

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

### **Anonymous Referee #2**

Received and published: 25 January 2013

Review of "Temperature and precipitation signal in two Alpine ice cores over the period 1961-2001" by Mariani et al.

The authors present two new data sets from Alpine ice cores that are located at a distance that probably places them at least sometimes in different weather regimes. The data certainly valid publication, but the analysis is a bit on the short side and partly inconclusive, and leaves substantial room for more analysis. Below I make suggestions on how the significance of the paper could be improved by major revisions.

### Major comments

1. The authors should more clearly point out that the annual mean is their target time scale. If retained, this however needs to be well justified, since I would expect that

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at subannual time scale the analysis would possibly provide more reliable results. At any given year winter and summer temperature variation may be compensating, since there is no reason to expect that e.g. a cold winter follows a cold summer. Thus the correlation analysis becomes more difficult due to a smaller detectable signal. Looking at the raw data it should be possible to create an approximate summer and winter mean signal by centering on the max and min values in the isotope time series.

2. To me, disentangling the influences of temperature vs. precipitation on d18O does not seem to be an achievable goal. The two parameters are intrinsically coupled, since the isotopes only record (in part) the condensation temperature of a precipitation event, not temperature in general. The condensation temperature may be quite different from the temperatures during non-precipitating conditions. Typically, winter temperatures are warmer and summer temperatures are colder during precipitation events. There is no reason to expect a pure temperature signal in d18O. The authors state this renders ice core analysis as proxy meaningless, which seems a bit strong and may need reconsideration.

3. The ice core time series should be compared with time series of larger-scale averaged temperature and precipitation rather than just reporting the correlation maps. It would be very revealing to separate the station records into summer and winter signals, or to create a precipitation-weighted station signal.

4. The presentation of the material needs to be improved, in particular wrt. Figures, as detailed below.

Detailed comments

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L 5-10: Please state more clearly the time scales of the various archives, and the time scale you are targeting in this study.

L 24: Maybe state here that isotopes in precipitation reflect the transport history and

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the final cloud temperature.

L 28: I would think that moisture sources contribute to variability in the deuterium excess, and would not so clearly show up in the d18O signal alone.

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L 9: There may be a lot of local variability during summer. But I would assume that most of the large precipitation events have a common origin due to large-scale weather patterns.

New paragraph after "Nevertheless. . ."

Pg 5871

L 15: "The frontal systems associated with the polar front": This could be more exactly referred to as mid-latitude winter storms, originating in the North Atlantic storm track.

Pg 5872

L 7: I doubt that there is no particular seasonality at this site, since both Grimsel and Grand St Bernard show a late summer minimum in precipitation (see URLs attached below).

L 13: remove brackets around Henderson reference

Pg 5873

L 9: Did you calculate density for each sample or infer it as an average from a longer ice core segment?

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L 18: It seems a bit strange that you did the correlation to high altitude temperatures. Is not the interest in using the ice cores as a surface temperature proxy? This needs more discussion.

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L 22: What kind of precipitation data is this, a model product, gridded station data, a blend of model and observations? Is there a reference?

L 24: Similar for the HISTALP data, what kind of data is this, why did you use this in addition?

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L 1: Which stations have been used? Refer to Table 1 here.

L 2: No clear, do you mean among all datasets listed above?

L 4: A detailed description of the data should be given at the start of the paragraph. Please combine Fig. 3 and 4 into one and put the data on a common time axis, so the two ice cores can be compared.

It would be very helpful to add a new Figure where you show e.g. station data of temperature and precipitation at the same time resolution so one can get an impression of the trend and variability from high-quality meteorological data. This is important context for evaluating the proxy data.

L 20: What about Fiescherhorn?

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L 15-18: As stated in the main comments, I would not expect separate signals for temperature and precipitation. Did you check if accumulation is correlated with temperature, or d18O with precipitation?

L 19: Which of the gridded data sets do you mean?

L 23-25: Not clear what you want to say here.

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L 19: I am sure you carefully examined the min/max values for each period, but just looking by eye at the raw data for FH I would count 11 maxima in the 1999-1990 and

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1979-170 window, and 9 data points in the 1969-1960 window. Maybe the assignment to years could be indicated by a bar on top of the graph with alternating black and white color representing each year as determined now.

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The first paragraph of the Conclusions reads very similar to the abstract, please chose a clearly different wording to avoid repetitions.

L 20: so->such

L 21: Why is this not useful for any paleoclimate reconstruction? This may depend on the particular reconstruction purpose. Maybe you could clarify in the introduction what you would want to use the reconstruction for.

L 23: I think this paper would benefit a lot if you targeted to understand sub-annual/seasonal signals, as explained in the major comments.

Fig. 5 and 6: Remove all panels where no substantial correlation pattern is shown. You may want to adjust the color scale to show more detail.

Precipitation climatology at stations Grimsel and Grand St Bernard  
[http://www.meteoschweiz.admin.ch/files/kd/climsheet/de/GSB\\_norm6190.pdf](http://www.meteoschweiz.admin.ch/files/kd/climsheet/de/GSB_norm6190.pdf)  
[http://www.meteoschweiz.admin.ch/files/kd/climsheet/de/GRH\\_norm6190.pdf](http://www.meteoschweiz.admin.ch/files/kd/climsheet/de/GRH_norm6190.pdf)

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Interactive comment on Clim. Past Discuss., 8, 5867, 2012.

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