Solar flare effects in geomagnetic field at Indian stations—Part III : Alibag, outside equatorial electrojet

R G Rastogi*
Department of Physics, Gujarat University, Ahmedabad 380 009
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The paper describes the solar flare effects (SFEs) in horizontal (H), eastward (Y) and vertical (Z) fields at Alibag, a station outside the equatorial electrojet current region. The amplitude of SFE(H) is a broad maximum around noon, while SFE(Y) is positive in the forenoon and minimum in the afternoon hours. The SFE(Z) field seems to be negative at any time of the day. These features are consistent with the effects expected of a normal \(S_q\) current over the station.

1 Introduction
In Parts I and II of the paper, descriptions of solar flare effects in H, Y and Z fields at equatorial stations Trivandrum and Annamalainagar are provided. In this paper the SFEs in H, Y and Z at Alibag, a station outside the equatorial electrojet region are described. At Alibag, H, Y and Z fields were recorded on separate photographic papers. No extensive analyses of SFE in Z field could be done due to non-availability of the corresponding microfilms.

Fig. 1—Yearly mean daily variation of the horizontal (H), eastward (Y) and vertical (Z) components of the geomagnetic field at Alibag during high (1958) and low (1964) sunspot years

*Also at: Physical Research Laboratory, Ahmedabad 380 009
Fig. 2—Reproduction of magnetograms at Alibag showing solar flare effects in H, Y and Z fields

Fig. 3—Mean daily variations of the solar flare amplitudes in H and Y fields at Alibag

2 Results

In Fig.1 are shown annual mean daily variations of $H$, $Y$ and $Z$ fields at Alibag during the maximum (1958) and the minimum (1964) sunspot years. During any of these years, $\Delta H$ was found to be maximum during 1100-1200 hrs LT. The $\Delta Y$ showed a maximum at 0900 hrs LT and a minimum at 1300 hrs LT. The $\Delta Z$ was minimum at 1100 hrs LT. Thus, $\Delta H$ is due to eastward current, $\Delta Y$ is due to southward current in the morning and northward current after 0900 hrs LT. The $\Delta Z$ is due to negative gradient of current with increasing latitude in the region of the station.

In Fig.2 are reproduced the tracings of $H$, $Y$ and $Z$ fields during some of the solar flares. In each of the cases the impulse in $H$ is positive. The $\Delta Z$ is slightly positive in the flare on 19 Oct. 1979 and in all other
cases $\Delta Z$ was negative. The $\Delta Y$ was positive on 19
Oct. 1979 and 9 July 1982 and negative in all the
other cases.

In Fig. 3 are shown the daily variations of the mean
amplitudes of solar flare effects in $H$ and $Y$ fields. It is
seen that the amplitude of SFE in $H$ had a broad
maximum around midday hours, in the same way as
the mean $S_q(H)$. The amplitude of SFE in $Y$ field
showed positive in the forenoon and negative in the
afternoon hours, again in conformity with the daily
variation of $S_q(H)$.

3 Conclusions
The solar flare effects observed at Alibag are
normal as expected of a $S_q$ current over the station
which is not affected by the equatorial electrojet
current or by the currents induced in the sub-surface
conducting region in Palk Strait region.