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Climate of the Past Discussions

Interactive comment on "Extreme climate, not extreme weather: the summer of 1816 in Geneva, Switzerland" *by* R. Auchmann et al.

Anonymous Referee #2

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This manuscript provides an interesting contribution to characterise in detail an outstanding climatic event (YWS). Using daily and sub-daily data for Geneva the authors have done a good job explaining a) the role of clouds on asymmetrical changes of morning and 2.p.m temperature distributions, b) how the rainier summer of 1816 resulted from an increase of wet days frequency rather their intensity, c) how changes in WTs frequency were partially responsible for the observed changes in temperature, precipitation and cloudiness. Overall the paper is clearly written with an appropriate length and abstract and supported by an appropriate number of figures and tables. In summary I consider that this manuscript is good and worth to be published after some minor clarifications listed below.

Minor suggestions/comments 1 (Section 3.4) I would like to suggest the authors to pro-

vide one or two references that help supporting the Weather Type (WT) classification methodology presented (even if applied to other regions). The set of rules used to define the different WT classes looks plausible and the obtained results confirm their usefulness (in respect to temperature and precipitation impact). However, this WT type classification is rather unusual as it depends only on local information from one station. No large scale information is used as is standard procedure in most WT classifications developed over the years. Could you please elaborate a little bit more to what extent are your results dependent on this particular WT methodology.

2 (Section 3.4) Following the issue raised above I wonder if the average SLP signature of your WT classes is similar to others obtained with more standard WT classification approaches developed for Switzerland. While I can imagine that daily SLP is not readily available on a gridded format for the considered reference period (1799-1821), you could always apply the same methodology to a more period (e.g. 1970-2000) and check the characteristics of the obtained patterns. For a comprehensive analysis of WT classifications over Europe using a large range of approaches please have a look on the papers summarizing the output of COSTaction_733 dedicated to WT classifications, validation and impacts), including the following summarizing papers: âĂć Philipp A., J. Bartholy, C. Beck, M. Erpicum, P. Esteban, X. Fettweis, R. Huth, P. James, S. Jourdain, F. Kreienkamp, T. Krennert, S. Lykoudis, S. Michalides, K. Pianko, P. Post, D. Rasilla Álvarez, R. Schiemann, A. Spekat, F. S. Tymvios (2010): COST733CAT - a database of weather and circulation type classifications. Physics and Chemistry of the Earth, 35, 360-373. DOI: 10.1016/j.pce.2009.12.010. âĂć Beck C. and A. Philipp (2010): Evaluation and comparison of circulation type classifications for the European domain. Physics and Chemistry of the Earth, 35, 374-387. DOI: 10.1016/j.pce.2010.01.001

3 (Sections 3.4, 3.5 and 3.6) There isn't much contextual information on previous works that have used large-scale circulation patterns (even at the monthly/seasonal scale) and the climate anomalies observed. A number of works have dealt with the impact of

large-scale atmospheric circulation patterns (NAO, EA, etc), obtained from EOF analysis or based in station defined indices. Besides the works of Trigo et al (2009) I would suggest the authors to add some more contextual information on the anomalous values of these large-scale circulation indices for the summer 1816, and also the unusual summer 1818. Just a few examples:

Casty C, Handorf D, Sempf M (2005) Combined climate winter regimes over the North Atlantic/European sector 1766–2000. Geophys Res Lett 32. doi:10.1029/2005GL022431

Casty C, Wanner H, Luterbacher J, Esper J, BoÂĺhm R (2005) Temperature and precipitation variability in the European Alps since 1500. Int J Climatol 25:1855–1880. doi:10.1002/joc.1216

4 (Table 2) I would suggest the authors to add another column to this table with the annual absolute frequency of each WT for the entire reference period and for the year 1816. Figure 6 provides only the relative frequency and is also restricted to the summer months.

5 (Figure 2 caption) There is confusion with the use of green and blue colour in this Figure caption (and a contradiction with the inset legend). Where it sates: "The green lines denote $\pm$1 standard deviation from the mean, the blue lines give the minima and maxima for the reference period" it should read: "The blue lines denote $\pm$1 standard deviation from the mean, the green lines give the minima and maxima for the reference period". Please re-write.

6 (Figure 2, upper panel) There is no information regarding the use of different tick lines in the inside part of the x-axis (2 green, 1 red and 2 black). Is this necessary? if so please add additional information. It is also not clear if the vertical line corresponds to the 16 April (last negative temperature that is mentioned in the manuscript), if that is the case it should be mentioned in the Figure caption. Why is the red line apparently highlighting the following day?

7 (Figure 2, lower panel) Why not providing the exact location of the 14 of August using a vertical line (in order to be consistent with the upper panel). The explicit location of the zero line in this graphic might be as relevant for 2.p.m temperature as it is for the morning values. Please be more consistent on the use of the information. In particular there's an outstanding cold event earlier in the year (late January), with both temperatures dropping below the minima observed for the reference period that deserves to be mentioned (with 2.p.m. temperatures close to -8°C). In this case, it would be an unusual weather event and not unusual climate!

8 (Figure 4) There's a remarkable drop in 1818 of both the total amount of precipitation (less than 100 mm) and the number of rainy days (about 10 days). This intense decline (that can be regarded has being symmetric to the wet summer of 1816) deserves some additional clarification, namely on the possible context of a regional drought during that year, where it was also dry at least in Iberia (Trigo et al., 2009). Please consider comment #3 when addressing this issue.

9 (References) I saw no reference in the manuscript to the work of Aguilar et al. (2003). If this citation is not necessary please remove it.

Interactive comment on Clim. Past Discuss., 7, 3745, 2011.