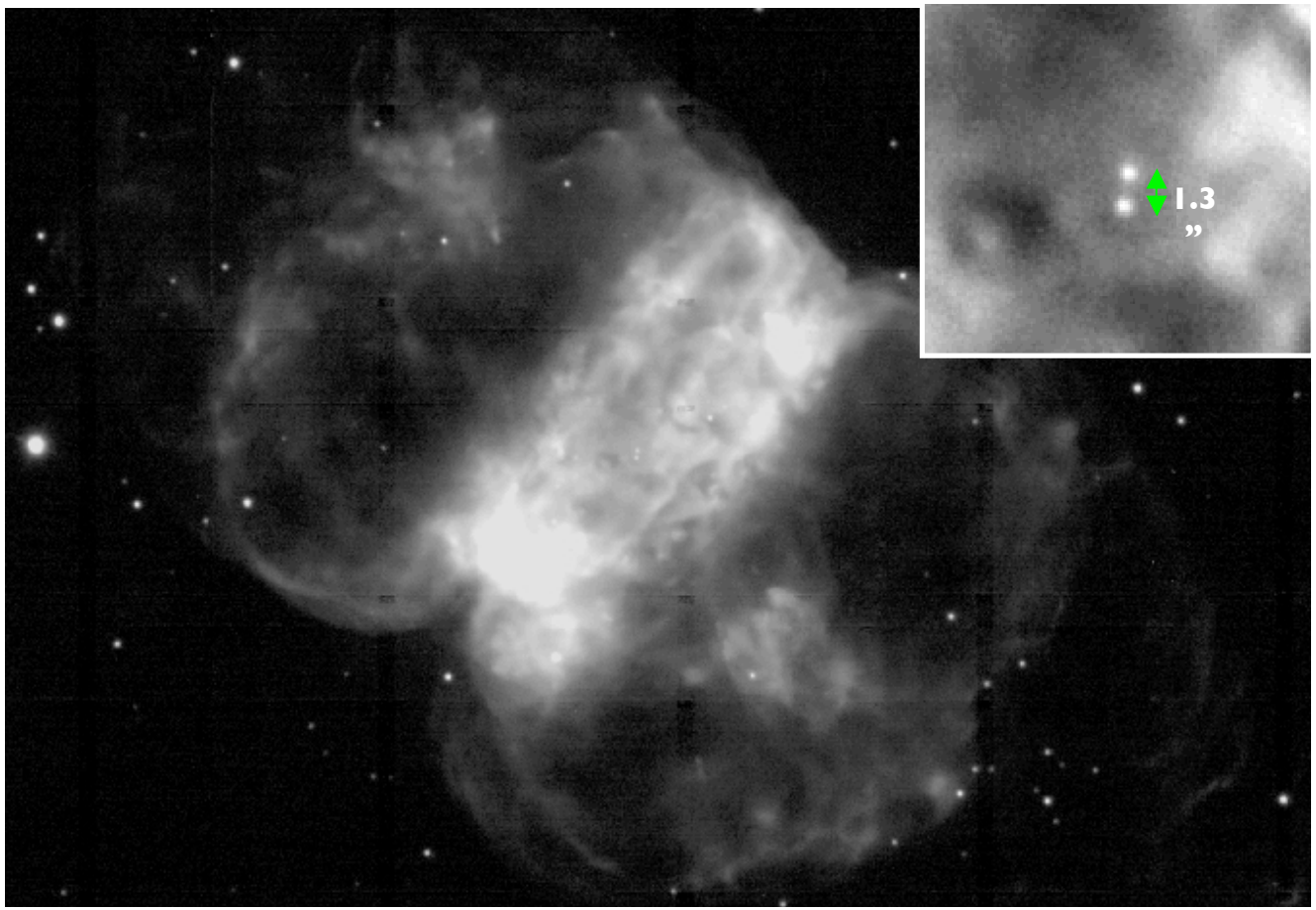
The Yale/ODI Survey(s)

- 90 nights of time allocated (30/yr for 3 yrs) through TSIP agreement
- Additional time may be allocated through Yale TAC
- "Core" survey + extensions + add-on projects
- Extensions and add-ons will likely propose for additional time
- Goals:
  - Provide basis for scientific projects by Yale and non-Yale PIs
  - Take advantage of excellent image quality
  - Exploit time domain from individual images and create deep summed images
  - Leverage data from current/past surveys; serve as precursor for future surveys
- Survey definition currently underway – aiming toward Oct 2/3 workshop
- Community participation welcome!

