Advantages of Regional and Global Data Exchange

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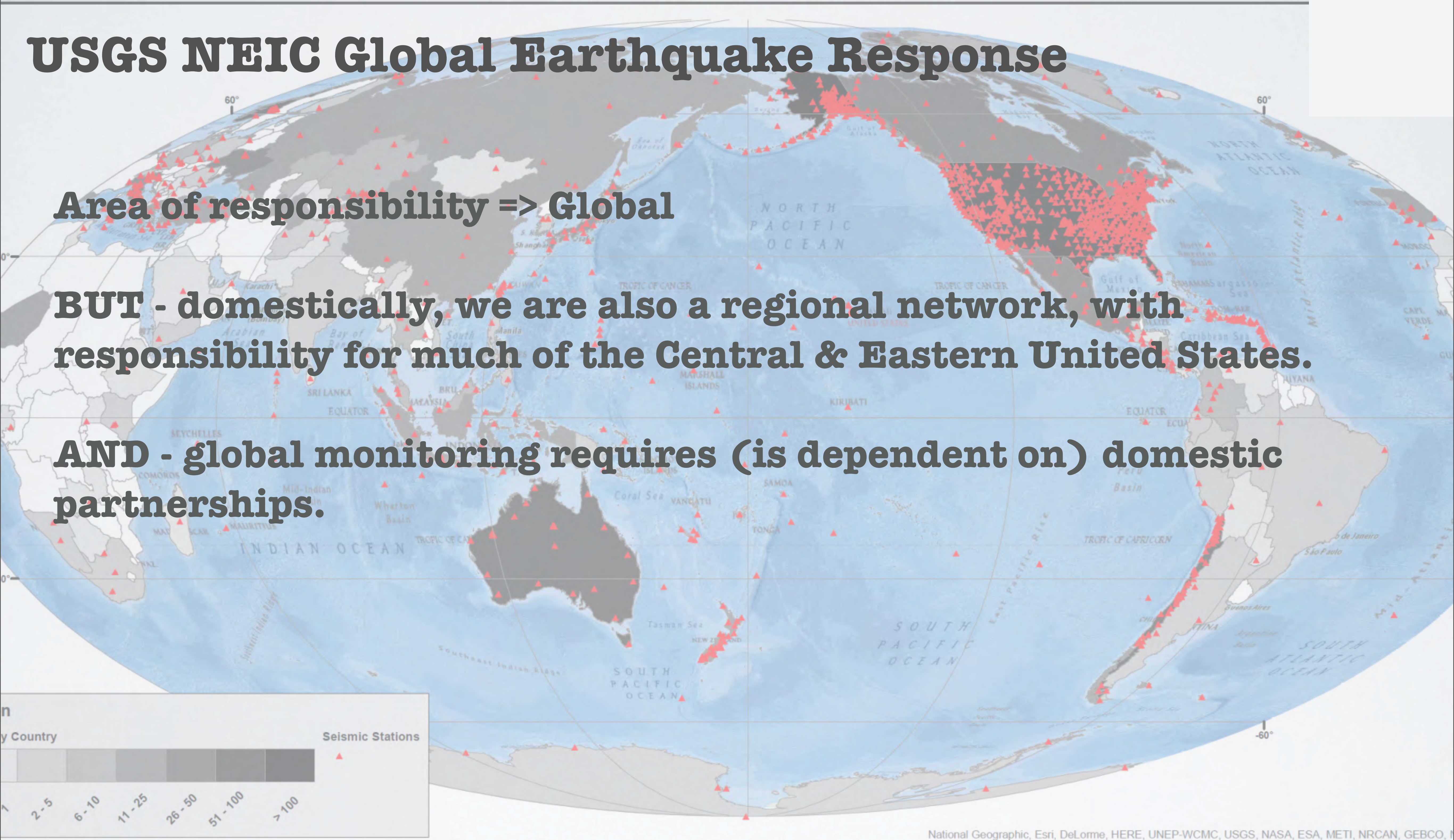
Area of responsibility => Global

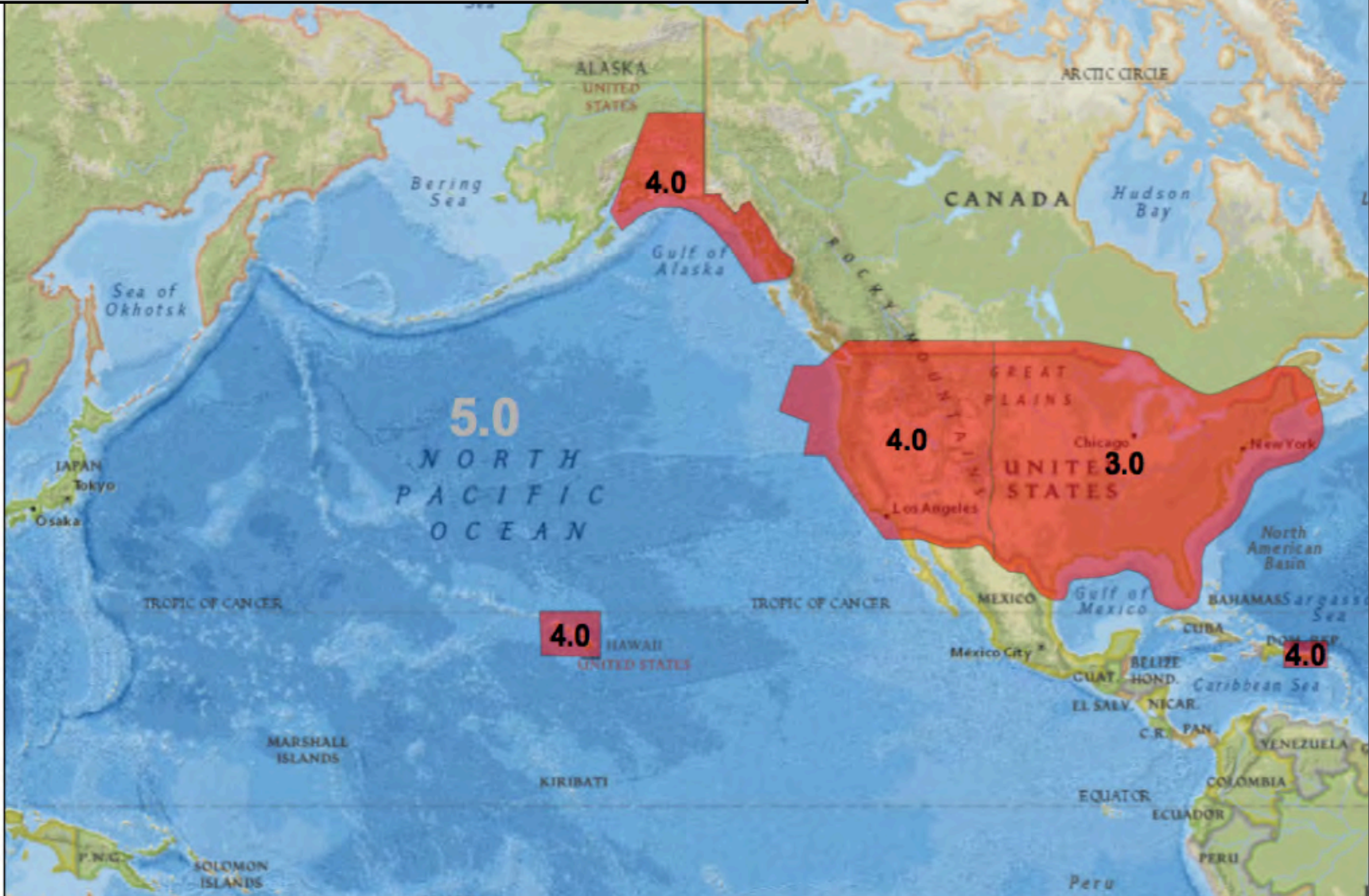
BUT - domestically, we are also a regional network, with responsibility for much of the Central & Eastern United States.

AND - global monitoring requires (is dependent on) domestic partnerships.



Regional Responsibility

Global Response Completeness



* Magnitude threshold labeled

Global Catalog Completeness

NEIC International Partnerships

NEIC partnering with foreign national networks to expand data exchange and improve global network operations.

