

Effective Area Analysis using the HETGS

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Chandra X-ray Center

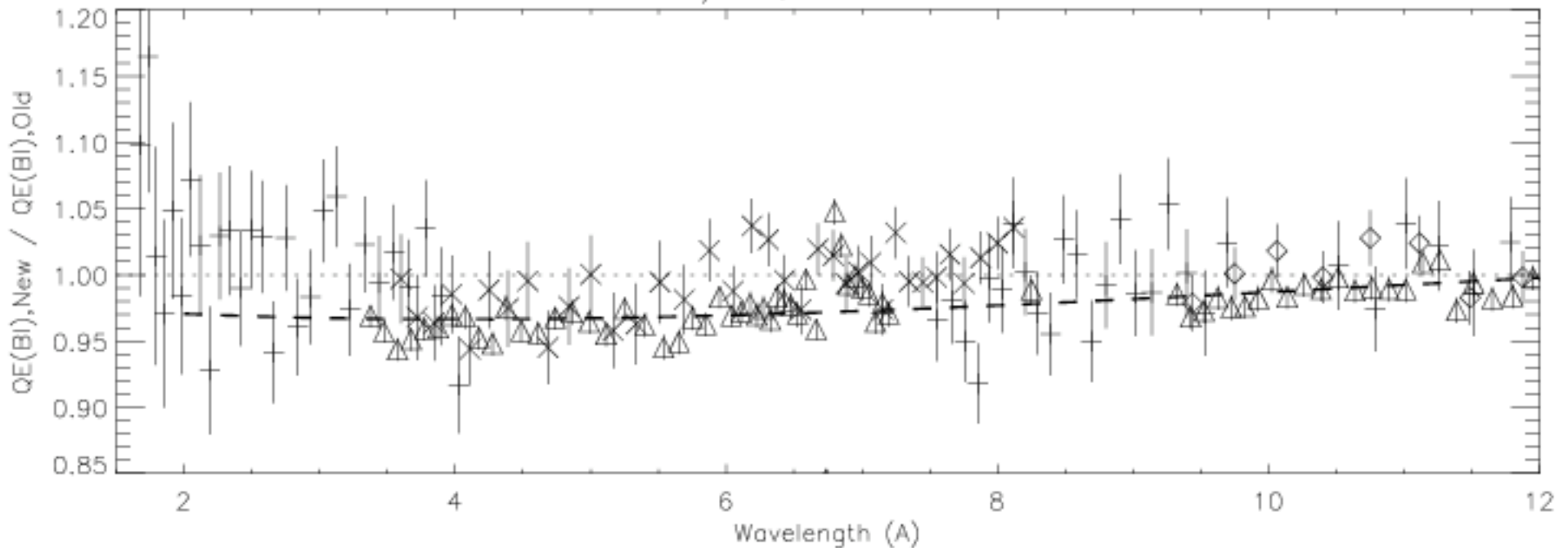
HETGS Effective Area Calibration

- ACIS-S
 - BI QE vs. FI QE — now down from <15% to <5%
 - Pileup — impact depends on source brightness
 - Si-K edge — 6% edge residual
 - N-K edge in FI chips — more important for LETG/ACIS
 - Contamination — see earlier talk
- ACIS OBF
 - C-K edge energy shift — only important for LETG/ACIS
 - O-K edge — incomplete, depends on contamination
- HETG Efficiency
 - MEG/HEG ratio update ready — <7% for $E > 0.8$ keV
 - Compare LETG to HETG — incomplete
- HRMA Effective Area
 - Ir-M edge — 10% jump at 2.075 keV

ACIS BI/FI QE

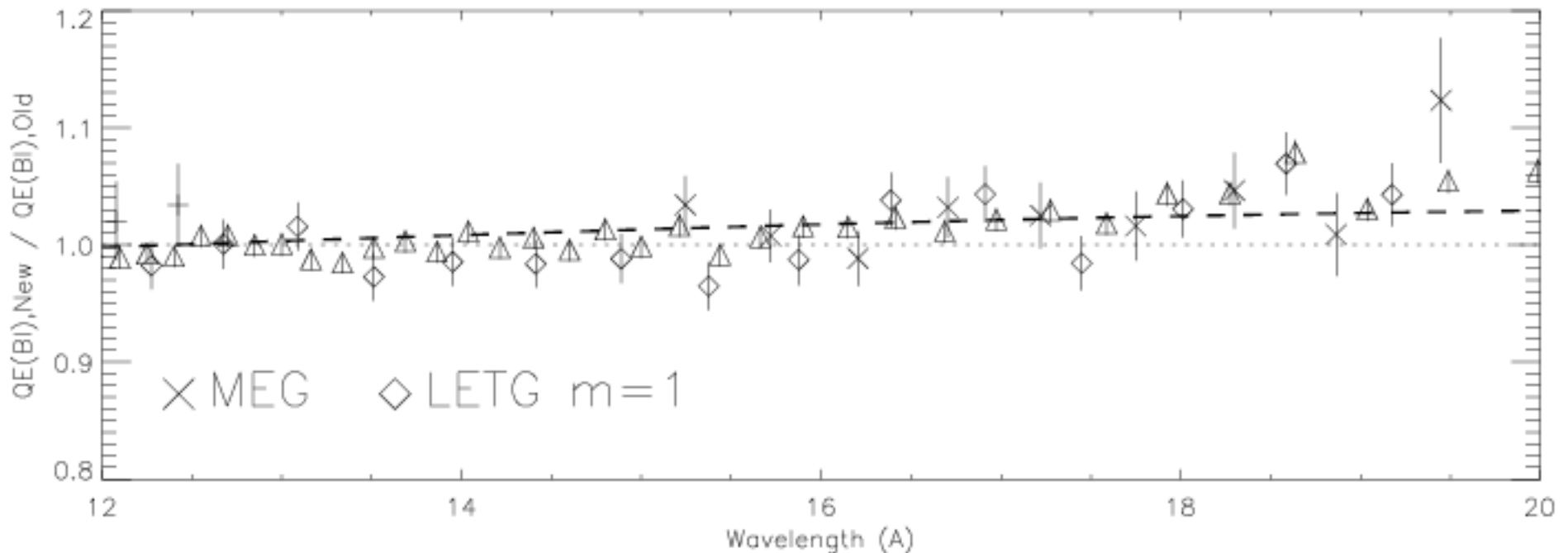
- New BI QEs improve matters considerably
- FI loss due to CR blooms is included
- At most 3-4% differences in 2-10 keV range
- No problems within HETGS data

