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Atmospheric Chemistry and Physics Discussions

Supplement of

Comparison of eddy covariance and modified Bowen ratio methods for measuring gas fluxes and implications for measuring fluxes of persistent organic pollutants

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Table S1

Parameter	**Units**
W'TSonic'(rot)	K m s-1
W'CO_2*(rot)	PPM m s-1
W'H_2O*(rot)	PPT m s-1
CO_2_25.7m	PPM
CO_2_33.0m	PPM
CO_2_41.5m	PPM
H_2O_25.7m	mmol mol-1 (PPT)
H_2O_33.0m	mmol mol-1 (PPT)
H_2O_41.5m	mmol mol-1 (PPT)
AirDensity_33m	Kg m-3
AirTemp_33.3m	Deg C
AirTemp_40.7m	Deg C
SensHtFlux	W m-2

Table S2

CO2 (PPM m)		spring		summer		fall		winter	
		Day	Night	Day	Night	Day	Night	Day	Night
eddy covariance		-0.332	0.295	-3.360	1.071	0.074	0.227	0.189	0.112
modified Bowen ratio hourly K_{heat}	1/h	0.245 (!)	0.470	-1.223	1.599	0.027	0.388	0.148	0.218
	1/2h	0.29 (!)	0.480	-1.133	1.789	0.061	0.417	0.162	0.189
	1/4h	0.306 (!)	0.473	-1.079	1.694	0.050	0.395	0.141	0.194
	1/8h	0.265 (!)	0.522	-1.069	1.889	0.098	0.416	0.173	0.157
	1/day	0.374 (!)	0.552	-1.137	2.897	0.152	0.559	0.191	0.182
	1/3days	0.355 (!)	0.778	-1.060	2.514	0.145	0.656	0.105	0.182
	1/week	0.432 (!)	0.543	-1.191	2.868	0.143	0.659	-0.020 (!)	0.031
MBR/EC method		-0.959 (!)	1.820	0.335	1.978	1.116	2.137	0.796	1.289

H2O (PPT m)		spring		summer		fall		winter	
		Day	Night	Day	Night	Day	Night	Day	Night
eddy covariance		0.420	0.016	1.118	0.038	0.180	0.005	0.049	0.001
modified Bowen ratio hourly K_{heat}	1/h	0.052	0.007	0.266	0.036	0.013	-0.001 (!)	-0.005 (!)	-0.009 (!)
	1/2h	0.057	0.007	0.256	0.038	0.009	-0.001 (!)	-0.004 (!)	-0.009 (!)
	1/4h	0.042	0.009	0.278	0.040	0.007	-0.000 (!)	-0.005 (!)	-0.007 (!)
	1/8h	0.035	0.011	0.259	0.036	0.008	-0.001 (!)	-0.009 (!)	-0.008 (!)
	1/day	0.030	0.011	0.292	0.052	0.008	-0.001 (!)	-0.004 (!)	-0.011 (!)
	1/3days	0.049	0.014	0.361	0.059	0.011	-0.004 (!)	-0.016 (!)	-0.015 (!)
	1/week	0.065	0.009	0.351	0.044	0.016	-0.001 (!)	-0.009 (!)	-0.014 (!)
MBR/EC method		0.109	0.570	0.261	1.117	0.055	-0.156 (!)	-0.132 (!)	-9.554 (!)

