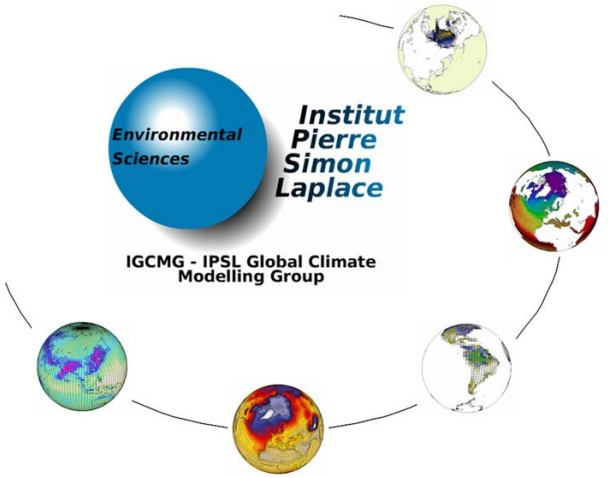

Plans for CMIP5 from IPSL

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WGCM 2008, 12th session, Paris, 22-24 September 2008

Current status of model development

ESM model:

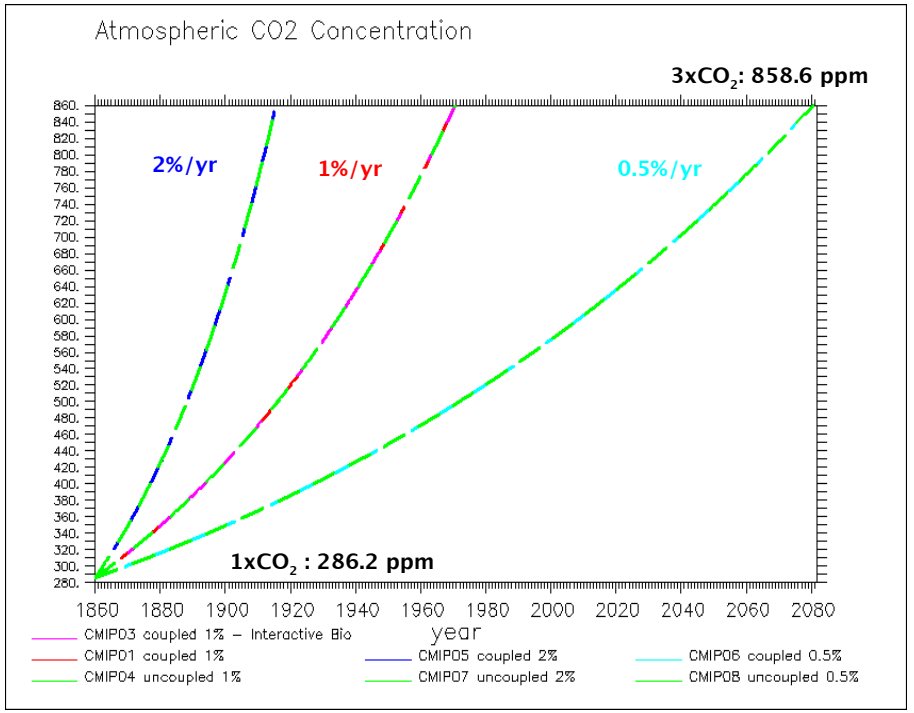
Based on an improved version of the IPSL-CM4 model used for CMIP3/AR4:

