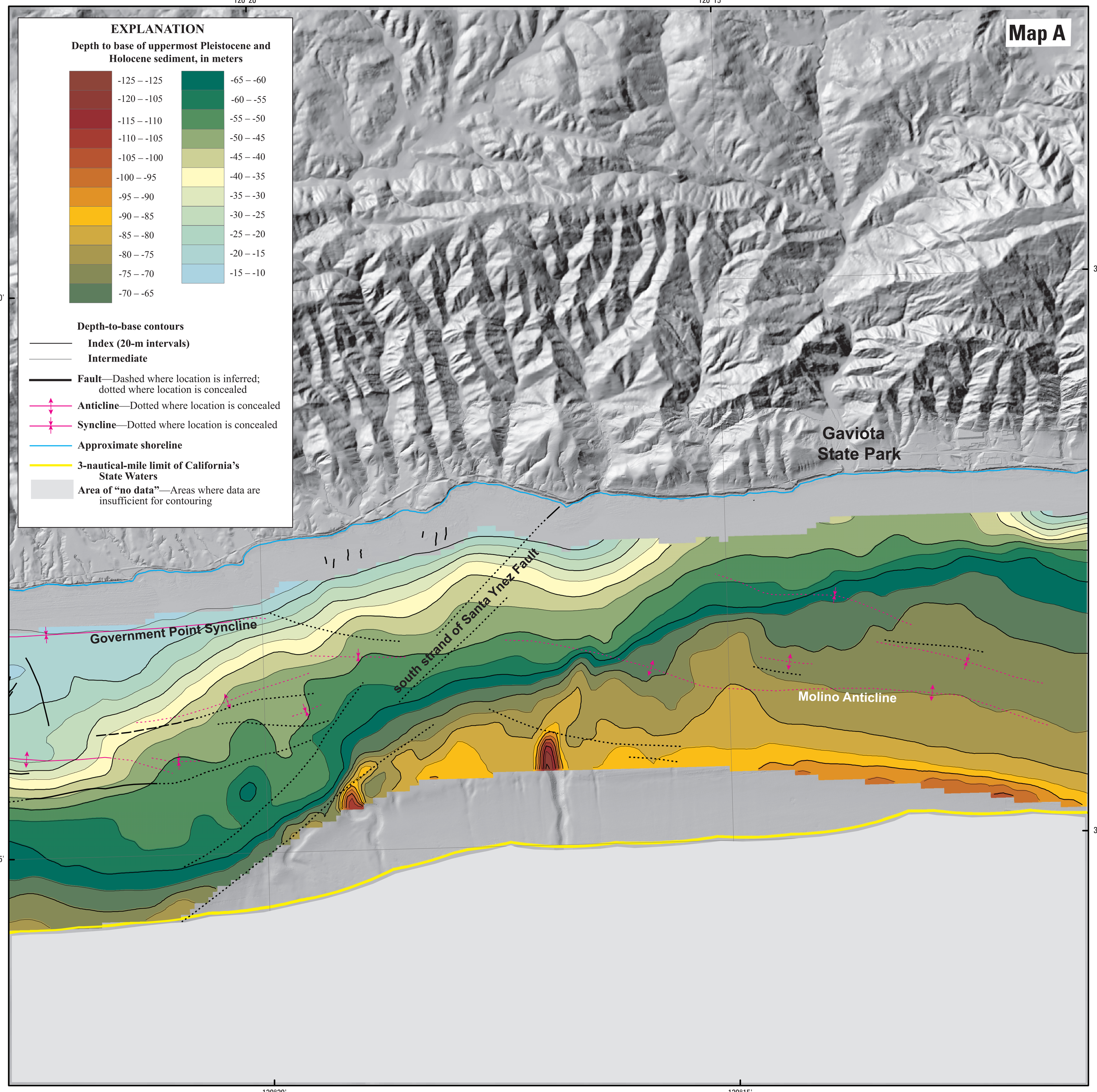
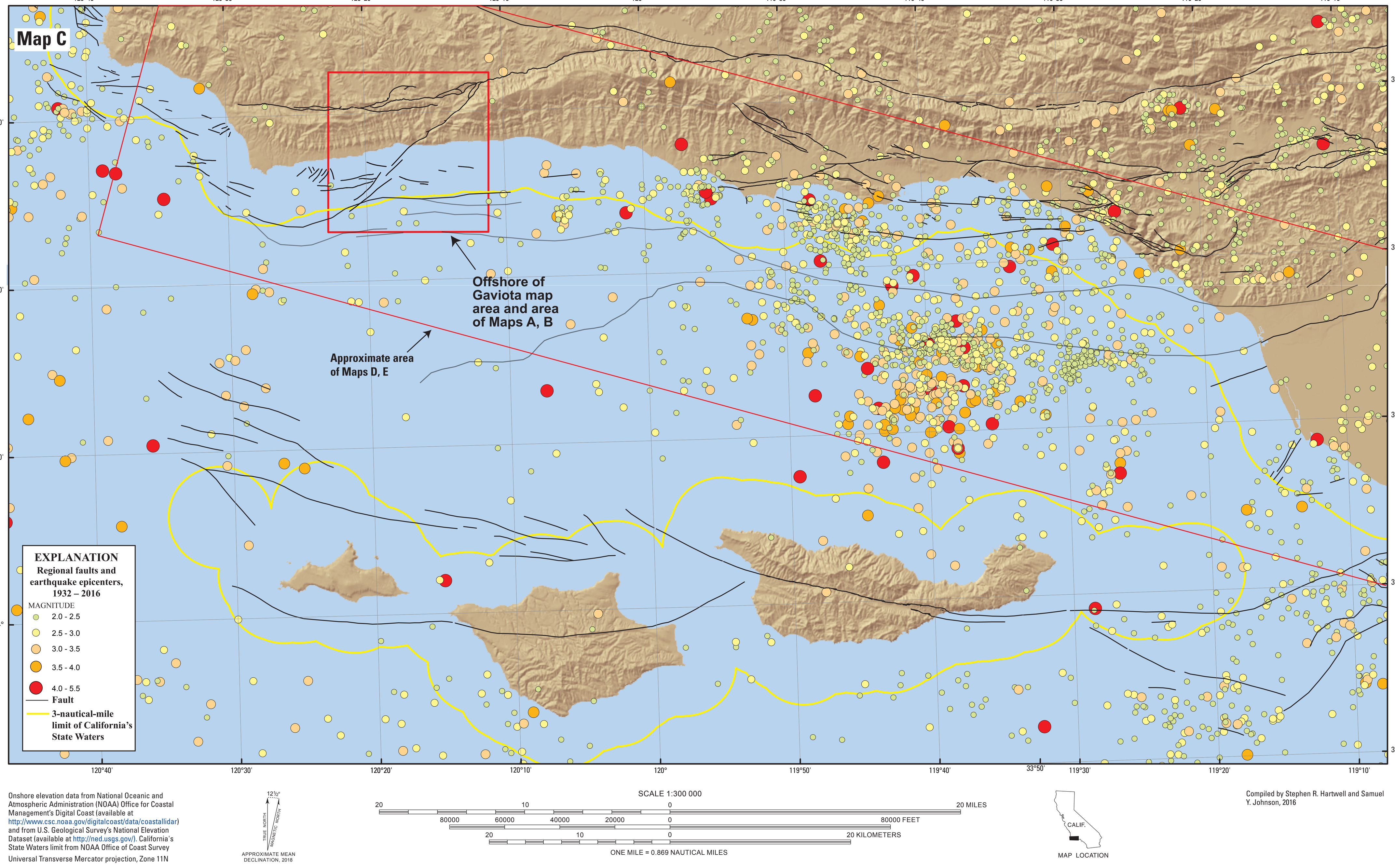
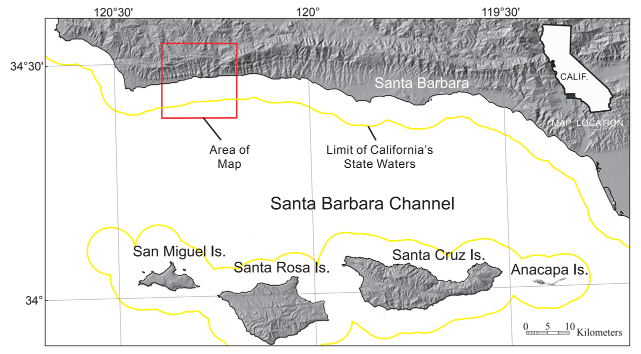






