

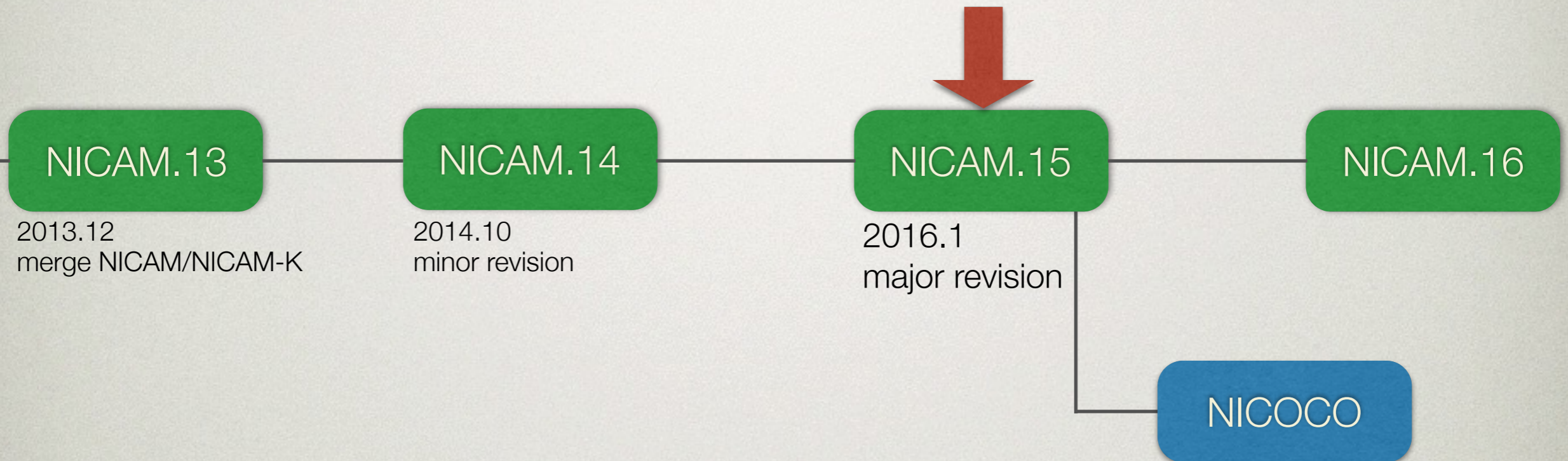
NICAM.15

CHANGES, NEW FEATURES, AND FIXES

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LAST UPDATE : 2016.2.15

Version milestone of NICAM



- NICAM.14 is stable.
- NICAM.15 needs some changes in NAMELIST

Caveats

- The source code of COCO (MIROC-OGCM) is not included in this distribution. Please contact to the developer directly.
- The backward compatibility of NAMELIST is not guaranteed. Please check slide 7, 13, and 14 of this document.

Change of directory depth

- root/
 - Coupler/
 - MIT license
 - jcf
 - jcup
 - jsp
 - kml-tools: external library, BSD license
 - mapping
 - LETKF/
 - BSD 3-clause license
 - **NICAM/**
 - Closed license, including BSD 2-clause license
 - COCO/
 - Closed license

make system

- The subcomponents are compiled according the options
 - `ENABLE_COUPLER=T` : compile coupler libraries
 - `ENABLE_LETKF=T` : compile letkf
 - `ENABLE_EIGENEXA=T` : use special eigenvalue solver
(Please prepare for EigenExa library by oneself)
 - `ENABLE_RTTOV=T` : use RTTOV
(Please prepare for RTTOV library by oneself.)
 - `ENABLE_COCO=T` : compile COCO
 - `COCO_NPE=XX` : default value is described in `COCO/setpath.sh`
 - `COCO_PROJ= full(1 deg) or hires(0.25deg)`
- You can set these options as environmental variables of the shell, or you can set at the time of making
 - `%> make NICAM_SYS=K ENABLE_COCO=T ENABLE_COUPLER=T`

Land-sea fraction

- Until now, land area and ocean area is masked by land use index.
- From this version, we use land fraction data. The surface properties and fluxes on the land/ocean are calculated and averaged by fraction
- The land fraction data and land use index data are controlled by nhm/share/mod_sfc_fraction, instead of share/mod_grd
- You can use land use index data as land fraction data, which has only 0 or 1 of fraction.
- New mklanddata tool is now preparing

