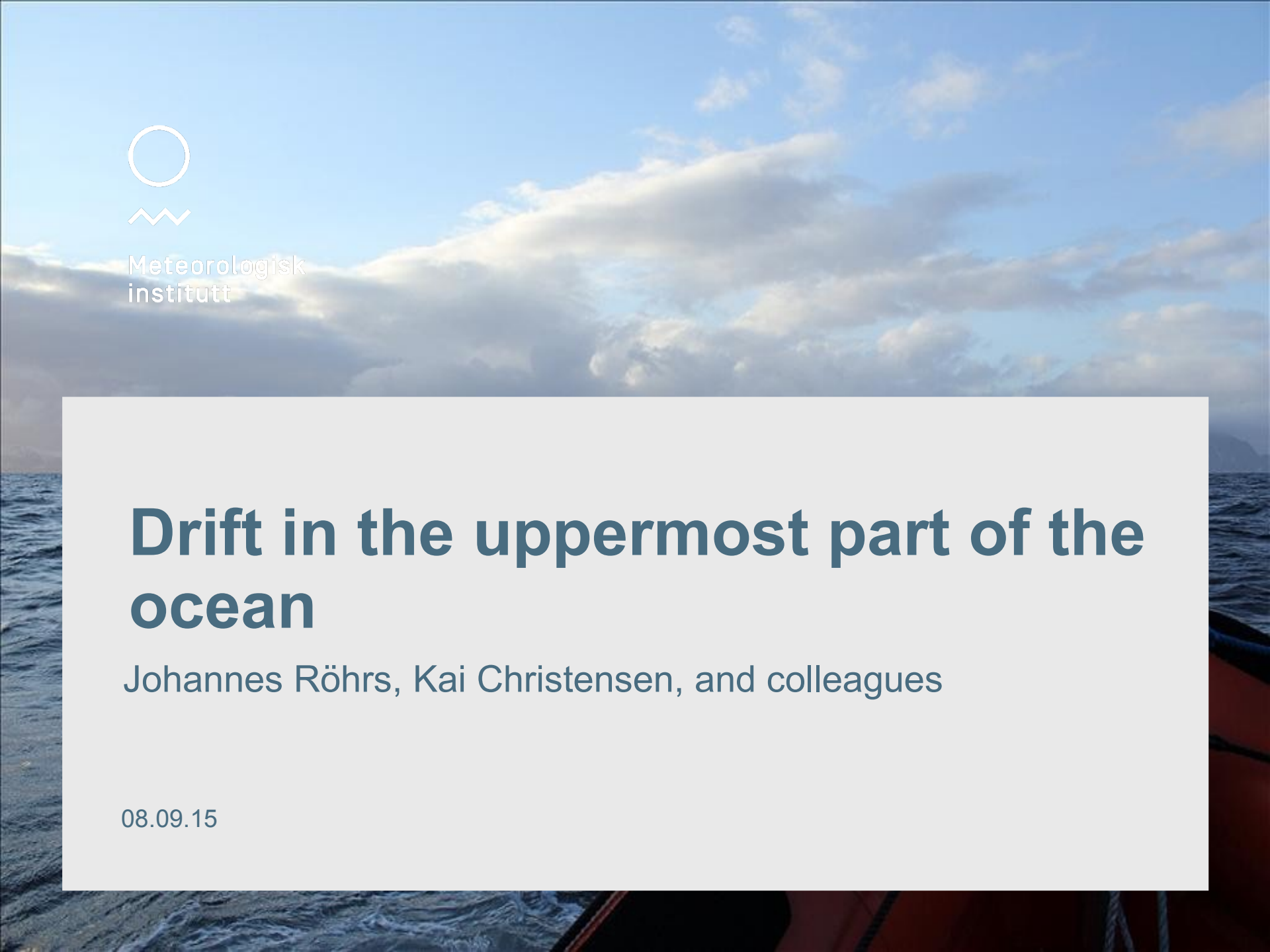

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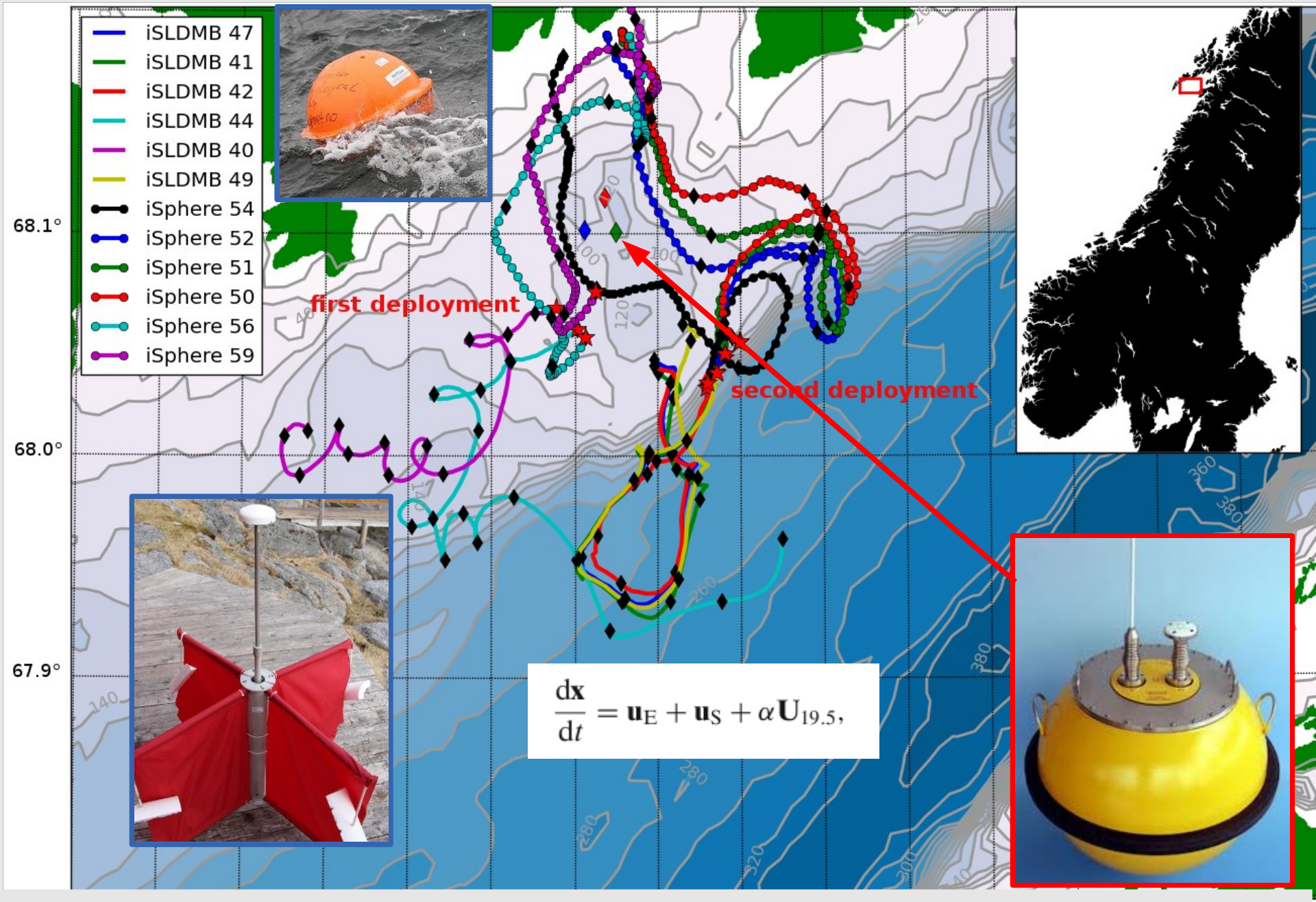
Drift in the uppermost part of the ocean

