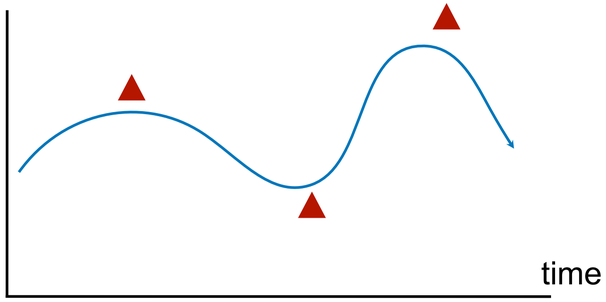
High-resolution Sea Surface Height mapping with assimilative simple models: status and plans

A. Stella, **V. Bellemin-Laponnaz**, F. Le Guillou, S. Metref, C. Ubelmann, A. Barboni and E. Cosme

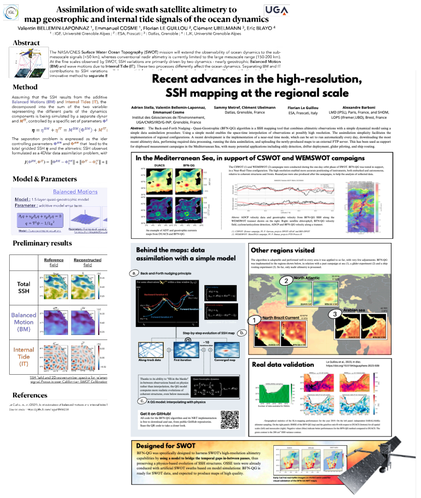
SWOT Science Team meeting 2023, Toulouse

Our approach: use simple and low-cost dynamical models

- Physically-based, consistent time interpolation of SWOT data
- Implement adapted, possibly high-level inversion algorithms
- Limit tuning efforts, ensure geographical flexibility
- Limit CPU and carbon costs
- Regional focuses (so far. And no tropics)



Check the posters!



Back-and-Forth Nudging the QG model in the Mediterranean Sea

- Tested in Neal-Real-Time to cover the C-SWOT/WEMSWOT companion campaigns, 21 march – 17 april 2023

