COMPARISON OF EBBR AND ECOR FLUX MEASUREMENTS AT SGP E39

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ABSTRACT

ECOR and EBBR flux systems were established at SGP EF39 in late 2015 to allow comparisons of the two flux measurement techniques for wheat and grassland. It appeared that the EBBR Automatic Exchange Mechanism (AEM) was not located high enough to measure fluxes from the wheat field to the south and so was raised from 0.8m (for the lowest level) to 1.17m on 2 August, 2016. Afterwards, the narrow grass strip between the EBBR and the wheat field was not cut and thus affected the flux measurements. On 6 November, 2017 the AEM was raised even higher, to 1.5m. Comparisons of the fluxes from the two systems are presented, showing the effects of the change of height of the EBBR AEM.

MOTIVATION

- ECOR and EBBR both measure sensible and latent heat fluxes across the SGP (Fig 1)
- ECOR fluxes fail to close the energy budget, while EBBR assumes closure in flux calculations
- Co-located ECOR and EBBR exhibit divergence in measured fluxes

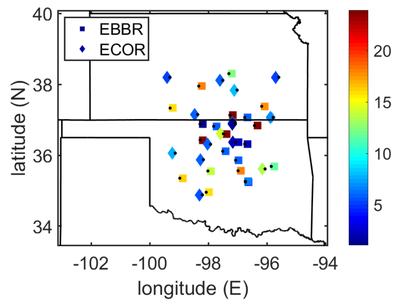


Fig 1. Location of past and current ECOR (diamonds) and EBBR (squares) at SGP and number of years of data at each site (color).

METHODS

- ECOR-EBBR correlation and bias are calculated prior to (June-July) and after (Aug-Oct) correcting AEM height
- ECOR-EBBR agreement exhibits marked seasonality (Fig 2). Thus, ECOR-EBBR comparisons are also made relative to the same months in 2017 after the AEM was operating at the correct height

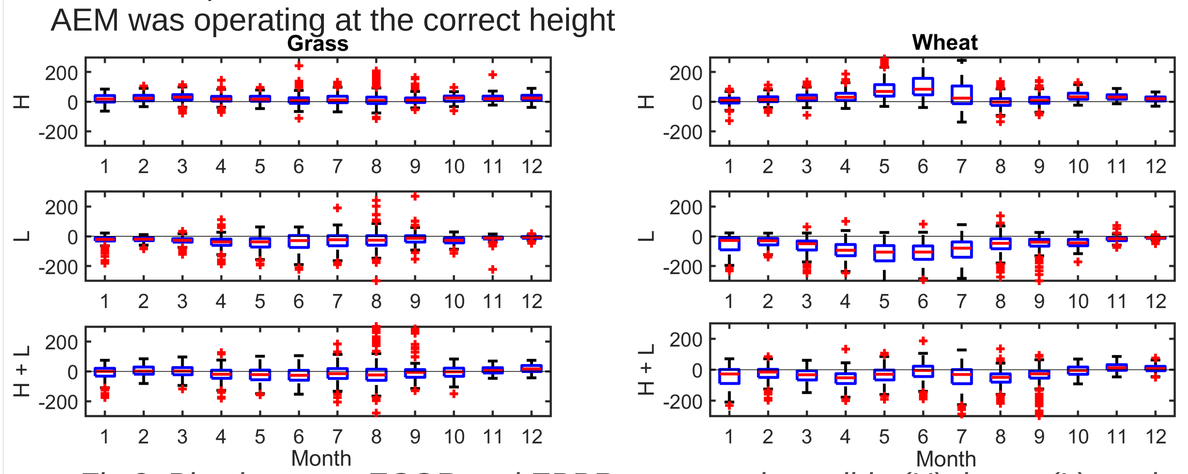
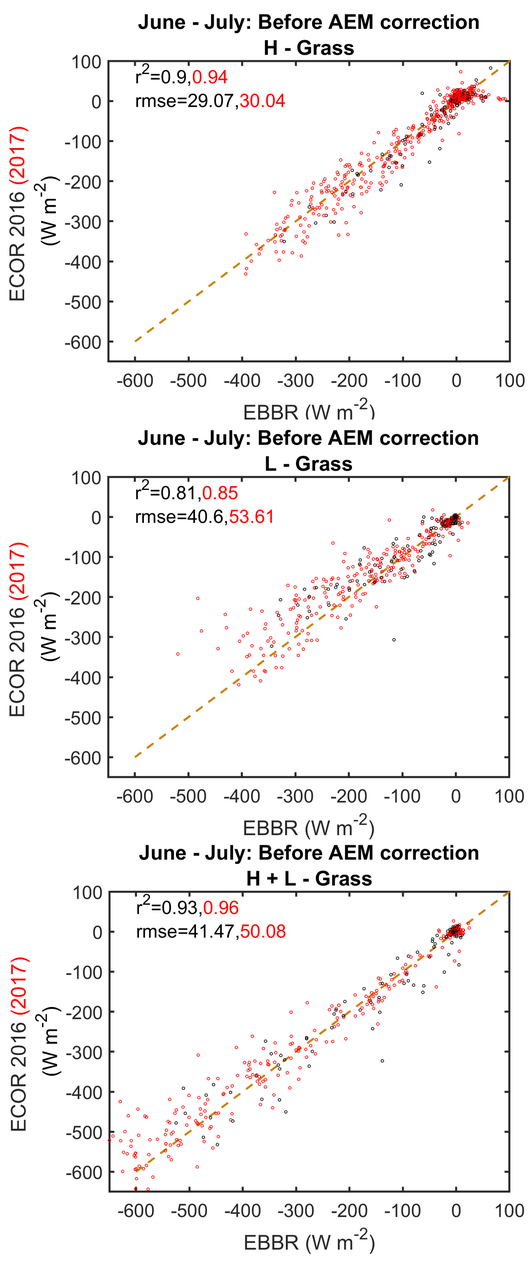


