Impact of Argo data set on an operational 1/4° global ocean forecasting system.

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Outline

- E-AIMS Project
- System and tools
- OSE Methodology
- Impact of argo data set on the operational system.
- Conclusion and perspectives

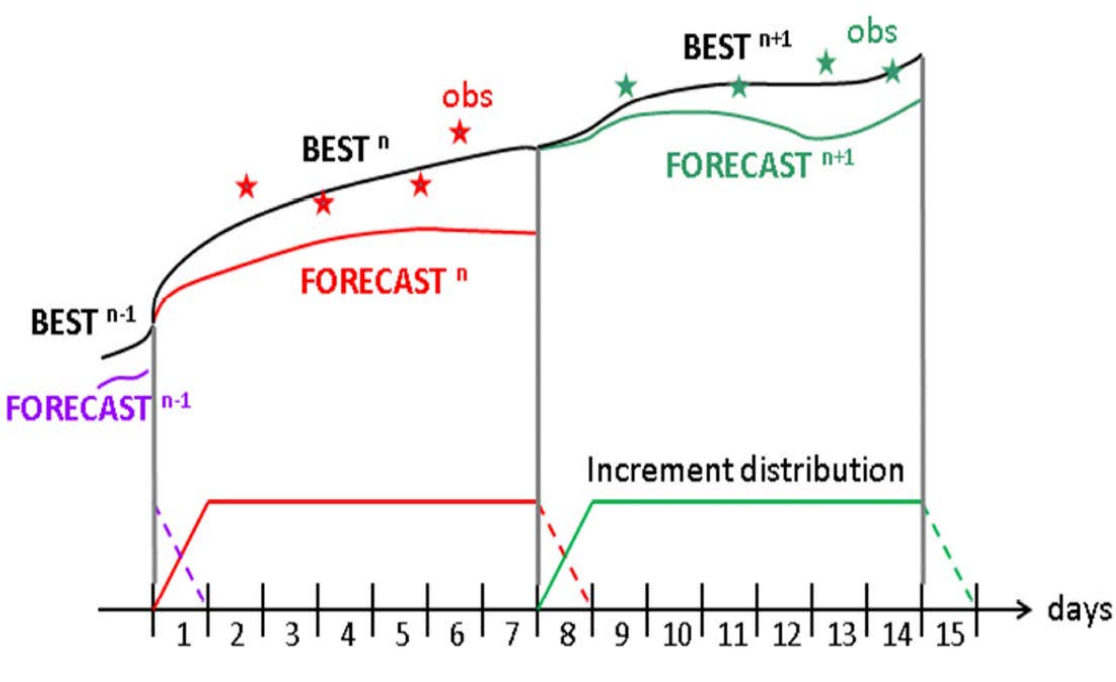
E-AIMS : Euro-Argo Improvements for the GMES Marine Service

WP3 – Task 3.1: analyzing the contribution and impact of Argo observations in the MyOcean global ocean data assimilation system.

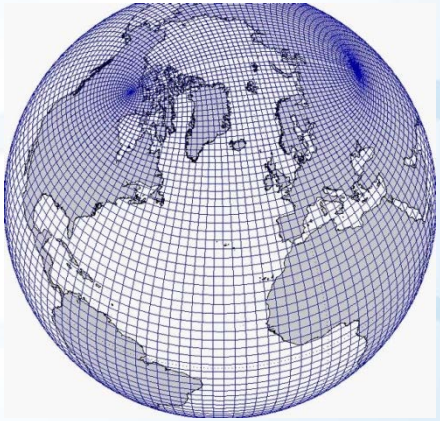
- Observing System Evaluation – OSE
  - Evidence of the importance of argo observations for the forcasting systems
- Observing System Simulation Experiment – OSSE
  - Analysing the future argo array, and giving recommandation… from an aoperational forcasting system point of view

Systems and Tools – background information

System	Domain	resolution	model	assimilation	Forcing
PSY3V3R3	Global	¼ degree 50 levels	Grid ORCA025 Ocean : NEMO3.1 Ice : LIM	SAM2 - IAU Datatype : SLA, SST, Insitu	ECMWF 2010



Grille ORCA025



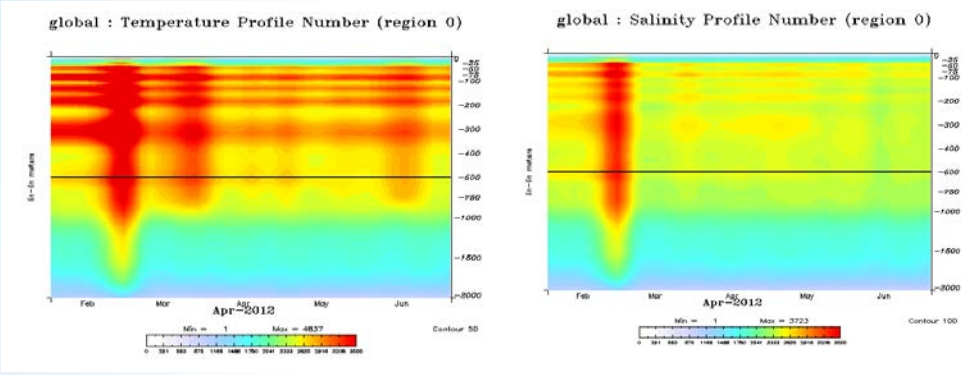
OSE - Methodology

RUN N°	RUN Characteristics	Insitu Data Assimilated by SAM	Insitu data used for diagnostics
RUN1	Operational RUN : The whole Insitu dataset is assimilated	Argo No_argo	Argo No_argo
RUN2	Argo data set is not assimilated	No argo	argo No_argo

