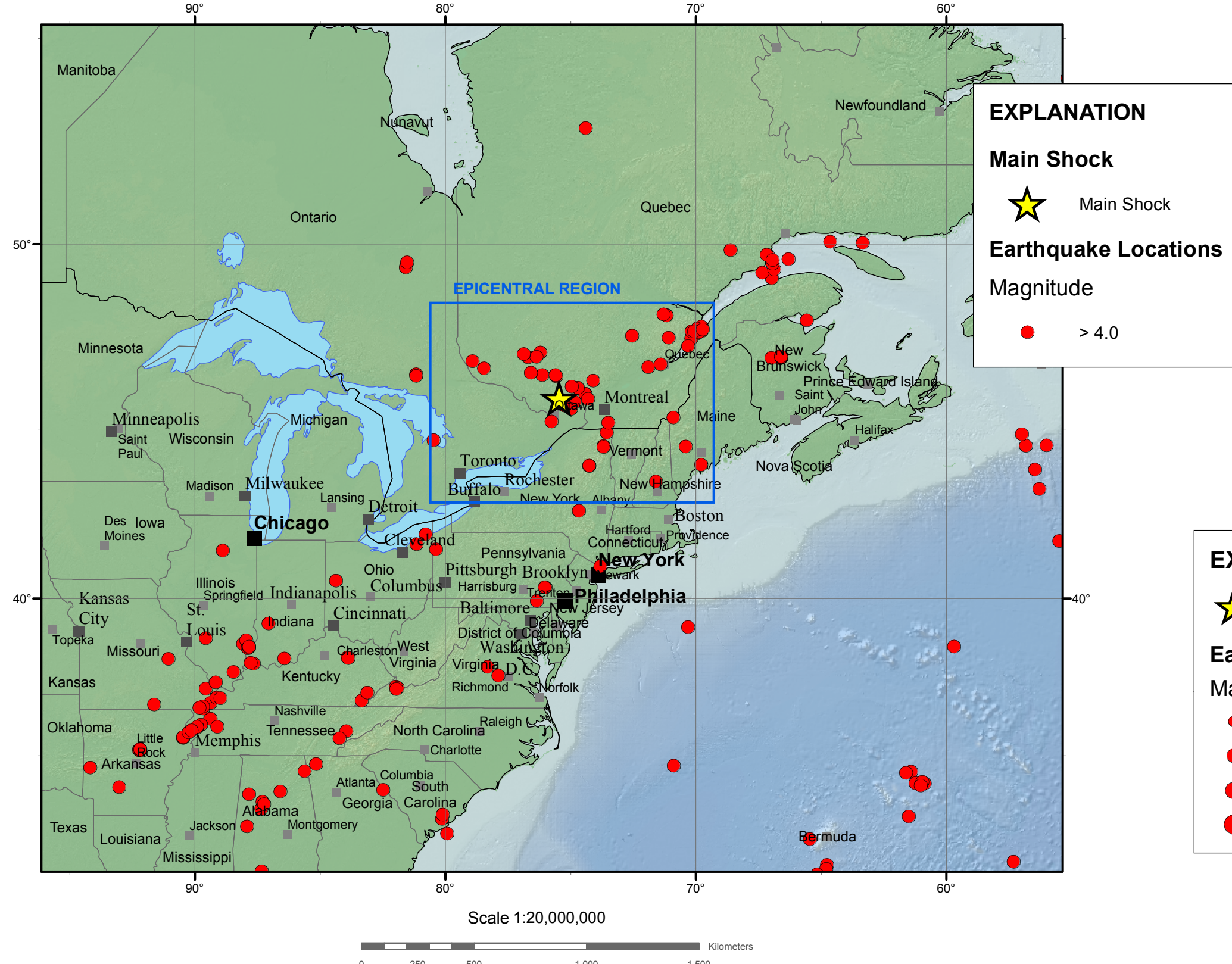


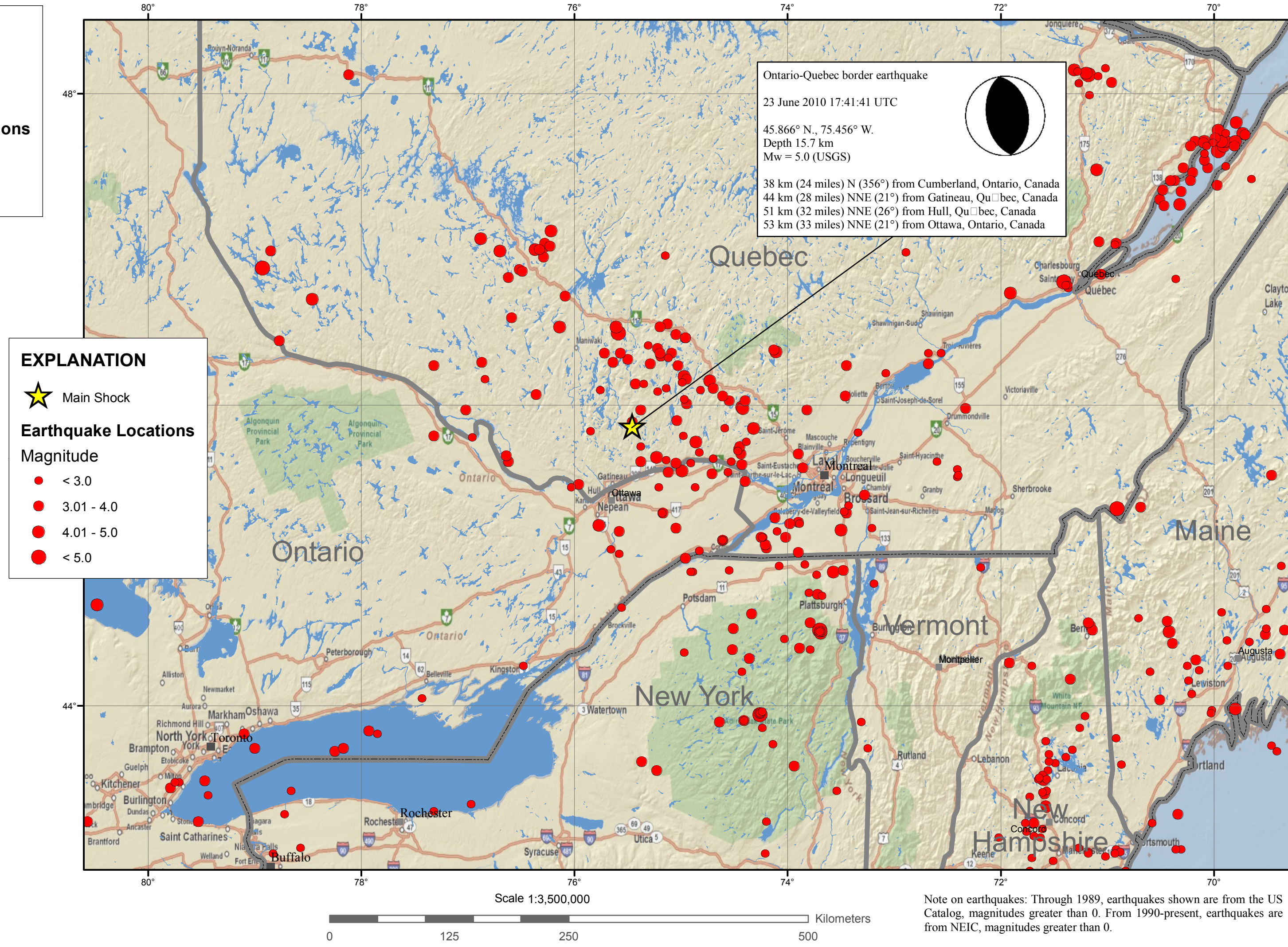
M 5.0 Ontario-Quebec Border Region, Canada Earthquake of 23 June 2010



