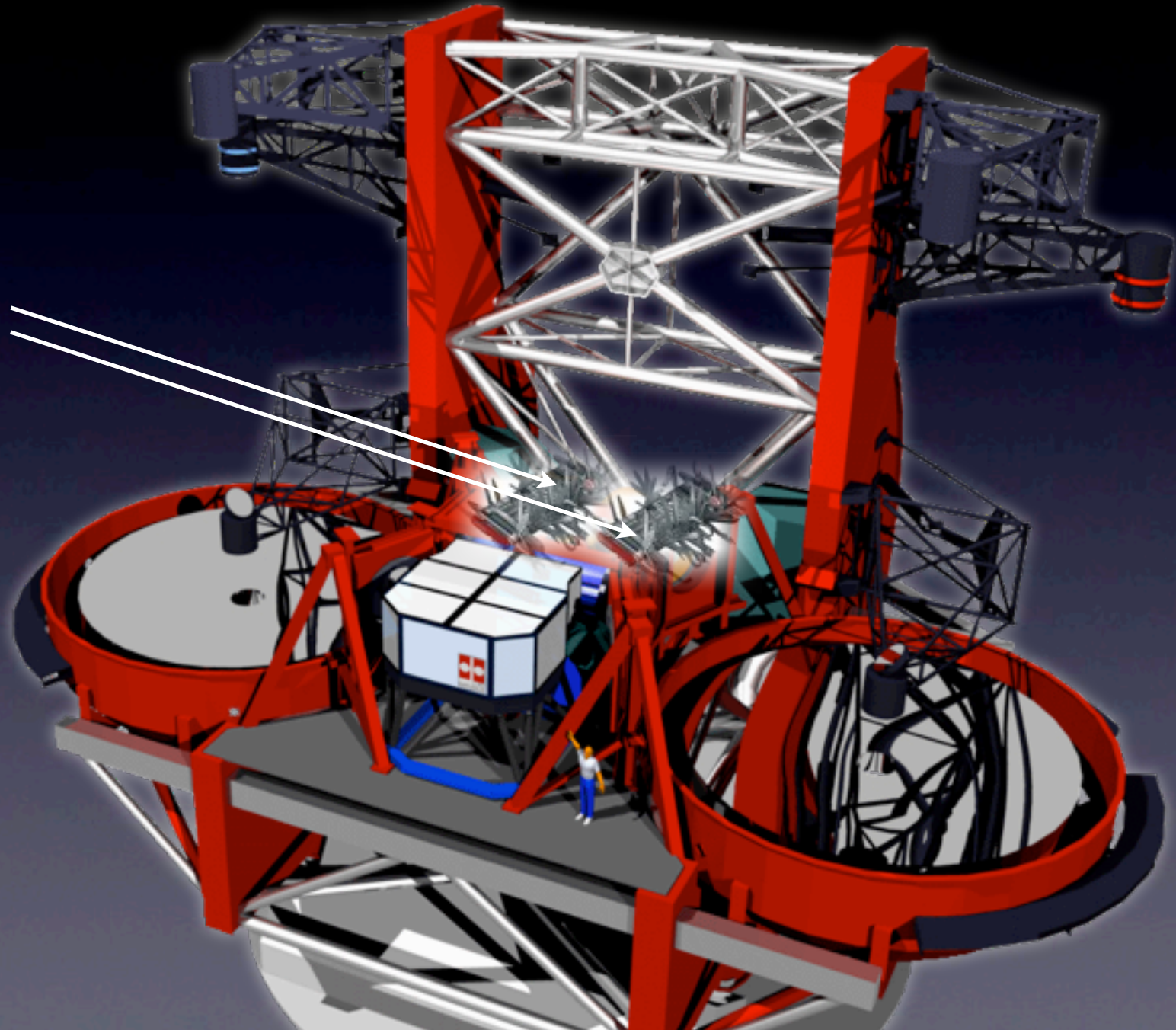


Luci - es geht noch schärfer

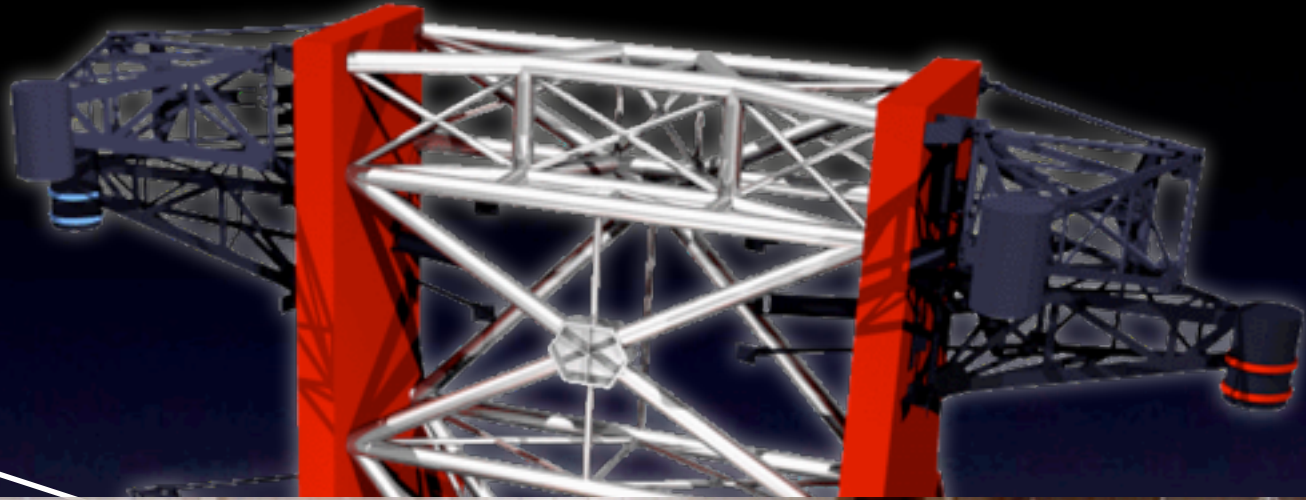
Roland Gredel, MPIA

The Large Binocular Telescope

Luci 1 & 2



The Large Binocular Telescope



Luci 1 & 2



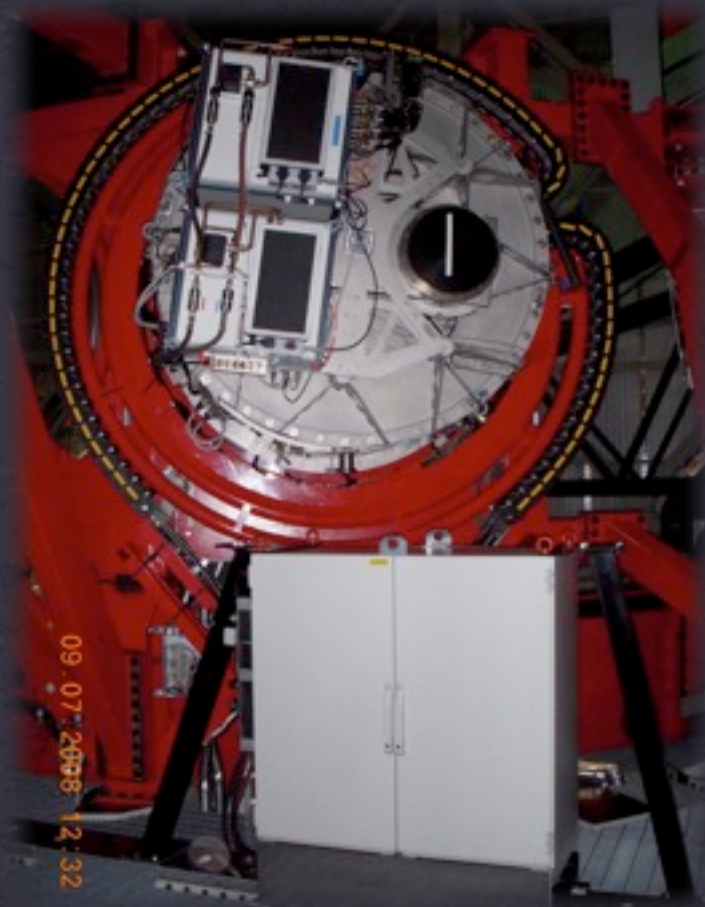


LBT NIR spectroscopic Utility with Camera and Integral- Field Unit for Extragalactic Research

Kurzdarstellung des Projekts Genese am MPIA

LUCIFER Konsortium

LSW	PI Institut
MPE	MOS-Einheiten
AIRUB	Software
MPIA	NIR Detektoren (bis Sommer 2012)





LBT NIR spectroscopic Utility with Camera and Integral- Field Unit for Extragalactic Research



Luci 1

SL operation since 12/2009

Luci 2

2010 - 2012: AIV

continued problems with IQ for A0

summer 2012: changes in management structure



LBT NIR spectroscopic Utility with Camera and Integral- Field Unit for Extragalactic Research



