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Supplement of

Methane emissions from an oil sands tailings pond: a quantitative comparison of fluxes derived by different methods

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Supplemental Figures

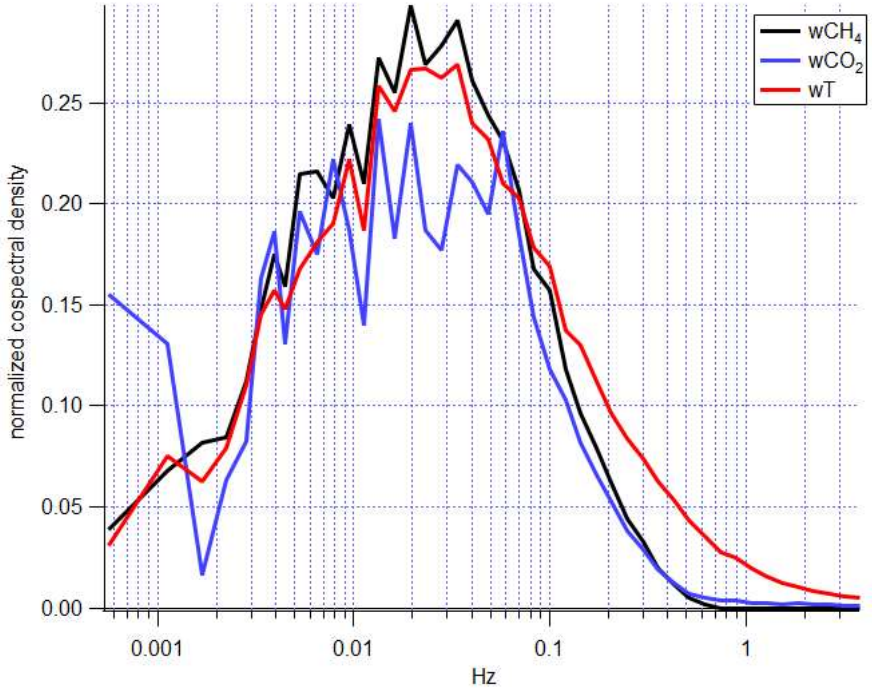

Figure S1 Average normalized cospectral densities for CH_4, CO_2 and sensible heat for those periods when the wind was from the pond and the data quality flag for the CH_4 flux was 0 or 1.

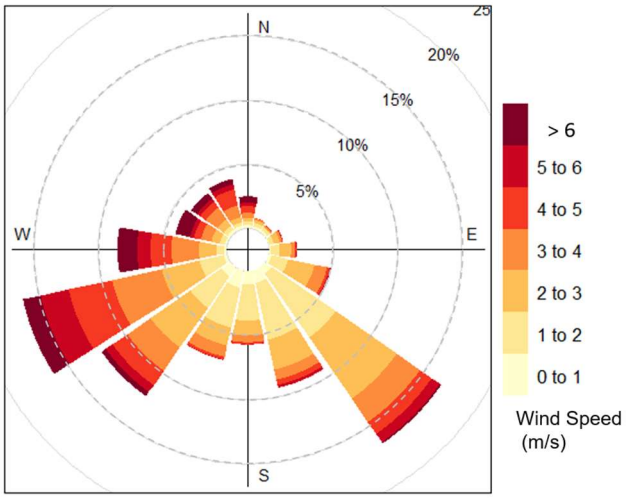

Figure S2 The wind rose for the entire measurement period. The color labels the wind speed (m/s). The radius represents the frequency of the wind in each direction bin.

