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Diurnal spatial variability of soil respiration estimated by ordinary kriging and sequential Gaussian simulation

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The role of greenhouse gases in the climate change is well know, however, the balance of greenhouse gases due to land use and management is still lacking. Hence it is important to characterize the main aspects of soil respiration (or soil CO2 emission) in agricultural areas, including its spatial variability, as quantitatively as possible. The objective of this work was to study the diurnal spatial variability of the soil respiration including their estimations by different methods: ordinary kriging and sequential Gaussian simulation. Evaluations were conducted in a regular grid having 64 points installed over a bare Eutrustox clay texture during the morning and afternoon periods. Measurements were conducted from 7:30 – 10:30 am (morning) and 13:30 – 16:30 pm (afternoon) using a portable soil respiration system (LI-8100), Lincoln, NE, USA. In order to estimate the best interpolation method it was applied the so-called external validation, where the respiration values of 5 points in grid were removed from interpolation process and after were estimated in the same points by kriging or sequential Gaussian simulation methods. This evaluation was also based on the sum of the square of residues, comparing observed with predicted respiration values in each of the 5 points selected for external validation. The highest CO2 emission was observed in the afternoon period, with mean value of 6.24 μmol m-2 s-1, when compared to the morning (4.54 μmol m-2 s-1). Our results indicate that the measurement period (morning or afternoon) did not interfere into the definition of emission spatial variability structure, as coefficient of variation, spatial variability models and their parameters were quite similar in morning and afternoon. However, despite the high correlation between kriging and sequential Gaussian simulation respiration maps (R2 =0.99) sequential Gaussian simulation showed to be more efficient into the estimations of non-sampled emissions in both periods, mornings and afternoons. Due to the nature of the interpolation methods we believe that sequential Gaussian simulation was better in the performance of estimation of non-sampled respirations due to the strong skewness of the probability distribution of soil respiration in both periods.