limits. Statistical errors involved in the star-count are analyzed in terms of the signal-to-noise ratio, the plate limit and the reseau size. Systematic errors due to the non-linearity in the number distribution of stars with magnitude are thoroughly analyzed, and a methodology is presented to correct for the effect of the systematic errors in the observed radial density gradient. The graphs are meant to be used in selecting proper size of the reseau and estimating errors inherent to the star-count analysis.

Efficiency of DRAO Radio Telescope

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In order to improve the antenna efficiency, we performed three kinds of works.

First, we adjusted the surface panel with the theodolite. The resultant surface random error is about 210μm.

Second, we compensated the gravitational deformation by the computer control of subreflector. The corrected antenna temperature is nearly constant within 10% above 30° in elevation.

Third, a new pointing model was made by observing the SiO maser sources. The pointing error is 8 seconds of arc rms.

After above works, the aperture efficiency and the beam efficiency at 100GHz were found to be 30% and 43% respectively. Now the scientific observations can be performed with our telescope.

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<研 究 論 文>

The Presence of Wielen Dip in the Disk Stellar Luminosity Function

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The disk stellar luminosity function is redetermined in order to check the Wielen dip is real or not, by mean absolute magnitude method utilizing the proper motion data of LHS catalog. The reduced proper motion diagram was used to exclude the contamination of the population II stars.

The derived luminosity function shows the similar dip in the magnitude range of $8<M_B<12$, with the one mentioned by Upgren and Armandroff (1981) in the Wielen's (1974) luminosity function which was derived from the nearby stars. It is found that the most critical problem in the mean absolute magnitude method so far used, is that one relation between the mean absolute

magnitude $\langle M \rangle$ and the reduced proper motion H for main sequence stars had been applied to the all sample of proper motion stars. The relations between $\langle M \rangle$ and H for subdwarfs and white dwarfs as well as main sequence stars are derived and applied seperately to each group of stars.

The Disk Accretion of a Tidally Disrupted Star onto a Massive Black Hole

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We consider the consequences of the tidal disruption of a star by a massive black hole. We argue that the initial extremely eccentric orbit of the stellar debris will become a circular orbit near the tidal radius after experiencing strong shocks which thermalize the orbital energy on a relatively short time scale. The subsequent evolution of the accretion disk is studied using a time dependent α-disk model. The luminosity evolves asymptotically toward the power law $L \propto t^{-1.2}$, and the light-to-mass ratio of the disk-plus-black-hole exceeds unity for several thousand years after disruption, unless (1) the rate of disruptions is much lower than $10^{-4}\ M_{\odot}\mathrm{yr}^{-1}$, (2) most of the stellar debris is ejected or accreted without significant emission before circularization occurs, or (3) the viscosity parameter $\alpha \lesssim 0.01$. We suggest that some fraction of galaxies (particularly dwarf ellipticals) should be extremely bright at far ultraviolet wavelengths if they contain black holes of mass $10^{6\sim 8} M_{\odot}$. On the other hand, our results may argue against the presence of massive black holes in nearby galaxies such as M32.

Determination of the Distance to B361 by a Modified Version of the Wolf Diagram

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Current estimates, based on the same star count analysis, of the distance to the globule Barnard 361 range from 300pc to 650pc. All the problems associated with the estimates have been fully rectified in this study and a modification has been made to the classical Wolf diagram to improve the accuracy in the distance determination. A reference field was carefully selected close to the globule but well outside the globule boundary and star counts for this field were performed on the blue POSS plate in order to set up the reference magnitude sequence appropriate to the general area of B 361. From the reference sequence the stellar density function has been derived specifically for the direction toward the globule. Correction was made for the general interstellar extinction and the luminosity function with the Wielen's dip was adopted. The resulting density function clearly reveals the existence of the local Cygnus-Orion arm in the direction of B 361 at about 700pc away from the Sun. Analysis of the star-count data for the program field locates the globule at distance 600±50pc, thus the globule is an object located in the Cygnus-Orion arm, residing somewhat toward its leading edge.