Tectonic Setting



Epicentral Region

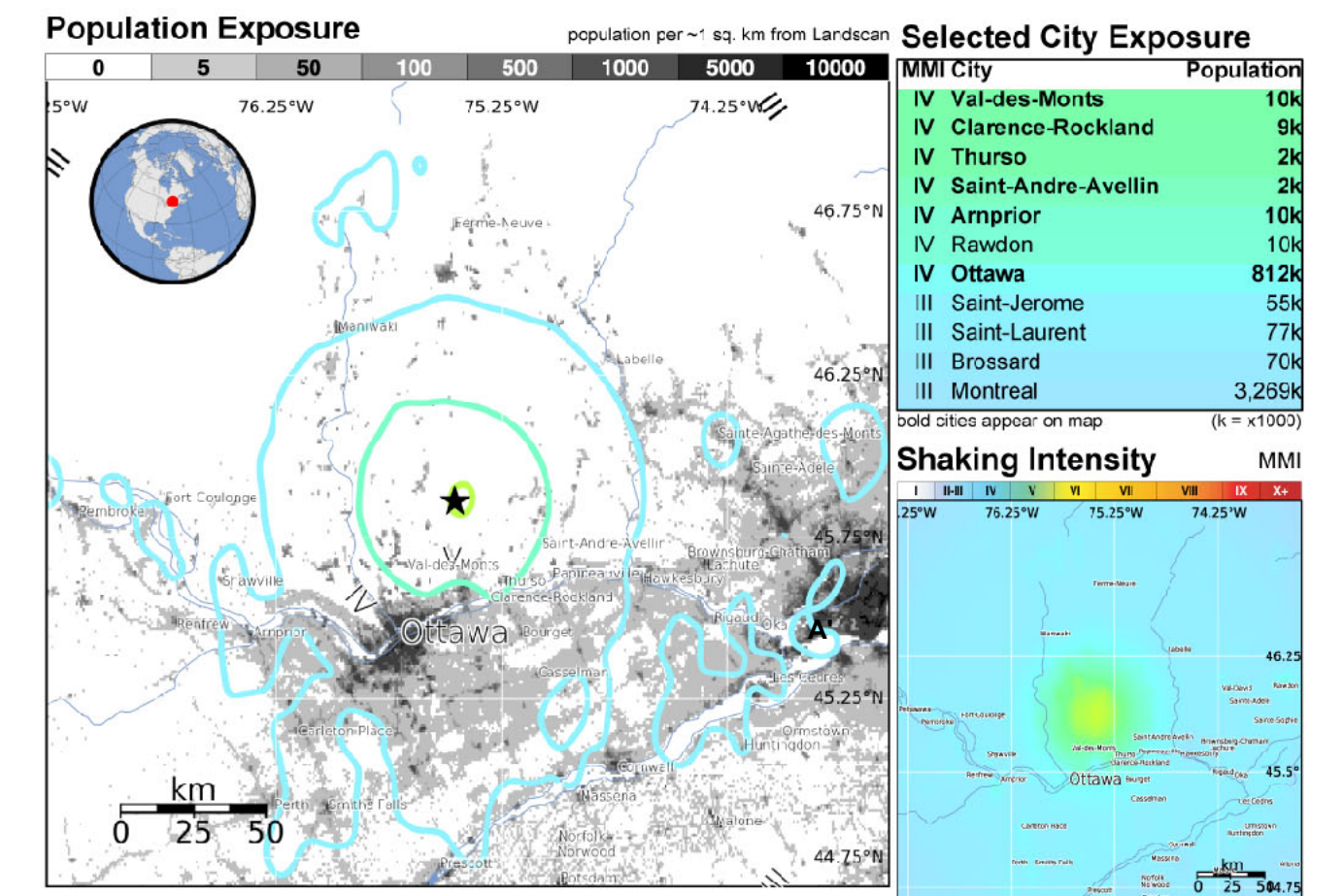


USGS **USAID**
PAGER
Version 4

M 5.0, ONTARIO-QUEBEC BORDER REGION, CANADA
Origin Time: Wed 2010-06-23 17:41:42 UTC
Location: 45.86°N 75.46°W Depth: 18 km

