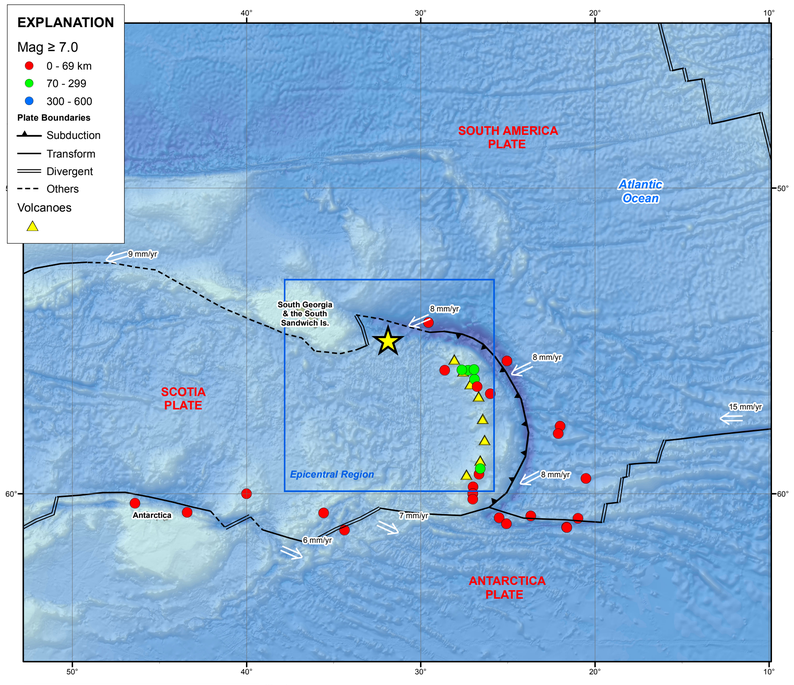
U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

