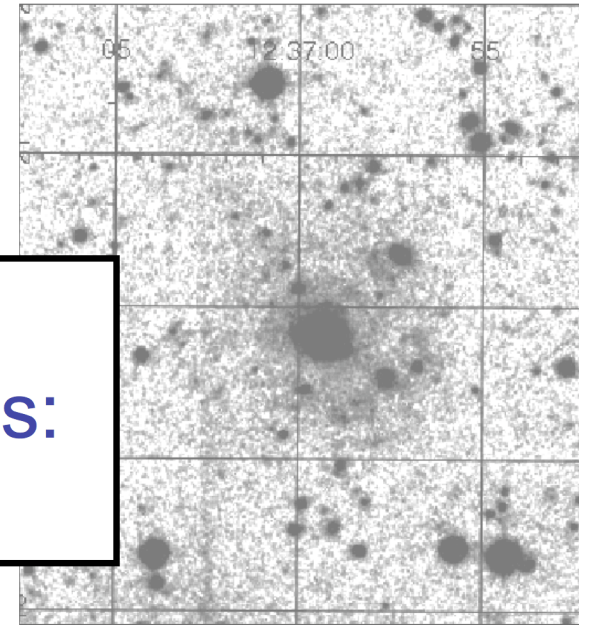


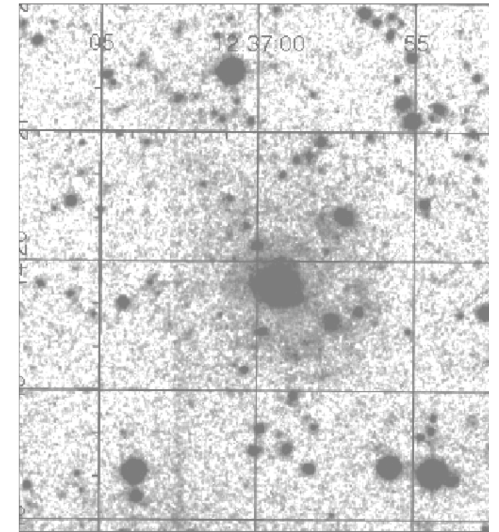
Giant Low Surface Brightness Galaxies:

Clues to the **interplay** between
galaxy **disks** and **halos...**



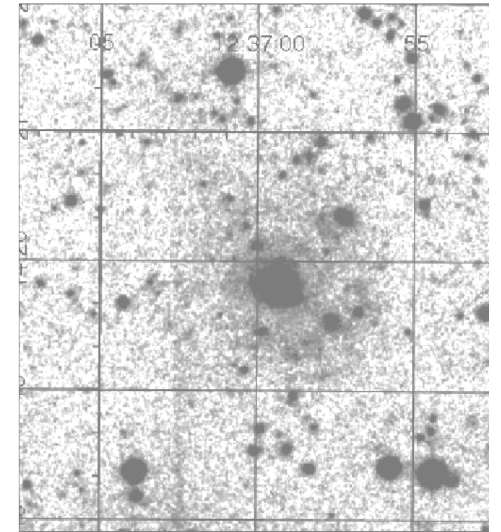
Giant Low Surface Brightness Galaxies:

- **Giant LSB** = a **class** that does **not need to be**.
- Hosts are ***ordinary galaxies***
- The LSB disks result from *extended HI disks*
- Mild *star formation* and increased diameter is triggered by ***tidal interaction***



The Prototype:

Malin 1



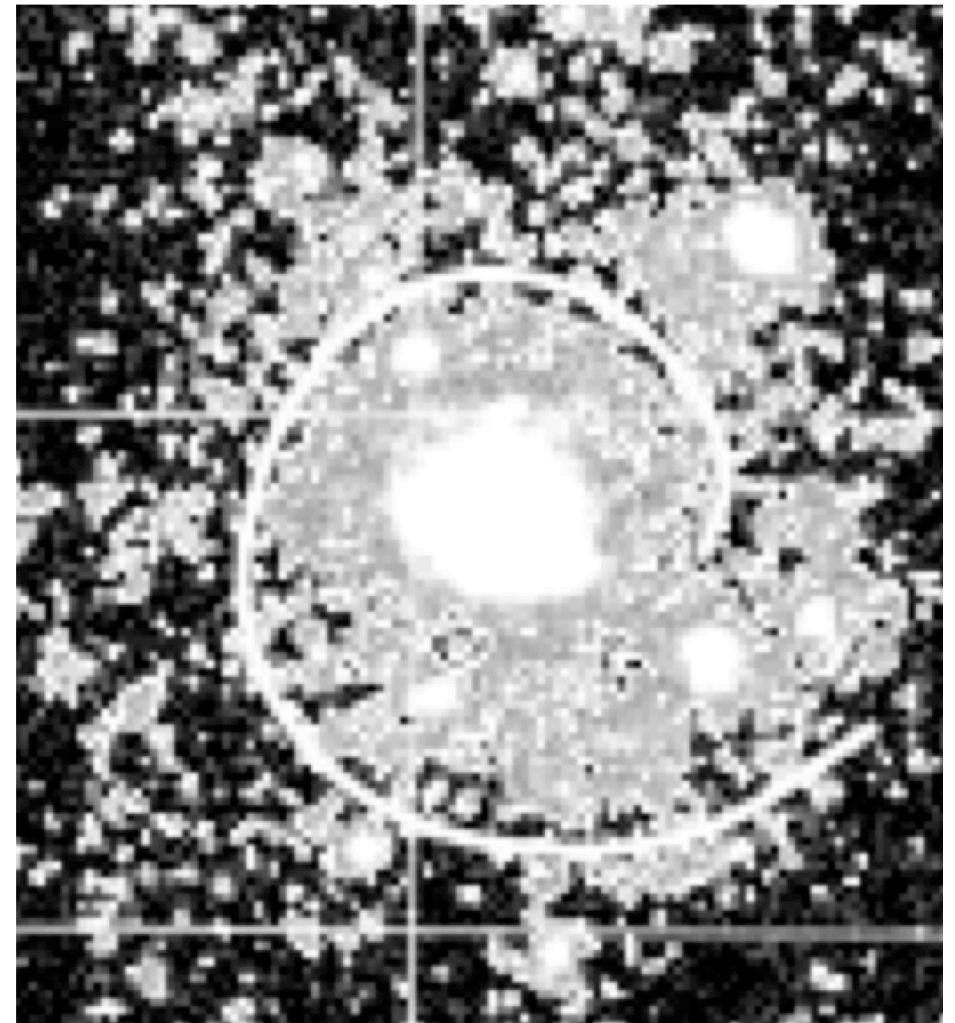
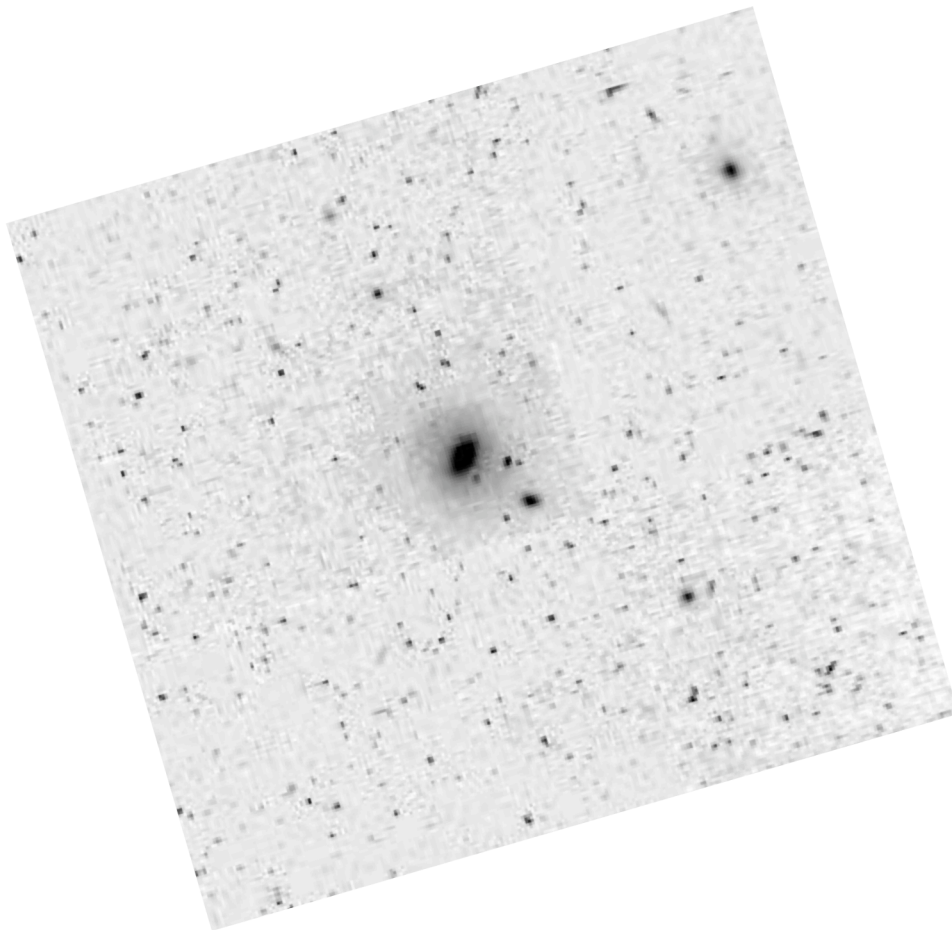
- a **galaxy**
- *prototype* of the **Giant Low Surface Brightness** class
 - **Giant** => disk scale-length ~50 kpc
 - **LSB** => low “central surface brightness” (23.5)
- faint **blue** light
- *quiescent* (low SFR), primitive (low metallicity) disks
- 2×10^{11} Solar Masses of HI ... => 7×10^{10}
- redshift ~25,000 km/s ($z \sim 0.08$)

Recent Optical images

Moore & Parker 2001

Stack of 63 sensitized Schmidt Plates

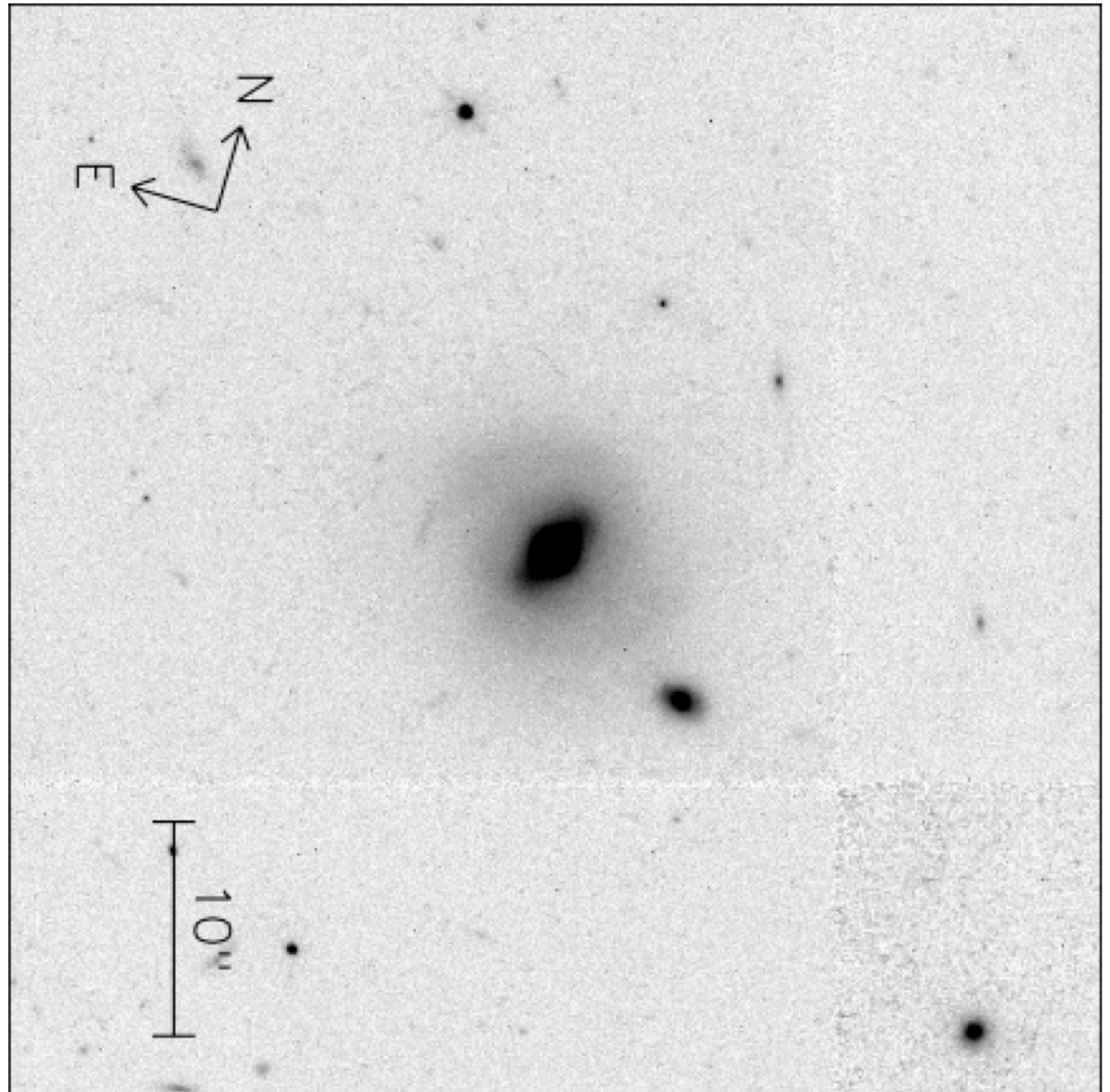
Archival HST Image



HST

Barth 2007

Normal stellar disk !
Out to 10 kpc,
typical SB0/a

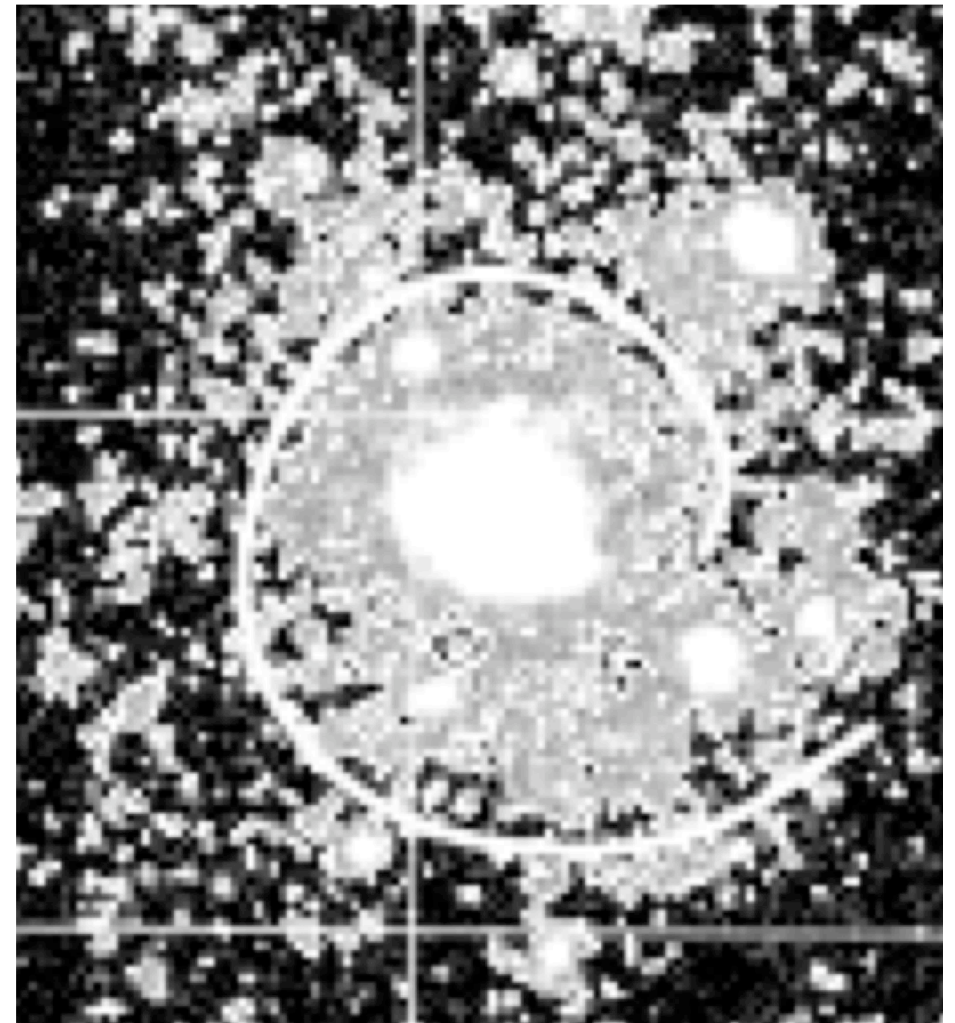
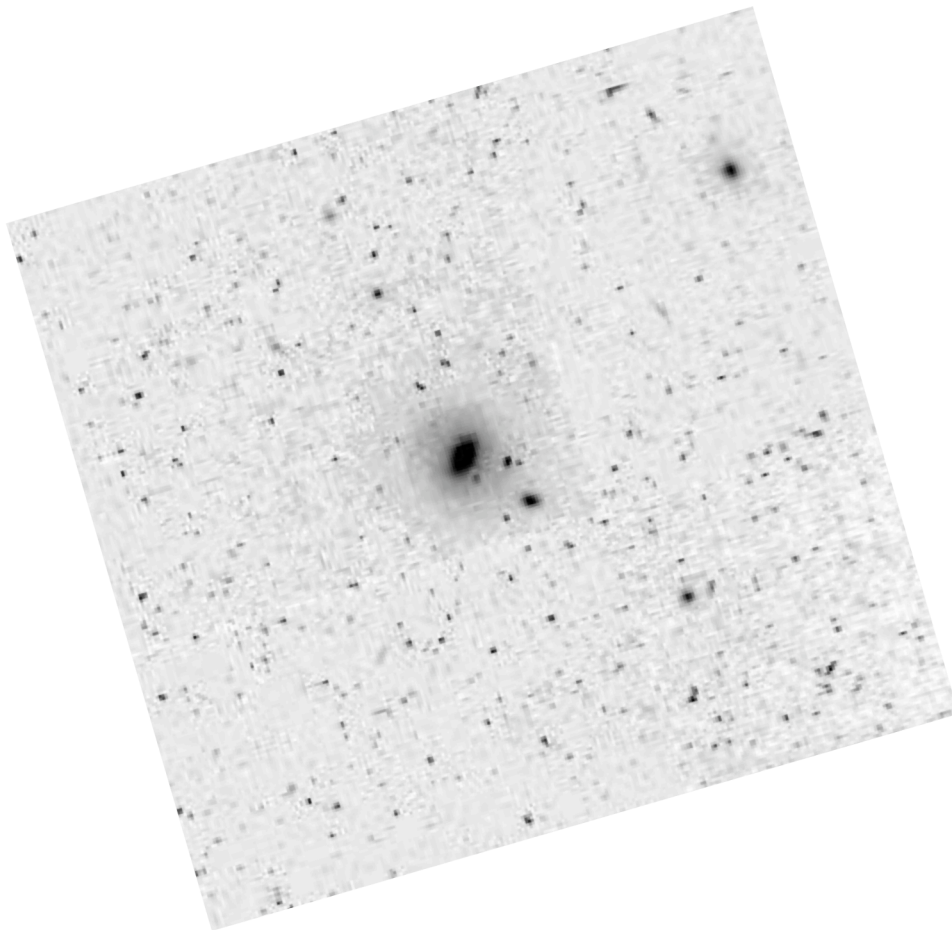


