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Reply on RC1

Lauren J. Davies et al.

Author comment on "Late Holocene cryptotephra and a provisional 15□000-year Bayesian age model for Cascade Lake, Alaska" by Lauren J. Davies et al., Geochronology Discuss., https://doi.org/10.5194/gchron-2021-18-AC1, 2021

We would like to thank Kristi Wallace for her thorough and constructive review of our manuscript, with comments focusing on the tephra data and the implications of this northern Alaska cryptotephra record. We agree with and will incorporate the suggested editorial comments, and have highlighted responses to the main suggestions/criticisms here:

1. "There needs to be more discussion about homogenous vs heterogenous glasses so make this point as not many Alaska eruptions are homogenous … The manuscript would benefit from more discussion regarding the limited suite of reference materials available and evaluation of the quality of the correlations made."

Discussion of available reference data will be added, specifically mentioning the limited available data for Holocene deposits in Alaska and that heterogenous deposits seem quite common in this region.

We would like to note that the confident correlations that underpin the chronology (that the reviewer does note they largely agree with) are to tephra that do have detailed geochemical datasets (either in published work or new data that are included here) and have been widely identified in other depositional records both intra- and extra-regionally. We will clarify this where necessary to emphasize these points.

2. "How do the glass shard morphologies compare, glass characteristics (microlitic, clean etc.)? … If there were more discussion regarding the "robustness" of each correlation it would allow the reader to evaluate if the age model is really improved by the addition of the tephra correlations. I suggest the authors review the community established best practice recommendations for correlation."

The basis for tephra correlation will be discussed explicitly, with added comments that evaluate the relative strength of our correlations. To achieve this, we will add:

- Shard morphology, characteristics and size data, to show that our tephra correlations are based on multiple parameters
- Proper references to the community established best practice recommendations for correlation
- A clarification on how independent published ages and tephrostratigraphies support the

correlations made her

3. "I am skeptical about the Ruppert correlations as it implies an unknown source that erupted in the late Holocene but that has only been identified as cryptotephra in very distal areas and a very large footprint yet no visible layers or source has been identified. This would make sense where ice has removed older records, but this is a young deposit where preservation should not be a problem and we should see this layer more often in Holocene sediment sequences."

We agree that the lack of identified visible deposits for Ruppert tephra is strange, but the geochemical correlation with deposits in eastern Canada (where it was first documented in Pyne-O'Donnell et al. 2012) and USA hold true as evidenced in Jensen et al. (in review). In addition, its presence in Alaska is firmly established regardless of the furthest afield correlations. This tephra is named after Ruppert Lake in the southern Brooks Range where it was reported by Monteath et al. (2017), only ~120 km south of Cascade Lake. The age of the tephra Rupert Lake is estimated at 2700-2300 cal yr BP, which is compatible with the age modelled in Jensen et al. (in review) that is used here.

As well as the additional clarification of correlations discussed in the previous point, we will also add a more thorough discussion of the independent ages of this tephra and explicitly mention the lack of visible deposits as an unusual situation.