LENS Pacemaker

1. Case Setup

CESM tag: cesm1_1_2_LENS_n19
CESM compset: B20TRLENS, BRCP85LENS
Time Period: 1920 - 2005 historical transient; BRCP85 2006-201X (extended to 2016?)

Instructions for B20TRLENS 1920-2005

- `cd $CESMROOT/scripts`
- `./create_newcase -case path_to_myCase -mach cheyenne -compset B20TRLENS -res f09_g16`
- `cd path_to_myCase`

```
./xmlchange -file env_run.xml -id RUN_TYPE -val hybrid
./xmlchange -file env_run.xml -id RUN_STARTDATE -val 1920-01-01
./xmlchange -file env_run.xml -id RUN_REFCASE -val b.e11.B20TRC5CNBDRD.f09_g16.001
./xmlchange -file env_run.xml -id RUN_REFDATE -val 1920-01-01
./xmlchange -file env_run.xml -id GET_REFCASE -val TRUE
./xmlchange -file env_build.xml -id OCN_TRACER_MODULES -val "iage"
./xmlchange -file env_build.xml -id CAM_CONFIG_OPTS -val "-phys cam5"
```

Instructions for BRCP85 2006-2016 extension

- `cd $CESMROOT/scripts`
- `./create_newcase -case path_to_myCase -mach cheyenne -compset BRCP85LENS`
- `-res f09_g16`
- `cd path_to_myCase`

```
./xmlchange -file env_run.xml -id RUN_TYPE -val hybrid
./xmlchange -file env_run.xml -id RUN_STARTDATE -val 2006-01-01
./xmlchange -file env_run.xml -id RUN_REFCASE -val <my_20thLENS_case?
./xmlchange -file env_run.xml -id RUN_REFDATE -val 2006-01-01
./xmlchange -file env_run.xml -id GET_REFCASE -val FALSE
./xmlchange -file env_build.xml -id OCN_TRACER_MODULES -val "iage"
./xmlchange -file env_build.xml -id CAM_CONFIG_OPTS -val "-phys cam5"
```

- **user_nl_cam**:

```
prescribed_ozone_datapath      = '/glade/work/nanr/toolsPacemaker/ozone/'
prescribed_ozone_file          = 'O3.1950-2011.AMIP_CLM.nc'
```

Perlim: Add this line to user_nl_cam to create multiple ensemble members:

`pertlim = N.d-14` (where N=ensemble number; e.g., `pertlim = 5.d-14`)

Ozone options:

1. ozone_1.9x2.5_**L66**_1849-2006_c130613.nc ***Origin**: L66 - based on WACCM :4-D ozone from CESM1-WACCM ensemble avg of run2&3 smoothed with a 10-year running mean using runave, on each month separately; quite strong*
2. O3.1950-2011.AMIP_CLM.nc ***Origin**: Created from ozone_CMIP5_ACC_**SPARC**_1850-2019_RCP8.5_T3M_O3.140423.nc (avg of CAMchem + something else; pretty strong)*

- **user_nl_pop2**:

```
&forcing_shf_nml
 luse_cpl_ifrac = .false.
 shf_data_inc = 730.
 shf_data_renorm(1) = 1.0
 shf_data_type = 'n-hour'
 shf_file_fmt = 'nc'
 shf_filename = '/<path_to_MASK_and_SST_Files>/ModifiedSST_ERSST_gx1v6.nc'
 shf_formulation = 'alyssa_restoring'
 shf_interp_freq = 'every-timestep'
 shf_interp_inc = 1.e20
 shf_interp_type = 'linear'
 shf_restore_tau = 2
 shf_strong_restore = 0.0
 shf_strong_restore_ms = 92.64
 shf_weak_restore = 0.
/
```

Optional Settings to reduce LENS data volume and lower computational costs

 # turn off ocean tracers: user_nl_pop2

```
&passive_tracers_on_nml
 cfc_on = .false.
 ecosys_on = .false.
 iage_on = .true.
 moby_on = .false.
/
```

