



Investigating the impact of the diurnal cycle of SST on the atmosphere

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The diurnal cycle is a prominent feature of our climate system and the most familiar example of externally forced variability. Despite this it remains poorly simulated in state-of-the-art climate models. A particular problem is the diurnal cycle in sea surface temperature (SST), which is a key variable in air-sea heat flux exchange. In most models the diurnal cycle in SST is not well resolved, due to insufficient vertical resolution in the upper ocean mixed-layer and insufficiently frequent ocean-atmosphere coupling.

Here, we focus on improving the representations of the diurnal cycle in SST in a climate model, and investigate the role of the diurnal cycle in climate. In particular, we coupled a 1-dimensional mixed-layer model to an atmospheric general circulation model. Comparison with in situ and satellite observations indicates that the new model reproduces the diurnal cycle in SST over most of the global oceans. Sensitivity experiments show a significant impact of the diurnal cycle in SST on the atmosphere. However, in the lower atmospheric boundary layer the model is still deficient in reproducing the diurnal cycle of 2m temperature. This suggests that an improved representation of the atmospheric boundary layer is required, before robust conclusions on the role of the diurnal cycle on climate can be drawn.