Solar large-scale chains: some events associated with halo coronal mass ejections

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Some features and evolution of the large-scale EUV chains in several halo coronal mass ejection (CME) events are considered proceeding from the SOHO/LASCO and SOHO/EIT data. Halo CMEs are chosen because they are associated with considerable perturbations in the solar magnetosphere and originate as a rule from the central sector of the solar disk. It allows one to trace development of the chains and other accompanying activity at the large area around a CME source. Moreover, just halo CMEs result in the most significant nonrecurrent geospace disturbances and therefore they are of a great interest from the space weather point of view. In particular, a number of spectacular events accompanied by the coronal waves, dimming, as well as by the solar proton flux enhancements and geomagnetic storms are analyzed. For each event, the modified images and movies mainly in the Fe XII line at 195 $\mathring{A}$ were formed and investigated.

The analysis of these materials confirms our previous assumptions and conclusions concerning the evolution of the chains in the global solar magnetosphere and their relations to CMEs. Particularly, it is obvious that the chains connect all remote active regions and centers, including ones located in different solar hemispheres on the both sides from the helioequator. It means that the global solar magnetosphere exists really. The features of the chain appear to support the assumption that the chains can particularly light up separators and quasi-separatrix layers forming on the boundaries of different interacting and reconnecting large-scale magnetic flux systems. Therefore the chains can be considered as an indicator of the evolution and restructuring of the global solar magnetosphere.

The chains demonstrate clearly that the flares and/or filament eruptions, which are considered usually as sources of the corresponding halo CMEs, indeed are only a part of a much more large- scale (or even global) activity covering often the whole solar disk.

The significant chain evolution takes place usually during many hours both before and after a CME eruption. The chains preceding CMEs appear to display energy release resulting from evolving large-scale magnetic structures at the stage when the development of these structures approach to a CME eruption. The chains following CMEs can result from the post-eruption energy release when magnetic fields in an extended region of the corona, strongly disturbed by a CME eruption, relaxes to its initial state via magnetic reconnection in large-scale coronal current sheets.

Generally, the chains appear to outline the large-scale coronal structures involved in the processes of the CME eruption and post-eruption energy release. The observed relations between chains and CMEs seem to be due to that the both phenomena are ultimately consequences of the evolution of large-scale magnetic fields and have often a global character. The relevant images and movies are available at the web site
http://helios.izmiran.troitsk.ru/lars/Chertok/