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The effect of micro scale vegetation heterogeneity on radiation measurements at a grass site

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The inability to close the earth's surface energy balance with experimental data is still a problem. Even over flat, short vegetation surfaces measured available energy is often 10-30% larger than the sum of turbulent heat fluxes. Several mechanisms where identified to have the potential to contribute substantially to the energy imbalance. Many of them can be finally reduced to be a matter of spatial and temporal scales, e.g. different footprints and sampling layers of the sensors employed to measure the different components of the energy transfer at a surface, advection effects, or loss of low frequency contributions to the turbulent fluxes measured by the eddy-covariance method. This work focuses on the effect of micro scale vegetation heterogeneity on long and short wave radiation measurements above a short grass canopy and its impact on the local energy balance closure. Two radiation balance measuring systems were operated side by side for more than one year at the micrometeorological field site of the Meteorological Observatory Lindenberg (Richard-Aßmann-Observatory) of the German Meteorological Service (Deutscher Wetterdienst, DWD) in north-eastern Germany. Even above this "homogeneous" surface net radiation differences where found to exceed by far the uncertainty of radiation measurements and to be comparable in magnitude to the soil and sensible heat flux under certain conditions.