Derivation of the 3D Structure of Flares in the Homologous Flare Series of 1992 February

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In order to undestand the mechanim of arcade type flares, it is important to determine its 3D magnetic tructures. In the active region NOAA7070, three arcade type flares which we consider to be a homologous flare series occured. These flares occurred on 21-February-1992, 24-Febtuary-1992 and 27-February-1992, respectively, and observed by the Yohkoh SXT. If the events are homologous, we can examine the corresponding features seen from different angles, and can discuss their 3D structures. Thus we use the time scale normalized by the duration for each flare and define flare phases to compare the corresponding features in the series of events. We also used Kitt Peak Magnetograms and Mitaka Hα images for analysis.

According to these analyses, we could say that this flare series actually constitutes a homologous series. We also obtained many new and remarkable findings that need explanations. Thus, we could discuss 3D structures of these arcade flares from these results and show their 3D configration which can explain these findings remarkablly well.

The remarkable points we have found are summarized as follows:

(i) The line of sight to flare cusp of 21-Feb-1992 was considered to be along the axis, but it was 45 degrees or so different from the direction of the axis of flare arcade. Furthermore, in the early stage of the flare, the cusp was only one loop like structure over the one of the diagonal line of the flare arcade that apper at later stage.

(ii) 4 magnetic sources participate in the coronal structures that will produce the flare.

(iii) In the disk events of 24-Feb-1992 and 27-Feb-1992, we can see the soft X-ray flare arcades at its decay phase by the Yohkoh SXT, but in the magnetograms at the footpoints of the arcades, there are no special features suggestive of the formation of the soft X-ray flare arcede there.

(iv) In the pre-event phase of 21-feb-1992, we found that the expansion of the high altitude faint loop on both sides precedes, and pulled out the X-ray blob.

(v) Examining the magnetograms for the series of events, we could hardly find any systematic long-distance footpoint shearing motion.

We will discuss those in more detail at the Conference.