Geophysical Research Abstracts
Vol. 12, EGU2010-3850, 2010
EGU General Assembly 2010
© Author(s) 2010

"Lysi-T-FACE" an experiment to simulate global warming impact on grassland

Markus Herndl, Erich Pötsch, Matthias Kandolf, Andreas Bohner, Andreas Schaumberger, Reinhard Resch, Wilhelm Graiss, Bernhard Krautzer, and Karl Buchgraber
(markus.herndl@raumberg-gumpenstein.at)

During the past century the average global surface air temperature has already increased by 1°C. A doubling of atmospheric concentration of CO2 near the end of the 21st century is predicted to result in a 3°C temperature increase. The Alpine region has experienced above average warming over the last century and is considered particularly vulnerable to global change. In Austria in some regions, grassland production suffered severe droughts during the last decade leading to serious damages and even temporal shortage in feed supply. Changes in temperature and precipitation have evident consequences for grassland vegetation. Increasing atmospheric CO2 concentration is a major driver of climate change. Photosynthesis and productivity of most grassland species might be stimulated by increasing CO2 when soil nutrients and water are not limiting. On dry grassland sites increasing CO2 also reduces plant water loss, thereby increasing plant water use efficiency. When plant production is limited by seasonal cold temperatures as e.g. in the inner Alpine parts of Austria and in high altitude or high latitude grasslands, combined warming and higher CO2 might continue to enhance plant production. However, it is still unknown to what extend a further increase of temperature and CO2 will result in higher biomass yield in different grassland communities. To study the effects of global warming on future grassland communities and management, the application of a heating treatment combined with free-air controlled enhancement of CO2 (T-FACE) to open-field plant canopies at lysimeters is an innovative approach which allows studying responses of the plant-soil-systems as well as carbon-water and nutrient fluxes under expected future climate. The experiment is scheduled to run in the first phase 6 years (2011-2017) and is located at the AREC Raumberg-Gumpenstein, Upper Enns Valley, Austria (47,49; 14,10). Heater arrays and miniFACE rings are installed in 1.6 m diameter plots and expose a grassland mixture to a factorial combination of two CO2 and two temperature regimes, with four replications each. To simulate water limitation a treatment with rainout shelters is planed. The results of the experiment should give answers to many aspects caused by global changes e.g. on plant productivity, nutrient and water dynamics and in the end shall give advice for farmers how future grassland require adjustments in management.