

Beyond the Cores of Cool Core Galaxy Clusters

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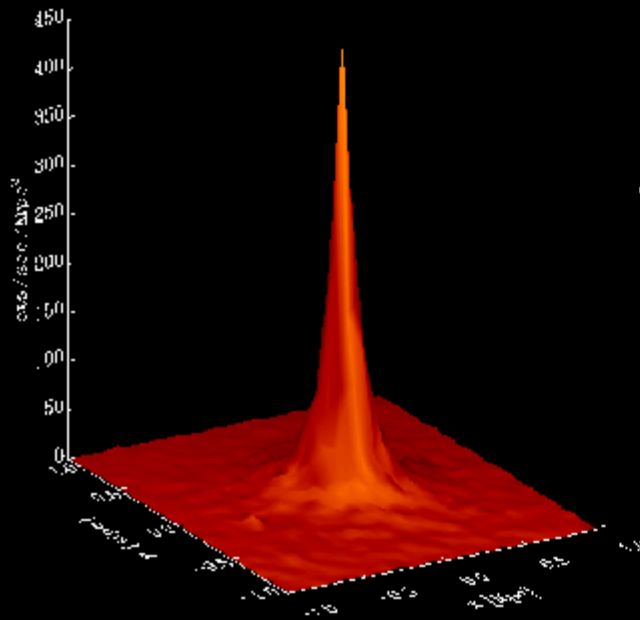
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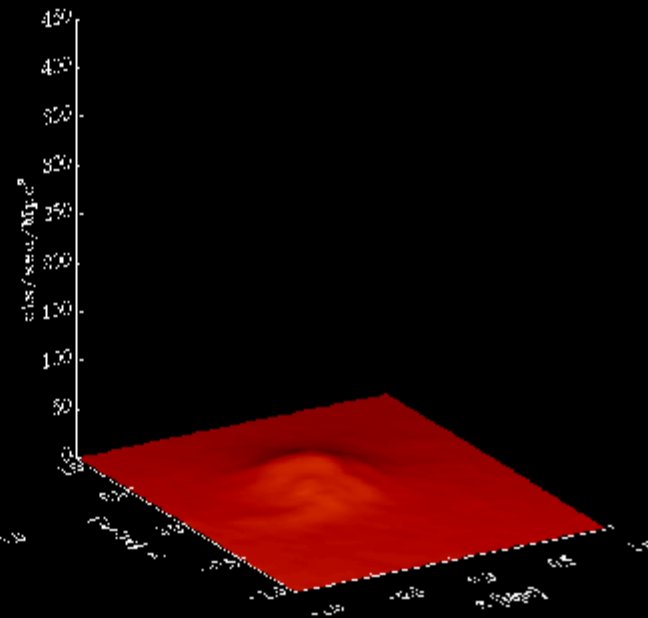
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Cooling Core vs Non-Cooling Core Clusters

