Tagungsnummer
V305

Thema
Kommission II: Bodenchemie

Organische Bodensubstanz: Struktur, Funktionen, Dynamik

Autoren
O. Shibistova[1,5], J. Boy[1], R. Godoy[2], D. Boy[1], R. McCulloch[3], R. Mikutta[4], G. Guggenberger[1]
[1]Leibniz Universität Hannover, Institut für Bodenkunde, Hannover; [2]Universidad Austral de Chile, Instituto de Ciencias Ambientales Evolutivas, Valdivia, Chile; [3]University of Stirling, Biological and Environmental Sciences, Scotland; [4] Martin-Luther-Universität, Soil Science and Soil Protections, Halle-Wittenberg; [5]Sukachev Institute of Forest, Krasnoyarsk, Russia

Titel
Greening boosts soil formation and soil organic matter accumulation in Maritime Antarctica

Abstract
Global warming in the Antarctic Peninsula, Maritime Antarctica, within the past 45 years has accelerated rapid glacier retreatment, forming temporal gradients of soil development that concurs with the colonization of the ice-free soils by phototrophs. In the past decade the paradigm emerged that above- and belowground processes are interconnected, e.g. recently gained carbon fuels microbial activity and thus drives soil organic matter built-up and decomposition as well as mineral weathering. Studies of carbon allocation for Antarctic ecosystems, occurring in harsh conditions are lacking. Little is also known about the contribution of bacteria and fungi to decomposition of different soil carbon pools with different turnover rates in these soils, which is of utmost importance for the prediction of the future feedback of the Antarctic carbon balance to climate change. We followed soil horizon formation, soil organic carbon accumulation and carbon exchange with the atmosphere along a gradient of phototrophs of different trophic complexity level at King George Island by combining soil chemical analyses, field CO_2 flux measurements, C-13 in situ labeling and molecular methods (PLFA and metabolomics). Our study revealed that colonization of the ice-free soils by vascular plant (Deschampsia antarctica) was leading to the formation of well-developed soil, with high contents of organic carbon and with a relatively high rates of photosynthesis and CO_2 soil efflux. The soils sampled under D. antarctica showed the impact of this higher plant on the soil organic matter, containing significantly higher amounts of carbohydrates and amines, presumably as a result of root exudation. As determined by the C-13 labeling experiment more than 15% of the carbon recently assimilated by D. antarctica was transferred belowground, with a major flow into soil fungi. This suggests that not bacteria, but rather fungi preferentially and faster utilize the recently assimilated low molecular compounds allocated to the soil. Probably, successful performance of vascular plants in Maritime Antarctica may significantly foster biological weathering via enhanced microbial activity.