MHD Wave Heating Mechanisms

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It has long been established that gradients in the Alfvén speed, and in particular the plasma density, are an essential part of the damping of waves in the solar corona by mechanisms such as resonant absorption or phase mixing. Models of wave damping often assume a fixed density gradient, without a self-consistent assessment of the temporal evolution of the coronal density. However, for some coronal structures, density gradients can evolve in a way that the wave damping processes are inhibited. For the case of phase mixing, wave heating cannot sustain the assumed density structure and the inclusion of feedback of the heating on the density gradient can lead to a highly structured density, although on long timescales. In addition, transport coefficients well in excess of classical values are required to maintain the observed coronal density. Hence, wave heating of coronal structures may face problems arising from the assumption of a fixed density gradient and different models of wave-based coronal heating mechanisms need to be explored.