Contribution ID: **62**

Type: **not specified**

Definitive calibration of CI, CO and dust as gas mass tracers across cosmic time

Wednesday, 16 October 2019 09:55 (15 minutes)

Contributed talk

Abstract:
"Measuring molecular gas mass in galaxies relies on the use of tracers as cold H2 is invisible. Historically CO has been the workhorse tracer as it is the second most abundant molecule in the ISM. However, it is expensive to observe large samples (100,000), and at high redshift the ground state J=1-0 transition is either inaccessible or extremely challenging to detect. Two alternative tracers have recently received attention: thermal emission from cool dust traced via sub-mm radiation, and emission from atomic Carbon (CI). Both are claimed to be 'as or more reliable' than CO, both are easier to observe at high redshift and sub-mm dust emission has already been observed in very large samples of galaxies with Herschel. In this talk I present a cross-calibration of all three tracers - the first sample of normal galaxies with CO, CI and dust emission from ALMA, plus literature observations of ˜300 sources which have two of the tracers. Combining them in a self-consistent manner we find that there is no requirement (or strong evidence for) a bimodal CO-H2 conversion as is commonly adopted in the literature for 'main-sequence' and 'ULIRG/SMG' type star formation. Our study shows that all types of galaxy (with high metallicity) across z=0-4 can be modelled with constant gas-to-dust, gas-to-CO and CI abundance (with intrinsic scatter but no clear trends). In order to accommodate the popular lower CO-H2 conversion in ULIRG/SMG, we have to postulate that they must also have a lower gas-to-dust ratio AND a much higher Carbon abundance. This violates Occam's razor which states that the simplest acceptable hypothesis is the most likely one to be true.
Our 'best bet' values for the conversion factors are presented, which are very close to those found in the Milky Way ISM."

Presenter: Dr DUNNE, Loretta

Session Classification: Cosmology