# EMODnet Thematic Lot n° 1- Bathymetry

EMODnet Phase 2 – Annual (interim) report

Reporting Period: 1/6/2013 – 31/8/2014

Date: 11/9/2014

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# Contents

# 0.  Introduction

The final output of the EMODnet Bathymetry project will consist of a dedicated portal that will provide access by browsing and downloading to a harmonised medium resolution bathymetry Digital Terrain Model (DTM with grid size 1/8 minute * 1/8 minute) of all sea basins in European waters and access by discovery and shopping process to all underlying and assembled bathymetric survey data sets in a uniform way. The open and restricted bathymetric survey data sets originate from hydrographic and research organisations in Europe and are used as input for generating the EMODnet DTM product. Agreed standards and common vocabularies have been adopted for data, data product and metadata formats. The portal follows INSPIRE and OGC standards for providing discovery, viewing, downloading and wider interoperability services.

This interim report gives the progress in the 1st year of the EMODnet Bathymetry contract which is defined as running from 1st June 2013 – 31 August 2014 for contractual and practical reasons. The project is a follow-up of the earlier developments for the EMODnet Hydrography and EMODnet Seabed Mapping projects which have taken place since June 2009 and that have resulted in the portal: http://www.emodnet-bathymetry.eu

The EMODNet Bathymetry project aims at a continuation of services, at an extension by including a full European coverage of sea basins, and at a refinement by upscaling the resolution of the DTM from ¼ minute * ¼ minute to 1/8 minute * 1/8 minute.

The portal provides 3 interrelated operational services:
1. The Bathymetry Viewing service gives users functionalities for viewing individual and combined layers of the EMODnet DTM together with external map layers and for downloading regional components of the EMODnet DTM in a range of formats; each cell in the DTM gives a reference to the prevailing data set or data product as used as input for the DTM generation. In case of missing data use is made of the GEBCO_2014 bathymetry which is indicated in the DTM grid cell data. Layers can be shared with other portals by means of the OGC WMS protocol;
2. The SeaDataNet Common Data Index (CDI) infrastructure with its network of distributed data centres has been adopted and adapted to provide an integrated and harmonised overview and access to bathymetric survey data sets that are gathered by the project. The CDI metadata files describe bathymetric survey measurements, following the ISO19115 – 19139 metadata standards, and are supported by SeaDataNet controlled vocabularies. CDI references are included in DTM grid cells, wherever survey data have been used for the DTM. CDI discovery and browsing services are public, however users need to register in the SeaDataNet user register for a single-sign-on data shopping process to all connected data centres to request access to survey data sets;
3. The SeaDataNet Sextant catalogue service has been adopted and adapted as discovery service for providing  details about Composite DTMs that are provided by some data centres instead of basic survey data sets. The Sextant metadata files also follow the ISO19115 – 19139 metadata standards, and are supported by SeaDataNet controlled vocabularies. Sextant references are included in DTM grid cells, wherever Composite DTMs have been used for the DTM.
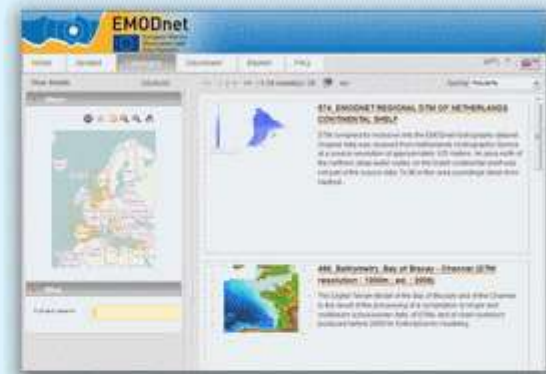
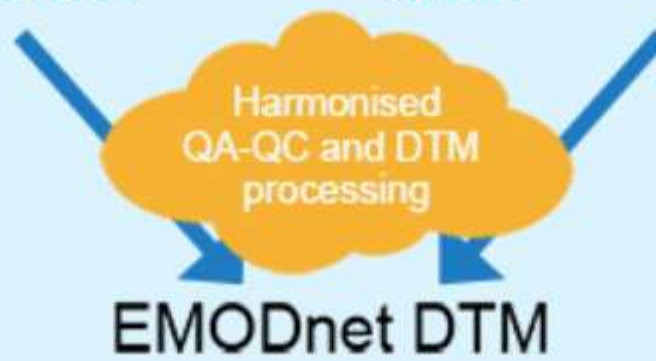*Image: Workflow and 3 interrelated services at the EMODnet Bathymetry portal*

Acronyms as used in this report are defined in the following list:

**CDI**, Common Data Index, provides a highly detailed description of the survey data, answering to the questions: where, when, how and who collected the data, and how to get them. One CDI describes a survey by means of a polygon or survey track. The CDI service also includes a shopping service for requesting access to selected data sets and for downloading as data files, if access has been granted by the data owners.

**CPRD**, Composite DTM data sets, giving a gridded bathymetry. In practice it appears that Hydrographic Offices (HO's) do not want or can not deliver primary surveys but composite data sets from the Digital Terrain Models that they maintain themselves for producing and maintaining their nautical charts following international IHO procedures. Composite DTMs are DTMs that have been generated by the data provider itself at a specific resolution and making use of survey data sets as managed by that data provider. These Composite DTMs might contain grid cells for which no survey data were available and which are then possibly completed by interpolation or other manipulation. Overall the EMODnet project prefers to get access to survey data sets, where possible, and not the derived Composite DTMs. However in practice this is not (yet) always possible and using the Composite DTMs can then be considered as the next best option. In addition, Composite DTM providers are encouraged to describe anyway their survey data sets in the CDI Data Discovery and Access service in order to give better insight in the real survey coverage. This is followed up by an increasing number of providers, but not always possible for historic reasons.

**DTM**, Digital Terrain Model, is a resulting grid data set with attributes for lat, lon, minimum depth, maximum depth, average water depth, standard deviation, number of values, number of elementary surfaces, smoothed average water depth, depth smoothed offset, CDI reference, and Composite DTM reference / GEBCO_2014 reference.

**GEBCO_2014,** the General Bathymetric Chart of the Oceans (GEBCO) consists of an international group of experts who work on the development of a range of bathymetric data sets and data products, including gridded bathymetric data sets, the GEBCO Digital Atlas, the GEBCO world map and the GEBCO Gazetteer of Undersea Feature Names. GEBCO operates under the joint auspices of the Intergovernmental Oceanographic Commission (IOC) (of UNESCO) and the International Hydrographic Organization (IHO). GEBCO 30" gridded data, new version 2014, is used by the EMODNet project to complete area coverage in case there are no survey data or Composite DTM data sets available to the partners. GEBCO is represented in the EMODNet Bathymetry consortium by means of its editor, NERC-BODC.

**Sextant,** catalogue service used to provide details about Composite DTM data sets. It allows to discover any Composite DTMs as available and used for the EMODnet DTM instead of bathymetry survey data sets. The location is given by a Lat-Lon box in a map and descriptions are given of each Composite DTM with information for what, when, how, and who. The Sextant entries are linked as references in the

EMODnet DTM grid cells, where appropriate, to indicate the source data. The Sextant service for EMODnet Bathymetry does not give a shopping service for requesting access to the Composite DTMs.

**SeaDataNet**, is the pan-European infrastructure for ocean & marine data management sponsored within FP7 (grant agreement 283607, 1/10/2011-30/9/2015) connecting at present more than 100 national oceanographic data centres and marine data centres from 35 countries riparian to all European seas.

# 1. Highlights in this reporting period

- Contract signed between EU and MARIS as coordinator in July 2013. The EMODNet Bathymetry Consortium initially consisted of 16 partners and 8 subcontractors. A Consortium Agreement has been signed by all partners and bilateral subcontracts have been signed with 7 out of 8 original subcontractors. Only the Danish Geodata Agency has not signed their subcontract yet and thus at present there is no permission to use DGA's earlier provided Composite DTM data set for the Danish waters;

- Three project meetings have taken place with attendance of all partners and subcontractors, in June 2013, January 2014 and May 2014 . More details are given in Chapter 5;

- Following the search for additional data sets several possible extra data providers have been identified and interested to become subcontractors , especially for the Black Sea region and the Eastern Mediterranean. These include GeoEcoMar from Romania, subcontracted, Marine Research, SME from Romanian, on a voluntary basis, Dokuz Eylul University - Institute of Marine Science and Technology from Turkey, subcontracted, and GeoMar from Germany, for which subcontracting negotiations are approaching finalisation;

- An overall methodology and tools for gathering and preparing metadata and data entries for hydrographic surveys and Composite DTMs have been adopted by the consortium. This concerns the use of the SeaDataNet MIKADO XML editor for generating CDI metadata entries for survey data sets and the SeaDataNet SEXTANT online CMS for generating SEXTANT metadata entries for Composite DTMs. These tools are freely available;

- The earlier QA / QC and DTM generation methodology has been upgraded and documented anticipating the required increase in EMODnet DTM resolution and lessons learned from the previous projects;

- The new Globe software by IFREMER has been adopted by the consortium for processing survey data sets, generating the regional EMODnet DTMs that will be integrated into the overall EMODnet DTM, and for QA / QC to be applied. The Globe software is made available free of costs under a license between individual partners and IFREMER;

- Established a cooperation and synergy with the Baltic Sea Digital Bathymetry project of the BSHC, whereby the BSBD coordinator is participating in the EMODnet Bathymetry project meetings and contributes with BSDB to the Regional EMODnet DTM for the Baltic Sea;

- Very good progress by almost all data providers with preparing and submitting new entries for bathymetric surveys in the CDI service and Composite DTMs in the SEXTANT catalogue service. Only delay in mobilising entries from new and potential subcontractors Dokuz Eylul University - Institute of Marine Science and Technology (Turkey) and GeoMar (Germany);

- Introduction and training on use of the first operational release of Globe software for generating DTMs following the upgraded EMODNet methodology at the Project meeting annex Training Workshop in January 2014;

- A range of upgraded releases of Globe software developed by IFREMER following suggestions and regular feedback from data providers, using the software for data and DTM processing and QA/QC activities;

- A number of promotion activities for EMODnet Bathymetry at international conferences and meetings. More details are given in Chapter 8.
- EMODNet 2013 DTM integrated into new release of GEBCO_2014 giving extra quality to GEBCO;
- New GEBCO_2014 (still to be released) incorporated as base file in Globe software for completing gaps in regional DTMs by regional coordinators; this has as a side effect that the new EMODnet DTM will make use indirectly of OLEX data as these have been incorporated in GEBCO_2014. This is especially relevant for the Central North Sea where no bathymetric survey data sets have been included so far and where OLEX is prominently available provided by fishermen. Only negative aspect is that GEBCO_2014 has a resolution of ½ * ½ arc minutes which degrades the OLEX contribution for EMODnet. Note: EMODnet will continue its attempts to receive direct input from OLEX as well as covering the Central North Sea with industry related surveys;
- Regional coordinators have prepared a first version of the Regional DTM compilations using the pre-processed data (subDTMs) and Composite DTMs from data providers as input and the Globe software as tool;
- A first compilation of all new Regional DTMs into the overall EMODnet DTM for all European sea areas has been prepared for inspection by partners end of August 2014. The overall result is impressive and a major step forward in comparison with the present public EMODnet DTM. Unfortunately some structural problems have been identified which prevent finalisation and public release of the upgraded EMODnet DTM through the portal on short term. These quality issues are documented in a report which is included as Annex.
- Upgrading of software and solving of anomalies are required for a public acceptable result. After deliberatiion with partners to assess the remedial actions and planning implications a new planning has been set as follow:
  - Upgrading of software – during September 2014
  - Correcting GEBCO_2014 upsampled base data set – during September 2014
  - Reprocessing of survey data sets and Composite DTMs by data providers – deadline mid October 2014
  - Regional integration and QA-QC by Regional Coordinators and delivery of updated Regional DTMs to the central integrator – deadline first week November 2014
  - Overall integration and QA-QC of the EMODnet DTM including checks on coherence of CDI and Sextant references – deadline first week December 2014
  - Inclusion of new EMODnet DTM in the spatial database, generation of layers, generation of downloadable files in a range of formats, upgrading of the Bathymetry Viewing and Download service for a number of aspects, and public launch – deadline **mid December 2014.**
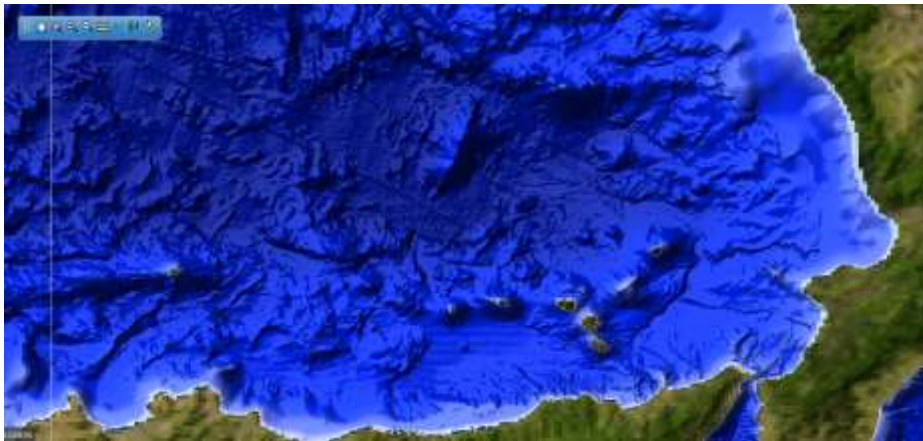- The next page gives a preliminary illustration of the DTM improvement.

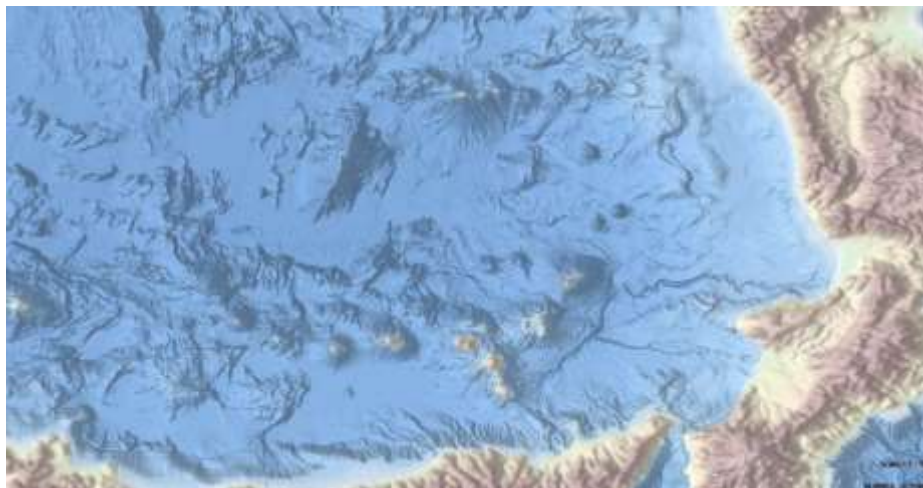*Image: existing EMODnet bathymetry near Sicily*



*Image: sneak preview new EMODnet bathymetry near Sicily*

# 2. Summary of the work done

The first year of the EMODnet Bathymetry project was dedicated to improving, adapting and validating the methodology and procedures for processing bathymetric survey data sets and Composite DTM data sets from data providers into Regional DTMs and a further integration into the overall EMODnet DTM with a resolution increasing from a grid size of ¼ minute * ¼ minute to a grid size of 1/8 minute * 1/8 minute. Furthermore, the first year was dedicated to managing the expansion of the consortium from 10 partners in EMODnet Seabed Mapping to now 24 active partners in order to cover all European sea basins.

The upscaling of the EMODnet DTM required upgrading of the methodology, but also a further upgrading of the tools. Therefore a lot of effort has been spent by partner IFREMER in an accelerated development of the Globe software that has been adopted by the consortium for a harmonised QA – QC and processing of bathymetric survey data sets and generation of Regional DTMs. The Globe software has been made available by IFREMER to all partners under a free user license. The adoption has put extra strains on the Globe software development because many extra functions and improvements as well as bug fixes were required to comply with the upgraded EMODnet methodology, formats, data volumes, and time schedule.

The upscaling of the consortium has required extra efforts for making all partners, in particular new partners, understanding the EMODnet Bathymetry model and approach in a relative short time period, and capable of implementing the approach. One element of the approach includes gathering and describing survey data sets respectively Composite DTM data sets, as locally managed by partners, with standard metadata formats in the SeaDataNet CDI Data Discovery & Access service respectively the SeaDataNet Sextant catalogue service. Both these services are supported by software tools & services which had to be explained to new partners and thereafter taken into operation by new partners with support and guidance by technical partners such as MARIS and IFREMER, and with support of several old partners. Furthermore all partners had to learn use of the Globe software and become fully acquainted with the EMODnet processing methodology and DTM standards.

These challenges have been solved by organising 3 project meetings with considerable attention for explanation and demonstration of the EMODnet approaches, including software and services, followed by active guidance and support by email communication. Halfway the first year, a Training Workshop of several days has been organised with hands-on training of the various tools for metadata and in particular of the 1st release of the Globe software with an active role of IFREMER and SHOM. Extensive minutes and action lists have been made and circulated of the first two project meetings to inform all partners and to provide useful reference, while all presentations and documents have been made available through the project Extranet. Extra communication about progress and planning of actions has been done by email.

The generation of Regional DTMs has been divided over regional sea subgroups, each with a Regional Coordinator and a number of contributing data providers. Each Regional Coordinator is responsible for

a quality assessment and selection of the data contributions and the compilation of the Regional DTM using the Globe software.

The overall integration of the Regional DTMs into the EMODnet DTM has been the responsibility of the technical partner GGSgc with support of MARIS. The step from Regional DTM to overall EMODnet DTM is not only an integration but also a final QA – QC to achieve a high quality bathymetry product that can be made public by the Bathymetry Viewing service at the portal for viewing and for downloading. The QA – QC also includes checking the coherence of CDI and Sextant references in the DTM cells, because the EMODnet model provides interactions between the 3 portal services so that users can identify interactively which survey data sets and Composite DTM data sets have been used to generate the values in each grid cell of the resulting EMODnet DTM.
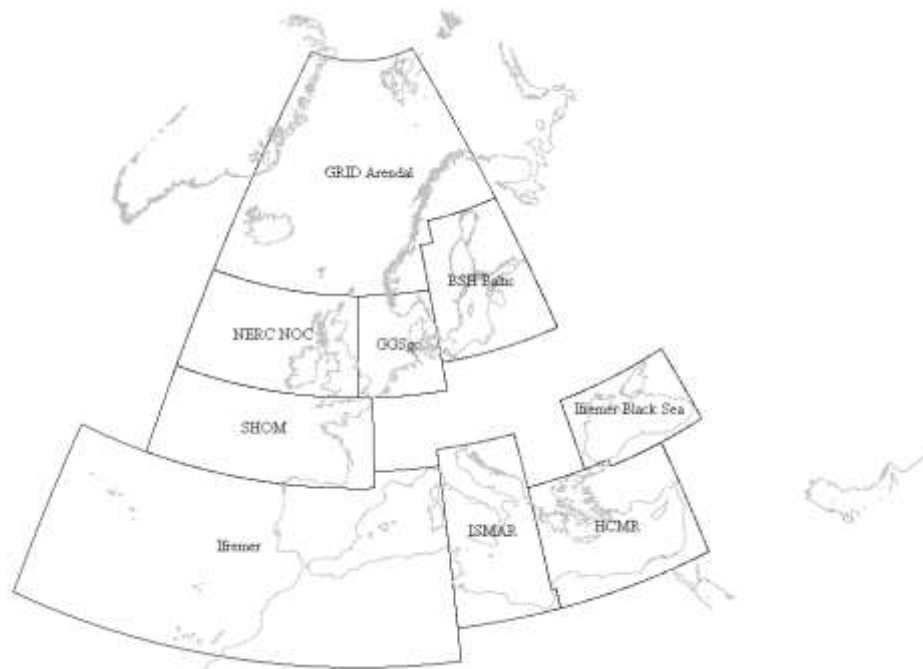


*Image: Regional DTMs with their Regional Coordinators*

The activities have resulted in a considerable increase of survey data sets that have been populated into the CDI Data Discovery & Access service and Composite DTMs that have been populated into the Sextant catalogue service. Also arrangements have been put into place for new partners connecting to the CDI infrastructure for handling user requests for data sets.

The activities have also resulted end August 2014 in a new EMODnet DTM of the higher resolution and covering all European sea basins. The overall result is impressive and a major step forward in comparison with the present public EMODnet DTM. Unfortunately some structural problems have been identified which require solving in the coming months for finalisation and public release of the upgraded EMODnet DTM through the portal which is now planned for mid December 2014.

