2nd Asia-Pacific Conference on Plasma Physics, 12-17,11.2018, Kanazawa, Japan MHD simulations on the formation of filament threads

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Abstract

Solar filaments are dense and cool plasma suspended in the solar corona. They are thought to be composed of threadlike fine structures tracing magnetic field lines, which has been confirmed by recent high-resolution observations. However, the origin of these fibril structures has not been fully understood yet. Since magnetic fields are believed not to be dramatically non-uniform in the solar corona, mechanisms explaining such an inhomogeneous distribution of filament threads are required. Traditional theories can be divided into two types, namely, models based on the contribution of the thermal conduction perpendicular to the magnetic field and models based on the contribution of magnetic Rayleigh-Taylor instabilities. Both of them are based on linear theory, but have some limitations. In this poster, we propose a new model to explain the formation of fibril structures, based on the stochastic heating at the bottom of solar atmosphere. A two-dimensional (2D) MHD simulation has been performed to confirm the feasibility of this model. Some observational features of the fibril structures obtained in the simulation, including the typical width, lifetime, and velocity, will be compared with recent observations and MHD simulations. Besides, comparison is made between our models and the traditional models.