

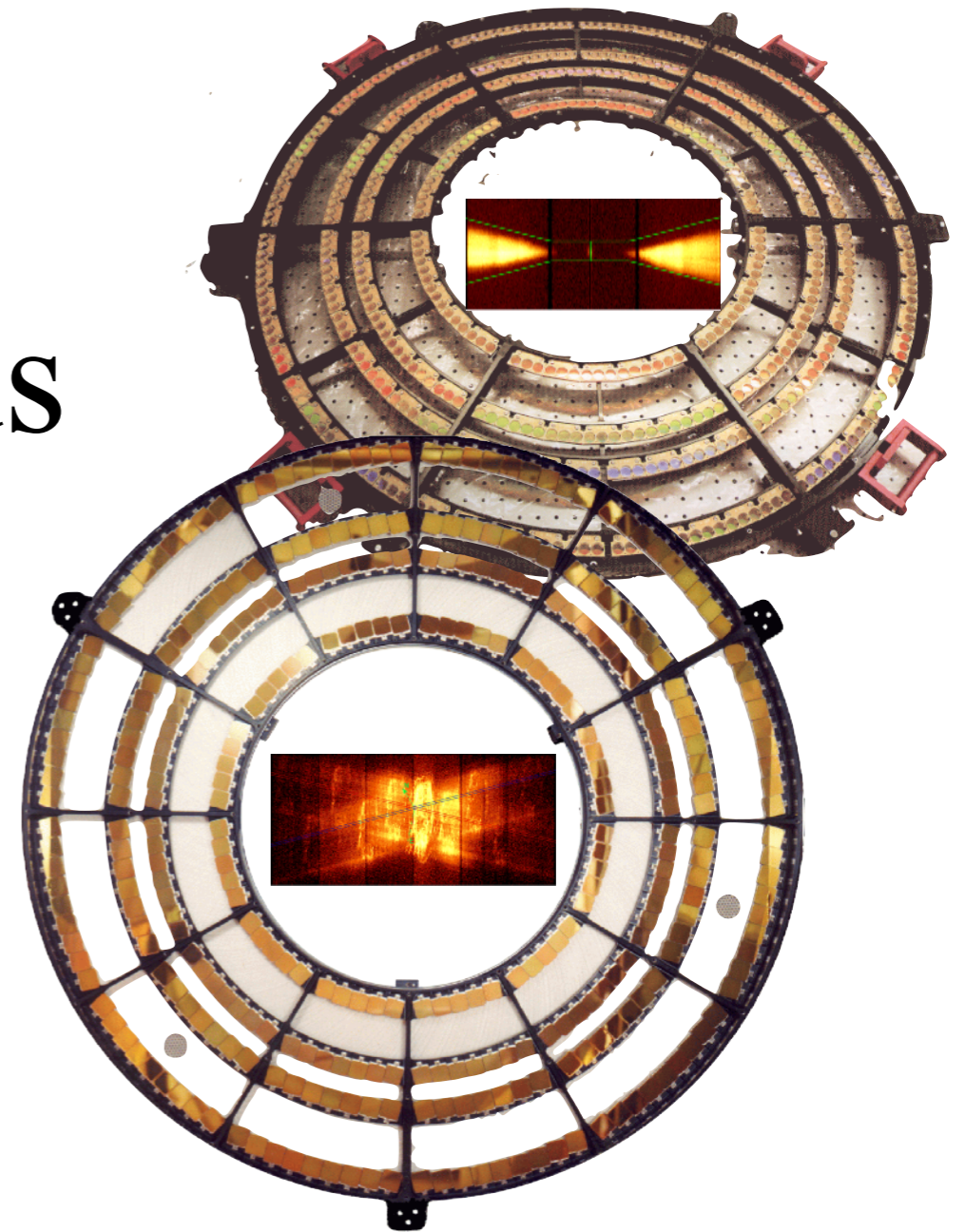


MIT KAVLI INSTITUTE

# HETG/LETG — Status

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# Ongoing HETG Team Activities Summary



Performance October 2018 — March 2019

## **HETG/ACIS-S** 847 ks

- 36 observations on 10 targets (23 GO, 7 GTO, 2 Cal, 4 TOO, 0 DDT)  
(special challenge: Sco X-1)

## **HETG/HRC-I** 32 ks

- 2 observations (GTO); (2nd observation failed, uncovering HRC procedural problem.)

