SWOT global SSH maps performances using OSSEs

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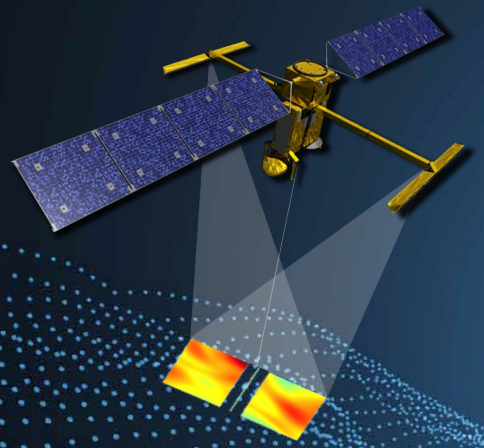
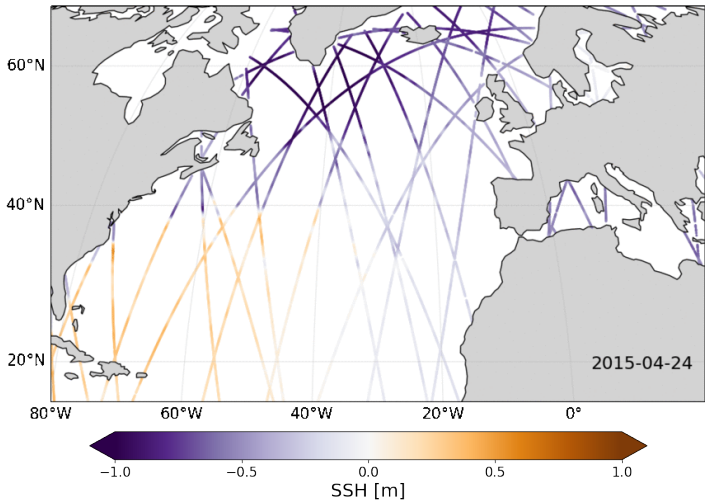


Introduction

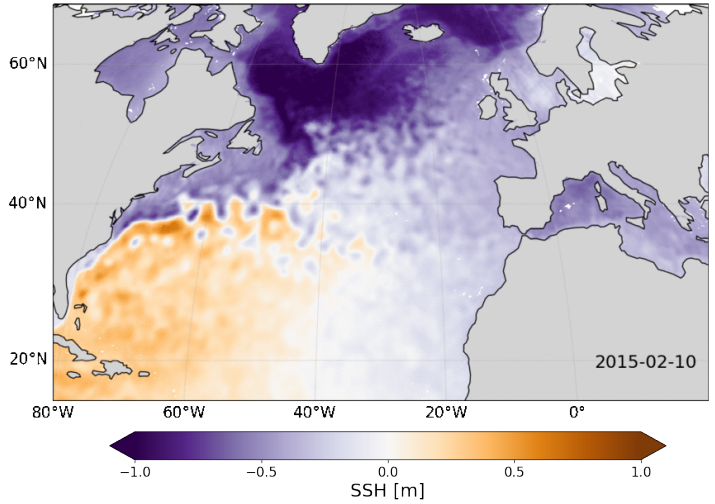
L3 along-track data

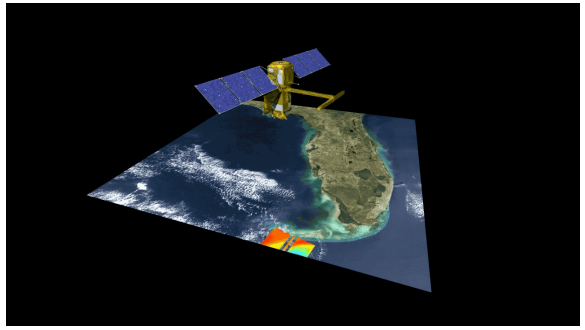


Mapping algorithm

DUACS, MIOST

L4 Gridded SSH map



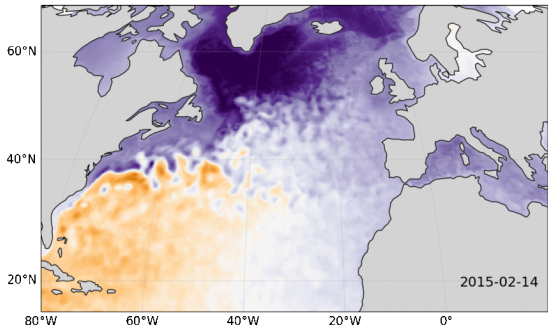


What are the performances of SWOT in global SSH maps?

