The NEMO configurations

Table of Content

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1. Description

The NEMO configuration described here is an ocean-sea ice configuration based on the version 3.6 stable of NEMO (Nucleus for European Models of the Ocean), which includes three major components: the ocean physics NEMO-OPA, the sea-ice dynamics and thermodynamics NEMO-LIM3 and the ocean biogeochemistry NEMO-PISCES. The available resolutions builded on the ORCA quasi-isotropic global tripolar grid are 2°, 1° and 1/4°. The 1° (eORCA1) and 1/4° (eORCA025) are extended to the south so as to better represent the contribution of Antarctic under-ice shelf seas to the Southern ocean freshwater cycle. Notice that the biogeochemical model PISCES can be run coupled online with the dynamics (ORCA1-LIM3-PISCES for example) or in a "stand-alone" (ORCA2-LIM3-PISCES). This NEMO configuration has been builded to be able to perfom the OMIP6 experiments (omip1 and omip2 protocol) ; thus some specific sources code are available through the shaconemo repository.

To find out more about the model description and the reference configurations, go here: ■http://www.nemo-ocean.eu/About-NEMO. To use and extract NEMO, you first need to register and choose a login/passwd

1. Technical details

1.1. 1 The configuration on mod.def

```
#-H- NEMO_v6_OMIP  NEMOGCM for CMIP6 exercise
#-H- NEMO_v6_OMIP  libIGCM trunk rev 1471
#-H- NEMO_v6_OMIP  XIOS branch xios-2.5 rev 1550
#-M- NEMO_v6_OMIP  Christian.Ethe@ipsl.fr
#-C- NEMO_v6_OMIP  trunk/libIGCM                                    1476  10 libIGCM         .
#-C- NEMO_v6_OMIP  branches/2015/nemo_v3_6_STABLE/NEMOGCM           9455   7  .               mo
#-C- NEMO_v6_OMIP  trunk/ORCA1_LIM3_PISCES                           275  17  .               mo
#-C- NEMO_v6_OMIP  trunk/eORCA025_LIM3                               275  17  .               mo
#-C- NEMO_v6_OMIP  trunk/eORCA025_LIM3_PISCES                        275  17  .               mo
#-C- NEMO_v6_OMIP  trunk/ORCA1_OFF_PISCES                            275  17  .               mo
#-C- NEMO_v6_OMIP  CONFIG/UNIFORM/v6/NEMO_v6                        4716  8   NEMO_v6         co
#-C- NEMO_v6_OMIP  XIOS/branchs/xios-2.5                            1550  12  XIOS            mo
```

1.2. Setting up pre-builded NEMO configurations

1.2.1. Installation and Compiling

```
mkdir $WORKDIR/NEMO_STD    ;     cd $WORKDIR/NEMO_STD
svn co http://forge.ipsl.jussieu.fr/igcmg/svn/modipsl/trunk modipsl
cd modipsl/util

./model NEMO_v6_OMIP
```

Several built-in configurations are provided to evaluate the skills and performances of the model (cd ../config/NEMO_v6) . They can be used as as first easy set-up and as template for setting up a new configuration :

- ORCA2_LIM3_PISCES : the fully coupled global ocean on 2° horizontal grid and 31 vertical levels, with 10 levels in the top 100m

  gmake ORCA2LIM3PISCES

- ORCA2_OFF_PISCES : stand-alone PISCES biogeochemical model on ORCA2 - dynamical fields are pre-calculated and read with specific time frequency

  gmake ORCA2OFFPISCES

- ORCA1_LIM3_PISCES : the fully coupled global ocean on 1° horizontal grid, extended to the south and 75 vertical levels (from 1~m at the surface to 10~m at 100~m depth, and reaches 200~m at the bottom)

gmake ORCA1LIM3PISCES

- ORCA1_LIM3_PISCES_CMIP6 : the ORCA1_LIM3_PISCES but to run the OMIP6 experiments

  gmake ORCA1LIM3PISCES

- ORCA1_OFF_PISCES : stand-alone PISCES biogeochemical model on ORCA1

  gmake ORCAOFFPISCES

- ORCA025_LIM3 : the global ocean on 1/4° horizontal grid, without the PISCES model

  gmake ORCA025LIM3

- ORCA025_LIM3_PISCES : the fully coupled global ocean on 1/4° horizontal grid

  gmake ORCA025LIM3PISCES

2. Creating the job

For example : To perform an interannual COREII atmospheric forcing and it uses the NCAR bulk formulaeYou can see that for the configurationORCA2_LIM3_PISCES. There are 3 co

```
cd modipsl/config/NEMO_v6
cp EXPERIMENTS/ORCA1_LIM3_PISCES/ia/config.card .

../../libIGCM/ins_job
```

3. Running the model

3.1. Input files: atmospheric forcings, initial states, namelists

The card files (opa9.card for orca1_lim and pisces.card for pisces) contain the list of files needed to perform the simulation.
These files are described here: ■https://forge.ipsl.jussieu.fr/igcmg_doc/wiki/DocImodelAnemo

3.2. The run

This example is a 50 years CORE2 forcing climatological run of ORCA1_LIM3_PISCES split in 1-year jobs.

```
JobName=eOR1L3P
#----- Short Name of Experiment
ExperimentName=ORCA1clim
#----- DEVT TEST PROD
SpaceName=DEVT
LongName="ORCA1_LIM3_PISCES NEMO configuration"
TagName=ORCA1_LIM3_PISCES
#D- Choice of experiment in EXPERIEMENTS directory
ExpType=ORCA1_LIM3_PISCES/clim
#============================
#-- leap, noleap, 360d
CalendarType=noleap
#-- Begin and end of Job
#-- "YYYY-MM-DD"
DateBegin=0001-01-01
DateEnd=0050-12-31
#============================
#-- 1Y, 1M, 5D, 1D
PeriodLength=1Y
```

3.2. Submlit the job

```
on ada :   llsubmit Job_eOR1L3P
on curie:  ccc_msub Job_eOR1L3P
```

3.3. Performances

The performances of the eORCA1_LIM3_PISCES configuration can be find here: ■http://forge.ipsl.jussieu.fr/igcmg/wiki/PerformancesIPSLCM6