

CORONAL LOOP OSCILLATIONS AND DIAGNOSTICS WITH HINODE/EIS

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Analysing the structure of solar coronal loops is crucial to our understanding of the processes which heat and maintain the coronal plasma at multimillion degree temperatures. The determination of the physical parameters of the loops remains both an observational and theoretical challenge. A novel diagnostic technique for quiescent coronal loops based on the analysis of power spectra of Doppler shift time series is proposed. It is assumed that the loop is heated randomly both in space and time by small-scale discrete impulsive events of unspecified nature. The loop evolution is characterised by longitudinal motions caused by the random heating events. These random motions can be represented as a superposition of the normal modes of the loop, i.e., its standing acoustic wave harmonics. The idea is borrowed from helioseismology where a similar approach resulted in a deep understanding of the solar interior. It is demonstrated that the analysis of the power spectra allows the distinction between uniformly heated loops from loops heated near their footpoints. It also becomes possible to estimate the average energy of a single heating event. Synthetic and direct Hinode/EIS observations of waves are presented both in the imaging and spectroscopy modes and the applicability of the method is tested.