

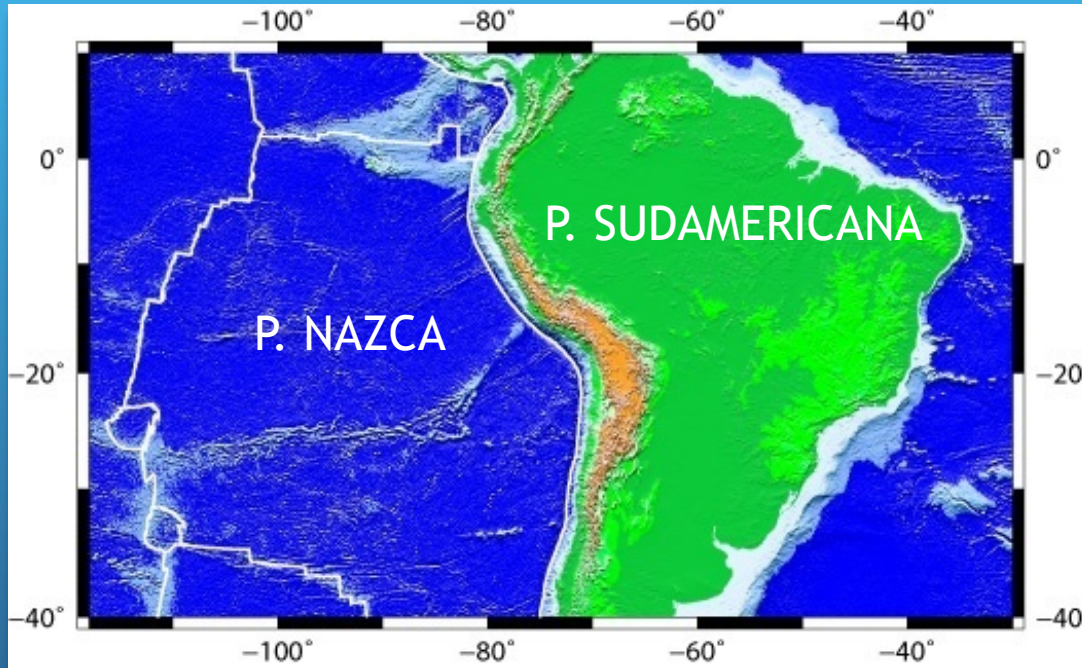
Geophysical Hazards and Space Geodesy in Peru

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Instituto Geofísico del Peru

IRIS Workshop National Geophysical Networks
May, 2015 – Santiago de Chile, Chile

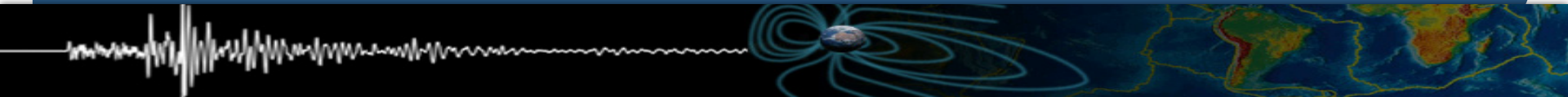
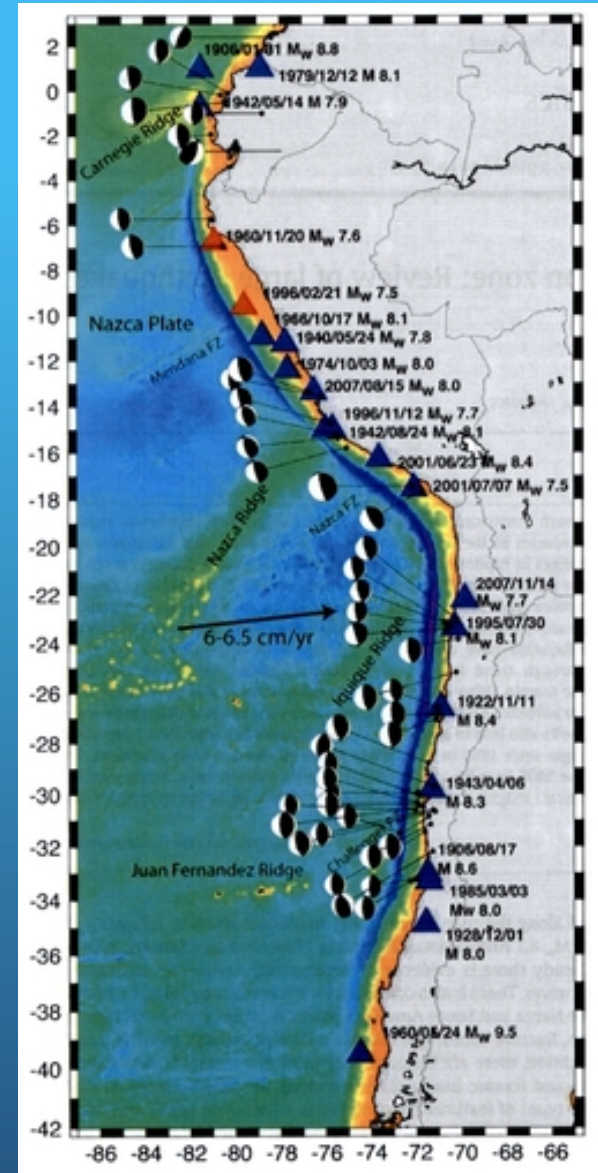


EXTREME SEISMIC EVENTS

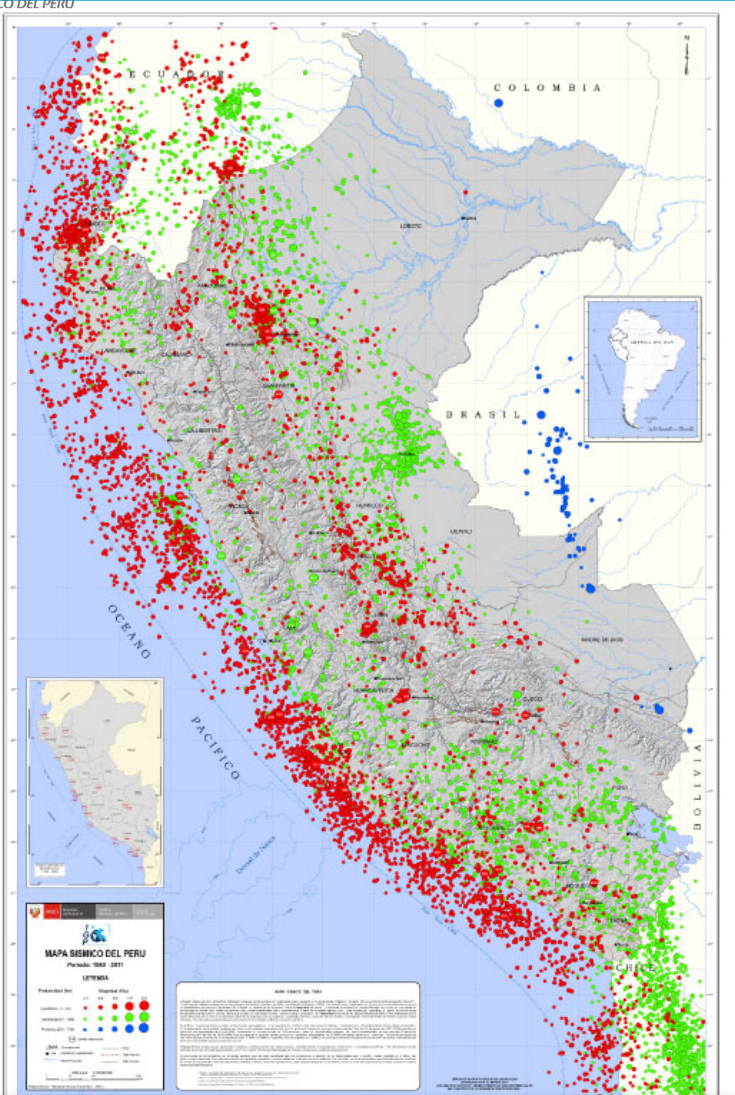


(Norabuena 1999, Kendrick 1999, ~68 mm/yr)

