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Roles of magnetic reconnection and buoyancy in the formation and evolution of dipolarization fronts in the magnetotail[1] MIKHAIL SITNOV, JHU/APL, MARC SWISDAK, UMD, NATALIA BUZULUKOVA, GSFC, KALMAN KNIZHNIK, JHU — Dipolarization fronts (DFs) are sharp magnetic pileup structures, moving with plasma in the direction opposite to the initial magnetic field stretching with the speed comparable to the Alfven speed in the terrestrial magnetotail. Being one of the main sources of hot plasma injections and magnetic field dipolarization during magnetospheric substorms and storms, DF have recently become very popular due to their observations by multi-spacecraft missions Cluster and THEMIS with unprecedented spatio-temporal resolution and global coverage. Recent kinetic theory and PIC simulations of 2D magnetotail equilibria revealed two possible mechanisms of the DF formation, mutual attraction of parallel current filaments in thin current sheets providing magnetic reconnection via the tearing instability and magnetic buoyancy resulting in the ballooning-interchange instability. Both mechanisms are most efficient in the geometries with accumulation of magnetic flux at the tailward end of a thin current sheet. To understand roles of magnetic reconnection and buoyancy effects in the formation and evolution of DFs we consider the linear stability of the corresponding magnetotail equilibria and the results of 2D and 3D PIC simulations of DFs. The theory and simulations are also compared with recent THEMIS observations of DFs and ballooning-interchange oscillations in the magnetotail.

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