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Lability classification of soil organic matter in the northern permafrost region

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Table S1. Overview of field study areas and incubated samples.

Study area	Geographic location	Approximate coordinates	Permafrost zone	Vegetation zone	Mean Annual/July Temperatures	Nr profiles / incubated soil samples	Partner and incubation experiment	Time of soil sampling
Ny Ålesund	Svalbard	78.9 N, 11.7 E	Continuous	Tundra	-5.8/+5.2	16 / 24	UCOP_PAGE21	Summer 2013
Adventdalen	Svalbard	78.2 N, 15.9 E	Continuous	Tundra	-6.0/+6.2	35 / 79	UCOP_PAGE21	Summer 2013
Lena Delta	N Siberia	72.3 N, 126.3 E	Continuous	Tundra	-12.5/+10.1	43 / 122	UCOP_PAGE21	Summer 2013
Logata	Taymyr Peninsula, N Siberia	73.4 N, 98.4 E	Continuous	Tundra	-14.3/+11.2	33 / 218	USB_CryoCarb 2	Summer 2011
Shalaurovo	Lower Kolyma, NE Siberia	69.5 N, 161.7 E	Continuous	Tundra	-12.1/+11.7	22 / 290	USB_CryoCarb 1	Summer 2010
Arymas	Taymyr Peninsula, N Siberia	72.5 N, 101.7 E	Continuous	Tundra, Forest Islands	-13.3/+12.2	34 / 294	USB_CryoCarb 2	Summer 2011
Cherskiy	Lower Kolyma, NE Siberia	68.8 N, 161.6 E	Continuous	Forest (-Tundra), Lowland, Alpine	-11.1/+12.7	16 / 207	USB_CryoCarb 1	Summer 2010
Seida	NW Russia	67.1 N, 62.9 E	Discontinuous	Tundra, Forest Islands	-6.1/+13.0	8 / 80	USB_CryoCarb 3	Summer 2008
Stordalen Mire	Abisko, N Sweden	68.3 N, 19.1 E	Sporadic	Alpine treeline ecotone	-0.2/+11.6	5 / 13	UCOP_PAGE21	Summer 2013

Table S2. Representation of landscape classes in each incubation experiment and its study area(s).

Study area	Geographic location	Incubation experiment	Peat deposit	Peaty wetland deposit	Mineral soil, mountains	Mineral soil, lowlands	Soils in alluvial deposit	Soils in eolian deposit	Mineral soil, deeper C-enriched	Pleistocene Yedoma deposit
Ny Ålesund	Svalbard	PAGE21			Y	Y	Y			
Adventdalen	Svalbard	PAGE21		Y	Y	Y	Y	Y	Y	
Lena Delta	N Siberia	PAGE21				Y	Y	Y	Y	
Stordalen Mire	Abisko, N Sweden	PAGE21	Y							
Shalaurovo	Lower Kolyma, NE Siberia	CryoCarb 1	Y	Y		Y	Y	Y	Y	Y
Cherskiy	Lower Kolyma, NE Siberia	CryoCarb 1	Y	Y	Y	Y	Y	Y	Y	Y
Logata	Taymyr Peninsula, N Siberia	CryoCarb 2		Y		Y	Y			
Arymas	Taymyr Peninsula, N Siberia	CryoCarb 2	Y	Y		Y	Y			
Seida	NW Russia	CryoCarb 3	Y	Y		Y				

Figure S1. Cross correlations between geochemical parameters for all samples in the four incubation experiments: a-c, PAGE21; d-f, CryoCarb 1-Kolyma; g-i, CryoCarb 2-Taymyr; j-l, CryoCarb 3-Seida. All regressions significant ($p<0.05$).

