Assessment of terrestrial dissolved organic carbon in northern permafrost

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Supplementary

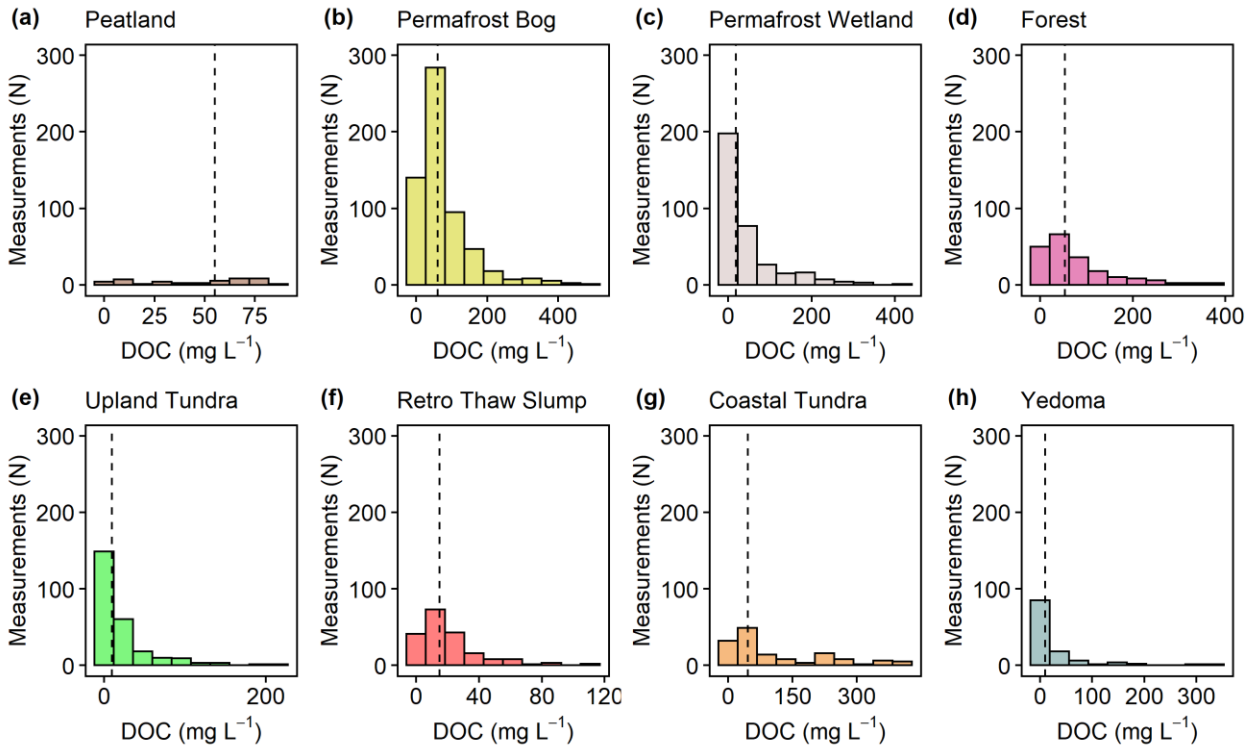

Figure S1. Histograms for the number of DOC measurements (N) at various DOC concentrations (mg L^{-1}) included in the dataset in the top 3 m for each ecosystem type. DOC concentrations binned into 10 groups for each. (f) Retro Thaw Slump = Retrogressive thaw slump. Black dotted vertical lines in each panel represents the median DOC concentration (mg L^{-1}) for that ecosystem. Note different scales of DOC concentrations on *x*-axis.

Table S1. Number of studies, DOC concentrations, and country location for each ecosystem type. Total number of studies in table is greater than number of studies in the database as some studies have sites at multiple ecosystem types

Ecosystem	No. of studies	No. of DOC measurements	Study location
Peatland	7	48	Can, Swe, USA
Permafrost bog	33	649	Can, Fin, Rus, Swe, USA
Permafrost wetland	19	452	Can, Gre, Rus, USA
Forest	20	332	Can, Rus, Swe, USA
Upland tundra	18	256	Can, Gre, Rus, Sva, Swe, USA
Retrogressive thaw slump	6	160	Can, USA
Coastal tundra	9	218	Can, USA
Yedoma	9	145	Can, Rus, USA

Can = Canada; Fin = Finland; Gre = Greenland; Rus = Russia; Sva = Svalbard; Swe = Sweden; USA = USA (Alaska)

