



Norwegian
Meteorological
Institute

NorESM e-resources

Part II : NorESM2 documentation

Ada Gjermundsen and Dirk Olivié
Oslo, November 15-17, 2021

Pausefisk

1. In the bashrc file on your local computer add betzy and nird login information as alias, then you don't have to type `ssh -Y username@betzy.sigma2.no` every time you log on to BETZY/NIRD

```
$ vi .bashrc
```

add your username instead

```
# ssh alias:
```

```
alias nird="ssh -Y username@login.nird.sigma2.no"
```

```
alias betzy="ssh -Y username@betzy.sigma2.no"
```

2. Generate ssh keys so you don't have to punch your password everytime every time you log on to BETZY or NIRD. You need to copy and add for BETZY and for NIRD. On your local computer (repeat for NIRD):

```
$ ssh-keygen -t ed25519 -a 100 -f .ssh/id_sigma2
```

```
$ ssh-copy-id -i ~/.ssh/id_sigma2 username@betzy.sigma2.no
```

```
$ ssh-add ~/.ssh/id_sigma2
```

```
$ vi .ssh/config
```

```
Host betzy
```

```
HostName betzy.sigma2.no
```

```
User username
```

```
IdentityFile .ssh/id_sigma2
```

add your username instead

NorESM2 documentation

NorESM2.0: <https://noresm-docs.readthedocs.io/en/noresm2/>

NorESM2.X: <https://noresm-docs.readthedocs.io/en/latest/>

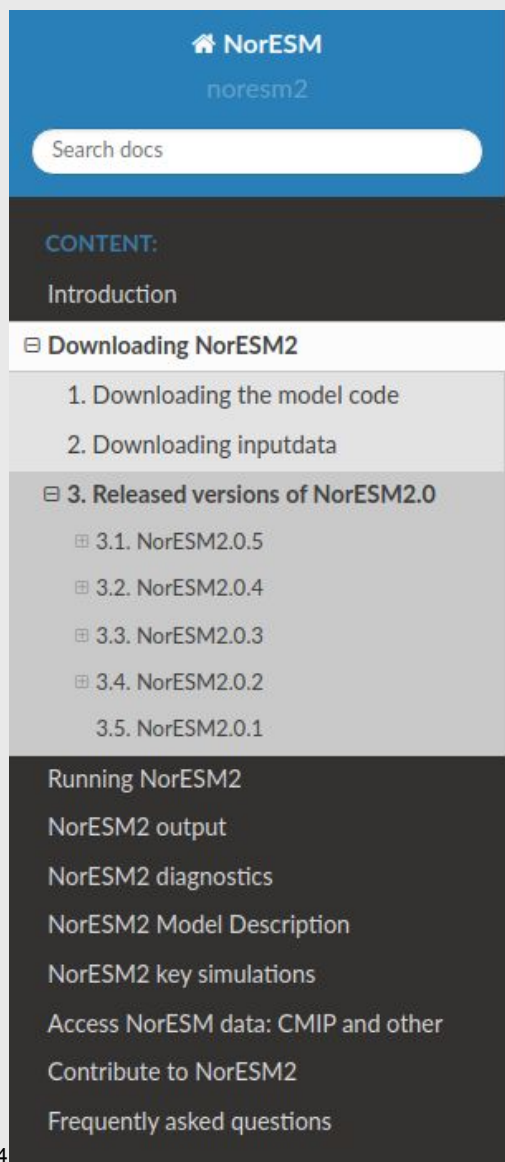
NorESM2.0 is the model version used for CMIP6

Detailed descriptions on:

- How to download the code
- How to run NorEMS2
- Compsets
- Model components
- Where to find the NorESM2 specific code
- Initial conditions and restart files
- Diagnostics tools
- Existing simulations (CMIP6)
- Literature

Note! The documentation for **NorESM2** and latest are similar, but not identical