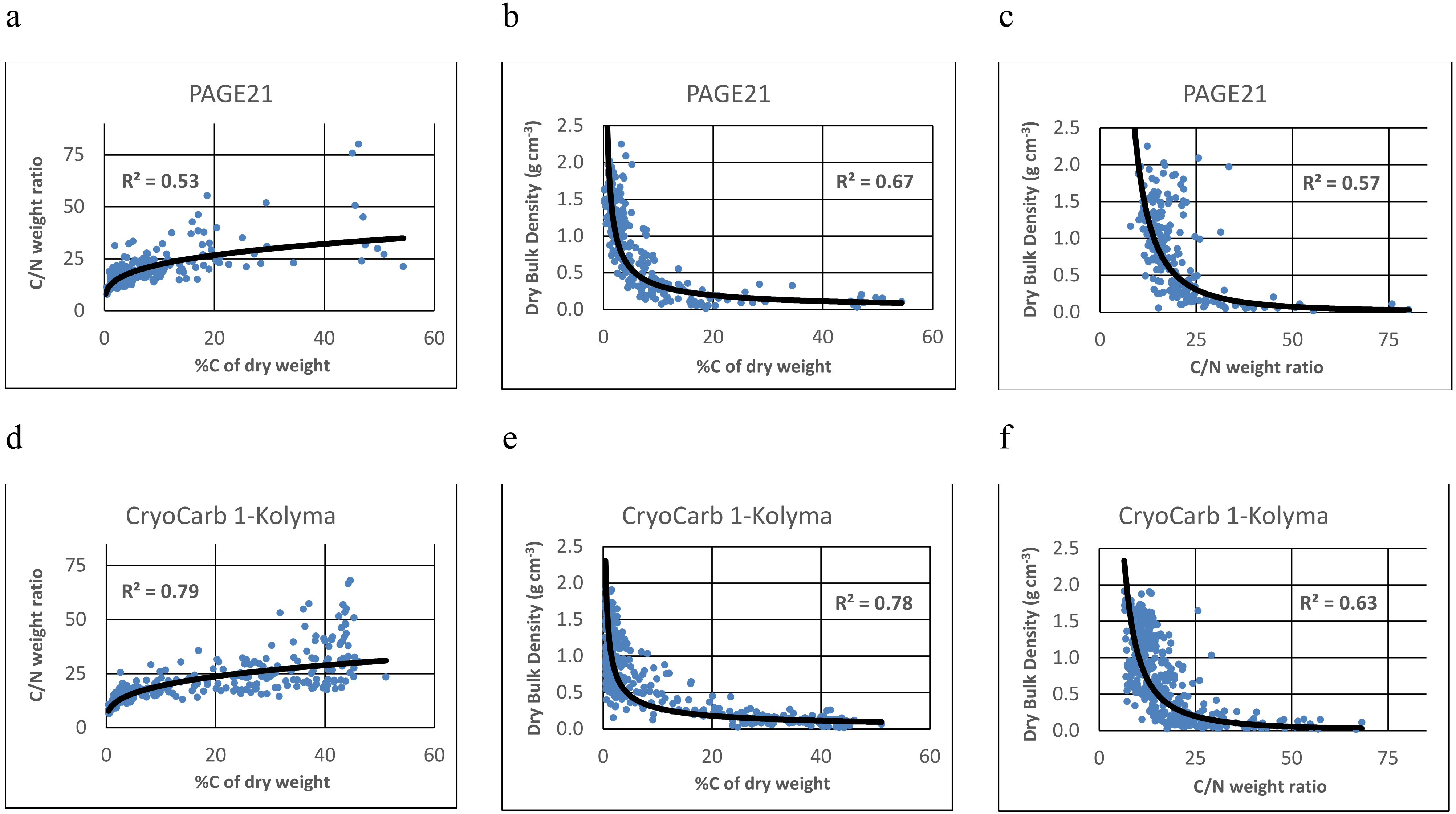

Figure S1, cont'd.

