

Magnetic reconnection in partially ionized plasmas.

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14 gennaio 2025

In partially ionized plasmas, collisions between neutral and charged particles affect the magnetic reconnection process in a way that depends on chemical composition, temperature and ionization. The coupling of neutral and ion dynamics influences the rate of magnetic dissipation, heating (hence the ionization itself), and the distribution of energies among particles accelerated into non-thermal tails. We review the onset of reconnection in a partially ionized plasma and discuss the detailed physics of the non-ideal coefficients, Ohmic, Hall and Ambipolar diffusivity. We discuss the regimes where each coefficient dominates the physics of the reconnection process. We then consider two applications. Small-scale, decoupled fast reconnection in the solar atmosphere may lead to preferential heating and energization of ions and electrons that escape into the corona. In protoplanetary disks, such reconnection causes localized heating in the atmospheric layers, changing much of the infrared atomic and molecular line emission observed with the Spitzer and James Webb Space Telescopes.