Natural Variability of Regional Sea Level in a High Resolution Global Coupled Climate Model

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The accurate prediction of trends at a regional scale is essential for adapting to and preparing for the effects of climate change. The prediction of local sea level trends is particularly critical. Sea level rise is one of the most often cited consequences of climate change and is presently impacting cities along the east coast of the United States. Currently, typical general circulation models (GCMs) have 1.0° resolution in the ocean, and are unable to resolve features like the Gulf Stream which may have large effects on regional sea level. The main goal of this research is to utilize high-resolution (HR, 0.1° resolution in the ocean) coupled model runs of CCSM4 to analyze regional sea surface height (SSH) trends. We first characterize the natural variability of SSH along the east coast of the United States in unforced, HR runs of CCSM4. The variability of coastal SSH from these runs is then compared to tide gauge observations, reanalysis datasets, and unforced, low-resolution (LR, 1.0°) runs of CCSM4. The connection between coastal SSH and global climate patterns is also compared between LR and HR model output and reanalysis. By characterizing the natural variability of SSH in models and observations we strive to understand what processes influence SSH along the east coast of the United States and to improve the prediction of sea level rise.

Keywords: high resolution climate model, regional sea level, coupled models