

Introducing land-cover and land-use changes in a climate scenario of the 21st century

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Method

Scenario simulation from 1970 to 2100, with **interactive coupling** between IMAGE2.2 and AOG GCM from **2000 to 2100 every 5 years**

General Circulation Model

Temperature
Precipitation

Integrated Impact Model

AOG

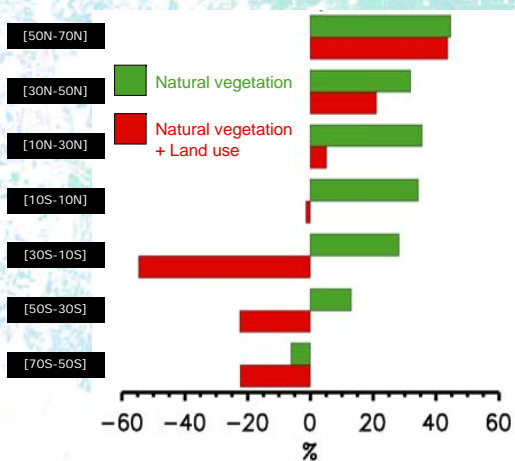
ARPEGE (atmosphere)
OPA (ocean) – IPSL/Lodyc
GELATO (sea-ice)
ISBA (land surface scheme)

IMAGE2.2

(RIVM, Holland)
Alcamo et al. (1998)

Land cover maps
GHGs concentrations
Sulphate aerosols

Need to include land-use changes



Zonal anomaly [2090-2099] – [1970-1979] of the **vegetation fraction** as evaluated from an IMAGE simulation for scenario A2

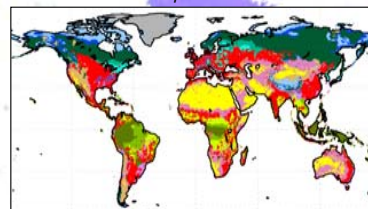
Projections over the 21st century considering only the evolution of natural vegetation would not be realistic. Vegetation models need also to take into account **anthropogenic land use changes**.

IMAGE2.2 is an adequate tool to address this question since it simulates the evolution of both natural vegetation and land use on a 0.5°x0.5° grid.

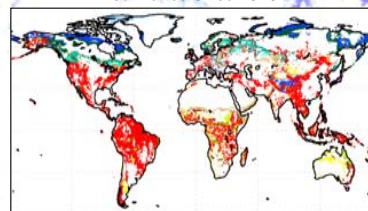
Results



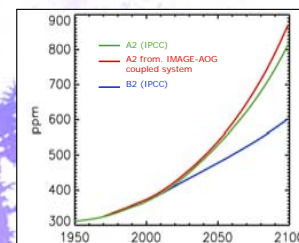
Land cover map simulated for 1970



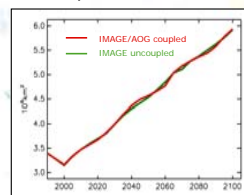
Land cover change simulated for 2100, represents only cells which have been converted since 1970



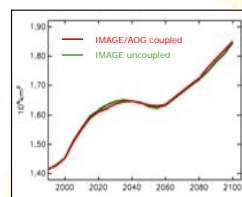
Projection of atmospheric CO₂ concentration



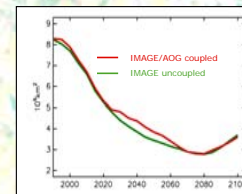
Temperate cereal area



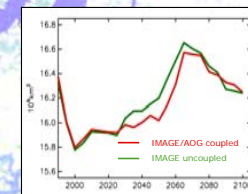
Rice area



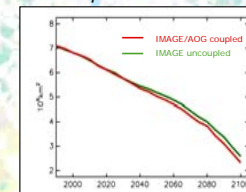
Savannah area



Boreal forest area



Tropical forest area



✗ The GCM simulation has been driven by consistent anthropogenic forcings provided interactively by IMAGE2.2

✗ Coupling IMAGE2.2 with a GCM has not modified greatly the IMAGE projection of natural land cover and land use changes

⇒ For GCMs coupled to a dynamic vegetation model that do not simulate the land use, we propose to use directly a **land use scenario** provided by IMAGE2.2 (in the same way as we use GHGs scenarios).