



Seasonal analyses of carbon dioxide and energy fluxes above an oil palm plantation using the eddy covariance method

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A study presents the measurements of carbon dioxide and latent and sensible heat fluxes above a mature oil palm plantation on mineral soil in Keratong, Pahang, Peninsular Malaysia. The sampling campaign was conducted over an 25-month period, from September 2013 to February 2015 and May 2016 to November 2016, using the eddy covariance method. The main aim of this work is to assess carbon dioxide and energy fluxes over this plantation at different time scales, seasonal and diurnal, and determine the effects of season and relevant meteorological parameters on the latter fluxes. Energy balance closure analyses gave a slope between latent and sensible heat fluxes and total incoming energy to be 0.69 with an R^2 value of 0.86 and energy balance ratio of 0.80. The averaged net radiation was 108 W m^{-2} . The results show that at the diurnal scale, carbon dioxide, latent and sensible heat fluxes exhibited a clear diurnal trend where carbon dioxide flux was at its minimum $-3.59 \mu\text{mol m}^{-2} \text{ s}^{-1}$ in the mid-afternoon and maximum in the morning while latent and sensible behaved conversely to the carbon dioxide flux. The average carbon dioxide flux was $-0.37 \mu\text{mol m}^{-2} \text{ s}^{-1}$. At the seasonal timescale, carbon dioxide fluxes did not show any apparent trend except during the Northeast Monsoon where the highest variability of the monthly means of carbon dioxide occurred.