

Nano-minerals plus higher temperatures accelerate the release and transport of carbon from sediment

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The objective of our research was to investigate the influence of climate change-induced temperature increases on the fate of natural OC in glacial meltwater riparian sediments. Increased weathering rates from temperature increases will result in enhanced release of iron and OC via the movement of iron-containing colloids and nano-materials into adjoining surface water[1]. However, it is unknown how nano-minerals influence OC transport. The relatively high specific surface area and potential sorptive capacity of nano-minerals[2] suggests that this interaction bears examination, as does the impact of how increasing temperatures and mineral weathering can influence colloid-facilitated transport.

We examined mineral weathering and nano-mineral facilitated transport of OC through a series of precisely controlled laboratory experiments using sediment from the banks of the glacially-fed Nisqually River, Mt. Rainer National Park, USA. Sediments with and without an illite amendment were incubated for three months at 4°C or 20°C to allow geochemical reactions, followed by batch and column leaching tests.

Organic C leaching rates for 20°C sediments were two- to three-times greater than for 4°C sediments. We demonstrated, for the first time, that higher temperature increased the rate of nano-mineral release from these sediments and consequently also increased the rate of OC release to pore water.

[1] Pokrovsky, O.S., et al., *Geochimica Et Cosmochimic Acta*, 2016. **188**: p. 1-20. [2]. Hochella, M.F., et al., *Science*, 2008. **319**(5870): p. 1631-1635.