DISCUSSION

This sheet includes maps that show the thickness and the depth to base of uppermost Pleistocene and Holocene (in other words, post–Late Glacial Maximum) deposits for the Offshore of Gaviota map area (Maps A, B), as well as for a larger area that extends about 130 km along the coast from Hueneme Canyon to Point Conception (Maps D, E) to establish a regional context. To make these maps, water bottom and depth to base of the uppermost Pleistocene and Holocene sediment layer were mapped from seismic-reflection profiles (sheet 7). The difference in the two horizons was exported for every shot point as XY coordinates (UTM zone 10) and two-way travel time (TWT). The thickness of the uppermost Pleistocene and Holocene unit (Maps B, E) was determined by applying a sound velocity of 1,600 m/sec to the TWT. The thickness points were interpolated to a preliminary continuous surface, overlaid with zero-thickness bedrock outcrops (see sheet 9), and contoured, following the methodology of Wong and others (2012). Data within Hueneme Canyon were excluded from the contouring because the seismic-reflection data are too sparse to adequately image the highly variable changes in sediment thickness that characterize the canyon (Maps D, E).

Several factors required manual editing of the preliminary sediment-thickness maps to make the final products. The Red Mountain Fault Zone (RMFZ), Pitas Point Fault (PPF), and Oak Ridge Fault (ORF) disrupt the sediment sequence in the region (Maps D, E). The data points also are dense along tracklines (about 1 m apart) and sparse between tracklines (1–2 km apart), resulting in contouring artifacts. To incorporate the effect of the faults, to remove irregularities from interpolation, and to reflect other geologic information and complexity, the resulting interpolated contours were modified. Contour modifications and regridding were repeated several times to produce the final regional sediment-thickness map (Wong and others, 2012). Data for the depth to base of the uppermost Pleistocene and Holocene unit (Maps A, D) were generated by adding the thickness data to water depths determined by multibeam bathymetry (see sheet 1).

In the Offshore of Gaviota map area, the thickness of the uppermost Pleistocene and Holocene sediments on the continental shelf ranges from 0 to 36 m (Map B). Mean sediment thickness on the shelf in the map area is 9.9 m, and the total sediment volume on the shelf is 853×10^6 m^3. The thickest sediment in the map area (about 36 m) is found within the Gaviota sediment bar. The primary sediment source, Cañada de la Gaviota, is the largest coastal watershed (about 52 km^2; Warrick and Mertes, 2009) between the Ventura River and Point Conception. Sediment thins markedly and is locally absent on the shelf both southeast and northwest of the Gaviota sediment bar, commonly forming only a thin veneer over bedrock outcrops.

Five different "domains" of sediment thickness, which are bounded either by faults or by Hueneme Canyon, are recognized on the regional maps (Maps D, E): (1) north of the south strand of the Red Mountain Fault Zone; (2) between the south strand of the Red Mountain Fault Zone and the Pitas Point Fault; (3) between the Pitas Point and Oak Ridge Faults; (4) between the Oak Ridge Fault and Hueneme Canyon; and (5) south of Hueneme Canyon. Table 6–1 (in pamphlet) shows the area of these five domains, along with estimates of their mean sediment thicknesses and total sediment volumes. These data highlight the contrast among three general zones of sediment thickness: (1) the uplifted, sediment-poor Santa Barbara and Point Conception shelf (domain 1; mean sediment thickness of 4.2 m); (2) a transitional zone (domain 2; mean sediment thickness of 18.0 m); and (3) the subsiding, sediment-rich delta and shelf offshore of the Ventura and Santa Clara Rivers and Calleguas Creek (domains 3, 4, and 5; mean sediment thicknesses of 39.2, 38.9, and 28.3 m, respectively).

The regional pattern of faults and of earthquakes occurring between 1932 and 2016 that have inferred or measured magnitudes greater than 2.0 is shown on Map C. Fault locations are based on our mapping within California's State Waters and on a generalized compilation that includes the mapping of Heck (1998), Minor and others (2009), and Jennings and Bryant (2010). Earthquake data are from the U.S. Geological Survey (2016). Although earthquake locations have been determined by the CalTech network since 1932, significantly greater precision began in 1969 with installation of a U.S. Geological Survey (USGS) seismographic network (see, for example, Lee and Vedder, 1973; Sylvester, 2001; U.S. Geological Survey, 2016). Epicentral data indicate that seismicity in the Santa Barbara Channel region is characterized by earthquake swarms, relatively frequent minor earthquakes, and infrequent major earthquakes.

