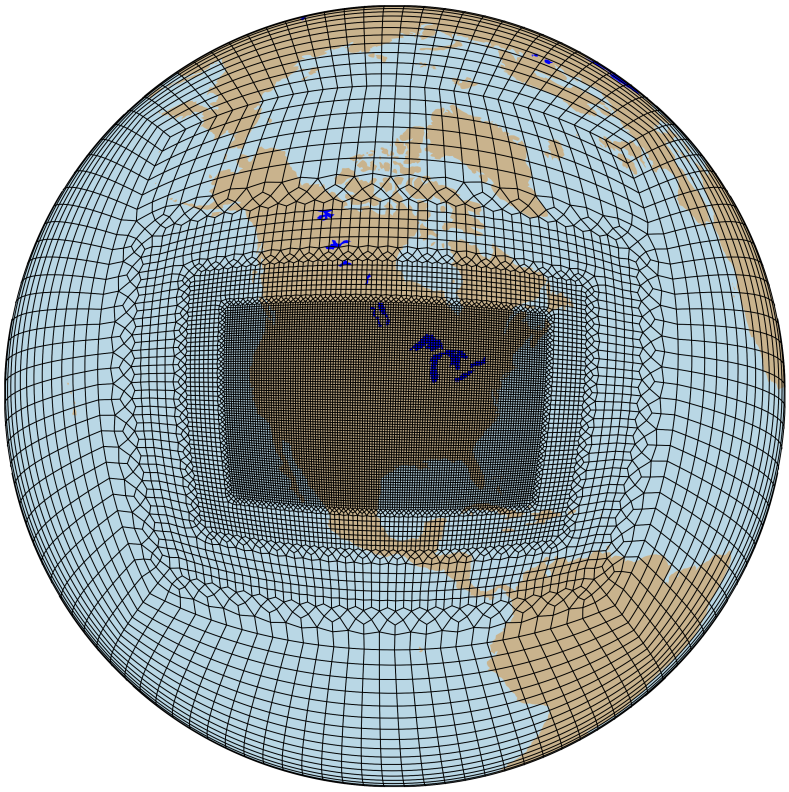
MUSICA Home



Overview

The Multi-Scale Infrastructure for Chemistry and Aerosols (MUSICA) will become a computationally feasible global modeling framework that allows for the simulation of large-scale atmospheric phenomena, while still resolving chemistry at emission and exposure relevant scales. MUSICA is being developed by the Atmospheric Chemistry Observations and Modeling (ACOM) Laboratory at NCAR with the atmospheric chemistry community. MUSICA will eventually replace and extend the current separate community chemistry modeling efforts at NCAR (e.g. WACCM, CAM-Chem, WRF-Chem), paralleling other activities at NCAR to streamline and unify model development. Please find more information on the background and governance of MUSICA at the MUSICA website.

MUSICAv0

The first implementation of MUSICA is a configuration of CAM-chem, the Community Atmosphere Model with chemistry, which is a component of the Community Earth System Model (CESM). This configuration uses the Spectral Element (SE) dynamical core, which allows for Regional Refinement (RR), so is called CAM-chem-SE-RR, or MUSICA-V0, and is available as a ready-to-use configuration in CESM2.2.

CAM-chem is a global chemistry-climate model, with full coupling to the land and ocean, and includes comprehensive tropospheric and stratospheric chemistry, the MAM4 modal aerosol model, and a VBS-SOA scheme (Tilmes et al., 2019; Emmons et al., 2020; and references therein). The SE regional refinement capability in CAM is described in Lauritzen et al. (2018). The default resolution of MUSICA-V0 is approximately 1-degree for most of the globe, with approximately 14 km for the contiguous United States (CONUS). This CONUS grid is shown above, where the grid elements are plotted, and each element has 9 grid points.

Getting started with MUSICAv0	
Community Simulation	• MUSICAv0 CONUS-grid output
Tutorials	• MUSICA Tutorial Series • CESM Tutorials • Survey on future tutorial sessions

Run MUSICA-V0	• Prerequisite: How to run CESM / CAM-chem • How to run CAM-chem-SE-RR in CESM2.2 • How to run MUSICAv0 Community Runs • Overview of Input Processing Tools • Video of Dec 2021 MUSICA Tutorial • Slides of Dec 2021 MUSICA Tutorial
Bugs and updates	• CLM bug affecting MEGAN emissions (July 2022) (CTSM github issue #1789) • SE Advection bug (critical over steep orography) - (CAM github issue #633) • Secondary bug in SE advection (high latitude noise) - (CAM github issue #678) • Wrong topography file in SE and variable resolution (April 2022 - Jan 2023)
Use different emissions	• Regridding emissions • Grid FINN fire emissions • Grid NEI US anthropogenic emissions • HEMCO ***NEW!***
Use different met data	• Regridding meteorology for nudging • Specified dynamics impact on transport (Davis et al., ACP, 2022)
Available grids	• Refined region grids available for use
Create new grid	• Instructions to create a variable resolution grid • Video of Feb 2021 Tutorial on making a new grid • Slides for Jan 2022 Tutorial • Video of Jan 2022 Tutorial
View output	• Plot output with Python • Python resources for CAM-chem • Plot output with VisIt • Plot output with NCL or MATLAB • Video of Nov 2021 MUSICA Tutorial on plotting • Slides of Nov 2021 MUSICA tutorial
Model evaluation	• MELODIES for MUSICA / MELODIES-MONET
Additional resources	• EUMETSAT/ESA/ECMWF joint training in atmospheric composition • CESM tutorial
User community	• CAM-chem & MUSICAv0 users and projects
Publications	• MUSICA publications list • MUSICA newsletters
Questions or Comments	• Get help from the CAM Variable Resolution forum • See the CAM-chem wiki for more info • Tips and FAQ • Provide suggestions for the FAQ and feedback on this site

Provide Feedback

- Provide feedback on what is missing or unclear on this site through **this Feedback Form**.