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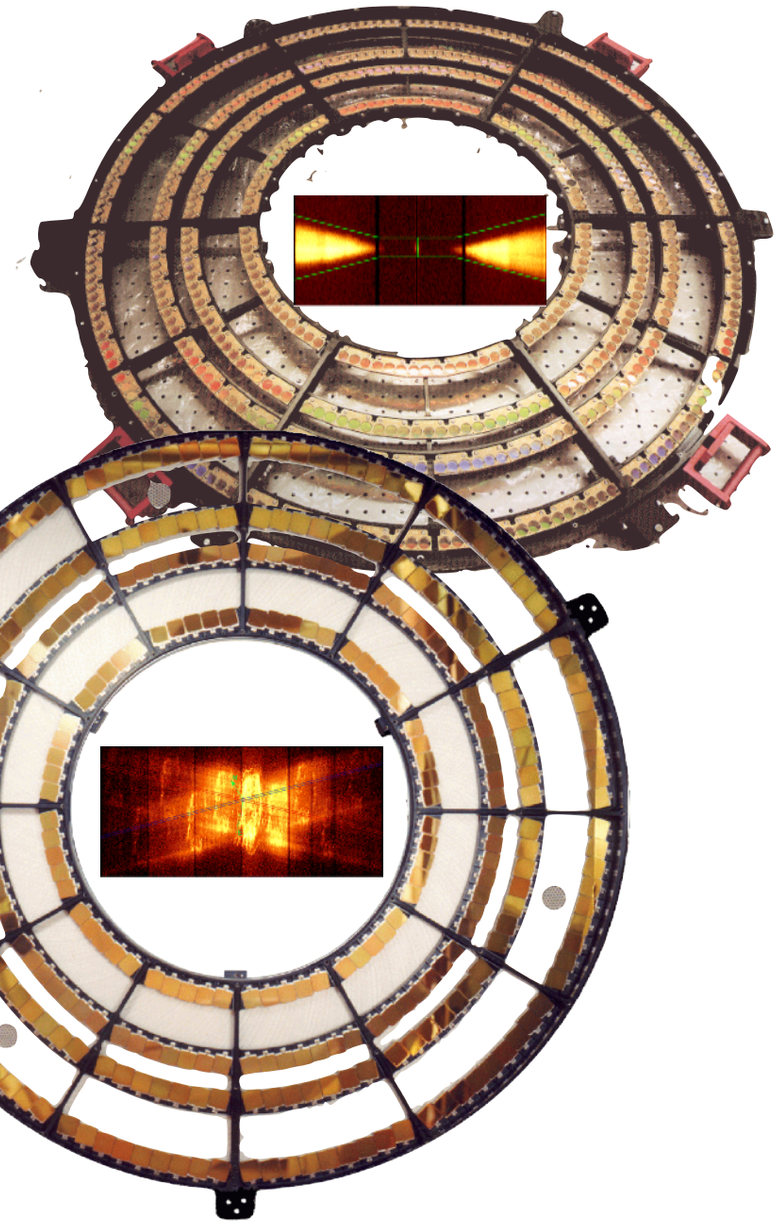
HETG/LETG — Status



Chandra Quarterly Review No. 49
1 April 2020
(COVID-19 Edition)

David Huenemoerder
dph@space.mit.edu

HETG IPI: Prof. C.R. Canizares
MIT Kavli Institute

Ongoing HETG Team Activities Summary

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Performance November 2019 — March 2020

HETG/ACIS-S 1600 ks

- 53 observations on 9 targets (45 GO, 3 GTO, 0 Cal, 3 TOO, 2 DDT)

HETG/HRC-I 15 ks

- 1 observation (Cal)

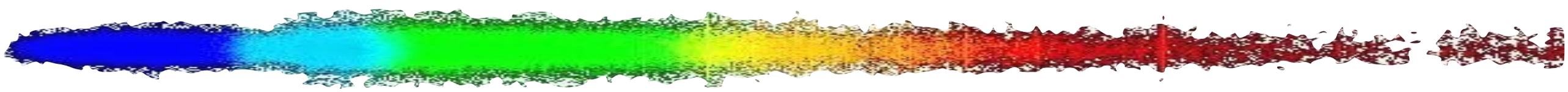
LETG 586 ks, 8 targets

- 13 LETG/HRC-S observations (423 ks; 4 GO, 1 GTO, 3 Cal, 4 TOO, 1 CoolCatTarg)
- 6 LETG/ACIS-S observations (161 ks; Cal)
- 1 LETG/HRC-I observations (2 ks; Cal)

Grating performance is nominal.

http://tgcat.mit.edu

TGCat has 2100 extractions for 500 objects (+55/+7 since last report)
Total volume: 470 GB
Downloads: 374 packages, 115 GB
Maintenance: port to modern infrastructure (PHP, MySQL), new server continuing.



