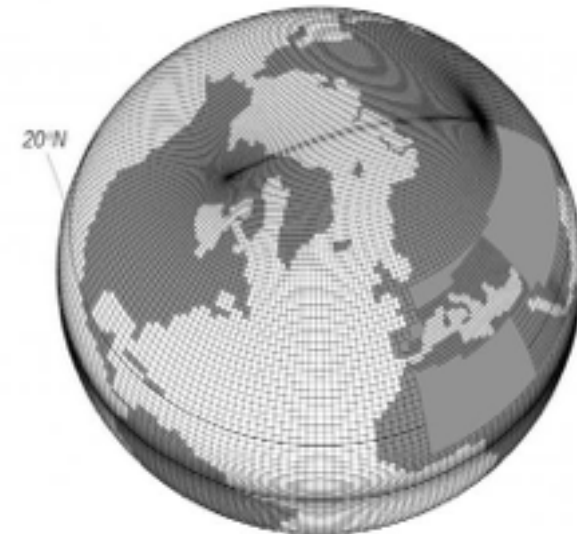
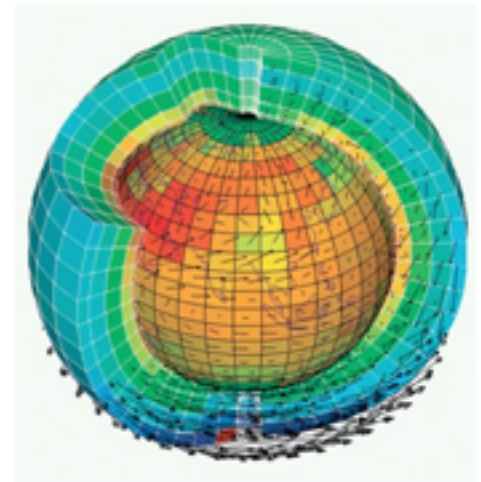
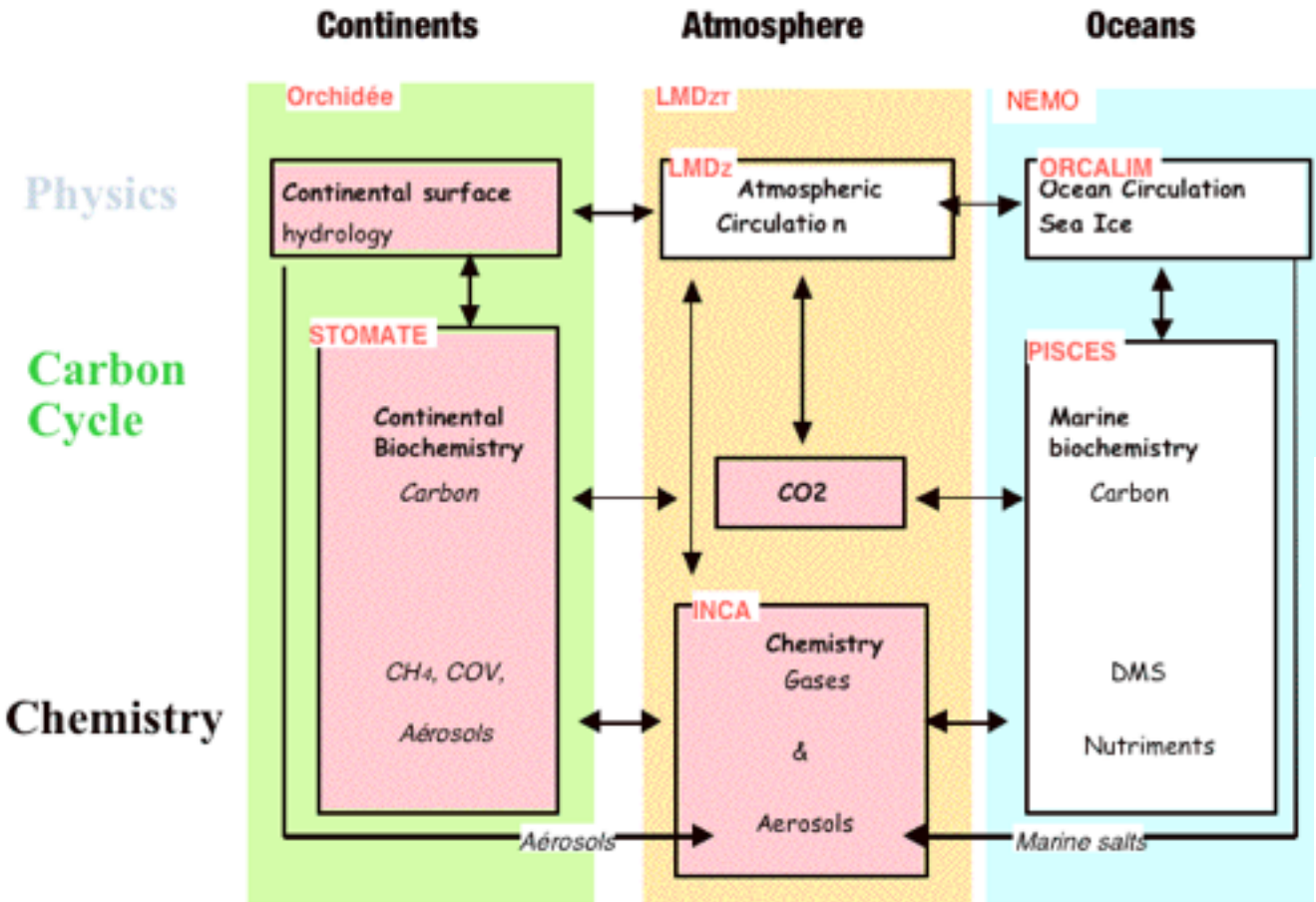