BI/FI QE Correction



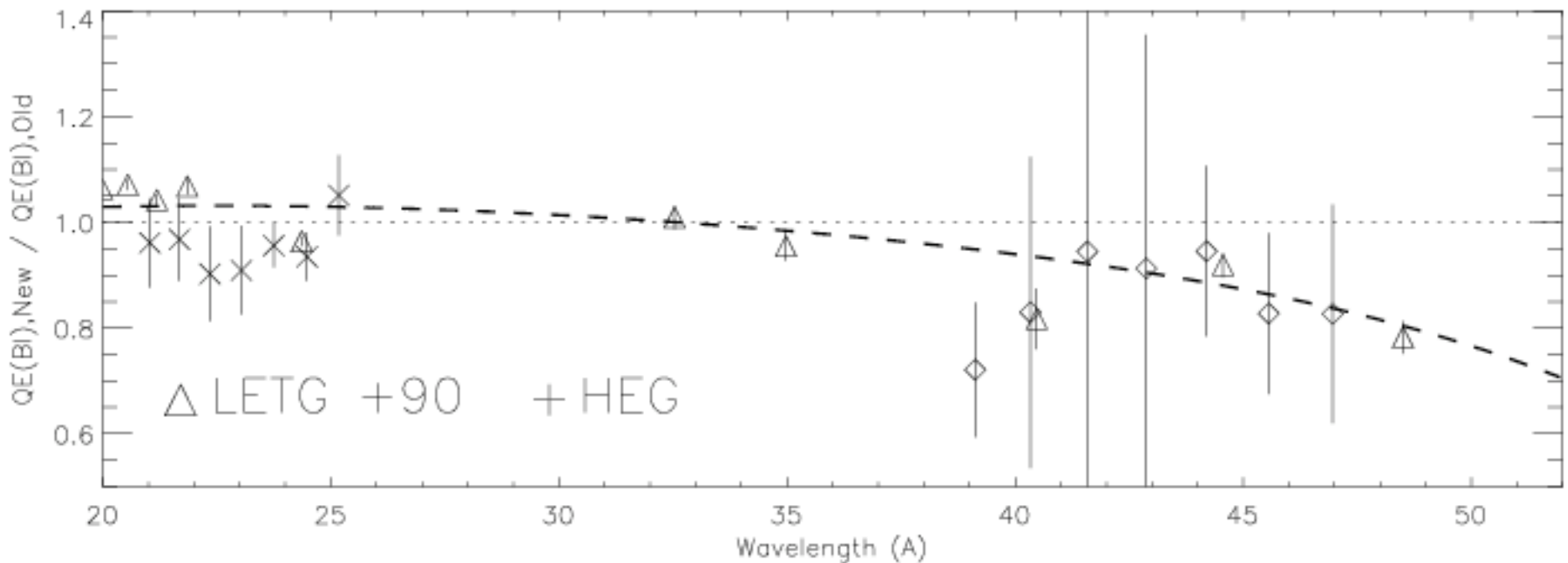
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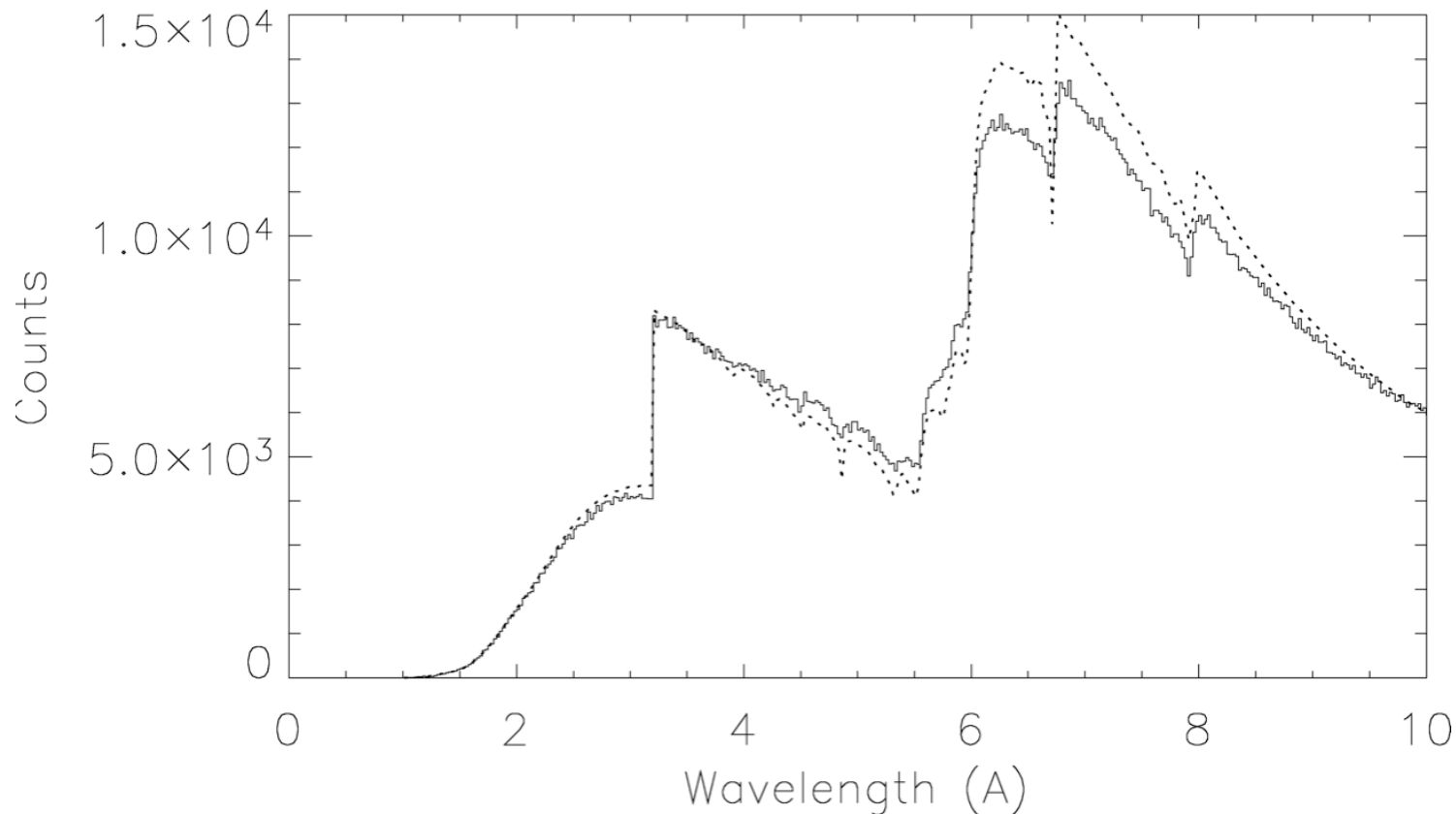


