Geophysical Research Abstracts
Vol. 12, EGU2010-11288, 2010
EGU General Assembly 2010


# Effect of vegetation dynamics on climate variability: contrasting results from two modeling studies.

Christine Delire (1), Nathalie de Noblet-Ducoudre (2), Adriana Sima (3), and Isabelle Gouirand (4)

(1) GAME - CNRS/Meteo-France, Toulouse, France, Climate Group (GMGEC), Toulouse cedex, France (christine.delire@meteo.fr), (2) LSCE - CEA/CNRS/UVSQ, Bat 712/Orme les Merisiers, Gif sur Yvette 91191 France, (3) LMD/CERES-ERTI, 24 rue Lhomond, Paris, 75231 France, (4) Dpt of Biological and Chemical Sciences, University of the West Indies, Cave Hill, Bridgetown, Barbados 11000

There is evidence that biophysical feedbacks from the vegetation to the atmosphere play an important role in the decadal persistence of dry and wet spells in the Sahel. Numerical studies by Wang and Eltahir (2000 a, b, c), Wang et al. (2004) and Zeng et al. (1999) show that changes in the Atlantic sea-surface temperatures off the coast of West Africa alone are not sufficient to cause the persistent drought observed in the region since the 1970s, unless local feedbacks from changes in the vegetation cover are included. At the interannual to decadal and centennial timescales links between the variability of land-cover and climate have been only partially explored. Very few GCM studies have addressed the potential of vegetation dynamics to shape climate variability at these time-scales (Delire et al. 2004, Crucifix et al. 2005). The question raised by these two studies is: how real is this effect of vegetation dynamics? With the exception of the Sahel, it is hard to tell. Decadal variability of the precipitation has been documented in the litterature for the Midwest in N. America with for instance the catastrophic drought of the 1930s.

Here we compare the results of two rather different global climate models (the NCAR/Madison CCM3/IBIS model and the IPSLCM4 model) that both include dynamic global vegetation models (IBIS and ORCHIDEE). We first compare their simulated climate and vegetation at equilibrium for the preindustrial period and we investigate the realism of the simulated vegetation-climate feedback using the statistical approach proposed by Liu et al., 2006 and compare it with observations. With CCM3/IBIS we then analyse the role of vegetation dynamics feedbacks on the simulated climate of the 20th century. For both the preindustrial period and the 20th century we perform pairs of simulations: one with interactive natural vegetation dynamics, and the other with a prescribed vegetation distribution.

Both models simulate vegetation-climate feedbacks that compare well with the observed ones (Liu et al, J Climate 2006), indicating a reasonable representation of the interactions between vegetation and atmosphere at timescales from a few months to a few years. Despite their rather large differences the 2 coupled vegetation-climate models simulate an increase in low-frequency variability of precipitation and temperature when taking into account vegetation dynamics compared to a fixed vegetation cover.