Observations of X-ray stellar flares and associated MHD oscillations in ξ Boo

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Abstract

Two flares were observed in ξ Boo by XMM-Newton. The flare loop parameters are derived using various loop models including state-of-art hydrodynamic flare model. The loop lengths derived for the flaring loop structure are found to be less than the stellar radius. The exponential decay of the X-ray light curves, and time evolution of the plasma temperature and emission measure are similar to those observed in compact solar flares. The X-ray light curve of post flare phase is investigated with wavelet and periodogram analyses. Both analyses clearly show oscillations of the period of 1019 s. Using the observationally estimated loop length, density and magnetic field, the theoretically derived oscillation period for fast-kink mode approximately matches with the observationally estimated period. This is the first likely observational evidence of fundamental fast-kink mode of magnetoacoustic waves in the stellar loops during the post-flare phase of heightened emission.