Estimated Population Exposed to Earthquake Shaking

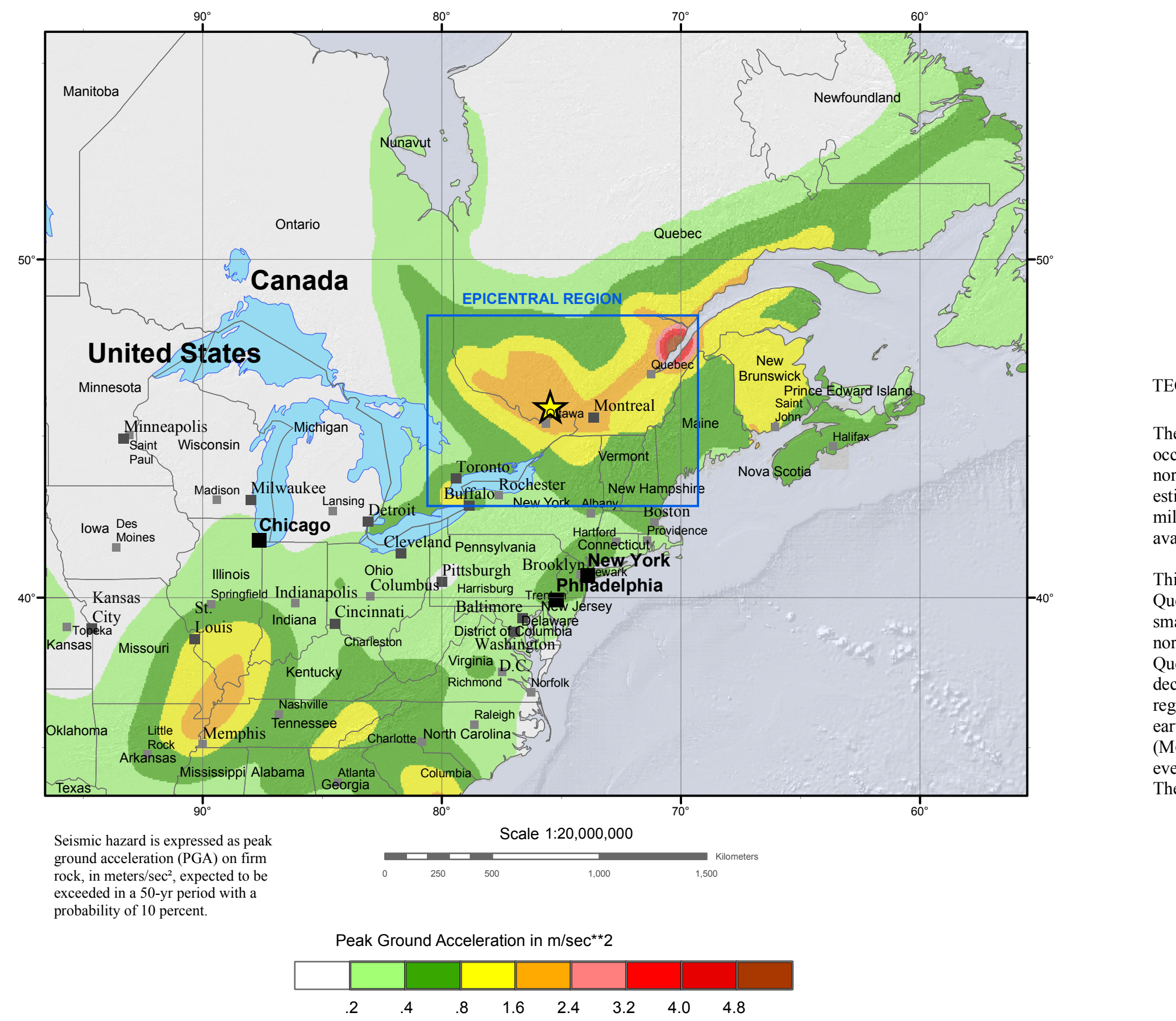
ESTIMATED POPULATION EXPOSURE (N = x1000)	I	II-III	IV	V	VI	VII	VIII	IX	X+
ESTIMATED MODIFIED MERCALLI INTENSITY									
PERCEIVED SHAKING	Not felt	Weak	Light	Moderate	Strong	Very Strong	Severe	Violent	Extreme
POTENTIAL DAMAGE	Resistant Structures: none	Resistant Structures: none	Vulnerable Structures: none	Vulnerable Structures: none	Vulnerable Structures: Light	Vulnerable Structures: Moderate	Vulnerable Structures: Moderate/Heavy	Vulnerable Structures: Heavy	Vulnerable Structures: V. Heavy



Overall, the population in this region resides in structures that are a mix of vulnerable and earthquake resistant construction. On November 6, 1997 (UTC), a magnitude 5.1 earthquake 332 km East of this one struck Canada, with estimated population exposures of 13,000 at intensity VIII and 84,000 at intensity VII, resulting in a reported 1 fatality.

