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A Model for Gradual Phase Heating Driven by MHD Turbulence in Solar Flares

Coronal flare emission is commonly observed to decay on timescales longer than one-dimensional flare loop models typically predict. This discrepancy is most apparent during the gradual phase, where emission from impulsively driven models decays over minutes, in contrast to the hour or more often observed. Magnetic reconnection is invoked as the energy source of a flare, but should deposit energy into a given loop within a matter of seconds. Models supplementing this impulsive energization with a prolonged, persistent *ad-hoc* heating have successfully reproduced long-duration emission, but without providing a clear physical justification. Here we propose a model for extended flare heating by the slow dissipation of turbulent Alfvén waves initiated during the retraction of newly-reconnected flux tubes through a current sheet. Using one-dimensional simulations, we track the production and evolution of MHD wave turbulence trapped by reflection from high-density gradients in the transition region. Turbulent energy dissipates through non-linear interaction between counter-propagating waves, modeled here using a phenomenological one-point closure model. AIA EUV light curves synthesized from the simulation reproduced emission decay on the order of tens of minutes. Moreover, turbulent broadening of synthetic high-temperature spectral lines decreased naturally in approximately 15-minutes, further corroborating separate spectroscopic observations. We find this simple model offers a possible mechanism for generating the extended heating demanded by observed coronal flare emissions self-consistently from reconnection-powered flare energy release.

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