Hard X-ray Emission and the Ionizing Source in LINERs
Yuichi Terashima1, Luis C. Ho2, and Andrew F. Ptak3

1NASA Goddard Space Flight Center, Code 662, Greenbelt, MD 20771
2The Observatories of the Carnegie Institution of Washington, 813 Santa Barbara St., Pasadena, CA 91101-1292
3Department of Physics, Carnegie Mellon University, 5000 Forbes Ave., Pittsburgh, PA 15213

abstract

We report X-ray fluxes in the 2–10 keV band from LINERs (low-ionization nuclear emission-line regions) and low-luminosity Seyfert galaxies obtained with the satellite. Observed X-ray luminosities are in the range between $4 \times 10^{39}$ and $5 \times 10^{41}$ ergs s$^{-1}$ cm$^{-2}$ s$^{-1}$, which are significantly smaller than that of the “classical” low-luminosity Seyfert 1 galaxy NGC 4051. We found that X-ray luminosities in 2–10 keV of LINERs with broad H$\alpha$ emission in their optical spectra (LINER 1s) are proportional to their H$\alpha$ luminosities. This correlation strongly supports the hypothesis that the dominant ionizing source in LINER 1s is photoionization by hard photons from low-luminosity AGNs. On the other hand, the X-ray luminosities of most LINERs without broad H$\alpha$ emission (LINER 2s) in our sample are lower than LINER 1s at a given H$\alpha$ luminosity. The observed X-ray luminosities in these objects are insufficient to power their H$\alpha$ luminosities, suggesting that their primary ionizing source is either than an AGN, or that an AGN, if present, is obscured even at energies above 2 keV.