- processes 7 nadir altimeters from CMEMS + SWOT nadir when available

BFN-QG geostrophic vel.
White arrows

C-SWOT Transect
ADCP Bk: surf, Rd: 200 m

Satellite SST

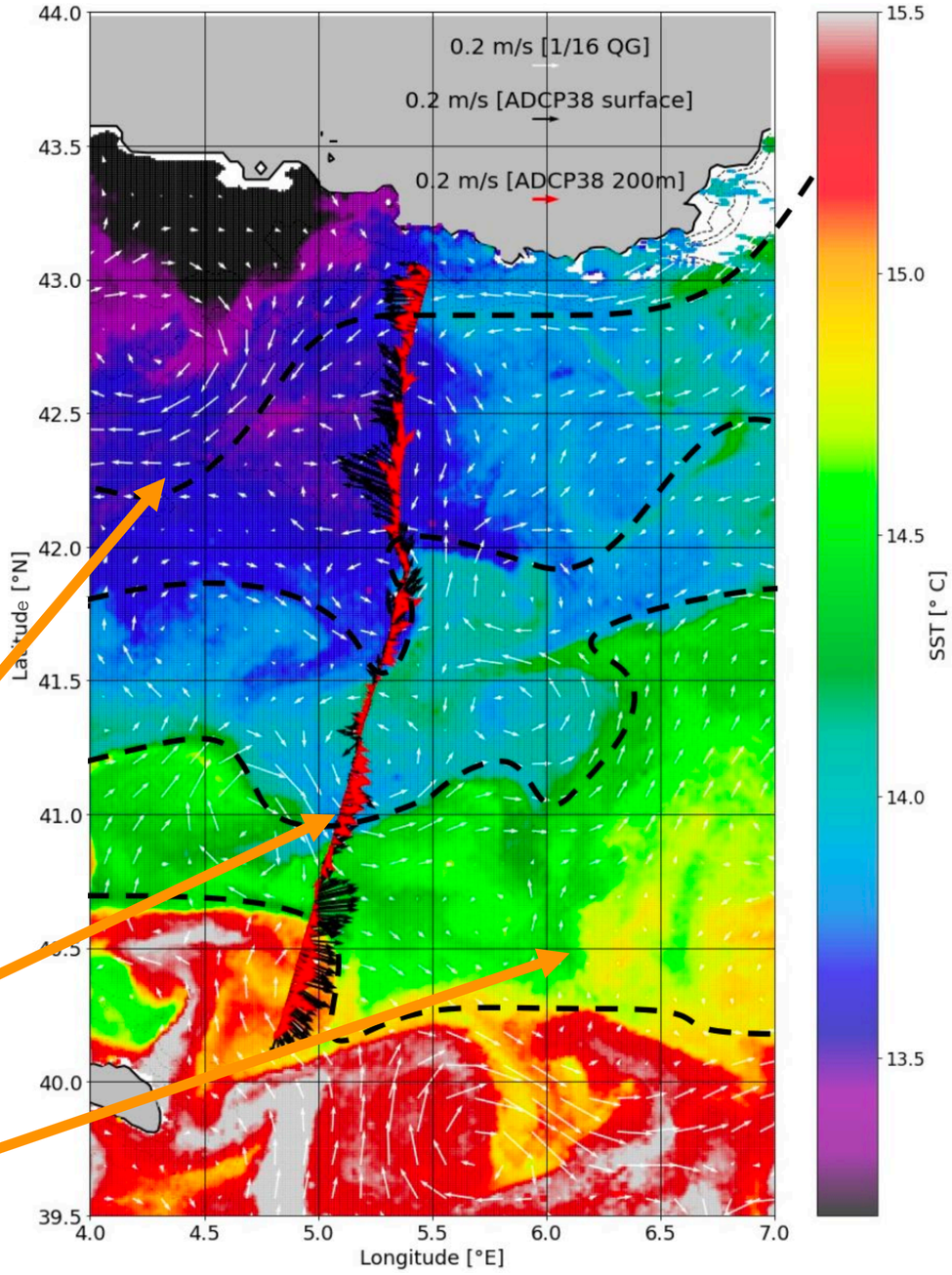
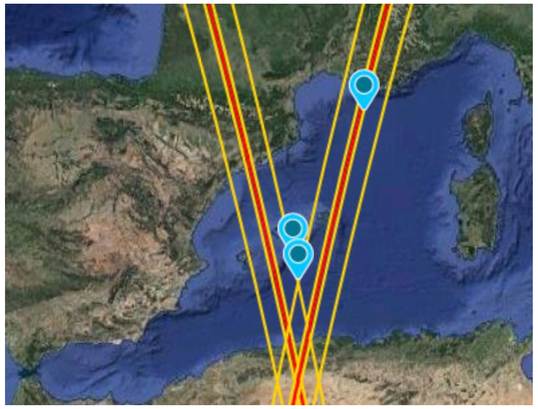
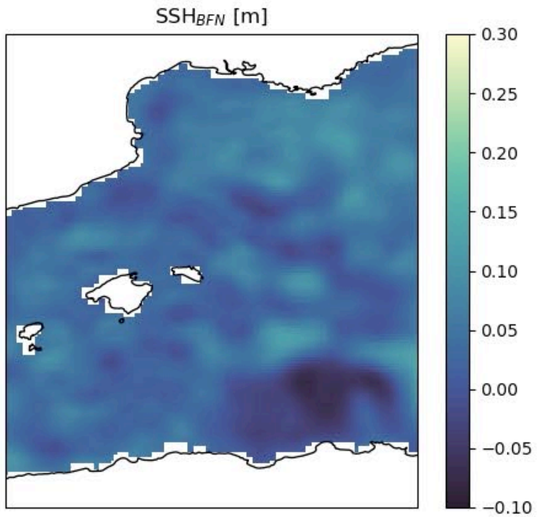


