

# A new scope for the ISC: Reaching beyond the seismological community

Gaspa O., Aspinwall M, and Storchak D. [International Seismological Centre](http://www.isc.ac.uk), email: [oriol@isc.ac.uk](mailto:oriol@isc.ac.uk)

## ABSTRACT

Each time a damaging earthquake occurs there is an outburst of public interest in seismology and related subjects. If an event turns out to be catastrophic the interest quickly escalates into a demand for information.

Seismology, like most of the sciences, uses a rather complex vocabulary which sometimes fails to attract people's interest and does not explain complicated issues in a simple manner. This is a must when dealing with the media or non-scientific users.

Following the example of other seismological data centres such as the **EMSC** and **NEIC**, the **ISC** has been working on an automated page for special events. We have targeted the widest range of users: from scientists looking for waveforms and historical seismicity to journalists interested in the most damaging events within a zone as well as members of the public looking for humanitarian information and ways to help.

This automated webpage is part of an ongoing project to support the ISC outreach officers with readily available information to address requests from media at the time of catastrophic events.

## The Qinghai Earthquake

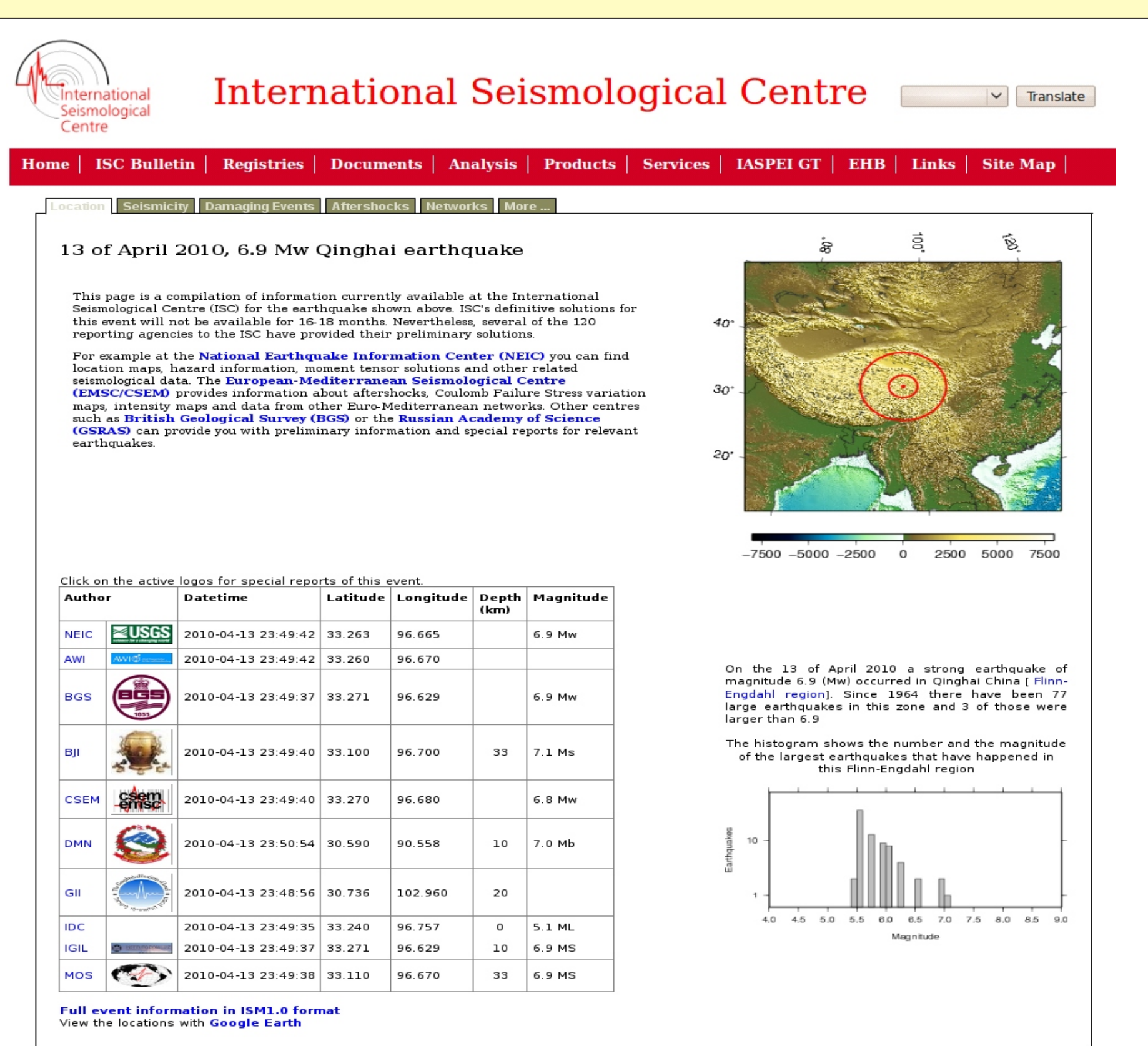


This powerful earthquake of magnitude 7.0 Mw, struck the remote Yushu county, 800km (500 miles) south-west of the provincial capital Xining, at 07:49 local time (23:49 GMT), at a shallow depth of 10km. Some 2000 people died and more than 10000 were injured. About 25,000 structures were damaged or destroyed and most of the buildings in the worst-hit town of Jiegu were wrecked and landslides cut off roads.

