X51a Importance of the scatter in the SFR-halo mass relation in analysing galaxy survey and line intensity mapping data

Rui Lan Zhang (UTokyo), Kana Moriwaki (UTokyo), Tom Theuns (Durham University)

Future observations aim to map increasingly larger volumes of the universe, with Euclid planning to map 15,000deg^2, for example. Spectroscopic galaxy surveys will provide precise position information, while line intensity mapping (LIM) can efficiently map faint galaxies undetected by galaxy surveys by measuring the cumulative emission from spectral lines. Besides its role in constraining cosmology, LIM complements galaxy surveys in providing opportunities to probe the star formation history and constrain the star formation rate density, by probing larger numbers of galaxies and deeper redshifts.

The observations will map emission lines, which can serve as indicators of the star formation rate (SFR), thereby offering valuable insights into star formation processes. However, interpreting these observations requires suitable models. A common alternative to computationally expensive hydrodynamical simulations is to assign galaxy properties to dark matter halos. With such methods, accurate modelling of scatter in the SFR remains challenging due to its stochastic nature. We evaluate how important the scatter in the SFR-halo mass relation is, including what uncertainties arise from assuming no scatter or Gaussian scatter. We are also using the IllustrisTNG and EAGLE simulations to investigate what drives this scatter, with the aim of building more accurate models. Additionally, we address other subtleties in modelling, such as how important the rare objects are. Questions such as these become important when we want to extrapolate to larger volumes.