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The Coupled High-Resolution Modeling of the Earth System (CHiMES) Project.

Abstract: Current resolutions of IPCC-class climate models are mostly in the 100-km range for both ocean and atmosphere. A central concern for the next generation of models is to understand natural and forced variability as we make the next leap in resolution. This leap is particularly interesting as fundamental new physics appears in models of both atmosphere and ocean at the next step: at 25 km resolution or so, we begin to see the influence of both ocean eddies and organized atmospheric storm systems.

We ask: are there modes of variability of the coupled ocean-atmosphere system that are predictable on timescales of a decade or more? Can we simulate this variability? and to what extent is this dependent on ocean resolution? These questions are central in exploring both the promises and the limits of climate prediction.

We also seek to address the question of whether the statistics of fine-scale phenomena (e.g., interannual variability in hurricane frequency and intensity) is predictable on the basis of free-running ESMs.

The Coupled High-resolution Modeling of the Earth System (CHiMES) project proposes a series of long-term integrations involving a state-of-the-art coupled model of unprecedented resolution.

Century-scale integrations of this model under varying initial conditions will provide valuable insights into the inherent predictability of this system, as well statistically robust answers to key questions about the response of modeled tropical storm frequencies and intensity to climate change. We show preliminary results from CHiMES and prospects for future research.