Spicule Formation and Coronal Heating by Nonlinear Alfvén Waves Driven by Observed Photospheric Motion

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Spicules are generally observed at the solar limb as jet like structures in the chromosphere. On disk counterparts of spicules are dark fibrils and bright/dark mottels. Since spicules exist ubiquitously, their dynamics plays a key role in determining the chromospheric structures. Moreover formation mechanism of spicules is deeply related with chromospheric and coronal heating. Therefore, spicules are one of the most important topics in solar physics.

There are various models for spicule formation such as p-mode leakage, magnetic reconnection, and Alfvén wave models. Among them, we will show the recent progress on Alfvén wave models using observation of granular motion [1]. The existing Alfvén wave models usually assume the wave power although spicule dynamics are sensitive to the wave power. In this study, we derive the photospheric horizontal velocity spectrum by using Hinode/SOT G-band movies and input the spectrum to MHD simulations. As a result, spicule dynamics and coronal heating are well explained by Alfvén wave models. Moreover we have found that the region between the photosphere and the transition region becomes an Alfvén wave resonant cavity.

References

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