# CENTER FOR

# ASTROPHYSICS

#### HARVARD & SMITHSONIAN



#### XRTpy

XRTpy is a Python package being developed for the analysis of observations made by the X-Ray Telescope (XRT) on the *Hinode* spacecraft. The first public release will be announced at the site, expected Fall 2022. We invite review and comments on our documentation at any time.

## Site Information

The XRTpy documentation site will guide you through installing XRTpy, briefly reviewing the X-Ray Telescope, functionalities offered by XRTpy, jupyter notebook example guides, bibliography, glossary, and methods of communicating. XRTpy's initial functionalities are motivated by the SolarSoft XRT Analysis Guide. Specified to address the most common analysis needs for XRT data.

#### Contact

XRTpy email : xrtpy@cfa.harvard.edu Site link: xrtpy.readthedocs.io GitHub: https://github.com/HinodeXRT/xrtpy Personal email: joy.velasquez@cfa.harvard.edu

# X-Ray Telescope Python package - XRTpy

Joy Velasquez<sup>1</sup>, Katharine Reeves<sup>1</sup>, Nicholas Murphy<sup>1</sup>, Mark Weber<sup>1</sup>, Jonathan Slavin<sup>1</sup> <sup>1</sup>Center for Astrophysics | Harvard & Smithsonian 60 Garden Street | Cambridge, MA, USA xrtpy.readthedocs.io | <u>xrtpy@cfa.harvard.edu</u> | https://github.com/HinodeXRT/xrtpy

Purpose



XRTpy's purpose is to enable XRT data analysis for Python users. Official Hinode analysis routines are written in IDL (Interactive Data Language), but NASA and the science community are moving towards Python. XRTpy is carefully developed to replicate results from the official IDL routines. Visit our site for more information about XRTpy.

## Capability

XRTpy includes an object-oriented representation of the instrument configuration for a set of XRT channel filters. Effective areas are calculated that pair channels with a contamination model for a given date and time. In addition, the temperature response is calculated for each channel (including the time-dependent contamination calibration) for a specified spectral emission model. In progress: derivation of electron temperature and emission measure using the filter ratio method.

### Plots generated using XRTpy

The effective area and temperature response from XRTpy have been calculated and are plotted below. The solid line define date is September 22, 2006 21:36:00 UTC and dashed line define date September 22, 2007 21:36:00 UTC. Using XRTpy, we are able to note differences for the thinner filters between the launch date and one year later for all XRT channels. This example highlights the effect of the contamination layer thickness. XRT performs regular bakeouts to mitigate the accumulation of contamination layers.



