CAB - Solar Flares
Lightcurves

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1. Exploring lc files:
    a. "lc" files are FITS files that contain information about the counts recorded by XSM. Open the files (added to drive) with astropy and find out what all headers are present.
    b. Open both the header files. What information does each one contain? Given that all further tasks will involve the count rate, which header seems more important?
    c. Read up on HDUs and HDUList.
2. Lightcurves:
    a. In 1b, you identified the header in the file that contains count rate information. Load up this data. What data type is it stored as and what all information does it contain?
    b. Plot a lightcurve for each of the lc files. (You can use a for loop and plot them all at the same time). A lightcurve is simply a plot of the countrate on the y-axis and the timestamps on the x-axis. Appropriately label the axes, provide a title to the plot etc. (Basically labelling the plot properly)
    c. Is there anything peculiar about the time axis? What do you think it is?
3. Flares:
    a. Identify flares from the above lightcurve visually. The identification involves marking a start time and a stop time of the flare. You can come up with your own method to set them, with justification.
    b. Mark the start and stop time of flares in your lightcurves using vertical lines.
    c. Calculate the following (Not necessary for all the flares you find, 2-4 should be sufficient):
        i.   The mean count rate in the flare window
        ii.   The peak count rate in the flare window
        iii. Average slope of rise
        iv.   Average slope of fall
              (Note: Here you may take rise as start time to peak time and fall as peak time to stop time)
    d. Calculate the mean background rate as well. For this exclude all flares in a lightcurve and calculate the mean of the remaining data points. How is this value in comparison to the flare mean count on average?
4. (Bonus) N-sigma:
    a. In part 3, you separated the lightcurve into flare and background. In addition to the mean calculate the standard deviation of the background and background + flare. Plot a horizontal line of the mean + n*standard-deviations (try different values of n) to if flares can be identified using this method.

Tip: use astropy/matplotlib docs in case of any issues. You can always ask in the group in case any issue persists