EMODnet High Resolution Seabed Mapping – further developing a high resolution digital bathymetry for European seas

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Access to marine data is a key issue for the **EU Marine Strategy Framework Directive** and the **EU Marine Knowledge 2020 agenda** and includes the **European Marine Observation and Data Network (EMODnet)** initiative. EMODnet aims at assembling European marine data, data products and metadata from diverse sources in a uniform way.

The EMODnet Bathymetry project has developed Digital Terrain Models (DTM) for the European seas. These have been produced from survey and aggregated data sets that are indexed with metadata by adopting the SeaDataNet Catalogue services. SeaDataNet is a network of major oceanographic data centres around the European seas that manage, operate and further develop a pan-European infrastructure for marine and ocean data management. The latest EMODnet Bathymetry DTM release has a grid resolution of 1/8 arcminute (ca 250 * 250 meters) and covers all European sea regions. Use has been made of circa 7800 gathered survey datasets and composite DTMs. Catalogues and the EMODnet DTM are published at the dedicated EMODnet Bathymetry portal including a versatile DTM viewing and downloading service.
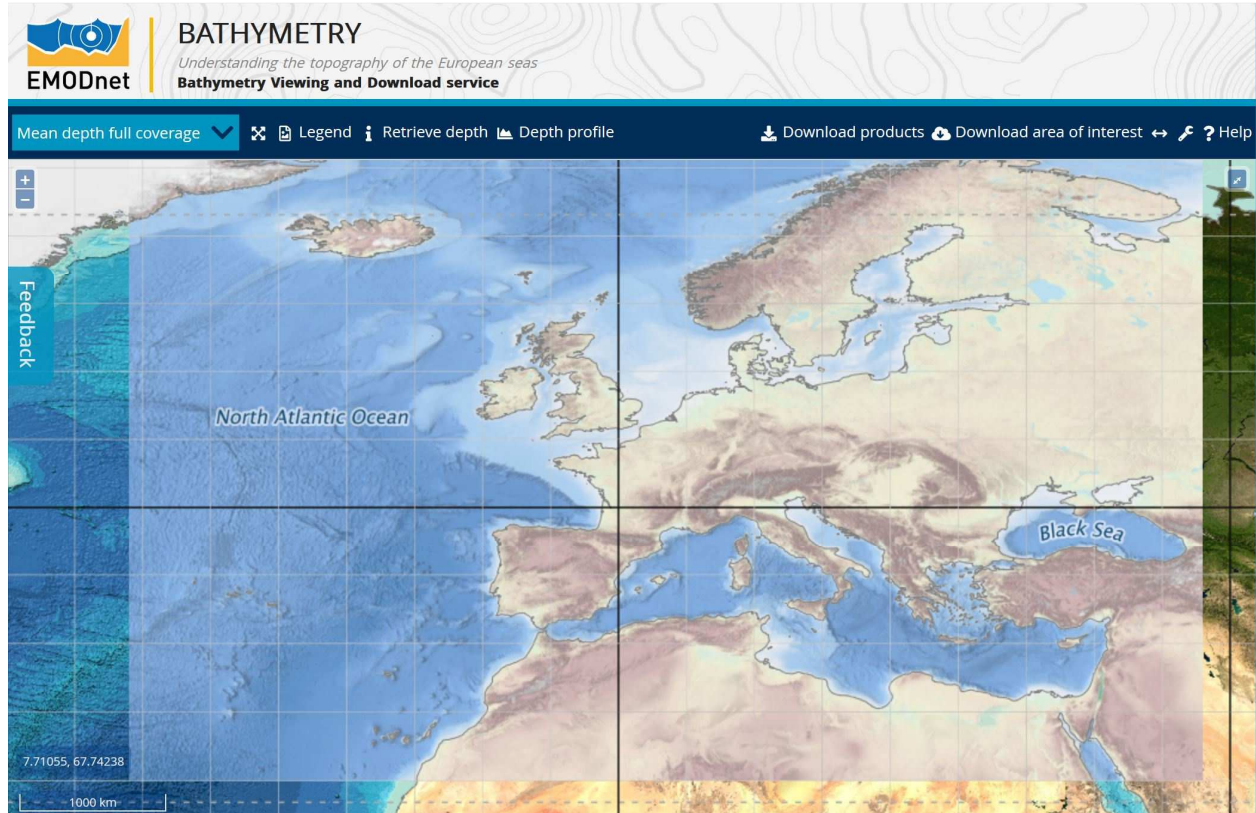

