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Publication date
2018

Document Version
Final published version

Published in
The astronomer's telegram

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A rapid state transition in MAXI J1820+070

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*on **5 Jul 2018; 21:59 UT***
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Subjects: X-ray, Black Hole, Transient

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/cm^2/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

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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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