

Interactive comment on “Permafrost thawing exhibits a greater influence on bacterial richness and community structure than permafrost age in Arctic permafrost soils” by Mukan Ji et al.

Anonymous Referee #2

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This manuscript reports significant influences of both permafrost thawing and age on bacterial richness and community structure. It also documented that permafrost thawing increased the contribution of determinism to bacterial community assembly, but didn't lead to community convergence. The study then showed that permafrost thawing had a greater influence on bacterial community than permafrost age. They extrapolate their findings to highlight that permafrost thawing in different ages can lead to distinct bacterial community compositions and different soil organic carbon degradation processes. The manuscript is well organized and figures are well prepared. I have several major concerns about this manuscript: 1. I am not an expert in permafrost. But I noticed that the samples used in this study should be the same samples reported in Kao-Kniffin

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et al. 2015. In this study, the permafrost age of different samples had been measured by Kao-Kniffin et al. 2015. However, basin age is used in that study instead of permafrost age. Does it mean that basin age is equal to permafrost age? If so, Why did this study reported different soil total organic carbon and total nitrogen from Kao-Kniffin et al. 2015? 2. It seems that Kao-Kniffin et al. 2015 also used amplicon sequencing of 16S rRNA gene to analyze bacterial communities in different permafrost ages and thawing status. They found that community composition appeared to converge in the active layer, however, the authors in this study didn't observe the community convergence due to permafrost thawing. Can you explain why you reanalyzed bacterial communities of these samples? At least, please compare your study with the results of Kao-Kniffin et al. 2015 and provide more discussion. 3. The thickness of active, transition and permafrost layers should be different in young, medium, old and ancient permafrost. Please provide more information about the soil profile of different layers in four kinds of permafrost. More variables should be taken into account to undermining the mechanism of bacterial response to permafrost thawing in different permafrost age. I'm not sure that structural equation modelling is a good method to quantify the relative importance of permafrost thawing status and age on bacterial community without any other environmental variables. Please incorporate more variables in structural equation modelling to show how permafrost thawing status and age influenced bacterial community directly or indirectly

Minor comments: 1. Fig.2 Can you provide information about bacterial phylogenetic diversity of bacteria in different permafrost age and thawing status? 2. Fig.4 the path coefficients in structural equation modelling can indicate the positive or negative correlations between two variables. Therefore, the raw value should be shown here, instead of the absolute value. 3. Line 95 vary -> varies 4. Line 272 Please rewrite this sentence. 5. 280 results is -> results are

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