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AN ATTEMPT TO CLASSIFY SOLAR MICROWAVE-BURSTS BY SOURCE LOCALIZATION CHARACTERISTICS AND DYNAMICS OF FLARE-ENERGY RELEASE

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Abstract

An overview of spatially resolved observations of solar radio bursts obtained by the Siberian Solar Radio Telescope at 5.8 GHz during the last ten years reveals the occurrence of different classes of burst emission defined by their source localization characteristics. Four major classes of bursts according to the source position relative to sunspots, the source size and structure, and the source height, could be tentatively distinguished and compared with burst spectral characteristics as well as with soft X-ray emission oberved by YOHKOH. These findings are in favour of a magnetic origin of the underlying flare process.

1. Introduction

It is anticipated that the consideration of topological microwave-burst source characteristics may help to get a deeper insight into the related physical processes of coronal energy release which, due to the lack of observations with sufficient spatial resolution, was hindered for many years before. The present study makes an attempt to include geometrical source characteristics in a burst classification scheme based on spatially resolved observations.

K. Koyama et al. (eds.), The Hot Universe, 205-206.

2. Observations

We used the observations of the large cross-type Siberian Solar Radio Telescope (SSRT) operating at 5.2 cm wavelength (5.8 GHz) (cf., e. g., Smolkov et al., 1986). For the present purpose daily observations obtained by the E-W arm of the instrument have been considered. The time and space resolution at local noon (about 05 UT) are 2 min 15 sec and 17″, respectively.

3. Topological classes of microwave bursts

A systematic inspection of daily observations of the SSRT during 1984–1994 revealed regularities of the burst sources stimulating the attempt of a classification scheme of microwave bursts according to the source topology and related properties determining four groups of bursts:
Group 1 comprises rather strong microwave bursts situated in the vicinity of large sunspots (distance d to sunspots less than about 20″). These events are signatures of strong energy dissipation in the deep corona.
Group 2 ($d \approx 1'$) signifies moderate energy release in higher reaching flare loops (altitude h up to about 100 000 km) lasting a few hours.
Group 3 is indicative for energy storage in between main sunspots with timescales up to several hours occurring typically before the onset of large flare events ('preheating').
Group 4 comprises smaller, compact microwave sources in active regions characterized by no or only weak sunspots.

4. Conclusions

The groups of microwave bursts given above indicate a certain connection between the burst characteristics and the position of the burst source relative to the site of sunspot-magnetic fields. These findings support the magnetic origin of the released flare energy similar as found, e. g., by Nishio et al. (1997). A more detailed description will be published elsewhere.

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