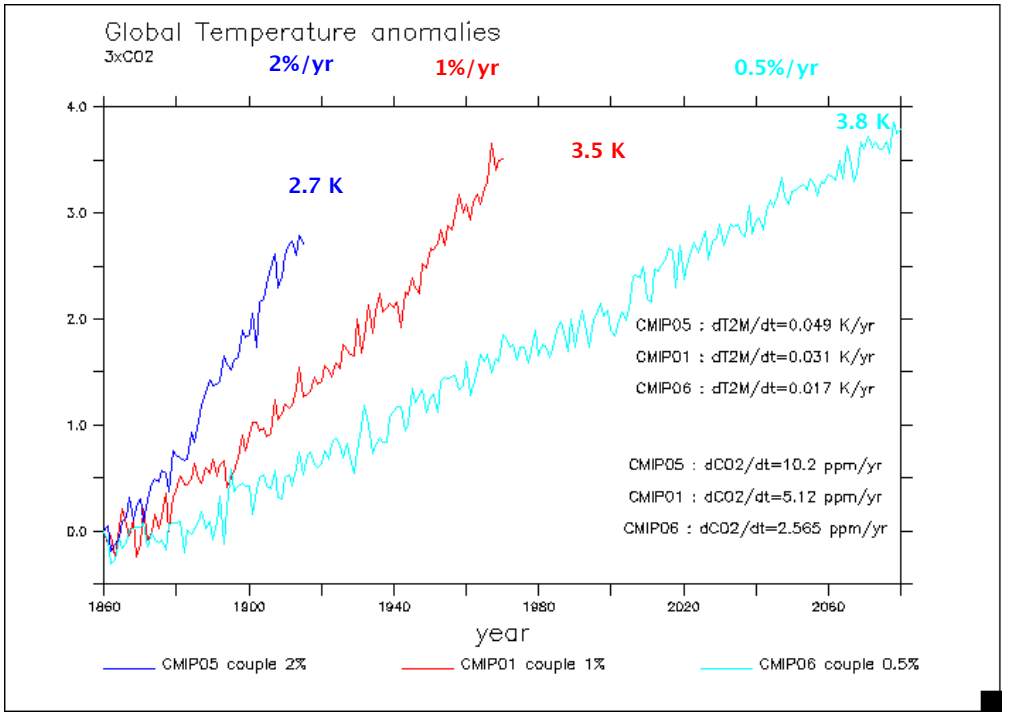
- Atmospheric model LMDZ-4
  - with higher horizontal resolution (2.5°x1.5°)
  - some update in the physics
  - Interactive aerosols and chemistry
- Oceanic model NEMO
  - Improvements of the physics and the dynamics
- Land Surface Model, ORCHIDEE
  - Land-use
- Improved Carbon cycle

