Morphologically-identified outflows with ALFOSC/NOT imaging

Laura Hermosa Muñoz, Sara Cazzoli, Isabel Márquez, Josefa Masegosa

Instituto de Astrofísica de Andalucía – CSIC, Glorieta de la Astronomía S/N 18010, Granada, Spain

Outflows play a major role in the evolution of galaxies, but we are far from having a complete picture of their properties. In particular, their relevance in the evolution of Low-Ionization Nuclear Emission-line Regions (LINERs), which are the most numerous local AGN population, is barely known. The Hα morphologies of outflows could be relevant to identify their characteristics, such as geometry or orientation. To that aim, we have obtained data for a sample of nearby low-luminosity AGNs with the ALFOSC instrument, located at the NOT telescope. We present the first systematic study of this kind in LINERs with the first results of our atlas of morphologically-identified ionised gas outflows.

Status of outflows in LINERs

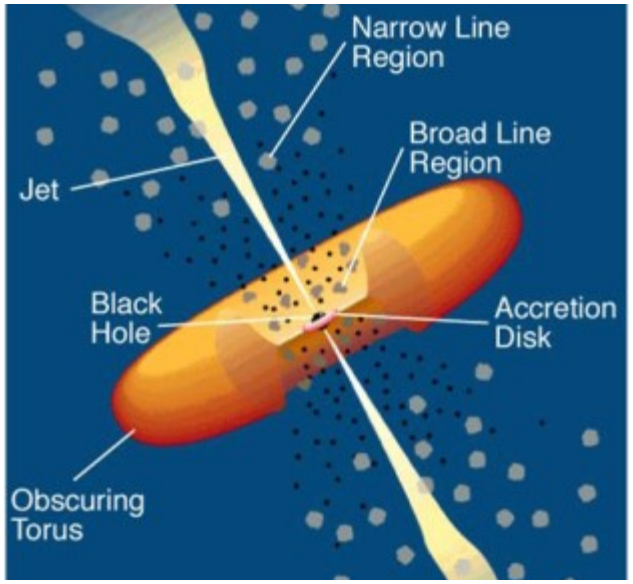
→ **LINERs** (Low-Ionisation Nuclear Emission-line Regions) are the low luminosity end of the **Active Galactic Nuclei** (AGN) family (Ho 2008).

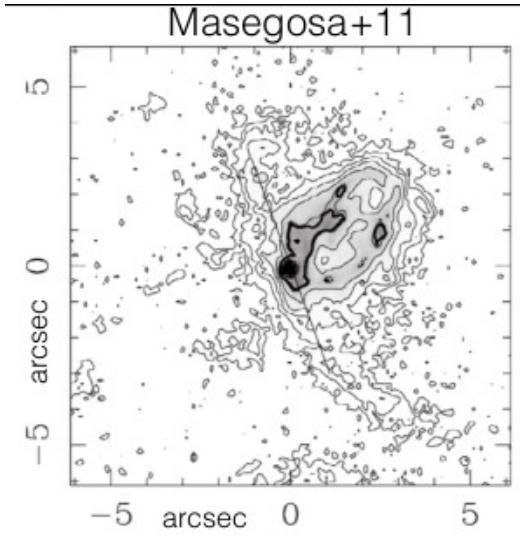
→ Few studies about their **ionised gas morphology** (Pogge et al. 2000; Masegosa et al. 2011).

→ Sample size limitation → unclear whether outflows are relevant in LINERs, and how they can be compared with those in higher power AGN or strong starbursts.

→ We aim to complete a **representative atlas of ionised gas in LINERs**, to identify the possible presence of outflows in their nuclear regions.

→ These are preliminary results of our work.





Methodology and sample

ALFOSC/NOT - 39 nearby LINERs [z: 0.0013 - 0.0233]

