Wisconsin ODI Plans

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ODISSE

The ODI Spectral Survey Experiment

P.I. Amy Barger, U. Wisconsin-Madison

- Use the wide-field ODI capability to perform a narrow-band image of a large area of the northern sky in the longest wavelength 9200 A low-sky emission atmospheric window
- Pick out strong emission line objects in various redshift windows
- Highly complementary to wide continuum imaging surveys such as PanSTARRS and LSST, which will provide complementary color information

Primary Science Goals

Find the lowest metallicity galaxies in the universe

Map the evolution of line emission with redshift

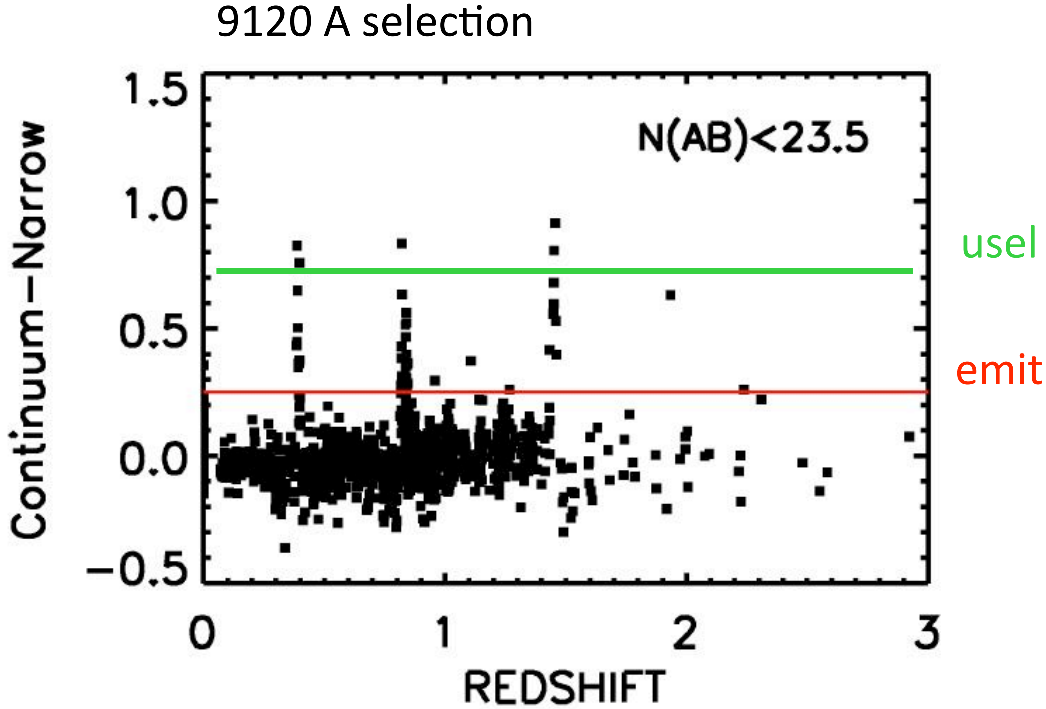
Find faint z~7 quasars

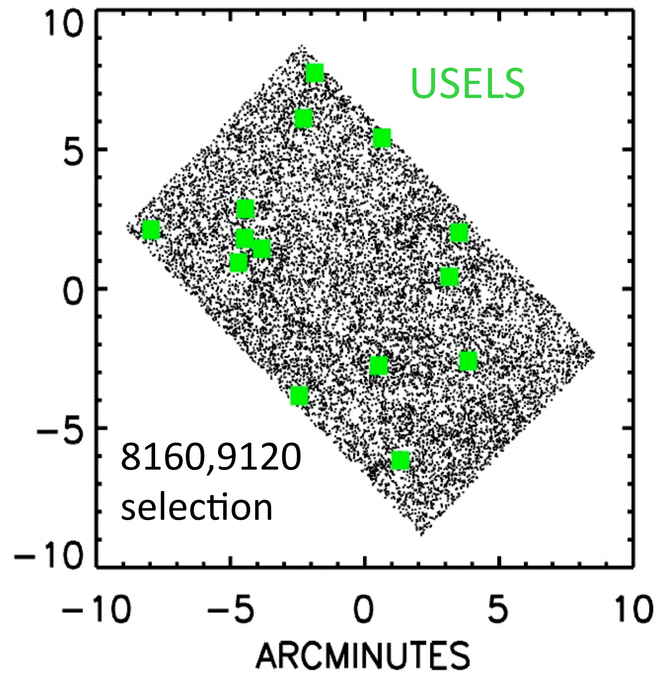
Baryon acoustic oscillations

The 9200 A filter chooses:

z=0.4 H alpha   z=0.8 [OIII]5007

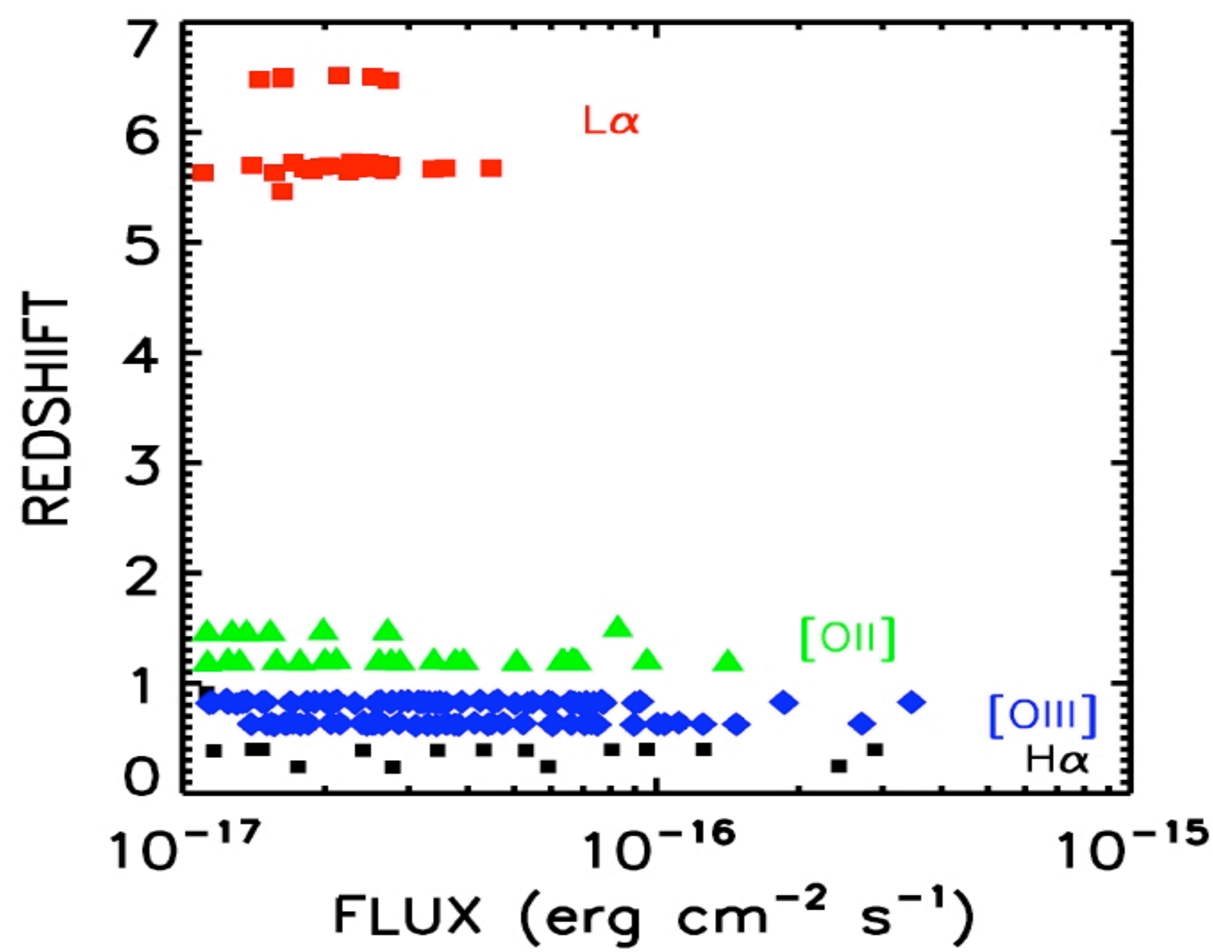
z=1.5 [OII]3727   z=6.6 L alpha



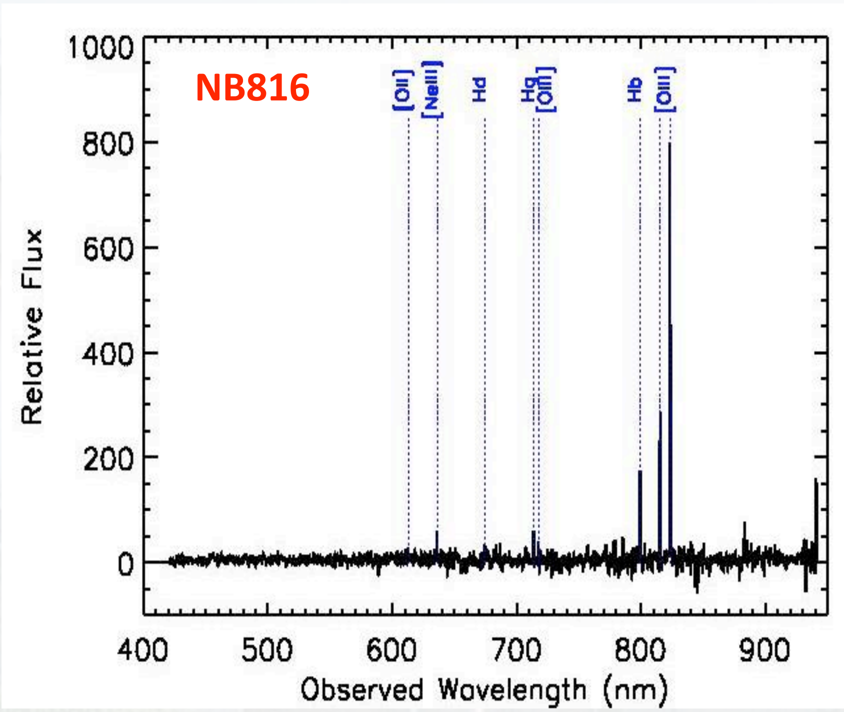


Selected galaxies in the GOODS-N (145 square arcminutes)

