

Catalog of the morphological features in the S⁴G

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DETAILED
ANATOMY OF
GALAXIES



UNIVERSITY of OULU
OULUN YLIOPISTO



The catalog (Herrera-Endoqui+2015 submitted to A&A: “Catalog of morphological features in the S⁴G”)

- **Measured structures**

- Bars
- Lenses
- Rings
- Spiral arms

- **Method**

- Visual inspection of S⁴G images at 3.6 μm (Sheth+ 2010).
- Fit ellipses (lenses and rings), logarithmic sections (spiral arms).
- Morphological classification from Buta+ 2015.

- **Obtained parameters**

- Size
- Orientation
- Pitch angle

- **Spitzer Survey of Stellar Structure in Galaxies (S⁴G; Sheth+2010):**

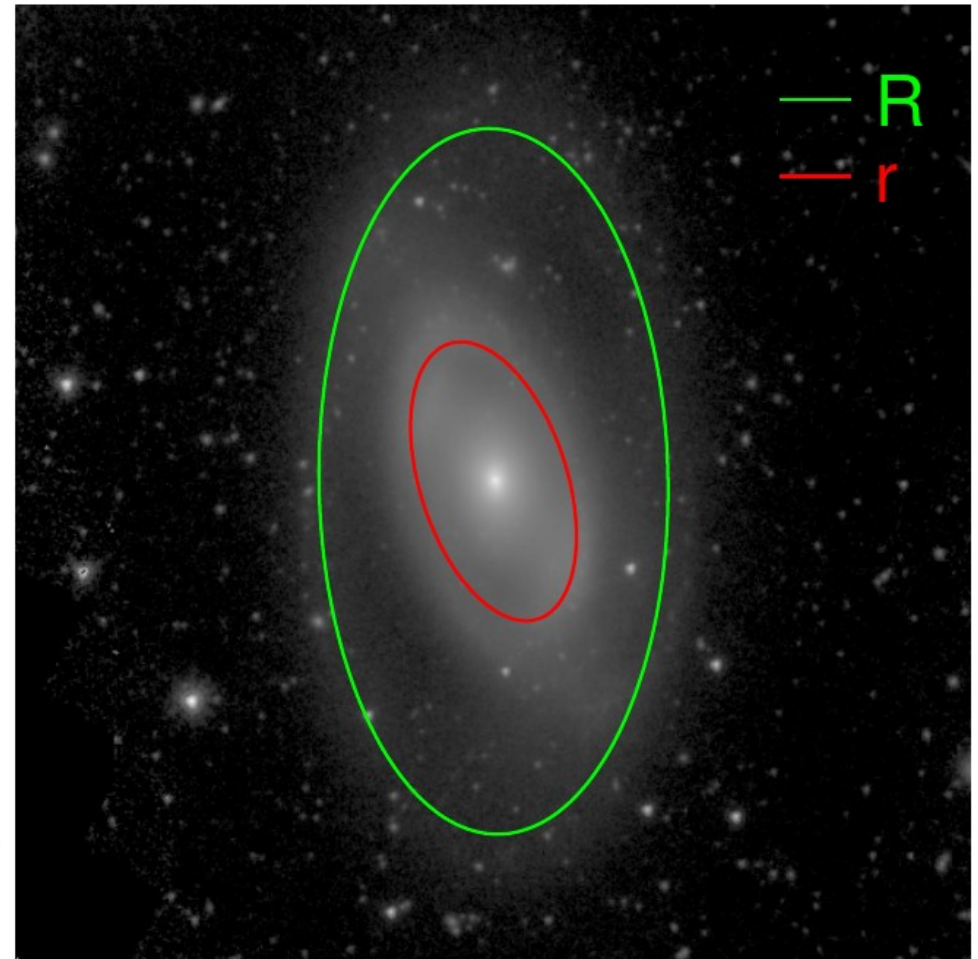
- ~2300 (+ ~500) galaxies observed with IRAC at 3.6 and 4.5 μm .
- $d < 40 \text{ Mpc}$; $|b| > 30 \text{ deg}$
- $B_{\text{corr}} < 15.5$
- $D25 > 1 \text{ arcmin}$
- Allows to look at old stars with minimal dust extinction.

- **Morphological classification (Buta+2015):**

- Bar type (family)
- Outer, inner and nuclear features
- Hubble stage
- Peculiarities: x-shaped bar morphologies and ansae.

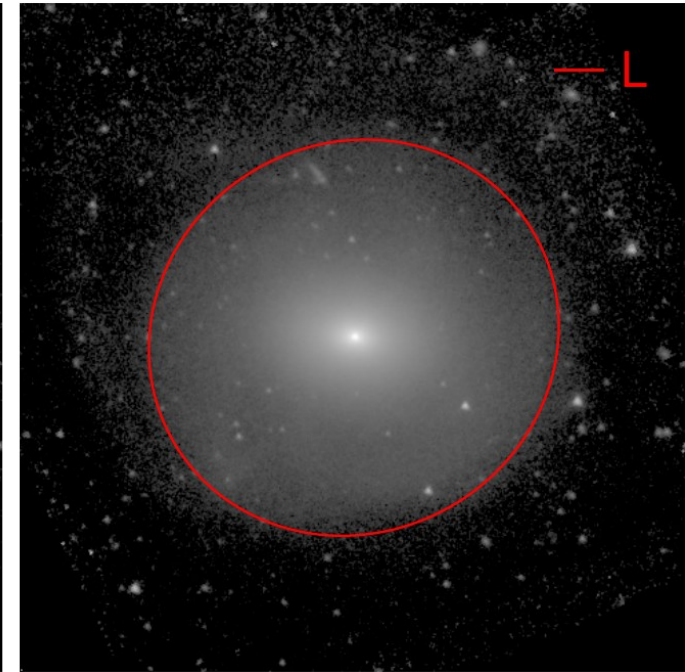
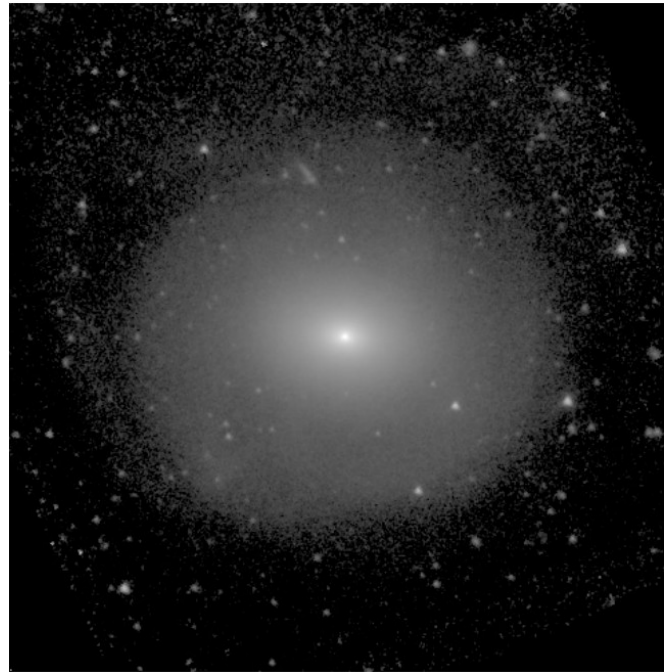
Ring: clear inner and outer edges

NGC 1350 (R)SAB_a(r,bl)0/a

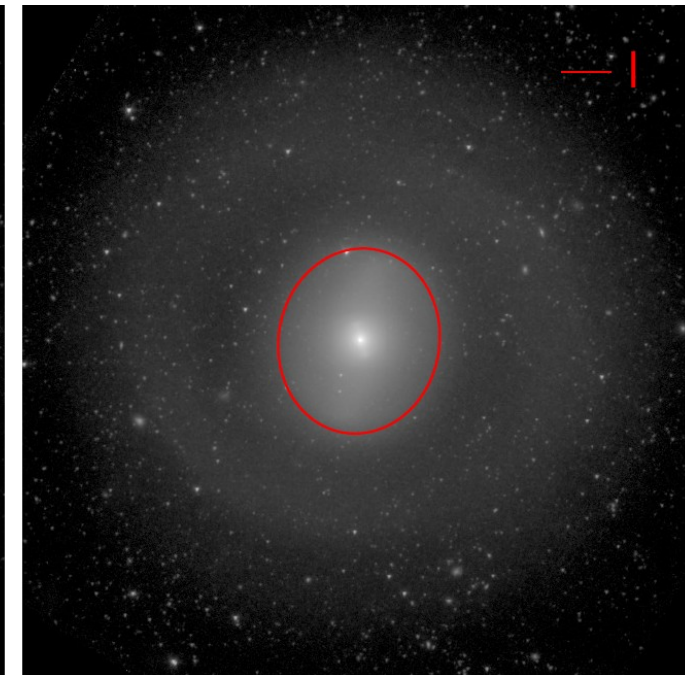
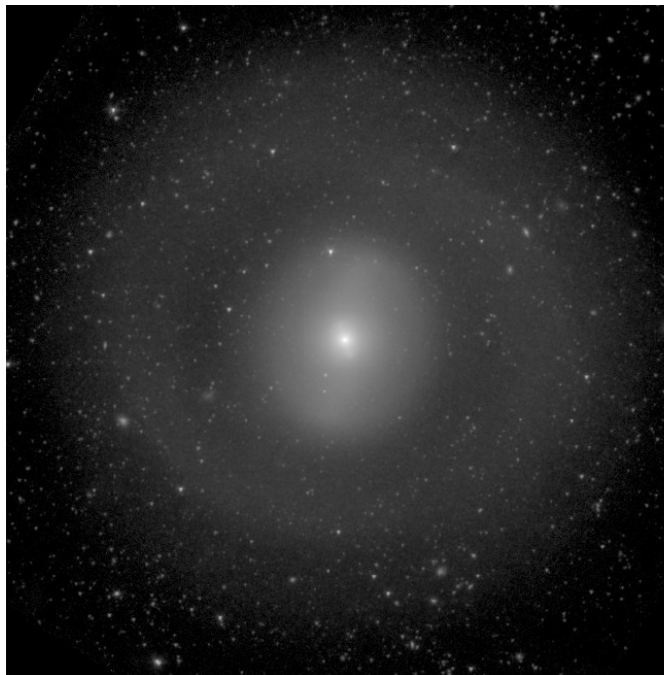


