

New NorESM e-resources

Part I : new git-repository structure

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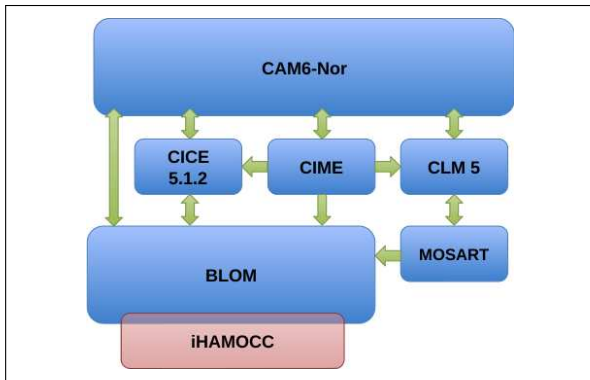
Oslo, September 21–23, 2020

- The components of NorESM2
- The repository structure of NorESM2
- The tags/branches/releases
- Obtaining a version of NorESM2
- Résumé

1. The components of NorESM2

NorESM2 – an Earth System Model

The model structure of NorESM2 :

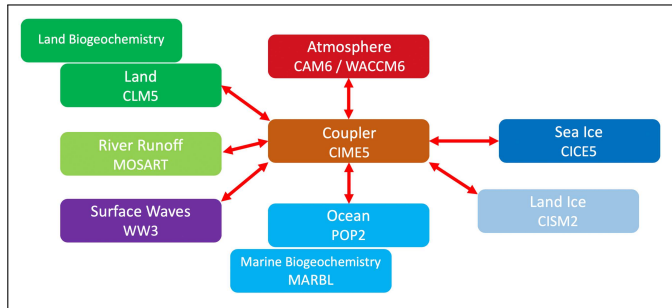


Seland et al. [2020, GMDD]

NorESM2 – based on CESM2

NorESM2 is based on CESM2 !

The model structure of CESM2 :



Danabasoglu et al. [2020, JAMES]

Additional components in CESM2 (w.r.t. NorESM2) : waves, land-ice.

2. The repository structure of NorESM2

Overview of the repositories

Code version system : git

Where can one find the model code for NorESM2? <https://github.com/NorESMhub/> [Norwegian Earth System Modelling hub]

Different repositories [7 in total]

NorESM : Norwegian Earth System Model and Documentation [Mainly an umbrella]

BLOM : Bergen Layered Ocean Model

CAM : Community Atmosphere Model including CAM6-Nor branches

CESM_CICE5 : CESM2 Version of CICE

cime : Common Infrastructure for Modelling the Earth

CTSM : Community Terrestrial Systems Model [includes the Community Land Model of CESM]

MOSART : Model for Scale Adaptive River Transport, Mosart, part of the Community Earth System Model

CESM has some additional repositories

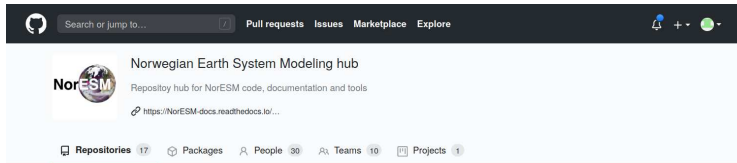
CISM : The Community Ice Sheet Model Wrapper

POP : Parallel Ocean Program

RTM : The River Transport Model [older version of new MOSART]

WW3 : Wave Watch III Model

github.com/NorESMhub

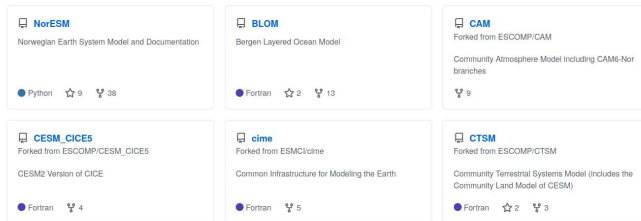


The screenshot shows the GitHub profile page for 'Norwegian Earth System Modeling hub'. The header includes the GitHub logo, a search bar, and navigation links for Pull requests, Issues, Marketplace, and Explore. The profile section features the 'NorESM' logo, the repository name, a description 'Repository hub for NorESM code, documentation and tools', and a link to 'https://NorESM-docs.readthedocs.io/...'. Below this, statistics are shown: 17 Repositories, Packages, 30 People, 10 Teams, and 1 Projects.