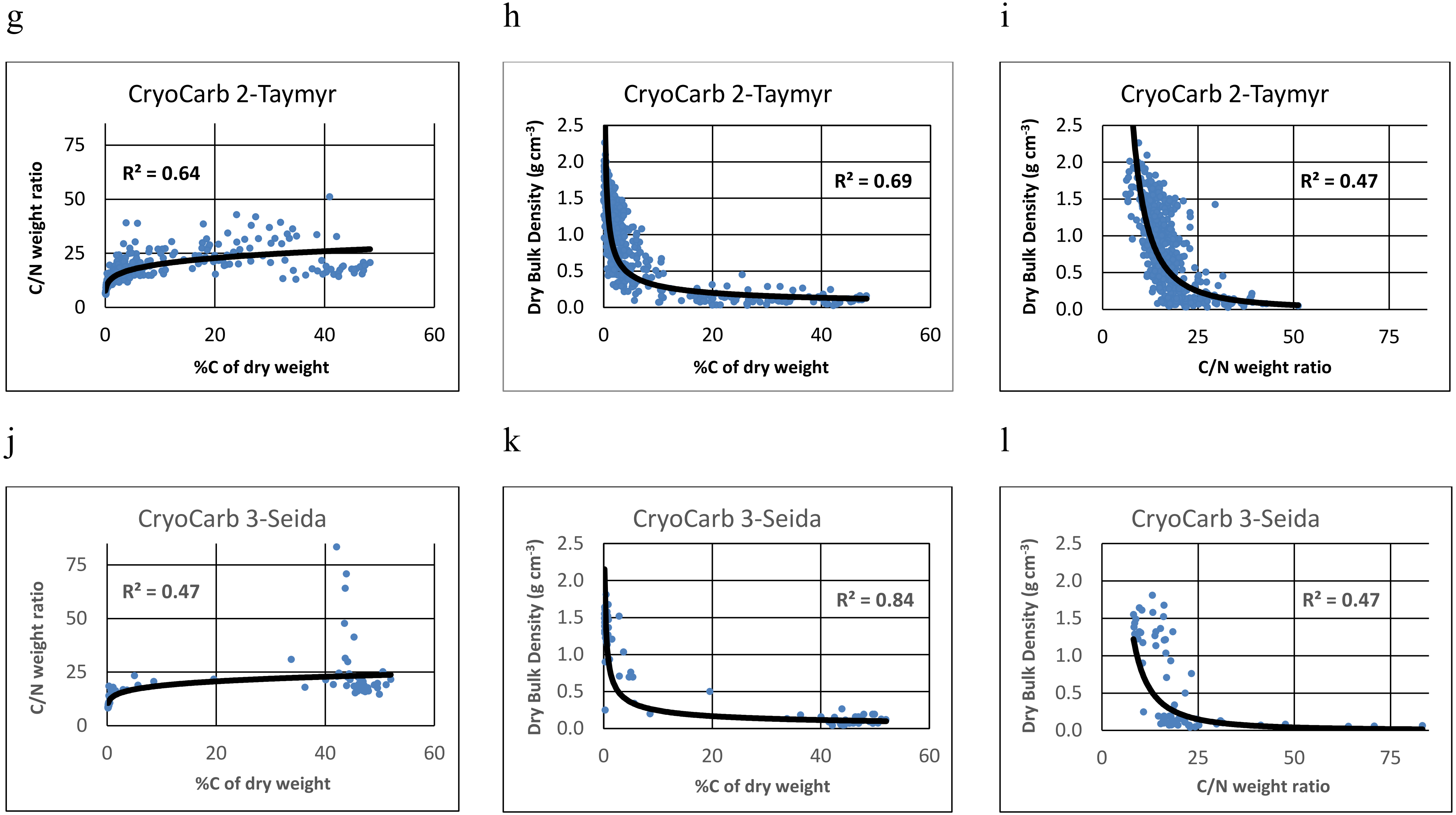

Figure S2. Correlations between geochemical parameters and µgC-CO2 production per gram dry weight (gdw) for all samples in the four incubation experiments: a-c, PAGE21; d-f, CryoCarb 1-Kolyma; g-i, CryoCarb 2-Taymyr; j-l, CryoCarb 3-Seida. All regressions significant ($p<0.05$).

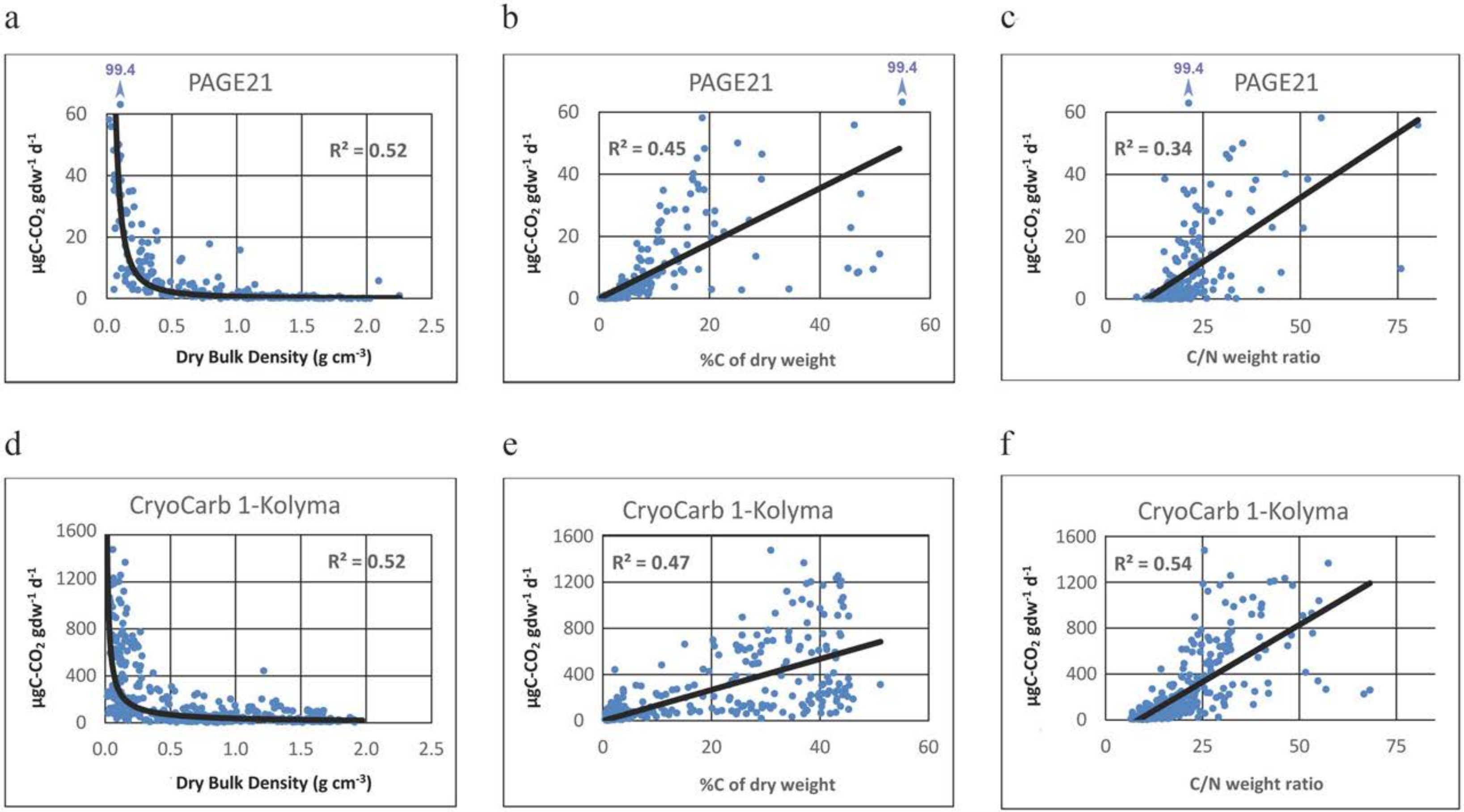

Figure S2, cont'd.