Latin America and Caribbean are a particular emphasis given the exposure to great earthquakes. Countries of recent focus include:

Chile: Multi-year OFDA funded effort since 2011

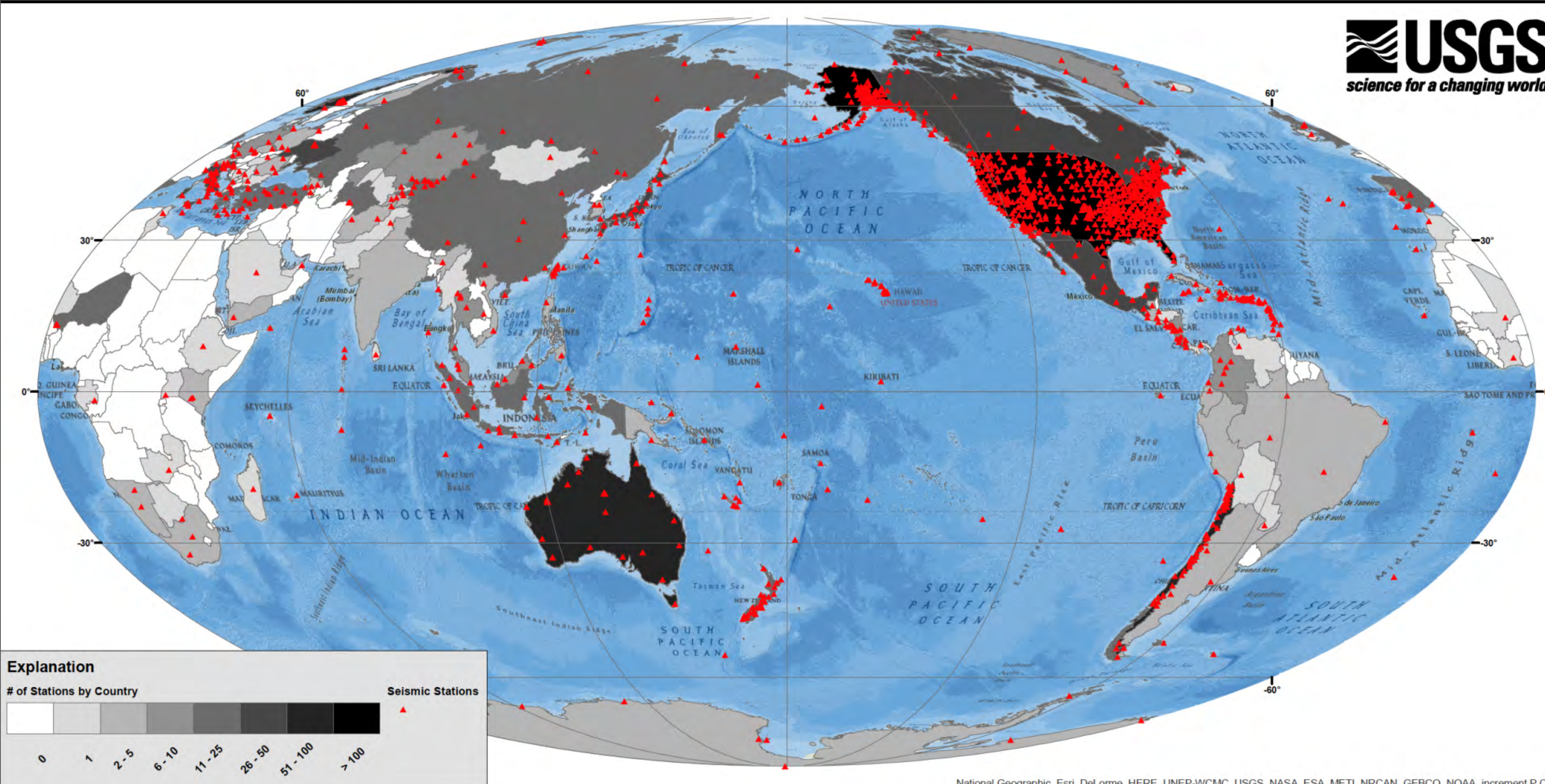
Cuba: Collaborations launched in 2014; data now arriving

Mexico: CICESI partnership for cross-border monitoring

Nicaragua: 2014-15 OFDA funded training effort; data exchange

Peru: Initial discussions occurred in February 2015

Global Station Coverage



3000+ data channels flowing to NEIC in real time.

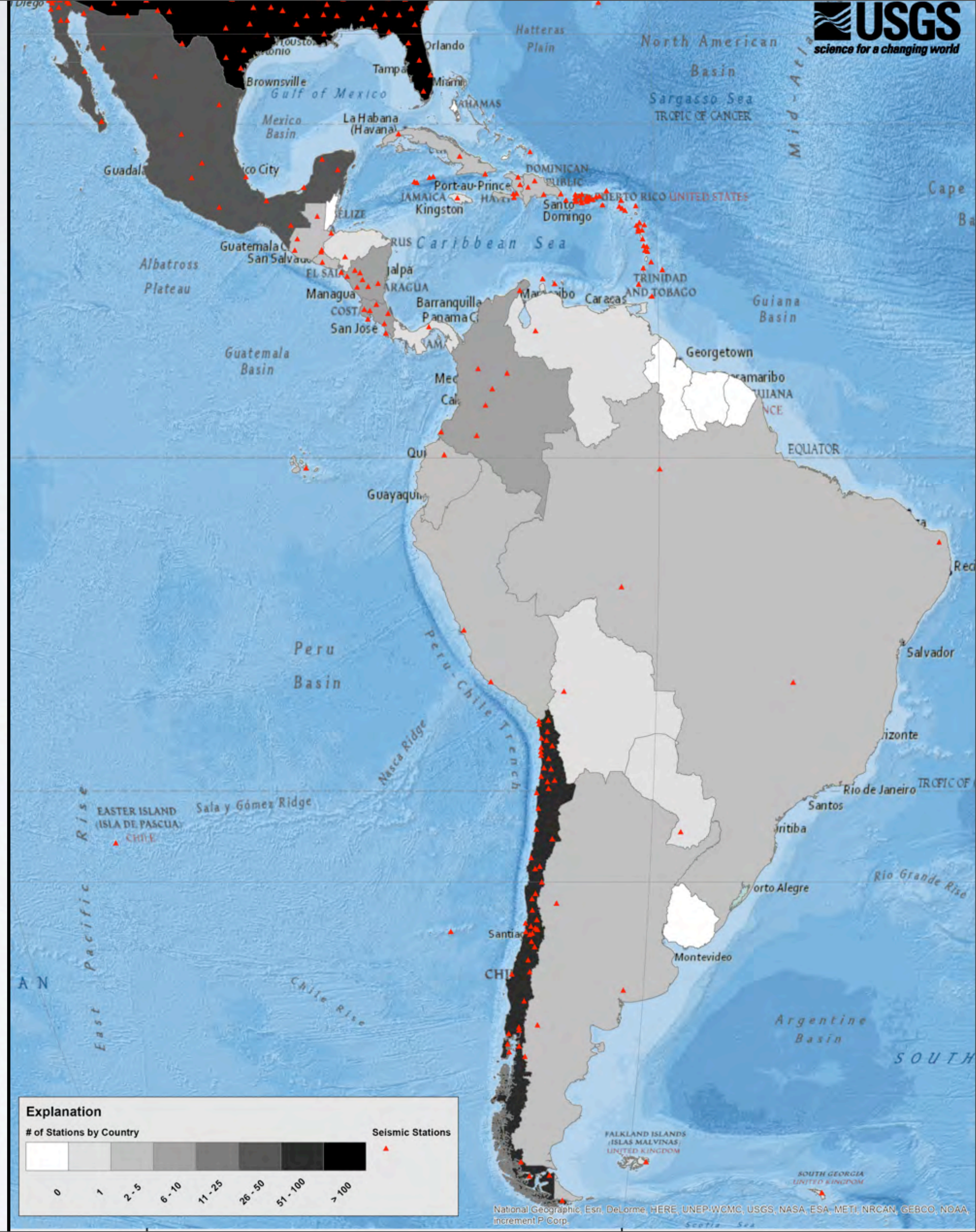
Regional Station Coverage (Central-South America)

Data from at least one station in most countries.

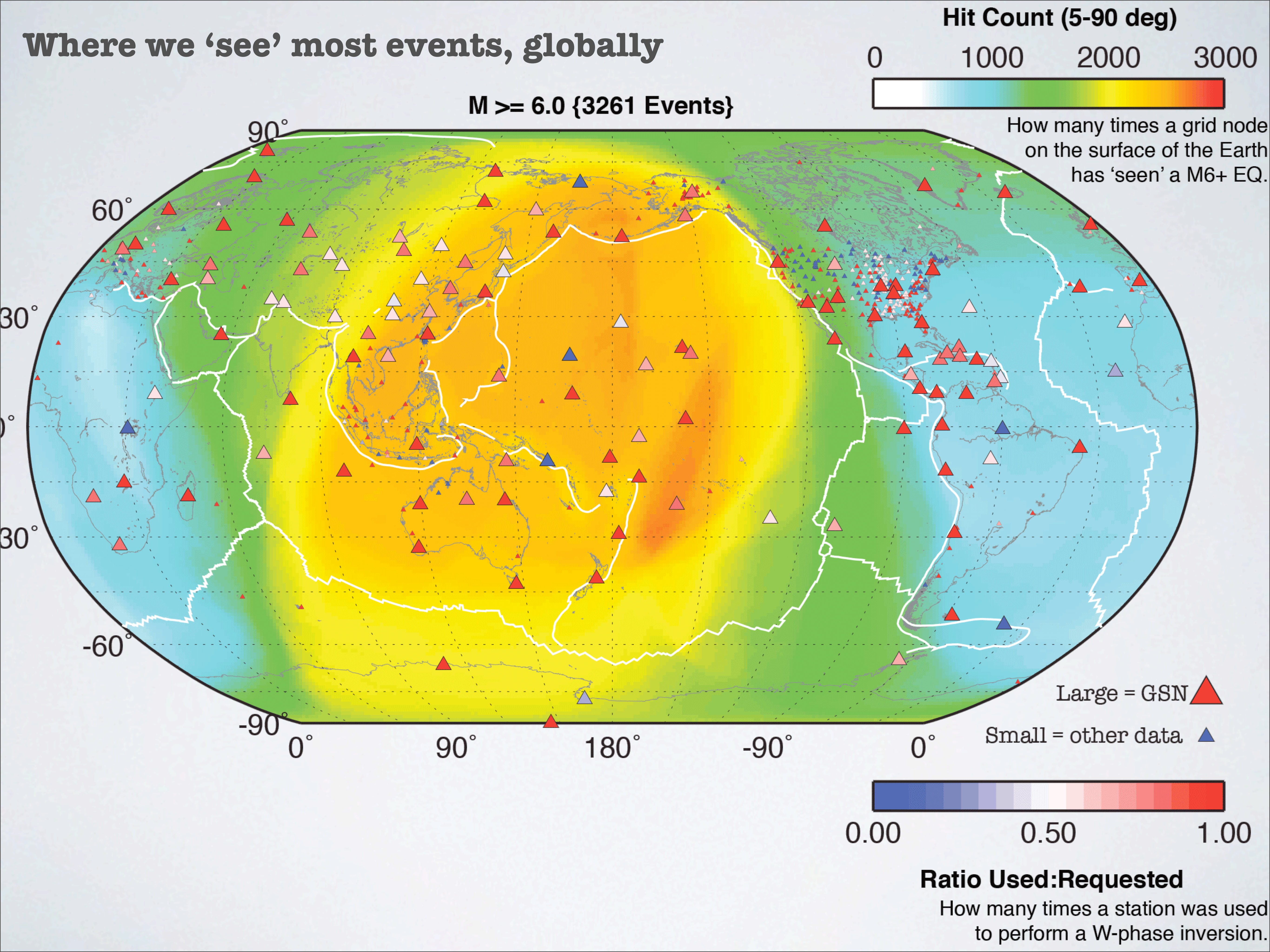
Several provide data from 5+ (Mexico, Nicaragua, Costa Rica, Colombia).

