

Hard X-ray source related with a plasma ejection in solar flares

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In most of impulsive solar flares that occurred near the solar limb, a hot-plasma ejection was observed above the soft X-ray loop. This is one of evidence that magnetic reconnection takes place above the flare loop. At the same time, in some cases, a looptop impulsive hard X-ray source is observed above the flare loop. This also indicates that the flare energy release, probably magnetic reconnection, occurs above the loop, and it is believed that this hard X-ray source is closely related with the downward reconnection flow. Is there any observational phenomenon related with the upward reconnection flow?

Recently, it is found in a few impulsive solar flares that a new type of compact hard X-ray source is located well above the impulsive looptop source. In these events, a hot-plasma ejection is observed in soft X-rays, and the new-type of hard X-ray source is located just at the lower edge of the ejection. This hard X-ray source might be related with the upward reconnection flow or high energy electrons accelerated upward near the reconnection site. That source shows a steeper spectrum than that of the footpoint source and is located at a higher altitude in a higher energy band. The simple interpretation of this result is that the electrons, which are accelerated between the plasma ejection and the flare loop, impinge on the ejected plasma and hard X-rays are emitted there by Bremsstrahlung. However, there is a large difference between the target density estimated from hard X-ray observations and the plasma density of the ejection obtained from soft X-ray. This is one of the remaining problems to be solved in the future.