CMIP runs with IPSL-CM4-LOOP

- ΔpCO_2 = 0.5 %/yr
- ΔpCO_2 = 1%/yr
- ΔpCO_2 = 2%/yr

All up to 3xCO2
Coupled and Uncoupled simulations



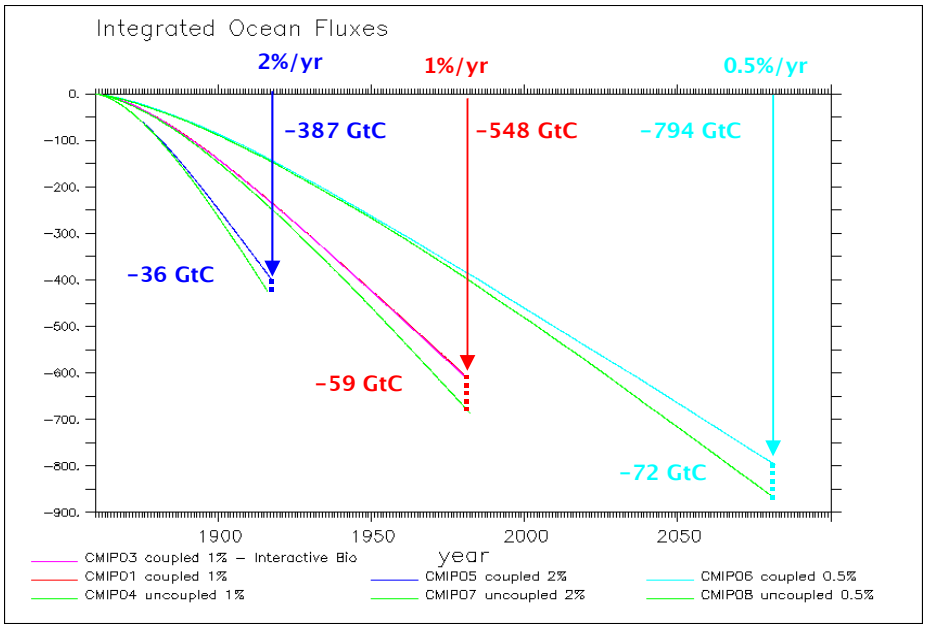


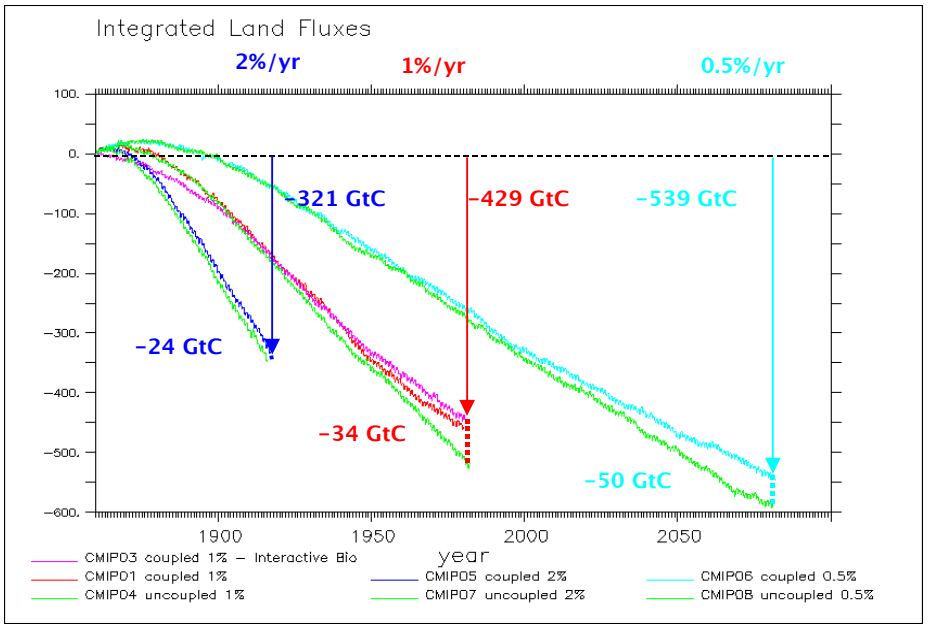
For slower rate of forcing :

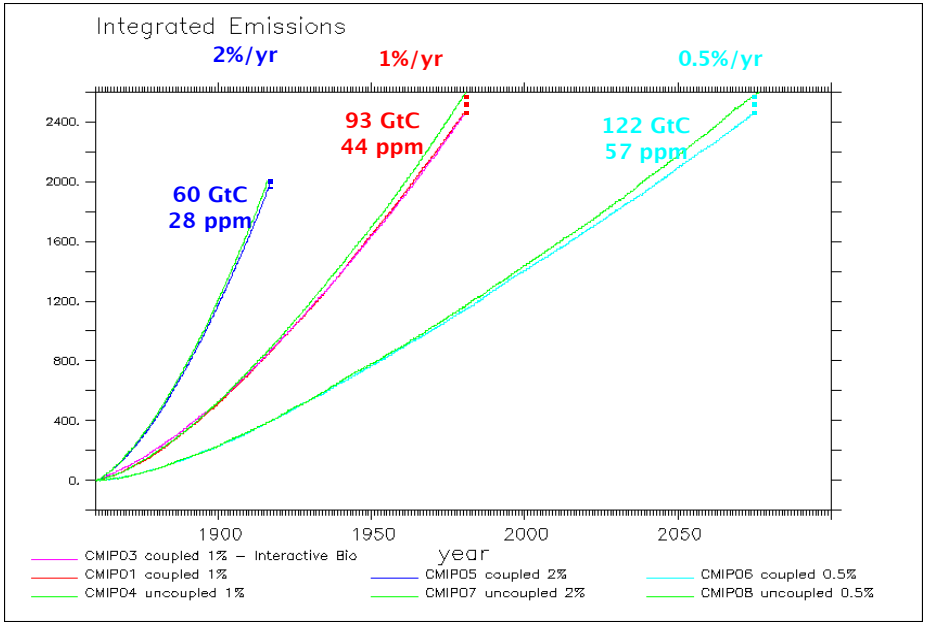
- larger realized warming (α)

