



Summer extreme climatic event in the future: impact on the net CO₂ and water fluxes of an upland grassland and buffering impact of elevated atmospheric CO₂

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Extreme climatic events are expected to be more frequent and intense in a few decades, but they will also occur in a climatic context different from the current one. In the Montpellier Ecotron, we studied the response of intact grassland monoliths (1m², 60 cm deep) sampled in an upland grassland of the French Massif Central. The first year the grasslands were acclimated to the average climatic conditions of the years around 2050 (+ 4 °C and – 56 mm for summer precipitations). The second year, the same climate was maintained but in half of the experimental units we imposed a summer drought and heat wave (50 % reduction of precipitations for a month and then 100 % precipitation reduction combined with a 3,4 °C increase in temperature for two weeks). A CO₂ treatment (520 vs 380 μmol/mol) was crossed with the climatic treatment.

Net CO₂ fluxes were measured continuously during the second year of the experiment. The extreme climatic event induced a total senescence of the canopy whatever the CO₂ treatment. The interactive effect of elevated CO₂ with the drought treatment was significant at the onset of the drought and particularly large in the fall after the recovery period, with a net photosynthesis twice as high in the (extreme climate+ CO₂) treatment compared to the control. Integrated over the year, elevated CO₂ totally buffered the impact of the extreme climatic event on net CO₂ exchanges. These results are discussed together with the evapotranspiration and soil humidity data.