Peculiar features arising from merging galaxy clusters: the case of A1644 and A2034

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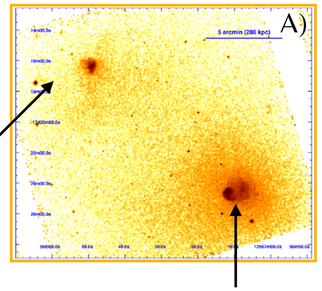
Galaxy clusters constitute the building blocks of the large scale structure, and some interesting events arise during the collisions among them. For example, we can cite the intracluster medium gas (ICM) sloshing or, in more extreme events, the temporary ICM stripping of the cluster potential well. A combination of weak lensing + spectroscopy + hydrodynamical simulations has been proven powerful to describe the three cluster main components (sorted in ascending mass), galaxies, ICM and dark matter (DM), and therefore, to understand the origin of those phenomena.

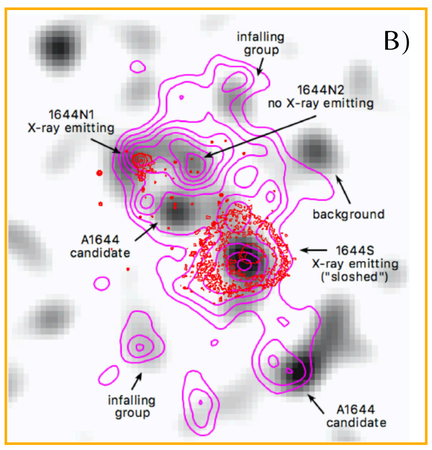
A1644

1) Chandra observations show a clear spiral-like structure in A1644S.

2) So, we can conclude that the sloshing in ICM was due to the interaction with A1644N1, right? Not yet!

3) Weak lensing mass distribution has shown that the scenario is more complex than it appears.

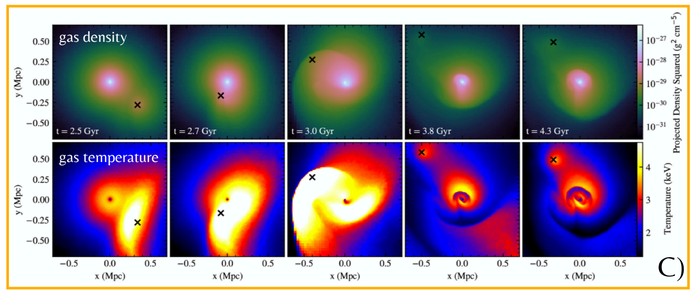




gray: weak lensing mass distribution
magenta: red sequence
red: X-ray emission

4) Which one was responsible for the sloshing in A1644S?

5) Hydrodynamical simulations brought the answer: the new gas poor structure discovered by weak gravitational lensing (A1644N2)!



A) Johnson et al. 2010, ApJ, 710, 1776
B) Monteiro-Oliveira et al. 2020, MNRAS, 495, 2007
C) Doubrawa et al. 2020, MNRAS, 495, 2022

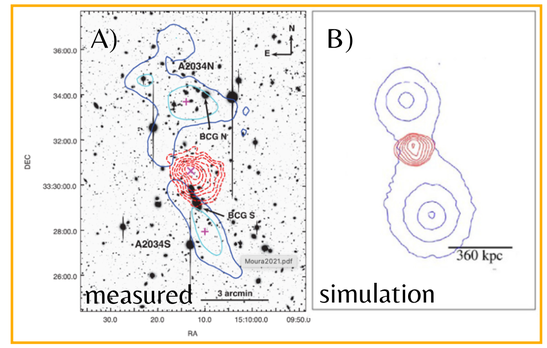
In collaboration with: L. Doubrawa, R. E. G. Machado , G. B. Lima Neto, M. Castejon and E. S. Cypriano.

A2034

weak lensing + X-rays

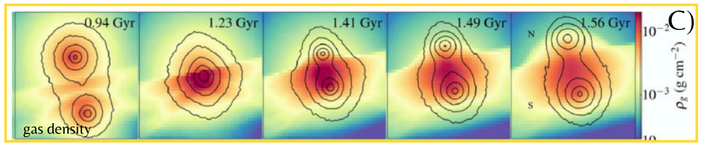
1) Chandra observations show a unimodal structure in A2034, but our weak lensing study has shown that there are (at least) two structures.

2) Combining the measured masses with the radial velocities of the members, we have found that A2034 is a post-merger seen just $0.56^{+0.15}_{-0.22}$ Gyr after the pericentric passage.



3) But, what has happened with the gas content of A2034N? It looks has been stripped of the subcluster potential well during the collision with A2034S. But it does not appear to be a rule since other merging clusters retain their gas content during the collision.

4) Our hydrodynamical simulation of A2034's merger has shown that the gas detachment depends uniquely on the initial gas concentration, not on DM halo concentration.



5) For more details on the simulations, see Micheli Moura's poster.

A) Monteiro-Oliveira et al. 2018, MNRAS, 481, 1097
B) Moura et al. 2021, MNRAS, 500, 1858
C) Moura et al. 2021, MNRAS, 500, 1858

In collaboration with: M. Moura, R. E. G. Machado , E. S. Cypriano, A. Z. Vitorelli, A. L. B. Ribeiro, L. Sodré, Jr, R. Dupke and C. Mendes de Oliveira