EFOSC CCD camera is restricted to a few (~20) square arcminutes, this survey technique is very efficient to identify objects showing up strongly through either their emission-lines or molecular bands. Concurrently, a semi-automatic procedure has been worked out by G. Muratorio in the MIDAS environment (Muratorio and Azzopardi 1993) to select through an impersonal mode, and more rapidly than by visual examination, the objects of interest.

References

Azzopardi M., 1993, Survey of Carbon Stars and Emission Objects. In: Baschek B., Klare G., Lequeux J. (eds.) Proc. Heidelberg Conference, New Aspects of Magellanic Cloud Research. Springer-Verlag, Heidelberg, p. 86.

Azzopardi M., Breysacher J., 1979, *A&A* **75**, 120.

Azzopardi M., Breysacher J., 1980, *A&A* **39**, 19.

Azzopardi M., Breysacher J., Muratorio G., 1981, *A&A* **95**, 191.

Azzopardi M., Meyssonnier N., 1988, A Curtis Schmidt Survey of Hα-Emission Objects in the Small Magellanic Cloud. In: Blanco V., Phillips M.M. (eds.) Proc. CTIO 25th Anniversary Symp., Progress and Opportunities in Southern Hemisphere Optical Astronomy. Brigham Young University, p. 386.

Azzopardi M., Rebeirot E., 1991, Large Scale Structure and Kinematics of the MCs from Carbon Star Studies. In: Haynes R., Milne D. (eds.) Proc. IAU Symp. 148, The Magellanic Clouds. Kluwer, Dordrecht, p. 71.

Azzopardi M., Vigneau J., 1975, *A&A* **22**, 285.

Azzopardi M., Vigneau J., 1977, *A&A* **56**, 151.

Blanco V.M., McCarthy M.F., Blanco B.M., 1980, *ApJ* **242**, 938.

Blanco V.M., McCarthy M.F., 1983, *AJ* **88**, 1442.

Boroson T.A., Liebert J., 1989, *ApJ* **339**, 244.

Breysacher J., Lequeux J., 1983, *The Messenger* **33**, 21.

de Vaucouleurs G., Freeman K.C., 1972, *Vistas in Astronomy* **14**, 163.

Hardy E., Suntzeff N.B., Azzopardi M., 1989, *ApJ* **344**, 210.

Henize K.G., 1956, *ApJS* **2**, 315.

Heydari-Malayeri M., 1990, *A&A* **234**, 233.

Lindsay E.M., 1961, *AJ* **66**, 169.

Meyssonnier N., Azzopardi M., 1991, A New Survey for Hα-Emission-Line Stars and Related Objects in the SMC. In: Haynes R., Milne D. (eds.) Proc. IAU Symp. 148, The Magellanic Clouds. Kluwer, Dordrecht, p. 196.

Morgan D.H., 1992, *MNRAS* **258**, 639.

Muratorio G., Azzopardi M., 1993, Detection of Faint Hα Emission-Line Objects and Carbon Stars in the Magellanic Clouds. In: Baschek B., Klare G., Lequeux J. (eds.) Proc. Heidelberg Conference, New Aspects of Magellanic Cloud Research. Springer-Verlag, Heidelberg, p. 96.

Rebeirot E., Azzopardi M., Westerlund B.E. 1993, *A&AS* **97**, 603.

Sanduleak N., Philip A.G.D., 1977 *Publ. Warner and Swasey Obs.* **2**, 105.

Walker A.R., 1983, *MNRAS* **203**, 25.

Westerlund B.E., Azzopardi M., Breysacher J., 1986, *A&AS* **65**, 79.

Westerlund B.E., Azzopardi M., Breysacher J., Rebeirot E., 1991, *A&AS* **91**, 425.

Westerlund B.E., Azzopardi M., Breysacher J., Rebeirot E., 1992, *A&A* **260**, L4.

Westerlund B.E., Lequeux J., Azzopardi M., Rebeirot E., 1991, *A&A* **244**, 367.

Zickgraf F.J., Wolf B., Stahl O., Leitherer C., Appenzeller I., 1986, *A&A* **163**, 119.

Zickgraf F.J., Wolf B., Stahl O., Humphreys R.M., 1989, *A&A* **220**, 206.

