MULTIPLE RADIO JETS AT THE CORE OF THE NGC2071 STAR-FORMING REGION

Carlos Carrasco-González[1], Guillem Anglada[1], Luis Felipe Rodríguez[2], José Francisco Gómez[1], José María Torrelles[3], Mayra Osorio[1]

[1] Instituto de Astrofísica de Andalucía (CSIC)
[2] Centro de Radioastronomía y Astrofísica UNAM
[3] Instituto de Ciencias del Espacio (CSIC) and Institut d'Estudis Espacials de Catalunya

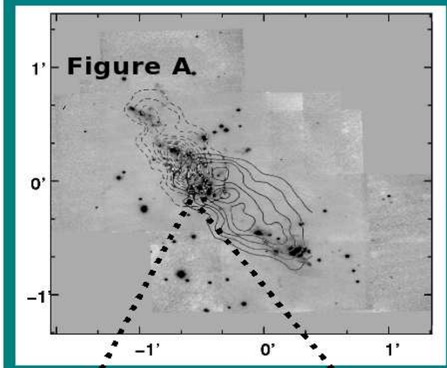

Figure A

INTRODUCTION

The NGC 2071 star-forming region, located at a distance of 390 pc (Anthony-Twarog 1982), is one of the closest regions known to contain young high- and intermediate-mass stars (Walther et al. 1993). The molecular core of NGC 2071 is associated with a bipolar outflow (see Fig. A) observed in CO, SO, SiO and HCO^+, H_2, high-density gas traced by NH_3, and multiple continuum sources observed at cm, mm, and IR wavelengths, and H_2O maser emission (see Torrelles et al. 1998 and references therein).

OBSERVATIONS

We observed the core of the NGC 2071 outflow at 3.6 cm using the VLA in its A configuration in six epochs, obtaining an angular resolution of ~0.22" (Carrasco-González et al. 2007). The intensity of the sources was enough to self-calibrate the data. In all the epochs we have detected three radio continuum sources (IRS 1, IRS 3 and VLA 1; Fig. B).

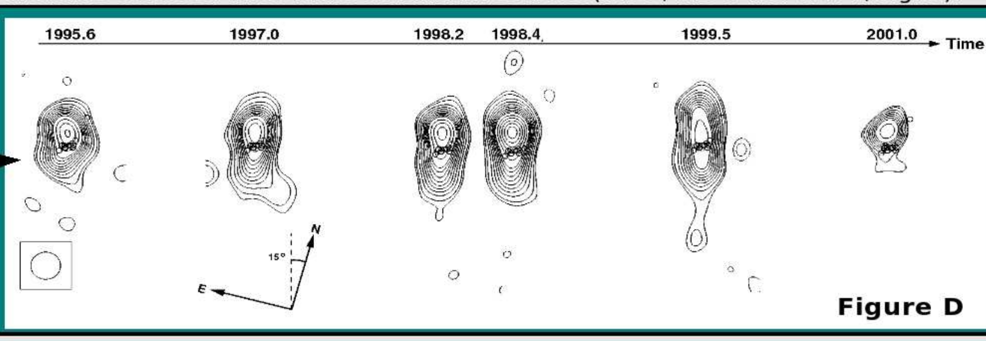

Figure D

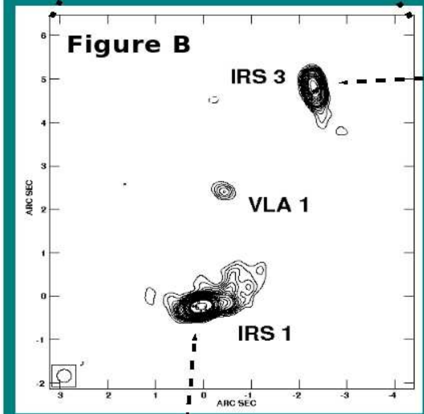

Figure B

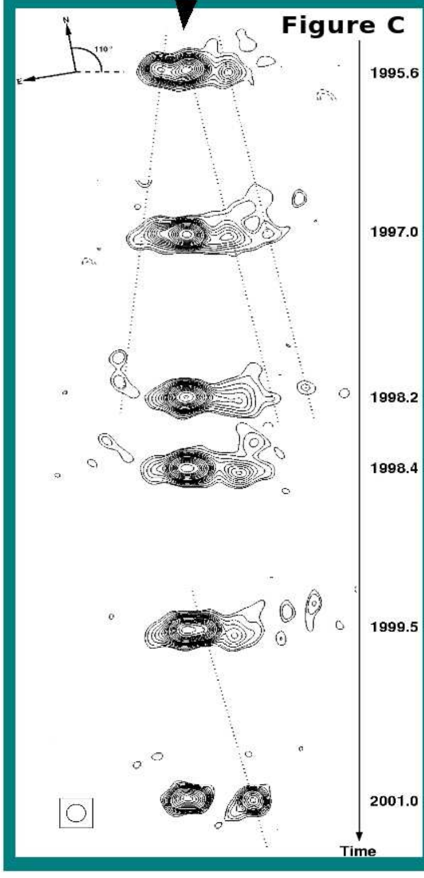

Figure C

IRS 1

This source is associated with water maser emission that seems to be tracing a jet (Torrelles et al. 1998). Recently, Skinner et al. (2007) using the XMM Newton, detected X-ray emission associated with IRS 1. The detection of a strong broad FeI line in the X-ray spectrum suggests the presence of a rotating protoplanetary disk. The X-ray spectrum also shows a cool, moderately absorbed component that Skinner et al. associate with a shock produced by a jet with velocity of ~700 km/s that is interacting with a dense clump in the surrounding medium.

In our 3.6 cm maps, IRS 1 appears as a strong stationary point source surrounded by elongated knotty emission (see Fig. C). We propose that these knots are tracing density enhancements in the jet of IRS 1. We have measured proper motions of ~600 km/s for some of these knots, in good agreement with the velocity inferred by Skinner et al. (2007).

IRS 3

Torrelles et al. (1998) detected 1.3 cm continuum emission and water maser spots associated with this source. The water maser spots seem to be tracing a disk of ~20 AU in radius. Additionally, the 1.3 cm source appears elongated perpendicular to the distribution of the water maser spots, suggesting that the 1.3 cm continuum emission traces a radio jet.

In our 3.6 cm maps, IRS 3 also shows an elongated morphology (Fig. D). We do not find clear variations in the size of the source from 1995.6 to 1998.4, suggesting that we are observing the inner optically thick base of the jet. However, we have detected an increase in the size of the source in 1999.5 that we interpret as an increase in the mass loss rate of the YSO.

VLA 1

Our 3.6 cm high sensitivity observations have allowed us to detect a new, weak compact source, VLA 1, at the center of the region. Unfortunately, so far this source has not been detected at other wavelengths, and its nature is still unclear. However, since neither IRS 1 nor IRS 3 radio jets appear to be aligned with the large scale outflow, it is possible that VLA 1 is tracing the driving source of the molecular outflow in NGC 2071.

REFERENCES

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