NorESM2 documentation



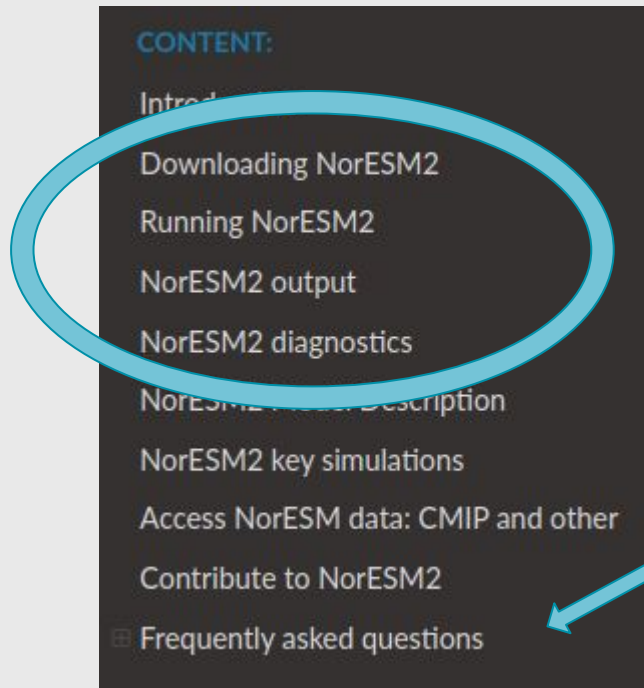
NorESM2.0:

<https://noresm-docs.readthedocs.io/en/noresm2/>

Released versions of NorESM2.0 is only available in the **noresm2** documentation:

https://noresm-docs.readthedocs.io/en/noresm2/access/releases_noresm20.html

NorESM2 documentation



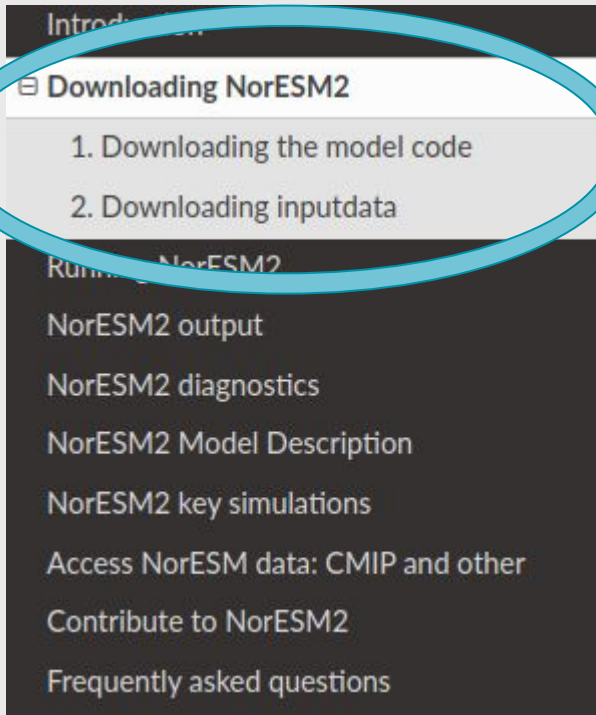
CONTENT:

- Intro
- Downloading NorESM2
- Running NorESM2
- NorESM2 output
- NorESM2 diagnostics
- NorESM2 model description
- NorESM2 key simulations
- Access NorESM data: CMIP and other
- Contribute to NorESM2
- Frequently asked questions

Most relevant for this workshop:

- Downloading NorESM2
- Running NorESM2
- Output
- Diagnostics
- Frequently asked questions

NorESM2 documentation - Downloading



Both the NorESM2 model code and the input data need to be downloaded in order to run NorESM2 simulations.

If you run NorESM2 on commonly used machines like FRAM, BETZY, NEBULA, TETRALITH, the input data are already available and should not be downloaded twice.

Day -1 (Monday, 15 November 2021)

10:00-10:30

- **Mats Bentsen** - *Introduction to NorESM and recent developments*

10:30-10:45

- Coffee break

10:45-11:30

- **Dirk Olivé and Ada Gjermundsen** - *Presentations on NorESM e-resources*

11:30-13:00

- **Ada G/Tomas Torsvik** - *hands-on session: download code and get familiar with NorESM; configuration and submit jobs*

13:00-14:00:

- Lunch

14:00-17:00

- **Ada G/Tomas Torsvik** - *hands-on session: advanced settings:- SourceMods, namelist, Debug, branch and Hybrid run, pecount (coffee break: 15:30-16:00)*

Running NorESM2: 1. Newbies guide

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Introduction

Downloading NorESM2

☐ Running NorESM2

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2. Experiments
3. Experiment settings and modifications
4. CMIP6 NorESM2 experiments setup
5. Reproduce CMIP6 piControl, historical and SSP5-8.5 experiments
6. Running on different platforms
7. Input data sets
8. Atmosphere
9. Ocean and Sea-Ice
10. Land and river run off
11. Land ice
12. Ensemble experiments
13. Nudged experiments

NorESM2 output

7 NorESM2 diagnostics

A quick-start guide on how set up and run a standard NorESM2 simulation by executing

4 steps:

- create a new case (the **create_newcase** script)
- configure case (the **case_setup** script)
- build case (the **case_build** script)
- submit case (the **case_submit** script).

