



Tracking mesoscale eddies from combined use of satellite altimetry and Argo profiling floats

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Altimetry

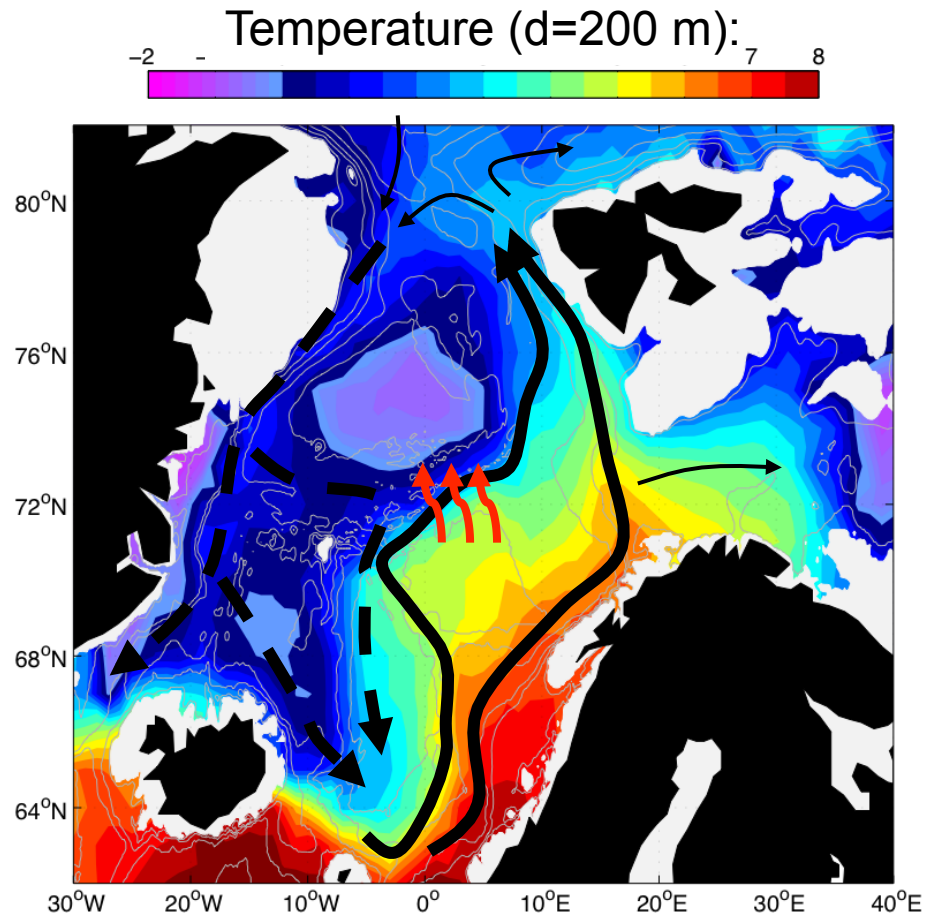
Eddy-collocation by altimetry and Argo floats

- How it is done
- **Classification of eddies**
- Identify water mass properties and heat content