Three significant earthquakes affected the Santa Barbara Channel area prior to 1932 (the year of the earliest earthquake in the U.S. Geological Survey [2016] catalog): in 1812, 1857 (the Fort Tejon earthquake on the San Andreas Fault), and 1925 (Stover and Coffman, 1993). Sylvester and others (1970) reported a location in the northern Santa Barbara Channel for the 1925 event (M6.3), as well as for a 1941 earthquake (~M5.5, 7/1/1941) about 7 km offshore and 15 km southeast of Santa Barbara, the largest earthquake shown on Map C (sheet 8). In addition, Sylvester and others (1970) documented a swarm of 62 earthquakes (M2.5–M5.2) that occurred between 6/26/1968 and 8/3/1968, which also were located 10 to 15 km south (offshore) of Santa Barbara. The largest recorded event in the Offshore of Gaviota map area (M3.1) occurred on 11/4/1987, about 7 km south of Gaviota (U.S. Geological Survey, 2016).

REFERENCES CITED

Heck, R.G., 1998, Santa Barbara Channel regional formline map, top Monterey Formation, *in* Kunitomi, D.S., Hopps, T.E., and Galloway, J.M., eds., Structure and petroleum geology, Santa Barbara Channel, California: American Association of Petroleum Geologists, Pacific Section, and Coast Geological Society, Miscellaneous Publication 46, 1 plate.

Jennings, C.W., and Bryant, W.A., 2010, Fault activity map of California: California Geological Survey Geologic Data Map No. 6, scale 1:750,000, available at http://www.conservation.ca.gov/cgs/cgs_history/Pages/2010_faultmap.aspx.

Lee, W.H.K., and Vedder, J.G., 1973, Recent earthquake activity in the Santa Barbara Channel region: Bulletin of the Seismological Society of America, v. 63, p. 1,757–1,773.

Minor, S.A., Kellogg, K.S., Stanley, R.G., Gurrola, L.D., Keller, E.A., and Brandt, T.R., 2009, Geologic map of the Santa Barbara coastal plain area, Santa Barbara County, California: U.S. Geological Survey Scientific Investigations Map 3001, scale 1:25,000, 1 sheet, pamphlet 38 p., available at http://pubs.usgs.gov/sim/3001/.

Stover, C.W. and Coffman, J.L., 1993, Seismicity of the United States, 1568-1989 (revised): U.S. Government Printing Office, 418 p.

