RevMexAA (Serie de Conferencias), **14**, 58–58 (2002)

BIPOLAR RELATIVISTIC EJECTIONS IN CYGNUS X-3

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We present a sequence of maps for the microquasar Cygnus X-3 showing, for the first time, the development of bipolar arcsecond radio jets. These results were obtained with the Very Large Array (VLA) of NRAO in a Target of Opportunity (ToO) context after a strong radio outburst of the source in September 2000. The interested reader will find a detailed account of our findings in Martí, Paredes & Peracaula (2001), hereafter MPP01.

The outburst event reached cm flux densities of $\sim$ 10 Jy at the time of its peak. Our ToO observations started to be carried out nearly one month after, during October-November 2000. By then the source was returning to, or already was, in the quiescent level ($\sim$ 0.1 Jy). Three different epochs of VLA data were obtained at a two week interval. During the first epoch, the VLA was about to complete its movement to the A configuration. Since we observed at the 6 cm wavelength, sub-arcsecond angular resolution was easily achieved. The final results are shown in the panel of Figure 1, taken from MPP01. Here, the sequence of maps clearly shows the development of a relativistic plasma ejection with a bipolar, or two-sided, jet geometry. Our best estimate of the jet proper motions are 9.3 ± 0.3 mas day^{-1} and 7.0 ± 0.2 mas day^{-1} for the northern and southern components, respectively. We can also estimate the flux density ratio between the jet components at equal angular distances from the core. Assuming a 10 kpc distance, all data are consistent with a mildly relativistic jet flow ($v \simeq 0.5c$) making a large angle with the line of sight ($\theta \simeq 70°$).

In MPP01, we also discuss the possible relationship between the VLA bipolar jets and the one-sided features observed sometimes in VLBI images. The change of morphology with angular resolution is likely due to absorption by the powerful wind from the Wolf Rayet companion in Cygnus X-3.

We acknowledge partial support from DGICYT AYA2001-3092 grant (Spain). The National Radio Astronomy Observatory is a facility of the National Science Foundation operated under cooperative agreement by Associated Universities, Inc.

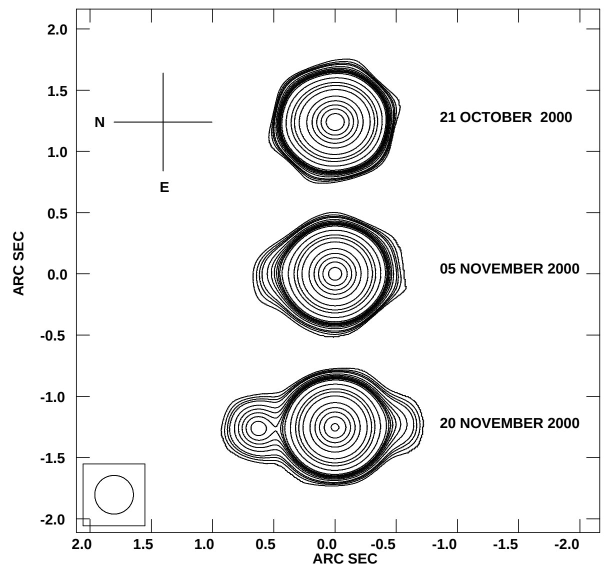

Fig. 1. Development of arcsecond radio jets in Cygnus X-3. The vertical offset between maps is proportional to the elapsed time and all of them have been rotated 90° counterclockwise. We used an averaged circular beam of 316 mas diameter, shown at the bottom left corner, to convolve all the clean components. The contours represented are 4, 6, 8, 10, 15, 20, 25, 30, 35, 40, 50, 100, 200, 300, 500, 1000, 1500, 2000, 2500, 3000 times the rms noise of the map. The rms noise is 0.12, 0.072 and 0.034 mJy beam^{-1} for the top, middle and bottom panel, respectively.

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