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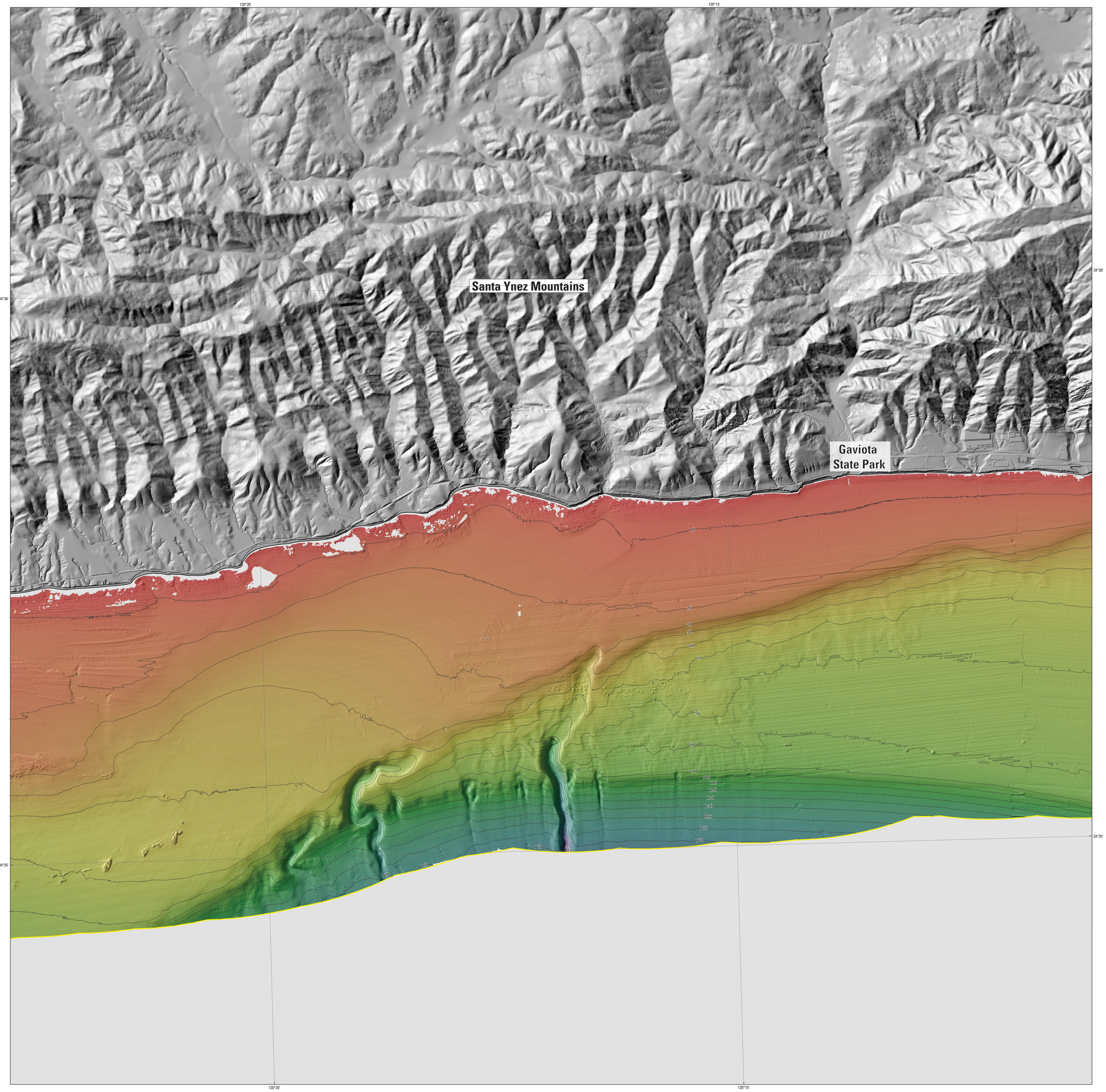
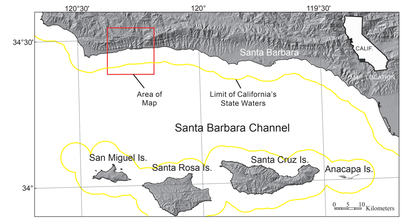
U.S. Department of the Interior
U.S. Geological Survey

