FLARE I ƆLUTION FROM PROGNOZ 9 DATA

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EXTENDED ABSTRACT

In the paper, we apply the new approach to the analysis of the flare soft X-ray radiation measured aboard the Prognoz-9 satellite. The Loop Energy Balance Analysis method (LEBAN) make use of the time behaviour of the three important flare plasma characteristics: T_{max} - the maximum temperature, T - the mean temperature end ε - the emission measure of the hot plasma component ($T > 8$ MK). In LEBAN, we assume that the flare energy release take place in a single, constant cross-section loop of semilength L. The loop configuration does not vary with time. Under these assumptions, we investigate in detail the energy balance equation for the flaring loop as a whole. Based on Pallavicini et al., (1983) results of numerical flaring loop simulations, we check validity of semiempirical relation describing the rate of energy deposition in terms of T_{max} and L. The radiative losses are taken from Rosner, Tucker and Vaiana, (1978). We observe, that for the initial flare phase, the conduction plays important role only as redistributor of the energy within the hot plasma. Based on the evolution of the observed parameters, the losses due to conduction are proved to be not important in this phase. In the decay phase, the radiative and conductive losses are important and usually balance the energy being deposited at this period. During decay, the conditions in the loop can be very well described in terms of the stationary scalling law (Rosner, Tucker, Vaiana, 1978). From the comparison of the initial and decay phase evolution it is possible to derive the effective geometrical parameters of the flaring loop, provided that the energy is uniformly deposited in the whole flare volume.

For seven flares observed by Prognoz-9 in 1983, we derive the effective flaring loop lengths, areas, volumes and densities. It appears that the flaring loops are elongated structures with typical diameter 1 - 4 arc sec and the length to radius ratio between 20 - 30. The knowledge of the loop geometry allows to study the time variation of the individual terms comprising flare energy balance equation.

The main advantage of the presented simple method of flare analysis is that it bases on easily derived parameters, available from many different instruments flown, for hundreds of flares. It provide us with the information about the flaring loop geometry - the quantity which is not easily available even from specialized observations because the loop diameters are below the resolving power of the instruments in the considered energy range.

The extended version of the paper will be published in the Proceedings of the COSPAR, Toulouse, 1986.

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