Mid IR obscuring structures in Seyfert galaxies

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Aim of the project

Look for mid-IR signatures of the known optical ionisation cones

Thus, the sample chosen includes galaxies with well defined optical ionisation cones

OBSERVATIONS

- Sample of Seyfert 2 galaxies *(NGC7582, NGC1386, Mrk573, NGC526A)* having ionization cones detected in [OIII]
- Observed with TIMMI2/ESO3.6 (Oct02)
- Chopping/nodding technique
- Pixel size: 0.2x0.2 arcsec; FOV: 64x48arcsec
- Difraction limited Imaging (0.5 arcsec) using filters N1, 11.9mm, 12.9mm and [NeII]

New observations: *NGC1365, NGC2110, NGC2992* (Dec03)

Results

- Detect extended emission in the continuum from dust in most of the observed objects
- Detect extended 12.9μm (includes [NeII]) line emission in some of the objects
- Indications of emission related to the optical ionisation structures hinted in NGC526A
- Dust emission possibly related to an inner bar in Mrk573
- No trace of the obscuring structure seen in either NGC7582 or NGC1386

Data Handling

To improve the spatial resolution:

→ Deconvolve with the PSF

Use Lucy-Richardson algorithm

→ These help separating the extended from the central (unresolved) emission.

NGC 7582

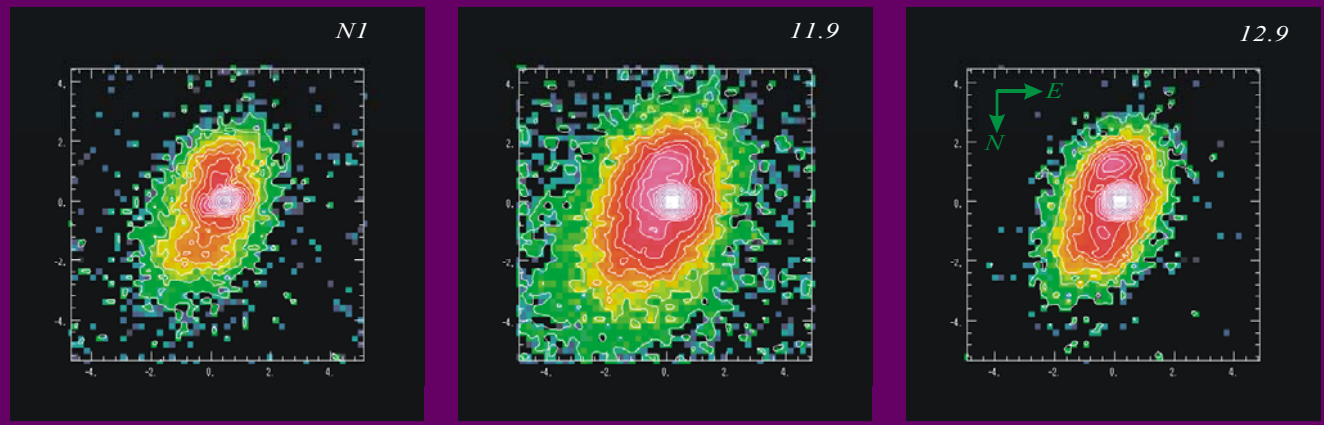
NLXG: X-ray luminosity of type 1 but narrow lines

Changed to optical type 1 during 3 months (Aretxaga et al 1999)

Strong circumnuclear star formation (Morris et al 1985)

Mixed AGN/starburst from far IR SED (Radovich et al 1999)

NGC7582



Resembles very closely the optical morphology.