About 5,000 specialist earthquake rescuers were dispatched from neighbouring provinces and many people fled to the surrounding mountains fearing that a nearby dam could burst.

In 2008, a huge earthquake struck in neighbouring Sichuan province, about 800km from Yushu, which left 87,000 people dead or missing and five million homeless.

## WEB SITE CONTENT



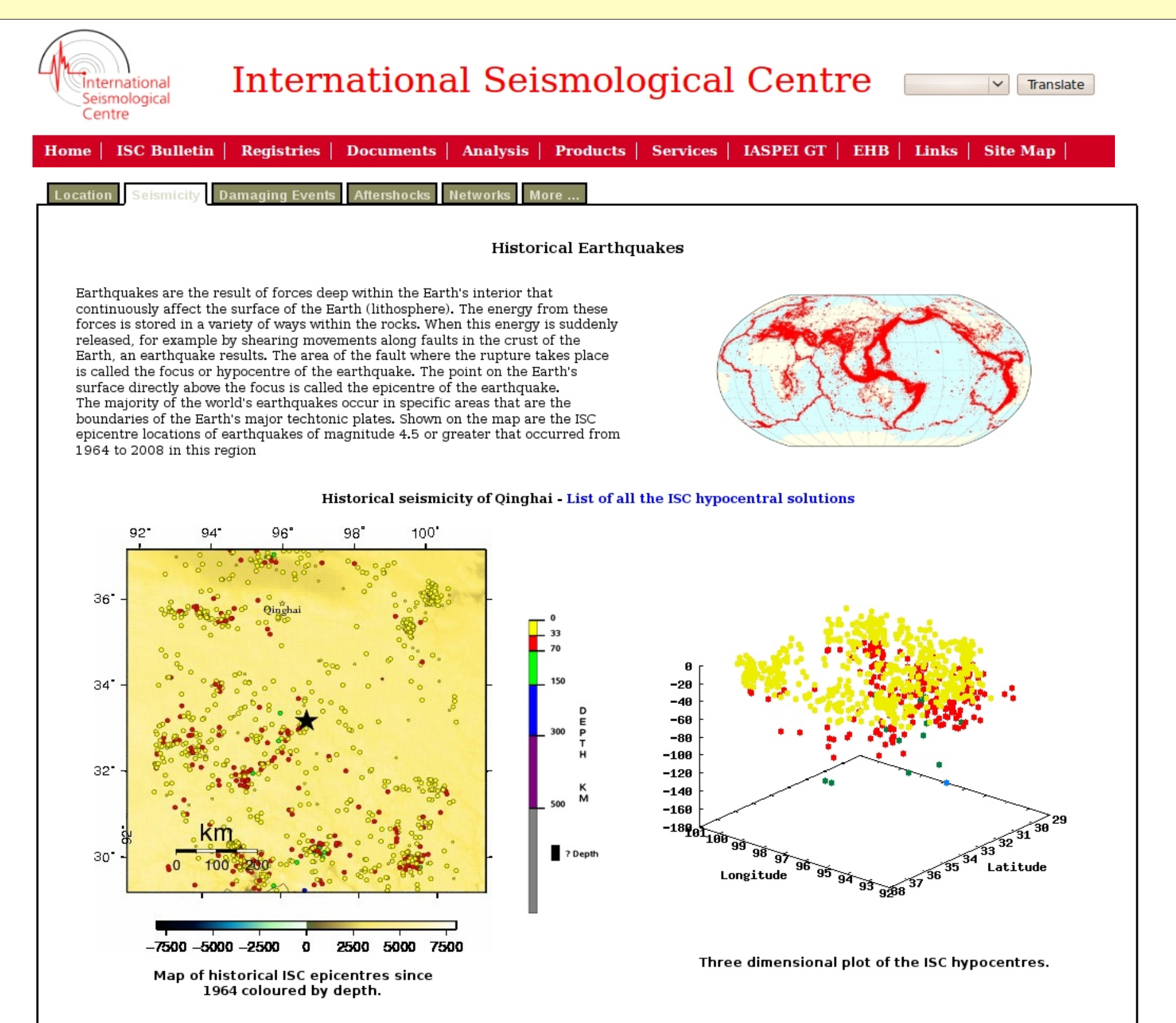
The page is a compilation of information currently available at the International Seismological Centre (ISC) for the earthquake shown above. ISC definitive solutions for this event will not be available for 48-72 months. Nevertheless, several of the 120 reporting agencies to the ISC have provided their preliminary solutions.

