

Energy transformation, turbulence and acceleration in space plasmas

Initiative: Trilaterale Partnerschaften – Kooperationsvorhaben zwischen Wissenschaftler(inne)n aus der Ukraine, Russland und Deutschland

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Space plasmas present intriguing puzzles to the scientific community. Impulsive energy release events are observed and challenge our understanding on how energy is transformed from one form to another. The best possibility to measure the physical characteristics of these events are provided by the analysis of observations by spacecraft in the Earth's magnetosphere. A key region of Earth's magnetosphere is the current sheet (CS) in the magnetotail. There, energy supplied by the solar wind is accumulated and then explosively released. This results in pronounced plasma heating and acceleration. The particles' energies, which can be boosted by factors of a thousand, determine the near-Earth space weather. The release of large amounts of energy and a strong acceleration of particles are triggered by CS instabilities. The triggering mechanisms for these instabilities are poorly understood. In this project the influence of the plasma composition and the anisotropy in velocity distribution functions on the stability of the CS will be studied. Another objective is to understand how turbulence associated with CS instabilities influences the particle's dynamics and energization. To answer these questions it is planned to combine a sophisticated analysis of multipoint spacecraft observations (Cluster mission, ESA) and theoretical approaches.

Projektbeteiligte

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