Luci 1

SL operation since 12/2009

Luci 2

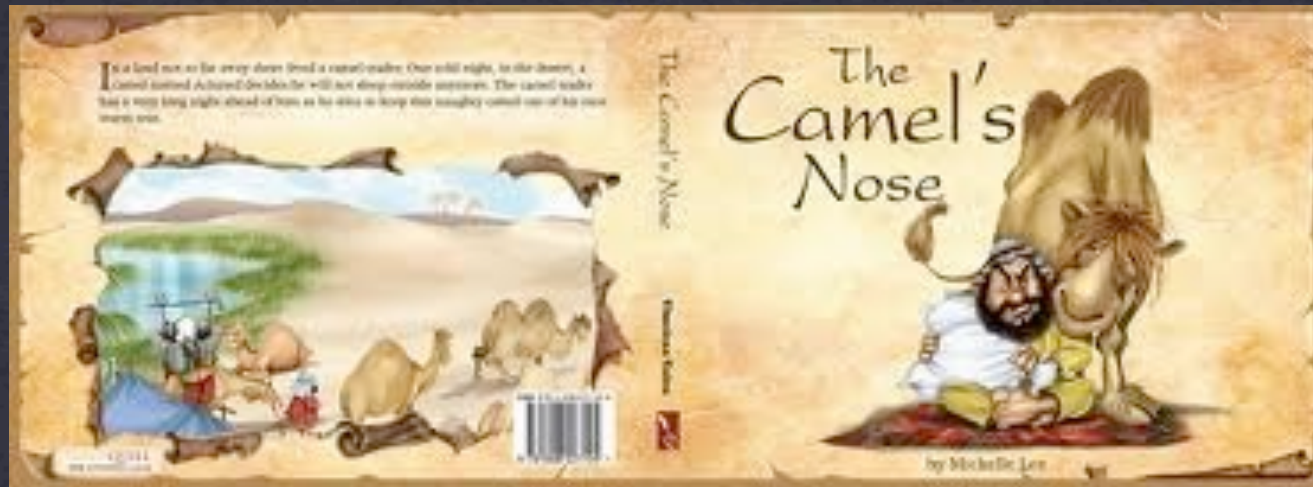
2010 - 2012: AIV

continued problems with IQ for A0

summer 2012: changes in management structure

PM@MPIA



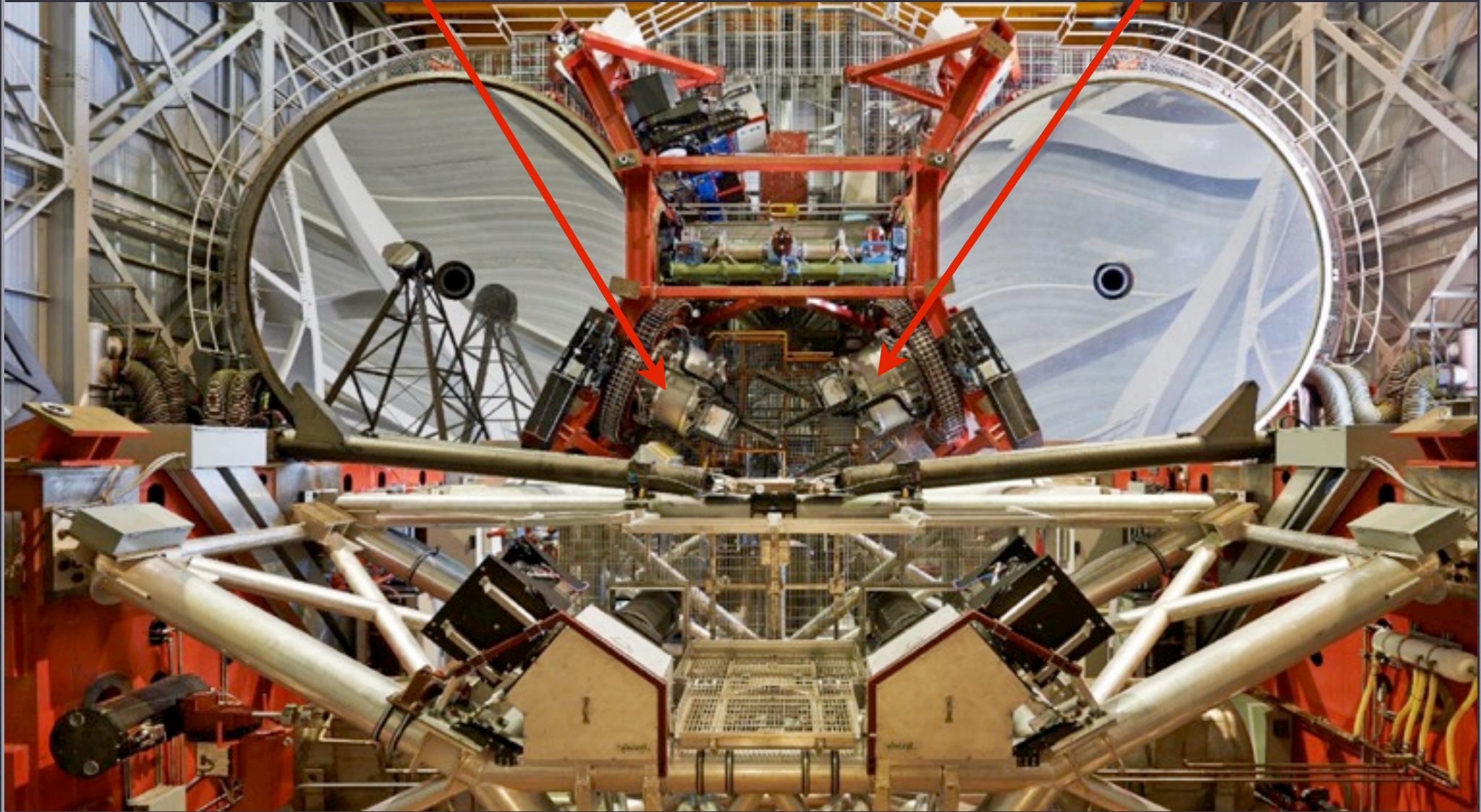


LUCI 2

7/2013 PPAE; [SL SEIT 9/2014]

LUCI 1

SEIT 12/2009



LUCI 2

7/2013 PPAE; [SL SEIT 9/2014]

LUCI 1

SEIT 12/2009



**Why build one
if you can build two at twice the price...**

Cost: 17.356.740 €

Mt. Graham International Observatory



Freitag, 12. Dezember 2014

VATT - VATICAN ADVANCED TECHNOLOGY TELESCOPE



© Zdeněk Bardon

Vatican Names Their Telescope LUCIFER



**Says it's a Perfectly
Normal Name**

Vatican Names Their Telescope LUCIFER



**Says it's a Perfectly
Normal Name**

Luci - general overview

SEEING LIMITED

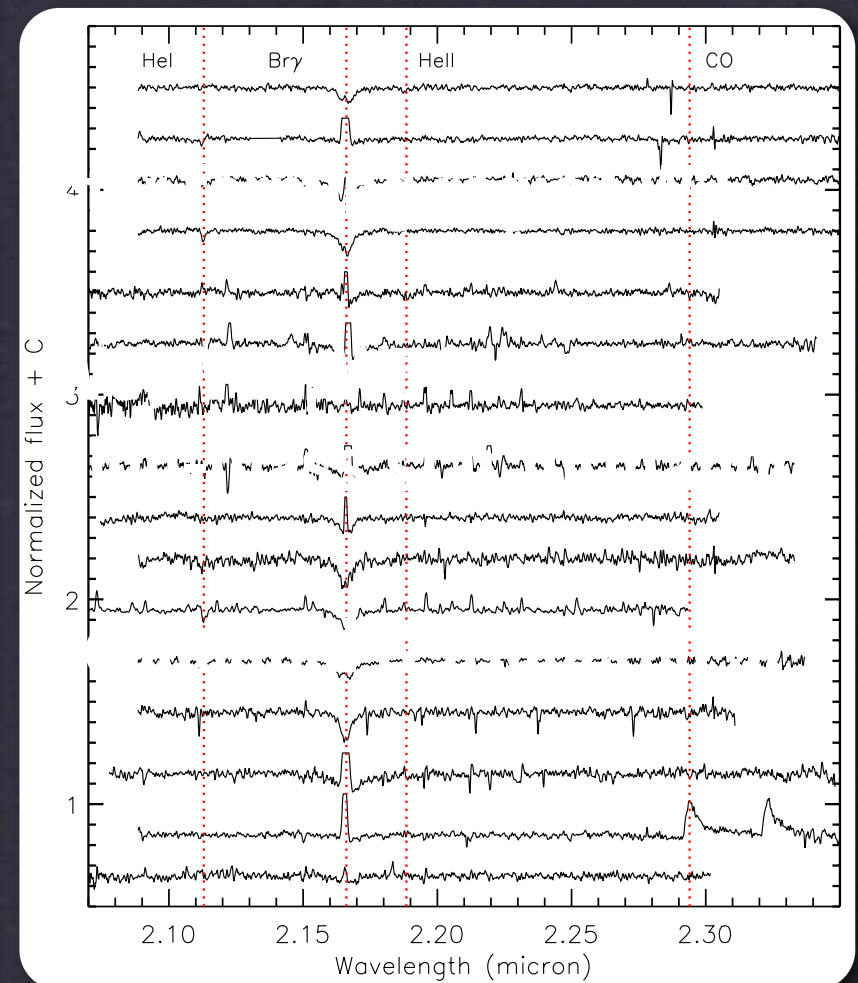
Modes	Spectral Coverage (μm)	Spectral Resolution	Field of View	Pixel Scale (arcsec/ pixel)
Imager Longslit, MOS	Z, J, H, K	5,000 - 10,000	4' \times 4'	0.12 & 0.25