→ **O**bserving **S**ystem **S**imulation **E**xperiment

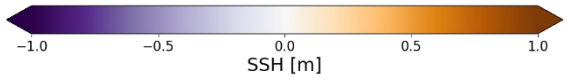
Experimental setup

Ocean model

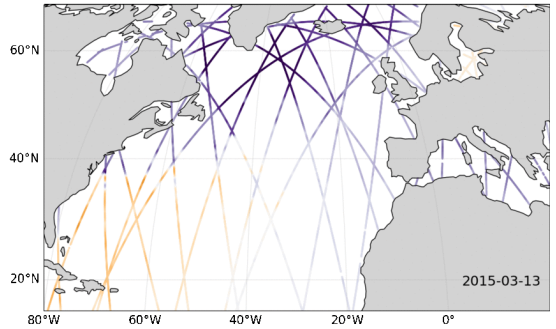


GLORYS12 [Lellouche 2018]

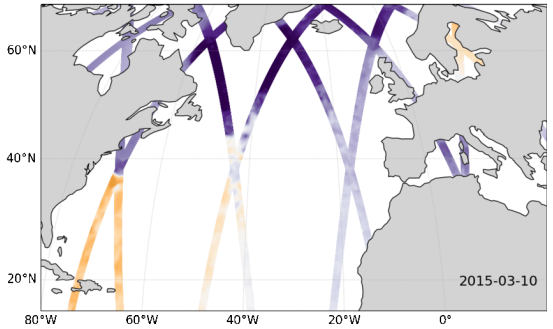
- Global assimilated model
- 1/12 ° horizontal resolution
- 1 day temporal resolution



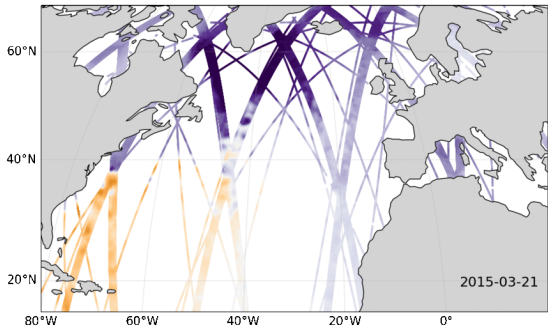
Simulated data



3 Nadirs

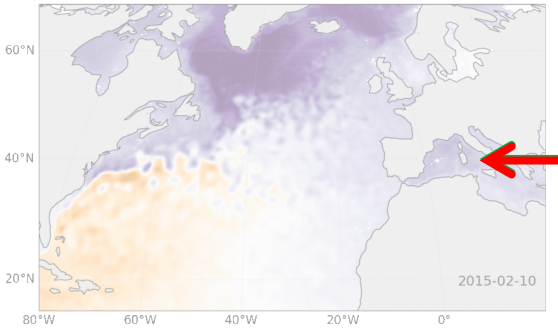


SWOT

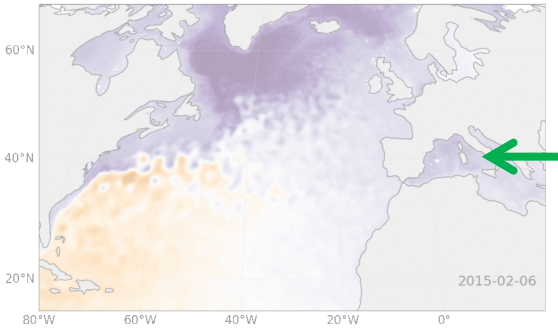


All Sats

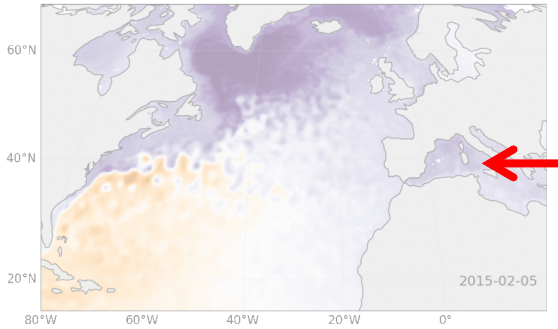
SSH maps



3 Nadirs



SWOT



All Sats

Difference between SWOT and 3 Nadirs ???

