WAVE LEAKAGE AS PHASE MIXING OF LEAKY CONTINUUM MODES: IMPLICATIONS FOR THE INITIAL VALUE PROBLEM

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Recently we have reported on the self-adjointness of the magnetohydrodynamic operator when it is considered on unbounded spatial domains, and have shown the existence of an additional continuum of linear magnetohydrodynamic (MHD) modes due to fast or slow lateral wave leakage (in addition to the well-known Alfvén and slow resonant continuum). These findings can help to judge about the physical relevance of certain discrete leaky modes with complex frequencies, which are to be interpreted as quasi-modes. In this contribution we emphasize that the detection of enhanced frequency power around certain frequencies (that are determined by the equilibrium) is very much dependent on the initial conditions. We describe the evolution of a wave signal and its subsequent decay due to leakage in terms of phase mixing of the excited leaky continuum modes. In this view, it is straightforward to derive rough indications on the importance of the initial conditions to the typical behavior of the evolving wave signal. For some initial conditions the observed frequency power depends almost solely on the initial conditions while for other initial conditions, the observed power is completely characterized by the equilibrium. Thus, whether the frequencies and damping times predicted by the quasi modes can be observed depends not only on the equilibrium but also on how these waves are excited. Implications for the detectability of leaky quasi-modes in coronal loop oscillations are discussed in this framework.