Study of the Shapley Supercluster

S. BARDELLI (1,4), R. SCARAMELLA (2), G. VETTOLANI (3), G. ZAMORANI (4,3), E. ZUCCA (1,3), C.A. COLLINS (5) and H.T. MACGILLIVRAY (6)

(1) Dipartimento di Astronomia, Università di Bologna, Italy; (2) Osservatorio Astronomico di Roma, Monteporzio Catone, Italy; (3) Istituto di Radioastronomia/CNR, Bologna, Italy; (4) Osservatorio Astronomico, Bologna, Italy; (5) Physics Department, University of Durham, United Kingdom; (6) Royal Observatory, Edinburgh, United Kingdom

1. Introduction

Superclusters (SC's) are the largest physical structures we know of today, and they constitute a very powerful probe for cosmology and extragalactic research. Indeed, some of the important questions which may be answered by studying superclusters concern the formation of galaxies and of galaxy clusters and related astrophysical problems. For example, biasing processes and efficiency of galaxy formation, the large-scale dynamics, power spectra of primordial density fluctuations, trends of M/L with size, and interactions and feedbacks on galaxies from a rich environment can all be investigated through the study of superclusters.

Superclusters are relatively rare objects and therefore are, on average, at large distance from us. This fact makes it difficult to collect the amount of different data which is necessary to perform a detailed analysis of their intrinsic properties. Therefore, a great opportunity is given if one is able to study a not too far but very rich SC. Fortunately, these are the characteristics of the SC discovered by Scaramella et al. (1989), which comprises about 25 rich Abell clusters over ≈ 300 square degrees, located at a distance of ~ 140 h^{-1} Mpc in the Centaurus region. The extreme richness of this SC in terms of galaxies brighter than 17th magnitude is such that its core was already noted in 1930 by Shapley, who reported an excess of counts over ~ 2.2 square degrees. Hence the name of Shapley Supercluster (or Concentration, hereafter SSC).

The SSC is by far the richest (Vettolani et al., 1990) and most interesting SC within 0.1c from us (Zucca et al., 1993). In fact, this concentration appears exceptional also by studying the surface distribution of optical galaxies (Raychaudhury, 1989; Raychaudhury et al., 1991) and by analysing the spatial distribution of IRAS galaxies (Allen et al., 1990). The SSC is also prominent in the X-ray band (Lahav et al., 1989). Indeed, this region contains 6 of the 46 X-ray brightest clusters of the sky at $|b^{II}|>20°$ (Edge et al., 1990), i.e. 13 % of the X-ray brightest clusters reside in only 1.4 % of the sky.

The SSC is also likely to be an important player in explaining the peculiar motion of the Local Group with respect to the Cosmic Microwave Background frame. In fact, Scaramella et al. (1989, 1991) pointed out that the SSC may be responsible for a significant fraction (≲30 %) of the Local Group peculiar motion, adding its dynamical pull on the LG to that from a closer overdensity of galaxies at ~40h^{-1} Mpc. The latter overdensity of galaxies, dubbed "Great Attractor", was suggested to be the source of the Local Group acceleration (Lynden-Bell et al., 1988; Lynden-Bell et al., 1989; Faber&Burstein, 1988; Dressler, 1988). The suggestions of Scaramella et al. (1989, 1991), on the contrary, implied a significantly larger

