



MIT Kavli Institute  
for Astrophysics  
and Space Research

# HETG - Status

*Chandra* Quarterly Review No. 28  
2 September 2009



*HETG's First Decade  
of Discovery*

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## Ongoing HETG Team Activities Summary

- HETG Performance (mid-March'09 through August'09)
  - 22 HETG obsids on 8 Science + 1 Cal target
    - \* 1 of our GTO targets, GX 5-1.
    - \* Last HETG obs on 6 July: limit switch anomaly on retraction.
    - \* Next HETG obs ~ 7 September (SN 1987A cont.)
  - **FWHM of streak** is steady; HETG performance is nominal.
  - LETG usage: 4 obsids on 1 Science + 3 Cal targets
    - \* Recent obsid 11015, 26 August, LETG-HRC-S; insertion OK.

- HETG Calibration

- Marx 4.4.0 [Davis]
- TE-CC mode w/4U 1957-11 [Schulz].
- Cygnus X-1 "all flying observatories" campaign [Talk by Hanke at *First Decade...*]
  - \* "HETG was *crucial* for modeling the forest of ionized absorption" [Nowak]

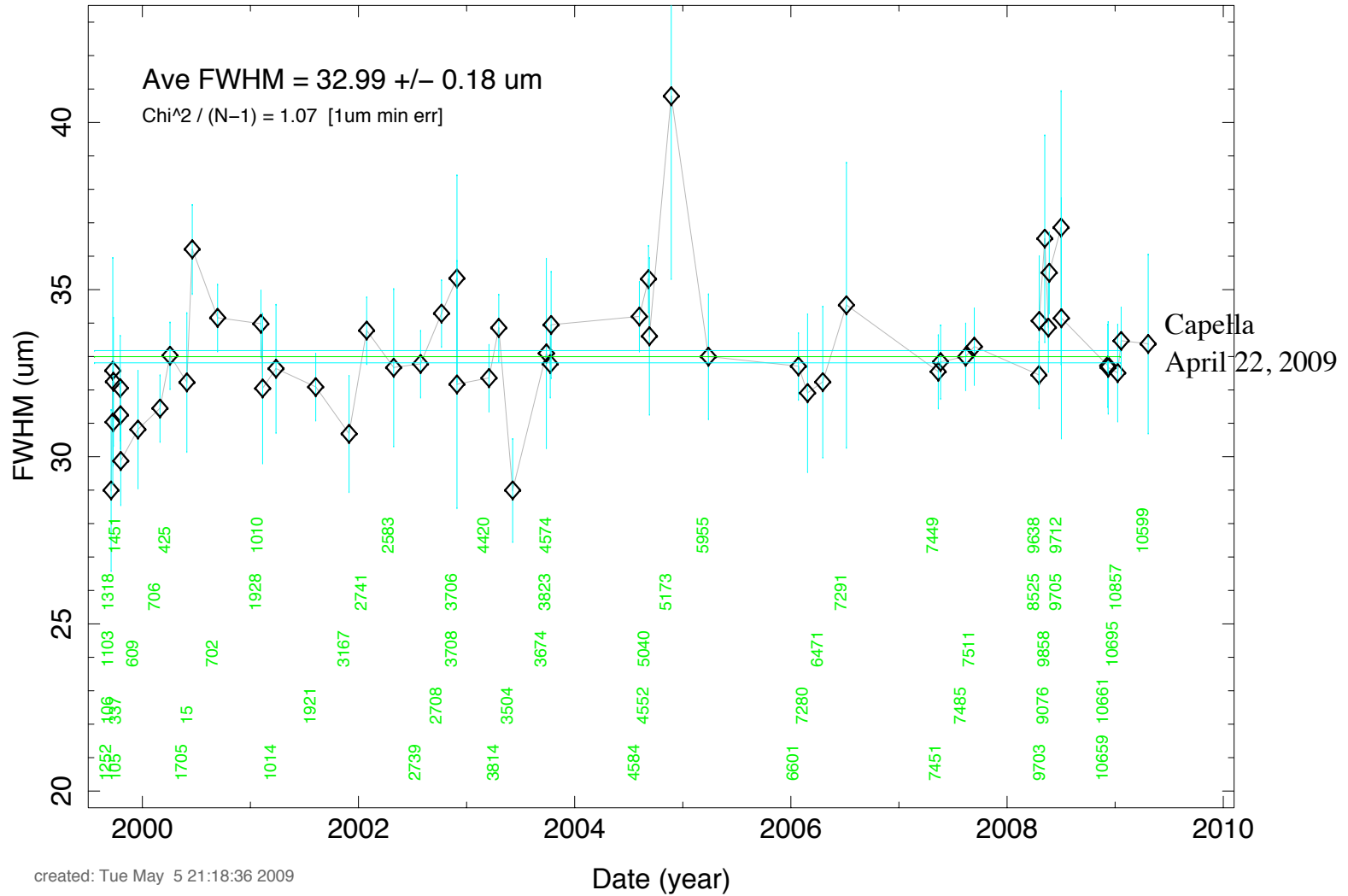
Chandra, XMM-Newton,  
Suzaku, RXTE,  
Integral, & Swift