50+ stations from Chile in real time.

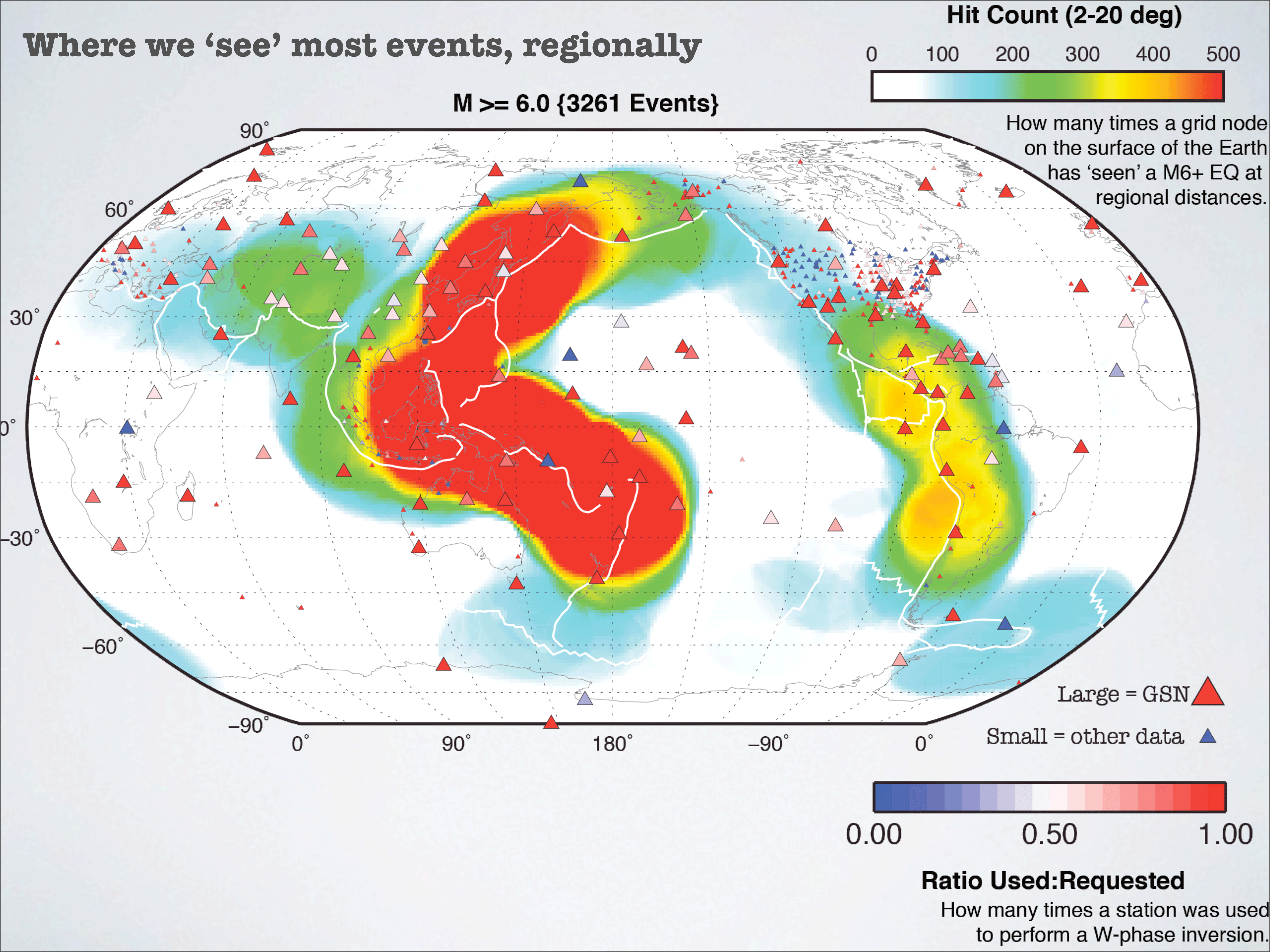
Sparse coverage in Ecuador-Peru-Bolivia.



Where we 'see' most events, globally



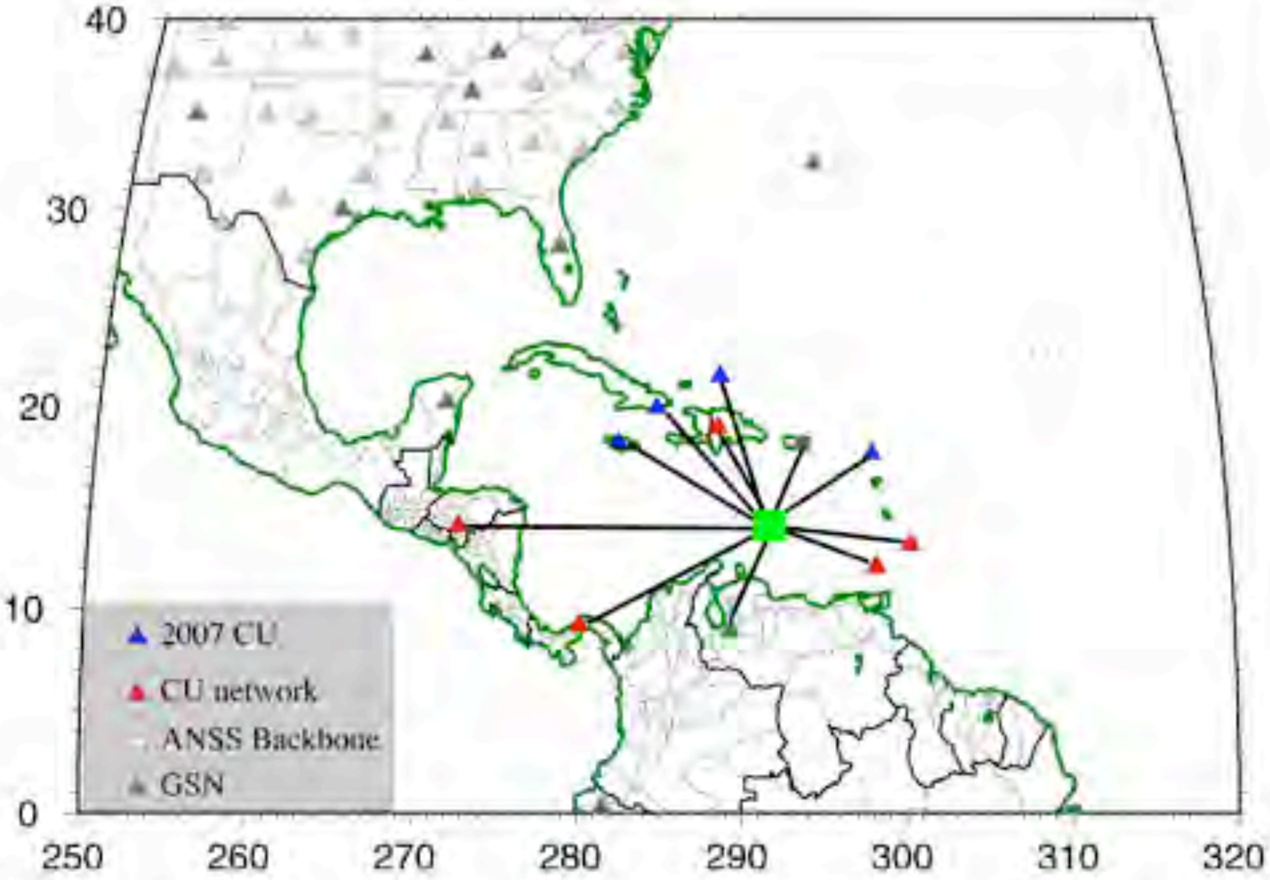
Where we ‘see’ most events, regionally



Detection Threshold Method

The minimum Mw level for each grid cell is modeled by computing:

the minimum Brune earthquake amplitude that exceeds ambient noise levels at **4 stations (*typically 6-9; modified to 4 for Chile network practices*).**



$Mw = 0.667 \log(Mo) - 10.7$ (*Kanimori*, 1977).