Open-File Report 2018–1023
Sheet 1 of 9
Pamphlet accompanies map





DISCUSSION

This colored shaded-relief bathymetry map of the Offshore of Gaviota map area in southern California was generated from acoustic-bathymetry data collected by the U.S. Geological Survey (USGS) and by Fugro Pelagos (fig. 1) in 2007 and 2008, using a combination of 400-kHz Reson 7125, 240-kHz Reson 8101, and 100-kHz Reson 8111 multibeam echosounders, as well as a 234-kHz SEA SWATHplus bathymetric sidescan-sonar system. In addition, bathymetric- and topographic-lidar data was collected in the nearshore and coastal areas by the U.S. Army Corps of Engineers (USACE) Joint Lidar Bathymetry Technical Center of Expertise in 2009 and 2010. These mapping missions combined to provide continuous bathymetry from the shoreline to the 3-nautical-mile limit of California's State Waters.

During the USGS mapping missions, GPS data with real-time-kinematic corrections were combined with measurements of vessel motion (heave, pitch, and roll) in a CodaOctopus F190 attitude-and-position system to produce a high-precision vessel-attitude packet. This packet was transmitted to the acquisition software in real time and combined with instantaneous sound-velocity measurements at the transducer head before each ping. The returned samples were projected to the seafloor using a ray-tracing algorithm that works with previously measured sound-velocity profiles. Statistical filters were applied to discriminate seafloor returns (soundings) from unintended targets in the water column. Further editing of the USGS 2007 bathymetric-sounding data was completed in 2016, and the final soundings were converted into a 2-m-resolution bathymetric-surface-model grid.

During the Fugro Pelagos mapping missions, an Applanix POS-MV (Position and Orientation System for Marine Vessels) was used to accurately position the vessels during data collection, and it also accounted for vessel motion such as heave, pitch, and roll, with navigational input from GPS receivers. Smoothed Best Estimated Trajectory (SBET) files were postprocessed from logged POS-MV files. Sound-velocity profiles were collected with an Applied Microsystems (AM) SVPlus sound velocimeter. Soundings were corrected for vessel motion using the Applanix POS-MV data, for variations in water-column sound velocity using the AM SVPlus data, and for variations in water height (tides) and heave using the postprocessed SBET data (California State University, Monterey Bay, Seafloor Mapping Lab, 2016).

Nearshore bathymetric-lidar data and acoustic-bathymetric data from within California's State Waters were merged together as part of the 2013 National Oceanic and Atmospheric Administration (NOAA) Coastal California TopoBathy Merge Project (National Oceanic and Atmospheric Administration, 2013). Merged bathymetry data from within the Offshore of Gaviota map area were downloaded from this dataset and resampled to 2-m spatial resolution, then the reprocessed 2007 USGS bathymetry data were incorporated into the downloaded data. An illumination having an azimuth of 300° and from 45° above the horizon was then applied to the new bathymetric surface to create the shaded-relief imagery. In addition, a "rainbow" color ramp was applied to the bathymetry data, using reds to represent shallower depths, and blueish greens (and in deeper submarine canyons, purples) to represent greater depths. This colored bathymetry surface was draped over the shaded-relief imagery at 60-percent transparency to create the colored shaded-relief map. Note that the ripple patterns and parallel lines that are apparent within the map area are data-collection and -processing artifacts. These various artifacts are made obvious by the hillshading process.

Bathymetric contours were generated at 10-m intervals from a modified 2-m-resolution bathymetric surface. The most continuous contour segments were preserved; smaller segments and isolated island polygons were excluded from the final output. The contours were smoothed using a polynomial approximation with exponential kernel algorithm and a tolerance value of 60 m. The contours were then clipped to the boundary of the map area.

