SeaDataCloud

Concluding remarks on consistency analysis of DIVAnd output with reference products

S. Simoncelli (INGV, Bologna)

SeaDataCloud WP11 Leader

ISTITUTO NAZIONALE
DI GEOFISICA E VULCANOLOGIA

OUTLINE

- what we learned
- how and why we should all uptake DIVAnd tool
- assessing the products quality
- consistency analysis

What we learned

- Use DIVAnd to produce climatologies and maps of various PHY and BGC EOVs
- how to proceed from the grid definition to the final product quality control using the residuals:
  - ✓topography
  - ✓load the data and integrate different data sources
  - ✓find duplicates
  - ✓define and optimize L and espilon2
  - ✓ visualize the results
  - ✓compute scores from residuals
  - ✓use advection constraints considering MYP currents fields
  - ✓define a background field

how and why we should all uptake DIVAnd tool

- Adopting DIVAnd tool means to work in a collaborative way, with open source code, which allows to advance through the merging of different developments and solving bugs
- it allows the publication of the code in scientific papers following the open science approach and transparency of scientific findings
- it allows to keep track of product versioning
- it facilitates the product metadata description for final publication in agreement with the standards and the DOI assignment required from dataset journals
- it will be soon available to the scientific community on a Virtual Research Environment (SeaDataCloud VRE pilot)

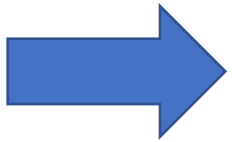
Assessing the product quality

How to measure product quality? Metrics to assess:

- accuracy (use model-obs)
- consistency → intercomparison of 2D fields (obs/model, model/model)
- representativeness
- robustness → assessment of integrated quantities (heat and salt content,…)

How to communicate on product quality?

- reports → **SDC PIDoc** for monitoring/reviewing/reporting/improving
- websites
- validation studies
- user feedbacks



to be improved in SDC

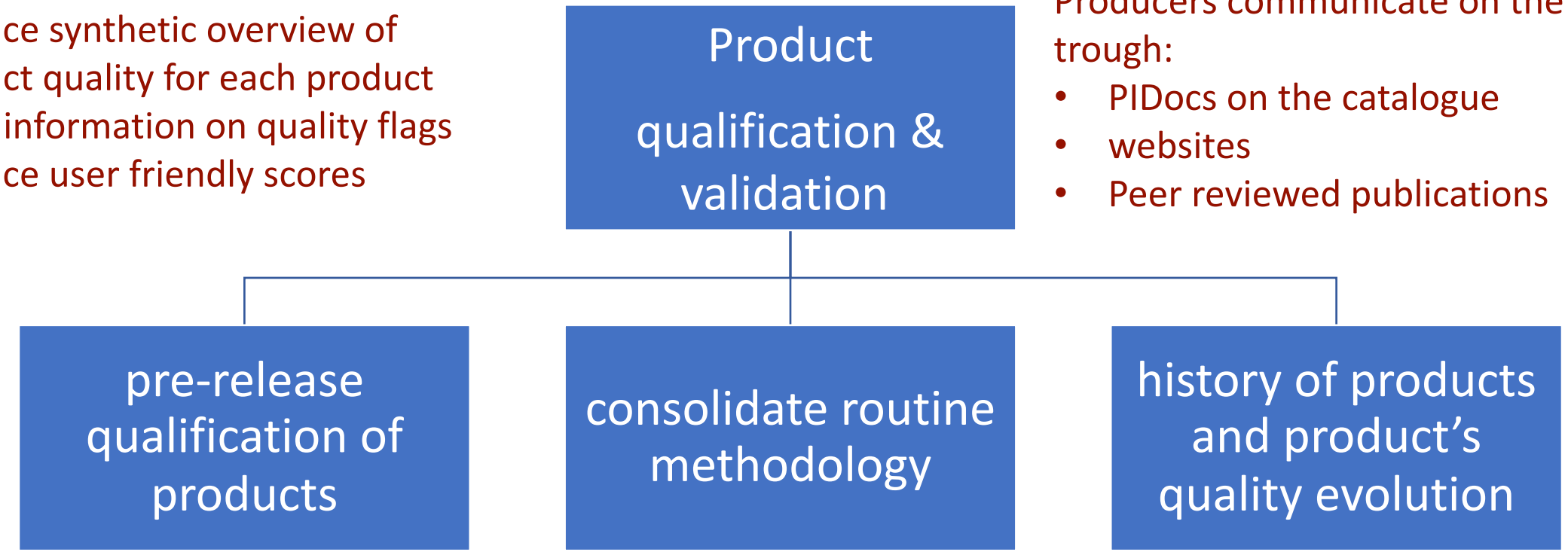
Assessing the product quality

User Needs:

- Produce synthetic overview of product quality for each product
- More information on quality flags
- Produce user friendly scores
- …

Producers communicate on the quality trough:

- PIDocs on the catalogue
- websites
- Peer reviewed publications

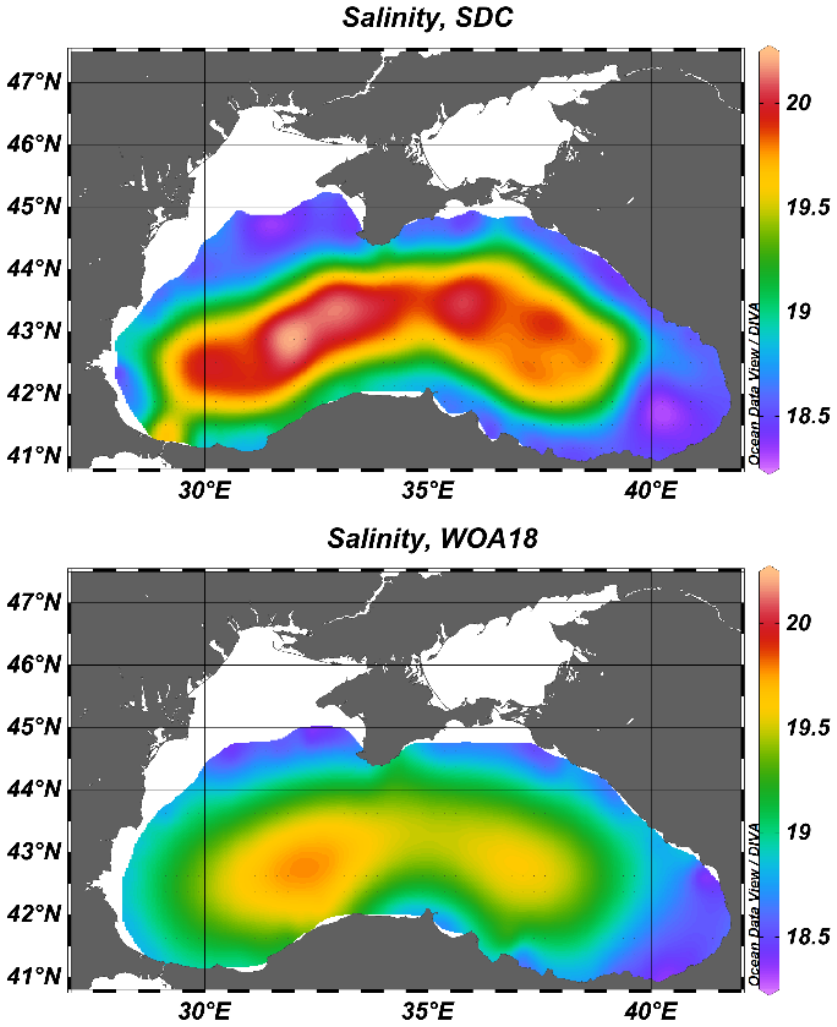


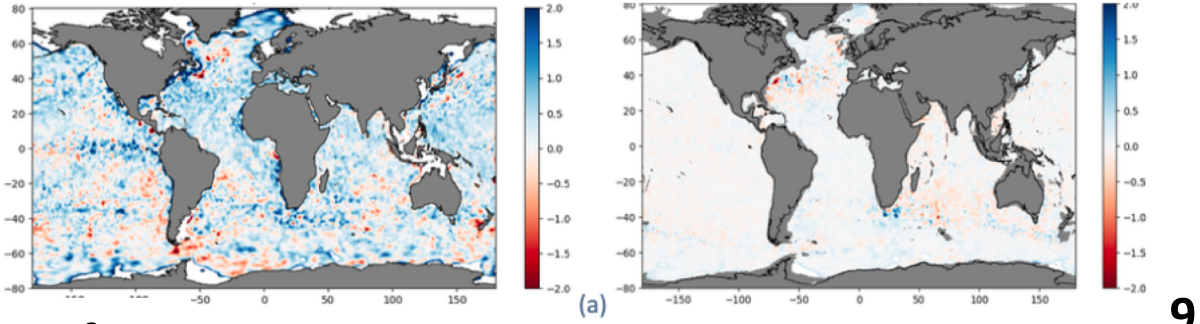
- to guarantee reliability and transparency
- to inform users about products' usability and limitations

- to facilitate QA
- to invest on continuous R&D

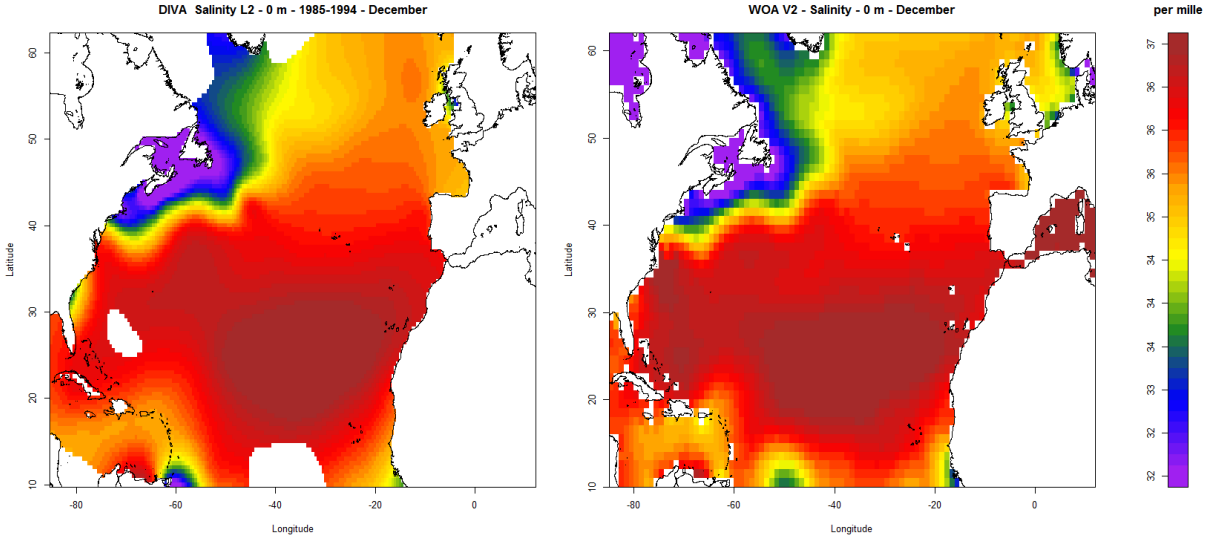
- to keep track of activities and performances

