VLA radio non-detection of IGR J17379-3747 as the X-ray flux drops

Gusinskaia, N.V.; Hessels, J.W.T.; Jaodand, A.D.; Miller-Jones, J.C.A.; Degenaar, N.; Deller, A.T.; Russell, T.D.; Bogdanov, S.

Publication date
2020
Document Version
Final published version
Published in
The astronomer's telegram

[Previous | Next | ADS]

VLA radio non-detection of IGR J17379-3747 as the X-ray flux drops

ATel #14061; *N. V. Gusinskaia (University of Toronto), J. W.T. Hessels (ASTRON, University of Amsterdam), A. D. Jaodand (California Institute of Technology), J. C.A. Miller-Jones (Curtin University), N. Degenaar (University of Amsterdam), A. T. Deller (Swinburne University of Technology), T. D. Russell (University of Amsterdam), S. Bogdanov (Columbia University)*
*on **3 Oct 2020; 12:45 UT***
Credential Certification: Jason W.T. Hessels (j.w.t.hessels@uva.nl)

Subjects: Radio, X-ray, Neutron Star, Transient, Pulsar

IGR J17379-3747 is an accreting millisecond X-ray pulsar (AMXP). During its previous outburst in 2018, it revealed a few remarkable properties (Bult et al. 2019, ApJ, 877, 70B) that are similar to those of transitional millisecond pulsars (tMSPs) -- binary neutron stars that switch between being active as a radio millisecond pulsar and looking like an AMXP.

Following the SRG/ART-XC report of a new outburst from IGR J17379-3747 on September 29th, 2020 (ATel#14051), we triggered our joint Karl G. Jansky Very Large Array (VLA) and Neil Gehrels Swift Observatory X-ray telescope (Swift-XRT) radio and X-ray monitoring programs, in which we aim to observe known tMSPs and tMSP candidates during their outbursts.

We observed IGR J17379-3747 with VLA on September 30th, 2020 starting at 23:30 UTC. The observation was 1 hr long (with ~35 min on source); the data were recorded at X-band (8-12 GHz) and the VLA was in B-configuration (X-band beam size of ~0.6 arcsec). The data were reduced and imaged using CASA (v.5.4.1; McMullin et al. 2007, ASPC, 376, 127).

No radio emission was detected at the known position of IGR J17379-3747 (reported in ATel#11487). The extracted flux density (~0.2 μJy) at the source position is consistent with the RMS noise of the image (~5 μJy), thus we set a 3-sigma upper limit of the source 10-GHz flux density of 15.2 μJy, which translates into a (8-kpc, 5-GHz, assuming a flat spectrum) radio luminosity of $L_R < 1.3 \times 10^{28}$ erg/s.

Additionally, two Swift-XRT observations were performed that bracket our VLA observation. The first observation (obsid: 00031270035) was performed on September 30th, 2020 at 12:10

Related

14061	VLA radio non-detection of IGR J17379-3747 as the X-ray flux drops
14056	NICER detects pulsations from a new outburst of the accreting millisecond X-ray pulsar IGR J17379-3747
14051	SRG/ART-XC detects an increased activity from IGR J17379-3747 - 468 Hz AMXP/burster
11520	X-ray re-brightening of the accreting millisecond X-ray pulsar IGR J17379-3747
11507	NICER discovers millisecond pulsations from the neutron star LMXB IGR J17379-3747
11487	VLA radio detection of the very-faint X-ray transient IGR J17379-3747
11447	MAXI/GSC detection of renewed activity from the gamma-ray source IGR J17379-3747
1714	Swift/XRT determines a precise location for IGR J17379-3747
1711	X-ray activity of IGR J17379-3747 confirmed with INTEGRAL
1709	New and Old Outbursts of IGR J17379-3747 (= XTE J1737-376)

UTC with 500 s exposure time. The second observation (obsid: 00013746001) was performed on October 1st, 2020 at 18:40 UTC with ~1300s exposure time. We derived unabsorbed fluxes of 1.8 +/- 0.3 x 10^{-11} erg/s and 3 +/- 1 x 10^{-13} erg/s for the first and second observations, respectively (using the online XRT product tool, the spectral parameters reported in Bult. et al. 2019 and WebPIMMS). These fluxes correspond to 8-kpc, 1-10 keV X-ray luminosities of 1.4 +/- 0.3 x 10^{35} erg/s and 2 +/- 0.7 x 10^{33} erg/s.

Assuming a steady decay of flux between the two Swift-XRT observations, the X-ray luminosity at the time of our VLA observation can be interpolated to be 4 x 10^{34} erg/s. This puts our new VLA/Swift-XRT measurement in the radio/X-ray luminosity plane fainter in radio than black-hole low-mass X-ray binaries and consistent with radio measurements of other neutron star X-ray binaries.

Our Swift-XRT observations, combined with SRG/ART-XC (ATel#14051) and NICER (ATel#14056) measurements, show that the source has been fading for the last 2.5 days. During its 2018 outburst, IGR J17379-3747 experienced a few significant re-brightenings after fading from the peak of the outburst. Similarly, the most recent Swift-XRT observation (obsid: 00013746002) indicates that the source's flux is rising again. Thus, we will likely continue Swift-XRT and VLA monitoring of IGR J17379-3747. Further multiwavelength observations are encouraged.

We thank Tony Perrault, and the VLA and Swift-XRT staff, for making these VLA and Swift-XRT observations possible.

[**Telegram Index**]

R. E. Rutledge, Editor-in-Chief rrutledge@astronomerstelegram.org

Derek Fox, Editor dfox@astronomerstelegram.org