Resolving the radio-X-ray interaction in Cygnus A: an observation with Chandra

D. A. Smith(*University of Maryland*) A. S. Wilson (*University of Maryland*), K. A. Arnaud (*NASA/GSFC*), Y. Terashima (*University of Maryland*) A. J. Young (*University of Maryland*)

Abstract

The results from a recent *Chandra* ACIS-S study of the cluster surrounding Cygnus A are presented. We have deprojected the X-ray spectra taken from various elliptical shells in order to derive the run of temperature, density, pressure, and abundance for the ICM as a function of radius. We confirm a drop in temperature of the X-ray emitting gas from ~ 8 keV more than $\sim 2'$ from the center to $\simeq 5$ keV some $30''$ from the center, with the coolest gas immediately adjacent to the radio galaxy. "Belts" of slightly cooler ($\simeq 4$ keV) X-ray emitting gas run around the minor dimension of the cavity created by the radio source. We find a metallicity gradient in the X-ray emitting gas, with the highest metallicities ($\sim$ solar) in the inner annuli, decreasing to ~ 0.3 solar in the outer parts. The total mass within 500 kpc is found to be (2.0–2.8) $\times 10^{14} M_{\odot}$ and approximately 3.5–5% of the mass is X-ray emitting gas. Finally, we also determine the temperature of the X-ray emitting gas at the center of the on-going merger between the main cluster and a smaller cluster to the NW.

CATEGORY: CLUSTERS OF GALAXIES