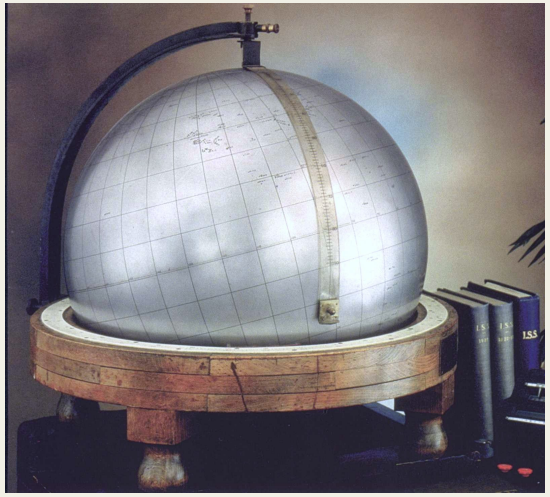


INTERNATIONAL SEISMOLOGICAL CENTRE

ISC

MISSION and PRODUCTS

Dmitry A. Storchak, Domenico Di Giacomo, James Harris

www.isc.ac.uk

International Seismological Centre, ISC

Prof. John Milne

- set up in **1964** to continue the work of the ISS and BAAS (from early **1900s**)
- international, non-profit, non-governmental
- based in **UK**
- 17-19 staff

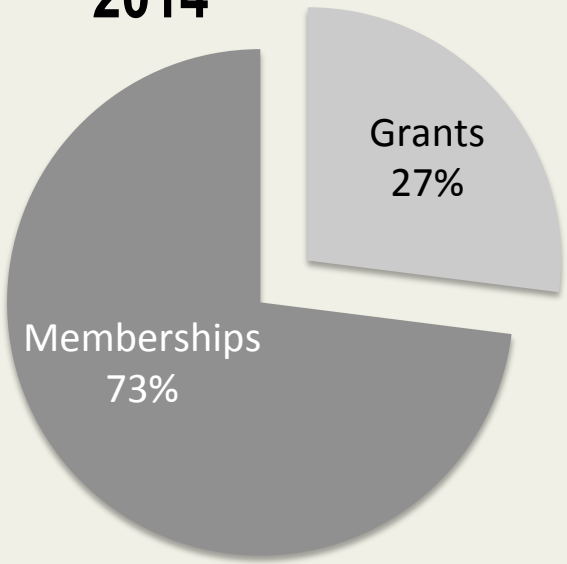
Supported by:

62 Member-Institutions worldwide, including Argentina, Chile, Jamaica, Mexico, Puerto Rico and Trinidad in LACSC region

Grants: *CTBTO, FM Global, GEM Foundation, Lighthill network, NSF, OYO, USGS*

Sponsors: *Reftek*

2014



ISC data products: www.isc.ac.uk

International Seismological Centre

Home | About ISC | Staff | Contact us | Site Map

About ISC | ISC Bulletin | International Station Registry | ASPEI GT Events | EHB Bulletin

Event Bibliography | Bibliography of Seismology | Seismological Contacts | ISC-GEM Catalogue

ISC News

2014-01-16
Sep - Dec 2013 Newsletter

2014-01-16
May - Aug 2013 Newsletter

2014-01-16
The new version 2.2.4 of the ISC locator code released

2013-04-14
ISC Event Bibliography released

News for / from data contributors

2013-11-21
Census of legacy Quanterra dataloggers

2013-04-26
100 years of the OSC, Bolivia

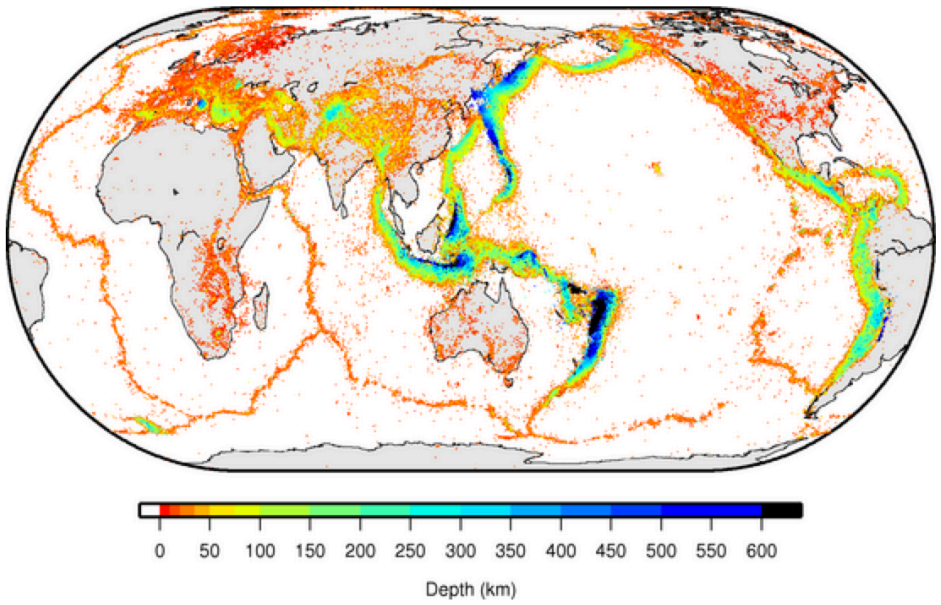
2012-11-05
Temporary development work, SRC, Trinidad

2012-10-06
Zlata Sinyova, KNDC, Kazakhstan

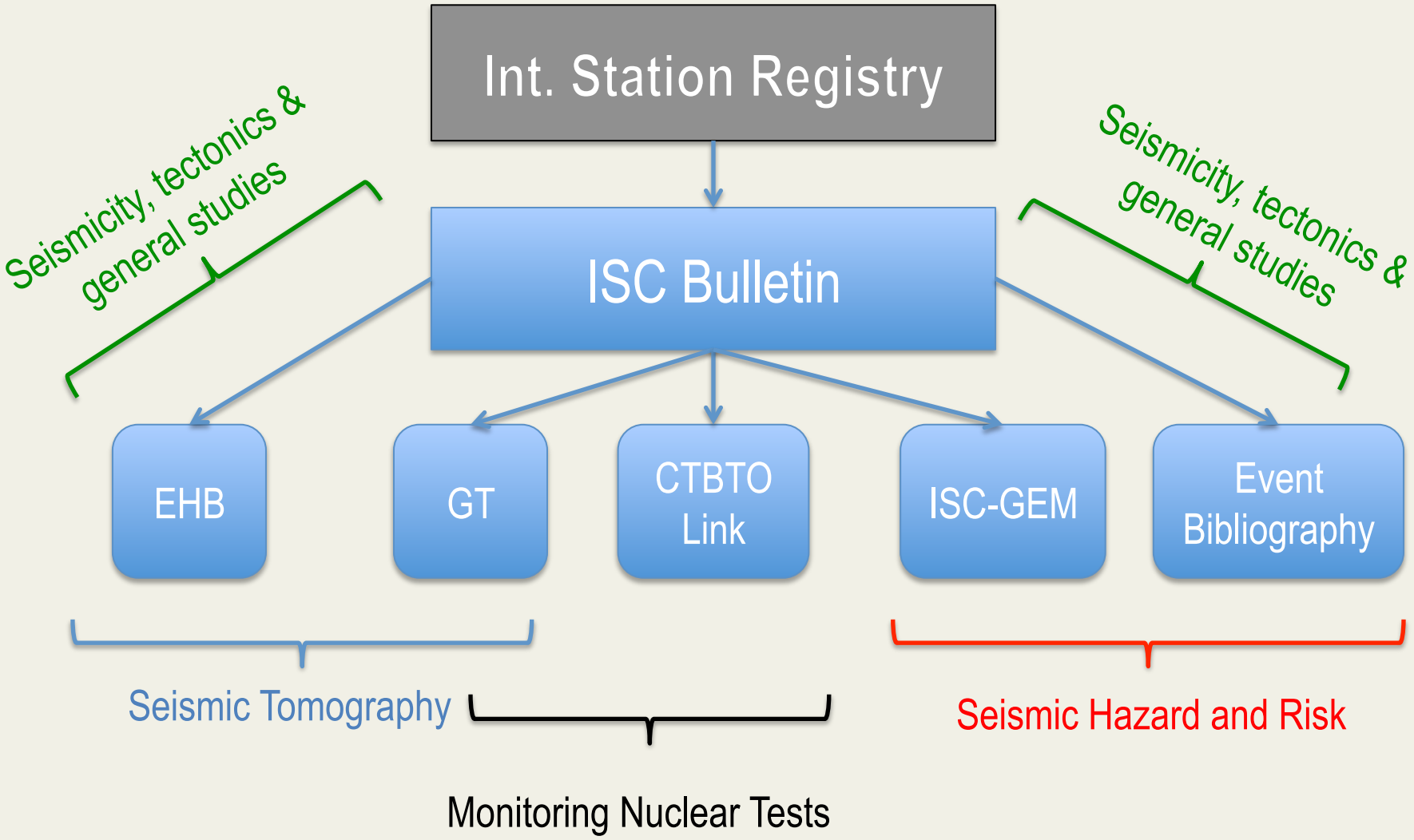
International Seismological Centre | Centre Séismologique International | Международный Сейсмологический Центр | 国際地震センター

国际地震中心 | Internationales Seismologisches Zentrum | المركز الدولي لبحوث الزلازل | Centro Internacional de Sismología

