DIGITAL MAPPING FOR THE MARINE ENVIRONMENT AND COASTAL ZONE

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The acquisition of hydrographic data has successfully supported the production of paper and electronic navigational charts for many years. Hydrographic offices worldwide are rightly committed to providing products in which safety of navigation is the prime factor. This article describes SeaZone, introduced by the UK Hydrographic Office and Metoc plc to meet the needs of users requiring digital mapping for purposes other than navigation.

As mentioned in the editorial in Hydro International, May 2005, products produced by HOs are used not only by navigators but also by engineers, coastal zone managers and marine scientists. This is not because the products meet their exact requirements, far from it. It is because up until now navigational data has been the only available source of hydrographic information. Traditionally, and in similar fashion to the way in which private producers of paper and, more recently, electronic charts (see Yves DesnoÃ«s, Hydro international, May 2005) have exploited official data, scientists have for many years been photocopying and digitising paper products. The data is required for a multitude of purposes including engineering design, marine operations, situation awareness, marine and coastal zone planning, environmental modelling and regulation. For example, the European Union (through the INSPIRE Draft Directive) has called for the creation of a regional spatial data infrastructure encompassing both land and sea to support sustainable development and better resource management.
It has been suggested that data contained in official or privately produced navigational products could meet the needs of the scientist, if only it was more accessible. To this end, a number of third-party software tools have been introduced that allow both raster and vector navigational data products to be read by Geographic Information Systems (GIS) and similar software. In some cases data can be exported to create surface models and other editable datasets in a way not envisaged (or authorised) by the official producers. The use of navigational data and third-party software tools avoids the need for scientists and engineers to capture data from paper, but it further exploits and devalues official hydrographic data, as the price of these products falls. For self-funding hydrographic offices this is a major concern.

SeaZone Specification
SeaZone was created specifically to meet the needs of professional scientists and engineers that require true marine geographic information. Source data is used wherever possible to create continuous datasets at one or more consistent scale levels. The SeaZone specification is differentiated from navigational products and is totally unsuitable for navigation. It does, however, meet the needs of professional non-navigational users requiring rich datasets that can be read directly by GIS. Contours, depth areas and elevation models are being created that are detailed, regular and scientifically correct. As more source data becomes available digitally, shoal bias inherent to charted data will be removed.
The data is arranged in Topic Layers (or themes) that correspond to emergent standards for geographic information and is being provided in structures and formats that users of land geographic information are used to. It is worth noting here that land agencies such as Ordnance Survey in Great Britain have been producing digital datasets in this form for more than twenty years. To users of land geographic information the thought of having to capture data from a paper map or to be forced into using an inferior substitute product is both alien and unbelievable.

Joining Land and Sea
Wherever possible, SeaZone data is joined to land geographic information through the adoption of a common shoreline. In the UK, as in many other countries, the split responsibility for marine charting and land mapping between different agencies has compounded a historical lack of interest and investment in surveying the coastal zone. In the UK the government-funded Integrated Coastal Zone Mapping data research project (www.icsmap.com) took data from Ordnance Survey, the UK Hydrographic Office (UKHO) and British Geological Survey (BGS) to create an integrated dataset for three pilot areas. Significantly, though, the project, which ended in July 2003, identified the key requirements needed to produce joined up data throughout the UK and, potentially, internationally. A similar project, Litto 3D, is underway in France.
As the first key requirement, Ordnance Survey undertook to create a common shoreline as part of its MasterMap dataset. The production of the Mean High Water shoreline (Mean High Water Springs in Scotland) was completed in March 2005. The second requirement was that the UKHO undertook to define the vertical reference framework needed to make the vertical adjustments. This project will probably be completed in late 2006. Horizontal datum transformations are addressed adequately (inshore) using OSTN02.
With all components now coming into place, the integrated datasets envisaged in ICZMap are giving way to marine and coastal data that is joined at the OS-derived shoreline. Landward, existing OS raster and vector products are being used; seaward, SeaZoneâ€™s new detailed bathymetry that will, as standard, match with the OS shoreline. This dataset will be based on best available raw survey and other data, as it is recorded from vessels at sea, airborne survey and Earth observation, or captured from existing analogue survey sheets. The need for hydrographic data other than for navigation will mean surveying areas outside those used for shipping. This will require a major shift in emphasis and major investment, potentially tempered by the use of lower cost technologies such as Lidar and Earth Observation. The integration of these new datasets with existing sources of data is an area of activity for SeaZone.

A better understanding of the vertical differences between Chart Datum and local land datum allows marine geographic information to be adjusted, thereby creating a joined-up, three-dimensional surface from land through to seabed. This has massive benefits for coastal zone flooding and shoreline management activities, as the work will allow extreme water levels, such as highest astronomical tide and surge levels, to be established. For the first time it will be possible to determine the true effect upon our shorelines of sea-level change caused by global climate change.

Looking Ahead

It is encouraging that recent amendments to the convention of the International Hydrographic Organisation introduce the idea that hydrographic data is being acquired and used for many purposes other than for navigation. The present author hopes that the IHO will now look towards developing protocols and standards that support this in a meaningful and consistent manner. That is, in a way that will allow land and marine mapping to coexist within a single framework, and that will reduce the risk of this valuable data resource being used inappropriately or illegally.

The need for true marine mapping has never been greater; marine mapping interoperable with land mapping through a common agreed shoreline for the support of marine spatial planning, strategic environmental and sustainability assessment. The hydrographic community now has an opportunity to embrace this need by helping to develop products that meet the aspirations of scientists and engineers, and no longer to encourage the devaluation of navigational data products by forcing them to be used for a purpose for which they were never designed.

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