Johannes Röhrs, Kai Christensen, and colleagues

08.09.15

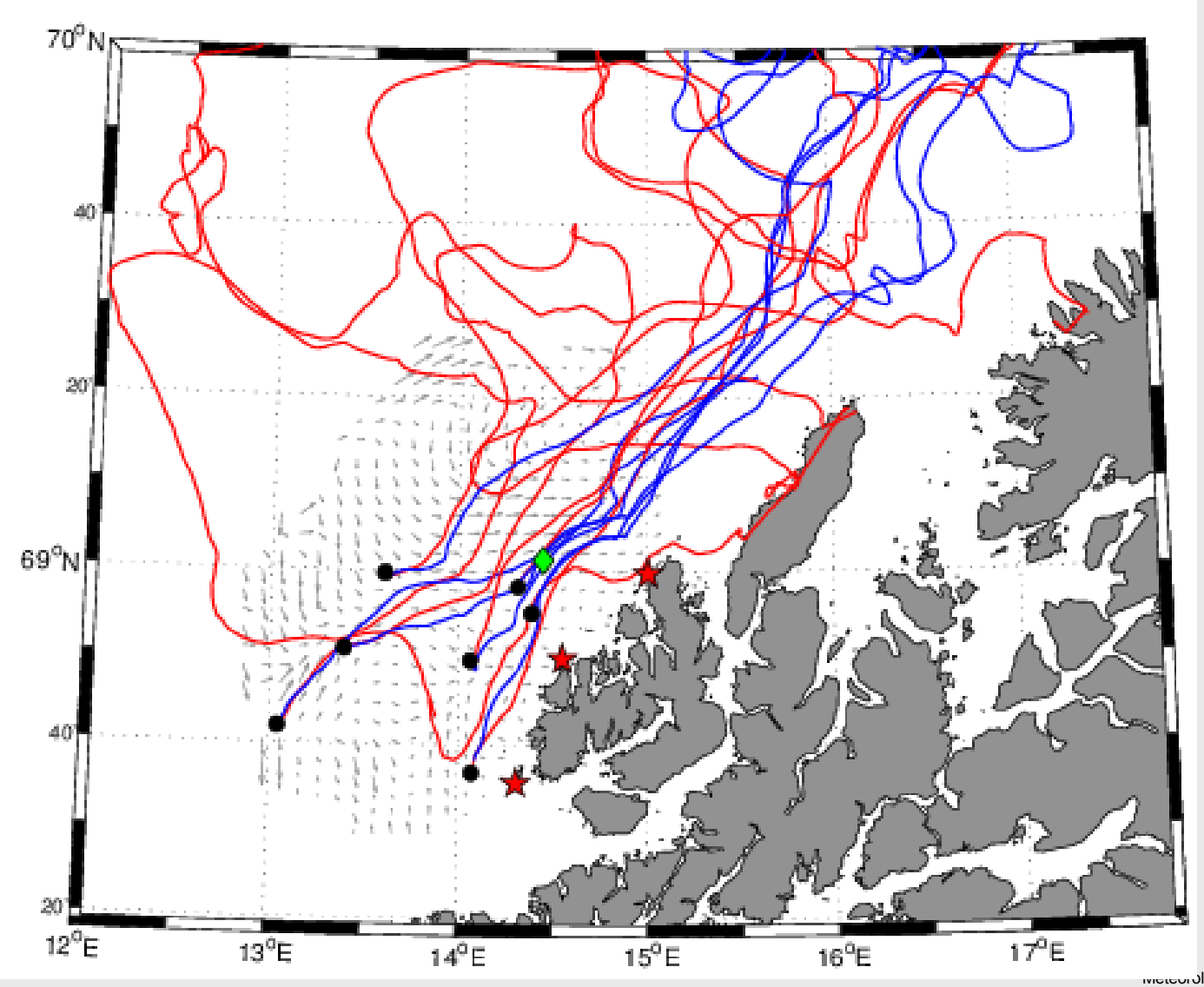
Drifting buoys

- at 0m and 0.8m depth

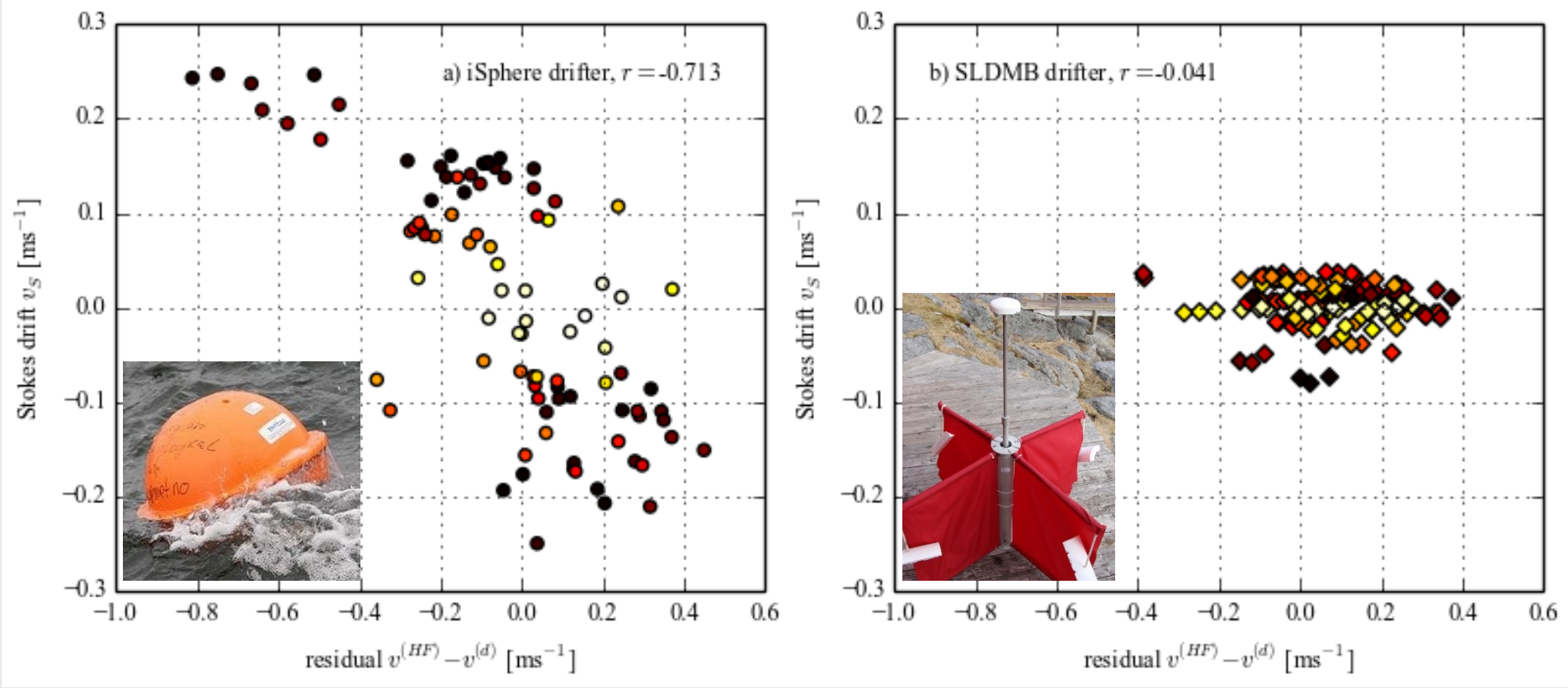


Röhrs et al. 2012: Observation-based evaluation of surface wave effects on currents and trajectory forecasts Ocean Dynam., 62.

drifters vs. HF radar current



Difference between HF radar current and drifter speed vs. Stokes drift



Röhrs et al. 2015. Comparison of HF radar measurements with Eulerian and Lagrangian surface currents Ocean Dynam. 65.

