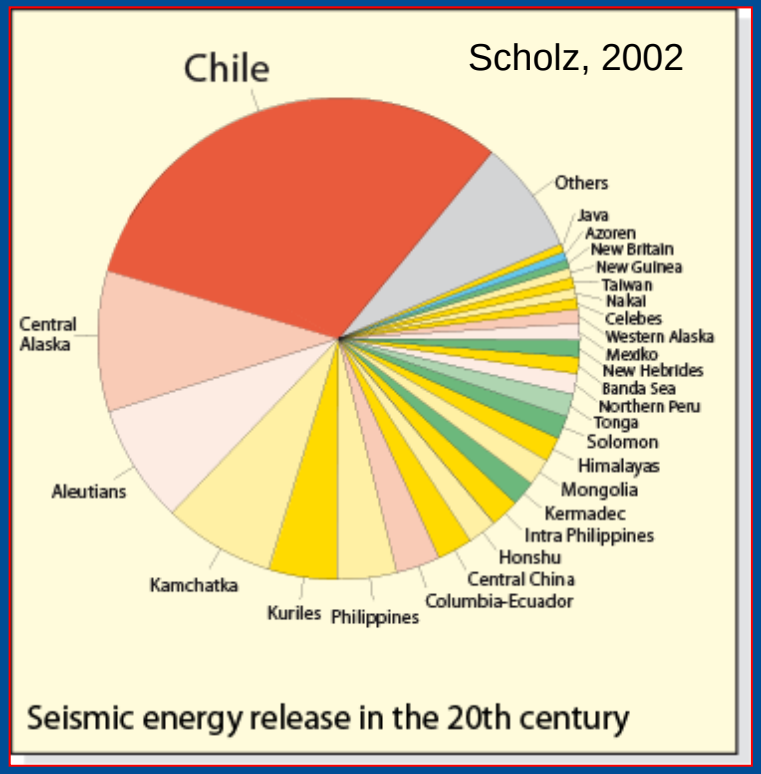
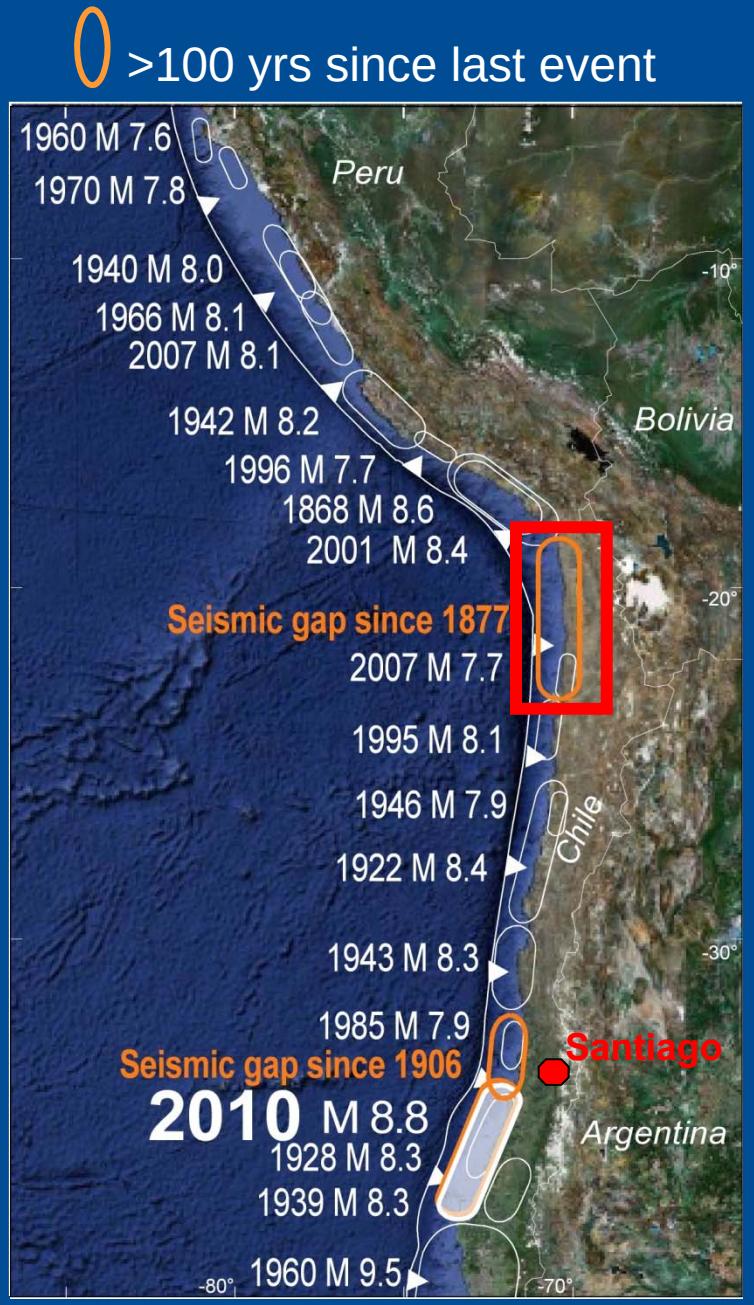
From IMAD to IPOC -

Why Plate Boundary Observatories ?

Why Chile ?

Onno Oncken and IPOC Group





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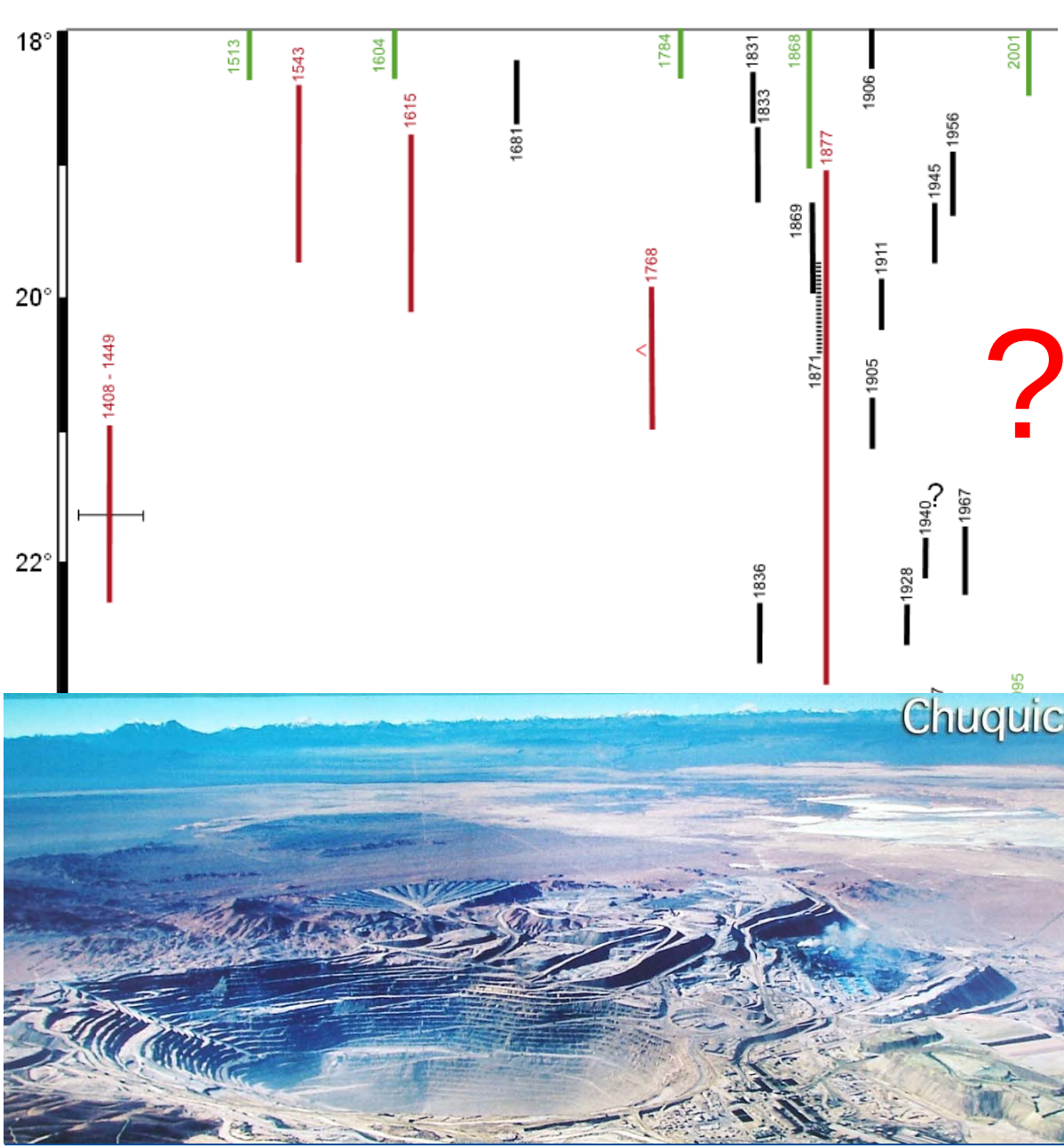
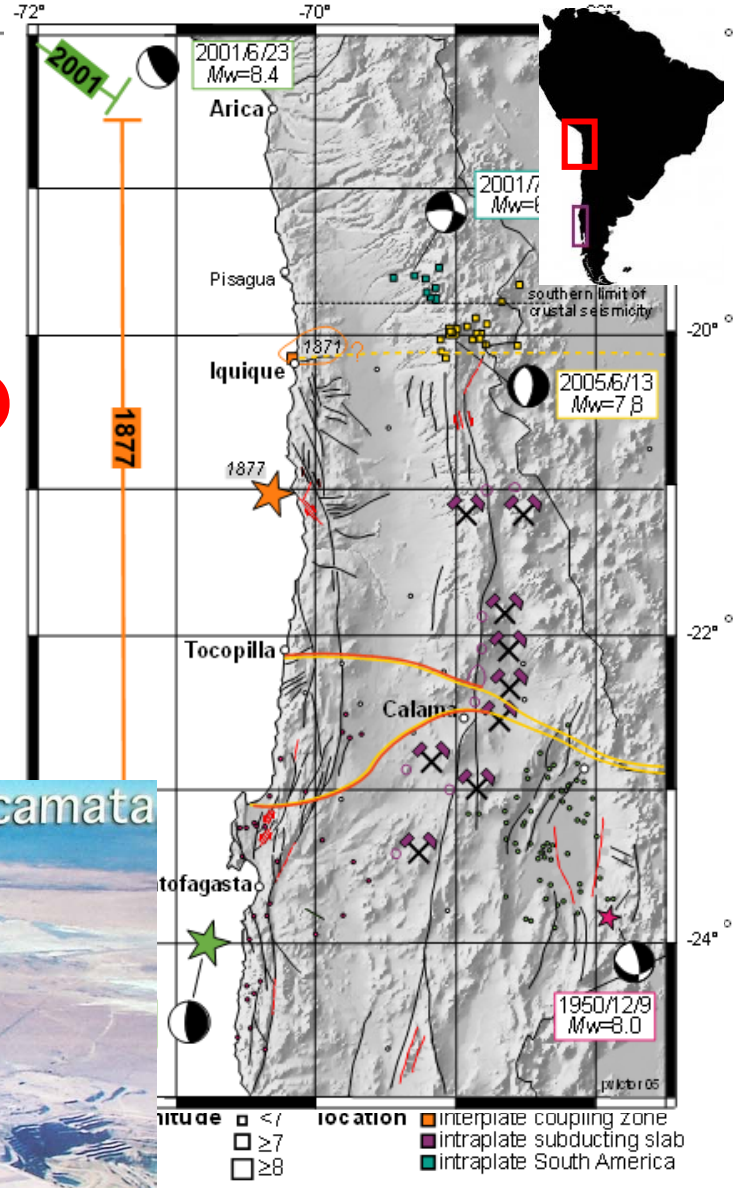
Northern Chile seismic gap





