Unveiling galaxy bias via the halo model, KiDS, and GAMA

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Galaxy bias

Galaxy bias is the relation between the distribution of galaxies and the underlying dark matter. In its simplest form this relation can be described by a single number. As galaxy formation is a complex process, it would be naive to assume that such a relation is also a simple one. The majority of previous studies showed that it is neither linear nor deterministic.

With this study we measure the scale dependence and the origin of non-linearity and stochasticity of the galaxy bias.

Data

The galaxy bias can be measured using a combination of galaxy-galaxy lensing and galaxy clustering, which one can combine to a bias function $\Gamma$. We use:

- **KiDS (Kilo Degree Survey)** for our weak lensing measurements
- **GAMA (Galaxy and Mass Assembly)** survey for our clustering measurements and lenses

Methods

We use the galaxy bias formalism as presented in Cacciato et al. 2012, which redefines the usual biasing formulation using the halo occupation framework. This means that the biasing relation can be described using halo masses and galaxy distributions in the form:

$$ b(M) \propto \frac{\langle N | M \rangle}{M} $$

Results

Given the halo occupation distribution constraints, galaxy bias is:

- **Non-linear** (due to presence of central galaxies)
- **Stochastic** (due to non-Poissonian distribution of satellite galaxies and their spatial distribution that is different of the dark matter one)


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