引力波与宇宙学实验室 讲座预告

Cluster Merger Impact on ICM Thermodynamics and BCG Activity

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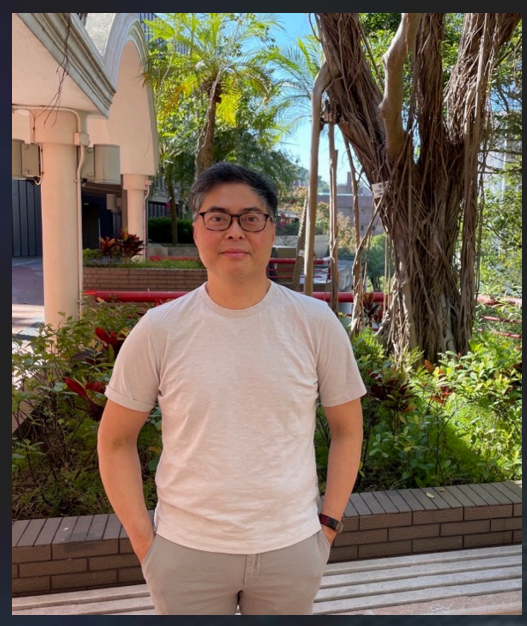

Prof. Jeremy Lim obtained his PhD at Macquarie University, Sydney, Australia, and then held positions as a postdoctoral fellow at University of Maryland and Caltech before taking up a position at ASIAA (Taiwan). Moving to the University of Hong Kong, his team focuses on a wide range of research topics spanning star formation and AGNs in nearby galaxies, X-ray cooling flows in galaxy clusters, and the astrophysical applications of gravitational lensing primarily to study the nature of Dark Matter. As an observational astronomer, Dr. Lim uses radio telescopes (e.g., VLA, SMA, ALMA) and optical-infrared telescopes (e.g., CFHT, HST, JWST).

Abstract

The intracluster medium (ICM) encodes both the evolutionary growth and physical state of galaxy clusters. At cluster cores, the ICM thermodynamics is thought to be locally dictated by a close balance between radiative cooling and mechanical reheating, the latter dictated by relativistic jets from an AGN in the brightest cluster galaxy (BCG). Yet, puzzlingly, clusters possessing the coolest ICM cores preferentially host BCGs displaying the most powerful AGNs. Here, we show that the ICM thermodynamics at cluster cores depend on the degree to which clusters are dynamically relaxed: more dynamically-relaxed clusters possess denser and cooler cores featuring higher thermal pressures and lower gas entropies, the latter implying shorter gas cooling times. Strikingly, cool gas and star formation in BCGs is restricted to, but ubiquitous among, the most dynamically-relaxed clusters. These results implicate mergers between galaxy clusters – the only process able to impact their global dynamics – for re-setting the ICM thermodynamics at cluster cores by transporting higher-entropy gas inwards from larger radii and generating turbulence to provide additional pressure support. As clusters dynamically relax following a merger, their cores transition to a denser and cooler state as the ICM again approaches hydrostatic equilibrium. Once a sufficiently dense and cool core is re-established, effectual ICM cooling resumes to fuel star formation in BCGs and boost their AGNs.

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地点：北京师范大学物理楼402