**Compiling the models**

The model simulations indicated in this manuscript were run on NOAA’s Research and Development High Performance Computing System (RDHPCS), Gaea platform. This document has information on compiling the Modular Ocean Model version 6.0 – Sea Ice Simulator version 2.0, MOM6-SIS2 model on Gaea. The details on this document are extracted from [here](https://github.com/NOAA-GFDL/MOM6-examples/wiki/Getting-started) (last accessed on January 15, 2026).

**Overview**

We need to build different executables depending on the coupled mode of the model. All modes require MOM6 and Flexible Modeling System (FMS) source code. When used in ice-ocean mode, whether with SIS or SIS2, we must link in a "null" land- and atmosphere-models. In fully coupled mode you also need the full land and atmosphere source codes.

The phases of compilation are:

1. Create a path\_names file that contains the relative path to the source files. This uses the list\_paths tools which ships with FMS Runtime Environment (FRE) but is also provided in the mkmf package. (Refer to the instructions on ‘mkmf’ package installation in section ***Build tools and compilation templates*** under ***Downloading additional component models for coupled models*** document).
2. Create a Makefile that will compile your library or executable. This uses the mkmf tool which ships with FRE.
3. Compile your library or executable.

We typically apply above steps either component-by-component (the usual method within FRE scripts) or, in these pages, applied to FMS and then everything else.

**Setting up the compile environment on Gaea**

The first step is to ensure that you have all the necessary prerequisite software installed. As a minimum you'll need: a fortran compiler (such as gfortran), an MPI implementation (such as openmpi or mpich2), and netcdf libraries and headers. Instructions for gaea platform are listed below,

***Intel compiler***

Use specific versions of compilers and libraries to obtain the same model solutions that are checked in for verification.

***mkdir -p build/intel***

***cat << EOFA > build/intel/env***

***module unload PrgEnv-pgi***

***module unload PrgEnv-pathscale***

***module unload PrgEnv-intel***

***module unload PrgEnv-gnu***

***module unload PrgEnv-cray***

***module load PrgEnv-intel***

***module swap intel intel/18.0.6.288***

***module unload netcdf***

***module load cray-netcdf***

***module load cray-hdf5***

***EOFA***

This way you could simply type source build/intel/env if you wanted to load up the correct environment.

**Compiling the FMS shared code**

It is best to compile the shared code separately from the model code (proves quicker when building multiple versions of the model).

Instructions for Gaea are shown below:

***mkdir -p build/fms/***

***(cd build/fms; rm -f path\_names; \***

***../../src/mkmf/bin/list\_paths -l ../../src/FMS; \***

***../../src/mkmf/bin/mkmf -t ../../src/mkmf/templates/ncrc-gnu.mk -p libfms.a -c "-Duse\_libMPI -Duse\_netCDF" path\_names)***

On your platform, replace ncrc-gnu.mk with the appropriate template file.

The above creates the file build/fms/Makefile which you can use to build the fms library:

***(cd build/fms/; source ../env; make NETCDF=3 REPRO=1 libfms.a -j)***

**Compiling MOM6 in MOM6-SIS2 coupled mode**

***mkdir -p build/ice\_ocean\_SIS2/***

***(cd build/ice\_ocean\_SIS2/; rm -f path\_names; \***

***../../src/mkmf/bin/list\_paths -l ./ ../../src/MOM6/config\_src/{infra/FMS1,memory/dynamic\_symmetric,drivers/FMS\_cap,external} ../../src/SIS2/config\_src/dynamic\_symmetric ../../src/MOM6/src/{\*,\*/\*}/ ../../src/{atmos\_null,coupler,land\_null,ice\_param,icebergs/src,SIS2,FMS/coupler,FMS/include}/)***

***(cd build/ice\_ocean\_SIS2/; \***

***../../src/mkmf/bin/mkmf -t ../../src/mkmf/templates/ncrc-gnu.mk -o '-I../fms' -p MOM6 -l '-L../fms -lfms' -c '-Duse\_AM3\_physics -D\_USE\_LEGACY\_LAND\_' path\_names )***

Finally, compile the MOM6 sea-ice ocean coupled model with:

***(cd build/ice\_ocean\_SIS2/; source ../env; make REPRO=1 MOM6 -j)***

A successful compilation will yield the file build/ice\_ocean\_SIS2/MOM6.