High Resolution Seafloor Products

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Multibeam sonars have been around since the mid 1980's but were typically only available for use on larger ships and in deep water. By the early 1990's technology allowed these sonars to be manufactured with transducers able to be mounted on smaller vessels, and with frequencies and resolution appropriate for use in shallower waters. In 1998 NOAA Ship *Rainier* was outfitted with multibeam echosounders (MBES) and began conducting hydrogaphic surveys in Alaska with these new sonars. In 2000 a system was installed on NOAA Ship *Whiting* and high resolution surveys soon were soon underway from Maine to the Caribbean. The tremendous data volume created by these sonars was unwieldy to manage in the traditional ways that single sounding measurements had been managed. So, in 2005 NOAA began gridding the soundings from these surveys and archiving these grids at the National Geophysical Data Center (NGDC) in Boulder, Colorado which can be found at: http://maps.ngdc.noaa.gov/viewers/bathymetry/. This data is also available in a GIS-friendly format at: http://gis.ngdc.noaa.gov/arcgis/rest/services/bag_bathymetry/ImageServer.

Gridded MBES data not only provided a more efficient and statistically robust means of managing sounding data, but it also provided a unique view of the seafloor that most people were not used to seeing. These high resolution grids (as fine as 0.5 meters) would frequently reveal geologic bed forms like sand waves, extinct underwater volcanos, bedrock fractures, and large boulders called glacial erratics. It also provided computational efficiency for creating new navigational products which could help mariners make better informed decisions on which route into port offered the deepest and safest path for their ship.

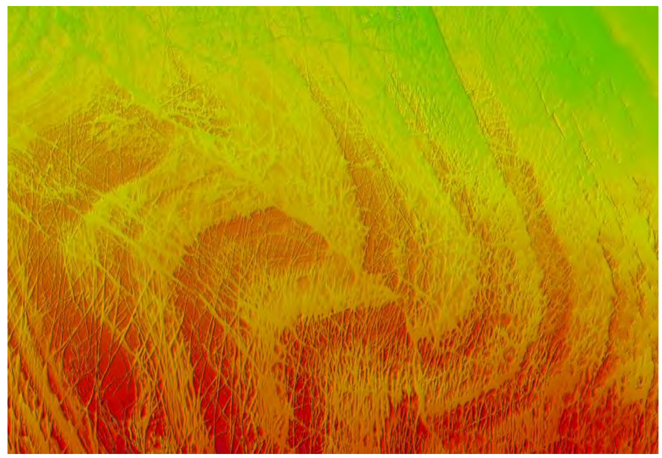

Figure 1: Gridded multibeam from survey H12451 off Chirikof Island, AK.

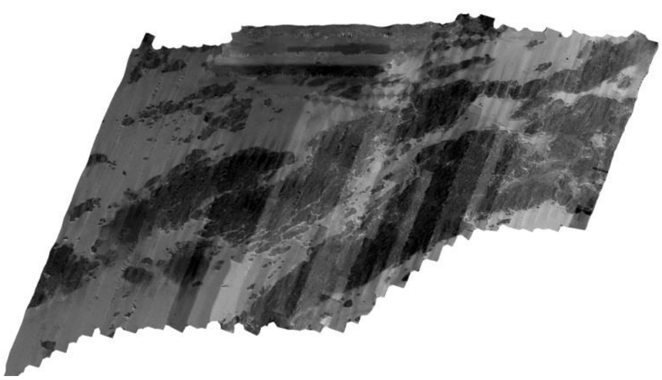

Figure 2: Backscatter data from survey H12614 off the coast of New Hampshire.

Multibeam sonars also provide ancillary data about the seafloor in the form of backscatter. This is a measure of the reflected sound intensity returning to the sonar after bouncing off the seafloor. Softer sediments like mud and silt will produce a weaker backscatter return, while rock will provide a stronger backscatter return. If these backscatter returns are mapped it can provide an indication of the composition of the seafloor. While NOAA does not have backscatter maps of all areas where MBES surveys were conducted, this is a product that we are moving towards providing regularly for all surveys and are seeking feedback on the interest in this type of data.

Lidar (Light Detection and Ranging) systems installed on NOAA aircraft are able to provide bathymetry and reflectance (similar to backscatter) maps for shallow water bathymetry and topography. This method of surveying provides dense bathymetry in shallow areas that are often difficult to survey from a vessel. Most new Lidar systems have both a bathymetric and topographic laser in the same system which makes surveying across the land-water interface very efficient Lidar data can be accessed at: http://coast.noaa.gov/digitalcoast/data/coastallidar.

