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SINGG-SUNGG KINEMATICS

6th International PHISCC Workshop 2013, Sydney, Australia

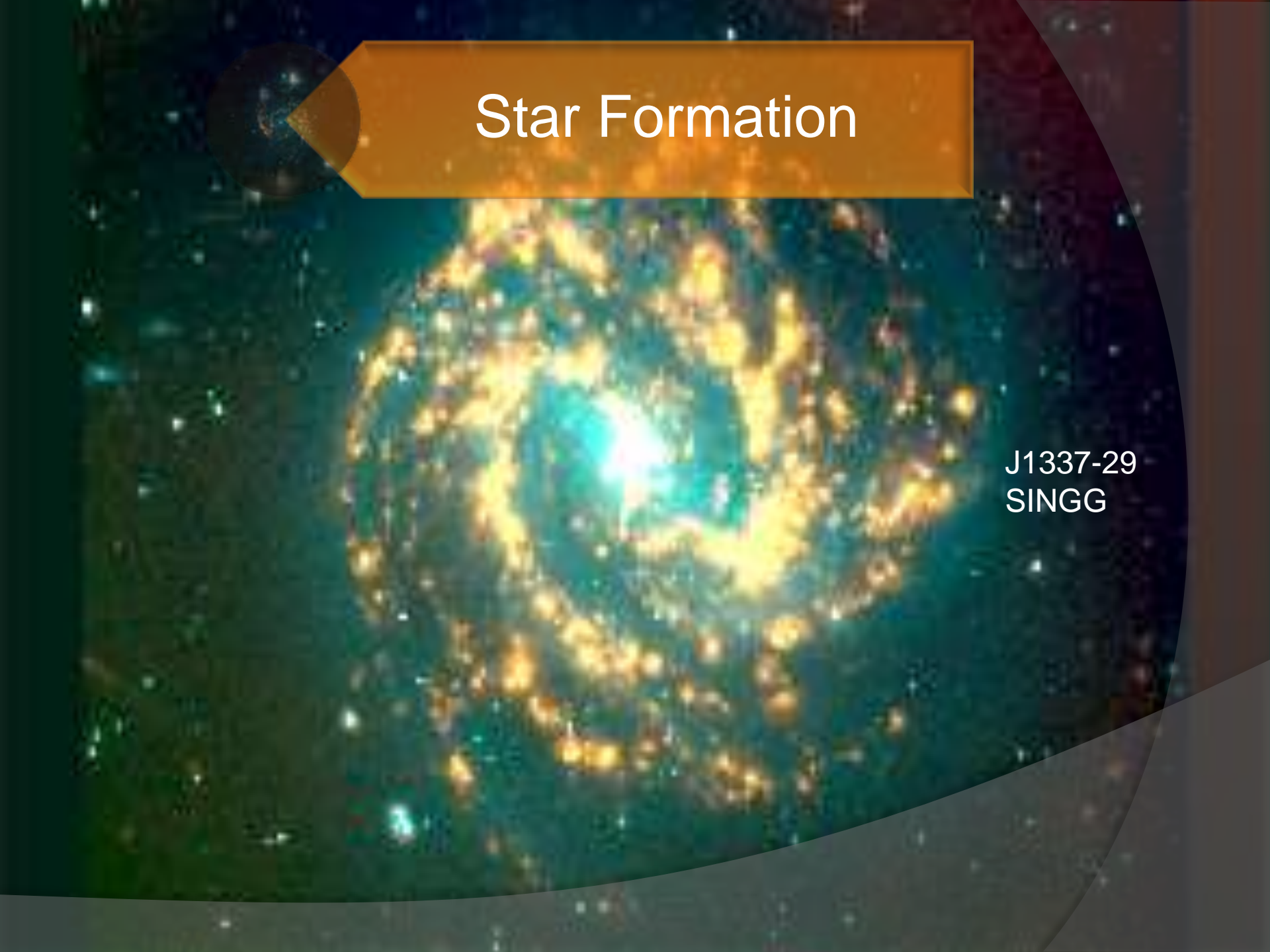


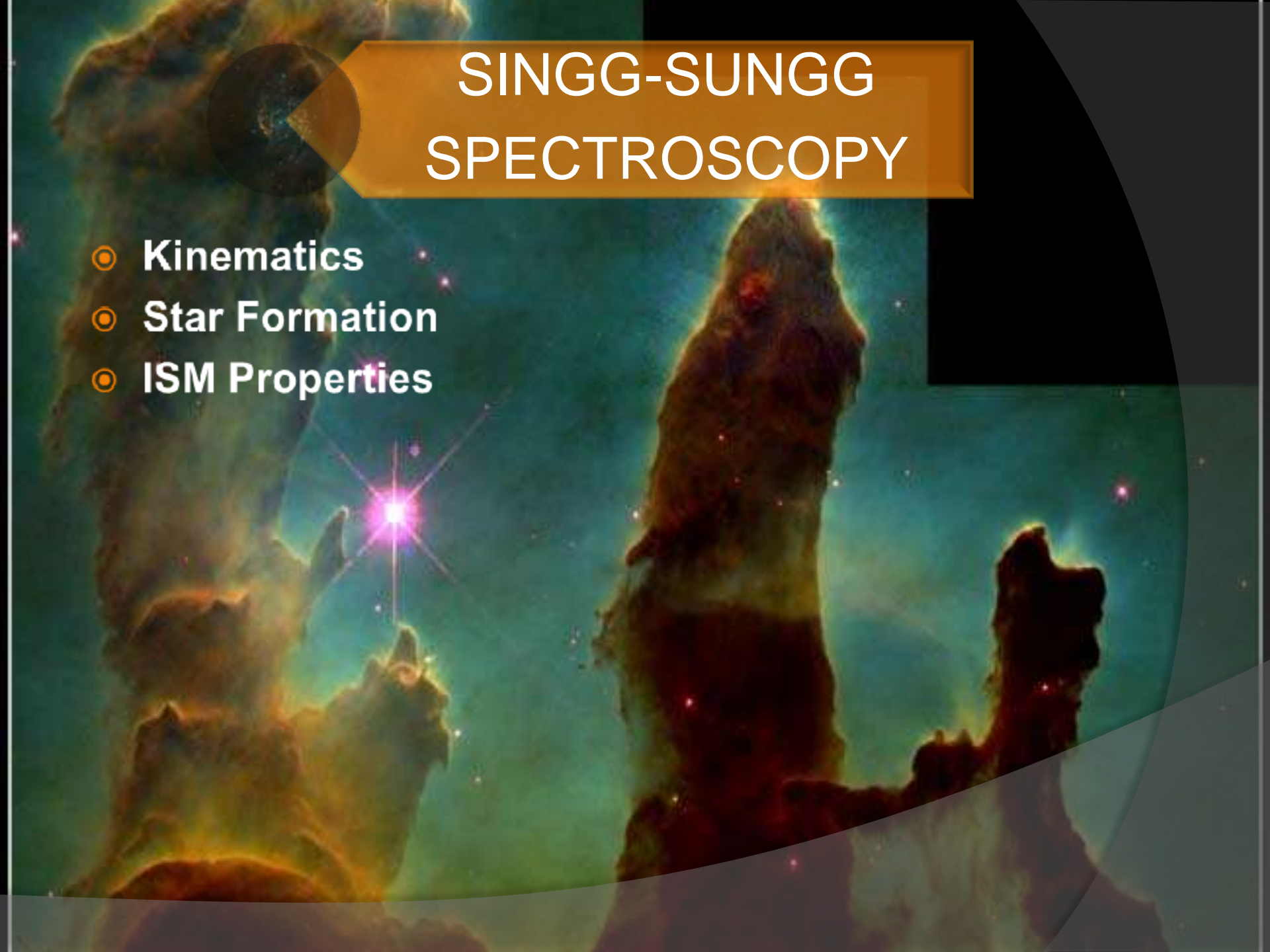
SINGG-SUNGG

- To uniformly survey SF properties of HI selected galaxies across entire HI mass function... [Meurer+ 2006]
- HIPASS selection
- HI flux $> 0.05\text{Jy}$, HI mass coverage, Position
- 471 Galaxies in Sample
- Observations:
 - R-band, $H\alpha$ (SINGG) (Meurer+ 2006, Hanish+ 2006, Oey+ 2007...)
 - UV (SUNGG) (Wong 2007)

Star Formation

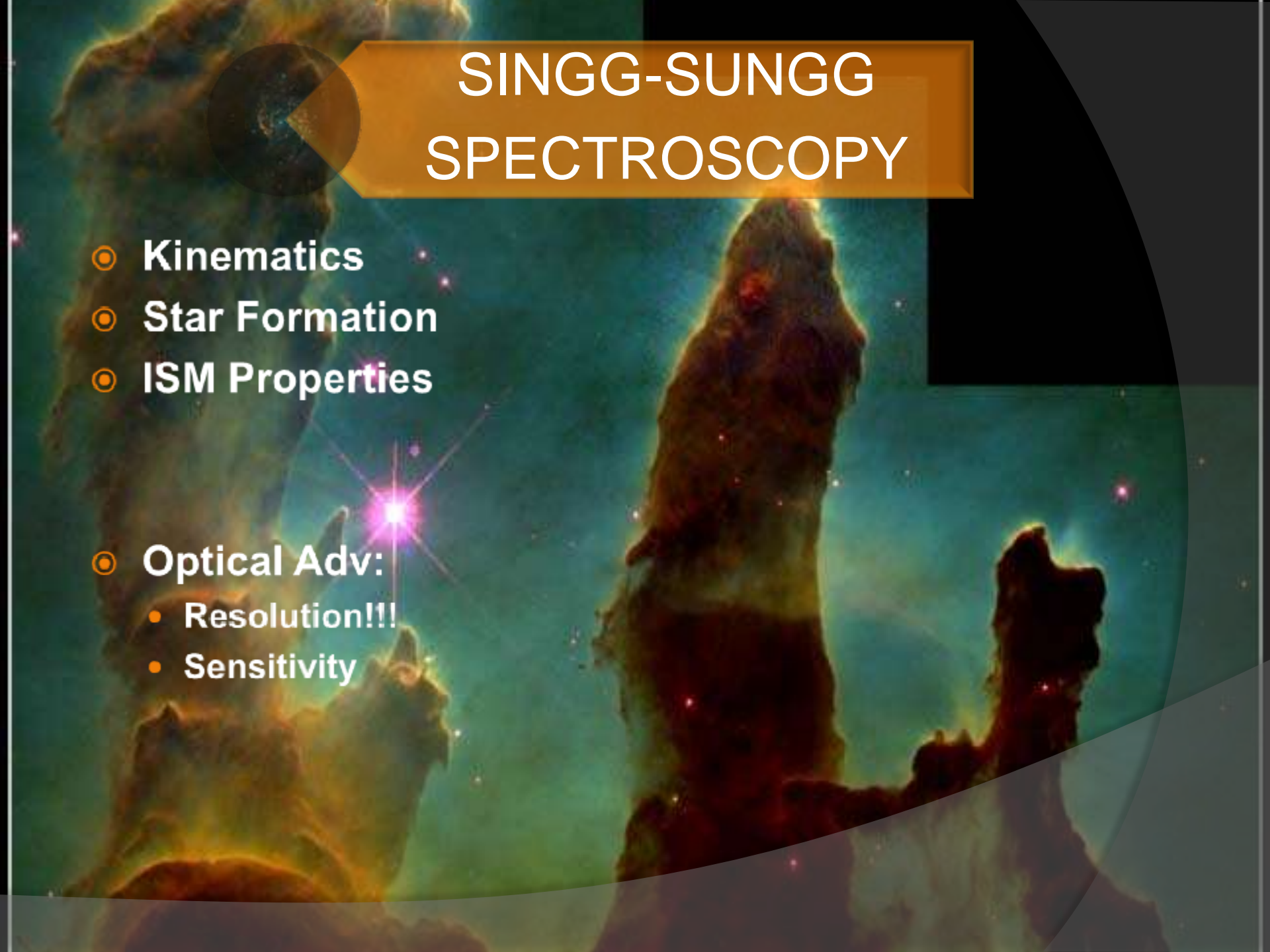
J1337-29
SINGG





SINGG-SUNGG SPECTROSCOPY

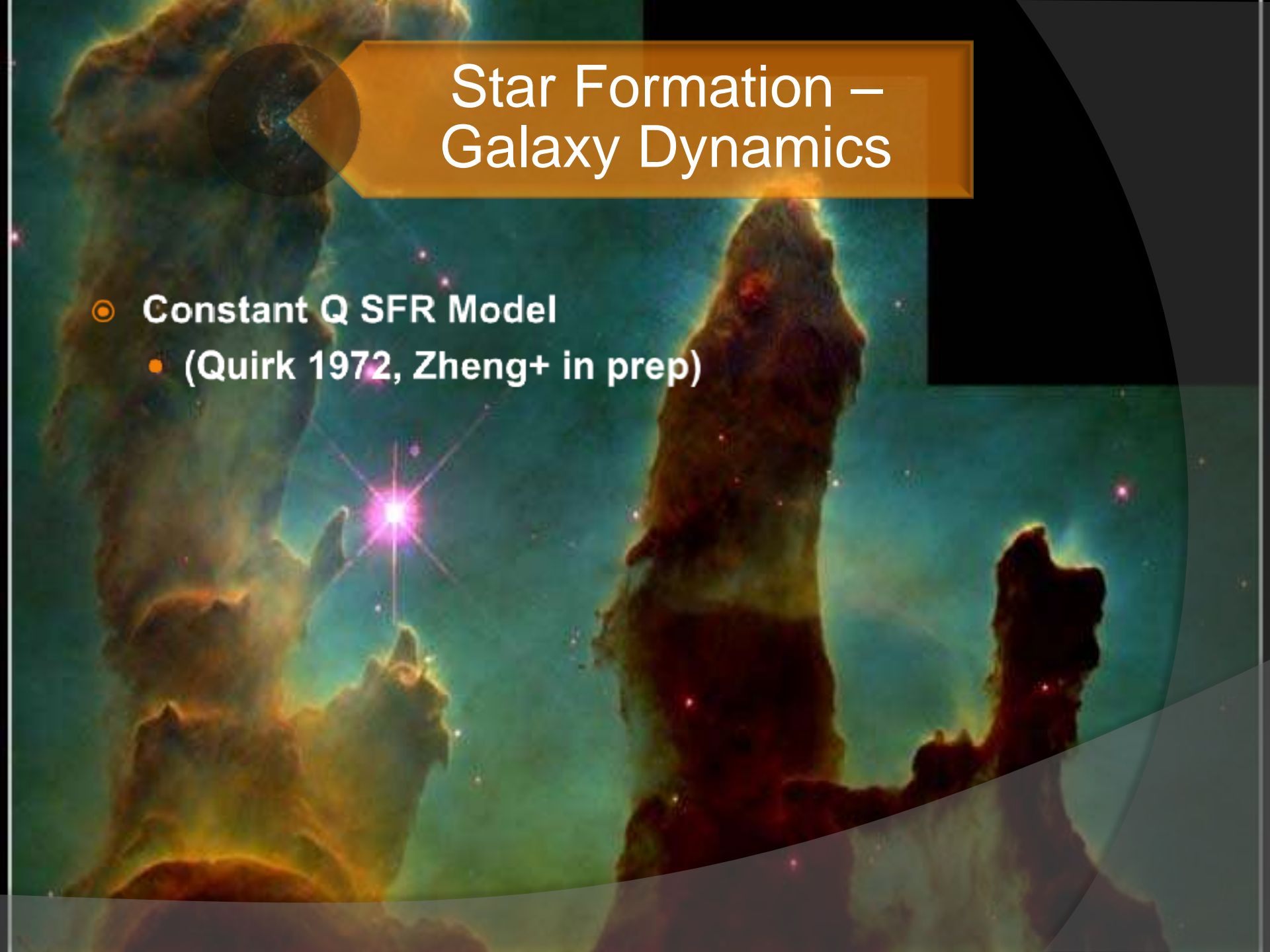
- **Kinematics**
- **Star Formation**
- **ISM Properties**



