Regional and Nearshore Bathymetry of American Samoa: Implications for Tsunami Run-Up and Public Awareness

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Bathymetry of Sandwell & Smith, Global Topo v. 12.1 and Wright et al. (2000), ve = 6
Only 5-10% of global seafloor charted with ships - “We need ~125 more years!...” *

*Sandwell et al. (2003), Eos, Transactions AGU; Image courtesy of Steve Miller, Scripps GDC
Primary Data Acquisition: “Deep”

Image from Lost City Expedition (2003)

Multibeam sonar, regional scale, 200 m and deeper
Primary Data Acquisition: “Shallow”

Multibeam sonar, 200 m and shallower
Ikonos, shoreline to 15 m
Data Description

- Multiple datasets collected during separate research cruises (1984-2006)
- Surveys operated by numerous institutions with a variety of scientific objectives
- Data collected by various shipboard multibeam sonar systems with differing quality
- *Regional* data merged at a resolution of 200 m, covering an area of 28,446 km²
# Deep Multibeam by Expedition

<table>
<thead>
<tr>
<th>Expedition</th>
<th>Year</th>
<th>Institution(s)</th>
<th>Vessel</th>
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<tbody>
<tr>
<td>Marathon</td>
<td>1984</td>
<td>Scripps Institution of Oceanography</td>
<td>R/V Thomas Washington</td>
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<tr>
<td>Papatua</td>
<td>1985-86</td>
<td>Scripps Institution of Oceanography</td>
<td>R/V Thomas Washington</td>
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<tr>
<td>Roundabout</td>
<td>1989</td>
<td>Scripps Institution of Oceanography</td>
<td>R/V Thomas Washington</td>
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<tr>
<td>Boomerang</td>
<td>1996</td>
<td>Oregon State University, Scripps Institution of Oceanography</td>
<td>R/V Melville</td>
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<tr>
<td>Kiwi</td>
<td>1997</td>
<td>Scripps Institution of Oceanography</td>
<td>R/V Revelle</td>
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<tr>
<td>AVON</td>
<td>1999</td>
<td>Scripps Institution of Oceanography, Woods Hole Oceanographic Institution</td>
<td>R/V Melville</td>
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<tr>
<td>Cook</td>
<td>2001</td>
<td>University of Rhode Island</td>
<td>R/V Melville</td>
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<td>Drift</td>
<td>2002</td>
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<td>ALIA</td>
<td>2005</td>
<td>Woods Hole Oceanographic Institution</td>
<td>R/V Kilo Moana</td>
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<td>HURL</td>
<td>2005-06</td>
<td>Hawaii Undersea Research Lab</td>
<td>R/V Ka’imikai-O-Kanaloa</td>
</tr>
</tbody>
</table>
Deeper Multibeam Compilation

American Samoa
Eastern Samoan Volcanic Province

-6,000 -3,000 0 1,000
Elevation (meters) with respect to sea level

200 meter resolution bathymetric grid in foreground. Predicted bathymetric surface derived from one kilometer satellite altimetry in background.

Data Source: Seamount Catalog - EarthRef.org | Projection: Linear WGS-84
Cartography: Jed Roberts, Oregon State University | Date: October, 2007
Interpretation of Major Features

Geomorphologic interpretation of major volcanic structures with 200 meter multibeam bathymetry in background.

Data Source: Seamount Catalog - EarthRef.org | Projection: Linear WGS-84
Cartography: Jed Roberts, Oregon State University | Date: October, 2007
Benthic Habitats of American Samoa
Products Derived for Tutuila and Aunu'u Islands from IKONOS Satellite Imagery

Benthic Habitat Mapping

This draft benthic habitat map was developed by the American Samoa government (Department of Marine and Wildlife Resources, Environmental Protection Agency, Department of Commerce), the National Oceanic and Atmospheric Administration's (NOAA) Fagatele Bay National Marine Sanctuary, the National Ocean Service, the Department of Interior's National Park of American Samoa, and Analytical Laboratories of Hawaii.

NOAA's National Ocean Service (NOS) acquired high-resolution color IKONOS satellite imagery for the islands of Tutuila and Aunu'u, American Samoa. The imagery is being used to create maps of the region's marine resources, including coral reefs and other habitats, for fisheries management, tourism, and other aspects of the coastal economy. Accurate habitat maps can be used by resource managers to make informed decisions about the protection of these resources in nearshore waters.

A primary product of this effort is a benthic habitat map in a geographic information system (GIS) format produced by visually interpreting the remotely sensed data. The benthic habitat map portrayed has been produced by manual delineation of habitats from the color IKONOS imagery.
Pago Pago Harbor could sustain the worst damage due to amplification of the tsunami by the narrowing of the channel.”
Shallow Bathy w/Tutuila Island

Digital Elevation Model and Sonar Bathymetry with Shallow-water Gap

Hogrefe, Wright, & Hochberg, Marine Geodesy, 2008
Lim, Eakins, & Taylor
U21E-2188 Poster
Tsunami Inundation DEM
Community Engagement

- Coastal Mgmt Program
- **AS GIS Users Group**
- Dept of Marine & Wildlife Resources
- Dept of Public Works
- AS Power Authority
- National Park of AS
- AS Environmental Protection Agency
- AS Community College
- AS Historic Preservation Office
Initial Tsunami Damage Maps

American Samoa Tsunami Effectected Villages

Legend:
- Red: Tsunami-affected area
- Yellow: Tsunami-affected villages
- Green: Light damage
- Gray: Villages

This map depicts the tsunami-affected areas of Tutuila based on preliminary reports and is not comprehensive. Only the first 50 to 500 meters of land from the coastline were affected depending on wave height, slope, vegetation, and other factors.

Samoa Tsunami Rapid Environmental Impact Survey
Survey sites

Legend:
- Red: Survey sites
- Black: Event Boundary
- Orange: Coastal

Paul Anderson
American Samoa Government
Continuing Work Includes

Ongoing collaborations with American Samoa Government agencies...
NOAA Coral Reef Ecosystem Division, NOAA Biogeography, NGDC ...

Eastern Samoa Volcanic Province bathy compilation and seamount statistics paper to G-Cubed ...

HURL submersible dives proposed for 2011

Continued updates at
dusk.geo.orst.edu/djl/samoa
seafloormapping.net
earthref.org/SBN
(Seamount Biogeosciences Network)
Fagatiele Bay National Marine Sanctuary (FBNMS) GIS Data Archive

This site provides GIS data from recent shallow-water multibeam bathymetric surveys conducted in 2001 and 2002 in support of the Fagatiele Bay National Marine Sanctuary, American Samoa in the SW Pacific Ocean. Most high-resolution multibeam bathymetric data were collected with a Kongsberg Simrad EM3001 system owned and operated by the Center for Coastal Ocean Mapping, Department of Marine Science, U. of South Florida. Also included is a recent compilation of terrestrial GIS data layers obtained from the American Samoa GIS User Group's various photographic images and Interchange files (i.e., *.tif files). This GIS data viewed in ArcExplorer undergone corrections for diff...
“Fa’afetai”

Download:
http://dusk.geo.orst.edu/agu09_samoa.html

More info:
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