ISC locations: 1960 to present

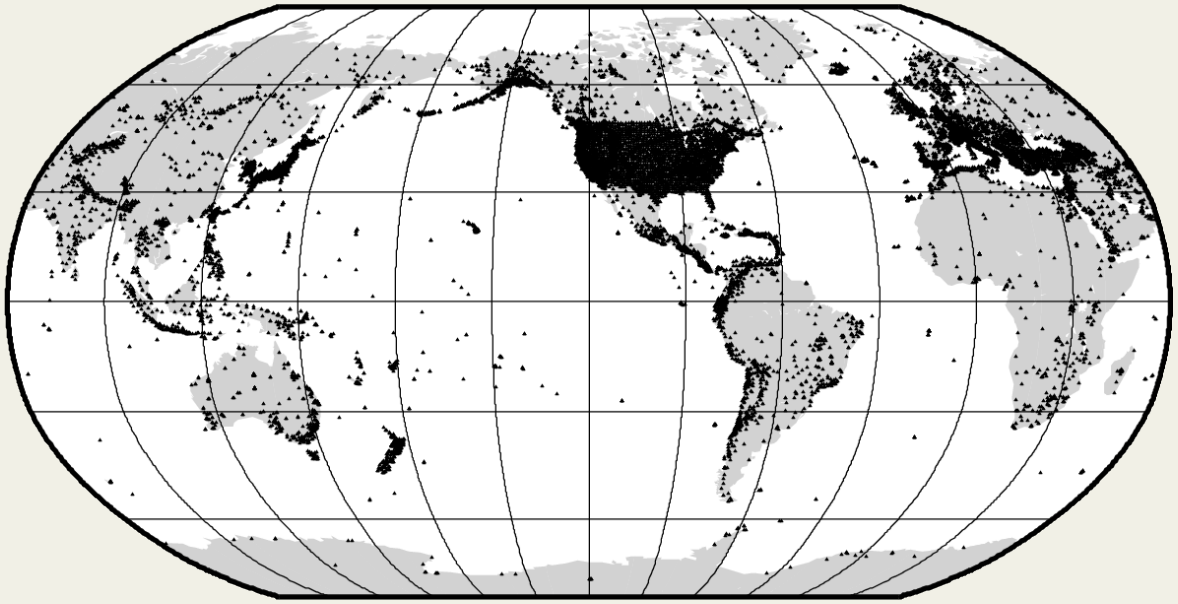


The ISC data products



1: International Seismograph Station Registry

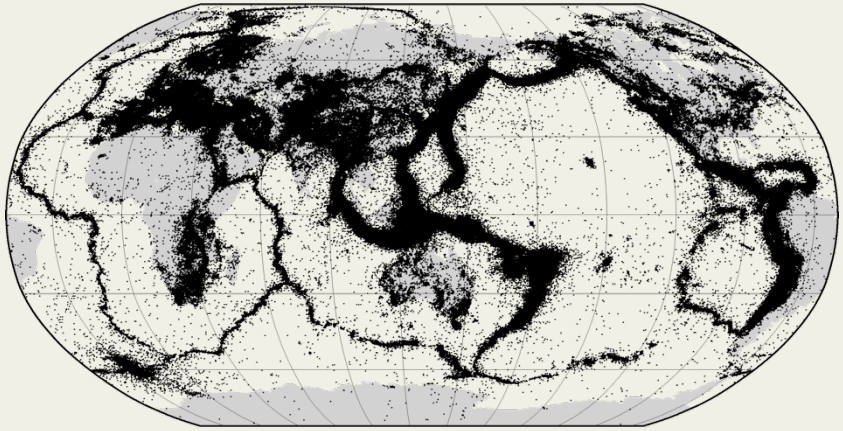
Since 1970s, we maintain the Registry jointly with NEIC / USGS



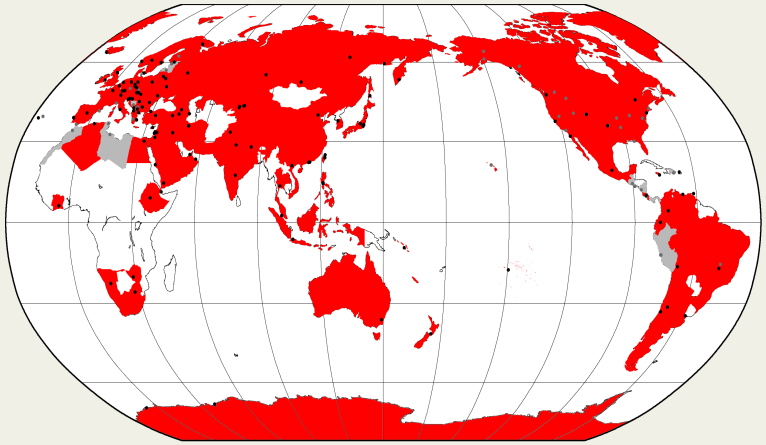
***~19,000** stations,*
open or closed,
were registered in the IR
at the end of 2013

The IR station codes are used in various types of seismological research as well as for waveform storage and distribution by IRIS DMC, EIDA and other data centres

2: ISC Bulletin (1964-2014)



5 million events, 1960-2014

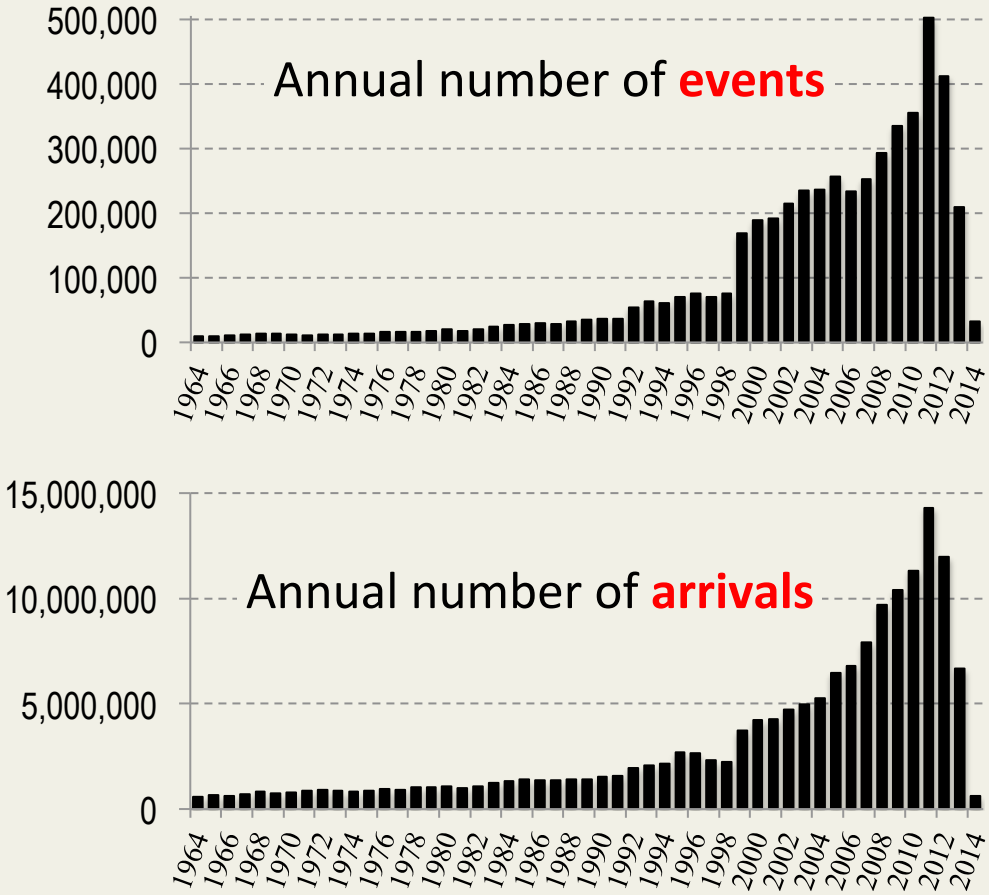


130 agency-contributors

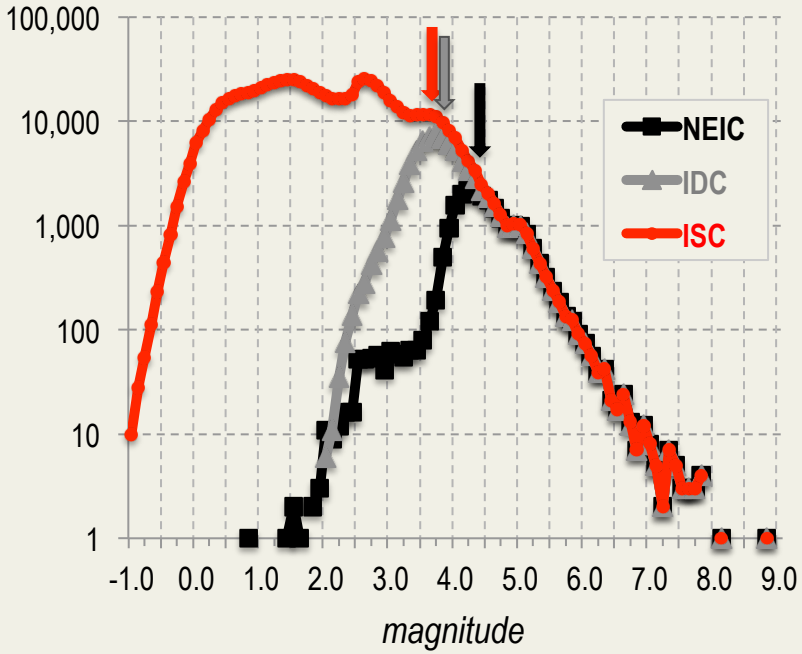
- The definitive and the most complete long-term record of global earthquake information
- Contains major source parameters of over 5 million seismic events: natural and anthropogenic
- ~130 agencies around the world report bulletin data to be included into the ISC Bulletin.
- Dry land territories covered by these reports are in red. Grey areas covered via reports from NEIC, EMSC and CASC.
- Individual agency bulletins in different formats are parsed, checked, merged per natural event, event parameters re-calculated, reviewed and made available to users in a standard format.

