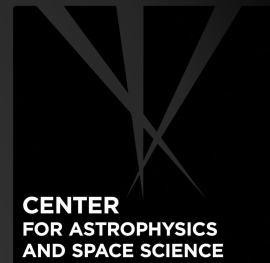


جامعة نيويورك أبوظبي



NYU | ABU DHABI



YOU SNOOZE, YOU LOSE

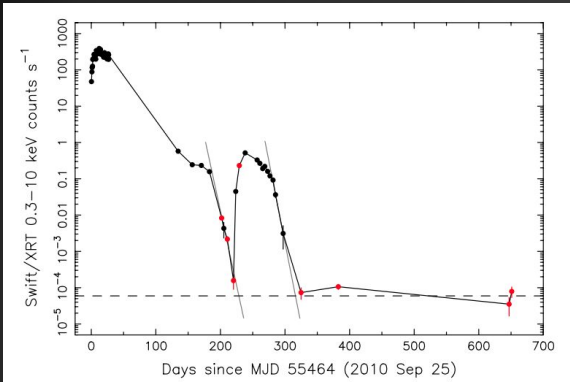
Kevin Alabarta

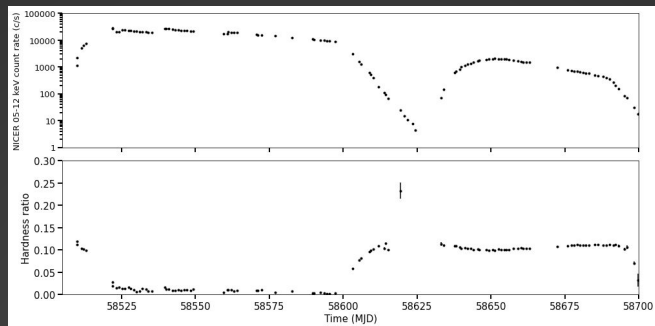
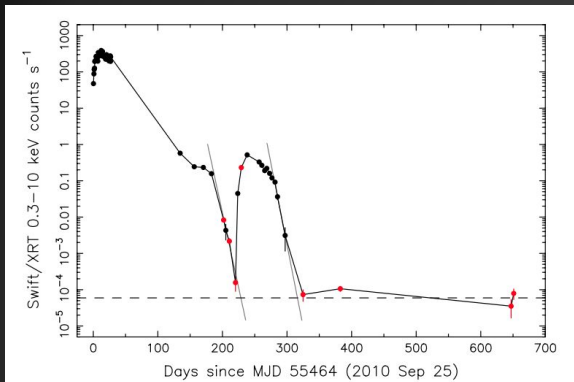
on behalf of all people working on XB-NEWS...

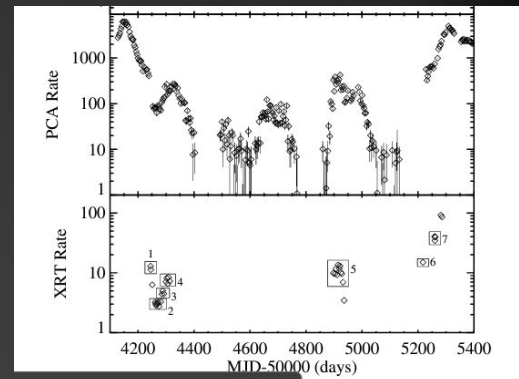
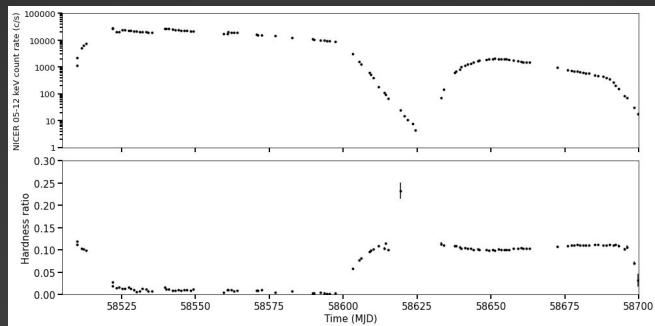
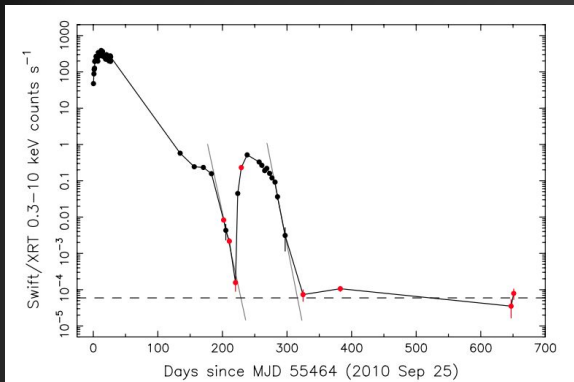
YOU SNOOZE, YOU LOSE

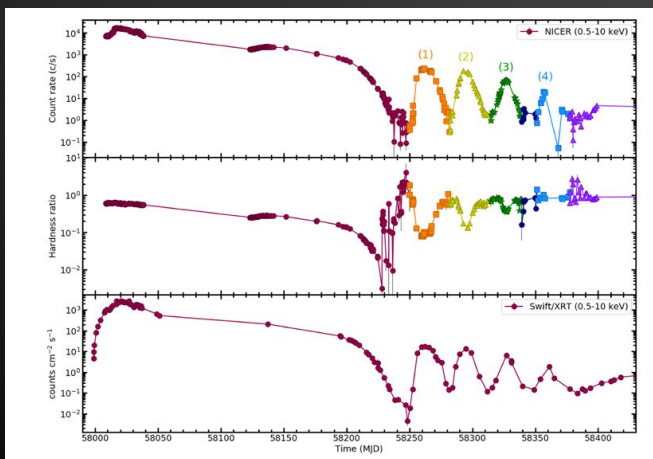
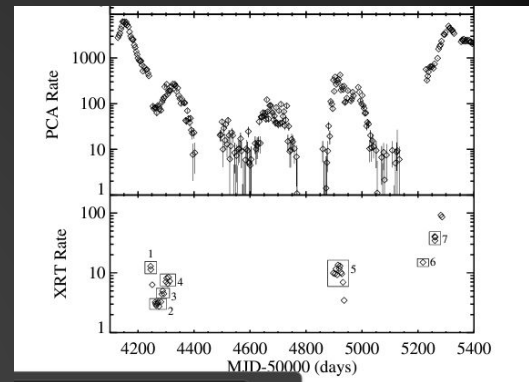
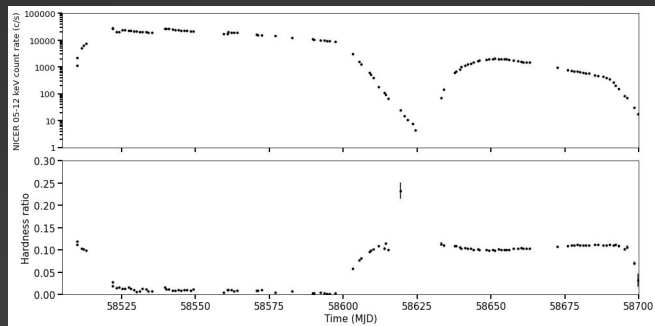
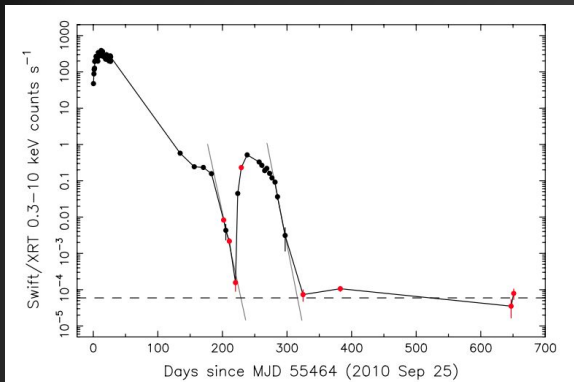
If you are unaware of an opportunity through not paying attention, you miss the opportunity