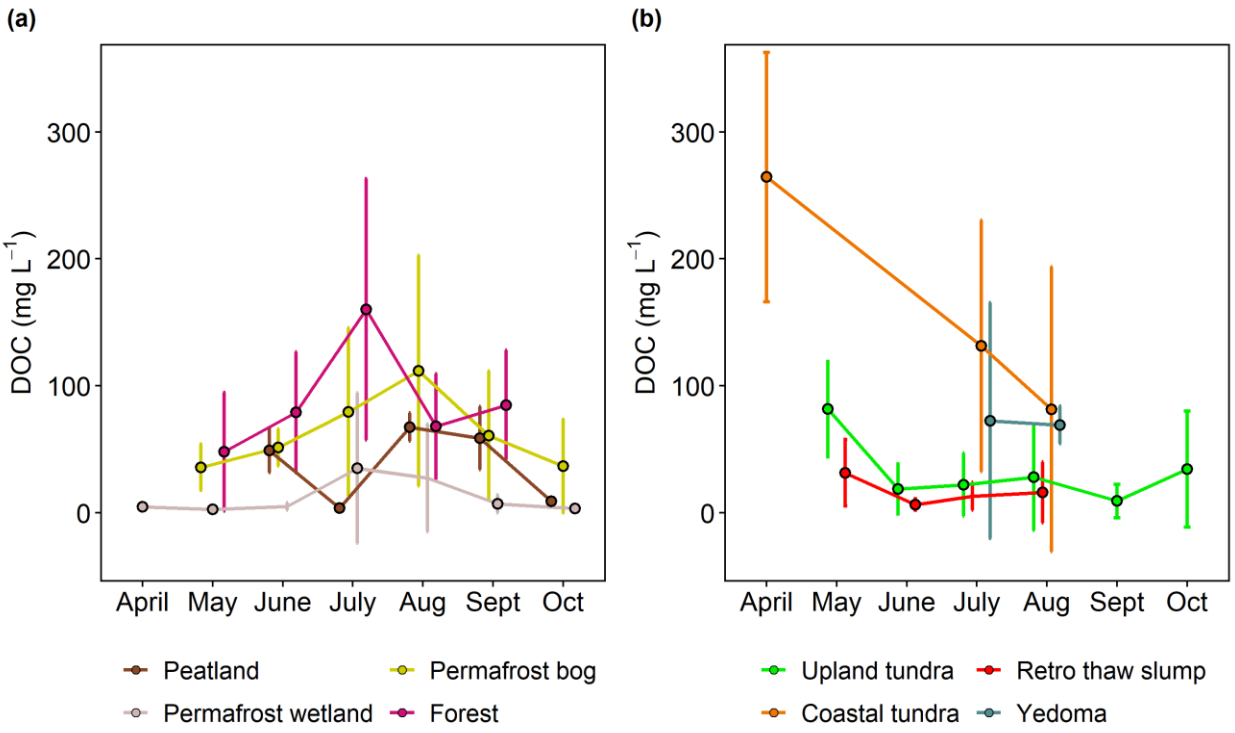

Figure S2. Seasonality in DOC concentrations (mg L^{-1}) in the top 3 m for each ecosystem type. (a) Organic rich ecosystems. (b) Mineral soil dominated ecosystems. Error bars represent ± 1 standard deviation.

