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Solar and Stellar Flares[1]

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Flares in the atmosphere of the Sun and of many other stars appear to result from the sudden conversion of electromagnetic field energy into a wide array of observable forms. Of these products the definitive modern observations are the X-rays and γ-rays, signifying the common occurrence of particle acceleration to mildly relativistic or higher energies. Abundant direct (the radiation) and indirect information confirms that this particle acceleration is energetically significant, as well as common. We are thus led to the physics of particle distribution functions that may deviate radically from Maxwellian distributions. Stellar observations allow us to study these phenomena across a wide variety of environments, whereas solar and planetary observations allow us to do imaging spectroscopy and thereby get a better understanding of the global structures of the processes. In particular we have spectacular new data from satellite solar observatories such as *RHESSI* (hard X-rays and γ-rays) and others, most recently the *Solar Dynamics Observatory*. Of particular interest from the point of view of plasma physics is the flare environment: a low-beta corona linked to a massive body through an intermediate weakly-ionized layer (the chromosphere). The chromosphere is extraordinarily complicated; its behavior is coming again to be recognized as fundamental to the overall flare process, and in this presentation I will attempt to clarify its role.

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