The NorESM Diagnostic Tool Package

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NorESM Diagnostic Package:

... is a NorESM model evaluation tool written with a set of scripts and utilities (bash, NCL, NCO, CDO etc) to provide a general evaluation and quick preview of the model performance with only one command line.

Components of the package:

The diagnostic tool package consists atmospheric/land components based on the NCAR package.

- CAM_DIAG: (NCAR's AMWG Diagnostics Package)
- CLM_DIAG: (CESM Land Model Diagnostics Package)
- CICE_DIAG: snow/sea ice volume/area
- HAMOCC_DIAG: time series, climaotology, zonal mean, regional mean
- BLOM_DIAG: time series, climatologies, zonal mean, fluxes, etc
- CISM_DIAG: time series, climatologies, etc

NorESM Diagnostic Package (cont.)

It has a one-line command interface, and is simple-to-use.

```
# run this wraper script without parameters shows basic usage
$ diag_run
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Program:
/projects/NS2345K/diagnostics/noresm/bin/diag_run
Version: 2.1
-----------------------------------------------
Short description:
A wrapper script for NorESM diagnostic packages.

Basic usage:
# model-obs diagnostics
$ diag_run -m [model] -c  [test case name] -s  [test case start yr] -e  [test case end yr]

# model1-model2 diagnostics
$ diag_run -m [model] -c  [test case name] -s  [test case start yr] -e  [test case end yr]
                      -c2 [cntl case name] -s2 [cntl case start yr] -e2 [cntl case end yr]
...
```

Two types of analysis:

- Compare model with observations
- Compare model with control (another simulation)

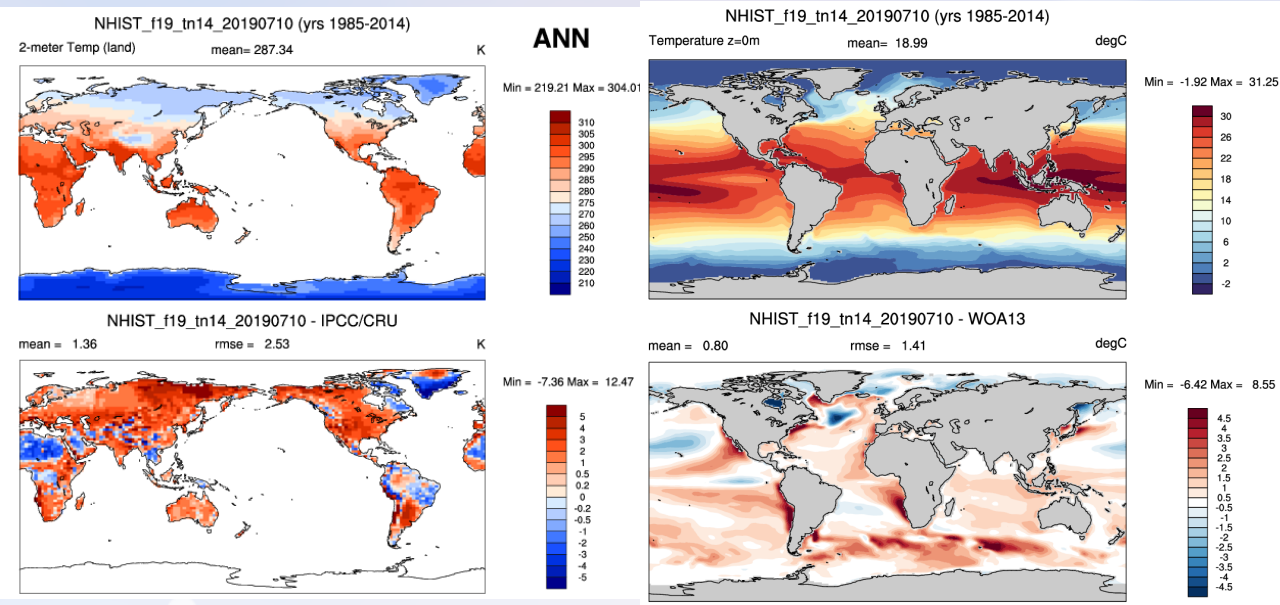
Two types of analysis

1. Compare model with observations

- sample plots: Historical simulation of ocean compared to observations

```
$ diag_run --model=cam,cice,blom \
--case=CASENAME \
--start_year=51 \
--end_year=100 \
--input-dir=/PATH/TO/MODEL/FOLDER \
--output-dir=/PATH/TO/OUTPUT/DATA \
--web-dir=/PATH/TO/GENERATED/WEBPAGES \

# or its short version
$ diag_run -m cam,cice,blom \
  -c CASENAME \
  -s 51 -e 100 \
  -i /PATH/TO/MODEL/FOLDER \
  -o /PATH/TO/OUTPUT/DATA \
  -w /PATH/TO/GENERATED/WEBPAGES
```