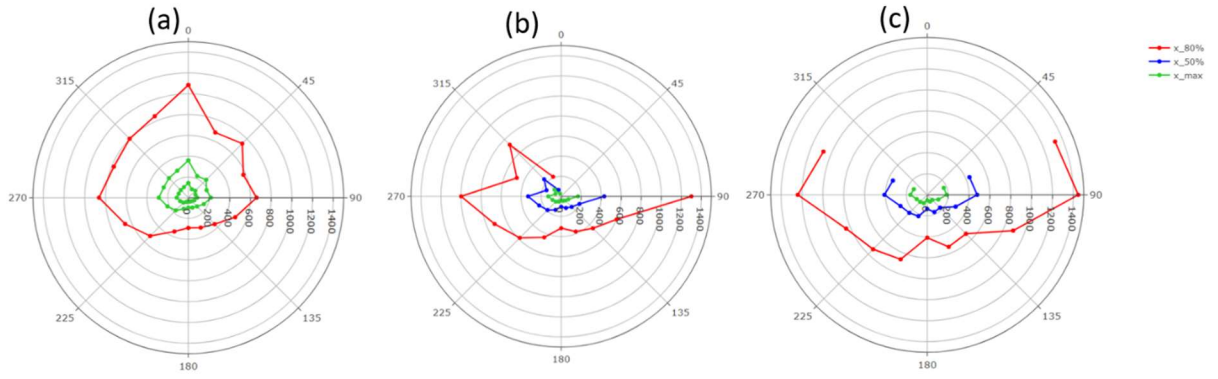

Figure S3 Polar plots show the footprints under unstable (a), neutral (b), and stable (c) conditions. The red and blue traces in the polar plots show the medians of 80% and 50% contribution distances (in meters) for the measured half-hour periods EC fluxes in 16 wind direction bins. The green traces show the medians of contribution distances with the footprint peak. Angles in the polar plot are the wind direction (0º = true North) with the center at the main site.