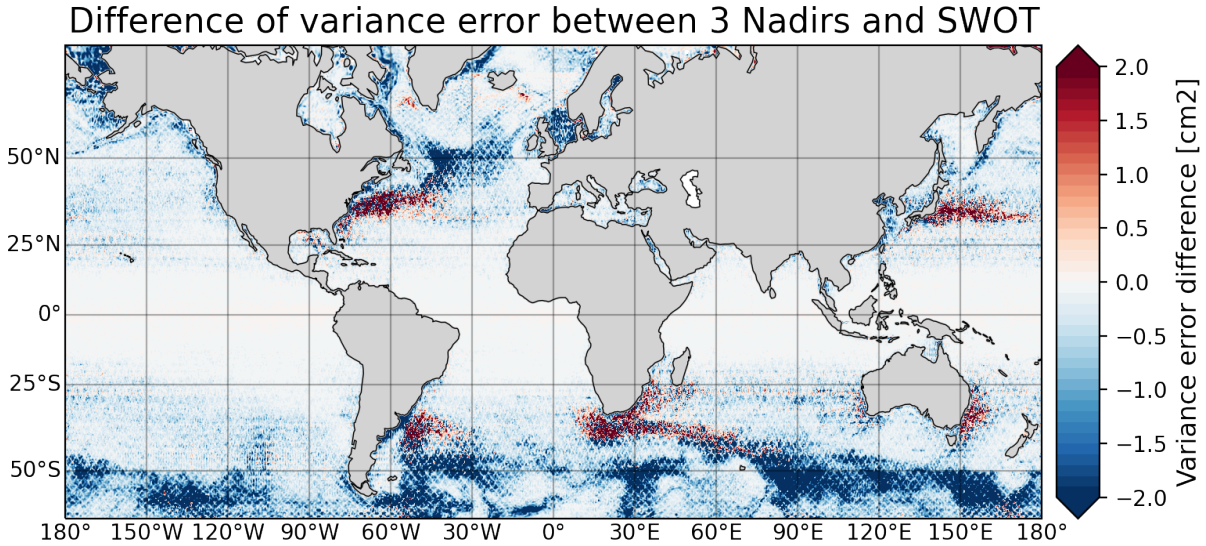
Benefit of SWOT when added to 3 Nadirs ???

Evaluation diagnosis

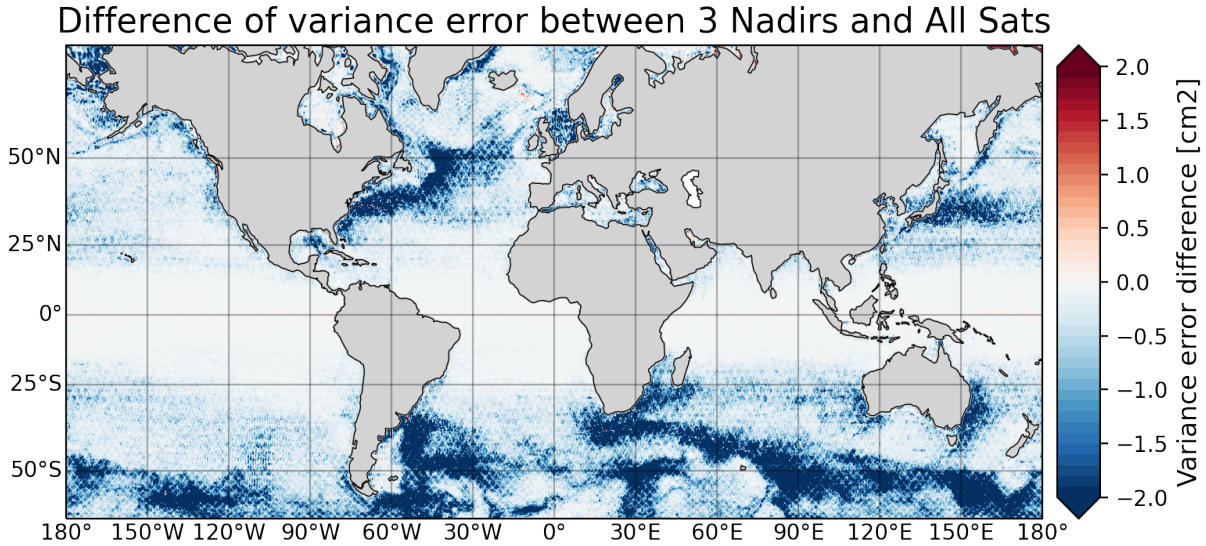
1. Variance of reconstruction error
2. Spatial resolution [Ballarotta *et.al.* 2019]
3. Eddy detection and tracking [Pegliasco *et.al.* 2022]