2: ISC Bulletin

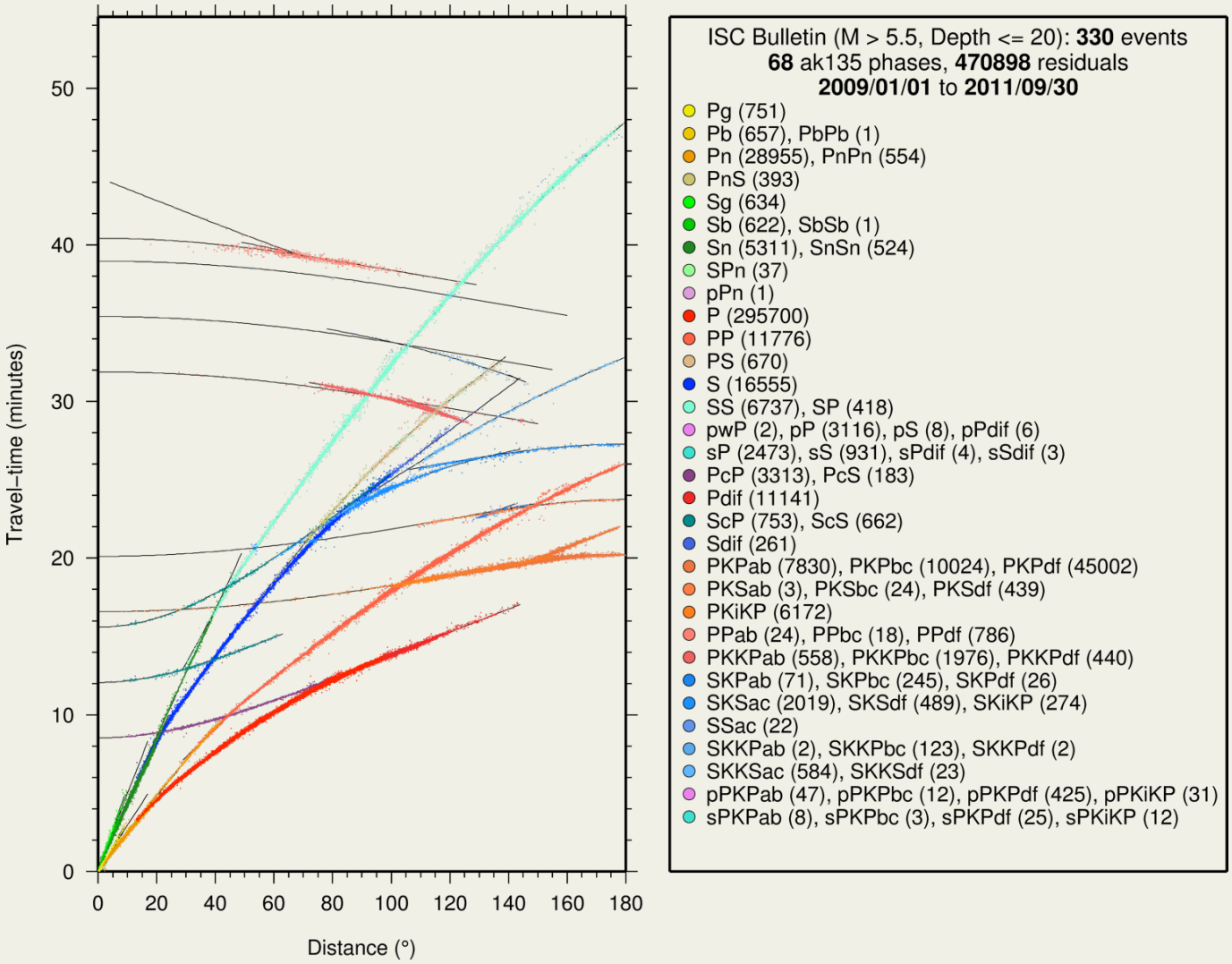
Growth of event & phase data volume continues



Worldwide, the ISC Bulletin is more complete than either of NEIC or IDC

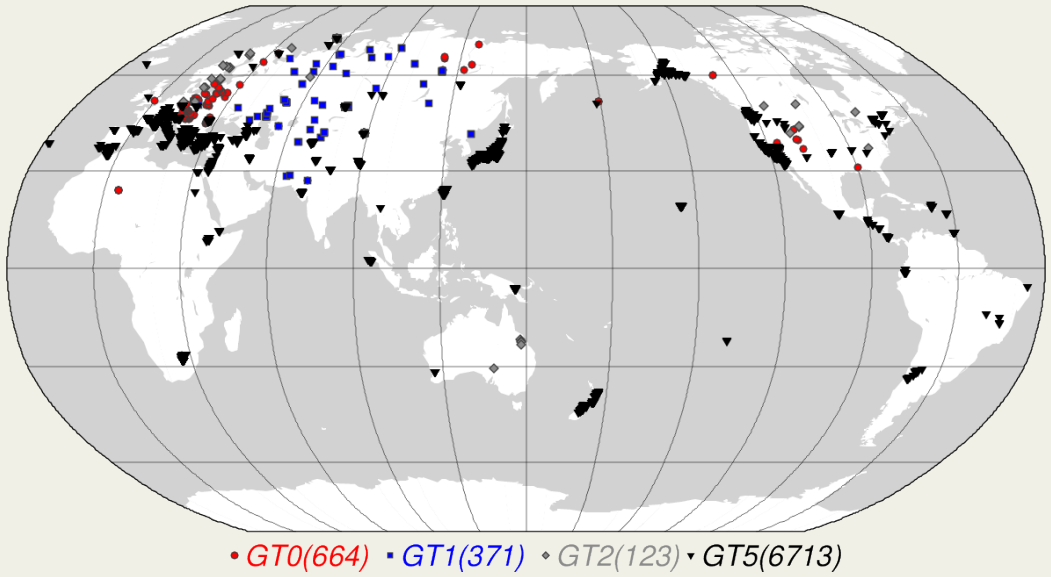


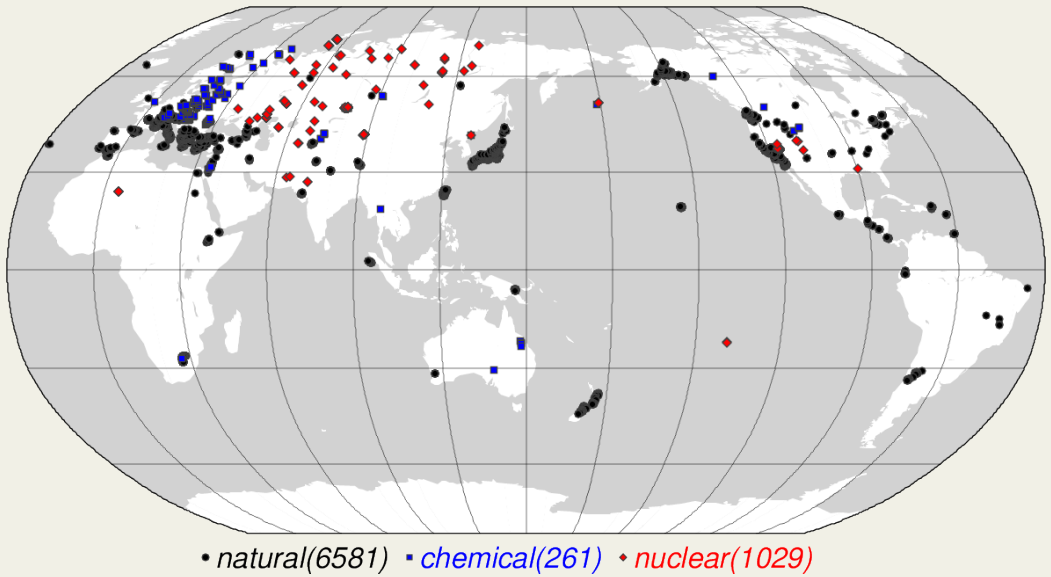
2: ISC Bulletin



The ISC Bulletin contains arrival times of many different types of seismic waves, including those predicted by the ak135 velocity model

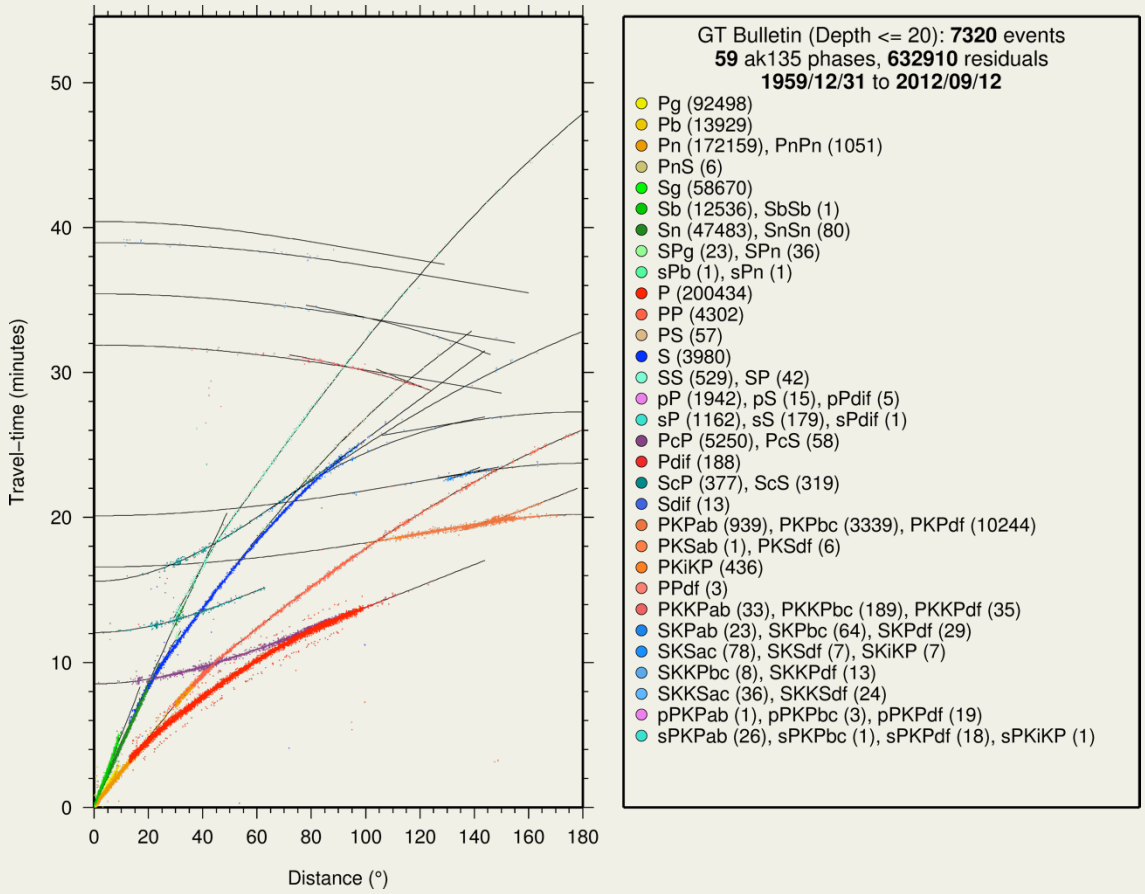
3: IASPEI Reference Event List, GT (1959-2012)