(Bilek et al., 2010)



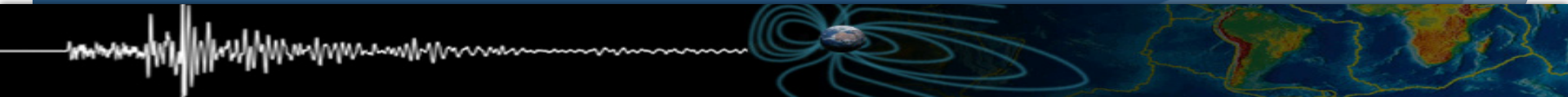
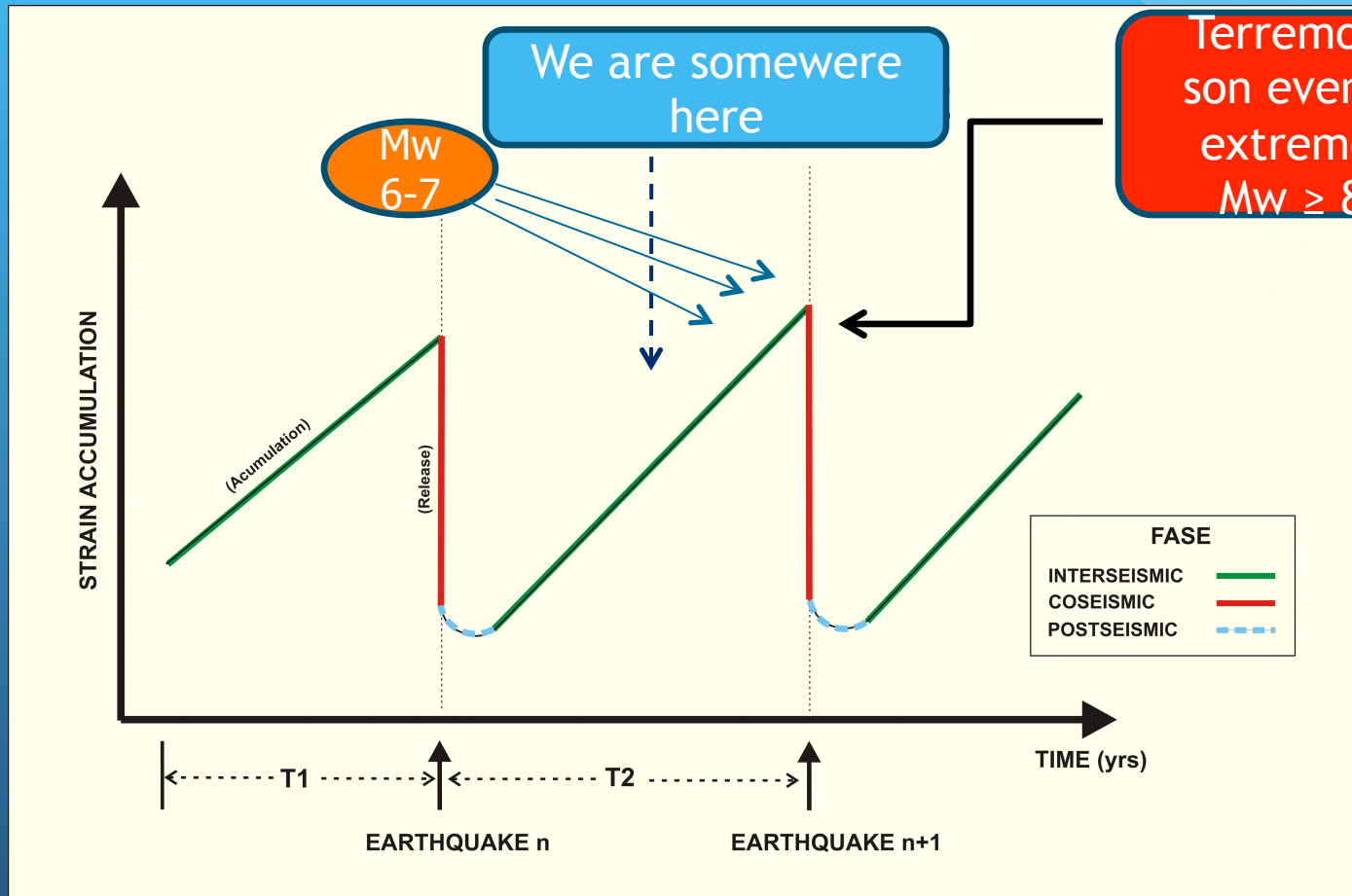
Peruvian Seismological Service



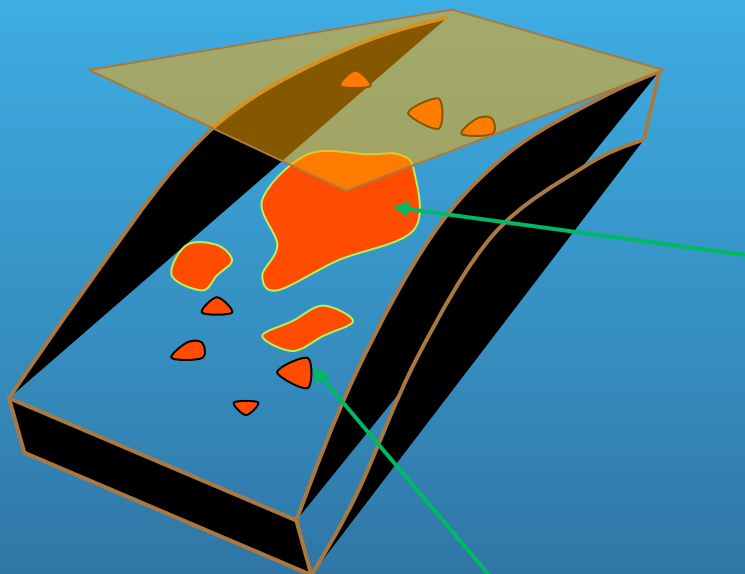
- Analyze seismic activity
- Compute earthquakes' Location, magnitude and intensity distribution
- Elaborate and transmit oficial Seismic Bulletins
- Analyze the source mechanism of significant events
- Build seismic catalogs



