Session: C38 Poster: Th17B

Exploring the role of surface fluxes in regional sea level variability among CMIP3 models

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Because most of the population lives near the coasts, sea level change can have a dramatic impact on human civilizations. Anticipating future sea level changes is thus fundamental. While all models agree on the global rise of sea level during the next century, they however disagree on the regional pattern of the sea level change. These regional variations can be large but are what is locally important. Such disparities could arise from the atmosphere model, the ocean model or both. Understanding the causes of these disparities should allow us to determine which processes are important in order to improve predictions. To try to understand the reasons for such differences we explore the impact of the surface fluxes from the atmosphere to the ocean. The ocean receives momentum, water and heat fluxes from the atmosphere. They can impact the uptake and distribution of heat and salinity directly or indirectly, e.g. by modifying the oceanic circulation; in the latter case the resulting change in the distribution of heat and salinity will then directly impact the sea level pattern. For this study we use the FAMOUS and HadCM3 AOGCMs; FAMOUS is a low resolution version of the HadCM3, whose atmosphere resolution is 7.5o longitude by 5o latitude and with ocean resolution of 3.75^{o} longitude by 2.5^{o} latitude and 20 levels. We prescribe anomalous surface fluxes from the CMIP3 database (scenario sresa1b) to evaluate their respective impact on the sea level distribution. We then analyze and compare the obtained regional sea level change patterns with the CMIP3 ones to determine which fluxes are dominant in setting the various patterns and how they impact regional sea level.