

Coupling ORCHIDEE to DYNAMICO

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Abstract

This note documents the work done to prepare the coupling of ORCHIDEE land model to DYNAMICO atmospheric dynamics. In order to make the coupling a re-organization was necessary to be done in the section of the code responsible of the interpolation of the morphology data (PFT, albedo, LAI, ...) from different files done by L. Fita in the mark of the HEAT project. This work is necessary in order to prepare ORCHIDEE to use XIOS libraries to interpolate the same data. This document describes all the steps done as a way to provide more insights and aims to left a testimony of the work done for that people how might face similar tasks.

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1 Introduction

HEATproject aims to develop a new Global Climate Model (GCM) using different components of the current Global Climate Model from the Institute Pierre et Simon Laplace (IPSL, <http://www.ipsl.fr/>):

- New atmospheric dynamical core called DYNAMICO (<http://forge.ipsl.jussieu.fr/dynamico>) led by T. Dubos (LMD)
- LMD atmospheric physics from: Laboratoire de Météorologie Dynamique (LMDZ, (<http://lmdz.lmd.jussieu.fr/>))
- IPSL land model: Organising Carbon and Hydrology In Dynamic Ecosystems (ORCHIDEE, (<http://labex.ipsl.fr/orchidee/>))
- ocean model: Nucleus for European Modelling of the Ocean (NEMO, <http://www.nemo-ocean.eu/> in collaboration with other institutions)
- IPSL atmospheric chemistry: Interaction avec la Chimie et les Aérosols (INCA, <http://www-lscea.cea.fr/>)
- ...

DYNAMICO uses an unstructured grid and XIOS libraries for I/O (<http://forge.ipsl.jussieu.fr/ioserver/>). All the components have to be prepared to be able to work on an unstructured grid (or not with OASIS model coupler) and with XIOS libraries. Thus, code components' have to use XIOS and ORCHIDEE's input and initialization files have to be understandable by XIOS

Due to efficiency constraints ORCHIDEE will be directly coupled to DYNAMICO. Current trunk version of ORCHIDEE uses XIOS for the output. Thus, ORCHIDEE should be prepared to use XIOS also for the input data. Planned steps:

1. Prepare ORCHIDEE to use XIOS variables-like outcome:
Do not add any new feature. JUST re-organization & standardization of the existing code
2. Prepare ORCHIDEE forcing files for XIOS

Work done in a new branch:

<svn://forge.ipsl.jussieu.fr/orchidee/branches/ORCHIDEE-DYNAMICO/ORCHIDEE>

More information at:

<https://forge.ipsl.jussieu.fr/orchidee/wiki/DevelopmentActivities/ORCHIDEE-DYNAMICO>

All this work is done via the creation of a new Fortran module called `interpweight`. Its main objectives are:

1. Prepare ORCHIDEE's interpolation code for XIOS
2. Generalize and flexibilize interpolation
3. Without introducing any new piece of code, just re-organize it

Current interpolation presents a series of characteristics:

- Uses a set of Fortran subroutines with an interface called `aggregate_p`. It searches the grid points from the source file which lies within the area of a grid point towards one wants to interpolate.
- Has a specific/particular interpolation for each file
- Different ranks 2D, 3D, 4D and kind of variables: unique value per grid point (`carteveg5km.nc`), multiple fractions per grid point (`PFTmap.nc`), continuous fields (`reftemp.nc`)
- Perform mainly three steps (file depending):

1. Modification of values from file
2. Creation of land/sea mask using values from file
3. Interpolate values

General aim of `interpweight` consist on:

- Join different ‘methods’ of each step in all purpose routines
- Get some key information (range of values, dimensions, ...) directly from data
- Prepare ORCHIDEE’s subroutines to use same output as the one provided by XIOS
- Completely disappear once XIOS is introduced

For that reason a series of new generic subroutines have been created (an kept all together within `src_global/interpweight.F90` which generalize the current interpolation steps:

1. Modification of initial values: *Removing that wrong values from the file*
`interpweight_modifying_input[1/2/3/4]D`: subroutines to modify 1D, 2D, 3D or 4D input data from file, using different methods: `noneg`
2. Masking input: *Compute ‘on fly’ the values of the land/sea mask taking the values in the file*
`interpweight_masking_input[1/2/3/4]D`: subroutines to compute the mask using data from input file using different methods: `nomask, mbelow, mabove, msumrange, var`
3. Area weights: Get coincident areas from input file to the target projection using `aggregate_p`
 No changes on it
4. Interpolate: Use obtained areas and interpolate values at each grid point at the same format as it will be provided by XIOS
 - `interpweight_provide_fractions[1/2/3/4]D`: Perform interpolation for fraction/category data
 - `interpweight_provide_interpolation[2/4]D`: Perform interpolation for continuous data
 - `variableusetypes`: Variable to provide the values along the additional dimension to perform the interpolation. (e.g.: in case the 13 pfts are: 1,3,6,18,23,34,35,39,48,...)
5. A new variable is added which explains the ‘availability’ of data to perform the interpolation (0, 1). When it is negative it means that there was no data for that grid point (see example in appendix 2)

$$availability = \frac{\sum_{i=1}^{Npts} A_i^{source}}{Area\ target\ grid\ point} \quad (1)$$

2 Planned work

1. XIOS2 & `interpWeight`
 - Release of XIOS2
 - Grouping of current interpolation (`read`, `aggregate_p`, apply weights and bring back fractions) in ORCHIDEE into a new module (`interpWeight`)
2. Commit and test both steps on the trunk
3. Open a new branch for the interpolation with XIOS2 [January 2016]

4. Work on the interpolation (doing nothing for the calendar) with a new `module_InterpWeight_XIOS` but with XIOS2
5. Validation off-line
6. Implement it on the current version on the trunk
7. Coupling to DYNAMICO

This document only describes until the commit to the trunk.

3 ORCHIDEE

This work takes the branch version¹, creation of a new ORCHIDEE_DYNAMICO model version, see appendix D):

```
$ svn co --username lluis.fita
$ svn co http://forge.ipsl.jussieu.fr/igcmg/svn/modipsl/trunk modipsl
$ cd modipsl/util
$ ./model ORCHIDEE_DYNAMICO
```

3.1 Current Interpolation

Interpolation in ORCHIDEE is currently (revision #2627, 26/iii/2015) spread in the code done by each file as follows:

1. Open data file (mainly regular lon/lat files)
2. Modify input values (following specific rules for each file)
3. Mask input values (following specific rules for each file)
4. Call subroutine `aggregate_p` which computes the interpolation weights
5. Get the new interpolation values by application of the interpolation weights

Actually the subroutine `aggregate_p` is found in a series of subroutines which deals individually with each file:

- `src_global/interpol_help.f90`: Aggregation routines, in an `INTERFACE` statement which is an interface to the subroutines `aggregate_2d_p`, `aggregate_vec_p`
- `src_sechiba/condveg.f90`: Initialise, compute and update the surface parameters emissivity, roughness and albedo, in subroutine: `condveg_soilalb` (for file 'soils_param.nc'), `condveg_background_soilalb` MODIS retrieved albedo (for file `alb_bg_jrctip.nc`)
- `src_sechiba/routing.f90`: Routes the water over the continents into the oceans and computes the water stored in floodplains or taken for irrigation, in subroutine: `routing_irrigmap` (for file 'floodplains.nc')
- `src_sechiba/slowproc.f90`: Initializes/updates vegetation cover, vegetation properties (LAI and fractional cover), in subroutines: `slowproc_interlai` (for file 'lai2D.nc'), `slowproc_update` (for file 'PFTmap.nc'), `slowproc_interpol` (for file 'carteveg5km.nc'), `slowproc_soilt` (for file 'soils_param.nc') and `slowproc_slope` (for file 'cartepente2d_15min.nc')
- `src_sechiba/chemistry.f90`: in `chemistry_initialize` using of a vegetable fertilization (for file 'orchidee_fertilizer_1995.nc' and 'orchidee_bbg_clim.nc')

There is a complementary interpolation in the STOMATE in `thermsoil.f90` and `thermsoilc.f90` (via the subroutine `read_reftempfile` for the file 'reftemp.nc'), which is currently not managed throughout `aggregate_p`.

¹following the instructions on <http://forge.ipsl.jussieu.fr/igcmg/wiki/platform/documentation/installation>

3.2 InterpWeight

This subroutine should account for all the interpolation which it is currently in the ORCHIDEE model². It generalizes the interpolation by the introduction of a generic subroutine (see table 1 for the methods per variable) from which one obtains the fractions of a series of types in each grid point. It will provide two variables:

- **ovar**: fractions of all the input categories into the interpolated projection:
- **aovar**: Availability of input data for the interpolation
 - [0., 1.]: Ratio between the taken input surface to interpolate and the surface of a given grid point
 - -1: Any equivalent input grid point has been found

The workflow of the main subroutines of interpolation modified from the original versions found in `condveg.f09` and `slowproc.f90` is left as follows³:

1. **Selection of the file**
2. **Set-up required variables**
3. **Use of new subroutine `interpweight_1D`, `interpweight2D`, `interpweight3D` or `interpweight4D`**: Provides the fraction on all the grid points of the final fraction of each of the types after the interpolation (1D to 4D input data version, see appendix A). They use:
 - (a) **open file**
 - (b) **read variable**
 - (c) **apply corrections to the variable**: apply a filter in order to get rid of weird values: zero
 - (d) **set-up the mask**: Create the mask according to: `nomask`, `maskvarname`, `maskabove`, `maskbelow`, `masksumrange`
 - (e) use `aggregate_p`: provides the areas and indices for each grid point to be used in the interpolation.
 - (f) use `provide_fractions2D_in2D`, `provide_fractions3D_in3D` or `provide_fractions4D_in4D`: provides the fractions at each grid point of all the types. If no values to interpolate are found for a given grid point the average of the minimum and maximum possible values is used (`varmin`, `varmin`, on the subroutine call)
4. With the variable that contains the fractions for each type of kind, the interpolation can be done following the specificities of each file/variable
5. For that kind of grid points with known issues (i.e. no values), automatic corrections are applied. At these problematic grid points, a given value on the quality variable `aovar` is assigned (see table 2)

3.2.1 CF standardization of input files

In order to simplify the interpolation within the ORCHIDEE, a series of standards to accomplish for the input files are proposed to be followed. More details can be found in the ORCHIDEE wiki page at <https://forge.ipsl.jussieu.fr/orchidee/wiki/Documentation/Forcings/CfStandard>.

All the input data will be slightly modified:

- All the oceanic values will be passed to a netCDF `FillValue` value.
- A new variable will be added to the files in order to provide information about the meaning of the different types included in the file (see details in appendix B). This new variable called `[var]names` will be a string variable with a content like:

²**NOTE:** before revision r3688, module was called `module_InterpWeight`. Afterwards ORCHIDEE's coding rules (https://forge.ipsl.jussieu.fr/orchidee/attachment/wiki/Documentation/ORCHIDEE_Coding_Guidelines_v1.0.pdf) were applied, see more details in appendix A

³a different interpolation is found for the modules `routing.f90`, `chemistry.f90` and `thermsoil.f90`, `thermsoilc.f90`

Table 1: Table of the ‘methods’ used by each variable. ‘corr.’, stands for corrections. ‘ma’, stands for maskabove, ‘mb’, stands for maskbelow and ‘msr’, stands for masksumrange. ‘msech’ stands for min_sechiba=1.e-8, mavar stands for maskvarname, ‘noma’ stands for nomask

variable	file	shape	corr.	mask	New int
LAI	lai2D.nc	4D	noneg	mb, 20.	interpwe
soilalb_dry ^a	soils_param.nc	3D	-	ma, msech	interpwe
soilalb_wet ^a	soils_param.nc	3D	-	ma, msech	interpwe
soilalb_moy ^a	soils_param.nc	3D	-	ma, msech	interpwe
veget	PFTmap.nc	3D	-	msr[1.-1.e ⁻⁷ , msech, 2.]	interpwe
vegetation_map	carteveg5km.nc	1D	-	ma, msech	interpwe
soilclass ^b	soils_param.nc	3D	-	ma, msech	interpwe
clayfraction ^b	soils_param.nc	3D	-	ma, msech	interpwe
pente	cartepente2d_15min.nc	2D	-	ma, msech	interpwei
bg_albedo	alb_bg_jrctip.nc	4D	-	mavar	interpwei
N_qt_WRICE_year	orchidee_fertilizer_1995.nc	2D	-		interpwei
N_qt_OTHER_year	orchidee_fertilizer_1995.nc	2D	-		interpwei
flx_co2_bbg_year	orchidee_bbg_clim.nc	2D	-		interpwei
temperature	reftemp.nc	2D	-	noma	interpwei
clayfraction	soils_param_usda.nc ^c	3D	-	ma, msech	interpwe
maxvegetfrac	ORCHIDEE_13PFTmap_2010_cmpi6_LUH2v2h.nc ^d	3D	-	mb, 20.	interpwe

^afrom soilcolor, visisble and infrared
^bfrom soiltext
^cpossible problems at point 209,79
^dused as PFTmap_025.nc

Table 2: Assigned availability values for that grid points with interpolation problems

Value	Meaning
0. ≤ 1.	Fraction of input data used to cover the interpolated grid point (== 1., fully covered)
≤ 0.	Not data available for the interpolation some ‘on-air’ corrections have been made
-1.	No data available from input file src_sechiba/slowproc.f90#slowproc_readvegetmax: PFTmap.nc
-0.25	No conservation of sum of veget_next. The sum of veget_next is different after reading Land Use map (verify the dgym case model)
-0.5	Problem with vegetation file for Land Use. No land point in the map for point (verify your land use file) src_sechiba/slowproc.f90#slowproc_interpol: carteveg5km.nc
-1.2	Antartica, Artica, Greenland points (impose vegetation_map = 0)

