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UV escape fraction and dust distribution of star forming galaxies at $z = 0 - 3$: a new dust attenuation model

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Abstract. The UV escape fraction, $f_{\rm UV}^{\rm esc}$, is a key parameter determining the apparent SED of star forming galaxies. However, it is not well known how $f_{\rm UV}^{\rm esc}$ depends on the global geometry of dust distribution, nor how it evolves with time, although several models are proposed (e.g., Calzetti (2001)). We use ∼130 normal star-forming galaxies (114 at $z \sim 0$ from Cortese *et al.* (2012) and 15 at $z \sim$ 1–3 from Magnelli *et al.* (2012) and Saintonge *et al.* (2013)), to find that the $z \sim 0$ galaxies show a relatively tight anti-correlation between $f_{\rm UV}^{\rm esc}$ and surface dust mass density, $\Sigma_{\rm d}$ (See Fig. 1(a)). This correlation can be reproduced by a dust geometry model that well-mixed stars and dust follow the same exponential profile (Fig. 1(b)) with an effective mass-absorption coefficient $\kappa(1600\text{Å}) = 7.6^{+5.3}_{-3.0} \times 10^4 \text{cm}^2\ \text{g}^{-1}$, similar to the Milky Way value including absorption and scatter. The $z \sim$ 1–3 galaxies are not inconsistent with this model. Our model can be easily implemented in semi-analytic models and cosmological hydrodynamics simulations (CHSs) of galaxy formation. Initial results for Shimizu *et al.* (2014)'s CHSs are presented.

Keywords. galaxies: evolution, infrared: galaxies, ultraviolet: galaxies, (ISM:) dust, extinction

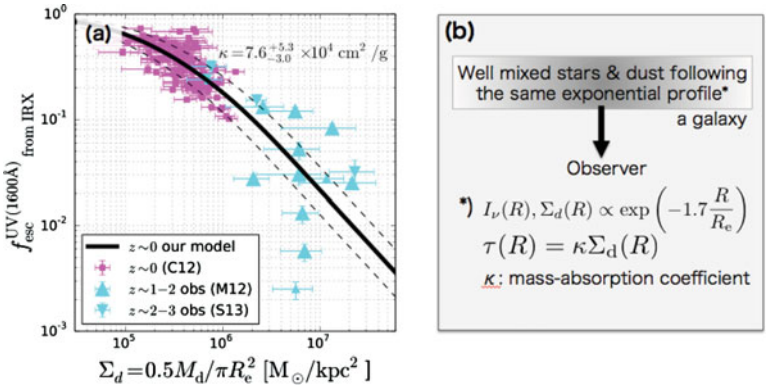

Figure 1. (a)$\Sigma_{\rm d}$ vs. $f_{\rm UV}^{\rm esc}$. The filled circles and triangles represent the data of $z \sim 0 - 3$ galaxies. The solid line (dashed lines) shows our model with the median (68%-range) κ of the $z \sim 0$ sample. (b) Description of our model.

References

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