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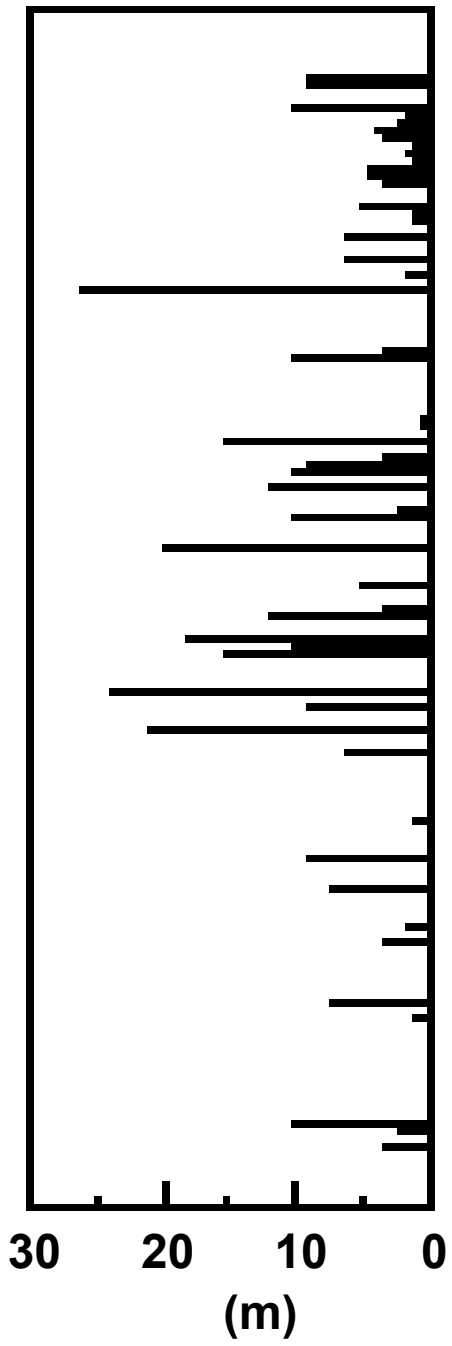
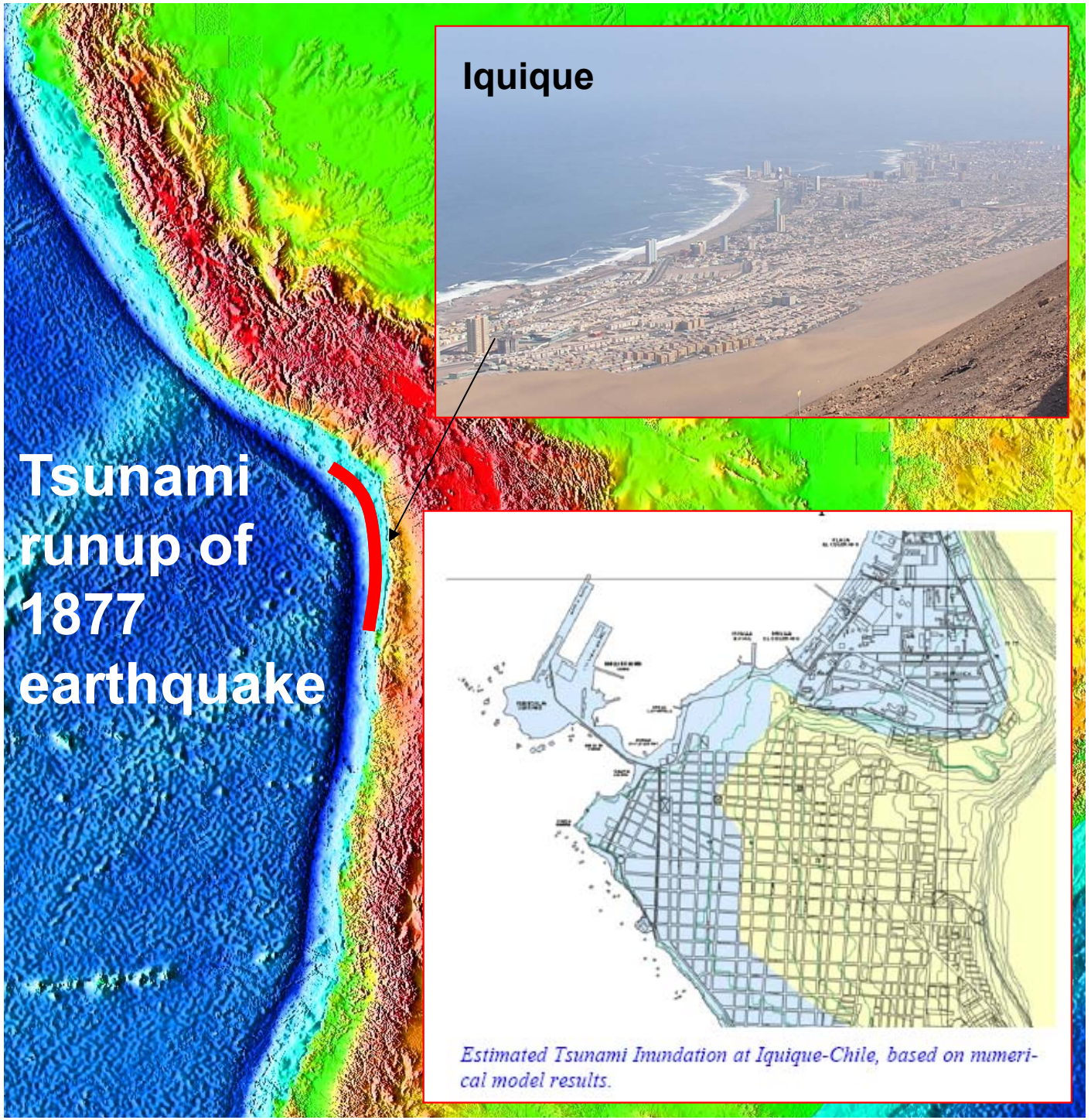
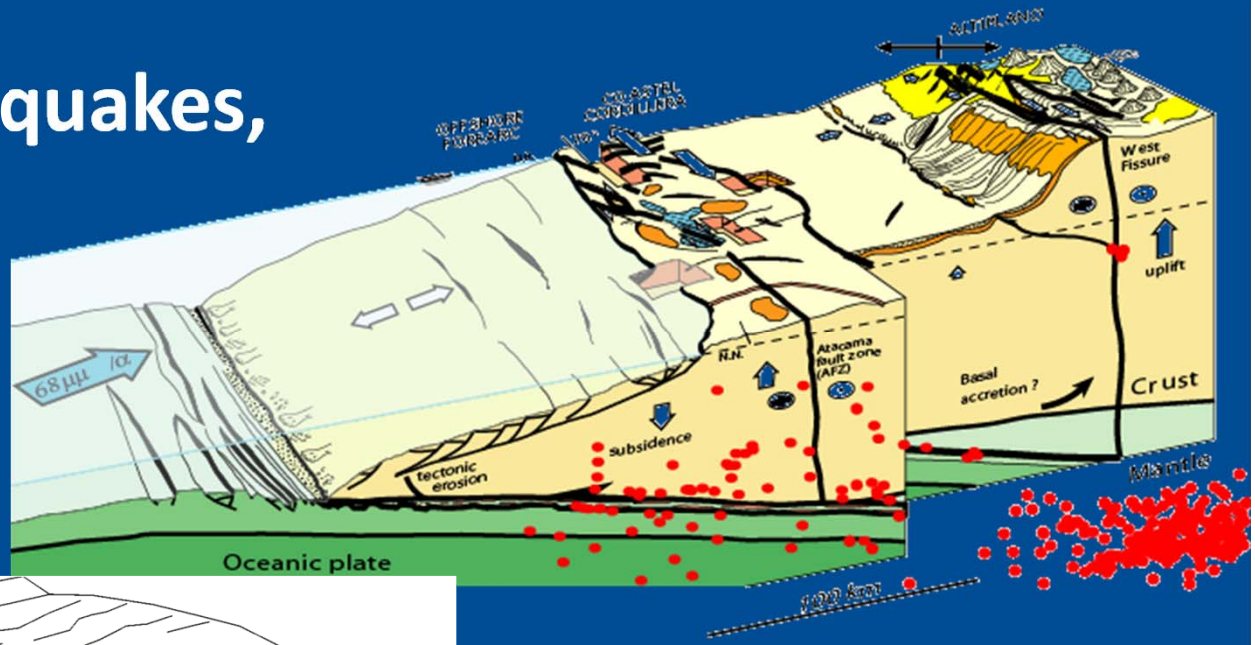
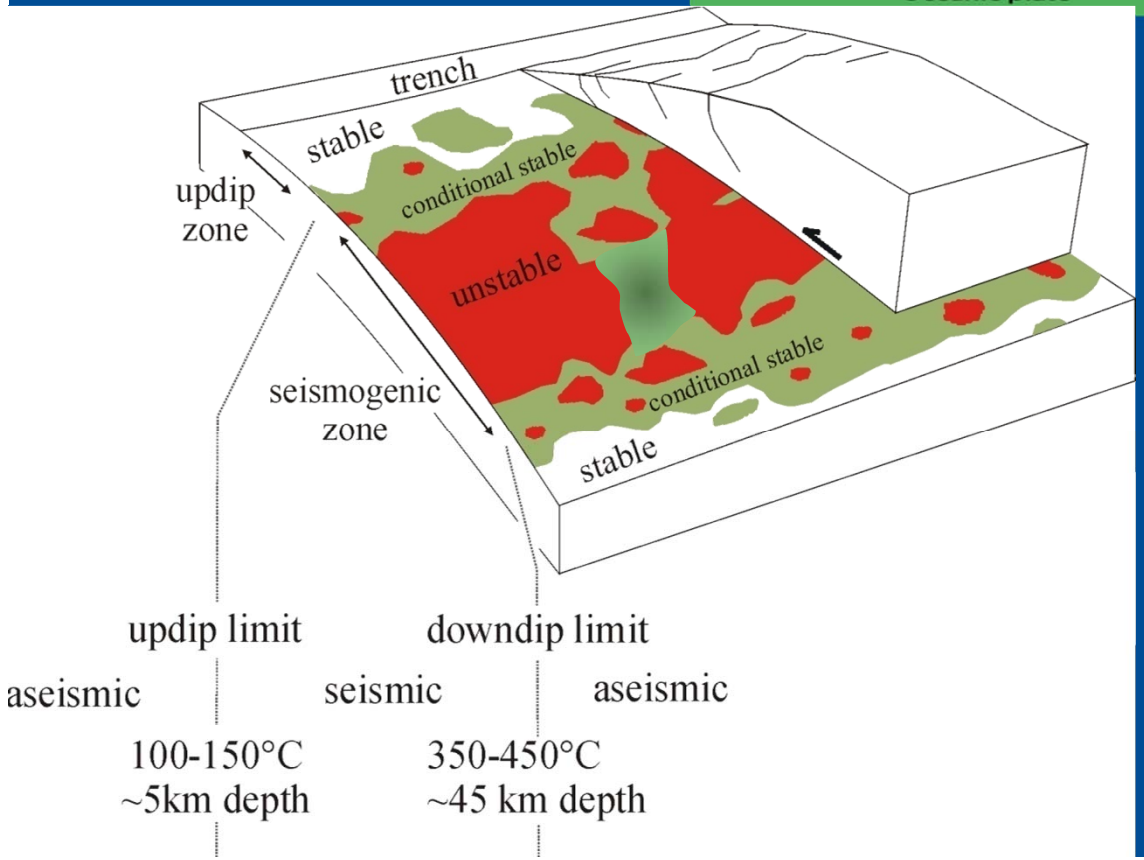