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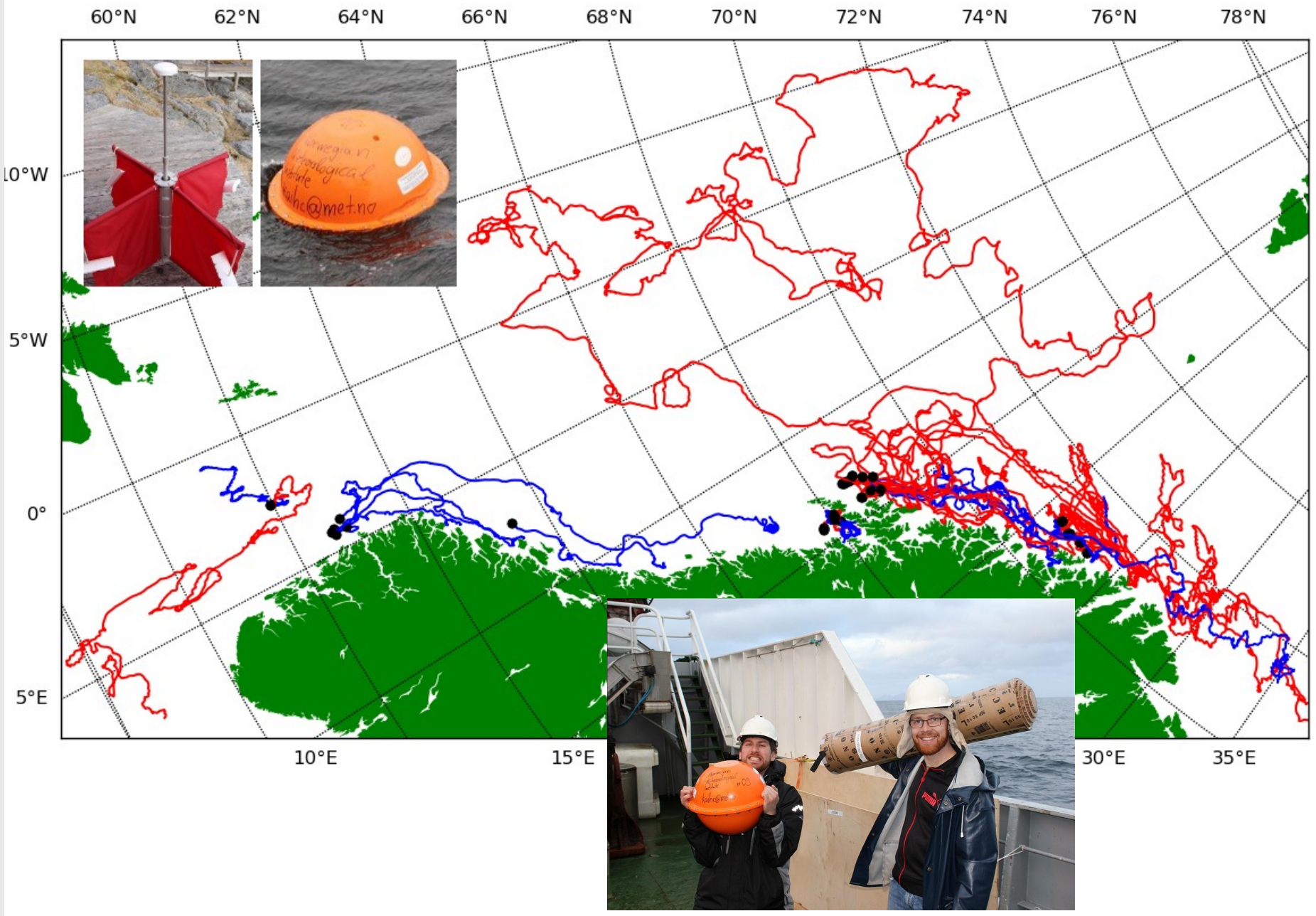
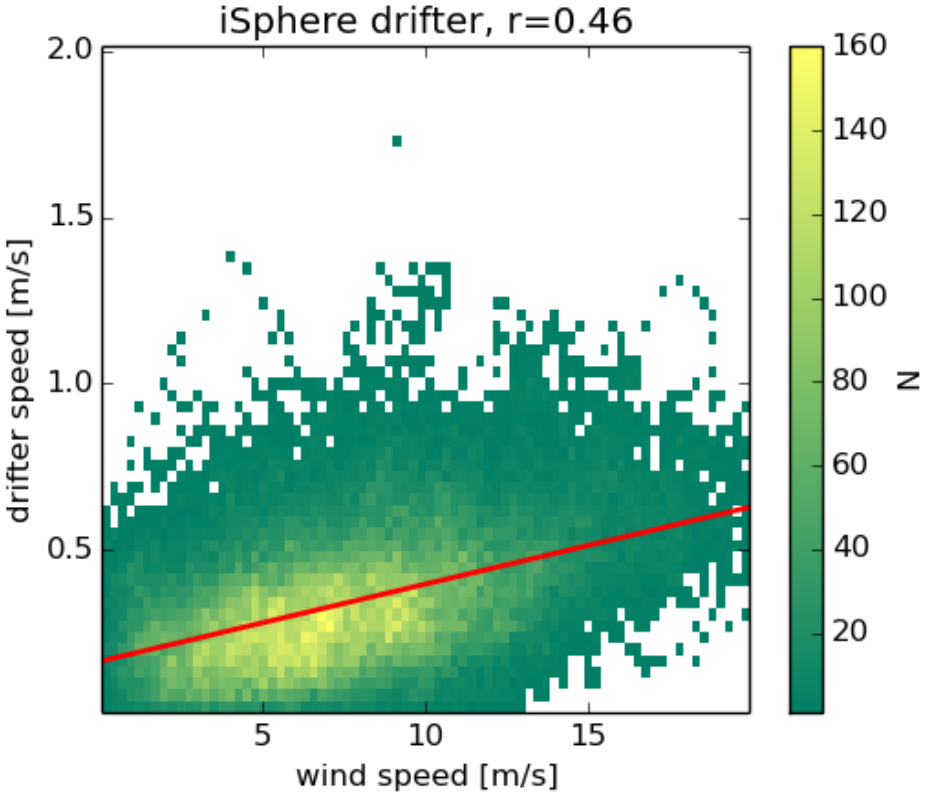
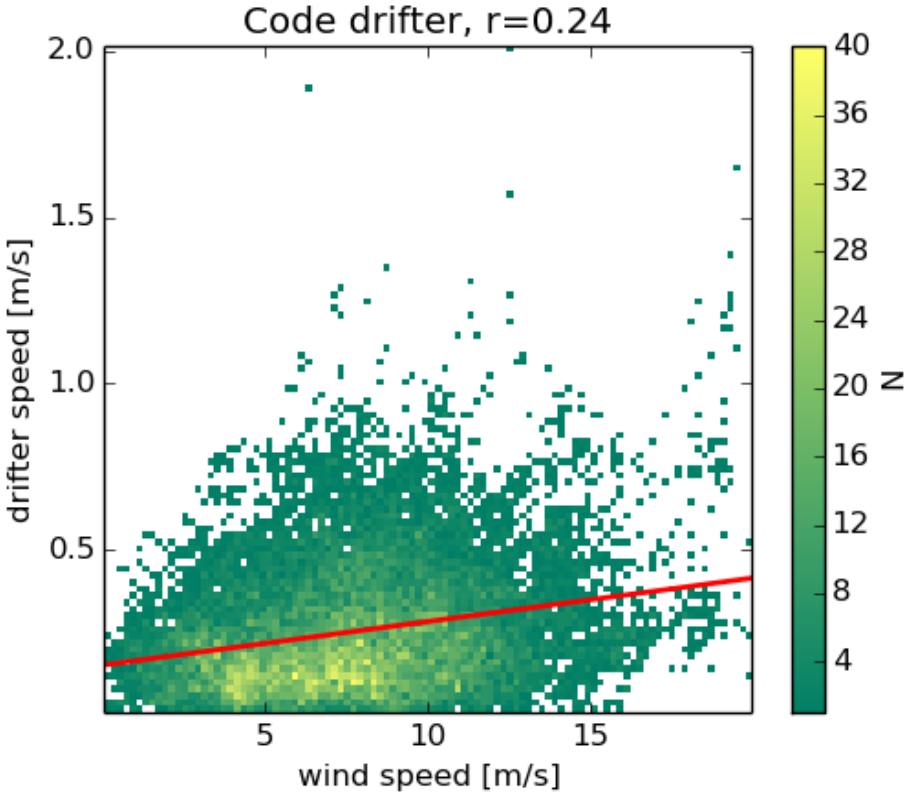
more data, more comprehensive



drifter speed vs. wind speed





Significant correlation, but very low.
Trajectories cannot be predicted from wind speed only

