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Particle Acceleration During Solar Flares and Magnetospheric Substorms

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Magnetic reconnection is an important process in most astrophysical plasma environments leading to efficient, fast and often explosive-like conversion of magnetic energy into kinetic energy of plasma particles and rapid reconfiguration of magnetic topology. The most detailed studies of this process at the moment are possible using in situ measurements in the near Earth space, remote solar corona observations, numerical simulations and laboratory observations. There are limitations and advantages associated with each of these approaches. In situ observations can give a detailed single-point picture of local electromagnetic fields and particle distribution functions but they cannot provide the overall context and integral properties of the process. In contrast, remote observations reveal the large-scale properties and context of the process but inherently suffer from line-of-sight limitations as well as have insufficient spatial resolution. Both communities have reached a high level of understanding about the details of magnetic reconnection. We compare the fields of reconnection near the Earth, in the solar wind and in the solar corona and identify the most important questions where synergies can bring new important understanding and insights. In particular we focus on mechanisms of energetic particle acceleration and compare in detail solar flares to substorms in the Earth's magnetosphere.