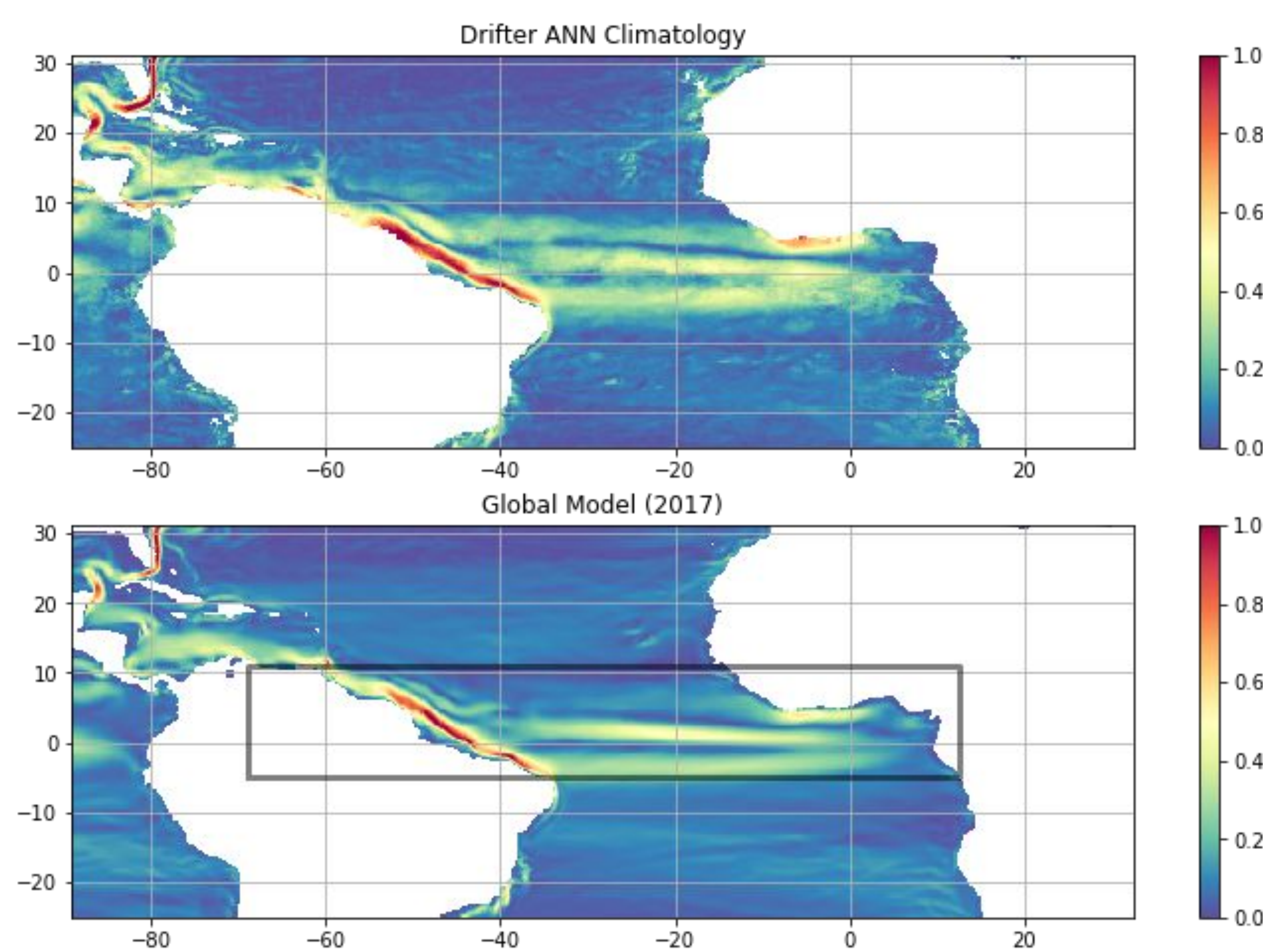


Regional Downscaling in the Tropical Atlantic Using MOM6