Cadule et al., in prep

CMIP runs with IPSL-CM4-LOOP







For slower rate of forcing :

- larger biogeochemical uptake (β)
- larger climate impact (γ)

- absolute emission reduction is larger
- relative reduction (gain) is lower

Cadule et al., in prep

Current status of model development

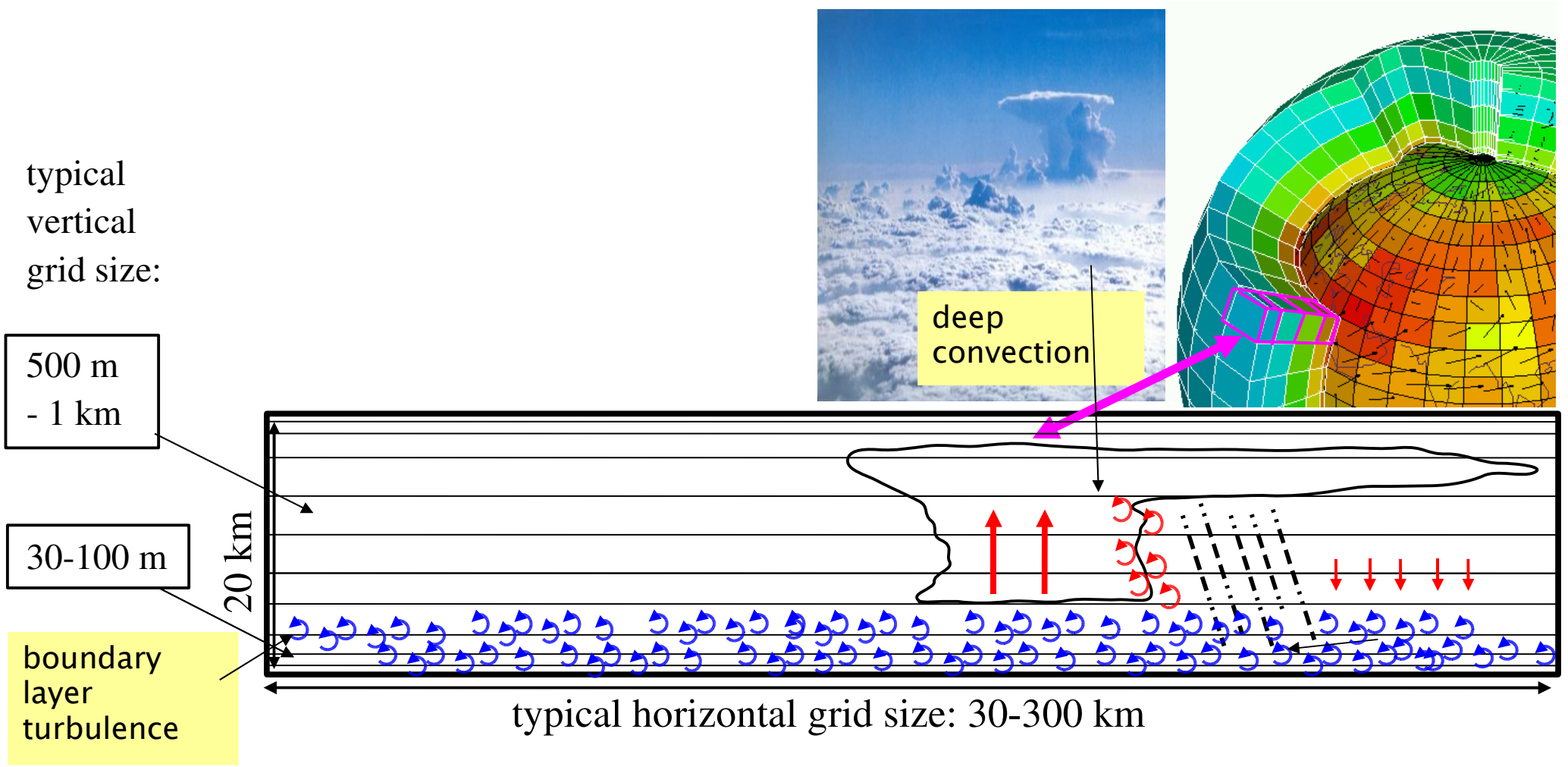
New OAGCM :