Lens: flat light distribution with well defined edge

NGC 2655
(L)SAB(s)0/a, pec

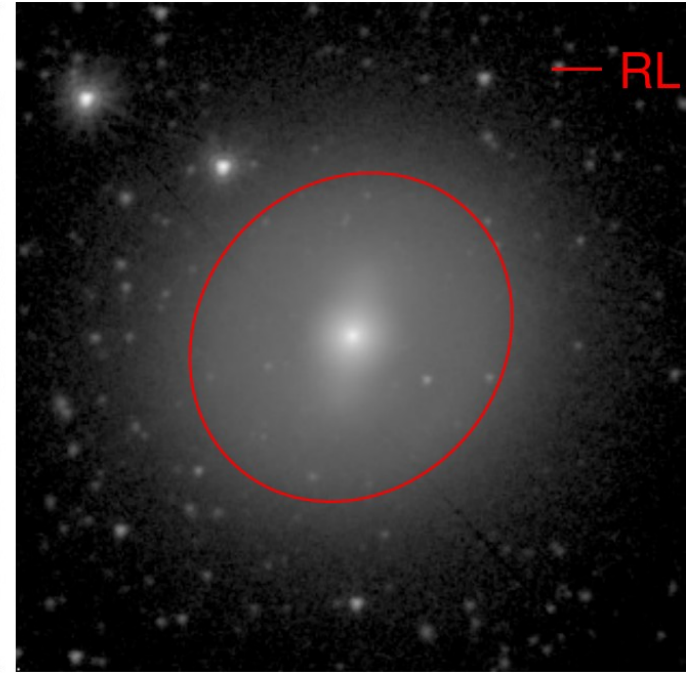
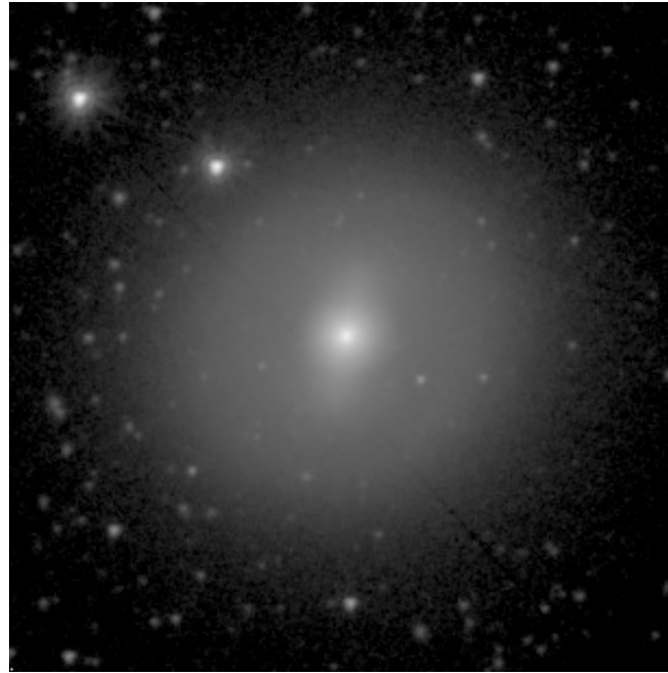


NGC 1291
(R)SAB(l,bl,nb)0+

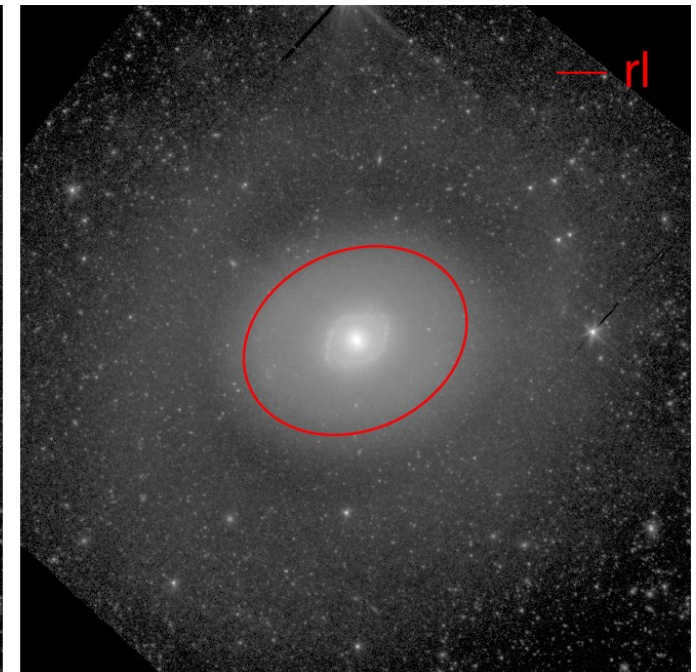
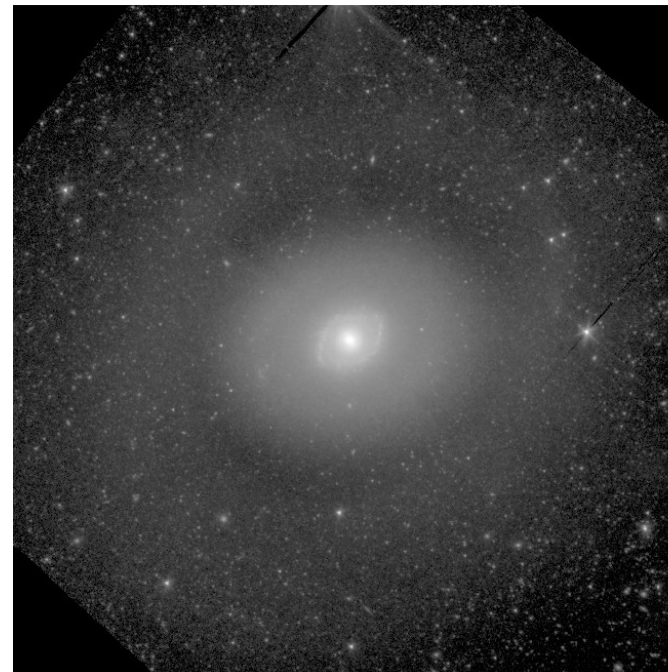