The Yale/ODI Survey: Image Quality

- OPTIC and QUOTA observations suggest median i-band seeing ~0.45
- Pixel scale 0.11”

M 76



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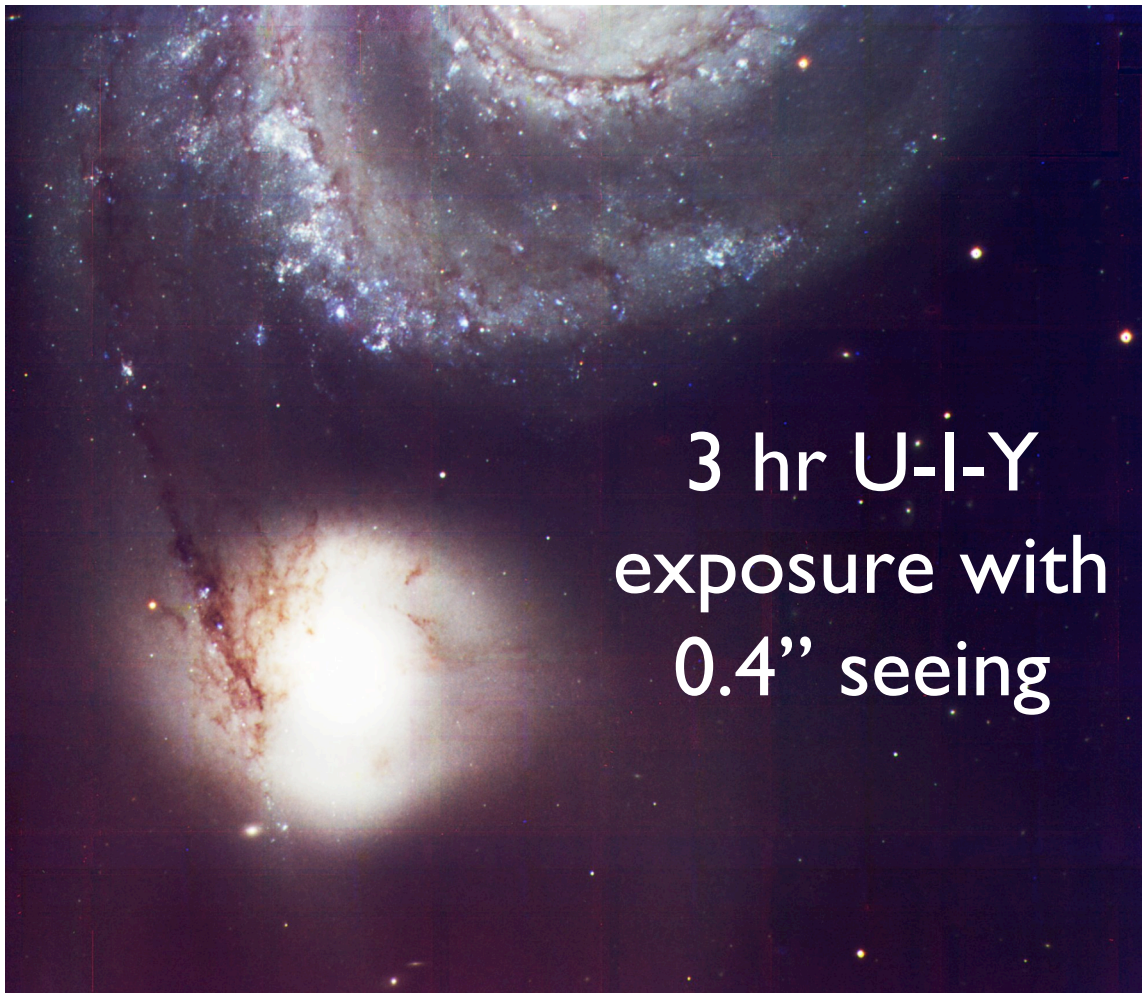


