



**THE INTERNATIONAL ASSOCIATION OF SEISMOLOGY AND
PHYSICS OF THE EARTH'S INTERIOR (IASPEI) AND THE
LATIN AMERICAN AND CARIBBEAN SEISMOLOGICAL
COMMISSION (LACSC)**

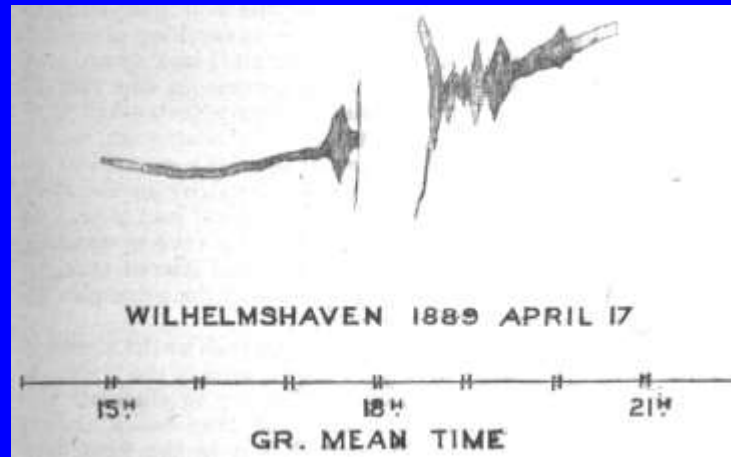
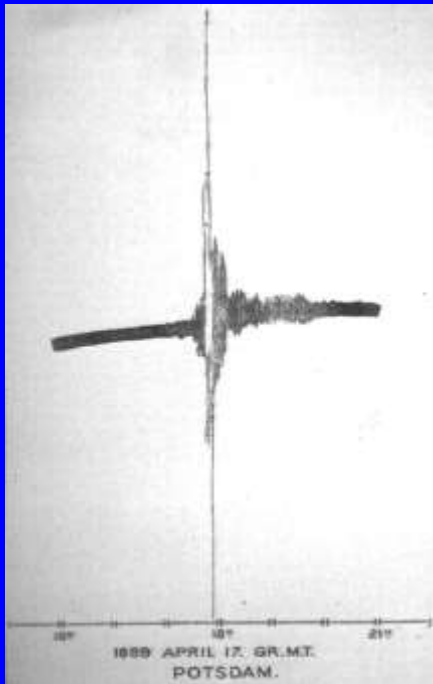
Marcelo Assumpção, Johannes Schweitzer

Workshop «GGRF in Latin America», Buenos Aires, 17 Sept 2019

ERNST VON REBEUR-PASCHWITZ (1861 – 1895)

The Earthquake of Tokio, April 18, 1889

Nature 40, 294-295, 1889



1TH INTERNATIONAL CONFERENCE ON SEISMOLOGY
11 – 13 APRIL 1901, STRASBOURG



INTERNATIONAL SEISMOLOGICAL ASSOCIATION (ISA)

1903 2nd Int'l Conference on Seismology, Strasbourg
participants from 19 countries.

1904 International Seismological Association (ISA)
18 countries signed the convention, including Chile and Mexico.



1ST MEETING OF
PERMANENT COMMISSION OF ISA
16 – 20 OCTOBER 1906, ROME

1ST GENERAL ASSEMBLY OF ISA
21 – 26 SEPTEMBER 1907, THE HAGUE



INTERNATIONAL SEISMOLOGICAL ASSOCIATION (ISA)

- 1906 1st meeting of the Permanent Commission, Rome (“Exec. Committee”).
- 1907 2nd meeting of the Permanent Commission & 1st General Assembly in The Hague, Netherland.
- 1909 3rd meeting of the Permanent Commission in Zermatt, Switzerland.
- 1911 4th meeting of the Permanent Commission & 2nd General Assembly in Manchester, UK.
- 1913 Argentina became ISA member.

ISA (1904) IAS (1930) IASPEI (1951)

OBJECTIVES OF THE ASSOCIATION

The International Association of Seismology and Physics of the Earth's Interior (IASPEI) is a non-governmental and non-profit organization to:

- a) facilitate research on seismology, adoption of standards for observatory practice and data storage.
- b) promote multidisciplinary research in earthquake science, internal structure, properties and processes of the Earth.
- c) coordinate the conduct and communication of research and cooperation between countries.
- d) organize international conferences and meetings and support participation of young researchers and of scientists from developing countries.

IASPEI: SOME SCIENTIFIC HIGHLIGHTS

- 1) Seismological Bulletins (ISS, now ISC)
- 2) Earth models and travel-time tables (Jeffreys-Bullen, PREM, IASPEI91, SP6, AK135)
- 3) Education (manuals of seismological practice: MSOP, NMSOP)
- 4) Definition of standards (phase names, criteria for magnitude measures)



IUGG

International Union of Geodesy and Geophysics

72 member **countries**

Eight **Associations:**

IACS, IAG, IAGA, IAHS,
IAMAS, IAPSO, **IASPEI**, IAVCEI



IUGG/IASPEI Assemblies

- **2011 IUGG**
- **2013 IASPEI, IAG, etc.**
- **2015 IUGG**
- **2017 IASPEI**
- **2019 IUGG (Montreal)**
- **2021 IASPEI (Hyderabad)**

THEMATIC OVERLAPS WITH OTHER IUGG ASSOCIATIONS

1969	First IASPEI Assembly jointly with IAGA (Spain)	<i>Geomagnetism</i>
2001	Second Joint Assembly with IAGA (Vietnam)	<i>Geomagnetism</i>
2013	Joint Assembly with IAHS & IAPSO (Sweden)	<i>Hydrology, Ocean</i>
2017	First Joint Assembly with IAG (Japan)	<i>Geodesy</i>
2021	Third Joint Assembly with IAGA (India)	<i>Geomagnetism</i>

**In the future we should promote
more IASPEI-IAG joint assemblies !**



IUUGG

GEODESY



**GEOMAG.
AERONOMY**



IASPEI



**MET. ATMOS.
SCIENCES**



etc.

8 Associations

**IASPEI Regional
Commissions**



1951



1996



2011



2012

IASPEI Members



LACSC:
10 countries,
titular members



IASPEI/IUGG

Executive Committee 2018-2020

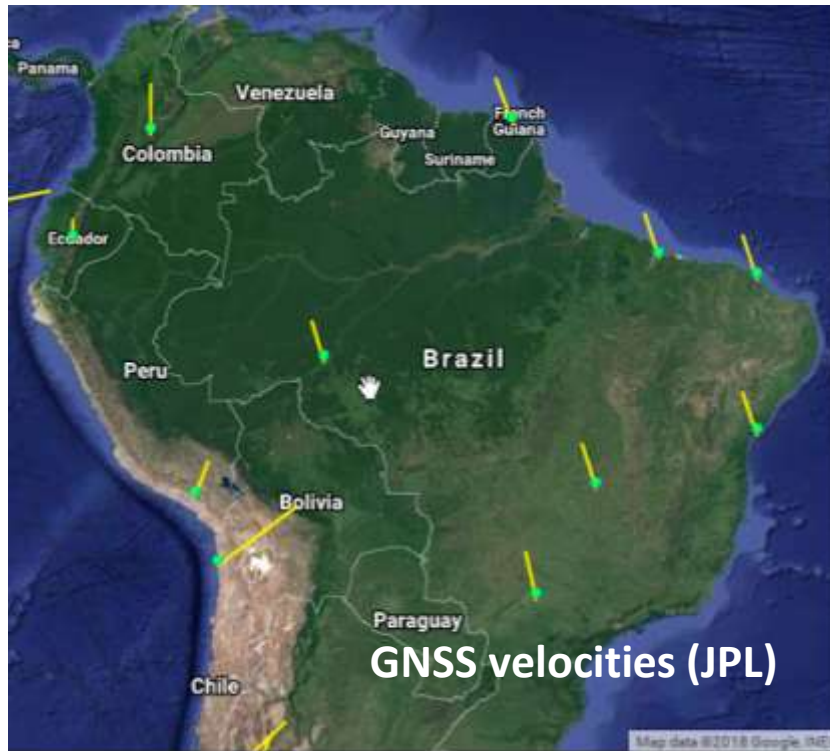
- Mario Ruiz (Ecuador) – President
- Victor Huérfano (Puerto Rico Seismic Net.) – Past Pres.
- Marino Protti (Costa Rica) - Vice-President
- Marcelo Assumpção (Brazil) – Exec. Secretary
- Leandro Rodríguez (Peru - CERESIS)
- Xyoli Pérez-Campos (Mexico)
- Eduardo Camacho (Panama)
- Lloyd Lynch (Trinidad-Tobago)
- Franck Audemard (Venezuela)
- Sergio Barrientos (Chile)
- Patricia Alvarado (Argentina)

