MARMOD database:
Marmara Sea marine data

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MARMOD project

- Full title: An integrated modelling system for the Marmara Sea
- Funding Agency: Ministry of Environment and Urbanization of Turkey
- Coordinators:
  - Institute of Marine Sciences, Middle East Technical University
  - Laboratory, Measurement and Monitoring Department, Ministry of Environment and Urbanization
- Participants:
  - Institute of Marine Sciences and Management, Istanbul University
  - TUBITAK Marmara Research Center
  - Institute of Marine Sciences and Technology, Dokuz Eylül University
- Time period: 2016-2017 (Phase 1), 2017-2020 (Phase 2)
**MARMOD project**

- **Ultimate goal**
  - Create an Integrated Modeling System ‘that will be used in the development of water quality improvement plans with environmental management and ecological approach specific to the Marmara Sea’

- **Objectives:**
  - Create integrated database of the Marmara Sea
  - Apply a coupled hydrodynamic biogeochemical model to identify and predict effects of the Black Sea, urbanisation, agriculture and industry on the environmental health of the Marmara Sea.
Area of research

Turkish Strait System (TSS)
- Bosphorus (İstanbul) strait
- Marmara Sea
- Dardanelles (Çanakkale) strait

Persistent two layer structure
Database objectives and data suppliers

• Objectives
  – Provide comprehensive environmental data for setting up the hydrodynamic biogeochemical model

• Data suppliers
  – IMS-METU (75% of data)
  – Ministry of Environment and Urbanization of Turkey
    • IU-IMST
    • TUBITAK MAM
Database general information

• The database is essentially the Ocean Data View* (ODV) collection:
  – 273 cruises
  – 9,092 stations, including
    • 8445 stations with CTD profiles
    • 3703 stations with bottle sampling
  – 18 parameters
  – 1,134,078 values
  – Time period 1985 - 2017

Spatial distribution

Stations density

IMDIS-2018, Barcelona, 5-7 November
Temporal distribution

Time histogram

Season histogram

IMDIS-2018, Barcelona, 5-7 November
## Statistics per parameter

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Stations</th>
<th>Values</th>
<th>% of good data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature</td>
<td>9011</td>
<td>1128947</td>
<td>99.7%</td>
</tr>
<tr>
<td>Salinity</td>
<td>9058</td>
<td>1128995</td>
<td>99.1%</td>
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<tr>
<td>Dissolved oxygen</td>
<td>1413</td>
<td>9056</td>
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<tr>
<td>NO2_N</td>
<td>832</td>
<td>5302</td>
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<tr>
<td>NO3+NO2_N</td>
<td>3024</td>
<td>18061</td>
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<tr>
<td>NH4_N</td>
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<td>6008</td>
<td>92.8%</td>
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<tr>
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<td>4051</td>
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<tr>
<td>PO4_P</td>
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<td>19289</td>
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<td>5011</td>
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<tr>
<td>Chl_A</td>
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<tr>
<td>Secchi Disc</td>
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<tr>
<td>DO_CTD</td>
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<tr>
<td>DO_CTD_Saturation</td>
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<td>pH_CTD</td>
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<td>30985</td>
<td>99.9%</td>
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<tr>
<td>Fluorescence</td>
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<td>60840</td>
<td>96.8%</td>
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<tr>
<td>Turbidity</td>
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<td>48238</td>
<td>94.4%</td>
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<tr>
<td>PAR</td>
<td>946</td>
<td>110577</td>
<td>81.4%</td>
</tr>
</tbody>
</table>
Quality control

- Quality Control of data was performed with help of ODV following the procedures elaborated by SeaDataNet
- 96.8% of data are flagged as good
Oxygen depletion

1985-2005

2005-2010

2010-2017

IMDIS-2018, Barcelona, 5-7 November

Transect Dardanelles - Bosphorus
Data usage: initialization and verification of the model
Selected model results

- Basin-borne nutrient loads at least 2 times exceed loads from the Black Sea
- If the Black Sea loads would be fully eliminated the Marmara Sea deep waters could recover from hypoxia in 7-8 years
- If terrestrial loads would be reduced by 40%, the hypoxia in the deep waters could be recovered in 6 years
- Reducing of terrestrial loads is a priority measure
MARMOD Database: future plans

New data from:
- external sources
- regular monitoring
- new transects to be included in the monitoring program for investigating pollution propagation
MARMOD Database: future plans

Within the II phase of MARMOD

- New data to be acquired in four seasonal cruises on a regular grid including data from underway instruments: ScanFish, ADCP, thermosalinograph, fluorometer
Acknowledgements

- Ministry of Environment and Urbanization of Turkey
- DEKOSIM - the Marine Ecosystem and Climate Research Center at IMS-METU
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Thank you