Energetic electrons in the corona

X-ray and radio observations of the long duration flare on 9 May 2021

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The 9 May 2021 event: a long duration flare observed from multiple viewpoints.











New positions of HXR sources in the long duration phase

Consistent with the evolution of the features Seen in EUV





EUV observations of the active region



Spatial evolution of HXR sources

13:57-13:58

Evolution of X-ray and radio sources during the impulsive phase



Evolution of radio sources close to EPD onset?

Electron event EPD Solar Orbiter Electron injection time UT@SOLO: Time shift analysis: 13:58:05 UT@SOLO Velocity dispersion analysis : 13:56:36 UT@SOLO +44 s for ground-based data comparison



Associated electron event





Evolution of X-ray and radio sources during the gradual phase

AIA 304





Different positions of radio sources in the gradual phase as compared to the first phase.

220 MHz 271 MHz 299 MHz 327 MHz 408 MHz M

Many radio fine structures are seen in the gradual phase produced at different locations.

It suggests continuous energy release and electron acceleration at many sites (reconnection of large scale evolving magnetic structures with preexisting magnetic fields?







Spectral characteristics of HXR emissions?



Evolution of thermal and non-thermal X-ray emissions

The X-ray thermal source changes of size and shape in the course of the gradual phase. It suggests continuous heating (energy release). The increase of the emission measure (see figure on the right) could be due to the increase of the emitting volume.

Non-thermal HXR sources are detected in some images in the gradual phase Some changes of HXR non-thermal emissions are close to changes of radio positions (see e.g. around 14:36)

All these observations suggest continuous and complex energy release in the active region during the long duration phase.

from FERMI/GBM observations