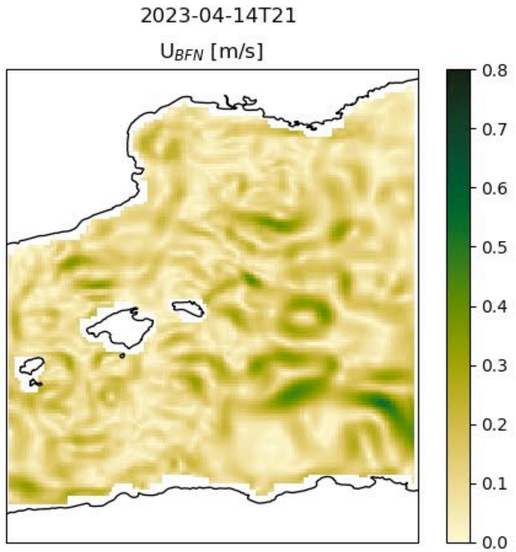
Figure from A. Barboni, F. Dumas, P. Garreau

Back-and-Forth Nudging the QG model in the Mediterranean Sea **WITH SWOT**

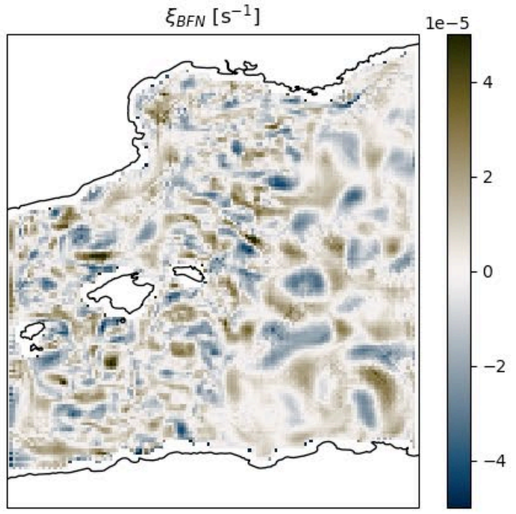




Sea Surface Height



