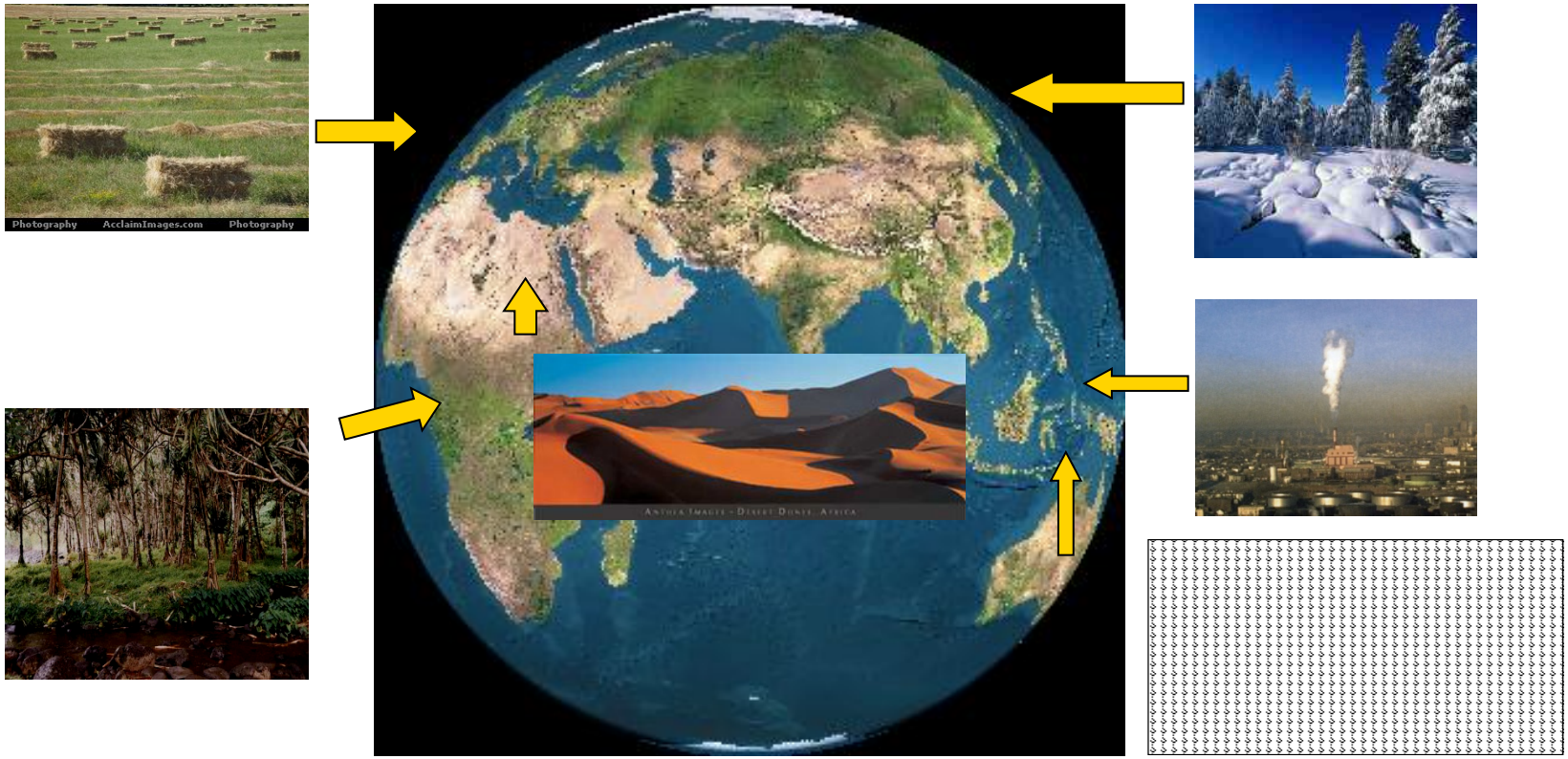
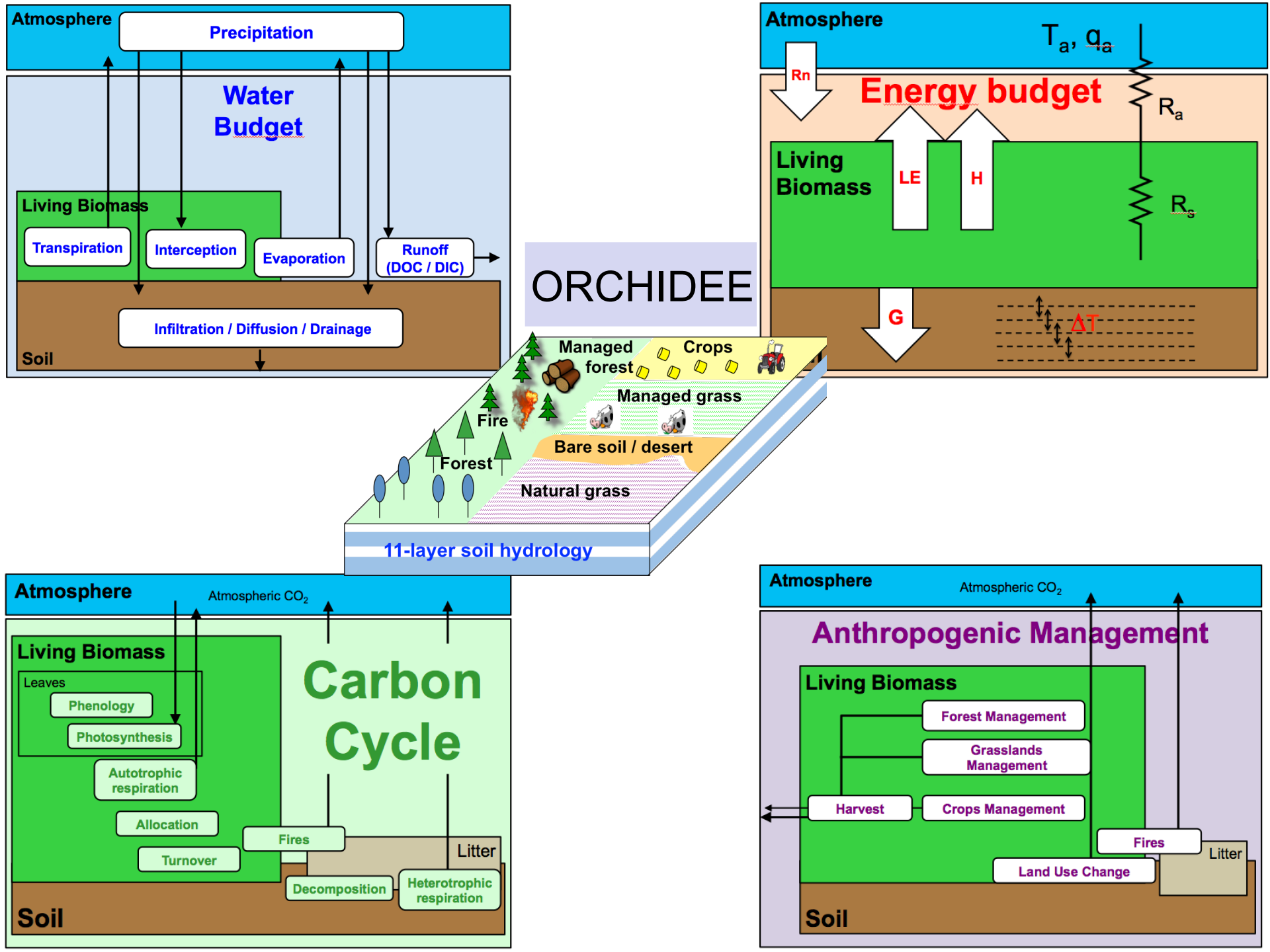
Dynamic Global Vegetation Model ORCHIDEE