IUGG/IASPEI/LACSC Assemblies

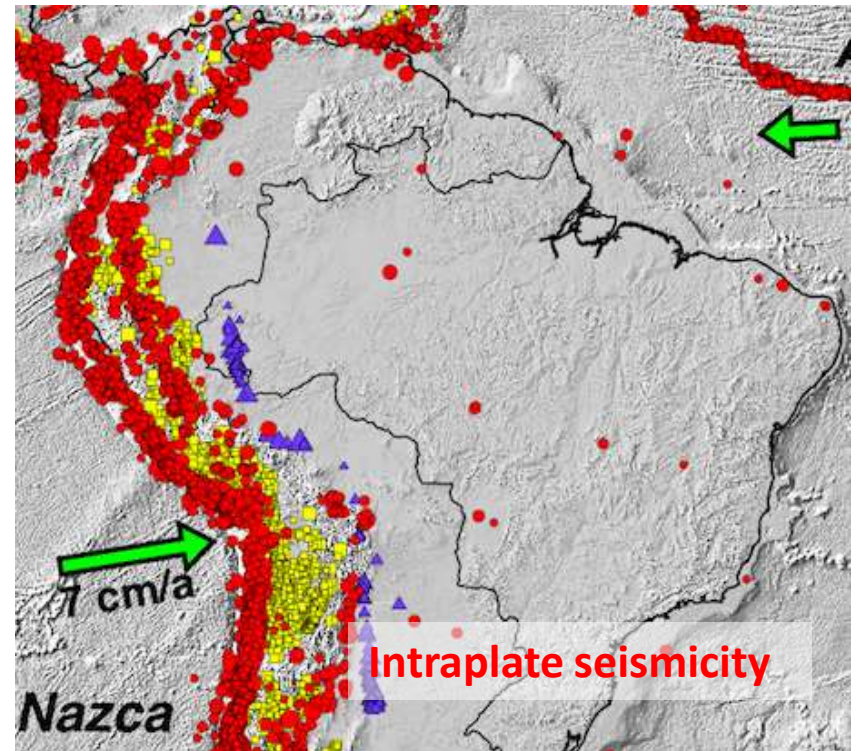
- **2011 IUGG**
 - **2012 LACSC – Peru, LACSC created**
- **2013 IASPEI**
 - **2014 LACSC – Colombia**
- **2015 IUGG**
 - **2016 LACSC – Costa Rica**
- **2017 IASPEI**
 - **2018 LACSC – Puerto Rico / Miami**
- **2019 IUGG (Montreal)**
 - **2020 LACSC – Ecuador**
- **2021 IASPEI (Hyderabad)**