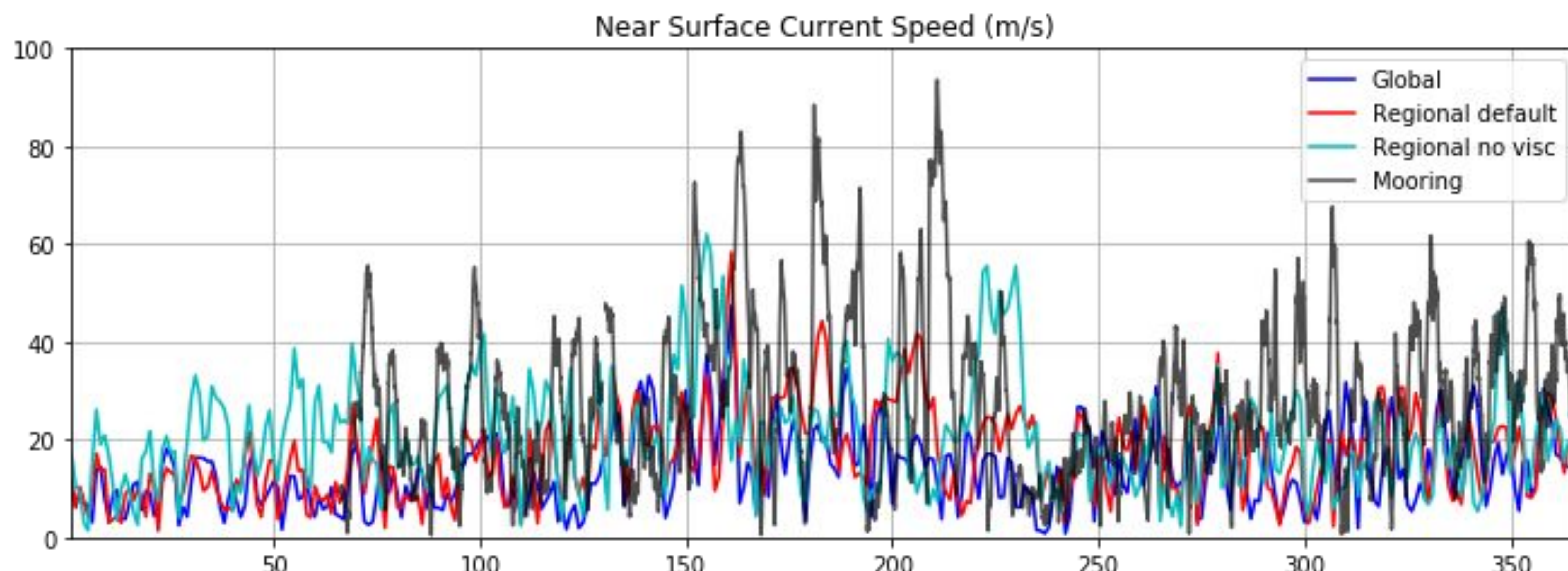
Matthew Harrison (NOAA/GFDL) ; Gregory Foltz and Renellys Perez NOAA/AOML)

