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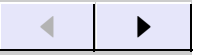
Conclusion



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The structure of

ORCHIDEE

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and Gerhard Krinner

December 8, 2000

Provides a brief overview of :

- The modularity of ORCHIDEE
- current state of each module
- expected evolutions
- Source code management

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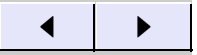

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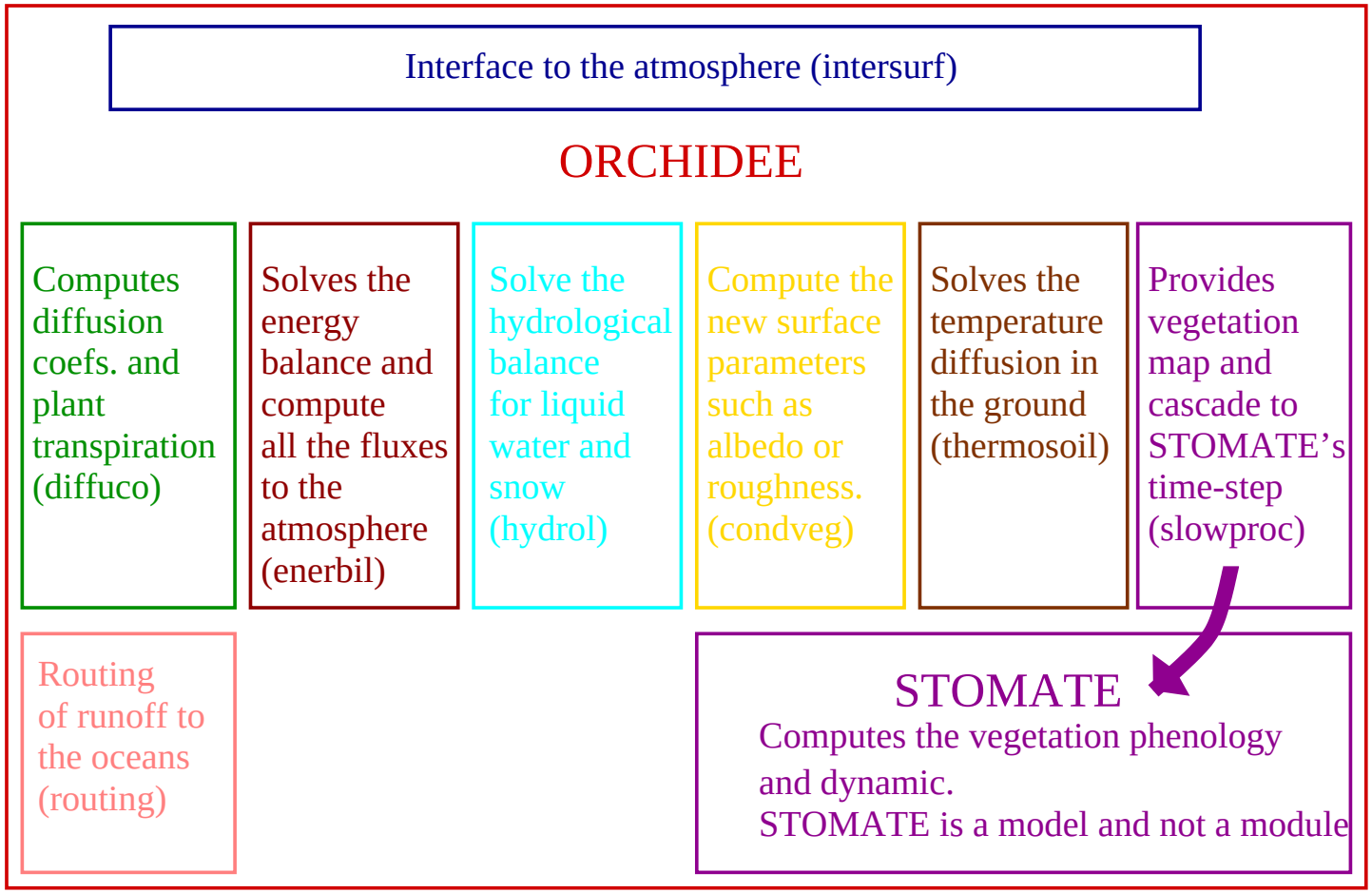
1. Introduction