Luci 1 SL: W3 Main



4' × 4'
2.6 × 2.6 pc

Arjan +, 2012



Luci 1 SL: W3 Main



star forming region W3

W3, W49, W51

high-mass star formation

sequential & triggered sf

4' × 4'
2.6 × 2.6 pc

Arjan +, 2012

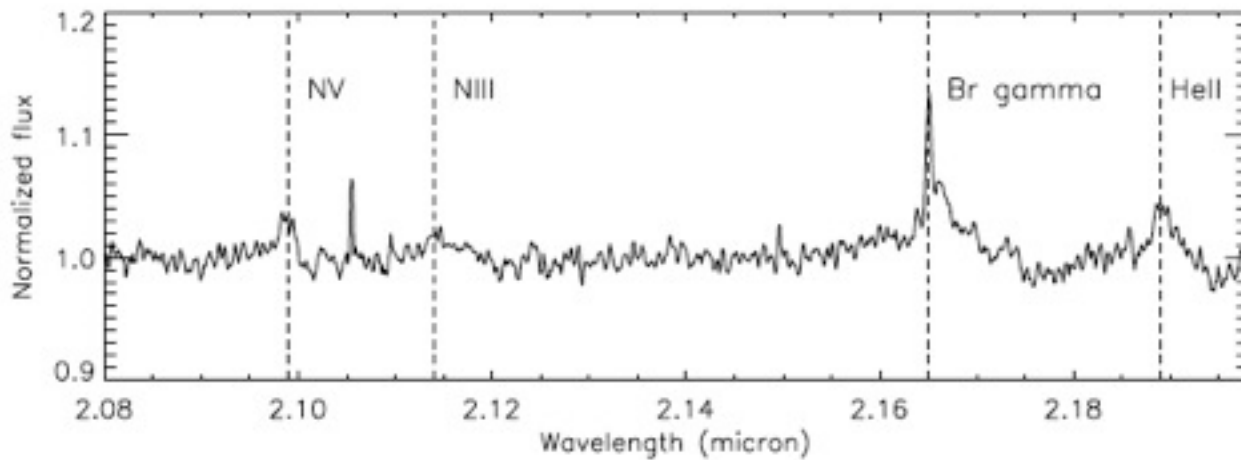
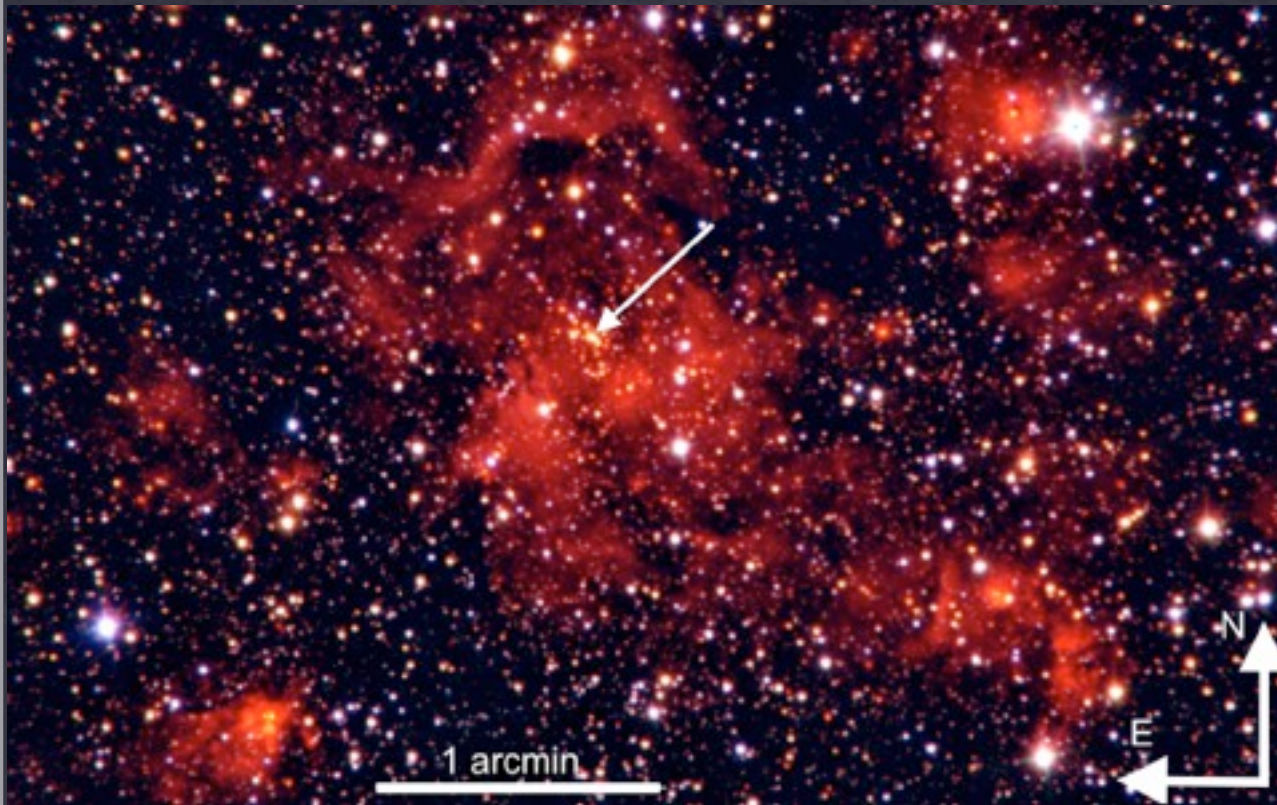
W49

Arjan +, 2014

W49nr1

O2 - 3.5 If*

100 - 180 M_{SUN}

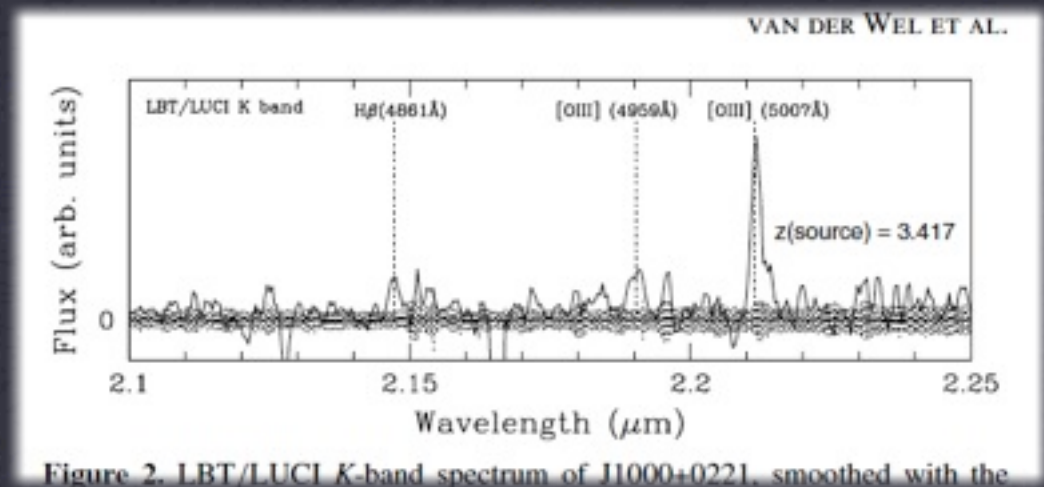
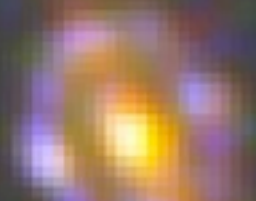


DISCOVERY OF A QUADRUPLE LENS IN CANDELS WITH A RECORD LENS REDSHIFT $z = 1.53$

A. VAN DER WEL¹, G. VAN DE VEN¹, M. MASEDA¹, H. W. RIX¹, G. H. RUDNICK^{1,2}, A. GRAZIAN³, S. L. FINKELSTEIN⁴,

¹Department of Astronomy, University of California, Santa Cruz, CA 95064, USA
²Department of Astronomy, University of Michigan, Ann Arbor, MI 48106, USA
³Department of Astronomy, University of California, Berkeley, CA 94720, USA
⁴Department of Physics, University of California, Berkeley, CA 94720, USA

Arjen +, 2013
LENS: Z=1.53
SOURCE: Z=3.4



Luci - it goes even sharper

SEEING LIMITED; 2 CAMERAS - N3.75 & N1.8

Modes	Spectral Coverage (μm)	Spectral Resolution	Field of View	Pixel Scale (arcsec/pixel)
Imager Longslit, MOS	Z, J, H, K	5,000 - 10,000	4' \times 4'	0.12 & 0.25

Luci - it goes even sharper

SEEING LIMITED; 2 CAMERAS - N3.75 & N1.8

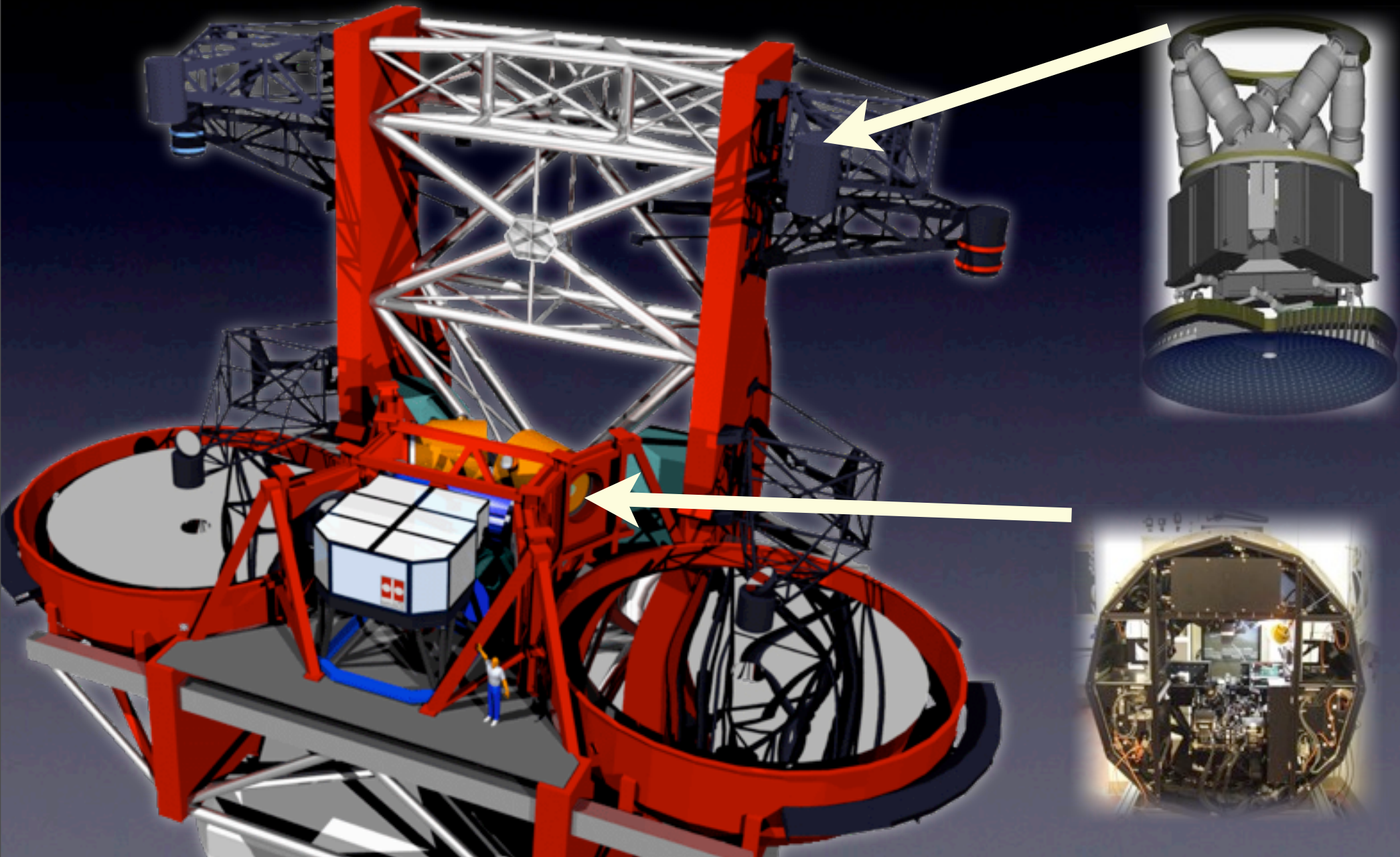
Modes	Spectral Coverage (μm)	Spectral Resolution	Field of View	Pixel Scale (arcsec/pixel)
Imager Longslit, MOS	Z, J, H, K	5,000 - 10,000	4' \times 4'	0.12 & 0.25