Abstract

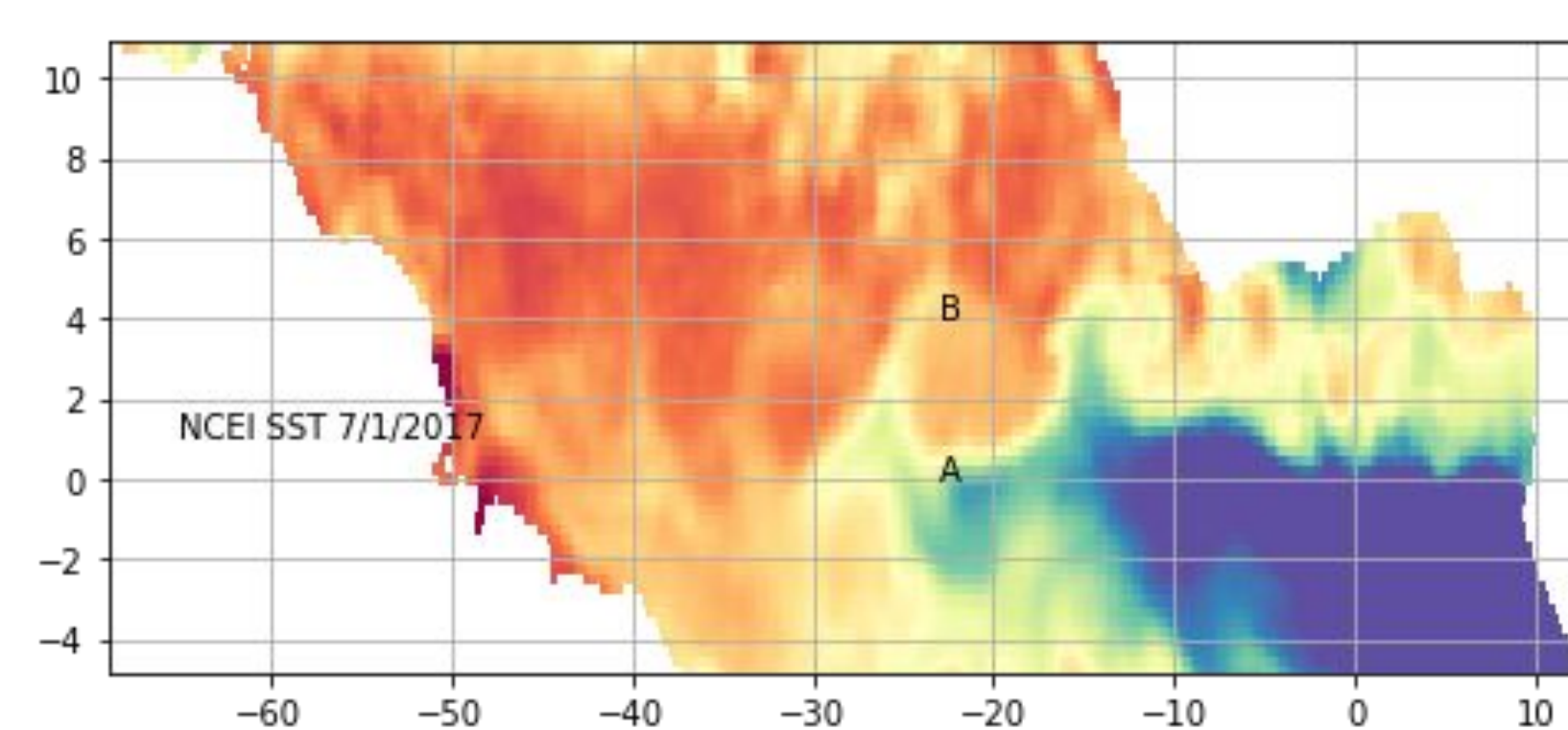
A global eddy-permitting ocean and sea-ice configuration based on the community MOM6 ocean model, OM4 (Adcroft et al, *JAMES* 2019) is forced with MERRA-2 hourly data (1993-present). The global model is found to exhibit weak tropical instability wave (TIW) activity compared to mooring observations at 4N,23W where significant TIW activity was observed in the Boreal Summer of 2017. A regional version of the global configuration is developed in order to assess model sensitivity to resolution, mixing parameterizations and forcing data. As a first step, the model is downscaled to a comparable 20km resolution in the tropical Atlantic, forced with boundary conditions from the global model. Background flow conditions and stratification are found to compare favorably to independent observations. Reducing the amount of lateral bi-harmonic friction produce more realistic TIW amplitudes in the downscaled version of the model. Further study is underway to assess the impacts of enhanced horizontal resolution.