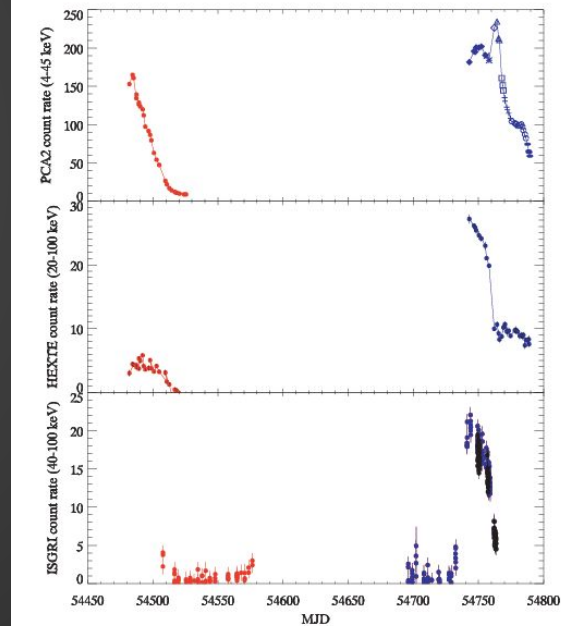
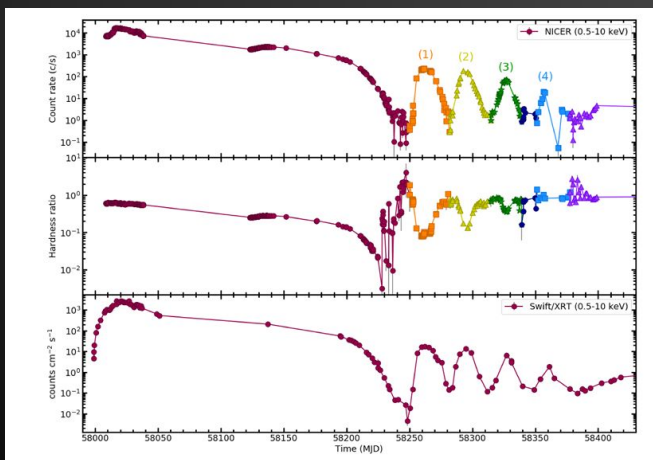
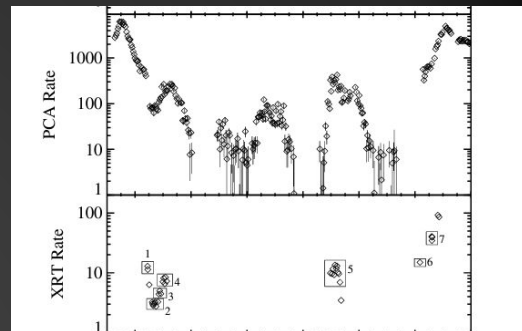
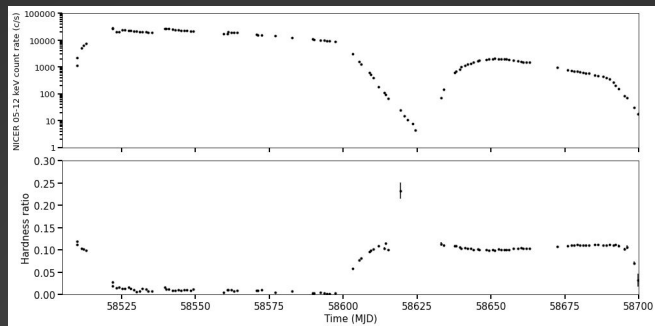
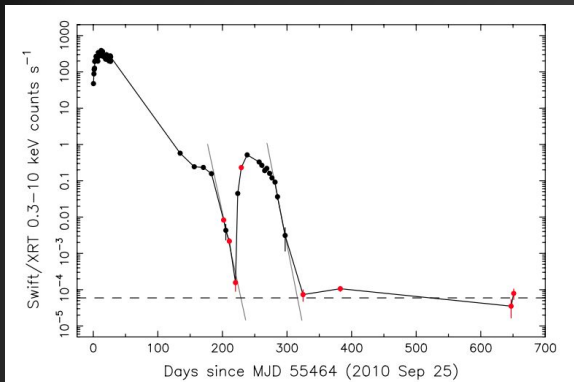
Collins Dictionary



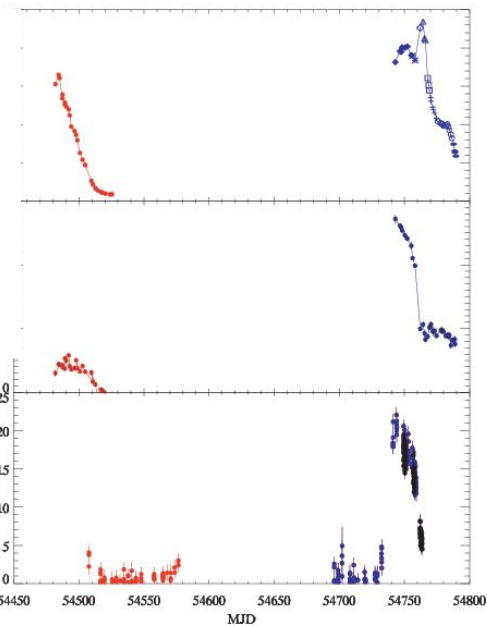
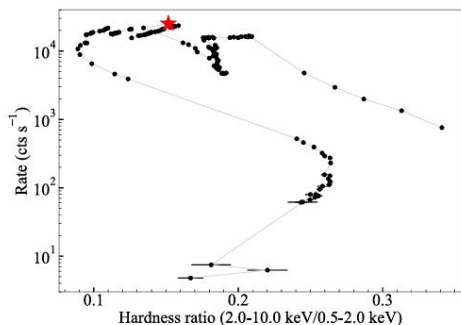
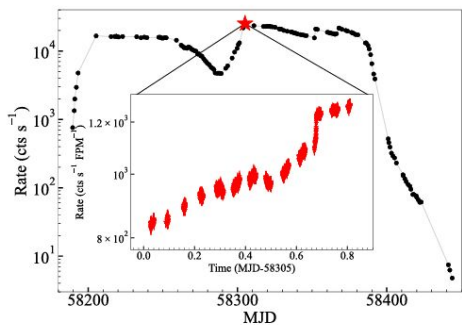
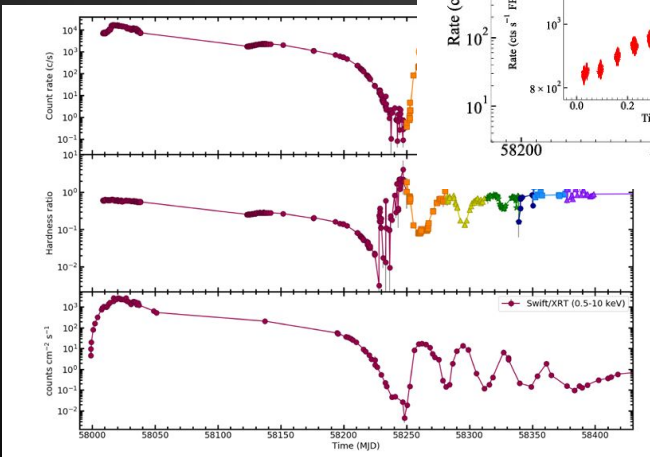
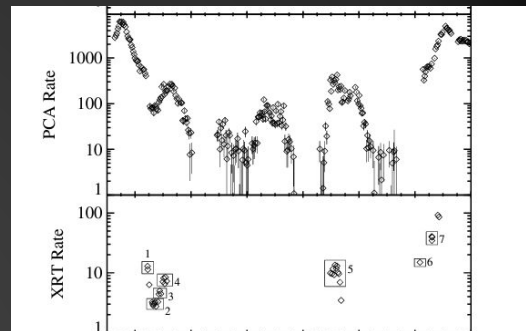
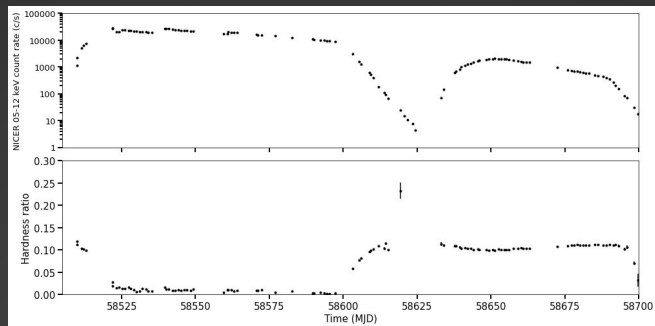
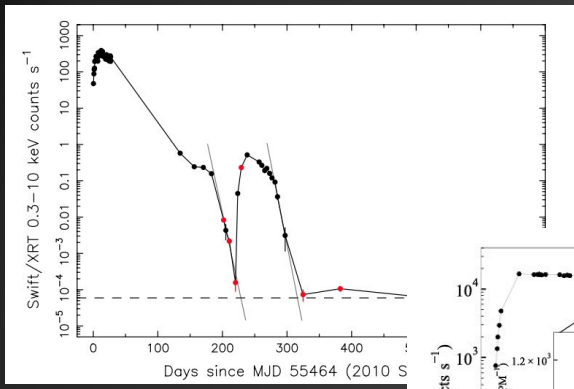