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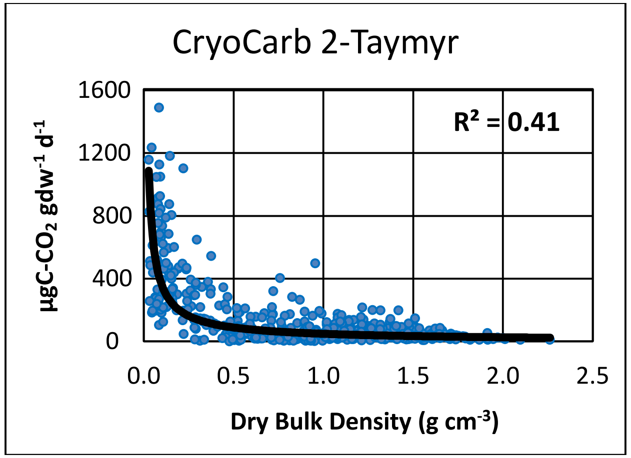

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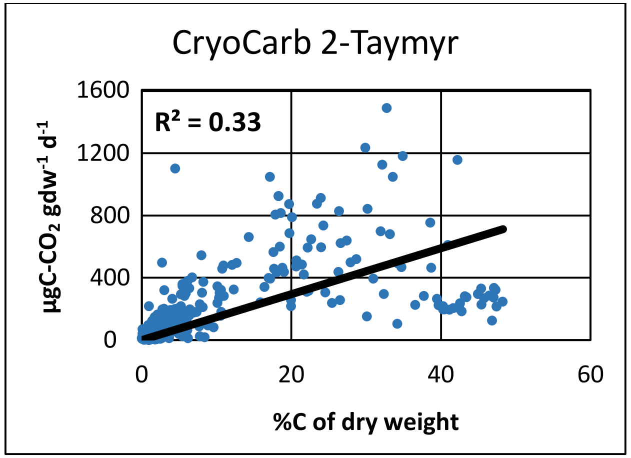

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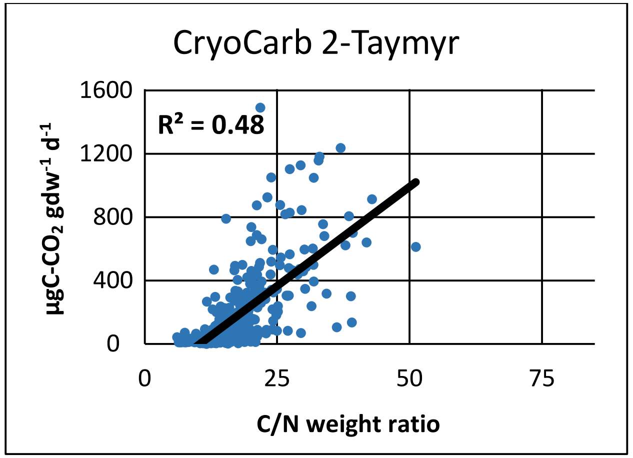

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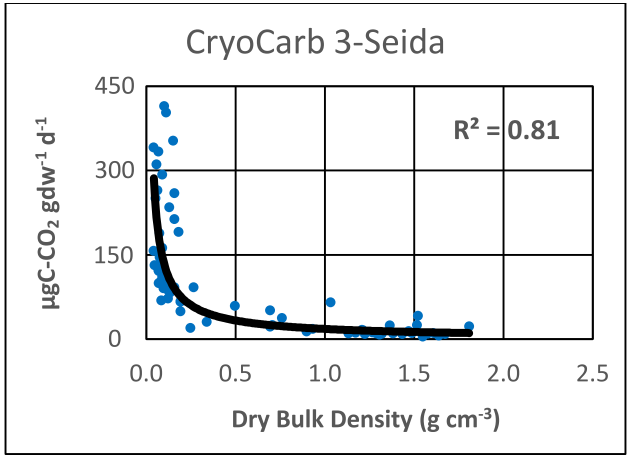

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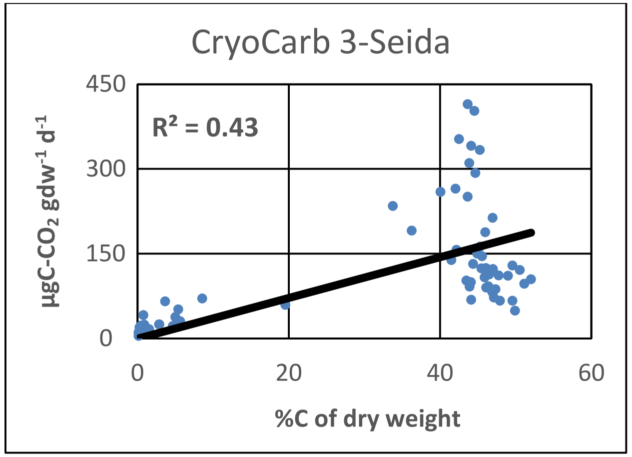