Emission line galaxies



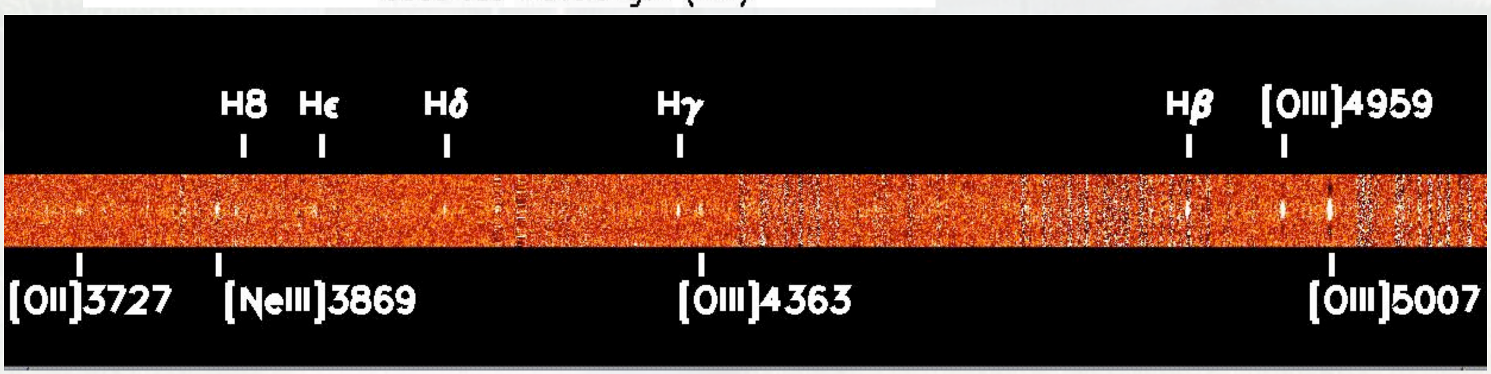
Ultra-strong emission-line galaxies pick up extremely low metallicity systems: ODISSE should let us determine if there is a low metallicity floor in the galaxies