Visual Consistency Analysis



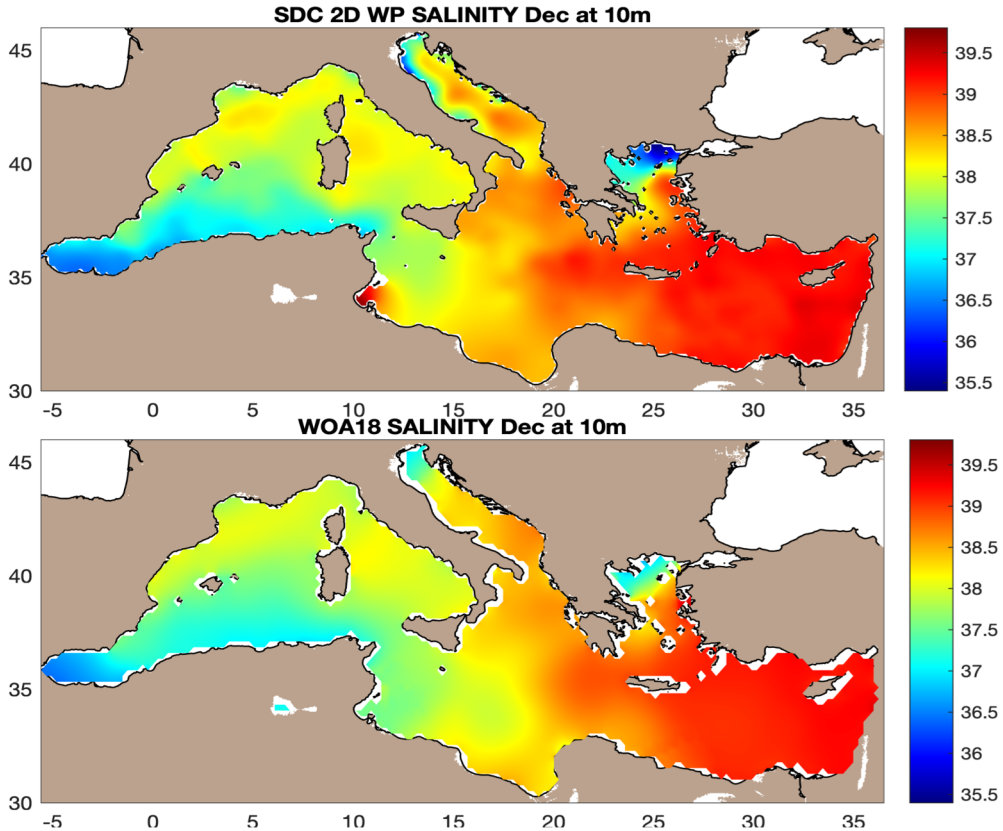


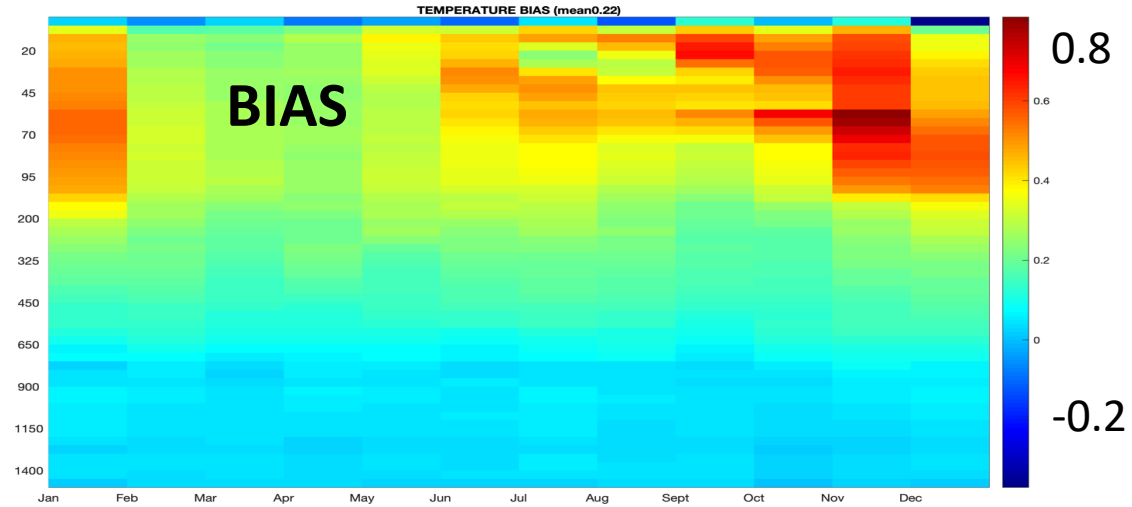
Surface **950m**

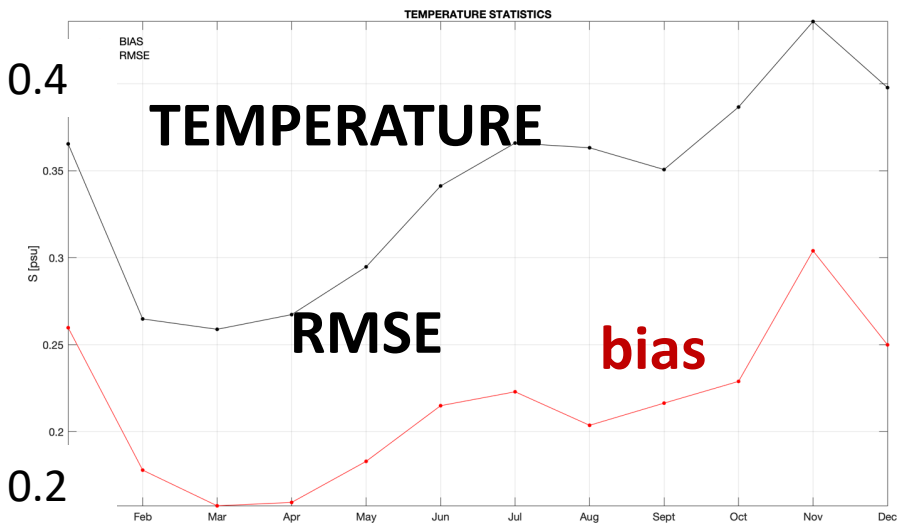


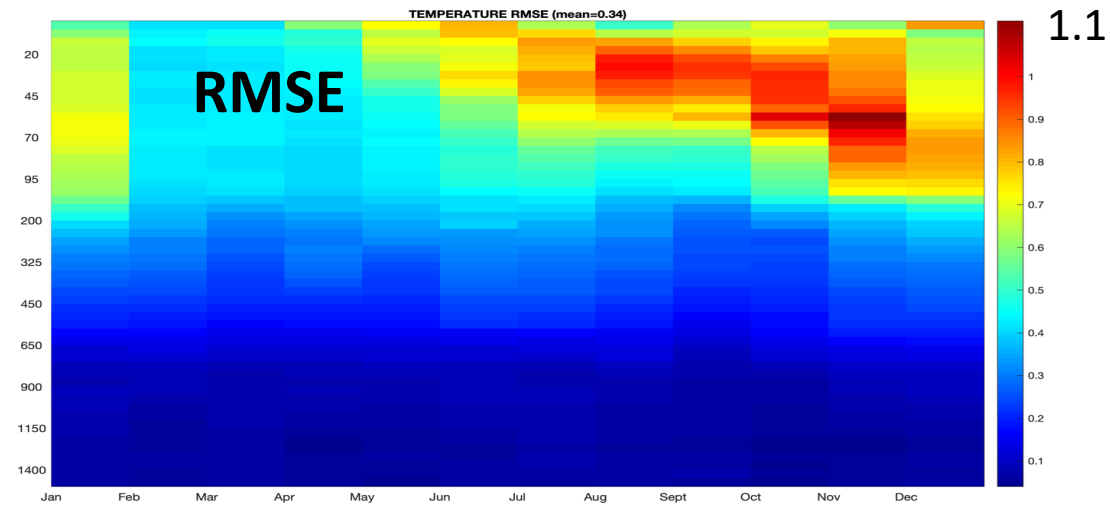
Surface Salinity (Jan)

Consistency Analysis









Consistency Analysis

Table 4 - Statistical indexes of difference between WOA18 and SDC climatology

Fields	Time span	Temperature		Salinity	
		BIAS	RMSE	BIAS	RMSE
Seasonal	1955 - 1964	-0.07	0.54	0.01	0.21
Seasonal	1965 - 1974	-0.06	0.51	-0.01	0.21
Seasonal	1975 - 1984	0.08	0.50	-0.06	0.22
Seasonal	1985 - 1994	0.03	0.42	-0.03	0.21
Seasonal	1995 - 2004	-0.09	0.89	-0.08	0.33
Seasonal	2005 - 2017	-0.03	0.47	0.03	0.28
Seasonal	1955 - 2017	0.02	0.39	-0.03	0.22
Monthly	1955 - 2017	0.01	0.46	-0.04	0.24