1) Reconstruction error

→ **Only wavelength below 200 km are considered.**



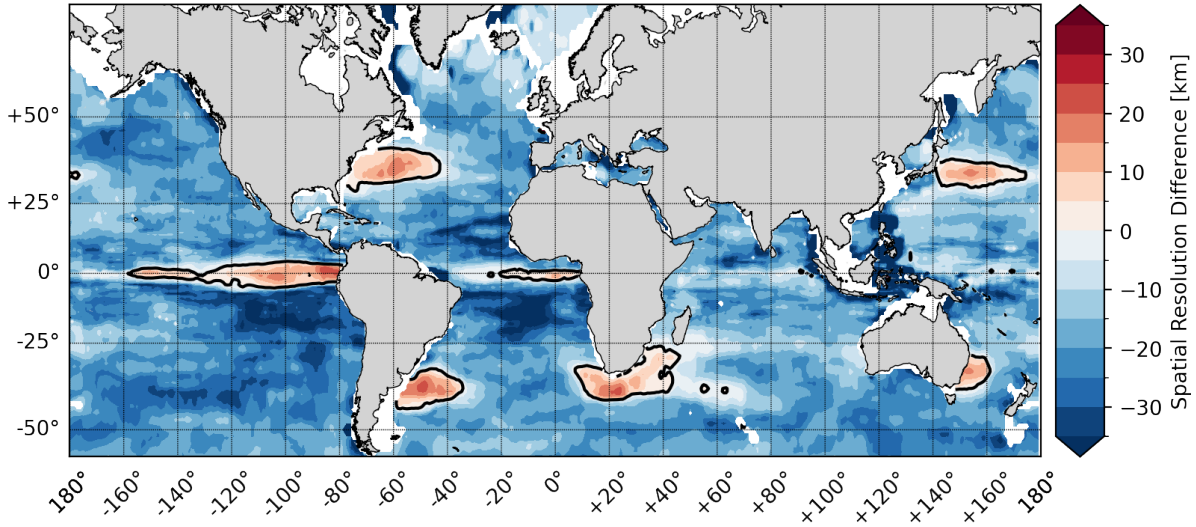
- **red :** 3 Nadirs commit less error
- **blue :** SWOT commits less error