# 3. Challenges encountered during the reporting period

| Partner | Challenges encountered | Short description | Measures to address challenges |
|---|---|---|---|
| MARIS, IFREMER | Making sure that all partners adopt the EMODNet Bathymetry approach and methodology | The challenge for EMODNet Bathymetry is to generate and publish a unified and harmonised DTM product supported by metadata | Organise projectgroup meetings and training workshop; production and distribution of extensive minutes and instructions; regular progress checks |
| MARIS | Populating new surveys and new providers into the CDI metadata service | The CDI service is used to connect data providers and to index their survey data in a standard way using SeaDataNet standards and tools | Providing instructions by presentations and supporting manuals; direct and regular interaction between MARIS CDI support desk and data providers for uptake and guidance |
| IFREMER | Populating new Composite DTMS and new providers into the Sextant metadata service | The Sextant service is used to index Composite DTMs in a standard way using SeaDataNet standards | Providing instructions by presentations and supporting manuals; direct and regular interaction between IFREMER Sextant support desk and data providers for uptake and guidance |
| IFREMER | Making sure that all partners can work with the Globe software | Globe software has been developed to allow the DTM production in accordance with the adopted EMODnet methodology | Training session organized in January 2014. Permanent technical support by Ifremer teams. |
| IFREMER | New zones covered by the project such as the Black Sea. | MARIS has coordinated the data collection by identifying and binding new data providers. IFREMER is the regional coordinator for the Black Sea DTM generation | Technical support by MARIS and IFREMER |

| IFREMER | DTM in waters under jurisdiction of non member states | Use of data along north African margin | Contacts in progress with scientific organizations of these countries to get authorizations |
|---|---|---|---|
| SHOM | Re-generating of all CDI XML files (6964) for updating all existing CDI entries, thereby safeguarding existing references. Re-generating of the CDI coupling table to connect CDIs to the local data files | Following a change of the database system at SHOM for bathymetric surveys all CDI XML files, coupling table and data files had to be re-generated | Adapting and running the local mapping for the SeaDataNet Mikado tool between the new database and the CDI standard. Creating a Python script to create the ODV data files from XML files and XYZ files |
| SHOM | Regional DTM production | SHOM has been appointed to new regional coordinator for Bay of Biscay / Channel and was faced with data and Globe software issues: 1) Some data providers provided their data in a format different than the one used by Globe; 2) Issues with timing and completeness of provider data sets; 3) Lack of data for the Channel Islands | Globe issues were corrected by Ifremer. Import feature and procedure had to be designed and implemented. Reminders were sent and explanations were given of the new role of SHOM as basin coordinator. Seeked to find additional data providers for gaps, but ultimately filled with GEBCO which gives an unsatisfactory result |
| SHOM | Globe software issues | Import of large amount of data files (soundings) and inclusion of corresponding CDI references. Initial lack of knowledge with handling basin compilation | Created a python script for support. And experience gained during the compilation |
| NERC-NOC | Globe software issues | Issues with data handling, data importing, data gridding, data formats, compatibility with EMODNet Hydrography data structures as well as general software/PC compatibility. Due to | Worked with Globe developers to address issues. |

| | | high resolution required for EMODNet Bathymetry and the extents of regional areas, there was an inability of Globe to process all in one batch. These resulted in wasted and inefficient use of time. | |
|---|---|---|---|
| NERC-NOC | Data provision | Each data provider provides data in a format they are familiar with, which can result in timely re-configuring to import into Globe. Some data providers provide significantly large data sets that conform to the EMODNet standard, but could not be imported into Globe | Worked with data partners to address quality issues. Work with Globe developers to find work around |
| NERC-NOC | Timeline | Some data providers did not respect the timeline for providing data | Worked with data partners to address these issues |
| NERC-BODC-GEBCO | Data quality | As part of the merge of the GEBCO and EMODnet grids, checks were carried out on the EMODnet grid to identify and spikes and holes | Any issues found were reported back to the Regional Co-ordinators |
| CNR-ISMAR | Software Issues | Various issues with Globe software including importing source data, merging DTMs and adding or modifying CDI references, missing standard deviation, -32767 values after merging the Composite DTM and the multibeam surveys for the Adriatic Sea area | Worked with software developers (IFREMER) to have issues addressed where possible on short term. Re-processing of the DTMs with the new releases of Globe software |
| CNR-ISMAR | Central Mediterranean Sea region too large for | Globe software was not able to process the full extent of data in the | The Central Mediterranean Sea was split into four regions |

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|  | processing as single area in Globe | Central Mediterranean Sea Region in one go | (Adriatic Sea, Ionian Sea, Sicily Channel, Tyrrhenian Sea) for processing. Other software was used to sub-divide the input data so that Globe could be used to process the data into the four sub-regional DTMs |
| CNR-ISMAR | Data Quality | Variable quality of data provided by regional data providers, but in general very good quality data | Bad quality data was not included into the final compilation, because there were enough data from other providers to replace the low quality (noise, sparse soundings) surveys |
| OGS | Coherence of references | Within EMODnet DTMs the references to CDIs are defined as a concatenation of EDMO_code of data provider and Local_CDI_ID as given by data provider. This was initially misunderstood by the Regional Coordinator for the Central Med | Solved by communication and intervention of project coordinator |
| OGS | Handling of navigation tracks for CDIs | The SeaDataNet CDI import and validation system has been upgraded overtime and this gave issues with provided GML for navigation tracks of surveys | GML revised by developing and applying new decimation software at OGS. SeaDataNet Ends and Bends tool was not able to handle the issue in this OGS case |
| OGS | Re-processed data with Globe 1.4.0 | After discovery of bugs in previous version of Globe data needed to be reprocessed | All data was reprocessed using Globe 1.4.0 and provided again to regional coordinators |
| IEO | Use of Globe software | Some problems with Globe software related to data importing, data gridding and software/PC | Communication with Globe developers |

| | | compatibility. These problems have been solved with new versions of the Globe software but this has involved a small loss of time | |
|---|---|---|---|
| IEO | Data provision | Each data provider provides data in a different format. This resulted in some loss of time | Communication with data provider |
| IEO | Metadata | Sometimes it appeared quite difficult to obtain from the original data provider all the relevant information to create the CDI and Sextant metadata | Communication with data provider |
| GSI | Globe Software issues | Various issues arose including: 1) Memory issues relating to file sizes which resulted in Globe crashing and hence the need to split files; 2) Issues with gaps occurring (1 raster cell) when you split files; 3) Issue with massive cache generated; 4) Merging issues which resulted in CDI reference disappearing; 5) Globe unable to deal with large area extent; 6) No tool available to clip dtms. (Our area needed to be clipped in 2 for 2 different regional coordinators); 7) Export to .emo command not working correctly; 8) A lot of time was spent trying to find a work around to these issues | Reported back to IFREMER on each version when issues were encountered. Sent data which outlined the problem. These were mostly resolved and a new version issued |

| GSI | CDI metadata errors | The CDI abstract field (aka description) for a few of our metadata files was too long | We had to remove some text and resend. It would be very helpful to add error messages relating to field length (or indeed the validation of all fields) and prevent users from saving the file unless valid in Mikado software |
|---|---|---|---|
| GSI | Preparing datasets for high resolution coastal project. All GSI surveys acquired since 2011 are levelled to the same vertical datum "Vertical Offshore Reference Frame" (VORF). VORF is a model which is referenced to the ellipsoid and integrates all vertical sea datum's | 4 multibeam surveys had been relevelled to VORF in 2013. However, 1 multibeam survey and the 2 Lidar surveys needed to be relevelled in order to align as best as possible before merging the datasets | The method used was to assess vertical errors by running 'difference and statistical analysis' on the base layers. The data was then block shifted in relation to the correctly levelled data. The shift was achieved by manipulating vessels files |
| IHPT | Software issues | Issues were: 1) Geographic bounds of the DTMs – resulting DTMs shifted; 2) Size of import ascii files; 3) Merging DTMs; 4) Some resulting DTM without CDI values; 5) Depth values on land due to interpolation | Communication with Globe software developers for reporting issues and ways for solving issues |
| IPMA | Software issues | Globe was not able to merge the 1/8 DTMs (from individual datasets) | Issues solved after communication with IFREMER and using new Globe version |
| IPMA | Data issues | Difficulties with re-processing one dataset from previous EMODnet-Bathymetry edition with a new list of CDI references | Issue solved after communication with IFREMER (CDI list file had a bug) |

| HCMR | Software Issues | Various issues with Globe software including importing emo format source data, merging DTMs and exporting emo format. Exporting capabilities in various formats such as arc ascii would be useful to be included in Globe. Modules like contouring and slope- useful for data analysis and processing - would also be useful to be included. Projection and transformation functions are currently not available | Contacts with software developers (IFREMER) to solve issues and update the software |
| --- | --- | --- | --- |
| HCMR | Data Quality | Questionable data quality in some regional data sets | Cleaning of data sets by manual removal of obvious artefacts |
| HCMR | Adaption of tools | Incompatibility between versions of Mikado and End&Beds software (CDIs with GML tracks from Ends&beds could not be opened by Mikado) | SeaDataNet End&beds software updated by IFREMER according to the latest CDI-XML format |
| BSH | Re-generating all the CDI XML files for BSH and include these as updates in the CDI service. Re-generating the coupling table and the data files. | Following the change of database system used for bathymetric surveys at BSH, the CDI XML files, the coupling table and the data files had to be re-generated | Created a workflow to convert BSH-Metadata to CDI format and generate coupling tables |
| BSH | Regional DTM production | Collecting the datasets from the Baltic Sea providers, create new metadata and merge them to the Baltic Sea model using Globe software | Import feature and procedure had to be designed and implemented, polygons were added using Esri ArcGIS |

| BSH | Globe software | Import of large data files failed | BSHC bathymetric data had to be split into smaller parts |
| --- | --- | --- | --- |
| GRID-Arendal | Globe software Issues | Various issues with Globe software: 1) importing emo format source data; 2) merging DTMs; 3) adding/modifying CDI references | Dialogue with software developers (IFREMER) to address issues in new upgrades |
| GRID-Arendal | Globe software issues | Globe software was not able to process the full Norwegian Sea Region in one go | The Norwegian Sea was split into four regions for processing. Other software was used to sub-divide the input data so that Globe could be used to process the data into the four sub-regional DTMs |
| GRID-Arendal | Data Quality | Variable quality of data provided by regional data partners | Worked with data partners to address quality issues. Cleaned data manually to remove obvious artefacts |
| IHM | Globe software issues | Some problems with early versions of Globe software resulting in wasted time | Issures solved by Globe developers in later versions |
| IHM | Metadata | Hydrographic internal QC criteria were sometimes not compatible with EMODnet recommendations in merging or splitting of surveys | Solved in coordination with MARIS support desk |
| HO-Belgium | Globe software issues | Several problems with the Globe software versions resulting in wasted time: 1) data importing; 2) merging DTMs; 3) generation of a 1/16 grid; 4) export of surveys to BAG format; 5) export of surveys to GeoTIFF format; 6) | Partly solved by Globe developers (IFREMER) in later versions. Also we used our cartographic production software to generate the 1/16 grid with the corresponding CDIs in the EMODNet ASCII export format |

| | | adding or modifying CDI references | |
|---|---|---|---|
| HO-Belgium | Metadata | Difficulties to integrate the surrounding polygon of the survey as GML in the CDI by using Mikado software. Missing CSR Identifiers for our survey ships in SeaDataNet Common Vocabularies. Converting Metadata from our Bathymetric DataBase to CDI XML format by using coupling table | GML and CSR identifiers solved in cooperation with MARIS support. The generation of the coupling table has been automated |
| GGSgc | Making sure that all data providers of the Greater North Sea region delivered their data in time and according to the agreed specification | The challenge is to ensure that consistent and up-to-date data sets are delivered, preferably following the agreed EMODnet specification. Data policies and available resources have to be taken into account | Through regular contact and meetings convinced new data providers to make their data available. Organized meetings with those data providers that experience difficulties or have additional questions |
| GGSgc | Integrate data contributions of data providers for Greater North Sea region and build the regional DTM | This work mainly consists of extensive data quality control and data conversion. Additional software is developed to work with specific formats and data specification as delivered by the providers | Specialized software development and development of QA/QC work procedures. |
| GGSgc | Create over 2000 CDI XML entries of survey data for the Dutch Hydrographic Service | GGSgc was tasked with the generation of all CDI entries for the Dutch Hydrographic Service | Specialized software has been developed to convert the internal metadata format of the Dutch Hydrographic Service to the agreed SeaDataNet meta data standard |
| GGSgc | Final QA-QC of all data from all regional coordinators and | Extensive QA-QC work was necessary and will provide input for the next version of the | Specialized software has been developed to perform QA-QC on the regional DTMs as |

| | assembly of the overall EMODnet DTM | EMODnet Bathymetry specifications. In addition a  huge data set (40 GB and over 500 million data points) as delivered in regional sets has been combined into a single consistent product | received. The new software follows the latest edition of the EMODnet Bathymetry specifications |
|---|---|---|---|
| OceanWise | Acquiring source survey data from authoritative providers in a timely manner | Survey data was made available to OceanWise with a significant delay and infrequently which then delayed processing and delivery to regional basin coordinators | Communicate regularly and apply pressure to relevant authorities and liaise closely with EMODNet project coordinators regarding progress |
| OceanWise | Generating CDI metadata to the required specification for 2038 separate survey records | The CDI metadata specification has been upgraded between 2013 and 2014 which had to be adapted in the local software. The Globe software could only export CDI records one by one, which was not suitable for the volume we needed to produce | Store CDI information within a database, export to CDI (xml) format using a software tool (written by OceanWise). Describe the CDI metadata specification in a configuration file so that the changes could be applied more easily |
| OceanWise | Exporting model grids to the EMODnet transfer format (.emo) | The EMODNet transfer format specification had changed since 2013. Additionally the Globe software could not import files that had been saved to this format | Separate the format specification from our export tool so that specification changes can be applied more easily. Work closely with regional coordinators and IFREMER to modify the Globe software to accept the transfer format |
| HO-Norway | Globe software issues | Various problems with Globe software, including export and import. Many new versions of Globe software were installed. Resulting in need for repetition of work and thus much wasted time | Globe software developers were very helpful and provided adjusted versions |

| NIOZ | Globe software issues | Various problems with Globe software | Contact with IFREMER developers of the software. Software was adjusted |
|------|----------------------|--------------------------------------|------------------------------------------------------------------------|

# 4.  Allocation of project resources

The following table gives an indication of the efforts in % of the total project efforts for the various work packages in the first year:

- WP0: Project Management
- WP1: Bathymetric data collection and metadata compilation for all maritime basins
- WP2: QC/QA and producing Digital Terrain Models for the basins
- WP3: Integration and inclusion of the DTM's into the portal
- WP4: Technical Development & Operation of portal
- WP5: Analysis & Evaluation

| Partner | Country | WP0 | WP1 | WP2 | WP3 | WP4 | WP5 | TOTAL % |
|---|---|---|---|---|---|---|---|---|
| MARIS | NL | 1.4 | 2.1 | 0 | 0.1 | 0.5 | 0 | 4.1 |
| IFREMER | FR | 0 | 1 | 2.5 | 0.3 | 0.2 | 0 | 4 |
| SHOM | FR | 0 | 1 | 1.7 | 0.1 | 0 | 0.1 | 2.9 |
| NERC-NOC | UK | 0 | 0.5 | 1 | 0.2 | 0 | 0 | 1.7 |
| NERC-BODC GEBCO | | 0 | 0 | 0.2 | 0.2 | 0 | 0 | 0.4 |
| CNR-ISMAR | IT | 0 | 1 | 2 | 0.1 | 0 | 0 | 3.1 |
| OGS | IT | 0 | 1 | 0.8 | 0 | 0 | 0 | 1.8 |
| IEO | ES | 0 | 0.7 | 0.55 | 0 | 0 | 0 | 1.25 |
| GSI | IE | 0 | 0.4 | 0.7 | 0 | 0 | 0 | 1.1 |
| IHPT | PT | 0 | 0.3 | 0.7 | 0 | 0 | 0 | 1 |
| IPMA | PT | 0 | 0.66 | 0.99 | 0 | 0 | 0 | 1.65 |
| HCMR | GR | 0 | 0.6 | 1 | 0.2 | 0 | 0.2 | 2 |
| IO-BAS | BG | 0 | 0.2 | 0.2 | 0 | 0 | 0 | 0.4 |
| BSH | DE | 0 | 0.5 | 1 | 0.1 | 0 | 0 | 1.6 |
| UNEP/GRID | NO | 0 | 0.6 | 1 | 0.1 | 0 | 0 | 1.7 |
| IHM | ES | 0 | 0.4 | 0.7 | 0 | 0 | 0 | 1.1 |
| HO Belgium | BE | 0 | 0.2 | 0.2 | 0 | 0 | 0 | 0.4 |
| GGSGC | NL | 0 | 0.2 | 0.8 | 0.3 | 1 | 0.1 | 2.4 |
| OceanWise | UK | 0 | 0.2 | 0.6 | 0 | 0 | 0 | 0.8 |
| UTM-CSIC-CMIMA | ES | 0 | 0.2 | 0.2 | 0 | 0 | 0 | 0.4 |
| HO Norway | NO | 0 | 0.2 | 0.3 | 0 | 0 | 0 | 0.5 |
| HO Netherlands | NL | 0 | 0.2 | 0.2 | 0 | 0 | 0 | 0.4 |
| NIOZ | NL | 0 | 0.1 | 0.3 | 0 | 0 | 0 | 0.4 |
| HO Faroes | FAROE | 0 | 0.4 | 0.2 | 0 | 0 | 0 | 0.6 |
| TOTALS PER WP | | 1.4 | 12.66 | 17.84 | 1.7 | 1.7 | 0.4 | 35.7 |

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# 5.  User Feedback

A number of feedback forms were received. These were support messages for the project, some questions about technical issues, citation and expected new releases. Messages were answered where needed. The table below gives an overview of  feedback events, while details on questions and answers are given in Annex 2.

Moreover the EMODnet secretariate provided user feedback on DTM quality for specific regions (email of 11th June 2014) that was provided to them by researchers at the EDM in Bremen – Germany. The follow-up is also detailed in Annex 2.

| Date | Name | Organization | Type of user feedback (*e.g. technical, case study etc*) | Response time to address user request |
|------|------|--------------|----------------------------------------------------------|---------------------------------------|
| 2013-06-28 | Hamid Mustafa Abdelgahar | Plymouth University | Question about citation and format | 3 days later |
| 2013-07-09 | Hamid Mustafa Abdelgahar | Plymouth University | Question about files | Same day |
| 2013-11-22 | David Harrison | Fugro | Question about using DTM | Same day |
| 2013-11-25 | Robin Waldman | Meteo France | Technical question about coordinates | Next day |
| 2013-12-01 | Adduladim | Unknown | Encouragement | Not needed |
| 2013-12-02 | Borja Aquilo | Unknown | Encouragement | Not needed |
| 2013-12-31 | Ruud van Wijk | Unknown | Encouragement | Not needed |
| 2014-01-06 | Zohar Gvirtzman | Unknown | Question about citation | Same day |
| 2014-01-09 | C. COCHET | Unknown | Question about reference | Same day |
| 2014-01-22 | Duncan Fraser | Blueyonder | Question about login | Same day |
| 2014-02-17 | Emmanouil I.Konstantinidis | Democritus University of Thrace | Question about citation | Same day |

| 2014-03-24 | Borja Aguiló | Unknown | Suggestion | Not needed |
|---|---|---|---|---|
| 2014-04-03 | Antoine Patru | ETHZ | Question about login | 6 months due to mislaid mail |
| 2014-04-07 | Mehran Eskandari | University of Birmingham | Question about citation | Next day |
| 2014-04-10 | Boris Espinasse | University of Nordland | Question about releases | Same day |
| 2014-06-03 | Felix Schalck | Unknown | Encouragement | Not needed |
| 2014-06-29 | Louis Hough | Unknown | Encouragement | Not needed |
| 2014-07-21 | Rudy Magne | Meteogroup | Question about releases | 2 months due to mislaid mail |
| 2014-07-28 | Stavros Stylianou | University of Cyprus | Question about releases | Same day |

# 6. Work package updates

## 6.1 WP0: Project Management:

The initial EMODnet Bathymetry consortium consisted of 16 partners and 8 subcontractors. The main contract has been concluded between EU and MARIS as coordinator on behalf of the full consortium. Following the EU contract, MARIS has drafted and circulated for discussion a Consortium Agreement for all partners and a Subcontract for bilateral contracting of individual subcontractors. The Consortium Agreement has been agreed and signed by all partners and 7 out of 8 subcontractors have signed the bilateral subcontract. Only the Danish Geodata Agency has not yet signed their subcontract and thus at present there is no permission to use DGA's earlier provided Composite DTM data set for the Danish waters. Further negotiations are taken place with DGA to come to a solution. Following the search for additional data sets several possible extra data providers have been identified and interested to become subcontractors, especially for the Black Sea region and the Eastern Mediterranean. These include GeoEcoMar from Romania, subcontracted, Marine Research, SME from Romanian, on a voluntary basis, Dokuz Eylul University - Institute of Marine Science and Technology from Turkey, subcontracted, and GeoMar from Germany, for which subcontracting negotiations are approaching finalisation.
Besides contractual affairs, the project coordinator has organised 3 projectgroup meetings, including preparing minutes and action lists. Also the project coordinator has drafted and submitted to the EU a progress report for the period June 2013 – December 2014, and bimonthly progress reports starting January 2014. In addition, the project coordinator has presented progress of the project at several meetings with the EU concerning EMODnet. The project coordinator maintains the project web portal and the Extranet with all relevant documents and presentations. The project coordinator has monitored, evaluated and controlled the overall progress of the project and its activities towards its objectives. Regular emails have been drafted and circulated to partners to remind them of actions and planning as well as to get information on progress and possible issues, that required solving.

## 6.2 WP1: Bathymetric data collection and metadata compilation for all maritime basins

The objectives are to gather identified bathymetric data sets and to compile metadata for all bathymetric data sets in the SeaDataNet CDI format. As part of the previous EMODNet Hydrography and Seabed Mapping projects already guideline documents and presentations had been prepared. These have been updated and presented at the project meetings, including guidance on standards, procedures and tools. Old partners have worked on extending their existing collection of CDI and Sextant entries with new and possible updated entries, while new partners had to start from zero, which required more effort for instructions and guidance.
In addition, efforts have been undertaken to identify and approach potential complementary data providers for including also their data sets in the project, especially for the 2 new regions: Baltic Sea and Black Sea. This has resulted in 4 new data providers of which 2 have already contributed to the data collection while the other 2 require more time for starting. Also deliberations have taken place with representatives of the Baltic Sea Bathymery Database (BSBD) project of the Baltic Sea Hydrographic Commission. This has resulted around end 2013 in a cooperation whereby the BSBD DTM data set can

be used as a considerable contribution for covering the Baltic Sea bathymetry in EMODnet. The BSBD coordinator from the Swedish Maritime Administration (SMA) is participating in EMODnet Bathymetry project meetings and project activities.

**Metadata compilation and inclusion in the CDI Data Discovery and Access Service:**

For all new gathered bathymetric survey data sets metadata records have been prepared, adopting the SeaDataNet Common Data Index (CDI) metadata format as already done in the previous EMODNet hydrography projects. The CDI metadata format is supported by Common Vocabularies. The newly gathered data sets and metadata have been converted to the standard formats as in use for the CDI Data Discovery and Access Service. This service gives users a detailed insight of the availability and geographical extent of marine data, archived at the connected data centres. It gives the description of individual data sets and measurements with key fields (what, where, when, how, who etc.). It also provides the link pin from the discovery services towards the delivery services, because it is directly related to the data sets, to which the users can request access. Access is given as downloading services, whereby the data sets can be downloaded by users from the data centres in a number of standard formats.

MIKADO is a versatile XML editor, provided by SeaDataNet, to prepare CDI XML entries. MIKADO runs on a PC and can be operated manually, but also in batch mode to generate automatically CDI XML records from a local metadatabase at a data provider. Beforehand a mapping analysis is required to match the local metadata to the CDI target model and to map the locally used terms to the SeaDataNet Common Vocabularies and the European Directory of Marine Organisations (EDMO) for organisations (data owners, distributors, holding centres). In addition there is a software tool, Ends&Bends, to assist in reducing the number of coordinates, depicting the original survey tracks or polygons, into a GML string that can be used in the CDI to indicate the location of the surveys for discovery purposes.

The new CDI records have been submitted to MARIS for loading into the CDI Data Discovery and Access Service. This is done in a few steps, starting with inclusion in a test CDI service for validating not only the syntax and semantics applied, but also the logical content and quality of the CDI entries. Thereafter attention has been given to the way how the data provider will be connected to the CDI service for giving access to data via the CDI shopping mechanism. Many data providers in the consortium were already operational in the CDI service and have added new entries where possible.

