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

Open-File Report 2018–1023
Sheet 4 of 9
Pamphlet accompanies map

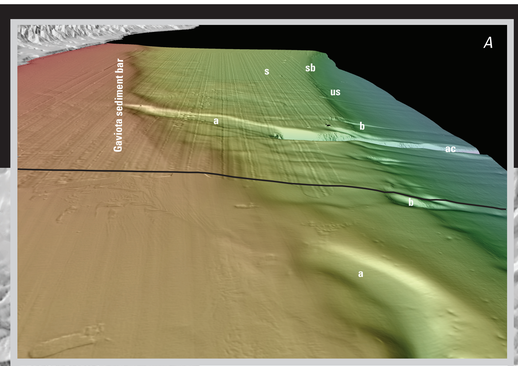


Figure 1. Perspective views to east over area south of Gaviota State Park. *A*, Perspective view of Gaviota sediment bar, shelf (s), shelf break (sb), and upper slope (us), showing larger (a) and smaller (b) canyons, gullies, and rills cutting into midshelf, outer shelf, and upper slope areas. Larger canyons such as "Alegria Canyon" (ac) propagate farther upslope, cutting through shelf and slope and into Gaviota sediment bar. Black line shows location of seismic-reflection profile in *B* below. *B*, Same perspective view as *A*, converted to block diagram that combines bathymetry with north-south-trending seismic-reflection profile GS–70 (also shown in fig. 5 on sheet 7 of this report, as viewed from opposite direction and at reduced vertical exaggeration). Block diagram shows that larger gullies are cutting through uppermost Pleistocene and Holocene sediments on shelf (blue shading). Mass-flow deposits are found on both south flank of Gaviota sediment bar and on steep upper slope (purple shading) (see fig. 4 for different view of mass-flow deposits; see also, sheets 7, 9 of this report). Dashed yellow line shows seafloor multiple (echo of seafloor reflector). Vertical exaggeration in both views, 2x; distance across bottoms, about 1.4 km.

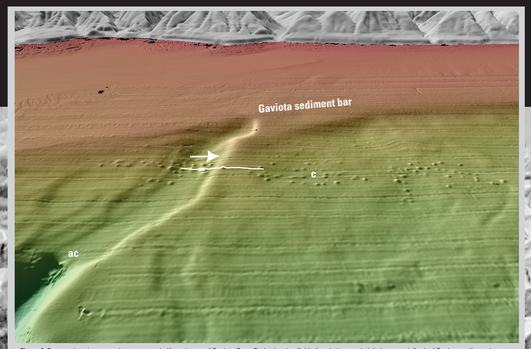


Figure 2. Perspective view to north over outer shelf southwest of Gaviota State Park, showing field of asphalt mounds (c) along south flank of Gaviota sediment bar and across "Alegria Canyon" (ac). Mounds are as much as 40 m wide and have as much as 2 m of vertical relief above surrounding seafloor. Thin white line shows path of camera sled, towed 1 to 2 m over seafloor, that captured video and photographs. White rectangle shows location of video mosaic (fig. 3) generated from video captured over an asphalt deposit. Parallel lines in bathymetry are data-collection and -processing artifacts. Vertical exaggeration, 2x; distance across bottom of image, about 1.8 km.

