Chandra Observations and the Dynamics of the Multiple Merger Cluster of Galaxies Abell 85

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Abstract

We have obtained Cycle 1 Chandra observations of the Abell 85 cluster of galaxies using the ACIS-I detector. Abell 85 is in the early stages of a multiple merger with two smaller subclusters, one impacting the main cluster from the south and one from the southwest. It also has a moderately strong cooling flow ($\dot{M} = 108\ M_{\odot}/\mathrm{yr}$) associated with the main cluster center.

The southern subcluster contains the remnant of a cooling flow which has not been completely disrupted by the merger, similar to the "cold fronts" seen in Abell 2142 and Abell 3667. A possible bow shock precedes the cold front. We determine the relative merger velocity of the southern subcluster from the stagnation pressure at the cold front and from the standard Rankine-Hugoniot jump conditions at the bow shock. We then construct a model for the merger based on this kinematic information.

The smaller and less massive southwestern subcluster is host to a filamentary radio relic. We discuss possible scenarios for its formation.

We also examine the interaction between the AGN at the center of the main cluster cooling flow and the surrounding X-ray gas. The AGN appears to have excavated a cavity in the X-ray gas on at least one side of the AGN core. Several X-ray "knots" are also observed near the center of the cooling flow, perhaps indicating further interaction of the AGN with the gas in the cooling flow, or a cooling wake due to relative motion of the central galaxy and the intracluster gas.

CATEGORY: CLUSTERS OF GALAXIES