- **red :** 3 Nadirs commit less error
- **blue :** All Sats commit less error

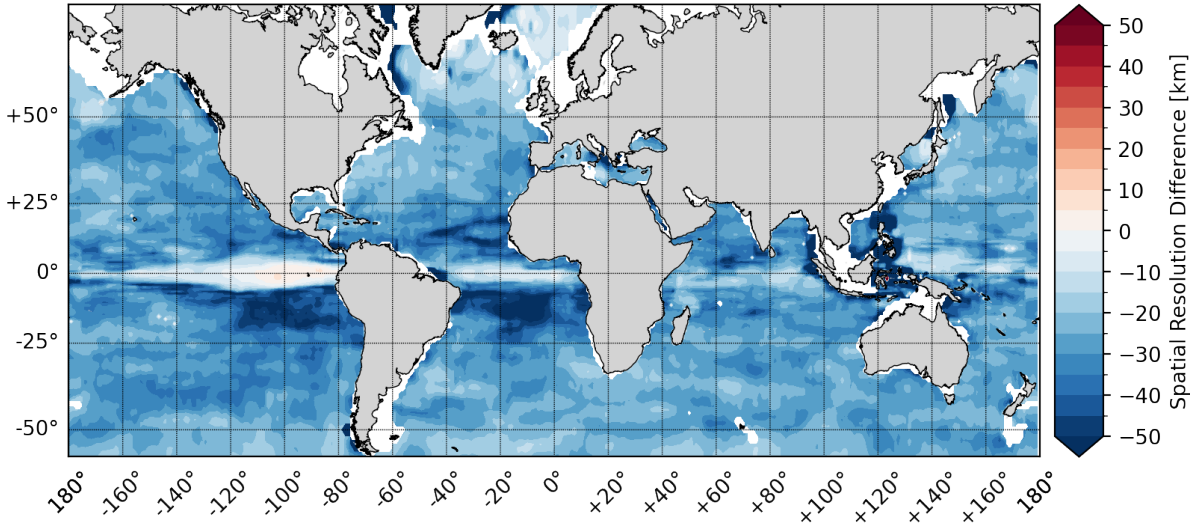
2) Spatial resolution

Spatial resolution difference between 3 Nadirs and SWOT



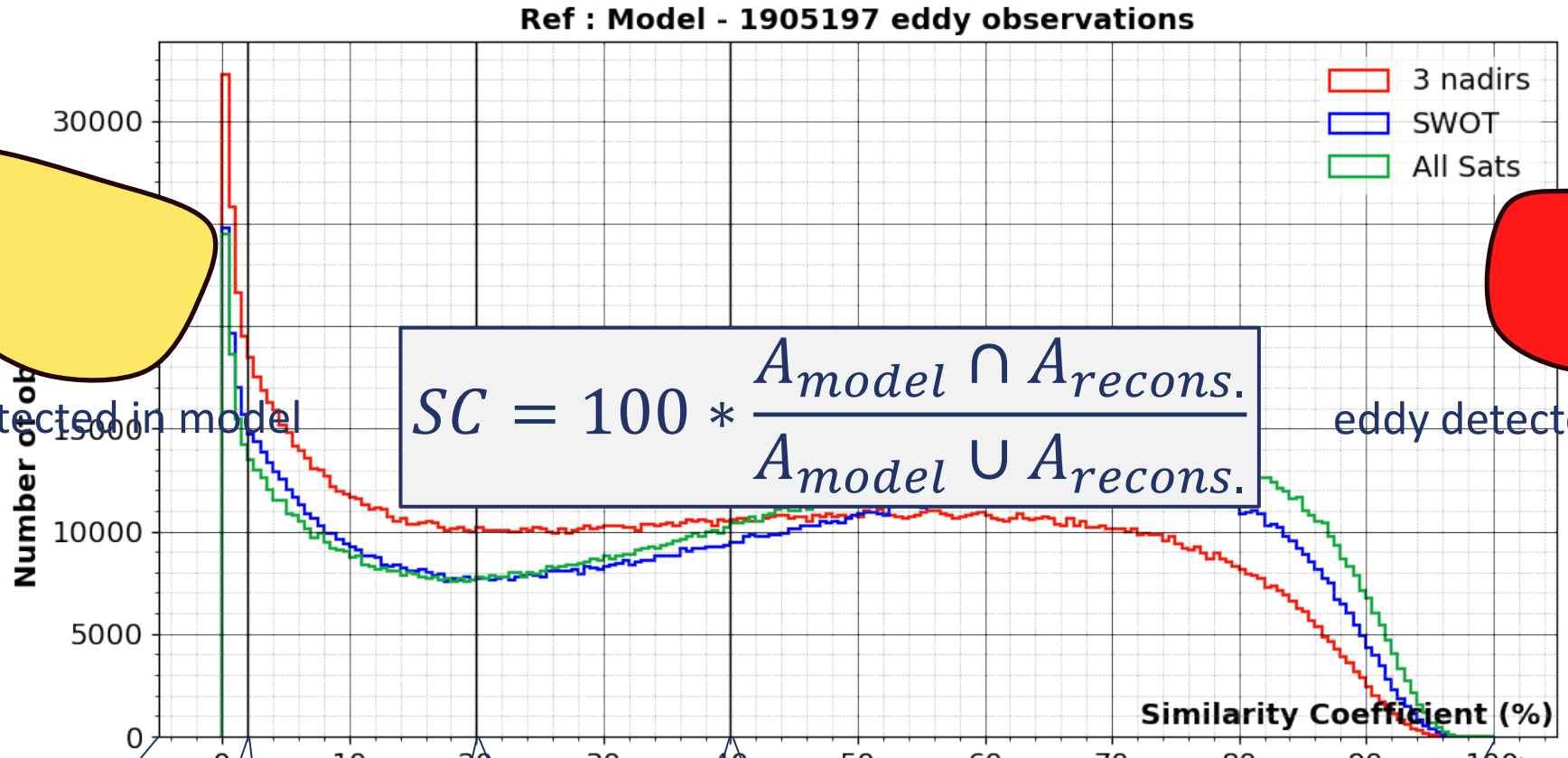
- **red :** 3 Nadirs have a better resolution
- **blue :** SWOT has a better resolution

