Chandra Observations of X-ray Emission from the Radio Lobes of Centaurus A: Indirect Evidence of a Counterjet?

R. P. Kraft,W. R. Forman, C. Jones, S. S. Murray, S. Vázquez (*SAO*), M. J. Hardcastle, D. M. Worrall (*Univ. of Bristol*),

Abstract

Our two 35 ks Chandra/ACIS-I observations of the nearest radio galaxy Centaurus A (d=3.4 Mpc) have provided an unprecedented view of the X-ray fine structure of a relativistic jet and its relationship with the surrounding hot interstellar medium. In this presentation we will discuss X-ray emission from the radio lobes, focusing primarily on an interesting feature in the SW. This feature consists of a bright enhancement at the leading edge of the radio lobe (not seen in the NE lobe) and diffuse emission co-incident with the lobe but offset from the peak of the radio emission. It's X-ray spectrum is described equally well by power-law and depleted-abundance optically-thin thermal models, but the lack of significant radio emission argues against a non-thermal origin. The diffuse X-ray component coincident with the radio lobe cannot be inverse Compton scattering of CMB photons off relativistic electrons in the lobe unless the lobe is far from equipartition. We suggest that the X-ray emission originates in a shell or cap of thermal plasma surrounding the radio lobe. The temperature and density of the enhancement are consistent with adiabatic compression of the hot ISM of the galaxy and imply that the thermal plasma is overpressured relative to the lobe, making it unlikely that the radio-emitting plasma is responsible for this compression if the lobe is close to equipartition. Additional compression will result if the lobe departs from standard equipartition by containing a large population of unseen protons or low-energy electrons. Alternatively, the ISM may have been compressed into a shell by an unseen kiloparsec-scale counterjet.

CATEGORY: ACTIVE GALAXIES AND QUASARS