

Interactive comment on “A note on the statistical evidence for an influence of geomagnetic activity on JRA-55 northern hemisphere seasonal-mean stratospheric temperatures” by Nazario Tartaglione et al.

Anonymous Referee #2

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General comments:

This manuscript reported a problem inherent in the attribution study of geomagnetic activity impact on the climate. The geomagnetic activity is regarded as an index for energetic electron precipitation, which attracts much attention as a third solar driver for climate. Although some previous studies suggested a strong and significant link between the geomagnetic activity and climate, its existence is still controversial. This manuscript clearly showed that the statistically significant link reported by the previous studies were likely to be erroneously detected by neglecting temporal and spatial au-

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tocorrelations of the data. This is an important suggestion and caveat for researchers dealing with this topic. The manuscript is concisely written, and the topic is suitable for AnGeo. Thus, I recommend a publication of this manuscript after addressing several points given below.

Major comments:

-Statistical significance and physical link

This study showed that the stratospheric temperature response to the geomagnetic activity was not statistically significant. Although it may be due to no physical link between them, it may be due to insufficient data length or too large internal temperature variations. The authors should mention that statistical insignificance does not deny an existence of the physical link.

-Zonal-mean temperature

Although this study is motivated by S09, the analyzed pressure levels were different (i.e., surface in S09 and stratosphere in this study). On the other hand, several previous studies examined geomagnetic activity impacts on stratosphere temperature, but only for zonal-mean temperature to my knowledge. In order to clarify whether this result can be applied to zonal-mean fields or not, I recommend showing the result for zonal-mean temperature in addition to the horizontal distribution.

-Ap index and F10.7

In this study (and S09), the Ap index was used to distinguish high and low geomagnetic activity years. Is there a potential that the correlation between Ap index and solar activity (i.e., F10.7) affects the result?

-Data length

In this study, the data between 1958-2006 was used to compare the result with S09. If the data period is extended to 2018 or 2019, does it affect the result?

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Minor comments:

-p.1, l.11-21

Previous studies are not adequately cited. At least, references about energetic particle precipitation into the thermo/mesosphere and long lifetime of polar-night NO_x should be added.

-p.2, l.29

"Forecast" -> "Forecasts"

-p.2, l.55

"2005" -> "2015"

-p.3, l.65

"of S09" -> "as S09"

-p.3, l.82 and p.6, l.175

"Wilks (2016)" -> "(Wilks, 2016)"

-p.4, l.91

"use" -> "use of"

-p.4, l.95

Why were 10 and 5 hPa levels chosen? While 10 hPa is representative of middle stratosphere, it seems that 1 and 100 hPa levels are appropriate as representative levels of upper and lower stratosphere, respectively.

-p.4, l.109-110

Why the AR(1) process is suitable for explaining a cumulative impact is not clear to me. Please explain it in more detail.

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-p.5, l.143

"equatl" -> "equal"

-p.8

Lu et al. and Long et al. should be reversed in order.

-p.10

"20001" -> "2001"

-p. 12-14

Units in temperature should be added.

Interactive comment on Ann. Geophys. Discuss., <https://doi.org/10.5194/angeo-2019-156>, 2019.

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