DETECTION OF COLLIMATED BIPOLAR MASS FLOW IN HH24

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ABSTRACT. High-resolution long-slit spectroscopy of HH24 has revealed the presence of collimated bipolar mass flow originating from the "central" infrared source SSV63. The bipolar system consists of the well known jet-like HH24C (mean V_{LSR} -190 km s^{-1} and a newly detected weak component, HH24E (∿+170 km s^{-1}).

1. INTRODUCTION

High-resolution long-slit spectroscopy has been used successfully in studies of the detailed kinematics of Herbig-Haro (HH) objects flowing at supersonic velocities away from a young stellar source. In case of HH1 and HH32 the position-velocity diagrams deduced from the observed emission lines show remarkable similarities to those predicted from the hydrodynamic model of a radiating bow shock (Böhm and Solf 1985; Solf, Böhm and Raga 1986). Compared to these objects the anchor-shaped HH24 exhibits a considerably more complex morphology consisting of at least four subcomponents (Herbig 1974). The infrared source SSV63 (Strom, Strom and Vrba 1976) detected near the geometric center of the nebular complex has been considered to be the star "powering" HH24.

2. OBSERVATIONS AND RESULTS

Using the coudé spectrograph of the 2.2 m telescope on Calar Alto and a two-stage image intensifier tube a number of deep long-slit spectra in the red were obtained from various positions within HH24, one of them with the slit centered near the position of SSV63 at position angle 334^{o}, thereby crossing HH24A and HH24C. The position-velocity diagram of the [SII] 6716 line (Fig. 1) deduced from that spectrogram presents a bow-shaped, highly blues-hifted feature (mean V_{LSR} -190 km^{-1}) due to HH24C, a rather compact low-velocity feature (∿+42 km s^{-1}) due to HH24A, and a weak third feature which is highly red-shifted (∿+170 km s^{-1}) and obviously due to a rather unconspicuous nebular condensation between SSV63 and HH24A. This condensation, hereafter referred to as HH24E, was also observed at a different slit angle indicating that it is elongated pointing away from SSV63, similar to HH24C on the opposite

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side of SSV63. Evidently, the high-velocity features HH24C and HH24E form the counterparts in a bipolar flow originating from SSV63. The jet-type morphology of both components indicates a rather high collimation of the flow with velocities above 200 km s^{-1}. Absorbing material in a disk-like structure around SSV63 may be responsible that the farther HH24E is seen much fainter compared to the nearer HH24C. The inclination of the flow vector with respect to the line of sight and the true flow velocity are not known. Proper motion measurements of HH24C are required to answer these questions. The relations of the low-velocity components HH24A (+42 km s^{-1}) and HH24B (-9 km s^{-1}) to the bipolar flow system are unclear so far. (HH24D represents reflected star light, probably from SSV63.) Since HH24A and HH24E are found at the same position angle with respect to SSV63, it is tempting to interprete HH24A as the fromt edge (or working surface) of the HH24E jet which has been decelerated by interacting with intervening material.

3. REFERENCES

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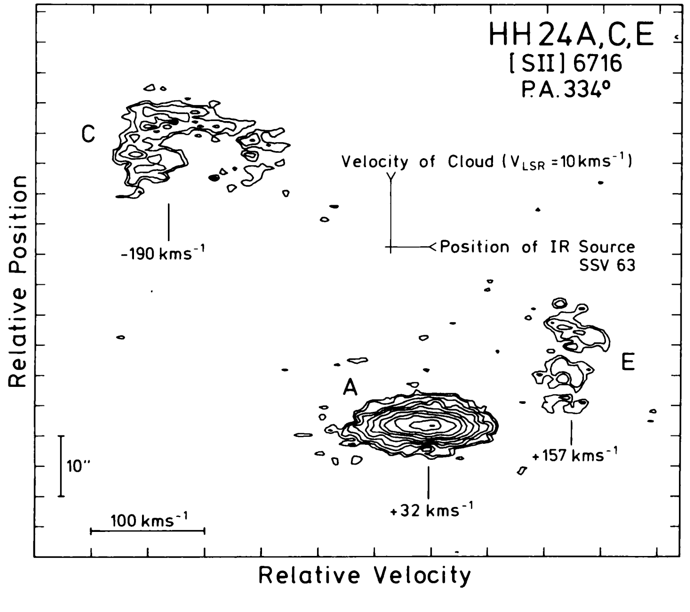

Figure 1. Position-velocity diagram of [SII] 6716 deduced from a long-slit spectrogram crossing HH24A, C and E. Intensity contours are spaced by factor of $\sqrt{2}$. Velocities are quoted relative to that of the parent molecular cloud, presumably identical with that of the "central" IR Source SSV63 (projected relative position marked).

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