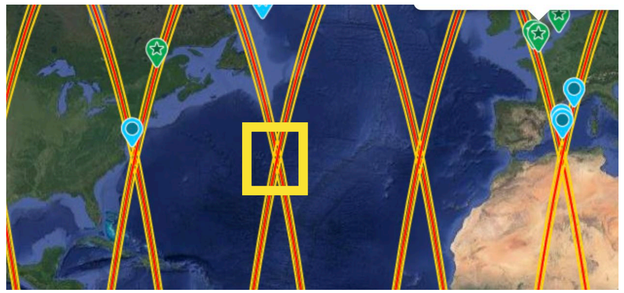
Geostrophic Velocities



Vorticity

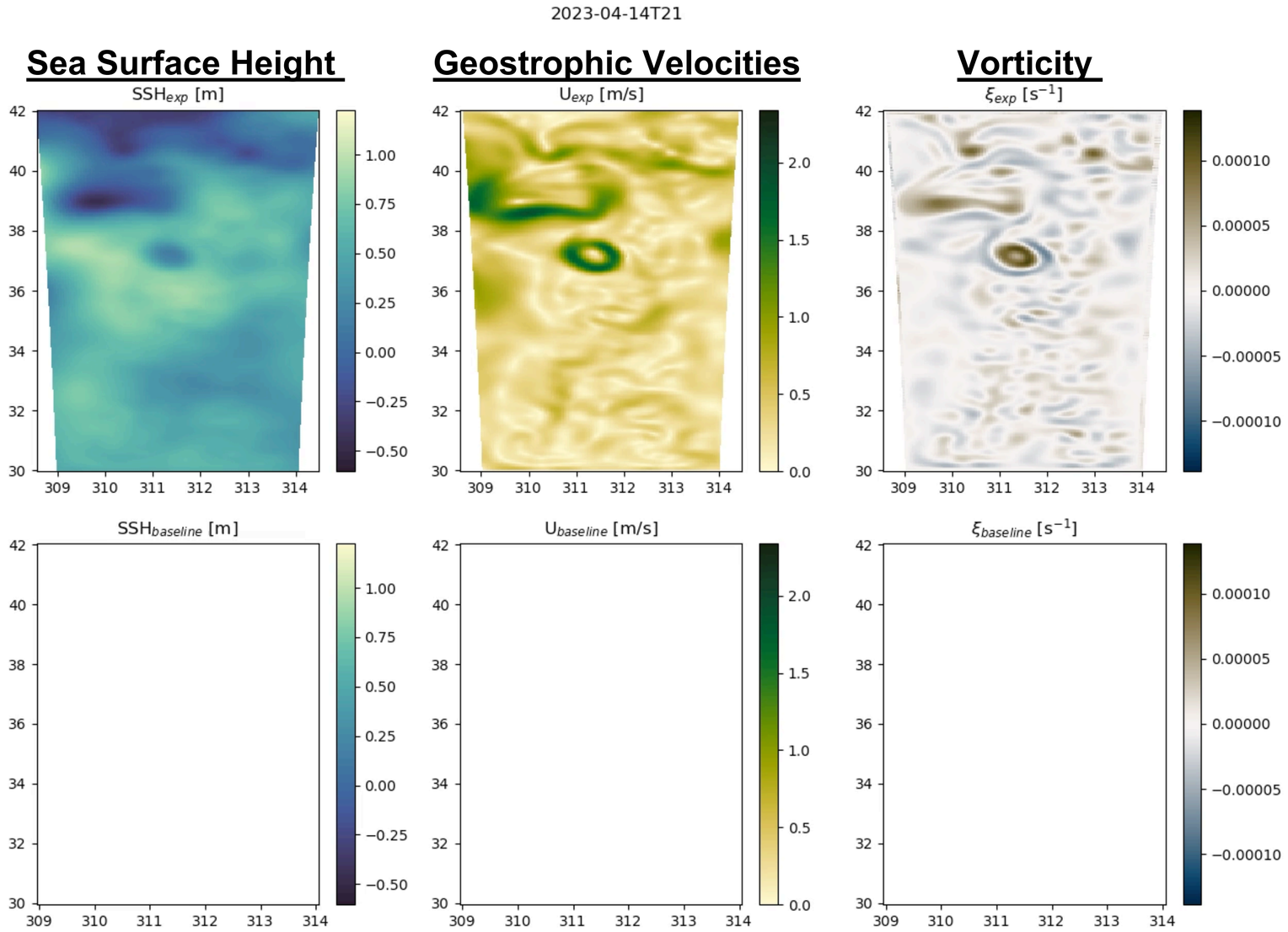
4DVar and QG model in the North Atlantic

4DVar-QG (nadirs + SWOT) ⟶



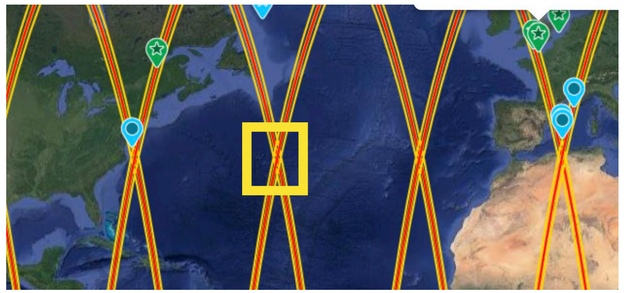
(SWOT-adac)