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Archival HST Image

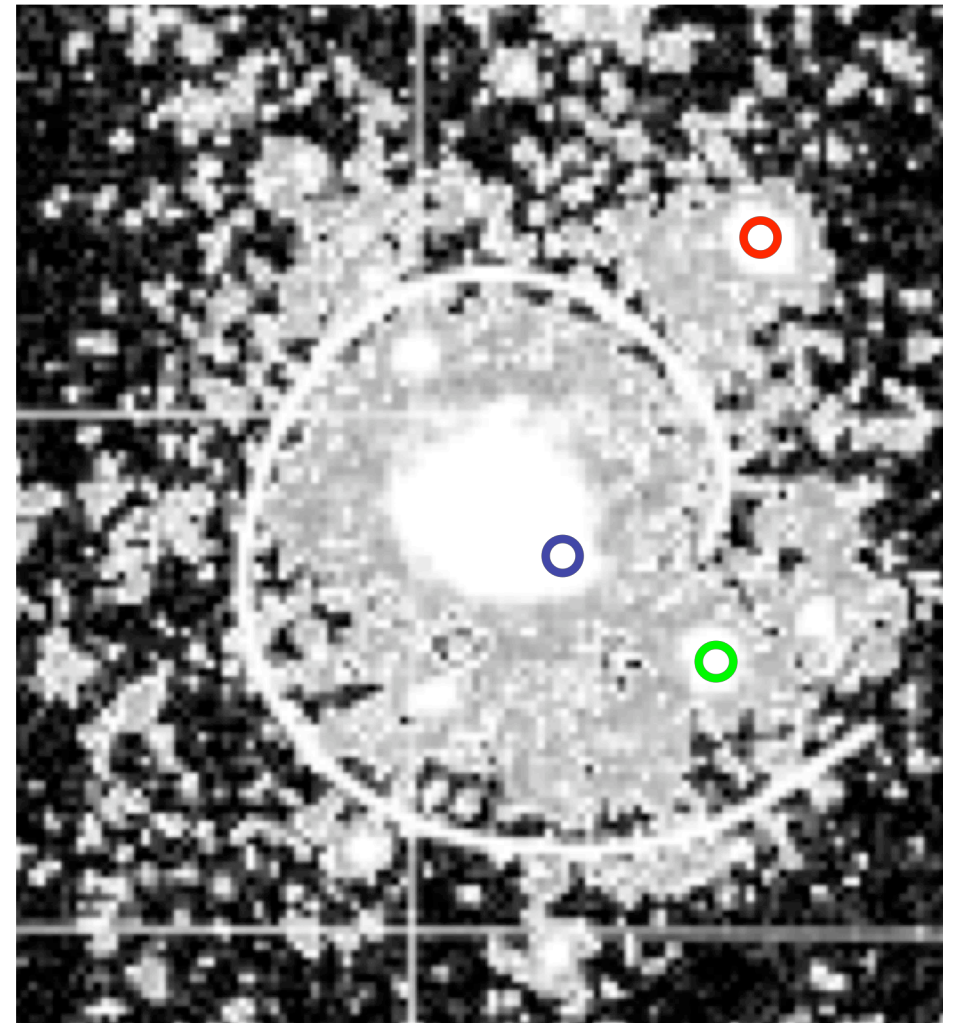
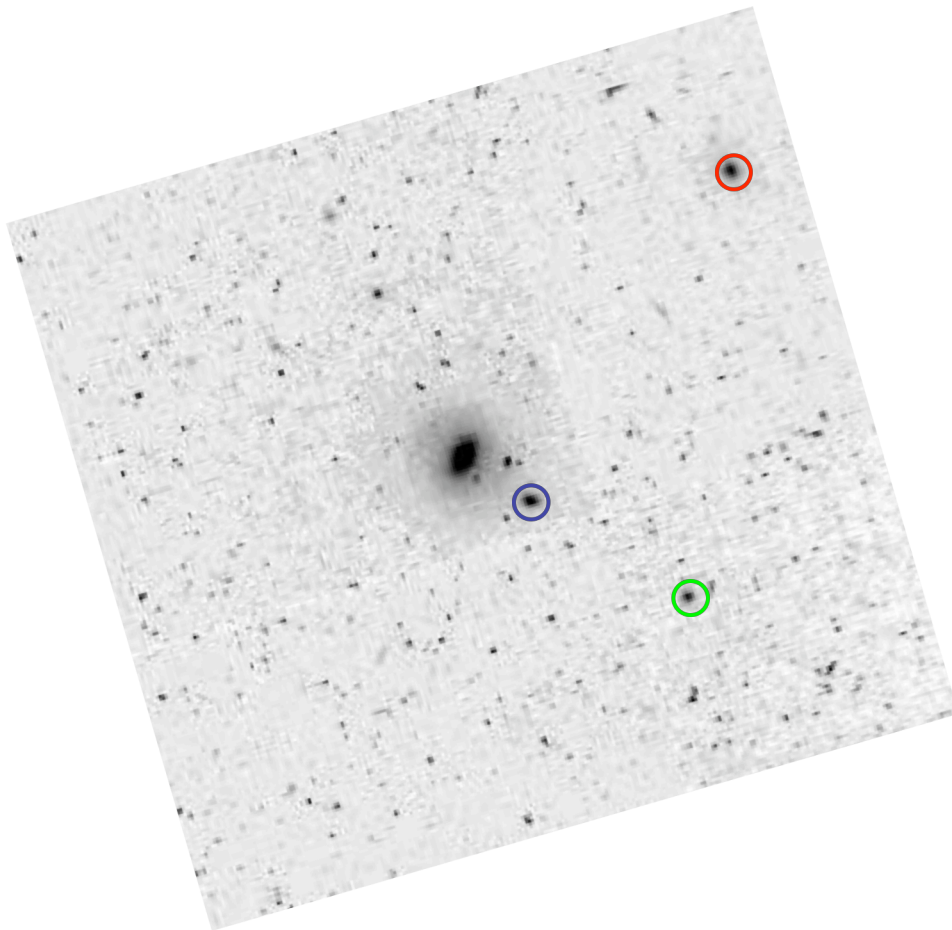


