VACUUM ULTRAVIOLET BACKGROUND RADIATION AROUND THE VIRGO CLUSTER REGION

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ABSTRACT. The vacuum ultraviolet (λ_{eff} = 156 nm and $\Delta\lambda \cong$ 30 nm) observation around the Virgo Cluster region (l = 280°–320° and b = 60°–80°) was performed by the GUV experiment, a rocket-borne two-dimensional imager. The diffuse background radiation in the high galactic latitude region was obtained after subtraction of the contributions from airglow, stars, and galaxies in the field of view. A comparison with HI 21 cm radio observations indicates a weak correlation of the diffuse ultraviolet (UV) background radiation with HI column density, suggesting a low scattering efficiency of the interstellar dust grains in the far-UV and the existence of the isotropic component in the diffuse background radiation.

1. INTRODUCTION

The GUV experiment was carried on the sounding rocket S520–8, which was launched at 16:15 UT (= 25:15 JST) on 21 February 1987 from the Kagoshima Space Center of the Institute for Space and Astronautical Science (ISAS), Japan. The main objective of the GUV experiment was to measure the total UV fluxes of galaxies in the Virgo Cluster as well as the diffuse background radiation around the cluster. Details of the experiment and the observations of stars and galaxies have been reported elsewhere (Onaka et al. 1989). This report presents the results of observations of the diffuse background radiation by the GUV experiment.

The GUV experiment consists of two identical telescopes with different fields of view, each 4° in diameter. The detector system is a two-dimensional imager provided by a CsI-coated microchannel plate and a resistive anode. Two-dimensional imaging experiments have an advantage in that they eliminate the contributions from pointlike sources. On the other hand, they lack spectral information, and interpretations must be made with caution if any line emission is present.

2. RESULTS

After subtraction of the contributions from point sources and the altitude-varying components of the airglow, a possible correlation of the UV background radiation with HI 21 cm radio intensity was examined. The corresponding radio data were obtained by integrating the intensity of the area in proportion to the GUV observing time. The Bell Laboratories survey data of HI 21 cm were used in this study (Stark et al. 1989). The result is shown in Figure 1.

The slope of the regression line indicates the galactic component of the diffuse background. If the dust-scattering model by Jura (1979) is applied, the GUV results indicate that $a(1 - g) = 0.065 \pm 0.015$, where a and g are the albedo and the asymmetry factor of the dust grains, respectively. This value is slightly smaller than that obtained from the space shuttle

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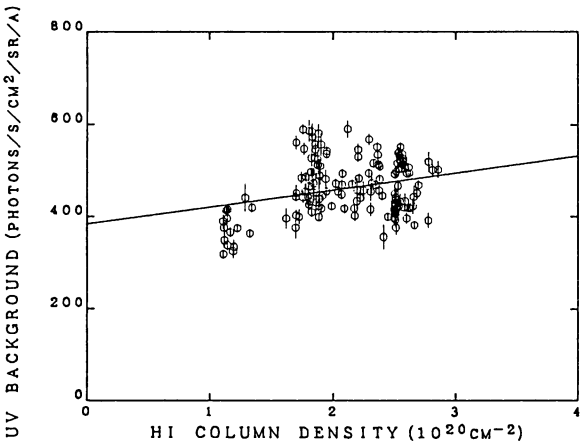

Figure 1. The GUV diffuse background intensity vs. the HI column density, assuming the line profiles are optically thin. The regression line is also indicated.

experiment (Hurwitz, Martin, and Bowyer 1986). Since the fluorescence of molecular hydrogen may also be contributing to the diffuse background (Jakobsen 1982), this scattering efficiency may be regarded as a upper limit.

Figure 1 suggests the presence of an isotropic component in this wavelength region (Murthy et al. 1989). A lower limit of the intercept of the recurrent line is estimated to be 300 photons cm^{-2} s^{-1} sr^{-1} $Å^{-1}$. There may be contributions of about 100 cm^{-2} s^{-1} sr^{-1} $Å^{-1}$ from airglow and faint point sources. If there is line emission as reported by Feldman, Brune, and Henry (1981), its contribution is estimated to be 70 ± 25 cm^{-2} s^{-1} sr^{-1} $Å^{-1}$. The GUV experiment suggests the intensity of 100 cm^{-2} s^{-1} sr^{-1} $Å^{-1}$ as a lower limit of the isotropic component of the diffuse UV background continuum radiation.

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REFERENCES

Feldman, P. D., Brune, W. H., and Henry, C. R. 1981, *Ap. J. (Letters)*, **249**, L51.
Hurwitz, M., Martin, C., and Bowyer, S. 1986, *Adv. Space Res.*, **6**, 2.
Jakobsen, P. 1982, **106**, 375.
Jura, M. 1979, *Ap. J.*, **227**, 798.
Murthy, J. et al. 1989, *Ap. J.*, **336**, 954.
Onaka, T. et al. 1989, *Ap. J.*, **342**, 238.
Stark, A. A. et al. 1989, in preparation.

P.M. Gondhalekar: *You showed some blue stars not included in the S2/68 catalogue; have you tried to identify these stars?*

T. Onaka: Yes, we have searched for the candidates in the Palomar Sky Survey Print and found that there are objects corresponding to most blue sources (Onaka et al. 1989).