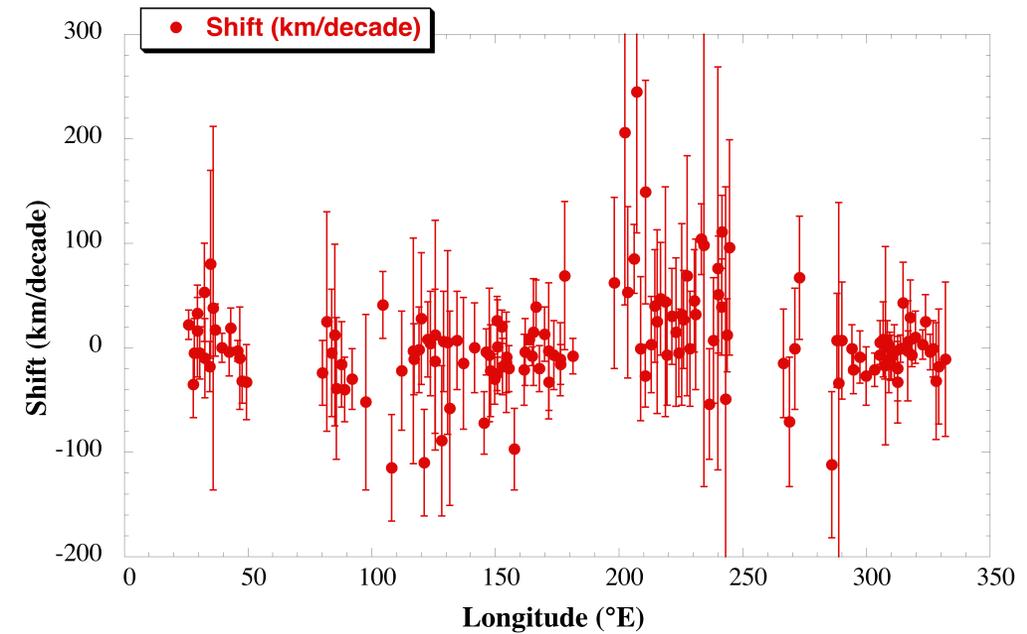
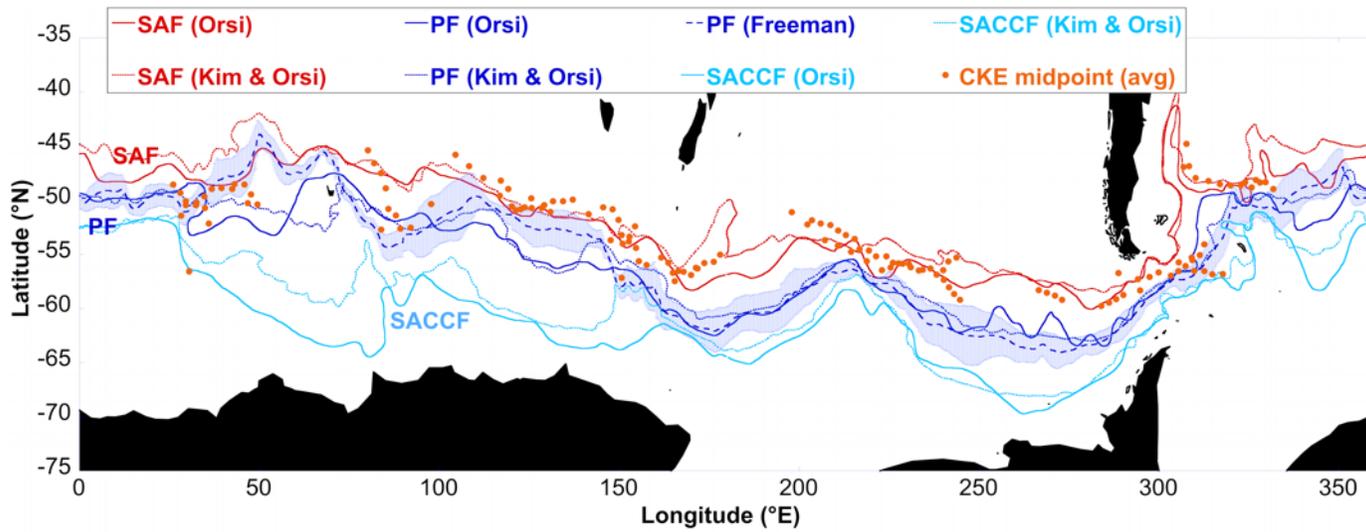


Analysis of kinetic energy and structure functions from along-track and crossover altimeter data

PI: Don Chambers (USF), Co-Is: Boris Galperin (USF), Xinfeng Liang (U. Delaware)