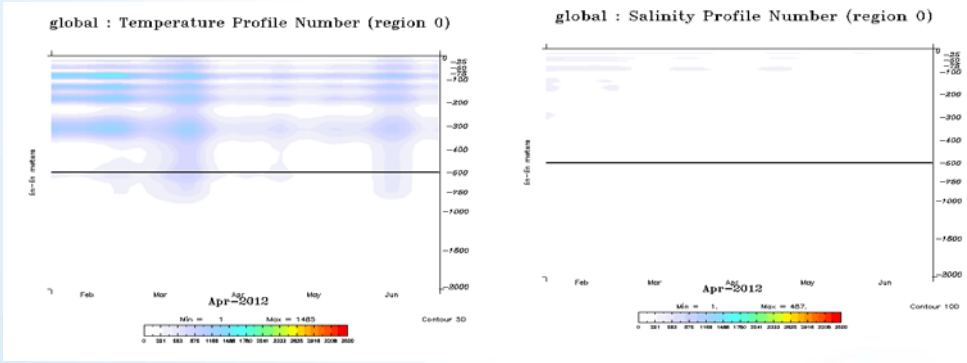
How can we assess the impact of argo in this system ?

- Statiscal results – innovation and observations misfit
- Mean values - Temperature and salt in different layers
- Physical process descritpion – convection, overflow, thermocline

