Title : Modelling of the global carbon cycle in the terrestrial biosphere.
Integration of satellite data.

This study aims at improving the diagnostic modelling of CO_2 fluxes between atmosphere and continental ecosystems. It is carried out within the framework of the 'terrestrial biosphere' component of the European project ESCOBA (*European Study of Carbon in the Ocean, Biosphere and Atmosphere*).
The terrestrial biosphere influences the global carbon cycle through the process of Net Ecosystem Productivity (NEP) which is the balance of vegetation Net Primary Productivity (NPP) and Heterotrophic Respiration (HR) from soil.
First, a new model of NPP, derived from the Kumar and Monteith (1981) approach was run over the years 1986-1991, accounting for remotely-sensed Global Vegetation Index (GVI) from the NOAA-AVHRR data-set. This experiment emphasised the ability of the model to simulate the effects of climatic events such as El Niño on terrestrial NPP. Particular efforts have been made on the radiometric quality of the signal we use to compute GVI. Indeed, a bias of 1% on the vegetation index can increase or decrease annual NPP by 1.4% (roughly 10^{15} gC/year). For the year 1990, we calculated NEP by coupling a temperature driven HR formalism with the NPP model. If achieved NEP fluxes were qualitatively consistent with the [CO_2] atmospheric signal, the atmospheric transport stressed the inaccuracy of the estimated budget.
So, we opted for a complementary approach which consists in using NEP obtained with an inverse calculation of intensity and land/ocean partitioning of CO_2 fluxes (Ciais *et al.*, 1995). The resulting bioterrestrial carbon budget was then considered as the target quantity to be reached by the difference NPP-HR by adjusting HR key parameters. The adjustment was performed on the soil respiration modelling, since it was supposed to be less realistic than that of NPP.
Resulting HR key parameters showed the same order of magnitude as commonly used values at different locations.
Nevertheless, different solutions of zonally adjusted parameters can lead to equivalent temporal signatures of NEP and make us wonder if atmospheric constrain is sufficient to validate NPP and HR simultaneously.
Atmospheric transport reveals itself as an essential tool, but which does not spare the use of NPP and HR calibration to measured carbon fluxes.

Key word:
Global carbon cycle, terrestrial biosphere, vegetation index, NOAA/AVHRR satellite, diagnostic modelling, net primary productivity, heterotrophic respiration, atmospheric transport.