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Evaluation of footprint models performances over a small crop field by means of a tracer experiment

Giacomo Nicolini (1), Vitaly Avilov (2), Juliya Kurbatova (2), Gerardo Fratini (3), Ivan Vasenev (4), Riccardo Valentini (1,5)

(1) University of Tuscia, DIBAF, Viterbo, Italy (g.nicolini@unitus.it), (2) Russian Academy of Sciences, Moscow, Russia, (3) LI-COR Biosciences, Lincoln, NE, USA, (4) K.A.Timiryazev Russian State Agrarian University - MTAA, Moscow, Russian Federation, (5) CMCC, Lecce, Italy

When measuring gas fluxes over a specific ecosystem by means of a micrometeorological technique such as eddy covariance, we obtain information about flux magnitude and direction, but few information about its source or sink location. However, knowledge of the source area extent, upwind from the measurement point, it is essential to correctly assess the measurement set-up, making representative measurements of an intended source area. In this experiment we have performed a controlled tracer (pure CO_2) release over an agricultural field of limited extension, measuring the resulting fluxes by an eddy covariance tower placed downwind to the source. The tower was equipped with two identical systems placed at two different heights. The aim was i. testing some of the most used footprint models (both analytical and Lagrangian) and ii. assessing the most appropriate system configuration to sample fluxes within the desired fetch. The comparison shows that models performs generally well for such kind of surface, but generally overestimates both the footprint size and the footprint peak distance. Since the footprint is influenced by atmospheric stability and the measurement height, this effect is more evident during neutral conditions and for the higher system.