SINGG-SUNGG SPECTROSCOPY

- **Kinematics**
- **Star Formation**
- **ISM Properties**

- **Optical Adv:**
 - **Resolution!!!**
 - **Sensitivity**



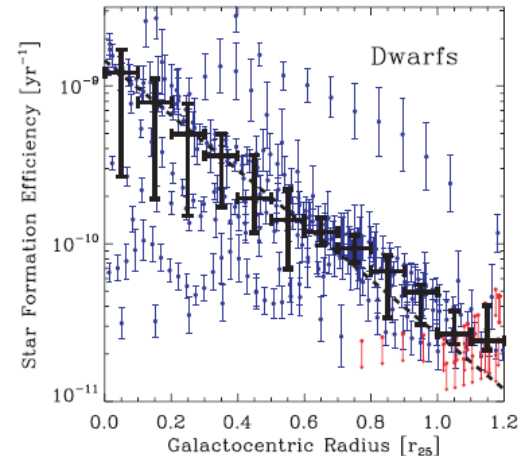
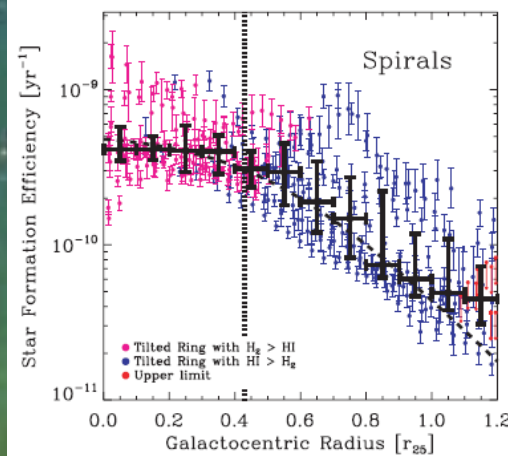
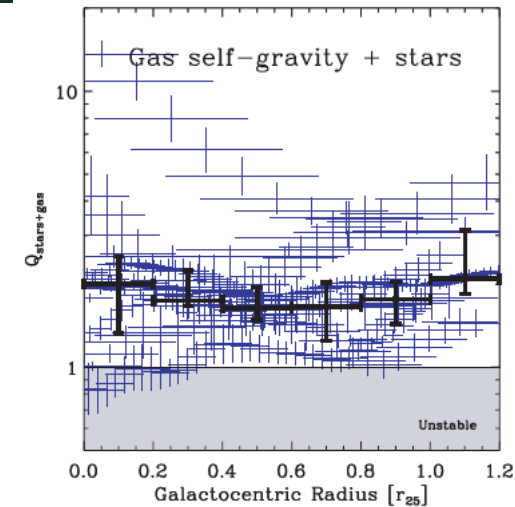
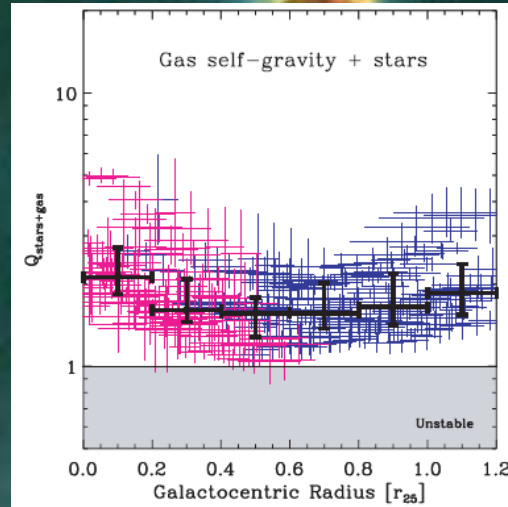
Star Formation – Galaxy Dynamics

- **Constant Q SFR Model**
 - (Quirk 1972, Zheng+ in prep)

Constant Q SF Model

Leroy et al. 2008

- Constant Q
- Constant SFE H_2
- Disk self-regulation*



Constant Q SF Model

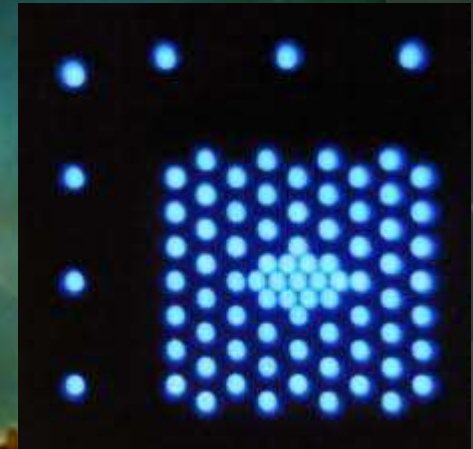
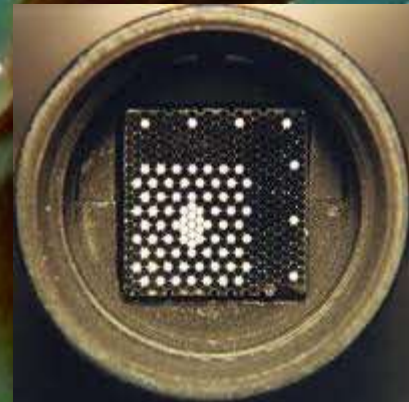
- Secular evolution is important for setting disk structure (Meurer et al. 2013)
- Secular Evolution → Disk Structure → SF Distribution

Stellar Mass S.Density $\rho(r)$
Rotation Curve $> \kappa(r)$
Velocity Dispersion σ

Radial:
SF Surface Density
HI Surface Density
H₂ Surface Density

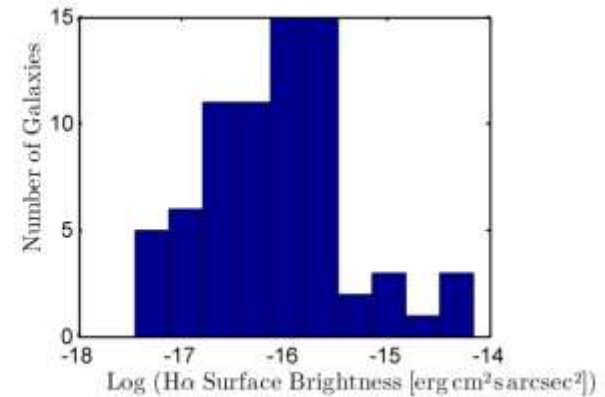
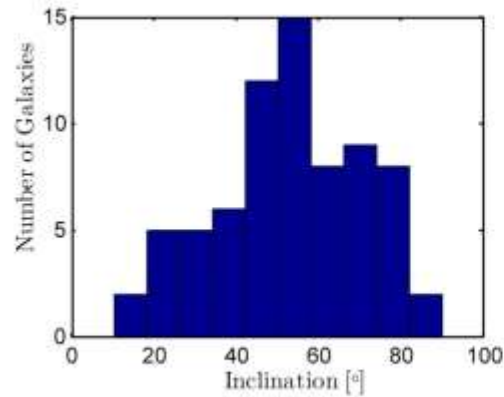
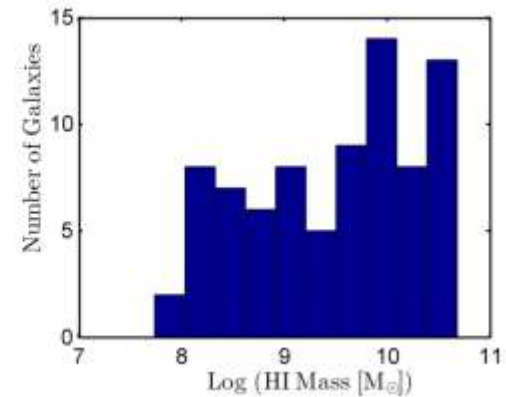
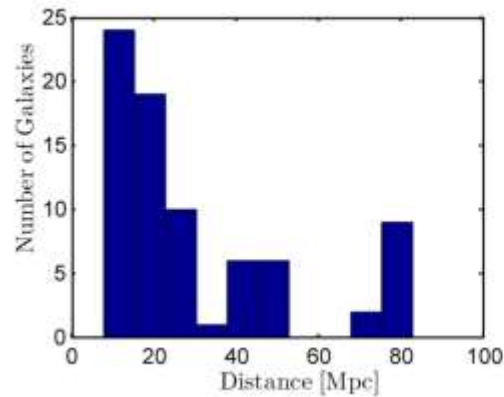
SINGG-SUNGG WIYN Kinematics

- WIYN 4.5m , SparsePAK
 - >63 Galaxies
 - 13 Runs
 - SparsePAK Multi-Fiber Unit
- ~650.0 – 690.0 nm
 - 82 fibers, 100" coverage
 - 0.02 nm Resolution
 - 4.5" Fiber Diameter



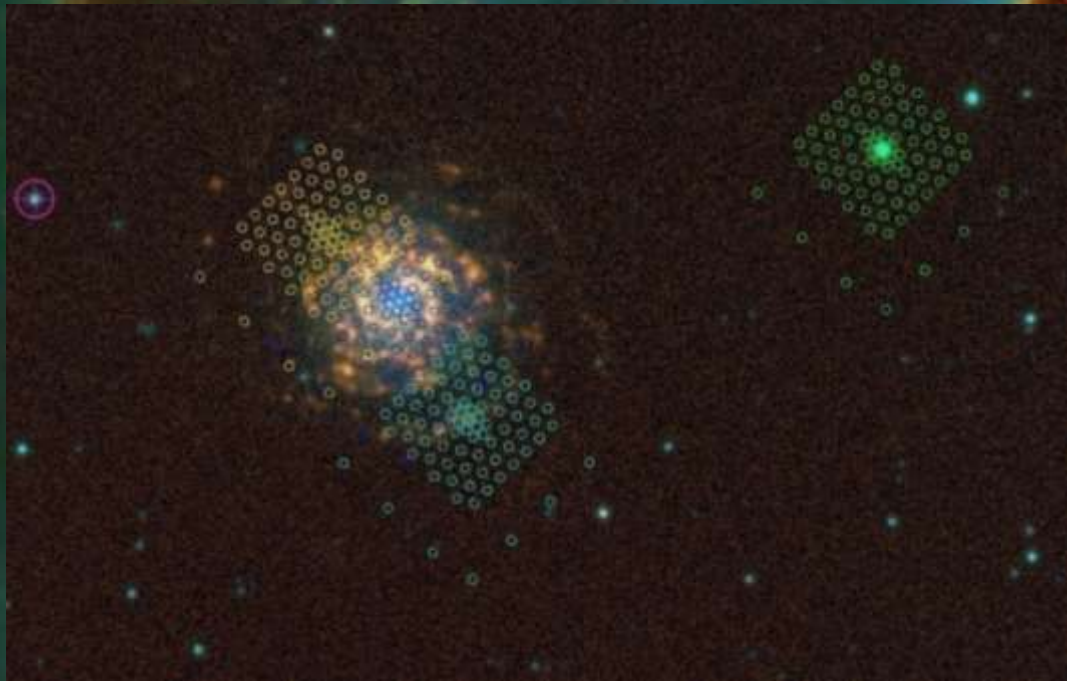
WIYN Kinematics

Sample:

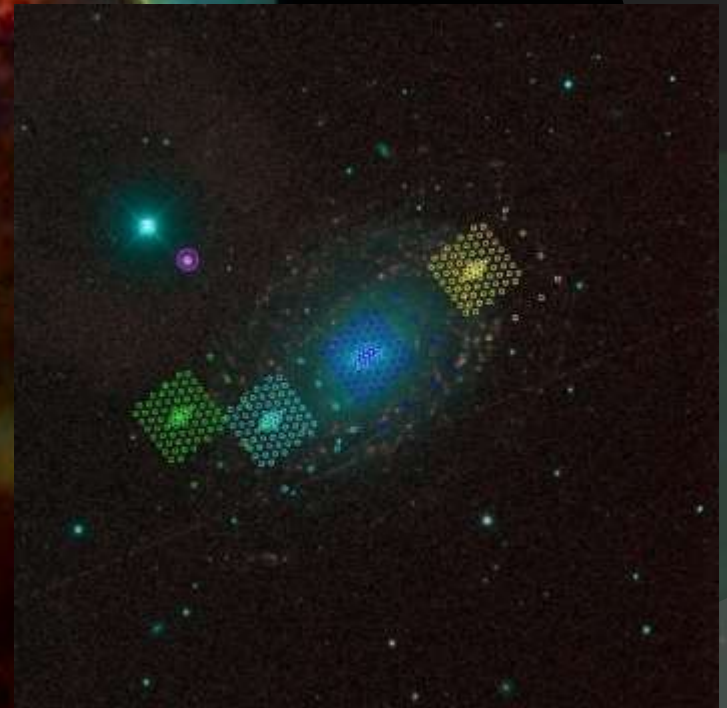


WIYN Kinematics

J0942+00

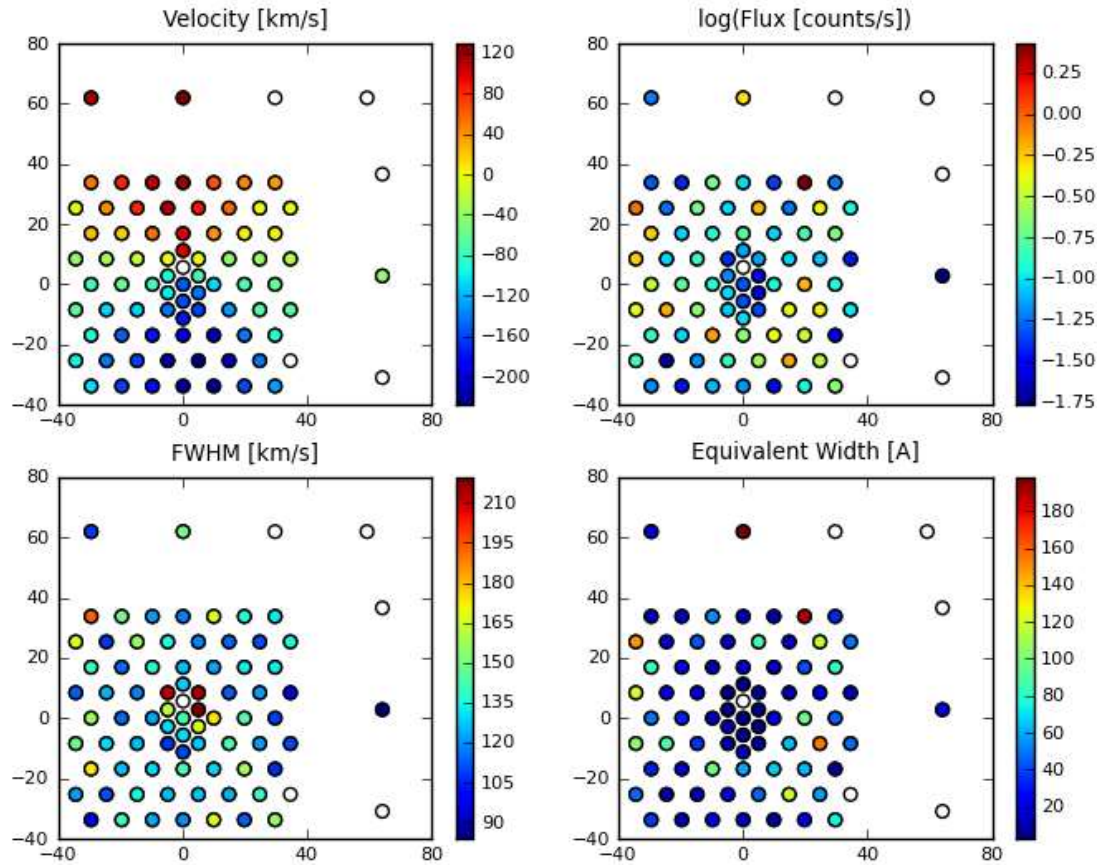


J0335-24



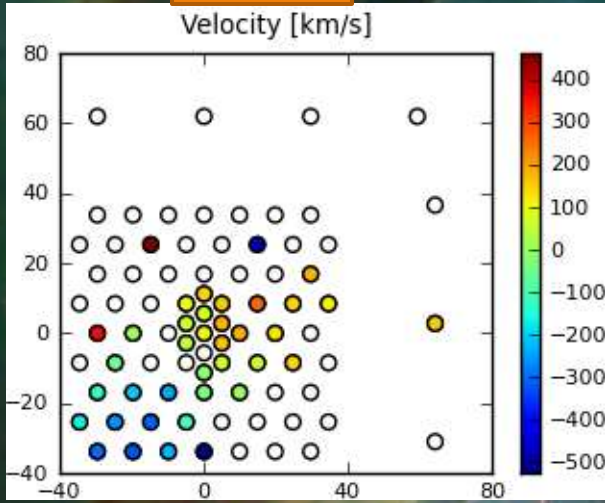
WIYN Kinematics

J0223-21p1_H-alpha 6562.819A

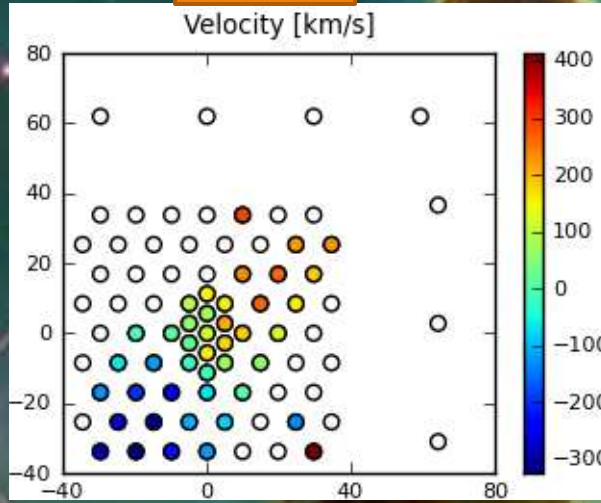


WIYN Kinematics

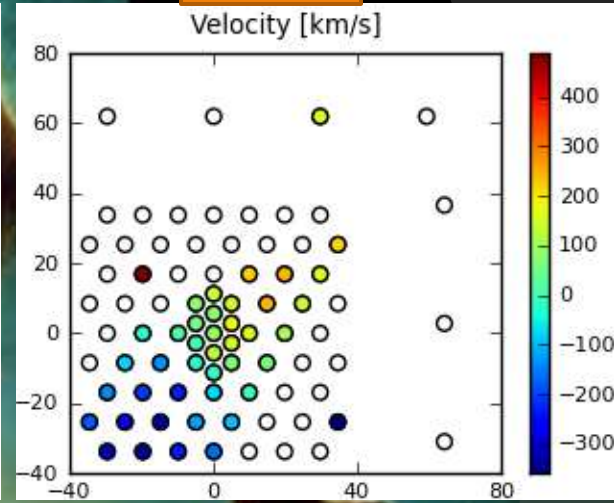
NII



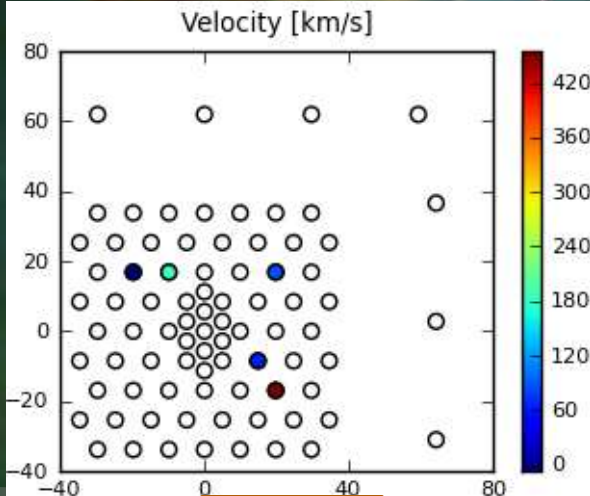
H α



NII

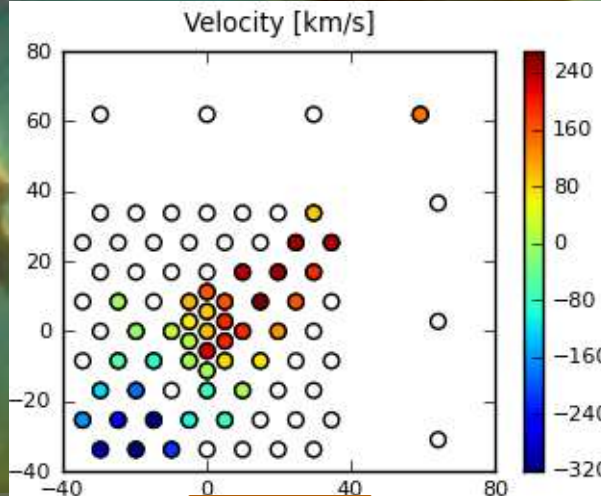


Velocity [km/s]



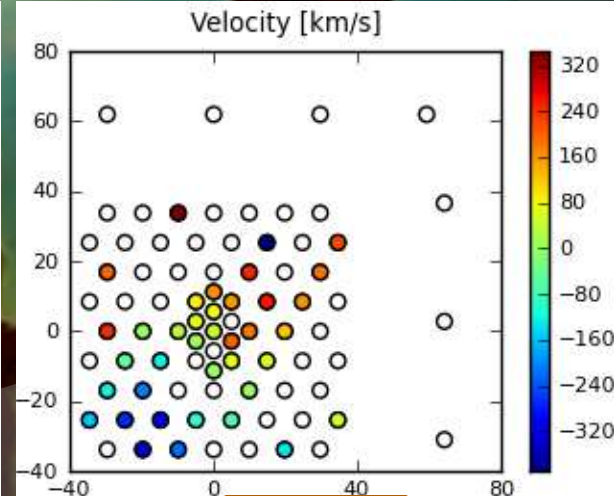
HeI

Velocity [km/s]



SII

Velocity [km/s]



SII



- ◉ **6000hr MeerKAT (de Blok+)**
- ◉ **30 Galaxies, 200hr each...**
- ◉ **Choosing Galaxies: ~96 galaxies in precursor sample (SINGG-SUNGG sample)**
- ◉ **How do galaxies get their gas?**
- ◉ **How is star formation regulated?**
- ◉ **How are outer disks and the cosmic web linked?**

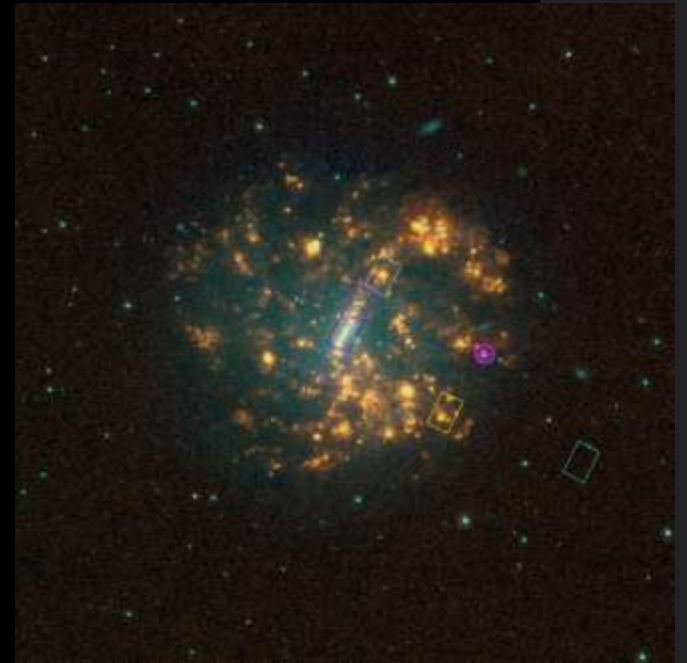
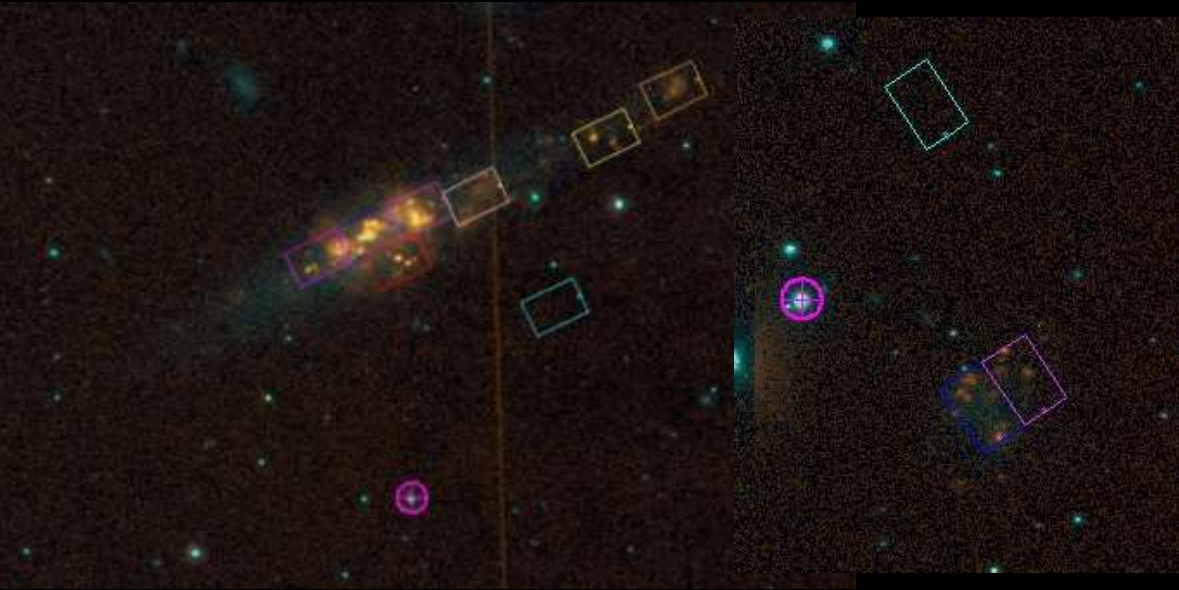


- **MHONGOOSE-WiFeS**
- **Spectroscopic observations of MHONGOOSE precursor sample:**
- **Looking for accretion?**
 - **Metallicity distribution**
 - **Kinematics**
- **ISM Properties**
- **Galaxy Kinematics**
- **Ancillary Data**



- **MHONGGOOSE-WiFeS**
- **~96 galaxies**
- **2.3m ANU Telescope**
- **WiFeS IFU**
 - **FOV: 25" x 38"**
 - **1" Res, Seeing-limited**
 - **Blue : 320-590nm (0.077nm)**
 - **Red : 530-706nm (0.044nm)**
 - **H α , H β , H γ , OI, OII, OIII, NII, SII, He I,...**

MHONGOOSE- WiFeS





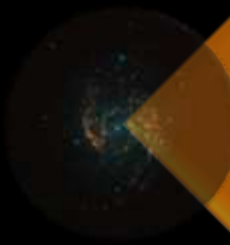
MY PROGRESS

○ **MHONGOOSE-WiFeS**

- 3 Runs Completed
- Data from 76 pointings (12 galaxies) has been reduced

○ **SWIYNG:**

- 13 Runs (2005-2013) Completed
- Data from 12 Runs: 145 Pointings, 64 galaxies (146, 65) reduced
 - Line Fitting
 - Velocity Fields
 - Total Profiles
 - Rotation Curves (initial)