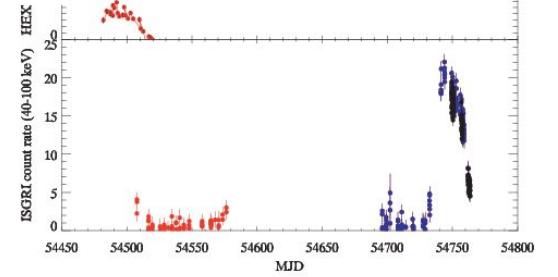
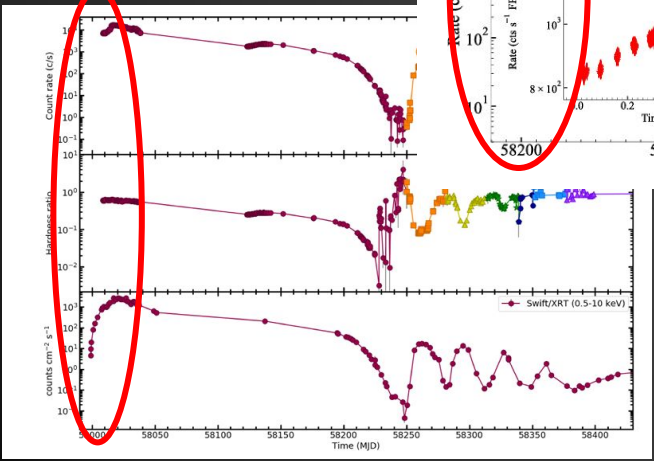
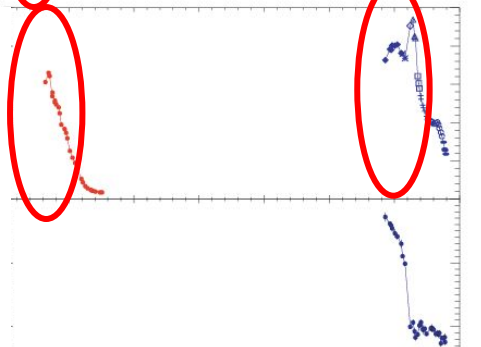
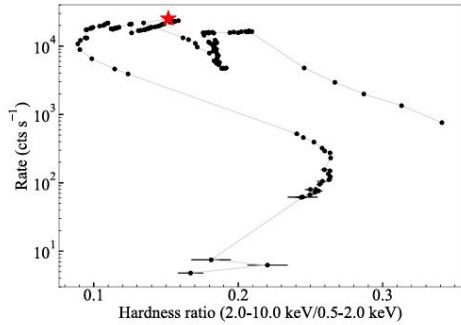
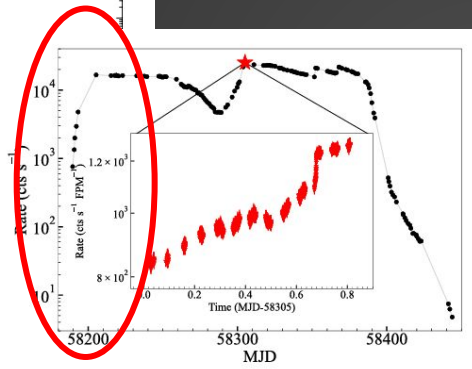
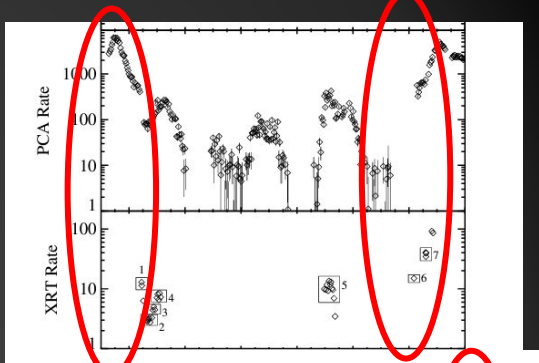
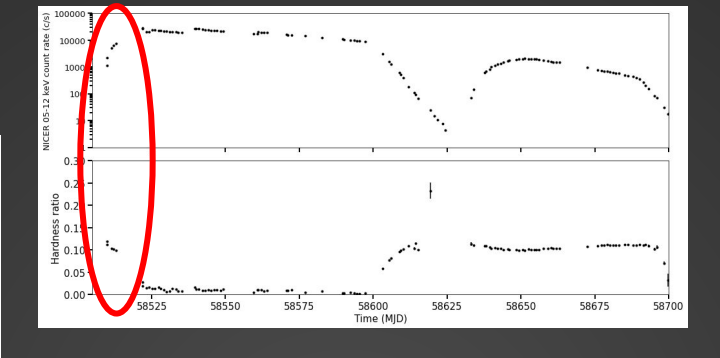
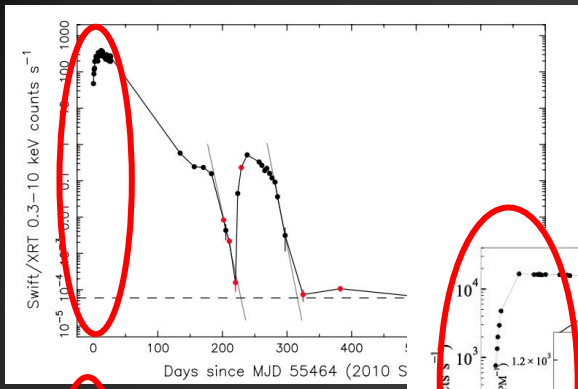






You snooze, you lose





You snooze, you lose

Three conditions

Condition 1: Regular observations

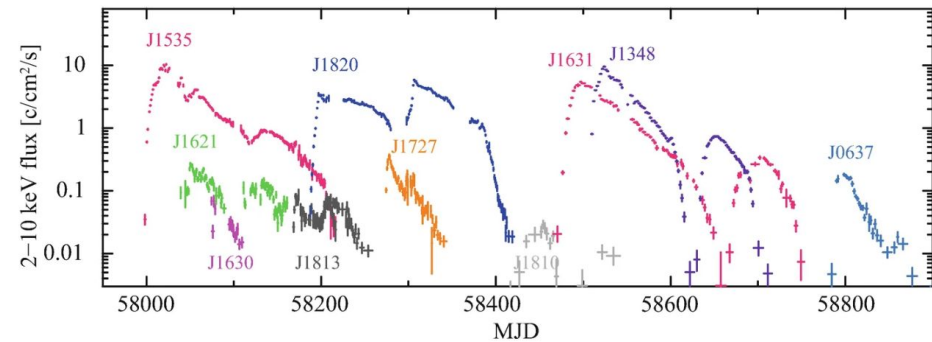


Credits: MAXI

Three conditions

Condition 1: Regular observations

From: **MAXI: Monitor of All-Sky X-Ray Image**



2–10 keV light curves of MAXI novae observed from April 7, 2017 (MJD 57850) to February 21, 2020 (MJD 58900). Some curves at low count rates are truncated to avoid the complexity due to the overlaps. The count rate of the Crab nebula in the 2–10 keV band is 2.24 counts/cm²/s

