

Chandra ACIS Background

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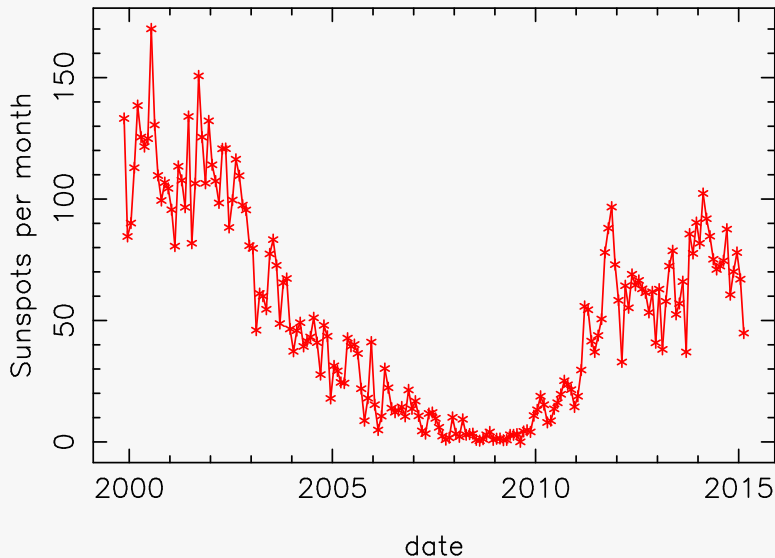
Chandra X-ray Center/Smithsonian Astrophysical Observatory

IACHEC 2015

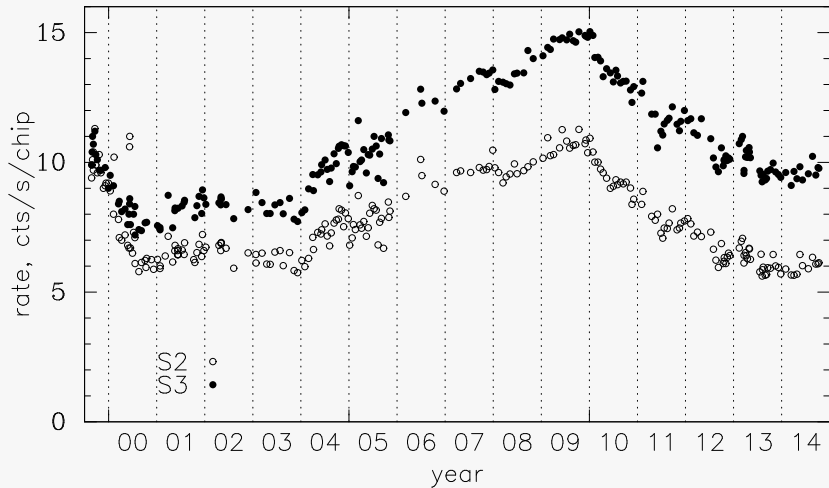
ACIS Background Rates

- *Chandra* ACIS:
- FI chips (I0, I1, I2, I3, S0, S2, S4, S5)
- BI chips (S1, S3): higher background, more susceptible to flaring
- examine S2 (FI), S3 (BI) backgrounds (ACIS-only, no gratings)
 - total quiescent background rates: remove sources, no grade/status filtering
 - flaring: remove sources, grade (but not status) filtered
- overall background rates and flaring frequency depend on solar activity rates
 - total quiescent background rates low around solar maximum; high around solar minimum
 - flaring *higher* around solar maximum; flaring much less frequent for current maximum

Sunspot Rates



ACIS Quiescent Background Rates (all grades)



Background “Flaring” Study (preliminary)

“Blank sky” (sources-removed, grade-filtered) Background:

- 768 ObsIDs
 - no gratings
 - both S2 and S3 on
 - exposure ≥ 20 ksec
- source removal:
 - wavelet smoothing
 - ds9 contouring for source exclusions;
construct ds9 exclusion regions;
threshold depends on exposure time
 - exclude source regions from event list using ds9 regions

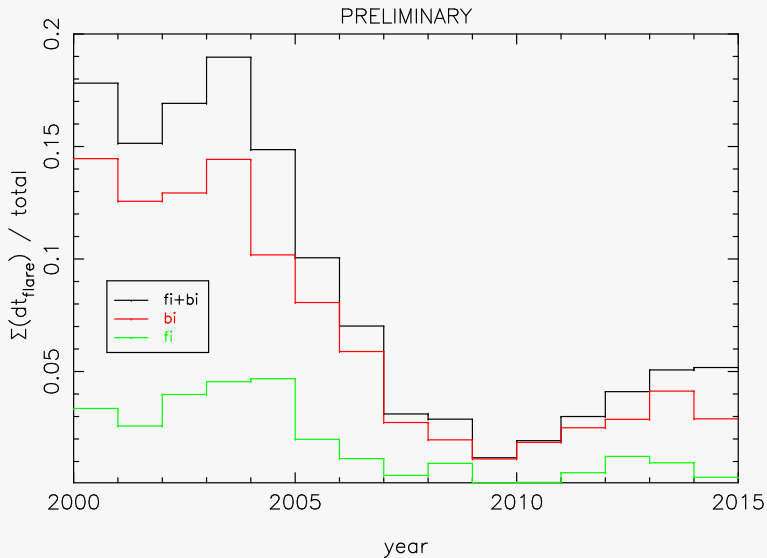
Background “Flaring” Study (preliminary)

continued

“Blank sky” (sources-removed, grade-filtered) Background:

- run `lc_clean` on “source-free” event list
 - 3σ clipping to find mean rate; cut factor is 1.2
 - FI chips: 259.28 s bins; $0.3 < E < 12$ keV
 - BI chips: 518.56 s bins; $2.5 < E < 6$ keV
- note: liberal “cut factor”
 - relatively small excursions are labeled as “bad”
 - likely overestimate of flaring fraction
 - more careful evaluation to be done
- for each year:
 - sum the total exposure time
 - sum total “bad” time for each year
- evaluate “bad”-time / total-time for each year

Background “Flaring” Study (preliminary)



Summary

- preliminary investigation of “flaring” component of background throughout the mission
- “Blank Sky” background for 768 ObsIDs
 - 2000 to 2014
 - no gratings, both S2 and S3 on, exposure ≥ 20 ksec
 - filtered on grade
- flaring fraction for current solar maximum much lower than the previous maximum
- relatively liberal flaring criterion - low level background excursions included
 - overestimate: more stringent criterion will reduce flaring contribution, particularly at later times
- next to be done: careful re-evaluation of flaring rate history