

On the diurnal cycle of the upper ocean and impacts on precipitation in CESM

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A simple scheme is presented for capturing the diurnal trapping of heat, freshwater and momentum within the upper meter or so of the ocean during daytime periods of strong solar heating, heavy rainfall and weak winds. Off-line results show a realistic daily maximum warming as a function of wind speed and solar radiation compared with estimates from satellite measurements. The scheme avoids the computational demands of explicitly resolving these diurnal cycles temporally and vertically, so it has been implemented in the air-sea coupling of the Community Earth System Model (CESM). The impacts on global precipitation and comparisons with observations are presented, first with prescribed sea surface temperature then with a fully coupled interactive ocean. The differences from submitted CESM CMIP5 results are highlighted and inferences on their reliability are discussed.