Reply to referee #2 Roberta Pini

Referee #2 The paper by Festi et al. assesses the chronology if the ADA16 ice core drilled at 3100 m asl at Pian di Neve (Adamello Glacier). The chronological approach is based on the comparison of three independent dating methods and their lines of evidence, namely peaks in biological proxies concentration (palynomorphs and refractory BC), 137Cs and 210Pb geochronometry. Methods and results are correctly presented. Here below I list some points that need to be considered by the authors for an improvement of the manuscript (text + figures).

Authors: We thank Roberta Pini for her useful suggestions to improve our manuscript, and we address as follows her the points of discussions.

Referee #2: how many of the 536 samples taken for palynology were actually analyzed? Looking at Fig. 2, it seems that they are way less than 536.

Authors: All of them were analysed and their entire content was quantified and identified but the large majority of the grains concentrated in those high concentration layers that are therefore visible in Figure 2.

Referee #2 147-151: the information represented in the PCA plot seem to be important for the interpretation of the pollen signal stored in the ADA 16 ice core. Please add the PCA plot in the main text.

Authors: Given that PCA results showed that 96% of the variance is included in the first principle component, a plot is not very readable and also a table of the component scores adds little value to the results. We here report the Table showing that all taxa correlate with the first principle component. Since it does not add value to the interpretation (i.e. possibility of extraction of a sub-annual pollen signal) we will not add it the manuscript.

Table Component loadings of the first three Principal Components (PC) based on pollen concentration data in the Adamello ADA16 core.

Taxa	Components 1	2	3	Taxa	Components 1	2	3
Chenopodiaceae T.	1.000	-0.016	0.002	*Artemisia*	0.999	-0.021	0.013
Brassicaceae	1.000	-0.017	-0.010	*Ulmus*	0.999	-0.035	0.014
Asteraceae	1.000	-0.019	0.007	*Rumex acetosella*	0.999	-0.035	0.012
Juglans	1.000	-0.018	0.012	Caryophyllaceae	0.999	-0.036	0.012
Apiaceae	1.000	-0.025	0.000	*Carpinus betulus*	0.999	-0.033	0.020
Tilia	1.000	-0.024	0.008	*Thalictrum*	0.999	-0.037	0.011
Plantago alpina T.	1.000	-0.018	-0.012	*Ambrosia*	0.999	-0.013	0.034
Plantago lanceolata T.	1.000	-0.026	0.000	Cyperaceae	0.999	-0.035	0.014
Urtica	1.000	-0.013	0.004	Trilete spores	0.999	-0.038	0.016
Ranunculaceae	1.000	-0.027	0.002	*Calluna vulgaris*	0.999	-0.038	0.017
Pinus cembra	1.000	-0.020	0.011	*Salix*	0.999	-0.038	0.016
Rumex acetosa T.	1.000	-0.028	0.001	*Juniperus*	0.999	-0.040	0.016
Abies	1.000	-0.022	0.017	*Betula*	0.999	-0.023	-0.001
Ephedra fragilis T.	1.000	-0.026	-0.003	*Corylus avellana*	0.999	0.011	0.006
Cerealia	1.000	-0.023	0.012	Monolete spores	0.999	0.002	0.030
Cannabaceae	1.000	-0.029	0.005	*Fraxinus excelsior*	0.999	-0.012	0.004
Fagus	0.999	-0.028	0.013	*Ostrya* T.	0.998	0.006	0.020
Scrophulariaceae	0.999	-0.031	0.004	*Quercus robur* T.	0.998	0.009	-0.036
Rosaceae	0.999	-0.030	0.006	*Alnus*	0.995	0.030	-0.022
Cichoriaceae	0.999	-0.031	0.011	*Olea*	0.994	0.042	-0.069
Saxifraga granulata T.	0.999	-0.032	0.007	*Castanea sativa*	0.988	0.059	-0.112
Saxifraga stellaris T.	0.999	-0.032	0.006	Gramineae	0.986	0.125	-0.095
Larix	0.999	-0.017	-0.001	*Quercus ilex* T.	0.982	0.059	-0.121
Fraxinus ornus	0.999	-0.005	-0.017	*Pinus*	0.957	0.261	0.070
Ericaceae	0.999	-0.030	0.018	*Alnus viridis*	0.939	0.231	-0.216
Zea mays	0.999	-0.032	0.018	*Picea*	0.914	0.340	0.209

Referee #2 152: can you determine the time length of the multiple year signal condensed at 2.1 and 12.2 m w.e. equivalent? can pollen concentration help with this issue?

