

Investigation of Interactions Between the Hot Plasmas and Galaxies in Clusters

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Gu Liyi (University of Tokyo)、 Inada Naohisa (Nara National College of Technology)、 Nakazawa Kazuhiro (University of Tokyo)、 Konami Saori (RIKEN)、 Kawaharada Madoka (ISAS/JAXA)、 Makishima Kazuo (University of Tokyo)

Many X-ray studies of galaxy clusters are looking for solution to the cooling-flow problem, which requires a long-term, continuous energy source that balances the radiative cooling over the cluster core. Optical observations, on the other hand, show a puzzling feature of more red and dead ellipticals in central regions of nearby clusters. To account for the two facts simultaneously, Makishima et al. (2001) proposed a galaxy infall model that member galaxies of each cluster are falling the cluster center and gradually losing their energy via friction with the ICM, which is used in turn for ICM heating.

Our model predicts the stellar component condenses more quickly than ICM in clusters. To demonstrate this hypothesis, Kitaguchi (2004) and Inada (2010) have examined the evolution of member galaxy brightness distributions compared to ICM mass distributions for a sample of clusters with redshift up to 0.3. As a direct continuation of these studies, our analysis is based on the optical data from the UH88 telescope and X-ray data from XMM-Newton, for a sample of 13 clusters with redshifts ranging from 0.1 to 0.9. We find that the galaxy light does become significantly more concentrated, relative to the hot plasmas, in the nearby clusters. This result reinforces our view of galaxy infall being a major plasma heating source in galaxy clusters.