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Reconnection-Driven Energy Release in the Solar Corona[1] SPIRO ANTIOCHOS, NASA Goddard Space Flight Center — The Sun's corona is characterized by bursts of energy release that are most strikingly observed as intense X-Ray solar flares. The underlying origin for this activity is that magnetic free energy builds up and is released impulsively to the plasma in the form of heating, mass motions, and/or particle acceleration. We present high-resolution observations from NASA/ESA/JAXA space missions showing that the energy buildup process appears to be similar for flaring activity ranging across orders of magnitude in scale and energy. Furthermore, the observations demonstrate conclusively that magnetic reconnection is the energy release process. We also present very recent MHD numerical simulations of solar flares that include self-consistently both the energy buildup and explosive release. Our models show that current sheet formation leading to reconnection and energy release occurs almost continuously in the corona, but explosive energy release occurs only when there is strong feedback between the reconnection and the global ideal evolution. We discuss the mechanism for flare reconnection onset and its 3D nature. Capturing accurately the multiscale feedback inherent in flare reconnection remains as the greatest challenge to understanding and eventually predicting these critically important space weather events.

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Spiro Antiochos
NASA Goddard Space Flight Center

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