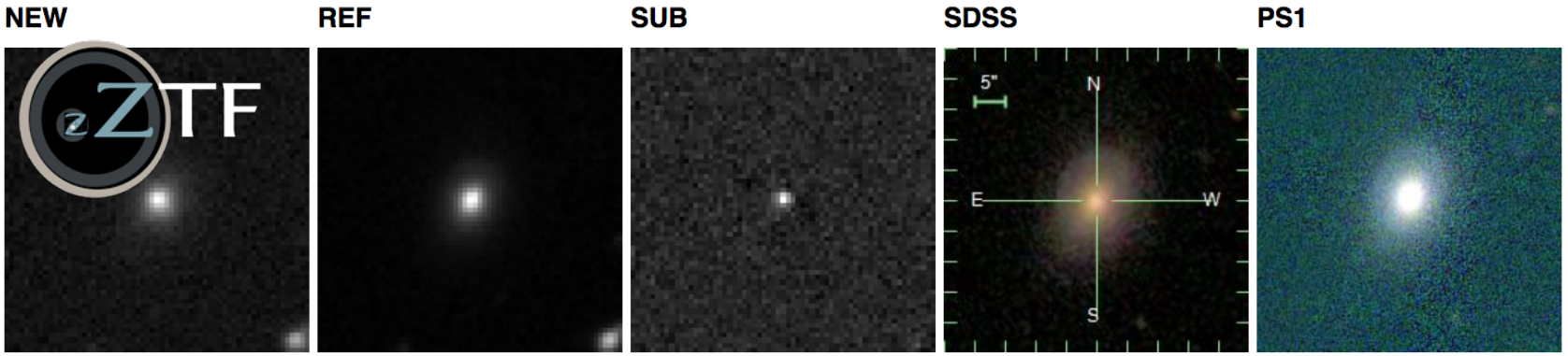
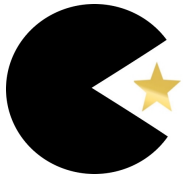
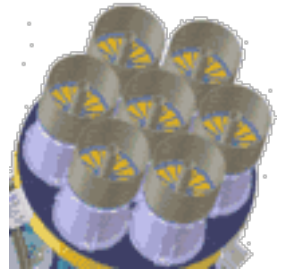




Some thoughts on…

eROSITA + ZTF:

