

Readme for GOES-R XRS Responsivity Data, v. 1.0

Janet Machol, Tom Woods and Don Woodraska

3 April 2020

1 Summary

Responsivity values, plots and an IDL code to read the data have provided by Tom Woods and Don Woodraska of LASP at the University of Colorado Boulder. The files are available from the NCEI GOES-R documents directory at <https://www.ngdc.noaa.gov/stp/satellite/goes-r.html>. For further information, contact janet.machol@noaa.gov or courtney.peck@noaa.gov.

The responsivity for the GOES-16 XRS channels is shown in Figure 1.

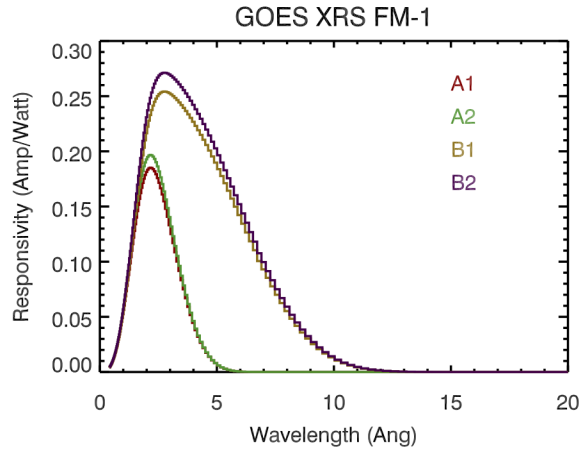


Figure 1: Response functions for the GOES-16 XRS channels.

2 Integrated Responsivity

The integrated responsivity for each channel is calculated with the assumptions of a FLAT solar spectrum and bandpasses of 0.05 to 0.4 nm for XRS-A and 0.1 to 0.8 nm for XRS-B.

The integrated responsivity, R_{integr} , is the ratio of the measured signal relative to the solar signal in the bandpass, and is given by

$$R_{integr}[A \cdot W^{-1}] = \frac{\int_0^{\infty} R_{\lambda} \cdot E_{\lambda} \cdot d\lambda}{\int_{\lambda_1}^{\lambda_2} E_{\lambda} \cdot d\lambda} \quad (1)$$

where $R_{\lambda}[A/W]$ is the responsivity as a function of wavelength, $\lambda[\text{nm}]$, and $E_{\lambda}[W/(\text{m}^2 \cdot \text{nm})]$ is the solar spectral irradiance. For a flat spectrum, i.e., where E_{λ} is a constant, and detector aperture area, $A[\text{m}^2]$,

$$R_{integr}[A \cdot W^{-1} \cdot \text{m}^{-2}] = A \cdot \frac{\int_0^{\infty} R_{\lambda} \cdot d\lambda}{\int_{\lambda_1}^{\lambda_2} d\lambda} \quad (2)$$

For XRS, the corrected current with a gain correction and all non-solar-irradiance background contributions removed, signal $S[A]$, is converted to irradiance, I , with

$$I[W \cdot m^{-2}] = S[A]/(R_{integr}[A \cdot W^{-1} \cdot m^{-2}].) \quad (3)$$

3 Data Files

The data files are for GOES-16 (FM1) and GOES-17 (FM2) XRS calibrated spectral responses. The XRS-A1 and XRS-B1 values are based on pre-flight calibrations at SURF. The term 'renormalization' in the file names refers to scaling of XRS-A2 to XRS-A1 and of XRS-B2 to XRS-B1 so that their on-orbit results match.

Files provide responsivity as a function of wavelength, integrated responsivity, and aperture area for each channel. The data files are ASCII text files with .DAT extensions. The IDL procedure read_dat.pro can be used to read the data files with the command: `data = read_dat(file_name)`.