## The WIYN One Degree Imager: Updates and recent progress

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#### Content

- What is pODI
- User interfaces
- Image products
- What works and what doesn't
- Pipeline, Portal & archive
- Quicklook pipeline



### What is pODI

- Original plan (~2002-05):
- 1 square degree
- 64 OTAs with  $4Kx4K \rightarrow -1$  GPixel
- OT shifting as ~semi-adaptive optics to improve seeing
- Focus sensors to maintain perfect focus

### **ODI: Specs**

Field of view: ~25x25 arcmin in center + 4x 8x8 "guide fields" Pixelscale: 0.11" Readout-time: 7s



Filters: SDSS griz + SDSS u, Hα, OIII + all Mosaic filters on request

# User interface

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#### What does data look like?

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#### A closer look at OTA 3,3

#### 1 OTA = 64 cells (w/ 64 overscan regions/gains/etc) = 1 fits w/ 65 extensions



#### **Calibrations: Bias and dark**



# readout glow and detector glow



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### Trailing at low background levels

Potential problem for frames with background levels < 50-70 counts:

- short exposures: guiding, U-band during dark time
- narrow-band data

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#### **ODI Pupil Ghost Images: Non-sequential Results**



#### ODI Pupil Ghost Images: Change Filter Position Can Reduce The Intensity of The Pupil Ghost Image.



128.6 mm

Move filter 31 mm forward, the diameter of the pupil ghost increase to 128.6 mm(the first filter position) Move filter 31 mm backward , the diameter of the ghost pupil increase to 91.2 mm (the third filter position)

91.2 mm

8

# **Comparing L2 and L1 flats**



# Image of pupil ghost template and before and after



# **Standard Calibration Plan**

00		ODI Exposure GUI	
File View I	Debug		odi-cwg TEST-12B-2105
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	□10 x Bias	□ 3 x 600 sec dark	
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	□ 5x Dome Flat g'	□ 5x Dome Flat g'	□ 5x Dome Flat g'

Start Exposure

# **OT shifting**

#### Principle: (charge in) pixels follows image motion

#### Modes:

- Fast guiding (>= 1 guide star)
- Coherent guiding (>= 3 guide stars)
- Local guiding (>1 guide star per OTA)

### **OT shifting: Pros**

- Better seeing or at least rounder stars
- Reduced windshake in windy conditions



#### pODI Coherent Correction Mode First Light Jan 23 2013



No OT-correction: Elongated stars due to telescope drift.



OT-correction applied: Round stars, telescope drift is compensated.

### **OT shift history**

10 6 • 64 shift x 2 56 5 0 48 -240 **11** 23 **42** 32 **1**4 -4 -200 -100 shift\_y 100 200 300 400 500 600 0 49 8 0 frame number 10 37 48 33 32 6 4 24 shift y -5 16 8 Λ -6 -200 -100 100 200 300 400 500 600 700 0 5 10 0 -10 -5 frame number shift\_x

Shift history for: o20130131T053622.0.33\_shift.fits -- #shifts = 590

### **OT shifting: cons**

- Traps cause image artefacts
- slighly smaller detector area (shift pixels off chip)
- Needs (many) bright guide stars
- For now: Guide readout to slow to make OT shifting effective (work in progress)
- Data reduction trickier: Need to convolve calibration files with shift history

# **OT shifting artefacts**



3.66e+04 3.71e+04 3.77e+04 3.82e+04 3.88e+04 3.93e+04 3.99e+04 4.04e+04 4.1e+04

### **OT shifting artefacts**



3.66e+04 3.71e+04 3.77e+04 3.82e+04 3.88e+04 3.93e+04 3.99e+04 4.04e+04 4.1e+04

### **OT shifting artefacts**



3.66e+04 3.71e+04 3.77e+04 3.82e+04 3.88e+04 3.93e+04 3.99e+04 4.04e+04 4.1e+04

#### **Atmospheric dispersion corrector**

#### • Two rotating prisms

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#### **Photometric calibration**



#### **Photometric calibration**



#### **Color terms ODI vs SDSS**



### Portal, Pipeline & Archive (PPA)

- portal.odi.iu.edu
- Run by Indiana U.
- Frontend to access/download/manipulate data  $\rightarrow$  demo
- Official pipeline still under construction Rumours: Release at end of month

### pODI Quickreduce pipeline

- Basic reduction directly at telescope (overhead, bias, dark, flat, [WCS], [[photometry]])
- Help judge data quality
- Written in Python, publicly available
- No IRAF/pyRAF
- Made in Wisconsin :-)

#### **Data reduction facility at UW**

#### Local pODI reduction:

- 8-core machine
- 54 GB memory
- External Raid disk with ~10 TB capacity
- Raid-0 Solid State Drives with 1 GB/s read/write speed
- Talk to me for account

# Things that (don't) work (yet)

- Working: Imaging/Dithering, guiding, data reduction, most GUIs, ADC
- Kinda working: pipeline, OT shifting
- Not working: Focus sensors

# Some pretty pictures

M33, quickreduce reduced



# Some pretty pictures

M33, quickreduce reduced

Bubble nebula, pipeline reduced





# Thank you!