$Mo = 2.29\sigma r^3$ dyne-cm (*Brune* 1970, 1971)

r=fault length

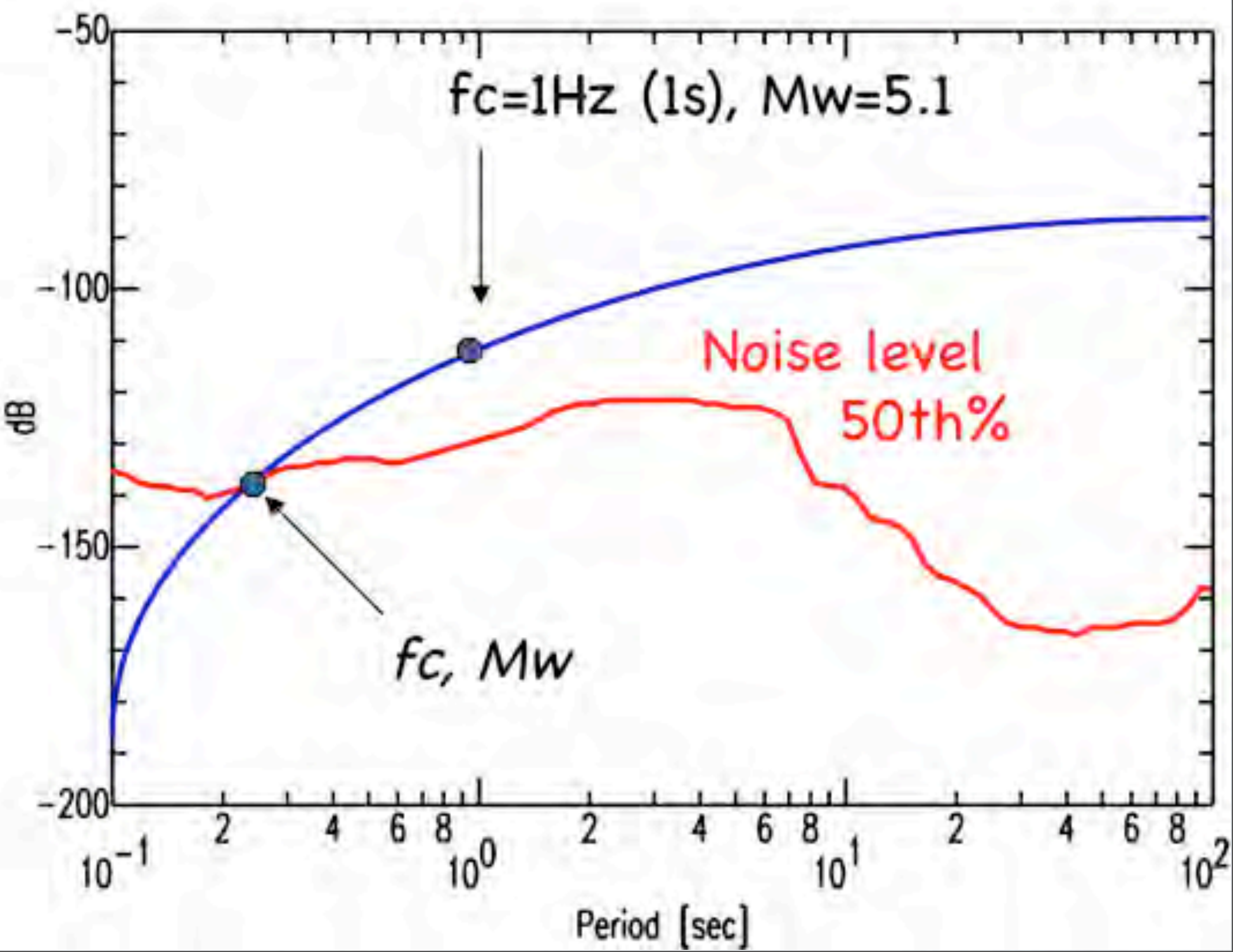
σ=stress drop

$$As = \frac{Mo}{4\mu\beta} \bullet \frac{fmfc^2}{fm^2} + \frac{fc^2}{\Delta}$$

(*Brune* 1970, 1971)

***dB* = 10log(*As*²)**

For each path determine min Mw exceeding station noise level.

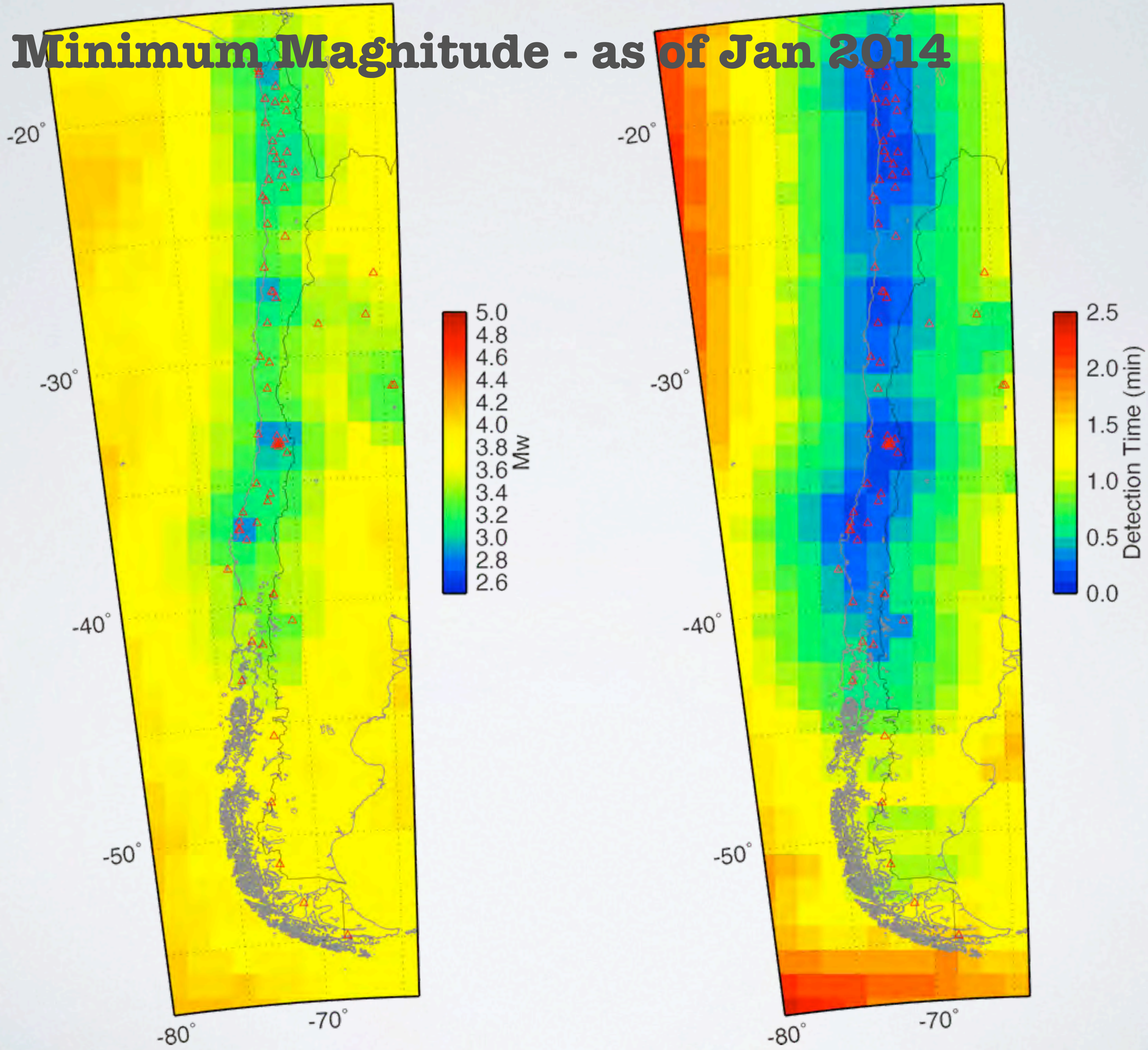


References:

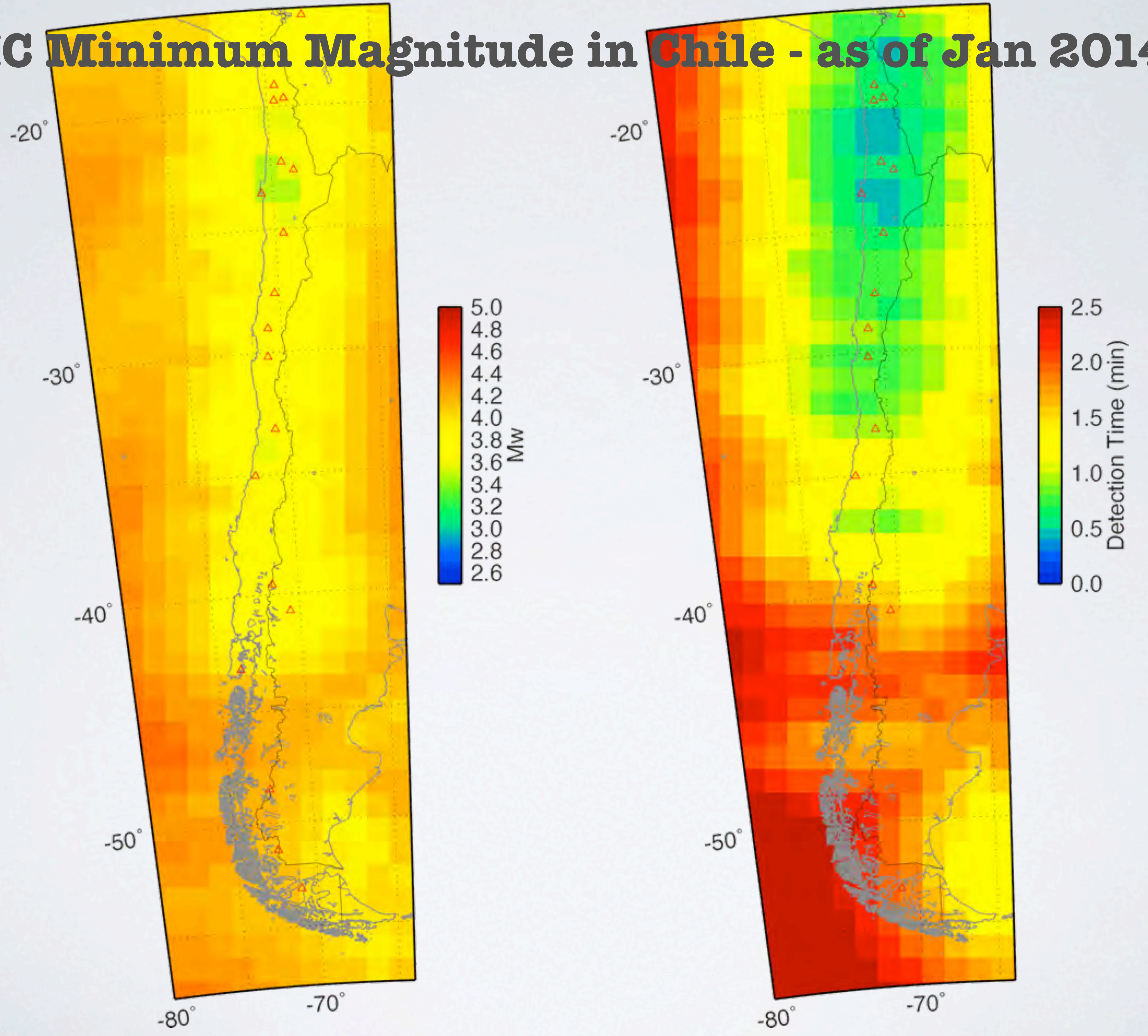
McNamara, D.E., and R. Buland, ANSS Detection threshold, *15th Annual IRIS Workshop*, 19-21 June, Yosemite, CA, 2003.

McNamara, D. E. and R.P. Buland, Ambient noise levels in the continental US, Bull. Seism. Soc. Am., 94, 4, 1517-1527, 2004.