**Metadata compilation and inclusion in the Sextant products catalogue service:**

As an alternative to providing direct access for the consortium to their survey data sets, some partners themselves have prepared Composite DTMs at a high resolution (minimum 1/16 minute) that are made available to the consortium. In those cases the data providers were required to prepare metadata entries for the Composite DTMs which should be done online in the Sextant products catalogue service using its Content Management System (CMS). Furthermore data providers were encouraged to enter also the CDI metadata for the underlying survey data sets in order to have a complete insight.

The operational CDI service for EMODnet Bathymetry now contains 10731 entries from 24 data centres from 14 countries. Their geocoverage is illustrated below. In addition, there are a further 2479 CDI

entries waiting in the import service that will be moved soon to the CDI production service. This brings the total numberc of CDI entries to **13210** CDI entries.
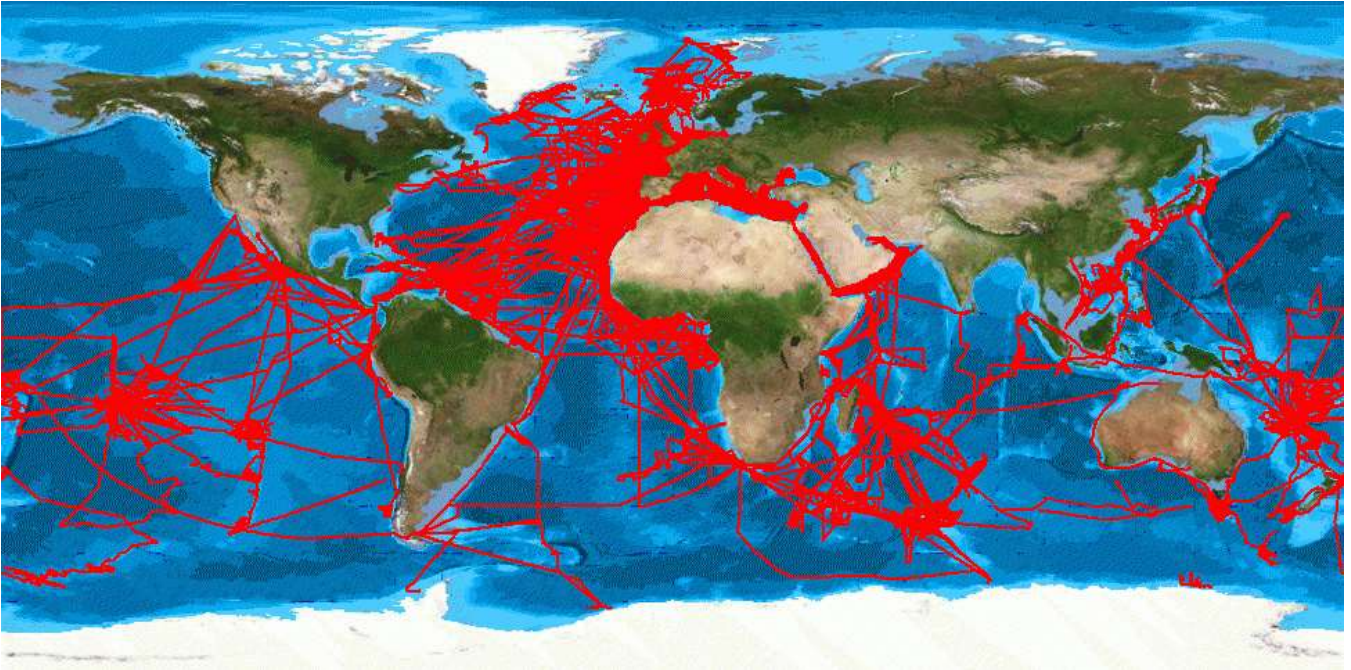


*Image: Overview of geographical coverage of bathymetry CDI entries end August 2014*

Overall the number of surveys in the CDI directory has increased in the first year from **9236** CDI entries to **13210** CDI entries.

Overall the number of Composite DTMs in the Sextant directory has increased in the first year from **32** Sextant entries to **39** Sextant entries.

More details are given in Chapter 9 – Indicators.

### 6.3    WP2: QC/QA and producing Digital Terrain Models for the basins

The objectives are to validate and harmonise the quality of bathymetric data sets that will be used as input for generating a Digital Terrain Model (DTM) per region. The present EMODnet DTM has a spatial resolution of 1/4 minute and all grid nodes are located along a common mesh : N0°W0° + n*1/4'. Each grid point in the resulting DTM has a lon-lat / WGS84, a minimum and maximum and average water depth over the cell, and ancillary layers such as statistics of the average waterdepth (standard deviation, number of interpolations, number of elementary surfaces), smoothed average waterdepth determined by a spline function, offset of smoothed waterdepth related to the average waterdepth and also references to the used sources of information. References to hydrographic survey data sets resp. Composite DTM data sets are documented by CDI metadata records resp. Sextant metadata records. In case of use of GEBCO a general GEBCO_2014 reference is included. For the new challenge of a higher

resolution an improved QA/QC and DTM generation methodology has been formulated which is described in detail in the **Manual on QA/QC and DTM generation** (on Extranet).

<u>**Data providers:**</u>

They should preferrably make use of **survey data** => to be described by **CDI metadata**. The survey should be processed into pre-sampled grid (pref using the Globe software). The choice of the grid cell size is dependent on: survey characteristics, data accuracy, depth range, positioning system, internal data policy. This choice is the responsibility of the data provider. The following table gives a guideline.

| Level of resolution | Cell size | Approx size in m | Single beam | Multibeam |
|---|---|---|---|---|
| 1 | 1/8' | 230 | deep sea | deep sea |
| 2 | 1/16' | 115 | deep sea and shelf / low density | continental margin |
| 3 | 1/32' | 60 | continental shelf | continental shelf |
| 4 | 1/64' | 30 | coastal area | coastal area |

*Table:  Pre-sampled grid resolutions accepted vs. context*

In some cases Data Providers will provide **Composite DTMs** => to be described by **SEXTANT Catalogue references**. These Composite DTMs are DTMs created from multiple datasets from the same provider. If possible, the Composite DTM **should be re-sampled at a resolution** comparable to those given in the Table above. The Data Provider should give details on the sampling method. The data set attribute content should at least include a water depth value and the CPRD ID for Composite DTMs per gridcell. The main issue with supplying data as a Composite DTM is that several attribute layers such as min/max depth, standard deviation and number of soundings might not be generated. In addition, integration of the data set into the final DTM product by the Basin Coordinator may create some artefacts in the regional basin DTM. ***Therefore supplying data as pre-sampled grids or raw soundings is preferred over Composite DTMs.***

**Note:** raw soundings stands for the data that the data provider is ready to provide in his own internal format, while pre-sampled grids stands for these raw soundings gridded at 1/16 (or better) and provided to the regional basin coordinator prior to integration. This is illustrated in the image on the next page.
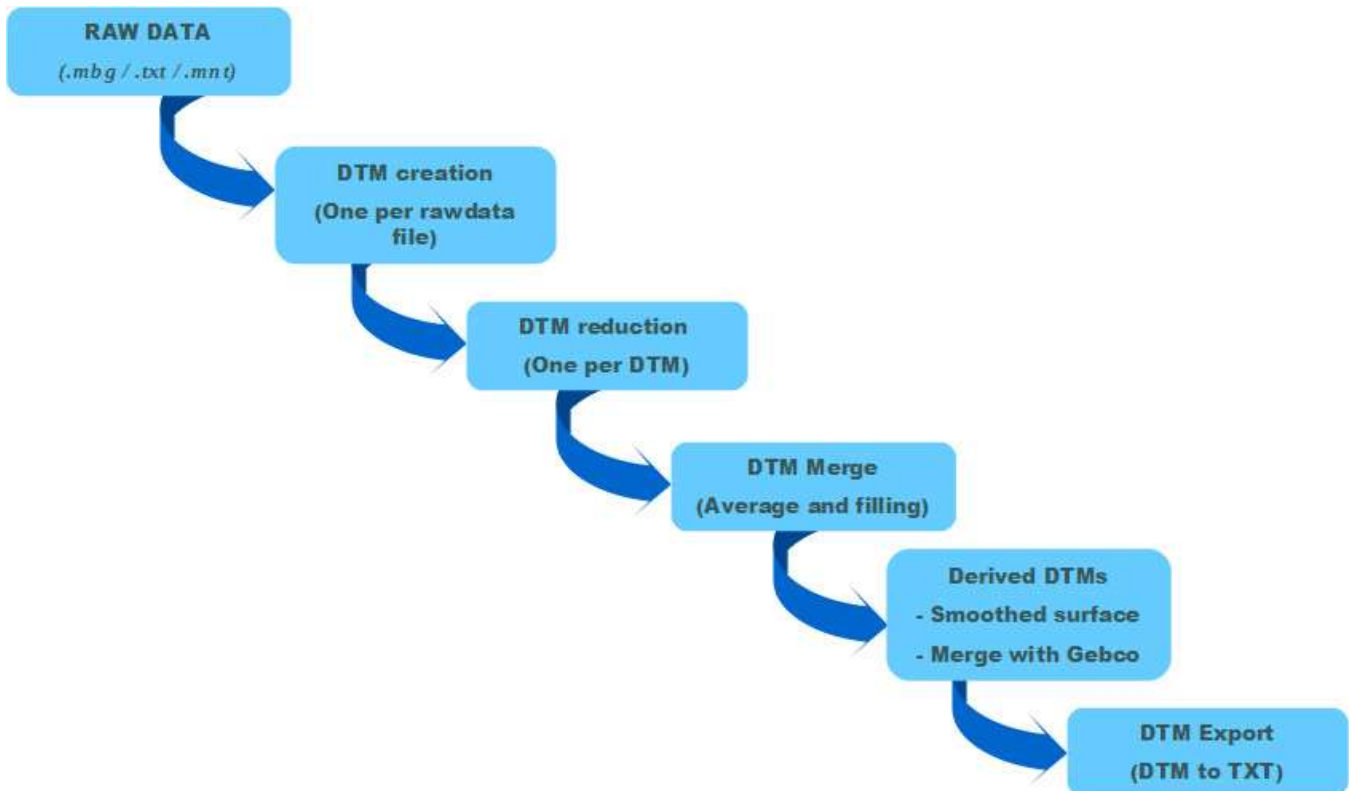
*Image: EMODnet process from raw data to DTM*

**Regional Basin coordinators:**

Next step in the EMODnet processing flow has been to produce a compiled bathymetric product for each of the regional basin areas from all the data sets contributed by the Data Providers. This part of the process has been carried out by each of the regional Basin Coordinators. This phase involved three steps: 1) aggregating the provided data sets, 2) generating a continuous bathymetry surface, sometimes called "smoothed depth layer" from the input data sets, and 3) DTM QA/QC. During the previous EMODnet projects, the process involved reducing and merging the 1/16 arc-minute DTMs to a 1/4 arc-minute grid. The revised approach involves aggregating "sampled data" grids at different resolutions to produce the final 1/8 arc-minute grid. The regional coordinators have worked on producing the best version, integrating also GEBCO_2014 to complete gaps. The regional coordinators have also performed a QA/QC analysis on the generated regional DTM, following a prescribed QA/QC template as included in the documentation. The boundaries of the regional DTMs have been defined as indicated in the following images. This has been circulated to all partners in March 2014.
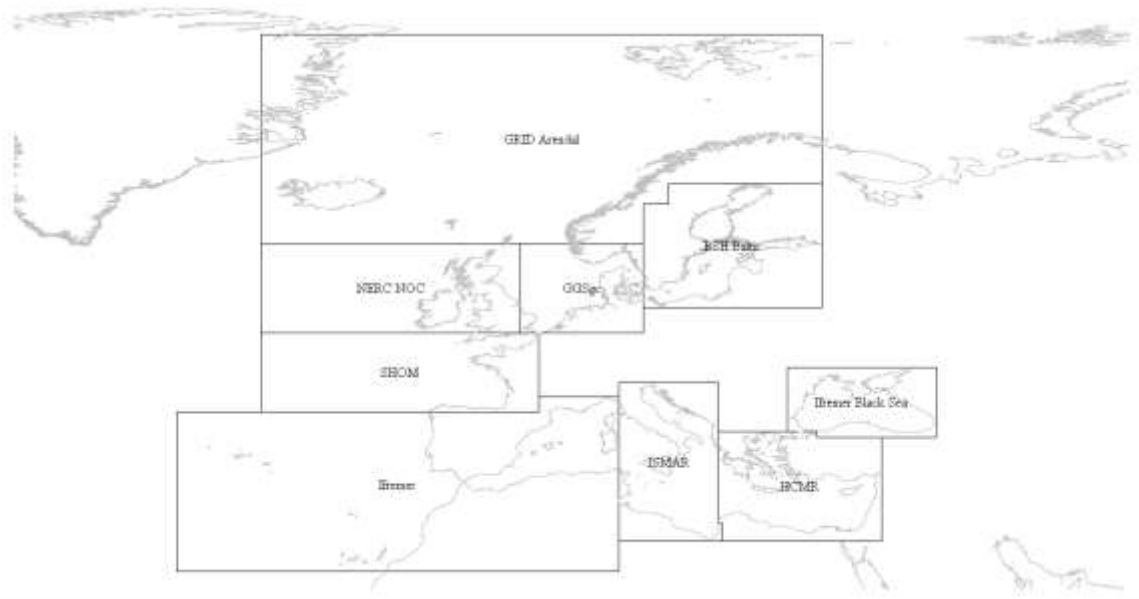
*Image: Regional DTMs with their regional coordinators*

The geographical boundaries are as follows:

| Coordinator | | Upper right | | Lower left | | Remark |
|---|---|---|---|---|---|---|
| Ifremer + IPMA | Iberian Coast - Atlantic - Macaronesia - Western Med | -34.5 | 43 | 10 | 27 | In the Mediterranean the area's northern lattitude is 44.5 degrees |
| HCMR | Eastern Med | 20 | 41.1 | 36.5 | 30 | Area includes Sea of Marmara and Bosphorus Strait south of 40.5 degrees. Area does not include Gulf of Sidra |
| Ifremer | Black Sea | 27 | 47.5 | 42 | 40.5 | Area **does not** include Sea of Marmara and Bosphorus Strait south of 40.5 degrees |
| CNR-ISMAR | Central Med | 10 | 46 | 20 | 30 | Area includes complete Gulf of Sidra |
| SHOM | Channel - part Atlantic - Bay of Biscay | -26 | 51 | 2 | 43 | |
| NERC-NOC | Celtic Sea - part Atlantic - part North Sea | -26 | 60 | 0 | 51 | Exclusive of the SHOM area |
| GGSgc | Greater North Sea | 0 | 60 | 12.5 | 51 | |
| BSH | Baltic | 12.5 | 66 | 30.5 | 53.5 | Exclusive of Norwegian Sea |

| GRID Arendal | Norwegian Sea - Icelandic Sea | -26 | 81 | 30.5 | 60 | Exclusive of BSH Baltic area |
|---|---|---|---|---|---|---|

The regional DTMs have been produced using the Globe software and with data input from the following data providers:

- **Bay of Biscay - Iberian Coast - Atlantic:** by **IFREMER** and **IPMA** with data contributions from IFREMER, SHOM, IEO, IHPT, IPMA, EMEPC, IHM, ICM-CSIC, and NIOZ.
- **Macaronesia regions - Azores + Madeira**: by **IHPT** with data contributions IHPT, IFREMER, SHOM
- **Macaronesia regions - Canary Islands**: by **IHM** with data contributions IHM, IEO, IFREMER
- **Western Mediterranean**: by **IFREMER** with data contributions IFREMER, SHOM, CNR-ISMAR, IEO, BSH, IHM, ICM-CSIC, and NIOZ.
- **Central Mediterranean**: by **CNR-ISMAR** with data contributions CNR-ISMAR, OGS, OGS, Israel (John Hall), and NIOZ
- **Eastern Mediteranean**: by **HCMR** with data contributions by HCMR, IFREMER, SHOM, and Israel (John Hall)
- **Celtic Seas and part Atlantic and part North Sea** : by **NERC-NOC** with data contributions of NERC-NOC, IFREMER, SHOM, NERC-BODC, GSI, OceanWise, and NIOZ.
- **Channel and part Atlantic**: **by SHOM** with data contributions of SHOM, NERC-NOC, IFREMER, NERC-BODC, GSI, OceanWise, and NIOZ.
- **Greater North Sea region:** by **GGSGC** with data contributions SHOM, NERC-NOC and NERC-BODC, BSH, HO Belgium, OceanWise, HO Netherlands, NIOZ, HO Faroes, and NPD.
- **Norwegian Sea - Icelandic Sea**: by **GRID-Arendal** with data contributions HO Norway, NPD, and HO Faroes
- **Baltic Sea**: by **BSH** with data contributions of BSH, and BSHC Bathymetry project
- **Black Sea**: by **IFREMER** with data contributions of IFREMER, IO-BAS, GeoEcoMar (RO), and Marine Research (RO)

**Inclusion of the EMODNet bathymetric grids into GEBCO_2014 and vice-versa:**

Through its Sub-Committee on Regional Undersea Mapping (SCRUM), GEBCO aims to work with regional mapping groups, such as EMODnet, as collaborative partners to help build authoritative regional and global bathymetric models. An updated GEBCO grid will also help to make a better base for future 'gap filling' work for EMODnet. As part of the cooperation GEBCO has integrated the existing EMODnet DTM into its GEBCO_2014 grid with grid size ½ minute which has been improved considerably. In turn GEBCO_2014 (not yet publicly released) has been made available to EMODnet for filling gaps in coverage in the new EMODnet DTM. GEBCO_2014 has also made use of additional sources, such as OLEX and IBCAO.

**Development of the Globe software tool:**

The new Globe software tool has been adopted by the Consortium for QA/QC and DTM processing. In a short time since the kick-off meeting, IFREMER has made great progress with the development of the Globe software for bathymetry processing. The Globe software has to deal with different data types such as multibeam surveys, seismic surveys, images etc. and provides support for seafloor mapping (elevation, backscatter, gridded, 4D data, water column echoes, rasters and grids). It also includes a 3D viewer, developed as part of Geo-Seas, on the basis of NASA WorldWind. The Globe software can handle data in NetCDF (CF), standard grids and sensor acquisition formats and after processing can make products compliant for WMS, GoogleEarth, GIS. The Globe development is succeeding the earlier Caraïbes software, that was used in the previous EMODnet Hydrography and Seabed mapping projects by various partners. The new Globe software has been made available for EMODnet partners for free use under a special license by IFREMER. Use of the Globe software to produce common DTMs was encouraged because it has the EMODnet methodology incorporated in its software. Therefore most partners have adopted and used Globe. During the project various extra requirements and bugs were identified which were followed up by IFREMER in a succession of software releases. A number of partners did not use Globe, but their own in-house software tools.

**Production and delivery of Regional DTMs:**

The actual processing and generation of the Regional DTMs took place in the period of June – July 2014, following the 3rd Projectgroup meeting where the project status was discussed and a final planning for the 1st new EMODnet DTM release was agreed. Unfortunately the processing of regional DTMs was hampered by Globe software issues which were taken into solving by IFREMER. However, the delivery of the Regional DTMs took place in July 2014 to the overall DTM integrator, GGSgc, who started its QA-QC and integration activities in August 2014 as part of WP3. In the meantime regional coordinators prepared QA – QC reports for their regional DTMs following an agreed template.

## 6.4 WP3: Integration and inclusion of the DTM's into the portal

GGSgc has received all Regional DTMs from the regional coordinators and has undertaken activities in August 2014 for QA – QC and integration of the overall new EMODnet DTM. The QA – QC findings have been written down in a QA – QC report that is attached to this 1st Annual Interim report as Annex. The following are a few excerpts from this report:

- All regional coordinators (with the exception of GGSgc) have used Globe to compile their Regional DTMs. This has resulted in a high level of standardization of the DTM data and in an almost 100% coverage match between the regional contributions (one exception in the Black Sea). In previous version there were more gaps and overlaps detected between the regional DTM contributions.
- DTM Data was received in various formats: EMODnet, Globe and NetCDF.
- Not all DTM datasets received contained a smoothed depth value
- Statistical information in most DTM datasets was either missing or incorrect
- In general there is no good match between the DTMs and the coastline. Both gaps and overlaps were identified
- The use of field 7 (Interpolation) and field 8 (number of elementary surfaces) is inconsistent and

requires better definition in the EMODnet Methodology and Guidelines document

- All datasets produced with Globe made no distinction between field 11 (CDI reference) and field 12 (DTM reference)
- The up-sampling of GEBCO data shows serious grid artefacts.
- A total of 6719 unique CDI references are used in the overall DTM (3844 in 2103 version)
- A total of 31 unique DTM references are used in the overall DTM (28 in 2013 version)
- Over 350 CDI / Composite DTM references were either incorrect or unknown in SeaDataNet (CDI and SEXTANT services) (Note: these have been corected in the meantime).

A number of issues could be resolved at integration level, but there are still issues which need correction before launching the 2014 EMODNet DTM at the public portal.  Some issues might be related to the Globe software while other issues might be solved by the Regional Coordinators, possibly in dialogue and cooperation with data providers, when the issue is at source level. Anyway it has been decided that the new EMODnet DTM is very impressive and promising, but not yet fit for publication. Therefore deliberation is ongoing between the project coordinator, regional coordinators and technical partners for analysing the issues and formulating issues in order to establish a planning for improvement. Following this decision the new EMODnet DTM has not yet been included in the EMODnet Bathymetry portal.

## 6.5    WP4: Technical Development & Operation of portal

The present EMODnet Bathymetry portal is operational at http://www.emodnet-bathymetry.eu and is managed and operated by MARIS in cooperation with GGSgc and IFREMER. It provides a website and 3 interrelated services for users for browsing, viewing and downloading the EMODnet DTM and for identifying and requesting access to the gathered bathymetric survey data sets and Composite DTM data sets for the European waters. The portal and services have been kept operational and up-to-date and a few upgrades have taken place:
- the CDI search facility has been extended by including sea areas;
- the online Content Management System for the Sextant catalogue service has been upgraded to ease use by data providers;
- preparations have been made for including in the Bathymetry viewing service a layer with detailed geography using Open Street View and a layer with a more detailed digital terrain model for the land part.

More upgrades and technical developments are planned, including a reshuffling  of the website and its navigation, following user feedback from the EMODnet Secretariate. Also an updating of texts is required. The updating and reshuffling of the website will be done before mid October 2014. Upgrading of the Bathymetry Viewing and Download service will coincide with the release of the new EMODnet DTM, planned for mid December 2014.