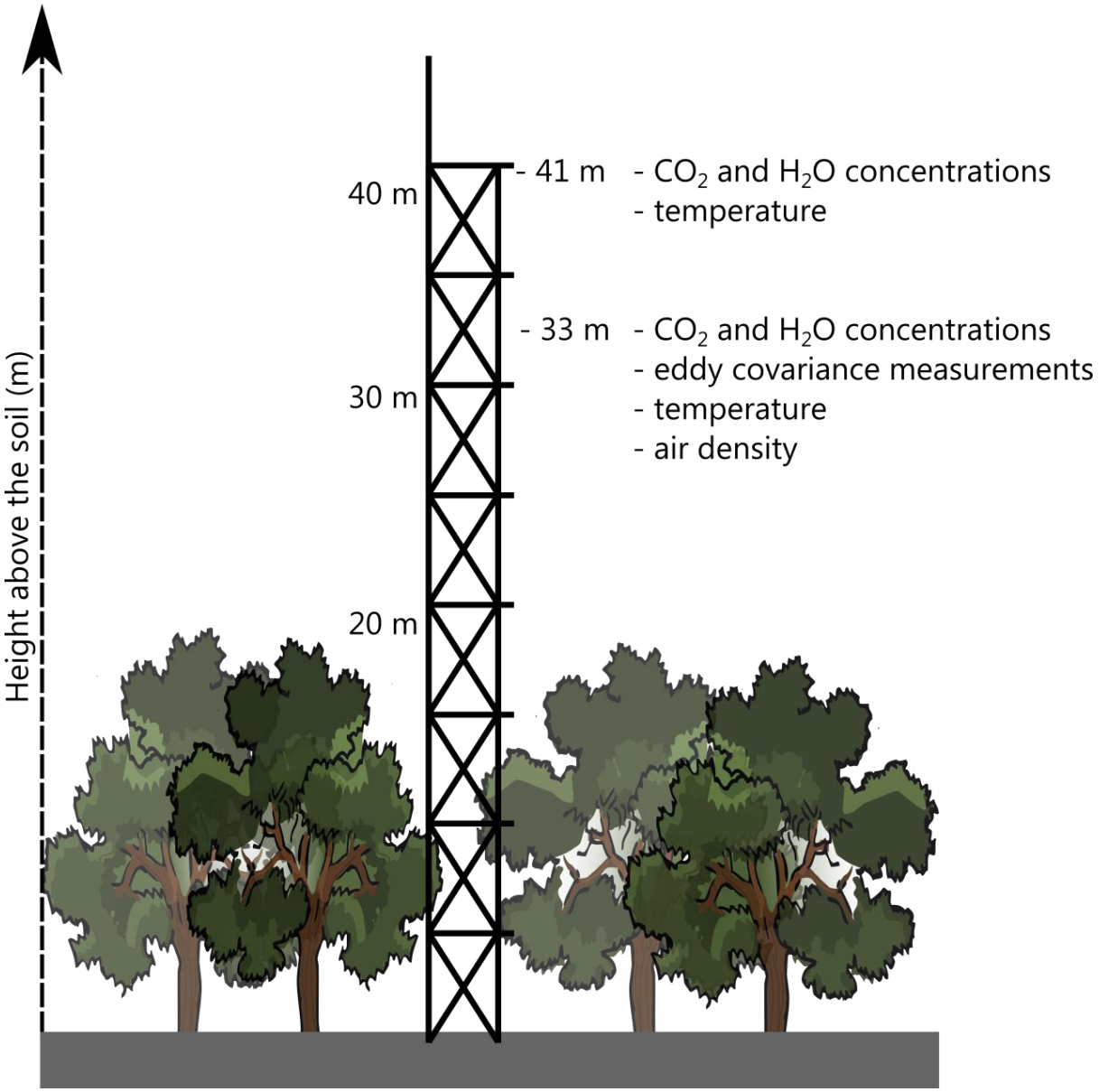

Fig. S1: The flux tower and parameters of interest to this study. A more detailed figure can be found on the website of Environment Canada (http://www.ec.gc.ca).

Table S1: Overview of parameters taken from the datasets. The comment "(rot)" is given when coordinates are rotated to correct for the sonic anemometer not being perfectly levelled.

Parameter	**Units**
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AirDensity_33m	Kg m-3
AirTemp_33.3m	Deg C
AirTemp_40.7m	Deg C
SensHtFlux	W m-2