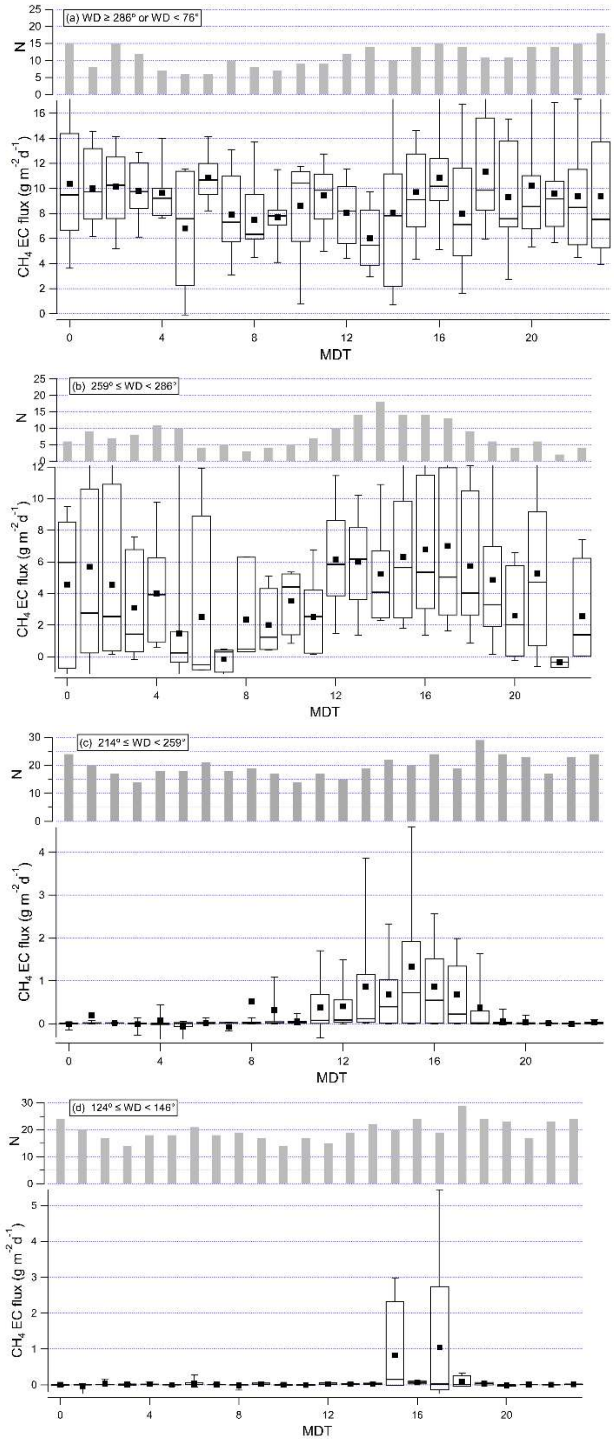

Figure S4 Diurnal variation of CH_4 EC flux (bottom) and number (N) of half-hours in each hour bin (top). (a) Wind direction (WD) ≥ 286°, or WD ≤ 76°, pond; (b) 259° ≤ WD < 286°, pond + shore of pond; (c) 214° ≤ WD < 259°, trees+ a lake; (d) 124° ≤ WD < 146°, worker's log and parking lots. MDT = Mountain Daylight Savings Time. Lower and upper bounds of the box are 25th and 75th percentile of each bin; the lines in the box and the black squares mark the median and mean of data in each bin; whiskers are 10th and 90th percentile of data.

