E3SM All-hands meeting

A Novel Modeling Framework to Improve Stratocumulus by Increased Horizontal and Vertical Resolution

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This presentation demonstrates that the Energy Exascale Earth System Model (E3SM) coupled with the novel Framework for Improvement by Vertical Enhancement (FIVE) is a viable option to improve the representation of low clouds while saving computational cost. FIVE allows E3SM to compute select physical processes (i.e. microphysics, radiation, turbulence, and vertical advection) at higher vertical resolution, independent of E3SM’s vertical grid. Using FIVE in E3SM with standard ne30 configuration (1 degree horizontal mesh) we run physics processes with LES-like vertical resolution in the lower troposphere to greatly improve subtropical marine stratocumulus (Sc). However, these simulations still suffer from large biases along the coastal regions of California and Peru. Therefore, we also run E3SM-FIVE at ne120 (0.25 degree mesh) to investigate the sensitivity of coastal stratocumulus to different horizontal and vertical resolutions. We show that concurrent horizontal and vertical resolution increases are needed for substantial overall reduction of stubborn marine Sc biases. Finally, we will discuss how our results will be used to generate a new Regional Refined Mesh (RRM) over a select subtropical Sc region.