Land-sea fraction: setting

- Minimum modification of NAMELIST

```
&GRDPARAM
```

```
    vegeindex_fname = 'veg_index_mat', ←This line is abolished  
/
```

```
&SFC_FRACTION_PARAM
```

```
    landfrc_fname      = 'veg_index_mat', ←index is used as 0/1 fraction  
    lakefrc_fname     = 'NONE',  
    landuseidx_fname  = 'veg_index_mat',  
    landfrc_direct_access = .false. ←Change this part as needed  
    landuseidx_direct_access = .false. ←Change this part as needed  
/
```

- For PaNDa format, the name of variables are landfrc, lakefrc, landuseidx

Ensemble execution

- Multiple simulation in one job
 - elevel is introduced : division rule is same as region division
 - You can set number of members according to the elevel
 - $elevel \leq glevel - rlevel$
 - $\#ofMembers = \text{divisor of } [4^{elevel} * (10 * 4^{rlevel} / \text{PEs per member})]$
 - $(10 * 4^{rlevel} / \text{PEs per member})$ is equal to the number of region per process
 - If you use glevel9, rlevel3, 1 region per process, you can take 1,2,4,8,16,32,64,128,256,512,1024,2048,4096 of ensemble members
 - If you use glevel6, rlevel0, 10 region per process, number of the ensemble members you can take is the divisor of 40960
- Input and output data : you can select from two style
 - division by directory, or identification by postfix
- Known problem : All of the member will abort if any member failed to run

Ensemble execution: setting(1)

- Only following NAMELIST is needed in nhm_driver.cnf (global configuration)

```
&GLOBALPARAM
  glevel      = 5,
  rlevel      = 0,
  elevel      = 2,
  prc_member  = 10,
  prc_ensemble = 16,
  prefix_dir  = "mem",
  extension_ens = "",
/
```

- Example 1 : specification of prefix_dir

```
nhm_driver.cnf  /mem000001  /nhm_driver.cnf
(GLOBALPARAM)  /input.peXXXXXX
                /output.peXXXXXX
                /output.log
```

```
                /mem000002  /nhm_driver.cnf
                /input.peXXXXXX
                /output.peXXXXXX
                /output.log
```

Ensemble execution: setting(2)

- Only following NAMELIST is needed in nhm_driver.cnf (global configuration)

```
&GLOBALPARAM
  glevel      = 5,
  rlevel      = 0,
  elevel      = 2,
  prc_member  = 10,
  prc_ensemble = 16,
  prefix_dir  = "",
  extension_ens = "mem",
/
```

- Example2 : specification of extension_ens

```
nhm_driver.cnf /nhm_driver.cnf.mem000001
(GLOBALPARAM) /input.mem000001.peXXXXXX
               /output.mem000001.peXXXXXX
               /output.log.mem000001

               /nhm_driver.cnf.mem000002
               /input.mem000002.peXXXXXX
               /output.mem000002.peXXXXXX
               /output.log.mem000002
```

The name of budget/mass monitor is changed

- ENERGY_BUDGET.INFO→BUDGET_energy1.log
 - Energy budget of the atmosphere
- MASS_BUDGET.INFO→BUDGET_mass.log
 - Mass budget of the atmosphere
- New→BUDGET_energy2.log
 - Energy budget of the atmosphere, format is fit to Trenberth et al. (2009)
- New→BUDGET_mass_sfc.log
 - Water budget monitor for ocean/land/lake/river

Central control of the restart file

- `mod_restart_driver` : default filename for input/output restart data is set
 - `RESTART_ADM_PARAM`
 - Both PaNDa and Legacy format is OK
- Enable to set interval to write restart
 - Overwriting option : keep last file
 - Multiple step option : for 4-D LETKF
- Add restart for surface diagnostics
- name changed : `mod_restart`→`mod_prgvar_restart`

Restart file: setting(1)