30
20
10
0
(m)


Iquique
Tsunami runup of 1877 earthquake
Estimated Tsunami Inundation at Iquique-Chile, based on numerical model results.

Subduction earthquakes, mechanics, and forearc systems





Rate and state friction law

$$\sigma_s = \mu\sigma_n = (\mu_o + a \ln(V/V_o) + b \ln(V_o\Theta/L_c))\sigma_n$$

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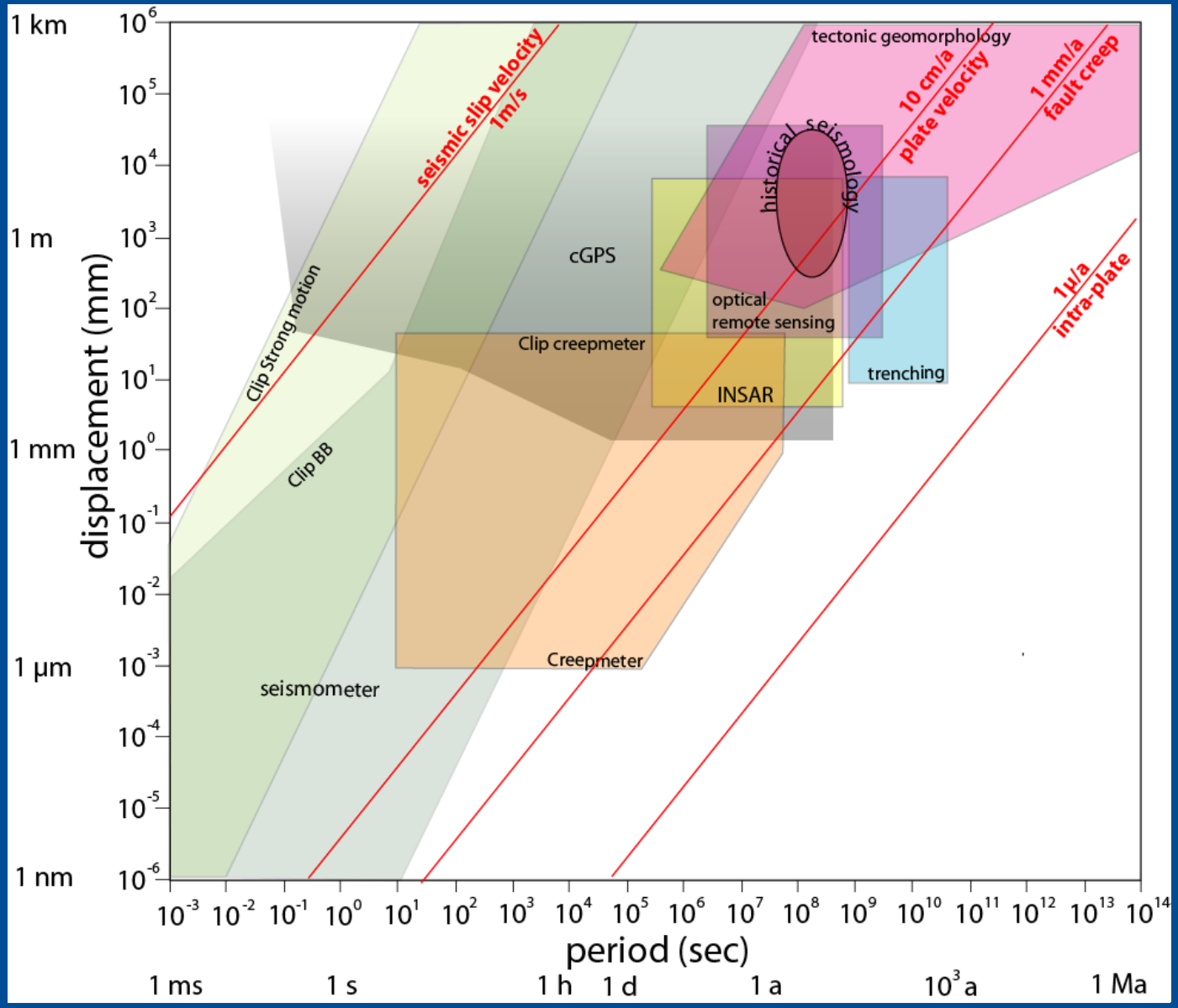
Observe the complete deformation spectrum



