GNSS Stations Around the Pantanal Basin, and Preliminary Estimates of Intraplate Strain Rates in Central Brazil

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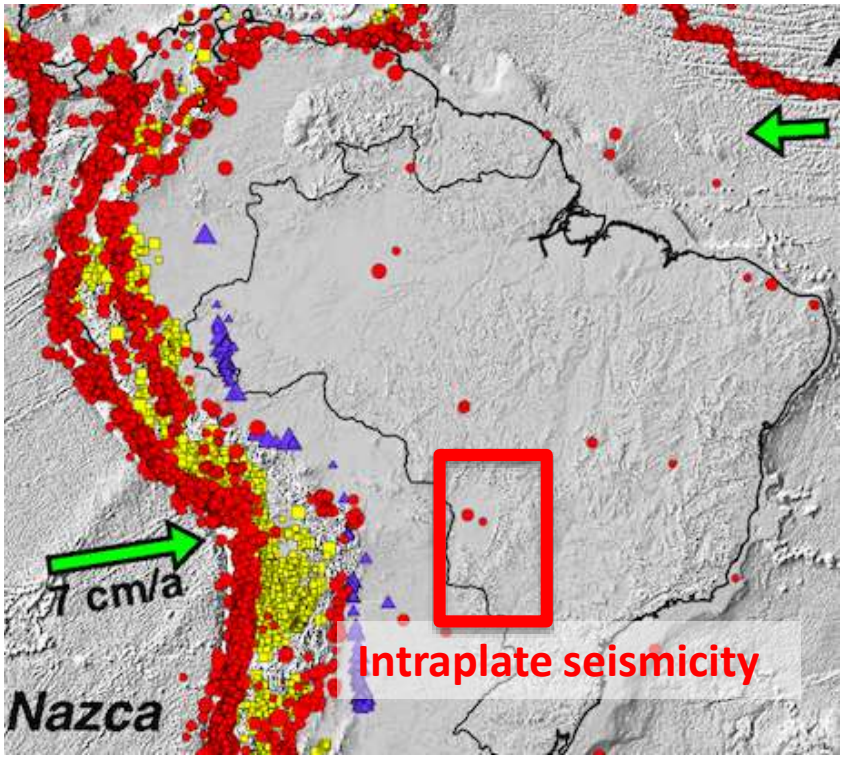
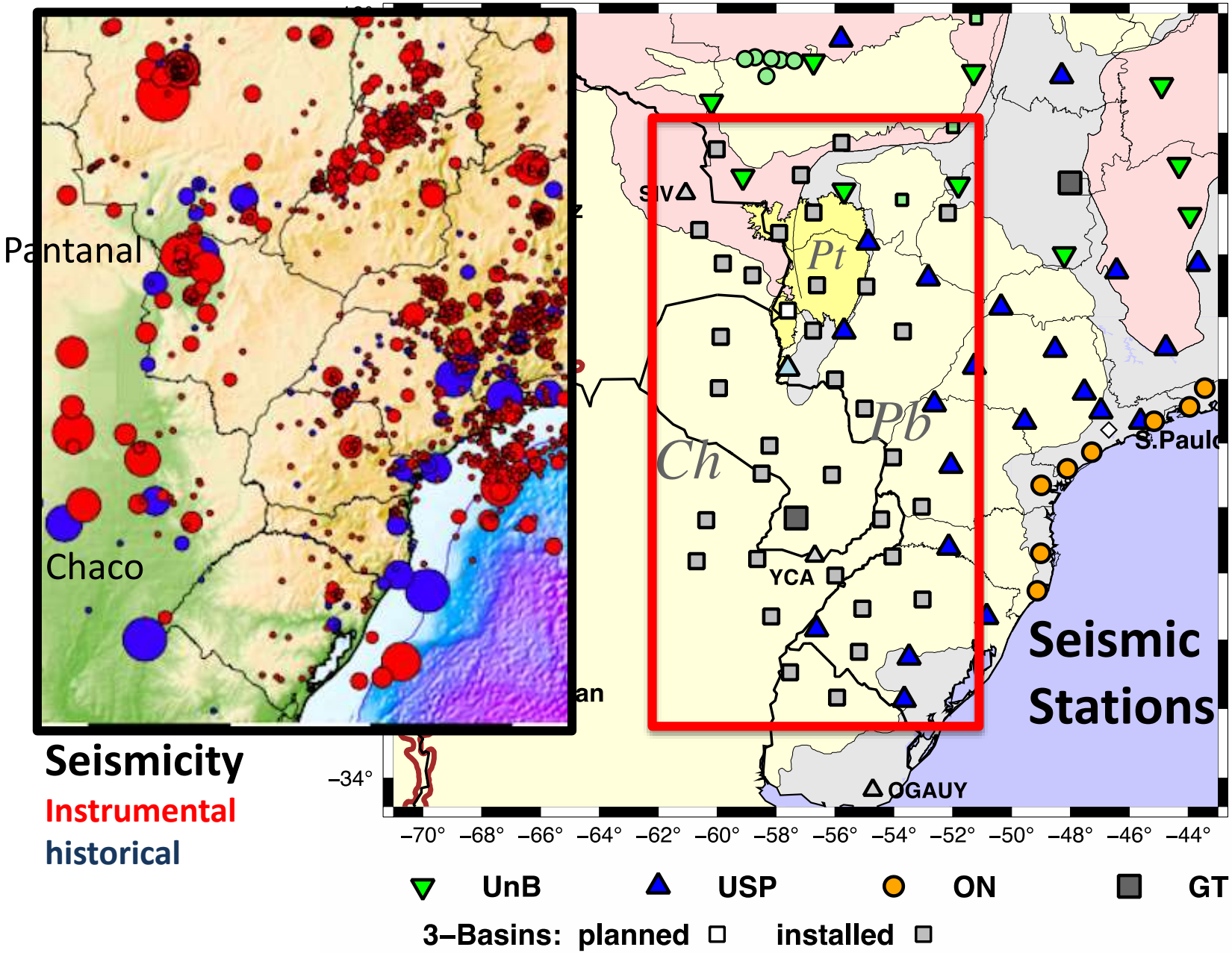


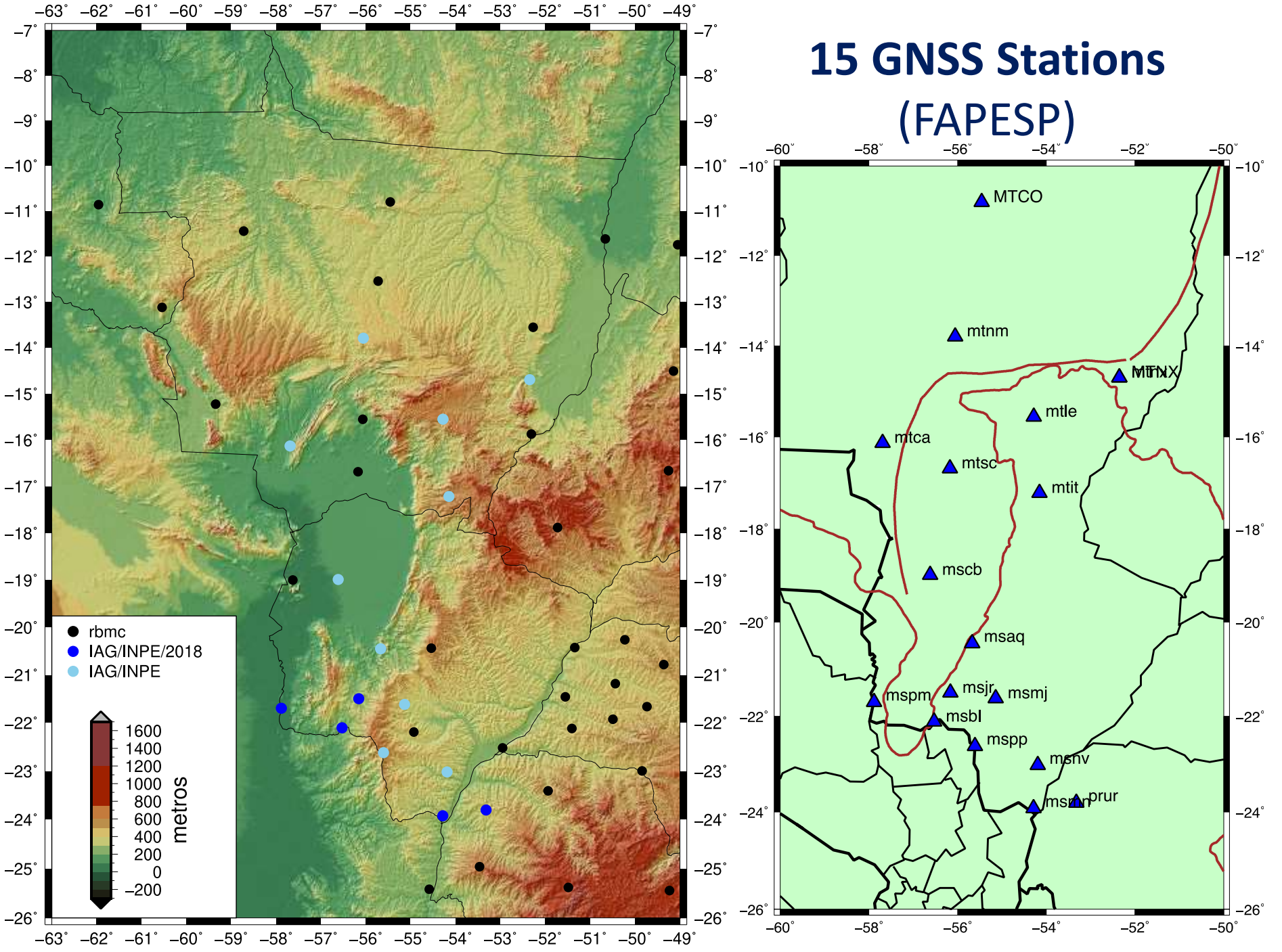
Intraplate Deformation (GNSS)

Intraplate Stresses (fault mechanisms)