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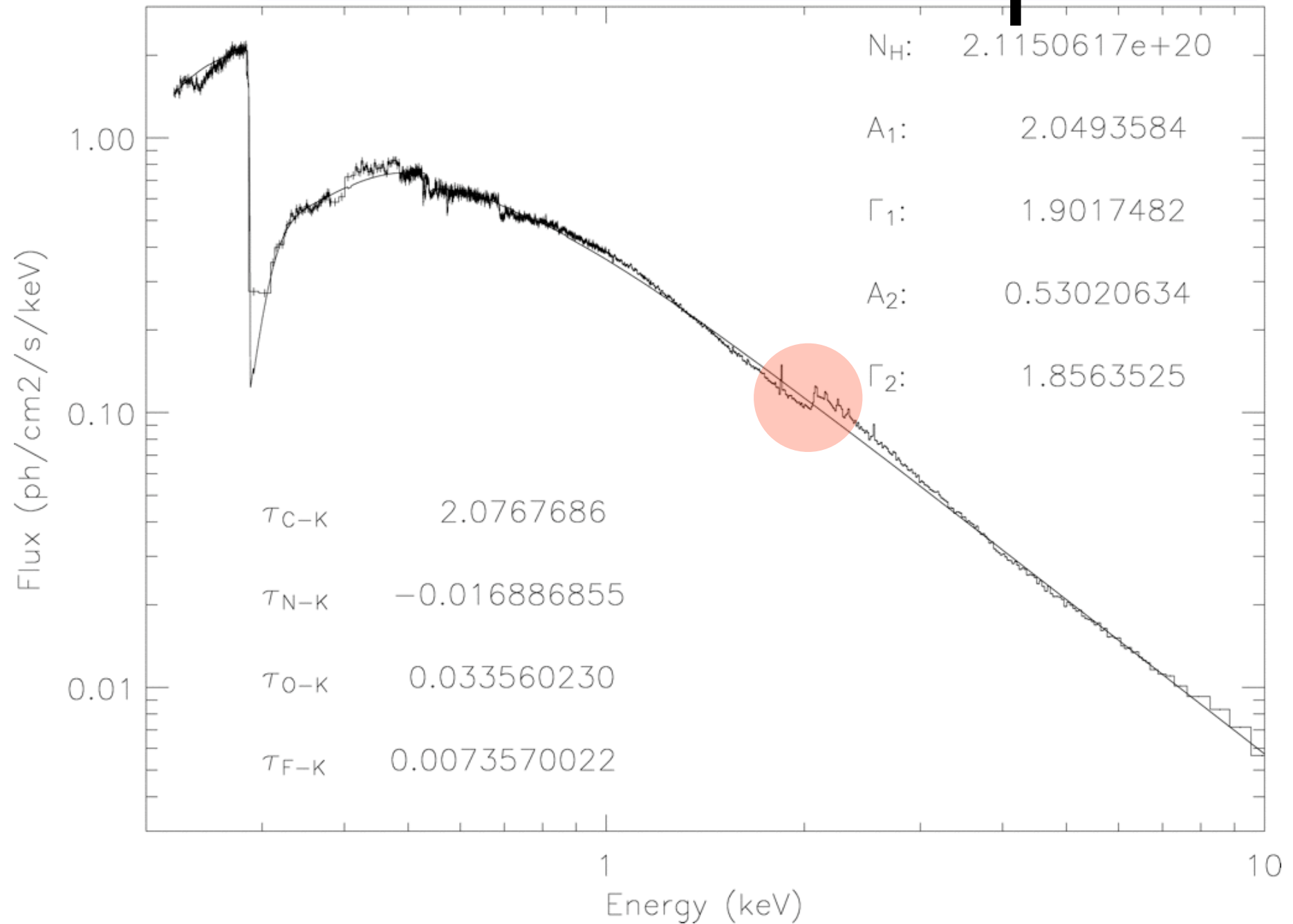
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HETGS — Pileup

- Edge appears at 2.1 keV due to effective area jump
- Rate (Rf) ~ 0.01 ct/frame/col., incur $\sim 5\%$ loss
- Mk 421 (4148): Rf = 0.05, giving jump of 19%