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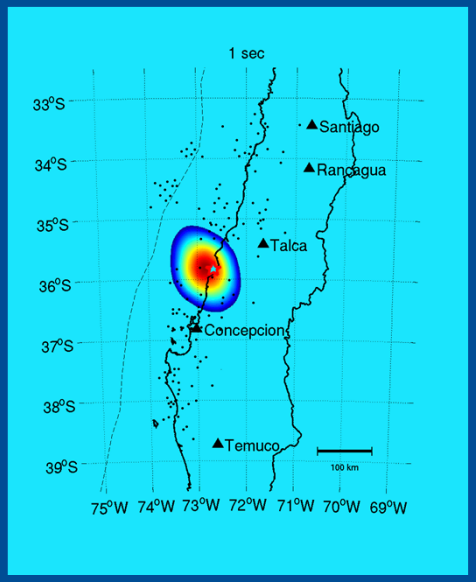
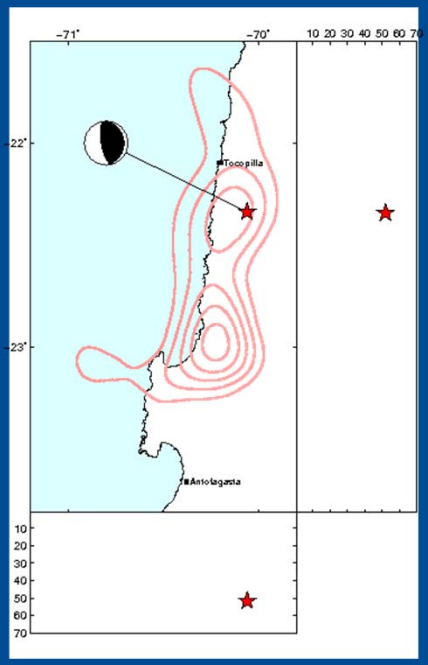
Is deformation self-similar over all scales ?

150 seconds
rupture evolution,
Maule 2010



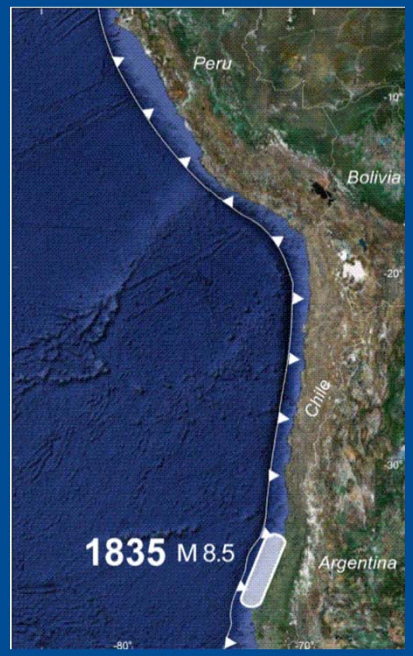
Y. Ma, GFZ, unpubl.

14 days
aftershocks,
Tocopilla, 2007



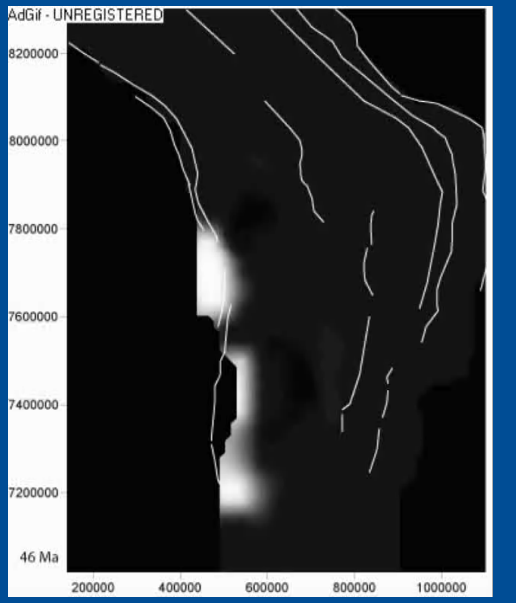
Schurr et al.,JGR , 2012

180 years
earthquakes in
South America



IPOC-network.org

50 million years
crustal deformation
Central Andes



Oncken et al., G3, 2012

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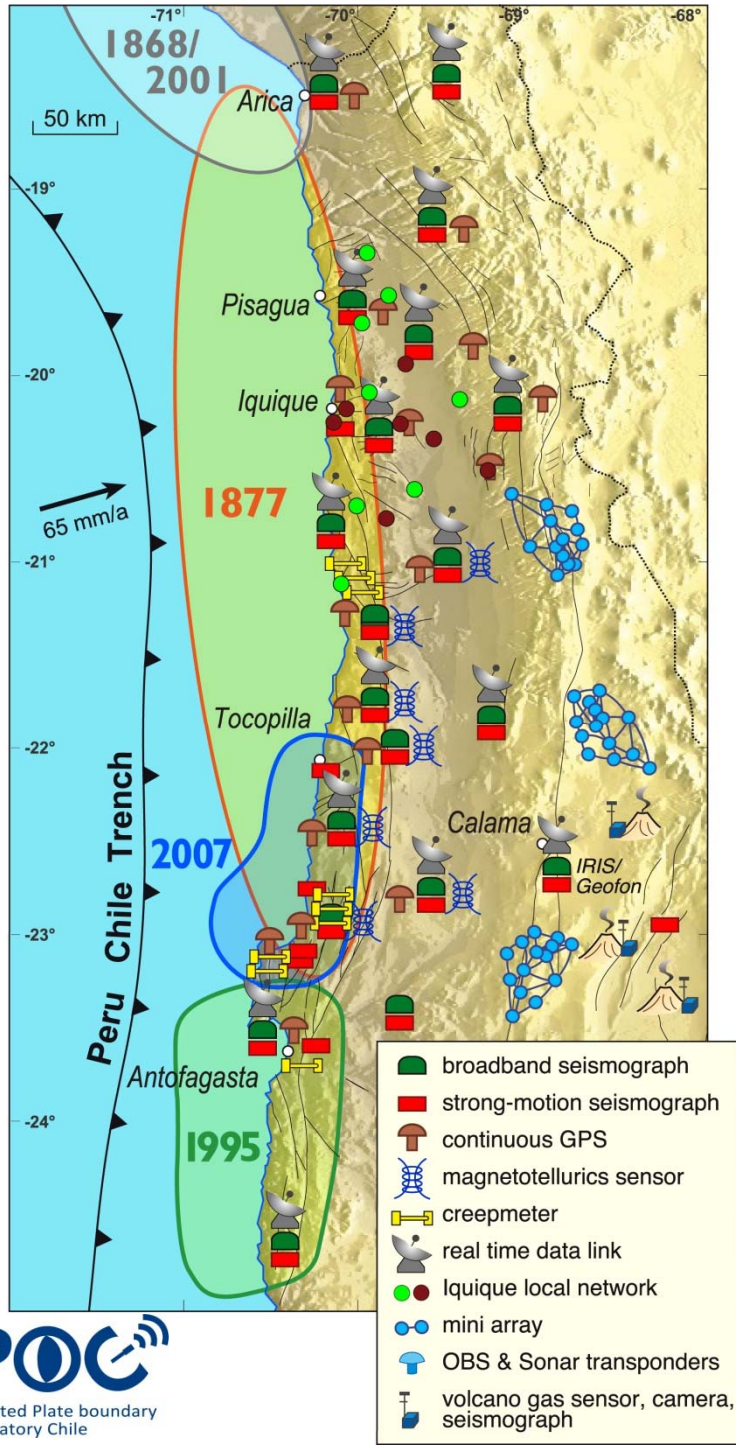
Science network IPOC