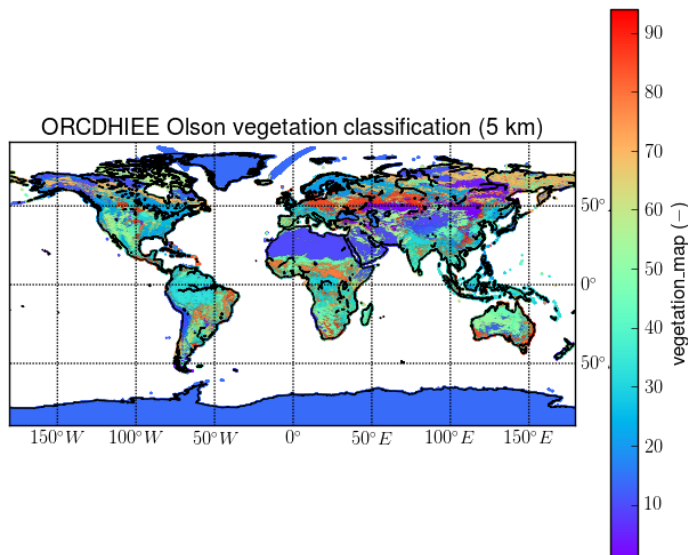


Figure 1: Olson vegetation classification included in `carteveg5km_XIOS.nc` at 5km resolution in a Goode projection

```
char [var]names(N[var], Lstring) ;
  [var]names:standard_name = "[var]names" ;
  [var]names:long_name = "description of [var] types" ;
  [var]names:units = "-" ;
```

With values like:

```
[var]names =
  "1: [type 1]",
  "2: [type 2]",
  (...)
  "N: [type N]" ;
```

At the same time, some recommendations of simplification of the code are recommended:

- removal of `neighbours` and `contfrac` from the `aggregate_p`
- removal of all the masking and input modification taking advantage of the CF-standardized files

Olson classification

The Olson vegetation classification comes from the file `carteveg5km.nc`. It contains a compressed format of the information, only the continental land points are saved. The file contains only triplets of longitude, latitude and vegetation type (from 94 possible values, see table 7). It is in a space conservative projection called Goode⁴. The file was created by Nicolas Viovy at LSCE, using c-libraries from Dan Steinwand's code available from (<http://edc2.usgs.gov/1KM/zip/gih112ls.c>)

In order to transform to a CF-like format, it has been decompressed. That means that a full 2D global map has been created with the same data and using the same libraries to obtain the pairs of longitudes and latitudes of the whole planet. At the same time, the cell boundaries have also been attached to the resultant final file called `carteveg5km_XIOS.nc` (see figure 1, with the resultant map).

3.2.2 routing

Routing has to be treated separately since the interpolation of the required files (from `'routing.nc'`) is much more complex. At this stage (April 29th 2016) this is not treated.

⁴https://en.wikipedia.org/wiki/Goode_homolosine_projection

3.3 Merging with trunk

On May 26th 2016, in order to facilitate the merging with the ‘trunk’, a merging between the branch and the trunk is scheduled. The merging will start from the last merging between the branch and the trunk (which was done in with version 3190, see [D.1.1](#)). A second merge was done on June 8th 2016 (r3531). The merging will be as (in folder /data/lfita/DATA/)

```
$ svn merge -r 3910:[current version of trunk] svn://forge.ipsl.jussieu.fr/orchidee/trunk
```

See more details in [appendix E](#)

3.4 InterpWeight_XIOS

4 DYNAMICO & ORCHIDEE

DYNAMICO uses an unstructured grid. Because of that, ORCHIDEE has to be generalized, since for example, unstructured has a variable number of neighbors. This generalization is done in parallel by J. Polcher, which generalizes the use of ORCHIDEE via its coupling to the WRF model. To be done and describe in an other document

A From module_InterpWeight to interpweight

A large amount of changes have been introduced from the original `module_interpweight.f90` in order to get working with `interpweight.f90`. With J. Ghattas on August 2016 (commit # 3694), some improvements, code cleaning and optimizations have been introduced.

- All subroutines/functions in `interpweight` names start with `interpweight`
- All subroutines/functions in `interpweight` are PRIVATE, except that ones used by ORCHIDEE (via a PUBLIC statement)
- All subroutines/functions in `interpweight` provided with a header and description of variable in same definition line after !!
- Remove all the OPTIONAL variables from `interpweight`.
 - if `initime` is -1, it is not used
 - `nonegative` is a mandatory value when modifying input values
 - Introduce new variables in `interpweight` when masking variables: `masktype`, `maskvalues` and `maskvar`
 - `provide_fractions/interpolate`, now only accept one variable with the desired shape for each function: 1D, 2D, 3D, 4D
- Enforce use of standard values in `interpweight` for number of types: ‘classnb’, ‘nvm’, ‘nolson’, ‘nzobler’, ‘nscm’,
- Introduce availability data for interpolation in the XML outputs (see appendix G as an example to add a variable in XIOS): `achem_wrice`, `achem_other`, `achem_co2`, `asoilcol`, `aalb_bg`, `alaimap`, `aveget`, `aveget5k`, `atext`, `aslope`, `reftemp`, `reftempc`
- Clarify meaning of new variables in the code
- Check all allocations
- Remove the use of `typevardims` (this would be re-introduced later when XIOS2 will be used)
- use of Fortran variable construction (/ (i, i=1,Ntypes) /) instead of function `interpweight_RangeI`
- move ‘nearest’ outside `nbpt` loop for `carteveget5km.nc` with a IF (ANY(aveget<zero))
- check use of `soils_param_usda.nc` by `slowproc_soilt` (not checked before). Also the ‘none’ case. Following documentation from A. Ducharme http://forge.ipsl.jussieu.fr/orchidee/attachment/wiki/Documentation/UserGuide/eqs_hydrol.pdf. Introduction of the new variable `ntextfile`

Table 3: Table of soil colors and their correspondence with their albedo (from `src_parameters/constants.f90`)

#	value	dry		wet	
		visible	infrared	visible	infrared
1	light (brightness=1)	0.24	0.48	0.12	0.24
2	bright (brightness=0.875)	0.22	0.44	0.11	0.22
3	sunny (brightness=0.750)	0.20	0.40	0.10	0.20
4	vivacius (brightness=0.625)	0.18	0.36	0.09	0.18
5	claire (brightness=0.500)	0.16	0.32	0.08	0.16
6	dull (brightness=0.375)	0.14	0.28	0.07	0.14
7	shadowy (brightness=0.250)	0.12	0.24	0.06	0.12
8	dusk (brightness=0.125)	0.10	0.20	0.05	0.10
9	dark (brightness=0)	0.27	0.55	0.15	0.31

Table 4: USDA soil textures and their constitution

#	value	sand [%]	clay [%]
1	Sand	0.93	0.03
2	Loamy Sand	0.81	0.06
3	Sandy Loam	0.63	0.11
4	Silt Loam	0.17	0.19
5	Silt	0.06	0.10
6	Loam	0.40	0.20
7	Sandy Clay Loam	0.54	0.27
8	Silty Clay Loam	0.08	0.33
9	Clay Loam	0.30	0.33
10	Sandy Clay	0.48	0.41
11	Silty Clay	0.06	0.46
12	Clay	0.15	0.55

B Types values

Description of the different values found in each table

B.1 Colors

The values of the descriptions for the soil colors (?) are extracted from `condveg.f90` subroutine `get_soilcorr_zobler`. Values for the file `soils_param.nc`. See the correspondence among soil color number and albedos in table 3

B.2 Textures

The values of the descriptions for the USDA soil textures (?) are extracted from `slowproc.f90` subroutine `get_soilcorr_usda`. Values (see table 4) for the file `soils_param_usda.nc`

The values of the descriptions for the Zobler soil textures (?) are extracted from `slowproc.f90` subroutine `get_soilcorr_zobler`. Values (see table 5) for the file `soils_param.nc`

B.3 Vegetation

The values of the descriptions from a simplified classification of 13 PFTs which are provided in table 6, contained in the file `PFTmap.nc`

The values of the descriptions for the Olson vegetation types (??) are extracted from `slowproc.f90` subroutine `get_vegcorr` (see table 7). Values for the file `carteveg5km.nc`

Table 5: Zobler soil textures. On <http://geonetwork.grid.unep.ch/geonetwork/srv/en/metadata.show?uuid=fb650de3-28d4-4461-92bd-36f5182b0de3> there are eight classes (organic) and their constitution

#	value	silt [%]	sand [%]	clay [%]
1	Coarse	0.12	0.82	0.06
2	Medium	0.32	0.58	0.10
3	Fine	0.39	0.43	0.18
4	Coarse-Medium	0.15	0.58	0.27
5	Coarse-Fine	0.34	0.32	0.34
6	Medium-Fine	0.00	1.00	0.00
7	Coarse-Medium-Fine	0.39	0.43	0.18

Table 6: Simplified 13 PFT map

#	value	#	value
1	bare soil	2	tropical broad-leaved evergreen
3	tropical broad-leaved raingreen	4	temperate needleleaf evergreen
5	temperate broad-leaved evergreen	6	temperate broad-leaved summergreen
7	boreal needleleaf evergreen	8	boreal broad-leaved summergree
9	boreal needleleaf summergreen	10	C3 grass
11	C4 grass	12	C3 agriculture
13	C4 agriculture		

Table 7: Olson vegetation types

#	value	#	value
1	Urban	2	Cool low sparse grassland
3	Cold conifer forest	4	Cold deciduous conifer forest
5	Cool Deciduous broadleaf forest	6	Cool evergreen broadleaf forests
7	Cool tall grasses and shrubs	8	Warm C3 tall grasses and shrubs
9	Warm C4 tall grasses and shrubs	10	Bare desert
11	Cold upland tundra	12	Cool irrigated grassland
13	Semi desert	14	Glacier ice
15	Warm wooded wet swamp	16	Inland water
17	sea water	18	cool shrub evergreen
19	cold shrub deciduous	20	Cold evergreen forest and fields
21	cool rain forest	22	cold conifer boreal forest
23	cool conifer forest	24	warm mixed forest
25	cool mixed forest	26	cool broadleaf forest
27	cool deciduous broadleaf forest	28	warm montane tropical forest
29	warm seasonal tropical forest	30	cool crops and towns
31	warm crops and towns	32	cool crops and towns
33	warm dry tropical woods	34	warm tropical rain forest
35	warm tropical degraded forest	36	warm corn and beans cropland
37	cool corn and bean cropland	38	warm rice paddy and field
39	hot irrigated cropland	40	cool irrigated cropland
41	cold irrigated cropland	42	cool grasses and shrubs
43	hot and mild grasses and shrubs	44	cold grassland
45	Savanna (woods) C3	46	Savanna woods C4
47	Mire, bog, fen	48	Warm marsh wetland
49	cold marsh wetland	50	mediterranean scrub
51	Cool dry woody scrub	52	Warm dry evergreen woods
53	Volcanic rocks	54	sand desert
55	warm semi desert shrubs	56	cool semi desert shrubs
57	semi desert sage	58	Barren tundra
59	cool southern hemisphere mixed forest	60	cool fields and woods
61	warm forest and field	62	cool forest and field
63	warm C3 fields and woody savanna	64	warm C4 fields and woody savanna
65	cool fields and woody savanna	66	warm succulent and thorn scrub
67	cold small leaf mixed woods	68	cold deciduous and mixed boreal forest
69	cold narrow conifers	70	cold wooded tundra
71	cold heath scrub	72	Polar and alpine desert
73	warm Mangrove	74	cool crop and water mixtures
75	cool southern hemisphere mixed forest	76	cool moist eucalyptus
77	warm rain green tropical forest	78	warm C3 woody savanna
79	warm C4 woody savanna	80	cool woody savanna
81	cold woody savanna	82	warm broadleaf crops
83	warm C3 grass crops	84	warm C4 grass crops
85	cool grass crops	86	warm C3 crops grass, shrubs
87	cool crops, grass, shrubs	88	warm evergreen tree crop
89	cool evergreen tree crop	90	cold evergreen tree crop
91	warm deciduous tree crop	92	cool deciduous tree crop
93	cold deciduous tree crop	94	wet sclerophylic forest

C interpweight

The current interpolation of the required data to run ORCHIDEE has been modified to a new methodology in which, new generic subroutines have been designed. All the new required subroutines and functions are contained in module `src_global/module_InterpWeight.f90` (see table 9). The final idea is to prepare the code in order to make easy the transformation from the current Input/Output use of the IOIPSL (<http://lmdz.lmd.jussieu.fr/utilisateurs/faq-en/installation/comment-installer-ioipsl-et-loutil-rebuild>) libraries to the new ones XIOS. This subroutine called `InterpWeight[N]D`, has three different versions as function of the input data to interpolate (1, 2, 3 and 4-D data).

The three versions have a similar call (taken the 3D version as reference⁵):

```
interpweight_3D(nbpt, Nvariabletypes, variabletypes, lalo, resolution,
neighbours, contfrac, filename, varname, inlonname, inlatname, varmin,
varmax, noneg, masktype, maskvalues, maskvarname, dim1, dim2, initime,
typefrac, plevel, nout, maxresollon, maxresollat, outvar3D, aoutvar)
```

Characteristic of the variables passed to the subroutine are provided in table 8.

