Using SWOT to assess the realism of km-scale models

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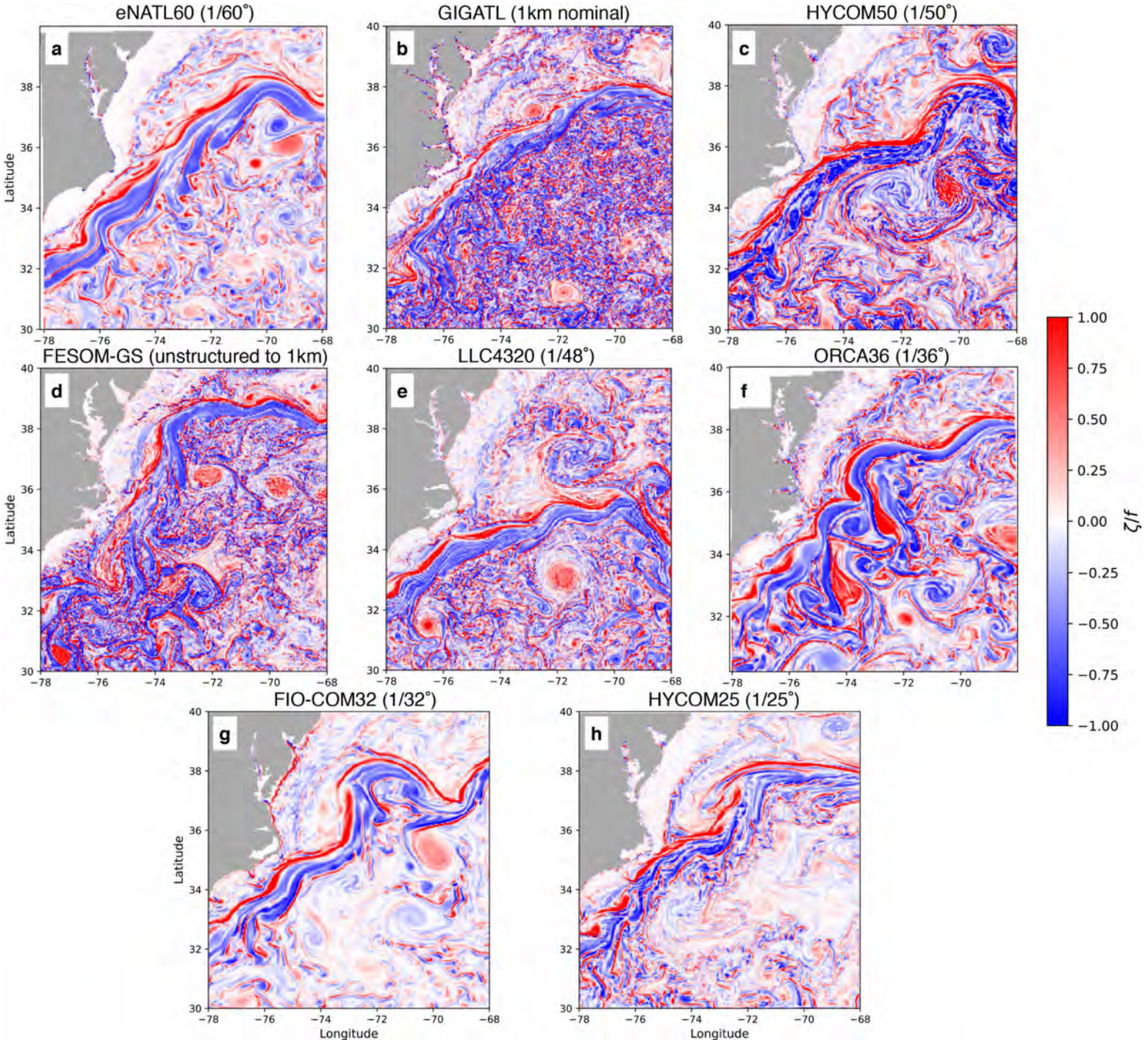
Uchida et al. (2022)

- Five 1-km scale models with very different behavior.
- Which one is closer to reality?
- Can SWOT help?
- CNES postdoc (to be hired-start date July 24) to quantify differences and identify what can be compared to SWOT data
  - Spectral analysis
  - Log-likelihood of (sub)mesoscale structures (machine learning)
  - Energy cascade analysis

