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Functionally ecological assessment of C dominant pools and fluxes in field agroecosystems with sod-podzoluvosols at the Central Region of Russia

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The Global Change problem has obvious interaction with greenhouse gases (GHG) emission. The principal GHG is carbon dioxide. There is a lot of data on its fluxes but the Central Region of Russia is still one of less investigated area especially in case of agroecosystem carbon dioxide fluxes monitoring by chambers and eddy covariance methods combined application. Our research has been at the representative key plots of cultivated sod-podzoluvosols located at the Precision Farming Experimental Field of the Russian Timiryazev State Agricultural University (Moscow) in 2012-2013 in frame of RF Government grant 11.G34.31.0079 and RFBR grant 11-04-01376 activities.

The research include the detailed soil cover patterns morphogenetic investigation, soil C pools dynamic analysis, soil CO_2 flux decade-based monitoring by method of exposition chambers with IRGA (infra red gas analyzer) and agroecosystem CO_2 flux seasonal monitoring by two eddy covariance stations in frame of 4 ha experimental plot. There were two crop versions (barley and grass mixture), and in case of chamber analysis – also two agrotecnology versions (traditional and no-till ones) with soil temperature and moisture analysis too.

The results have shown high daily and seasonal dynamic of soil and agroecosystem CO_2 emission. The beginning of vegetation period (until plant height of 10-12 cm) is characterized by high average soil CO_2 emission and adsorption at the same time. The adsorption is significantly higher. The resulted CO_2 absorption during the day is approximately two times higher than emissions at night. After harvesting CO_2 emission is becoming essentially higher than adsorption. In 2012 data have shown for barley the small predominance of CO_2 emissions over the absorption.

The daily dynamics of soil CO_2 emissions depends on the air temperature dynamics with the correlation coefficient changes from 0.86 at the beginning of the season to 0.52 and 0.38 at the middle and at the end of one. Soil moisture has stronger influence on the seasonal dynamics of soil and agroecosystem CO_2 emissions. The crop factor input is stronger that the agro technology one.

According to the obtained results it is especially important to carry out the soil CO_2 emission measurement at the same time period during the day (the best one is between 11 and 15) due to high changes in CO_2 emission during the 24 hours period – especially at the beginning of the summer. At the end of the season the influence of the temperature daily dynamics is becoming not so significant for CO_2 emission monitoring.