BASIC REPRESENTATION EARTHQUAKE CYCLE



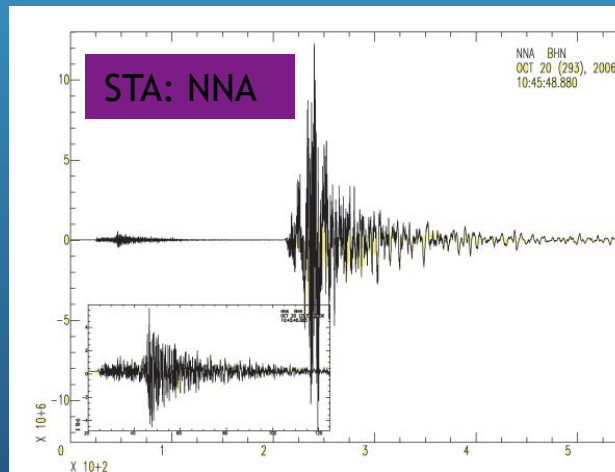
Asperity model



Main (L*W km);
High coupling

Lower coupling

$$M_0 = \mu D^*(L*W) \quad \text{Energía liberada}$$

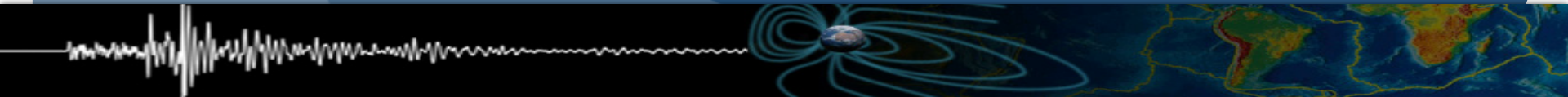


Space technology

- ❖ Global Navigation Satellite Systems- GNSS (GPS, GLONASS, Galileo, Beidou)



- ❖ InSAR



Data acquisition

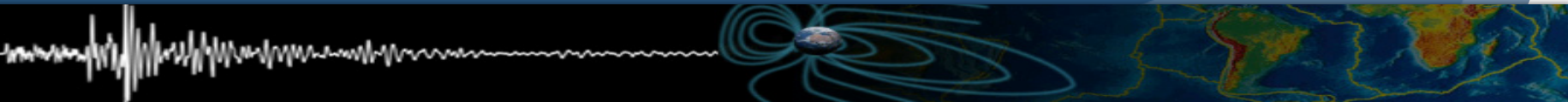


Hardware:

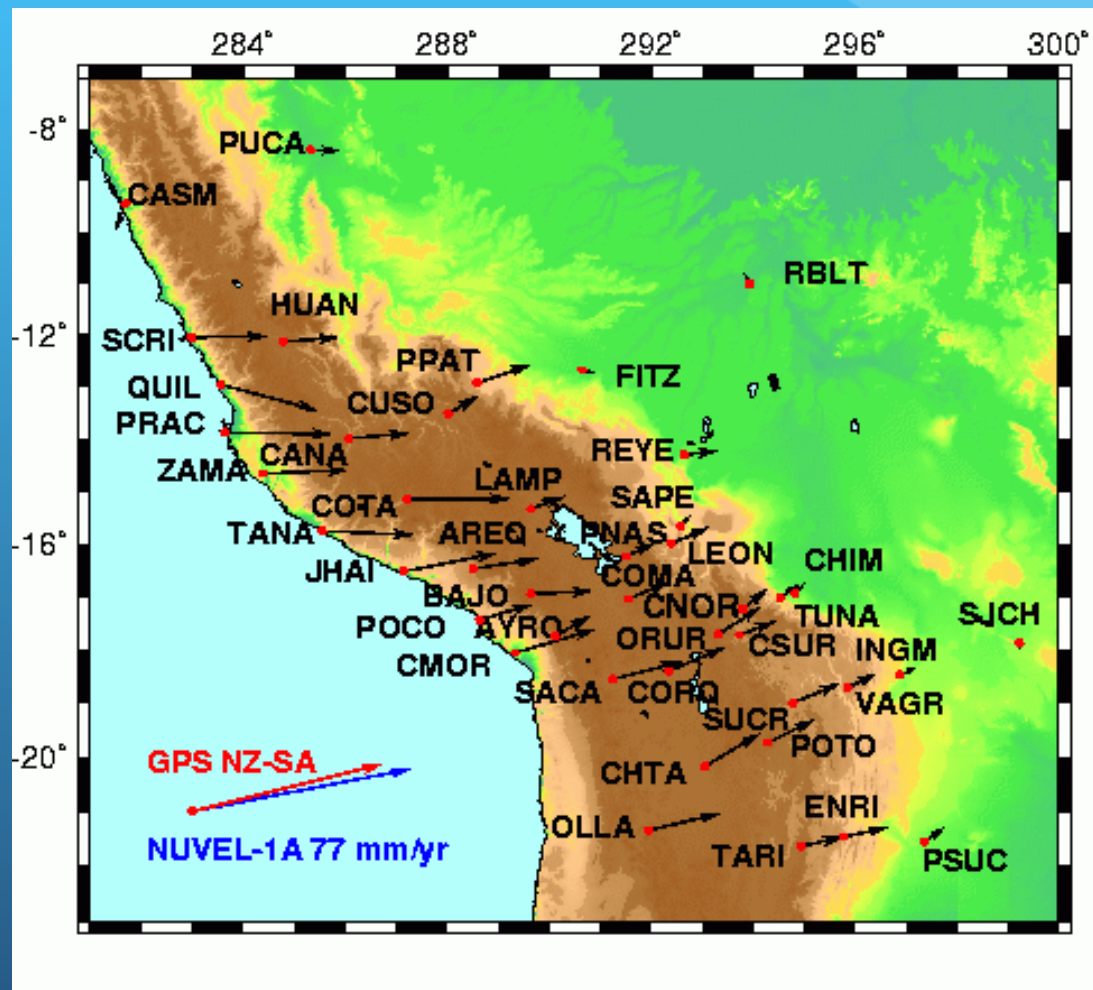
- Trimble dual frequency RX's
- Choke ring and zephyr antennas
- 0.5m fixed height spikes

Survey parameters:

- 3-5 full UTC observation days per station at each campaign.
- Observables collected at 15 secs.



