Contribution ID: **53** Type: **not specified**

How flux rope heating models affect solar prominence formation.

Tuesday 31 May 2022 11:30 (15 minutes)

Prominences are cool, dense plasma clouds found in the optically thin solar corona, which makes them classical examples of condensations due to thermal instability. The levitation-condensation mechanism has been used in simulations to explain prominence formation in a flux rope, which is created through shearing and converging motions of coronal loop footpoints. These simulations employ two classes of background heating models for the solar corona: models based on scaling laws in which the heating rate depends on local parameters like density and magnetic field strength, and models with a steady background decaying exponentially with height. Two problems arise: heating based on local parameters only produces conditions favourable to in-situ condensations in case the flux rope is formed through anti-shearing motions, while an exponentially dropping heating rate ignores the complex flux rope structure consisting of field lines twisted around a central 'spine'. We present a parametric study of these two different heating prescriptions in 2.5D simulations of prominence formation through levitation-condensation with the code MPI-AMRVAC. Additionally, we propose a unified, new and dynamic heating model by identifying the flux rope during runtime and reducing the internal heating rate, as to mimic the 3D structure of the flux rope. The plane-projected flux rope structure is modelled as an ellipse centred in the flux rope centre, which is tracked using a method based on magnetic field curvature. It turns out that the two classes of heating models lead to morphologically distinct prominences. Furthermore, flux ropes with reduced heating rates produce considerably larger and more massive condensations, an essential ingredient to bridging the gap between simulation and observation. Finally, a look at the evolution of the phase space distribution provides insight in the condensation process and subsequent recovery of force balance.

Presenter: BRUGHMANS, Nicolas (KU Leuven)

Session Classification: Parallel session