Authors: Partially. The higher concentration in pollen is a sign that these layers include multiple years, however giving the variability of the pollen concentration of the core it is not possible to calculate the exact number of years. For this reason, the number of years were assigned taking into account also the 1986 and 1963 time horizons.

Referee #2 217: "The dating of the three independent dating methods ...". Please rephrase.

Authors: Rephrased into "The dating obtained with the three independent methods (ALC, ^{210}Pb, ^{137}Cs) is in excellent agreement."

**Referee #2** 221: is it just pollen or pollen+spores? if so, use the term palynomorphs

Authors: It is pollen and spores indeed. Changed.

Referee #2 295: Filipazzi instead of Filippazzi

Authors: Corrected.

Referee #2 Fig. 1: please add lat-long grids to the insets showing images of glaciers and surrounding mountains and some geographic names to help the readers in localizing the site.

Authors: The figure has been updated also accordingly to suggestions by other review and it now includes detailed maps of the glaciers and an overview map:
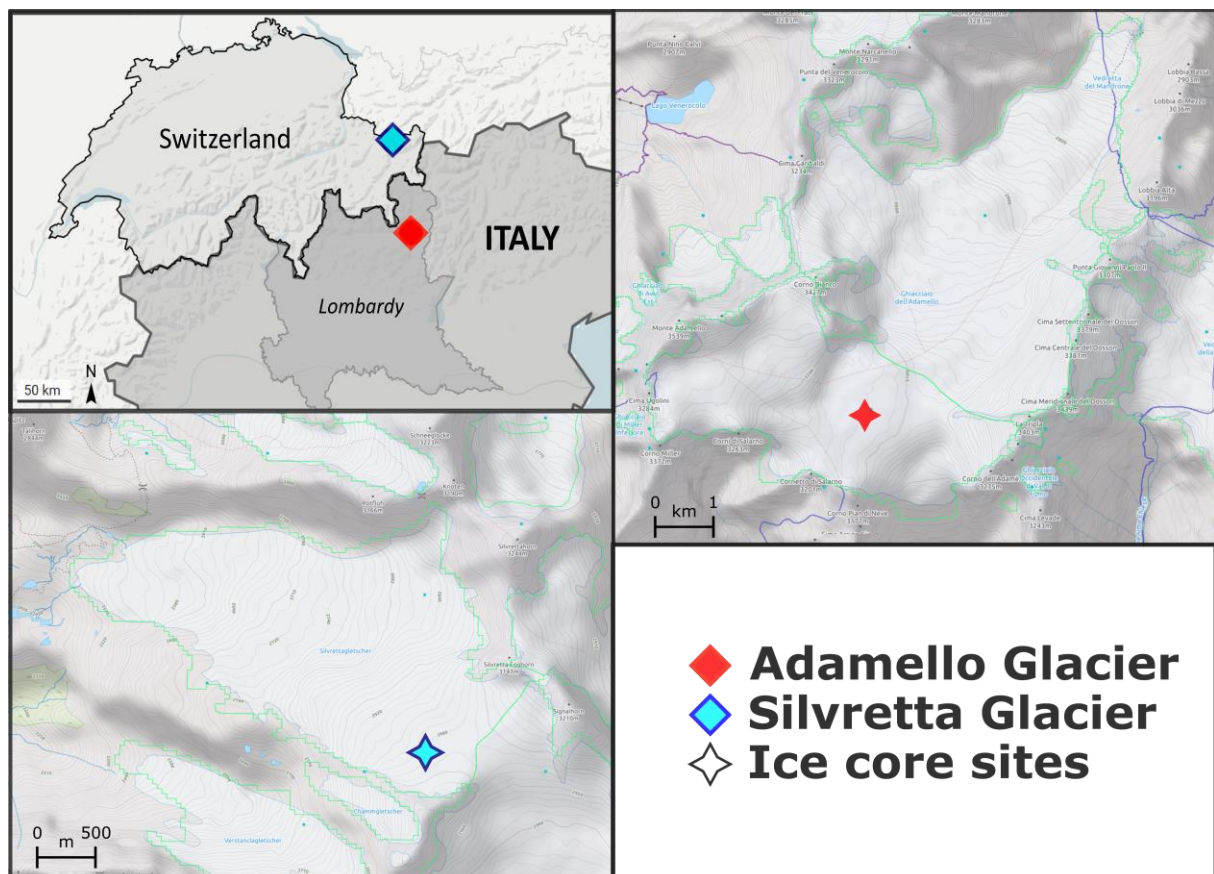
Figure 1. Map showing the locations of the Adamello (red diamond) and Silvretta (light-blue diamond) Glaciers) and respective zoom-in maps on ice core drilling sites: Adamello (red star); Silvretta (blue star). All maps are north-up oriented.