

Interactive comment on “Temperature and precipitation signal in two Alpine ice cores over the period 1961–2001” by I. Mariani et al.

Anonymous Referee #1

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This manuscript investigates the comparison between two European Alpine ice core records (18O and accumulation) and regional meteorological records (temperature and precipitation). It is a pity that the manuscript does not refer to a very close parallel manuscript also submitted to Climate of the Past (Brönnimann et al), focus on a "synthetic ice core signal" and which has much overlap with this one.

This manuscript provides a revised chronology for the Fiescherhorn and Grenzletscher ice cores and annual 18O and accumulation records. Spatial correlations are used with respect to regional temperature and precipitation data.

The manuscript is well written and quite short. There are a number of caveats which require at least major revisions. Best would be an integration with the parallel manuscript of Brönnimann.

What is missing in the present manuscript:

1) introduction : surprisingly, absolutely no reference to modelling studies based on 18O in atmospheric general circulation models and have investigated 18O -temperature relationships in European precipitation; no discussion of differences between precipitation and accumulation, and the problems which could be linked with summer melt.

2) no discussion of the validity of atmospheric analyses for the region, no systematic comparison of the various datasets that are used. One would be interested in the spatial correlation of temperature and precipitation within the meteorological station data, and the gridded data investigated around the ice core sites.

3) the ice core records (18O and accumulation) from Figs. 3 and 4 are almost not described in the main text.

4) age scale. No discussion of the method which allows to establish the age scale uncertainty. It is possible to firmly rule out an error by more than 1 year for selected periods? What is the relevance of a lag 1 correlation with respect to age scale accuracy? Why do not the authors establish a different choice of year to avoid splitting the winter signal into 2 years?

5) meteorological data. The temporal variations are never shown (only maps of spatial variations). One would expect to see the temporal variations of temperature (annual, winter, summer), precipitation weighted temperature, and precipitation variations and the visual comparison with the ice core data. Unfortunately, this is addressed in the companion paper which is not cited here.

6) statistics. Correlation analyses seem to be overwhelmed by trends. I suggest to first discuss the trends in the ice core data (with an objective determination) and the meteorological data (as in the previous item). Then an assessment of the consistency / differences. Then an analysis of detrended data to focus on inter annual variations.

7) quantitative relationships between ice core accumulation and precipitation, ice core

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18O and temperature. The authors should discuss the quantitative relationships (slopes) obtained and compare them with similar studies reported in the literature. Do they make sense with respect to known distillation processes? Altogether, which fraction of the ice core variance is explained at best by meteorological data (it seems to vary between 0 and 60% if I understand correctly). Processes other than these may also affect the 18O variability such as changes in moisture origin; they are not discussed.

8) Figure 1 is not sufficiently informative. It would be nice to add the position of the weather stations and the grids of the datasets used.

9) Figure 2 should include age markers which allow to establish the error bar on the chronology.

10) Figures 3 and 4 should also show the meteorological data which give the strongest correlation. Why are there gaps in the Grenzgletscher data?

11) I do not find Figs 5-6-7 very informative. A specific analysis of the spatial correlation within the meteorological records would be useful (spatial length of correlation of detrended, annual precip / temperature signals).

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