Eutrophication and Contaminants Black Sea data management in the framework of EMODnet Chemistry

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In order to unlock fragmented and hidden European marine data resources, to improve Europe's marine data infrastructure, increase the availability of high quality data and assemble them under a common framework and to make these available to individuals and organisations (public and private), DG-Mare launched in 2009 a new initiative: European Marine Observation and Data Network (EMODNet) as proposed in the EU Green Paper on Future Maritime Policy. In present EMODNet (www.emodnet.eu) provides access to marine data and derived data products from eight thematic portals: bathymetry, geology, sea bed habitats, chemistry, biology, physics, human activity and coastal mapping.

Through a stepwise approach, EMODnet Chemistry (www.emodnet-chemistry.eu) aims to collect, standardize, check the quality of data developing new services to share and visualize information and products at the scale of regions and sub-regions defined by the Marine Strategy Framework Directive.The third phase of EMODnet Chemistry partnership involves 45 institutes from 27 countries and 3 international organisations (ICES, Black Sea Commission, UNEP/MAP) from all European Seas.

The Black Sea is one of the regional seas in EMODNet Chemistry. Black Sea is a unique marine environment representing the largest land-locked basin in the world. Its waters are in a state of almost complete isolation from the world ocean, as a result of the restricted exchange with the Mediterranean Sea through the Turkish Straits System. As a result, the basin is almost completely anoxic, containing oxygen in the upper 150 m depth (13% of the sea volume) and hydrogen sulphide in the deep waters. (Özsoy and Ünlüata, 1997).

Data products on eutrophication (Nutrients, Chlorophyll, Oxygen) and ocean acidification will be presented, highlighting the availability of historic and present time data and problems encountered with the datasets from contributors.

National Institute for Marine Research and Development "Grigore Antipa" - NIMRD, as Regional leader for the Black Sea, receives harvested data collections as "raw' data for further QC and validation and data products.

The MSFD Black Sea area (enlarged with Marmara Sea besides Black Sea and Sea of Azov) data collection contained datasets originated from 24 CDI-partners from 41 data. Out of total number of the Black Sea CDIs, 82% are non-restricted data (SDN License/unrestricted) while 18% are restricted (by negotiation/academic/moratorium).

NIMRD applied established standard quality control to the data which consists in: data format checks, units conversions, broad range control checks to exclude erroneous high values, negatives, handling of LOD, duplication eliminations and comparison of interpolated data with spatially averaged profiles. The parameters aggregation was done automatically by the new enhanced ODV built-in aggregation module. For Data Aggregation and Data Quality Control the common project methodology has been followed.

EMODnet Chemistry developed products suitable to visualize the time evolution of a selected group of measurements and to calculate spatially distributed data products specifically relevant for MSFD descriptor 5 (eutrophication), 8 (chemical pollution), and 9 (contaminants in seafood). Two type of data products are prepared:

- Interpolated maps of specific parameters in time and depth per sea region;
- Graphical time series of specific parameters at point locations

The interpolated maps have been produced with the Variational Inverse Method (VIM) using the software DIVA (Data-Interpolating Variational Analysis). DIVA is an appropriate numerical implementation of VIM suitable for oceanographic data spatial analysis as it is designed to obtain a gridded field from the availability of non-uniformly distributed observations and it gives major benefits above standard interpolations. Seasonal DIVA products (concentration maps) are available for visualization and downloading at OceanBrowser Viewing Service EMODnet Chemistry - Map Server (http://oceanbrowser.net/emodnet/). An example of a DIVA horizontal map for oxygen parameter in Black Sea is given in Figure 1.
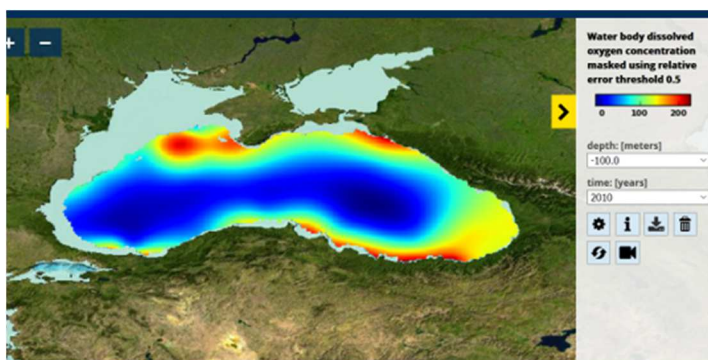

Figure 1. DIVA horizontal map for Water body dissolved oxygen concentration in the Black Sea in spring, at 100 m depth, decade 2005-2014, centred on year 2010

The harmonized and validated data collections were sent to Central Buffer and used for EMODNET Chemistry - Dynamic Plots (Figure 2)
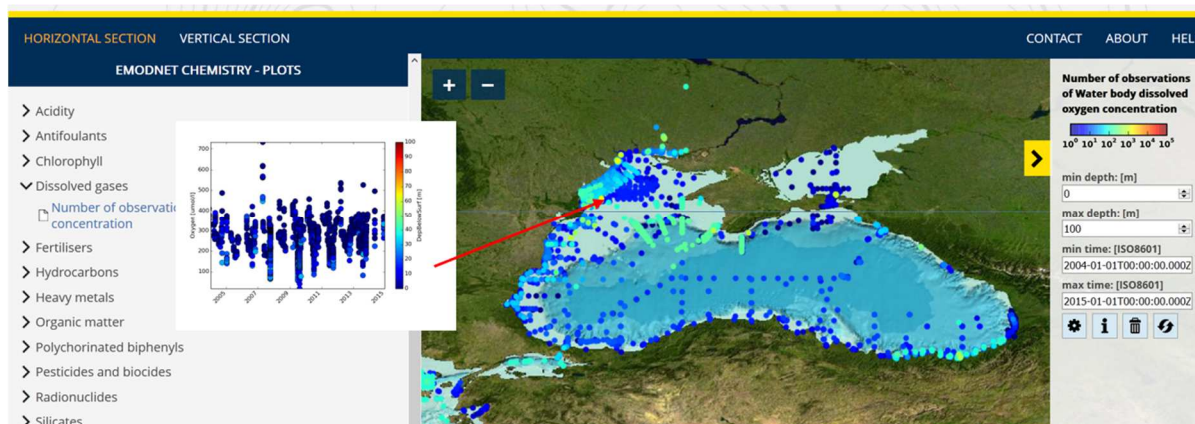

Figure 2. The distribution of sampling stations, number of observations and time series for Water body dissolved oxygen concentration in the Black Sea, period: 2004-2015.