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Plume Detectability Using Multiscale Atmospheric Transport Modeling

Multiscale atmospheric transport models (ATM) resolve mesoscale meteorology, such as frontal passages, and microscale meteorology near-source, which is often strongly influenced by complex terrain and heterogeneity of the land surface. The ability of material collection stations to detect passing plumes can be strongly influenced by local variations in atmospheric flow, particularly nearby the source and detector, which motivates the development and use of multiscale ATM. Resolving the diverse meteorological phenomena of interest within a multiscale simulation requires a highly capable model, significant computational resources, and detailed knowledge of both the local and synoptic conditions. Here, we discuss lessons learned from multiscale transport and dispersion simulations executed with the Weather Research and Forecasting (WRF) model and a young model undergoing active development, the Energy Research and Forecasting (ERF) model. ERF is a highly efficient and scalable atmospheric model designed to take advantage of the latest supercomputing resources with hybrid (CPU and GPU) architectures that enables fast-running multiscale simulations approaching operational timescales. This work was performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under contract DE-AC52-07NA27344. Lawrence Livermore National Security, LLC. This is abstract LLNL-ABS-871294.

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