IACHEC Contamination WG Summary

Eric D. Miller (MIT)

IACHEC 2015 – 北京香山饭店

Agenda

- summary by Eric (~ 5 min)
- presentations (~ 60-75 min)
  - Doug: "Chandra Contamination-Migration Model Update"
  - Herman: ACIS "Big Dither 2015"
  - Eric: XIS updates
  - Kallol: ASTROSAT SXT plans
  - ~~Steve S.: EPIC-MOS and pn~~
  - ~~Andy B.: XRT~~
  - ~~ASTRO-H?~~
- ~~organization of contamination white paper (~ 45-60 min)~~

Membership

Eric Miller (chair, Suzaku, Astro-H)
Andy Beardmore (Swift)
Vadim Burwitz (eROSITA)
Larry David (Chandra)
Tadayasu Dotani (Astro-H)
Megan Eckart (Astro-H SXS)
Michael Freyberg (eROSITA)
Terry Gaetz (Chandra)
Catherine Grant (Chandra)
Kenji Hamaguchi (Suzaku)
Maurice Leutenegger (Astro-H SXS)
Herman Marshall (Chandra)
Kallol Mukerjee (ASTROSAT SXT)
Steve O'Dell (Chandra)
Paul Plucinsky (Chandra)
Steve Sembay (XMM-Newton EPIC)
Doug Swartz (Chandra)
Masahiro Tsujimoto(Suzaku, Astro-H)
Cor de Vries (XMM-Newton RGS)
Qazuya Wada (Suzaku)

2014: 12 out of 19 members present
2015: 6 out of 20 members present

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Topics

- comparison among instruments and missions
  - chemical composition
  - time dependence
  - spatial dependence (micron to cm scales)
  - temperature dependence (where is the coldest surface?)
  - environmental dependence (orbit)
- mitigation for current instruments
  - celestial monitoring targets
  - effects on calibration and science results
  - "bake-out" procedures
- mitigation for future instruments
  - design (cold traps, contamination blocking filters)
  - procurement
  - ground procedures
  - ground testing and calibration
  - on-orbit monitoring

Action Items

- A/I 1 DUE: March 30: Eric will ask Astro-H folks about any updates
- A/I 2 DUE: March 30: Eric will ask ASTROSAT folks to join (Kallol Mukerjee)
- A/I 3 DUE: March 30: Eric will update the multi-mission plot with the information he has on ACIS,XIS,MOS and send it to Steve S. for display at EPIC cal meeting
- A/I 4 DUE: April 13: Herman, Steve S., Eric will send Eric tau_c, tau_o for instruments vs. time (XIS,ACIS,MOS) and space (XIS,ACIS)
- A/I 5 DUE: April 21: IACHEC WG session: Steve S. will look up possible environmental effects to explain MOS1/2 differences
- A/I 6 DUE: April 21: IACHEC WG session: Steve S. will ask about RGS contamination update, include slide
- A/I 7 DUE: April 21: IACHEC WG session: Eric: make differential rate plot, showing rate of build-up for Suzaku
- A/I 8 DUE: April 21: IACHEC WG session: Eric: combine RXJ1856 data and see if H has changed for Suzaku

Chandra Big Dither 2015

- C continues to build at a high rate
- Contamination is top-bottom symmetric
  - Possibly higher F/C in top half
- O/C varies from center to edge
  - Center has larger O/C: two components
  - Spatial models are same for two components
- F/C still does not vary (space or time)
- Possible H in model at N_H/N_C = 50-100

