

Turkish National Oceanographic Data Inventory

S. T. Beşiktepe¹, V. Myroshnychenko¹, M. Özyalvac², E. Sayın³, K. Seyhan⁴, L. Bat⁵

sukru@ims.metu.edu.tr

¹Middle East Technical University, Institute of Marine Sciences, Erdemli, Icel, Turkey

²Turkish Navy, Department of Navigation, Hydrography and Oceanography, Cubuklu, Istanbul, Turkey

³Dokuz Eylül University, Institute of Marine Science and Technology, Izmir, Turkey

⁴Karadeniz Technical University, Faculty of Marine Sciences, Trabzon, Turkey

⁵Ondokuz Mayıs University, Sinop Aquatic Resources Faculty, Sinop, Turkey

Abstract- This paper provides an overview of the design and structure of the inventory of the oceanographic data collected by the Turkish Institutions. This inventory contains basic oceanographic data and covers the period between 1960 and present. A web based user interface developed to easily handle and search the meta data related to the data. This inventory was created by the participation of the main institutes from the Turkey. In order to collect the data, forms prepared and sent to partners. The data inventories prepared by each Institute in these standard forms were edited and released on the net. The web based user interface allows display of the maps with selections based on geographic regions, data sets, Institutes, year, month, etc.

Introduction

Compilation of the inventory of the oceanographic data is an important step to establishment of the National Oceanographic Data Centre. At the same time it can create an effective tool for stimulating cooperation between and among scientific institutes, governmental departments involving in marine science related activities. These two issues were motivated to develop project for creating the Turkish Oceanographic Data Inventory.

In order to achieve the above goal the main data oceanographic institutes collecting and holding data formed a consortium. Authors of this paper were assigned by their Institutes to act and work on this project. At the initial phase, the extent of the inventory and the distribution of the responsibilities have been discussed and decided through the working meetings. Afterwards data inventory forms prepared and all partners compiled information from their own Institutes. In the paper, the description of the inventory and the web interface are presented.

Creation of the Data Base Inventory

Data base inventory is a compilation of the information about the actual data which is called meta data. Meta data is the essential component of the data sets and include all the necessary information related to the collection and storage of the real data. In order to compile an inventory of available data, forms prepared according to the data types decided by the partners. The information needed and collected with these forms were included, the originating institute, principal contact

in the originating institute, location and time, variables measured, etc. In order to compile information as fast as possible the data types were limited to common oceanographic variables and grouped as follows;

- Coastal zone (e.g. Coastline, lagoons etc.)
- Meteorological (Surface measurements)
- Physical oceanography (T,S, currents, optics, waves, sea level etc.)
- Chemical oceanography (TSS, Nutrients, pH, TCO₂, etc.)
- Marine biology (pigments, biota, etc.)
- Pollution(PAH, heavy metals, etc)
- Fisheries (aquaculture, fish stocks)
- Geology and Geophysics (Bathymetry, sismology, sed. etc)
- Remote sensing (aerial photos, satellite images)

The data inventories prepared by the participants, were checked and brought into the unified form and web based inventory were created to provide easier access to the information.

Design of the Web module

Special Web Module has been created to provide Internet access to the Inventory. User can explore Inventory with the help of standard Web Browser, such as Internet explorer or Netscape Navigator. User interface is quite simple and convenient: it is possible to locate required information by "walking" step by step along Inventory hierarchical tree or using convenient query form for searching information. The functional layout of the Inventory Web Module is presented on Fig. 1. Inventory Web Module is functioning on the IMS METU Web Server (<http://ims.metu.edu.tr/Inventory>) and consists of: Inventory Database, developed in MS Access; Inventory ISAPI Module, developed using Borland Delphi; and set of files with Map Data (coastline and bathymetry files from GEBCO Digital Atlas CD-ROM).