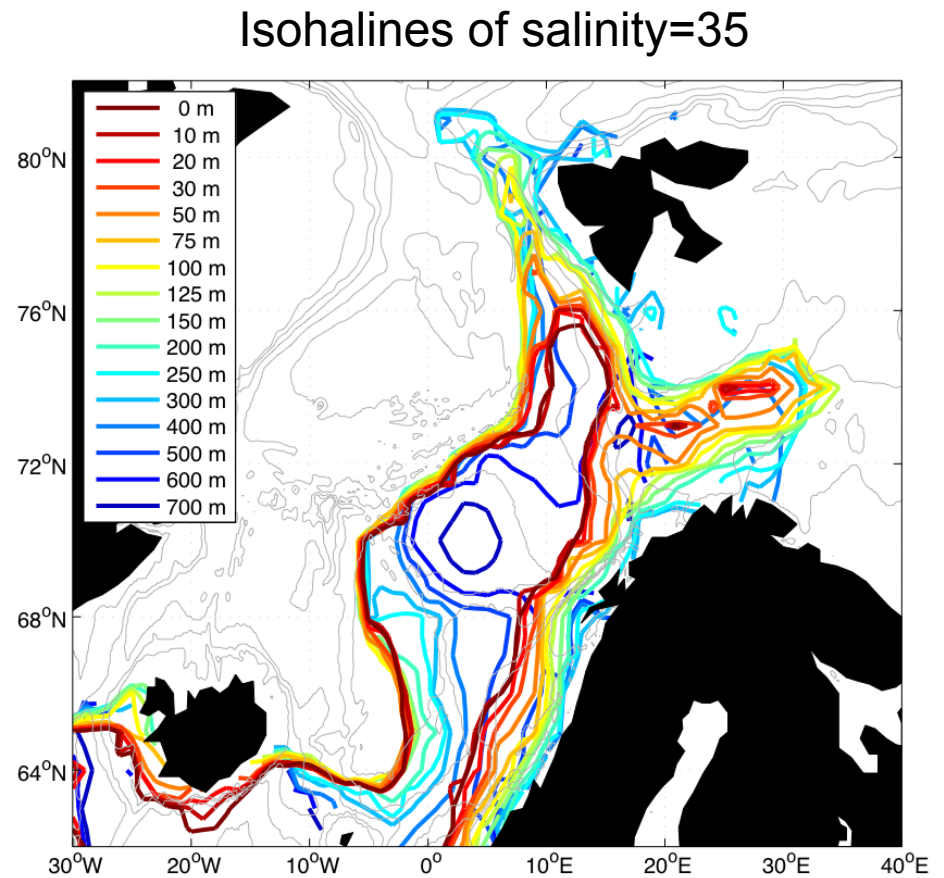


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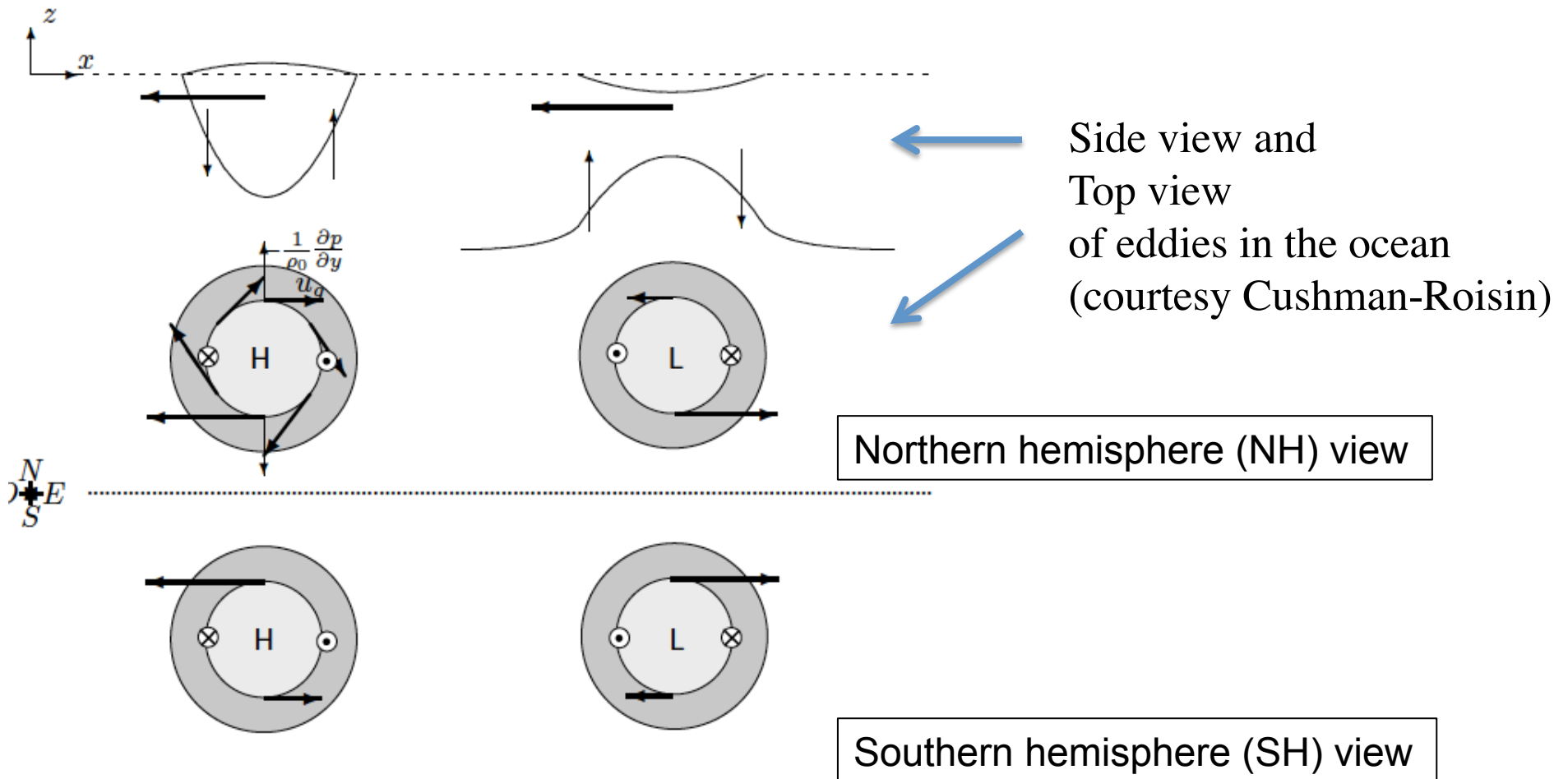
Water masses and circulation in the Nordic Seas



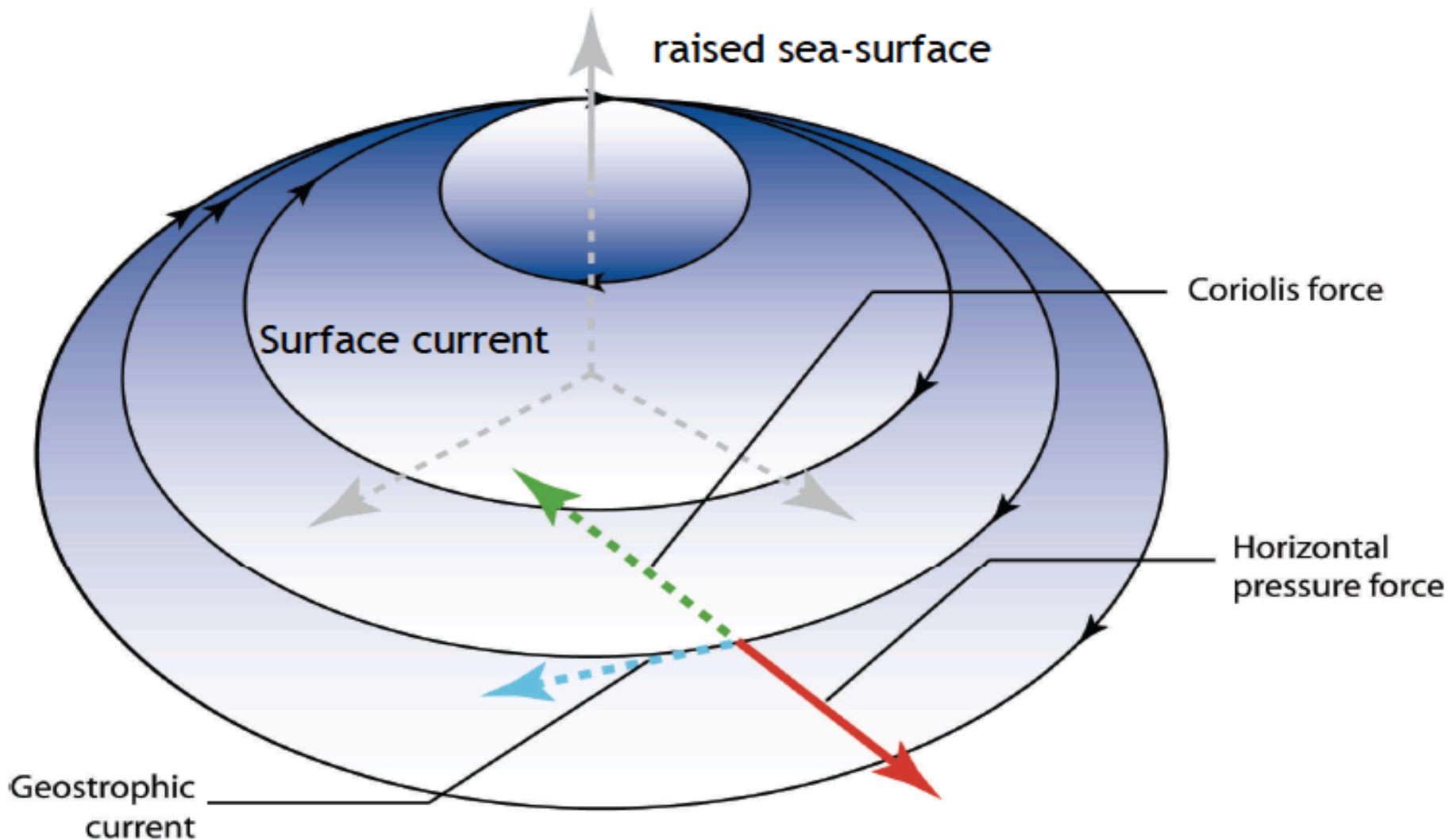
Eldevik et al. (2009)

