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IBIRYS reanalysis 2002-2011

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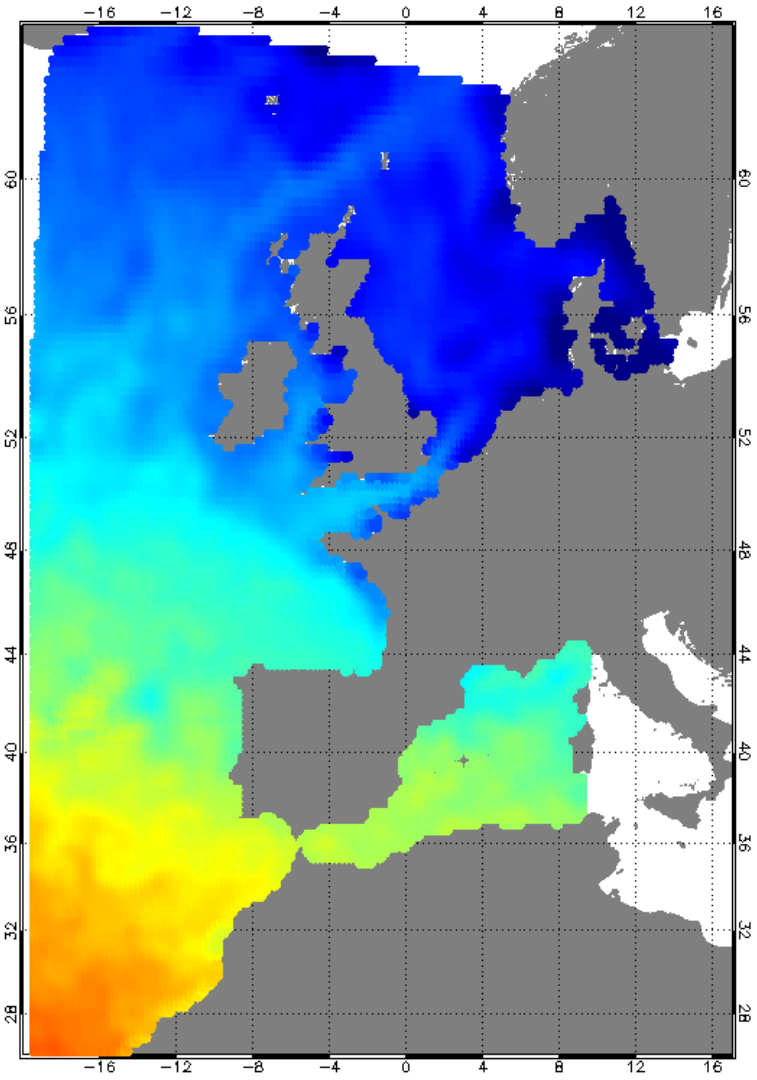
1) MERCATOR OCEAN 2) CLS 3) PUERTOS DEL ESTADO

GODAE COSS-TT Lisbon 2015

OUTLINE

- Configuration
- Metrics
- Processus
- Conclusions / Perspectives



Configuration

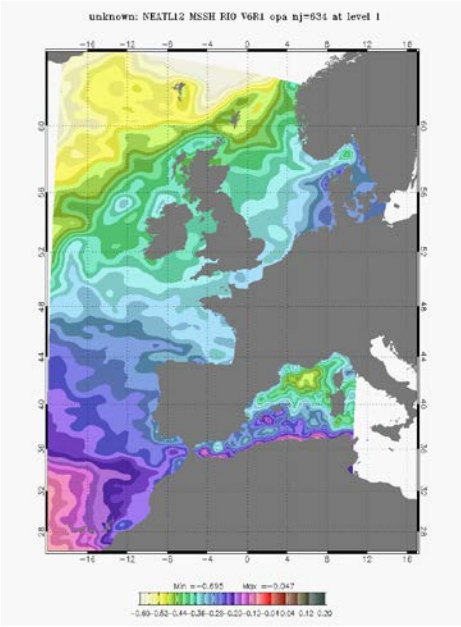
	Reanalysis IBI V1 (2002-2011)
NEMO version	2.3
Horizontal resolution	1/12° (5-6 km)
Vertical coord.	z*=f(ssh) 75 levels Partial bottom cells
Bathymetry	Composite (GEBCO_08 + different local databases)
Free surface	Explicit, non-linear, time-splitting
Open boundary data	From daily 1/4° GLORYS2V3
Vertical mixing	k-epsilon
Tracer advection	QUICKEST + ZALEZAK
Rivers	As lateral point sources Merge of daily SMHI & PREVIMER & Monthly climatology (GRDC), 35 rivers
Atm. forcing	ECMWF ERA INTERIM (3h) + analytic diurnal cycle from daily short wave irradiance
Surge capability	Yes
Tides	Yes (11 tidal components, astro pot)
Ocean color effects	Merged SEAWIF/IFREMER kpar climatology
IC & OBCs	GLORYS2V3 ¼°
Data Assimilation	SAM2 (SEEK Filter) + IAU

GLORYS2V3: NEMO code, ¼° resol, 75 z levels, ECMWF ERA INTERIM

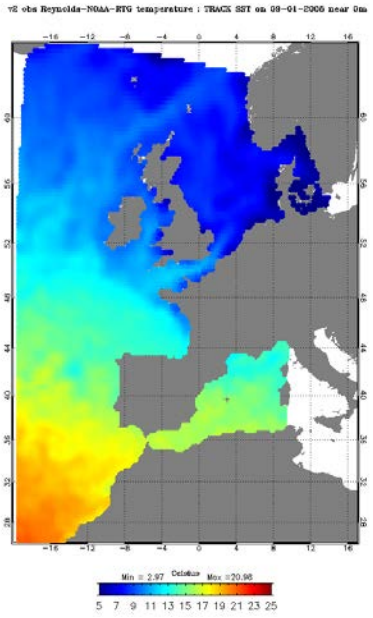
Assimilation obs. data

- Along track altimeter data **(AVISO ALTO/DUACS):** Jason1, Envisat and GFO
- Temperature and Salinity in-situ profiles **(provided by CORIOLIS including ARGO)**
- Sea Surface Temperature : **AVHRR_SST (1/4° x 1/4°)**
- MADT : CNES_CLS09 ***(Rio et al, CLS 2009)***

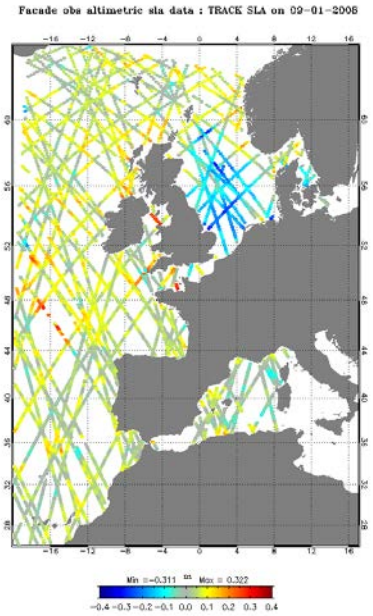
MDT_CNES-CLS09



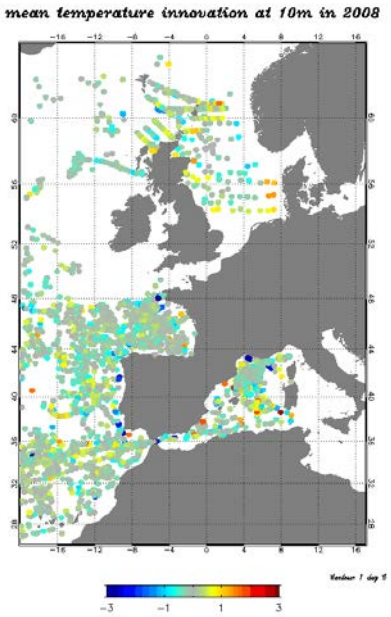
AVHRR _SST



SLA coverage for a week JASON1, ENVISAT & GFO



In situ TS- profiles 2008



Metrics

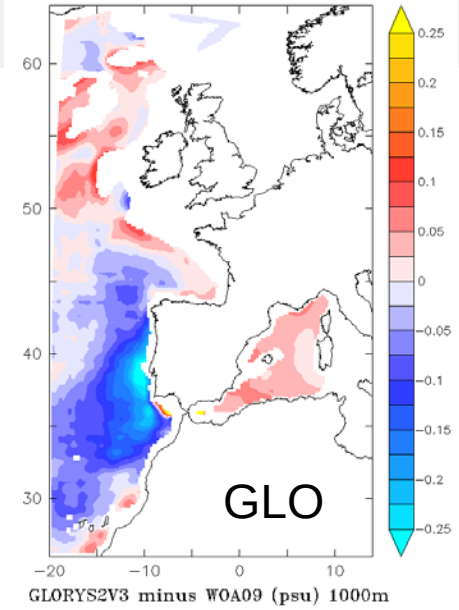
A common framework for the Cal/Val of reanalyses was defined during the MyOcean2 project. Various metrics are used for physics and BGC. These metrics have been applied to IBIRYS and GLORYS reanalyses.

