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Plasma sheet flow damping by oscillatory flow braking

Evgeny V. Panov (1), Olga S. Leontyeva (2), Wolfgang Baumjohann (1), Rumi Nakamura (1), Olaf Amm (3), Vassilis Angelopoulos (4), Karl-Heinz Glassmeier (5), Marina V. Kubyshkina (6), Anatoli A. Petrukovich (7), Victor A. Sergeev (6), and James M. Weygand (4)

(1) Space Research Institute, Austrian Academy of Sciences, Graz, Austria (evgeny.panov@oeaw.ac.at), (2) TeleConsult Austria GmbH, Graz, Austria, (3) Finnish Meteorological Institute, Helsinki, Finland, (4) Institute of Geophysics and Planetary Physics, UCLA, Los Angeles, USA, (5) Institut fuer Geophysik und extraterrestrische Physik, TU Braunschweig, Braunschweig, Germany, (6) Institute of Physics, St. Petersburg State University, St. Petersburg, Russian Federation, (7) Space Research Institute, Russian Academy of Sciences, Moscow, Russian Federation

Using simultaneous observations in the near-Earth plasma sheet by five Time History of Events and Macroscale Interactions during Substorms (THEMIS) probes, conjugate ground all-sky camera observations from Canada, and magnetometer networks over North America, we show that auroral bulge dynamics is modulated by a recently discovered process known as oscillatory flow braking, which occurs at about 10 Earth radii down the Earth's magnetotail. In oscillatory flow breaking, plasma sheet flows oscillating with different periods at various distances collide, producing pressure forces that exert shear stresses on the magnetic field, transiently amplifying the vertical magnetic field component. Sporadic fast relief of these stresses through significant particle precipitations causes damping of plasma sheet fast flows.