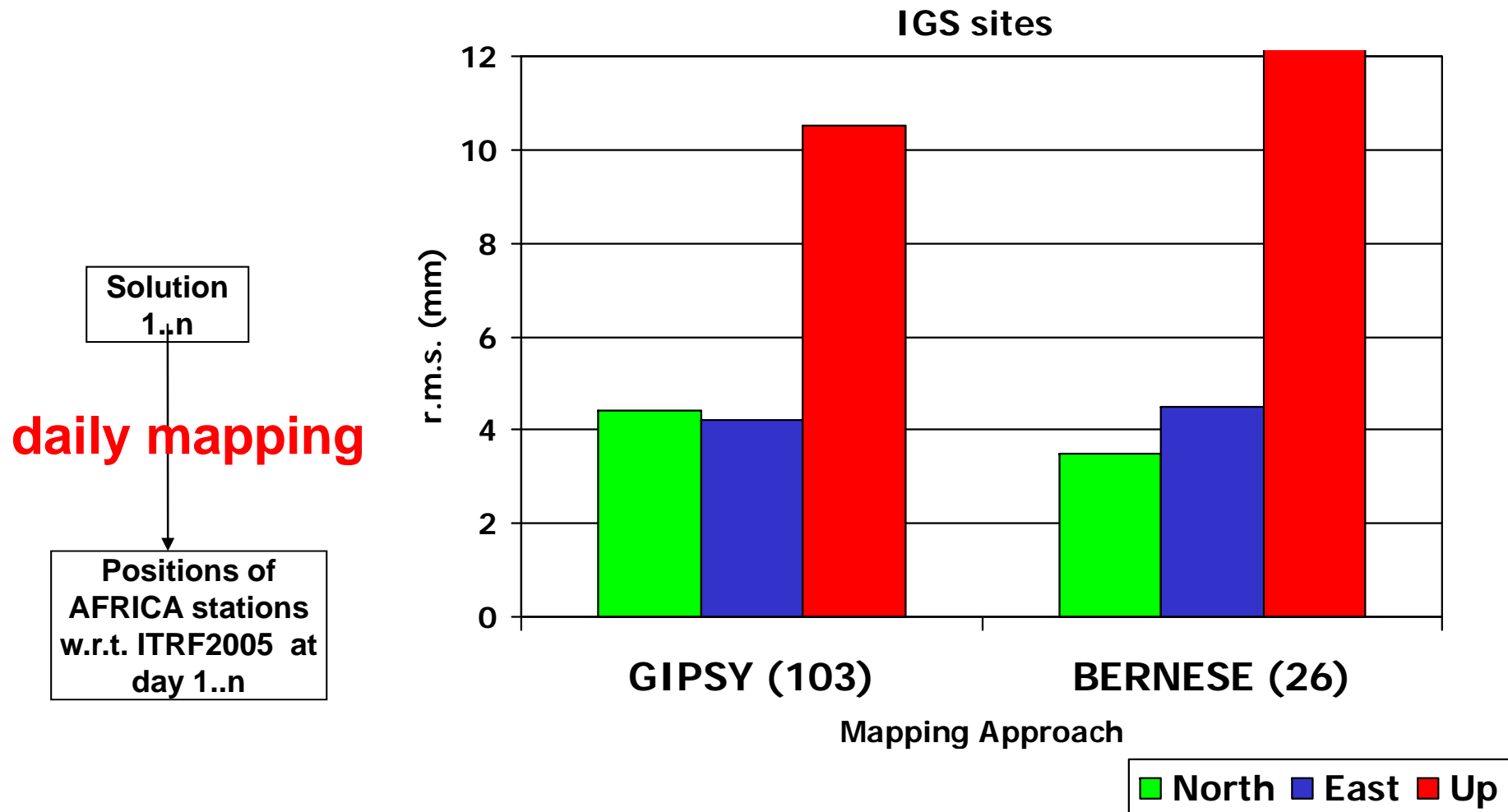
AFREF08 Results

Comparison Global/Regional mapping

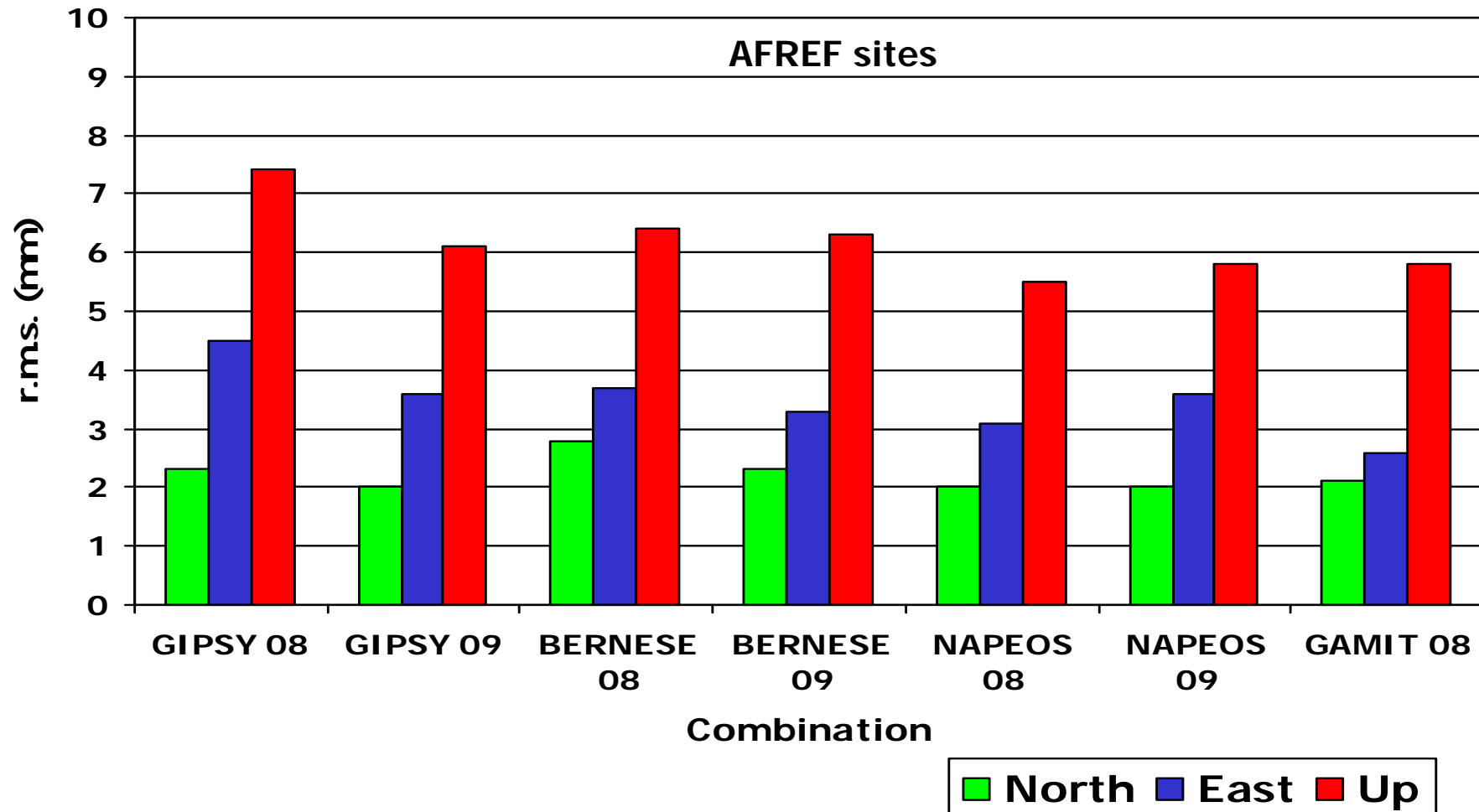


AFREF09 Results

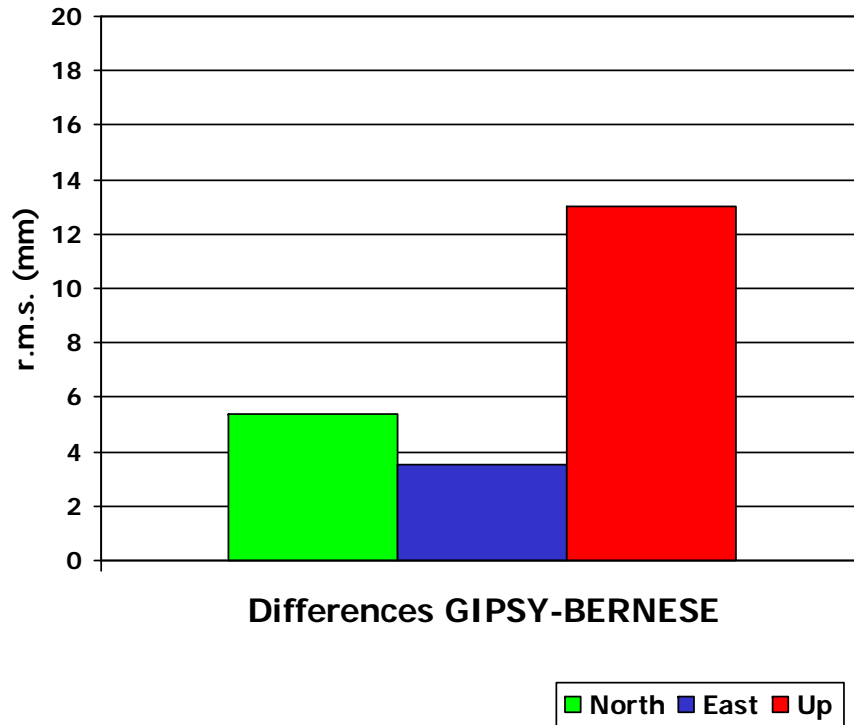
Comparison Global/Regional mapping



