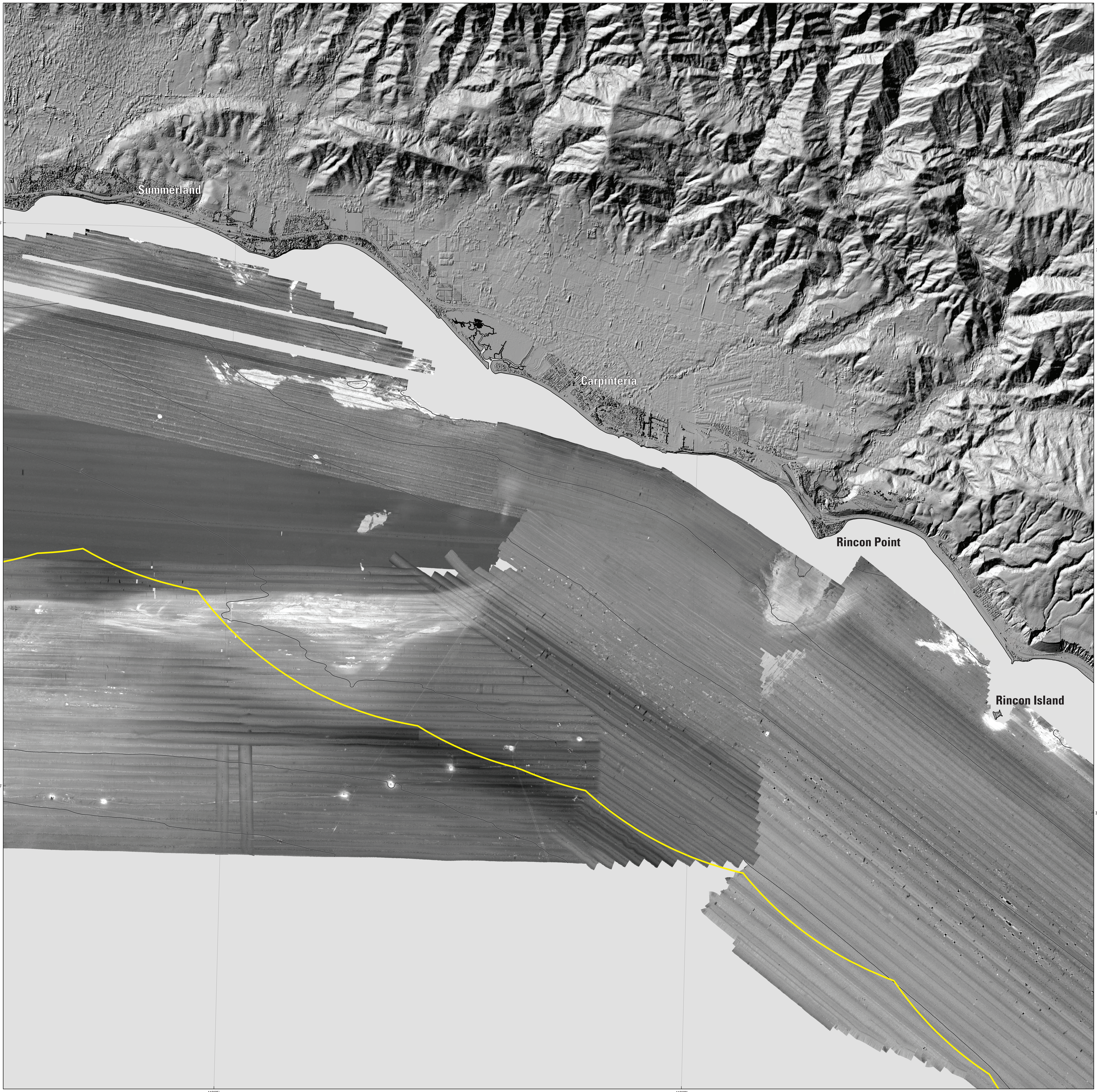

Onshore elevation data from NOAA Coastal Services Center (data collected by EarthData International in 2002-2003) and from U.S. Army Corps of Engineers (data collected by Fugro Pelagos in 2009). California's State Waters limit from NOAA Office of Coast Survey