Credits: Tatehiro Mihara, Hiroshi Tsunemi & Hitoshi Negoro, 2022

Three conditions

Condition 1: Regular observations

Condition 2: Optical telescopes

Condition 3: Real-time analysis

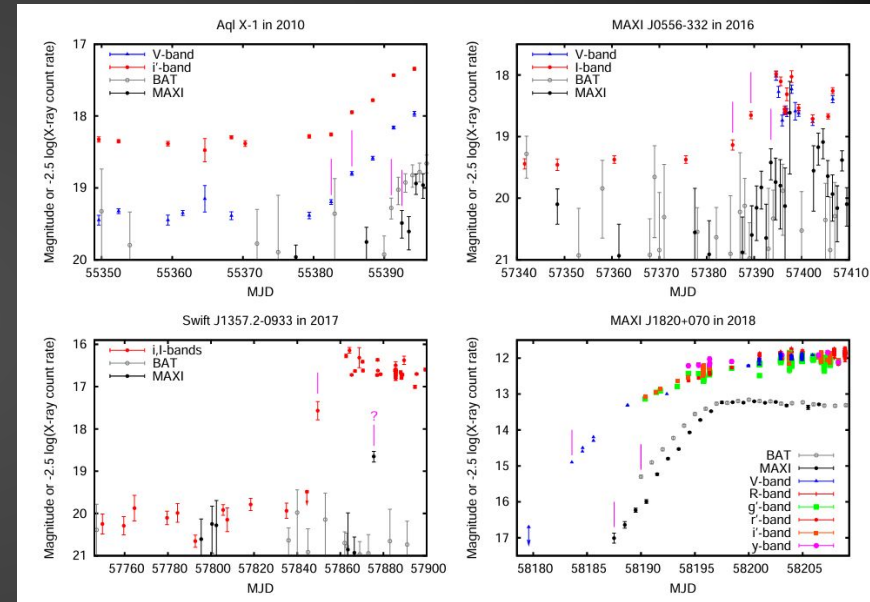


Three conditions

Condition 1: Regular observations

Condition 2: Optical telescopes

Condition 3: Real-time analysis



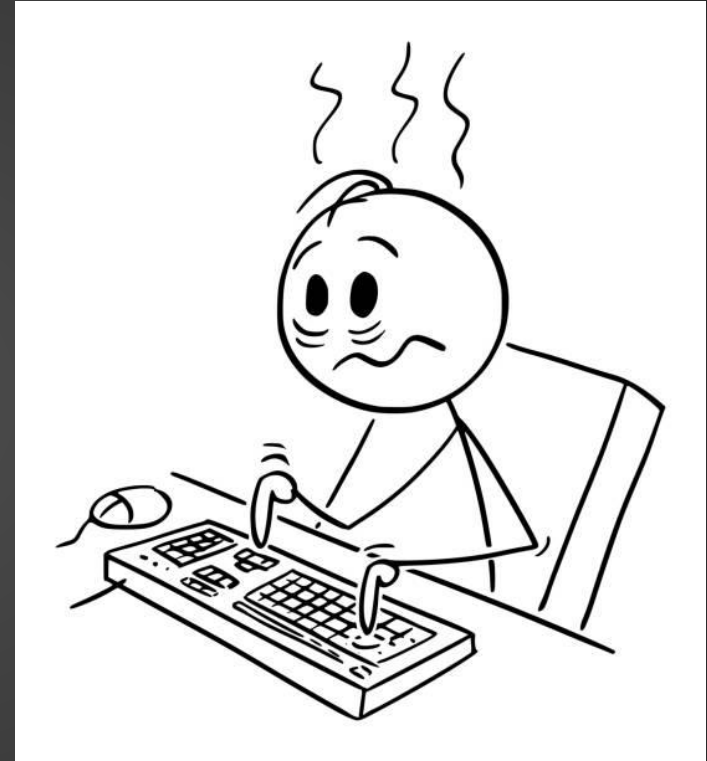
Russell et al. 2019

Three conditions

Condition 1: Regular observations

Condition 2: Optical telescopes

Condition 3: Real-time analysis



Three conditions

Condition 1: Regular observations

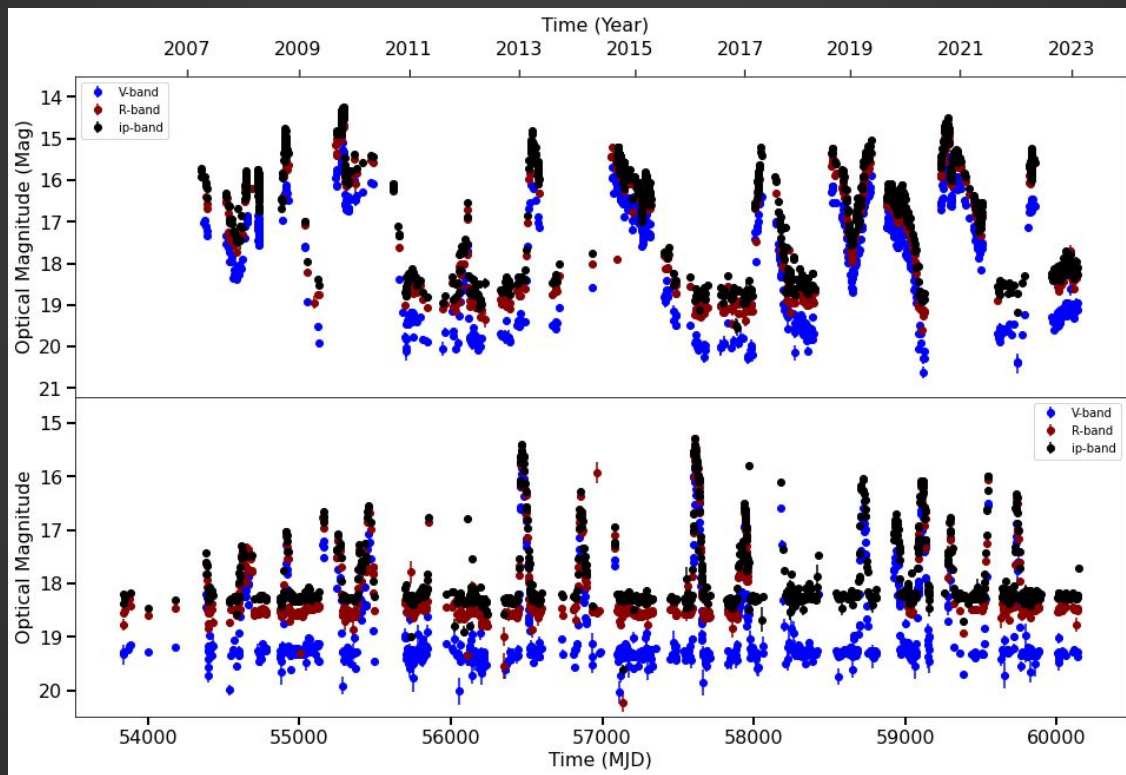
Condition 2: Optical telescopes

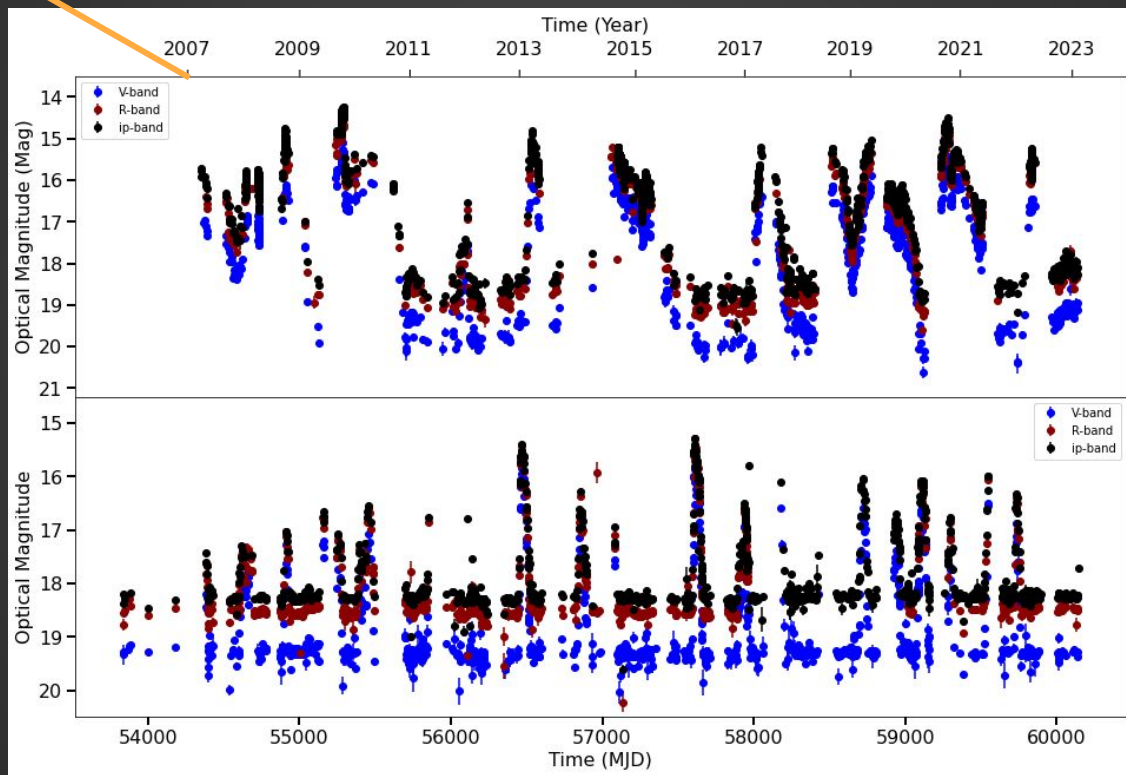
Condition 3: Real-time analysis

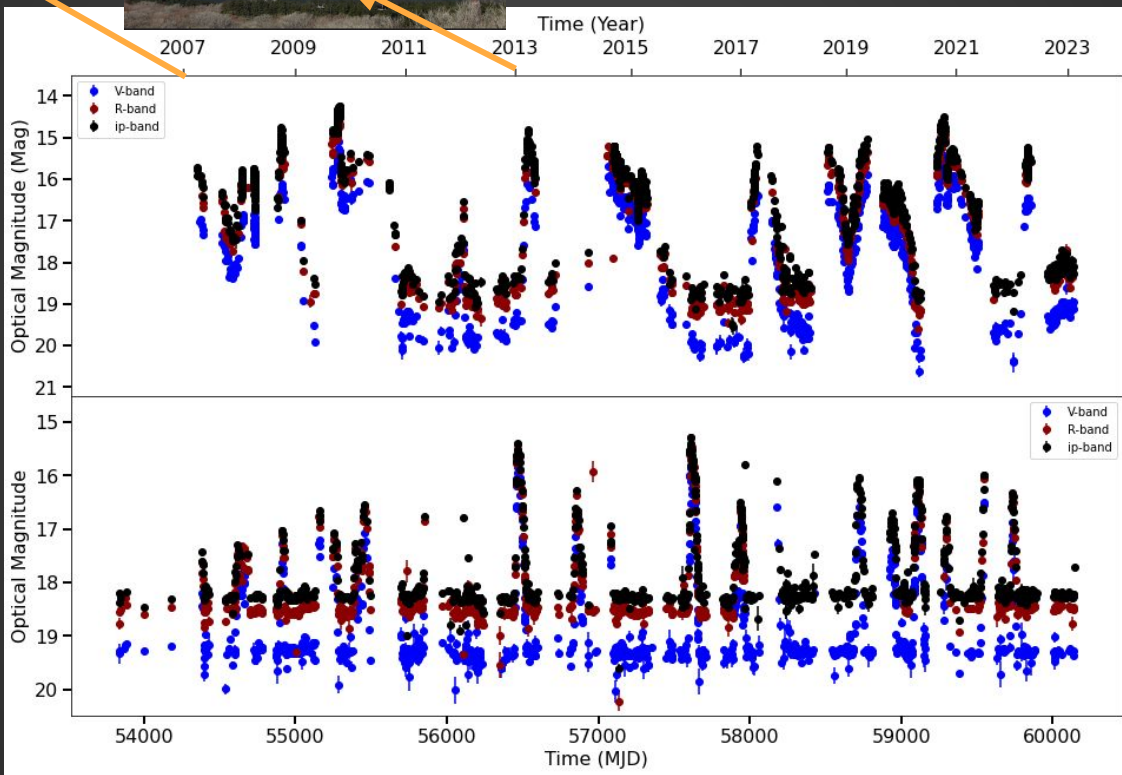
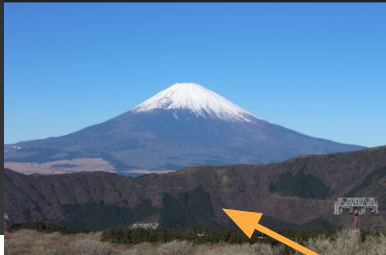


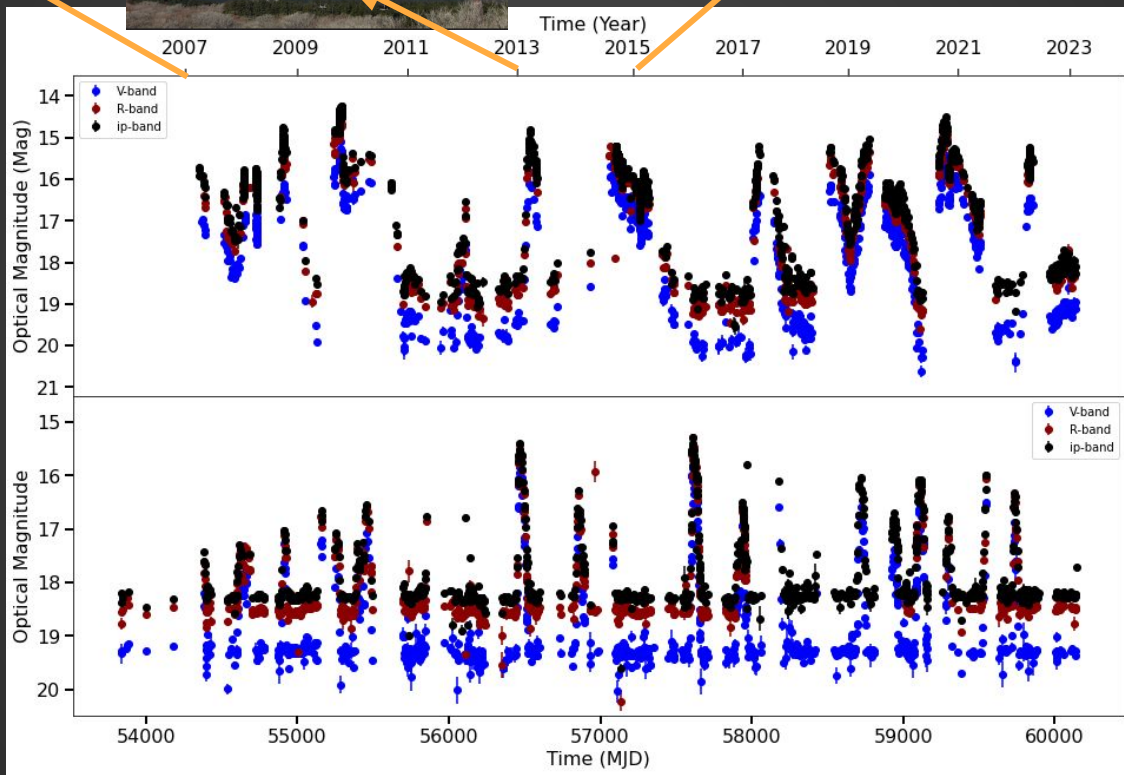
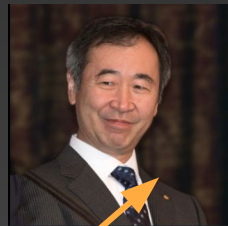
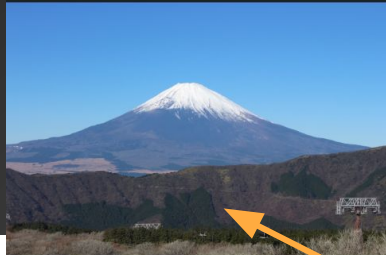
<https://lco.global/observatory/sites/>