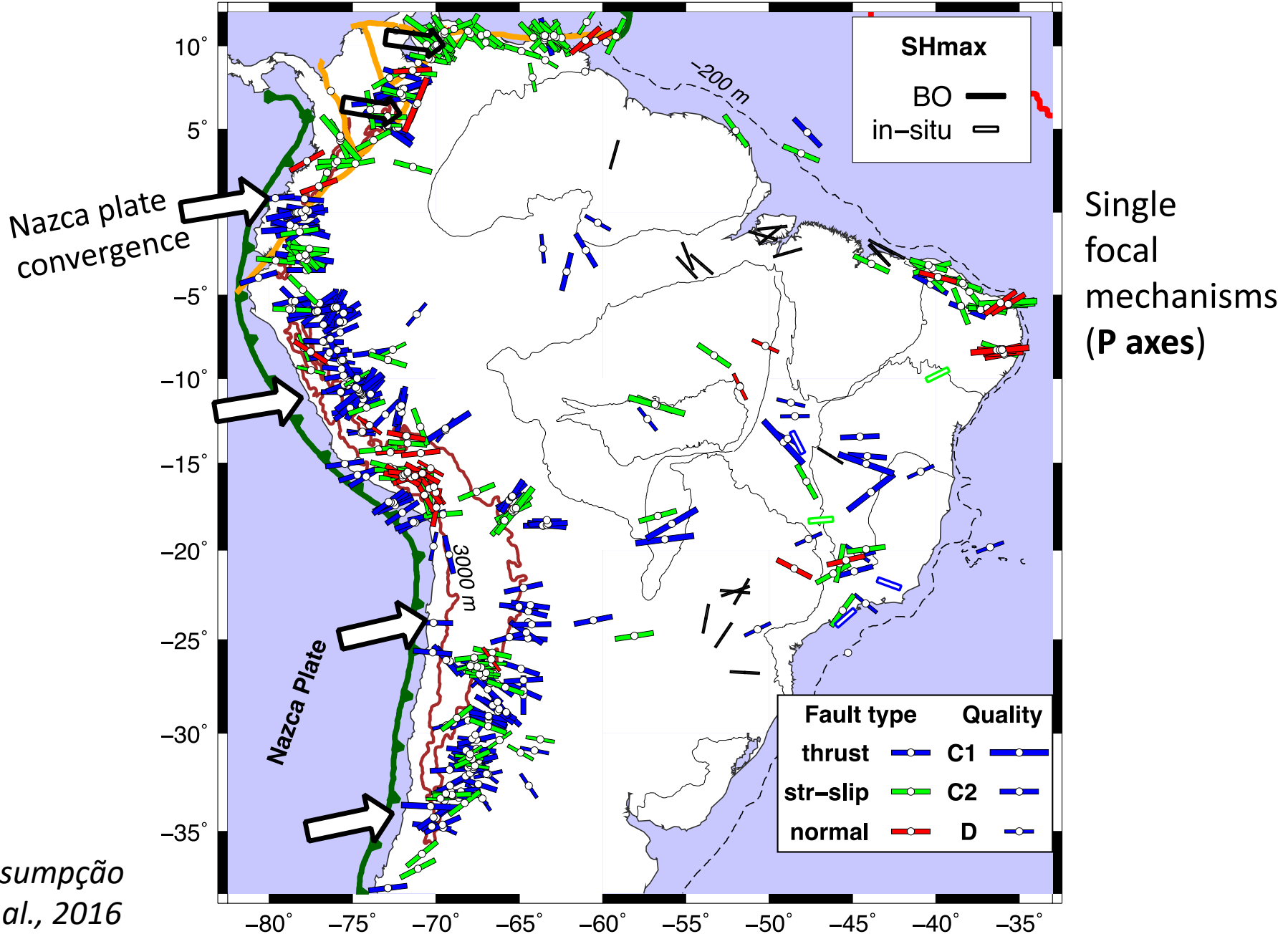
Intraplate Deformation from GNSS

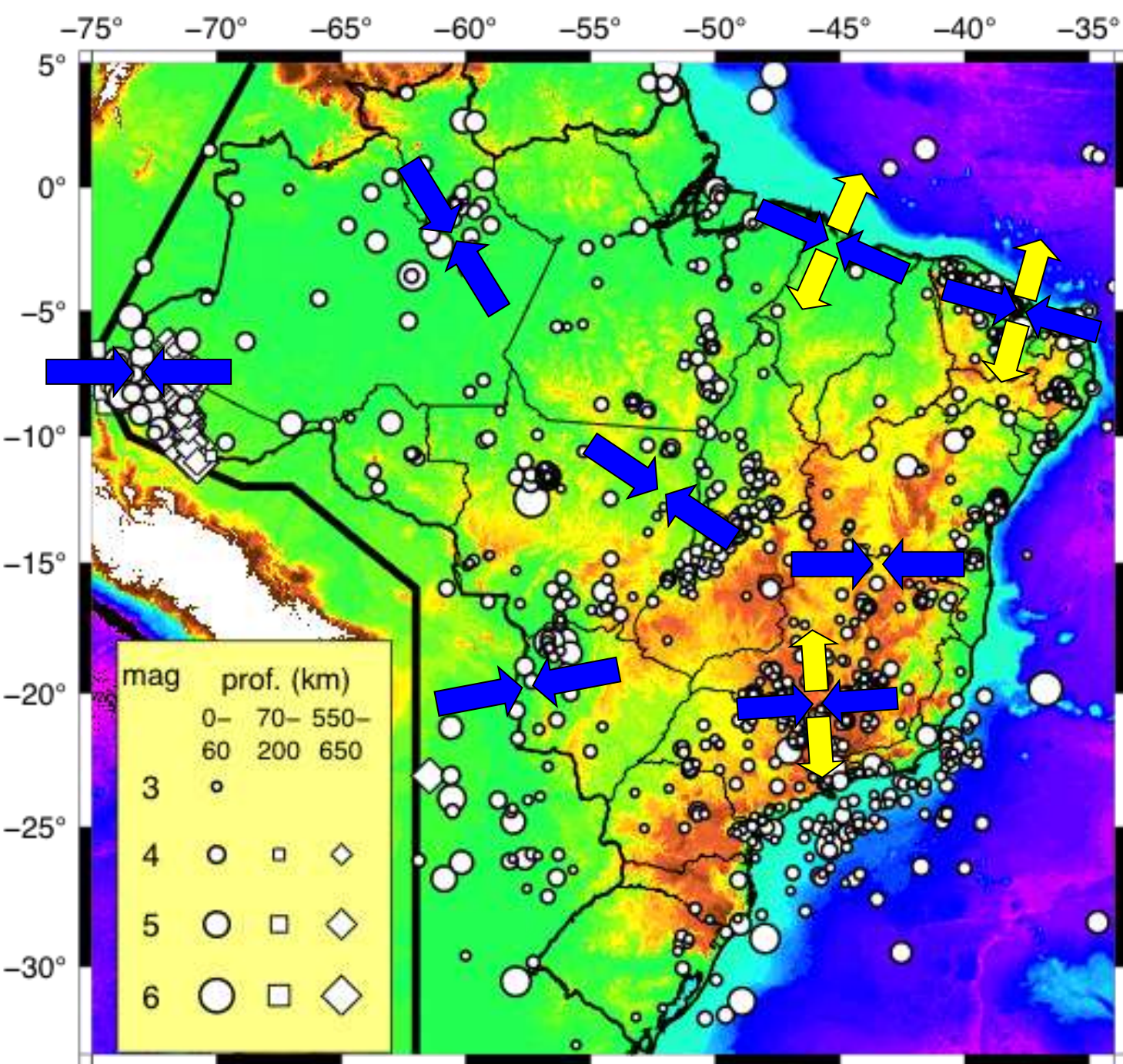


Intraplate Stresses from Focal Mechanisms



Maximum Horizontal Compression (estimates)

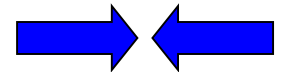




Crustal Stresses in Brazil

Magnitude 5
every 5 years

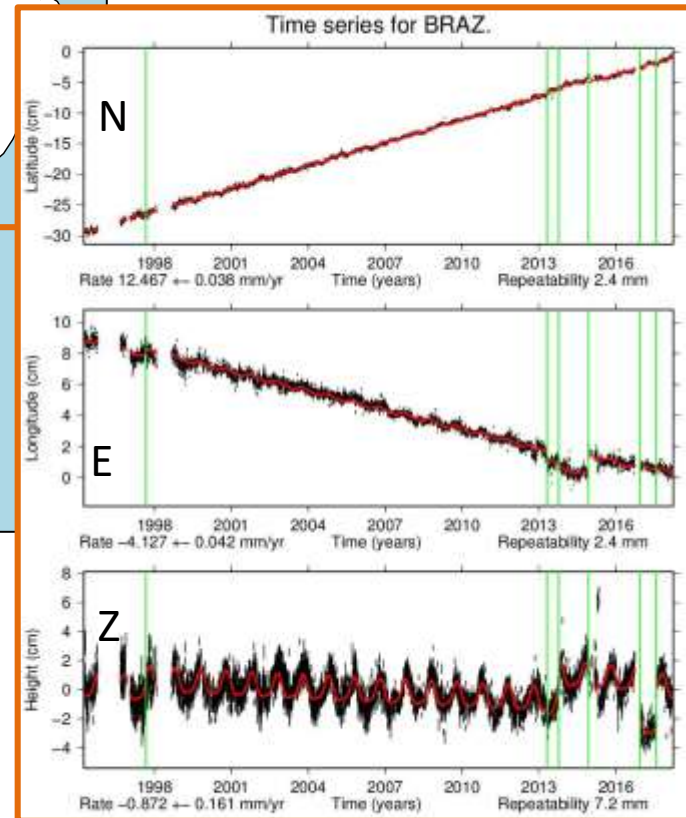
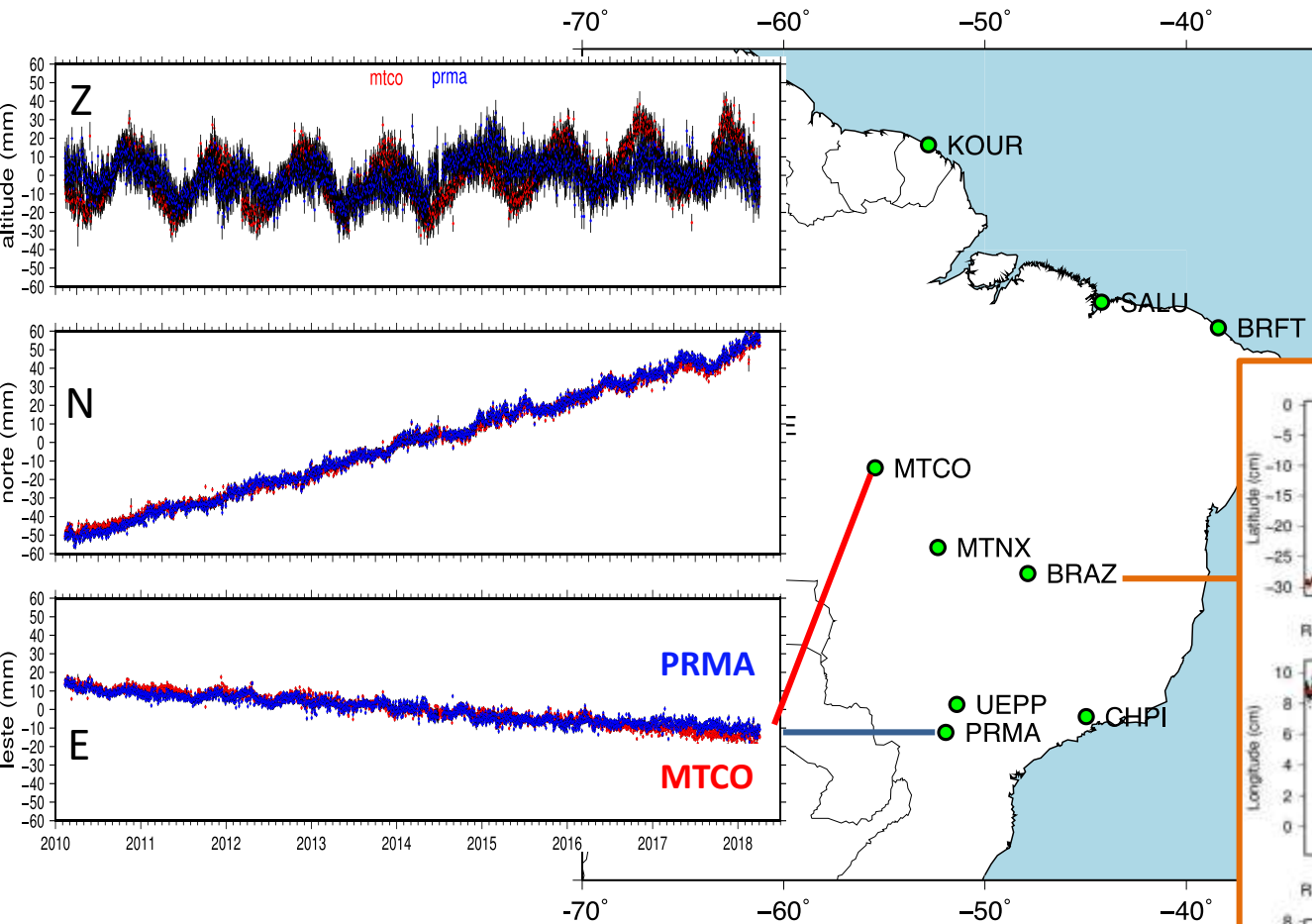
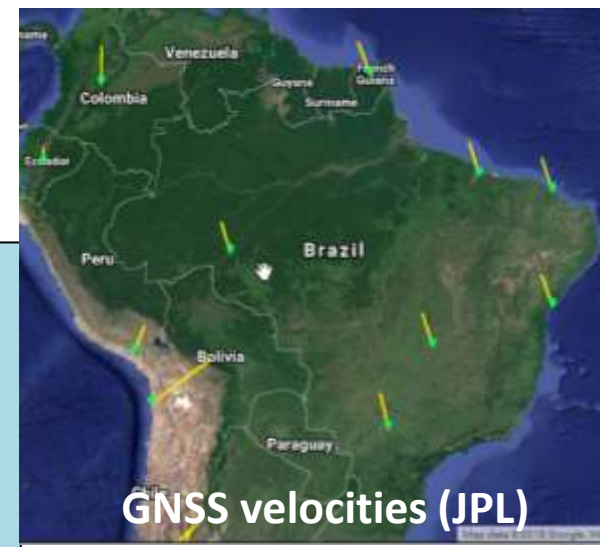
compression



