



Effect of simulated monsoon failure on the carbon balance of mountain forests, Bhutan, eastern Himalayas

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Extreme climatic events leading to severe disturbances in ecosystems are expected to increase globally. Such events carry strong potentials for severe reductions or whole losses of ecosystem services. This is particularly true for the Himalayas: they are located in a region forming a tipping element in the Earth's climate system. At a millennial time scale, complete breakdowns of the summer monsoon circulation and a resulting failure of the Indian summer monsoon rains have occurred several times during the last 1000 years. Climate change potentially increases the frequency of such monsoon failures and related mega-droughts. Given the significance of the region, the knowledge on the effects of climate change on forest ecosystem C dynamics is strikingly limited. While the effects of droughts are studied experimentally in Europe and North America, no precipitation manipulation experiments have been carried out in the Himalayas yet. We make use of natural forests with coexisting conifer and broadleaf as well as deciduous and evergreen species at slopes of stark environmental gradients for conducting a replicated large-scale five year throughfall exclusion experiment. We study drought response at individual tree and ecosystem levels. We present the effects of the experimental drought on the ecosystem carbon balance, integrating above- and belowground pools and fluxes such as heterotrophic and autotrophic soil respiration, litter fall and root turnover as well as above- and belowground tree growth. A preliminary assessment indicates that soil microbes were primarily affected during the first three years of simulated drought, whereas trees altered allocation patterns but survived the experimental drought. A detailed analysis will be presented at the conference.