Deep X-ray Observations of Normal Galaxies from $z \approx 0.1$–1

A. E. Hornschemeier(*Penn State*), CDF-N Team

[Contributed talk, 15min.]

Abstract

Extremely deep (≈ 1 Ms) Chandra observations are detecting optically "normal" galaxies in increasing numbers. These "normal" galaxies are objects which do not show the obvious signatures of actively accreting supermassive black holes, and likely have X-ray emission dominated by X-ray binaries, supernova remnants and diffuse ISM. In some cases these objects also have contribution from a low-luminosity AGN. In even deeper (> 1 Ms) Chandra surveys, these normal galaxies are expected to arise as perhaps the most numerous class of X-ray emitters.

The Chandra Deep Field-North (CDF-N) survey has reached 1 Ms of ACIS coverage of the Hubble Deep Field-North and its environs. This superb X-ray coverage maintains this region of extragalactic sky as the most comprehensively studied at all wavelengths, which also makes it an excellent choice for a comprehensive X-ray study of normal galaxies at higher redshifts ($z > 0.1$). We are thus now able to place X-ray constraints on galaxy evolution over cosmologically interesting timescales.

Of the 370 X-ray sources detected in the CDF-N area, approximately 70 have the low X-ray to optical flux ratios typical of normal galaxies. The CDF-N team is following up these 70 objects with optical spectroscopy using the Hobby-Eberly and Keck Telescopes. For well-characterized galaxies (those with redshift and morphological information) not individually detected in the X-ray, we find statistical detections using stacking analyses. Both of these approaches and their impact on our understanding of the evolution of galaxies will be discussed.

CATEGORY: NORMAL GALAXIES