Recent Optical images

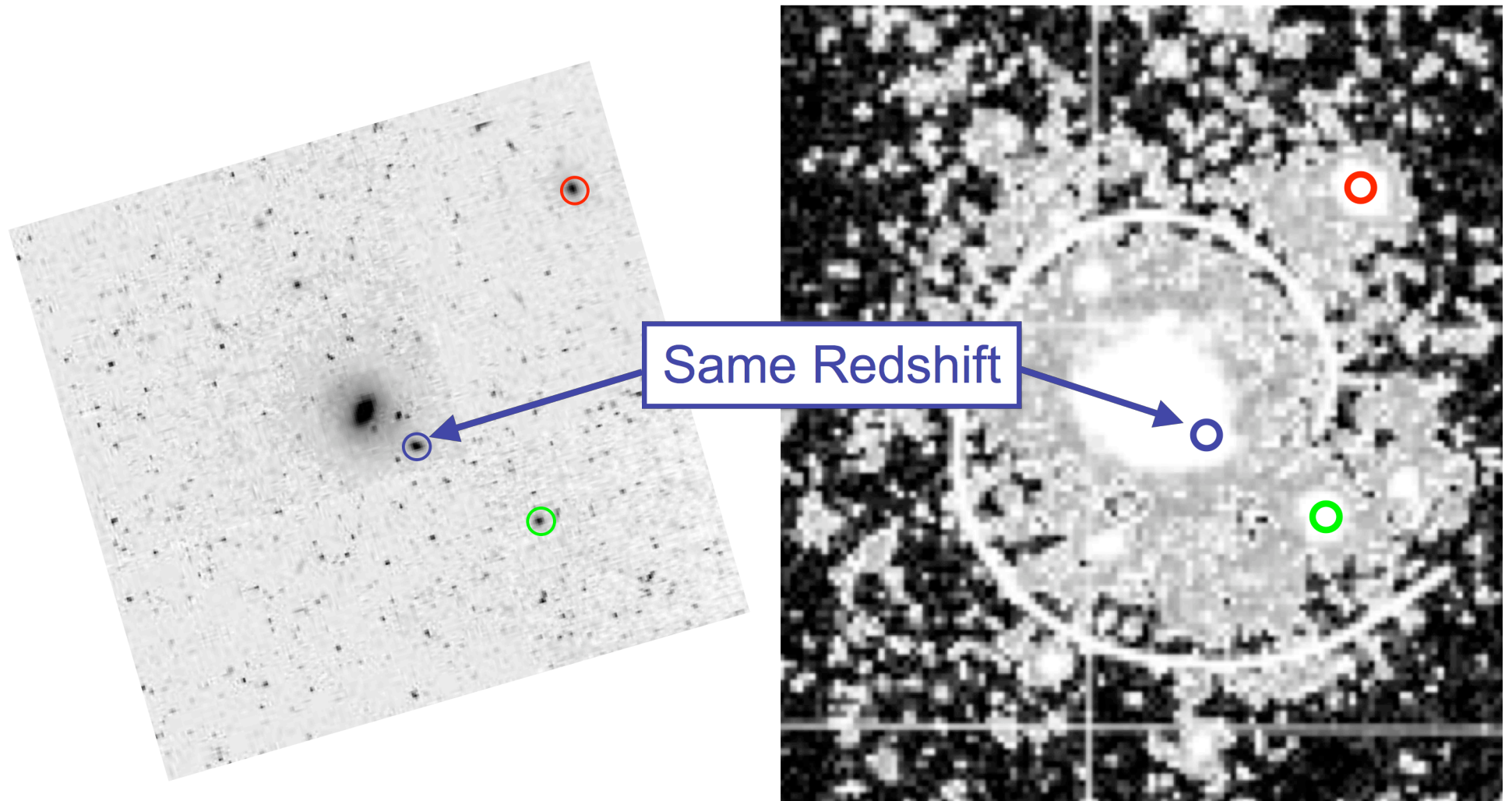
Moore & Parker 200

Archival HST Image

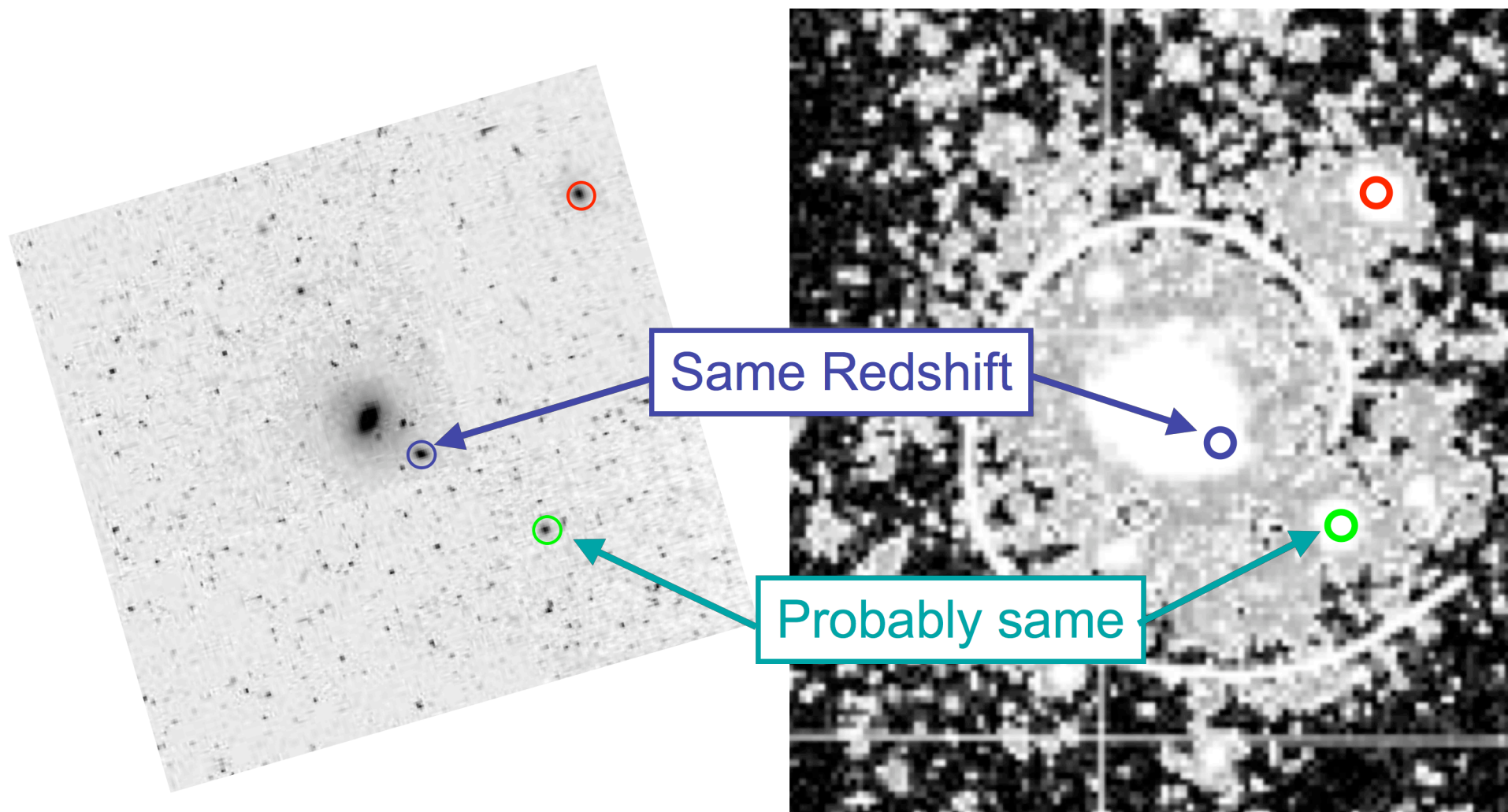
Stack of 63 sensitized Schmidt Plates



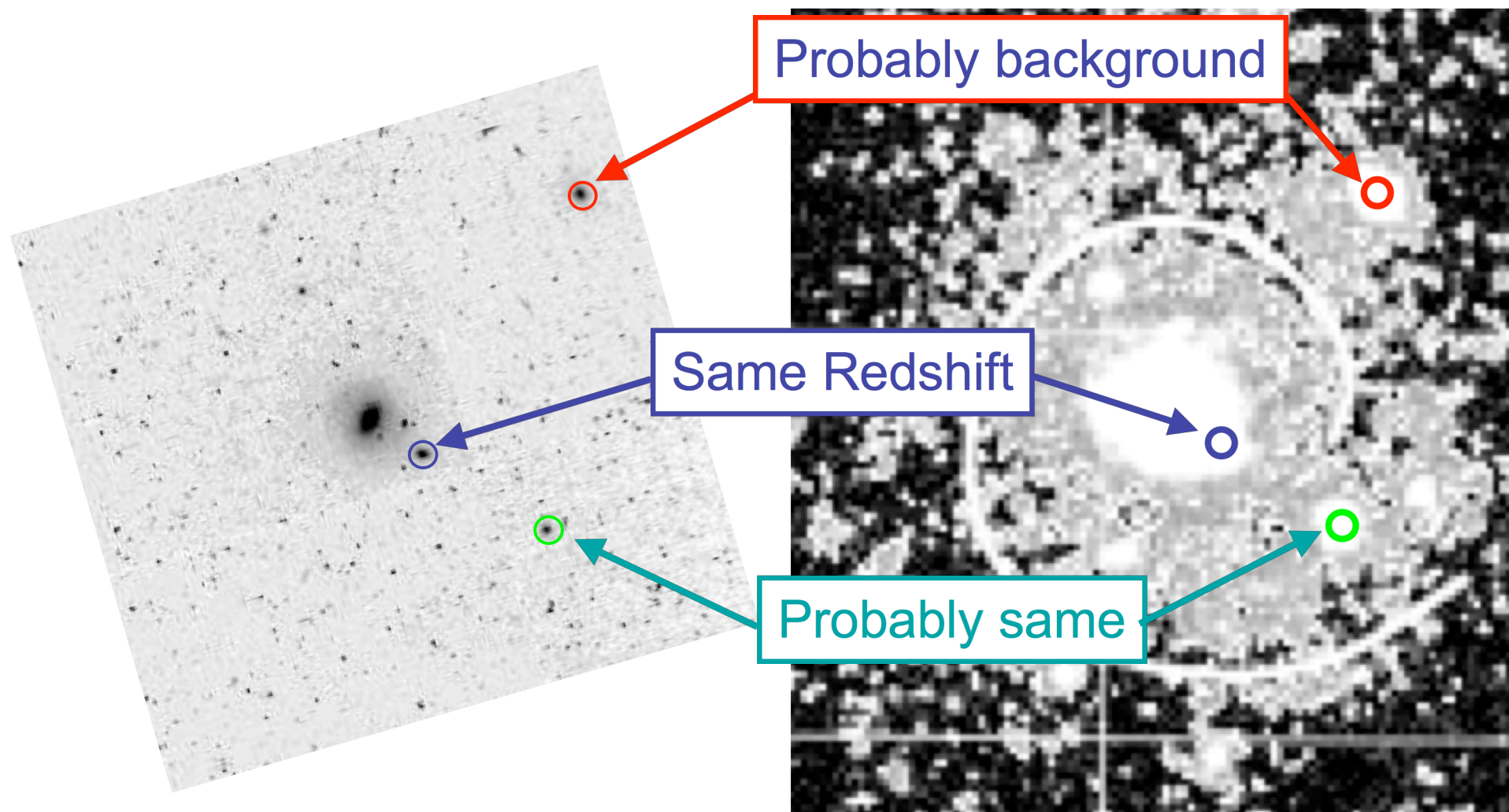
Redshifts 2.3m SSO: Pracy, Jerjen



Redshifts 2.3m SSO: Pracy, Jerjen

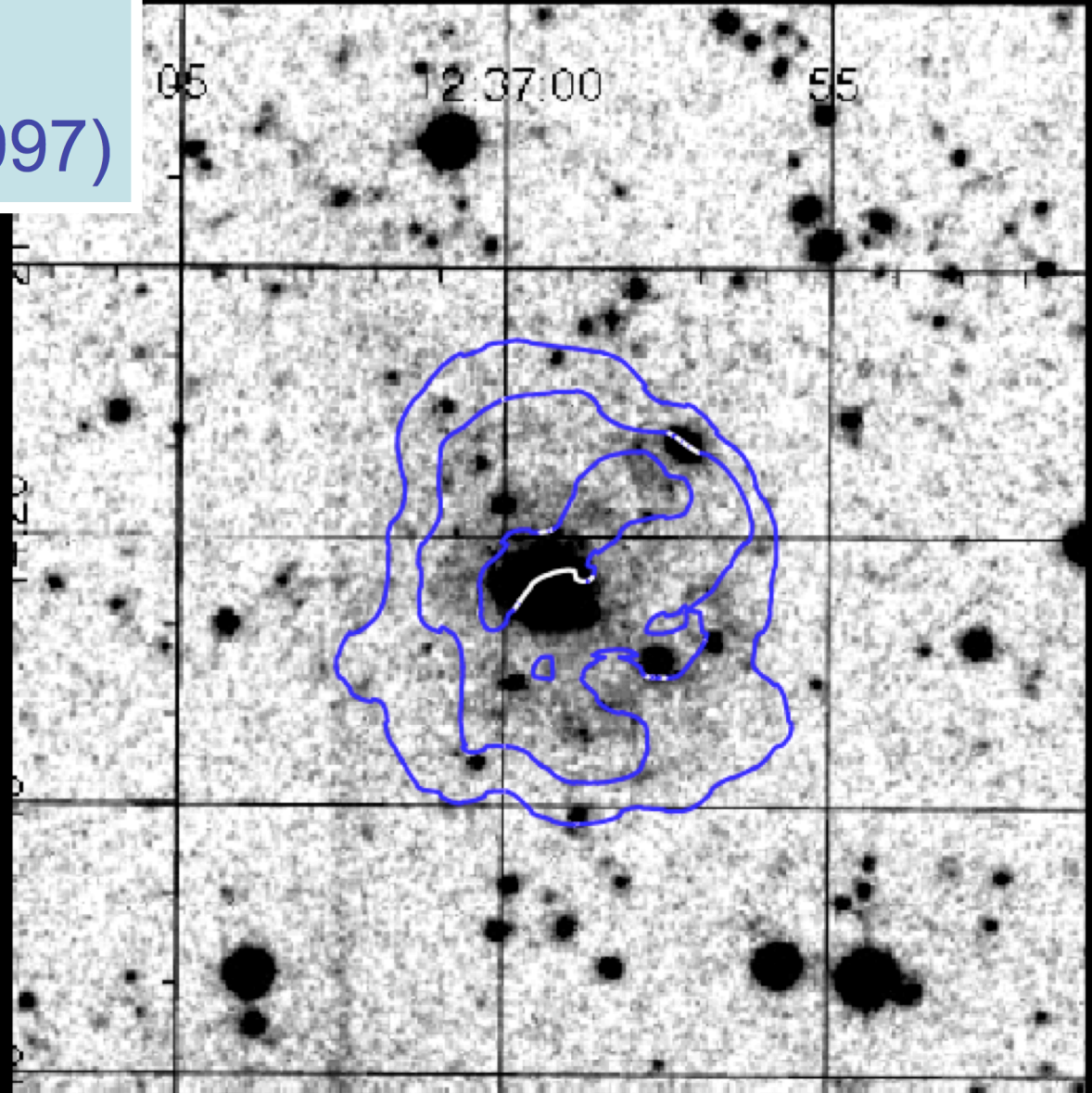


Redshifts 2.3m SSO: Pracy, Jerjen



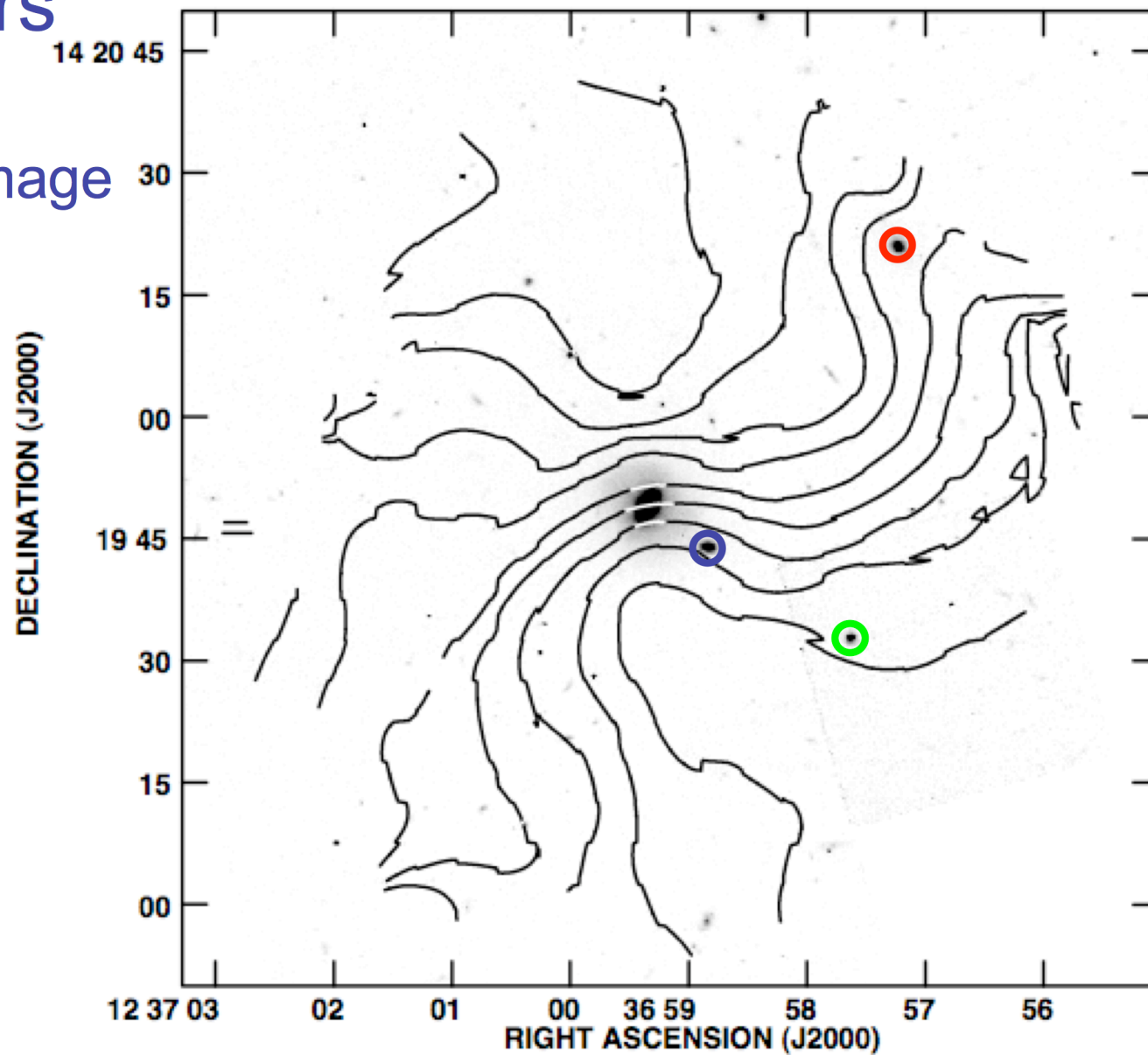
HI Column Density
contours ...
(Pickering et al 1997)

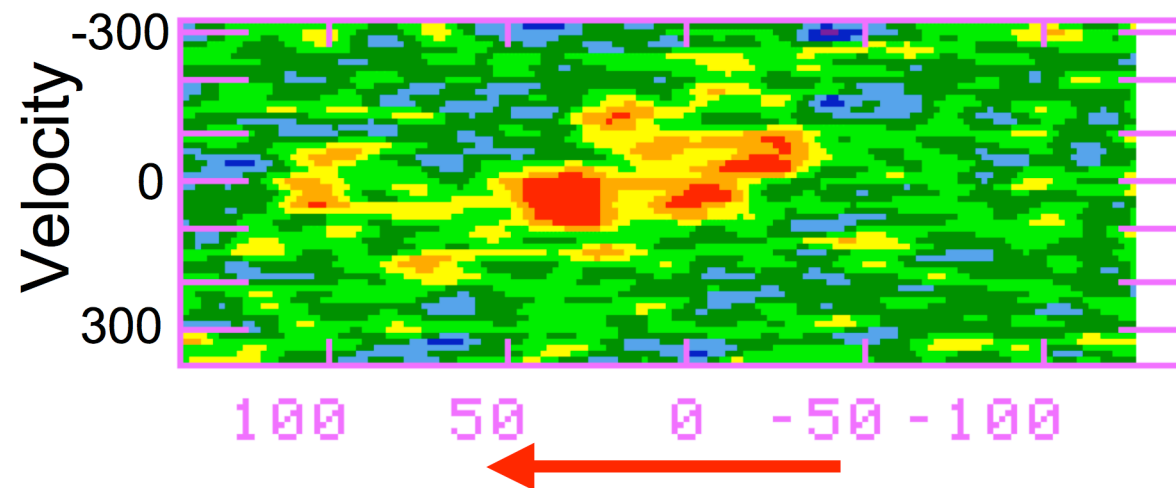
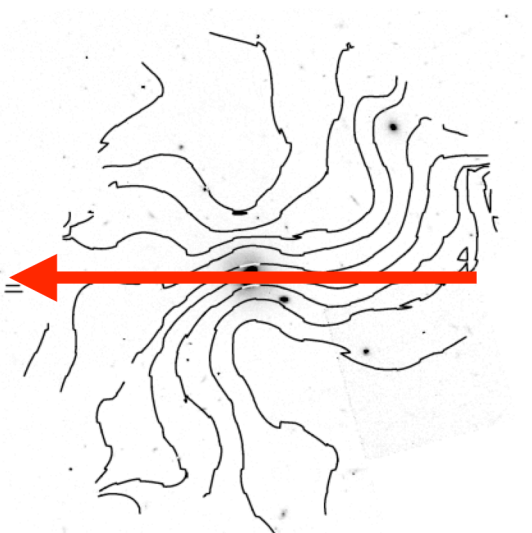
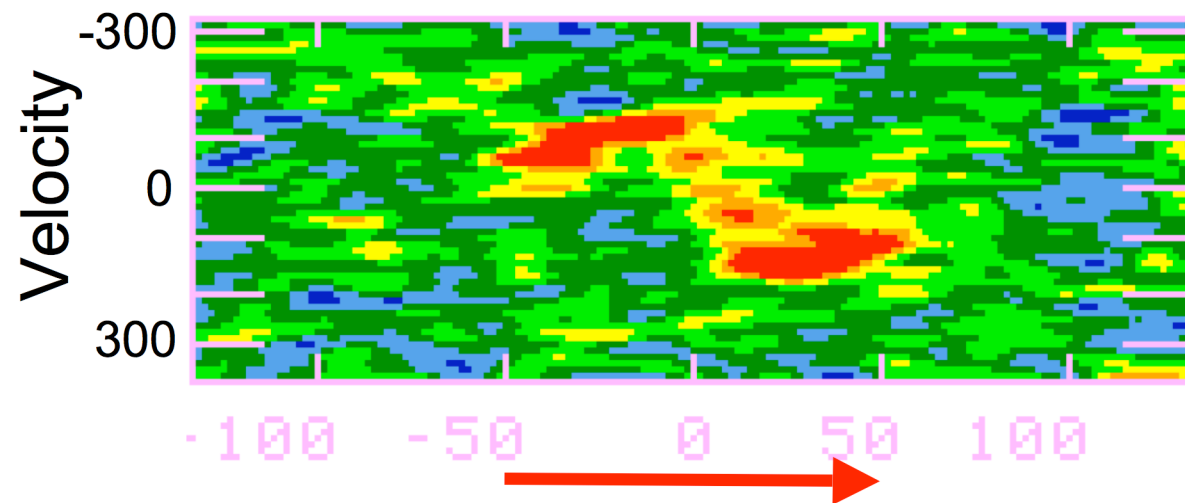
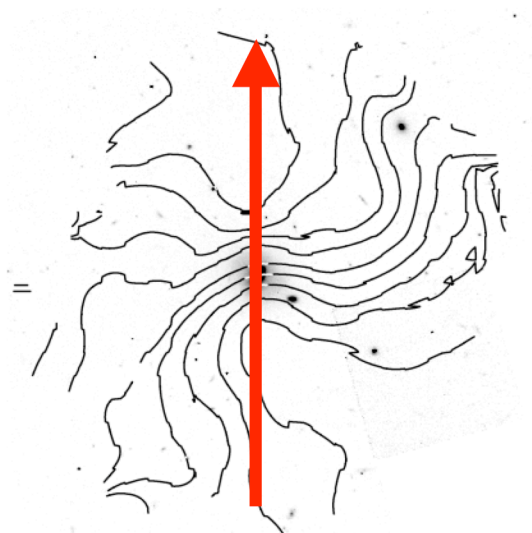
Radio resolution