Figure 1: Current EMODnet Digital Terrain Model for all European seas

End December 2016 the Bathymetry project has been succeeded by EMODnet High Resolution Seabed Mapping (HRSM). This includes continuing gathering of bathymetric in-situ data sets with extra efforts for near coastal waters and coastal zones. So far a major increase has been achieved of the total number of survey data sets included in the CDI service from **14791 to 27078** records and Composite DTM entries from **78 to 115.** The latter also includes 18 satellite derived Composite DTMs generated from Landsat images for the Mediterranean coastal zones of Spain, Greece and Libya. The total number of data providers has increased from **28 to 39.** The Satellite Derived Bathymetry data are included to fill gaps in coverage of the coastal zones. The extra input data is used for producing the new EMODnet DTM with a common resolution of 1/16 arc minutes (circa 125 * 125 meters). This product will be released by mid-2018. The Bathymetry Viewing and Download service is also being upgraded to provide a multi-resolution map and including 3D viewing capability. The viewer will be based on Cesium. Current open source implementations of Cesium all make use of a height map (raster based) tile structure. Although workable, the performance on an average computer is not optimal and in areas below sea level, artefacts (tile joints) may be visible. Therefore, to overcome these issues it was decided to develop a data structure based on a triangulated irregular network (TIN). Having a TIN instead of a regular grid enables faster representation of the complexity of the map (i.e. the number and size of triangles). As there was no open-source tool available for creating tiles in quantized mesh format out of a raster format such as used in EMODnet, this software is developed by the project. This opens the door to trying different approaches for simplifying the terrain. The software will be ready in time for delivery of the new EMODnet HRSM DTM.
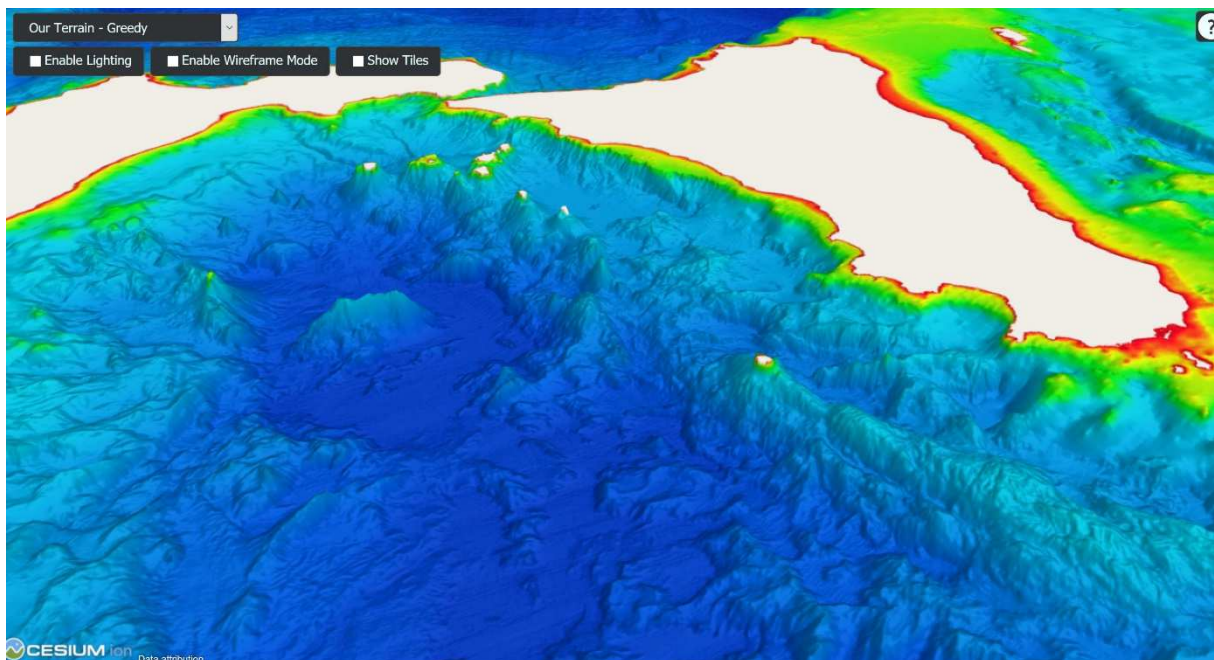

Figure 2: Beta 3D visualisation of the Tyrrhenian Sea DTM

Also good progress is made with determining best-estimates of the European coastline for a range of tidal levels. A methodology has been developed for automatic extraction of a coastline from high-resolution bathymetry and from optical satellite images (typically Sentinel-2 and Landsat-8). This includes retrieving a large number of satellite images. By linking the satellite images to information about the sea-level at the time and place that the image was taken, one can derive coastlines. Coastline contours will be computed for various levels, such as LAT (Lowest Astronomical Tide), MSL (Mean-Sea-Level), and MHW (Mean-High-Water). The sea-level data are derived from the Global Tide Surge Model (GTSM). This model will also facilitate to provide the next version of the EMODnet DTM both relative to LAT and MSL.

The presentation will highlight key details of the EMODnet Bathymetry results and the way how challenges of the new HRSM project have been tackled.