DIVA as a Virtual Research Environment

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What is DIVA?

- DIVA: Data Interpolating Variational Analysis

- Objective: **derive a gridded climatology from in situ observations**

- The variational inverse methods aim to derive a continuous field which is:
  - close to the observations
  - "smooth"

- DIVA works internally on a finite element mesh:
  - decouples basins based on **topography**
  - can take **ocean currents** into account
  - can detect **trends** in your data
  - can detect and remove **outliers**
  - consistent **error variance estimation**
Application of such climatologies

Various applications and interpretations of marine data require a gridded field covering the complete domain as a first step:

- computation of budgets (e.g., heat, salt content),
- identification of long-term trends,
- identification and characterization of oceanographic features,
- determination of derived variables from parameters not necessarily measured at the same location (for example density which is a function of temperature and salinity),
- model initialization and validation.
What is OceanBrowser?

- Web-interface to **visualize gridded** data sets in NetCDF
- Implements the **Web Map Service** protocol
- Horizontal and vertical sections
- Scalar and vector fields
- OceanBrowser is used in
  - SeaDataNet
  - EMODNET Chemistry
- In those projects it is used to visualize gridded data sets generated by the tool DIVA

SeaDataNet: [http://sdn.oceanbrowser.net/web-vis/](http://sdn.oceanbrowser.net/web-vis/)
DIVA-on-web

- Web interface for **2d analyses** (longitude/latitude)
- No registration required
- Data uploaded as text file
- For example (longitude, latitude, value):

  29.76 45.15 16.14
  29.76 45.15 16.34

- [http://ec.oceanbrowser.net/emodnet/diva.html](http://ec.oceanbrowser.net/emodnet/diva.html)
Overview

- DIVA creates gridded data products based on in situ observations
Overview

- Gridded data products are made available using OceanBrowser
Overview

- Users can download the gridded data products and the underlying observations
Proposed implementation

- Users either:
  - will login to a work-space
  - *"demo account"* also available with a limited storage
- Input and output data set are identified a URL
- For SeaDataCloud data set
  - login credentials will be used to import the data into the users' work-space
  - the object behind the URL is a NetCDF or ODV format
- Other data set can be important using e.g. OPENDAP URLs

<table>
<thead>
<tr>
<th></th>
<th>demo account</th>
<th>registered user</th>
</tr>
</thead>
<tbody>
<tr>
<td>storage</td>
<td>3 GB</td>
<td>20 GB</td>
</tr>
<tr>
<td>max. age of file</td>
<td>5 days</td>
<td>15 days</td>
</tr>
</tbody>
</table>

- The size of a DIVA analysis is about 500 MB
- Should be able to support ~30 users to make a DIVA analysis in parallel (a typical class room)
EUDAT services

- Possible EUDAT services useful for the DIVA VRE
- In addition: authentication service
Summary

- DIVA is a tool to generate **gridded data fields from in situ observations**

- OceanBrowser allows the visualization of gridded data sets:
  - along a **horizontal section** (at given time and depth)
  - along a **vertical section** (e.g. at a fixed distance from coast)

- The DIVA Virtual Research Environment will provide a web interface to DIVA:
  - **Web API** to call DIVA
  - On top of the web API we will build a **user interface**
User interface (mock-up)

- Provide URLs of input data
- Choose parameters
- Time frame
- Accepted quality flags
Domain selection

- Coordinates of the domain
- Resolution
Parameter of the analysis

- Parameters to choose
Additional meta-data

- Additional meta-data about the gridded product
User information

- Contact information of the user
**Visualization**

- User will get an email when a DIVA analysis is ready
- The DIVA analysis is saved on the user's work-space
- The DIVA analysis can be visualized in OceanBrowser
- User can download the analysis as a NetCDF file

**XML metadata for DIVA products**

- Currently: standand-alone tool DIVAdoxml-gui
  - Institution names (EDMO code)
  - Vocabulary codes
  - EMODnet Chemistry aggregated parameter names (P35)
  - SeaDataNet Parameter Discovery Vocabulary (P02)
  - Salt and fresh water body names (C19)
- Remain to be seen: how this will be integrated in Sextant