International Conference on "Ozone and Plant Ecosystems" 2018: Session
Presentation style: Oral presentation

Title of the Presentation: Elevated ground-level ozone modifies the microbiome

Youzhi Feng[*(1)], Haoye Tang[(1)], Jianwei Zhang[(1)], Xiangui Lin[(1)], Jianguo Zhu[(1)]

[(1)] State Key Laboratory of Soil and Sustainable Agriculture, Institute of Soil Science, Chinese Academy of Sciences, Nanjing, 210008, Jiangsu Province, P.R. China

Abstract

Elevated ground-level ozone (eO_3) imposes adverse influences on ecosystems. However, the information regarding responses of belowground, such as soil microorganisms, to eO_3 as well as their feedbacks remains elusive. As the indispensable part of soil ecosystem, the knowledge on soil microorganisms is pivotal to comprehensive understanding of global change influencing ecosystem. To this end, a field experiment in China Ozone Free-Air Concentration Enrichment (FACE-O_3) facility on a rice-wheat rotation system was carried out to investigate paddy microbial responses to eO_3. Using real-time quantitative PCR, DNA-based fingerprinting and high throughput sequencing approaches in combined with culture-reliant method, we evaluated two paddy anoxic microorganisms, anoxygenic phototrophic purple bacteria (AnPPB) and methanogenic archaea, and total bacterial communtiy in response to eO_3 as well as the differences between different O_3-sensitive rice cultivars. It is found that eO_3 reduces AnPPB and methanogenic archaeal abundances in flooded rice soils via decreasing their genotypic diversity and metabolic capability. Concomitantly, their community compositions changes under eO_3. For total bacterial community, the similar phenomena are observed. Furthermore, when comparing two different O_3-sensitive rice cultivars, it is found that crop cultivar is important in determining the responses of soil biota to eO_3. The contrasting responses of soil bacterial and methanogenic archaeal communities in two rice cultivars are observed to eO_3. Although more adverse influences on O_3-sensitive cultivar, several keystone bacterial guilds are consistently negatively affected by O_3 pollution in two rice cultivars. Collectively, the abovementioned findings indicated that continuously eO_3 would negatively influence paddy microorganisms and their critical ecological functions and more attention should be focused on the responses of soil microorganisms in crop cultivars when evaluating the effect of climate change on agroecosystems. These findings will contribute to a comprehensive understanding of the responses and feedbacks of paddy ecosystems to global climate change.

Keywords: Elevated ground-level O_3, Soil microorganisms, Diversity, Paddy soil, Rice cultivars

*Corresponding author: yzfeng@issas.ac.cn