- The IASPEI Reference Event List, commonly known as the GT-ground truth bulletin, is a database of earthquakes and explosions, for which:
  - ✓ hypocentral information (lat, lon, depth) is known with high confidence (to 10 km or better (GT10)) and
  - ✓ seismic signals recorded at regional and/or teleseismic distances.
- The list is maintained by the ISC under the supervision of IASPEI

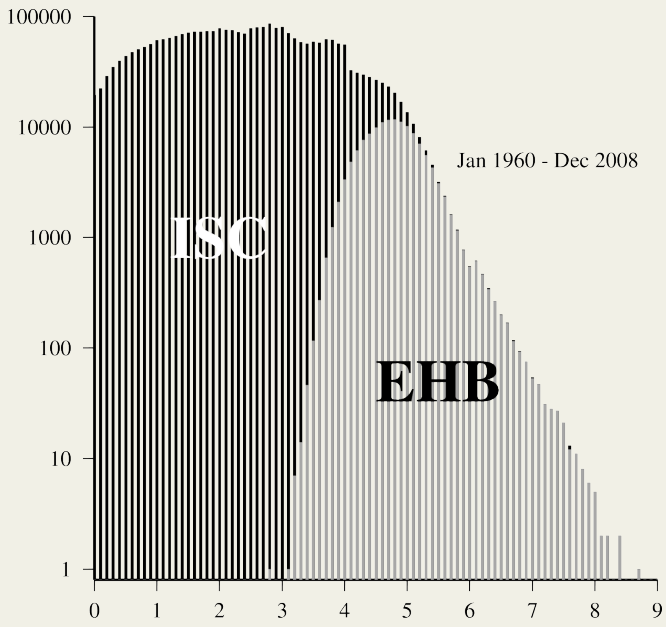
3: IASPEI Reference Event List, GT



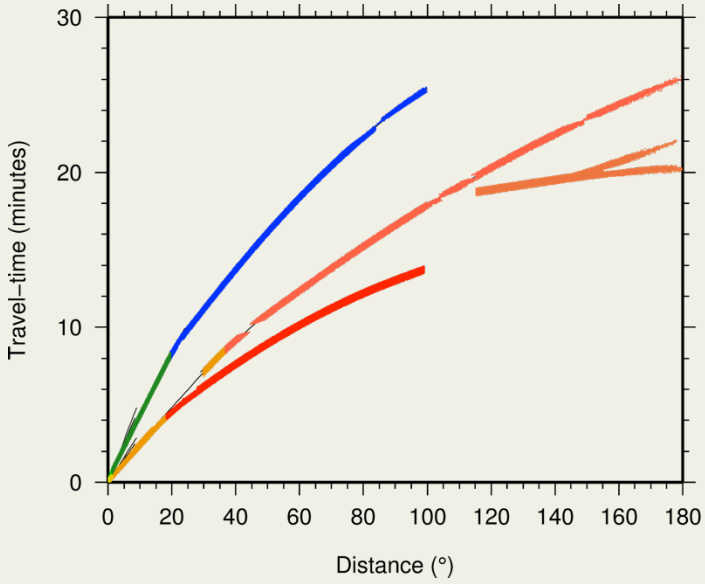
~8,000 events

~650,000 seismic arrivals

4: EHB (1960-2008)



The EHB dataset is a groomed subset of the ISC Bulletin with well recorded seismic events relocated using *(Engdahl et al, 1998)* technique

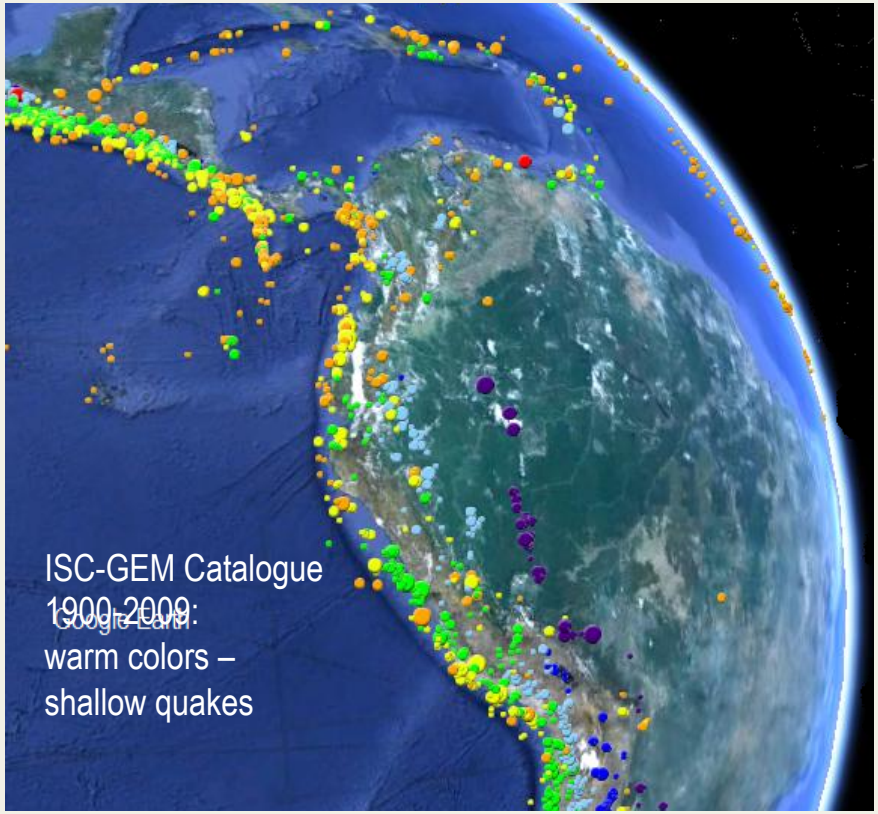


EHB Bulletin (Depth <= 20): **37262** events
16 ak135 phases, **6780078** residuals
1960/01/01 to **2008/12/31**

- Pg (31922)
- Pb (9959)
- Pn (851574), PnPn (12998)
- Sg (17265)
- Sb (9118)
- Sn (203515)
- P (4236435)
- PP (109526)
- S (273235)
- pwP (100553), pP (133404)
- sP (79647)
- PKPab (77791), PKPbc (165270), PKPdf (467866)

The EHB contains arrival times of the most prominent and well reported types of seismic waves

5: ISC-GEM Catalogue (1900-2009)



- **1900-1917**: M_S≥**7.5** worldwide + smaller shallow events in stable continental areas
- **1918-1959**: M_S≥**6¼**
- **1960-2009**: M_S≥**5.5**

The ISC-GEM Global Instrumental Earthquake Catalogue is built for the purpose of seismic hazard assessment:

- ~19,000 homogeneous hypocentre locations and M_W estimates
- with the estimates of uncertainty
- covering 110 years period
- prepared using uniform location and magnitude determination techniques,
- using original arrival time measurements

5: ISC-GEM Catalogue, large data entry effort

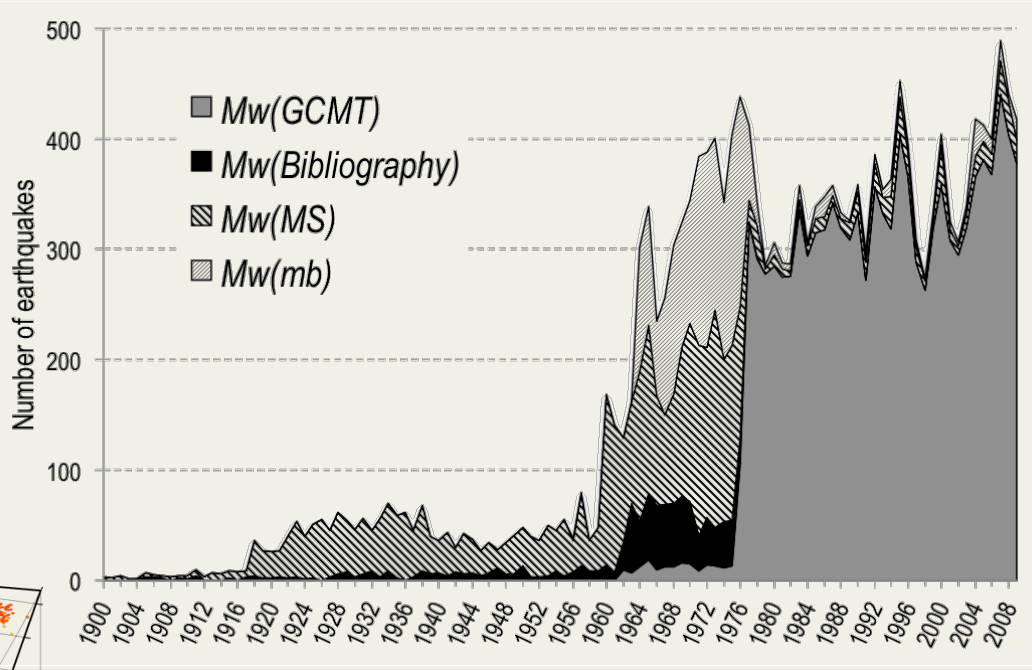
The work on the ISC-GEM Catalogue required digitising of a large volume of data that has not been available electronically in the past.