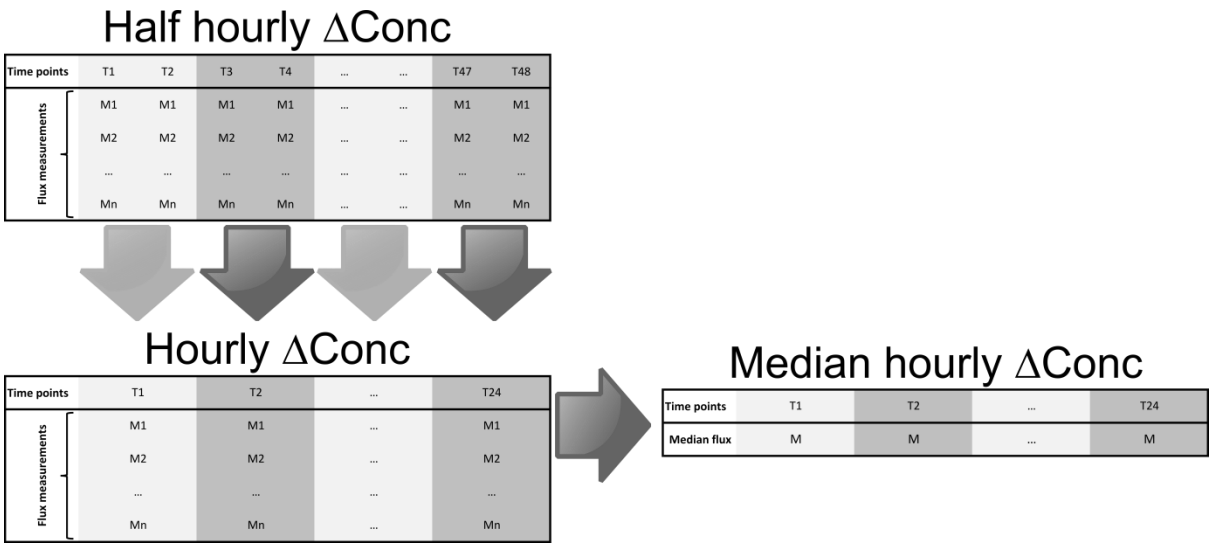

Fig. S2: Example of how the data was pooled, with ΔConc as the concentration gradient over the 2 heights. For example, fluxes calculated from 1 h simulated sampling times are based on the median of average vertical concentration gradients in 1 h pools measured at the same time each day over the entire 2 month period.

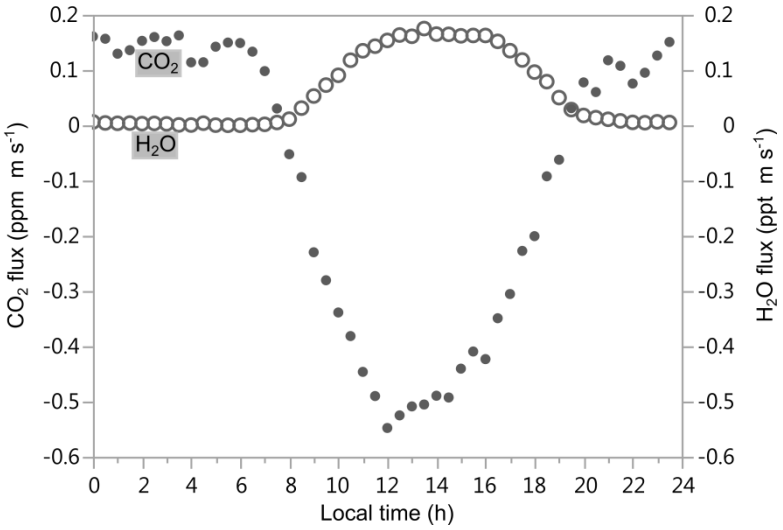

Fig. S3: Comparison of daily averaged fluxes for CO_2 and H_2O in summer. Note the difference in scale between the two compounds.