Ringlens: (not)well defined (inner)outer edge

NGC 1533
(RL)SB(bI)0⁰



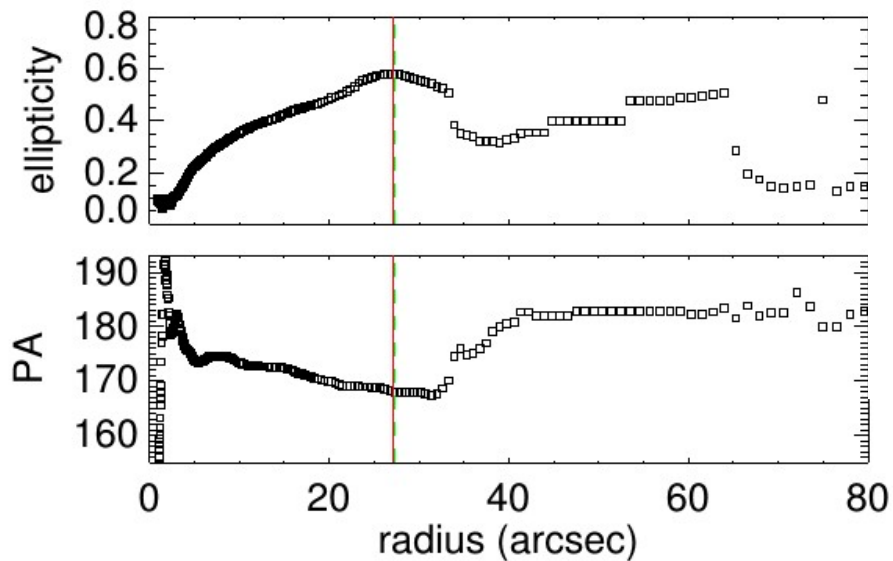
NGC 4736
(R)SA(rl,rs,nl,nb)a



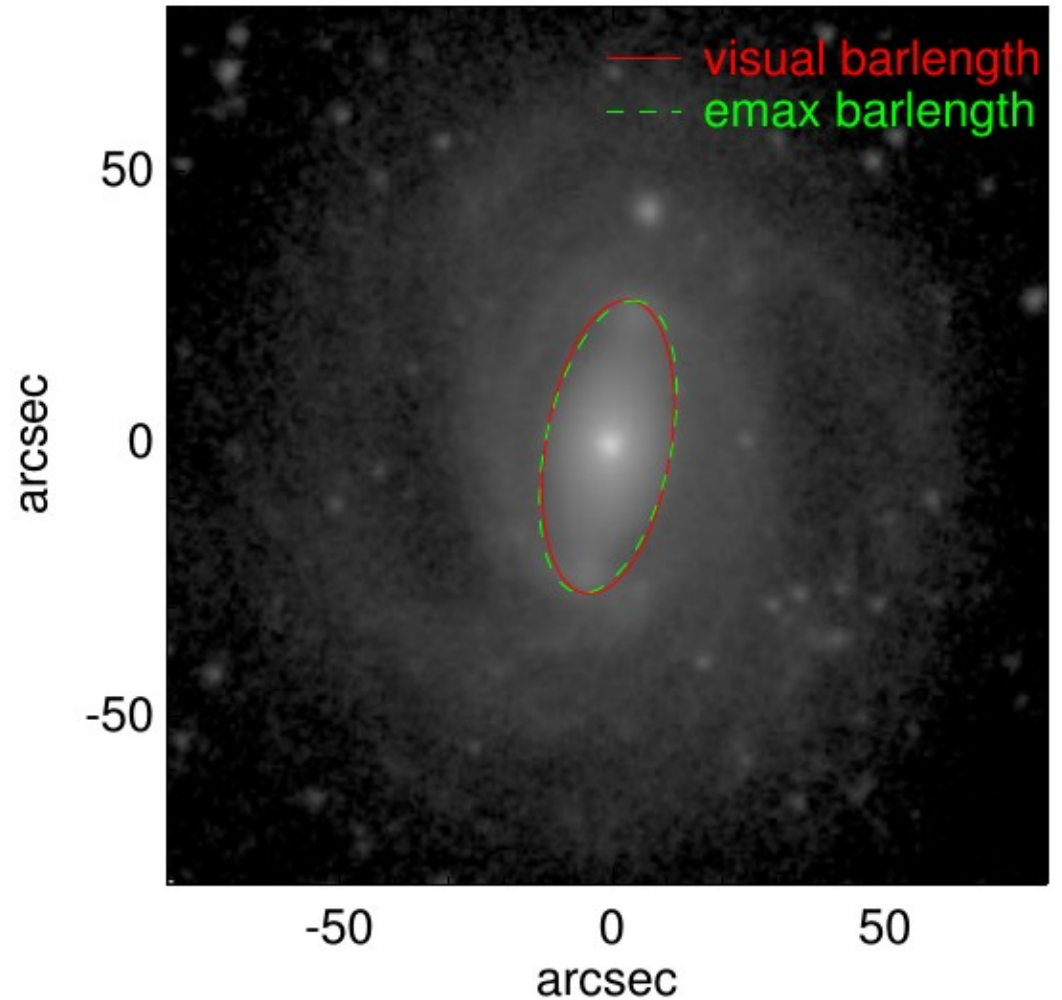
Bars

- Visual estimation
- Maximum of ellipticity profile (S⁴G Pipeline 4, Salo+2015)

Analysis of bars to appear in Díaz-García+2015 (submitted to A&A).

