OSnet : Reconstruction of temperature, salinity and MLD from remote sensing using a neural network in the Gulf Stream region.

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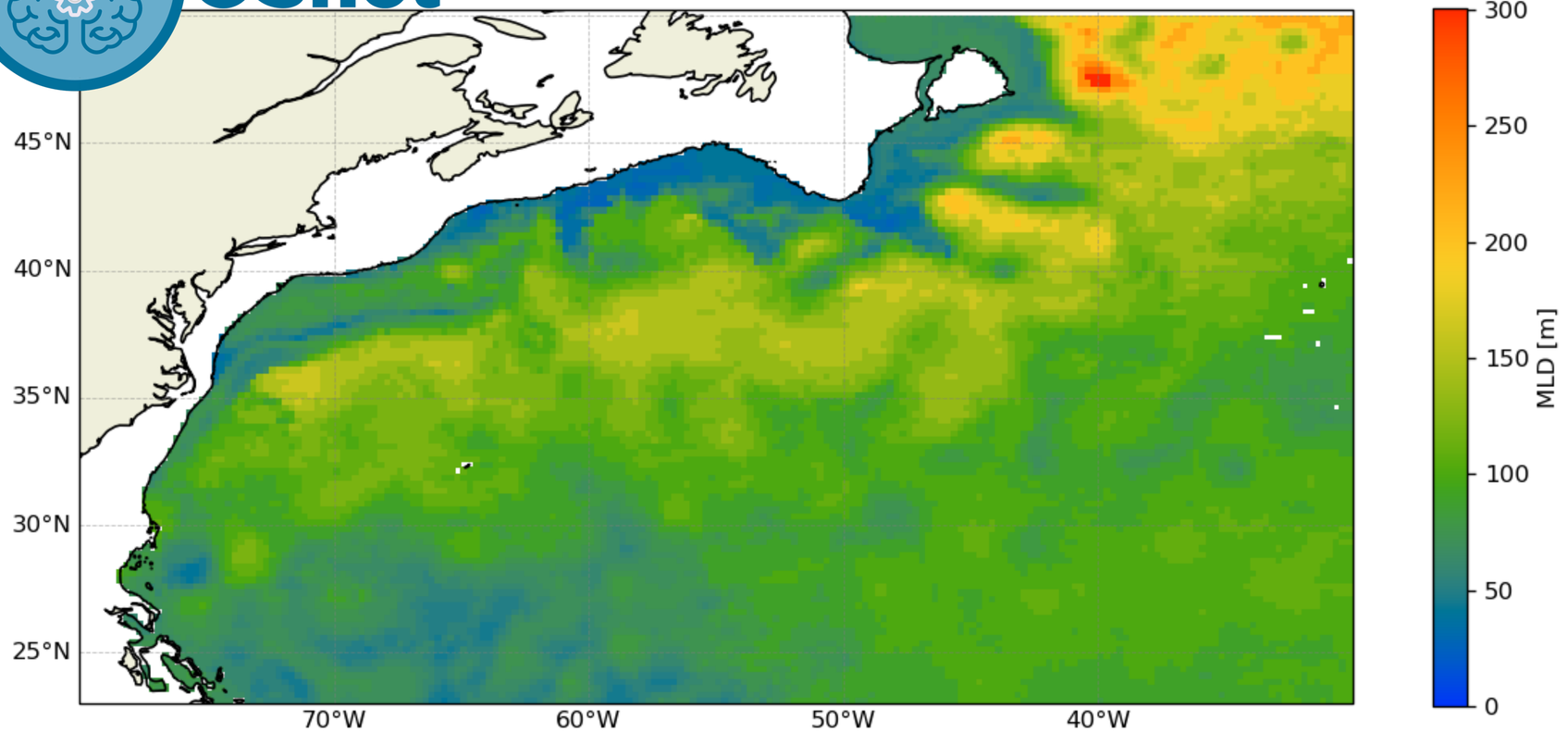
OSnet