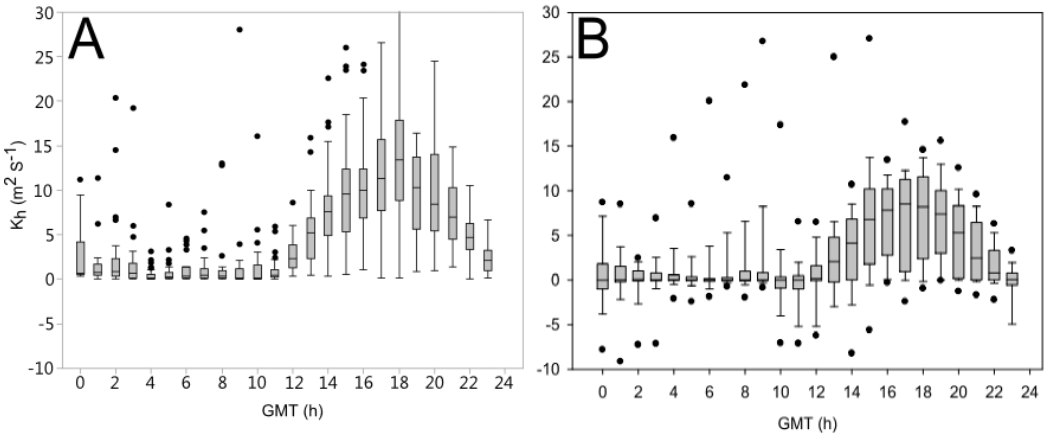

Fig. S4: Comparison of K_{heat} for the Borden forest during days 126 to 153 in 2009 (A) and 2003 (B) respectively. Data from 2003 was taken from Choi et al.(S. -D. Choi et al., 2008). Values in the left plot represent the geometric mean for every half hour across the entire period.

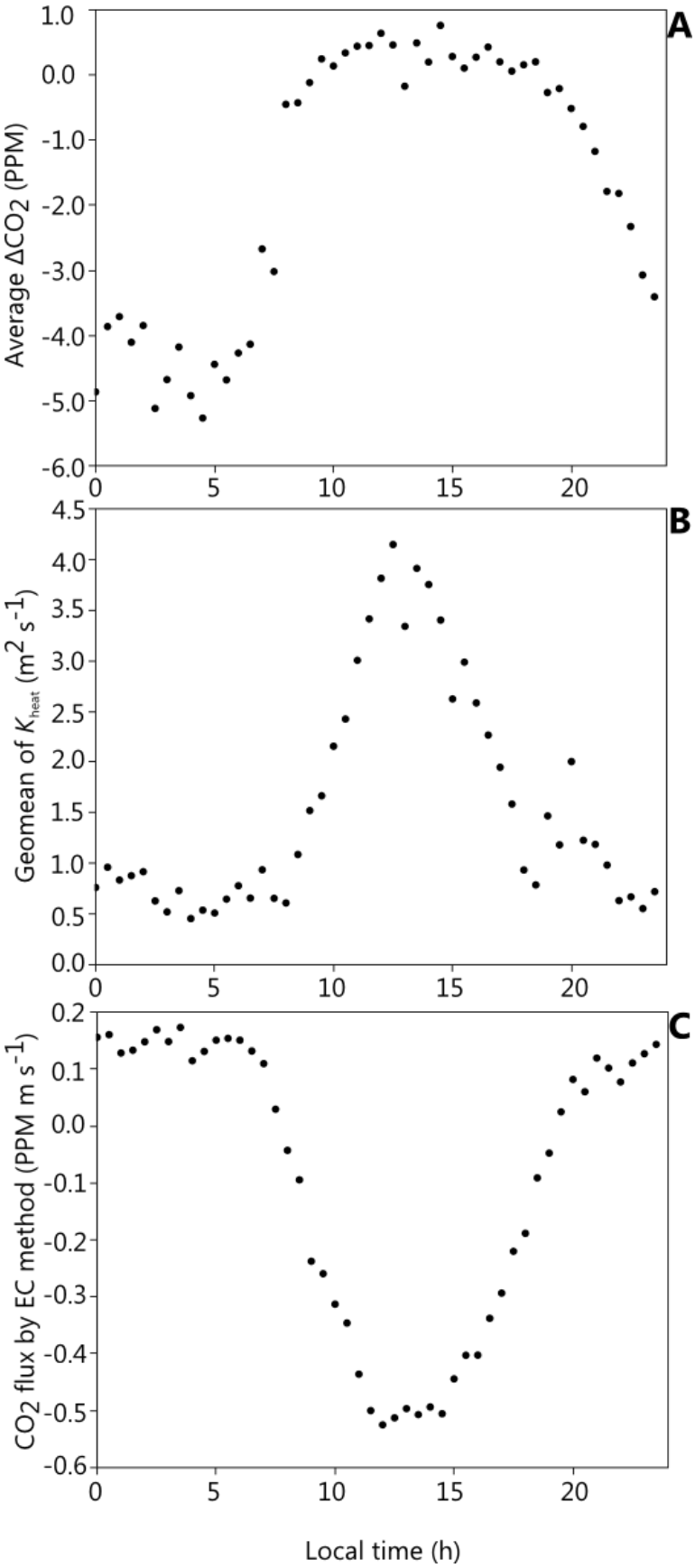

Fig. S5: Plots of the CO_2 gradient (A), the the eddy diffusivity of heat (K_{heat}, B) and the EC measurements for CO_2 during the summer period (July and August).

