



# IfA-UH Report

G. Hasinger  
Subaru Users Committee Meeting  
Atami, January 19, 2015

# Daniel K. Inouye Solar Telescope (DKIST) on Haleakala close to completion

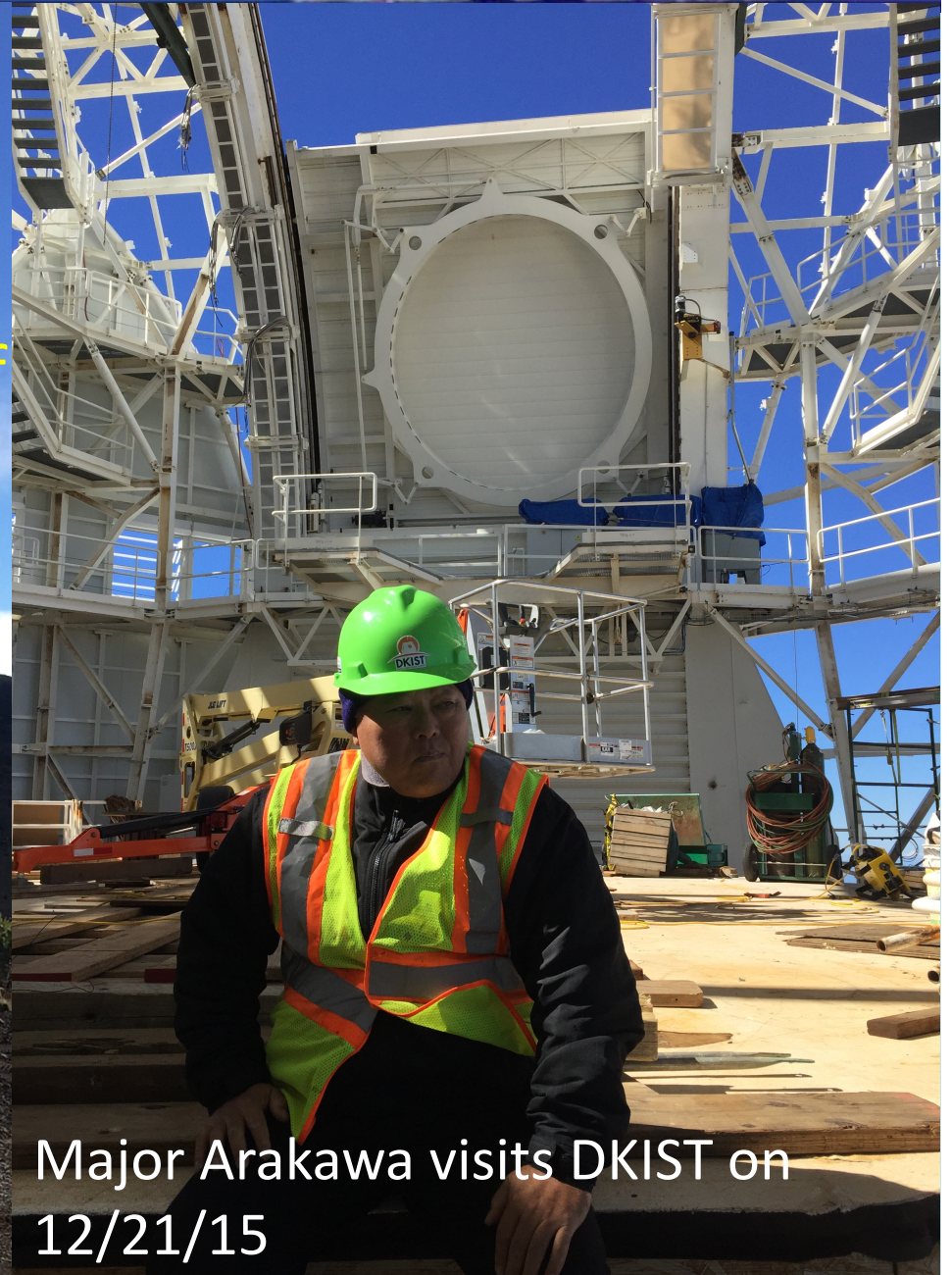


# Maui DKIST Matters !

Major and law enforcement agencies are very supportive of astronomy.



Last DKIST Wide load arrives on Haleakala summit on 08/19/15



Major Arakawa visits DKIST on 12/21/15

- Pan-STARRS1 continues to be the most prolific discovery machine for Near-Earth Objects. Operations fully funded by NASA.
- Has discovered a 400m asteroid zooming by Earth on Halloween
- PS1 Science Consortium Survey images shipped to STScI for public

## Halloween Asteroid 2015 TB145

Arecibo Radar Image. IRTF spectrum looks like a dead comet.

in February 2016

- Expect to double NEOs

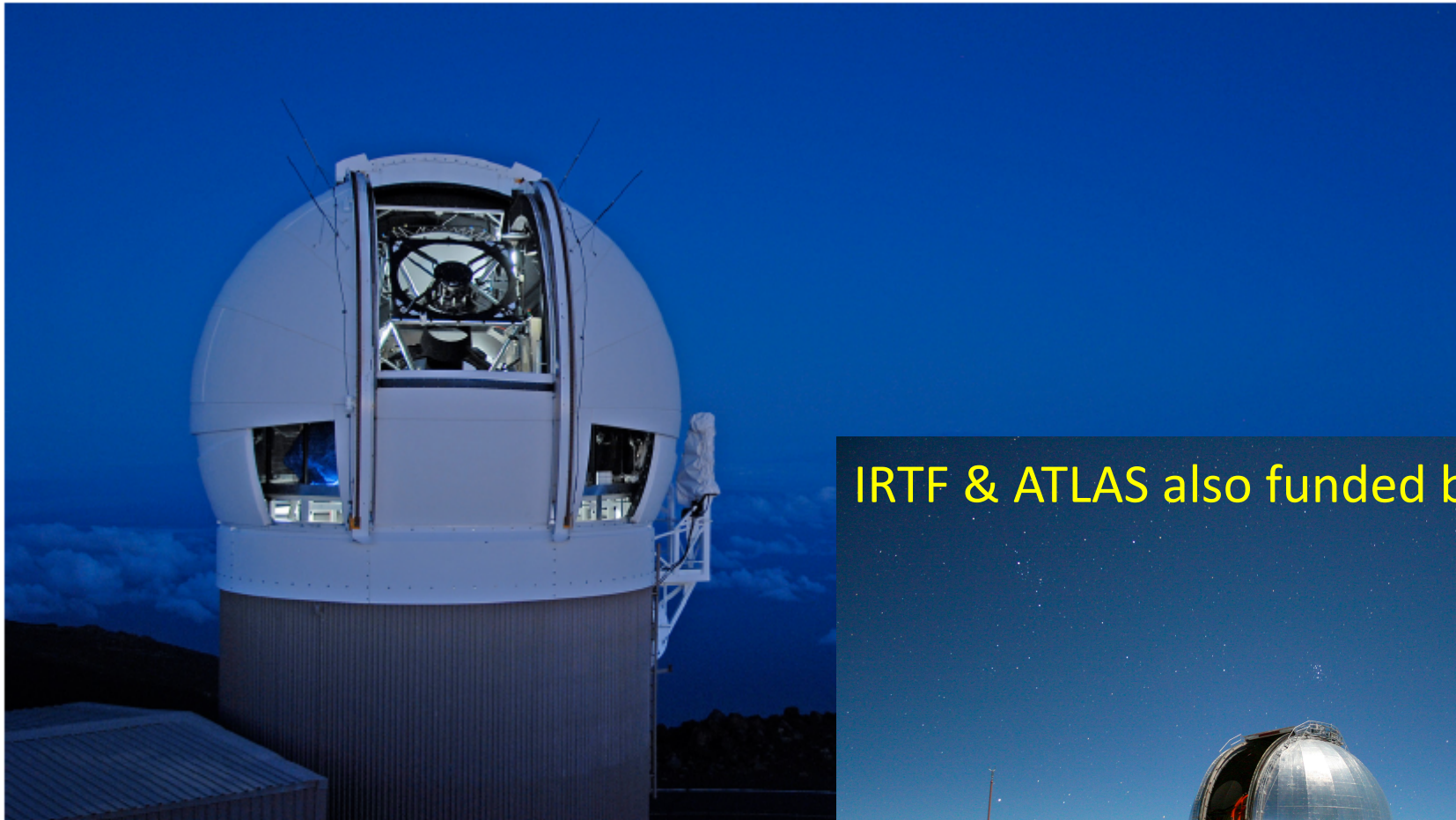


400 m Diameter, 1.3 x lunar distance





**Jan 7, 2016 press release: A new NASA Office for “Planetary Defense” to Coordinate Asteroid Detection, Hazard Mitigation. Lindley Johnson & Kelly Fast**