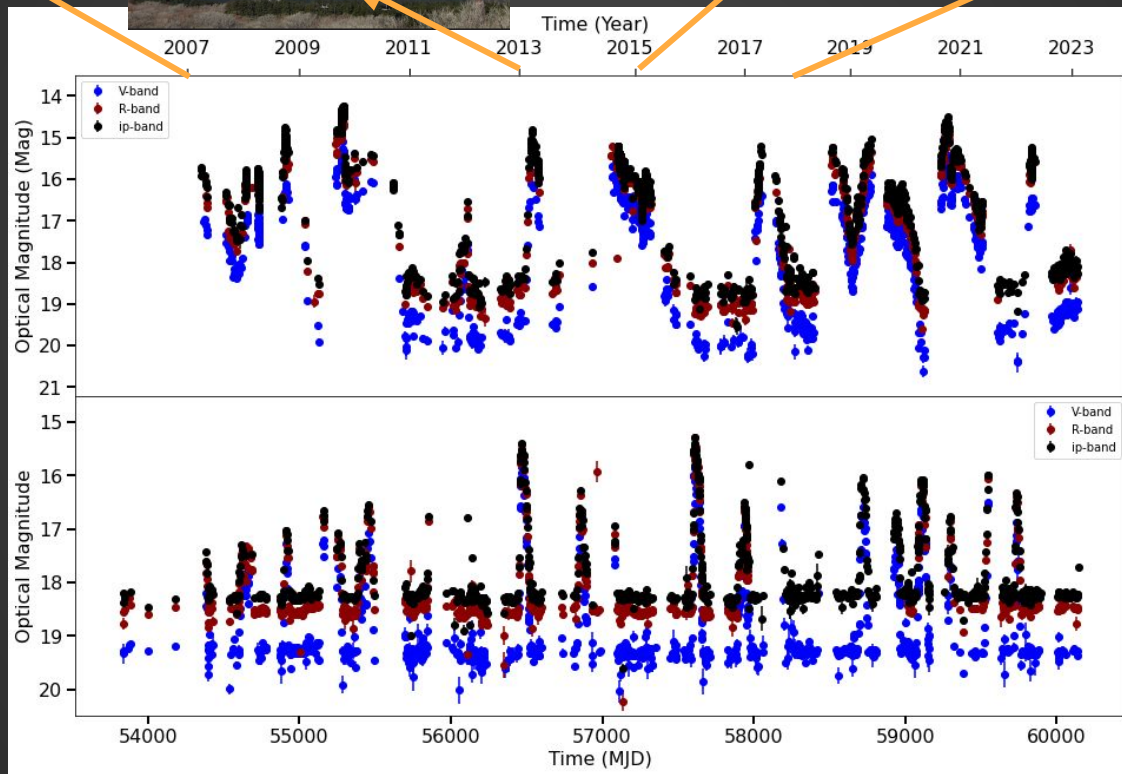
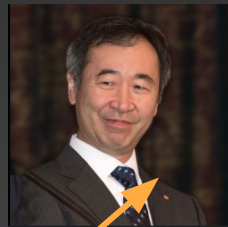
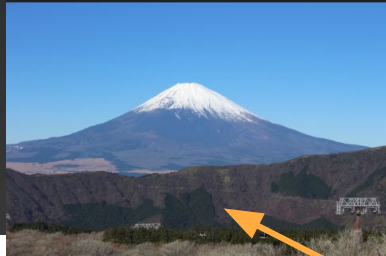
XB-NEWS AND THE LCO MONITORING PROGRAM











X-ray Binaries New Early Warning System (XB-NEWS)



1. Interrogates the LCO data archive several times per day.
2. Downloads all new data of our target list, and calibration files.
3. Flux calibrates the data, checks for flat reduction errors.
4. Produces light curves in near real-time and puts them online.
5. Alerts us when a new outburst is happening (or other interesting activity).

Home Page

Go to:	Pipeline Controller: Running
Home Page	Pipeline Overview
Target List	Pipeline Failures
Target Download-Matrix	

Introduction:

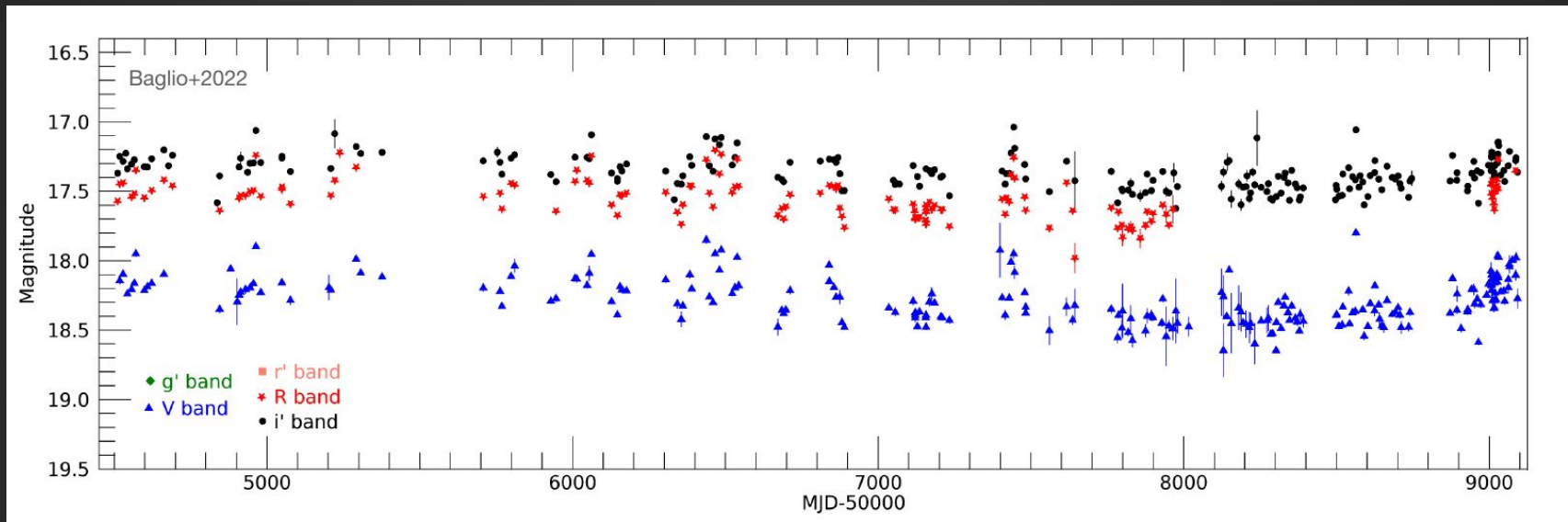
Welcome to the **X-ray Binary New Early Warning System (XB-NEWS)** pipeline webpages. These webpages provide a graphical interface to the data processing and the output light curves. Full documentation for the XB-NEWS pipeline is available [here](#).

The downloading of data by the XB-NEWS pipeline is driven by a **target list** that is split into active targets (classified as either regular or non-regular) and inactive targets. The pipeline searches for data corresponding to active targets in the Las Cumbres Observatory (LCO) archive on a regular basis, and it immediately downloads any new data that it finds. The pipeline does not search for data corresponding to inactive targets in the LCO archive. All downloaded data that exist locally are reduced by the XB-NEWS pipeline, regardless of whether the corresponding target is currently active or inactive, and the results are displayed on these webpages.

Here are some quick links to our individual target webpages:

- **Regular targets:**
JRXS_J190408-9-342058_AU_0614+09_AU_1543-47_AU_1808-52_AU_1630-47_AU_1957-11_A0620-00_Alg_X-1_Cen_X-4_GRO_J0422+32_GRO_J1055-40_GRO_J1719-24_GRS_J009-45_GRS_J124-68_GS_1154-84_GS_2000+25_GX_209-4_H1705-250_H1745-322_HETE_J0601-2455_IGR_300281-6834_IGR_J17051-3024_MAXI_20506-332_MAXI_20637-430_MAXI_21348-630_MAXI_21539-571_MAXI_21549-964_MAXI_21659-152_MAXI_21803-298_MAXI_21807+132_MAXI_21820+070_MAXI_21828-249_MAXI_21836-194_SAX_J1808-4-3658_Swift_J1745-26_Swift_J1753-5-0127_Swift_J1858-6-0814_Swift_J1910-2-0546_V404_Cyg_V4041_Sgr_XTE_J0029-314_XTE_J1118+480_XTE_J1950-964_XTE_J1650-900_XTE_J1728-295_XTE_J1752-223_XTE_J1899+226_XTE_XJ233-058
- **Non-regular targets:**
230114+05_AU_2538-52_AT2020kn_Cyg_X-1_IC_10-X-2_IGR_J17279-2747_LMC_X-3_MAXI_21631-478_MAXI_21719-212_PSR_J0045-7319_PSR_J0524-6703_PSR_J0610-2100_PSR_J0636+5128_PSR_J1001-5507_PSR_J1023+0038_PSR_J1301+0833_PSR_J1302-3258_PSR_J1513-25_PSR_J1816-4510_PSR_J2129-6429_PSR_J2215-5135_SGR03_071522.1-191609_SS_Cyg_Swift_J0840-7-3516_Swift_J1913.1+1946_VER_0521+211_XSS_J12270-4859_XTE_J1701-462
- **Inactive targets:**
1899-BUL-45_1FGJ_300215-2529_1FGJ_31417-3-4407_1RXS_J154439-4-112820_2MASX_J130951-721908_3MASX_J130902-631558_AX_11548-6-5416_AZ_Cen

