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Dissecting the chemical properties of the ICM in massive galaxy clusters

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We investigate the spatial distribution of iron in the intracluster medium (ICM) of massive clusters at different cosmic epoch, focusing on two distinct components: a central peaked distribution, and a wider, flatter component. Thanks to the angular resolution of Chandra data, we are able to follow the increase in the size of the central component, which, however, does not grow significantly in mass in the range 0<z<1. This behavior is consistent with an early production of the bulk of the metals at z»1, and a slow diffusion process possibly driven by the mechanical-mode feedback from the central galaxy. On the other hand, the flatter and wider component includes the majority of the metal mass and has a much slower evolution with epoch. We recast the evolution of iron in terms of total iron mass within a given radius in each component, and attempt to constrain the enrichment mechanisms and the associated time scales. As a byproduct of the high spatial resolution analysis of iron distribution, we are also able to investigate the origin of the "central iron drop", a small-scale decrement observed at the center of the iron peak in some clusters. We find that although the iron drop is mostly due to a mechanical process removing the highly enriched ICM from the center, it should also be ascribed partially to iron depletion onto dust grains, consistent with the most recent scenario of the baryon cycle in cool-core clusters.

Topic

Hot and diffuse baryons

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