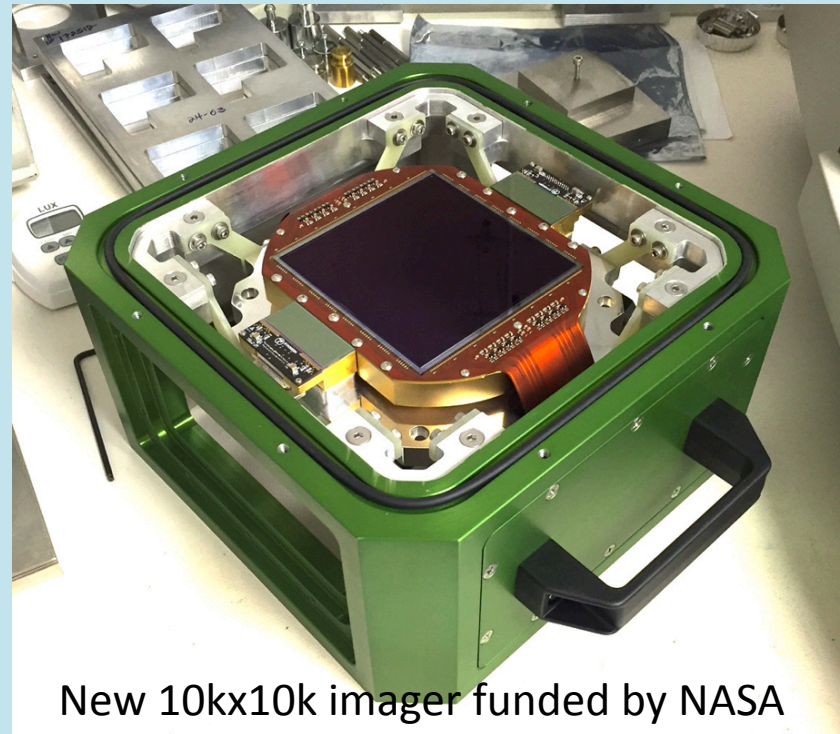


**IRTF & ATLAS also funded by NASA**

The Panoramic Survey Telescope & Rapid Response System (PSTARRS) at Haleakala, Hawaii has produced the most near-Earth object discoveries in 2015. Image credit: University of Hawaii Institute for Astronomy /

# UH88" Telescope: Major Refurbishment

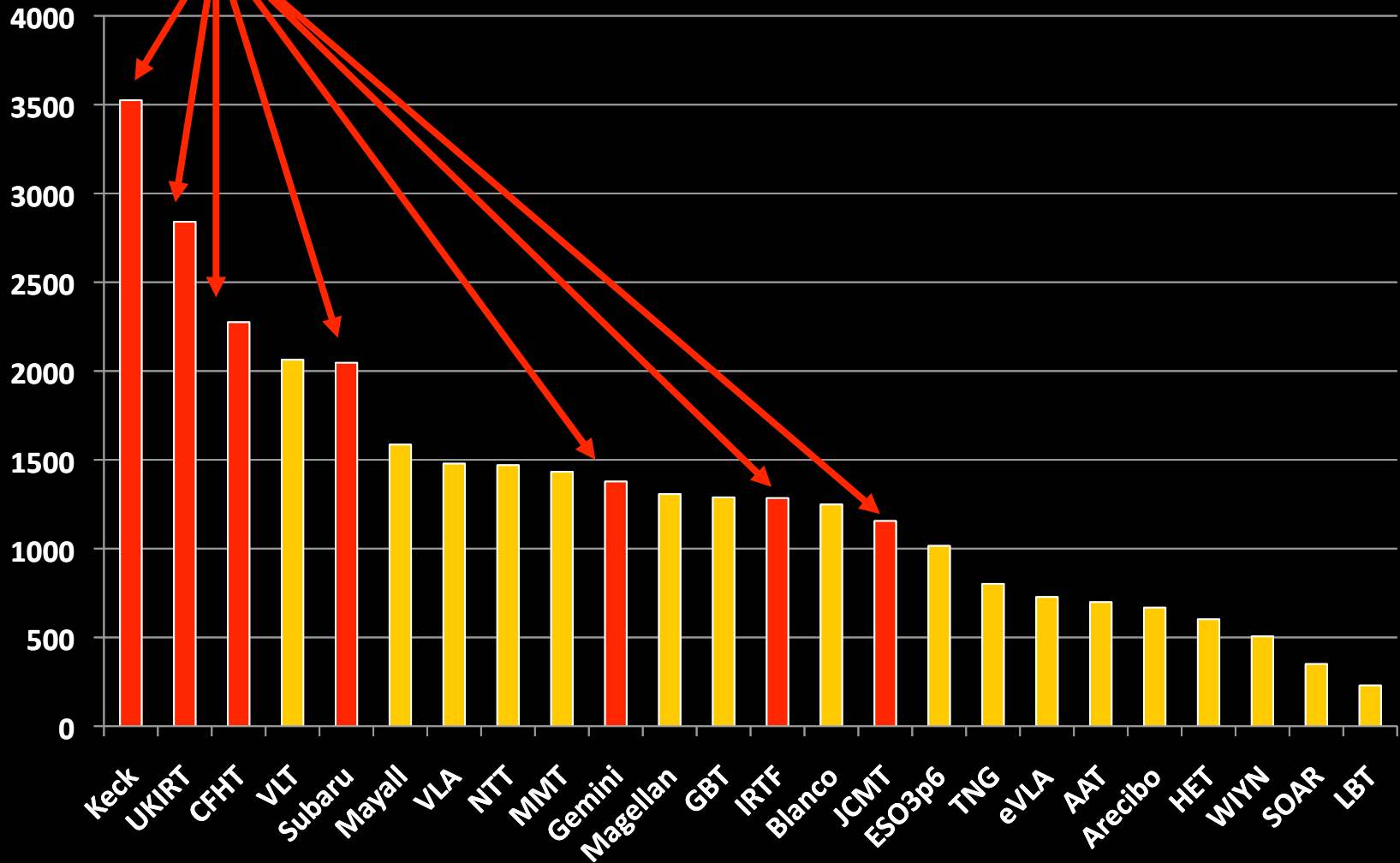
- Renovate the 40 years old telescope and enclosure
- Turn the telescope into a robotic laser guide star AO facility
- Combination of State funds, UH funds, IfA private funds, NSF, NASA
- Install a copy of the Robo-AO system and an efficient IFS
- Fast follow-up ATLAS, Pan-STARRS and LSST discoveries
- Grad/undergrad Student telescope



New 10kx10k imager funded by NASA

# MAUNAKEA OBSERVATORIES

## Total Science Impact per Telescope (2015 – Courtesy D. Crabtree)



# Fight against light pollution

Discussions with Honolulu Mayor and State Transportation Department director

Great concern about increased light pollution from 4000K LEDs (see e.g. LA).

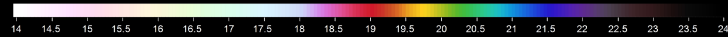
City of Honolulu agreed to change LEDs from 4000K to 3000K.

DOT agreed to change Maui highway lights and airports and harbors to 3000K.

Oahu highway lights will remain at 4000K, but fully shielded and regulated.

No problem on Hawaii Island because of the strict lighting ordinance.

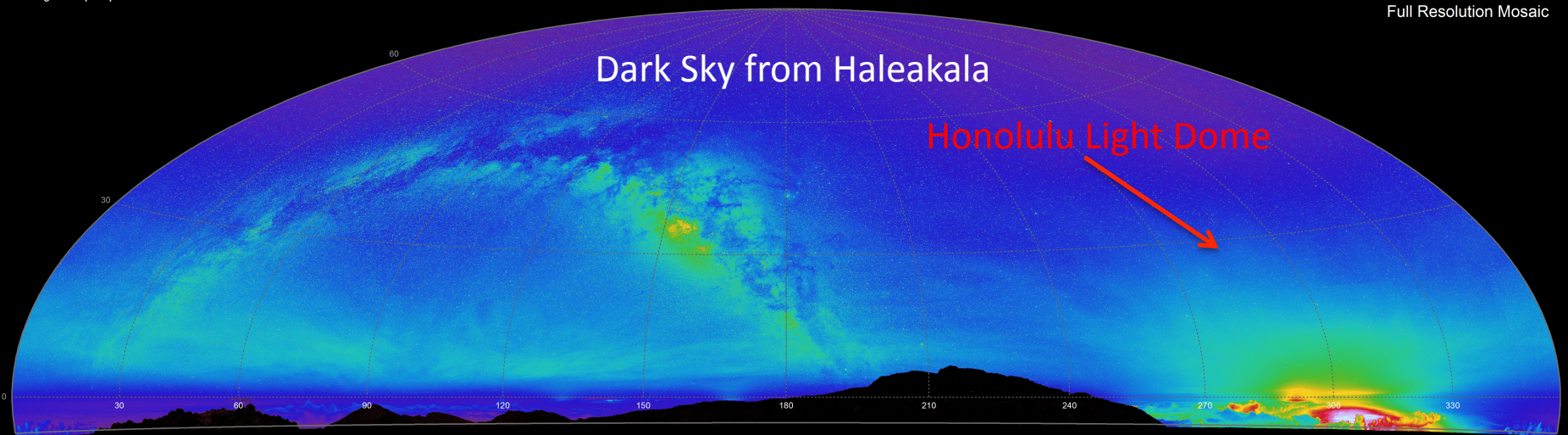
With help of legislators the bill for the Starlight Reserve Committee will be introduced (Richard Wainscoat was the chair and spends a large amount of time and energy)



Visual Magnitudes per square arc-second

Haleakala NP Halakula Overlook June 14, 2012 22.9 hours LMT

Full Resolution Mosaic



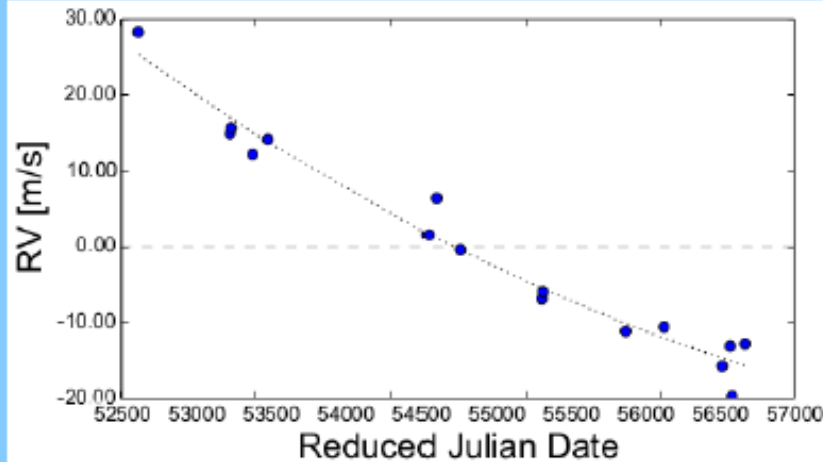
U.S. National Park Service  
Night Skies Program