The onshore-area image was generated by applying the same illumination (azimuth of 300° and from 45° above the horizon) to 2-m-resolution topographic-lidar data from National Oceanic and Atmospheric Administration Office for Coastal Management's Digital Coast (available at http://www.csc.noaa.gov/digitalcoast/data/coastallidar/) and to 10-m-resolution topographic-lidar data from the U.S. Geological Survey's National Elevation Dataset (available at http://ned.usgs.gov/).

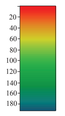
REFERENCES CITED

California State University, Monterey Bay, Seafloor Mapping Lab, 2016, Southern California 2008 CSMP surveys: California State University, Monterey Bay, Seafloor Mapping Lab Data Library, accessed October 2016 at http://seafloor.otterlabs.org/SFMLwebDATA_SURVEYMAP.htm.

National Oceanic and Atmospheric Administration, 2013, 2013 NOAA Coastal California TopoBathy Merge Project: National Oceanic and Atmospheric Administration, National Centers for Environmental Information database, accessed October 2016 at http://www.ngdc.noaa.gov/docucomp/page?xml=NOAA/NESDIS/NGDC/MGG/Lidar/iso/xml/2013_CA_TopoBathy_m2612.xml&view=getDataView&header=none.

EXPLANATION

Depth (in meters) and illumination (bright areas are illuminated, facing false sun; dark areas are in shadow, facing away from false sun)



Direction of illumination from false sun—Position of false sun is at 300° azimuth, 45° above horizon [arrow included in explanation for illustration purposes only; not shown on map]

Area of "no data"—Areas near shoreline not mapped owing to insufficient high-resolution seafloor mapping data; areas beyond 3-nautical-mile limit of California's State Waters were not mapped as part of California Seafloor Mapping Program

3-nautical-mile limit of California's State Waters

Bathymetric contour (in meters)—Derived from modified 2-m-resolution bathymetry grid. Contour interval: 10 m

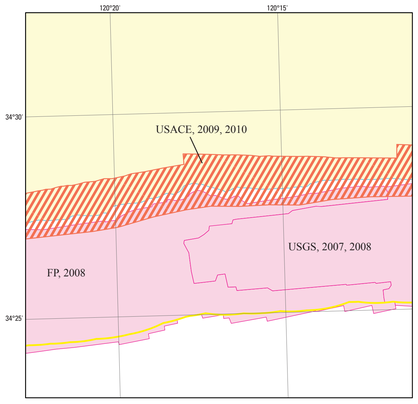


Figure 1. Map showing areas of multibeam-echosounder and bathymetric-sidescan surveys (pink shading), bathymetric- and topographic-lidar surveys (orange diagonal lines), and publicly available onshore topographic-lidar data (yellow shading). Also shown are data-collecting agencies (FP, Fugro Pelagos; USACE, U.S. Army Corps of Engineers; USGS, U.S. Geological Survey) and dates of surveys if known.

Onshore elevation data from National Oceanic and Atmospheric Administration (NOAA) Office for Coastal Management's Digital Coast (available at http://www.csc.noaa.gov/digitalcoast/data/coastallidar/) and from U.S. Geological Survey's National Elevation Dataset (available at http://ned.usgs.gov/). California's State Waters limit from NOAA Office of Coast Survey

Universal Transverse Mercator projection, Zone 10N

NOT INTENDED FOR NAVIGATIONAL USE

SCALE 1:24 000

1 1/2 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 0 1 KILOMETER

BATHYMETRIC CONTOUR INTERVAL 10 METERS

ONE MILE = 0.869 NAUTICAL MILES

Shaded-relief bathymetry by Peter Dartnell, 2016 (data collected by U.S. Geological Survey in 2007 and 2008, by Fugro Pelagos in 2008, and by U.S. Army Corps of Engineers Joint Lidar Bathymetry Technical Center of Expertise in 2009 and 2010). Bathymetric contours by Peter Dartnell, 2016

GIS database and digital cartography by Nadine E. Golden and Stephen R. Hartwell

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Colored Shaded-Relief Bathymetry, Offshore of Gaviota Map Area, California

By

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2018

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