## **LETG** 648 ks

- 8 LETG/HRC-S observations, 3 targets (7 GO, 0 GTO, 1 Cal, 0 DDT, 474 ks)
- 1 LETG/HRC-I observations (Cal, 2 ks)
- 8 LETG/ACIS-S observations, 1 target (Cal, 172 ks)

*Grating performance is nominal.*

<http://tgcat.mit.edu>

*TGCat* has 1969 extractions for 490 objects (+76/+7 since last report)

Total volume: 444 GB

Downloads: 199 packages, 65 GB

[35245 single file, 19 GB — bad robots? 1 month had >30000 downloads]

# HETG GTO Science Program



## Cycle 18:

- ★ ULX/BH: NGC 1313 X-1 481 ks Ultra-luminous source outflow: absorption, emission lines
- ★ NS/BH: GRS 1915+105 97 ks Black hole accretion, line variability
- ★ XRB: 4U 1626-67 45 ks Neutron star accretion; Fe K absorption variability

## Cycle 19:

- ★ **AGN:** **Fairall 51** 120/240 ks Seyfert 1, warm absorber variability (w/ NuSTAR 120 ks)
- ★ **HMXB:** **4U 1907+09** 142 ks Accreting neutron star; wind emission, absorption lines
- ★ Stars: V773 Tau 140 ks Evolution of pre-MS stars; flares (w/ NuSTAR 150 ks)
- ★ Stars: TW Hya 32/75 ks Accretion/winds in pre-main-sequence stars (*HETG/HRC-I*)
- ★ ISM: 4U 1636-53 128 ks Si, Fe absorption edges; part of survey vs  $N_H$

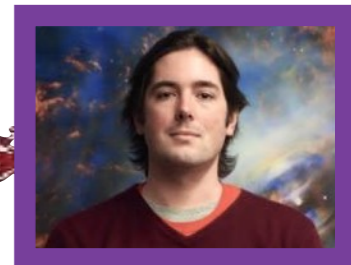
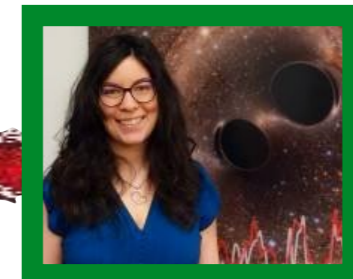
## Cycle 20:

- ★ NS: Terzan 5 X-2 0/200 ks TOO (10%); Neutron Star Equation of State
- ★ LIGO: GW2019nnnn 0/300 ks TOO (10%); Gravitational wave transient
- ★ Stars: SZ 96 0/250 ks Young, low mass stellar accretion
- ★ **XRB:** **4U 1626-67** 48 ks Neutron star accretion (monitoring)
- ★ SNR: Cas A 0/100 ks Decadal visit — 20 yrs on, dynamics
- ★ **AGN:** **Mrk 355** 0/280 ks TOO Narrow Lined Seyfert, w/ NuSTAR, NICER; warm absorbers

### HETG Postdoc status/activities:

Dr. Rozenn Boissay, since Feb 2017 (Ph.D. U. Geneva, May 2016)

Dr. Paul Hemphill, since Oct 2016 (Ph.D. UCSD, August 2016) [partial GTO support]





# LETG GTO Science Program



## Cycle 18:

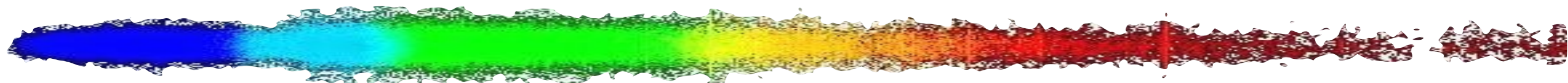
- ★ AGN: (Kaastra/SRON) IC 4329a 174 ks Neutral, warm absorbers (HETG/ACIS-S); Mehdipour & Costantini, (2018, A&A, 619, A20) "Probing the nature and origin of dust in the reddened quasar IC 4329A with global modeling from X-ray to infrared".
- ★ Stars: (Predehl/MPE) Proxima Cen 166 ks Reference spectrum of an old M-dwarf (LETG/HRC-S)