The Yale/ODI Survey: Science

Primary science goals focus on high image quality and time domain:

Image quality projects:

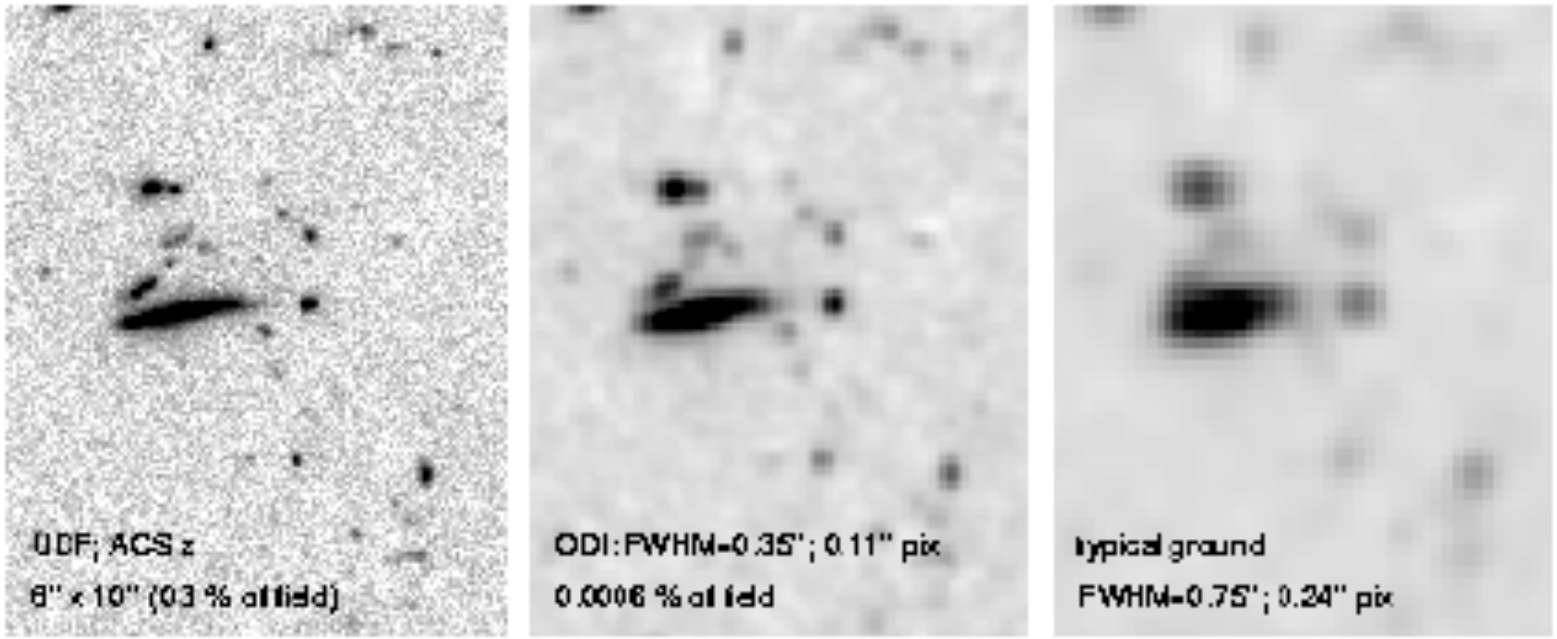
- High-z galaxy morphology
- galaxy-cluster; galaxy-galaxy lensing
- faint galactic/local group photometry
- astrometry (see time domain)

