BIPOLAR OUTFLOWS AROUND NGC 7023: EVIDENCE FOR THE DISK FLOW

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NGC 7023 has been observed to be one of the CO bipolar outflow regions. The outflows are moving outward along the R.A., nearly perpendicular to the line of sight. The velocity versus R.A. map shows the distinctive outflow motion in NGC 7023. The calculated mass flow rate is $\sim 10^{-5}$ $M_\odot$ yr^{-1}, assuming the constant stellar wind velocity of $\sim$100 km s^{-1} and the dynamical age is $\sim 8.3 \times 10^4$ years.

The column density maps (^{12}CO, ^{13}CO) show the density enhancement at the ends of the flows where molecular lines (H_2O, CS, etc.) had been observed.

The peak temperature maps (^{12}CO, ^{13}CO) show the peak temperature regions that are observed perpendicular to the outflows. I expect that these peak temperature regions can be produced in a surrounding accretion disk around HD 2000775 (B3e type), the central star of NGC 7023.

From the results, I suggest that the bipolar outflows are distributed to both the disk wind flow and the stellar wind flow.

Numerically I obtain both disk and stellar flows with some assumptions. If the disk flow is more dominant than the stellar flow, then the opening angle of the outflow becomes narrower. To confine the outflow within the narrow opening angle, the disk flow must be much stronger than the stellar flow itself. So the highly collimated outflow may be attributed to the strong disk flow.

ON THE COMET-LIKE FEATURE IN THE EMISSION NEBULA NGC 7635

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NGC 7635, the so-called Bubble Nebula and the comet-like structure within its boundaries is part of the more extended H II region S162. On the basis of short-exposure interference filter protographs in Hα and [N II]λ6584 lines we show that the comet structure is composed of essentially three distinct condensations-globules (characteristic diameter ≃ 0.2 pc). Our observations provide firm evidence that the northern edge of NGC 7635, which on long exposure photographs exhibits a distinctly crescent shape, is composed of discrete and well defined amorphous circular filaments each one associated with a globule of the comet-structure and apparently starting from it. The ionization source is generally accepted to be an O6 III f star outside the comet-like structure since no stellar object is detected within the globules. The velocity field we have obtained from short exposure Fabry Pérot interferometry in Hα and N II λ6584, is consistent with the following picture: the globules, as well as their corresponding arcs, are inscribed on the far side of a tenous spherical shell expanding at a velocity of $\sim$ 4 km s^{-1}.

The Of star has (1) either ejected the brightness globule nearest to it, which globule in turn may have given rise to the next one and so on, or (2) that the ejection has occurred at different times with different masses and energies.

The possible kinship of the globules to the HH-objects is discussed. Magnetic phenomena may provide the funneling mechanism in the formation of the arcs; to check this hypothesis polarization measurements in optical and radio regions in the globules and their associated appendages are desirable.