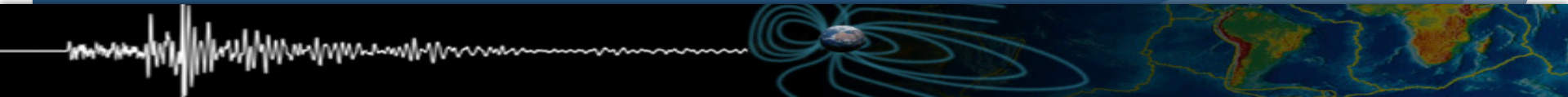
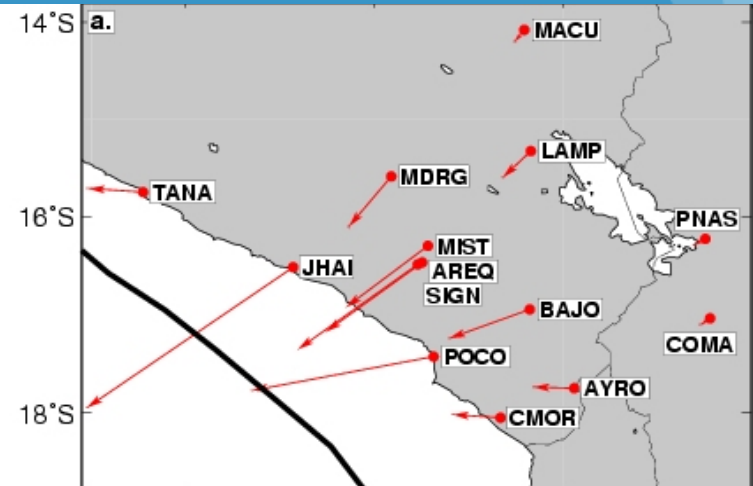
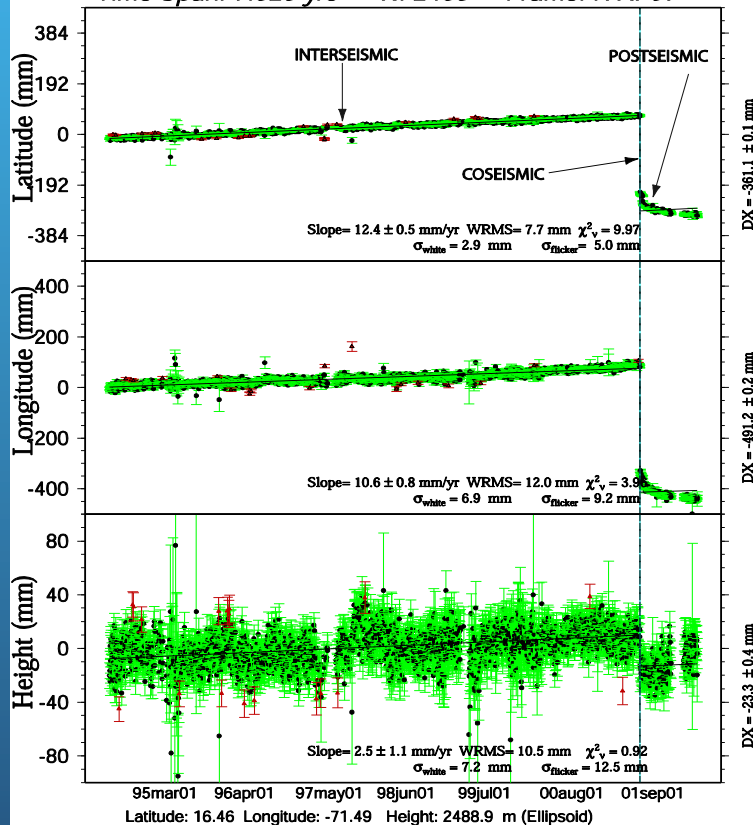
Central Andes Displacement Field



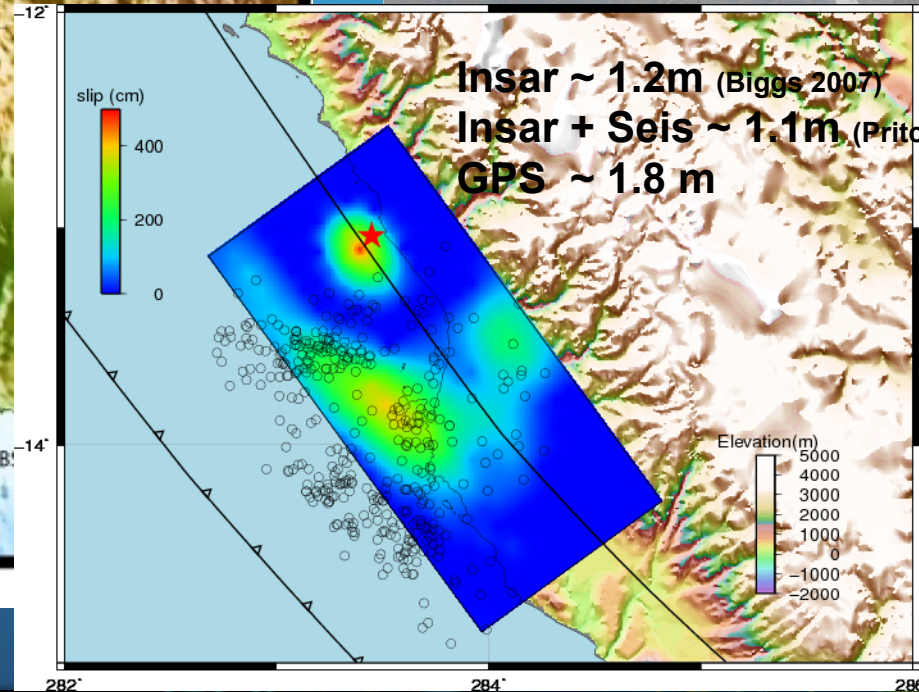
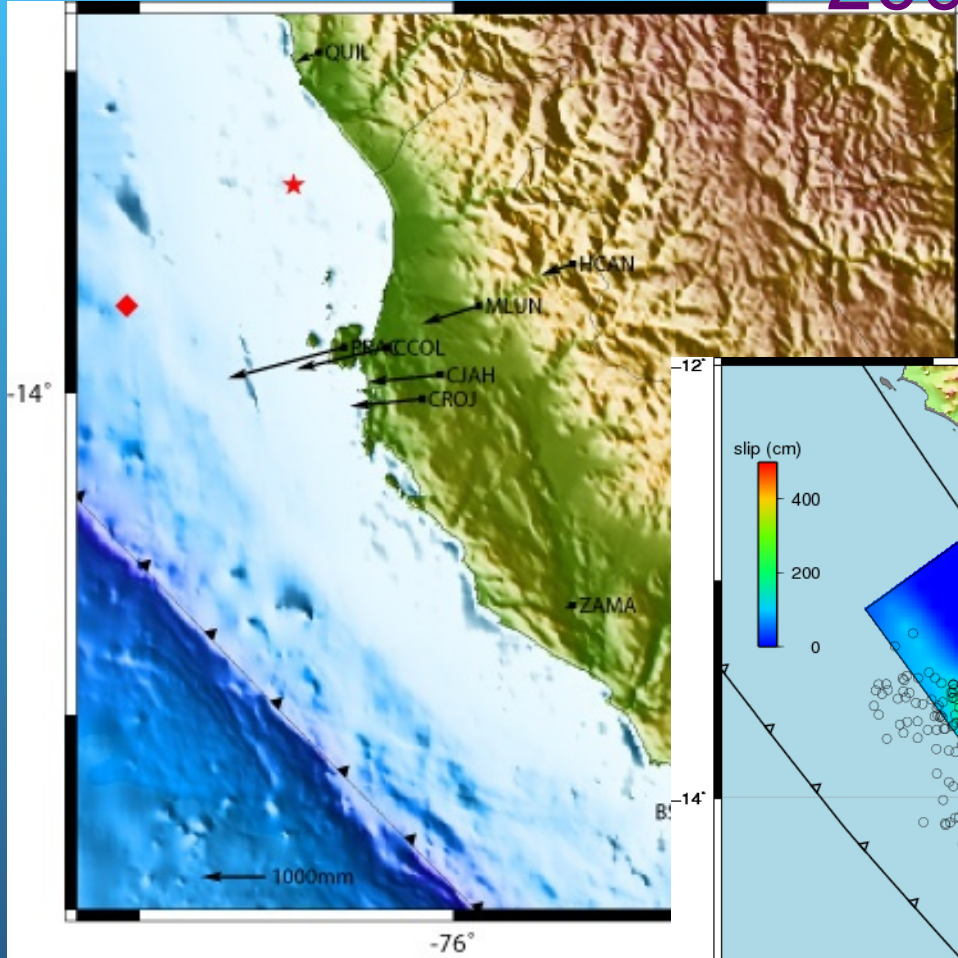
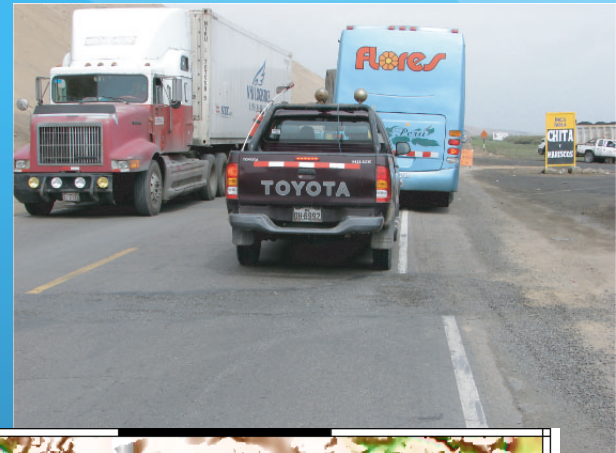
Terremoto de Arequipa 2001 (Mw 8.4)