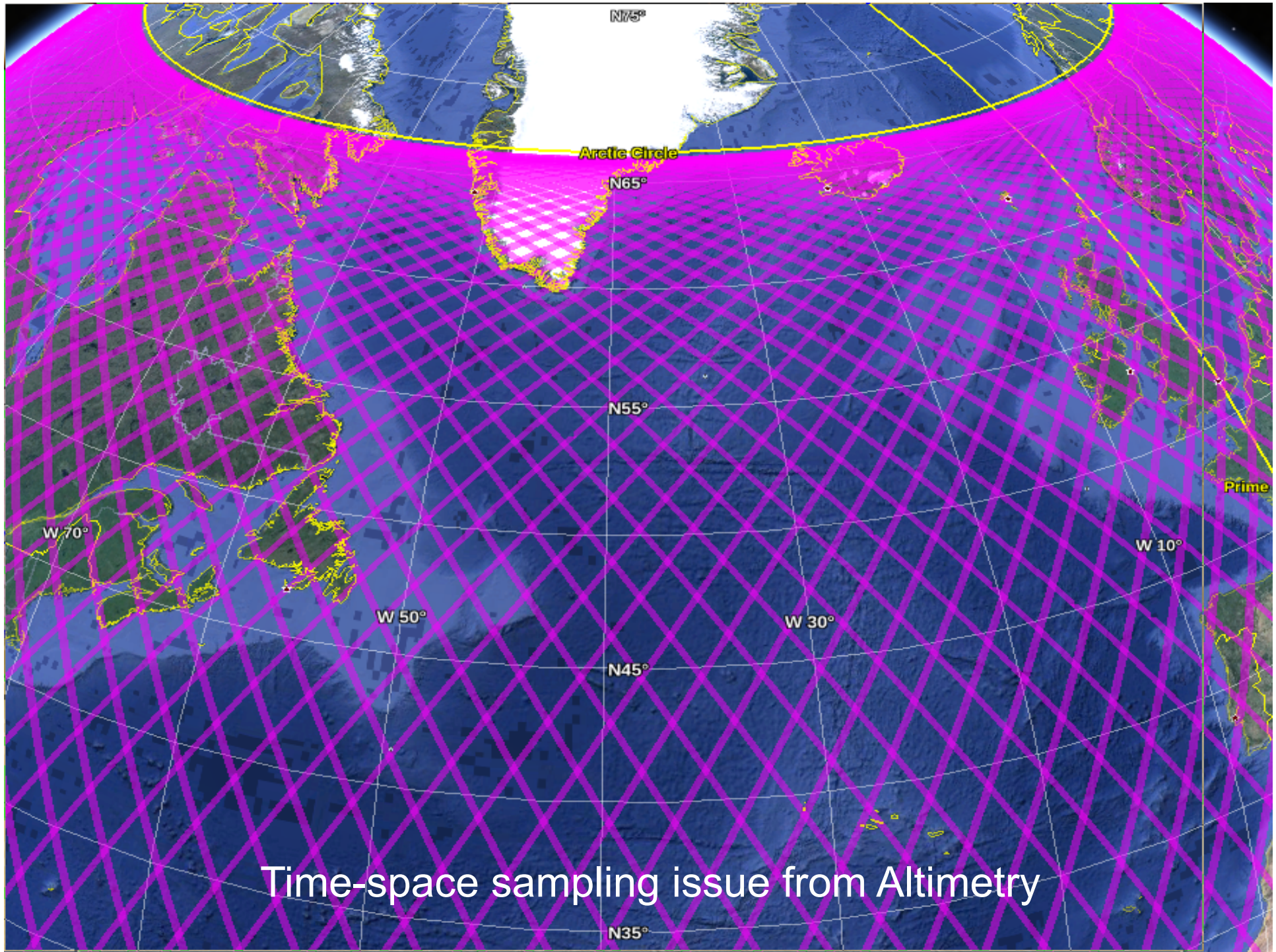


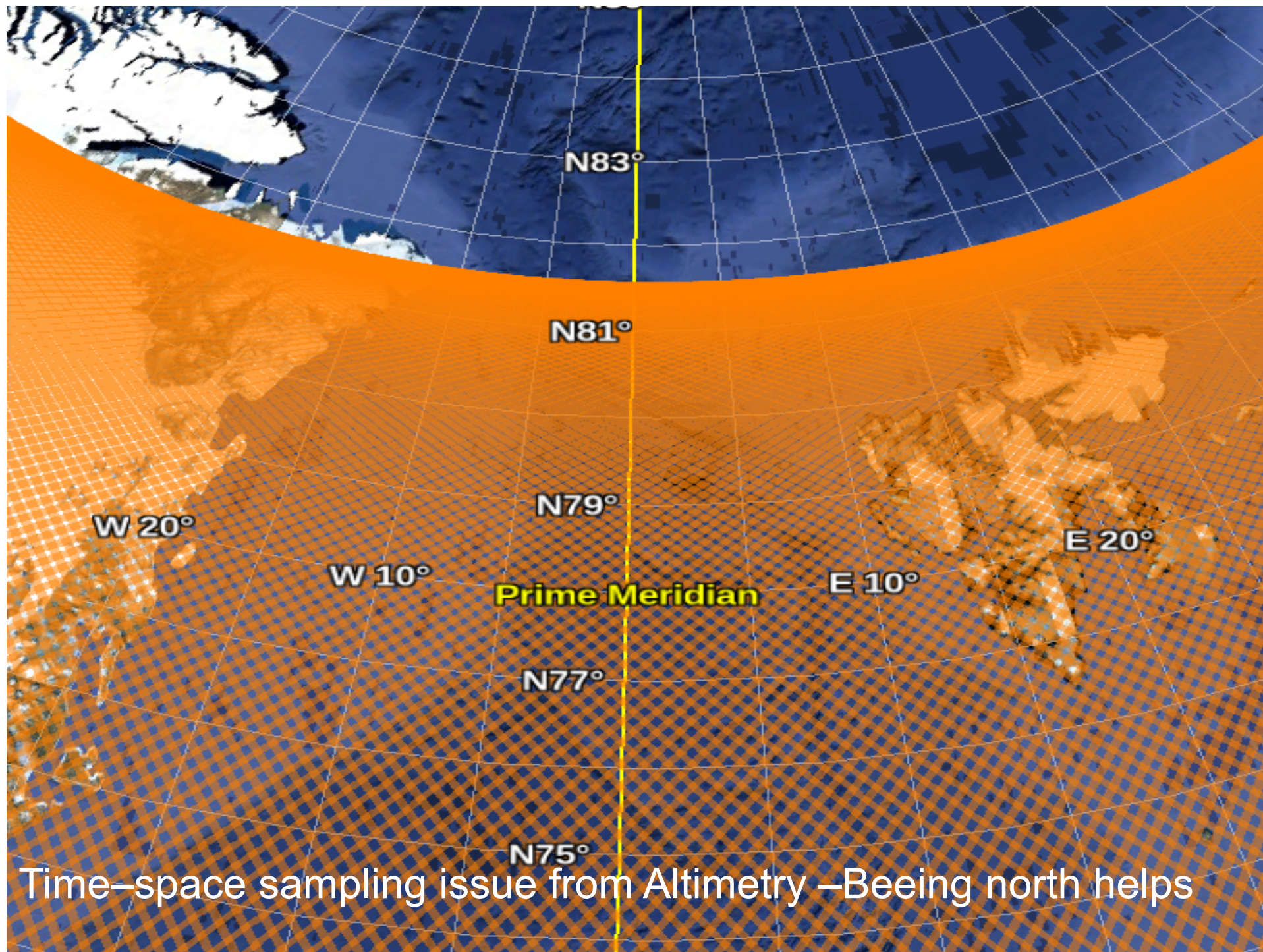
Eddy dynamics and surface elevations



Eddy detection and geostrophic assumption from Altimetry

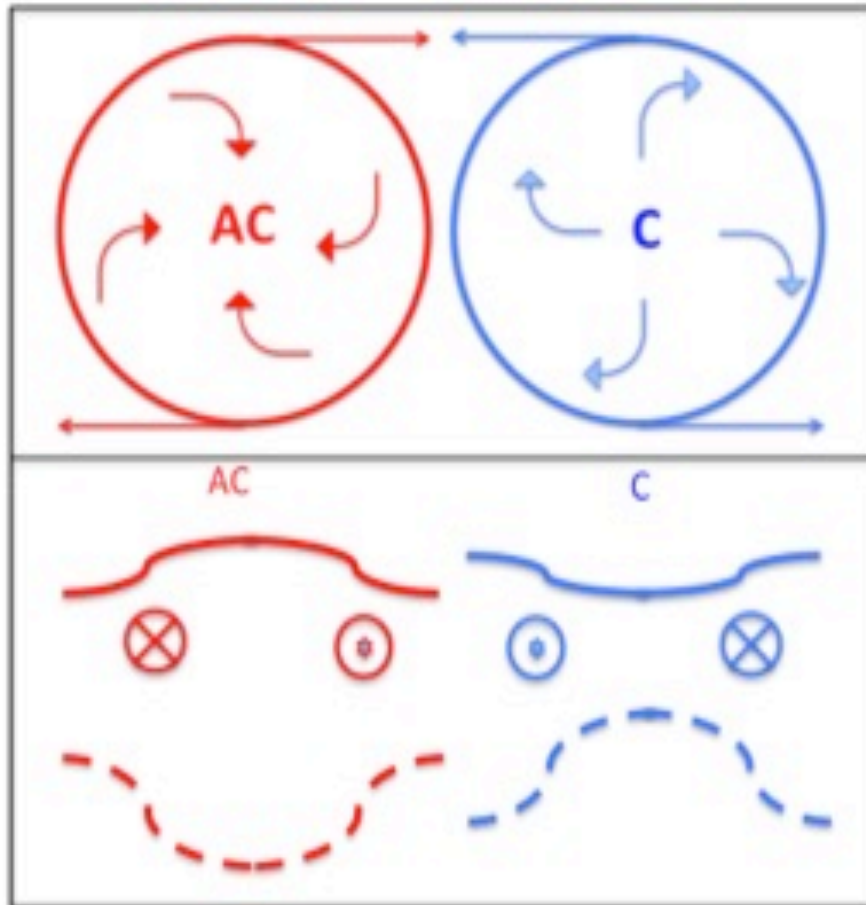






Time-space sampling issue from Altimetry - Beeing north helps