Chandra Contaminant Migration Model

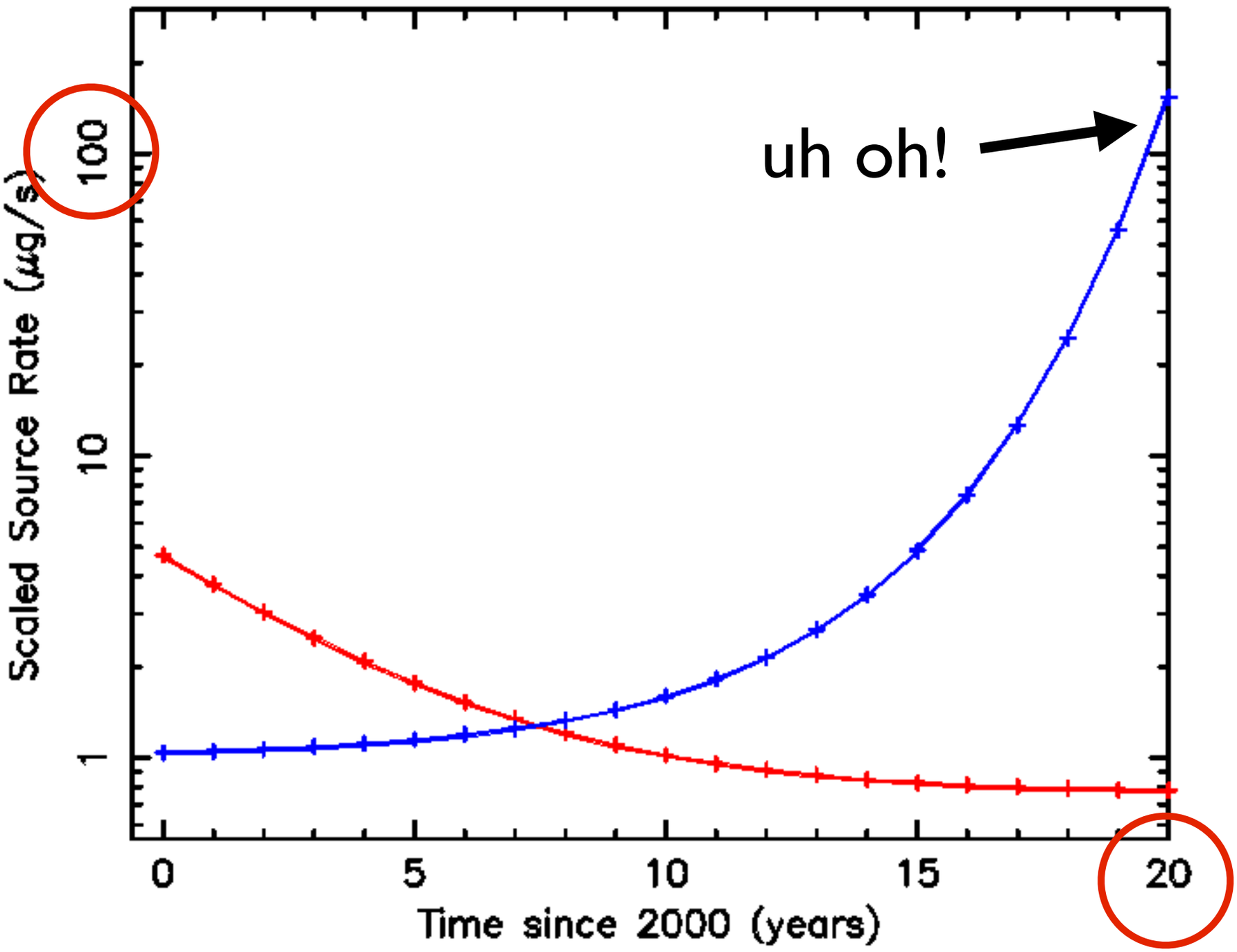
Motivation:

The accelerated accumulation observed since ~2012 cannot be reproduced under the old assumptions of one (or more) gradually depleting contaminant source(s) -- any new paradigm must consider source(s) with rates *increasing* with time (but consistent within S/C trends).

- ✦ Volatility of contaminants can be tightly constrained by simulations.
- ✦ Accelerated buildup since 2010 has 30* higher volatility at -60°C ; likely to 'clean' readily at elevated temperatures.
- ✦ Current exponentially increasing trend in OBA temperature is predicted to lead to *extremely rapid buildup* of 'second' contaminant: 5∗source rate for 10°C increase in 3 yrs; 30∗ in 5 yr
- ✦ At t~16 yrs, 0.4 grams of contaminant is within the S/C with only 5% (20mg) on OBFs (~270 μg/cm^2).

