The Evolution of Barbs of a Polar Crown Filament Observed by SDO

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Abstract

From 16 to 21 August 2010, a northern (∼N60) polar crown filament was observed by *Solar Dynamics Observatory* (SDO). Employing the six-day SDO/AIA data, we identify 69 barbs, and select 58 of them, which appeared away from the western solar limb (≤W60), as our sample. We systematically investigate the evolution of filament barbs. Three different types of apparent formation of barbs are detected, including i) the convergence of surrounding moving plasma condensations, comprised 55.2 % of our sample, ii) the flows of plasma condensations from the filament, comprised 37.9 %, and iii) the plasma injections from the neighboring brightening regions, comprised 6.9 %. We also find three different ways that barb disappear, involving: i) bi-lateral movements (44.8 %), and ii) outflowing of barb plasma (27.6 %) results in the disappearance of a barb, as well as iii) disappearance of a barb is associated with a neighboring brightening (27.6 %). The evolution of the magnetic fields, *e.g.* emergence and cancellation of magnetic flux, may cause the formation or disappearance of the barb magnetic structures. Barbs exchange plasma condensations with the surrounding atmosphere, filament, and nearby brightenings, leading to the increase or drainage of barb material. Furthermore, we find that all the barbs undergo oscillations. The average oscillation period, amplitude, and velocity are 30 min, 2.4 Mm, and 5.7 km s–1, respectively. Besides the oscillations, 21 (36 %) barbs manifested sideward motions having an average speed of 0.45 km s–1. Small-scale wave-like propagating disturbances caused by small-scale brightenings are detected, and the barb oscillations associated with these disturbances are also found. We propose that the kinematics of barbs are influenced or even caused by the evolution of the neighboring photospheric magnetic fields.

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