What About the Other 88%?

Despite the last decade's flurry of UNCLOS ECS mapping, the amount of the oceans surveyed remains around 12%. The continuing search for the MH370 wreckage emphasises our scant knowledge of the actual deep ocean seafloor despite the apparently detailed overall picture derived from satellite altimetry's synthetic bathymetry.

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Just eight years ago, from this 'bully pulpit', I wrote about GOMaP, a 1999 proposal to devote USD8-16 billion over 20-30 years to swath map all the oceans deeper than 500m. I concluded 'Unfortunately GOMaP lacked the sex appeal of placing humans on Mars or fulfilling other dreams'.
One year ago, Larry Mayer presented 'What Difference a Swath Makes' when GEBCO's Science Day was held at the AGU Fall Meeting in San Francisco. After comparing awesome full-resolution swath to GEBCO or SRTM_30PLUS 0.5 min grids, he computed the proportions of seafloor between 150m and 1km and then over 1km intervals, using the latest GEBCO 2014 grid. Operating at 10kts, with swaths of 4x water depth, he showed 65,246 days were needed. Using a USD52k/day rate the cost (for mapping only) totals approximately USD3.4bn.

Few people question the value of our oceans. Bordering 153 of the world's 194 countries, they are a heat and CO2 sink, protein provider for 3 billion people, the source of our worst weather, and the pathways for most of our commerce. Despite annually generating USD3tn, they are actually a dwindling USD24tn asset taken mostly for granted.

Web searches show primary concern about the upper photic layer, scarcely 1% of the average depth. But the ocean seafloor is too important to ignore. While all but one of the known animal phyla are found in the sea, almost half are exclusively marine. The >100,000 seamounts >1km high and mid-ocean ridges and trenches produce the varying habitats that harbour these mostly unknown life forms, while their steep critical slopes provide the mixing that prevents a stratified and dying water mass.

The revised budget is amazingly small. Assuming ~60 deep ocean ships with modern sonar, only three years are required to map the world's oceans. A period of 10-15 years is more likely, costing about one Boeing 787-10 Dreamliner per year.
For mapping the vast areas beyond sovereignty claims, one solution might come from rapidly improving deepwater swath equipped AUVs. Imagine a large mother ship with crew and workshops for the care of perhaps 50 HUGIN 3000 and 6000 AUVs, each capable of 60 hours endurance at 4kts. Assuming 6 hours for recovery, data downloading, battery swapping, route programming, and launching of one HUGIN, each could, at a depth of 2km above the bottom, accomplish up to 3,500 km2 of mapping every 66 hours. All 50 could do 175,000 km2 in that period. The daily logistics and maintenance load would amount to about two AUV turnarounds per hour, probably only possible with specially designed moon-pool. Monthly data acquisition could approach 1.9m km2 (compared to UNH-CCOM-JHC's UNCLOS mapping of 2.29m km2 from 2003 to 2012). Operational areas would change as 100% coverage was completed, with locations chosen for their benign weather.

Acquisition of such a ship and AUVs would probably be around USD250m, with annual operational costs of some USD60m. This would be similar to the IODP budget for operating the JOIDES Resolution. The recent Ocean XPrize might kick start this giant step forward.

More Information

http://oceandiscovery.xprize.org/about/overview