Differential dust attenuation in CALIFA galaxies

CALIFA Survey

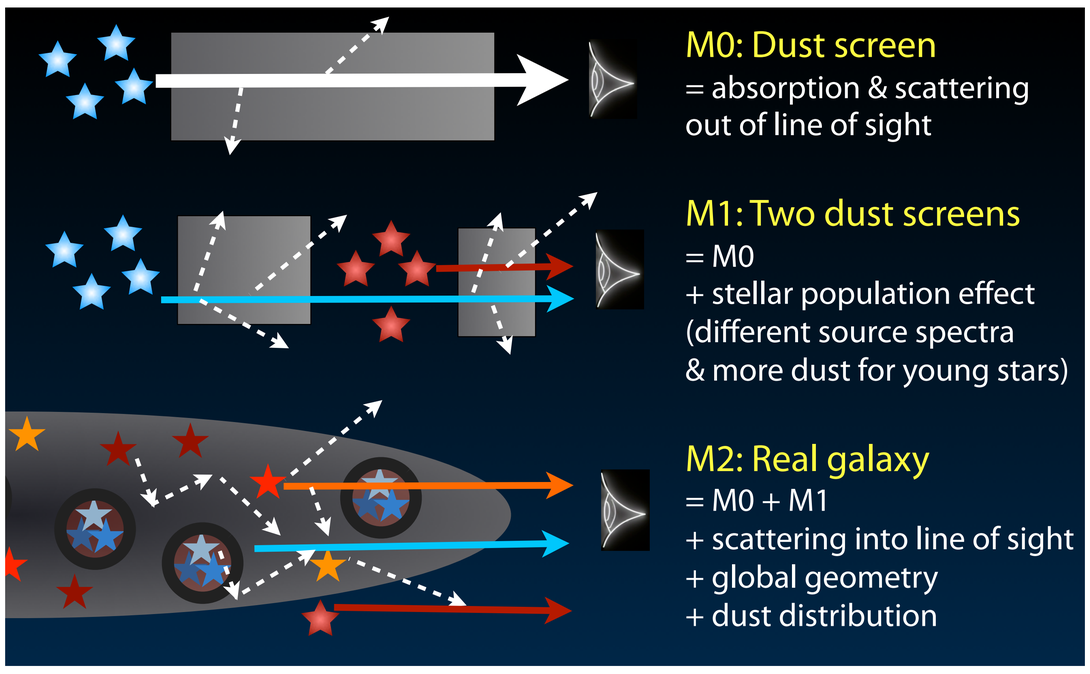
Natalia Vale Asari
UFSC, Brazil
natalia@astro.ufsc.br

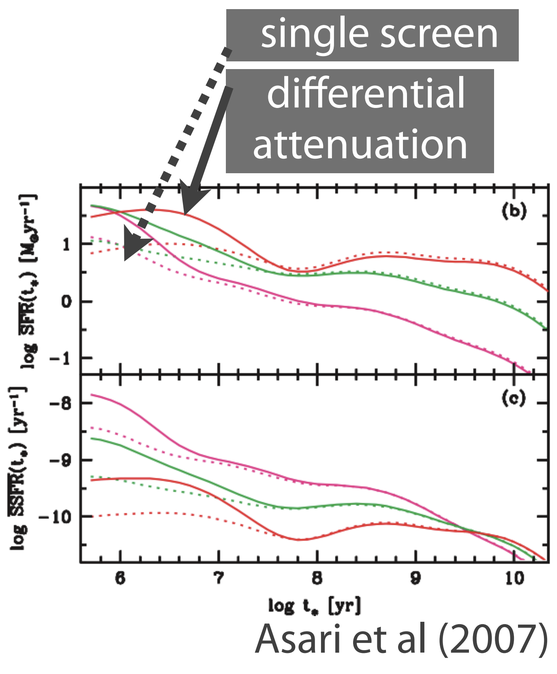
Roberto Cid Fernandes, André Amorim, Eduardo Lacerda, Marielli Schlickmann
UFSC, Brazil

