



*Supplement of*

## **Characterization of atmospheric methane release in the outer Mackenzie River delta from biogenic and thermogenic sources**

**Daniel Wesley et al.**

*Correspondence to:* Daniel Wesley ([dwesley@stfx.ca](mailto:dwesley@stfx.ca))

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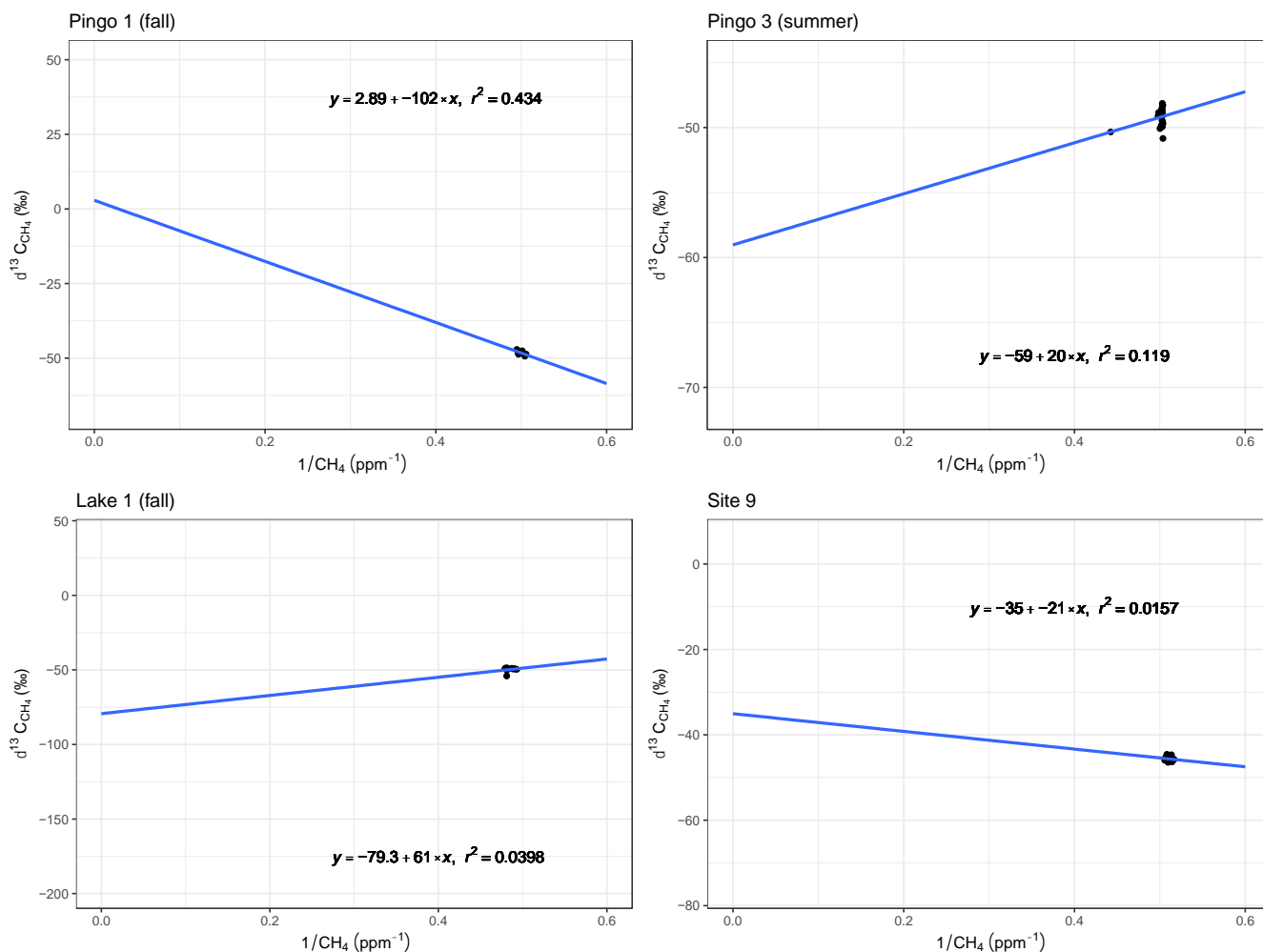
## Supplemental Results

An outline of the sites sampled during this study are included in Table S1. Pingo 1, Lake 1, Wetland 2 and Wetland 3 were included in the main analysis despite low  $R^2$  values. The Keeling plot intercept for Wetland 2 and Wetland 3 were low enough that even with a lower confidence in the signature we can still have confidence that it is within the range of biogenic values.

- 5 Pingo 1 and Lake 1 were included because high  $\text{CH}_4$  concentration samples clearly indicated a shift towards a thermogenic source despite the poor fit of the keeling plot. This adds confidence to the interpretation even with a low  $R^2$  value. A few high concentration samples cannot verify the source signature, but they can indicate that the source has a signature that is higher (thermogenic) or lower (biogenic) than the atmospheric background value.

10 **Table S1: Site locations and  $\text{CH}_4$  source isotopic signatures.**

Site	Latitude	Longitude	Source $\delta^{13}\text{C}-\text{CH}_4$ (‰)	$R^2$	Max $\text{CH}_4$ (ppm)	Max wind speed (km/h)	Site Type
Wetland 1 (fall)	68.9691°	-134.7168°	-88.3	0.999	62.50	16.2	Aquatic seep
Pingo 3 (fall)	68.9393°	-134.4114°	-73.6	0.987	3.19	2.6	Aquatic seep
channel seep	69.3197°	-135.4775°	-42.5	0.982	27.00	10.5	Aquatic seep
Wetland 1 (summer)	68.9691°	-134.7168°	-56.4	0.927	18.46	5.0	Aquatic seep
Pingo 2	69.2856°	-135.5039°	-63.6	0.845	2.58	10.5	Airborne EC
Pingo 1	69.0888°	-135.7951°	-53.0	0.722	5.62	5.5	Airborne EC
Wetland 3	69.2088°	-135.2714°	-71.9	0.675	2.23	6.0	Airborne EC
Wetland 2	68.9243°	-135.3883°	-78.4	0.596	2.19	10.0	Airborne EC
Lake 1 (summer)	69.2294°	-135.2441°	-44.7	0.480	7.57	N/A	Aquatic seep
<b>Sites sampled but not reported due to low <math>R^2</math></b>							
Pingo 1 (fall)	69.0888°	-135.7951°	-2.9	0.434	2.02	14.2	Airborne EC
Pingo 3 (summer)	68.9393°	-134.4114°	-59.0	0.119	2.26	3.6	Aquatic seep
Lake 1 (fall)	69.2294°	-135.2441°	-79.3	0.040	2.09	14.0	Aquatic seep
Site 9	68.9466°	-135.8452°	-35.0	0.016	1.98	3.5	Airborne EC



15 **Figure S1: Keeling plots for Pingo 1 (fall), Site 9, Pingo 3 (summer), Lake 1 (fall) and Site 10. Pingo 1, Site 9 and Site 10 were identified as areas of high flux rate by aerial surveys but could not be verified during this study. Pingo 3 and Lake 1 were identified in October by holes in the ice caused by high rate ebullition. Regression analysis was inconclusive and not included in the main analysis. All plots had low  $R^2$  values due to low  $\text{CH}_4$  concentrations. The maximum  $\text{CH}_4$  measured at any site was at Pingo 3 and was 2.261 ppm.**