Molecules as probes of activity in obscured luminous galaxies

S. Aalto[1]

[1]*Department of Earth and Space Science, Onsala Observatory, Chalmers University of Technology, SE-439 92 Onsala, Sweden*

Chemistry of the molecular interstellar medium (ISM) can be used to distinguish between AGN and starburst-driven activity in heavily extincted nuclei. It is a potentially powerful tool to help track evolution of activity, probing the interplay between activity and ISM properties and to explore the starburst-AGN relation. For example, the chemistry of the ISM near an intense X-ray source such as an AGN (an XDR, X-ray Dominated Region) is expected to show a different chemical signature than that of an evolved starburst characterized by PDRs (Photon Dominated Regions). Young star formation dominated by dense, warm and shielded gas will have properties different from both XDRs and PDRs.

Interpreting extragalactic mm- and sub-mm molecular line emission involves disentangling excitation and radiative transfer effects (e.g. optical depth, radiative excitation, absorption) from those of chemistry. As an example of the challenges and rewards of studies of the molecular ISM of luminous galaxies I will discuss the prototypical ULIRG (Ultra Luminous IR Galaxy) Arp220 and observations/models of HNC, $HCO^+$and $H_3{}^+O$. Furthermore, the unusually luminous HC_3N line emission towards the IR-bright, but otherwise inconspicuous, S0 galaxy NGC4418 (Fig. 1) will be discussed. Herschel studies of IR-luminous galaxies will be presented as well as a recent 3-mm line survey carried out with the IRAM 30m EMIR instrument.

References

[1] Costagliola, F. & Aalto, S., 2010, S., A&A, 515, 71
[2] Evans, A., et al 2003, AJ, 125, 2341

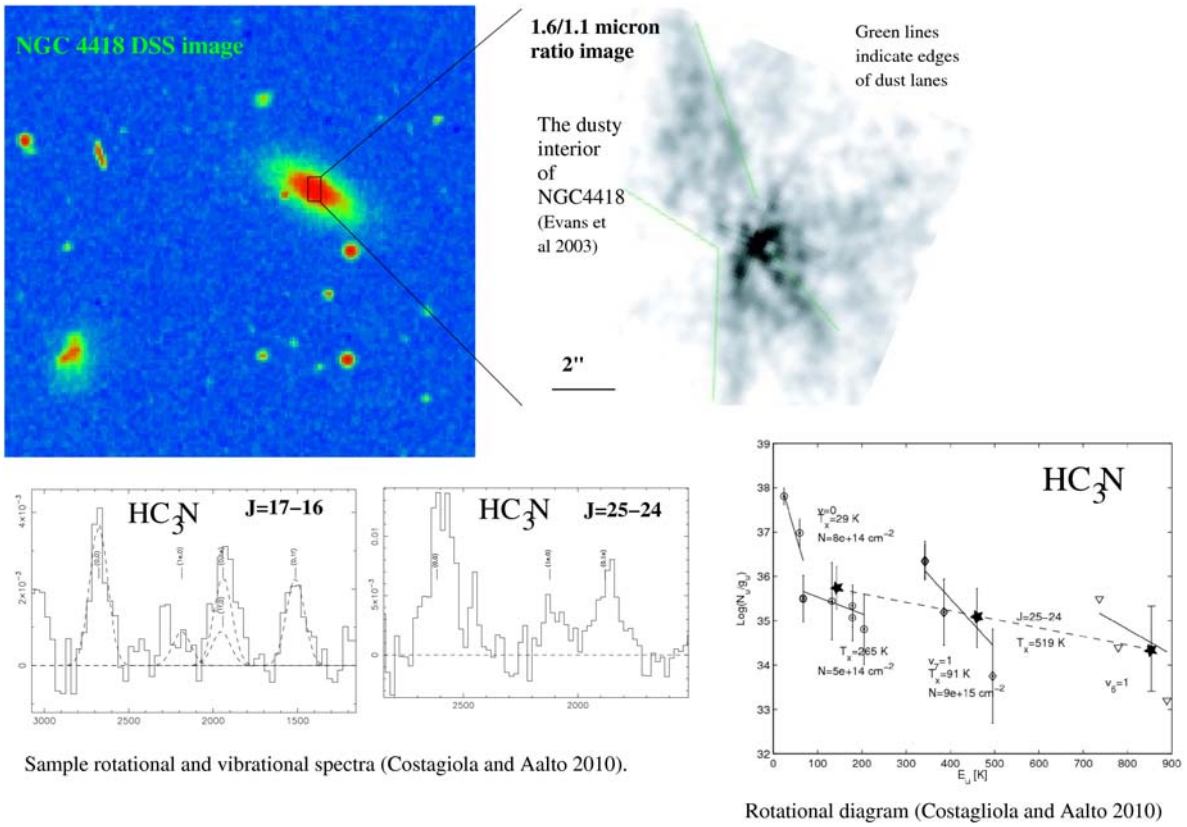

Figure 1: Sample HC_3N spectra and rotational diagram of NGC4418. Note the prominent vibrational lines and the multiple temperature components in the raotational diagram.