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Impact of ocean coupling strategy on extremes in high-resolution atmospheric simulations

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Abstract.

This paper discusses the sensitivity of tropical cyclone climatology to ocean coupling strategy in high-resolution configurations of the Community Earth System Model. Using two supported model setups, we demonstrate that the choice of grid on which the lowest model level wind stress and surface fluxes are computed may lead to differences in cyclone strength in multi-decadal climate simulations, particularly for the most intense cyclones. Using a deterministic framework, we show that when these surface quantities are calculated on an ocean grid that is coarser than the atmosphere, the computed frictional stress is misaligned with wind vectors in individual atmospheric grid cells. This reduces the effective surface drag, and results in more intense cyclones when compared to a model configuration where the ocean and atmosphere are of equivalent resolution. Our results demonstrate that the choice of computation grid for atmosphere/ocean interactions is non-negligible when considering climate extremes at high horizontal resolution, especially when model components are on highly disparate grids.