

The Centennial Evolution of Geomagnetic Activity revisited

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Geomagnetic activity is one of the most important heliospheric parameters, and the most reliable indicator of decadal and centennial changes in solar activity. Here we study the centennial change in geomagnetic activity using the newly proposed IHV (Inter-Hour Variability) index. We correct the earlier estimates on the centennial increase by taking into account the effect of the fact that the sampling of the magnetic field changed from one sample per hour to hourly means in the first years of the previous century. Since the IHV index is a variability index, the larger variability in the case of hourly sampling leads, without due correction, to excessively large values in the beginning of the century and an underestimated centennial increase. We discuss two ways to extract the necessary sampling calibration factors and show that they agree very well with each other. The effect of calibration is especially large at the mid-latitude CLH/FRD station where the centennial increase changes from only 6% to 24-25% due to calibration. Sampling calibration also leads to a larger centennial increase of global geomagnetic activity based on the IHV index. The results verify a significant centennial increase in global geomagnetic activity, in a qualitative agreement with the aa index, although a quantitative comparison is not warranted. We also find that the centennial increase has a rather strong and curious latitudinal dependence. It is largest at high latitudes. Quite unexpectedly, it is larger at low than mid-latitudes. These new findings indicate interesting long-term changes in the near-Earth space. We also discuss possible internal and external causes to these observed differences. The centennial change of geomagnetic activity may be partly affected by changes in the external conditions, partly by the secular decrease of the Earth's magnetic moment whose effect in near-Earth space may be larger than so far estimated.