Geophysical Research Abstracts
Vol. 19, EGU2017-9948, 2017
EGU General Assembly 2017

Momentum, sensible heat and CO_2 correlation coefficient variability: what can we learn from 20 years of continuous eddy covariance measurements?

Quentin Hurdebise (1), Bernard Heinesch (1), Anne De Ligne (1), Caroline Vincke (2), and Marc Aubinet (1)
(1) Terra, University of Liege, Gembloux, Belgium (quentin.hurdebise@ulg.ac.be), (2) Earth and Life Institute, Université catholique de Louvain, Louvain-la-Neuve, Belgium

Long-term data series of carbon dioxide and other gas exchanges between terrestrial ecosystems and atmosphere become more and more numerous. Long-term analyses of such exchanges require a good understanding of measurement conditions during the investigated period. Independently of climate drivers, measurements may indeed be influenced by measurement conditions themselves subjected to long-term variability due to vegetation growth or set-up changes.

The present research refers to the Vielsalm Terrestrial Observatory (VTO) an ICOS candidate site located in a mixed forest (beech, silver fir, Douglas fir, Norway spruce) in the Belgian Ardenne. Fluxes of momentum, carbon dioxide and sensible heat have been continuously measured there by eddy covariance for more than 20 years. During this period, changes in canopy height and measurement height occurred.

The correlation coefficients (for momemtum, sensible heat and CO_2) and the normalized standard deviations measured for the past 20 years at the Vielsalm Terrestrial Observatory (VTO) were analysed in order to define how the fluxes, independently of climate conditions, were affected by the surrounding environment evolution, including tree growth, forest thinning and tower height change.

A relationship between canopy aerodynamic distance and the momentum correlation coefficient was found which is characteristic of the roughness sublayer, and suggests that momentum transport processes were affected by z-d. In contrast, no relationship was found for sensible heat and CO_2 correlation coefficients, suggesting that the z-d variability observed did not affect their turbulent transport. There were strong differences in these coefficients, however, between two wind sectors, characterized by contrasted stands (height differences, homogeneity) and different hypotheses were raised to explain it. This study highlighted the importance of taking the surrounding environment variability into account in order to ensure the spatio-temporal consistency of datasets.