CCD IMAGING WITH A 1° FIELD

R.-J. DETTMAR[1†], B.A. SKIFF[2] and K.M. XILOURIS[3]
[1] *Space Telescope Science Institute, 3700 San Martin Drive, Baltimore, MD 21218, U.S.A.*
[2] *Lowell Observatory, 1400 W. Mars Hill Rd., Flagstaff, AZ 86001, U.S.A.*
[3] *University of Crete, Physics Dept., Heraklion 714 09, Crete, Greece*

1. Introduction

At most research telescopes, the physical size of CCDs currently still restricts the accessible field-of-view. However, for galactic as well as extragalactic work a field significantly larger than the typical 15′ is needed to study objects with large angular extent. In particular, this is desirable for objects that are well studied in other wavelength regimes such as the radio or FIR. High quality surface photometry of structures ≥ 40′ can be obtained by using CCDs with telescopes of short focal lengths.

Here we present results from observations obtained with TI CCDs (15 μm pixels) attached to telescopes of 20 cm and 30 cm apertures at Lowell Observatory, Flagstaff, AZ and Mt. Sinakas Observatory, Crete, respectively.

2. Telescopes and Fields of View

Both instrumental set-ups were originally designed for cometary work. The Takahashi ε200 telescope ('BBST', Gallagher et al. 1991) is mounted on the side of the 1.1 m Hall-telescope at Lowell Observatory's Anderson Mesa site. A TI 800 x 800 CCD is used in the f/8 Newtonian focus. This set-up has ≈51′ field-of-view at an image scale of 4″/pixel. The 30 cm Schmidt-Cassegrain telescope on Mt. Sinakas has a f/3.2 focus. The TI4849 chip gives an image scale of 5″ covering a field of 48′ x 36′. The observations reported here were obtained with broad-band R and B_J filters. Flat field corrections were obtained by a combination of dome and night sky flats.

3. Scientific Applications

The following examples demonstrate the use of these telescopes for surface photometric studies of galaxies. Examples for applications in Galactic research are presented elsewhere at this conference (Papamastorakis et al.).

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† Affiliated with the Astrophysics Division in the Space Science Department of ESA.

H. T. MacGillivray et al. (eds.), Astronomy from Wide-Field Imaging, 79–81.

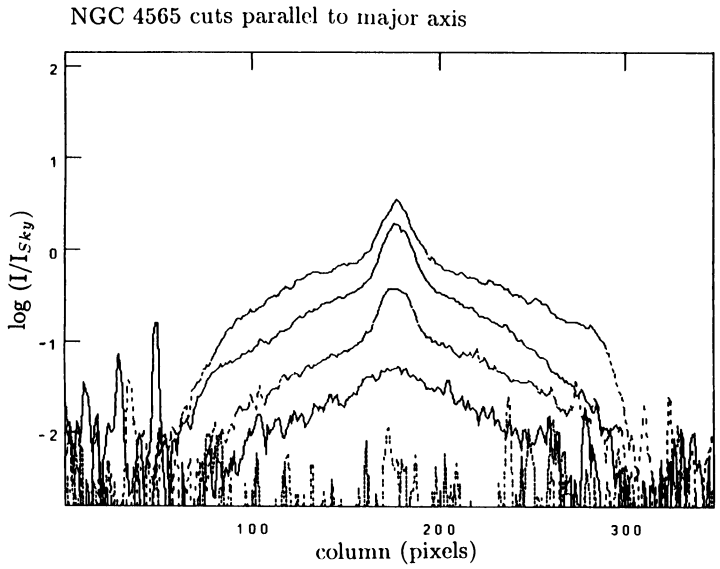

Figure 1. Several cuts through the sky-normalized intensity distribution of NGC 4565 parallel to the major axis. With the log I scale linear parts represent the exponential disk that can be followed out to its sudden decline at the cut-off radius. The lowest intensity cut represents the noise level.

3.1 SURFACE PHOTOMETRY OF NGC 3521.

NGC 3521, previously always considered a '*normal*' spiral, is one of the two galaxies with slowly declining rotation curves presented by Casertano & van Gorkom (1991). From a comparison of 28 well observed HI rotation curves these authors concluded that declining rotation curves are predomonantly observed in bright, compact galaxies and that this compactness is determined by the initial spin parameter of the proto-cloud. The angular extent of >20′ made deep imaging with CCDs difficult. Our CCD photometry obtained with the 20 cm telescope at Lowell Observatory shows at low surface brightness levels asymmetries and distortions (Dettmar & Skiff 1993). From this it is concluded that the compactness and mass distribution is influenced by a recent interaction or even merging event, i.e. evolution rather than formation.

3.2 CUT-OFF RADII OF GALACTIC DISKS

The sudden radial termination or '*cut-off*' of exponential disks in spiral galaxies was first noticed by van der Kruit & Searle (1981) in their photographic surface photometry of edge-on galaxies. One possible way to interpret this cut-off is in terms of the angular momentum distribution of the proto-cloud (van der Kruit 1988). Therefore, the determination of cut-off radii can help to constrain the conditions of disk galaxy formation. Using the example of NGC 4565, we demonstrate in Fig. 1 the feasibility of measuring cut-off radii for edge-on galaxies with large angular extent at a S/N level exceeding previous observations based on photographic material.

We have obtained similar data on NGC 253, NGC 891, M 82, NGC 3079, NGC 4244, NGC 4631 and NGC 7331.

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