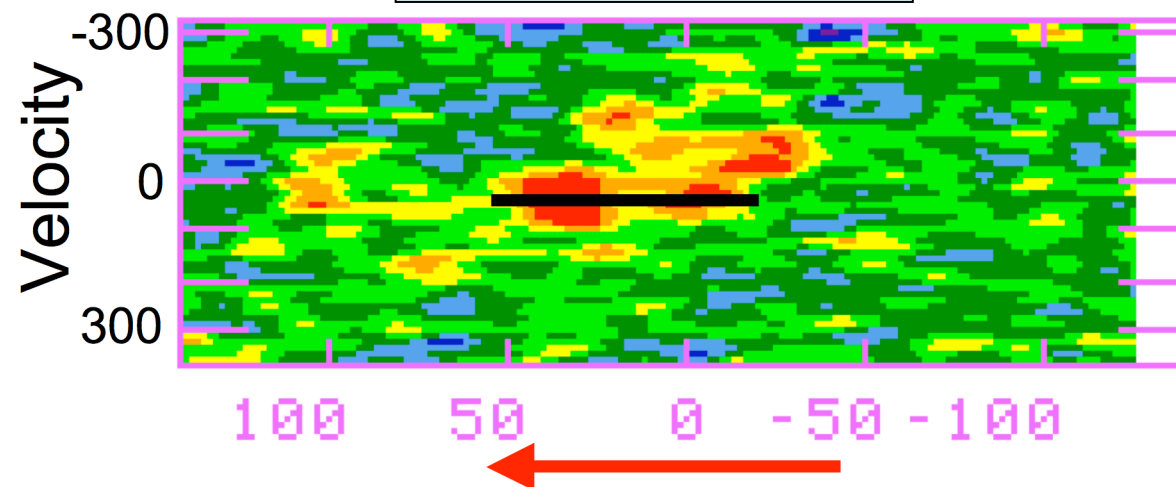
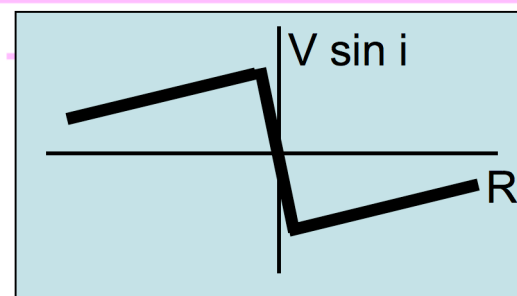
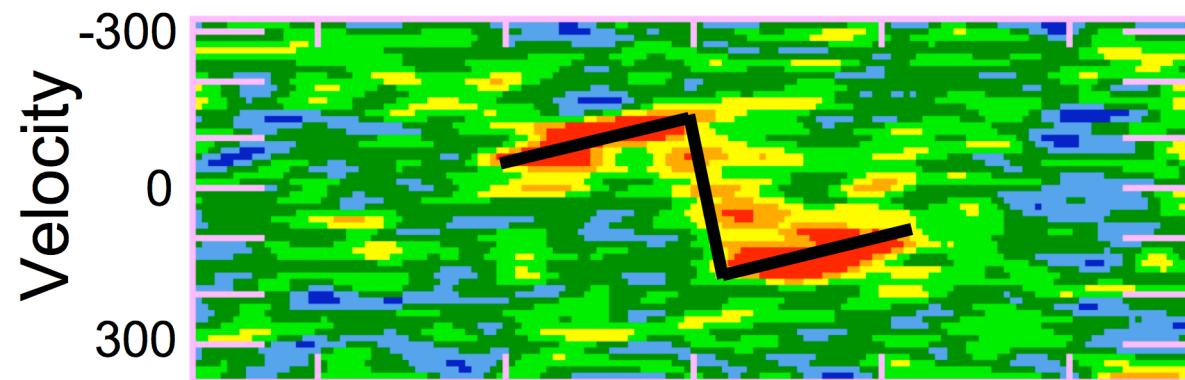
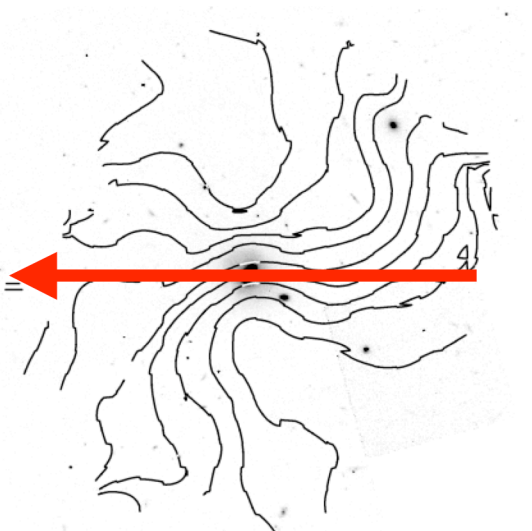
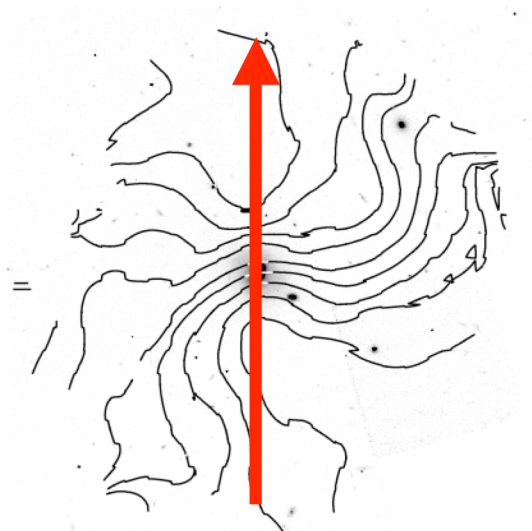


HI Velocity Centroid contours

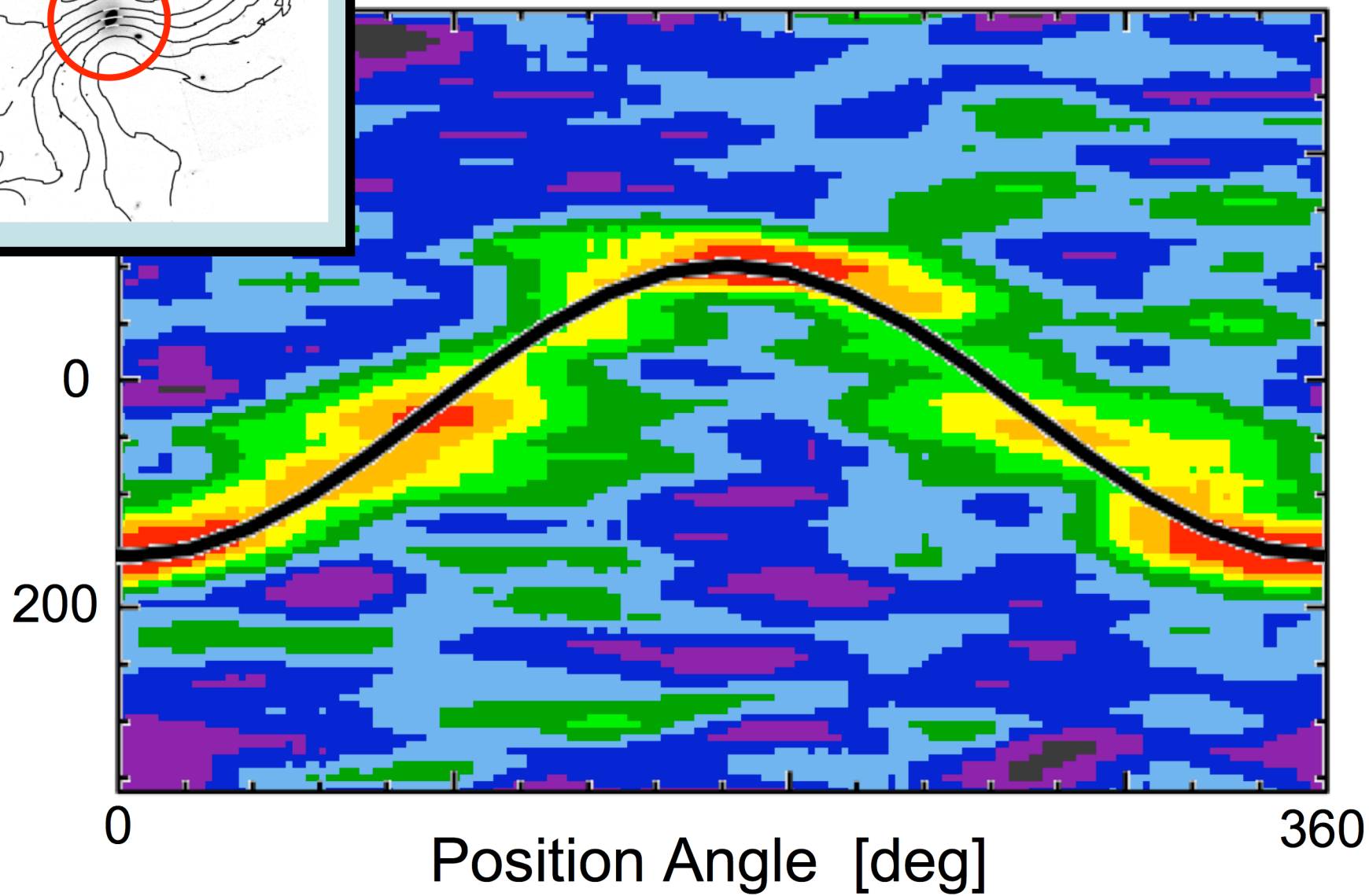
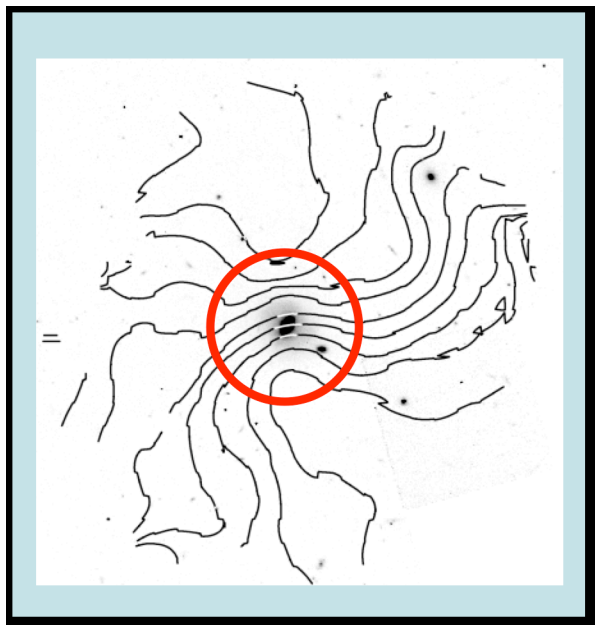
overlaid on HST image



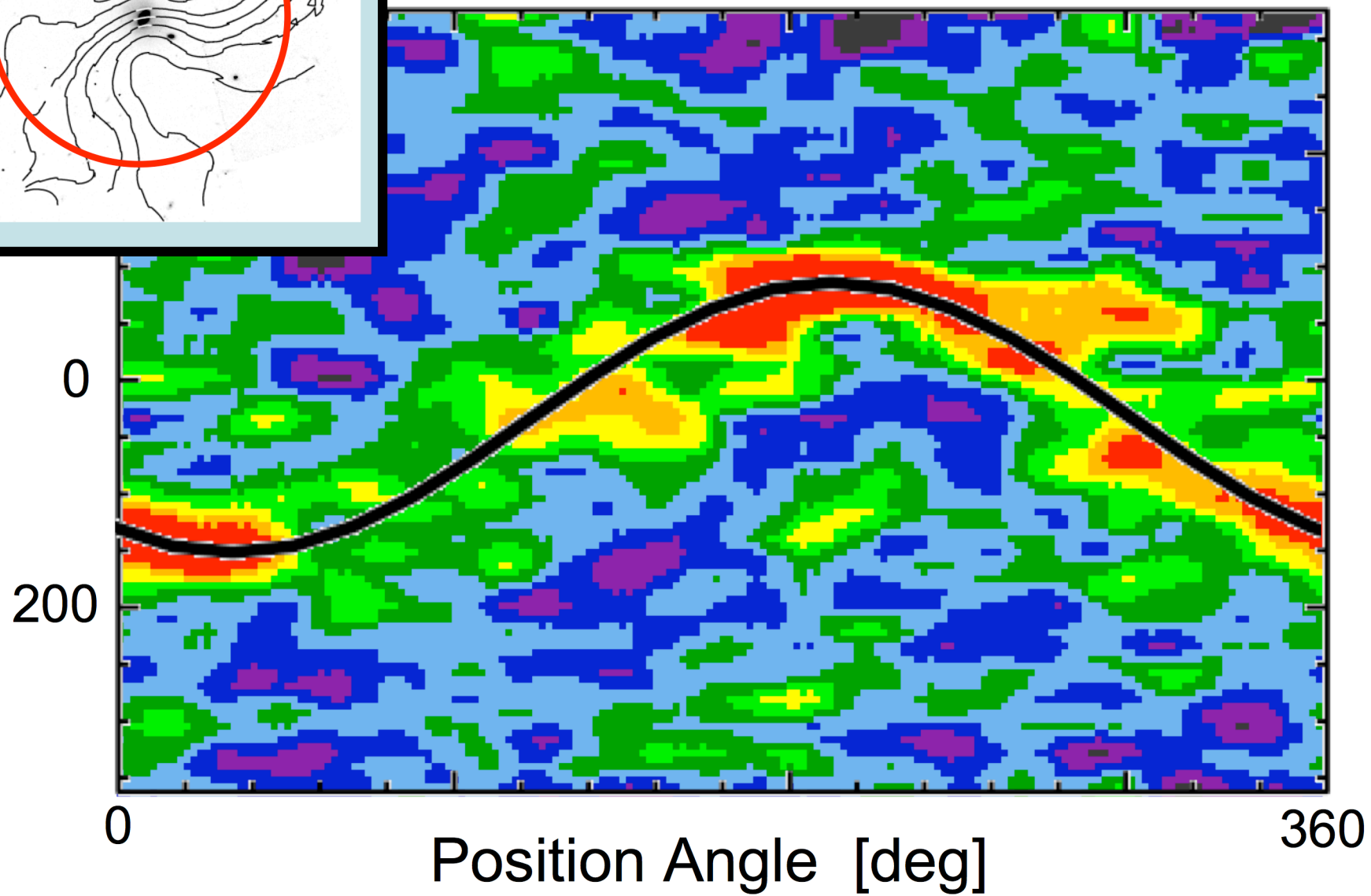
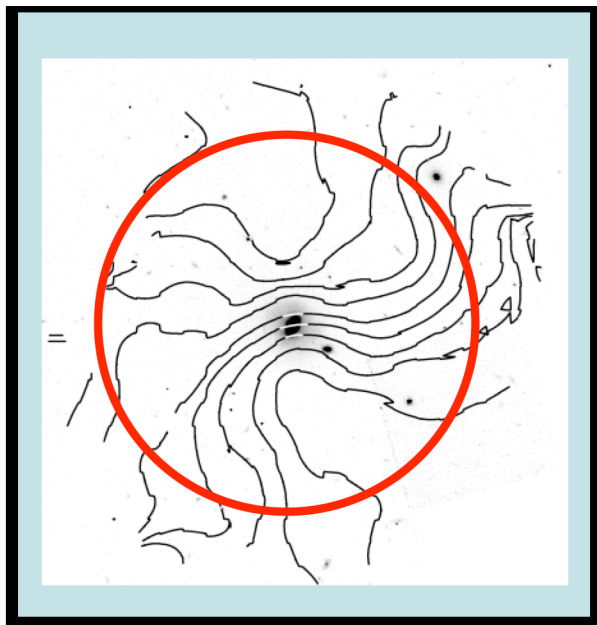