Vivienne Wild
St Andrews, UK

Robert Kennicutt
IoA, Cambridge, UK

Differential dust in spectral synthesis codes

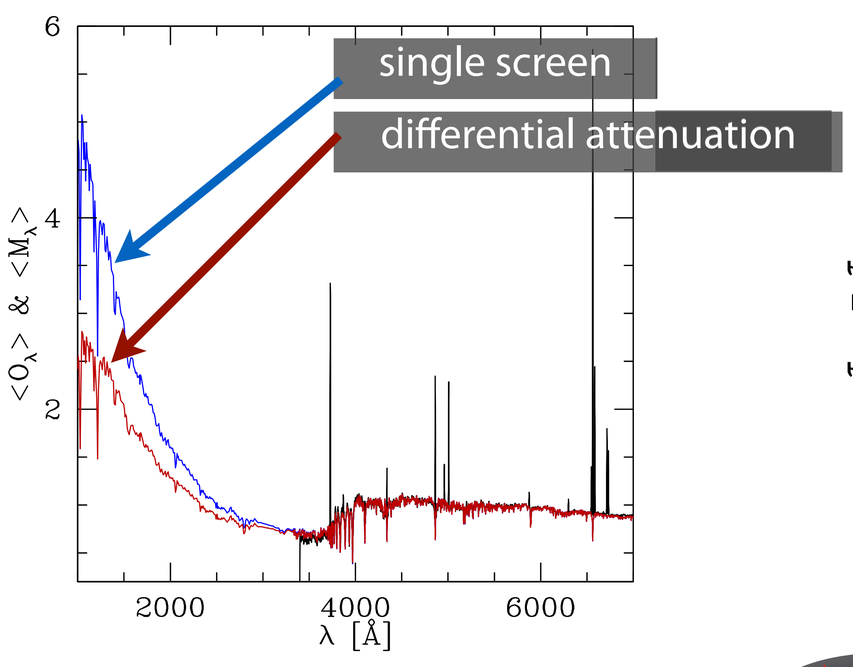


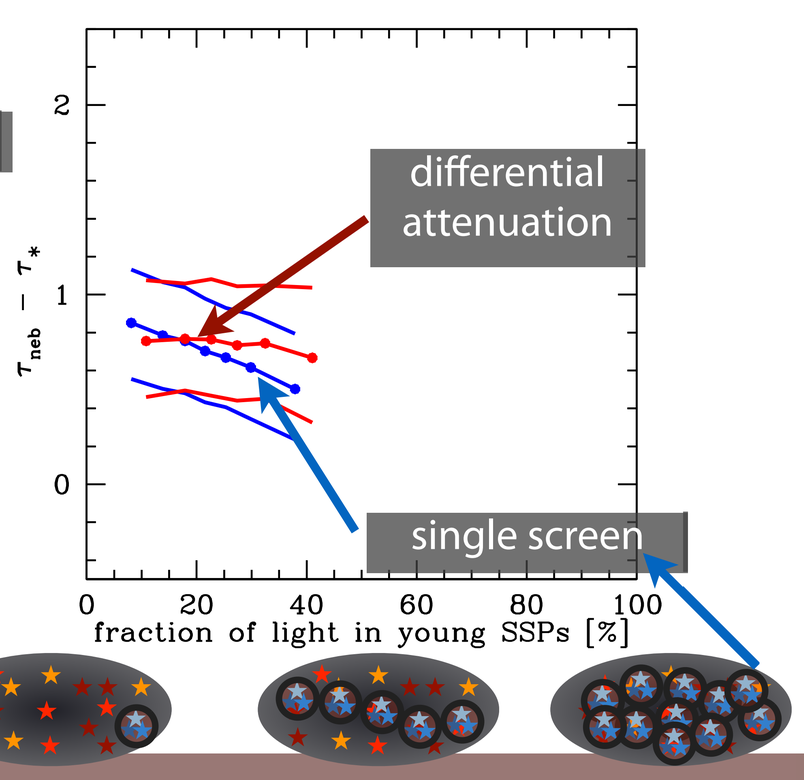


Asari et al (2007)

Dust attenuation has long been treated as a simple parameter in SED fitting. A very popular model is the single dust screen, which is a crude approximation to real galaxies (M0). The measured dust attenuation is not a simple function of the dust optical depth, but depends strongly on galaxy inclination and the relative distribution of stars and dust. Thus a realistic model can be made very complex (M2). A middle-ground solution is to model a galaxy as having differential dust attenuation (M1; e.g. Charlot & Fall 2000). In Asari et al. (2007) we have shown how the star formation histories of SDSS galaxies change when treating dust either as a single screen or with a simple differential attenuation recipe.