For example at the International Earthquake Information Centre (IEIC) you can find location maps, hazard information, moment tensor solutions and other related seismological data. The European Mediterranean Seismological Centre (EMSC-SEM) provides information about aftershocks, Coulomb Failure Stress variation maps, intensity maps and data from other Euro-Mediterranean networks. Other centres such as the British Geological Survey (BGS) or the Russian Academy of Science (RAS) can provide you with preliminary information and special reports for relevant earthquakes.

Author	Datetime	Latitude	Longitude	Depth (km)	Magnitude
NEIC	2010-04-13 23:49:42	33.283	96.665	9.970	6.9 Mw
BGS	2010-04-13 23:49:42	33.260	96.670		
IASPEI	2010-04-13 23:49:37	33.271	96.629		6.9 Mw
IEIC	2010-04-13 23:49:40	33.100	96.700	33	7.1 Ms
EMSC	2010-04-13 23:49:40	33.270	96.680		6.9 Mw
DMRI	2010-04-13 23:50:54	30.590	96.550	10	7.0 Ms
IGI	2010-04-13 23:48:54	30.736	102.960	20	
IGI	2010-04-13 23:49:35	33.240	96.757	0	5.1 Ms
ISC	2010-04-13 23:49:37	33.271	96.629	10	6.9 Mw
MOS	2010-04-13 23:49:38	33.110	96.670	33	6.9 Ms

The **front page** presents generic information about the affected zone:

- \* General information for centres with special information
- \* A histogram of large earthquakes in the zone
- \* A compilation of provisional solutions reported to the ISC
- \* Access to the ISC Bulletin in IMS1.0 format

