HIGH LATITUDE HELICAL SURGE OF MAY 22, 1989

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Abstract. A helical surge (S 72, W 90) was recorded by a monochromatic filter at the University Observatory of Istanbul. It is a significant one at a very high latitude and without any center of activity. A sequence of the filtergrams showed some condensed points from which the motions of the plasma are traced. Different velocities were determined on each of the branches of the helical surge during its evolution. The surge reached its maximum height of 298 000 km and the maximum velocity of this upper region was 250 km s⁻¹.

1. Introduction

Surges were classified by Harrison et al. (1988) as ejections of material which do not achieve the escape velocity and thus return to the solar surface. They also said that the material usually shows evidence of confinement along the magnetic structure in the low corona. Although there are some surges far from spot groups (Kleczek, Kleczková, and Kvičala, 1971), it is known that a high percentage of surges occur close to the edge of sunspot penumbras and many are preceded by flares (Gopasyuk and Ogir, 1963; Rust, 1968; Westin, 1969). It is believed that a surge ejection is due to some sudden change in the distribution of the magnetic field in the active region.

On the other hand, it is known that outside of ±40° solar latitude, the presence of an active center is less common. Therefore, a surge event is not expected in high latitudes.

The surge event that we observed on 22 May, 1989 was a rare example in regard to its location; it occurred at a latitude of S 72, where there was no center of activity. We can only say that the surge may be associated with a quiescent filament which seemed to be near it. However, it was a typical example for a helical surge with a maximum height of 298 000 km.

In this paper we present the observed evolution and observational results of this phenomenon.

2. Observations and Results of Measurements

On May 22, 1989 at 06:27 UT a helical surge (S 72, W 90) was recorded on the west limb of the Sun by a monochromatic Lyot filter which is mounted on a refracting telescope at the University Observatory of Istanbul. The aperture and focal length of the system (telescope + filter) are 12 cm and 232 cm, respectively. During the observation, Kodak Technical Pan 2415 film was used, however only a total of 24 filtergrams showed a suitable measurement and were chosen accordingly. Measurements of con-
densed material of the surge have been made in a system of rectangular coordinates in which the origin was on the solar limb in latitude 72° S, the x-axis was tangent to the solar limb at this point, and the y-axis passed through the origin in the direction of the radius of the apparent solar disk. Measurements have been made on the filtergrams using a mechanical comparator constructed by 'The Gaertner Scientific Corporation'. The errors of measurements are ± 100 km.

When the chromospheric observation of the Sun began at 06:27 UT the event had already started, which we estimated had begun a few minutes earlier. At the beginning of the event we observed that the two branches of the helical surge had wrapped very

Fig. 1. A sequence of Hα observations of the helical surge on May 22, 1989. All the pictures were taken at the University Observatory of Istanbul with an Hα monocromatic filter on 35 mm film of Kodak Technical Pan 2415 at Hα line center.