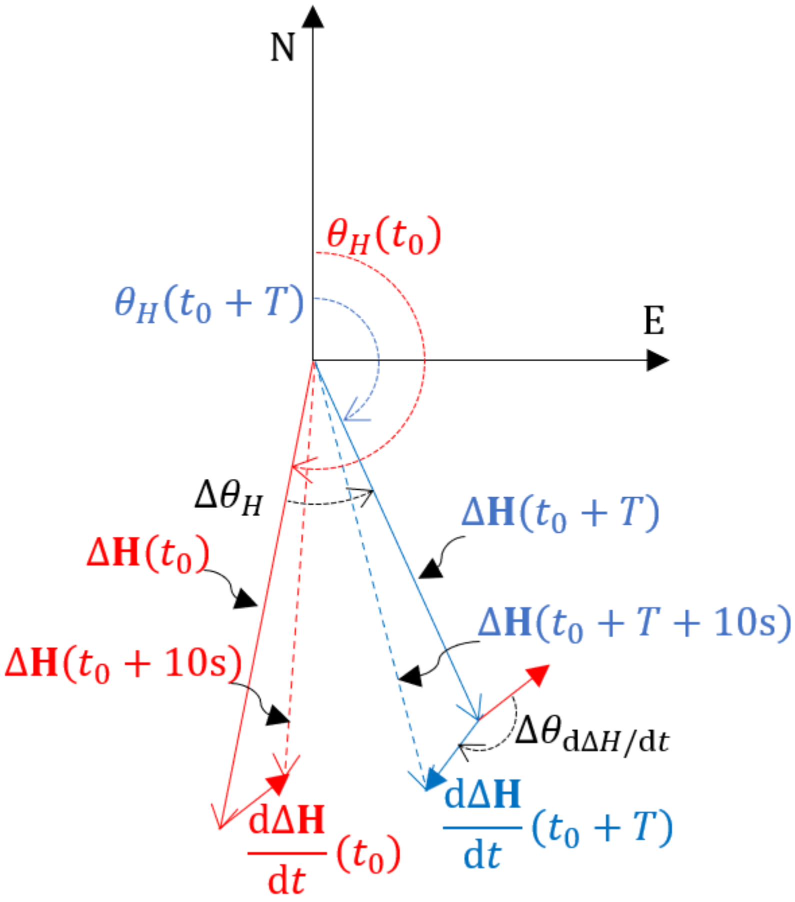
Figure 2: What about this one (or similar), where $\mathrm{d}\Delta\mathbf{H}/\mathrm{d}t$ is also depicted?

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**Ignoring Δ is a common practice within space physics community, and makes notations a little simpler. We will add a mention of this in the text.**

**H** has a definite and widespread meaning within the geomagnetic community: the total horizontal geomagnetic field vector. The **H** used in the manuscript refers to a perturbation, i.e., a difference from a baseline, which is something substantially different. Please, use $\Delta\mathbf{H}$ to avoid confusion. It may even be mentioned in the text that the suppression of Δ is a common practice in space science to refer to the perturbation, although its use is preferable to conform to the generalized definition of **H**: the total horizontal geomagnetic field vector. Likewise, even if the time derivative of the baseline is small, please use $\mathrm{d}\Delta\mathbf{H}/\mathrm{d}t$ instead of $\mathrm{d}\mathbf{H}/\mathrm{d}t$ to be more precise (I missed it in my first review).

Note that the two occurrences of “d” in $\mathrm{d}\Delta\mathbf{H}/\mathrm{d}t$ should not be italicized, as they are not variables.

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Regarding the reliability of the external/internal separation of the geomagnetic field perturbations, I understand that the arguments given by the authors in the new version of the manuscript and in their response to my comments point to a reasonable separation. However, given the importance of this point in the manuscript, the authors should give further arguments beyond more or less reasonable speculation. I also understand that they do not have an alternative code at hand to compare separation methods independent from each other (based, e.g., on SCHA, or on an EM forward solver capable of providing the separation given the ground conductivity structure shown in Juusola et al., 2020). So, in an attempt of flexibility on my side, I propose to the authors an alternative check based on SECS:

1- Choose (at least) one variable from all the variables that the authors have represented in the manuscript. For example, $\mathrm{d}\Delta\mathbf{H}/\mathrm{d}t$ ext. and $\mathrm{d}\Delta\mathbf{H}/\mathrm{d}t$ int. at SOD station for a certain year (Figure 7 a and b).
2- Run the SECS code with a minimum number of geomagnetic stations in the IMAGE network, e.g., 10. These 10 stations must be selected randomly. This will probably give a directional distribution quite different from the one represented in the mentioned figure.
3- Repeat the process iteratively a significant number of times with 10 stations randomly selected at a time. Compute the mean of all the directional distributions with 10 stations. This will give a mean distribution associated with 10 stations.
4- Now repeat steps 2 and 3 by choosing 11 stations randomly, then 12, and so on until you complete the original network.
5- Think of a quantity that allows to quantify the difference between the final distribution (i.e., with all the stations) and each of the test distributions. For example, the standard deviation of the difference of two directional distributions.
6- Represent (perhaps in another Appendix) the evolution of this quantity as a function of the number of stations used. The resulting curve should converge towards a stable value as the number of stations increases.

Although some objection could be argued about this validation process, it is a reasonable check and, in case the curve does not converge (I hope it does), it would at least provide the reader with an idea of the reliability of the external/internal separation procedure employed in the manuscript.

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After rereading the manuscript, I realize that the significance of Figure 9 is rather limited, and I think it could be improved. The values in this figure are calculated from directional distributions as those represented in Figure 7. However, some of the distributions are appreciably even (e.g., that of 1998 for the internal contribution of dH/dt), while others are narrower (that of 2008 for the external contribution of dH/dt). Figure 9 provides a single value that does not account for this fact. Moreover, because of the special procedure followed to calculate the mean angle, this mean tends to be shifted towards 180º with respect to the most likely direction. I'm not willing to start a new discussion here on the procedure for calculating the mean; however, I suggest that a parameter be included in Figure 9 that accounts for the "evenness" or uniformity of the distributions in Figures 6 and 7 (thus accounting for the significance of the provided mean angle). This parameter could again be the standard deviation of the distribution, which is larger for the year 1998 than for 2008. This can be represented in Figure 9 as bars superimposed on the mean values.

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Minor points:

L39: "the" is repeated.

L48: "more complex than **that** of"

L75: Please, cite the studies the authors refer to.

L78: "… where $\Delta\mathbf{H}$ is the **baseline-subtracted** total …"

Figure 3, panel 5): the authors have selected a high range of values for the vertical axis (-100º  to 100º) to highlight the small amplitude of the variations of $\Delta\theta(\Delta\mathbf{H})$ compared to those of $\Delta\theta(\mathrm{d}\Delta\mathbf{H}/\mathrm{d}t)$. However, the range of this axis does not coincide with the range of panel 6. Either impose the same range, o rather use a more adjusted range, commensurate with the depicted variation, e.g., +-20º.

L166: Add something like: "… 90 degrees**, which is the mean of an even distribution in $\boldsymbol{\Delta\theta}$**".

L192: This citation is inappropriate. The referred article performs the separation based on Spherical Harmonic Analysis (SHA), which is suitable for the entire globe. In any case, perhaps Spherical Cap Harmonic Analysis (SCHA) could be one of the suggested regional methods, but it should be noted that difficulties could arise if the size of the sources is larger than that of the region under study. In fact, many of the workers that attempted to model external field variations by SCHA encountered difficulties in the proper separation of external and internal fields for the above-mentioned reason, as discussed in Torta (2020)*. In the case of high latitudes, the main source of geomagnetic disturbances is closely related to the auroral electrojet, which is especially limited in latitude, so SCHA could probably perform comparably to SECS.

**Torta, J.M., 2020, Modelling by Spherical Cap Harmonic Analysis: A Literature Review, Surv Geophys 41, 201–247. https://doi.org/10.1007/s10712-019-09576-2*

L193: "… will be a small portion of **the true** external field present in the **modelled** internal field …"

L252: "The **mean of** the relative …"

L261 and 162: Replace "Appendix …" with "Figures … in Appendices A and B".

L275: Viljanen et al. (2001, p. 1110)

Figure A2: Use the format yyyy/mm instead of yyyym or yyyymm in the headers of each subplot.