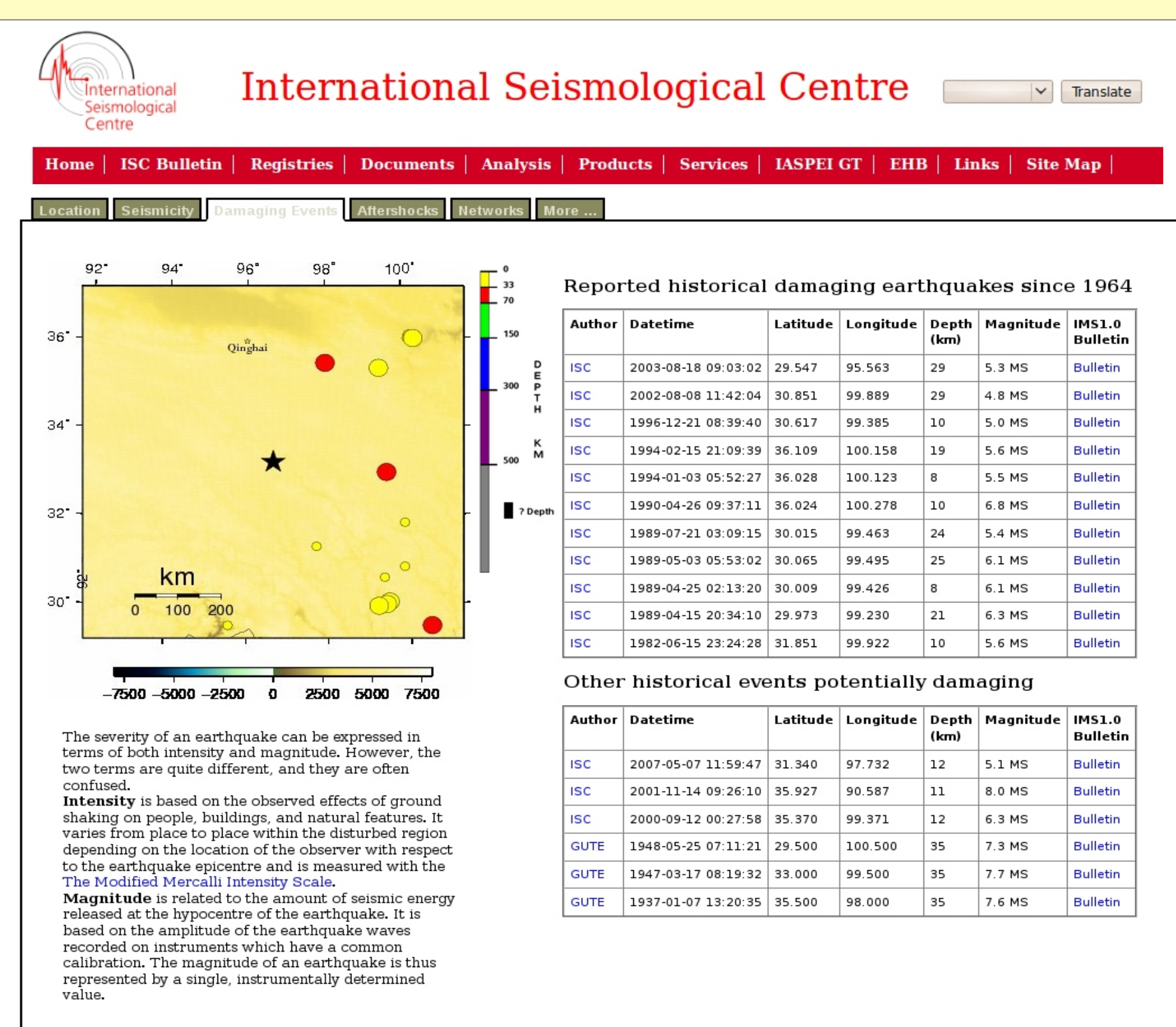


Earthquakes are the result of forces deep within the Earth's interior that continuously affect the surface of the Earth (lithosphere). The energy from these forces is stored in a variety of ways within the rocks. When this energy is suddenly released, for example by slinging moments along faults in the crust of the Earth, an earthquake results. The area of the fault where the rupture takes place is called the focus or hypocentre of the earthquake. The point on the Earth's surface directly above the focus is called the epicentre of the earthquake. The majority of the world's earthquakes occur in specific areas that are the boundaries of the Earth's major tectonic plates. Shown on the map are the ISC epicentre locations of earthquakes of magnitude 4.0 or greater that occurred from 1964 to 2008 in this region.

Historical seismicity of Qinghai - List of all the ISC hypocentral solutions

Three dimensional plot of the ISC hypocentres.

The **seismicity** page puts the earthquake in context with the historical seismicity compiled from the ISC Database with a typical 2D seismicity map as well as a rotating 3D map. It also has a simplified explanation of how earthquakes occur. The list of hypocentres with their main location parameters are stored in an Ascii file which can be downloaded.



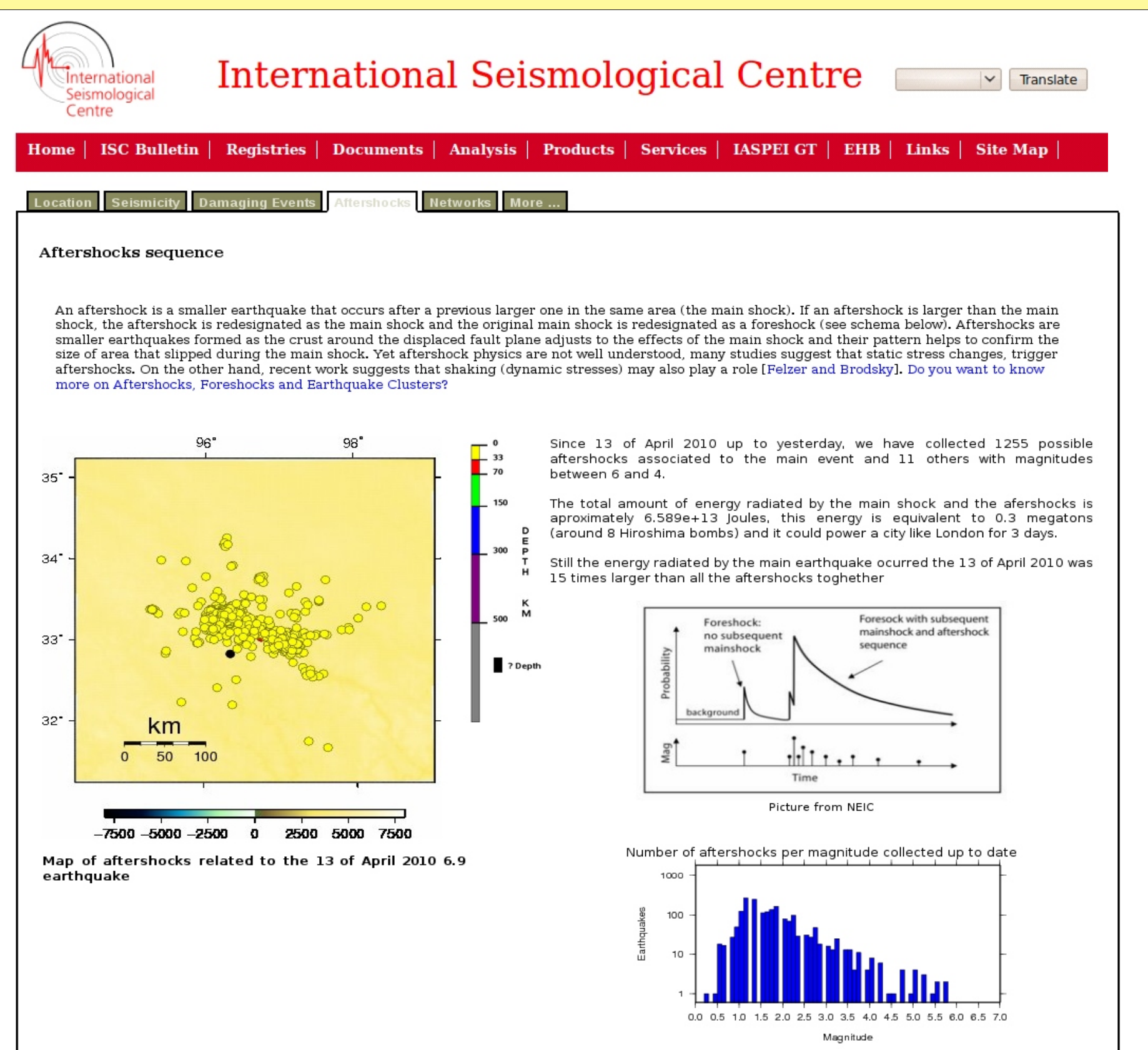
Reported historical damaging earthquakes since 1964