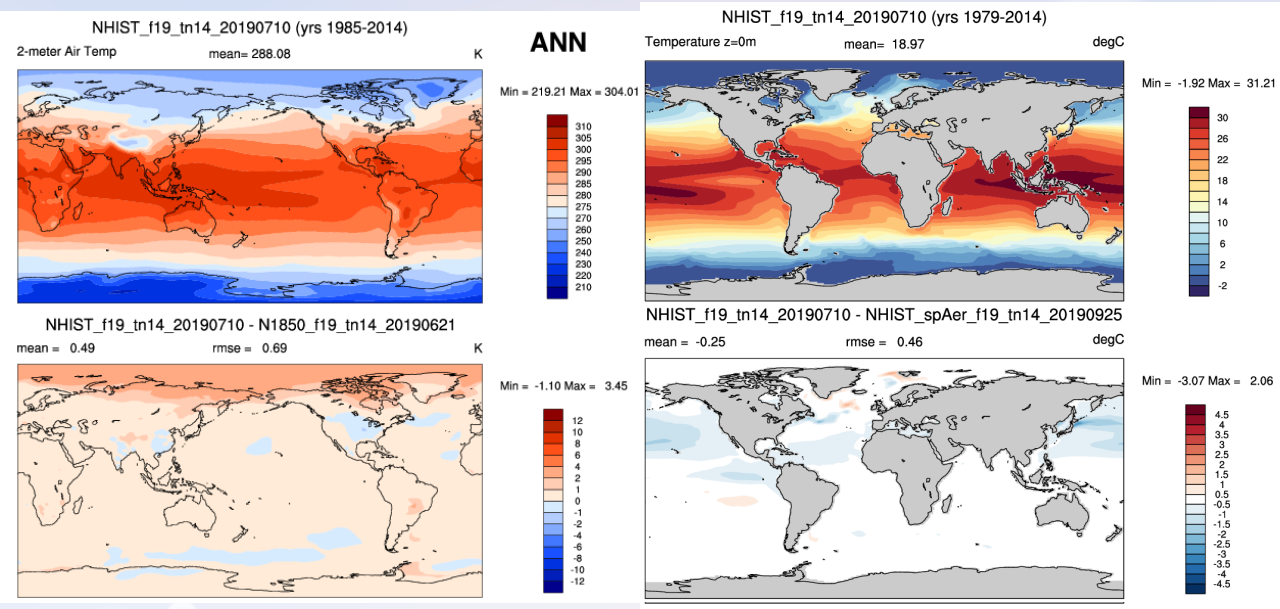


2. Compare model with control (another simulation)

Sample plots: Historical simulation of atmosphere compared to PI control

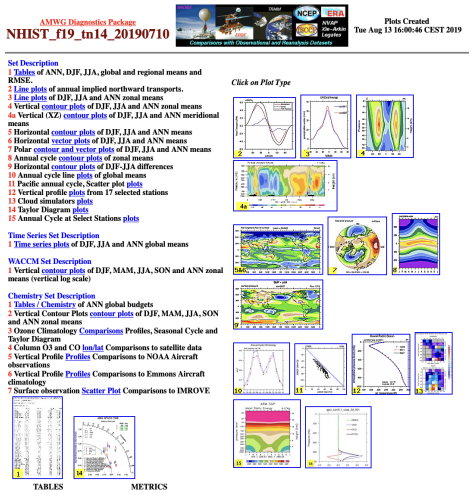
```
$ diag_run --model=cam,cice,blom \
--case1=CASENAME1 \
--start_year1=51 \
--end_year1=100 \
--input-dir1=/PATH/TO/MODEL/FOLDER1 \
--case2=CASENAME2 \
--start_year2=2 \
--end_year2=50 \
--input-dir2=/PATH/TO/MODEL/FOLDER2 \
--output-dir=/PATH/TO/OUTPUT/DATA \
--web-dir=/PATH/TO/GENERATED/WEBPAGES \

# or its short version
$ diag_run -m cam,cice,blom \
 -c1 CASENAME1 -s1 51 -e1 100 -i1 /PATH/TO/MODEL/FOLDER1 \
 -c2 CASENAME2 -s2 1  -e2 50  -i2 /PATH/TO/MODEL/FOLDER2 \
 -o /PATH/TO/OUTPUT/DATA \
 -w /PATH/TO/GENERATED/WEBPAGES
```



Sets of diagnostics

Atmospheric diagnostics (example plots)



Ocean diagnostics(Example plots)

Biogeochemistry diagnostics (Example plots)

Sets of diagnostics (cont.)