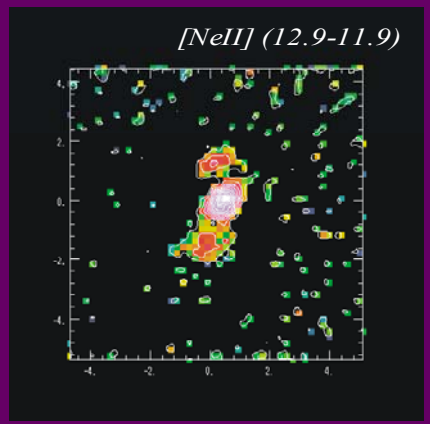
Extended emission in

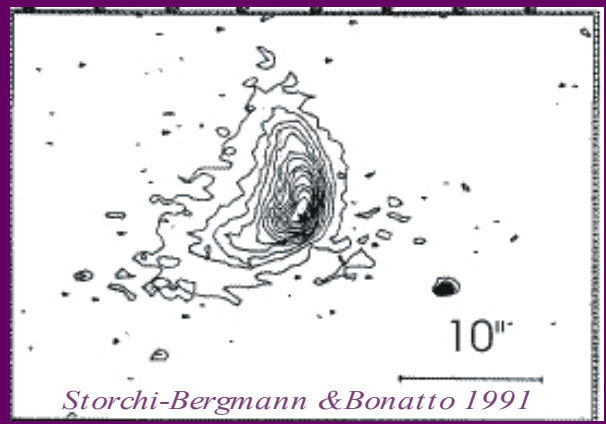
N1 band (thermal IR continuum emission from warm dust): hints of spiral structure.

11.9mm (dominated by PAH emission): starforming regions

No sign of the obscuring torus responsible for the geometry of the ionization cones.

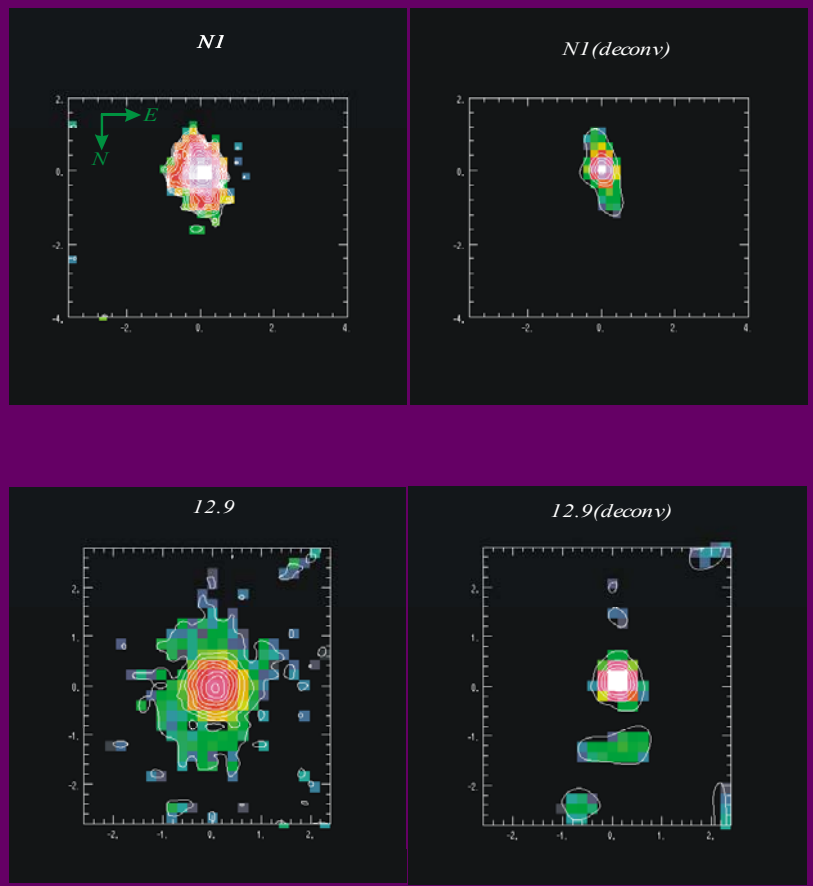
NGC 7582





12.9mm - 11.9mm (dominated by the [NeII]12.8mm emission): close agreement with the [OIII] image of Storchi-Bergmann & Bonatto (1990).