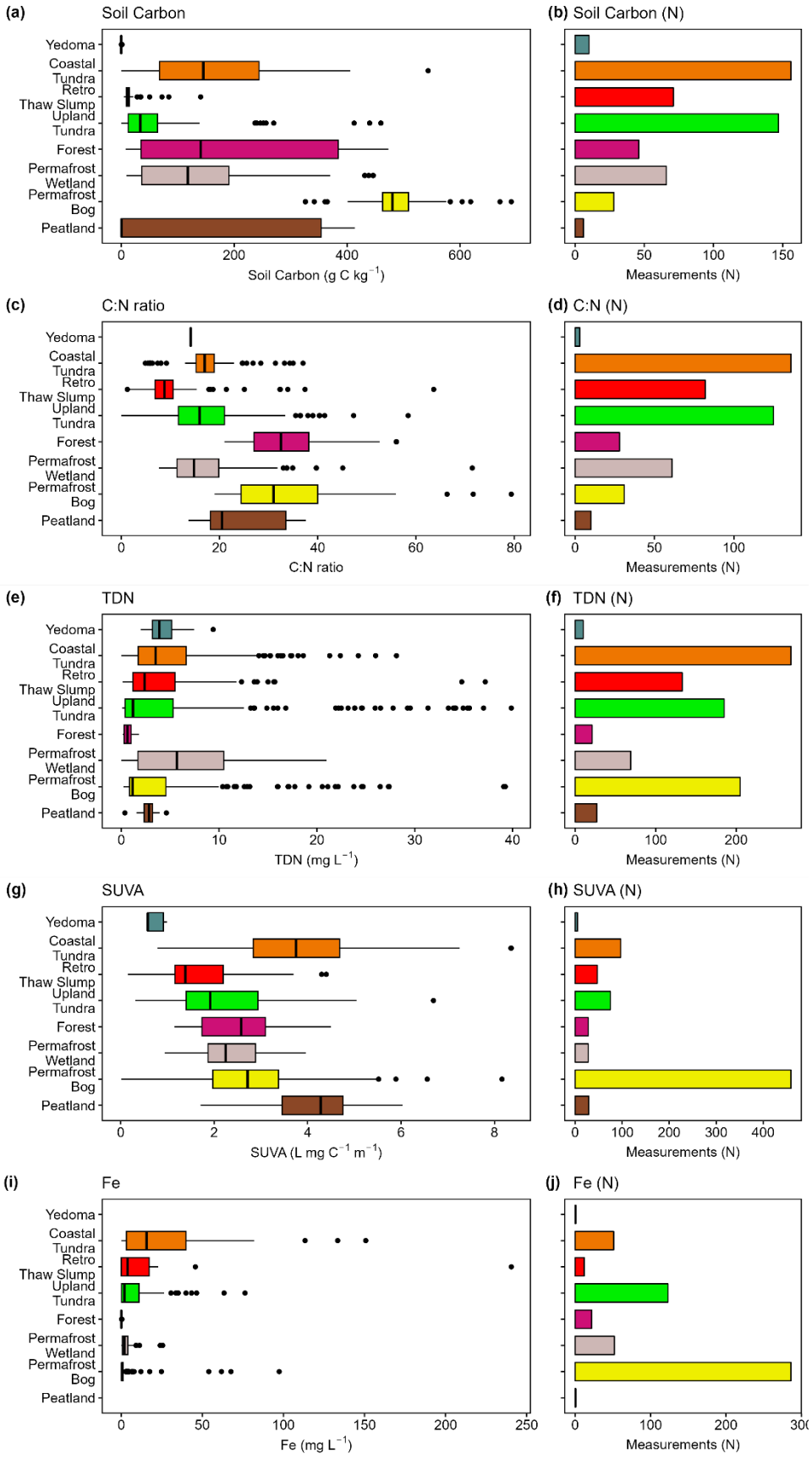
(a) Soil Carbon
(b) Soil Carbon (N)
(c) C:N ratio
(d) C:N (N)
(e) TDN
(f) TDN (N)
(g) SUVA
(h) SUVA (N)
(i) Fe
(j) Fe (N)
Yedoma
Coastal Tundra
Retro Thaw Slump
Upland Tundra
Forest
Permafrost Wetland
Permafrost Bog
Peatland
Soil Carbon (g C kg^{-1})
C:N ratio
TDN (mg L^{-1})
SUVA (L mg C^{-1} m^{-1})
Fe (mg L^{-1})
Measurements (N)

Figure S3. Boxplot of (a, c, e, g, i) continuous variables used in analysis, and bar plots of (b, d, f, h, j) the number of measurements of each continuous variable taken from the top 3 m for each ecosystem type. Boxes represents the interquartile range (25 – 75%), with median shown as black horizontal line. Whiskers extend to 1.5 times the interquartile range (distance between first and third quartile) in each direction. Soil Carbon = carbon content of soil (g C kg^{-1}). C:N ratio = carbon:nitrogen ratio. TDN = total dissolved nitrogen (mg L^{-1}). SUVA = the specific UV absorbance at 254 nm (L mg C^{-1} m^{-1}). Fe = dissolved iron ((mg L^{-1}).