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EGU meeting - 26th May 2022

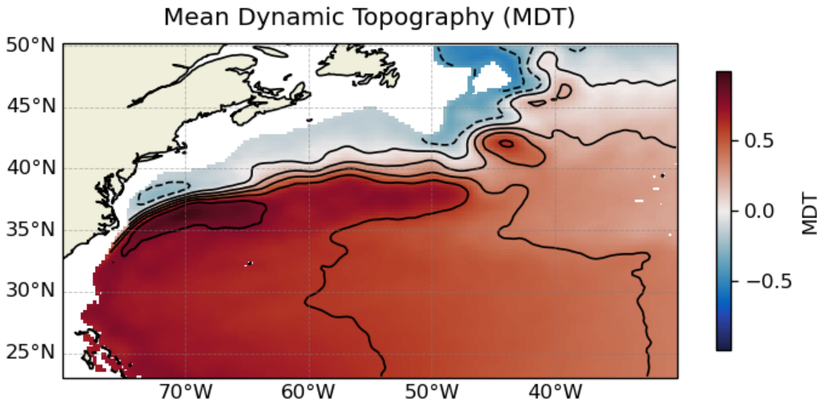
Introduction / Motivation

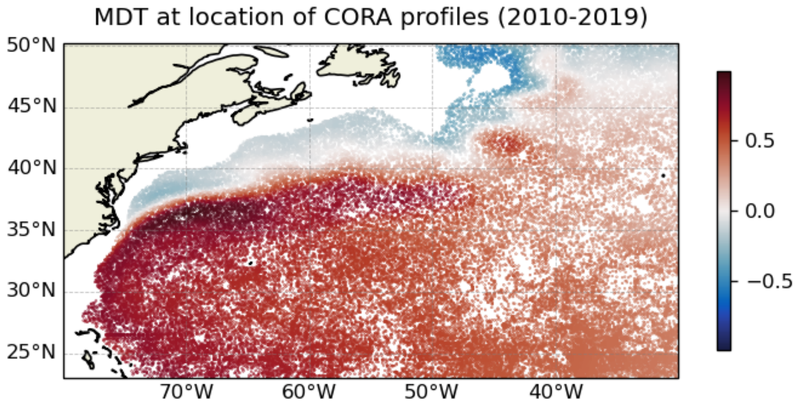
CORA : database of all available hydrographic profiles

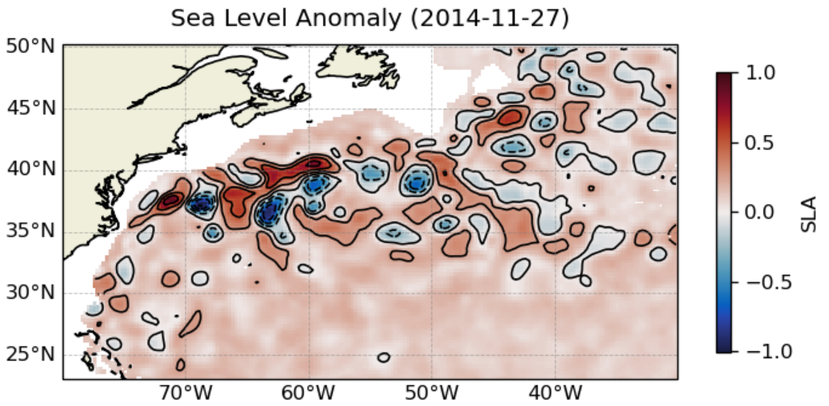
- The lack of in-situ hydrographic data prevent us to study robustly the eddy-scale variations of the ocean's stratification.

