X-RAY ASTRONOMY 2019
Current Challenges and New Frontiers in the Next Decade
8-13 September 2019
CNR/INAF Research Area, Bologna, Italy

Contribution ID: **218** Type: **Contributed**

Quantitatively defining consistent relaxed galaxy cluster samples for precision cosmology with impending surveys

Tuesday 10 September 2019 17:40 (15 minutes)

Impending surveys from facilities such as e-Rosita, SPT-3G and Euclid will revolutionize cluster cosmology by yielding samples with $> 10^5$ galaxy clusters, producing an exquisitely detailed 10 Gyr picture of cluster formation. In this new era of precision cluster cosmology dynamically relaxed clusters occupy a special role, enabling a reliable deprojection of ICM properties and reduced systematics associated with mass estimation. However, defining a relaxed cluster is non-trivial. Visual classification, based on a regular morphology and strong central emission, has an inherent lack of objectivity and presents a daunting challenge given the scale of future surveys. In contrast, classifying clusters by measurable image features produces an objective and reproducible method, but is fundamentally a thresholding exercise with arbitrary cut-off values depending on the study. In this talk, we will use mock X-ray observations of the IllustrisTNG, C-Eagle, BAHAMAS and MACSIS simulations to produce a quantitative definition of a relaxed galaxy cluster based on minimizing the scatter in estimated masses. We will examine the high-dimensional relaxation criteria space to explore if the common 3D aperture theoretical and 2D aperture X-ray observable relaxation criteria thresholds can be aligned to yield a consistent sample of relaxed clusters and how this evolves with sensitivity, redshift, numerical resolution and subgrid modelling. Finally, we will assess the impact of a quantitative definition of relaxed on estimated cluster masses, scaling relations and the covariance of cluster observables.

Topic

Hot and diffuse baryons

Affiliation

MIT

Author: Dr BARNES, David (MIT)

Co-authors: Ms POP, Roxana (Harvard CfA); Ms PEARCE, Francesca (University of Manchester); Dr KAY, Scott (University of Manchester); Prof. VOGELSBERGER, Mark (MIT)

Presenter: Dr BARNES, David (MIT)

Session Classification: HOT AND DIFFUSE BARYONS