Processing of Client request is going on next scenario: Client downloads Inventory start-up web page in Web Browser. Clients formulates request by selecting predefined link or filling query form. Client sends request to Web Server by clicking on link or pressing <Query> button of query form. Inventory Web Module processes request:

- establishes connection to the Database
- generates SQL request for retrieving data from the Database
- processes SQL response and generates dynamic HTML page with results

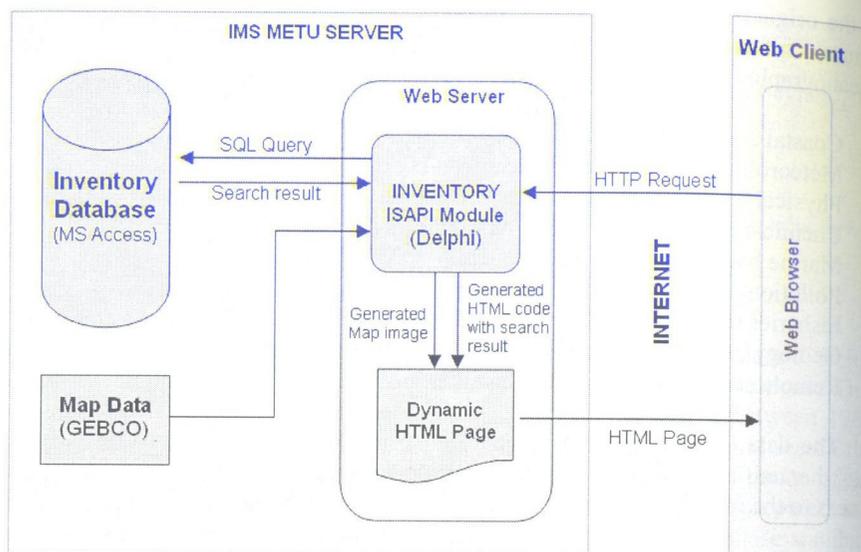


Fig. 1. Functional layout of the Web module of the Turkish Oceanographic Data Inventory

The special HTML tag with request for map image is included into result HTML page. Web Server sends result HTML page to Client. Upon arriving in Client's Browser HTML page automatically sends request for retrieving map image, which contains also SQL request for retrieving geographical data from database.

Inventory Web Module receives request for map image and sends SQL request to the Database for retrieving station coordinates. Special mapping procedure of the Inventory Web Module receives SQL response from the Database and generates map image with station positions on it. Web Server sends generated map image to Client. Finally, full Web page with retrieved data and map image is displayed in Client's Web Browser.

User interface and present content of the inventory

Web based inventory allows display of maps, selection of geographic regions; selections of data sets or stations on the map; printing and saving in bitmap format; customization of map view. These selections can be done with specifying institution; date, data types etc.(Fig. 2).

After each selection all the information about the data sets can be obtained. First part of the information includes brief description of the data sets. This information is holders of the data, data collection methodology, platform, address and e-mail of the contact point etc. Second part lists the station by station detailed information if it is a cruise data or lists each sampling time if it is time series data. At station level, it is possible to obtain list of the variables measured at particular

station. All this information is in the tabular form and interested users can contact to originator using the information given in the description of the data set.

	Min	Max
Date:	15/12/1954	10/11/2001
Latitude:	32.83	45.50
Longitude:	23.17	44.91
Sea Depth:	0.00	4100.00

Month: January, February, March (logical OR)

Regions: Aegean Sea, Black Sea, Bosphorus (logical OR)

Parameters: Chemical parameters: TSS, Geological parameters: Geological data, Geophysical parameters: Geophysical data (selected), Meteorological parameters: Air Temperature, Meteorological parameters: Cloudness (logical AND)

Fig. 2. Snapshots of the screen showing the data selection.

The positions of the all oceanographic station already included in the inventory are shown in Fig. 3. At present more than 30.000 stations are included in the data base. The oceanographic data at these stations were collected by the

Department of Nav., Hydrogr. and Oceanography, Turkish Navy,
 DEÜ Institute of Marine Sciences and Technology, Izmir
 EU Faculty of Aquatic Sciences, Izmir
 KTÜ Faculty of Marine Sciences, Trabzon
 OMÜ Faculty of Aquatic Sciences, Sinop
 METU Institute of Marine Sciences, Erdemli

Another data set in the inventory is the transects where seismic records obtained. Web interface allows to plot these transects as shown in Fig. 4. The starting and ending points of these transects together with the other information are in the inventory.