Abell 478



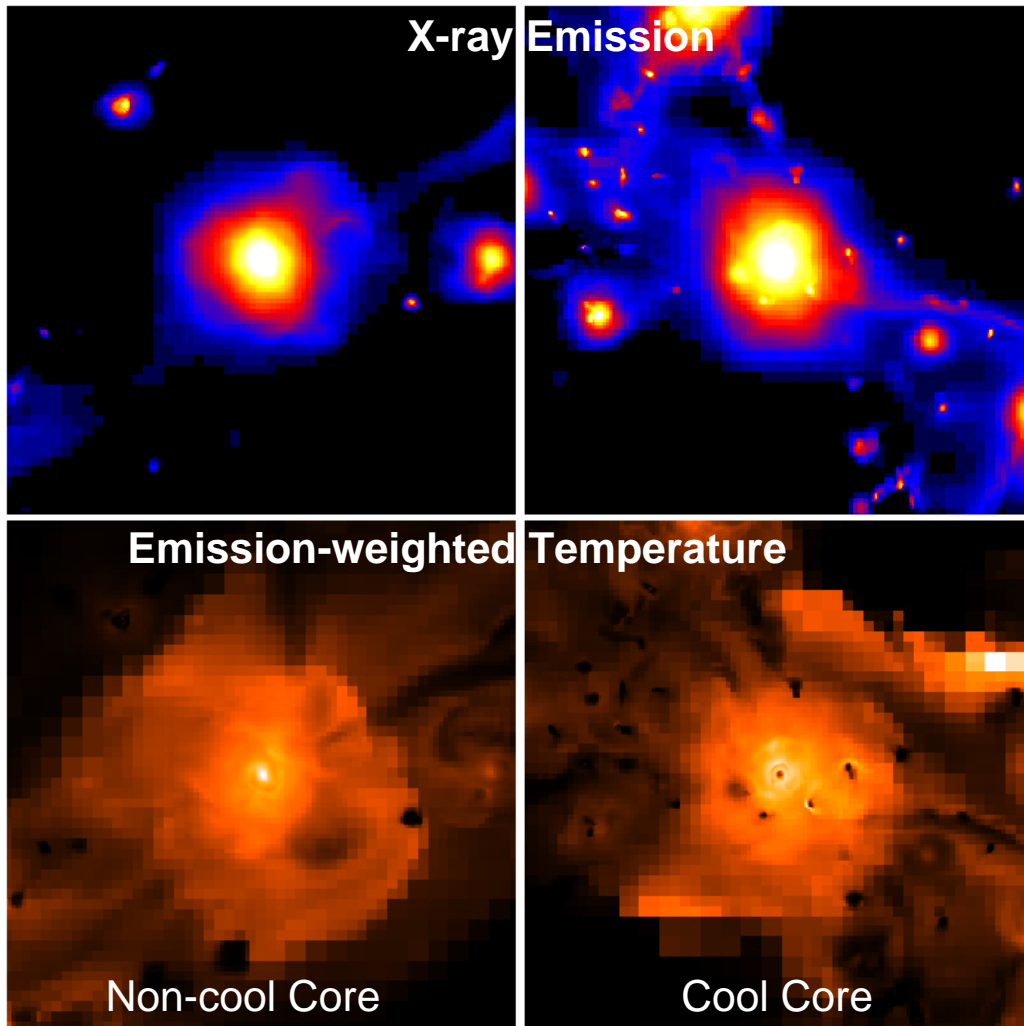
Coma



(slide courtesy of A. Fabian)

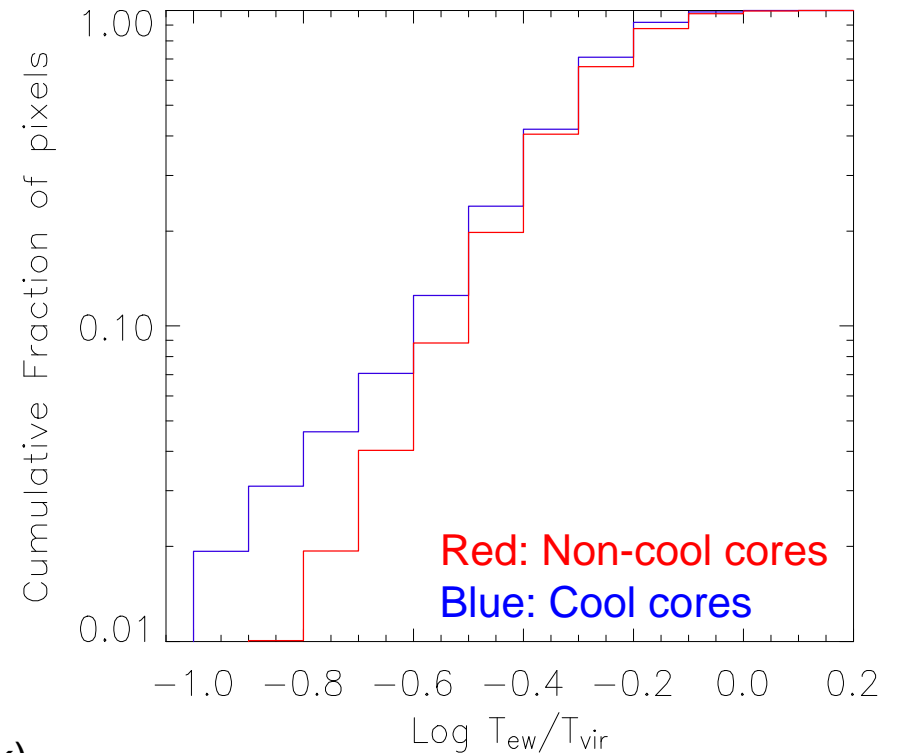
Why “Cooling Flows” Don’t Work

- By-products of presumed $100 M_{\odot}$ /yr infall are not seen:
 - Star-formation < 1000 times of expected rate
 - Little or no HI
 - Molecules like CO not detected in abundance or over extended volume
- Central temperatures observed to be not less than $\sim 0.3 \cdot T_{\text{virial}}$
- Simple model does not account for on-going accretion/mergers from supercluster environment, producing turbulent ICM



(Simulations include cooling, star formation, & feedback)

