



# SeaDataNet

PAN-EUROPEAN INFRASTRUCTURE  
FOR OCEAN & MARINE DATA  
MANAGEMENT

## *North Atlantic Climatology*

Christine Coatanoan, WP10 Meeting, Athens, 08th April 2015





# ***PLAN (following the report)***

## 1. Methodology

- Domain definition
- Time-space resolution
- DIVA settings (table with the parameters)
- Description of the tuning of DIVA
- Background field choice
- Error Maps

## 2. Temperature Maps

Description of the main features

## 3. Salinity Maps

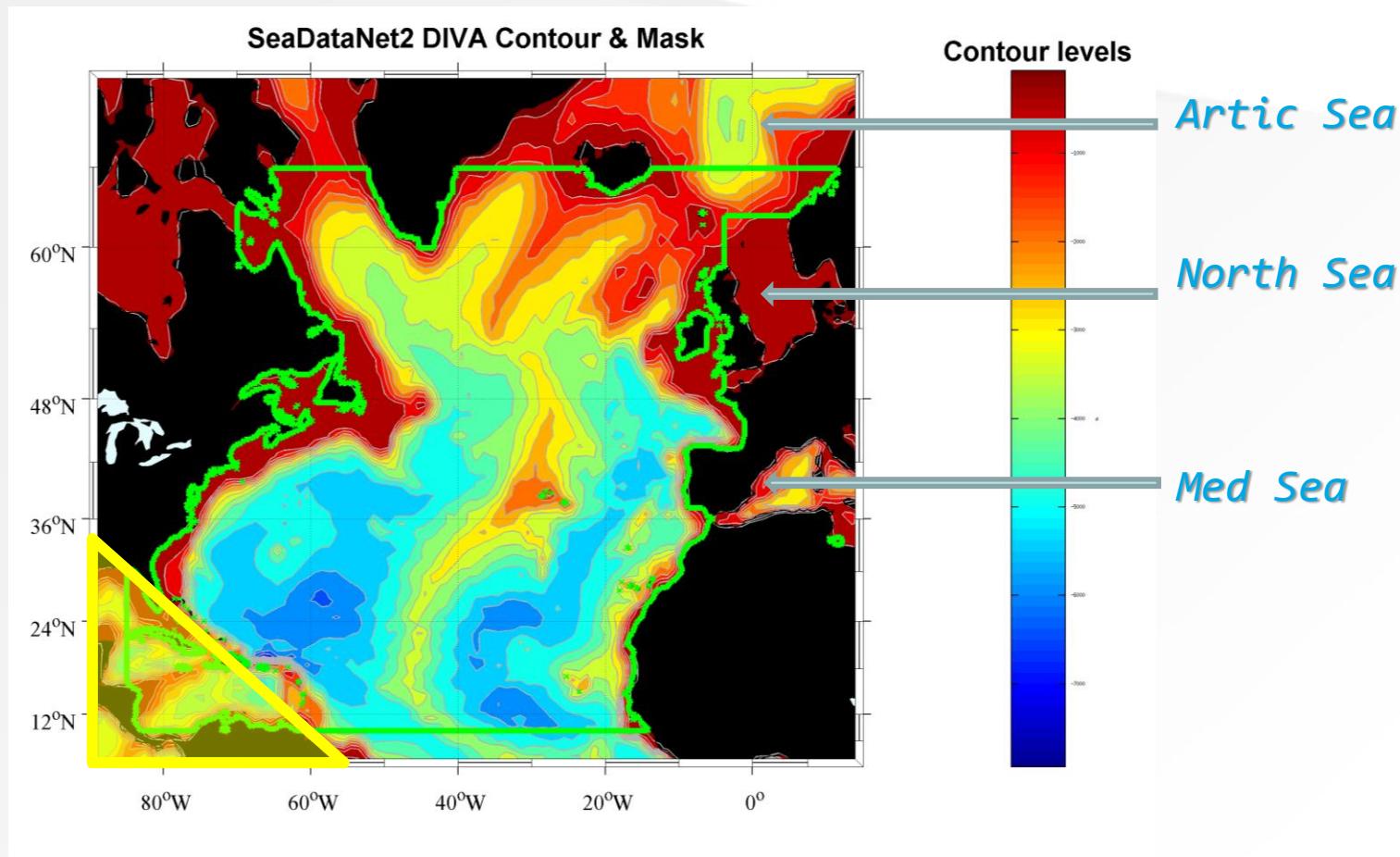
Description of the main features

## 4. Climatology validation

Comparison of SDN climatology with pre-existent ones (previous versions, WOA, ...)



## Domain definition and mask – North Atlantic area (from Gebco bathymetry)



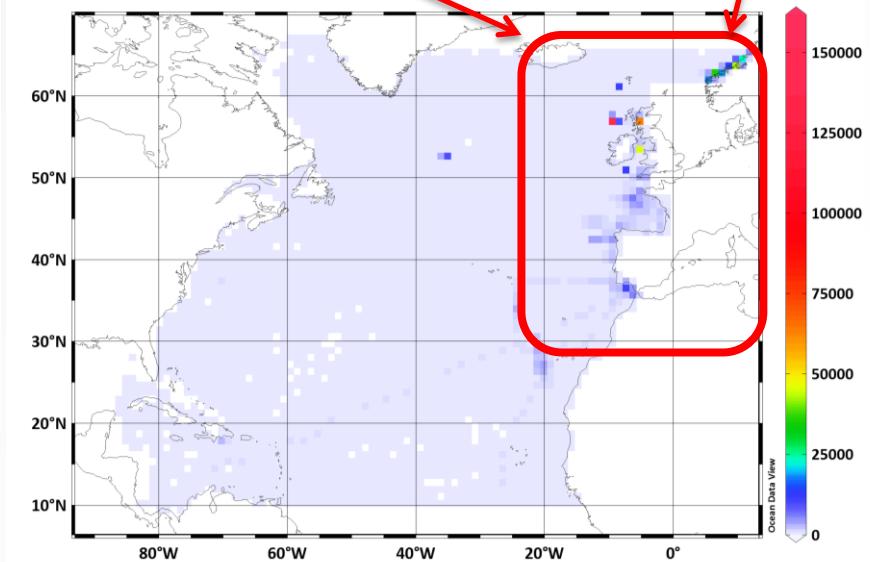
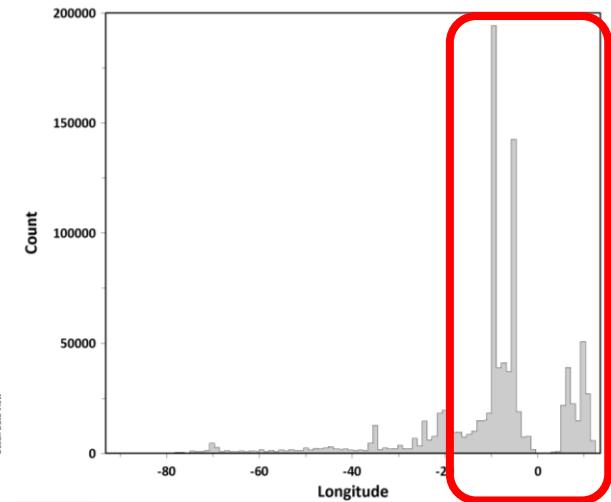
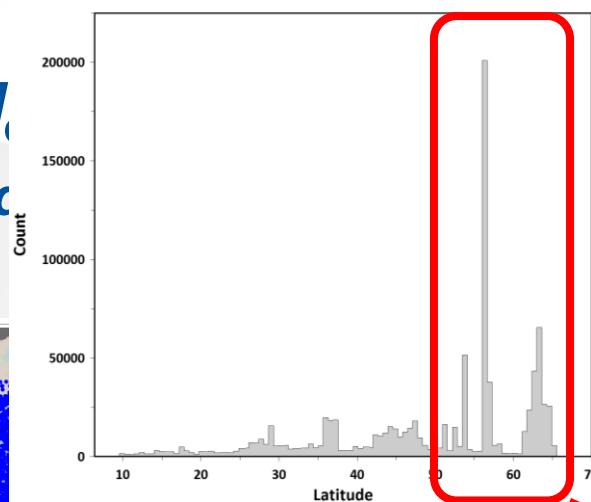
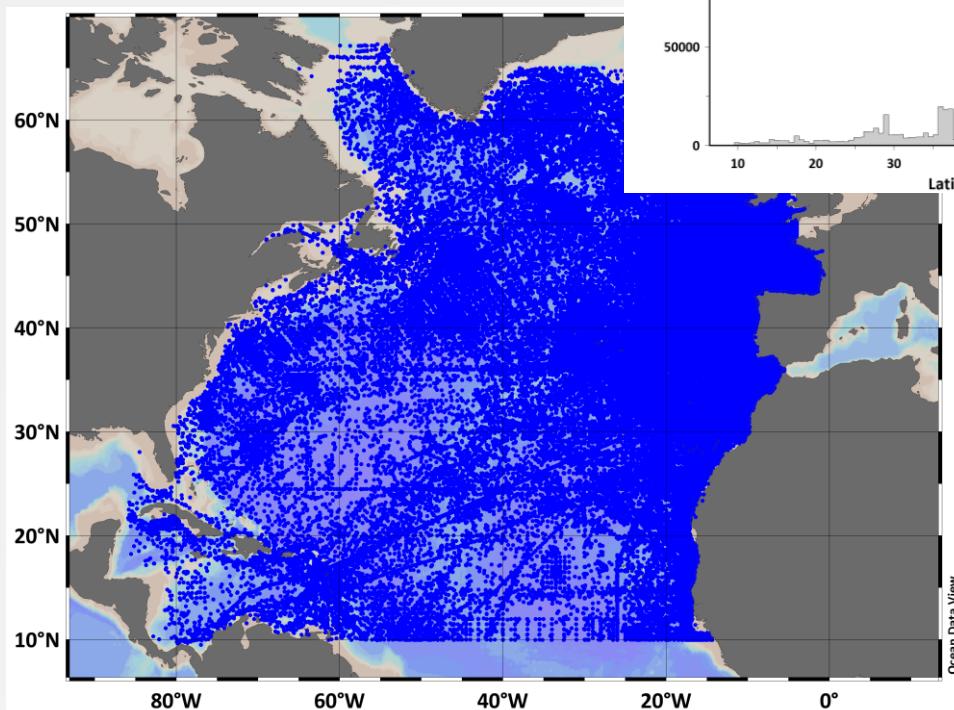


## ***Time-space resolution***

- Variable : Temperature & Salinity
- Year : 1900 to 2012
- Monthly : 01 to 12
- Season : 1202 – 0305 – 0608 – 0911
- Depth : (IODE) 33 levels - 0 to 5500 (used 0 to 4000)  
 $(5500,5000,4500,4000,3500,3000,2500,2000,1750,1500,1400,1300,1200,1100,1000,900,$   
 $800,700,600,500,400,300,250,200,150,125,100,75,50,30,20,10,0)$
- Data : public and restricted

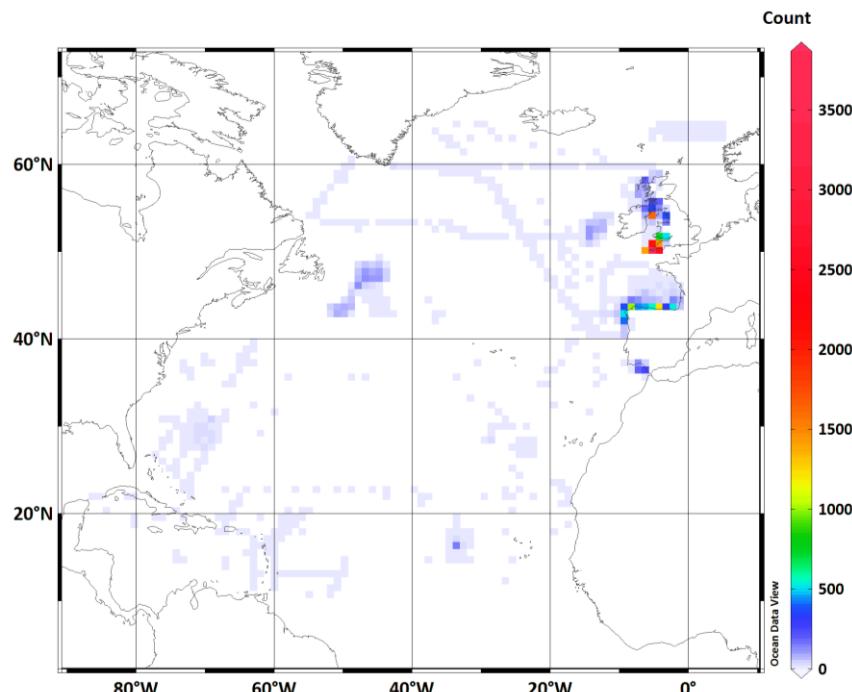
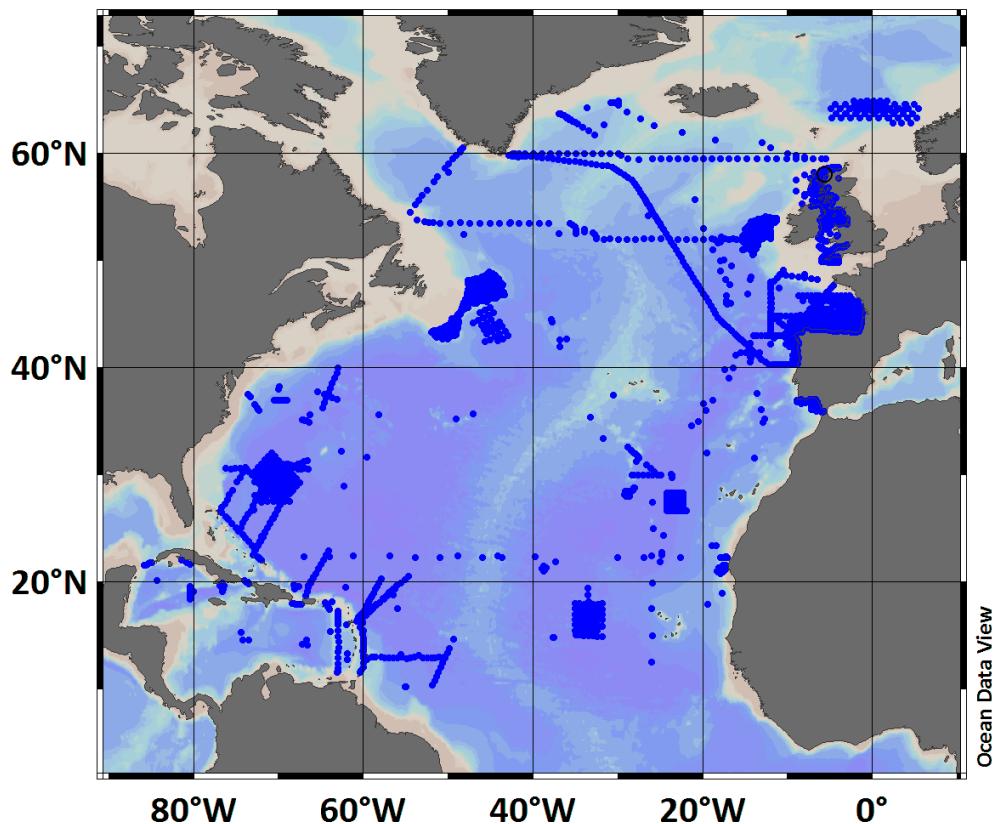