New atmospheric parameterizations to address some long standing AGCMs problems:

- Wrong diurnal cycle of the convection: maximum at noon, instead of late afternoon
- Lake of sensitivity of the convection to mid troposphere humidity
- Lake of low level clouds (cumulus, strato cumulus...)

Physical package used for CMIP3 / AR4 simulations

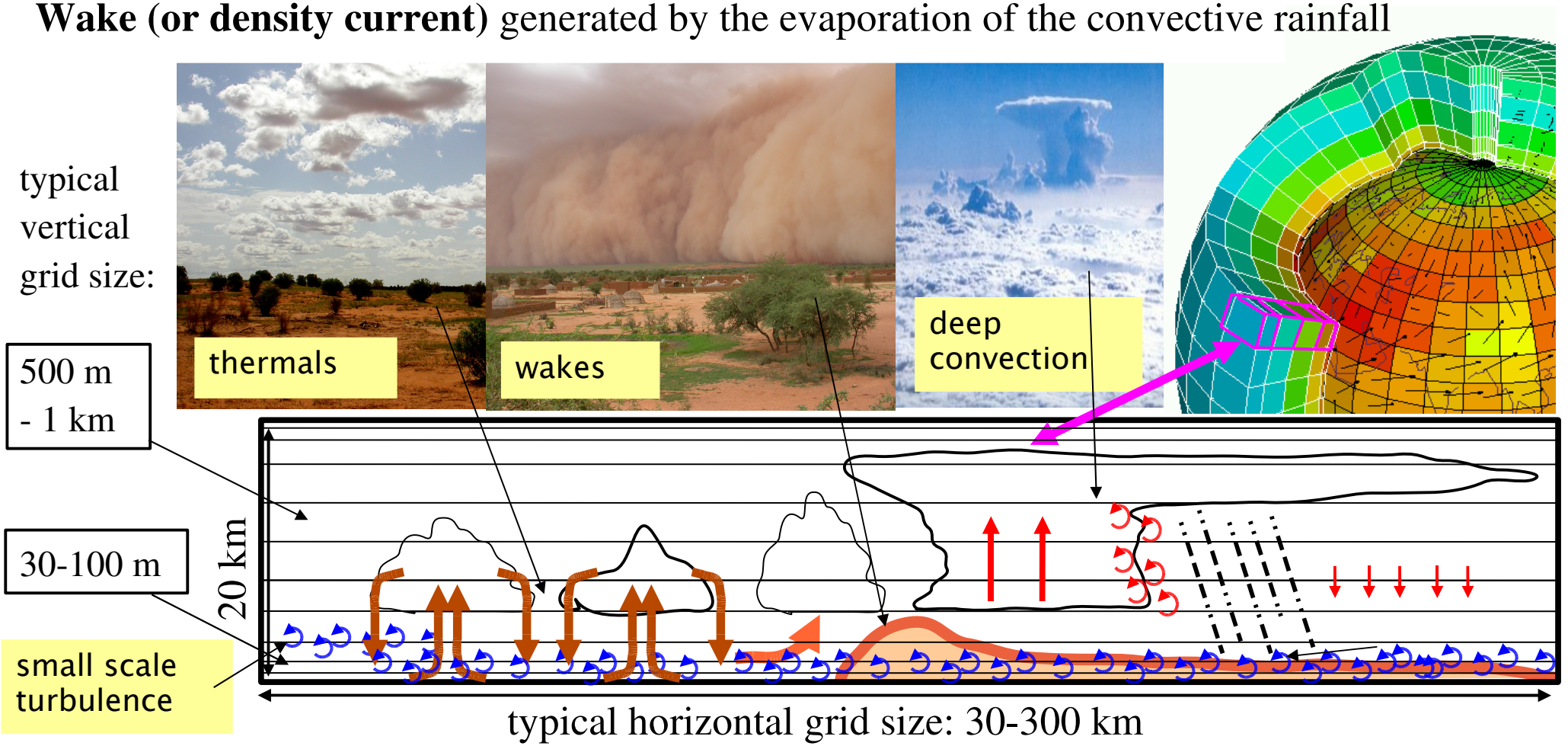
- **Turbulent diffusion** (10-300 m) Kz=l dU/dz f(Ri)
- **Deep moist convection** (Emanuel, 1993)
- **Cloud scheme** based on the subgrid-scale distribution coupled to the convection scheme (Bony and Emanuel, 2001)



