**The local atmospheric response to sea ice loss in CAM4, atmospheric reanalysis, and satellite observations**

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My work uses observationally constrained atmospheric forecasts to evaluate the boundary layer and net radiation response to prescribed 2007 sea ice conditions in the Community Atmosphere Model (CAM4). While July 2007 boundary layer temperatures and humidities are minimally affected by sea ice loss, the September 2007 boundary layer is more turbulent, unstable, warm, and moist over newly open water. Low clouds increase over newly open water in both the July 2007 and the September 2007 forecasts. In response to the 2007 sea ice loss, net surface energy budgets change by +19.4 $Wm^{-2}$ and -17.9 $Wm^{-2}$ in the July 2007 and September 2007 forecasts respectively. For reference, I compare the CAM4 energy budget results to the NCEP-NCAR reanalysis, the MERRA reanalysis, and CERES satellite data-constrained fluxes.

While many aspects of the CAM4 forecasted response to sea ice loss are consistent with physical expectations and observations (e.g., Kay and Gettelman (2009)), CAM4's ubiquitous July cloud increases over newly open water are not. In coupled model runs, these unrealistic cloud increases would dampen projected Arctic sea ice loss and warming. The unrealistic cloud response results from the global application of parameterization designed to diagnose stratus clouds based on lower tropospheric stability. Because Arctic boundary layers are often not well mixed, an assumption underlying the implemented stratus parameterization is violated. A physically motivated change to the stratus parameterization improves the modeled cloud response as compared to observations, and increases surface energy budgets by +11 $Wm^{-2}$ in the July 2007 forecasts. Of importance to projected Arctic change and high-latitude climate feedbacks, the cloud response to the 2007 sea ice loss depends on the CAM4 atmospheric state. Unrealistic cloud compensation for sea ice loss only occurs when dry and stable atmospheric conditions exist in CAM4, such as those that led to the record-breaking 2007 Arctic sea ice loss.