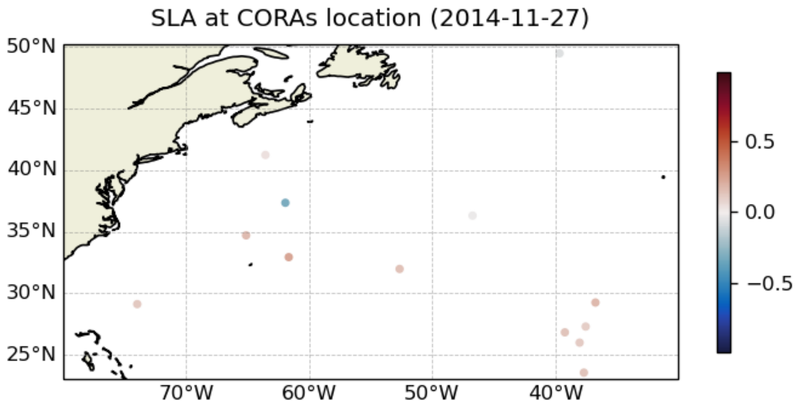
- Remote sensing offers high spatial and temporal observation of the ocean's surface.

- Can we learn a robust statistical link between the surface information and the temperature and salinity profiles ?









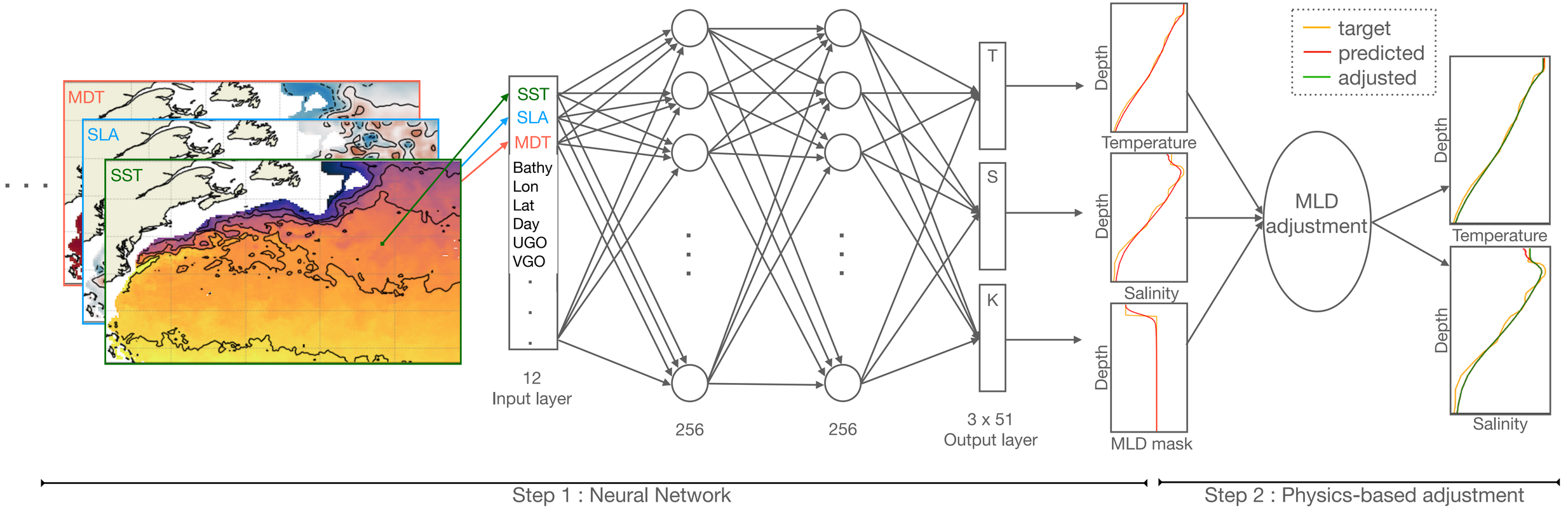
Pauthenet et al. (2022)

https://github.com/euroargodev/OSnet-GulfStream

Method

- **Training a a multi layer perceptron to learn the T-S profiles from surface data**
- adjustment of Mixed Layer Depth (MLD)
- generalization on a daily grid of 1/4° of horizontal resolution

