Climate
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Discussions

Interactive comment on "Large-scale drivers of Caucasus climate variability in meteorological records and Mt Elbrus ice cores" *by* Anna Kozachek et al.

Anonymous Referee #3

Study on the drivers of climate variability in a region is very important for understanding climate change and its prediction. Based on the meteorological data and ice core records, this paper discussed the impacts of NAO, AO and NCP on climate change in the Caucasus, and found that in the summer season the isotopic composition in the Elbrus ice core depends on the local temperature, while in winter, the atmospheric circulation is the predominant driver of the ice core isotopic composition, and the ice core isotopic composition appears mostly related to characteristics of large-scale atmospheric circulations such as the NAO. However, there are some issues in the paper which should be clarified. 1. If possible, it would be better to draw a dividing line in Fig.1 to separate the regions with and without a distinct seasonal variation of precip-

itation. This can help readers to understand some discussions in the paper. 2. The dating is very important for the ice core study. In the section of dating, i.e. 2.1.4, authors used the mean value of the $\delta 18O$ of the whole dataset (-15.5 ‰ as a threshold to separate between the warm and cold seasons. This suggestion should be verified and/or confirmed by the data of $\delta 18O$ in precipitation at the GNIP stations around the ice core drilling site. Another way to test the effectiveness of the division of seasons in ice core is to discern if there is a consistency between the ratio of warm season accumulation rate to cold season accumulation rate (in table 3) and that of precipitation at the adjacent meteorological stations (this method was used by Wang et al (2002, Annals of Glaciology, Vol.35, 273-277) in a Himalayan ice core). Authors also mentioned that the other parameters with seasonal variational characteristics, such as dust and ammonium concentrations, were used to identify the warm/cold season in the ice core profile. It would be better to display the variations of these parameters in the Fig. 3. 3. Authors calculated the correlation between temperature and $\delta 18O$ in the Lines 329-332 of the text using the 11-year running means for the different periods, and found that the correlations changes with time. If possible, authors can do this by a sliding window method used by Wang et al. (2003, Geophysical Research Letters. Vol.30, No.22, doi: 10.1029/2003GL018188) in a Tibetan ice core. Another issue is that the data series used in the paper ended in 2013, why their 11-year running means also ended in 2013 (shown in Fig. 11)? 4. The significance test in the paper should be paid much attention, especially for the datasets of 11-year and 20-year running means. The degree of freedom can be reduced sharply for the running mean datasets. For example, as for the 11-year mean data sets over the period of 1994-2013, their degree of freedom is only 2 (20/11 is about 2). 5. In the paragraph, Lines 343-346, authors should present the results of the seasonal cycle of precipitation isotopic composition calculated by using the LMDZiso model, and compare that with the ice core record in one chart. 6. When discussing the variations of $\delta 18O$ in precipitation in lines 362-365, the continental effect should be considered. 7. In Tables 2 and 4, the period of calculation should be presented. 8. Line 321, "in the Alps by (Bohleber et al., 2013)" should

be "in the Alps by Bohleber et al. (2013)". 9. Line 327, "the methods described by (Bohleber et al., 2013)" should be "the methods described by Bohleber et al. (2013)".

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