Integrated Plate boundary Observatory Chile

A multiparameter research observatory jointly organized by

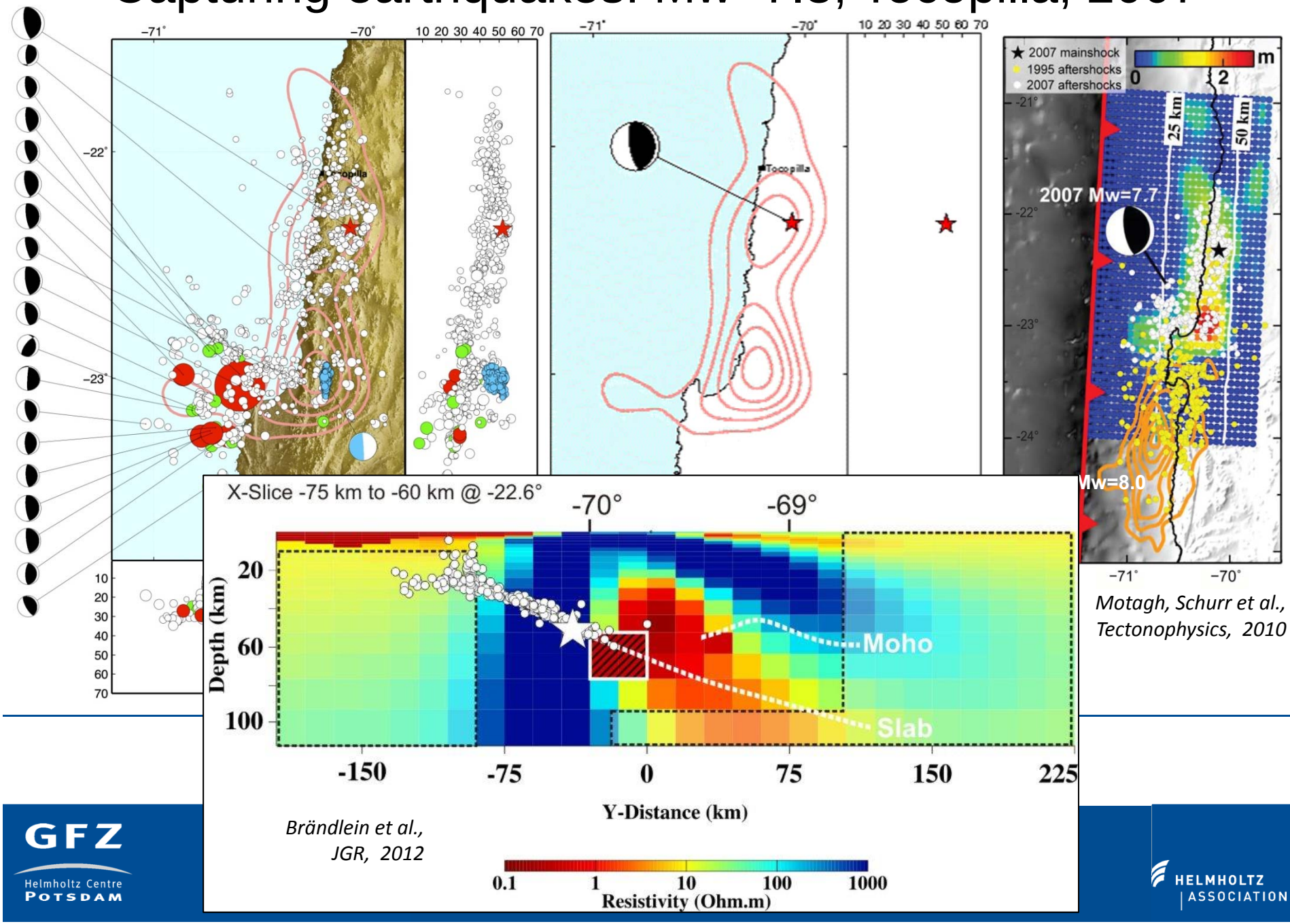
- GFZ Potsdam , GEOMAR, DLR
  Universities Postdam, Berlin
- IPG Paris, INSU, CNRS
- DGF (U de Chile),
  Chilean Seismological Survey;
- Universidad Catolica del Norte
- Pontifica Universidad Catolica
- CALTECH, Pasadena, USA
- ……

GFZ
Helmholtz Centre
POTSDAM



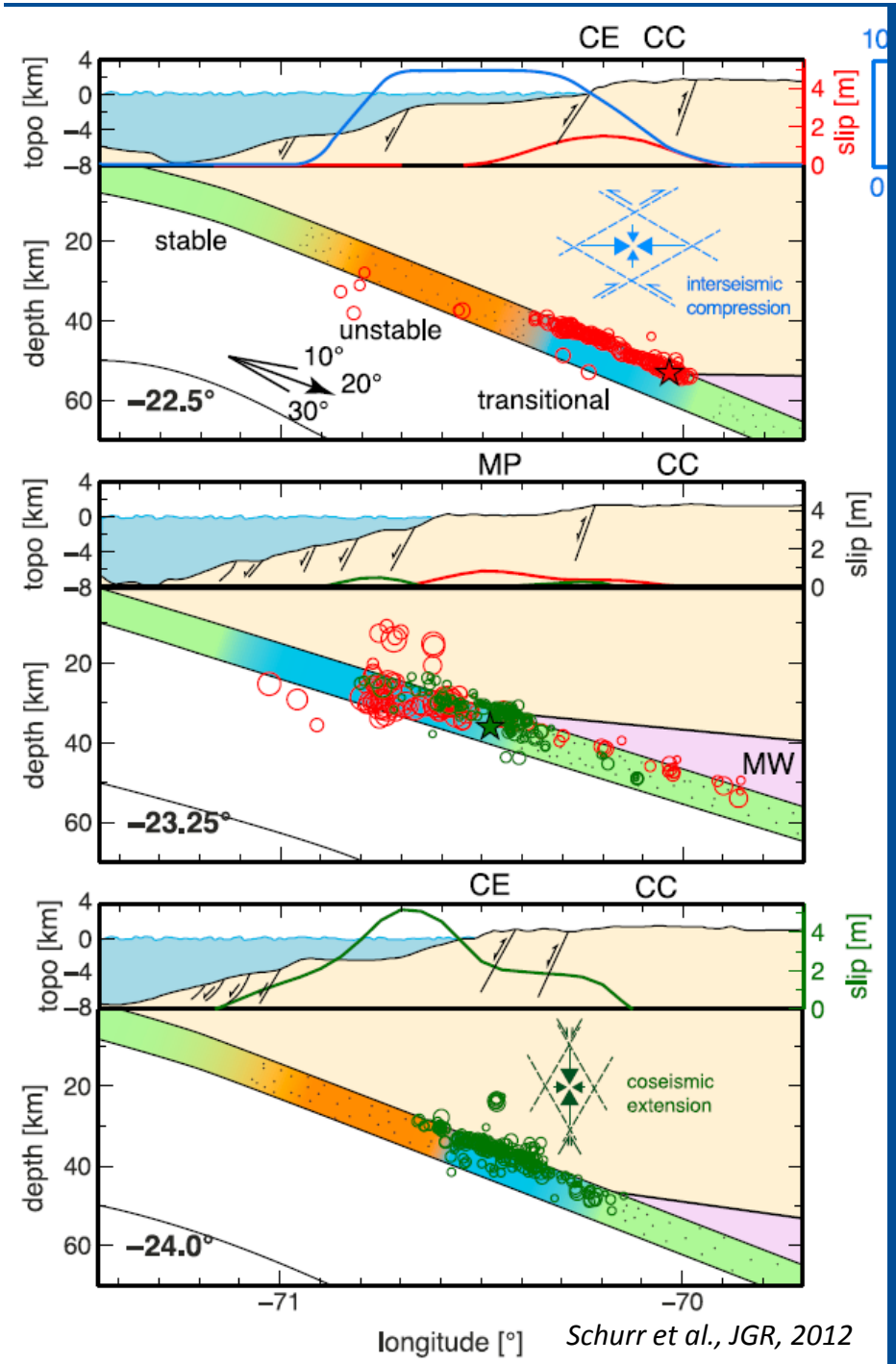
IPOC
Integrated Plate boundary
Observatory Chile

