



X-RAY ASTRONOMY 2019

Current Challenges and New Frontiers in the Next Decade

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Shocking news from the ICM

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In the process of cluster formation, giant shock waves are driven in the intra-cluster medium (ICM) leaving remarkable imprints in the X-ray emitting gas. The detection of these fronts is complicated as shocks are generally located in the cluster outskirts, where the count statistics is low. In the very recent years, the number of merger shocks observed increased thanks to deep observations performed with Chandra, XMM-Newton, and Suzaku, allowing us to study the mechanisms leading to the formation of relativistic particles in the ICM.

I will report on the recent discoveries of new shocks in the ICM of a number of clusters. In particular, I will:

(i) discuss the connection between shocks and radio relics (i.e. diffuse synchrotron sources found in cluster outskirts). Although the relic-shock connection is nowadays indisputable, the acceleration of particles via the commonly adopted diffusive shock acceleration theory is severely challenged by the low Mach numbers of merger shocks if electrons are accelerated from the thermal pool. I will show that other mechanisms, such as shock re-acceleration of a pre-existing population of mildly relativistic particles, are favored by current observations.

(ii) present the results of a recent work aimed to search for new edges in the ICM in an objective way thanks to the combination of different techniques of X-ray data analysis. In this work, 22 new discontinuities were found in a sample of 15 merging clusters (6 shocks, 8 cold fronts, and 8 edges with uncertain origin), increasing the number of discontinuities observed in merging systems.

Topic

Hot and diffuse baryons

Affiliation

IRA-INAF

Primary author: BOTTEON, Andrea (IRA-INAF)

Presenter: BOTTEON, Andrea (IRA-INAF)

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