⁵**NOTE:** Not all the subroutines have all the masking options

Table 8: Information of the variables used on the InterpWeight [N]D subroutines

name	type	dimension	intent	description
nbpt	INTEGER ^a	-	in	Number of points for which the data needs to be interpolated
Nvariabletypes ^b	INTEGER	-	in	Number of types of the variable
variabletypes	REAL ^c	(Nvariabletypes)	in	Vector of values of the types
lalo	REAL	(nbpt,2)	in	Vector of latitude and longitudes (beware of the order = 1 : latitude, 2 : longitude)
resolution	REAL	(nbpt,2)	in	The size in km of each grid-box in X and Y
neighbours	INTEGER	(nbpt,8)	in	Vector of neighbours for each grid point (1=N, 2=NE, 3=E, 4=SE, 5=S, 6=SW, 7=W, 8=NW)
contfrac	REAL	(nbpt)	in	Fraction of land in each grid box
filename	CHAR ^{80d}	-	in	name of the input map to read
varname	CHAR ⁸⁰	-	in	name of the variable to interpolate
inlonname	CHAR ⁸⁰	-	in	names of the longitude in the input file
inlatname	CHAR ⁸⁰	-	in	names of the latitude in the input file
varmin	REAL	(d1)	inout	min values to use for the renormalization ^e
varmax	REAL	(d1)	inout	max values to use for the renormalization
noneg	LOGICAL	-	in	mask negative values
masktype	CHAR ^{50f}	-	in	Type of masking 'nomask': no-mask is applied 'mbelow': take values below mvalues(1) ^g 'mabove': take values above mvalues(1) 'msumrange': take values within 2 ranges; mvalues(2) <= SUM(vals(k)) <= mvalues(1) mvalues(1) < SUM(vals(k)) <= mvalues(3) (normalize by mvalues(3)) 'var': mask values are taken from a variable (>0.)
maskvalues	REAL	(3)	in	values to use to mask (according to 'masktype')
maskvarname	CHAR ^{250h}	-	in	name of the variable inside the file with the mask
typefrac	CHAR ⁵⁰	-	in	Type of fraction retrieval: 'XYKindTime': Input values are kinds of something with a temporal evolution on the dx*dy matrix'
dim1	INTEGER*	-	in	3D dimension of the output variable ⁱ
dim2	INTEGER*	-	in	4D dimension of the output variable ^j
intime	INTEGER*	-	in	Initial time to take (for input data with time values)
plevel	INTEGER*	-	in	Level of print (for debugging, 0 to 5)
nout	INTEGER*	-	in	Standard output unit
outvar3D	REAL	(nbpt,d1)	out	3D output variable and re-dimensioned
aoutvar	REAL	(nbpt)	out	Availability of input data for the interpolation
sumfrac	REAL	(nbpt)	out	TOTAL sum of spatial fractions used in the grid point

^ainteger kind i_std=4

^bshortcut Nvartyp

^creal kind r_std=4

^dequivalent to CHARACTER (LEN=80)

^ein interpweight_2D this value and varmax are scalars

^fequivalent to CHARACTER (LEN=50)

^gshortcut of maskvalues(1)

^hequivalent to CHARACTER (LEN=250)

ⁱusually Nvartyp

^jusually time

Table 9: Subroutines and functions of the new module `src_global/module_InterpWeight.f90`. S: subroutine, F: function

name	type	description
<code>interpweight_1D</code>	S	Interpolate any input file to the grid of the model for a 1D-variable
<code>interpweight_2D</code>	S	Interpolate any input file to the grid of the model for a 2D-variable
<code>interpweight_3D</code>	S	Interpolate any input file to the grid of the model for a 3D-variable
<code>interpweight_4D</code>	S	Interpolate any input file to the grid of the model for a 4D-variable
<code>interpweight_2Dcont</code>	S	Interpolate any input file to the grid of the model for a continuous 2D-variable
<code>interpweight_4Dcont</code>	S	Interpolate any input file to the grid of the model for a continuous 4D-variable
<code>interpweight_calc_resolution_in</code>	S	Compute the resolution of the input data
<code>interpweight_modifying_input1D</code>	S	Modify the initial 1D values from the given file
<code>interpweight_modifying_input2D</code>	S	Modify the initial 2D values from the given file
<code>interpweight_modifying_input3D</code>	S	Modify the initial 3D values from the given file
<code>interpweight_modifying_input4D</code>	S	Modify the initial 4D values from the given file
<code>interpweight_masking_input1D</code>	S	Mask input 1D values
<code>interpweight_masking_input2D</code>	S	Mask input 2D values
<code>interpweight_masking_input3D</code>	S	Mask input 3D values
<code>interpweight_masking_input4D</code>	S	Mask input 4D values
<code>interpweight_provide_fractions1D</code>	S	Provide 1D fractions from a 1D incoming variable
<code>interpweight_provide_fractions2D</code>	S	Provide 2D fractions from a 2D incoming variable
<code>interpweight_provide_fractions3D</code>	S	Provide 3D fractions from a 3D incoming variable
<code>interpweight_provide_fractions4D</code>	S	Provide 4D fractions from a 4D incoming variable
<code>interpweight_provide_interpolation2D</code>	S	Provide 2D interpolation from a continuous 2D incoming variable
<code>interpweight_provide_interpolation4D</code>	S	Provide 4D interpolation from a continuous 4D incoming variable
<code>interpweight_handle_err</code>	S	Provide the error message when something with netCDF went wrong ^a
<code>interpweight_get_var2dims_file</code>	F	Get the dimensions of a given 2D variable inside a file
<code>interpweight_get_var3dims_file</code>	F	Get the dimensions of a given 3D variable inside a file
<code>interpweight_get_var4dims_file</code>	F	Get the dimensions of a given 4D variable inside a file
<code>interpweight_get_varNdims_file</code>	F	Get the number of dimensions of a given variable inside a file
<code>interpweight_Index1DArrayI</code>	F	Provide the first index of a given value inside a 1D integer array
<code>interpweight_Index1DArrayR</code>	F	Provide the first index of a given value inside a 1D real array
<code>interpweight_Index2DArrayI</code>	F	Provide the first index of a given value inside a 2D integer array
<code>interpweight_Index2DArrayR</code>	F	Provide the first index of a given value inside a 2D real array
<code>interpweight_Index1DLonLat</code>	F	Provide the first index of a given pair of longitude and latitude from a set of lon, lat 1D arrays
<code>interpweight_Index2DLonLat</code>	F	Provide the first index of a given pair of longitude and latitude from a set of lon, lat 2D arrays
<code>interpweight_RangeI</code>	F	Provide a range of d1 values from 'iniv' to 'endv', of integer values in a vector
<code>interpweight_RangeR</code>	F	Provide a range of d1 values from 'iniv' to 'endv', of real values in a vector
<code>interpweight_ValVecI</code>	F	Provide the number of times and where that a given value 'oper' on a vector of integers
<code>interpweight_ValVecR</code>	F	Provide the number of times and where that a given value 'oper' on a vector of reals

^afrom http://www.unidata.ucar.edu/software/netcdf/docs/group__error.html

D DYNAMICO-ORCHIDEE in CICLAD

D.1 Compilation

This are the different steps followed for the compilation of the coupling ORCHIDEE-DYNAMICO in ciclad

1. Settin up ORCHIDEE subversion user in ciclad:

```
$ svn co --username lluis.fita
```

2. Checking out the code:

```
$ svn co http://forge.ipsl.jussieu.fr/igcmg/svn/modipsl/trunk modipsl
```

3. Setting up new model related to the coupling DYNAMICO-ORCHIDEE:

```
$ cd modipsl/util
vim mod.def
```

```
#-H- ORCHIDEE_DYNAMICO ORCHIDEE-DYNAMICO configuration
#-H- ORCHIDEE_DYNAMICO This is a working configuration using the latest revision of ORCHIDEE trunk
#-M- ORCHIDEE_DYNAMICO Josefina.Ghattas@ipsl.jussieu.fr
#-C- ORCHIDEE_DYNAMICO IOIPSL/tags/v2_2_2/src HEAD 8 IOIPSL/src modeles

#-C- ORCHIDEE_DYNAMICO branches/ORCHIDEE-DYNAMICO/ORCHIDEE HEAD 14 ORCHIDEE modeles
#-C- ORCHIDEE_DYNAMICO trunk/ORCHIDEE_OL HEAD 14 ORCHIDEE_OL config
#-C- ORCHIDEE_DYNAMICO XIOS/branchs/xios-1.0 604 12 XIOS modeles
```

4. Getting the code⁶

```
$ ./model ORCHIDEE_DYNAMICO
```

5. Compiling the code⁷:

```
$ ./ins_make >& run_ins_make.log
```

6. **debugging NOTE:** Changes in AA_make.gdef⁸

```
#-Q- ifort_CICLAD #F_O = -DCPP_PARA -O3 $(F_D) $(F_P) -I$(MODDIR)
-module $(MODDIR) -fp-model precise
#-Q- ifort_CICLAD F_O = -DCPP_PARA -p -g -traceback -fp-stack-check
-fttrapuv -check bounds $(F_D) $(F_P) -I$(MODDIR) -module $(MODDIR)
```

7. Going there:

```
$ cd ../config/ORCHIDEE_OL
```

8. Modifying some issues for compilation in CICLAD (in Makefile, adding no-parallel compilation):

```
(...) ./make_xios --netcdf_lib netcdf4_seq (...)
```

⁶**NOTE:** use the right pwd for the subversion user!!

⁷following <http://forge.ipsl.jussieu.fr/igcmg/wiki/IPSLCM5A#Commentacc%27a9der%27a0IPSLCM5Acompileretlancerunepremi%27a8reexp%27a9rience>

⁸after <http://forge.ipsl.jussieu.fr/orchidee/wiki/Documentation/UserGuide/flags>

9. Compiling

```
$ make >& run_gmake.log
```

10. Checking for errors (should be empty):

```
$ cat -n run_gmake.log | grep Error
$ cat -n run_gmake.log | grep Erreur
```

11. A version problem occurred during the process. See appendix [D.1.1](#) for more information**D.1.1 Subversion problem**

During the implementation of the changes, initial working copy of `src_sechiba/condveg.f90` and `src/sechiba/slowproc.f90` were not the same as the versions in the branch. Thus, a compilation problem arises:

In order to fix it, branch is updated with the last version of the trunk, on `Thu Feb 4 11:42:42 CET 2016`:

1. Gathering trunk version when the branch was created (on the branch working copy):

```
$ svn log | more
(...)
-----
r3141 | lluis.fita | 2016-01-21 17:50:16 +0100 (Thu, 21 Jan 2016) | 2
lines

Adding first version of the new interpolation

-----
r3129 | josefine.ghattas | 2016-01-18 15:25:52 +0100 (Mon, 18 Jan 2016)
| 3 lines

Copied revision 3115 on the trunk into new branch ORCHIDEE-DYNAMICO.
(...)
```

2. Getting actual version of the branch:

```
$ svn up
U arch/arch-X64_ADA.fcm
U arch/arch-X64_ADA.path
Updated to revision 3190.
```

3. Getting branch information:

```
$ svn info
Path: .
URL: svn://forge.ipsl.jussieu.fr/orchidee/branches/ORCHIDEE-DYNAMICO/ORCHIDEE
Repository Root: svn://forge.ipsl.jussieu.fr/orchidee
Repository UUID: f489ceea-5127-0410-b15c-c4a6149ed9a7
Revision: 3190
Node Kind: directory
Schedule: normal
Last Changed Author: yann.meurdesoif
Last Changed Rev: 3190
Last Changed Date: 2016-02-04 06:51:47 +0100 (Thu, 04 Feb 2016)
```

4. Merging with trunk version:

```

$ svn merge -r 3129:3190 svn://forge.ipsl.jussieu.fr/orchidee/trunk/ORCHIDEE
--- Merging r3130 through r3190 into '.':
--- Merging r3130 through r3190 into '.':
U   src_parallel/xios_orchidee.f90
U   src_parallel/ioipsl_para.f90
U   orchidee.default
U   src_sechiba/condveg.f90
Conflict discovered in 'src_sechiba/slowproc.f90'.
Select: (p) postpone, (df) diff-full, (e) edit,
(mc) mine-conflict, (tc) theirs-conflict,
(s) show all options: p
C   src_sechiba/slowproc.f90
U   src_parameters/constantes.f90
U   src_parameters/constantes_mtc.f90
U   src_parameters/constantes_var.f90
Summary of conflicts:
Text conflicts: 1

```

5. Getting actual status:

```

$ svn st
?   .config
(...)
M   src_parallel/xios_orchidee.f90
M   src_parallel/ioipsl_para.f90
M   orchidee.default
?   src_sechiba/slowproc.f90.working
?   src_sechiba/slowproc.f90.merge-right.r3190
?   src_sechiba/slowproc.f90.merge-left.r3129
M   src_sechiba/condveg.f90
C   src_sechiba/slowproc.f90
M   src_parameters/constantes_mtc.f90
M   src_parameters/constantes_var.f90
M   src_parameters/constantes.f90

