Comment on gchron-2021-13
Anonymous Referee #2

Referee comment on "Evidence for old carbon contamination in \(^{14}\)C wiggle-match age series for the 946 CE eruption of Changbaishan volcano" by Richard N. Holdaway et al., Geochronology Discuss., https://doi.org/10.5194/gchron-2021-13-RC2, 2021

This is a really interesting article that also raises an interesting point that there is at least the potential that trees being dated by Dendro/\(^{14}\)C wiggle matching may be influenced by geological dead \(^{14}\)C. As such the paper should be published. It is an important but fundamentally overlooked point. I do, however, have a number of concerns that need in my mind to be addressed.

My first issue is one that is also raised by the first referee, in that there are many sources of contamination that can cause problems with \(^{14}\)C ages, and my not be removed by standard techniques. There is clearly a problem that is unlikely to be related to volcanic CO2 in the ages that are too young, as opposed to being too old. This needs to be discussed in more detail. In fact I think the paper needs to more be an examination of the problems that can be encountered with \(^{14}\)C ages and placed in the context of wiggle match dating of eruptions. In this unusual case we know the age very specifically and that allows a discussion of these problems. Some of the problems with the dates relates to contamination by older \(^{14}\)C, which may be from volcanic degassing, but could be from a range of other issues. Some dates have been contaminated by young \(^{14}\)C and this is unlikely to be a volcanic origin. One way of looking for potential contamination sources is through delta 13C measurements. In cases where \(^{14}\)C and 13C of volcanic emissions have been considered on modern trees there is evidence of a shift in both isotopes. The fact that it is pretty difficult to find 13C measurements for most of the cases used in this study makes the point that there are a whole host of quality assurance issues in radiocarbon dating of volcanic eruptions that need to be considered. The known age of the B-TM makes this a great paper around which to have that wider discussion. This is more so because I do not see how, unless we know the exact age of the eruption, we can use this approach, to finding old carbon. Also even is we can find the percentage of old carbon in a sample, without additional measurements such as 13C we can't start to suggest the source of the old carbon with much reliability.

I also wasn't sure why the outlier function in OxCal wasn't used instead as this has largely superceeded the use of AI's in OxCal outlier detection studies. The AI is simply the area of overlap between posterior and prior. I would like to see at the very least the analyses done again with appropriate outlier detection.