Impact of the spatial resolution on the measurement of the SFR in galaxies

Although measuring star formation at a local scale is of utmost importance to constrain star formation laws, it is not yet clear whether and how the measure of star formation is affected by the spatial scale at which the galaxy is observed. This issue is especially important as with the recent commissioning of ALMA and the launch of the JWST by the end of the decade, we will soon be in position to map star formation in high z galaxies, something we can only do in the nearby universe currently.

Making use of state-of-the-art observations of the local galay M33, in this talk I will discuss the impact of the resolution on the determination of the spatially resolved SFR and other directly associated physical parameters such as the attenuation. In particular, I will show that there are strong scale-dependent discrepancies between monochromatic SFR estimators and Hα+24 μm. The scaling factors between individual IR bands and the SFR also show a strong dependence on the spatial scale and on the luminosity. Finally, I will show that strong variations of the differential reddening between the nebular emission and the stellar continuum are seen, depending on the specific SFR and on the resolution. These variations provide new constraints on attenuation curves and the relative geometry between UV-emitting stars and dust in galaxies.

These findings show that the extension of local calibrations to high redshift galaxies presents non-trivial challenges as the properties of these systems may be poorly known. Studies utilising the JWST and ALMA simultaneously will be required to extend known calibrations to the high-redshift regime down to the kpc scale. The computation of the SFR through standards estimators appears unreliable at scales smaller than 1 kpc.