```

The conflict arises as:

```

<<<<<< .working
=====

!! =====
!! SUBROUTINE   : slowproc_change_frac
!!
!!>\BRIEF       Update the vegetation fractions
!!
!! DESCRIPTION  : Update the vegetation fractions. This subroutine is called in the same time step as lchange in stomatelpj has
!!                has been done. This subroutine is called after the diagnostics have been written in sechiba_main.
!!
!! RECENT CHANGE(S): None
!!
!! MAIN OUTPUT VARIABLE(S) :: veget_max, veget, frac_nobio, totfrac_nobio, tot_bare_soil, soiltile
!!
!! REFERENCE(S) : None
!!
!! FLOWCHART    : None
!! \n
!! _
!! =====

SUBROUTINE slowproc_change_frac(kjpindex, lai, &
                                veget_max, veget, frac_nobio, totfrac_nobio, tot_bare_soil, soiltile)
!
! 0. Declarations
!
! 0.1 Input variables
INTEGER(i_std), INTENT(in)          :: kjpindex    !! Domain size - terrestrial pixels only
REAL(r_std), DIMENSION (kjpindex, nvm), INTENT(in) :: lai        !! Leaf area index (m^2 m^{-2})

! 0.2 Output variables
REAL(r_std), DIMENSION (kjpindex, nvm), INTENT(out) :: veget_max    !! Maximum fraction of vegetation type including none biological fraction (unitless)
REAL(r_std), DIMENSION (kjpindex, nvm), INTENT(out) :: veget        !! Fraction of vegetation type including none biological fraction (unitless)
REAL(r_std), DIMENSION (kjpindex, nnobio), INTENT(out) :: frac_nobio  !! Fraction of ice, lakes, cities etc. in the mesh
REAL(r_std), DIMENSION (kjpindex), INTENT(out)       :: totfrac_nobio !! Total fraction of ice+lakes+cities etc. in the mesh
REAL(r_std), DIMENSION (kjpindex), INTENT(out)       :: tot_bare_soil  !! Total evaporating bare soil fraction
REAL(r_std), DIMENSION (kjpindex, nstm), INTENT(out) :: soiltile     !! Fraction of each soil tile (0-1, unitless)

! 0.3 Local variables
INTEGER(i_std)          :: ji, jv        !! Loop index

!! Update vegetation fractions with the values coming from the vegetation file read in slowproc_readvegetmax.
!! Partial update has been taken into account for the case with DGVM and AGRICULTURE in slowproc_readvegetmax.
veget_max = veget_max_new
frac_nobio = frac_nobio_new

!! Verification and correction on veget_max, calculation of veget and soiltile.
CALL slowproc_veget (kjpindex, lai, frac_nobio, totfrac_nobio, veget_max, veget, soiltile)

!! Calculate tot_bare_soil needed in hydrol, diffuco and condveg
tot_bare_soil(:) = veget_max(:,1)
DO jv = 2, nvm
  DO ji = 1, kjpindex
    tot_bare_soil(ji) = tot_bare_soil(ji) + (veget_max(ji, jv) - veget(ji, jv))
  ENDDO
END DO
>>>>>> .merge-right.r3190

END MODULE slowproc

```

6. Accepting trunk version:

```

$ svn revert src_sechiba/slowproc.f90
Reverted 'src_sechiba/slowproc.f90'

```

7. Actual status:

```

$ svn st ?      .config M      src_parallel/xios_orchidee.f90
M      src_parallel/ioipsl_para.f90
M      orchidee.default
M      src_sechiba/condveg.f90
M      src_parameters/constantes_mtc.f90
M      src_parameters/constantes_var.f90
M      src_parameters/constantes.f90

```

8. Committing changes:

```

$ svn commit src_parallel/xios_orchidee.f90 src_parallel/ioipsl_para.f90
orchidee.default src_sechiba/condveg.f90 src_parameters/constants_mtc.f90
src_parameters/constants_var.f90 src_parameters/constants.f90
Sending orchidee.default
Sending src_parallel/ioipsl_para.f90
Sending src_parallel/xios_orchidee.f90
Sending src_parameters/constants.f90
Sending src_parameters/constants_mtc.f90
Sending src_parameters/constants_var.f90
Sending src_sechiba/condveg.f90
Transmitting file data .....
Committed revision 3191.

```

9. After some attempts, code is fixed manually, giving a final revision number # 3197

D.1.2 compiling rebuild

D.2 Running tests

D.2.1 standard

1. From: /data/lfita/etudes/DYNAMICO/ORCHIDEE/tests/ORCHIDEE_OL/dynor and following: <https://forge.ipsl.jussieu.fr/orchidee/wiki/Documentation/UserGuide/TestCase1>
2. Getting the files directly from ciclad

```

$ cp /prodigfs/ipslfs/igcmg/IGCM/SRF/METEO/NCC/ncc_for_1982.nc
forcing_file.nc
$ cp /prodigfs/ipslfs/igcmg/IGCM/SRF/PFTmap_1850to2005_AR5_LUHa.rc2/PFTmap_IPCC_1982.nc
./PFTmap.orig.nc
$ cp /prodigfs/ipslfs/igcmg/IGCM/SRF/soils_param.nc
./soils_param.orig.nc
$ cp /prodigfs/ipslfs/igcmg/IGCM/SRF/reftemp.nc ./

```

3. Using the new files with the descriptive variable (**NOTE: NOT needed!!!**):

```

$ ln -s new_PFTmap.nc ./PFTmap.nc
$ ln -s new_soils_param.nc ./soils_param.nc

```

4. Getting the XIOS files:

```

$ cp /data/lfita/DATA/modipsl/modeles/ORCHIDEE/src_xml/iodef_xios1.xml
./iodef.xml $ cp /data/lfita/DATA/modipsl/modeles/ORCHIDEE/src_xml/context_orchidee.xml
./
$ cp /data/lfita/DATA/modipsl/modeles/ORCHIDEE/src_xml/field_def_orchidee.xml
./
$ cp /data/lfita/DATA/modipsl/modeles/ORCHIDEE/src_xml/file_def_orchidee.xml
.

```

5. Keeping an original copy of the file, an modifying it accordingly (also buffer increase):

```

$ cp file_def_orchidee.xml file_def_orchidee.orig.xml
$ vim file_def_orchidee.xml

```

6. Getting 'run.def' and edditing it accordngly:

```
$ cp /data/lfita/DATA/modips1/config/ORCHIDEE_OL/FORCESOIL/PARAM/run.def
./
$ vim run.def
```

7. Running it:

- Running it manually

- (a) Loading environment

```
$ module load openmpi/1.4.5-ifort
$ module load netcdf4/4.2.1.1-ifort
$ ulimit -s unlimited
```

- (b) Running it

```
$ ./orchidee_ol > out_orchidee_ol 2>&1
```

- (c) Remember to remove restart files if has been any error:

```
$ rm *rest*
```

- (d) Rebuilding after run

```
$ module load netcdf4/4.2.1.1-ifort
$ module load openmpi/1.4.5-ifort
/home/igcmg/rebuild/src_X64_CICLAD/modips1_v2_2_3_netcdf4.2/bin/rebuild
-o sechiba_out_2.nc sechiba_out_2_0*
/home/igcmg/rebuild/src_X64_CICLAD/modips1_v2_2_3_netcdf4.2/bin/rebuild
-o sechiba_history.nc sechiba_history_0*
/home/igcmg/rebuild/src_X64_CICLAD/modips1_v2_2_3_netcdf4.2/bin/rebuild
-o stomate_history.nc stomate_history_0*
/home/igcmg/rebuild/src_X64_CICLAD/modips1_v2_2_3_netcdf4.2/bin/rebuild
-o stomate_ipcc_history.nc stomate_ipcc_history_0*
```

- Running it in parallel

- (a) Getting the script

```
$ cp /home/lfita/etudes/OR4L/ciclad/run_orchidee_ol-intel_mpi-openmp.pbs
./
```

- (b) Running it

```
$ qsub run_orchidee_ol-intel_mpi-openmp.pbs
```

D.2.2 Execution errors

- Buffer size error:

```
(...)
> Error [CCClientBuffer::hasSpace(int size)] : In file
'/data/lfita/DATA/modips1/modeles/XIOS/src/buffer_client.cpp', line 49 -> request
size is too big for buffer, increase buffer client size
Current buffer_size : 10000000
buffer_size must be > 36937124
```

```
Modify in 'iodef.xml' buffer_size:
    <variable id="buffer_size"
                                type="integer">36937124</variable>
```

D.3 Running control runs

In order to compare results from modifications. A series of 'control' is needed. Thus, a new installation/compilation of ORCHIDEE is done. From /data/lfita/DATA/:

D.3.1 standard

- Getting the code in a new folder `modipsl_preDYN`

```
$ svn co http://forge.ipsl.jussieu.fr/igcmg/svn/modipsl/trunk
modipsl_preDYN
```

- Setting up new model related to the version just before the modifications started coupling DYNAMICO-ORCHIDEE (remember merging with trunk!):

```
$ cd modipsl/util
vim mod.def
```

```
#-H- ORCHIDEE_trunk  ORCHIDEE-DYNAMICO configuration
#-H- ORCHIDEE_trunk  This is a working configuration using the latest revision of ORCHIDEE trunk
#-M- ORCHIDEE_trunk  Josefina.Ghettas@ipsl.jussieu.fr
#-C- ORCHIDEE_trunk  IOIPSL/tags/v2_2_2/src                HEAD    8  IOIPSL/src        modeles

#-C- ORCHIDEE_trunk  branches/ORCHIDEE-DYNAMICO/ORCHIDEE      3190   14 ORCHIDEE          modeles
#-C- ORCHIDEE_trunk  trunk/ORCHIDEE_OL                    HEAD   14 ORCHIDEE_OL       config
#-C- ORCHIDEE_trunk  XIOS/branches/xios-1.0                604    12 XIOS              modeles
```

- Getting the code⁹

```
$ ./model ORCHIDEE_trunk
```

- Compiling the code¹⁰:

```
$ ./ins_make >& run_ins_make.log
```

- Going there:

```
$ cd ../config/ORCHIDEE_OL
```

- Modifying some issues for compilation in CICALD (in `Makefile`, adding no-parallel compilation):

```
(...) ./make_xios (...) --netcdf_lib netcdf4_seq (...)
```

- Compiling

```
$ gmake >& run_gmake.log
```

- Checking for errors (should be empty):

```
$ cat -n run_gmake.log | grep Error
$ cat -n run_gmake.log | grep Erreur
```

- Execution folder:

```
$ cd /data/lfita/etudes/DYNAMICO/ORCHIDEE/tests/ORCHIDEE_OL/control
```

- Getting the files from ciclad

⁹**NOTE:** use the right pwd for the subversion user!!

¹⁰following <http://forge.ipsl.jussieu.fr/igcmg/wiki/IPSLCM5A#Commentacc%3a9der%c3%a0IPSLCM5Acompileretlancerunepremi%3a8reexp%3a9rience>

```

$ cp /prodigfs/ipslfs/igcmg/IGCM/SRF/METEO/NCC/ncc_for_1982.nc
forcing_file.nc
$ cp /prodigfs/ipslfs/igcmg/IGCM/SRF/PFTmap_1850to2005_AR5_LUHa.rc2/PFTmap_IPCC_1982.nc
./PFTmap.nc
$ cp /prodigfs/ipslfs/igcmg/IGCM/SRF/soils_param.nc ./
$ cp /prodigfs/ipslfs/igcmg/IGCM/SRF/reftemp.nc ./

```

12. Getting the XIOS files:

```

$ cp /data/lfita/DATA/modipsl/modeles/ORCHIDEE/src_xml/iodef_xios1.xml
./iodef.xml $ cp /data/lfita/DATA/modipsl/modeles/ORCHIDEE/src_xml/context_orchidee.xml
./
$ cp /data/lfita/DATA/modipsl/modeles/ORCHIDEE/src_xml/field_def_orchidee.xml
./
$ cp /data/lfita/DATA/modipsl/modeles/ORCHIDEE/src_xml/file_def_orchidee.xml
.

```

13. Keeping an original copy of the file, an modifying it accordingly:

```

$ cp file_def_orchidee.xml file_def_orchidee.orig.xml
$ vim file_def_orchidee.xml

```

14. Getting 'run.def' and edditing it accordongly:

```

$ cp /data/lfita/DATA/modipsl/config/ORCHIDEE_OL/FORCESOIL/PARAM/run.def
./
$ vim run.def

```

15. Getting the executable:

```

$ ln -s /data/lfita/DATA/modipsl_preDYN/bin/orchidee_ol ./

```

16. Running it:

- Running it manually

- (a) Loading environment

```

$ module load openmpi/1.4.5-ifort
$ module load netcdf4/4.2.1.1-ifort
$ ulimit -s unlimited

```

- (b) Running it

```

$ ./orchidee_ol > out_orchidee_ol 2>&1

```

- (c) Remember to remove restart files if has been any error:

```

$ rm *rest*

```

- Running it in parallel

- (a) Getting the script

```

$ cp /home/lfita/etudes/OR4L/ciclad/run_orchidee_ol-intel_mpi-openmp.pbs
./

```

- (b) Running it

```

$ qsub run_orchidee_ol-intel_mpi-openmp.pbs

```


D.3.2 using carteveget5km.nc

1. First one should indicate in the `run.def` file the use of a new vegetation map.

```
VEGETATION_FILE = carteveg5km.nc
LAND_USE = n
IMPOSE_VEG = n
MAP_PFT_FORMAT = n
```

2. Getting the required file

```
$ cp /prodigfs/ipslfs/igcmg/IGCM/SRF/carteveg5km.nc ./
```

3. running the simulation

```
$ qsub run_orchidee_ol-intel_mpi-openmp.pbs
```

D.3.3 activating routing

1. First one should indicate in the `run.def` file the use of routing.

```
RIVER_ROUTING = y
ROUTING_FILE = routing.nc
HYDROL_CWRR = y
DT_ROUTING = 86400
RIVER_DESC = y
RIVER_DESC_FILE = river_desc.nc
ROUTING_RIVERS = 50
```

2. Getting the required files

```
$ cp /prodigfs/ipslfs/igcmg/IGCM/SRF/routing.nc ./
cp /prodigfs/ipslfs/igcmg/IGCM/SRF/cartepente2d_15min.nc ./
```

3. running the simulation

```
$ qsub run_orchidee_ol-intel_mpi-openmp.pbs
```

D.3.4 using alb_bg_jrctip.nc

1. First one should indicate in the `run.def` file the use the file.

```
ALB_BG_MODIS=y
```

2. Getting the required file

```
$ cp /prodigfs/ipslfs/igcmg/IGCM/SRF/albedo/alb_bg_jrctip.nc ./
```

3. running the simulation

```
$ qsub run_orchidee_ol-intel_mpi-openmp.pbs
```

D.3.5 using reftemp.nc

1. First one should indicate in the `run.def` file the use the file.

```
READ_REFTEMP=y
```

2. Getting the required file

```
$ cp /prodigfs/ipslfs/igcmg/IGCM/SRF/reftemp.nc ./
```

3. running the simulation

```
$ qsub run_orchidee_ol-intel_mpi-openmp.pbs
```

D.3.6 using orchidee_fertilizer_1995.nc

1. First one should indicate in the `run.def` file the use the file.

```
CHEMISTRY_BVOC = y  
CO2_FOR_BVOC_WILKINSON=n  
CO2_FOR_BVOC_POSELL=n
```

