M 6.4 - 8km S of Indios, Puerto Rico

U.S. Department of the Interior
U.S. Geological Survey

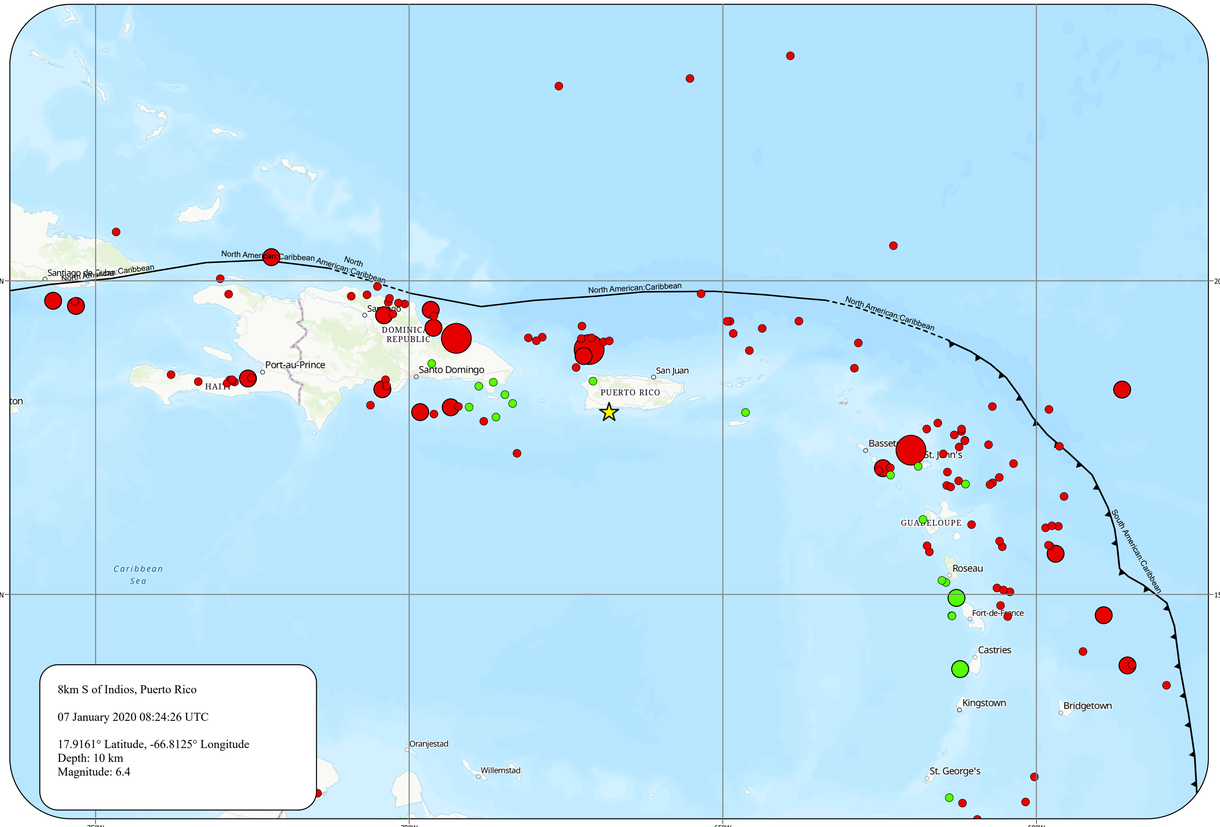
Earthquake Summary Map
prepared in cooperation with
the Global Seismographic Network

