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The Mansurov Effect: Real or a statistical artefact?

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The Mansurov Effect is related to the interplanetary magnetic field (IMF) and its ability to modulate the global electric circuit, which is further hypothesized to impact the polar troposphere through cloud generation processes. In this paper we investigate the connection between IMF By-component and polar surface pressure by using daily ERA5 reanalysis for geopotential height since 1980. Previous studies have shown to produce a significant 27-day cyclic response during solar cycle 23. However, when appropriate statistical tests are applied, the correlation is not significant at the 95% level. Our results also show that data from three other solar cycles, which have not been investigated before, produce similar cyclic responses as during solar cycle 23, but with seemingly random offset in the timing of the signal. We examine the origin of the cyclic pattern occurring in the super epoch/lead lag regression methods commonly used to support the Mansurov hypothesis in all recent papers, as well as other phenomena in this community. By generating random normally distributed noise with different levels of temporal autocorrelation, and using the real IMF By-index as forcing, we show that the methods applied to support the Mansurov hypothesis up to now, are highly susceptible, as cyclic patterns always occurs as artefacts of the methods. This, in addition to the lack of significance, suggests that there is no adequate evidence in support of the Mansurov Effect.