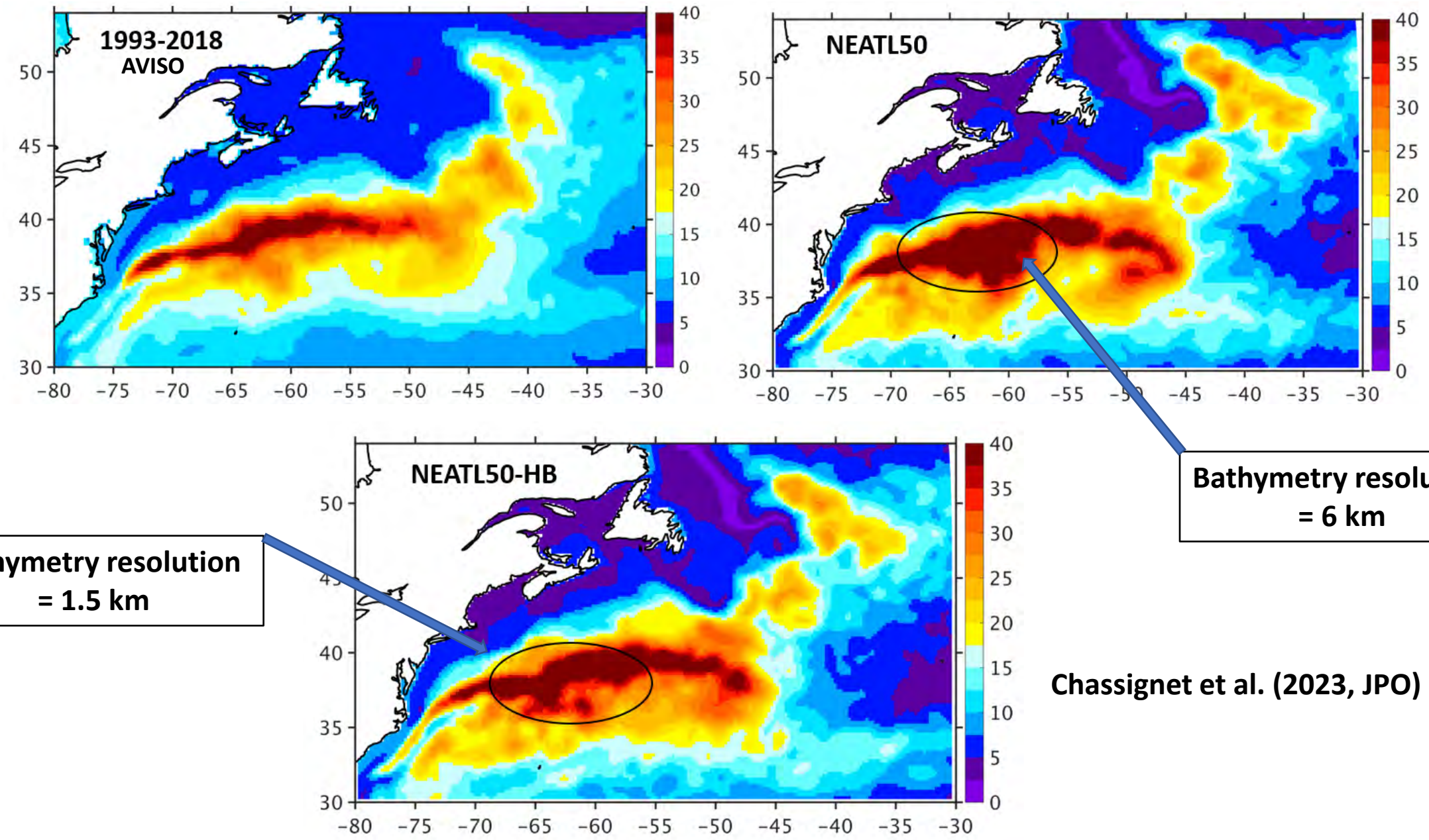


Km-scale models are sensitive to numerical/physical choices

- Bathymetry
- Atmospheric forcing

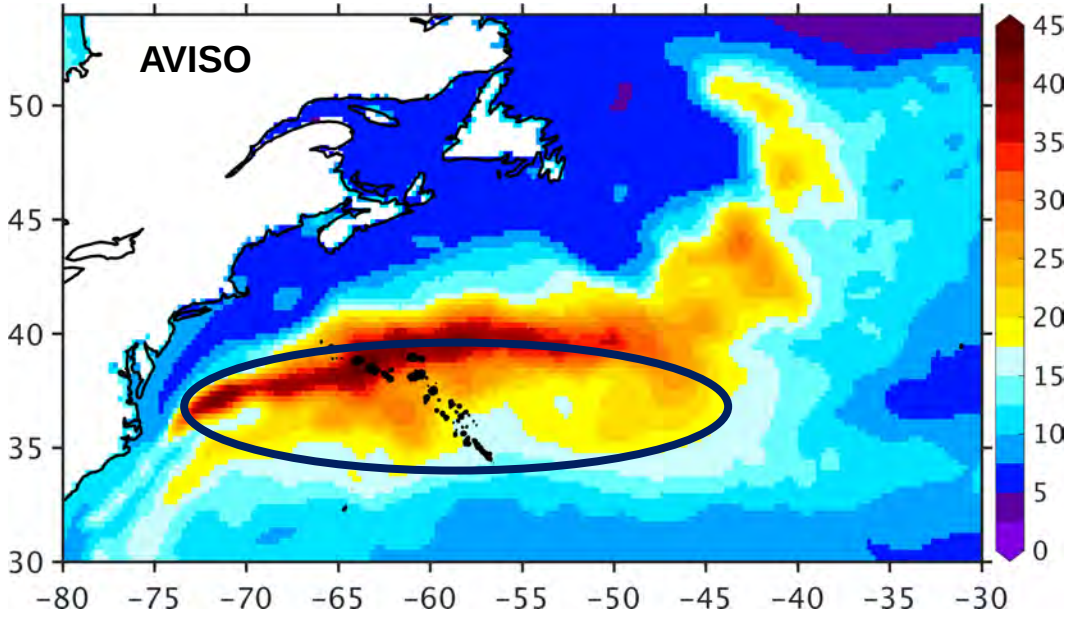
=> Better quantification using SWOT – examples follows

