Biogeosciences Discuss.,
doi:10.5194/bg-2016-117-RC1, 2016

Biogeosciences Discussions
Open Access
EGU

Interactive comment on "Permafrost thaw and release of inorganic nitrogen from polygonal tundra soils in eastern Siberia" *by* Fabian Beermann et al.

Anonymous Referee #1

Received and published: 3 May 2016

This is an interesting study, which consists basically of two parts: an observational part examining the profiles are of organic and inorganic nitrogen in permafrost soils, and a modeling study that attempts to quantify the response of N to increased active layer thickness during warming.

The observational part of this study is a nice contribution with a clear result: that inorganic N pools are much higher in permafrost layers than in the active layer, implying that mineralization of nitrogen in permafrost layers and/or transport of mineral N from the active layer to permafrost layers outpaces consumption of mineral nitrogen (particularly ammonium). It would be very interesting to explore whether this observation can be used to partition the seasonal cycle of nitrogen or the temperature sensitivity

Printer-friendly version

Discussion paper

of various components of the N cycle in these soils better. In particular, the soils were sampled in August. I'd propose that there is merit, in future work, in trying to construct a seasonal cycle of this observation to ask whether ammonium builds up in seasonally frozen layers as it does in permafrost. Identifying an amplitude of the ammonium and nitrate seasonal cycles with depth may help to identify the timescales for nitrogen cycling, in order to better quantify the impact that this nitrogen may have upon release.

That question forms the modeling part of the study, and here the results are ambiguous: the calculated N to be mobilized as a functin of active layer deepening are large in comparison to slow N cycle fluxes such as fixation, but small in comparison to fast N cycle fluxes such as gross mineralization or immobilization. Thus it is not clear what role this extra nitrogen at depth may play.

Given that the much more substantial store of permafrost-layer nitrogen is in the organic pools, which may mineralize more efficiently with warming, I would think that it is more useful to view the elevated profiles of frozen inorganic nitrogen as a diagnostic for the relative rates of nitrogen sources versus sinks in these layers, and how such an observation may inform models of permafrost nitrogen cycling, rather than being a major lever in the ecosystem state on its own. It seems the authors agree with that, but I would encourage the authors to think more about how these profiles have been generated rather than just about how they may respond to warming.

Interactive comment on Biogeosciences Discuss., doi:10.5194/bg-2016-117, 2016.

Printer-friendly version

Discussion paper