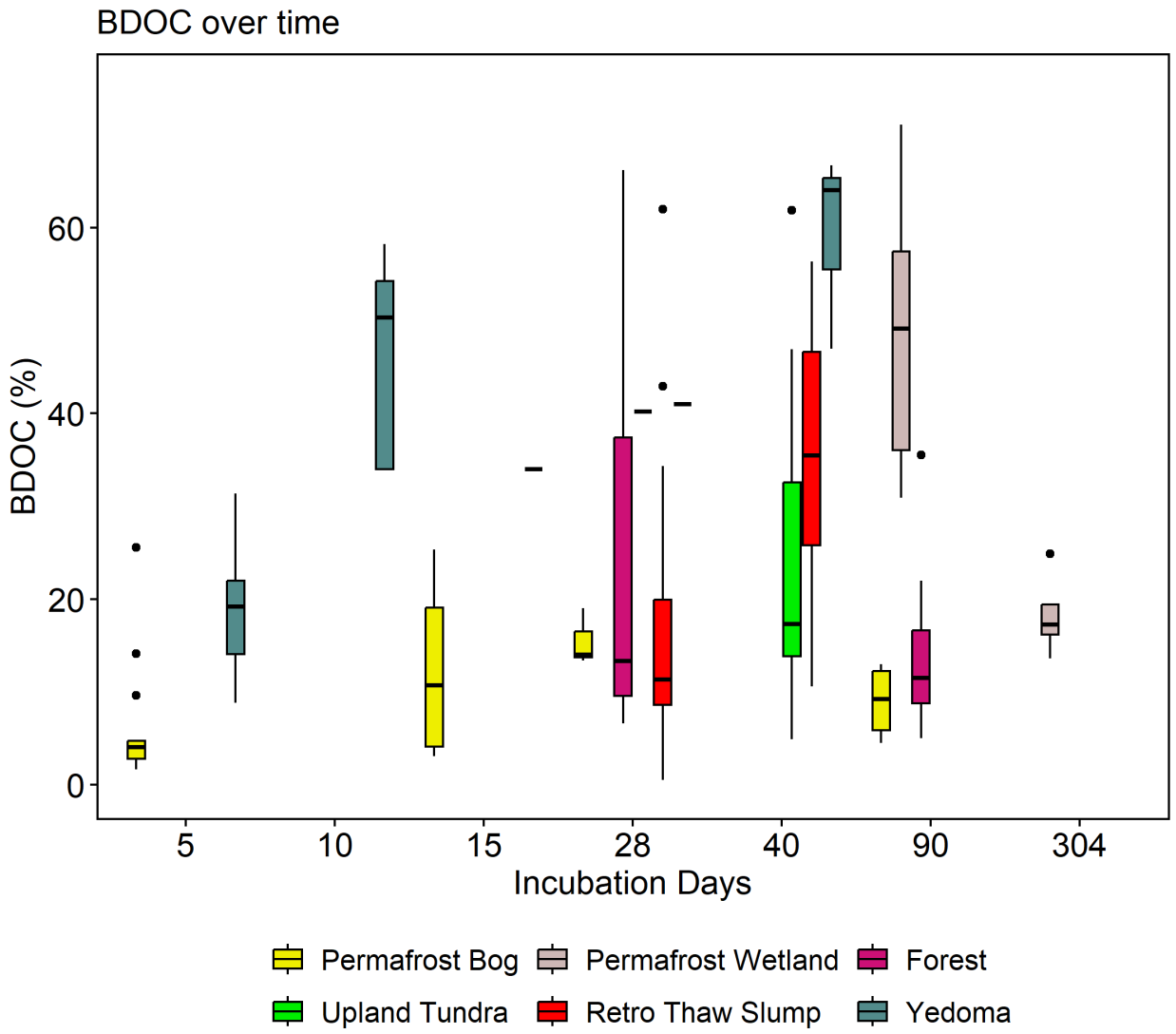

Figure S4. Change in biodegradable DOC (BDOC; %) from the top 3 m over time during incubations for each ecosystem type where data was available. BDOC loss was determined following 3 – 304 days of incubation. Time points were binned into 5, 10, 15, 28, 40, 90, and 304 incubations days for improved clarity of presentation. Data from different incubation lengths was combined due to low sample size. Retro Thaw Slump = Retrogressive Thaw Slump. Boxes represents the interquartile range (25 – 75%), with median shown as black horizontal line. Whiskers extend to 1.5 times the interquartile range (distance between first and third quartile) in each direction, with outlier data plotted individually as black dots.

