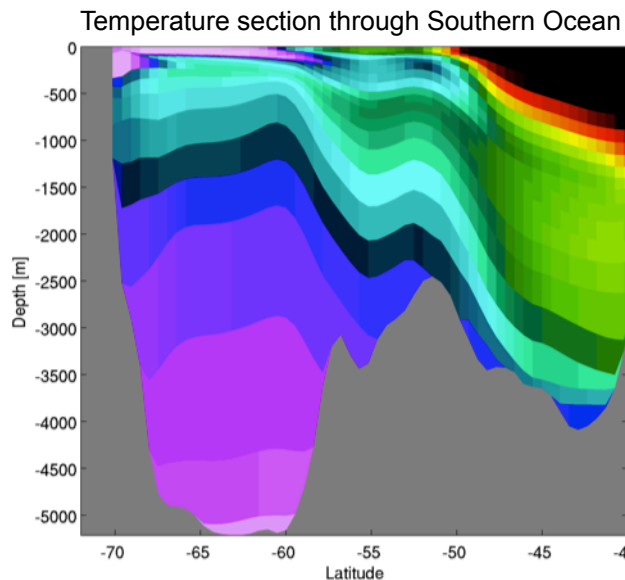


CMOR post-processing of NorESM output

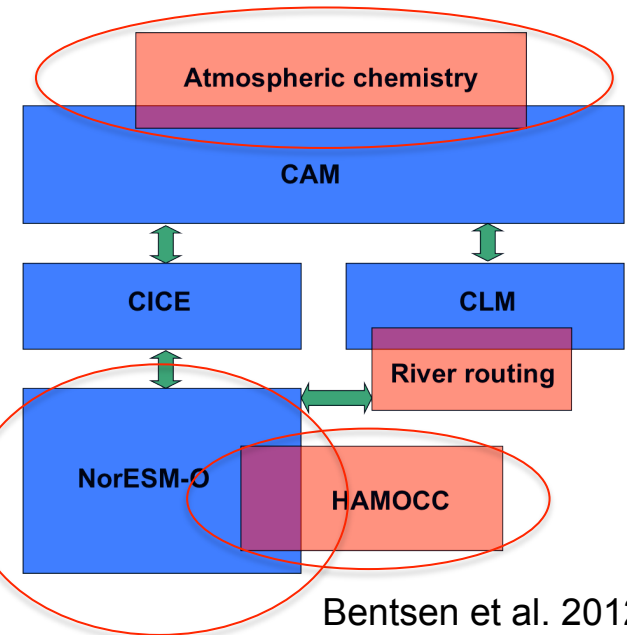
Ingo Bethke (UNI), Alok Gupta (UNI), Helene Muri (UiO) and Alf Grini (MET)

Norwegian Earth System Model (NorESM)

Flavor of NCARs Community Earth System Model version (CESM)