<http://chandra.harvard.edu/photo/2009/cygx1/>



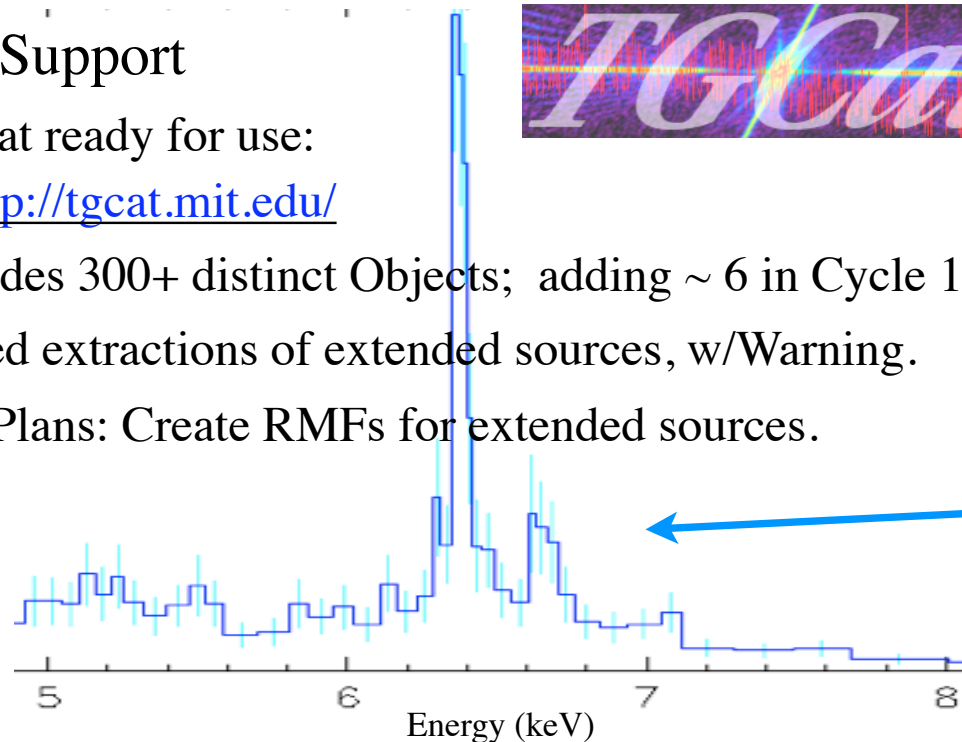
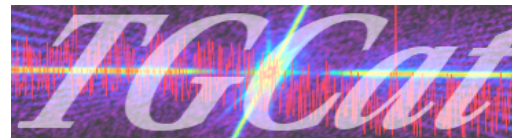
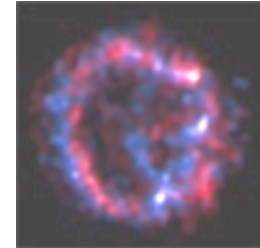
# FWHM of HETG Streak Core vs Time (TGCat processed)



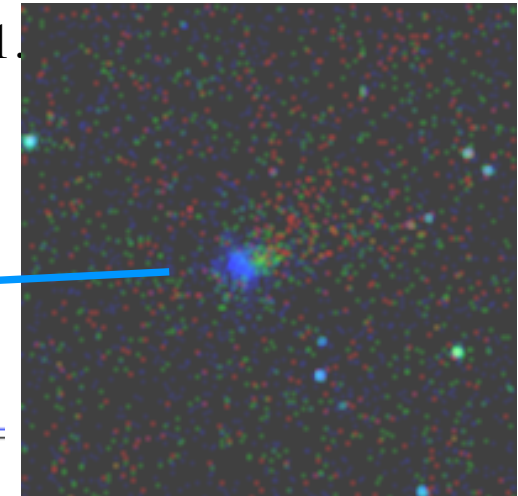


## Ongoing HETG Team Activities, cont.

- Science Support to CXC, etc.
  - Participated in Peer Review & SNR/PWN Meeting
  - Contribute to [E0102 PR 7/23/09](#)
  - TGCat Support
    - \* TGCat ready for use:  
<http://tgcate.mit.edu/>
    - \* Includes 300+ distinct Objects; adding ~ 6 in Cycle 11.
    - \* Added extractions of extended sources, w/Warning.
      - \* Plans: Create RMFs for extended sources.