Universal Transverse Mercator projection, Zone 11N

NOT INTENDED FOR NAVIGATIONAL USE

APPROXIMATE MEAN DECLINATION, 2013

SCALE 1:24 000

BATHYMETRIC CONTOUR INTERVAL 10 METERS

ONE MILE = 0.869 NAUTICAL MILES

MAP LOCATION

Acoustic-backscatter imagery collected by California State University, Monterey Bay, Seafloor Mapping Lab in 2007 (reprocessed by Peter Dartnell, 2010) and by U.S. Geological Survey in 2005-2006. Bathymetric contours by Andrew C. Ritchie, 2011

GIS database and digital cartography by Nadine E. Golden and Eleyne L. Phillips

Edited by Taryn A. Lindquist

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Acoustic Backscatter, Offshore of Carpinteria Map Area, California

By

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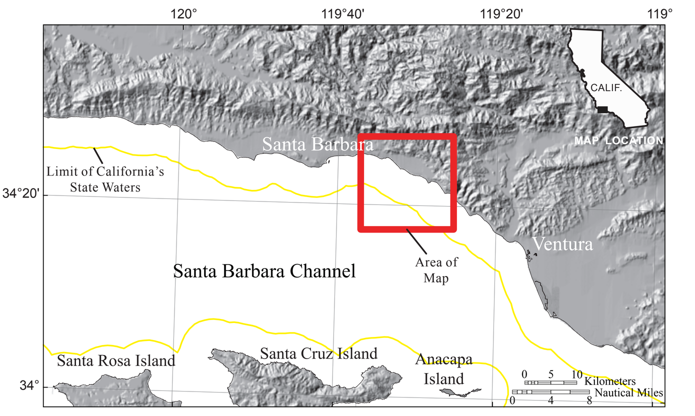

DISCUSSION

This acoustic-backscatter map of the Offshore of Carpinteria map area in southern California was generated from backscatter data collected by California State University, Monterey Bay (CSUMB), and by the U.S. Geological Survey (USGS) (fig. 1). The southeastern nearshore and shelf areas, as well as the western midshelf area, were mapped by CSUMB in the summer of 2007, using a 244-kHz Reson 8101 multibeam echosounder. The western nearshore area, as well as the western outer shelf area, were mapped by the USGS in 2005 and 2006, using 117-kHz and 234.5-kHz SEA (AP) Ltd. SWATHplus-M phase-differencing sidescan sonars. These mapping missions combined to collect acoustic-backscatter data from about the 10-m isobath to beyond the 3-nautical-mile limit of California's State Waters.

During the CSUMB mapping mission, an Applanix position and motion compensation system (POS/MV) was used to accurately position the vessel during data collection, and it also accounted for vessel motion such as heave, pitch, and roll (position accuracy, ±2 m; pitch, roll, and heading accuracy, ±0.02°; heave accuracy, ±5%, or 5 cm). NavCom 2050 GPS receiver (CNAV) data were used to account for tidal-cycle fluctuations, and 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) using vertical-position data from the CNAV receiver. Backscatter data were postprocessed using CARIS7.0/Geocoder software. Geobars were created for each survey line using the beam-averaging engine. Intensities were radiometrically corrected (including despeckling and angle-varying gain adjustments), and the position of each acoustic sample was geometrically corrected for slant range on a line-by-line basis. The contrast and brightness of some geobars were adjusted to better match the surrounding geobars. Individual geobars were mosaicked together at 2-m resolution using the auto-seam method. The mosaics were then exported from CARIS as georeferenced TIFF images, imported into a GIS, and converted to GRIDs.

During the USGS mapping missions, differential GPS (DGPS) data were combined with measurements of vessel motion (heave, pitch, and roll) in a CodaOctopus F180 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 the raw samples that discriminate the seafloor returns (soundings and backscatter intensity) from unintended targets in the water column. The backscatter data were postprocessed using USGS software (D.P. Finlayson, written commun., 2011) that normalizes for time-varying signal loss and beam-directivity differences. Thus, the raw 16-bit backscatter data were gain-normalized to enhance the backscatter of the SWATHplus system. The resulting normalized-amplitude values were rescaled to 16-bit and gridded into GeoJPEGs using GRID Processor Software, then imported into a GIS and converted to GRIDs.