 # Modify user_nl_cpl

```
 flds_co2a = .true.
 flds_co2c = .false.
```

 # comment out daily cice: user_nl_cice

 # comment out daily runoff: user_nl_rof

2.1 Source Mods

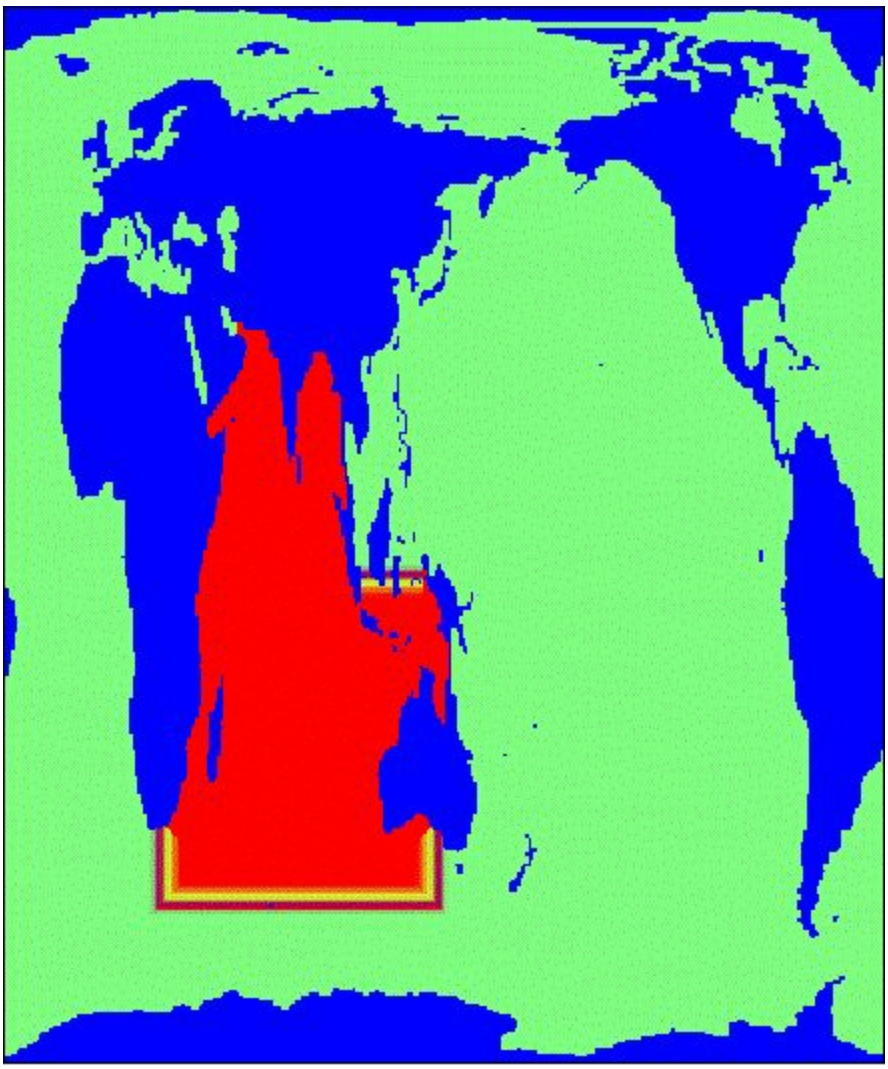
Option #1
DOWNLOAD: Copy these files into your $CASEROOT/SourceMods/src.pop2 directory before building your case:

```
/web/web-data/staff/nanr/proj/paceMaker/paceMaker.src.pop2.tar.gz
```

Option #2
GLADE: Copy these files into your $CASEROOT/SourceMods/src.pop2 directory before building your case:

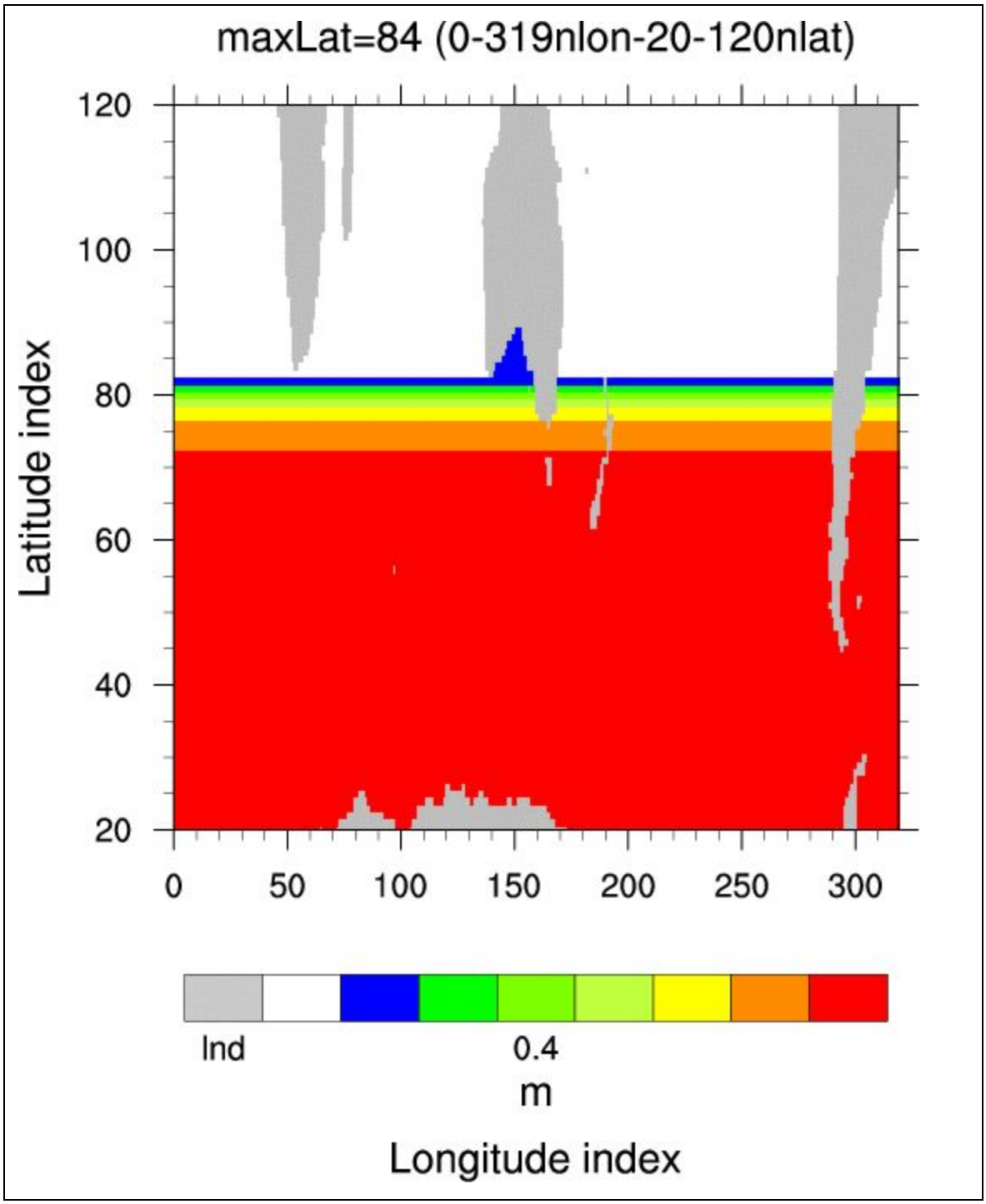
```
cp /glade/work/nanr/toolsPacemaker/SourceMods/src.pop2/*.F90
cp /glade/work/nanr/toolsPacemaker/SourceMods/src.pop2/gx1v6_tavg_contents
cp /glade/work/nanr/toolsPacemaker/SourceMods/src.pop2/namelist_definition_pop2.xml
```

