Dear Francis Ludow,

Thank you so much for taking the time to go through the manuscript in such detail, your effort and time to improve the manuscript further is very much appreciated. We have implemented your comments in the text. Below you will find some extra explanations for some of your more extensive comments.

In the abstract we found a mistake in the phrasing of line 40. We changed it to the following:

'Pollen from bogs inside these study areas are analysed at high resolution (1-3 cm sample intervals) to give insights into the validity of the GDD model set-up with regard to the volcanic climate impact on the regional scale, and to link the different data sets with the archaeological records.'

Line 505: Is the argument here that there were no prolonged periods in the past when the negative NAO pattern dominated over the study region? For a location like Ireland, I know there have been periods when the dominant mode switched back and forth between positive and negative NAO and would have presumed this would be the same for Scandinavia. Maybe you mean that this has been the case for much of the 20th century?

Here we mean that the overall dominant pattern in our 1-1850 CE past2k simulations is the NAO+. We have changed the phrasing of the sentence so that this becomes more clear:

'... and also for our past2k from climate model simulations (1-1850 CE, Fig. A4a and Section 2.1.1; this study and van Dijk et al., 2022)'

As we show in van Dijk et al. (2022) Fig. A4b, we simulate a clustering of NAO+ or NAO- only for a couple of years in a row during 520-680 CE.

Line 602: There is no mention of the effect on wheat in the preceding paragraphs on this page. Maybe you will be dealing with this later?

We do not mention wheat specifically, but it is mentioned above that the GDD requirements are only met for rye and barley in Fron, for rye, barley, and oats in Høgsfjorden, and for Sarpsborg none of the cereal types are threatened. Therefore we indirectly mention that wheat would not grow at the first two sites, and that it would grow at the Sarpsborg area.

Line 629: Is anything notable happening in the post-550 period, i.e., the remainder of the 6th century, when we might expect to see more of a response to these eruptions - given that the eruptions date only toward the end of the 500-550 period?

We see an increase again in anthropochores and apophytes for Ulberg and Åsheim towards the end of the 6th century, indicating a possible recovery. We have added this to the text:

‘This early 6th century decline is followed by a slight increase again towards the end of the century, and an almost halt to agricultural activities in the 7th century.’

Line 951: I was confused at first as I assumed that being further north would generally be bad for crops as you would have lower GDD values. But I think you are saying that the GDD requirements are less here because it is drier (so this outweighs the impact of being further north)? Perhaps a slight tweak to the phrasing for clarity?

It is a little counterintuitive, but earlier in the methods, we explained that north of 60°N the GDD requirement goes down, due to the longer daylight hours. This means that the crops need less GDD to mature compared to the other areas further south. Here we argue, that even though the GDD requirements are lower due to Fron being dry and further north (longer daylight), at the same time the growing season is shorter (in number of days) and it is located at a higher altitude, which makes that with a cooling the GDD value does not reach the requirements anymore. We have rephrased the sentence slightly:

‘Fron is considered a dry area, and is located further north (north of 60°N) than the other two study areas, resulting in a reduction of the GDD requirements. However, Fron is also associated with a significantly shorter growing season as well as higher altitude.’