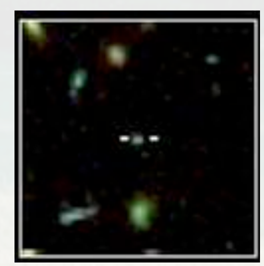
(Kakazu, Cowie, & Hu 2008
Hu, Cowie, Barger, & Kakazu 2009)

12 + log(O/H) = 7.27 = 1/40$Z_{\odot}$ [7.17 – 7.39} → **Comparable to the minimum metallicity found locally**
[e.g. I Zw 18; 12 + log(O/H) = 7.1 – 7.2]

Compact object



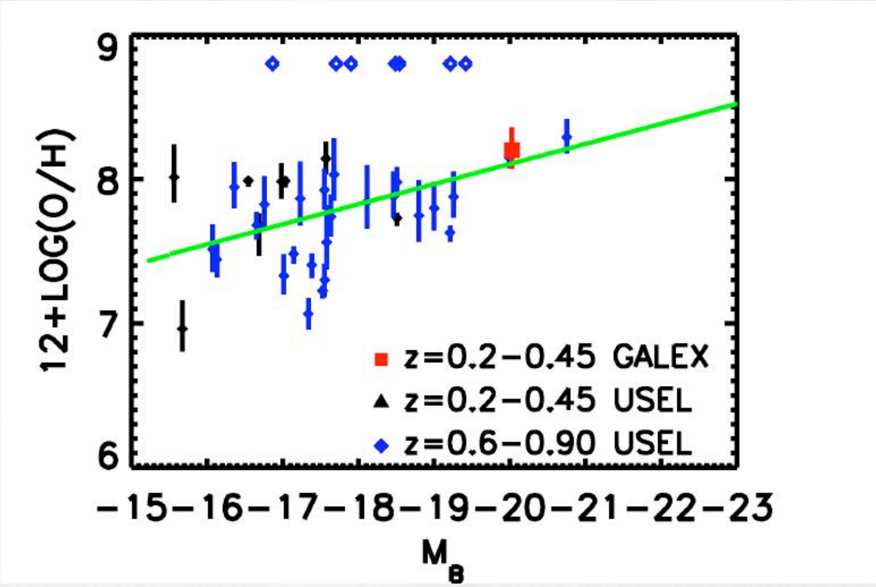
6.5 hours Keck/DEIMOS 2D spectrum

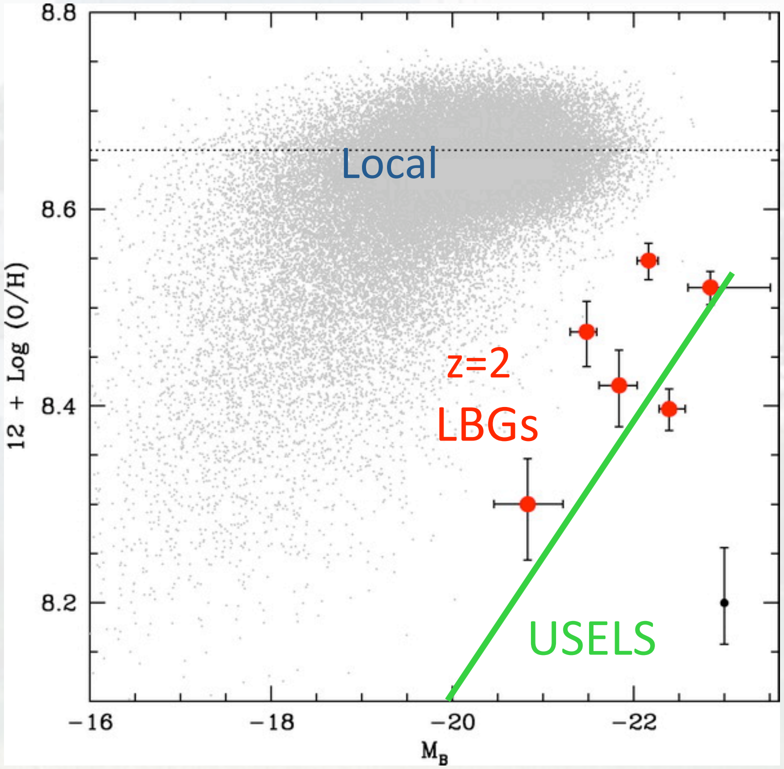


HST/ACS (B, V, I)
12.5” x 12.5”

USEL metallicity-luminosity

USELs pick out the very low metallicity edge of the galaxy metal-luminosity relation





Erb et al. 2005

ODISSE DESIGN

