A MULTI WAVELENGTH STUDY OF THE CIRCUMNUCLEAR REGION OF NGC 1365

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1. HST and VLA observations

The nuclear region of the supergiant barred spiral galaxy NGC 1365 contains bright "hot spots", as seen at optical wavelengths, as well as a number of non-thermal radio continuum sources, some of which remain unresolved at $0.25'' \times 0.10''$ resolution (Sandqvist et al. 1995, *A&A 295*, 585).

The distribution of [OIII] λ5007 emission from the nuclear region supports the scenario of an [OIII] cone emanating from the Seyfert nucleus. The velocity field of the high excitation gas in the cone has been modeled by Hjelm & Lindblad (1996, *A&A 305*, 727) in terms of an accelerated bipolar conical outflow. Such conical or biconical high-excitation emission-line structures extending from the position of the nucleus are found in several active galactic nuclei.

We have observed the nuclear region in the [OIII] λ5007 line and neighbouring continuum with the HST/FOC (Kristen et al. 1997, *A&A*, in press). In the continuum light numerous bright "super star clusters" (SSCs) are seen. They tend to fall on an elongated ring (radius $\sim 7''$) around the nucleus and contribute about 20 % of the total continuum flux in this wavelength regime. The brightest SSCs are very compact with radii $R < 3$ pc and complementary ground-based spectroscopy indicates a true luminosity $M_B = -16.6 \pm 0.6$ mag.

The HST [OIII] λ5007 observations resolve the inner structure of the conical outflow and reveal a complicated structure of individual emission-line clouds, some of which gather in larger agglomerations. The total luminosity in the [OIII] line amounts to $L_{[OIII]} \simeq 3.7 \times 10^{40}$ erg s^{-1} where about 40 % is emitted by the clouds.

Y. Sofue (ed.), The Central Regions of the Galaxy and Galaxies, 277-278.

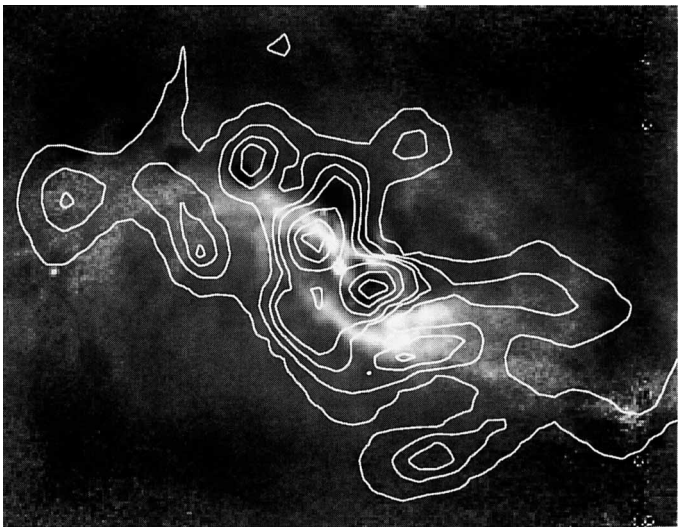

Figure 1. **Contours:** SEST MEM map of NGC 1365 (effective resolution 5") in the J = 3-2 CO line over an approximately 120" × 60" region, centered on the optical nucleus and covering the bar. The contour values are [0.01, 0.05, 0.1, 0.15, 0.2, 0.3, 0.4, 0.5, 0.7, 0.9] x 958 K km s^{-1}. **Greyscale:** B -Gunn$z$ colour index image, which emphasizes the dust lanes (light areas) as well as hot-star- and HII-regions (dark areas).

As a result from the HST observations, the bright compact radio source NGC 1365:A is found to coincide spatially with one of the SSCs, SSC:10. The fact that none of the other similar SSCs in the field surrounding the nucleus contain a similar radio source, is a very definite indication that NGC 1365:A is a radio supernova.

2. SEST observations

We have made SEST observations of NGC 1365 in the J = 3-2 CO line, centered on the optical nucleus and covering the bar. A Maximum Entropy Method (MEM)-treated map of the total integrated line intensity ($\int T_{\rm mb} {\rm d}V$) is shown in Fig. 1.

The most interesting phenomenon is the doubly-peaked CO structure seen near the optical nucleus, with a local minimum right at the nucleus. This structure and its alignment along the major axis of the galaxy is strongly suggestive of a circumnuclear molecular torus with a radius of about 5" ($\sim$ 500 pc). The position of the super star cluster SSC:10 and radio supernova lies very close to the southwestern central CO peak. There is a second CO minimum near the positions of the radio jet and the conical shell of ionized [O III] gas, southeast of the nucleus. Various CO extensions lead out from the torus into the two dominant eastern and western dust lanes, as well as into the HII regions north and northeast of the nucleus.