AREQ Geographical Coordinates

Time Span: 7.825 yrs N: 2485 Frame: ITRF97



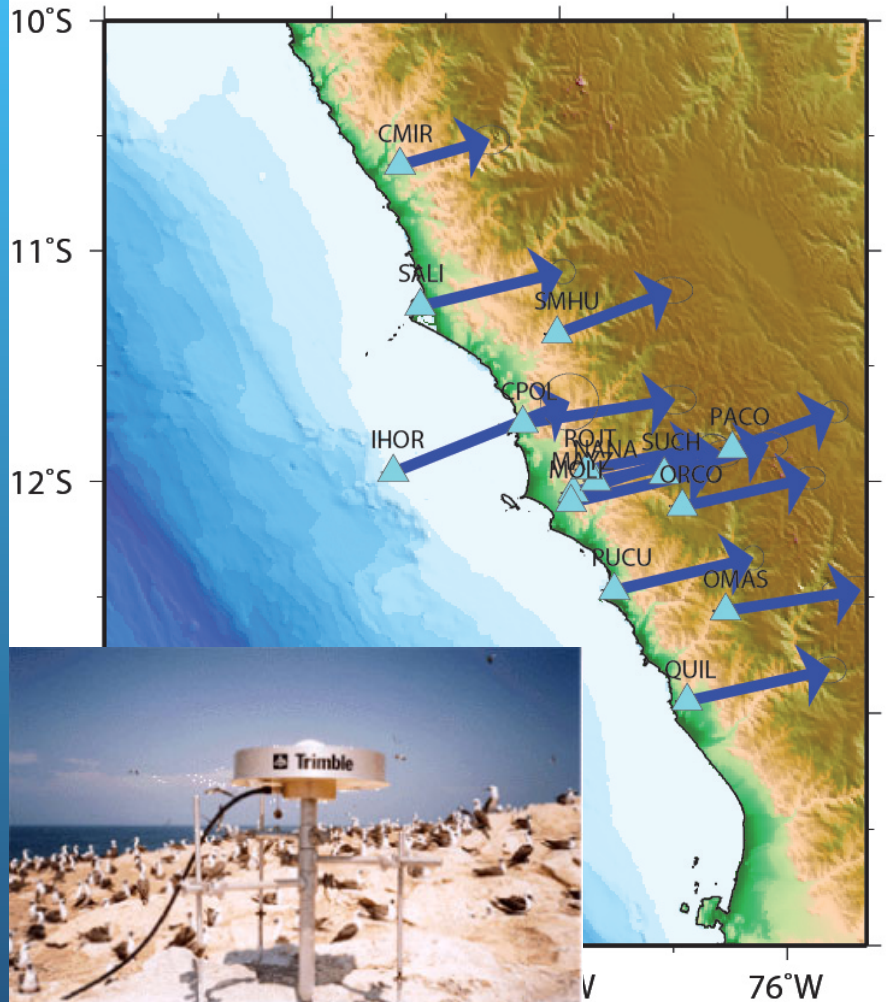
Coseismic Displacement Pisco 2007



Insar ~ 1.2m (Biggs 2007)
Insar + Seis ~ 1.1m (Pritchard et al, 2008)
GPS ~ 1.8 m



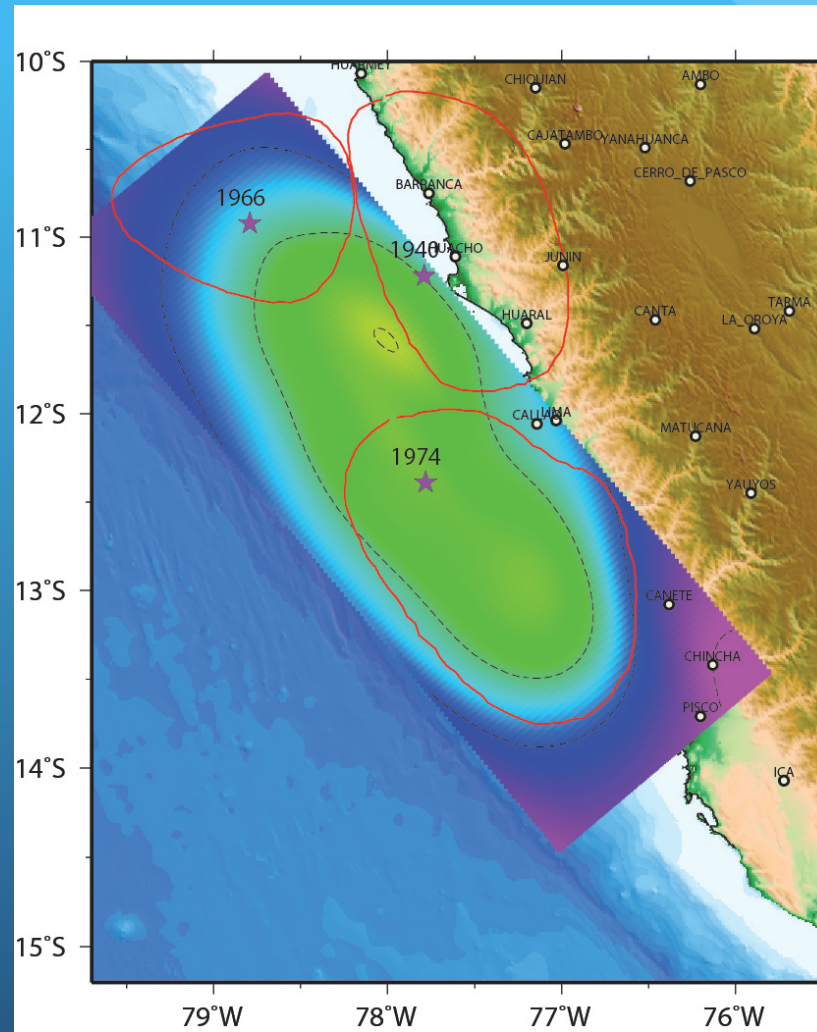
Lima Region Interseismic velocity field



- 15 geodetic sites, 1 offshore.
- GPS observables were processed Using JPL's GIPSY-OASYS software.
- Inferred velocities were transformed into the ITRF2008 reference frame.
- Finally using GEODVEL's NZ-SA Euler Pole:
(54.1 N, 92.2W)
- all station velocities were estimated with respect to stable South America.



