M12a Radiative loss and temperature in magnetic chromosphere with 1.5D MHD simulation

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Classic static solar atmospheric model indicates higher temperature (around 6000 K) in the chromosphere while previous dynamic non-magnetic atmospheric model suggests that higher temperature in the chromosphere is not necessary for reproducing emission line. In addition, lower chromospheric temperature also appears in other non-magnetic chromospheric models (Kalkofen 2010). On the other hand, dynamic chromospheric model in magnetic region has not been well discussed before. There are advanced 3D radiative MHD simulations but they are too complex to reach a clear understanding of the underlying process. In our study, we carry on 1.5D MHD numerical simulation with realistic radiative loss introduced by Carlsson & Leenaarts (2012). In our simulation, we assume an expanding flux tube geometry mimicking the chromosphere above network region. Alfvén wave is initiated by transverse motion near the lower boundary which has a power spectra consistent with observation. Simulation result suggests that spatial distribution of radiative loss profile is consistent with classic model. However, time averaged temperature in the chromosphere is apparently lower than that in classic model. We find that as sudden increase of radiative loss occurs at shock front leads to enough radiative loss, low temperature region between shocks dominates most of the time which leads to lower time averaged temperature in the chromosphere.