MIOST (nadirs + SWOT) ⟶



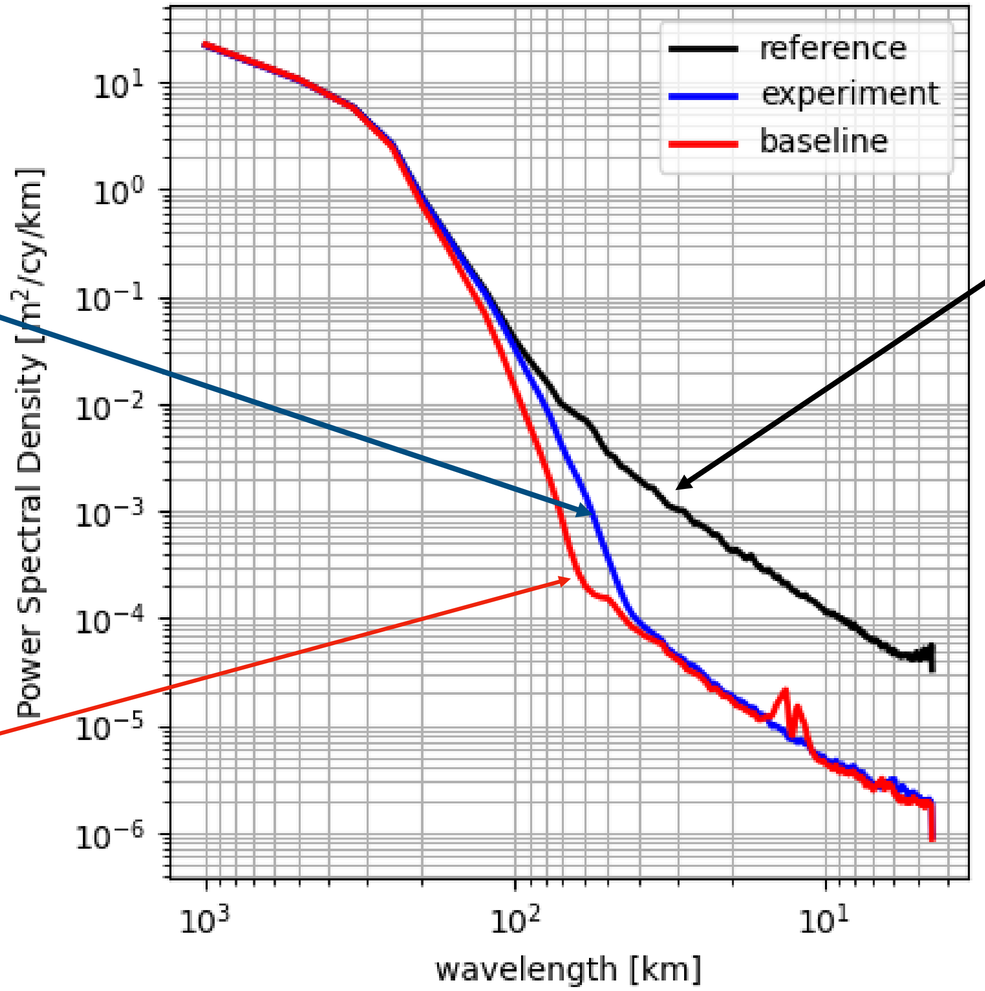
4DVar and QG model in the North Atlantic

4DVar-QG (nadirs + SWOT)
on SWOT swath



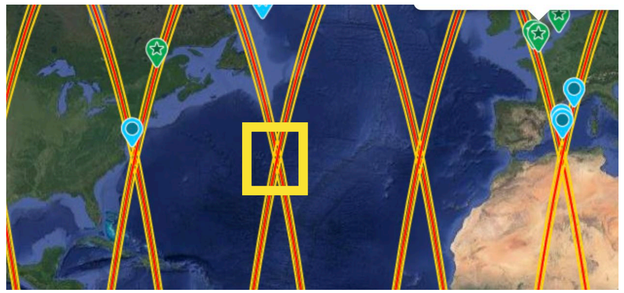
(SWOT-adac)