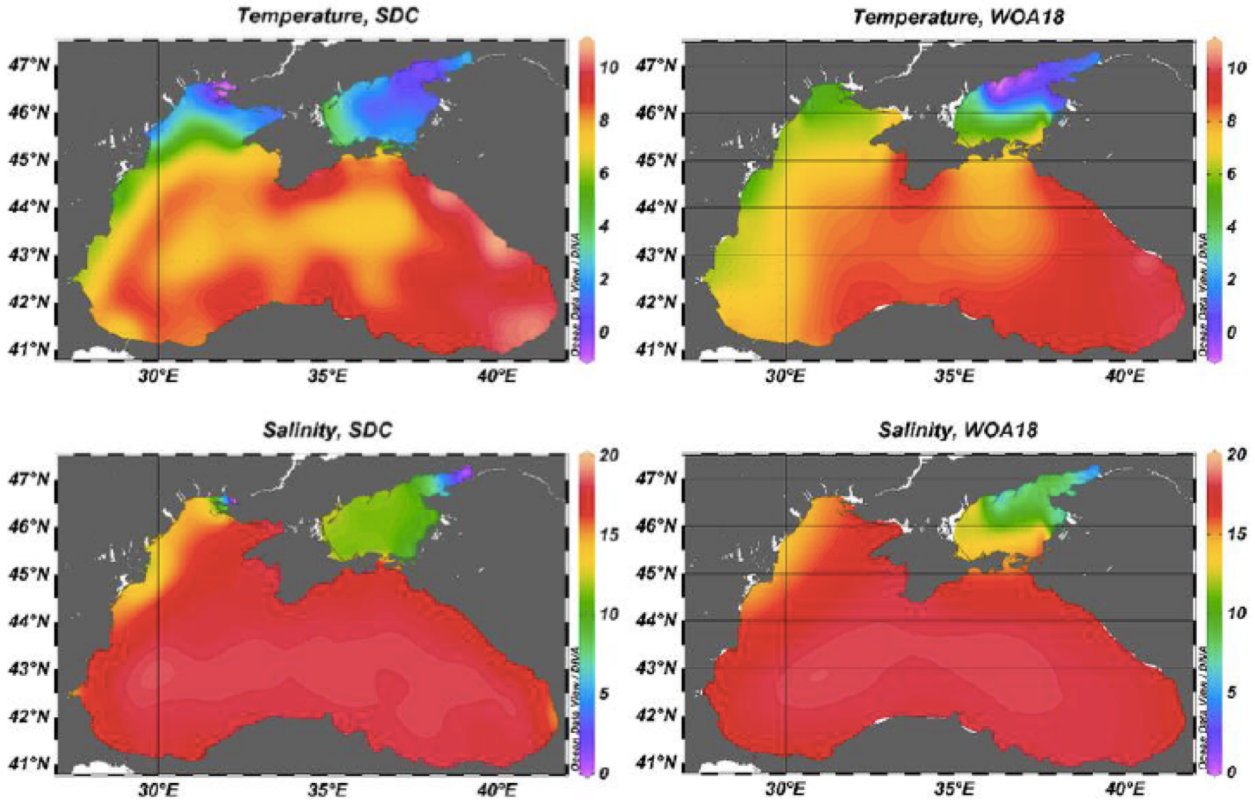


Figure 25 - SDC and WOA18 temperature (January) and salinity (July) maps at the surface for time span 1955-2017.

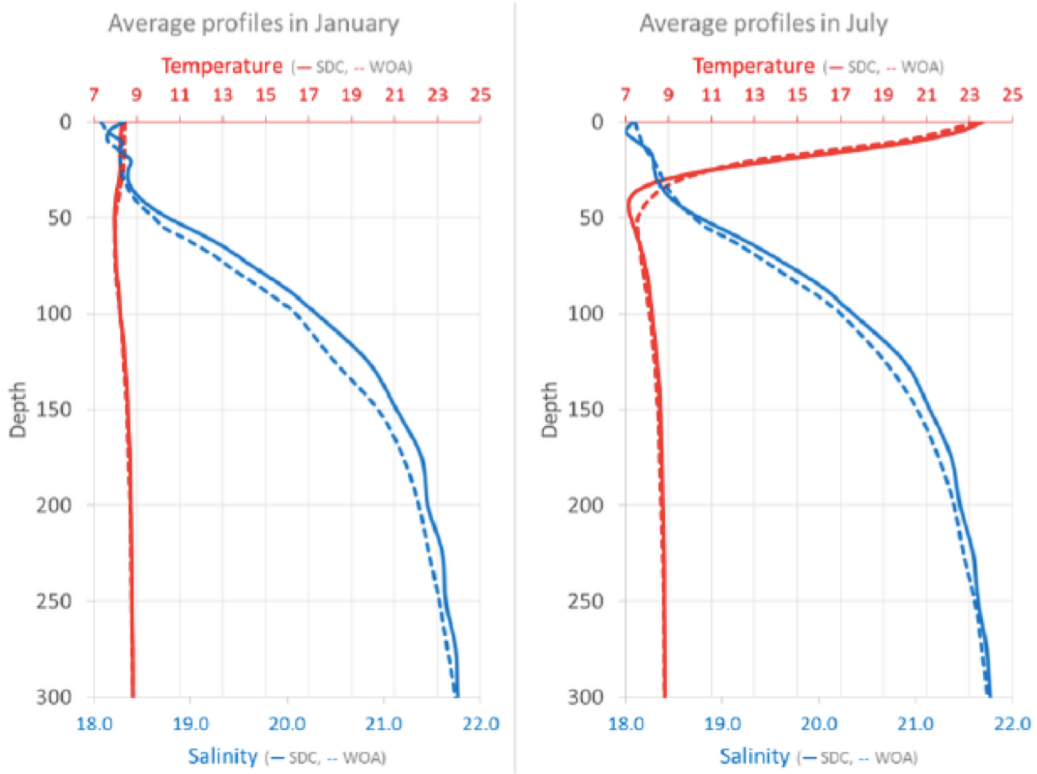


Figure 28 - Average profiles of Temperature and Salinity for area 42 – 44.5N, 31-38E.

DO variability in the Gulf of Lion and the Bay of Biscay

Data

EMODnet Chemistry products derived from SeaDataNet/EMODNet Chemistry Data Network observational.

1) Mediterranean Sea DIVA 4D analysis of Water body dissolved oxygen concentration: moving 10-years and 6-years analysis of DO concentration in the Mediterranean Sea for each season. Every year of the time dimension corresponds to the 10-year centered average of each season. Decades span from 1971-1980 until 2006-2015. Observational data span from 1911 to 2015. Depth range (IODE standard depths):-3000.0, -2500.0, -2000.0, -1750.0, -1500.0, -1400.0, -1300.0, -1200.0, -1100.0, -1000.0, -900.0, -800.0, -700.0, -600.0, -500.0, -400.0, -300.0, -250.0, -200.0, -150.0, -125.0, -100.0, -75.0, -50.0, -30.0, -20.0, -10.0, -5.0, -0.0.

