

RHESSI Constraints on Ion Acceleration in Flares

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The Reuven Ramaty High-Energy Solar Spectroscopic Imager (RHESSI) has detected nuclear gamma-ray line emission from at least eleven solar flares over the past three years. These gamma-ray lines are produced when flare-accelerated ions collide with the ambient solar medium. Accelerated protons and alphas produce relatively narrow lines, while accelerated heavy ions produce lines which are Doppler-broadened nearly into a continuum. By comparing the fluences in the broad and narrow lines, we can constrain the ratio of accelerated heavy ions to protons. By comparing the ratios among narrow lines, we can constrain the energy spectrum of the accelerated protons, the alpha/proton ratio, and the abundances in the solar atmosphere where the ions interact. Finally, due to RHESSI's high energy resolution, we can easily examine the Doppler profiles of the narrow lines, which provide information on the tilt of the magnetic loop in which the ions are trapped, constraints on the angular distribution of the interacting ions about the local magnetic field, and an independent measurement of the accelerated alpha/proton ratio. We will summarize the RHESSI results so far using these techniques and describe our plans for further analysis.

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