

Interactive comment on “Microbial nutrient limitation in arctic lakes in a permafrost landscape of southwest Greenland” by B. Burpee et al.

Anonymous Referee #2

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This paper explores extracellular enzyme activities (beta-glucosidase, N-acetylglucosaminidase, Leu-peptidase and phosphatase) in 24 permafrost lakes in Greenland. The authors employed enzyme ratio as a surrogate for an indicator for nutrition limitation. Key finding include that DOM exhibited a significant correlation with TN, but not with TP. Overall enzyme ratio suggests that the system is mostly P-limited and an increase in DOM further induces P-limitation. The authors employed a proper and well-established method for the measurement of enzyme, and data interpretation along with statistical tests is scientifically sound. 1) I can see that collection and storage of samples were highly difficult due to the location of study sites, but freeze-and-thawing affects and often substantially interfere with enzyme activities.

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The authors should explain possible problems or a source of error due to the sample treatment. 2) High correlation between DOM and TN and absence of such relationship between DOM and TP do not necessarily indicate the difference in availability between N and P. Rather, different chemical properties of organic N (which is mostly directly bonded to C) and organic P (mostly tied as an ester bond) could be the reason for that. 3) One reservation for the paper is about C- mineralizing enzyme. Most of DOM delivered to lakes could be composed of highly recalcitrant carbon for which beta-glucosidase may not be a representative enzyme. Decomposition of phenolic or humic materials is known to be harnessed by oxidase activity (e.g., phenol oxidase or laccase), which in turn may limit the activities of other hydrolases (see, Freeman et al., 2001). Enzymes involved in mineralization of recalcitrant carbon should be discussed somewhere in the manuscript.

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