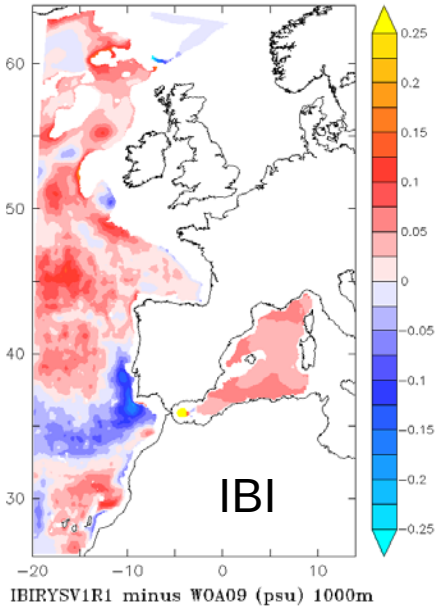
Ocean variables:
- Temperature
- Salinity
- Sea level
- Currents
- Transports
- Sea Ice
- Biogeochemistry

Type of metric (GODAE/MERSEA classification):
- CLASS1 to CLASS4

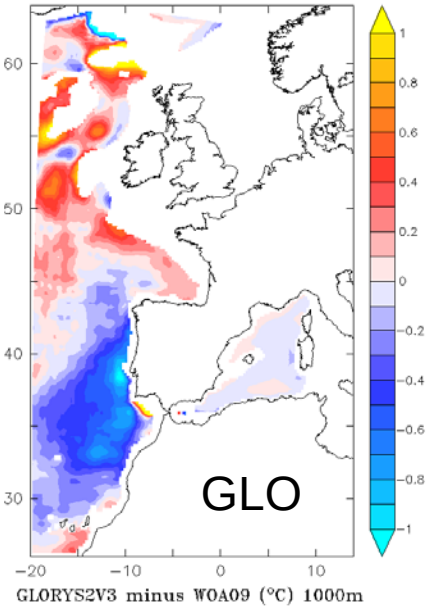
CLASS1 3D MEAN

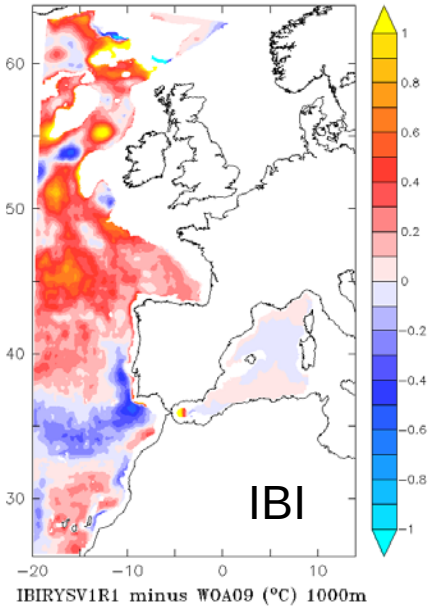
Difference in S and T at Mediterranean level compared to climatology





