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MHD simulation of Alfvén wave propagation in magnetized solar chromosphere: effect of mode coupling on solar chromosphere heating.

Yikang Wang[1], Takaaki Yokoyama[1]
[1] Department of Earth and Planetary Science, The University of Tokyo

We perform magnetohydrodynamic simulation to investigate propagation of Alfvén wave in solar chromosphere. We use 1.5-dimensional expanding flux tube geometry setting and transverse perturbation at the bottom to generate Alfvén wave following Matsumoto & Shibata (2010) and Kudoh & Shibata (1999). Comparing with previous studies, our expansion is that we include radiative loss term introduced by Carlsson & Leenaarts (2012). We find that the inclusion of radiative loss term has a minor effect on wave energy flux in the corona. When an observational-based transverse wave generator is applied, we find that the spatial distribution of the time-averaged radiative loss profile in the middle and higher chromosphere in our simulation is consistent with VALC (Vernazza et al. 1981) model. In addition, wave flux in the corona is larger than 3×10^5 erg s^{-1} cm^{-2} , which is the averaged required value for quiet sun coronal heating. Our study shows that Alfvén wave driven model has the potential to explain chromospheric heating and transport enough energy to the corona simultaneously.

References

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