

Geochronology Discuss., referee comment RC3  
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## **Comment on gchron-2021-18**

Anonymous Referee #3

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Referee 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-RC3>, 2021

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The submission by Davies et al. is one half of a twin submission: the other submission by Steen et al. (gchron-2021-19) focuses on paleomagnetic secular variation (PSV) data and the offset between a radiocarbon derived age-depth model (supported by the Davies et al. cryptotephra data), specifically for the younger part of the sediment sequence in Cascade Lake. As requested by the editor, my following comments are about the compatibility of the two submissions.

The underlying tephra-related data in Davies et al. seem robust and there are probably sufficient data to be able to test the validity of the younger part of the radiocarbon-based age model without relying on the PSV data and specially the correlations that have received negative criticism in the ongoing gchron discussion (see next paragraph). If pursued further, the section "1.1 Palaeomagnetic chronologies" contains some statements that need to re-worded, for example that "...sediments at high-latitude sites can be sensitive to palaeomagnetic secular variation...". What does that mean? Sediments at all latitudes are equally capable of recording PSV.

The ongoing gchron discussion about the Steen et al. paper includes some negative criticism of the paleomagnetic data (quantity and quality). There are large uncertainties in the palaeomagnetically derived ages that rely on subjective tie points between inclination trends in the composite record from Cascade Lake, a nearby radiocarbon-dated record from Burial Lake and the predictions (note, not "calculations") of time-varying geomagnetic field models. The two submissions cross-reference each other and it is difficult to understand how by much the conclusions of Davies et al. are dependent on the conclusions of Steen et al. (and vice versa). There is duplication of data sets in the two submissions (e.g. radiocarbon ages) that should be addressed. Davies et al. state that there is more detail about the construction of the age-depth model in Steen et al., but in fact the latter contains less detail than one would expect.

My advice would be for Davies et al. to remove the references to Steen et al. and use the

known ages of the detected cryptotephra to point out the offset in ages. Subsequently, ages obtained through PSV correlation could be used to test the radiocarbon-tephrochronology based age-depth model in a separate, future improved manuscript by Steen et al. An alternative would be to combine the data into one paper, but that will not remove the underlying uncertainty in the PSV data from Cascade Lake and the correlations to other PSV data & model predictions.