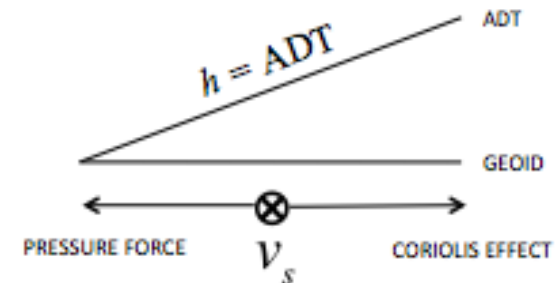
How identification and classification is done



Eddies are detected in Altimetry via sea surface height anomalies.

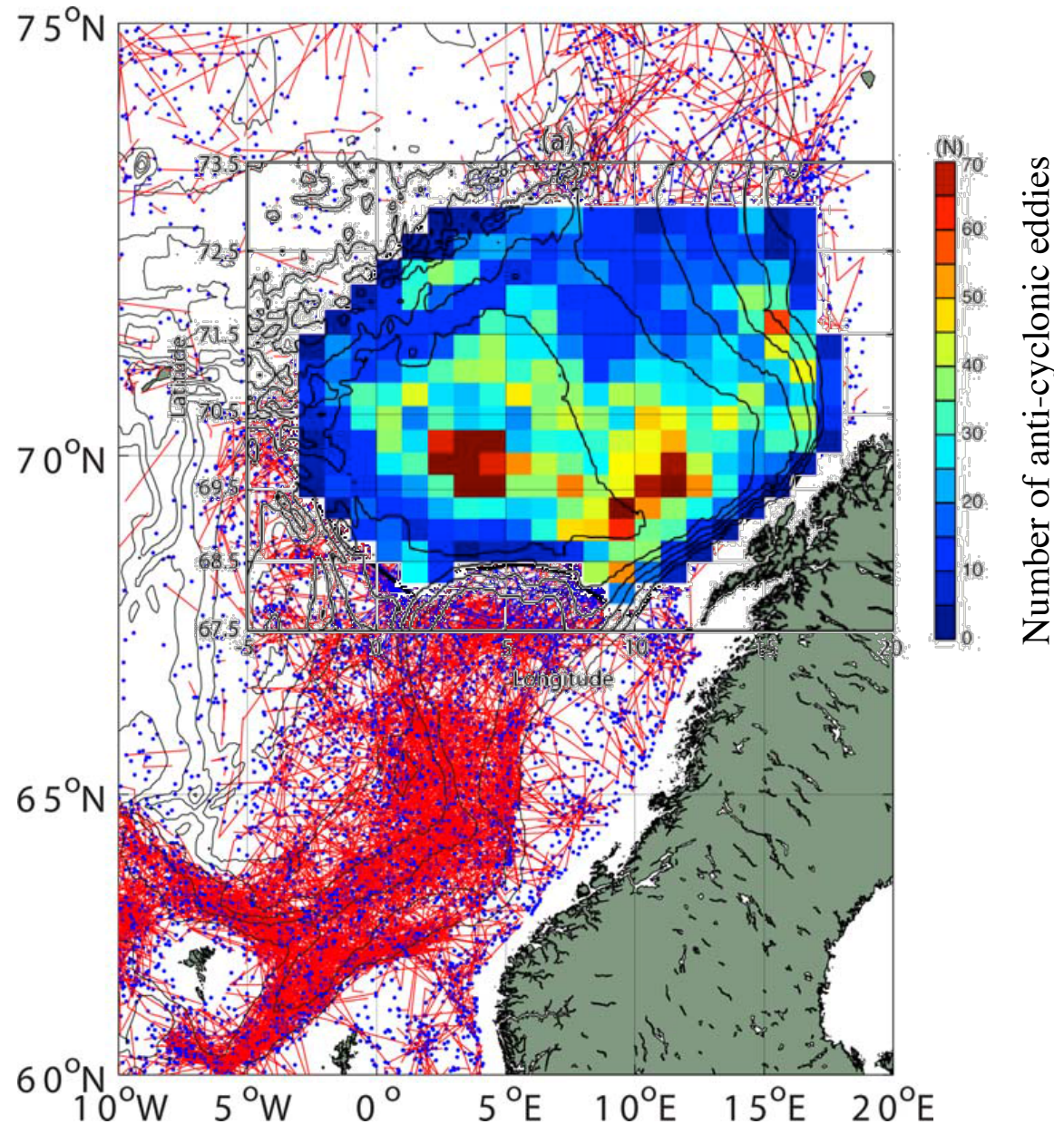
Anti-cyclones (AC) are elevated while **Cyclones (C) are depressed**.
NH convention