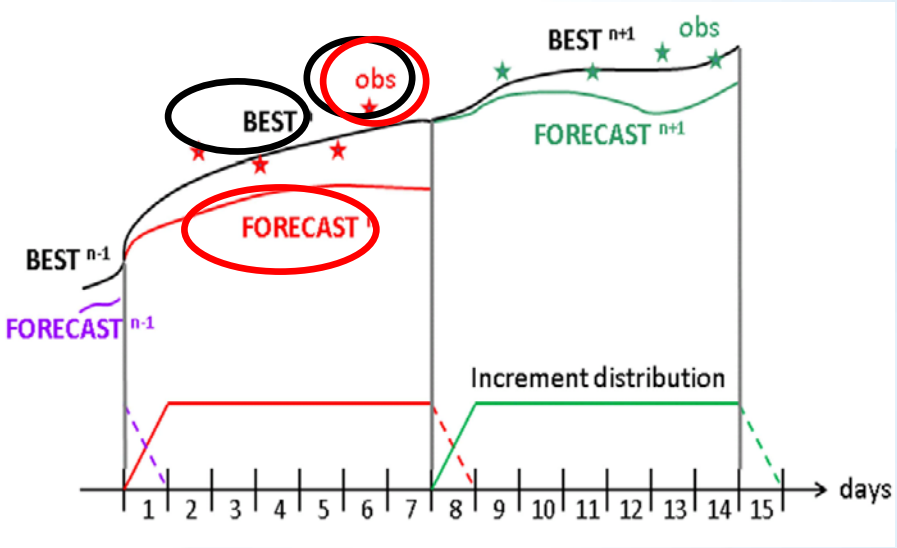
Global Statistics



RUN1 Argo



RUN2 no argo

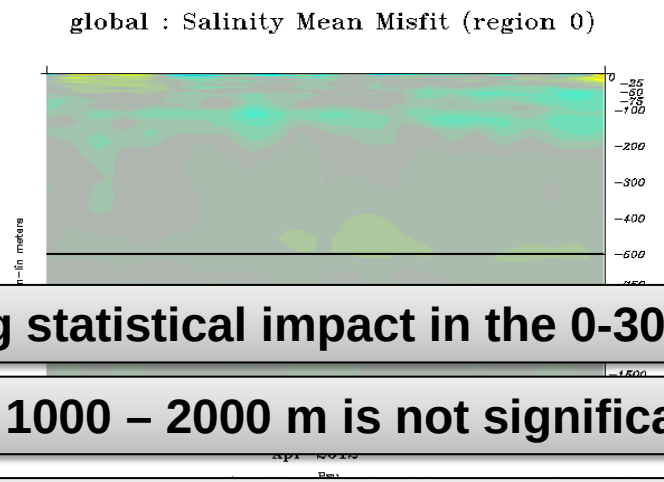


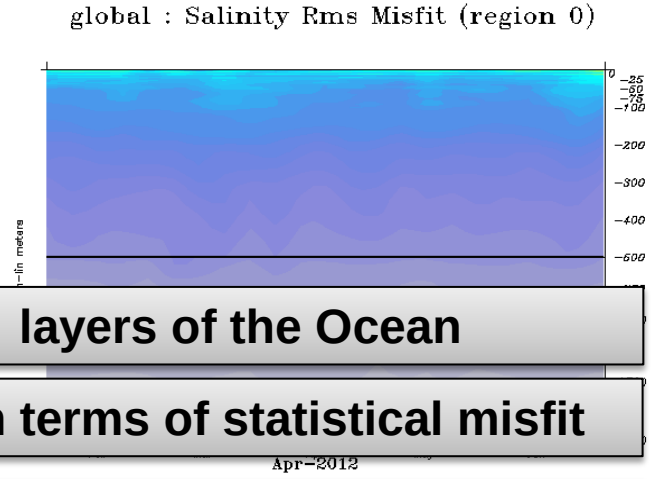
innovation = obs – model forecast

observations misfit = obs – model best

Global Statistics
Salinity misfit Time Series

RUN1 argo



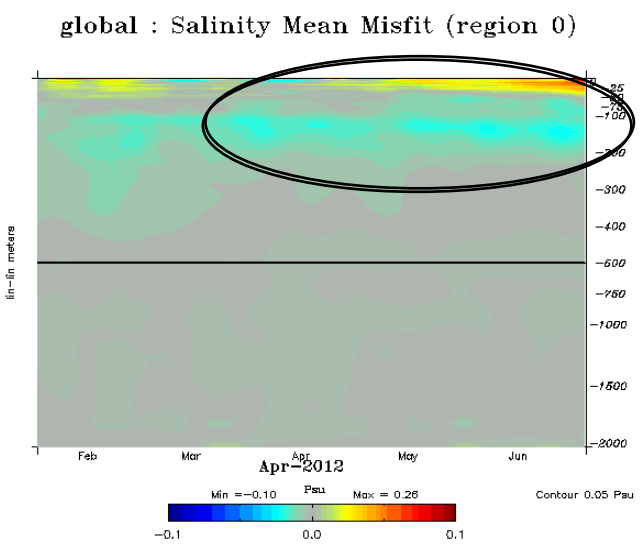


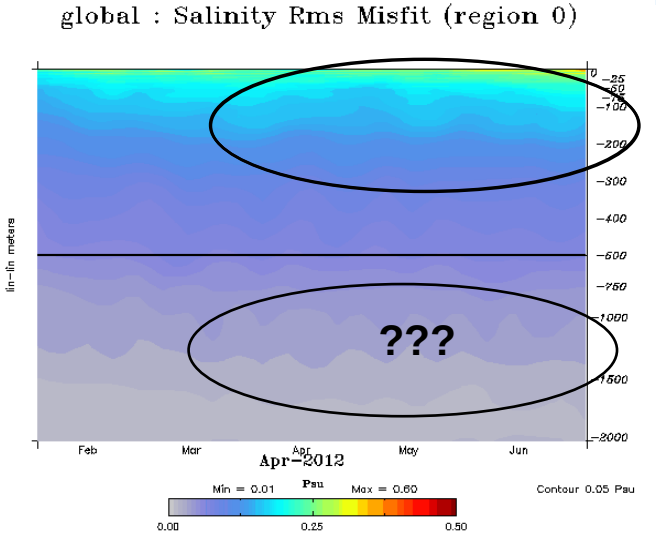
Strong statistical impact in the 0-300m layers of the Ocean

Impact in the 1000 – 2000 m is not significat in terms of statistical misfit

Need more than 6 month to catch the statistical impact in depth

RUN2 no argo





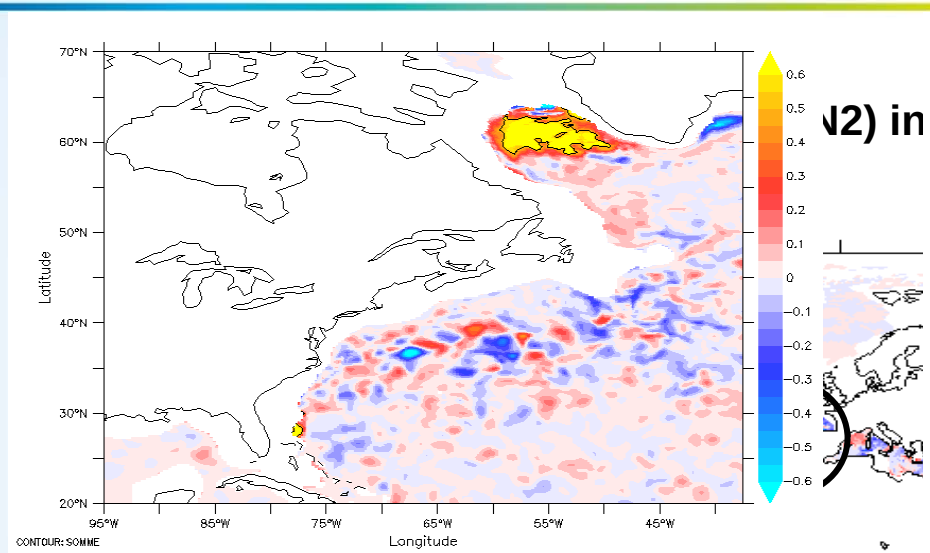
How can we assess the impact of argo in our systems ?

