The chromospheric source of explosive events

Werner Curdt[1],

[1]Institute for Solar System Research

Contact: [curdt@mps.mpg.de]

In a recent paper Doyle et al. (A&A 439, 1183) report on the different manifestation of explosive events in the O V λ 629 and the N V λ 1238 emission lines. Despite of their almost identical formation temperature, many events can 'much easier be identified in N V, while they are practically absent in O V'. Doyle and co-workers try to explain this phenomenon with differences in the atomic physics in the excitation of both ions, and which seem to be more effective at higher (chromospheric) densities. They suggest a chromospheric source for those events, which show this behaviour and they support this evidence by the observed Si II brightening which goes together with these events.

The spectral band 7b will allow simultaneous observation of transition region emission in various lines. It will specifically allow observation in Si II, Si III and Ly-alpha emission, thus covering an interesting temperature range for this type of events. In addition, it will allow very accurate co-alignment with VIM data applying continua rasters (cf., science case photosphere to TR linkage for details) and with EUI Ly-alpha channel data. Thus we can hope to reveal not only key parameters like height and temperature of these events, but also to understand their connection to the underlying magnetic field.

EUS instrument requirements

1. Emission line requirements

Chromospheric to TR lines, like Si II, Si III, O V, N V, Ly-alpha.
Need also a section of Si I or C I recombination continuum, free of emission lines.

2. Spectral resolution requirements

continuum: N/A
Si II, Si III, N V, O V: need at least 5 km/s resolution

3. Spatial coverage

A supergranular cell, to be able to see the chromospheric network (i.e. 200 x 100 arsec at perihelion) for the rasters to be taken every 30 minutes. Most of the time (25 out of 30 minutes) sit-and-stare in the middle of the context raster.

4. Time resolution (incl. count rates)

Need good time resolution, since we are looking at small structures. An exposure time of 3s will result in a 5 minute raster, which should be ok and in compliance with the telemetry rate. 3 s will also provide a sufficient time resolution in sit-and-stare mode even for smaller dynamic events.

5. Requirements for other instruments

Need VIM filtergrams and vector-magnetograms to see the photospheric context. Need also EUI hires Ly-alpha images to see the overall dynamic behaviour of the chromospheric plasma and the large-scale chromospheric context.

6. Other requirements

n/a

Relation to Solar Orbiter science goals

1. Determine the properties, dynamics and interactions of plasma, fields and particles in the near-Sun heliosphere

n/a

2. Investigate the links between the solar surface, corona and inner heliosphere

We will be able the study the origin and the dynamic and development of explosive events. We will hopefully also be able to understand their connection to the photospheric magnetic field.

3. Explore, at all latitudes, the energetics, dynamics and fine-scale structure of the Sun's magnetized atmosphere

Cf., 2.

4. Probe the solar dynamo by observing the Sun's high-latitude field, flows and seismic waves

n/a