New physical package based on 3 scales

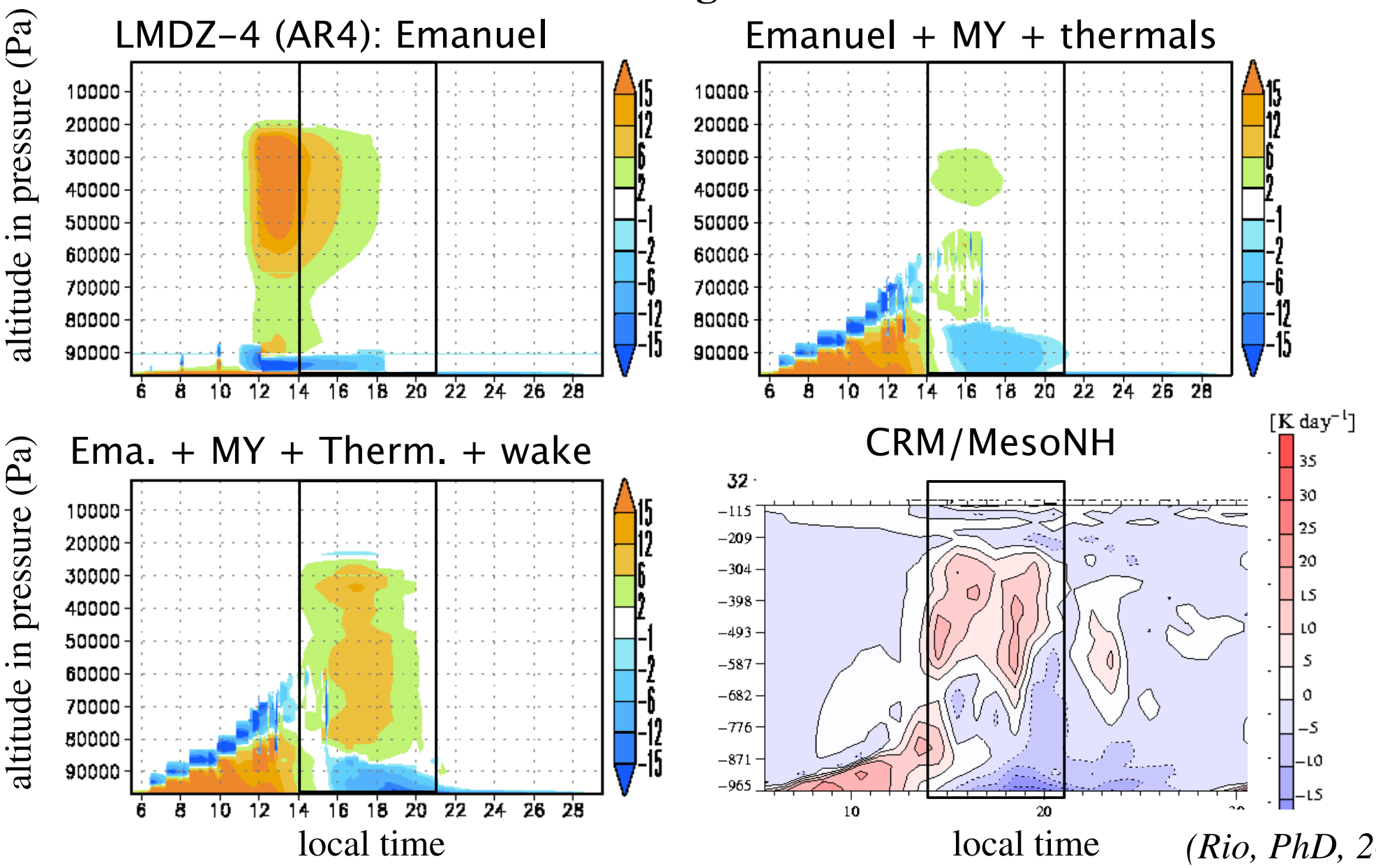
- **Turbulent diffusion** (10-300 m), prognostic eq. for the TKE (Yamada,1983)
- **Cloudy thermal plume** (Hourdin et al, 2001, Rio et Hourdin, 2008)
- **Deep moist convection** (Emanuel, 1993) modified by Grandpeix et al. (2004), Rio (PhD, 2007), Grandpeix and Lafore, (in prepa.)
  - mixing probability, closure and triggering based on the boundary layer characteristics

