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# *Interactive comment on* "Predicting the maximum *aa/Ap* index through its relationship with the preceding minimum" *by* Zhanle Du

**Anonymous Referee #2**

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The author identified maximum and minimums of smoothed aa and Ap indices through several solar cycles and calculate correlations between minimum and maximum values and between min/max values with respect to the preceding-following cycle. The relations that are found through the means of linear regression are then use to predict estimated aa/Ap minimum/maximum values for solar cycle 25.

Main comments

1. My main concern is with the selection of the dataset. It is not clear to me why the author choose to work with the 13-month smoothed aa index instead of the highest resolution available. Smoothing everything will naturally result in predictions that converge to the mean values and therefore fail to capture the spiky behavior of storm indices. This is particularly relevant in the case of Ap index. As shown in Table 1,



the Ap smoothed monthly means corresponds to period of at most minor geomagnetic activity. Therefore all storm activity is lost. I suggest the author repeat the calculations using the highest available temporal resolution of the indices and compare them with the current results of the manuscript.

2 Page 2 L19-21 These results are hardly relevant. Simpler methods will estimate the duration of solar cycle phases with significantly better accuracy (For example, NOAA predicts a rising duration with an error of $\sim$8 months). Estimating the duration of half a cycle with an uncertainty of almost half the solar cycle results in a disconnection between the mathematical results and the known repetitiveness of the studies phenomena. There's a reason it is called the 11-year cycle. I suggest the author to revise the calculations and to interpret them in the context of what could be a reasonable assumption of the duration of the phases of SC25.

3. The main results of the paper (shown in Figures 1-4) are heavily influenced by the decision of using smoothed indices. While they may be correct in that particular context, the author should consider if the methodology utilized is the appropriate for this particular problem. Going back to point 1, if a different dataset is utilized, all figures need to be remade. On a note regarding presentation of the figures, adding colors to the different lines and making the figures of the appropriate size will significantly improve the readability.

Specific comments

Title: I suggest replacing "minimum" with "solar minimum" to explicitly refer to solar cycle. Note that currently the title is misleading, as the prediction is regarding the smoothed data. Please adjust accordingly.

Page 2

L10 - What is the meaning of a double plus-minus. Is it referring to different error sources? In that case please specify. L18 - Do you mean anti-correlated? L26 What

do you mean by deviations? Please provide relevant references.

Page 4

L2-3 Predicted or estimated? A prediction is a statement about the future. A correlation between two variables at most indicates the ability to estimate one when the other is available, which appear to be the case.

Page 7

L2-4 This extremely high correlation is clearly affected by the process of smoothing the data. Similar with other figures and equations, please correct based on major comments.

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