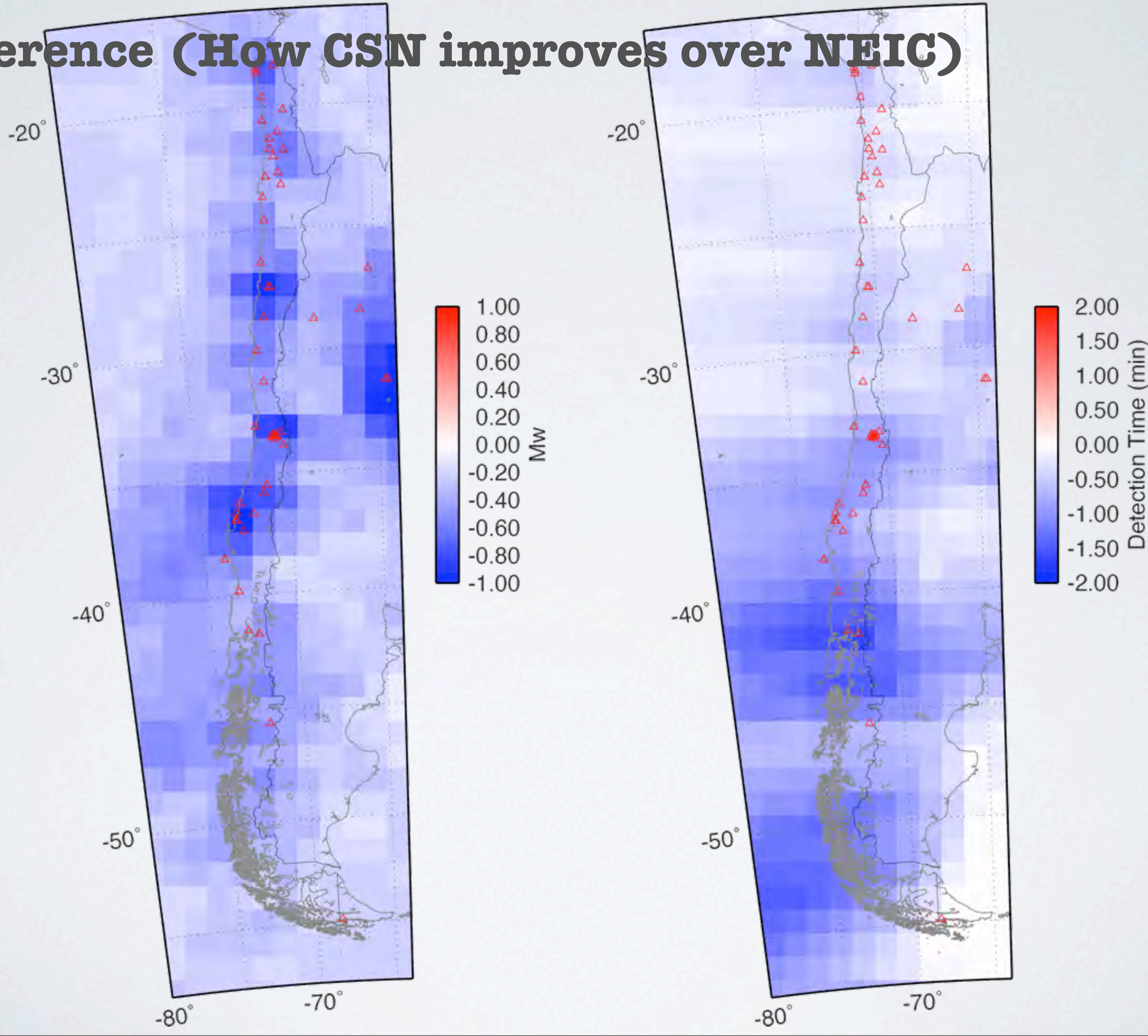
CSN Minimum Magnitude - as of Jan 2014



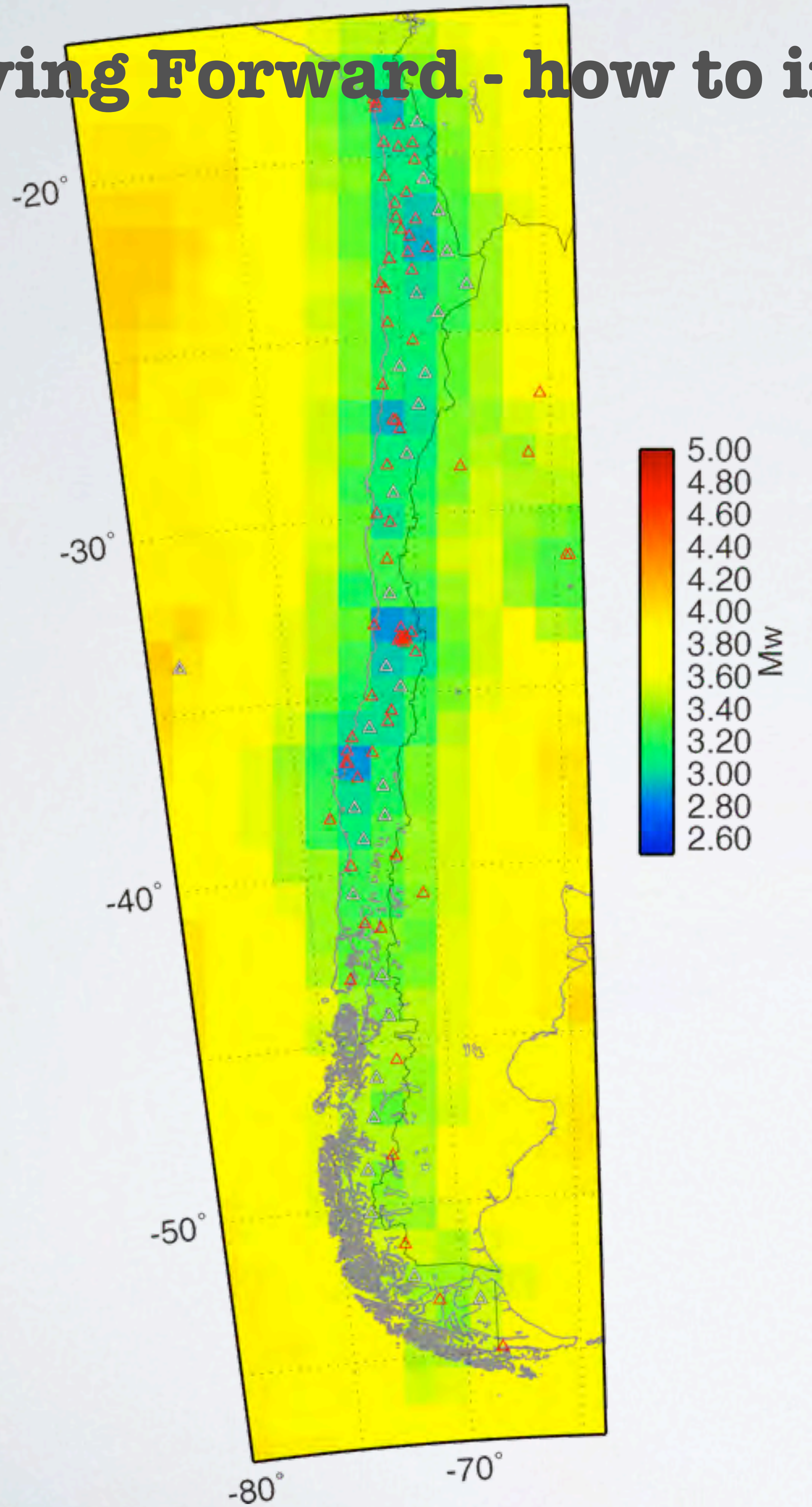
NEIC Minimum Magnitude in Chile - as of Jan 2014

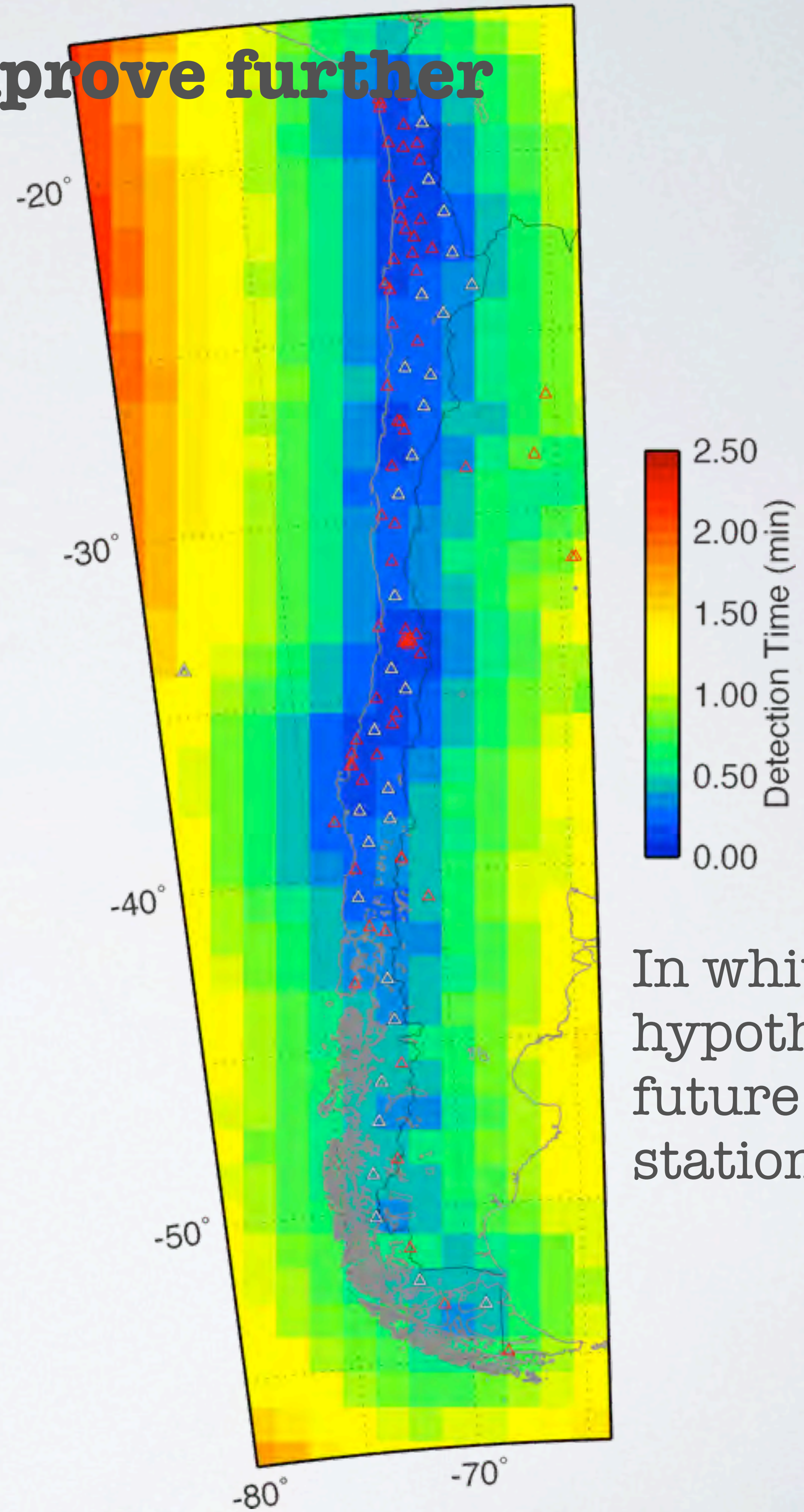


Difference (How CSN improves over NEIC)