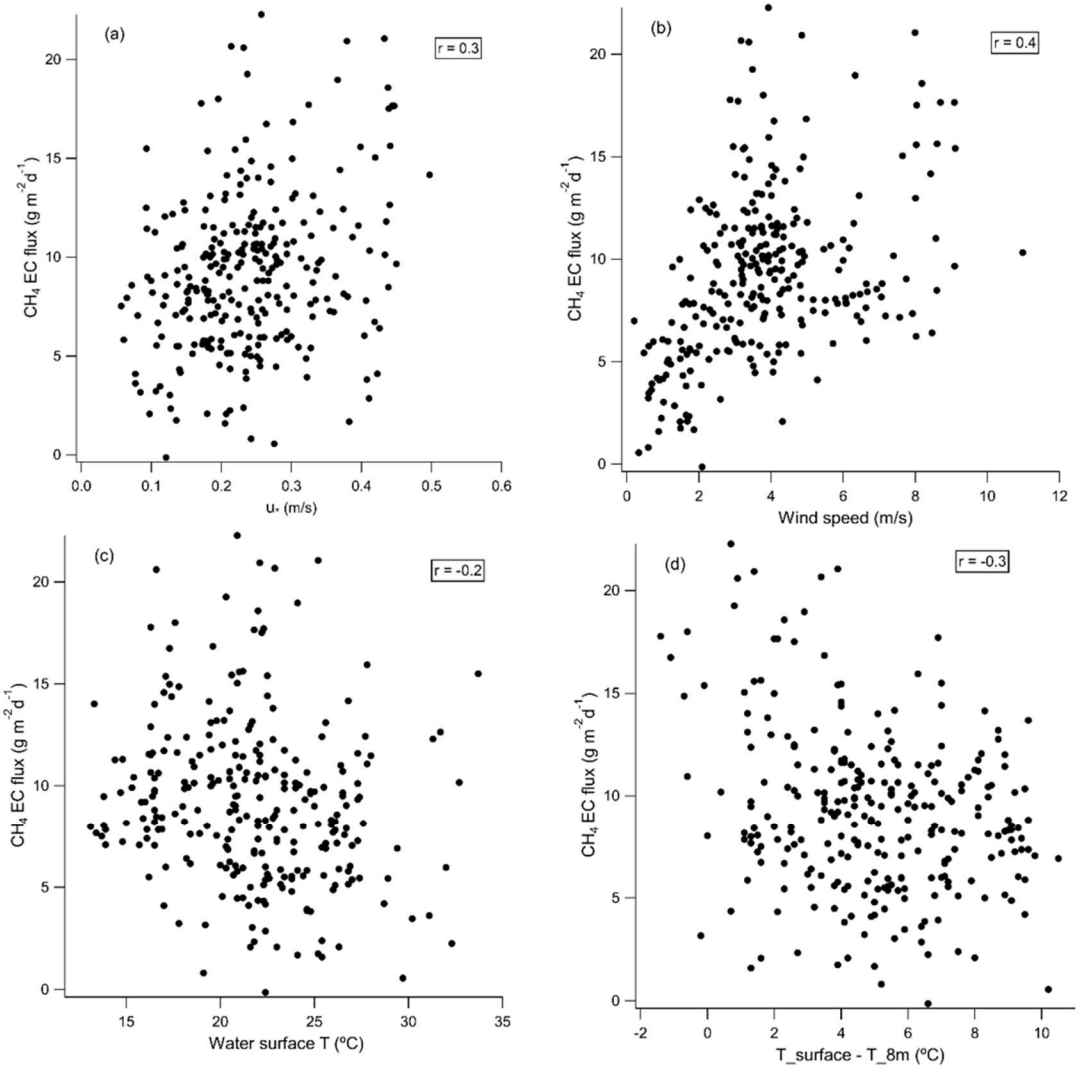

Figure S5 CH_4 EC flux when the wind came from the pond direction as a function of (a) u_*; (b) wind speed; (c) water surface temperature; (d) temperature difference between water surface and 8 m. r in each panel labels the correlation coefficient of the least square fit in linear regression analysis.

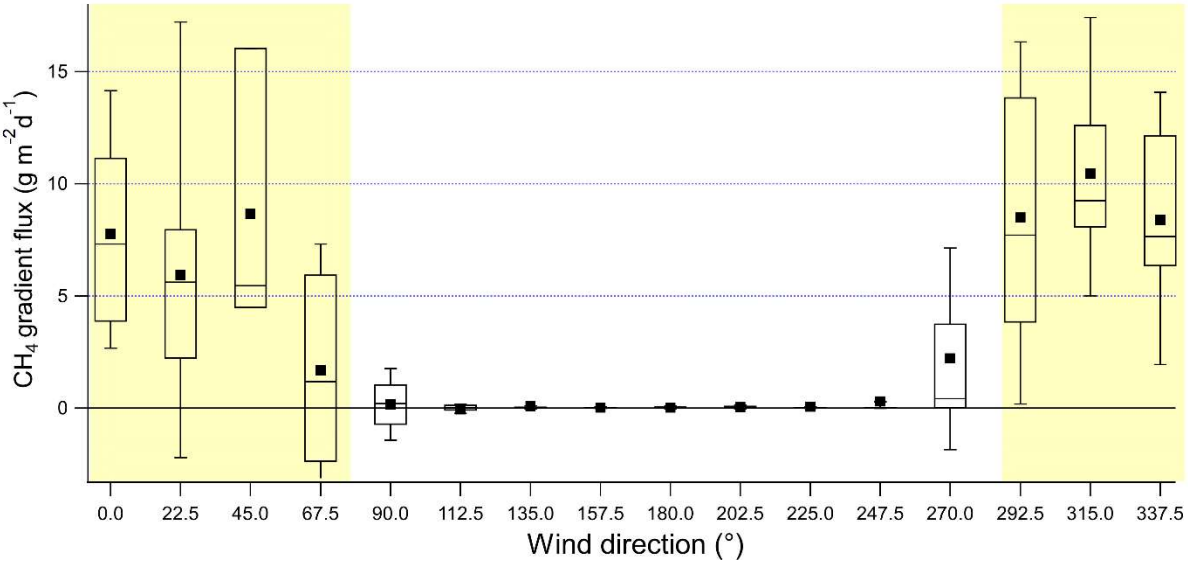

Figure S6 Gradient flux of CH_4 as a function of wind direction, yellow shades indicate wind directions from the pond. . Lower and upper bounds of the box plot are 25th and 75th percentile; the line in the box marks the median and the black square labels the mean; the whiskers label the 10th and 90th percentile. Yellow shades indicate the wind directions from the pond.