- Statiscal results - innovation, misflit

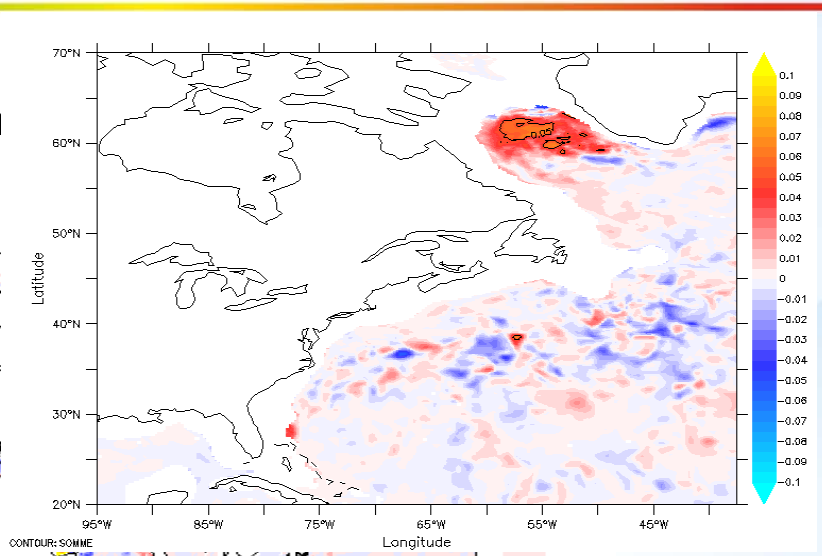
- In the 1000m – 2000m layer
  - Mean values - Temperature and salinity
  - Physical process descritpion – convection, overflow

- In the 0m – 300m layer
  - Mean values - Temperature and salinity
  - Physical process descritpion – thermocline