HETG and LETG Observation History

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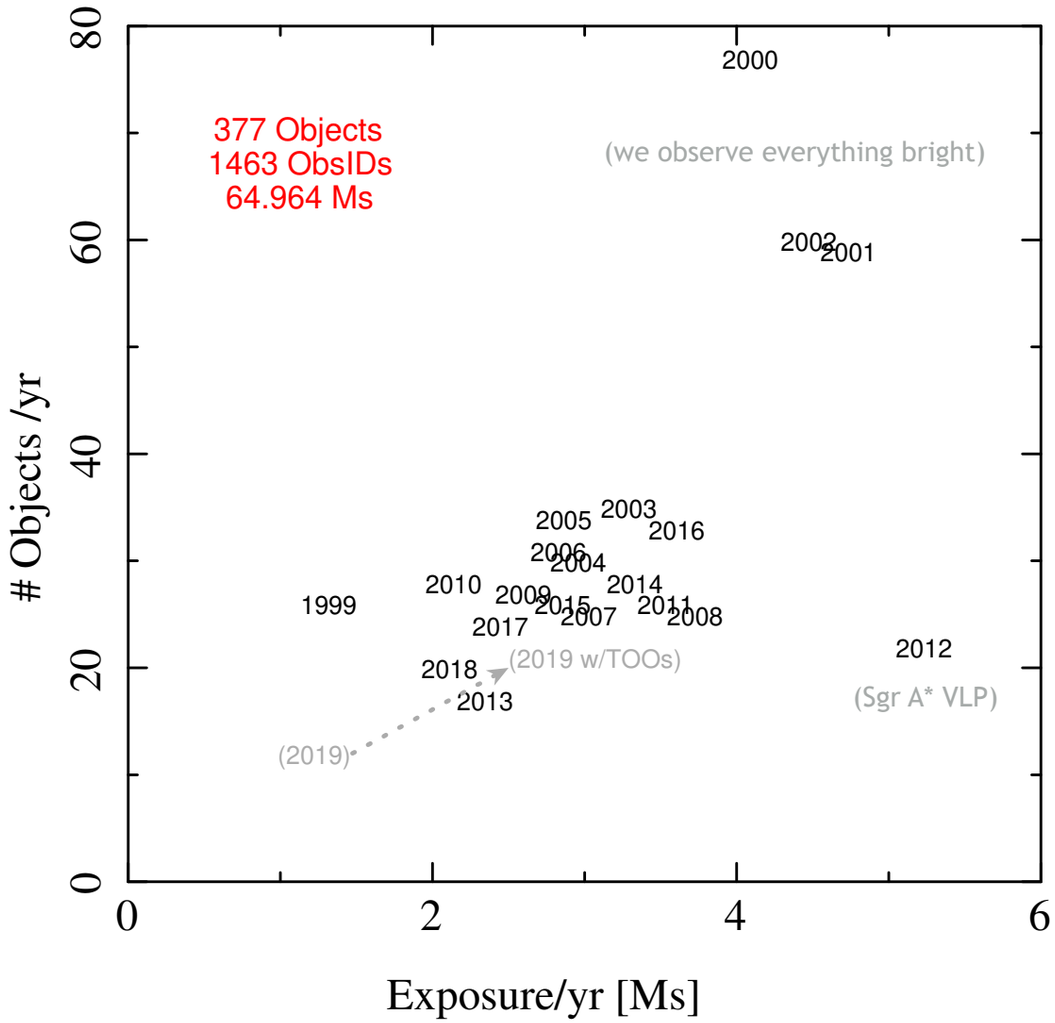
