Geophysical Research Abstracts
Vol. 21, EGU2019-47, 2019
EGU General Assembly 2019


# Increase in temperature accelerates gross N mineralization in the Himalayan soils

Niharika Sharma and Sanjeev Kumar

Physical Research Laboratory, Geosciences Division, Ahmedabad, Gujarat, India (amc.nak@gmail.com)

Global warming induced rise in temperature can have a significant impact on the carbon sequestration capacity of plants and soil microbial functioning leading to alteration in the availability of nutrients in soils. Nitrogen (N) is one of the major nutrients required by plants which gets transformed in soils through various microbial processes. As these microbial processes are dependent on temperature, the availability of N in soils may also depend on temperature. However, our knowledge vis-à-vis temperature dependence of nutrient availability in soils is largely limited to the colder/temperate climate with limited data from tropical ecosystems. Given the higher vulnerability of tropical ecosystems to rising in temperature, the quantification of N transformation rates in such system is desirable. In order to understand the impact of temperature change on gross N transformation in a subtropical montane system, gross N mineralization and nitrification rates were measured in the lower Himalayan soils of northern India. For this purpose, soil samples from 3000 m, 2500 m, 2000 m, 1500 m, and 1000 m above mean sea level were collected in triplicate from two different layers in the soil profiles (0-20 cm and 20-40 cm) during October 2017. The mean temperature of the sampling region at the time of sample collection was 12 °C. During the 15N isotope dilution experiments for gross N transformation rates, the soils were incubated at two temperatures, i.e. the field temperature (10 °C) and room temperature (22 °C) to assess changes in N transformation as a function of temperature and elevation. The soils showed significantly higher NH4+ concentration (top: 16.6 ± 6.2 mg-N kg-1; bottom: 8.5 ± 3.6 mg-N kg-1) than $NO_3$- (top: 2.9 ± 1.5 mg-N kg-1; bottom: 1.5 ± 0.8 mg-N kg-1) in both layers of the soil ($P < 0.001$). There was no significant effect of elevation on gross N mineralization or nitrification rates. However, significant increase ($P < 0.01$) in gross N mineralization was observed at higher incubation temperature (top: 5.5 ± 2.2 mg-N kg-1 d-1, bottom: 2.4 ± 0.5 mg-N kg-1 d-1) compared to lower temperature (top: 3.0 ± 1.2 mg-N kg-1 d-1, bottom: 1.2 ± 0.3 mg-N kg-1 d-1). Such a significant increase was not observed for gross nitrification rates. This result suggests that subtropical montane soils may mineralize faster when subjected to a relatively higher temperature, particularly during winter months. Therefore, in future, increase in average temperature due to climate change may lead to an increase in production of NH4+ in soils of subtropical montane ecosystem with both positive and negative effects. Increase in availability of NH4+ along with rise in average temperature may result in higher primary productivity; however, this can also lead to accumulation of NH4+ in soils, particularly in light of no significant increase in nitrification rates, leading soil acidification.