HETGS — Pileup

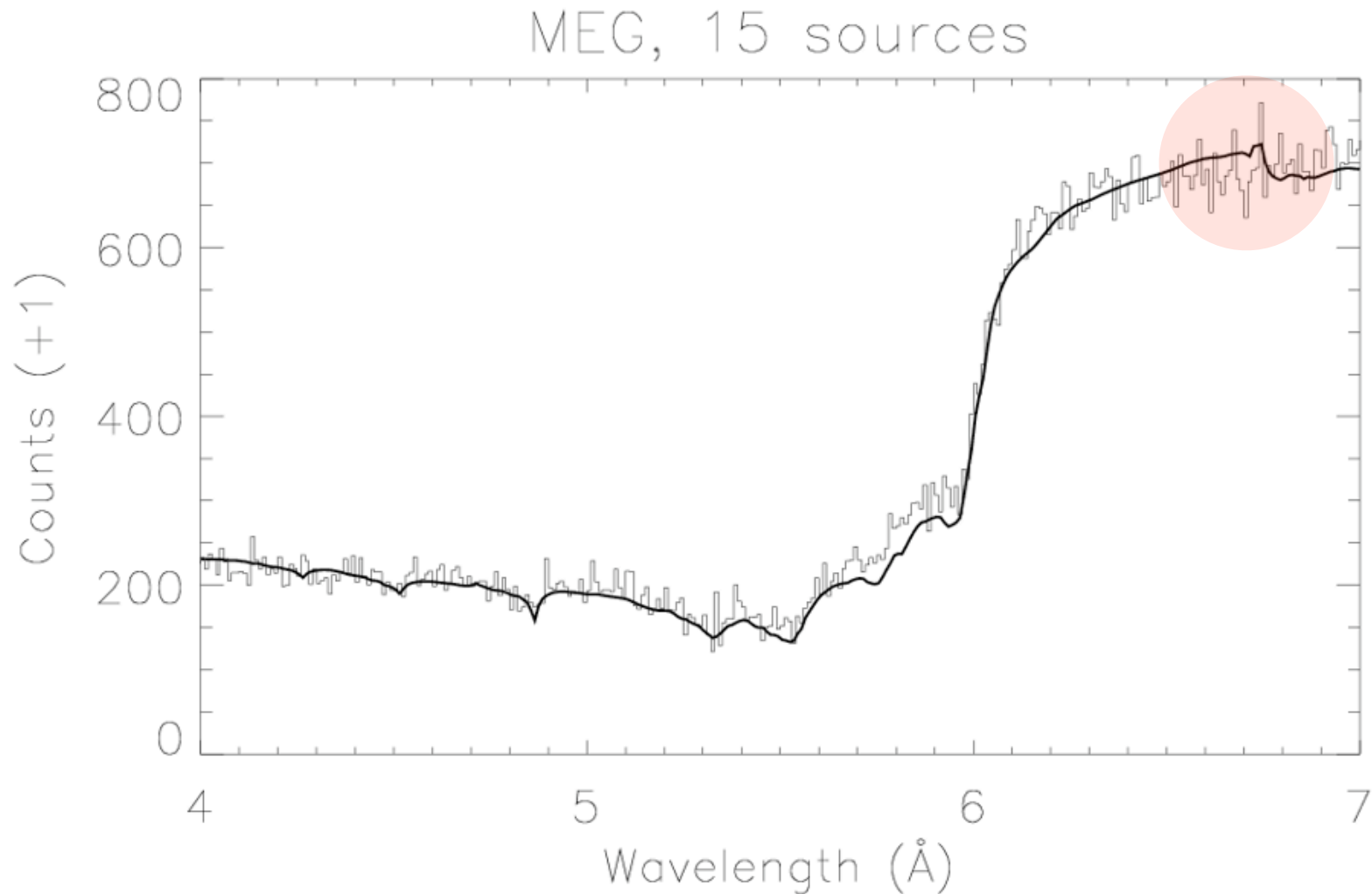


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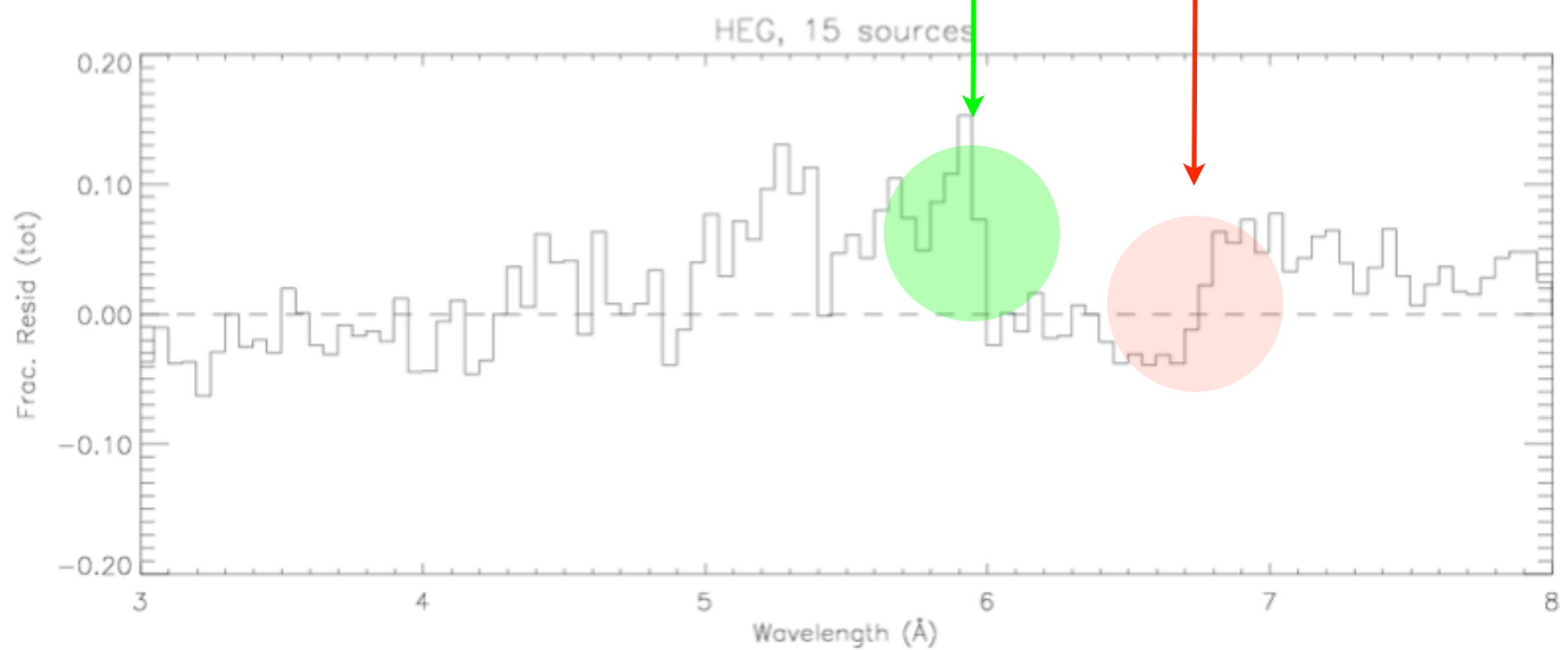
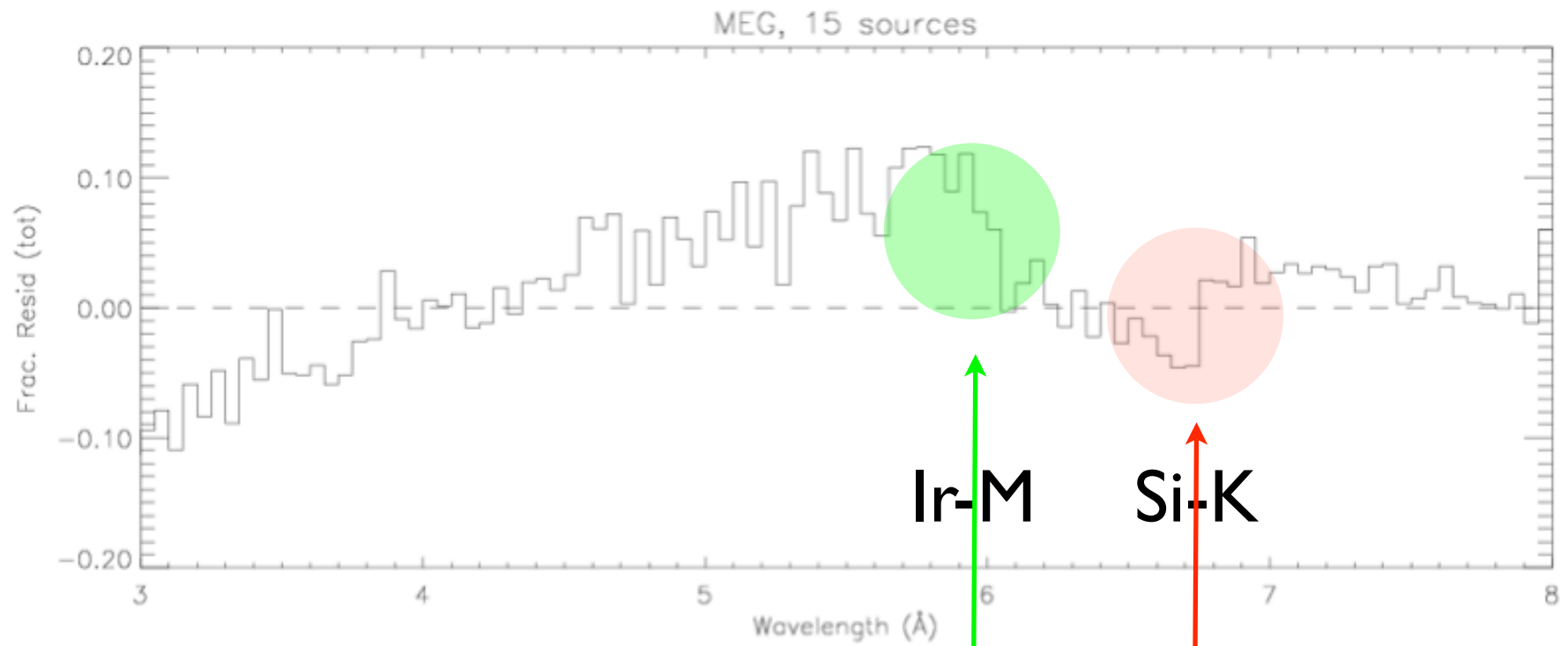
Si-K Edge in BI QE

- Appears when using the new BI QE models
- Effect is an inverse, reversed edge
- Jump is about 6%



