Probing the impact of metallicity on the dust properties in galaxies

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As galaxies evolve, their Interstellar Medium (ISM) becomes continually enriched with metals, and this metal enrichment influences the subsequent star formation. Low-metallicity dwarf galaxies of the local Universe are ideal candidates to study the influence of this metal enrichment on the ISM properties of galaxies. Previous studies have shown that the ISM of dwarf galaxies poses a number of interesting puzzles in terms of the abundance of dust grains, the dust composition and even the FIR emission processes. Before the advent of Herschel, these studies were limited to the warmer dust emitting at wavelengths shorter than 200 microns and were done only on a small number of dwarf galaxies. Thanks to its increased sensitivity and resolution in FIR and submillimeter (submm) wavelengths, *Herschel* gives us a new view on the cold dust properties in galaxies and enables us to study the lowest metallicity galaxies in a systematic way.

We carried out a systematic study of the integrated dust properties in a sample of ~110 local Universe galaxies, using the dust continuum spanning the near-infrared to millimetre wavelengths and realistic dust models, and compared this to the gas properties. We considered two Herschel surveys (the Dwarf Galaxy Survey and the KINGFISH sample; [1,2]) spanning a wide range of galactic properties in terms of metallicity, but also morphological type, stellar mass, star formation activity, etc.

Our study reveals different dust properties in low-metallicity environments compared to those observed in more metal-rich systems (e.g., an overall warmer dust component) [3,4], which will be presented here. An excess submm emission is often apparent near and/or beyond 500 microns rendering large uncertainties in the dust properties, even for something as fundamental as dust masses. We will discuss the appearance of this submm excess in our sample and test alternative dust composition, with more emissive grains, to explain this excess emission [3,4]. Ideal tracer of the chemical evolutionary stage of a galaxy, the gas-to-dust mass ratios (G/D) is found to be much higher than what is expected by simple chemical evolution models. We will then focus on the relation between G/D and metallicity and interpret it with the aid of different chemical evolution models to explain this unexpected trend [5].

Références

[1]Madden S.C., et al. PASP, 125, 600 (2013), [2]Kennicutt R., et al. PASP, 123, 1347 (2011), [3] Rémy-Ruyer A., et al. A&A, 557,95, (2013) [4] Rémy-Ruyer A. in prep [5] Rémy-Ruyer A., et al. A&A, 563,31 (2014)