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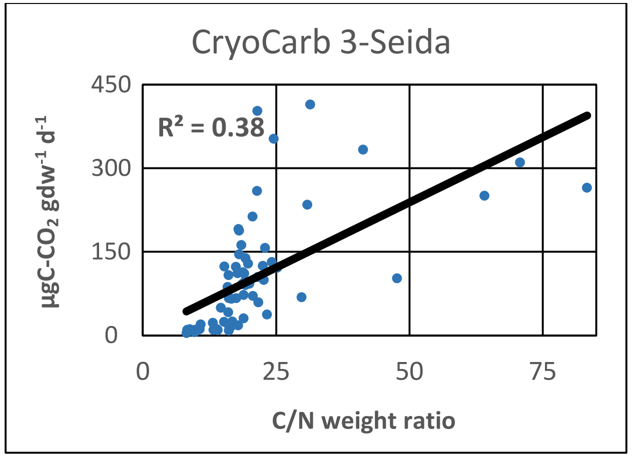
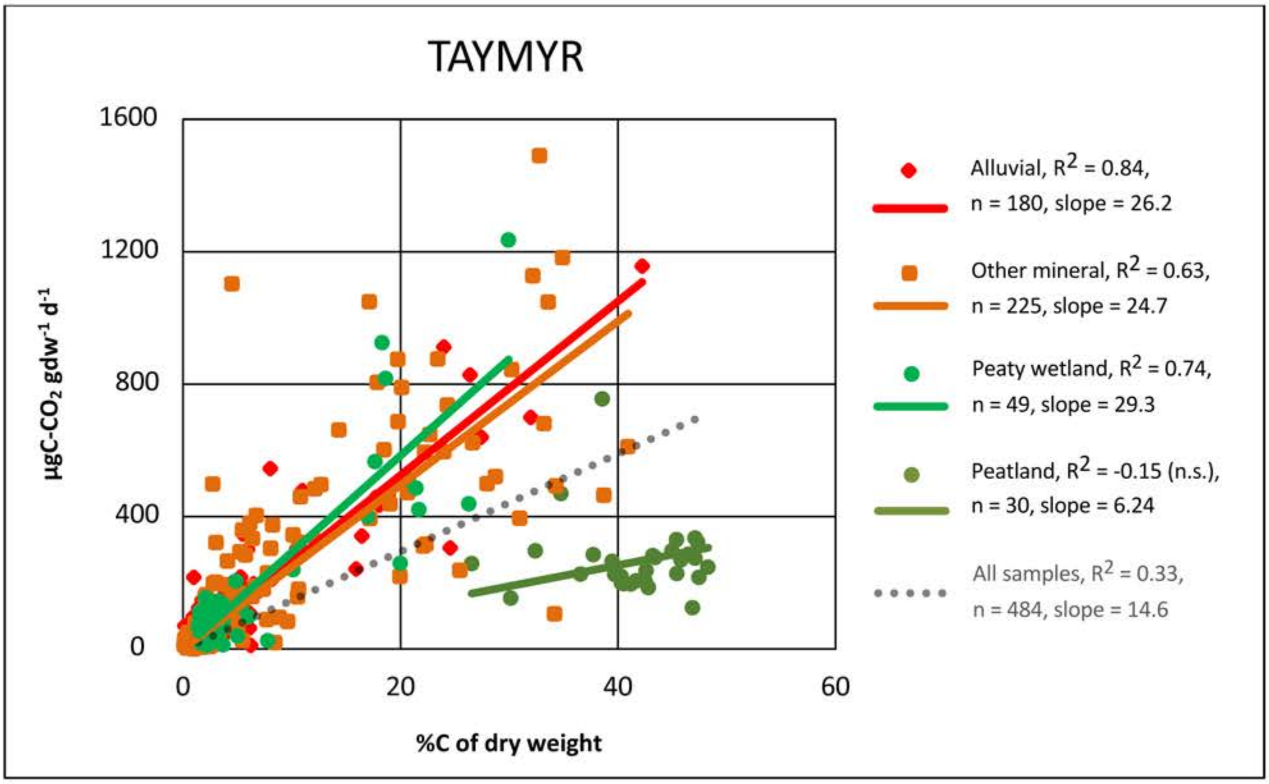


Figure S3. µgC-CO_2 production per gram dry weight as a function of %C of the sample for the different landscape unit classes in the CryoCarb 2-Taymyr (a, top panel) and CryoCarb 3-Seida (b, lower panel) incubation experiments: Alluvial class (red line and diamonds, CryoCarb 2-Taymyr experiment only); Mineral class (brown line and squares); Peaty wetland class (light green line and circles); Peatland class (dark green line and circles). All regressions significant ($p<0.05$), except for peat deposits in the CryoCarb 2-Taymyr dataset (n.s.).