Fitting Si-K Edge in HETGS Residuals

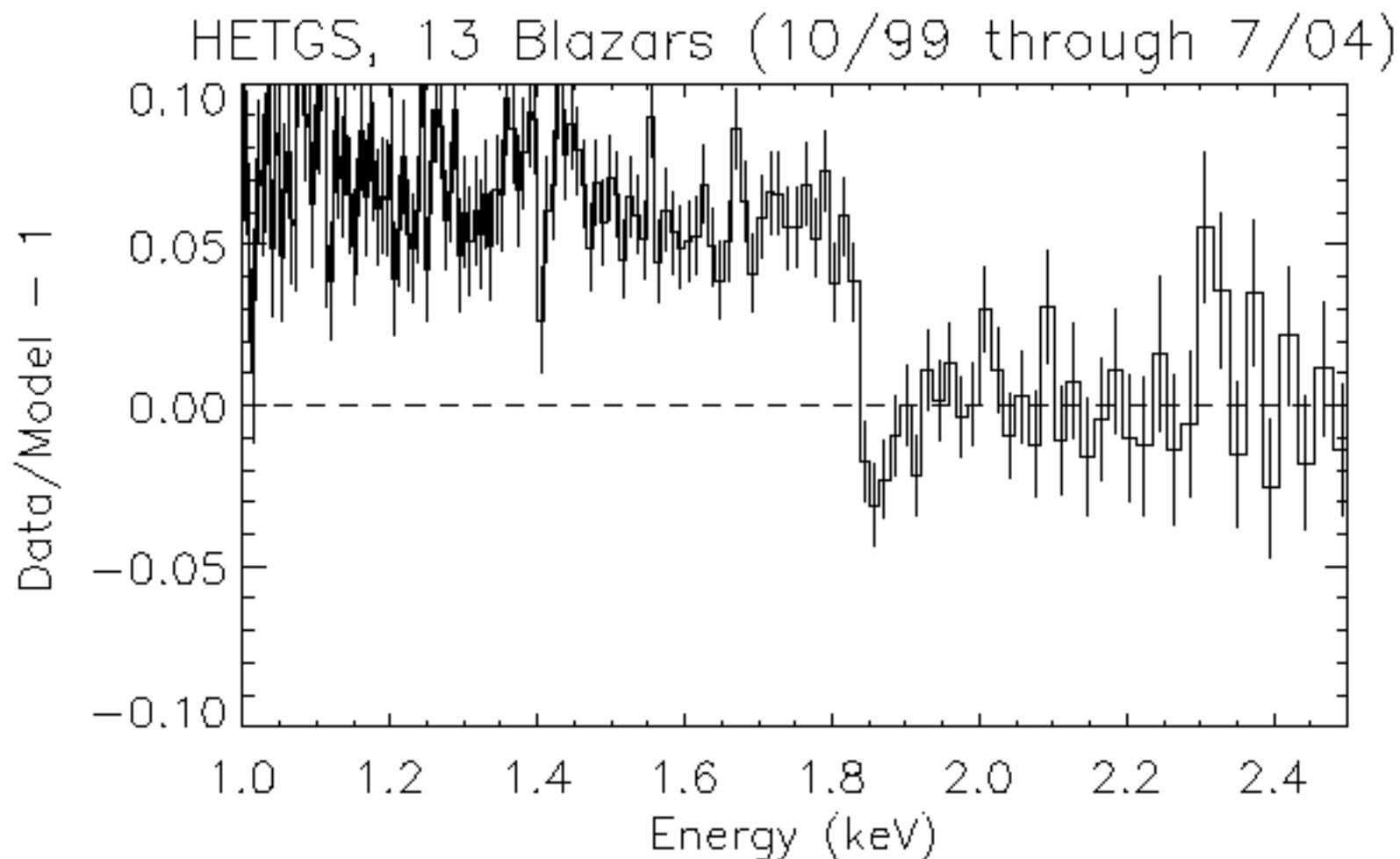
- Use 13 blazar observations
- Si-K is near Ir-M
 - Fixing Ir-M edge requires good fit to Si-K
 - Use 2 steps: approx. Si-K to get Ir-M, then use good Ir-M fix to finish Si-K fix adjustment
- Residual has near edge structure — use Si-K opacity from ACIS team



