(NASA-CR-196265) A ROSAT DEEP SURVEY OF THE BEST STUDIED HIGH LATITUDE AREAS Final Technical Report, 1 Aug. - 31 Jul. 1994 (Arizona State Univ.) 2 p

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ANNUAL REPORT

REPORTING PERIOD: For August 1 through July 31, 1994

ROSAT Grant Number: NAG5-2322

I. PRINICIPAL INVESTIGATOR: Rogier A. Windhorst

II. INSTITUTION: Arizona State University

III. PROJECT TITLE: A ROSAT Deep Survey of the Best Studied High Latitude Areas

IV. SUMMARY OF PROJECT ACTIVITIES:

1. Brief description of the primary objectives and scope of the project:

Our first deep PSPC survey has been highly successful. We received an additional 19.2 ksec with the PSPC in another field during the AO-3 cycle. These two fields have been extensively studied in the optical ($B_J \lesssim 26$ mag) and radio ($\gtrsim 50$ μJy) from the ground. The data obtained from both fields will yield ~200 discrete X-ray sources down to $\sim 7 \times 10^{-15}$ $ergs\ cm^{-2}\ s^{-1}$, which permits statistically significant studies of: 1) the nature of weak X-ray sources (AGN, starburst galaxies, clusters, stars); 2) the turn-off in their log(N)–log(S) plus their contribution to the XRB; 3) the X-ray–optical–radio luminosity function and its evolution with cosmic time; and 4) the effect on all these properties of the ~20–30% field–to–field fluctuations expected from deep radio-optical surveys.

2. Description of the findings to date:

Over the past decade we used Westerbork, the VLA, the Hale 200" and KPNO 4m telescopes to obtain deep multi-wavelength studies of several Selected Areas. These data include: over 1,000 weak radio sources in 8 deg^2 down to 20 μJy ; nearly 100% complete optical identifications from deep contiguous CCD-mosaics down to V~26 mag (Windhorst et al. 1987, 1991); redshifts for 300 galaxies with $V \lesssim 22.5$ mag (Koo & Kron 1988) and optically-selected AGN with $B \lesssim 23$ (Anderson & Schechter 1988). The faint radio source population consists of both giant ellipticals and actively starforming galaxies. The latter cause the excessive number of sub-mJy radio sources (Windhorst et al. 1985).

Before ROSAT's all sky survey, our best knowledge of the X-ray sky at the $\sim 10^{-13}$ $ergs\ cm^{-2}\ s^{-1}$ level came from Einstein surveys (Giacconi et al. 1979; Maccacaro et al. 1982, 1991; Gioia et al. 1990; Griffiths et al. 1983, 1989), which showed the faint X-ray counts are dominated by QSO's and Seyferts (AGN), with a minority of BL-LAC's, starburst galaxies, cluster and cD galaxies. Preliminary results from 30 ksec PSPC surveys of QSO fields have shown that AGN also dominate the ROSAT number counts (> 100 deg^{-2}). The faint log(N)–log(S) slope *appears* to turn over from –1.5 to about –1.2 just below the Einstein Deep Survey limit ($S_X \sim 3 \times 10^{-14}$ cgs; Shanks et al. 1991; Hasinger 1991, 1992; Anderson et al. 1992; Windhorst et al. 1992).

During AO-1, we obtained a total of 67 ksec good PSPC data on our survey field Lynx.3A. The limiting sensitivity is $\sim 6 \times 10^{-15}$ cgs (3.5σ). Within the central 40′ diameter PSPC region, ~70 sources were found down to 3.5σ. The fractional contribution to the 0.5-2 keV XRB from these *detected* discrete sources is ~30% in the J-band. All our candidate id's were selected by positional coincidence with our deep optical/radio images, and most are stellar or compact in appearance. About two thirds have Gunn *gri* colors typical of QSO's, consistent with the 65–80% AGN fraction of Shanks et al. (1991). The remainder of our stellar objects are red, presumably X-ray stars. We also found several compact galaxy ids, several galaxies in groups or clusters (one with estimated z>0.75 from colors), and a starburst radio galaxy with known z=0.451.

For AO-3 we received ~20 ksec PSPC data on another survey field VLB. Our preliminary analysis shows ~30 sources within the central PSPC region. Optical spectroscopic work continues

on this field to determine the likely optical candidate(s) for the X-ray sources. Work also continues on cross-correlating the X-ray sources with the radio sources.

3. Name and date (or anticipated date) of the publication of results:

We expect to submit a paper this fall (1994) to the Astronomical Journal. One of the key features of this paper will be the presentation of the optical identifications of the ROSAT X-ray sources as determined from spectroscopy done using the KPNO 4m HYDRA multi-fiber spectrograph and the MMT spectrograph.

4. Suggestions and additional comments:

None.

Signed,