Molecular Gas, Dust, and Star Formation in Galaxies
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GOODS-*Herschel*: Dust attenuation up to z∼4

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Abstract. We quantitatively explore in a unbiased way the evolution of dust attenuation up to $z \approx 4$ as a function of galaxy properties. We have used one of the deepest datasets available at present, in the GOODS-N field, to select a star forming galaxy sample and robustly measure galaxy redshifts, star formation rates, stellar masses and UV restframe properties. Our main results can be summarized as follows: **i)** we confirm that galaxy stellar mass is a main driver of UV dust attenuation in star forming galaxies: more massive galaxies are more dust attenuated than less massive ones; **ii)** strikingly, we find that the correlation does not evolve with redshift: the amount of dust attenuation is the same at all cosmic epochs for a fixed stellar mass; **iii)** this finding explains why and how the SFR–A_{UV} relation evolves with redshift: the same amount of star formation is less attenuated at higher redshift because it is hosted in less massive galaxies; **iv)** combining our finding with results from line emission surveys, we confirm that line reddening is larger than continuum reddening, at least up to z≈1.5; **v)** given the redshift evolution of the mass-metallicity relation, we predict that star forming galaxies at a fixed metal content are more attenuated at high redshift. Finally, we explored the correlation between UV dust attenuation and the spectral slope: **vi)** the correlation is evolving with redshift with star forming galaxies at lower redshift having redder spectra than higher redshift ones for the same amount of dust attenuation.

Keywords. galaxies: evolution — galaxies: fundamental parameters — galaxies: ISM — surveys

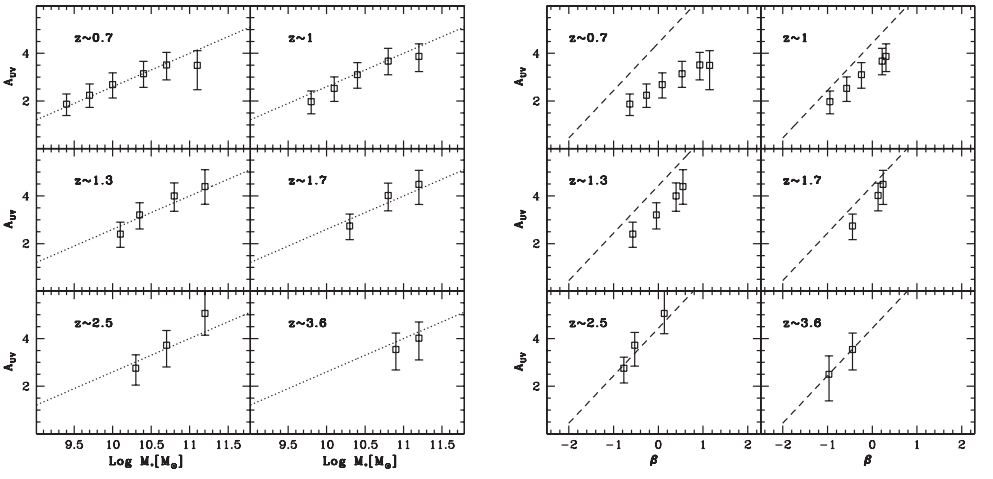

Figure 1. Left: $A_{UV} = 2.5 \times \mathrm{Log}(SFR_{IR}/SFR_{UV} + 1)$ vs. M_*. The correlation is strikingly the same over the whole redshift range explored: $A_{UV} = 1.4 \times LogM_* - 11.4$ *(mag)*. **Right:** A_{UV} vs. β, the UV spectral slope such that $f_\lambda \propto \lambda^\beta$. The dashed line shows the relation for local starburst galaxies and LBGs at z≈3 from Meurer *et al.* (1999).