## Cycle 19:

- ★ NS: (Predehl/MPE) RX J2143.0+0654 173 ks Cyclotron Absorption Line in an Isolated Neutron Star (LETG/HRC-S)
- ★ Gal: (Kaastra/SRON) 1E 2216/1E 2215 147 ks Shocks in Galaxy Cluster Collisions (ACIS-I)
- ★ ISM: (Kaastra/SRON) 4U 1608-522 25 ks ISM dust, Mg and Si K-edge absorption (HETG/ACIS-S)

## Cycle 20:

- ★ NS: (Predehl/MPE) RX J1856.6-3754 0/172 ks Isolated neutron star, calibration (with eRosita) (LETG/HRC-S)
- ★ Gal: (Kaastra/SRON) NGC 5548 0/175 ks AGN outflows, absorption, ionization, obscuration (HETG/ACIS-S)

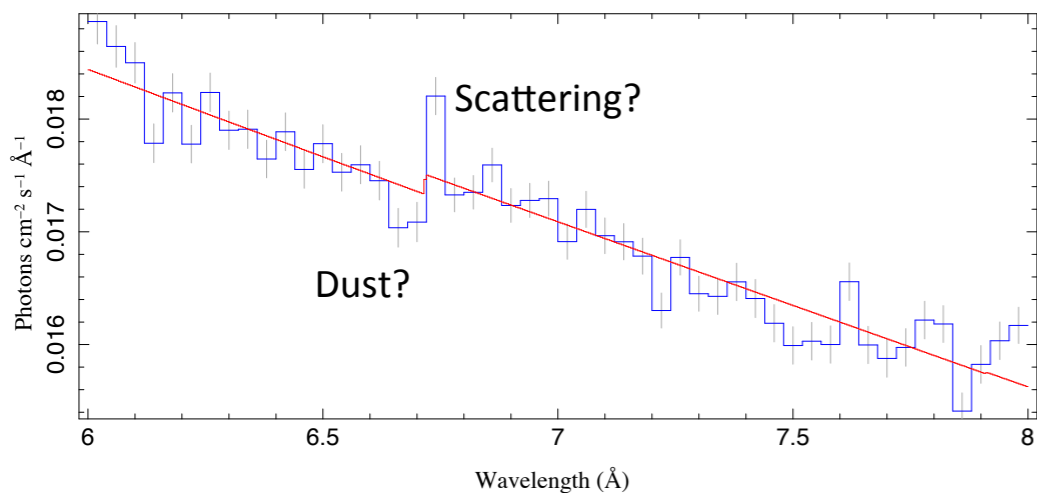




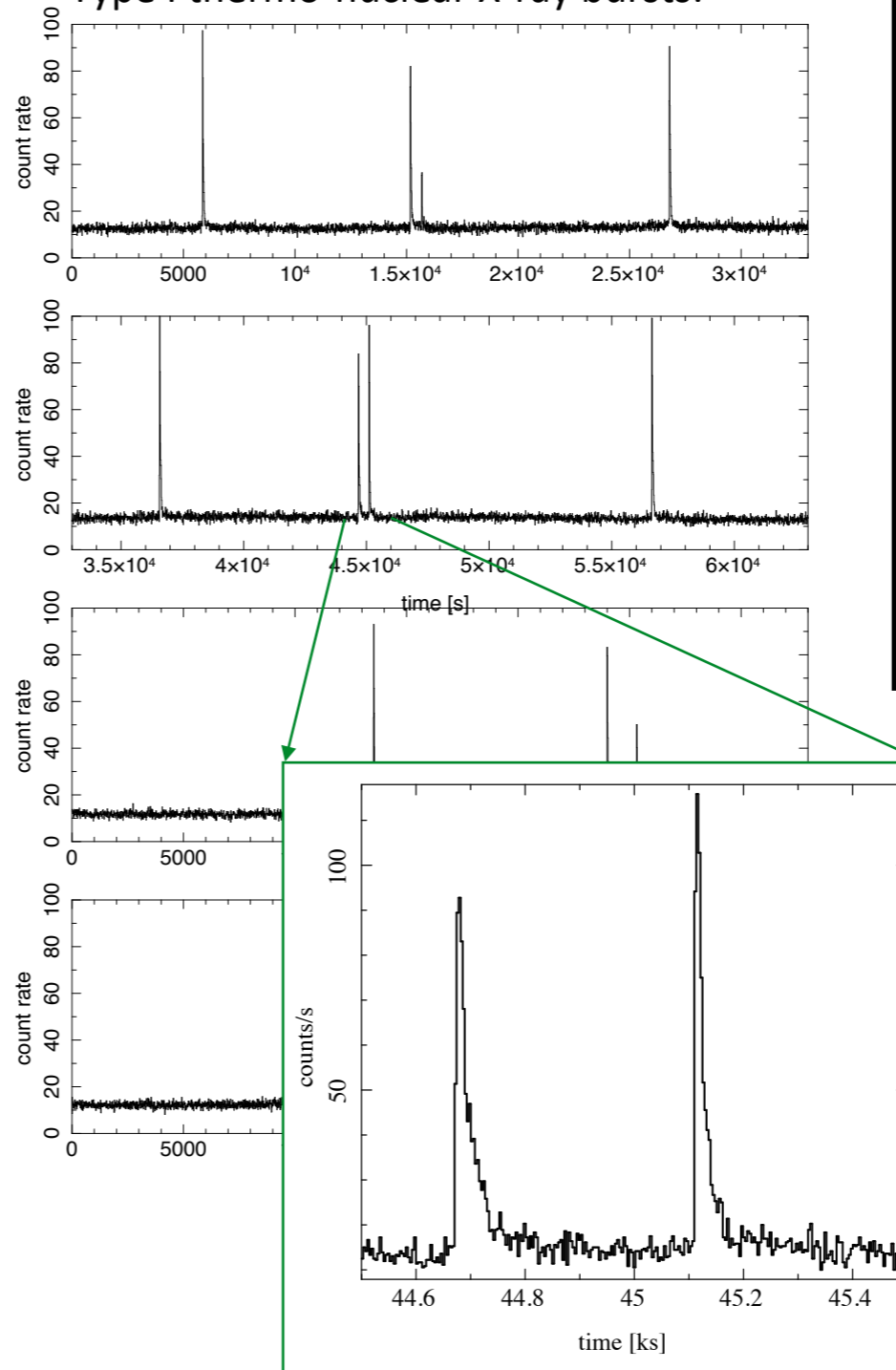
## Interstellar medium studies: 4U 1636-53 (140ks)

The primary objective for this observation was to measure the Si K edge optical depth in an X-ray source with a low column density that also has a measurable Fe L edge optical depth. Together with a high column source that exhibits Si K and Fe K optical depths we then can – using the Si K optical depth as a proxy – obtain a Fe K to Fe L optical depth ratio in the ISM to test its ionization equilibrium conditions:

$$\tau (\text{Si K}) = 0.033 \pm 0.017 \text{ (preliminary)}$$



## Other science with 4U 1636-53: Type I thermo-nuclear X-ray bursts:



## Active Galactic Nuclei:

“Relativistic Components of the Ultra-fast Outflow in the Quasar PDS 456 from Chandra/HETGS, NuSTAR, and XMM-Newton Observations”

