

A new view on galaxy clusters with the FLAMINGO simulations

Tuesday, 16 May 2023 17:00 (15 minutes)

We use FLAMINGO, the biggest full hydro cosmological simulation ever, to study the most massive objects in the universe and do a direct comparison with observations. FLAMINGO hosts many thousands of massive clusters, in their full cosmological environment, making it an ideal testing ground to do a statistically relevant comparison with observations. Using a new forward modelling pipeline, including photo-ionization models from CLOUDY, we can accurately model the x-ray emission from clusters and their surroundings in a wide mass-range. We study how x-ray scaling relations are impacted by mass, cool-core fractions and redshift. Tracing galaxy cluster mergers through time, we show how merging clusters move on x-ray scaling relations and elucidate whether merging clusters have a discernable offset from relaxed objects. Furthermore, because FLAMINGO has 9 observationally motivated feedback variations, we show the impact of AGN and stellar feedback on cluster profiles. For all FLAMINGO clusters, we also fit their profiles to estimate the hydrostatic bias, which we can now do for thousands of massive clusters, and as a function of cluster properties. With the unprecedented size of the FLAMINGO simulations, we can do all these things for statistically relevant sample sizes, enabling a real comparison with observations at all masses.

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Session Classification: Parallel session

Track Classification: NOVA NW1