Mean Value – 1000m:2000m

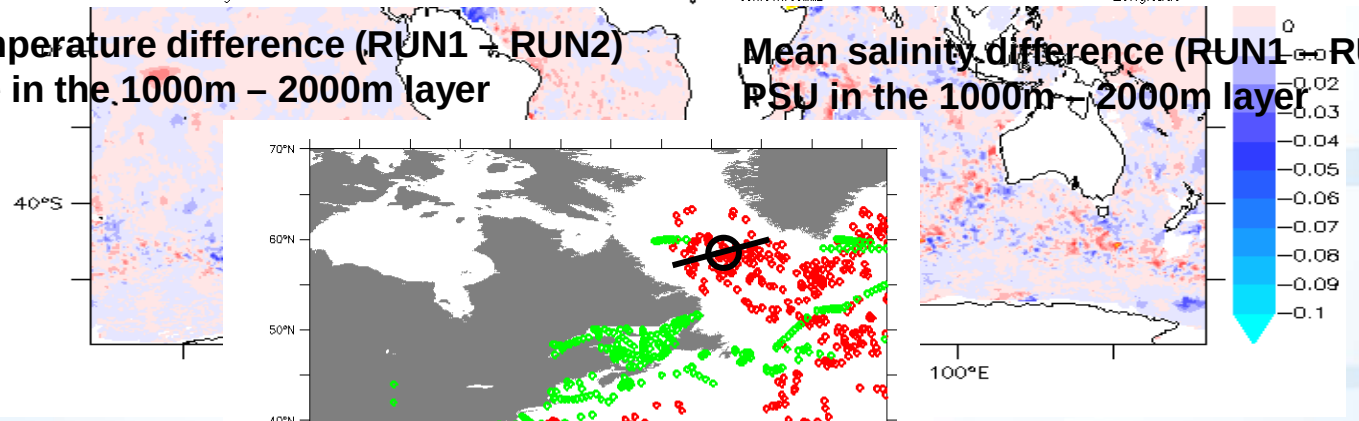


N2) in



Mean temperature difference (RUN1 – RUN2) in degree in the 1000m – 2000m layer

Mean salinity difference (RUN1 – RUN2) in PSU in the 1000m – 2000m layer



Impact **e result for temperature**

Argo and no argo data
Cross section and mooring

Convection and re-stratification

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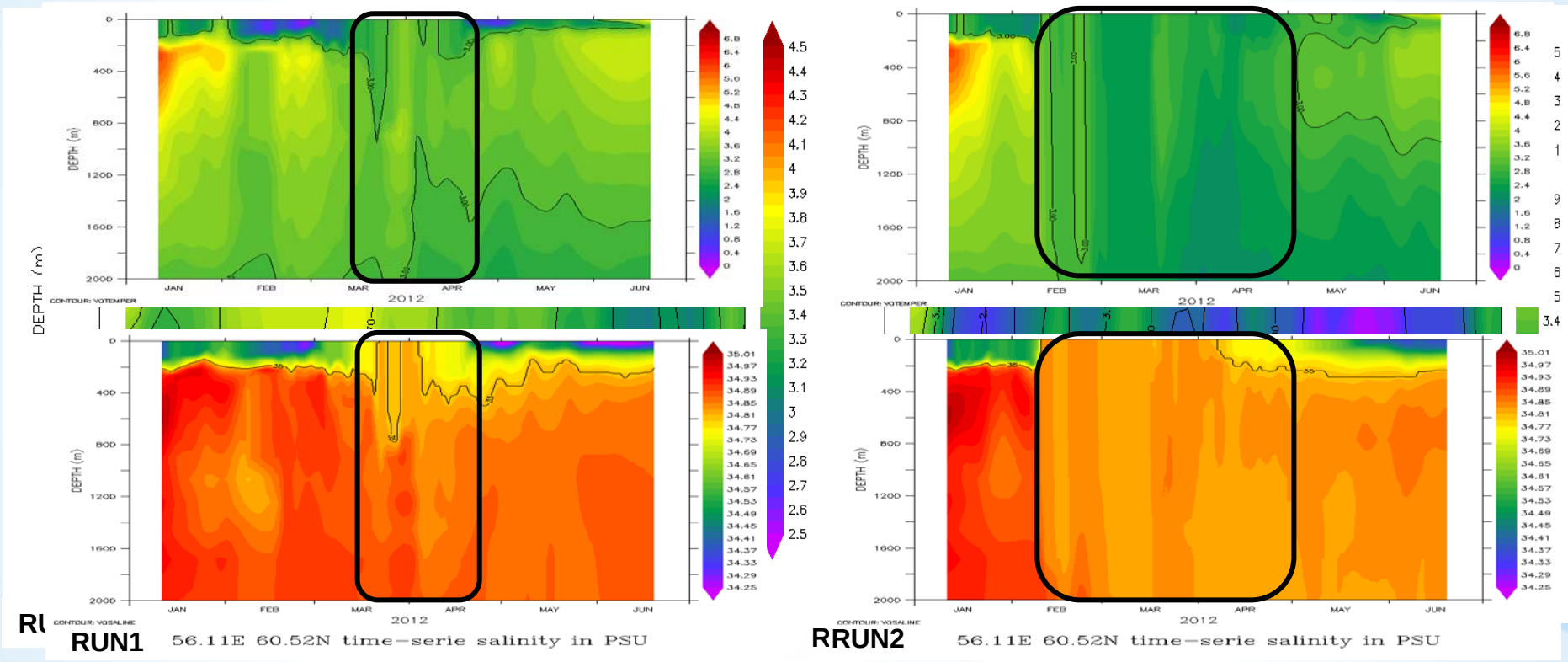
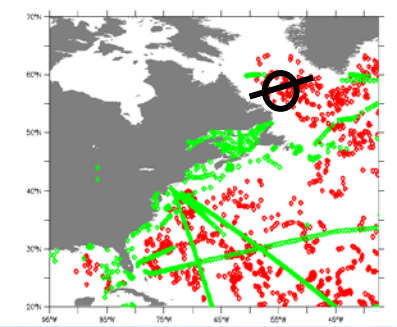
Mooring time series in the labrador sea during a convection and re-stratification episod

Temperature cross section in the labrador sea during a convection episod

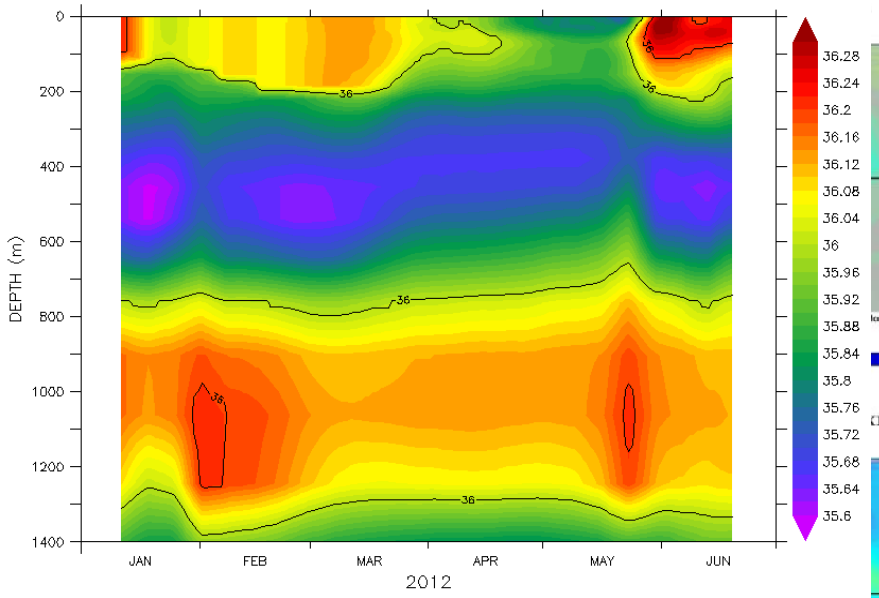




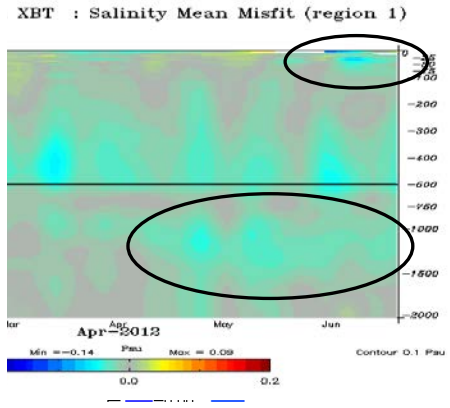
Strong impact of argo assimilation during convection phenomenon

