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Effect of radiation on partially ionized magnetic reconnection under chromospheric conditions

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Magnetic reconnection under chromospheric conditions is studied in five different ionization levels from 0.5% to 50%. We use a self-consistent two-fluid (ions + neutrals) that accounts for compressibility, collisional effects, chemical reaction and anisotropic heat conduction. The effects of optically thin radiation are assessed using an approximation of the radiative losses of a plasma with photospheric abundances. Radiative cooling affects the partially ionized plasma by modifying the ionization level inside the current sheet and, therefore, the ambipolar diffusion and the chemical equilibrium. The results quantify this complex non-linear interaction showing that a strong cooling results in faster reconnections than have been found without radiation, especially in the cases with larger ionization level. The appearance and growth of the tearing mode instability is greatly influenced by the ionization level inside the current layer. Results with radiation show rates and outflows comparable to the observed ones in spicules.