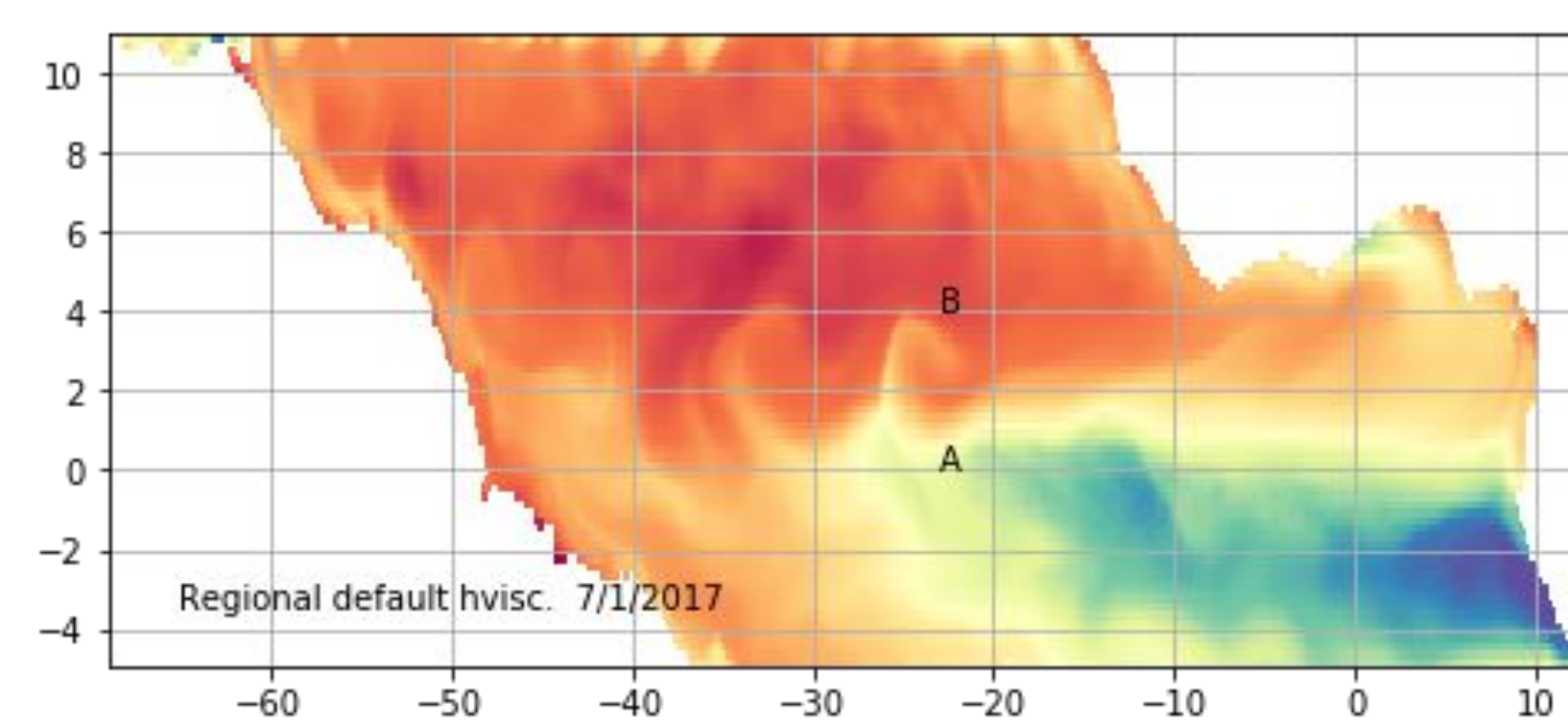
Top: Annual global drifter program near-surface current speeds (m/s). Bottom: Global model in 2017.



