

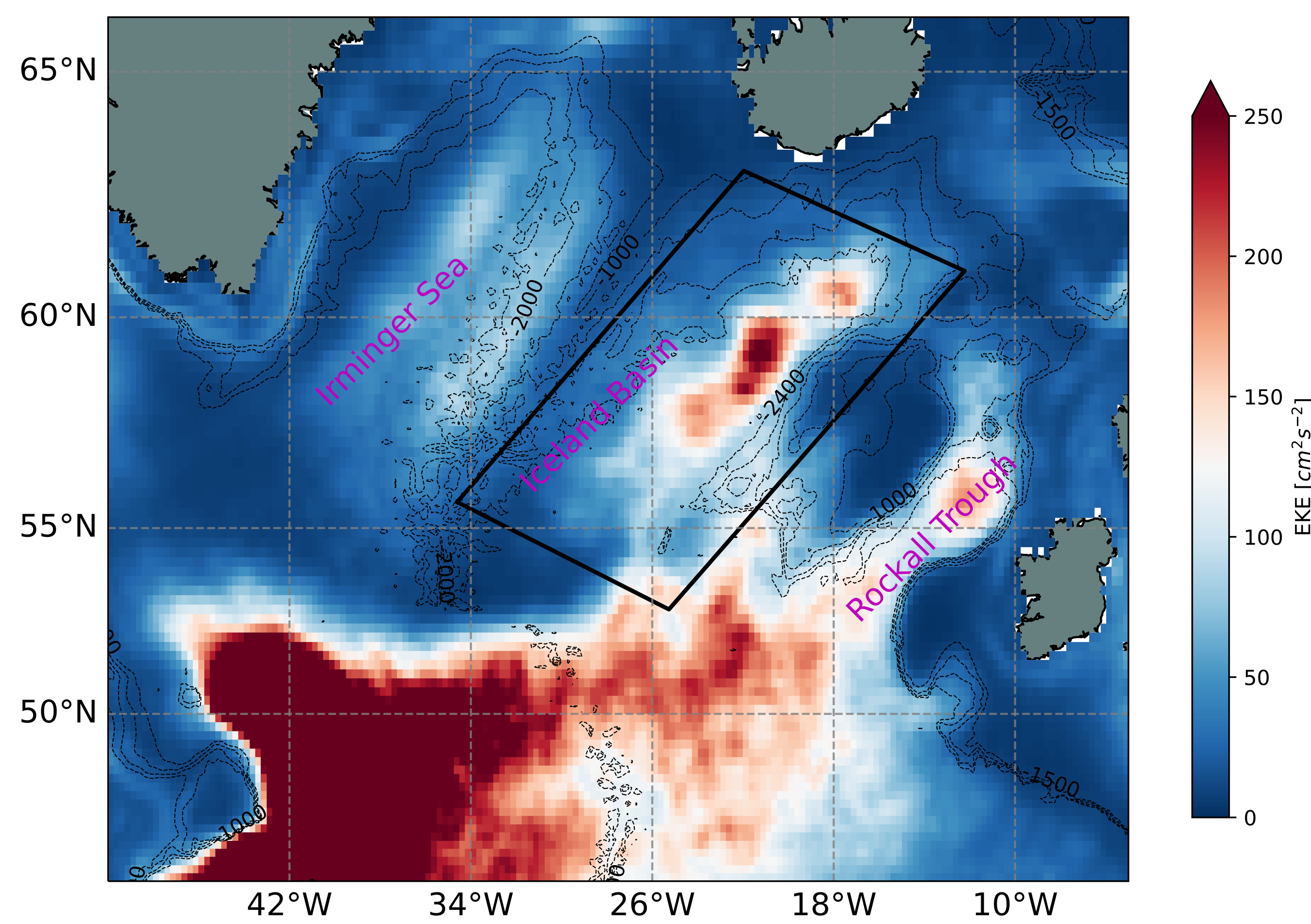
Investigating the variability of eddy formation in the eastern subpolar North Atlantic from satellite altimetry

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Introduction:

- ❑ The Iceland Basin (IB) is a region of intense eddy activity in the eastern Subpolar North Atlantic (SPNA).
- ❑ Velocity changes associated with mesoscale processes contribute about 50% of the total meridional heat transport variability in the Iceland Basin (Zhao et al., 2018).