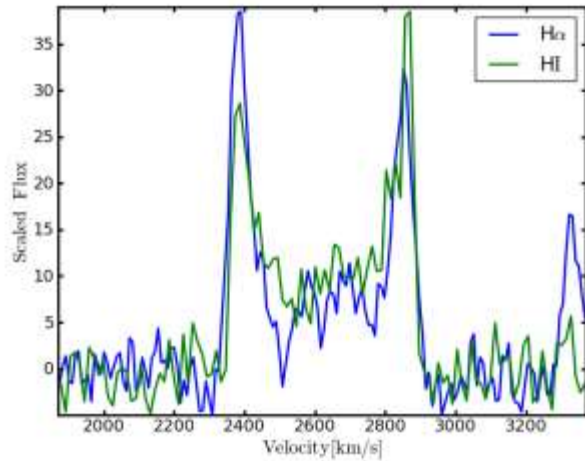
Meanwhile, in the computer...
(when its not in a semi-
broken state)

◎ **IN THE COMPUTER:**

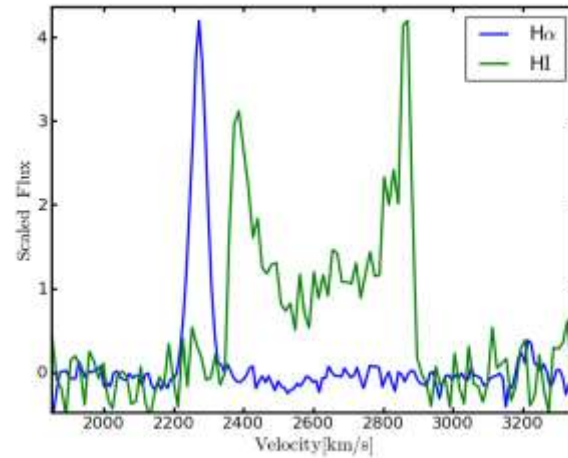
- **Developed reduction, line-fitting & parameter extraction software/pipeline (Python)**
 - (pyRAF, pywifes, KapteynPython...)
 - [output : Velocity Field and other Parameter maps]
- **Velocity Field Fitting/ Rotation Curve software... custom made (J. Allen), ROTCUR...**
 - Ideally automated (but not so simple...)
 - Sparse Sampling
 - Sensitive to Initial Parameter Estimates/Uncertainties
 - DiskFit, Bayesian approach (eg.. Se-Heon)?,...

H α vs HI

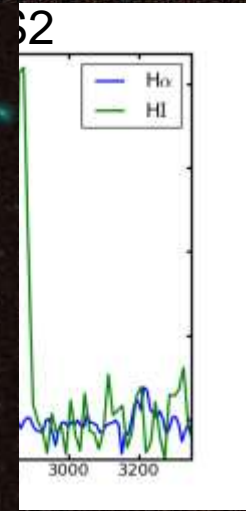
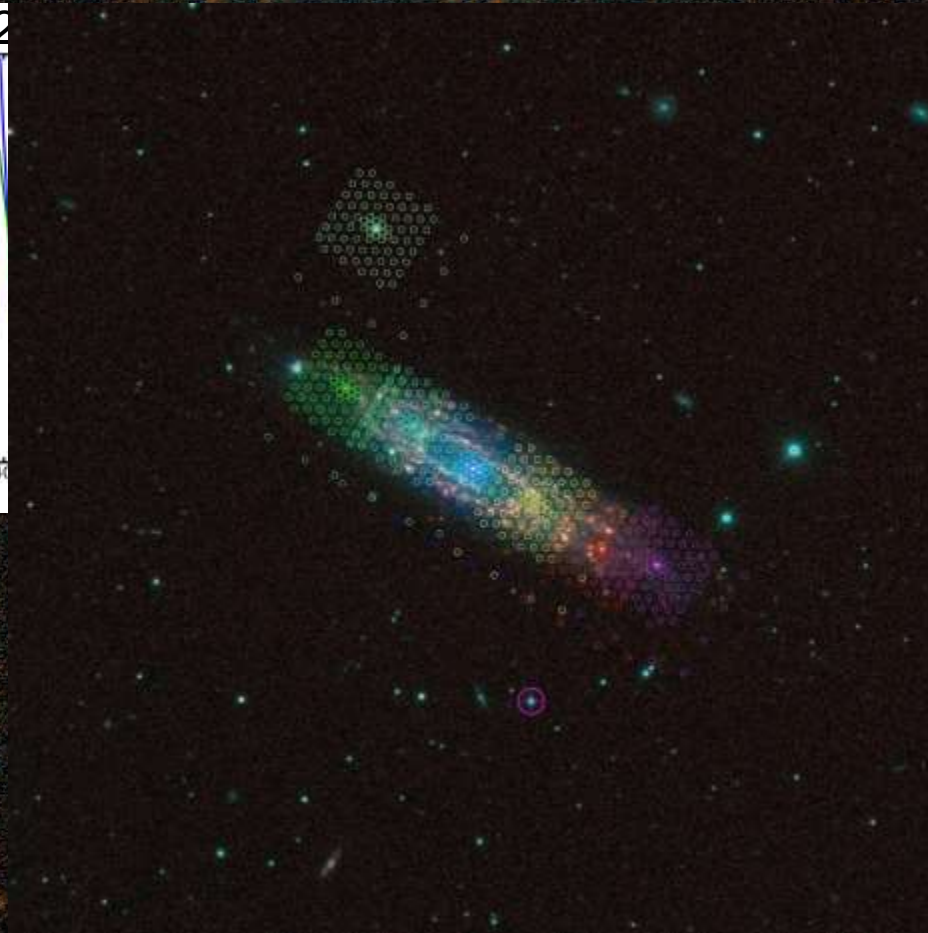
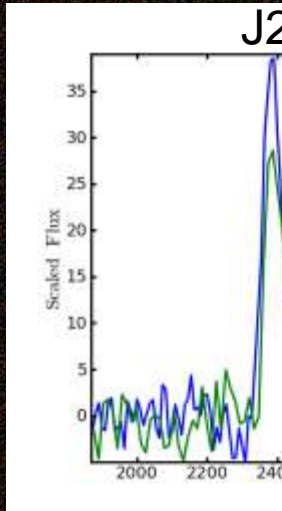
J2202-20:S1



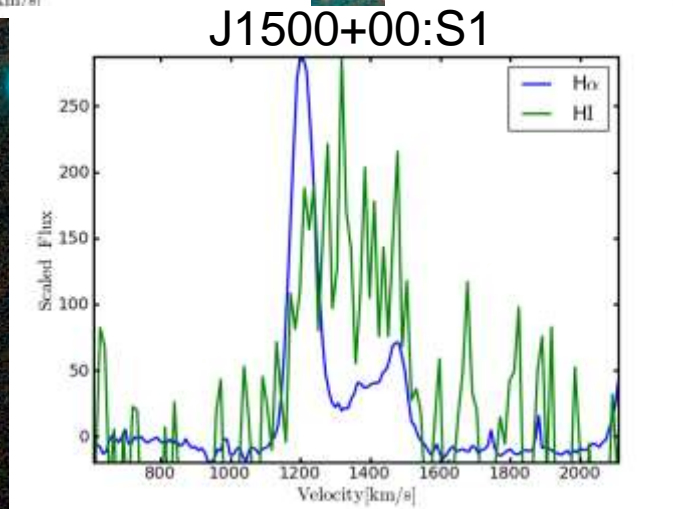
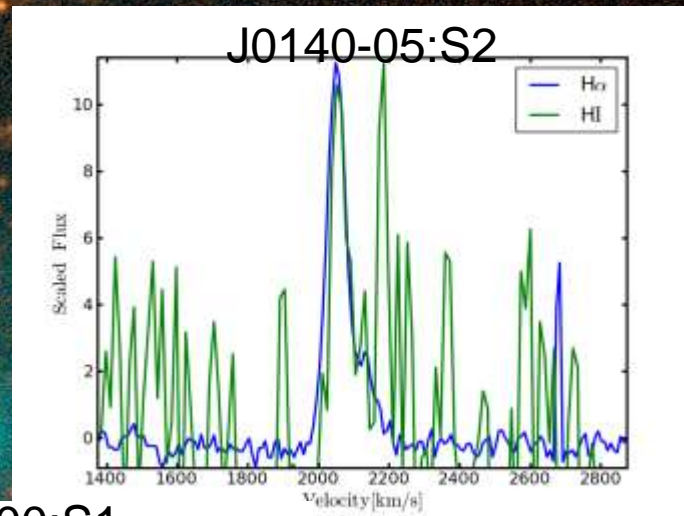
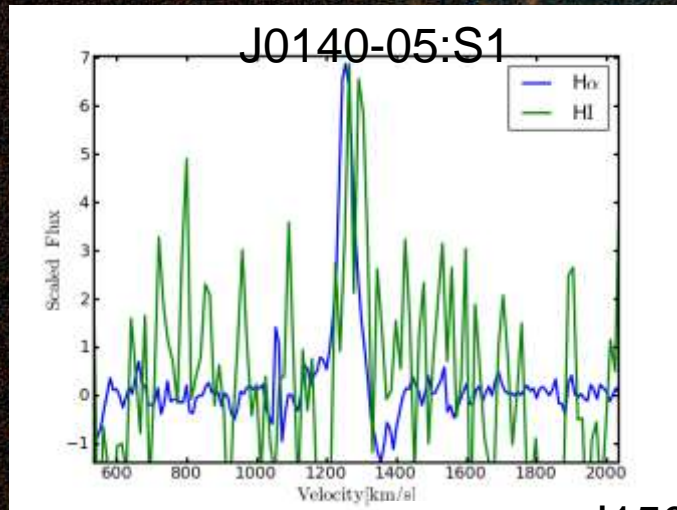
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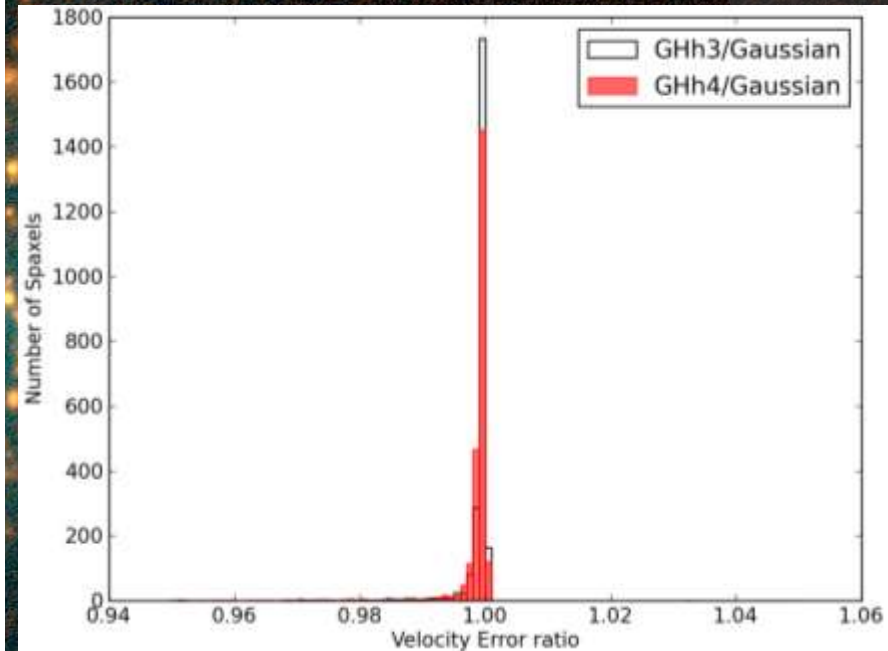
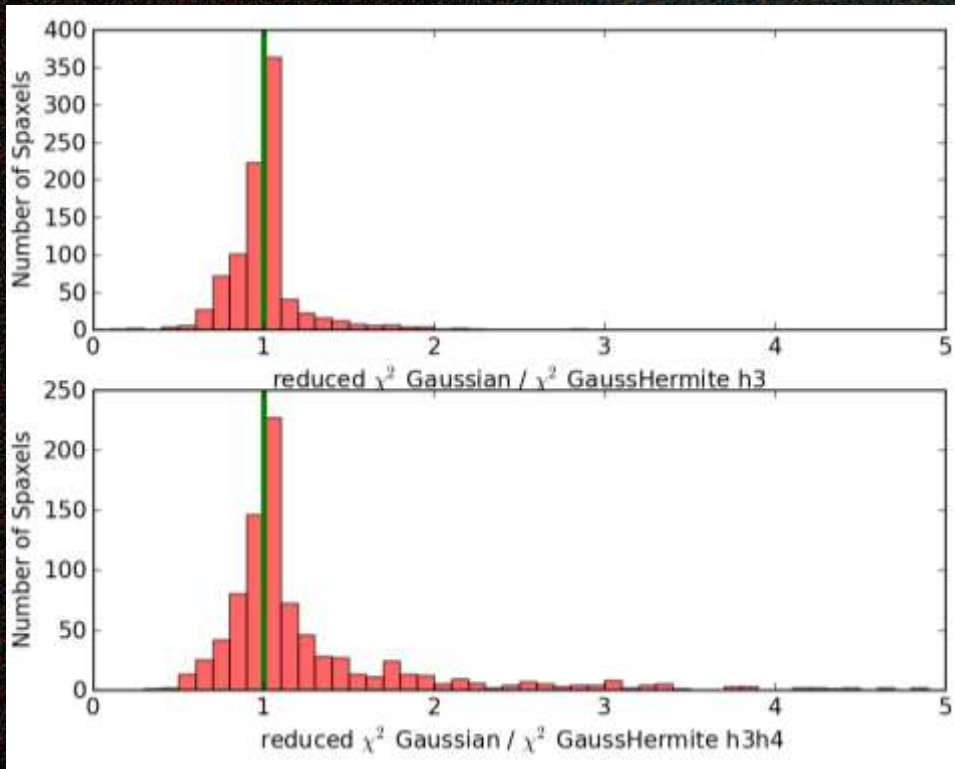
H α vs HI



