Dust and molecules in the feeding and feedback of nearby galaxies

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Abstract

Local Luminous- and Ultraluminous infrared galaxies (U/LIRGs) are extreme examples of star-forming and/or AGN-driven galaxies where the IR output is powered by dust absorption and re-emission of photons originating in the embedded activity. These galaxies evolve rapidly and are the focus of intense study, for example at mm to FIR wavelengths, where radiation penetrates the thick layers of gas and dust, often to reveal extreme physical conditions in their circumnuclear regions. Dust embedded galaxy evolution also occurs in less extreme galaxies, including nearby starbursts or enshrouded AGNs. Studying them is fundamental to our understanding of local galaxy evolution. The nuclear activity will often drive mechanical feedback in the form of molecular outflows. This feedback may for example remove baryons, result in quenching and/or possibly be linked to the M-sigma relation. With ground based mm/submm instruments and FIR space telescopes we can study the extent, morphology, velocity structure, physical conditions and chemistry of these cold flows at unprecedented sensitivity and resolution. We use molecules as diagnostic tools - exploiting their ability to trace dynamical, chemical and physical conditions. I will give a brief review of the mm to FIR view of AGN and starbursts in our local and distant Universe. I will show how studies at these wavelengths help reveal the link between the feedback and the molecular properties of the galaxies including extremely obscured, compact nuclei. Specific examples will include N1068, N1377, IC860 and Arp220. I will also discuss how vibrationally excited molecular emission can reach behind the curtain of dust to undertake new studies of heretofore hidden, rapid evolutionary phases of galaxy nuclei.