New Mediterranean Sea Climatologies

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OUTLINE

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INTRODUCTION

New temperature and salinity monthly climatologies have been produced for the Mediterranean Sea within the framework of SeaDataNet2 EU project.

OBJECTIVES:

• To present/provide new temperature and salinity climatologies for the Mediterranean Sea and develop/implement standard validation/consistency analysis procedure considering reference datasets.

• To provide climatologies for model (analysis and reanalysis) validation and initialization and serve the operational oceanography community.

• To implement a standard validation procedure to be included in quality information documents (like CMEMS QUIDs) and increase SDN products uptake.
SeaDataNet2 → WP10 dedicated to data products, regional aggregated datasets and climatologies

**Quality Control Strategy**

Iterative approach to facilitate the upgrade of the database and the versioning of data products through the release of new data collections at the end of each QCS loop and the generation of the derived climatologies after a certain time lag.

3 QCS loops

- V1 not released
- V1.1 released
- V2 released

CLIMATOLOGIES + SDN restricted data
INPUT DATASET

SDN2 V1.1 Climatologies are based on the V1.1 historical data collection of all available temperature and salinity in situ profiles spanning the time period 1900-2013.
ANALYSIS METHODOLOGY

- DIVA (4.6.9 version)
- Resolution: 1/8° on 33 IODE standard levels
- Monthly fields
- Error field: “clever poor men’s error field” (ispec=111)
- Correlation Length: 2 degrees (Lc)
- Signal to noise ratio: 0.5 (snr)
- Variance of the background field 0.6: (varbak)
- Background fields semi-normed analysis:

Annual SALINITY BKG

3-monthly TEMPERATURE BKG
VALIDATION METHODOLOGY

Reference dataset → WOA 2013 V2 monthly temperature and salinity

<table>
<thead>
<tr>
<th>WOA2013V2</th>
<th>SDN2 V1.1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Horizontal extent</td>
<td>global</td>
</tr>
<tr>
<td>Horizontal resolution</td>
<td>1/4°</td>
</tr>
<tr>
<td>Vertical extent</td>
<td>0-1500m</td>
</tr>
<tr>
<td>Vertical resolution</td>
<td>57 levels</td>
</tr>
<tr>
<td>Temporal data coverage</td>
<td>Averaged decades 1955-2012</td>
</tr>
</tbody>
</table>

The consistency analysis has been performed over 24 coincident data layers.

1. Computation of simple statistics, RMSD and BIAS;
2. Visual consistency analysis to check the climatological patterns and verify possible big discrepancies.
RESULTS: Temperature

Temperature Jan at 10m

Temperature Jan at 100m

Temperature Jan at 300m

Temperature Jan at 1000m
CONSISTENCY ANALYSIS: Temperature

WOA13 V2 TEMPERATURE

SDN V1.1 TEMPERATURE

TEMPERATURE BIAS (mean=0.05)

TEMPERATURE RMSE (mean=0.21)

TEMPERATURE STATISTICS

SDN-WOA13V2
monthly basin average BIAS and RMSE
CONSISTENCY ANALYSIS: Temperature

February

WOA13 Temperature Feb at 10m

October

WOA13 Temperature Oct at 10m
RESULTS: Salinity

Salinity Jan at 10m

Salinity Jan at 100m

Salinity Jan at 300m

Salinity Jan at 1000m
CONSISTENCY ANALYSIS: Salinity

WOA13 V2 SALINITY

SDN V1.1 SALINITY

SALINITY BIAS (mean-0.01)

SALINITY RMSE (mean=0.08)

SALINITY STATISTICS

BIAS

RMSE

S [psu]

Jan Feb Mar Apr May Jun Jul Aug Sept Oct Nov Dec
CONSISTENCY ANALYSIS: Salinity
CONSISTENCY ANALYSIS with CMEMS Reanalysis

Extracted from CMEMS Mediterranean Sea Physical Reanalysis 1997-2014

Figure 8T-CLASS1-T3D_MEAN Annual mean maps of Temperature at 350m of depth: (top) from SDN climatology; (middle) from MED REA climatology; (bottom) differences between MED REA and SDN climatology (1900-2009).

Figure 25S-CLASS1-S3D_MEAN Annual mean maps of Salinity at 15m of depth: (top) from SDN climatology; (middle) from MED REA climatology; (bottom) differences between MED REA and SDN climatology (1900-2009).
CONSISTENCY ANALYSIS with CMEMS Reanalysis

Extracted from CMEMS Mediterranean Sea Physical Reanalysis QUID

Figure 11 Temperature difference between (a) MED REA monthly Climatology and monthly basin SDN Climatology; (b) MED REA monthly basin averaged profile (time period 1987-2013) and SDN monthly Climatology within the first 1000m of water column.

Figure 22 Salinity difference between: (a) MED REA monthly basin climatology and monthly SDN Climatology (b) MED REA monthly basin averaged profile (time period 1987-2013) and SDN monthly Climatology within the first 1000m of water column.
DISSEMINATION

SeaDataNet provides the following products for all the European sea basins:

- **aggregated datasets**: ODV collections of all SeaDataNet measurements of temperature and salinity by sea basins
- **climatologies**: regional gridded field products based on the aggregated datasets

http://www.seadatanet.org/Products
DISSEMINATION

http://sextant.ifremer.fr/en/web/seadatanet/
DISSEMINATION

http://www.emodnet-physics.eu/portal/Products
At European level, different groups are contributing to high quality ocean physics data products or services. They are developed, operated and made available by the research or the environment monitoring communities.

Here EMODNET-Physics federates access to the data products provided by Copernicus Marine Environment Monitoring Service (DG Growth) and SeaDataNet (DG Research) in a single catalogue. The function, provided by Sextant technical component, is currently in demonstration mode.

<<<See the products from our contributing partners >>>>
WORK IN PROGRESS
in collaboration with *S.lona* EMODnet Chemistry

Looking for decadal variability patterns: CMEMS REANALYSIS

**MEDREA TEMPERATURE 15m 1987-1996**

**MEDREA TEMPERATURE 15m 1997-2006**

**MEDREA SALINITY 15m 1987-1996**

**MEDREA SALINITY 15m 1997-2006**

Warming in the Levantine basin

Salinity increase in the northern Ionian (NIR)
Looking for decadal variability patterns: climatologies

Do we have enough data to solve these decadal patterns?

More Tuning of DIVA parameters is needed
CONCLUSIONS

- SDN2 V1.1 Mediterranean Sea climatology have been produced and distributed through SDN and EMODnet Physics catalogues
- SDN2 V1.1 climatology is consistent with the WOA2013V2, it has higher horizontal resolution and it solves better the coastal gradients
- The standard validation procedure provides a simple and efficient view to check the quality of the climatology and the consistency with other available products
- This standard validation will raise user awareness and products uptake
FUTURE WORK (SeaDataCloud)

• Increase of horizontal and vertical resolution
• Merge different datasets: SDN+CMEEMS REP
• Compute different climatologies on decadal base but considering the long term variability of the basin (EMT, NIR)
• Use of different reference datasets for validation/consistency: CMEEMS REP SST, CMEEMS reanalysis
• Test the standard validation methodology for EMODnet chemistry products (e.g. nutrient/oxygen/clorophyll climatologies)