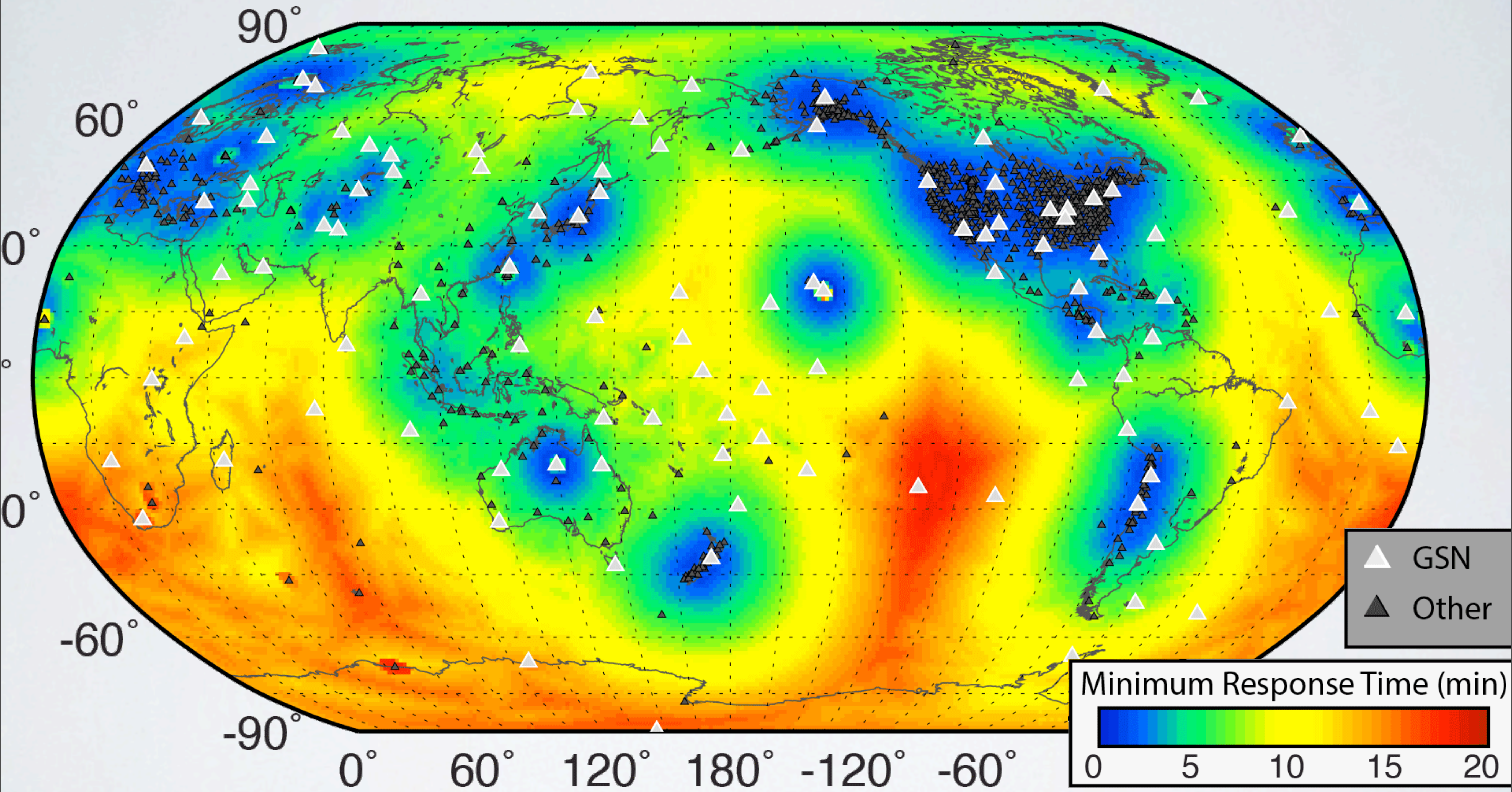
Moving Forward - how to improve further





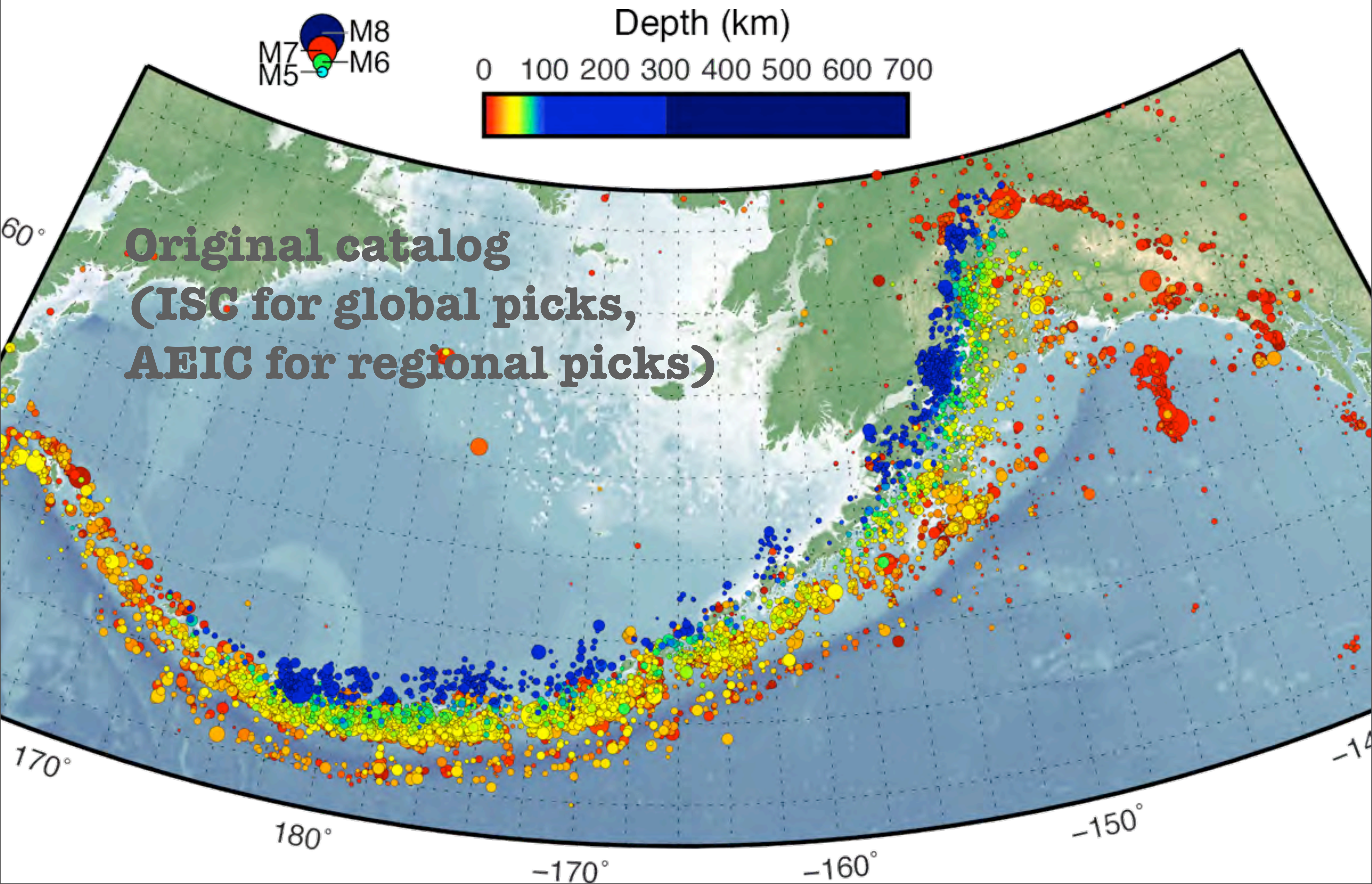
In white: hypothetical future stations

Idealized Response Times: Current Data Coverage

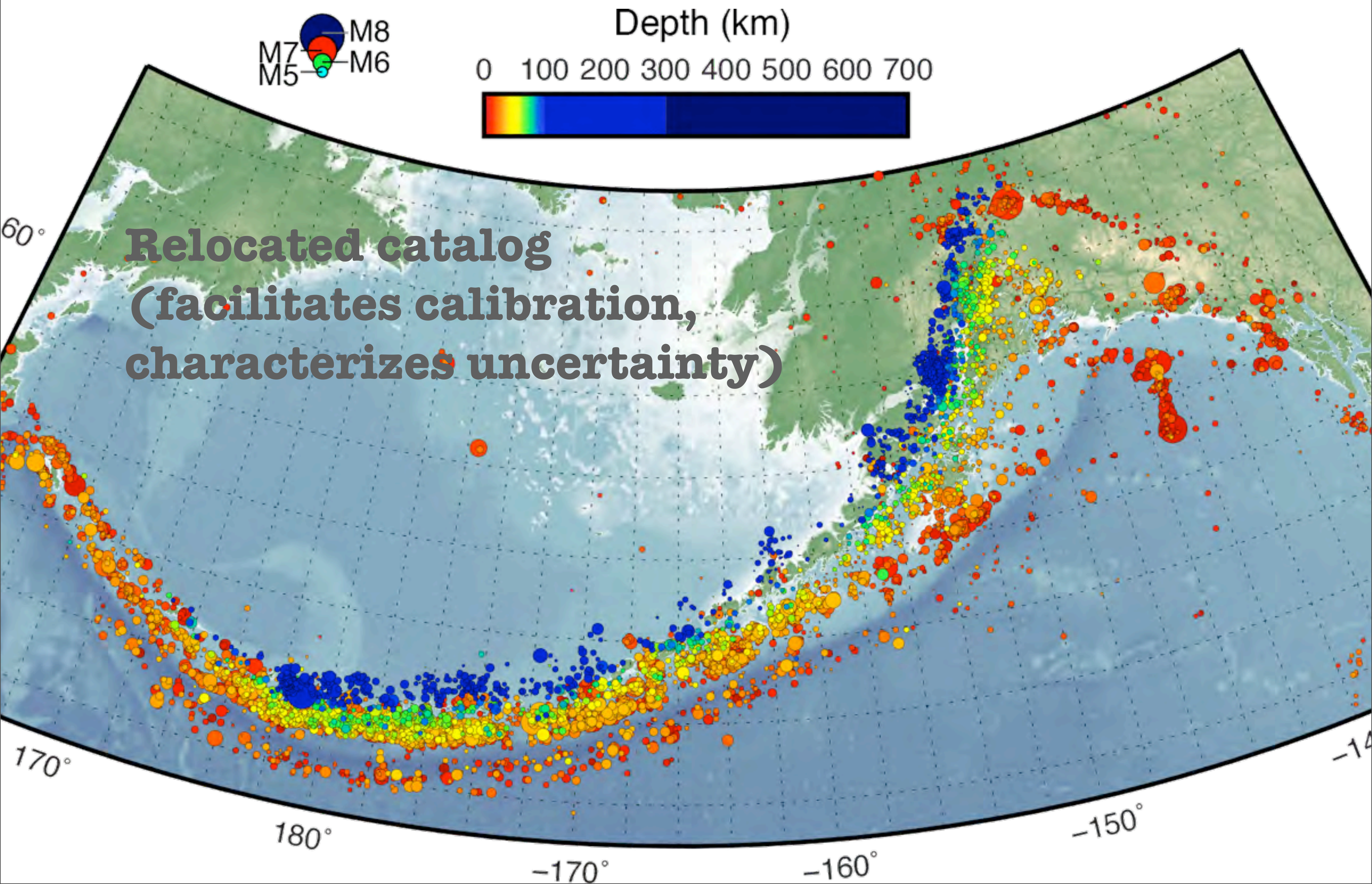


Some Examples of the Importance of Global AND Regional Data…

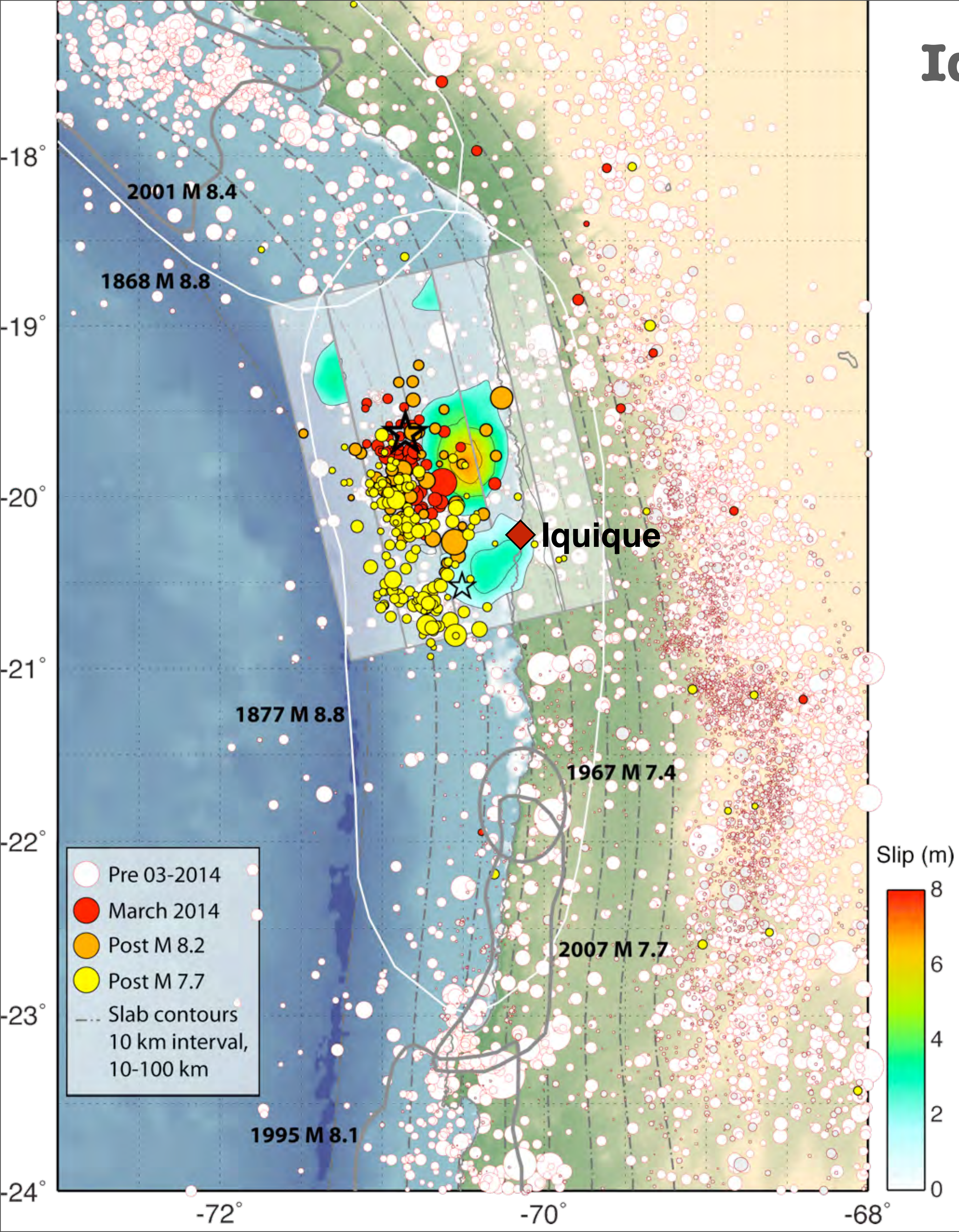
Relocating the Global Catalog



Relocating the Global Catalog

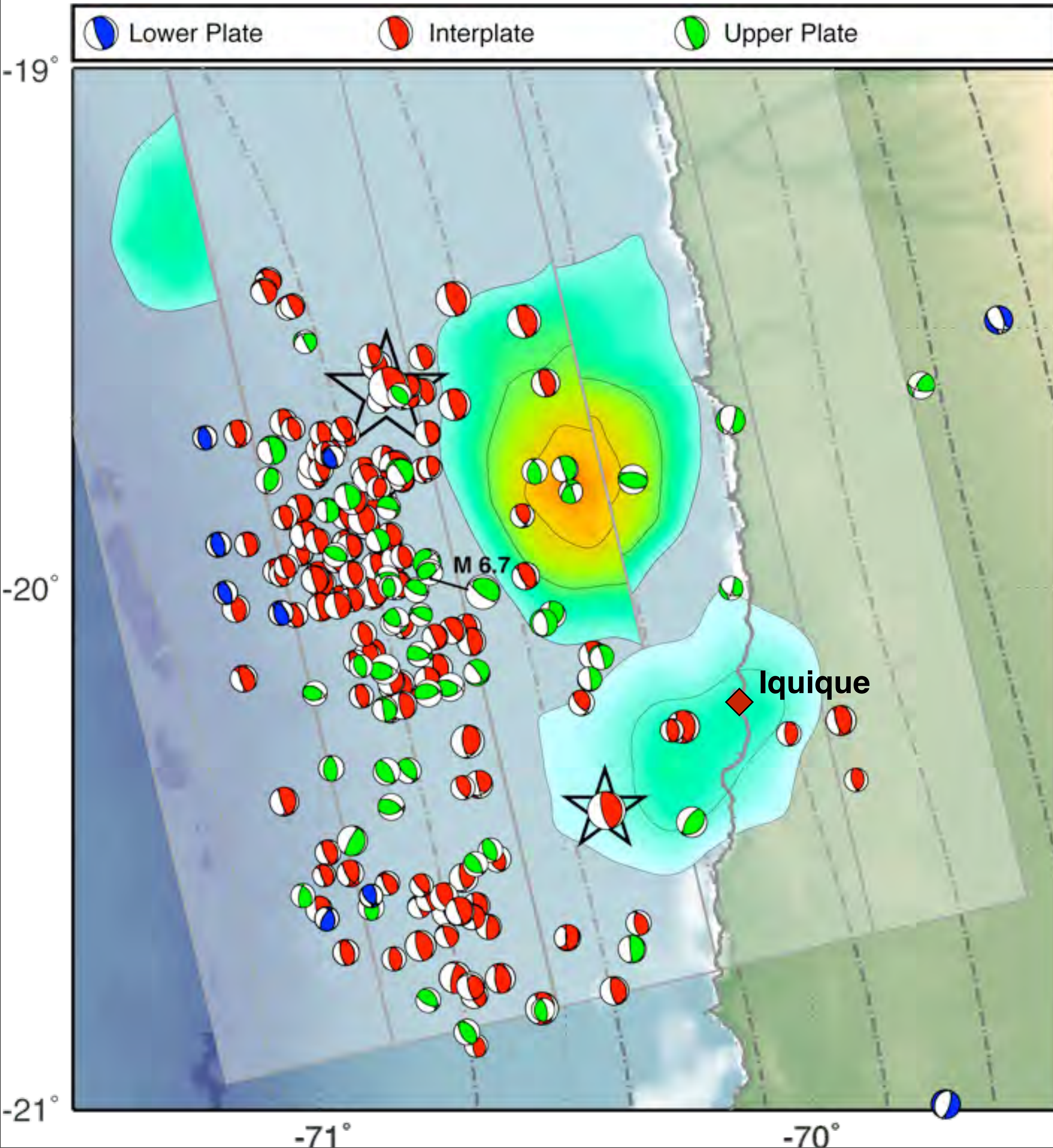


Relocated catalog (facilitates calibration, characterizes uncertainty)



Iquique EQ Sequence

- **Earthquake Relocations** (to reveal detailed relative relationships)
- **Finite Fault Modeling** (source processes of largest events)
- **Regional Moment Tensors** (faulting mechanisms of aftershocks)
- **Coulomb Stress Transfer analyses** (How EQs respond to stress loading - and what hazard remains).



Regional Moment Tensors of sequence show interface thrust faulting dominant, though upper plate (thrust) faulting common also.

The M 6.7 foreshock (March 16) is significantly rotated (NW-SE) wrt to the SZ interface; 60°-70° => upper plate splay?

Occurred in a region of common upper plate faulting.

Advantages of International Partnerships

From NEIC's Perspective:

- Helps to improve the global catalog - both in quantity of events, and in quality of their locations (via efforts in multiple-event relocation techniques).

- In line with our increased focus on regional monitoring and small earthquakes (response to international events improves our domestic monitoring efforts).

- Improves our earthquake response efforts globally - faster response times, more accurate locations & magnitudes.

