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Refining Coronal Mass Ejection Dynamics: A Semi-Analytical Flux-Rope Model Incorporating Magnetic Erosion

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Our study aims to advance our understanding of the complex interactions between Coronal Mass Ejections (CMEs) and the solar wind/interplanetary magnetic field (IMF) system. We introduce a novel flux-rope semi-analytical MHD model that incorporates a comprehensive approach to understanding the impact of magnetic erosion and virtual mass on the propagation of CMEs. This model explores the profound effects of these processes, specifically focusing on the consequences of magnetic reconnection, which progressively diminishes the azimuthal magnetic flux and the mass of the outer shell of CME structures. With this study, we investigate how these forenamed processes can influence the dynamics of fast CMEs, affecting their anticipated arrival times in the near-Earth space environment and the space weather forecasts in general.

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