Wake (or density current) generated by the evaporation of the convective rainfall



1D case of the diurnal cycle of deep precipitating convection over land proposed by Guichard et al. (2004)

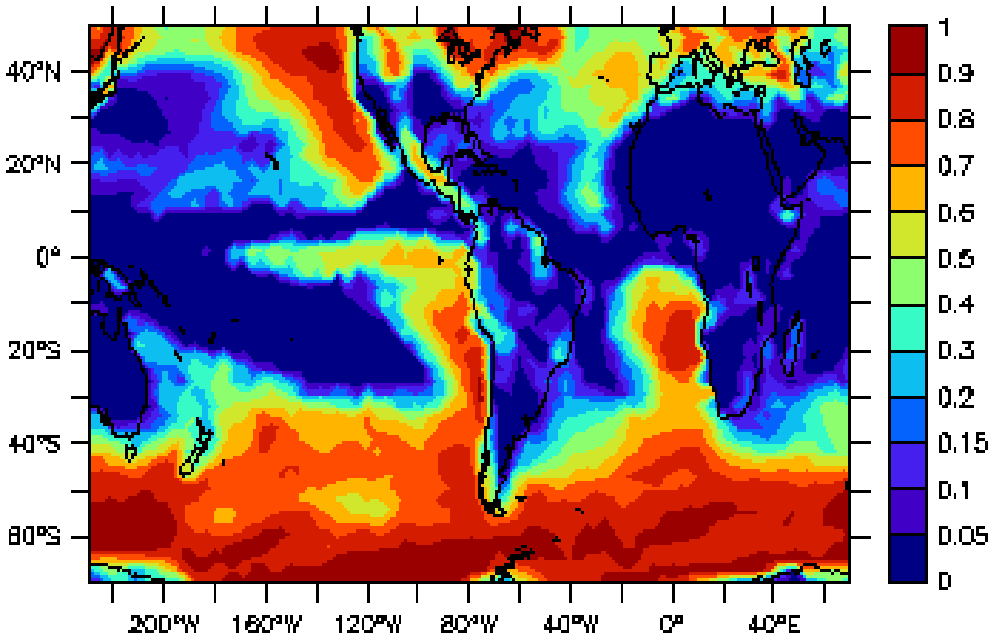
Convective heating rate(K/day)



