Talk at Splinter Meeting

Splinter K

IRIS observations and simulation of explosive events in the transition region of the Sun

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Small-scale explosive events on the Sun are thought to be related to magnetic reconnection. While Petschek reconnection has been considered as a reconnection mechanism for explosive events on the Sun for quite a long time, the fragmentation of a current sheet in the high-Lundquist-number regime caused by the plasmoid instability has recently been proposed as a possible mechanism for fast reconnection. The actual reconnection sites are too small to be resolved with images but these reconnection mechanisms, Petschek and the plasmoid instability, have very different density and velocity structures and so can be distinguished by high-resolution line profiles observations. We use high-resolution sit-and-stare spectral observations of the Si IV line, obtained by the IRIS spectrometer, to identify sites of reconnection, and follow the development of line profiles. The aim is to obtain a survey of typical line profiles produced by small-scale reconnection events on the Sun and compare them with theoretical line profiles of reconnecting current sheets to determine whether reconnection occurs via the plasmoid instabilty or the Petchek mechanism. To make direct comparison with IRIS observations, we set up a numerical experiment with a current sheet under high Lundquist number and use the simulation result to construct synthetic line spectra of the current sheet. The synthetic line spectra agree qualitatively with IRIS observations, suggesting that the plasmoid instability is a possible explanation for observed line spectra of the explosive events.