2) Atlantic Sea DIVA 4D analysis of Water body dissolved oxygen concentration: moving 10-years and 6-years analysis of DO in the Atlantic Sea for each season. Every year of the time dimension corresponds to the 10-year centred average of each season. Decades span from 1963-1972 until 2005-2014. Observational data span from 1963 to 2014.

CMEMS Products

- MEDSEA_REANALYSIS_BIO_006_008 (https://doi.org/10.25423/MEDSEA_REANALYSIS_BIO_006_008, Teruzzi et al. 2016)
- GLOBAL_REANALYSIS_BIO_001_018

WOA2013

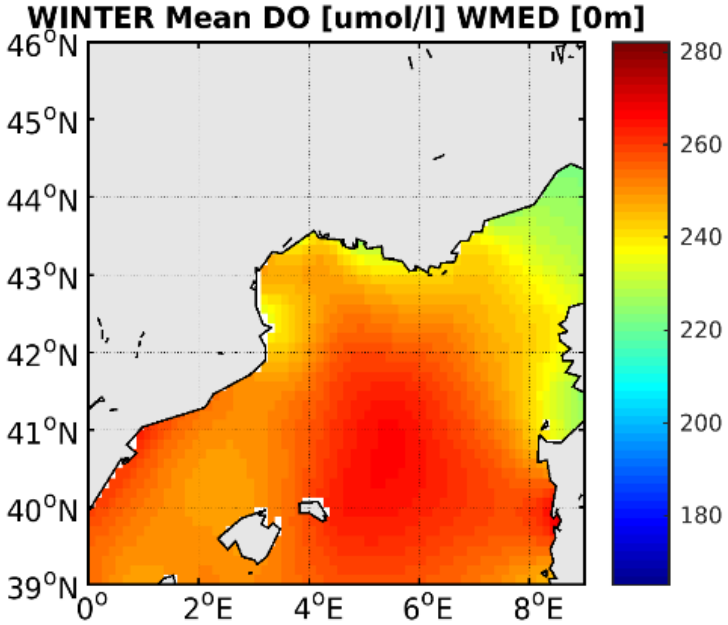
Oxygen climatological fields covering the time period 1965-2012 → this could be updated to WOA2018

DO variability in the Gulf of Lion and the Bay of Biscay

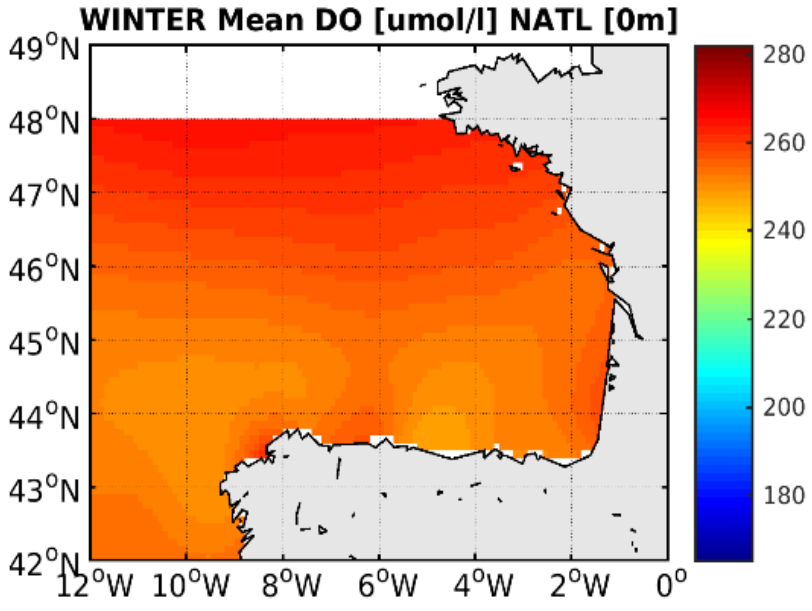
	Time coverage	Horizontal resolution	Vertical levels	Type of Product
	WMED			
EMODnet_10	1971-2015	1/8°	IODE 29	Seasonal decades from 1976 to 2010
EMODnet_6				
WOA2013_V2	1965-2012	1°	30	Seasonal climatologies
CMEMS	1999-2017	1/16°	63	Monthly fields
	NATL			
EMODnet_10	1963-2014	1/8°	IODE 30	Seasonal decades from 1966 to 2009
EMODnet_6				
WOA2013_V2	1965-2012	1°	30	Seasonal climatologies
CMEMS	1998-2016	1/4°	71	Monthly fields

DO variability in the Gulf of Lion and the Bay of Biscay

Areas of study



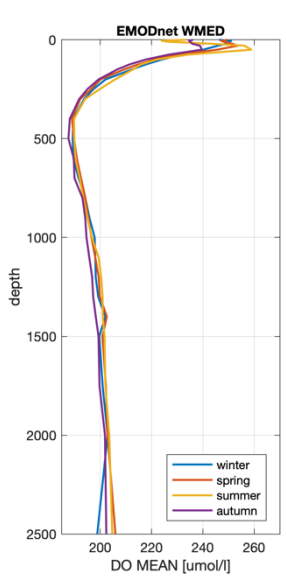
Gulf of Lion GoL
(Northwestern Mediterranean

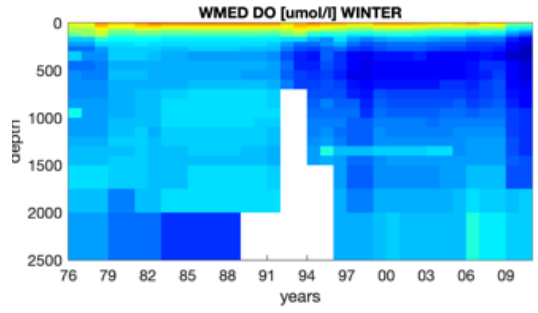


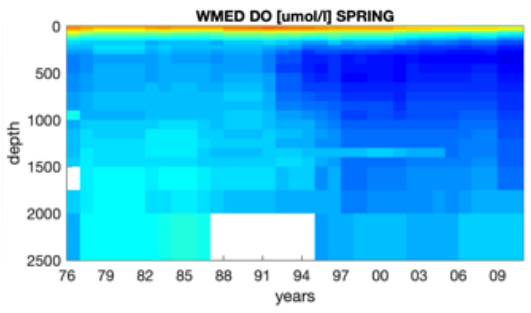
Bay of Biscay BoB
(Northeastern Atlantic)