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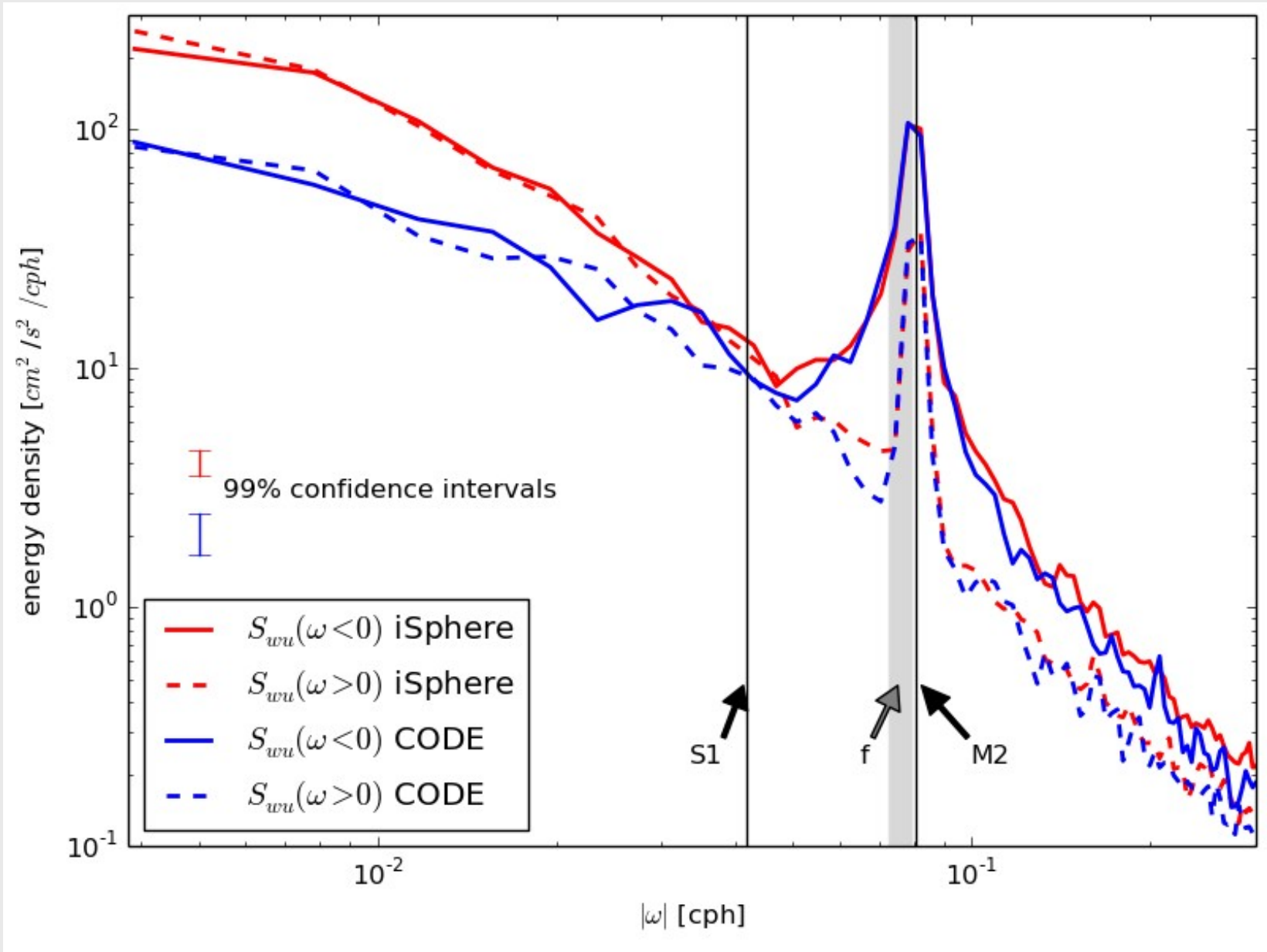
rotary spectra of drifter velocity