The EMODNet Bathymetry infrastructure provides access to bathymetric data sets from distributed data centres. Users need to register in the SeaDataNet user register for a single-sign-on data shopping process to all connected data centres. As part of the SeaDataNet and EMODNet Physics projects further work is ongoing for upgrading the underlying Authentication, Authorisation and Accounting (AAA) service towards a Marine ID service. The next step as planned is to motivate the Copernicus marine service

(MyOcean 2) to make use of the same AAA service paving the way towards using the same logon details for both EMODNet, SeaDataNet and Copernicus Marine Service. Moreover there is a Personal Layer functionality in the Bathymetry Viewing and Download service that also requires a user id – password. It is strived to change this logon also to Marine ID as part of the upgrade for mid December 2014. Then the EMODnet Bathymetry services would all have a Single-Sign –On based on SeaDataNet Marine ID.

## 6.6    WP5: Analysis & Evaluation

No activities in this period.

# 7. Meetings held since last report

| Date | Location | Topic | Short Description |
|---|---|---|---|
| 17 - 18 June 2013 | Lisbon - Portugal | Project kick-off meeting | To start the project, meet the partners, and to communicate the overall approach |
| 4 - 5 July 2013 | Copenhagen - Denmark | Marine Observation and Data Expert Group (MODEG), incl WG-DIKE members and EMODNET coordinators | To present results of previous EMODnet Hydrography and Seabed Mapping projects and scope of EMODnet Bathymetry |
| 20 - 21 October 2013 | Brussels - Belgium | Marine Observation and Data Expert Group (MODEG), | Discussing plans for the central EMODnet portal, installation of EMODnet Secretariate, and developments by BSHC for Baltic Sea |
| 16 - 17 December 2013 | Brussels - Belgium | 1st meeting of the EMODnet Steering Committee | Discussing development of the central EMODNet portal, next to proposed procedure for reporting on EMODNet lots. |
| 27 - 30 January 2014 | Tenerife - Spain | Projectgroup meeting annex Training Workshop | To plan first release of new DTM products and hands-on Training Workshop where the partners were instructed in the EMODNet DTM generation methodology, Quality Assurance, preparation of metadata, and using the various tools as provided by SeaDataNet and the new DTM processing software Globe of IFREMER. This Training Workshop has been instrumental in assuring a common approach by all regional groups and a high quality output. |

| 26 – 27 May 2014 | Hamburg - Germany | Projectgroup meeting | To discuss progress and finetune Workplan for 1$^{st}$ release |
| 4 – 5 June 2014 | Rome - Italy | EMODNet SC meeting | Presenting progress and planning |

# 8. Outreach and communication activities

| Date | Media | Title | Short description and/or link to the activity |
|---|---|---|---|
| 8-12 July 2013 | Conference | Esri International User conference, San Diego | Network activities and briefing on EMODnet activities during the Hydrography Special Interest Group meeting chaired by IHO president Robert Ward. By GGSgc |
| September 2013 | Meeting | annual Baltic Sea Hydrographic Commission (BSHC) meeting | used by BSH to seek synergy between Baltic Sea Bathymetric Database project and EMODnet Bathymetry |
| 17 - 20 September 2013 | Conference | MARES 2020, International Conference "Marine Research Horizon 2020" (host IO-BAS) | EMODnet Bathymetry presented by MARIS in session "EMODNET - Achievements and Future" . |
| 23-25 September 2013 | Conference | IMDIS 2013, International Conference on Marine Data and Information Systems (host SeaDataNet) | SeaDataNet Technical Coordinator included EMODnet in the IMDIS opening presentation of cooperation. |
| 18 September 2013 | Conference | Regional Hydrographic Commission for South Africa and Islands RHC hosted by Portugese HO, Lisbon | Presentation by OceanWise - The Wider Use of Hydrographic Data; Inclusion of EMODNet programme in context of data access and supply. |
| September 2013 | Poster | Harmonization of DTM production in EU distributed infrastructures | *http://imdis2013.seadatanet.org/content/download/73945/957705/file/S2P39_IMDIS2013.pdf*<br>*Presented at Imdis and Gebco conferences by SHOM* |
| 7 - 8 October 2013 | Conference | GEBCO Science Day 2013 (host CNR-ISMAR) | EMODnet Bathymetry presented by MARIS and also a final agreement between GEBCO and EMODnet was reached for the release of the new GEBCO bathymetry in which EMODnet is included and cited as a regional effort. |
| 10 October 2013 | Conference | INFOMAR Annual Seminar 2013 Limerick, Ireland | GSI presented "INFOMAR and European Projects". Four slides (15-18) were dedicated to: "EMODNET Hydrography 2". http://www.infomar.ie/Annual_Seminar/2013_UL/Irish%20mapping%20&%20EU%20Projects%20_GSI_%20MJ.pdf Poster "EMODNET Hydrography " displayed. |
| 28 - 31 October 2013 | Conference | BS-GES 2013, 4th Bi-annual Black Sea Scientific Conference Challenges Towards Good Environmental Status (host NIMRD) | organised by the Black Sea Commission Secretariate together with NIMRD. EMODnet Bathymetry presented by MARIS. |
| 28 October 2013 | Exhibition | World Hydrography Day - Southampton | EMODNet slide in rolling OceanWise presentation on exhibition Stand |

| 29-30 October 2013 | Conference | Digital Hydrography on the Maritime Web –Solent University | EMODNet slide in rolling OceanWise presentation on exhibition Stand |
|---|---|---|---|
| 11 November 2013 | Conference | Atlantic Ireland 2013 Dublin, Ireland | Poster "EMODNET Hydrography " displayed on INFOMAR stand by GSI |
| 17 November 2013 | Workshop | Welsh Govt. PGA Supplier Day | User experiences with marine mapping – EMODNet as a case in point by OceanWise |
| Oct / Nov 2013 | Magazine | Inshore Ireland (vol 9 nr 5) | GSI article "EMODNet Phase 2 initiatives" http://issuu.com/inshoreirelandpublishing/docs/inshore_ireland_vol_9_nr_5_oct-nov_/25 Also, available on INFOMAR's facebook page. https://www.facebook.com/595185173894900/photos/a.610997545646996.1073741832.595185173894900/612453645501386/?type=3&theater |
| 26 November 2013 | Conference | Geoscience 2013 Dublin, Ireland | GSI presented "INFOMAR 2026" Some slides (18 &19) were dedicated to: "EMODNET Hydrography 2. http://www.gsi.ie/NR/rdonlyres/D4E4B47F-6963-4F4C-90D6-1B8BEE51ACC0/0/Session51INFOMARArchieDonovan.pdf Poster "EMODNET Hydrography " displayed. |
| 06 December 2013 | Conference | AGI Cymru Conference 2013 | Presentation – uses of marine data included availability of EMODNet as a source for use by OceanWise |
| 12- 13 January 2014 | Conference | Coastal Futures 2014 | EMODNet slide in rolling OceanWise presentation on exhibition Stand |
| 4 February 2014 | Journal Article | Harris, P.T., Macmillan-Lawler, M., Rupp, J. and Baker, E.K. 2014. Geomorphology of the oceans. Marine Geology, 352: 4-24. | The Emodnet bathymetry was used as one source of data in the publication on geomorphology of the oceans. This publication presents a global map of geomorphic features based on interpretation of bathymetric data. By GRID-Arendal |
| March 2014 | Exhibition | Oceanology International 2014 | EMODNet Bathymetry presented by MARIS at stand |
| 1 March 2014 | Poster | | New poster by MARIS, available via the website |
| 10 March 2014 | conference | Noth Sea Hydrografic Conference – Resurvey WG Meeting | EMODNet Bathymetry presented by BSH |
| 19 March 2014 | Seminar | UK Harbourmasters [UKHMA] Spring Seminar | EMODNet slide in rolling OceanWise presentation on exhibition Stand |

| April 2014 | Congress | European Geophysical Union (EGU) | EMODNet Bathymetry presented by MARIS in session |
|---|---|---|---|
| May 2014 | Presentation(s) to University undergrad and MSc students | Use of bathymetry in the United Nations Convention on the Law of the Sea (UNLOS) | Introduction of availability and access to bathymetry within the EU via the EMODNet Hydrography/Bathymetry programmes. By NERC-NOC |
| 11-13 June 2014 | Conference | IV Simposio internacional de Ciencias del Mar. Las Palmas de Gran Canaria. Spain. | "European initiatives to dissemintae the Geo-information of marine environment: EMODNET. Marine Knowledge 2020. IEO contributions" by IEO |
| 12 – 13 June 2014 | Workshop | 8TH GEO EUROPEAN PROJECTS WORKSHOP | EMODNet Bathymetry presented by MARIS in session |
| 13-15 June 2014 | Meeting | Joint IHO-IOC Guiding Committee for GEBCO meeting, Monaco | Inclusion of information about the GEBCO-EMODnet collaboration work and its status in a report to the GEBCO Guiding Committee. By NERC-BODC-GEBCO |
| 25-27 June 2014 | Meeting | 31st North Sea Hydrographic Commission meeting, Amsterdam | Inclusion of information about the GEBCO-EMODnet collaboration work in a general presentation given about the work of GEBCO. By NERC-BODC-GEBCO |
| 22 August 2014 | Magazine | Geology Matters Issue 16 (GSI Newsletter) | GSI article "EMODNET Hydrography 2 - Producing a high resolution digital bathymetry for European sea basins" http://www.gsi.ie/NR/rdonlyres/0ED13073-3083-474A-BEC6-0222D348B104/0/Issue_16A.pdf |

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# 9.  Updates on Progress Indicators

## *Indicator 1 - Volume of data made available through the portal*

The total number of CDIs for bathymetric survey data sets has increased in the period 1 June 2013 to 31 August 2014 from:  **9127  to 10731**

Moreover in the import system there are new entries underway which will be move into production soon: **2479**

The total in production covers the whole Globe. Specifically relevant for European waters has increased from: **6323  to 7852**

Lat Long box**: N80, W-30 ; N20, E45**
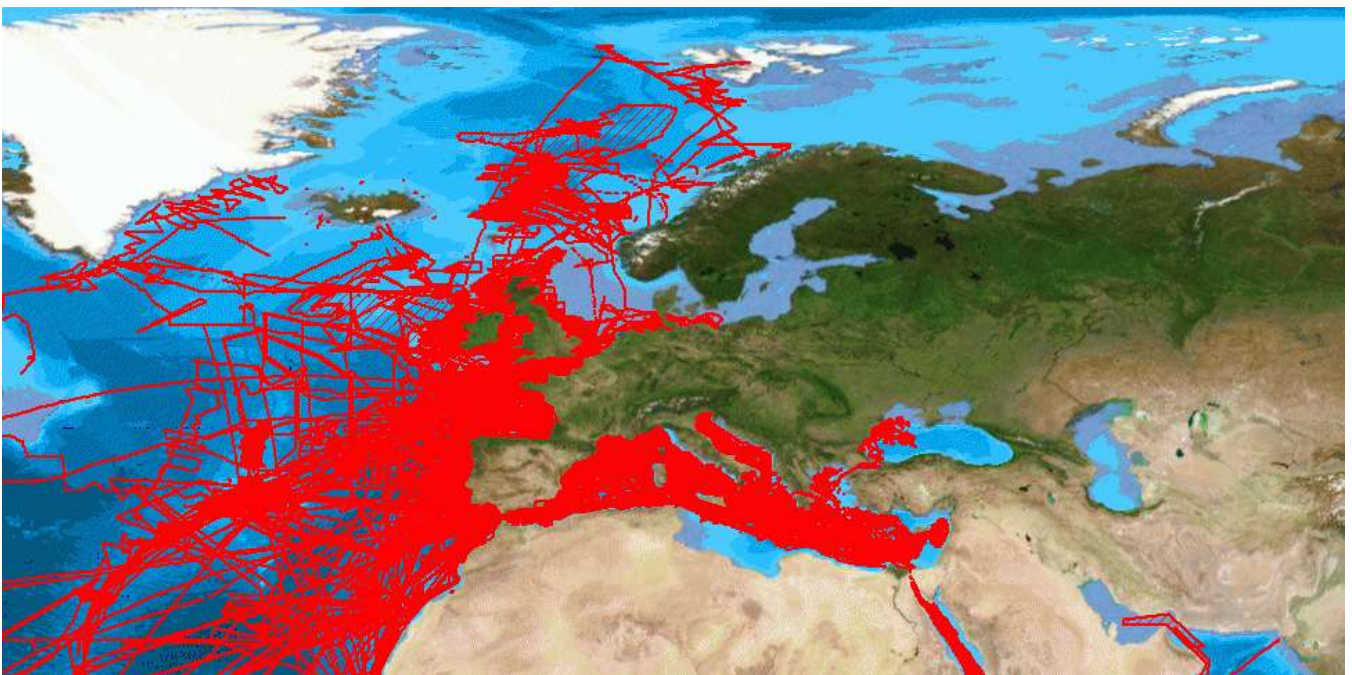


As can be seen in the image above, the CDIs now also contain entries for the Norwegian Sea, Black Sea and Baltic Sea.

Of these **274** CDIs are unrestricted, while all other require negotiation. Bathymetric survey data are costly to acquire and by most data providers treated with access restrictions which are indicated as part of the CDI metadata. Users can submit requests for access by means of the shopping mechanism in the CDI Data Discovery and Access service. This way data providers are informed about the requests

and will contact the users by email or telephone for further discussing their requests. This can lead to positive decisions and delivery of data sets through the CDI Data Discovery and Access service or directly by e-mail by-passing the CDI service. It can also be that no agreement can be reached and then users will not get access to the requested data sets. Anyway the negotiation is an issue between the users and the data providers whereby the CDI service and in particular its Request Status Manager (RSM) servicve can serve as an instrument, but it can be by-passed. So as EMODnet Bathymetry there is no complete insight in transactions.

Regional DTMs are available at present for the following sea regions:

- the Greater North Sea, including the Kattegat and stretches of water such as Fair Isle, Cromarty, Forth, Forties,Dover, Wight, and Portland
- the English Channel and Celtic Seas
- Western Mediterranean, the Ionian Sea and the Central Mediterranean Sea
- Iberian Coast and Bay of Biscay (Atlantic Ocean)
- Adriatic Sea (Mediterranean)
- Aegean - Levantine Sea (Mediterranean).
- Madeira and Azores (Macaronesia)

Next to survey data as described in the CDI Data Discovery and Access service, there are also Composite DTMs used as source data. These are described with metadata in the Sextant catalogue service. The table below gives a list of the present Composite DTM entries.

| DTM | DTM provider | Domain | Type of data | Resolution |
|---|---|---|---|---|
| Regional DTM of NL continental shelf | Hydrographic office of NL | Continental shelf | Single beam | 125 m |
| Regional DTM for Norway area | Atlis | | Electronic charts NHS | |
| Regional DTM of Denmark continental shelf | Atlis | Continental shelf | Single beam | 50 m |
| Regional DTM of German continental shelf | Atlis | Continental shelf | from German Hydrographic Office | 50 m |

| | | | | |
|---|---|---|---|---|
| Regional DTM of Belgium continental shelf | Atlis | Continental shelf | single beam and multibeam | 400 m |
| EMODNet Regional DTM of the Belgium Continental Shelf | Flemish Hydrographic Office | | single beam | 125 m |
| NHS 50m grid from multibeam surveys | Norwegian Hydrographic service | SW Norway | multibeam | 50 m |
| NHS 50m grid | Norwegian Hydrographic service | North Norway | multibeam | 50 m |
| Norway coastal 50 m composite DTM | Norwegian Hydrographic service | Coasts of Norway | single beam | 50 m |
| Bathymetry_Bay of Biscay | Ifremer | from coast to deep ocean | Multi sources | 1000 m |
| Adriatic_singlebeam | CNR-ISMAR | Italian side of the Adriatic Sea | Single beam | 200 m |
| Adriatic_Emilia-Romagna | CNR-ISMAR | | Single beam and multibeam | 10 m |
| West Continental Shelf of Portugal | EMEPC | | Multibeam | 500 m |
| EMEPC Central_Continental_Shelf_Portugal | IPMA | | Multibeam (EMEPC sources) | 500 m |
| West Central Continental Shelf Portugal | IPMA | | (EMEPC sources) | 250m |

| | | | | |
|---|---|---|---|---|
| Balear Islands Margin | IEO | EEZ | Single beam | 250 m |
| Catalan Margin | IEO | | Multibeam | 100 m |
| Strait of Gibraltar | IEO | | Single beam | 100 m |
| Alboran Sea | IEO | | Multi beam | 250 m |
| Cantabric Sea | IEO | Cantabric margin | Single beam | 200 m |
| Golfo de Vera (Spain) Margin | IEO | | Multibeam | 200 m |
| Levante margin | IEO | Levante margin | Single beam | 100 m |
| South Alboran Sea | IEO | | From IBCM | |
| ZEE_GALICIA | IEO | Galicia margin | multibeam | 460 m |
| Murcia Margin | IEO | | multibeam | 100 m |
| Formentera Island South Margin | IEO | | multibeam | 200 m |
| ECOMARG | IEO | Cantabric margin | multibeam | 200 m |
| Gulf of Cádiz (353_291106) | IEO | | | |
| Gulf of Cádiz (353_291219) | IEO | Gulf of Cadix | single beam | 200 m |
| Gulf of Cádiz (353_291218) | IEO | Gulf of Cadix | single beam | 200 m |
| Balear Islands South Margin | IEO | | multibeam | 200 m |
| PAIS_VASCO | IEO | | multibeam | 250 m |
| Canal Menorca Margin | IEO | Balear Islands | multibeam | 250 m |

| MARCONI | IEO | Cantabric margin | multibeam | 100 m |
|---|---|---|---|---|
| Catalan margin Coast Brava | IEO | catalan margin | multibeam | 100 m |
| Ecocartografia IBIZA - FORMENTERA | IEO | Balear Islands | | 225 m |
| Ecocartografia MENORCA | IEO | Balear Islands | | 225 m |
| Espace-Medit-Continental-Shelf | IEO | Alboran Sea | | 225 m |
| Cyprus-Compilation | Geological Survey of Israel | Shelf of Cyprus | Composite 25 m grids | 0.25 minutes |
| Joint Israel National Bathymetric Survey Data | Geological Survey of Israel | Coast and upper slope | Multibeam | 0,25 minutes |
| Nile-Delta-UKHO-UKHD-Soundings | Geological Survey of Israel | | Soundings fro UKHO | 0.1 minutes |
| Libya-Italian-HDNO-0.25min | Geological Survey of Israel | Lybian coast | Italian surveys | 0.25 minutes |
| Baltic Sea Bathymetry Database | Baltic sea Hydrographic Commission | | | 500 m |

Note: it is difficult to indicate the total area covered by these Composite DTMs because this information is not readily available.

# Indicator 2 -- Organisations supplying each type of data based on (formal) sharing agreements and broken down into country and organisation type (e.g. government, industry, science).

| Data Centre | Country | Total no. | No restrictions | Restrictions |
|---|---|---|---|---|
| British Oceanographic Data Centre | United Kingdom | 83 | 50 | 33 |
| German Oceanographic Datacentre (NODC) | Germany | 15 | 15 | 0 |
| OGS (Istituto Nazionale di Oceanografia e di Geofisica Sperimentale), Division of Oceanography | Italy | 10 | 0 | 10 |
| Institute of Marine Science (ISMAR) - Bologna | Italy | 65 | 0 | 65 |
| Hellenic Centre for Marine Research, Hellenic National Oceanographic Data Centre (HCMR/HNODC) | Greece | 76 | 0 | 76 |
| IEO/Spanish Oceanographic Institute | Spain | 66 | 0 | 66 |
| Geological Survey of Ireland | Ireland | 136 | 136 | 0 |
| IFREMER / IDM/SISMER | France | 714 | 70 | 644 |
| SHOM (SERVICE HYDROGRAPHIQUE ET OCEANOGRAPHIQUE DE LA MARINE) | France | 4128 | 0 | 4128 |
| IHPT, Hydrographic Institute | Portugal | 274 | 0 | 274 |
| NIOZ Royal Netherlands Institute for Sea Research | Netherlands | 30 | 0 | 30 |
| Bulgarian National Oceanographic Data Centre(BGODC), Institute of Oceanology | Bulgaria | 16 | 0 | 16 |
| National Institute of Marine Geology and Geoecology | Romania | 2 | 0 | 2 |
| Hydrographic Institute of the Navy | Spain | 53 | 0 | 53 |
| Management Unit of North Sea and Scheldt Estuary Mathematical Models, Belgian Marine Data Centre | Belgium | 93 | 93 | 0 |
| National Laboratory of Energy and Geology | Portugal | 3 | 0 | 3 |

| | | | | |
|---|---|---|---|---|
| Institute of Marine Sciences. Mediterranean Marine and Environmental Research Centre (CMIMA-ICM-CSIC). Department of Marine Geology | Spain | 4 | 0 | 4 |
| Flemish Ministry of Mobility and Public Works; Agency for Maritime and Coastal Services; Coastal Division | Belgium | 78 | 0 | 78 |
| OGS (Istituto Nazionale di Oceanografia e di Geofisica Sperimentale), Infrastructures Division | Italy | 23 | 0 | 23 |
| Marine Technology Unit. Mediterranean Marine and Environmental Research Centre | Spain | 6 | 0 | 6 |
| UNEP/GRID-Arendal | Norway | 7 | 0 | 7 |
| OceanWise Limited | United Kingdom | 1961 | 0 | 1961 |
| Portuguese Institute of Ocean and Atmosphere | Portugal | 4 | 0 | 4 |
| Jardfeingi, the Faroe Islands Earth and Energy Directorate | Faroe Islands | 5 | 0 | 5 |
| | | | | |
| **TOTALS** | | **7852** | **364** | **7488** |

The increase in the period from 1 June 2013 to 31 August 2014 is indicated below.

| Data Centre | Country | Total no. | No restrictions | Restrictions |
|---|---|---|---|---|
| British Oceanographic Data Centre | United Kingdom | 33 | 33 | 0 |
| German Oceanographic Datacentre (NODC) | Germany | 15 | 15 | 0 |
| Institute of Marine Science (ISMAR) - Bologna | Italy | 17 | 0 | 17 |
| Hellenic Centre for Marine Research, Hellenic National Oceanographic Data Centre (HCMR/HNODC) | Greece | 39 | 0 | 39 |
| Geological Survey of Ireland | Ireland | 42 | 42 | 0 |
| IFREMER / IDM/SISMER | France | 61 | 0 | 61 |
| IHPT, Hydrographic Institute | Portugal | 37 | 0 | 37 |
| NIOZ Royal Netherlands Institute for Sea Research | Netherlands | 11 | 0 | 11 |
| Bulgarian National Oceanographic Data Centre(BGODC), Institute of Oceanology | Bulgaria | 16 | 0 | 16 |

| | | | | |
|---|---|---|---|---|
| National Institute of Marine Geology and Geoecology | Romania | 2 | 0 | 2 |
| Hydrographic Institute of the Navy | Spain | 53 | 0 | 53 |
| Institute of Marine Sciences. Mediterranean Marine and Environmental Research Centre (CMIMA-ICM-CSIC). Department of Marine Geology | Spain | 4 | 0 | 4 |
| Flemish Ministry of Mobility and Public Works; Agency for Maritime and Coastal Services; Coastal Division | Belgium | 78 | 0 | 78 |
| OGS (Istituto Nazionale di Oceanografia e di Geofisica Sperimentale), Infrastructures Division | Italy | 19 | 0 | 19 |
| UNEP/GRID-Arendal | Norway | 7 | 0 | 7 |
| OceanWise Limited | United Kingdom | 1086 | 0 | 1086 |
| Portuguese Institute of Ocean and Atmosphere | Portugal | 4 | 0 | 4 |
| Jardfeingi, the Faroe Islands Earth and Energy Directorate | Faroe Islands | 5 | 0 | 5 |
| **TOTAL INCREASE** | | **1529** | **90** | **1439** |

# *Indicator 3 -Organisations that have been approached to supply data with no result, including type of data sought and reason why it has not been supplied.*

The Danish Geodata Agency was a subcontractor in the EMODnet Bathymetry bid, but so far DGA has not signed the subcontract. Therefore there is no permission (yet) to use the Composite DTM data sets for the Danish waters as earlier used for the present EMODnet DTM. Negotiations are ongoing to change DGA's standpoint.

