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Probing chromospheric fine structures with an Hα proxy using MURaM

The solar chromosphere consists of poorly understood, dynamic fine structures. In this work we use the MURaM code, which has recently been updated to include the NLTE physics required to treat the chromosphere. Our flux emergence simulations of an enhanced network element show finely structured chromospheric features, akin to the rapid red and blue shifted excursions (RREs and RBEs) observed in the wings of the Hα line and dynamic fibrils detected in the line core. Using a proxy for Hα, we identify features in the line wings. We find numerous fine structures detected by the proxy to be rooted at the network patches, similar to observations in Hα. These ubiquitous features could play a crucial role in mass and energy supply to the corona. The dynamics of one such feature (RBE) at a Doppler shift of 37km/s shows that flux emergence and consequent reconnection events drive the formation of this feature. Lorentz forces further expand the field and compress the plasma locally. This drives a flow along the field line carrying the feature, making it behave like a jet. It forms in the mid chromosphere (2-4 Mm above the solar surface) and has a lifetime of 240s. It has a maximum length of 5Mm and also shows lateral displacement during its lifetime. There is strong viscous and resistive heating at the birth of the feature which propagates a heating front at alfvenic speeds.

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