$$v_s = \frac{g}{f} \frac{\partial h}{\partial x}$$



Eddies in the Norwegian Sea

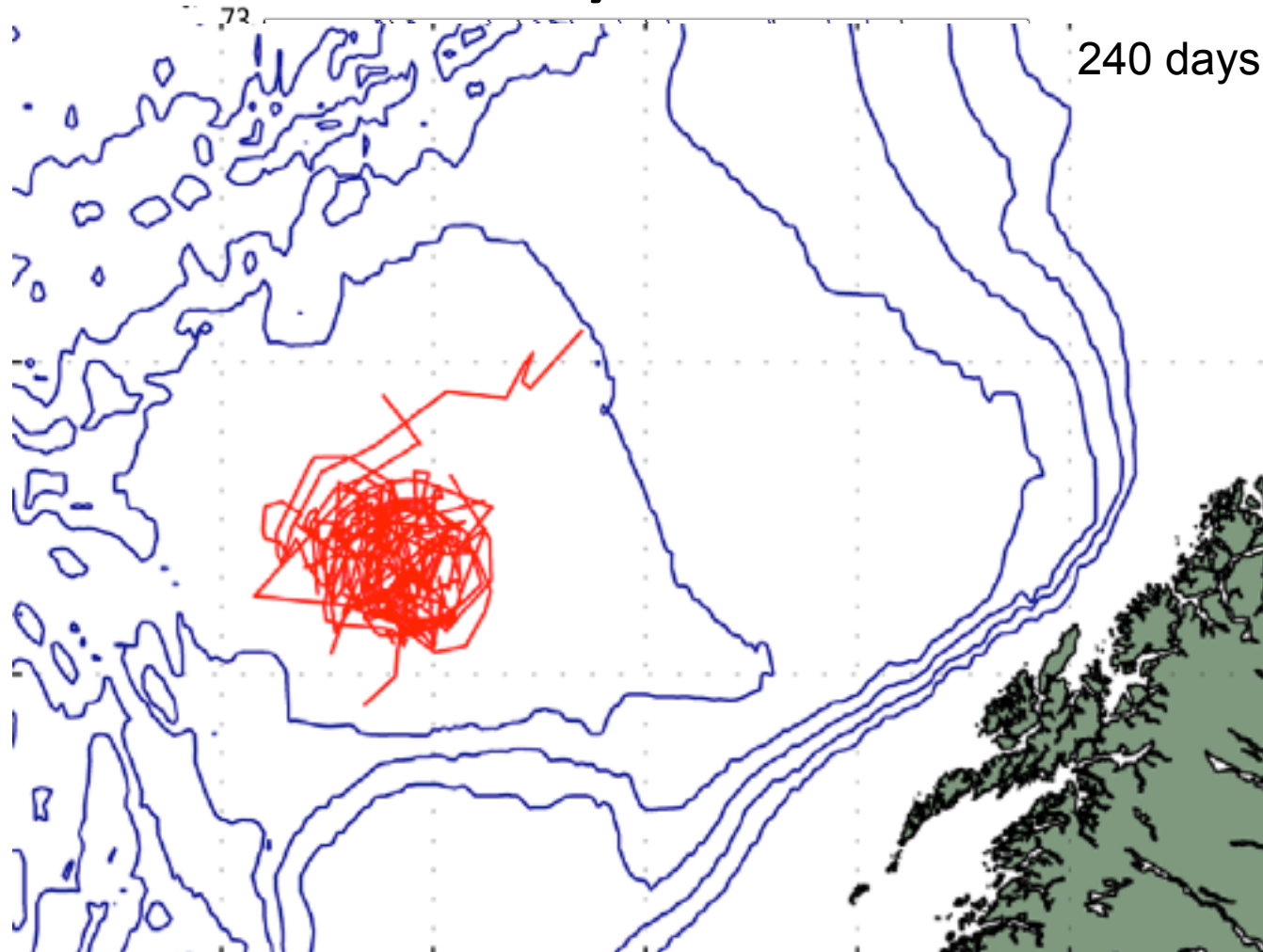
- Using altimetry
- Automated eddy detection
- Eddy tracking
- Separate cyclonic and anti-cyclonic eddies
- Colocate with Argo profiling floats, confirm the separation and detail the watermasses and heat content



What about the subsurface structures?



Tracked anti-cyclonic eddies of

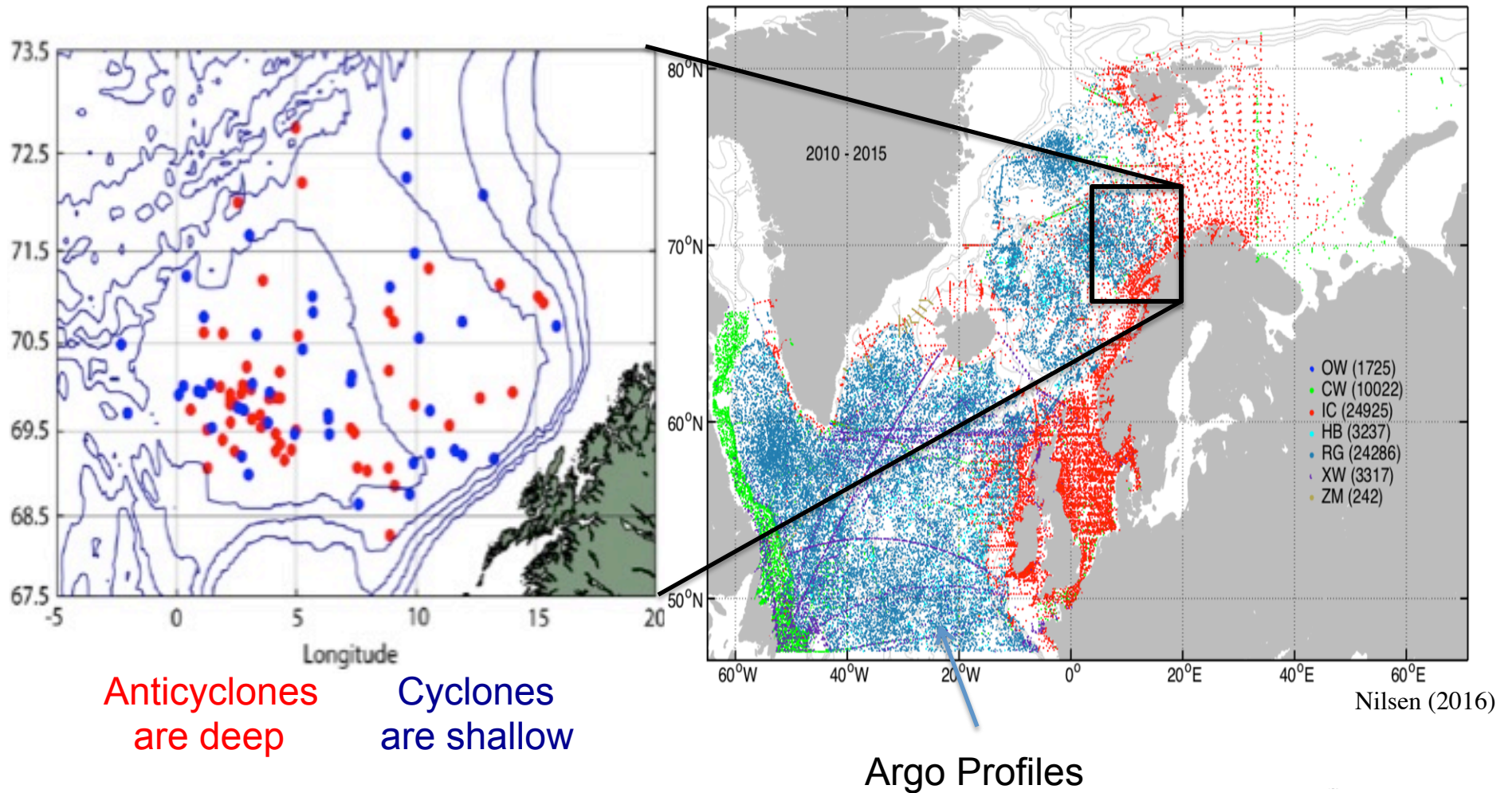


Raj et al. (2015a)



