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Magnetic Reconnection with Strong Radiative Cooling[1] DMITRI UZDENSKY, University of Colorado Boulder, JONATHAN MCKINNEY, Stanford/KIPAC — Magnetic reconnection in many high-energy-density astrophysical and laboratory environments is significantly affected by radiation and so traditional nonradiative reconnection models are not applicable for them. As a step towards remedying this situation, a Sweet–Parker-like theory of resistive reconnection with strong radiative cooling is developed. General relationships between key reconnection parameters and the radiative cooling function are obtained. For the zero guide field case (in contrast to strong guide field), intense radiative cooling leads to strong plasma compression, yielding a higher reconnection rate. The compression ratio and the layer temperature are governed by the balance between ohmic heating and radiative cooling. In both zero and strong guide-field cases, the lower temperature in a radiatively-cooled layer leads to a higher resistivity and hence a higher reconnection rate. Several specific optically-thin radiative processes (bremsstrahlung, cyclotron, and inverse Compton) are considered and concrete expressions for the reconnection parameters are derived, along with their applicability conditions.

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