Exciting Opportunities for TDE Science

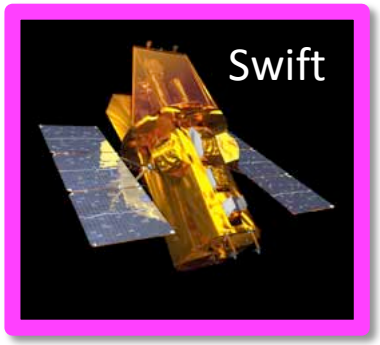


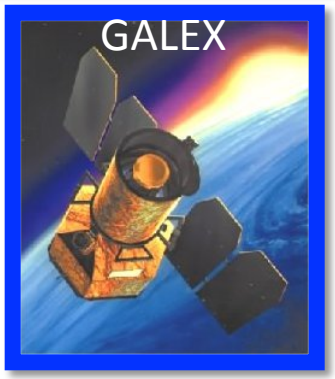
Suvi Gezari

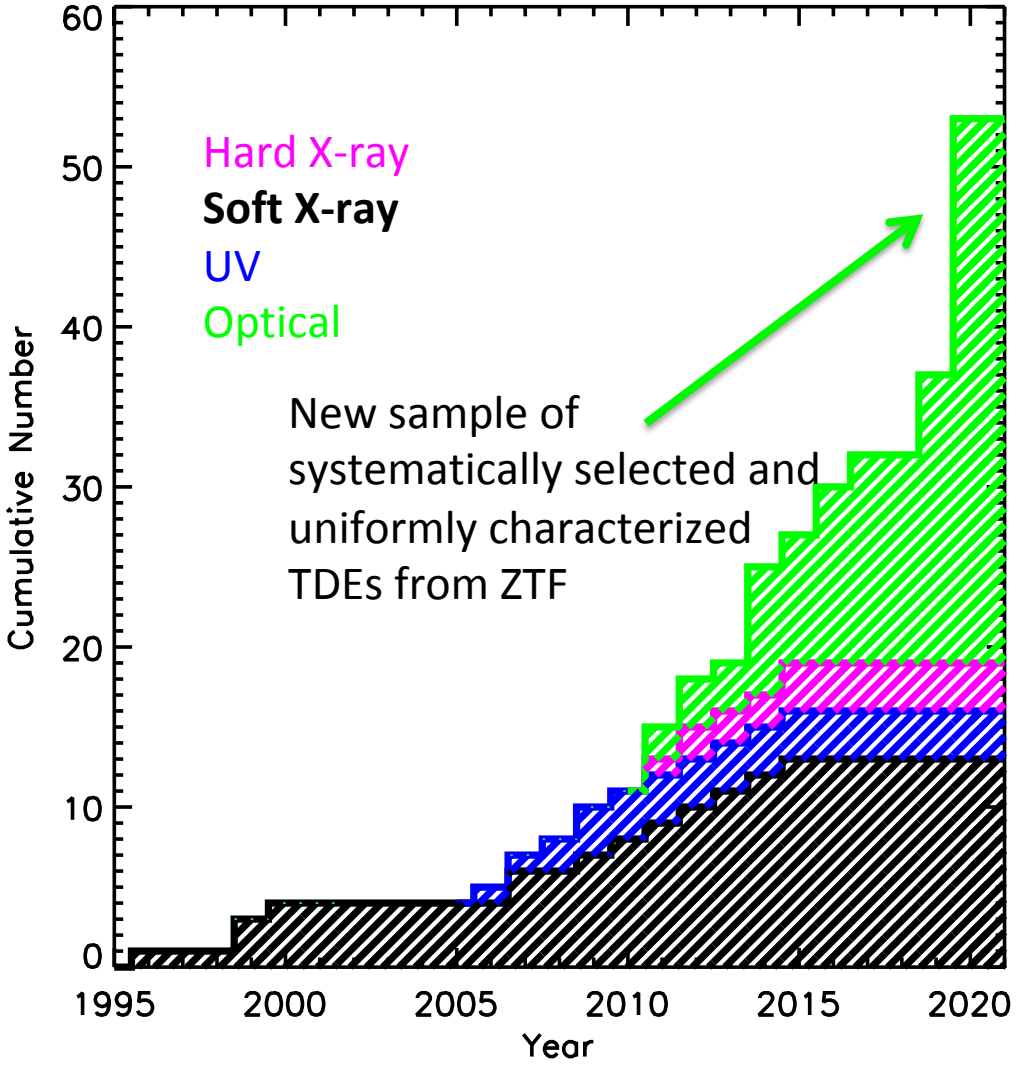
UNIVERSITY OF MARYLAND

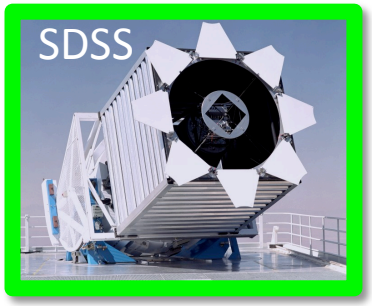
ZTF 2020 Spring Meeting -- Cyberspace