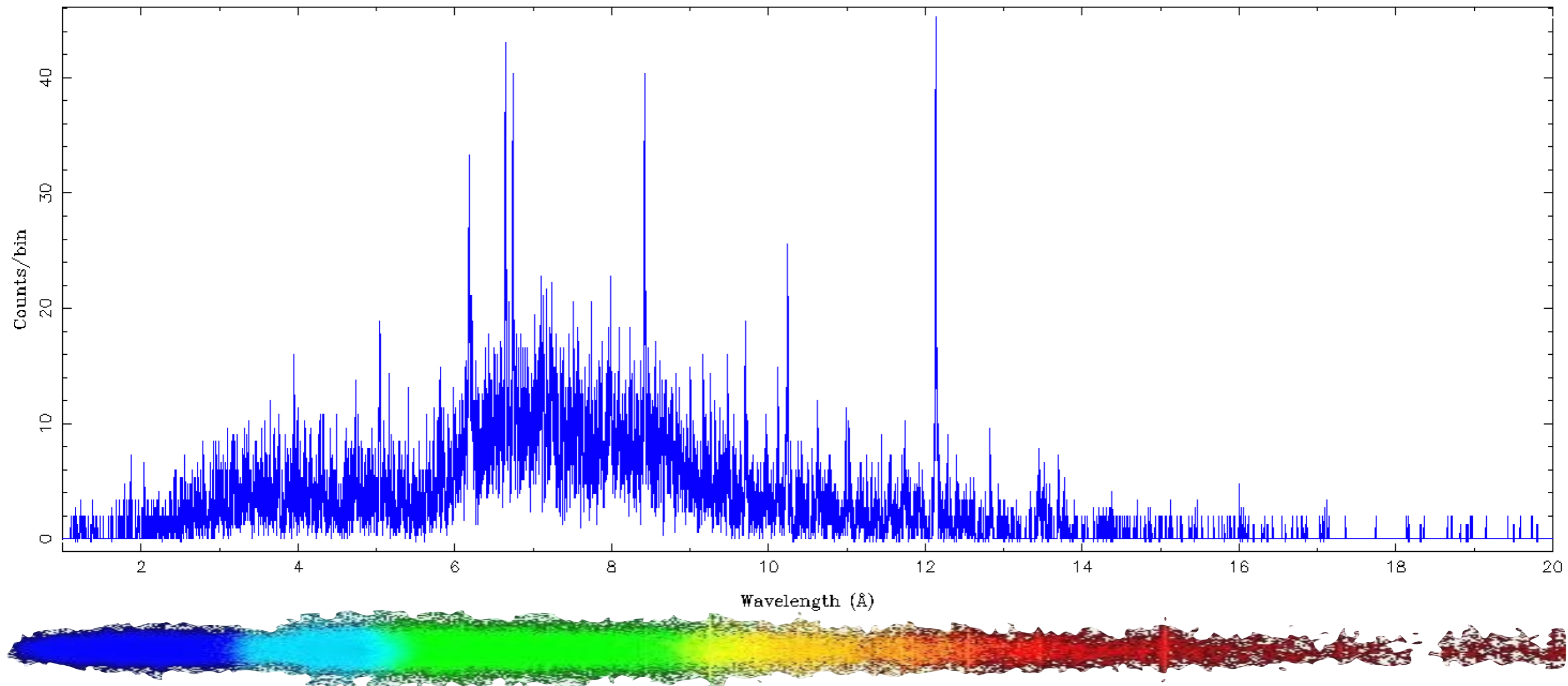
Rozenn Boissay-Malaquin et al 2019 ApJ, 873, 29

(details were presented in Q46)



## V773 Tau, HETGS, 140 ks (Cycle 19; Observer: David Principe)

V773 Tau represents one of the nearest examples of the relatively rare class of very young ( $\sim 1$  Myr) yet diskless weak-lines T Tauri star systems. This unresolved binary is known for undergoing frequent flaring events and was the first joint HETG-NuSTAR observation targeting a pre-MS system. Joint observations were necessary to search for non-thermal emission associated with flaring events. Analysis of the NuSTAR observations are underway.





## Some GTO activities leading to both calibration and CIAO work:

- GTO observations of M31 (HETG/ACIS-S, 660 ks) are being used for zeroth-order calibration
- GTO/Cal observations using HETG with HRC-I are motivating CIAO & CALDB updates to provide support for this mode (currently manual processing and investigation of changes required)