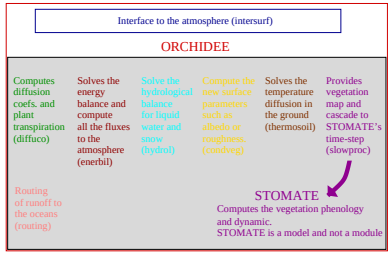
In 1998 a redesign of SECHIBA was undertaken to allow for the inclusion of STOMATE. The following guidelines were set :

- The code should be modular.
- The modules should be as independent as possible to make them exchangeable. Each module has only one entry point.
- Each module manages its own prognostic variables.
- The model should have only one interface to the atmosphere. It should work as well for coupled as for off-line applications.
- FORTRAN 90 is the programming language.
- The model should be able to run at any resolution and over any region of the globe.
- Only one input/output format should be used.

2. The general structure



2.1. Interface with the atmosphere



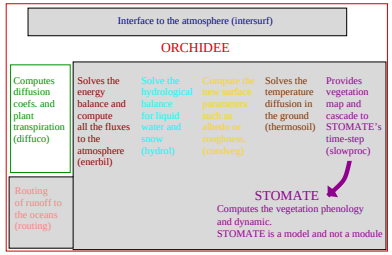
Description :
Polcher et al. 1998
(PILPS 4c coupler)
+ recent evolutions.

Inputs	Outputs
Geographical coordinates	Glacier fraction
Atmospheric conditions	Surface fluxes
Rain and snowfall	Runoff to oceans
Radiative fluxes	Albedo
PBL diffusion & sensitivities	Surface roughness
	Emissivity
	Surf. radiative temperature

Planed evolutions :

- Improve the control mechanism for the output variables.

2.2. Diffusion coefficients



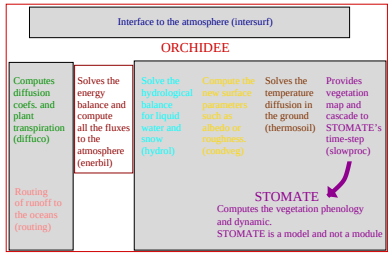
Description :
Ducoudre et al. 1993
+ parameter changes.

Inputs	Outputs
Atmospheric conditions	Resistances for :
Solar fluxes	interception loss
Dry soil height	bare soil evaporation
Soil moisture stress	transpiration
Fraction of vegetation	sublimation
Photosynthesis parameters	
Surface drag **OR**	Surface drag

Planed evolutions :

- Replace the empirical formulation described in Ducoudre et al. by the more bio-physically based parameterization from STOMATE.
- Re-calibrate the parameters.

2.3. Surface energy balance



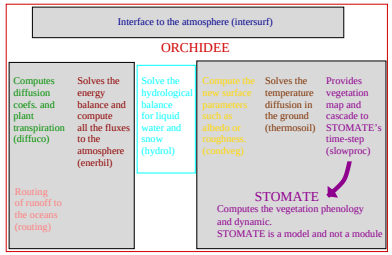
Description :
Polcher et al. 1998
+ recent improvements.

Inputs	Outputs
Atmospheric conditions	New surface temperature
Radiative fluxes	Surf. radiative temperature
All resistances	Sensible & latent heat flux
Surface type fractions	Evaporation and its components
Surface drag	GPP

Planed evolutions :

- Replace the current bulk formulation by the Penman-Montheith equation.
- Introduce a separate energy balance for each surface type.

