

LBT Status

instruments
science production,
technology

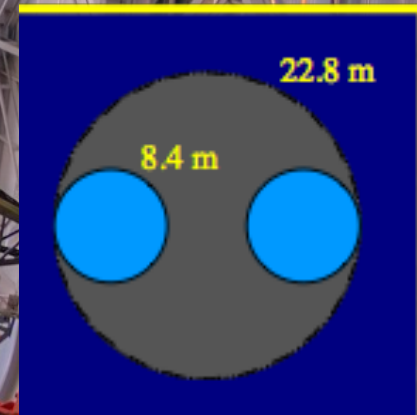


F. Mannucci – INAF - Arcetri

LBT: a revolutionary telescope

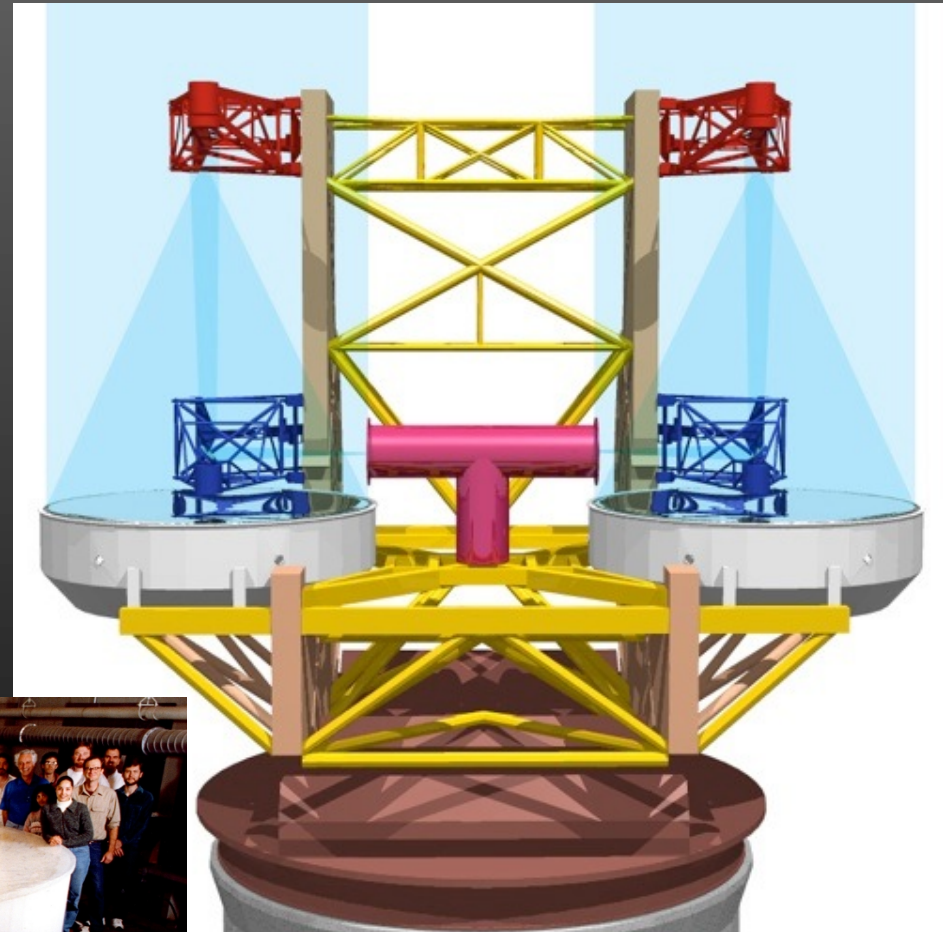
- Binocular configuration
- Interferometry
- First "adaptive" telescope

Collecting area: 2x
Resolution 3x



LBT binocular capabilities

1. always in the same direction in the sky
2. two different instruments on the same targets
3. two different set of targets in the same region
4. non-interferometric combination
5. Interferometric imaging