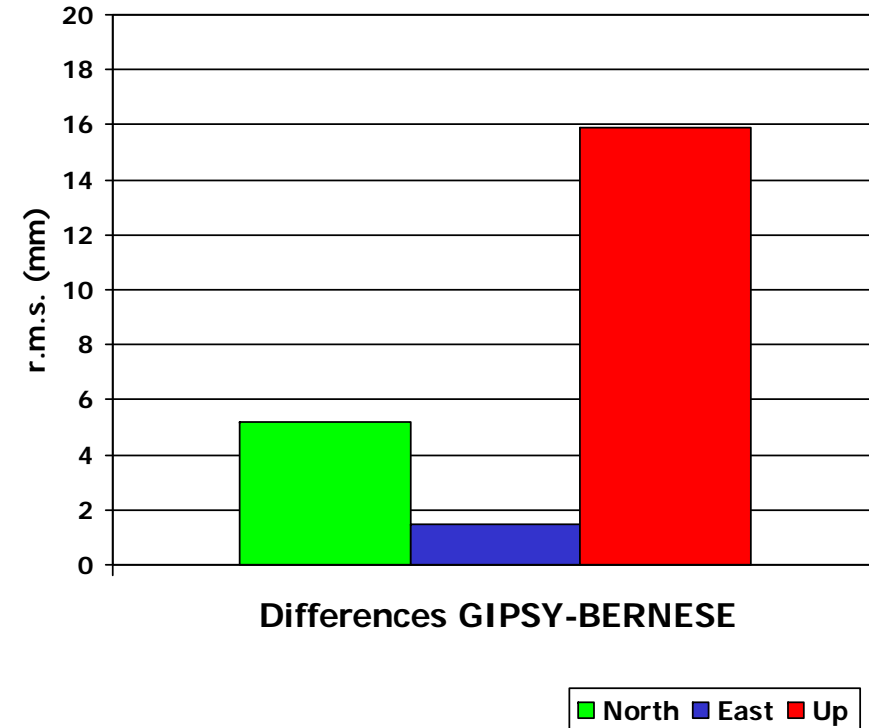
Solution Combination Comparison



Comparison between the BERNESE & GIPSY



AFREF08



AFREF09

Summary

AFREFxx will be estimated using a consistent set of stations distributed by the entire continent (plus some stations located in neighborhood regions).

Almost all available CORS stations in Africa will be part of the AFREFxx solutions (the few exceptions are due to good reasons [e.g., Trignet, Nignet]).

