The Simulated Infrared Dusty Extragalactic Sky (SIDES): a Semi-Empirical Simulation for Long-Wavelength Extragalactic Surveys

The Simulated Infrared Dusty Extragalactic Sky (SIDES) is a semi-empirical simulation of extragalactic surveys at long wavelengths. It is based on pre-existing dark-matter lightcones, in which halos are populated using an abundance-matching technique. We then apply a set of scaling relations to generate realistic galaxy properties, and derive broadband fluxes using empirically calibrated spectral energy distribution (SED) libraries, as well as line fluxes. SIDES also includes tools to produce simulated maps and spectral cubes. All these procedures can be performed with modest computational resources, allowing us to simulate fields as large as 117 deg².

I will present some of the main successes of this simple modeling approach. By realistically simulating the impact of confusion, we reconcile the statistical properties of galaxies observed at different angular resolutions. We also reproduce the anisotropies of the cosmic infrared background (from arcsecond to degree scales) emitted by dusty galaxies tracing large-scale structures across cosmic time. Finally, SIDES is a powerful tool for preparing future instruments. I will illustrate this with the study of the confusion limit in intensity and polarization of the PRIMA far-infrared telescope, and the separation of free-free and