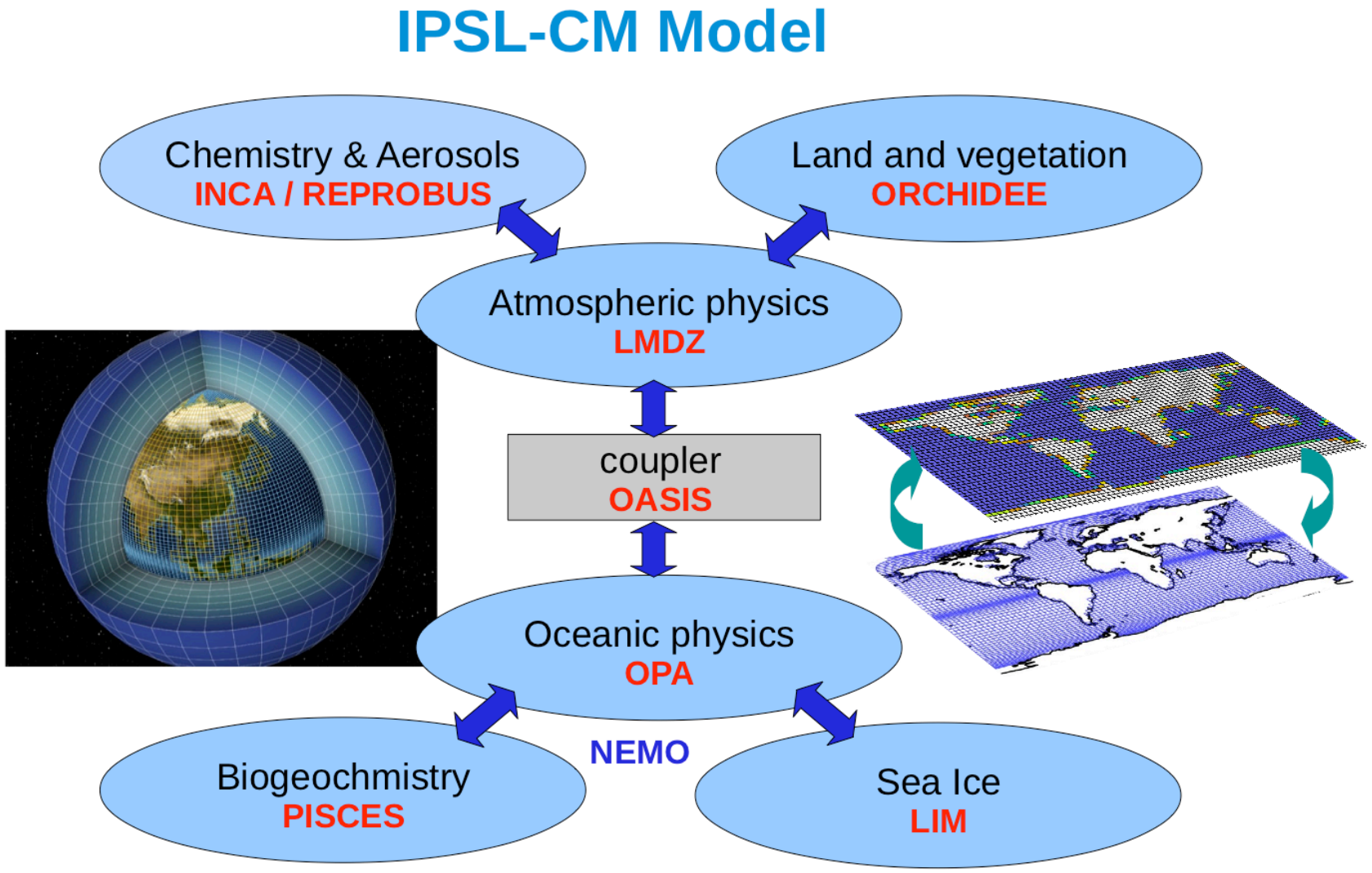
Simulates the Energy, Water and Carbon balance
Land component of the IPSL Earth System Model