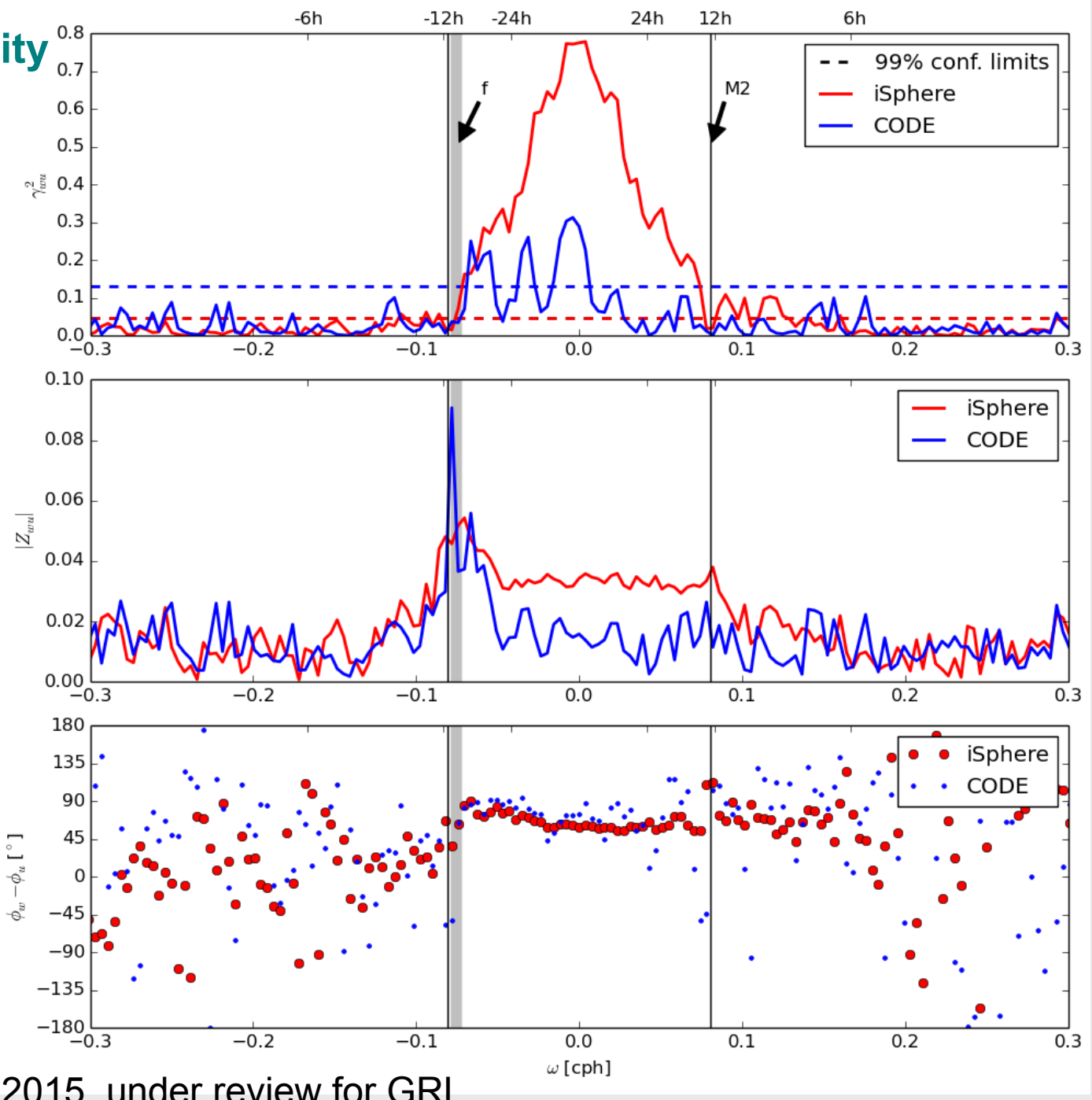


wind – drifter velocity cross spectra

Coherence
indicates if the signals have a well-defined phase difference

Admittance
measures how strong one signal forces the other

Phase differece
may be due to temporal or directional offset

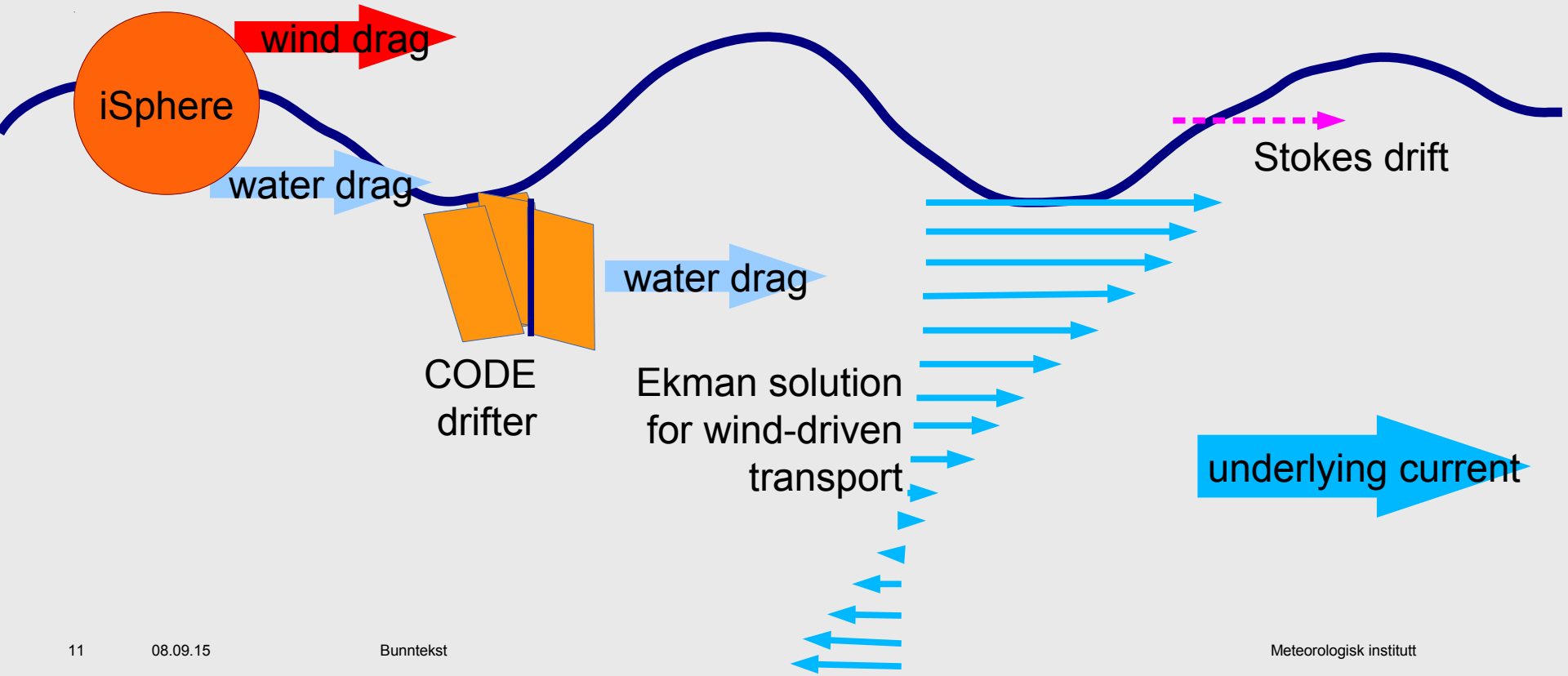


Röhrs and Christensen 2015, under review for GRL

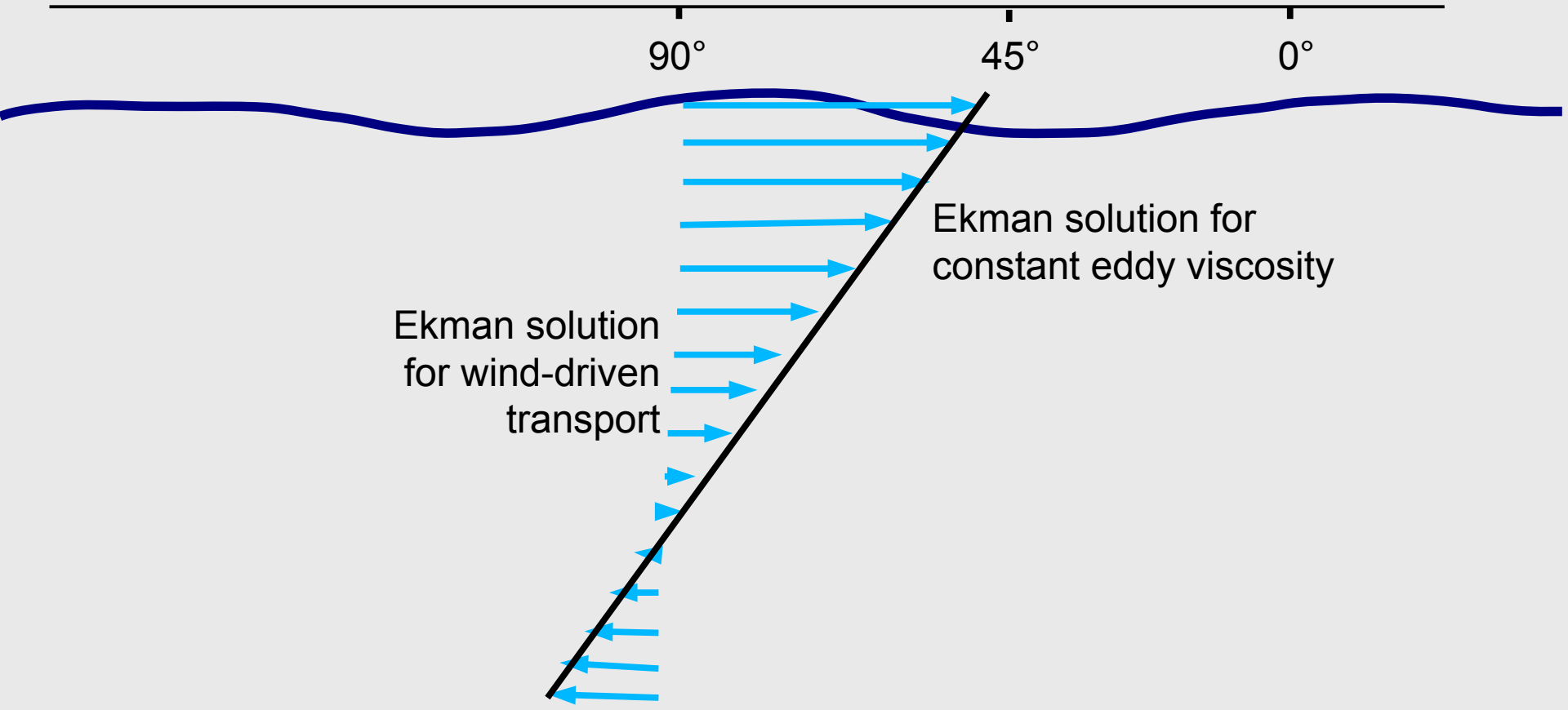
Surface drift deflection angle

	surface (iSphere)	1m (CODE)	15m (SVP)
our study	60°	80°	
Niiler and Paduan 1995	60° (regression model)		70°
Rio and Hernandez 2003			20°-60°
Poulain et al 2009	17-20° (undrogued SVP)	28°	27°-42°
Gonella 1972	45-90° (analytical)		
Weber 1984	10-40° (analytical)		
Ekman 1905	45° (analytical)		