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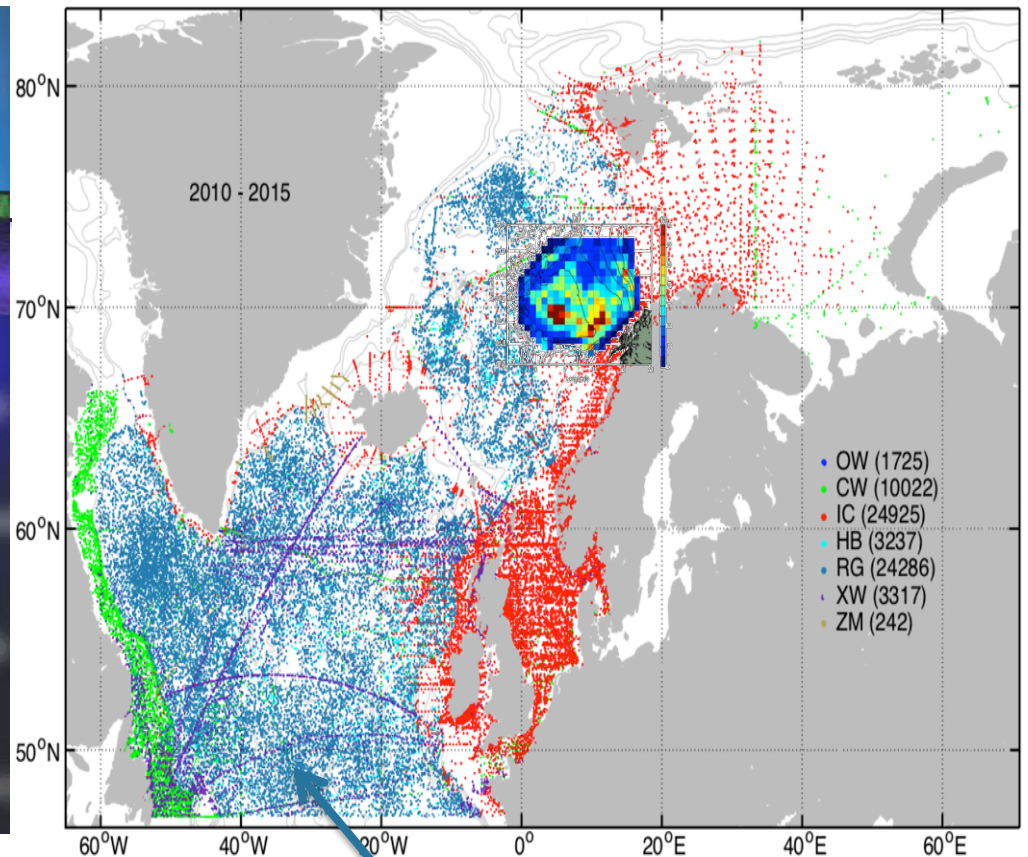
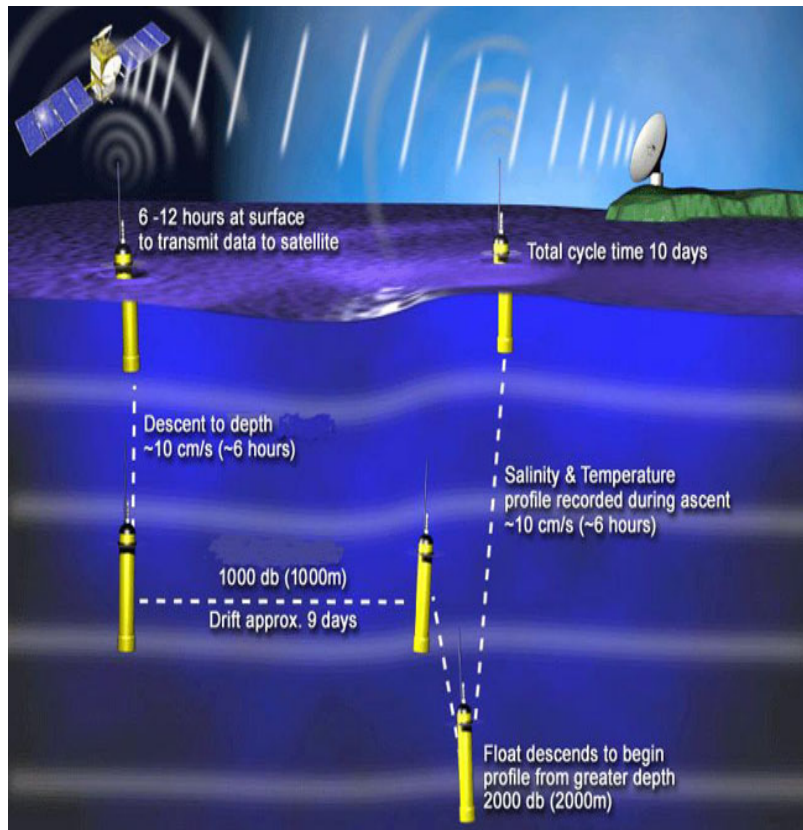
Colocation of eddies from altimetry and Argo



Confirming the type of eddies

The operation of autonomous ARGO floats

Hydrographic profiles in our region during 2010 – 2015



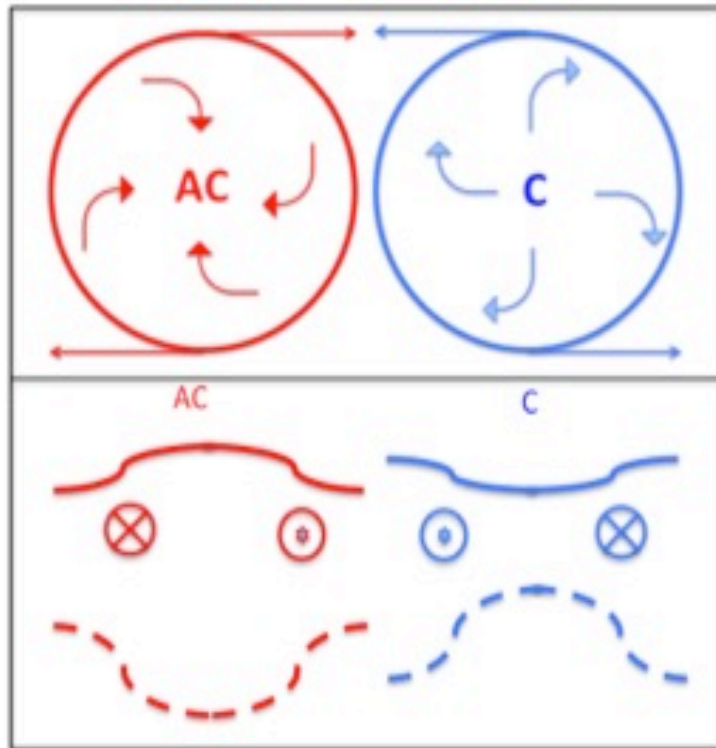
Nilsen (2016)

ARGO-profiles

Anti-cyclones carry more heat than cyclones here.