Impact of bathymetry on surface EKE

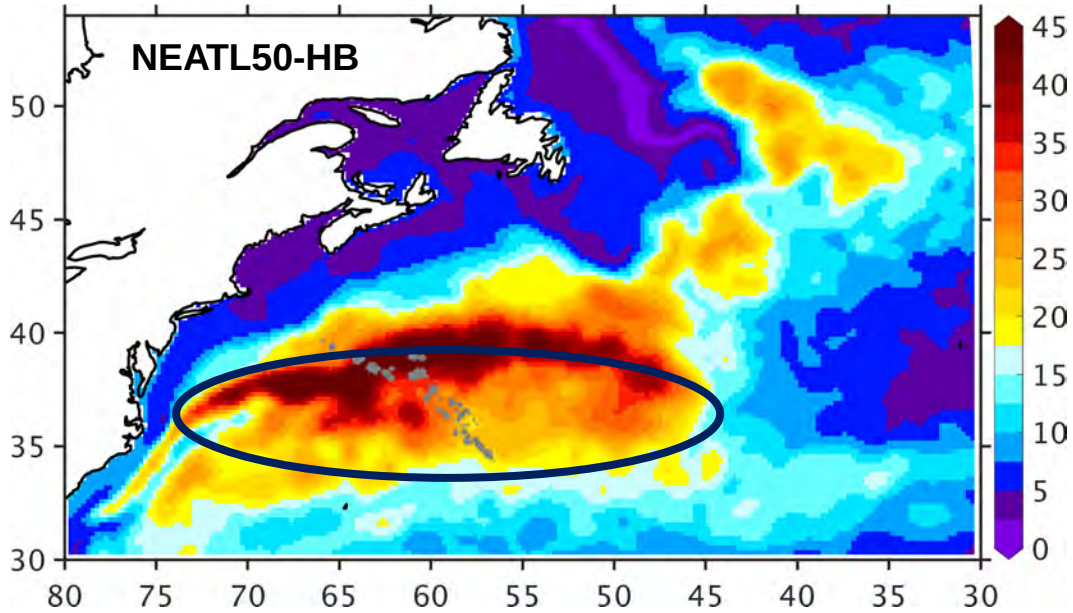


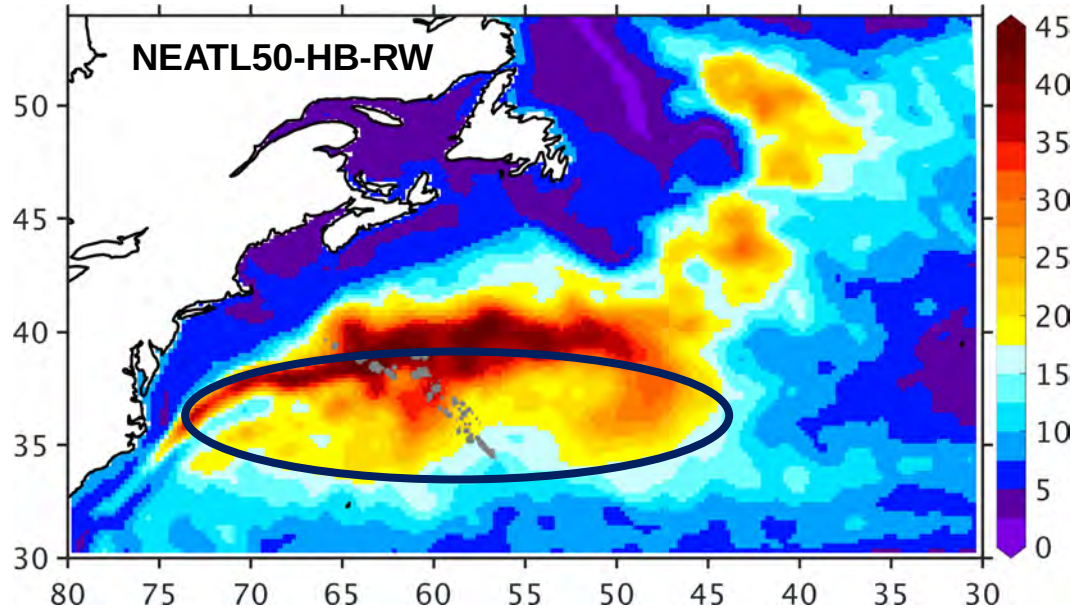
Chassignet et al. (2023, JPO)

