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Cygnus X-1 entered the soft state

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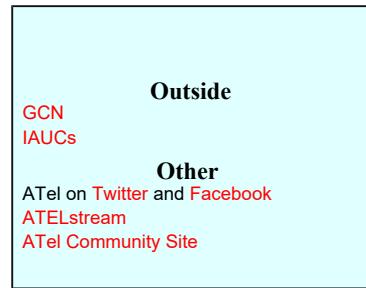
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Cygnus X-1 entered the soft state

ATel #3616; *V. Grinberg (Remeis/ECAP/FAU), M. Boeck (Remeis/ECAP/FAU), K. Pottschmidt (CRESST/GSFC/UMBC), G. G. Pooley (MRAO), J. Wilms (Remeis/ECAP/FAU), M. A. Nowak (MIT-CXC), M. Cadolle Bel (ESA/ESAC), J. Rodriguez (CEA SAP/Lab. AIM Saclay), D. M. Marcu (CRESST/GSFC/UMBC), P. Uttley (Univ. Southampton), J. A. Tomsick (SSL/UC Berkeley), A. Bodaghee (SSL/UC Berkeley), S. B. Markoff (Univ. Amsterdam)*

on 31 Aug 2011; 13:12 UT

Credential Certification: Joern Wilms (j.wilms@sternwarte.uni-erlangen.de)

Subjects: Radio, X-ray, Binary, Black Hole

Referred to by ATel #: [3636](#), [3802](#), [3880](#)

Radio and X-ray monitoring observations over the past few weeks - ATel #[3534](#) (MAXI/GSC), ATel #[3535](#) (AMI) and ATel #[3546](#) (RATAN) - indicated Cyg X-1 entering the soft state. A plot of the behaviour of Cyg X-1 as observed with AMI, MAXI and BAT can be found under: <http://www.mrao.cam.ac.uk/~guy/ex1/2011.ps>. Our bi-weekly RXTE monitoring campaign of Cyg X-1 shows that the source transited into a soft state between August 13 and August 26. Three groups of observations were conducted: on July 29 (ObsID 96121-01-16-00/01/02/03/04, overall exposure 10 ks), August 13 (96121-01-17-00, 16 ks) and August 26/27 (96121-01-18-00/01/02/03, 6 ks). We model the 3--40 keV RXTE/PCA spectra with a broken power law, an iron line, an absorption component and, where required, a disk black body.

July 29:

The soft photon index of ~ 1.9-2.0 and the average 3.2-10 Hz time lag ranging between 3ms and 4ms point towards a softer mode of the hard state. The power spectra (PSDs) show a clear two-humped structure without a power law component and no black body component is required in the spectral fits.

August 13:

The spectra are similar to those of the July 29, with a slight softening of the photon index to 2.05-2.15 and an increase of the lag to 4-5 ms, while the PSDs remains two-humped with no or very small power law contribution and the black body is still not required. This behaviour is still indicative of a softer mode of the hard state or of the hard intermediate state.

August 26/27:

Related

- [11539](#) The 30-day monitoring of MAXI J1820+070 at 4.7 GHz
- [10459](#) Ongoing radio monitoring of Cyg X-1 with the RATAN-600 radio telescope
- [10446](#) Change in radio behaviour of Cygnus X-1
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- [7322](#) The current RATAN-600 observations of Cygnus X-1
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- [6344](#) Cygnus X-1 has returned to soft state
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- [6119](#) Fermi GBM detection of a rise in Hard X-rays from Cyg X-1
- [6115](#) MAXI/GSC detection of a transition back into the hard state in Cygnus X-1
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- [3880](#) Fermi GBM observes another decrease in hard x-rays from Cyg X-1
- [3803](#) Cygnus X-1 15-GHz radio flux increasing
- [3802](#) FERMI GBM Observes Increase in Hard X-rays from Cyg X-1
- [3636](#) Fermi GBM Observes Decrease in Hard X-rays from Cyg X-1
- [3616](#) Cygnus X-1 entered the soft

A multi-temperature black body component (diskbb) with a temperature of 0.35-0.50 keV is clearly required in the fits. The spectrum is steep, with a soft power law index between 2.7 and 2.9. The time lag is highly variable between 9 ms and -0.2 ms and the PSDs show a strong power law component as is typical for the soft state.

Taking into account the recent X-ray and radio monitoring data, we conclude from these three pointed observations that the source has transited into a soft state. This is especially interesting since the transition occurred so quickly after the end (ATel #3307) of the last prolonged soft state, which lasted from July 2010 to April 2011.

	state
3546	The RATAN observations of Cygnus X-1
3535	Cygnus X-1 radio observations
3534	MAXI/GSC detected a possible hard-to-soft state transition in Cygnus X-1
3307	Cyg X-1 entered a transitional state, may be on its way from the soft state back to the hard state
2906	EVN e-VLBI detections of MAXI J1659-152
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2714	RXTE-ASM detects the start of a possible state transition in Cygnus X-1
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2512	AGILE detection of a gamma ray flare from the Cygnus X-1 region

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R. E. Rutledge, Editor-in-Chief

rrutledge@astronomerstelegram.org

Derek Fox, Editor

dfox@astronomerstelegram.org

Mansi M. Kasliwal, Co-Editor

mansi@astronomerstelegram.org