Poster session I

PROMINENCES

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On Critical Heights and Longitudinal Magnetic Field Strength in Prominences

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Abstract. The distributions of the measured longitudinal magnetic field strength, $B_{//}$, and maximum height observed, h, are presented. 50 Mm, 30–35 G and 50 G respectively are found to be the critical h and $B_{//}$ for the pre-eruption of quiescent prominences.

Keywords. Sun: prominences, Sun: magnetic fields, techniques: polarimetric

1. Histograms on B$_{//}$ and h

The former magnetic measurements by "the Fabry-Perot magnetograph + the 50 cm coronagraph" assembly (Nikolsky *et al.* 1982, Stepanov 1990, Klepikov 1990) with a "magnetic resolution" (the diameter of a pinhole) of $4-8''$ (arc sec) and an accuracy of $3-5$ G are used. When the "magnetic resolution" is ten times worse than the angular one, it is appropriate to use statistical analysis to find h and $B_{//}$ typical for different classes of prominences. The preliminary analysis was made with measurements in 145 prominences observed in 1975–1985 (Kim 1990). Here, an analysis is presented for 312 prominences observed in 1975–1990. Selection of quiescents (Q) was based on the location far from active regions (AR) and the fine vertical structure, activated quiescents (AQ) represent Q with quickly increasing h, active region filaments (ARF) are observed as fine dark filaments in AR at the disk and fine horizontal structures on the limb.

1.1. *Distributions on the longitudinal magnetic fields strengths*

Each of prominences underwent measuring in 3–15 "points", each "point" was measured at least 3 times to determine the averaged $B_{//}$. Fig. 1 (left) shows the histograms of $B_{//}$.

– The upper distribution represents the whole set of 312 prominences. The y-axis indicates the quantity both in %, n (left), and actual number, N′(right). An asymmetry in the distribution and the relatively long "tail" indicate a possible multimodality. $B_{//}$ varies from 0 to 65 G with a significant peak at 10–15 G.

– The Q distribution (N = 159) is the unimodal one with an asymmetric maximum centered at 10 G, and seems to correspond the stability of quiescent prominences.

– The AQ distribution (N = 31) has maxima at $10-15$ G (an initial stage of activation), $30-35$ G, and a broad one centered at 50 G. There is not enough data to estimate the probabilities of the maxima.

– The bimodal ARF distribution (N = 122) has maxima at 10–15 G and about 30 G.

1.2. *Distribution on prominence heights*

To our knowledge, Leroy *et al.* (1984) were the first to identify the maximum prominence height observed, h, as a "magnetic" parameter. Later, Makarov *et al.* (1992) used the idea that the height of prominences characterizes the strength of the background magnetic

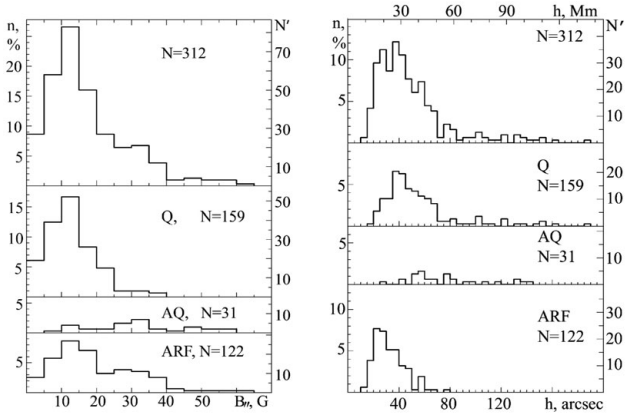

Figure 1. Prominence distributions on $B_{//}$ (left) and h (right).

field. We used the filtergrams of the Fabry-Perot magnetograph to obtain the distribution on h with a step of $5''$. The x-axis in Fig. 1 (right) indicate h in arc sec and Mm.

– The upper distribution represents the whole set. It is a multimodal one with 2 maxima centered at $25''$ and $40''$.

– The Q distribution (N = 159) is a unimodal one with a maximum centered at $40''$ and corresponds to the stability of quiescent prominences.

– The distribution for AQ (N = 31) is a broad one with $h = 40 - 135''$, with the averaged h of $70''$ (≈ 50 mM). We note the agreement with the critical height calculated by Filippov *et al.* (2006) and based on disk observations of filaments and magnetic fields.

– The ARF distribution (N = 122) is a unimodal one with a maximum at $20 - 30''$.

2. Summary

The above mentioned allows us to determine the averaged $B_{//}$ and h typical for different classes of prominences: $B_{//} = 10$ G and $h = 40''$ for the stable Q; $B_{//} = 30 - 35$ or 50 G (depending on the latitude) and $h = 70''$ (≈ 50 mM) for activated or pre-erupting Q; $B_{//} = 10 - 15$ G or 30 G (depending on the latitude) and $h = 20 - 30''$ for ARF.

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