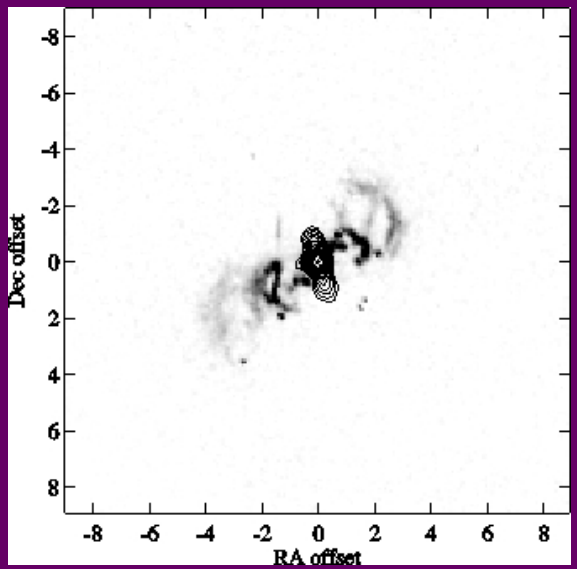
Mrk 573

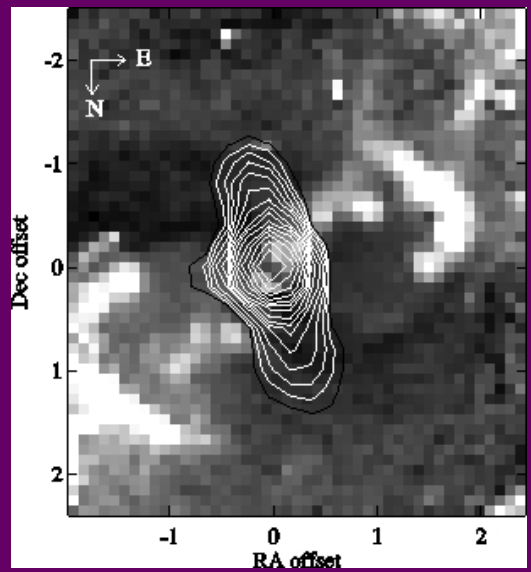


Extended emission both in the N1 and N12.9mm bands.

N1: direction almost perpendicular to the axis of the optical [OIII] ionization cone.

N12.9mm: extensions towards either side of the nucleus, closely following the direction of the extended N1 band emission.

