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VLBA ASTROMETRY OF THE AeBe STAR EC 95 IN SERPENS

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RESUMEN

Presentamos un análisis de once observaciones VLBA del sistema binario EC 95 obtenidas a lo largo de 2.5 años. Cada una de las dos fuentes fue detectada un número suficiente de veces para permitir ajustes astrométricos independientes de alta calidad. La paralaje trigonométrica deducida de estos ajustes coresponde a una distancia $d = 429 \pm 2$ pc. Nuestras observaciones también sugieren que ambos componentes de EC 95 podrían ser estrellas jóvenes de masa intermedia.

ABSTRACT

We present an analysis of eleven VLBA observation of the binary system EC 95 covering a total observing time span of 2.5 years. Both sources in the system were detected a sufficient number of times to allow for high quality independent astrometric fits. The trigonometric parallax obtained from these fits corresponds to a distance $d = 429 \pm 2$ pc. Our observations further suggest that both components in EC 95 could be young stellar objects of intermediate mass.

Key Words: astrometry — binaries: general — magnetic fields — radiation mechanisms: non-thermal — radio continuum: stars — techniques: interferometric

1. INTRODUCTION

Several years ago, we initiated a large VLBA project aimed at measuring the trigonometric parallax of several young stars located in the most often studied star-forming regions within a few hundred parsecs of the Sun. As part of this program, we observed the highly embedded ($A_V = 36$, Preibisch 1999) young stellar object EC 95 toward the Serpens molecular core at a distance of about 415 pc (Dzib et al. 2010). EC 95 is presumably the precursor of a 3–5 $M_\odot$ Herbig AeBe star (Preibish 1999; Dzib et al. 2010).

An unexpected outcome of these observations was the demonstration that EC 95 is in fact a tight binary system (see Figure 1) as discussed in Dzib et al. (2010). Here, we present new VLBA observations of EC 95 which provide additional constraints on the distance to the source, and the nature of the stars in the system. The data will be described in § 2, and analyzed in § 3. Conclusions and perspectives are given in § 4.

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2. OBSERVATIONS

In addition to the eight observations reported by Dzib et al. (2010), we will make use here of three VLBA observations collected between March 2010 and September 2010. In total, our eleven observation cover a time span of 2.5 years. The data were edited and calibrated using the Astronomical Image Processing System (AIPS). All data (including those presented in Dzib et al. 2010 were reprocessed). Each epoch consisted of intertwined observations of the target, a main phase calibration, three secondary calibrators, and all sky calibrators. The calibration followed standard VLBA procedure for phase-referenced observations, including the multi-calibrator schemes and, tropospheric and clock corrections. These calibrations were described in detail by Loinard et al. (2007), Torres et al. (2007) and Dzib et al. (2010). After the calibration, the visibilities were imaged with a pixel size of 50 μm as using a weighting scheme intermediate between natural and uniform (ROBUST=0 in AIPS). The rms noise levels in the final images were 0.08–0.12 mJy beam^{-1}.

3. RESULTS

From our observations, the primary of the system (EC 95a) was detected 5 times, while the secondary (EC 95b) was detected 9 times. The absolute coordinates of each component was measured accurately from these observations, and an astrometric fitting scheme including acceleration terms