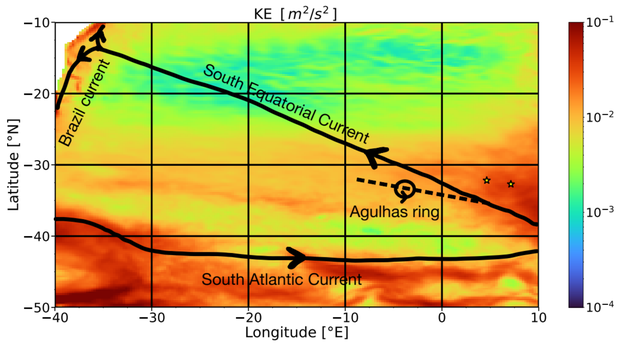
Motivation

- Energy can neither be destroyed nor created: It can only be transferred to different spatial scales.
- In the South Atlantic complex interactions between high energetic processes take place
- How is energy to transferred from mesoscales to large scales (inverse energy cascade)?



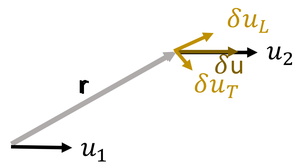
- The inverse energy cascade is often inferred from drifter data via structure functions (ensemble averages over velocity increments).

Can structure functions be applied to Satellite Sea Surface height data?

Methodology

Structure Functions:

$\delta u_L = \delta \mathrm{u} \cdot \frac{r}{|r|}$, $\delta u_T = \delta \mathrm{u} \times \frac{r}{|r|}$,



with $\delta \mathrm{u} = u_2 - u_1$

D2 = $\langle (\delta {u_L}^2 + \delta {u_T}^2) \rangle$ ~ scale averaged energy

D3 = $\langle \delta u_L (\delta {u_L}^2 + \delta {u_T}^2) \rangle$ ~ estimation of dissipation

Spectral kinetic energy flux:

$\prod_K < 0$: inverse cascade

Injection Scale: $\prod_K = 0$, Arrest scale: $\frac{\partial \prod_K}{\partial k} = 0$

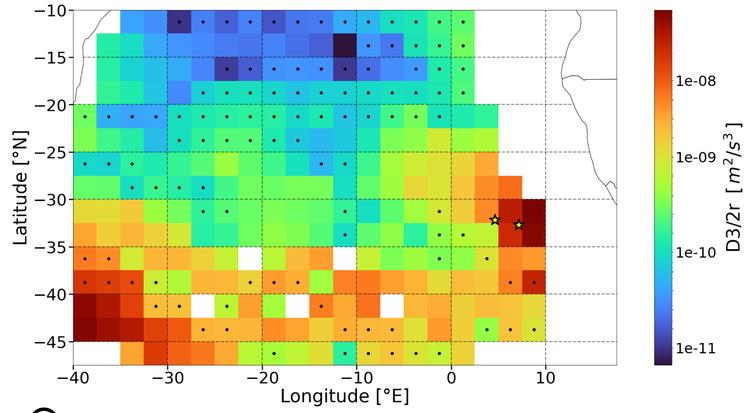
Diagnosing the inverse energy cascade in the South Atlantic using sea surface height data

Emelie Breunig, Alexa Griesel and Julia Draeger Dietel

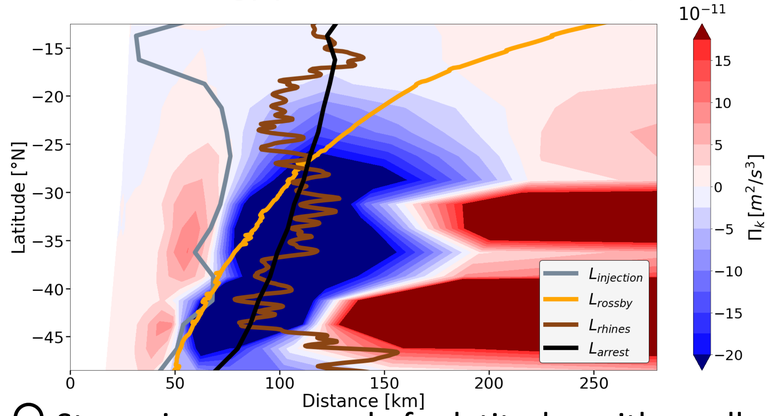
This presentation participates in OSPP

Outstanding Student & PhD candidate Presentation contest

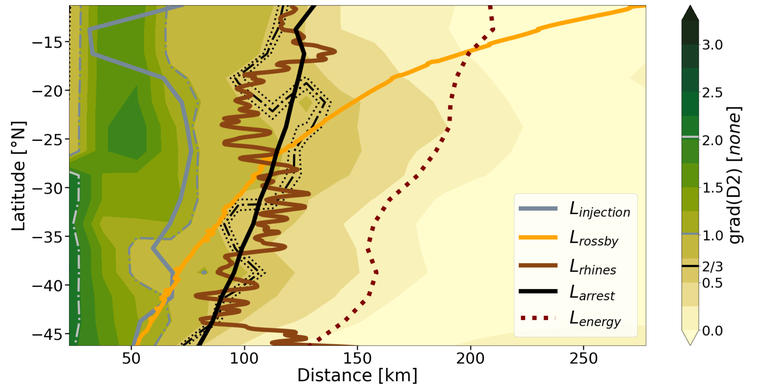
Results



Estimate of dissipation from D3/2r follows kinetic energy pattern (dots: D3/2r > 0)



Strong inverse cascade for latitudes with smaller Rossby radius than Rhines scale



Spectral power law of an inverse cascade ($r^{2/3}$) is close to the energy arrest scale

Open Question

What is the meaning of negative D3/2r values (negative dissipation)?