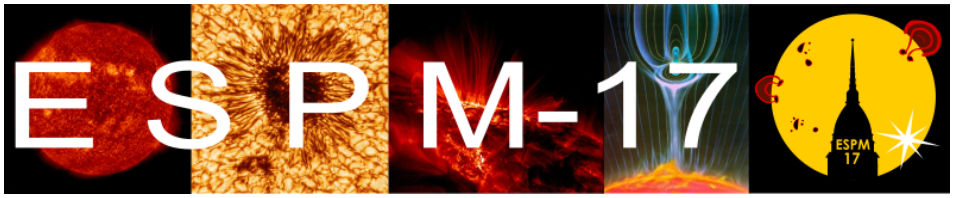

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Observation and modelling of decayless kink oscillations in short magnetic loops

Magnetic loops are widely observed structures in the solar transition region and corona. As closed magnetic flux tubes, they can act as important wave guides for MHD waves, particularly transverse waves/oscillations. In recent coronal observations, transverse oscillations in small magnetic loops have been frequently studied, uncovering two different types of decayless kink oscillations. The first type displays shorter periods that exhibit a linear correlation with loop lengths, indicating their nature as standing kink eigenmodes. The second type, first detected by us in 2022, is mainly observed in coronal bright points (CBPs). These oscillations have longer periods that show no linear scaling with loop lengths. Notably, a peak at approximately 5 minutes in the period distribution histogram suggests that these oscillations could be externally driven oscillations or propagating waves excited by photospheric p-modes. With 3D MHD simulations, we find that both types of oscillations can be excited by p-modes in short coronal loops. This implies that p-modes may contribute to coronal heating by exciting decayless transverse oscillations in small loops. On the other hand, the transition region also hosts many small-scale magnetic loop structures, especially in active regions. Our recent observation using the Interface Region Imaging Spectrograph (IRIS) reveals the existence of transverse kink oscillations in these structures for the first time. We also estimate the corresponding energy flux and conduct a seismological diagnosis of magnetic field strength in these loops.

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