Seasonal cycle shifts in the Amazon hydroclimatology associated with the land cover change

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Land use change can influence the climate through alterations in biogeochemical processes and by changing the physical properties of the land surface – thereby altering the energy, mass and momentum balances at surface. These impacts are particularly intense over the tropical region, where there is a strong coupling between the surface energy balance and the atmospheric convection. In this study we explore how deforestation throughout the Amazon impacts the seasonal and annual hydrological cycle. We use the IBIS integrated biosphere model in two modes: (i) offline simulations with IBIS (no climate feedback); (ii) IBIS coupled to the National Center for Atmospheric Research Community Climate Model 3 (CCM3), to simulate the response of the atmosphere to the land use (climate feedbacks). When deforestation does not feedback to climate there is a general increment of river runoff, proportional to the deforested area; which would increase the flood risk. When the climate respond to the land use changes, there is a progressive reduction in the annual precipitation, intensifying the droughts events. Precipitation reductions are more severe during the dry season and during the transition from dry to wet season, when drought events become more frequent. Under the more extreme scenario (deforestation projected to 2050) the dry season length increases by more than one month, and the percentage of months under water deficit (monthly precipitation lower than the average evapotranspiration) increases from 29.6% to 41.3%. For this scenario, the occurrence of months with very low precipitation (below 30 mm) increases from 3.5 % to 13.6 %.