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A rapid state transition in MAXI J1820+070

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on 5 Jul 2018; 21:59 UT

Credential Certification: Jeroen Homan (jeroen@space.mit.edu)

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Referred to by ATel #: [11823](#), [11827](#), [11831](#), [11855](#), [11887](#), [11899](#), [11936](#), [11951](#), [12057](#), [12061](#), [12064](#), [12068](#), [12128](#), [12157](#)

We report on ongoing NICER monitoring observations of the black hole transient MAXI J1820+070 (ATel #[11399](#), #[11400](#), #[11418](#), #[11423](#), #[11420](#), #[11426](#)).

Following a fast rise upon its discovery in March 2018 and an extended hard state plateau, the 0.2-12 keV count rate of the source began a steady decline in mid-May (see link below for light/hardness curves). A reversal of this behavior was observed in mid-June. The NICER X-ray Timing Instrument (XTI) showed a broad minimum (at ~ 5600 cts/s) yielding to an increase in count rate, along with a softening of the spectrum. This increase and softening have both been accelerating in the past week. On July 5 the average 0.2-12 keV count rate was ~ 34300 cts/s, up from ~ 9300 cts/s on June 27.

Rapid evolution has also been seen in the power density spectra. The low-frequency QPOs, which have been reported previously (ATel #[11488](#), #[11510](#) #[11576](#), #[11578](#)), have increased in frequency from ~ 0.35 Hz on June 27 to ~ 3.0 Hz on July 5. To emphasize the rate of evolution, we note that the QPO frequency doubled in less than 18 hours between the July 4 and 5 observations.

The spectrum of the July 5 observation is reasonably well described by an absorbed continuum model consisting of a disk component, a power law, and reflection. The slope of the power law (~ 2.4) is considerably steeper than during the hard state observations of the source (1.6-1.7, ATel #[11576](#)). The unabsorbed 0.3-10 keV flux on July 5 was $9.8e-8$ erg/cm²/s. For a distance of 3.2 kpc (Gandhi et al. 2018, arXiv:1804.11349) this corresponds to a luminosity of $1.2e38$ erg/s.

The above behavior suggests that MAXI J1820+070 is currently in a hard intermediate state and transitioning, at an unusually rapid rate, toward the soft state. Since the soft state may already be reached within a few days, NICER observations of the source are continuing at an intensive rate and we strongly encourage observations at all wavelengths in the coming days to follow this state transition in detail.

NICER is a 0.2-12 keV X-ray telescope operating on the International Space Station. The NICER

Related

- 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 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

mission and portions of the NICER science team activities are funded by NASA.

Count rate and hardness evolution of MAXI J1820+070

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