Salinity: model – WOA09





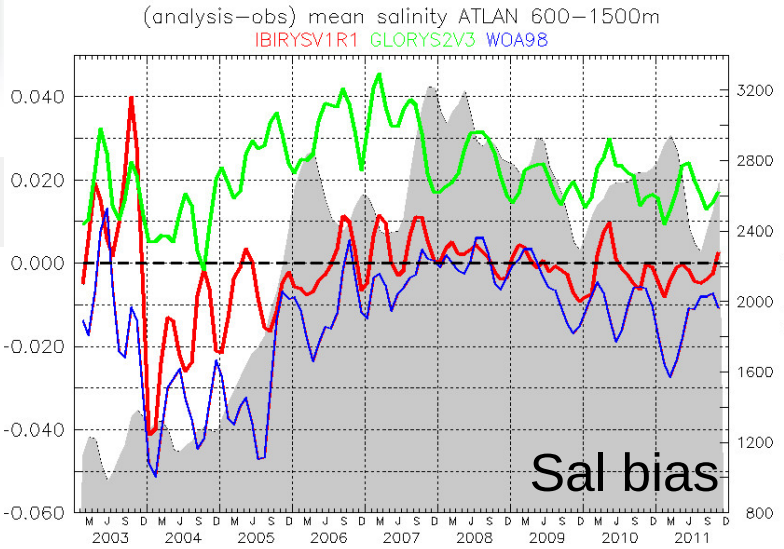
Temperature: model – WOA09

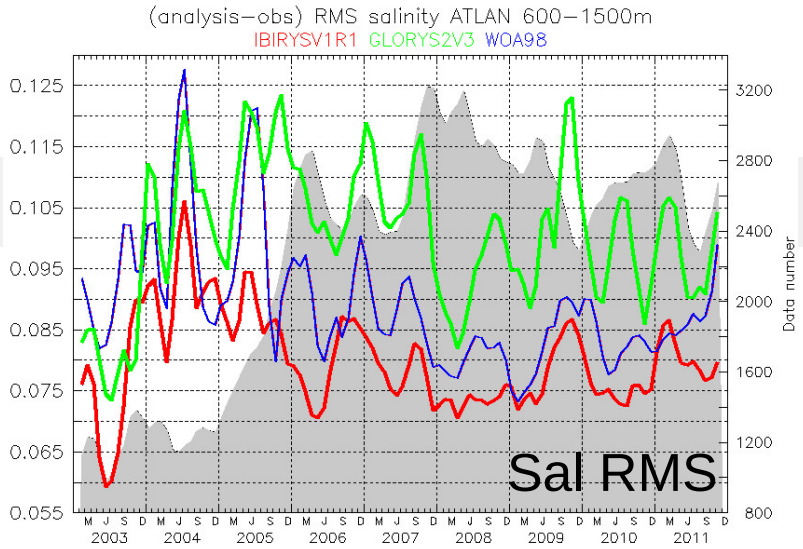
CLASS4-LAYER

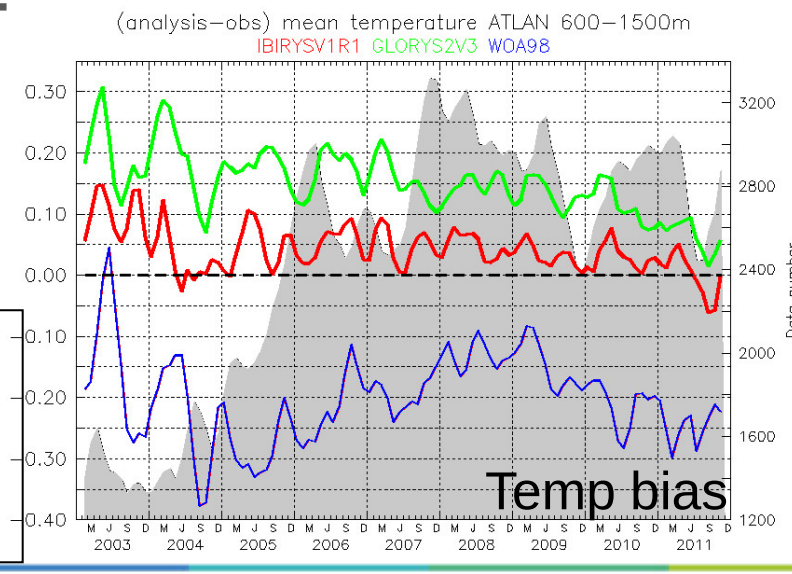
600-1500m layer Atlantic region

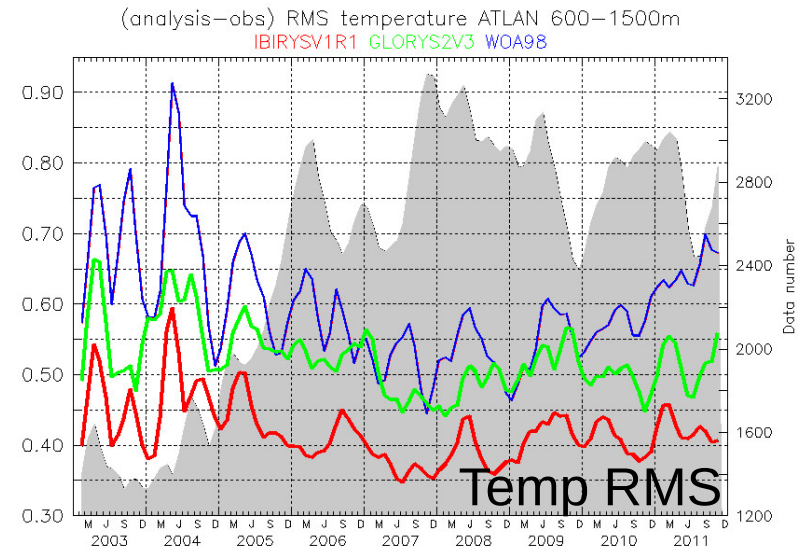
In-situ obs: CORA database

IBIRYS
GLORYS
WOA09





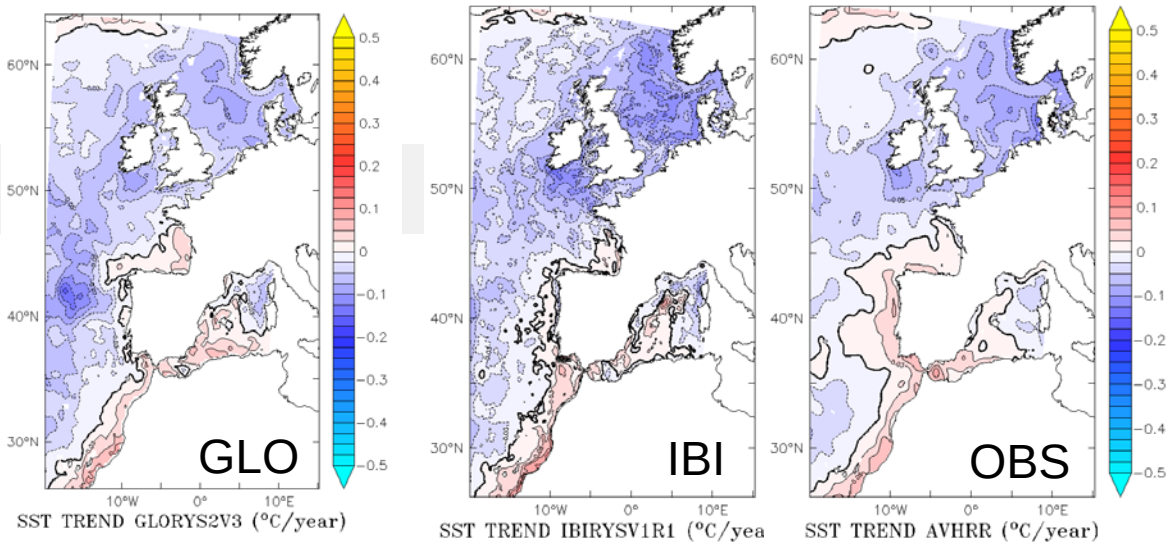




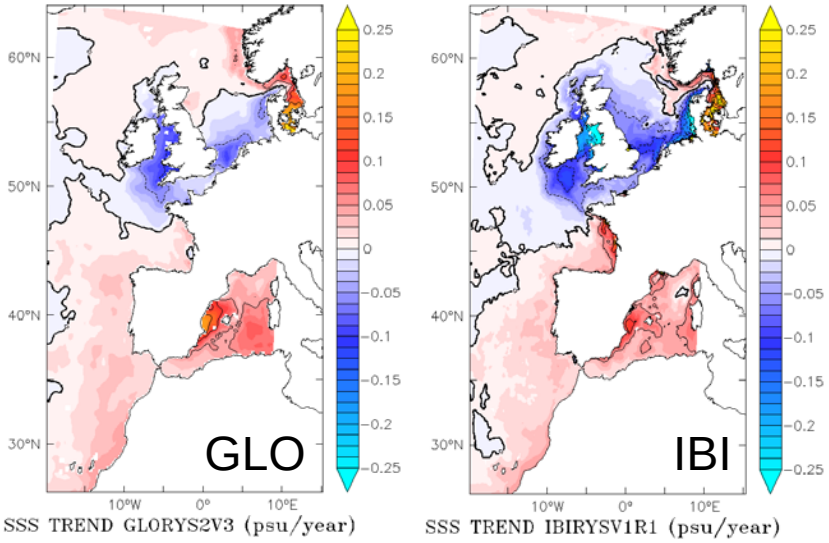
CLASS1-SST-TREND/ CLASS1-SSS-TREND

Consistent trend for IBI and GLO at large scale.