extension

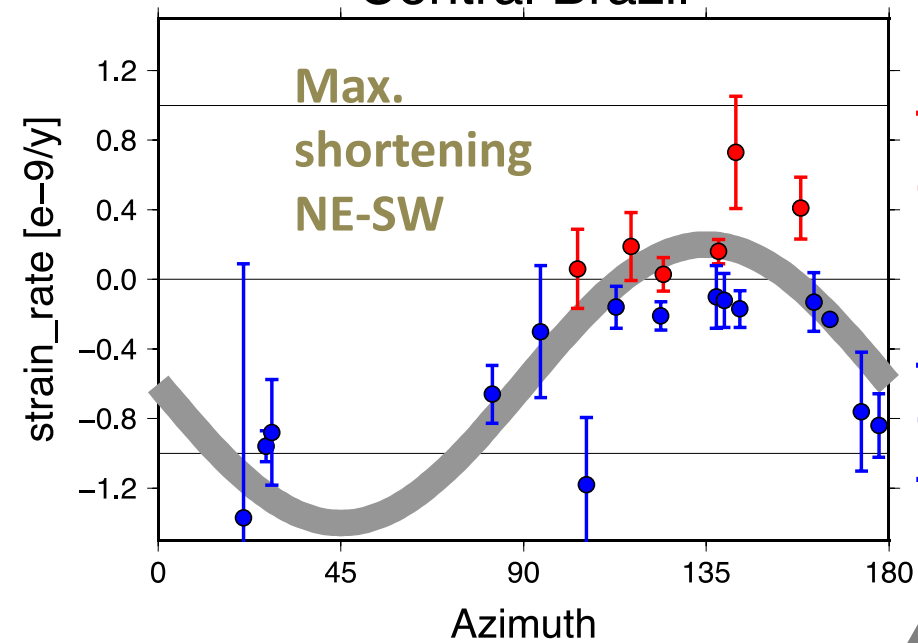


Good quality time series,
 ~10 – 20 years recording



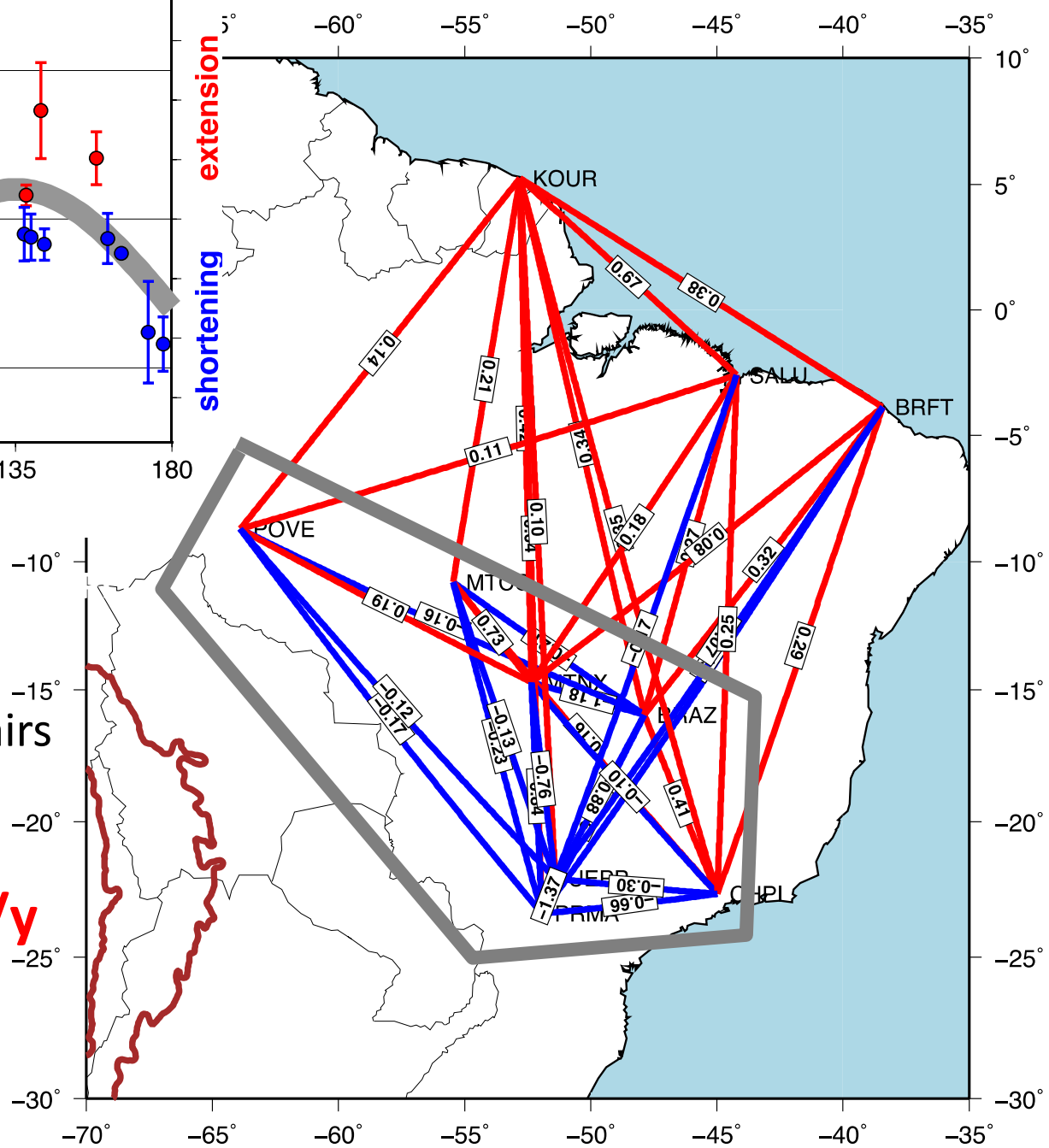
PRMA: V_n 13.065 \pm 0.009 mm/y
 V_e -2.878 \pm 0.010 mm/y
 (GIPSY-OASIS)