Author	Datetime	Latitude	Longitude	Depth (km)	Magnitude	IMS1.0 Bulletin
ISC	2003-08-18 09:03:02	29.547	95.563	29	5.3 Ms	Bulletin
ISC	2002-08-08 11:42:04	30.851	99.889	29	4.8 Ms	Bulletin
ISC	1996-12-21 08:39:40	30.617	99.365	10	5.9 Ms	Bulletin
ISC	1994-02-15 21:09:39	36.109	100.158	19	5.6 Ms	Bulletin
ISC	1994-01-03 05:52:27	36.028	100.123	8	5.5 Ms	Bulletin
ISC	1990-04-26 09:37:11	36.024	100.278	10	5.8 Ms	Bulletin
ISC	1989-07-21 03:09:15	30.015	99.463	24	5.4 Ms	Bulletin
ISC	1989-05-03 05:53:02	30.085	99.495	25	6.1 Ms	Bulletin
ISC	1989-04-25 02:13:20	30.009	99.426	8	6.1 Ms	Bulletin
ISC	1989-04-15 20:34:10	29.973	99.230	21	6.3 Ms	Bulletin
ISC	1982-06-15 23:24:18	31.851	99.922	10	5.6 Ms	Bulletin

Other historical events potentially damaging

Author	Datetime	Latitude	Longitude	Depth (km)	Magnitude	IMS1.0 Bulletin
ISC	2007-05-07 11:59:47	31.360	97.732	12	5.1 Ms	Bulletin
ISC	2001-11-16 09:24:10	35.837	92.587	11	6.0 Ms	Bulletin
ISC	2000-09-12 00:27:58	35.370	93.371	12	6.3 Ms	Bulletin
GUTS	1948-05-25 07:11:21	29.500	100.500	35	7.3 Ms	Bulletin
GUTS	1947-03-17 08:19:32	33.000	99.500	35	7.7 Ms	Bulletin
GUTS	1937-01-07 13:20:35	35.500	98.000	35	7.6 Ms	Bulletin

The **damaging events** page, as its name suggests is a compilation of the historical damaging earthquakes that have occurred within the zone of influence of the earthquake. Events are presented in a simple form of (date, latitude, longitude, depth and magnitude) and a map with access to the ISC Bulletin for further studies. An explanation of intensity and magnitude measurements is also provided for those users unfamiliar with seismological terms.



An aftershock is a smaller earthquake that occurs after a previous larger one in the same area (the main shock). If an aftershock is larger than the main shock, the aftershock is redesignated as the main shock and the original main shock is redesignated as a foreshock (see schema below). Aftershocks are smaller earthquakes formed as the crust around the displaced fault plane adjusts to the effects of the main shock and their pattern helps to confirm the size of area that slipped during the main shock. Yet aftershock physics are not well understood, many studies suggest that static stress changes, trigger aftershocks. On the other hand, recent work suggests that shaking (dynamic stress) may also play a role (Freiler and Brodsky). Do you want to know more on Aftershocks, Foreshocks and Earthquake Clusters?

Since 13 of April 2010 up to yesterday, we have collected 1255 possible aftershocks associated to the main event and 11 others with magnitudes between 6 and 4.