FAPESP Thematic Project: Pantanal, Chaco, Paraná Basins

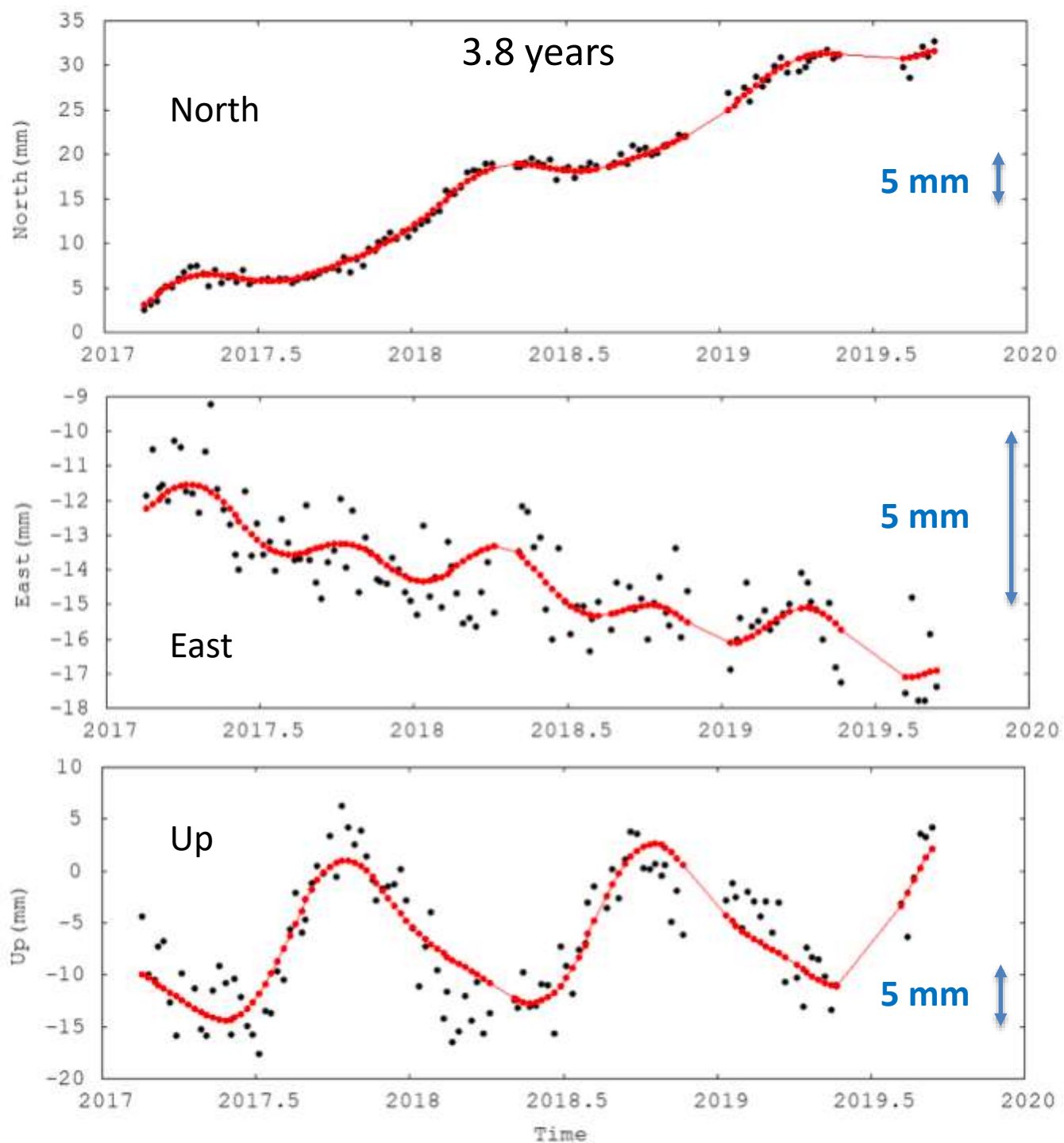


15 GNSS Stations (FAPESP)



SESC – Pantanal

2017.749



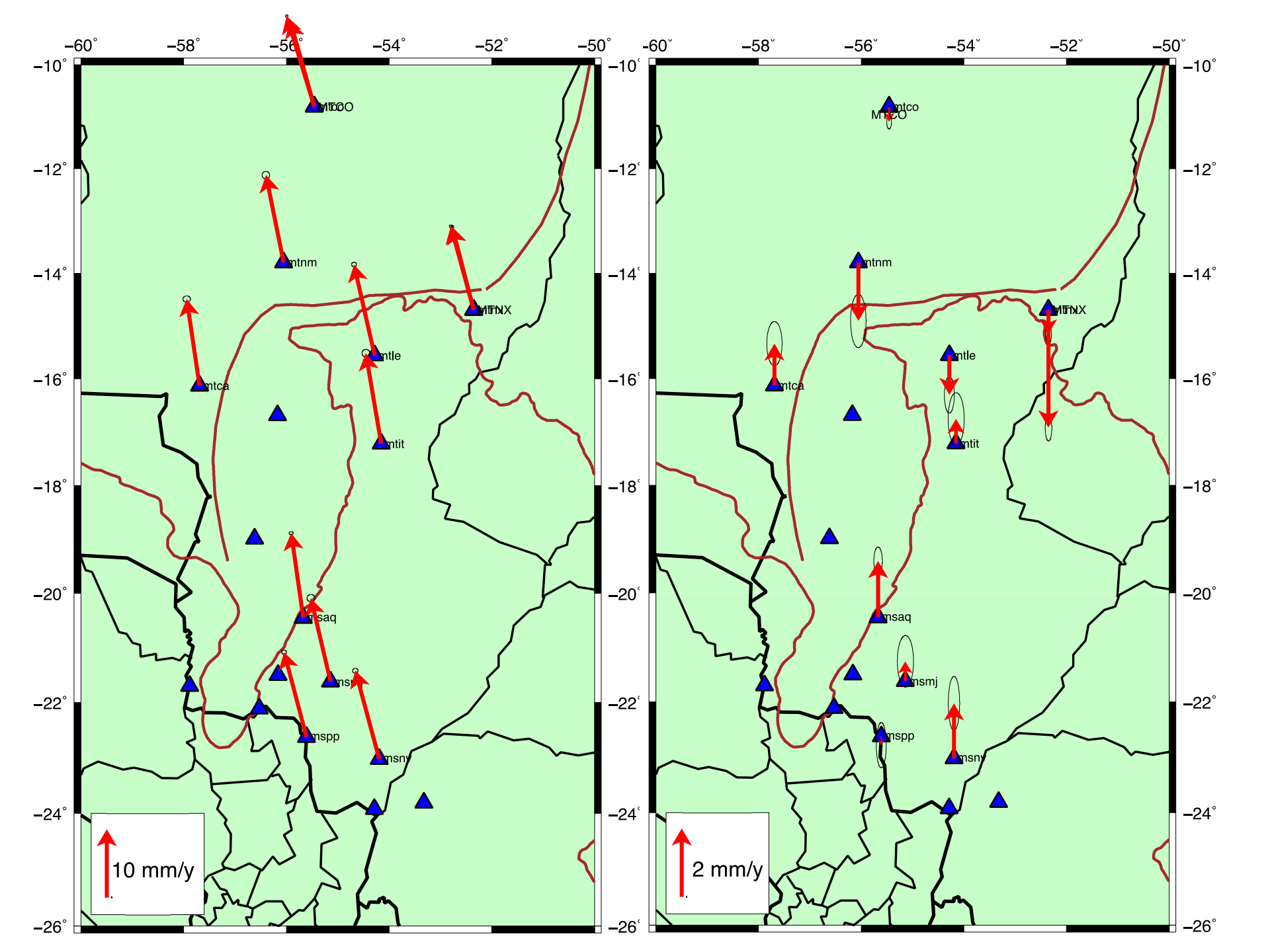
AQDB (Aquidauana)

Weekly SIRGAs time series, ITRF14

- Statistical analysis for time series cleaning;

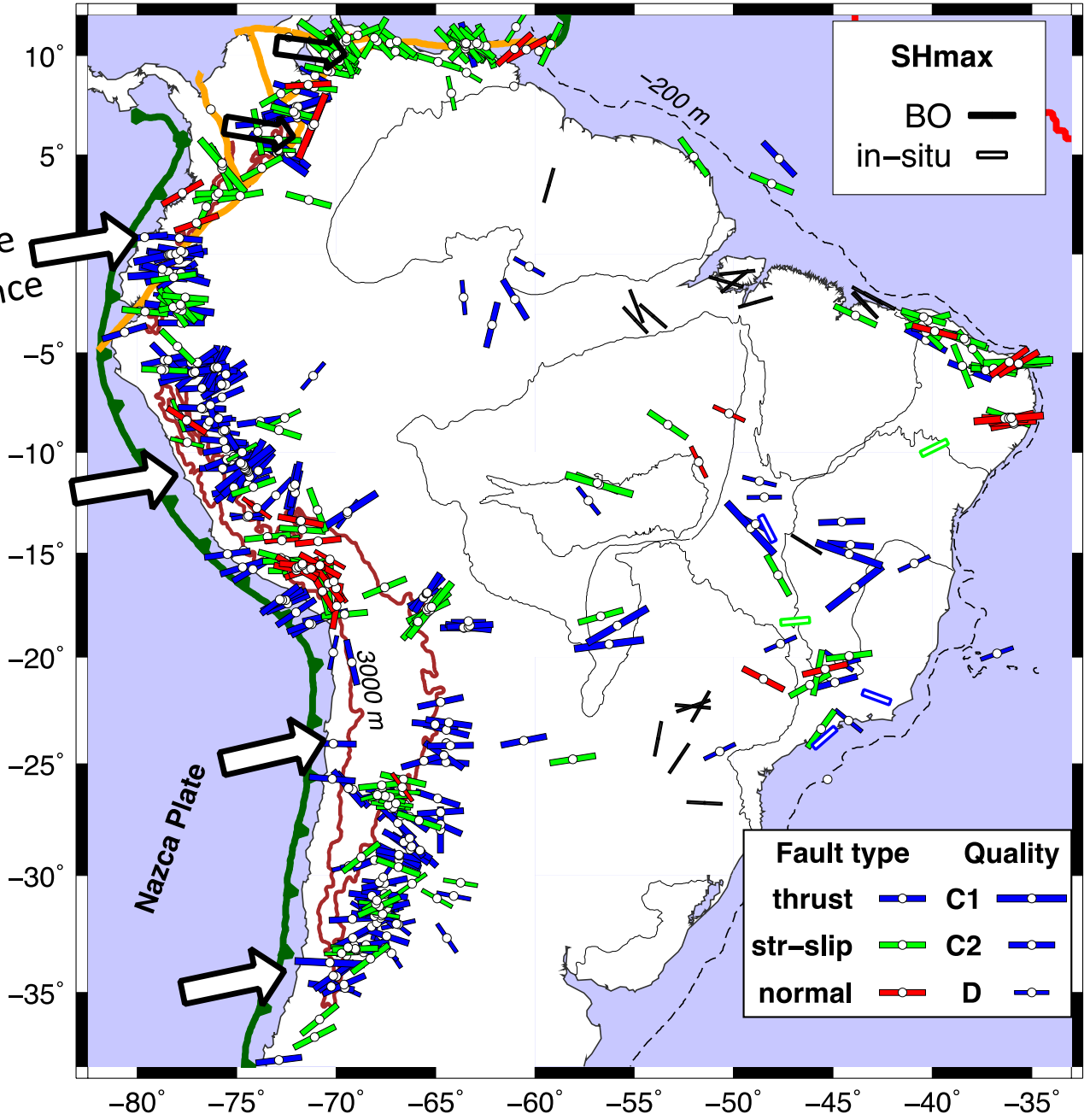
- Stochastic model estimation (LSVCE)

- Velocity estimation with annual and semi-annual variations; time breaks


−60°
−58°
−56°
−54°
−52°
−50°
−10°
−12°
−14°
−16°
−18°
−20°
−22°
−24°
−26°
mtco
mtnm
mtca
mtle
mtit
msaq
mspp
msny
10 mm/y
2 mm/y