Capturing earthquakes: Mw=7.8, Tocopilla, 2007

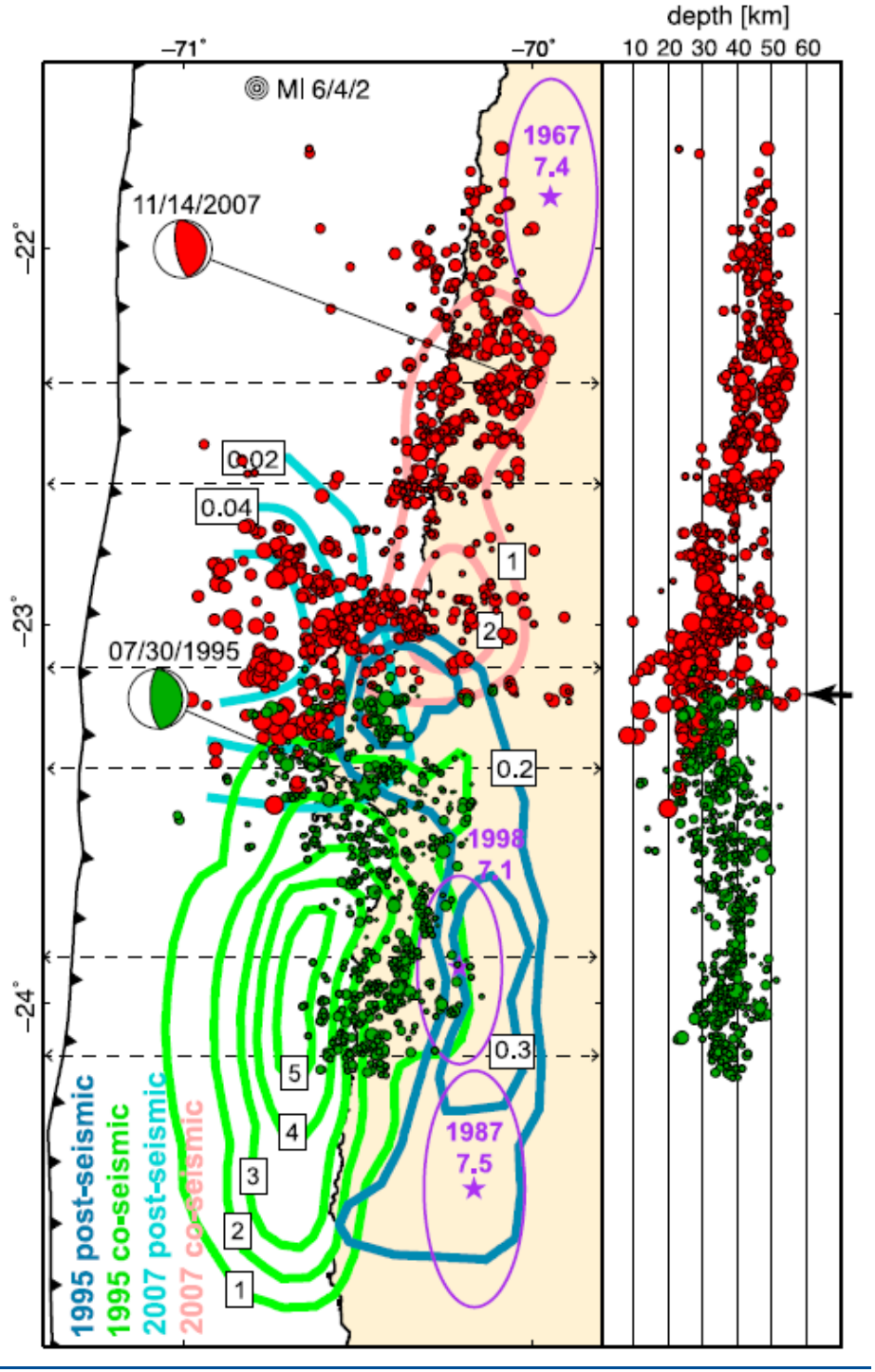


Motagh, Schurr et al., Tectonophysics, 2010

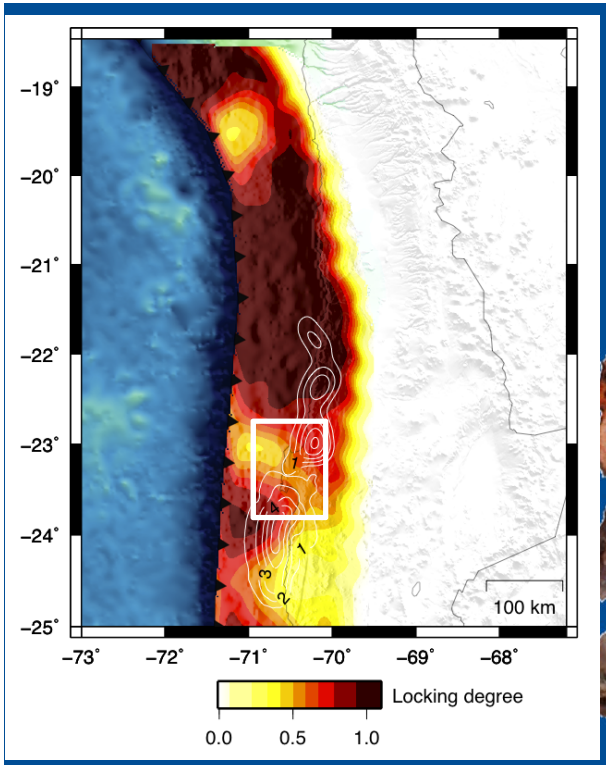
Brändlein et al., JGR, 2012

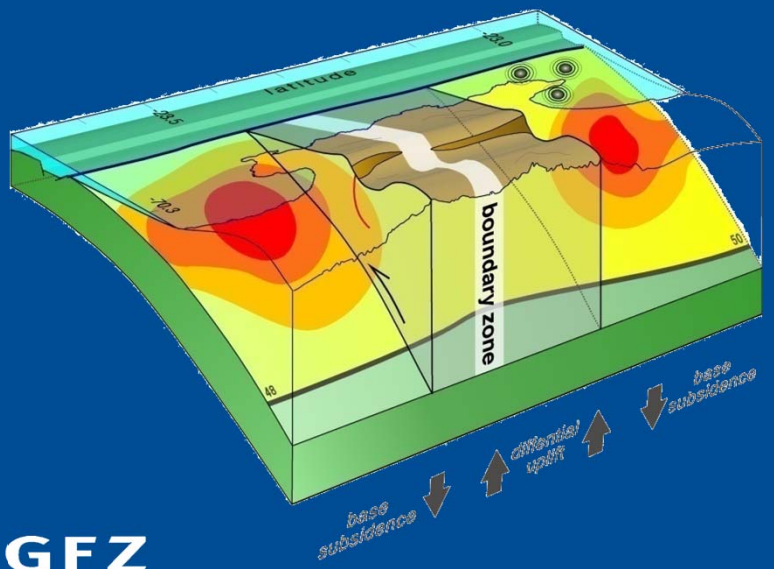


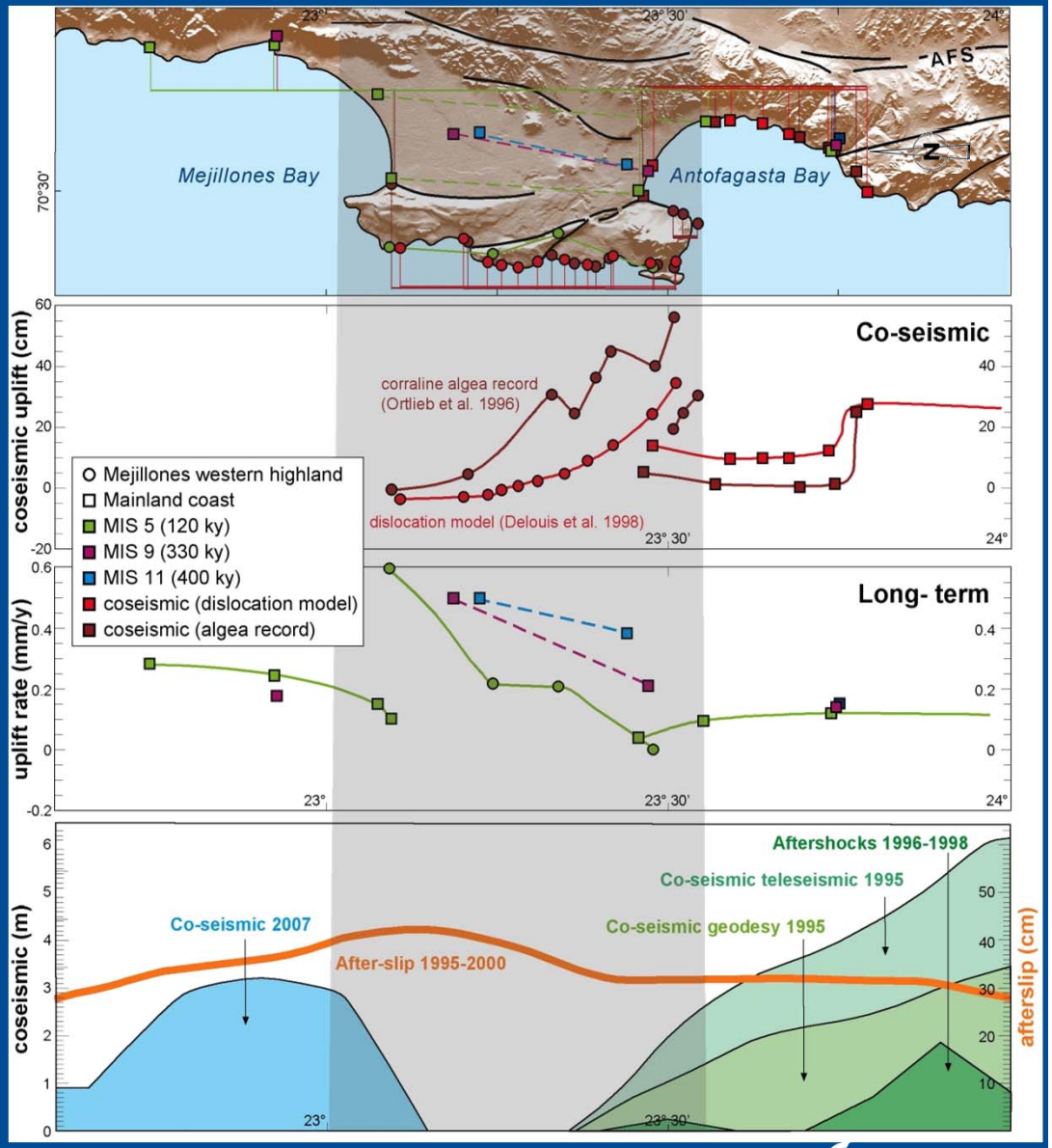
Schurr et al., JGR, 2012



Geodetic locking and the long-term record







