New NorESM e-resources
Part I : new git-repository structure

Ada Gjermundsen and Dirk Olivié
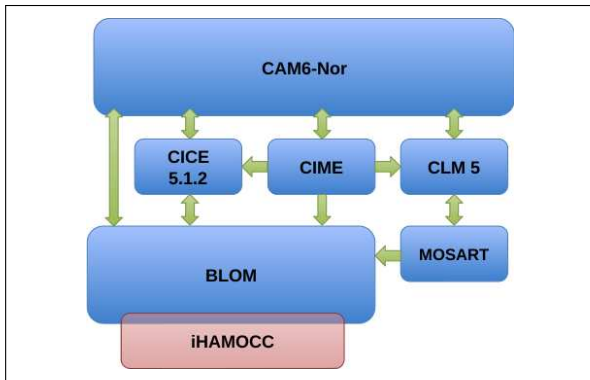
Oslo, September 21–23, 2020

Overview

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

1. The components of NorESM2
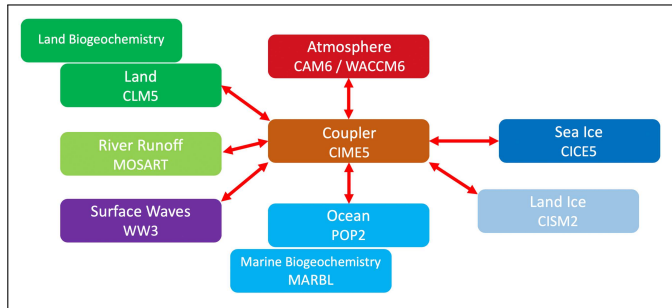
The model structure of NorESM2 :

Seland et al. [2020, GMDD]

NorESM2 – based on CESM2

NorESM2 is based on CESM2 !

The model structure of CESM2 :

Danabasoglue 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]

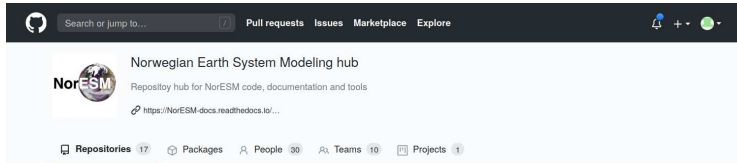|		
NorESM	:	Norwegian Earth System Model and Documentation [Mainly an umbrella]
BLOM	:	Bergen Layered Ocean Model
CAM	:	Community Atmosphere Model including CAM6-Nor branches
CESM_CICE5	:	CESM2 Version of CICE
cime	:	Common Infrastructure for Modelling the Earth
CTSM	:	Community Terrestrial Systems 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]
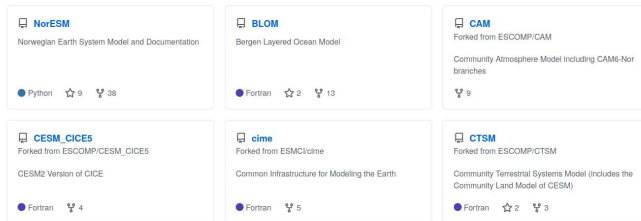
WW3 : Wave Watch III Model

NorESMhub

github.com/NorESMhub

Fork

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

Schematic of fork on github.com

On github.com   NorESMhub/BLOM   →fork(1x)→   DirkOlivie/BLOM
                                    ←pull − request

                                                clone (1x) ↓ ↑ pull/push
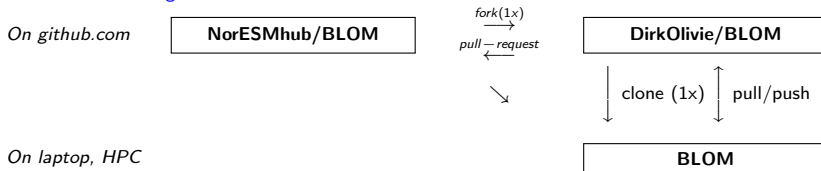
On laptop, HPC   BLOM

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

⑂ NorESMhub / **CAM**
forked from ESCOMP/CAM

⟨⟩ Code   ⓘ Issues 3   ⇡⇣ Pull requests   ⊙ Actions   ▦ Projects   ⊞ Wiki   ⛊ Security   ⬚ Insights   ⚙ Settings

👁 Watch ▾ 1   ☆ Star 0   ⑂ Fork 45

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

Fork of a fork . . .

Schematic of fork of fork on github.com

On github.com

| ESCOMPE/CAM | $\xrightarrow{fork}$ | NorESMhub/CAM | $\xrightarrow{fork}$
 $\xleftarrow{pullrequest}$ | DirkOlivie/CAM |

clone | pull/push

On laptop, HPC

| CAM |

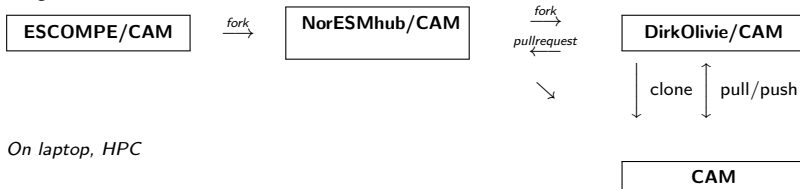# NorESM git-structure

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
manage_externals/checkout_externals
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 ./manage_externals/checkout_externals to change branch

5. Résumé

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)	CAM4-Oslo	**CCSM4.0** (April 2010)	https://github.com/metno/noresm	(2007–...)
NorESM1-happi			https://github.com/metno/noresm	(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

Anne Fouilloux, NCAR