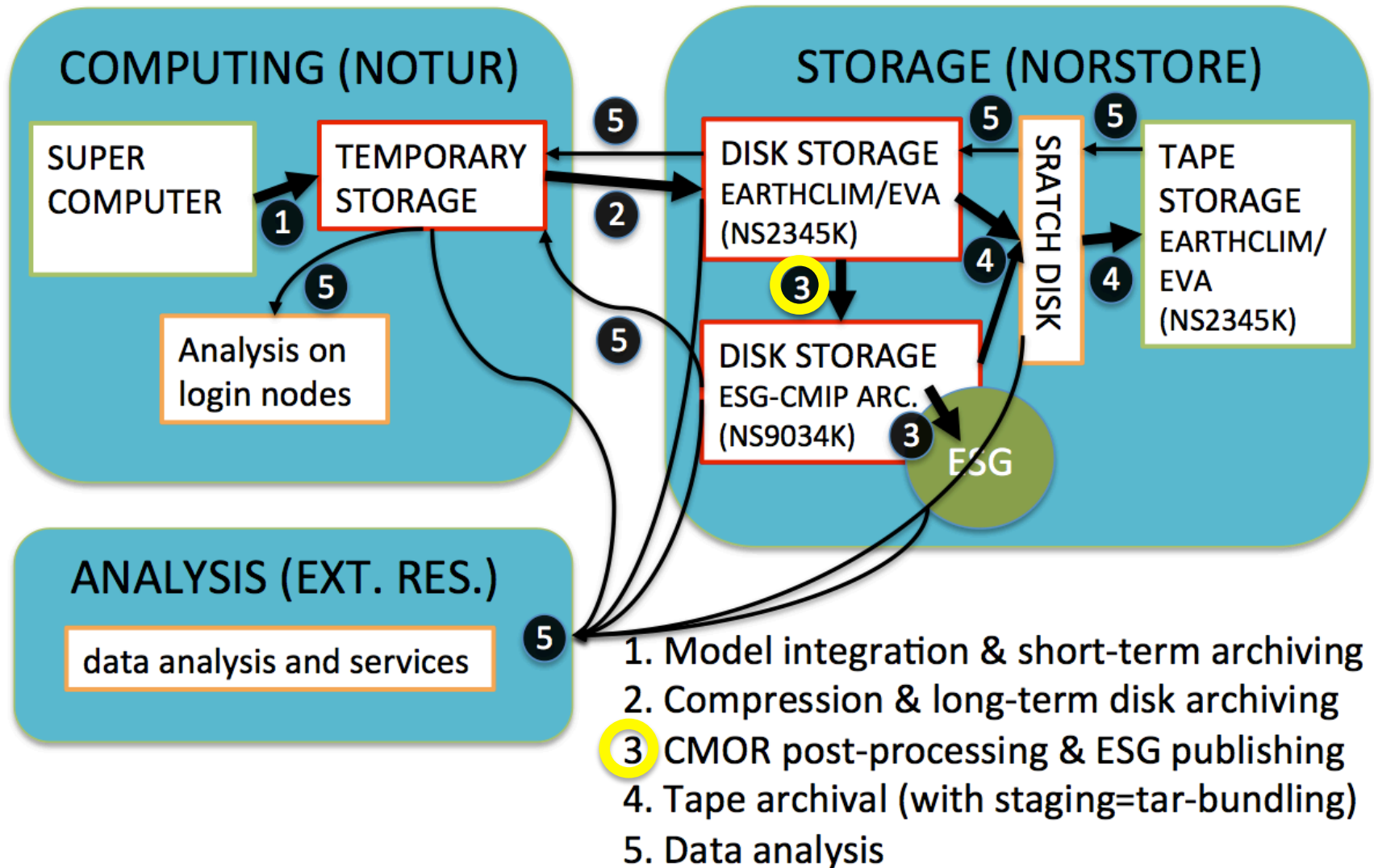
isopycnic coordinate
ocean model based on
MICOM (Bleck 2002)



Challenges for post-processing:

- time-varying vertical coordinate in ocean component
- exotic output fields from aerosol-chemistry component
- exotic output fields from ocean biogeochemistry component

Data-flow in a typical NorESM production



Why cmor-izing?

What it does:

- post-processing step in which raw climate model output is rewritten in standardized format (“CMIP” standard)
- reorganization of output file structure (single record, multiple variables -> multiple records, single variables)
- basic annotation and quality control

Advantages:

- facilitates data-sharing of multi-model intercomparison studies through ESG
- facilitates multi-model output analysis and employment of common evaluation tools
- makes output more accessible to climate science community (~500 publications have used NorESM output prepared for CMIP5)
- post-processing tools can be reused in different projects (common output standard not only for models but also for all projects!)

Disadvantages:

- doubling of storage volume if raw output is kept
- cmor-izing takes time, system resources and human resources

Past cmor-ization of NorESM output

Project	Extended title	Model	Volume	When	NorESM contact
CMIP5	fifth Coupled Model Intercomparison Project	NorESM1-M NorESM1-ME	~60 TB	2011	Ingo Bethke (UNI)
GeoMIP	Geoengineering Model Intercomparison Project	NorESM1-M	~10 TB	2011	Helene Muri (UiO), Kari Altersjær (UiO)
PlioMIP	Pliocene Model Intercomparison Project	NorESM-L	~1 TB	2012	Zhongshi Zhang (UNI)

- people with NorESM cmor-izing experience: Ingo Bethke (UNI), Helene Muri (UiO), Kari Altersjær (UiO), Alf Grini (MET), Zhongshi Zhang (UNI), Jerry Tjiputra (UNI), Anna Lewinschal (MISU), Bjørn Samset (CICERO)
- NorESM participation in intercomparison projects that did not require cmor-ization: CMIP2, CMIP3, CORE2, PEGASOS...

