Tracing High-z Galaxy Kinematics

Evolution of turbulent disks to quenched spheroids

Emily Wisnioski & The KMOS$^{3D}$ Team

PIs: N.M. Förster Schreiber & D. Wilman, J.T. Mendel, S. Wuyts, E. Wuyts,
K. Bandara, A. Beifiori, R. Bender, G. Brammer, J. Chan, R. Davies, M. Fabricius,
M. Fossati, R. Genzel, S. Kulkarni, J. Kurk, P. Lang, D. Lutz, I. Momcheva, E. Nelson,
D. Rosario, R. Saglia, S. Seitz, L.J. Tacconi, K. Tadaki, P. van Dokkum,
et al.

+ Instrumentation & Commissioning Teams!
High-z Kinematics: What we know

~>50% of galaxies are rotation dominated

83% in KMOS$^{3D}$ but see refs.

Disk velocity dispersions were higher at higher-z (reflecting marginally stable disks with high gas fns)


Wisnioski et al. 2015
**High-z Kinematics: What we don't know**

What happens to the kinematics as galaxies are shutting-off SF

How different are the kinematics of "quenched" galaxies from SF disks at $z \gtrsim 1$?

Are we consistently estimating dynamical masses from resolved and unresolved data?
KMOS$^3$D: Survey Design

~600 mass selected galaxies at 0.7<z<2.7

1. Targeting: Halpha - [NII] - [SII]
2. Statistics: 75nts over 5yrs
3. Deeper: 4hrs YJ, 6hrs H, 8-10hrs K
4. Ancillary data: CANDELS fields
5. Selection: 3D-HST
Current Status of KMOS$^3$D observations

- 467 galaxies observed
- $K<23$
- 15+ hours on ~39 targets
- Detection of UVJ passive, below-MS galaxies
- 78-86% detection of dusty SF galaxies

Observations are 60% complete
"the [3D-HST] survey makes all the difference" - P. van Dokkum

Brammer et al. 2012, Skelton et al. 2014, Momcheva et al. 2015
Example KMOS 3D observations: Wisnioski, Förster-Schreiber et al. 2015
New Results: compact/dense SFGs

Can the integrated line-width be used to connect dynamics of the red and blue galaxy populations?

Compact/dense Star-forming Galaxies

Compact Quiescent Galaxies

log(SFR/SFR_{MS}) > -0.85, 
log(M*/r^{1.5}) > 10.3 
log(M*[1 \, kpc]/r_{1kpc}^2) > 9.7 

34 already observed compact SFGs at z=0.9-3.7 
(+50 compact 'quiescent gals')
Resolved evidence that compact SFGs are rotationally supported

Wisnioski et al. 2015 (in prep)
Compact SFG Kinematics with KMOS$^3$D

What contributes to the integrated line-width?
can kinematics confirm cSFGs as progenitors for cQGs?

... 

cSFGs have lower angular momentum than over all sample (Burkert et al. 2015)

Next Steps:

direct measures of gas content

connecting the stellar and gas kinematics in individual galaxies (VIRIAL + KMOS$^{3D}$)

ref: R. Bezanson’s talk
Compact SFGs: The Role of AGN?

ref: E. Wuyts talk
Wisnioski et al. (in prep),
Genzel et al. 2014
Summary:

SFG Kinematics with KMOS؀

3D-HST provides a key element of the KMOS؀ Survey

Despite instrumental limitations compact galaxies are resolved & rotating with a range of dynamic properties

Compact SFGs may be closely tied to AGN activity with large contributions from winds

Thanks!