

OPTICAL BACKGROUND FROM GALAXIES

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ABSTRACT. The optical brightness of the sky due to galaxies is determined up to 15.7 Zwicky magnitude and to $B = 15^m$.

1. INTRODUCTION

Some years ago we initiated a project known as the Metacatalog of galaxies. The early state of the project is given by Kalinkov and Kuneva (1982) and Kalinkov (1982). The Metacatalog contains information for galaxies, clusters of galaxies, counts of galaxies and references.

Now we have a merged catalog of galaxies in which the main catalogs of galaxies are incorporated, e.g., Zwicky et al. (1961-1965), Nilson (1973), Vaucouleurs et al. (1976), Lauberts (1982), Huchra et al. (1983), Fairall and Jones (1988). Many lists of galaxies are also included in our catalog.

Here we use this catalog to compute the optical brightness of the sky due to galaxies. Two cases are studied: all Zwicky galaxies (27,841) and all galaxies up to $B_T = 15.0$ (14,361).

An attempt to remove the influence of absorption in our Milky Way is made.

1.1. Zwicky Galaxies

We use the original magnitude of the Zwicky catalog without any correction.

Assuming a $\text{csc}(b)$ law for the galactic extinction, a standard procedure for solution of

$$\log N(b) = \log N_0 + 0.6 A_V \text{csc}(b) \quad (1)$$

is applied. $N(b)$ is the number of galaxies (per square degree) observed at galactic latitude b , and A_V is the extinction coefficient. The galactic latitude in (1) is $b = \sin^{-1}((\sin b + \sin(b + \Delta b))/2)$, which halves the corresponding zones of Δb .

The coefficients are given in Table 1.

	$\Delta b = 5^\circ$		$\Delta b = 10^\circ$	
	$b > 0$	$b \leq 0$	$b > 0$	$b \leq 0$
A_V	0.256	0.225	0.322	0.316
$\log N_0$	0.497	0.451	0.573	0.558

The most reliable extinction coefficient is $A_V = 0.256$, the Hubble's value. Therefore, the Zwicky catalog may be used to derive A_V (cf. Vaucouleurs and Buta, 1983).

All Zwicky magnitudes are corrected for galactic extinction. The number of galaxies which could not have been observed due to absorption is determined in accordance with the observed luminosity function and the latter are added in the magnitude range $([15.7 - A_V \text{csc}(b)] + 15.7)$. Similar corrections are made for regions outside the scope of the Zwicky catalog.

Table 2. Optical Brightness (mag arcsec⁻²), due to Galaxies up to $m_{Zw} = 15.7$ and $B_T = 15.0$

m_{Zw}, B_T	12.0	13.0	14.0	14.5	15.0	15.5	15.7
b							
85°–90°	31.2	31.1	30.8	30.7	30.5	30.3	30.2
	31.0	30.9	30.7	30.6	30.2		
80–85	31.4	31.3	31.1	31.0	31.0	30.8	30.7
	31.2	31.1	31.0	30.9	30.7		
75–80	31.3	31.0	30.9	30.8	30.7	30.6	30.5
	31.1	30.9	30.7	30.7	30.4		
70–75	31.6	31.2	31.0	30.9	30.8	30.5	30.4
	31.4	31.1	30.9	30.8	30.6		
65–70	31.8	31.5	31.3	31.2	31.0	30.8	30.7
	31.6	31.4	31.1	31.0	30.8		
60–65	32.2	31.9	31.6	31.6	31.4	31.1	31.0
	32.1	31.8	31.5	31.4	31.1		
55–60	31.8	31.6	31.4	31.3	31.1	31.1	30.7
	31.8	31.6	31.3	31.2	31.0		
Mean	31.6	31.4	31.1	31.1	30.9	30.7	30.6
st. dev.	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Mean	31.4	31.2	31.0	30.9	31.0		
st. dev.	0.4	0.4	0.3	0.3	0.5		

Table 2 contains the results. In this table, the first rows refer to the optical background from galaxies, up to $m_{Zw} = 15.7$.

1.2. Galaxies up to $B = 15.0$

Some relations between B_T (RC2) and magnitudes from other catalogs have been found. These relations are used for transformation into the B_T system. For this sample of galaxies $A_V = 0.172$ (for $b > 0$) and 0.155 (for $b \leq 0$). The results for the B_T background are given by the second row of numbers in Table 2.

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