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Modeling flare heating with turbulent thermal conduction

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During solar flares, the impulsive release of magnetic energy drives plasma heating, fast flows, and intense brightening across the spectrum. Current models of solar flares are able to accurately reproduce many key observables, including the speed of chromospheric evaporation flows, plasma densities and atomic line intensities. However, after the cessation of impulsive heating, the models predict time scales for slowing flows and cooling to quiescence that are an order of magnitude faster than observed. Such a discrepancy indicates missing ingredients in the models. As shown in recent work, turbulence suppresses thermal conduction and is a likely candidate for explaining long duration cooling times. Even more, turbulent velocities produce broadened atomic line profiles, which have been observed in numerous flares. Here we report on our recent work modeling the response of the solar atmosphere to flare heating including turbulent thermal conduction suppression and its effects on atomic line profiles. Comparing model predictions with observations of a C-class flare, we find a moderate amount of turbulence best reproduces observed velocities and line widths.

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