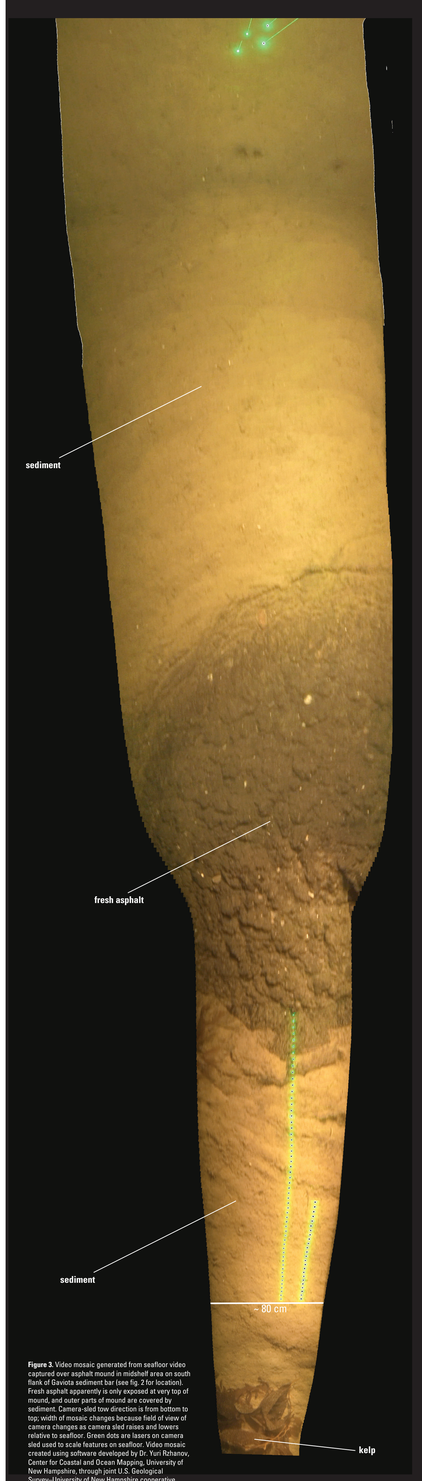


Figure 3. Video mosaic generated from seafloor video captured over asphalt mound in midshelf area on south flank of Gaviota sediment bar (see fig. 2 for location). Fresh asphalt apparently is only exposed at very top of mound, and outer parts of mound are covered by sediment. Camera-sled tow direction is from bottom to top; width of mosaic changes because field of view of camera changes as camera sled raises and lowers relative to seafloor. Green dots are lasers on camera sled used to scale features on seafloor. Video mosaic created using software developed by Dr. Yuri Rzhanov, Center for Coastal and Ocean Mapping, University of New Hampshire, through joint U.S. Geological Survey–University of New Hampshire cooperative agreement.

Map view. Colored shaded-relief bathymetry map of Offshore of Gaviota map area, generated from multibeam-echosounder and bathymetric-sidescan data. Colors show depth: reds and oranges indicate shallower areas; greens, blueish-greens, and purples (in submarine canyons), deeper areas. Illumination azimuth is 300°, from 45° above horizon. Ripple patterns and parallel lines that are apparent within map area are data-collection and -processing artifacts; these artifacts are made obvious by hillshading process. Numbered arrows show viewing directions of perspective views shown on this sheet; numbers correspond to figure numbers of views.

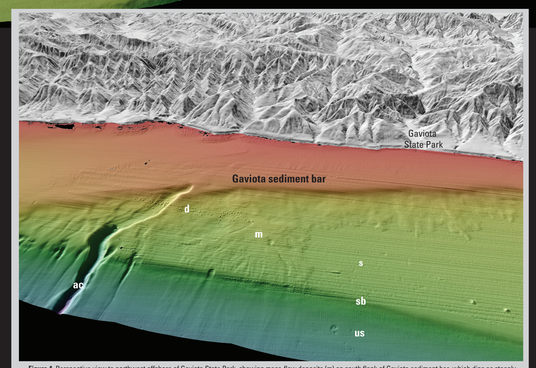


Figure 4. Perspective view to northwest offshore of Gaviota State Park, showing mass-flow deposits (m) on south flank of Gaviota sediment bar, which dips as steeply as 5°, whereas shelf (s) dips about 1.0° to 1.2° offshore. Mass-flow deposits locally extend across shelf break (sb) to upper slope (us); asphalt deposits (d) (see figs. 2, 3) are found within mass-flow deposits. Also shown is "Alegria Canyon" (ac). Vertical exaggeration, 2x; distance across of image, about 7 km.

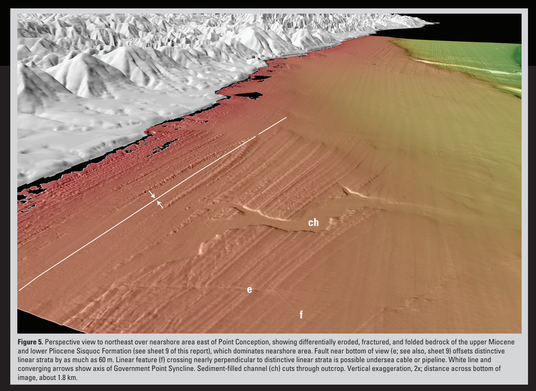


Figure 5. Perspective view to northeast over nearshore area east of Point Conception, showing differentially eroded, fractured, and folded bedrock of the upper Miocene and lower Pliocene Sisquoc Formation (see sheet 9 of this report), which dominates nearshore area. Fault near bottom of view (e; see also, sheet 9) offsets distinctive linear strata by as much as 60 m. Linear feature (f) crossing nearly perpendicular to distinctive linear strata is possible undersea cable or pipeline. White line and converging arrows show axis of Government Point Syncline. Sediment-filled channel (ch) cuts through outcrop. Vertical exaggeration, 2x; distance across bottom of image, about 1.8 km.

DISCUSSION

Mapping California's State Waters has produced a vast amount of acoustic and visual data, including bathymetry, acoustic backscatter, seismic-reflection profiles, and seafloor video and photography. These data are used by researchers to develop maps, reports, and other tools to assist in the coastal and marine spatial-planning capability of coastal-zone managers and other stakeholders. Seafloor-character, habitat, and geologic maps may be used for fisheries management, for designation of Marine Protected Areas, for monitoring of environmental change such as sea-level-rise impacts, for prediction of sediment and contaminant budgets and transport, and for assessment of earthquake and tsunami hazards. To achieve these goals, it is helpful to integrate the different datasets and then view the results in three-dimensional representations such as those displayed on this data integration and visualization sheet for the Offshore of Gaviota map area.

The map view in the center of the sheet is similar to the colored shaded-relief bathymetry map of the Offshore of Gaviota map area (see sheet 1 of this report). Numbered arrows show viewing directions of the perspective views on this sheet (figs. 1, 2, 4, 5, 6); the numbers indicate the figure number of the perspective view.

