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Investigating transition region explosive events in a quiet-Sun model

Explosive events are characterized by non-Gaussian profiles of the emission lines formed in the transition region. Traditionally, the spectra from explosive events with enhanced wings have been explained by reconnection of oppositely directed magnetic field. We used a 3D radiation MHD model to investigate if this 2D picture also holds in a more realistic setup of a quiet Sun simulation. For this, we located profiles of Si IV synthesized from the model that show signatures of bi-directional flows. The events we identified by this are consistent with observed explosive events in that they are clustered around the edges of the network and are (mostly) not heated to coronal temperatures. We examined the magnetic field structure in and around some of these explosive events and find that the majority of these does not show oppositely directed magnetic field that is reconnecting. Instead, mostly the field lines reconnect at small angles, i.e., they undergo component reconnection. Even though these explosive events do not reach coronal temperatures, they share the same magnetic setup as we found before for transient coronal brightenings, sometime referred to as campfires. This could imply that the only major difference between an explosive event and a campfire is the amount of converted magnetic energy and the density in the reconnection region. Still, we will further explore the current simulation and new models with more flux emergence and cancellation to investigate if our current results also hold in a more general setup.

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