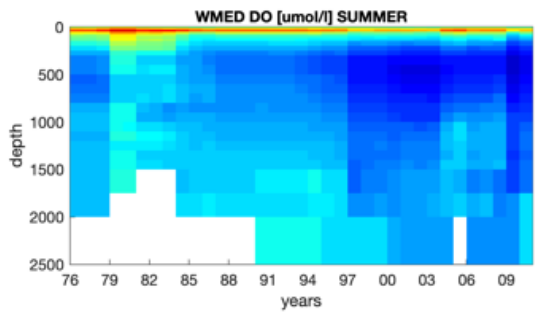
Seasonal DO GoL

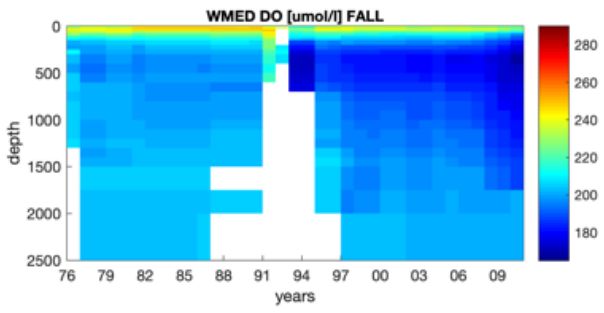
Seasonal hovmoller plots and profiles in the GoL region with zoom in the first 200m of the water column