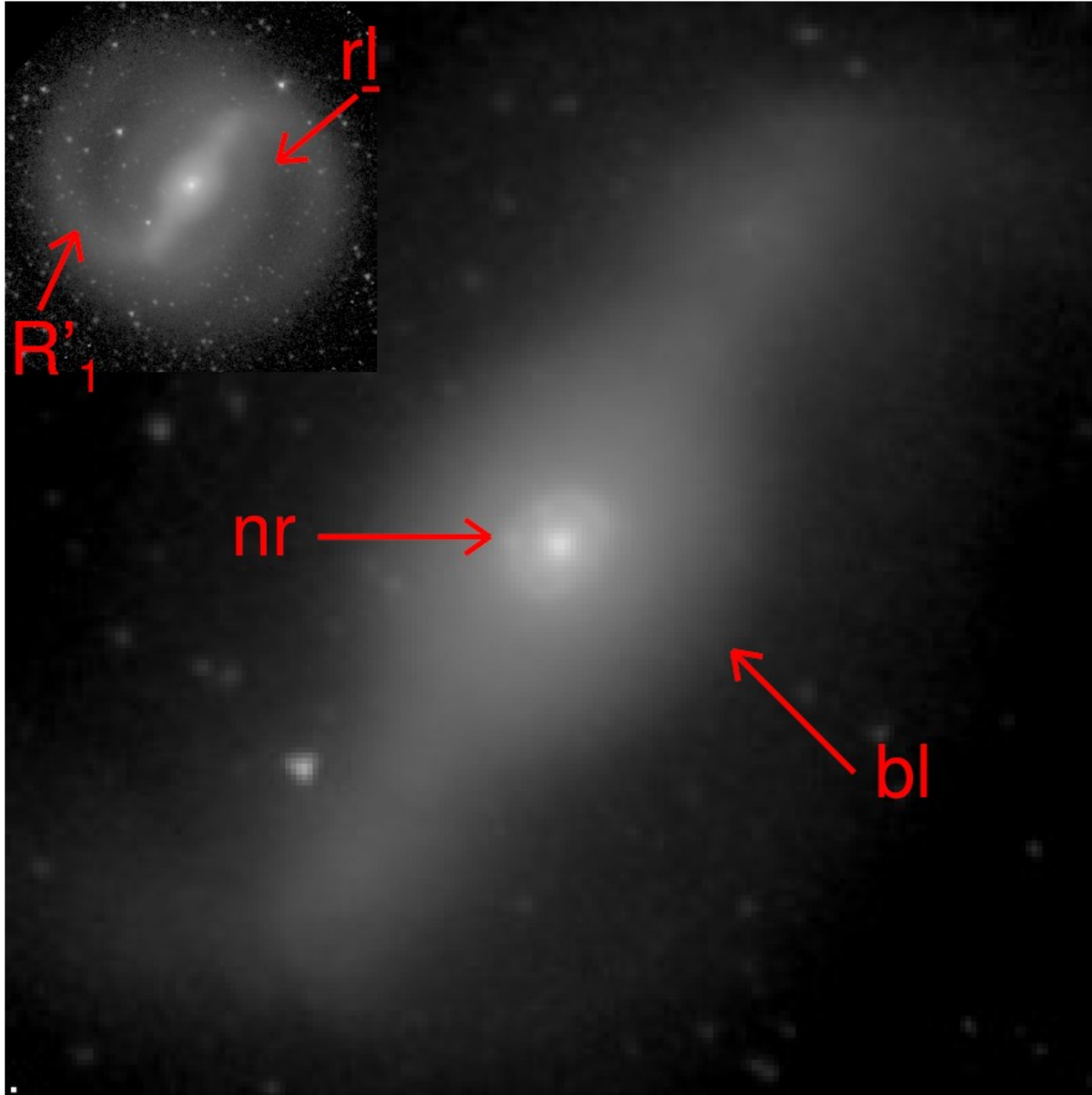


NGC 5375

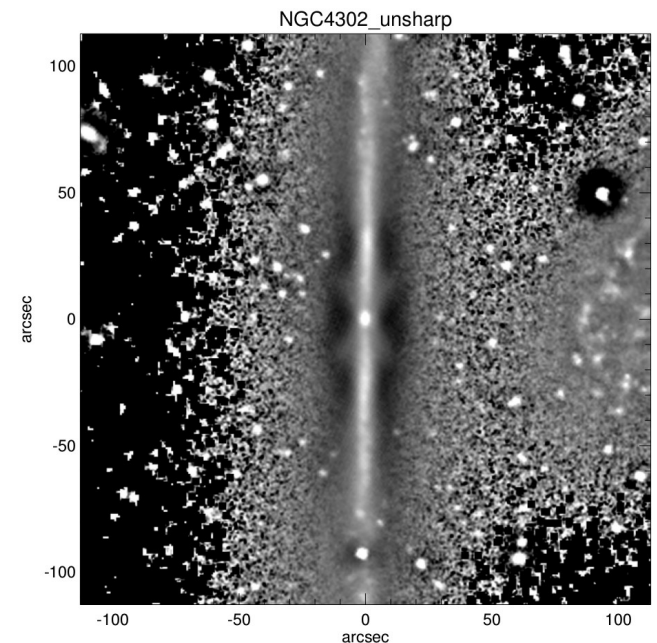


Barlens: lens-like structure embedded in the bar

NGC4314 (R'₁)SB(r_l,bl,nr)a

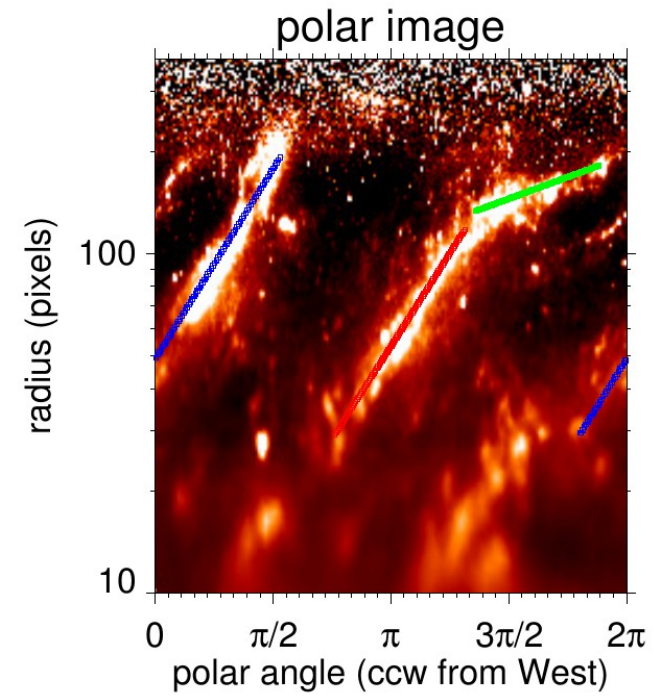
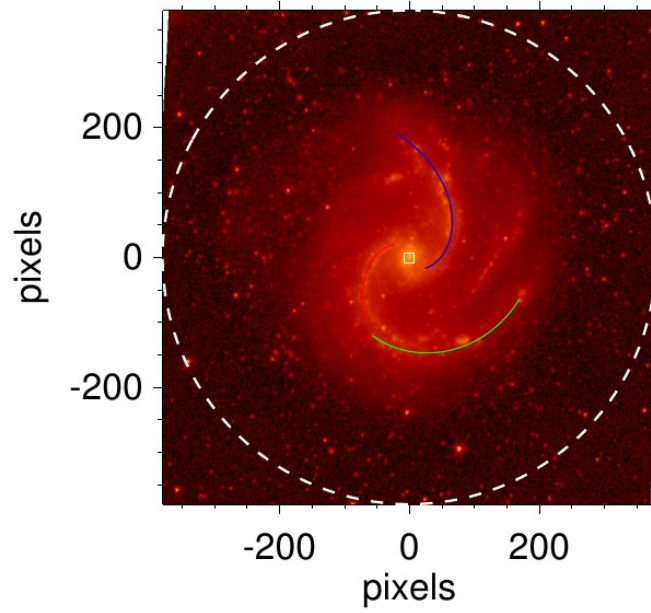
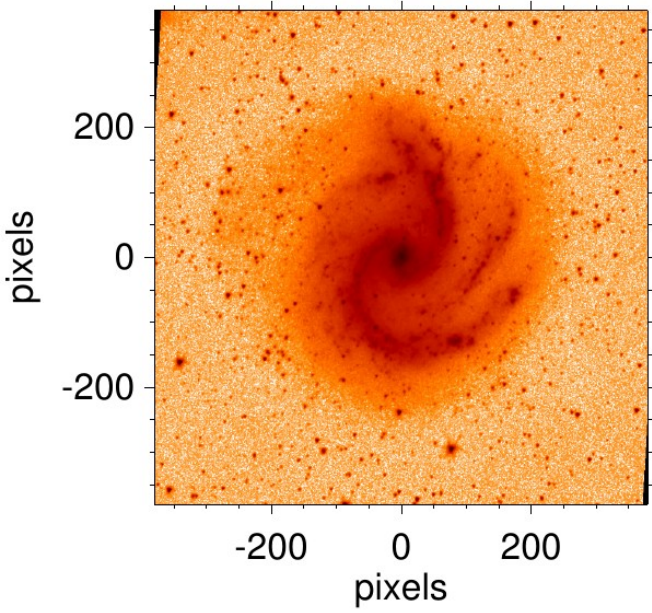


Suggested to be the face-on counterpart of boxy/peanut/bulges observed in edge-on galaxies (Laurikainen+2014, Athanassoula+2014)

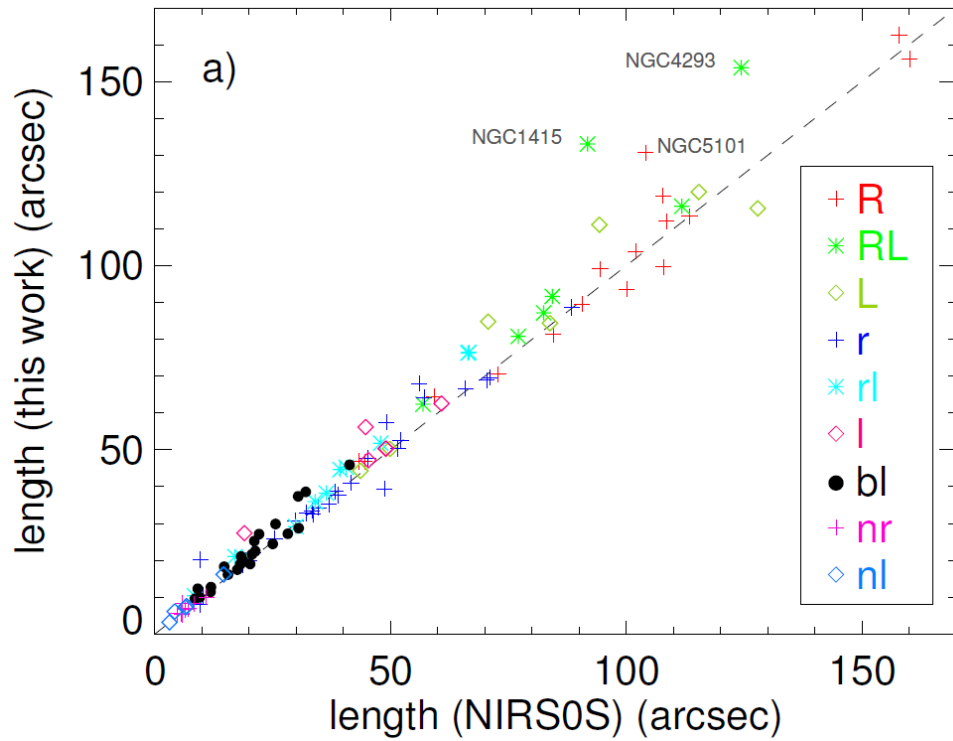


Spiral arms

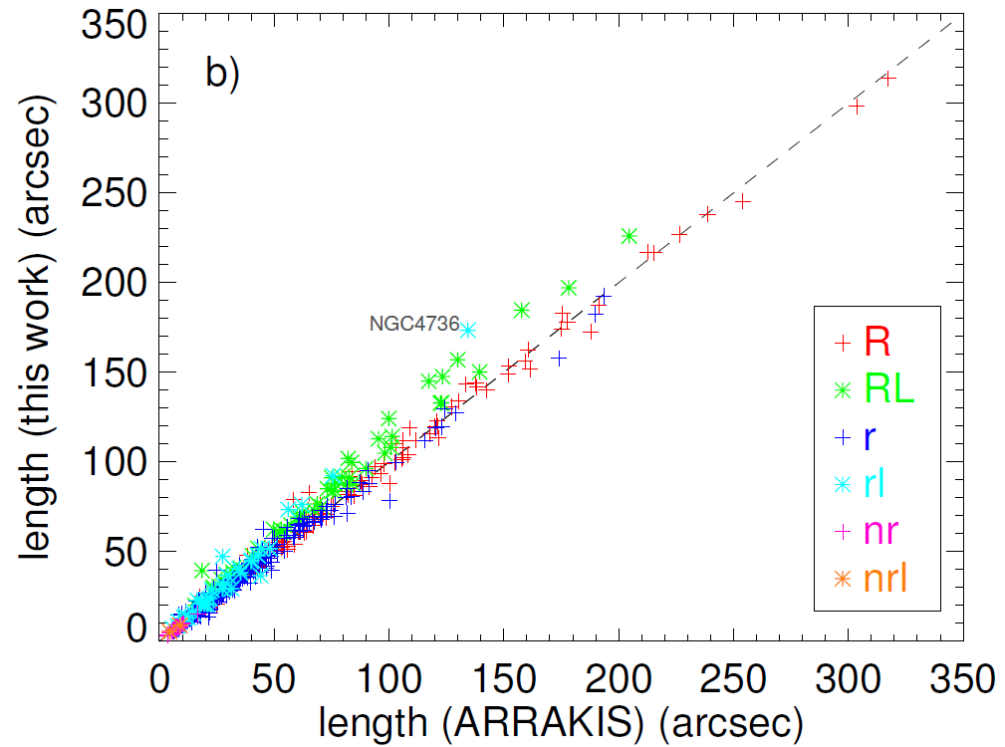
NGC5247



Comparison to previous works?



