

**ATS/CIRA Colloquium**

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from Pennsylvania State University

**Hosted by Dave Randall**

**3 p.m. Thursday, Sept. 21**  
**ATS 101 and Zoom**

**Exploring Climate Extremes and Communicating Risk  
with Convective-Permitting, Variable-Resolution  
Models**

In this presentation, recent projects completed using both the Community Earth System Model (CESM) and the Energy Exascale Earth System Model (E3SM) at km-scale grid spacings are demonstrated. While there is a great deal of ongoing effort to support these model configurations for global model assessments in the coming decades, it is shown that actionable climate science is permitted with present computing architectures through the use of variable-resolution meshes and short-term "storylines." A technique for game planning "gray swan" tropical cyclones -- storms that are historically unrealized but physically plausible in current and future climates -- is described. When simulated with 3km CESM and E3SM, hurricanes strikingly resemble observed storms. While others have shown storm-total precipitation can be credibly captured by 25km climate models, hourly rain rates, commonly used by stakeholders for hazard planning, are more faithfully represented by km-scale models when compared to NEXRAD data.

Opportunities exist to inform other sectors, such as coupling results to outage prediction models to expose electric grid vulnerability. Unfortunately, it isn't all fun and cool gifs; subgrid parameterization and computational challenges in running such models are also highlighted, along with current gaps and ongoing development in tools for analyzing this voluminous, unstructured model data.

Colloquia page: [atmos.colostate.edu/colloquia](https://atmos.colostate.edu/colloquia)