Global Parametric Data	1900–1959	1960–1970	1971–1977	1978–2009
Body wave arrival times amplitudes & periods	Became electronically	Already available		
Surface wave amplitudes & periods	available thanks to the			as part of the
Mo & Mw	ISC–GEM catalogue			ISC & GCMT

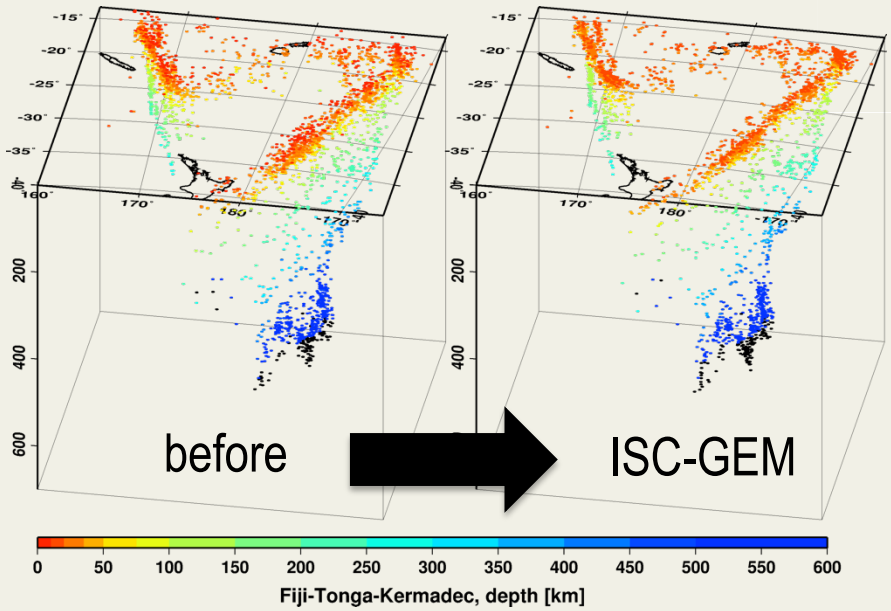
(Storchak et al., 2014)

5: ISC-GEM Catalogue, homogeneity

All magnitudes are expressed in M_W scale with uncertainties



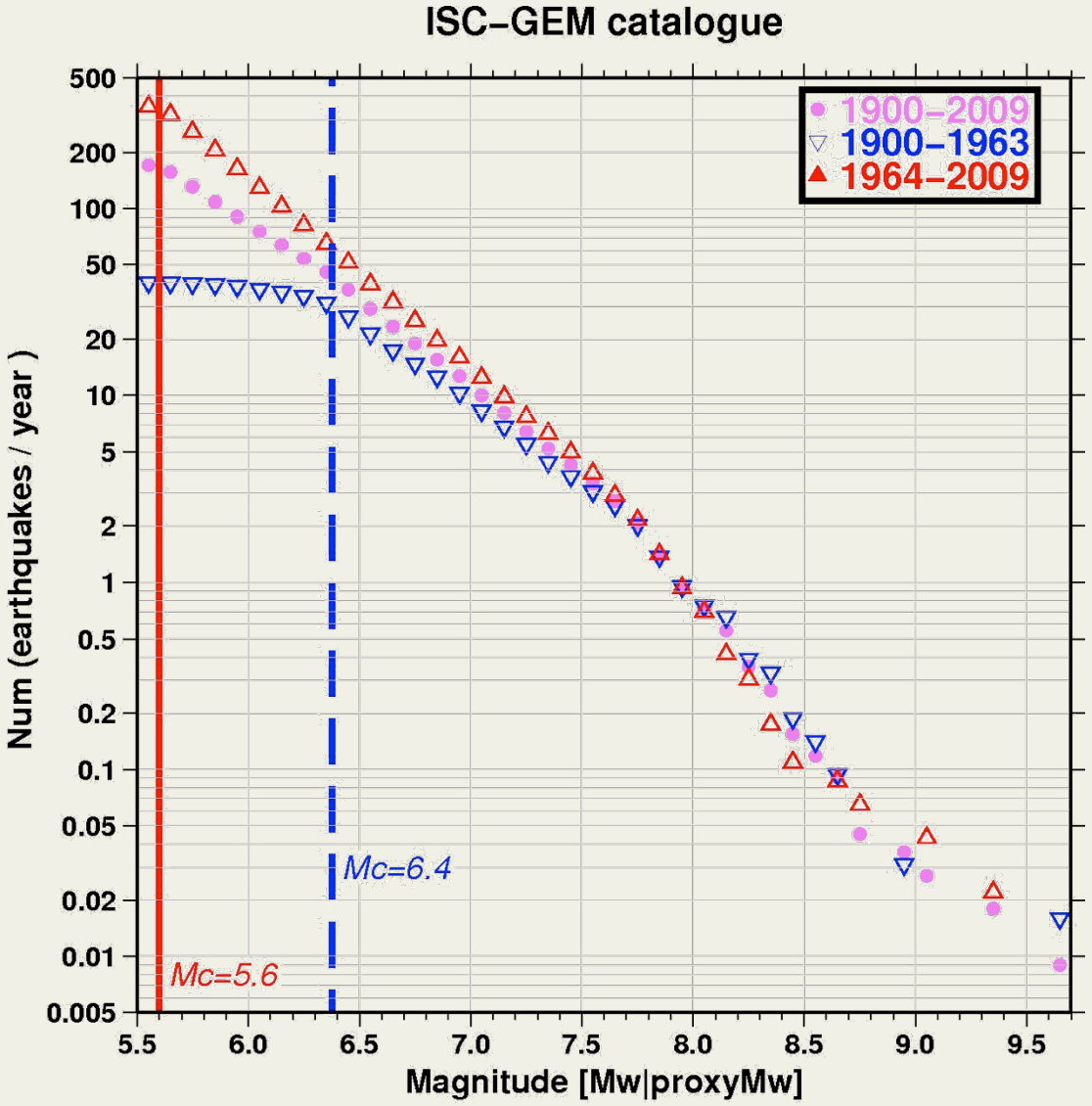
(Storchak et al., 2014)



(Bondár et al., 2014)

All hypocentres recomputed using a combination of **EHB** and **ISC** location techniques

5: ISC-GEM, magnitude-frequency distribution

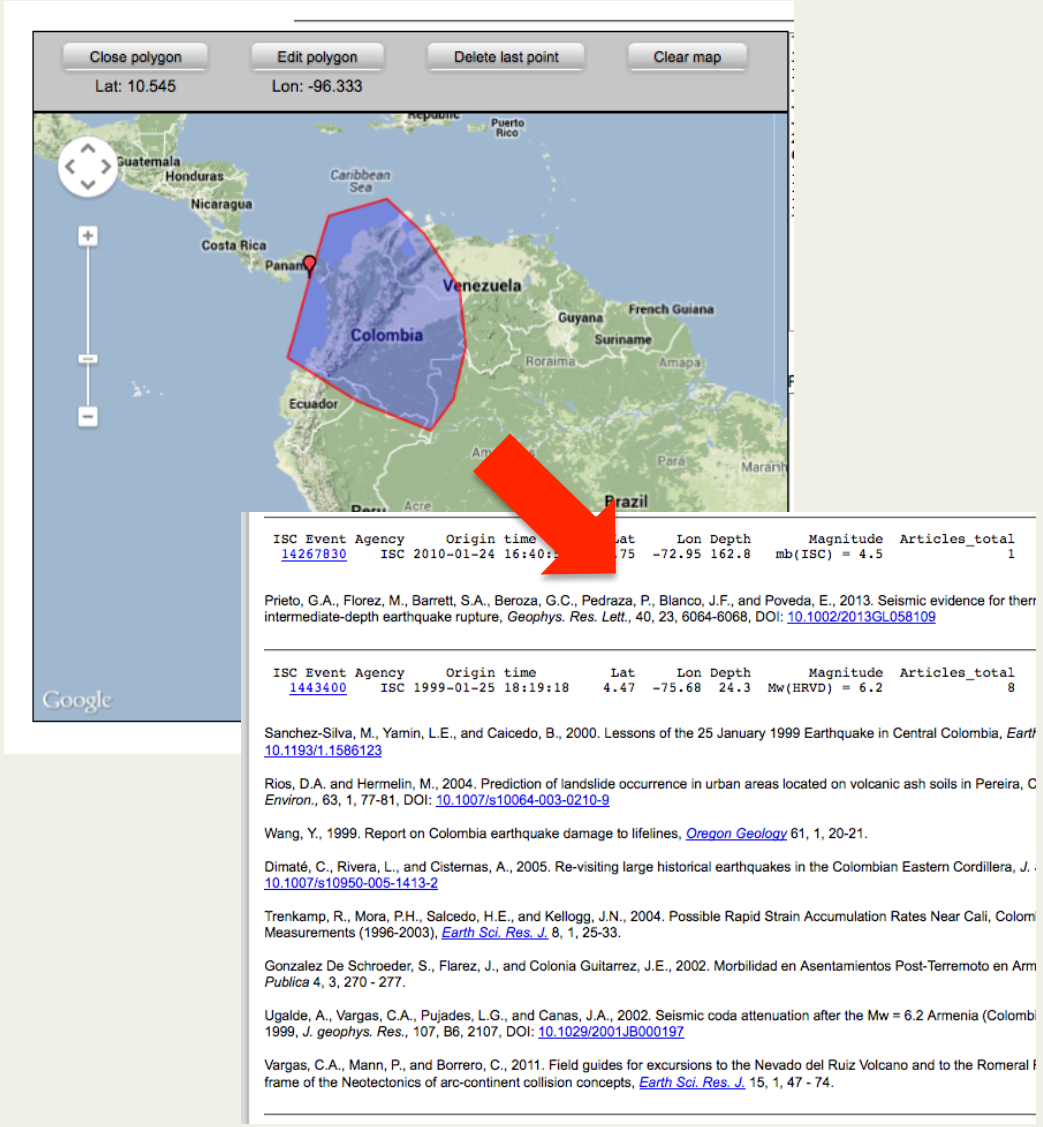


Seismicity rates for large (M>7.5) earthquakes better assessed considering the entire time period (pink)