Running NorESM2: 2. Experiments

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NorESM2 output

NorESM2 diagnostics

- Experiments = NorESM2 model simulations
- Detailed instructions for users on how to set up, build and run, but also *modify* a standard NorESM2 simulation.
- Settings for **creating** a case:
 - Many of the simulation configuration settings are defined by the so called **compsets**. The compsets are used to define which model components to include, parameter settings, forcing etc.
 - Information about which **resolutions** are scientifically supported.

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Running NorESM2:

3. Experiment settings and modifications

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NorESM2 output

NorESM2 diagnostics

- Machine specific environments:
 - Number of processors (nodes)
 - Libraries
- Run environments
 - Length of simulation
 - Type of simulation (startup, hybrid, branch)
 - Set some NorESM2 specific code
- Username lists (user_nl_cam, user_nl_blom,++)
 - Parameter changes
 - Initial state files
 - Output
- Run and archiving time environments
 - Length of simulation
 - Archiving time

Running NorESM2 4 and 5: Reproduce CMIP6 experiments

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NorESM2 output

NorESM2 diagnostics

Overview of the most used CMIP6 experiments:

- which version to checkout
- which compsets to use
- what output to expect
- includes links to diagnostics

Detailed recipe on how to set up and run 3 NorESM2.0 CMIP6 coupled experiments:

- pre-industrial conditions: piControl
- historical forcing: historical
- SSP5-8.5 future scenario: ssp585

Running NorESM2 - Model components

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NorESM2 output

Detailed description for each model component:

- NorESM2 specific code
- Initial conditions
- Forcing files
- How to modify user name lists e.g. change default parameter values
- Stand alone experiments
- Code modification

NorESM2 output

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☐ NorESM2 output

1. Standard output

2. Aerosol diagnostics and output

3. COSP output

NorESM2 diagnostics

NorESM2 Model Description

NorESM2 key simulations

Access NorESM data: CMIP and other

Contribute to NorESM2

Frequently asked questions

Standard output:

- Lists of standard output variables for each components

Aerosol diagnostics:

- NorESM2 can be run with additional aerosol output and diagnostics

COSP:

- COSP calculates model cloud diagnostics that can be directly compared with satellite observations

NorESM2 - diagnostics

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☐ NorESM2 diagnostics

1. ESMValTool

2. NorESM2 Diagnostics Package

3. Aerosol diagnostics

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Frequently asked questions

Several diagnostics tools are available to perform provide a general evaluation and quick preview of the model performance



Day -3 (Wednesday, 17 November 2021)

9:00-11:30

- **Yanchun He** - *NorESM output and post-processing (coffee break: 10:15-10:45)*

CMIP6 and NorESM2 key simulations

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Frequently asked questions

<https://noresmhub.github.io/noresm-exp/intro.html>

An overview of NorESM2 experiments including upgrades, code modifications and parameter settings.

The overview includes (NorESM2-MM and NorESM2-LM):

- CMIP6 DECK simulations
- CMIP6 historical simulations
- CMIP6 scenario simulations (SSPs)
- Spin up simulation tree

☐ Access NorESM data: CMIP and other

☐ 1. CMIP6 archive of NorESM results

☐ 1.1. Data access

1.2. DECK contributions

1.3. MIPs contributions

1.4. References

2. CMIP5 archive of NorESM results

3. HAPPI and HappiEVA data

- Where to access **cmorized** CMIP6 NorESM2 data (ESGF and NIRD)
- DECK contributions
- MIPs contributions

