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 collisionless plasmas present intriguing puzzles to the scientific community. Impulsive energy release events are observed there and challenge our understanding on how energy is transformed from one form to another without particle collisions. The major way of energy transfer in such plasmas is particle interactions with waves. The understanding of how the magnetic energy is transformed to the kinetic and thermal energy of plasma, and how this energy is distributed between different plasma populations is the key problem in space plasma physics.The goals of the project are i) to study the properties of magnetic and electric field fluctuations and turbulence developed in the region of energy transformation in planetary magnetotails (Earth's, Jovian, Saturn's and Martian) and ii) to understand how these phenomena contribute to the energization of different plasma populations. The magnetotails of planets listed above enable to study the processes of energy release and associated phenomena occurring at various spatial and temporal scales in plasma with various ion composition and characteristics (e.g. density, temperature). To achieve the project's goals a sophisticated analysis of multipoint spacecraft observations at kinetic scales (MMS, NASA; Cluster mission, ESA), spacecraft observations in planetary magnetotails (Juno, MAVEN, NASA; Cassini, ESA) and theoretical approaches are combined.

Projektbeteiligte

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Dipolarization fronts in the Jovian magnetotail: Statistical survey of ion intensity variations using Juno observations
Processes in the Current Disruption Region: From Turbulence to Dispersion Relation
Plasmoids in the Jovian magnetotail: Statistical survey of ion acceleration using Juno observatio
Kelvin-Helmholtz Instability Associated with Reconnection and Ultra Low Frequency Waves at the Ground: A Case Study Ground: A Case Study
Turbulent dipolarization regions in the Earth's magnetotail: ion fluxes and magnetic field changes.