

Título/Title:

The dust-to-gas ratio problem in nearby Universe

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Descrição/Description:

Galaxies are a gravitationally bound system made of stars, an interstellar medium (ISM), and a dark matter halo. The ISM is in turn formed by neutral hydrogen, molecular hydrogen (H₂), and a dust component. H₂ is very difficult to observe, but its mass determination is crucial for studying the star formation processes occurring within the ISM. To overcome this problem, scientists use the second most abundant molecule, carbon monoxide (CO), as a tracer of H₂. The measured CO intensity is then converted into molecular hydrogen column density using a conversion factor, XCO.

However, its determination is highly uncertain, and even the physics behind the XCO itself is not clear. A possible technique to measure XCO is to use dust as a tracer of the total gas column density. Assuming that dust and gas are well mixed, the dust-to-gas ratio (DGR) is not a function of atomic and/or molecular phase, but the observed dust mass surface density can be converted into a total gas mass surface density, allowing to define the DGR. Previous studies investigated this subject using mainly nearby galaxies, but now we can apply this technique at higher distances.

The main goal of the project is to build a large sample of galaxies with CO, atomic hydrogen, and dust measurements and to investigate how each different gas phase affects the DGR. We will simultaneously measure the DGR and XCO and, as a final step, we will discuss the implications of different metallicities calibrator in the DGR-XCO correlation, as gas fraction varies. The project will end with an analysis of the DGR-XCO differences within different redshifts and environments, with the goal of understanding what are the main drivers of these variations in the local Universe.