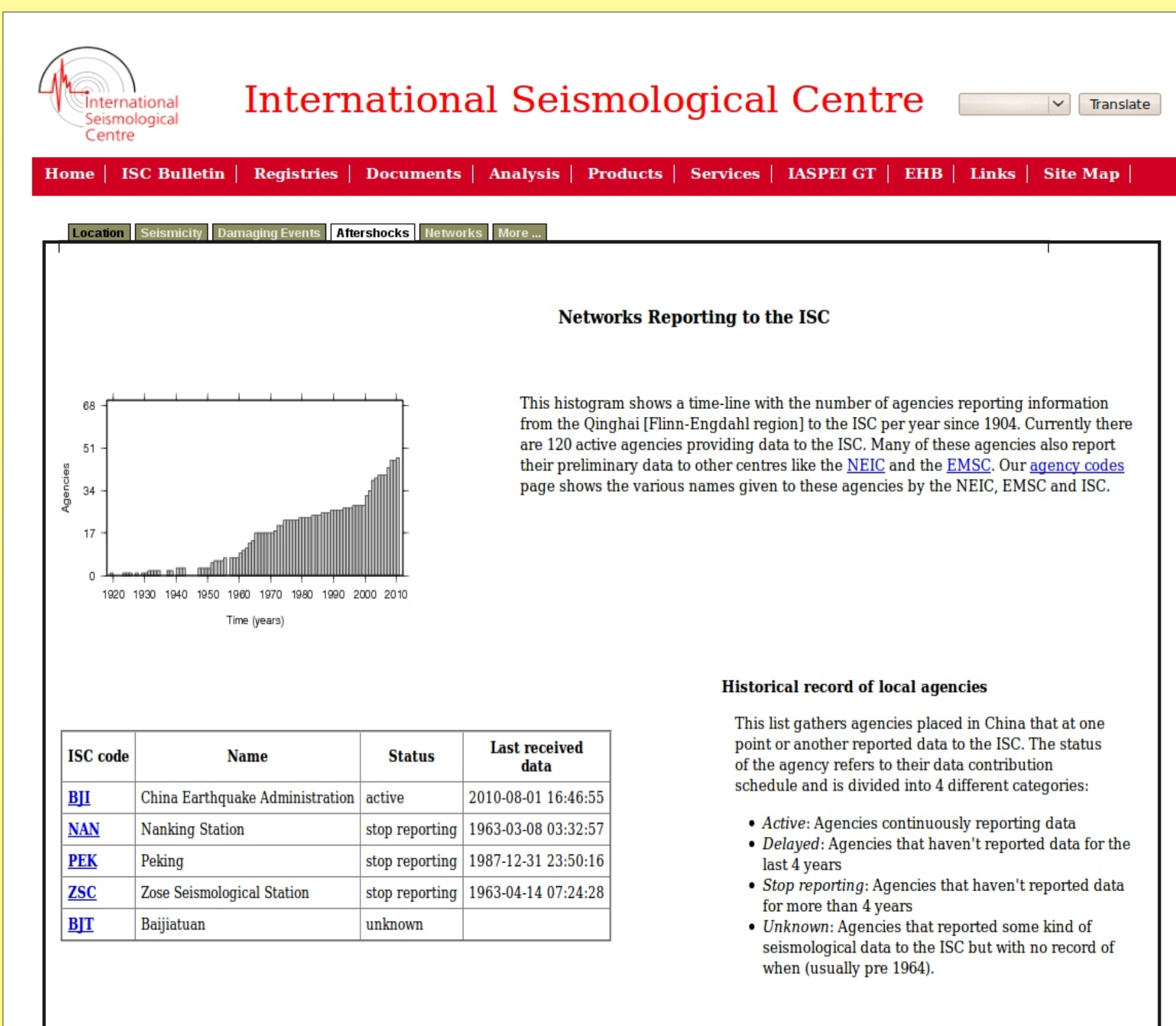
The total amount of energy radiated by the main shock and the aftershocks is approximately 6.58e+13 Joules, this energy is equivalent to 0.9 megatons (around 8 Hiroshima bombs) and it could power a city like London for 3 days.

Still the energy radiated by the main earthquake occurred the 13 of April 2010 was 15 times larger than all the aftershocks together.

Picture from NEIC

Number of aftershocks per magnitude collected up to date

The **aftershocks** page present all those earthquakes potentially related to the main event. The page shows some basic statistics on number of aftershocks per magnitude, total number of aftershocks reported and a simple **comparison** between the energy released by the main earthquake, the aftershocks and a more well known source.



Networks Reporting to the ISC

This histogram shows a time-line with the number of agencies reporting information from the Qinghai (Hsin-England) region to the ISC per year since 1964. Currently there are 120 active agencies providing data to the ISC. Many of these agencies also report their preliminary data to other centres like the **NEIC** and the **EMSC**. Our agency codes page shows the various names given to these agencies by the NEIC, EMSC and ISC.

