

Interactive comment on “Linking pollen deposition, snow accumulation and isotopic composition on the Alto dell’Ortles glacier (South Tyrol, Italy) for sub-seasonal dating of a firn temperate core” by Daniela Festi et al.

Anonymous Referee #2

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Dating of ice cores are challenging subject especially in non polar ice caps, where melting can influence the signal. Here the authors aim at using pollen to date a shallow firn core from the South tyrol alps with a day to day resolution by comparing results from ice cores with nearby station data.

It is an interesting approach to use pollen to date ice cores. In a previous paper (Festi, 2015) the authors used the same core and the same pollen data to date the record using PC and PCA methods to compare with airborne pollen samples from Solda. In this paper they use Jaccard similarities with the same airborne samples from Solda.

C1

They also in this paper use their highly resolved record to derive accumulation rates and compare those with a mass balance model, which as input use meteorological station data and move on to judge whether melt layers influence the pollen record.

The main argument is based purely on the statistics, and the authors should consider how the sample depth may relate to the order of the samples. There is quite some indication of inverse orders, which to my opinion is not very well justified.

However if accepting this kind of uncertainty in the dating of the samples, the pollen only arrive in spring/summer making the date of year dating only possible in spring/summer. This is not very clearly stated either.

To me it is unclear that this paper brings much novelty to the already published paper by Festi (2015) in Journal of Glaciology, however I would suggest the authors to make largely rewrite the manuscript and focus more on the novel aspects (as compared to the Festi (2015) publication, eg. the comparison to the accumulation model and the water isotopes as well as to emphasize the uncertainties and justify the inversions of the dating better.

Specific comments:

Section 3.1 Define the time of year in which you can make depth to day comparisons based on pollen.

Section 4.1, line 6 expand the explanation about inversions. And consider also in Table 1 to explain this inversions, as the table otherwise is very confusing with dates going back and forth.

Section 4.1 in general should be more concise, it is very long and mainly lists the information from table 1

Section 4.1 eg. line 24, 31, 36 with more. The samples are 10 cm thick (?), how can layers be given in precision of cm, eg. 87 cm, 91 cm etc. These numbers should have uncertainties based on the sample sizes.

C2

Section 5.1 line 35/ Figure 3 (correlation figure). I am confused as it looks like you have more data in the correlation part of Figure 3 (eg. points during winter and autumn), where no points exist in the main part of figure 3 for pollen, where do these additional data stem from?

Section 5.2 Discusses melt layers, however nowhere in any figures are the position of melt layers shown. Please add melt layers to relevant figures, eg. as vertical bars in Fig 2 (and Fig 3).

Section 5.4 (figure 5) . Here you discuss the comparison to water isotopes. In the years 2007, 2008 and 2009 the water isotope data from april to July gets very steep, followed by a somewhat not steep slope down to the next winter. This seems like an effect of you having the pollen data very specifically dated in exactly those months. You suggest that those years are fine, but rather 2006 and 2005 are influenced by meltwater percolation from summer into the winter affecting the summer peak. This may very well be, but it does not explain the lack of similarities for the later years, where the steep slope to me looks very artificial. I would suggest you add some comments about the uncertainty of the dating, it could eg. be explained by later blooming of the pollen shifting the summer bloom and extending the dD peaks to have a more sinusoidal behavior as also observed in the Solda record of temperature.

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