

# SPACE AND COSMIC RAY PHYSICS SEMINAR

University of Maryland  
Computer & Space Sciences Building, Rm 2400  
4:30 PM Monday, April 19, 2004  
Tea & cookies 4:00-4:30 PM

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### **RHESSI Observations of the 2003 October/November Flares: Evidence for $> 2 \times 10^5$ K Temperatures at Chromospheric Densities**

The 2003 Oct. 28 and Nov. 2 flares were the most prolific emitters of nuclear  $\gamma$ -rays observed by *RHESSI*, with measured fluences  $>1700$  and  $900 \gamma \text{ cm}^{-2}$ , respectively. The Oct. 28 event was the brightest gamma-ray flare detected in over 20 years. I discuss measurements of nuclear de-excitation lines from Fe, Mg, Ne, Si, C, and O that provide information on the directionality of flare-accelerated particles. Neutrons produced in particle interactions are captured by H in the photosphere to produce a strong narrow  $\gamma$ -ray line. *RHESSI* has imaged this capture-line and resolved a double source with components located on opposite sides of the post-flare arcade observed by *TRACE* in the Oct. 28 flare.

The positron-electron annihilation line and continuum provide information about the temperature and density near where the ions interact. In an earlier study, we found that the 511-keV line observed by *RHESSI* in the 2002 July 23 flare had a Gaussian width of  $\sim 8$  keV FWHM. The annihilation lines observed early in the Oct. 28 and Nov. 2 flares are also broadened:  $\sim 6 - 7$  keV FWHM. The line broadening and lack of an intense positronium continuum in the flare spectra suggests that annihilation occurs in an ionized medium with temperatures  $>2 \times 10^5$  K and densities  $\sim 10^{14} \text{ H cm}^{-3}$ . The 511-keV line narrows significantly to less than  $\sim 1$  keV later in the Oct. 28 flare, suggestive of a significant drop in temperature.

Sponsored by: Department of Physics, University of Maryland, and the Institute for Physical Science and Technology, University of Maryland. For information call Matthew Hill at (301) 405-6209 or go to the following website: [http://space.umd.edu/seminars/Spring\\_2004\\_Seminar.html](http://space.umd.edu/seminars/Spring_2004_Seminar.html) (A PDF file of this abstract is available for download at this URL.)

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