Central Brazil

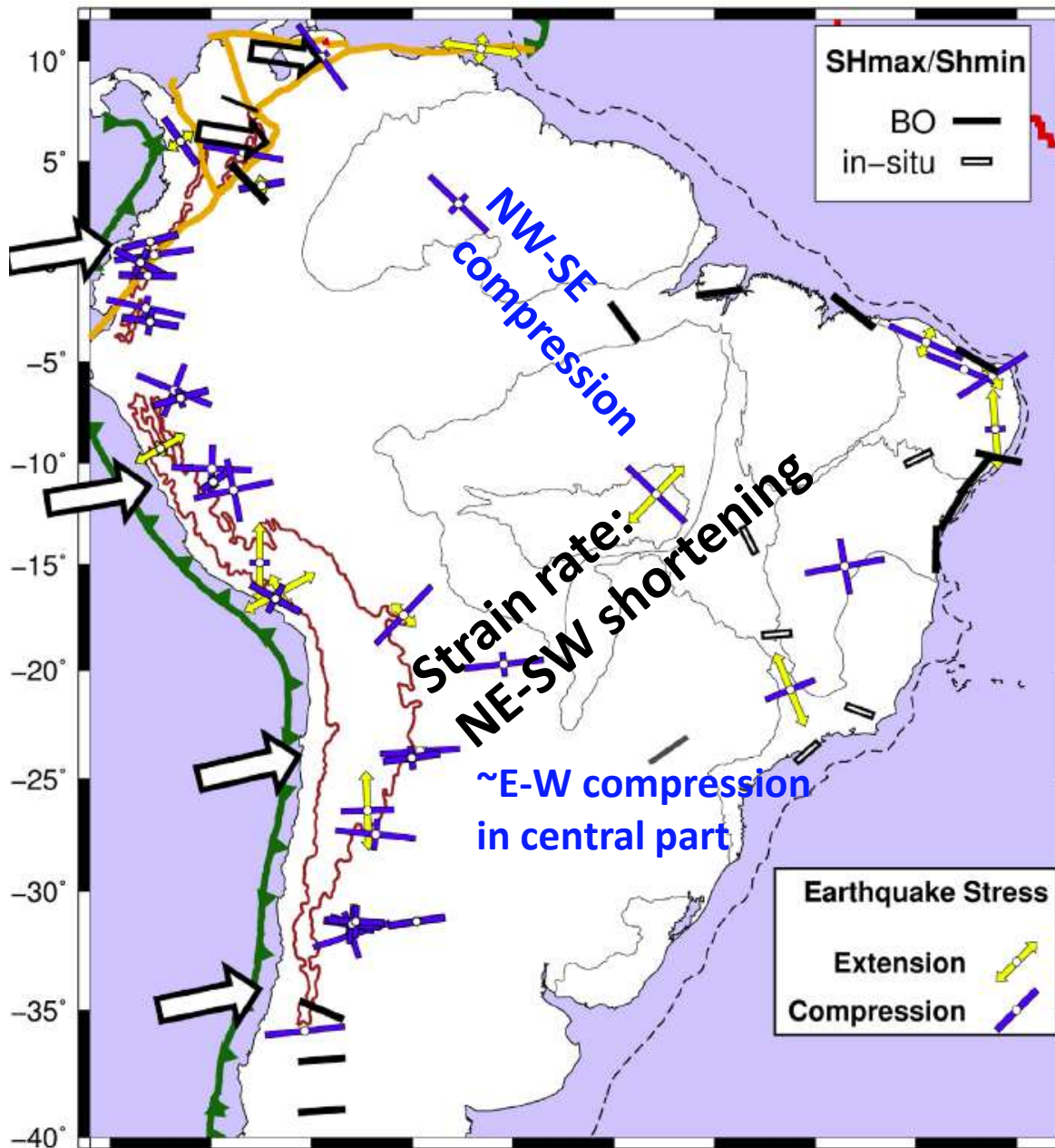


Strain Rates between all pairs of stations range from:

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

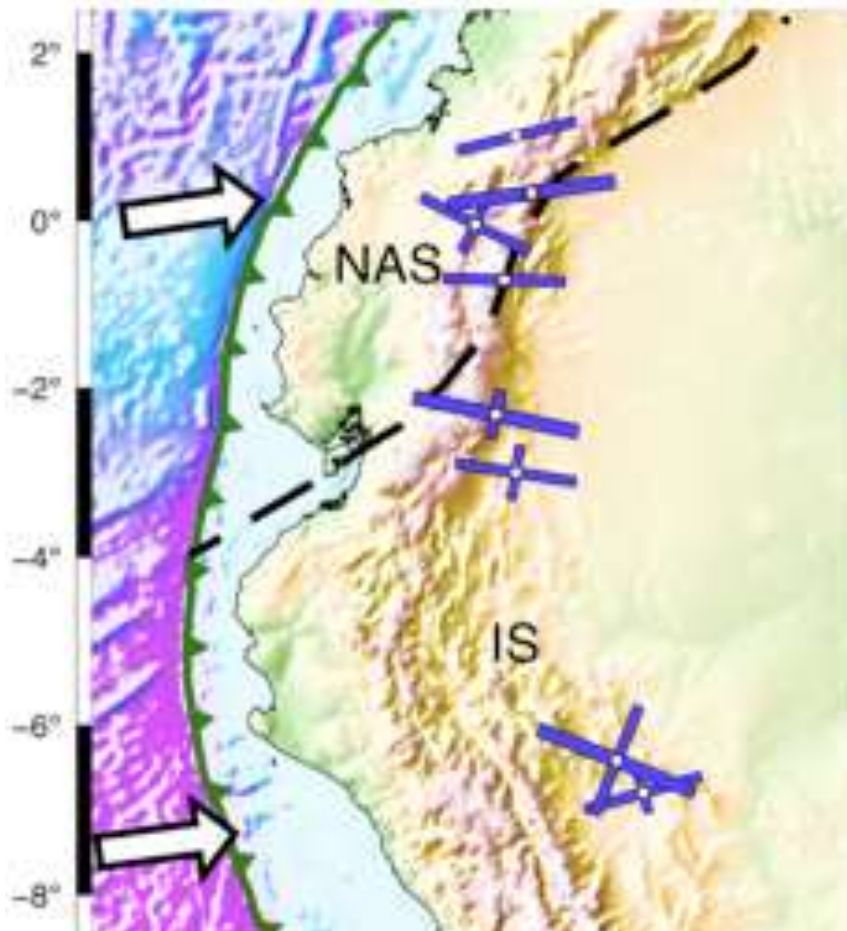


Stress patterns (from earthquake mechanisms)

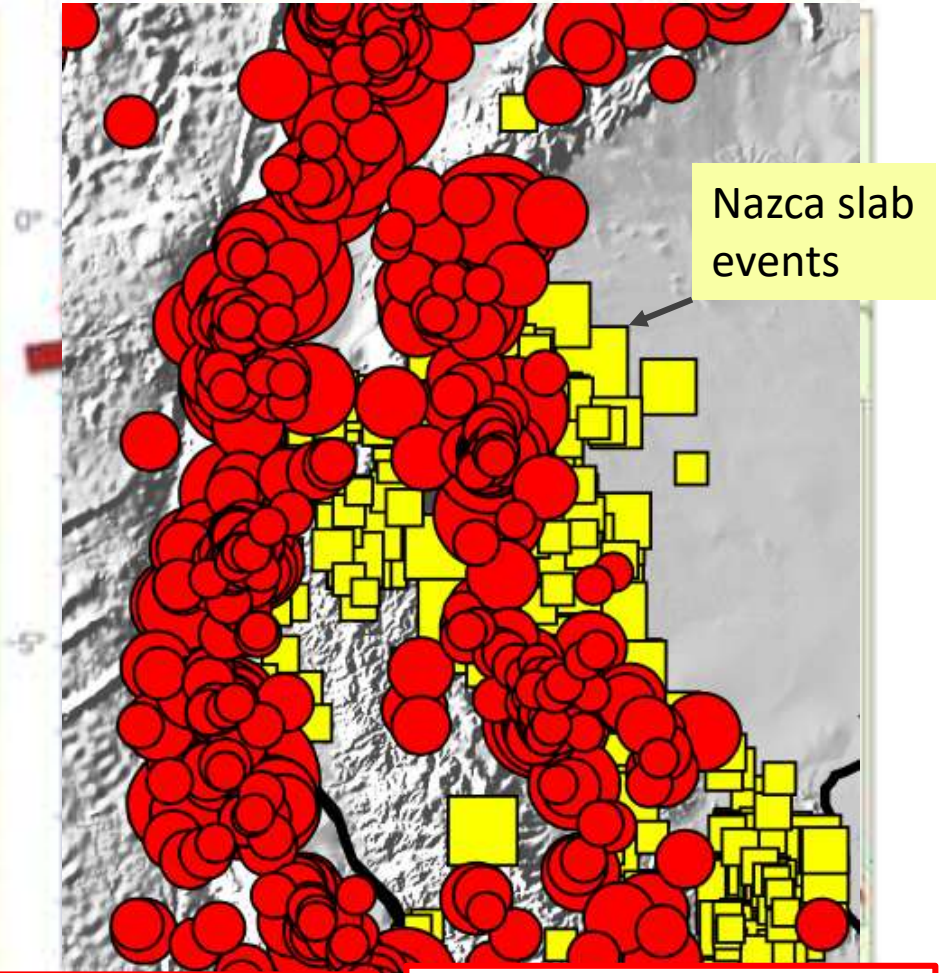


Stresses in sub-Andes (Ecuador)

S. Colombia – Ecuador – N. Peru



Stress tensors from foc.mec.