SST trend



SSS trend

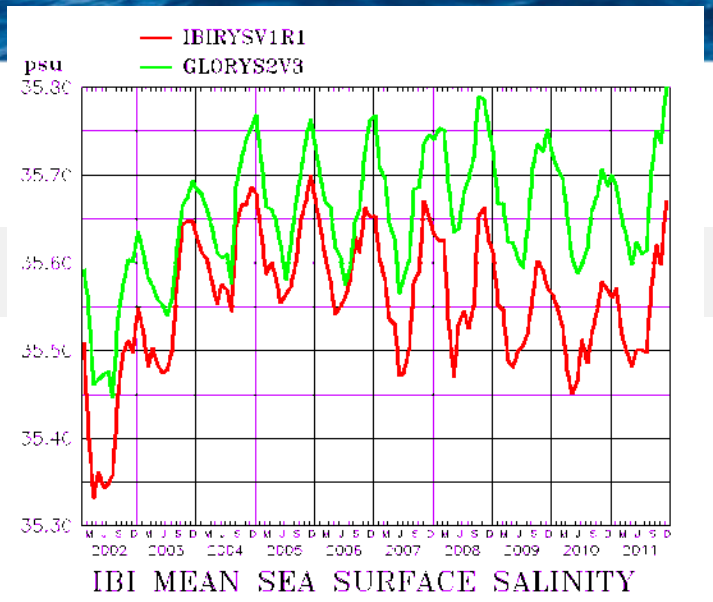


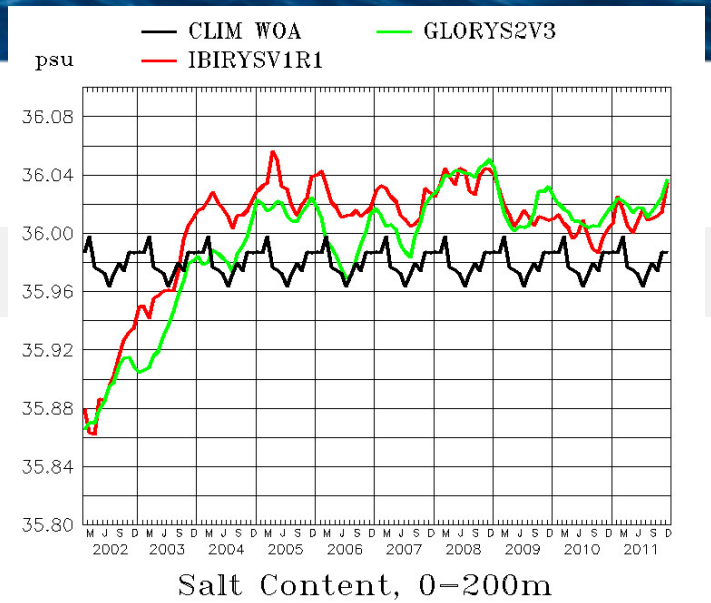
CLASS3-SSS-SWF-MEAN / CLASS3-SC-LAYER

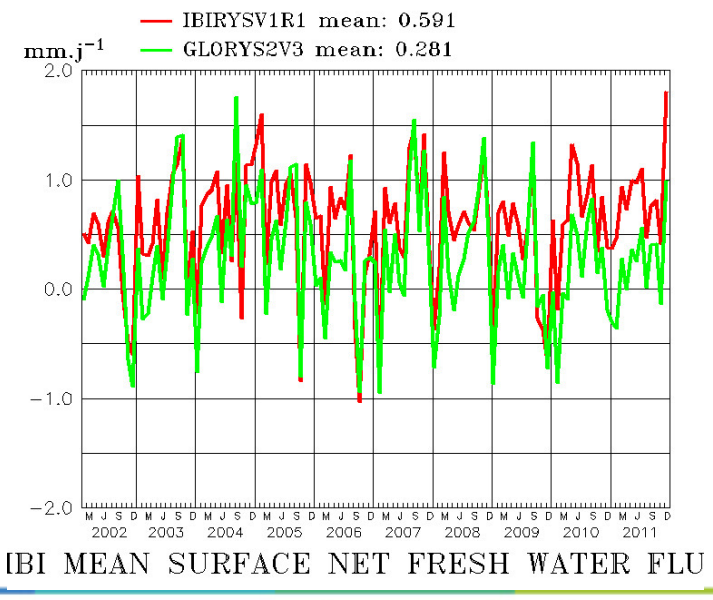
Domain averaged of SSS (psu)

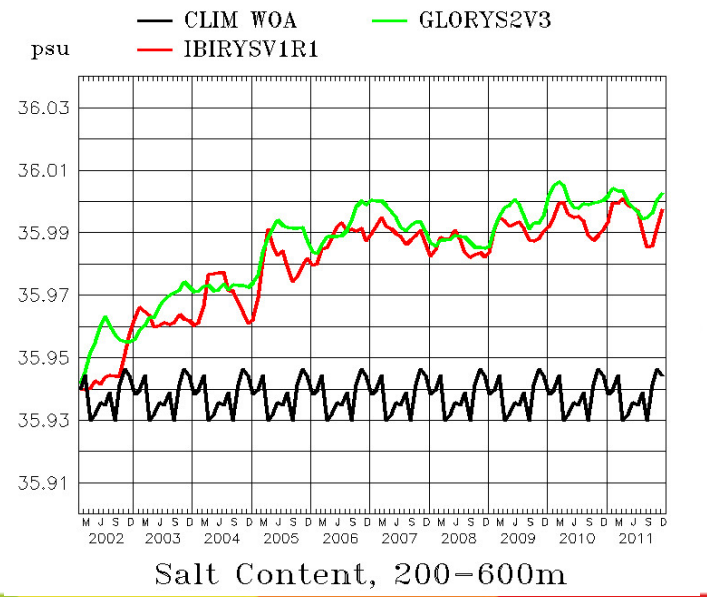
IBIRYS
GLORYS
WOA09

Domain averaged of net fresh water flux ($mm.d^{-1}$)





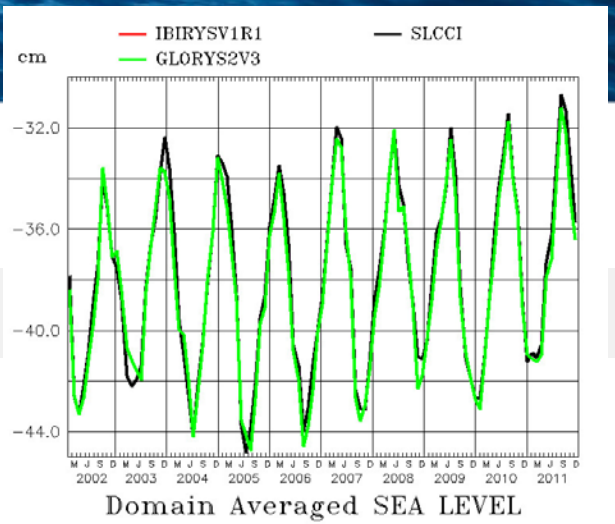




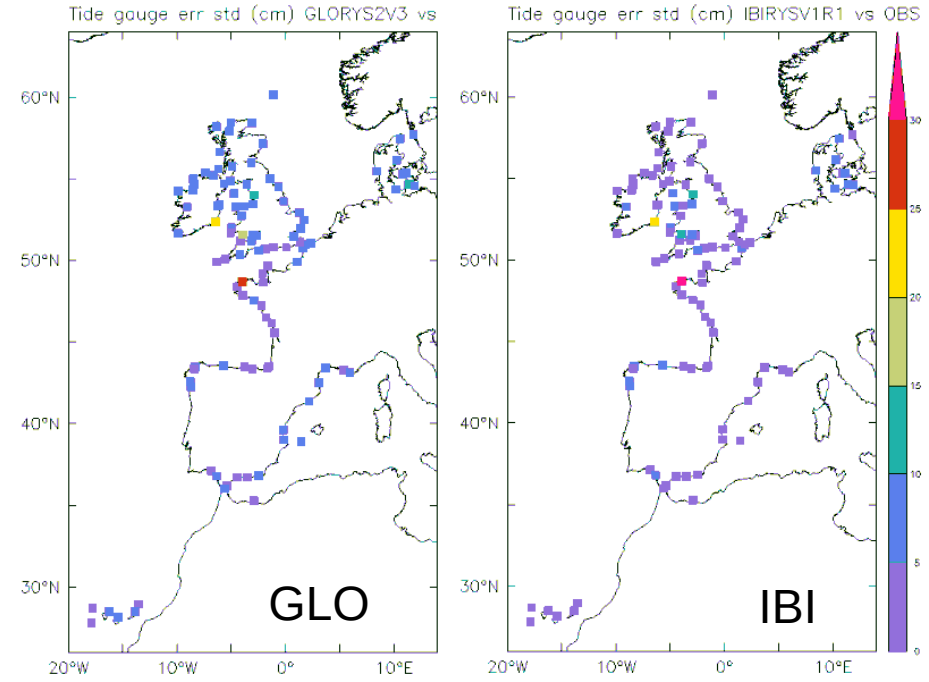
Domain averaged of sal. (psu)

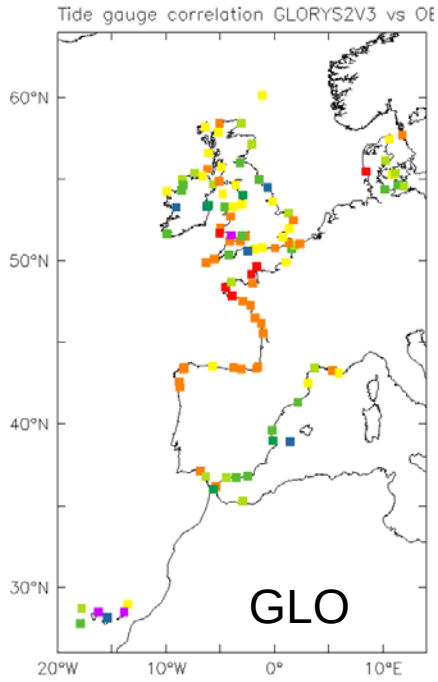
SL-CLASS2-TIDE_GAUGE / SL-CLASS3-2DMEAN

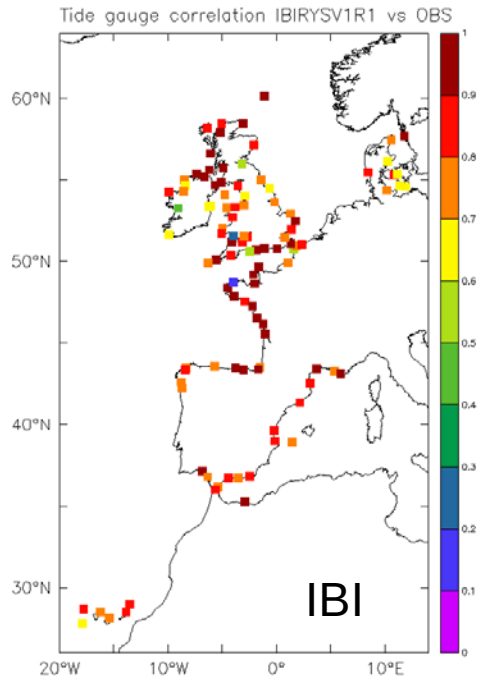
Domain averaged sea level



RMS error and correlation (tide gauges)







Metrics

In this part we applied a set of statistical metrics to the global (parent) reanalysis and the regional one (child).