Tectonic Summary

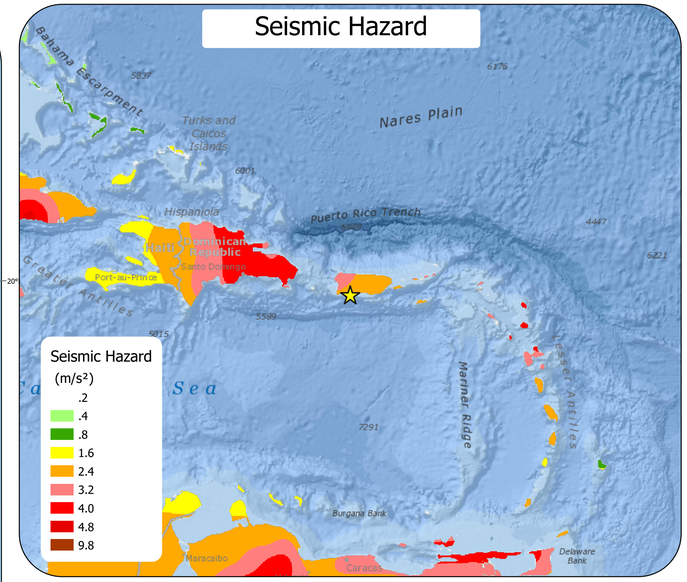
The January 7, 2020, M 6.4 earthquake offshore of southwest Puerto Rico occurred as the result of oblique normal faulting at shallow depth. Preliminary focal mechanism solutions for the earthquake indicate faulting occurred as the result of slip on either a moderately dipping plane striking just north of west, or on a moderately dipping plane striking just west of south. At the location of this event, the North America plate converges with the Caribbean plate at a rate of about 20 mm/yr towards the west-southwest. The location and focal mechanism solution for the event are consistent with an intraplate tectonic setting within the lithosphere of the Caribbean plate, rather than on the plate boundary between the two plates.

The preliminary location of this earthquake is within about 12 km of the January 6, 2020, M 5.8 earthquake. Over the past several weeks, hundreds of small earthquakes have occurred in this same region, beginning in earnest with a M 4.7 earthquake late on December 28 and a M 5.0 event a few hours later. Since the M 4.7 event, over 400 M 2+ earthquakes have occurred in this region, 11 of which were M 4+, including today's M 6.4 event and the January 6th M 5.8. The proximity of these events to Puerto Rico, and their shallow depth, mean that dozens of these events have likely been felt on land, though with the exception of the M 5.8 earthquake and the latest M 6.4, none are likely to have caused significant damage.

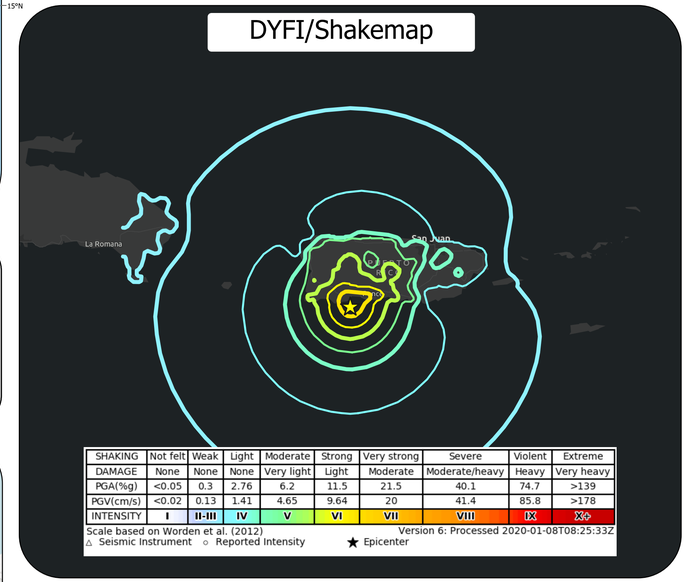
Tectonics in Puerto Rico are dominated by the convergence between the North America and Caribbean plates, with the island being squeezed between the two. To the north of Puerto Rico, North America subducts beneath the Caribbean plate along the Puerto Rico trench. To the south of the island, and south of today's earthquake, Caribbean plate lithosphere subducts beneath Puerto Rico at the Muertos Trough. The January 6 and 7 earthquakes, and other recent nearby events, are occurring in the offshore deformation zone bound by the Punta Montalva Fault on land and the Guayanilla Canyon offshore.