- 9200/100 A filter
- 20 minute per field + 5 minute z-band exposure
- 23.5 5-sigma limiting 3'' aperture magnitude (AB)
- 2000 square degree coverage (approx 100 nights)
- Fields with deep continuum so color selection can be used to separate redshifts
- Approximately 250,000 Ultra-strong emitters

  (EW(H alpha) > 80 A)
- Approximately 2 million emission line galaxies

  (about a third of these will be [OIII]5007 at z=0.8)

EGGO

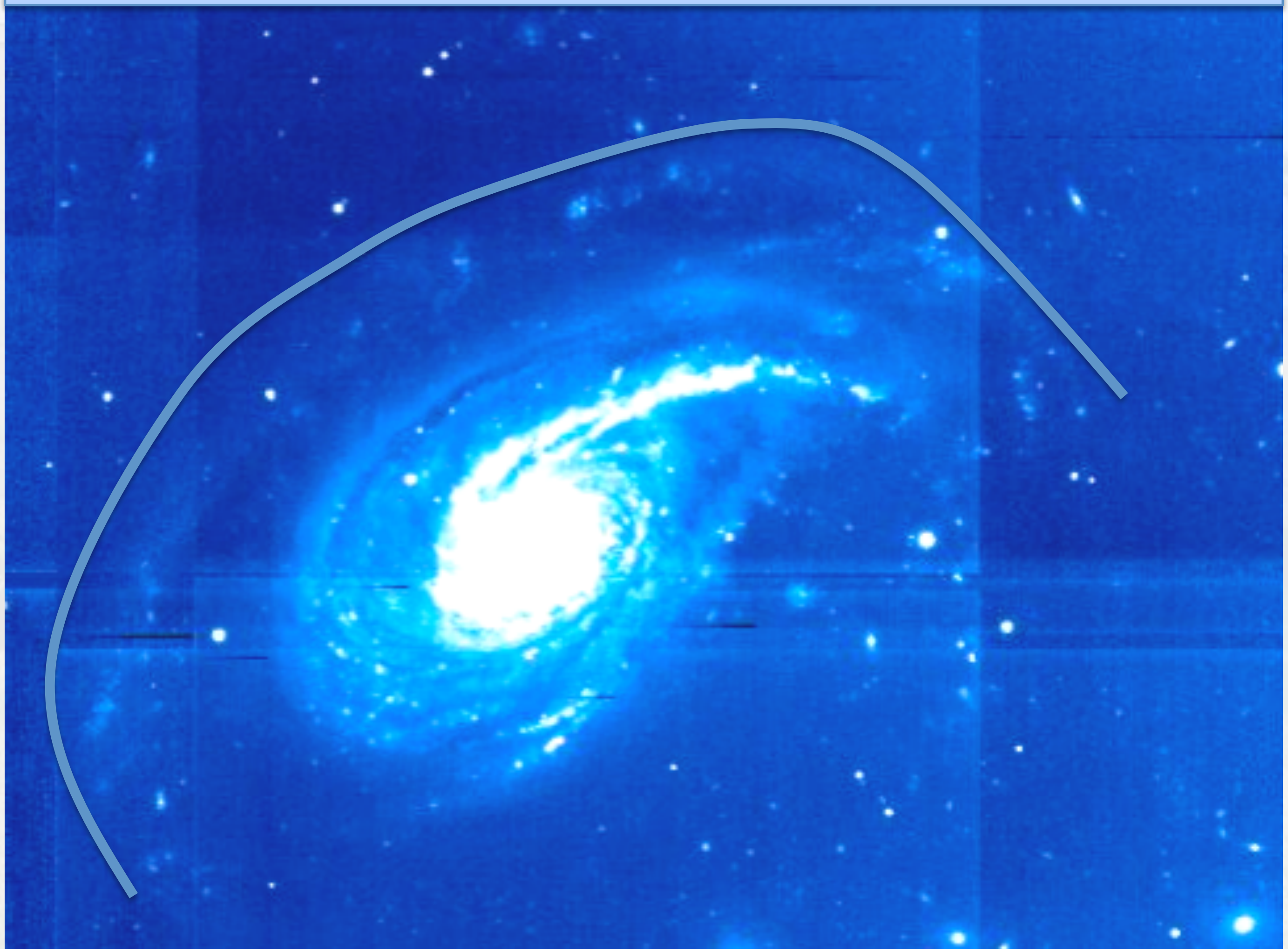
Evolution of Galaxy Groups with ODI
Investigating Interrelationships Between Galaxy Building Blocks