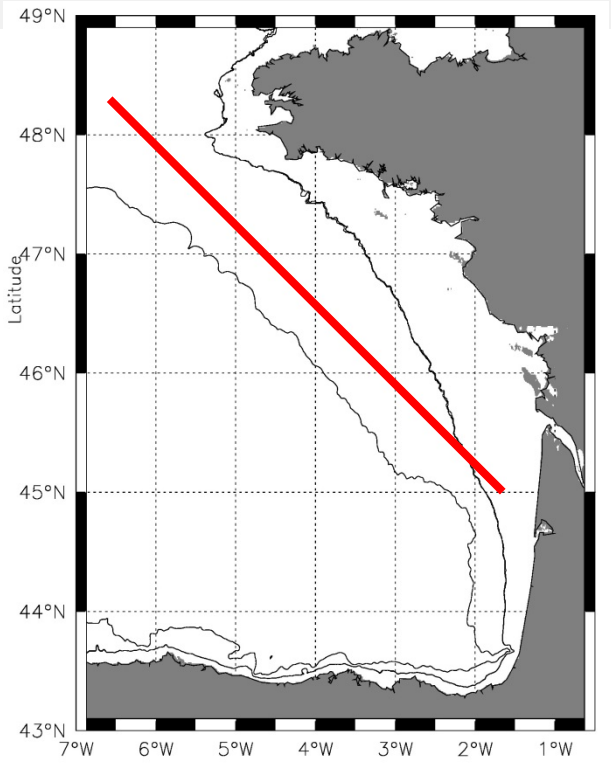
(Observation – analysis) statistics is a necessary step of the quality control, but will not always capture the improvements due to higher resolution and better physics.

Study of physical processes is needed to highlight the added-value of the regional reanalysis.