2. Getting the required files

```
$ cp /prodigfs/ipslfs/igcmg/IGCM/SRF/chemistry/orchidee_fertilizer_1995.nc  
./  
$ cp /prodigfs/ipslfs/igcmg/IGCM/SRF/chemistry/orchidee_bbg_clim.nc ./
```

3. running the simulation

```
$ qsub run_orchidee_ol-intel_mpi-openmp.pbs
```

D.3.7 using 'none' as soils texture

1. First one should indicate in the `run.def` file the use of 'none' soil textures

```
HYDROL_CWRR = y  
SOILTYPE_CLASSIF = none  
SOILCLASS_FILE = soils_param.nc  
SOILALB_FILE = soils_param.nc
```

2. Getting the required file

```
$ cp /prodigfs/ipslfs/igcmg/IGCM/SRFsoils_param.nc ./
```

3. running the simulation

```
$ qsub run_orchidee_ol-intel_mpi-openmp.pbs
```

D.3.8 using soils_param_usda.nc

1. First one should indicate in the `run.def` file the use of the complementary textures map¹¹.

```
HYDROL_CWRR = y
SOILTYPE_CLASSIF = usda
SOILCLASS_FILE = soils_param_usda.nc
SOILALB_FILE = soils_param.nc
```

2. Getting the required file

```
$ cp /prodigfs/ipslfs/igcmg/IGCM/SRFsoils_param_usda.nc ./
```

3. running the simulation

```
$ qsub run_orchidee_ol-intel_mpi-openmp.pbs
```

D.3.9 using alb_bg.nc

1. After merge with trunk r3711, there is a new albedo file with two variables 'bg_alb_vis', 'bg_alb_nir'
2. Getting the required file

```
$ cp /prodigfs/ipslfs/igcmg/IGCM/SRF/albedo/alb_bg_modisopt_2D.nc
alb_bg.nc ./
```

3. running the simulation

```
$ qsub run_orchidee_ol-intel_mpi-openmp.pbs
```

D.3.10 using lai2D.nc

1. First one should indicate in the `run.def` file the use the file.

```
LAI_FILE = lai2D_03.nc
STOMATE_OK_CO2= y
STOMATE_OK_STOMATE= n
LAI_MAP = y
```

2. Getting the required file

```
$ ln -s /prodigfs/ipslfs/igcmg/IGCM/SRF/lai2D_03.nc ./
```

3. running the simulation

```
$ qsub run_orchidee_ol-intel_mpi-openmp.pbs
```

¹¹Following documentation from A. Ducharne http://forge.ipsl.jussieu.fr/orchidee/attachment/wiki/Documentation/UserGuide/eqs_hydrol.pdf

D.3.11 using ORCHIDEE_13PFTmap_2010_cmpi6_LUH2v2h.nc

1. First one should indicate in the `run.def` file the use of a new PFT map at 0.25° of horizontal resolution.

```
VEGETATION_FILE = PFTmap_025.nc
```

2. Getting the required file

```
$ ln -s /data/jgipsl/ORCHIDEE_13PFTmap_2010_cmpi6_LUH2v2h.nc  
./PFTmap_025.nc
```

3. running the simulation

```
$ qsub run_orchidee_ol-intel_mpi-openmp.pbs
```

E Trunk merging

Once modifications have been checked and shown that they work, one needs to merge with the trunk in order to have the modifications with the last version of the trunk. Doing that, modifications in the branch will be ready to be fully incorporated with trunk and make them available for every ORCHIDEE user.

```
$ svn merge -r [branch_trunk_rev]:[trunk_rev]
  svn://forge.ipsl.jussieu.fr/orchidee/trunk/ORCHIDEE
```

1. Current version of the trunk

```
$ svn info svn://forge.ipsl.jussieu.fr/orchidee/trunk/ORCHIDEE
Path: ORCHIDEE
URL: svn://forge.ipsl.jussieu.fr/orchidee/trunk/ORCHIDEE
Repository Root: svn://forge.ipsl.jussieu.fr/orchidee
Repository UUID: f489ceea-5127-0410-b15c-c4a6149ed9a7
Revision: 3469
Node Kind: directory
Last Changed Author: anne.cozic
Last Changed Rev: 3462
Last Changed Date: 2016-05-25 10:31:04 +0200 (Wed, 25 May 2016)
```

2. Starting point. **NOTE: Make sure there is not any pending commit in the branch!!!**¹²

```
$ svn info
Path: .
URL: svn://forge.ipsl.jussieu.fr/orchidee/branches/ORCHIDEE-DYNAMICO/ORCHIDEE
Repository Root: svn://forge.ipsl.jussieu.fr/orchidee
Repository UUID: f489ceea-5127-0410-b15c-c4a6149ed9a7
Revision: 3214
Node Kind: directory
Schedule: normal
Last Changed Author: lluis.fita
Last Changed Rev: 3198
Last Changed Date: 2016-02-08 05:41:44 +0100 (Mon, 08 Feb 2016)
```

3. The merge will be done first in dry mode to check what will be changed (branch was merged with trunk revision 3190)

¹²\$svn st, should only have ? as file status!

```
$ svn merge --dry-run -r 3190:3469 svn://forge.ipsl.jussieu.fr/orchidee/trunk/ORCHIDEE
--- Merging r3191 through r3469 into '.':
U   src_parallel/xios_orchidee.f90
U   src_parallel/mod_orchidee_omp_transfert.F90
U   src_parallel/mod_orchidee_para.F90
U   src_parallel/mod_orchidee_para_var.F90
UU  src_parallel/mod_orchidee_transfert_para.F90
U   makeorchidee_fcm
U   orchidee.default
U   src_sechiba/sechiba.f90
U   src_sechiba/hydrol.f90
U   src_sechiba/hydrolc.f90
C   src_sechiba/chemistry.f90
C   src_sechiba/slowproc.f90
U   src_sechiba/diffuco.f90
U   src_sechiba/enerbil.f90
U   src_sechiba/intersurf.f90
U   src_sechiba/ioipslctrl.f90
C   src_sechiba/thermosoil.f90
C   src_sechiba/condveg.f90
U   src_sechiba/routing.f90
C   src_sechiba/thermosoilc.f90
U   src_sechiba/explicitsnow.f90
U   src_xml/context_orchidee.xml
U   src_xml/file_def_orchidee.xml
U   src_xml/field_def_orchidee.xml
A   src_global/module_llxy.f90
A   src_global/polygones.f90
A   src_global/interregxy.f90
U   src_global/solar.f90
A   src_global/haversine.f90
U   src_global/interpol_help.f90
U   src_global/grid.f90
U   src_parameters/constantes_soil_var.f90
U   src_parameters/vertical_soil.f90
U   src_parameters/control.f90
U   src_parameters/constantes_mtc.f90
U   src_parameters/pft_parameters_var.f90
U   src_parameters/constantes_soil.f90
U   src_parameters/constantes_var.f90
U   src_parameters/pft_parameters.f90
U   arch/arch-ifort_LSCE.fcm
U   arch/arch-ifort_CICLAD.fcm
C   arch/arch-X64_ADA.fcm
U   arch/arch-X64_CURIE.fcm
U   src_stomate/stomate.f90
U   src_stomate/lpj_pftinout.f90
U   src_stomate/stomate_lpj.f90
U   src_stomate/lpj_establish.f90
U   src_stomate/stomate_io.f90
U   bld.cfg
```

```

A   src_oasisdriver
A   src_oasisdriver/orchideeoasis.f90
A   src_oasisdriver/orchoasis_tools.f90
A   src_oasisdriver/driver2oasis.f90
U   src_driver/teststomate.f90
A   src_driver/orchideedriver.f90
A   src_driver/globgrd.f90
A   src_driver/getlandseamask.f90
U   src_driver/dim2_driver.f90
A   src_driver/forcing_tools.f90
U   src_driver/readdim2.f90
A   src_driver/testrouting.f90
Summary of conflicts:
Text conflicts: 6

```

4. All the conflicts will be solved later (`postpone (p)`)

```

$ svn merge -r 3190:3469 svn://forge.ipsl.jussieu.fr/orchidee/trunk/ORCHIDEE
$ svn st
?   arch.fcm
?   .config
?   svn-commit.tmp
?   lib
?   diffs.inf
?   arch.path
?   bin
?   config.fcm
?
?   Makefile
?   src_stomate/Makefile
M   src_stomate/lpj_establish.f90
M   src_stomate/stomate_io.f90
M   src_stomate/stomate.f90
M   src_stomate/lpj_pftinout.f90
M   src_stomate/stomate_lpj.f90
M   bld.cfg
A +  src_oasisdriver
A +  src_oasisdriver/orchoasis_tools.f90
A +  src_oasisdriver/driver2oasis.f90
A +  src_oasisdriver/orchideeoasis.f90
?   src_driver/Makefile
A +  src_driver/getlandseamask.f90
M   src_driver/dim2_driver.f90
M   src_driver/readdim2.f90
A +  src_driver/forcing_tools.f90
A +  src_driver/testrouting.f90
M   src_driver/teststomate.f90
A +  src_driver/orchideedriver.f90
A +  src_driver/globgrd.f90
?   src_parallel/Makefile

```

```

M      src_parallel/mod_orchidee_para.F90
M      src_parallel/mod_orchidee_omp_transfert.F90
M      src_parallel/xios_orchidee.f90
M      src_parallel/mod_orchidee_para_var.F90
MM     src_parallel/mod_orchidee_t_transfert_para.F90
M      orchidee.default
M      makeorchidee_fcm
?      src_sechiba/thermosoil.f90.merge-right.r3469
?      src_sechiba/thermosoil.f90.merge-left.r3190
?      src_sechiba/thermosoilc.f90.merge-left.r3190
?      src_sechiba/thermosoil.f90.working
?      src_sechiba/slowproc.f90.2.edited
?      src_sechiba/chemistry.f90.merge-right.r3469
?      src_sechiba/slowproc.f90.merge-right.r3469
?      src_sechiba/chemistry.f90.merge-left.r3190
?      src_sechiba/Makefile
?      src_sechiba/condveg.f90.edited
?      src_sechiba/condveg.f90.merge-right.r3469
?      src_sechiba/chemistry.f90.working
?      src_sechiba/slowproc.f90.working
?      src_sechiba/thermosoilc.f90.merge-right.r3469
?      src_sechiba/condveg.f90.merge-left.r3190
?      src_sechiba/condveg.f90.working
?      src_sechiba/slowproc.f90.edited
?      src_sechiba/thermosoilc.f90.working
?      src_sechiba/slowproc.f90.merge-left.r3190
M      src_sechiba/ioipslctrl.f90
C      src_sechiba/condveg.f90
C      src_sechiba/thermosoil.f90
M      src_sechiba/routing.f90
M      src_sechiba/explicitsnow.f90
C      src_sechiba/thermosoilc.f90
M      src_sechiba/sechiba.f90
M      src_sechiba/hydrol.f90
M      src_sechiba/hydrolc.f90
C      src_sechiba/chemistry.f90
C      src_sechiba/slowproc.f90
M      src_sechiba/diffuco.f90
M      src_sechiba/enerbil.f90
M      src_sechiba/intersurf.f90
M      src_xml/field_def_orchidee.xml
M      src_xml/context_orchidee.xml
M      src_xml/file_def_orchidee.xml
?      src_global/Makefile
M      src_global/interpol_help.f90
A +    src_global/haversine.f90
M      src_global/grid.f90
A +    src_global/module_llxy.f90
A +    src_global/polygones.f90
M      src_global/solar.f90
A +    src_global/interregxy.f90
?      src_parameters/Makefile
M      src_parameters/constantes_mtc.f90
M      src_parameters/pft_parameters_var.f90

```



```

M src_parameters/constantes_soil.f90
M src_parameters/constantes_var.f90
M src_parameters/pft_parameters.f90
M src_parameters/constantes_soil_var.f90
M src_parameters/vertical_soil.f90
M src_parameters/control.f90
? arch/arch-X64_ADA.fcm.working
? arch/arch-X64_ADA.fcm.merge-right.r3469
? arch/arch-X64_ADA.fcm.merge-left.r3190
M arch/arch-ifort_CICLAD.fcm
C arch/arch-X64_ADA.fcm
M arch/arch-X64_CURIE.fcm
M arch/arch-ifort_LSCE.fcm

```

5. Conflicts are treated one-by-one, editing the given file and getting the right version of the code¹³

(a) Merging `src_sechiba/condveg.f90`

```

$ vim src_sechiba/condveg.f90
$ svn resolve --accept working src_sechiba/condveg.f90
Resolved conflicted state of 'src_sechiba/condveg.f90'
$ svn st src_sechiba/condveg.f90
M src_sechiba/condveg.f90

```

(b) Merging also `src_sechiba/thermsoil.f90`, `src_sechiba/thermsoilc.f90`, `src_sechiba/chemistry.f90`, `src_sechiba/slowproc.f90`, `arch/arch-X64_ADA.fcm`

(c) Checking final state:

```

$ svn st
? arch.fcm
? .config
? svn-commit.tmp
? lib
? diffs.inf
? arch.path
? bin
? config.fcm
?
? Makefile
? src_stomate/Makefile
M src_stomate/lpj_establish.f90
M src_stomate/stomate_io.f90
M src_stomate/stomate.f90
M src_stomate/lpj_pftinout.f90
M src_stomate/stomate_lpj.f90
M bld.cfg
A + src_oasisdriver
A + src_oasisdriver/orchoasis_tools.f90
A + src_oasisdriver/driver2oasis.f90
A + src_oasisdriver/orchideeoasis.f90
? src_driver/Makefile
A + src_driver/getlandseamask.f90
M src_driver/dim2_driver.f90
M src_driver/readdim2.f90
A + src_driver/forcing_tools.f90