CMIP6 and NorESM2 key simulations

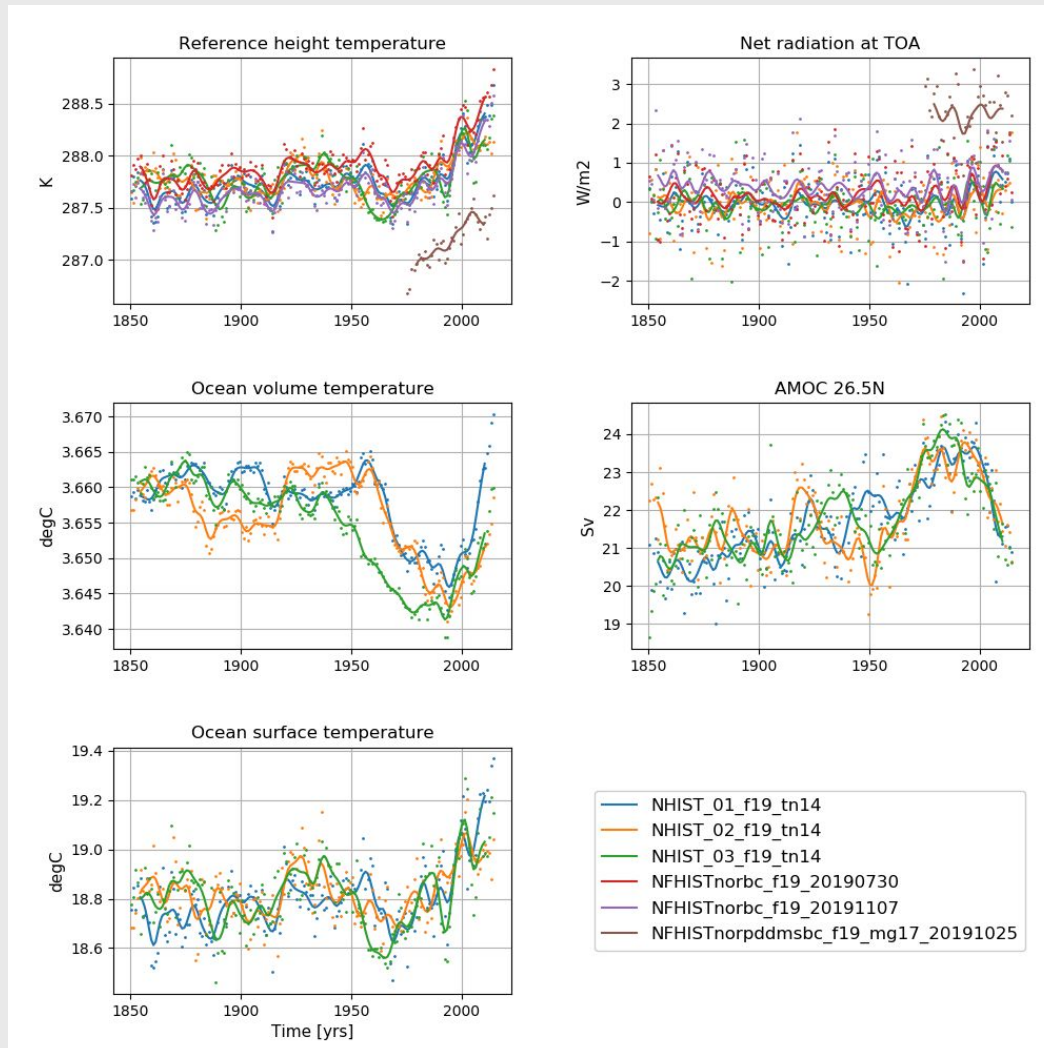
<https://noresmhub.github.io/noresm-exp/intro.html>

For selected CMIP6 NorESM2 simulations a detailed description of the simulation is provided including:

- case name and folder (rawdata, restart files ++)
- parent
- branch time
- compset

NHIST_f19_tn14_20190625 (1850 - 1949)

CESM parent	CESM2.1.0
Parent	N1850_f19_tn14_11062019
Run type	hybrid
Branch time from parent	1600-01-01
Simulated years	01-01-1850 - 31-12-1949
Compset	HIST_CAM60%NORESM_CLM50%BGC-CROP_CICE%NORESM-CMIP6_MICOM%ECO_MOSART_SGLC_SWAV_BGC%BDRDDMS
Git branch	featureCESM2.1.0-OsloDevelopment
Git commit	6a0b992
Resolution	f19_tn14
Machine	Fram
Case folder	/cluster/projects/nn2345k/oyvinds/NorESM2_CMIP6/cases/NHIST_f19_tn14_20190625
Diagnostics	-



NorESM2 - FAQs

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For Developers

☐ Frequently asked questions

1. Technical FAQ

2. Aerosol FAQ

3. Post-processing and plotting FAQ

If you have some questions during the workshop, you may want to check FAQs and see if you find the answer.

Divided into 3 sections:

- **Technical:**
 - common crashed
- **Aerosols:**
 - aerosol related questions
- **Post-processing:**
 - Variable names (that you can also find in NorESM2 output)
 - Ocean and sea-ice grids
 - Sigma coordinates
 - Code examples (very few)

Feedback welcome!

We want to improve the documentation and especially the frequently asked questions section.

You will receive a survey about the documentation during this workshop and I will present the results on Thursday, so please provide feedback. It takes max 10 minutes to complete.

Please send questions, feedback and comments to **adag@met.no**