2.4. Surface hydrology



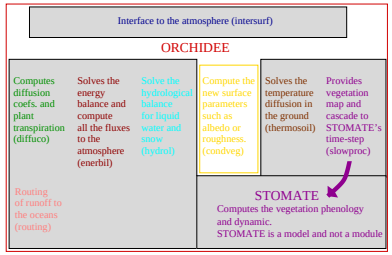
Description :
de Rosnay and Polcher 1998

Inputs	Outputs
Rainfall	A diagnostic soil moisture profile
Snowfall	Snow mass and age
Evaporation components	Grid-box runoff
Soil temperature profile	Dry soil height
Vegetation distribution	Soil moisture stress
	litter humidity
	Intercepted water

Planed evolutions :

- Introduction of a multi layer diffusion scheme (de Rosnay et al. 2000).
- Soil freezing needs to be included.

2.5. Surface conditions



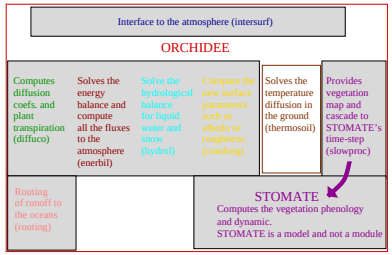
Description :
Bidouille et al. 1999.

Inputs	Outputs
Snow mass, fraction and age	Albedo
Dry soil height	Surface roughness
Vegetation fraction	Surface Emissivity
Dead leave cover	Soil types
Vegetation height	

Planed evolutions :

- This module needs to be properly validated !

2.6. Soil thermodynamics



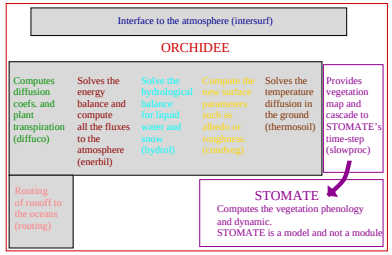
Description :
Not published !

Inputs	Outputs
Surface temperature Snow mass Soil moisture profile	A diagnostic soil temperature profile. Soil heat capacity

Planed evolutions :

- Introduce a soil moisture dependence in the soil thermal capacity.
- Soil freezing needs to be included. This will have consequences on the interface as water phase changes will have to be passed

2.7. Slow processes (STOMATE)



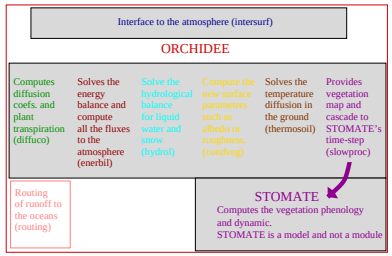
Description :
G. Krinner 1999 !

Inputs	Outputs
Atmospheric conditions	Leaf area index
Surface temperature	Fraction of vegetation
Soil moisture stress	Interception capacity
Litter humidity	Soil respiration
GPP	Photosynthesis parameters
	Dead leave cover

Planed evolutions :

- This module deals also with the LAI evolution when STOMATE is not present. This needs to be improved in order to obtain a realistic annual cycle for a simplified set-up.

2.8. River routing



Description :
A sub-grid catchment approach is implemented.

Inputs	Outputs
Grid-box runoff Grid-box drainage	Stream-flow Coastal flow Return flow into the soil moisture reservoir

Planed evolutions :

- Each sub-grid basin has its time constant for lateral flow.
- Large basins will be further subdivided along isochronous lines.

Module is in beta test and should be availabe by the end of the year.

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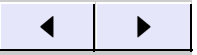

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3. Source code management

To make the evolution of the code transparent to all users it is managed by CVS. This softwares (freely available for all UNIX systems) allows to perform the following actions :

- Obtain the latest version of the model.
- Extract the model as it was on a given date.
- Find the differences to a previous version.
- Update you working model with the latest modifications archived by CVS. (This will preserve your changes.)

There is a restricted access for changing the model in CVS or creating new versions (Software editors).

