

4. Eruptions in the solar atmosphere

Non-damping oscillations at flaring loops

Dong Li¹, Ding Yuan², Yingna Su¹, Qingmin Zhang¹, Wei Su³, and Zongjun Ning¹

¹*Key Laboratory for Dark Matter and Space Science, Purple Mountain Observatory, CAS*

²*Institute of Space Science and Applied Technology, Harbin Institute of Technology, Shenzhen Campus*

³*MOE Key Laboratory of Fundamental Physical Quantities Measurements, School of Physics, Huazhong University of Science and Technology*

We investigate the properties of non-damping oscillations at flaring loops using observations from the IRIS, SDO, Fermi and GOES. The double-component Gaussian fitting method is used to extract the line profile of Fe XXI 1354.08 Å at the spectral window. The quasi-periodicity of loop oscillations are identified in the Fourier and wavelet spectra. A quasi-period of about 40 s is detected in the line properties of Fe XXI 1354.08 Å, hard X-ray emissions in GOES 1–8 Å derivative, and Fermi 26–50 keV. The Doppler velocity and line width oscillate in phase, while a phase shift of about $\pi/2$ is detected between the Doppler velocity and peak intensity. The amplitudes of Doppler velocity and line width oscillation are about 2.2 km s^{-1} and 1.9 km s^{-1} , respectively, while peak intensity oscillate with amplitude at about 3.6% of the background emission. The observations show that 40 s oscillations are not damped significantly, which could be linked to the global kink modes of flaring loops. The magnetic field strengths at flaring loops are estimated to be about 120–170 G using the MHD seismology diagnostics and the flux rope insertion method. Meanwhile, a quasi-period of about 155 s is identified in the Doppler velocity and peak intensity of the Fe xxi 1354.08 Å line emission, and AIA 131 Å intensity, and it is likely a signature of recurring downflows after chromospheric evaporation along the flaring loops.