```

¹³following <http://svnbook.red-bean.com/en/1.7/svn.tour.cycle.html#svn.tour.cycle.resolve>

```

A +   src_driver/testrouting.f90
M     src_driver/teststomate.f90
A +   src_driver/orchideedriver.f90
A +   src_driver/globgrd.f90
?     src_parallel/Makefile
M     src_parallel/mod_orchidee_para.F90
M     src_parallel/mod_orchidee_omp_transfert.F90
M     src_parallel/xios_orchidee.f90
M     src_parallel/mod_orchidee_para_var.F90
MM    src_parallel/mod_orchidee_t_transfert_para.F90
M     orchidee.default
M     makeorchidee_fcm
?     src_sechiba/condveg.f90.edited
?     src_sechiba/slowproc.f90.edited
?     src_sechiba/slowproc.f90.2.edited
?     src_sechiba/Makefile
M     src_sechiba/ioipslctrl.f90
M     src_sechiba/thermosoil.f90
M     src_sechiba/condveg.f90
M     src_sechiba/routing.f90
M     src_sechiba/thermosoilc.f90
M     src_sechiba/explicitsnow.f90
M     src_sechiba/sechiba.f90
M     src_sechiba/hydrol.f90
M     src_sechiba/hydrolc.f90
M     src_sechiba/chemistry.f90
M     src_sechiba/slowproc.f90
M     src_sechiba/diffuco.f90
M     src_sechiba/enerbil.f90
M     src_sechiba/intersurf.f90
M     src_xml/field_def_orchidee.xml
M     src_xml/context_orchidee.xml
M     src_xml/file_def_orchidee.xml
?     src_global/Makefile
M     src_global/interpol_help.f90
A +   src_global/haversine.f90
M     src_global/grid.f90
A +   src_global/module_llxy.f90
A +   src_global/polygones.f90
M     src_global/solar.f90
A +   src_global/interregxy.f90
?     src_parameters/Makefile
M     src_parameters/constantes_mtc.f90
M     src_parameters/pft_parameters_var.f90
M     src_parameters/constantes_soil.f90
M     src_parameters/constantes_var.f90
M     src_parameters/pft_parameters.f90
M     src_parameters/constantes_soil_var.f90
M     src_parameters/vertical_soil.f90
M     src_parameters/control.f90
M     arch/arch-ifort_CICLAD.fcm
M     arch/arch-X64_ADA.fcm
M     arch/arch-X64_CURIE.fcm
M     arch/arch-ifort_LSCE.fcm

```

- Once all the conflicts are solved, check for error messages along the compilation and solve the problems (from `/data/lfita/DATA/modips1/config/ORCHIDEE_OL`)

```
$ make clean
$ make >& run_gmake.log; cat -n run_gmake.log | grep Error
```

- After all errors solved commit

```
$ svn commit
```

- Perform running tests on running folder `/data/lfita/etudes/DYNAMICO/ORCHIDEE/tests/ORCHIDEE_OL/dynor`.
- First copying new xml files:

```
$ cp /data/lfita/DATA/modips1/modeles/ORCHIDEE/src_xml/context_orchidee.xml ./
$ cp /data/lfita/DATA/modips1/modeles/ORCHIDEE/src_xml/field_def_orchidee.xml ./
$ cp /data/lfita/DATA/modips1/modeles/ORCHIDEE/src_xml/file_def_orchidee.xml ./
```

- Configuring file `file_def_orchidee.xml` (it has the `_AUTO_` variable from the libIGCM)

```
$ vim file_def_orchidee.xml
<file id="sechibal" name="sechiba_history" output_freq="1mo"
enabled=".TRUE.">
<file id="stomate1" name="stomate_history" output_level="10"
output_freq="1d" enabled=".TRUE.">
<file id="stomate2" name="stomate_ipcc_history" output_level="1"
output_freq="1mo" enabled=".TRUE.">
```

E.1 Getting trunk version r3469 to realize checking tests

Once the merge has been carried out, checks of non-modified results should be done. From `/data/lfita/DATA`

- Getting the libIGCM code

```
$ svn co http://forge.ipsl.jussieu.fr/igcmg/svn/modips1/trunk
modips1_r3469
```

- Getting the right version of the sources

```
$ cd modips1_r3469/util
$ vim mod.def
#---- Offline configurations with ORCHIDEE

#-H- ORCHIDEE_trunk ORCHIDEE offline configuration
#-H- ORCHIDEE_trunk This is a working configuration using the latest
revision of ORCHIDEE trunk
#-M- ORCHIDEE_trunk Josefina.Ghattas@ipsl.jussieu.fr
#-C- ORCHIDEE_trunk IOIPSL/tags/v2_2_2/src HEAD 8 IOIPSL/src modeles
#-C- ORCHIDEE_trunk tags/libIGCM_v2.7 HEAD 10 libIGCM .
#-C- ORCHIDEE_trunk trunk/ORCHIDEE 3469 14 ORCHIDEE modeles
#-C- ORCHIDEE_trunk trunk/ORCHIDEE_OL HEAD 14 ORCHIDEE_OL config
#-C- ORCHIDEE_trunk XIOS/branchs/xios-1.0 604 12 XIOS modeles
```

3. Getting the code

```
$ ./model ORCHIDEE_trunk
```

4. compiling the code:

```
$ ./ins_make >& run_ins_make.log
```

5. Going there:

```
$ cd ../config/ORCHIDEE_OL
```

6. Modifying some issues for compilation in CICLAD (in Makefile, adding no-parallel compilation):

```
(...)
./make_xios (...) --netcdf_lib netcdf4_seq (...)
```

7. Compiling

```
$ gmake >& run_gmake.log
```

8. Checking for errors (should be empty):

```
$ cat -n run_gmake.log | grep Error
$ cat -n run_gmake.log | grep Erreur
```

E.2 Checking tests

Checking tests are necessary to be sure that any errors have been made during the merging. This checks are done in the folder `/data/lfita/etudes/DYNAMICO/ORCHIDEE/tests/ORCHIDEE_OL/merge_tests`. Script `perform_orctests.bash` run 1982 91-days global off-line runs with all the possible off-line ORCHIDEE configurations: `simple`, `olson`, `routing`, `modisalb`, `reftemp`, `pftipcc`, `chem` (see table 10 with explanation of the anachronisms)

At each new version, there are new variables in the ORCHIDEE output, thus, `.xml` files have to be update too

1. Getting the right version of `xml` files (that files from `src_xml` with a modification [M] when merging with the trunk):

```
$ cp /data/lfita/DATA/modips1_r3469/modeles/ORCHIDEE/src_xml/context_orchidee.xml
$ cp /data/lfita/DATA/modips1_r3469/modeles/ORCHIDEE/src_xml/file_def_orchidee.xml
$ cp /data/lfita/DATA/modips1_r3469/modeles/ORCHIDEE/src_xml/field_def_orchidee.xml
```

2. While we are using `libIGCM`, `xml` files have some `_AUTO_` values which have to be modified:

```
<file id="sechiba1" name="sechiba_history" output_level="11"
output_freq="1mo" enabled=".TRUE.">
<file id="sechiba2" name="sechiba_out_2" output_level="2"
output_freq="10800s" enabled=".TRUE.">
<file id="stomate1" name="stomate_history" output_level="10"
output_freq="1d" enabled=".TRUE.">
<file id="stomate2" name="stomate_ipcc_history" output_level="1"
output_freq="1mo" enabled=".TRUE.">
```

Table 10: Table of checks between different ORCHIDEE compiled versions. All simulations use: forcing_file.nc (link from ncc_for_1982.nc), PFTmap.nc (link from PFTmap_1850to2005_AR5_LUHarc2/PFTmap_IPCC_1982.nc), soils_param.nc

name	Additional files to use	description
simple		simplest ORCHIDEE configuration
olson	carteveg5km.nc	using Olson 5km vegetation configuration
routing	routing.nc, cartepente2d_15min.nc	simulation with routing activated
modisalb	alb_bg_jrctip.nc	using albedo from MODIS satellite measurements
reftemp	reftemp.nc	using reference temperature
pftipcc	PFTmap_IPCC_2000.nc	using pft from IPCC exercises
chem	orchidee_fertilizer_1995.nc, orchidee_bbg_clim.nc	activating chemical options
usda	soils_param_usda.nc	use of the complementary textures map ^a
usda	soils_param_usda.nc	without using of the complementary textures map
new albedo	alb_bg_modisopt_2D.nc	New albedo file since merge with trunk r3711
lai	lai2D_03.nc	use 'LAI map' instead of dynamical one from stomate

^aFollowing documentation from A. Ducharne http://forge.ipsl.jussieu.fr/orchidee/attachment/wiki/Documentation/UserGuide/eqs_hydrol.pdf

E.2.1 Second merge

A second merge was done on June 8th 2016:

1. Getting the current version of trunk

```
$ svn info svn://forge.ipsl.jussieu.fr/orchidee/trunk/ORCHIDEE
Path: ORCHIDEE
URL: svn://forge.ipsl.jussieu.fr/orchidee/trunk/ORCHIDEE
Repository Root: svn://forge.ipsl.jussieu.fr/orchidee
Repository UUID: f489ceea-5127-0410-b15c-c4a6149ed9a7
Revision: 3531
Node Kind: directory
Last Changed Author: josefine.ghattas
Last Changed Rev: 3525
Last Changed Date: 2016-06-03 13:40:05 +0200 (Fri, 03 Jun 2016)
```

Testing the merge

```

$ svn merge --dry-run -r 3469:3531 svn://forge.ipsl.jussieu.fr/orchidee/trunk/ORCHIDEE
--- Merging r3470 through r3531 into '.':
U   src_parallel/xios_orchidee.f90
U   orchidee.default
U   src_sechiba/ioipslctrl.f90
U   src_sechiba/thermosoil.f90
U   src_sechiba/condveg.f90
U   src_sechiba/explicitsnow.f90
U   src_sechiba/sechiba.f90
U   src_sechiba/hydrol.f90
U   src_sechiba/hydrolc.f90
U   src_sechiba/slowproc.f90
U   src_sechiba/diffuco.f90
U   src_sechiba/intersurf.f90
U   src_xml/file_def_orchidee.xml
U   src_xml/field_def_orchidee.xml
U   src_parameters/constantes_var.f90
U   src_parameters/pft_parameters.f90
U   src_parameters/constantes_soil_var.f90
U   src_parameters/vertical_soil.f90
U   src_parameters/control.f90
U   src_parameters/constantes.f90
U   src_parameters/constantes_mtc.f90
U   src_parameters/pft_parameters_var.f90
U   arch/arch-ifort_CICLAD.fcm
U   arch/arch-X64_ADA.fcm
U   arch/arch-X64_CURIE.fcm
U   arch/arch-ifort_LSCE.fcm

```

2. Merging

```
$ svn merge -r 3469:3531 svn://forge.ipsl.jussieu.fr/orchidee/trunk/ORCHIDEE
```

3. Compilation and tests are also done

E.2.2 Third merge

A third merge was done on August 22nd 2016. This merge is equivalent to merge with trunk version r3740

1. Getting the current version of trunk

```

$ svn info svn://forge.ipsl.jussieu.fr/orchidee/trunk/ORCHIDEE
Path: ORCHIDEE
URL: svn://forge.ipsl.jussieu.fr/orchidee/trunk/ORCHIDEE
Repository Root: svn://forge.ipsl.jussieu.fr/orchidee
Repository UUID: f489ceea-5127-0410-b15c-c4a6149ed9a7
Revision: 3711
Node Kind: directory
Last Changed Author: josefine.ghattas
Last Changed Rev: 3687
Last Changed Date: 2016-08-01 16:51:05 +0200 (Mon, 01 Aug 2016)

```

2. Testing of the merge

```

$ svn merge -dry-run -r 3531:3711 svn://forge.ipsl.jussieu.fr/orchidee/trunk/ORCHIDEE
-- Merging r3532 through r3711 into '.':
U   src_driver/orchideedriver.f90
U   src_driver/forcing_tools.f90
U   src_parallel/xios_orchidee.f90
U   makeorchidee_fcm
U   orchidee.default
U   src_sechiba/routing.f90
U   src_sechiba/explicitsnow.f90
U   src_sechiba/sechiba.f90
U   src_sechiba/hydrol.f90
U   src_sechiba/hydrolc.f90
U   src_sechiba/slowproc.f90
U   src_sechiba/diffuco.f90
U   src_sechiba/intersurf.f90
U   src_sechiba/ioipslctrl.f90
U   src_sechiba/thermosoil.f90
C   src_sechiba/condveg.f90
U   src_global/haversine.f90
U   src_global/grid.f90
C   src_xml/field_def_orchidee.xml
C   src_xml/file_def_orchidee.xml
U   src_parameters/pft_parameters.f90

```

```

U   src_parameters/constantes.f90
U   src_parameters/constantes_mtc.f90
U   src_parameters/pft_parameters_var.f90
U   src_parameters/constantes_var.f90
U   src_stomate/lpj_gap.f90
U   src_stomate/lpj_light.f90
U   src_stomate/stomate_season.f90
U   src_stomate/lpj_fire.f90
Summary of conflicts:
Text conflicts: 3