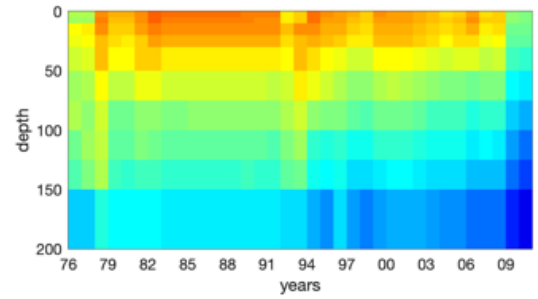


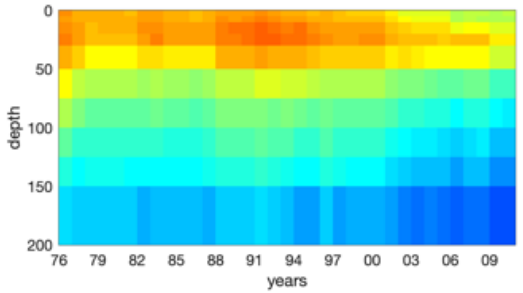


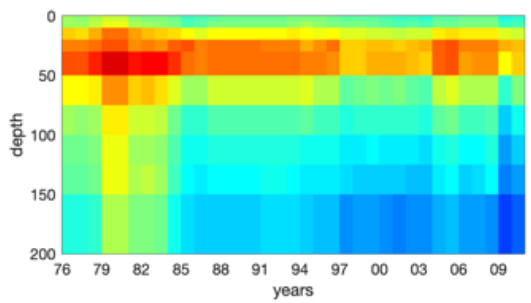


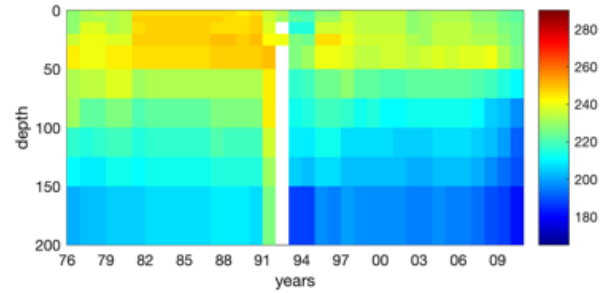




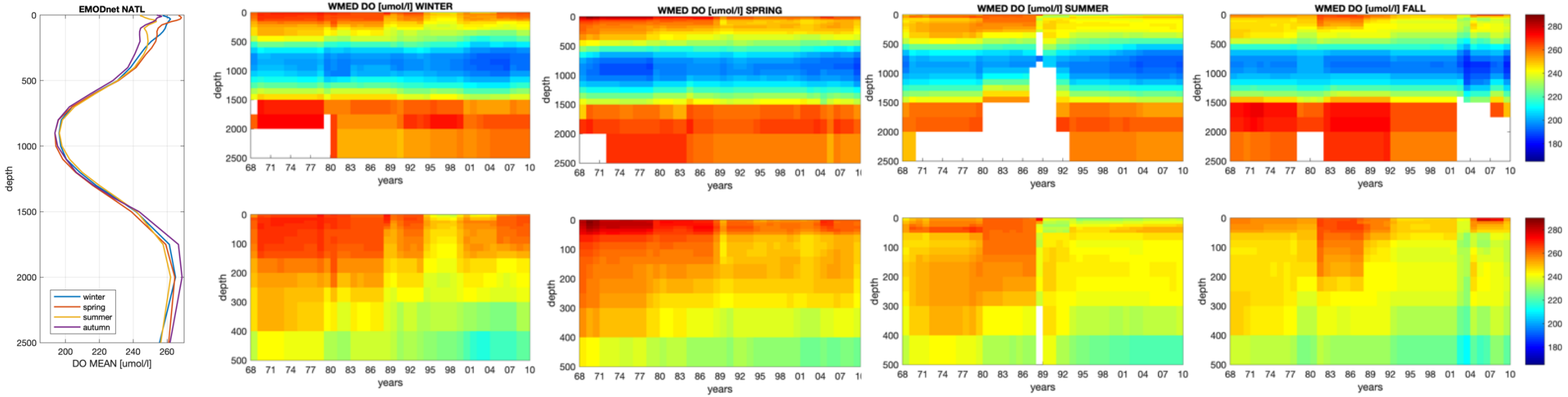








Seasonal DO variability in the BoB

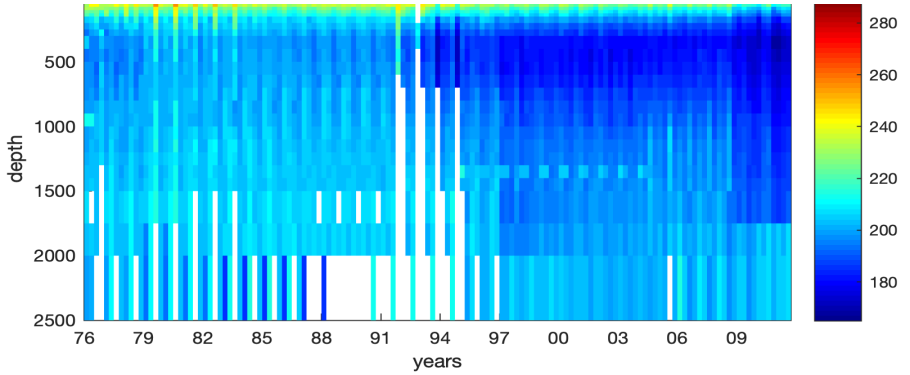


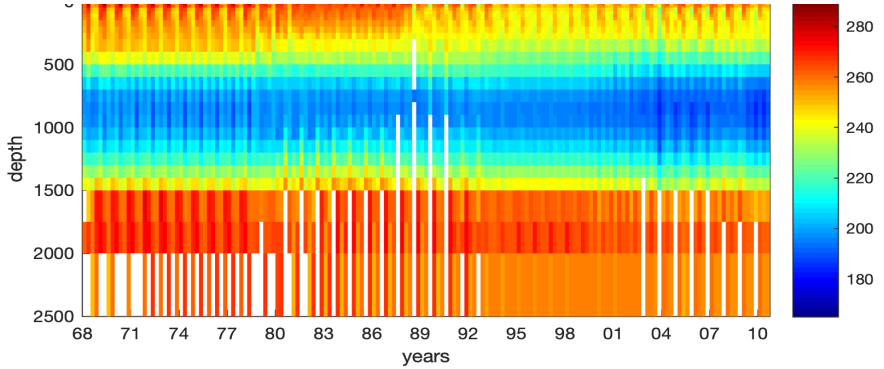
DO variability in the GoL and the BoB

GoL 1976-2010

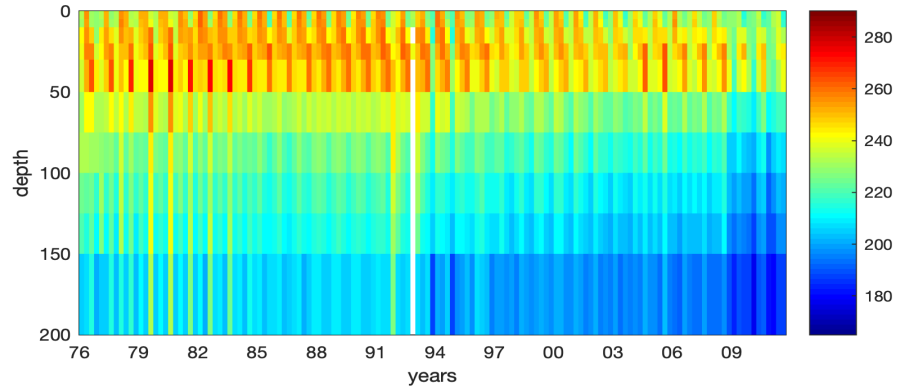
BoB 1966-2009

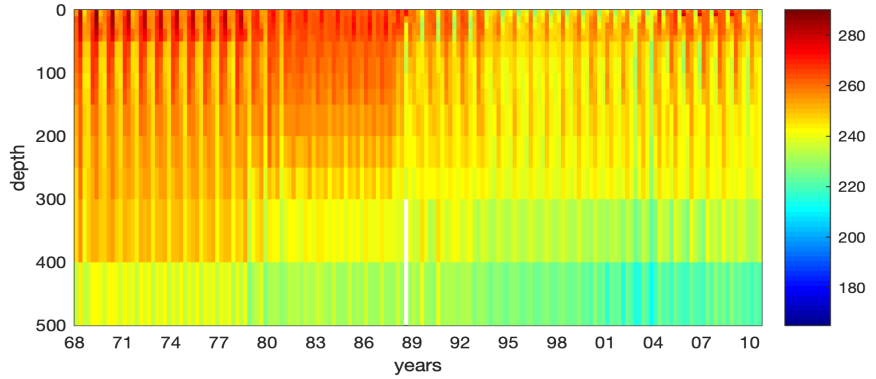
Full water column