Crustal Stresses from Earthquake Faulting Mechanisms

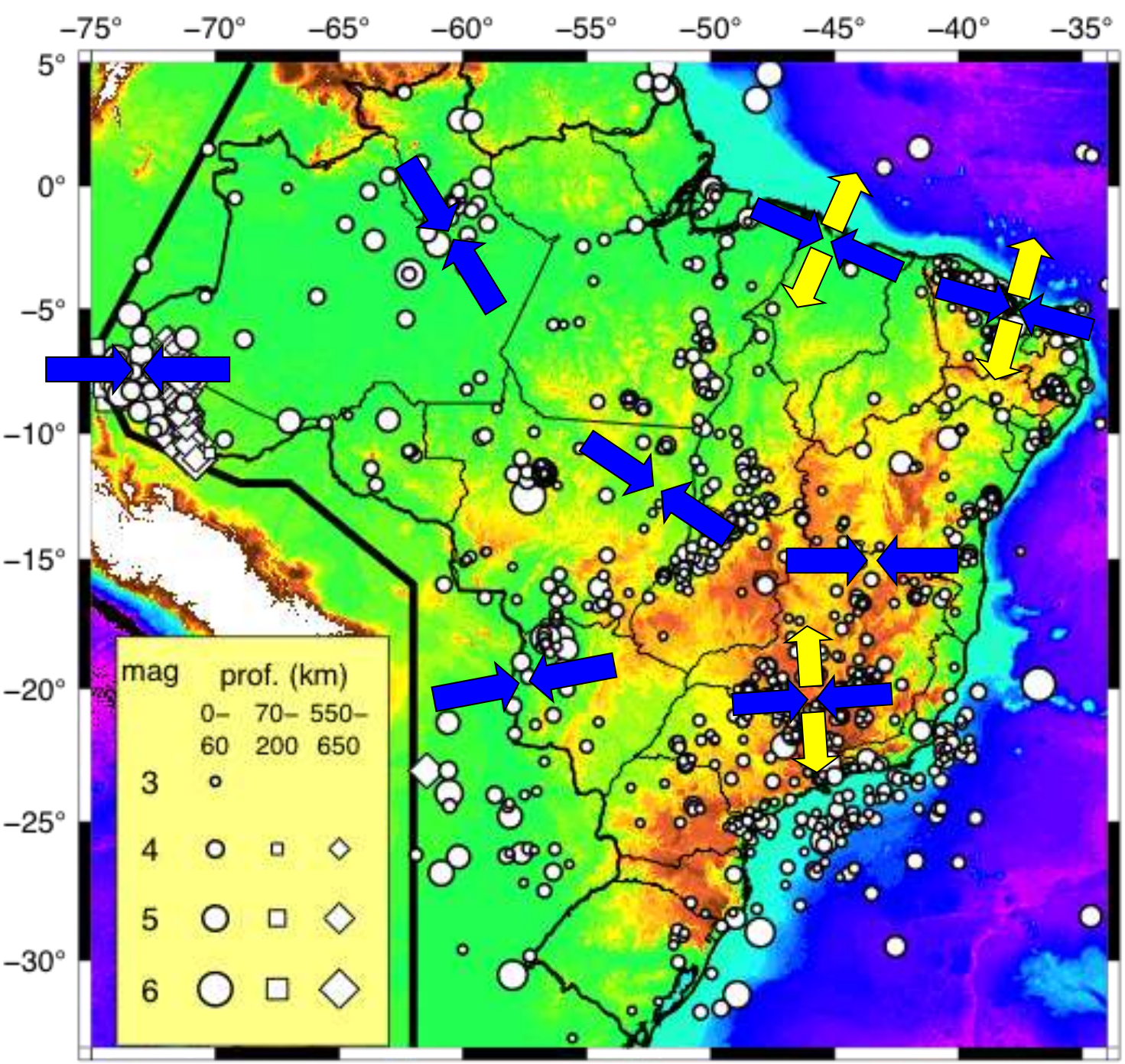
Maximum Horizontal Compression (estimates)



Nazca plate convergence

Single fault mechanisms (**P axes**)