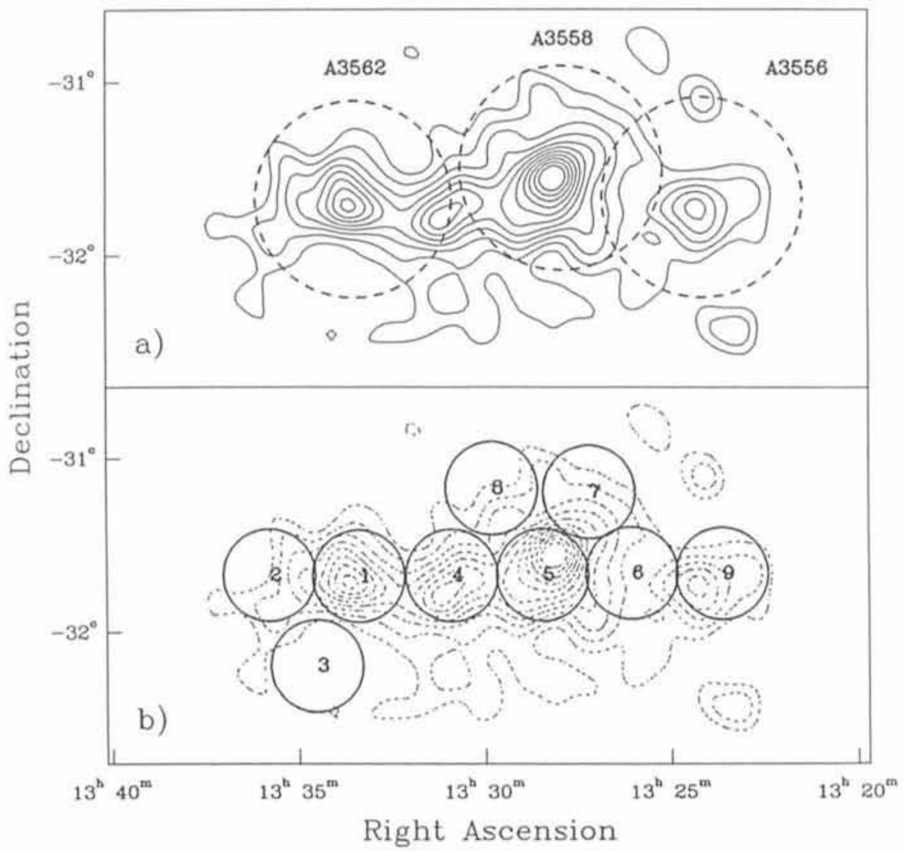

Figure 1: *a) Isodensity contours of the core of the SSC in an area of ~3°.5×2°. The figure refers to galaxies with $b_J \leq 19.5$ and binned in 1 arcmin × 1 arcmin bins; the data have been smoothed with a Gaussian with a FWHM of 6 arcmin. For the three Abell clusters of the core circles of one Abell radius have been drawn (dashed curves); the poor cluster SC 1329-314 is the peak between the clusters A3558 and A3562. b) The same as Figure 1a, with superimposed the nine OPTOPUS fields observed in March 1991.*

coherence scale for the peculiar velocity flow, a fact which seems to be supported by recent findings (Willick, 1990; Mathewson et al., 1992). Also, Tully et al. (1992) suggested that these two "attractors" could be part of a single elongated planar structure, extending for $\sim 450\,h^{-1}$ Mpc.

The astronomical interest of the SSC is therefore evident, and we are carrying on a long-term study of the SSC in order to describe its dynamical state and to determine its mass and its luminosity. Our project consists of redshift determinations (with the ESO telescopes at La Silla) for galaxies both in the clusters and in the intra-cluster field of the SSC, and of X-ray observations (ROSAT) of the hot gas in some of its clusters.

In this paper we report the current status of this project and our future plans.

2. Analysis of the Bi-Dimensional Distribution of Galaxies

The photometric data used in our analysis derive from the COSMOS/UKST galaxy catalogue of the southern sky (Yentis et al., 1992) obtained from automated scans of the UKST-J plates by the COSMOS machine. Our sample consists of all galaxies brighter than b_J = 20 in seven plates (382, 383, 443, 444, 445, 509 and 510), for which the catalogue lists accurate coordinates (α and δ), b_J magnitudes, major diameters, ellipticities and position angles.

The core of the SSC, formed by A3556, A3558, A3562 and SC 1329-314, is entirely contained in the plate 444. Figure 1a shows the isodensity contour map of the galaxies in this region. The radii of the dashed circles superimposed on the three Abell clusters correspond to $1.5\,h^{-1}$ Mpc (i.e. one Abell radius). The centre of the cluster SC 1329–314 coincides with the density enhancement between A3562 and A3558. This figure, in which the contours of each cluster smoothly join with those of the adjacent clusters, suggests the possibility that all these clusters may be interacting and may be part of a single dynamical structure. In order to better assess the dynamical status of this complex we need information about the three-dimensional distribution of galaxies in this region.