# Aggregated data public and restricted access





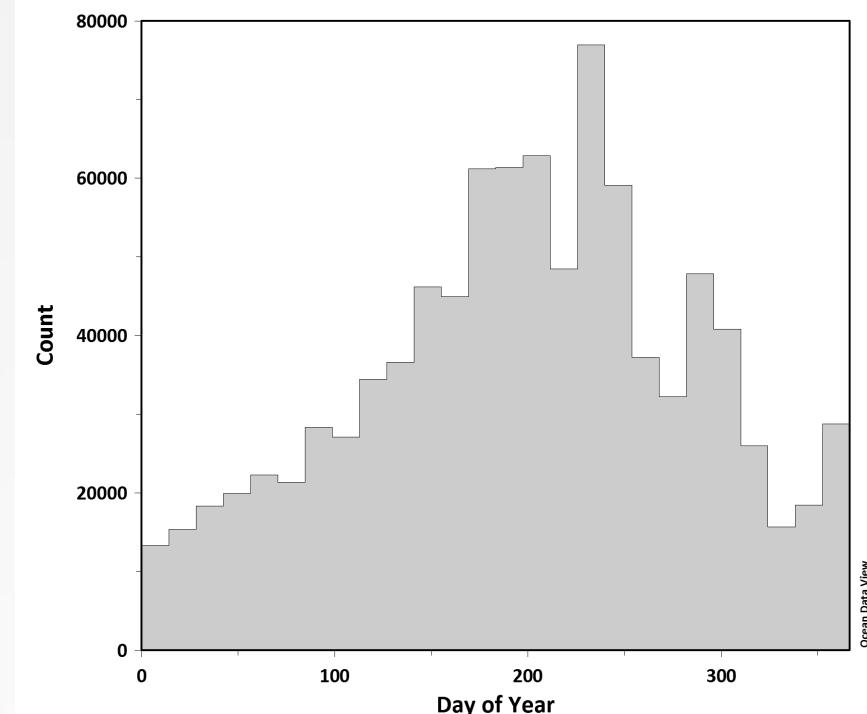
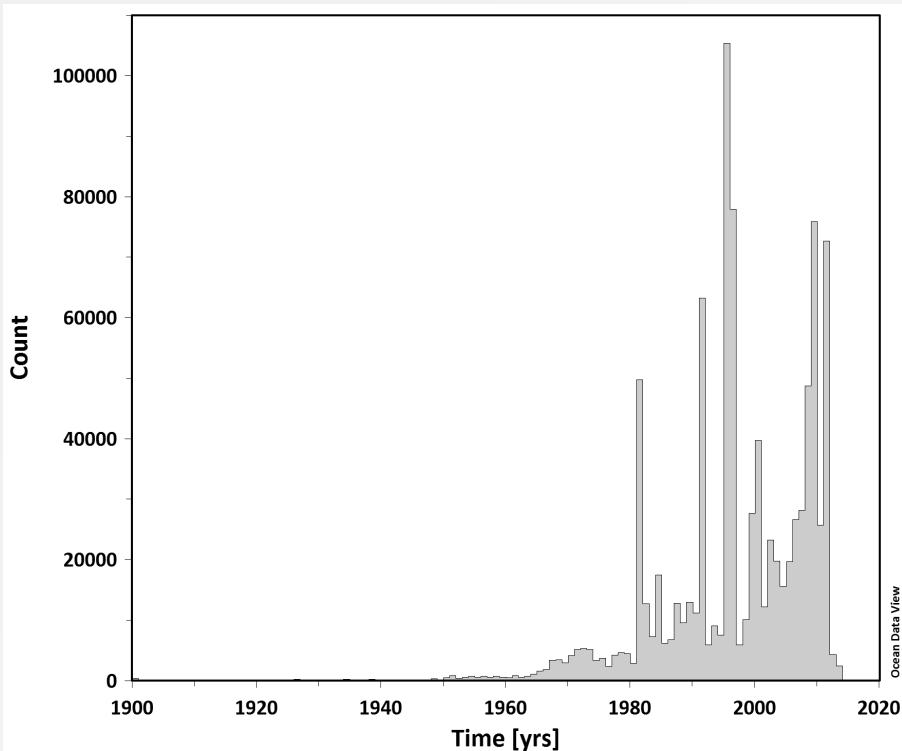
## Restricted data



PAR	# points
	28338
T	15403
S	24873
TS	14922



## *Time scale - year and seasonal distribution*





## Configuration (1/2)

- Version of DIVA : 4.6.8
- DIVA : many configurations available

Which one to use ? Need to test a lot of runs....

- Horizontal projection, type, resolution
- Parameters determination : correlation length, signal-to-noise ratio
- Background field ? Which one ?
- Velocity or not ? Advection ?



## Configuration (2/2)

- correlation length estimated from diva tool, based on the dataset itself
- divafit => update of the param.par
- signal-to-noise ratio  $\lambda = \sigma^2/\epsilon^2$  estimated from diva tool (a Generalized Cross-Validation (GCV)).
- No outliers elimination (already done with ODV)
- Background field ? First run :null - second one : mean

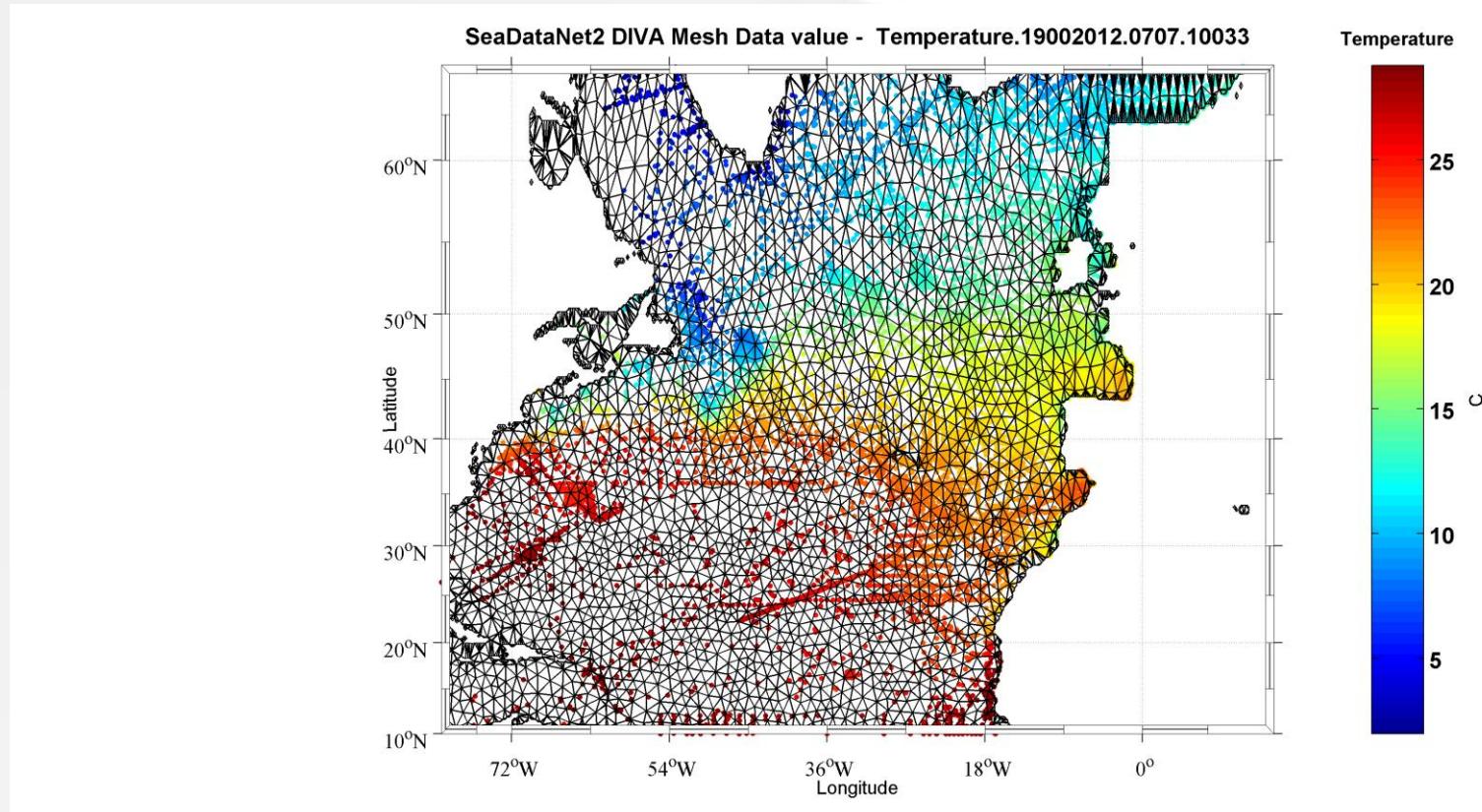


## ***Summary of parameters***

<b>Lc: correlation length</b>	<b>6.84083557</b>	
<b>snr: signal to noise ratio</b>	<b>1.06429684</b>	
<b>varbak</b>	<b>5.41515350</b>	
<b>Parameters estimation and vertical filtering:</b>	<b>-30</b>	Estimation and vertical filtering of SN ratio and Lc using data mean distance as a minimum for Lc
<b>xori</b>	<b>-80</b>	dx 0.20 – nx 460
<b>yori</b>	<b>10</b>	dy 0.20 – ny 275
<b>vertical levels</b>	<b>33 levels</b>	5500, 5000, 4500, 4000, 3500, 3000, 2500, 2000, 1750, 1500, 1400, 1300, 1200, 1100, 1000, 900, 800, 700, 600, 500, 400, 300, 250, 200, 150, 125, 100, 75, 50, 30, 20, 10, 0

