Observable Signatures of Coronal Heating Frequency in a Global Active Region Model

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Understanding the frequency of energy release in non-flaring active region cores is critical to understanding how the quiescent corona is heated. We use efficient hydrodynamic loop models combined with an extrapolated magnetic field skeleton and advanced forward modeling to create global active region models in order to investigate observable signatures for a range of heating frequencies. We predict the response in all channels of both the Atmospheric Imaging Assembly (AIA) and the EUV Imaging Spectrometer (EIS) by calculating the emissivity for the relevant ions using CHIANTI, incorporating non-equilibrium ionization by solving the ionization balance equations, folding this information through the appropriate instrument response functions, and then mapping it to the extrapolated field geometry. Using these synthesized observations, we calculate typical observables, including the emission measure distribution and spectral line widths (for wavelength-resolved observations), in order to understand how properties of the heating might be better diagnosed through such observable signatures. We also discuss how the underlying structure of the extrapolated field is related to the observed multi-thermal coronal emission (if at all). Additionally, our forward-modeling software has been developed to be both modular and generally applicable. We briefly discuss how this framework for synthesizing observations might be useful to others in the solar physics/coronal loops community.