3. Analysis of the Three-Dimensional Distribution of Galaxies

In order to obtain three-dimensional information for the core of the SSC, we have covered it with a number of fields (shown in Figure 1b) observed with the

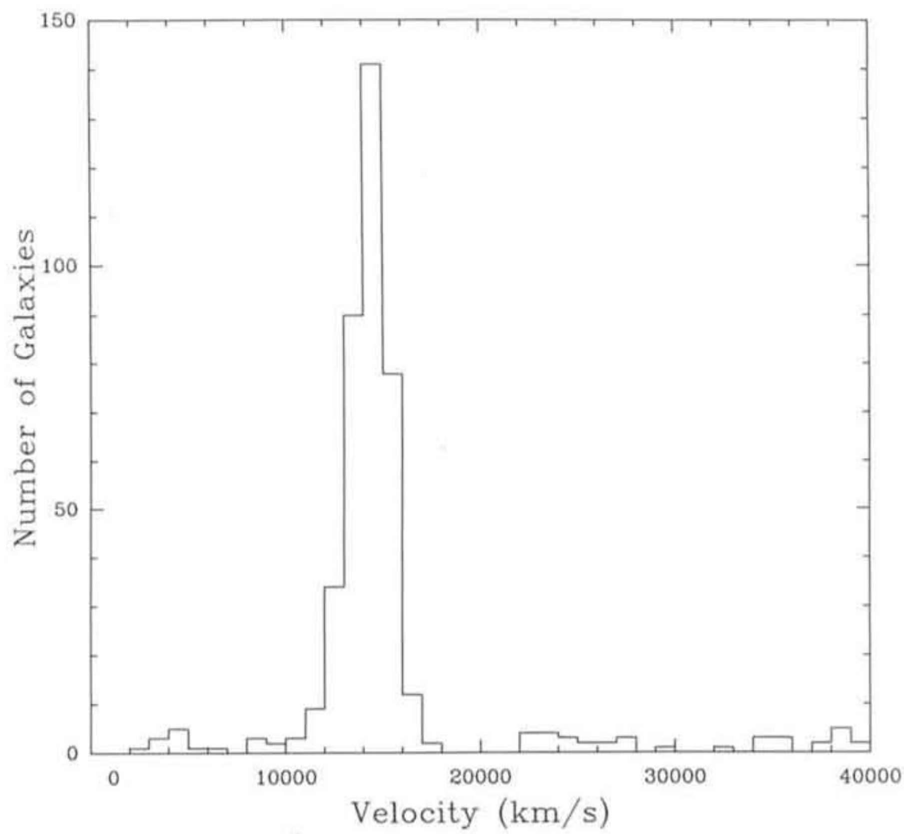

Figure 2: *Velocity histogram of 446 galaxies in the region of the core of the SSC.*

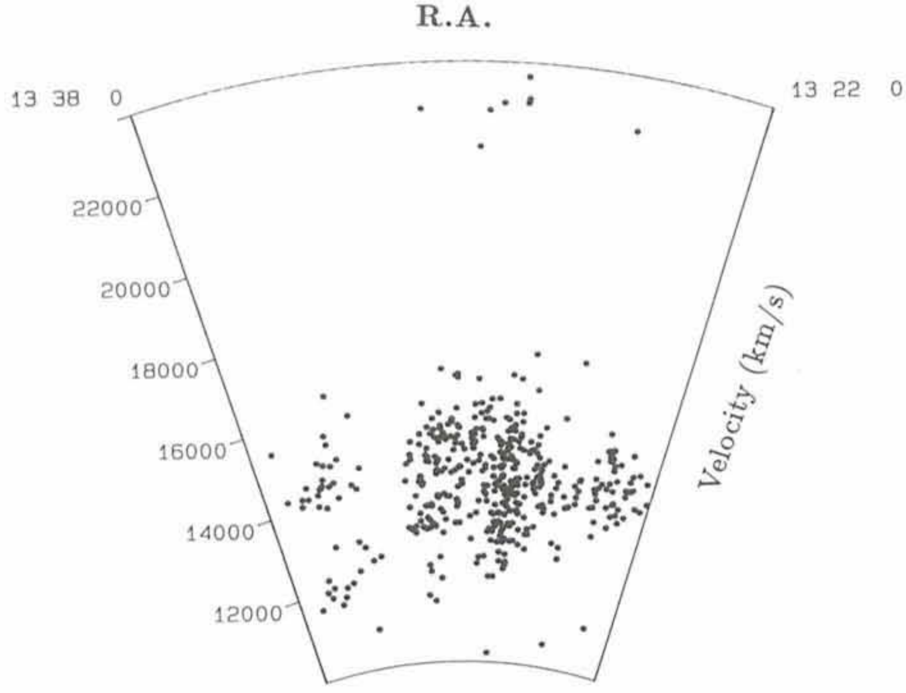

Figure 3: *Wedge diagram of our sample in the velocity range 10,000–24,000 km/s. The coordinate range is $13^h22^m < \alpha < 13^h38^m$ and $-32°35' < \delta < -30°35'$.*

ence of a void of about 4,000 km/s, just behind the peak. No galaxy is seen in the velocity range 18,000–22,000 km/s, where ~ 10 galaxies would be expected on the basis of a uniform distribution. This number has been computed by integrating the galaxy luminosity function with the magnitude limit corresponding to our data.