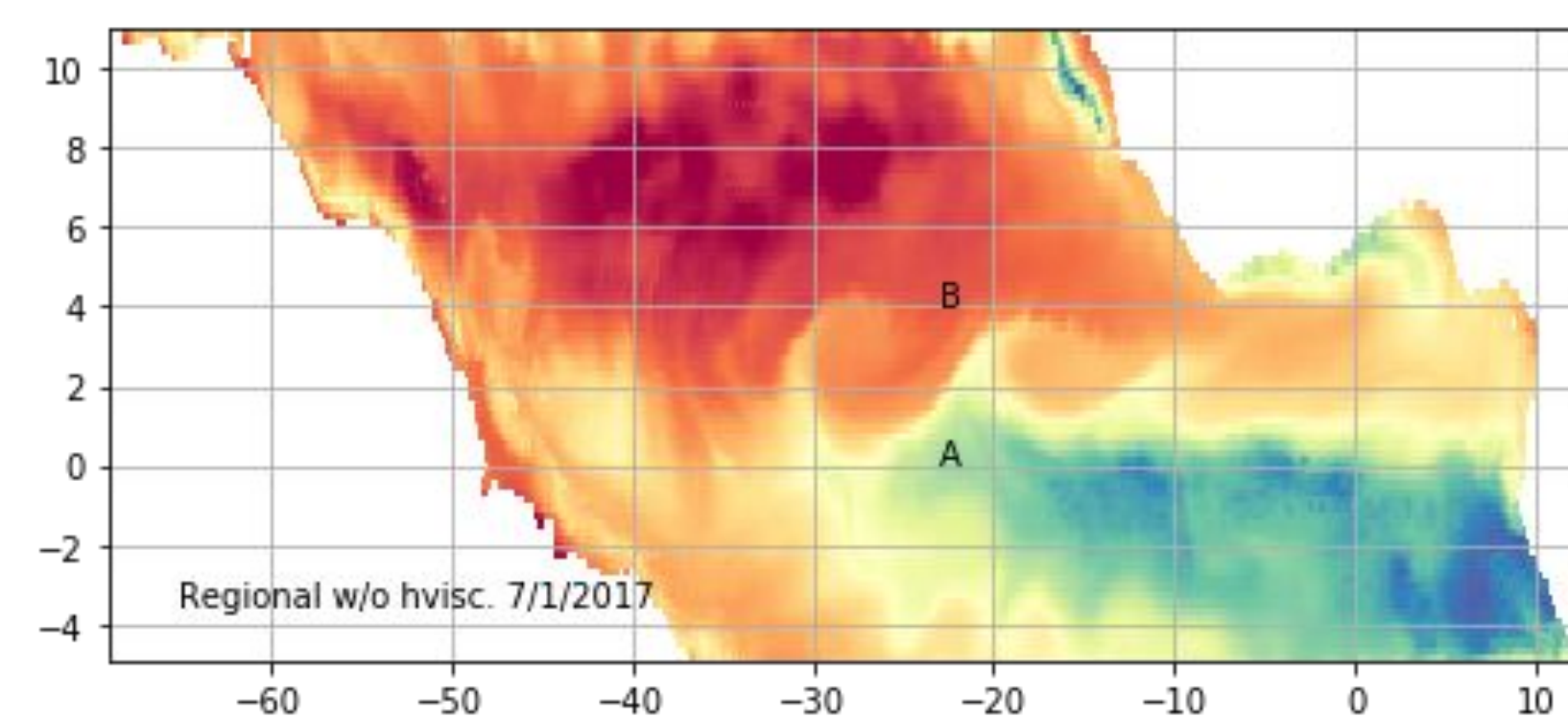
Daily average near surface currents at the 4N,23W mooring during 2017. Observations are online in early March. The global and regional models with default friction are under-estimating enhanced TIW variability observed during Boreal Summer (total RMS=7.9 and 9.0 cm/s, respectively). Reducing the bi-harmonic friction results in enhanced surface current variability (RMS=11.1 cm/s)