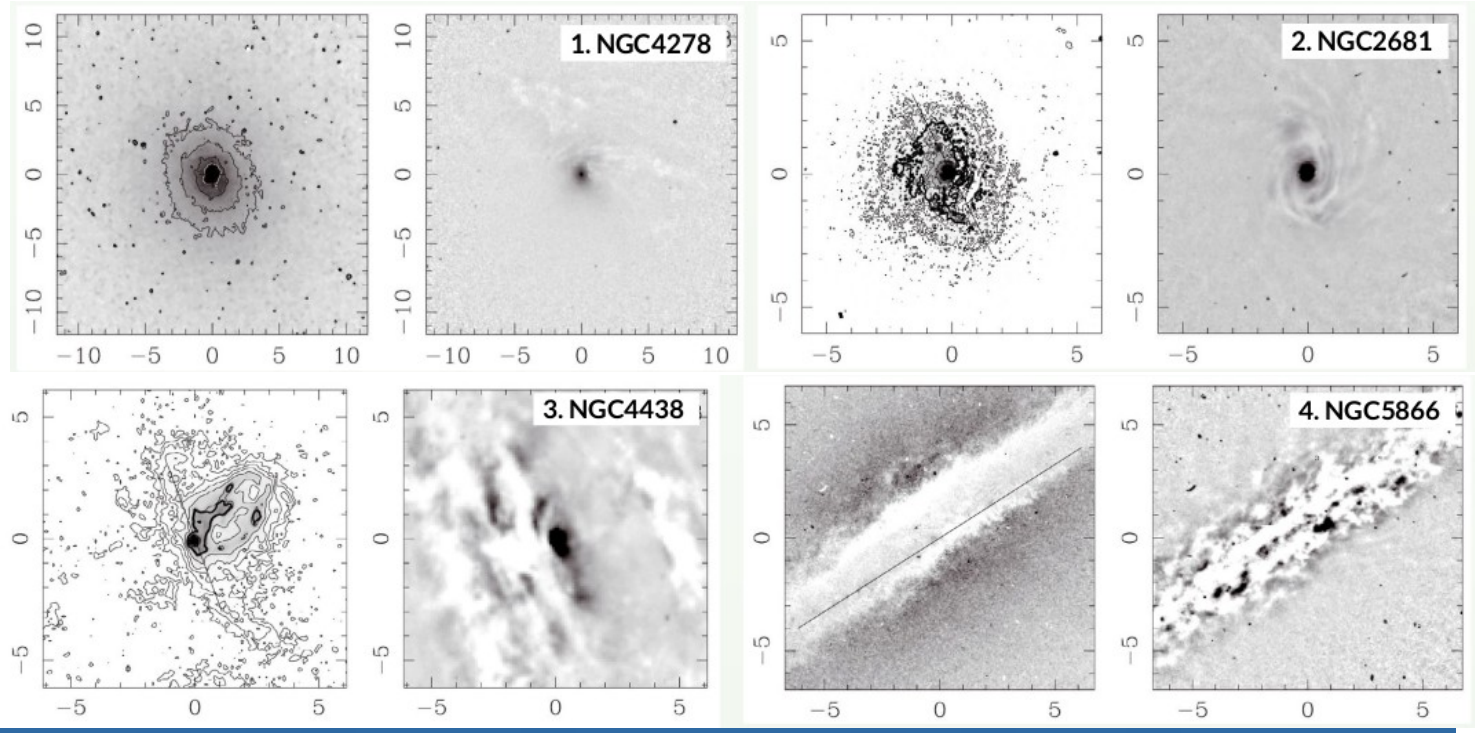
- Narrow band (~ 5 Å) imaging by using filters at the wavelength of redshifted Hα for each galaxy.
- Broad band images for continuum subtraction.
- Spatial sampling: 0.2138'' pix -1 / Mean magnitude (V): 10.81 / Seeing FWHM about 0.9''.

1. CORE-HALO
Unresolved nuclear structure surrounded by diffuse emission

2. DISK-HALO
Face-on structures with Hα emission in the spiral arms, with rings or diffuse emission in the disc.

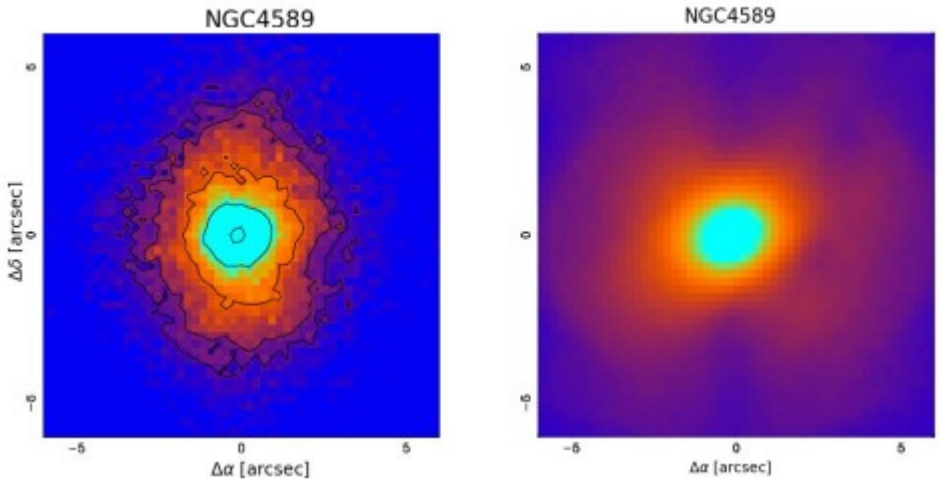
3. OUTFLOW
Nuclear outflows seen as biconical or bubble-like structures or filamentary extensions.

