

Spicule dynamics over plage region

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Abstract. We studied spicular jets over a plage region and derived their dynamic characteristics using HINODE Solar Optical Telescope (SOT) high-resolution Ca II H images. The observations were made from 22:05 UT to 23:59 UT on 2007 August 14 with a fixed cadence of 45 sec and an exposure time of 0.15 sec. The spatial pixel size was 0.109. The target plage region was near the west limb of the solar disk. This location permitted us to study the dynamics of spicular jets without any effects from the overlapping of spicular structures. In this work, to increase the accuracy with which we can identify spicules on the disk, we applied the image processing method “MadMax” developed by Koutchmy et al. (1989). It enhances fine, slender structures (like jets), over a diffuse background. We identified 169 spicules over the target plage. This sample size permits us to derive statistically reliable results regarding spicular dynamics.

The properties of plage spicules can be summarized as follows: (1) In a plage area, we clearly identified spicular jet features. (2) They were shorter in length than the quiet region limb spicules, and followed ballistic motion under constant deceleration. (3) The majority (80%) of the plage spicules showed a full rise and retreat (which we call ‘parabolic’ spicules), while 10% of them faded out without a complete retreat phase (which we call ‘fade out’ spicules). (4) The deceleration of the spicule was proportional to the velocity of ejection (i.e. the initial velocity).