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Greenhouse gas emissions from grasslands: current knowledge and challenges

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Grassland ecosystems in a wider sense cover up to 40% of the global terrestrial surface (White et al. 2000). Knowledge about the exchange of the major greenhouse gases (GHG's, carbon dioxide – CO_2, methane – CH4 and nitrous oxide – N2O) remains still limited for grasslands, while other ecosystems such as forests and peatlands (particularly systems storing large amounts of carbon) have been investigated more intensively.
Here, we give an overview of the current state of GHG measurements in the alpine region of Europe (Switzerland, Austria) and the associated challenges in deriving annual GHG budgets as well as determining the abiotic and biotic variables driving the fluxes of CO_2, CH4 and N2O. In particular the importance of management activities, that is fertilization and removal of above-ground biomass through harvesting and grazing, besides climate, the challenges when trying to measure small fluxes of CH4 and N2O using chamber or micrometeorological methods and the need of including winter emissions in annual balances will be stressed.