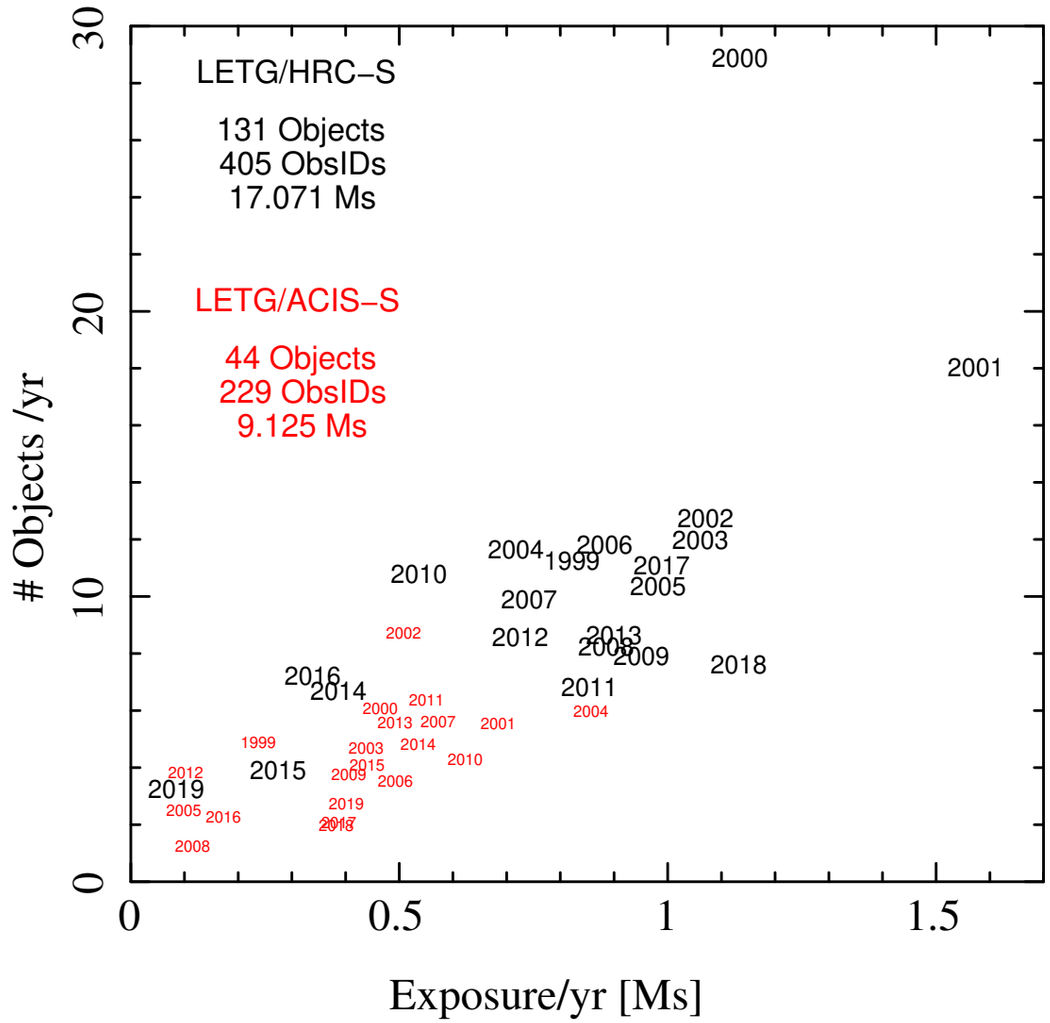
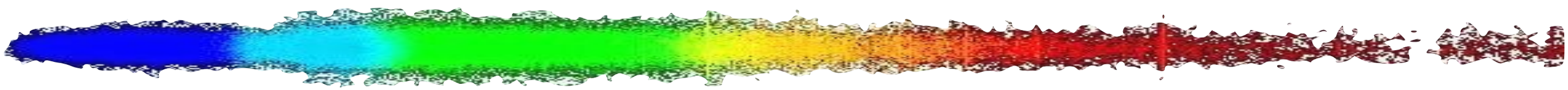
HETG Observation History