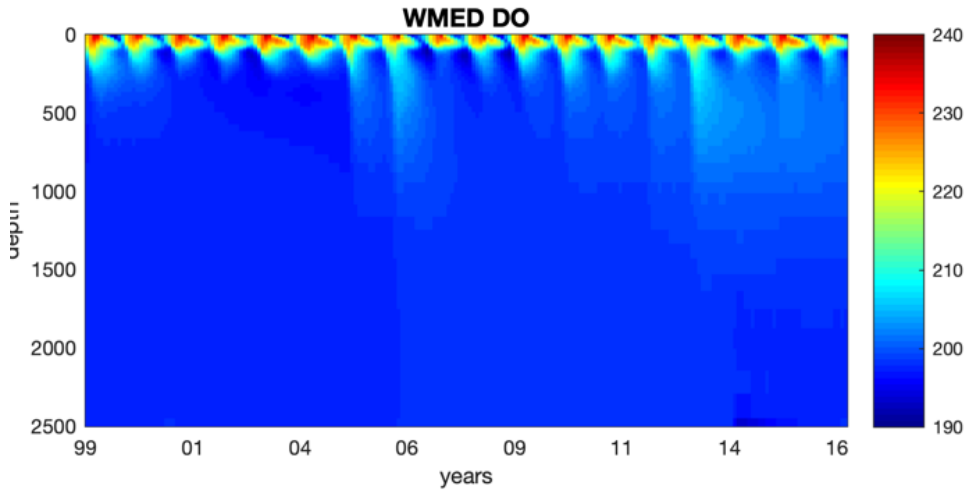
0-200m zoom

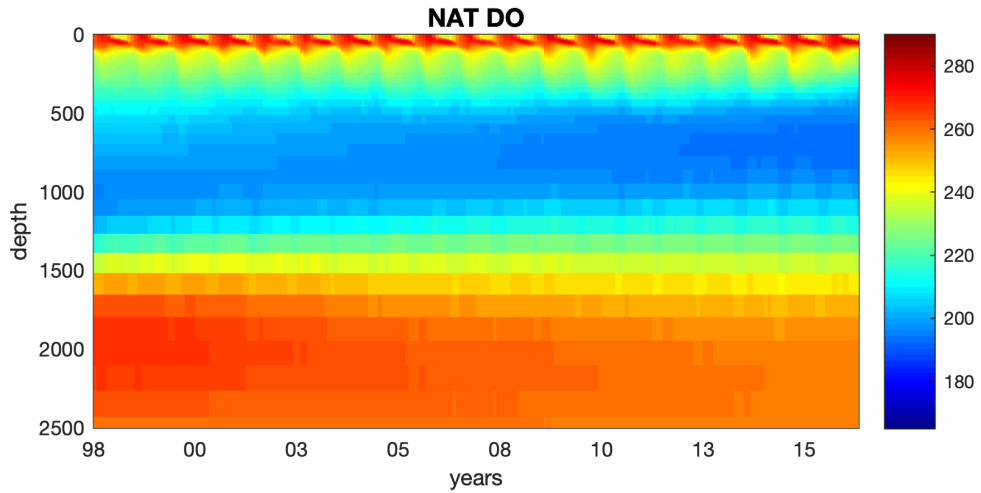


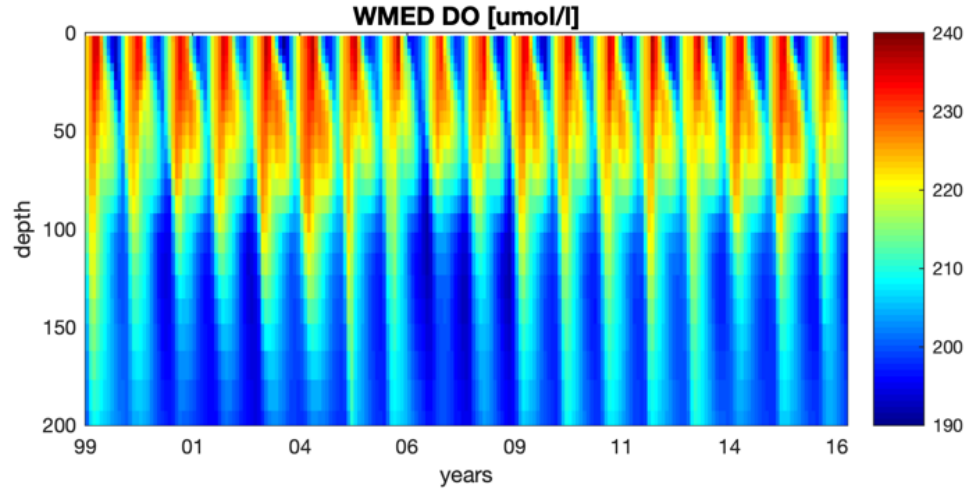


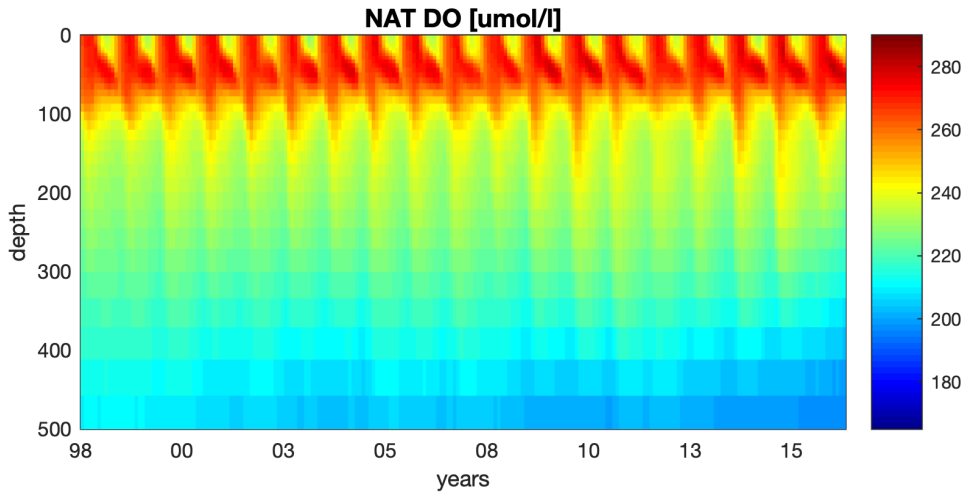
Hovmoller plots of Dissolved Oxygen [$\mu mol/l$] from EMODnet Chemistry data products (50% of error masking)

DO variability in the GoL and the BoB



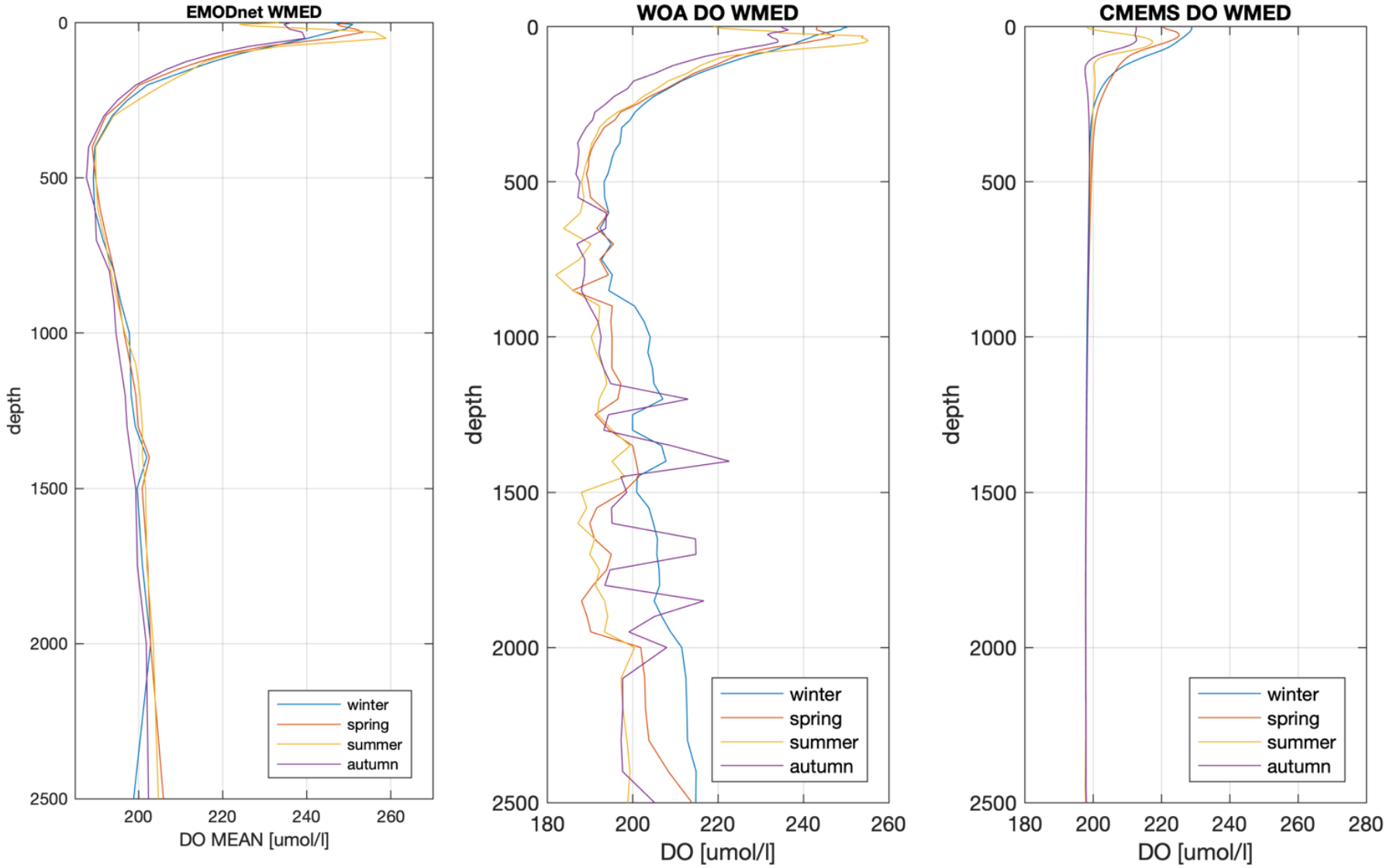






Hovmoller plots from CMEMS reandata: GoL 1999-2016 and BoB during 1998-2016

DO variability in the GoL



DO variability in the BoB