Drift


wind drag
iSphere
water drag
Stokes drift
water drag
CODE
drifter
Ekman solution
for wind-driven
transport
underlying current

Velocity shear in the Ekman layer



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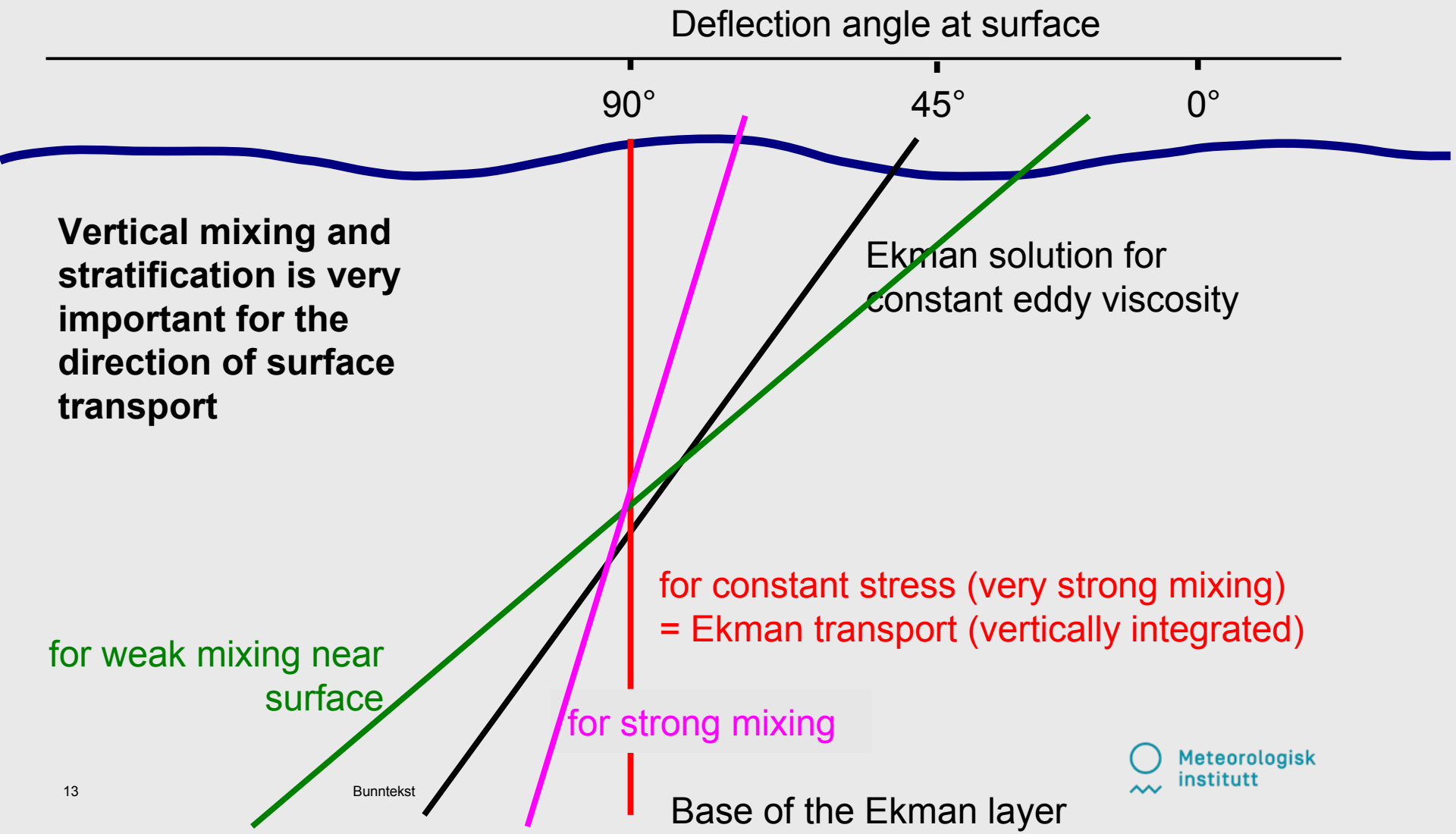
Velocity shear in the Ekman layer



