M16c Three dimensional simulation of solar prominence formation driven by implusive localized heating

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Solar prominences are cool, dense plasma structures suspended in the hot corona. Their formation and evolution are closely linked to thermal instability, mass circulation, and coronal magnetic field dynamics, making them crucial for understanding solar atmospheric processes and space weather. In our previous studies primarily based on 1D and 2D numerical simulations, we came up with a self-consistent model that explains the two most popular models for prominence formation, which are evaporation-condensation model and direct-injection model in a single framework, as a formation process driven by impulsive energy deposition at the footpoint of the prominence magnetic structures. However, previous studies mainly focus on individual prominence threads formed in magnetic sheared arcades, but lack a comprehensive understanding of the complete prominence structure formed in magnetic flux ropes. To address these gaps, this research will employ 3D MHD simulations based on previous models. A strong localized heating pulse originated from a microflare is set at the footpoint of a magnetic flux rope in the solar atmosphere. This event will lead to the formation of a prominence in the magnetic structure. This work intend to investigate the collective behavior of prominence threads, their interactions, features of the footpoint localized heating and the formation of fine structures like barbs. This work aims to extend current models, provide deeper insights into prominence dynamics, and bridge the gap between theoretical predictions and observational appearance.