Relative wind impact on surface EKE

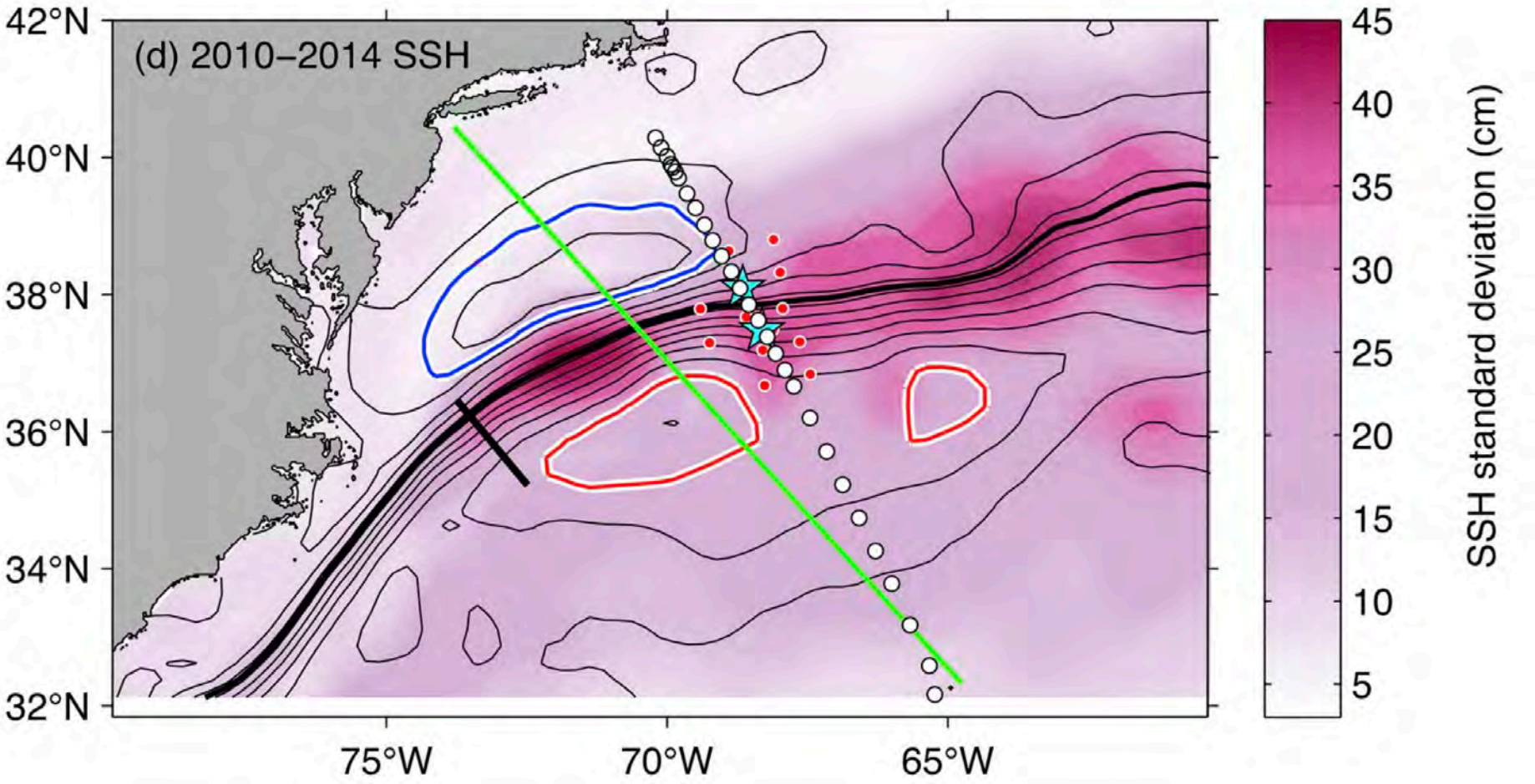


Renault et al. (2019) proposed a 70% relative wind stress formulation to take into account ocean-atmospheric feedback.



