EMS Annual Meeting Abstracts
Vol. 10, EMS2013-319, 2013
13th EMS / 11th ECAM

Multi-seasonal energy, water and carbon fluxes for a suburban area in the UK

H.C. Ward (1,2), J.G. Evans (1), C.S.B. Grimmond (2,3)

(1) Centre for Ecology and Hydrology, Wallingford, Oxfordshire, United Kingdom, (2) Department of Geography, King's College London, London, United Kingdom, (3) Department of Meteorology, University of Reading, Reading, United Kingdom

Energy, water and carbon fluxes were measured using eddy covariance over a 2-year period (2011-12) in Swindon, UK. Analysis reveals strong seasonality in energy partitioning: sensible heat is favoured in spring and summer whilst in winter evaporation dominates, compensated for by a negative sensible heat flux for much of the day. The Bowen ratio was significantly lower in 2012 compared to 2011 as a result of contrasting rainfall patterns. Although both summers were wet, the effect of limited water availability is clearly seen in spring and autumn as the impervious surfaces dried out. The observed fluxes are strongly dependent on land cover, particularly during the summer.

Marked contrasts between natural and anthropogenic processes are evident in the temporal variation of the carbon dioxide flux. There is significant photosynthetic uptake during summer daytimes, whilst emissions from traffic and building energy use constitute peak carbon release in winter when the diurnal cycle has two clear peaks corresponding to anthropogenic activity.

Due to the heterogeneous nature of the suburban surface, turbulent heat fluxes were also measured at larger scales using scintillometry. Results are remarkably compatible between the different scales although the scintillometers give lower sensible and higher latent heat fluxes attributable to the greater proportion of vegetation typically within their source area. The sensible heat fluxes exhibit similar responses to changes in net radiation due to cloud cover and similar seasonal trends. The controls on evaporation are studied through the surface conductance, with direct applications for modelling.