P.I.: J. Gallagher, E. Wilcots, & D. Harbeck
U. Wisconsin-Madison

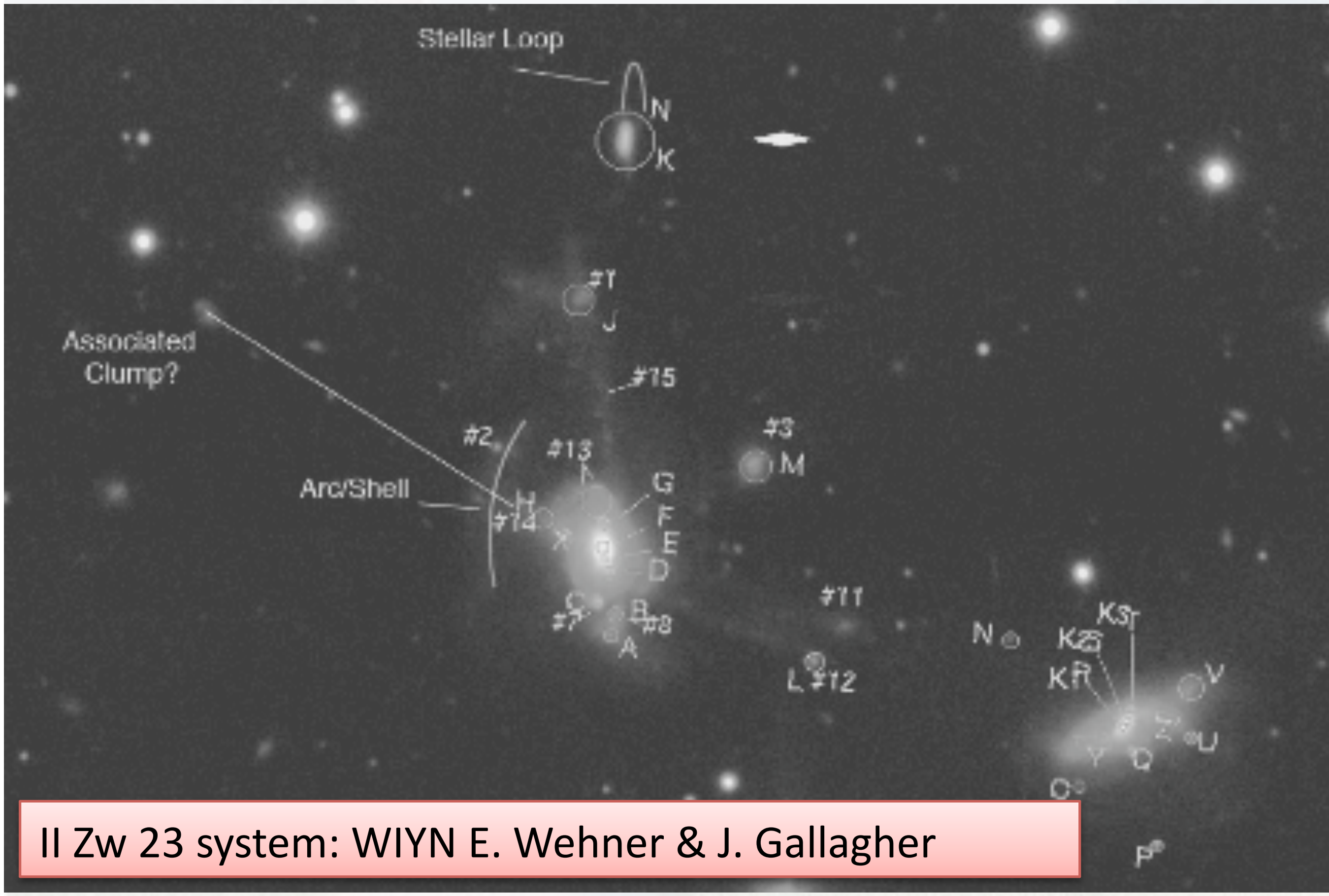
- Study environmental influences in galaxy groups over range of mass & environments.
- Apply wide-field ODI: map substructures in galaxy groups--tidal debris, dwarfs, outer features.
- U-band: locations of recent star formation in low baryon density regions.
- Narrow band emission line images: ionized gas.
- Deep imaging—outer disk structures tidal debris/outer distortions.
- Optical component of multi-wavelength project.