Norwegian Earth System Modeling hub
Repository hub for NorESM code, documentation and tools
<https://NorESM-docs.readthedocs.io/...>

Repositories 17 Packages People 30 Teams 10 Projects 1

Pinned repositories



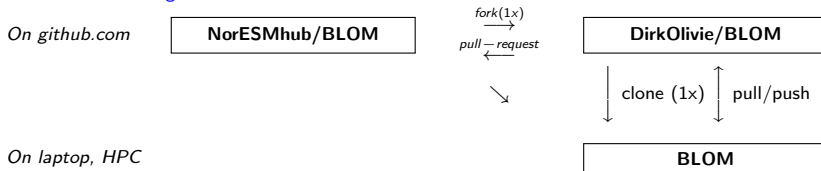
A grid of six pinned repository cards. Each card displays the repository name, a brief description, the programming language, and star/fork counts.

Repository	Description	Language	Stars	Forks
NorESM	Norwegian Earth System Model and Documentation	Python	9	38
BLOM	Bergen Layered Ocean Model	Fortran	2	13
CAM	Forked from ESCOMP/CAM Community Atmosphere Model including CAM6-Nor branches			9
CESM_CICE5	Forked from ESCOMP/CESM_CICE5 CESM2 Version of CICE	Fortran		4
cime	Forked from ESMCI/cime Common Infrastructure for Modeling the Earth	Fortran		5
CTSM	Forked from ESCOMP/CTSM Community Terrestrial Systems Model (includes the Community Land Model of CESM)	Fortran	2	3

Fork

What is fork? A personal copy on github of *someone else* project on github.com

Schematic of fork on github.com



Make a fork? [Action on github.com] [only once]

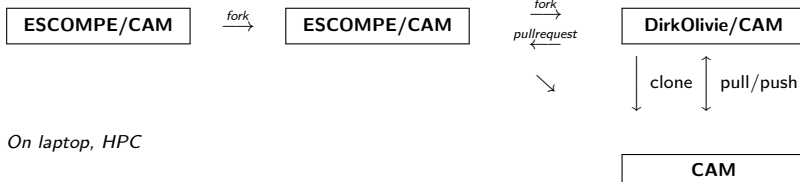


Make a pull-request [Action on github.com]

Fork of a fork ...

Schematic of fork of fork on github.com

On github.com



On laptop, HPC

NorESM git-structure

[Original or fork](#) Some of the repositories in [github.com/NorESMhub](#) are independent, some have been forked from [github.com/ESCOMPE](#) (or [github.com/ESMCI](#))

Overview of the repositories for NorESM2

github.com/ESCOMPE github.com/ESMCI		github.com/NorESMhub		github.com/DirkOlivie
		NorESMhub/ NorESM	→	DirkOlivie/NorESM
		NorESMhub/ BLOM		
ESCOMPE/CAM	→	NorESMhub/ CAM	→	DirkOlivie/CAM
ESCOMPE/CESM_CICE5	→	NorESMhub/ CESM_CICE5		
ESMCI/cime	→	NorESMhub/ cime	→	DirkOlivie/cime
ESCOMPE/CTSM	→	NorESMhub/ CTSM	→	DirkOlivie/CTSM
ESCOMPE/MOSART	→	NorESMhub/ MOSART	→	DirkOlivie/MOSART

Differences between [github.com/ESCOMPE](#) and [github.com/NorESMhub](#)

Some differences are very small (e.g., CTSM and MOSART)

Other differences are substantial due to specific NorESM2-developments (e.g., CAM)

Making personal fork (e.g., DirkOlivie)

One can fork even further : NorESMhub → DirkOlivie

3. The tags/branches/releases

Branches/tags

Repository can contain different versions of the model in the form of branches/tags

- branch** There are different lines of development : **branch** to distinguish these ...
[Continuous evolution → Obtaining the latest version might differ from week to week]
- tag** There are different points in time marked in the branches : **tags** to distinguish these ...
[Fixed model versions→ always the same code]

Obtaining a model version to run a simulation

- To run the model : you need at least NorESM + 6 components
- From all the components one specific version/branch/tag/...

Branches and tags in CAM [NorESMhub]

Branches [evolving]

- master (almost empty)
- cam_cesm2_1_rel
- **cam_cesm2_1_rel_05-Nor**
- cam_cesm2_1_rel_05-Nor-SpAer
- cam_development

Tags [fixed]

- **cam_cesm2_1_rel_05-Nor_v1.0.2** [based on branch cam_cesm2_1_rel_05-Nor]
- cam_cesm2_1_rel_05-Nor_v1.0.1 [based on branch cam_cesm2_1_rel_05-Nor]
- cam_cesm2_1_rel_05-Nor_v1.0.0 [based on branch cam_cesm2_1_rel_05-Nor]
- ...
- cam_cesm2_1_rel_05
- ...