The coordinate positions should be computed by combining independent solutions using different software packages.

AFREFxx will be formed by a set of coordinates linked to ITRFxx at a certain epoch together with an angular velocity model that will express the relative motions of the existing tectonic blocks in the continent with respect to the Nubian plate.

ETRS89

The European Terrestrial Reference System 89 (ETRS89) is used as the standard precise GPS coordinate system throughout Europe.

This reference system forms the backbone for all geo-referencing projects on the European territory both on a national as on an international level.



247 permanent GNSS tracking stations (including 2 inactive) are part of the EUREF Permanent Network.

ETRF2000 (R8)

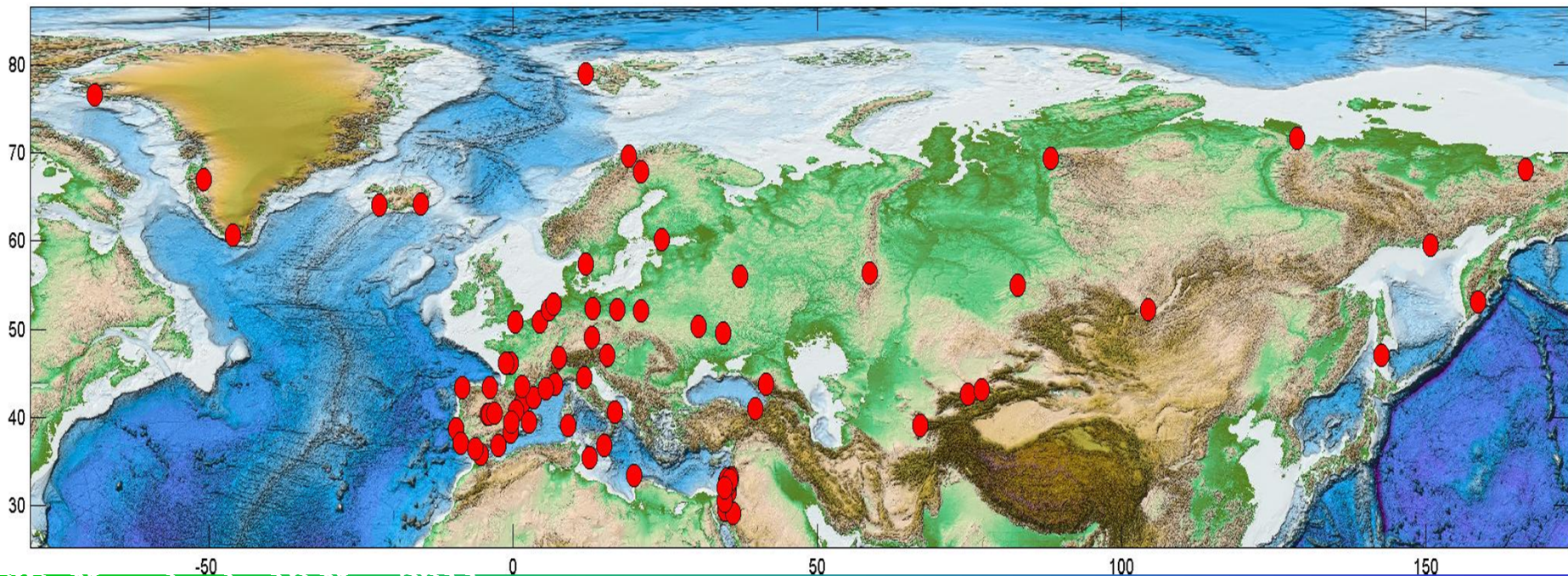
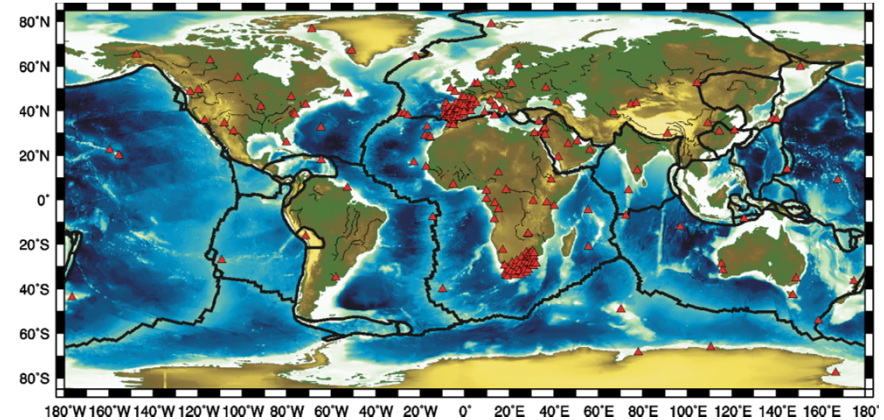
Following its definition, ETRS89 can be realized using ITRS realizations: for each frame labeled ITRF_y a corresponding frame in ETRS89 has been and labeled ETRF_y.