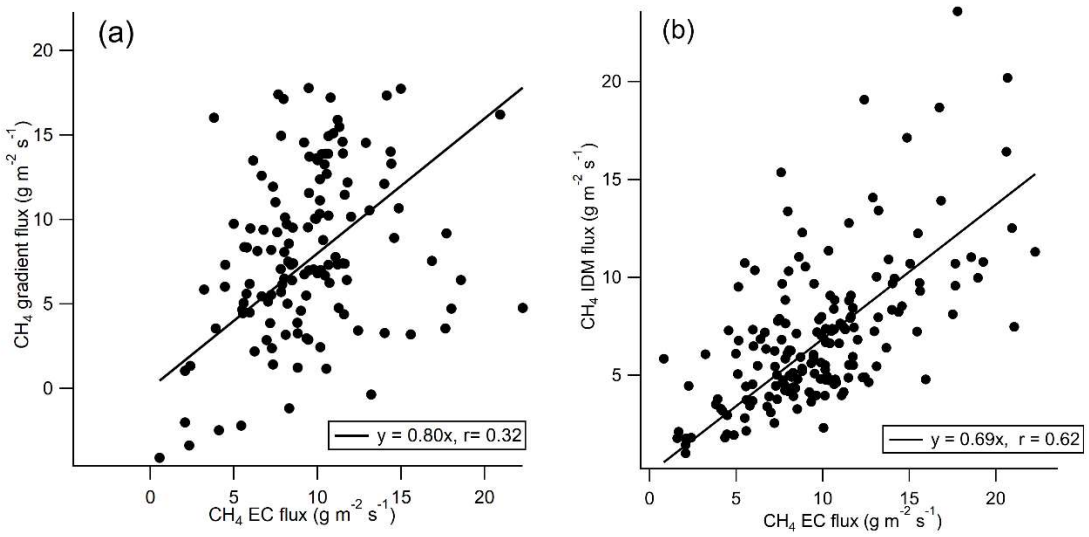

Figure S7 (a) CH_4 gradient flux, and (b) CH_4 IDM flux compared with EC flux, when the wind was from the pond direction.

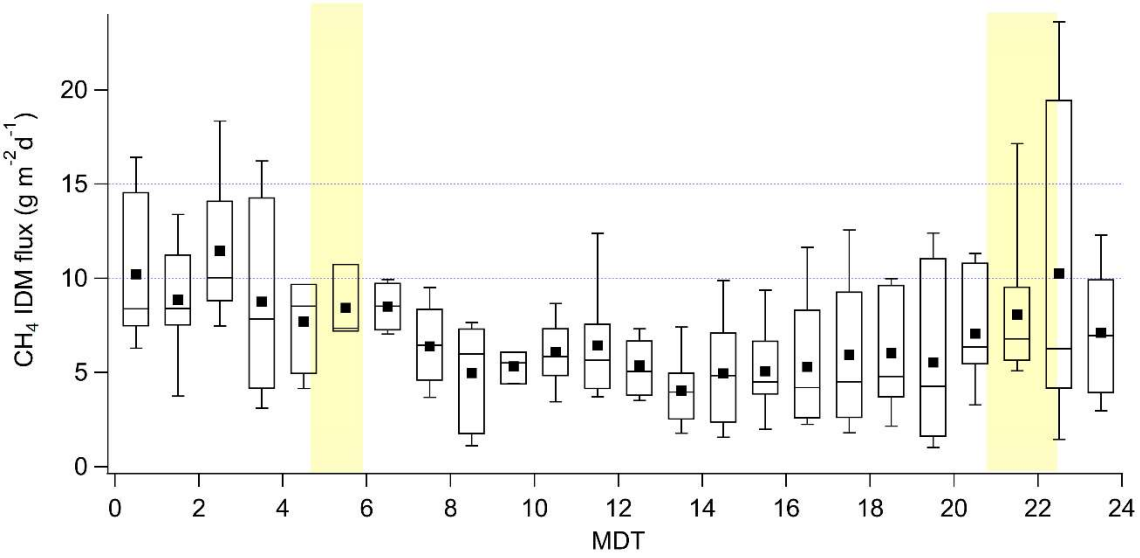

Figure S8 Diurnal variation of IDM flux. MDT = Mountain Daylight Savings Time. Lower and upper bounds of the box plot are 25th and 75th percentile; the line in the box marks the median and the black square labels the mean; the whiskers label the 10th and 90th percentile. The yellow shades mark the range of local sunrise and sunset time during this 5-week project.

Supplemental Table

Table S1 CH_4 gradient flux (g m^{-2} d^{-1}) results with two approaches for calculating S_c.

(g m^{-2} d^{-1})	Q_25%	median	Q_75%	mean[a]
Variable S_c	3.8	6.1	11.0	7.2 ± 3.5
Constant S_c	1.3	4.0	8.2	4.8 ± 2.4

[a] Errors with the mean fluxes are calculated with a "top-down" error estimation approach, using the average of standard deviations of fluxes from five periods when the fluxes displayed high stationarity.