# M7.4 South Georgia Island Region Earthquake of 19 August 2016

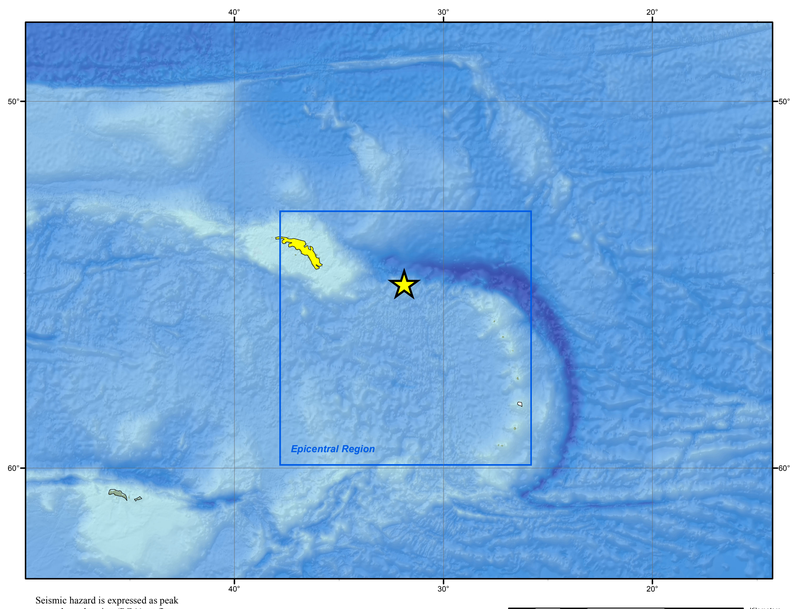
EARTHQUAKE SUMMARY MAP

*Prepared in cooperation with the Global Seismographic Network*

## *Tectonic Setting*




## *Seismic Hazard*

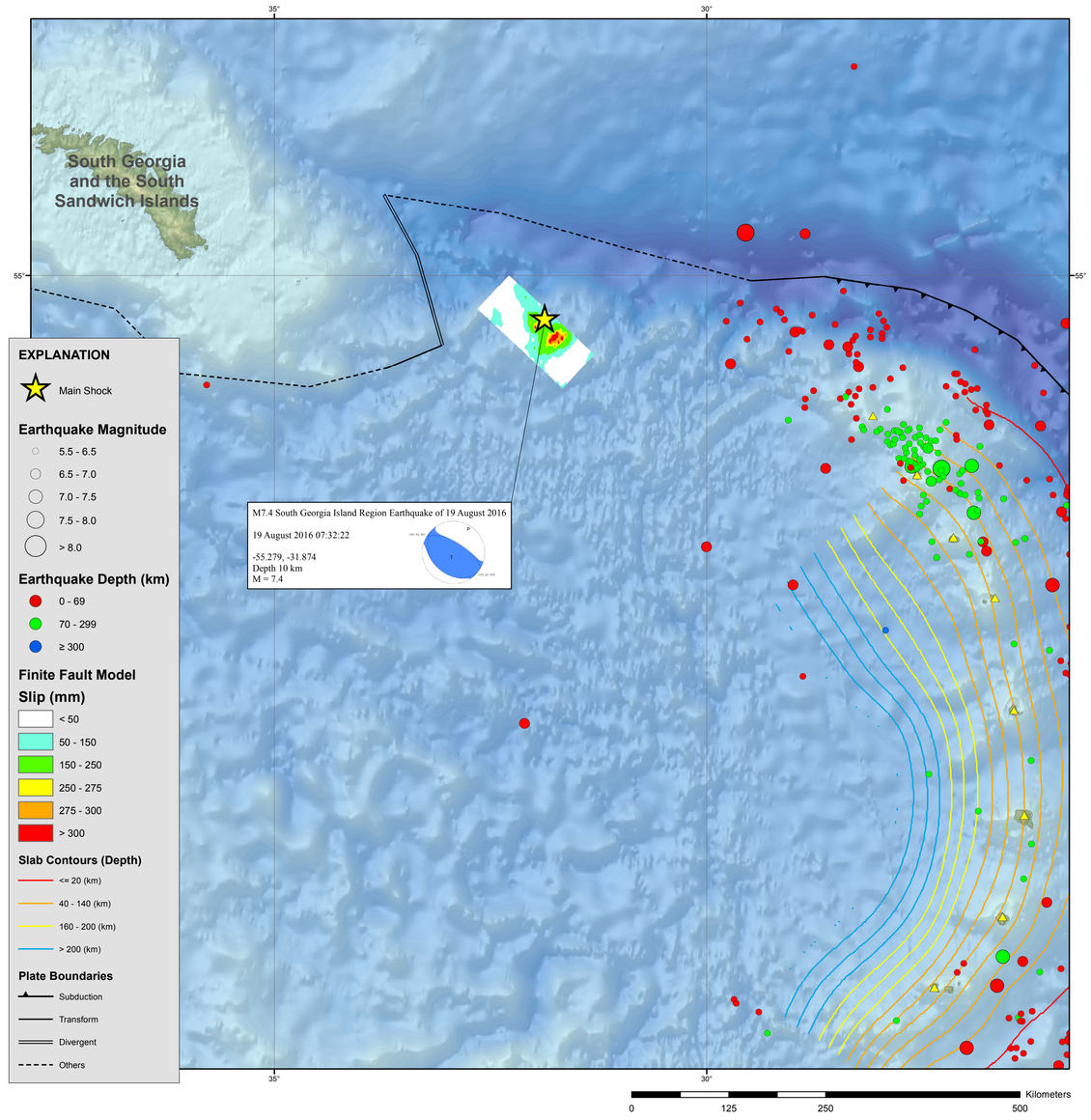



Seismic hazard is expressed as peak ground acceleration (PGA) on firm rock, in meters/sec$^2$, expected to be exceeded in a 50-yr period with a probability of 10 percent.