Period : 1993-2019
Depth range : 0-1000m (51 depth levels)
Number of T-S profiles : 67,000



Pauthenet et al. (2022)

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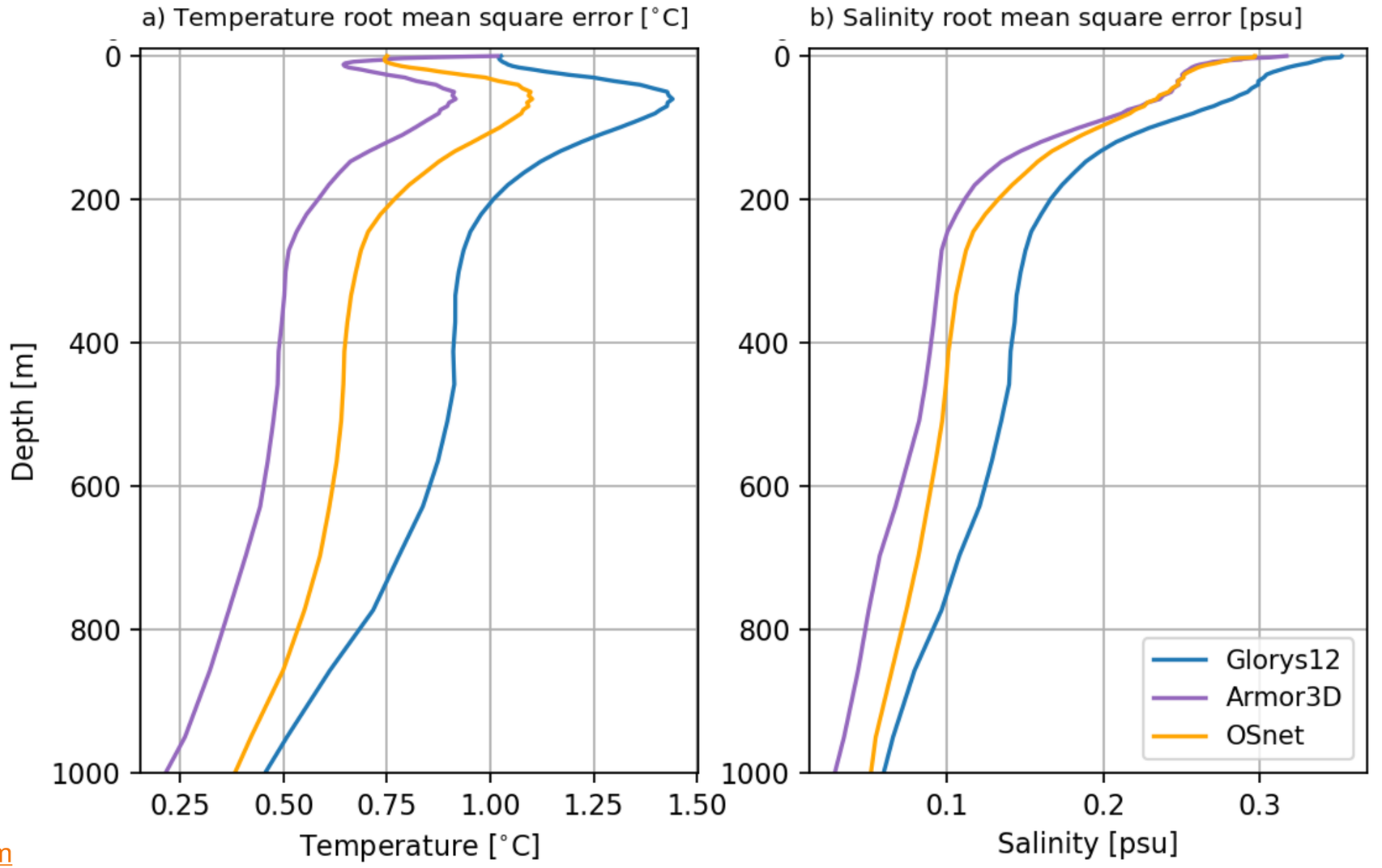
Accuracy of the predictions compared to observations

Glorys12 : physics-based ocean reanalysis
Armor3D : observation-based interpolation scheme

Armor3D profiles are the closest to the observed profiles
BUT they contain a large number of density inversions.



