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Diagnosing Magnetic Reconnection and Energy Release from High-resolution Observations of Flare Ribbons

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Magnetic reconnection governing energy release in solar flares takes place in the corona; the lower atmosphere responds rapidly to energy transfer from the corona, generating prominent radiation and dynamic signatures that help us infer properties of energy release and transfer. Fine-scale structures embedded in the generally curvilinear-shaped flare ribbons indicate the global organization of patchy reconnection events, each of them manifesting a packet of energy release. Recent observations have revealed some intriguing evolution timescales of the radiation and dynamic signatures on flare ribbons, and efforts have been made to quantify the amount of energy released over these timescales in the packets of spatial scales up to the instruments' resolving capability. It has not been clear what determines these timescales, what is the magnetic structure of these packets, and what physical mechanisms convert free magnetic energy to particle or plasma energies during or after magnetic reconnection. Crucial connections between the coronal and chromospheric signatures can be clarified in future observations and advanced numerical models.

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