DIFFRACTION LIMITED; THIRD CAMERA - N30

Modes	Spectral Coverage (μm)	Spectral Resolution	Field of View	Pixel Scale (arcsec/pixel)
AO	J, H, K	\sim 30,000	30" \times 30"	0,015

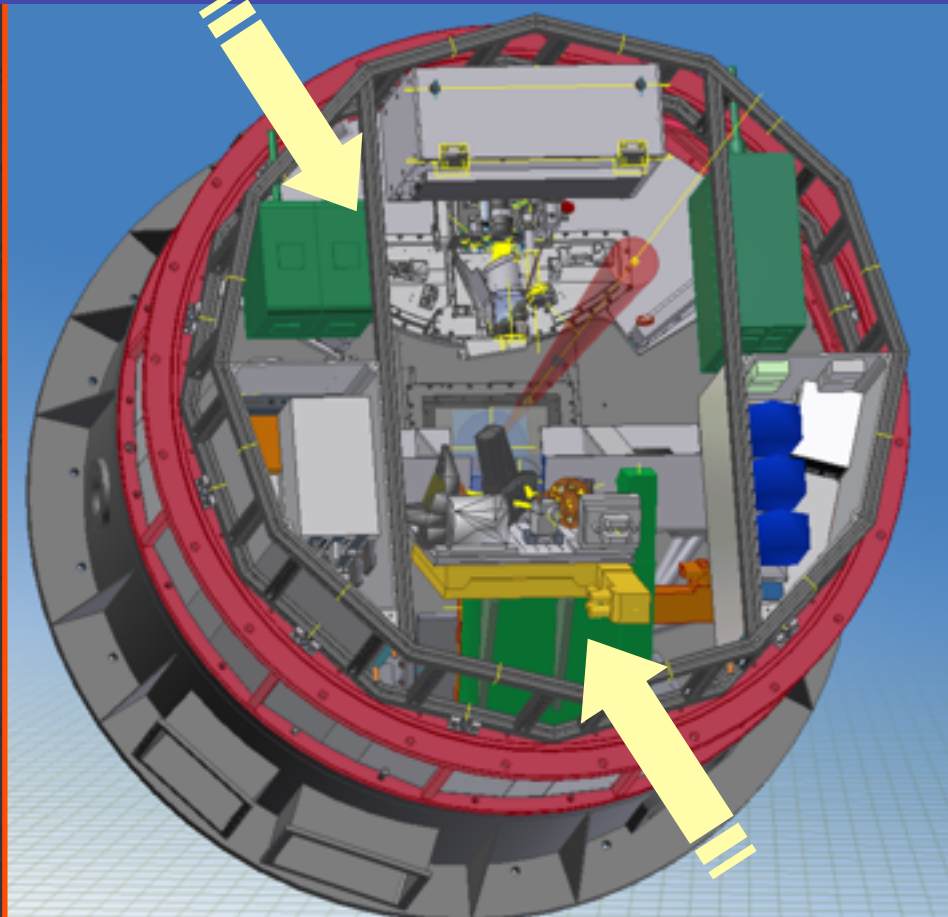
The Large Binocular Telescope

diffraction limited operations

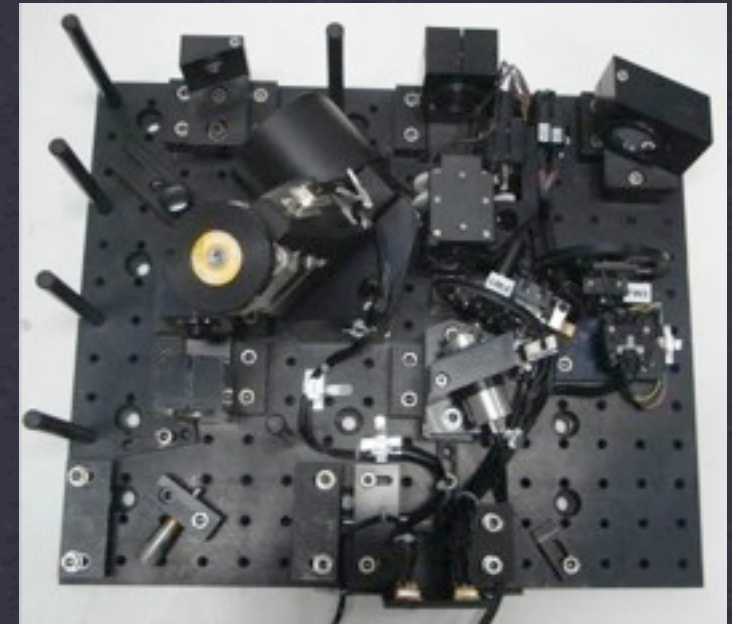


A closer view to WFS unit

**ACQUISITION & GUIDING AG
UNIT**



WAVEFRONT SENSING W UNIT



THE WFS BOARD DURING INTEGRATION



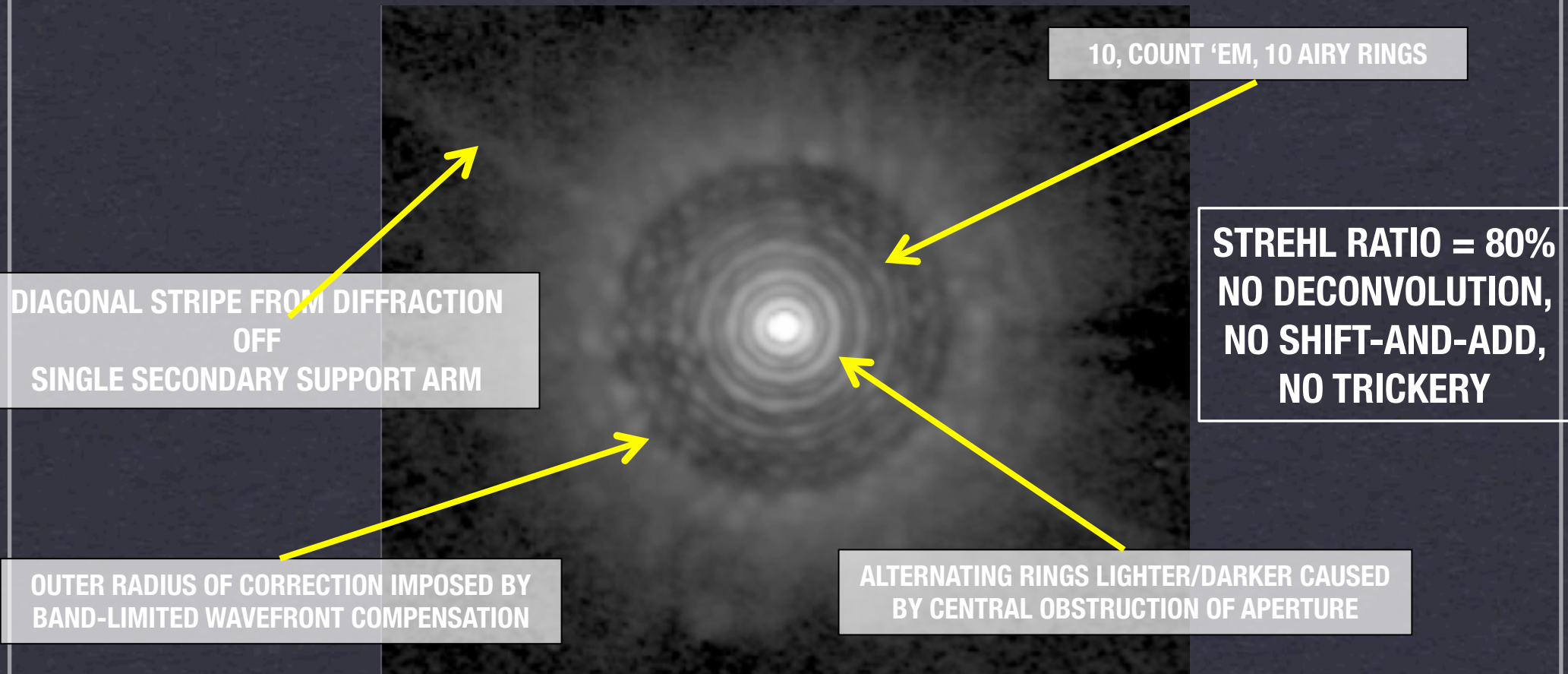
**THE GLASS PYRAMID
FOR LBT WFS**



LBT AdSec SX & DX bedingt einsatzbereit