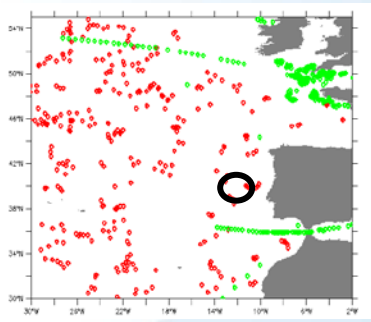
Better modeling of the convection episode and faster restratification of the ocean

Overflow region

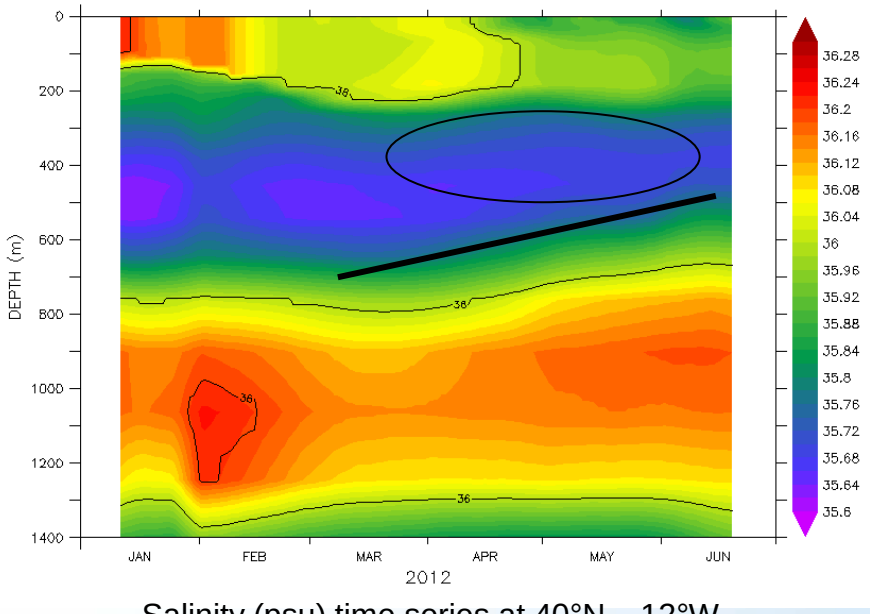


Salinity (psu) time series at 40°N – 12°W





Mean salinity difference (RUN1 – RUN2) i
1000m – 2000m layer



Salinity (psu) time series at 40°N – 12°W

Statistical impact in the 1000m – 2000m layer

Importance of argo data in modelling water masses

Trend to get the same results as M. Benkiran

RUN1

How can we assess the impact of argo in our systems ?

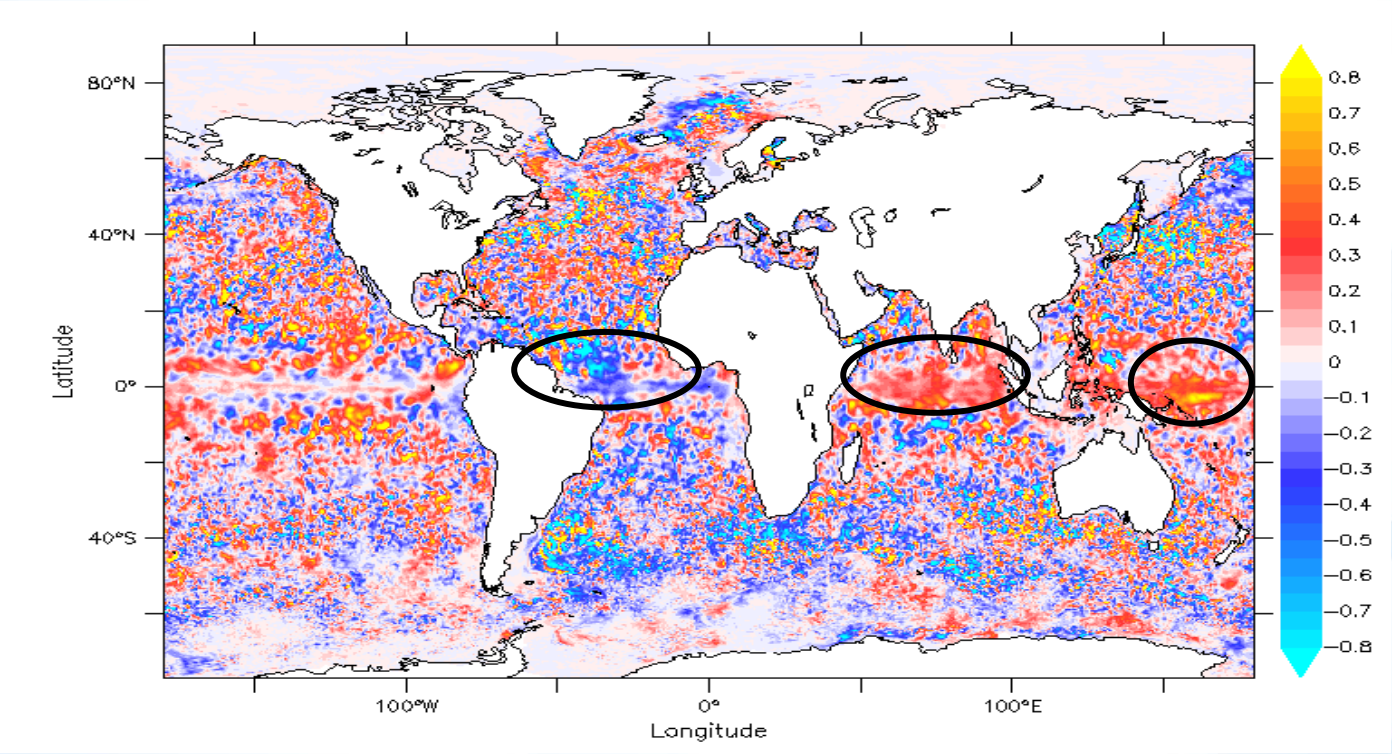
- Statiscal results - innovation, misflit