NIRS0S (Laurikainen+2013)



ARRAKIS (Comerón+2014)

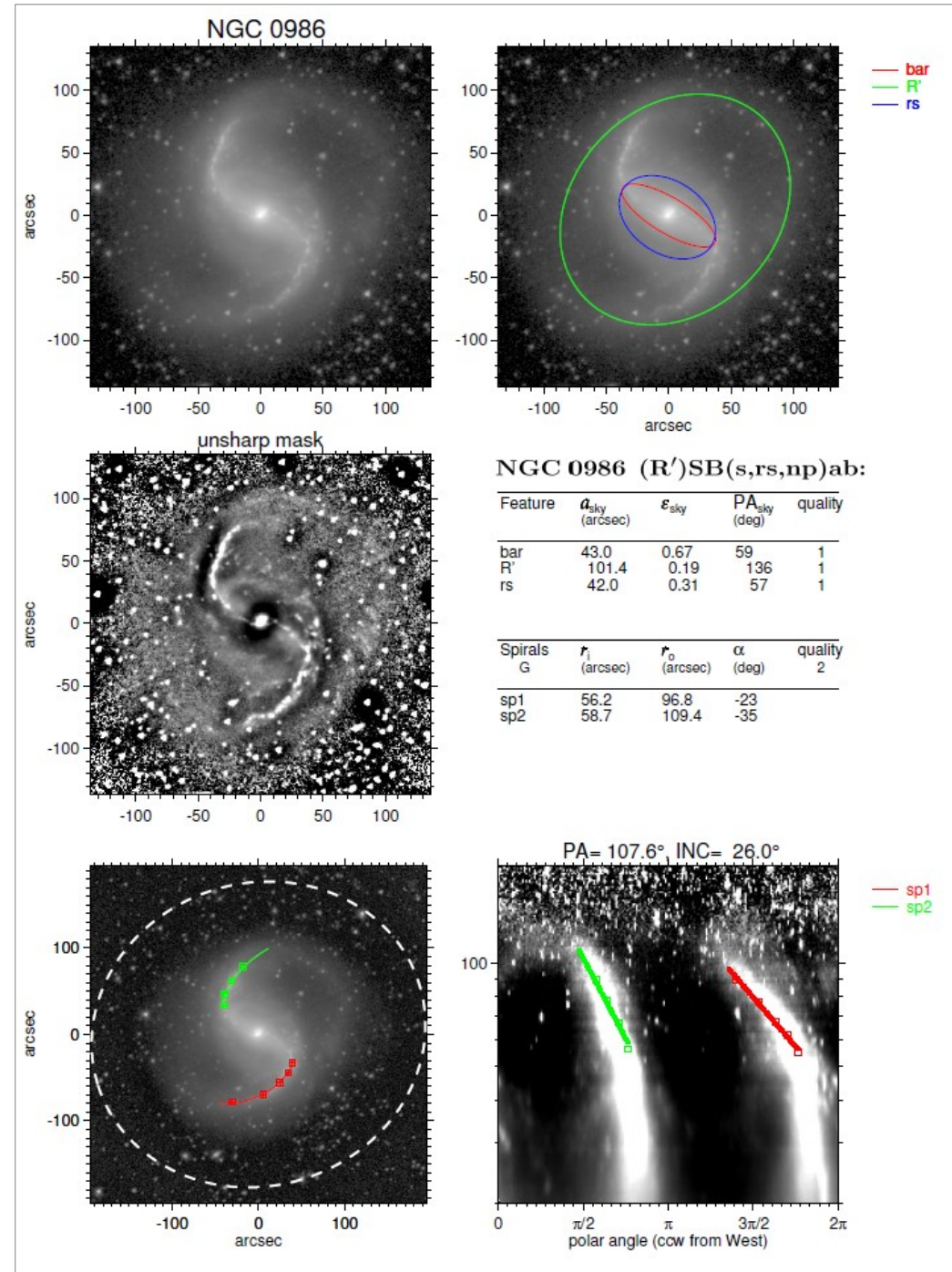
The catalog

Measurements numbers:

- Bars: 1147 (904 in galaxies with inc < 65 degrees)
- Nuclear bars: 13
- Lens and ringlenses: 294
- Rings: 799
- Barlens: 67
- Nuclear features: 87
- Spirals in galaxies: 482

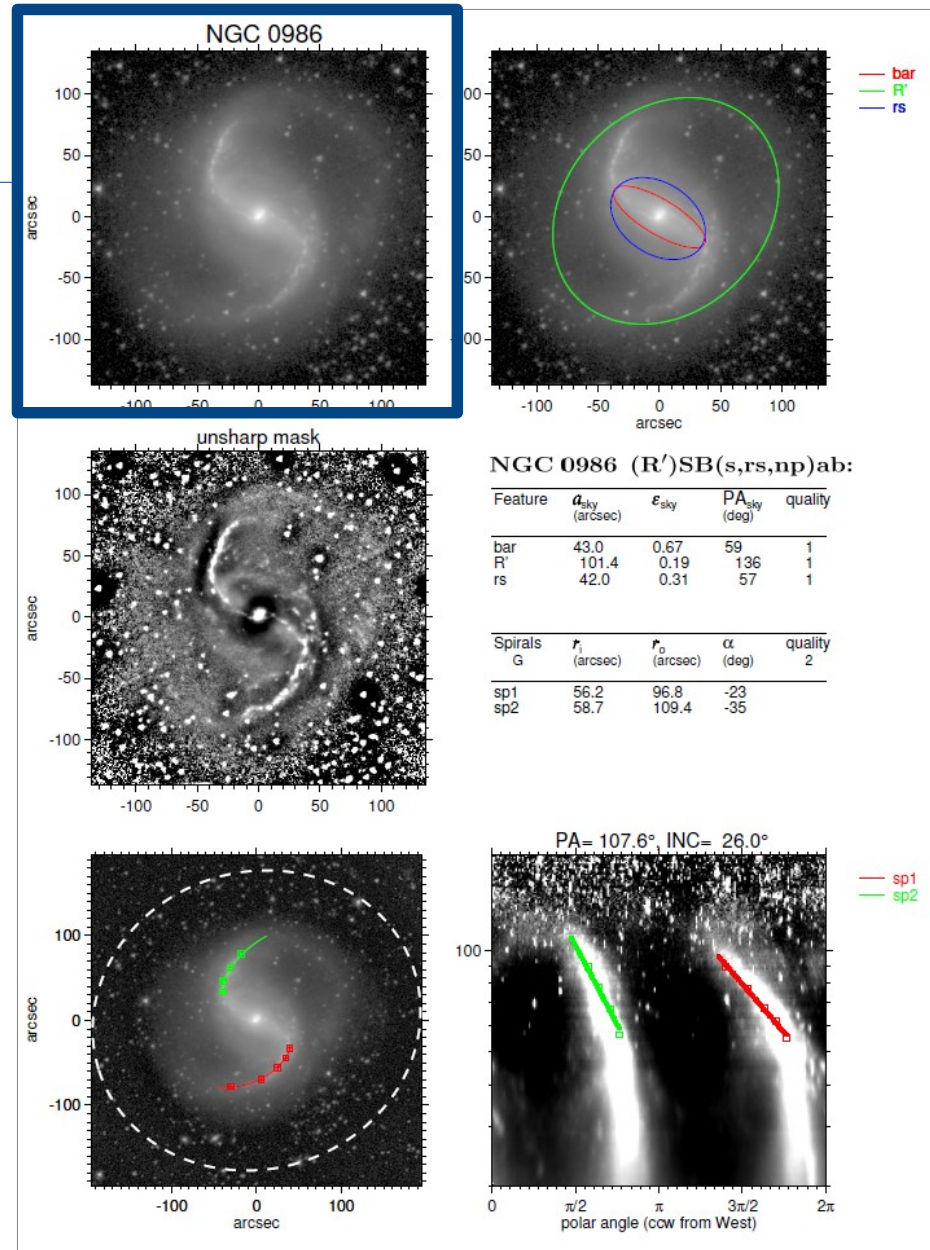
Catalog:

http://cc.oulu.fi/~mherrera/atlas_new0.html

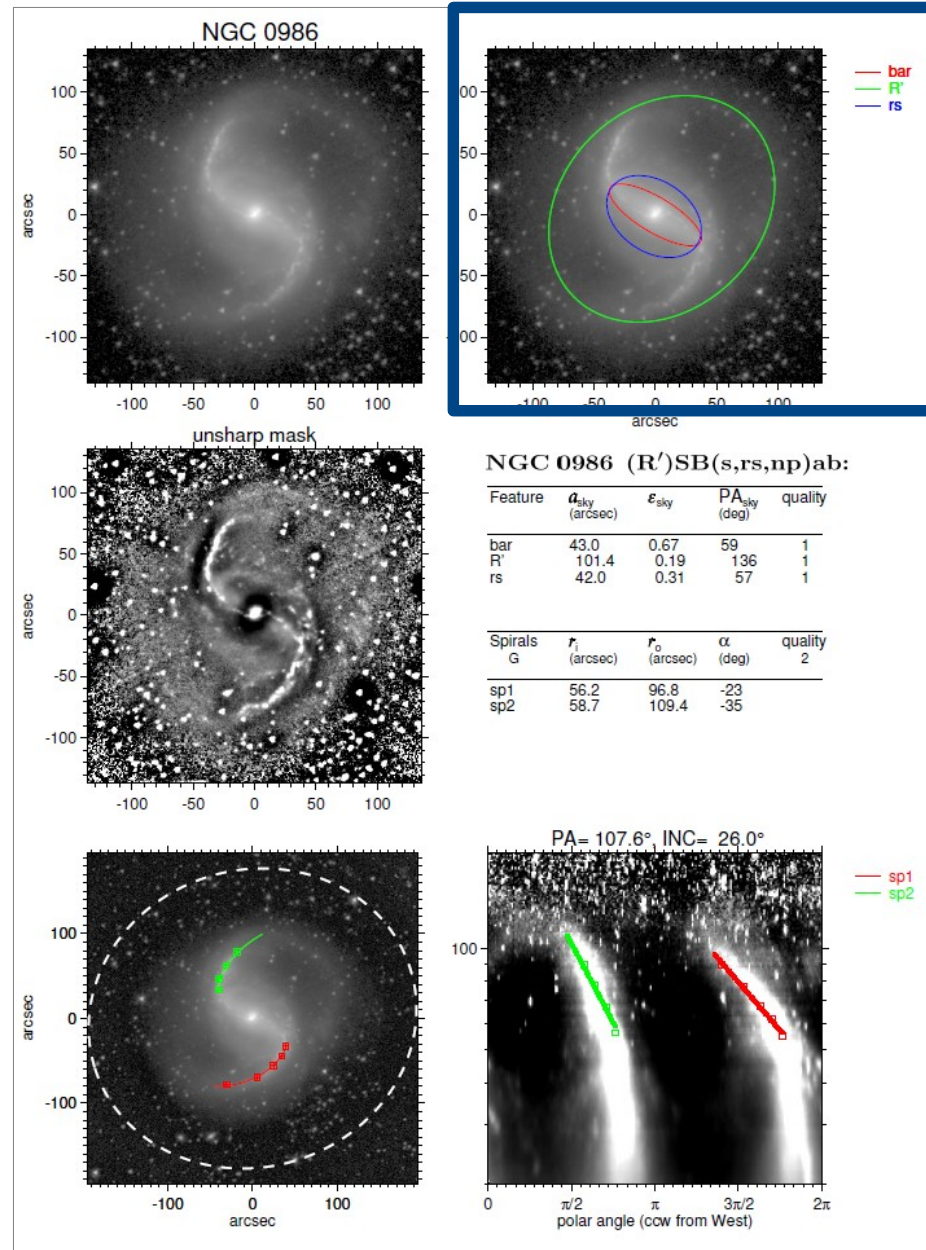


Catalog characteristics

3.6 μm image

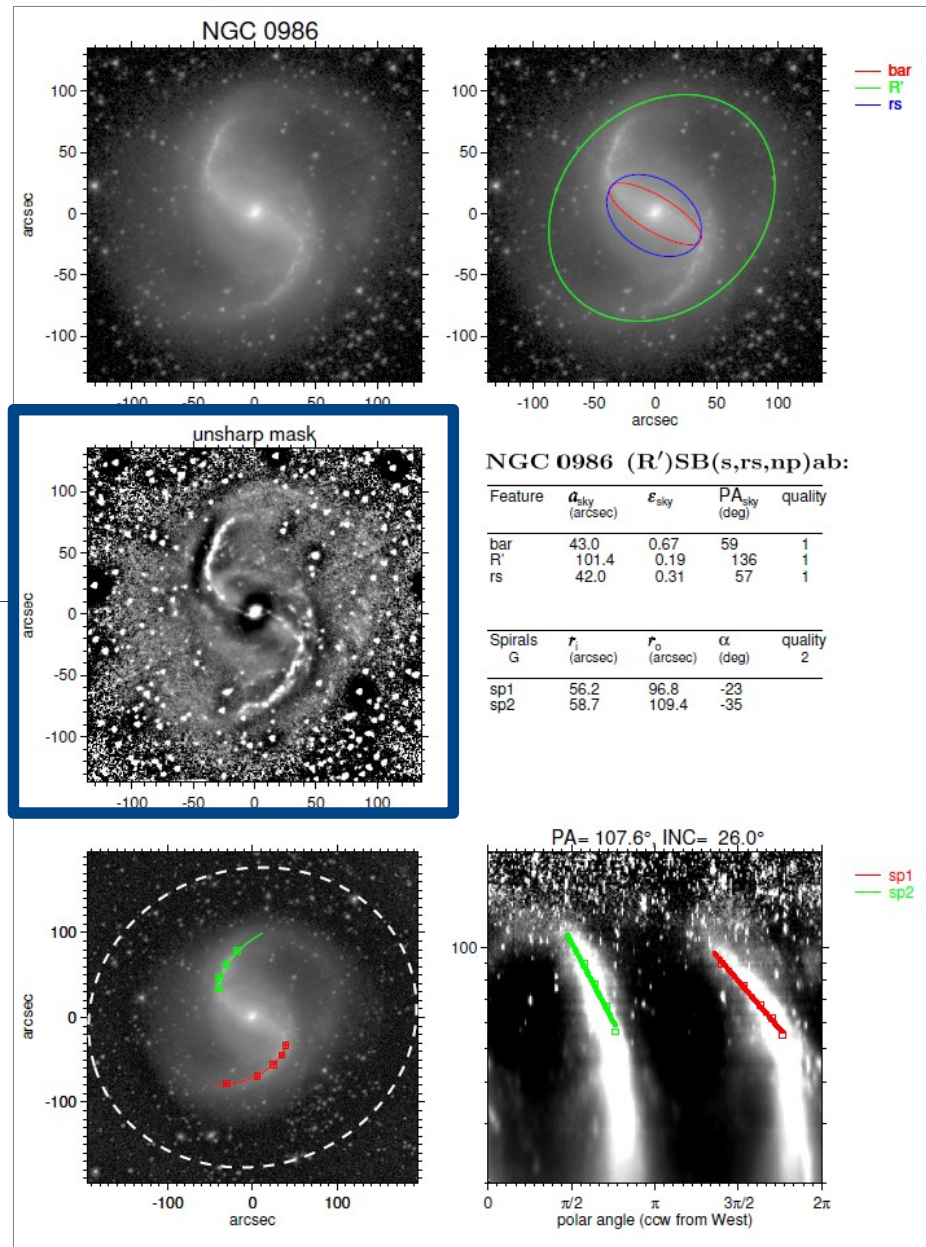


Catalog characteristics



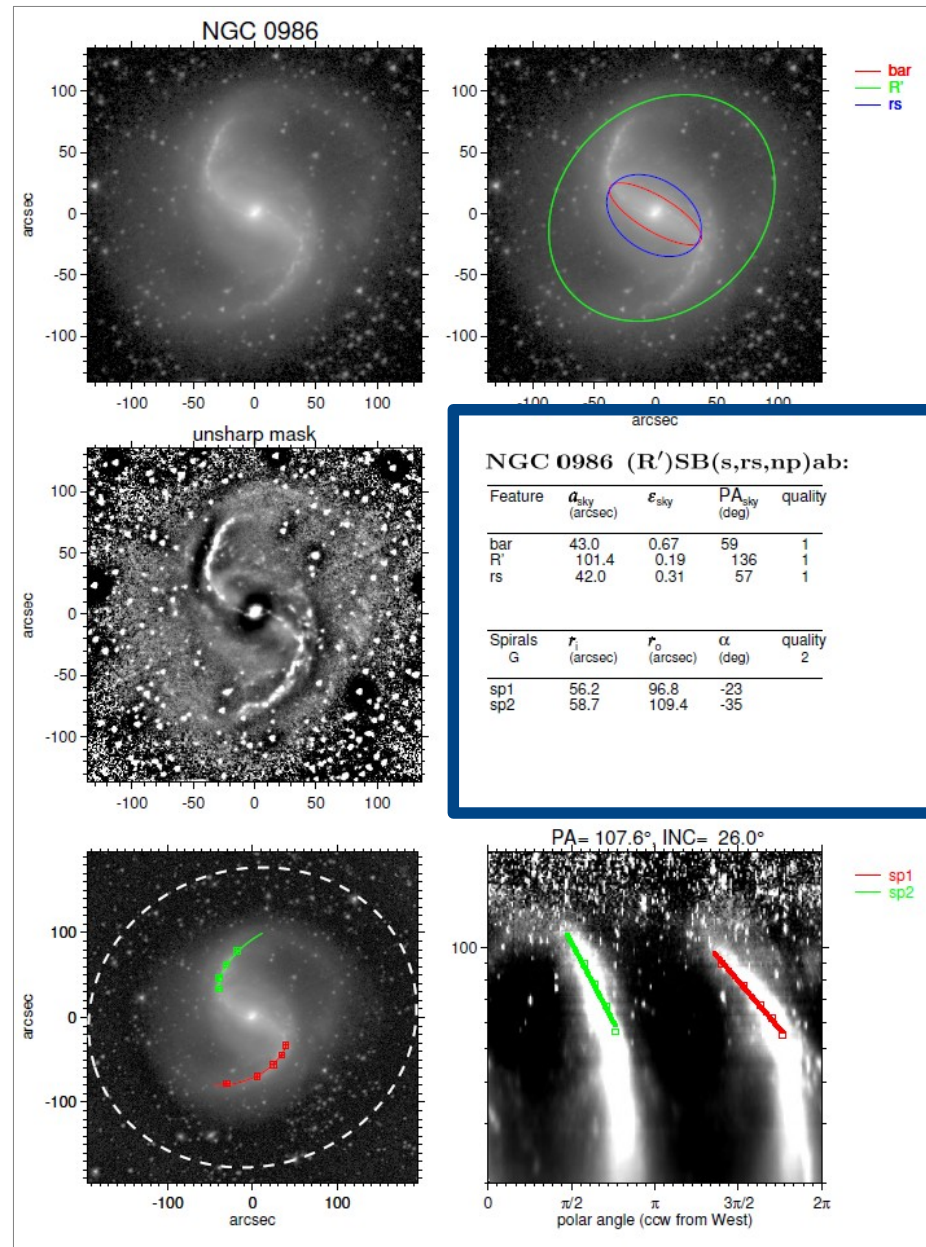
Measured features overplotted

Catalog characteristics



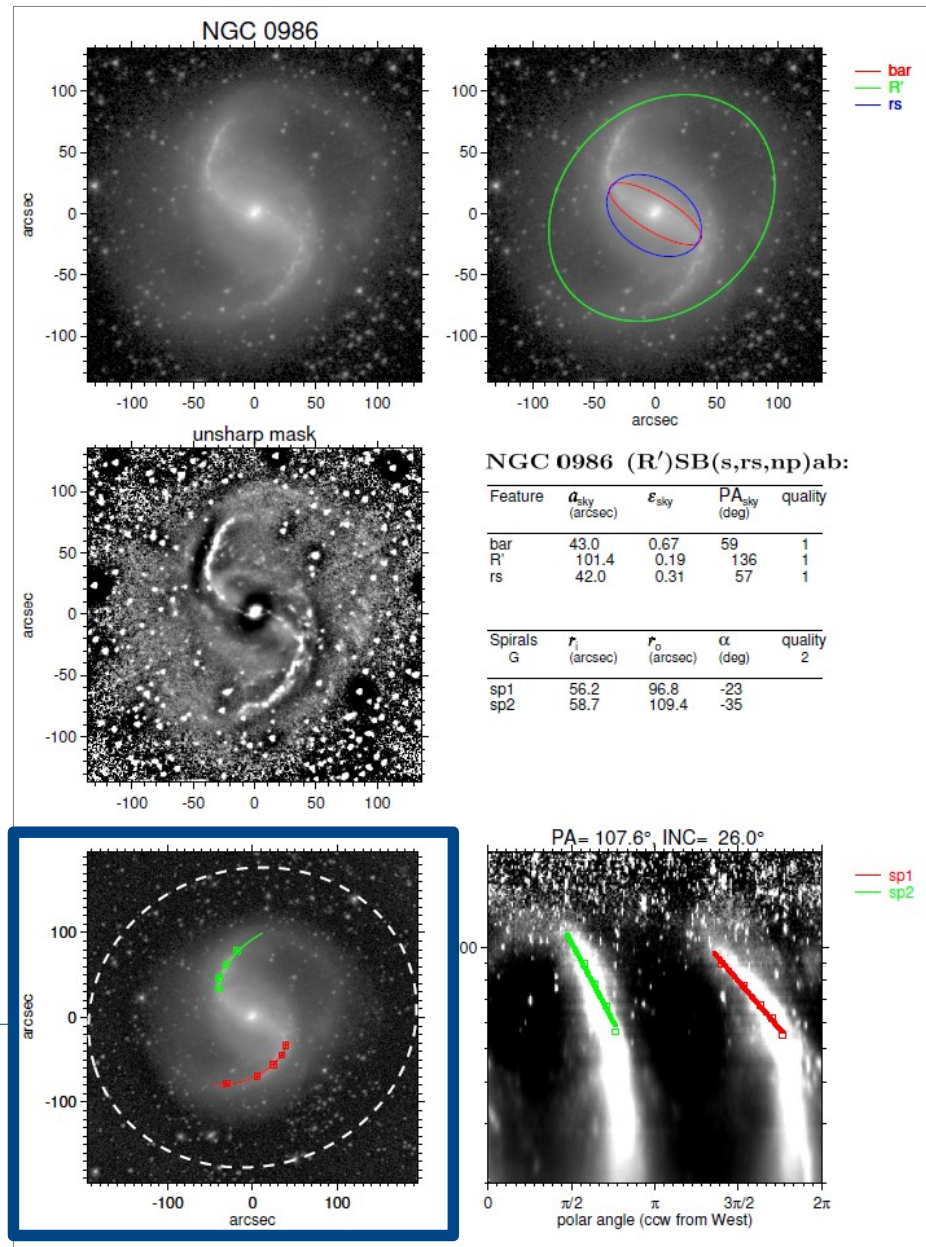
Unsharp mask ←

Catalog characteristics



Data table