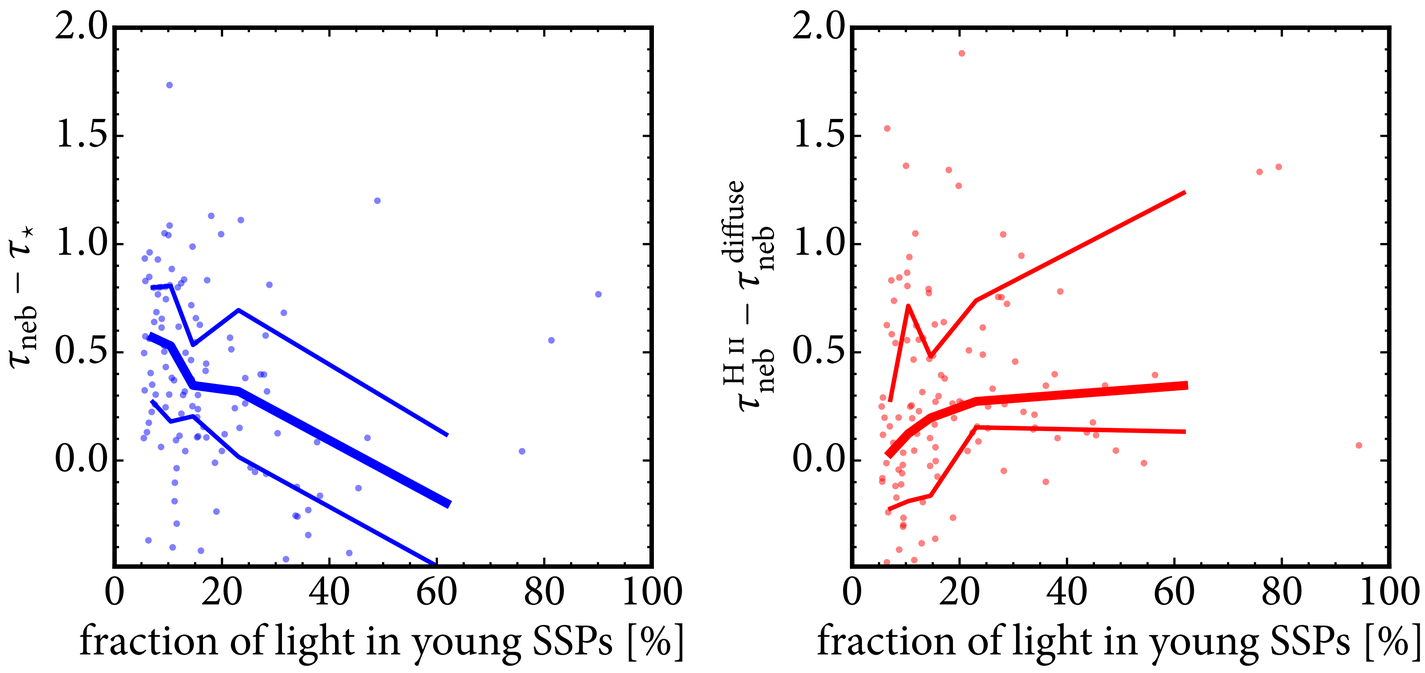
SDSS galaxies modelled with STARLIGHT





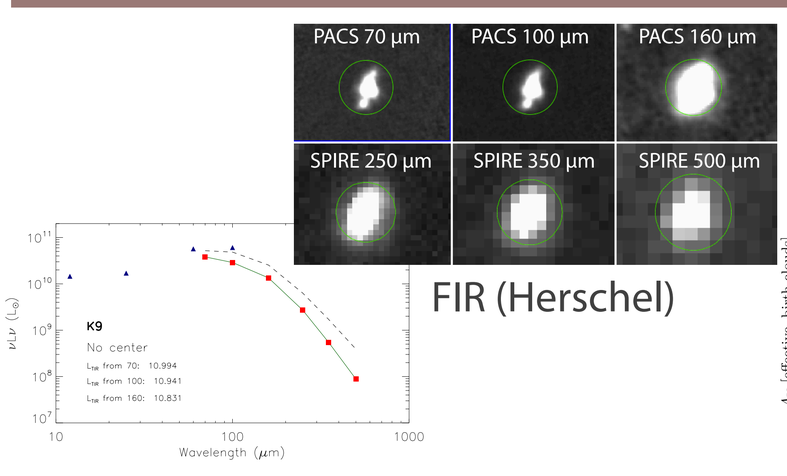
STARLIGHT fits a galaxy spectrum with a sum of simple stellar populations. We compare fits using a single and a two-dust screen model for 14 000 star forming SDSS galaxies. We find the following. (1) Differential dust models tend to predict less UV emission. (2) The difference between the nebular attenuation (τ, calculated from Hα/Hβ) and the stellar attenuation inferred from a single dust screen goes from one to zero as the contribution of young stars (x_y) to the integrated light increases. This can be interpreted as H II regions dominating the stellar τ at higher x_y. (3) A new version of STARLIGHT uses a differential attenuation model based on the observed Hα/Hβ to fit τ of young stars. Thus $\tau_{neb} - \tau_\star^{old}$ is simply the birth cloud τ, which we find to be independent of x_y.

The CALIFA view



We have turned to CALIFA galaxies to see if our interpretation of the SDSS results holds when galaxy spectra are dissected spaxel-by-spaxel. We have selected a few hundred H II regions from disc galaxies using the H II explorer code (Sanchez et al. 2012). We have modelled the H II regions and the diffuse spectra with STARLIGHT using a single dust screen. (1) The $\tau_{neb} - \tau_\star$ vs x_y relation for H II regions follows the same trend as the one inferred for SDSS galaxies. (2) When we remove the contribution from diffuse emission to τ_{neb}, we find that the resulting τ is uncorrelated to x_y, very much like the case when we model SDSS galaxies with our improved differential dust attenuation recipe.

Extra plots: Questions welcome!



FIR (Herschel)