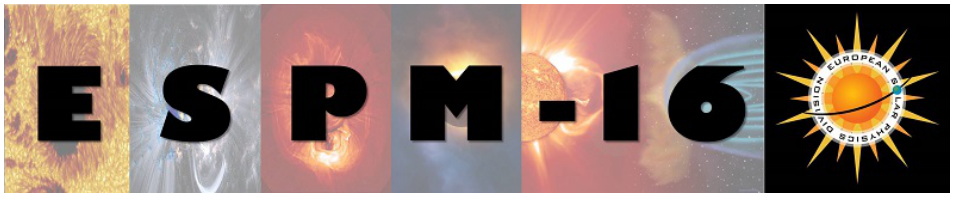

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Seismology of coronal active regions with decayless kink oscillations

Wednesday 8 September 2021 17:09 (13 minutes)

The ubiquity of low-amplitude decayless kink oscillations of plasma loops allows for the seismological probing of the corona on a regular basis. We analysed decayless kink oscillations in several distinct loops belonging to active region NOAA 12107 during its quiet time period. The oscillation periods were estimated with the use of the Motion Magnification technique. The lengths of the oscillating loops were determined within the assumption of its semicircular shape by measuring the position of their footpoints. The density contrast was estimated from the observed intensity contrast accounting for the unknown spatial scale of the background plasma. The combination of those measurements gives the distribution of kink and Alfvén speeds in the active region. Thus, we demonstrate the possibility of obtaining seismological information about coronal active regions before flares and CMEs, which can be used for their forecasting. Using full 3D magnetohydrodynamic numerical simulations, we studied the effects of magnetic field sigmoidity on the fundamental kink oscillation. Our model consists of a single denser coronal loop, embedded in a plasma with dipolar force-free magnetic field with a constant α-parameter. For a loop with no sigmoidity, we find that the numerically determined oscillation period matches the theoretical period calculated using WKB theory. With increasing sigmoidity, the actual period is increasingly smaller than the one estimated by WKB theory. The discrepancy could be exploited seismologically to determine the free energy in the hosting active region.

Student poster?

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