Systematic SST errors in eastern boundary regions: effect of embedding a high resolution ocean model in CESM

Abstract:
Many coupled global climate models suffer from warm SST biases in eastern boundary regions, sometimes extending to the equator. It has previously been suggested that the warm SST bias has its root in the poor representation of one or more of the following processes: coastal winds, the persistent stratocumulus deck, coastal currents, and upwelling. In this paper we focus on the coastal ocean processes by embedding a high resolution ocean model in the Community Earth System Model (CESM) framework. Here the Regional Ocean Modeling System (ROMS) interacts in a one-way or partial two-way manner with the global ocean model, and the merged SST is passed to the CESM coupler. We first discuss an implementation of this nested Regional Climate Model (nRCM) in the California Current System eastern boundary upwelling region. The SST bias is reduced off California due to a combination of more vigorous upwelling and equatorward surface currents in ROMS. We look at the feedbacks on SST associated with the modulation of low level cloud and of the air-sea fluxes, and how this affects the upper ocean heat budget. Finally, new results obtained by employing the nRCM in the south-east Atlantic will be presented. In this region coastal upwelling and equatorial processes are intertwined, allowing for improvements to coastal SST to potentially affect the tropics and the ITCZ.