4. DUSTY
Clear dust layers obscuring the Hα structure in the inner regions.

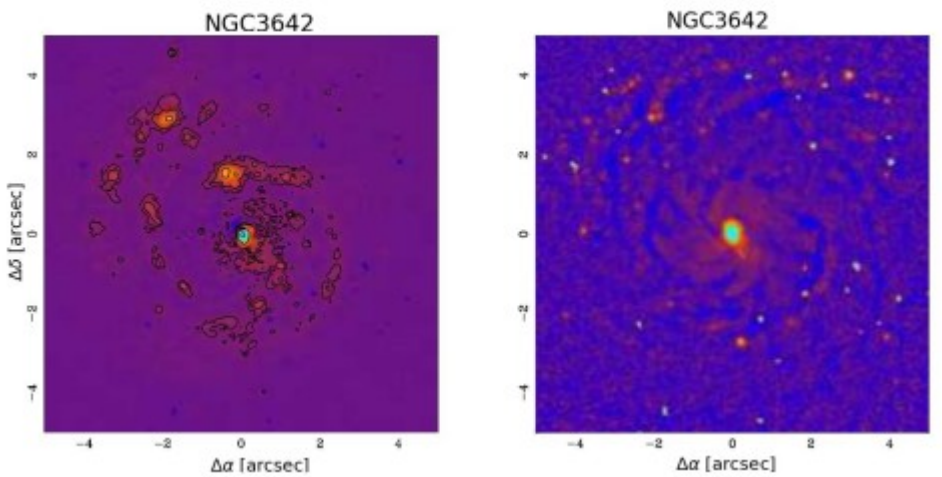


Preliminary results: 4 morphologycal types

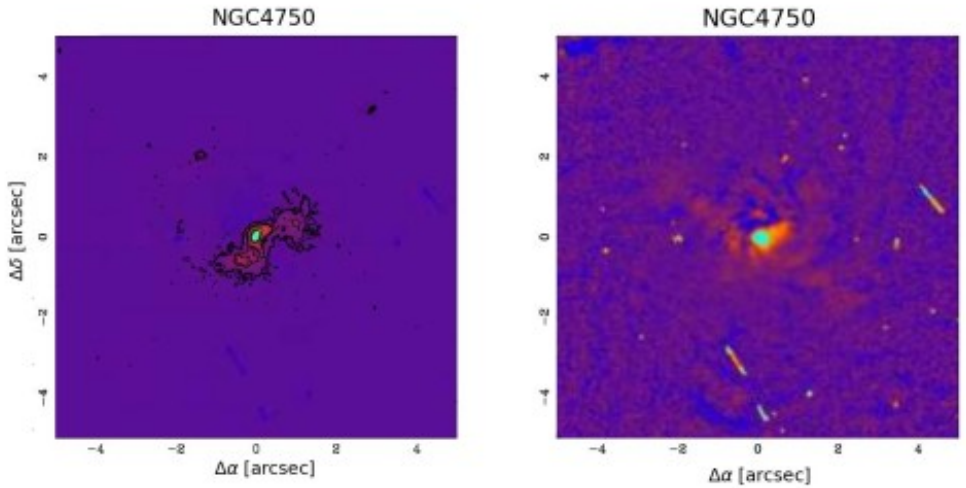
CORE-HALO EXAMPLE



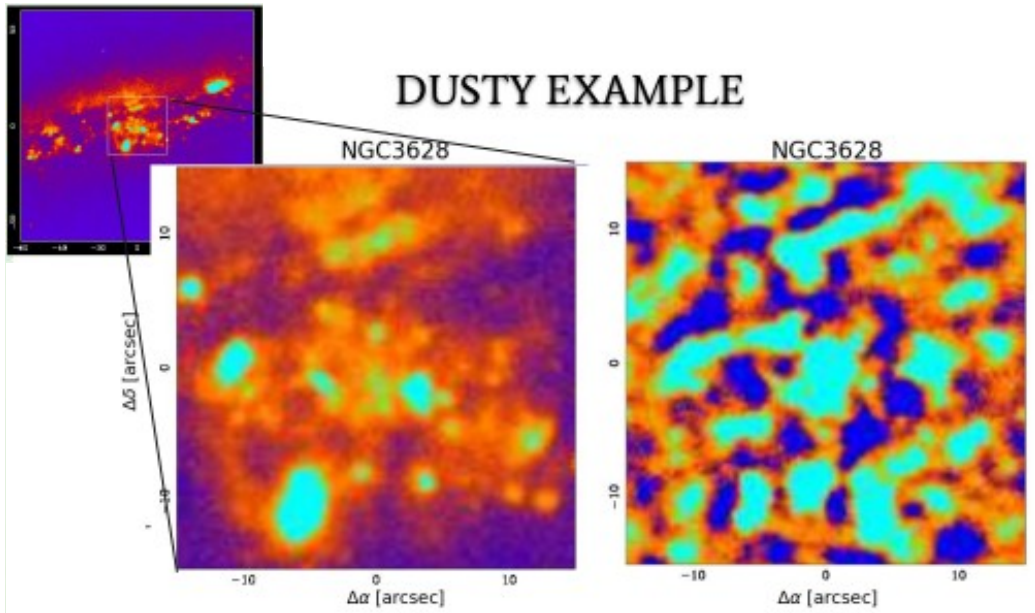
DISK-HALO EXAMPLE



OUTFLOW EXAMPLE



DUSTY EXAMPLE



On-going and future work

1) The majority of the morphologies are disk- and core-halo.

2) **On-going observations** with ALFOSC/NOT (both Open Time and Guaranteed Time).

3) Complemented with **HST data** from the archive in Hα and continuum.

4) The objects with morphological signatures of ionised outflows will be studied with integral field spectroscopy, in particular will be observed with **MEGARA@GTC**.