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Laser-scintillometry system to measure fluxes over small agricultural fields located in heterogeneous landscapes. An alternative for eddy-covariance?

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This paper deals with measuring technique for fluxes and other relevant parameters over small agricultural fields located in heterogeneous terrain. This concerns conditions where most micrometeorological concepts and assumptions made in nowadays models are violated. There is no constant flux layer, no horizontal homogeneity and flows are non-stationary. Local advection affects creates stable conditions during daytime, which in its turn enhances surface evaporation. Eddy covariance (EC) observation techniques are not suitable for these conditions. Because sensors has to be installed well above the surface, EC evaporation tends to be too low when the upwind terrain is dry. In the last decade some studies has revealed that laser-scintillometry might be a suitable alternative for EC when dealing with small fields in heterogeneous landscape. Unfortunately, the method did not receive much attention and further investigations are needed. It is the objective of our presentation to summarize some important results published in recent literature of laser scintillometer applications. Amongst others, we will discuss the work by Frehlich, Thiermann, Hartogensis and Van Kesteren et al. The latter showed that 1 minute fluxes of water vapor and CO_2 can be measured with a laser scintillometer combined with a LICOR. In addition, Distributed Temperature Sensing (DTS), which allows for dense spatial observations of air temperature along optical finers, can be an additional tool to analyze small-scale fluxes.
Our aim is to interest attendees of the Session AS2.2 of the EGU 2019 Assemble in laser-scintillometry, combined with a LICOR and DTS. Participation in future R&D needed to make the methodology operational is encouraged.