Multi-λ Searches for TDEs

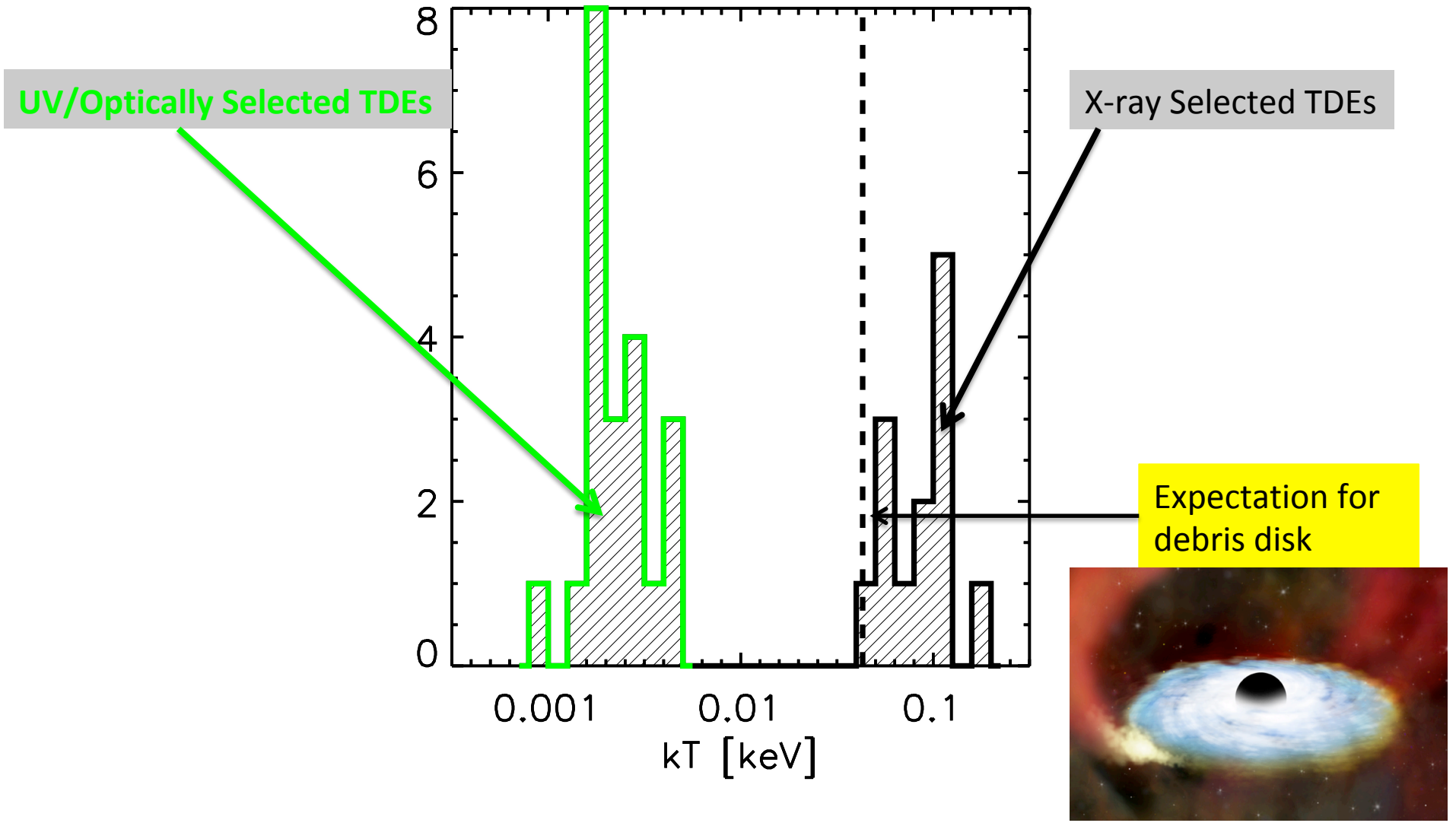




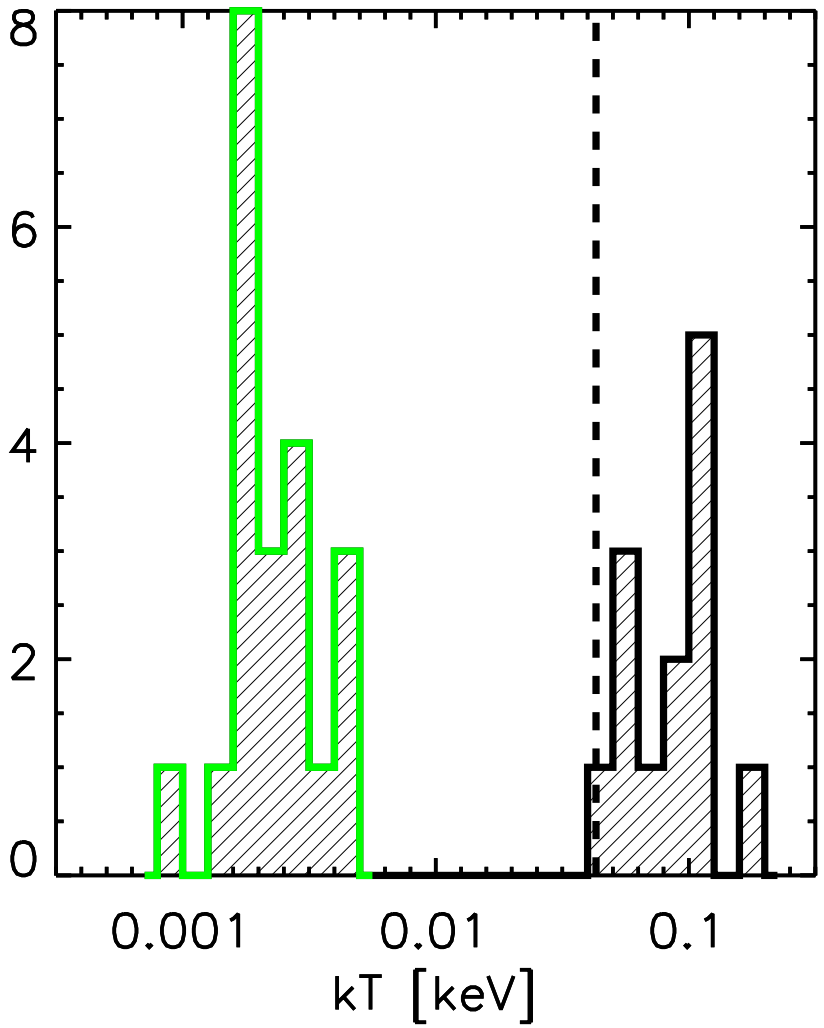




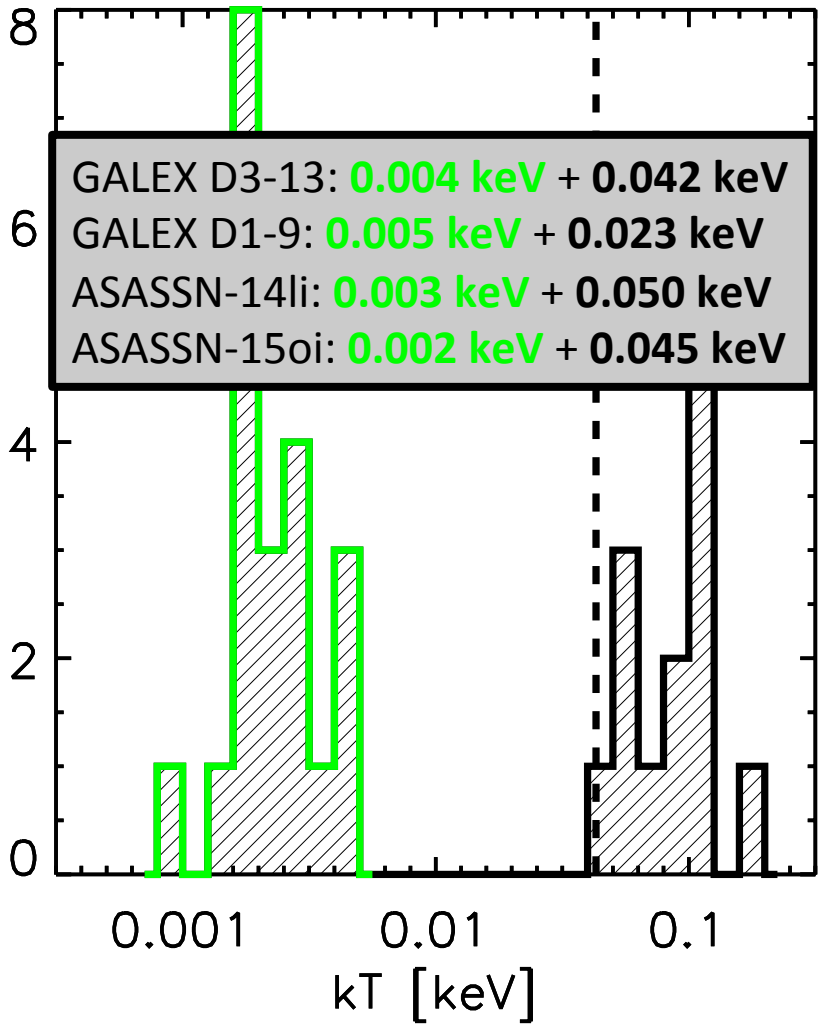
Surprise: Dichotomy of T_{BB}



Two Populations?

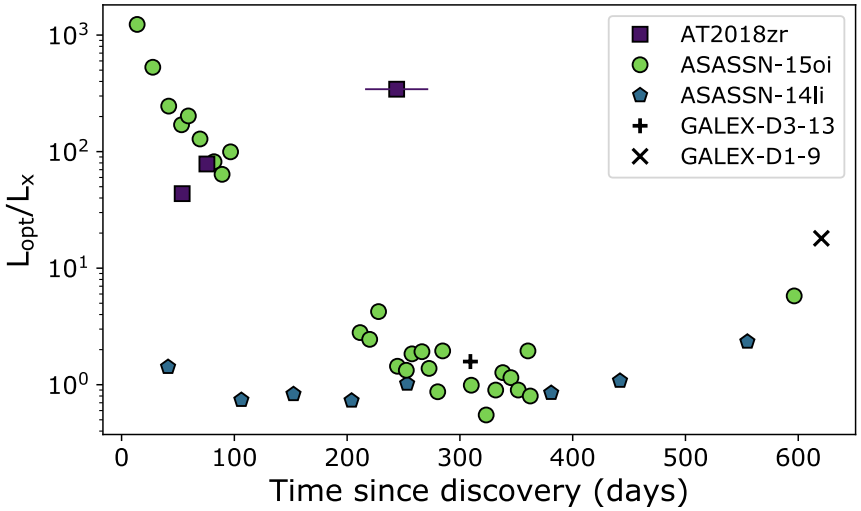


Two Components?