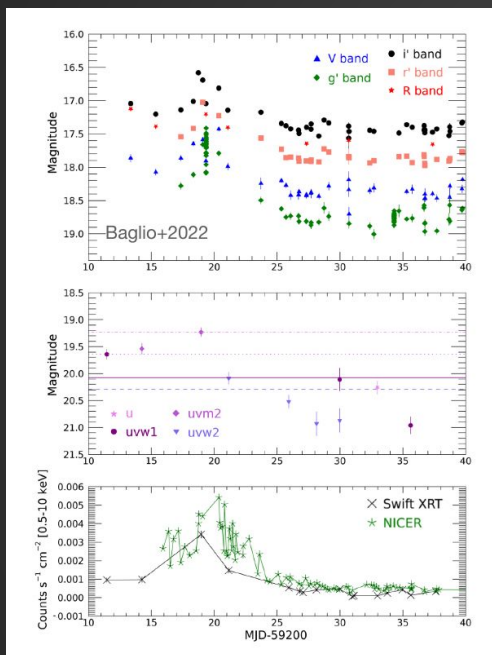
Long-term optical behaviour of LMXBs in quiescence



Baglio et al. 2022

Cen X-4

Long-term optical behaviour of LMXBs in quiescence



Cen X-4

Baglio et al. 2022

THE ASTROPHYSICAL JOURNAL, 930:20 (13pp), 2022 May 1

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<https://doi.org/10.3847/1538-4357/ac63ad>



A Misfired Outburst in the Neutron Star X-Ray Binary Centaurus X-4

M. C. Baglio^{1,2,3}, P. Saikia^{1,2}, D. M. Russell^{1,2}, J. Homan⁴, S. Waterval^{1,2}, D. M. Bramich^{1,5}, S. Campana³, F. Lewis^{6,7}, J. Van den Eijnden⁸, K. Alabarta^{1,2,9,10}, S. Covino³, P. D'Avanzo³, P. Goldoni¹¹, N. Masetti^{12,13}, and T. Muñoz-Darias^{14,15}

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¹³ Departamento de Ciencias Físicas, Universidad Andrés Bello, Av. Fernández Concha 700, 7591538 Las Condes, Santiago, Chile

¹⁴ Instituto de Astrofísica de Canarias, E-38205 La Laguna, Tenerife, Spain

¹⁵ Departamento de Astrofísica, Universidad de La Laguna, E-38206 La Laguna, Tenerife, Spain

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Abstract

We report on a long-term optical monitoring of the neutron star X-ray binary Centaurus X-4 performed during the last 13.5 yr. This source has been in quiescence since its outburst in 1979. Our monitoring reveals the overall evolution of the accretion disk; we detect short-duration flares, likely originating also in the disk, superimposed with a small-amplitude (<0.1 mag) ellipsoidal modulation from the companion star due to geometrical effects. A long-term (~ 2300 days) downward trend, followed by a shorter (~ 1000 days) upward one, is observed in the disk light curve. Such a rise in the optical has been observed for other X-ray binaries preceding outbursts, as predicted by the disk instability model. For Cen X-4, the rise of the optical flux proceeded for ~ 3 yr, and culminated in a flux increase at all wavelengths (optical–UV–X-rays) at the end of 2020. This increase faded after ~ 2 weeks, without giving rise to a full outburst. We suggest that the propagation of an inside-out heating front was ignited due to a partial ionization of hydrogen in the inner disk. The propagation might have stalled soon after the ignition due to the increasing surface density in the disk that the front encountered while propagating outward. The stall was likely eased by the low-level irradiation of the outer regions of the large accretion disk, as shown by the slope of the optical/X-ray correlation, suggesting that irradiation does not play a strong role in the optical, compared to other sources of emission.

Unified Astronomy Thesaurus concepts: Neutron stars (1108); Low-mass x-ray binary stars (939); Stellar accretion disks (1579)

Supporting material. data behind figures

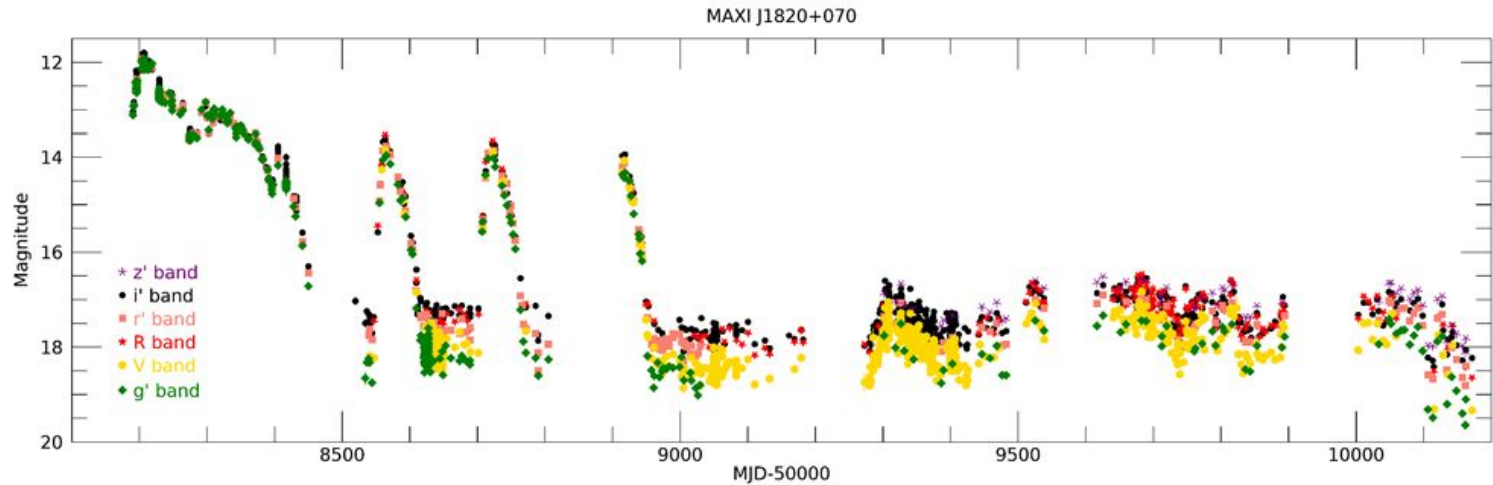
1. Introduction

Low-mass X-ray binaries (LMXBs) are binary systems hosting a compact object, which can be a neutron star (NS) or a

slower decay that can take place over weeks to months, until reaching its former quiescent level (Frank et al. 1987).

X-ray radiation typically comes from the internal part of the

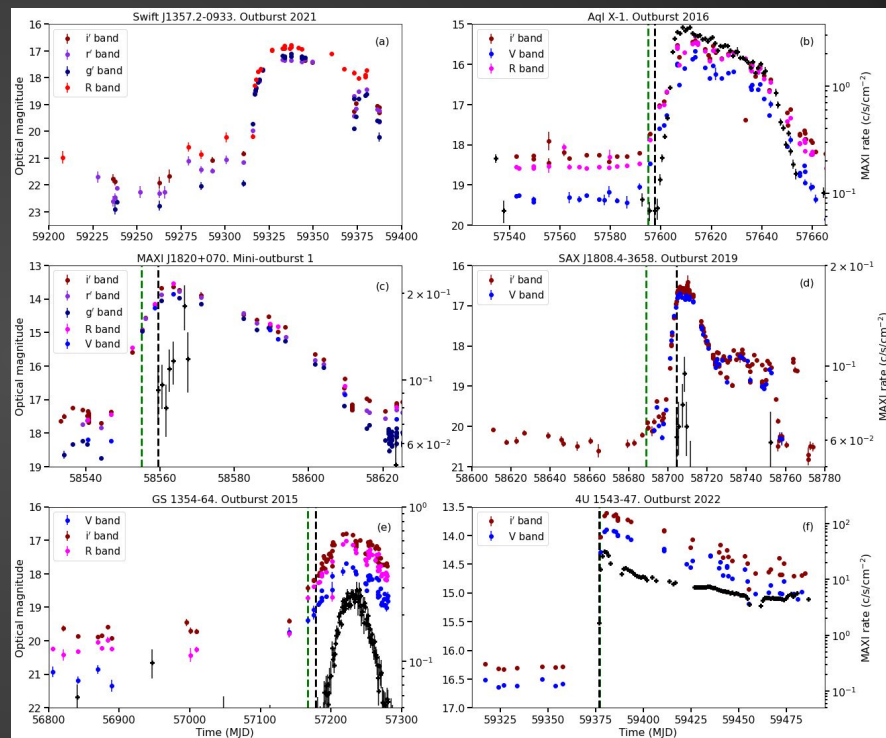
Long-term optical behaviour of LMXBs in quiescence



Plot courtesy of Prof. Russell

We are often the first to detect new LMXB outbursts

1. Well sampled rises in optical (LCO) and MAXI in X-rays of 25 outbursts corresponding to the 2008-2023 time period.
2. On average, we detect the outbursts ~ 11 days in optical before than in X-rays with MAXI.