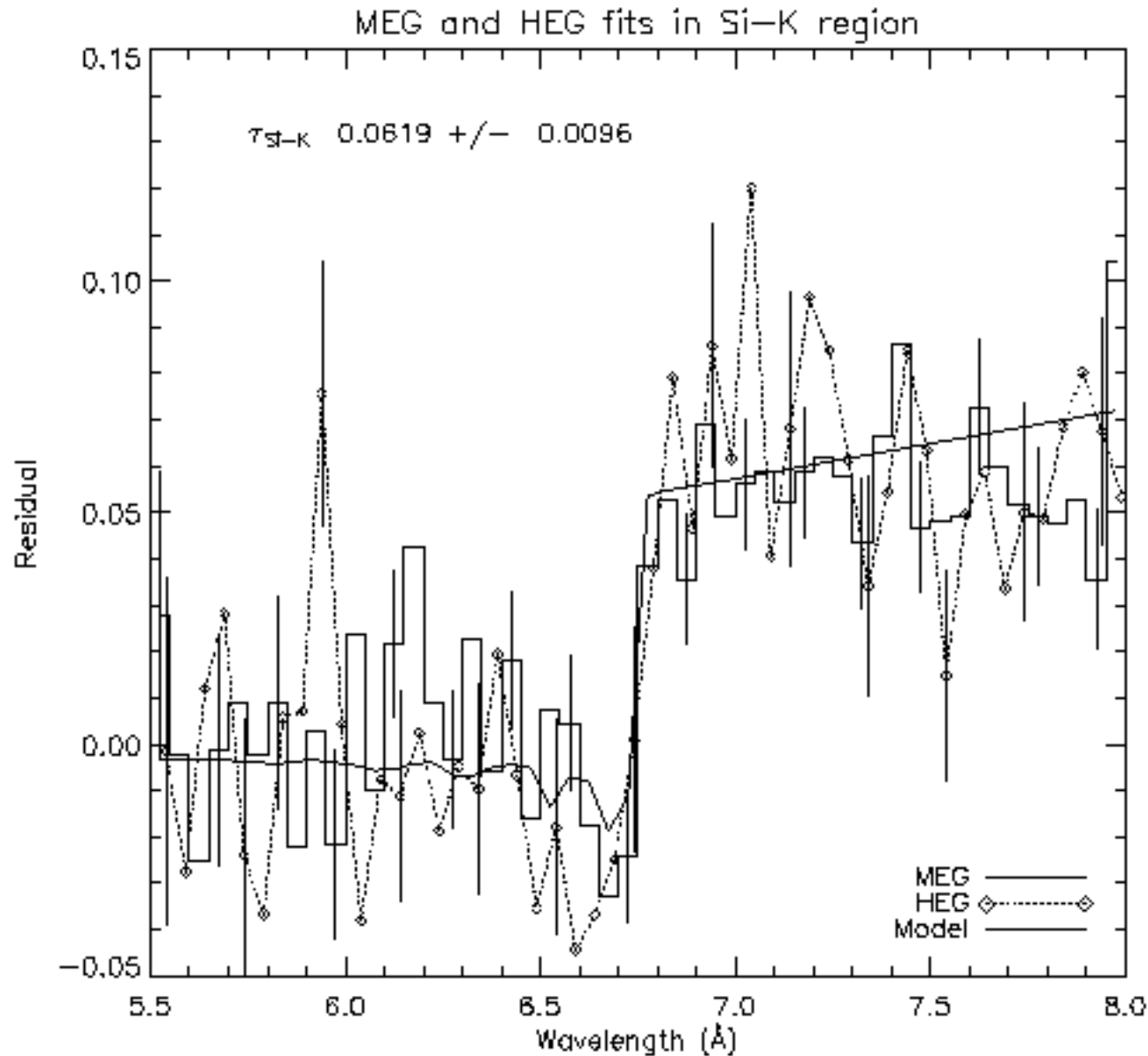
Effective Area

CUC — 1/05

HETGS Residuals after fixing Ir-M edge



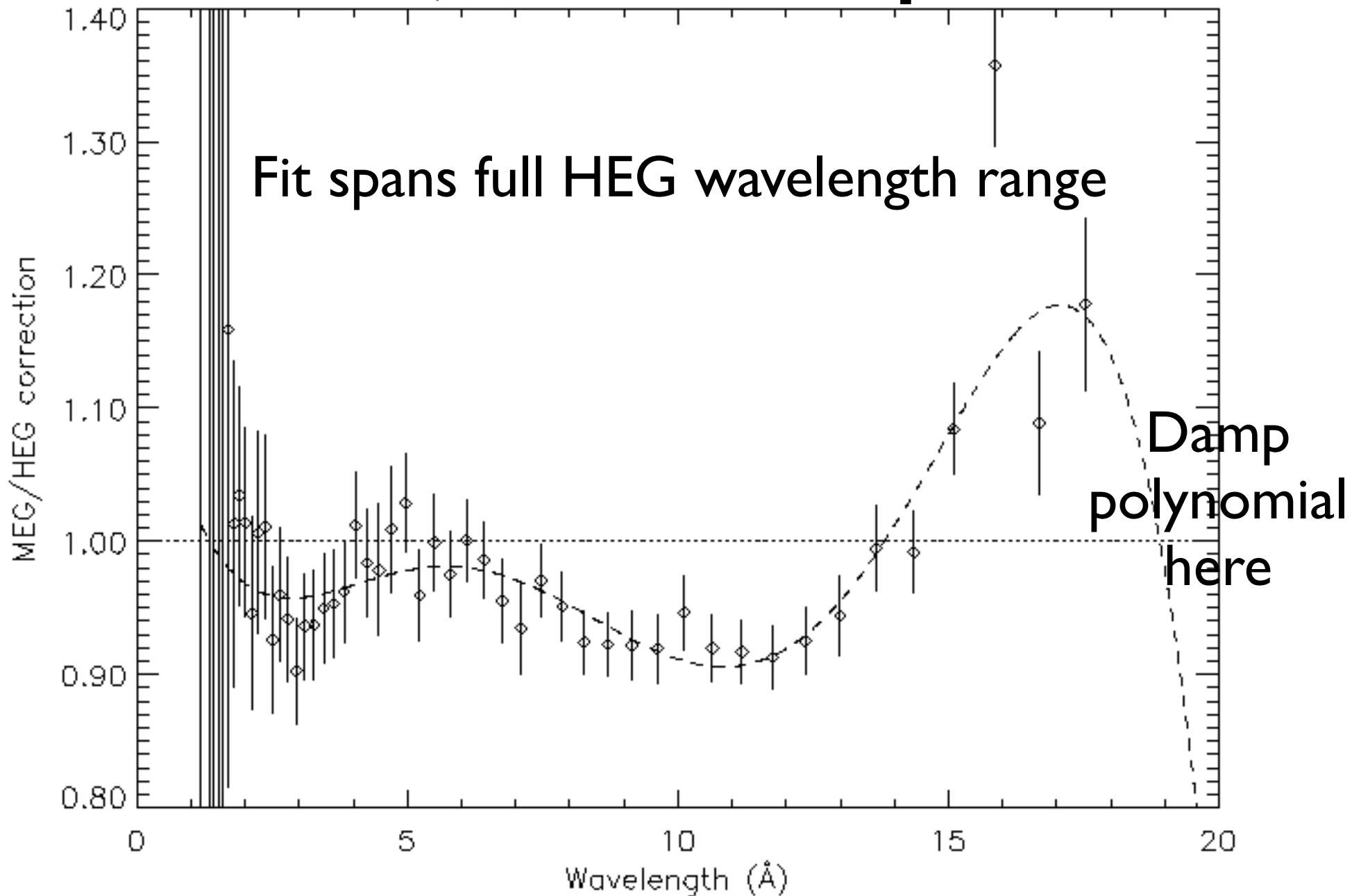
Fit to Si-K edge