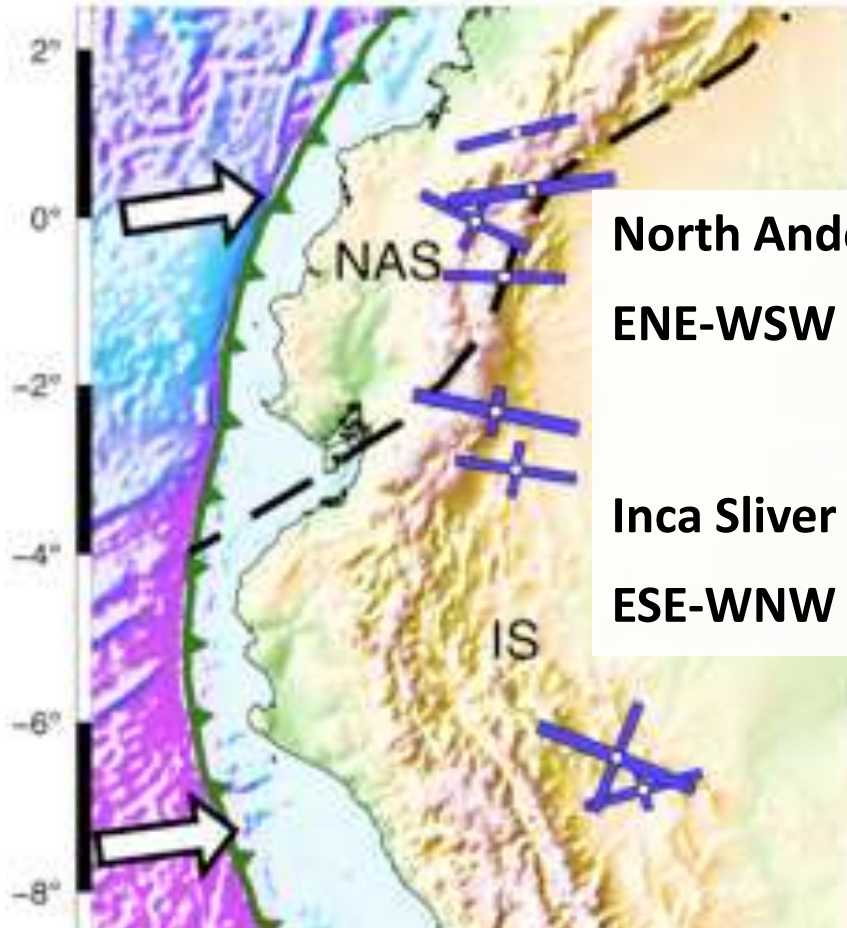
Nazca slab events

Naza-S.America
interplate

Crustal seismicity
Sub-Andes intrapl.

Comparison with Strain Data – sub-Andes

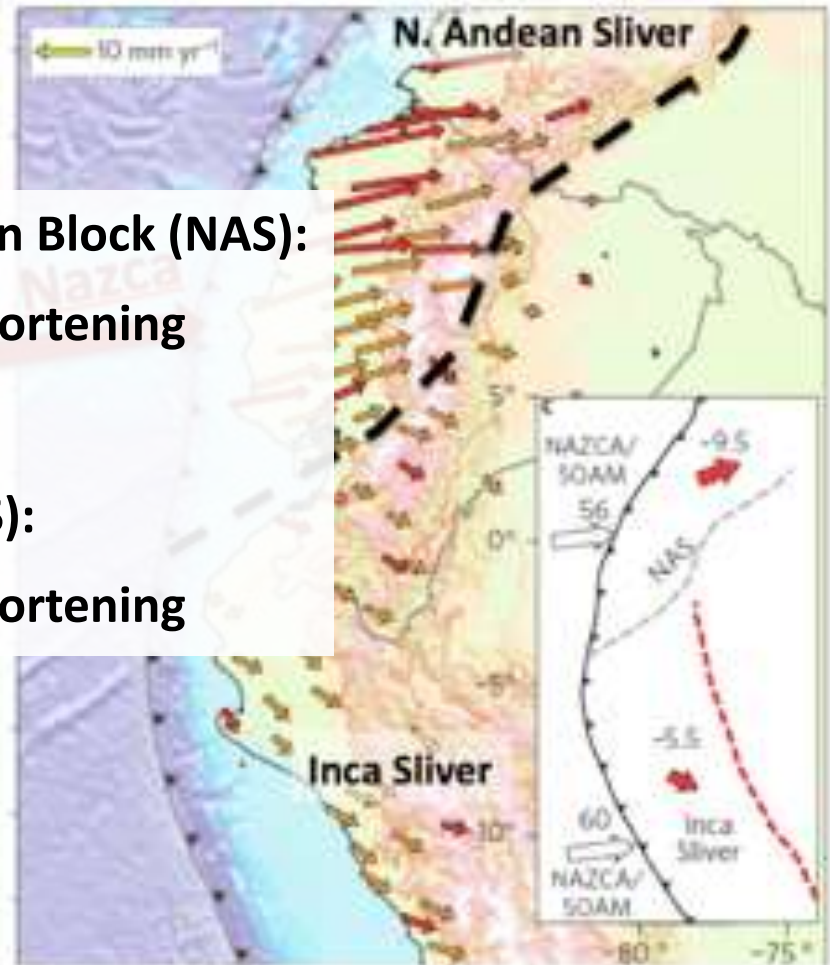
S. Colombia – Ecuador – N. Peru



North Andean Block (NAS):
ENE-WSW shortening

Inca Sliver (IS):
ESE-WNW shortening

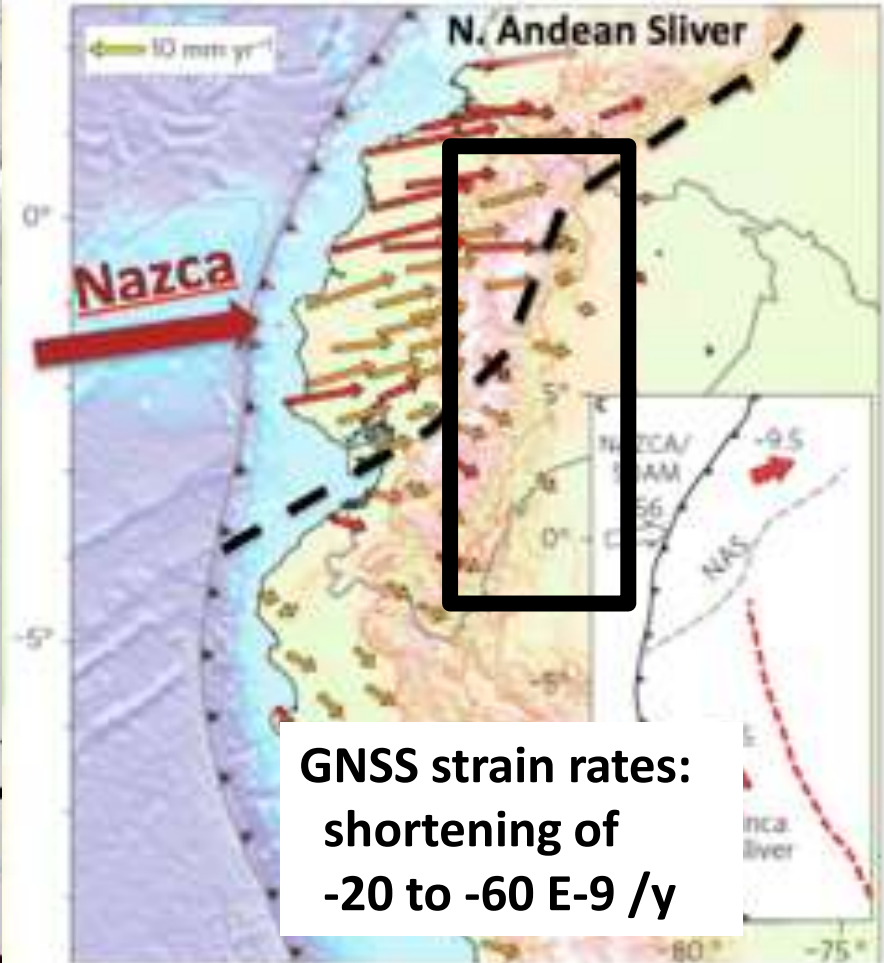
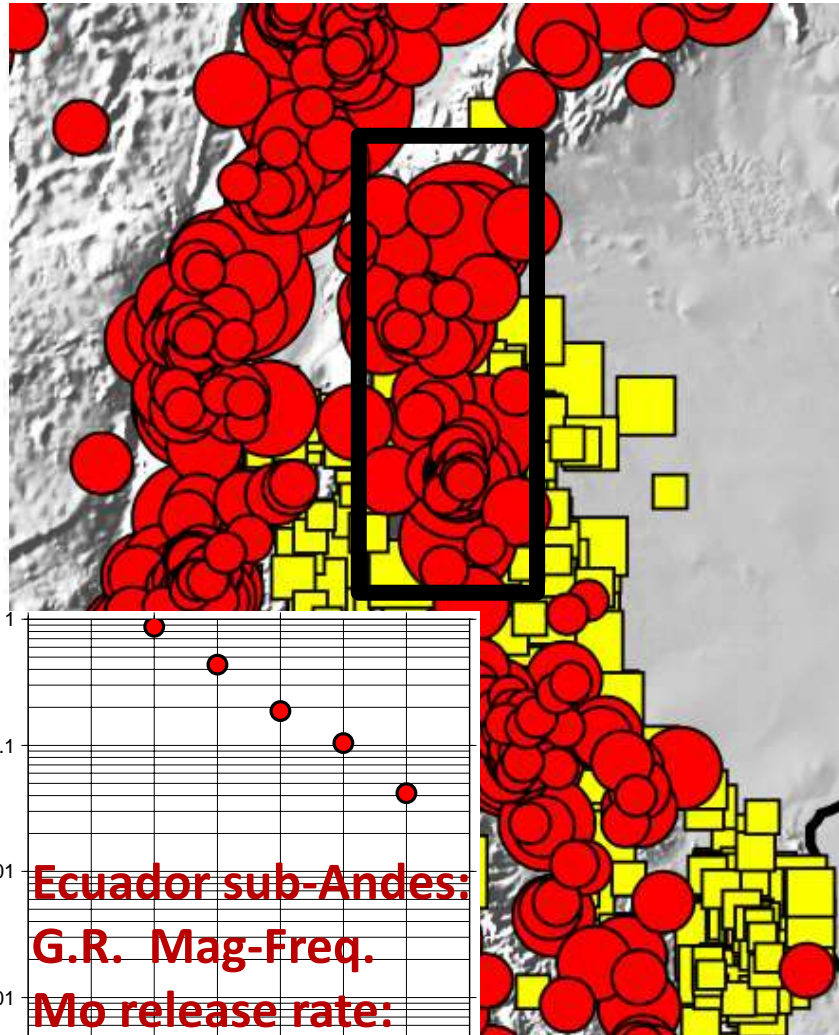
Stress tensors from foc.mec.