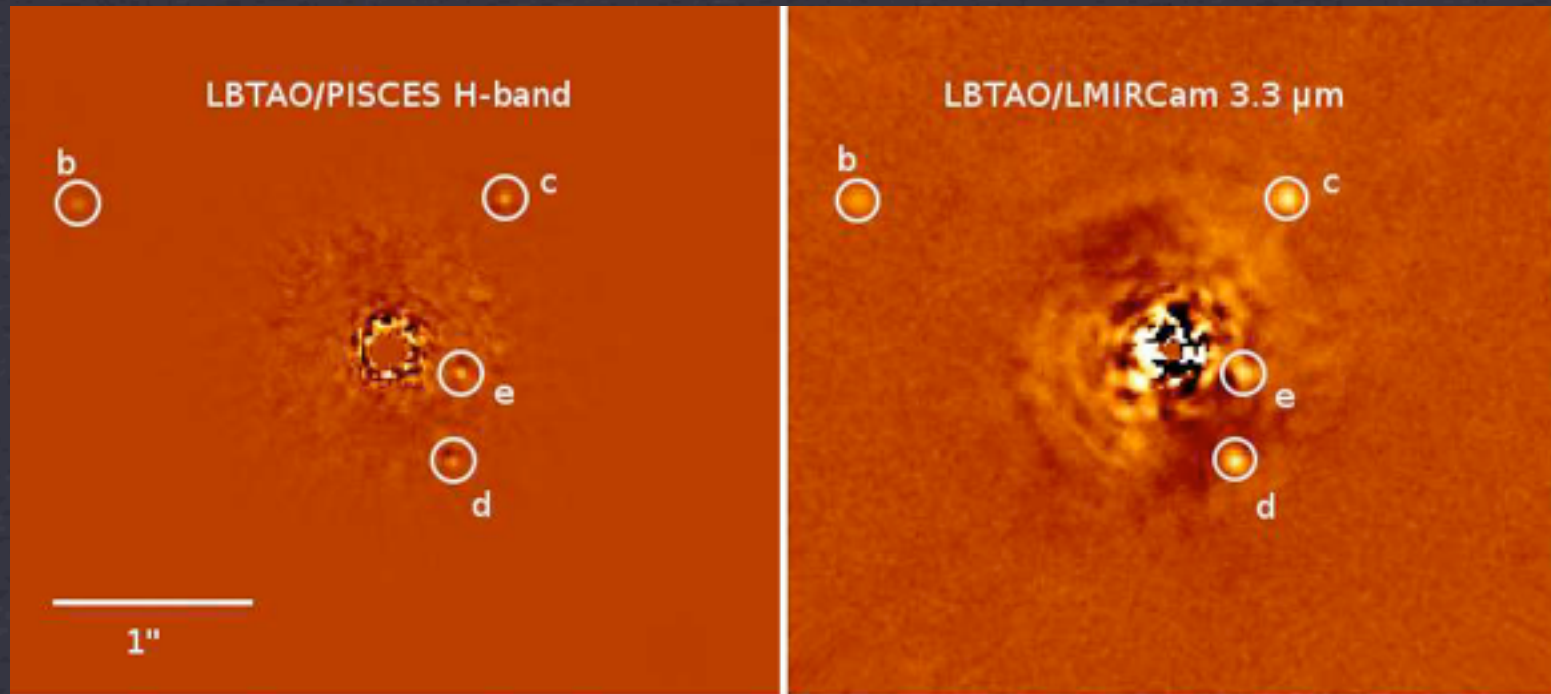
very good when it works
... but failing too often ...

The textbook AO point-spread function



STAR: HD175658 AO CORRECTION SPEED: 1 KHZ
R MAGNITUDE: 6.5 # OF CORRECTED MODES: 400
EXPOSURE TIME: 20 S SEEING: 0.9"
WAVELENGTH: 1.6 MM IMAGE CORE WIDTH: 0.040"

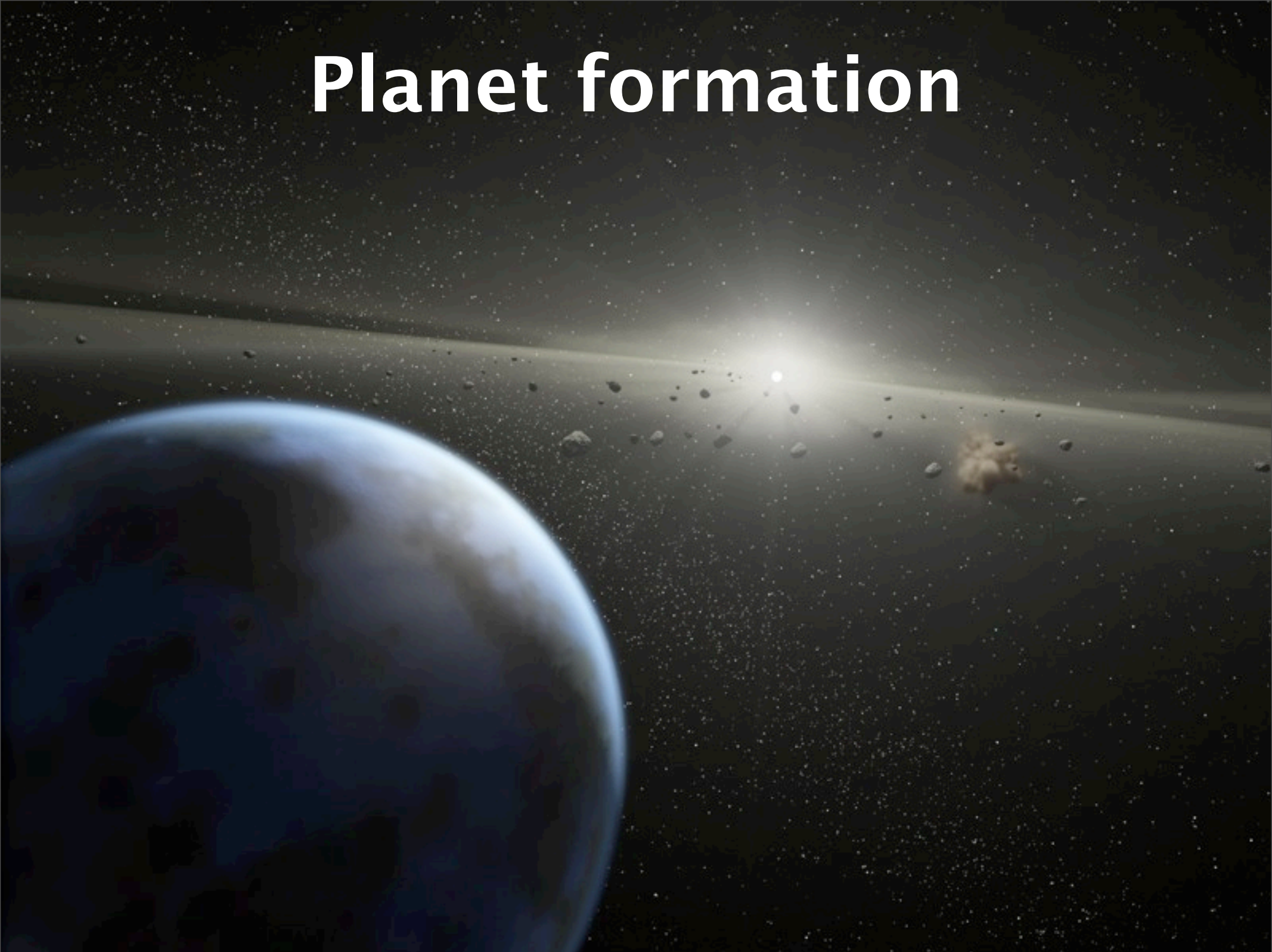
A0#1, PISCES & LBTI/LMIRCam



ESPOSITO ET AL, SKEMER ET AL. 2013

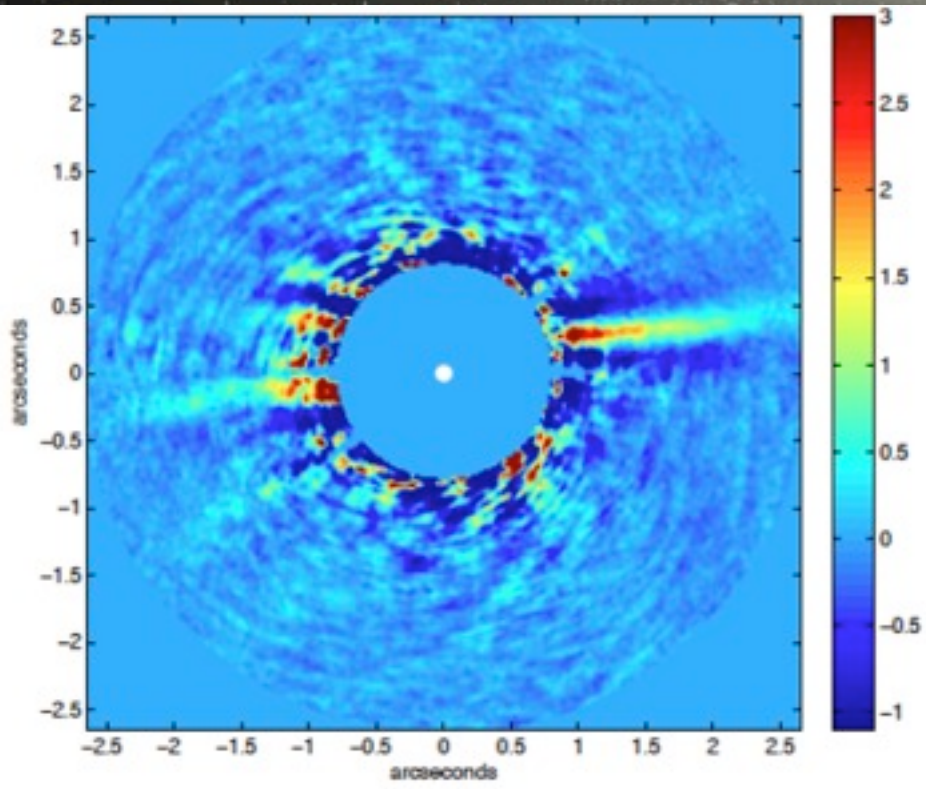
**HR8799e detected in H-band
large flux @3.3 μm , not expected from CH_4 absorption in
atmosphere**

