Suzaku XIS
Charge Leakage vs. Power Cycling

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Problem

micro-meteoroid impacts (as evidenced by CCD charge leakage, OBF holes)

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UVC shutdowns and power cycling

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bad (apparently)
OBF Holes

bright Earth raw frames (images) from July 2013

XIS1 (BI)

Dec 2009

XIS 3 (FI)
CCDs vs. Power Cycles

- dead region on XIS0, produced by micrometeoroid impact in 2009, has increased from 1/8 to 1/4 of CCD
- increase of noise behind CI rows
- CI register exacerbates leakage
- new dead/noisy regions on XIS3
- both occurred after extended power-offs for battery failure
XIS FI Raw Frames
XIS FI Noise
raw frame data, 2011 to 2015
SegD, RAWY>750
excluding CI rows ±10 rows
overclock-corrected

XIS0
XIS3
XIS1

2014-05
UVC
2015-03
XIS off
HXD on

mean (ADU)

RMS (ADU)

0 5 10 15 20
0 5 10 15

5×10^7 10^8

sec since 347155202. (2011-01-01)
corner pixel PH
E0102 event data, 2005 to 2015
pipeline processed, GRADE=0,2,3,4,6

mean (ADU)

2014-05
UVC 2015-03
XIS off
HXD on

XIS0
XIS3
XIS1

RMS (ADU)

2x10^8 3x10^8 4x10^8
Suzaku mission time (sec)
XIS FI Telemetry Saturation
Summary

• micrometeoroids have produced:
  • several OBF holes (5–10 per CCD?)
  • obvious damage to 2 (maybe 3) CCDs

• CI register provides a pathway for charge leakage

• power cycling or unstable power supply (UVCs) has exacerbated the charge leakage

• BI is robust to damage due to shielded gate structure (?)