Figure 3 is a wedge diagram of this sample, in the velocity range 10,000–24,000 km/s. The "hole" on the left of the diagram is due to the absence of data in field #1, corresponding to the core of A3562. From this figure it is clear that the clusters and the galaxis between them form a single structure, as already indicated by the contour map in Figure 1a.

We have determined the mean and the dispersion of the velocities for the clusters in this region. However, the interpretation of these data is not straightforward because of the presence, outside the core of A3558, of a number of sub-condensations, some of which are clearly visible in Figure 3. A quantitative

OPTOPUS multifiber spectrograph (Lund, 1986) at the 3.6-m ESO telescope at La Silla. Two different observations were planned for three of these fields (#1, 4 and 5), because of their high density of galaxies. These observations were performed in March 1991; unfortunately field #1 could not be observed because of bad weather. For the same reason, the next observing run was completely lost also (April 1992), during which we had planned to extend the coverage of this area and to observe the concentration A3528-A3530-A3532, which is also part of the SSC.

We used the ESO grating #15 (300 lines/mm and blaze angle of 4°18′) which gives a dispersion of 174 Å/mm in the wavelength range from 3700 to 6024 Å. The detector was the Tektronix 512×512 CCD with a pixel size of 27 μm corresponding to 4.5 Å. Five out of the 50 OPTOPUS fibers were dedicated to sky measurements, while the remaining 45 fibers were dedicated to the galaxies. We have obtained a total of 421 spectra: 81 spectra (~19 %) were not useful for redshift determination, while 29 objects (~7 %) turned out to be stars, leaving us with a sample of 311 new galaxy redshifts. These data, added to the 135 redshifts already present in literature for A3558, lead to a three-dimensional sample of 446 galaxies.

In Figure 2 we show the velocity histogramm of this sample: notice that, in addition to the outstanding peak centred at v ~ 14,200 km/s which corresponds to the core of the SSC, this histogram suggests the possible pres-