Coupling model



The Arica Earthquake

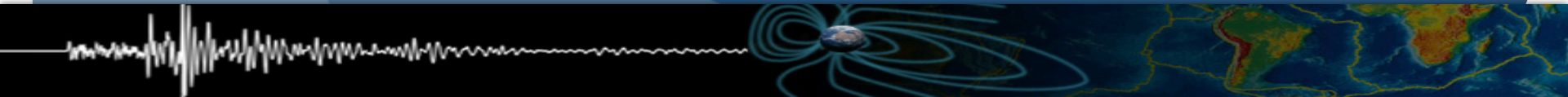
13/08/1868 - (Mw 8.9)



Puerto de Arica después del terremoto.

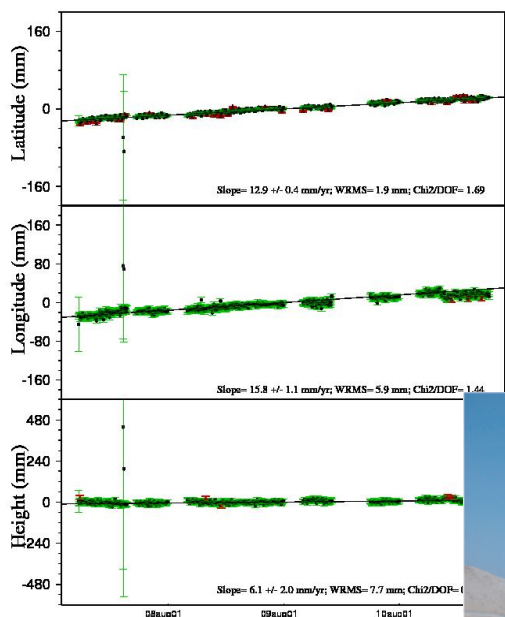


From USC-Tsunami group



Monitoring the Moquegua-Tacna seismic gap

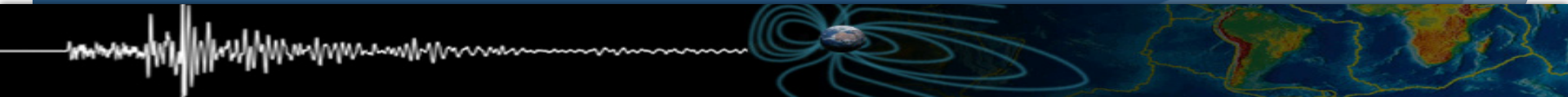
LYAR Geographical Coordinates

