Geophysical Research Abstracts
Vol. 19, EGU2017-1358, 2017
EGU General Assembly 2017

Interactive effects of elevated CO_2 and warming on soil respiration in a mountain grassland

David Reinthaler (1), Claudia Gstir (1), Markus Herndl (2), Erich Pötsch (2), and Michael Bahn (1)

(1) LFU Innsbruck, Istitute of Ecology: Plant, Soil & Ecosystem Processes, Innsbruck, Austria (david.reinthaler@student.uibk.ac.at), (2) HBLFA Raumberg-Gumpenstein, Pflanzenbau und Kulturlandschaft

Soil respiration is the largest source of CO_2 emitted from terrestrial ecosystems to the atmosphere. In grasslands, which cover over 30% of the global land area and around 70% of the world's agricultural acreage, the contribution of soil respiration to total ecosystem respiration is particularly high. The ClimGrass experiment aims to understand individual and combined effects of multi-level changes in temperature and atmospheric CO_2 concentrations and of extreme drought on the biogeochemical cycles of a managed C3 grassland typical for European mountain regions. The ClimGrass experiment, based at AREC Raumberg Gumpenstein in Central Austria, comprises a total of 54 plots subjected to different combinations of experimental warming (ambient, +1.5°C, +3°C) and elevated CO_2 (ambient, +150°C, +300 ppm), as well as extreme drought and heatwave. Here, we present first results concerning the interactive effects of warming and elevated CO_2 on soil respiration. For this study we combined measurements of an automated system (LiCor 8100) with manual measurements of soil respiration (PP-Systems EGM4), in plots exposed to ambient and elevated CO_2, both under ambient temperature conditions and +3°C warming. Our results from the first year of treatment indicate a significant increase of soil CO_2 efflux caused by warming and a decrease under elevated CO_2, with a strong interactive effect leading to a dampened warming effect under elevated CO_2. Interestingly, elevated CO_2 had stronger indirect than direct effects on soil respiration, mediated by altered soil moisture under elevated CO_2. In the second and third year, however, all treatments increased soil CO_2 efflux, with higher flux rates under elevated CO_2 than under warming. Overall, elevated CO_2 and warming had additive effects on soil moisture, but non-additive effects on soil respiration. Analyses of isotopic signatures of soil respired CO_2, of the contribution of the heterotrophic component to total soil respiration and of soil CO_2 concentration profiles will help to disentangle the observed responses of soil respiration to climate change.