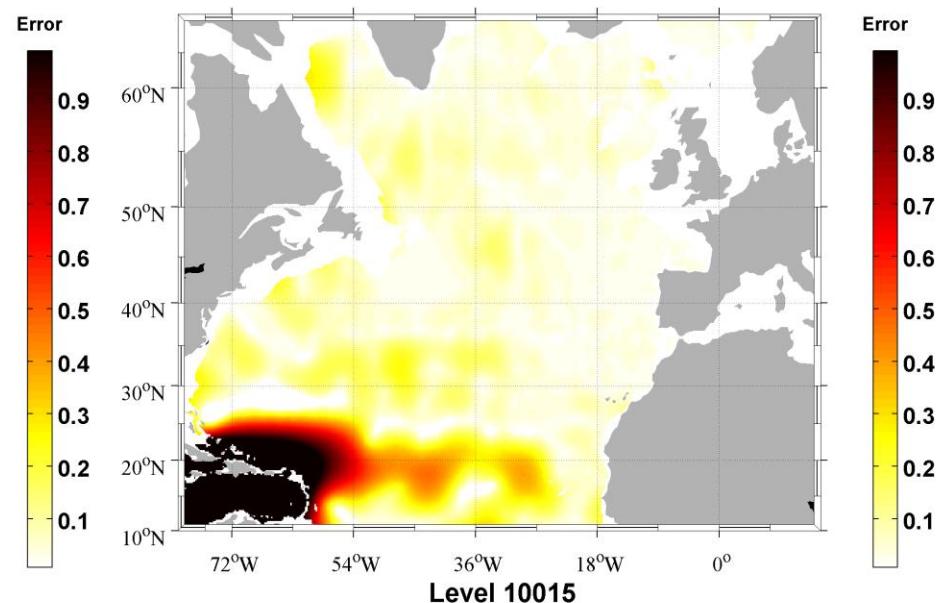
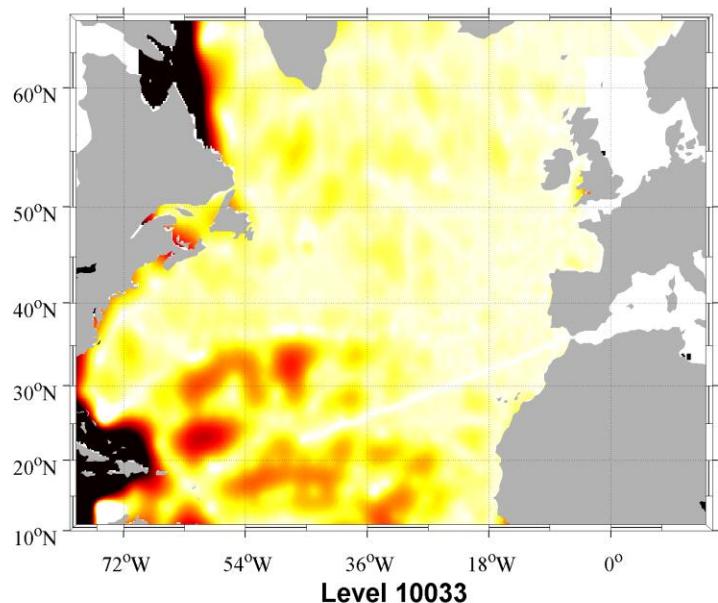


Finite-element mesh and temperature measurements used for the run monthly



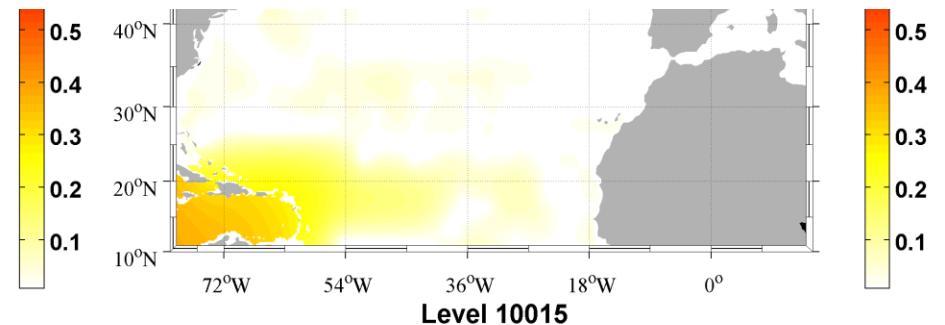
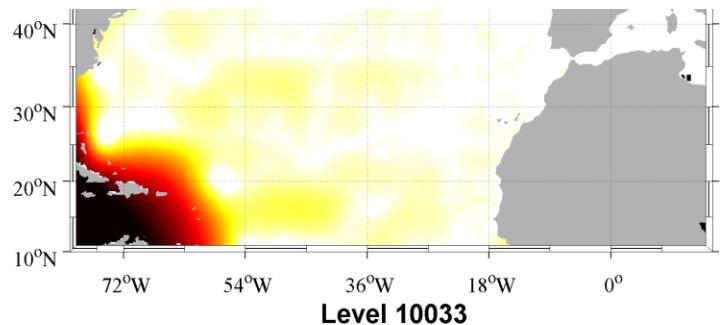
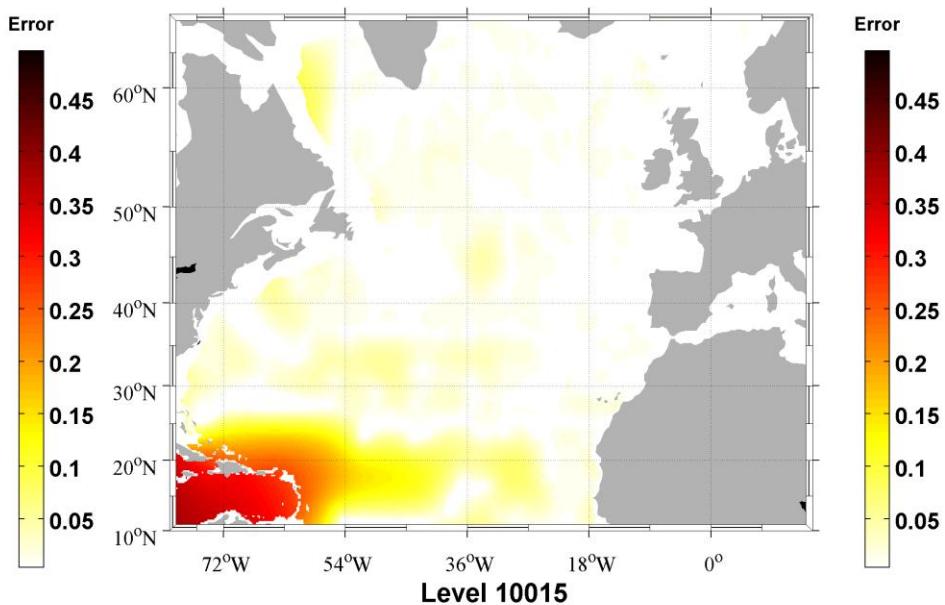
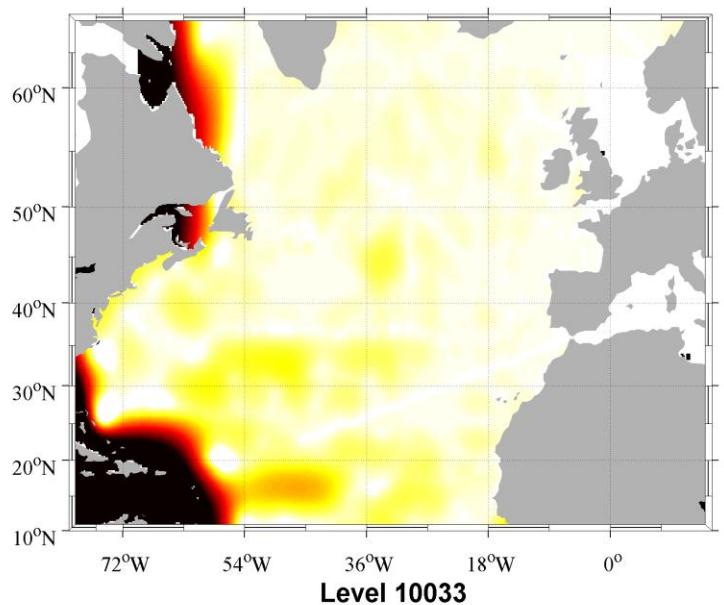


SeaDataNet2 DIVA Analysis error - Temperature.19002012.0707



Error field for Temperature at surface and at 1000m depth

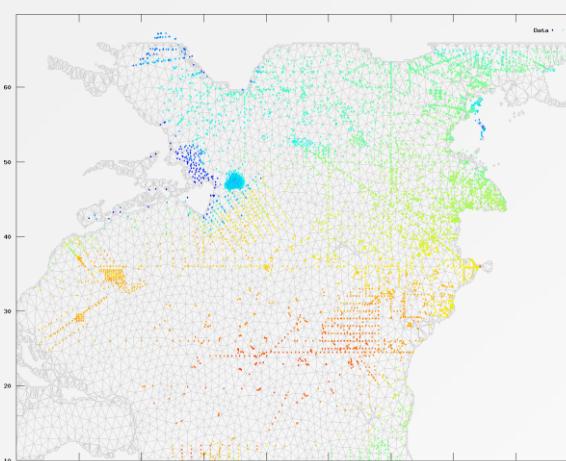
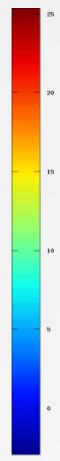
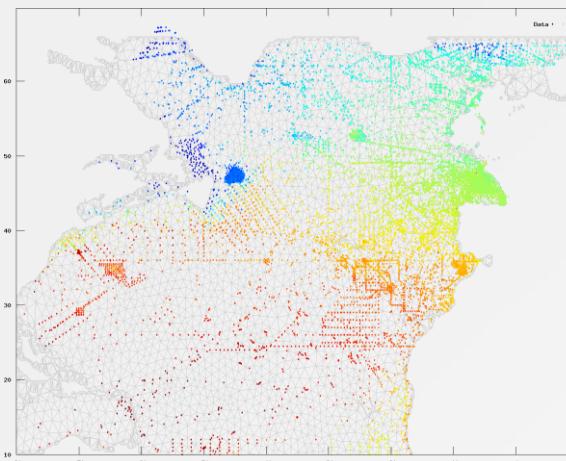
### SeaDataNet2 DIVA Analysis error - Salinity.19002012.0707



Error field for Salinity at surface and at 1000m depth

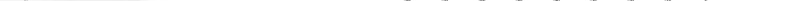
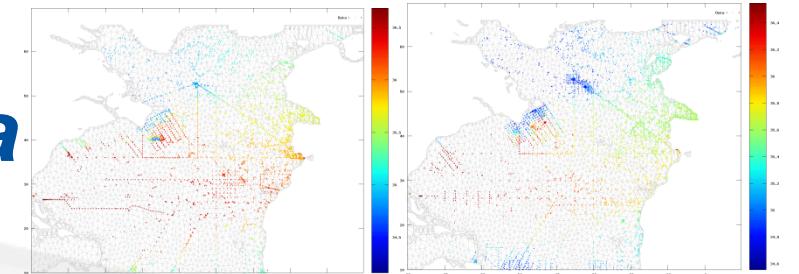
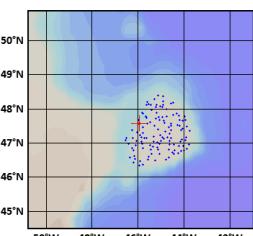
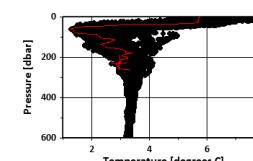
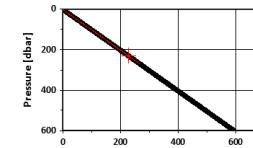


# First run and first bad data



Ocean Data View - //oia1/oo10\_oo/co04/co0411/SEADATANET2/SDN2014\_Aggregated\_Dataset\_ODV465/SDN\_2014-03\_TS\_Atlantic\_QC2\_465

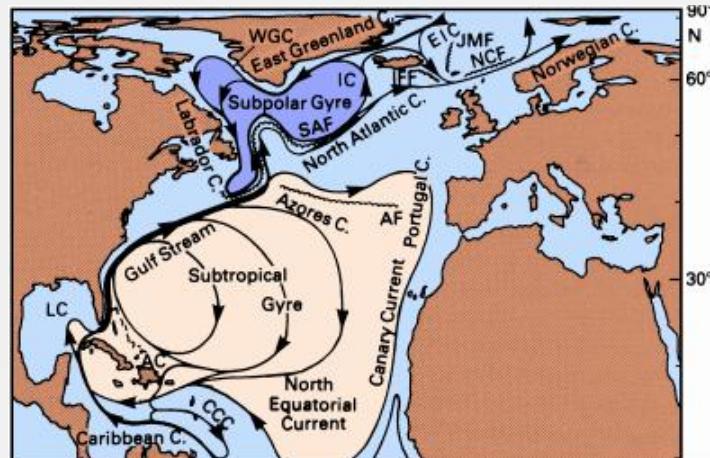
File Collection View Import Export Tools Help



