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The Enhanced Coronal Green Line Intensity and the Magnetic Field Gradients

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Extended abstract

Ramesh, Nagabhushana and Varghese (1999) have shown that the green line intensity enhancement does not depend entirely on the strength of the underlying spot magnetic field though the coronal intensity enhanced feature is almost sure to occur at the locations of sunspots with strong magnetic fields and at the locations of plages having larger areas. Presented here are the results of an analysis of intensity of green line emission and the active region magnetic signatures as seen in Stanford magnetograms.

The data base used in this study consisted of homogeneous data set (HDS) of 5303 Å green coronal intensity measured at position angle intervals of 5° on any given day from several stations (see Rybansky, 1975) and brought down to the common scale of Lomnicky Stit. Daily maps of sunspots, and Ca plages are then superposed on the green line intensity maps of the corresponding day. Resultant composite maps are then compared with the Stanford magnetograms published in *Solar Geophysical Data.*

Careful scrutiny of the Stanford magnetograms in association with the composite maps of green line emission show the persistent presence of moderate to high field gradients along the neutral line at the locations of the intensity enhanced features. This result is in good agreement with the results obtained by Vaiana *et al.* (1973) in case of coronal X-ray emission.

In our next step we have measured the magnetic field gradients along the neutral line scanning from east limb to west limb for each individual event. Further analysis showed that the peak intensity does not depend on the level of field gradient though a threshold gradient of 3×10^{-5} G/km seems to be essential for the enhancement in green line emission.

Examination of the individual cases in a greater detail revealed the following. All the events showed consistently the development of moderate to high field gradients along the neutral line in the wake of either the fresh flux emergence in the vicinity of a persistent active region or the evolution of a new active region.

Case studies of individual intensity enhancement features and their associated active regions indicated that the enhancements are not the resultant of any flares. Continuous emergence of flux within or in the vicinity of a pre-existing active region leading to the formation of moderate to high field gradients along the neutral line seems to play a key role in heating the corona at the locations of 5303 Å intensity enhancement.

Wang *et al.* (1997) indicated that the magnetic energy residing near the base of the loop acts as the heating source for the green line corona by lifting chromospheric gas into the overlying loop and converting it into plasma with a temperature of around 2×10^6 K. Our work showed that a given degree of gradients does not always produce the same degree of brightness. Therefore, it appears that the degree of magnetic reconnection through which the stored magnetic energy is dissipated into the corona to raise the plasma temperature to the order of 2MK plays an important role. Reconnection probably is determined by the nature of magnetic flux emergence through the photosphere.

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