Geophysical Research Abstracts
Vol. 18, EGU2016-3813, 2016
EGU General Assembly 2016

Simulated heat waves affected alpine grassland only in combination with drought

Hans J. De Boeck (1), Seraina Bassin (2), Maya Verlinden (1), Michaela Zeiter (3), and Erika Hiltbrunner (4)

(1) Research Group of Plant and Vegetation Ecology, Department of Biology, Universiteit Antwerpen, Belgium (hans.deboeck@uantwerp.be), (2) Agroscope, Climate/Air Pollution Group, Reckenholzstrasse 191, CH-8046 Zurich, Switzerland (seraina.bassin@agroscope.admin.ch), (3) School of Agricultural, Forest and Food Sciences, Bern University of Applied Sciences, Länggasse 85, CH-3052 Zollikofen, Switzerland (michaela.zeiter@ips.unibe.ch), (4) Institute of Botany, Department of Environmental Sciences, University of Basel, Schönbeinstrasse 6,CH-4056 Basel, Switzerland (erika.hiltbrunner@unibas.ch)

The Alpine region is warming fast, leading to an increase in the frequency and intensity of climate extremes. Currently, it is unclear whether alpine ecosystems are sensitive or resistant to such extremes. In an experiment carried out in the Swiss Alps, we subjected Swiss alpine grassland communities to heat waves with varying intensity (5-10 °C warming) by transplanting monoliths to four different elevations (2440-660 m a.s.l.) for 17 days. Half of the monoliths were regularly irrigated while the other half were deprived of irrigation to additionally induce a drought at each site.

We found that heat waves had no significant short-term impacts on fluorescence (Fv/Fm, a stress indicator), senescence and aboveground productivity if irrigation was provided. However, when heat waves coincided with drought, plants showed clear signs of stress, resulting in vegetation browning and reduced phytomass production. This likely resulted from direct drought effects, but also, as measurements of stomatal conductance and canopy temperatures suggest, from increased high-temperature stress as water scarcity decreased heat mitigation through transpiration.

The immediate responses to heat waves (with or without droughts) recorded in these alpine grasslands were similar to those observed in the more extensively studied grasslands from temperate climates. Climate extreme impacts may differ in the longer run, however, because the short growing season in alpine environments likely constrains recovery.