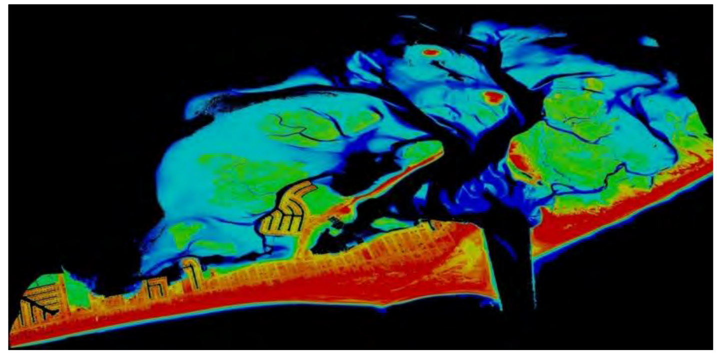
Figure 3: Lidar data from Barnegat Inlet

NOAA also has high resolution photogrammetry that is acquired simultaneously with lidar data. This high-resolution imagery provides a valuable bird's eye perspective on our nation's ports, harbors, and coastal waters and can be valuable for route planning or locating other shoreside infrastructure. Photogrametric data can be found at: http://coast.noaa.gov/digitalcoast/. NOAA uses both Lidar and photogrammetric means to determine the mean high water and mean lower low water shoreline that is used on nautical charts. Depending on the scale of the chart it serves, the derived shoreline data may be available at a higher resolution than depicted on the chart. This is typically available in a GIS-ready format and can be downloaded at: http://www.ngs.noaa.gov/NSDE/.

Other ancillary data produced from NOAA's hydrographic surveys are positions on discrete features that rest on the seafloor. Both MBES and side scan sonar (SSS) echosounders provide a high resolution view of what is on the seafloor. In addition to the naturally occurring geologic features, there are frequently features that are manmade in origin, like wrecks or other sunken debris. The features deemed to be of most concern to navigation will make it onto the chart. However, there are many features which are too small to be of interest to surface navigation, but which may hold interest to specialized groups of mariners like recreational or commercial fishermen. While this higher density of features is not currently available for use, it could be reconstituted for use should a significant demand be found.

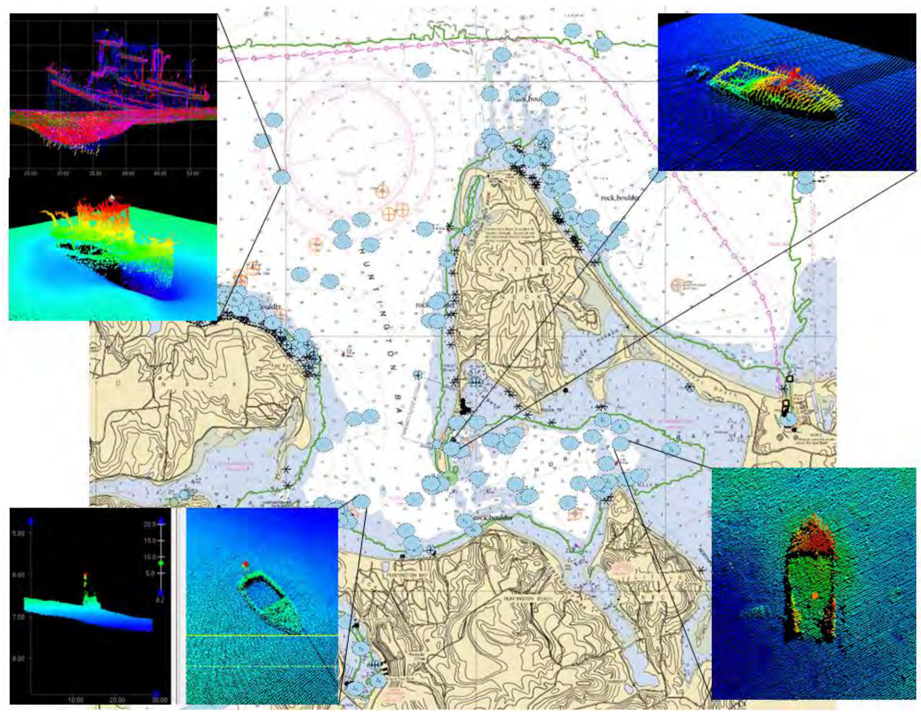
Figure 4: Images of wrecks from a survey in Long Island Sound. Blue circles indicate areas where a feature was identified on the seafloor.