Glorys12 : Lellouche et al. (2021)
Armor3D : Guinehut et al. (2012)
Pauthenet et al. (2022)

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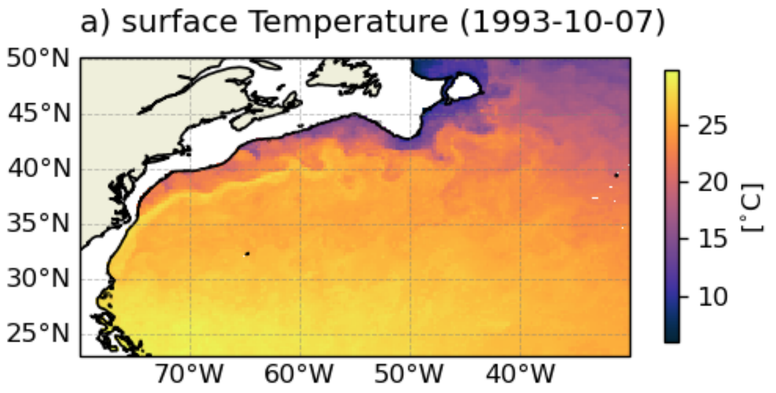
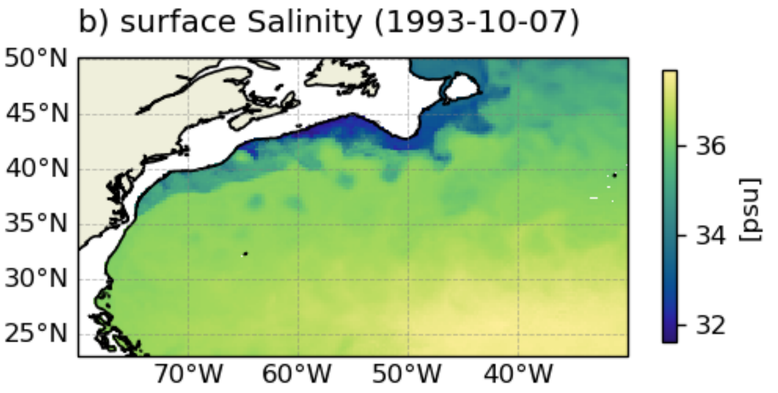
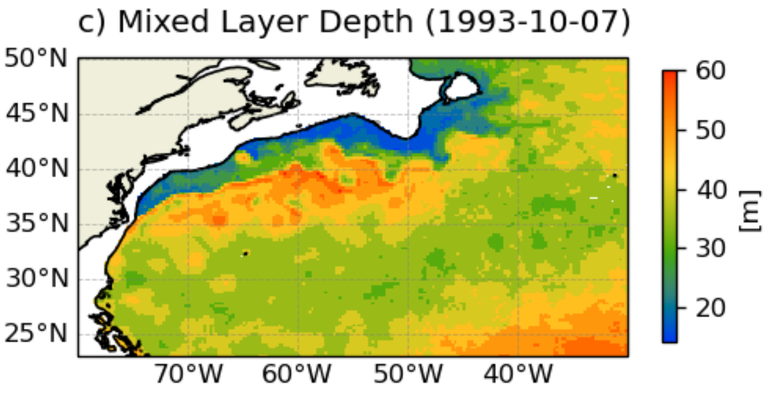
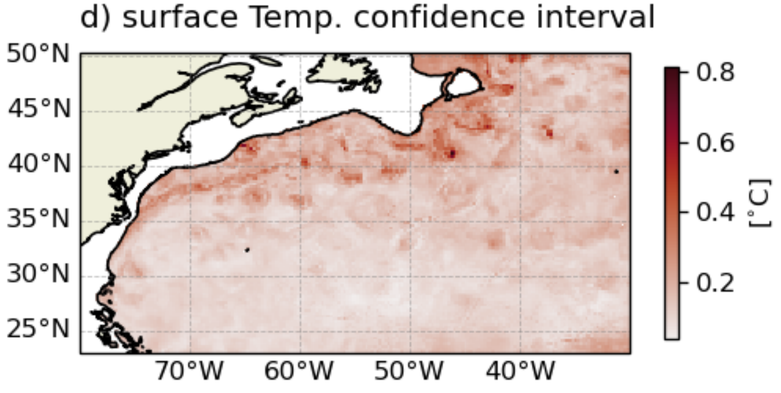
Temperature, salinity and MLD maps, example at the surface