Assumpção et al., 2016



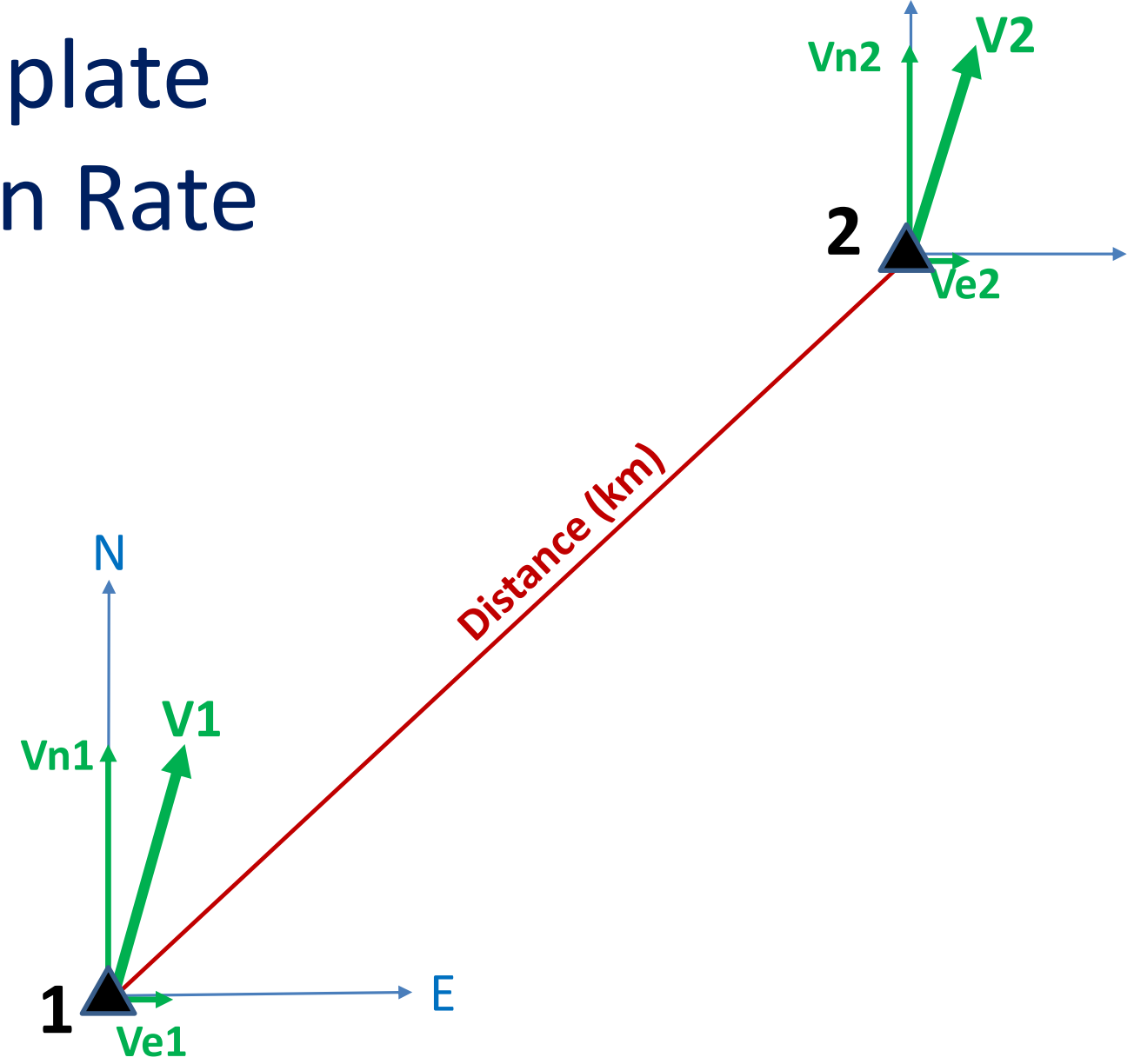
Crustal Stresses in Brazil

compression

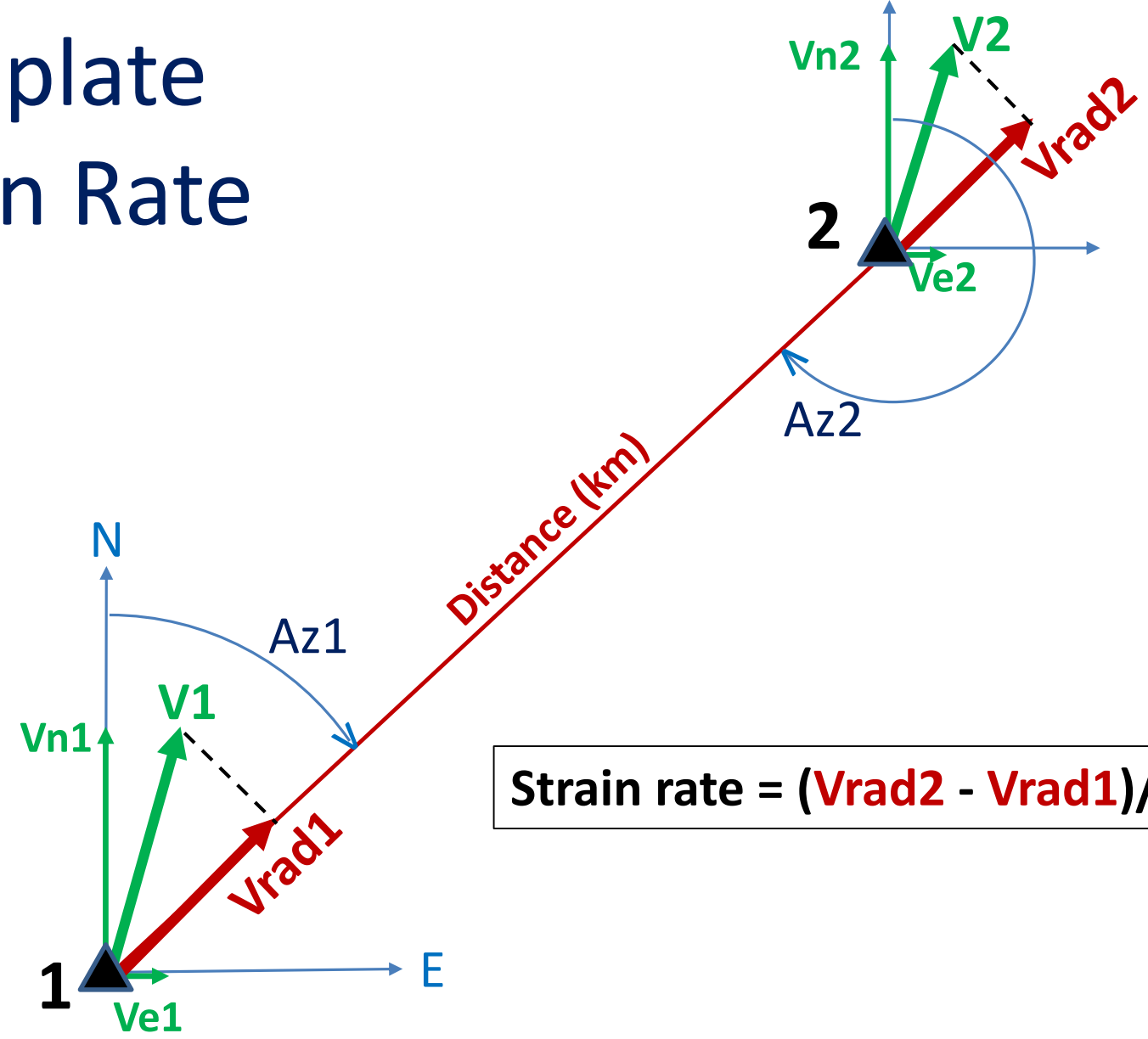
extension

Intraplate Deformation Rate

Intraplate Strain Rate

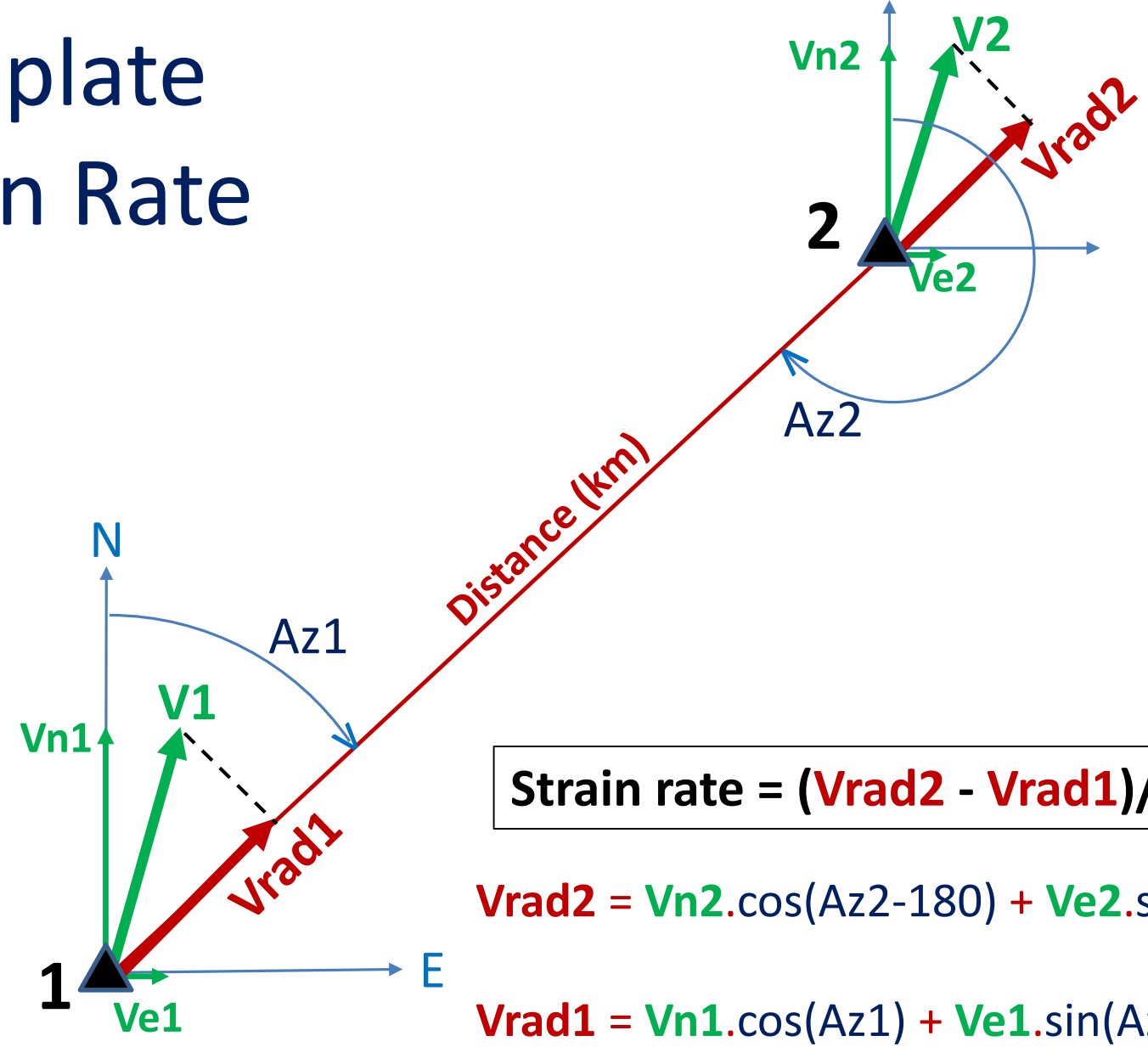


Intraplate Strain Rate



Strain rate = (Vrad2 - Vrad1)/Distance

Intraplate Strain Rate



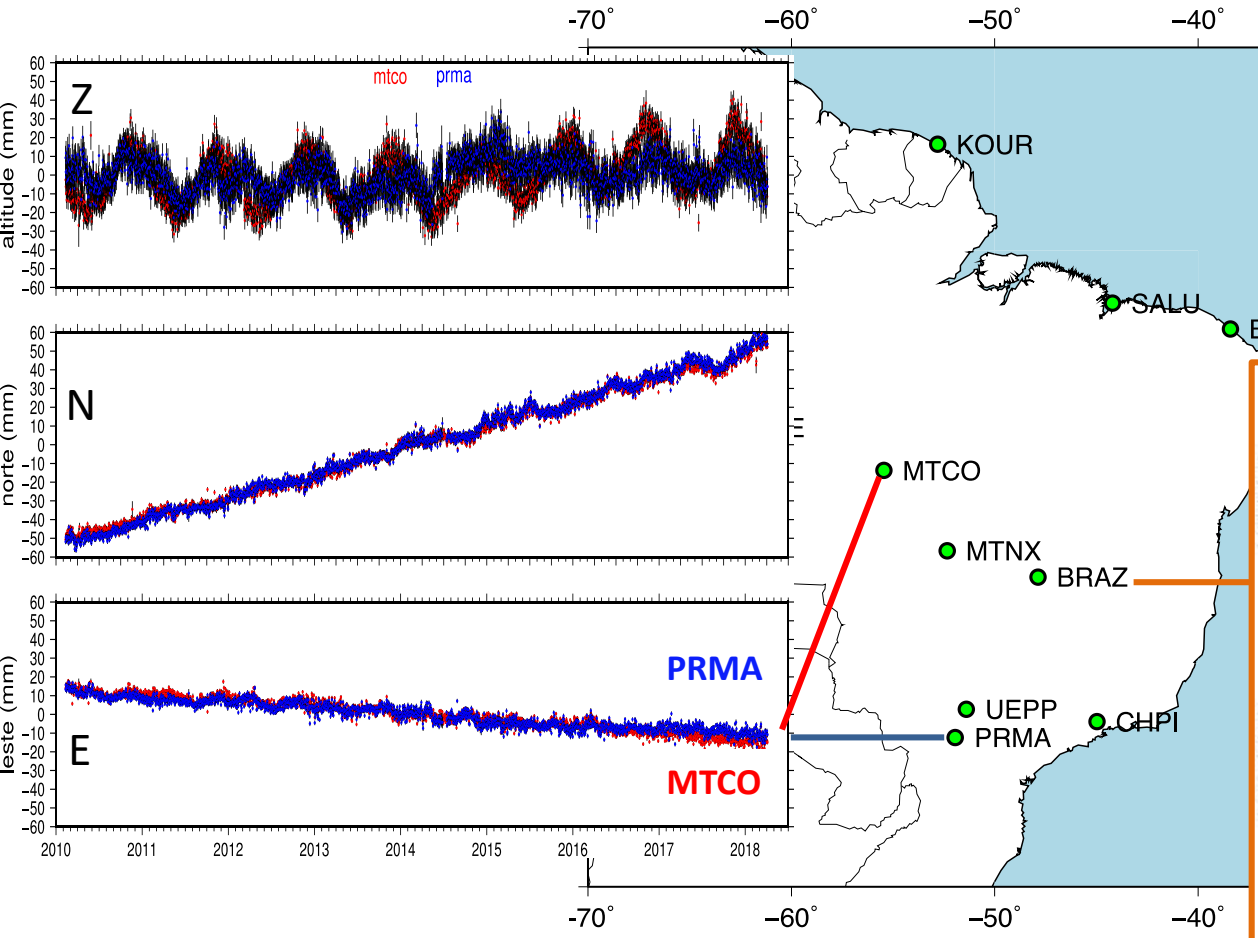
Strain rate = (Vrad2 - Vrad1)/Distance

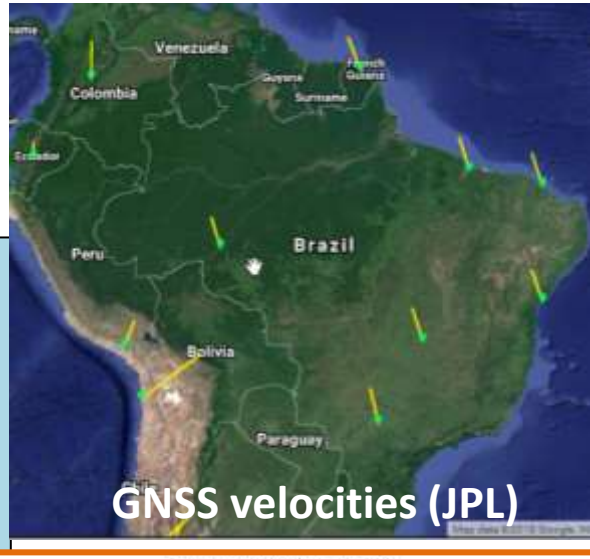
Vrad2 = **Vn2**.cos(Az2-180) + **Ve2**.sin(Az2-180)

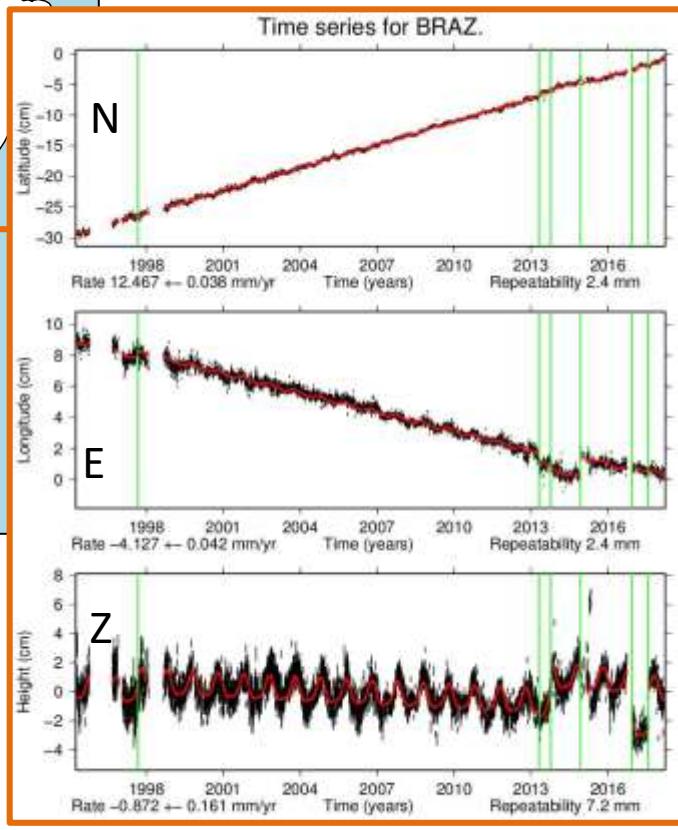
Vrad1 = **Vn1**.cos(Az1) + **Ve1**.sin(Az1)

Strain rate = (Vrad2 - Vrad1)/Distance

Good quality time series, 10 – 20 years (RBMC)







