
A survey of molecular gas in HI-Absorption-Selected Systems

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Abstract

Studying the multiphase circum-galactic medium and its connection to the baryons in the host galaxies is an important step towards a better understanding of the evolution of galaxies over time. Large steps forward have been made in detecting the multiphase circum-galactic medium through absorption line studies. Today it is possible to connect the cold neutral gas in the halo to its host galaxy by combining absorption and emission selected samples. However, the link to the molecular gas phase from which the stars form is still missing. We have exploited ALMA calibrator observations to perform a novel (sub)mm survey, ALMACAL. We are searching for CO emission lines from the host galaxies of known Lyman alpha absorbers. The parent sample of 57 absorbers towards 26 quasars probes a redshift range of $0.05 < z < 3.0$. We have detected CO emission from seven galaxies coincident with the absorber redshift at $0.25 < z < 2$ with impact parameters between 6 and 240 kpc. We derive molecular gas masses of $10^{10} - 10^{11} M_{\odot}$ and relate the molecular gas masses with the impact parameter of the quasar sight line. Furthermore, we can infer the conditions for star formation in those galaxies from the CO spectral line energy distribution and get first constraints of the temperature and density of the ISM. Preliminary modelling of the CO spectral line energy distribution suggests that some of these galaxies do not show Milky Way like star formation conditions.

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