Review of “Evidence of radionuclide fractionation due to meltwater percolation in a temperate glacier” by Elena Di Stefano, Giovanni Baccolo, Massimiliano Clemenza, Barbara Delmonte, Deborah Fiorini, Roberto Garzonio, Margit Schwikowski, and Valter Maggi.

The manuscript of Di Stefano et al., presents 3H and 137 Cs ice core profiles from the temperate Adamello glacier (3100 m asl, Italian Alps). Both parameters show enhanced concentrations which were attributed to reflect the effect of atmospheric nuclear bomb tests in the 1950s and 1960s. However, the records of the well-dated maximum of these bomb tests which is expected in snow in 1963 for both parameters, is displaced between the 3H and 137Cs depth profiles by 1.5 m.

There are two former publications from this Adamello ice core, one (Di Stefano et al., 2019) presenting the 137Cs depth profile and concluding that 137Cs is tightly bound to insoluble particulate matter inside the ice core, and one (Festi et al., 2021) which established a timescale in annual resolution for the ice core on the basis of black carbon and pollen seasonality in combination with radionuclides 210 Pb and 137 Cs.

The authors of this study here attributed the observed displacement of the 3H and 137Cs bomb test signals to post depositional melting processes which affect 137Cs more than 3H as it was observed in former studies in temperate glaciers from the Alps and from Svalbard. However, beyond this conclusion on the depth difference of the 3H and 137Cs 1963 peak in a temperate glacier, which is already known in literature, no further implications were outlined concerning e.g. the established timescale of this ice core, or on the general suitability to use this glacier site as paleo-archive. Therefore the manuscript does not fulfill the standard of The Cryosphere.

In addition, the discussion about the misalignment of 3H and 137Cs seems to be not conducted thorough. E.g., two 3H depth profiles are presented in the manuscript, one measured on the drilling chips and one on ice core samples, whereas the absolute 3H maxima of both data sets show a depth difference of 1.5m. Further 1.5m below is located the 137Cs peak, and again 1m deeper in the core there is an outstanding mineral dust layer. Comparing these depth displacements with the regular occurring black carbon and pollen horizons and the out of this resulting ice core dating (Festi et al., 2021) based on regular seasonal occurrences of pollen and black carbon peaks during summer it seems that the time interval between the two 3H and the 137Cs peaks, and the mineral dust layer are in the order of magnitude of 1 year each. Thus, the outstanding dust layer would correspond to accumulations from precipitation around 1959-1960, and should lie therefore still lie completely within the time interval influenced by the bomb tests and the resulting enhanced H3 and 137Cs contamination, as it was observed in European precipitations and deposition archives. However, in the Adamello core 137Cs as well as 3H showed pre bomb test levels at the corresponding ice core depth of this outstanding mineral dust layer, what questions whether the dating is wrong or the complete 3H and 137Cs bomb inventories before 1963 (or 1960?) were removed completely by percolation. And if percolation occurred, why was the 137Cs not at least partly accumulated together with the mineral dust in the outstanding dust layer below?

My recommendation would be that the authors revisit their data concerted with all of the already existing glacio-chemical and dating information to present a carful discussion of novel observations to draw a consistent picture of ice core signal preservation conditions at the site.