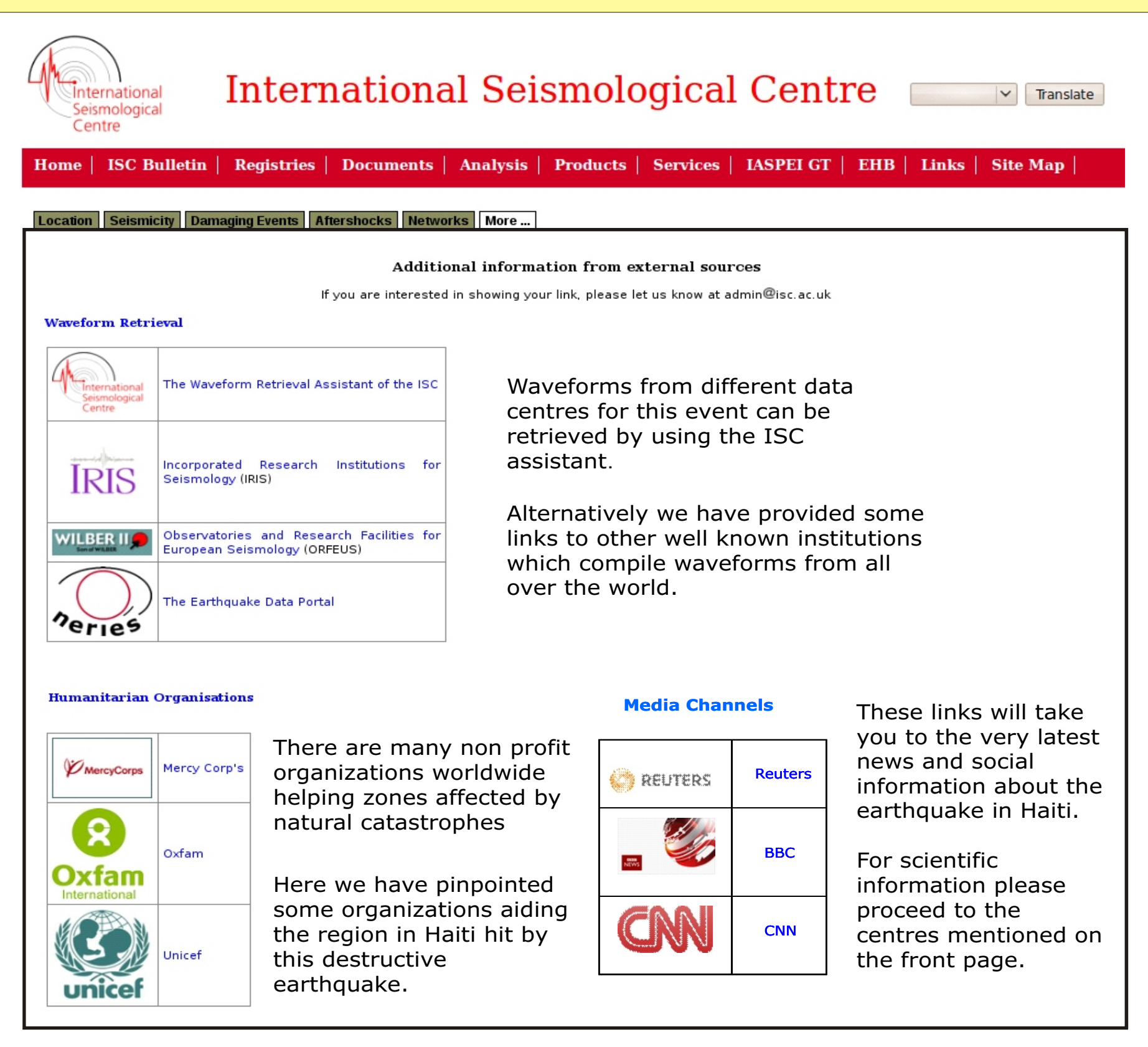
Historical record of local agencies

This list gathers agencies placed in China that at one point or another reported data to the ISC. The status of the agency refers to their data contribution schedule and is divided into 4 different categories:

- Active: Agencies continuously reporting data
- Delayed: Agencies that haven't reported data for the last 4 years
- Stop reporting: Agencies that haven't reported data for more than 4 years
- Unknown: Agencies that reported some kind of seismological data to the ISC but with no record of when (usually pre 1964).

ISC code	Name	Status	Last received data
BJI	China Earthquake Administration	active	2010-08-01 16:46:55
NAN	Nanking Station	stop reporting	1963-03-08 03:32:57
PEK	Peking	stop reporting	1987-12-31 23:50:16
ZSC	Zase Seismological Station	stop reporting	1963-04-14 07:24:28
BJT	Beijitian	unknown	

The **networks** page is related to information on networks, institutions and centres located within or close to the affected area. It shows a simple history of how many **institutions** have been reporting data to the ISC since the beginning as well as specific historical and contact information of those agencies located close to the earthquake.



Additional information from external sources

If you are interested in showing your link, please let us know at [admin@isc.ac.uk](mailto:admin@isc.ac.uk)

Waveform Retrieval

- The Waveform Retrieval Assistant of the ISC
- IRIS: Incorporated Research Institutions for Seismology (IRIS)
- WILBER: Observatories and Research Facilities for European Seismology (ORFES)
- The Earthquake Data Portal