New Landscape of Optical+X-ray TDEs

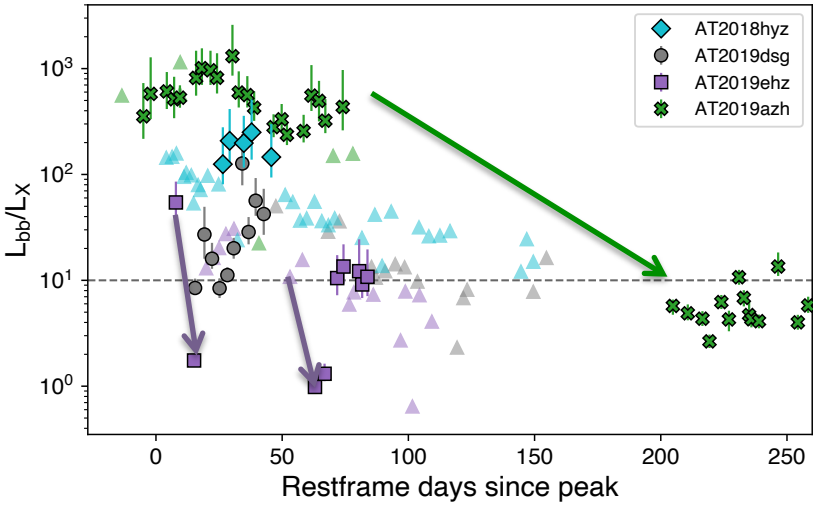
Before ZTF



van Velzen, Gezari, et al. 2018

*AT2018zr, the first TDE detected by ZTF, was one of only 5 TDEs with an optical **and** X-ray detection!*