Alabarta et al. to be submitted

We are often the first to detect new LMXB outbursts

XB-NEWS detects a new outburst from the black hole X-ray binary MAXI J1820+070

ATel #14492; *M. C. Baglio, D. M. Russell, P. Saikia, D. M. Bramich (NYU Abu Dhabi), F. Lewis (Faulkes Telescope Project & Astrophysics Research Institute, LJMU)*

on 29 Mar 2021; 17:58 UT

Distributed as an Instant Email Notice Transients

Credential Certification: *Maria Cristina Baglio (cristina.baglio@brera.inaf.it)*

Subjects: Optical, Binary, Black Hole, Transient

Referred to by ATel #: 14495, 14582, 15277

XB-NEWS detection of a new outburst of MAXI J1348-630

ATel #13451; *Saarah F. Pirbhoy, Maria Cristina Baglio, David M. Russell, D. M. Bramich, Payaswini Saikia, Aisha Al Yazeedi (NYU Abu Dhabi), Fraser Lewis (Faulkes Telescope Project & Astrophysics Research Institute, LJMU)*

on 5 Feb 2020; 18:14 UT

Distributed as an Instant Email Notice Transients

Credential Certification: *Maria Cristina Baglio*

Subjects: Optical, Binary, Black Hole, Transient

Referred to by ATel #: 13454, 13459, 13465, 13467, 14016, 14132, 14254, 14302, 14332, 14415, 14419, 15719, 16096, 16147, 16187, 16192, 16232, 16260,

New outburst of the black-hole low-mass X-ray binary GX 339-4 detected with XB-NEWS and Swift/XRT

ATel #16260; *Kevin Alabarta (NYU Abu Dhabi), Jeroen Homan (Eureka Scientific), David M. Russell (NYU Abu Dhabi), Sara Motta and M. Cristina Baglio (INAF-OAB), Payaswini Saikia, D. M. Bramich and Sandeep Rout (NYU Abu Dhabi), and Fraser Lewis (Faulkes Telescope Project & Astrophysics Research Institute, LJMU)*

on 28 Sep 2023; 06:37 UT

Credential Certification: *Kevin Alabarta (kalabarta@nyu.edu)*

Subjects: Optical, X-ray, Binary, Black Hole, Transient

Referred to by ATel #: 16302, 16424, 16425

XB-NEWS detects a probable new outburst from Cen X-4 after 41 years

ATel #14302; *Payaswini Saikia, Maria Cristina Baglio, David M. Russell (NYU Abu Dhabi), Jeroen Homan (Eureka Scientific & SRON), Stefan Waterval, D. M. Bramich (NYU Abu Dhabi), Fraser Lewis (Faulkes Telescope Project & Astrophysics Research Institute, LJMU), Jakob van den Eijnden (Univ. of Oxford)*

on 6 Jan 2021; 10:09 UT

Credential Certification: *David M. Russell (dave.russell5@gmail.com)*

Subjects: Optical, Ultra-Violet, X-ray, Binary, Neutron Star, Transient

Referred to by ATel #: 14303, 14317, 14332, 14333

New optical outburst of the black-hole low-mass X-ray binary Swift J1753.5-0127 detected with XB-NEWS; X-ray non-detection with Swift/XRT

ATel #16262; *Kevin Alabarta (NYU Abu Dhabi), Jeroen Homan (Eureka Scientific), David M. Russell (NYU Abu Dhabi), M. Cristina Baglio (INAF-OAB), Payaswini Saikia, D. M. Bramich and Sandeep Rout (NYU Abu Dhabi), and Fraser Lewis (Faulkes Telescope Project & Astrophysics Research Institute, LJMU)*

on 29 Sep 2023; 16:49 UT

Credential Certification: *Kevin Alabarta (kalabarta@nyu.edu)*

Subjects: Optical, X-ray, Binary, Black Hole, Transient

Referred to by ATel #: 16272, 16281, 16283, 16308, 16314, 16318, 16427

We are often the first to detect new LMXB outbursts

XB-NEWS detects a new outburst from the black hole X-ray binary MAXI J1820+070

ATel #14492; *M. C. Baglio, D. M. Russell, P. Saikia, D. M. Bramich (NYU Abu Dhabi), F. Lewis (Faulkes Telescope Project & Astrophysics Research Institute, LJMU)*
on 29 Mar 2021; 17:58 UT
Distributed as an Instant Email Notice Transients
Credential Certification: *Maria Cristina Baglio (cristina.baglio@brera.inaf.it)*

Subjects: Optical, Binary, Black Hole, Transient

Referred to by ATel #: 14495, 14582, 15277

XB-NEWS detection of a new outburst of MAXI J1348-630

ATel #13451; *Saarah F. Pirbhoy, Maria Cristina Baglio, David M. Russell, D. M. Bramich, Payaswini Saikia, Aisha Al Yazeedi (NYU Abu Dhabi), Fraser Lewis (Faulkes Telescope Project & Astrophysics Research Institute, LJMU)*
on 5 Feb 2020; 18:14 UT

Distributed as an Instant Email Notice Transients
Credential Certification: *Maria Cristina Baglio*

Subjects: Optical, Binary, Black Hole, Transient

Referred to by ATel #: 13454, 13459, 13465, 13467, 14016, 14132, 14254, 14302, 14332, 14415, 14419, 15719, 16096, 16147, 16187, 16192, 16232, 16260,

New outburst of the black-hole low-mass X-ray binary GX 339-4 detected with XB-NEWS and Swift/XRT

ATel #16260; *Kevin Alabarta (NYU Abu Dhabi), Jeroen Homan (Eureka Scientific), David M. Russell (NYU Abu Dhabi), Sara Motta and M. Cristina Baglio (INAF-OAB), Payaswini Saikia, D. M. Bramich and Sandeep Rout (NYU Abu Dhabi), and Fraser Lewis (Faulkes Telescope Project & Astrophysics Research Institute, LJMU)*
on 28 Sep 2023; 06:37 UT

Credential Certification: *Kevin Alabarta (kalabarta@nyu.edu)*

Subjects: Optical, X-ray, Binary, Black Hole, Transient

Referred to by ATel #: 16302, 16424, 16425

XB-NEWS detects a probable new outburst from Cen X-4 after 41 years

ATel #14302; *Payaswini Saikia, Maria Cristina Baglio, David M. Russell (NYU Abu Dhabi), Jeroen Homan (Eureka Scientific & SRON), Stefan Waterval, D. M. Bramich (NYU Abu Dhabi), Fraser Lewis (Faulkes Telescope Project & Astrophysics Research Institute, LJMU), Jakob van den Eijnden (Univ. of Oxford)*
on 6 Jan 2021; 10:09 UT

Credential Certification: *David M. Russell (dave.russell5@gmail.com)*

Subjects: Optical, Ultra-Violet, X-ray, Binary, Black Hole, Transient

Referred to by ATel #: 14303, 14317, 14332, 14333

New optical outburst of the black-hole low-mass X-ray binary Swift J1753.5-0127 detected with XB-NEWS; X-ray non-detection with Swift/XRT

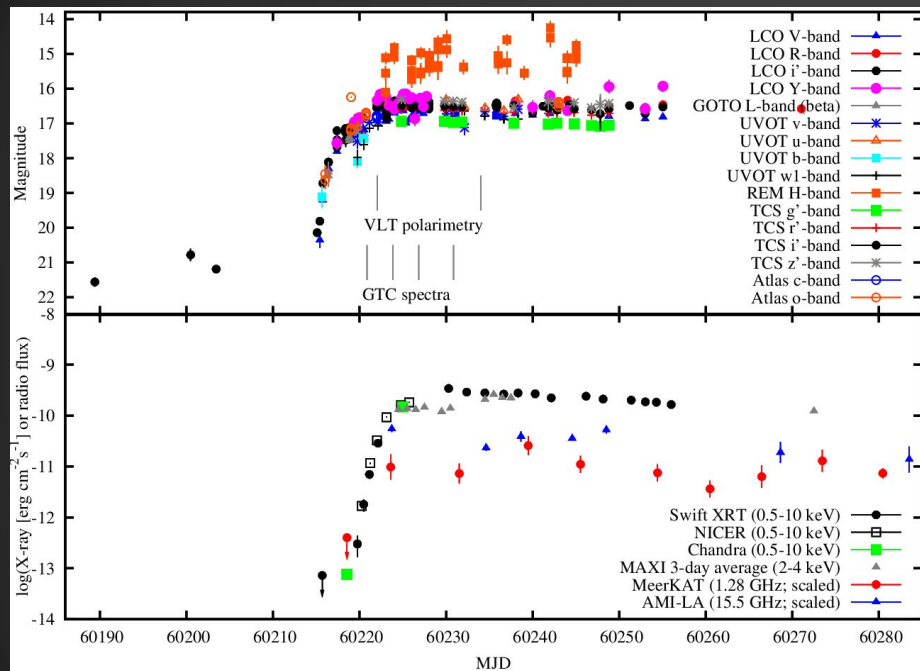
ATel #16262; *Kevin Alabarta (NYU Abu Dhabi), Jeroen Homan (Eureka Scientific), David M. Russell (NYU Abu Dhabi), M. Cristina Baglio (INAF-OAB), Payaswini Saikia, D. M. Bramich and Sandeep Rout (NYU Abu Dhabi), and Fraser Lewis (Faulkes Telescope Project & Astrophysics Research Institute, LJMU)*
on 29 Sep 2023; 16:49 UT