Modelling paleo-climates with a general circulation model

Camille Contoux, Post doc OT-Med

# What is a General Circulation Model (GCM)?

## The IPSL Earth System Model



GCMs are used for future projections in the IPCC !

# What are the boundary conditions ?

- CO<sub>2</sub> level (and other greenhouse gases, aerosols)
- orbital configuration (Milankovitch)

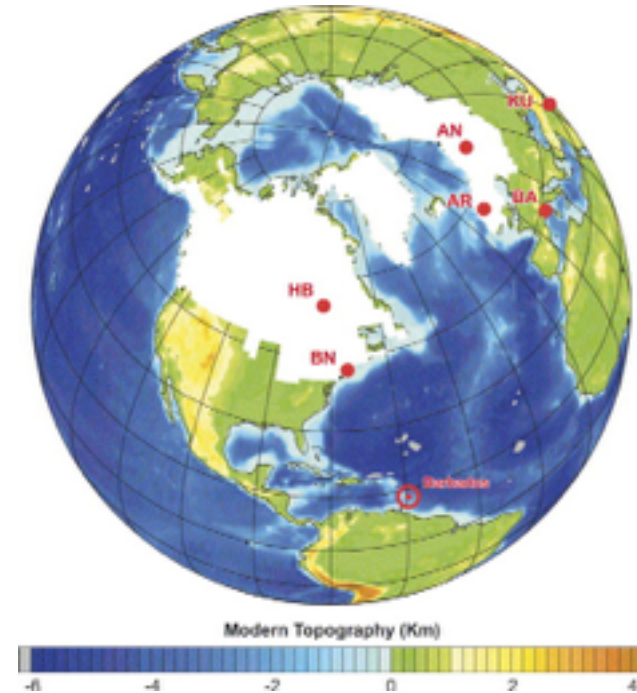


- topography/land-sea distribution
- ice sheets
- vegetation
- etc.
- initial state not important ( $\neq$  meteo)

# Example : the Last Glacial Maximum (-21 000 yrs)

Boundary conditions:

- CO<sub>2</sub> = 185 ppm (preind = 280)
  - Orbital change
  - Ice sheet reconstruction (ICE-5G, Peltier & Fairbanks 2006)
  - - 120 m of sea level
- 
- The model runs until reaching equilibrium

