US Law of the Sea Mapping

The United States is conducting multi-beam surveys of the US continental margins where a potential exists for a claim under United Nations Convention on the Law of the Sea (UNCLOS) Article 76. The University of New HampshireÂ¡Â¯s Center for Coastal and Ocean Mapping-Joint Hydrographic Center is directing the surveys as part of its National Oceanic and Atmospheric Administration (NOAA)-sponsored research programme. To date, two areas in the Bering Sea, two areas in the Arctic Ocean and a large portion of the US Atlantic continental margin have been mapped.

The Center for Coastal and Ocean Mapping/Joint Hydrographic Center, University of New Hampshire was directed by Congress through funding by the NOAA to evaluate current data holdings and identify areas that would benefit from new surveys. It was asked to direct multi-beam mapping of US continental margins in areas where a potential exists for a claim under Article 76 of the UNCLOS (see www. ccom.unh.edu). Working with a variety of data acquisition partners, our efforts began in 2003 with the mapping of three areas: two in the Bering Sea and one in the Arctic Ocean.
In 2004, portions of the US Atlantic margin and an area of the Alaskan Arctic margin were mapped. The required survey areas on the US Atlantic margin will be completed and a large area of the Gulf of Alaska margin will be mapped in 2005 using the University of Hawaii R/V *Kilo Moana*.
The mapping objectives in all these areas are to locate the 2,500m isobath and map the foot of the slope. We have, where possible, been mapping the entire area between the ~1,000m and ~4,800m isobaths using Multi-Beam Echo Sounders (MBES), systems capable of producing maps with at least 100-metre spatial resolution and a vertical precision of <1% of the water depth. Navigation on all cruises has been inertial-aided DGPS navigation. All of the MBES systems used produce backscatter as well as bathymetry, although the quality varies considerably. The processed data is posted on www.jhc.unh.edu/unclos/ html/index.htm within a few months of completion of each cruise.

Bering Sea

The north flank of Bowers Ridge and a portion of the southern Beringian margin (Figure 1) were mapped in 2003. A hull-mounted, 12kHz Reson 8150 MBES operated by Thales Geosolutions (now Fugro Pelagos) of San Diego, California on R/V *Davidson* was used for the survey. The new mapping reveals the northern flank of Bowers Ridge as steep (~20Â¢Âª), heavily incised and complex, with an abrupt foot of the slope. Numerous canyons and channels dissect the flank, presumably cut into bedrock. The mapping discovered a series of three plateaux along the northern flank, two of which have eastward-projecting ridges (Figure 2) located about 15km north of the main flank margin and following the general curvature of Bowers Ridge. One of these ridges is more than 50km long.
The mapped area of the Beringian margin (Figure 1) lies between Pervenets and St. Matthew Canyons. The new data shows that although it has a similar geological history to Bowers Ridge, the Beringian margin has a considerably different morphology (Figure 3). It is composed of a series of seaward-projecting sediment tongues or drifts, some of which extend more than 40km beyond the steep margin. These features appear every 5-10km along the length of the margin and some have heights of more than 150m above the surrounding seafloor. The individual sediment tongues have relatively sharp crests and are deeply eroded only on their south-facing flanks.

Arctic Ocean

Two cruises, one in 2003 and another in 2004, were conducted in the Chukchi Borderland and the Alaskan Margin in the Amerasian Basin of the Arctic Ocean. The Â¡Â®natural prolongationÂ¡Â¯ of the Chukchi Borderland from mainland Alaska and a thick accumulation of sediment in the Amerasian Basin makes this region a viable target for an extended shelf claim under UNCLOS Article 76. Severe constraints imposed by pervasive ice in this region have thus far limited our mapping to the 2,500m isobath. We have not yet begun to map the area between the 2,500m isobath and the foot of the slope.
Both Arctic Ocean cruises were conducted on the USCG Icebreaker Healy using its hull-mounted 12kHz Seabeam 2112 MBES system. Our first cruise, during August and September 2003, was designed to explore the feasibility of using an icebreaker-mounted MBES system to locate and follow critical bathymetric targets in this region. Our exploratory mission demonstrated the viability of this approach, because in ten days we were able to collect about 3,000km of MBES bathymetry along the 2,500-m isobath and reach 79Â¡Ã†30Â¡Â¯N in 8/10 ice conditions. The collection of this
data substantially changed the mapped position and complexity of the 2,500m isobath, found further evidence of pervasive ice and current erosion (flutes and scours) in deep water, evidence of gas-related pockmarks and discovered a previously unmapped seamount rising more than 3,000m above the surrounding seafloor. The limited time available prevented us from collecting more than one or two swaths over any area of the margin, with the exception of the seamount, that we fully mapped and named Â¡Â®Healy Seamount.Â¡Â¯
A twenty-day Arctic cruise aboard Healy in 2004 had the objective of completing mapping of the 2,500m isobath and locating the foot of the slope on the Chukchi Borderland. This cruise was conducted later in the season (October and November) and encountered very heavy ice (9/10 to 10/10). We were able to progress to 78Â¡Ã†45Â¡Â¯N in these ice conditions and added an additional 370km to our mapping of the 2,500m isobath, but we were unable to survey the foot of this slope. As a fallback, we proceeded to completely map an approximately 18,500km2 region of the Alaskan margin northeast of Barrow that encompassed a depth range from approximately 800m to 3,700m (Figure 4).
The MBES coverage of the Barrow margin shows a remarkable set of parallel, asymmetric ridges and valleys spaced ~10km apart and rising >500m high (Figure 5). The ridges have consistently gentler eastward-facing slopes and steeper westward-

facing slopes. High-resolution sub-bottom profiler records show well- stratified sediments typically covering the gentler, eastward-facing slopes, whereas the steeper slopes are not so covered, implying that sediment has been transported from east to west with sediment accumulation on the current-facing slopes.

US Atlantic Continental Rise

About 75% of the US Atlantic continental rise was mapped in 2004 (Figure 6) using a hull-mounted 12kHz Kongsberg Simrad EM121A on USNS *Henson* (T-AGS 63), a survey ship operated by the Military Sealift Command in support of Naval Oceanographic Office (NAVOCEANO) programmes. NAVOCEANO personnel carried out the data acquisition and SAIC of Newport, RI was contracted to process the bathymetry data. The objective was to map the continental margin between the ~1,000m isobath and the foot of the slope. The major features revealed in more detail by the new bathymetric data include numerous submarine canyon channels, most of which have been known for decades. Also shown are the western portion of the New England Seamounts, some of which have also been previously mapped, and broad areas of sediment failures that blanket the present seafloor (Figure 7). The upper continental rise has a dense network of submarine canyons and canyon channels that have fed sediments to the margin for millions of years. There are several areas on the lower continental rise where channel heads abruptly appear without upslope continuity with any observable feature. These features may represent fluid seeps. Landslide deposits mantle the entire mapped length, and about 80% of the mapped width of the continental rise. The landslides NE of Hydrographer Canyon form tongues of sediment that stream to the SE for more than 100km over slopes <0.2Â¢Âª. Southwest of Hydrographer Canyon, the landslides form a continuous wedge of sediment that extends to the limit or beyond the mapped area.

EditorÂ¡Â¯s note

The article as submitted contained many references. The author will gladly provide the full article if requested.

https://www.hydro-international.com/content/article/us-law-of-the-sea-mapping