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# Modelling the responses of atmosphere-biosphere interactions to changing land use and climate in the Amazon basin-a project overview.

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Several modelling experiments of different spatial and time resolution are conducted to address the uncertainties of local and regional changes in the hydrological and carbon cycles due to land use change in the Amazon river basin. The models used are the numerical process-based terrestrial ecosystem dynamics model HYBRID 8, the high resolution atmospheric model ATHAM (Active Tracer High-resolution Atmosphere Model) and a simple idealized coupled soil-atmosphere 0-d model.

High resolution experiments with spatial resolution of the order of a couple of hundreds of meters and temporal resolution of 2-3 seconds will be conducted with ATHAM-HYBRID, to study the effects of different vegetation cover on cloud formation and on mesoscale convective events.

The possible feedback mechanism of short lived clouds on vegetation will also be analysed.

These experiments are necessary to demonstrate the importance of cumulus clouds in the atmospheric boundary layer both on the hydrologic and carbon diurnal cycles. The boundary layer clouds modify the near-surface climate and they also affect the diurnal $CO_2$ cycle, diffusing the solar radiation, which enhances the uptake of $CO_2$ by vegetation, leading to changes in the carbon fixation ratio (Arellano *et al.* 2012).

For the effect of land use change at a regional level and on longer timescales, the 0-d model will be used to generate rainfall. We will use several scenarios with decreasing advection from Atlantic Ocean and decreasing local recycling for investigating the resilience and stability of vegetation to climate and land use change.

The resulting precipitation and temperature then will be used as input to force the dynamic vegetation model HYBRID until equilibrium is achieved in the carbon pools. The changes in the hydrological cycle, gross primary production, net ecosystem exchange and total ecosystem respiration will be investigated.

We will compare the output from both experiment types (ATHAM/HYBRID, 0-d model/HYBRID to the flux data from different humid tropical experiments namely LBA and FLUXNET.