Branches and tags in CTSM (NorESMhub)

Branches [evolving]

- master
- cesm2_tutorial
- clm4_5_11_r189
- fates_next_api
- gh-pages
- lilac_cap
- release-cesm2.0
- release-clm5.0
- **release-clm5.0.14-Nor**
- sspscenarios

Tags [fixed]

- **release-clm5.0.14-Nor_v1.0.1** [based on release-clm5.0.14-Nor]
- release-clm5.0.14-Nor_v1.0.0 [based on release-clm5.0.14-Nor]
- ...
- release-clm5.0.14
- ...

Branches and tags in BLOM (NorESMhub)

Branches [evolving]

- master
- feature-hamocc_sediment_burst-coupling
- release-1.0

Tags [fixed]

- **v1.0.0**
- blomb0_0_001
- blom0_0_000

Branches and tags in NorESM (NorESMhub)

Branches

- **master** [active development]
- master_cesm
- noresm1 (only documentation)
- **noresm2** [evolving, but not answer changing modifications anymore]

Tags

- **release-noresm2.0.2** [July 19, 2020]
- release-noresm2.0.1 [April 23, 2020]
- release-noresm2.0.0 [April 13, 2020]
- 1.0.0

NorESM repository

Contains some machine settings, some user-mods, ...

NorESM repository

Contains one important file **Externals.cfg**

4. Obtaining a version of NorESM2

The file Externals.cfg

Role of Externals.cfg

- Determines which tag/branch for the different components should be used
- Is used in the automatic download of the different components
- Allows to prescribe coherent component combinations

Content of Externals.cfg

[cam]

```
tag = cam_cesm2_1_rel.05-Nor_v1.0.2
protocol = git
repo_url = https://github.com/NorESMhub/CAM
local_path = components/cam
required = True
```

[cice]

```
tag = cice5_20181109-Nor_v1.0.2
protocol = git
repo_url = https://github.com/NorESMHub/CESM_CICE5
local_path = components/cice
required = True
```

[cime]

```
tag = cime5.6.10_cesm2_1_rel.06-Nor_v1.0.2
protocol = git
repo_url = https://github.com/NorESMhub/cime
local_path = cime
required = True
```

...

Obtaining NorESM2

What determines the model version? The actual model version is determined by tag/branch of NorESM2, which determines (via Externals.cfg) the component version.

To obtain a working model version

- 1 Download (clone) the (small) NorESM git-repository
- 2 Choose your tag/branch of NorESM2 → Externals.cfg
- 3 Based on Externals.cfg, download automatically all the other components (their specific branch/tag) [`./manage_externals/checkout_externals`]

Convention

Released tags of NorESM2 : should refer only to tags of the components. Makes the model completely reproducible.

Branch of NorESM2 : can refer to branches of the components.

You can modify Externals.cfg [**before step 3**]

- to use another tag/branch than the one prescribed
- to use *your/someone else* fork (e.g., repo_url = `https://github.com/DirkOlivie/CAM`)

Subcomponent of component

The components can contain their own subcomponents (e.g., via External_CLM.cfg)

Checking out sub-components : goes automatically for CTSM : fatex, pctclm

Obtaining NorESM2

Results of the download

- Code directory ready to build/compile the model
- The code is downloaded with correct links to the git repositories

Code structure of downloaded model

```
cime
cime_config
components
Externals.cfg
manageExternals/checkoutExternals
components/blom
components/cam
components/clm
components/cice
components/mosart
```

Remark

- 1 All components are individual clones of the corresponding git-repositories → allows to use standard git-commands (change branch)
- 2 One can change Externals.cfg and rerun ./manageExternals/checkoutExternals to change branch

5. Résumé

github.com/NorESMhub NorESM2 consists out of 7 repositories

[Fork/pull-request](#) Repositories can be forked to contain personal developments.
NorESMhub-version can be upgraded via pull-requests.

[Branches/tags](#)

[Externals.cfg](#) File which determines the branch/tag for individual components (to be used in your NorESM2-setup)

[Different usage of repositories](#) Clone one component *versus* obtaining a full model-version to run a simulation

NorESM evolution

NorESM versions

NorESM1 (used for CMIP5) NorESM1-happi	CAM4-Oslo	CCSM4.0 (April 2010)	https://github.com/metno/noresm https://github.com/metno/noresm	(2007–...) (2016–...)
NorESM_c1.2	CAM5.3-Oslo	CESM1.2 (June 2013)	https://github.com/metno/noresm	(2013–...)
NorESM2 (used for CMIP6)	CAM6-Oslo	CESM2.1 (Dec 2018)	https://github.com/metno/noresm-dev	(2016–...)
NorESM2	CAM6-Nor	CESM2.1 (Dec 2018)	https://github.com/NorESMhub	(2020–...)

Acknowledgements

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