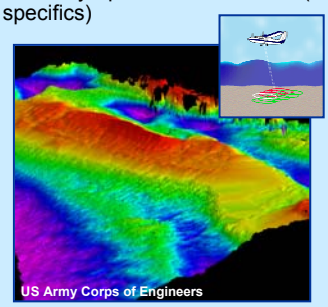
What Type of Benthic Information Will I Get from Active Sensors?

Optical

Bathymetry

Bathymetric LIDAR

Series of bathymetric points (x, y, z) up to 60 meters in depth (depending on water quality) with vertical accuracy up to 15 centimeters (depending on mission specifics)



This bathymetry data for New Pass, Florida, was created using a type of airborne Light Detection and Ranging (LIDAR) sensor known as SHOALS (Scanning Hydrographic Operational Airborne LIDAR Survey). The points were interpolated to a raster grid for viewing and analysis. The colors represent the depth of the channel – deeper areas are represented by purples, blues, and greens, and the shallower waters by yellows, oranges, and reds.

How can I use these data?
- Coastal topography and shallow water bathymetry mapping
- Navigation and hazards

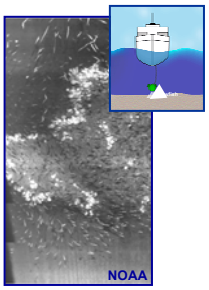
What will I see?
- Depth in shallow water and features on seafloor, such as sandwaves and objects

Limitations
- Water penetration is limited by clarity – generally two to three times the Secchi depth
- Data analysis for habitat mapping is in experimental stages

Habitat

Laser Line Scan

High-contrast underwater images with pixel sizes ranging from a few millimeters to centimeters (depending on mission requirements and environmental conditions)



Laser line scan image of a large group of fish congregating around an isolated rock outcrop. This raster image captures the intensity of the reflected laser. The rock has white sea anemones on it and is surrounded by soft sediment (light gray).

How can I use these data?
- Marine resource and habitat inventory
- Damage assessment and mitigation
- Pipeline and cable route surveys
- Search and recovery of small items
- Detailed species inventories
- Transect monitoring

What will I see?
- Marine life, including fish and invertebrates, some species data
- Detailed benthic habitat types
- Coral health assessments

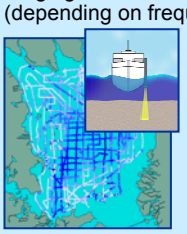
Limitations
- Narrow swath width (average 1 to 15 meters) makes it difficult to collect continuous coverage of the seafloor
- Resolution and swath size dependent on water clarity and height of towfish off seafloor
- Requires tethered towfish

Acoustic

Bathymetry

Single Beam Echosounder

Series of bathymetric points (soundings) along a track in water ranging from 1 to 11,000 meters deep (depending on frequency)



Bathymetry points for Rehoboth Bay, Delaware, colored by depth (darker blues are deeper, lighter blues are shallower). One depth point per second was collected with an echosounder along interweaving transects to create this dense series of points.

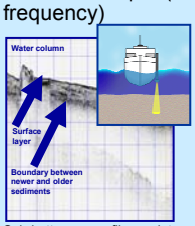
How can I use these data?
- Transportable system for bathymetry mapping

What will I see?
- Depth points along transects

Limitations
- Narrow swath width makes it difficult to collect continuous coverage of the seafloor
- Footprint is small and dependent on depth

Single Beam Sub-Bottom Profiler

Series of points (soundings) that penetrate up to 50 meters of the sediment surface in waters 1 to 11,000 meters deep (both dependent on frequency)



Sub-bottom profiler data points collected in Hudson River, New York. The data is displayed as a cross-section of the sediments.

How can I use these data?
- Historical erosion and deposition studies

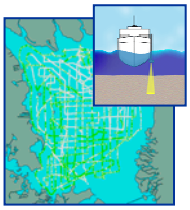
What will I see?
- Differences between recent and old sediments
- Buried features, such as oyster reefs

Limitations
- Narrow swath width makes it difficult to collect continuous coverage of the seafloor
- Footprint is small and dependent on depth
- Requires extensive field calibration

Habitat

Single Beam Seafloor Classifier

Series of individual points (soundings) analyzed to identify seafloor features in water ranging from 1 to 11,000 meters deep (depending on frequency)



Seabed classification points collected once per second along intertwining transects in Rehoboth Bay, Delaware. The green points indicate the presence of algae, and the light gray areas indicate bare mud.

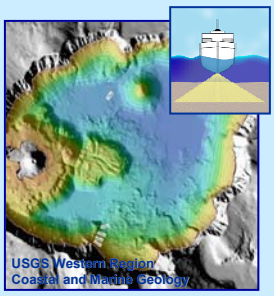
How can I use these data?
- Transportable system for benthic habitat studies
- Field verifying other remote sensing data sets

What will I see?
- Individual data points of seafloor habitat substrate

Limitations
- Narrow swath width makes it difficult to collect continuous coverage of the seafloor
- Footprint is small and dependent on depth
- Requires extensive field calibration

Multibeam Sonar

Raster data set derived from analysis of numerous primary acoustic returns for the depth and topography of the seafloor with variable swath width (depending on depth)



Bathymetry map of Crater Lake, Oregon, created using multibeam data for the deep areas (>15 meters: blues, greens, and yellows) and marine LIDAR (SHOALS) for the shallow areas (<15 meters: oranges).

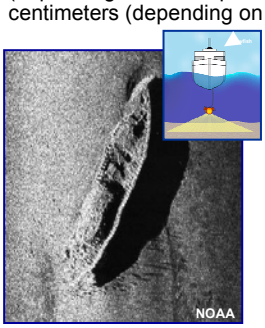
How can I use these data?
- Deep-water bathymetric mapping
- Navigation and charting
- Potential uses of image (i.e., backscatter) analysis for bottom characterization

What will I see?
- Depth and topography of the seafloor
- Continuous coverage of seafloor – wide swath width up to 8 times the depth

Limitations
- Image (i.e., backscatter) analysis for bottom characterization is in experimental stages
- System configuration is very complicated and may require a dedicated vessel
- Requires extensive data processing and large file storage capacity

Side Scan Sonar

Raster image (i.e., backscatter) of the texture and composition of seafloor up to 11,000 meters in depth (depending on frequency) with pixel sizes in centimeters (depending on depth)



Side scan sonar image of the USS *Monitor*, sunk off the coast of North Carolina. Side scan sonar raster images capture and display the intensity of the reflected sonar waves.

How can I use these data?
- Sediment characterization
- Vegetation mapping
- Search and recovery
- Location of shipwrecks
- Marine archaeology
- Obstacle detection

What will I see?
- Features on seafloor, including sediments, vegetation, and objects
- Continuous coverage of seafloor – wide swath width up to 8 times the height of the towfish off the seafloor

Limitations
- No bathymetric information
- Normally requires tethered towfish