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Plasma acceleration on multiscale temporal variations of electric and magnetic fields during substorm dipolarization in the Earth's magnetotail

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Magnetic field dipolarizations are often observed in the magnetotail during substorms. These generally include three temporal scales: (1) actual dipolarization when the normal magnetic field changes during several minutes from minimum to maximum level ; (2) sharp bursts (pulses) interpreted as the passage of multiple dipolarization fronts with characteristic time scales < 1 min, and (3) bursts of electric and magnetic fluctuations with frequencies up to electron gyrofrequency occurring at the smallest time scales ($\leq$ 1 s). We present a numerical model where the contributions of the above processes (1)-(3) in particle acceleration are analyzed. It is shown that these processes have a resonant character at different temporal scales. While O+ ions are more likely accelerated due to the mechanism (1), H+ ions (and to some extent electrons) are effectively accelerated due to the second mechanism. High-frequency electric and magnetic fluctuations accompanying magnetic dipolarization as in (3) are also found to efficiently accelerate electrons.