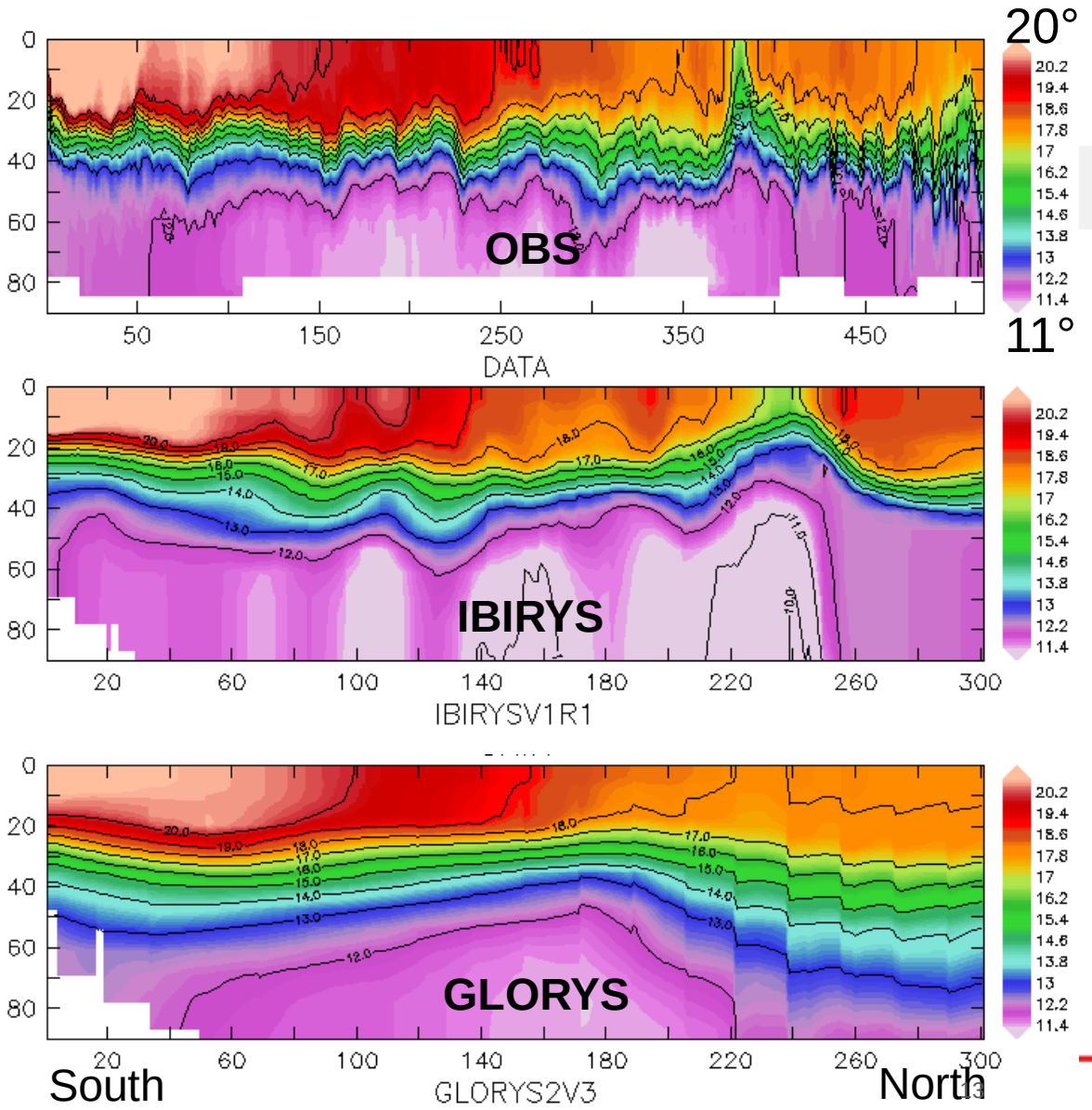
Processus

Bay of Biscay summer thermocline

Temperature section (ASPEX G)
September 2010

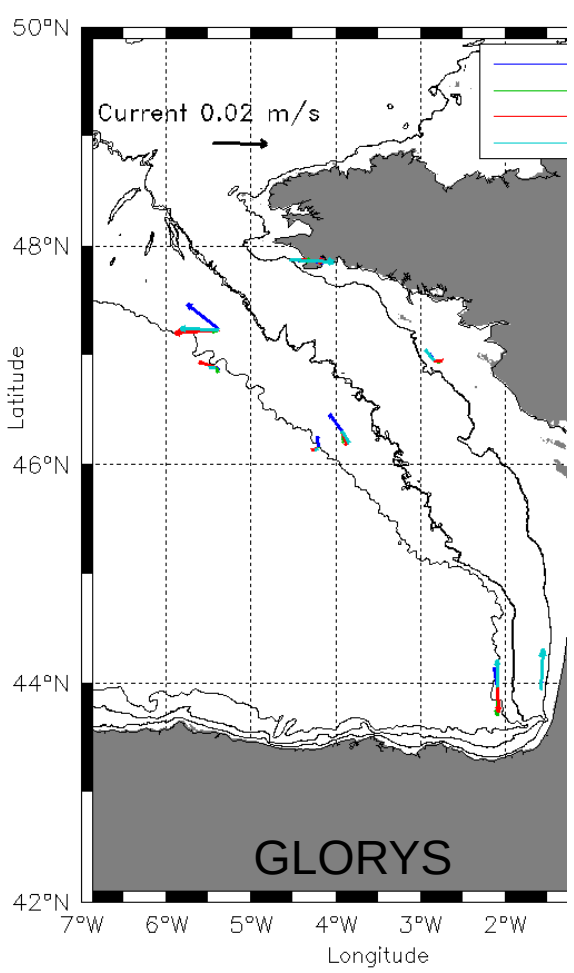


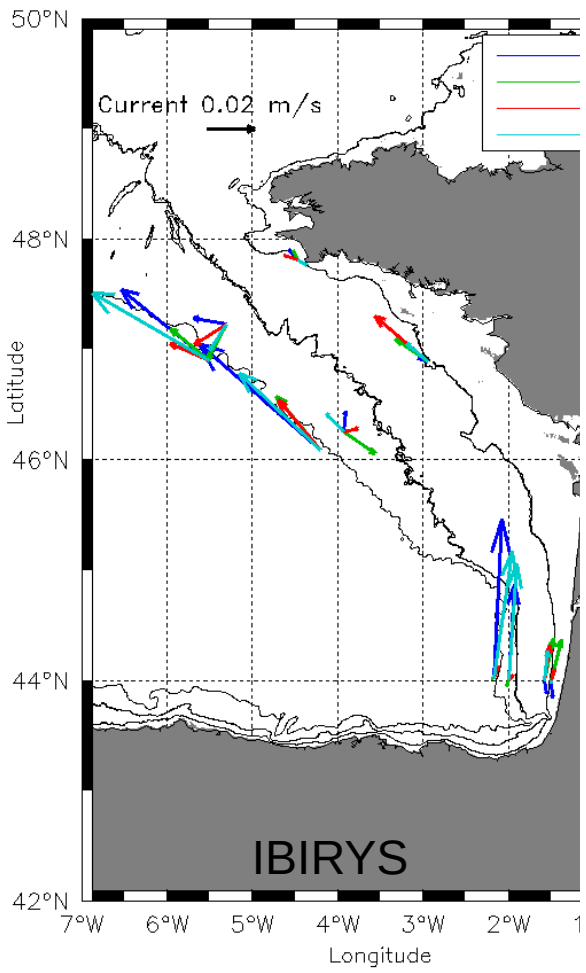
ASPEX cruise,
Le Boyer *et al* (2013)

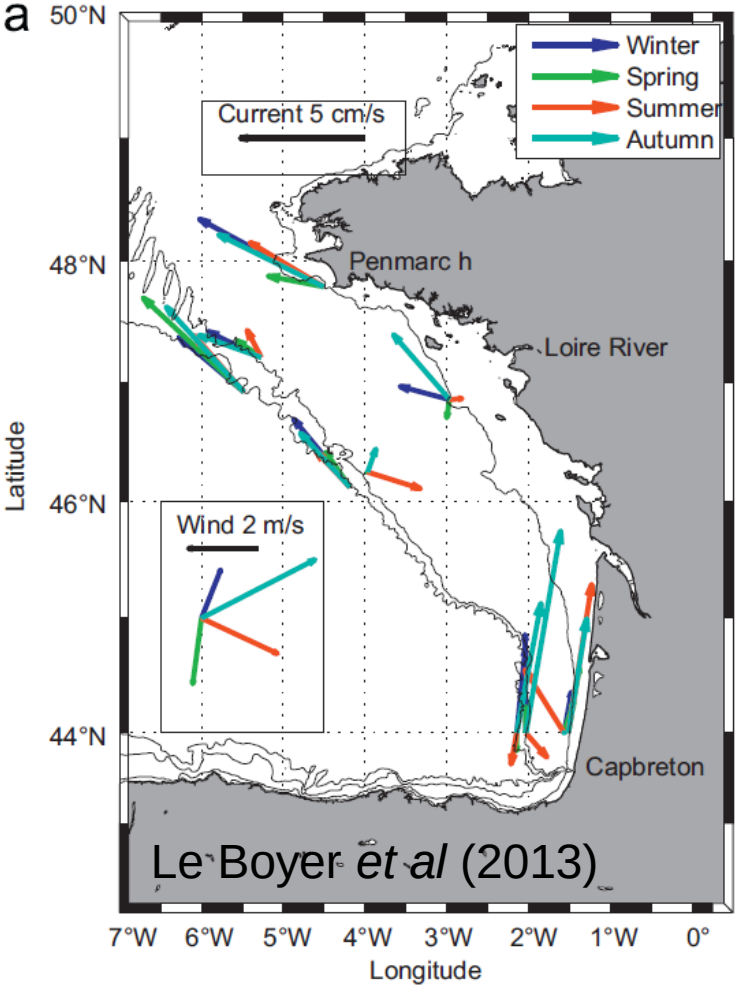


Bay of Biscay seasonal currents

Seasonal averages of depth-averaged currents at ADCP locations





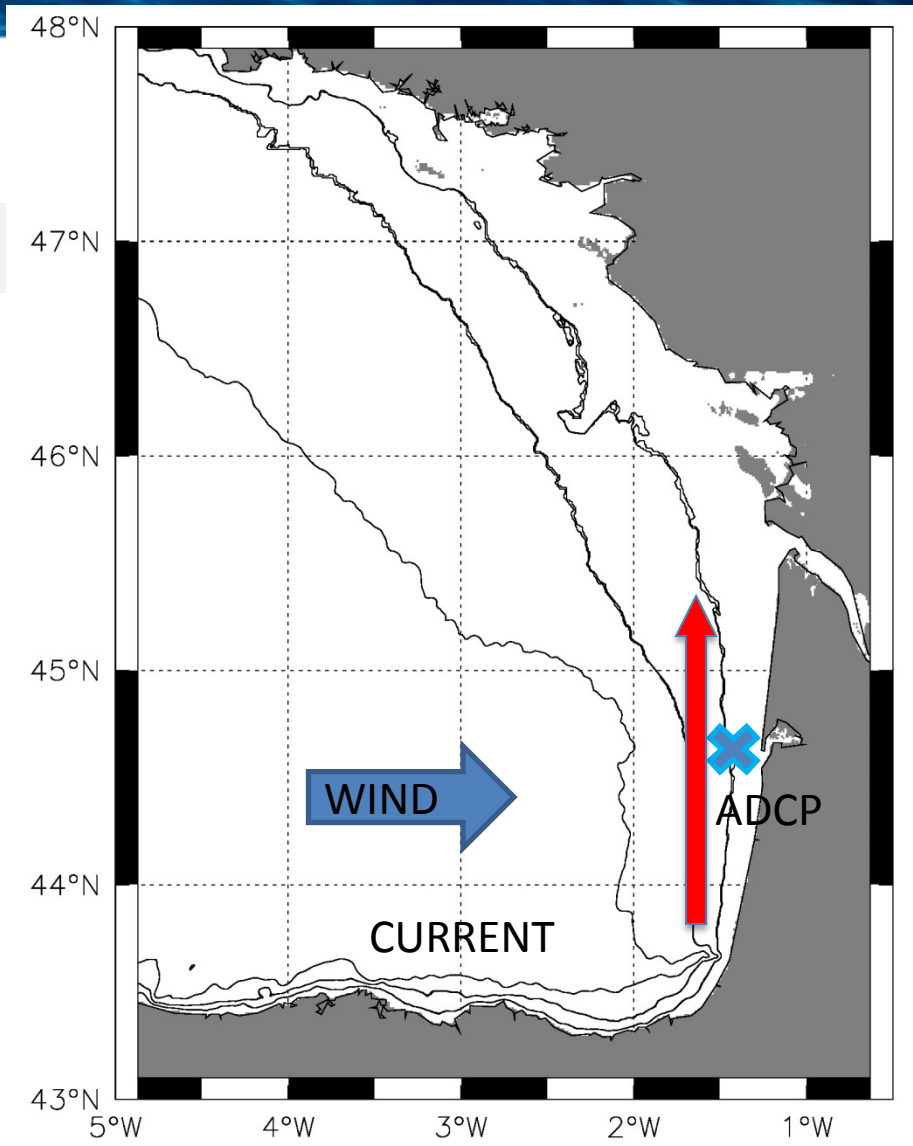


Bay of Biscay coastal jet (1)

Batifoulier et al (2012):

Observations of poleward costal jets along the Aquitaine shelf, associated with increase of the bottom temperature.

The triggering mechanism is due to downwelling situation along the Spanish coast induced by westerlies winds.