a



b

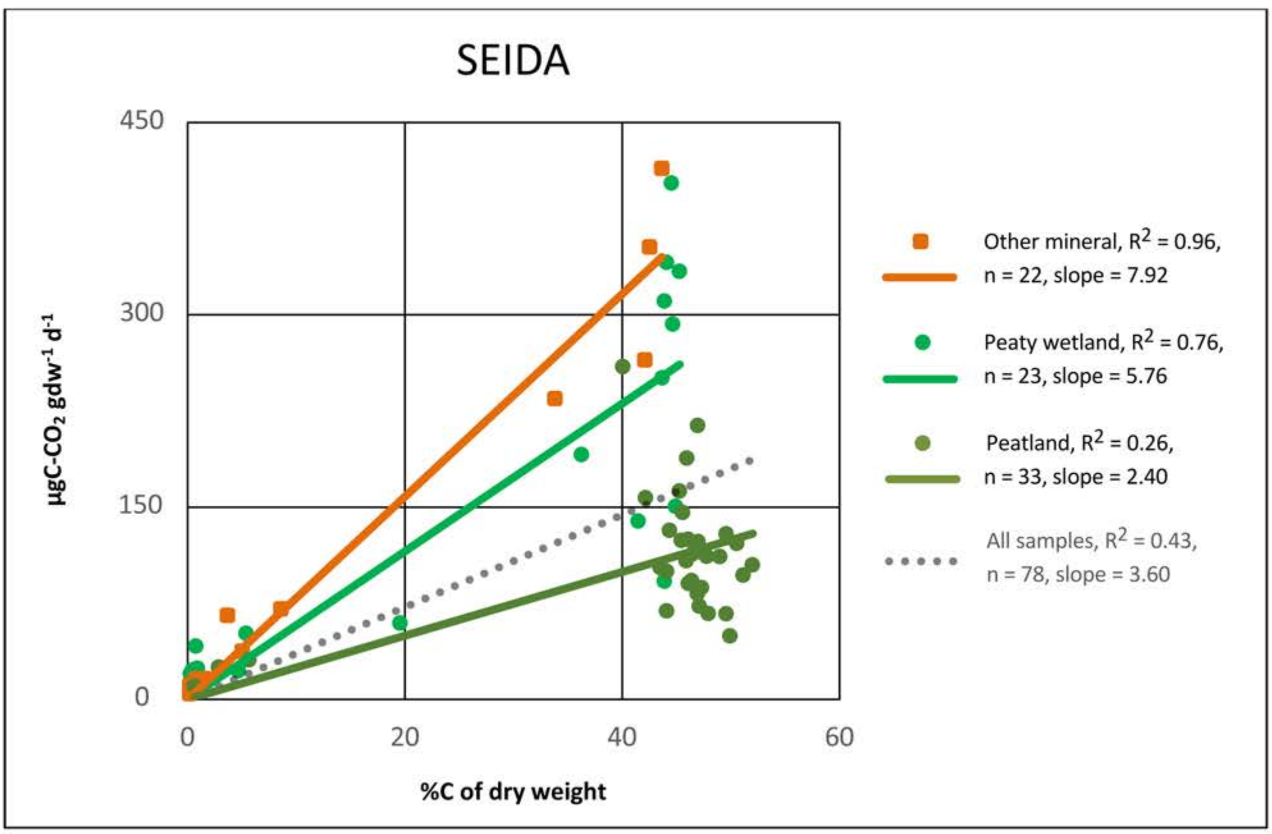


Figure S4. µgC-CO_2 production per gram dry weight as a function of C/N of the sample for the different landscape unit classes in the PAGE21 (a, top panel left), CryoCarb 1-Kolyma (b, lower panel left), CryoCarb 2-Taymyr (c, top panel right) and CryoCarb 3-Seida (d, lower panel right) incubation experiments: Alluvial class (red line and diamonds); Eolian class (blue line and triangles); Mineral class (brown line and squares); Peaty wetland class (dark green line and circles); Peatland class (light green line and circles). All regressions linear fits, except for peat deposits in the PAGE21 dataset and peat deposits in the CryoCarb 1-Kolyma (power fits). All regressions significant ($p<0.05$), except for peaty wetland and peat deposits in the PAGE21 dataset and peat deposits in the CryoCarb 1-Kolyma and CryoCarb 3-Seida datasets (n.s.). Note that not all landscape unit classes are represented in all four incubation experiments.

