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Continuous series of catchment-averaged sensible heat flux from a Large Aperture Scintillometer: efficient estimation of stability conditions and importance of fluxes under stable conditions.

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A Large Aperture Scintillometer (LAS) observes the intensity of the atmospheric turbulence across large distances, which is related to the path averaged sensible heat flux, H. Two problems in the derivation of continuous series of H from LAS-data are investigated and the importance of nighttime H -fluxes is assessed.
Firstly, as a LAS is unable to determine the sign of H, the transition from unstable to stable conditions is evaluated in order to make continuous H -series. Therefore, different algorithms to judge the atmospheric stability for a LAS installed over a distance of 9.5 km have been tested. The diurnal cycle of the refractive index structure parameter, CN2, results in the best suitable, operational algorithm.
A second issue is the humidity correction for LAS-data, which is performed by using the Bowen ratio (β). As β is taken from ground-based measurements with data gaps, the number of resulting H -values is reduced. Not including this humidity correction results in a marginal error in H, but increases the completeness of the resulting H -series.
Applying these conclusions to the two-year time series of the LAS, results in an almost continuous H -time series. As the majority of the time steps has been found to be under stable conditions, there is a clear impact of Hstable on H24h ,the 24h average of H. For stable conditions, Hstable -values are mostly negative, and hence lower than the H = 0 W/m2 assumption as is mostly adopted. For months where stable conditions prevail (Winter), H24h is overestimated using this assumption, and calculation of Hstable is recommended.