The possible reason for this denial is that the Hydrographic Office of Danmark has been merged into the Danish Geodata Agency which needs to find part of its funding by charging for geo data, including bathymetry.

# *Indicator 4 -Volume of each type of data and of each data product downloaded from the portal*

Time period 1 June 2013 – 31 August 2014:

**CDIs:**

No of CDI basket transactions: **23**

No of CDIs requested: **650**

Different users: **23**

Different data centres: **12**

**Data products – DTMs:**

| Tile | Downloads |
|---|---|
| Greater North Sea | 3351 |
| Adriatic-Ionion Sea - C.Meditarrenean | 3275 |
| Celtic Seas | 3241 |
| West Mediterranean | 3097 |
| Aegean-Levantine Sea | 3078 |
| Madeira | 2780 |
| Azores | 2754 |
| Bay of Biscay - Iberian Coast | 852 |

|  |  |
|---|---|
|  | **22428** |

| Format | Downloads |
|---|---|
| ESRI |  |
| ASCII | 5889 |
| XYZ | 4808 |
| GeoTiff | 5436 |
| NetCDF | 2244 |
| CSV | 3135 |
| SD | 916 |

|  |  |
|---|---|
| **22428** |  |

## *Indicator 5 -Organisations that have downloaded each data type*

Liverpool University – UK

Exeter University – UK

BSH – Germany

UPCT – Spain

VLIZ – Belgium

GSI – Ireland

SHOM – France

IPMA – Portugal

USGS – USA
ETHZ – Switzerland
NERC-NOC – UK
SeaScape Consultants – UK
Garmin – Italy
US Naval Research Laboratory – USA
+ 9 persons with gmail / hotmail accounts

## *Indicator 6 -Using user statistics to determine the main pages utilised and to identify preferred user navigations routes*

Time period 1 June 2013 – 31 August 2014:

Bathymetry main portal:

| Month | Unique visitors | Number of visits | Pages | Hits | Bandwidth |
|---|---|---|---|---|---|
| Jun 2013 | 648 | 1,320 | 13,381 | 40,393 | 2.55 GB |
| Jul 2013 | 731 | 1,412 | 16,485 | 44,009 | 3.17 GB |
| Aug 2013 | 638 | 1,097 | 11,742 | 32,782 | 1.33 GB |
| Sep 2013 | 837 | 1,443 | 14,158 | 42,490 | 3.79 GB |
| Oct 2013 | 976 | 1,705 | 16,857 | 49,609 | 4.38 GB |
| Nov 2013 | 864 | 1,507 | 17,665 | 51,634 | 4.29 GB |
| Dec 2013 | 800 | 1,378 | 12,119 | 36,143 | 2.51 GB |
| Jan 2014 | 932 | 1,569 | 17,827 | 52,468 | 3.95 GB |
| Feb 2014 | 931 | 1,579 | 22,536 | 60,710 | 3.82 GB |
| Mar 2014 | 1,039 | 1,713 | 19,840 | 56,544 | 3.19 GB |
| Apr 2014 | 984 | 1,659 | 20,766 | 54,708 | 2.91 GB |
| May 2014 | 1,002 | 1,760 | 18,063 | 53,529 | 3.46 GB |
| Jun 2014 | 995 | 1,784 | 17,402 | 51,169 | 2.67 GB |
| Jul 2014 | 988 | 1,791 | 15,955 | 45,079 | 1.92 GB |
| Aug 2014 | 933 | 1,602 | 12,575 | 36,651 | 1.63 GB |

Note: Unique visitors are users that browse to the portal by internet. The list of visitors is sorted for unique visitors within a monthly period. The number of visits are the number of times that users browse to the portal. Considering the above statistics it seems that visitors browse to the portal on average twice per month. During a visit they browse through various pages of the portal. Again considering the statistics above one could say that circa 10 – 12 pages on average are viewed by the average visitor. Each page can consist of objects such as text and images. These are counted as hits when viewed, so one page can concern multiple hits. Bandwidth indicates the volume of bytes that goes from the server by internet to the webbrowser of the users for displaying the portal pages.

Visitors in August 2014:

| Hosts (Top 10) - Full list - Last visit - Unresolved IP Address | Pages | Hits | Bandwidth | Last visit |
|---|---|---|---|---|
| Hosts : 727 Known, 405 Unknown (unresolved ip) 933 Unique visitors | | | | |
| 84.41.108.220 | 1,333 | 1,333 | 15.94 MB | 29 Aug 2014 - 14:16 |
| ns500848.ip-192-99-19.net | 1,078 | 1,339 | 11.02 MB | 21 Aug 2014 - 16:54 |
| pcpros.ogs.trieste.it | 451 | 566 | 3.04 MB | 13 Aug 2014 - 14:21 |
| unknown.shom.fr | 324 | 1,144 | 10.59 MB | 29 Aug 2014 - 13:21 |
| ip-193-33-2-112.mde.es | 299 | 415 | 2.30 MB | 22 Aug 2014 - 11:13 |
| ip82-139-126-41.lijbrandt.net | 231 | 320 | 5.84 MB | 16 Aug 2014 - 19:11 |
| dynx663.guwlan.gu.se | 178 | 272 | 1.83 MB | 20 Aug 2014 - 14:31 |
| u-128-128-43-1.xr.usgs.gov | 169 | 287 | 16.71 MB | 22 Aug 2014 - 21:23 |
| host206-163-dynamic.10-87-r.retail.telecomitalia.it | 168 | 381 | 3.13 MB | 04 Aug 2014 - 08:24 |
| 80.246.188.132 | 166 | 198 | 2.04 MB | 28 Aug 2014 - 14:55 |
| Others | 8,178 | 30,396 | 1.56 GB | |

Bathymetry DTM viewer service:

## Activity by Month

| Month | Hits | Page Views | Visitors | Bandwidth (KB) |
|---|---|---|---|---|
| Jun 2013 | 2,718 | 1,518 | 1,209 | 34,402,201 |
| Jul 2013 | 2,319 | 1,417 | 1,230 | 23,886,622 |
| Aug 2013 | 2,131 | 1,249 | 970 | 26,640,188 |
| Sep 2013 | 2,234 | 1,350 | 1,084 | 24,217,135 |
| Oct 2013 | 2,411 | 1,382 | 1,232 | 39,461,249 |
| Nov 2013 | 2,040 | 1,151 | 901 | 33,941,964 |
| Dec 2013 | 1,892 | 1,338 | 1,094 | 38,285,983 |
| Jan 2014 | 2,243 | 1,639 | 1,265 | 45,548,931 |
| Feb 2014 | 2,670 | 1,923 | 1,379 | 72,287,244 |
| Mar 2014 | 2,395 | 1,794 | 1,397 | 50,619,242 |
| Apr 2014 | 2,671 | 1,846 | 1,423 | 71,812,795 |
| May 2014 | 2,863 | 1,894 | 1,413 | 69,785,915 |
| Jun 2014 | 2,835 | 1,785 | 1,362 | 75,397,306 |
| Jul 2014 | 2,696 | 1,740 | 1,323 | 64,411,889 |
| Aug 2014 | 2,471 | 1,559 | 1,213 | 46,749,993 |
| Total | 36,589 | 23,585 | 18,495 | 717,448,665 |

| | Hosts | | | | |
|---|---|---|---|---|---|

**Top Hosts**

| | Host | Country | Hits | Visitors | Bandwidth (KB) |
|---|---|---|---|---|---|
| 1 | ptr.cnsat.com.cn | China | 4,612 | 4,156 | 27,056,129 |
| 2 | 119.63.193.194 | Japan | 882 | 782 | 3,956,985 |
| 3 | 119.63.193.130 | Japan | 803 | 763 | 3,780,769 |
| 4 | 119.63.193.131 | Japan | 776 | 744 | 695,710 |
| 5 | 119.63.193.132 | Japan | 778 | 740 | 4,483,263 |
| 6 | 119.63.193.195 | Japan | 787 | 737 | 2,460,717 |
| 7 | 119.63.193.196 | Japan | 719 | 669 | 2,160,652 |
| 8 | 193.182.186.254 | Sweden | 296 | 253 | 918,205 |
| 9 | ec2-50-18-216-148.us-west-1.compute.amazonaws.com | United States | 361 | 174 | 1,962,678 |
| 10 | user.vliz.be | Belgium | 313 | 122 | 5,538,484 |
| 11 | unknown.shom.fr | France | 220 | 111 | 4,990,406 |
| 12 | 119.Red-79-144-191.dynamicIP.rima-tde.net | Spain | 138 | 90 | 545,122 |
| 13 | nat.bo.ismar.cnr.it | Italy | 180 | 75 | 3,539,188 |
| 14 | wgate.npl.co.uk | United Kingdom | 124 | 59 | 9,110,725 |
| 15 | br148-029.ifremer.fr | France | 124 | 56 | 3,043,194 |
| 16 | static.kpn.net | Netherlands | 140 | 49 | 4,097,298 |
| 17 | google-proxy-66-249-81-183.google.com | United States | 44 | 44 | 115,757 |
| 18 | google-proxy-66-249-81-3.google.com | United States | 41 | 41 | 451 |
| 19 | 46.34.88.155 | Unknown | 117 | 38 | 1,575,643 |
| 20 | smtp-out.navionics.com | Italy | 69 | 38 | 551,301 |
| 21 | 193.137.20.13 | Portugal | 88 | 33 | 1,576,776 |
| 22 | msnbot-131-253-38-67.search.msn.com | Canada | 37 | 31 | 462,692 |
| 23 | 93.160.60.22 | Denmark | 34 | 30 | 313,421 |
| 24 | 199.19.249.196 | United States | 38 | 30 | 1,783,517 |
| 25 | a82-93-143-37.adsl.xs4all.nl | Netherlands | 71 | 28 | 1,290,868 |
| 26 | google-proxy-66-249-81-5.google.com | United States | 27 | 27 | 297 |
| 27 | unallocated.star.net.uk | United Kingdom | 85 | 26 | 2,322,417 |
| 28 | google-proxy-66-249-93-183.google.com | United States | 27 | 25 | 297 |
| 29 | h137-191-239-189.gn.gov.ie | Ireland | 46 | 25 | 660,468 |
| 30 | google-proxy-66-249-93-3.google.com | United States | 38 | 25 | 23,389 |
| 31 | 195.10.221.34 | United Kingdom | 53 | 25 | 846,656 |
| 32 | 178.16.165.22 | France | 37 | 25 | 1,835,098 |
| 33 | 130.206.32.66 | Spain | 79 | 25 | 1,390,827 |
| 34 | google-proxy-66-249-81-85.google.com | United States | 24 | 24 | 264 |
| 35 | garr4.isprambiente.it | Italy | 117 | 24 | 2,024,257 |
| 36 | kokosnoot.wur.nl | Netherlands | 87 | 24 | 3,857,715 |

### *Indicator 7 -List of what the downloaded data has been used for (divided into categories e.g. Government planning, pollution assessment and (commercial) environmental assessment, etc.)*

Nothing to report

# 10. Additional User Statistics

No further statistics available.

## *Annex 1*

**EMODnet DTM Integration Report**

# EMODnet Integration

# Report
# Date: 5 September 2014
# Author: George Spoelstra
# Editor: Dick M.A. Schaap

## 1. Characteristics of the regional DTM input relevant to the overall EMODnet 2014 DTM

Regional DTM input contributing to the overall EMODnet 2014 DTM are originating from the following regional coordinators:

| Regional Coordinator | Country | Format | Area |
|---|---|---|---|
| SHOM | France | Globe | - Bay of Biscay / Channel |
| Ifremer | France | EMODnet | - Atlantic and Iberian Coast<br>- Madeira / Canarias<br>- Western Mediterranean<br>- Black Sea |
| NOC | GB | EMODnet | - Celtic Sea |
| IHPT | Portugal | Globe DTM/ EMODnet | - Azores |
| GRID Arendal | Norway | Globe | - Norwegian Sea / Icelandic Sea |
| BSH | Germany | Globe/ EMODnet | - Baltic Sea |
| HCMR | Greece | Globe/ EMODnet | - Eastern Mediterranean |
| CNR-ISMAR | Italy | EMODnet | - Central Mediterranean |
| GGSgc | Netherlands | EMODnet | - Greater North Sea |
| GEBCO/IHO | International | NetCDF | - GEBCO Europe ½ arc minute xyz grid |

The Regional DTM coverage for each Regional Coordinator is illustrated below (figure 1).
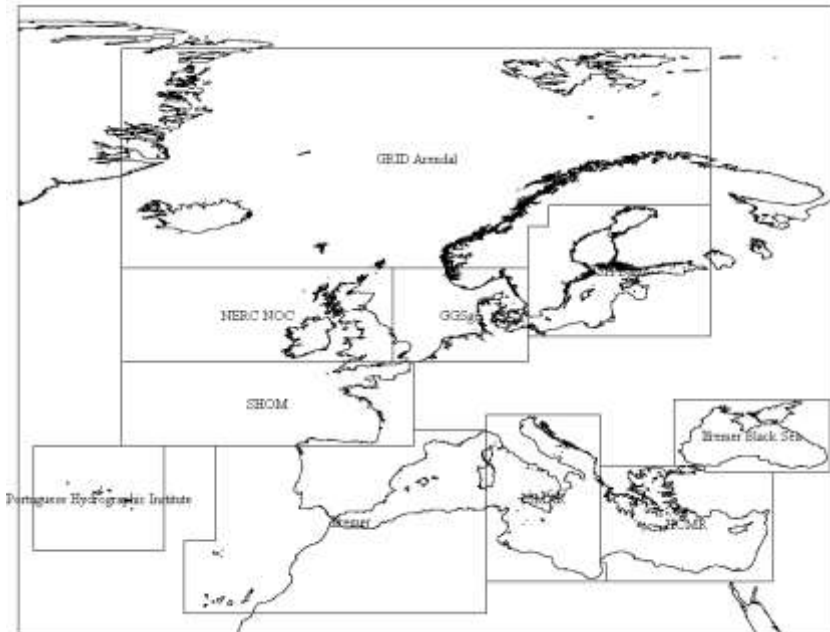
**Figure 1 Regional Coordinators data areas**

The following general comments can be made about the Regional DTMs as received:

- At the Hamburg Meeting in May 2014 it was decided to create an overall EMODnet DTM covering a area limited by full latitude and longitude. The 2013 version of EMODnet roughly followed the outline of the data coverage giving it a very irregular shape. As a result the 2014 version is much larger than the 2013 version. And as a consequence the 2014 version contains more GEBCO data.

- All regional coordinators (with the exception of GGSgc) have used Globe to compile the Regional DTMs. This has resulted in a high level of standardization of the DTM data and in an almost 100% coverage match between the regional contributions (one exception in the Black Sea). In previous version there were more gaps and overlaps detected between the regional DTM contributions.

- DTM Data was received in various formats: EMODnet, Globe and NetCDF.

- Not all DTM datasets received contained a smoothed depth value

- Statistical information in most DTM datasets was either missing or incorrect

- In general there is no good match between the DTMs and the coastline. Both gaps and overlaps were identified

- The use of field 7 (Interpolation) and field 8 (number of elementary surfaces) is inconsistent and requires better definition in the EMODnet Methodology and Guidelines document.

- All datasets produced with Globe made no distinction between field 11 (CDI reference) and

field 12 (DTM reference)

- The up-sampling of GEBCO data shows serious grid artefacts.

- A total of 6719 unique CDI references are used in the overall DTM (3844 in 2103 version)

- A total of 31 unique DTM references are used in the overall DTM (28 in 2013 version)

- Over 350 CDI / Composite DTM references were either incorrect or unknown in SeaDataNet (CDI and SEXTANT services) (Note: correction process is almost finalised to take away this issue).

A number of issues could be resolved at integration level, but there are still issues which need correction before launching the 2014 EMODNet DTM at the public portal.

The present result can be viewed at the following internal website:

http://map.test.n4m5.eu:9090/geoserver/gwc/demo/ne:atlas?gridSet=EPSG:4326&format=image/png

This website gives only the average waterdepth (not smoothed) but can be used by Regional Coordinators and all other partners (data providers) for inspecting quality issues.

**REMARK: THIS IS A TEMPORARY INTERNAL WEBSITE AND SHOULD NOT BE ADVERTISED OR COMMUNICATED TO EXTERNAL USERS!!!!**
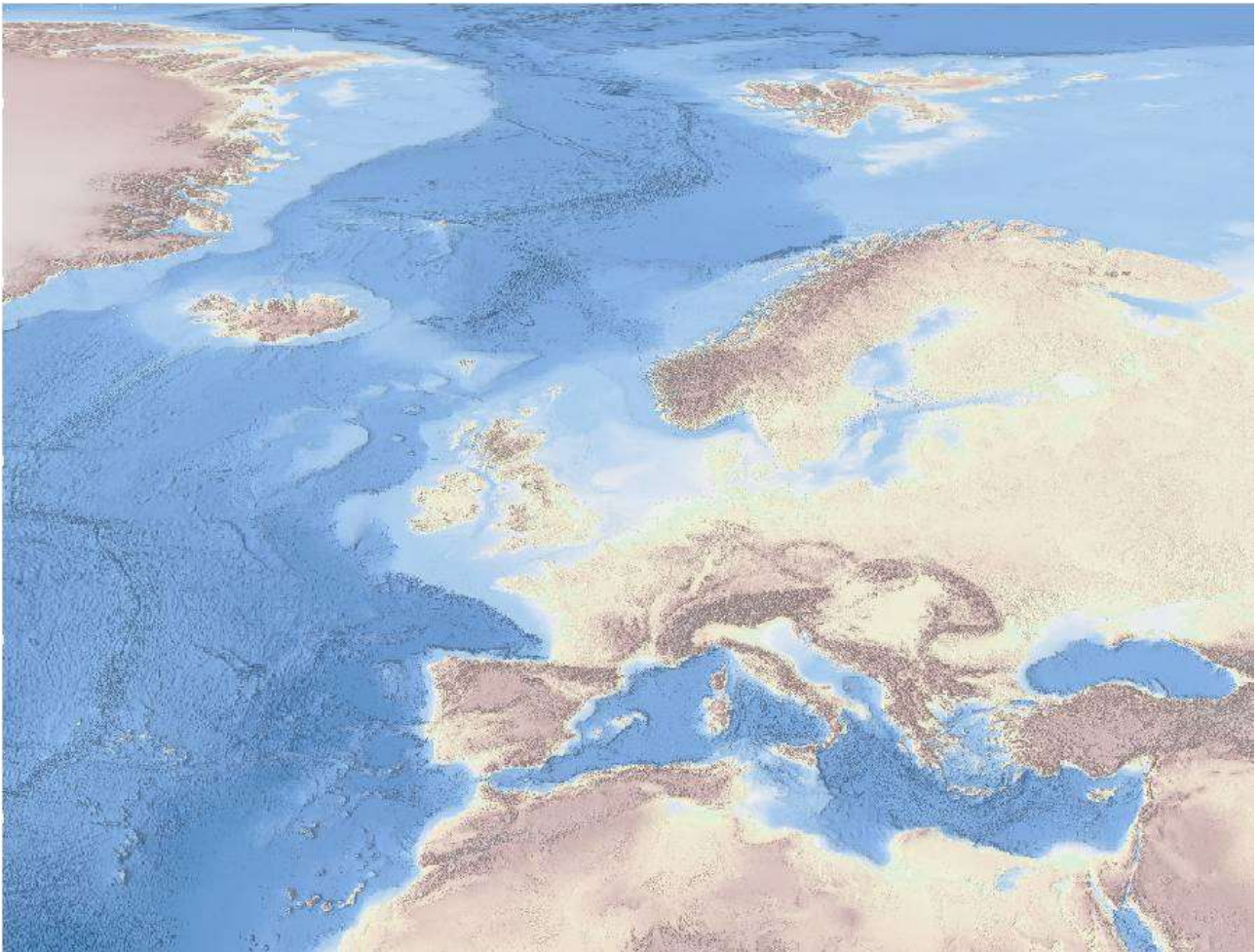
**Figure 2 Overall EMODnet 2014 DTM**

