

Numerical experiments using different model configurations

Results from the following experiments are included in this dataset.

Short name	Note	Simulation years
nc00	E3SMv2 but without lower bound for CDNC	2005–2014
nc10	E3SMv2 default (CDNCmin = 10/cm3)	2005–2014
nc10_600hPa	With the lower bound CDNCmin = 10/cm3 applied only to model layers with normal pressure higher than 600 hPa	2011
nc10_fliq0.9	With the lower bound CDNCmin = 10/cm3 applied only to grid boxes with cloud fraction larger than 0.9	2011
nc00_w10	With no lower bound for CDNC but with the characteristic updraft velocity used for aerosol activation enhanced by a factor of 10 in lower tropospheric grid columns containing grid boxes with large cloud fraction and weak turbulence	2011
nc00_w10k10	With no lower bound for CDNC but with both the characteristic updraft velocity used for aerosol activation and the eddy diffusivity coefficient for cloud droplet number enhanced by a factor of 10 in lower tropospheric grid columns containing grid boxes with large cloud fraction and weak turbulence	2011

The string `<exp>` in the remainder of this document refers to the experiment short names listed above.

All variables in the data files are 2D fields remapped from the E3SMv2 atmosphere model's cubed sphere grid to a 1-degree latitude-longitude grid.

Aerosol Effective Radiative Forcing (ERF) diagnostics

File names

- Annual mean aerosol ERF diagnostics of the year `<yyyy>` can be found in files with the naming convention `PP_diag_v2_ndg_<exp>_pd.<yyyy>_v2_ndg_<exp>_pi.<yyyy>_ANN.nc`.
- Monthly mean aerosol ERF diagnostics of the year `<yyyy>` can be found in files with the naming convention `PP_diag_v2_ndg_<exp>_pd.<yyyy>_v2_ndg_<exp>_pi.<yyyy>_monthly.nc`.

Variable names

The variables for the top-of-model aerosol ERF diagnostics are explained below. All variables are expressed in the unit of W/m2.

Variable name	Meaning
TTAEF	Total (shortwave + longwave) aerosol ERF
SWAEF	Shortwave component of aerosol ERF
LWAEF	longwave component of aerosol ERF
TTACI	Total (shortwave + longwave) ERF due to aerosol-cloud interactions (ACI)
SWACI	Shortwave component of ERF due to ACI
LWACI	longwave component of ERF due to ACI
TTARI	Total (shortwave + longwave) ERF due to aerosol-radiation interactions (ARI)
SWARI	Shortwave component of ERF due to ARI
LWARI	longwave component of ERF due to ARI

For more details, see documentation at https://github.com/kaizhangpnl/e3sm_erf_aerosol/tree/main.

Miscellaneous 2D fields

Results from the simulations performed using PD and PI emissions can be found in files with the following naming conventions:

- `EFF_2D_v2_ndg_<exp>_pd_<yyyy>_yearmonmean.nc` (PD),
- `EFF_2D_v2_ndg_<exp>_pi_<yyyy>_yearmonmean.nc` (PI).

The physical quantity represented by each variable is explained by the “long_name” attribute of the variable in the data file.