3.1 Create restoring mask :: example 1 - extended Indian Ocean



Color scale: 0 (green) to 1 (red). 0=no restoring; 1=full restoring.

3.2 Create restoring mask :: example 2 - Southern Ocean



Scale: 0 (white) to 1 (red). 0=no restoring; 1=full restoring.

4. SST Forcing - sea ice masked (-1.8 degrees C)

SST Forcing: These are netCDF files, divided into 12 monthly files/year, and renamed by forcing file date. **(Note: negative T is reset to -1.8 to represent sea ice.)**

Soft-link the SST files into your work

/glade/p/cesm/cvwg/proj/pacemaker_restore/input/restore/seaIceSSTv1

Background:

1. 1. Observed ERSST anomaly (1920-2013, mean state is 1920-2005), then convert to POP oceanic resolution
2. Model climatological mean (12 values, mean state is same as OBS, 1920-2005), then convert to POP resolution
3. Create input SST data(Observered SST anomaly + Model Climatological mean)
4. observer ERSST anomaly for 1919.12/2014.01 and convert to POP resolution
5. modify the format of input SST data

Date range: Jan 1920 through October 2017

Naming protocol: ModifiedSST_ERSST_gx1v6.nc.Year.JulianDay.DayOfMonth

E.g., Filenames for year 2011:

```
ModifiedSST_ERSST_gx1v6.nc.2011.016.05
ModifiedSST_ERSST_gx1v6.nc.2011.046.15
ModifiedSST_ERSST_gx1v6.nc.2011.077.01
ModifiedSST_ERSST_gx1v6.nc.2011.107.11
ModifiedSST_ERSST_gx1v6.nc.2011.137.21
ModifiedSST_ERSST_gx1v6.nc.2011.168.07
ModifiedSST_ERSST_gx1v6.nc.2011.198.17
ModifiedSST_ERSST_gx1v6.nc.2011.229.03
ModifiedSST_ERSST_gx1v6.nc.2011.259.13
ModifiedSST_ERSST_gx1v6.nc.2011.289.23
ModifiedSST_ERSST_gx1v6.nc.2011.320.09
ModifiedSST_ERSST_gx1v6.nc.2011.350.19
```

Procedure:

1. create a new directory for your case. This is where you will store your SST forcing files and restoring mask (named “ModifiedSST_ERSST_gx1v6.nc”).
2. cd to your new SST forcing directory.
3. Soft-link your restoring mask to this directory, renaming it “ModifiedSST_ERSST_gx1v6.nc”
   ln -s /mypath/myRestoringMask.nc ./ModifiedSST_ERSST_gx1v6.nc
4. Soft-link the ERSST forcing files to this directory:

```
ln -s /glade/p/cesm/cvwg/proj/pacemaker_restore/input/restore/seaIceSSTv1/ModifiedSST_ERSST_gx1v6.nc.* .
```