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Microwave emission as a proxy of CME speed in ICME arrival time predictions

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The propagation of a coronal mass ejection (CME) to the Earth takes between about 13 hours and several days. Observations of early radiative signatures of CMEs therefore provide a possible means to predict the arrival time of the CME near Earth. The fundamental tool to measure CME speeds in the corona is coronography, but the Earth-directed speed of a CME cannot be measured by a coronagraph located on the Sun-Earth line. Various proxies have been devised, based on the coronographic measurement. As an alternative, we explore radiative proxies. In the present contribution we investigate if microwave observations can be employed as a proxy for CME propagation speed. Caroubalos (1964) had shown that the higher the fluence of a solar radio burst near 3 GHz, the shorter is the time lapse between the solar event and the sudden commencement of a geomagnetic storm. We reconsider the relationship between CME speed and microwave fluence for limb CMEs in cycle 23 and early cycle 24. Then we use the microwave fluence as a proxy of CME speed of Earth-directed CMEs, together with the empirical interplanetary acceleration model devised by Gopalswamy et al. (2001), to predict the CME arrival time at Earth. These predictions are compared with observed arrival times and with the predictions based on other proxies, including soft X-rays and coronographic measurements.