



UvA-DARE (Digital Academic Repository)

MAXI J1820+070 continuing its rapid evolution toward the hard state

Homan, J.; Stevens, A.L.; Altamirano, D.; Gendreau, K.; Arzoumanian, Z.; Strohmayer, T.E.; Uttley, P.; Cackett, E.M.; Kara, E.; Pasham, D.R.

Publication date

2018

Document Version

Final published version

Published in

The astronomer's telegram

License

Unspecified

[Link to publication](#)

Citation for published version (APA):

Homan, J., Stevens, A. L., Altamirano, D., Gendreau, K., Arzoumanian, Z., Strohmayer, T. E., Uttley, P., Cackett, E. M., Kara, E., & Pasham, D. R. (2018). MAXI J1820+070 continuing its rapid evolution toward the hard state. *The astronomer's telegram*, 2068. <http://www.astronomerstelegam.org/?read=12068>

General rights

It is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), other than for strictly personal, individual use, unless the work is under an open content license (like Creative Commons).

Disclaimer/Complaints regulations

If you believe that digital publication of certain material infringes any of your rights or (privacy) interests, please let the Library know, stating your reasons. In case of a legitimate complaint, the Library will make the material inaccessible and/or remove it from the website. Please Ask the Library: <https://uba.uva.nl/en/contact>, or a letter to: Library of the University of Amsterdam, Secretariat, Singel 425, 1012 WP Amsterdam, The Netherlands. You will be contacted as soon as possible.



Outside
 GCN
 IAUCs

Other
 ATel on [Twitter](#) and [Facebook](#)
[ATELstream](#)
[ATel Community Site](#)

[[Previous](#) | [Next](#) | [ADS](#)]

MAXI J1820+070 continuing its rapid evolution toward the hard state

ATel #12068; *J. Homan (Eureka Scientific and SRON), A. L. Stevens (Michigan State U. and U. Michigan), D. Altamirano (University of Southampton), K. Gendreau, Z. Arzoumanian, T. E. Strohmayer (NASA/GSFC), P. Uttley (University of Amsterdam), E. M. Cackett (Wayne State University), E. Kara (University of Maryland, JSI), Dheeraj R. Pasham (MIT) for the NICER team*

on 28 Sep 2018; 22:00 UT

Credential Certification: jeroen@space.mit.edu

Subjects: X-ray, Black Hole, Transient

We report on recent NICER observations of the transient black hole candidate MAXI J1820+070 (ASASSN-18ey).

After spending the initial part of its outburst in the hard state, MAXI J1820+070 made a rapid transition to a softer spectral state in early July (ATel #11820, #11823). NICER monitoring observations show that it remained in this softer spectral state until recently. MAXI, Swift, and radio observations (ATel #12057, #12061, #12064) indicate that the source started a transition toward a harder spectral state between Sep. 21 and 23. Despite near-daily NICER observations of the outburst, the start of this transition occurred during a 4-day gap in our coverage. Swift observations revealed non-monotonic spectral evolution, casting some doubt on whether the source was truly returning to the hard state (ATel #12064). NICER light/hardness curves and a hardness-intensity diagram (see link below) indicate that the source is still continuing its rapid transition towards the hard state, but has not yet reached the same hardness values seen during the initial hard state.

An energy spectrum obtained earlier today (Sep. 28 12:41 UT, 120 s exposure) can be well modelled with a combination of absorbed disk blackbody and power-law components (similar to the Swift spectra analysed in ATel #12064). We find an nH of $\sim 2e21 \text{ cm}^{-2}$, a disk temperature $\sim 0.22 \text{ keV}$, and a power-law index of ~ 2.5 . The 0.3-10 keV flux (unabsorbed) is $2.95e-8 \text{ erg/s/cm}^2$, with a power-law flux contribution of $\sim 65\%$. Compared to the Swift spectra from Sep. 25, the disk temperature is lower and the power-law index higher.

In terms of X-ray variability, we observe significant evolution in the rapid variability properties as well. The averaged 0.3-12 keV power spectrum (PDS) from the last ten days before the current transition shows weak power-law noise with an integrated (0.1-100 Hz) strength of $\sim 0.5\%$ rms. The PDS of the first observation after the transition showed much stronger ($\sim 4\%$ rms) peaked noise around 2 Hz, with a hint of a weak QPO around 16 Hz. In the days following the 0.1-100 Hz noise increased in strength to $\sim 11\%$ (Sep. 28) and decreased in frequency. Note that in the 2-10 keV band (which is more comparable to the RXTE band) the rms values after the start of the