Data collected by: B Meadows, J Briggs  
Data processed by: B Meadows

Hammer-Aitoff Equal Area Projection

# Direct Imaging Search for Companion Giant Planets and Brown Dwarfs to Sun-like Stars with Radial Velocity Drifts using Subaru/SCEXAO

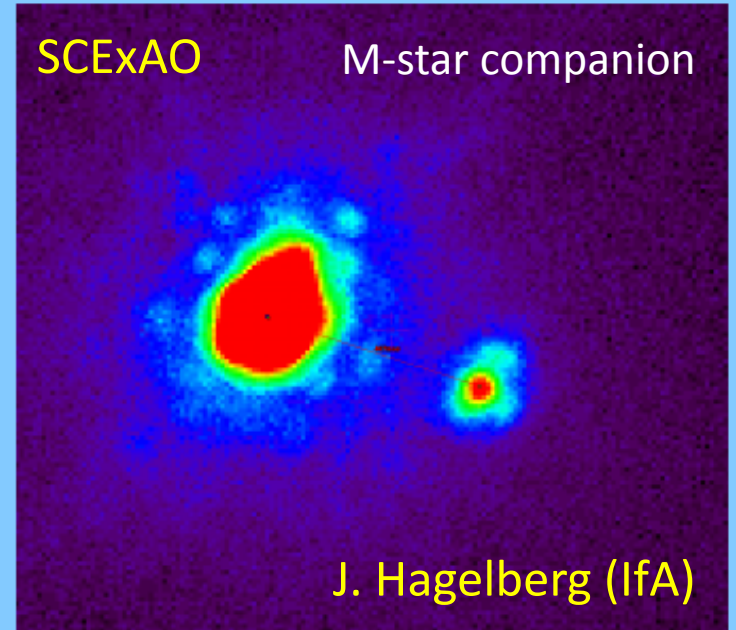
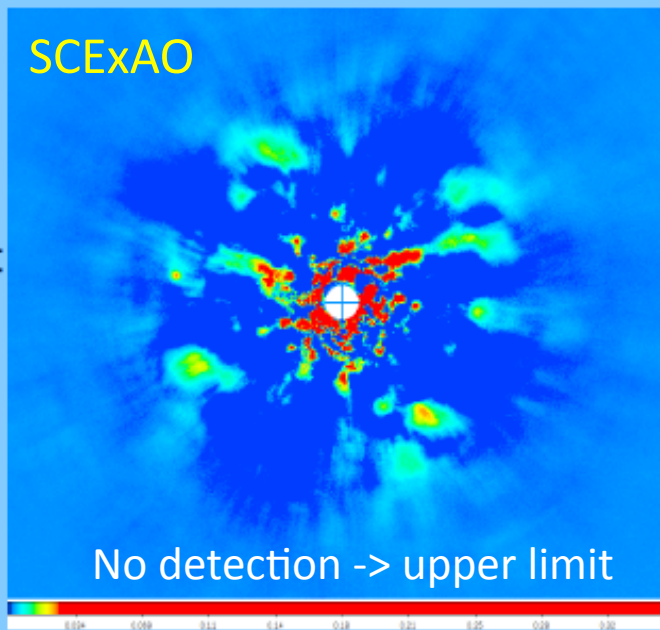
Elodie/Sophie  
radial velocity  
drift over 12  
years



Janis Hagelberg<sup>1</sup>  
N. Jovanovic<sup>2,3</sup>, J. Lozi<sup>2</sup>,  
O. Guyon<sup>2,4,5</sup>, M. Liu<sup>1</sup>,  
and the Sophie Consortium  
(1) IfA, University of Hawai'i, USA  
(2) NAOJ, Subaru Telescope, USA  
(3) Department of Physics, Macquarie Univ., Australia  
(4) Steward Observatory, Univ. of Arizona, USA  
(5) College of Optical Sciences, Univ. of Arizona, USA

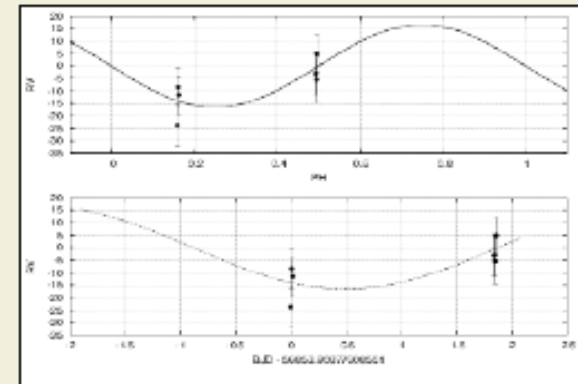
Direct detection of  
the companions at  
the origin of the drift

First result in press:  
Hébrard et al. 2016



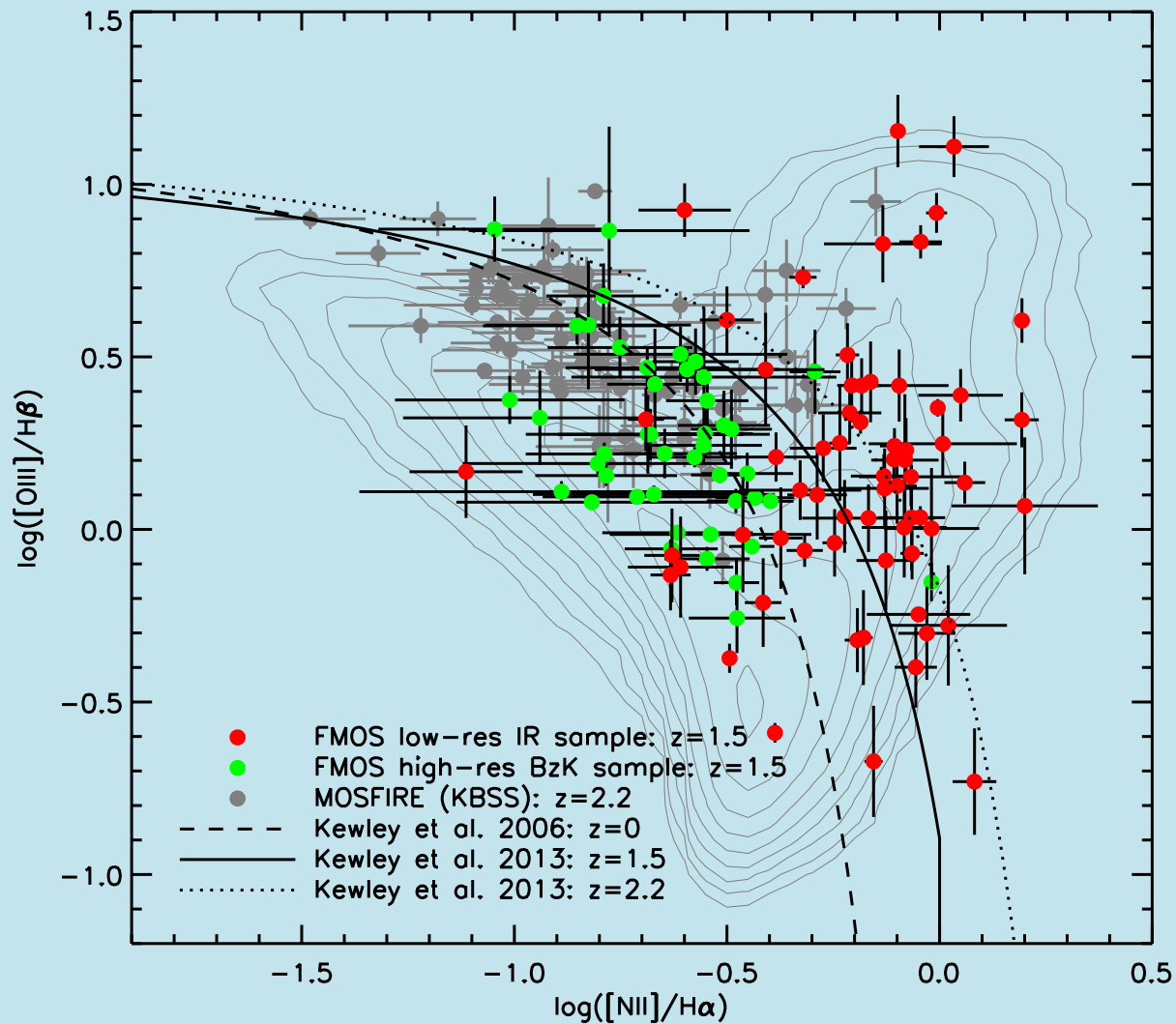
## Subaru/HDS Follow-up of Transiting Planet Candidates from the HAT Ground-Based Transit Surveys

- Goal: confirming and characterizing transiting Neptune-size planets around bright/nearby stars and/or transiting planets around M dwarfs.
  - Very few of these are currently known.
  - These would be among the best targets for atmospheric characterization.
- Subaru Observations to Date involving IFA researchers (B. Fulton):
  - 1n in 2014A (PI Bakos, Gemini time-exchange)
    - Observed 3 targets, all are consistent with 5-10 m/s variations (Neptunes; example at right), need more RVs for confirmation.
  - 4x0.5n in 2015B (PI Sato, Subaru open use).
    - Lost 0.5n due to weather.
    - Observed 5 targets (2 M Dwarfs, 1 late K dwarf, and 2 candidate Neptunes). 1 target has since been set aside as a triple star system false positive, the other 4 are active/promising candidates.
    - Reductions of Subaru/HDS observations are in progress.



