

SPECTRAL FITTING WITH THE REXIS SOLAR X-RAY MONITOR (SXM). Andrew Cummings¹, Branden Allen², Jaesub Hong², Daniel Hoak², David Guevel², Jonathan Grindlay², Richard P. Binzel¹, Rebecca Masterson¹, Mark Chodas¹, Carolyn Thayer¹, Madeline Lambert¹, Lucy F. Lim³, Dante S. Laurotta⁴.

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The Regolith X-ray Imaging Spectrometer (REXIS) instrument [1] aboard OSIRIS-REx performs its science objectives by measuring the X-ray fluorescence of Benu's surface that is stimulated by the incoming flux of solar x-rays. However the Sun's variation over the course of minutes-to-hours requires simultaneous solar X-ray monitoring for correct interpretation of the flux received from Benu. For this reason REXIS is equipped with a Solar X-ray Monitor (SXM) which consists of a silicon drift diode (SDD) and measures incident solar x-ray spectra (see **Figure 1**).

To model the SXM spectra we employ the Chianti Atomic Database [2], which is the premier resource for calculating the spectral energy distribution emitted by the Sun. The ChiantiPy python library is used in conjunction with the Chianti database to model solar spectra and to determine the best-fit (**Figure 2**) as a function of time on time scales down to 32 s.

This presentation will show the results for raw solar spectra generated over a range of temperatures between 0.5 to 100 MK and multiple abundances in order to properly characterize X-ray flares whose primary emission originates either in the photosphere or the corona of the sun. Fitting the solar temperature is accomplished by folding the simulate Chianti spectra with the SXM response to produce a series of simulated SXM observations as a function of Chianti input parameters (temperature, flux, solar composition) and then a minimization routine is carried out in order to produce the best fit.

The addition of abundances on the reconstruction of solar X-ray spectra is discussed as are the effects on the error budget of the reconstructed solar spectral parameters.

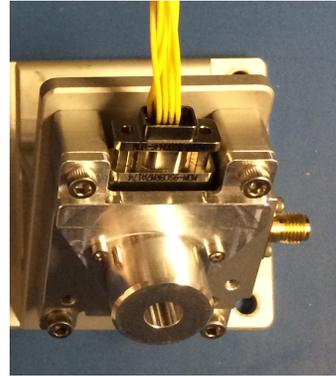


Fig. 1 - The REXIS solar X-ray monitor.

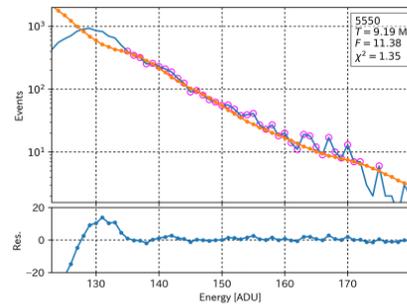


Fig. 2 - Fit of REXIS SXM data to a single solar spectrum taken during a solar flare over a 32 s integration period. The blue line shows the SXM spectrum collected and the red line shows the best-fit model. The magenta points represent the SXM spectral bins used in the fit where low energy bins have been excluded to avoid threshold effects.

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References:

- [1] Masterson, R.A. et al. (2018) Space Sci Rev. 214, 48.
- [2] Dere et al. (1997) Astron. Astrophys. Supp. 125, 149.