Spatial resolution difference between 3 Nadirs and All Sats



- **red :** 3 Nadirs have a better resolution
- **blue :** All Sats have a better resolution

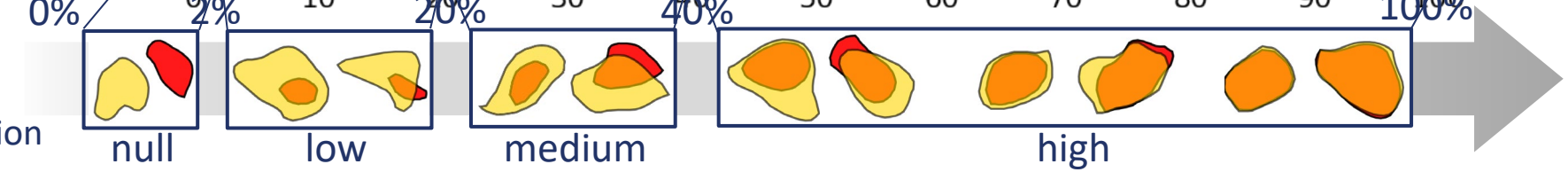
3) Eddy detection



eddy detected in model

$$SC = 100 * \frac{A_{model} \cap A_{recons.}}{A_{model} \cup A_{recons.}}$$

eddy detected in reconstruction



