IRIS Observations of Solar Flares in Comparison with Hybrid Particle and Radiative Transfer Hydrodynamic Simulations

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We have recently developed a hybrid model that combines the Fokker-Planck Flare code (Petrosian et al. 2001; Petrosian & Liu 2004) with the RADYN radiative hydrodynamic code (Carlsson et al. 1992, 1996; Allred et al. 2005). This allows a self-consistent simulation of intimately coupled physical processes including particle acceleration and transport and the atmospheric response to energy deposition. Among flares well-observed by IRIS, we selected the 18 April 2014 M7.3 flare to perform data-driven simulations. One of the interesting features found is the blueshift at the cool O I line (logT=3.8) in contrast with redshifts at warmer lines, Mg II k/h (logT= 4.0), C II (logT= 4.3), and Si V (logT= 4.8), which is not expected in the standard picture of chromospheric evaporation. We use simultaneous RHESSI hard X-ray observations to constrain model parameters for the Fokker-Planck code, allowing us to model the multi-wavelength emission of the flare in a realistic manner and to compare it directly with IRIS observations. We discuss the implications of such comparisons for flare dynamics in the lower atmosphere and particle acceleration mechanisms.