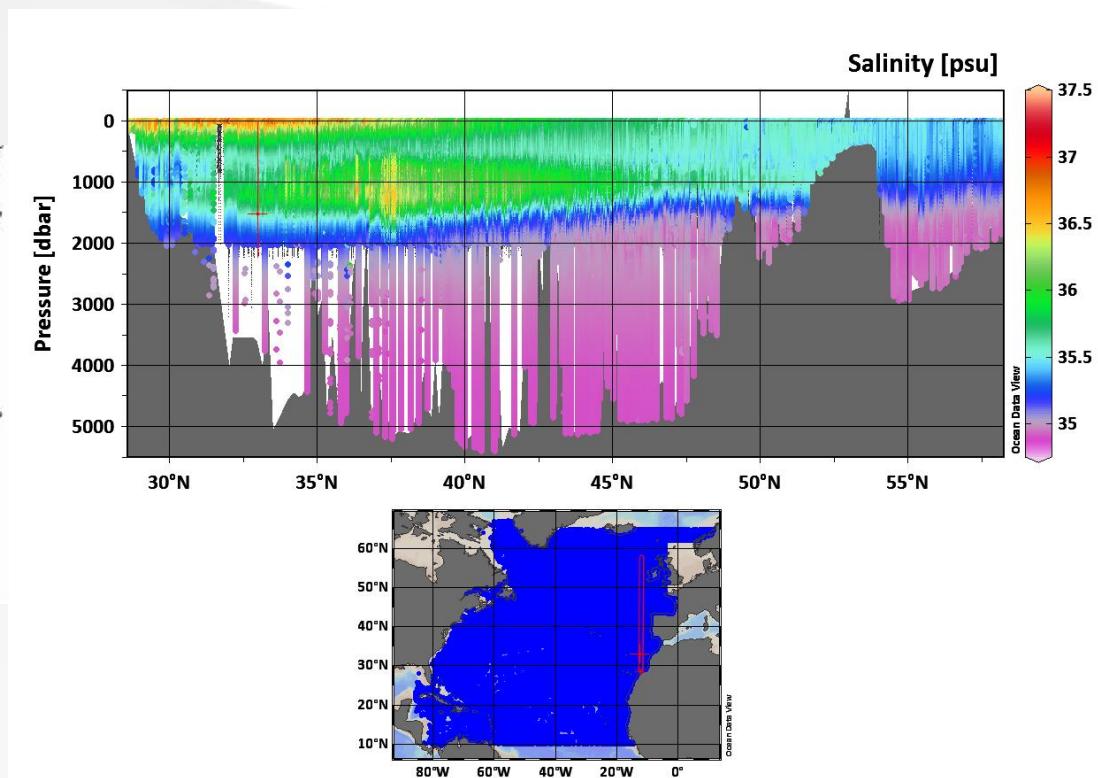
Station ID: 272658	
Accession Number	272660
Cruise	FLEMISH CAP 1991
Station	00340 (C)
Position	45.93°W / 47.58°N
Date	07 July 1991
Time	04:39:00.000
Pressure Range [dbar]	[1 - 270]
LOCAL_CTD_ID	S291991070300340_353
EDMO_code	353
Bott. Depth [m]	999999
Platform type	31
Instrument / gear type	130
Originator	1404
CDI-record id	101966
Data set name	CTD_SD9199107003.dat
Category	AHGT,PSAL,TEMP
CDI-record creation date	2011-03-28 21:20:00.127000000
CDI-partner	353
Sample: 199 / 234	
1: Pressure [dbar]	230
2: Depth [m]	228
3: Temperature [degrees C]	2.96
4: Salinity [psu]	34.601
dvdt: Potential Density Anomaly $\sigma_0$ [kg/m <sup>3</sup> ]	27.573
Isosurface Values	
Longitude	314.070
Latitude	47.580
Time [yr]	1991.513
Day of Year	188



## First results – study on surface level and 1000m

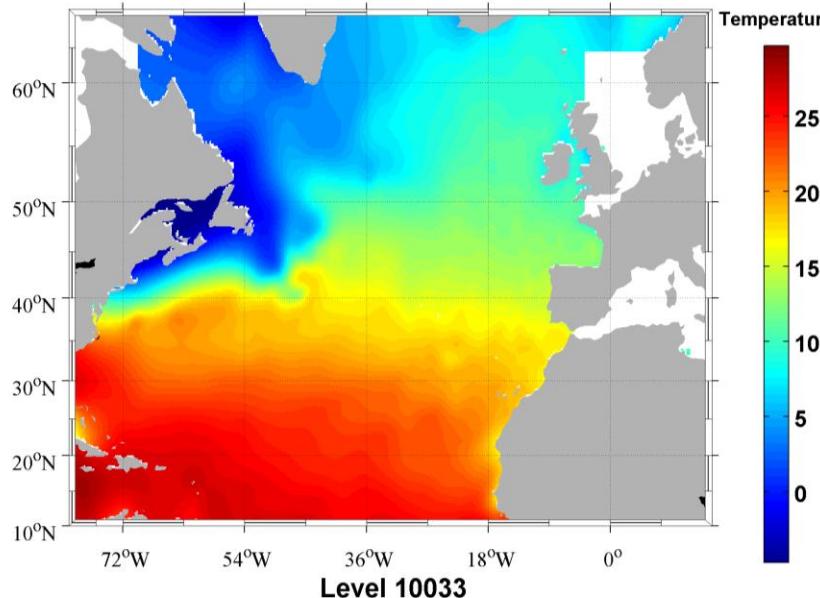


Tomczak, Matthias & J Stuart Godfrey: Regional  
Oceanography: an Introduction  
2nd edition (2003))

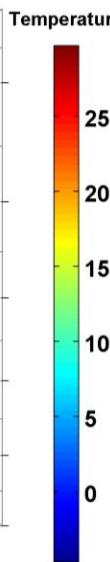


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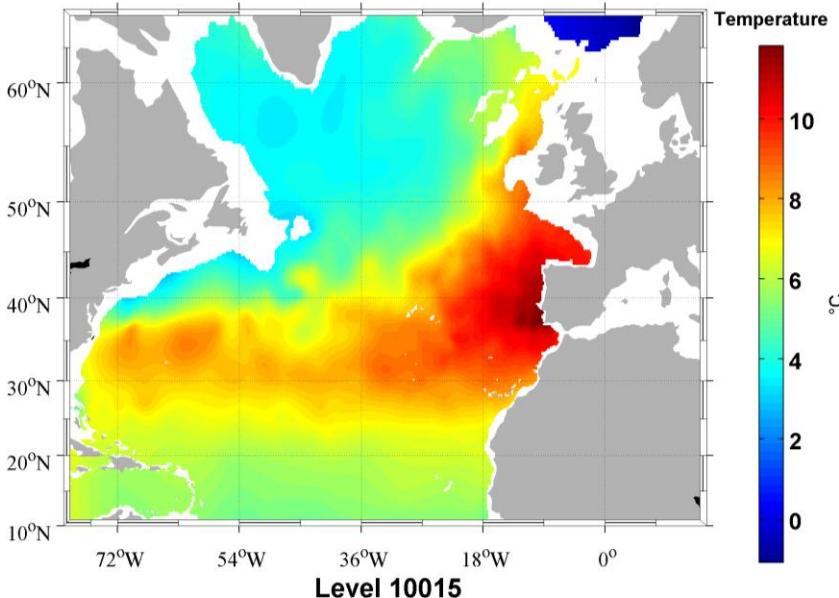
### SeaDataNet2 DIVA Analysis - Temperature.19002012.0101



Level 10033



Surface

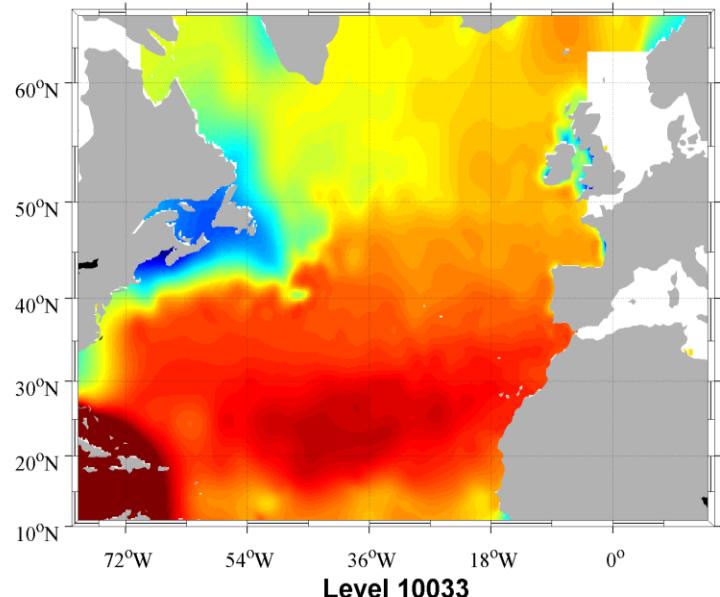


Level 10015

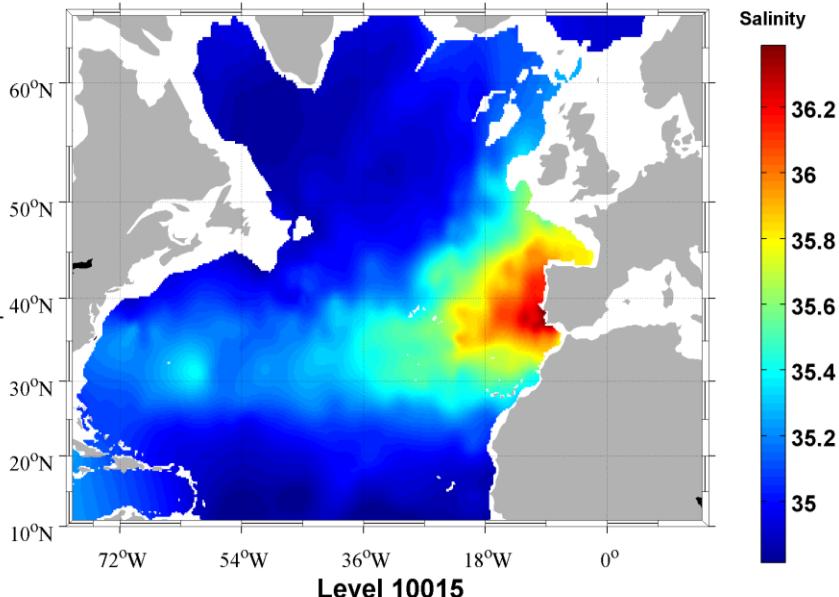
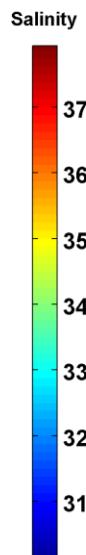
1000m



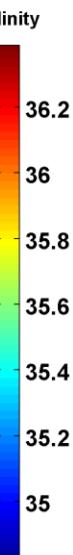
### SeaDataNet2 DIVA Analysis - Salinity.19002012.0101



Level 10033



Level 10015





Tomczak, Matthias & J Stuart Godfrey: *Regional Oceanography: an Introduction*  
2nd edition (2003))

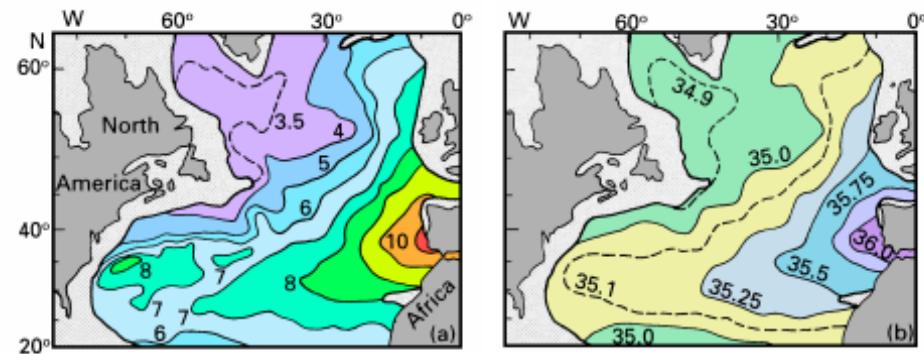
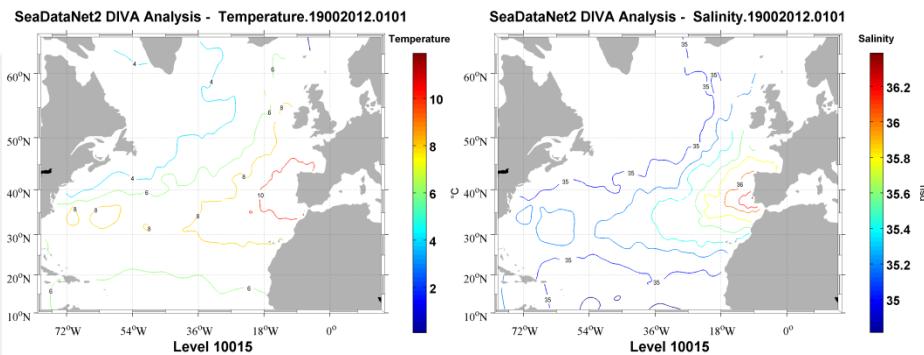
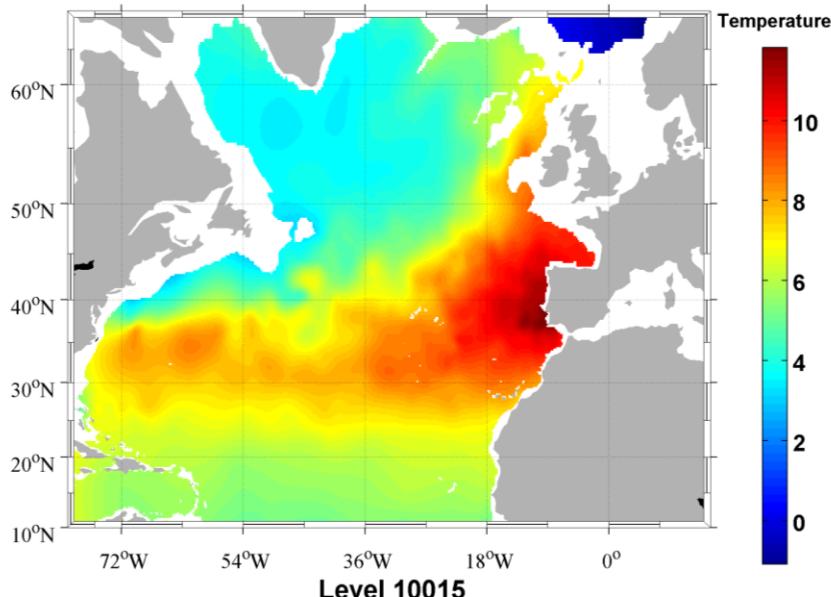
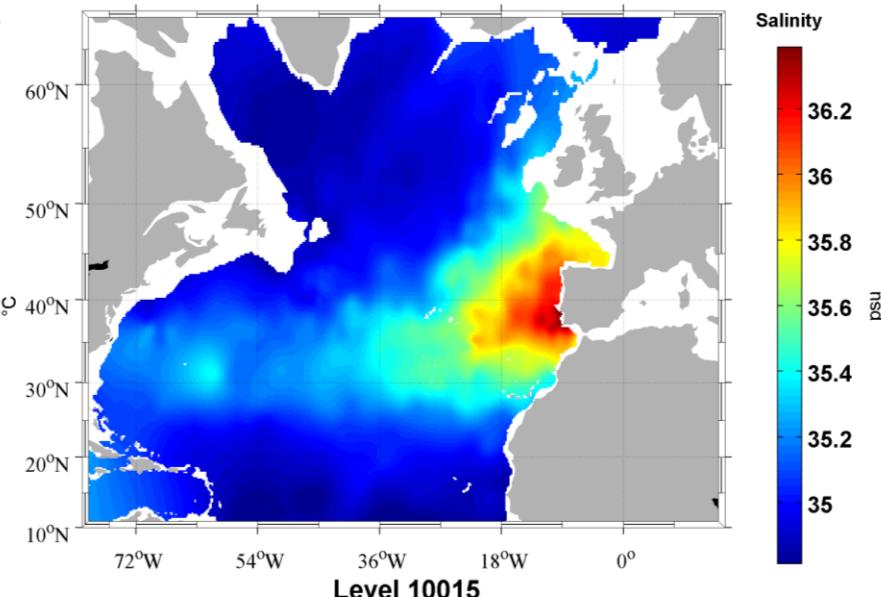


