Updating the ACIS Contamination model

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Indications II

Update on Contaminant Buildup

Data for all Of S3:
Grant (MIT)

Model:
O’Dell & Tennant (MSFC)
For middle of S3
Vikhlinin (SAO)

Paul Plucinsky

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Why Now?

Model no longer fit ECS data (HLM, 12/08)

AV confirms, 3/09
Approach

- Begin with fits to $\tau_{C-K}(t)$, $\tau_{O-K}/\tau_{C-K}$, $\tau_{F-K}/\tau_{C-K}$
  - Use LETG/ACIS blazar spectra
  - Use $\tau_{O-K}/\tau_{C-K}$, $\tau_{F-K}/\tau_{C-K}$ to compute $\tau_{0.66}(t)$
- Compare to external cal source (ECS)
- Model excess opacity with “fluffium”
- Model $\tau_{C-K}$, edge$(t)$ - $\tau_{C-K}$, center$(t)$
- Compute $\tau_{0.66}$, edge$(t)$ - $\tau_{0.66}$, center$(t)$
  - Compare to ECS measurements
  - Model excess opacity with fluffium
- Adjust fluffium spectrum using ECS $\tau_{Al-K}(t)$
- Repeat for ACIS-I but without C-K
ECS fits 660 eV

Data from Alexey Vikhlinin

Model: $0.29 \left(1-e^{-t}\right) + 0.053 \cdot t$

Model: $0.66 \left(1-e^{-t}\right) + 0.054 \cdot t$

Model: $0.56 \left(1-e^{-t}\right) + 0.070 \cdot t$
ECS fits 1.486 keV

Data from Alexey Vikhlinin
Model: $0.86(1-e^{-t}) + 0.30t$
Spectral model

Contaminant Models

- Caldb version at 2002.82
- Elemental Component, \( \tau = 2.51 \)

- Difference at 2002.82
- Scaled fluffium model
- Scale C-K model to 660 eV
- Subtract from CS data
- Fit to rising exponential
- Assign difference to fluffium
• Offset from center of S array
• Scale from C-K edge-center model
• Assign remainder to fluffium
• Fluffium now has spatial-temporal model

![Graph showing data with different models and data sets]
• Predict Al-K optical depths

• One free parameter: $\tau_{\text{Al-K}}$, fluff

• Error bars set at 0.05
Testing I

ECS Residuals from model 9989, Mn-L + F-K data

ECS Residuals from model 9989, Al-K data
ACIS observations of Coma (Larry David)
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ACIS observations of Coma (Larry David)
Testing III
Testing IV

Relative Energy Flux, 0.33 - 0.54 keV Band

Flux Method: II
Version: SAS9.0 - CIA04.1/CA
Summary

• A new contamination correction will soon be available
  • Still testing on flight data
  • An alternative model from AV is being tested

• Fluffium component is not understood
  • Physical basis is untenable
  • Approach breaks down if ECS Al-K data are reliable
  • Alternative models will be explored