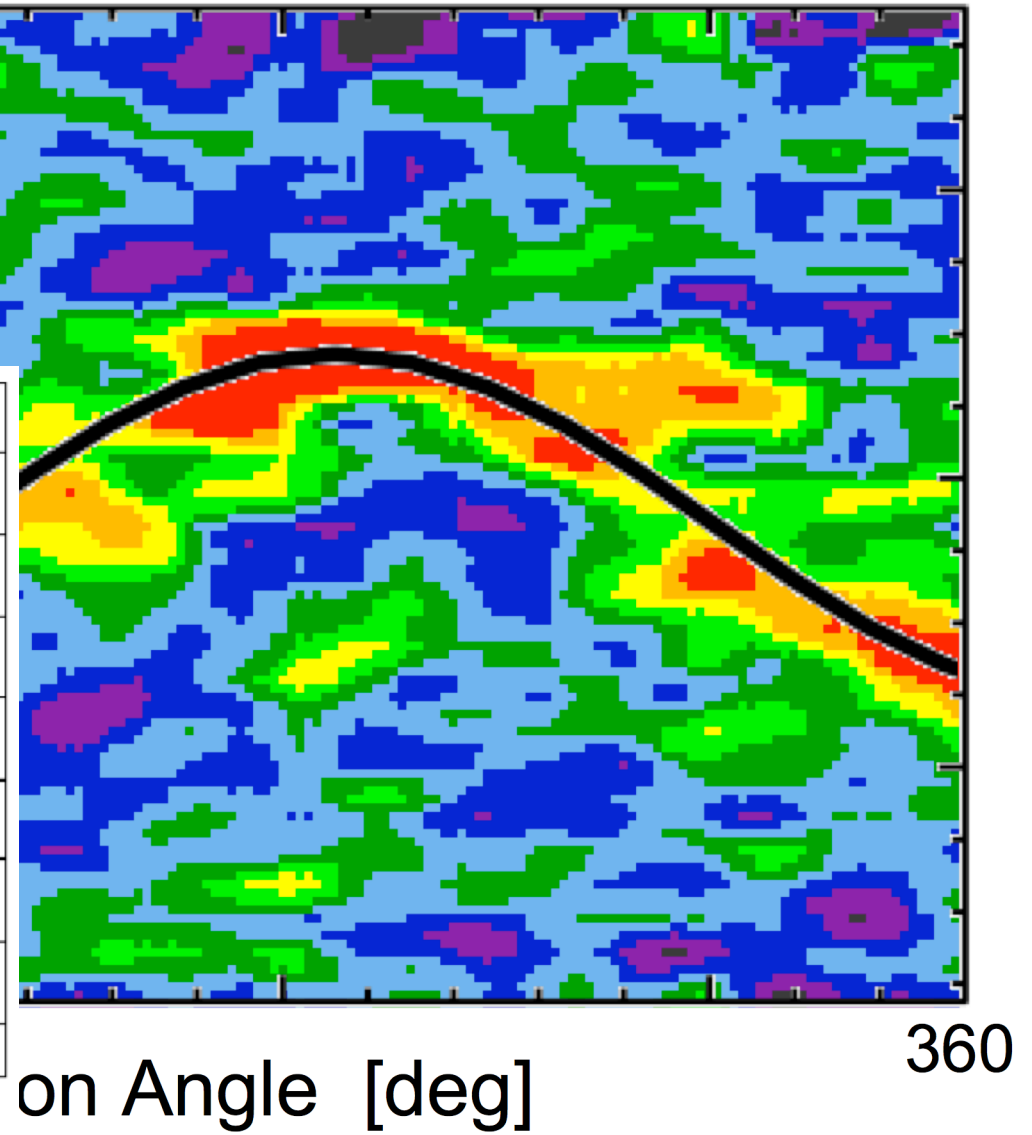
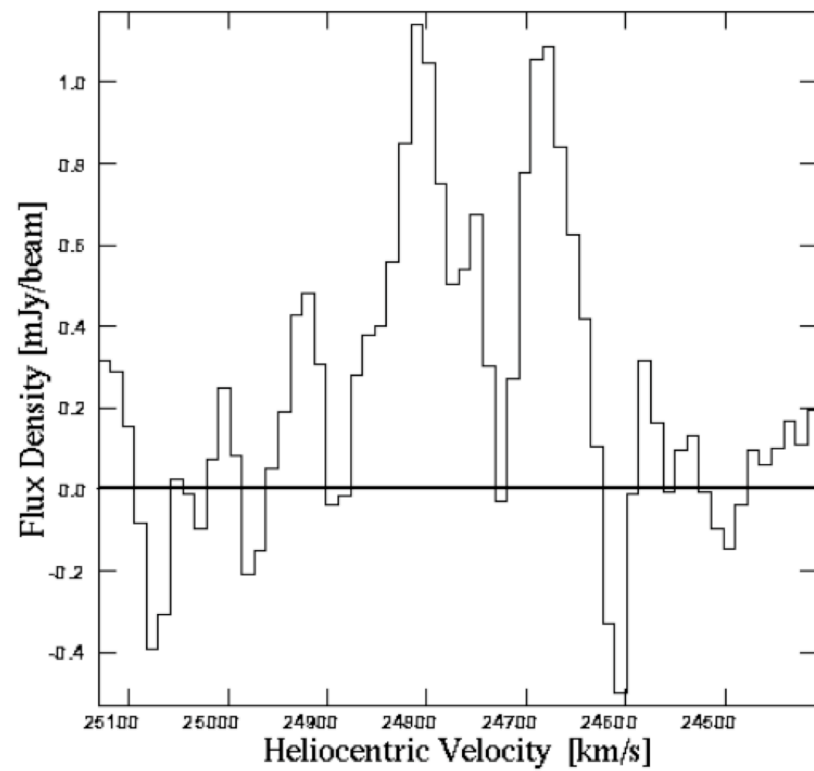
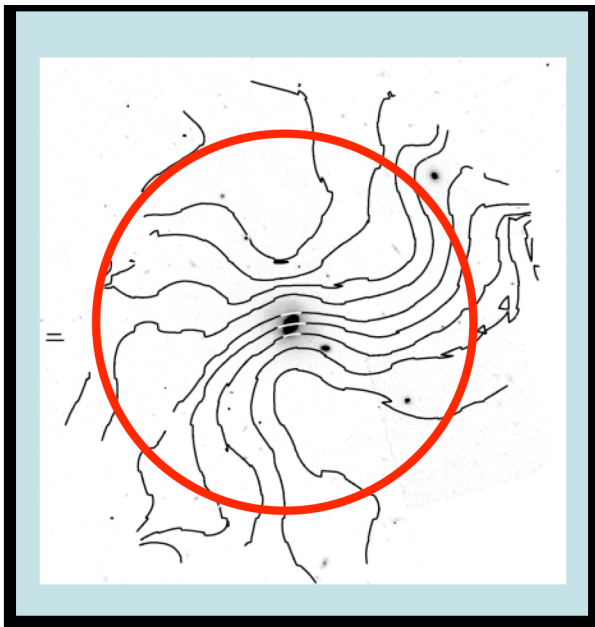
$R=20''$

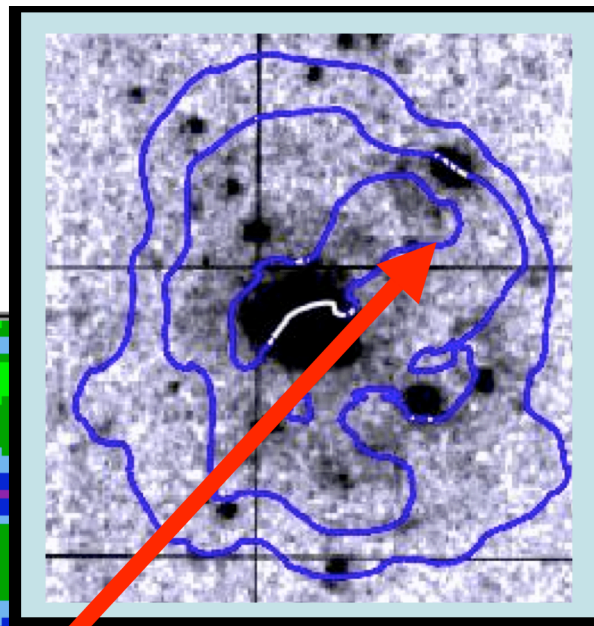
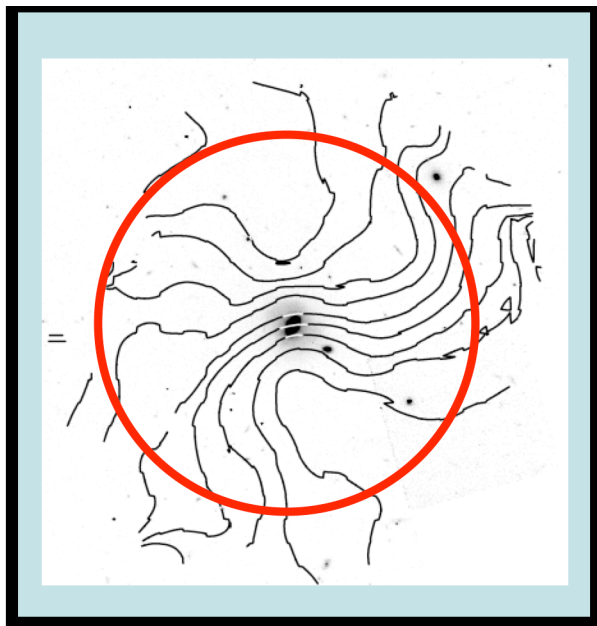


$R=40''$

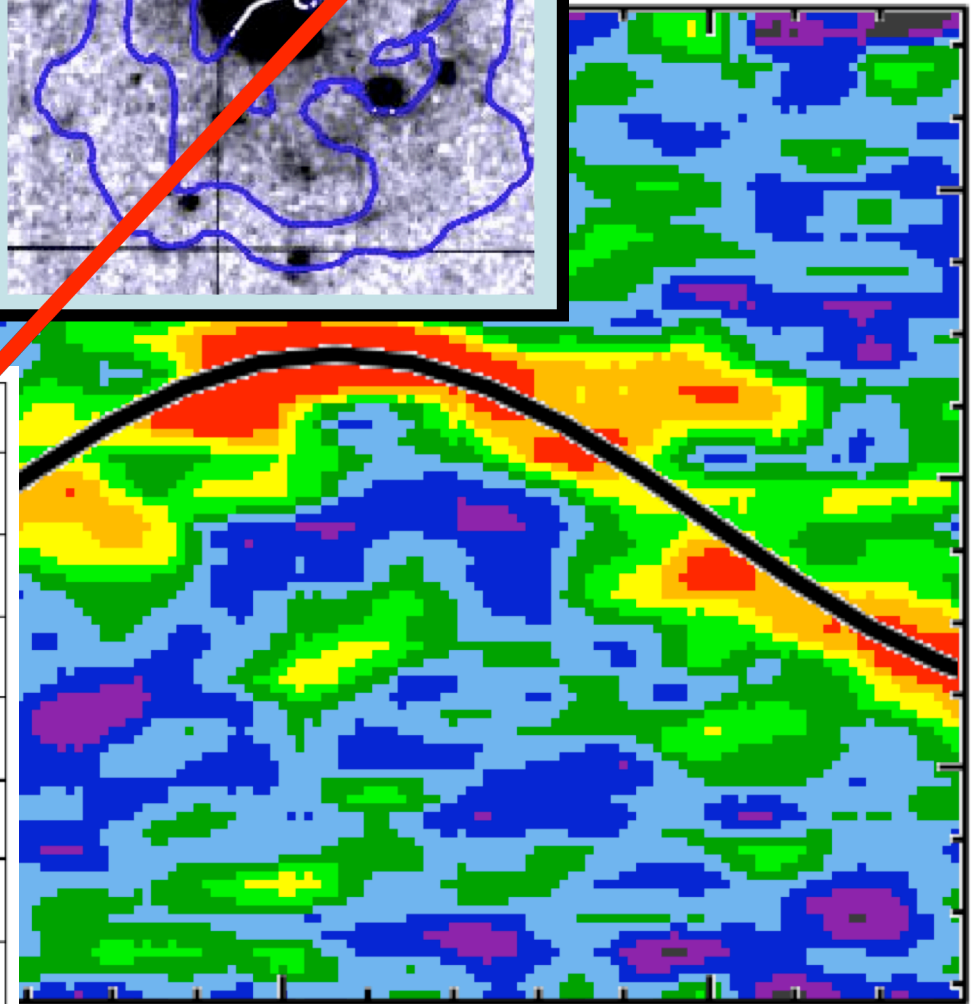
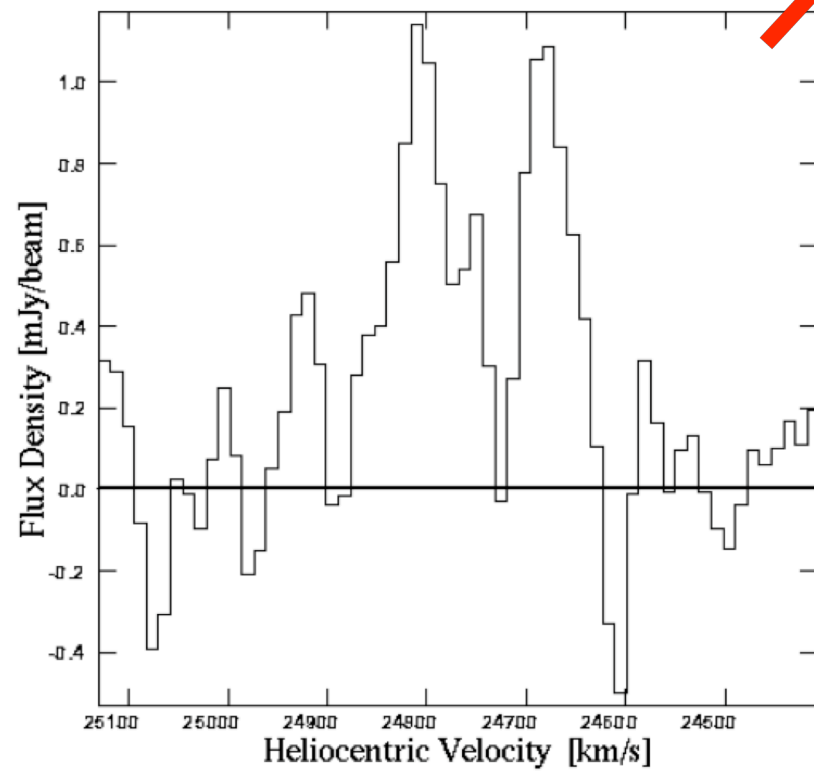


$R=40''$





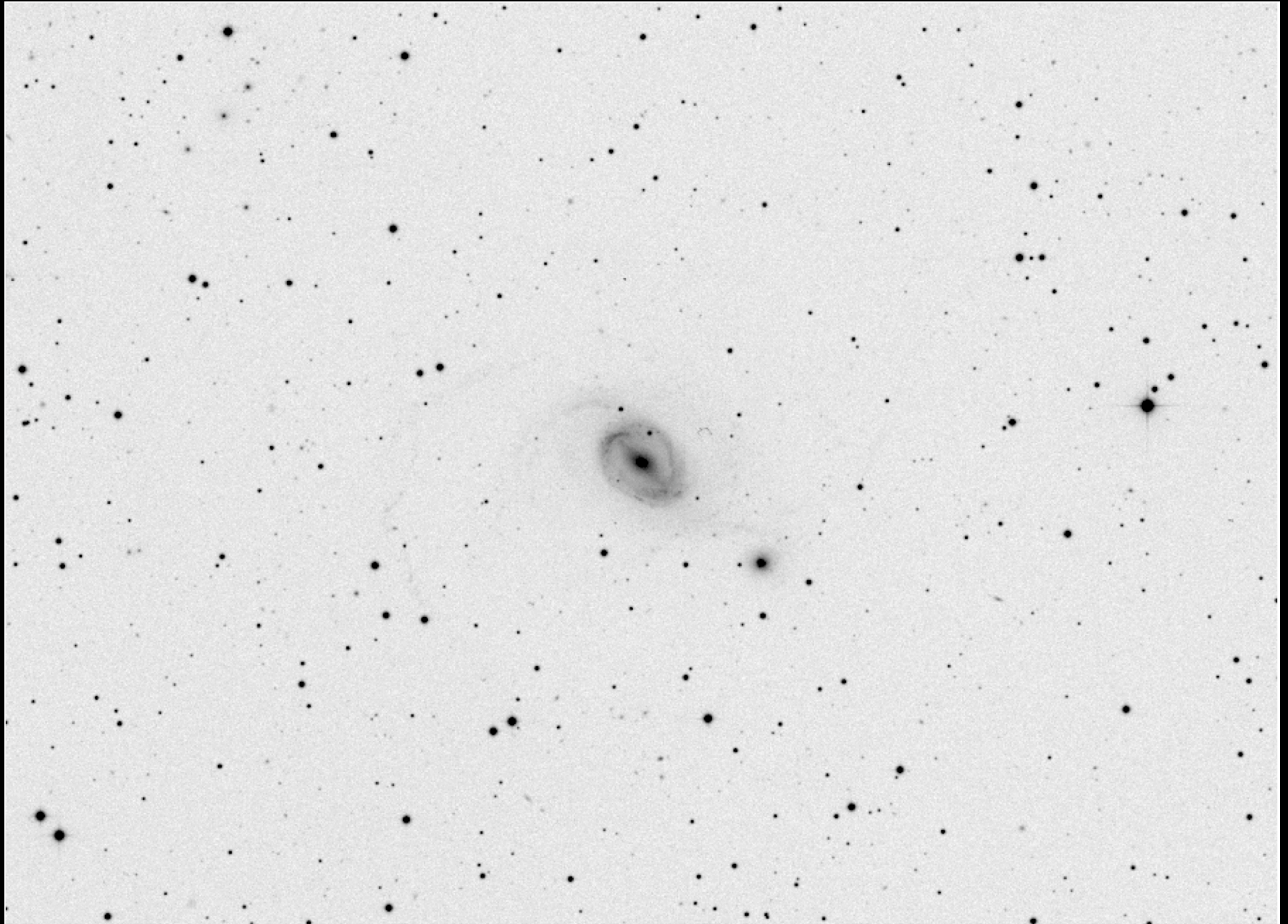
$R=40''$



360

Nearby Analogs...