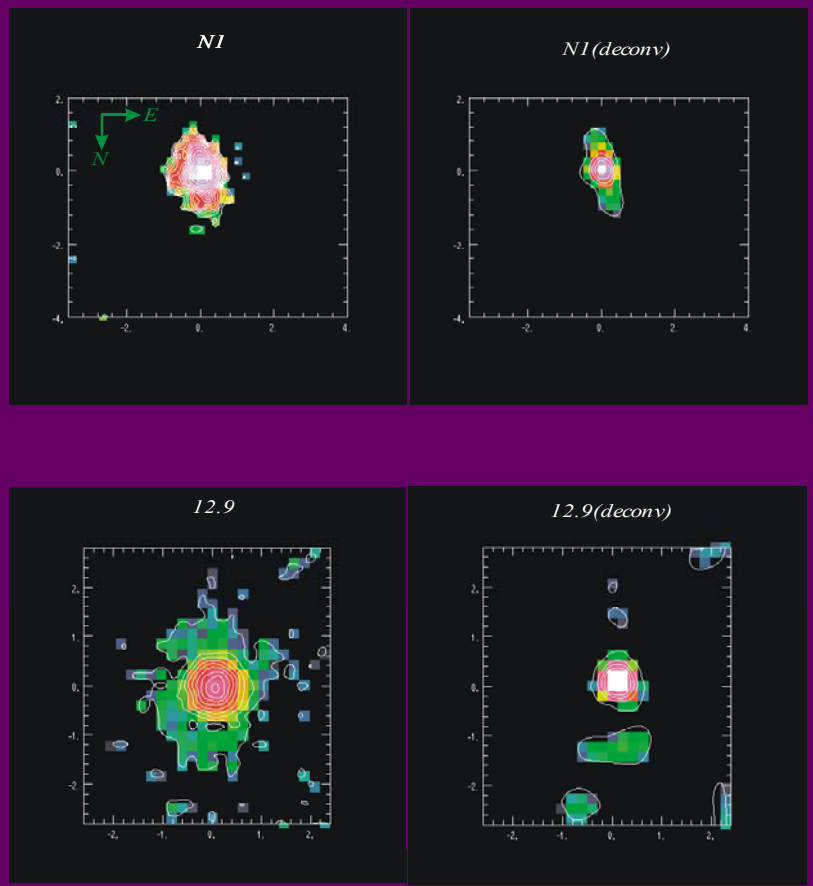




Perpendicular to the [OIII] cone

Coincident with a inner bar
(Quillen et al 2000)

Mrk 573

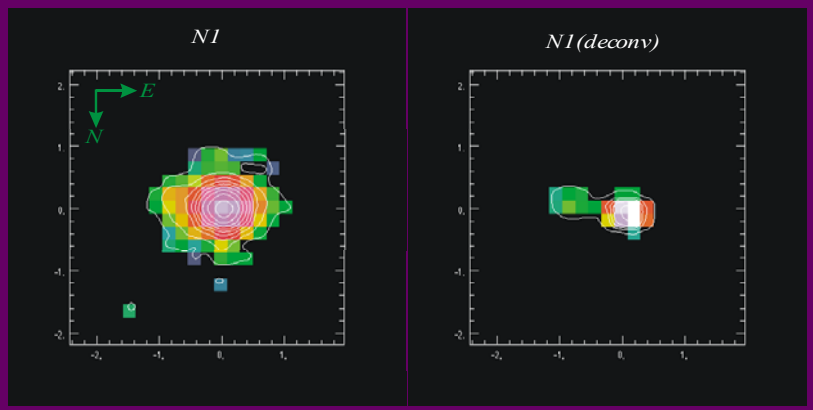


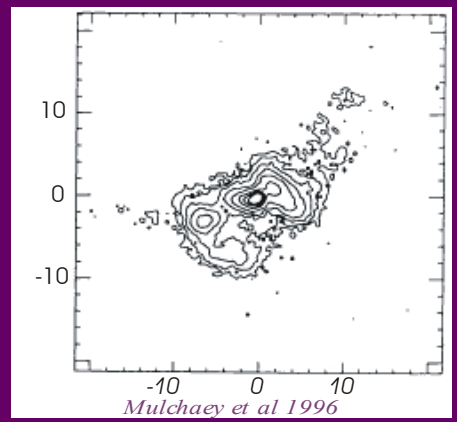
Extended emission both in the N1 and N12.9mm bands.

N1: direction almost perpendicular to the axis of the optical [OIII] ionization cone.

N12.9mm: extensions towards either side of the nucleus, closely following the direction of the extended N1 band emission.