The latest realization is ETRF2000 (R8) - European station coordinates available in the ITRF2008 solution expressed in ETRF2000.



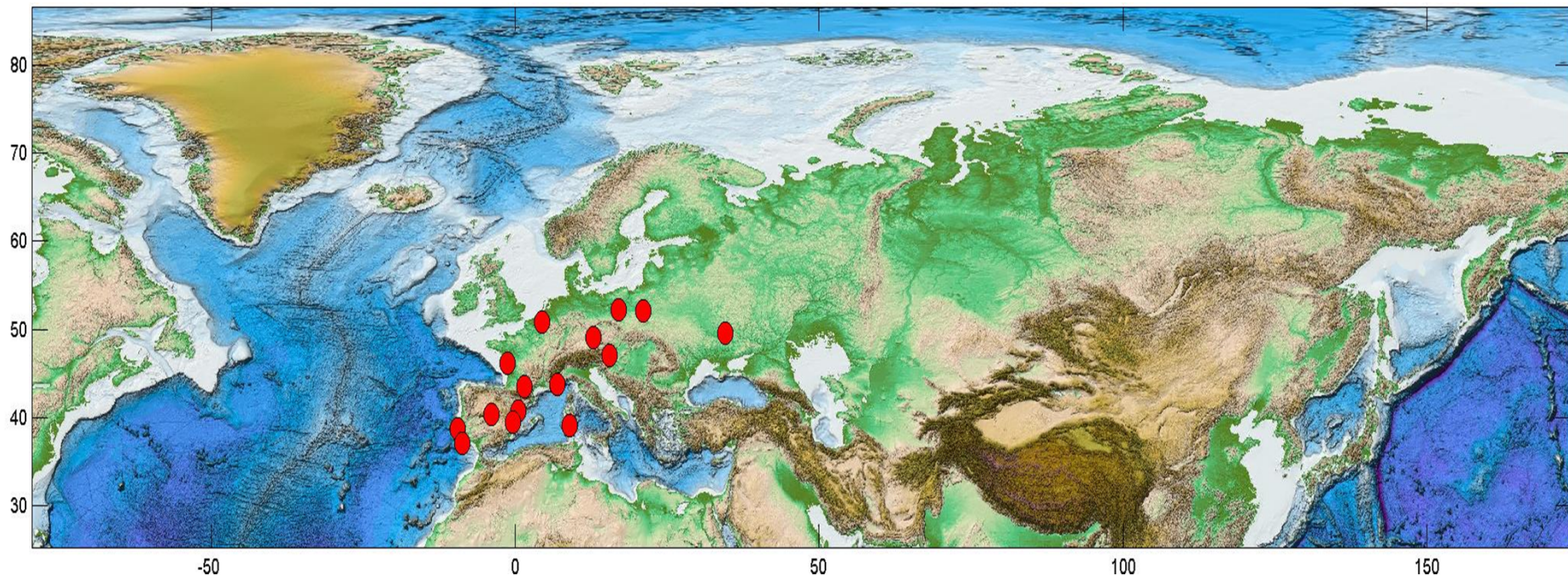
Comparison between ETRF2000 (R8) and AFREF solutions (GIPSY used)