Humanitarian Organizations

- Merry Centre
- Oxfam International
- Unicef

Media Channels

- Reuters
- BBC
- CNN

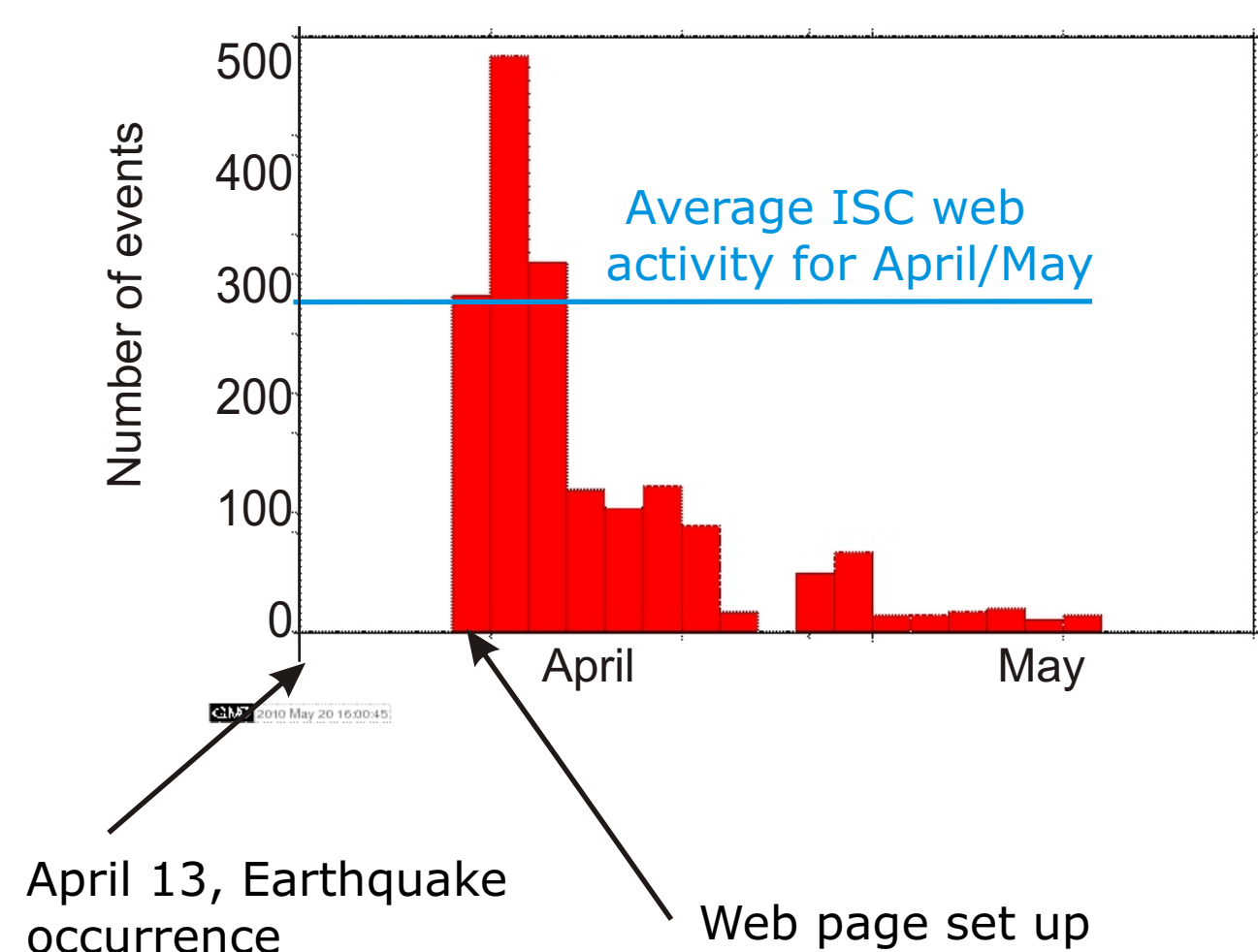
These links will take you to the very latest news and social information about the earthquake in Haiti. For scientific information please proceed to the centres mentioned on the front page.

The final page is a gathering of additional information. On one hand we offer scientists some links and assistance to retrieve waveforms for that particular event. On the other we present a series of links to Humanitarian organizations and media channels who have referenced the catastrophic event on their websites. This is an ever increasing list and any contribution is welcomed.

## Content summary

- ✗ Preliminary solutions and Google Earth View
- ✗ Historical Seismicity and 3D projections
- ✗ Aftershocks and energy release information
- ✗ Damaging events
- ✗ Historical agency information
- ✗ Access to the ISC Bulletin and simplified lists
- ✗ External links to media channels and non-profit organizations
- ✗ Waveform retrieval assistance

## Browsing activity on the Qinghai earthquake webpage



## Performance summary

- ✓ Good user-response to our first trial for the Qinghai earthquake. There was a 20-25% increment of activity on the ISC website based on this special webpage
- ✓ The majority of the links and sections were visited, from the ISC Bulletin to the humanitarian organizations, showing a wide range of interested and users
- ✓ Development in software and programming is required to match the expectations of the users

## Conclusions

Scientific institutions should do what is in their power to shorten the gap between scientists, media and lay people as much as possible. At the ISC we have started with what we hope is a suitable approach for both scientist and the general public when dealing with catastrophic earthquakes, merging seismological information with topics of general interest. Together with other centres we hope we can provide a better understanding of such phenomena without losing the scientific point of view required by such institutions.