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Disturbed Things Come in small packages

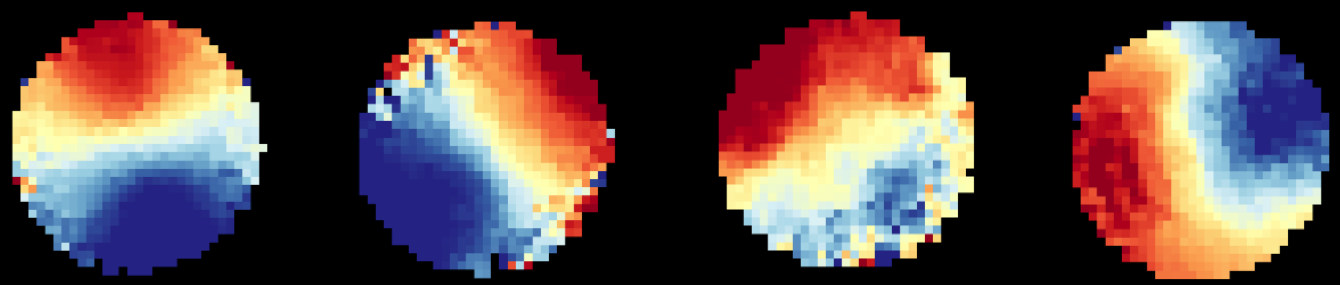


Thanks to:
Scott Croom
Julia Bryant
Joss Bland-Hawthorn

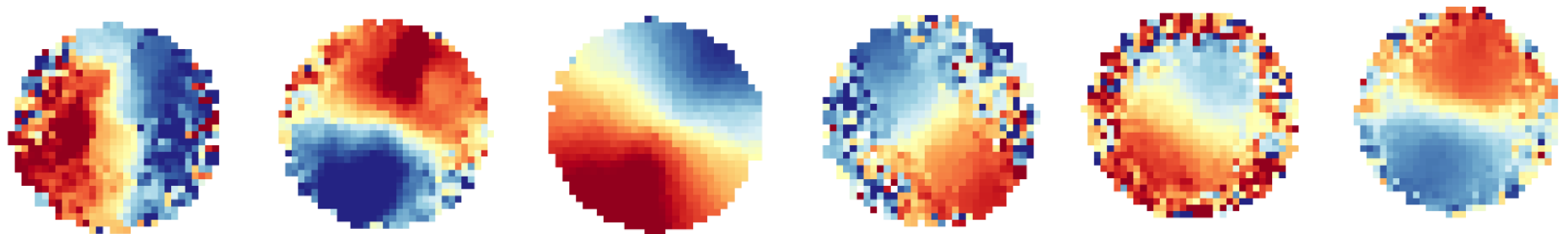
Kinematics can uncover processes shaping galaxy evolution

- Kinematic classification of SAMI galaxies
- Physical basis for scatter off the Tully-Fisher relation
- What determines asymmetry?

Data



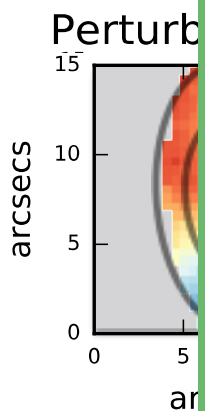
- SAMI Galaxy Survey data cubes
- H α emission line kinematic maps fit by LZIFU (Ho et al., 2014) – subsample of 816 galaxies
- MY SAMPLE: **532** galaxies after H α S/N cuts



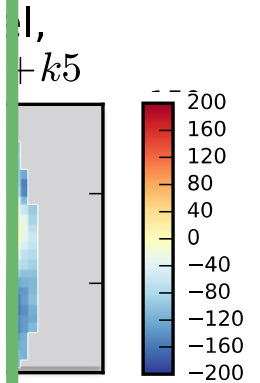
KINEMETRY

Asymmetry ($n > 1$)

