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EVIDENCE FOR TIME EVOLUTION IN THE EXCITING SOURCE OF THE EXPANDING WATER MASER BUBBLE IN CEPHEUS A

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The objectives of this note are: (1) to show the time variability of the thermal jet Cep A HW2 from 1982.4 to 1990.2 both in clean and in restored maximum entropy (ME) maps (see Figure 1; the ME method provides an improvement in angular resolution), (2) to show that the radio continuum source R5, detected systematically in centimeter images made after 1986, was not present or was significantly fainter in the 1982.4 image reanalyzed here, and (3) to speculate that the turn-on of the source R5 may be related to the birth of an OB star or to a poorly understood interaction between the Cep A HW2 jet and a passive structure associated with R5.

VLBA observations (Torrelles et al. 2001a,b) have revealed five "micro-structures" of maser spots, R1 to R5, with sizes of 3 to 100 mas (2 to 70 AU). The most unusual structure, R5, can be fitted by a circle of radius 62 AU, and is expanding uniformly at 9 km s^{-1}, which implies a dynamical age of ~ 33 yr. The authors suggest that this bubble is driven by a young stellar object (YSO) at the center of the circle. However, an expanding H II region decelerates with time. Thus, doing some calculations, we find that the age of the H II region in 1996 was about 13.5 years. This kinematic age gives a birth epoch around 1983, which is consistent with our results. Recently, the source VLA-R5 was detected at 3.6 cm (Curiel et al. 2002) and is nearly coincident with the center of the water bubble in R5 (Fig. 1), but its nature is still unknown.

We refer the reader to Porras et al. (2002) for a more detailed description of the data analysis and the discussion of speculations that can only be tested with high angular resolution monitoring of the radio continuum and H_2O maser emission in the region.

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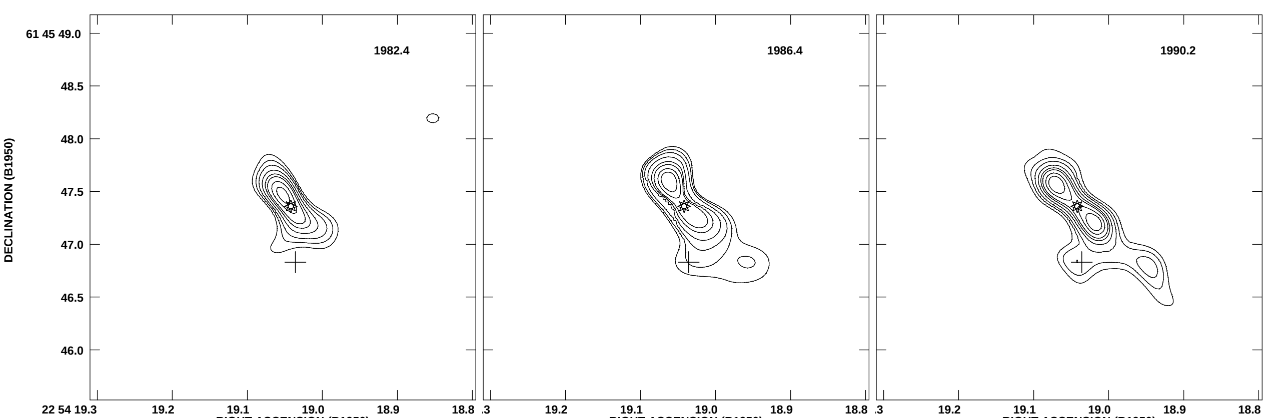

Fig. 1. ME restoration maps of the Cep A HW2 region for 1982.4 (left), 1986.4 (middle), and 1990.2 (right). The contours are 0.8, 1.8, 4, 10, 20, 30, 50, 70, and 100% of the peak value of each map. The position of VLA-R5 (cross) and the exciting source of HW2 (star; Rodríguez et al. 2001) are indicated.

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