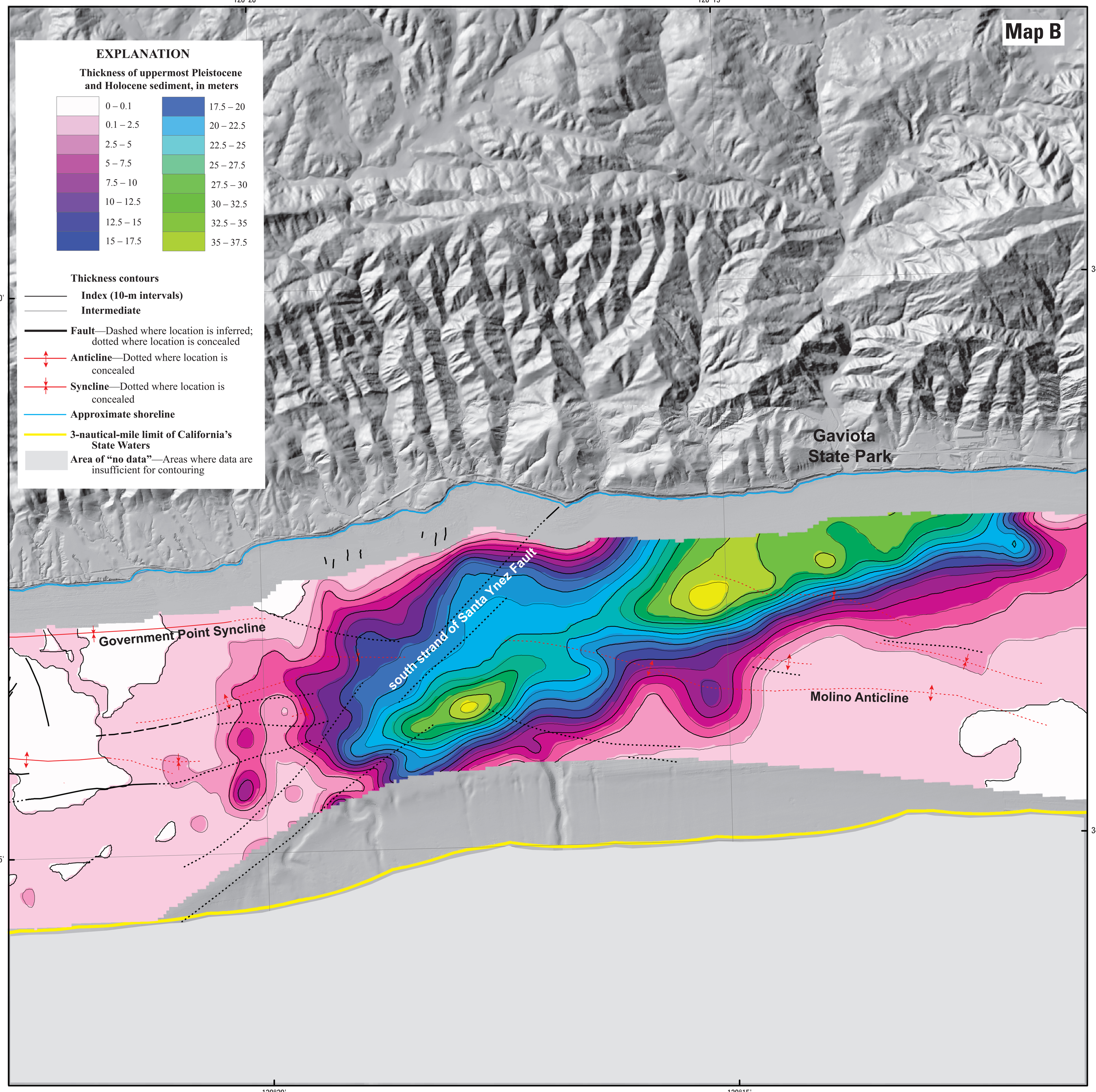
Sylvester, A.G., 2001, Catalog of Santa Barbara earthquakes—1800 to 1960: Santa Barbara, University of California, Santa Barbara database, accessed March 2016 at http://projects.crustal.ucsb.edu/sb_eqs/SBEQCatlog/SBEQCATINTRO.html.

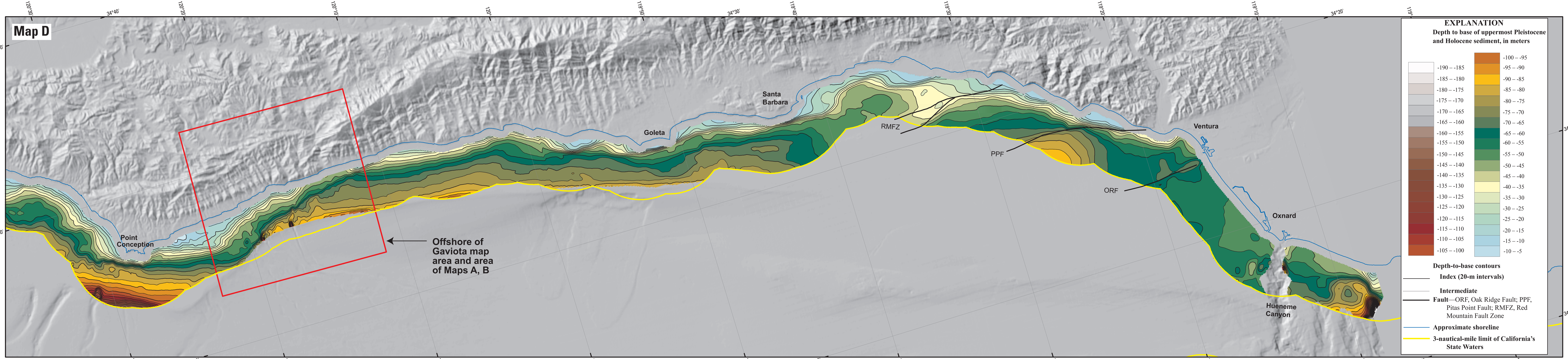
Sylvester, A.G., Smith, S.S., and Scholz, C.H., 1970, Earthquake swarm in the Santa Barbara Channel, California, 1968: Bulletin of the Seismological Society of America, v. 60, p. 1,047–1,060.

