

## Updates on the Development of MUSICA

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This presentation gives an overview of the development and current capabilities for the Multiscale Infrastructure for Chemistry and Aerosols (MUSICA), which is the next generation atmospheric chemistry modeling at NSF NCAR. Our efforts have followed a two-prong development path, 1) testing, evaluating, and applying global-to-regional-to-local scale modeling, and 2) developing software to create a Model Independent Chemistry Module (MICM). MUSICA version 0, which is a configuration of the Community Earth System Model using the Community Atmosphere Model (CAM), allows for regional grid mesh refinement to grid spacings of ~7 km and has been applied to air quality events in the USA, South Korea, South America, and East Asia. MUSICA version 1 uses the Model for Prediction Across Scales (MPAS) grid mesh and dynamical core, which allows regional refinement to convective-permitting scales (~3 km grid spacing). Results will be presented for our current evaluation of MUSICA v1, which is investigating impacts of convective transport on the upper troposphere composition for an Asian Summer Monsoon case.

The software infrastructure development follows modern software standards and is designed to be able to connect to any atmosphere model. MICM is currently being implemented in CAM as part of the NSF NCAR System for Integrated Modeling of the Atmosphere (SIMA) Project, MusicBox (<https://musicbox.acom.ucar.edu/>) which is a chemical box model, and other chemistry transport models. The MUSICA infrastructure provides interfaces via Fortran, C, and Python, allowing partners in the community to contribute modules for representing atmospheric chemistry. This follows the goal of MUSICA to be developed collaboratively by NSF NCAR and university and government researchers. The community is encouraged to participate in MUSICA development and applications. More information for learning MUSICA v0 and MusicBox is provided on the MUSICA homepage (<https://www2.acom.ucar.edu/sections/multi-scale-infrastructure-chemistry-modeling-musica>).