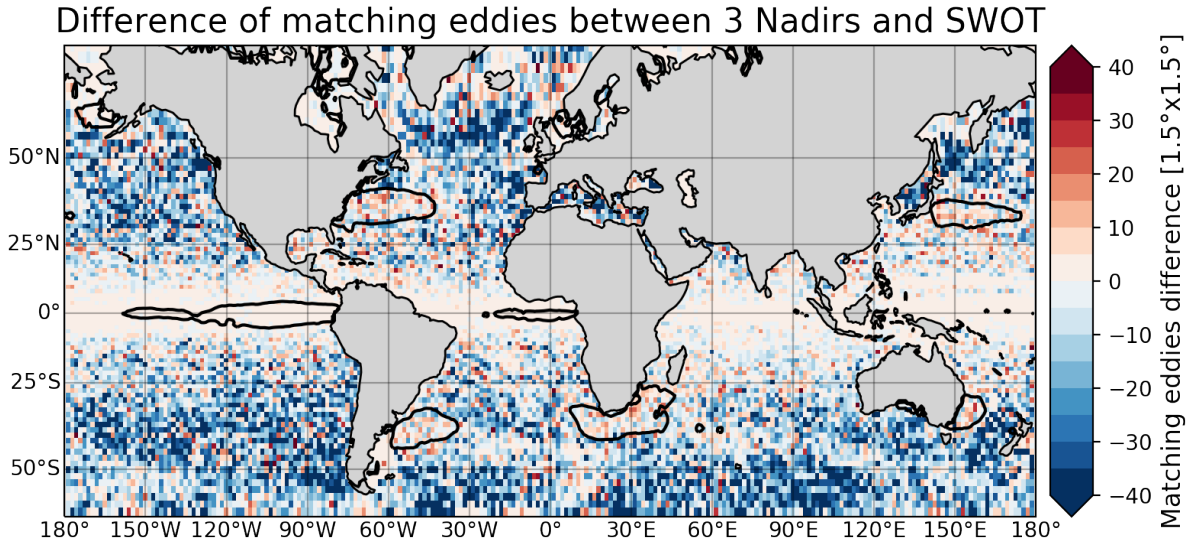
NO MATCH
btw. Model
& Reconstruction

TOTAL MATCH
btw. Model
& Reconstruction

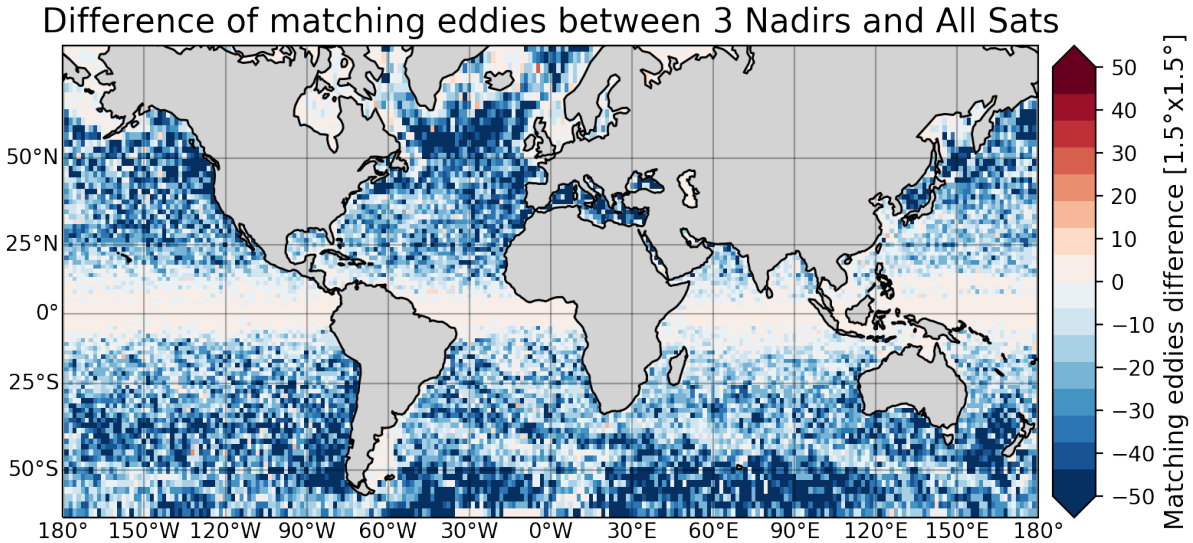
eddy from model

eddy from reconstruction

3) Eddy detection



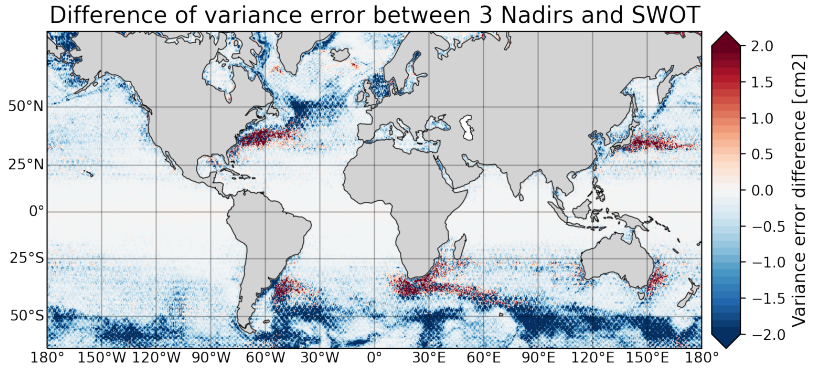
- **red :** 3 Nadirs have more matching eddies
- **blue :** SWOT has more matching eddies