- Improves earthquake response coordination. One of the more confusing issues for non-scientific agencies involved in earthquake response surrounds conflicting magnitudes. Data & knowledge exchange and coordination efforts can eliminate such discrepancies (i.e., we must share our solutions, not just our data).

Advantages of International Partnerships

From Regional Perspective:

- Multiple quality checks; generation of NEIC products with same datasets provides validation for regional solutions.

- Contribution to global EQ response (useful funding justification).

- Hazards cross borders - thus data sharing should too.

- Different methods require different distance ranges for data - particularly for seismic data, stations close to large EQs can be vulnerable to clipping.

- Improves scientific knowledge of a country. Any given place has more scientific problems than that country can work on alone => open access to data will rapidly advance seismotectonic understanding.

- Data sharing leads to scientific collaborations, knowledge transfer, and improvements in network operations & response (you can learn from our mistakes).

Advantages of International Partnerships

From Regional Perspective:

- Data sharing leads to scientific collaborations, knowledge transfer, and improvements in network operations & response.

- Regional nets can learn from the mistakes made by global groups like USGS & IRIS, so they don't have to be repeated.

- Building on the strengths of data archival & QC at IRIS & USGS benefits long-term data security and quality.

- Many opportunities for shared training exercises to make network installation & management better quality, and more uniform.

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Thank You

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