Comparative analysis of type III and fiber solar radio bursts before and during CME propagation

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Abstract

The general context of the present paper is to develop radio diagnostic tools for CMEs, which can work in combination with standard optical observations. Aims. The main goal is to analyze radio observational signatures of the dynamical processes in solar corona. In particular, to perform a dependence analysis of decameter radio emission data on local plasma parameters before and during CME propagation. In order to achieve this goal, we focus on the analysis of (in total 429) type III and (in total 129) fiber radio bursts. We study their main characteristic parameters such as their drift rate, the duration and instantaneous frequency bandwidth of these radio events using standard statistical methods. Furthermore, we infer local plasma parameters (e.g. density scale height, emission source radial sizes, emission spectrum width, etc.) using definitions of duration and instantaneous frequency bandwidth. The analysis reveals that the physical parameters of coronal plasma before (quiet period) considerably differ from those during the CMEs propagation (the periods of type IV radio bursts). Local density radial profiles and the characteristic spatial scales of radio emission sources vary more drastically during the CME propagation compared to quiet periods. The latter result may indicate the presence of coronal dimming, which is associated with CMEs and other eruptive events.The results of the work enable to distinguish different regimes of plasma state in the solar corona during the two considered periods. Our results create a solid perspective for the development of novel tools for coronal plasma studies using CME radio dynamic spectra.