

Interactive comment on “Influence of the sunspot cycle on the Northern Hemisphere wintertime circulation from long upper-air data sets” by Y. Brugnara et al.

Anonymous Referee #1

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In this paper, Brugnara and colleagues use several recently compiled upper-air data sets for investigating how the 11 year solar cycle influences the atmospheric circulation in the Northern Hemisphere. They find consistent, statistically robust anomaly patterns of upper-tropospheric geopotential heights and winds as well as lower-tropospheric temperatures. This study is a timely contribution to a relevant research field, the influence of solar variability on climate. Many studies in this field have relied on reanalysis data from the last about five decades, and there has been some debate if their results were strongly affected by the limitation of the time period. By incorporating longer observational data sets, the present study gives us more confidence in the significance of the tropospheric circulation anomalies associated with variations in the solar activity.

The paper is mostly well written, and the methods are sound. I only have some minor comments, and I recommend publication in Atmospheric Chemistry and Physics once these comments have been addressed.

Minor Comments:

P 30372, L 13: confidence in

P 30376, L 27: What is meant by the term “calibrated with the ERA-40 reanalysis”? Is it correct that the statistical reconstructions are only used up to 1957, and ERA-40 data thereafter? This should be stated more explicitly. The analysis is then affected by (at least) the same inhomogeneity problems as other studies based on reanalyses only (as described in the introduction), is it not? This should be discussed somewhere in the manuscript.

P 30377, L 8: Maybe add reference to Fig. 5, where the grid points are shown.

P 30377, L 11: “SLP observations/measurements”, instead of just “SLP”

P 30377, L 22: The large variations in the number of surface stations may also cause inhomogeneities in 20CR.

P 30378, L 6: I think the treatment of ENSO and volcanic eruptions should be explained before mentioning the statistical methods.

P 30378, L 23: I find this part on the TSI trend somewhat confusing. What is the conclusion for the present study?

P 30379, L 9: “influence remarkably our results”: strange word order

P 30379, L 11; P 30380 L 1: I can hardly believe that the results are totally unchanged. Introduce something like “substantially/remarkably”?

P 30380, L 1: “as described”

P 30382, L 17: A very similar analysis of the 20CR data was performed in a recent

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paper by Sirocko et al. (2012), leading to similar results (as expected). This paper should be cited here.

P 30382, L 24: “reduce/decrease” instead of “make . . . lower”

P 30383, L 19: “showing how different the wind field appears”: strange formulation

P 30384, L 9: “on” instead of “from”

P 30384, L 12: “the temperature field”

P 30384, L 25: “is not significant” instead of “almost disappears”

P 30385, L 1: Again the 20CR results are similar to those of Sirocko et al. (2012).

P 30385, L 22: “more reliable” compared to what?

P 30386, L 13: You may add references to Cattiaux et al. (2010) and Guiguis et al. (2011) here.

P 30386, L 18: I think you should mention again that the signal is much weaker in the first half of the period.

P 30387, L 5: “would have led to”

Caption of Fig. 6: Can you be more specific than “MLR solar coefficient” (“regression coefficient”?; use symbol introduced in the text).

References:

Cattiaux, J., R. Vautard, C. Cassou, P. Yiou, V. Masson-Delmotte, and F. Codron (2010), Winter 2010 in Europe: A cold extreme in a warming climate, *Geophys. Res. Lett.*, 37, L20704, doi:10.1029/2010GL044613.

Guirguis, K., A. Gershunov, R. Schwartz, and S. Bennett (2011), Recent warm and cold daily winter temperature extremes in the Northern Hemisphere, *Geophys. Res. Lett.*, 38, L17701, doi:10.1029/2011GL048762.

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Sirocko, F., H. Brunck, and S. Pfahl (2012), Solar influence on winter severity in central Europe, *Geophys. Res. Lett.*, 39, L16704, doi:10.1029/2012GL052412.

Interactive comment on *Atmos. Chem. Phys. Discuss.*, 12, 30371, 2012.

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