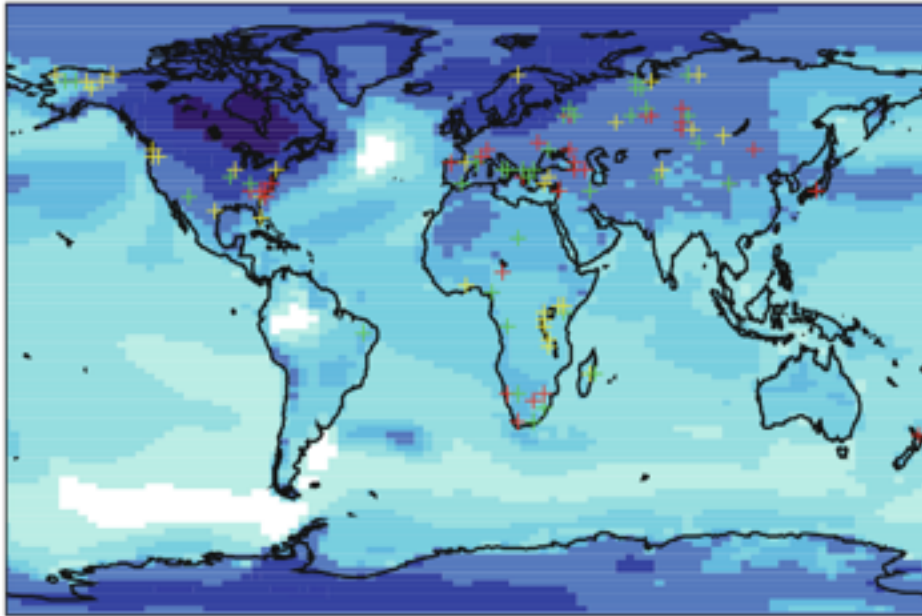


# What is the output?

- Atmosphere : temperature, winds, cloud cover, precipitation, pressure...
- Land : leaf area index, carbon fluxes  
If interactive vegetation : Plant Functional Types
- Ocean : temperatures and salinity from surface to depth, currents, heat transport, sea-ice thickness and extent...

# Simulated climate for Last Glacial Maximum with IPSL-CM5A

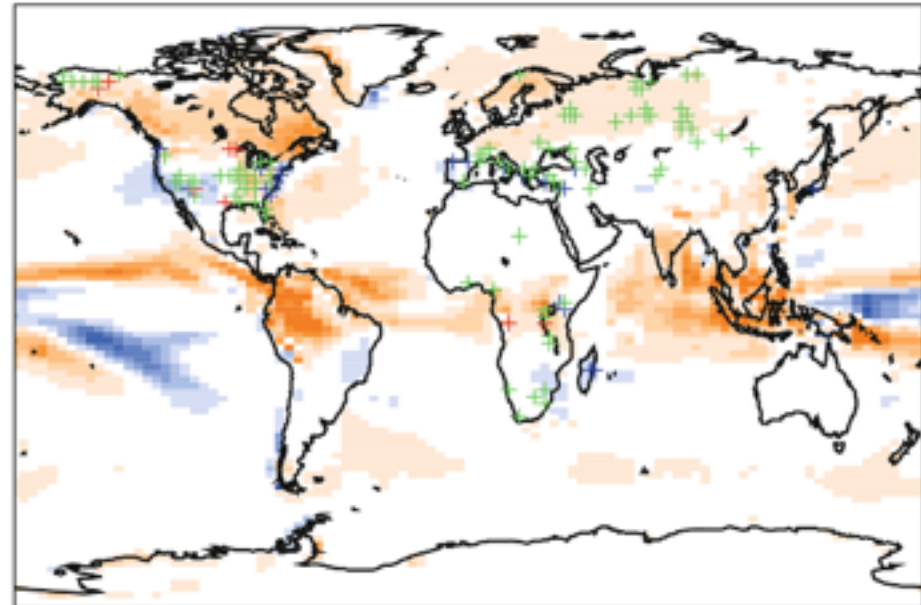
IPSLCM5 MAT (LGM - PI)



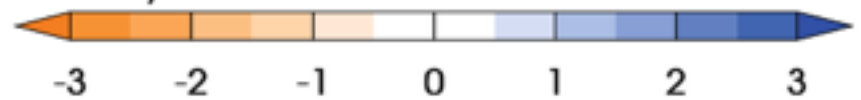
( 32 too cold - 37 ok - 29 too warm)



IPSLCM5 MAP (LGM - PI)



8 too dry - 91 ok - 22 too wet



GCMs are great but coarse resolution...  
How can we use them for impact studies ?

Downscaling :

- dynamic : regional models or zoomed models

Computer time ++

- statistical relationships between large scale and small scale

Very fast but less variables predicted

Careful for paleo

