Geophysical Research Abstracts
Vol. 16, EGU2014-14788, 2014
EGU General Assembly 2014

Temperature and moisture effects on ammonia oxidizer communities in cryoturbated Arctic soils

Stefanie Aiglsdorfer (1,2), Ricardo J. E. Alves (1,2), Jiří Bárta (3), Iva Kohoutová (3), Hana Bošková (3), Katerina Diáková (3), Petr Čapek (3), Jörg Schnecker (2,4), Birgit Wild (2,4), Maria Mooshammer (4), Tim Urich (1,2), Norman Gentsch (5), Antje Gittel (2,6), Georg Guggenberger (5), Robert Mikutta (5), Nikolay Lashchinskiy (7), Andreas Richter (2,4), Hana Šantrůčková (3), Olga Shibistova (5,8), Christa Schleper (1,2), and the whole CryoCARB Team

(1) Division of Archaea Biology and Ecogenomics, Department of Ecogenomics and Systems Biology, University of Vienna, Vienna, Austria, (2) Austrian Polar Research Institute, Vienna, Austria, (3) Department of Ecosystems Biology, University of South Bohemia, České Budějovice, Czech Republic, (4) Division of Terrestrial Ecosystem Research, Department of Microbiology and Ecosystem Science, University of Vienna, Vienna, Austria, (5) Institut für Bodenkunde, Leibniz Universität Hannover, Hannover, Germany, (6) Department of Biology, Centre for Geobiology, University of Bergen, Bergen, Norway, (7) Central Siberian Botanical Garden, Siberian Branch of Russian Academy of Sciences, Novosibirsk, Russia, (8) V.N. Sukachev Institute of Forest, Siberian Branch of Russian Academy of Sciences, Krasnoyarsk, Russia

Arctic permafrost-affected soils contain large amounts of soil organic carbon (SOC) and are expected to experience drastic changes in environmental conditions, such as moisture and temperature, due to the high surface temperature increase predicted for these regions. Although the SOC decomposition processes driven by the microbiota are considered to be nitrogen (N) limited, little information about the microbial groups involved in N cycle is currently available, including their reactions to environmental changes. Here, we investigate the presence of ammonia oxidizing archaea (AOA) and bacteria (AOB) in distinct soil horizons from the Taymyr peninsula (Siberia, Russia), and investigate their activities under changing temperature and moisture regimes. These two groups of organisms perform the first step in nitrification, an important and rate limiting process in the global N cycle, which involves the oxidation of ammonia to nitrate via nitrite. The soil samples were separated into different horizons: organic topsoil (O) and subducted organic topsoil (A_{jj}). The samples were incubated for 18 weeks at 4, 12 and 20˚C and 50, 80 and 100 % water holding capacity (WHC). AOA and AOB abundances were quantified by quantitative PCR targeting genes of the key metabolic enzyme, ammonia monooxygenase. AOA diversity was analyzed in-depth by high-throughput amplicon sequencing of the same gene. Additionally, gross and net nitrification and mineralization rates were determined in order to investigate potential relationships between AOA and AOB populations and these processes, in response to the incubation treatments. We found higher abundances of AOA than AOB in the organic topsoil, whereas AOB dominated in the subducted organic topsoil. Increased temperature resulted in higher numbers of both groups at low WHC %, with AOB showing a more pronounced response. However, these effects were not observed under anaerobic conditions (100 % WHC). Deep sequencing of AOA *amoA* genes revealed the presence of functionally heterogeneous AOA populations and complex changes in the population composition in response to all treatments. Interestingly, the effect of different temperatures and moisture on net nitrification throughout the incubation did not always correspond to the effect observed on AOA and AOB abundance. This study provides insights into the dynamics of nitrifier populations in Arctic soils, and suggests that they hold an important role in the response of the N cycle in Arctic soils to environmental changes.