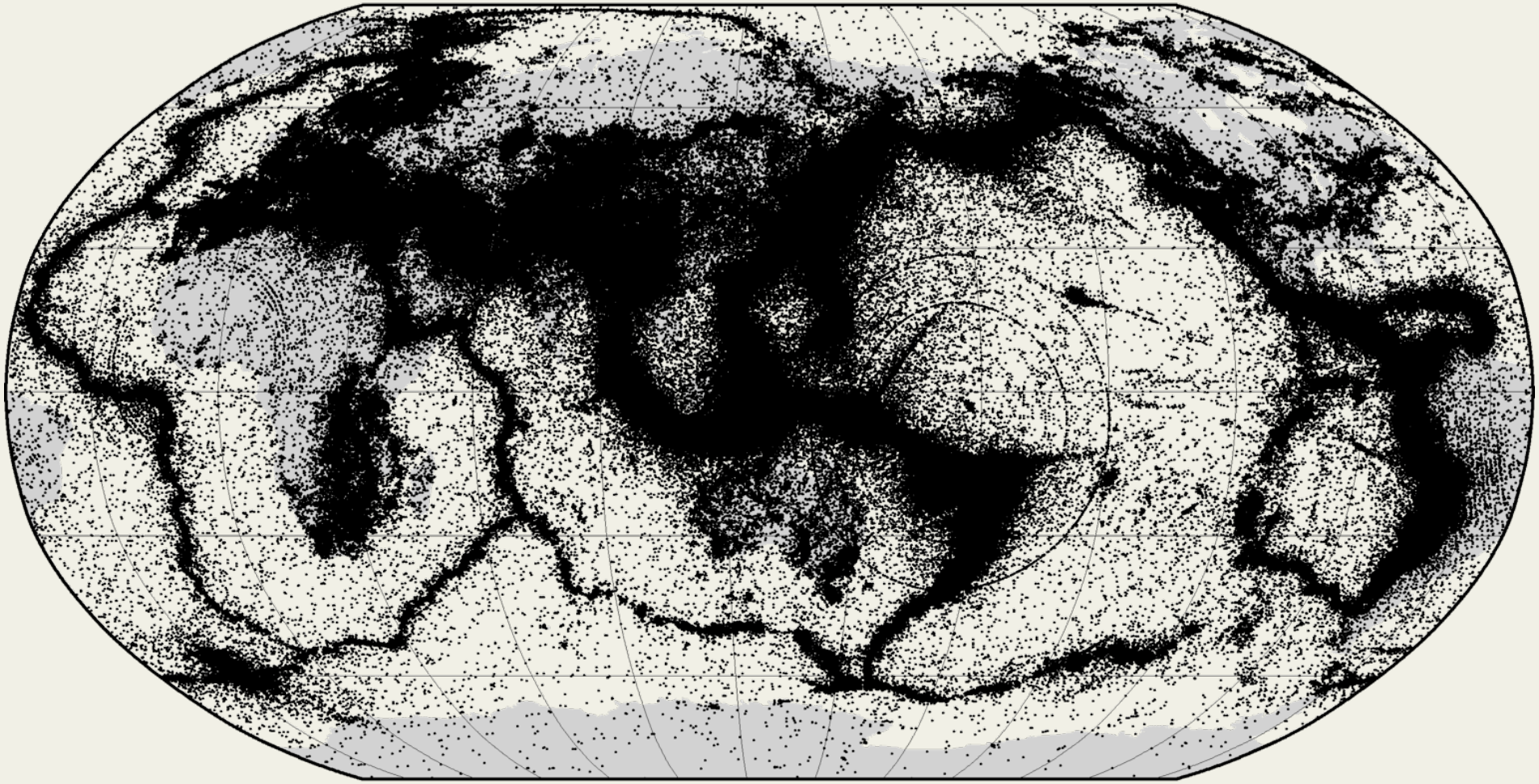
For moderate earthquakes the modern period (red) is a better basis for magnitude-frequency studies, whereas for strong to major shallow earthquakes the entire ISC-GEM catalogue should be used

6: ISC Event Bibliography (1904-2014)

- An interactive web-search for references to scientific articles related to seismic events in a particular region and period of occurrence/publication;
- **~16,000** articles, **~14,000** seismic events and **~500** journal titles (Di Giacomo *et al.*, 2014);
- seismic events cover: 1904-present;
- publications cover: 1950–present;
- includes articles in many fields of Geosciences;

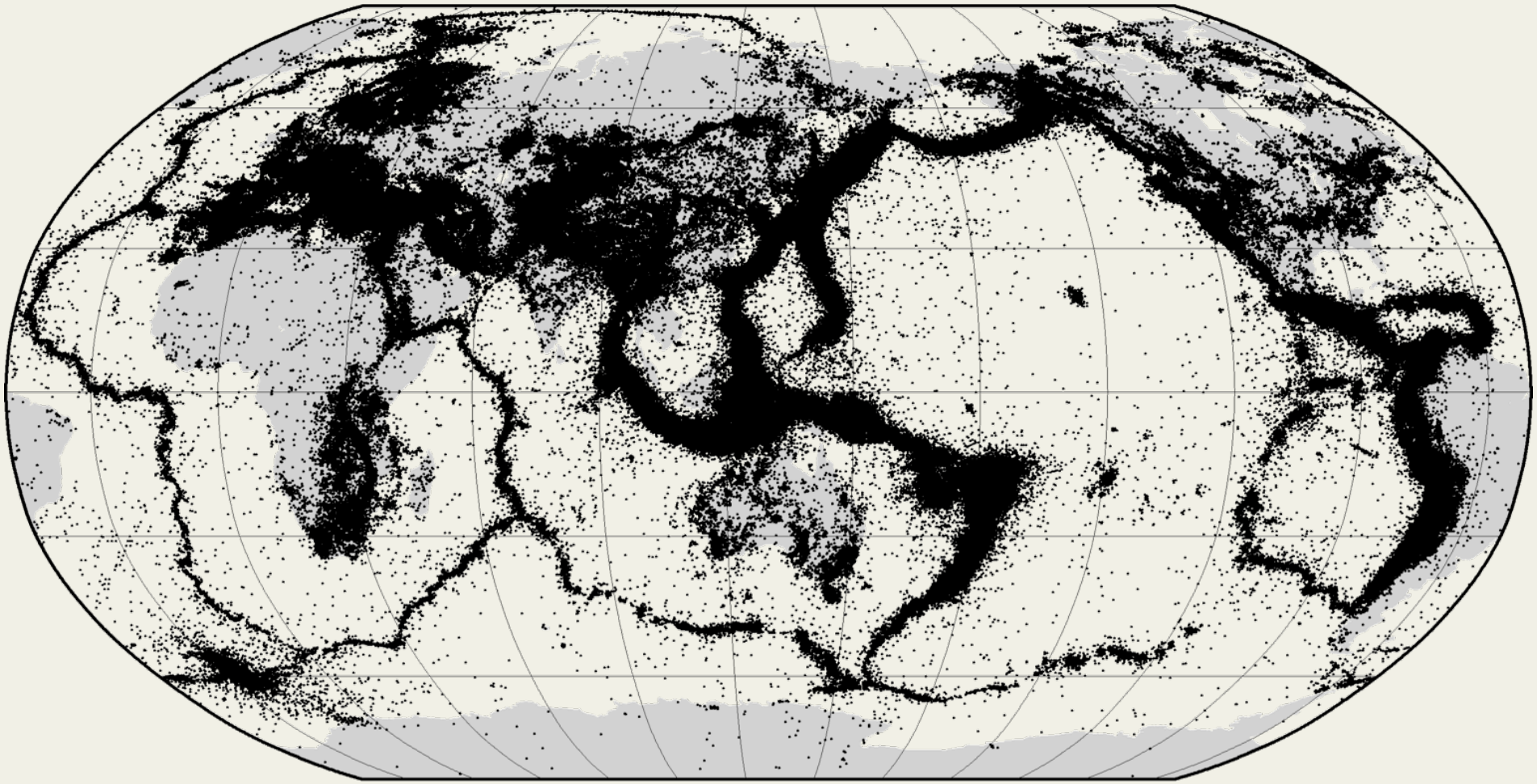


All hypocentres reported to the ISC



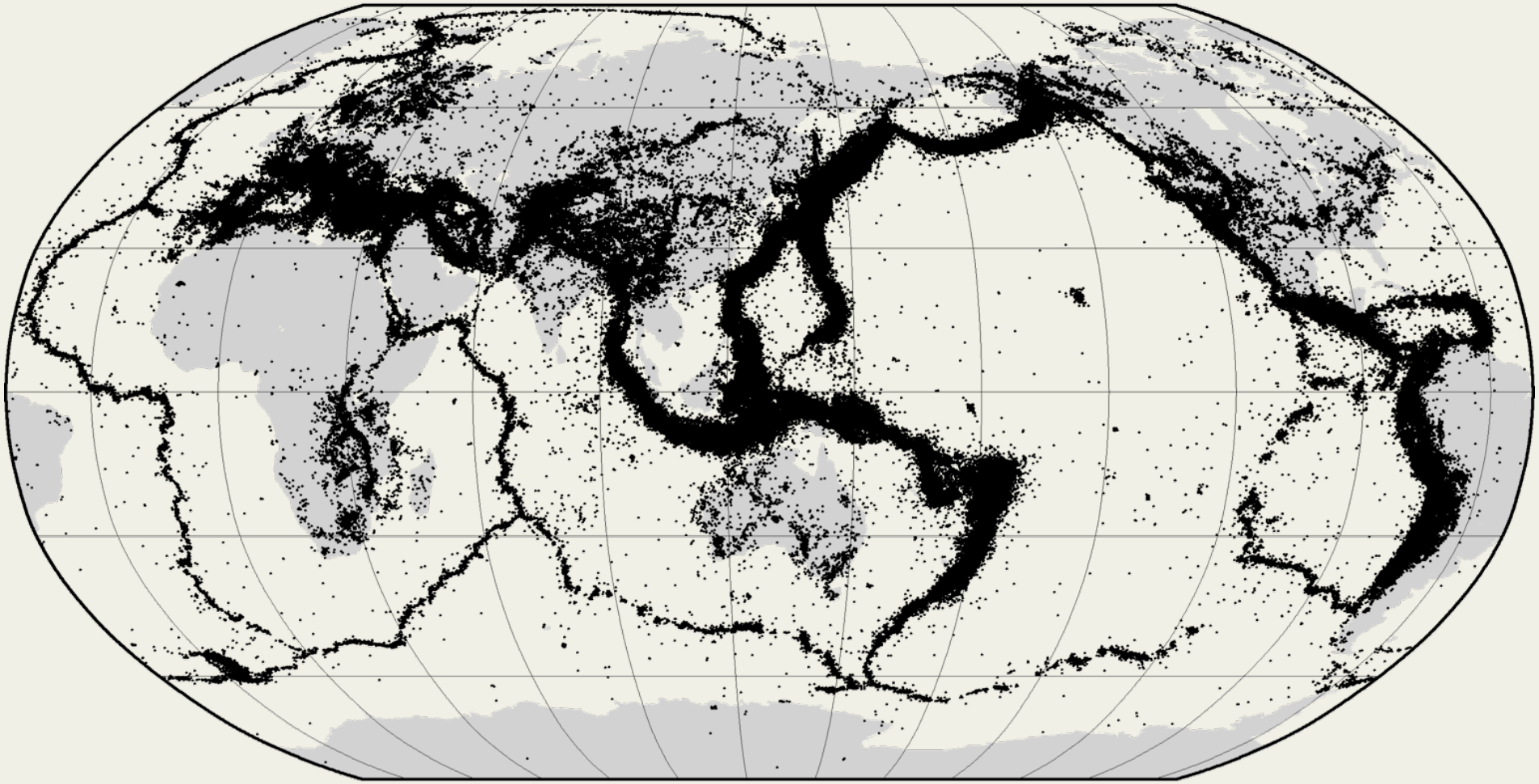
10 M hypocentre solutions

Events in ISC Bulletin, grouped (1964-2014)



