

Wednesday Morning Practice: impact of surface spectral emissivity on polar climate

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I. Script tutorial

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Step-by-step instruction of using AMWG package

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based on Script of running AMWG package: amwg-cesm211-emis_standard.csh or
diag140804.csh (provided by AMWG)

=====

model-to-model comparison,
test case VS control case

IMPORTANT: BEFORE running the script, please make sure to load following modules

```
module load nco
```

```
module load ncl
```

This has to be outside the script and must be done before running the script. Otherwise, the script cannot produce results.

Note: you can type "module list" on command line to see all loaded modules.

Things you need to be aware in amwg-cesm211-emis_standard_PMWG.csh

1. set working director; replace "USER = hxl" with your own username

```
# set $wrkdir that the AMWG plots will be saved there
```

```
set USER = hxl
```

```
set scratchdir = /glade/scratch/$USER/
```

```
set wrkdir = $scratchdir/y01-amwg-$temp/
```

2. Set the identifying casename and paths for the test case run. The output files MUST BE "\$test_path_history/\$test_casename.cam.h0.YYYY-MM.nc"

Note: for this practice, the output file is store in \$test_path_history and you do not need to change it. If you use this script later with your own output file, you need to change this to the right path.

```
set test_casename = u02-cesm211_emis-ETEST-f19_g17
```

```
set test_filetype = monthly_history
```

```
#set test_filetype = time_series
```

```

set test_path_history = /glade/scratch/yihuan/archive/${test_casename}/atm/hist/
set test_path_climo  = $wrkdir/amwg_climo/${test_casename}/
set test_path_diag   = $wrkdir
set test_path_HPSS   = /CCSM/csm/${test_casename}/atm/hist/

```

2. Set the identifying casename and paths for your control case run. The output files MUST BE "\$cntl_path_history/\${cntl_casename}.cam.h0.YYYY-MM.nc"

Note: for this practice, the output file is store in \$cntl_path_history and you do not need to change it. If you use this script later with your own output file, you need to change this to the right path.

```

set cntl_casename = u01-cesm211_standard-EEST-f19_g17
set cntl_filetype = monthly_history

set cntl_path_history = /glade/scratch/yihuan/archive/${cntl_casename}/atm/hist/
set cntl_path_climo  = $wrkdir/amwg_climo/${cntl_casename}/
set cntl_path_HPSS   = /CCSM/csm/${cntl_casename}/atm/hist/

```

3. Turn on/off the computation of climatologies. If the climatologies are already in \$test_path_climo and \$cntl_path_climo, set to 1(=OFF).

```

set test_compute_climo = 0 # (0=ON,1=OFF)
set cntl_compute_climo = 0 # (0=ON,1=OFF)

```

If computing climatological means for test/cntl case, specify the first year of your data, and the number of years of data to be used.

```

set test_first_yr = 6      # first year (must be >= 1)
set test_nyrs    = 5      # number of yrs (must be >= 1)

set cntl_first_yr = $test_first_yr  # first year (must be >= 1)
set cntl_nyrs    = $test_nyrs      # number of yrs (must be >= 1)

```

Note: for this practice purpose, to save time, we only take differences for 5 years of simulation. The simulation output here that can be used are actually from yr 1 to 35.

4. Select the diagnostic sets to be done. You can do one at a time or as many as you want at one time, or all at once.

```

set all_sets = 0 # (0=ON,1=OFF) Do all the CAM sets (1-16)
set set_1 = 1 # (0=ON,1=OFF) tables of global,regional means
set set_2 = 1 # (0=ON,1=OFF) implied transport plots
...

```

5. Use custom case names for the PLOTS instead of the case names encoded in the netcdf files (default).

```
set custom_names = 0 # (0=ON,1=OFF)
set test_name = cesm211_emis # test case name
set cntl_name = cesm211_standard # control case name
```

6. (optional) Compute whether the means of the test case and control case are significantly different from each other at each grid point.

```
set significance = 1 # (0=ON,1=OFF)
set sig_lvl = 0.05 # level of significance
```

Note: 5 years are indeed not enough to give robust significance

7. (optional: need this if you run on other machines) Set amwg diagnostic package root location

```
# CSIL machines (geyser, caldeira, ...)
setenv DIAG_HOME /glade/p/cesm/amwg/amwg_diagnostics
```

8. Change other settings in the script as necessary

9. execute the AMWG package script

```
> ./amwg-cesm211-emis_standard.csh
```

Once the execution finished, a tar file "\$test_casename-\$cntl_casename.tar" would be in \$test_path_diag, i.e., your working directory \$wrkdir.

10. View AMWG plots

```
untar the tar file and then a folder "$test_casename-$cntl_casename" will be created.
> tar -xvf $test_casename-$cntl_casename.tar
```

View AMWG plots

```
> cd $test_casename-$cntl_casename
```

Open index.html in any web browser and you will see all AMWG plots.

II. Practice

After the plots are generated, please take a look and describe the difference caused by the inclusion of surface spectral emissivity for following variable. Particularly paying attention to wintertime at the high latitudes

(a) In Set 3:

1. Zonal-mean surface climate (Ts, 2-m T, longwave downward flux, residual energy flux)
2. Zonal-mean TOA flux imbalance (residual flux at TOA)

(b) In Set 7:

1. Spatial patterns of the differences for 2-m air temperature over both polar regions (annual mean and winter only)

2. For sea ice fraction

3. For surface energy flux (longwave downward flux, sensible and latent heat flux)

(c) Exploration: any differences in precipitation or cloud fields? Any other fields you see noticeable differences?