DENSITY-TEMPERATURE DIAGNOSTICS OF 31 AUGUST 1980 DOUBLE FLARE

J. Sylwester[1], J. Jakimiec[2], A. Fludra[2], J.R. Leman[3]

[1]Space Research Centre, Polish Academy of Sciences, Wroclaw, Poland,

[2]Astronomical Institute, Wroclaw University, Poland,

[3]Mullard Space Science Laboratory, Dorking, U.K.

EXTENDED ABSTRACT. The double flare event on 31 August 1980 (around 1250 UT) had already gained considerable interest among solar physicists. Strong et al., 1984, presented a detailed description of the event. In the present paper we apply the new method of energy balance analysis LEBAN (Sylwester et al., 1986) to the data collected by HXIS, BCS and FCS instruments aboard the SMM satellite. The evolution of maximum plasma temperature is derived from the ratio of count rates in channels 3 and 1 of HXIS. The mean temperature and emission measure of the hot plasma (above T 8 MK) is derived from fitting the BCS channel 1 Ca XIX spectra. The results are presented in Table 1 for both flares (hot component). Based on the analysis of the FCS images obtained in six X-ray lines, the characteristics of the cold flare plasma component T 3 - 5 MK are derived and given in Table 1.

Results of the performed analysis indicate that both flares comprising the double event are very compact. The effective loop lengths derived within LEBAN are in close agreement with the lengths obtained from deconvolved HXIS and FCS images.

It appears that each of the flares consists of the two magnetically separated plasma components: the cool envelope and the hot core, where the most dynamic processes take place. The diameter of the core loop is of order of 1 arc sec only.

The extended version of the paper is due to be published in Solar Physics. (1987).

Table 1

PARAMETERS OF THE 31 AUGUST 1980 FLARE

	Flare 1	Flare 2
Hot component parameters		
Length of the loop [cm]	7.8+8	6.71+8
Diameter [cm]	7.1+7	1.08+7
Volume [cm^3]	3.11+24	6.14+24
Area [cm^2]	3.98+15	9.15+15
Maximum density [cm^{-3}]	1.38+12	1.76+12
Maximum pressure [$dyne\,cm^{-2}$]	2200	3470
Evaporation velocity [$km\ s^{-1}$]	50	20
Area of the evaporation [cm^2]	2.3+15	1.65+16
Total energy deposited [erg]	1.74+28	1.84+29
The heating rate [$erg\ cm^{-3}\ s^{-1}$]	117	218
Maximum E_{th} [erg]	6.34+27	5.6+28
Cold component parameters		
Diameter [cm]	3.9+8	2.6+8
Volume [cm^3]	3.1+26	1.4+26
Area [cm^2]	4.0+17	2.1+17
Maximum density [cm^{-3}]	1.7+11	3.7+11
Maximum pressure [$dyne\,cm^{-2}$]	110	273
The heating rate [$erg\ cm^{-3}\ s^{-1}$]	1.5	3.5
Maximum E_{th} [erg]	1.0+29	1.1+29

REFERENCES

Strong, K.T., Benz, A.O., Dennis, B.R., Leibacher, J.W., Mewe, R., Poland, A. I., Schrijver, J., Simnett, G., Smith, J.B., Sylwester, J.: 1984, Solar Phys. 91, 325.

Sylwester, B., Fárník, F., Sylwester, J., Jakimiec, J., Valníček, B.: 1986, in Proceedings of COSPAR, Toulouse.