Adaptive Optics



First extreme-AO system in the world

adaptive secondary

674 actuators, 1 KHz

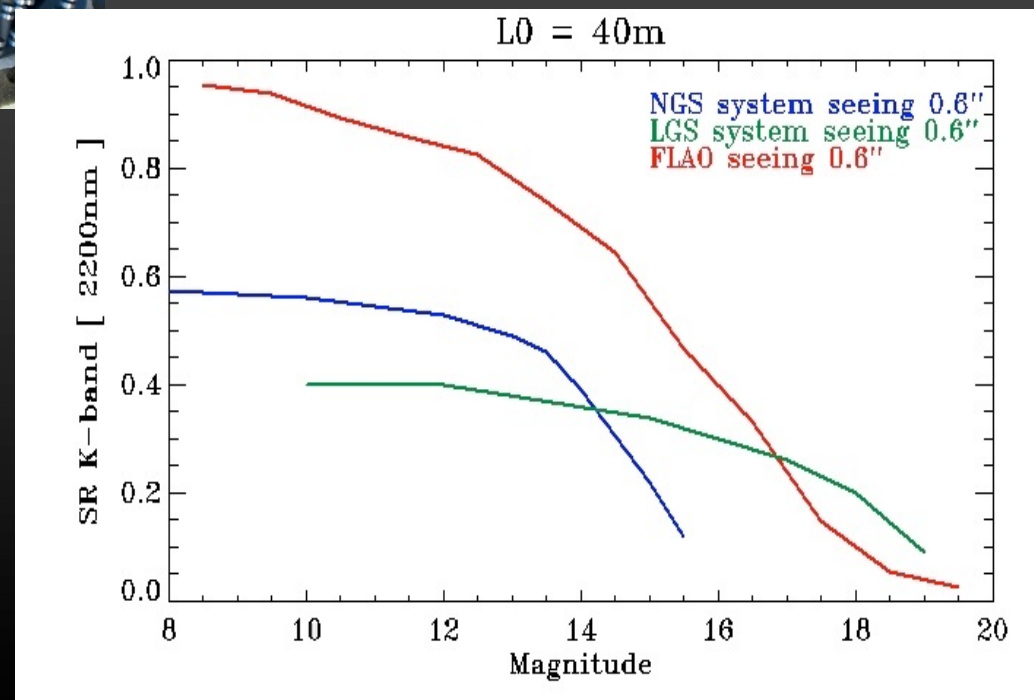
correction down to R-band

SR up to 95%

pyramid wavefront sensor

guide star R mag = 4.0 - 17.5

Laser stars



Adaptive Optics



adaptive secondary

674 actuators, 1 KHz

correction down to R-band

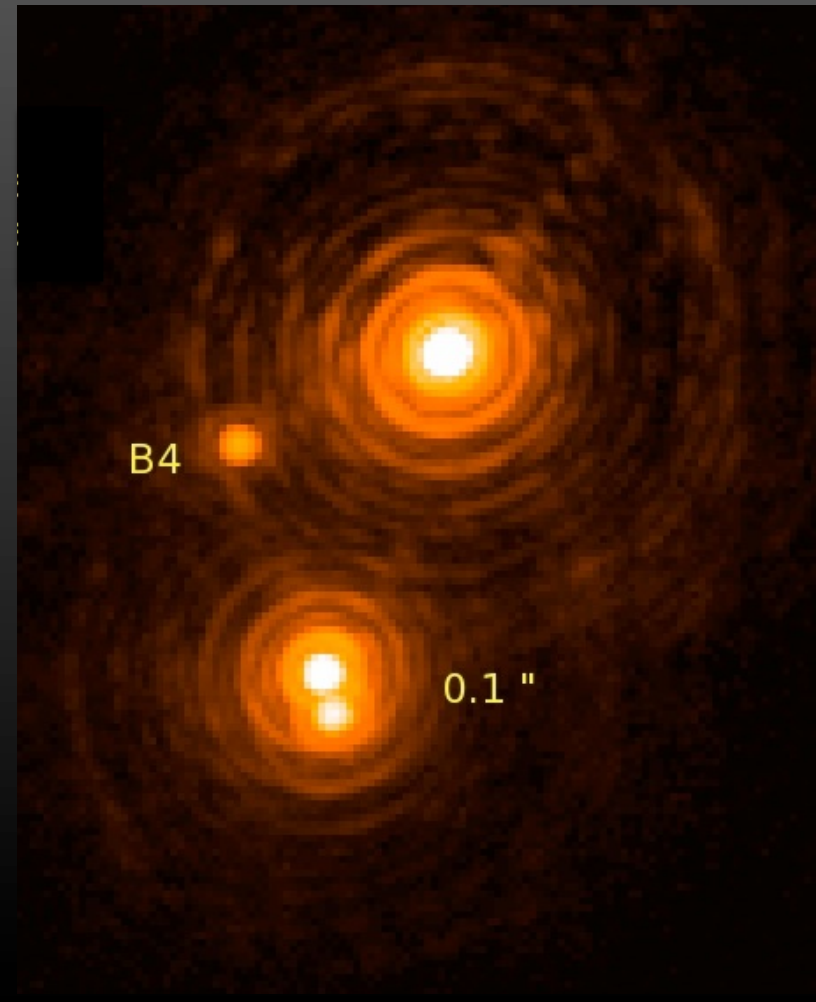
SR up to 95%

pyramid wavefront sensor

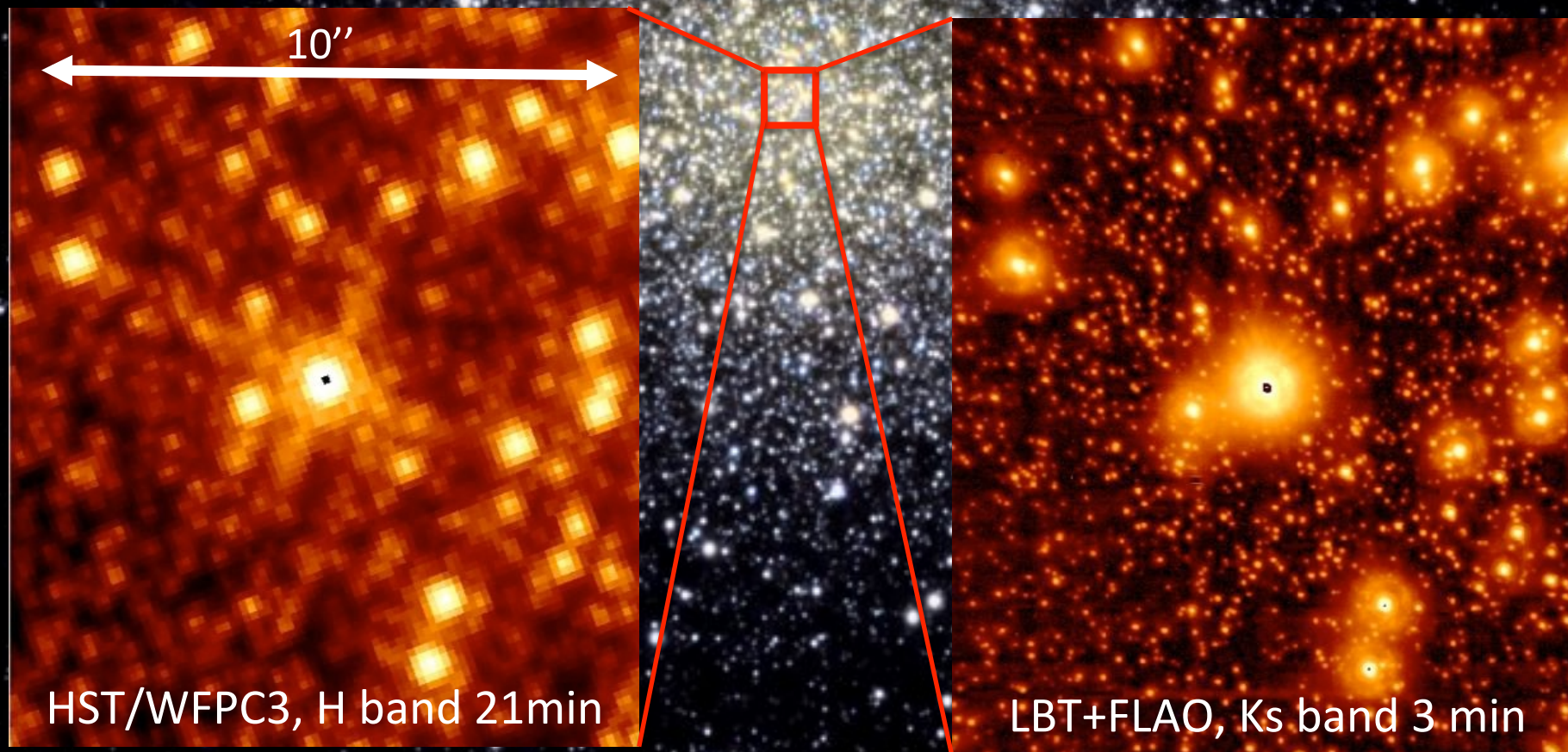
guide star R mag = 4.0 - 17.5

Laser stars

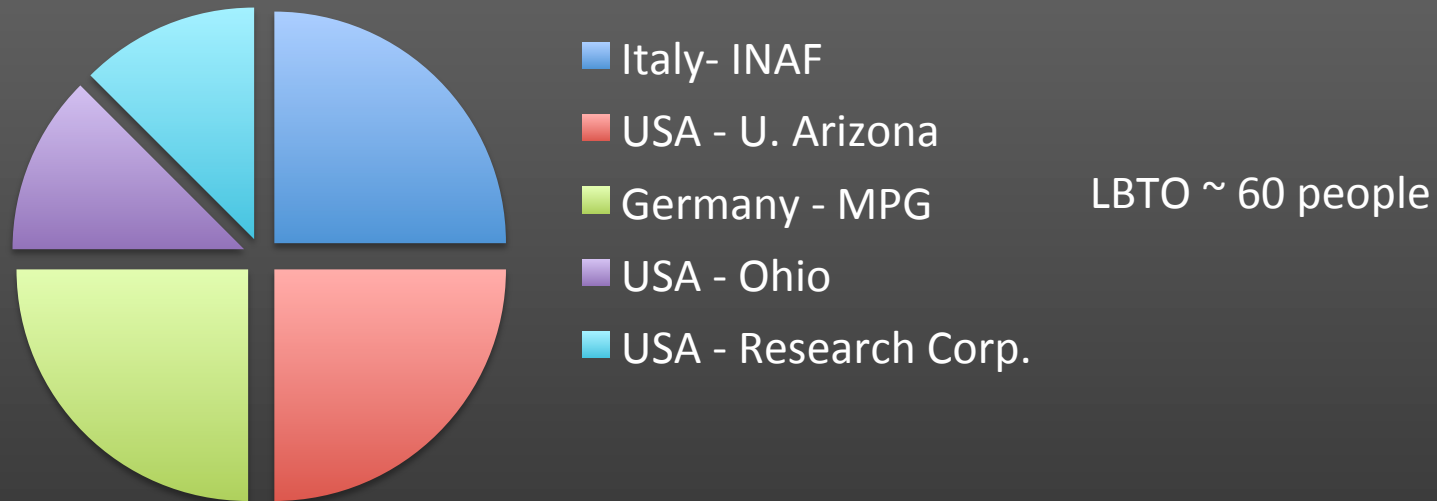
First extreme-AO
system in the world



Adaptive optics



Partners & italian organization



Board: A. Fontana, R. Ragazzoni, F. Zerbi

Science adv. com.: I. Pagano, M. Bellazzini (L. Origlia, F. Mannucci)

LBT director: C. Veillet

Service mode observations: R. Speziali, M. Faccini E. Sani, F. Cusano, A. Bongiorno, M. Fumana, K. Boutsia, R. Carini

Data processing: V. Testa, S. Gallozzi, R. Smareglia, M. Faccini, C. Knapic, D. Paris

Outreach: M. Faccini

Facilities: data reduction LUCI LBC, MODS; data archive (all the collaboration)

