Dust attenuation curves of 230,000 low-redshift galaxies: The key to accurate SFRs at high redshift

Surveys with JWST will probe the rest-frame UV and optical SEDs of high-redshift populations, but without the information on the dust emission in the IR. The accuracy of dust-corrected SFRs derived from just the UV-optical SED fitting will be critically limited by the use of appropriate dust attenuation curves. Large systematics (up to 0.7 dex) arise from assuming a shallow curve (based on local starbursts) as opposed to a steep curve such as the SMC curve. The knowledge of dust attenuation curves on galaxy-by-galaxy basis such that would establish any possible trends of curve shapes with galaxy's physical properties is essential, but has so far been lacking, even in the local universe.

We performed a large-scale study of dust attenuation curves of 230,000 individual galaxies in the local universe, for galaxy populations ranging from quiescent to intensely star-forming (high-z analogs). We use Bayesian SED fitting of UV (GALEX) and optical (SDSS) photometry constrained by accurate IR luminosity from WISE, calibrated on Herschel-ATLAS deep data. The use of IR allows us to treat attenuation curve parameters as free. We find that dust attenuation curves span a very wide range of slopes, but are on average quite steep (SMC like), especially for high-z analogs. We also find that the curves on average exhibit a UV bump, but only half as strong as the one in the MW extinction curve. Finally, we find that the slopes depend on galaxy stellar mass, but not on metallicity or inclination. We discuss implications for IRX-beta relation.