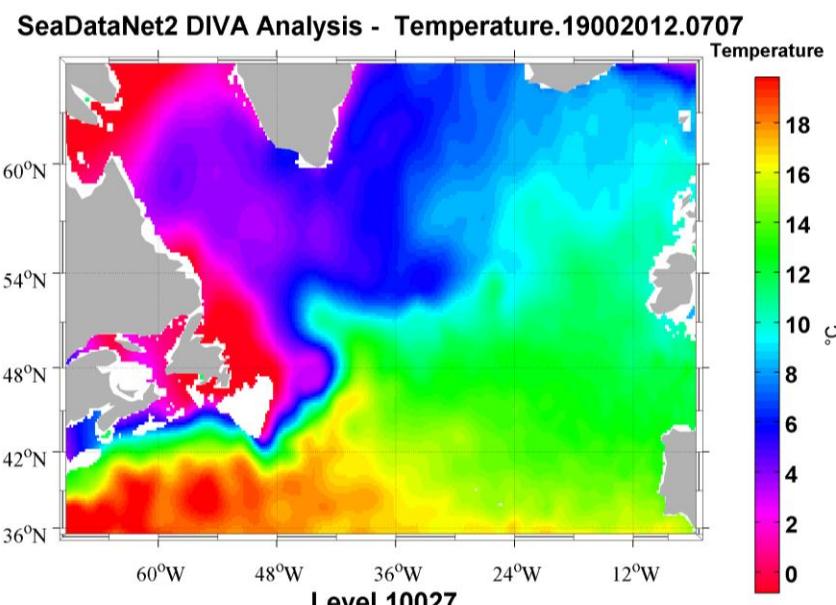
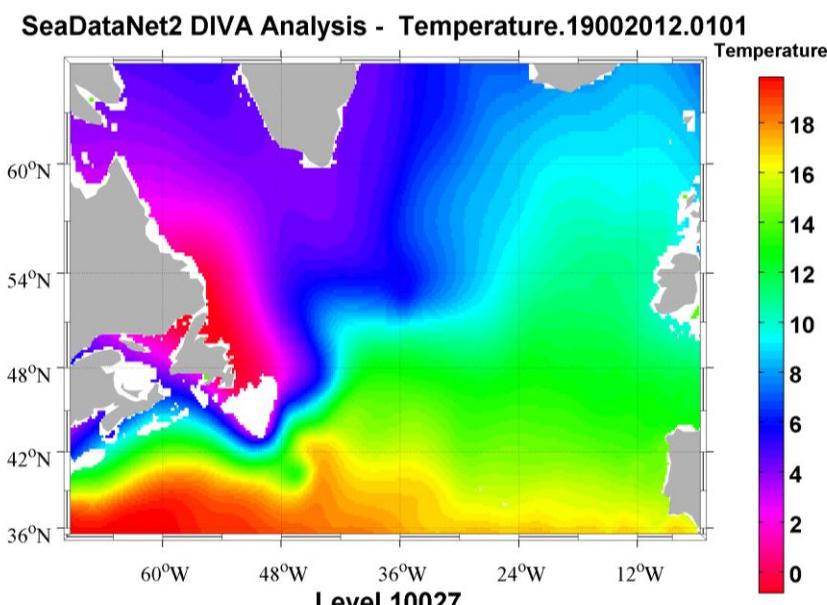
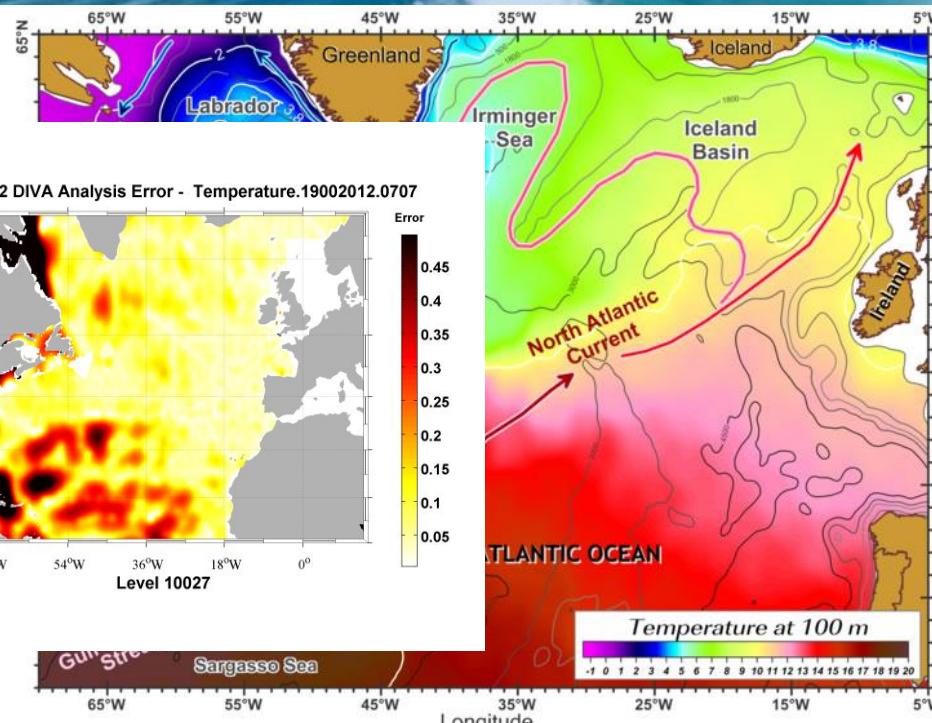
Fig. 15.4. Temperature ( $^{\circ}\text{C}$ ) (a) and salinity (b) in the North Atlantic Ocean at 1000 m depth.

SeaDataNet2 DIVA Analysis - Temperature.19002012.0101



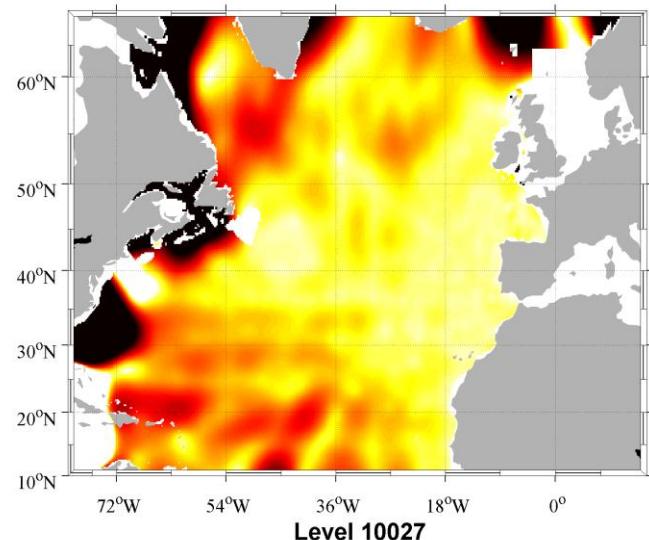
SeaDataNet2 DIVA Analysis - Salinity.19002012.0101



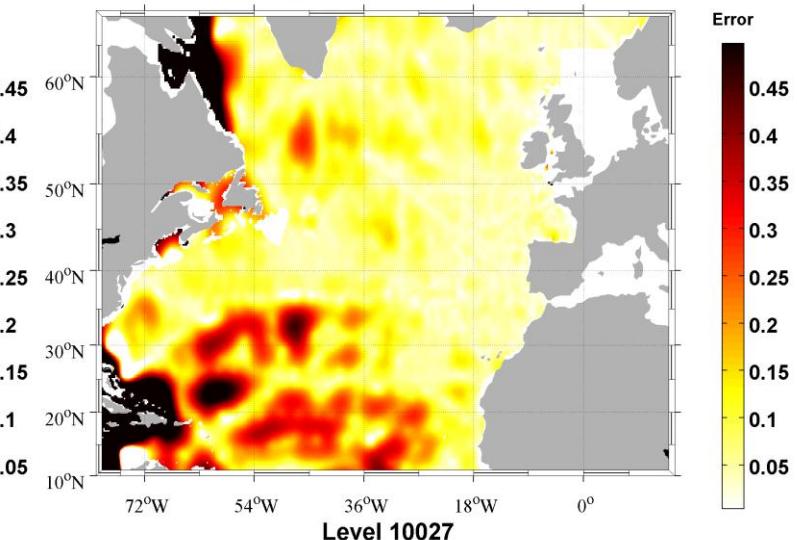


## Level at 100m depth

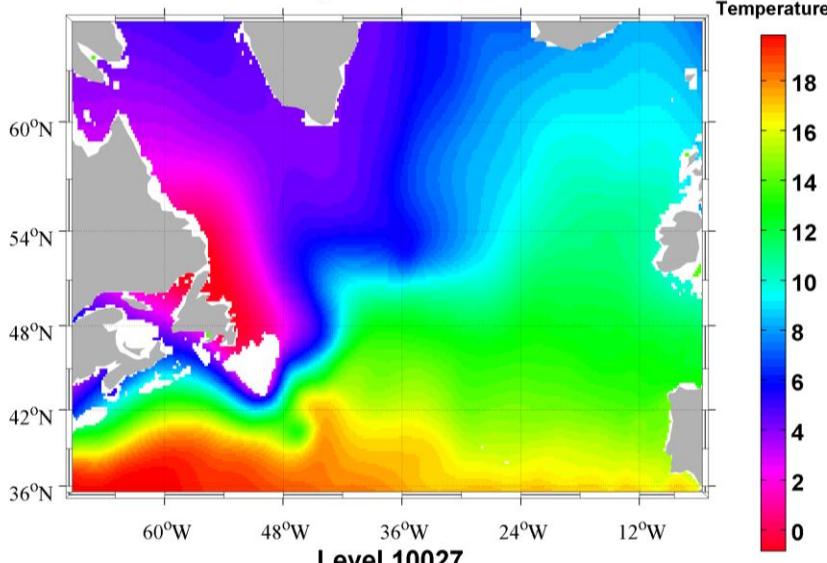
SeaDataNet2 DIVA Analysis error - Temperature.19002012.0101



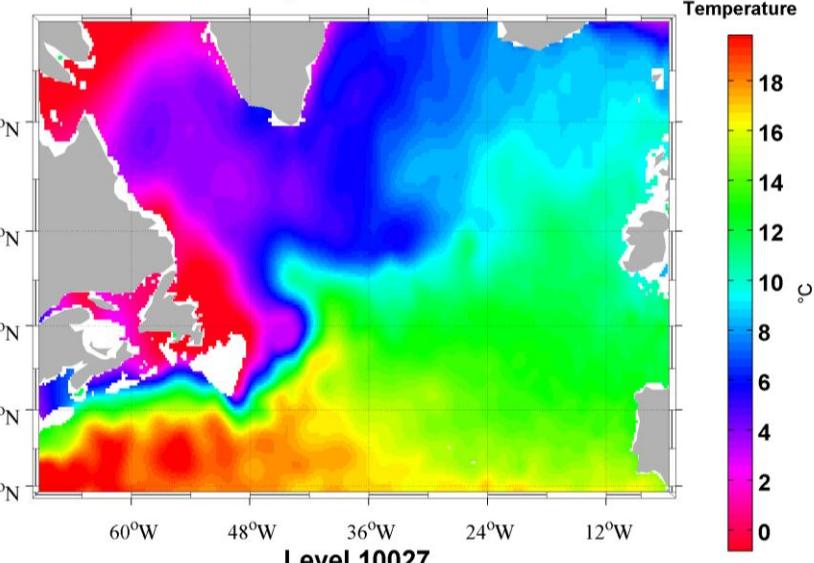
SeaDataNet2 DIVA Analysis Error - Temperature.19002012.0707