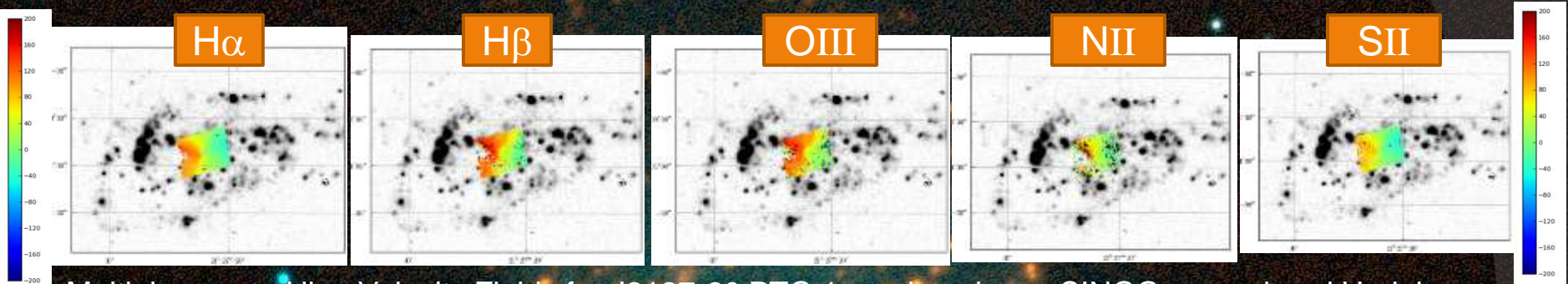
H α vs HI



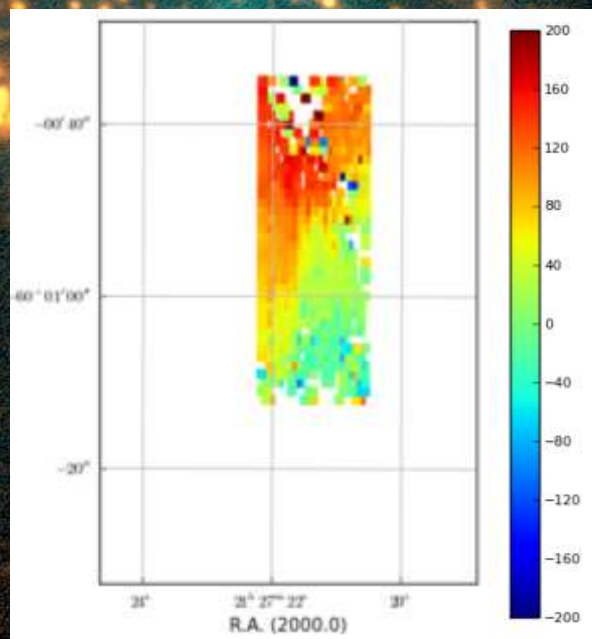
Velocity Fields Tests...



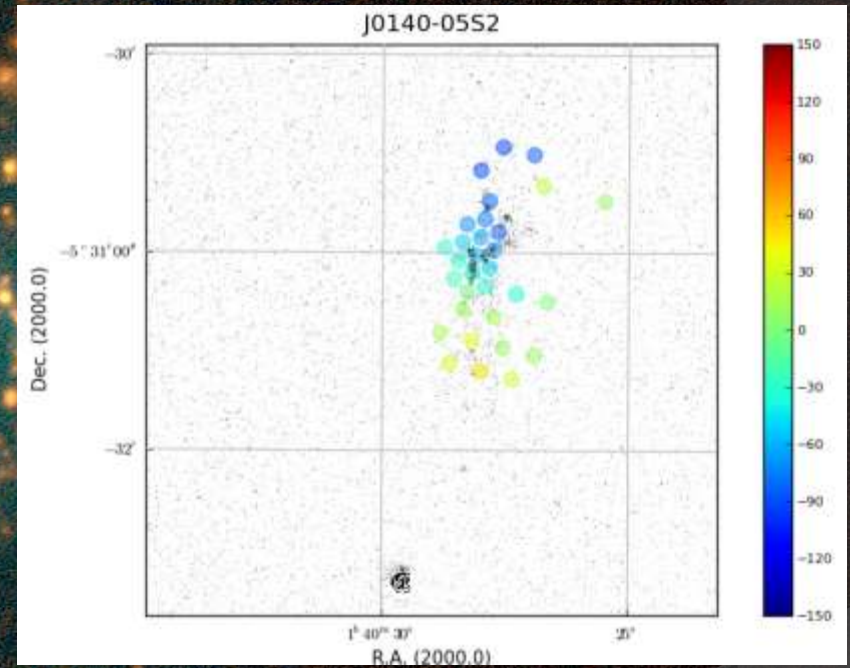
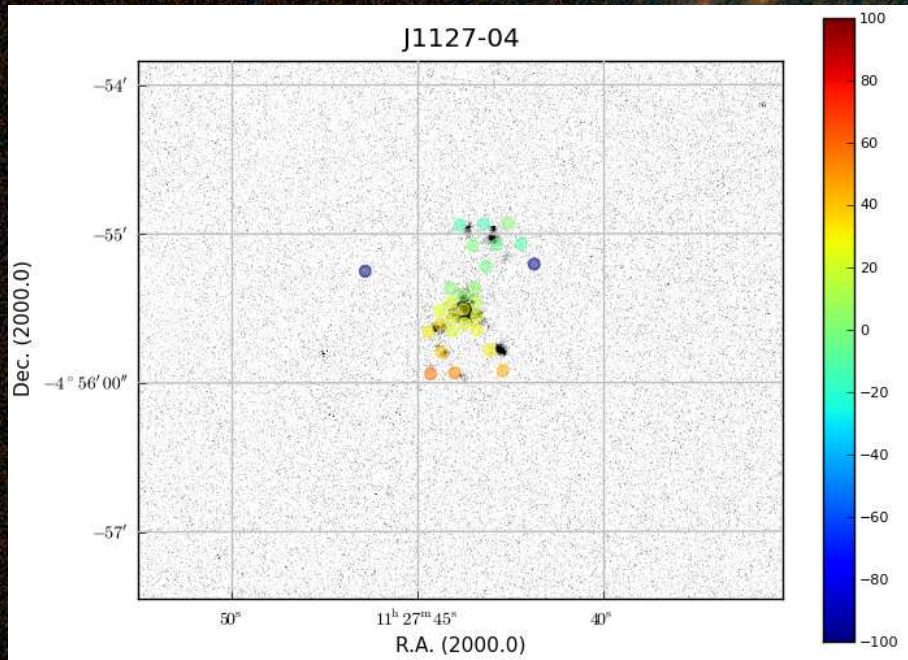
Velocity Fields



Multiple-spectral line Velocity Fields for J2127-60 PTG 1 overlaid over SINGG narrowband H-alpha observations

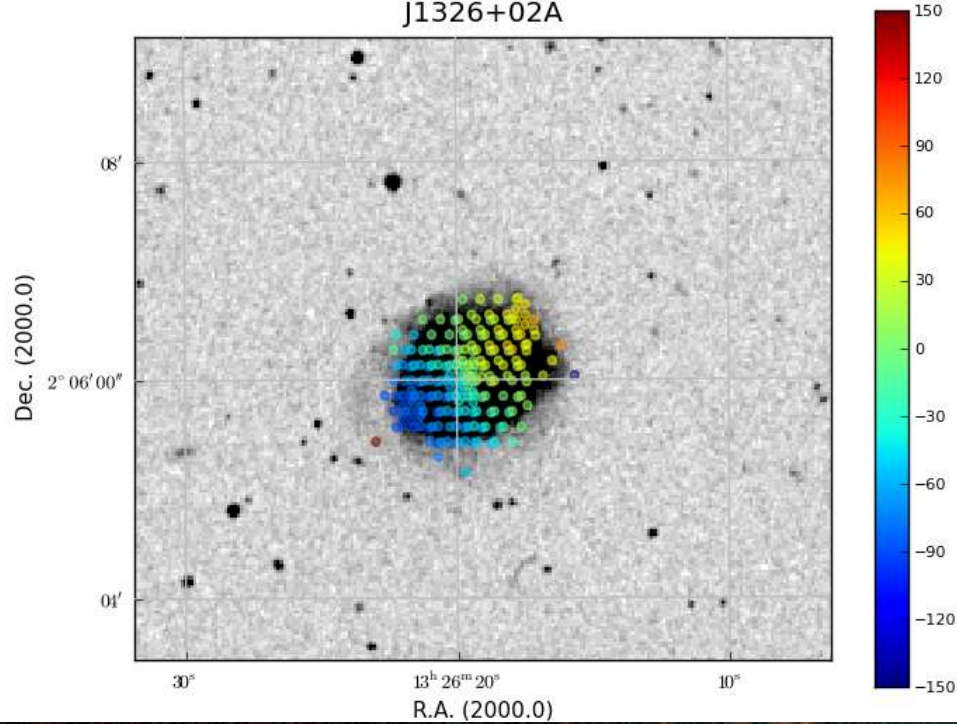


Velocity Fields

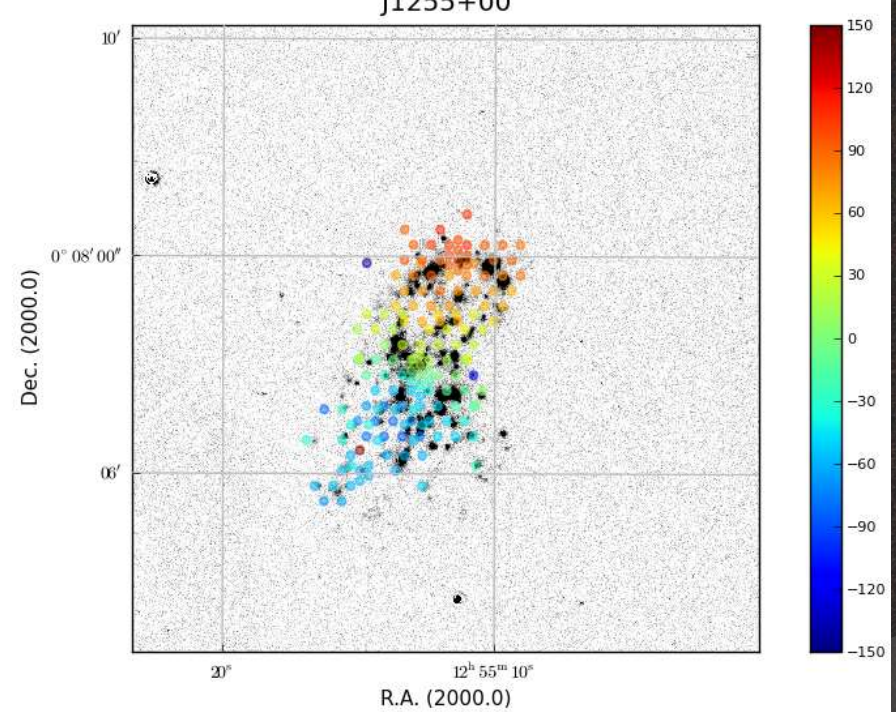


Velocity Fields

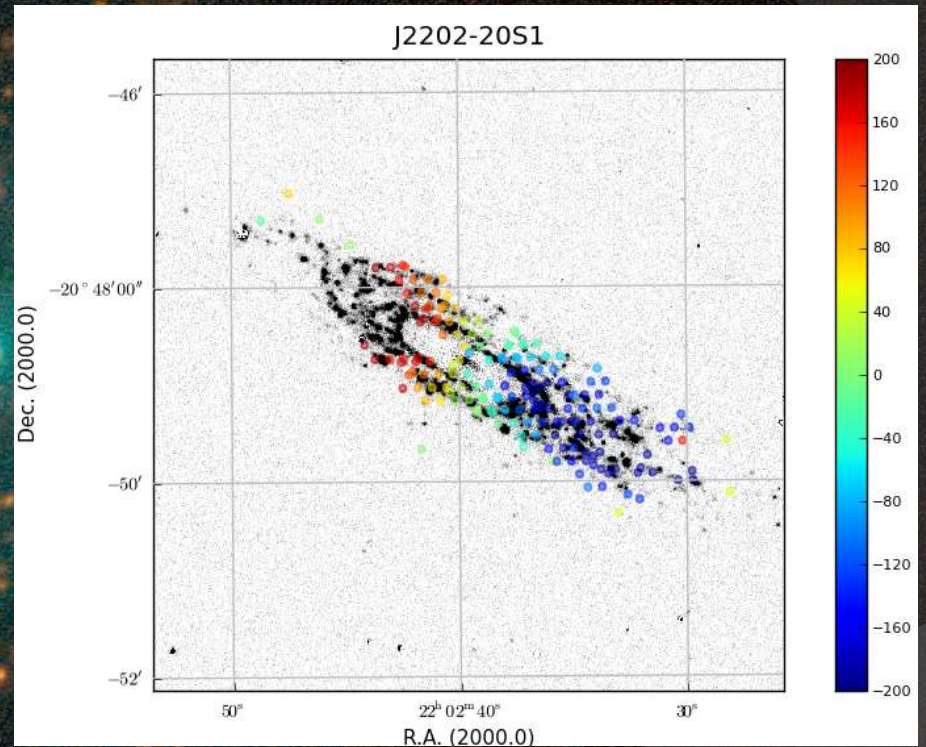
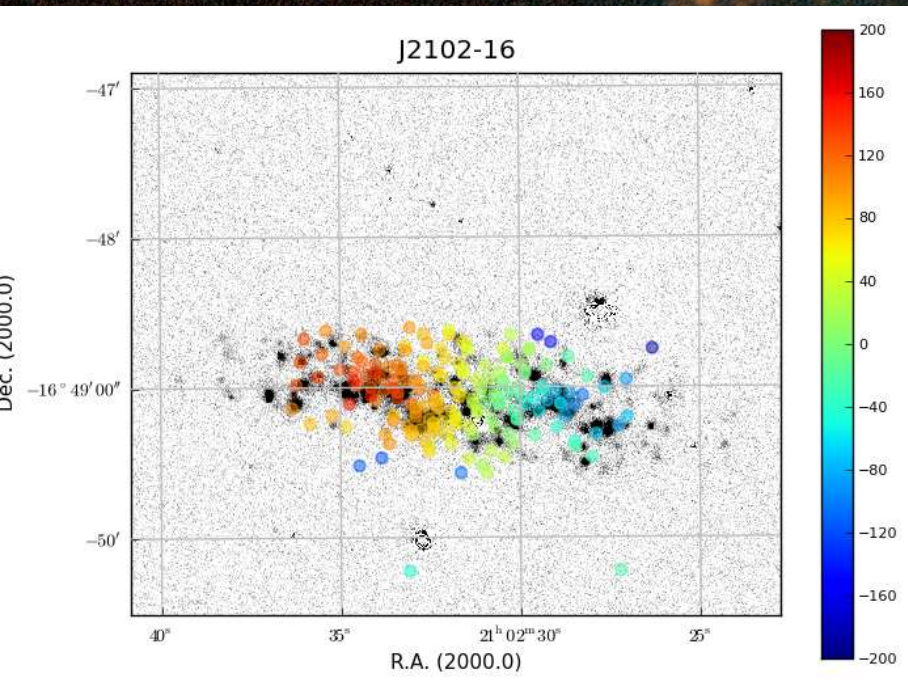
J1326+02A