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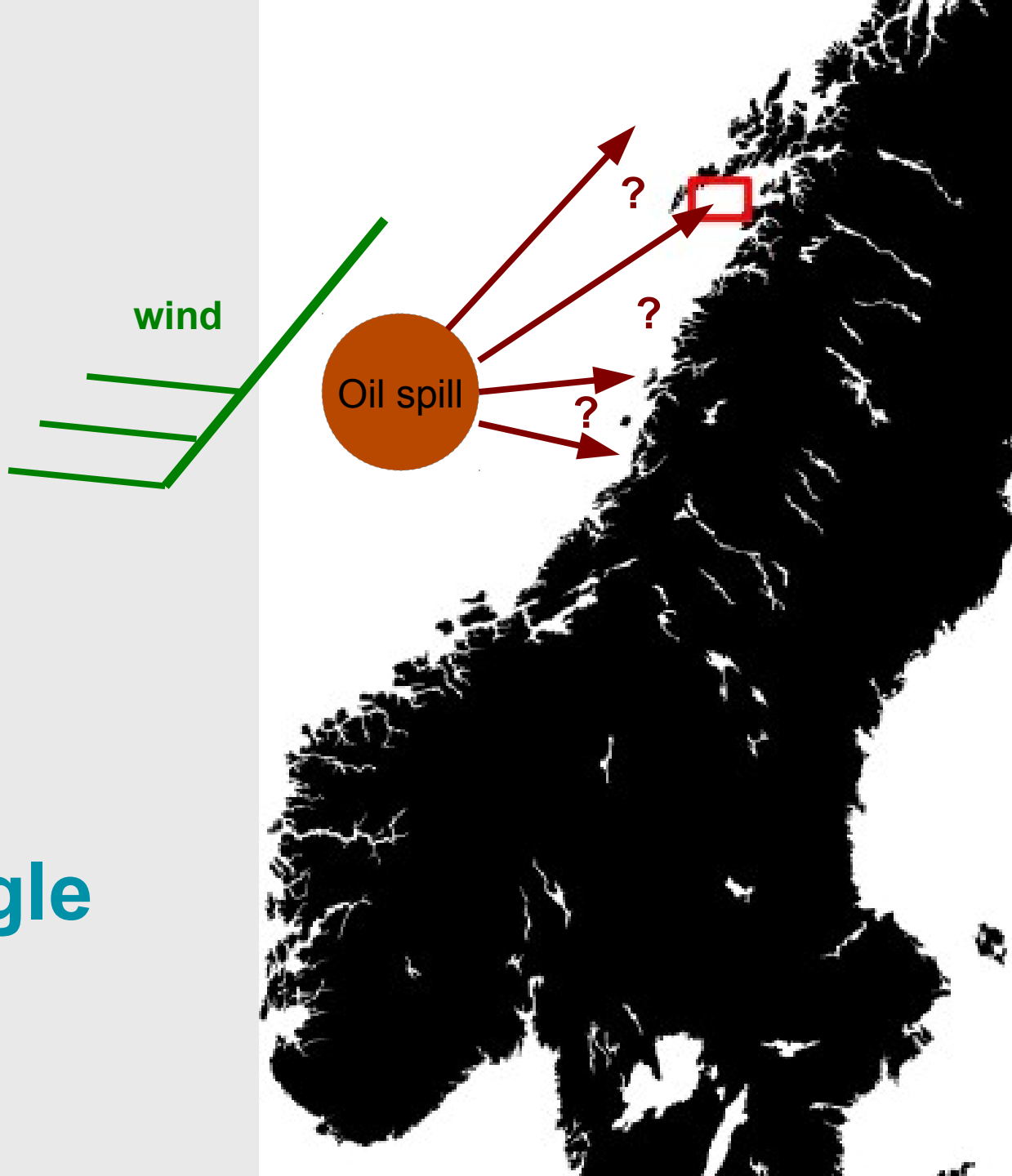
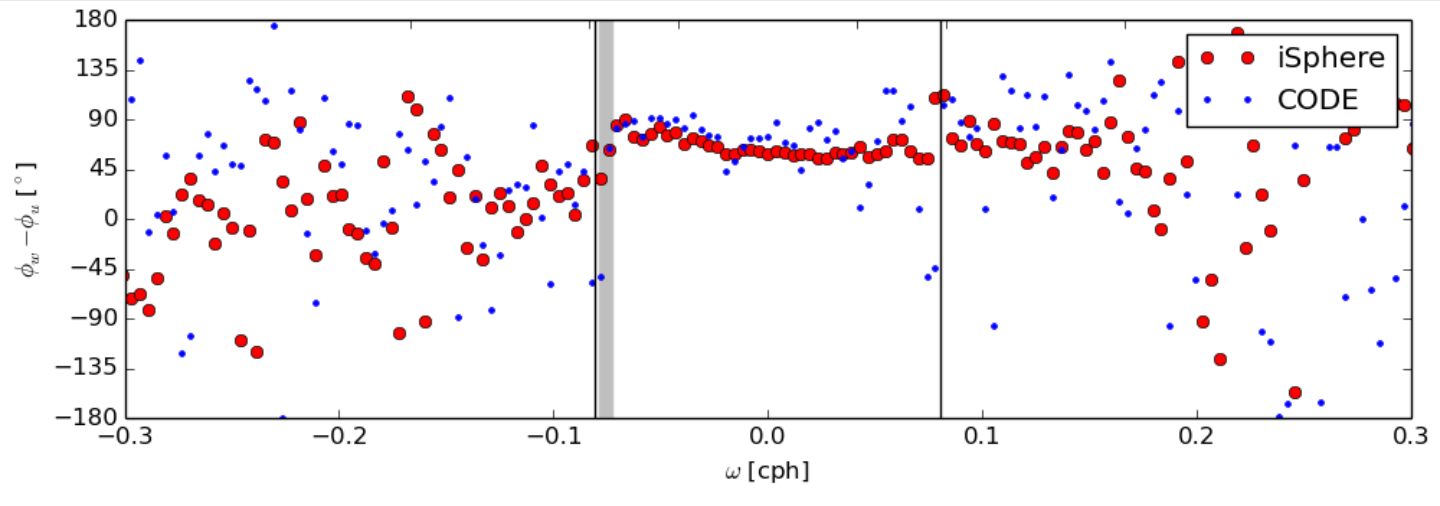
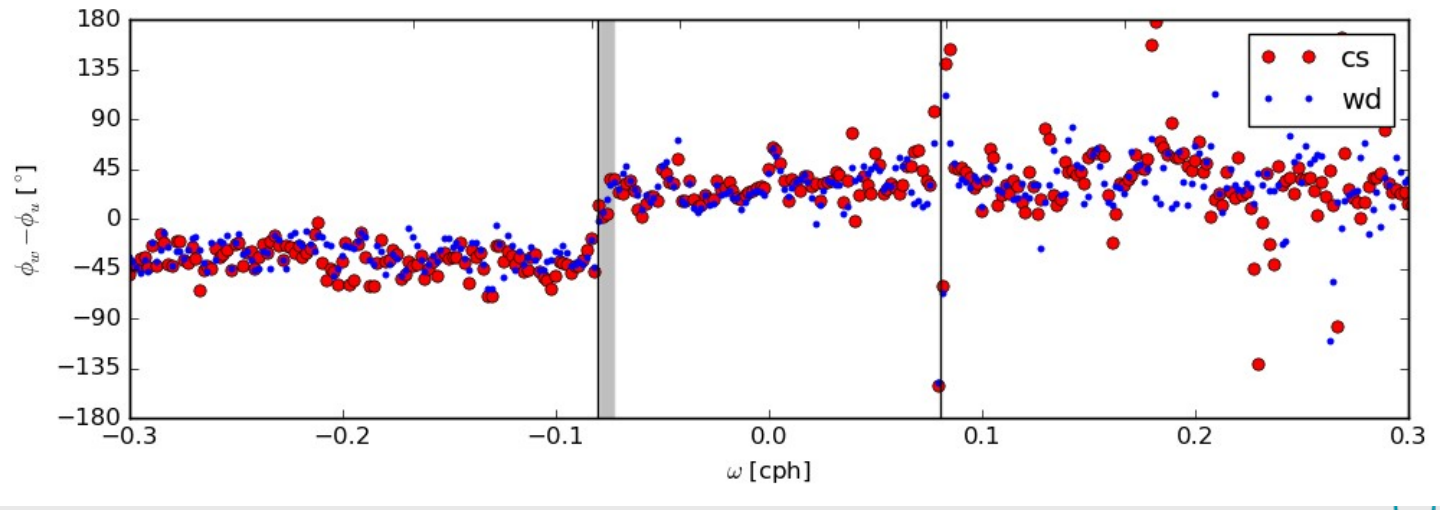
possible implication of the drift deflection angle





deflection angle in ROMS (k-omega mixing)



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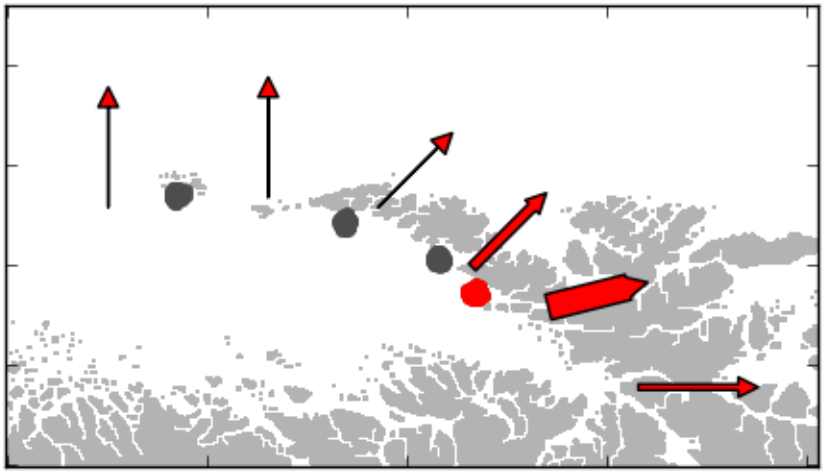
Adjoint sensitivity studies on surface currents?

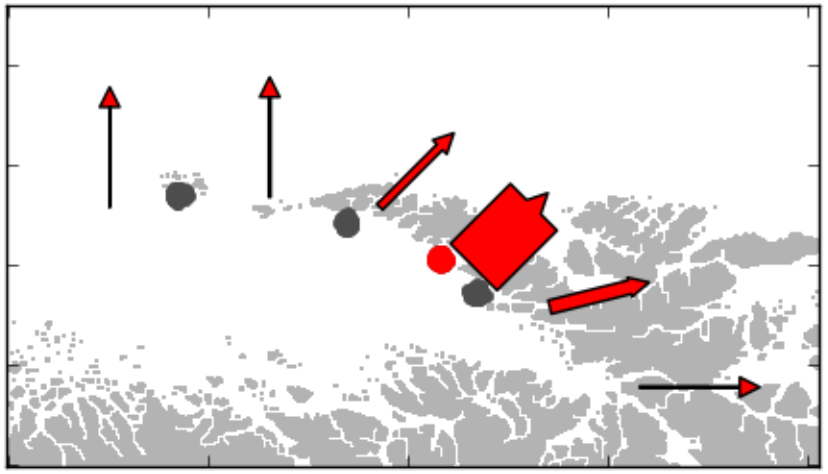
- Wind forcing
- How important is stratification and mixing to determine the direction?

