El Nino induced productivity drops in Amazonia : how sensitive are they to anthropogenic land-cover changes ?

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There is growing evidence that Anthropogenic Land Cover Change (ALCC) can produce significant impact on regional climate. Historical ALCC, mainly consisting of forest clearing at northern mid and high latitudes, is even recognized to have cooled the northern hemisphere surface climate via an increase in surface albedo.

In the future, deforestation is expected to intensify in tropical regions, and will result in decreased evapotranspiration that may lead to a warmer and drier surface climate. This may have some consequences on the productivity of all ecosystems, whether natural or anthropogenic (e. g. crops, pasture), specially if combined with additional climate changes resulting from the greenhouse induced global warming.

A number of studies have also demonstrated that ALCC have an impact on climate extremes and droughts.

In this study we examined the sensitivity of El Nino induced productivity drops in Amazonia to one potential future ALCC change. To examine this issue we used the "Institut Pierre Simon Laplace" climate model (IPSL-CM4) [Marti et al., 2005], which couples the LMDZ4 atmospheric General Circulation Model (GCM) [Hourdin et al., 2006] with the ORCA/OPA ocean GCM [Madec et al., 1998], the LIM sea ice model [Fichefet and Maqueda, 1997] and the ORCHIDEE dynamic global vegetation model [Krinner et al., 2005]. We performed three simulations, all with GHG concentrations and aerosols set to pre-industrial values. Simulations referred as PAST, PRES and FUTU have prescribed pre-industrial (1860), present day (1992) and future (2100) vegetation distributions, respectively. Future anthropogenic land areas are based on results from the IMAGE2.2 model [Alcamo et al., 1994] which projects land cover change in response to a "business as usual" economical scenario (i.e. A2 scenario). From our fully coupled equilibrium simulations we have extracted all El Nino events and evaluated their impacts on the productivity of all ecosystems.