

Probing coronal magnetic field by kink oscillations of coronal loops

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The persistent presence in the solar corona of low-amplitude decay-less kink oscillations of coronal loops allows for routine diagnostics of solar active regions by MHD seismology. Unlike traditional approach based on the analysis of decaying large-amplitude kink oscillations caused by flares and other eruptive processes in active regions, decay-less oscillations are also observed in quiet active regions and can therefore provide diagnostics before a flare or coronal mass ejection, which is necessary for predicting these events.

We have analyzed decay-less kink oscillations in several coronal loops belonging to the active region NOAA 12107 and observed on the western solar limb on July 10, 2014 by the AIA instrument on board the orbital observatory SDO at the wavelength of 171 Å. The oscillation periods were estimated using the motion magnification technique. The length of the oscillating loops was determined in assumption of their semicircular shape by measuring the position of the footpoints. Density contrast in the loops was estimated from the observed intensity contrast, taking into account unknown spatial scale of the background plasma. The combination of these measurements allows us to determine the spatial distribution of the kink and Alfvén speeds in the active region as well as the coronal magnetic field. Thus, we demonstrate the possibility of diagnosing coronas of active regions by MHD seismology methods at the quiet stage of their development.

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