BJ Fulton (IfA)

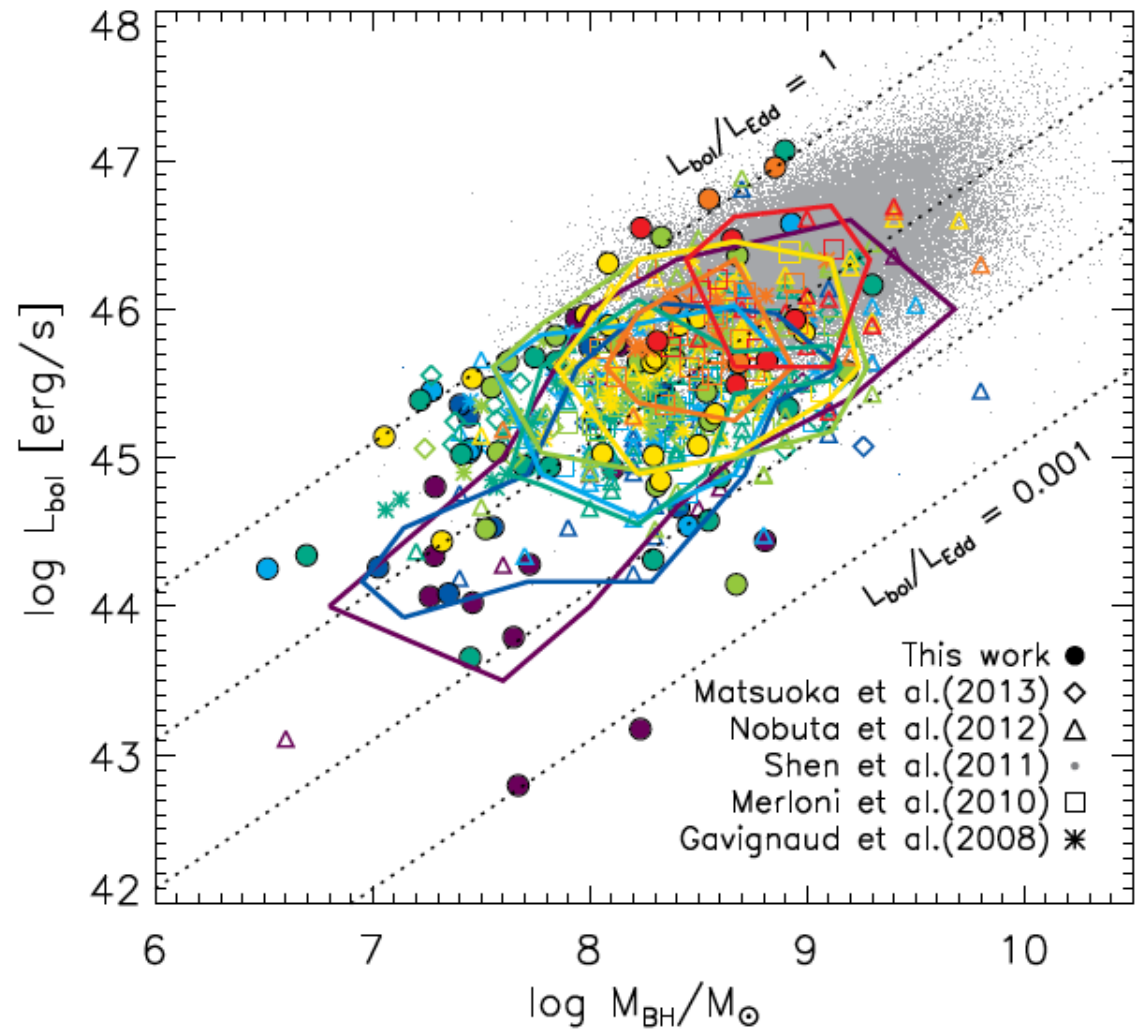
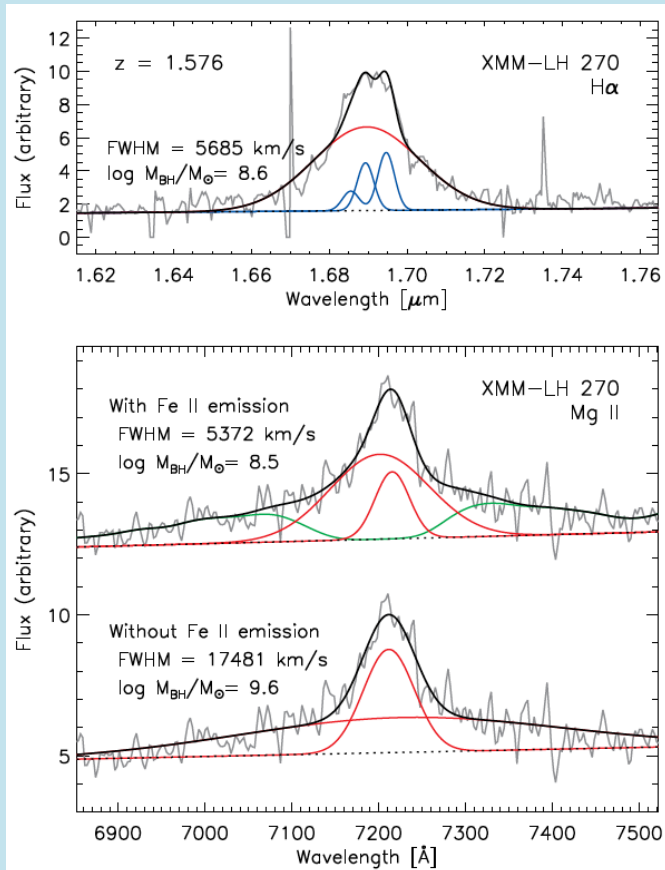
# FMOS COSMOS Spectroscopy @ $z \sim 1.5$



BPT Diagram

# FMOS ECDFS/LH Broad Line Spectroscopy

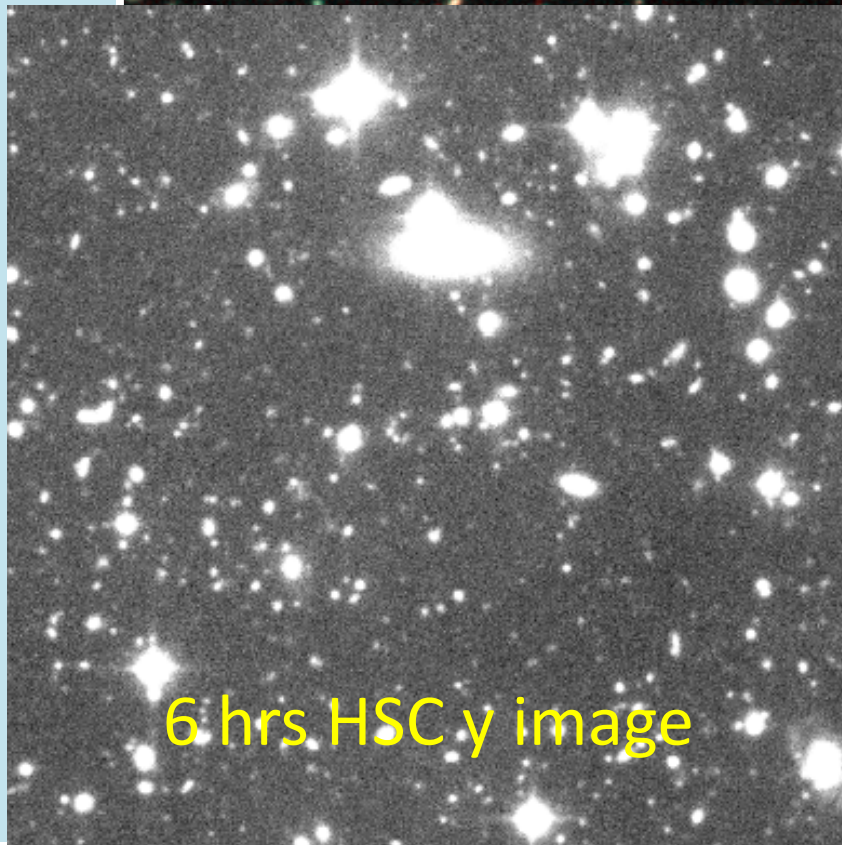
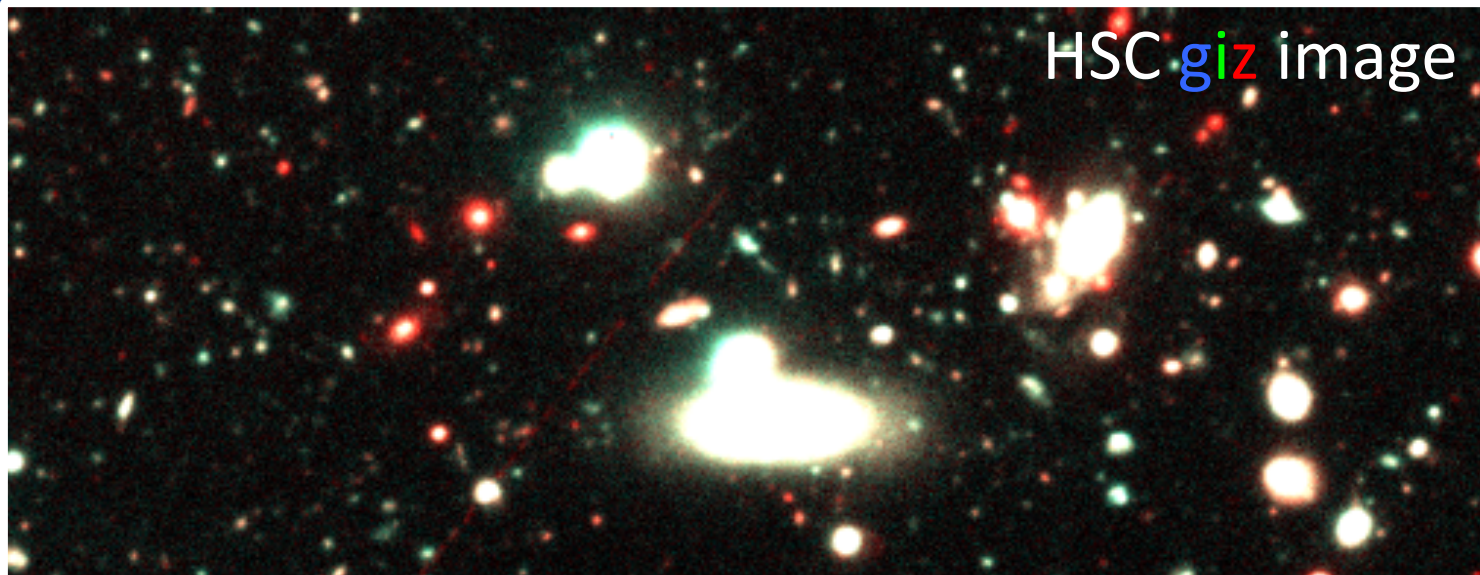
Detailed fits to broad- and narrow line components in H $\alpha$ , H $\beta$ , and MgII. Determination of BH masses