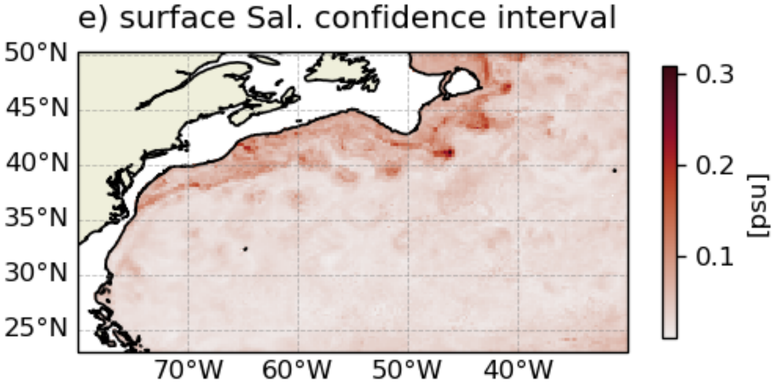
The predicted properties show coherent spatial structures.











Pauthenet et al. (2022)

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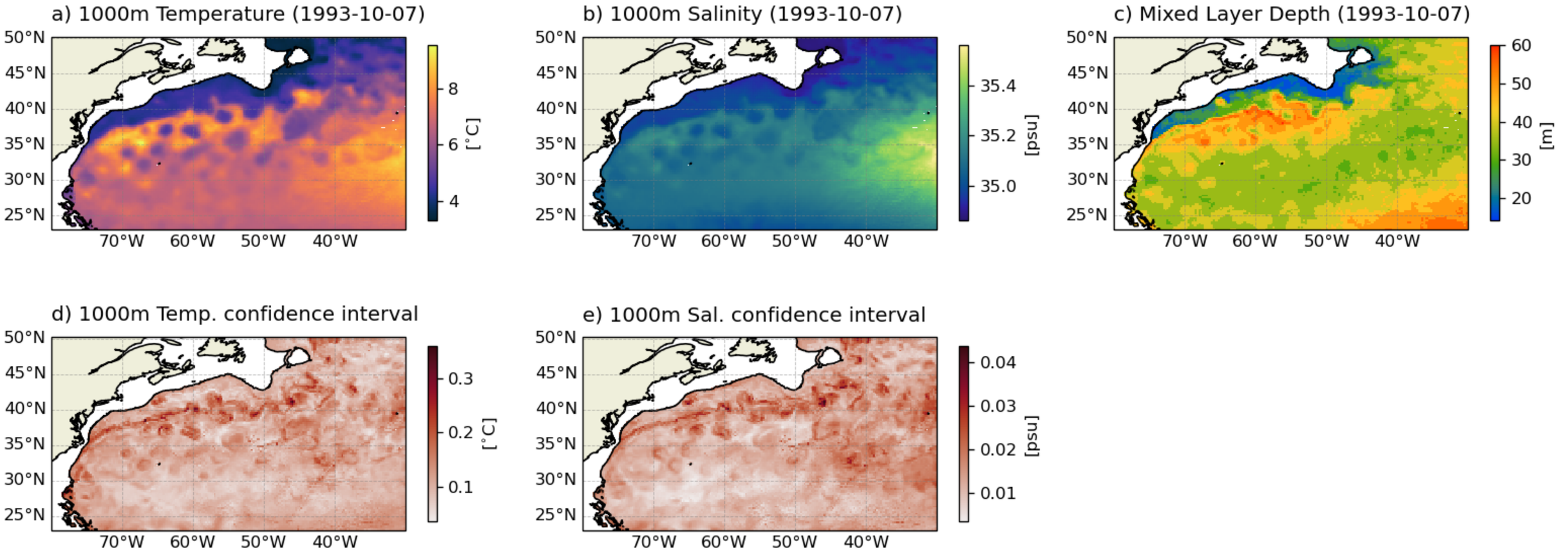
Temperature, salinity and MLD maps, example at 1000m

