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Interactive comment on "A timescale analysis of the NH temperature response tovolcanic and solar forcing in the past millenium" *by* S. L. Weber

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General comments
A number of valid comments are made by this referee, which are mostly taken into account in the revised version of the paper. Hopefully, the presentation has improved and is more precise now. The regression is defined (section 2) and the issue of seasonality is addressed more extensively (section 4) in the revised paper. More specific comments are adressed below. With respect to the negative correlations at multi-centennial timescales for two of the records, one can say that correlations (either positive or negative) at these timescales are not very robust due to the limited record length. The amplitude of the negative trend for one record (Mo05) is indeed large, but the ratio (of trend versus 40-120yr frequency band) is in fact comparable to that in the Cr00 record, see Table 1. The possible reasons underlying the different regressions in the seven records are briefly mentioned in the paper, with reference to the literature that exists on this subject. A more thorough discussion falls outside the scope of

the present paper (and the expertise of its author). The aim of the present paper is to analyse the forced signals in reconstructed temperature records (and model simulations) - not to evaluate the scaling of different records.

Specific comments

1) title is shortened, while the time interval is now given in the first sentence of the abstract

2-4) correct, addressed in the revised paper

5) the description of the solar forcing has been modified.

a) The Be10/Lean splice was used, which is displayed as a NET radiative forcing in Crowley (2000). This reduces its amplitude by a factor of about 0.7.

b) It is correct that the 'net radiative forcing' is conventionally used for estimating climatic sensitivity S. In contrast, I have chosen to use the regression R defined in terms of the radiative forcing (anomalies in TSI divided by four). This is now clearly stated in section 2. To my view it is most straightforward to carry out a model-data comparison study in terms of R, because past albedo's are not known. Any estimate of past albedo's would be different from the time-varying (dynamically computed) albedo's in the model simulations. The different definitions (net or total radiative forcing) were taken into account when comparing the present study to earlier work using more comprehensive GCMs.

6) Correct, the 0.2% decrease is not clear from Fig. 1 because it does not display the modern values (there is indeed a 0.68 W/m2 decrease in radiative forcing going from the present century to the MM). I have given this number to put the Crowley (2000) reconstruction in the context of the comparison made by Bard et al. (2000) of different reconstructions in terms of the % decrease in TSI during the MM. This is stated clearly in the revised text.

7) The differences between simulated JJA and annual-mean temperatures is discussed in the revised text (and a Figure is added).

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8) Yes, it has annual resolution. However, it does not contain variability on annual-decadal timescales. This seems to be because it takes some time before snow accumulated on polar ice caps becomes solid ice, resulting in a certain amount of diffusion of gaseous inclusions like Be10.
9) correct, changed in revised text.
10) discussion is expanded and a Figure has been added.
11) Correct, one would expect the solar forcing and temperatures to be correlated at decadal timescales. This is indeed found by Waple et al (2002) who use the Lean et al. solar forcing reconstrucion for the time interval 1650-1850. This reconstruction does contain annual variability. With the Be10-based solar forcing the regression/correlation for the unfiltered/20-yr LP filtered data is determined solely by the longer timescales (there is no correlation for the 0-20 yr band-pass filtered data). For this reason it is not shown, but only the more meaningful correlations for LP40 and longer filter periods are shown.
12) the linear superposition of the responses to each forcing factor does not follow from the regression against the combined solar-volcanic forcing (as is seen directly from the definition given in section 2, where the amplitude of the forcing enters into the denominator). It is derived conventionally from a) the superposition of the temperature signals or b) the similarity of the regression in experiments with one forcing only to that derived from experiments with the combined solar-volcanic forcing. This aspect is briefly discussed in section 4.
13) In case of the orbital forcing, seasonality plays a major role as the forcing itself strongly depends on the time of the year. Differences in regressions for JJA and annual-mean data are obtained in all simulations, as discussed now more extensively in section 4, but they are small.

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