NGC 1512



NGC 1512



NGC 1512

SB(r)ab



NGC 1512

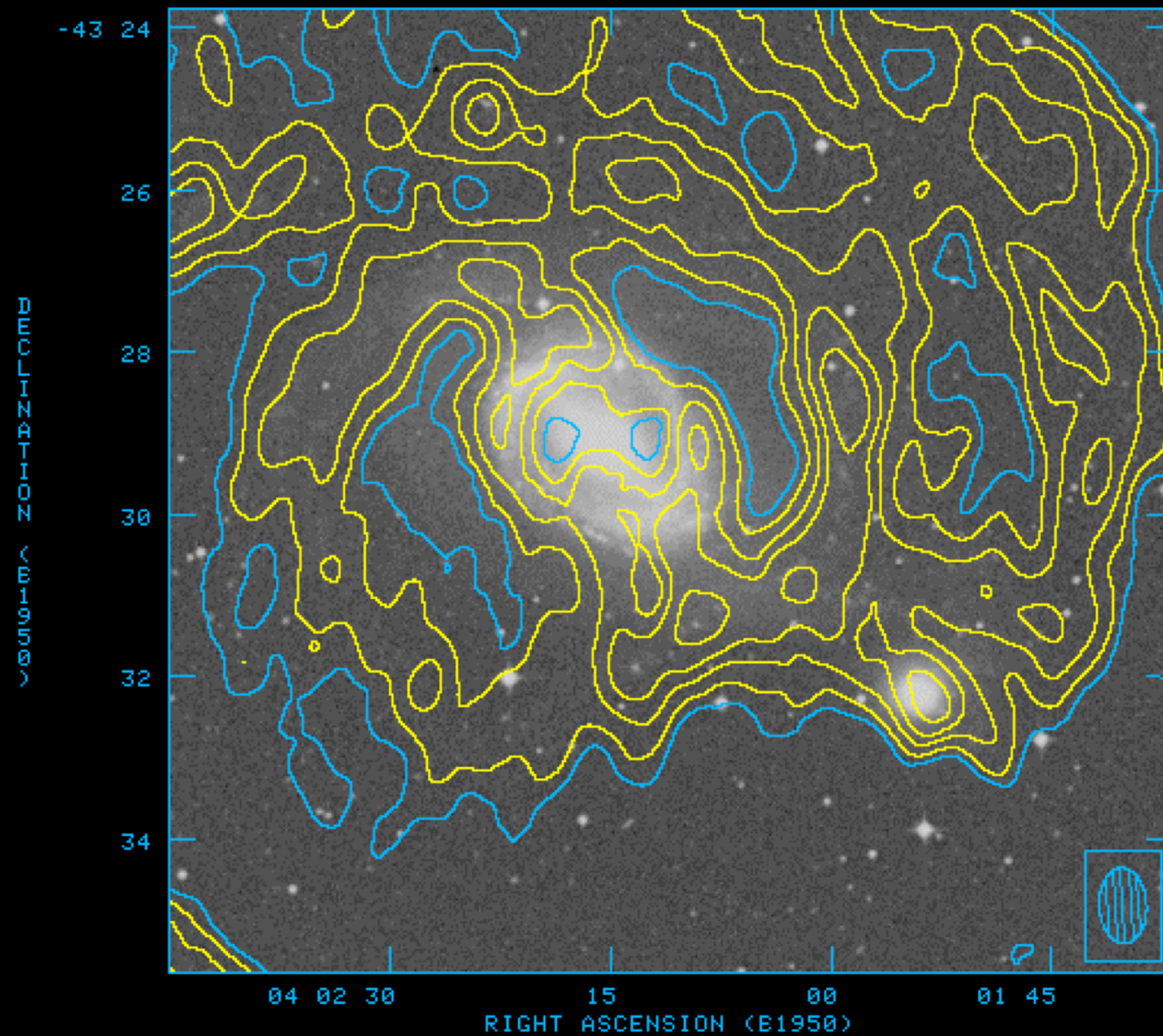
SB(r)ab

N1510 E...SAOpec?

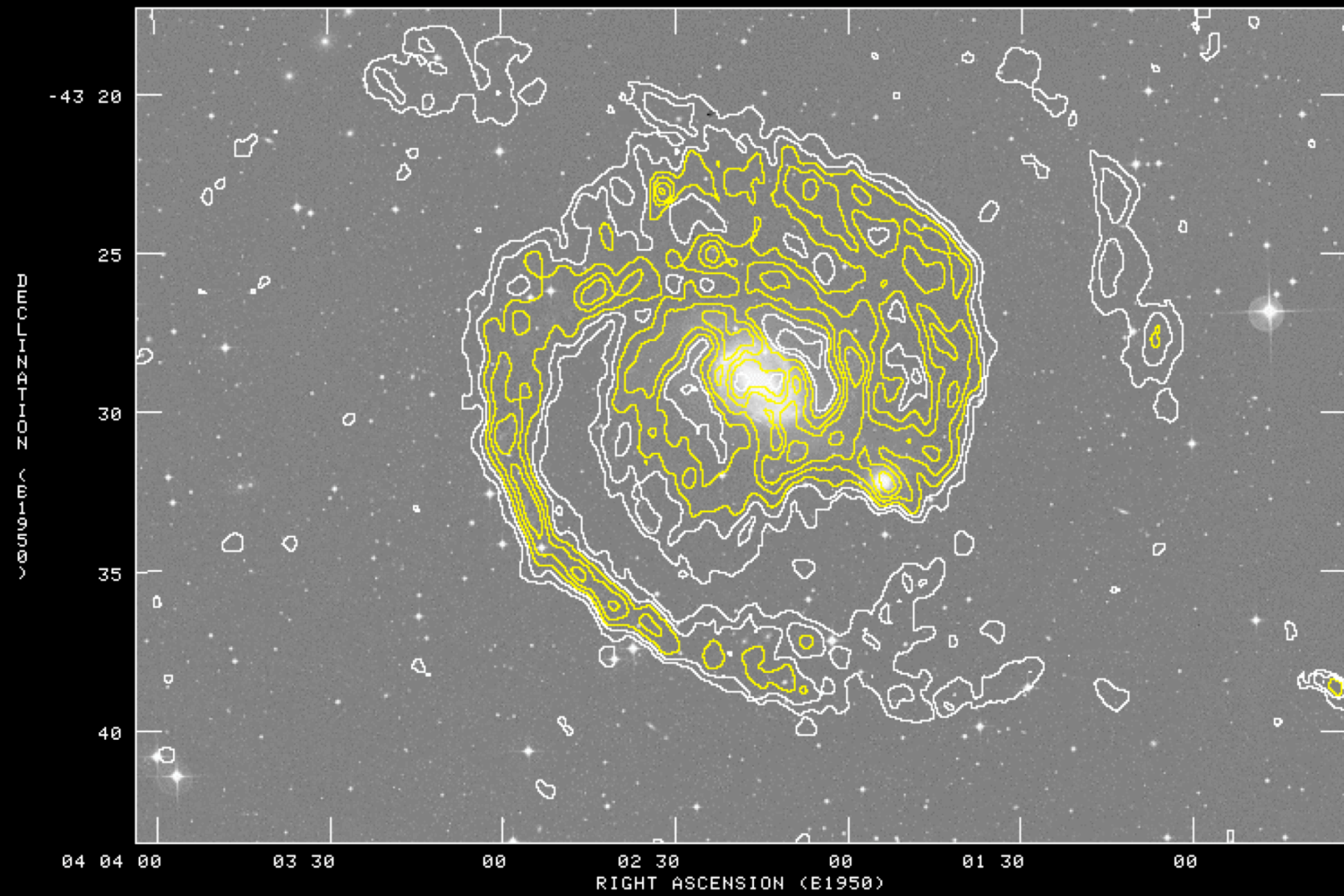


NGC 1512

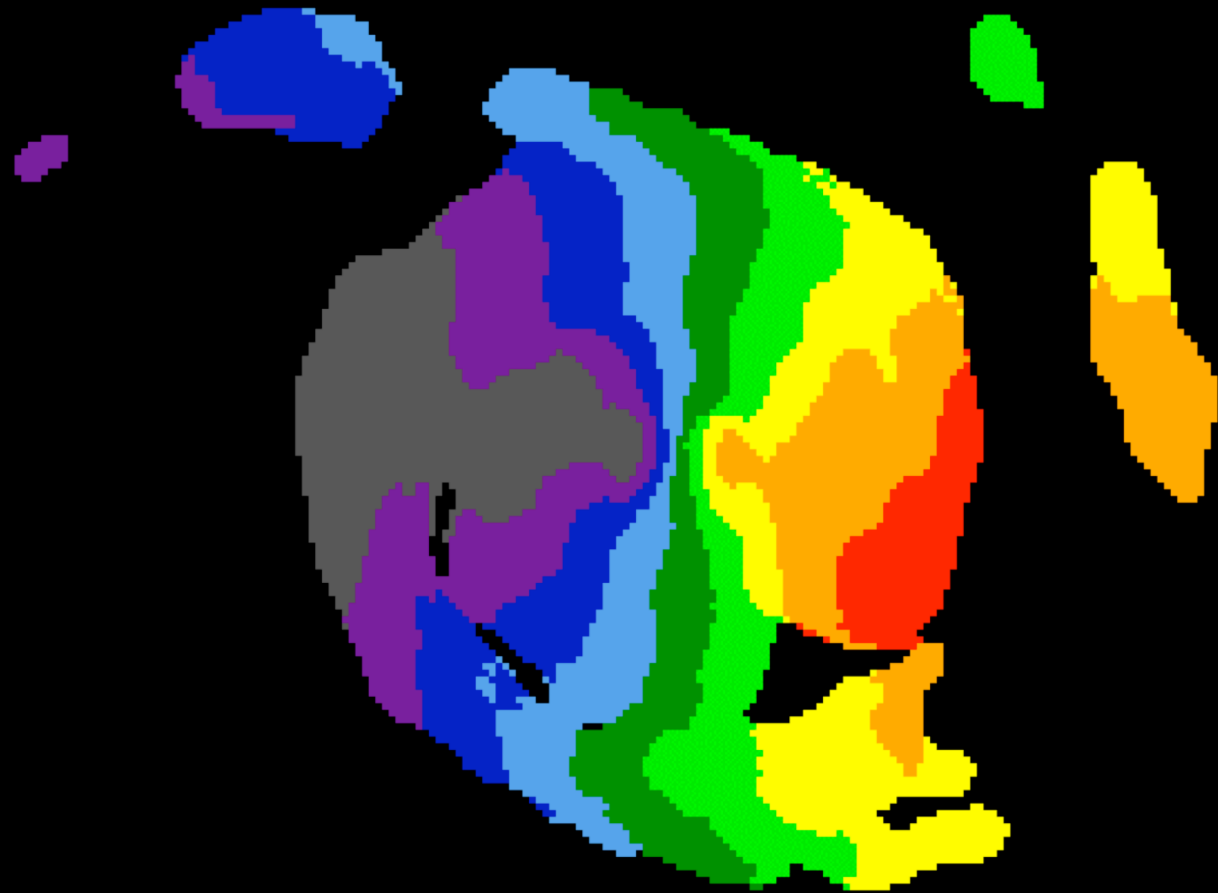
HI Contours



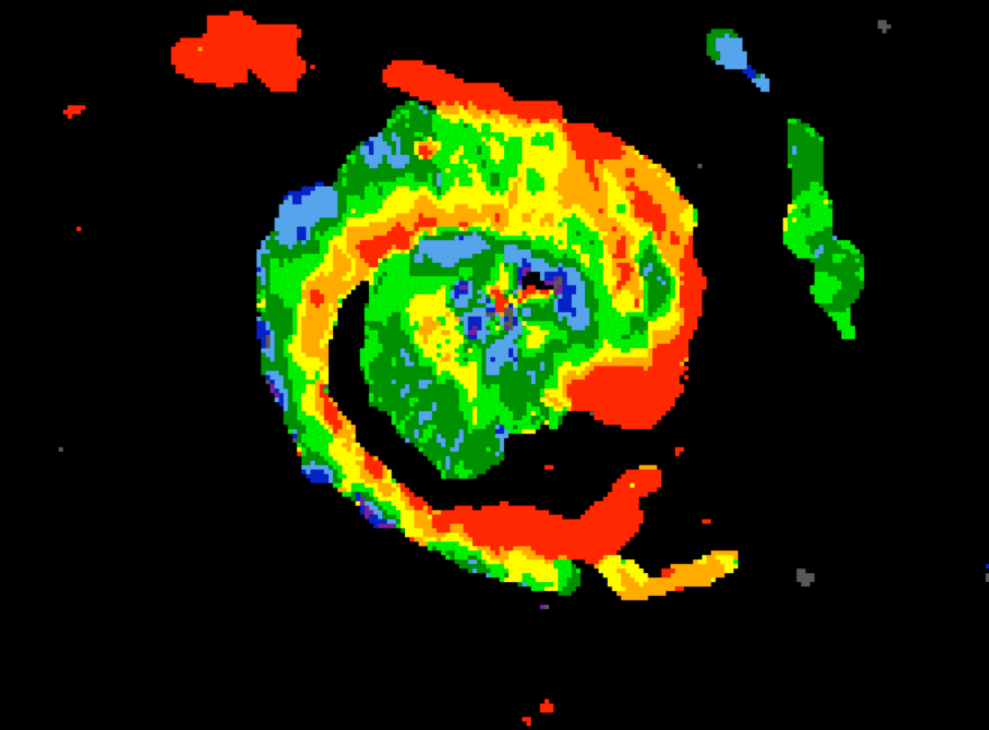
NGC 1512



NGC 1512



NGC 1512

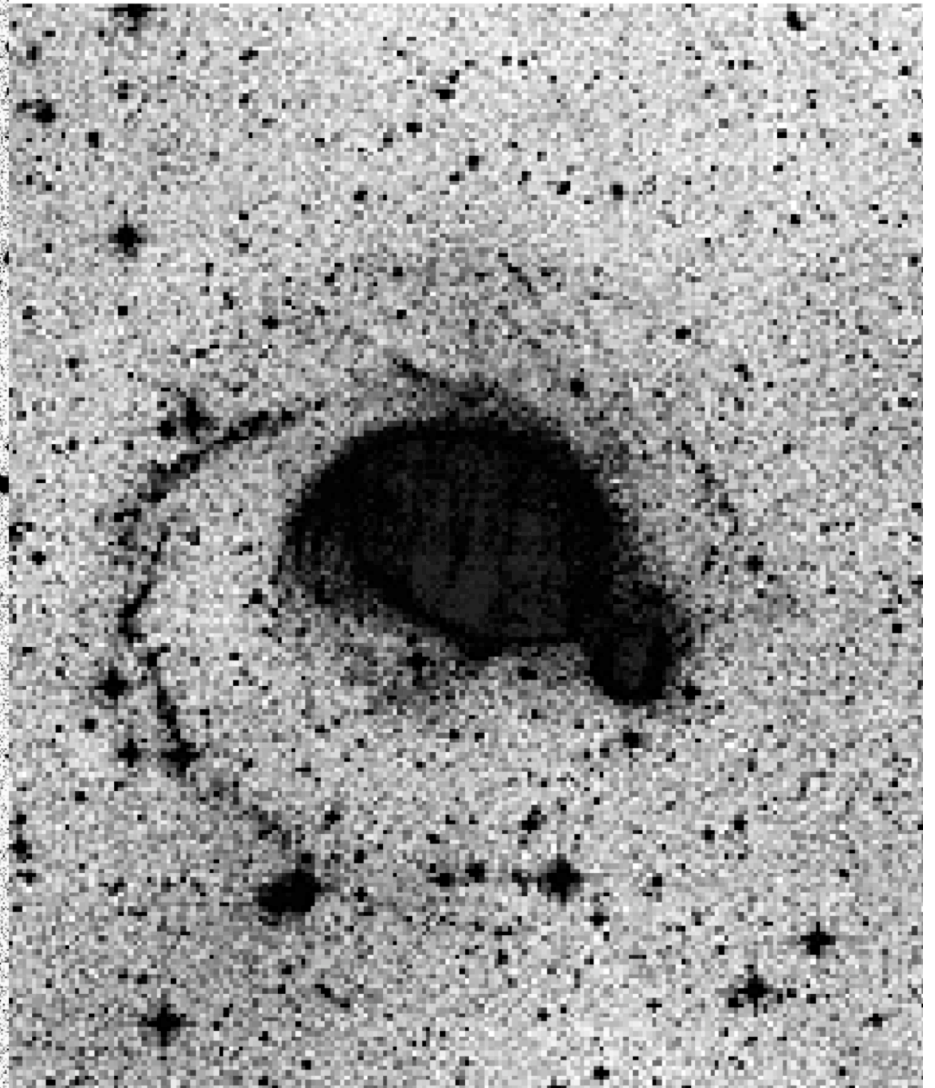
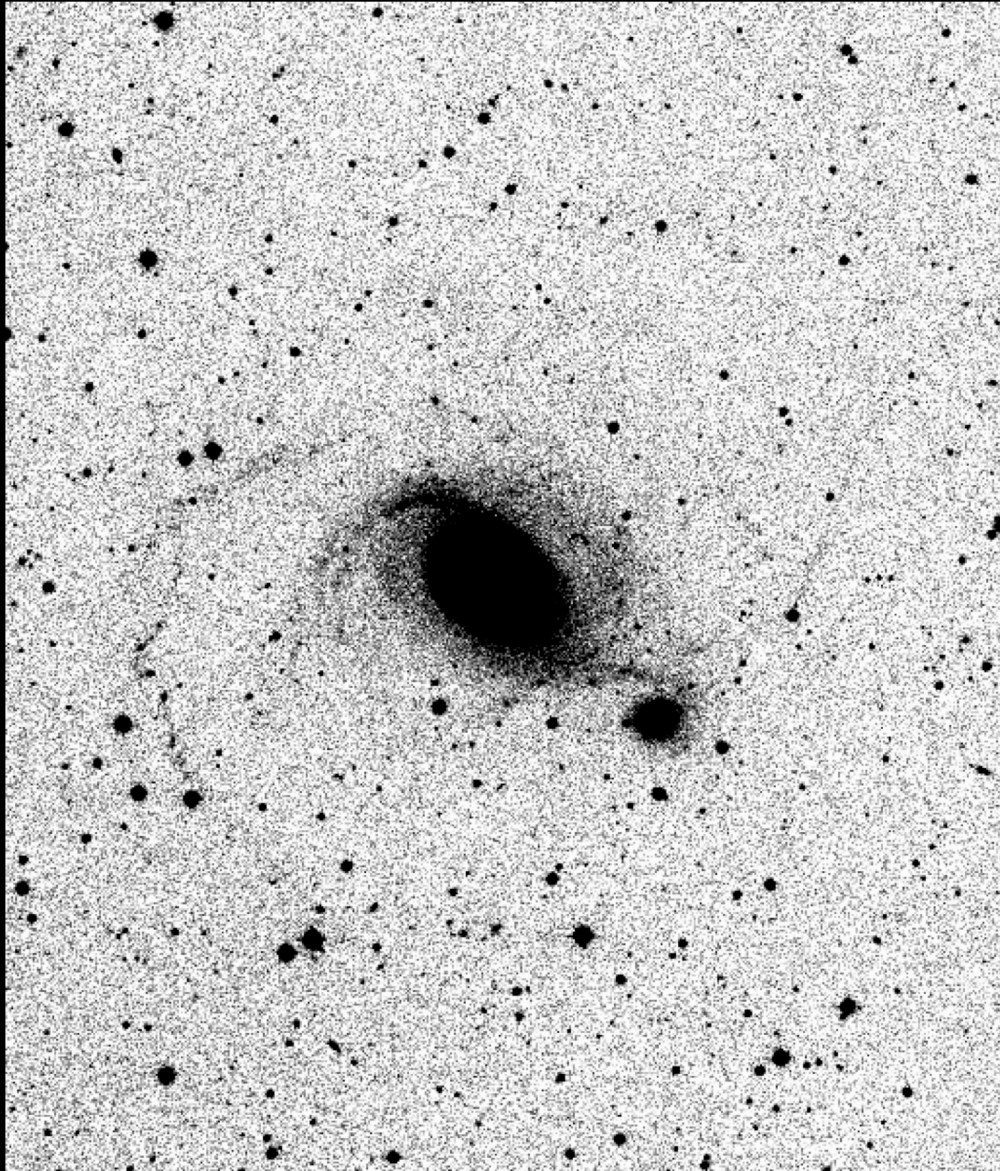


-40 -20 0 20 40

KILO M/S

NGC 1512

Deeper images ... “Malinized plate” !