Doug Swartz

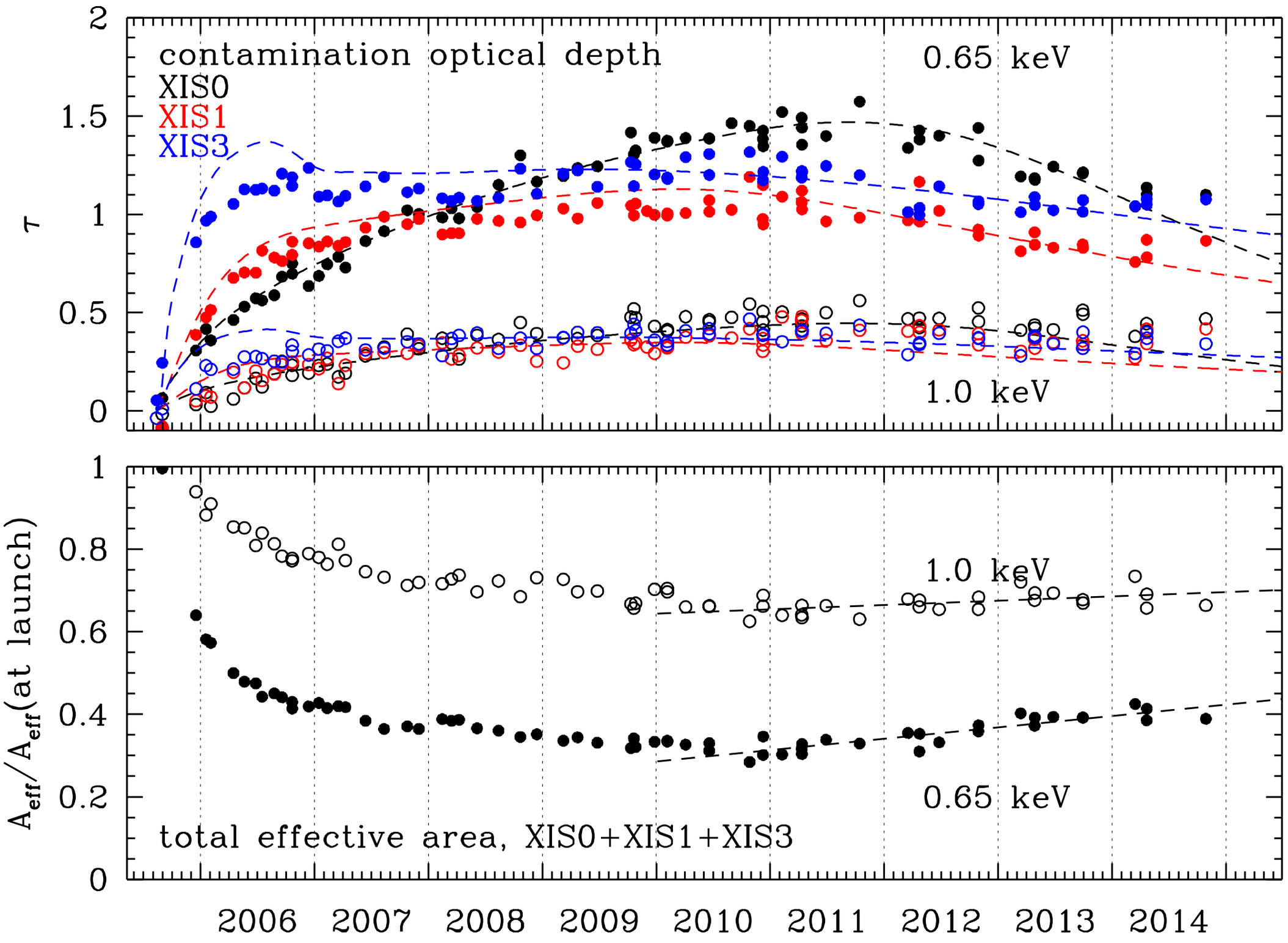
Chandra Contaminant Migration Model



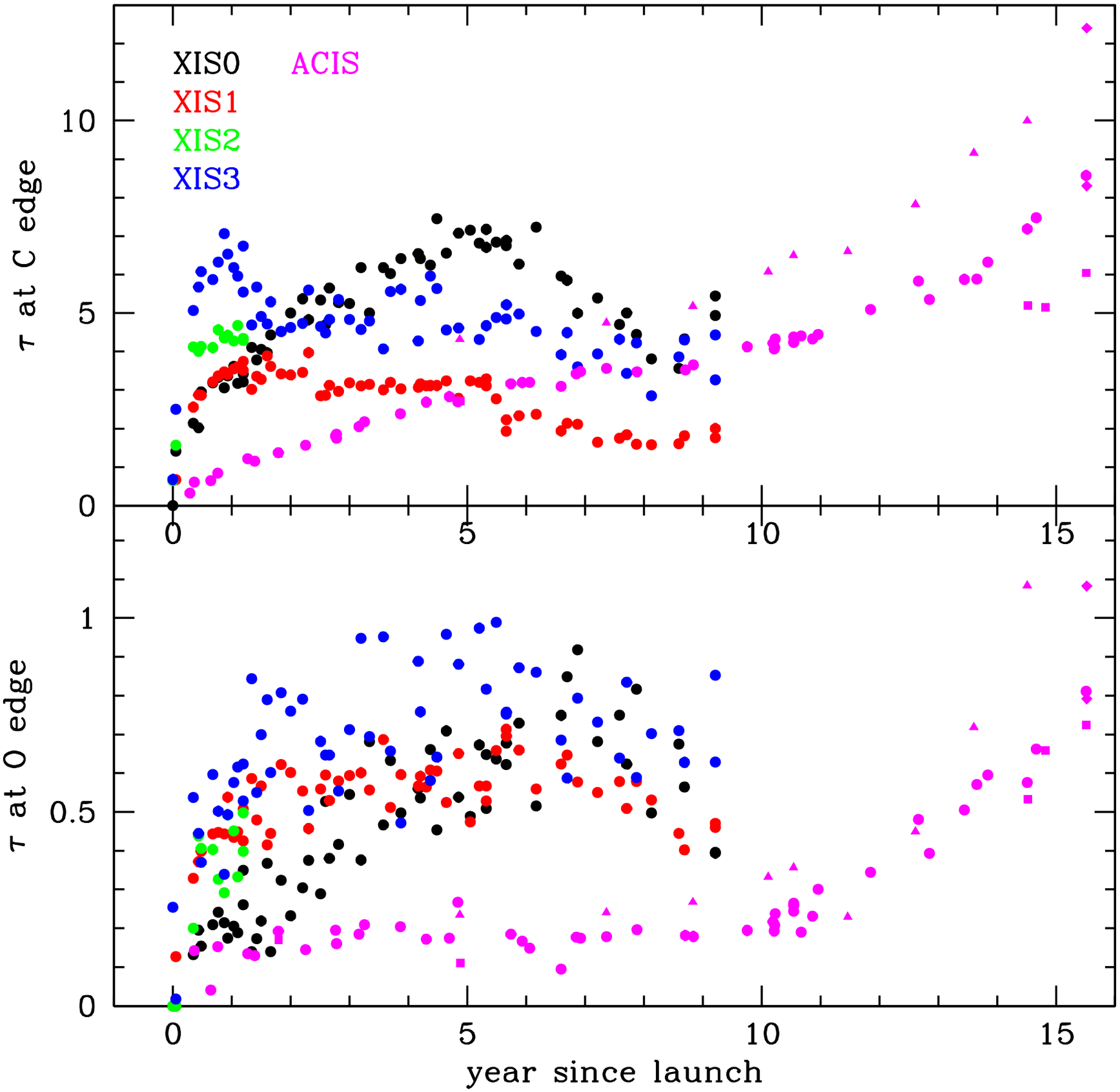
Doug Swartz

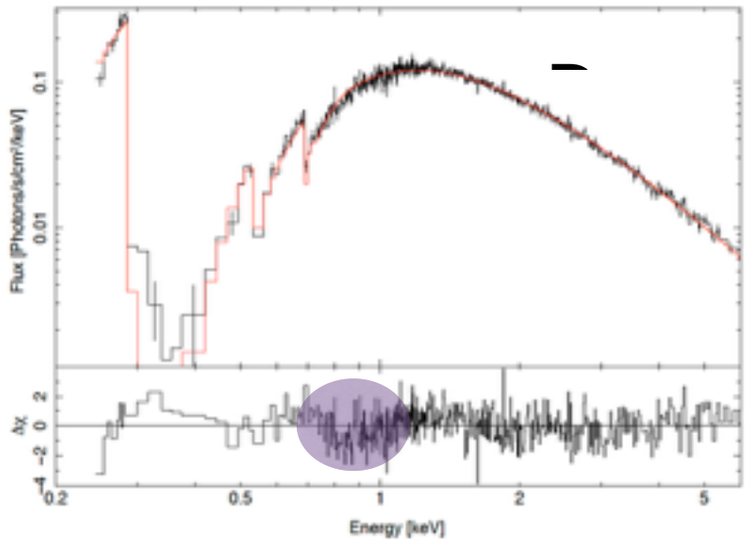
Suzaku XIS Contamination Trend

Eric Miller



ACIS vs. XIS Comparison





Contamination WG Plan

- legacy/heritage WG white paper
  - lessons learned for design and ground mitigation
  - lessons learned for first light targets, "zero-contamination" baseline
  - targets and observing strategies to detect and monitor contamination
  - primary role of this working group!
  - Eric & Herman will discuss this at MIT, prepare a skeleton manuscript with example text for *Suzaku* XIS (A/I Eric due 2015 August 30)