**Figure 3 Detail 1**
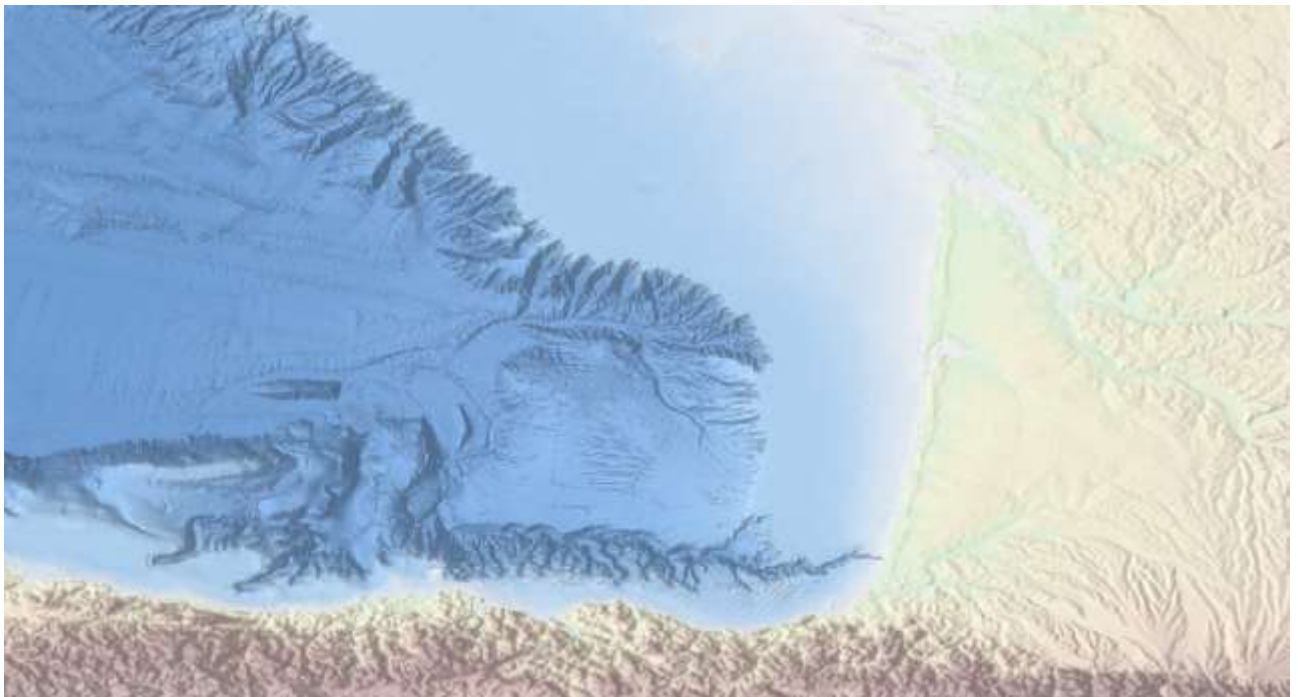


**Figure 4 Detail 2 – Bay of Biscay**

**Figure 5 Detail 3 – Bay of Biscay**



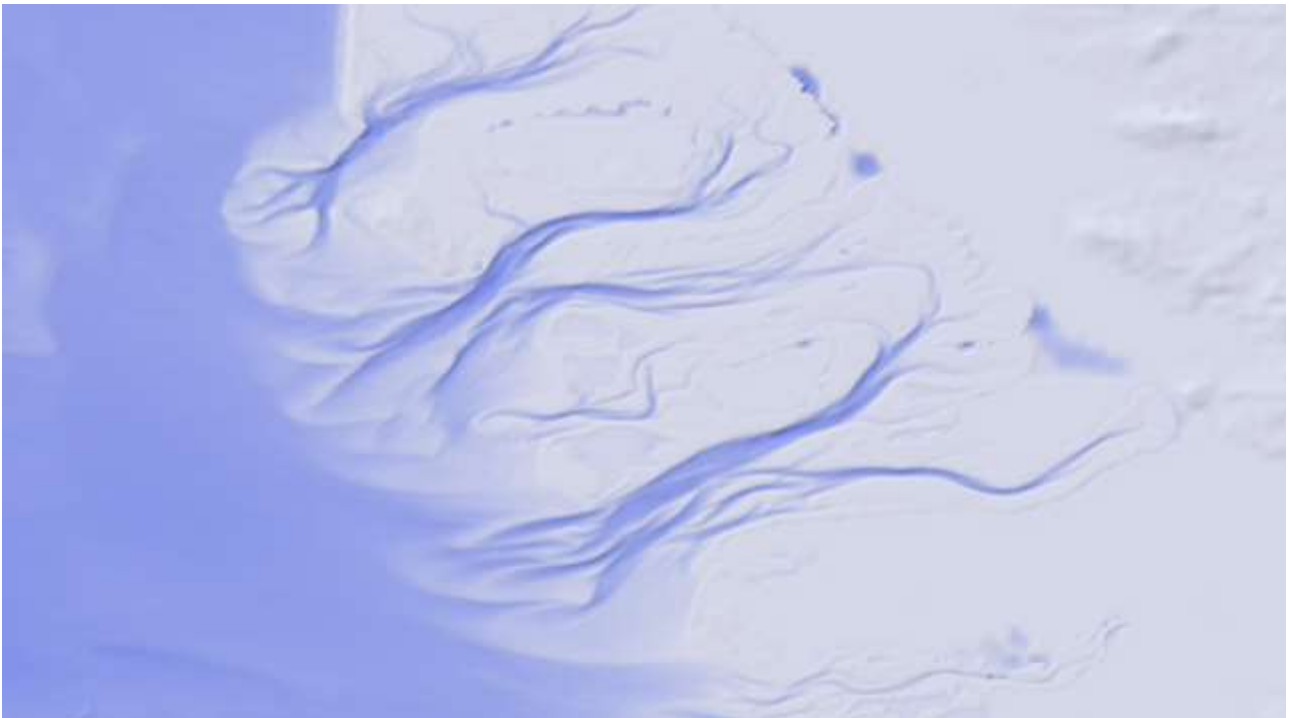**Figure 6 - Detail 4 – Bay of Biscay**
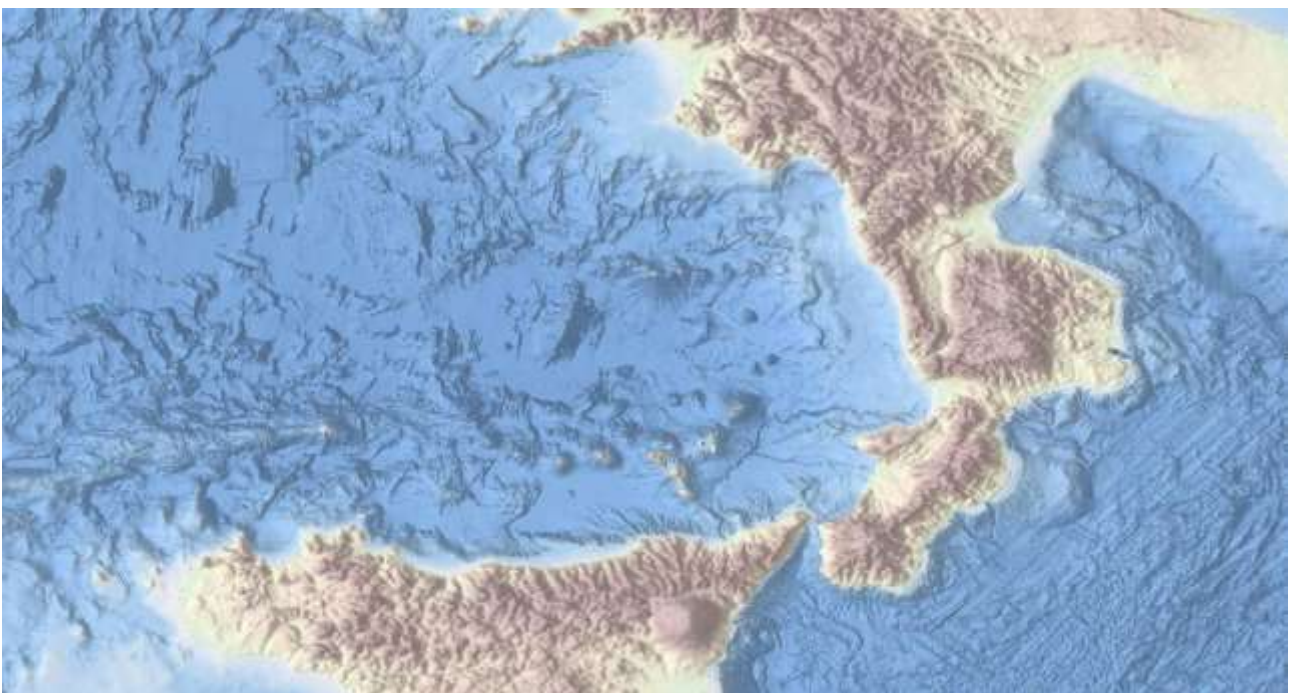
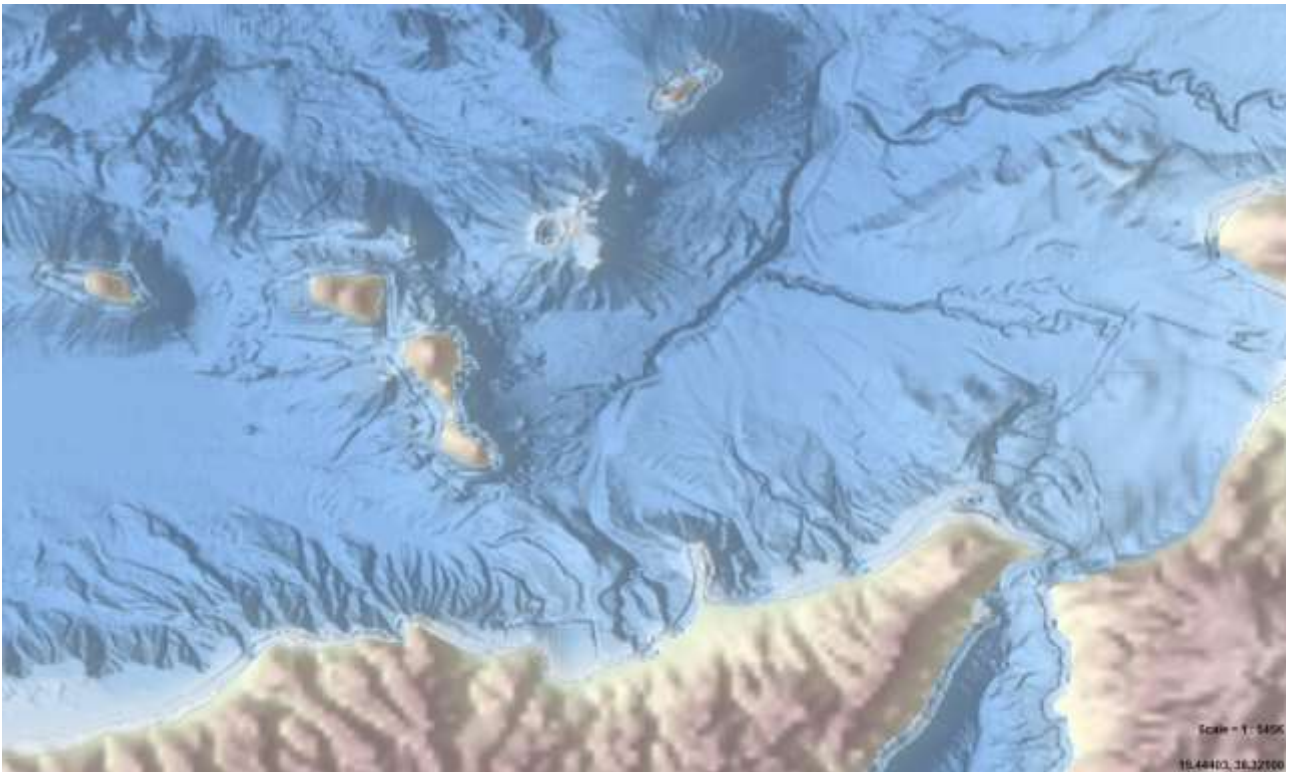**Figure 7 - Detail 5 German Bight**



**Figure 8 Detail 6 - Tyrrhenian Sea**

**Figure 9 Detail 7 - Tyrrhenian Sea**

## 2. Detailed issues and actions undertaken at integration

| Region | Issue | Action | Remark |
|---|---|---|---|
| Azores | -32767 values | Set to "NULL" | NULL indicates that the field is not used. In the EMODnet format only the delimiter is used to close the field. |
| | - Last minute change of GEBCO data | - GEBCO data replaced and re-smoothing of data | It seems that interpolated data in the original data set was flagged as GEBCO in the DTM field. See 2.1 |
| | Incorrect min,max and stdev fields | Min,max and stdev fields removed. | For now only average and smoothed average waterdepth used |
| Celtic Sea | Incorrect min,max and stdev fields | Min,max and stdev fields removed. | For now only average and smoothed average waterdepth used |
| | -32767 values | Set to "NULL" | NULL indicates that the field is not used. In the EMODnet format only the delimiter is used to close the field. |
| | 2607_interpolate 2607_iterpolated CDIs used | Replace with more generic "int" in field 12 | This needs to be resolved in the EMODnet Methodology and Guidelines document. Although it was agreed to mark interpolated small gaps as such there is no defined standard for this in the document. |
| Central Mediterranean | Problem with Standard Deviation (set to 0 with different min/max fields) | Not corrected | For now only average and smoothed average waterdepth used |
| | Cells with no CDI and DTM reference | Set to GEBCO_2014 | |
| | -32767 values | Set to "NULL" | NULL indicates that the field is not used. In the EMODnet format only the delimiter is used to close the field. |
| Norwegian Sea | DTMs to large for export in Globe | Globe DTM splitted | |
| | No smoothed depth field used | Data set smoothed | |
| | 2607_interpolated CDIs used | Replace with more generic "int" in field 12 | This needs to be resolved in the EMODnet Methodology and Guidelines document. Although it was agreed to mark interpolated small gaps as such there is no defined standard for this in the document. |
| | Various survey in data set with depth sign reversed | Localized corrections applied (depth * -1) | See 2.2 |

| | | | |
|---|---|---|---|
| | (negative downwards) | | |
| | Very inconsistent data around Iceland. | Some datasets removed | See 2.2 |
| | 14 individual surveys combined into a single CDI | Split into 14 individual CDIs based on survey polygon | |
| | Area North of Norway is showing major grid artefacts | Not fixed | See 2.2 |
| | Incorrect min,max and stdev fields | Min,max and stdev fields removed. | For now only average and smoothed average waterdepth used |
| Baltic Sea | Data was clipped incorrectly | New patch received and added | |
| Eastern Mediterranean | Overlap with Black Sea | Overlap removed | |
| | GEBCO data cells have invalid format | Format corrected | |
| | Interpolated cells flagged but not in a standardized way | Replace with more generic "int" in field 12 | This needs to be resolved in the EMODnet Methodology and Guidelines document. Although it was agreed to mark interpolated small gaps as such there is no defined standard for this in the document. |
| Western Mediterranean | GEBCO data cells have invalid format | Format corrected | |
| | Interpolated cells flagged but not in a standardized way | Replace with more generic "int" in field 12 | This needs to be resolved in the EMODnet Methodology and Guidelines document. Although it was agreed to mark interpolated small gaps as such there is no defined standard for this in the document. |
| | Problem with Standard Deviation (set to 0 with different min/max fields) | Not corrected | For now only average and smoothed average waterdepth used |
| Madeira Canarias | GEBCO data cells have invalid format | Format corrected | |
| | Interpolated cells flagged but not in a standardized way | Replace with more generic "int" in field 12 | This needs to be resolved in the EMODnet Methodology and Guidelines document. Although it was agreed to mark interpolated small gaps as such there is no defined standard for this in the document. |

| | Problem with Standard Deviation (set to 0 with different min/max fields) | Not corrected | For now only average and smoothed average waterdepth used |
|---|---|---|---|
| Atlantic Iberian Coast | GEBCO data cells have invalid format | Format corrected | |
| | Interpolated cells flagged but not in a standardized way | Replace with more generic "int" in field 12 | This needs to be resolved in the EMODnet Methodology and Guidelines document. Although it was agreed to mark interpolated small gaps as such there is no defined standard for this in the document. |
| | Problem with Standard Deviation (set to 0 with different min/max fields) | Not corrected | For now only average and smoothed average waterdepth used |
| | Cells with no CDI and DTM reference | Set to GEBCO_2014 | |
| Black Sea | GEBCO data cells have invalid format | Format corrected | |
| | Interpolated cells flagged but not in a standardized way | Replace with more generic "int" in field 12 | This needs to be resolved in the EMODnet Methodology and Guidelines document. Although it was agreed to mark interpolated small gaps as such there is no defined standard for this in the document. |
| | Problem with Standard Deviation (set to 0 with different min/max fields) | Not corrected | For now only average and smoothed average waterdepth used |
| Bay of Biscay | 2607_interpolated 540_interpolated CDI used | Replace with more generic "int" in field 12 | This needs to be resolved in the EMODnet Methodology and Guidelines document. Although it was agreed to mark interpolated small gaps as such there is no defined standard for this in the document. |
| | Incorrect min,max and stdev fields | Min,max and stdev fields removed. | For now only average and smoothed average waterdepth used |
| North Sea | NIOZ input data are raw survey files | NIOZ data not used for regional DTM | This specific data set was recorded with the special aim of water column imaging. Since the NIOZ data covers only a very small part of the entire North Sea area, which is already covered by existing data, not using the NIOZ data will not result in a data gap. |

| | Due to a change in data distribution policy Denmark has not delivered any data for EMODnet in 2014. | Use of GEBCO_2014 for Danish waters in North Sea and Baltic Sea | GST (the Danish Geo Data Institute) is investigating whether data can be delivered to EMODnet and has requested not to use the original Danish background and foreground data until further notice. It is expected that permission will be granted in 2015 to re-use the existing foreground ¼ arc minute data for EMODnet in the Baltic Sea area of Denmark (including Kattegat) and to use the existing background data for the North Sea area. |
|---|---|---|---|
| | OceanWise grid origin is off by 1/32 of arc minute | Has been corrected for North Sea | It appears also in Celtic Sea regional DTM; may need an overall correction |
| | Problem with Standard Deviation (set to 0 with different min/max fields), also because some partners provided Composite DTMs without statistics | New statistics produced during resampling where possible | OceanWise statistics show suspicious values |

# 2.1 Interpolation issues in Azores DTM
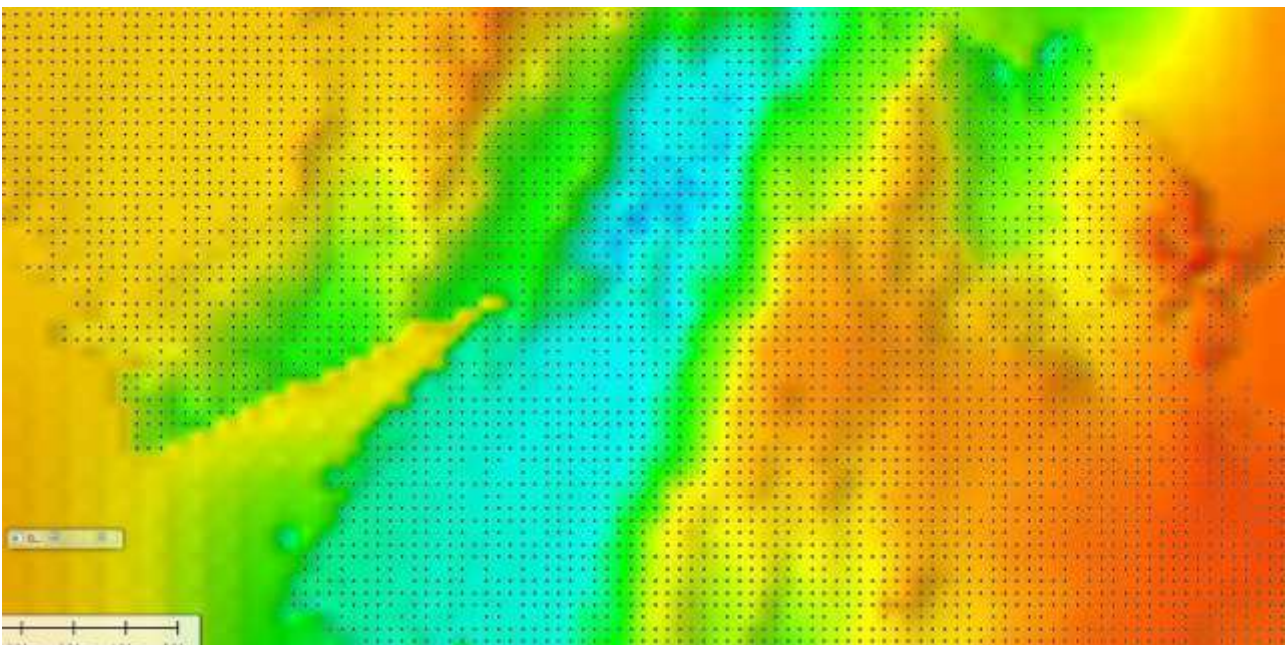


**Figure 10 Before removing GEBCO**
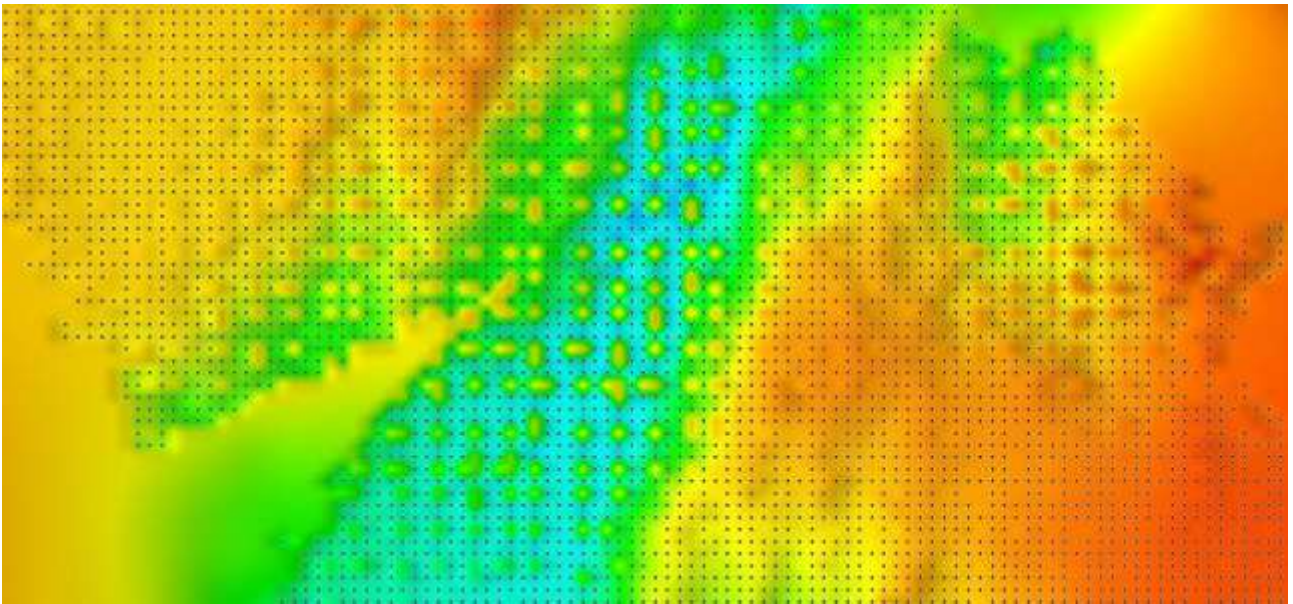
**Figure 9 After removing and replacing GEBCO**

