Ocean Bathymetry; Step-child of Hydrography

Although 71% of Earth is covered by oceans, only some 11% has been mapped in detail. In relation to SOLAS and safe marine transport, marine surveys are making giant steps forward. However, lack of knowledge about the deep ocean floor limits our ability to foresee future impacts on society.

This column comes just 50 years after my introduction to ocean bathymetry as a young marine geophysicist standing PGR echo sounder watches aboard WHOI's R/V Chain in the midst of the Cuban missile crisis. This was followed by six years at Lamont and a PhD from working up nine years of Arctic geophysical drifting station data. Marriage to an Israeli brought me to Jerusalem where over four decades have been spent mapping the 'puddles' around the Arabian Plate, and long-time involvement in the IBCM and GEBCO compilations.

Recently, cancellation of US 'Man in the Sea' programmes has raised questions about our abandoning the 99.9% of the oceans not yet observed. What is lost in these arguments is the fact that every detailed survey of the ocean floor offers new insights into a world where two-thirds of the species are still unknown, and where powerful geological and tectonic processes are at work posing far-reaching threats to society.

Unfortunately, worldwide compilation of detailed bathymetry is not sexy. The 30" marine grids available from GEBCO, Scripps, Lamont and others are the life's work of a handful of 'get a life' diehards, but accurately mapped areas still remain a small patchwork. However, I suspect that seafloor mapping will progress, under the radar so to speak, just as land topography did 13 years ago. Then, in just 10 days, NASA's STM-99 Shuttle Radar Topographic Mission (SRTM) made a coherent and relatively accurate mapping of 82% of the continents, the basis for more detailed mapping that has greatly benefited society. The developments in airborne Lidar and GPS precision have corrected faulty topography that could not foresee flooding and geological hazards.

The bathymetric mapping community has greatly benefited from the many UNCLOS Article 76 surveys and their detailed coverage, which increased public awareness of the value of the seabed for mineral and petroleum exploration, and fisheries habitat. Ships with multi-beam sonar have proliferated, as the sonar costs decrease relative to that of the ships and their fuel, and as systems' bathymetry, backscatter analysis, and water column capabilities improve. Working well below the keel depth (50m) of the largest vessels or the maximum dive depths of submarines, the offshore petroleum industry is surveying prospective offshore fields to 2,000m depth. And often AUVs are making the near-bottom surveys at engineering quality for future oil or gas field infrastructure.

Over the past few years, the human cost from tsunamis (Sumatra, Japan) and rising sea levels (Sandy, Katrina) has far eclipsed what hydrographers generally deal with. Is a SRTM-like effort with government support likely (SRTM's cost totalled USD142 million)? NOAA has recently put a cost benefit on improved geodesy (1). Is a deeper understanding of sea level rise, ocean warming, and tectonic and slump sources of tsunamis cost effective? Is increasing ocean acidification and its effect on the marine food chain and ultimately the fish stocks worth a global mapping programme? In light of these recent wake-up calls, the posited USD8-16 billion cost of a 20 year GOMaP-like project (2) would seem to be a no-brainer.