PRMA: Vn 13.065 +- 0.009 mm/y

Ve -2.878 +- 0.010 mm/y

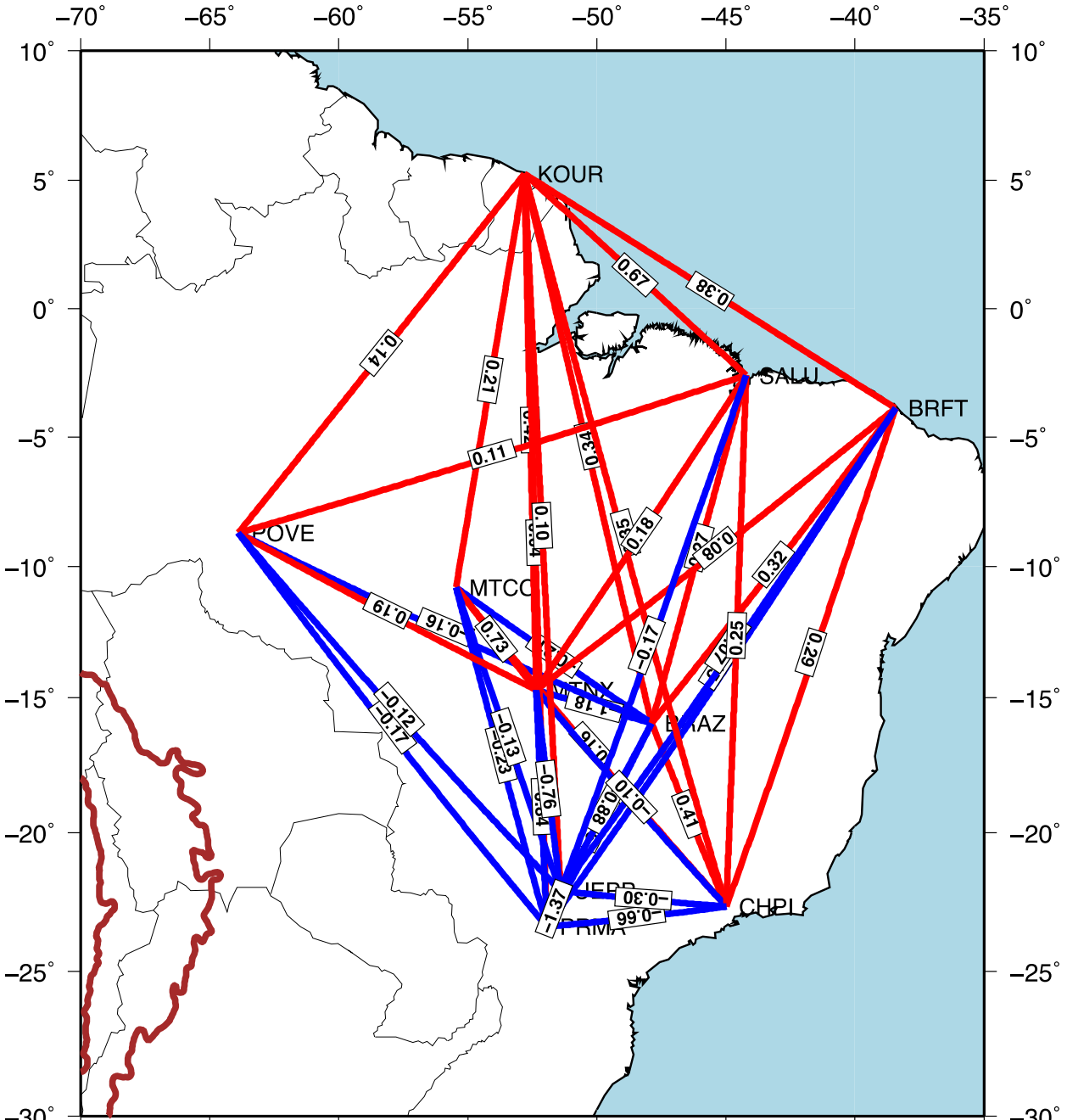
(GIPSY-OASIS)

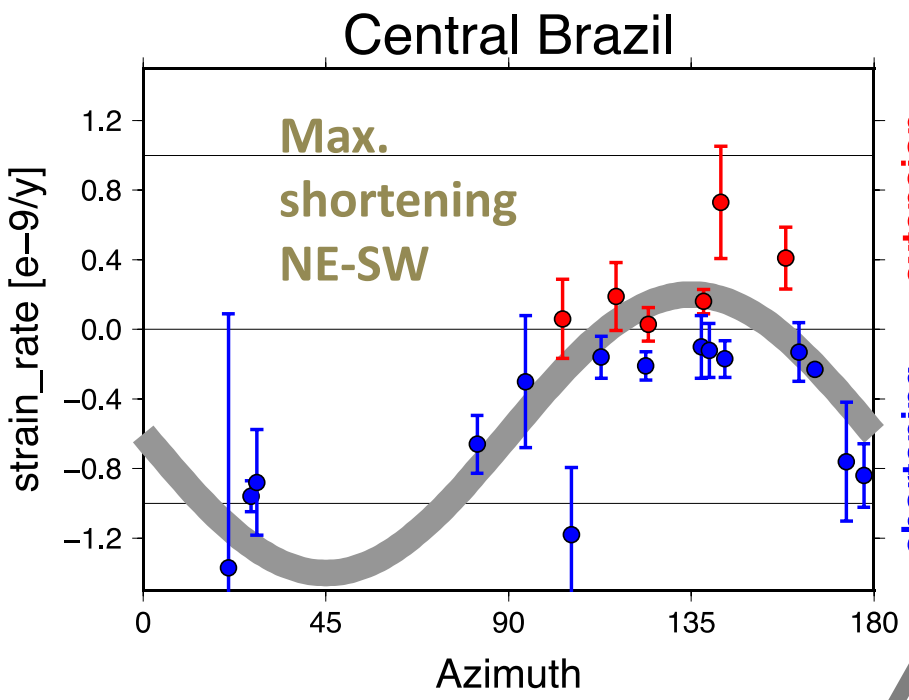
Strain Rates between all pairs of stations range from:

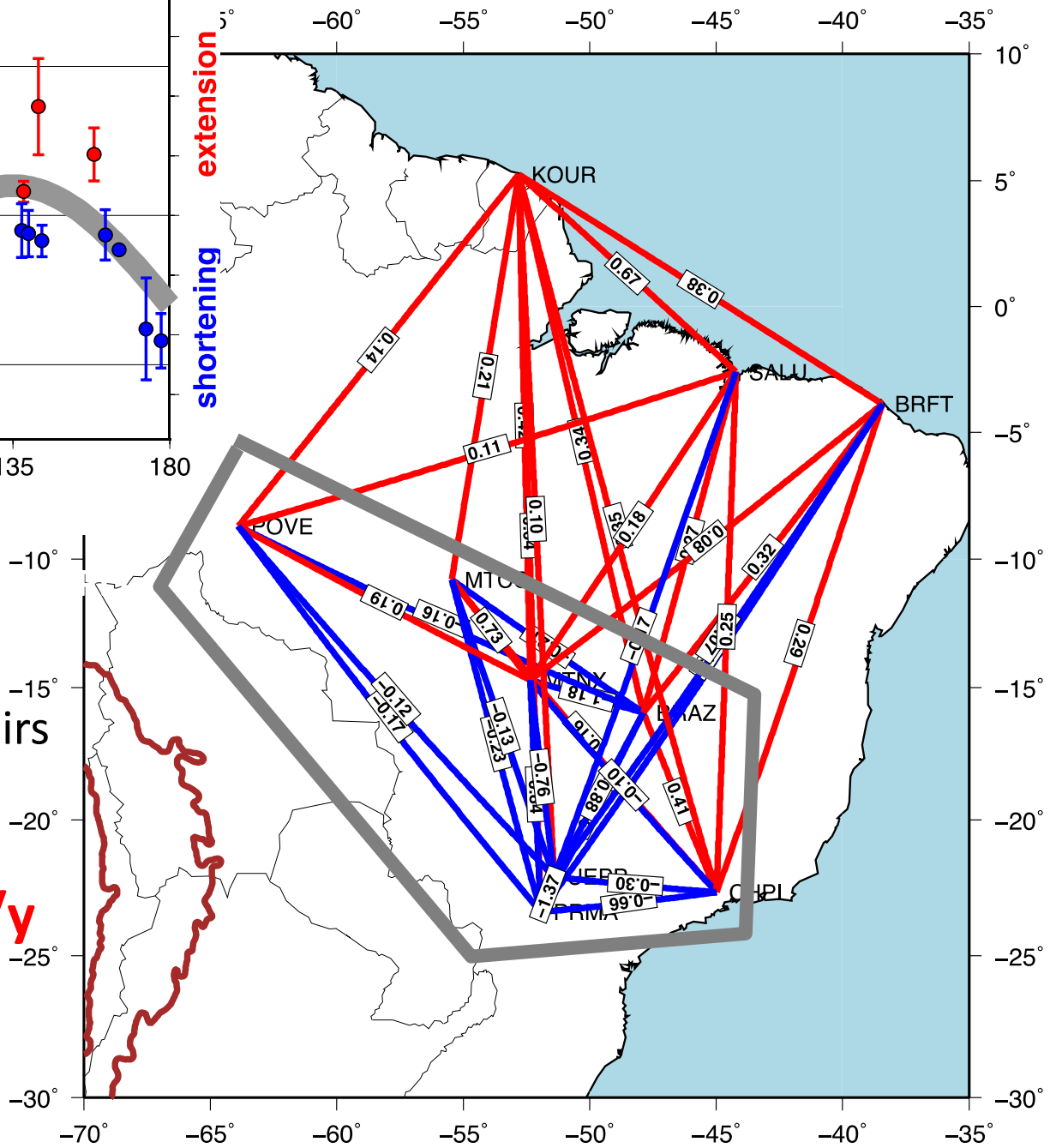
-1.0 E-9/y
(shortening)

to

+0.4 E-9/y
(extension)



