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Contribution of mode coupling and phase-mixing of Alfvén waves to coronal heating.

Recent observations of coronal loops reveal ubiquitous transverse velocity perturbations, that undergo strong damping as they propagate. Observational estimates show that these perturbations contain significant amounts of energy. We have previously demonstrated that this observed rapid damping can be understood in terms of coupling of different wave modes in the inhomogeneous boundaries of the loops: this mode coupling leads to the coupling of the transversal (kink) mode to the azimuthal (Alfvén) mode, observed as the decay of the transverse kink oscillations. However, an important point to note here is that (observed) wave damping does not automatically imply dissipation, and hence heating. To investigate under which circumstances this process can contribute to the coronal heating and to what extend the heating rate is sustainable, we perform 3D numerical experiments modelling the observed, transverse oscillations including the effects of resistivity and thermal conduction. We first analyse the contribution from a single monochromatic pulse, and then we extend the study by investigating different sizes and structures of the boundary layer and a continuous driver. We conclude that only a specific range of energy input and magnetic resistivity can sustain the coronal heating in our setup.

We also introduce the extension of this analysis to the resonant absorption of Alfvén waves during standing oscillations of coronal loops in presence of multiple harmonics.