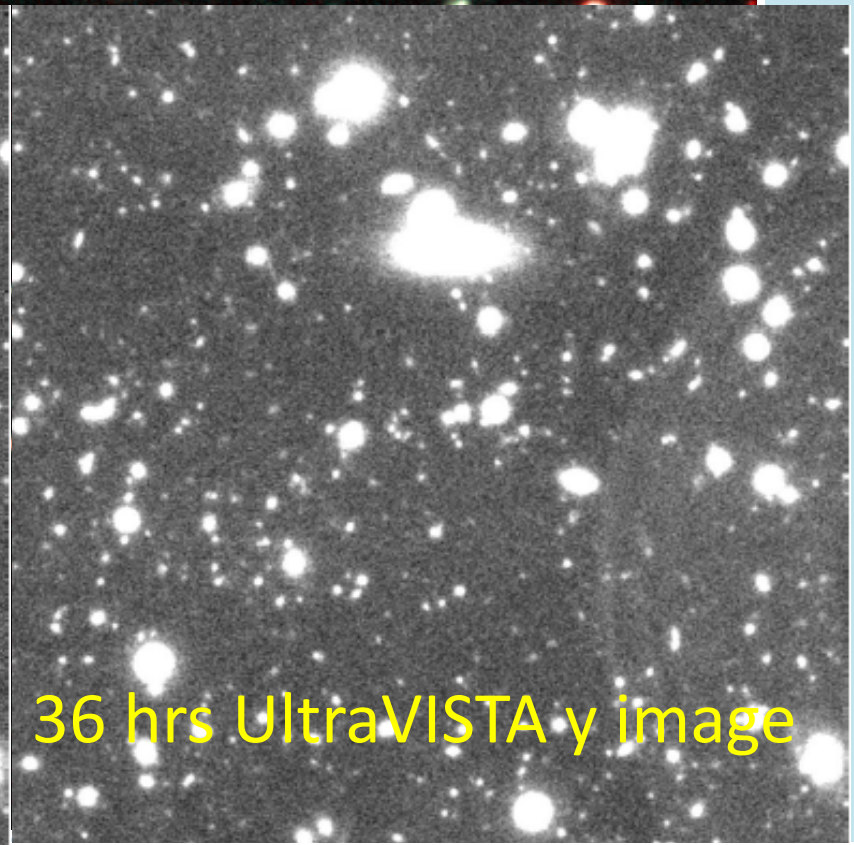
# COSMOS Subaru HSC Observations

Band	Exposure	Date	Seeing
y	1:30 h:m	3/25/14	0.8-1.1"
i	2:44	3/26/14	0.5-0.7"
i	2:14	1/16/15	0.6-1.0"
y	4:28	1/17/15	0.7-1.2"
z	2:14	1/18/15	0.6-1.0"
g	2:16 h:m	1/19/15	0.9-1.2"
y_tot	6:00		0.7-1.2"
i_tot	4:58		0.5-1.0"

