Wikiprint Book

Title: 1. Introduction

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The ORCHIDEE model

1. Introduction

■Visit the ORCHIDEE's official website
■Follow the actualities in developements of ORCHIDEE

The ORCHIDEE model includes 3 components: sechiba, stomate and LPJ (dynamic vegetation). Only the 2 components sechiba and stomate are activated by default. If you are using a coupled configuration with LMDZ, you will need the sechiba component to compute the water and energy balance. You will also need the stomate component to compute the carbon balance but this component can be deactivated. You will find additional information on how to use ORCHIDEE in libIGCM-supported configurations below.

2. Compile methods in ORCHIDEE

2 compile methods are used in ORCHIDEE depending on the version. Read more about compiling on the ORCHIDEE wiki:
■https://forge.ipsl.jussieu.fr/orchidee/wiki/Documentation/UserGuide/CompileMethods

Compiling with makeorchidee_fcm

- This method is available in the trunk ORCHIDEE, since revision 2149, in LMDZOR_v5.2 configuration and all _v6 configurations.
- All platform dependent compile options are set in modeles/ORCHIDEE/arch/
- Changing compile options or adding a new machine is done in modeles/ORCHIDEE/arch
- 3 different levels of optimization is available and can be changed using an argument to makeorchidee_fcm: -prod(default), -dev or -debug. These options can be changed or added in the main makefile in config/LMDZOR_v5.2 directory.

Obsolete : Standard makefiles created based on AA_make and AA_make.gdef

- This is the only method available in CMIP5 version of ORCHIDEE. All _v5 configurations with ORCHIDEE compile in this way.
- All platform dependent compile options are set in modipsl/util/AA_make.gdef
- => Change compile options in AA_make.gdef, recreate makefiles with ./ins_make, clean previous compilation and recompile

3. Run options

Predefined run options are set in orchidee.card and stomate.card for coupled configurations and in orchidee_ol.card, sechiba.card and stomate.card for offline configurations. Other options not listed in the card can be set directly in the parameter file run.def (for offline run) or orchidee.def(for coupled run).

3.1. Choice of hydrology scheme

2 hydrology scheme are implemented in ORCHIDEE. An old 2 bucket scheme called Choisnel and a newer multilayer scheme called CWRR. In _v5 configurations only the 2-bucket Choisnel scheme could be used. In newer version in offline and _v6 configurations can choose between the two scheme. Choose the hydrology in the configuration

- _v5 and _v6 configurations by setting DefSuffix=CWRR or DefSuffix=Choi in the section [UserChoices] in orchidee.card. The variable DefSuffix will be used to copy the corresponding orchidee.def file from PARAM directory, see the line :

```
[ParametersFiles]
List=   (${SUBMIT_DIR}/PARAM/orchidee.def_${DefSuffix}, orchidee.def)
```

- ORCHIDEE_OL offline configuration by setting NEWHYDROL=y for CWRR and NEWHYDROL=n for Choisnel in sechiba.card. This variable will change the value for HYDROL_CWRR in the parameter file run.def.

3.2. Vegetation map

The vegetation map (PFTmap.nc) can be constant or updated annually. Use the option VEGET_UPDATE=0Y for constant vegetation map and VEGET_UPDATE=1Y to update annually the vegetation map. Note that in previous versions of ORCHIDEE up to revision 2718 on the trunk, including _v5 configurations, the vegetation map was updated in the end of the year with the map for the next coming year. In newer versions and all _v6

configurations, the vegetation map is updated on the first day of the year.

For constant vegetation map, set in orchidee.card (or sechiba.card) VEGET_UPDATE=0Y and set in [InitialStateFiles] the PFTmap.nc file you want to use for the simulation. Note that for constant vegetation map, the vegetation will be read from the restart file. Only if it is not found in the restart file, then the file PFTmap.nc will be read.

To update annually the vegetation map set in orchidee.card (or sechiba.card) VEGET_UPDATE=1Y and set :

- for _v6 configurations and newer ORCHIDEE trunk from revision 2718:

```
[BoundaryFiles]
List=  (${R_BC}/SRF/${config_UserChoices_TagName}/PFTmap_1850to2005_AR5_LUHa.rc2/PFTmap_IPCC_${year}.nc, PFTmap.nc)
```

- for _v5 configurations or offline with ORCHIDEE trunk or tag older than revision 2718:
  - Note that here we use year_p1 to have the next coming year as the file is read in December for the next coming year
  - You must also set LAND_COVER_CHANGE=y in section [UserChoices]
  - With monthly period length:

```
[SmoothFiles]
List=(${R_BC}/SRF/${config_UserChoices_TagName}/PFTmap_1850to2005_AR5_LUHa.rc2/PFTmap_IPCC_${year_p1}.nc, PFTmap.nc,
```

  - With yearly period length, note for this case you can not have PFTmap.nc also in the [InitialStateFiles] section:

```
[BoundaryFiles]
List=  (${R_BC}/SRF/${config_UserChoices_TagName}/PFTmap_1850to2005_AR5_LUHa.rc2/PFTmap_IPCC_${year_p1}.nc, PFTmap.nc
```

3.3. Managing output in _v5 configurations using IOIPSL

The model output frequency is configured in

- config.card
  - The WriteFrequency variable in the [SRF] section induces a change of the WRITE_STEP variable in orchidee.def. WRITE_STEP determines the output frequency for the sechiba_history.nc file. The available frequencies are: xY (x years), xM (x months), 5D(5 days), 1D (1 day), xs (x seconds). This file is mandatory. If you add HF a second sechiba_out_2.nc file will be written with the 3H frequency.
  - The WriteFrequency variable in the [SBG] section induces a change of the STOMATE_HIST_DT variable in orchidee.def. STOMATE_HIST_DT determines the output frequency for the stomate_history.nc file. The stomate_history_ipcc.nc file always has daily outputs.
- orchidee.card
  - sechiba_LEVEL : mandatory variable, no default value, it varies between 0 and 11. The SECHIBA_HISTLEVEL variable is set to sechiba_LEVEL. This variable determines the number of variables written in sechiba_history.nc.
- stomate.card
  - stomate_LEVEL : mandatory variable, no default value, it varies between 0 and 10. The STOMATE_HISTLEVEL variable is set to this value. This variable determines the number of variables written in stomate_history.nc.

4. Deactivate stomate in ORCHIDEE

You can deactivate STOMATE component included by default in all experiments with ORCHIDEE and only run the SECHIBA component. To do so:

- in config.card: delete the line for SBG in the ListeOfComponents section
- in COMP/orchidee.card (for _v5 or _v5.2 configurations) or in COMP/sechiba.card (for ORCHIDEE_OL configuration): add the lai2D.nc file in BoundaryFiles, ListNonDel section as follow:

```
ListNonDel= (${R_BC}/SRF/${config_UserChoices_TagName}/lai2D_03.nc, lai2D.nc)
```

- in PARAM/orchidee.def (for _v5 or _v6) or PARAM/run.def (for ORCHIDEE_OL): add parameter LAI_MAP to request the reading of LAI_MAP:

```
# Read a LAI map (12 monthly values)
LAI_MAP = y
```

```
# default = n
```