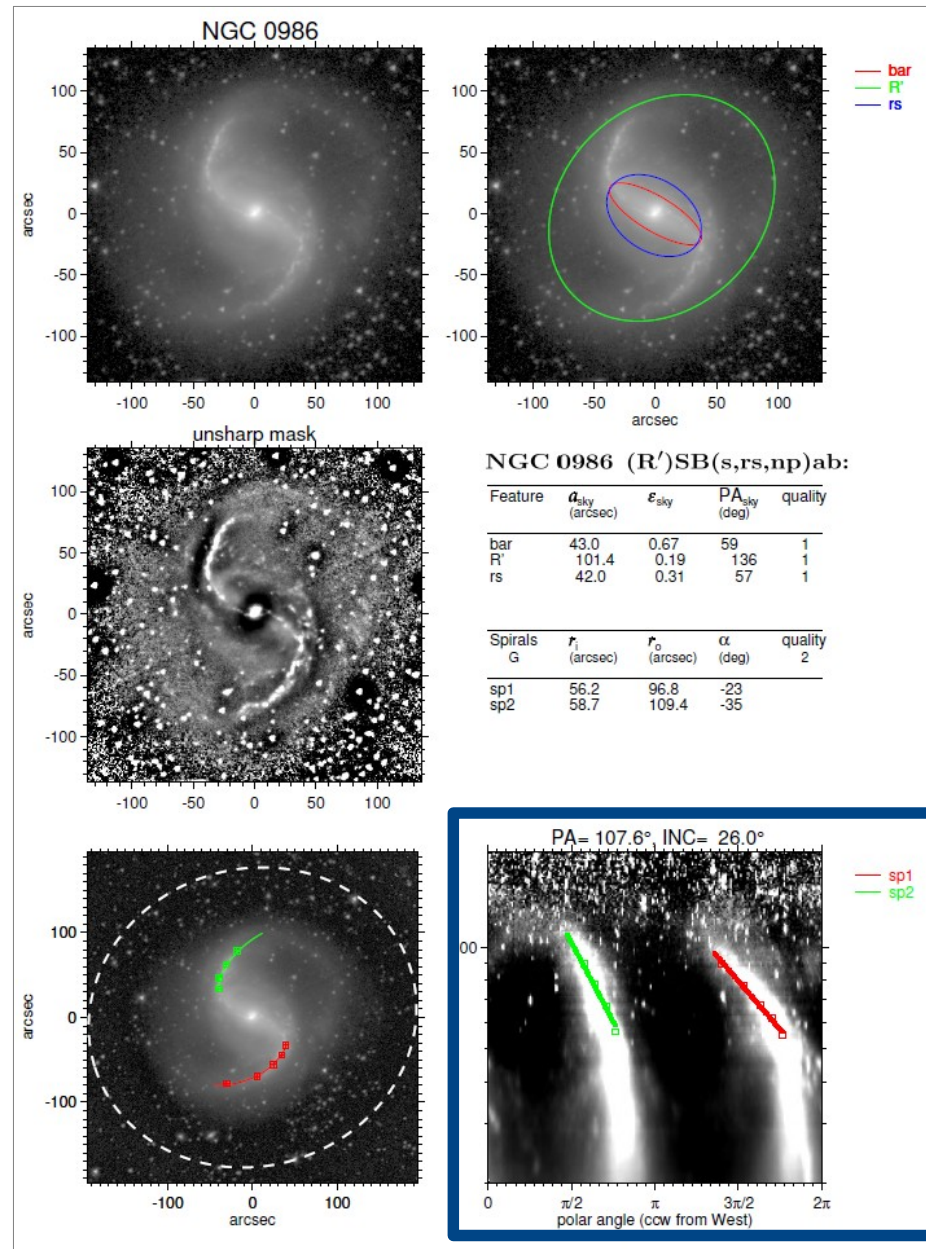
Catalog characteristics



Spiral fits in sky plane

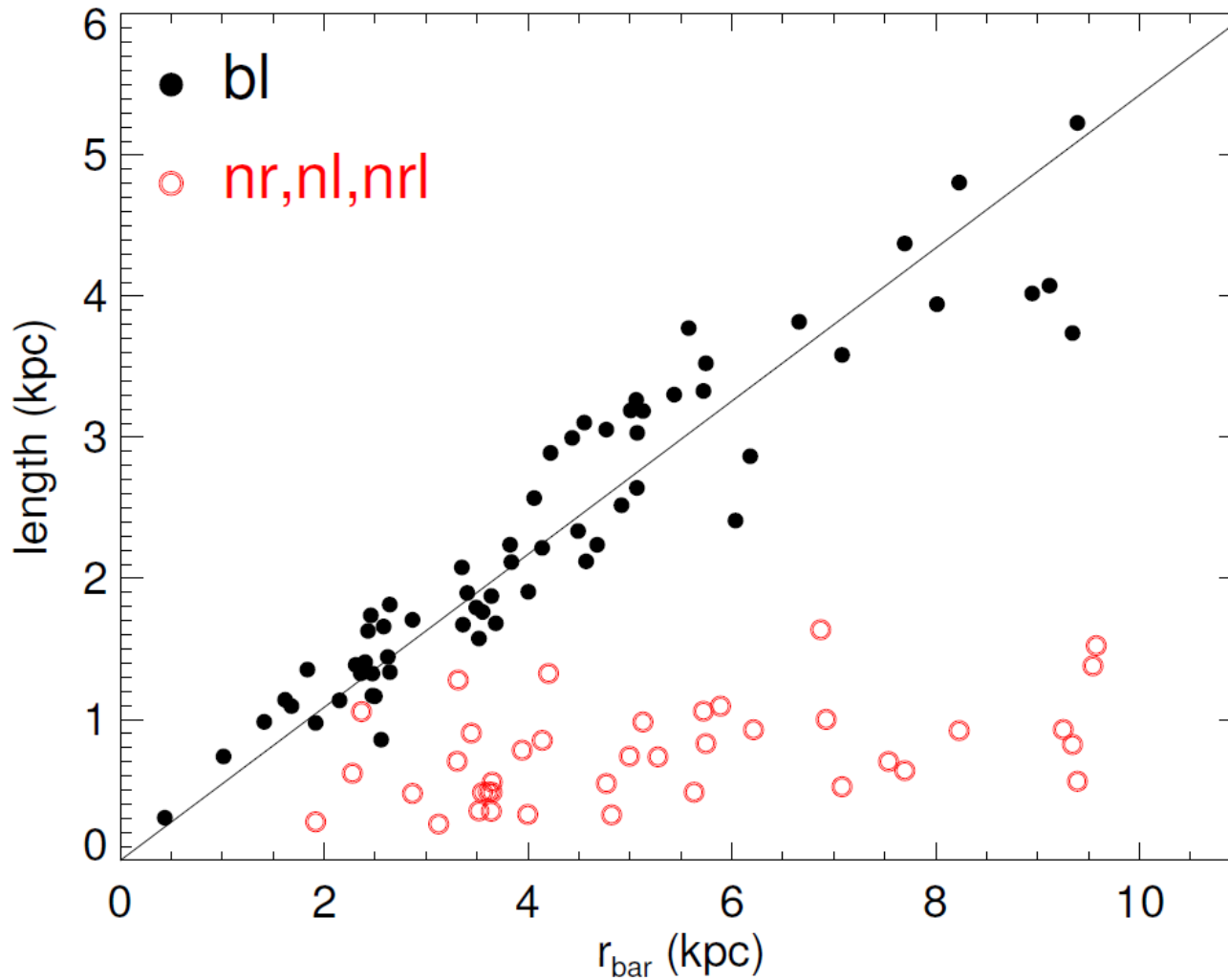


Catalog characteristics



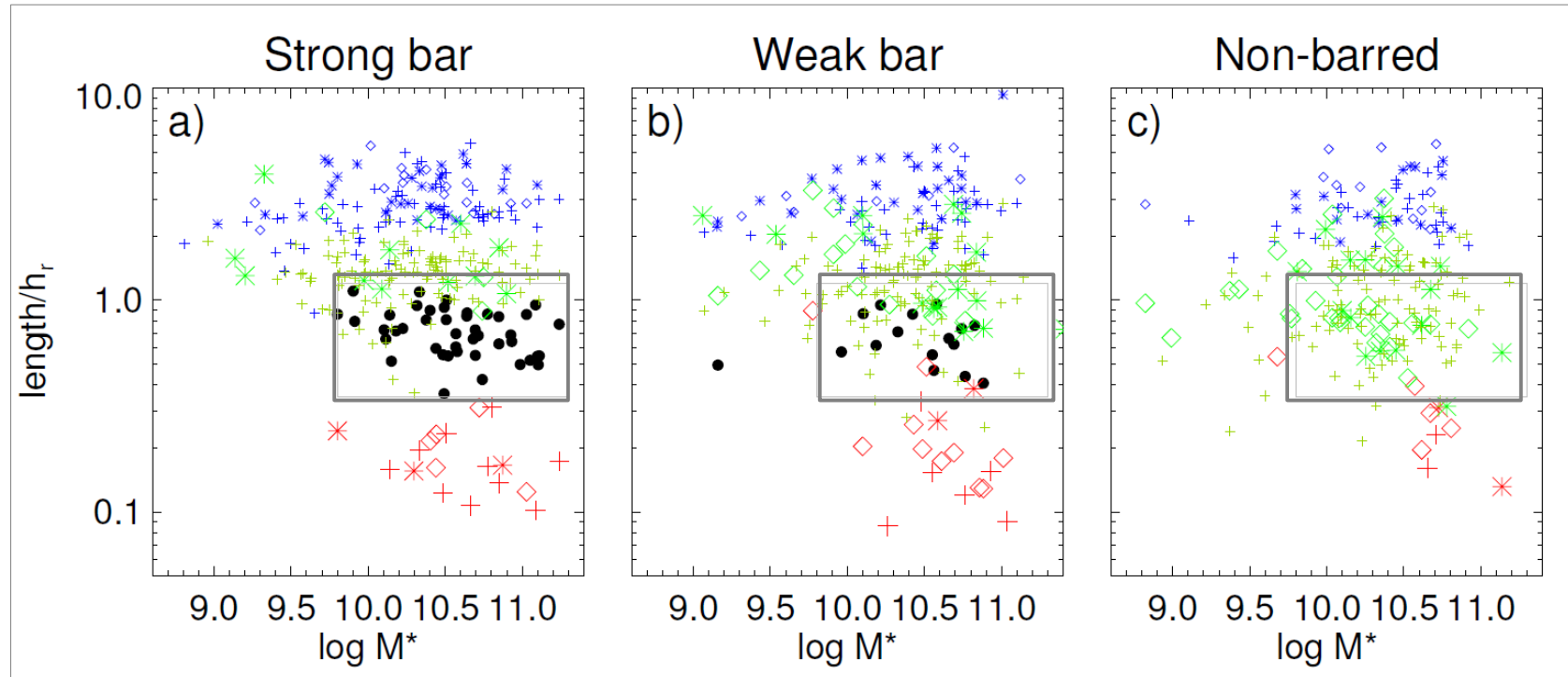
→ Spiral fits in polar plot

Some results



Correlation between sizes of bl and bars => Barlenses form part of the bar.

Some results



Region populated by bl in strongly barred galaxies is populated by inner structures (in particular lenses) in non-barred galaxies.

inner lenses in non-barred galaxies are former bl:

- in which the thin part of the bar dissolved? (Laurikainen+2013)
- perhaps only the lens-like structure was developed?

Take home message

- Catalog data available soon.
- Useful to study the origin of the morphological features in galaxies.

Thank you!