NICER observations of MAXI J1820+070

Continuing evolution of X-ray variability properties

Homan, J.; Altamirano, D.; Arzoumanian, Z.; Buisson, D.; Eikenberry, S.; Fabian, A.C.; Gendreau, K.; Kara, E.; Ludlam, R.; Neilsen, J.; Ray, P.S.; Remillard, R.; Steiner, J.; Uttley, P.; NICER team

Publication date
2018

Document Version
Final published version

Published in
The astronomer's telegram

The Astronomer's Telegram
Post | Search | Policies
Credential | Feeds | Email

15 Apr 2019; 09:28 UT

[Previous | Next | ADS]

NICER observations of MAXI J1820+070: Continuing evolution of X-ray variability properties

ATel #11576; *J. Homan (Eureka Scientific & SRON), D. Altamirano (Univ. of Southampton), Z. Arzoumanian (GSFC), D. Buisson (Univ. of Cambridge), S. Eikenberry (Univ. of Florida), A. C. Fabian (Univ. of Cambridge), K. Gendreau (GSFC), E. Kara (Univ. of Maryland), R. Ludlam (Univ. of Michigan), J. Neilsen (Villanova), P. S. Ray (NRL), R. Remillard (MIT), J. Steiner (MIT), P. Uttley (Univ. of Amsterdam) for the NICER Team*
*on **26 Apr 2018; 20:39 UT***
Credential Certification: Jeroen Homan (jeroen@space.mit.edu)

Subjects: X-ray, Black Hole, Transient

Referred to by ATel #: 11578, 11723, 11820, 11951, 12057

The X-ray transient MAXI J1820+070 has been in outburst since its discovery on March 11 2018 (ATel #11399). Observations at various wavelengths, including the optical counterpart ASASSN-18ey (ATel #11400), suggest that the source is a black hole transient in the hard spectral state (e.g., ATel #11418, #11423, #11420, #11426). NICER has been observing the source on a regular basis. Recent NICER observations (April 16-20) reveal variability that remains consistent with a black hole hard state, but with a continuing power-spectral evolution toward higher frequencies. Low-frequency QPOs were previously detected with INTEGRAL (~0.045 Hz on March 27, ATel #11488) and Swift (~0.06 Hz on April 1, ATel #11510). NICER observations on April 16/17 reveal two harmonically related QPOs at 0.125(3) Hz and 0.238(6) Hz. These QPOs have fractional rms amplitudes in the 0.2-12 keV band of 8+/-1% and 4+/-1%, respectively, and Q-values between 3 and 8.

Although the frequencies of the low-frequency QPOs continue to increase, this does not necessarily mean that a state transition is imminent. For example, during the 2000 outburst of the black hole transient XTE J1118+480 the low-frequency QPO increased in frequency from 0.07 Hz to 0.15 Hz, without the source ever leaving the hard state (Wood et al. 2000, ApJ, 544, L45).

Spectrally, no clear evolution has been seen in the last couple of weeks. A NICER 0.5-10 keV spectrum obtained on April 20 can be modeled well with an absorbed, strongly Comptonized low-temperature accretion disk component (kT~0.28 keV, power-law index ~1.65), confirming that the source remains in the hard state. A broad iron line is present as well at 6.7 keV (EW=140 eV). The unabsorbed (NH~1.2e21) 0.5-10 keV flux is 4.5e-8 erg/cm^2/s.

We also obtained a distance measurement for MAXI J1820+070 from the GAIA data archive (Brown et al. 2018; https://arxiv.org/abs/1804.09365). The parallax of the source is listed as 0.30+/-0.10 mas, indicating a relatively nearby black hole X-ray binary at a distance of ~3.3 (-0.8/+1.7) kpc. Using the flux quoted above, this distance implies a 0.5-10 keV luminosity of

Related
12608 Optical spectroscopy and photometry of MAXI J1820+070 (ASASSN-18ey) during the large multi-wavelength re-brightening of March 2019
12596 Optical observations of MAXI J1820+070 confirm the rebrightening
12577 AMI-LA and Swift confirm the multi-wavelength rebrigtening of MAXI J1820+070
12573 Swift observation of the rebrightening in MAXI J1820+070
12567 Rebrightening of ASASSN-18ey = MAXI J1820+070
12534 MAXI J1820+070 is close to quiescence
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 Al 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

5.7e37 erg/s, which corresponds to ~6% of the Eddington luminosity for a 8 Msun black hole. This number could be substantially higher when taking into account the flux outside the 0.5-10 keV band.

Finally, we note that further inspection of NICER observations taken during the rise of the outburst between March 12 and March 16 (unabsorbed flux: ~(0.3-1.5)e-8 erg/cm^2/s), reveals strong dips in the light curves below 2 keV. While spectral analysis suggests that these dips are due to absorption and/or obscuration (possibly ionized), their nature is not yet fully understood. These dips were no longer seen once the source reached its current flux plateau (after March 21). The presence of the dips could indicate that MAXI J1820+070 is viewed at a relatively high inclination (>70 degrees).

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.

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

11462 Near Infrared JHKs observations of the transient MAXI J1820+070 / ASASSN-18ey: Erratum on 2MASS counterpart designation

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

11427 The hard X-ray spectrum of 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

10459 Ongoing radio monitoring of Cyg X-1 with the RATAN-600 radio telescope

---

[**Telegram Index**]

R. E. Rutledge, Editor-in-Chief rrutledge@astronomerstelegram.org
Derek Fox, Editor dfox@astronomerstelegram.org
Mansi M. Kasliwal, Co-Editor mansi@astronomerstelegram.org