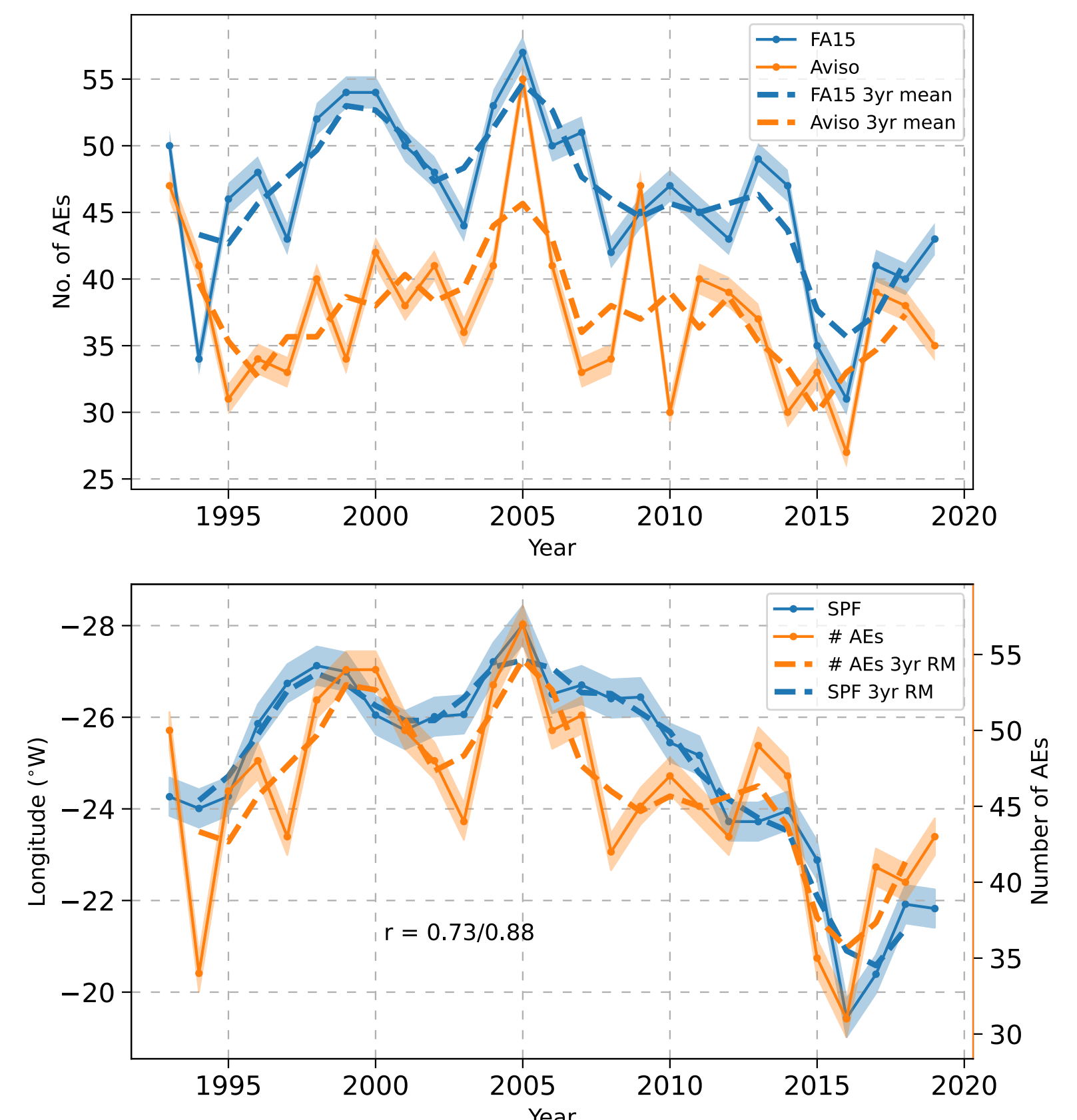
- ❑ However, how the coherent eddy field in the IB, has varied over the altimetry era and how it is linked to the pronounced decadal-scale climate variability of the SPNA remains poorly understood.

Materials and methods:

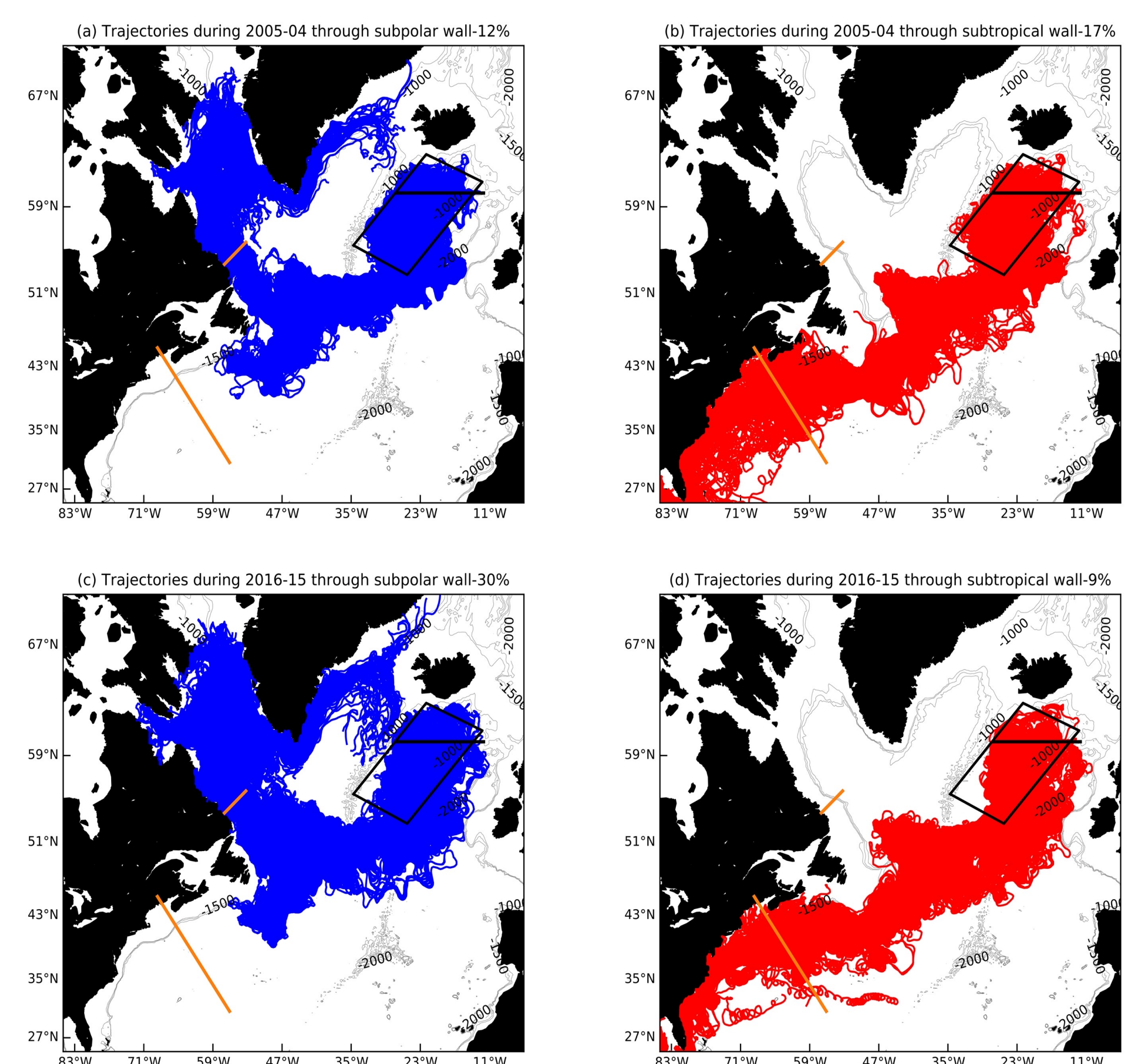
- ❖ We use satellite-derived Sea Level Anomaly (SLA) data between 1993-2019 for the detection and tracking of WCRs.
- ❖ Two automatic eddy detection schemes (Chelton et al. 2011 (AVISO); Faghmous et al. 2015 (FA15)) are used to track the Anticyclonic Eddies (AEs) in the IB.

Results:

- The interannual variation in the count of AEs based on these two ocean eddy detection schemes, FA15 and AVISO, shows a pronounced low-frequency variability.
- The zonal position of the sub-polar front (SPF) (35.3 isohaline) is found to explain more than 53/77 % of the variability in the count of AEs on interannual/decadal timescales.



Lagrangian Tracking



- Backtracking of particles reaching IB in periods of high and low counts of AEs.
- During 2004–2005 (high number of AEs) nearly two times as many particles reached IB from the subtropics compared to the 2015–2016 (low number of AEs) period.

Conclusions:

1. The relative contribution of subtropical and subpolar water reaching the IB modulates the position of SPF. The SPF's zonal position in the IB can explain 77 % variability of the formation of AEs.
2. On a decadal scale the formation of AEs are modulated by baroclinic instabilities at the subpolar frontal zone (Kondetharayil Soman et al (2022))

References:

1. Zhao et al. Meridional heat transport variability induced by mesoscale processes in the subpolar North Atlantic. *Nat. Commun.* 9, 1124 (2018).
2. Chelton et al. Global observations of nonlinear mesoscale eddies. *Prog. Oceanogr.* 91, 167–216 (2011).
3. Kondetharayil Soman et al. Linking coherent anticyclonic eddies in the Iceland Basin to decadal oceanic variability in the Subpolar North Atlantic. *JGR Oceans*, 127 (2022)
4. Faghmous et al. A daily global mesoscale ocean eddy dataset from satellite altimetry. *Sci. Data* 2, 150028 (2015).



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