Sea surface salinity signature of Agulhas Rings from CCI satellite data

(1) (2)

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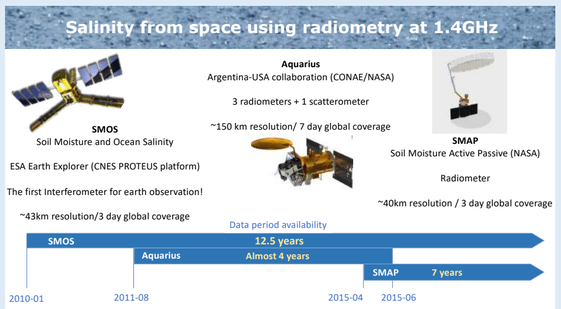
Context:

The Aghulas retroflexion gives birth to long lived mesoscale structures called Aghulas Rings. Those vortices propagate in the Atlantic Ocean water masses issued from the Indian Ocean. They have a signature of higher salinity and temperature (Duncombe et al., 1996).

Their characteristic radius is around 50km which should make them visible from space using salinity issued from L-Band radiometry. We thus investigate the signature of the Aghulas rings (ARs) during their propagation in the Atlantic Ocean.

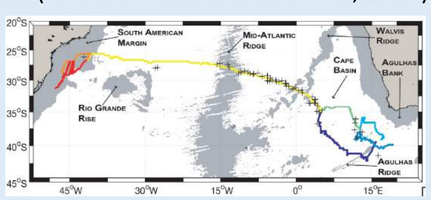
Datasets:

- The Sea Surface Salinity used is the new CCI L4 product (v3.2)

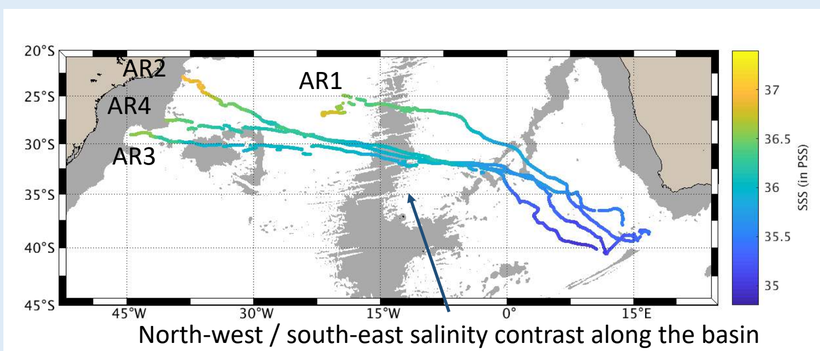


Adapted from Reul et al. 2020

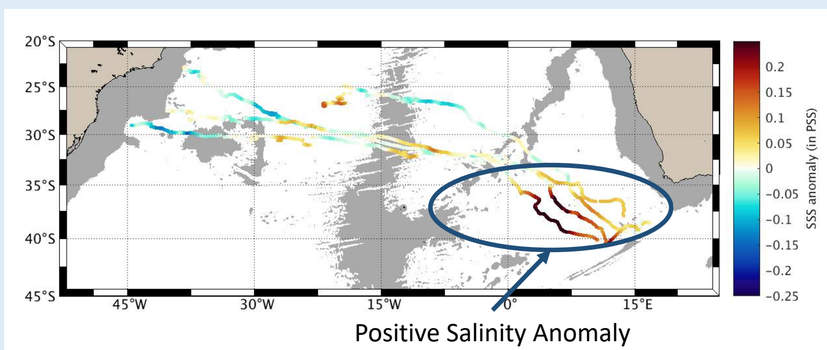
- Eddy trajectories are coming from the TOEDDIES algorithm (described in Laxenaire et al., 2019)



We calculate for each position of an AR the mean SSS inside the core and we deduce the anomaly as the difference between this mean and the surrounding mean SSS:

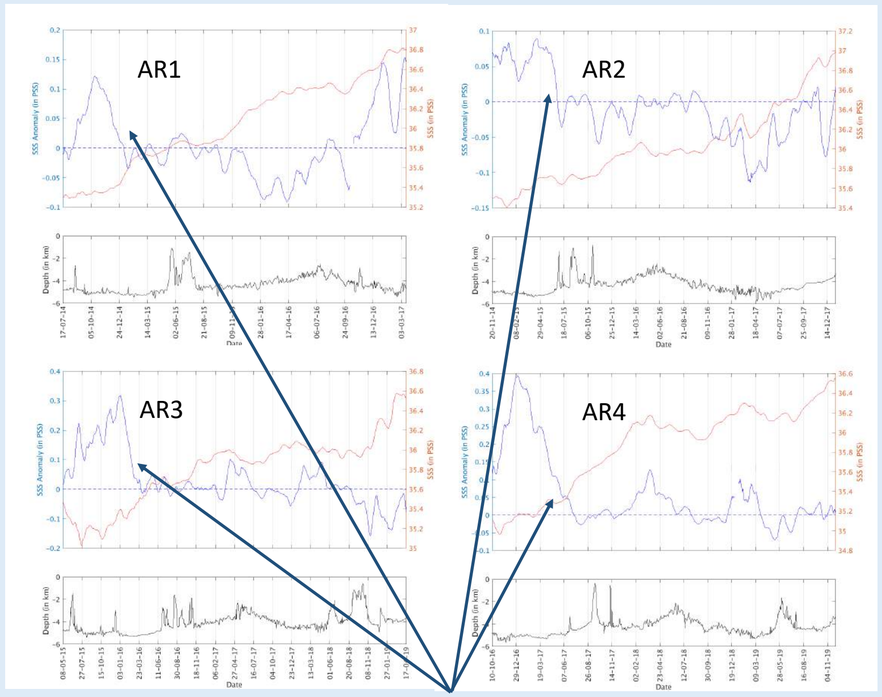


North-west / south-east salinity contrast along the basin



Positive Salinity Anomaly

Time Evolution of the Salinity and the salinity anomaly and corresponding bathymetry:



Anomaly decreases before arriving to the Walvis ridge

Conclusion:

- The CCI dataset shows us a clear signature for the ARs in the Cap Basin (positive SSS anomaly).
- This signal is disappearing after passing the Walvis ridge in accordance with paper showing the subduction of the ARs after leaving the Cape Basin (Laxenaire et al., 2019).
- For some trajectories, it seems that the ARs can re-emerge when arriving on new topography.

Openings:

- New L-Band Satellite generation with a better spatial resolution can provide helpful information to investigate such structures (SMOS-HR).

References:

Reul N. et al. (2020), “Sea surface salinity estimates from spaceborne L-band radiometers: An overview of the first decade of observation (2010–2019).” *Remote Sensing of Environment*, 242. L111769.17

Laxenaire R. et al. (2019), “Evolution of the Thermohaline Structure of One Agulhas Ring Reconstructed from Satellite Altimetry and Argo Floats.” *Journal of Geophysical Research: Oceans*, 124(12):8501-9705

Duncombe Rae C. et al. (1996), “The eddy field of the southeast Atlantic Ocean: A statistical census from the Benguela Sources and Transports Project.” *Journal of Geophysical Research: Oceans*, 101(C5):11949–11964.