Impact of Variable SST on Simulated Warm Season Precipitation

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Introduction

What are the impacts of variability in SSTs on RAMS model simulations of the North American Monsoon on seasonal and surge timescales and at coarse and high resolutions?

The Colorado State University – Regional Atmospheric Modeling System (RAMS) was recently upgraded with the capability of ingestting more modern and higher resolution Sea Surface Temperature (SST) datasets for ocean surface initialization and forcing. Prior model versions were limited to use of climatological data or Reynolds’s 1°x1° datasets. Within the past year we have added the capability of ingestting the AVHRR 18km data as well as the MODIS 36km and 4.63km data from both the Terra and Aqua platforms.

The North American warm season moisture transport and precipitation, including moisture surges from the Gulf of California, are strongly influenced by the ocean temperature and gradients in SST. Thus, simulations of monsoon-related precipitation may vary dramatically if the SST forcing is varied due to the data source alone. This may indicate the need to determine the most accurate and best resolution source of SSTs as well as the necessary model resolution for simulating the fine scale features of the monsoon.

RAMS Model Setup

   b. Parent grid above + nested 7.5km grid spacing covering extreme southwest U.S. and most of Mexico for the July 13-15, 2004 surge event.
3. INITIALIZATION: NCEP 2.5° reanalysis.
4. PHYSICS:
   a. Single moment microphysics for liquid and ice hydrometeors on both grids.
   b. Kain-Fritsch cumulus parameterization within the coarse parent grid.
5. SST FORCING:
   a. Climatology (CLIMO), b. Reynold’s Version-2 (REYV2)
   c. AVHRR 18km (AVHRR), d. MODIS 4.63km Terra (MODIS)

***Only the 2004 SST sensitivity simulations are presented here.***

SST Dataset Variability

JJA Averaged SST Differences (°C)

The CLIMO SSTs vary most dramatically and are much cooler along the Gulf of California than in the other datasets. The MODIS and AVHRR are most similar, but still offer SST differences up to 1 °C along the west coast of Mexico.

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