J1255+00

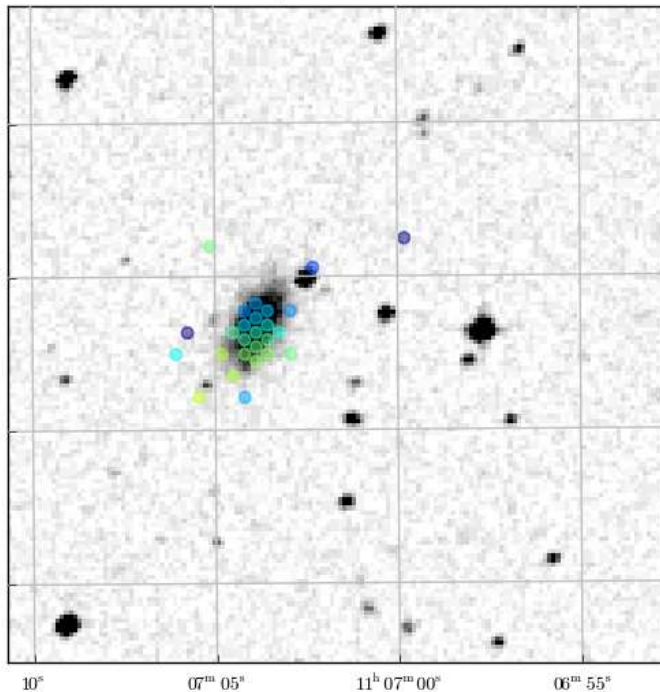


Velocity Fields

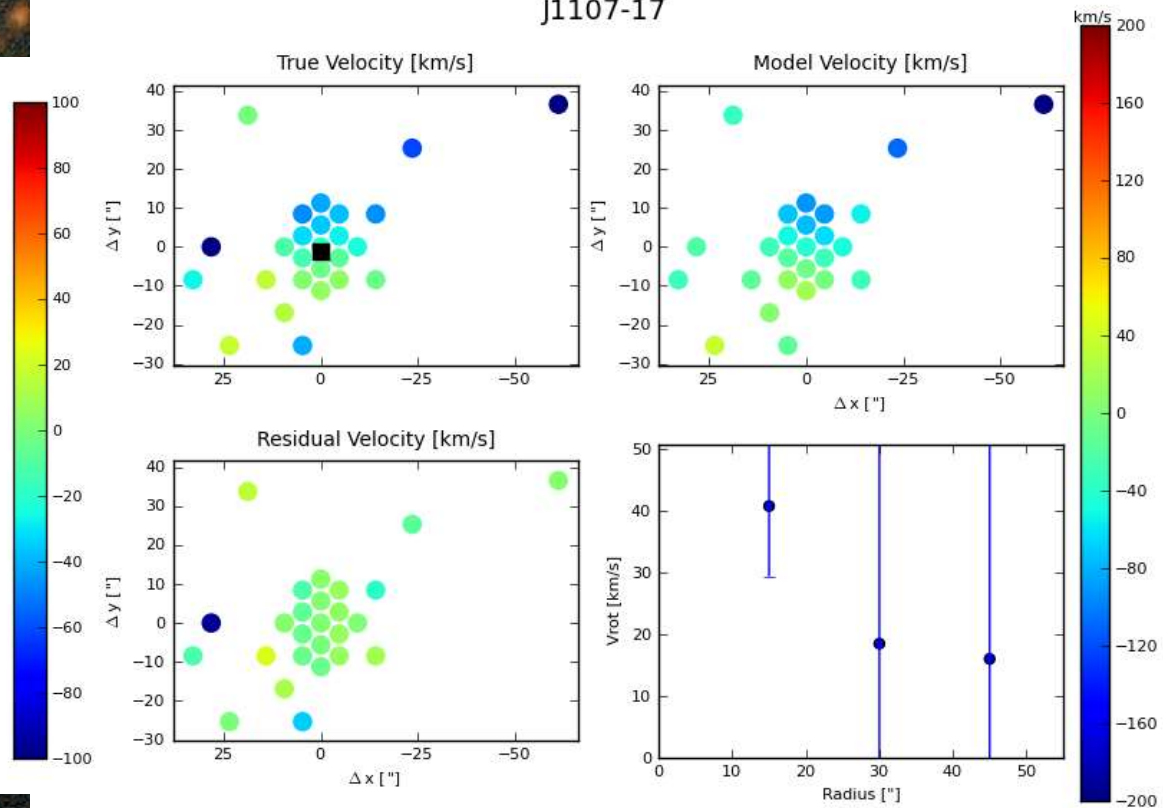


Rotation Curves (or not)

J1107-17

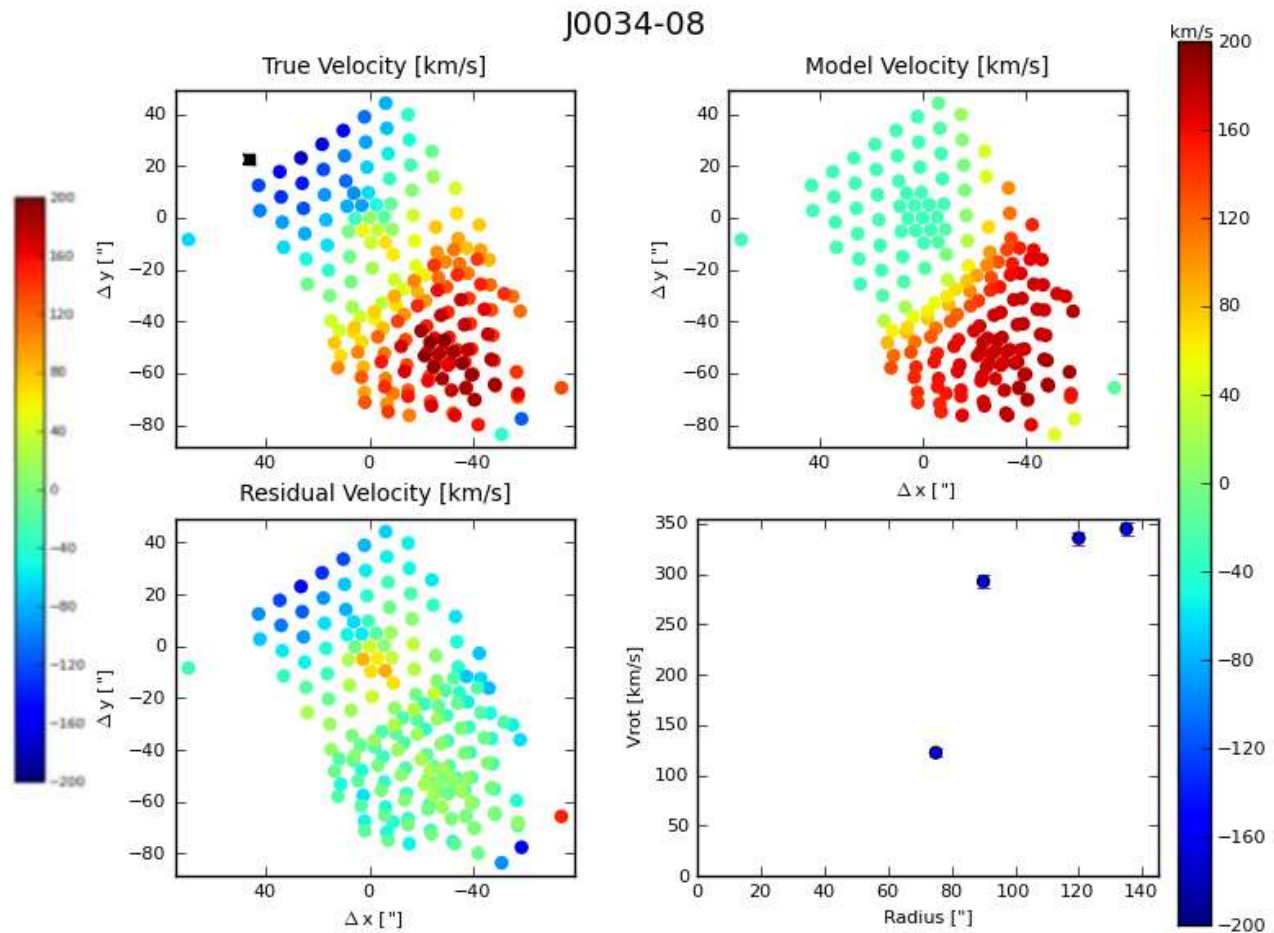
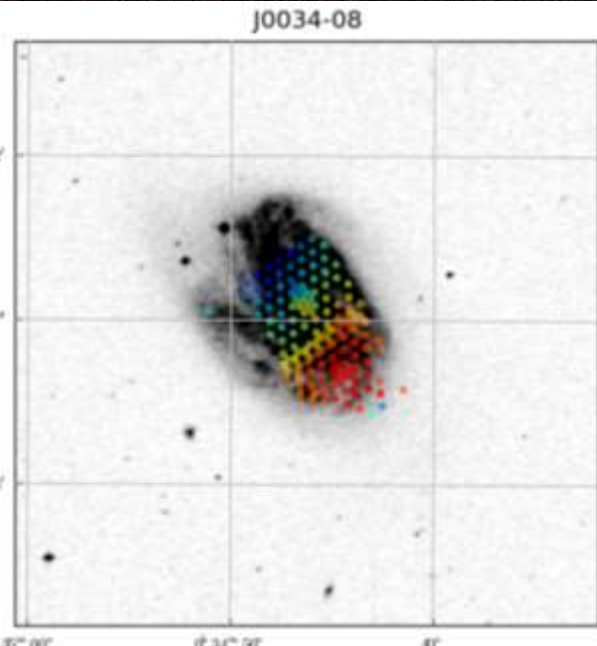


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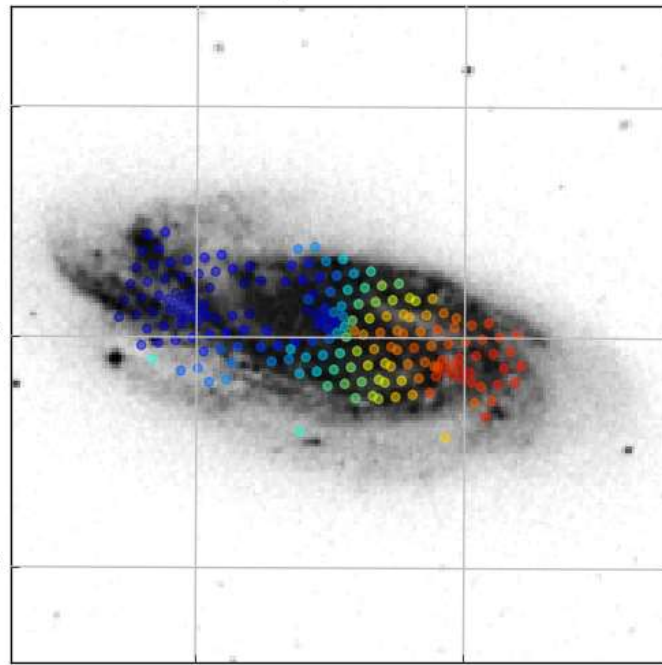
Rotation Curves...

?