HSC *giz* image



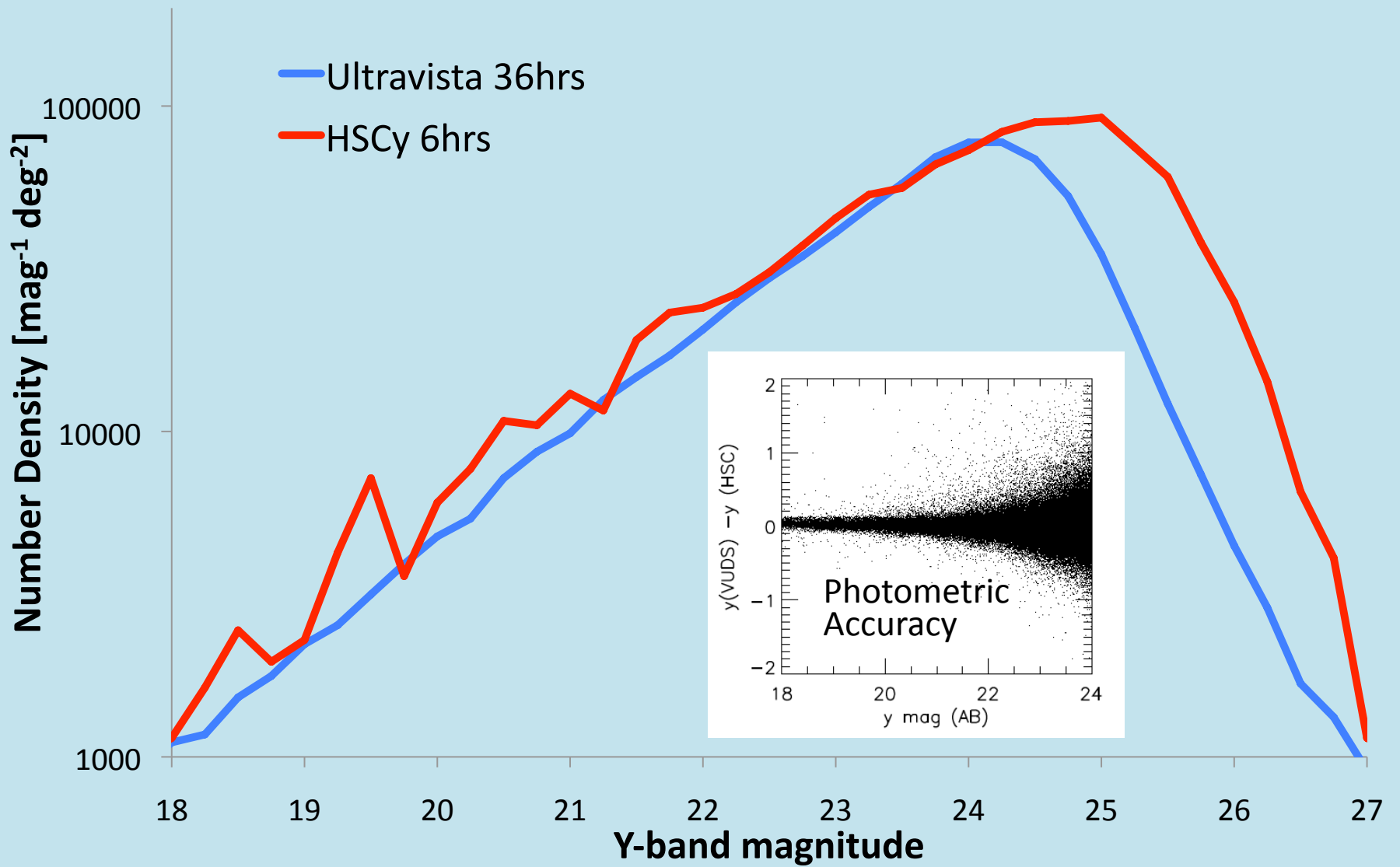
6 hrs HSC *y* image



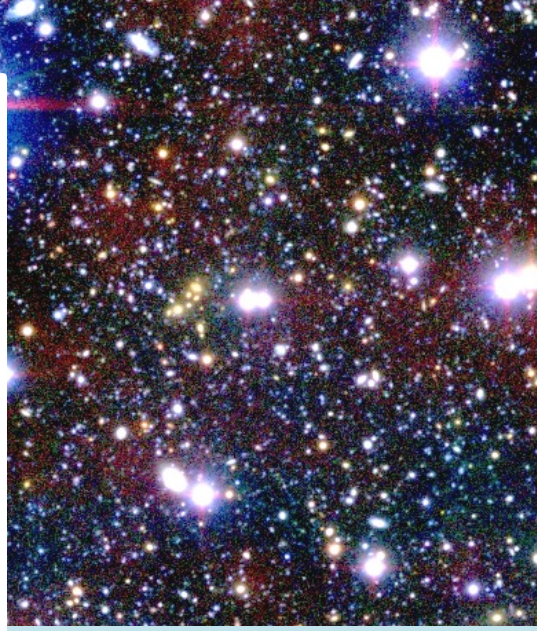
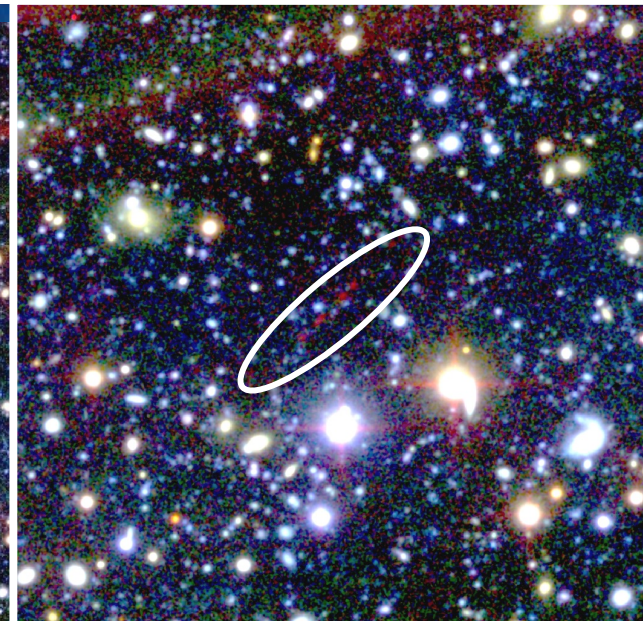
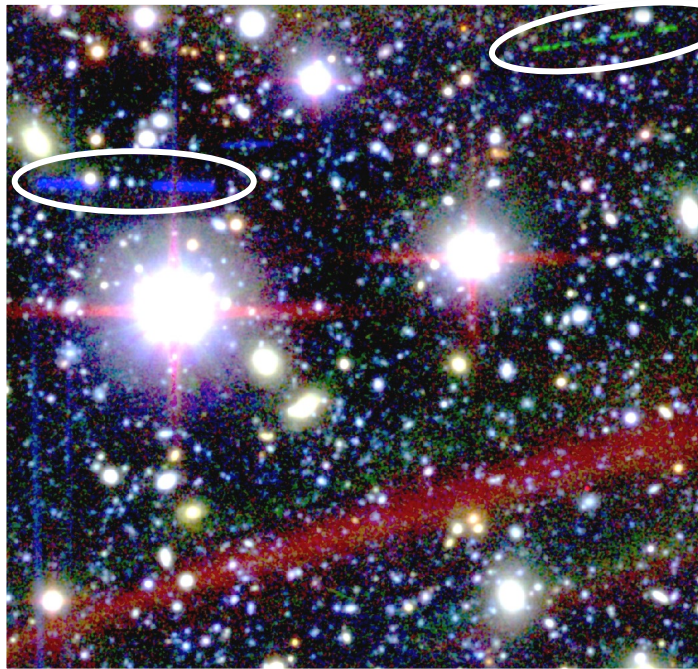
36 hrs UltraVISTA *y* image