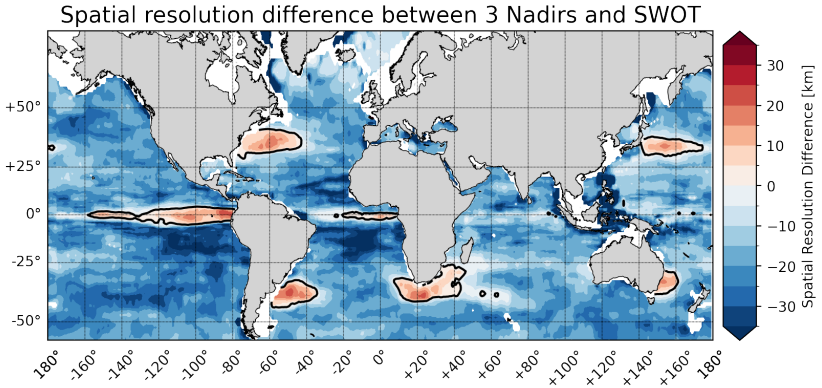


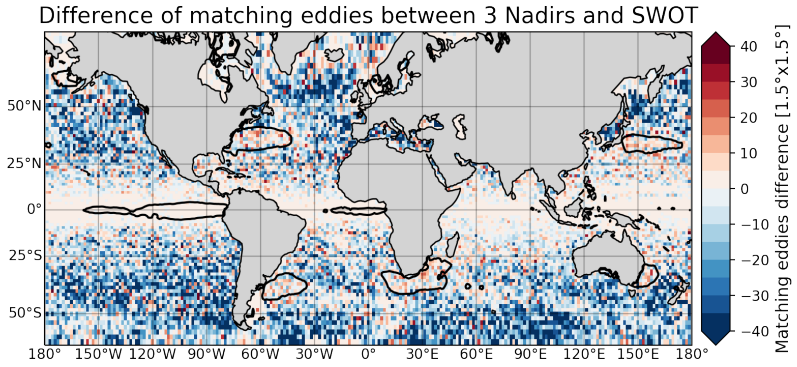
- **red :** 3 Nadirs have more matching eddies
- **blue :** All Sats have more matching eddies

Main message

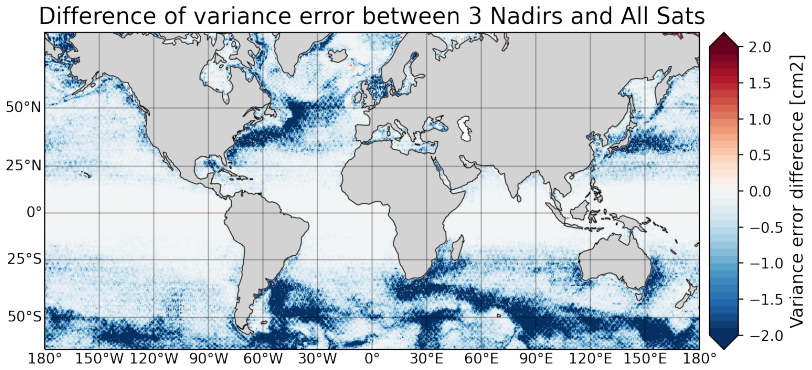
→ Regarding difference between SWOT and 3 Nadirs

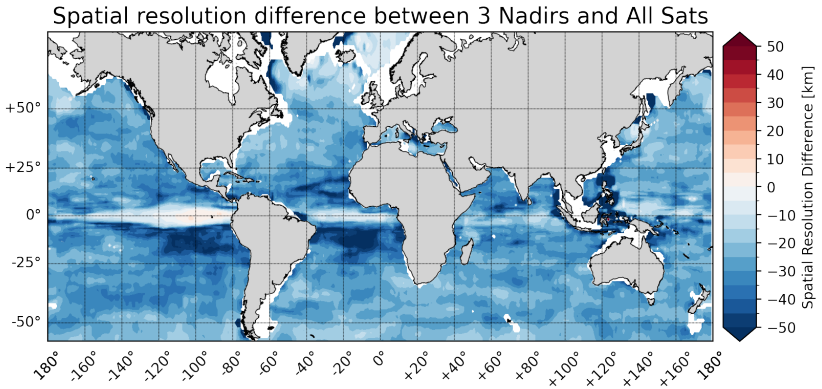


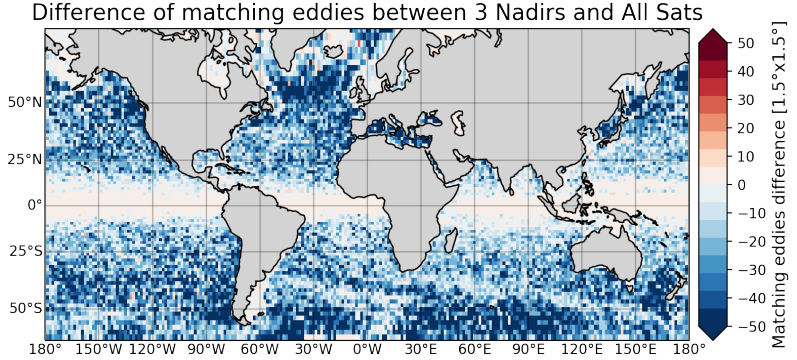




→ Regarding benefit of SWOT when added to 3 Nadirs







Conclusion

- Showed performances of SWOT with **MIOST** algorithm (Ubelmann *et. al.* 2021a)
- What are the performances with dynamical mapping methods?
  - Dynamical interpolation (Ubelmann *et. al.* 2015)
  - 4DVarNet (Beauchamp *et.al.* 2020)
  - Data assimilation (Le Guillou *et. al.* 2021)