NGC 526A



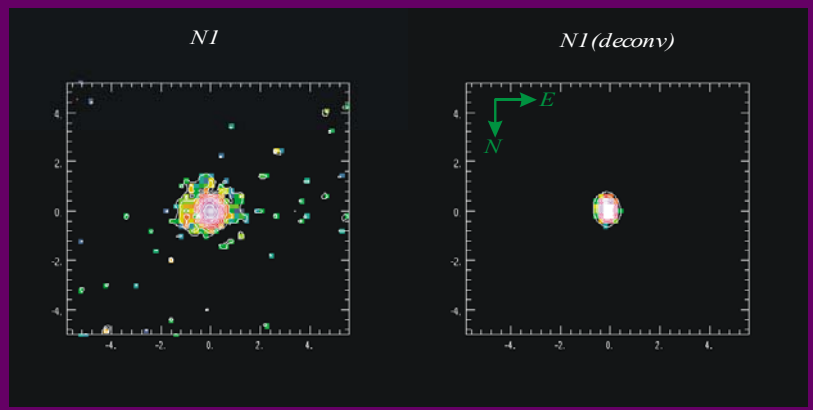


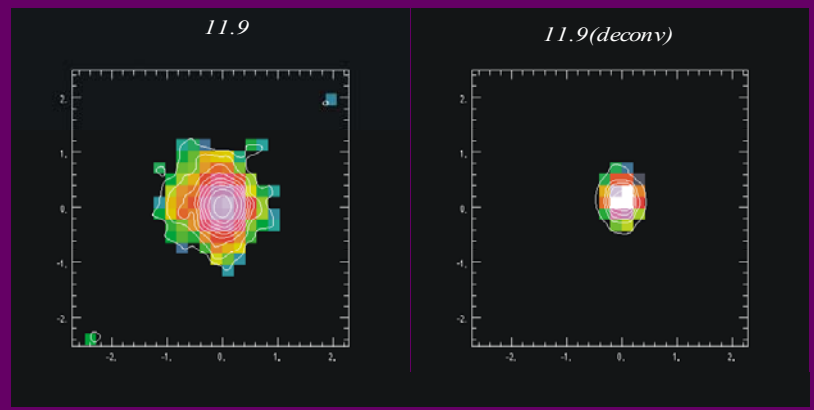
N1: after deconvolution shows a clear extension West of the nucleus.

This extension of continuum emission from warm dust seems to run along the side of the [OIII] ionization cone.

➡ part of the obscuring structure that confine the ionization cone near the nuclear region?

NGC 1386

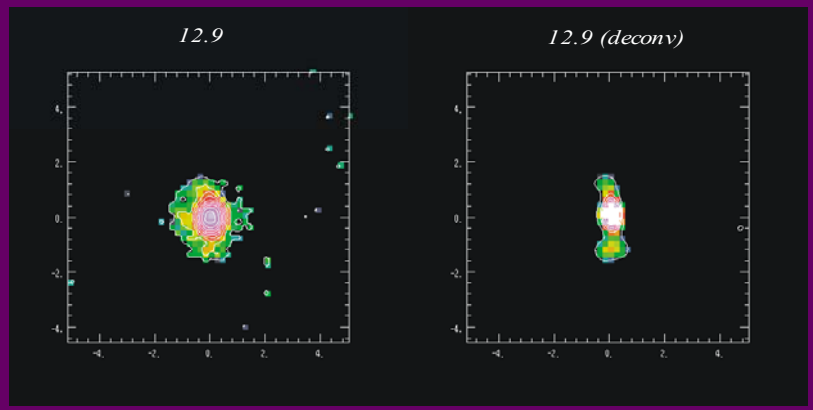


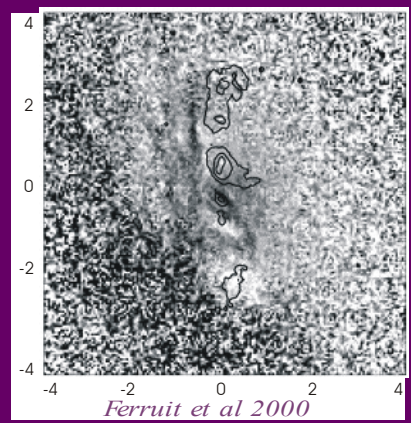


N1: No extended emission

11.9mm(PAH): concentrated in the nucleus

NGC 1386





Extended emission in 12.9μm (dominated by [NeII]12.8μm emission).

Close similarity with the [OIII]l5007 image of Ferruit et al (2000).

No trace of the obscuring torus in the mid IR images.

Conclusions & Questions

- All the sample galaxies show extended mid IR emission due to dust heated by the active nucleus
- Some but certainly not all of these galaxies show conspicuous structures that seem to be related with either the optical ionisation cones or inner bars.
- Why are we not seeing cone structures in the rest? Is it a questions of S/N? Are the cones still sufficiently thick?