

# CESM2.1:CAM-chem as Boundary Conditions

## Description

We have saved CAM-chem simulation output that is intended to be used as boundary conditions for regional modeling. We used CAM-chem at 0.9x1.25 horizontal resolution simulation with 56 vertical levels. Meteorology is driven by specified dynamics, by nudging with 50h relaxation (1%) to MERRA2 reanalysis. Data is saved as instantaneous fields every 6 hours. See a [list of saved species](#). Chemistry is the MOZART-T1 mechanism, described in Emmons et al. (2019). You can find a [description of all simulated species](#) online. We use the MAM4-VBS scheme to model aerosols. Files are collected as daily information (4 time-slices per file). Anthropogenic emissions are from CMIP6, CMIP6 2014 anthropogenic emissions are repeated for dates past 2014 to 2016. Anthropogenic and "other" emissions are changed to SSP5-85 for 2017 onwards. Biogenic emissions are from online MEGAN2.1, fire emissions are from QFED CO2 x FINN emission ratios (from 2015), with emission ratios updated from 2017 onwards. Note that fire emitted DMS 2001-2015 is from CMIP6, in 2016 from GFAS and 2017 onwards from QFED. SST in 2019 are repeated from 2018.

- Data Format: netCDF
- File size: 4.8 GB per day (4 x 6-hour instantaneous time slices per day)
- Data coverage: January 1, 2001 to December 31, 2018

\*\*\* NOTE: This version of output has incorrect HCN and O3S, please do not use these species \*\*\*

## Get the data

### 1. Subset from dates within the time period January 1, 2001 to June 30, 2019

A small subset of the boundary conditions are available via rapid access from the ACOM server:

<https://www.acom.ucar.edu/cam-chem/DATA/>

Regional and temporal subsetting option can be found at: <https://www.acom.ucar.edu/cam-chem/cam-chem.shtml>

For more recent dates, you could consider using the [WACCM forecast](#) for boundary conditions, which is available from a year ago to 10 days from now: <https://www.acom.ucar.edu/waccm/register.shtml>.

### 2. All available dates January 1, 2001 to June 30, 2019

To access any of the complete dataset of shared files between January 2001 and December 2018 you will need a Globus account, which requires a Google account. [Get Globus access here](#).

Once you can log into Globus, the boundary conditions are stored here:

January 2001 to June 2017: [https://app.globus.org/file-manager?origin\\_id=2acef47e-ed07-11e8-8cae-0a1d4c5c824a&origin\\_path=%2F](https://app.globus.org/file-manager?origin_id=2acef47e-ed07-11e8-8cae-0a1d4c5c824a&origin_path=%2F)

January 2017 to December 2018: [https://app.globus.org/file-manager?origin\\_id=a0e862f4-772b-11e9-bf47-0e4a062367b8&origin\\_path=%2F](https://app.globus.org/file-manager?origin_id=a0e862f4-772b-11e9-bf47-0e4a062367b8&origin_path=%2F)

Files can be transferred to another location using the Globus system. To set up a transfer point see the relevant page:

OSX:

<https://docs.globus.org/how-to/globus-connect-personal-mac>

Windows:

<https://docs.globus.org/how-to/globus-connect-personal-windows>

Linux:

<https://docs.globus.org/how-to/globus-connect-personal-linux>

**Note:** direct download option from this site is in beta testing phase and should be available in the future.

## Reference

To cite the data directly, please use:

Buchholz, R. R., Emmons, L. K., Tilmes, S., & The CESM2 Development Team. (2019). CESM2.1/CAM-chem Instantaneous Output for Boundary Conditions. UCAR/NCAR - Atmospheric Chemistry Observations and Modeling Laboratory. Subset used<sup>†</sup> XXX, Accessed<sup>\*</sup> dd mmm yyyy, <https://doi.org/10.5065/NMP7-EP60>.

<sup>†</sup>Please fill in the "subset used" with region and/or date of the subset you used (e.g. Lat: -10 to 10, Lon: 100 to 150, September 2015 - February 2016).

<sup>\*</sup>Please fill in the "Accessed" date with the day, month, and year that you last accessed the data (e.g. - 5 Aug 2011).

We suggest to also cite the following paper that discusses the new configuration of CESM2/CAM-chem and assesses chemical species, including using output from this boundary condition simulation.

Emmons et al., The Chemistry Mechanism in the Community Earth System Model version 2 (CESM2), JAMES, submitted August, 2019.

## Other simulations

Directions to access other experimental output can be found here: [Benchmarks and Production](#)

## Using the boundary conditions with WRF-Chem

The CAM-chem chemistry and aerosols for this run are identical to the WACCM forecasts. Mapping CAM-chem output to WRF-Chem chemistry schemes can be found in:

[https://www2.acom.ucar.edu/sites/default/files/wrf-chem/CESM-WRFchem\\_aerosols\\_20190822.pdf](https://www2.acom.ucar.edu/sites/default/files/wrf-chem/CESM-WRFchem_aerosols_20190822.pdf)

which is linked from this page:

<https://www2.acom.ucar.edu/wrf-chem/wrf-chem-tools-community>