Geophysical Research Abstracts
Vol. 21, EGU2019-588-5, 2019
EGU General Assembly 2019

Precipitation as a main soil emission driver during summer season in boreal middle taiga forests of Central Siberia

Anastasia Makhnykina (1,2), Daria Polosukhina (1), Nataly Koshurnikova (1), Sergey Verkhovets (1), and Anatoly Prokushkin (2)

(1) Siberian Federal University, Russian Federation (amakhnykina@sfu-kras.ru), (2) V.N. Sukachev Institute of forest, Russian Federation

CO_2 emission from soil to atmosphere is the second component of the global carbon cycle after photosynthesis. The temperature sensitivity of the seasonal course of soil CO_2 emissions reflects the accumulation of CO_2 in the soil in summer and depletion in winter. It was assumed that in ecosystems of cold and humid climates, such as boreal and temperate forests, soil CO_2 emissions are described well enough only by temperature, and in ecosystems with moisture deficiency (steppes, prairies, deserts) it is necessary to take precipitation into account.
In this paper, for the first time on the basis of five growing seasons, it is shown that in the boreal zone in a vast area of pine forests with sandy soils, CO_2 emissions are poorly described only by temperature. A new approach to modeling CO_2 emissions in such ecosystems, which is based on the mathematical division of time (within the season) into dry and wet periods for areas with different types of vegetation cover, is proposed.
In the work it was found that the magnitude of the flow is determined by the diversity of plant cover of a particular plot and the hydrothermal conditions of the growing season. In seasons with insufficient moisture, soil emissions decreased by 43% compared with other measuring seasons.
By a multistep analysis and consideration of the seasonal course of soil emission, the optimum soil moisture limit was found for the areas with different types of vegetation. The mechanism for finding the value of the optimum soil moisture is described in detail. A set of measurements with soil moisture above the threshold value demonstrates a strong relationship between soil temperature and soil emission.
It was found that in drought conditions the temperature sensitivity does not depend on the type of vegetation of the plot.