MIOST (nadirs + SWOT)
on SWOT swath



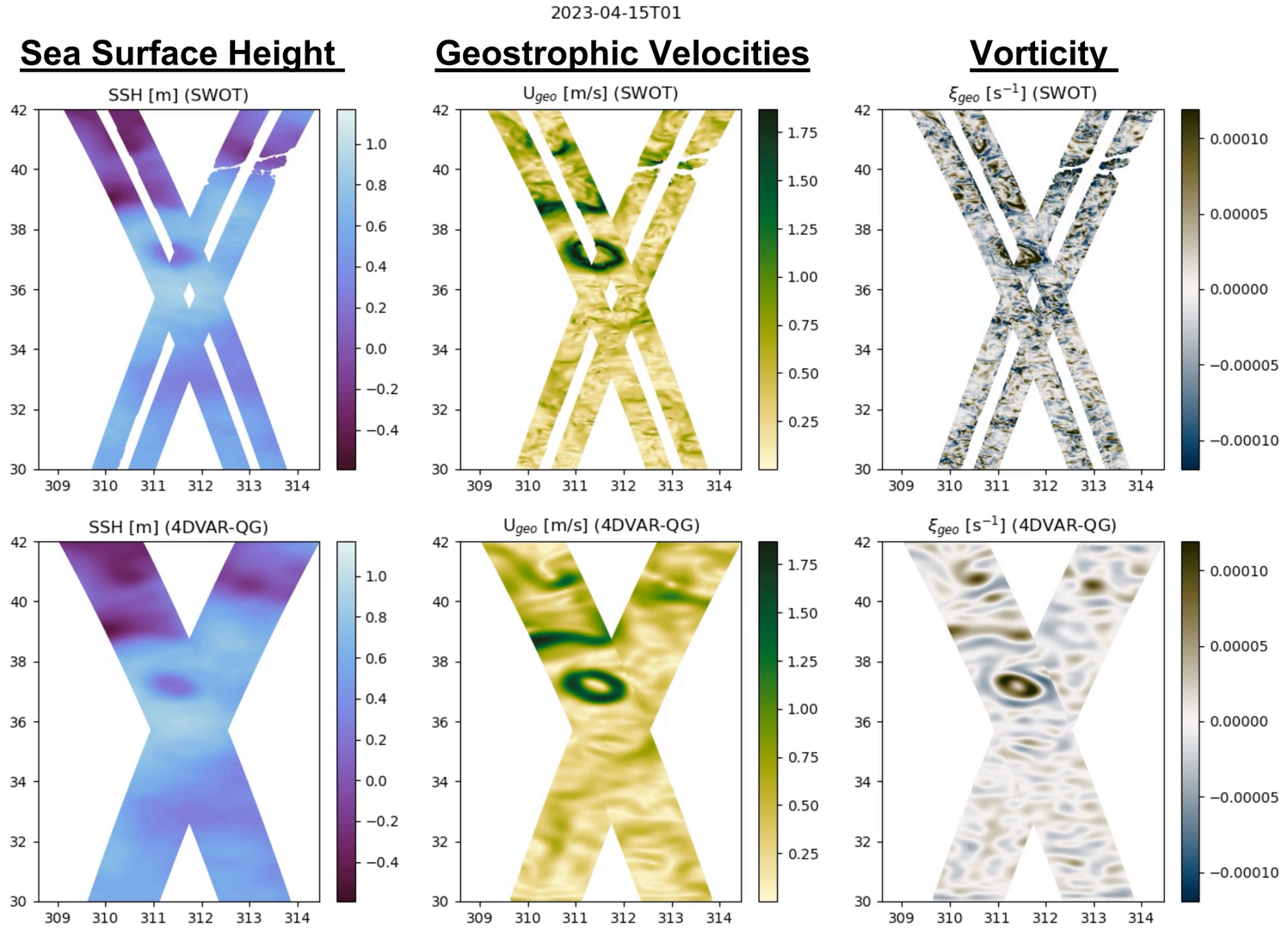
4DVar and QG model in the North Atlantic

SWOT filtered with Unet
(Treboutte et al, 2023)