The perspective views in figures 1, 2, 4, 5, and 6 show the colored shaded-relief bathymetry of the Offshore of Gaviota map area, as viewed from different directions. These views highlight the seafloor morphology in the offshore of Gaviota map area, which includes asphalt mounds, rock outcrops, gullies, sediment mass-flow deposits, and linear striations interpreted as trawling scars.

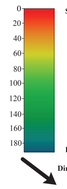
Video-mosaic images created from digital seafloor video (fig. 3) can display the geologic (rock, sand, mud) and biologic complexity of the seafloor. Whereas photographs capture high-quality snapshots of smaller areas of the seafloor, video mosaics can capture larger areas and, thus, can show transitional zones between different seafloor environments.

Draping the acoustic-backscatter imagery (see sheet 3 of this report) over the bathymetry data (fig. 6) highlights the relations between the backscatter intensity and the seafloor morphology. It also aids in seafloor habitat and geology interpretations and mapping sediment-transport pathways.

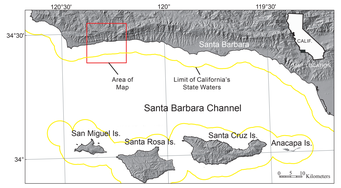
Block diagrams (fig. 1), which combine the bathymetry with seismic-reflection-profile data (see sheet 7 of this report), help reveal the stratigraphic and structural relations between the surface and subsurface.

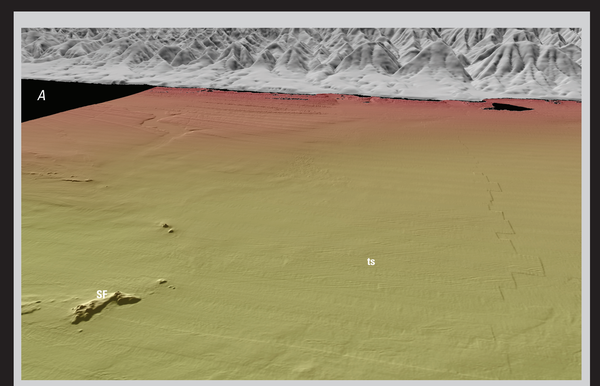
EXPLANATION

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]





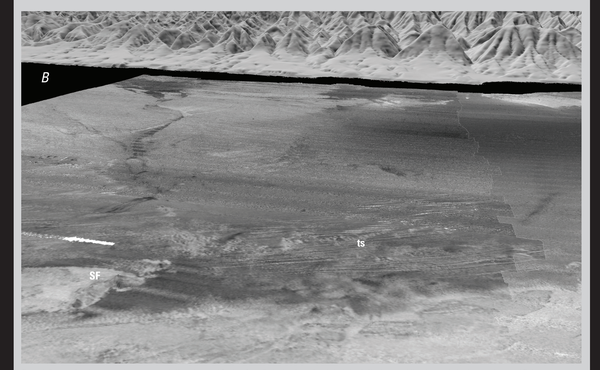


Figure 6. Perspective views to northwest across shelf southwest of Gaviota State Park, showing colored shaded-relief bathymetry (*A*) and acoustic-backscatter imagery (*B*). In acoustic-backscatter imagery, lighter tones indicate stronger backscatter intensity, suggesting rock or coarser grained sediment, whereas darker tones indicate weaker backscatter intensity, suggesting finer grained sediment. Views show outcrop (SF) of the upper Miocene and lower Pliocene Sisquoc Formation (see sheet 9 of this report), exposed near left side of image. Northeast (to right) of outcrop, northeast-trending linear striations (ts) on midshelf are interpreted as trawling scars (see sheet 9). Backscatter imagery (*B*) shows that striations have higher backscatter intensity than surrounding seafloor. North-south-trending, short black lines in bathymetry imagery and east-west-trending, straight, light-colored lines in backscatter imagery are all data-collection and -processing artifacts. Vertical exaggeration of perspective views, 2x; distance across bottom of both views, about 1.9 km.

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/). Offshore shaded-relief bathymetry from map on sheet 1, this report

Universal Transverse Mercator projection, Zone 10N

NOT INTENDED FOR NAVIGATIONAL USE

MAP LOCATION

Perspective views by Peter Dartnell, 2018. Seismic-reflection profile in figure 1 from sheet 7, this report. Video-mosaic image in figure 3 by Peter Dartnell, 2015, using software developed by Dr. Yuri Rzhanov, Center for Coastal and Ocean Mapping, University of New Hampshire, through joint U.S. Geological Survey–University of New Hampshire cooperative agreement. Acoustic-backscatter imagery in figure 6 from map on sheet 3, this report.

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

Manuscript approved for publication February 12, 2018

Data Integration and Visualization, Offshore of Gaviota Map Area, California

By
Peter Dartnell

2018

For sale by U.S. Geological Survey, Information Services, Box 25286, Federal Center, Denver, CO 80225, 1–888–ASK–USGS

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

Suggested Citation: Dartnell, P., 2018, Data integration and visualization, Offshore of Gaviota map area, California, sheet 4 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.

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