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A Review of the 0.1 Reconnection Rate Problem and its Implications

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The 0.1 reconnection rate problem refers to the rate of reconnection normalized to ambient plasma parameters near where reconnection is occurring, which has been found to be remarkably similar for a wide range of plasma conditions. A rate of 0.1 is consistent with explosive energy release in solar flares and during substorms in the Earth's magnetotail. I will review some of the key simulation and observational studies regarding the 0.1 problem, and then discuss some recent work that posits that this 0.1 value may represent a theoretical maximum for the reconnection, with the implication that most systems find a way to reconnect close to this maximum value. An issue, though, is that if such a fast reconnection rate is always available then magnetic energy can never accumulate and explosive events such as solar flares would never occur. There must be a high threshold to initiate this fast reconnection, which is believed to relate to the thickness of the equilibrium current sheet. An illustrative example involves strong turbulence in solar coronal conditions and the reconnection it generates, which I will briefly review.

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