Reproducing the structure of the seasonal cycle of SST in ocean mixed layer models forced with contemporary surface flux estimates; what works, where there are discrepancies, and opportunities for using improvements in one to benefit the other.

A.M. Chiodi
D.E. Harrison

Abstract:
Globally, and in the vast majority of oceanic regions, the seasonal cycle stands out as the dominant mode of sea surface temperature (SST) variability. Accurately reproducing the seasonal cycle serves as a good benchmark for models used to study the climate system and, in the forced-ocean case, offers a good test of both model fidelity and our knowledge of the surface fluxes. Though such models have been shown to be highly capable of reproducing observed variability in some regions, doing so in the higher latitudes, where the reasons for the observed structure of the seasonal cycle of SST are not fully understood, has proven more difficult. Herein, we attempt to reproduce the structure of the seasonal cycle of SST in the non-tropical and ice-free regions of the Southern Hemisphere using a hierarchy of quasi-one-dimensional ocean mixed layer model experiments forced with various contemporary surface forcing data sets, including those from numerical weather prediction models and derived from in situ records of surface marine variables. Results show that, in some cases, effects of simple 1-D physical processes forced with currently available surface heat flux estimates accurately reproduce observations. These results suggests an explanation for the structure of the seasonal cycle, though considerable differences exist between results from the various data sets, that highlight areas where improved constraints on either the effects of ocean processes, or surface fluxes, will benefit the other.