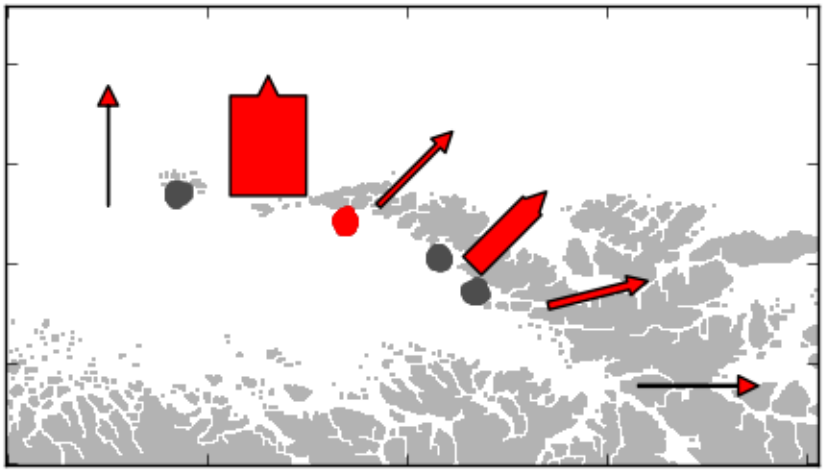
Define an index *J* that describes surface currents, or Lagrangian surface transport

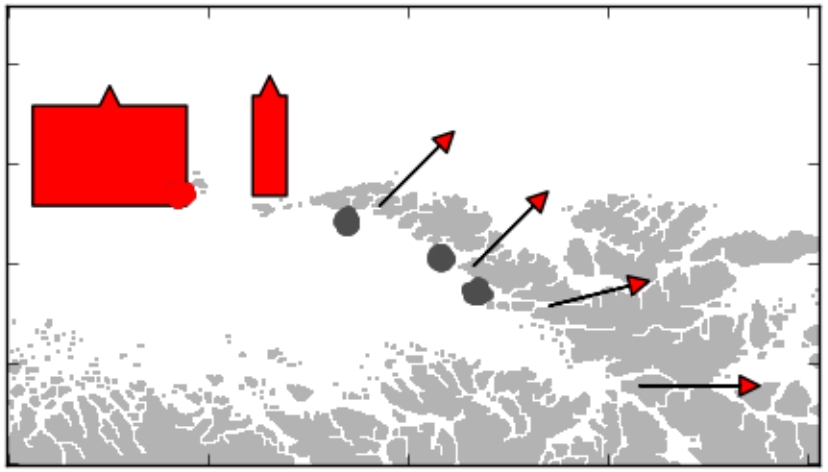
- total speed
- mesoscale eddy kinetic energy
- shoreward velocity
- deflection angle to wind?
- can we use Lagrangian quantities?

Cod egg transport through passages

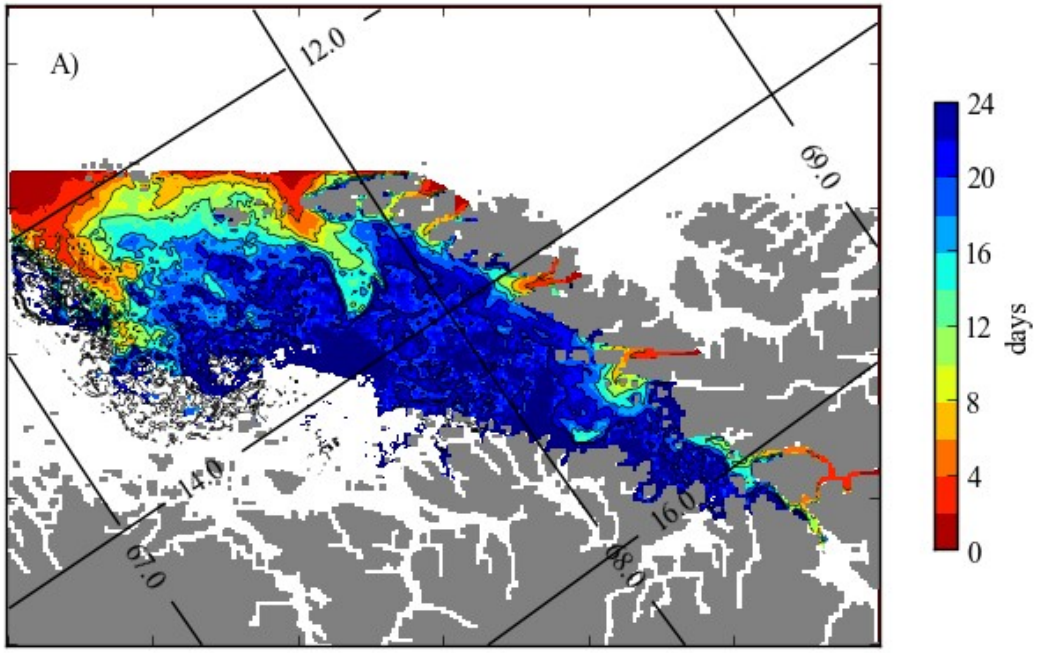




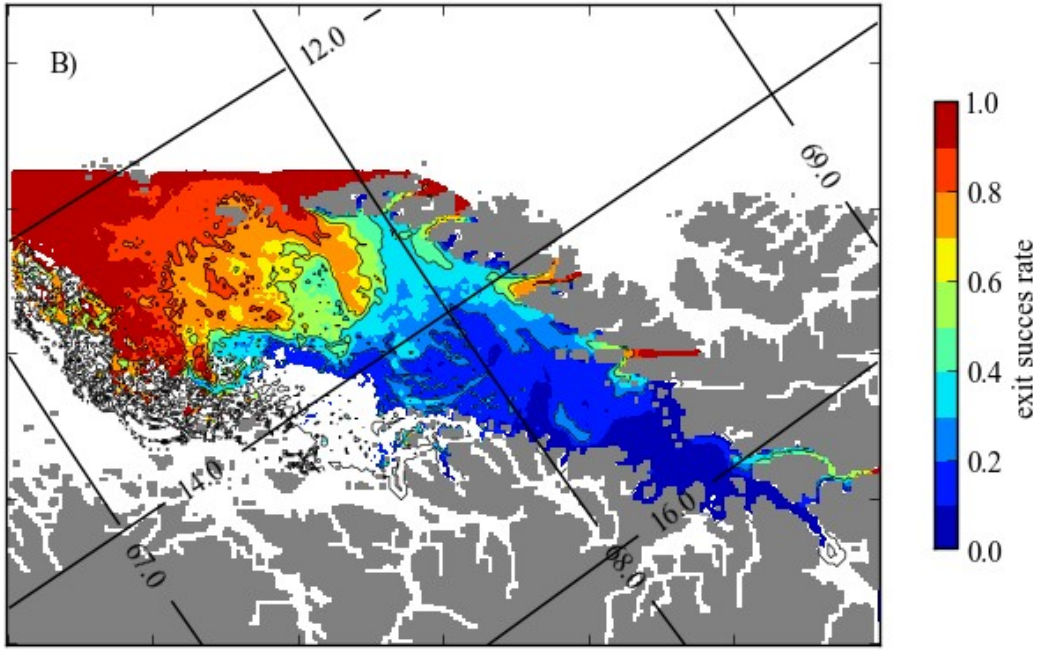




Residence time of cod eggs in Vestfjorden



Fraction of eggs that manage to escape



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Telefon 55236611
E-post johannes.rohrs@met.no