Seismic Hazard



DYFI/Shakemap



SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
DAMAGE	None	None	None	Very light	Light	Moderate	Moderate/heavy	Heavy	Very heavy
PGA(%g)	<0.05	0.3	2.76	6.2	11.5	21.5	40.1	74.7	>139
PGV(cm/s)	<0.02	0.13	1.41	4.65	9.64	20	41.4	85.8	>178
INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+

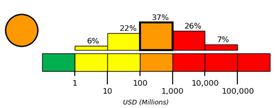
Scale based on Worden et al. (2012) Version 6: Processed 2020-01-08T08:25:33Z
△ Seismic Instrument ○ Reported Intensity ★ Epicenter

Earthquake Impact

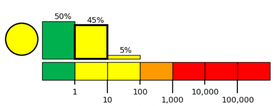
Orange alert for economic losses. Significant damage is likely and the disaster is potentially widespread. Estimated economic losses are 0-1% GDP of Puerto Rico. Past events with this alert level have required a regional or national level response.

Overall, the population in this region resides in structures that are a mix of vulnerable and earthquake resistant construction. The predominant vulnerable building types are mud wall and informal (metal, timber, GI etc.) construction.

Estimated Economic Losses



Estimated Fatalities



Ground-Failure

Landslide Estimate

Little or no area affected

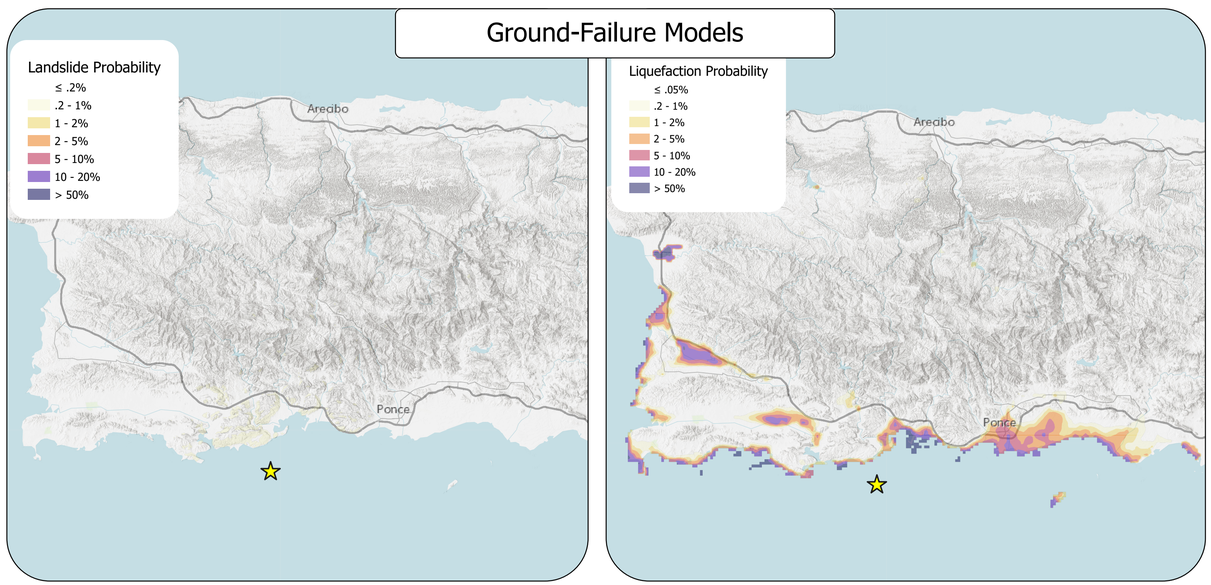
Little or no population exposed

Liquefaction Estimate

Limited area affected

Limited population exposed

Ground-Failure Models



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.

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.

Map updated by U.S. Geological Survey
National Earthquake Information Center
08 January 2020
https://earthquake.usgs.gov/
Map not approved for release by Director USGS