## *2.2 Data Issues in Norwegian Sea*
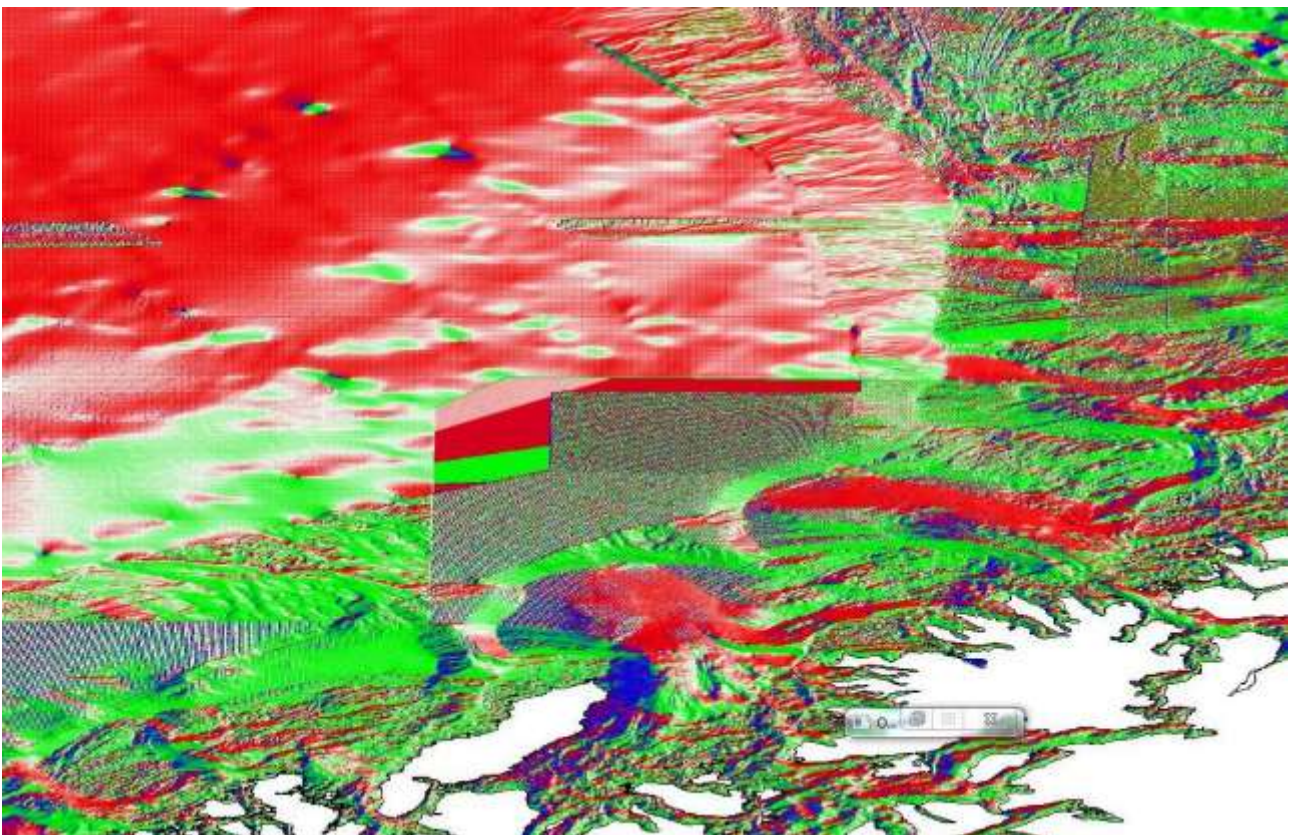


**Figure 10 Grid artefacts north of Norway**

EMODnet Annual Report 1 – Lot 1
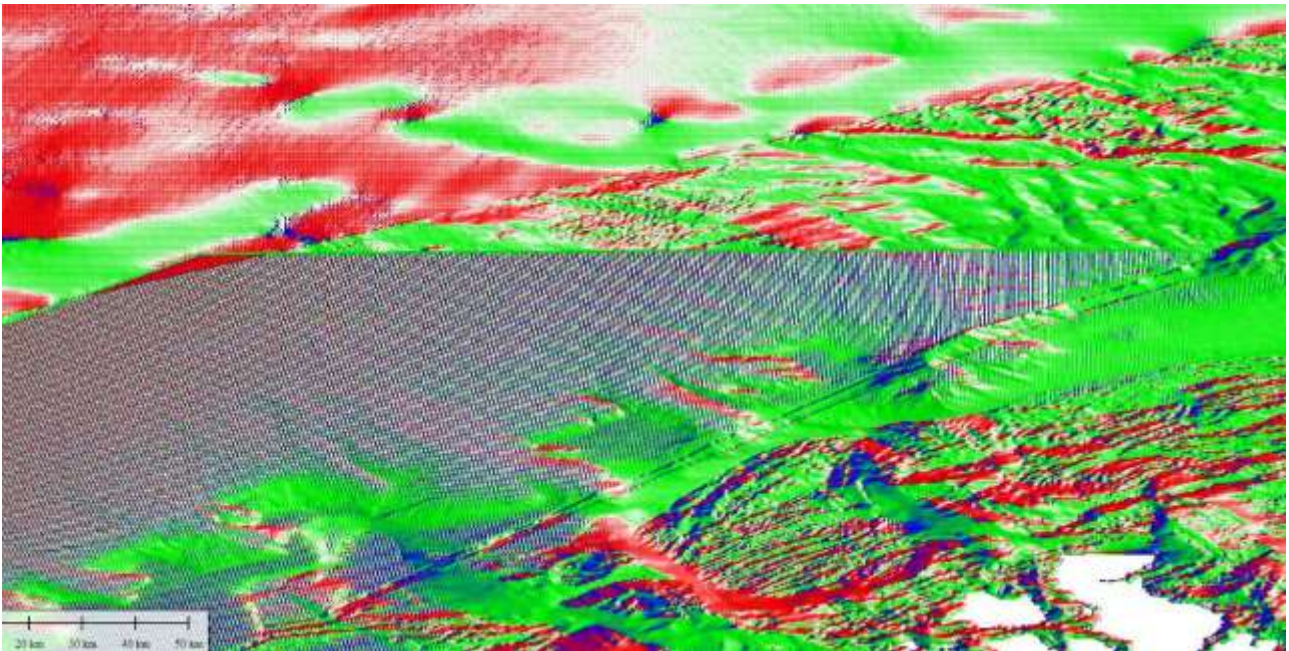


**Figure 11 Detail grid artefacts North of Norway (slope direction view)**
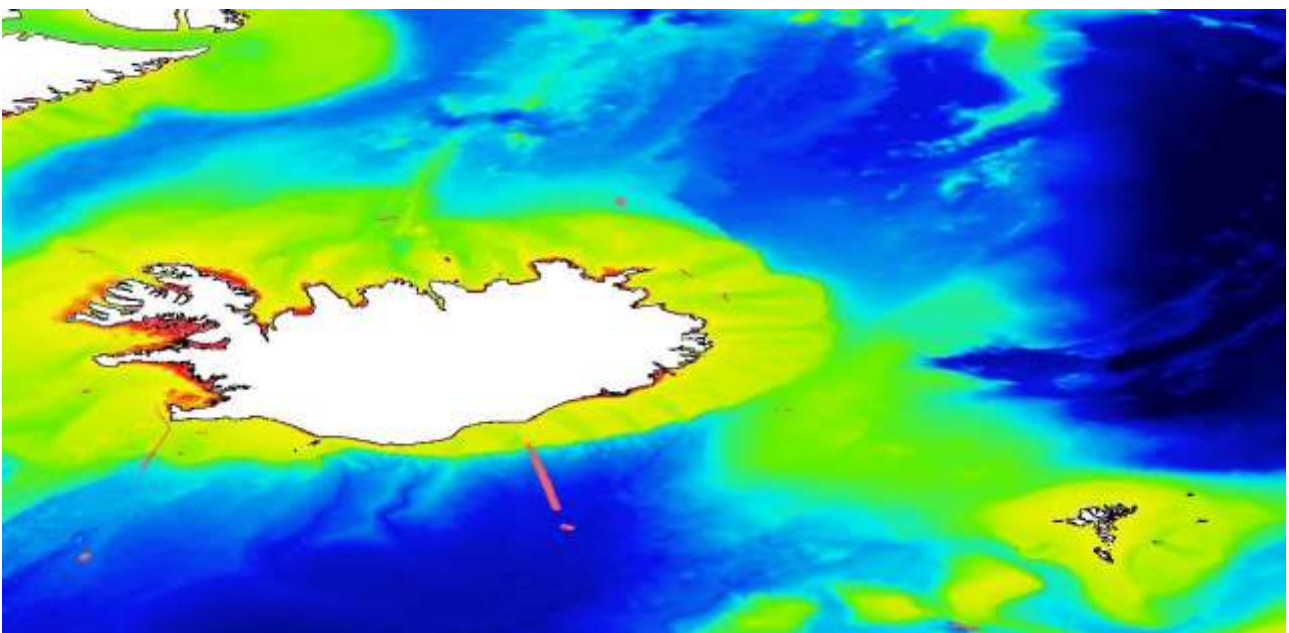


**Figure 12 Depth sign reversed for surveys around Iceland**

## *2.3 GEBCO resample artefacts*
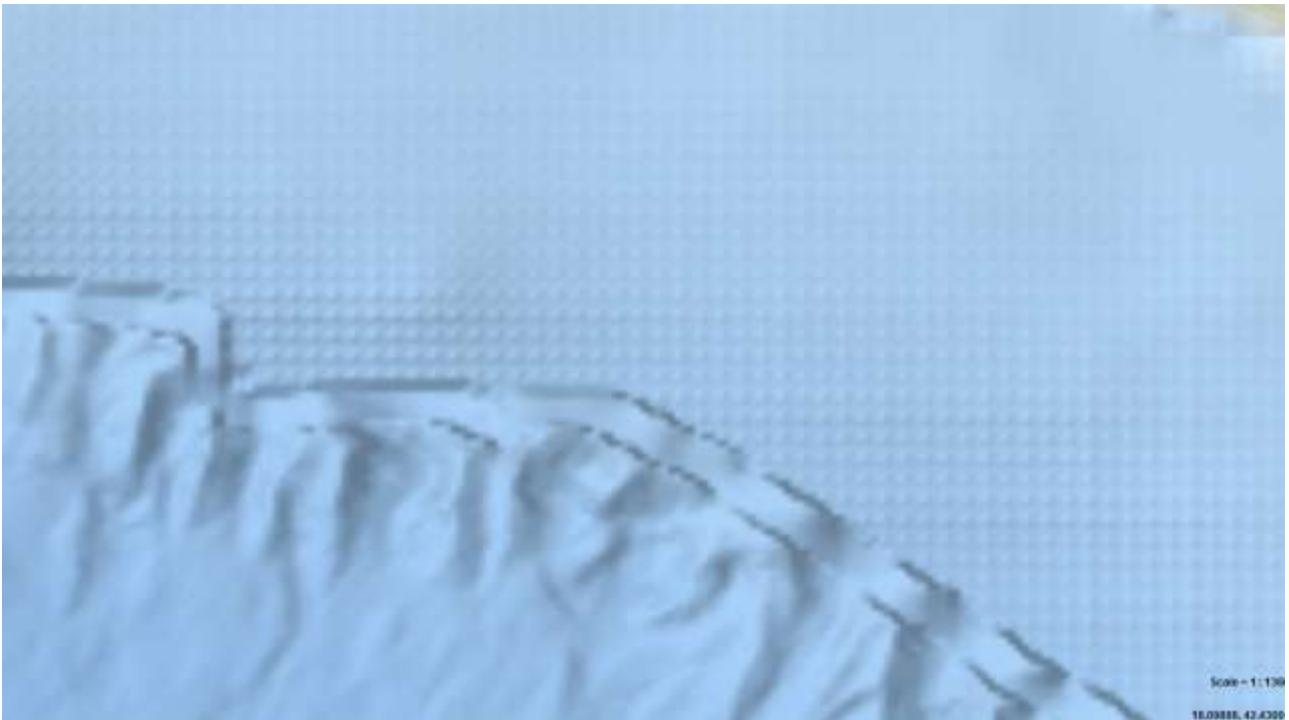
**Figure 13 Illustration of grid artefacts in up-sampled GEBCO data in the Adriatic Sea**
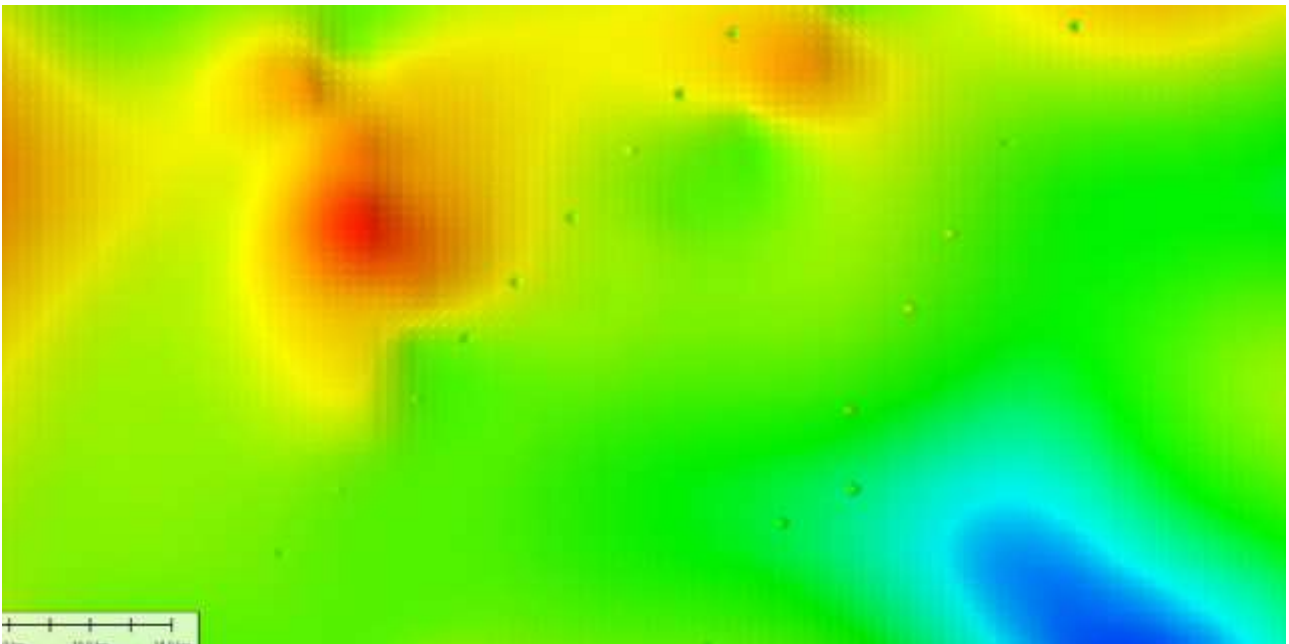


**Figure 14 Another illustration of grid artefacts in up-sampled GEBCO data**
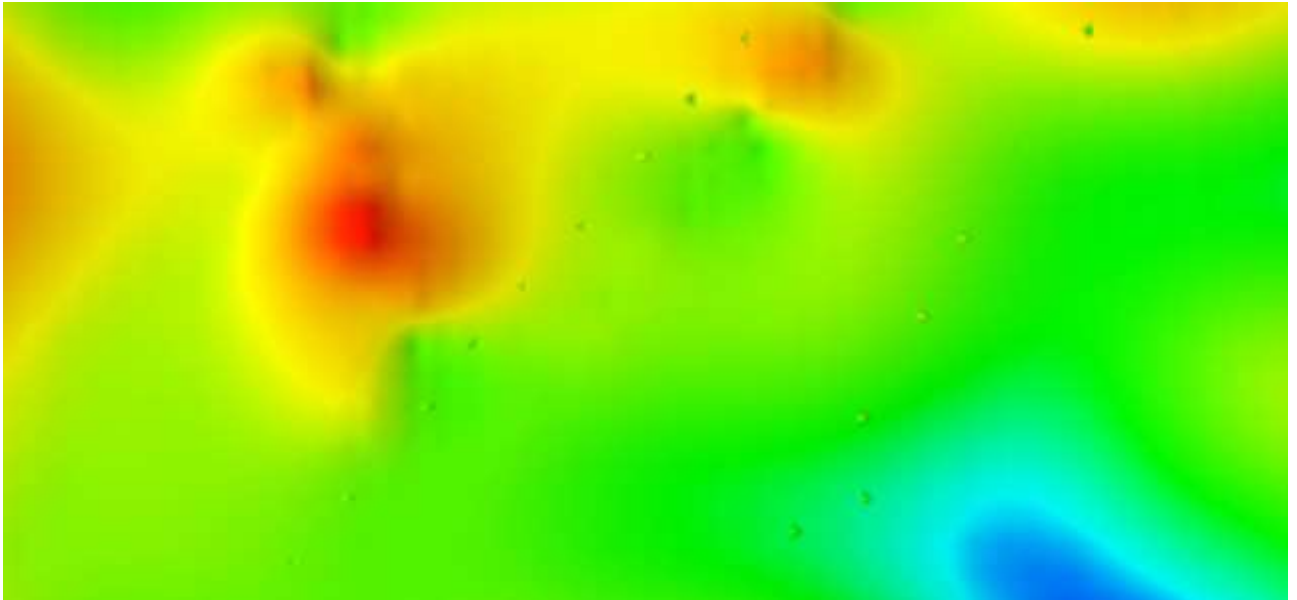
**Figure 15 - Same area using an Overhauser spline algorithm**

## 2.4 OceanWise grid origin shift with 1/32 minute
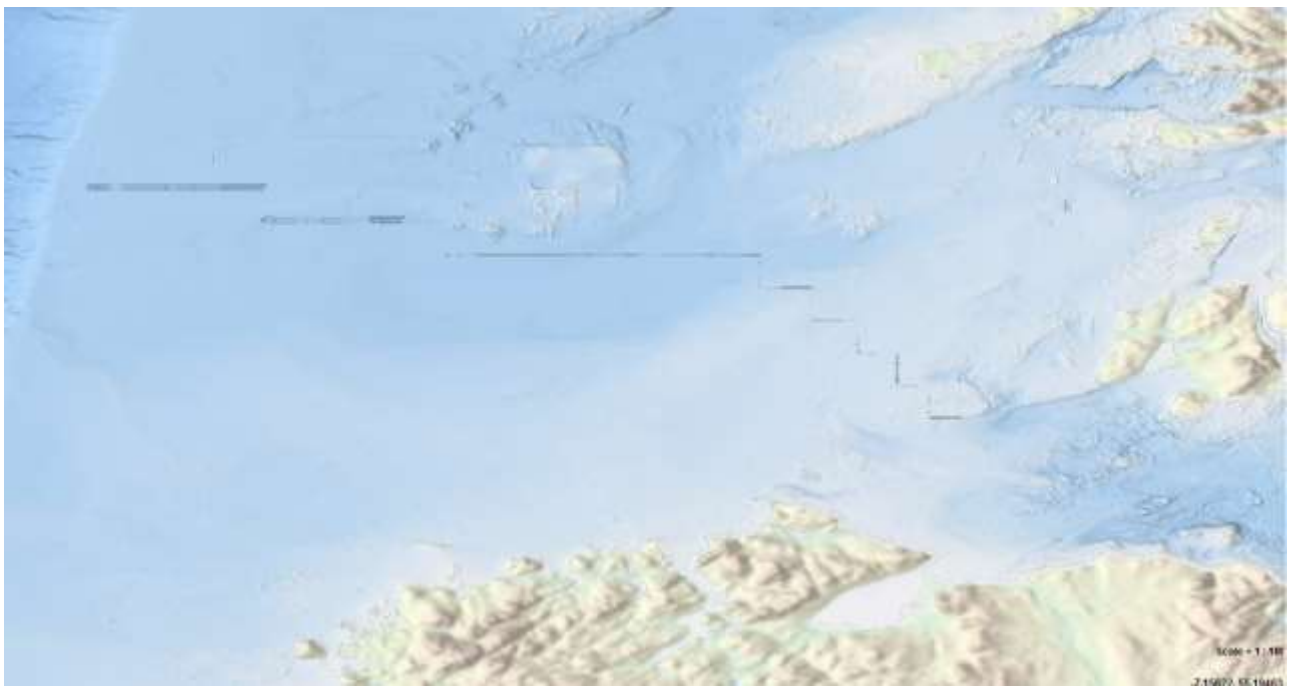
**Figure 16 – Not connected grids in Celtic Sea DTM between Ireland and UK, possibly due to OceanWise grid origen shift**

# 3. Conclusions and recommendations

The overall quality, completeness and coverage of the EMODnet 2014 DTM shows very significant improvements over the 2013 version. The increase in resolutions provides 4 times more detail in areas with full data coverage resulting in a very spectacular view of the European underwater morphology.

However there are multiple quality issues which need to be corrected before publishing of the integrated DTM at the EMODNet Bathymetry portal. Partly these might be due to remaining technical issues with the Globe software and partly these concern local data and processing issues which need to be solved by a closer inspection and repair of the Regional DTMs by their originators.

Overall issues that need to be solved are:

- Calculation and provision of reliable statistical fields per cell
- Major raster artefacts in the Norwegian Sea and incorrect application of the depth sign around Iceland
- Shift of grid origen by 1/32 minute in OceanWise DTM data
- Incorrect up-sample algorithm for GEBCO_2014 and Baltic Sea DTM
- Check on correctness of smooth algorithm in Globe
- Input and output format of Globe must follow EMODNet Bathymetry standard with distinct fields for CDI references and Composite DTM references

In addition Regional Coordinators are requested to inspect in detail their resulting regional DTM at the temporary portal in conjunction with their regional DTM QA-QC analysis and report to identify and correct clear anomalies.

*Annex 2*

**Details of users feedback and follow-up**

Date: 2013-06-28

Name: Hamid Mustafa Abdelgahar

E-mail: eng-7amed'hotmail.com

Feedback: I am intending to use the Bathymetric data of the English Channel (GeoTIFF) for my dissertation (Desk study for submarine cable routing between England & France).My enquiries are firstly, how can I find information about the equipment used for the bathymetric survey, contractor, date of the survey, resolution (grid size) of the bathymetric data, and IHO standard. Secondly, Is there any copy right statement set by EMODnet that I have to incorporate into my dissertation where ever I use the data. Regards, Hamid

-----------------------------------------------------------------------------------------------------------------------

**Reply:**

------- Original Message --------

**Subject:**Fwd: EMODnet contact form

   **Date:**Mon, 01 Jul 2013 12:19:22 +0200

   **From:**Dick M.A. Schaap <dick@maris.nl>

      **To:**eng-7amed@hotmail.com

Dear Hamid,

Please include the attached Acknowledgement in your dissertation.