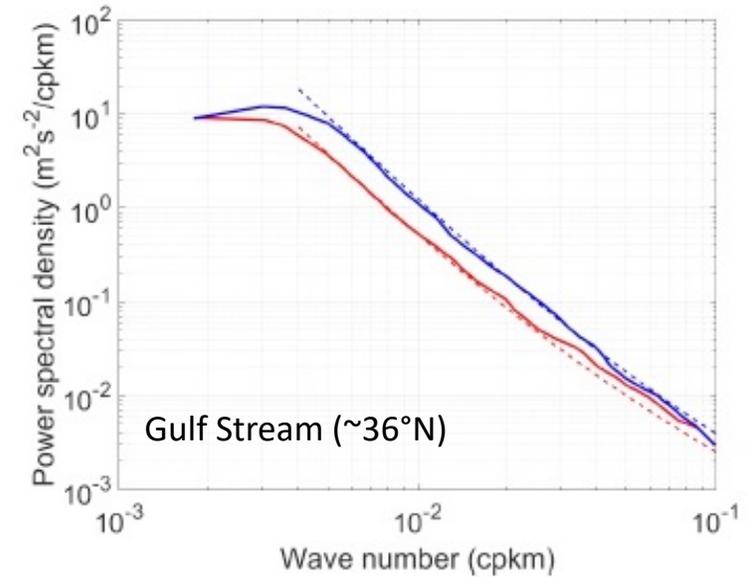
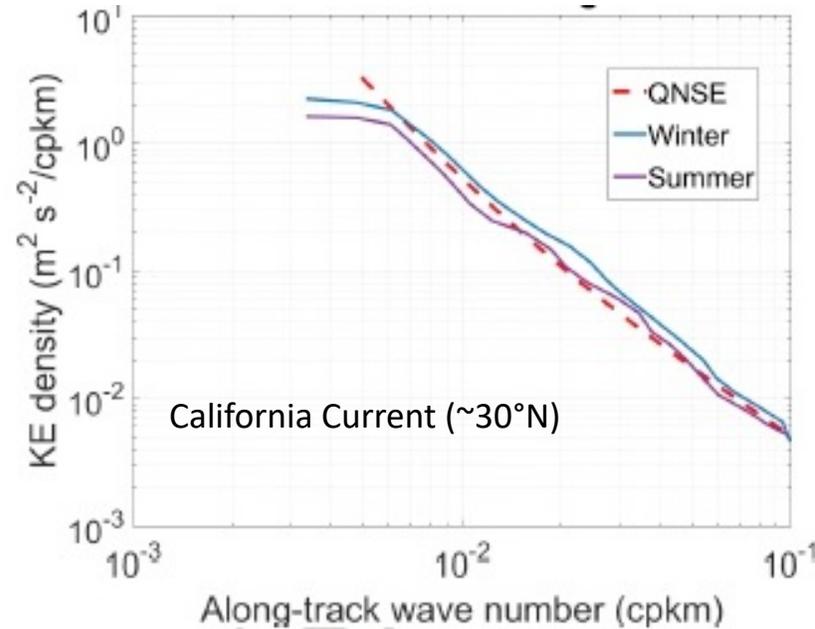
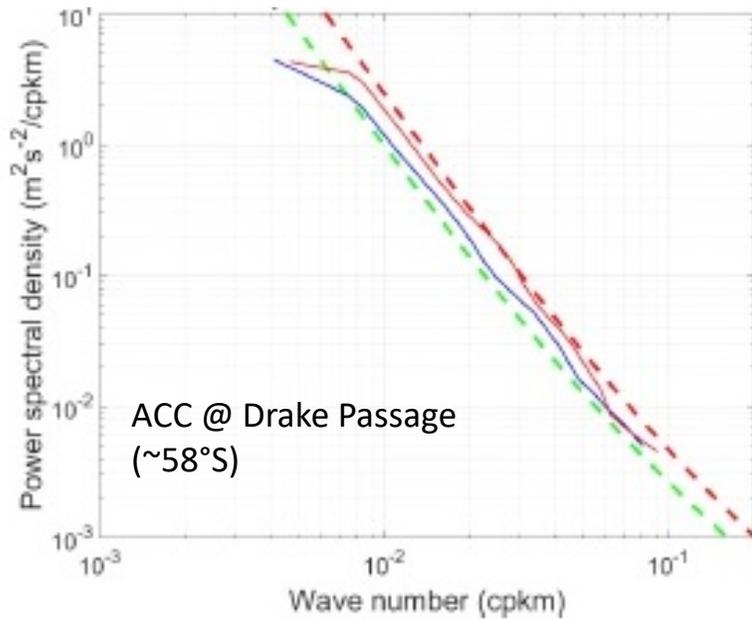


Chambers, D. P. (2018), Using kinetic energy from altimetry to detect shifts in the positions of fronts in the Southern Ocean, *Ocean Sci.*, 14, 105–116, <https://doi.org/10.5194/os-14-105-2018>.

Computed kinetic energy from cross-track velocity (CKE) using 1-Hz along-track sea level anomalies from TOPEX/Poseidon, Jason-1, and Jason-2. Determined mid-point of envelopes of high CKE (**left**), which aligns with fronts. Using yearly estimates, tracked the shift over time of the mid-point (**right**). There was no substantial shift either north or south in most areas, indicating no systematic shifts in the fronts since 1993.

