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Curved coronal arcades: proliferation and heating of an MHD avalanche

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MHD avalanches involve small, intensely localized instabilities that spread across neighbouring regions in a magnetic field.
Cumulatively, many small events release vast amounts of stored magnetic energy.
Straight cylindrical flux tubes, in Parker (1972)'s model of coronal loops, are liable to such avalanches: one unstable flux tube can cause instability to proliferate through reconnection, resulting in an ongoing chain of like events.
True coronal loops are curved, arching between different footpoints on one photospheric plane.
Using three-dimensional MHD simulations, we here verify the viability of MHD avalanches within the curved magnetic geometry of a multi-threaded coronal arcade.
In contrast to the behaviour of straight cylindrical models, a kink mode occurs more readily and preferentially upwards in this new geometry.
Such instability spreads over a region wider than the original flux tubes, and arguably wider than is seen in a model of straight flux tubes.
Consequently, the release of substantial amounts of energy is sustained, in a series of nanoflare-type events, contributing significantly to coronal heating.
Overwhelmingly, viscous heating dominates over Ohmic, attributable to the shocks and jets produced around these small events.
Reconnection is not the greatest contributor to heating, but rather the facilitator of those processes that are.
Localized and intermittent, the heating shows no strong spatial preference, except for a small bias away from footpoints.
Effects of realistic plasma parameters, and the implications for one-dimensional, loop-aligned models of energetic transport, are discussed.

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