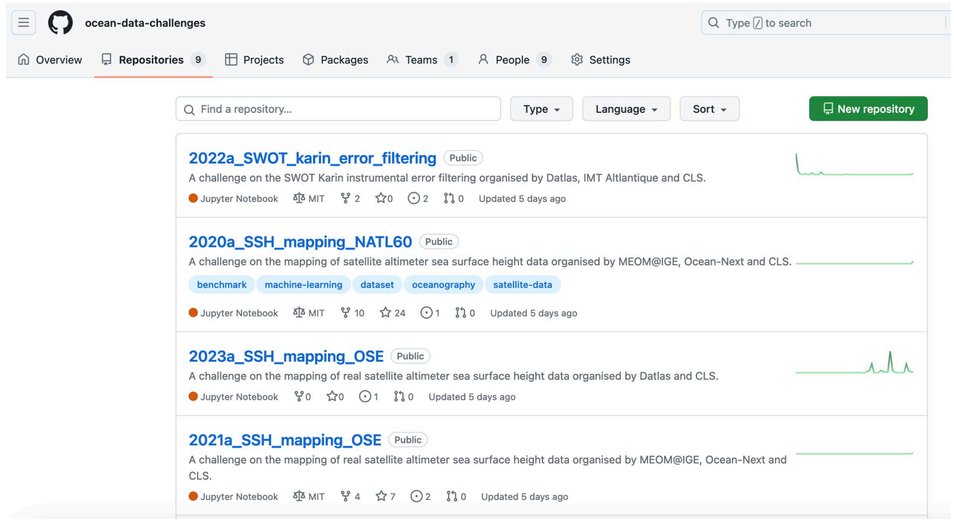


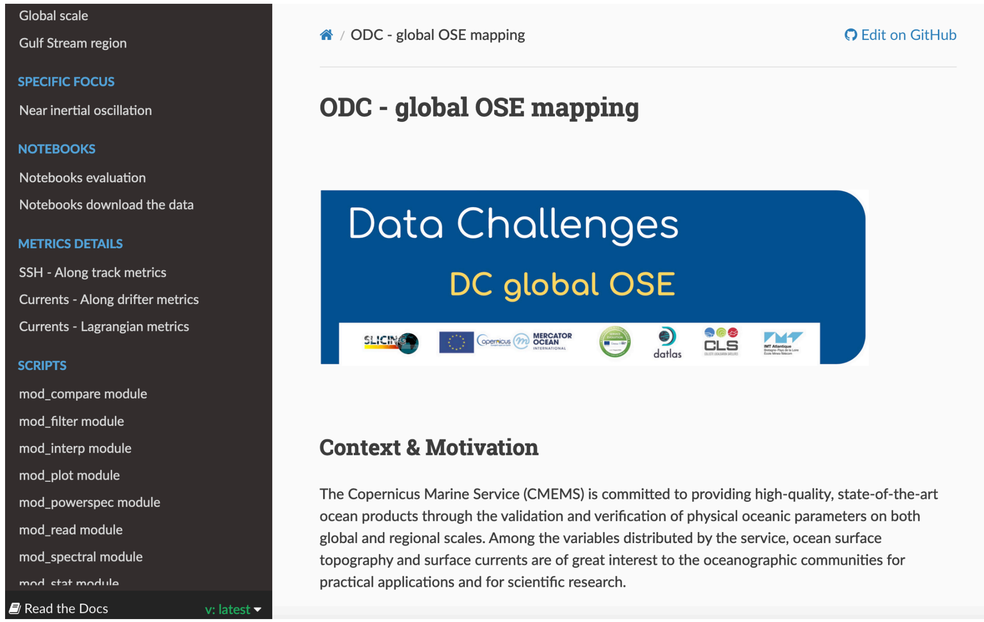
(SWOT-adac)

4DVar-QG (nadirs + SWOT)



Data challenges and tools for diagnostics





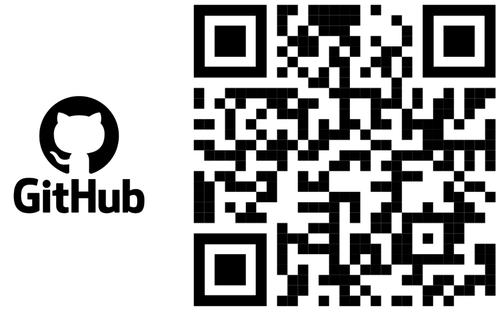
GitHub

Read the Docs

A few plans

- Consolidate results on the Med Sea
- Further develop mapping capacities, in particular for geostrophic current / internal wave separation (see poster on 4Dvar)
- Estimation of ageostrophic part of current
- Consolidate codes usability

What we can provide to colleagues



- All the codes are in open access (github.com/leguillf/MASSH)
- We are (almost) ready to run BFN-QG or 4DVar-QG in any non-tropical region upon request
- We provide free, open, documented and easy-to-use diagnostic tools.