SeaDataNet2 DIVA Analysis - Temperature.19002012.0101



SeaDataNet2 DIVA Analysis - Temperature.19002012.0707



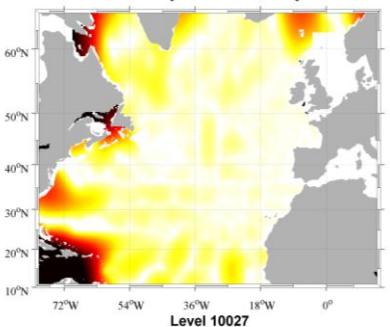
**Level at 100m depth**



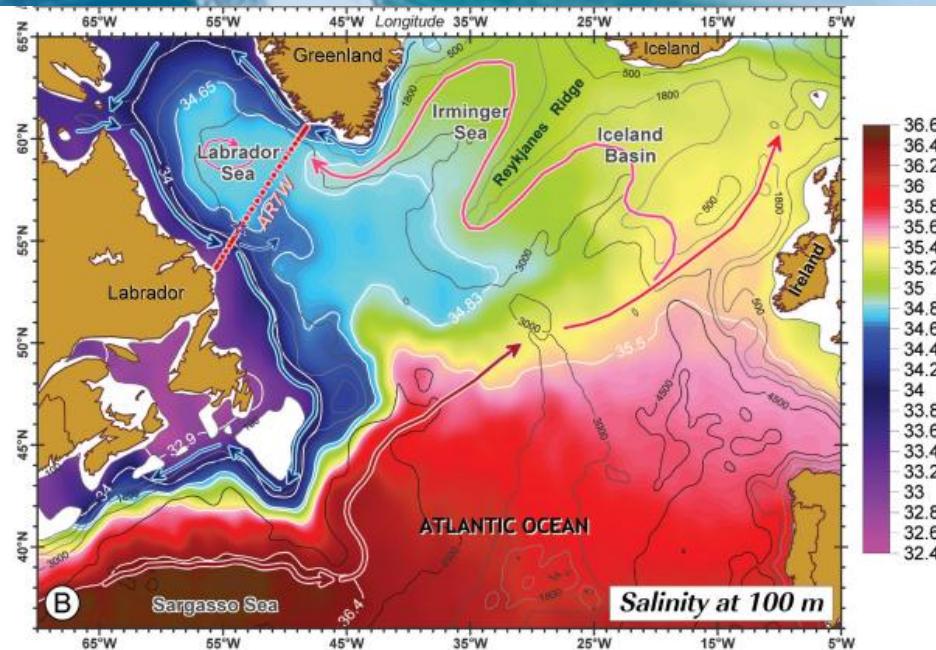
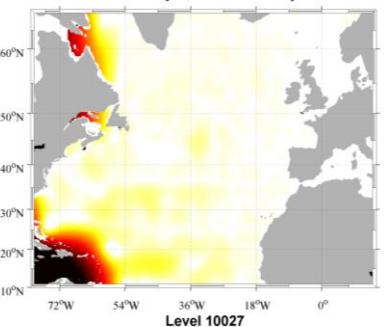
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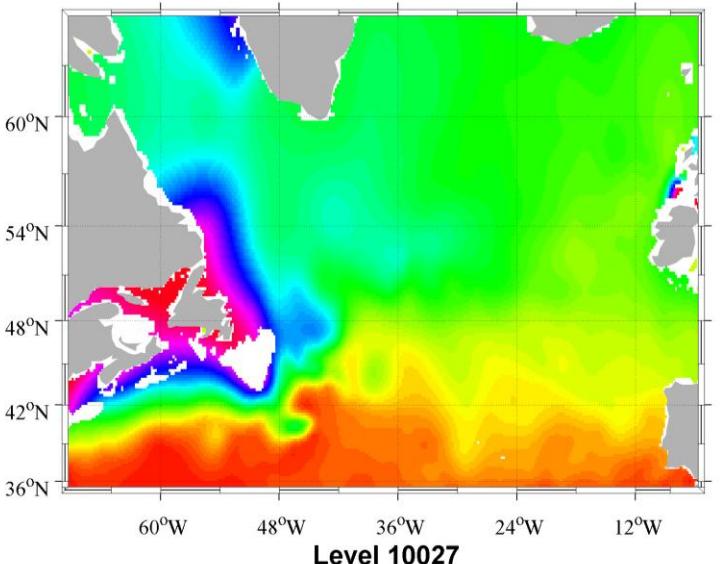
SeaDataNet2 DIVA Analysis Error - Salinity.19002012.0101



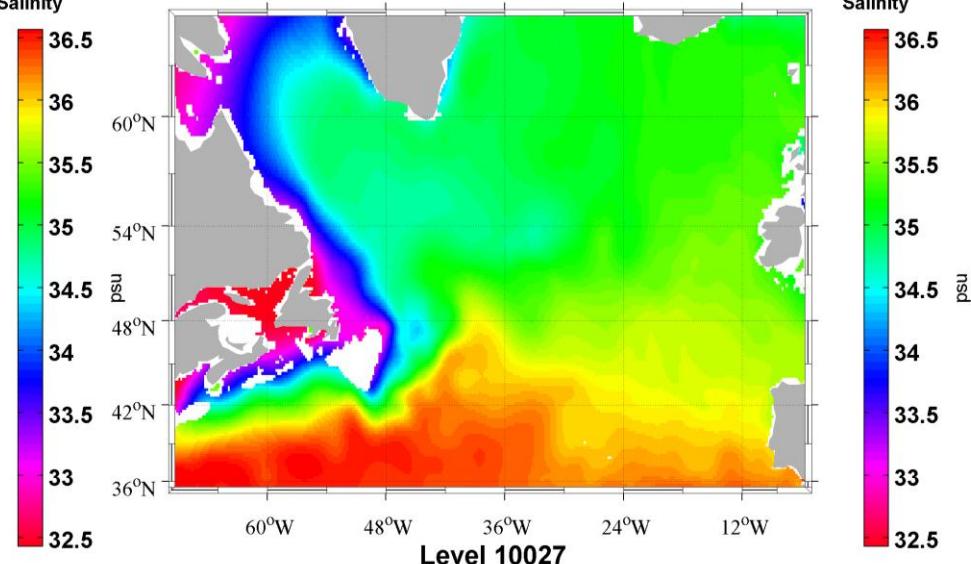
SeaDataNet2 DIVA Analysis Error - Salinity.19002012.0707



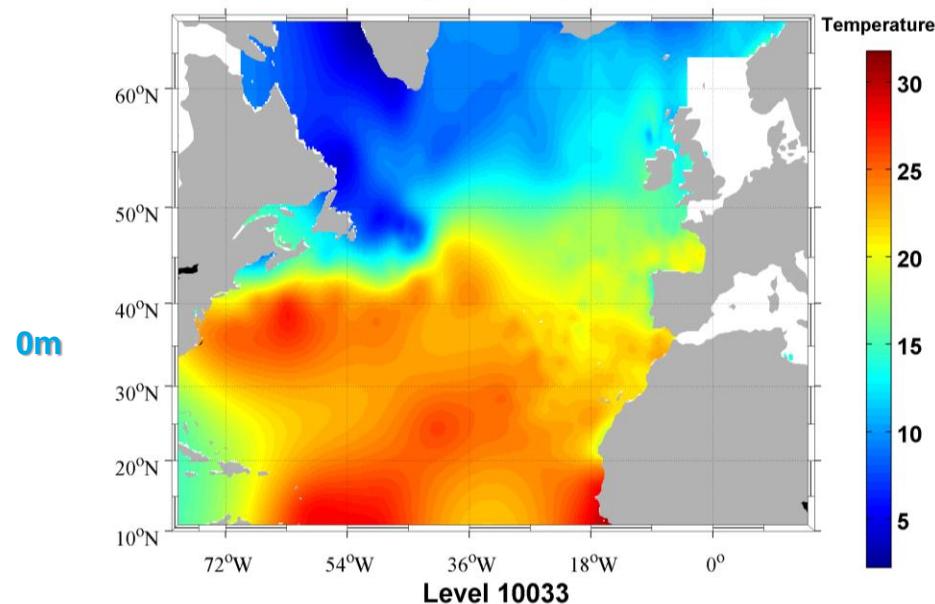
SeaDataNet2 DIVA Analysis - Salinity.19002012.0101



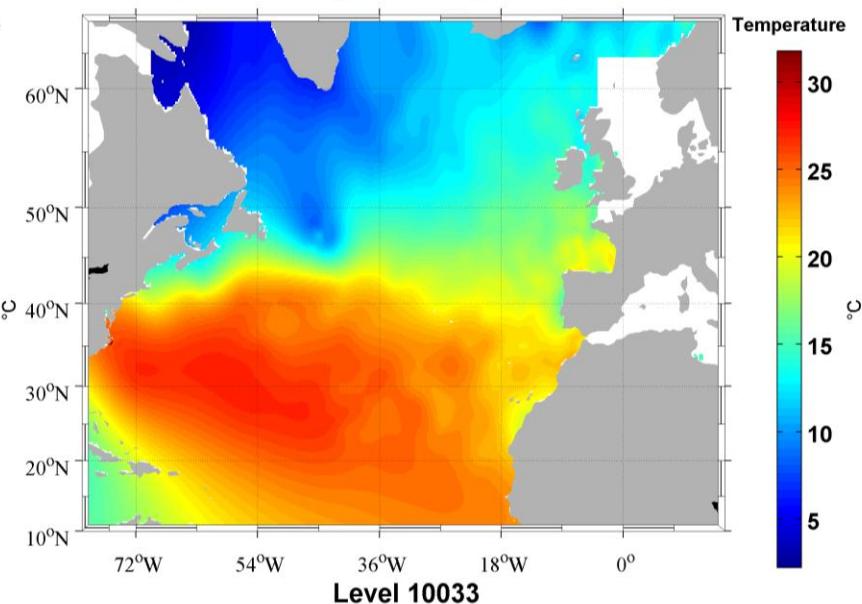
SeaDataNet2 DIVA Analysis - Salinity.19002012.0707



SeaDataNet2 DIVA Analysis - Temperature.19901999.0707

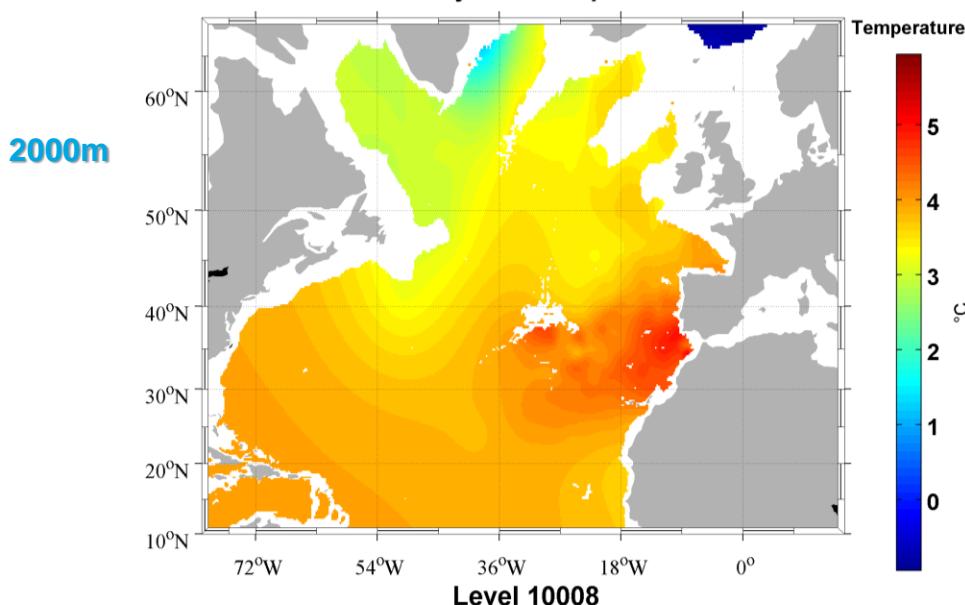


SeaDataNet2 DIVA Analysis - Temperature.20002009.0707

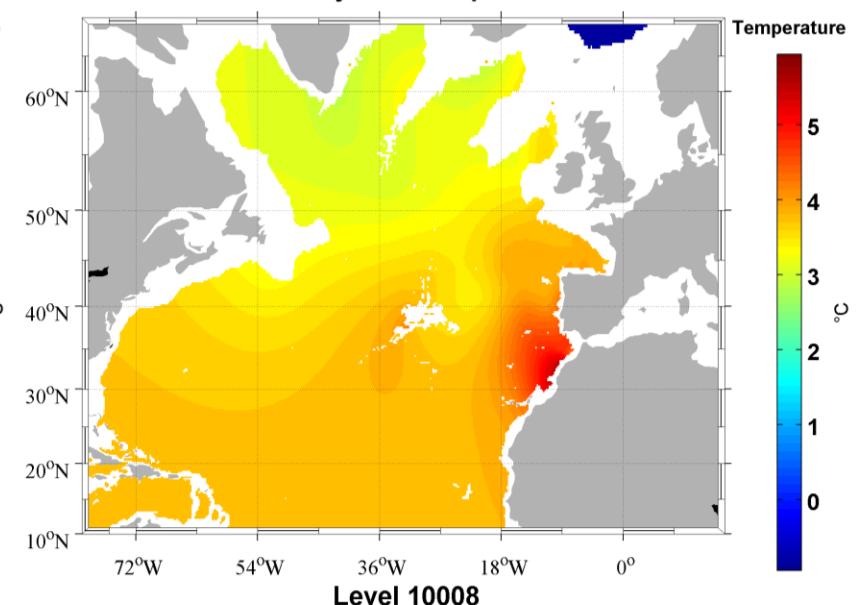


## DECadal STUDY

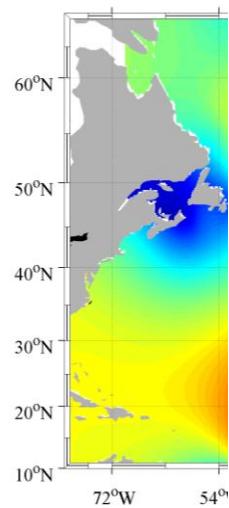
SeaDataNet2 DIVA Analysis - Temperature.19901999.0707