Related

- 12157 MAXI 1820+070 has completed the decline from the recent optical re-brightening following the soft to hard transition
- 12128 Optical brightening of MAXI J1820+070 over the soft to hard transition observed with LCO and the AI Sadeem Observatory
- 12068 MAXI J1820+070 continuing its rapid evolution toward the hard state
- 12064 Swift observes MAXI J1820+070 in transition from the soft to the hard-intermediate state
- 12061 AMI radio detection of the black hole candidate MAXI J1820+070 during the soft to hard transition.
- 12057 MAXI/GSC detection of a rapid increase in the hard X-ray flux of MAXI J1820+070
- 11960 The 55 Hz signal we detected in MAXI J 1820+070 is not a QPO
- 11951 Detection of a 55 Hz high-frequency QPO in MAXI J1820+070 with NICER
- 11936 Optical timing observations of MAXI J1820+070 with IFI+IQUEYE and AQUEYE+ soon after state transition
- 11899 Short-lived episodes of emission line splitting in the candidate black hole X-ray binary MAXI 1820+070
- 11887 LOFAR observations of MAXI J1820+070 (ASASSN-18ey) during its recent state transition
- 11855 Polarimetric monitoring of the MAXI J1820+070 in optical and near-infrared wavelengths
- 11833 Declining near-infrared flux from the black-hole candidate MAXI J1820+070 (ASASSN-18ey) in transition
- 11831 (Sub)-millimetre Observations of MAXI J1820+070 (ASASSN-18ey) Suggest Jet Quenching on July 6
- 11827 AMI-LA 15.5 GHz observations of radio flaring from the black hole

transition increased from ~11% to 27%. By Sep. 28 the QPO had decreased in frequency to ~3 Hz and increased in strength as well. On Sep. 27, two (probably harmonically related) QPOs were detected at 5.73 ± 0.20 Hz and 10.78 ± 0.13 , with Q-values of ~5-6 and strengths of ~1.5% rms (~7% in the 2-10 keV band). These are likely type-C QPOs. Combined with the position of the source in the HID and the spectral parameters listed above, the recent power spectral properties are consistent with the MAXI J1820+070 evolving through the hard-intermediate state.

We strongly encourage rapid, simultaneous, multi-wavelength observations of MAXI J1820+070 as it transitions. A file containing the upcoming NICER schedule for the source can be found at the link below.

NICER is a 0.2-12 keV X-ray telescope operating on the International Space Station. The NICER mission and portions of the NICER science team activities are funded by NASA.

Light/hardness curves, hardness-intensity diagram, and scheduled observations

	candidate MAXI J1820+070 in transition
11824	Other low-frequency optical QPO-like features in MAXI J1820+070 detected with IFI+IQUEYE@Galileo
11823	Continuing NICER observations of the state transition in ASASSN-18ey/MAXI J1820+070
11820	A rapid state transition in MAXI J1820+070
11723	Low-frequency optical QPO in MAXI J1820+070 detected with IFI+IQUEYE@Galileo
11609	Simultaneous LOFAR and AMI-LA observations of MAXI J1820+070
11591	Further detection of the optical low frequency QPO in the black hole transient MAXI J1820+070
11578	Exponential increase in X-ray QPO frequency with time in MAXI J1820+070
11576	NICER observations of MAXI J1820+070: Continuing evolution of X-ray variability properties
11574	Optical/X-ray Flux Decoupling in MAXI J1820+070
11540	VLITE meter-wavelength detection of MAXI J1820+070 at 339 MHz
11539	The 30-day monitoring of MAXI J1820+070 at 4.7 GHz
11533	A bright mid-infrared excess in MAXI J1820+070
11510	Detection of optical and X-ray QPOs at similar frequencies in MAXI J1820+070
11490	INTEGRAL observations of MAXI J1820+070: public data products
11488	Low-frequency QPOs in MAXI J1820+070 as seen by INTEGRAL/SPI
11481	MAXI J1820+070: VLT and GTC spectroscopic follow-up shows a significant spectral evolution from the early stages of the outburst
11480	ePESSTO spectroscopic classification of optical transients
11478	INTEGRAL observations of MAXI J1820+070
11458	Near Infrared JHKs observations of the transient MAXI J1820+070 / ASASSN-18ey
11451	Fast infrared photometry of the black-hole candidate MAXI J1820+070
11445	First measurements of linear polarization of MAXI J1820+070
11440	NOEMA Sub-millimetre Detection of MAXI J1820+070
11439	A flat radio spectrum of MAXI J1820+070
11437	Red sub-second optical flaring in MAXI J1820+070 observed by ULTRACAM/NTT
11432	Correlated Optical/X-ray Timing Variations in MAXI J1820+070 found by Swift UVOT and XRT
	The hard X-ray spectrum of

11427	MAXI J1820+070 observed by Swift/BAT
11426	Detection of 10-msec scale optical flares in the black-hole binary candidate MAXI J1820+070 (ASASSN-18ey)
11425	Optical Spectra of MAXI J1820+070 with Keck
11424	SOAR/Goodman optical spectroscopy of MAXI J1820+070
11423	NICER observations of MAXI J1820+070 suggest a rapidly-brightening black hole X-ray binary in the hard state
11421	Fast optical flaring in the suspected black-hole binary MAXI J1820+070 (ASASSN-18ey)
11420	AMI radio observations of the black hole candidate MAXI J1820+070
11418	Optical observations of MAXI J1820+070 suggest it is a black hole X-ray binary
11406	MAXI J1820+070: Errata and updated XRT Position
11404	MAXI J1820+070: Swift/UVOT counterpart correction
11403	Swift detection of MAXI J1820+070
11400	Optical follow-up of MAXI J1820+070 and possible identity with ASASSN-18ey
11399	MAXI/GSC detection of a probable new X-ray transient MAXI J1820+070

[**Telegram Index**]

R. E. Rutledge, Editor-in-Chief

Derek Fox, Editor

Mansi M. Kasliwal, Co-Editor

rrutledge@astronomerstelegram.org

dfox@astronomerstelegram.org

mansi@astronomerstelegram.org