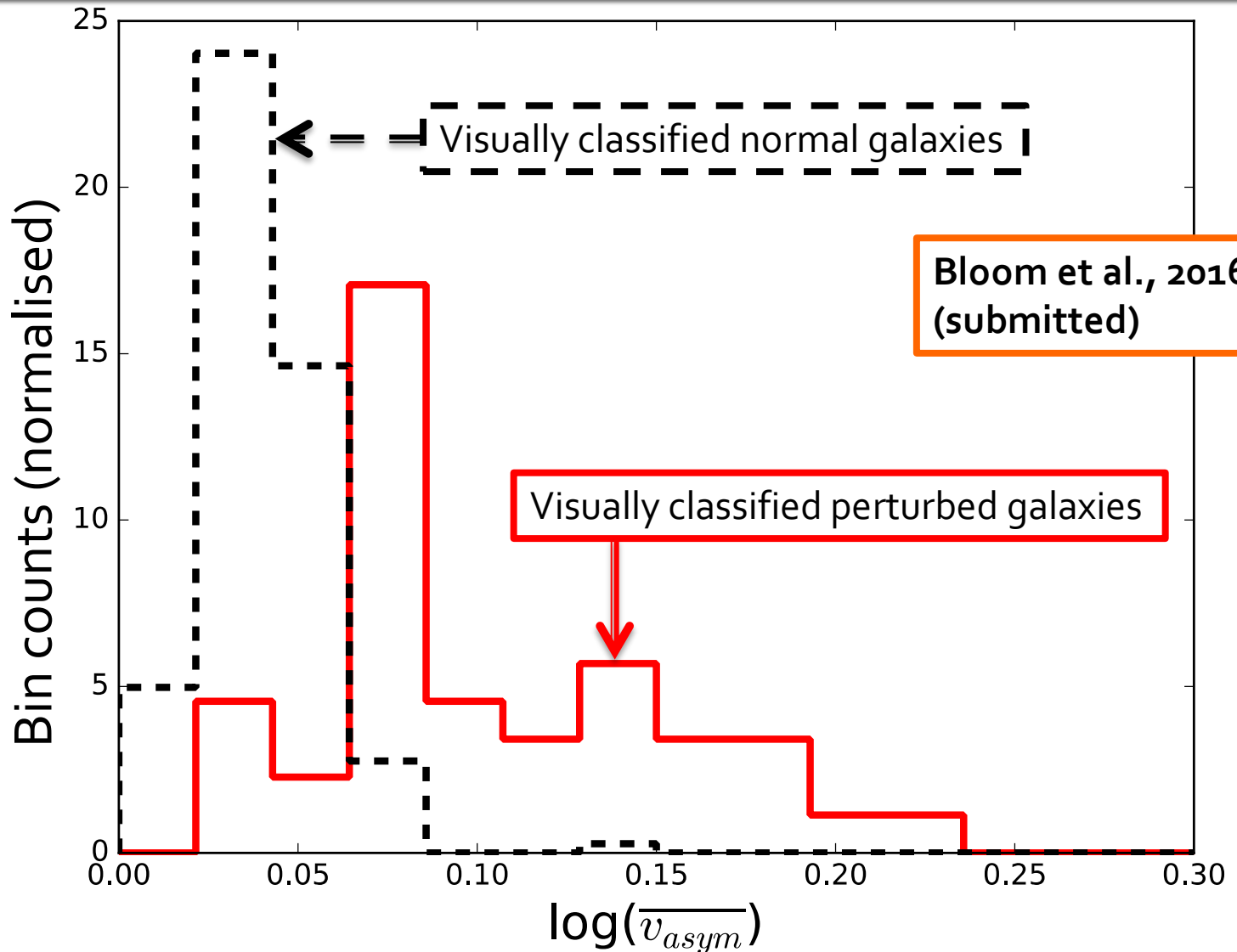
POWER IN
HIGHER MODES INDICATES
KINEMATIC ASYMMETRY



$$\overline{v_{asym}} = \left\langle \frac{k_3 + k_5}{2k_1} \right\rangle$$



Classification using kinematics



Scatter off the Tully-Fisher Relation (can be physically explained)

TFR remains at all stellar masses

Causes:

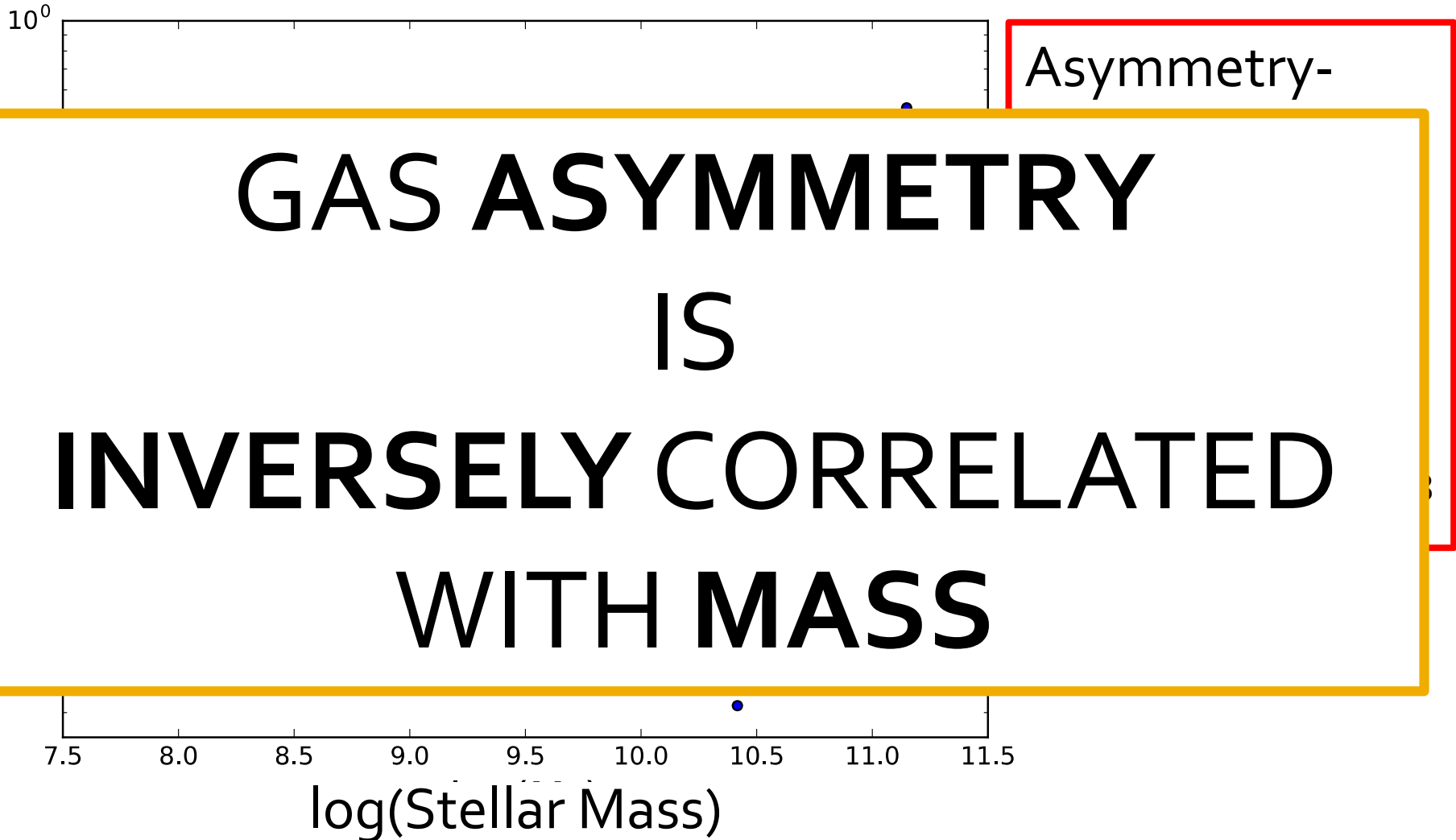
**SCATTER OFF TFR
INVERSELY CORRELATES
WITH
STELLAR MASS**

Scatter increases at low mass

8.0 8.5 9.0 9.5 10.0 10.5 11.0 11.5
log(Stellar Mass)

V_{rot} measurements by
L. Cortese

Asymmetry is related to stellar mass



Why are asymmetry and mass anticorrelated?

- Interactions?
 - Are low mass galaxies satellites of large galaxies?
- Are low mass galaxies qualitatively different?
 - High gas fraction → turbulence, star formation...



More likely to be
← kinematically disturbed

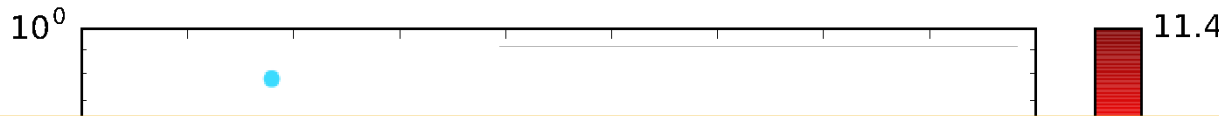
Less likely →



What about distance to nearest neighbour?

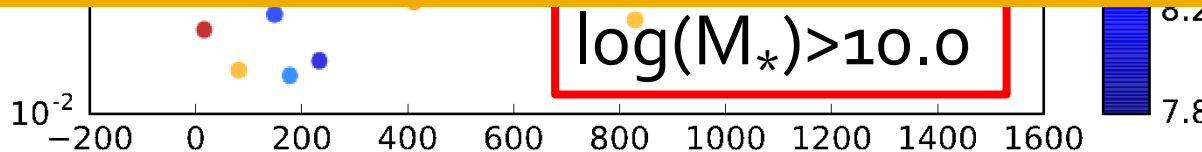
GAMA: Liske et al., 2015

Brough et al., 2013



$D_N =$

**AT ALL D_N
LOW MASS GALAXIES
HAVE HIGHER
GAS ASYMMETRY**



Slope=-0.063,
p-value=0.49

Disturbed things trend **small**

- Stellar mass is more strongly related to asymmetry than distance to **nearest neighbour**
 - Asymmetry can be caused by turbulence, bursty star formation
 - Interaction is not the primary cause of asymmetry
- Scatter off the Tully-Fisher relation can be explained
 - Scatter is often caused by **offset between photometric and kinematic PA**



Differences in PA \rightarrow rotation velocity

