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

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The solar corona is a million degree plasma that has been investigated for long time to understand the cause of this high heating rate. In particular, phase-mixing of Alfvén waves in the solar corona has been identified as one possible candidate to explain coronal heating by observations of ubiquitous oscillations in the corona carrying sufficient wave energy and by theoretical models that have described the concentration of energy in small scale structures.
The aim of this work is to assess how much energy can be converted into thermal energy by a phase-mixing process triggered by the propagation of Alfvénic waves in a cylindric coronal structure, such as a coronal loop, and to estimate the impact of this conversion on the coronal heating and thermal structure of the solar corona plasma.
We run 3D MHD simulations of a magnetised cylinder where the Alfvén speed varies through a boundary shell and a footpoint driver is set to trigger kink modes which mode couple to torsional Alfvén modes in the boundary shell. These Alfvén waves are expected to phase-mix and the system allows us to study the following thermal energy deposition on the plasma. We run a reference simulation to explain the main process and then we vary simulation parameters, such as the size of the boundary shell, its structure and the persistence of the driver.
Taking into consideration high values of magnetic resistivity and strong footpoint drivers, we find i) that phase-mixing leads to a temperature increase, ii) that this energy is able to balance the radiative losses only in the localised region involved in the heating.