79 common stations in Eurasia

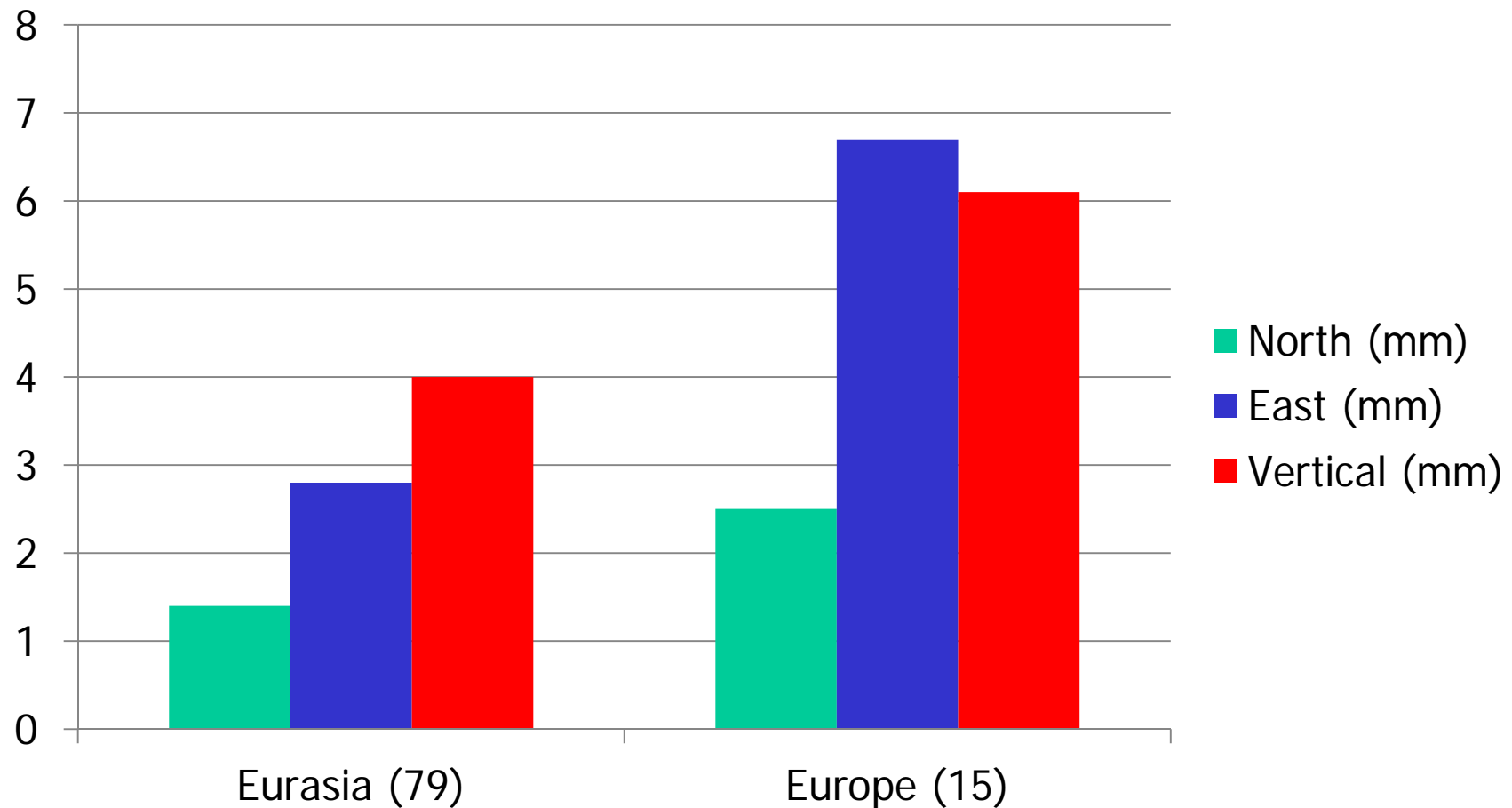


Comparison between ETRF2000 (R8) and AFREF solutions (GIPSY used)

15 common stations in Europe



Comparison between ETRF2000 (R8) and AFREF solutions (GIPSY used)



Conclusion: In order to link directly the continental reference frames (exemplified here with AFREF and EUREF), it is necessary to have sufficient common points with a good spatial distribution.

Questions...



THANK YOU...