Institut Pierre Simon Laplace




Atmosphere
Precipitation
Water Budget
Living Biomass
Transpiration
Interception
Evaporation
Runoff (DOC / DIC)
Infiltration / Diffusion / Drainage
Soil
ORCHIDEE
Atmosphere
T_a, q_a
Rn
Energy budget
R_a
Living Biomass
LE
H
R_s
G
ΔT
Managed forest
Crops
Managed grass
Fire
Forest
Bare soil / desert
Natural grass
11-layer soil hydrology
Atmosphere
Atmospheric CO_2
Living Biomass
Leaves
Phenology
Photosynthesis
Autotrophic respiration
Allocation
Turnover
Carbon Cycle
Fires
Litter
Decomposition
Heterotrophic respiration
Soil
Atmosphere
Atmospheric CO_2
Anthropogenic Management
Living Biomass
Forest Management
Grasslands Management
Harvest
Crops Management
Fires
Litter
Land Use Change
Soil

CMIP exercice are key milestone



The ORCHIDEE project

- COLLABORATIVE effort with many contributors !!
- More than 15 permanents and over 30 CDD
  - Several laboratories but mainly from IPSL
- YOU may include new processes or change some
  ➔ It should benefit to the ORC project
- AND never forget:
  ➔ The current ORC model that will allow your research results from a huge team work !