Time domain projects (variability, not transients):

- identification and period of pulsators
- identification and period of binaries
- non-periodic variables: AGN and flare stars
- astrometry (see image quality)

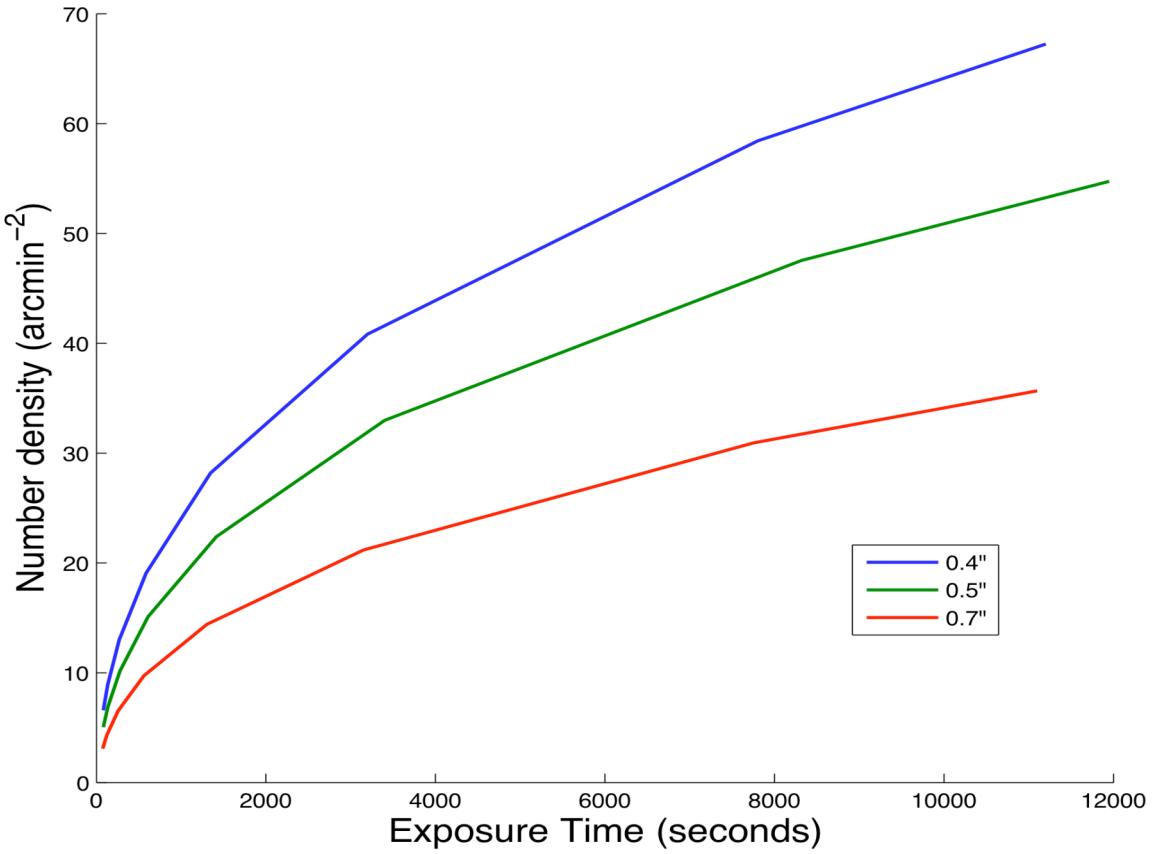
The Yale/ODI Survey: High-z Galaxy Morphology

- Group Leaders: Pieter van Dokkum, Nikhil Padmanabhan
- Key: many galaxies have sizes comparable to ~0.5”
- Morphology measurements possible for much wider range of targets
  - sizes
  - structure (disk vs bulge)
  - surface brightness profiles