Planet formation

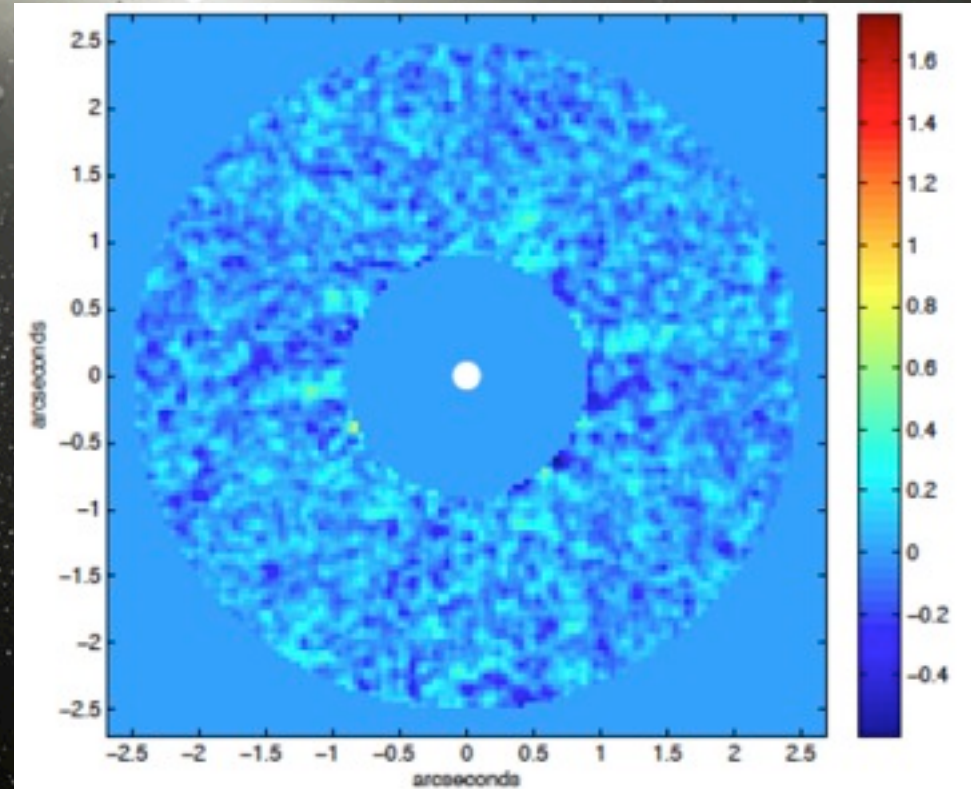


Planet formation

HD 15115 Debris Disk



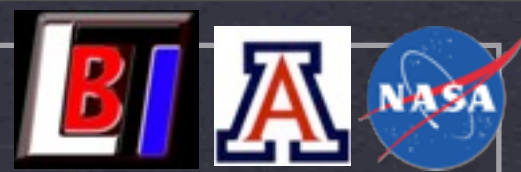
2.2 μm



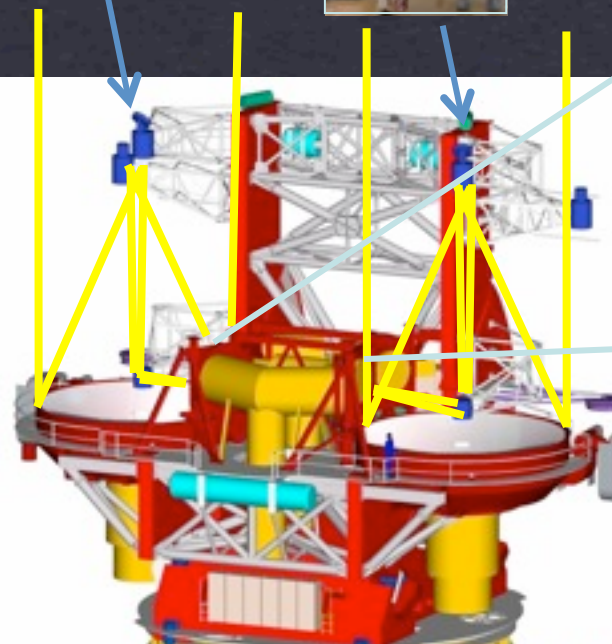
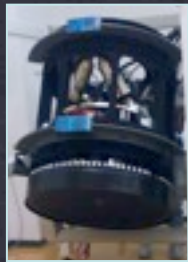
3.8 μm

Rodigas et al. 2012

AO SYSTEM FOR LBTI



Focal Station	Modes	Spectral Coverage (μm)	Spectral Resolution	Field of View	Pixel Scale (arcsec/pixel)
Center-Bent	Nulling Interf Short Fizeau Long Fizeau	8 - 13 3-5 8-25	2 - 30	25"	0.1



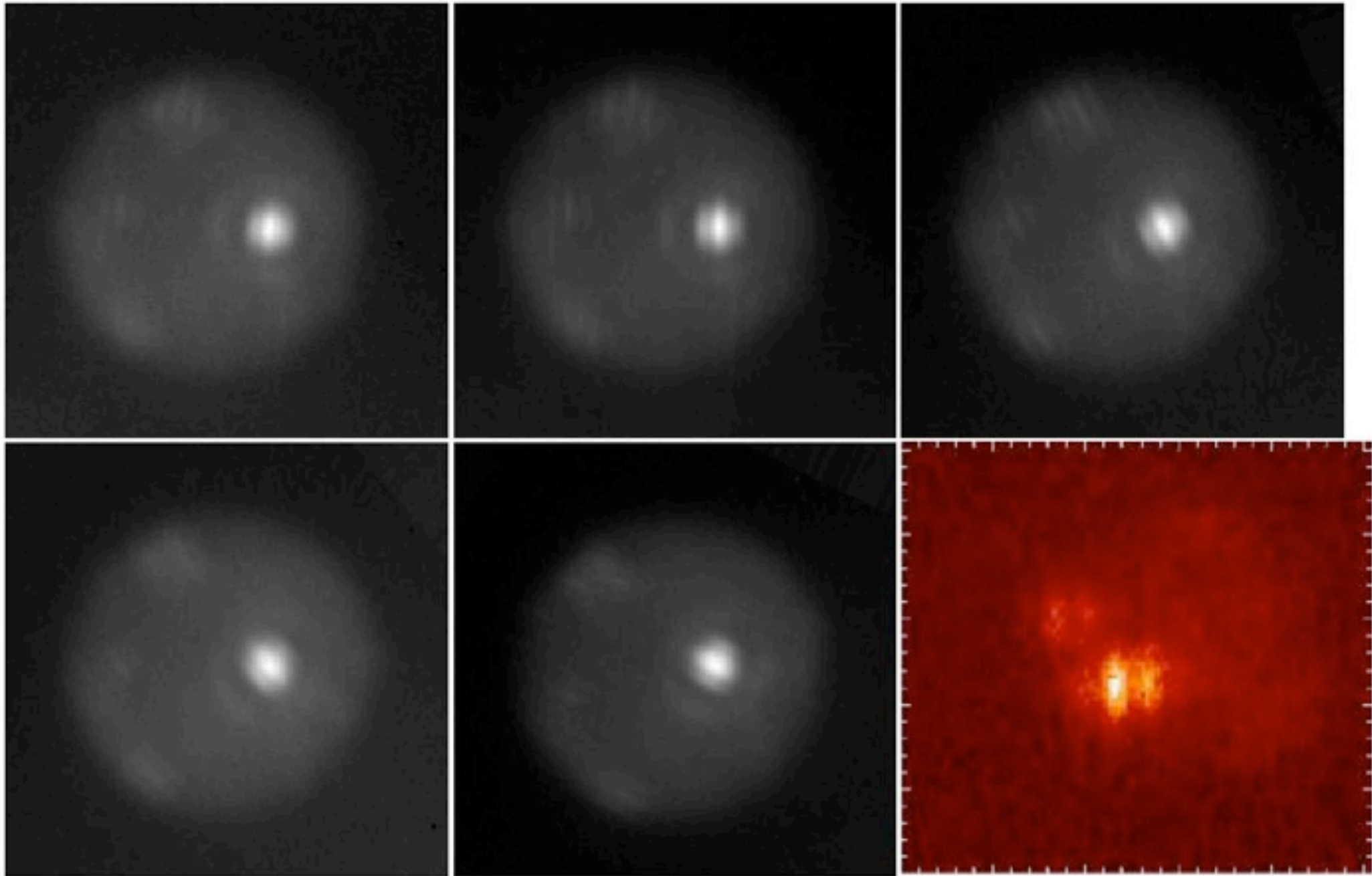
NULLING AND IMAGING CAMERA:

- NULLING OPTIMIZED MID-INFRARED CAMERA (8-25UM)

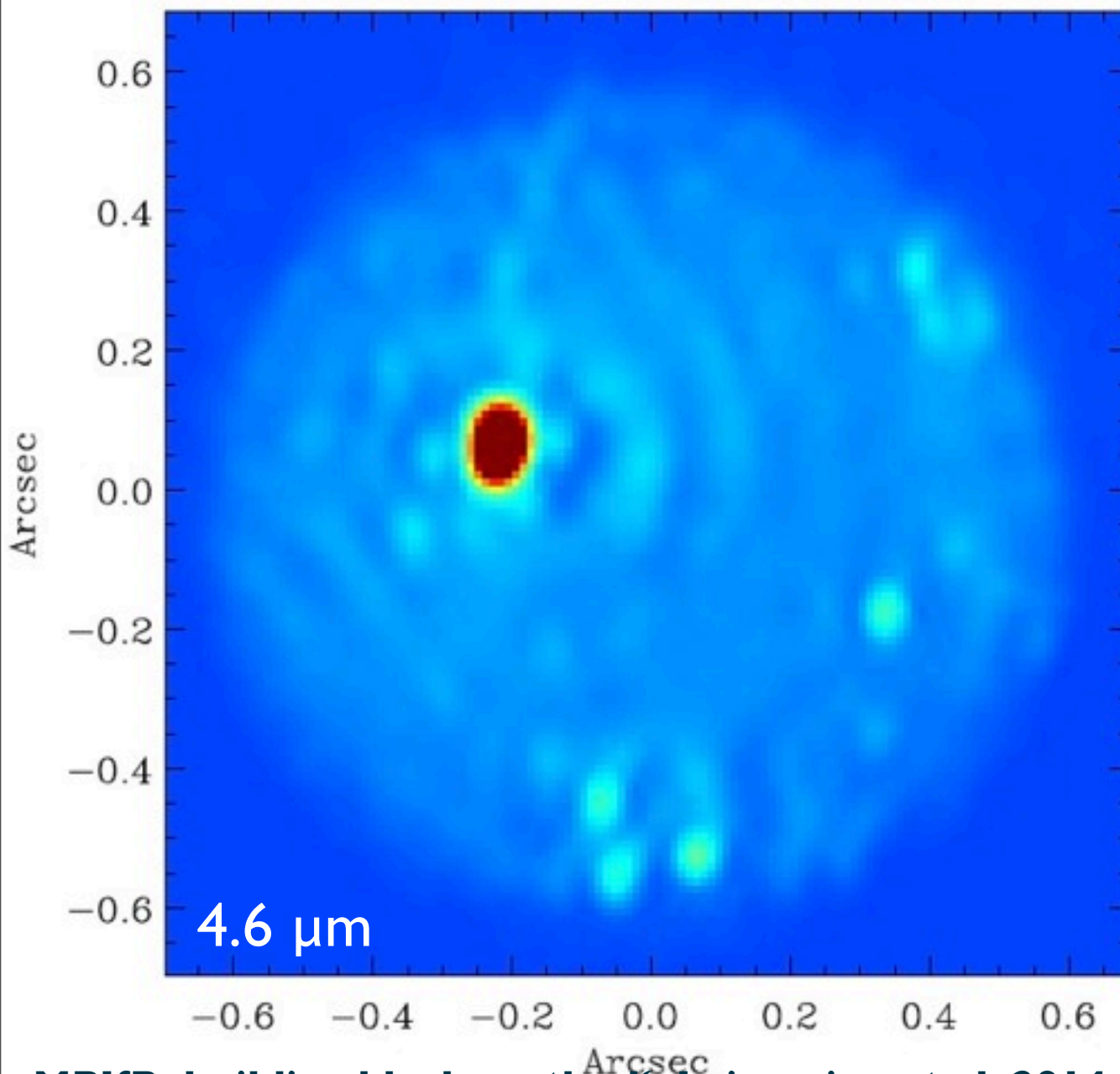
LMIRCAM (3-5UM)
[HINZ - SPIE 2008]

[HTTP://PLANETQUEST.JPL.NASA.GOV/LBTI/LBTI_INDEX.CFM](http://planetquest.jpl.nasa.gov/lbti/lbti_index.cfm)

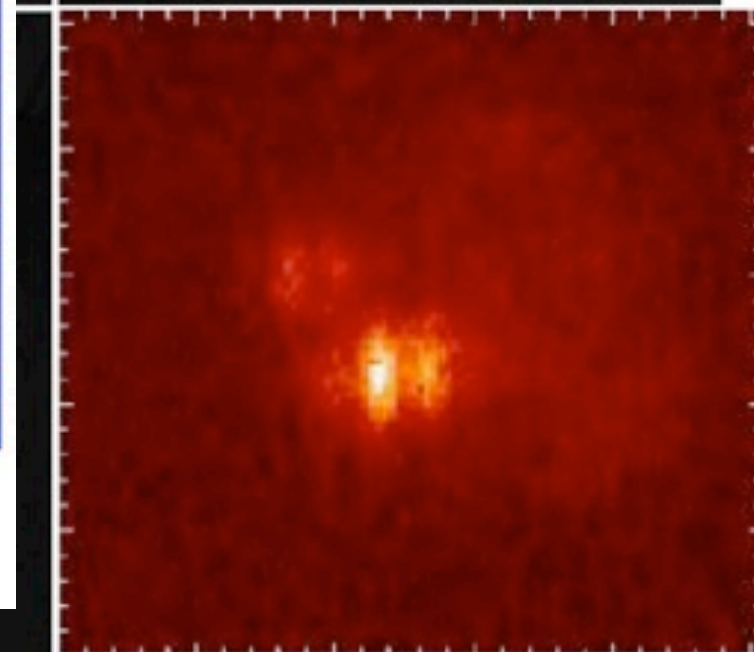
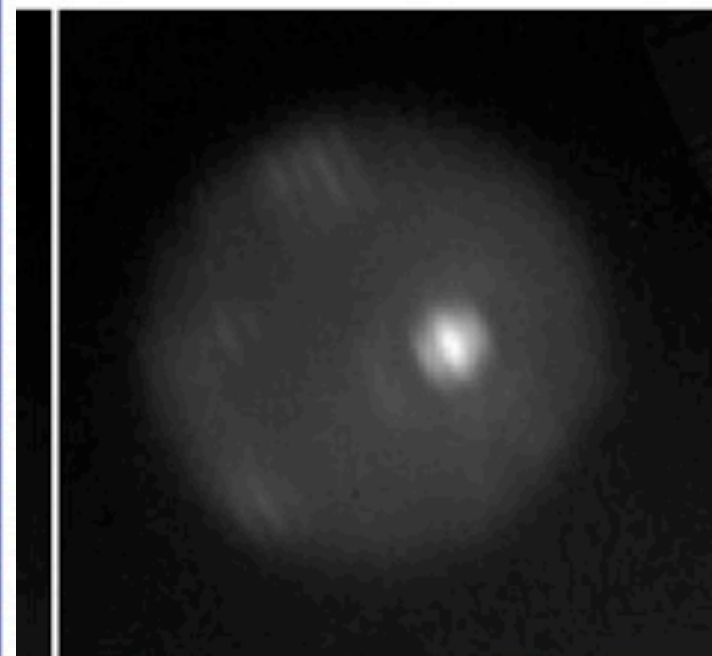
Infrared interferometric imaging of Io