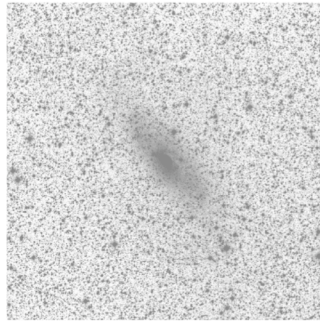


How to make a giant LSB galaxy ...

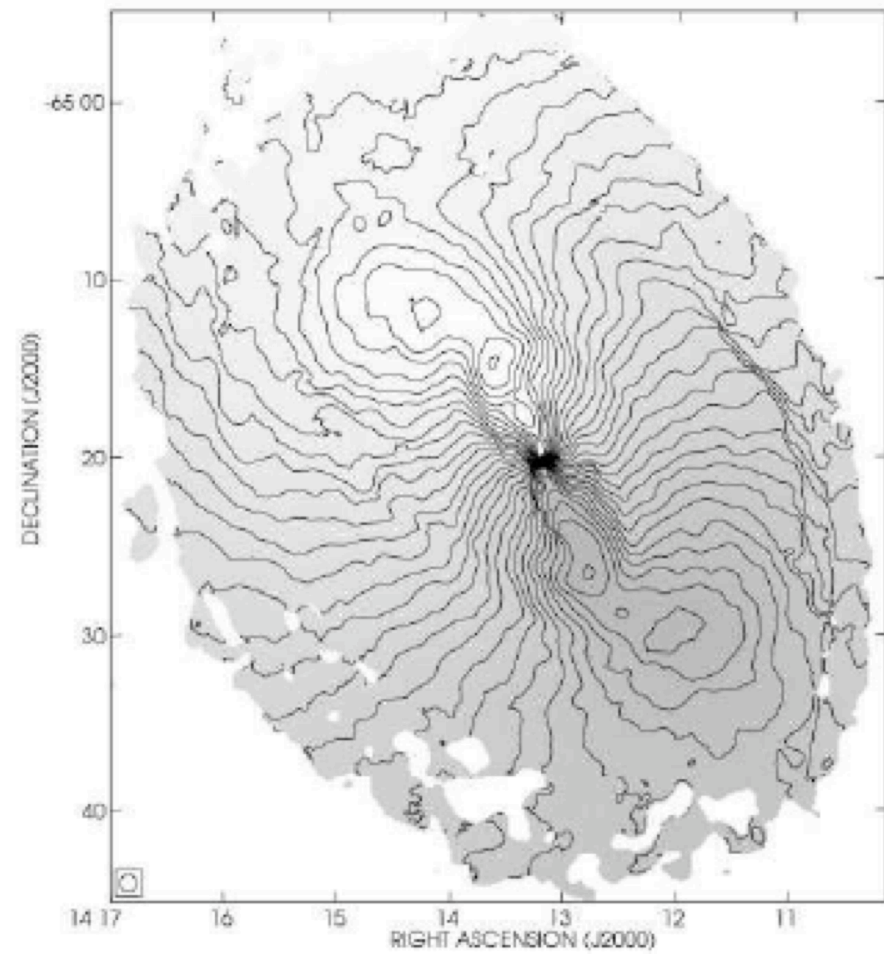
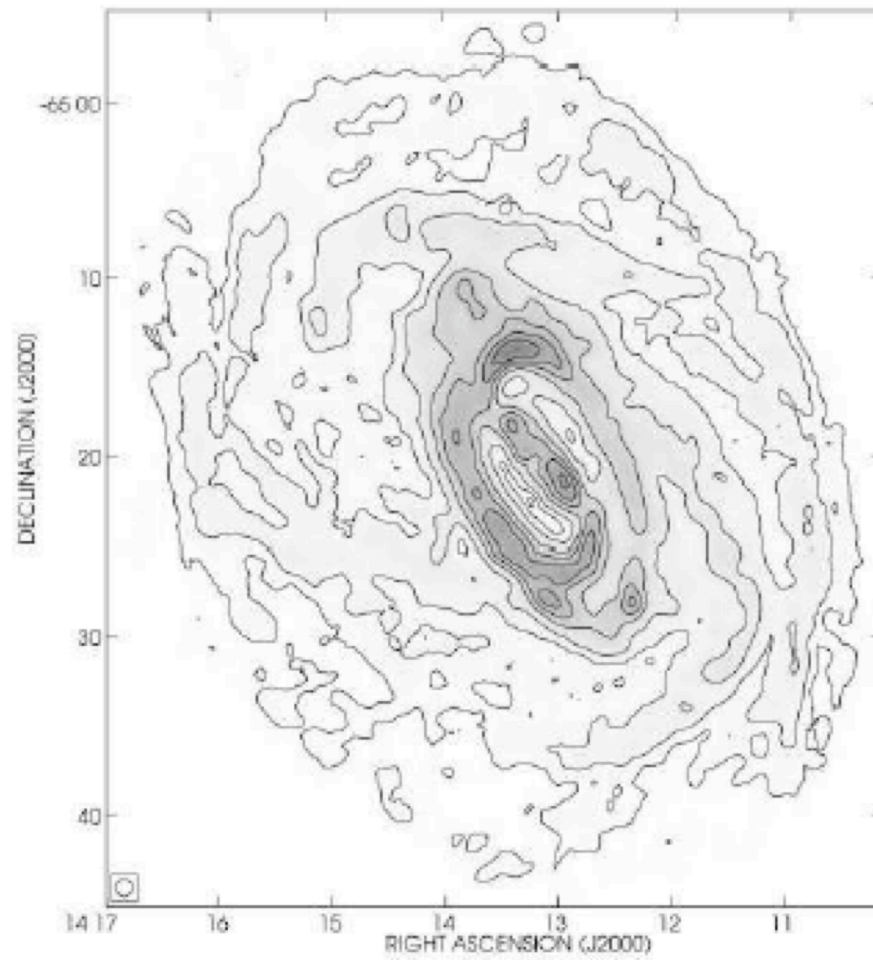
... needs lots of HI ...

... then light it up, gently.

Circinus

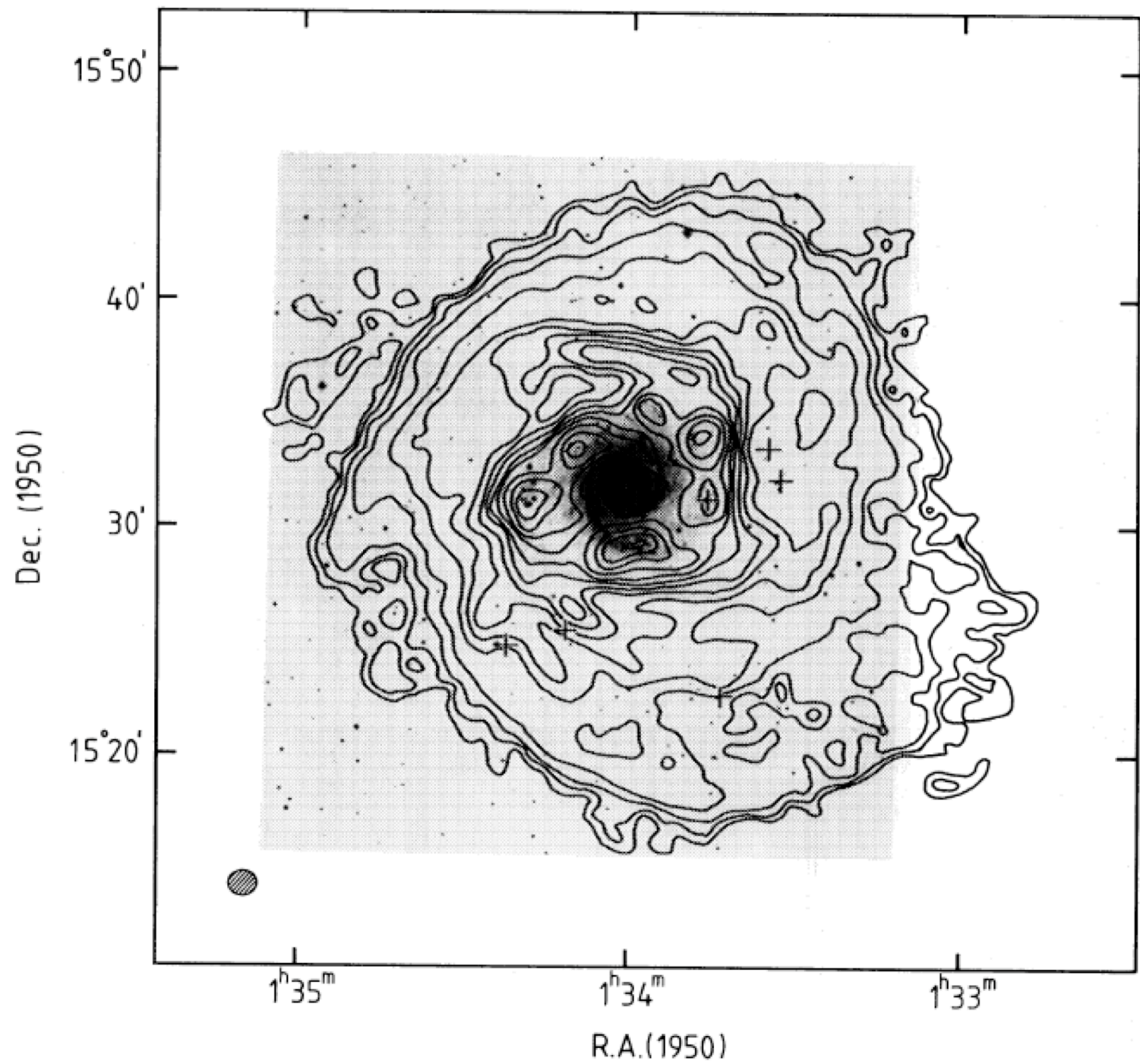


HI: Jones et al 1999



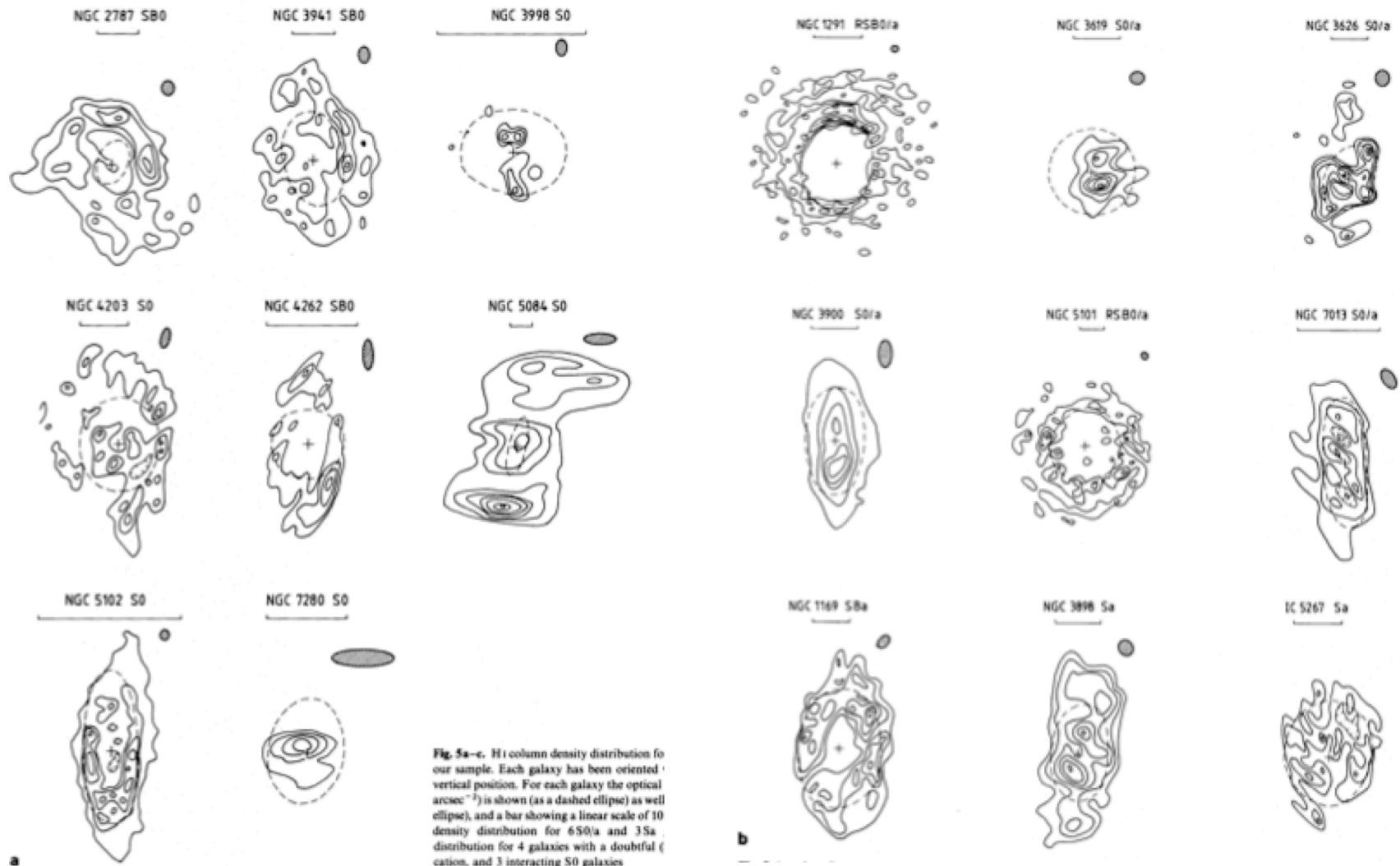
NGC 628
= M74

Kamphuis &
Briggs 1992



“Distribution and motion of HI in Lenticular Galaxies”

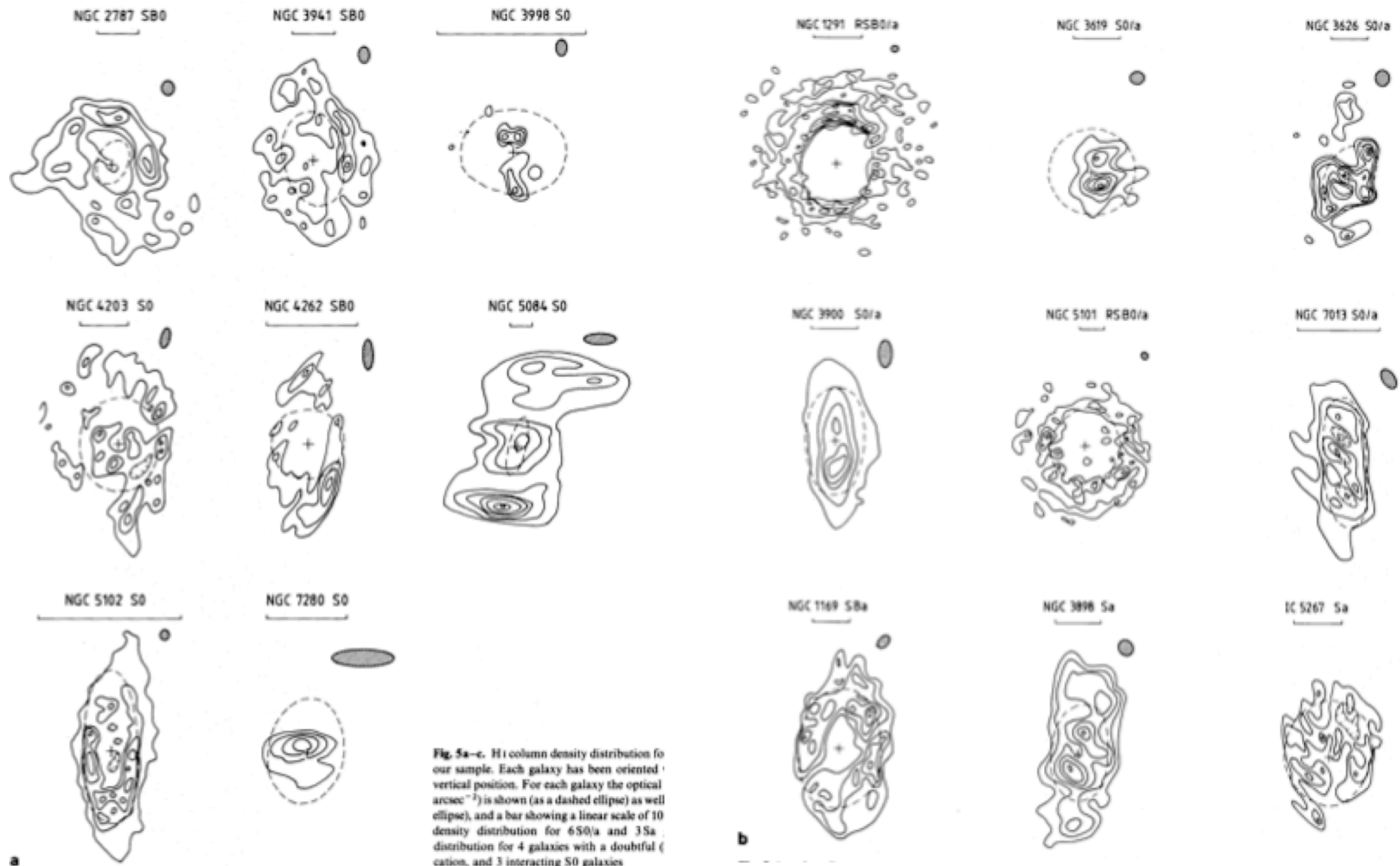
van Driel & van Woerden (1991)



“Distribution and motion of HI in Lenticular Galaxies”

van Driel & van Woerden (1991)

Oosterloo & co !