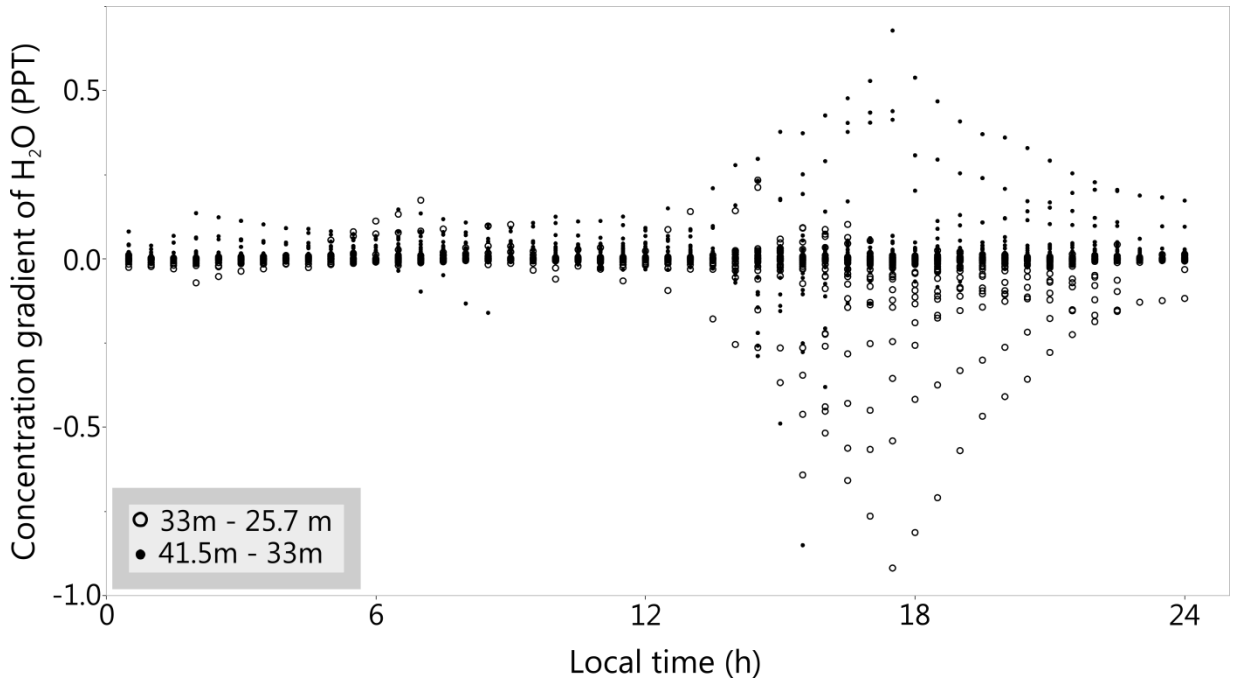

Fig. S6: Plot showing the discrepancy between the concentration gradient of H_2O measured over 2 different height intervals in the winter.

Table S2: Cumulative fluxes for 8 h periods representing day and night across the 2 month periods representing spring, summer, fall and winter. Fluxes measured by the MBR method that are in the opposite direction than those measured by the EC method are marked with „!“.Positive fluxes are defined as fluxes moving upwards from the canopy. The ratio of MBR results over EC results is based on the geometric mean of the MBR results divided by the EC result. The MBR fluxes for the 1-week sampling period were left out in the calculation of the geometric mean during the day in winter for CO_2 and during the night in fall for H_2O.This table shows fluxes calculated with an hourly-resolved value for K_{heat}.