22.8-Meter Reconstruction



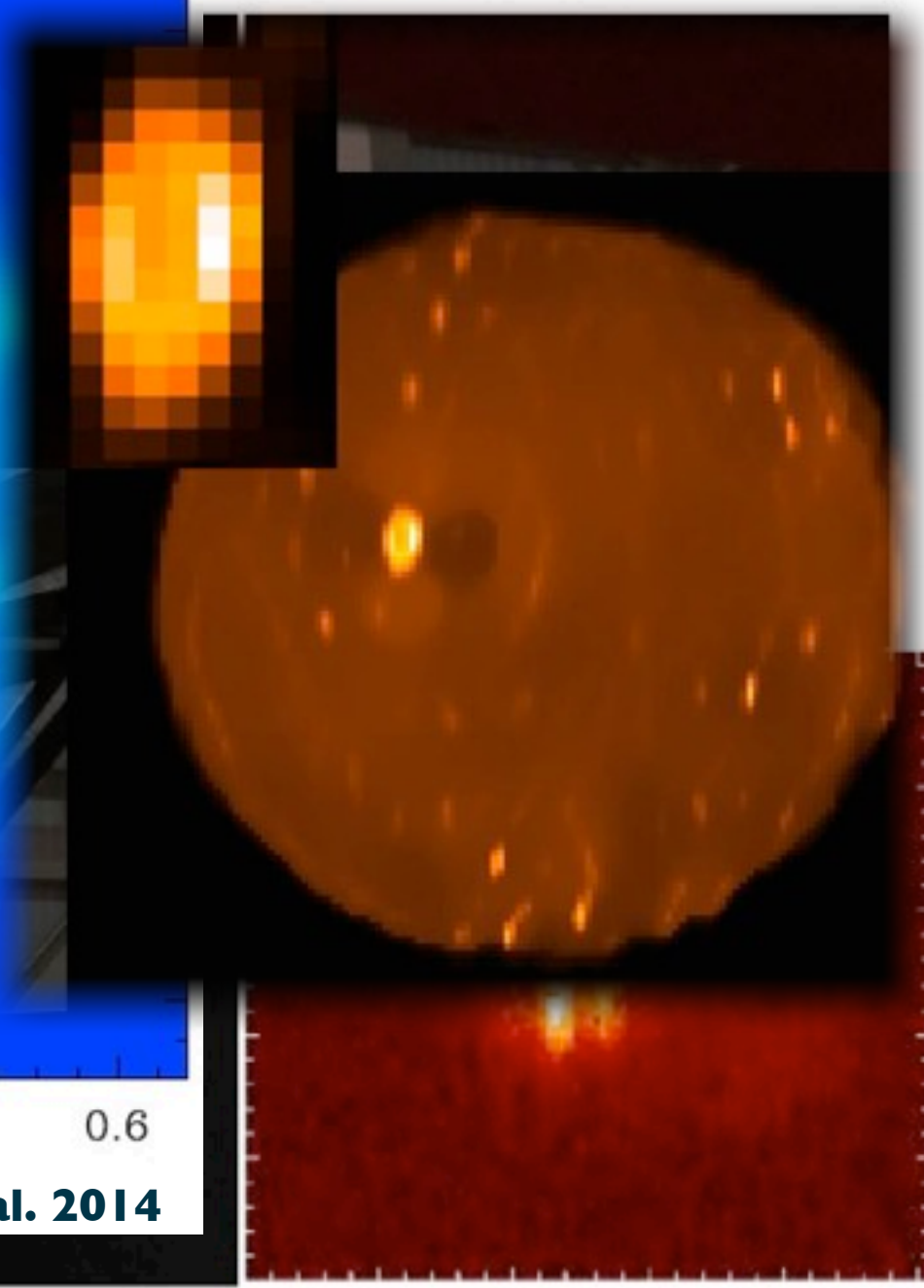
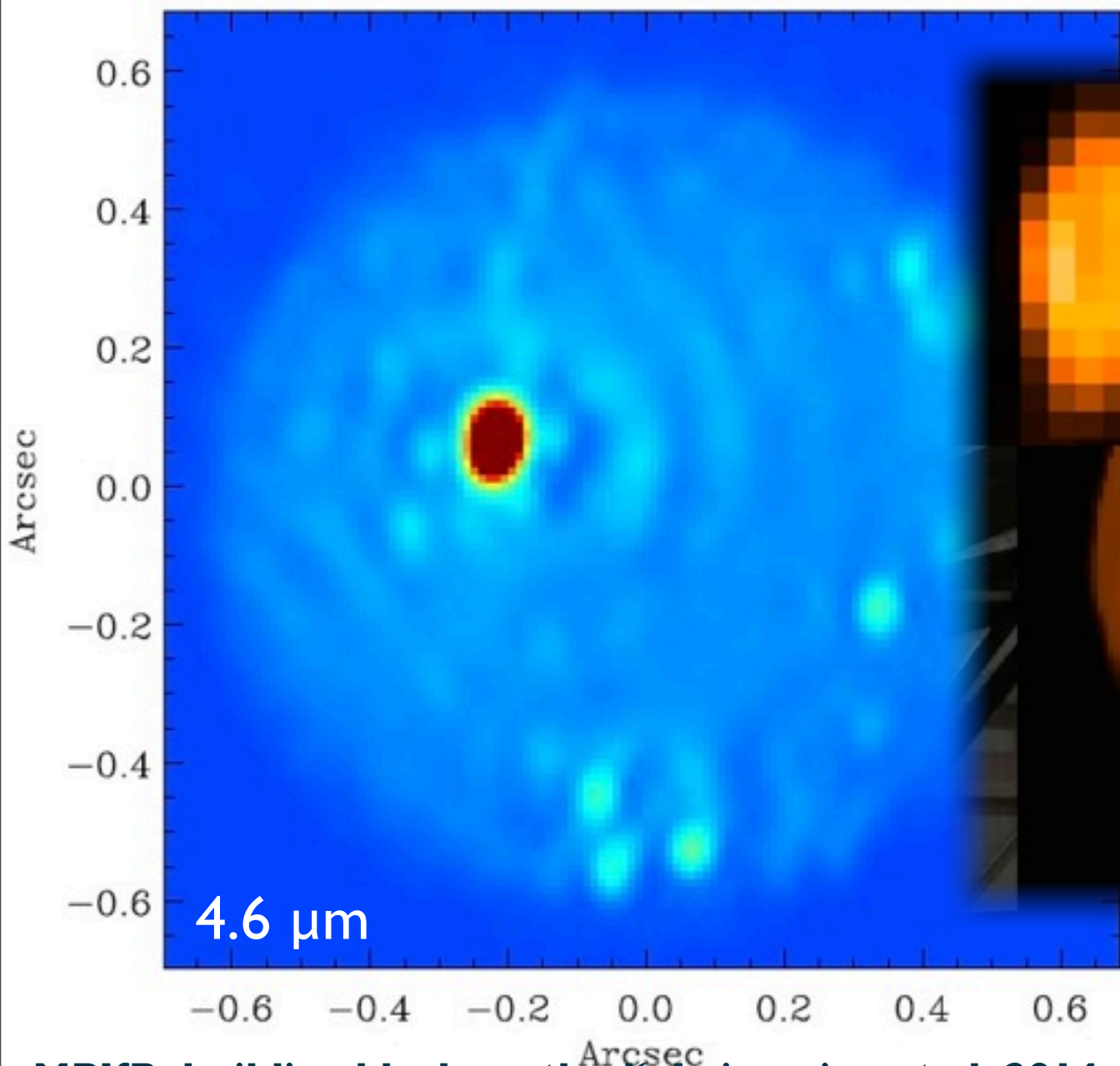
Imaging of Io



MPIfR „building block method“, Leisenring et al. 2014

22.8-Meter Reconstruction

Imaging of Io

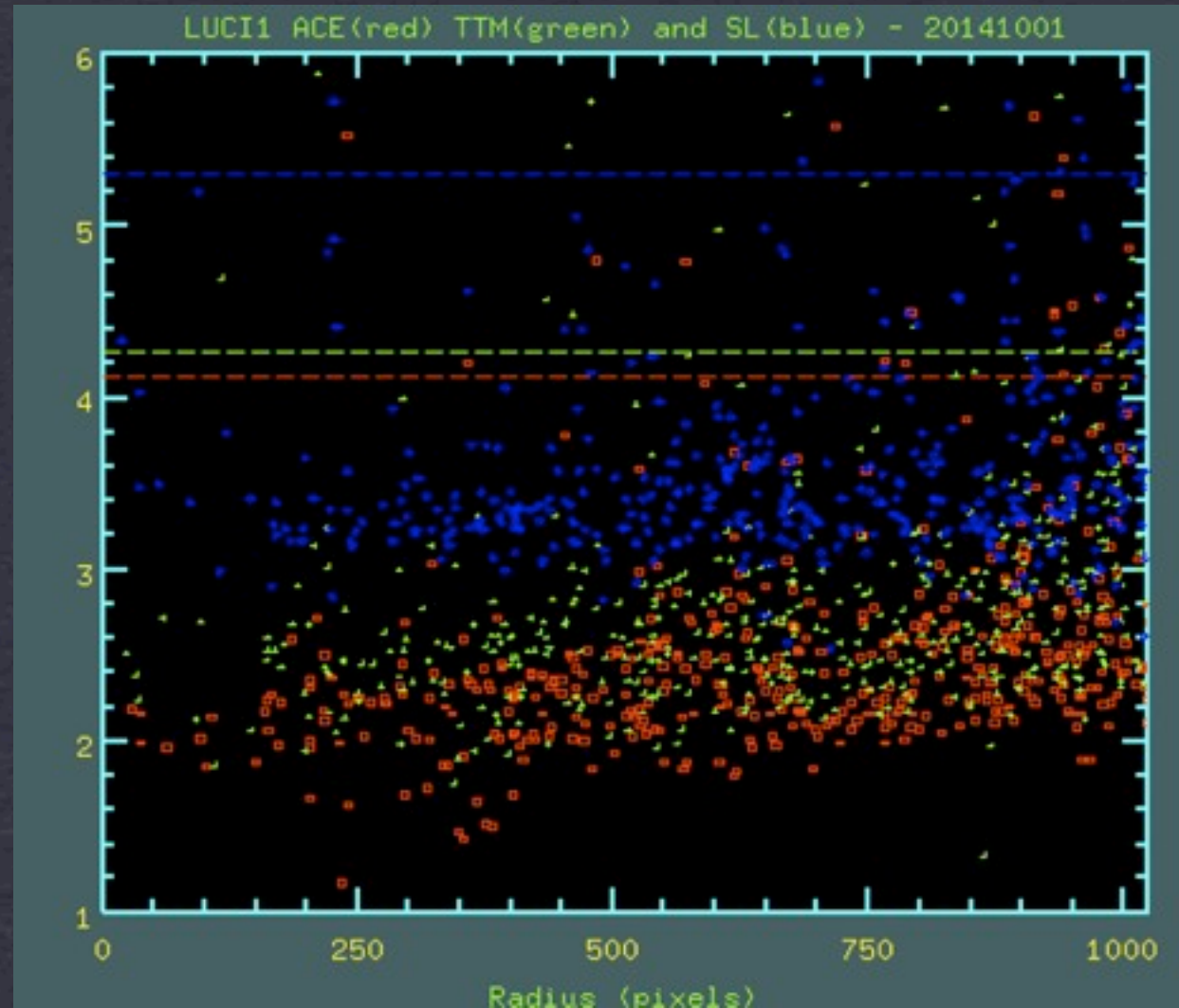


MPIfR 'building block method', Leisenring et al. 2014

Luci 1 A0 with N3.75 camera

blue: SL
green: A0 in TTM
red: A0@110 modes

$r \sim 0.''65$
 $0.''125/\text{px}$



Luci 2 - History



Jan 2010 - Sep 2010

Luci 2 AIV

Sep 2010

N30 camera mirrors bad

Oct 2011

new N30 mirrors, again bad

Sep 2011 - Mar 2012

Luci 2 AIV on hold (Luci I detector explosion)

Apr 2012

N30 mirrors OK, mirror support bad

Juli 2012

Luci optics bad (pupil mirror, FM4)

LUCI I detector