The eddy signature at depth are present in the product.



Pauthenet et al. (2022)

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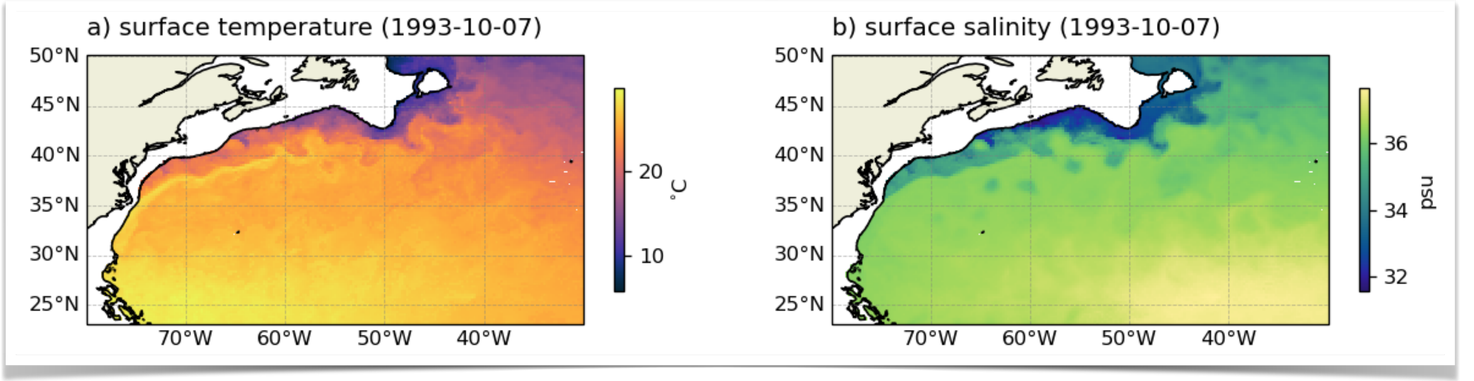
Conclusion

OSnet is an observation-based daily product of the ocean stratification.

OSnet product from 1993 to 2019 is available on Zenodo :
https://doi.org/10.5281/zenodo.6011144

The models for the Gulf Stream are available on Github :
https://github.com/euroargodev/OSnet-GulfStream

The paper is available as an EGUsphere preprint :
https://egusphere.copernicus.org/preprints/2022/egusphere-2022-25/



OSnet **Gulf-Stream**	**`OSnet` is a python library to make T/S/MLD predictions in the Gulf Stream region using Neural Network**
Methodology	Pauthenet et al, 2022 DOI 10.5194/egusphere-2022-25 Method source code: https://github.com/euroargodev/OSnet
OSnet gridded dataset	DOI 10.5281/zenodo.6011144
OSnet software *to make your own predictions*	license Apache-2.0 python 3.7 | 3.8 release date no releases or repo not found pypi package or version not found

Many improvements could be tested :
—> network architecture
—> loss constrained with physics
—> patches as inputs instead of single points
—> global ocean prediction, or poorly sampled regions,…

Pauthenet et al. (2022)