Victor et al., JGR, 2011

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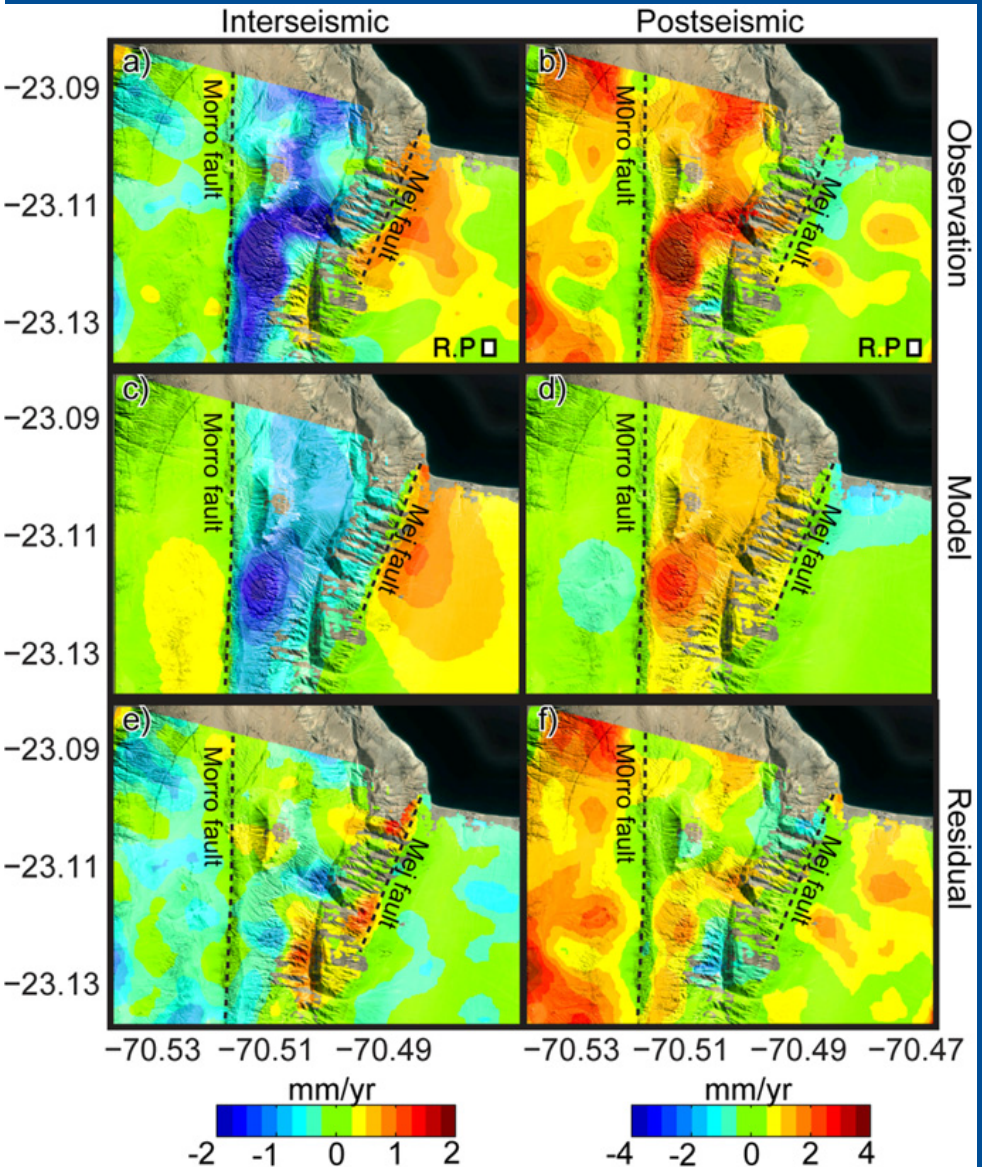
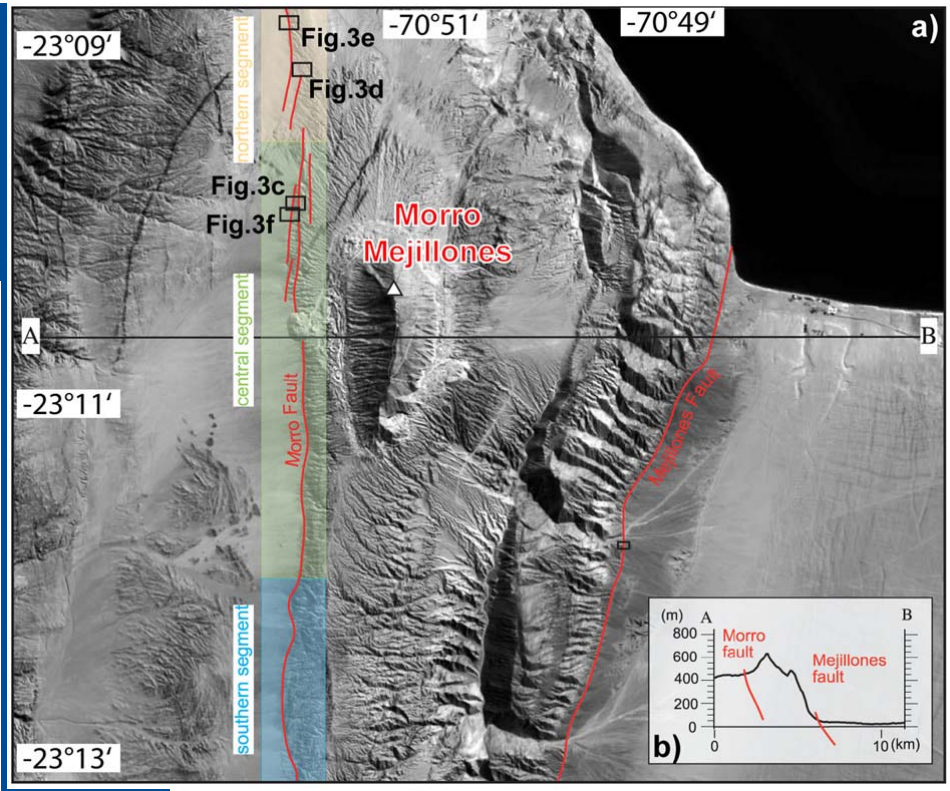
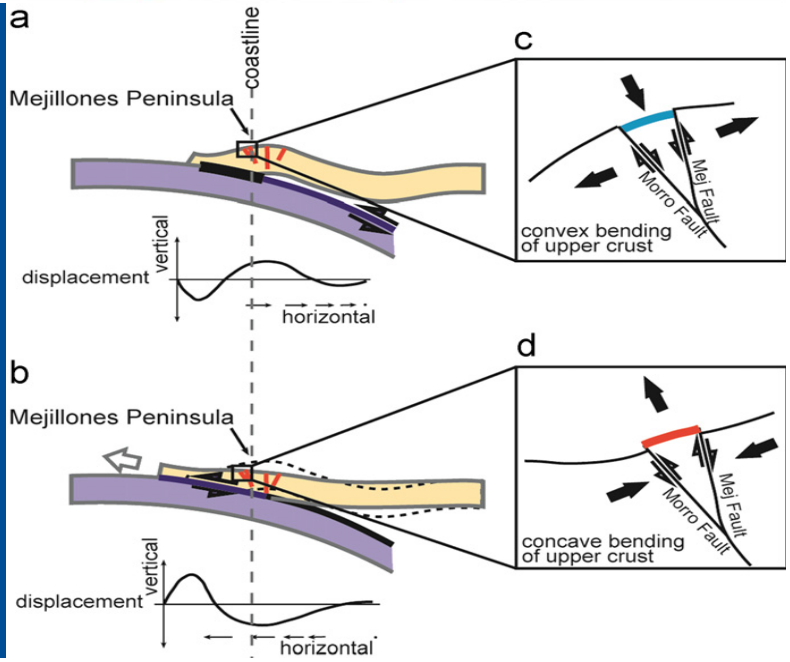
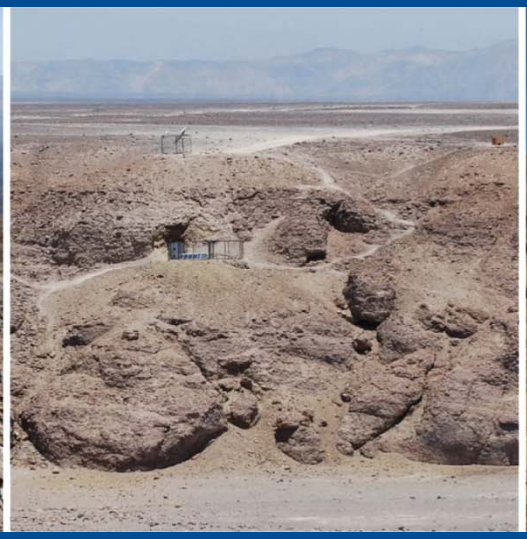
Slip reversal on upper plate faults during megathrust seismic cycle