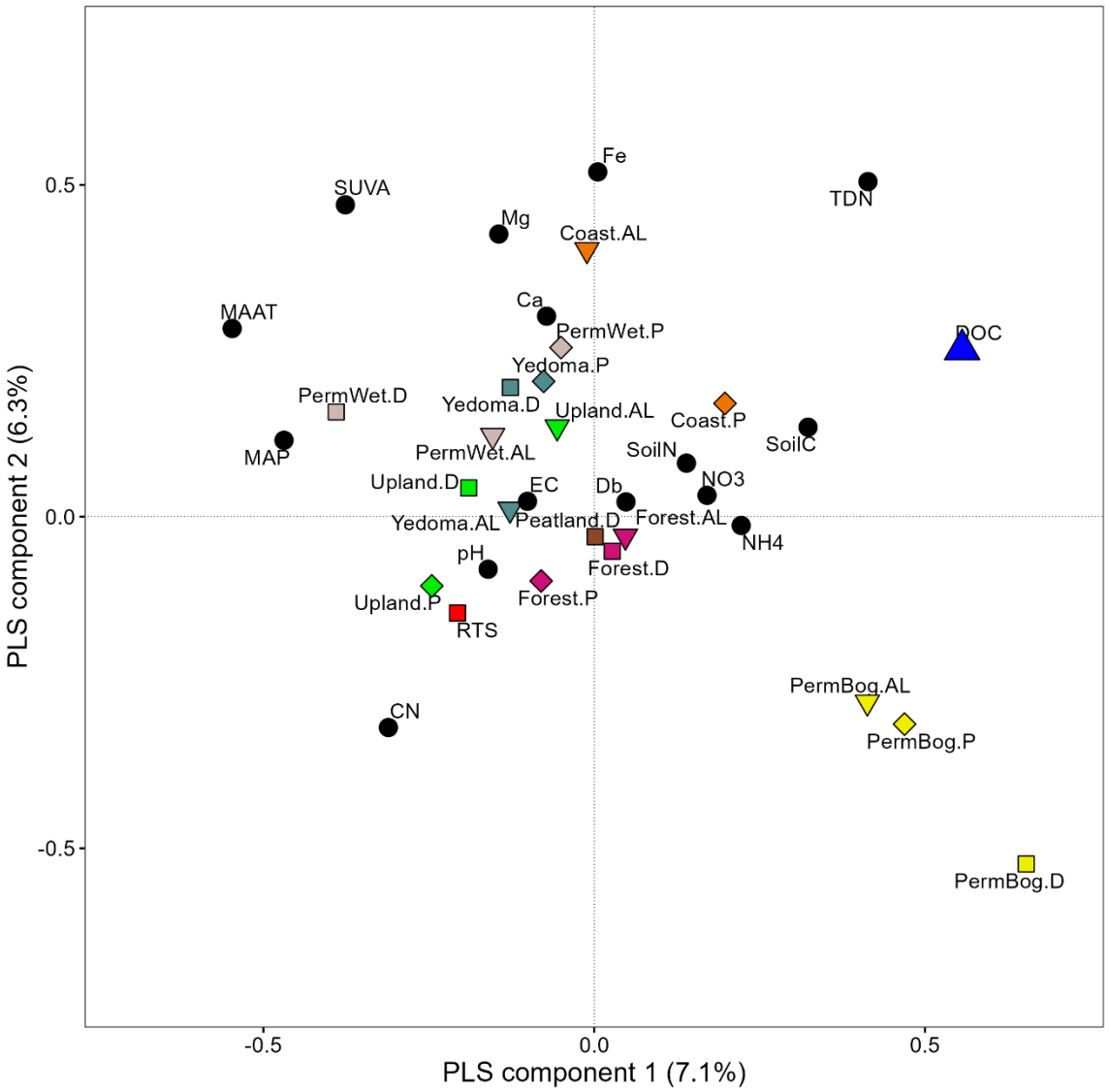

Figure S5. Partial least squares regression (PLS) with loadings plot containing all continuous and categorical variables considered when attempting to explain the variance in DOC concentrations (blue triangle). Black circles in the loadings plot represent continuous environmental data that had at lest 20% coverage of DOC data. All continuous data was log transformed, mean centered, and standardized. CN = carbon:nitrogen ratio. SUVA = the specific UV absorbance at 254 nm. MAP = mean annal precipitation. MAAT = mean annual temperature. SoilC = carbon content of. TDN = total dissolved nitrogen. Fe = dissolved iron. Ca = dissolved calcium. Mg = dissolve d magnesium. Db = bulk density of soil. pH = soil or pore water pH. EC = electrical conductivity of soil pore water. SoilN = soil nitrogen content. NO3 = dissolved nitrate. NH4 = dissolved ammonium. PermWet = permafrost wetland ecosystem class. Yedoma= Yedoma ecosystem class. RTS = retrogressive thaw slump ecosystem class. Coast = coastal tundra ecosystem class. PermBog = permafrost bog ecosystem class. Forest = forest ecosystem class. Upland = upland tundra ecosystem class. Peatland = peatland tundra ecosystem class. Measurements from the active layer of each ecosystem class are shown as downward pointing triangle icons and labelled ".AL" after the ecosystem label. Measurement s

from the permafrost lens of each ecosystem class are shown as diamond icons and labelled “.P” after the ecosystem label. Measurements from disturbed sites of each ecosystem class are shown as square icons and labelled “.D” after the ecosystem label.