

Abstract Submitted
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Condition for Transition to Fast Collisionless Reconnection and its Role in Regulating Solar Coronal Heating¹ DMITRI UZDENSKY, Princeton University — I suggest that solar coronal heating is a self-regulating process keeping the plasma marginally collisionless. The proposed mechanism is based on the interplay of two effects. The first one is the transition between the slow collisional (Sweet–Parker) and the fast collisionless reconnection regimes. I formulate a simple criterion for this transition, highlighting the strong effect of the ambient density on gas collisionality. When the density drops below critical, fast reconnection can occur causing magnetic energy release. The second key effect is the chromospheric evaporation caused by the coronal energy release. It increases the density and thereby temporarily inhibits any subsequent reconnection involving a given loop. As a result, statistically, the density fluctuates around a critical value which is found to be comparable with the observed coronal density. On a longer time-scale, coronal heating can be seen as a repeating cycle of fast reconnection events, followed by evaporation episodes, followed by long and quiet periods of magnetic stress build-up and gradual radiative cooling.

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