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The dust/gas/metallicity scaling relations in the Local Universe

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Abstract. We have combined data of the DustPedia project with observations of gas components of the interstellar medium (ISM) and metallicity abundances for late-type DustPedia galaxies to definitively characterize the ISM scaling relations in the Local Universe. In particular, we have focused on the comparison of the dust-to-gas mass ratio with gas phase metallicities.

Keywords. dust, ISM, ISM: abundances

1. Dust-to-gas mass ratio as metallicity tracer

The project DustPedia (www.dustpedia.com, Davies *et al.* 2017) is an European collaborative-focused program aimed at performing the complete characterization of dust in local galaxies. This research is carried out on a sample of 875 objects, i.e. all the large ($D_{25} > 1'$) and nearby ($z < 0.01$) galaxies observed by *Herschel* Space Observatory. A legacy database was constructed from *Herschel* and other UV-to-microwave observations (http://dustpedia.astro.noa.gr/, Clark *et al.* 2018).

Dust constitutes an important property to understand chemical evolution of galaxies. Metals are produced mainly by the stellar nucleosynthesis and then returned to the interstellar medium (ISM), either as gas and as solid grains condensed during the later stages of stellar evolution; they can later be destroyed and incorporated into new generations of stars. We have presented main scaling relations between dust, gas (CO & HI), and metallicity for a sample of ∼450 DustPedia late-type galaxies. The CO and HI data have been extracted from the literature, uniformly homogenized, and reported to their values within r_{25} according to Casasola *et al.* (2017) and Wang *et al.* (2014). Using literature data, we have also determined the characteristic gas-phase metallicity for each sample galaxy (De Vis *et al.* 2019).

The main preliminary results are: *i)* the DGR correlates with metallicity, stellar mass and star formation rate, and hence the DGR can be used to estimate metallicity; *ii)* the DGR depends on the morphological type (for late-type galaxies) and the CO-to-H_2 conversion factor (X_{CO}). These findings are confirmed by using a very large local galaxy sample and various assumptions on X_{CO} (constant X_{CO} and X_{CO} depending on metallicity). The definitive results will be published in Casasola *et al. submitted.*

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