

## Cyclogeostrophic inversion for estimating Sea Surface Currents from SWOT altimeter data Vadim BERTRAND, Victor VIANNA ZAIA DE ALMEIDA, Julien LE SOMMER and Emmanuel COSME (corresponding author: vadim.bertrand@univ-grenoble-alpes.fr)

SWOT altimeter data observes Sea Surface Height (SSH) at scales <100km. SSH is routinely used for estimating Sea Surface Currents (SSC) through the geostrophic balance. This poster introduces a new formulation of the cyclogeostrophic inversion problem, with elements suggesting that cyclogeostrophic corrections will be key at SWOT scales.

## **Sea Surface Currents from altimeter data**





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More contrasted results near the Gulf Stream.



![](_page_0_Figure_20.jpeg)

![](_page_0_Figure_22.jpeg)

![](_page_0_Figure_24.jpeg)

regions of the Mediterranean Sea with corrections in the intertropical band. cyclogeostrophic corrections.

# **Perspectives with SWOT** DUACS effective spatial resolution: $L_{FF}$

noticeable.

SWOT is expected to improve the effective spatial resolution of altimetry products, leading us to hypothesise that cyclogeostrophy will be key to estimate SSC with SWOT. This will be investigated using altimeter and drifter data from the 2023 C-SWOT campaign.

### Notes on the method and its implementation

- physical solution might not exist <sup>[7]</sup>

- 1109. https://doi.org/10.5194/os-15-1091-2019

- (MDS). <u>https://doi.org/10.48670/moi-00148</u>
- z961

![](_page_0_Picture_44.jpeg)

## **Caveats and future perspectives**

![](_page_0_Figure_46.jpeg)

Areas where the ratio between the baroclinic Rossby radius of deformation and the effective spatial resolution co-locate with areas where the cyclogeostrophic corrections are most

Under extremely energetic conditions, the cyclogeostrophic balance may not hold, and

 jaxparrow manipulates C-grids, and currently employs a 3-point central finite difference to compute gradients. Numerical errors could be reduced with the use of wider stencils <sup>[1]</sup>

### Key takeaways

• We propose a new approach to the cyclogeostrophic inversion problem • Along with its implementation as a **publicly available Python package: jaxparrow** We evaluate it against both model and operational product

Field data from SWOT AdaC campaigns will be key to evaluate the need for cyclogeostrophic corrections at scales <100km

## References

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