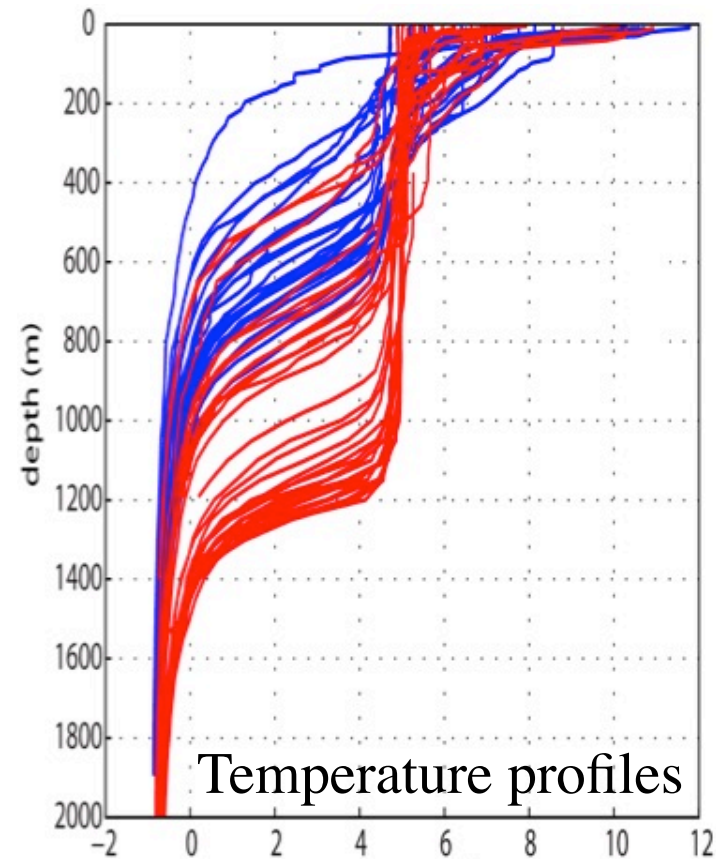
Consistent relationship between orbital motion and water mass properties

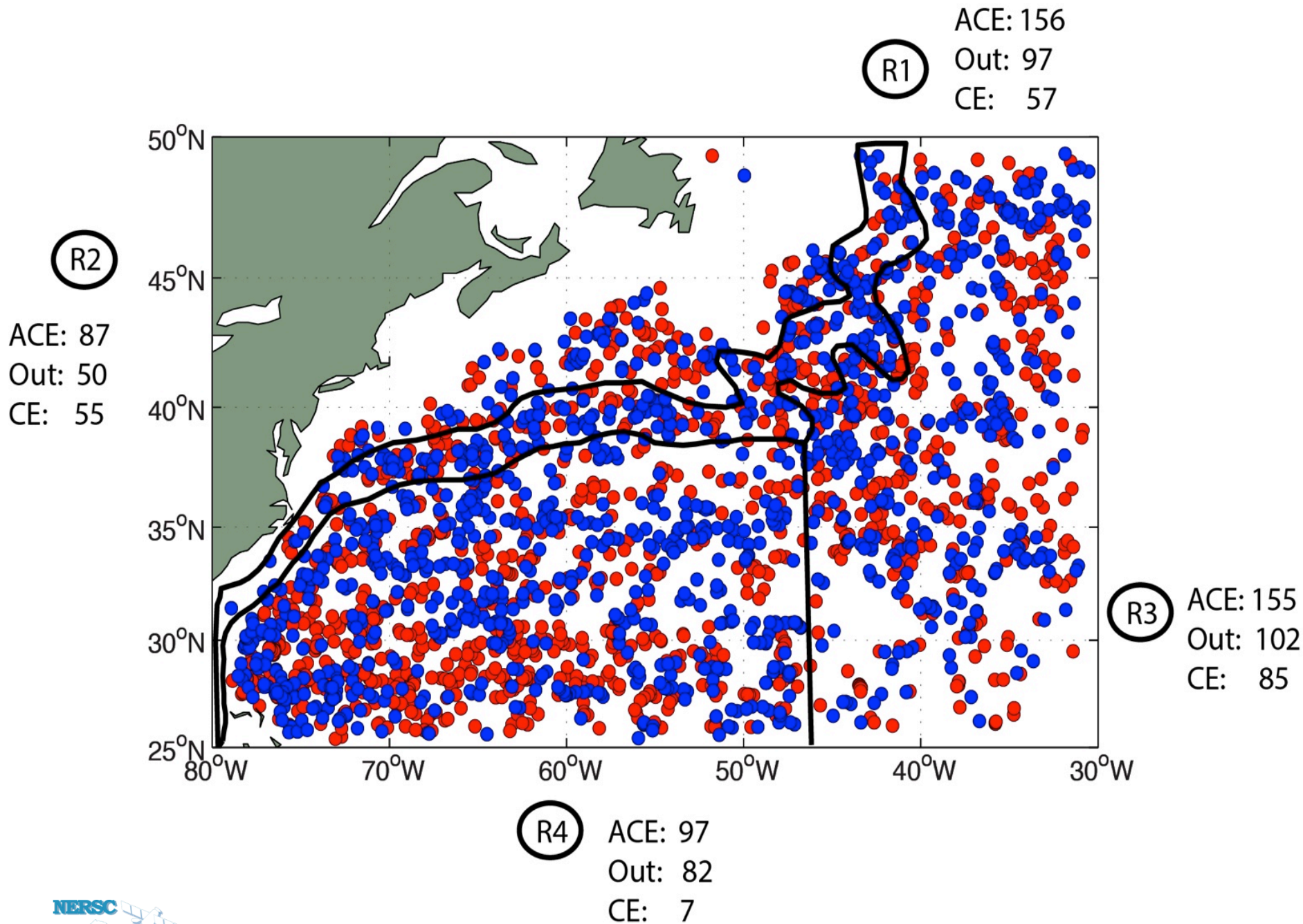
Argo profiling floats trapped in **Anti-cyclones (AC)** reveal **deep upper layer** while they observe **shallow upper layers** in **Cyclones (C)**. NH



