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From monolithic or multi-stranded loops to turbulent loops using 3D simulations of wave heating

As was previously found, transverse kink waves are Kelvin-Helmholtz unstable. Because of that, loops driven with transverse waves form a layer of turbulent roll-ups (so-called TWIKH rolls), or are even completely turbulent. I will present 3D numerical models that show this phenomena. The turbulence has a profound effect on the loop's thermodynamics and its observability.

(1) The loop's edge is a mixing region where the external plasma is mixed with the loop plasma, which is observed as apparent heating.

(2) Because of the turbulence, originally multi-stranded loops are mixed.

(3) A turbulent regime with a power-law cascade from the large scales of the driver to small scales of kinetic plasmas is set up, resulting in efficient heating near the footpoints.