```

3. Merging (postponing all the conflicts and manually editing them)

```
$ svn merge -r 3531:3711 svn://forge.ipsl.jussieu.fr/orchidee/trunk/ORCHIDEE
$ svn st
?   arch.fcm
?   .config
?   lib
?   diffs.inf
?   arch.path
?   bin
?   config.fcm
?   Makefile
?   src_stomate/Makefile
M   src_stomate/stomate_season.f90
M   src_stomate/lpj_fire.f90
M   src_stomate/lpj_light.f90
M   src_stomate/lpj_gap.f90
?   src_driver/Makefile
M   src_driver/forcing_tools.f90
M   src_driver/orchideedriver.f90
?   src_parallel/Makefile
M   src_parallel/xios_orchidee.f90
M   orchidee.default
M   makeorchidee_fcm
?   src_sechiba/condveg.f90.merge-left.r3531
?   src_sechiba/condveg.f90.working
?   src_sechiba/condveg.f90.merge-right.r3711
?   src_sechiba/Makefile
M   src_sechiba/ioipslctrl.f90
C   src_sechiba/condveg.f90
M   src_sechiba/thermosoil.f90
M   src_sechiba/routing.f90
M   src_sechiba/explicitsnow.f90
M   src_sechiba/sechiba.f90
M   src_sechiba/hydrol.f90
M   src_sechiba/hydrolc.f90
M   src_sechiba/slowproc.f90
M   src_sechiba/diffuco.f90
M   src_sechiba/intersurf.f90
?   src_global/Makefile
```



```

M   src_global/haversine.f90
M   src_global/grid.f90
?   src_xml/file_def_orchidee.xml.merge-left.r3531
?   src_xml/field_def_orchidee.xml.working
?   src_xml/file_def_orchidee.xml.merge-right.r3711
?   src_xml/field_def_orchidee.xml.merge-left.r3531
?   src_xml/field_def_orchidee.xml.merge-right.r3711
?   src_xml/file_def_orchidee.xml.working
C   src_xml/field_def_orchidee.xml
C   src_xml/file_def_orchidee.xml
?   src_parameters/Makefile
M   src_parameters/constantes_mtc.f90
M   src_parameters/pft_parameters_var.f90
M   src_parameters/constantes_var.f90
M   src_parameters/pft_parameters.f90
M   src_parameters/constantes.f90

```

4. Solving conflicts

- Conflict in `src_xml/field_def_orchidee.xml`

```

<<<<<<.working
  <field id="asoilcol" name="asoilcol" long_name="Availability of data
for the soil color interpolation (negative values if no data found)"
unit="1" operation="once"/>
  <field id="evap" name="evap" long_name="Evaporation" unit="mm/d"/>
  <field id="coastalflow" name="coastalflow" long_name="Diffuse coastal
flow" unit="m^3/s"/>
  <field id="riverflow" name="riverflow" long_name="River flow to the
oceans" unit="m^3/s"/>
=====
  <field id="vevapp" name="evap_sec" long_name="Total Evaporation"
unit="kg/m^2/s"/>
  <field id="vevapp_day" name="evap" field_ref="vevapp"
long_name="Evaporation per day" unit="mm/d" > vevapp*86400 </field>
>>>>>> .merge-right.r3711

```

– Solved as:

```

  <field id="asoilcol" name="asoilcol" long_name="Availability of data
for the soil color interpolation (negative values if no data found)"
unit="1" operation="once"/>
  <field id="coastalflow" name="coastalflow" long_name="Diffuse coastal
flow" unit="m^3/s"/>
  <field id="riverflow" name="riverflow" long_name="River flow to the
oceans" unit="m^3/s"/>
  <field id="vevapp" name="evap_sec" long_name="Total Evaporation"
unit="kg/m^2/s"/>
  <field id="vevapp_day" name="evap" field_ref="vevapp"
long_name="Evaporation per day" unit="mm/d" > vevapp*86400 </field>

```

– Solved:

```

$ svn resolve -accept working src_xml/field_def_orchidee.xml
Resolved conflicted state of 'src_xml/field_def_orchidee.xml'
$ svn st src_xml/field_def_orchidee.xml
M   src_xml/field_def_orchidee.xml

```

- Conflict in `src_xml/file_def_orchidee.xml`

```

<<<<<< .working
  <field field_ref="asoilcol" level="11"/>
  =====
  <field field_ref="frac_snow" level="11"/>
  <field field_ref="lake_overflow_coast" level="7"/>
  <field field_ref="frac_snow_veg" level="12"/>
  <field field_ref="frac_snow_nobio" level="12"/>
>>>>>> .merge-right.r3711

```

– Solved as:

```

<field field_ref="asoilcol" level="11"/>
<field field_ref="frac_snow" level="11"/>
<field field_ref="lake_overflow_coast" level="7"/>
<field field_ref="frac_snow_veg" level="12"/>
<field field_ref="frac_snow_nobio" level="12"/>

```

– solved

```

$ svn resolve -accept working src_xml/file_def_orchidee.xml
Resolved conflicted state of 'src_xml/file_def_orchidee.xml'
$ svn st src_xml/file_def_orchidee.xml
M      src_xml/file_def_orchidee.xml

```

- All conflicts in `src_sechiba/condveg.f90` are related to the use of a new file `alb_bg.nc` (as a copy of the real file `alb_bg_modisopt_2D.nc`) instead of `alb_bg_jrctip.nc` in ‘`condveg_background_soilalb`’. In this new file and methodology, there are two variables `bg_alb_vis`, `bg_alb_nir`, without temporal dependency. Changes are too long to be detailed here.

```

$ svn resolve -accept working src_sechiba/condveg.f90
Resolved conflicted state of 'src_sechiba/condveg.f90'

```

5. Merge is done and committed: r3764

6. More changes in code are introduced after a meeting with Josefine Ghatas and Jan Polcher. Almost all of them committed with version r3767

- Remove all the `IF (ALLOCATED(X)) DEALLOCATE(X)`
- Check consistency of text in the preface of the subroutines
- check text consistency on the `vecpos` section
- No need to read again the variable inside `modifying_input[N]D`
- Use `undef_sechiba` for that values not used for: `maskvals`
- Remove all the `maskvar` from `masking_input`
- No need to use `rangeR`, it can be done as `(/ (ip*1.,ip=1,Ntypes) /)`

7. More changes in code are introduced after a meeting with Josefine Ghatas and Jan Polcher (con’t and finising).

- remove sending up of the ‘Availability’ variables
- Use of the full functions/subroutines’ name in error and debug messages instead of `TRIM(fname)` (`printlev`, `printlev_loc`, `ipslerr_p`)

8. After all these changes are committed:

```

$ svn commit
Sending      src_global/interpweight.f90
Sending      src_sechiba/chemistry.f90
Sending      src_sechiba/condveg.f90
Sending      src_sechiba/slowproc.f90
Sending      src_sechiba/thermosoil.f90
Sending      src_sechiba/thermosoilc.f90
Transmitting file data .....
Committed revision 3769.

```

9. Josefine Ghatas work on the code to make tests on the compilation and use with coupled runs with LMDZ.
10. After a meeting on October 2016 13th, was agreed to introduce a little bit more of commentaries on the header of the module `interpweight.F90`. Comments added which gives a final version at revision 3816.
11. Modifications have been added the trunk with the reference:

```

$ svn info
Path: .
URL: svn://forge.ipsl.jussieu.fr/orchidee/branches/ORCHIDEE-DYNAMICO/ORCHIDEE
Repository Root: svn://forge.ipsl.jussieu.fr/orchidee
Repository UUID: f489ceea-5127-0410-b15c-c4a6149ed9a7
Revision: 3839
Node Kind: directory
Schedule: normal
Last Changed Author: josefine.ghattas
Last Changed Rev: 3830
Last Changed Date: 2016-10-19 18:42:41 +0200 (Wed, 19 Oct 2016) |

```

12. On 2016 October 21st is found that tests over `lai2D.nc` file were not done and it is not working. Modifications are done in order to work with the `lai2D.nc` file
13. Work is finished on October 31st and code is also working with the `lai2D.nc` file

```

$ svn commit
Sending      src_global/interpweight.f90
Sending      src_sechiba/slowproc.f90
Transmitting file data ..
Committed revision 3853.

```

14. A new file is added into the ORCHIDEE flow: `ORCHIDEE_13PFTmap_2010_cmpi6_LUH2v2h.nc` 0.25° resolution map of PFTs. This file has a different way to create its mask. It has already been sea masked by giving the `'_fillValue'` to all the sea points. Thus, this file has to be used in a different way than the original `PFTmap.nc`. Assuming that this new file is used with a new name `PFTmap_0.25.nc` small modifications are introduced into:

- `src_sechiba/slowproc.f90` at subroutine `'slowproc_readvegetmax'`:

```

IF (TRIM(filename) .EQ. 'PFTmap_025.nc') THEN
  ! Type of mask to apply to the input data (see header for more details)
  maskingtype = 'mbelow'
  ! Values to use for the masking
  maskvals = (/ 20., undef_sechiba, undef_sechiba /)
ELSE
  ! Type of mask to apply to the input data (see header for more details)
  maskingtype = 'msumrange'
  ! Values to use for the masking
  maskvals = (/ 1.-1.e-7, min_sechiba, 2. /)
END IF

```

- There was an issue on `src_global/interpweight.f90`. According to IOIPSL one needs to advice when a $\leq 3D$ variable is read without a temporal axis. Looking in IOIPSL/`src/flincom.f90` at line #1296:

```
!- itau_dep : Time step at which we will start to read
!- itau_fin : Time step until which we are going to read
!-           For the moment this is done on indexes
!-           but it should be in the physical space.
!-           If there is no time-axis in the file then use a
!-           itau_fin < itau_dep, this will tell flinget not to
!-           expect a time-axis in the file.
```

Following it a huge assumption is made: all 3D fields will not have a time-axis. Thus in `src_global/interpweight.f90` at line #1076:

```
      IF (is_root_prc) CALL flinget(fid, TRIM(varname), iml, jml, lml,
0, 2, 1, invar3D)
```

F ORCHIDEE bug

A bug has been found in the code. When the trunk version of the code is compiled in debug mode (in the Makefile, change from `-prod` to `-debug`), model in routing configuration, simulation crashes.

- chem

(...)

C02 impact on BVOC - Wilkinson parameterisation: F
 forrtl: severe (193): Run-Time Check Failure. The variable
 'chemistry_mp_chemistry_read_\$DATA_GLOBAL' is being used without being
 defined

Image	PC	Routine	Line	Source
orchidee_ol	000000002ADFCEA	Unknown	Unknown	Unknown
orchidee_ol	000000002ADE9C6	Unknown	Unknown	Unknown
orchidee_ol	000000002A8F120	Unknown	Unknown	Unknown
orchidee_ol	000000002A4FEFE	Unknown	Unknown	Unknown
orchidee_ol	000000002A50DD8	Unknown	Unknown	Unknown
orchidee_ol	000000002672235	chemistry_mp_chem	1862	

chemistry.f90

- routing

(...)

forrtl: error (63): output conversion error, unit 100, file
 /data/lfita/etudes/DYNAMICO/ORCHIDEE/tests/ORCHIDEE_OL/merge_tests/routing/ref/out_orchidee_0001

Image	PC	Routine	Line	Source
orchidee_ol	000000002ADFCEA	Unknown	Unknown	Unknown
orchidee_ol	000000002ADE9C6	Unknown	Unknown	Unknown
orchidee_ol	000000002A8F120	Unknown	Unknown	Unknown
orchidee_ol	000000002A4FEFE	Unknown	Unknown	Unknown
orchidee_ol	000000002A4F43F	Unknown	Unknown	Unknown
orchidee_ol	000000002A82637	Unknown	Unknown	Unknown
orchidee_ol	000000000D32D37	stomate_mp_stomat	1781	
stomate.f90				
orchidee_ol	000000000B337AD	slowproc_mp_slowp	387	
slowproc.f90				
orchidee_ol	000000000ABF61F	sechiba_mp_sechib	808	
sechiba.f90				
orchidee_ol	00000000072B591	intersurf_mp_inte	627	
intersurf.f90				
orchidee_ol	000000000644C30	MAIN__	1491	
dim2_driver.f90				
orchidee_ol	00000000052C97C	Unknown	Unknown	Unknown
libc.so.6	0000003BA5A1ED5D	Unknown	Unknown	Unknown
orchidee_ol	00000000052C879	Unknown	Unknown	Unknown

forrtl: error (65): floating invalid

Image	PC	Routine	Line	Source
orchidee_ol	000000000168E81C	diffuco_mp_diffuc	2352	
diffuco.f90				
orchidee_ol	000000000160738C	diffuco_mp_diffuc	403	
diffuco.f90				
orchidee_ol	000000000AB2A48	sechiba_mp_sechib	695	
sechiba.f90				
orchidee_ol	00000000072B591	intersurf_mp_inte	627	

```

intersurf.f90
orchidee_ol      000000000644C30  MAIN__          1491
dim2_driver.f90
orchidee_ol      00000000052C97C  Unknown          Unknown  Unknown
libc.so.6        0000003BA5A1ED5D  Unknown          Unknown  Unknown
orchidee_ol      00000000052C879  Unknown          Unknown  Unknown
(...)
ATT :    1 big temperature jumps on 1982-03-27: 12.0000
Maximum change of surface temperature located at : 22.5000000000000 61.5000000000000
Coordinates in grid space:          203          7
Change from 273.479551828420 to 278.626716062450 with sw_in = 275.048271439300
Air temperature change from 279.264801025391 to 279.594390869141
Max of dtdt : 2.859535685572230E-003 with dt = 1800.000000000000
ATT :    2 big temperature jumps on 1982-03-30: 0.5000
Maximum change of surface temperature located at : 111.5000000000000 62.5000000000000
Coordinates in grid space:          292          6
Change from 242.531480338615 to 247.603490174248 with sw_in = 145.364908810065
Air temperature change from 241.987564086914 to 243.376417795817
Max of dtdt : 2.817783242018269E-003 with dt = 1800.000000000000

