RESULTS FROM ASCA SKY SURVEYS

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1. Introduction

The origin of the Cosmic X-ray Background (CXB) radiation has been investigated extensively by soft X-ray deep survey imaging observations with *Einstein* and *ROSAT*. In contrast, the lack of telescopes capable of detecting hard X-rays has prevented us from extensive study of the nature of the CXB in the energy range above 2 keV before *ASCA*.

ASCA Deep Sky Survey (DSS) and Large Sky Survey (LSS) were intended to carry out unbiased surveys in the wide energy range of 0.5–10 keV. DSS was planned to survey a small sky region with extremely high sensitivity reaching to the source confusion limit of the *ASCA* XRT, while LSS covers a much larger sky area with relatively shallow exposures. These two surveys play complimentary roles in our approaches to the nature of the faint X-ray objects and the origin of the CXB, especially in the 2–10 keV band.

2. DSS Results

The DSS consists of moderately deep pointings of five sky regions and extremely deep pointings of Selected Area 57 (SA57) (Ogasaka 1996). The data reduction and analysis have been done for the Lynx Field, the Lockman Hole and a part of SA57, covering a total solid angle of 0.29 deg^2. The $N(>S)$ in the 2–10 keV band was derived as 55 ± 25 deg^{-2} at the flux limit

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of 3.80×10^{-14} erg sec^{-1} cm^{-2}. This is consistent with the extrapolation of Log$N$–Log$S$ relations from previous experiments(*e.g.*, Hayashida 1991; Piccinotti *et al.* 1982). At this flux limit about 40% of the CXB intensity in the 2–10 keV band is resolved into discrete sources. On the other hand, the $N(>S)$ in the 0.5–2 keV band is consistent with more sensitive *ROSAT* Log$N$–Log$S$ relation derived by Hasinger *et al.* (1993).

3. LSS Results

The Large Sky Survey, where a continuous sky regions near the North Galactic Pole is systematically surveyed, covered 6 deg^2 up to the present (Ueda 1996). We detected $\sim$ 50 sources in the survey energy band of 2–10 keV whose flux distribute from 1.5×10^{-13} to 2.0×10^{-12} erg sec^{-1} cm^{-2}. The derived Log$N$–Log$S$ relation above 2 keV is consistent with the extrapolation from the previous results. The average spectrum for the sources with flux less than 2.5×10^{-13}erg sec^{-1} cm^{-2} shows a photon index of 1.5$\pm$0.2 above 2 keV, which is harder than that of bright AGN observed so far. This result suggests that the hard sources responsible for the CXB above 2 keV appear when the sensitivity drops to $\sim 10^{-13}$erg sec^{-1} cm^{-2}.

4. Source Identifications

We have carried out the optical follow-up observations for X-ray sources detected from the Lynx, SA57 and LSS fields. Significant fraction of hard X-ray dominated sources were identified with narrow-line objects. One of them is the narrow-line quasar at z$\simeq$0.9 discovered from the Lynx Field (Ohta *et al.* 1996). It is possible that this object is the "type-2 quasar," whose existence has been expected from the unified model of AGNs, and from the "spectral paradox" of the CXB.

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