Bay of Biscay coastal jet (2)

2008

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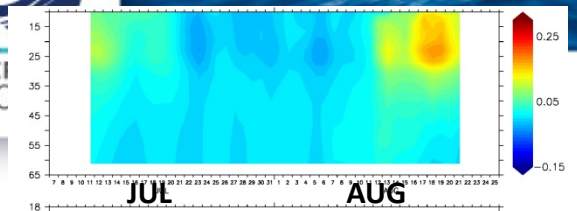

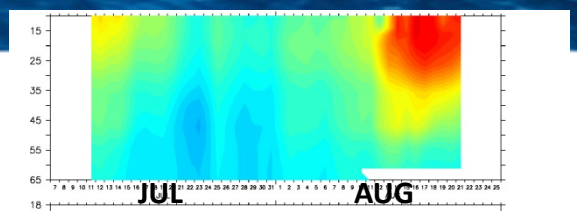

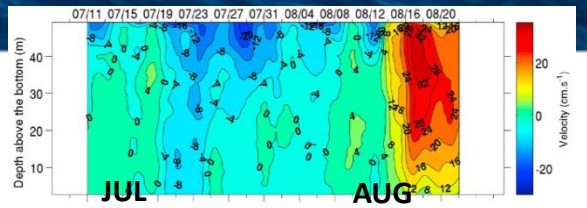

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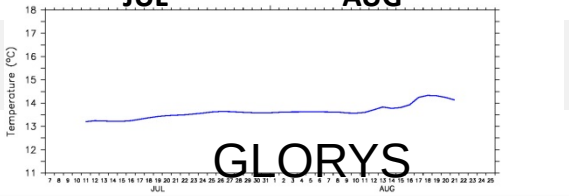

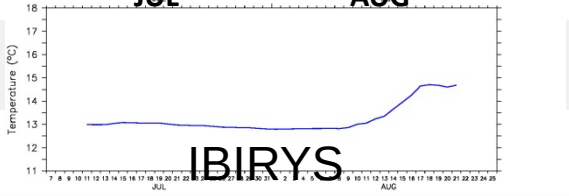

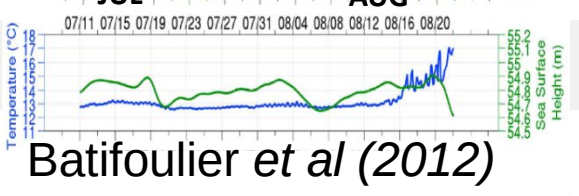

Batifoulier *et al (2012)*

2009

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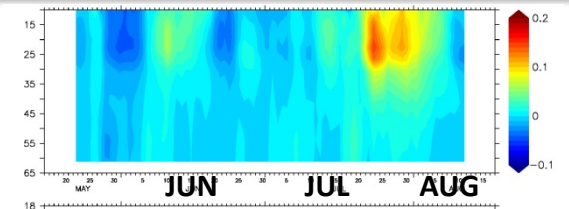

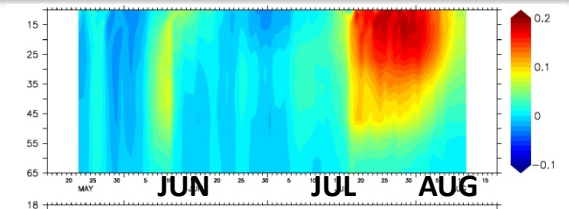

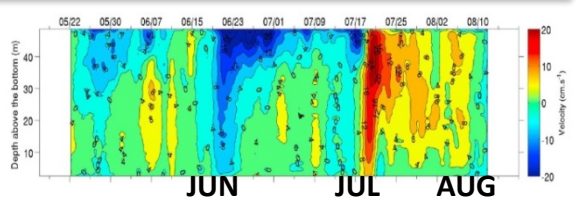

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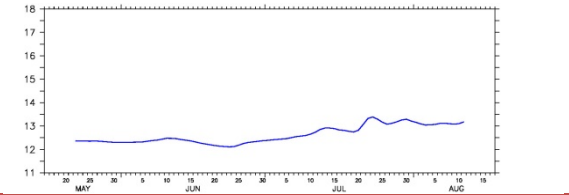

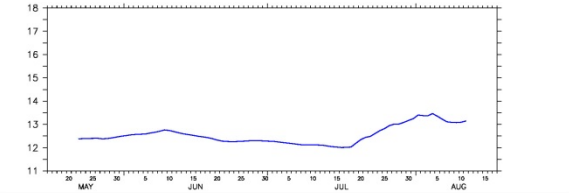

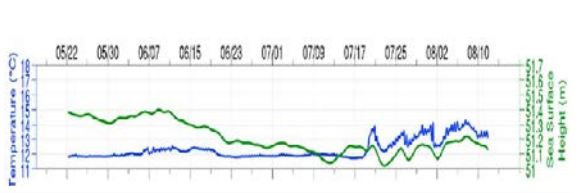

2002

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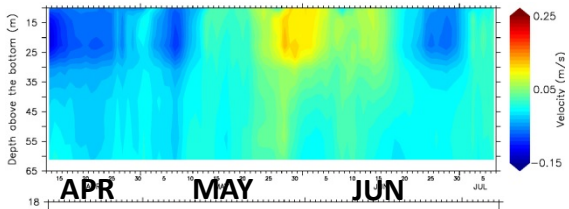

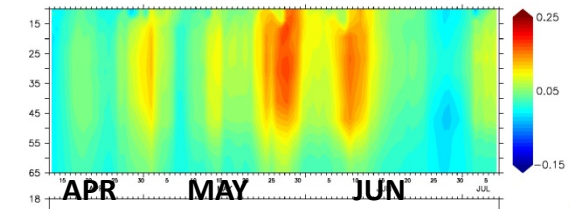

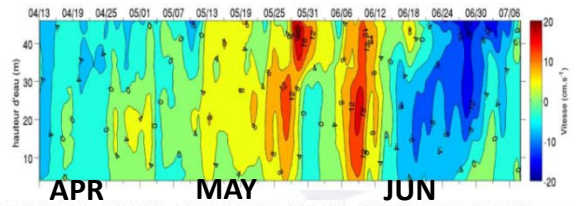

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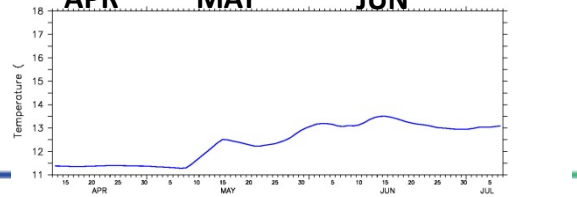
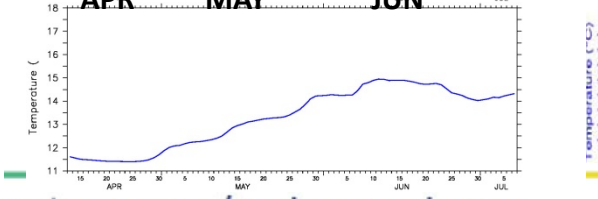
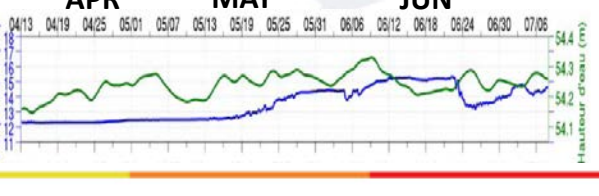






