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Spicules and their role in the transition region and corona

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Abstract. We use a variety of data including CRISP images at the Swedish 1m Solar Telescope, Hinode/SOT BFI and NFI images, Hinode/EIS spectra and TRACE and XRT coronal images to study the sometimes subtle but significant effects that chromospheric spicules have on the momentum and energy balance of the transition region and corona. The CRISP and Hinode/NFI data for the first time reveal the disk counterparts of the rapid, short-lived type 2 spicules that were recently discovered at the limb with Hinode. Their rapid disappearance from the chromospheric passbands (H-alpha, Ca II H 3968 A and Ca II 8542 A) and correlation with blueward asymmetries of TR and coronal line profiles (with EIS) at high speeds (50-150 km/s) suggest that a fraction of the spicular matter is accelerated and heated to TR and coronal temperatures, in an episodic, sometimes quasi-periodic manner. These upflows are also visible in TRACE and XRT imaging data as faint, episodic, "blobs" of plasma that are propelled upward along coronal loops. We show that these quasi-periodic upflows can be difficult to distinguish from the slow-mode magnetoacoustic waves that have been reported with coronal imagers and, more recently, Hinode/EIS.
Our results suggest that a significant part of the heating and energizing of the corona may occur at chromospheric heights, in association with chromospheric jets.