Fig 2. Bias between ECOR and EBBR measured sensible (H), latent (L), and turbulent (H + L) heat fluxes (W m^{-2}) by month when the prevailing wind is over grass (left) and wheat (right). Negative values indicate ECOR < EBBR.

FETCH OVER GRASS

BEFORE AEM CORRECTION



AFTER AEM CORRECTION

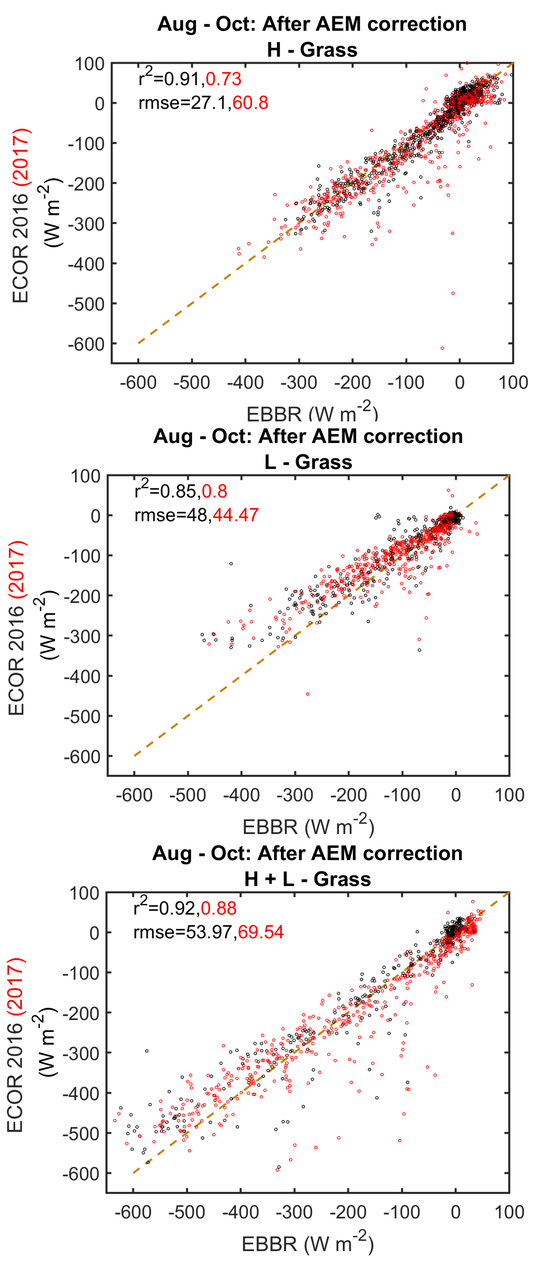
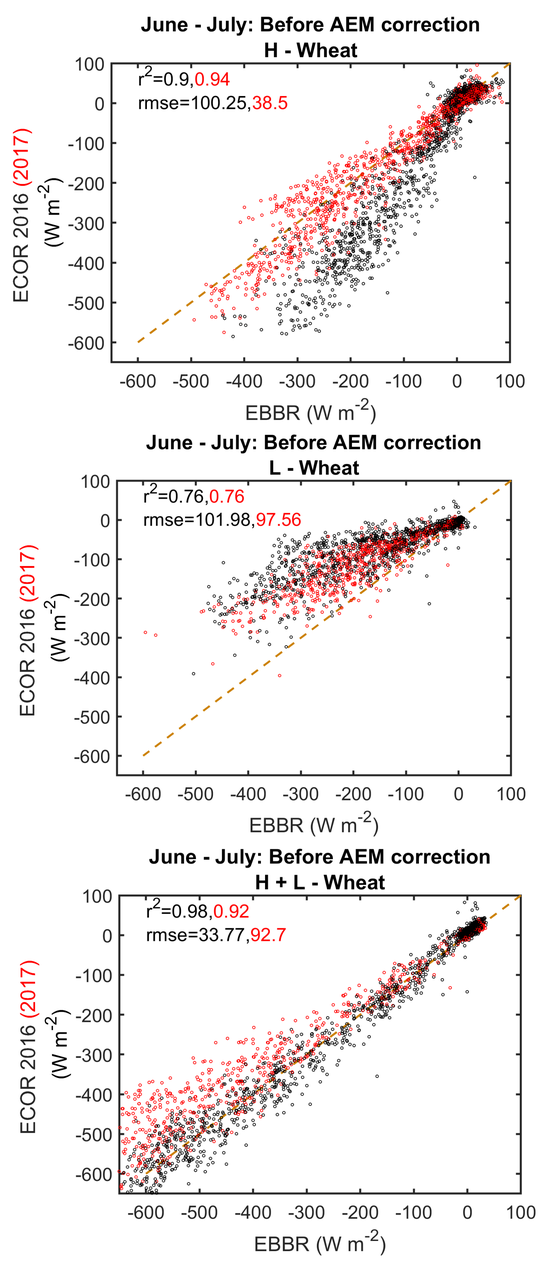


