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Can Molecular Ratios be used as Diagnostics of AGN and Starburst activity? The Case of NGC 1068.

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The gas and dust present within galaxies, known as the Interstellar Medium (ISM), is not homogeneous; star formation, supernovae events, as well as AGN activities may all greatly alter the ISM. In particular, recent studies of nearby external galaxies have shown that the molecular ISM varies at kiloparsecs as well as at parsec scales, with evidence of different gas components traced by different molecular species or rotational transitions. Molecular line ratio diagnostics are often used to investigate the physics and chemistry of the ISM. For example, as the gas chemistry located in the central/nuclear regions of galaxies is believed to be dominated by X-rays emitted from the AGN, this is thus greatly affect the conditions of the ISM in the surrounding regions, especially compared to regions located in starbursts. Hence, line ratios of specific molecules have been proposed as indicators of certain energetic or physical processes e.g. HCN/HCO^+ as a tracer of AGNs; HCN/HNC as a 'thermometer', HCN/CO as a density tracer. In order to investigate these molecular line ratio diagnostics we perform a global investigation into the use of molecular line ratios as tracers particularly of AGN versus SB activity. We shall use the galaxy NGC 1068 as a "laboratory" for this study. NGC 1068 is a Seyfert 2 barred spiral galaxy; it is also the archetypal composite AGN/SB galaxy. With the use of radiative transfer modelling we are able to both delve into the respective properties of these regions as well as testing the reliability of the ratios themselves.

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