LETG Observation History





HETG Calibration Update

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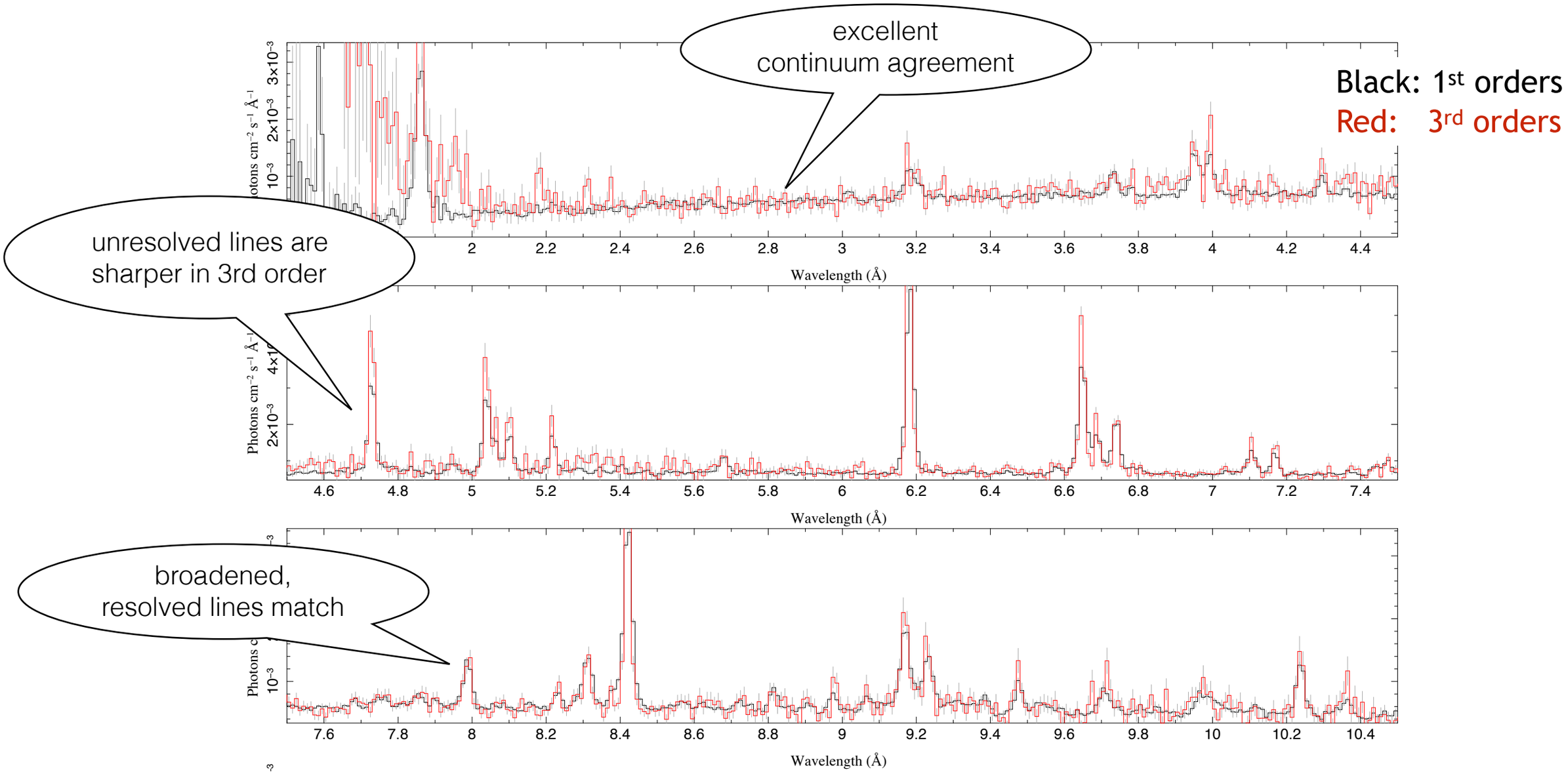
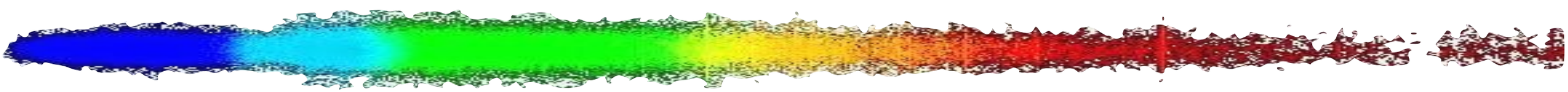
First- and third-order effective area calibrations agree very well:
θ¹ Ori C (an O7 star in the Orion Nebula Cluster), 21 observations, 720 ks MEG +/- combined:





LETG GTO Science Program

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Cycle 19:

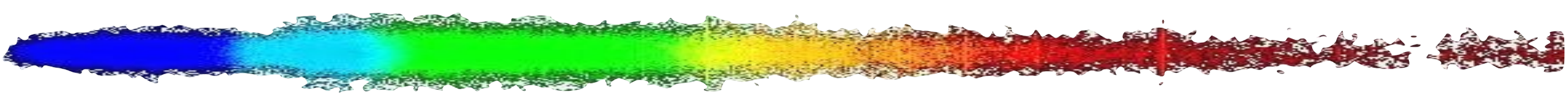
★ NS: (Predehl/MPE) RX J2143.0+0654 173 ks Cyclotron Absorption Line in an Isolated Neutron Star (LETG/HRC-S)
★ ISM: (Kaastra/SRON) 4U 1608-522 25 ks ISM dust, Mg and Si K-edge absorption (HETG/ACIS-S)
★ Gal: (Kaastra/SRON) 1E 2216/1E 2215 147 ks Shocks in Galaxy Cluster Collisions (ACIS-I)
Gu et al (2019, Nature Astronomy, 3, 838) *Observations of a pre-merger shock in colliding clusters of galaxies*

Cycle 20:

★ NS: (Predehl/MPE) RX J1856.6-3754 166 ks Isolated neutron star, calibration (with eRosita) (LETG/HRC-S)
★ Gal: (Kaastra/SRON) NGC 5548 168 ks AGN outflows, absorption, ionization, obscuration (HETG/ACIS-S)

Cycle 21:

★ AGN: (Kaastra/SRON) Mrk 279 0/175 ks AGN outflows, ionization, absorption (LETG/HRC-S)
★ SN,SNR: (Predehl/MPE) DEM S5 0/171 ks Pulsar wind nebula, morphology, dynamics (ACIS-S)
★ Sol.Sys: (Predehl/MPE) Mars 0/75 Solar wind - atmosphere interaction (LETG/HRC-S)



HETG GTO Science Program

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Cycle 19:

★ **AGN:**	**Fairall 51**	234 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	73 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
★NS:	IGR J17480-2446	0/200 ks	TOO (10%); Neutron star (slowly rotating)
★LIGO:	GW2019nnnn	0/300 ks	TOO (10%); Gravitational wave transient
★Stars:	SZ 96	246 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 335**	0/280 ks	TOO Narrow Lined Seyfert, w/ NuSTAR, NICER; warm absorbers

Cycle 21:

★Stars:	Brey 84	114/250 ks	Massive stars, stellar winds
★SNR:	Cas A	0/100 ks	Decadal visit — 20 yrs on, dynamics

HETG Postdoc status/activities:

Dr. Paul Hemphill — now at Boston Fusion

New hires (Fall 2020): Peter Kosec (U.Cambridge), Daniele Rogantini (SRON)

HETG GTO Science: Recent Publication

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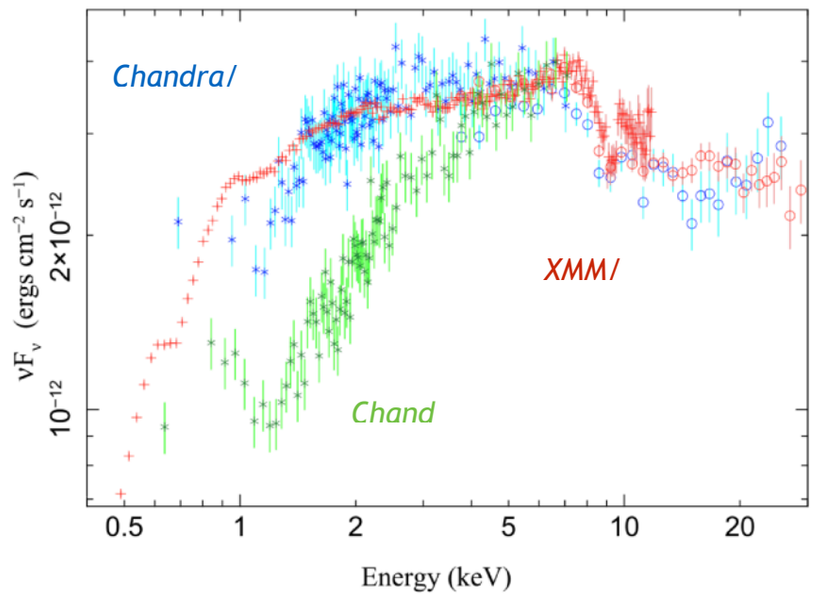
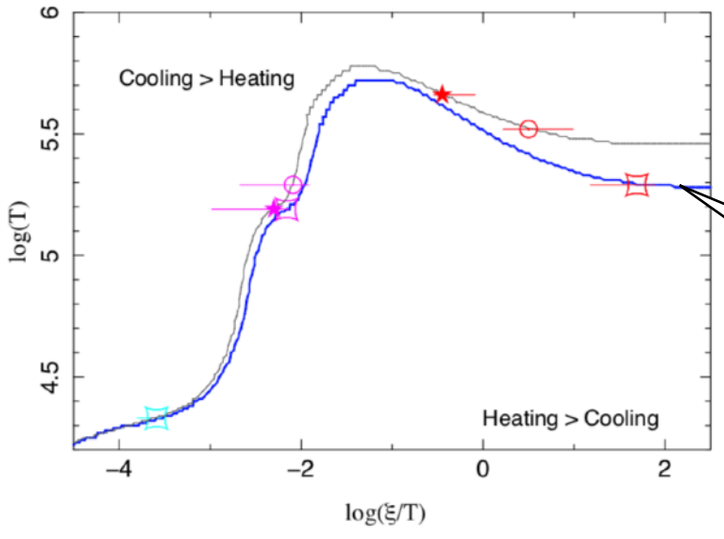
The Astrophysical Journal, 873:29 (23pp), 2019 March 1