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GEOSEA Network (GEOMAR)

Installation of an offshore component to IPOC

Continuous measurement of active deformation above the offshore seismogenic zone

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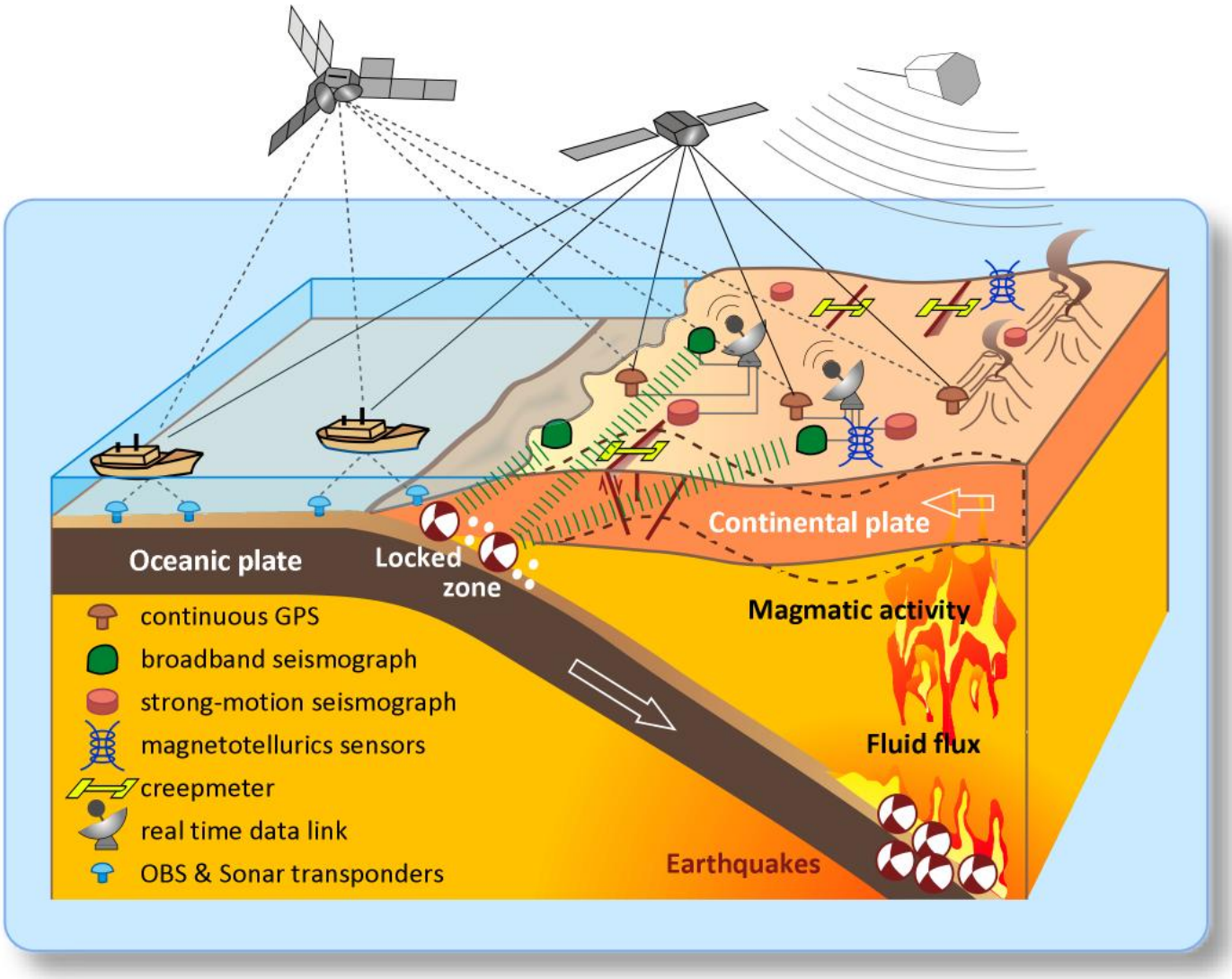
IPOC

Integrated Plate boundary Observatory Chile

Understand processes to develop a new generation of hazard prediction tools



For more information and data portal: ipoc-network.org

Where do we go from here ?

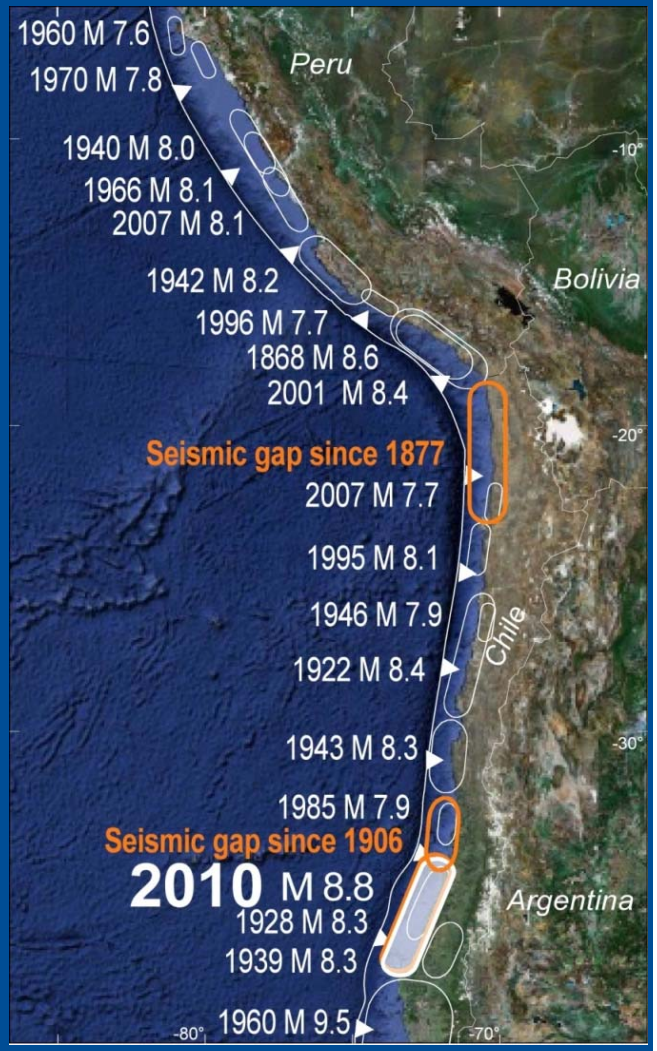
Enhance IPOC by additional instrumentation and observation of more processes

Expand laterally to other segments in Chile:
e.g. Valparaiso gap,
contrasting stages of seismic cycle

How about a Chile array experiment combining monitoring and HR imaging of plate interface etc. ?

Plan next IMAD deployment with near-0-time lag

Include studies on hazard assessment
and enhance link to Chilean risk authorities



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