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A Magnetic Reconnection model for Hot Explosions in the Cool Atmosphere of the Sun

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The Interface Region Imaging Spectrograph (IRIS) satellite has frequently observed hot explosions of ~80,000 K in the cool low solar atmosphere of ~6,000 K. Their formation mechanisms challenge our understanding of magnetic reconnection and heating occurring in partially ionized cool plasmas. We have numerically studied magnetic reconnection between the strong new emerging magnetic field and the background field by including partial ionization effects. Our high-resolution simulations with the diffusivities approaching the realistic ones clearly reveal the multi-thermal turbulent fine structures, which appear not only inside the main current sheet but also in the region where the outflow plasmas collide with the surrounds. These mixed hot tenuous and cold dense plasmas may account for the explosions with temperatures ranging from 4,000 K to above 80, 000 K.

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