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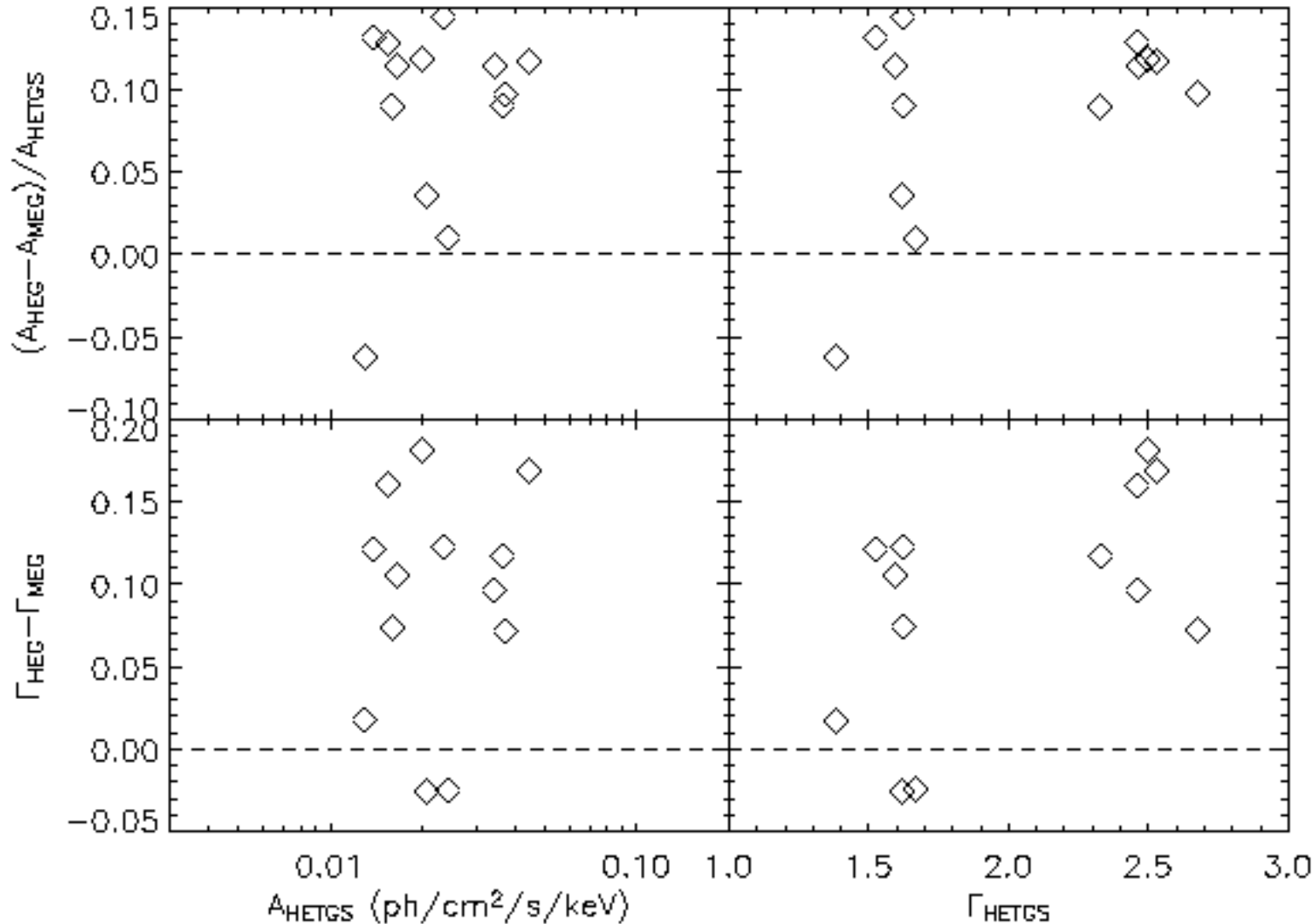
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HEG/MEG Comparison



