**ABSTRACT**

High-resolution global climate modeling holds the promise of capturing planetary-scale climate modes and small-scale (regional and sometimes extreme) features simultaneously, including their mutual interaction. This presentation discusses a new state-of-the-art high-resolution Community Earth System Model (CESM) simulation that was performed with these goals in mind. The atmospheric component was at 0.25º grid spacing, and ocean component at 0.1º. One hundred years of “present day” simulation were completed. Major results were that annual mean sea surface temperature (SST) in the Equatorial Pacific, and El-Niño Southern Oscillation variability were well simulated compared to standard resolution models. Tropical and Southern Atlantic SST also had much reduced bias compared to previous versions of the model. In addition, the high resolution of the model enabled small-scale features of the climate system to be represented, such as air-sea interaction over ocean frontal zones, mesoscale systems generated by the Rockies, and tropical cyclones. Associated single component runs and standard resolution coupled runs are used to help attribute the strengths and weaknesses of the fully coupled run. The high-resolution run employed 23,404 cores, costing 250 thousand processor-hours per simulated year and made about 2 simulated years per day on the NCAR- Wyoming supercomputer ‘Yellowstone’.