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Impacts of a summer extreme event on soil CO_2 fluxes in grassland in a context of future climate change

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Future scenarios forecast more frequent and severe extreme events, such as heat waves and severe droughts. In this context, it is urgent to know the contribution of ecosystems such as grassland to the global carbon flux.
The aim of this work was to study how elevated atmospheric CO_2 could mediate the effects of a summer extreme event on carbon flux, and in particular, on soil respiration components. Indeed, soil respiration, with its autotrophic (Ra) and heterotrophic (Rh) components, constitutes the second largest carbon flux between terrestrial ecosystems and atmosphere.
Grassland monoliths were exposed, from May 2010 to December 2011, to air temperature and precipitation expected for the period 2040-2060. From January 2011 to December 2011 a CO_2 enrichment of +180 ppm was applied to half of the experimental units and during summer a heat wave and a severe soil drought was also applied. Total soil respiration and Ra and Rh were measured. Preliminary results show that soil respiration was not significantly affected by elevated CO_2 until four months after the start of the CO_2 enrichment, but it increased under elevated CO_2 by about 20% afterwards. The extremes treatment decreased drastically soil respiration both at ambient and at elevated CO_2. Soil respiration recovered from extremes events, even if Ra and Rh showed different recovery times. This was associated to a recovery of root growth and an increase in root decomposition. This behavior agrees with preliminary data on daily ecosystem carbon uptake showing a stronger recovery after rewetting and under elevated CO_2 compared to ambient CO_2. In view of these results, the interactions between elevated CO_2 and extreme events will be discussed.