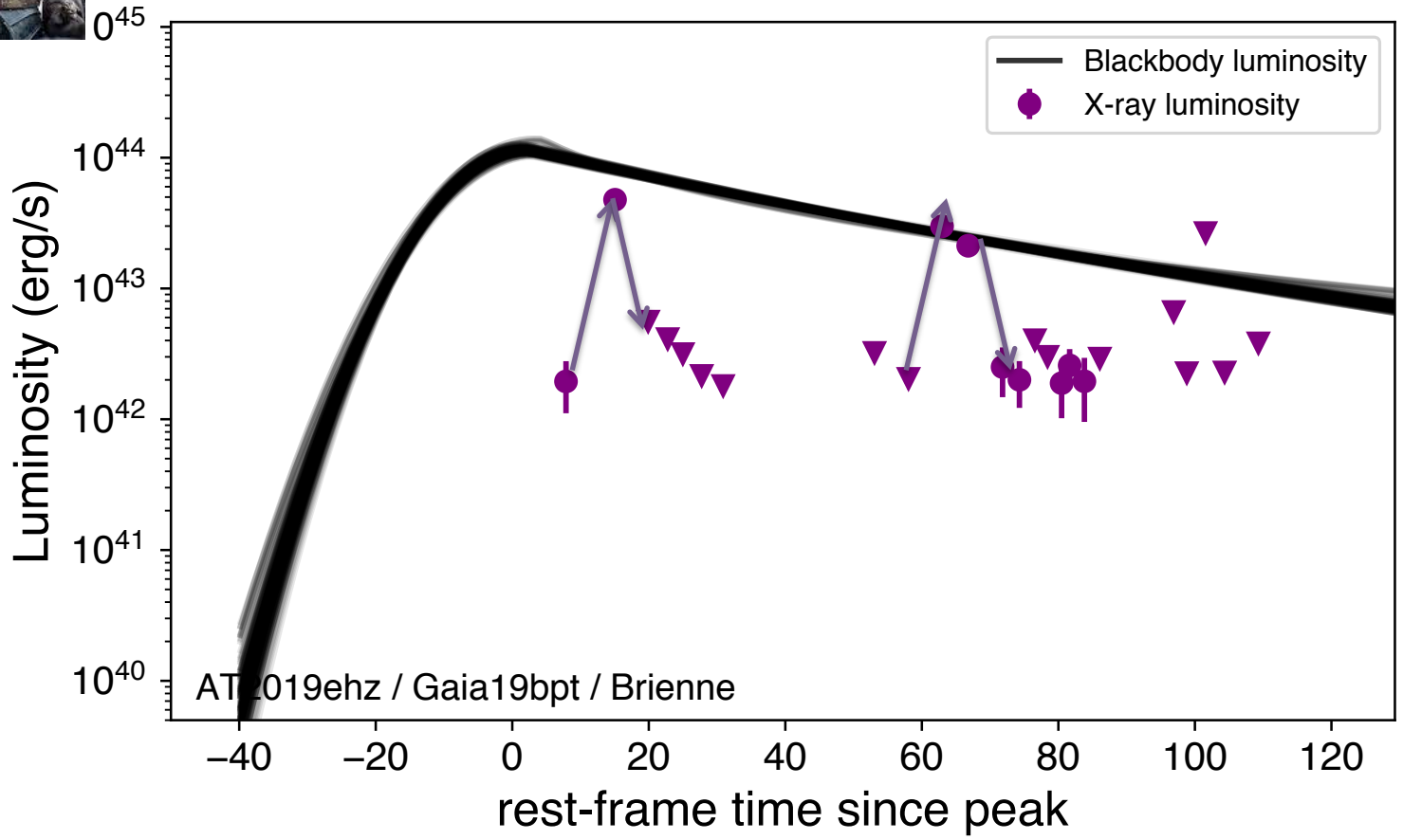
After ZTF



van Velzen, Gezari+ 2020

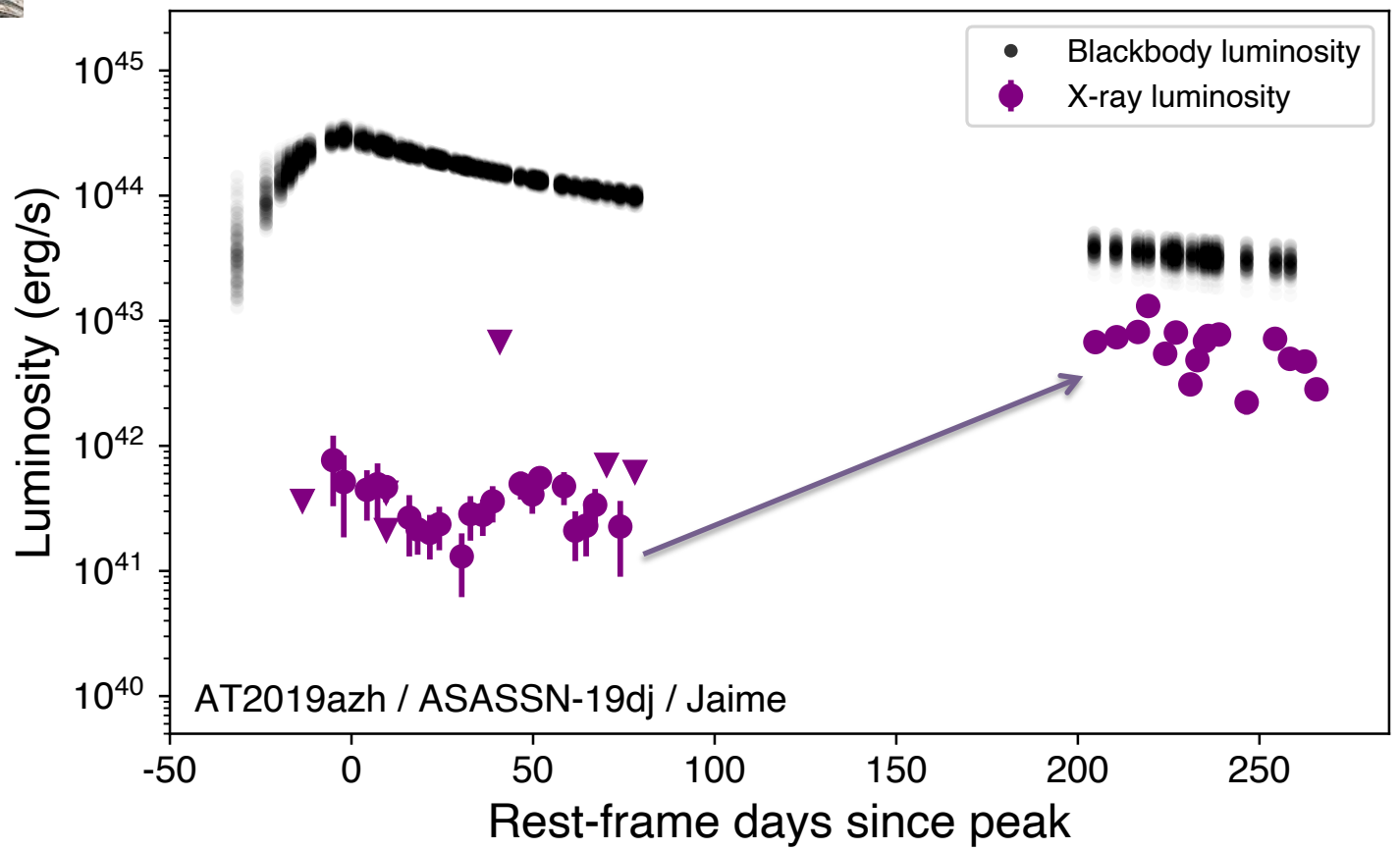
In the first 1.5yr of ZTF survey operations, we now have detected 4 more TDEs in the soft X-rays, and with dramatic variability!