Credential Certification: *Kevin Alabarta (kalabarta@nyu.edu)*

Subjects: Optical, X-ray, Binary, Black Hole, Transient

Referred to by ATel #: 16272, 16281, 16283, 16308, 16314, 16318, 16327

We are often the first to detect new LMXB outbursts

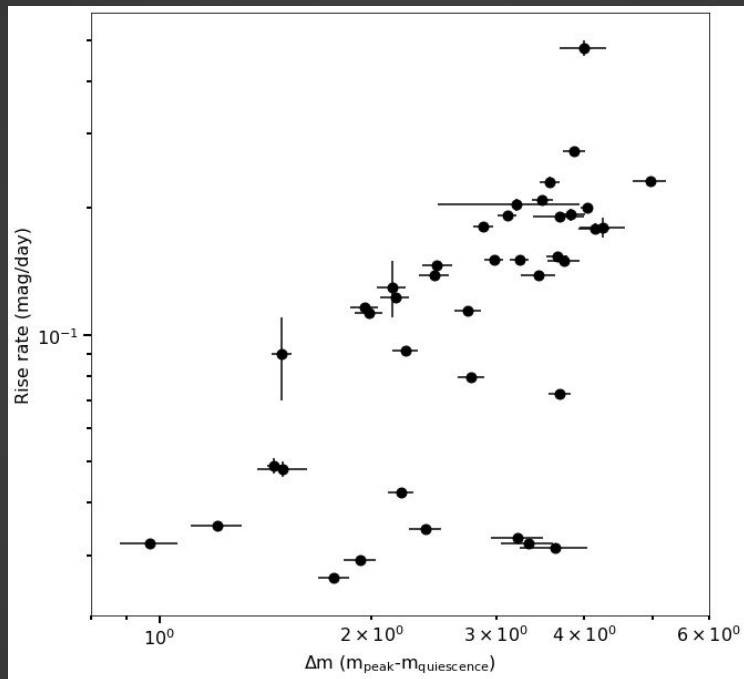


Russell et al. (to be submitted)

- ~5 days between the start of the optical and the start of the X-ray
- First time has been measured from the quiescent level

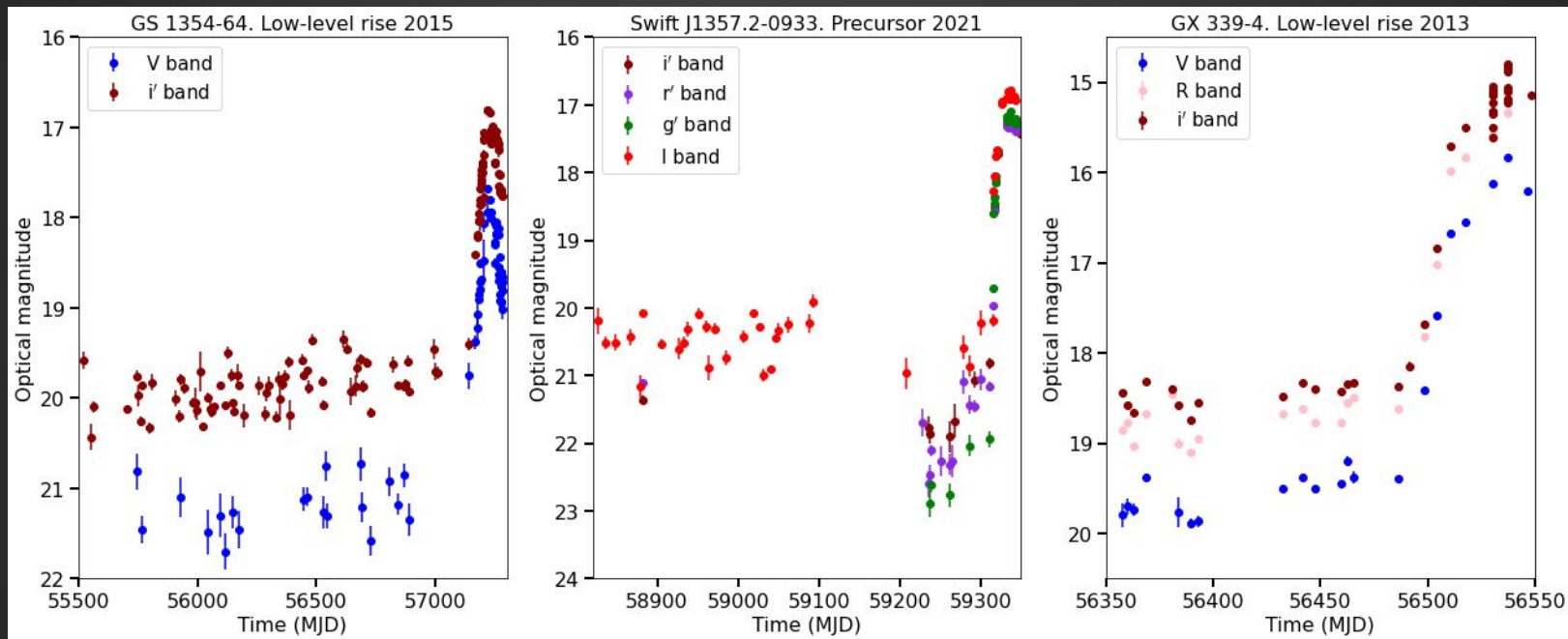
Revealing the physics at early stages of outbursts

Studying the early stages of outbursts



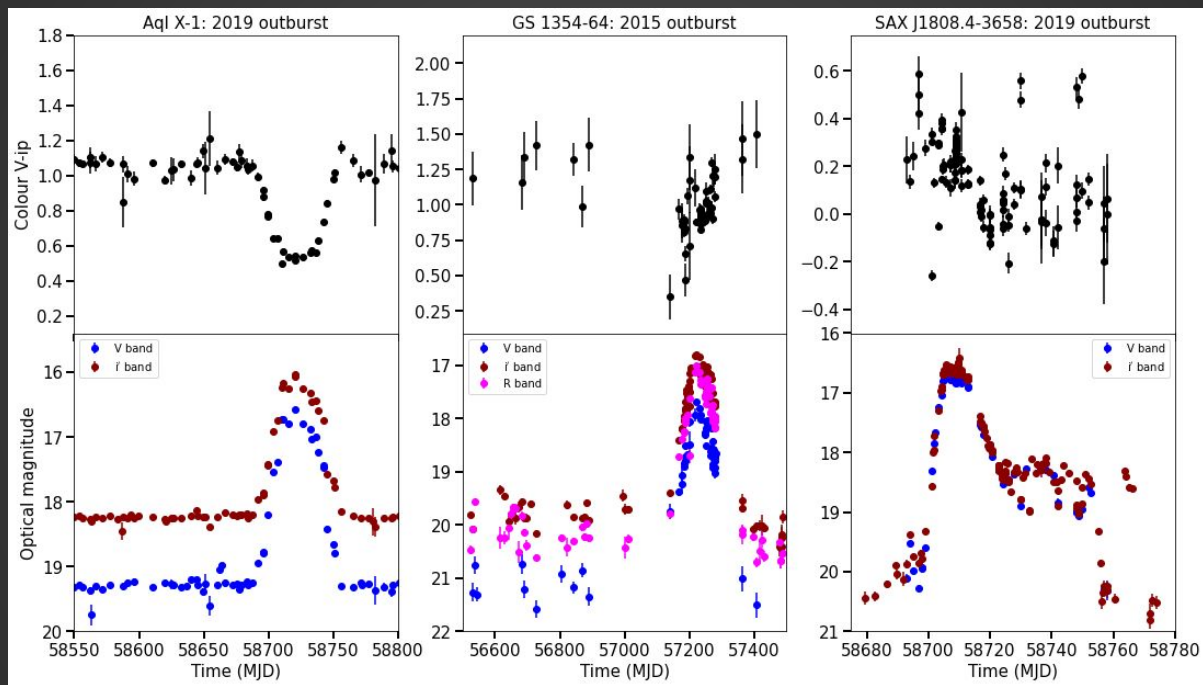
Alabarta et al. to be submitted

Long-term optical behaviour of LMXBs in quiescence

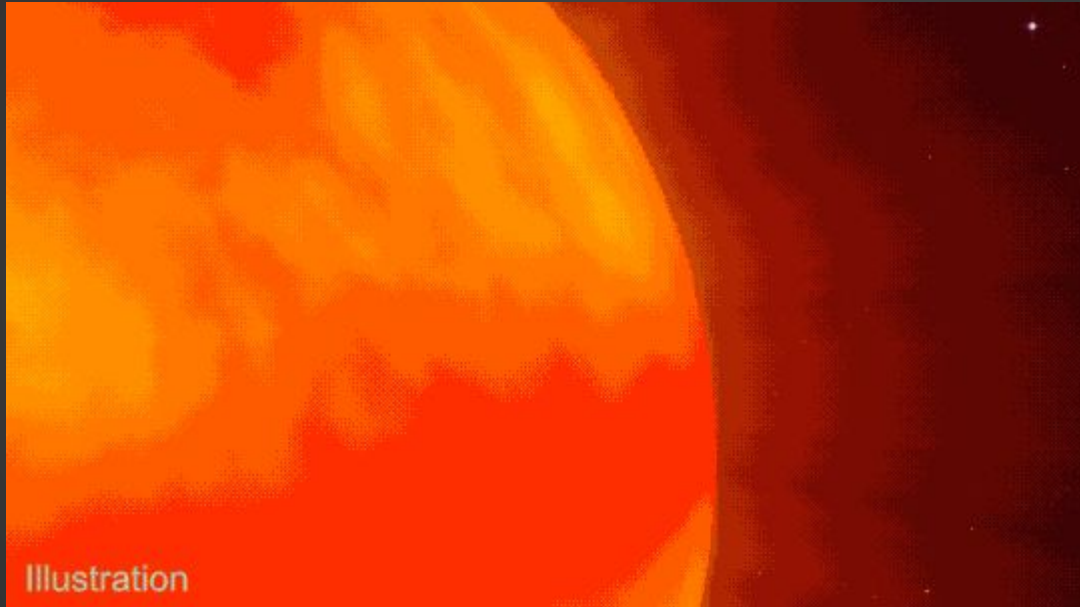


Alabarta et al. to be submitted

Studying the early stages of outbursts



Alabarta et al. to be submitted



Credits: NASA

Take-home messages



A more than 15 year archive of optical light curves (mostly of XRBs) ready to be exploited. XB-NEWS allows us to get optical light curves in real-time.

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We find an average delay of 11 days between the first optical and X-ray detections and been able to detect optical precursors.

Take-home messages



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We find an average delay of 11 days between the first optical and X-ray detections and been able to detect optical precursors.



We can test some of the predictions of the DIM at the early stages of the outburst

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