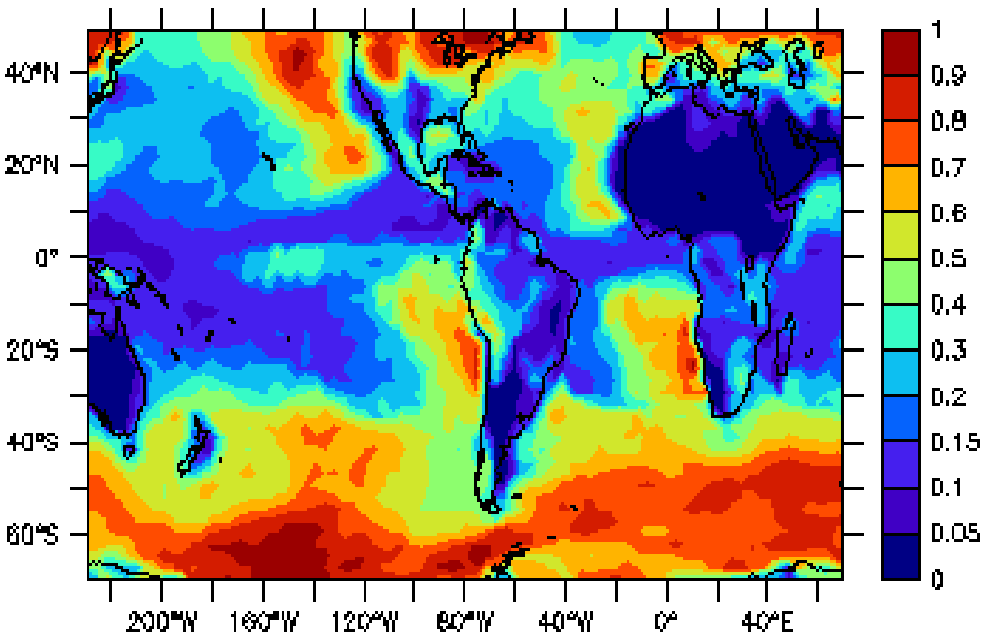
(Rio, PhD, 2007)

New physical package in the 3D model also improves low level clouds cover.

Low level cloud cover (January)



Old physics, 40 vert. layers



New physics, 40 vert. layers

Next step: Global evaluation and tunning of the atmospheric model

IPSL plans for CMIP5

Long-term experiments :

- IPSL-ESM (improved CMIP3/AR4 physics)
  - With carbon cycle and land-use
  - With interactive aerosols (probably not in all runs)
- IPSL-OAGCM (new atm. Physics, possibly higher resolution ocean)
  - With prescribed aerosols
  - ? with carbon cycle ?

IPSL plans to perform all the mandatory experiments, and most of the high priority and recommended experiments, and many "satellite" experiments

IPSL will also participate in PMIP, CFMIP, C4MIP, CCMval, AEROCOM...

Experiments set-up: need to specify for which set of experiments the model set-up has to be exactly the same: interactive aerosols, dynamic vegetation, ozone...

IPSL plans for CMIP5

Short-term experiments :

Time slice experiments: (8.1 and 8.2) with chemistry models,

Near term prediction: no plans yet

Runs will started end of 2009.

Aquaplanet: yes

Observation simulator (SCOPS): yes

Computer resources:

- NEC SX8, 80 proc, 1 year
- the model resolution (Atm. 2.5x1.25°xL40, Oce. 2°xL31) has been chosen to be able to run almost all the CMIP5 and many "satelitte" experiments

Main constrain: (1) man power (especially model developers) and (2) computing ressources