

# NONLINEAR ALFVÉN WAVE MODEL OF SPICULES AND CORONAL HEATING

**T. Kudoh**

*National Astronomical Observatory of Japan, Mitaka, Tokyo 181-8588,  
Japan*

We have a review about the theoretical studies of the Alfvén wave model of spicules and coronal heating, mainly based on the papers by Kudoh & Shibata (1999), Saito et al. (2000) and Moriyasu et al. (2004) which performed MHD numerical simulations of nonlinear Alfvén waves propagating along a magnetic flux tube in the solar atmosphere. Kudoh & Shibata (1999) and Saito et al. (2000) found that, if the root mean square of the perturbation is greater than  $\sim 1 \text{ km s}^{-1}$  in the photosphere, (1) the transition region is lifted up to more than  $\sim 5000 \text{ km}$  (i.e., the spicule is produced), (2) the energy flux enough for heating the quiet corona ( $\sim 3.0 \times 10^5 \text{ ergs s}^{-1} \text{ cm}^{-2}$ ) is transported into the corona by Alfvén waves. Moriyasu et al. (2004) demonstrated that a hot corona is created in an initially cool loop as a result of the nonlinear Alfvén waves produced near the photosphere. We conclude that the nonlinear Alfvén waves are the promising origin of coronal heating and spicules.