Brienne: Rapid Flaring



van Velzen, Gezari+ 2020

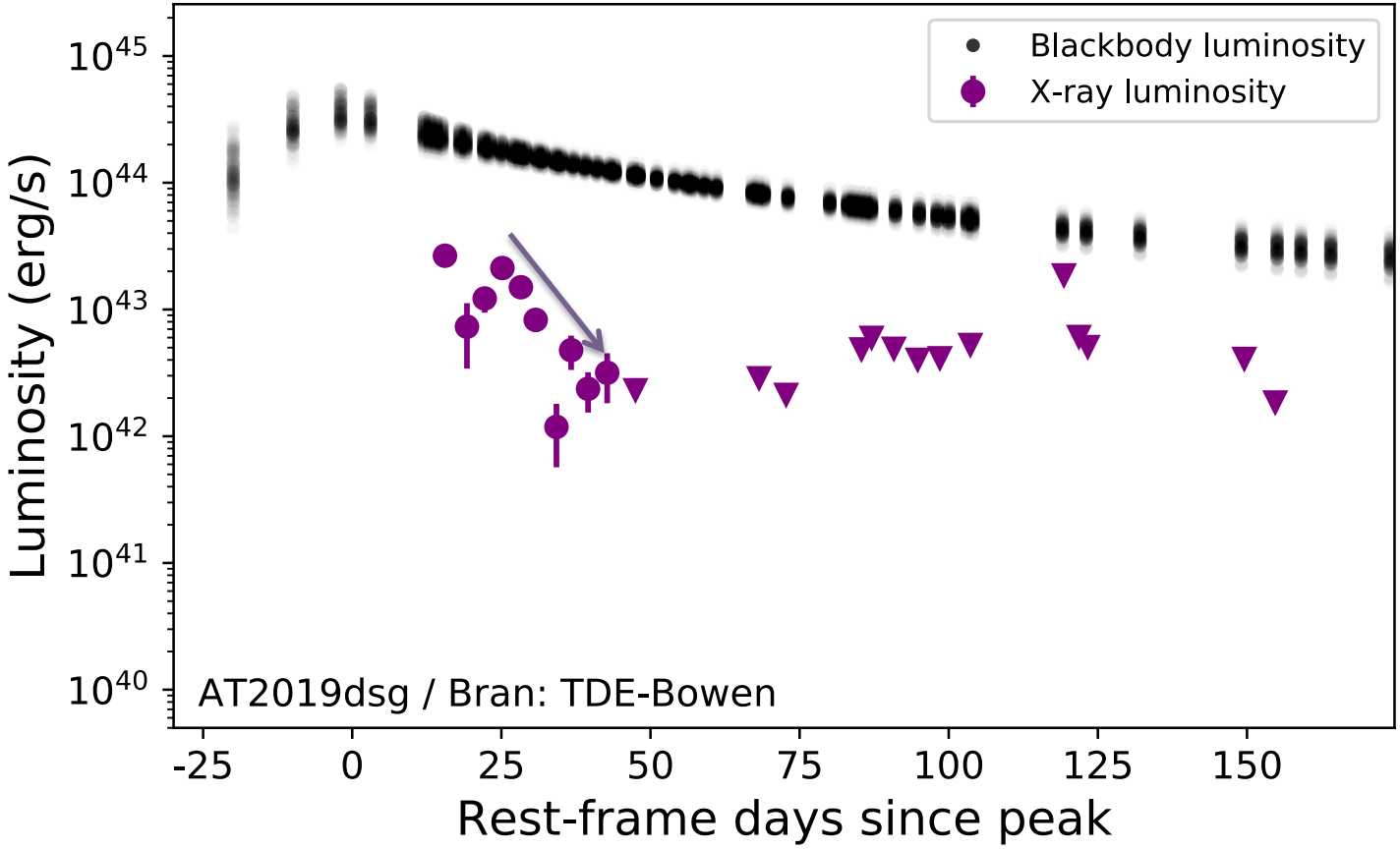
Jaime: Late-time Brightening



van Velzen, Gezari+ 2020

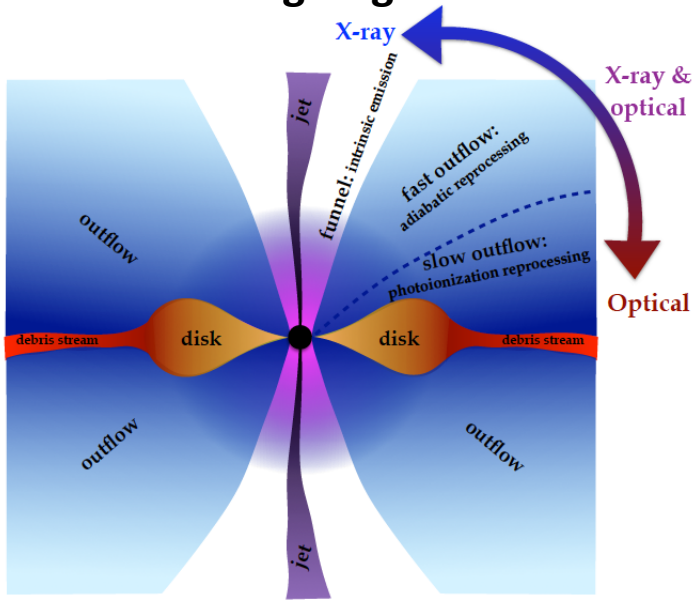
Bran: Early-time Fading

This is the neutrino TDE candidate!



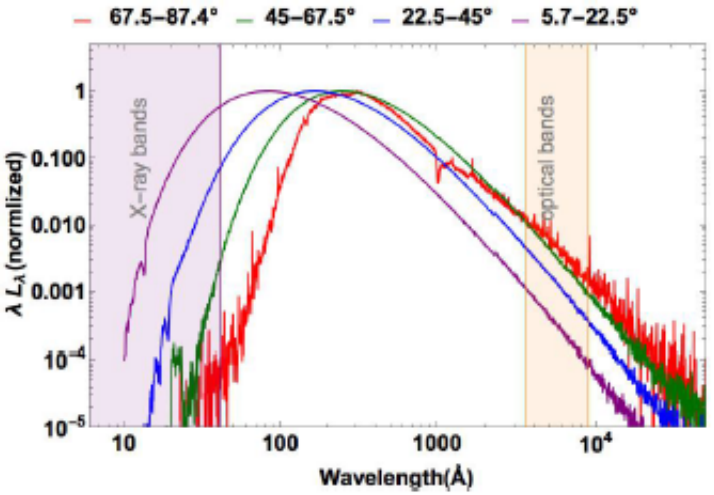
What is driving dramatic soft X-ray evolution?

Viewing Angle?



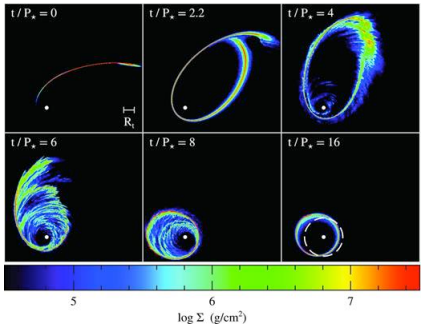
Dai et al. 2018

Reprocessing?



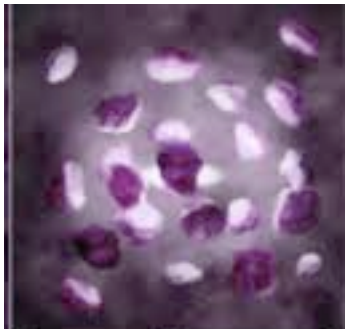
Dai et al. 2018

Circularization Delay?



Bonnerot+ 2016, Piran+2015

Patchy Obscuration?



van Velzen, Gezari+ 2020

eROSITA on Spectrum-Roentgen-Gamma (SRG)

Energy range: 0.5-10 keV
Russian and German mission
FOV: 0.83 deg^2
Survey the whole sky in multiple epochs
Launched on July 13, 2019
First light on October 22, 2019
6-month halo orbit around L2
4 year survey
20 times deeper than ROSAT All-Sky Survey
Excellent spatial and temporal overlap of ZTF II and Russian eROSITA Northern half of data rights

eROSITA

eROSITA+ZTF TDE Candidates

With a complementary X-ray selection of TDEs from eROSITA, we can:

- determine the true rate of TDEs
- determine the efficiency of the formation of the TDE accretion disk
- find out what physical properties determine their optical brightness

eROSITA+ZTF TDE Candidates

eROSITA+ZTF: Geralt

ZTF Target ZTF19acymzwg

http://skipper.caltech.edu:8080/cgi-bin/growth/view_source.c

[Previous | Next | [ADS]]

