APEX at the QSO MUSEUM: Molecular gas reservoirs associated with z ~ 3 quasars and their link to the extended Lyα emission

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Optical surveys routinely report the detection of cool gas (T ~ 10^4 K) reservoirs (as traced mainly by Lyman-alpha (Lyα) emission) extending on halo scales around z~3 quasars (e.g., [1], [2], [3] and [4]), but little or nothing is known about the molecular gas reservoir surrounding the targeted objects. In this poster, I will present an APEX/SEPIA180 spectroscopic survey (~200 hours, [5]) of the CO(6-5), CO(7-6) and [CI](2-1) emission lines for a sample of nine z~3 quasars from the QSO MUSEUM survey [6], which have similar UV luminosities, but very diverse Lyα nebulae. Using these CO and [CI] observations, we constrain the molecular gas masses to be M_{H2}= (0.4-6.9) x10^{11} $M_\odot$ for the detected sources, and M_{H2}< 1.1 x10^{11} $M_\odot$ for non-detections. We discuss their link with the Lyα properties on larger scales. In particular, we find large velocity shifts (from ~-400 to ~+1200 km s^{-1}) of the Lyα nebulae with respect to the now available molecular redshifts in five sources, suggesting turbulent inflows/outflows around these quasars. We also find that the two most massive molecular reservoirs in our sample are associated with the dimmest and smallest Ly nebulae. From this, we speculate that obscuration from the host galaxy, due to physical properties or geometry, could reduce the escape of ionizing and Ly photons emitted by the quasar, ultimately reducing the emission from the cool CGM.

References

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[3] Cai et al., ApJS, 245, 23 (2019)
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