**Adaptive-Mesh Refinement
Hydro/N-body Cosmology
Simulation using ENZO**
[15.6 kpc peak resolution, (250 Mpc)³
volume, concordance Λ CDM]

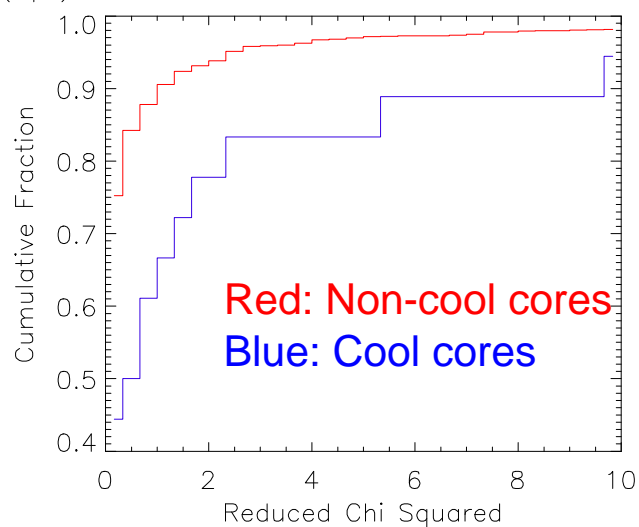
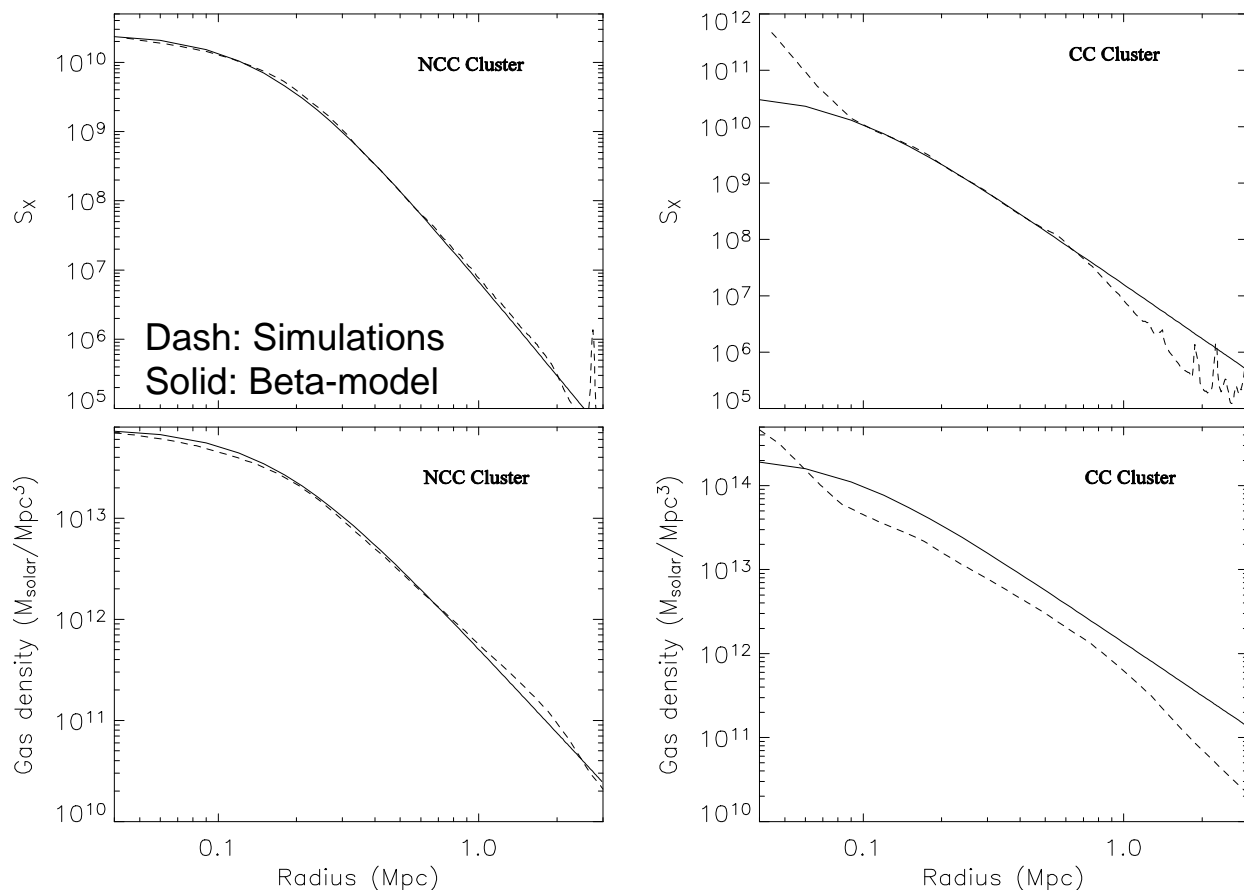


- More cold gas outside the cores in cool-core clusters than in non-cool core clusters.
- Cool core clusters lie within a denser, more crowded supercluster environment.