This information was automatically generated and has not been reviewed by a seismologist.
<http://earthquake.usgs.gov/pager> Event ID: us2010xwa7

Seismic Hazard



TECTONIC SUMMARY

The June 23, 2010 Ontario-Quebec border region earthquake occurred at 1:42 pm local (eastern) time about 60 km (38 miles) north of Ottawa, Ontario, Canada's capital city. The preliminary estimate of magnitude (M) is 5.0, at a depth of roughly 19 km (12 miles). These estimates may change as more data becomes available.

This earthquake occurred near the southern edge of the Western Quebec Seismic Zone. Earthquakes within this zone are mostly small. They tend to cluster in a wide area that is slightly elongated northwest-southeast. Historically, earthquakes in the Western Quebec Seismic Zone have caused damage roughly once a decade. Three or four smaller events each year are felt in the region but are generally too small to cause damage. The largest earthquakes known in this part of Canada occurred in 1935 (M6.1), about 250 km (150 miles) to the northwest of today's event, and in 1732 (M6.2), about 150 km (100 miles) to the east. The 1732 earthquake caused significant damage in Montreal.

Earthquakes of the size of today's event are uncommon east of the Rockies, but many have occurred since the arrival of European settlers three centuries ago. In eastern North America and geologically similar regions worldwide, M5.0 to M5.5 earthquakes typically cause light to moderate damage out to a few tens of kilometers (miles) from the epicenter, depending on the number of people and type of buildings near the epicenter. Typically these earthquakes are felt hundreds of kilometers (miles) away. Earthquakes of this size and depth are unlikely to rupture the Earth's surface, although exceptions are known.

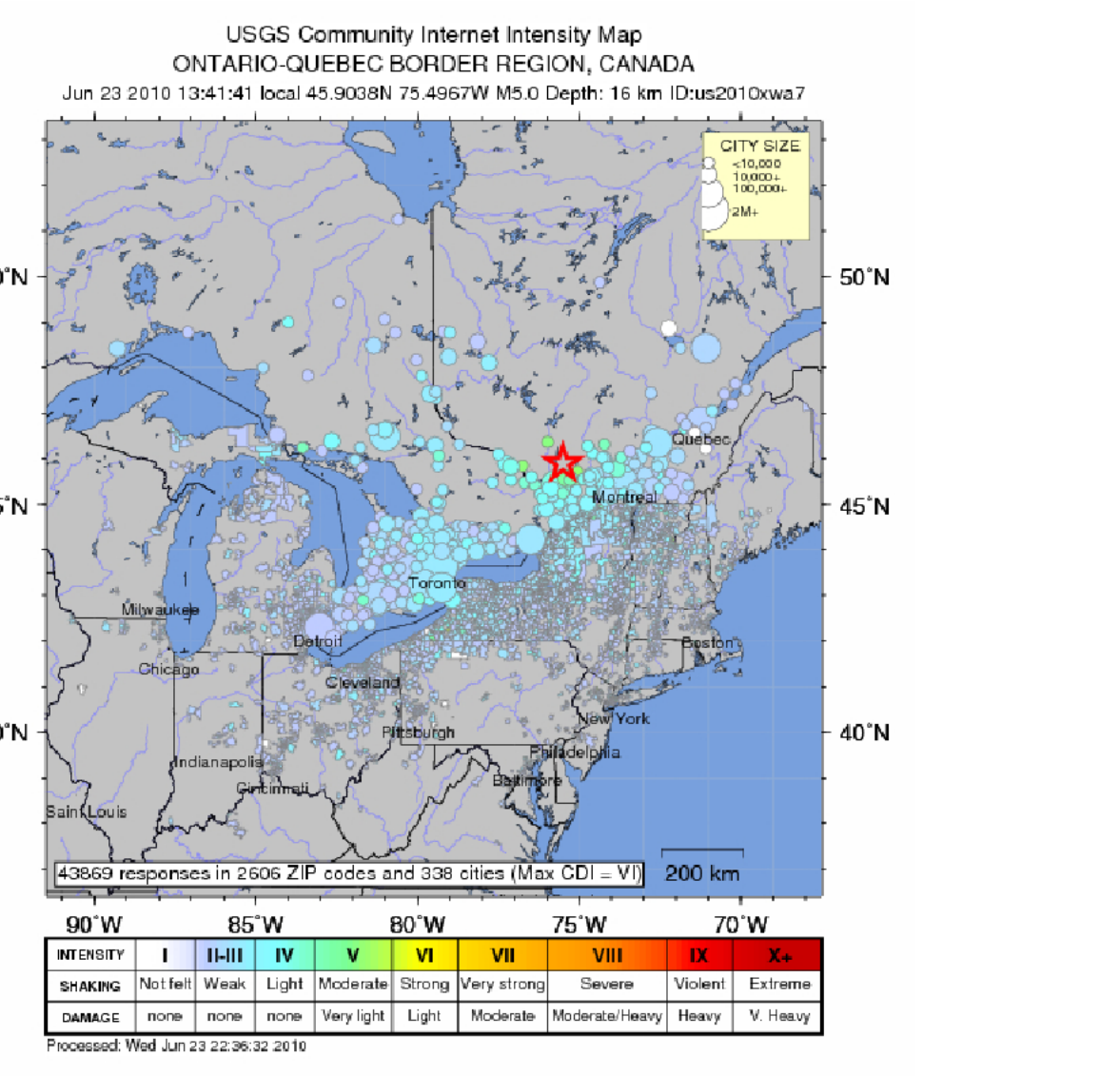
The main faults near this earthquake zone trend northwest. These faults form the Ottawa graben and were most active several hundred million years ago. Some of the faults of the graben have been reactivated one or more times since then. The initial focal mechanism of today's earthquake suggests reverse faulting on a fault trending southeast-northwest. However, the size and depth of this earthquake make it uncertain whether the causative fault can be identified.