- In the 1000m – 2000m layer
  - Mean values - Temperature and salt in different layers
  - Physical process descritpion – convection, overflow, thermocline

- In the 0m – 300m layer
  - Mean values - Temperature and salt in different layers
  - Physical process descritpion – convection, overflow, thermocline

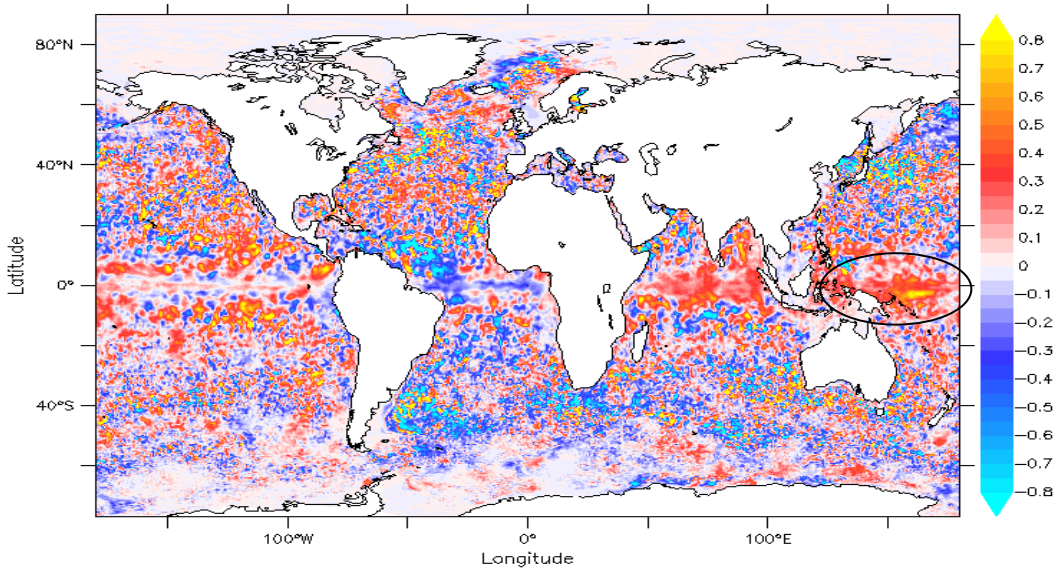
Mean values – 0:300m

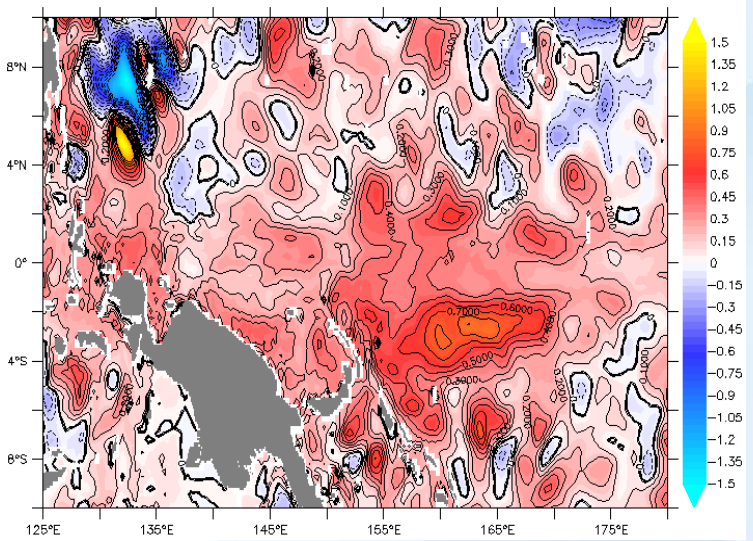
Mean temperature difference (RUN1 – RUN2) in the 0m – 300m layer