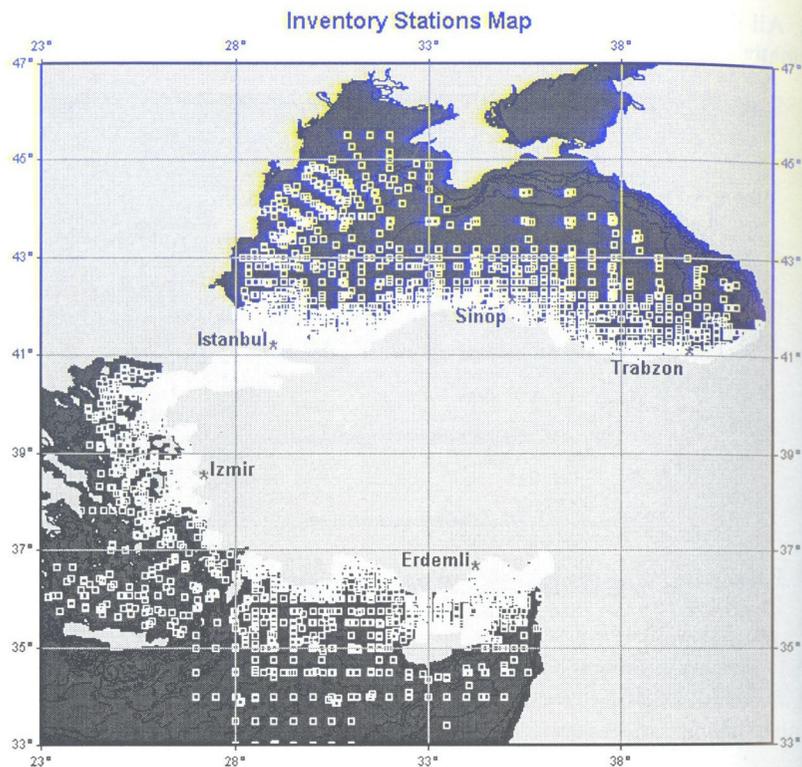


Fig. 3. Locations of the oceanographic stations

At present Turkish Oceanographic Data Inventory contains 80 variables (Fig. 5). Obviously most of the data collected by the Turkish Institutes are temperature and salinity which are collected by the CTD probe. Second most measured variables group is the basic chemical variables and includes inorganic nutrients. Biological and pollution data forms least collected data in the inventory. However this may not reflect the real situation. Because most of the biological data is in the personal data archives and compilation of this information requires more efforts.

The temporal distributions of the oceanographic stations carried out by the Turkish Institutes are shown in Fig. 6. It can be seen that the majority of the data have been collected after 1985. This year corresponds to the initiation of the national monitoring program by the Turkish Scientific and Technical Research Council. It also corresponds to the time of the starting of the two Turkish Institutes in the open ocean research with their new research vessels.

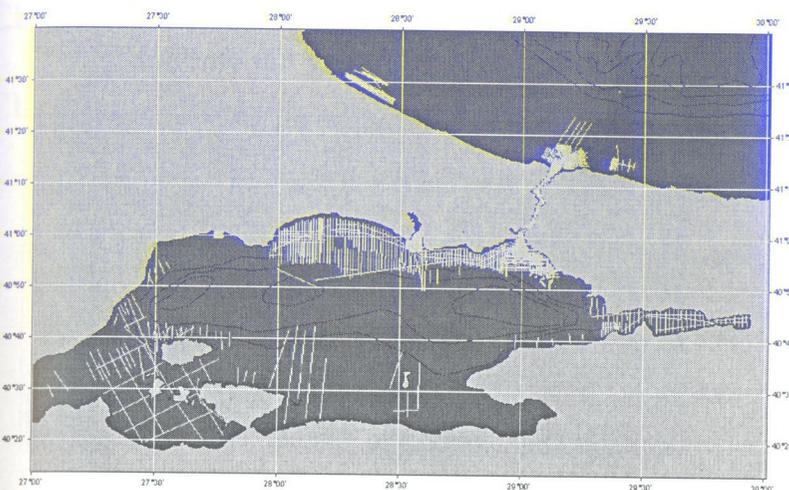


Fig. 4. Map showing the seismic transects in the inventory.

