# The resolved dust-continuum emission of galaxies within the IllustrisTNG simulation: an explanation for the compact dust emission in z> 1 galaxies and the use of dust-continuum emission as a tracer of a galaxy's H2 distribution

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**Abstract**

The mass-size relation of galaxies and its evolution has been well studied for the stellar component of galaxies, both through observations and in simulations. Now that ALMA has reached its full capabilities, the dust-continuum size of galaxies has been measured for a number of z > 1 sources. It is expected that in the next few years the dust continuum distribution of galaxies will be observed on a more systematic basis accross the star-forming main-sequence and cosmic time. Available observations of SMGs and the most massive main-sequence galaxies have suggested that the sub-mm continuum size of galaxies is smaller than the stellar size. Galaxy formation simulations such as IllustrisTNG50 now have the mass and spatial resolution to provide detailed predictions for the dust-continuum size of thousands of main-sequence galaxies throughout cosmic time. We have obtained resolved dust continuum maps of thousands of main-sequence galaxies from z=1 to z=5 taken from the IllustrisTNG50 simulation, by running the model galaxies through the radiative transfer code SKIRT. In this talk I will present the results of this effort and show 1) how the dust continuum mass-size relation of galaxies evolves; 2) that the observed dust-continuum emission of z> 1 galaxies is more compact than the stellar emission because of dust obscuration; 3) how well the dust continuum spatially follows the H2 distribution of galaxies; 4) how the distribution of dust-continuum emission compares to the distribution of SFR and dust mass in galaxies and what drives the differences. I will finish by discussing the implications of our results for the interpretation of resolved dust-continuum observations and the planning of future observations.

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