A Review of Present-day Carbon Cycle in Amazonia: Source or Sink?

Carlos A. Nobre, Centro de Previsão de Tempo e Estudos Climáticos-CPTEC/INPE, Cachoeira Paulista, SP, 12630-000 Brazil (email: nobre@cptec.inpe.br)

Due to the large areas of the tropical rainforests of South America which are felled and burnt every year (around 15 to 25 thousand km^2) over the last 2 decades, Amazonia has been thought as an important source of CO_2 and other Greenhouse Gases for the atmosphere. In fact, recent calculations taking into account several CO_2 emission sources and sinks (fires, decomposition, secondary growth, export in timber in wood products) indicate that the average net balance for the 1980's is about + 200 MtonC/year for the Brazilian Amazonia only. That is estimated to be about 10 to 15% of the total global emissions of carbon due to land use and land cover change.

However, recent measurements of CO_2 fluxes above the forest canopy on a number of sites in Amazonia show that the undisturbed forest appears to be sequestering carbon at high rates (2 to over 5 tonC/ha/year). Forest inventories independently also seem to confirm this result. Even ecosystem models applied to Amazonia calculate the forest to be functioning as a carbon sink over the last decade, although with large interannual variability related to climate (as a source in El Niño years, with below normal rainfall in large portions of tropical South America, and as a sink in La Niña years, with above normal rainfall).

The ongoing LBA Experiment will throw some light on this question since it is already and will carry out continuous surface flux measurements for a number of sites over 5 years. It is hoped that the new data will help in elucidating the reasons for the undisturbed forest to be apparently acting presently as a sink of excess atmospheric CO_2 and also to project into the future if and when will such sink saturate.