ZTF19acymzwg Unlikely Related to SRG/eROSITA X-ray TDE Candidate

ATel #13507; *S. Gezari (UMd), S. van Velzen (UMd), Charlotte Ward (UMd), S. Frederick (UMd), K. De (Caltech), S. Kulkarni (Caltech), M. J. Graham (Caltech), and S. B. Cenko (NASA/Goddard) on behalf of the ZTF Collaboration*
*on **20 Feb 2020; 00:00 UT***
Distributed as an Instant Email Notice Transients
Credential Certification: Suvi Gezari (suvi@astro.umd.edu)

Subjects: Optical, AGN, Black Hole, Transient, Tidal Disruption Event

Referred to by ATel #: 13510

Related

13510 NuSTAR and Chandra observations of the bright X-ray transient in SDSS J143359.16+400636.0
13509 Chandra Detection of SN2020bvc
13507 ZTF19acymzwg Unlikely Related to SRG/eROSITA X-ray TDE Candidate
13500 Bright emission lines in the optical spectrum and the redshift of the host galaxy of TDE candidate SRGet J143359.25+400638.5
13496 VLA X-band Detection of SN2020bvc
13494 A bright X-ray TDE candida SRGet J143359.25+400638.5 in SDSS J143359.16+40063
13464 A new X-ray transient in SD J143359.16+400636.0

Tweet

ATel #13494 reported the association of Zwicky Transient Facility alert ZTF19acymzwg with the SRG/eROSITA X-ray TDE candidate SRGet J143359.25+400638.5 detected centered on the galaxy SDSS J143359.16+400636 on 2019 Dec 27, and coincident with the X-ray source detected by Swift XRT on 2020 Feb 05 (ATel #13464). We have inspected the ZTF alert packets for ZTF19acymzwg, and note that the transient is significantly off-center from the host galaxy nucleus, by more than 1.0 arcsec in the g and r bands. We speculate that the transient, detected first by ZTF with g=19.3 mag on UT 2019 Dec 14 and then faded monotonically to g=20.5 mag on UT 2020 Jan 24, is in fact a supernova in the host galaxy that is unrelated to the SRG/eROSITA X-ray source.

We also obtained a spectrum of the host galaxy nucleus with Keck/LRIS on UT 2020 Feb 18, and confirm the presence of strong narrow emission lines at z=0.099 as also reported in ATel #13500, and we note that the line ratios of [O III]/Hbeta and [N II]/Halpha are in the Seyfert region of the BPT diagram. The AGN classification for the host galaxy optical spectrum, together with the relatively hard spectrum of the X-rays reported by SRG/eROSITA (kT = 0.29 keV compared to previously reported X-ray selected TDEs with 0.04 keV < kT < 0.17 keV), suggest that the X-ray variability may be related to the host galaxy AGN, and not a tidal disruption event.

ZTF alert offset from host, likely a fading SN unrelated to the eROSITA source.
Host galaxy has narrow-line ratios consistent with an AGN.

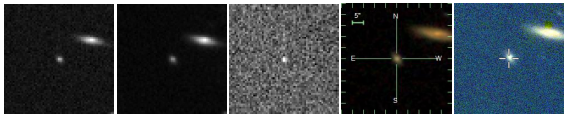
ZTF19acymzwg

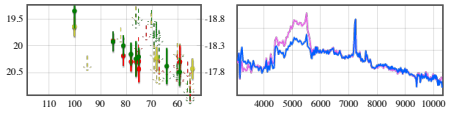
14:33:59.19 +40:06:35.8
218.496606 +40.109938

View another

OVERVIEW | PHOTOMETRY | SPECTROSCOPY | OBSERVABILITY | EXAMINE | FINDING CHART

NEW | REF | SUB | SDSS | PS1





i = 20.4 (54.3 d) | Upload New Photometry

z = 0.099 | Upload New Spectroscopy
DM (approximate) = 38.28

First saved in partnership data.

ADDITIONAL INFO

NED | TNS | SNEx | SIMBAD | VizieR | HEASARC | SkyView | MPChecker | Extinction | CFHT | IPAC | DSS | WISE | Subaru | VLT | FIRST | CRTS | ADS | iPTF Marshal | LegacySurvey | Avro Packets

CURRENT FOLLOWUP REQUEST

ADD FOLLOWUP

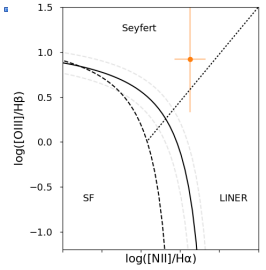
Instrument: <-- Select Instrument -->

ASSIGNMENTS

Added On	Assignment Date	Instrument	Priority	Comment	Program	PI	Status
2020-02-17	2020-02-17	Keck1+LRIS	4.0	Classification	eROSITA detection *(mansi)*	Fast Transients	A. Ho	pending

Add to: 2020-03-22 Keck1+LRIS (Mansi Kasliwal) Priority: 1 (1=low, 5=high)
Science Program (optional):
Request Type: Classification
Comment:

ToO Assignments



AUTO ANNOTATIONS
2020 Feb 17 mansi [passed_filter]: ZTF Science Validation
2020 Feb 17 annayqho [SDSS_photz_auto]: 0.109 +- 0.0342 (0.389*, [reference])
2020 Feb 17 annayqho [Reference]: 2018-02-24 10:49:04 to 2018-06-21 04:22:44
2020 Feb 17 annayqho [saved_by_id]: Fast Transients Auto Annotation Submission Form
COMMENTS
2020 Feb 18 dperley [comment]: Blue-side reduction seems to have issues
2020 Feb 18 dperley [redshift]: 0.099
2020 Feb 18 dperley [comment]: Clearly AGN-like line ratios
2020 Feb 17 lyan [info]: TDE candidate from SRG

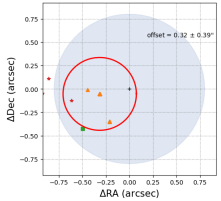
Add a Comment:

Attach File: Browse... No file selected.
Type: info Save Comment

SEND AN ALERT
'ZTF Science Validation'
Soft Alert (email)
Hard Alert (email + SMS)
Send Alert

Add to Favorites
Subscribe to this Target (daily digest)
Subscribe to this Target (immediate alerts)

Offset Plot



Transfer To Another Program

eROSITA+ZTF: Yennefer

ZTF Target ZUDS20dkxcy

http://skipper.c

[Previous | Next | [ADS]]

ZTF Detection of Optical Transient Coincident with SRG/eROSITA X-ray TDE candidate

ATel #13513; *S. Gezari (UMd), C. Ward (UMd), D. Goldstein (Caltech), M. J. Graham (Caltech), S. van Velzen (UMd), S. B. Cenko (NASA/Goddard), and S. Kulkarni (Caltech) on behalf of the ZTF Collaboration*

*on **22 Feb 2020; 18:42 UT***
Distributed as an Instant Email Notice Transients

Credential Certification: Suvi Gezari (suvi@astro.umd.edu)

Subjects: Optical, Request for Observations, AGN, Black Hole, Transient, Tidal Disruption Event

Tweet

ATel #13499 reported the discovery by SRG/eROSITA of an X-ray TDE candidate, SRGet J134954.70+432859.5, on 2019 Dec 12 centered on the galaxy SDSS J134954.68+432856.0. Here we report the serendipitous detection of an optical transient, ZUDS20dkxcy, within 0.75 arcsec of the host galaxy nucleus in subtracted 7-day coadds from the ZTF Survey. The coadds were produced as a part of the ZTF Uniform Depth Survey (ZUDS; Goldstein et al. 2020, in prep), a ZTF partnership experiment. They typically contained 7 g (30s), r (30s), or i-band (90s) exposures, reach a limiting magnitude of 21.5 in all three filters. ZUDS20dkxcy was detected with g = 20.2 mag on 2019 Dec 12, fading monotonically to g = 21.5 mag on 2020 Feb 18. We can constrain the onset of the transient to be after the the last non-detection in the g-band on 2019 Nov 17. We detect no previous optical variability in the galaxy from over 1 year of 3-day cadence ZTF survey observations. At the redshift of the host galaxy of z=0.045, the optical flare absolute magnitude is only M_g=-16.3 mag, which is faint compared to optically selected tidal disruption events (typically with M_g ~ -19 to -20 mag), but this could be a result of selecting the TDE candidate in the X-rays. Optical spectroscopy is encouraged to characterize the nature of this X-ray and optical transient.

Related

13513 ZTF Detection of Optical Transient Coincident with SRG/eROSITA X-ray TDE candidate

13499 Bright X-ray source SRGet J134954.70+432859.5 in the direction of galaxy SDSS J134954.68+432856.0

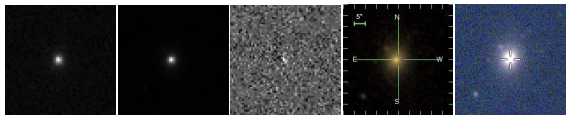
ZUDS20dkxcy

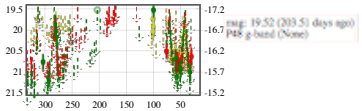
13:49:54.61 +43:28:55.9
207.477539 +43.482189
Note: 0.9" from **ZTF18aarmqso**

View another

OVERVIEW | PHOTOMETRY | SPECTROSCOPY | OBSERVABILITY | EXAMINE | FINDING CHART

NEW | REF | SUB | SDSS | PS1





r = 20.6 (30.2 d) | Upload New Photometry

Upload New Spectroscopy
DM (approximate) = 36.67

First saved in partnership data.

ADDITIONAL INFO

NED | TNS | SNEx | SIMBAD | VizieR | HEASARC | SkyView | MPChecker | Extinction
CFHT | IPAC | DSS | WISE | Subaru | VLT | FIRST | CRTS - ADS
iPTF Marshal | LegacySurvey | Avro Packets

CURRENT FOLLOWUP REQUEST

ADD FOLLOWUP

Instrument: <-- Select Instrument -->

ASSIGNMENTS

Add to: 2020-03-22 Keck1+LRIS (Mansi Kasliwal) Priority: 1 (1=low, 5=high)
Science Program (optional):
Request Type: Classification
Comment:

ToO Assignments

AUTO ANNOTATIONS
2020 Feb 27 ashotB [saved_by_id]: ZUDS and ZTFBH
2020 Feb 20 mansi [SDSS_specz_auto]: 0.0449 +- 1.87e-05 (0.799", GALAXY, [reference])
2020 Feb 20 mansi [SDSS_photz_auto]: 0.0815 +- 0.0156 (0.799", [reference])
2020 Feb 20 mansi [CLU_d_to_galaxy_arcsec]: 0.79491
2020 Feb 20 mansi [CLU_cluid]: 375714
2020 Feb 20 mansi [CLU_name]: 2MASX J13495466+4328563
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2020 Feb 20 mansi [saved_by_id]: ZUDS and CLU
Auto Annotation Submission Form

COMMENTS
2020 Feb 27 suvi [redshift]: 0.049528

Add a Comment:

Attach File: Browse... No file selected.
Type: info Save Comment

SEND AN ALERT
'ZUDS and ZTFBH'
Soft Alert (email)
Hard Alert (email + SMS)
Send Alert

Add to Favorites
Subscribe to this Target (daily digest)
Subscribe to this Target (immediate alerts)

Offset Plot
Offset Plot Unavailable

Transfer To Another Program

f 2

1:22 PM

ZTF detected a faint optical counterpart with ZUDS with g =21.2 mag , but no UV emission detected by Swift (uvw2 > 21.62 mag).

Items for Discussion

So far we have been responding to ATels...

- Can we form a direct relationship with the eROSITA team to optimize our follow-up observations?
- How can we improve their X-ray TDE candidate criteria?
- With sparsely sampled X-ray light curves, how does one differentiate AGN variability from true, transient TDE outbursts?
- What archival ZTF+eROSITA projects should we plan for?