Once all the acoustic-backscatter images were transformed to a common projection, the grids were combined in a GIS to create this map, on which brighter tones indicate higher backscatter intensity, and darker tones indicate lower backscatter intensity. The intensity represents a complex interaction between the acoustic pulse and the seafloor, as well as characteristics within the shallow subsurface, providing a general indication of seafloor texture and sediment type. Backscatter intensity depends on the acoustic source level; the frequency used to image the seafloor; the grazing angle; the composition and character of the seafloor, including grain size, water content, bulk density, and seafloor roughness; and some biological cover. Harder and rougher bottom types such as rocky outcrops or coarse sediment typically return stronger intensities (high backscatter, lighter tones), whereas softer bottom types such as fine sediment return weaker intensities (low backscatter, darker tones). The differences in backscatter intensity that are apparent in some areas of the map are due to the different frequencies of mapping systems, as well as different processing techniques.

The onshore-area image was generated by applying an illumination having an azimuth of 300° and from 45° above the horizon to coastal airborne topographic-lidar data, as well as to publicly available, 3-m-resolution, interferometric synthetic aperture radar (ifSAR) data, available from National Oceanic and Atmospheric Administration (NOAA) Coastal Service Center's Digital Coast, at http://csc-s-maps-q.csc.noaa.gov/dataviewer/viewer.html (last accessed April 5, 2011).

EXPLANATION

Backscatter intensity

High

Low

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

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

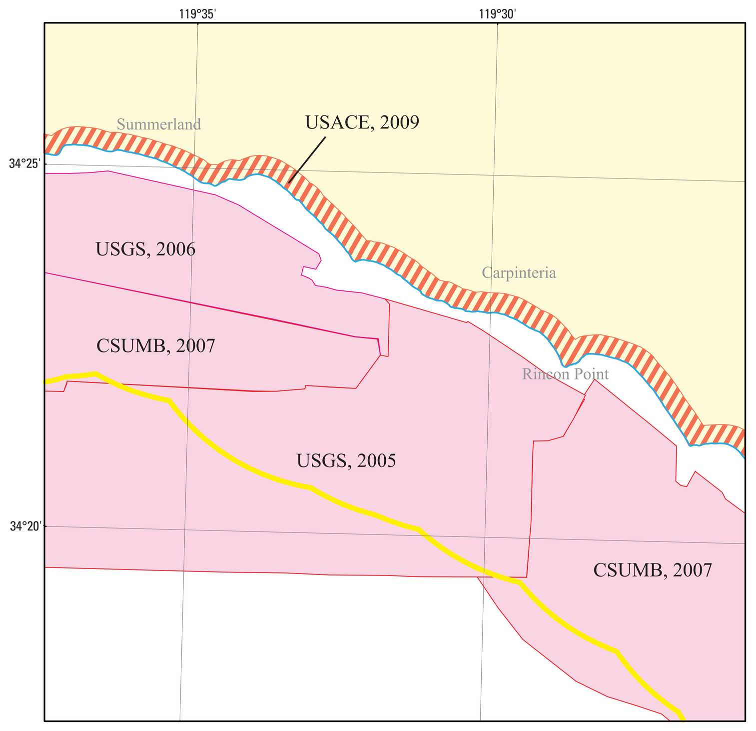

Figure 1. Map showing areas of multibeam-echosounder and bathymetric-sidescan surveys (pink shading), topographic-lidar surveys (orange diagonal lines), and publically available interferometric synthetic aperture radar (ifSAR) topography (yellow shading). Also shown are data-collecting agencies (CSUMB, California State University, Monterey Bay, Seafloor Mapping Lab; USACE, U.S. Army Corps of Engineers; USGS, U.S. Geological Survey) and dates of surveys if known.

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

Digital files available at http://pubs.usgs.gov/sim/3261/

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