b) GNSS (Nocquet et al., 2014)

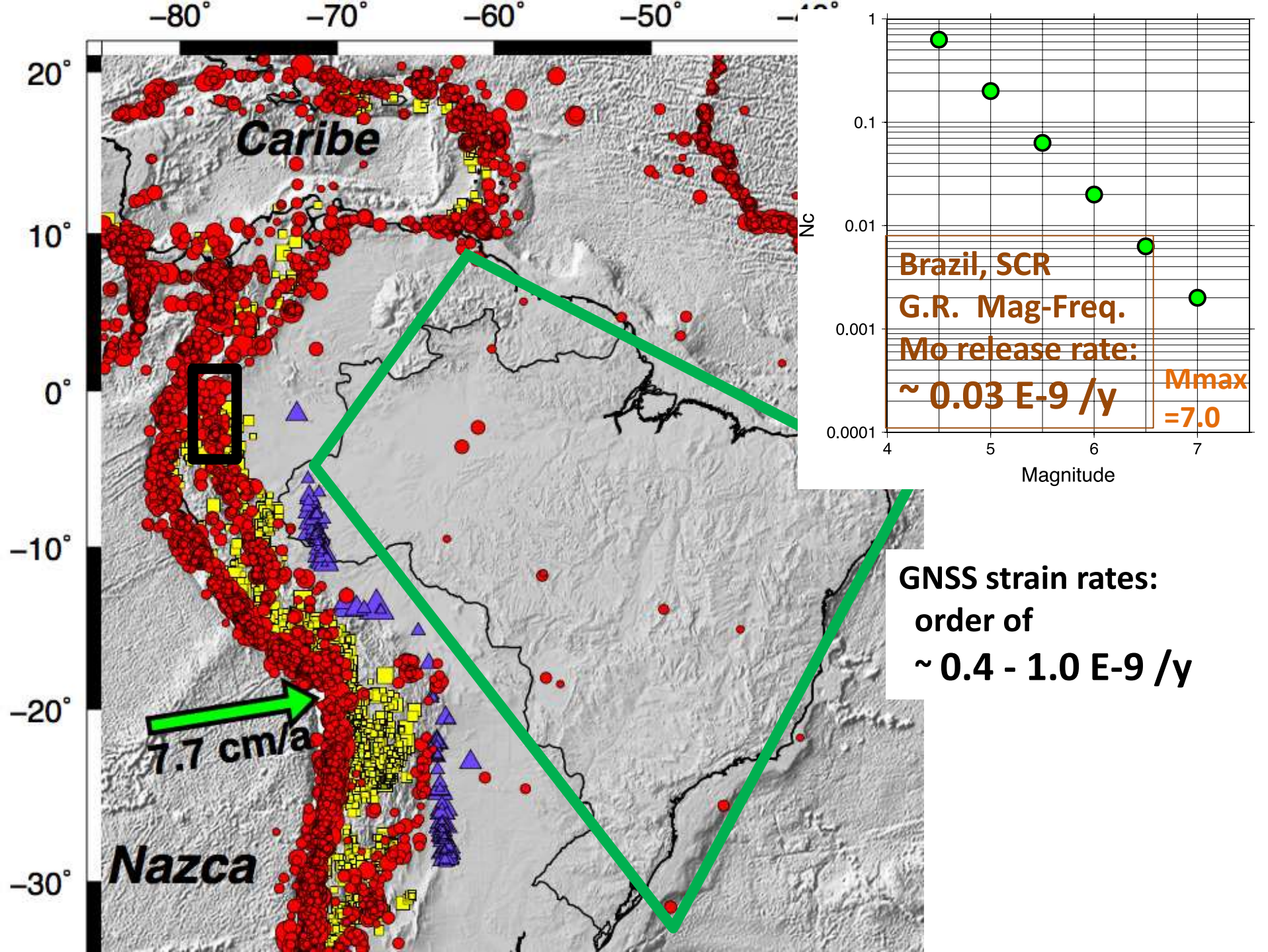
Comparison with Strain Data – sub-Andes

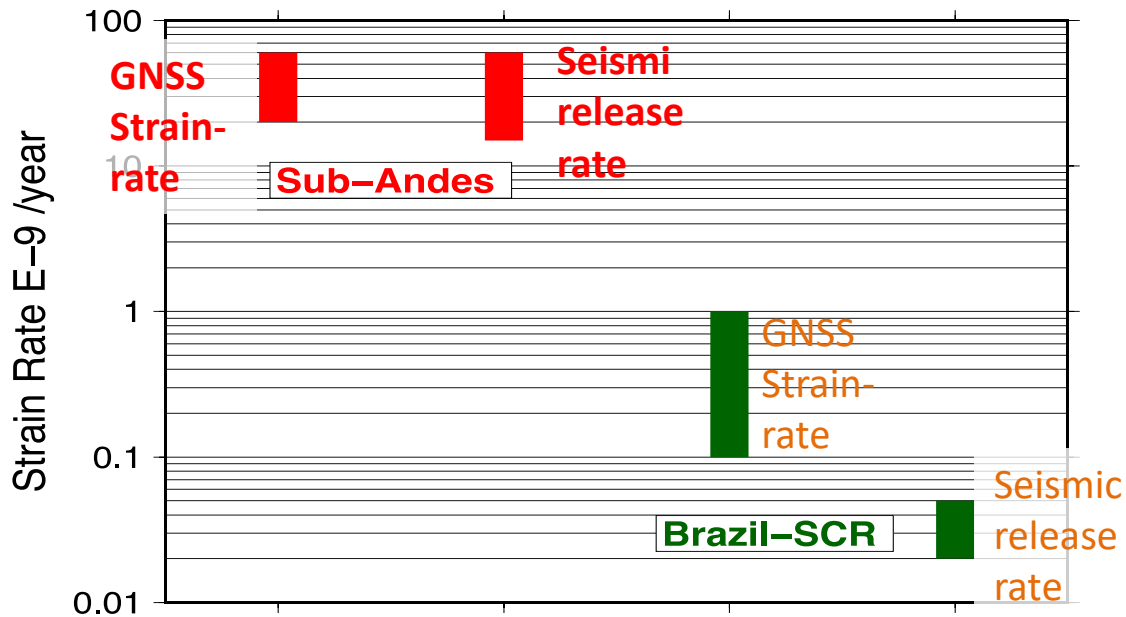
S. Colombia – Ecuador – N. Peru



b) GNSS (Nocquet et al., 2014)