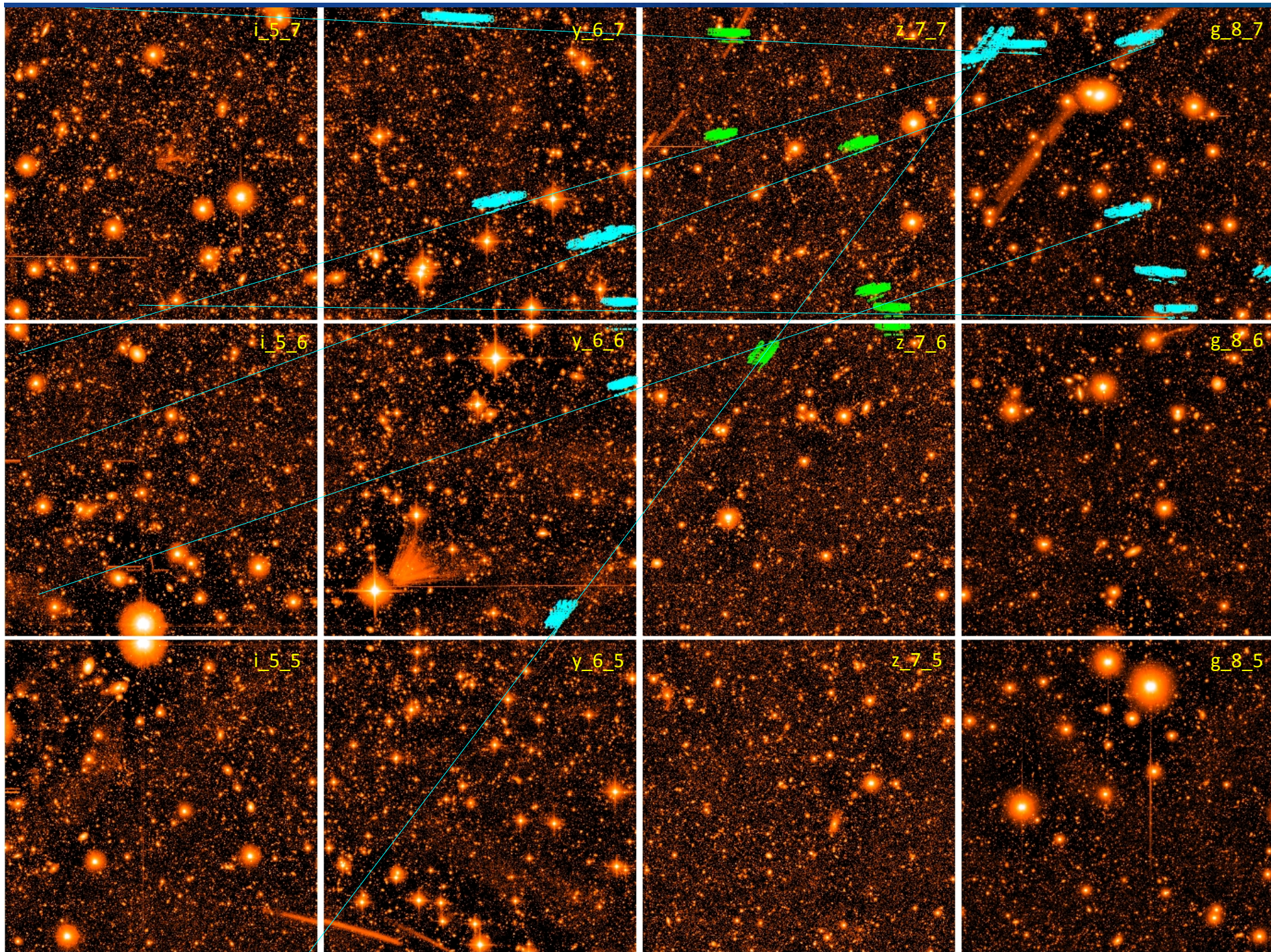


# Deepest y-band wide-field image



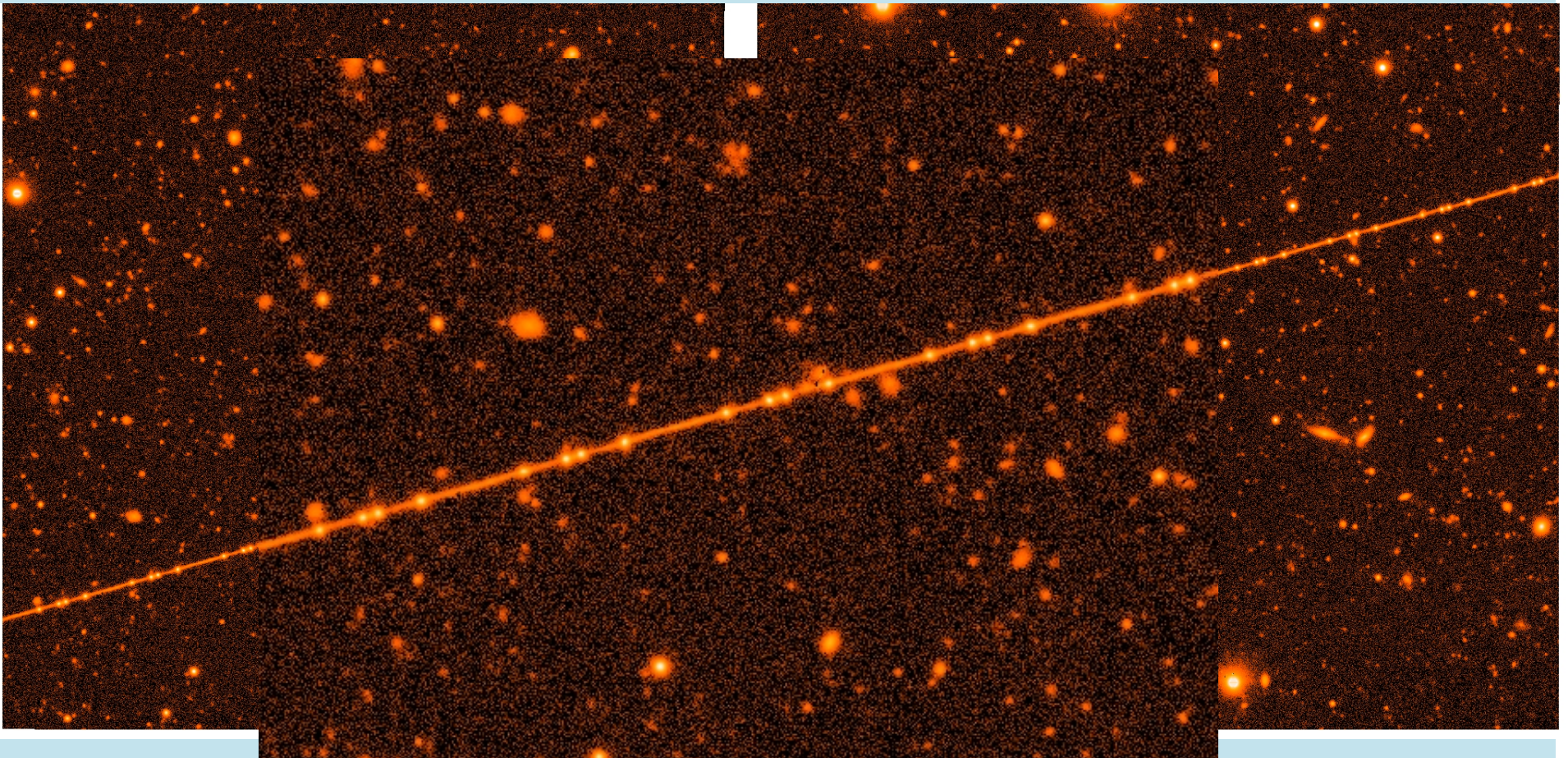
HSC *g**i**y* image



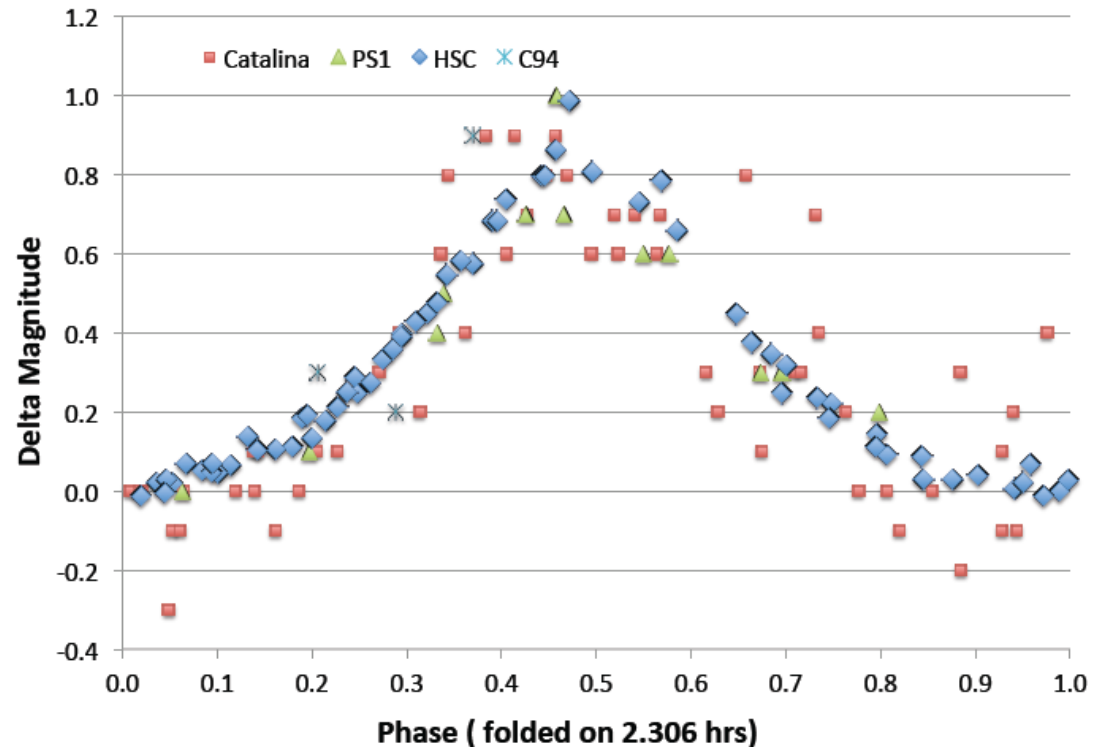
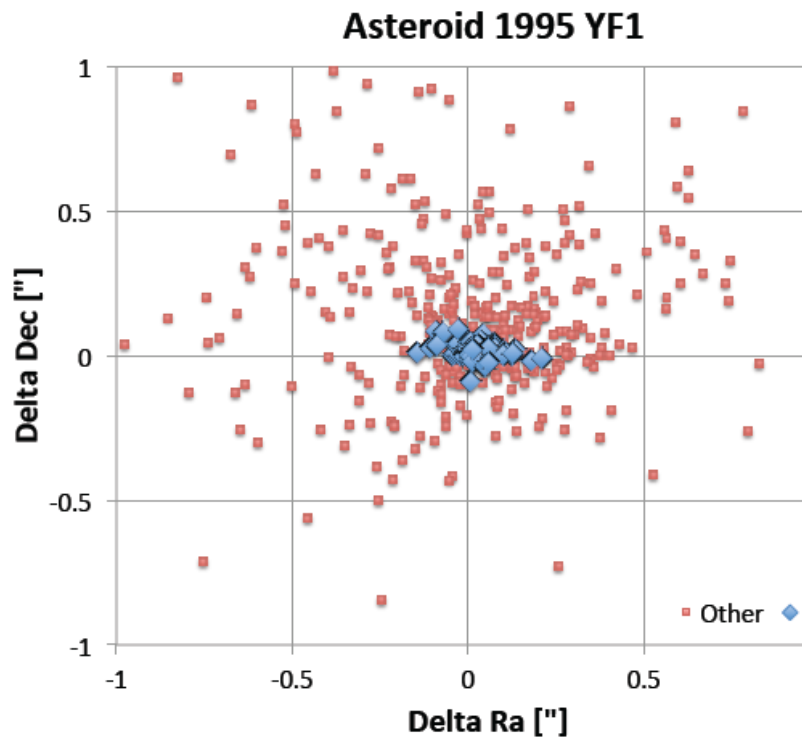




# Satellite Trails !



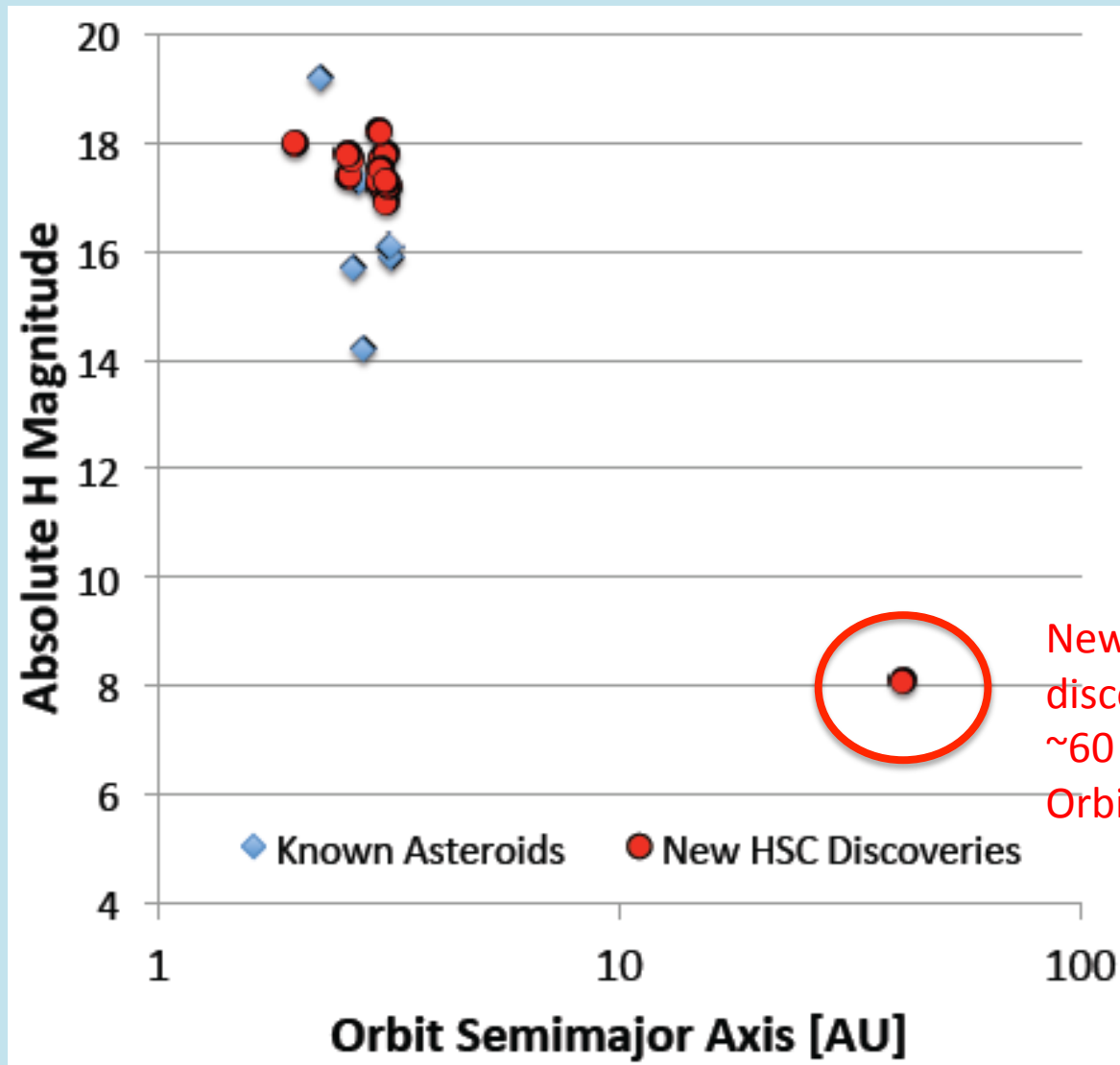
# Asteroid 1995 YF1



Subaru HSC data has excellent astrometric and photometric accuracy.  
Rotation period of that asteroid discovered in the HSC data.