MEG-HEG Consistency

- Fit PL models to MEG and HEG independently
- Fit parameters show slight calibration biases

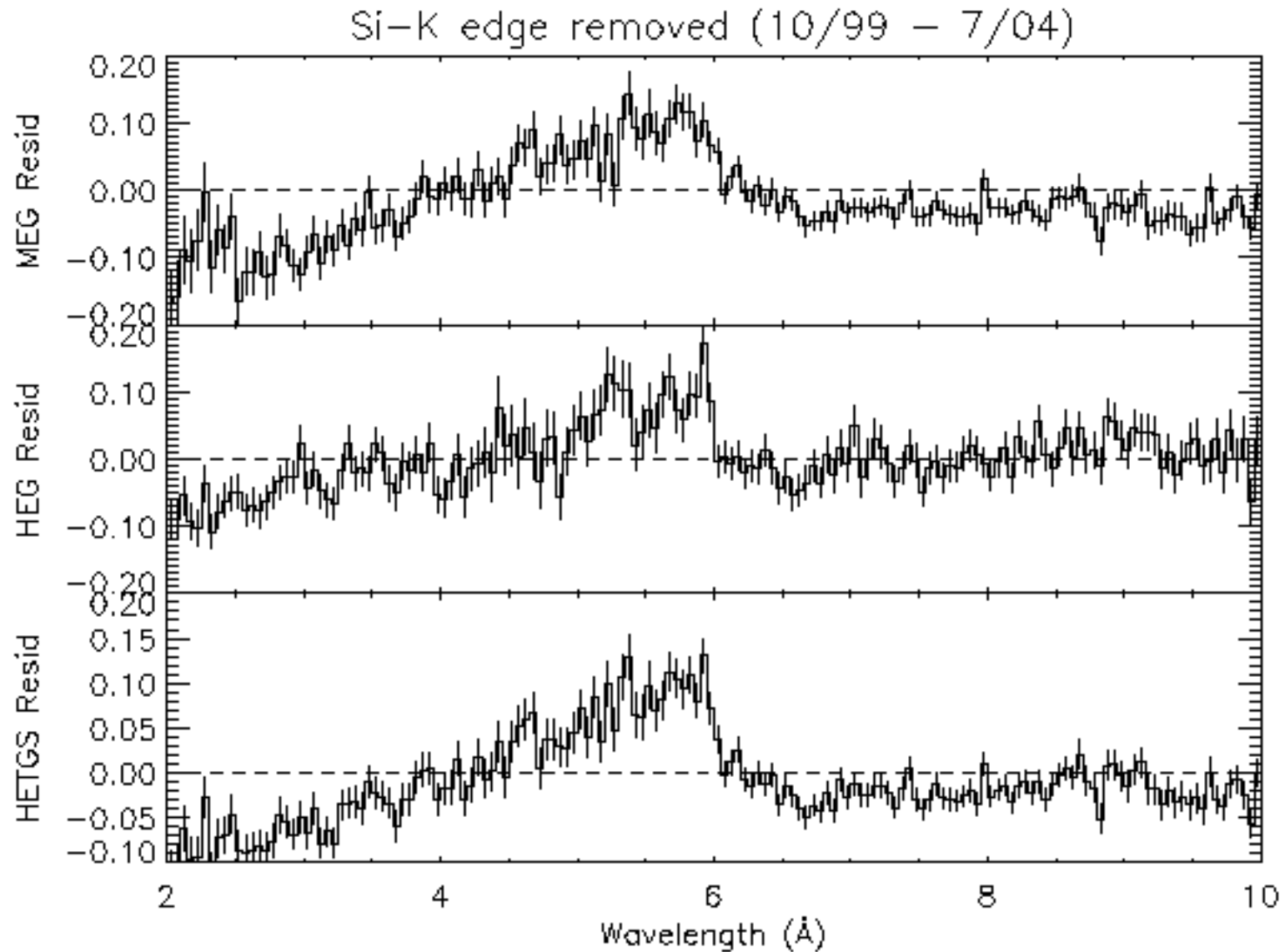


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HRMA Ir-M edge

- Jump is about 10%
- MEG and HEG agree
- See Diab Jerius' talk



HRMA Overlayer: $17 \pm 5 \text{ \AA}$

HETGS, 13 Blazars (10/99 through 7/04)