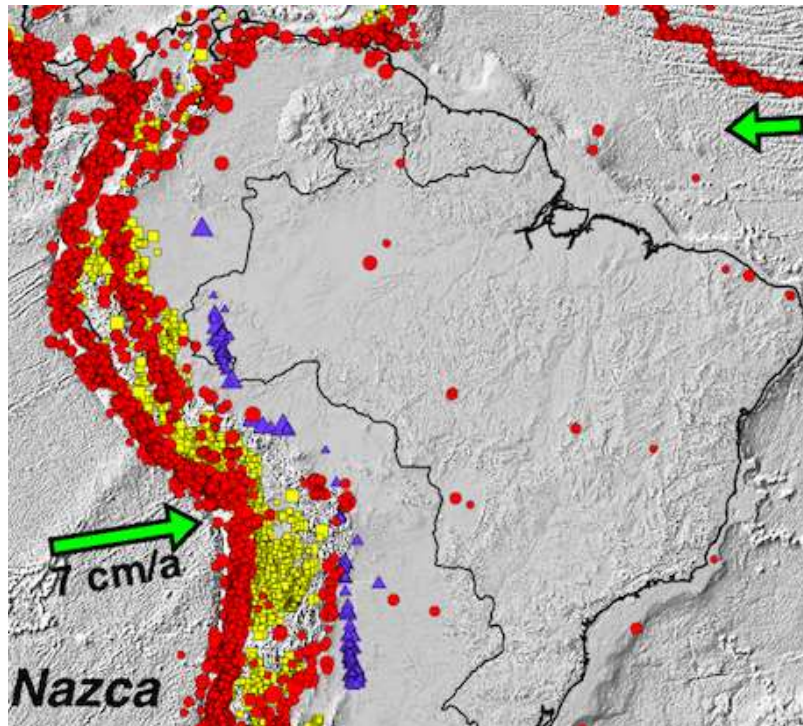
Sub-Andes: strain rate consistent with seismic moment release rate !





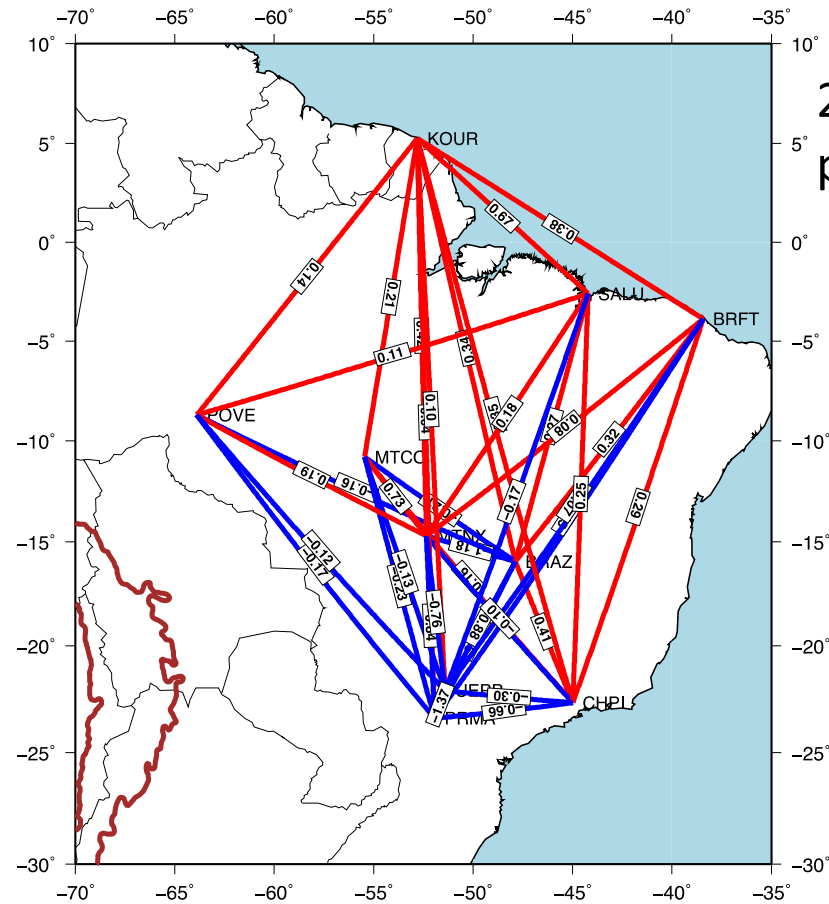
In mid-plate Brazil, seismic release is one order of magnitude lower than deformation rate:

Different causes!



My Questions, Your Answers:

- 1) Are the strain rates in Brazil (~1 E-9/y) real or artifact?
(Or, the velocity errors reported by JPL are realistic or optimistic?)

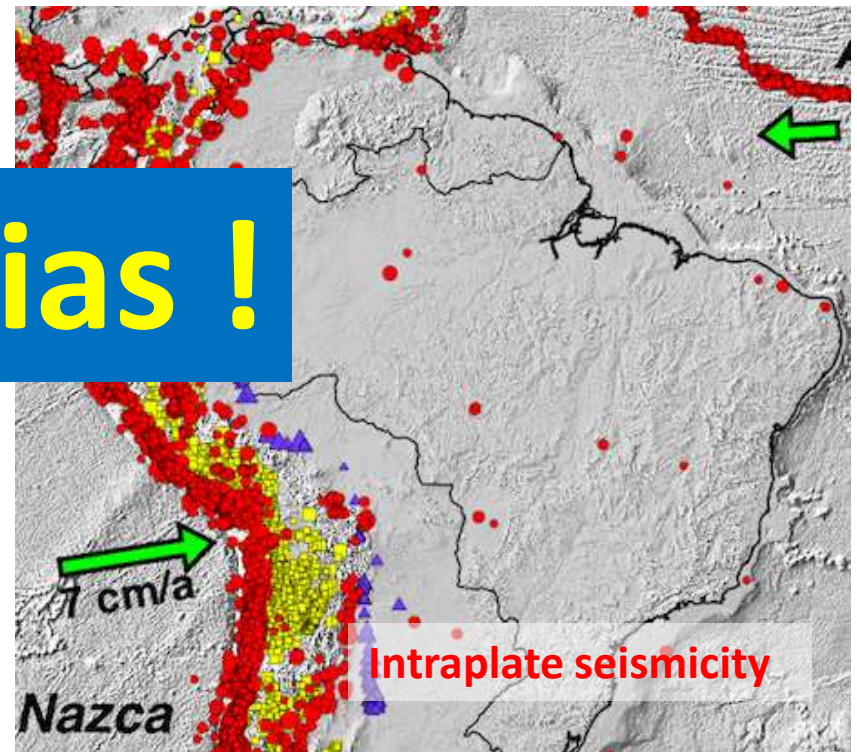
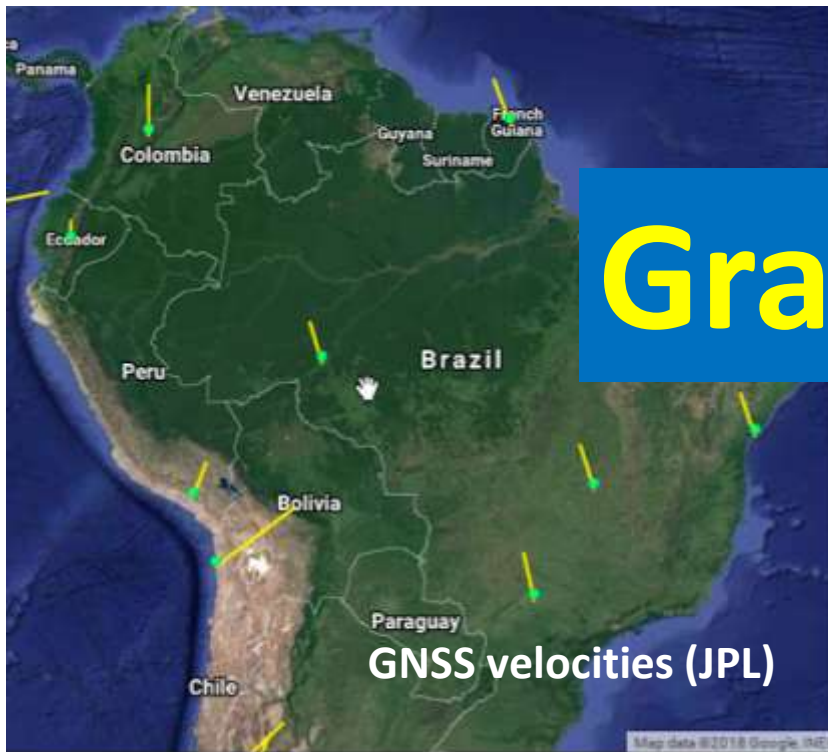


- 2) What causes NE-SW shortening rate in mid-plate South America?
And possibly extensional rates along the coast?

3) The strain rates can be explained by:

- Global Glacial (Andean?) Isostatic Adjustment ?
- Relaxation after large Andean earthquakes?
- Decadal deep hydrological cycles, climate change?

In the coming years, more interaction between IAG/SIRGAS and IASPEI/LACSC



Gracias !