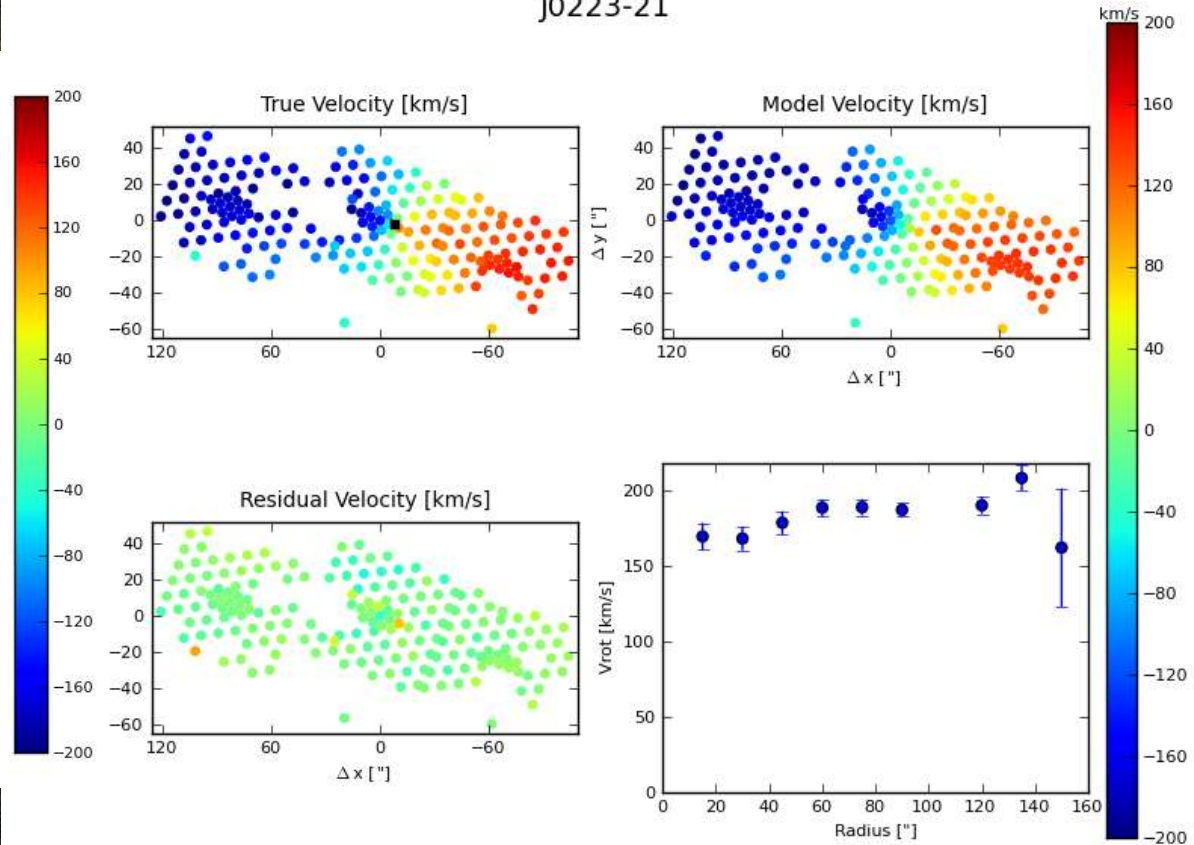


Rotation Curves

J0223-21



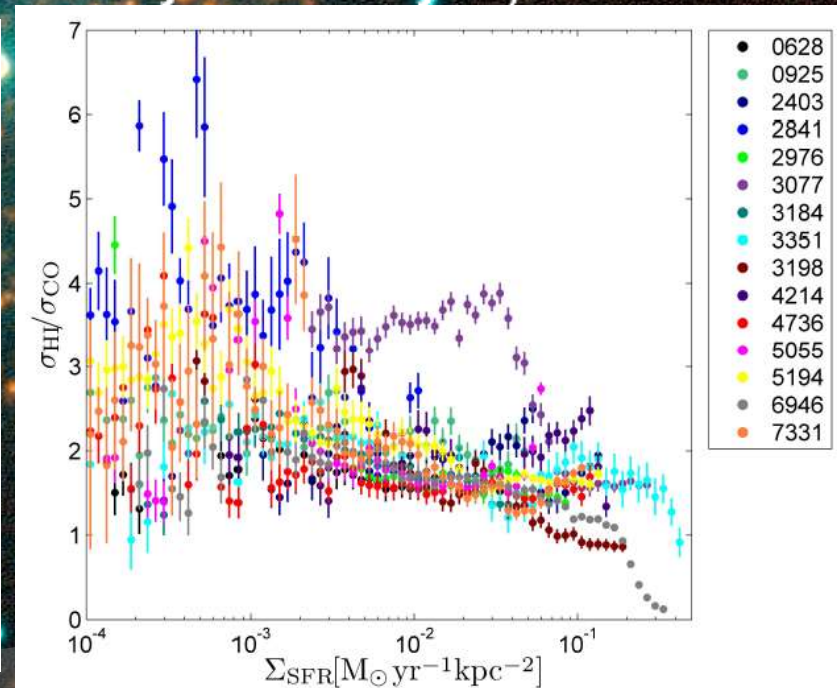
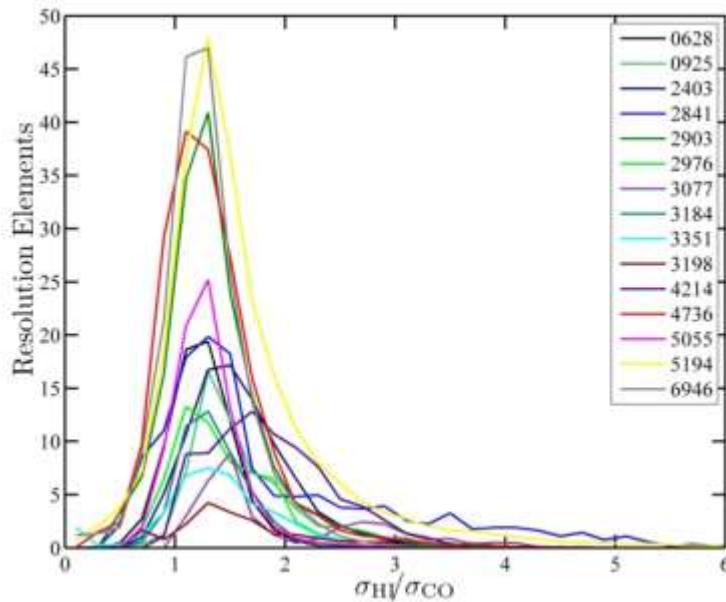
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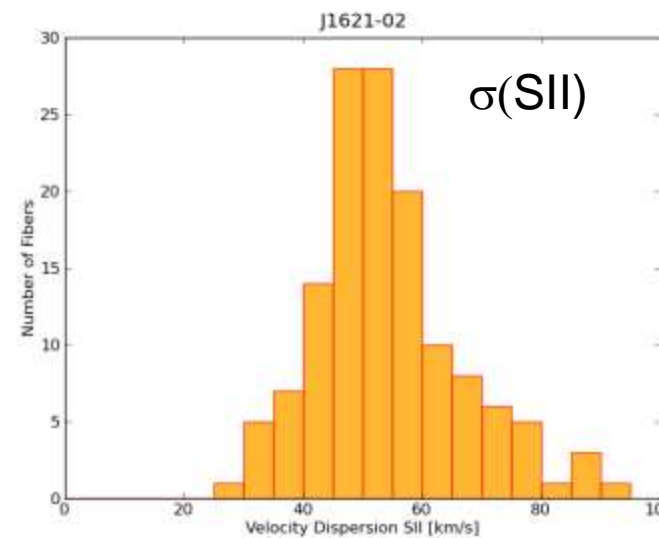
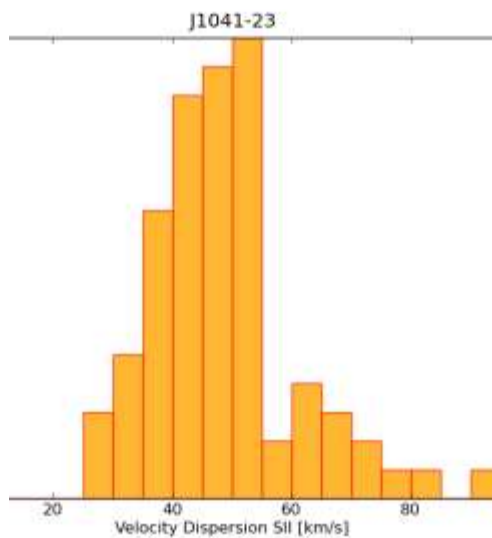
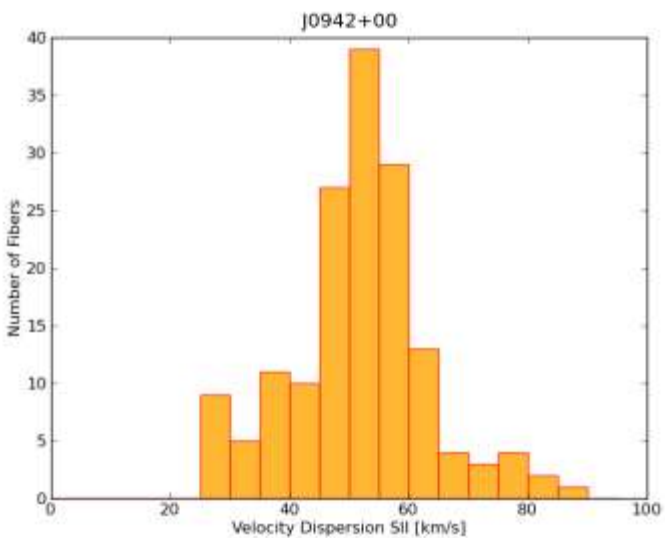
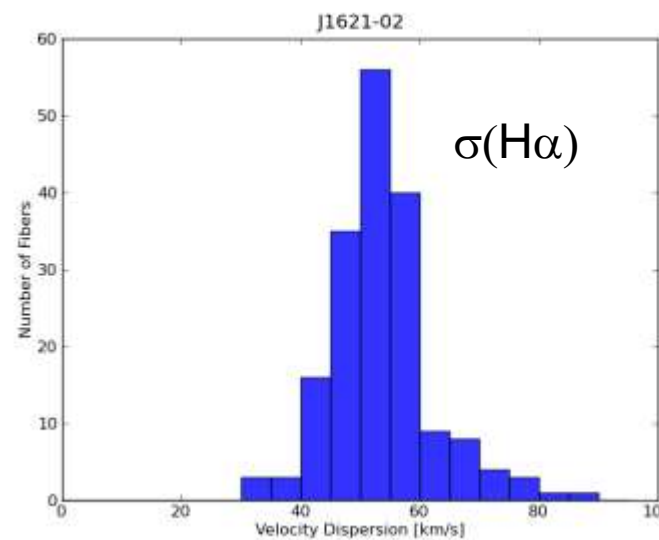
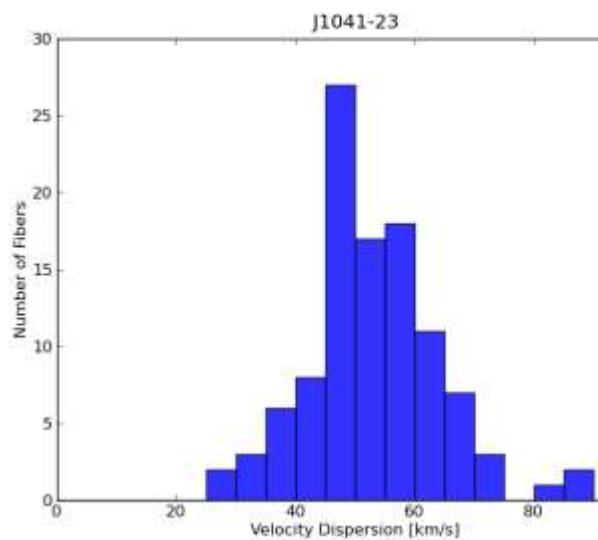
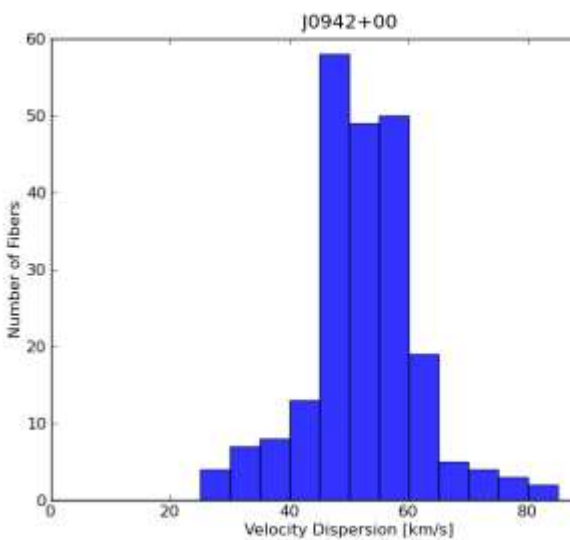
Disk Self Regulation i.e. Feedback

○ THINGS-HERACLES CO & HI Dispersions

- Tamberro et al. 2008 (Simple Kinetic Energy SF study)
- Ianjamasimana et al. 2012 (HI Cold & Warm Phase Stacking) & (in prep)
- Caldu et al. in prep. (CO & HI Stacking)
- Mogotsi et al. in prep. (CO & HI Pixel by Pixel analysis)



Feedback ...





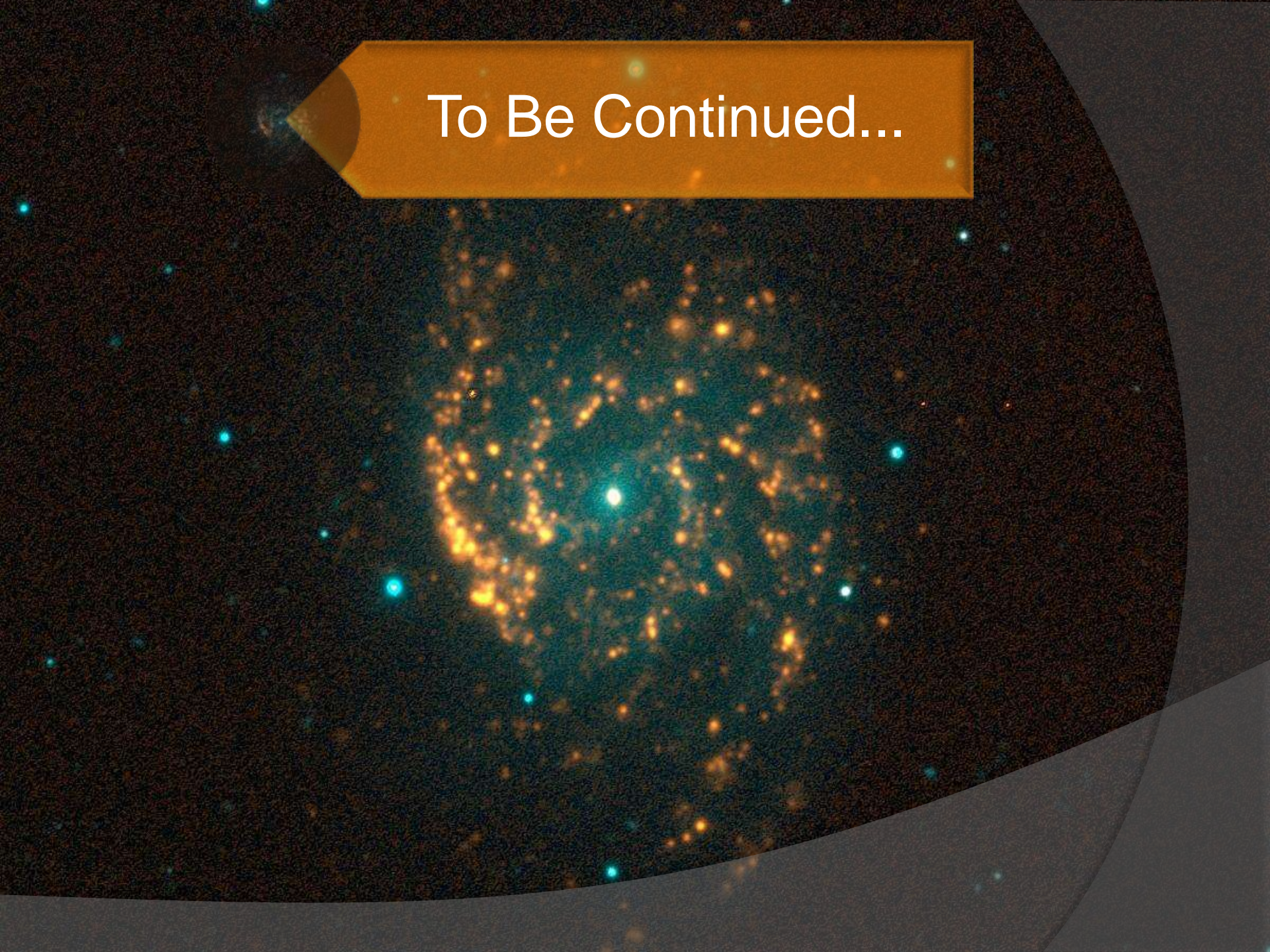
○ Nearby Future:

- Stellar Mass Surface Density : WISE
- Star Formation : WISE (obscured SF)

○ Further along:

- Good way to trace infalling gas & gas transport in galaxies...
- Analysis including HI (Archival, LVHIS) & CO (B0DEGA, JCMT, ALMA) for inner parts of galaxies (where models tend to break down) and low metallicity star forming areas.

