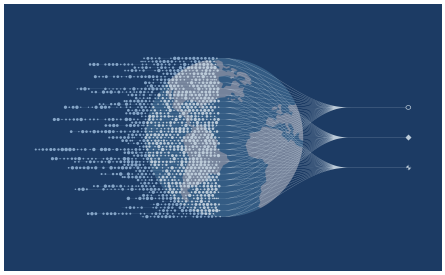

ID: **O1.1-479** Type: **Oral**

Transport Modeling of Radionuclides Using Artificial Intelligence Generated Weather

Atmospheric transport models (ATMs) are used for many important applications, including fate and transport simulations of radionuclides emitted to the atmosphere (forward modeling) and determining the possible origin of release of radionuclides measured by the International Monitoring System (backward modeling). Large meteorological data sets are needed by ATMs, which are generated and updated regularly from weather forecast centers. Until recently, these data sets were produced by running slow numerical weather models on high performance computers. Within the past two years, several new weather forecast systems based on artificial intelligence (AI) and machine learning algorithms have demonstrated prediction skill that rival traditional numerical models, but for a small fraction of the computational cost. By using AI systems, the turnaround time for running ATM simulations can be reduced dramatically because weather data can be generated locally instead of relying on forecast centers to run numerical models. Large ensembles of ATM simulations are also possible with AI-generated weather, enabling new ways to quantify ATM uncertainty. We present analyses and comparisons of radionuclide ATM simulations using weather from traditional numerical models and new AI systems. We highlight the errors of both systems relative to observations and summarize future opportunities for ATM.

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Session Classification: O1.1 The Atmosphere and its Dynamic

Track Classification: Theme 1. The Earth as a Complex System: T1.1 The Atmosphere and its Dynamics