Non-linear Relationship between Sunspot Number and Geomagnetic Activity

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An attempt is made to establish a correlation between the sunspot numbers and annual means of 3-hourly K-indices for 9 geomagnetic stations selected globally. Our study mainly concentrated on the previous sunspot cycles i.e. from 1957-2009 and tried to analyze the impact of sunspot activity on the earth's magnetic field. Studies have already been on sunspot numbers with 'aa' indices and a strong relationship is established (1). We have observed a phase difference between K-indices and sunspot number over a long smoothed series of annual means. The same phase difference is seen in monthly means of the 2 datasets. We have also attempted to estimate the influence of secular variation on this relationship.

To find the secular variation component over a period of 1969-2006, a fourth order smoothed polynomial fit is subtracted from the series of annual means of Quiet Days for Hyderabad and Alibag observatories data (2). The residual from this is taken as an estimate of external variation and compared later to smooth annual means of sunspot number, K, Kp and Ap. To examine the behavior of this series more closely the smooth daily/monthly/yearly mean variation are also studied. Comparison of the effects of different timescales and information extracted is presented here.

Keywords: K-Indices, Sunspots, Geomagnetic activity and Secular variation

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