M15c A unified model of solar prominence formation

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There are several mechanisms explaining the formation of a solar prominence, among which the evaporation-condensation model and direct-injection model are the most popular ones. In the evaporation-condensation model, the hot plasma evaporated from the chromosphere suffers from catastrophic cooling due to thermal instability or thermal non-equilibrium, and condensates to become a prominence. In the direct-injection model, the cold plasma at the bottom of the chromosphere is ejected into the corona along the magnetic field lines dynamically. In our previous work using 1-dimensional hydrodynamic simulation, the two models are unified by distinguishing the height of the in-situ localized heating. If the localized heating heats the upper chromosphere, the local cold plasma will be heated to millions of kelvins and evaporated into the corona, and finally condensates as a prominence, such process is manifested as evaporation-condensation model. If the localized heating happens in the lower chromosphere, the cold plasma above will be ejected by the gas pressure and move up to the corona, such process is manifested as direct-injection model. In this work, we performed a 2D-MHD simulation, which replaces the manual localized heating with magnetic reconnection triggered by ephemeral magnetic field near the footpoint of the background coronal magnetic field. The rationality of our unified model is further stated, and we analyzed the reason and consequence of the different height of magnetic reconnection. Additionally, we discussed about the coronal rain events included in our simulation results. The paper is in preparation.