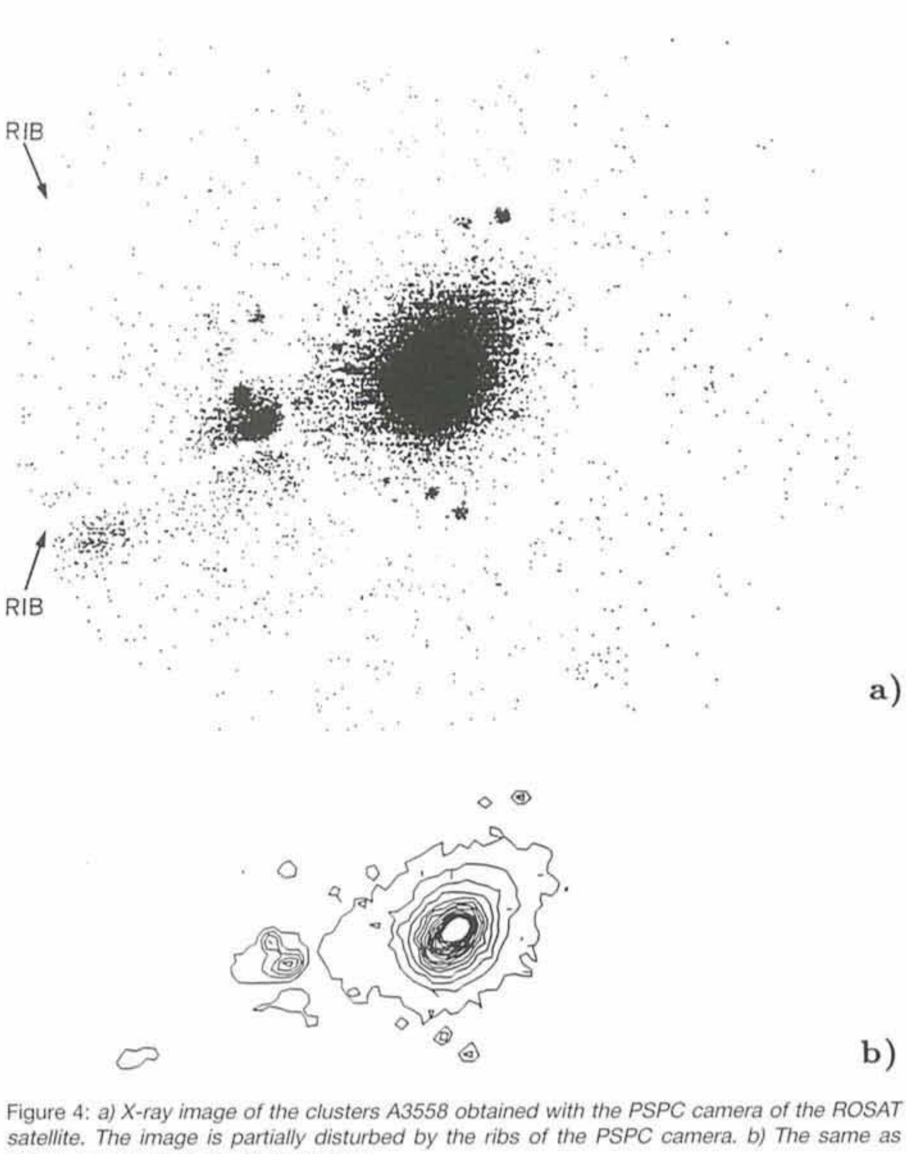

Figure 4: *a) X-ray image of the clusters A3558 obtained with the PSPC camera of the ROSAT satellite. The image is partially disturbed by the ribs of the PSPC camera. b) The same as Figure 4a represented with isophotes.*

analysis of these data will be presented elsewhere (Bardelli et al., in preparation). On a qualitative basis, we can here conclude that Figures 1 and 3 suggest that the massive cluster A3558 could be accreting galaxies from its nearby clusters; probably, this is the beginning of a merging process. Further redshift data about these clusters will enable us to calculate the masses of A3558 and A3562, in order to estimate the time scale of this merging.

4. Future Work

A3558 is the richest ACO cluster (the only one with richness class 4) and is placed in the core of the SSC; moreover, it is probably attracting its surrounding clusters. For this reason it is important to determine its mass and its dynamical state. For this purpose, we have observed it in the X-ray wavelength with the ROSAT satellite: Figure 4 is the image of this cluster obtained with the PSPC camera, in the range 0.1–2.4 KeV, with an exposure time of ~ 30,000 seconds. Similar observations for the cluster A3528 (the central cluster of the concentration A3528-A3530-A3532, see Zucca et al., 1993) are scheduled for the next ROSAT observing period.

In the context of further optical observations, our next run at the 3.6-m ESO telescope will be in February 1993. In this run we will extend the coverage of the core of the SSC and we will observe the A3528-A3530-A3532 structure, in addition to the observation of the field #1 (A3562). These data will allow an estimate of the mass of these clusters.

In order to study the mass distribution of the whole complex and to estimate the overdensity of galaxies outside clusters, we are also planning to map the whole SSC with a regular grid of MEFOS fields, observing all galaxies with $17 < b_J < 18$.

