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## **A multi-wavelength study of a X9.3-class chromospheric flare ribbon, and the overlooked line profiles it contains**

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We used  $H\alpha$ , Ca II 8542, Ca II K line and Ca II K continuum point observations of an X9.3 flare on Sept 6th 2017 from the Swedish Solar Telescope and, where possible, hard X-ray maps from RHESSI to describe the morphology and evolution of a flare ribbon. This highlighted systematic variations of the line profiles over photospheric features including granulation, light bridges, penumbral, and umbral features such as umbral bright points, as well as a set of curious elongated features over Sunspot umbrae that may be the flare equivalents of umbral fibrils.

Moreover, small kernels of extremely broad, highly Doppler-shifted flare profiles have been reported in chromospheric line profiles since the mid-1900s. In the flare presented there were many emission profiles showing monotonically increasing intensity against wavelength, throughout the entire Fabry Perot etalon spectral windows. These occurred in both Calcium and Hydrogen lines. When faced head-on, these profiles imply something uncomfortable about the standard conceptions of chromospheric physics in flares. Modern instruments have also been designed in ways that coincidentally conceal this omission.

Plausible explanations of the broadening of these profiles include that there could be parts of the flare ribbons emitting in lines such as  $H\alpha$  and Ca II 8542 that are much hotter than is being discussed. There could also be an exacerbation of the persistent underestimation of chromospheric line widths from forward modeling of non-flaring atmosphere. There may also be other explanations, such as alternative methods of energy transfer. We present warts-and-all observational evidence from chromospheric spectral lines during flares in order to force the evaluation of plausible explanations, to highlight future observation possibilities that could resolve these issues, and to invite insights from the wider solar community.

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