- Minimum modification of NAMELIST

```
&nm_ocean_init
  GOSST_INIT,
  GOICE_INIT,
  GOICR_INIT,
  GOSNW_INIT,
  GOIST_INIT,
  merged_rst_in,
  merged_rst_out,
  merged_input_restfname,
  merged_output_restfname,
  input_io_mode,
  output_io_mode,
/
```

disuse

disuse

change names

```
&nm_ocean_init / &
  input_basename,
  output_basename,
  input_io_mode,
  output_io_mode,
  input_steppos,
/
```

please specify if multiple time steps are included in the file

```
&nm_land_init
  G_INIT,
  W_INIT,
  WC_INIT,
  SN_INIT,
  FR_INIT,
  SA_INIT,
  OSSTIN,
  SNRTC0_INIT,
  ISOR1_INIT,
  ISOR2_INIT,
  merged_rst_in,
  merged_rst_out,
  merged_input_restfname,
  merged_output_restfname,
  opt_albsfc_in,
  opt_albsfc_out,
  opt_albsfc_tem,
  input_io_mode,
  output_io_mode,
  limitval_glw,
/
```

disuse

disuse

change names

output is forced to "true"

cold start is enabled now

disuse

```
&nm_land_init
  ISOR1_INIT,
  ISOR2_INIT,
  input_basename,
  output_basename,
  input_io_mode,
  output_io_mode,
  input_steppos,
/
```

please specify if multiple time steps are included in the file

Restart file: setting(2)

- NAMELISTの変更分
 - これまでのデータベースをそのまま使う場合

```
&DIAGVARPARAM
  input_io_mode,
  output_io_mode,
  input_direct_access,
  output_direct_access, disuse
  restart_layername,
  output_basename,
  output_basename_CBMFX,
  output_basename_CBMFX_CHIKIRA,
  output_basename_QV_TB_TEND,
  output_basename_EVAP_SFC,
  output_basename_SH_FLUX_SFC,
  output_basename_MP,
  output_basename_ROUGHNESS_SEA,
  CBMFX_fname,
  CBMFX_CHIKIRA_fname,
  QV_TB_TEND_fname,
  EVAP_SFC_fname,
  SH_FLUX_SFC_fname,
  MP_fname,
  ROUGHNESS_SEA_fname,
  TB_fname,
/
```

→
not changed

```
&DIAGVARPARAM
  input_io_mode,
  output_io_mode,
  input_basename, If you use PanDa format, specify this
  output_basename,
  restart_layername, please specify if multiple time
  input_steppos, steps are included in the file
  output_basename_CBMFX,
  output_basename_CBMFX_CHIKIRA,
  output_basename_QV_TB_TEND,
  output_basename_EVAP_SFC,
  output_basename_SH_FLUX_SFC,
  output_basename_MP,
  output_basename_ROUGHNESS_SEA,
  output_basename_TB
  CBMFX_fname,
  CBMFX_CHIKIRA_fname,
  QV_TB_TEND_fname,
  EVAP_SFC_fname,
  SH_FLUX_SFC_fname,
  MP_fname,
  ROUGHNESS_SEA_fname,
  TB_fname,
/
```

New features

- Cloud Microphysics
 - NSW6 : Khairoutdinov and Kogan (2000), Roh and Satoh(2014)
- Aerosol
 - Input data of emission is now fit to HTAP v2
- Radiation
 - MSTRNX_AR5 & MSTRNX_AR5_CRM are merged to MSTRNX
- Surface submodels
 - mod_ocean_sublayer_xxx : Kawai and Wada (2007)
 - mod_lake_xxx : slab lake
 - mod_river_xxx : TRIP (Oki et al., 2001)

New features

- history output : for CFMIP, detailed tendency
 - ECMWF-type SLP calculation: sl_slp_ecmwf
- new monitors: water budget, aerosol budget
- new variables : water mass in ocean and lake (diff from start)

- Nicoview : visualization tools powered by DCL
-
- fio_cat : concatenate PaNDa format data
- fio_sel : extract variables from PaNDa format data
- mko3_ugamp : Make 3-D ozone field from UGAMP data

Bugfixes

- Avoid touching undefined data in the array
- Avoid zero dividing

- The inexact power operations for integer : for ES

- Aerosol transport
 - Wrong turbulent transport : unit of DFE [m/s²]
 - Missing cumulus convection transport
 - Wrong rain flux in precipitation transport (new scheme)