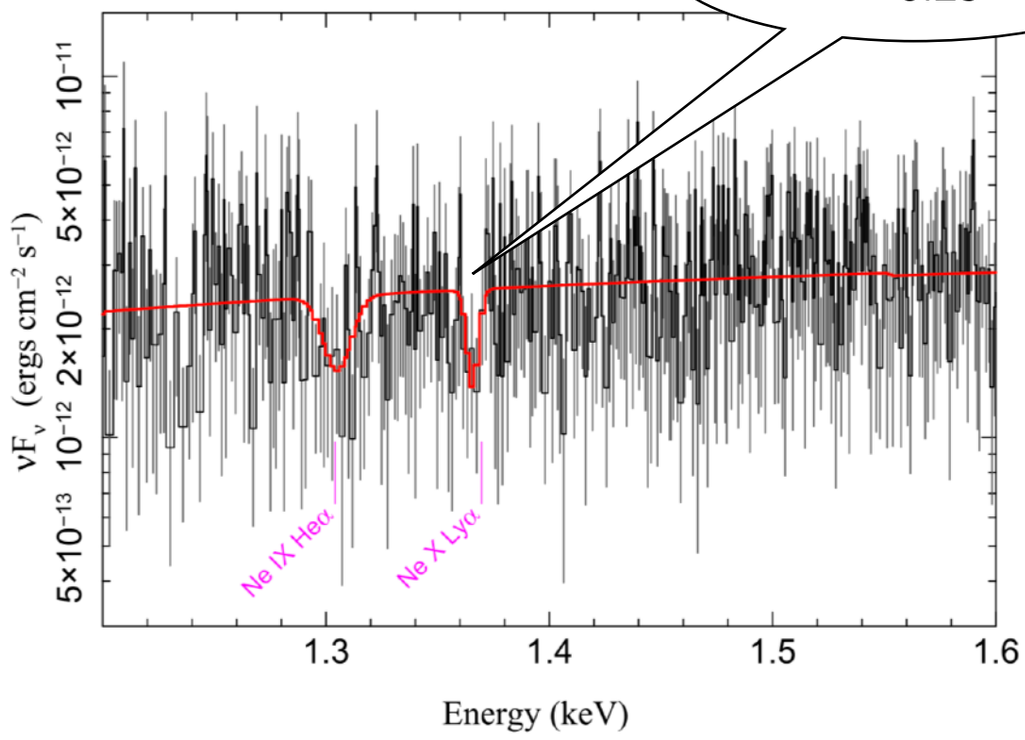
Relativistic Components of the Ultra-fast Outflow in the Quasar PDS 456 from *Chandra*/HETGS, *NuSTAR*, and *XMM-Newton* Observations

Rozenn Boissay-Malaquin[1], Ashkbiz Danehkar[2], Herman L. Marshall[1], and Michael A. Nowak[1,3]
[1] Massachusetts Institute of Technology, Kavli Institute for Astrophysics, Cambridge, MA 02139, USA; rboissay@mit.edu
[2] Harvard-Smithsonian Center for Astrophysics, 60 Garden Street, Cambridge, MA 02138, USA
[3] Department of Physics, Washington University, One Brookings Drive, St. Louis, MO 63130-4899, USA





thermally stable, highly ionized plasma, at ultra-high velocities.



The outflow of PDS 456 is probably composed of several components from multiple layers having different velocities and ionizations, launched from the accretion flow close to the SMBH, and certainly radiatively driven. Both relativistic components of the outflow are powerful enough to play a role in the evolution of the host galaxy, with mass outflow rates of 2%–20% and kinetic powers of 0.8%–8% of the Eddington values.