Large-Scale Shining Chains on the Solar Disk: Yohkoh/SXT, SOHO/EIT and TRACE Data

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The discovery of the large-scale microwave shining chains on the modified Nobeyama radio heliograms (see Chertok and Shibasaki 1998, this Symp.) stimulated the similar analysis at first of the Yohkoh/SXT and SOHO/EIT images and recently of the TRACE images as well. It turned out that the large-scale shining chains in the EUV (especially) and soft X-ray ranges are still more typical and pronounced than at microwaves.

Rather often the bright points are not scattered chaotically through the solar disc, but are aligned at definite structures forming large-scale chains and treads of various (sometimes very puzzled) configurations. The EUV and soft X-ray chains consist of bright points of smaller sizes in comparison with the blobs in the microwave chains. Their typical sizes are a few tens of arcseconds, and the life-time is several hours. Usually the spatial interval between the neighbor bright points is of several times larger than their sizes. There are examples, in which almost continuous thin shining threads rather than the bright point chains are observed.

The reality of these chains and threads is confirmed by the fact that in many cases their form and location coincide on the EUV and soft X-ray images and sometimes also on some ground-based images, including Nobeyama radio heliograms.

Similar to the microwave chains, the EUV and soft X-ray chains and threads seem to be related to CMEs. They display very strong evolution at the time scale of hours, especially in the CME-associated events. However, the question on the character of the relationship between the EUV and soft X-ray chains and CMEs (post-CME energy release) appears to be opened.

One more strange feature of the analyzed chains and threads (which, however, should be also verified carefully in the course of the further studies) is that they seem to cross such essential large-scale structures as the reverse polarity lines of the magnetic fields, filaments, coronal holes and so on.

As preliminary consideration shows, sometimes the dark (i.e. absorption) thin large-scale threads are also observed on the disk. Perhaps some of them transform later into the shining threads or chains.

At present, it is not clear to what extent the microwave blob chains and the EUV/X-ray chains of bright points are the same phenomenon.

It is obvious that the discovered chains reflect some unknown peculiarities of the organization and evolution of just the large-scale magnetic fields, which should be studied in the course of the further analysis. Apparently, the prolonged energy release, occurring under such an evolution (including the process of CMEs and the post-eruption relaxation of the magnetic fields), initiates a plasma heating in the wide temperature range (from tens of thousands to millions of degrees), which takes place, on the one hand, in sufficiently compact local elements corresponding to the individual bright points, and, on the other hand, in some selected, globally organized magnetic structures corresponding to the observed large-scale chains.

The overall analysis of these new interesting phenomena and especially detailed comparison with other images and magnetograms are in progress.