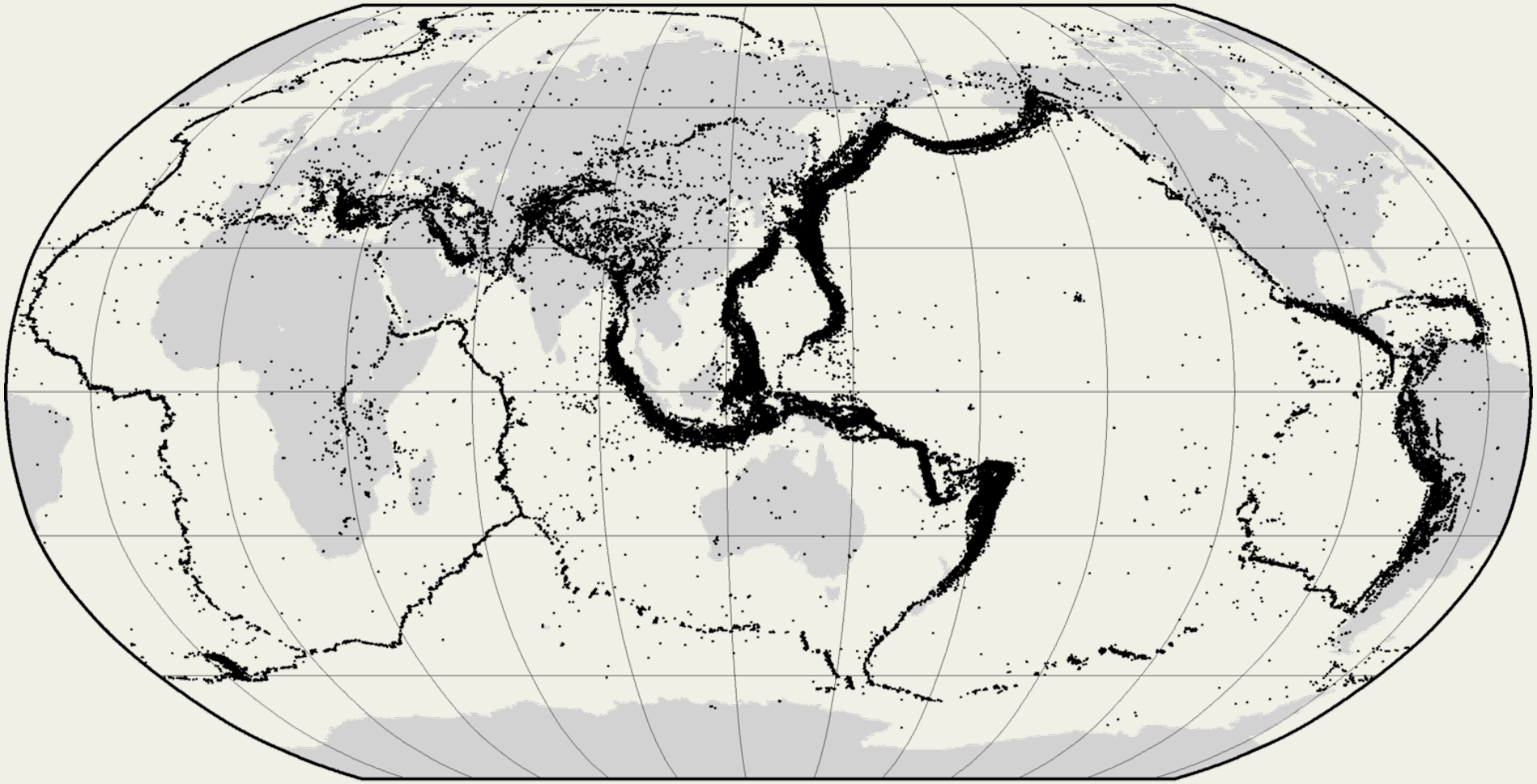
5.1 M events

Events relocated by ISC (1964-2011)



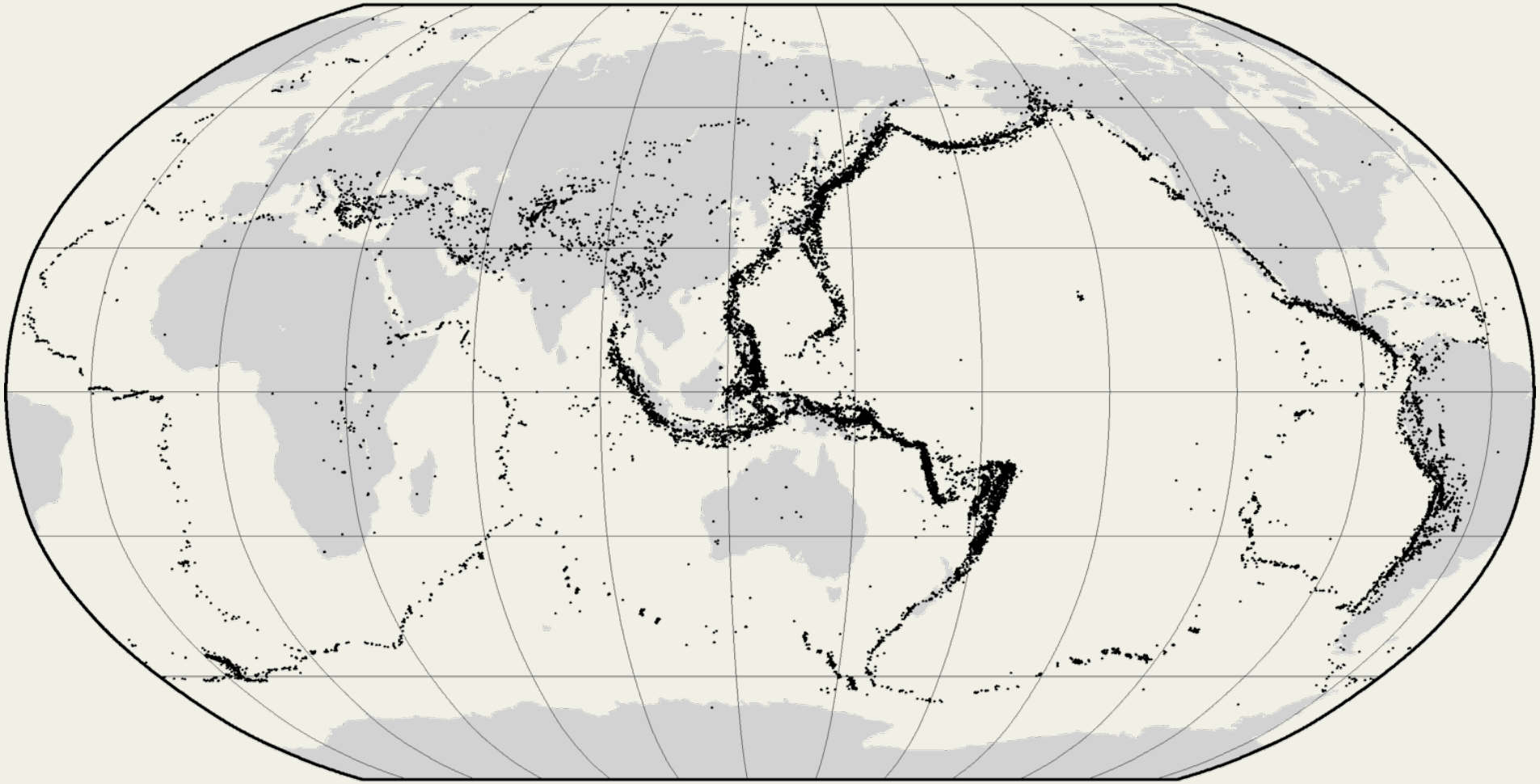
1.1 M events

EHB (1960-2008) (Engdahl *et al*., 1998)



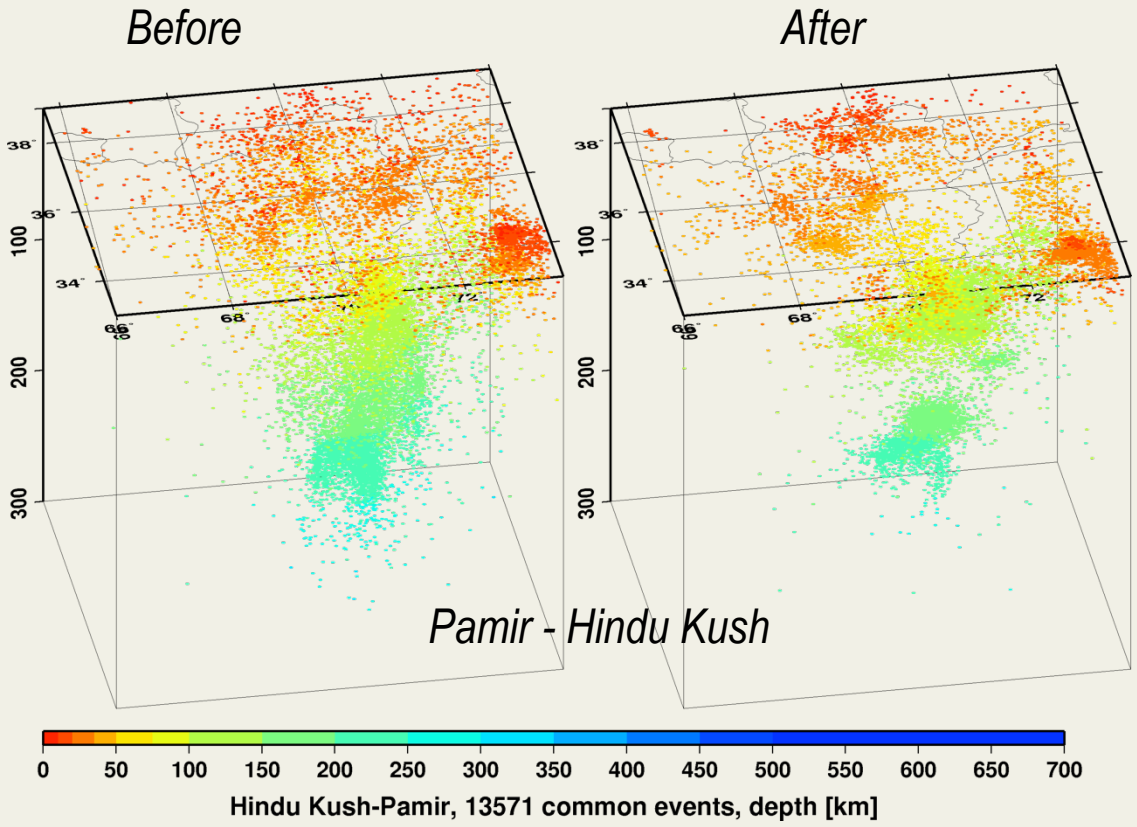
0.14 M events

ISC-GEM events, M>=5.5 (1900-2009)