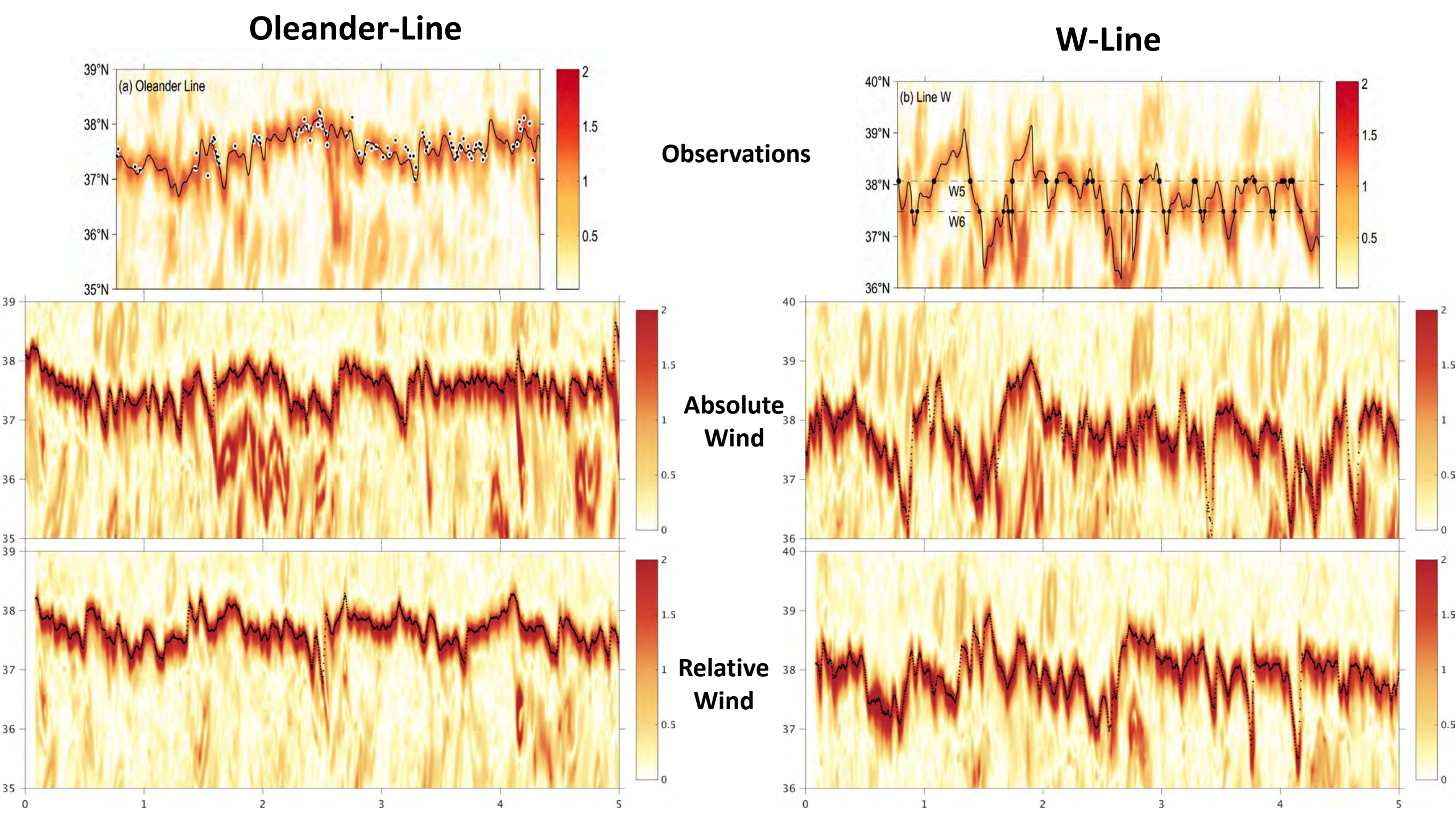


Comparison with Oleander & W line results (Andres et al., 2020)



