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Combined use of eddy correlation measurements and energy balance model to better understand in situ data

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The use of energy data to validate land surface models requires that the conservation of energy balance closure is satisfied. The energy balance closure is studied to evaluate the reliability of the measured ground data and the implication that has on the interpretation of the energy fluxes. Usually the energy balance is not closed when measuring energy with an eddy correlation station and the available energy is usually bigger than the sum of the turbulent vertical fluxes. But it is difficult to isolate the causes of the measurements errors due to the complexity of the influences that afflict the data quality, mainly due to instrumental errors and to the sensors configuration, especially those of the eddy covariance technique, to the problem of heterogeneities in the area, to meteorological conditions (such as heavy rain or snow), to different source area of the instrument and to the energy storage terms. This work tries to analyze this source of errors to understand when the measured data are reliable.
The present work investigates the possibility to improve the energy balance closure correcting the measured ground heat flux with the one modeled by a distributed energy water balance model (FEST-EWB). The ground heat flux is selected to be substituted because it is the flux with the smallest source area that can be up to two orders of magnitude lower than the latent and sensible heat fluxes footprint and moreover from literature is the flux with the highest uncertainty.
FEST-EWB is developed and monitored at field scale with fluxes measured from three eddy correlation towers to check the model performances. The analysis tries to asses the potentiality to control energy fluxes through the detection of land surface temperature from the synergic use of ground observations and of the thermodynamic equilibrium temperature of the modeled energy water balance.
The analyses are performed for three agricultural fields of Landriano (Italy - 2006), Bondville (USA - 2005) and Moscazzano (Italy - 2008).