Variables

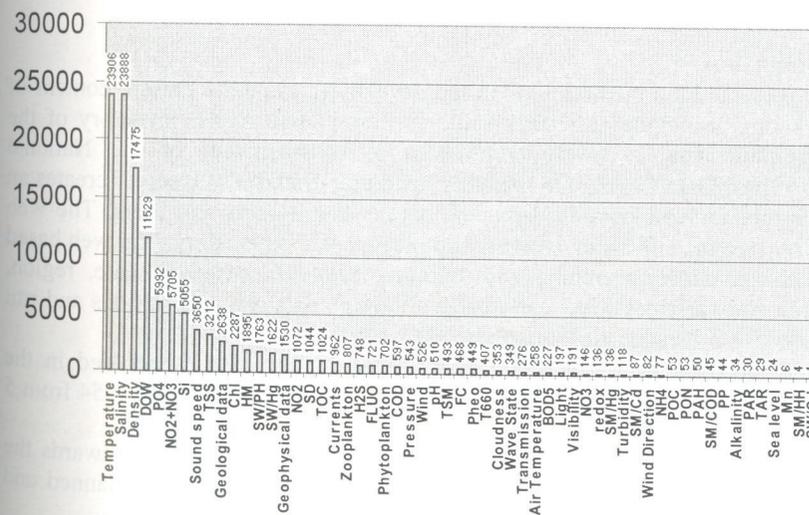


Fig. 5. List of the variables versus number of data of each variable in the inventory

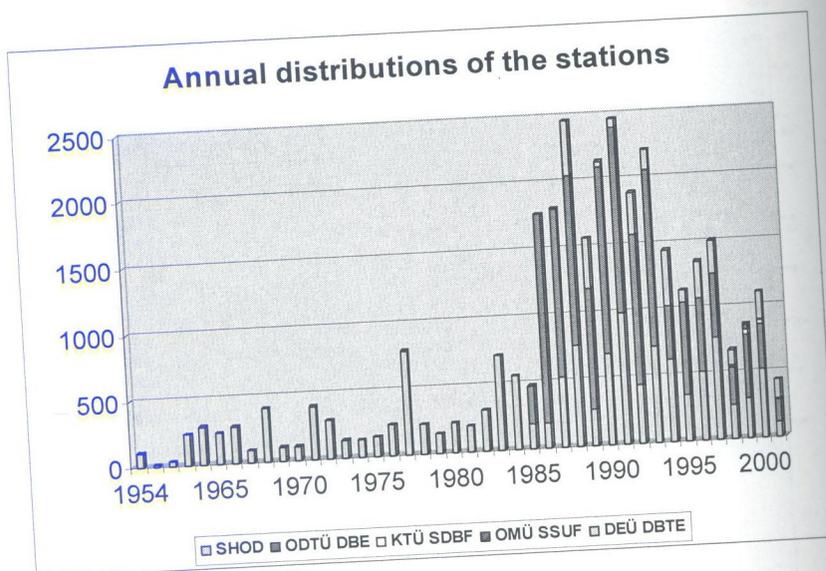


Fig. 6. Temporal distribution of the number of stations in the inventory.

Conclusion

We presented the methodology in the development and the present content of the Turkish Oceanographic Data Inventory. Compilation of the inventory of the oceanographic data is an important step to establishment of the National Oceanographic Data Centre. On the other hand user-friendly web server creates an effective tool for collaboration between marine data holders and users. The web based user interface of the inventory is simple and self explanatory. The web based user interface allows searching and selecting data sets based on date, region, institution and variables. User can navigate through data sets and stations and can get results as stations locations map and tabular list.

Basic physical, chemical, biological and geological data is included in the inventory. Presently, inventory contains information on datasets since 1954 from 5 institutions.

This inventory is updated as the new data arrives. The next step towards the establishment of the Turkish Oceanographic Data Centre is already planned and will be based on this inventory.