A brief history of ORCHIDEE

Model

Carbon Cycle (STOMATE)

SECHIBA

Dynamic Veg. (LPJ)

ORCHIDEE

+ new hydrology

+ river routing

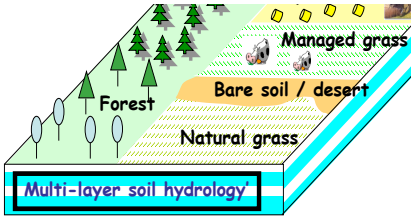
+ Forest management

+ Crops module

+ Permafrost

+ Nitrogen Cycle

Toward a single community tool



(Laval et al., 1981) *(Ducoudré et al., 1993)* *(Viovy et al., 1997)* *(Polcher et al., 1998)* *(Krinner et al., 2005)*

80s 90s 2000 2009

Project / Users

Few Scientists at LMD (3-4)

Small group btw LMD/LSCE (5-10)

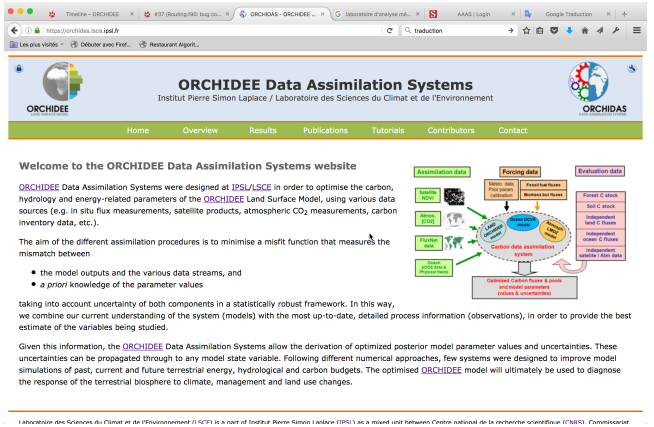
Increasing number of developers & users (15-25)

LMD — organization LMD/LSCE → Specific "Project Group" across IPSL & few other labs.

Several web sites…

- Official web site :
  for external people

- Wiki web site: contains all what you need
  https://forge.ipsl.jussieu.fr/orchidee/wiki



- Web site for Data Assimilation
  https://orchidas.lsce.ipsl.fr/

- Web site for ref simulation visualisation
  https://orchidas.lsce.ipsl.fr/mapper/

Specific documents

- https://docs.google.com/document/d/13R22r1fx0JoYKCojG1k3IM2C18RWuFNvxoYKdtacJEI/edit

  Contain some information on:
  - Governance
  - Project and articles
  - List of all people working with ORCHIDEE (with their activity)
    => Everyone to update

- https://sharebox.lsce.ipsl.fr/index.php/s/AhJk0Bk6rdySXKL

  Contain recently submitted ORC articles

Wiki site: content all info you need

Search

Login | Help/Guide | About Trac | Preferences

Wiki | Timeline | Roadmap | Browse Source | View Tickets | Search

wiki: WikiStart

Start Page | Index | History

Model developments | **Documentation** | **Source Code** | **Reference Simulations** | **Group Activities & Contact**

Wiki of ORCHIDEE model

This wiki aims at gathering information on ORCHIDEE model : code versions and documentation, configurations used by the model, evaluation, seminars...
Information is organized according different sections which are described below :

Section	Description	Highlights or short cuts to sub-sections
Model Developments	In this section, you will find all the informations on the ongoing developments	CMIP6
Documentation	'News', Scientific documentation, Information on the implementation of the code, Users guide/How To, Informations on the forcing	UserGuide/How To
Source Code	Where you will find the source code of the different versions, restricted access for some ongoing developments	See the trunk here.
Reference Simulations	All the information on evaluation protocol and reference simulation	validation simulation with rev 2724
Group Activities	Include: ORCHIDEE-POLICY, meetings, seminars, users list, contact, training courses	Training courses

Several mailing lists

- ORCHIDEE-DEV:
  All users and developpers.
  Main list to exchange information

- ORCHIDEE-PROJECT:
  Restricted mainly to permanent people
  plus few CDDs « main developpers »..