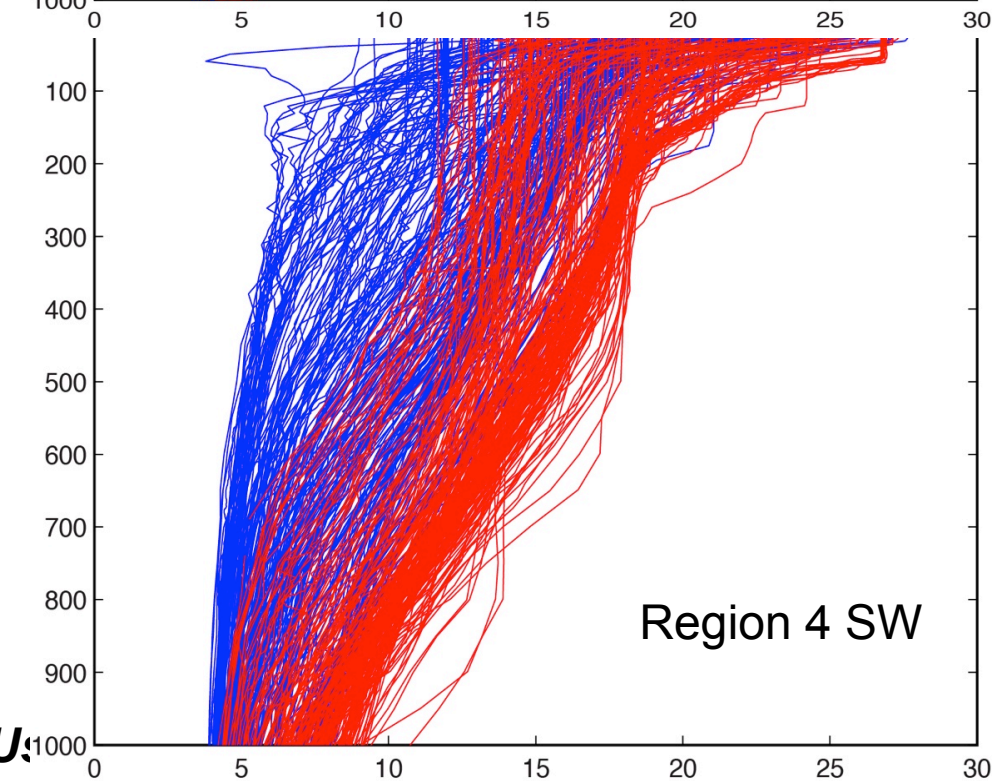
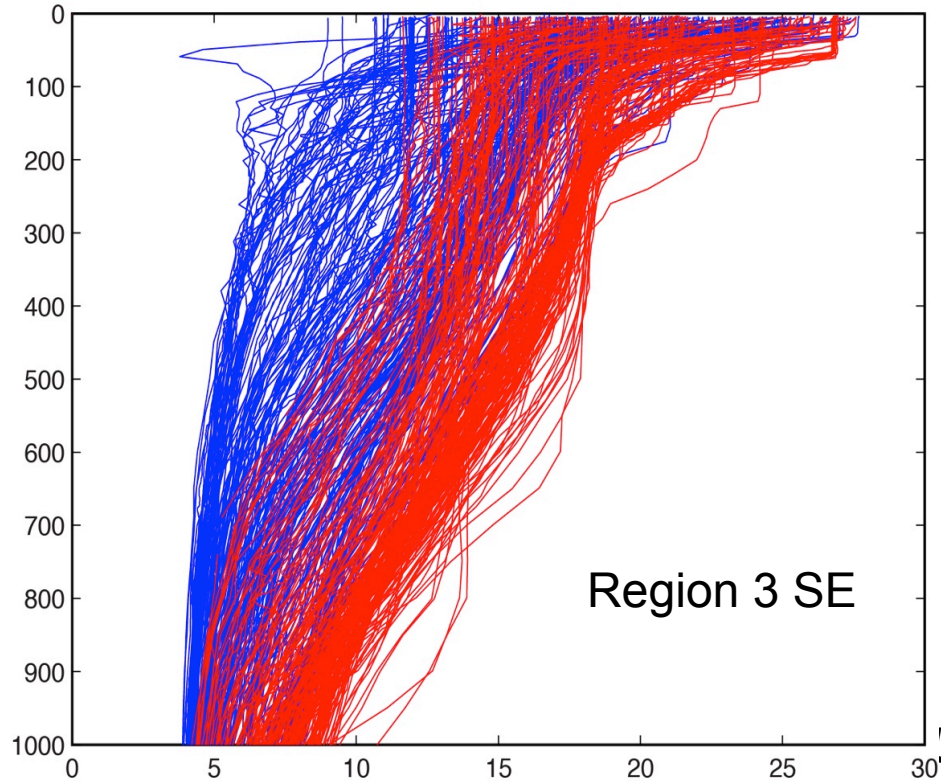
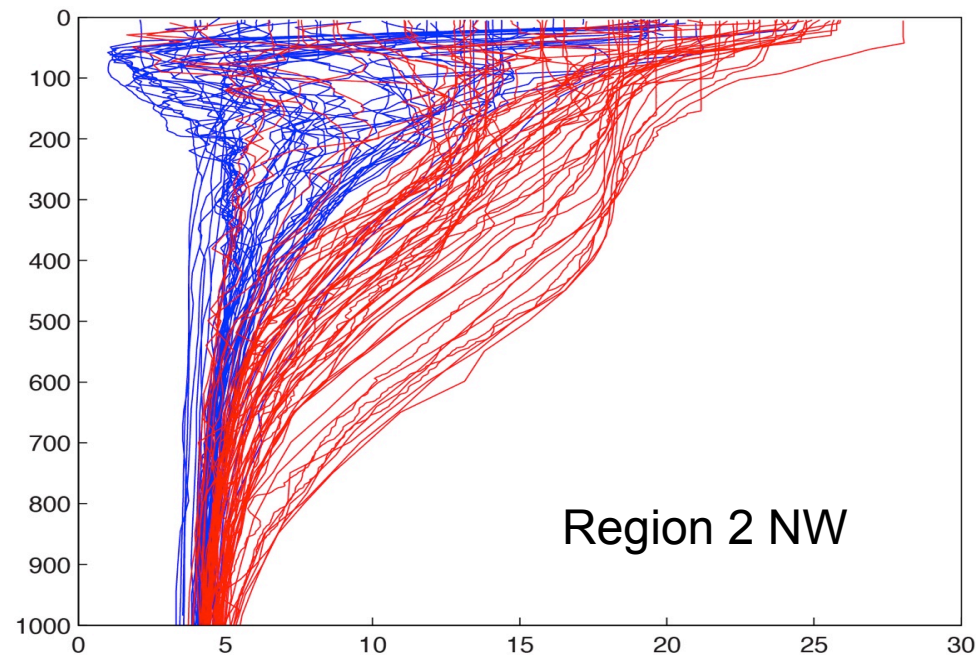
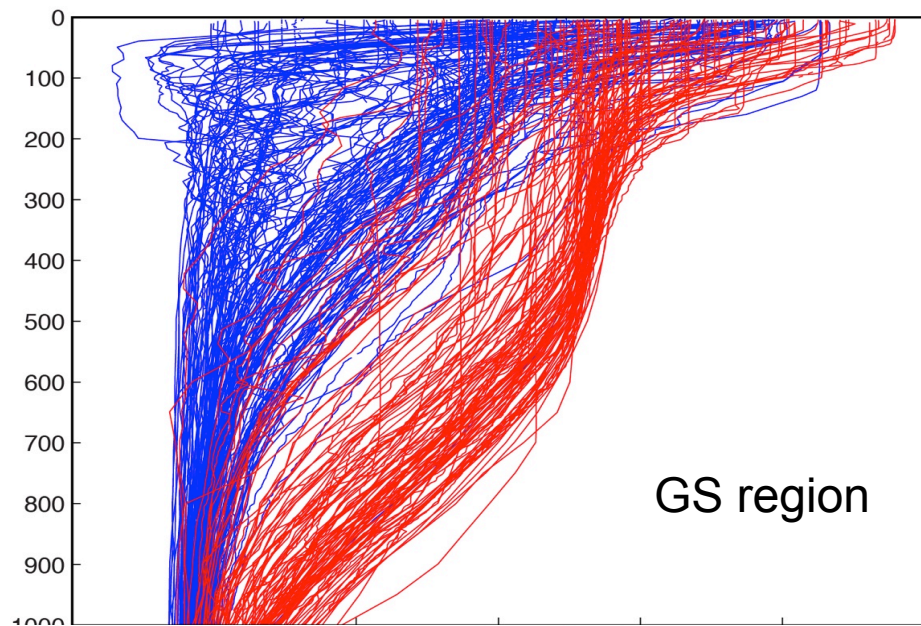
Anticyclones
are **DEEP**

Cyclones
are **SHALLOW**





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Summary

Tracking capability of the **Anticyclonic** and **Cyclonic** eddies at ~30-50 km radius every 10 days at the surface collocated with the profiling Argo floats (each at a 10-days cycle) provides:

- Identification of ACE and CE and corresponding
 - water mass properties,
 - eddy thickness
 - eddy heat content
- Lagrangian tracking
- Seasonality to be examined

