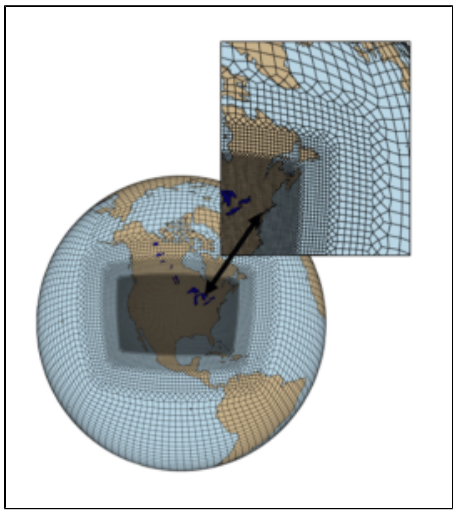
How to run MUSICAv0 Community Runs

Purpose of the MUSICA Community Runs

- Production runs of MUSICAv0 between 2012 and 2013 with regional refinement over the contiguous U.S.
- New component set and data sets have been developed for easy reproduction, extension and modification of the model simulations by the users
- Output of the existing simulations have been published for easy access for analysis

Output available on GDEX: Geoscience Data EXchange (formerly called DASH repostory): https://doi.org/10.5065/tgbj-yv18

- Each file has a single variable (e.g., T, O3, etc.) for a timeseries
- Monthly averages are grouped by year
    - Available on native variable resolution grid and interpolated to 0.9x1.25 regular grid
- Daily averages are grouped by month (on variable resolution grid)
- Hourly averages will be available soon



Specifics of the MUSICA Community Runs

The compset "**FCcotagsNudged**" has been created for the MUSICAv0 Community runs, available only in a code tag on cheyenne (to be added in released github version soon). Specifics of this configuration (component set = "compset") are:

- Code base: cesm2.2.0 (with additional capabilities available only in sandbox listed below)
- Chemistry: MOZART-TS1 mechanism for troposphere and stratosphere plus changes: Added CO tags, and bug fixes (as described on the CAMchem wiki page)
- Code fix in the land model to allow specific output (needed for surface ozone adjustment calculation) (currently needs to be still added by hand)
- Updated lightning NO and dust emissions tuning
- Lower boundary conditions (greenhouse gas concentrations and CFCs) using SSP5-8.5 after 2014
- Updated meteorology nudging values (10% nudging as suggested by Davis et al., 2021)
- Anthropogenic Emissions: CAMS V5.1 for years 2000-2021 available
- Biomass Burning Emissions: QFED (2010-2020)
- Online Air-Sea Interface for Soluble Species OASISS Ocean emissions (DMS emissions from machine learning implementation)
- Updated sea-surface temperature file until 2021

Default settings for FCcotagsNudged in development code

- Start date: **2012-01-01**
- Initial conditions based on a spinup using a Spectral Element ne30 (1deg) configuration starting in 2010
- Output variables: currently monthly averages, daily averages, 6-hourly, hourly

Nudging to meteorological reanalysis

- Winds (U, V) and Temperature are nudged towards MERRA2 meteorological analysis. MERRA2 data have been interpolated to the CAMchem model grid (32 levels) in the vertical and the CONUS regional refined horizontal grid using (using 10% nudging) for the years 2012 - 2021(August). Nudging can be changed to only be applied outside the CONUS region. More information can be found here: Regridding meteorological data

Setup your "out of the box" CONUS run

- **Create your new case in your case directory: case_dir**

Go to the $CESM_ROOT directory. In our case we use the available sandbox:

```
>cd  /glade/work/fvitt/cesm/cesm2.2.0_cotags/cime/scripts
```

```
>./create_newcase --compset FCcotagsNudged --res ne0CONUSne30x8_ne0CONUSne30x8_mt12  --project <$PROJECT_NUMBER> --case <your_path/$CASENAME> --run-unsupported
```

NOTE: The FCcotagsNudged compset is currently ONLY available in this sandbox - ***it is not in the release code***.

- **Commands to set up, build and submit your run**

```
>cd <your_path/$CASENAME>
```

```
>./case.setup
```

```
>qcmd -A $PROJECT_NUMBER  -- ./case.build
```

>./case.submit

- **Check your model run**

>qstat -u <username> -> status of your run

>qdel <run_number> -> delete a run