EGGO: Outer disks: optical boundaries: U-band detection of sites of recent star formation

Arp 78 U-band: WIYN Mini-Mosaic (J. Gallagher, R. Kotulla, U. Fritze):
Outer arm: also XUV feature in GALEX imaging



Objectives: Circum-Galactic Structures: Evidence for Levels of Interactions



II Zw 23 system: WIYN E. Wehner & J. Gallagher

Multiple interactions can drive evolution after group formation: observing process of hierarchical galaxy growth. Evidence in tidal debris.

EGGO: Selecting Targets

- Group sizes ≈1 Mpc→ 1 degree at 60 Mpc.
- Inner scale of ≈1 kpc to resolve & distinguish dwarf galaxies. 10 angular resolution elements → D < 50 Mpc .
- Photometry at GC peak at M≈-7.5 → D < 30 Mpc
- Key distance range for EGGO: 10-50 Mpc.
- Dozen groups to cover range in mass & locations

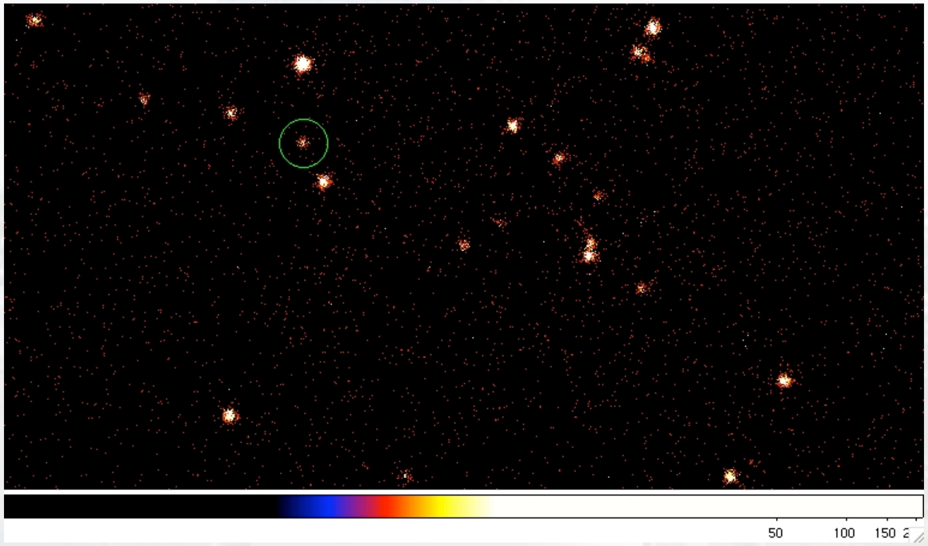
The Living Galaxy Survey of M33

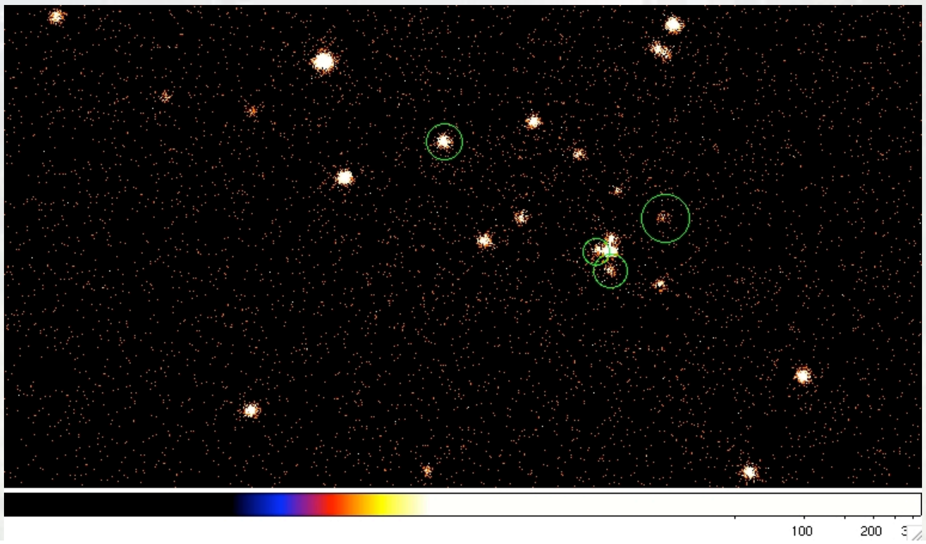
P.I.: R. Townsend & M. Orio

- *UBV* monitoring of M33 over ~2 years
- Look for
  - Periodic variables (Cepheid, β Cepheid, B supergiant)
  - Irregular variables (Miras)
  - X-ray sources
  - LBV outbursts
  - Nova outbursts
  - Gonzo objects
- Explore metallicity correlations
- Also, census of extended halo
- What does ODI bring?
  - Superb angular resolution
  - High time resolution
  - Blue sensitivity

And the ever-changing Andromeda galaxy:
PI: Orio

- Cover major axis of the largest spiral of the Local Group we extend out to 6 degrees away from the center, we observe most luminous mass of the galaxy.
- 17% of the stellar content is comprised only within the central arcminute.
- Observe a very large number of classical and recurrent novae and all sort of flaring sources.
- Every week tens of X-ray transients can be observed and optical identification is crucial to understand their physics.
- By-weekly imaging of the central field and bi-monthly observations of ~6-7 peripheral areas, comprising also many globular clusters.
- The "box" of 1.7x0.9 arcmin in the right was imaged with Chandra HRC-I at the end of December of 2004 and less than 8 weeks later. The transients are marked with green circles.





Standard PI Project Ideas Under Discussion

- Narrow band imaging—Galactic emission line from WHAM surveys.
- Stellar content of halos of Local Group galaxies.
- Galactic star forming region studies.
- Current estimate ~70-80% Wisconsin ODI time to surveys, 20-30% PI projects assigned in normal way.