Significant Earthquakes Mag >= 4.5

Year	Mon	Day	Time	Lat	Long	Dep	Mag
1973	06	15	0109	45.255	-71.133	3.6	4.8
1983	10	07	1018	43.953	-74.342	7.8	5.1
1988	11	25	2346	48.065	-71.269	24	5.9
1990	10	19	0701	46.465	-75.579	15	4.6
1997	11	06	0234	46.772	-71.386	22.5	4.7
2000	01	01	1122	46.859	-78.870	9.5	4.6
2002	04	20	1050	44.481	-73.700	10.2	5.2
2010	06	23	1741	45.866	-75.456	15.7	5.0

DISCLAIMER

Base map data, such as place names and political boundaries, are the best available but may not be current or may contain inaccuracies and therefore should not be regarded as having official significance.



DATA SOURCES

EARTHQUAKES AND SEISMIC HAZARD
USGS, National Earthquake Information Center
NOAA, National Geophysical Data Center
IASPEI, Centennial Catalog (1900 - 1999) and extensions (Engdahl and Villasehor, 2002)
IEDP (amplified earthquake catalog) (Engdahl, 2003)
Global Seismic Hazard Assessment Program

PLATE TECTONICS AND FAULT MODEL
P19202 (Bird, 2003)
Finite Fault Model, Chen Ji, UC Santa Barbara (2007)

BASE MAP
NIMA and ESRI, Digital Chart of the World
USGS, EROS Data Center
NOAA GEBCO and GLOBE Elevation Models
ESRI Online

REFERENCES

Bird, P., 2003, An updated digital model of plate boundaries: *Geochem. Geophys. Geosyst.*, v. 4, no. 3, pp. 1027-80.

Engdahl, E.R. and Villasehor, A., 2002, *Global Seismicity: 1900 - 1999*, chap. 41 of Lee, W.H.K., and others, eds., *International Earthquake and Engineering Seismology, Part A: New York, N.Y.*, Elsevier Academic Press, 932 p.

Engdahl, E.R., Van der Hilst, R.D., and Buland, R.P., 1998, *Global teleseismic earthquake relocation with improved travel times and procedures for depth determination*: *Bull. Seism. Soc. Amer.*, v. 88, p. 722-743.

Map prepared by U.S. Geological Survey
National Earthquake Information Center
23 June 2010
Map not approved for release by Director USGS