**Investigating ten years of warming and enhanced snow depth on nutrient availability and greenhouse gas fluxes in a High Arctic ecosystem**

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# Supplemental Information

Chart, histogram

Description automatically generated

**Figure S1.** Air temperature and rainfall patterns for 2017 (top) and 2018 (bottom) at the Cape Bounty Arctic Watershed Observatory (CBAWO) during the summer months of June, July and August (JJA).

**Chart, bar chart

Description automatically generated**

**Fig. S2** Seasonal patterns of NH4+-N availability and NO3--N availability in **a)** 2017 and **b)** 2018. Treatments are coded as snow-warmed (SW), snow-control (SC), control warmed (CW), and control-control (CC). Error bars indicate one standard error for all plots. Note differences in y-axis scales between the two years.

**Chart

Description automatically generated**

**Fig. S3** Seasonal patterns of **a)** CO2 release, **b)** CH4 flux, and **c)** N2O flux in 2017 (left) and 2018 (right). Treatments are coded as snow-warmed (SW), snow-control (SC), control warmed (CW), and control-control (CC). Error bars indicate upper limit of one standard error for all plots. Note differences in y-axis scales between the two years.

**Table S1.** Four-way repeated measures analysis of variance (ANOVA) results for assessing two-way interactions of enhanced snow depth, warming, and study year (between subjects) and within study years (within subjects) on soil temperature, active layer depth, soil moisture, NH4+-N availability, NO3--N availability, CO2 release, CH4 flux, and N2O flux. Significance values are reported as significant (\*\*, p < 0.05) or non-significant (p > 0.05).

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Variable** | **Df** | **Snow × Warm** | | **Snow × Year** | | **Warm × Year** | | **Snow × Time** | | **Warm × Time** | | **Year × Time** | |
| **F** | **Sig.** | **F** | **Sig.** | **F** | **Sig.** | **F** | **Sig.** | **F** | **Sig.** | **F** | **Sig.** |
| Soil temperature | 1,53 | 5.95 | 0.02\*\* | 1.48 | 0.230 | 0.13 | 0.72 | 1.44 | 0.24 | 0.46 | 0.50 | 1.07 | 0.31 |
| Active layer depth | 1,53 | 4.45 | 0.04\*\* | 11.24 | 0.00\*\* | 0.43 | 0.52 | 4.42 | 0.04\*\* | 0.13 | 0.73 | 8.80 | 0.01\*\* |
| Soil moisture | 1,53 | 0.49 | 0.49 | 0.13 | 0.72 | 0.65 | 0.43 | 0.43 | 0.51 | 0.97 | 0.33 | 10.26 | 0.00\*\* |
| NH4+-Navailability | 1,53 | 0.70 | 0.38 | 1.59 | 0.21 | 2.08 | 0.16 | 0.87 | 0.36 | 0.20 | 0.66 | 1.19 | 0.28 |
| NO3--Navailability | 1,53 | 1.95 | 0.17 | 1.92 | 0.17 | 0.38 | 0.54 | 0.470 | 0.50 | 0.01 | 0.94 | 4.07 | 0.05\*\* |
| CO2 release | 1,53 | 0.21 | 0.65 | 1.32 | 0.26 | 2.18 | 0.15 | 0.01 | 0.40 | 6.28 | 0.02\*\* | 6.30 | 0.02\*\* |
| CH4 flux | 1,53 | 0.63 | 0.43 | 0.08 | 0.78 | 0.37 | 0.55 | 0.13 | 0.73 | 1.43 | 0.24 | 9.66 | 0.00\*\* |
| N2O flux | 1,53 | 0.31 | 0.58 | 14.28 | 0.00\*\* | 0.01 | 0.94 | 0.05 | 0.82 | 0.06 | 0.81 | 0.39 | 0.54 |