Instrumentation



LBC Red

Thermal IR Nuller /
Beam Combiner

LINC/NIRVANA
Near IR/Visible
Beam Combiner

PEPSI 1

MODS 1

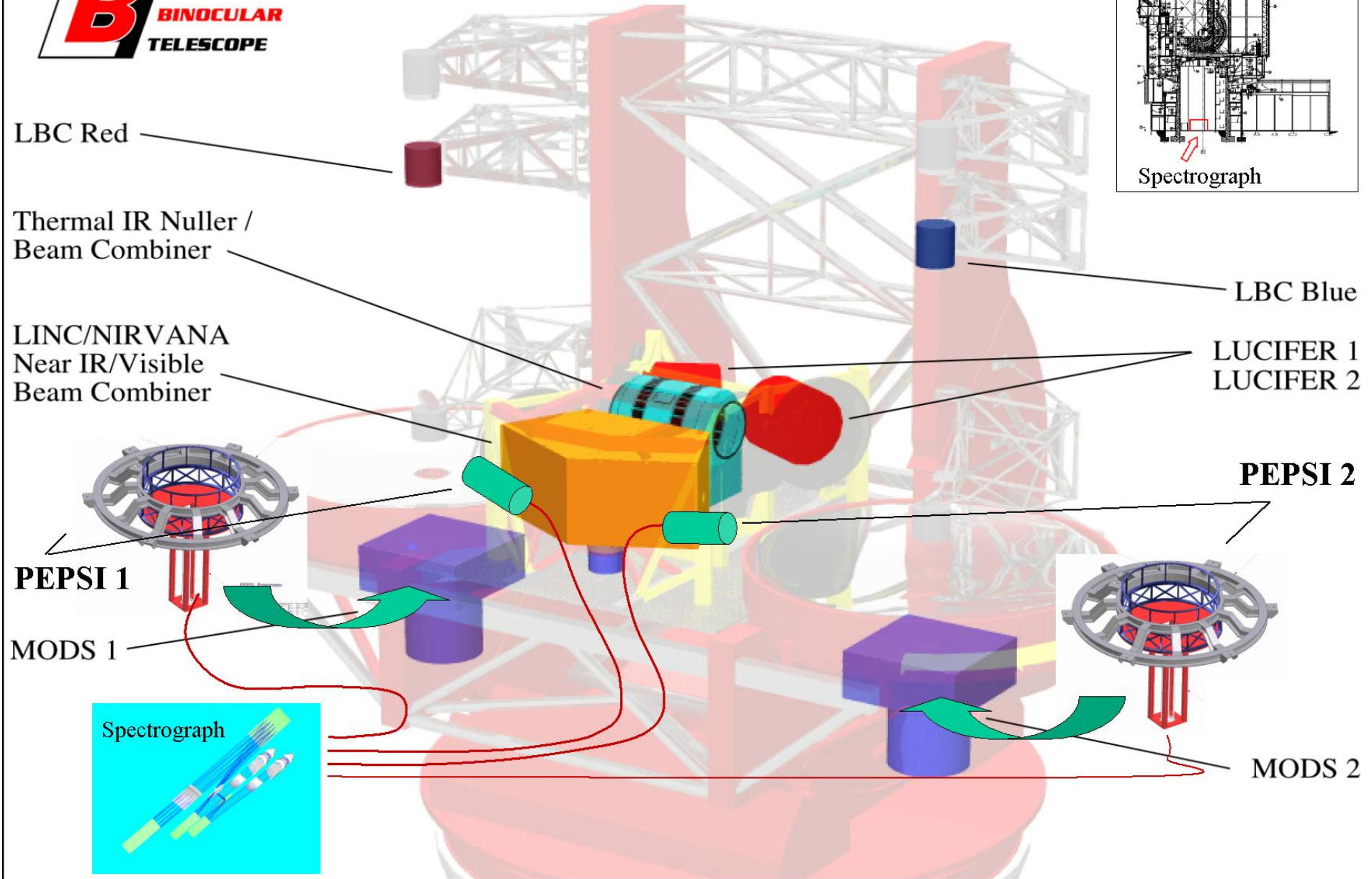
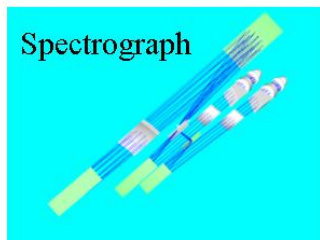
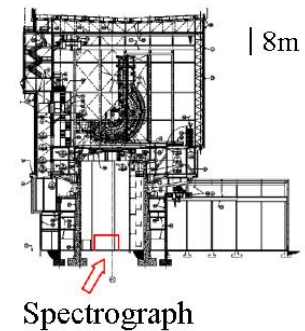
Spectrograph

LBC Blue

LUCIFER 1
LUCIFER 2

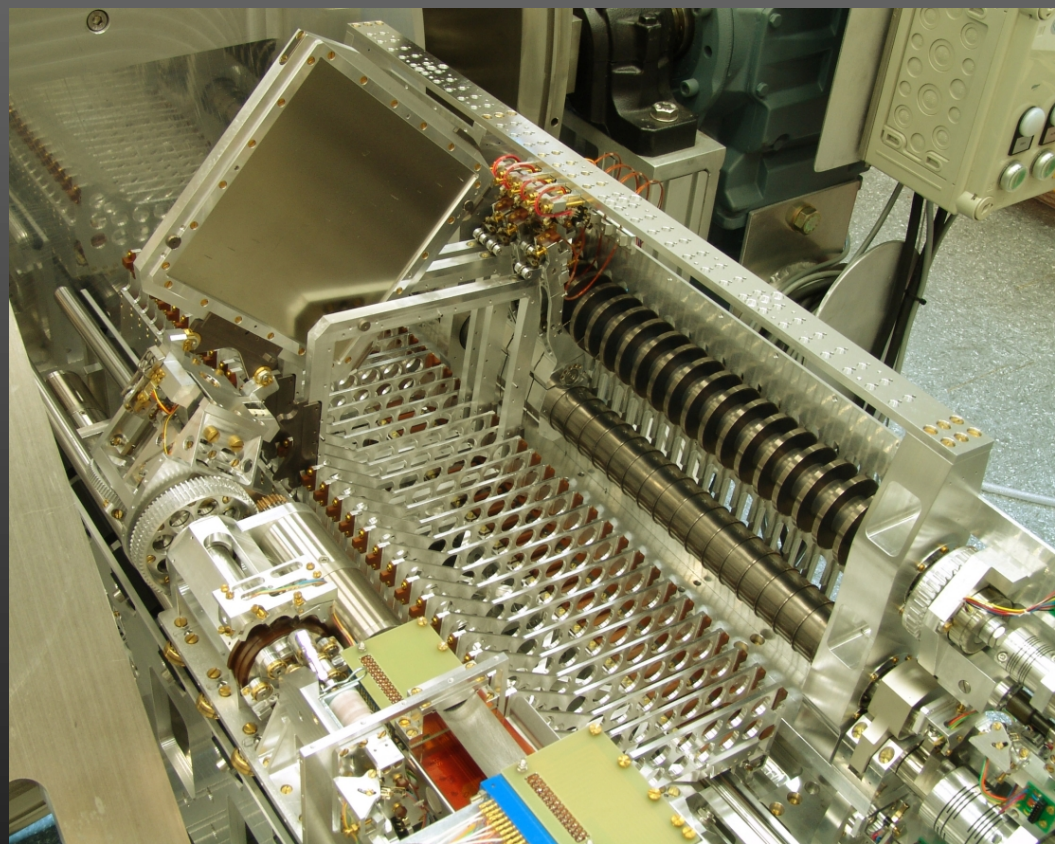
PEPSI 2

MODS 2

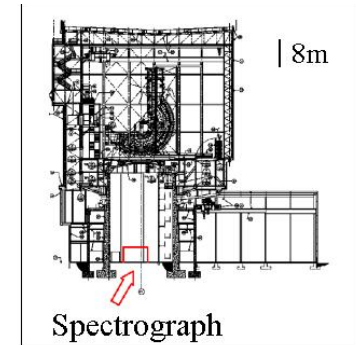


LUCI – near-IR camera and MOS

MPE and Heidelberg



Instrumentation



LBC Red

Thermal IR Nuller /
Beam Combiner

LINC/NIRVANA
Near IR/Visible
Beam Combiner

PEPSI 1

MODS 1

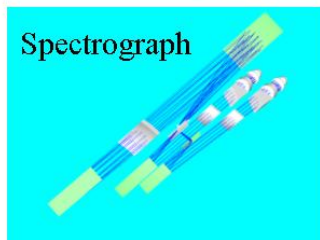
Spectrograph

LBC Blue

LUCIFER 1
LUCIFER 2

PEPSI 2

MODS 2



Activities

- Observing
- Science results
- Publications
- future developments
- general impact

Observing

Allocated time:

60% to science
40% to commissioning

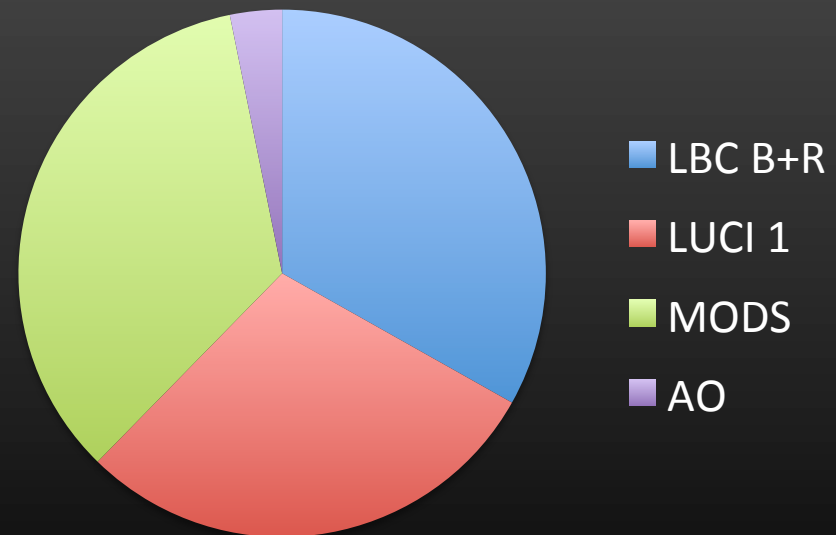
weather losses = 33%
downtime = 7%

6 Calls for proposals (2010-2014)

- 201 proposals
- 2630 hours requested (13 h/prop)
- oversubscription = 3.6

45 Italian Proposals observed (feb 2011- apr 2013)

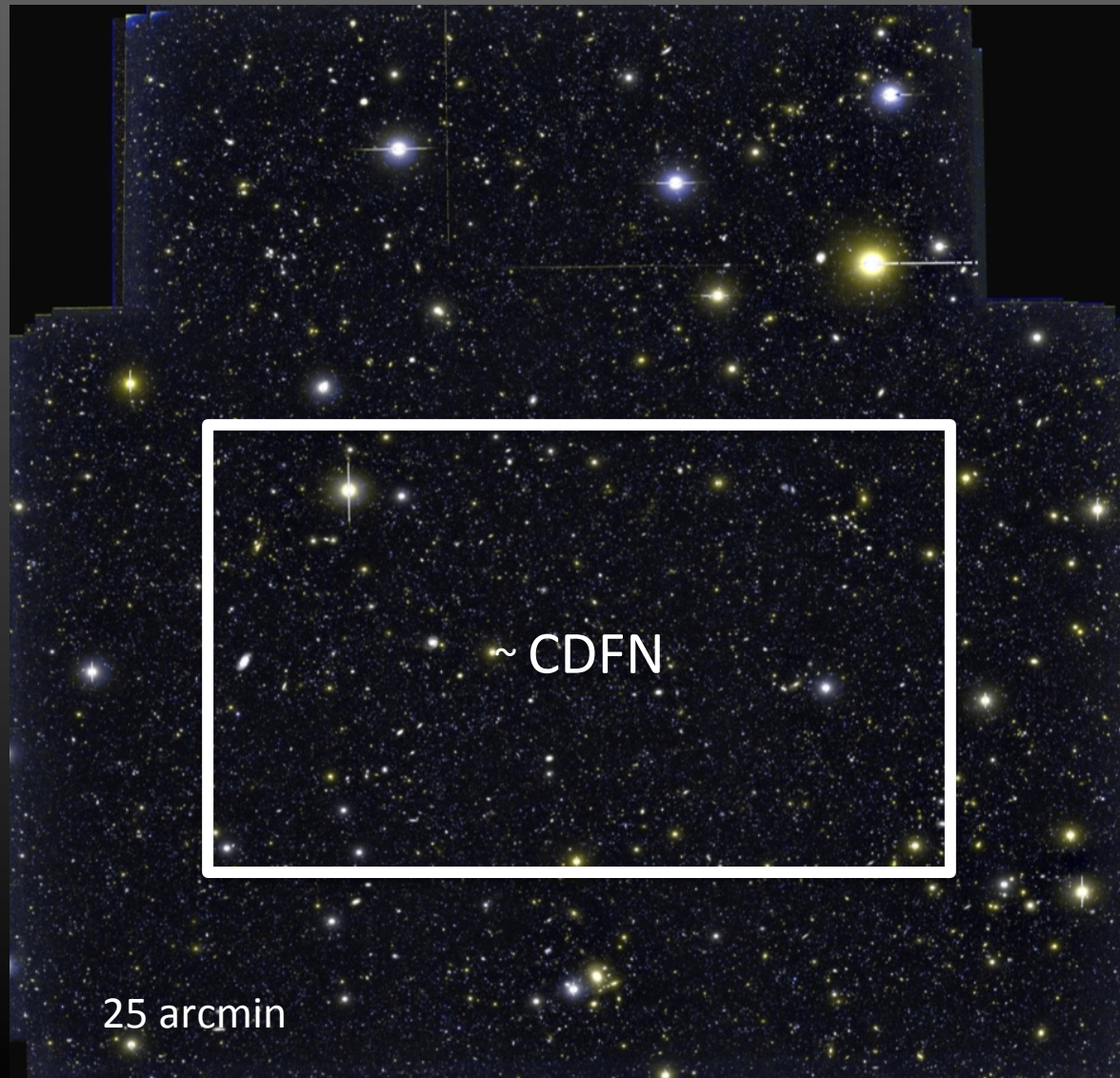
18 (40%) observed at 100%
21 (47%) observed at >75%
32 (71%) observed at >50%



Efficiency (open-shutter time) ~ 43%

VLT 4.1hr/night/telescope -> efficiency about 40-45%

the deepest U-band image ever



Grazian et al.

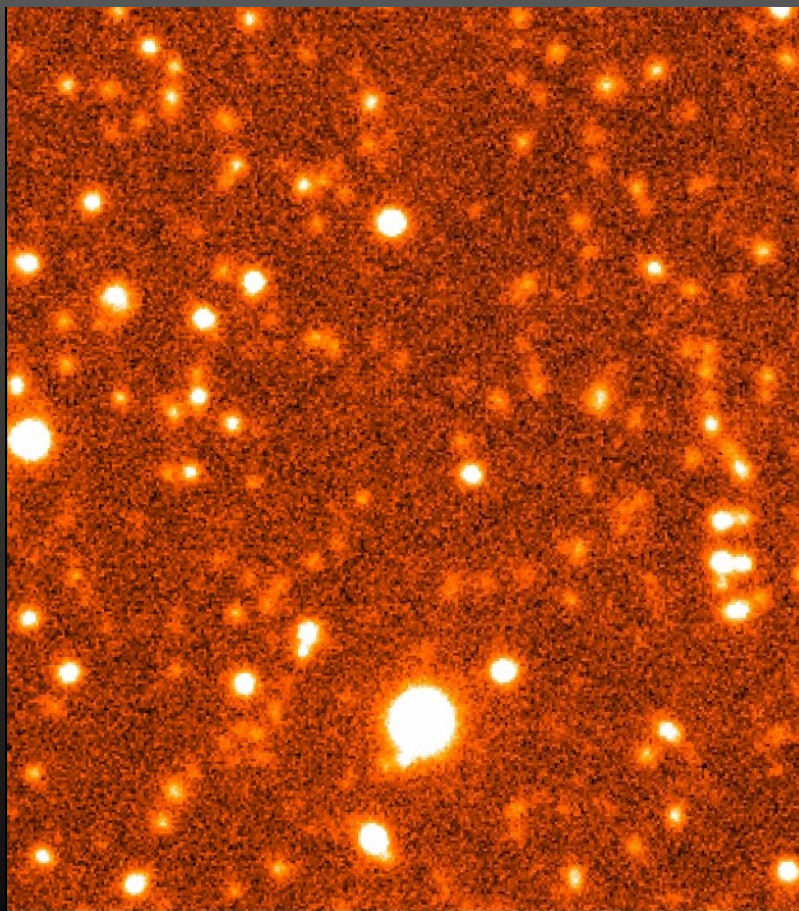
Completing CANDELS with U-band data

- Selecting faint star-forming galaxies at $z > 2$
- SED fitting: SFR, masses, ages, dust extinction, photom. z
- faint side of the Luminosity Function.
- Find passively evolving galaxies at $z \sim 1.5$
- Lyman Continuum escape fraction of galaxies at $z=3$, Reionization

