Using IRIS to Constrain Flare Loop Properties in Simulations of Impulsive Conduction-Driven Evaporation

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During a flare, magnetic reconnection in the corona creates closed coronal loops which are then free to contract under tension. The energy released during this process is converted to shocks and thermal conduction fronts, which transport thermal energy down the loop into the chromospheric footpoint plasma. The heated plasma then flows upward to fill the coronal loop in a process referred to as chromospheric evaporation. This process is thought to depend on the properties of the energy release, the state of the pre-flare corona, and the magnetic geometry of the footpoints. In this study, we analyze an M7.3 flare which occurred on 2014-April-18, which was observed by the Interface Region Imaging Spectrograph (IRIS) in a sit-and-stare operation with 9-second cadence. The slit pointing for this flare was ideally located over both footpoint and coronal portions of flaring loops, capturing spectral data for the Si IV, O IV, and Fe XXI emission lines. The high cadence allows for detailed analysis of the time-evolution of the Doppler velocity shifts for these lines within both footpoint and coronal regions during the impulsive phase of the flare. We then utilize a simplified 1-D hydrodynamic code, which we have developed specifically to simulate impulsive shock-induced chromospheric evaporation, to calculate synthetic Doppler shift profiles for the lines of interest. Finally, we compare the synthetic Doppler profiles from multiple simulations to the observed data to place constraints on the flare loop properties described above.