Hot Gas in the Nuclear Region of IC 342
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IC 342 is one of the closest galaxies to the Milky Way and, at the same time, the most similar to it, as it is a late-type galaxy with a nuclear cluster formed 60 Myr ago. The properties of the molecular clouds found in IC 342 and the inferred luminosity are very similar to those in the Milky Way. IC 342 is a very rich source of molecular emission due to its face-on position. Also, as many galaxies studied lately, it shows a high concentration of molecular gas within the inner 1kpc. The largest quantity of gas is within 250pc from the nucleus, with a small starburst in the center. Previous studies have shown that IC 342 is one of the closest galaxies to the Milky Way and, at the same time, the most similar to it, as it is a late-type galaxy with a nuclear cluster formed 60 Myr ago. The properties of the molecular clouds found in IC 342 and the inferred luminosity are very similar to those in the Milky Way.

We present the first VLA and SMA molecular observations of IC 342 in the high-temperature gas tracers NH$_3$ (6,6). The source was observed in February 2003, using the D configuration. The contours represent the line emission, and the colour scale the continuum emission. We observe two different peaks in the central condensation, and when comparing the line emission with the continuum emission, we find that the weakest peak in the emission line coincides with the continuum emission peak. We have also detected CO(3-2) emission from IC 342 using the SMA. We observe several peaks as well in this line.

The spectra that we extract from the two central peaks together with the other feature found on the west side, are plotted below. The third structure has a very broad scale the continuum emission. We observe two different peaks in the central condensation, and when comparing the line emission with the continuum emission, we find that the weakest peak in the emission line coincides with the continuum emission peak.

We plot the positions of the 5 giant molecular clouds as described by Downes et al. (1992). We observe that the line emission peak coincides with GMC C, whereas the continuum emission peak is quite close to GMC B. We observe that the two peaks are located in the same positions of what we have called GMC B and GMC C.

We compare CO(2-1) observations taken with the Owens Valley Millimeter Array (Schinnerer et al. 2003). The NH$_3$ (6,6) emission appears in contours, and the CO(2-1) in colours. The OVRO distribution is better than the VLA one (12" opposed to 7.8"), but we have to adapt the maps to the same resolution. The CO(2-1) traces the two molecular spiral arms that terminate in the inner ring. The NH$_3$ (6,6) peaks at the outer edge of the central area. As shown before, the line peak coincides with GMC C. Therefore, this suggests that the gaseous material flowing inwards from the "mini-spiral" is intercepted there with the inner ring, possibly triggering a important burst of star formation.

We also compare the NH$_3$ (6,6) integrated emission map (contours) with the CO(1-0) emission observed with the BIMA interferometer combined with the NRAO 12m antenna (Helfer et al. 2003). The NH$_3$ (6,6) emission peaks are offset with respect to the CO(1-0) peak. This suggests that the CO(1-0) is tracing the more extended and colder gas that forms the S-shaped bar, while the NH$_3$(6,6) detects the warmer material occurring in the region where the inflow from the bar affects the inner ring.

Finally, we compare the NH$_3$(6,6) integrated intensity map (contours) with the CO(1-0) VH II region map (left). As expected, the continuum emission peak in NH$_3$(6,6) is in the same position as the 6cm continuum peak. The line emission peak appears at the edge of the inner ring, consistent with the continuum emission.