Fig 3. Scatter plots of coincident ECOR and EBBR measurements of sensible (H), latent (L), and turbulent (H + L) heat fluxes before (left-black) and after (right-black) the AEM height correction for wind advecting over grass. As the ECOR-EBBR agreement varies seasonally (Fig 2), also shown are the fluxes during 2017 for reference (red). Correlation coefficients (R^2) and root mean square error (rmse) are also shown.

FETCH OVER WHEAT

BEFORE AEM CORRECTION



AFTER AEM CORRECTION

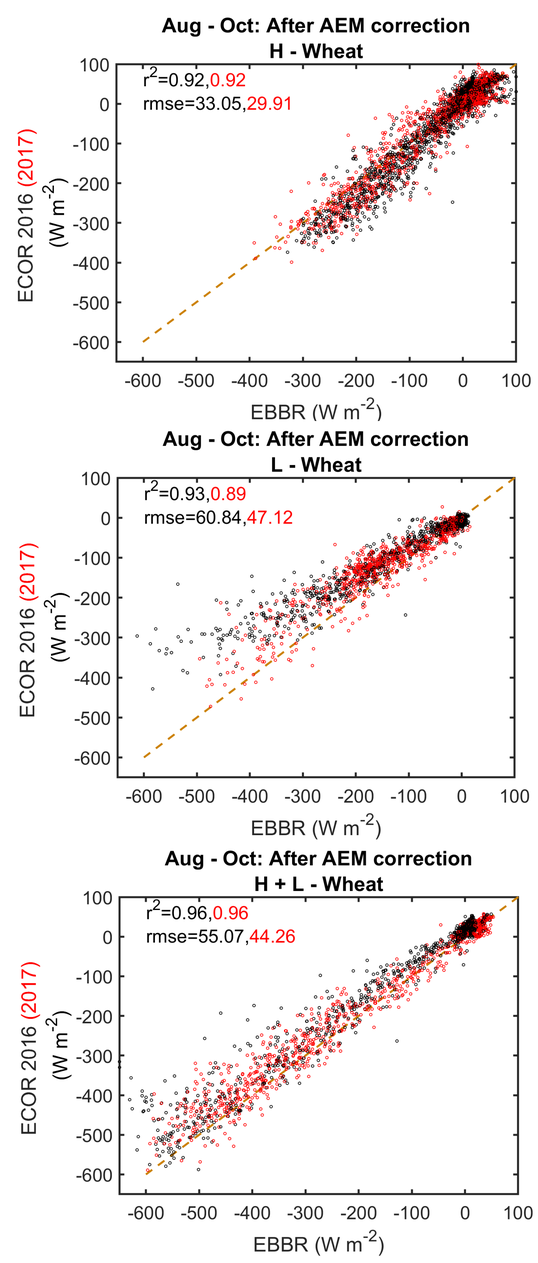


Fig 4. As in Fig 3, but for wind advecting over wheat.

ACKNOWLEDGEMENTS

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CONCLUSIONS

- ECOR latent heat fluxes are lower than EBBR and ECOR sensible heat fluxes are higher than EBBR, indicating discrepancies in the Bowen ratios derived from the contrasting instrument methodologies
- Divergence between the two instruments is greatest in summer and larger over wheat than grass
- Inter-instrument comparison for fetch over wheat indicates EBBR latent heat flux measurements were not strongly impacted by the AEM height, but sensible heat fluxes were biased low relative to ECOR when the AEM was too low