- ORCHIDEE-HELP
  To use with parsimony..

➔ Find all lists under : https://listes.ipsl.fr/sympa/home
(you can subscribe directly on the web site)

« Animation »

- ORC – DEV meeting every 2-3 months
  on specific scientific and technical topics

- Irregular « annual retreat »
  next one not decided yet..

- Project meeting every Tuesday (restricted):
  ➔ Summary accessible to everyone
  (need to be log on to see the summary)

https://forge.ipsl.jussieu.fr/orchidee/wiki/GroupActivities/Meetings/Weekly

Coding guidelines..

- A document that summarizes the MAJOR RULES that you NEED TO FOLLOW when developing new code
- NEEDED to get support from the group
- NEEDED if you want your code to be further used and included in the main ORC version
- You are welcome to suggest new coding rules…

➔ Access it under :
https://forge.ipsl.jussieu.fr/orchidee/wiki/Documentation

Coding guidelines..

Please respect the following:

- Comments should be in english
- Indentation to maintain
- Key words should be in capital letters
- Always have Module and Subroutine description sections
- ...

➔ Access it under :
https://forge.ipsl.jussieu.fr/orchidee/wiki/Documentation

Use of SVN

- Josefine will explained it uses…
- SVN is the BEST way to maintain properly your developments
- SVN is is the BEST way to insure your code will be further used in the TRUNC
- SVN is a facilitating tool.

Use of the “Help”

- TO BE USED SPARINGLY… (as little as you can)
- FIRST: Dig as much as you can into the code..
- SECOND: check the WIKI
- THIRD: ask your main advisor
- FOURTH: Ask your colleague/neighbour
- THEN: post a message to “orchidee-help@ipsl.jussieu.fr
- AS A RETURN, please:
  - Try to write a little summary of the answer to your question on the WIKI (if relevant)
  - Use the “How to ?” section

Various recommendations…

- USE LIBIGCM…

- BE CAREFULL with computer time consumption
  - CURRIE: DO NOT use “many processors” without strong advice from experts !!
  - LSCE: Cluster will increase in size but respect the main rule (under LSCE web site)
  - OTHER systems: Ask the main advisor..

- Propose “Talks” for our regular ORC dev meeting

Fair Use policy

- To ensure “reward” to developers of new physical modules and people maintaining the code (including drivers)
- New developments are not “free” to use : fair use should include/propose co-authorship to the developers
- Reward the “difficult” and less visible technical maintenance and improvement of the code
- Try to prevent “competition” within the ORC group

➔Access from the wiki:
https://forge.ipsl.jussieu.fr/orchidee/wiki/GroupActivities/UseOfORCHIDEEpolicy

Exemple of model functionality and status

Last Name	First name	Lab	Scientific objectives with ORC + project your work is related to (if any)	Fields of expertise (scientific and technical)	Papers in progress (1 yr time frame) in which you lead the ORCHIDEE contribution	Main contact in the ORC core team (if relevant)	Contract start/end dates+type (PhD, postdoc, etc.)	Email+personal webpage if any
Peylin	Philippe	LSCE	- Data Assimilation with ORC - Use of Tree ring data - various developments (multi layers, snow, albedo,...)	Carbon cycle in general Data assimilation Progressively Water cycle..	- ORC-TRUNK v2.0 description - Possibly albedo optimization paper - Launois, Barichivich et al.: use of tree ring data - Possibly effect of soil freezing in couple simulation; impact of soil insulation		None	peylin@lsce.ipsl.fr
Lathière	Juliette	LSCE	-Investigate interactions between the terrestrial vegetation and atmospheric chemistry -Assess natural contribution to the atmospheric chemical composition -Study the impact of pollution on vegetation	-Biogenic emissions (VOCs especially) -Atmospheric chemistry -Global scale and changes -Ferret	None	None	None	juliette.lathiere@lsce.ipsl.fr
Guenet	Bertrand	LSCE	-Improve the soil carbon scheme -Better represent the N feedbacks on plant production from soil organic matter mineralization -Couple the biogeochemical cycles from Land and Ocean by adding lateral fluxes	-soil microbial ecology	Evaluation of ORCHIDEE-SOM over Europe	None	None	bertrand.guenet@lsce.ipsl.fr
Krinner	Gerhard	IGE	Snow, permafrost: improve their representation, evaluate their role in climate system	High latitudes	ESM-SnowMIP description	I'm perfectly irresponsibl	None	gerhard.krinner@cnrs.fr