Information about the data collection, such as organisation, instrument etc is included in the CDI Data Discovery & Access service which you can interrogate in the Data & Metadata sectiomn of the portal. It does not gives highly detailed metadata, but so-called discovery metadata.  We do not have more details, but of course individual data centres as indicated might have additional metadata.

The CDI references (about survey data used) and Sextant references (about composite DTMs used from HOs) áre also included in the Grid cells of the DTMs.  In case we had no survey data nor composite DTM we refer and used GEBCO info.

Kind regards

Dick M.A. Schaap

Coordinator

==========================================================================

Date: 2013-07-09

Name: Hamid Mustafa Abdelgahar

E-mail: eng-7amed'hotmail.com

Feedback: I have downloaded the ascii XYZ data for the English Channel but when I added the data to ArcGIS, the file comes up empty..would you please help me on that..Kind regards, Hamid

-----------------------------------------------------------------------------------------------------------------**Reply:**

-------- Original Message --------

**Subject:**Re: EMODnet contact form

   **Date:**Tue, 09 Jul 2013 07:00:28 +0200

**From:**Dick M.A. Schaap <dick@maris.nl>
   **To:**eng-7amed@hotmail.com

Dear Hamid,

First make sure that you have downloaded the full ZIP file, which is indicated in your browser. Depending on your connection this might take several minutes, because the Celtic Sea XYZ zip file is ca 100 Mb. Thereafter you have to unzip it which releases an xyz file of ca 1.3 Gb. I have just downloaded it myself, and it opens ok.

The file format description with its attributes can be found in:

http://www.emodnet-hydrography.eu/documents/emodnet_hydrography/html_page/euco-0901-002_dtm_exchange_format_specification_v1.5.pdf

For loading it into ArcGIS please check the ArcGIS manual or speak to a fellow student with ArcGIS experience. Hope you succeed.

Kind regards

EMODnet Bathymetry coordinator

=========================================================================

Date: 2013-11-22

Name: David Harrison

E-mail: d.harrison@fugro.co.uk

Feedback: Good morning, My name is David Harrison and I work for a geological consultancy company called Fugro GeoConsulting based in Wallingford in the UK. I was wondering whether you allow for companies to reproduce the bathymetric data, that is downloadable from your map portal, in reports that we issue to our clients? When no site-specific data is available, we often rely on GEBCO data, however for Europe the data you present is of much greater resolution.

Look forward to hearing from you,

David

**Reply:**

-------- Original Message --------

**Subject:**Re: Emodnet-Hydrography Feedback form
  **Date:**Fri, 22 Nov 2013 09:25:40 +0100
  **From:**Dick M.A. Schaap <dick@maris.nl>
    **To:**d.harrison@fugro.co.uk

Dear David,

You can use it. However you need to include an acknowledgement which you can find at:

http://www.emodnet-hydrography.eu/content/content.asp?menu=0360000_000000

We are happy that you like it. We are preparing for wider European coverage and higher resolution to be launched around summer 2014.

Kind regards
Dick M.A. Schaap
Coordinator
=====================================================================
Date:      2013-11-25
Name: Robin Waldman
E-mail: robin.st.waldman@meteo.fr
Feedback: Hello, I am extracting bathymety data from the Western Mediterranean sea in netcdf format. I have a doubt on the conversion from x - y coordinate to degree as longitude and latitude are in meters. I didn't find any mention of the meter unit for coordinates. I divide longitude and latitude by 40,000/360 km to have degrees, but I still observe a slight offset on my result (about 0.05°). How should I convert longitude and latitude from meters in x – y projection to degrees ? Thanks in advance, best regards, Robin Waldman, PhD student at CNRM / Météo France

**Reply:**

-------- Original Message --------
         **Subject:**Re: Fwd: EMODnet contact form
           **Date:**Tue, 26 Nov 2013 17:18:22 +0100
           **From:**Eric MOUSSAT <Eric.Moussat@ifremer.fr>
**Organization:**IFREMER
             **To:**Dick M.A. Schaap <dick@maris.nl>
             **CC:**LOUBRIEU <benoit.loubrieu@ifremer.fr>, Jean-Marc SINQUIN
                 <jean.marc.sinquin@ifremer.fr>
Hi Dick,

I contacted Robin by phone because mails are returned by Meteo France.
He found by himself the solution because he has in the header of NetCDF
the bounding box of the grid.
The present format is the temporary one using metric coordinates
equivalent to lat lon using the value of an arc of latitude of
GRS80/WGS84 (I say latitude and not longitude) of 1mn  = 1855.4m with a
regular grid with square cell.
Robin is verifying the conversion.
Benoit and I  will update the doc
By the way, Robin mentionned some problem on the portal when trying to
download the grid using other format (altered display of the portal). I
asked him to detail the problems.
By the way too, he is very happy with the resolution and accuracy of the
grid...
Kind regards
I keep you informed anyway
Eric

--------------------------------
Le 25/11/2013 22:57, Dick M.A. Schaap a écrit :
> Dear Benoit or Eric,
>
> Can anyone of you help and answer this person?
>
> Thanks
=========================================================================
Date: 2013-12-01
Name: abduladim
E-mail: al_maitig@yahoo.com
Feedback: thanks million its a useful map

**No reply given, because seen as encouragement .**
=========================================================================
Date: 2013-12-02
Name: borja
E-mail: baguilo@gmail.com
Feedback: First of all I would like to thank the people involved in the development  of this fantastic tool. I would like to just comment how useful would be the ability to donwload certain data by defining two coordinate locations. This will reduce the amount of data to be downloaded and would accelerate the postprocess of it.
Thanks again!
Best regards,
Borja Aguiló

**No reply given, because seen as suggestion.**
=========================================================================
Date: 2013-12-31
Name: ruud
E-mail: ruud.vanwijk@upcmail.nl
Feedback: perfect project thanks for using it.
Ruud (Netherlands)

**No reply given, because seen as encouragement**
Date: 2014-01-06
Name: Zohar Gvirtzman
E-mail: zohar@gsi.gov.il
Feedback: I downloaded bathymetry of the Easternmost Mediterranean. How do I cite it? Thanks.
Zohar

**Reply:**

-------- Original Message --------
**Subject:**Re: EMODnet contact form
**Date:**Mon, 06 Jan 2014 11:04:55 +0100
**From:**Dick M.A. Schaap <dick@maris.nl>
**To:**zohar@gsi.gov.il

Dear Zohar,

Please use the acknowledgement as available at the portal:

http://www.emodnet-hydrography.eu/content/content.asp?menu=0360000_000000

Kind regards

Dick M.A. Schaap

Coordinator

=================================================================

Date: 2014-01-09

Name: C. COCHET

E-mail: cochetc@gmail.com

Feedback: Hello, This tool could prove very useful. Could specify the reference taken for the bathymetric data (depth): is Chart Datum or Mean Sea Level or another reference?

Best regards,

C. C.

**Reply:**

-------- Original Message --------
**Subject:**Re: Emodnet-Hydrography Feedback form
**Date:**Thu, 09 Jan 2014 14:15:58 +0100
**From:**Dick M.A. Schaap <dick@maris.nl>
**To:**cochetc@gmail.com

It is LAT

=================================================================

Date: 2014-01-22

Name: Duncan Fraser

E-mail: dunacn.fraser@blueyonder.co.uk

Feedback: login details you provided tonight are invalid

---------------------------------------------------------------

**Reply:**

-------- Original Message --------
**Subject:**Re: Fwd: Registration request for SeaDataNet

**Date:** Wed, 22 Jan 2014 13:43:24 +0100
**From:** Dick M.A. Schaap <dick@maris.nl>
    **To:** Duncan Fraser <duncan.fraser@blueyonder.co.uk>
Dear Duncan,

You have registered and received the LOGIN details from SeaDataNet and these are valid for requesting access to data sets as managed in the so-called CDI Data Discovery and Access service. You can find this service at the EMODNet Hydrograhy portal at:
http://www.emodnet-hydrography.eu/content/content.asp?menu=0280000_000000
and then:
http://www.emodnet-hydrography.eu/v_cdi_v3/browse_step.asp
The LOGIN details are relevant, once you have identified relevant data sets, included these in your shopping basket and then want to submit your data request to the related data centres. Moreover you need the LOGIN details for checking by the RSM service the progress of your requests.
http://www.emodnet-hydrography.eu/content/content.asp?menu=0300000_000000
and then:
http://seadatanet.maris2.nl/request/welcome.html
I have checked the validity of your LOGIN and it works fine.
So please try again.
Regards
Dick M.A. Schaap
PS: for downloading the Bathymetry DTMs you do not need any LOGIN, but simply can do that from the Data Products page using the Bathymetry Viewer and its functions:
http://www.emodnet-hydrography.eu/content/content.asp?menu=0310000_000000
then
http://www.emodnet-hydrography.eu/content/content.asp?menu=0310019_000000

On 22-1-2014 13:31, Duncan Fraser wrote:
as requested
Begin forwarded message:

**From:** Duncan Fraser <duncan.fraser@blueyonder.co.uk>
**Subject: Re: Registration request for SeaDataNet**
**Date:** 21 January 2014 23:05:45 GMT
**To:** "noreply@seadatanet.org" <noreply@seadatanet.org>

The login is invalid
Sent from my iPhone regards Duncan

On 21 Jan 2014, at 22:30, noreply@seadatanet.org wrote:
Welcome to SeaDataNet
Your personal identification is :
Login   : df312e9

Passwd : rh751RHD

Please, note this identification is strictly individual and provided within the terms of SeaDataNet data licence.

You can check/change your personnal information :

https://www.ifremer.fr/AAARegistration/faces/UserPersonalInformation.jsp

==============================================================================

Date: 2014-02-17

Name: Emmanouil I.Konstantinidis

E-mail: ekonstan@pme.duth.gr

Feedback: Dear Sirs/Madame, I would like to use one of your maps in a paper that will be published in a scientific journal. Could you please provide me with written permission to do so?

Thank you in advance

Emmanouil I. Konstantinidis

----------------------------------------------------------------

**Reply:**

-------- Original Message --------

**Subject:**Re: Emodnet-Hydrography Feedback form

   **Date:**Mon, 17 Feb 2014 22:51:20 +0100

   **From:**Dick M.A. Schaap <dick@maris.nl>

      **To:**ekonstan@pme.duth.gr

Dear Emmanouil,

It is ok, but please make use of the EMODNet acknowledgement. See:

http://www.emodnet-hydrography.eu/content/content.asp?menu=0350000_000000

Also I will appreciate a PDF of your publication / paper.

Regards

Dick M.A. Schaap

Coordinator

==============================================================================

Date: 2014-03-24

Name: Borja Aguiló

E-mail: borja.aguilo-portulas@power.alstom.com

Feedback: I would make the color scale adaptable to what is actually being shown in the screen.

Otherwise when you zoom-in you don't see an appreciable change in depth for example.

Thank you very much for the great data and website.

**No reply given, because seen as suggestion.**

==============================================================================

Date: 2014-04-03

Name: Antoine Patru

E-mail: apatru@ethz.ch

Feedback: I've registered under SeaDataNet User Register but I can't access the login in the interactive tool with bathymetric data! How can I proceed?

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**Reply**

-------- Original Message --------

**Subject:**Re: EMODnet contact form

  **Date:**Fri, 19 Sep 2014 17:25:48 +0200

  **From:**Dick M.A. Schaap <dick@maris.nl>

    **To:**apatru@ethz.ch

Dear Antoine,

Sorry for the delay in answering. However access to the bathymetry viewer service and downloading of the DTMs is free and requires no logon.

The SeaDataNet user register is applicable if you want to request access to data by the CDI data discovery and access service.

Hope this helps.

Regards

Dick M.A. Schaap

Coordinator

===========================================================================

Date: 2014-04-07

Name: Mehran Eskandari

E-mail: mxe043@bham.ac.uk

Feedback: Dear Sir/Madam, I am a PhD student at University of Birmingham and I am preparing a journal paper to be submitted to the Energy Policy Journal. Therefore can I ask for your permission to include a map from your on line service please.

Regards

Mehran Eskandari

-----------------------------------------------------------------

**Reply:**

-------- Original Message --------

**Subject:**Re: Emodnet-Hydrography Feedback form

  **Date:**Tue, 08 Apr 2014 18:02:31 +0200

  **From:**Dick M.A. Schaap <dick@maris.nl>

**To:**mxe043@bham.ac.uk

Dear Mehran,

That is fine, but please include an acknowledgement as specified here:

http://www.emodnet-bathymetry.eu/content/content.asp?menu=0360000_000000

Kind regards

D.M.A. Schaap

Coordinator

===============================================================================

Date: 2014-04-10

Name: Boris

E-mail: Boris.espinasse@uin.no

Feedback: Hei, I am very interested by the bathymetry data in Norway sea, especially to use it with Ocean Data View I see on the website that you mention an availability date around mi-2014, have you more information?

-----------------------------------------------------------------------------------------------------------------

**Reply:**

-------- Original Message --------
**Subject:**Re: EMODnet contact form
  **Date:**Thu, 10 Apr 2014 14:03:15 +0200
  **From:**Dick M.A. Schaap <dick@maris.nl>
    **To:**Boris.espinasse@uin.no

Dear Boris,

We are working on this together with GRID-Arendal, Norwegian Hydrographic Service and Norwegian Petroleum Directorate and hope to be publish the 1st version of the DTM by end June - mid July 2014.

Regards

DMA Schaap

Coordinator

===============================================================================

Date: 2014-06-03

Name: Felix Schalck

E-mail: felix.schalck@gmail.com

Feedback: Awesome job! Would love to see the whole thing vectorized. Continue the great work,

Felix

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**No reply given, because seen as encouragement.**

===============================================================================

Date: 2014-06-29

Name: Louis Hough

E-mail: nancy244@centurytel.net

Feedback: I truly appreciate the work you have done in assembling this data base. Am also interested in how soon you will complete the new additions.

**No reply given, because seen as encouragement**
==============================================================================
Date: 2014-07-21

Name: Magne

E-mail: rudy.magne@meteogroup.com

Feedback: Dear Emodnet team, I have seen on the website that a new bathymetry dataset will be released around june 2014. Do know you when you plan to make these new data available ? By the way, thanks for this EMODNET initiavite to make accurate hydrographic data available. Best regards Rudy Magne

**Reply:**

-------- Original Message --------

**Subject:** Re: EMODnet contact form
  **Date:** Fri, 19 Sep 2014 17:08:52 +0200
  **From:** Dick M.A. Schaap <dick@maris.nl>
    **To:** rudy.magne@meteogroup.com

Dear Rudy,

Very good to hear that you appreciate our efforts. Unfortunately we have some delay with the release of the higher resolution version with wider geo coverage, but hope to have it public before the end of the year or rather earlier.

Kind regards,

Dick M.A. Schaap

Coordinator
==============================================================================
Date: 2014-07-28

Name: Stavros Stylianou

E-mail: stylians@ucy.ac.cy

Feedback: Hello, I have download the bathymetry for Aegean-Levantine Sea in NetCDF file format and when I open it with ArcMAp as raster I see that there is something wrong with the bathymetry around Cyprus. There is something like a square around the island ... I would have send images but I cannot through this contact form. Best Regards Stavros Stylianou

**Reply:**

-------- Original Message --------

**Subject:** Re: EMODnet contact form
  **Date:** Mon, 28 Jul 2014 14:11:57 +0200
  **From:** Dick M.A. Schaap <dick@maris.nl>

**To:** stylians@ucy.ac.cy

Dear Stavros,

We are aware of this issue and it will be repaired in the next release, planned around end August 2014.

Regards,

Dick M.A. Schaap

Coordinator

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**Feedback received via EMODnet Secretariate at 11th June 2014 from users at the EMD in Bremen – Germany :**

**Case Study 1: Dr. Gianandrea Mannarini (CMCC)**

Region: Sicily channel area

Contact:

CMCC - Centro Euro-Mediterraneo sui Cambiamenti Climatici

post address  : Via Augusto Imperatore 16, piano 1, 73100 Lecce (Italy)

tel.         : +39-0832-6710-35

e-mail       : gianandrea.mannarini@cmcc.it

web          : http://www.cmcc.it/website/people/mannarini-gianandrea

I send attached a comparison of EMODnet  (15 arcsec) with  GEBCO_08 (30 arcsec) and MedOneMin  (stemming form NOAA, 60 arcsec) bathymetry in the Sicily channel area.

As you will notice, multibeam artifacts are visible in the EMODnet field, especially close to Malta island.

**Case study 2: Dr. Marco Zavatarelli (Bologna University)**

Region: Croatian island region (Northern adriatic region)

Downloaded: July 2013

Please find attached the following two files containing the Northern adriatic bathymetry:

Bathy_NAdri_REA: here you can find the northern Adriatic bathymetry described in the attached paper.

Bathy_emodnet. the corresponding N Adri Bathymetry using data downloaded from EmoDnet. The download was carried out in July 2013

**Reply via Italian partner CNR-ISMAR**

-------- Original Message --------

Subject:Fwd: Bathymetry product -user review

   Date:Wed, 11 Jun 2014 17:31:04 +0200

**From:**Dick M.A. Schaap <dick@maris.nl>
  **To:**marzia.rovere@bo.ismar.cnr.it
Dear Marzia,
See attached message. Could you possibly contact the 2 Italian colleagues and see whether you could take on board their remarks as part of the present upgrade for Central Mediterranean sea?
Please keep me posted because I will have to report back to the EMODNet secretariate.
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Hope to hear from you.
Regards
Dick


------- Original Message --------
**Subject:**Bathymetry product -user review
  **Date:**Wed, 11 Jun 2014 13:55:30 +0100
  **From:**Liesbeth Renders <liesbeth.renders@seascapeconsultants.co.uk>
    **To:**Dick Schaap <dick@maris.nl>, Jan Bart Calewaert
      <janbart.calewaert@seascapeconsultants.co.uk>


Dear Dick,
As outlined in the steering committee, we have been conducting user reviews on the different thematic portals. I am in the process of finalizing the document for the bathymetry, which contains summaries of the information received, focused mainly on navigation and user functionality.
In the meanwhile I have now received additional feedback from users that I met at the EDM in Bremen, which I have attached to this email, as these are assessments of a particular region of the bathymetry  dataproducts. Both researchers have indicated that they can be contacted for additional information if required.
As you are aware we are very keen to promote user feedback on all aspects of EMODnet to ensure it is 'fit for purpose'. So it would be much appreciated if you could follow up with them and provide any update or information you may hold on their regional findings.
Thank you very much,
Liesbeth

**Reply CNR-ISMAR**

-------- Original Message --------
**Subject:**Re: Fwd: Bathymetry product -user review
  **Date:**Thu, 12 Jun 2014 13:02:52 +0200
  **From:**Marzia Rovere <m.rovere@ismar.cnr.it>
    **To:**Dick M.A. Schaap <dick@maris.nl>
    **CC:**Federica Foglini <federica.foglini@bo.ismar.cnr.it>

Dear Dick,

My answers:

Could you possibly contact the 2 Italian colleagues and see whether you could take on board their remarks as part of the present upgrade for Central Mediterranean sea?

No problem Dick, Federica will contact Marco Zavatarelli for the northern Adriatic Sea to see if they have relevant new data especially in the Croatian coastal waters which are the only areas significantly different from the GEBCO/Emodnet compilation. It is possible that they only manipulated already existing grids to fit with the oceanographic/rapid assessment models. She will also contact Gianandrea Mannarini for the Sicily channel area, but I can anticipate you that the so-called artifacts are due to the multibeam coverage compared to the "smoother" GEBCO or MedOneMin compilations, which not include multibeam data. The question is: do we want a smooth and "nice looking" compilation similar to the ones already available or do we want to show where actual sparse (especially in areas like the Sicily channel) data exist? Federica will keep you posted during the various communications. I am leaving for my cruise now, so it will be easier for her to maintain the contacts, but I feel that part of the answer is already contained in this message.

Regards
marzia
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**Further reply CNR-ISMAR:**


-------- Original Message --------
**Subject:**Adriatic Bathymetry - EMODNET Project
  **Date:**Thu, 10 Jul 2014 11:51:14 +0200
  **From:**Federica Foglini <federica.foglini@bo.ismar.cnr.it>
    **To:**rsignell@usgs.gov
    **CC:**Anna Correggiari <anna.correggiari@bo.ismar.cnr.it>, "Dick M.A. Schaap" <dick@maris.nl>,
      "marzia.rovere@ismar.cnr.it" <marzia.rovere@ismar.cnr.it>

Dear Richard Signell,
I am Federica Foglini and I am working at CNR-ISMAR with Anna Correggiari and Marzia Rovere. We are involved in the EMODNET Hydrography project (http://www.emodnet-hydrography.eu/) for producing a compilation of bathymetric data for the Central Mediterranean Sea. In particular we are in charge of a providing data for the Adriatic sea. Since 2003 we collected huge amount of data, both single beam and multi beam and we produced  a new bathymetric map of the Adriatic Sea for the Italian water (please find attached the publication describing the bathymetry).
We are missing data from the western side and we were wondering if it is possible to include the bathymetry you produced in order to merge the data.

There is a procedure in EMODNET for data merging and the results is freely available from the EMODNET portal (http://www.emodnet-hydrography.eu/content/content.asp?menu=0310019_000000). As you can see in this version of the DTM  the western side is covered by GEBCO data but in the new release, that we will produce by the end of august, it would be nice to include real data for the western side

All bathymetric data are linked to a metadata acknowledging  the data source and data provider. The metadata are stored in a metadata catalogue system called Sextant and managed by IFREMER (http://sextant.ifremer.fr/fr/;jsessionid=F2C752BD35158B2D97E19E9B0BD1F3A0). If you  agree to take part to this compilation with your bathymetry I will kindly ask you to provide  the DTM as .xyz and to create a metadata using Sextant. I will provide you all necessary instruction and credential.

It could be a good chance for producing together  a new bathymetry for the entire Adriatic Basin including new available data.

I am looking forward to hearing from you

My Best Regards

Federica

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**Further reply of CNR-ISMAR:**

 **Date:**Wed, 23 Jul 2014 13:57:35 +0200

**From:**Marzia Rovere <m.rovere@ismar.cnr.it>

   **To:**Dick M.A. Schaap <dick@maris.nl>

   **CC:**Federica Foglini <federica.foglini@bo.ismar.cnr.it>

Dear Dick,

Signell never answered to the request of including his bathymetry
elaboration into the Emodnet compilation of the Adriatic Sea. I am ready
with the Central Med DTMs (one version with and one version without
Signell). They still present the problem of anomalous values of -32767
in the composite DTM I have mentioned before, there are no ways for me
to solve it, although while visualizing the DTM with Globe , everything
seems OK and, according to Benoit, there are no problems. I have
re-processed all with the ultimate version of Globe.

Regards
Marzia
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