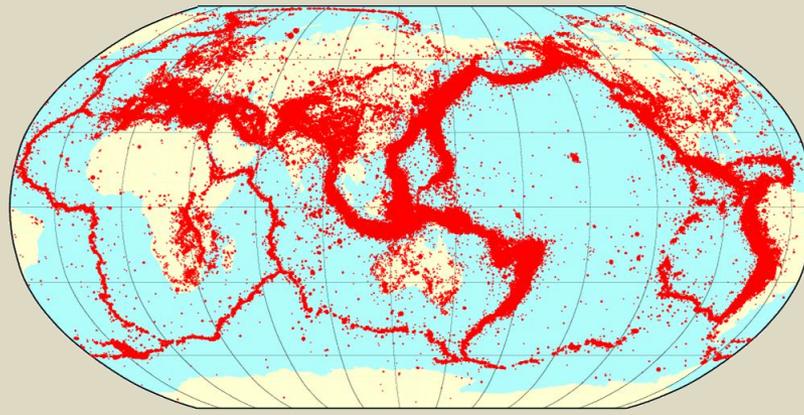




# GEM Global Instrumental Seismic Catalogue (1900-2009)

Dmitry A. Storchak (ISC),  
on behalf of international team of experts

# Purpose of the project



To compile a Reference Global Instrumental Seismic Catalogue  
(1900-2009)  
to be used by GEM for characterization of the spatial distribution  
of seismicity, the magnitude frequency relation and the  
maximum magnitude.

# International Team of Experts

To work on the project of compilation of the GEM Global Instrumental Catalogue the ISC has put together a team of international experts in the field:

- ✓ Bob Engdahl (Colorado University)
- ✓ Antonio Villaseñor (IES Jaume Almera)
- ✓ Willie Lee (USGS, emeritus)
- ✓ Peter Bormann (GFZ, emeritus)
- ✓ István Bondár (ISC)
- ✓ Dmitry Storchak (ISC)
- ✓ Graziano Ferrari (INGV/SISMOS)
- ✓ Peter Suhadolc and colleagues from Japan, Germany, US & UK as observers on behalf of the IASPEI.

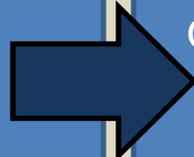
Overall project management by **Dmitry Storchak** with scientific input from **Willie Lee**.

The Project has **6 Tasks**.

# Task 1: Earthquake Relocation

## Approach:

Similar to one used for Centennial Catalogue by R.E. Engdahl & A. Villaseñor with special care taken on earthquake depth determination



## Major Sources of Bulletin Data:

Abe and Noguchi (1900-1903)  
Gutenberg-Richter Notepads (1904-1917)  
ISS Bulletins (1918-1963)  
ISC Bulletins (1964-2009)  
&  
Some other quality bulletins

- 1900-1917:  $M_s \geq 7.5$  worldwide + smaller shallow events in stable continental areas
- 1918-1959:  $M_s \geq 6.25$
- 1960-2009:  $M_s \geq 5.5$

Engdahl,  
Villaseñor,  
Bondár

# Task 2: $M_S$ Computation

$M_S$  is to be computed based on amplitude & period measurements of surface waves recorded at seismic observatories around the world:

- ❑ Already in the ISC database (1971-2009) and
- ❑ Collected from historical station bulletins as part of Task 3

We shall provide:

- ✓ magnitude uncertainties,
- ✓ credible magnitudes based on several station measurements,
- ✓ using Alfa-trimmed mean in averaging process,
- ✓ recovering digitally available data that weren't used before,
- ✓ magnitudes consistent with hypocentre solutions from Task 1.

ISC,  
P. Bormann

# Task 3: Historical Seismic Bulletin Processing

Huge undertaking, mostly manual work, essential to all Tasks of the Project

We shall concentrate on known quality sources first and then expand if time & funding permits

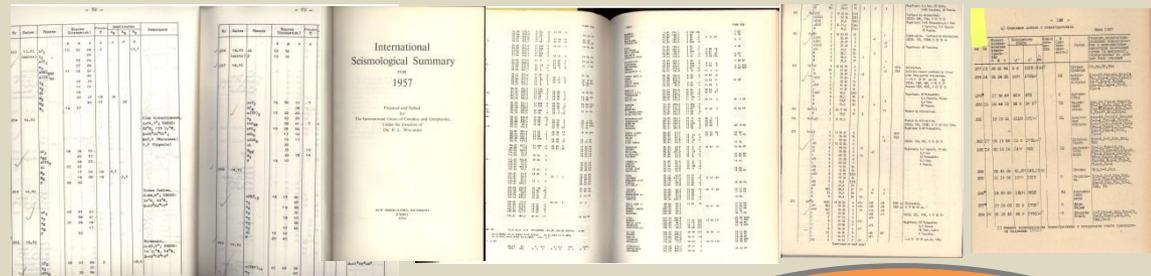
We shall preserve link between the data in the database and the scanned pages of historical bulletins

## To be collected:

- Surface wave amplitudes (1900-1970)
- Seismic arrival times (1900-1917)

## Sources:

ISC warehouse, IASPEI handbook  
SISMOS/INGV scanned collection,  
Gutenberg Notepads scanned at USGS,  
W. Lee private garage,  
BGS collection



ISC,  
P. Bormann,  
W. Lee

# Task 4: $M_w$ Computation and Scientific Evaluation

For each seismic event we shall provide  $M_w$  with uncertainty  
via  $M_0$  or  
via  $M_S$  or  
via other magnitude types  
using empirical relationships

We shall evaluate the catalogue's spatial and temporal completeness & thoroughly document all unavoidable temporal and spatial gaps

W. Lee,  
P. Bormann,  
ISC, IASPEI

# Task 5: Data Integration, Management & Dissemination

**The following is to be part of a single Database at the ISC:**

- ✓ Hypocenter locations with uncertainties
  - ✓  $M_S$  with uncertainties
  - ✓ Seismic Moments
- ✓  $M_W$  (incl. Proxies) with uncertainties
  - ✓ Seismic wave arrival times
  - ✓ Amplitudes & periods
- ✓ Scanned station bulletin images

Access to the database for GEM, GEM Regional Projects and other users shall be provided via a dedicated GEM Section of the ISC website to be maintained for duration of the project and beyond.

The logo for the International Seismological Centre (ISC), consisting of the letters "ISC" in white, centered within an orange oval with a grey border.

ISC

# Task 6: Overall Project Management

- ✓ Start-up funding from GEM received in May 2010.
- ✓ Kick-off meeting of principle workers with IASPEI observers on board conducted on May 27-28 at the ISC.



- ✓ Three new temporary members of the ISC staff hired.
- ✓ The ISC is responsible for delivering final products & reports as well as for the overall financial management.



# Project Deliverables (Apr 2012):

- 110 years of relocated earthquake hypocenters;
- Recomputed  $M_S$  values for relocated events;
- $M_W$  values based on seismic moment where possible (mainly 1980-2009) and proxy values in other cases using appropriate empirical relationships;
- Database with all above information and reference to original sources including scanned historical bulletin pages.