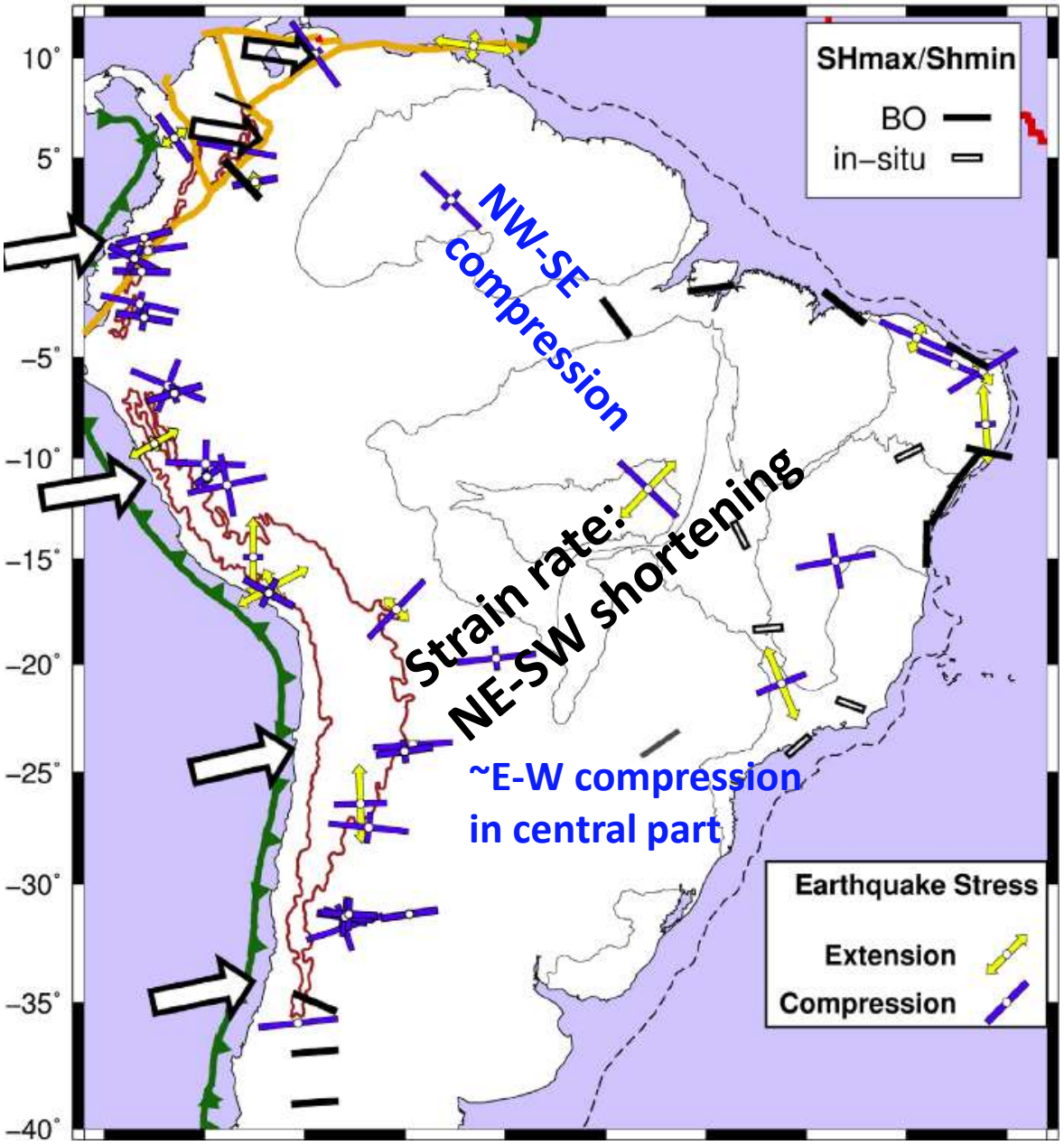




Strain Rates between all pairs of stations range from:

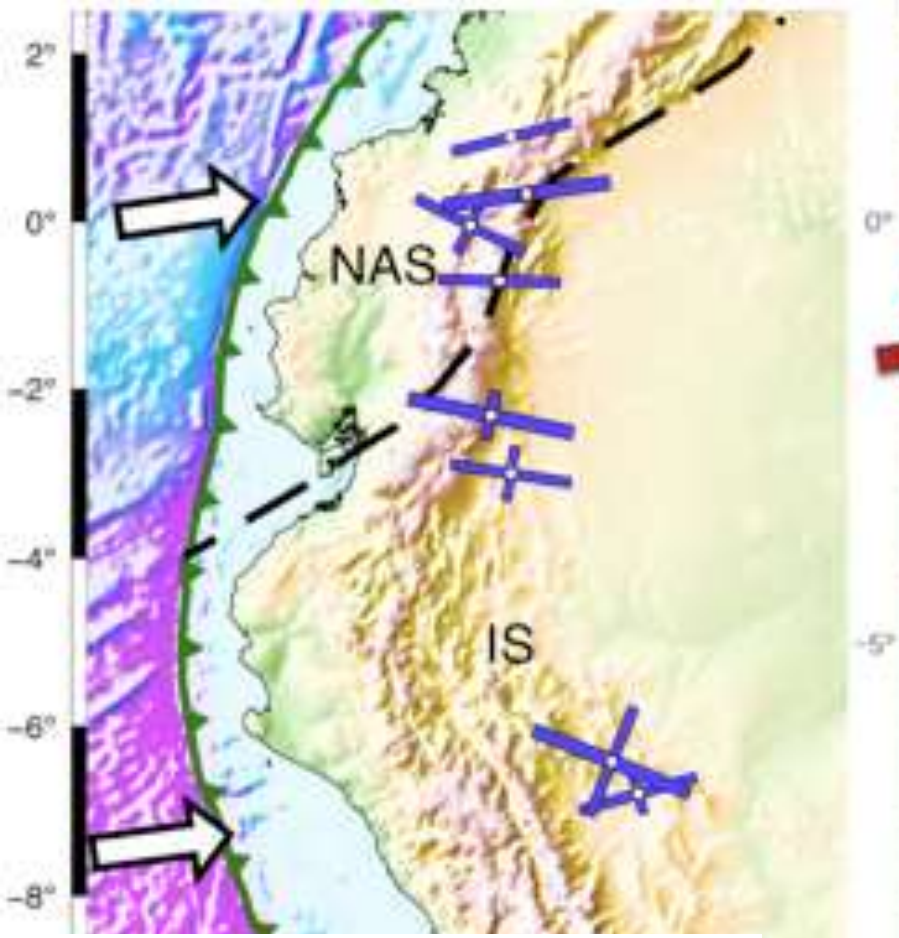
-1.0 E-9/y to **+0.4 E-9/y**

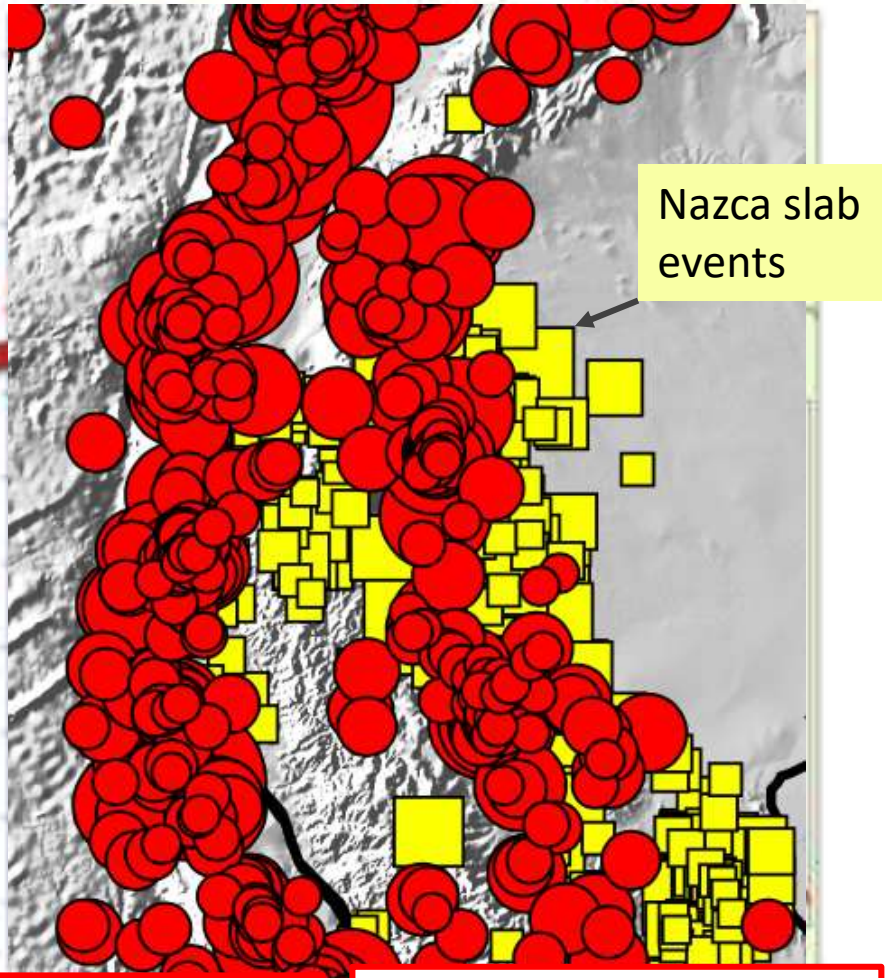
Stress patterns (from earthquake mechanisms)



Stresses in sub-Andes (Ecuador)

S. Colombia – Ecuador – N. Peru





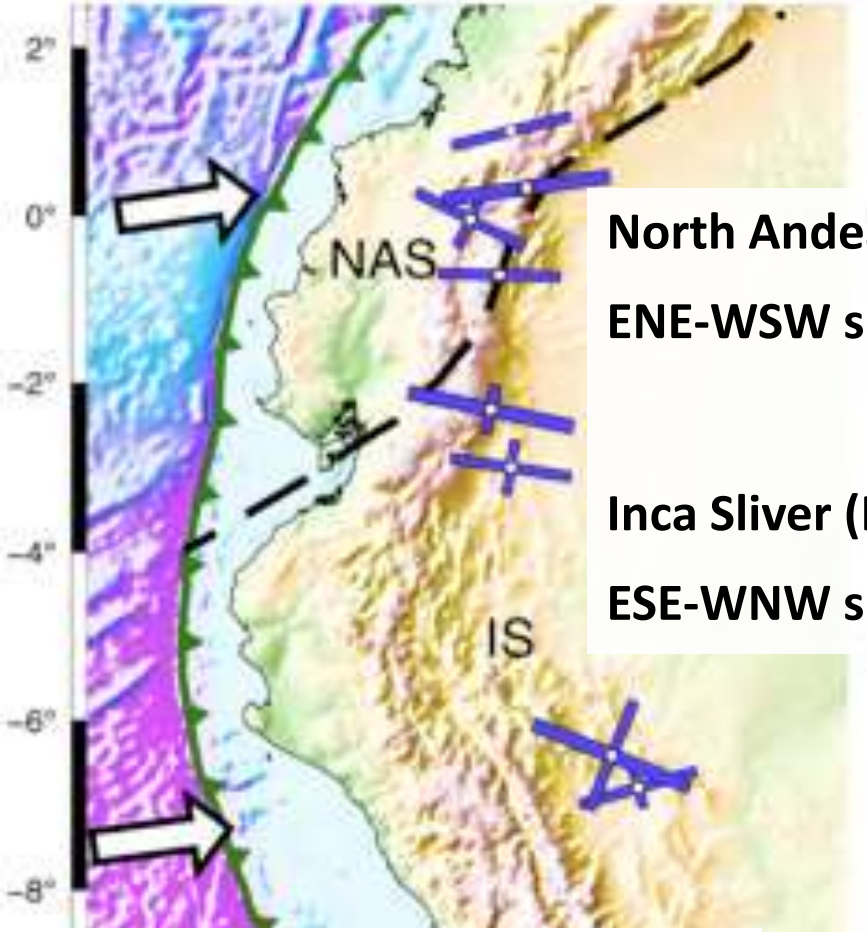
Stress tensors from foc.mec.

Naza-S.America interplate

Crustal seismicity Sub-Andes intrapl.