3.1. Source code management : Browsing the code evolution

Previous Directory				
Attic/ [Don't hide]				
Makefile	1.10	*2 months*	ssipsl	Some housekeeping on the code. The Makefile now work on SUNs. Still a precisio...
Makefile.c90	1.7	*3 months*	ssipsl	Slightly modified interface between Sechiba and Stomate: "tree" is not an outpu...
Makefile.dec	1.5	*3 months*	ssipsl	Slightly modified interface between Sechiba and Stomate: "tree" is not an outpu...
Makefile.linux	1.13	*2 months*	ssipsl	This version compiles for the SX5. That does not mean much yet but work had to ...
Makefile.rhodes	1.2	*2 months*	ssipsl	A version which runs on SX5. Not very fast but still it runs. The makefiles ar...
Makefile.sx5	1.1	*2 months*	ssipsl	A version which runs on SX5. Not very fast but still it runs. The makefiles ar...
condveg.f90	1.21	*7 weeks*	ssipsl	The following problems were corrected : - Albedo values were improved. It is n...
diffuco.f90	1.24	*8 days*	ssipsl	This new version has changed a few things in the interface atmosphere/land-surf...
enerbil.f90	1.16	*8 days*	ssipsl	This new version has changed a few things in the interface atmosphere/land-surf...
hydrol.f90	1.23	*7 weeks*	ssipsl	The following problems were corrected : - Albedo values were improved. It is n...
intersurf.f90	1.10	*8 days*	ssipsl	This new version has changed a few things in the interface atmosphere/land-surf...
sechiba.f90	1.29	*8 days*	ssipsl	This new version has changed a few things in the interface atmosphere/land-surf...
sechiba_io.f90	1.4	*8 months*	ssipsl	A few bugs removed. sechiba_io modified (in/out problems) in restcom, some par...
slowproc.f90	1.26	*2 months*	ssipsl	This version compiles for the SX5. That does not mean much yet but work had to ...
thermosoil.f90	1.13	*3 months*	ssipsl	Updated IOIPSL (10/2/00) ! Corrected a bug in the attribute specification of r...

3.2. Source code management : Browsing the code evolution

Request diff between arbitrary revisions

Default branch: MAIN

Revision **1.23** / (**download**) – annotate – [select for diffs] , *Wed Apr 5 14:48:07 2000 UTC* (7 weeks, 5 days ago) by *ssipsl*
Branch: **MAIN**
CVS Tags: **v2**, **HEAD**
Changes since **1.22: +3 -4 lines**
Diff to previous 1.22

```
The following problems were corrected :

- Albedo values were improved. It is not perfect but a lot better
than before.

- IOIPSL was patched but the new release of IOIPSL will be installed soon.

- hdry was added as a diagnostic.

- A patch was put to correct for the solar radiation values above 2000
W/m^2 which can be found in ISLSCP !

        Jan
```

Revision **1.22** / (**download**) – annotate – [select for diffs] , *Thu Mar 2 10:45:36 2000 UTC* (2 months, 4 weeks ago) by *ssipsl*
Branch: **MAIN**
Changes since **1.21: +3 -3 lines**
Diff to previous 1.21

```
Corrected little bug in hydrol
GK020300
```

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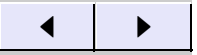

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4. Files needed to run ORCHIDEE

The following ancillary data sets are needed :

Vegetation map : Currently a $5km \times 5km$ version of the IGBP map is used. It has 87 vegetation classes derived by Nicola Viovy from the Olson classification.A more flexible solution is under development.

Soil type map : The $1° \times 1°$ Zobler soil type map is used.

Soil color type : A soil color map at $1° \times 1°$ from the ISLSCP data set is used.

Basin map : The basin map at $0.5° \times 0.5°$ available from U. of New Hampshire is used.

For off-line applications a file is needed with the atmospheric forcing. These files should follow the ALMA convention : `http://www.lmd.jussieu.fr/~polcher/ALMA/dataex_main.html`.
All files are in the netCDF format.

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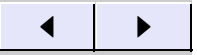

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5. Conclusion

ORCHIDEE is still very much work in progress but the future looks bright :

- The coupling to LMDZ is currently beeing tested. The is **no difference** between the coupled and off-line version of the model.
- For the various modules of ORCHIDEE clear tasks are identified but the manpower is not always there.
- Validation at various scales is underway.

Now we need to think about the future and see how the structure needs to evolve so that data assimilation can be included.