Re-brightening of the black hole candidate MAXI J1535-571 as it transitioned back to the soft state

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*on **18 May 2018; 18:19 UT***
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Referred to by ATel #: 11682

MAXI J1535-571 is a black-hole candidate in a low-mass X-ray binary that was detected independently by Swift and MAXI in outburst in early 2017 September (GCN #21792, ATel #10699). The source transitioned to a soft state in late 2017 November (ATel #11020) and was reported to transition back to its hard state around 2018 April 30 (ATel #11611).

More recent Swift/X-ray Telescope (XRT) observations of the source in the hard state indicated that the source was decaying. On 2018 May 11 the source exhibited a minimum observed flux of ~1.2E-12 erg/cm^2/s (0.5-10 keV; unabsorbed). However, the following XRT observation, carried out on 2018 May 14 (intermittently between 08:42 and 13:37 UT), showed that the flux had increased by a factor of ~20 to ~2.4E-11 erg/cm^2/s (0.5-10 keV; unabsorbed). We fitted the spectrum from this observation with an absorbed power-law model. We fixed the equivalent hydrogen column density Nh to 4.4E22 cm^{-2} (obtained by fitting data with higher signal-to-noise ratio; see ATel #11611). The spectrum corresponded to a photon index of Γ = 1.7 +/- 0.3, indicating that the source was still in the hard state.

Around the same time as this initial X-ray re-brightening, we observed MAXI J1535-571 with the Australia Telescope Compact Array (ATCA) on 2018 May 14 (between 16:11 and 21:48 UT). These observations were taken at 5.5 and 9 GHz (simultaneously) with a bandwidth of 2 GHz at each frequency. We used PKS 1934-638 for primary calibration and 1520-58 for phase calibration. Following standard procedure in CASA (v4.7.2; McMullin et al. 2007, ASPC, 376, 127) the data were reduced then imaged (using natural weighting). We significantly detected the source at both frequencies. Fitting a point source in the image plane we measure flux densities of 0.89 +/- 0.02 mJy at 5.5 GHz and 1.04 +/- 0.02 mJy at 9 GHz. The radio spectral index of α = 0.3 +/- 0.1, where $S_{nu} \propto nu^{\alpha}$, is consistent with emission from a compact jet during a hard X-ray state.

The most recent XRT observation, observed on 2018 May 18 (intermittently between 02:28 and 12:04 UT), indicated that the source had brightened further, by a factor of ~400 corresponding to

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a flux of ~9.8E-9 erg/cm /s (0.5-10 keV; unabsorbed). The spectrum was fit by a photon index of Γ = 4.7 +/- 0.2 (Nh fixed to 4.4E22 cm^{-2}), indicating that the source may have transitioned to a soft state. Close in time to this second XRT observation, we observed MAXI J1535-571 with ATCA and the Atacama Large Millimeter/submillimeter Array (ALMA). The ATCA observations were taken on 2018 May 17 (between 06:54 and 11:00 UT) and followed the same setup and procedures described above. With these radio observations, we do not detect the source at either 5.5 or 9 GHz, with 3-sigma upper-limits of 0.06 mJy/beam at 5.5 GHz and 0.1 mJy/beam at 9 GHz. The source was also not detected in our quasi-simultaneous ALMA observations, which were taken at 97, 140 and 230 GHz, with 8 GHz of bandwidth at each frequency. All three bands were observed on May 17, where the 97 GHz observations were taken between 01:42 and 02:02 UT, the 140 GHz observations between 08:03 and 08:30 UT, and the 230 GHz observations between 01:09 and 01:41 UT. All three ALMA observations provide preliminary 3-sigma upper limits of 0.075 mJy/beam in all three bands. These non-detections imply the compact jet was quenched, as expected during the soft X-ray spectral state.

Our current XRT campaign will continue to observe MAXI J1535-571 until 2018 May 30. We will request further XRT observations if the source remains X-ray active. We will also continue to monitor this source at radio frequencies.

We thank Swift, ATCA, and ALMA for scheduling these observations.

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