Comparison with Strain Data – sub-Andes

S. Colombia – Ecuador – N. Peru



North Andean Block (NAS):

ENE-WSW shortening

Inca Sliver (IS):

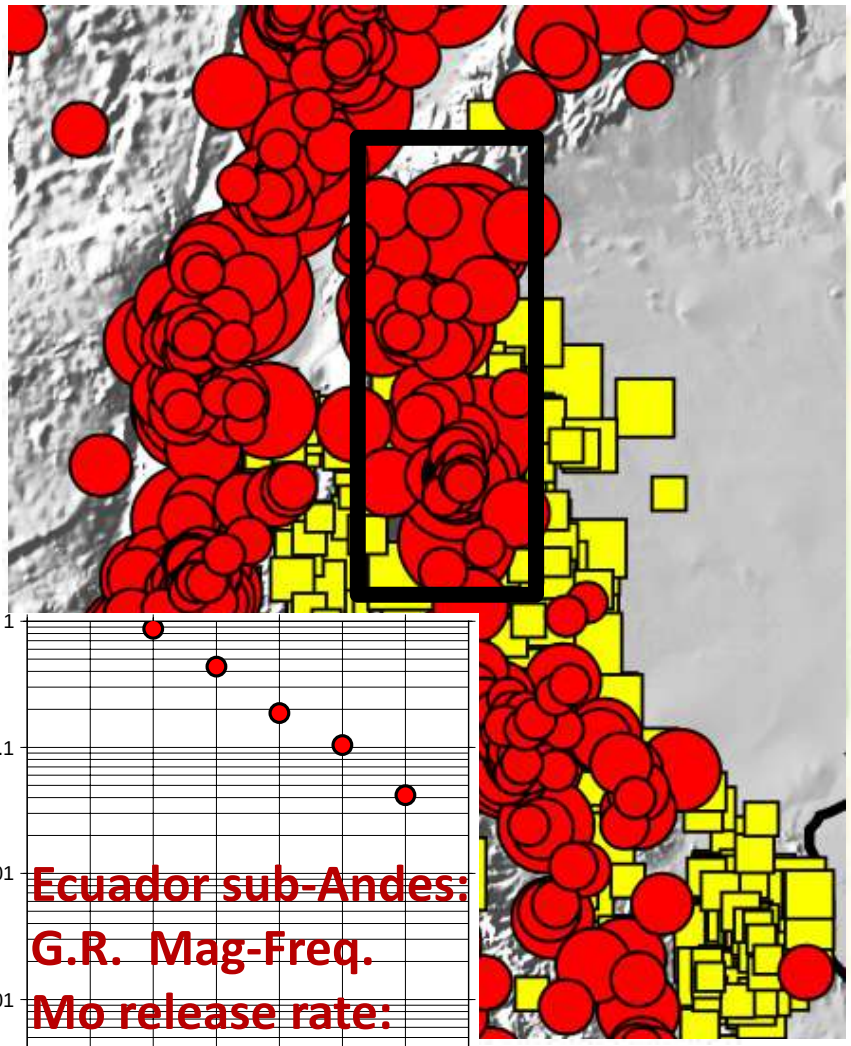
ESE-WNW shortening

b) GNSSS (Nocquet et al., 2014)

Stress tensors from foc.mec.

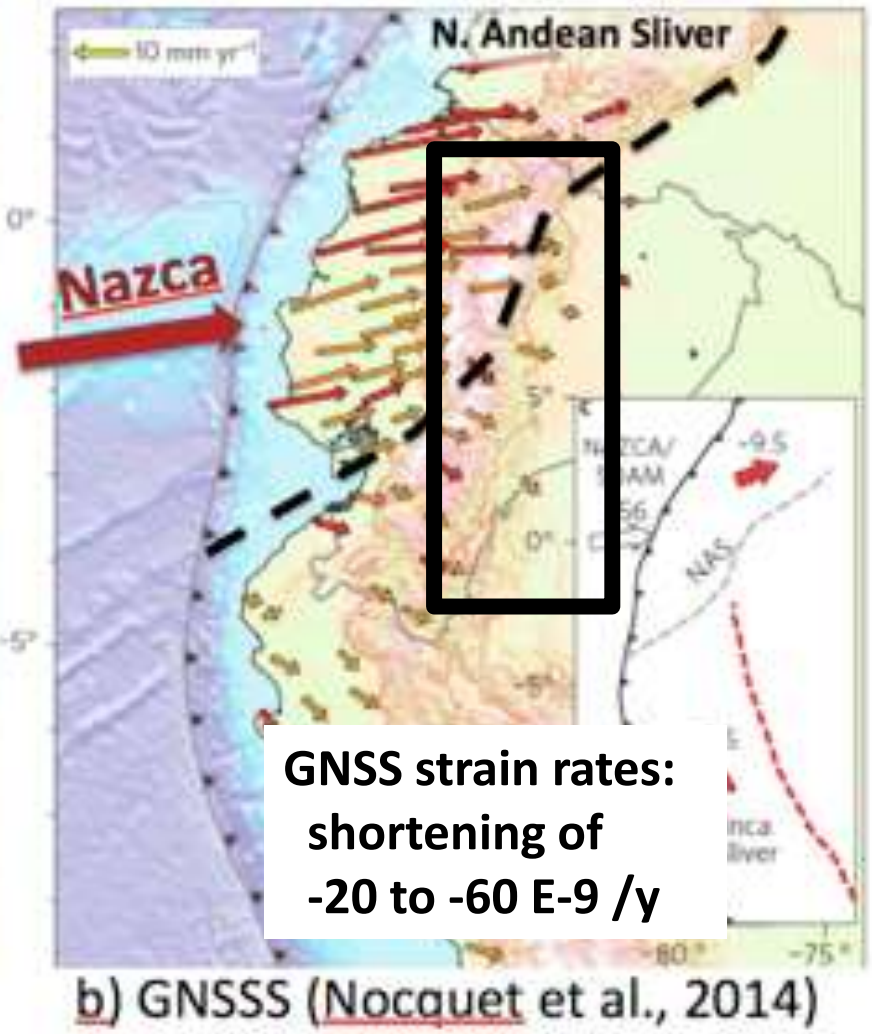
Comparison with Strain Data – sub-Andes

S. Colombia – Ecuador – N. Peru



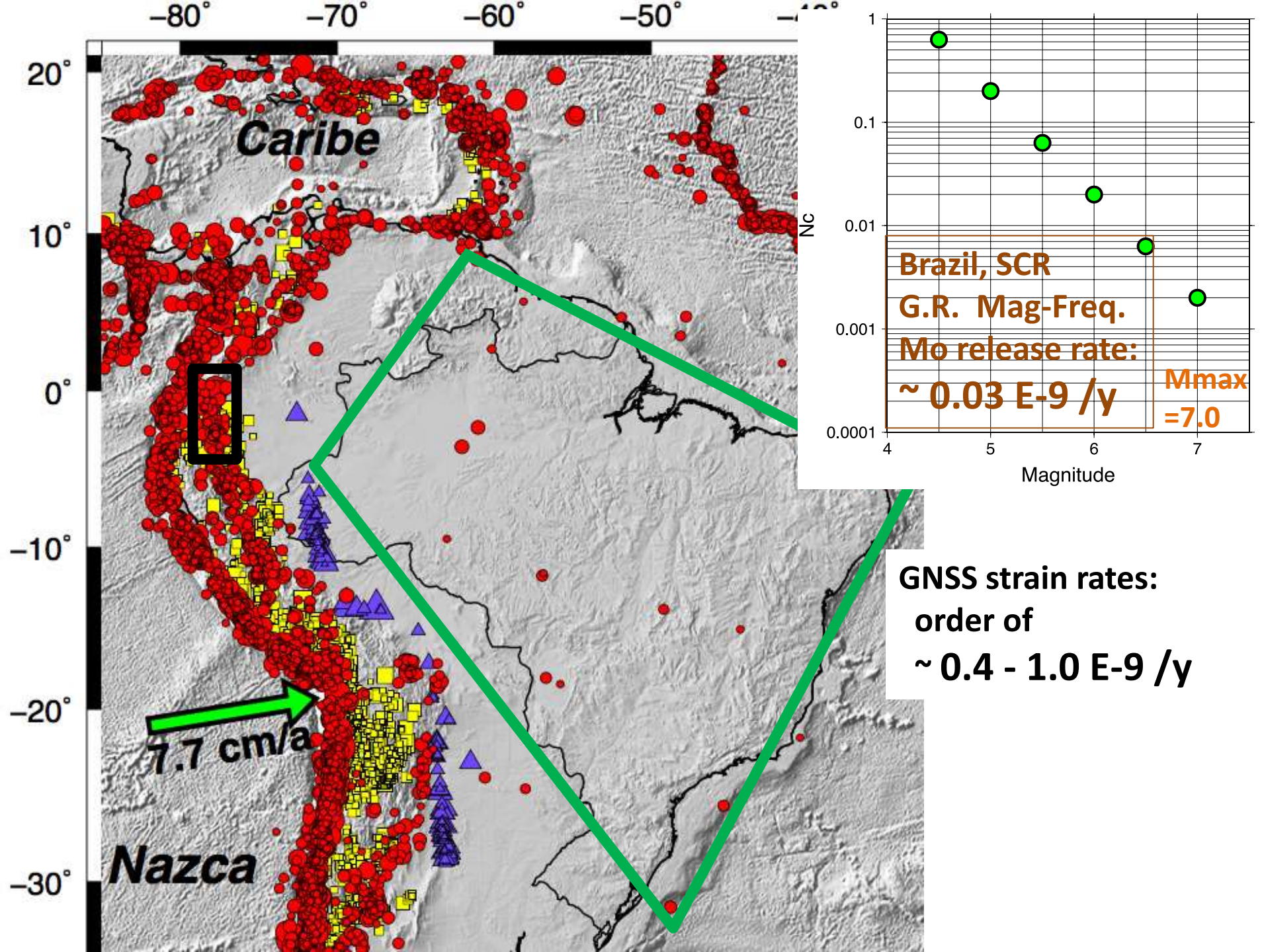
Ecuador sub-Andes:
G.R. Mag-Freq.
Mo release rate:
~ - 30 E-9 /y