NCEI SST

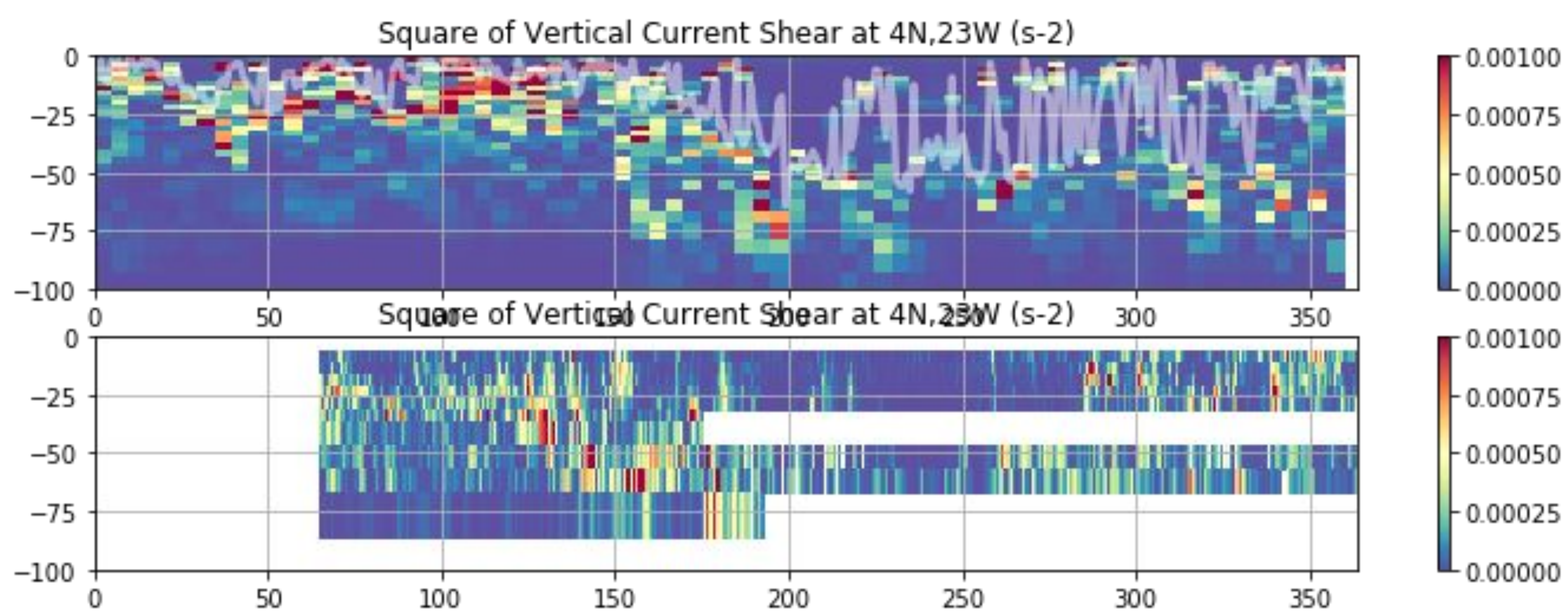


Default Lat. Viscosity



No Lat. Viscosity

Sea surface temperature on 7/1/2017



Vertical current shear squared (s-2) at the 4N,23W mooring location - model (top) and observations (below). The light line in the top panel indicates the approximate mixed layer depth. Elevated shears exist at the base of the mixed layer in both model and observations at similar depth ranges..

Summary and Future Plans

We are developing a modeling strategy for the tropical Atlantic domain leveraging regional downscaling capabilities developed for MOM6. This will allow us to further improve our models through detailed observational comparisons using the PIRATA array. We are planning to continue our investigation using multiple one-way nesting towards higher lateral resolution in order to better represent TIW activity and associated heat transport.