NGC 4945





## Ongoing HETG Team Activities, cont.

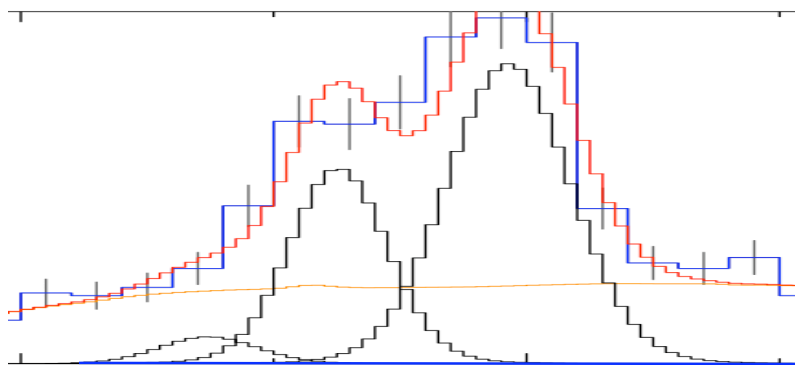
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- GTO Science Program
  - Cycle 10:
    - ✓ AGN, Ark 564 (250 ks); XRB/IGM, 4U 0614+091 (200 ks)
    - ✓ Flare star, EV Lac (100 ks); XRB: 4U 1556-60 (32, 40 ks)
      - XRB: GX 5-1 (4x 8 ks: three are done, one 8 ks left)
      - Cas A "HETG-II": 8.5-years-later (70 ks) ~ January 2010
  - Cycle 11:
    - AGN: ESO 323-G077 (300ks) & NGC 2992 (150 ks)
    - XRB: GX 13+1 (5x 30 ks); T-Tauri binary: TWA 19A (60 ks)
  - Postdoc status:
    - \* One PD 'graduated', in keeping with our plans.
    - \* Contract funding supports 2 HETG Postdocs in coming years.

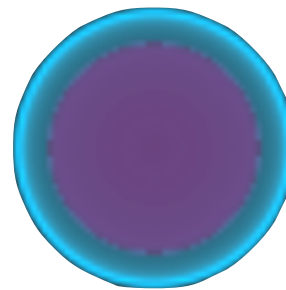
## Science: SN 1996cr Changes in a Decade

- SN 1996cr exploded around time of XRCF testing...
- Near Circinus Galaxy: HETG-observed in 2000 & 2004
- '96cr and SN 1987A are unique SN: having *increasing* flux at years after explosion: bubble - shell CSM model (V.V. Dwarkadas).
- But, '96cr is 75 times farther:  $\sim 0.01''$  dia. -- a point source to Chandra.
- Deep GO (F.E. Bauer) HETG observation at  $\sim 2009.0$
- HETG data constrains model, see poster at

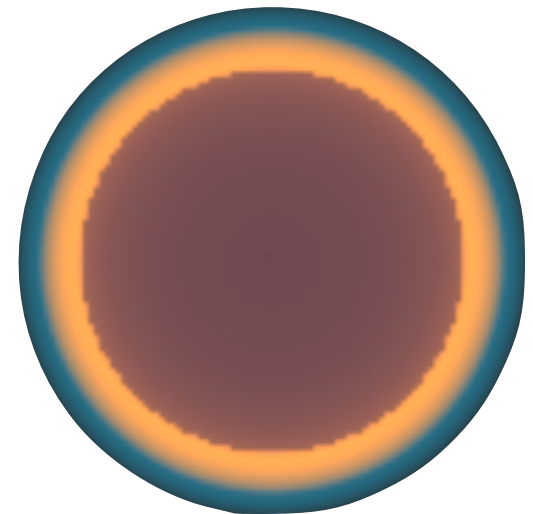
### *Chandra's First Decade of Discovery !*



HETG



**Model:  
year 2000**



**Model: year 2009**