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Soil respiration in a long-term tillage treatment experiment

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Regular soil CO_2 efflux measurements have been carried out at Józsefmajor longterm tillage experimental site in 2014 and 2015 with static chamber technique in no-till and ploughing plots in seven spatial replicates. The trial was established in 2002 on a loamy chernozem soil at the experimental site of the Szent István University nearby the city Hatvan, northern Hungary. At the site sunflower (Helianthus A.) and wheat (Triticum A.) was grown in 2014 and 2015, respectively. Ancillary measurements carried out at the site included weather parameters, soil water content, soil temperature. The aim of the investigation was to detect the effect of soil disturbance and soil tillage treatments on soil CO_2 emission in agricultural ecosystems. Soil respiration measurements were carried out every week during the vegetation period and campaign measurements were performed scheduled to tillage application. In this latter case, measurements were carried out 1, 2, 3, 4, 6, 12, 18, 24, 48, 72, 96, 120 hours and 7 days after tillage operation.

Results showed that during the vegetation season in the majority of measurement occasions emission was higher in the no-till plots. These differences; however were not found to be statistically significant. Due to the short term effect of tillage treatment, emissions increased following tillage treatment in the ploughed plots.

Soil water content was also examined as main driver of soil CO_2 fluxes. Soil water content sharply decreases in the surface layer (5-10 cm depth) after tillage treatment indicating a fast drying due to soil disturbance. This effect slowly attenuated and eventually extincted in approx. two weeks.

CO_2 emission measurements were associated with high uncertainties as a result of the measurement technique. Our further aim is to reduce this uncertainty using independent measurement techniques on the field.