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NEW RESULTS ON THE HH 80-81 JET

C. Carrasco-González,[1,2] L. F. Rodríguez,[3] M. Osorio,[2] G. Anglada,[2] J. Martí,[4] J. M. Torrelles,[5] R. Galván-Madrid,[3,6,7] and P. D'Alessio[3]

RESUMEN

Presentamos nuevas resultados en el chorro HH 80-81 obtenidos por medio de observaciones con el SMA y el VLA. Estas observaciones nos han permitido resolver un disco circunestelar compacto alrededor de la protoestrella masiva, y descubrir emisión sincrotrón linealmente polarizada en el chorro.

ABSTRACT

We present new results on the HH 80-81 jet obtained from SMA and VLA observations. These observations allowed us to resolve a compact circumstellar disk around the massive protostar, and to discover linearly polarized synchrotron emission from the jet.

Key Words: ISM: jets and outflows

1. RESOLVING A CIRCUMSTELLAR DISK AROUND A MASSIVE PROTOSTAR

It is well known that the formation of low-mass stars takes place with the assistance of an accretion disk that transports gas and dust from the envelope of the system to the protostar, and a jet that removes angular momentum from the system, allowing the accretion to proceed. However, in high-mass stars it has been difficult to establish the presence of accretion disks. Only a few accretion disks around B-type protostars have been tentatively reported (e.g., Cepheus A HW2; Patel et al. 2005). However, most of these candidates are still controversial, and even, it has been proposed that high-mass protostars could not be associated with circumstellar disks.

The HH 80-81 system consists of a highly collimated radio jet with a total projected extent of 5.3 pc at an adopted distance of 1.7 kpc (Martí et al. 1993). The jet is driven by the IRAS 18162−2048 protostar, whose luminosity ($\sim 2\times10^4$ $L_\odot$) is equivalent to that of a B0 zero-age main sequence (ZAMS) star. Since HH 80-81 possesses an extraordinarily well-collimated jet, it seems reasonable to propose that it should be originating from an accretion disk. Some studies have reported the presence of large structures of dense molecular gas with elongated morphologies perpendicular to the axis of the outflow (e.g. Torrelles et al. 1986; Yamashita et al. 1989). Thermal dust continuum emission at mm and sub-mm wavelenghts has also been detected towards the protostar (Gómez et al. 2003; Fernández-López et al. 2011; Qiu & Zhang 2008). However, all those observations lack angular resolution to resolve the structure of a compact disk, and the existence of such a disk is still unclear.

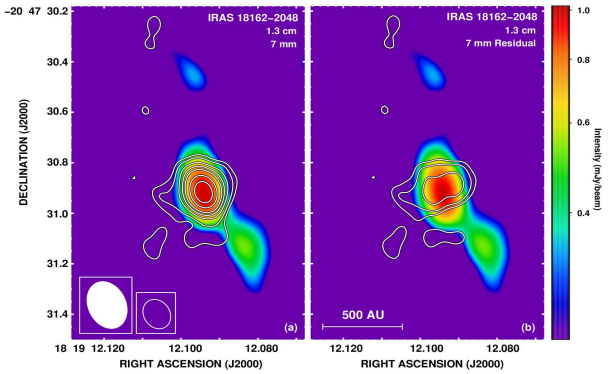

Fig. 1. (a) Superposition of the 7 mm VLA contour map over the 1.3 cm VLA map (colors). Contours are 3, 4, 6, 8, 10, 14 and 18 times the rms of the map, 120 μJy beam^{-1}. (b) Same as (a), but after substraction of the free-free contribution at 7 mm.

Through Submillimeter Array (SMA) observations at 860 μm, we detected emission from the SO molecular line associated with the protostar. This emission shows a velocity gradient ($\sim$3 km s^{-1} over $\sim$1700 AU), roughly perpendicular to the radio jet, with the protostar located at its center. We interpret this gradient as due to rotational motions gravitationally bounded by the central protostar, and we estimated a central mass of $\sim$17 $M_\odot$.

[1]Max-Planck Institute für Radioastronomie, Germany.
[2]Instituto de Astrofísica de Andalucía, CSIC, Spain.
[3]Centro de Radioastronomía y Astrofísica, Universidad Nacional Autónoma de México, Mexico.
[4]Departamento de Física, EPSJ, Universidad de Jaén, Spain.
[5]Instituto de Ciencias del Espacio (CSIC/IEEC), Spain.
[6]Harvard-Smithsonian Center for Astrophysics, USA.
[7]Academia Sinica, Inst. Astron. and Astrophys., Taiwan.