ON THE MASS DENSITY DISTRIBUTION OF THE INNER GALAXY

T. Maihara
Department of Physics, Kyoto University, Kyoto

Based on current 2.4-micron observations of the Galaxy (see Okuda et al. in this Symposium), we have proposed a specific model for the bulge component. This model is a concentric spheroid with an axial ratio of ~0.5; $\rho(a) \propto (a^2+a_c^2)^{-1}\exp(-(a/a_o)^2)$, where a_o = 2.5 kpc and a_c = 0.14 kpc respectively. A constant mass-to-luminosity ratio $M/L_V \simeq 7.6$ is assumed, which yields the relevant rotational velocity in the inner region (Figure 1); the absolute velocity is normalized to 250 km s^{-1}. This value of M/L_V is likely to meet with giant-rich synthetic models for the nuclear bulge of M31.

Other important information from the 2.4-micron observations concerns the existence of a particular inner disk component suggested in the longitudinal brightness distribution (Figure 2). The near-infrared intensity, which should represent the stellar distribution in the Galaxy, shows a prominent excess of radiation at R≃3~5.5 kpc over that of the

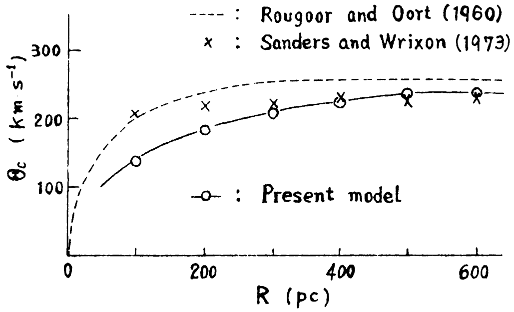

Figure 1. Rotation curves in the central region (left).

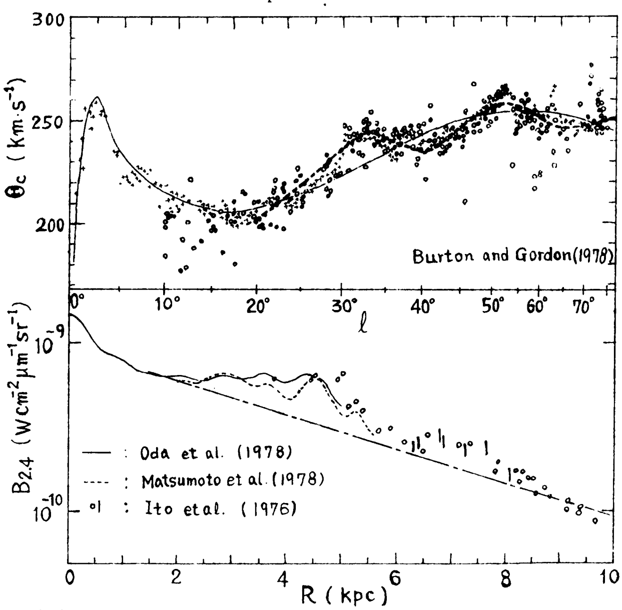

Figure 2. The upper:summarized rotational velocities in the Galaxy (Burton and Gordon 1978), the lower: 2.4-micron surface brightness along the galactic plane (right).

W. B. Burton (ed.), The Large-Scale Characteristics of the Galaxy, 381–382.

https://doi.org/10.1017/S0074180900014819 Published online by Cambridge University Press

so-called exponential disk. One can also notice a small excess at $R \simeq 6.5 \sim 8$ kpc. Although these features do not directly represent the actual radial distribution of stars, it is interesting to note that the excesses correspond exactly not only to the global behavior of the rotation curve provided by HI and CO observations but also to the wavy flucutations in it, as demonstrated in the figure.

DISCUSSION

Lockman: I notice that your infrared emission is not always symmetric about $b = 0°$, especially near $\ell = 20°$. Do you think that this is a feature of the stellar distribution or of the extinction?

Okuda: Modulation by the interstellar extinction is the most probable explanation.

Puget: What is the extent of the region over which you integrate to get the mass of dust which you give (10^5 $M_\odot$)?

Okuda: It is the mass in a cylinder with radius 300 pc and thickness 150 pc.

Stecker: Would you care to comment about the peak at $\ell \simeq 347°$, $b \simeq 0°$ in your observations?

Okuda: The peak may be due to some irregularities in the interstellar extinction or it may reflect a possible arm structure in the inner Galaxy.

Puget: You mentioned a 10μ luminosity for our Galaxy. So far observations have only been done with a beam-switching technique. The extended flux in the far infrared has been underestimated in several cases by about 1 order of magnitude. This could be the same for the 10μ flux.

Viallefond: The spiral M83 has been observed in the far infrared. Using a beam-switching technique, we observe a gradient of the infrared emission in the band 70-95μ along a scan almost parallel to the E-W direction. The signal-to-noise ratio is between 5 and 8. After integration of this gradient profile, we get the distribution of the far infrared emission along the scan. Two maxima are observed, at locations where the scan crosses the arms, which are very rich in HII regions. Because we do not detect a strong signal in the band 115-190μ, we presume that the bulk of the emission comes from HII regions rather than from molecular clouds although a large amount of molecular gas has been observed.