

Ann. Geophys. Discuss., author comment AC1
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Reply on CC1

Mirjam Kellinsalmi et al.

Author comment on "The time derivative of the geomagnetic field has a short memory" by
Mirjam Kellinsalmi et al., Ann. Geophys. Discuss.,
<https://doi.org/10.5194/angeo-2022-4-AC1>, 2022

Thank you for your interest in our work and for the great question.

As it was briefly mentioned in the Discussion section 4.2.1, we also tried a few other methods, including some basic circular mean functions and Davis (2002) method, but these proved to be unreliable with the very scattered distributions. In these cases the circular mean functions tend to give mean directions that visibly are not in agreement with the distribution polar plots (see attached figure). Because of this, we decided to first do this selection of the subset of data, and after that we are able to use the circular mean [1] with reliable results.

There most likely are also other methods for getting a meaningful mean direction for these kinds of distributions, but the method we used was the first one to work reliably with this data. We understand your worry of using only a subset of the values, but in practice, this subset is at least 50% of all the directional values, since we are using data in the semicircle surrounding the approximate direction. Also, since these time derivative distributions are generally bimodal (roughly speaking, symmetrical), we think that relevant information is not lost. We should still discuss this in more detail in the Discussion section, since it clearly raises some questions.

Attached is an example figure comparing these two methods. Top figure: mean direction using our method, bottom: mean direction using only circular mean. Mean direction, [deg], is given on top of the polar plots and also shown as a black bar in the plot.

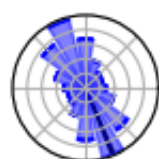
References

Davis, J. C.: Statistics and data analysis in geology, Wiley, New York, 3rd ed. edn., 2002.

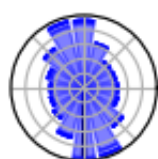
[1] https://docs.astropy.org/en/stable/_modules/astropy/stats/circstats.html#circmean

Our method

167.0

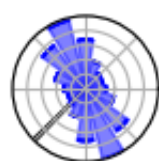


177.0



Circular mean

222.0



212.0