Land diagnostics (example plots)

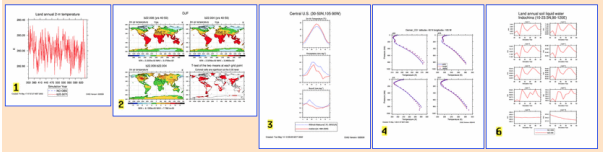
NHIST_f19_tn14_20190625
and
NHIST_spAer_f19_tn14_20190925

LND_DIAG Diagnostics Plots Source: /projects/NS2345K/noresm_diagnostics/packages/CLM_DIAG

Set Description

1 Line plots of annual trends in energy balance, soil water/ice and temperature, runoff, snow water/ice, photosynthesis
2 Horizontal contour plots of DJF, MAM, JJA, SON, and ANN means
3 Line plots of monthly climatology: regional air temperature, precipitation, runoff, snow depth, radiative fluxes, and turbulent fluxes
4 Vertical profiles at selected land raobs stations
5 Tables of annual means
6 Line plots of annual trends in regional soil water/ice and temperature, runoff, snow water/ice, photosynthesis
7 *(Inactive)* Line plots, tables, and maps of RTM river flow and discharge to oceans
8 *(Inactive)* Line and contour plots of Ocean/Land/Atmosphere CO2 exchange
9 *(Inactive)* Contour plots and statistics for precipitation and temperature. Statistics include DJF, JJA, and ANN biases, and RMSE, correlation and standard deviation observations

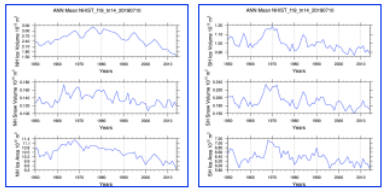
Click on Plot Type



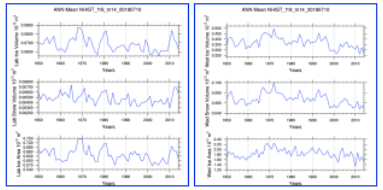
Sea ice diagnostics (Example plots)

CICE Output for NHIST_f19_tn14_20190710

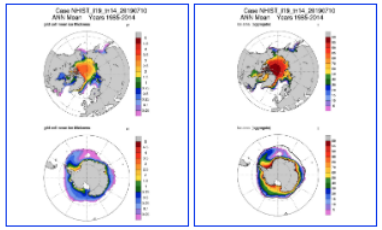
Time Series of Ice Volume, Snow Volume and Ice Area



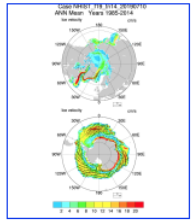
Regional Time Series



NH and SH Contour Plots



NH and SH Vector Plots



Browse plots online, while you enjoy the peace ☕🍵
http://ns2345k.web.sigma2.no/diagnostics/noresm