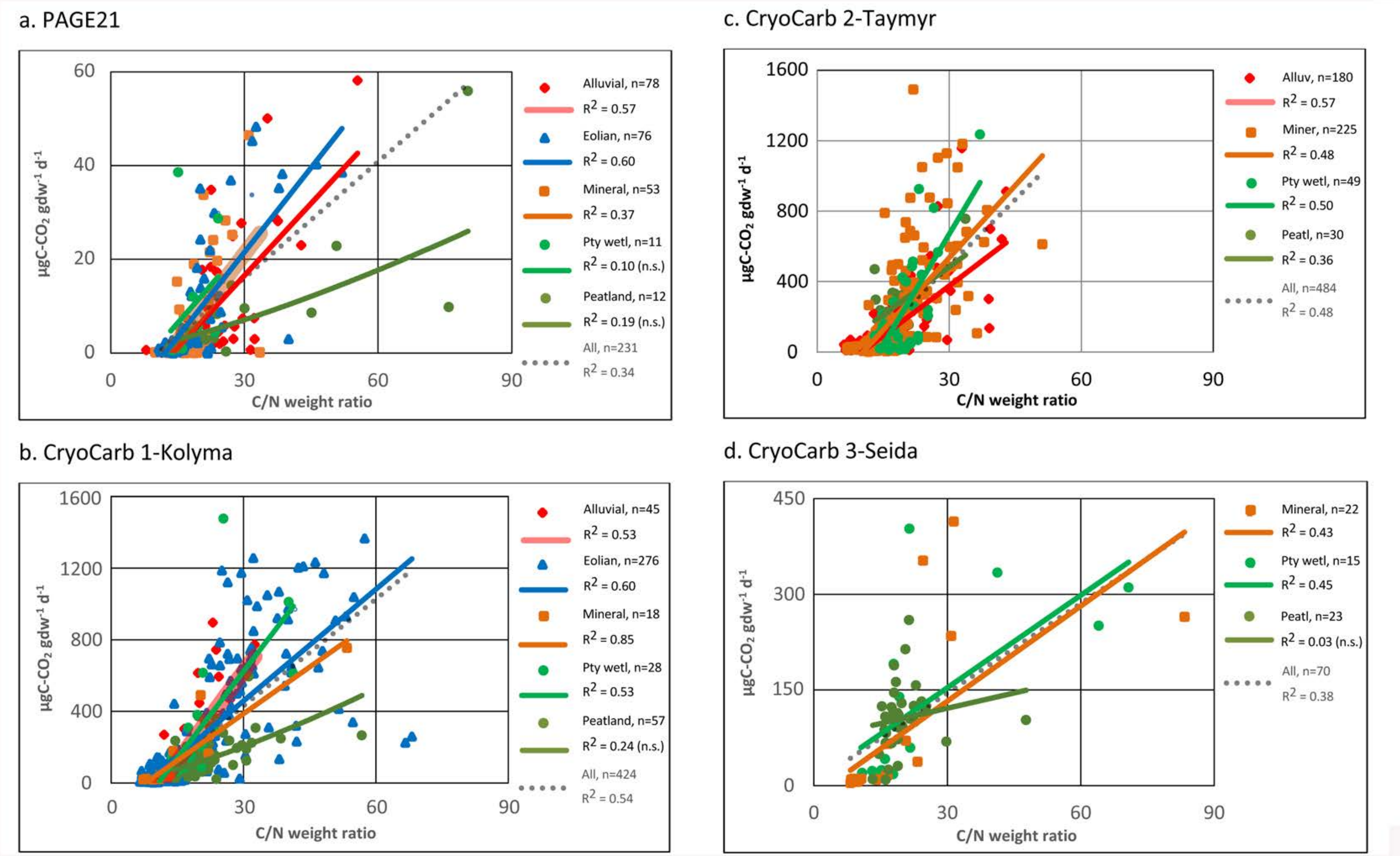
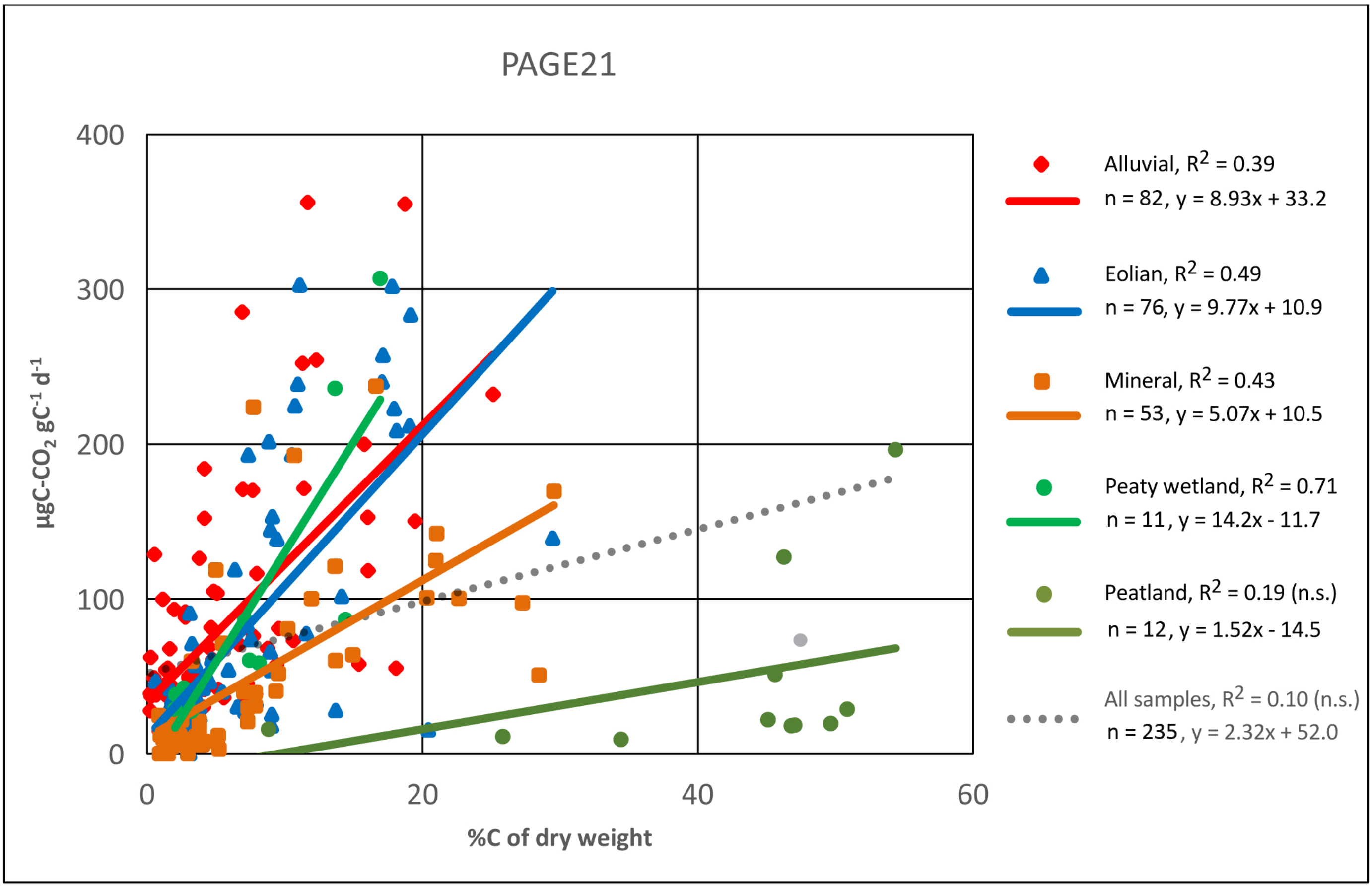


Figure S5. a) µgC-CO2 production per gram carbon as a function of %C of the sample and b) µgC-CO2 production per cm3 as a function of %C of the sample, for the different landscape classes in the PAGE21 dataset: Alluvial class (red line and diamonds); Eolian class (blue line and triangles); Mineral class (brown line and squares); Peaty wetland class (dark green line and circles); Peatland class (light green line and circles). Non-significant regressions (p>0.05), are marked n.s.