Impact around the equator - Same results for salinity

West Pacific Warm Pool

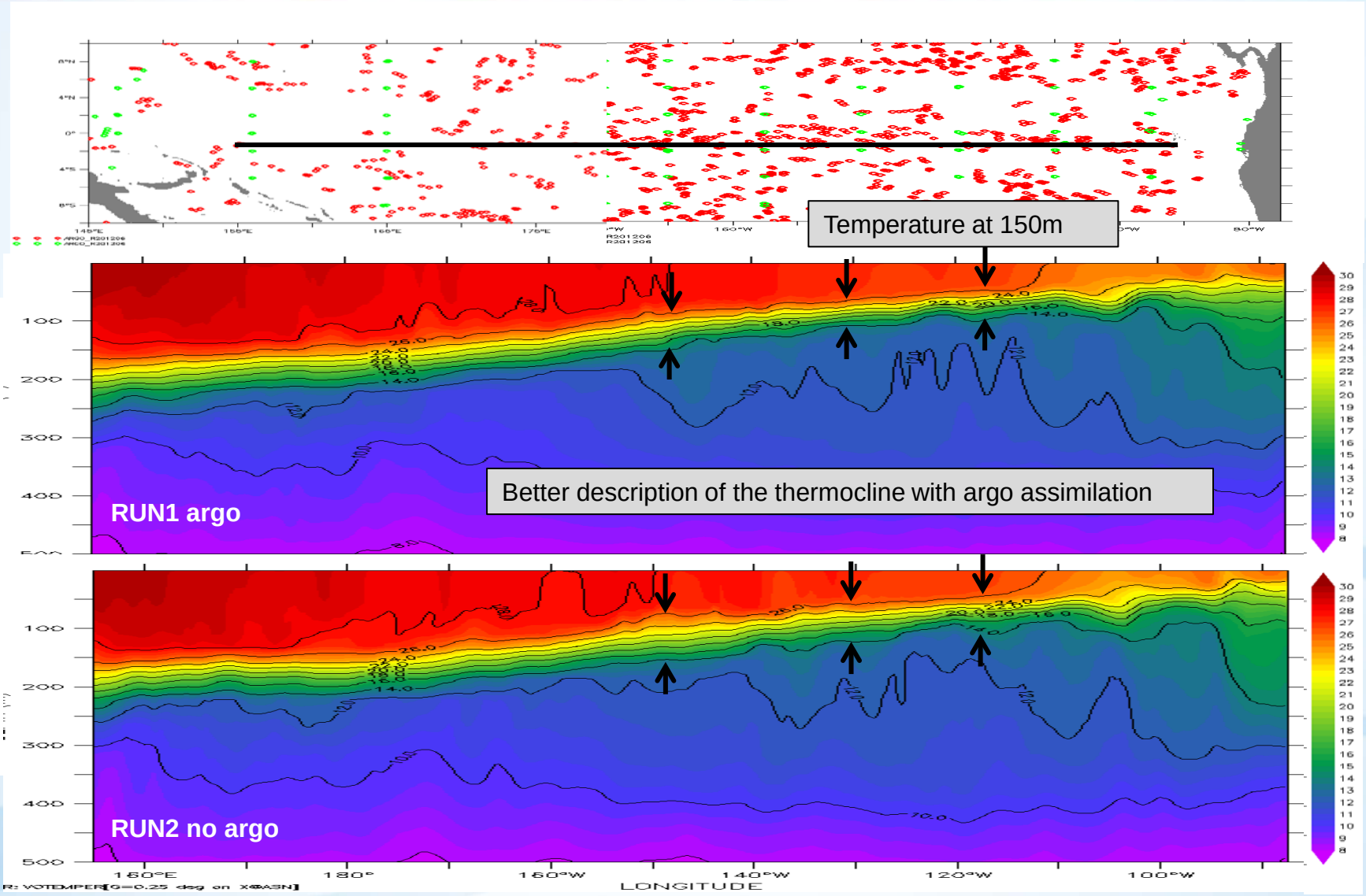




Mean temperature difference (RUN1 – RUN2) in celsius degrees in the 0m – 300m layer

Pacific Ocean Warm Pool

Cross section at 2.55 South



Conclusion and perspectives

Conclusion

- Mean and RMS misfit in temperature and salinity are improved by argo assimilation
- Low statistical impact under 1000m in a global point of view
- One year of simulation is probably needed to fully asses the impact of argo in a global 1/4th degree system
- Better modeling of ocean water masses
    - overflow (mediteranean water, red see water)
    - convection and restratification (labrador sea)
    - Thickness of the thermocline

Perspectives and questions

- Complementarity between SLA and argo?
- OSSE
- E-AIMS : What kind of results is needed to prepare and improve the future of euro-argo?