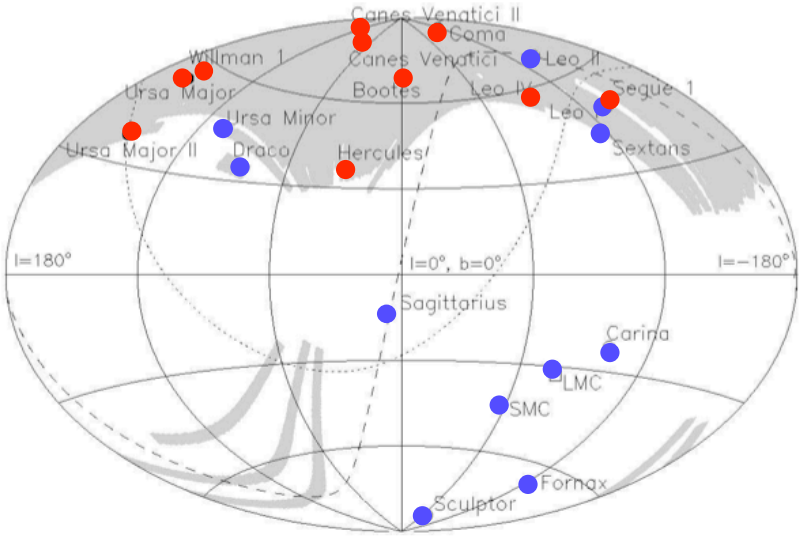
The Yale/ODI Survey: Gravitational Lensing

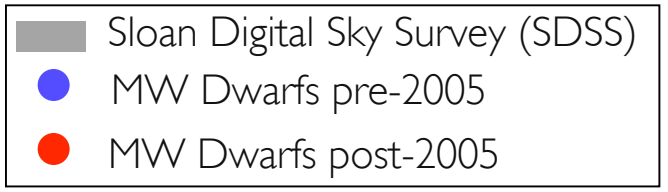
- Group Leaders: Ian Dell'Antonio, Nikhil Padmanabhan
- Good image quality leads to more measurable galaxy shapes per area
- Key for galaxy-cluster and galaxy-galaxy lensing



The Yale/ODI Survey: Galactic/Local Group Photometry

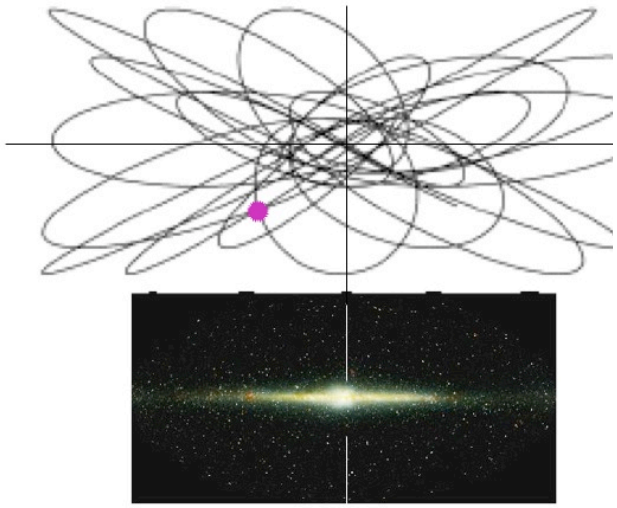
- Group Leader: Marla Geha
- 12 new dwarf galaxies discovered near Milky Way since 2005 through stellar overdensities in SDSS
- Given incompleteness, may be as many as 400 more (Tollerud et al. 2008)
- Background galaxy contamination increases dramatically at r>23
- Galaxy/star separation will be key to future progress