a



b

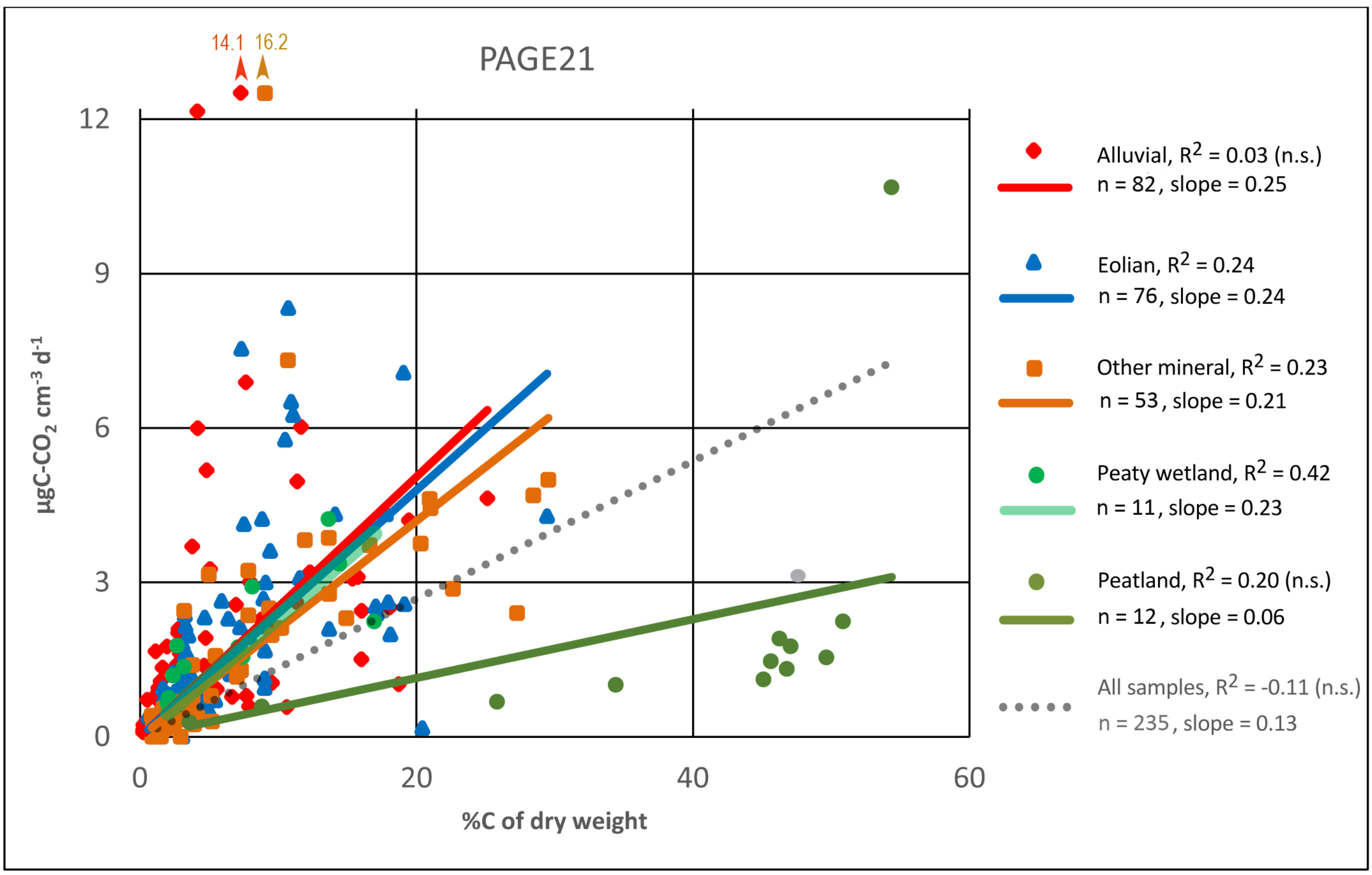


Figure S6. C content (as %C of dry weight) in samples of (a) the PAGE21 and (b) the CryoCarb 1-Kolyma incubation experiments, grouped according to soil horizon criteria. Abbreviations: AL-OL = Active layer topsoil organics; AL-Min = Active layer mineral; AL-Ce = Active layer C-enriched; P-Min = Permafrost layer mineral; P-Ce = Permafrost layer C-enriched; AL-Pty = Active layer thin peat (CryoCarb 1-Kolyma experiment only); AL-Pt = Active layer peat; P-Pt = Permafrost layer peat (CryoCarb 1-Kolyma experiment only); AL-Lss OL = Active layer topsoil organics in Late Holocene loess deposits (PAGE21 experiment only); AL-Lss Min = Active layer mineral in Late Holocene loess deposits (PAGE21 experiment only); P-Lss Min = Permafrost layer mineral in Late Holocene loess deposits (PAGE21 experiment only); P-Yed = Permafrost Pleistocene Yedoma deposits (CryoCarb 1-Kolyma experiment only); Fr-Yed = Thawed out Pleistocene Yedoma deposits (CryoCarb 1-Kolyma experiment only). Box-whisker plots show mean and standard deviation (in red) and median, first and third quartiles and min/max values (in black), for the different soil horizon groups.