Where does gas come from ...

- left over from formation ?
- accreted from outside ?

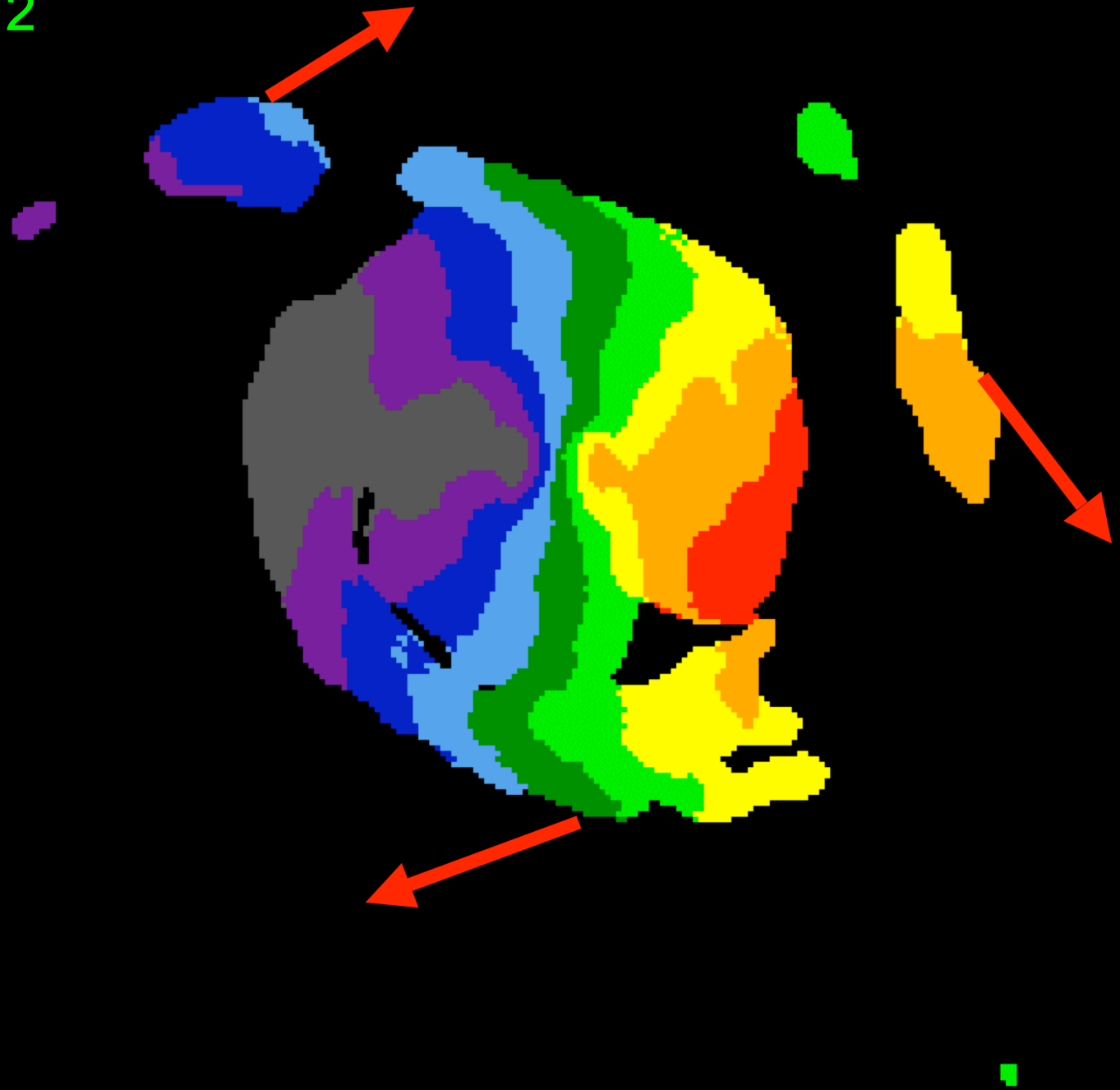
Where does gas come from ...

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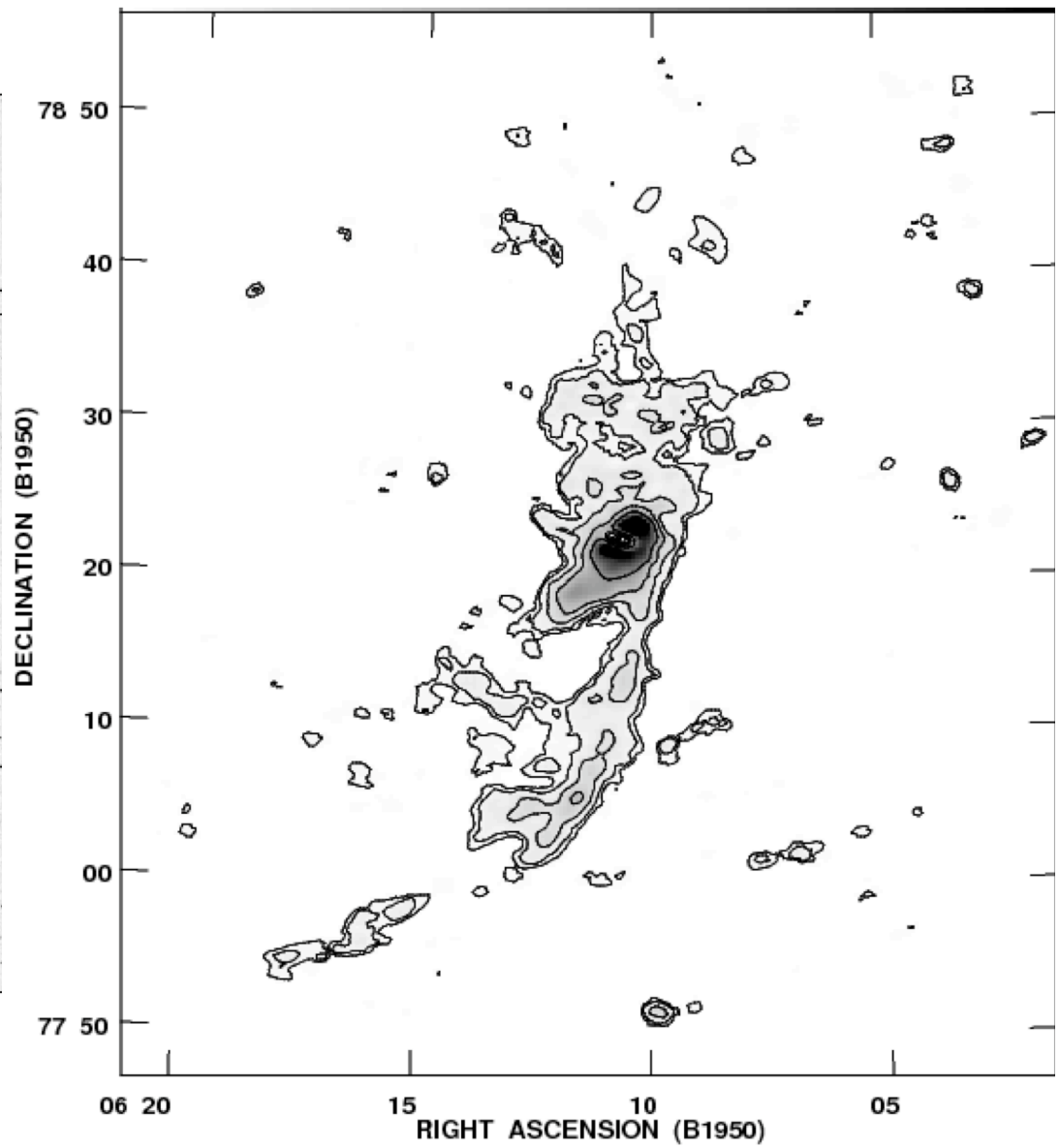
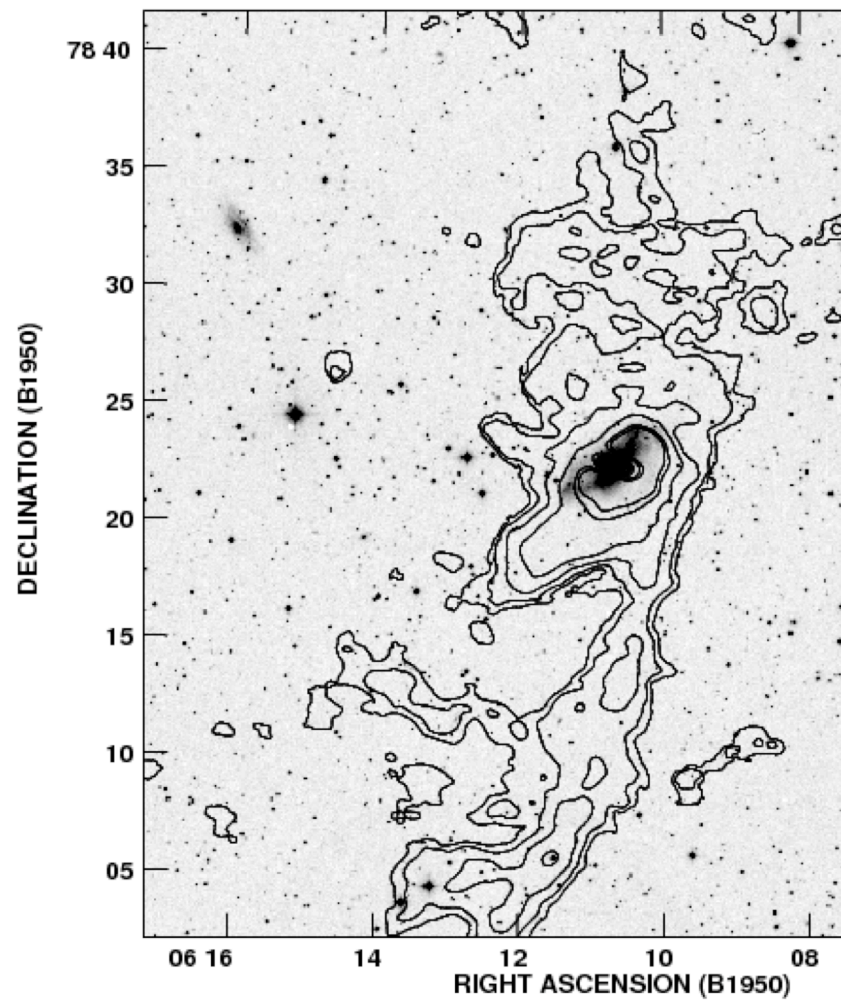
Clues to “formation”...

.... look at where interaction is going...

NGC 1512

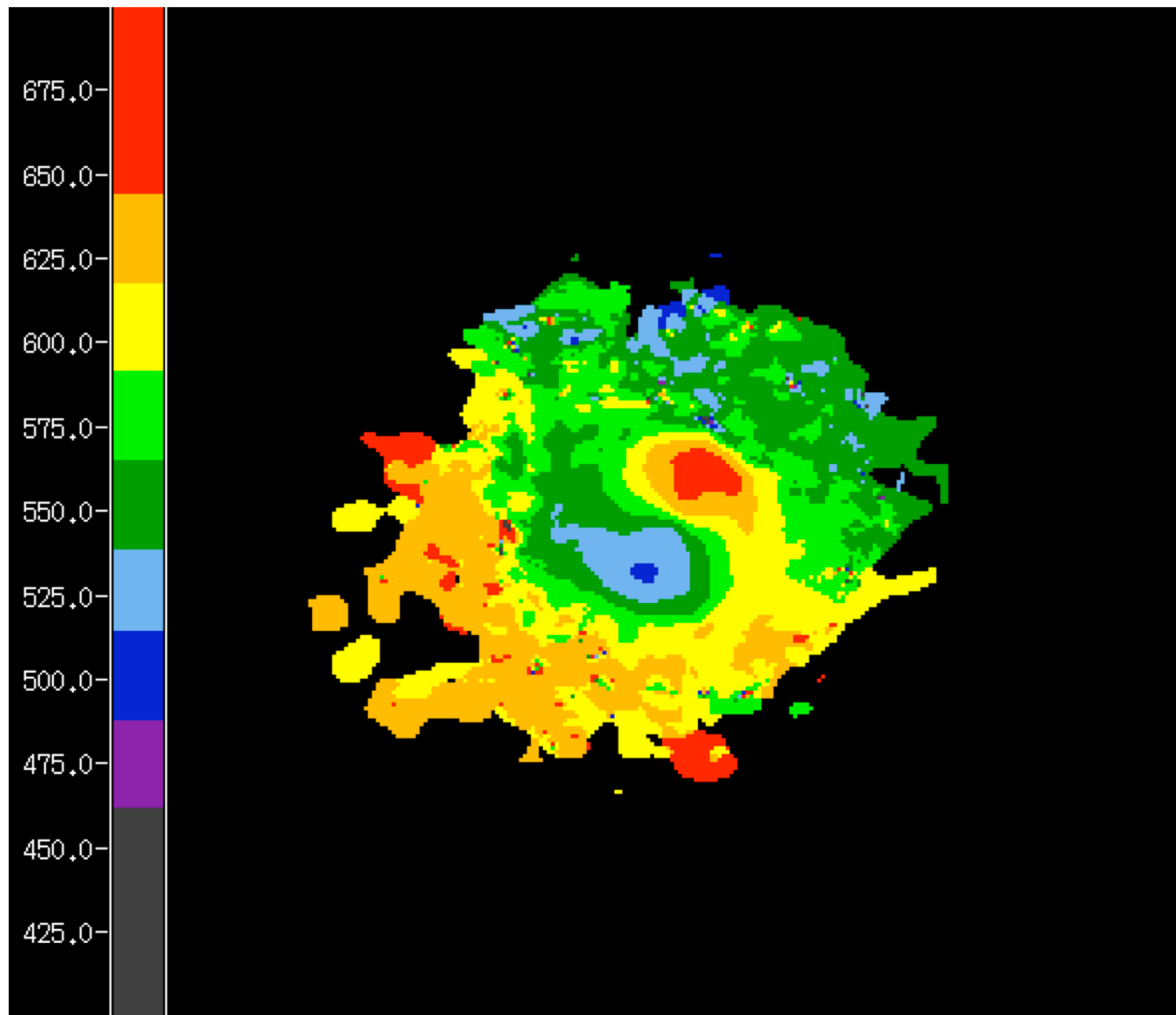


NGC 2146



Warped disks... created by ongoing return of gas ...

NGC 3344



(interesting that never
see counter-rotating
extended HI ...
or even clouds)

(might have implications
for angular momentum
of QSO absorption
halos)

Giant Low Surface Brightness Galaxies:

- **Giant LSB** = a **class** that does **not need to be**.
- Hosts are *ordinary galaxies*
- The LSB disks result from *extended HI disks*
- Mild *star formation* and increased diameter is triggered by *tidal interaction*
- Formation interactions may also build a reservoir for *gentle re-accretion...*