References

Allen, D.A., Norris, R.P. Staveley-Smith, L., Meadows, V.S., and Roche, P.F., 1990, *Nat.* **343**, 45.
Dressler, A., 1988, *Ap.J.* **329**, 519.
Edge, A.C., Stewart, G.C., Fabian, A.C., and Arnaud, K.A., 1990, *M.N.R.A.S.* **245**, 559.
Faber, S.M., and Burstein, D., 1988, in *Large-Scale Motions in the Universe*, proc. of the Pontifical Academic of Science Study Week #27, V.C. Rubin and G.V. Coyne eds., Princeton University, Princeton, p. 115.
Lahav, O., Edge, A.C., Fabian, A.C., and Putney, A., 1989, *M.N.R.A.S.* **238**, 881.
Lund, G., 1986, *OPTOPUS – ESO Operating Manual No. 6.*
Lynden-Bell D., Faber, S.M., Burstein, D., Davies, R.L., Dressler, A., Terlevich, R.J., and Wegner, G., 1988, *Ap.J.* **326**, 19.
Mathewson, D.S., Ford, V.L., and Buchhorn, M., 1992, *Ap.J. (Lett.)* **389**, L5.
Lynden-Bell., D., Lahav, O., and Burstein, D., 1989, *M.N.R.A.S.* **241**, 325.
Raychaudhury, S., 1989, *Nat.* **342**, 251.
Raychaudhury, S., Fabian, A.C., Edge, A.C., Jones, C., and Forman, W., 1991, *M.N.R.A.S.* **248**, 101.
Scaramella, R., Baiesi-Pillastrini, G., Chincarini, G., Vettolani, G., and Zamorani, G., 1989, *Nat.* **338**, 562.
Scaramella, R., Baiesi-Pillastrini, G., Chincarini, G., Vettolani, G., and Zamorani, G., 1991, in *Large-Scale Motions* (Rio Workshop 1989), Latham, D.W. e da Costa, L. (eds.), *A.S.P. Conf. Ser.* **15**, 13.
Shapley, H., 1930, *Harvard Obs. Bull.* **874**, 9.
Tully, B.R., Scaramella, R., Vettolani, G., and Zamorani, G., 1992, *Ap.J.* **388**, 9.
Vettolani, G., Chincarini, G., Scaramella, R., and Zamorani, G., 1990, *A.J.* **99**, 1709.
Willick, J.K., 1990, *Ap.J. (Lett.)* **351**, L5.
Yentis, D.J., Cruddace, R.G., Gursky, H., Stuart, B.V., Wallin, J.F., MacGillivray, H.T., and Collins, C.A., 1992, in *Digitized Optical Sky Surveys*, H.T. MacGillivray and E.B. Thomson eds., Kluwer Academic Publishers, The Netherlands, p. 67.
Zucca, E., Zamorani, G., Scaramella, R., and Vettolani, G., 1993, *Ap.J.* in press.

HIGH-RESOLUTION IMAGING WITH THE NTT:

The Starburst Galaxy NGC 1808

B. KORIBALSKI, Max-Planck-Institut für Radioastronomie, Bonn, Germany
R.-J. DETTMAR[1], Radioastronomisches Institut der Universität Bonn, Germany

1. Introduction

NGC 1808 is a beautiful spiral galaxy located in the southern sky at a distance of more than 10 Mpc. The peculiarity of its nuclear region has first been mentioned by Morgan (1958) who identified numerous, extremely brilliant, small nuclei in the central region which he called "hot spots". A real-colour image of this most interesting and unusual central region has been presented in *The Messenger* by Véron-Cetty & Véron (1983). This image nicely demonstrates the presence of several very blue "hot spots", corresponding to bright H II regions, and of a reddish nucleus which shows spectroscopic evidence for the presence of Seyfert activity (Véron-Cetty & Véron 1985).

[1] Present address: Space Telescope Science Institute*, Baltimore, MD, USA (*affiliated with ESA).

An additional peculiarity of this complex central region was noted in 1968 by Burbidge & Burbidge. They found that NGC 1808 "contains an unusual amount of dust [in the disk] and some curious dust lanes which look almost radial in form". These prominent dust filaments which seem to emerge from the nuclear region are best seen on optical short exposures of NGC 1808, e.g., those given by Laustsen et al. (1987) or Tarenghi (1990) in a previous issue of *The Messenger*. Whereas in 1970 Arp & Bertola already speculated "that these lanes represent the passage of compact bodies outwards from the nucleus", we now have observational evidence that they are indeed connected with the outflow of neutral and ionized gas into the halo of NGC 1808 (Koribalski et al. 1992a, Phillips 1992). Also new is the discovery of a fast rotating torus of cold gas very near to the centre which has been revealed using HI absorption measurements against the extended radio continuum emission (Koribalski et al. 1992b).

The far-infrared (FIR) luminosity of NGC 1808 is with $\approx 2\ 10^{10}\ L_{\odot}$ quite high, similar to NGC 253 and M 82.

Here, we want to present high-resolution Hα observations of NGC 1808 which have been kindly made available by Sandro D'Odorico from ESO (thanks a lot!). These new data may very well help answering the question how the various phenomena observed in NGC 1808 are related to each other.

2. Observations

Over the last couple of years the starburst galaxy NGC 1808 has been observed in detail with the Very Large