Scale Dependence of Air-Sea Coupling in CCSM3.5 and Observations

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APPROACH

Analysis of Annual Averaged Sea-surface Height (SSH –proxy for ocean heat content) and Latent Heat Flux (LHFLX)

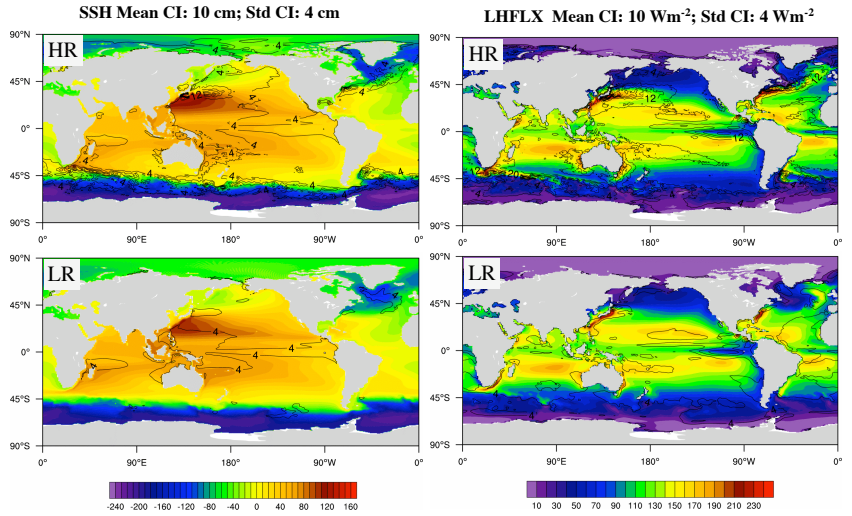
NCAR CCCSM3.5 Fully Coupled Model

Two ~150 year simulations (last ~100 years analyzed) with same ~0.5º horizontal resolution in the atmosphere (CAM3.5) and different horizontal resolution in the ocean (POP): (1) 0.1º eddy resolving (HR) (2) 1.0º non-eddy resolving ocean (LR) Analyses done on atmosphere grid

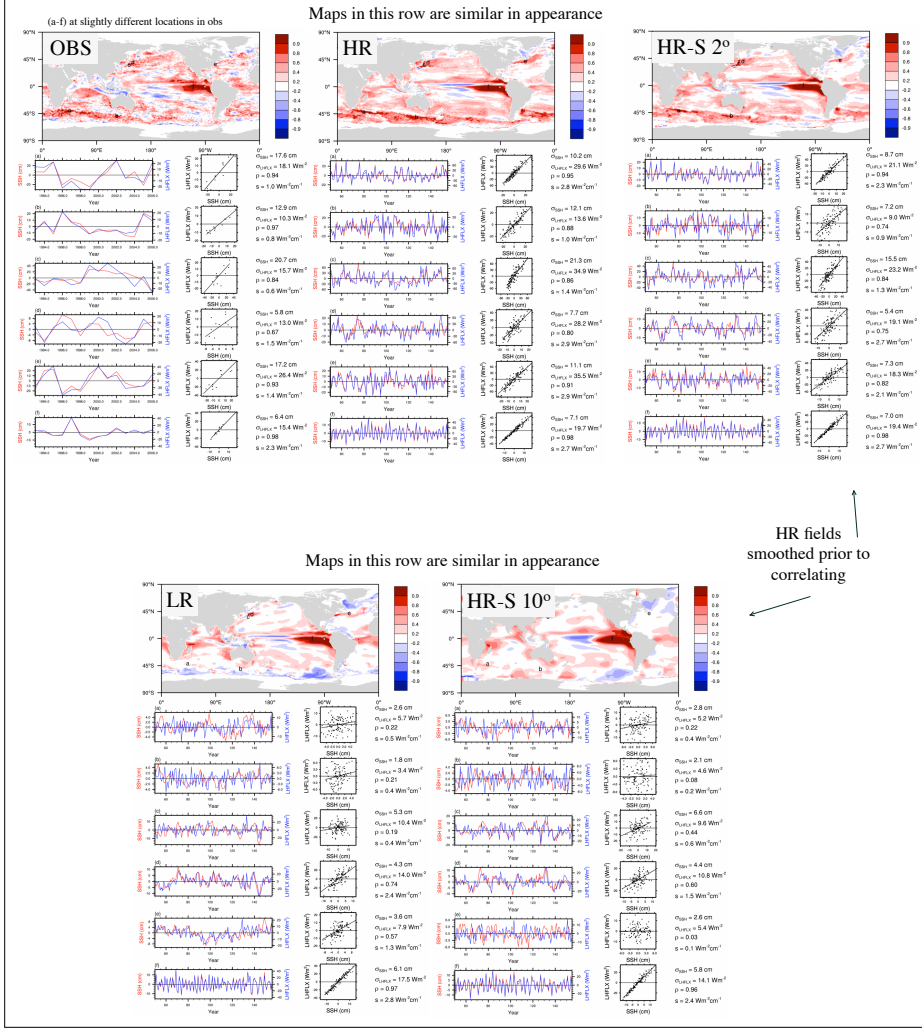
Observational Products

1993-2006 (14 years) AVISO SSH and JOFUR latent heat flux, both at 0.25º horizontal resolution

Mean and Standard Deviation



Correlation SSH and LHFLX



Summary & Conclusions

- There is much more SSH and LHFLX temporal variability in regions of strong frontal boundaries in the simulation using the HR compared to LR ocean component
- Mean SSH and LHFLX fields are similar across ocean model resolution in most regions
- In both simulations the mean LHFLX has local maxima coincident with local maxima in the standard deviations

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- Positive correlations between SSH and LHFLX (ocean forcing atmosphere) are generally more extensive and stronger in the simulation made using the HR compared to LR ocean model outside tropics. The correlations are similar in tropics
- The correlations computed from the observations closely resemble those from the HR simulation, much more so than those from the LR simulation
- For points in mid-latitudes, the slope of the regression lines between LHFLX and SSH are larger by as much as 2-3 times (except at (b)) in the HR simulation compared to the observations
- Smoothing HR fields nominally to the LR resolution before calculating the correlations does not change the results much and does not make them resemble the LR results – different processes rather than just differences in resolution across ocean models lead to differences in the correlations
- Smoothing HR fields to 10º yields correlations that qualitatively resemble those from the LR simulation