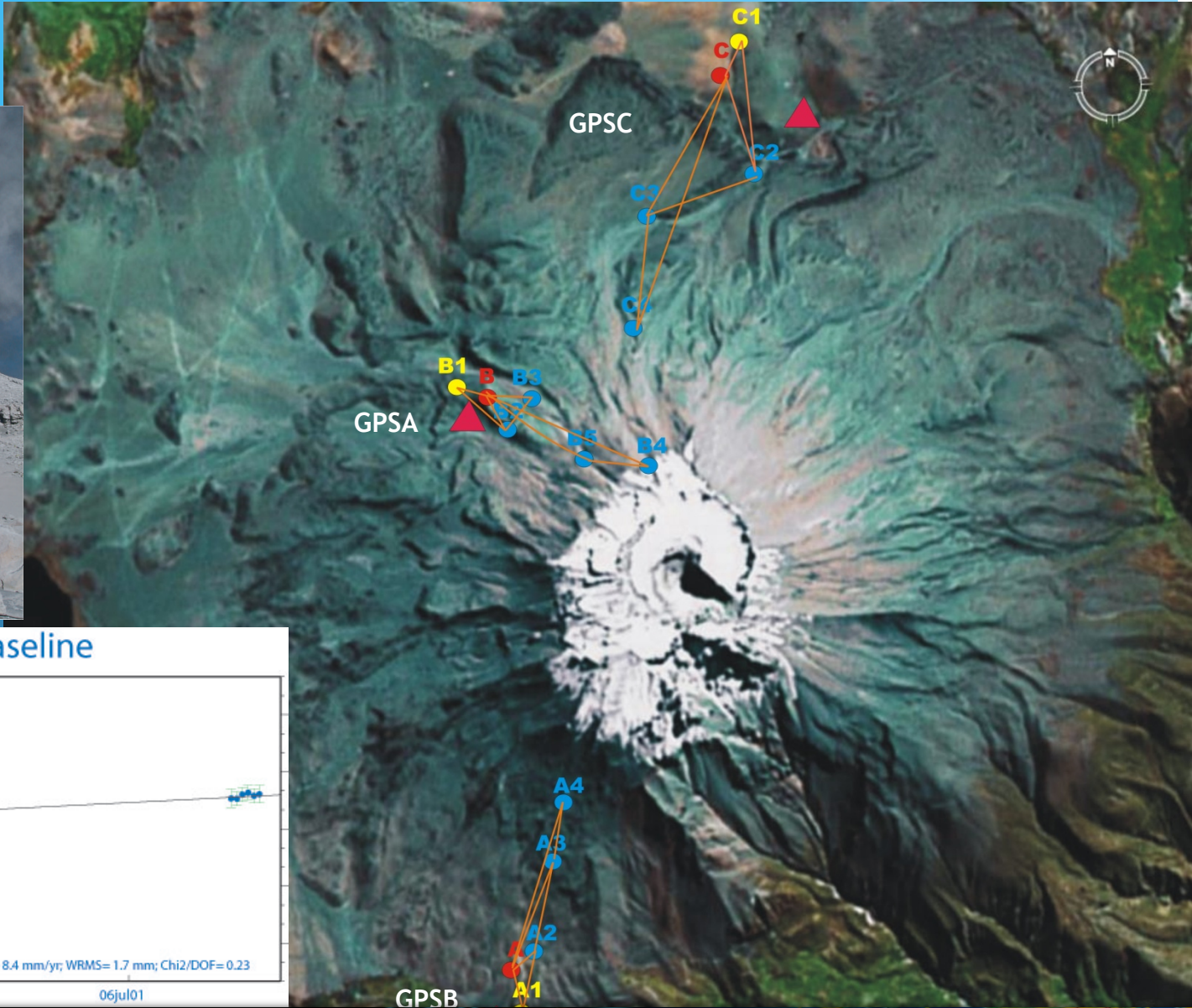


IGP 2012 Jan 30 20:53:09 Instituto Geofísico del Perú

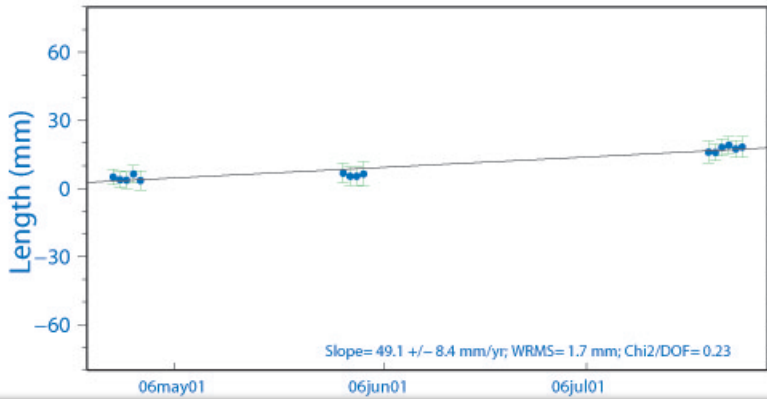


Monitoring of volcanic activity

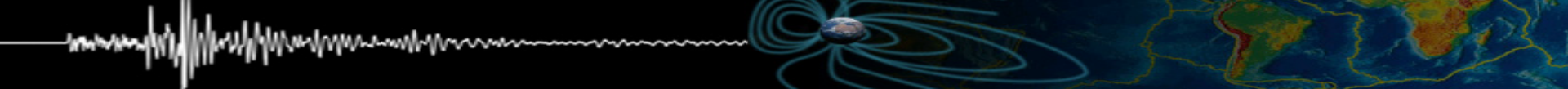




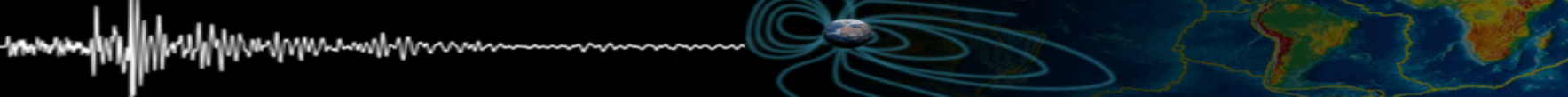
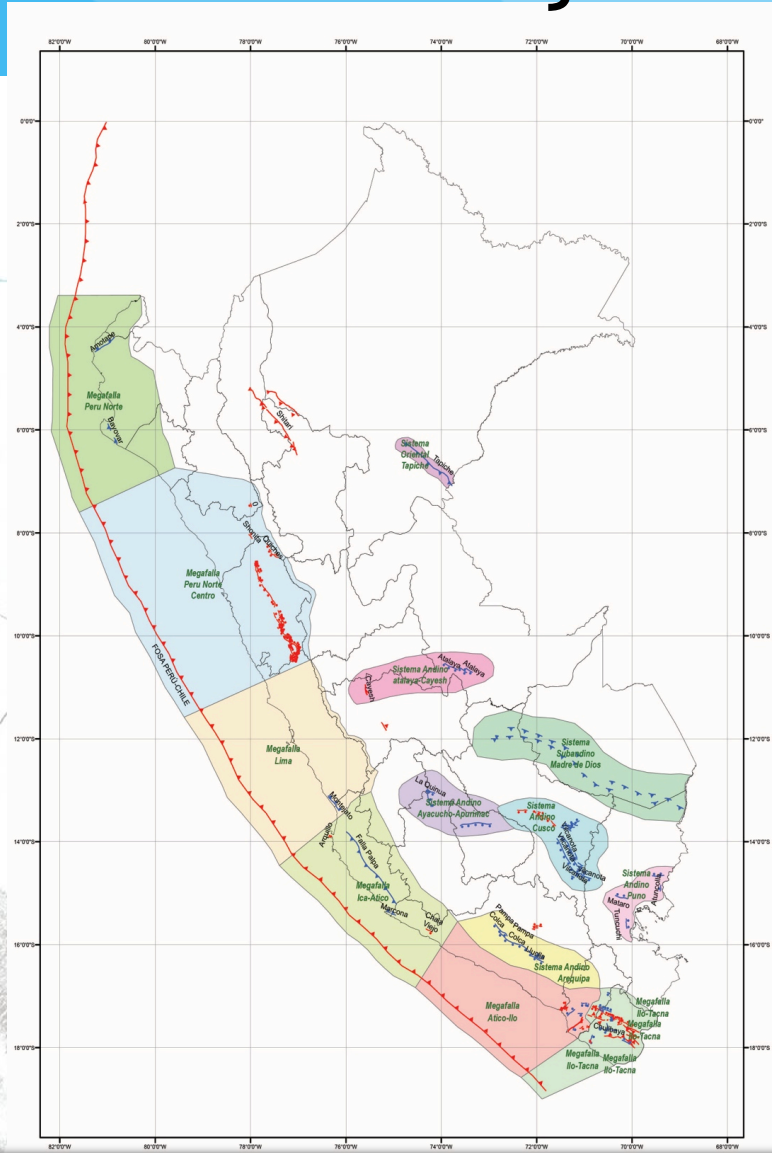
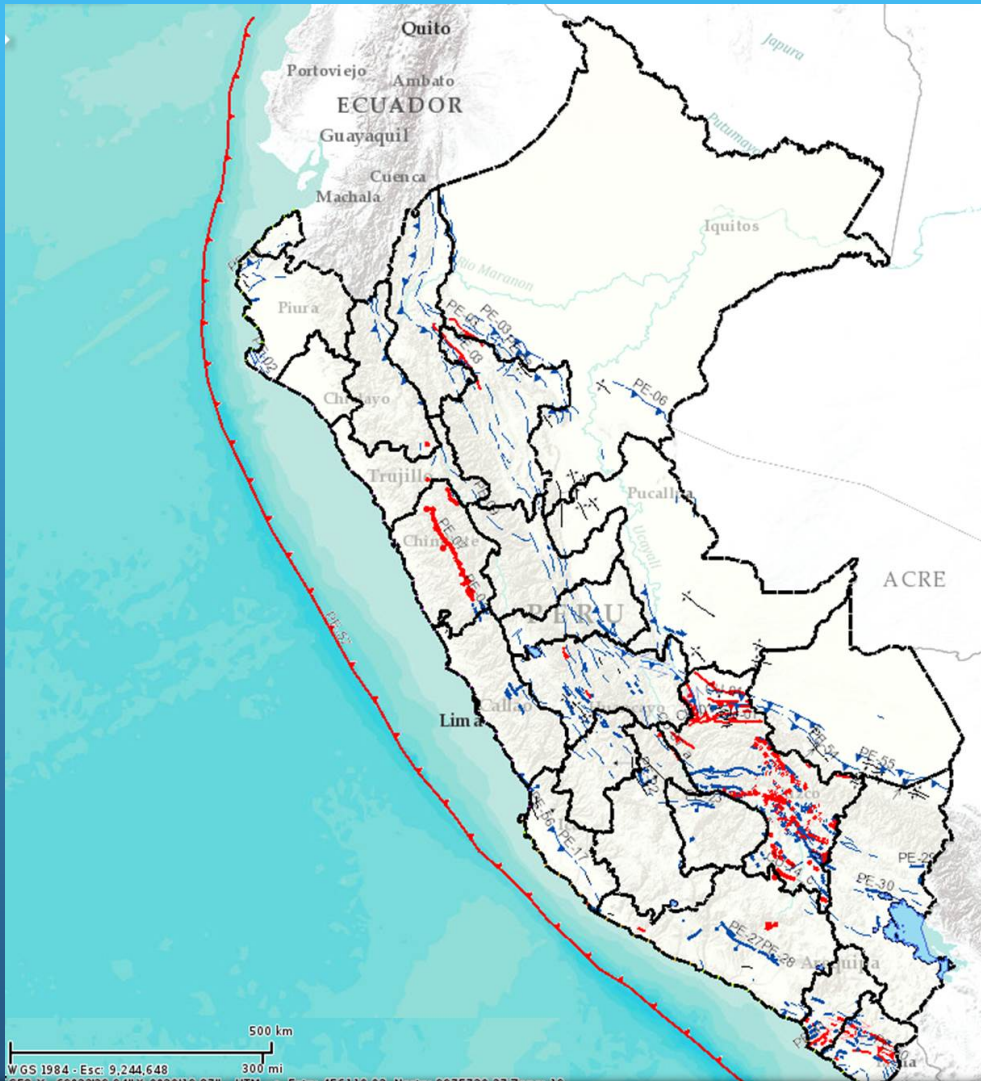
UBIA–UBIB Baseline



