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Geoscientific Instrumentation Methods and Data Systems Discussions

Interactive comment on "On the validation of K index values at Italian geomagnetic observatories" *by* Mauro Regi et al.

Anonymous Referee #3

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I evaluate favorably this paper because there is a serious work to assess the convenience of maintaining the k9 values given by IAGA to the Italian observatories. It has interesting discussions about the consequences of using different algorithms to compute local k indices.

I find that the paper is suitable for publication subject to some edits. I have some specific comments for the authors but also have several questions that the authors should address in a revised manuscript.

Firstly, there are two major questions where, from my point of view, the authors are out of focus and should be realigned in this paper.

a) The paper presents the situation as if each observatory has to choose its own k9.

But, according to the International Service of Geomagnetic Indices (ISGI), the ISGI-headquarters are in charge of the computation of k9 value for each magnetic observatory. ISG is a service of the International Association of Geomagnetism and Aeronomy (IAGA) which recognized "the unique role of the International Service of Geomagnetic Indices (ISGI) in the derivation, publication, and dissemination of these indices" (IAGA, Resolution No. 9 (1989). So, this paper should present its conclusions as an academic effort to check the assigned k9 values rather than to propose a new operational value.

b) K index is a coarse indicator of magnetic activity which simplifies the environmental situation into 10 digits for the sake of having a simple way to classify a magnetic disturbance. The scale is not linear nor logarithmic but a sort of personal choice of Bartels to have some events in each interval. Specially, in the high numbers, very diverse disturbances are assigned to the same figure (e.g. k=8 in Nimeck could be 331 nT or 500 nT) Moreover, Sq estimation, necessary because it should be removed before k computation, is rather subjective and involve a large uncertainty. In each algorithm, Sq is interpreted differently (Menvielle et al., 1995).

The authors claim the necessity of giving k9 values in units of nT or even with tenths of nT (Ln 268-273) but this it would be misinterpreted as if they were very precise when they are not!

On the other hand, other minor questions are addressed to the authors:

c) Niemek (NGK) was the reference observatory where this scale was defined by Bartels. The rest of other observatories where assimilate to this to create distributions similar to that one. So, the comparison of the Italian observatories with this observatory has more sense than with other German observatory (WNG). In fact, this observatory although being located very close to NGK, has not a perfect correspondence in distribution with (19% deltaK=-1, ln 130).

d) However, as K index measures the effect of auroral activity, it seems more reasonable to compare Italian observatories' distribution with other observatories with similar

latitude. Moreover, it is well known that k9 limit does not follow a regular law with the angular distance to the auroral zone (Mayaud, 1980).

e) Although it is true that digital algorithms grant reproducibility (Pg 2 ln 49), this does not mean that they are more certain. In the past, K index was “estimated” for manual procedures; but, now, an automatic algorithm also produces “estimated” values. And, of course, different algorithms would produce different values (pg9 ln255).

f) Comparing the distribution of Italian indices generated by KASM algorithm with NGK and WNG indices generated by FMI algorithm (Ln 137) is a rough way to do this because these distributions change with the algorithm and even with the year being considered (Figure 7). h) The correlation analysis used to obtain the best value of k9 (figure 4) presents a flat and asymmetric shape in an interval ranking for more than 50 nT. There, any change, as the use of a different algorithm, would produce a different maximum. So, I would not take the new values as a step forward. In fact, final results (those choosing a new value of k9 for DUR (fig. 5) implies a variation of 10% of population in deltaK=-/+1, in the limit of the precision of the method.

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