Bull. Astr. Soc. India (1998) **26**, 317-318

CCD observations of eruptive prominence of March 19, 1994

Wahab Uddin, V.P. Gaur and M.C. Pande

U.P. State Observatory, Manora Peak, Naini Tal 236 129, India

Abstract. The observations of a limb prominence (N 26; E 90) were carried out with the help of a Peltier cooled CCD system. In the beginning the prominence was observed as quiescent prominence with compact helical structure. Rise, detwisting and stretching of the helical structure near the top portion of the prominence was noticed at first which later on changed into a funnel shape depicting many bright knots. Then the eruption of the prominence occurred. During eruption, oscillations in velocity (maximum observed velocity 500 km s^{-1}) have been noticed. The prominence had remained perceivable upto a height of about 4×10^5 km.

Key words: CCD observations - eruptive prominence - helical structure.

1. Introduction

Eruptive prominences frequently exhibit helical structure (Vrsnak et al. 1988, 1991; Rompolt, 1991). The helical pattern maybe noticeable in the pre-eruptive phase, although it is more discernable during prominence eruption (Uddin et al., 1995). The helical structure represents the configuration of the magnetic field which is in the form of twisted helical magnetic flux tubes (Hirayama, 1985; van Ballegooijen and Martens, 1990). These configurations form due to electric currents along the prominence.

In this paper we present the study of the eruptive prominence of 19 March 1994. The prominence was observed with the help of a 15 cm, f/15 Coude refractor equipped with Bernhard-Hale Hα filter (passband 0.5/0.7 A) and Peltier cooled AT1 CCD camera.

2. Discussion and results

The selected CCD filtergrams are reproduced in Fig. 1 to demonstrate the successive changes of the structure in the eruptive prominence. The picture at 02:29:26 UT shows the pre-eruptive phase in which the prominence appears almost like a loop (6×10^4 km high) anchored at one end. In the beginning from 02:29:26 UT to 05:14:04 UT it is obvious that prominence rose quite slowly with an average of about 10 km s^{-1}. The structural changes in the prominence are also slow. After 05:14:04 UT to 06:47:12 UT its velocity increased to 50 km s^{-1}. The significant

Figure 1. Some selected Hα filtergrams of the eruptive prominence of 19 March 1994.

changes in the prominence structure can be noticed unambiguously at 06:47:12 UT when the prominence assumed a funnel or chimney like structure or loose helical flux ropes. The measured height was 1.8×10^5 km above the limb. We noticed that stretching and detwisting in the prominence was nonuniform. From 06:47:12 UT its velocity increased rapidly. The highest measured velocity was 550 km s^{-1}. The oscillations in velocity were noticed during eruption. The height was not increasing uniformly which may be due to variations in velocity at different heights. The angle between the prominence axis and the limb increases during eruption. Around 07:30:10 UT when the upper part of the prominence appeared as detached, the prominence was in a dynamic stage. When the upper part showed detwisting, the part near the footpoints showed twisting like a screw with bright knots (cf. figure at 07:30:10 UT). The upper part then moved higher like a smoke and showed loose flux ropes like structure. Finally around 08:10:02 UT, the upper part of the prominence disappeared. The maximum height of the prominence; which we could determine from our filtergrams was 4×10^5 km. From the helically kinked flux ropes like structure and eruption of the prominence it seems that MHD helical kink instability in the prominence maybe the cause of eruption as suggested by Rust and Kumar (1996).

References

Hirayama T., 1985, Solar Phys., 100, 415.

Rompolt B., 1990, Hvar Obs. Bull., 14 (1), 357.

Rust D.M., Kumar A., 1996 ApJ., 464, L 199.

Uddin W., Gaur V.P., Pande M.C., 1995, BASI, 23, 159.

van Ballegooijen A.A., Martens P.C.H., 1990, ApJ. 361, 283.

Vrsnak B., Ruzdjak V., Brajsa R., Dzuber A., 1988, Solar Phys., 116, 45.

Vrsnak B., Ruzdjak V., Rompolt B., 1991, Solar Phys., 136, 151.