Advances in Data Processing Techniques and Base Surface Generation: Interferometric Sonar vs. Multibeam Echo Sounders

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A primary objective of the U.S. Geological Survey (USGS) Coastal and Marine Geology Program (CMGP) is reconnaissance mapping of selected areas within the shallow U.S. Exclusive Economic Zone (EEZ), with emphasis on heavily utilized areas of the sea floor. The objective is to develop a detailed understanding of sea-floor geology that will provide information for management decisions and process-oriented investigations. Geologic investigations of the nearshore environment are utilized by state and federal agencies, as well as the private sector, in coastal erosion, habitat, aggregate resources, and pollutant monitoring studies, and affect decisions made by agencies responsible for management of coastal resources. Past studies providing extensive sidescan-sonar coverage has shown that the nearshore surficial geology of the shallow U.S. EEZ is often complex, and backscatter data must be augmented with high-resolution bathymetry and subbottom data to fully understand geologic framework processes. To this end, the USGS primary acoustic mapping tools consist of sidescan-sonar, seismic, and bathymetric systems that allow us to interpret geologic framework in three dimensions. Additionally, swath bathymetric information has greatly increased our understanding of the sea floor, especially on the inner-shelf, and in some cases, radically changed the geologic interpretation of large scale bedforms mapped solely with sidescan-sonar systems. Thus, in October 2000, the USGS CMGP took delivery of a SEA SwathPlus interferometric sonar system in order to augment our existing remote sensing tools. The systems's wide swath, lower maintenance, substantially lower-cost and portability compared to multibeam echo sounders influenced the program's decision to purchase this system. In the eight years since the USGS acquired the SwathPlus system, significant advances in the accurate determination of range/angle pairs from the returning wave front and received signal enhancements have greatly improved the resulting bathymetric gridding process. We will present data collected with the SwathPlus 234 kHz system during an October 2008 survey of Portsmouth Harbor approaches. Utilizing a standard processing flow, we will both empirically and quantitatively compare/contrast these data with data from other multibeam echo sounders contributed to the Common Data Set for 2008. The USGS have also made these data available for use by other participants as part of the Common Data Set. Recently, NOAA has invested in several interferometric sonars and is conducting tests to determine the utility of these sonars for shallow water (< 20 meters) charting purposes. Following in that theme, swath coverage comparisons for each system, as well as estimates of vertical resolution and preliminary base surface error models will also be highlighted in this talk.