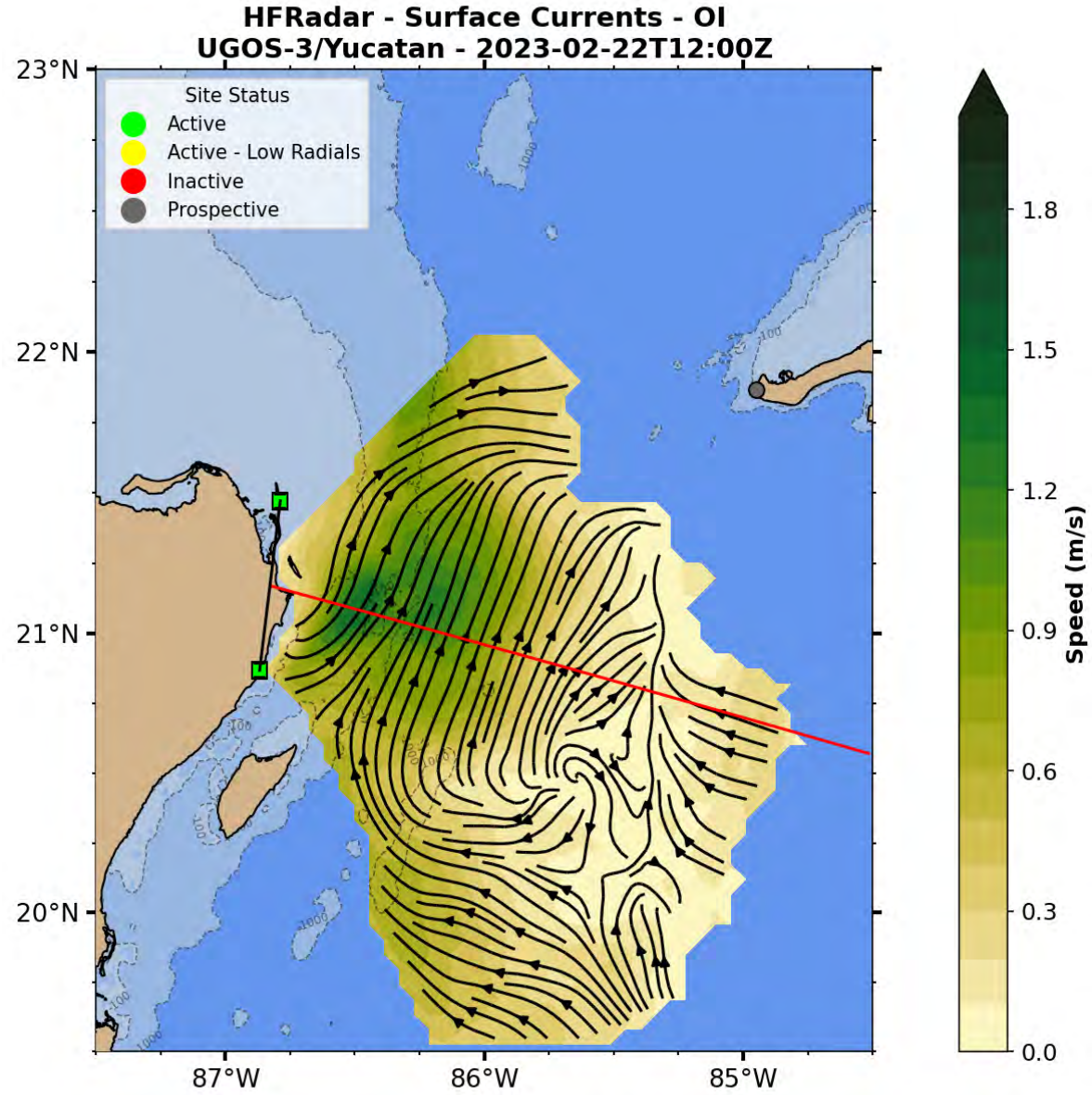
Oleander-Line

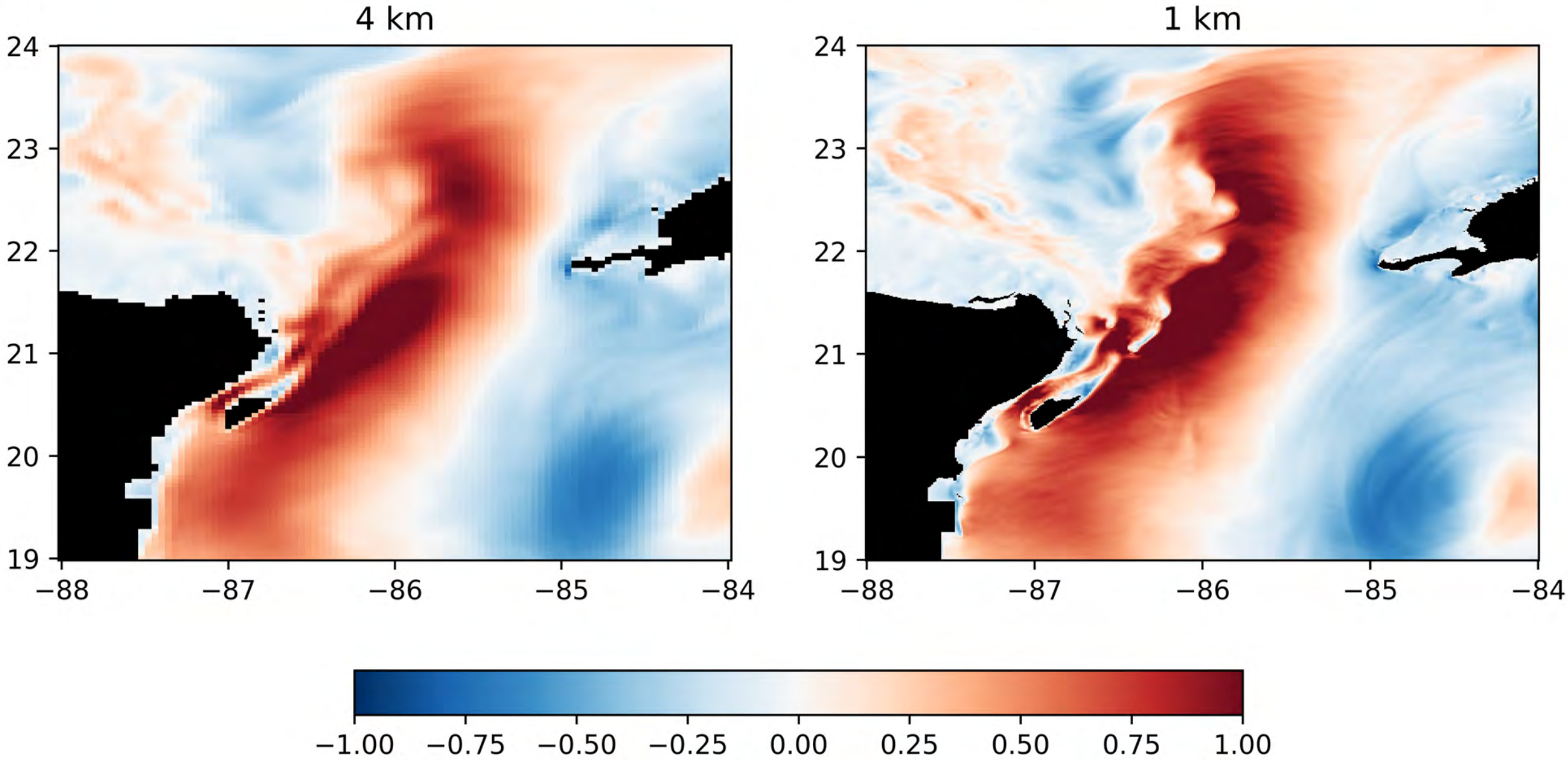
W-Line

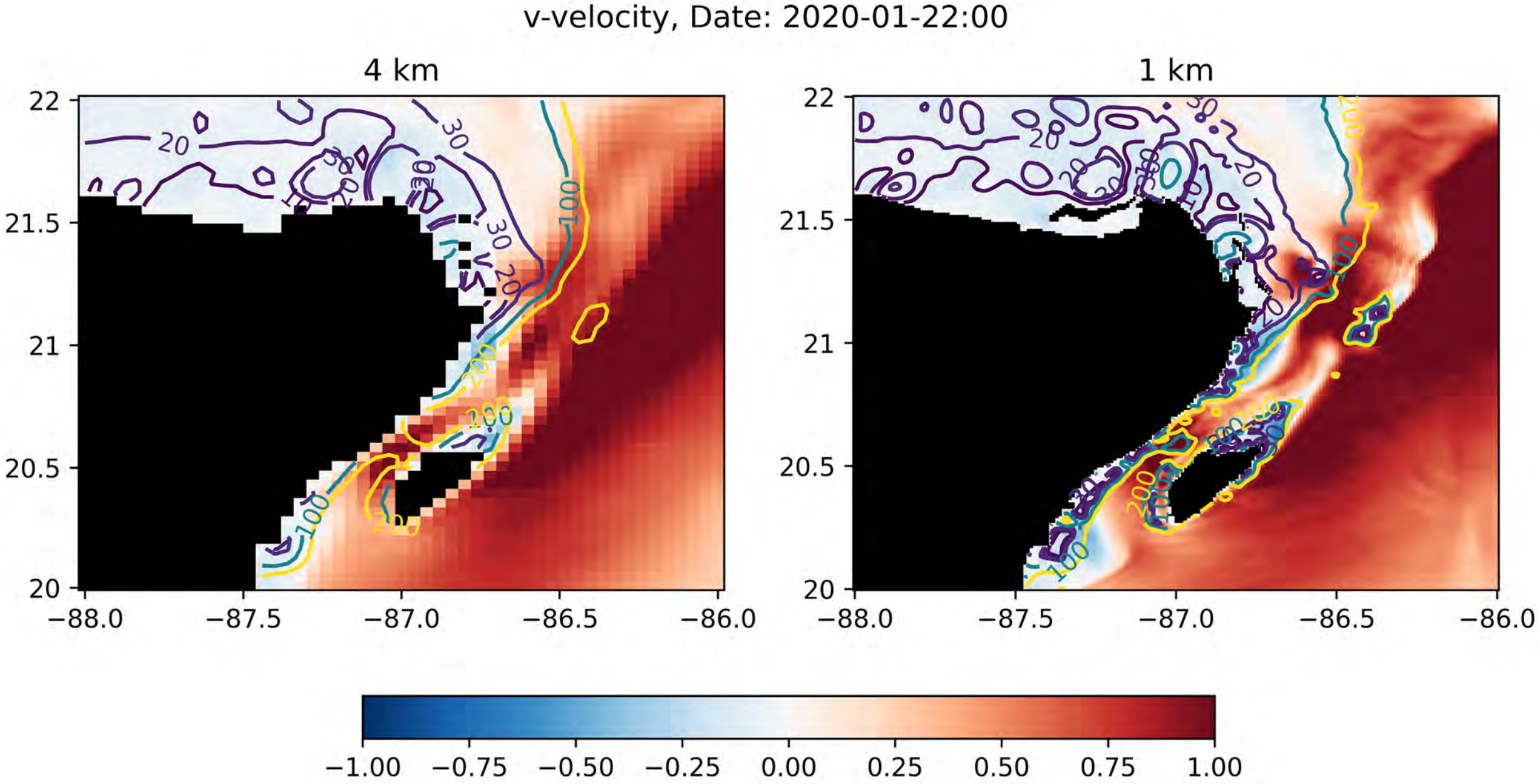


Impact of resolution on Gulf of Mexico Loop Current

1 km versus 4 km Gulf of Mexico HYCOM configuration




v-velocity, Date: 2020-01-22:00
4 km
1 km
24
23
22
21
20
19
−88
−87
−86
−85
−84
−1.00
−0.75
−0.50
−0.25
0.00
0.25
0.50
0.75
1.00


v-velocity, Date: 2020-01-22:00
4 km
1 km
22
21.5
21
20.5
20
−88.0
−87.5
−87.0
−86.5
−86.0
−1.00
−0.75
−0.50
−0.25
0.00
0.25
0.50
0.75
1.00