Combining chemical evolution and spectral synthesis models to unveil galaxy populations

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Abstract

We investigate here the mass assembly and SF history of different galaxy populations at $z \sim 1-2$, including dusty star forming (U)LIRGs, BzK galaxies and extreme off-main sequence objects. These sample are unique as they benefit from a full multiwavelength coverage from far-UV to Radio including Herschel data. This is done by combining chemical evolution models with the predictions of a self-consistent spectral synthesis code including a radiative transfer treatment of dust effects. The availability of this rich suite of photometric data allows us to constrain not only the current SFR of galaxies but also their SFHs. We demonstrate that the interpretation of the optical to far-IR emission in terms of the rate of star formation is subject to some uncertainties depending on the age of the stars responsible for the dust heating and reprocessing. If intermediate-age stars (with ages older than 10-90 Myr on average) significantly contribute to it, we may have even factors of 2 difference on the ongoing rate of SF compared to standard calibrations as from Kennicutt(1998). On the contrary, the addition of radio luminosity to the spectral multi-band fitting offers a tighter constraint on the SFR, considering that only stars younger than about 10 Myr produce the galactic cosmic rays responsible for the non-thermal radio emission. We show that our physical analysis can significantly affect the interpretation of the SFR-$M_\star$ diagram. The effect strongly depends on the level of dust obscuration and on the nature of star formation (starburst vs gradually evolving SF). We have in plan to apply our analysis to larger statistical sample of both MS and SB galaxies making use of sophisticated physically motivated semi-empirical approaches including energy balance as the one provided by CIGALE. The new version of the code allows to combine the power of spectral synthesis with the output from chemical evolution models thus representing a unique tool for this kind of study.

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