The JSBACH (Jena-Scheme for Biosphere-Atmosphere Coupling in Hamburg) and TRACES (Trace Gases and Aerosol Cycles in the Earth System) project aims at the integration of climate and biogeochemistry model components. These components are:

Atmospheric Model: ECHAM-5

Coupled Vegetation and Land Surface Model (fast processes): BETHY / VIC

Vegetation Dynamics Model (slow processes): LPJ

One aim of the project is to quantify the feedbacks between the terrestrial processes (incl. carbon cycle and land vegetation) and the atmospheric climate system under a scenario of human interference (land use change and greenhouse gas emissions). We will study emissions and uptake of CO2, nitrogen, and dust as climatically active tracers.

The nature of the feedback studied may be

(1) Biophysical: changes in atmospheric CO2 content, nitrogen input to vegetation, and in the water balance of land surfaces have a pronounced effect on leaf stomatal pores on a global scale. This can lead to changes in energy partitioning between latent and sensible heat and thus influence climate.

(2) Biogeographic: changes in vegetation cover, due to migration or land use, can change emissions of dust aerosols and alter the lower boundary of the atmosphere, for example albedo, with pronounced effects on climate.

(3) Biogeochemical: climate change can alter the activity of vegetation and thus influence the biogeochemical cycles of carbon and nitrogen. This in turn changes the greenhouse gas content of the atmosphere (CO2, nitrogen compounds), which also constitutes a feedback loop.