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The role of Kelvin-Helmholtz instability in losses of magnetospheric energetic particles through the magnetopause: High-resolution MHD-test-particle simulations. ALEKSANDR UKHORSKIY, KAREEM SORATHIA, VIACHESLAV MERKIN, Applied Phys Lab/JHU — The Earth's magnetopause is a sharp boundary separating the geomagnetic field from interplanetary field and plasma. During increased solar wind driving and geomagnetic activity, energetic particles produced inside the magnetosphere can gain access to the magnetopause and be permanently lost from the system by crossing the boundary into the region of open interplanetary magnetic field lines. The efficiency of the loss process is controlled by the details of particle interaction with the magnetopause boundary. Characterizing this interaction is important for understanding storm-time variability of magnetospheric energetic particle populations including ring current and radiation belts. The magnetopause structure can be very dynamic due, in particular, to the Kelvin-Helmholtz instability (KHI) produced by the velocity shear at the magnetospheric boundary. The goal of this study is to investigate the role of KHI in energetic particle loss through the magnetopause. For the analysis we use large-scale test-particle simulations in the electromagnetic fields computed with a global magnetospheric MHD model with resolution sufficiently high to resolve KHI. We compute the spatial distributions and rates of the magnetopause losses of energetic electrons, hydrogen and oxygen ions, and discuss our results in the context of recent measurements of magnetopause losses from the Magnetospheric Multiscale (MMS) mission.

Aleksandr Ukhorskiy
Applied Phys Lab/JHU

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