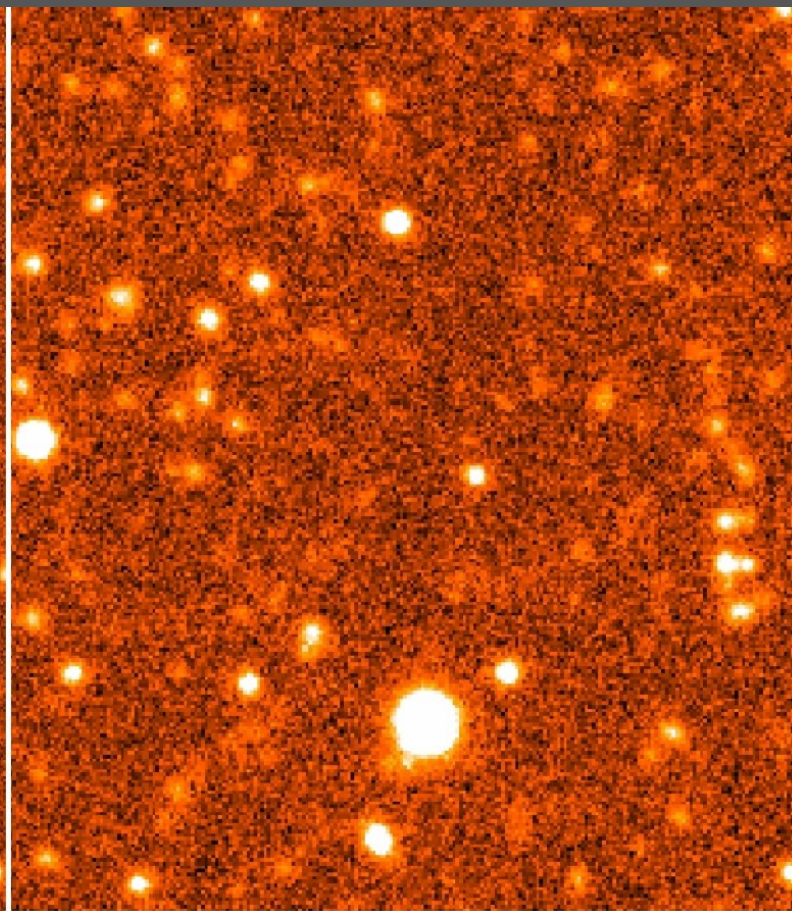
33h with LBC-blue
26h with LBC-red

the deepest U-band image ever

LBT/LBC 33h



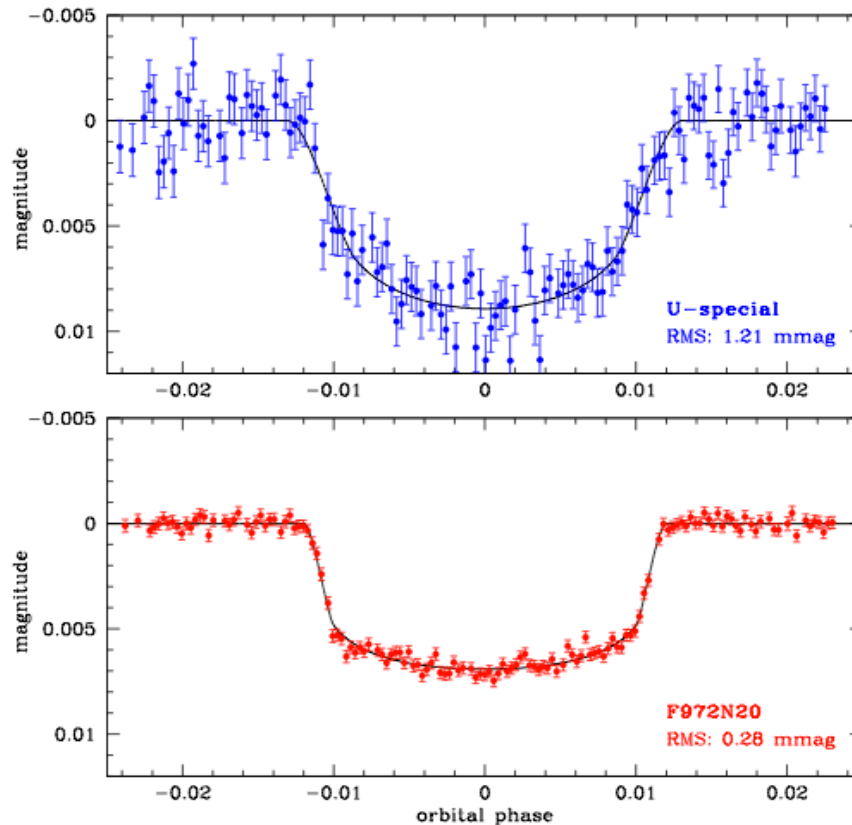
KPNO 50h



Planets: Transit and atmosphere

The blue sky of GJ3470b: the atmosphere of a low-mass planet unveiled by ground-based photometry★

V. Nascimbeni^{1,2★★}, G. Piotto^{1,2}, I. Pagano³, G. Scandariato⁴, E. Sani⁵, and M. Fumana⁶

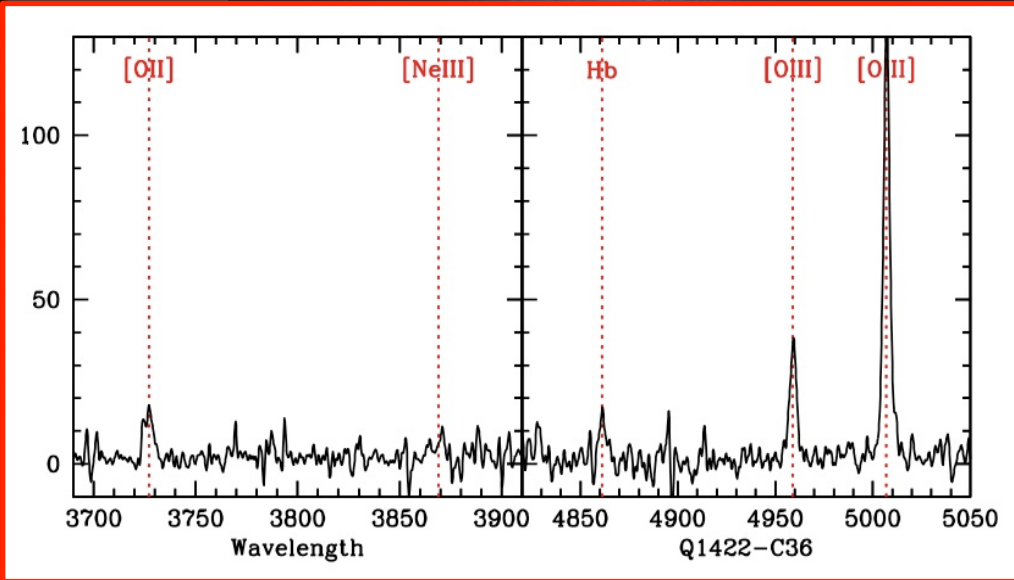
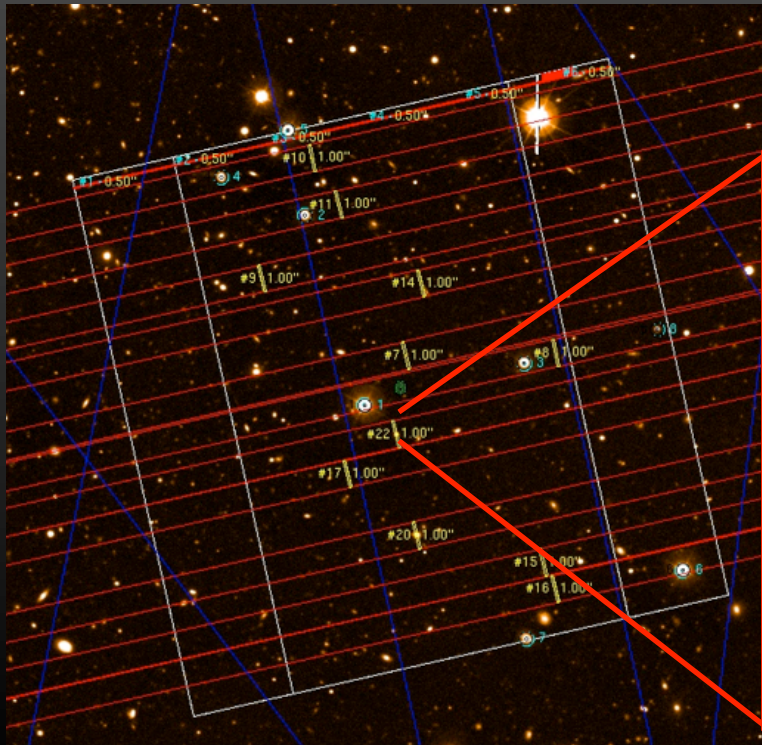


different radii at different
wavelengths:
scattering processes
mean molecular weight