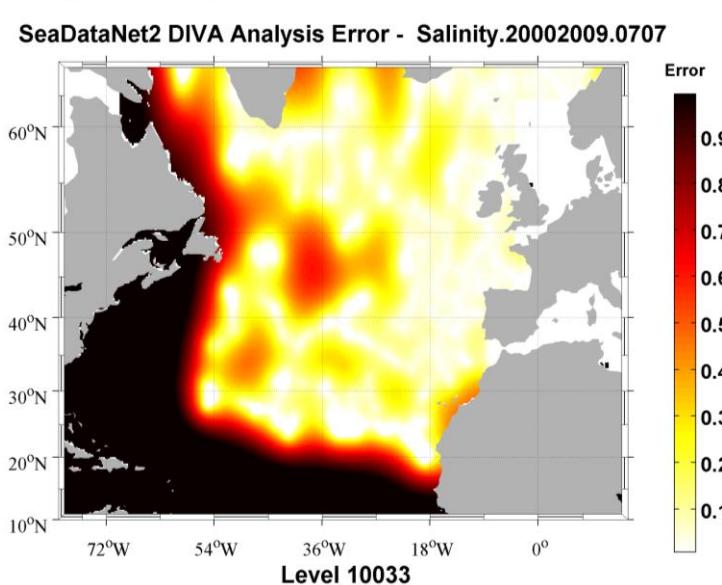
SeaDataNet2 DIVA Analysis - Temperature.20002009.0707



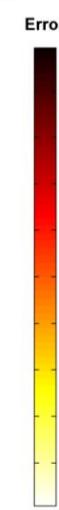
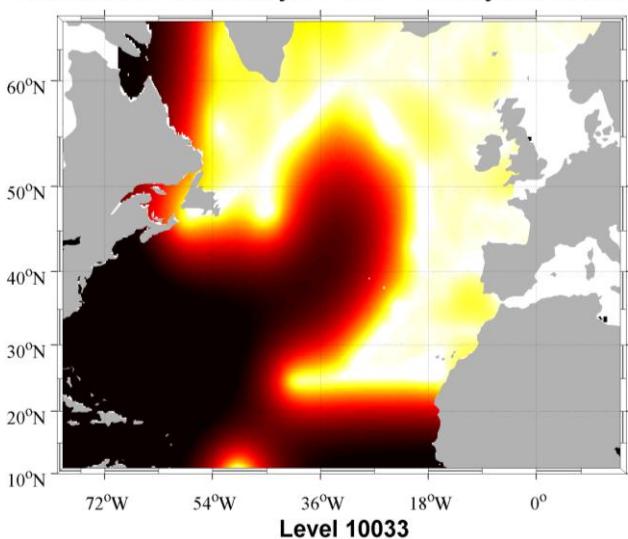
SeaDataNet2 DIVA Analysis - Salinity.19901999.0707



SeaDataNet2 DIVA Analysis - Salinity.20002009.0707

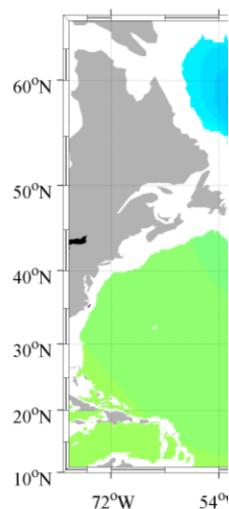


SeaDataNet2 DIVA Analysis Error - Salinity.19901999.0707

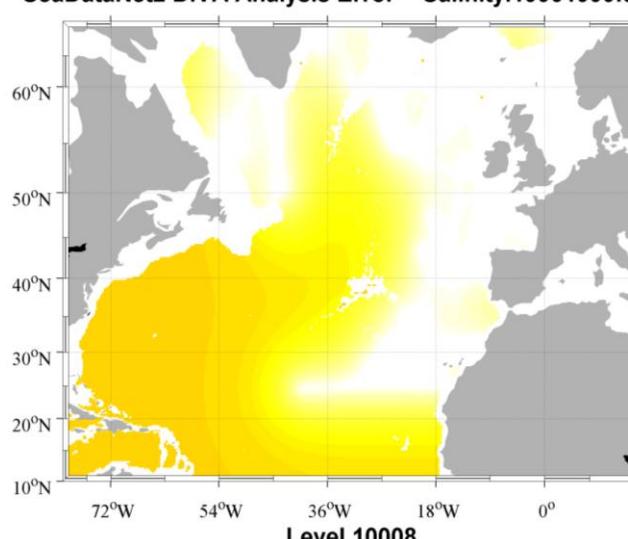


Level 10033

SeaDataNet2 DI

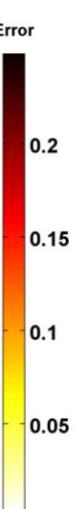
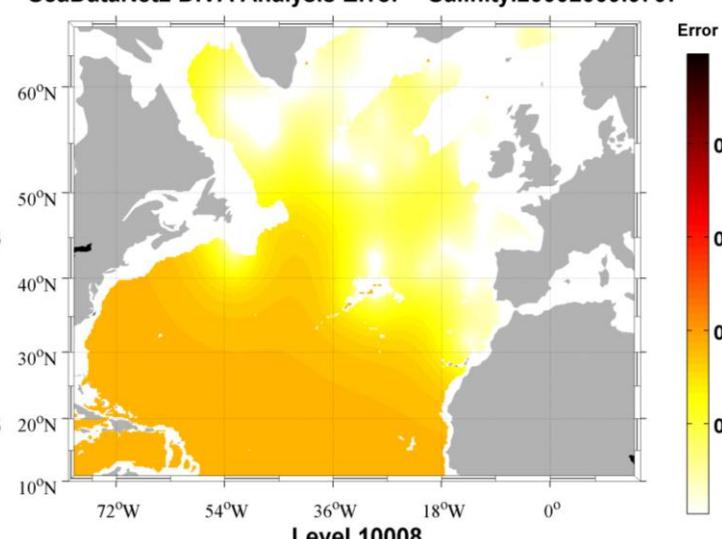


SeaDataNet2 DIVA Analysis Error - Salinity.19901999.0707



Level 10008

SeaDataNet2 DIVA Analysis Error - Salinity.20002009.0707



sdn-userdesk@seadatanet.org – www.seadatanet.org



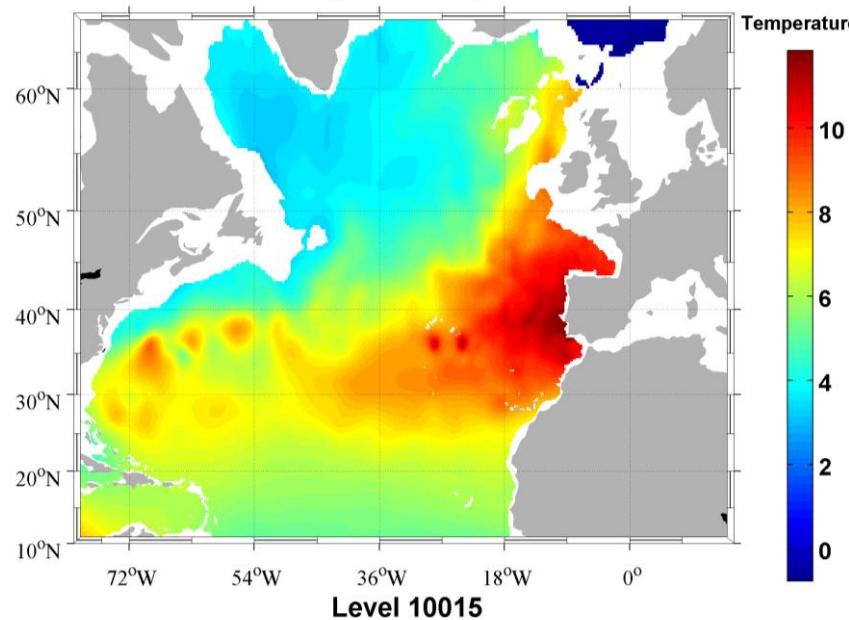
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## **COMPARISON - VALIDATION**

- WOA 2013
- ISAS
- Others

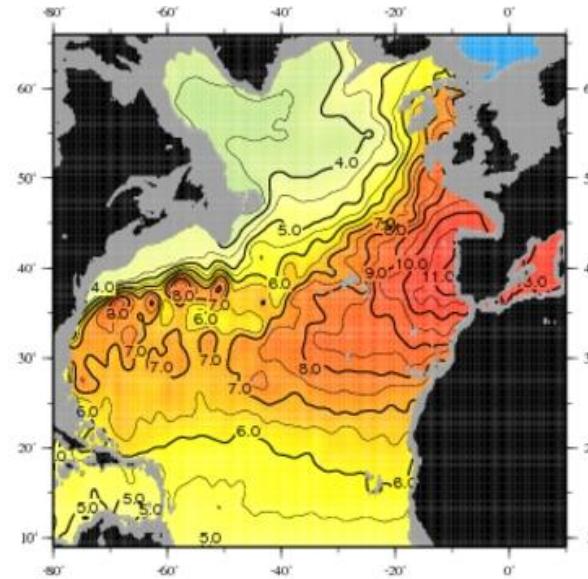
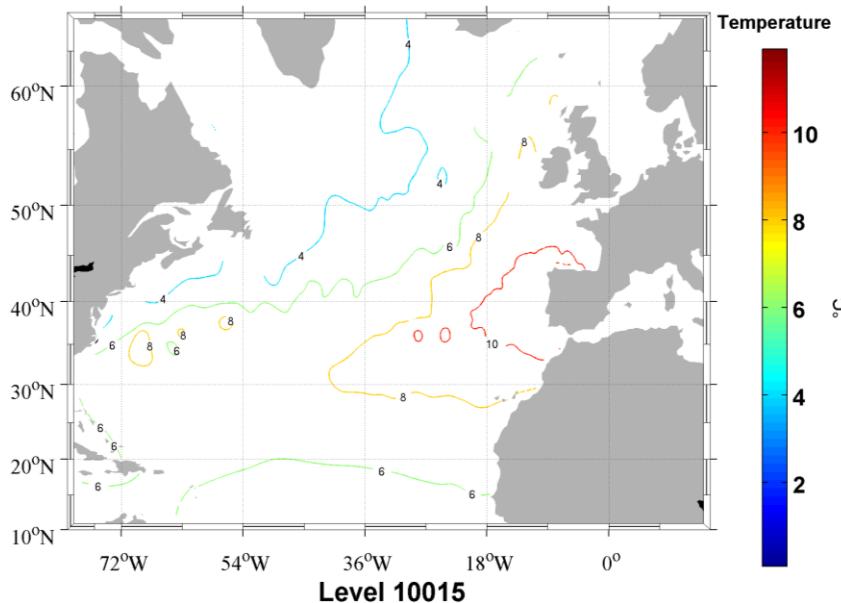
SeaDataNet2 DIVA Analysis - Temperature.19002012.0707



STRUCTURE  
DATA

**WOD 2013**

SeaDataNet2 DIVA Analysis - Temperature.19002012.0707



July mean temperature [°C] at 1000 m. depth.

