

Halo Sparsity: A Swiss army knife for galaxy cluster astrophysics and cosmology

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Halo sparsity, the ratio of two masses of a dark matter halo measured at two different overdensities, has proven itself to be a promising avenue to probe cosmology using the internal structure of dark matter haloes. In this talk I will present multiple applications of halo sparsity beyond current cosmological constraints. Most notably I will show how sparsity correlates with the dynamical state of a halo and can be used to detect haloes undergoing major mergers. In addition I will present how sparsity can also be used to express the halo mass function at different overdensity contrasts and how its non parametric nature allows it to unify previous models for the internal structure of dark matter haloes into a single formalism.

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