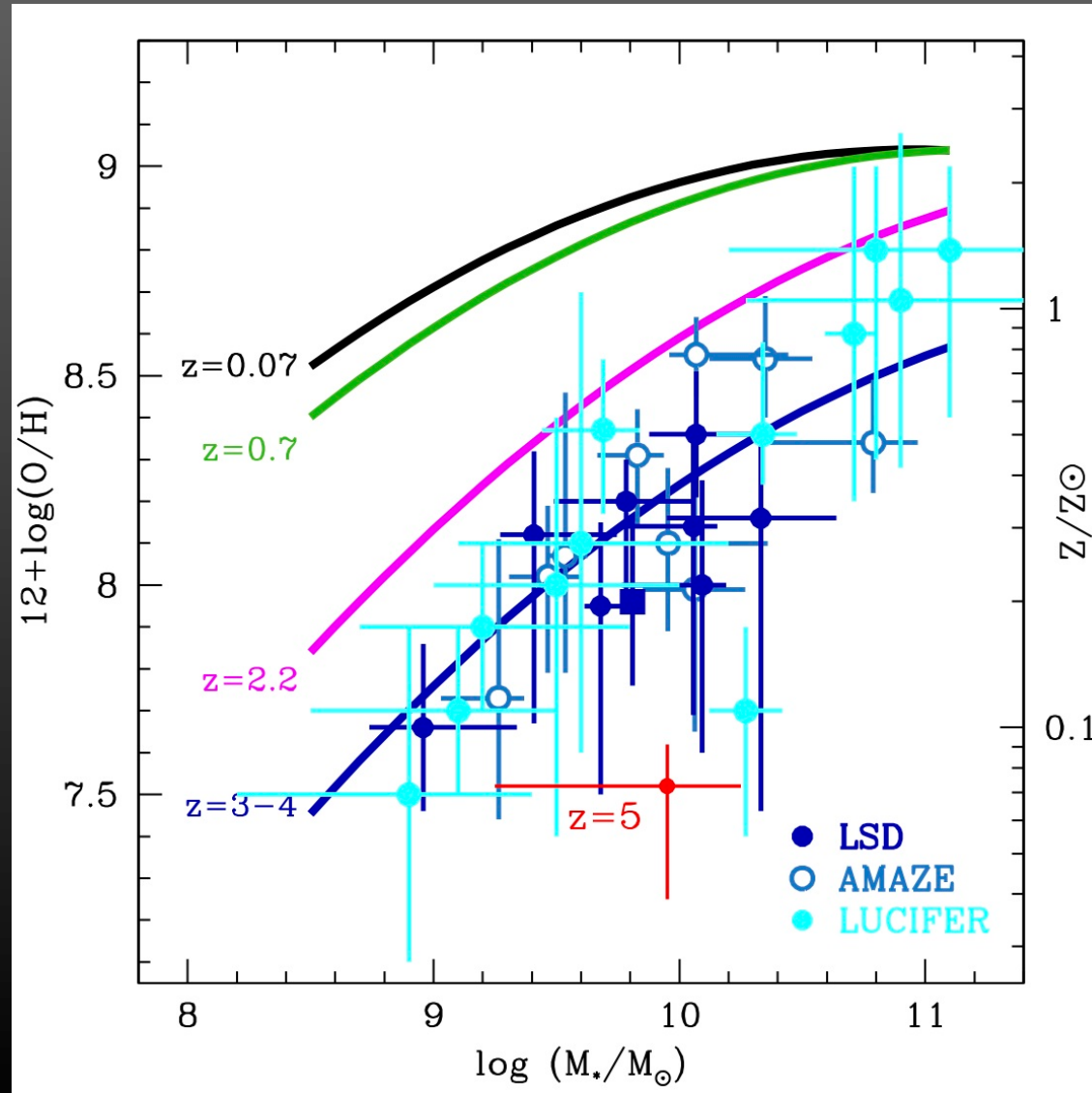
LUCI - Near-IR multi-object spectroscopy

metallicity: fundamental parameter to understand galaxy formation, in-outflows, feedback.....

near-IR spectroscopy necessary at $z > 1$
5-10 hr/obj are necessary



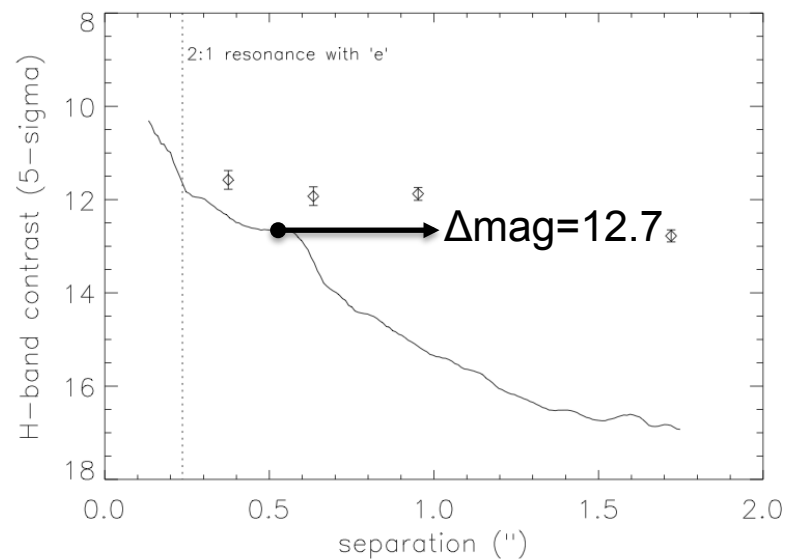
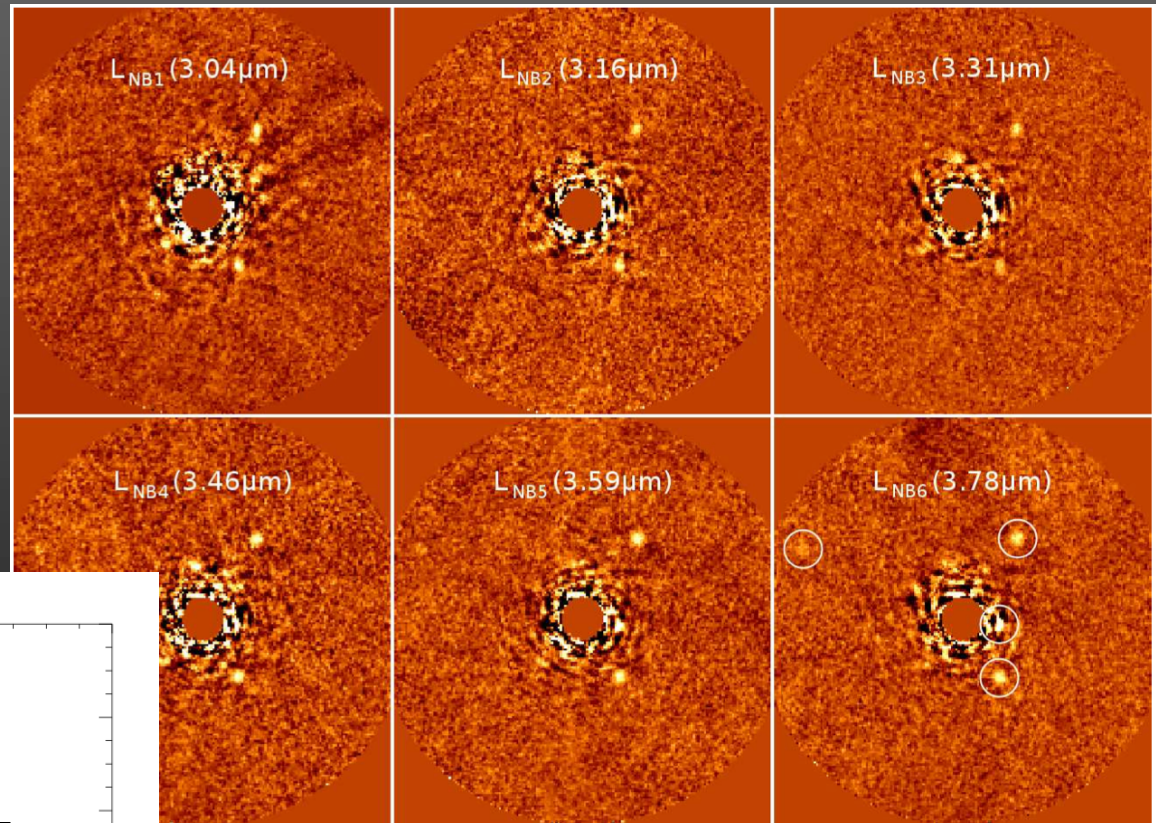
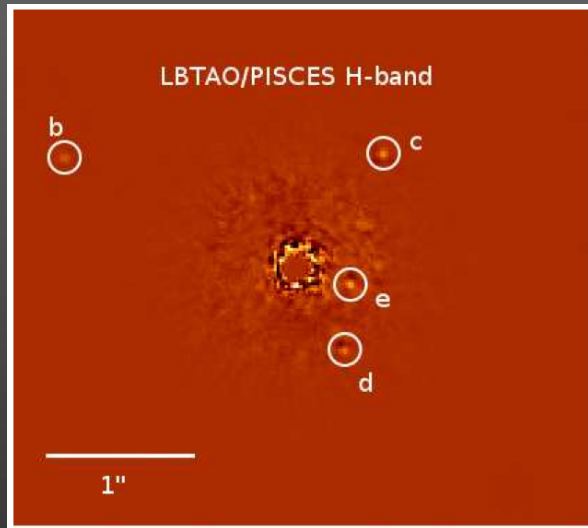
LUCI - Near-IR multi-object spectroscopy



Cresci et al.:

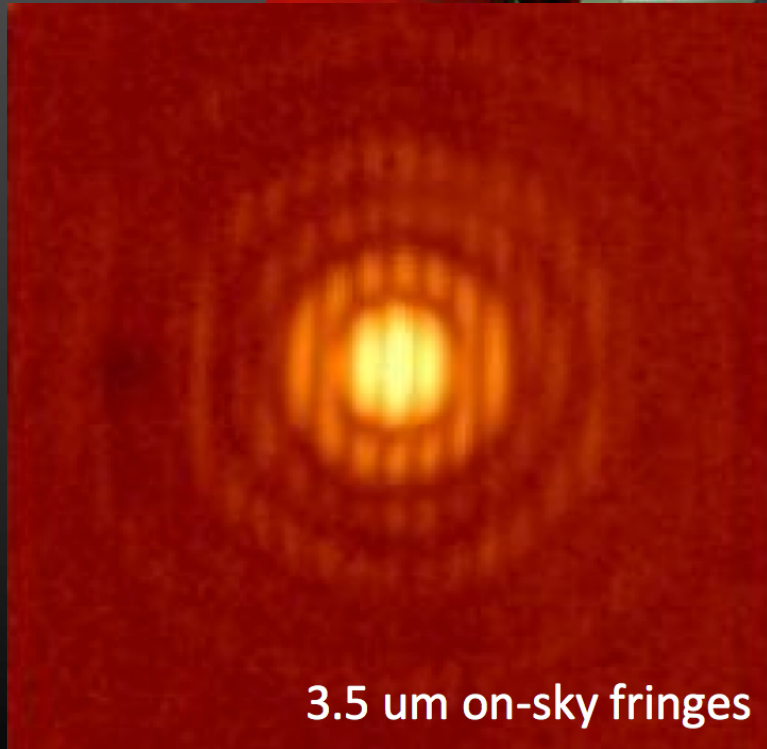
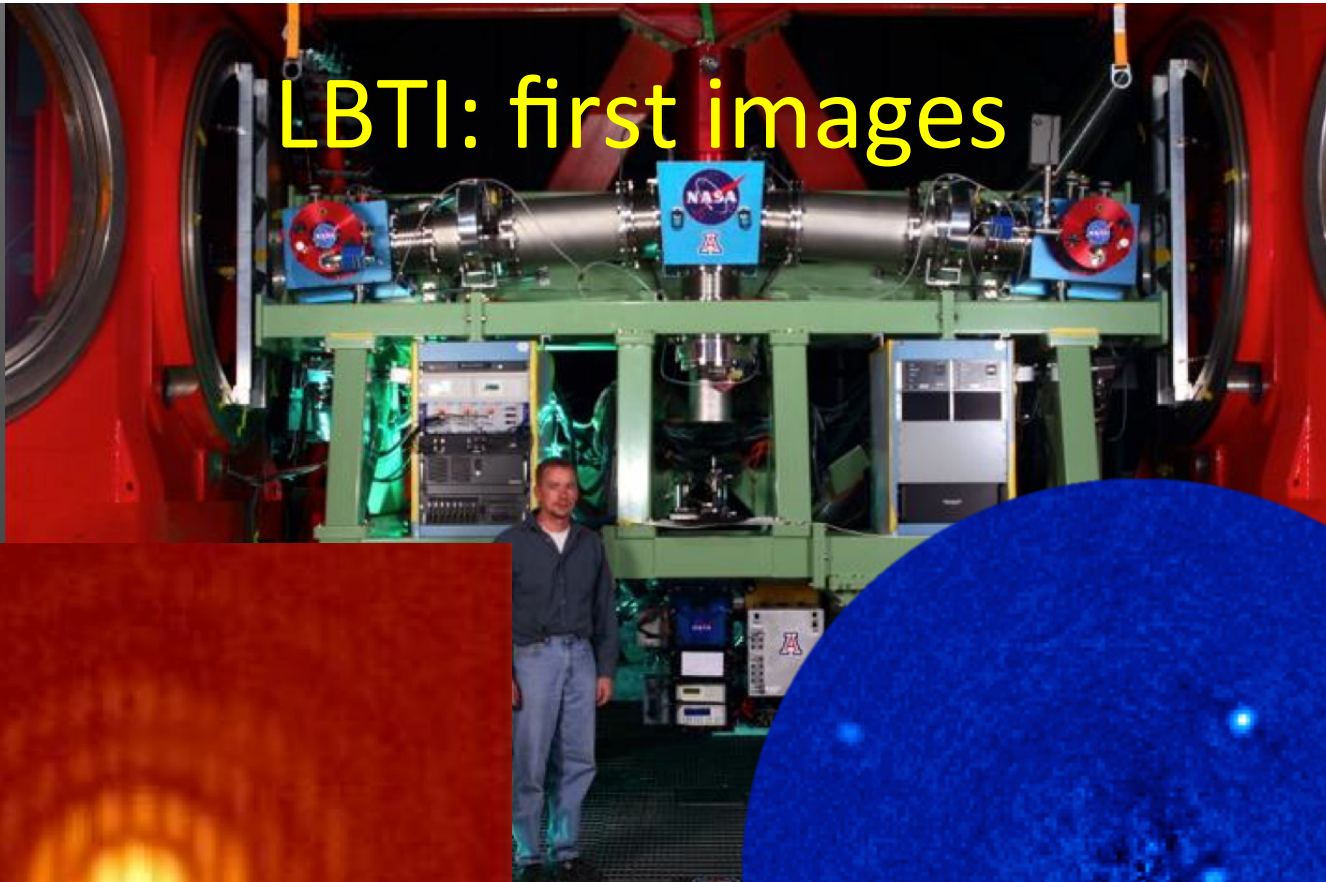
- evolution of the mass-metallicity relation
- evolution of the FMR
- central role of gas infall

FLAO+LBTI: Planets: direct imaging



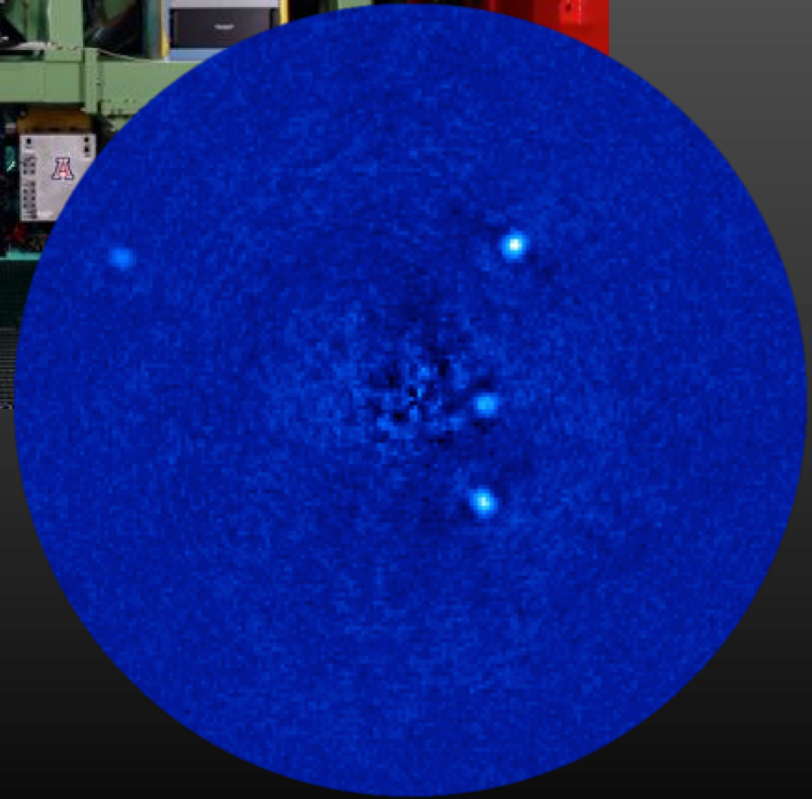
Esposito, Mesa et al 2012
Skemer et al 2012, 2014

