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The Cryosphere Discussions

Interactive comment on "Significant mass loss in the accumulation area of the Adamello glacier indicated by the chronology of a 46 m ice core" *by* Daniela Festi et al.

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Festi et al (2020) provide a detailed review of the dating and accumulation record revealed from an ice core in the former accumulation zone of the Adamello Glacier. The change from a net accumulation rate of ∼0.9 ma-1 to no preservation of accumulation is as important as the dating of the core. More attention needs to be given to other dated temperate glacier cores, in particular in the Alps. There are regional mass balance records that extend over at least part of the ice core period and the period when no accumulation has been preserved that can highlight the pattern identified here. Further records from this same glacier, also referred to as Mandrone Glacier, which are

more recent should be noted (Ranzi et al. 2010; Grossi et al. 2012) (1995-2009). The greater context will strengthen the findings of this paper.

14: Reword: "Dating glaciers is an arduous yet essential task in ice core studies, which becomes more challenging when the glacier is experiencing mass loss in the accumulation zone as result of climate warming leading to an older ice surface of an unknown age."

22: You have a short abstract and could add what is equally important to the ability to date this core, something like "The change in mass balance at the coring site, in the former accumulation zone, but which no longer retains accumulation, is in the range of ∼1 ma-1".

32: ".. even in what had formerly been the accumulation zone."

36: "... making annual layer counting impossible when the seasonality in the signal is lost"

37: Reference for the percolation issue for annual signal retention would be good.

39: Reword, "To date relatively few ice cores from temperate high elevation glaciers have been successfully be dated (von Gunten et al., 1982; Kang et al., 2015; Pavlova et al., 2015; Kaspari et al., 2020; Gäggeler et al., 2020)." This avoids having to be accurate in citing every dated ice core from an alpine glacier. Other examples I have had a chance to review from temperate glacier settings in North America alone include Naftz et al. (1996), Neff et al. (2017) and Yalcin et al. (2006). In the Alps you should refer to specific locations where this has been accomplished in addition to Silvretta Glacier. Should mention the Colle Gnifetti core from Monte Rosa (Schwikowski et al. 1999), and Col du Dom on Mont Blanc (De Angelis and Gaudichet, 1991).

47: State elevation for comparison to Ortles Glacier.

67: Reword "Adamello Glacier is located at a relative low elevation of 2500-3400 m a.s.l. (Figure 1) and currently affected by considerable mass loss (Maragno et al.,

2009) with recent negative mass balance observed even in the accumulation zone above ? m." This likely indicates the glacier does not have a persistent accumulation zone. What has been the ELA in recent years?

85: Figure 1 is not satisfactory. Figure 1 the left panel for Adamello Glacier is not sufficiently clear to be useful. The field area maps need to include elevation contours, longitude-latitude and scale, since these can easily be found in GLIMS or Grossi et al. (2012).

155: What is the timing of the potential multi-year pollen signal and does that coincide with years of high snowlines when snowcover was lost at glaciers with mass balance records? Review Huss et al (2015) and Carturan et al (2013), the latter in Table 3 also lists annual ELA.

188: Any insight on why the usual decrease in activity with depth was not observed?

200: Can you quantify very close agreement?

205: The year 1998 also marks the beginning of a periods of substantially more negative mass balance in the region Huss et al. (2015) and Carturan et al. (2013). Relate to mass balance observations on Adamello (Mandrone) Glacier for part of the period where a record is not retained Ranzi et al. (2010) and Grossi et al. (2012).

222: It is worth quantifying the size of the pollen grains to the ice crystals. Does the lack of pollen migration suggest the pollen is incorporated in ice crystals, or that meltwater percolation rates are too low to mobilize? You may not have insight on this, but if you do it will be interesting.

229: Reword, because it more accurate to say no accumulation has been retained. "Based on the good agreement and our confidence in the dating we can conclude that for at least two decades no net accumulation has been preserved at the drill site."

239: The annual accumulation that had existed 1963-1986 indicates that mass balance in this area of the accumulation since 1998 when accumulation is not preserved has

declined by more than 1 m on average. This is as important a finding as the dating and should be emphasized more.

255: Explain why this model is a good choice and how it has worked in a similar environment. How does this compare to methods used at Colle Gniffeti by Lüthi and Funk (2000).

274: "..indicating no accumulation preserved during the last 20 years." The lack of retained accumulation across an accumulation zone also indicates a glacier that cannot survive (Pelto, 2010).

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