Mmax=7.5

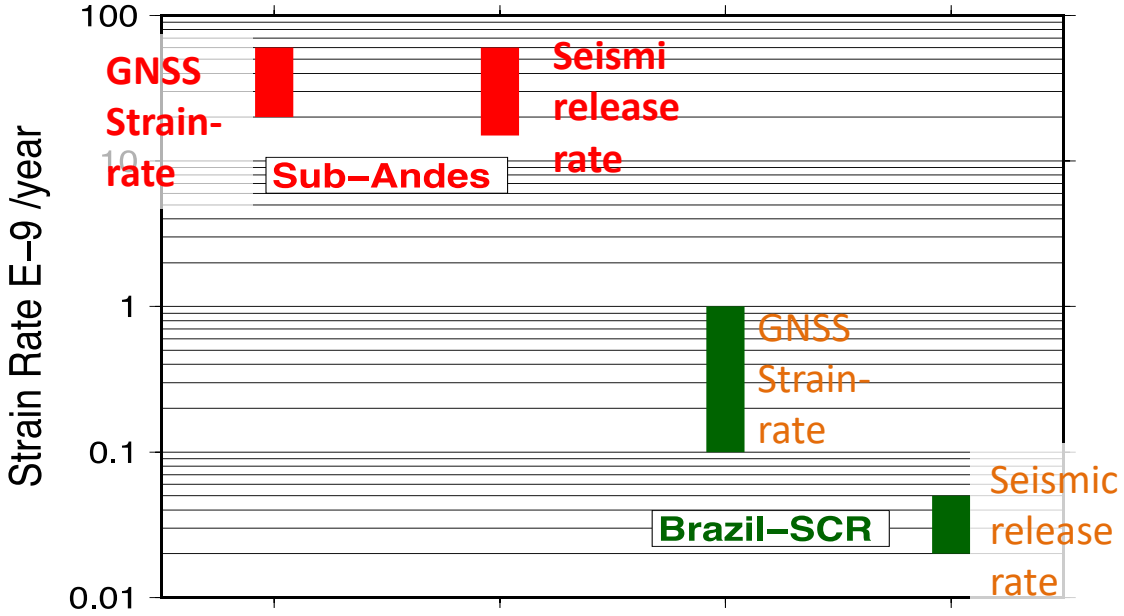


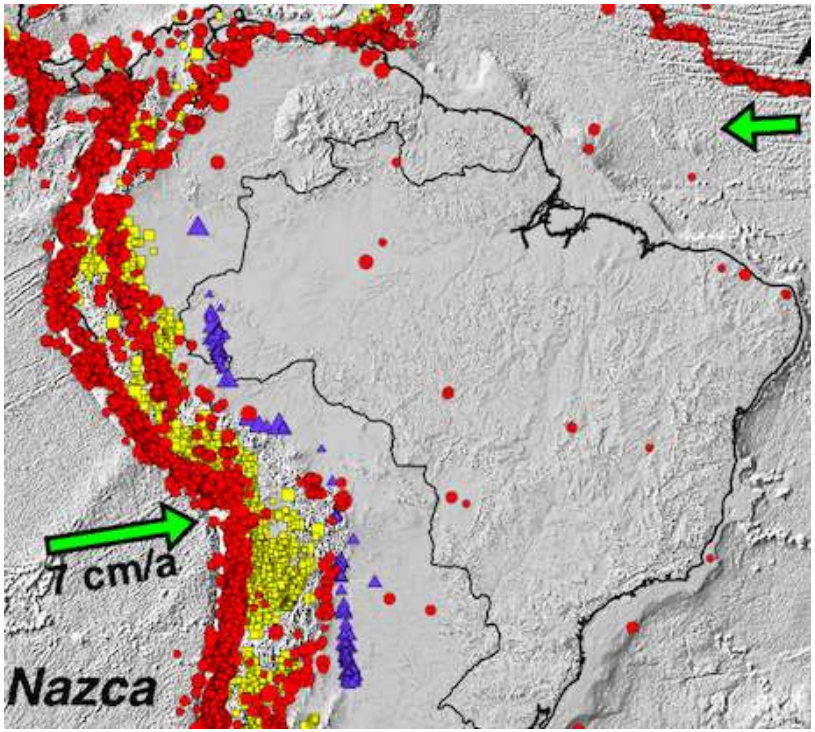
GNSS strain rates:
shortening of
-20 to -60 E-9 /y

Sub-Andes: strain rate consistent with seismic moment release rate !



GNSS strain rates:
order of
~ 0.4 - 1.0 E-9 /y

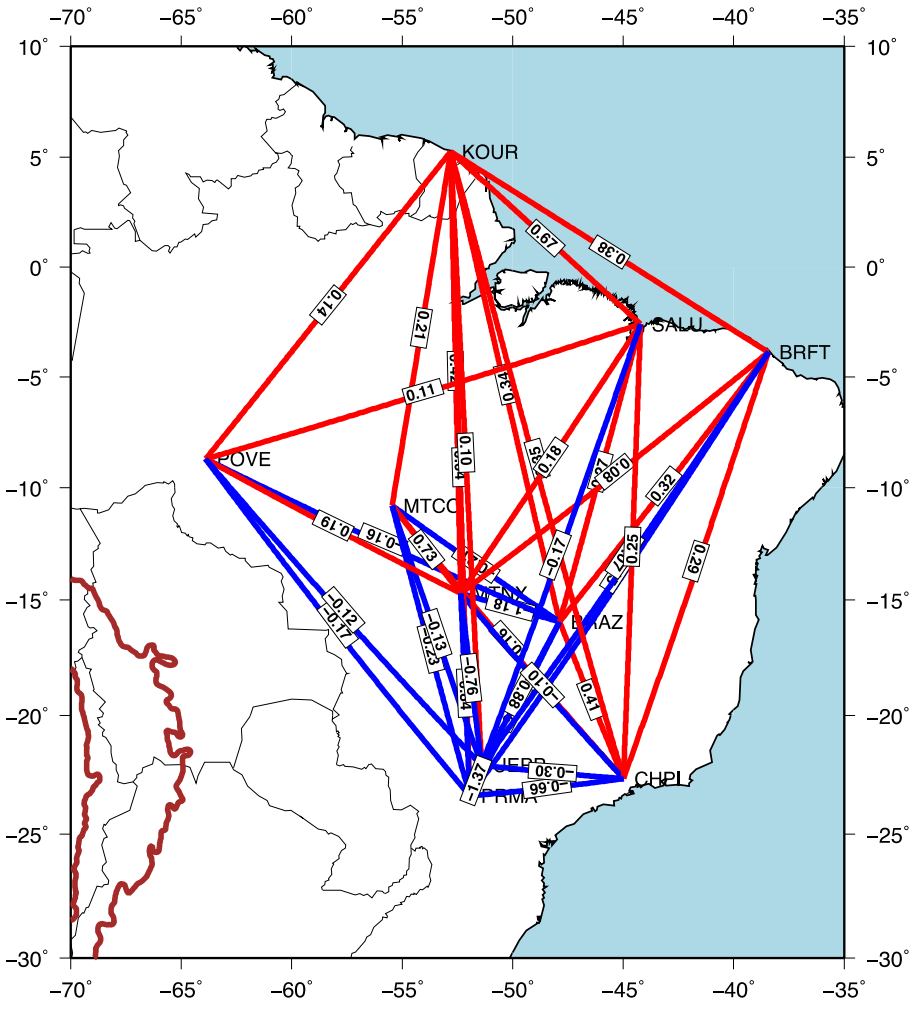




In mid-plate Brazil, seismic release is one order of magnitude lower than deformation rate:

Different causes!

Points for future discussion



1) What causes NE-SW shortening rate in mid-plate South America?
And possibly extensional rates along the coast?

2) The strain rates can be explained by:

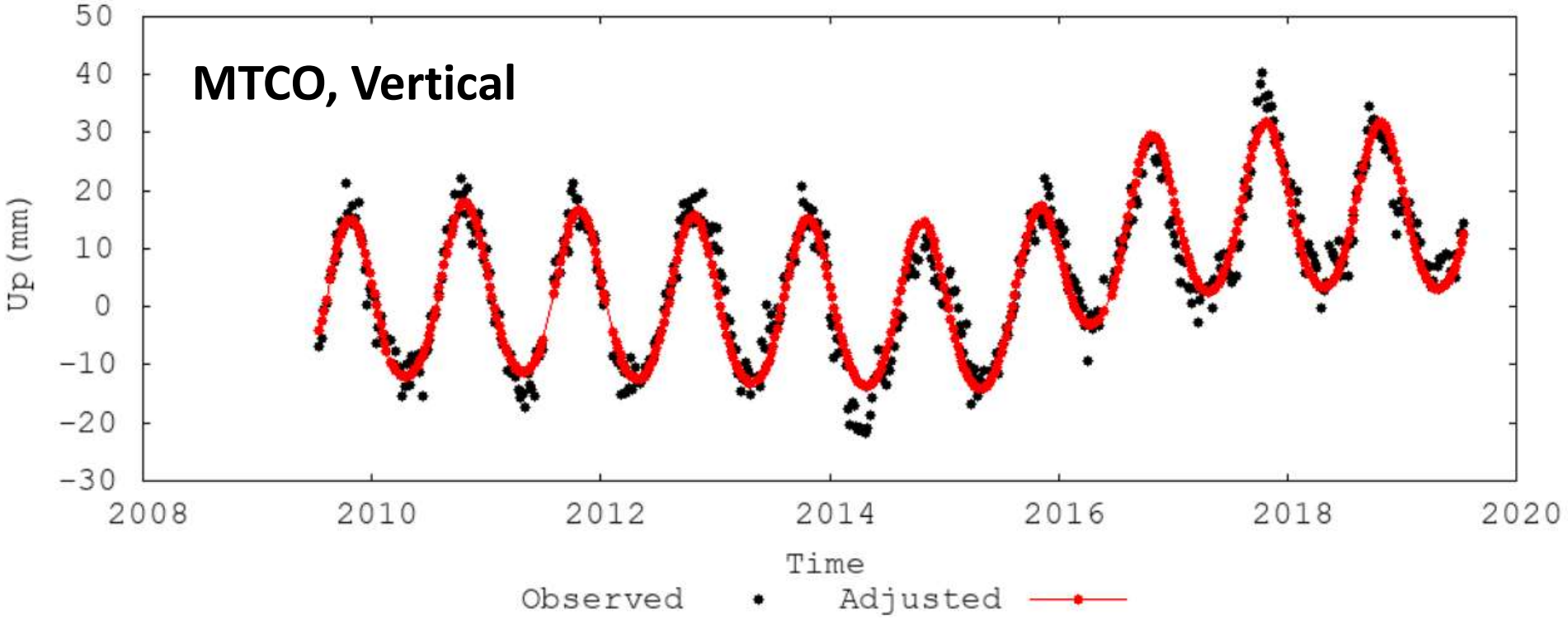
- Global Glacial (Andean?) Isostatic Adjustment ?

- Relaxation after large Andean earthquakes?

- Decadal deep hydrological cycles, climate change?

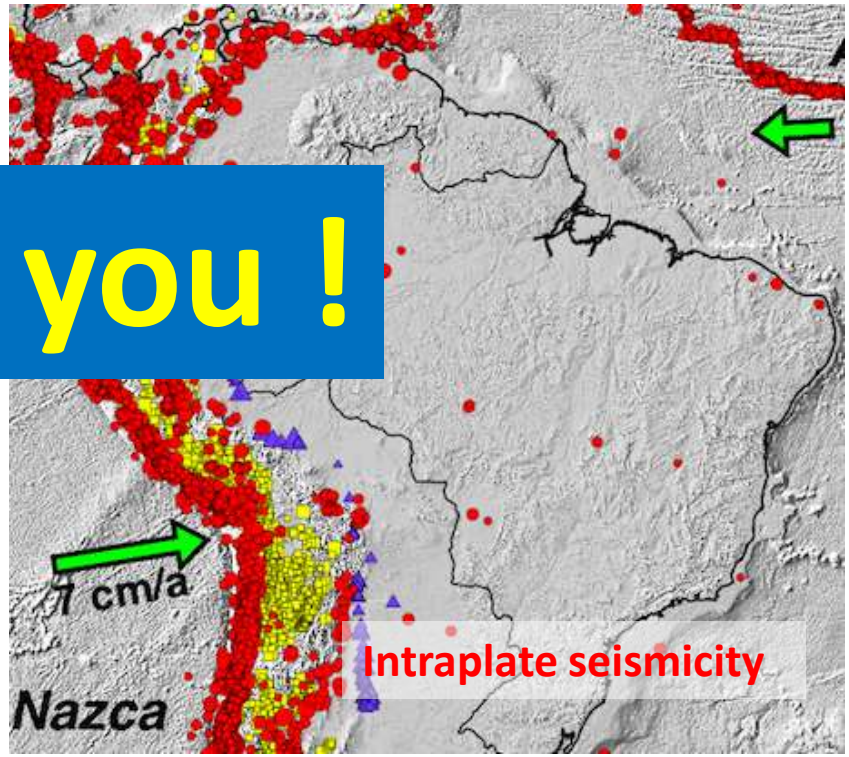
- Any relation with regional earthquakes?

Decadal variations: Noise or Geodynamics?



GNSS velocities (JPL)

Thank you !



Intraplate seismicity