LBTI: first images



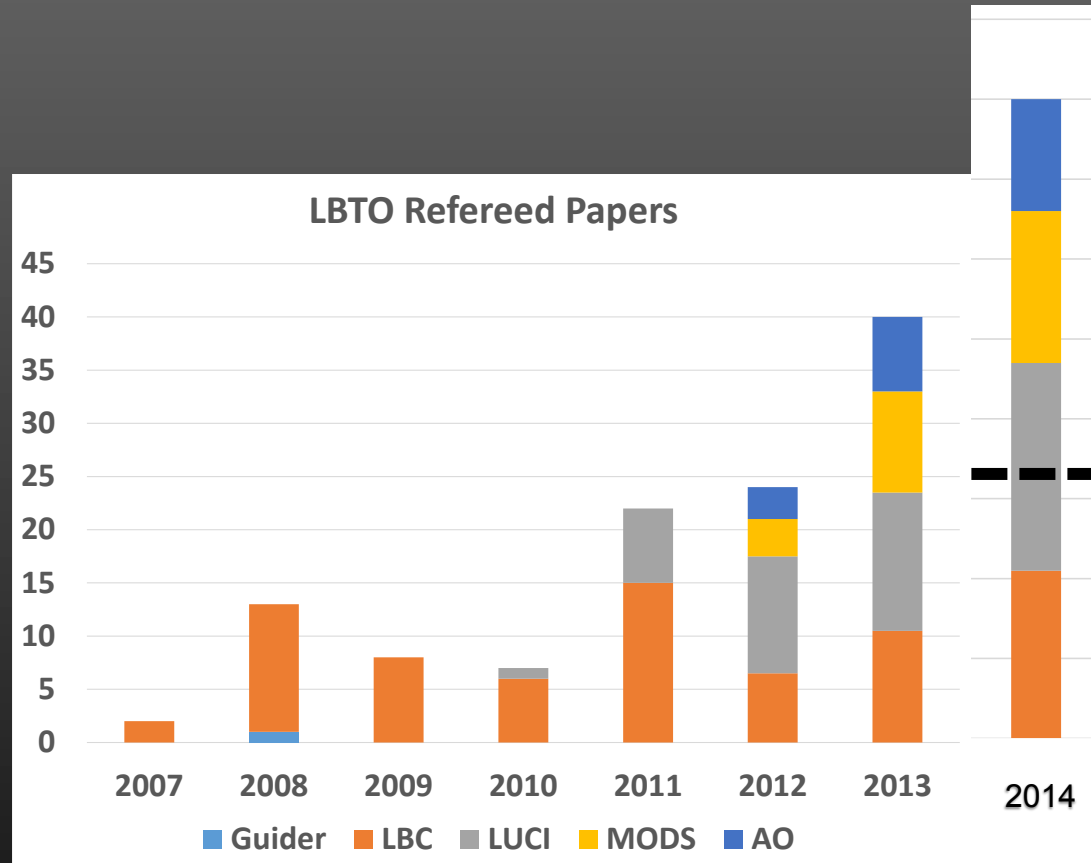
3.5 μm on-sky fringes

first interferometric images



first coronagraphic image

Publications (with referee)



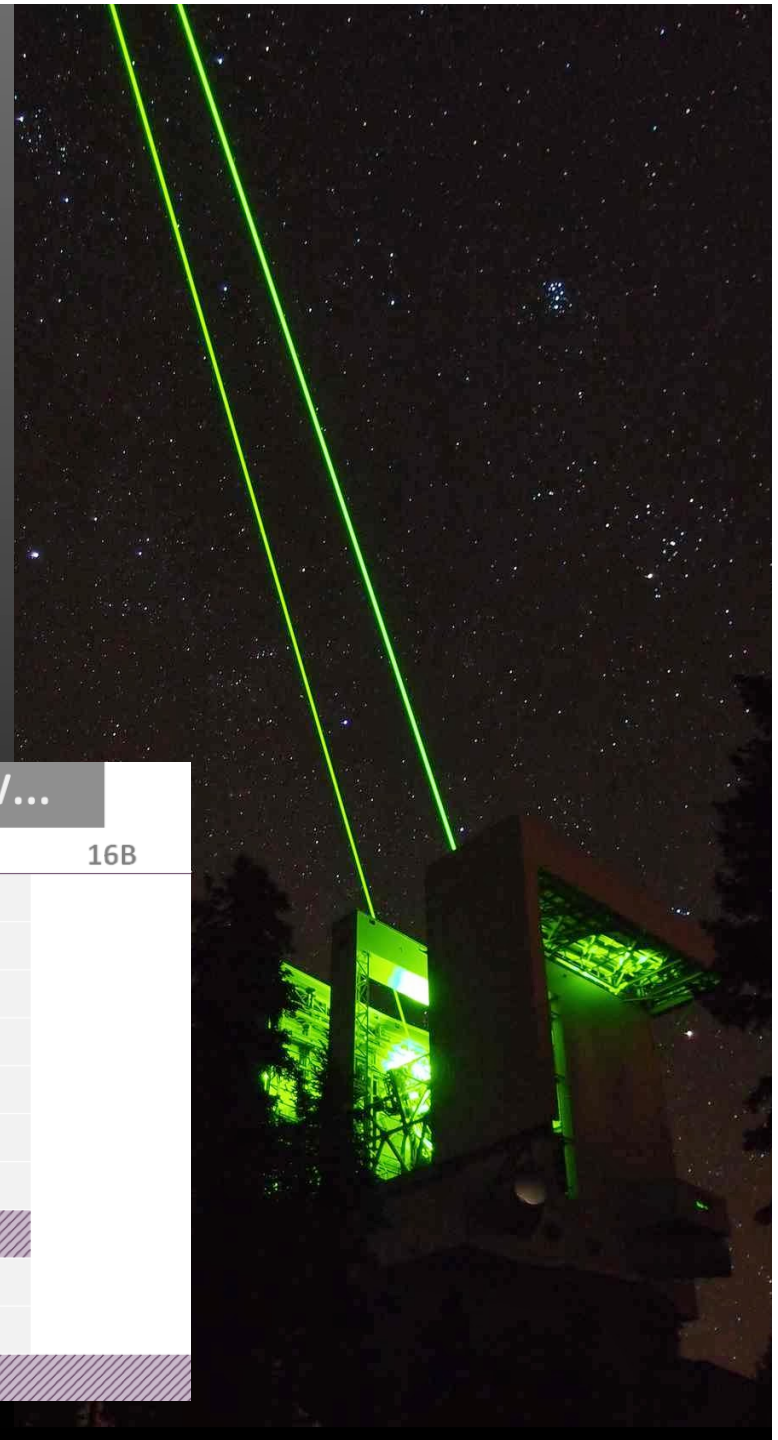
VLT= 170 pap/tel (80 at 6 years of age)

Keck = 155 pap/tel (95 at 6 years of age)

On-going commissioning

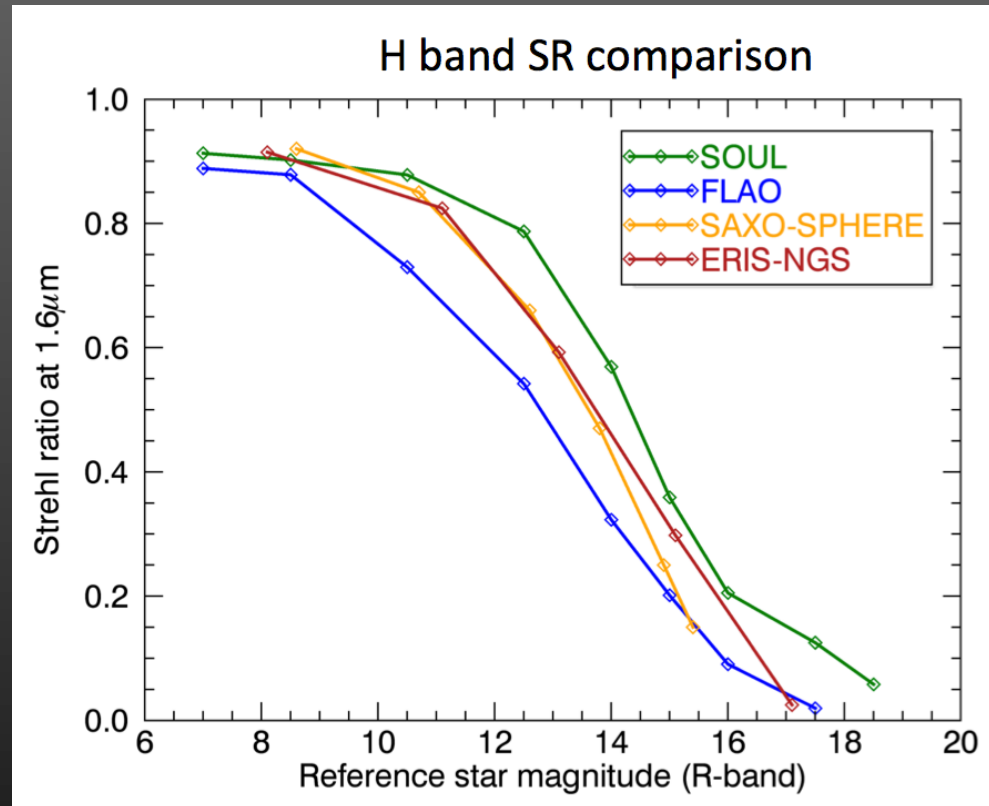
- ARGO (GLAO)
- LBTI
- MODS2
- LUCI2 (seeing-lim and AO)
- LINC-NIRVANA pathfinder
- PEPSI

Commissioning	A preliminary view...					
	14A	14B	15A	15B	16A	16B
LUCI2-DL						
LUCI2-AO						
LUCI1-Retrofit						
MODS2						
MODS1-Retrofit						
ARGOS						
PEPSI-Spectro						
PEPSI-Polarimetry						
LBTI						
PATHFINDER						
LN						



Future developments

- **SOUL**: Upgrade of the AO system
sky coverage: x10
contrast: x3
- **SHARK**: high-resolution optical and near-IR imager
resol $\sim 8\text{mas}$ in R



LBT Impact

- **Money for INAF !**
~2ME to INAF from GMT, ESO, UA,
Magellan
- **Money for italian industries !**
~ 40ME from ESO, GMT,
- **Future for astronomy**
X-AO is possible, ELT is possible