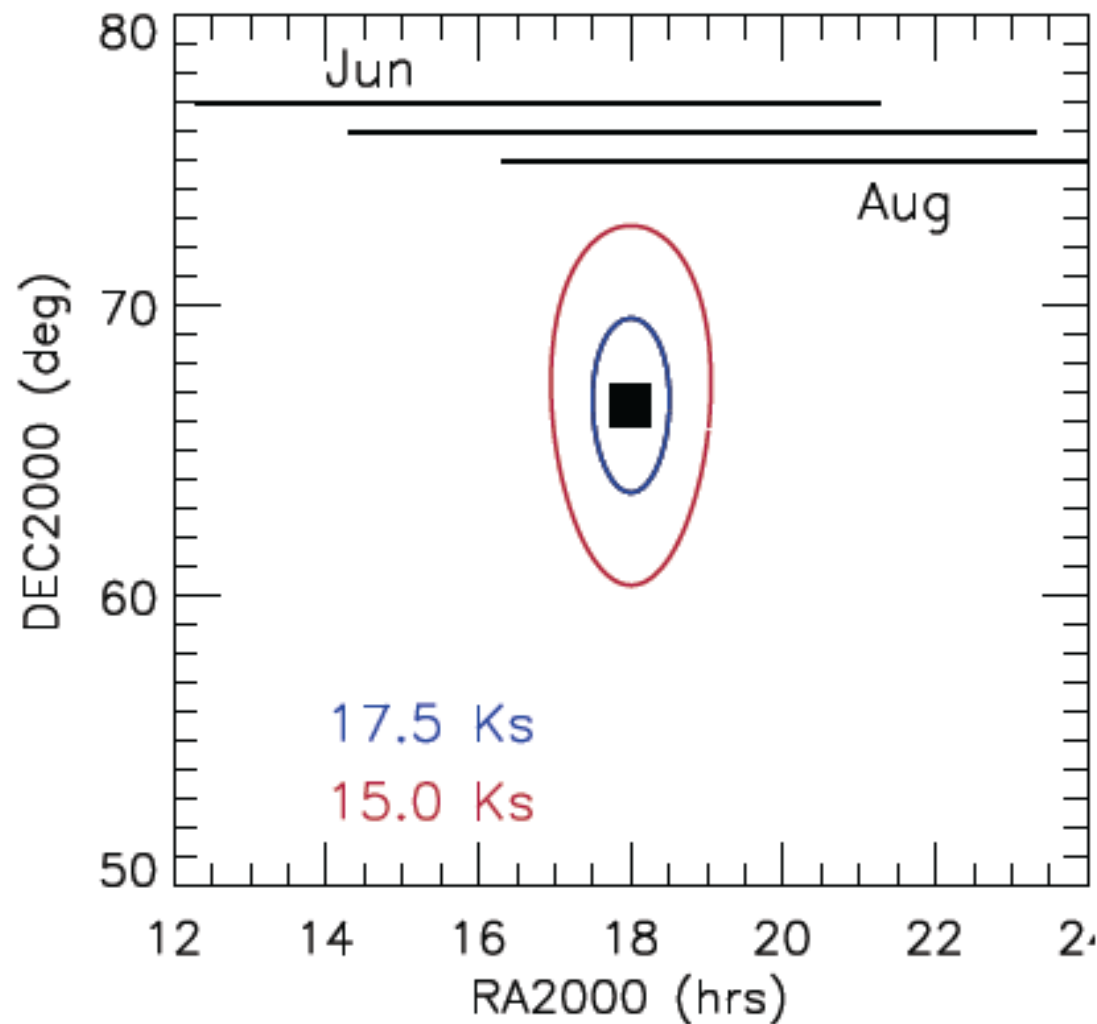
# Subaru Asteroid Data in COSMOS



New TNO/KBO  
discovered!  
~60 km object  
Orbit similar to Pluto



# The Hawaii EROsita Ecliptic-pole Survey



A new UH large program, about 50 nights on Subaru and CFHT over 3 years.

~120 square degrees centered on the North-Ecliptic Pole, where eROSITA (launch 2017) will have its deepest exposure time.

Collaboration with Russia

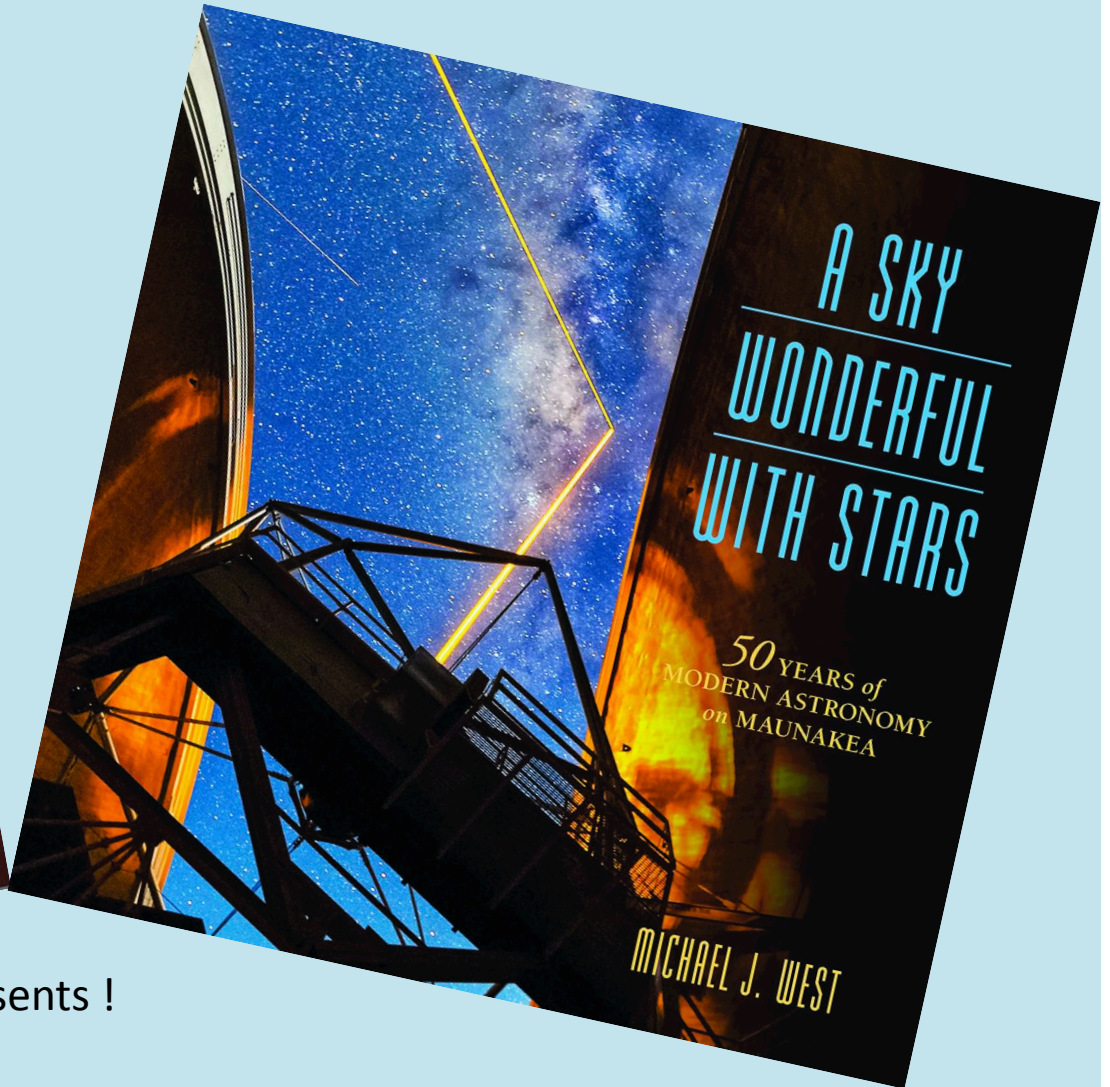
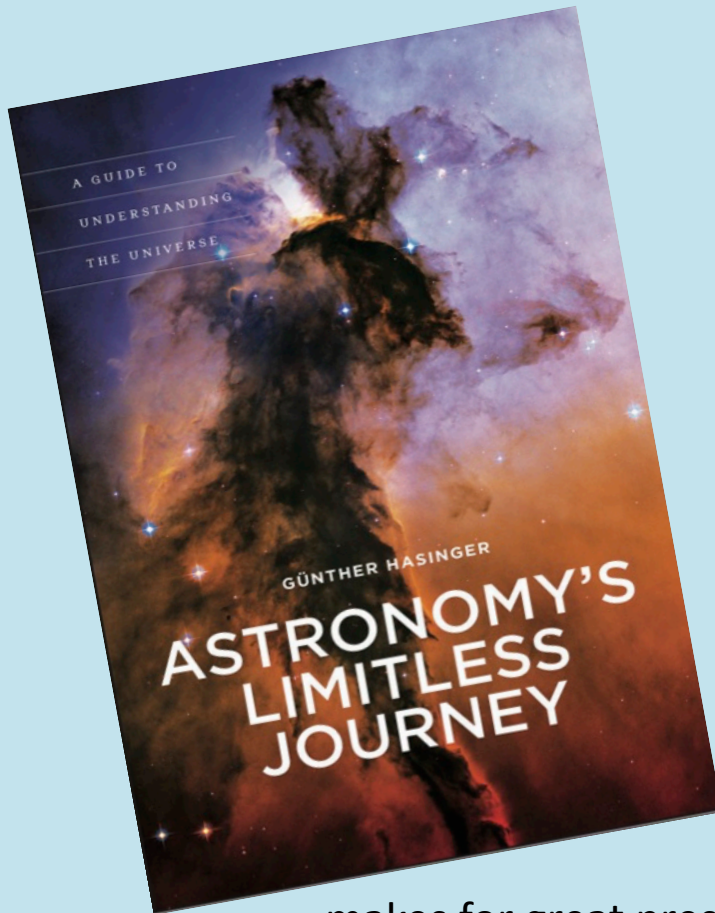
# HEROES

Table 1. HEROES specifications

Instrument (1)	Filter (2)	Redshift Range (3)	Exposure/pixel (mins) (4)	$5\sigma$ mag (5)
HSC SUBARU	g	...	10	26.5
	r	...	10	26.1
	i	...	15	25.7
	z	...	20	25.1
	y	...	20	24.4
	8140	5.67-5.75	10	24.1
	9210	6.53-6.62	20	24.0
WIRCAM CFHT	J	...	5	22.1
MEGAPRIME CFHT	U	...	20	25.5

# Cooperation with U Hawaii Press

We are planning an event at the upcoming Hawaii Book and Music Festival in Honolulu (4/16)



... makes for great presents !