Upcoming cmor-ization of NorESM output

Project	Extended title	Volume	When	NorESM contact
NON-CMIP				
GeoMIP	Geoengineering MIP	?? TB	2016-	Helene Muri (UiO)
CDR-MIP	Carbon Dioxide Removal MIP	?? TB	2016-	Helene Muri (UiO)
EXPECT	Exploring the potential and side effects of climate engineering	?? TB	2016	Alf Grini (MET) Helene Muri (UiO)
CMIP6				
DECK	Diagnosis, Evaluation, and Charact. of Klima	200 TB	2016	Seland (MET), Bethke (UNI)
AerChemMIP	Aerosols Chemistry MIP	32 TB	2017	Dirk Olivie
C4MIP	Coupled Climate Carbon Cycle MIP	5 TB	2017	Christoph Heinze (UiB)
CFMIP	Cloud Feedback MIP	5 TB	2017	Alf Grini (MET)
DAMIP	Detection and Attribution MIP	38 TB	2016/7	Seland (MET), Bethke (UNI)
DCPP	Decadal Climate Prediction Project	100 TB	2017	Noel Keenlyside (UiB)
OMIP	Ocean MIP	21 TB	2016	Mats Bentsen (UNI)
PDRMIP	Precipitation Driver Response MIP	37 TB	2017	Alf Kirkevåg (MET)
PMIP	Paleoclimate MIP	30 TB	2017	Zhongshi Zhang (UNI)
RFMIP	Radiative Forcing MIP	15 TB	2017	Alf Kirkevåg (MET)
ScenarioMIP	Scenario MIP	16 TB	2016/7	Iversen (MET), Heinze (UiB)
VolMIP	MIP on the Response to Volcanic Forcing	5 TB	2017	Odd Helge Otterå
GeoMIP CMIP6	Geoengineering MIP	21 TB	2017	Muri (UiO), Kristjansson (UiO)
HighResMIP	High Resolution MIP	??? TB	2017/8	Alok Gupta (UNI)

*NorESM2 versions: MH, HH, MM, LM, LME, LMEC

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Post-processing challenges

- many MIPS=many experiments to process
 - new output diagnostics
 - more model configurations (CMIP5=3, CMIP6=6)
 - big data volume (CMIP6 ~ 10 X CMIP5)
- **high demands on post-processing tools**

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noresm2cmor – the CMOR-ization tool for NorESM output

Basic features

- FORTRAN based command line tool
- uses namelists to define system, model, experiment and output information
- performs various tasks:
 - renaming
 - unit conversion
 - vector rotation
 - vertical interpolation (e.g., from hybrid to pressure level)
 - global integration (e.g., co2mass)
 - computation of derived variables (e.g., barotropic streamfunction)
 - annotation

Basic usage

```
noresm2cmor CMIP5_NorESM1-M_historical_r1i1p1.nml
```

Advanced features

- advanced file scanning and handling of time information with no/few requirements on input format (just implemented)
- MPI-parallization along variable dimension (available soon)

