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The new coupled land surface model HUMBOL-TD - Concept and performance

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The megadiverse Andean mountain rain forests in southern Ecuador are threatened by climate and land use change, which are expected to alter biodiversity and thus functional traits impacting ecosystem processes. However, the high biodiversity of tropical mountain forests is still poorly represented in Land Surface Models (LSMs). We developed a biodversity-informed LSM entitled HUMBOL-TD (Hydroatmo Unified Model of Biotic interactions and Local Trait Diversity) to analzye the impact of climate and land-use change on carbon- and water fluxes. HUMBOL-TD consists of three coupled submodels specialized to represent different processes at the land surface. As such, energy- and water fluxes between land surface and atmosphere (LSMatmo) are simulated by the Community Land Model (CLM), vegetation dynamics including C, N and P cycling (LSMbio) are simulated by the Lund-Potsdam-Jena General Ecosystem Simulator (LPJ-GUESS), while the soil hydrology (LSMhydro) is represented by the Catchment Modeling Framework (CMF). A first test towards the simulation of the mountain forests and their replacement systems is conducted for a pasture site at 2000 m elevation. The model is parameterized and validated using a year of local site data. The first runs of the model enable the investigation of the differences in accuracy of modeled changes in the carbon- and water fluxes between coupled, partially coupled (LSMatmo – LSMbio, LSMatmo – LSMhydro, LSMbio – LSMhydro) and the fully coupled model (LSMatmo – LSMbio – LSMhydro).