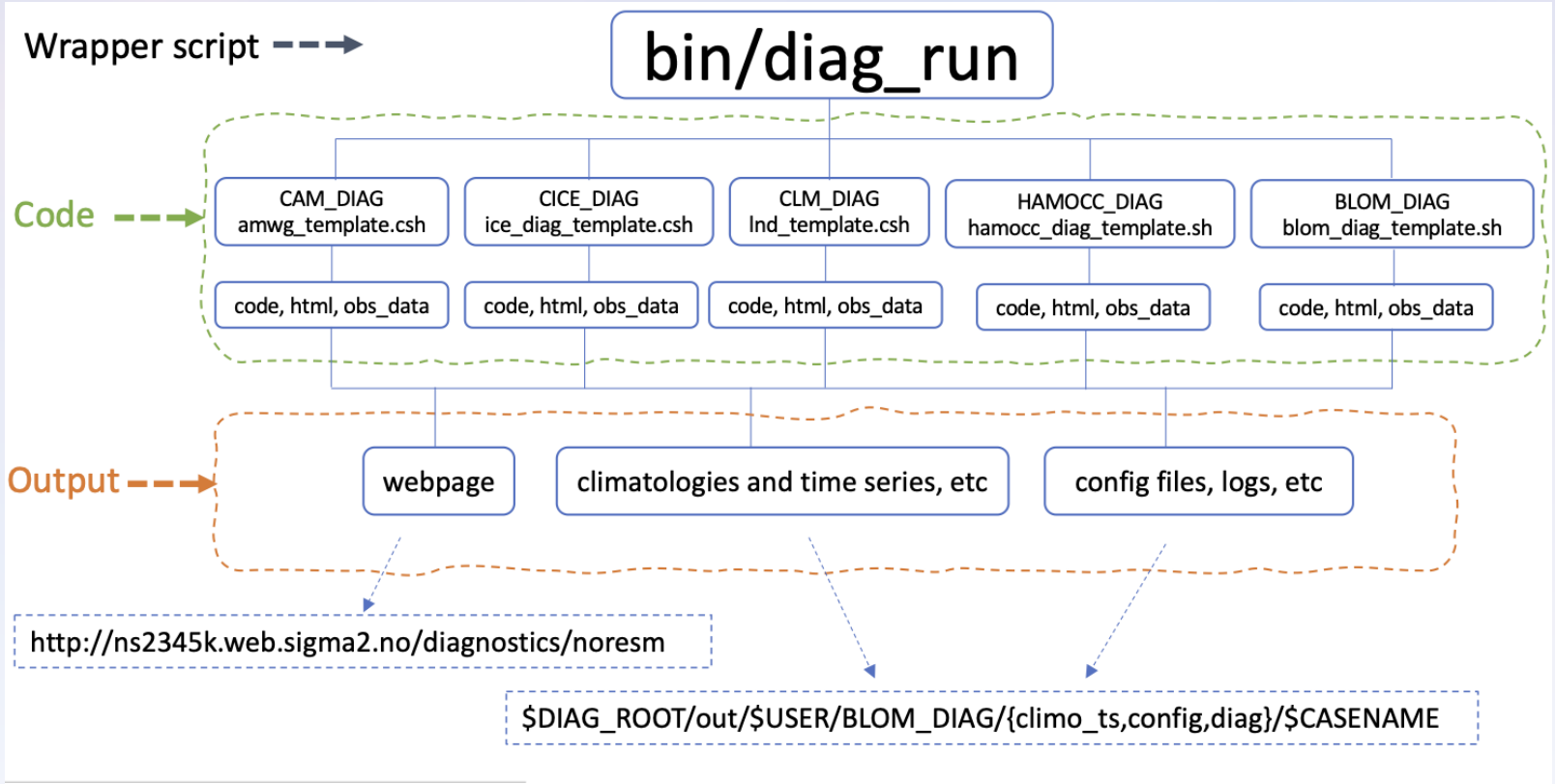
- shared diagnostics are stored under `commom/`
- personal diagnostics are store under `$username/`

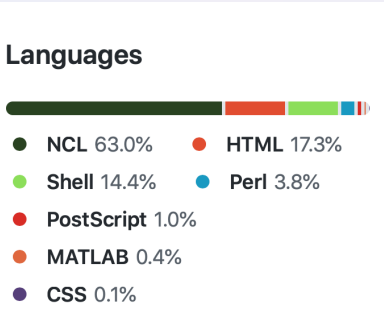
Note

If you don't have access to the NS2345K project, you have to specify another directory to write your webpage output by `-w` option.
You can then make a tarball (`tar -cvzf casenme.tar.gz /path/to/the/weboutput`)
And download to your local computer to view with your browser.

NorESM Diagnostic Package (cont.)

Code structure





Resources

Where is it?

- Github: https://github.com/NordicESMhub/noresmdiagnostics
- Normal NIRD login nodes: /nird/projects/NS2345K/diagnostics/noresm
- "IPCC" node of NIRD: /diagnostics/noresm
- Betzy: /cluster/shared/noresm/diagnostics/noresm

Do **NOT** directly modify these installations

Find the full doocumentation:

- https://noresm-docs.readthedocs.io/en/noresm2/diagnostics/diag_run.html
- https://nordicesmhub.github.io/noresmdiagnostics/ (NOT up-to-date)

Hands-on exercise:

- https://noresm-docs.readthedocs.io/en/noresm2/diagnostics/diag_run.html