Numerical Simulations of the Generation of Type II Spicules

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All over in the lower solar atmosphere, the corona is permeated by chromospheric jets, in which plasma is propelled at speeds of 50-150 km/s (so-called type II spicules). We perform numerical simulations using the Bifrost code. We find that type II spicules naturally occur in self-consistent simulations only when we combine full radiative MHD, with ion-neutral interaction effects, large scale magnetic connectivity, all at high enough spatial resolution to resolve the small-scale processes in the solar atmosphere. The ion-neutral collision frequency is computed using recent studies that improved the estimation of the cross sections under chromospheric conditions (Vranjes & Krstic 2013). Self-consistently driven jets (spicules type II) in magnetohydrodynamic simulations occur ubiquitously when magnetic tension is confined and transported upwards through interactions between ions and neutrals. The formation of type II spicules release flows, heats the upper chromosphere, and generates, both, acoustic and alfvenic waves.