

Redistribution of particle kinetic energy at the onset of polarity switching: comparing ground and microgravity measurements using PK-4

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The PK-4 microgravity laboratory on the International Space Station (ISS) provides a flexible platform for studying a wide variety of dusty plasma phenomena under conditions where the multiple influences on structure and dynamics of the system, otherwise masked under gravity conditions, are finally revealed. A key feature of PK-4 operations is the use of “polarity switching” – a periodic modulation of the axial current and electric field to enable the trapping of the microparticles in the plasma. At the onset of polarity switching, the unidirectional flow of particles is halted, and the particles are rapidly brought to rest, causing a rapid dissipation of the kinetic energy of the particles. In particular, PIV analysis techniques have been shown to be particularly effective at tracking the evolution of the particle motion during this transition. This presentation will discuss a preliminary analysis of the redistribution of the dust particle kinetic energy through a comparison of ground-based studies using the PK-4 science reference module and microgravity experiments using the PK-4 laboratory on the International Space Station. This work is supported by NASA/JPL, NSF, and NSF-EPSCoR. The joint ESA-ROSCOSMOS Experiment «Plasma Kristall-4» on-board the International Space Station ISS is funded by DLR/BMWi under contract 50WM1441.