Geophysical Research Abstracts
Vol. 19, EGU2017-16775, 2017
EGU General Assembly 2017

Intra-Sensor Variability Study of two BLS 900 Scintillometers

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The latent heat flux is an important validation parameter for satellite measurements and a wide variety of hydrological and meteorological numerical models. Scintillometers can provide references for such validations due to their ability to spatially integrate turbulent fluxes. Large-aperture near-infrared scintillometers are capable of determining spatial averages of the structure parameter of temperature and the sensible heat flux over path lengths up to 5 km. One way to derive both sensible and latent heat flux is to use a combined optical and microwave scintillometer system. With only an optical scintillometer and additional measurements of ground heat flux and net radiation, the latent heat flux can be calculated from the residual of the energy balance.
Studies have shown, however, that in certain cases measurements from the same types of scintillometers differ due to minute differences in construction. In order to prove the robustness of the measurements of two near-infrared scintillometers for future studies, we compared their observations and validated them by comparison to the sensible heat flux derived from an eddy covariance system.
In this study two boundary layer scintillometers (BLS; BLS900, Scintec, Rottenburg, Germany) were installed in a central European valley as part of the TERENO preAlpine observatory during the years 2013 and 2015. An independent measurement of the sensible and latent heat flux was obtained from a permanent eddy covariance system installed in the vicinity of the scintillometer path. The structure parameter of the refractive index and average sensible heat fluxes of both BLS units were compared with each other. In general, the BLS structure parameters correlated very well and the high correlation between the BLS-derived sensible heat fluxes and the eddy covariance-derived sensible heat fluxes encouraged further application of these scintillometers in separate experiments.