```

Trying to compile with `gfortran` to check the possible origin of the bug. From `/data/lfita/DATA/MODIPSL/dynor`

1. Getting the code

```
$ svn co http://forge.ipsl.jussieu.fr/igcmg/svn/modipsl/trunk gfortran
```

2. Going to the configuration of the compilation

```
$ cd gfortran/uitl
```

3. Adding DYNAMICO_ORCHIDEE configuration in `mod.def` (see previous compilations as in appendix D)

```
$ vim mod.def
```

4. Installing the sources:

```
$ ./model ORCHIDEE_DYNAMICO
```

5. In file `AA_make.gdef`, there is a `gfortran` compilation for `CICLAD` with the tag: `gfortran_CICLAD`. Thus changing to this configuration in file `w_i_h`:

```
$ vim w_i_h
( ciclad* )          DSYS="gfortran_CICLAD";;
```

6. Including `gfortran` compilation for the `XIOS`

(a) Going to the `XIOS` source code:

```
$ cd ../modeles/XIOS
```

(b) links `arch.fcm` and `arch.path` are empty (configuration files do not exist)

```
$ ls -la arch.fcm arch.path
arch.path -> /data/lfita/DATA/MODIPSL/dynor/gfortran/modeles/XIOS/arch/arch-gfortran_
arch.fcm -> /data/lfita/DATA/MODIPSL/dynor/gfortran/modeles/XIOS/arch/arch-gfortran_C
```

(c) Creating the `arch` files for `XIOS` to be compiled in `CICLAD` with `gfortran`

- arch/arch-gfortran_CICLAD.fcm

```
#####
#####                               Projet XIOS                               #####
#####

%CCOMPILER      mpicc
%FCOMPILER      mpif90
%LINKER        mpif90

%BASE_CFLAGS    -ansi -w
%PROD_CFLAGS    -O3 -DBOOST_DISABLE_ASSERTS
%DEV_CFLAGS     -g -O2
%DEBUG_CFLAGS   -g

%BASE_FFLAGS    -D__NONE__
%PROD_FFLAGS    -O3
%DEV_FFLAGS     -g -O2
%DEBUG_FFLAGS   -g

%BASE_INC       -D__NONE__
%BASE_LD        -lstdc++

%CPP            cpp
%FPP            cpp -P
%MAKE           gmake
```

- arch/arch-gfortran_CICLAD.path

```
NETCDF_INCDIR="-I/opt/netcdf42/gfortran/include"
NETCDF_LIBDIR="-L/opt/netcdf42/gfortran/lib"
NETCDF_LIB="-lnetcdf -lnetcdff"

MPI_INCDIR=""
MPI_LIBDIR=""
MPI_LIB=""

HDF5_INCDIR="-I/opt/hdf518/gfortran/include"
HDF5_LIBDIR="-L/opt/hdf518/gfortran/lib"
HDF5_LIB="-lhdf5_hl -lhdf5 -lhdf5 -lz"

#OASIS_INCDIR="-I$PWD/../../oasis3-mct/BLD/build/lib/psmile.MPI1"
#OASIS_LIBDIR="-L$PWD/../../oasis3-mct/BLD/lib"
#OASIS_LIB="-lpsmile.MPI1 -lscrip -lmct -lmpeu"
```

7. Including gfortran compilation for ORCHIDEE

- Going to the ORCHIDEE source code:

```
$ cd ../modeles/ORCHIDEE
```

- arch/arch-gfortran_CICLAD.fcm

```

%COMPILER      /usr/lib64/openmpi/1.6.5-gfortran/bin/mpif90
%LINK          /usr/lib64/openmpi/1.6.5-gfortran/bin/mpif90
%AR            ar
%MAKE          make
%FPP_FLAGS     -P -C -traditional
%FPP_DEF       NC_DOUBLE
%BASE_FFLAGS   -c -fdefault-real-8 -fcray-pointer
%PROD_FFLAGS   -O3 -funroll-all-loops
%DEV_FFLAGS    -O -Wall -fbounds-check
%DEBUG_FFLAGS  -ffpe-trap=invalid,zero,overflow -Wall
-fbounds-check -g3 -O0 -fstack-protector-all
%MPI_FFLAGS
%OMP_FFLAGS    -fopenmp
%BASE_LD       -Wl,-rpath=/opt/netcdf42/gfortran/lib
%MPI_LD
%OMP_LD        -fopenmp

```

- `arch/arch-gfortran_CICLAD.path`

```

NETCDF_LIBDIR="/opt/netcdf42/gfortran/lib -lnetcdf -lnetcdf"
NETCDF_INCDIR=/opt/netcdf42/gfortran/include
IOIPSL_INCDIR=/data/lfita/DATA/LMDZ/gfortran/modipsl/lib
IOIPSL_LIBDIR=/data/lfita/DATA/LMDZ/gfortran/modipsl/lib

```

8. installing the code (from util:

```

$ ./ins_make

Installation of makefiles, scripts and data for gfortran_CICLAD

Installation in ../config/ORCHIDEE_OL
Path from Makefile to modipsl/util : ../../util
Installation in ../modeles/ORCHIDEE/src_sechiba
Path from Makefile to modipsl/util : ../../../../util
Installation in ../modeles/ORCHIDEE/src_parameters
Path from Makefile to modipsl/util : ../../../../util
Installation in ../modeles/ORCHIDEE/src_parallel
Path from Makefile to modipsl/util : ../../../../util
Installation in ../modeles/ORCHIDEE/src_driver
Path from Makefile to modipsl/util : ../../../../util
Installation in ../modeles/ORCHIDEE/src_stomate
Path from Makefile to modipsl/util : ../../../../util
Installation in ../modeles/ORCHIDEE/src_global
Path from Makefile to modipsl/util : ../../../../util
Installation in ../modeles/ORCHIDEE
Path from Makefile to modipsl/util : ../../util
Installation in ../modeles/IOIPSL/src
Path from Makefile to modipsl/util : ../../../../util

```

9. Going there:

```
$ cd ../config/ORCHIDEE_OL
```

10. Modifying some issues for compilation in CICLAD (in Makefile, adding no-parallel compilation):

```
(...) ./make_xios --netcdf_lib netcdf4_seq (...)
```


11. Removing IOIPSL compilation in CICALAD (in Makefile):

```
# with_xios : Compiling ORCHIDEE, XIOS and IOIPSL.  
with_xios : xios driver_xios verif
```

12. Compiling

```
$ gmake >& run_gmake.log
```

13. Checking for errors (should be empty):

```
$ cat -n run_gmake.log | grep Error  
$ cat -n run_gmake.log | grep Erreur
```

G Adding an output variable in XIOS

Different new variables with the information of the availability of the data used in the interpolation (`a[varname]`) have been added with `interpweight`. Here is described the process followed to add a variable as example.

1. In `sechiba_src/condveg.f90`, availability data information `asoilcol` for the soil color has been added. Declaration of the variable is done in the `field_def_orchidee.xml`. As soil color is used in *sechiba*, variable is defined in this section. This variable should only be output once (it does not change in time). Definition is added just after `albedo_glob` as:

```
<field id="asoilcol" name="asoilcol" long_name="Availability of data
for the soil color interpolation (negative values if no data found)"
unit="1" operation="once"/>
```

2. Variable has to be add into the input file. This is done in `file_def_orchidee.xml`. This diagnostic variable should only be output for specific cases, thus it will be attributed to a high level of output (11). Again, because it is a variable related to *sechiba*, it will be attributed to the file `sechiba_history.nc`. As the last variable with output level 11 (just after variable `snowgrain`) as:

```
<field field_ref="asoilcol" level="11"/>
```

3. Finally this variable should be output from the code. Within `src_sechiba/condveg.f90`, at the end of the subroutine `condveg_soilalb`:

```
! Write diagnostics
CALL xios_orchidee_send_field("asoilcol",asoilcol)
```

The same method is used to include the set of diagnostics of the '*data availability*', see variable-file attribution in table 11 the values for the vegetation map `aveget` are shown in figure 2

Table 11: File assignation of all the 'data availability' diagnostic variables (unitless)

variable	module#subroutine	output file	description
achem_wrice	chemistry.f90#chemistry_initialize	sechiba_history.nc	Availability of data for the rice fertilizers interpolation (negative values if no data found)
achem_other	chemistry.f90#chemistry_initialize	sechiba_history.nc	Availability of data for the other crops fertilizers interpolation (negative values if no data found)
achem_co2	chemistry.f90#chemistry_initialize	sechiba_history.nc	Availability of data for the co2 bbg interpolation (negative values if no data found)
asoilcol	condveg.f90#condveg_soilalb	sechiba_history.nc	Availability of data for the soil color interpolation (negative values if no data found)
aalb_bg	condveg.f90#condveg_background_soilalb	sechiba_history.nc	Availability of data for the albedo interpolation from MODIS related data-set (negative values if no data found)
alaimap	slowproc.f90#slowproc_interlai	sechiba_history.nc	Availability of data for the lai interpolation (negative values if no data found)
aveget	slowproc.f90#slowproc_readvegetmax	sechiba_history.nc	Availability of data for the vegetation fraction interpolation (negative values if no data found)
aveget5k	slowproc.f90#slowproc_interpol	sechiba_history.nc	Availability of data for the vegetation fraction at 5km interpolation (negative values if no data found)
atext	slowproc.f90#slowproc_soilt	sechiba_history.nc	Availability of data for the soil texture interpolation (negative values if no data found)
aslope	slowproc.f90#slowproc_slope	sechiba_history.nc	Availability of data for the slope interpolation (negative values if no data found)
areftemp	thermosoil.f90#read_reftempfile	sechiba_history.nc	Availability of data for the reftemp interpolation (negative values if no data found)
areftempc	thermosoilc.f90#read_reftempfile	sechiba_history.nc	Availability of data for the reftemp interpolation (negative values if no data found)

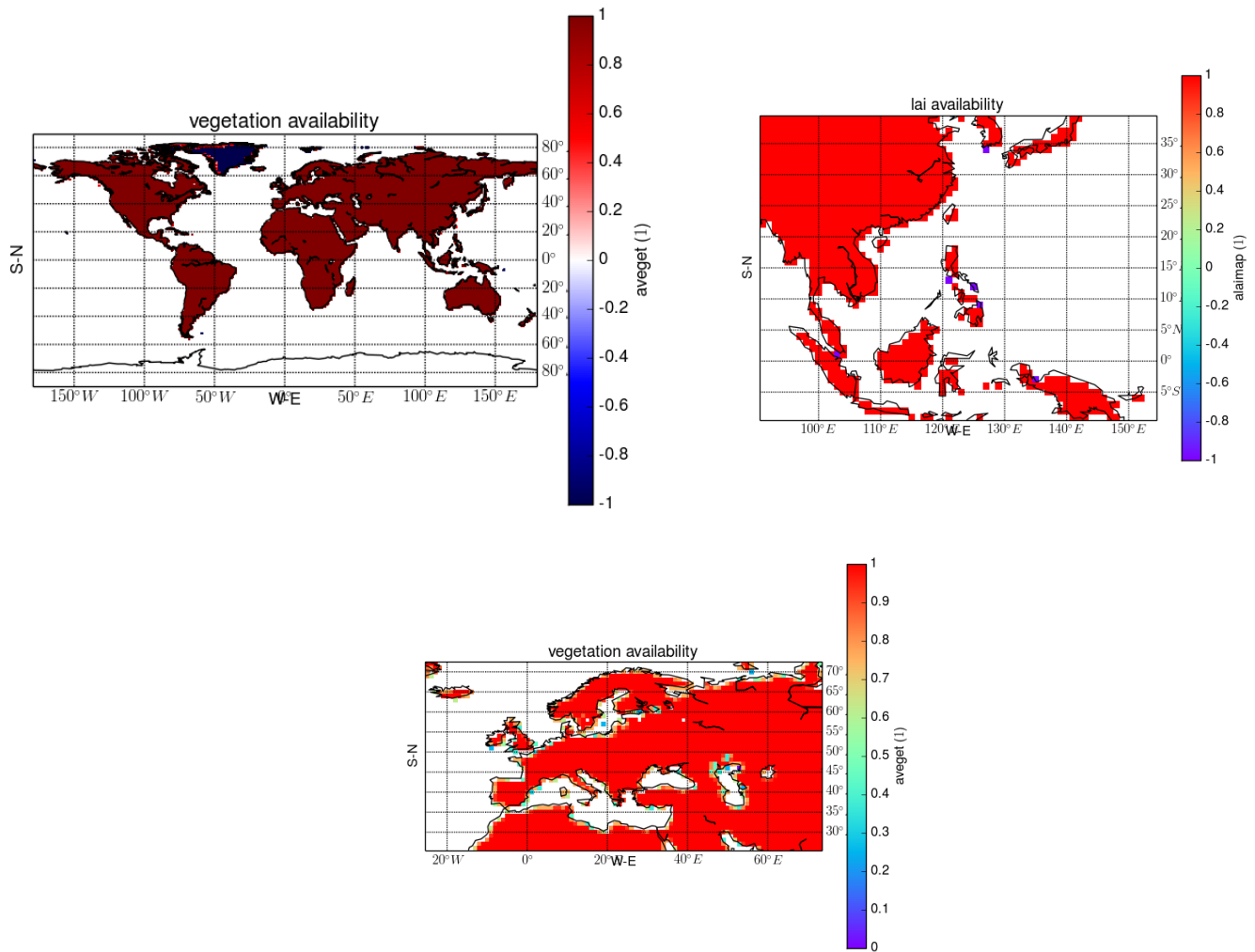


Figure 2: Availability data for the vegetation map maxvegetfrac found in PFTmap.nc (left) and LAI found in lai2D_03.nc and maxvegetfrac found in ORCHIDEE_13PFTmap_2010_cmpi6_LUH2v2h.nc (bottom)