20 K events

New ISC seismic event locator

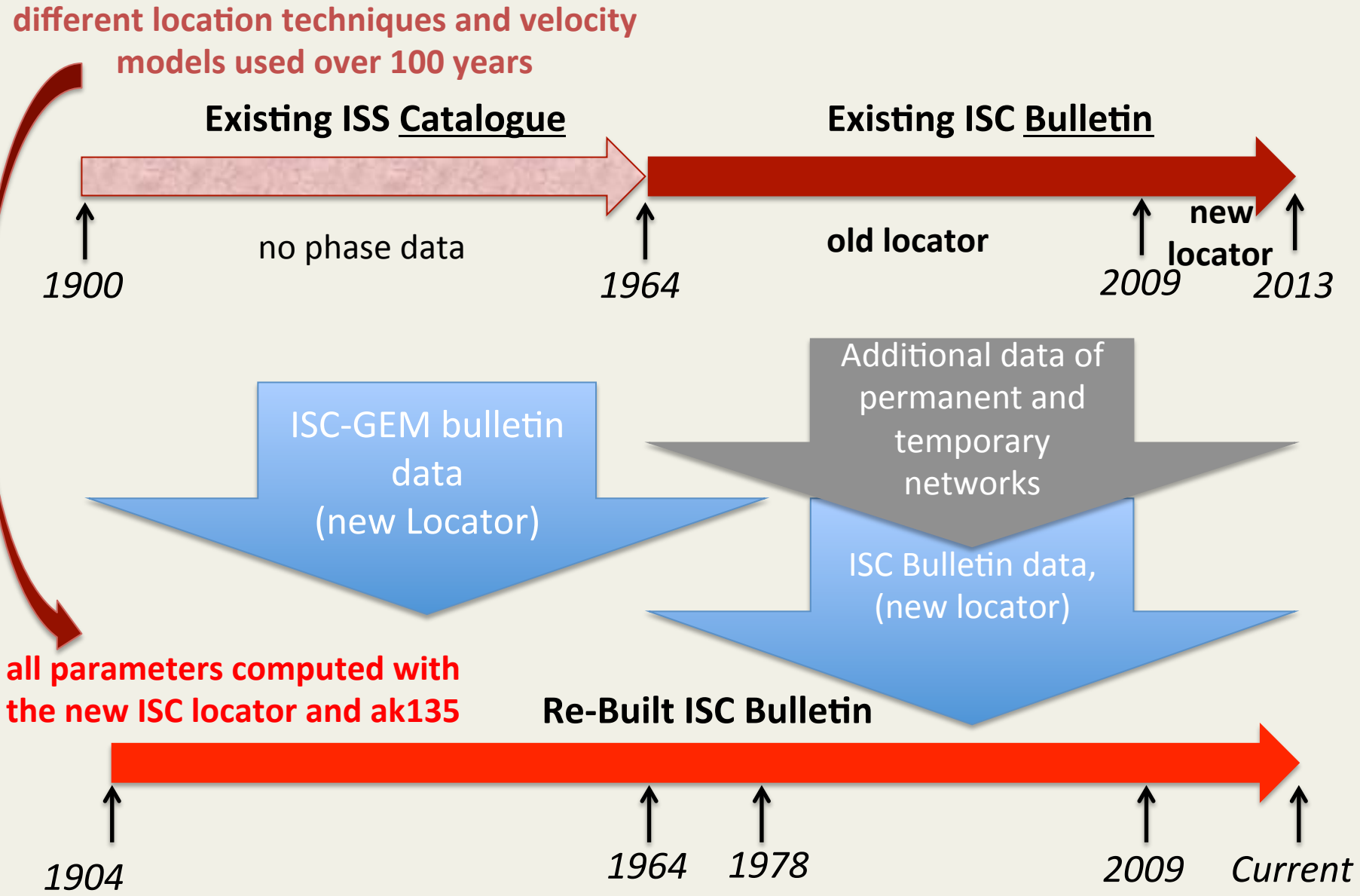


- ✓ uses all ak135 predicted phases;
- ✓ obtains an initial hypocentre via the Neighbourhood Algorithm;
- ✓ accounts for correlated travel-time prediction error structure;
- ✓ performs iterative linearized inversion using *a priori* estimates of the data covariance matrix;
- ✓ obtains depth-phase depth via depth-phase stacking;
- ✓ provides robust network magnitude estimates with uncertainties;
- ✓ attempts free-depth solution only in the presence of local networks or reported depth-sensitive phases;
- ✓ if there is no depth resolution, the depth is fixed to a region-dependent default depth.

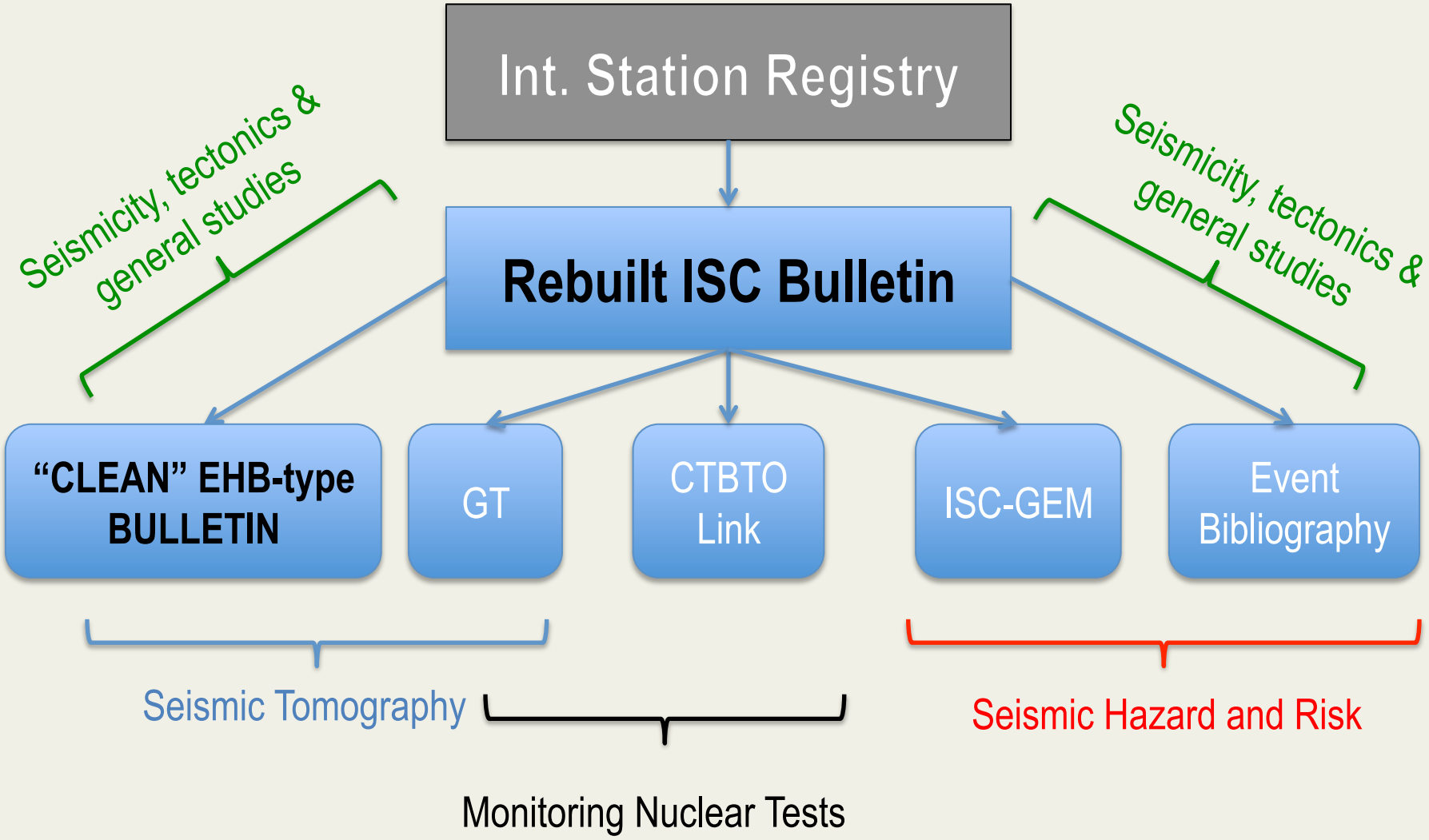
The new ISC Location program was put in operation from data year 2009 *(Bondár & Storchak, 2011)*

The Bulletin for 1964-2008 so far retained the original hypocentre locations

ISC Bulletin Rebuild, ingredients



The ISC data products as expected by mid-2015



Summary

- The ISC continues with its unique long-term international mission collecting seismic bulletin data from 130 agencies worldwide
- The ISC Products are freely available:
  - Int. Station Registry (1964-2014)
  - ISC Bulletin (1964-2014)
  - EHB (1964-2008)
  - GT (1959-2012)
  - ISC-GEM Catalogue (1900-2009)
  - ISC Event Bibliography (1950-2014)

- The Rebuilt ISC Bulletin will be available by mid-2015.
- Several geophysical institutions in LAC region are ISC members and many more contribute bulletin data to the ISC
- We encourage other geophysical institutions in the LAC area to join the ISC and provide bulletin data on a regular basis.

International Seismological Centre