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Quasi-Periodic Oscillations of Si IV Doppler Velocity During an M-6.5 Class Solar Flare

Quasi-periodic oscillations (QPOs) observed in the solar chromosphere and transition region during flares offer valuable insights into the atmospheric response to sudden energy releases and the evolution of the magnetic field. We have analyzed an M-6.5 class flare observed by the Interface Region Imaging Spectrograph (IRIS) with emphasis on the QPOs in the Doppler velocity measured in the Si IV line at the flare ribbons. Our findings reveal variations in the period of oscillatory signals at different flare phases. Specifically, during the flare's impulsive phase, Doppler velocity oscillations with a period of approximately 5 minutes were observed. Pre-flare oscillations exhibited a maximum power at around 3 minutes. However, during the gradual decay phase of the flare, longer period oscillations (~8 minutes) were detected in and around the flare ribbons. We interpret the change in periodicity to 5 minutes during the impulsive phase as indicative of a change in the formation height of the Si IV to a deeper atmospheric layer, responding to the local acoustic cut-off frequency. Additionally, the longer period oscillations observed during the decay phase may be attributed to a reorientation of the magnetic field, becoming more inclined post-flare.

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