Conclusions / Perspectives

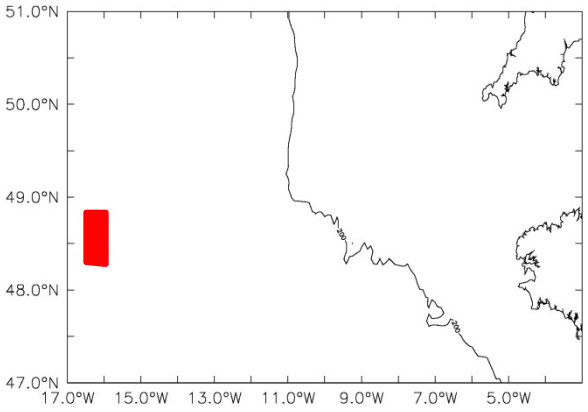
Conclusions / Perspectives

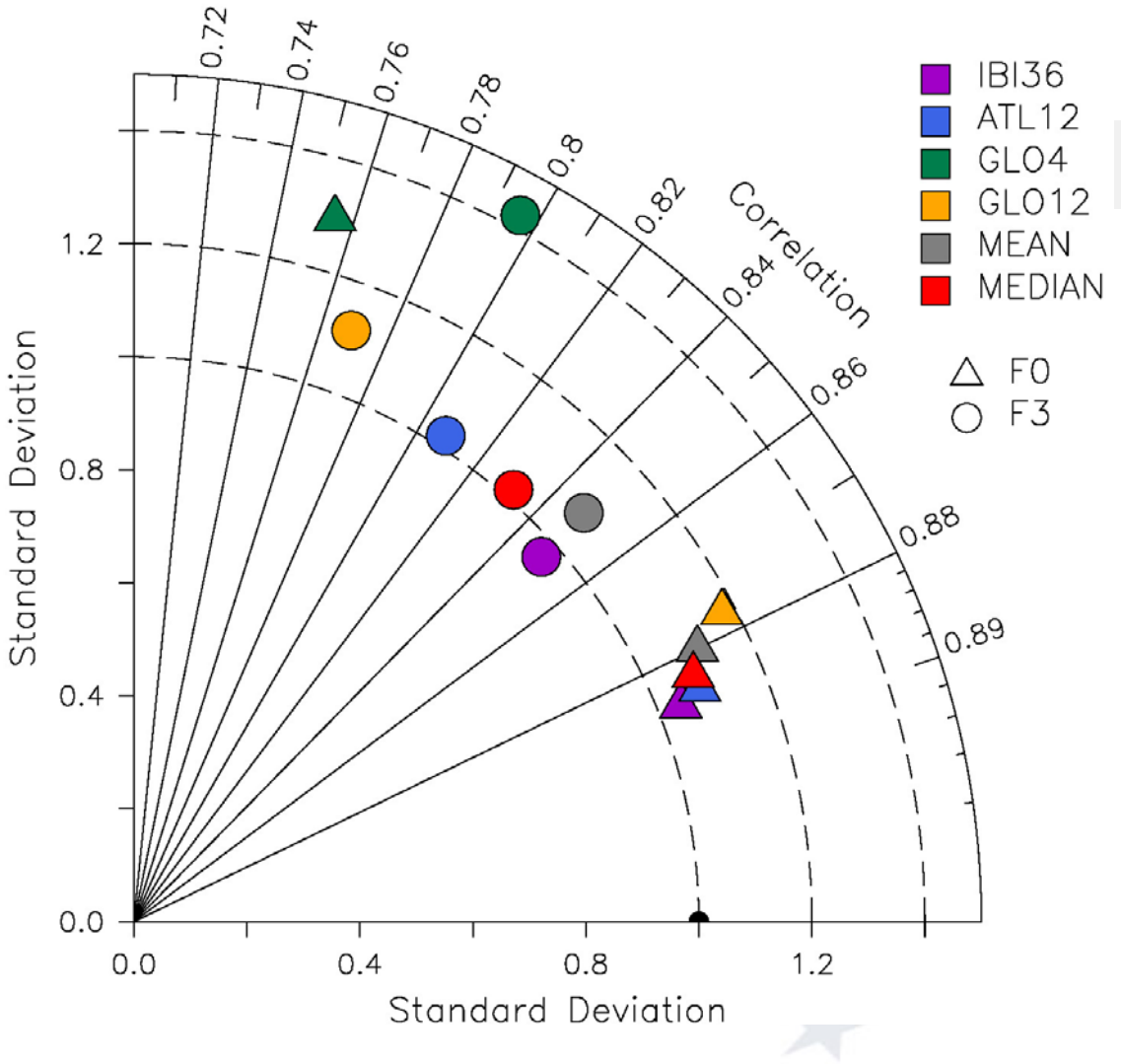
- Following the recommended strategy, a set of common metrics were applied to global and regional reanalyses
- IBIRYS and GLORYS show consistent results at large scale
- Looking at small scale and high frequency processus shows the added value of regional reanalysis.
- Application oriented metrics: examples of MLD and littoral SST

Conclusions / Perspectives

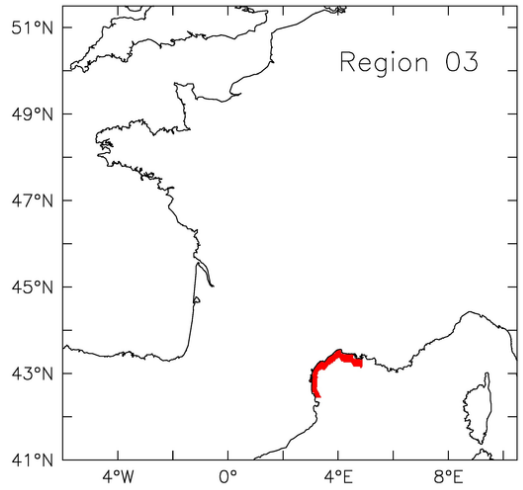
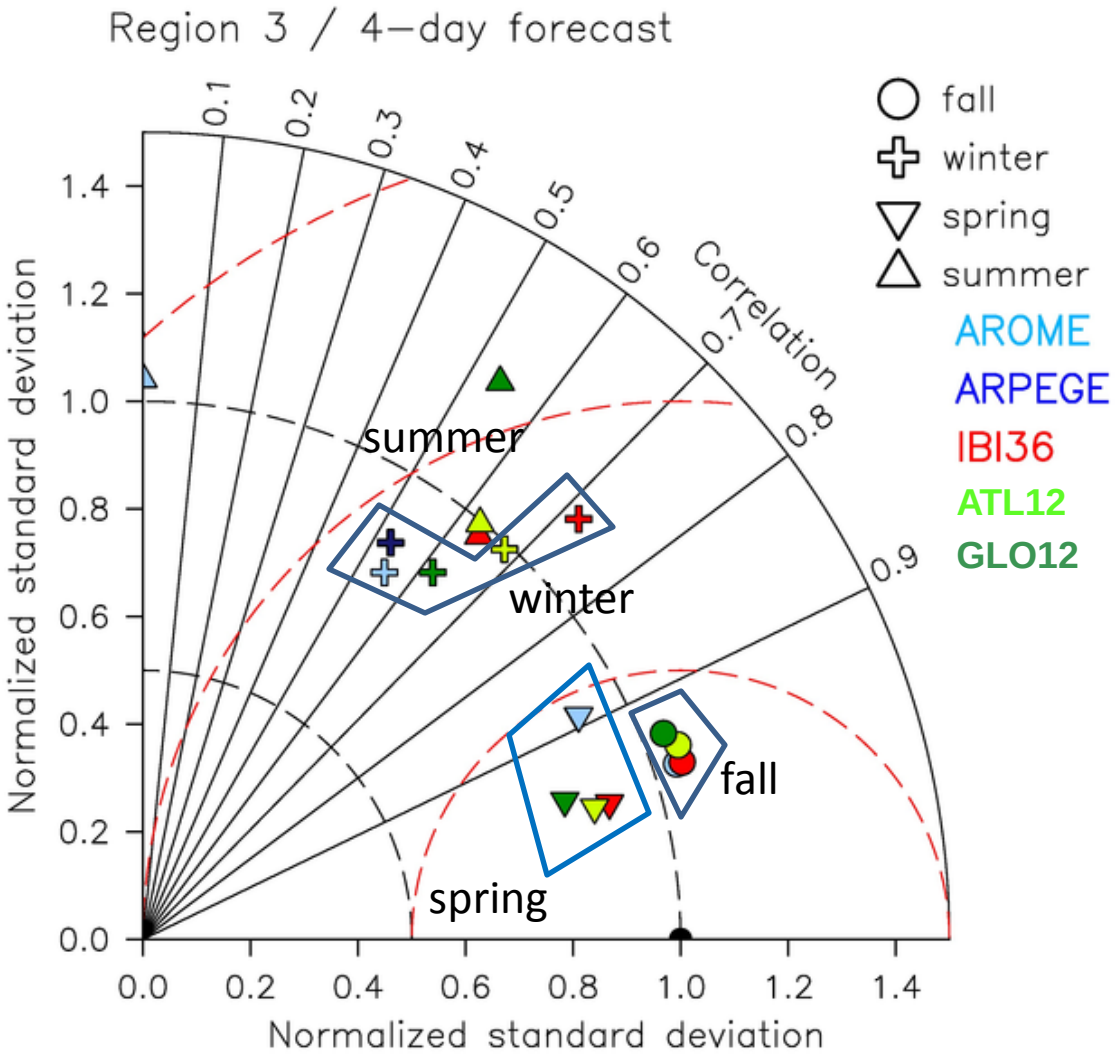
Mixed Layer Depth forecasts

Application in NEA, comparisons to gliders observations (OSMOSIS project), may 2013 (Drillet *et al*, 2015)





Conclusions / Perspectives

Coastal SST forecasts

Application to french coast, comparisons to satellite SST observations, sept 2013 – aug 2014