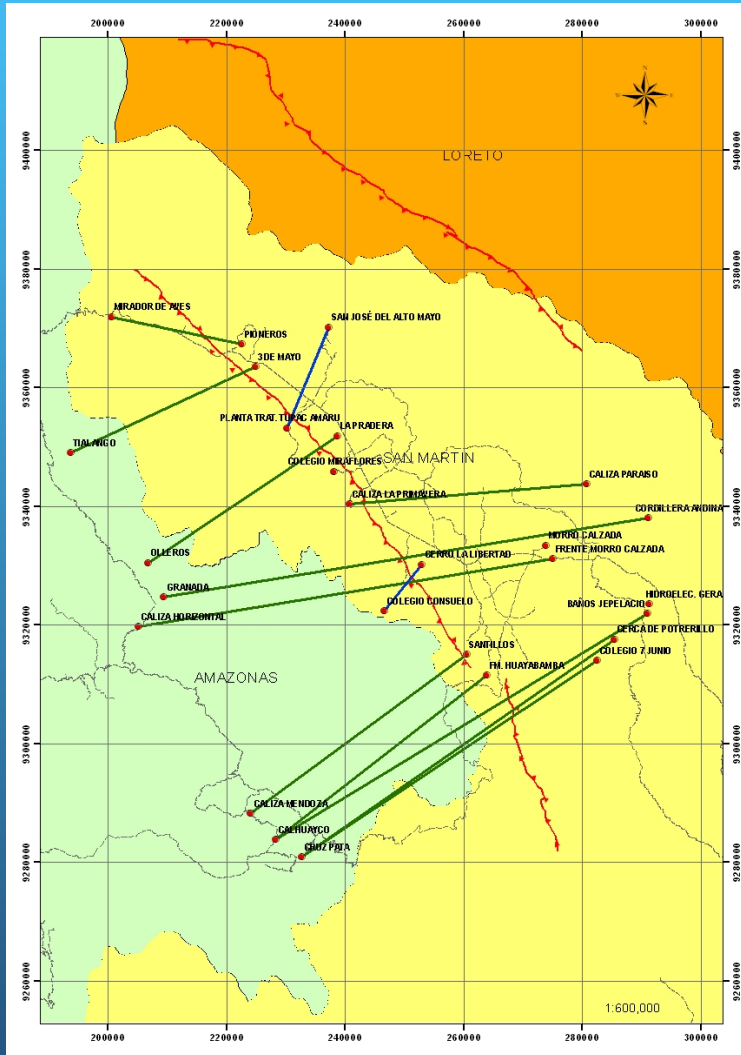
GPAB



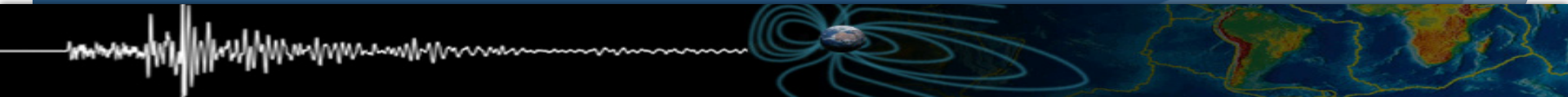
Peruvian Active Faults Project



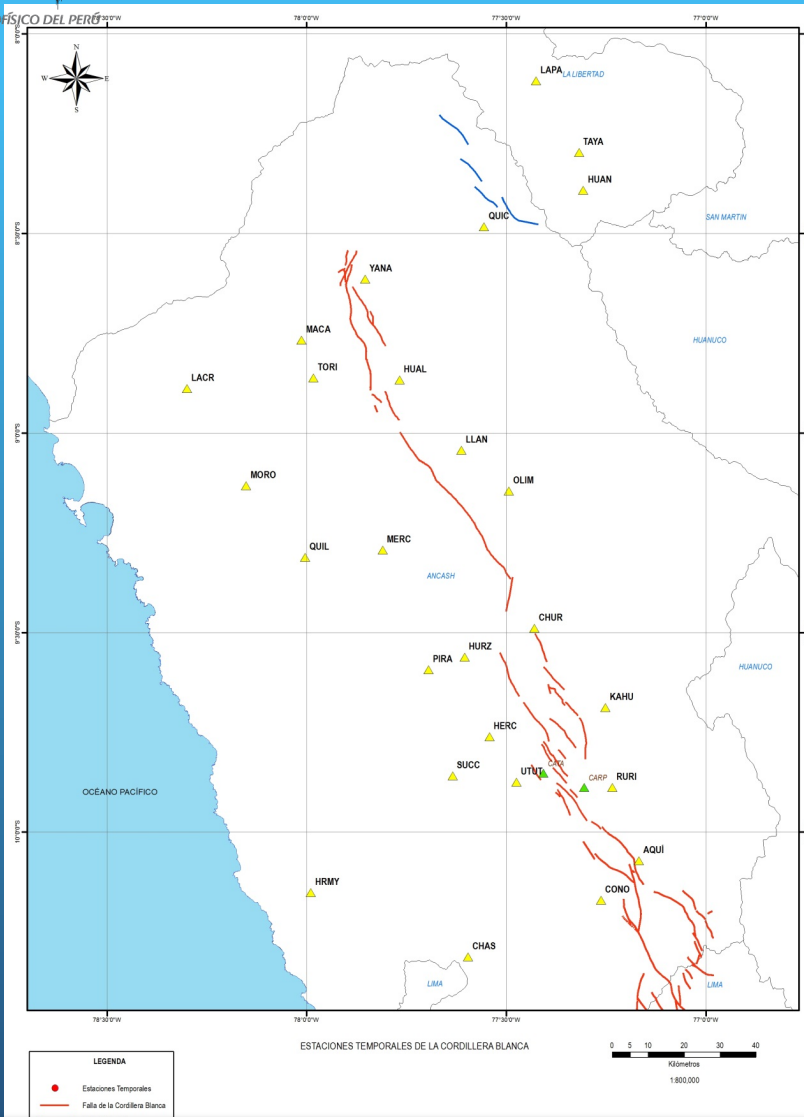
Alto Mayo Fault System



Inverse fault, ~ 150 km
 Extreme events : May 1990 (6.4 Mw) ; April 1991 (6.2 Mw) death toll total 234



Cordillera Blanca Fault



Normal fault system, length ~ 200km
 Geological rates indicate max slip of 2.5m
 1946 Quiches earthquake (M7) at NE



*Gracias
por su atención*

