SDO/AIA Light Curves and Implications for Coronal Heating: Model Predictions

James A. Klimchuk
Nicholeen M. Viall
NASA / GSFC

It seems largely agreed that many coronal loops---those observed at a temperature of about 1 MK---are bundles of unresolved strands that are heated by storms of impulsive nanoflares. The nature of coronal heating in hotter loops and in the very important but largely ignored diffuse component of active regions is much less clear. Is it also impulsive or is it quasi steady? The spectacular new data from the Atmospheric Imaging Assembly (AIA) telescopes on the Solar Dynamics Observatory (SDO) offer an excellent opportunity to address this question. We analyze the light curves of coronal loops and the diffuse corona in 6 different AIA channels and compare them with the predicted light curves from theoretical models. Light curves in the different AIA channels reach their peak intensities with predictable orderings as a function the nanoflare storm properties. We show that while some sets of light curves exhibit clear evidence of cooling after nanoflare storms, other cases are less straightforward to interpret. Complications arise because of line-of-sight integration through many different structures, the broadband nature of the AIA channels, and because physical properties can change substantially depending on the magnitude of the energy release. Nevertheless, the light curves exhibit predictable and understandable patterns. This presentation emphasizes the modeling aspects of our study. A companion presentation emphasizes the observations.