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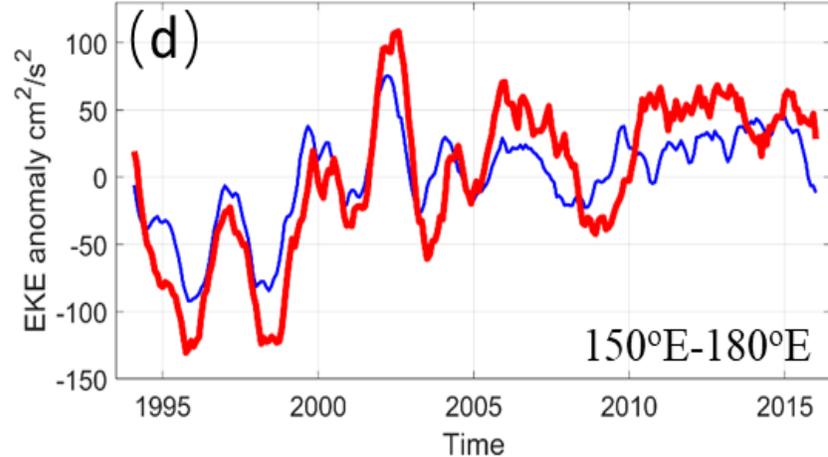


Galperin, B., and Sukoriansky, S. (2020) Quasinormal scale elimination theory of the anisotropic energy spectra of atmospheric and oceanic turbulence. *Physical Review Fluids*, 5, <https://doi.org/10.1103/PhysRevFluids.5.063803>.

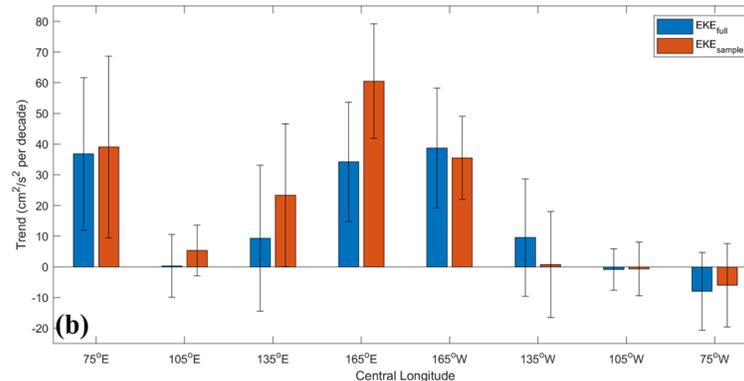
Co-I Boris Galperin has developed a theory explaining why spectra of velocity data changes as a function of latitude related the changing Coriolis force. In the plots above, the **dashed lines** represent the predicted spectra from the theory and the **solid lines** are spectra computed from ADCP measurements.

Analysis of kinetic energy and structure functions from along-track and crossover altimeter data

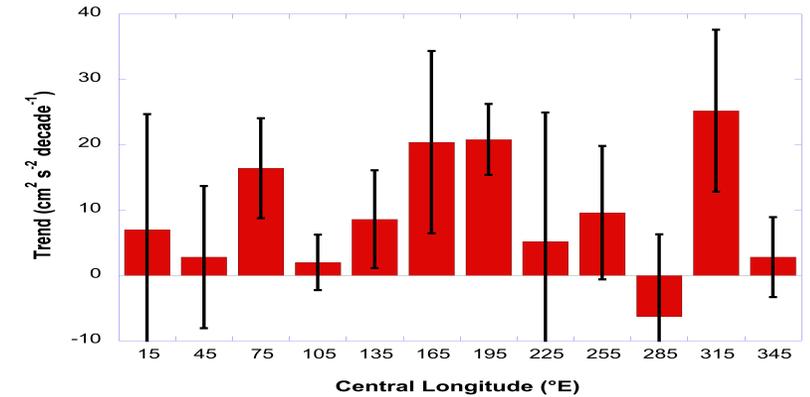
PI: Don Chambers (USF), Co-Is: Boris Galperin (USF), Xinfeng Liang (U. Delaware)



EKE from a high-resolution model (blue) compared to that computed from sampled crossovers (red). A 1-year boxcar has been applied.



22-year trends (1994-2015) in EKE from the crossover sampling experiment (red) and the full model model (blue) for 30° longitude sectors in the Southern Ocean. Error bars are 90% confidence.



22-year trends (1993-2014) in EKE from altimeter crossovers. Error bars are 90% confidence.

Zhang, Y., D. Chambers., and X. Liang (2020) Regional Trends in Southern Ocean Eddy Kinetic Energy, *manuscript in preparation*.

A student-led investigation has been quantifying the error in using altimeter crossovers to study EKE trends and low-frequency variability in the Southern Ocean, using a sampling experiment with a high-resolution (<10 km) ocean state estimate. Our conclusions are that crossovers sample the Southern Ocean sufficiently to detect significant trends. Moreover, we find that EKE has only increased significantly in a few regions of the Southern Ocean, primarily downstream of topography. This is causes overall increases in EKE for large areas of the Southern Ocean observed by others (e.g., Hogg et al., 2015).