The Yale/ODI Survey: Astrometry

- Group Leader: Bill van Altena and Yale astrometry group
- Proper motions (with existing 1st epoch, or as 1st epoch for future work)
    - Galactic streams (Sgr, Mon)
    - Main Milky Way components (thin disk, thick disk, halo)
    - Specific targets (dwarf galaxies, clusters)
- Parallax
    - Volume sampled scales as cube of parallax precision
    - Parallax accuracy should be +/- 0.6 mas for a star I<22
    - Stellar density within 150 pc to 1.5%
    - Key input into determinations of Dark Matter in solar neighborhood



Freeman 2007, Dinescu et al. 1999

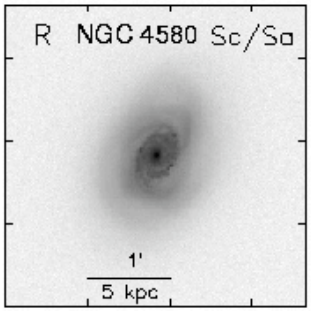
The Yale/ODI Survey: Variability

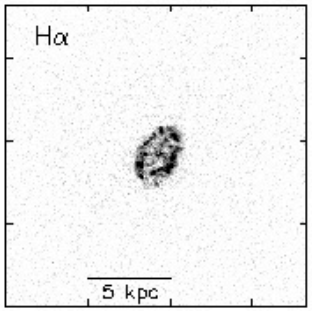
- Group Leaders: Charles Bailyn
- Currently, time domain goals involve variability, not transients
- Periodic variables
    - RR Lyr (galactic structure)
    - Faint eclipsing binaries (parameters of low mass stars)
- Aperiodic variables
    - AGN
    - flare stars
- Serendipitous new variables

The Yale/ODI Survey: Virgo Hα Survey ("Bad" Seeing Project

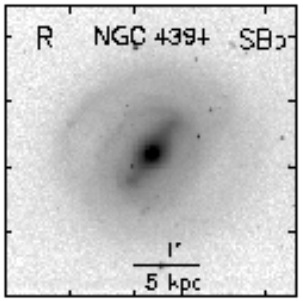
- Group Leader: Jeff Kenney
- Narrow-band imaging a key niche for ODI
- Shallow Virgo survey: 200 sq degrees, 1 hr exposure per position (1" OK)
    - star formation rates throughout cluster
    - variation of properties with galaxy mass and location