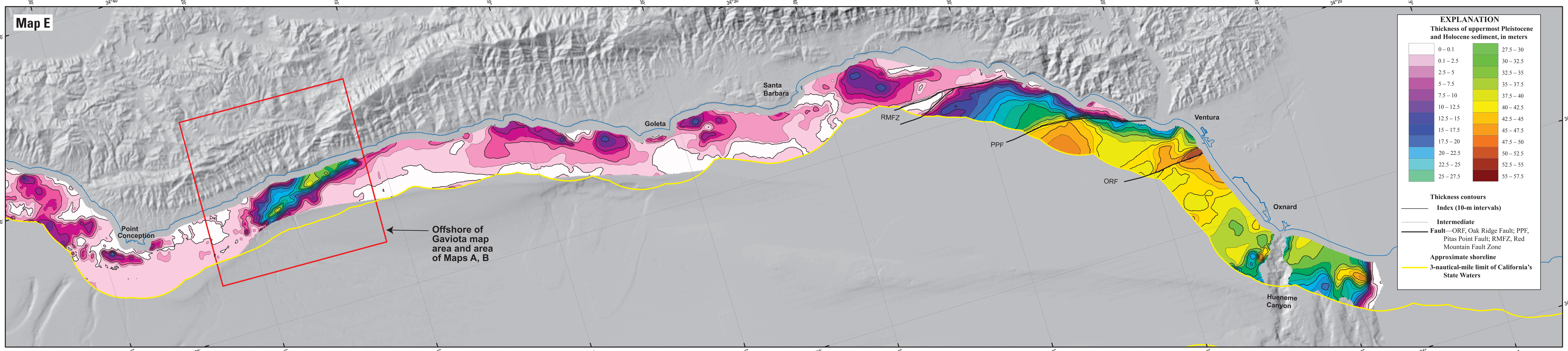
U.S. Geological Survey, 2016, Earthquake catalog: U.S. Geological Survey database, accessed June 14, 2016, at https://earthquake.usgs.gov/earthquakes/search/.

Warrick, J.A., and Mertes, L.A.K., 2009, Sediment yield from the tectonically active semiarid Western Transverse Ranges of California: Geological Society of America Bulletin, v. 121, p. 1,054–1,070.

Wong, F.L., Phillips, E.L., Johnson, S.Y, and Sliter, R.W., 2012, Modeling of depth to base of Last Glacial Maximum and seafloor sediment thickness for the California State Waters Map Series, eastern Santa Barbara Channel, California: U.S. Geological Survey Open-File Report 2012–1161, 16 p., available at http://pubs.usgs.gov/of/2012/1161/.







NOT INTENDED FOR NAVIGATIONAL USE

NOT INTENDED FOR NAVIGATIONAL USE

Depth and thickness mapped by Samuel Y. Johnson, Eleyne L. Phillips, and Stephen R. Hartwell, 2010–2016

GIS database and digital cartography by Andrew C. Ritchie, Eleyne L. Phillips, Florence L. Wong, and Stephen R. Hartwell

Manuscript approved for publication February 12, 2018

Local (Offshore of Gaviota Map Area) and Regional (Offshore from Point Conception to Hueneme Canyon) Shallow-Subsurface Geology and Structure, Santa Barbara Channel, California

By
Samuel Y. Johnson and Stephen R. Hartwell

2018

ISSN 2331-1258 (online)
https://doi.org/10.3133/ofr20181023

Digital files available at https://doi.org/10.3133/ofr20181023

Suggested Citation: Johnson, S.Y., and Hartwell, S.R., 2018, Local (Offshore of Gaviota map area) and regional (offshore from Point Conception to Hueneme Canyon) shallow-subsurface geology and structure, Santa Barbara Channel, California, *sheet 8 in* Johnson, S.Y., Dartnell, P., Cochrane, G.R., Hartwell, S.R., Golden, N.E., Kvitek, R.G., and Davenport, C.W. (S.Y. Johnson and S.A. Cochran, eds.), California State Waters Map Series—Offshore of Gaviota, California: U.S. Geological Survey Open-File Report 2018–1023, pamphlet 41 p., 9 sheets, scale 1:24,000, https://doi.org/10.3133/ofr20181023.