ORCHIDEE developments for CMIP6

Implemented: V1

Soon..: V1.5

Merging

New Aerodynamic resistance

Nitrogen – carbon Coupled cycles

Optimized albedo (using MODIS)

Permafrost carbon

Land cover based on ESA-CCI

Forest management & forest structure

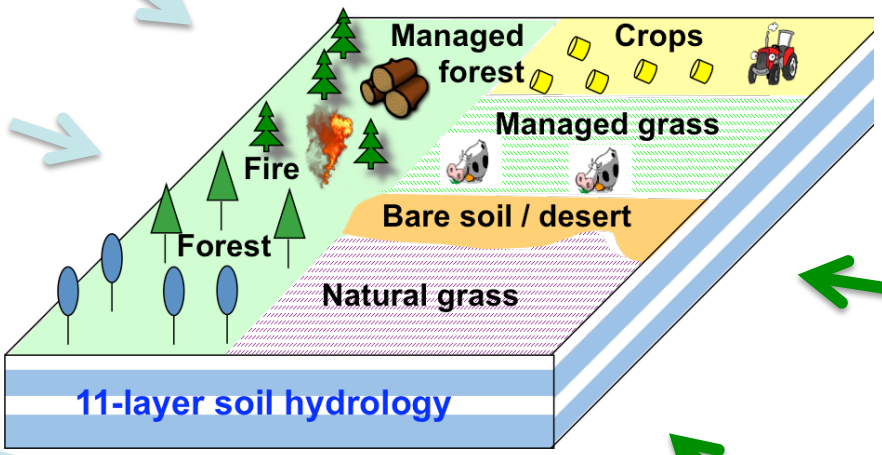
New 3 layers snow model

SPITFIRE and Land use gross transitions

11-layer soil hydrology With soil freezing

Improved Carbon cycle description

CH4 emissions (wetland and permafrost)



Other recent developments

Biophysical

Lake model (FLAKE)

Irrigation

Termokarst lake

DOC – DIC transport by river

New boreal PFTs (Mosses, lichens, shrubs)

Biogeochemical

Nitrogen – Phosphorus - Carbon coupled cycles

Soil Carbon discretization

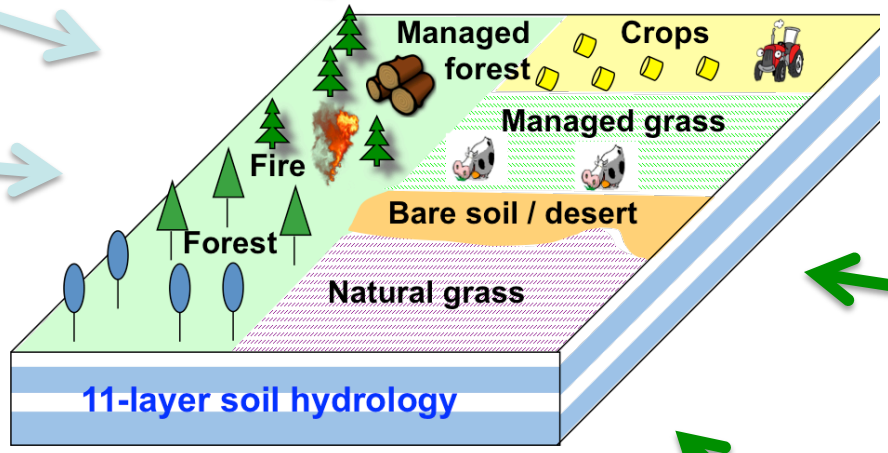
Crop model (wheat, corn, rice,…)

Grassland management

Peatland model (CH4)

Herbivory (large herbivore)

Plant Traits



Current major branches

- Version 2.0 : in use for CMIP6
- Current TRUNK includes Nitrogen cycle (CN)
- CAN-CN : Canopy structure – forest management – CN (soon the Trunk)
- MICT : high latitude focus
- CNP : with the Phosphorus cycle

ORCHIDEE today…

ORCHIDEE tomorrow…

Need collaboration from EVERYONE !