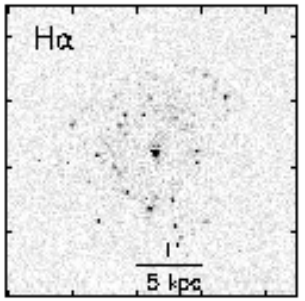
truncated



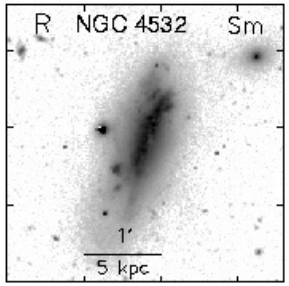


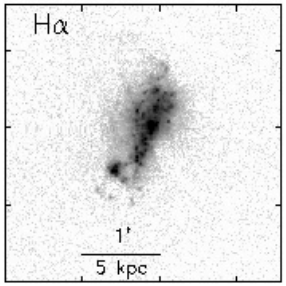
anemic





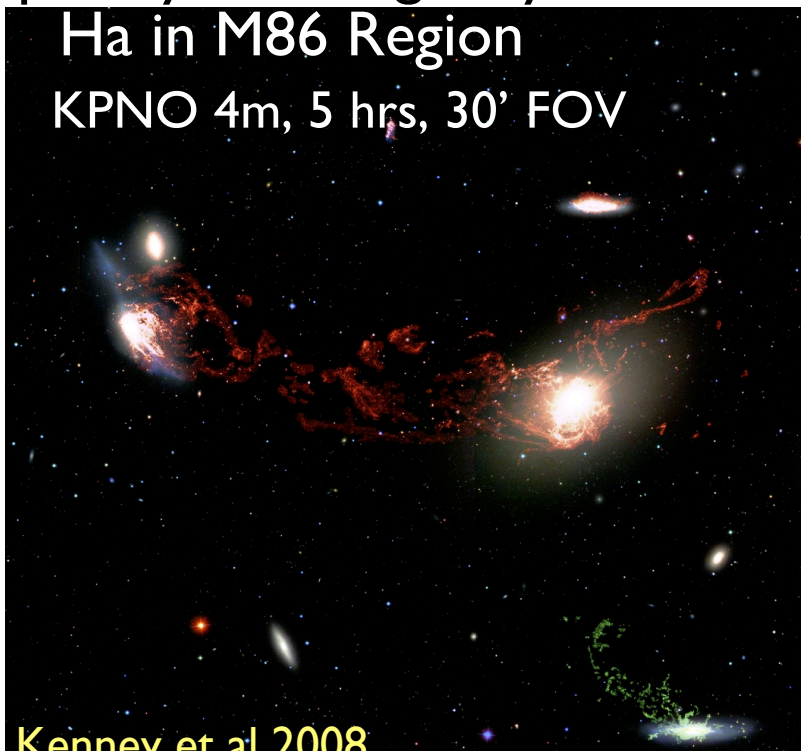
starburst





The Yale/ODI Survey: Virgo Hα Survey ("Bad" Seeing Project

- Group Leader: Jeff Kenney
- Narrow-band imaging a key niche for ODI
- Deep Virgo survey: 10 sq degrees, 10 hr exposure per position (1-2" OK)
    - Reveals ICM complexity due to galaxy and cluster interactions



The Yale/ODI Survey: Strawman Plans

Active discussions currently underway to define fields, filters, depth, cadence of "core" survey. Some science programs may be better served by data taken as extensions of the core survey or as "add-on" projects, different from the core survey but with data obtained as part of the survey queue.

The Yale/ODI Survey: Image Quality

Approach: best imaging conditions will all be taken in i-band to obtain high resolution image – other bands will match depth, but not resolutio

Strawman plan:

Best 25% image quality: i-band only (seeing < 0.4" in i)
Medium image quality (dark): g-band plus one i-band image for time series
Medium image quality (bright): z-band plus one i-band image for time series
Weakest 25% image quality: special "bad seeing" projects (seeing >~ 1" in i)

The Yale/ODI Survey: Cadence/Depth

Approach: individual images to match depth of individual LSST images. Logarithmic time intervals from minutes to years. 20+ visits per field fo period determination and characterization of variability

Strawman plan:

Each visit: ~5 dithered exposures down to limiting magnitude 24 (similar to LSST)
Exposure times vary with image quality and bandpass – generally minutes
Delivered read noise will be crucial for ultimate plan
Visits separated by
- hours (2-3 visits per night for some nights)
- days (visits on 3-5 nights per lunation for some lunations)
- weeks/months (visits during 2-3 lunations/yr in at least one year)
- years (visits during each of three years)

At least one i-band observations during each "medium seeing" visit key to timeser
Total exposure time per field 1-2 hrs/filter – of order 100 one-degree fields

The Yale/ODI Survey: Field Choice

Approach: Several regions of tens of sq degrees in continguous compac areas around the sky. Overlaps with some existing data (especially whe improved image quality is important), some new regions. Also some individual "special" fields – may or may not be part of the survey propei

Strawman plan:

RA=2, dec=-4: overlaps with CFHTL W-1, SWIRE (etc), extend to equator for overlap with SDSS strip

RA=14 dec=+34: NOAO medium-deep Bootes field

RA=8 near equator: low latitude (l=25 degrees) field in Monoceros stream

No field near RA=20 (monsoon season!)

The Yale/ODI Survey: Next Steps

- Science groups currently forming – more projects welcome!
- Detailed strawman proposal (fields, cadence, depth) currently under development
- Extensions and add-ons also being developed
- Plans will be completed and frozen following workshop in New Haven on October 2-3, 2009

Collaborators welcome!

- opportunity to join existing science groups
- possible new science groups
- extensions and add-ons