MM AND SUBMM MOLECULAR LINE OBSERVATIONS OF THE SOUTHWEST LOBE OF L1551 - EVIDENCE OF A SHELL STRUCTURE.

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Observations have been made of the southwest outflow lobe of L1551 in several millimetre and submillimetre molecular lines. Maps have been made in the J=3-2 and J=2-1 transitions of CO over areas of 7.5 by 2.5 arc minutes and 5 by 5 arc minutes respectively at UKIRT. More detailed maps have also been made in the J=2-1 CO transition over an area of about 6 by 3.5 arc minutes at the NRAO 12m telescope. Additional observations of the J=4-3 transitions of HCN, HCO+ and $H^{13}CO^+$ were made at selected positions.

The HCO+ J=4-3 transition was detected at several positions along the outflow axis and at the position of IRS 5. Similarly the HCN J=4-3 transition was detected at the position of IRS 5 and also at a position close to HH29. However, the J=4-3 transition of $H^{13}CO^+$ was not detected at the position of IRS 5 even though it was observed at the position close to HH29 with a peak corrected antenna temperature of 0.23K at a V_{LSR} of 1 km s^{-1}. The detection of the J=4-3 transitions of both HCO+ and $H^{13}CO^+$ close to the position of HH29 suggest the presence of very dense gas in this region.

LVG analysis of the various molecular lines observed give a kinetic temperature between 10 and 15K and a density from 10^5 to 10^6 cm^{-3} at the position of IRS 5 at the ambient cloud velocity. At the position close to HH29 LVG analysis of the CO observations gives a density between 10^3 and 10^4 cm^{-3} at a kinetic temperature of 25K for a V_{LSR} of 0 km s^{-1}. The density of the gas giving rise to the HCO+ emission could not be deduced by the LVG analysis. To the southwest of HH29 there is a large decrease in both the linewidth and intensity of CO emission. This may be due to the interaction between the outflow and a dense clump of gas which gives rise to HH29.

The maps of the CO J=3-2 and CO J=2-1 emission integrated in 3.25 km s intervals show the shell structure postulated by Snell and Schloerb (1985), particularly those maps made from the NRAO CO J=2-1 data shown in Figure 1. At 3.5 km s^{-1} the outline of the shell is clearly visible and the points A and B from the lunar occultation measurements of Snell and Schoerb (1985) lie on this shell. At velocities further from the ambient cloud velocity emission is from areas closer to the outflow axis. Red shifted emission from the northern edge of the shell may be a consequence of rotation of this shell.

References:-

Snell, R. L. and Schloerb, F. P. 1985, Ap. J., 295, 490.

Figure 1

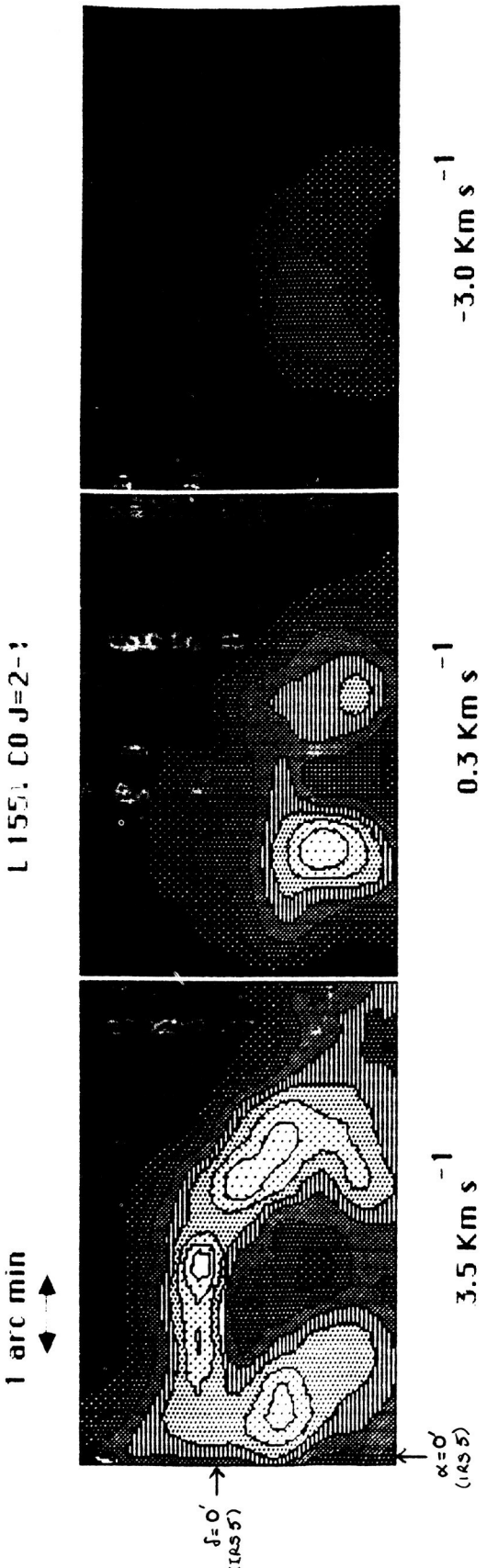

Figure 2. CO J=3-2 (solid line) and CO J=2-1 (broken line) spectra observed at the positions of IRS 5 and 2'W2'S of IRS 5 at UKIRT.