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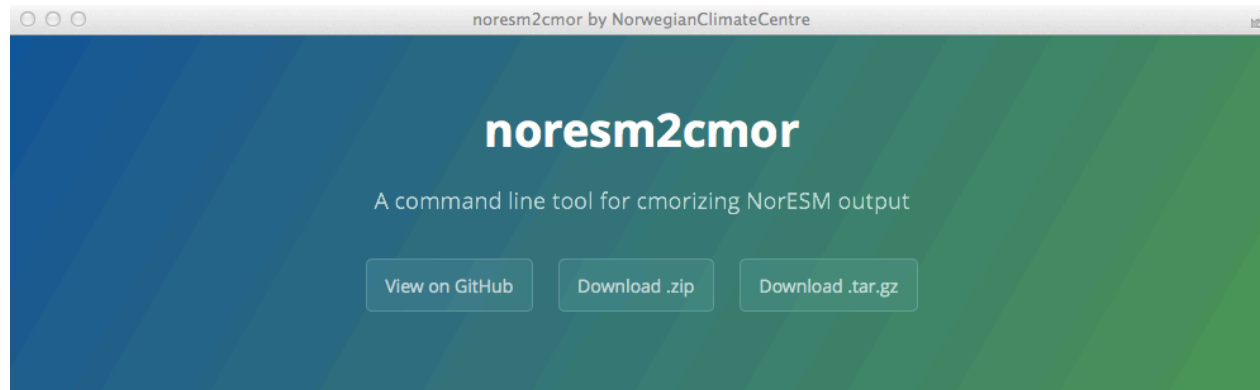
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The cmor-ization tool for NorESM output – noresm2cmor



Welcome to noresm2cmor's project page

noresm2cmor is a FORTRAN based command line tool for post-processing NorESM output using the Climate Model Output Rewriter libraries.

Support or Contact

For any questions, please write to [ingo.bethke\[at\]uni.no](mailto:ingo.bethke[at]uni.no).

Sponsors

The development of the tool has been funded by the Research Council of Norway through the projects **Integrated Earth System Approach to Explore Natural Variability and Climate Sensitivity (EarthClim)** and **Earth system modelling of climate Variations in the Anthropocene (EVA)**.

noresm2cmor is maintained by **NorwegianClimateCentre**.

This page was generated by [GitHub Pages](#) using the [Cayman](#) theme by Jason Long.

Code available at <http://norwegianclimatecentre.github.io/noresm2cmor>

Wiki page will come soon...

noresm2cmor – the CMOR-ization tool for NorESM output

NorwegianClimateCentre/noresm2cmor

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A command line tool for cmorizing NorESM output — Edit

7 commits 2 branches 1 release 1 contributor

Branch: master noresm2cmor / +

File	Commit Message	Time
IngoBethke	delete old files	Latest commit 981b0d6 22 hours ago
build	delete old files	22 hours ago
namelist	delete old files	22 hours ago
old	First commit	7 days ago
source	Added scripts to download grid data and sample input. Revised namelis...	22 hours ago
table	First commit	7 days ago
README	Added scripts to download grid data and sample input. Revised namelis...	22 hours ago
install_griddata.sh	Added scripts to download grid data and sample input. Revised namelis...	22 hours ago
install_inputdata.sh	Added scripts to download grid data and sample input. Revised namelis...	22 hours ago

README

NORESM2CMOR (v20151113)

Code Issues 0 Pull requests 0 Wiki Pulse Graphs Settings

HTTPS clone URL https://github.com/ NorwegianClimateCentre/noresm2cmor

You can clone with HTTPS, SSH, or Subversion.

Clone in Desktop Download ZIP

Development at <http://github.com/NorwegianClimateCentre/noresm2cmor>

Everyone is welcome to join and create their personal/project branches

Transferable knowledge, special competence, ect

- documentation of post-processing tools (lack of competence)
 - exchange of documentation and code
 - common documentation standard for cmor-izing tools of different model systems
- quality control procedures and tools (lack of competence)
 - scaling errors for non-standard variables with no pre-defined typical range
 - scaling errors that lie within the pre-defined typical range (e.g. if the units say concentration but the actual data is written as fraction)
 - sign error in flux variables
 - error in vector direction (e.g. velocities are not correctly rotated to East/North)
- best-practice/infrastructure for correcting output data (moderate competence)
 - collect user feedback (e.g., user reports a bug to support mailing list)
 - bug needs to be fixed in post-processing tool
 - published datasets have to be retracted from ESG (or marked as deficient)
 - affected data has to be reprocessed and republished in new dataset
 - changes have to be documented/reported somewhere (e.g. on erratum page)
- dealing with exotic model grids (moderate/lack of competence)
 - exchange of cmor-izing experience with grids
 - how-to for grid description files