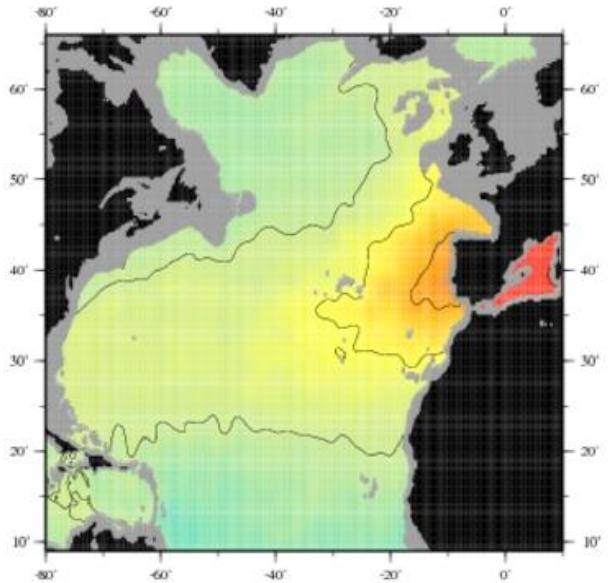
Min Value= -1.99 Max Value= 13.37 Contour Interval= 0.50  
1/4° Climatology

31 Mar 2015

Color Scale

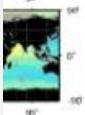
10.5
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0

Locarnini, R. A., A. V. Mishonov, J. I. Antonov, T. P. Boyer, H. E. Garcia, O. K. Baranova, M. M. Zweng, C. R. Paver, J. R. Reagan, D. R. Johnson, M. Hamilton, and D. Seidov, 2013. *World Ocean Atlas 2013, Volume 1: Temperature*. S. Levitus, Ed., A. Mishonov Technical Ed.; NOAA Atlas NESDIS 73, 40 pp.

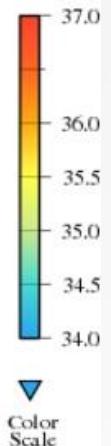


July mean salinity [PSS] at 1000 m. depth.

Min Value= 34.49 Max Value= 38.56 Contour Interval= 0.50  
1/4° Climatology

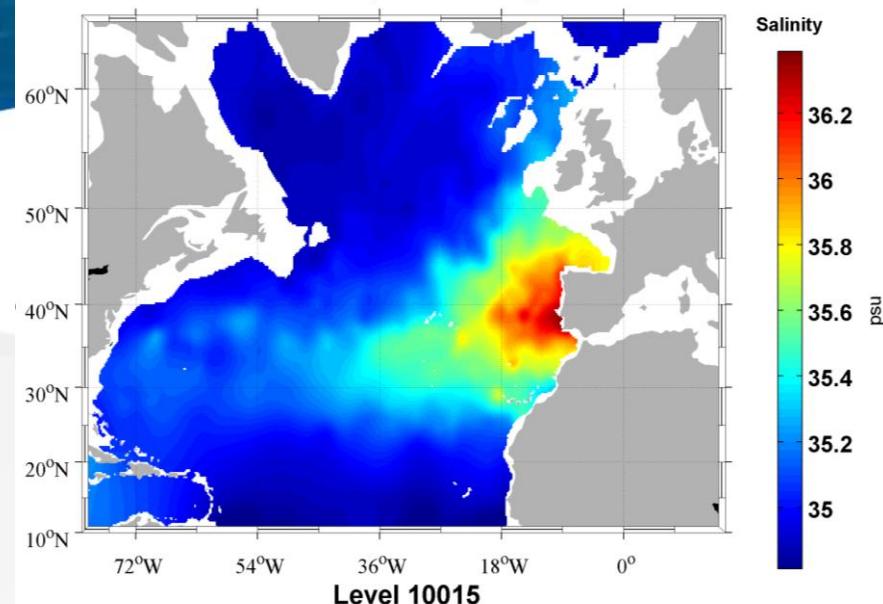


31 Mar 2015

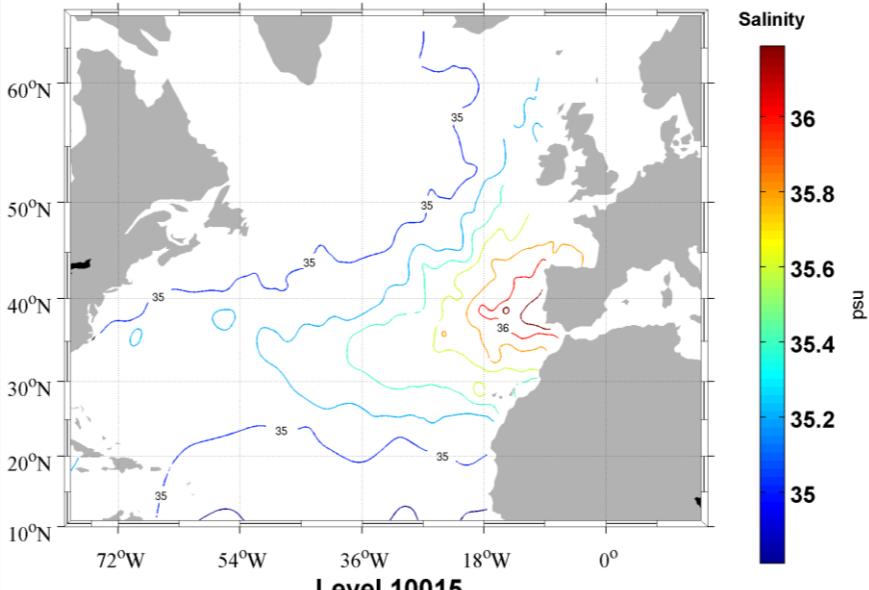


Zweng, M.M., J.R. Reagan, J.I. Antonov, R.A. Locarnini, A.V. Mishonov, T.P. Boyer, H.E. Garcia, O.K. Baranova, D.R. Johnson, D.Seidov, M.M. Biddle, 2013. *World Ocean Atlas 2013, Volume 2: Salinity*. S. Levitus, Ed., A. Mishonov Technical Ed.; NOAA Atlas NESDIS 74, 39 pp.

SeaDataNet2 DIVA Analysis - Salinity.19002012.0707



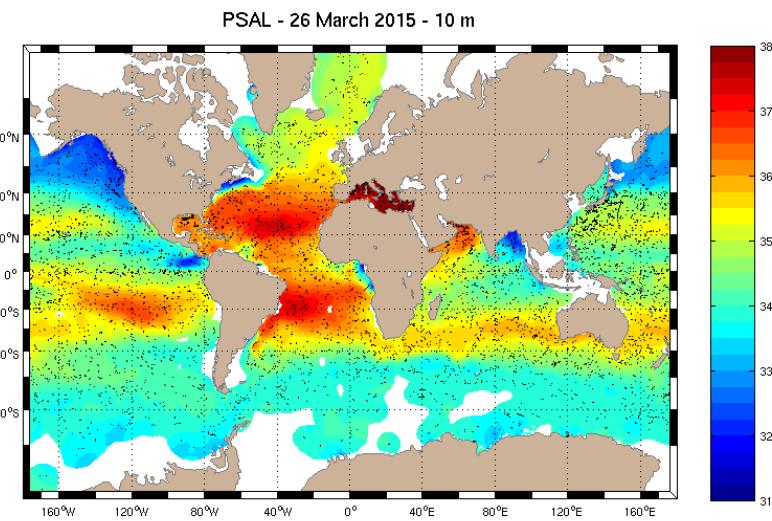
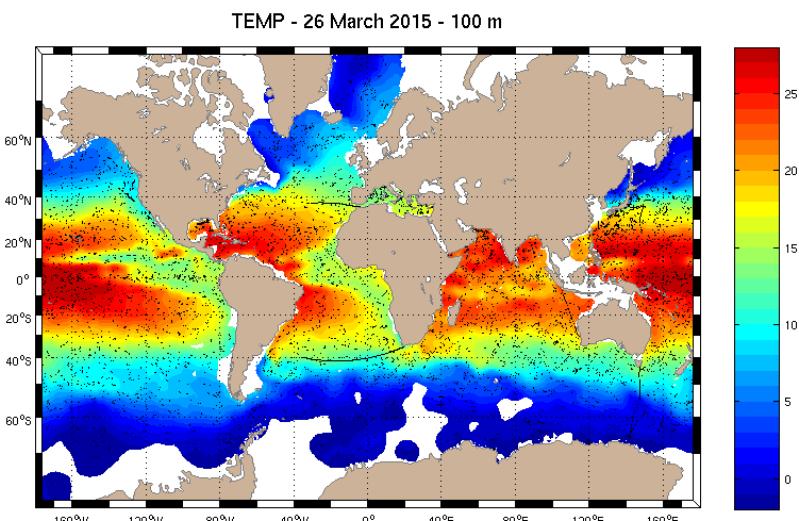
SeaDataNet2 DIVA Analysis - Salinity.19002012.0707





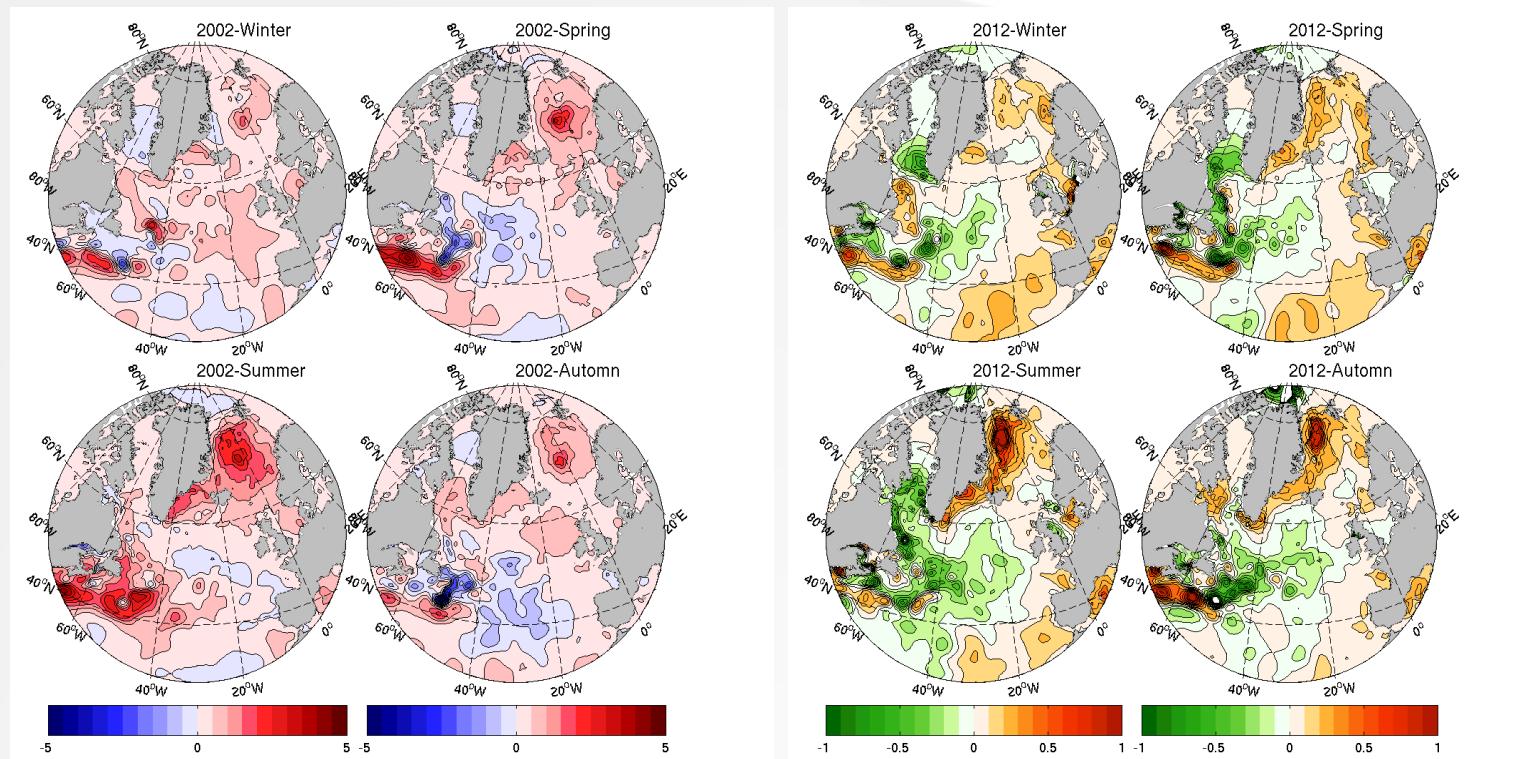
# Other validation (ISAS, Ifremer)

<http://www.coriolis.eu.org/Data-Products/Products/Gridded-Fields>





## Temperature and Salinity anomalies for near surface seasonal cycles (2002 for temperature and 2012 for salinity)





## DIVA method

- ispec (param.par) change errors output
- Need to exploit more in details the log and error list
- Min Max L & SN

## Validation

- To exploite more in details model results
- Comparison not only with plots but also from gridded fields



## Difficulties

- DIVA different versions (installation – cygwin and NetCDF library need to be updated)
- DIVA : several runs : cleaning of the directories not clear
- DIVA : not easy following results between DIVA3D/divastripped/output/ and JRA4/Climatology/output/
- DIVA : error lists : not easy to know what we have to do (true errors or just warning ?)
- DATASET : Bad data still existing (feedback to originator)



## ***Improvements – tuning (for next version)***

- Decrease domain definition (focus on east)
- On boundaries : add others datasets (north sea, artic sea, med sea close to Gibraltar strait)
- Remove deepest levels (not enough data)
- Check outliers for some levels
- Use data detrending (group on years/levels)
- Use advection
- Use better reference field
- See description metadata field in NetCDF files