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# Multi-year measurements of turbulent surface fluxes in Canadian Arctic at Eureka observatory

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This study analyzes and discusses turbulent fluxes including carbon dioxide flux data collected in Canadian Arctic at Eureka observatory (80.0 N, 85.9 W) during 2007-2010. This work extends and complements our previous study where only data from August 2007 until July 2008 were available. Turbulent fluxes and mean meteorological data are continuously measured and reported at various levels on a 10-m flux tower. Tower-based eddy covariance measurements provided a long-term near continuous temporal record of hourly average mass and energy fluxes. The data show that sensible heat flux, water vapor and carbon dioxide fluxes were small and mostly irregular in the cold seasons while the ground remained completely covered with snow. However the turbulent fluxes increase rapidly upon air temperatures rise above freezing during spring melt and eventually reach a summer maximum. According to our data, strong upward sensible and latent (water vapor) heat fluxes observed during summer months. This indicates unstable (convective) conditions on average. This study shows that the sensible heat flux, water vapor, and carbon dioxide fluxes exhibited clear diurnal cycles in Arctic summer. This behavior of the sensible heat flux is similar to the diurnal variations in mid-latitudes in summer. However, it was found that on average the turbulent flux of carbon dioxide was mostly negative (uptake by the surface) in summer, i.e. the Eureka site was a net sink for atmospheric CO2 during the growing seasons. It is also found that in a summer period observed temporal variability of the carbon dioxide flux was generally in anti-phase with water vapor flux (downward CO2 flux and upward H2O flux). During late summer and early autumn all turbulent fluxes rapidly decreases in magnitude when the air temperature decreases and falls below freezing.