

The title is:

Cooling, AGN Feedback and Star Formation in Cool-Core Galaxy Clusters

Abstract:

The feedback from active galactic nuclei (AGNs) is widely considered to be the major heating source in cool-core galaxy clusters, preventing a classical cooling flow. Numerical simulations with AGN feedback have successfully suppressed radiative cooling, but generally fail to reproduce the right amount of cold gas and the expected cyclical AGN activities. We perform adaptive mesh simulations including both momentum-driven AGN feedback and star formation to study the interplay between cooling, AGN heating and star formation over ~ 6.5 Gyr in an isolated cool-core cluster. Cold clumps first cool out of the ICM due to the non-linear perturbation driven by the AGN jets. These cold clumps feed both star formation and the supermassive black hole (SMBH), triggering an AGN outburst which increases the entropy of the ICM and reduces its cooling rate. Within 1-2 Gyr, star formation completely consumes the cold gas, which leads to a brief shutoff of the AGN. The ICM quickly cools and develops multiphase gas again, followed by another cycle of star formation/AGN outburst. Within 6.5 Gyr, we observe three such cycles. The average star formation rate is ~ 40 solar mass/yr. The black hole accretion rate shows large variations, but the average correlates well with the star formation rate and is roughly one order of magnitude lower.

Thank you!

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