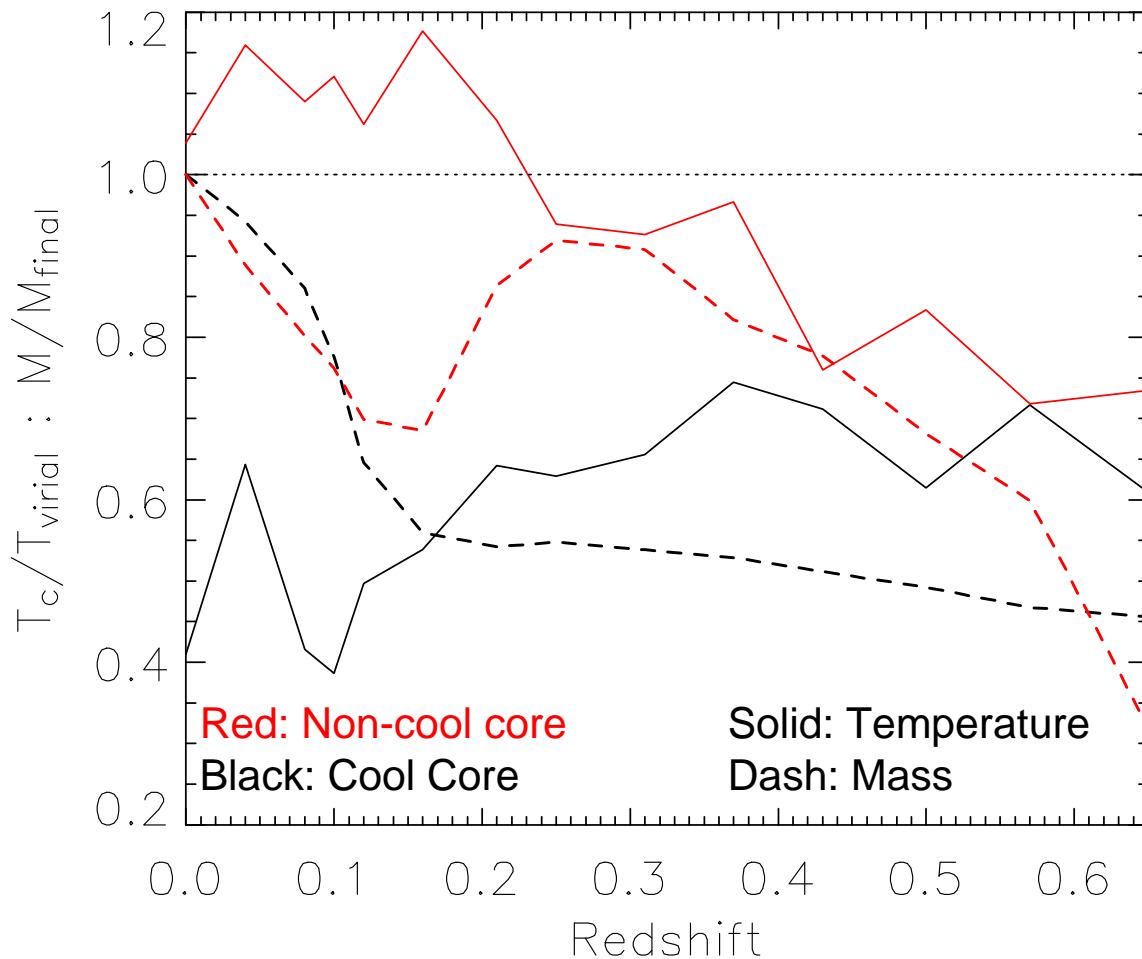
X-ray Surface Brightness Profiles

- Non-cool core clusters are fit very well to beta models.

- Cool core clusters are fit poorly by beta models between r_{500} and r_{200} .



A Realistic Model for Cool Core Clusters within a Cosmological Context



- Non-cool core clusters suffer major mergers early which destroys embryonic cool core that does not re-form later.
- Cool core clusters grow slowly, adding cool gas to their centers via mergers; cool cores survive late major mergers.

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