APEX and NOEMA observations of H2S in nearby luminous galaxies and in the ULIRG Mrk 231

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Abstract

Molecular gas plays an important role in starbursts and the feeding of supermassive black holes (SMBHs) in Active Galactic Nuclei (AGNs) of (Ultra) luminous Infrared Galaxies ((U)LIRGs). We have selected a promising tracer of radiative and mechanicalfeedback, hydrogen sulphide (H2S), to investigate the impact of starburst and AGN activity on the chemistry of the interstellar medium. In particular we aimed to study the impact of outflows since H2S can be formed through hydrogenation of a sulphur atom on grain surfaces, which can be evaporated by shocks or radiation. Using the APEX telescope, we observed the λ =2 mm 1-1 line of o-H2S towards the centres of 12 active galaxies and detected H2S emission in 9 of them. The line intensity ratio of H2S to HCN shows considerable variation, which could be due to significant H2S abundance changes among the studied galaxies. Four galaxies stand out as particularly H2S luminous: two of them exhibiting strong outflows and the other two harbouring dusty obscured nuclei. We suggest that primarily grain chemistry is behind the elevated H2S abundances, due to either shocks or radiative processes. We do not find that H2S is enhanced or correlated with the presence and velocity of the molecular outflows in our sample of LIRGs. Although we detect H2S in the molecular outflow of Mrk231 using the NOEMA, it is not elevated with respect to other high density tracers compared to what is seen in the line core. Recently obtained ALMA data will allow us to investigate with high spatial resolution the origin of the H2S enhancement in (U)LIRGs.

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