To Be Continued...

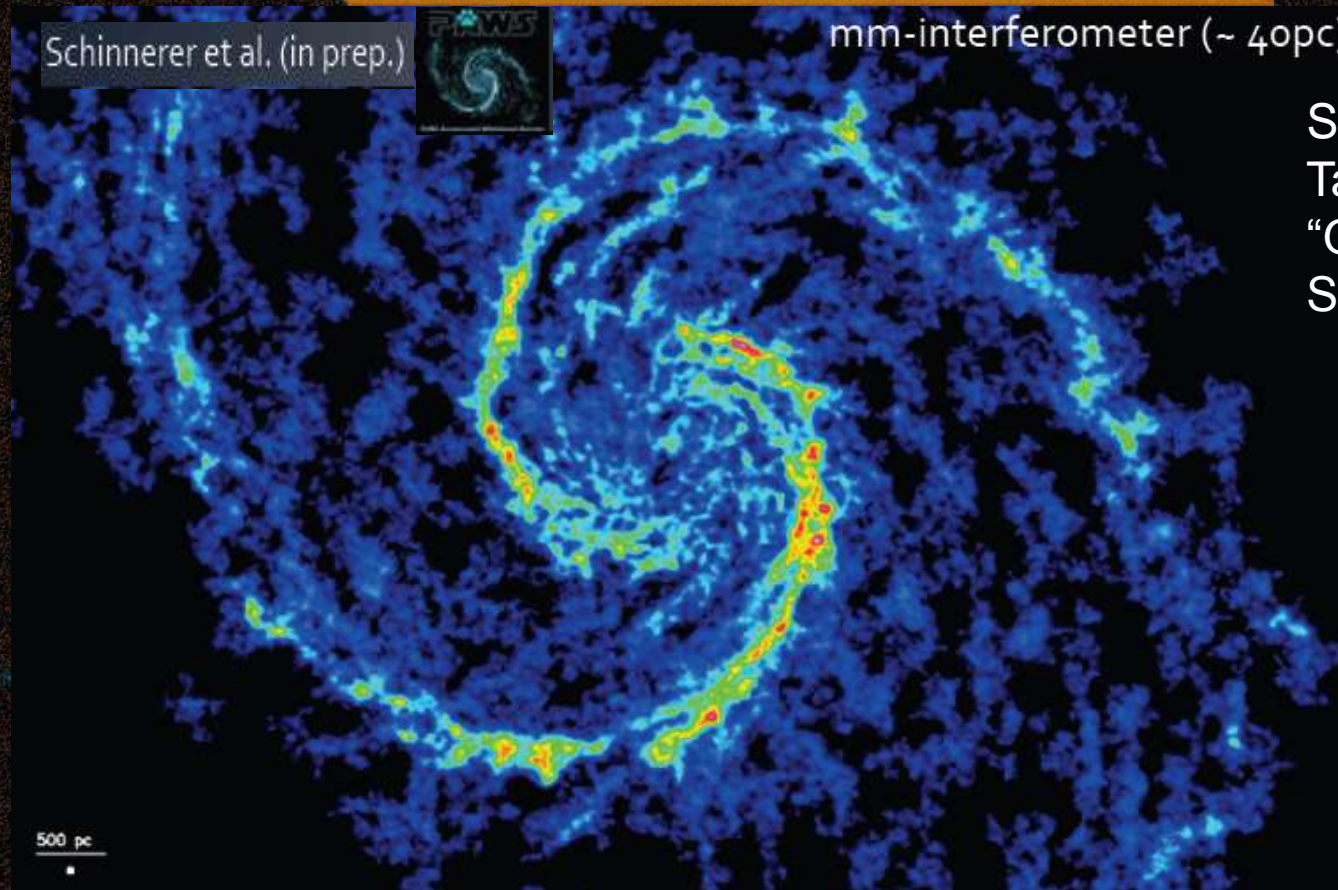


HI in Nearby Galaxies with SKA

Schinnerer et al. (in prep.)



mm-interferometer ($\sim 40\mu\text{pc}$)



500 pc

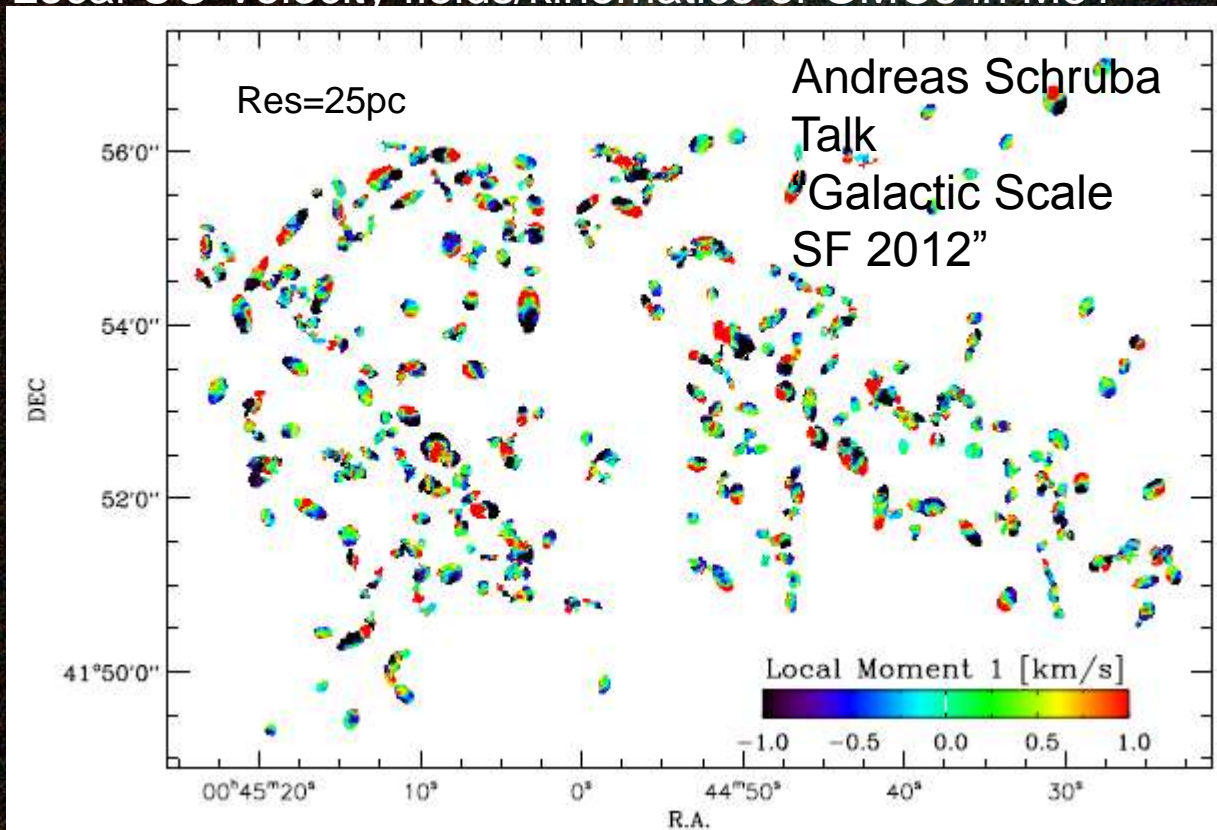
Schinnerer
Talk
“Galactic Scale
SF 2012”

Pre-ALMA!

PAWS
M51
CO
D=8Mpc

HI in Nearby Galaxies with SKA

Local CO Velocity fields/kinematics of GMCs in M31



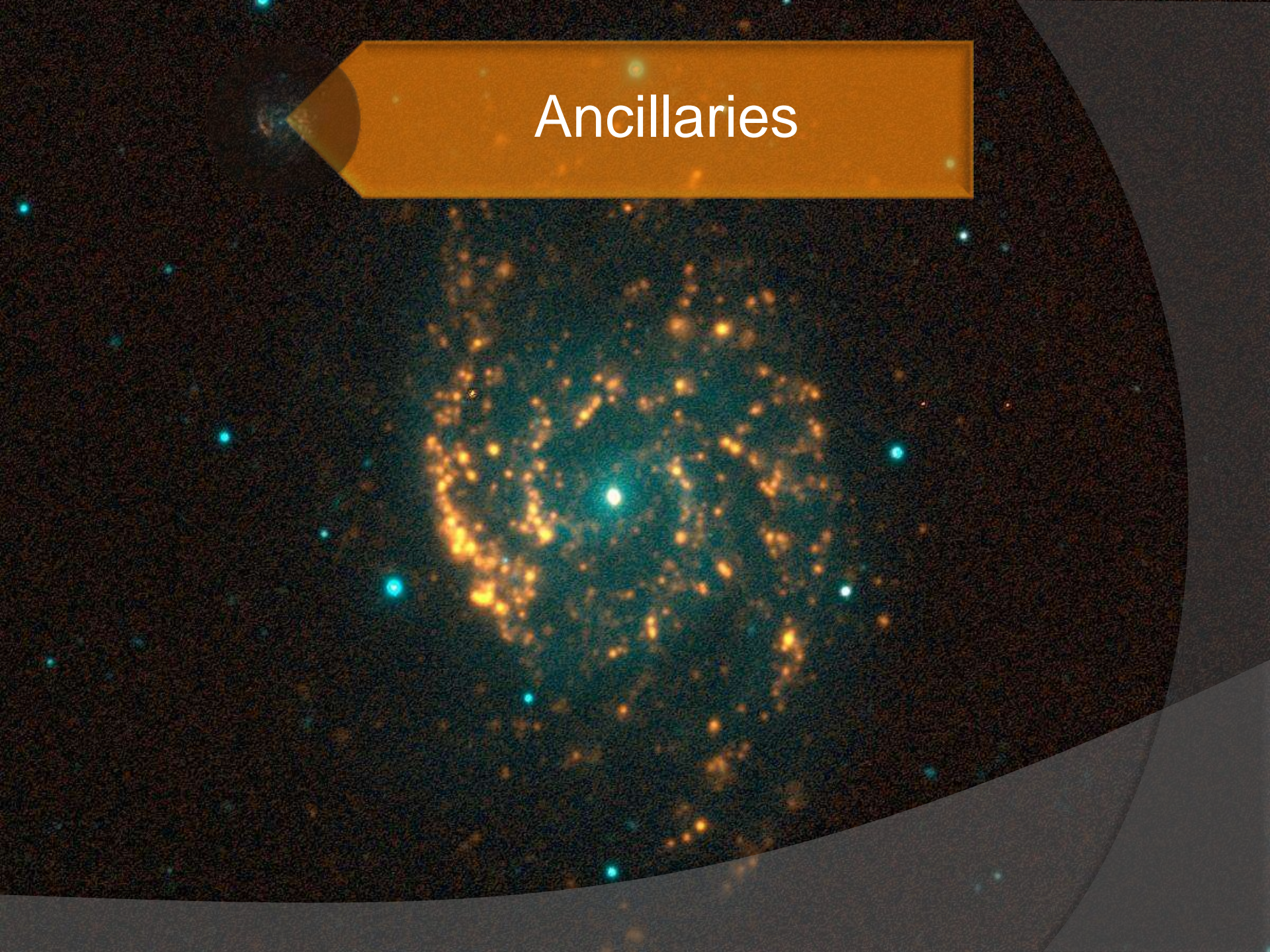
Pre-ALMA!



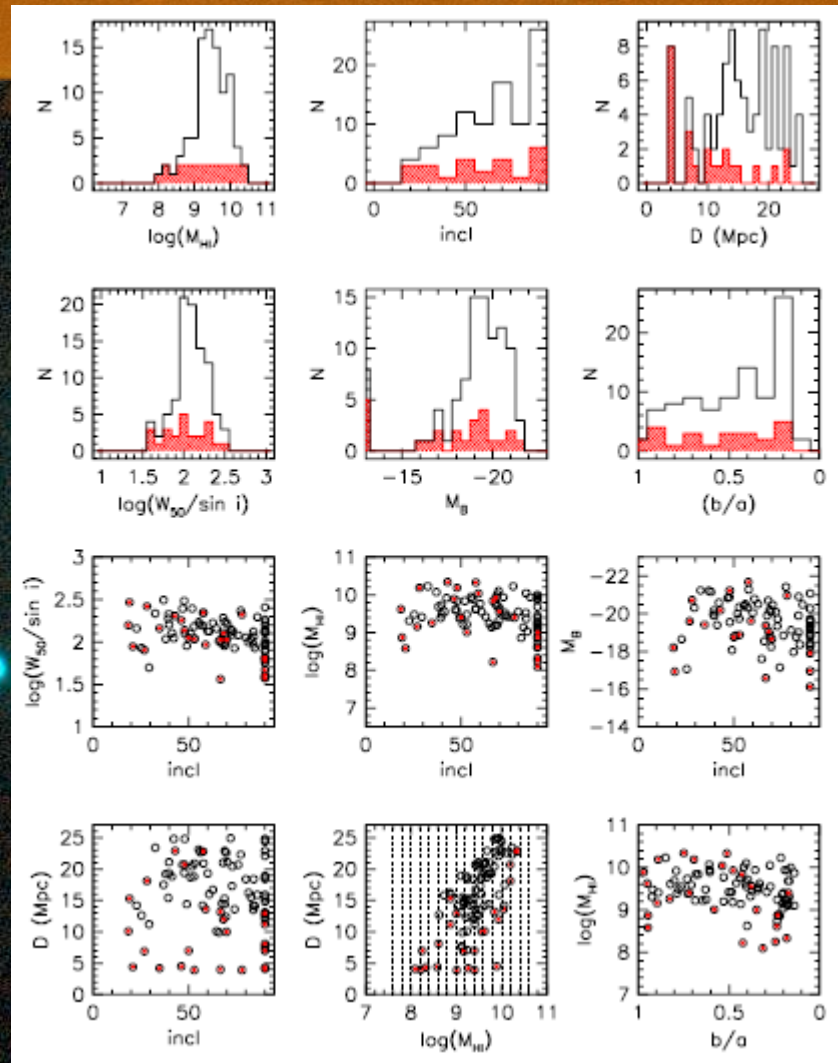
THANKS!



Ancillaries



Ancillaries



Ancillaries