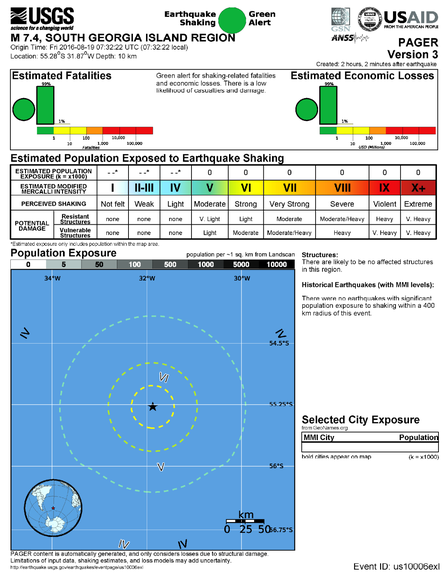
Peak Ground Acceleration in m/sec**2

.2 .4 .8 1.6 2.4 3.2 4.0 4.8

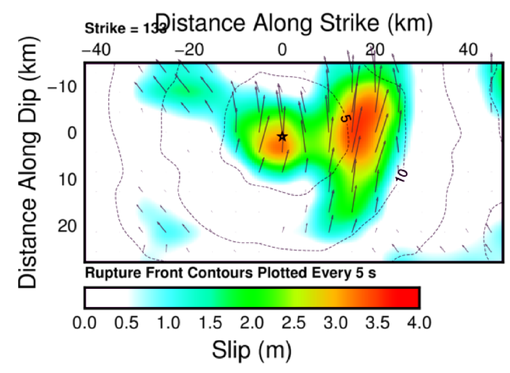
## *Epicentral Region*




## *PAGER*




## *Finite Fault Model*




Distribution of the amplitude and direction of slip for subfault elements of the fault rupture model are determined from the inversion of teleseismic body waveforms and long period surface waves. Arrows indicate the amplitude and direction of slip (of the hanging wall with respect to the foot wall); the slip is also colored by magnitude.The view of the rupture plane is from above. The strike of the fault rupture plane is 133° and the dip is 29°SW. The dimensions of the subfault elements are 5 km in the strike direction and 4.3 km in the dip direction.The rupture surface is approximately 65 km along strike and 35 km downdip. The seismic moment release based upon this plane is 1.5e+27 dyne.cm.

## TECTONIC SUMMARY

The August 19, 2016 M 7.4 earthquake east of South Georgia Island, in the South Atlantic Ocean, occurred as the result of shallow thrust faulting near the plate boundary between the South America and Scotia plates. In this region, the South America plate subducts to the west-southwest beneath the Scotia Plate and the South Sandwich Island Arc, mainly south and east of the epicenter of todays quake along the South Sandwich Trench. To the west of this event, near South Georgia Island, the Scotia-South America plate boundary is represented by the North Scotia Ridge, a left-lateral transform fault. At the location of this earthquake, the South America plate moves towards the west-southwest with respect to the Scotia plate at a rate of just 9 mm/yr. Rates of subduction along the South Sandwich Trench are in excess of 65 mm/yr, but slow in the region of the August 19th earthquake due to back-arc spreading along the East Scotia Ridge, just east of this event. The focal mechanism solution of this earthquake indicates southwest-oriented thrust faulting, consistent with occurring along the plate boundary interface between the South America and Scotia Sea (and South Sandwich micro-) plates.

While commonly plotted as points on maps, earthquakes of this size are more appropriately described as slip over a larger fault area. Thrust faulting events of the size of the August 19, 2016 earthquake are typically about 70x35 km in size (length x width).

While the South Sandwich Arc subduction zone is active seismically, all moderate-to-large historic events have occurred east of the East Scotia Ridge, >~130 km to the east of the August 19 earthquake. 23 such earthquakes of M 6+ have occurred within 250 km of the August 19 event over the preceding century. These include a M 8.1 earthquake in June 1929, 160 km to the east of the August 19 event, and more recently, two M 6.9 events in September 2004 and June 2014, between 190-230 km to the east. Both of these 21st century events demonstrated oblique-thrust faulting, consistent with South America subduction. Due to the remote location of these events far from population centers that might be vulnerable to earthquake shaking, none are known to have recorded casualties or damage.


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 Villaseñor, 2002)
EHB catalog (Engdahl et al., 1998)
HDF (unpublished earthquake catalog, Engdahl, 2003)
Global Seismic Hazard Assessment Program
Volcanoes of the World (Siebert and Simkin, 2002)

PLATE TECTONICS AND FAULT MODEL
PB2002 (Bird, 2003)
Ji, C., D.J. Wald, and D.V. Helmberger, Source description of the 1999 Hector Mine, California earthquake; Part I: Wavelet domain inversion theory and resolution analysis, Bull. Seism. Soc. Am., Vol 92, No. 4 pp. 1192-1207, 2002.
DeMets, C., Gordon, R.G., Argus, D.F., 2010. Geologically current plate motions, Geophys. J. Int. 181, 1-80.

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

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 Villasenor, 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 updated by U.S. Geological Survey National Earthquake Information Center
19 August 2016
http://earthquake.usgs.gov/
Map not approved for release by Director USGS