

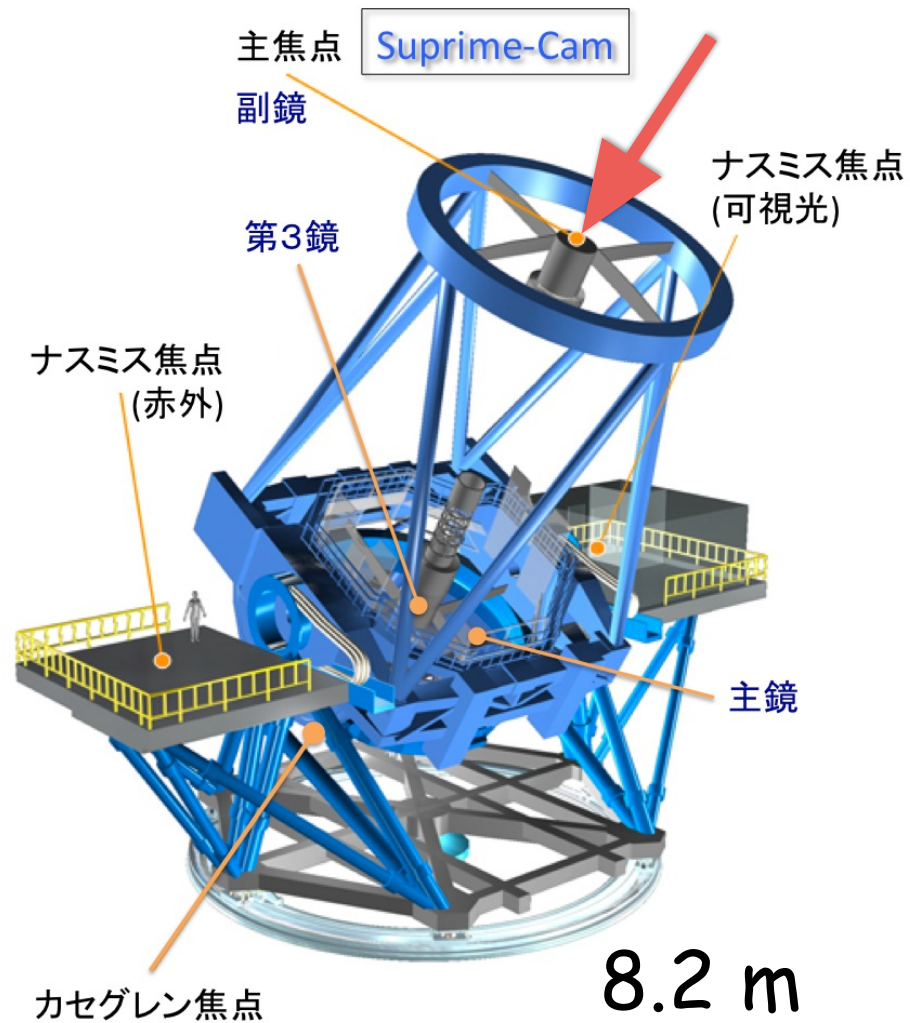
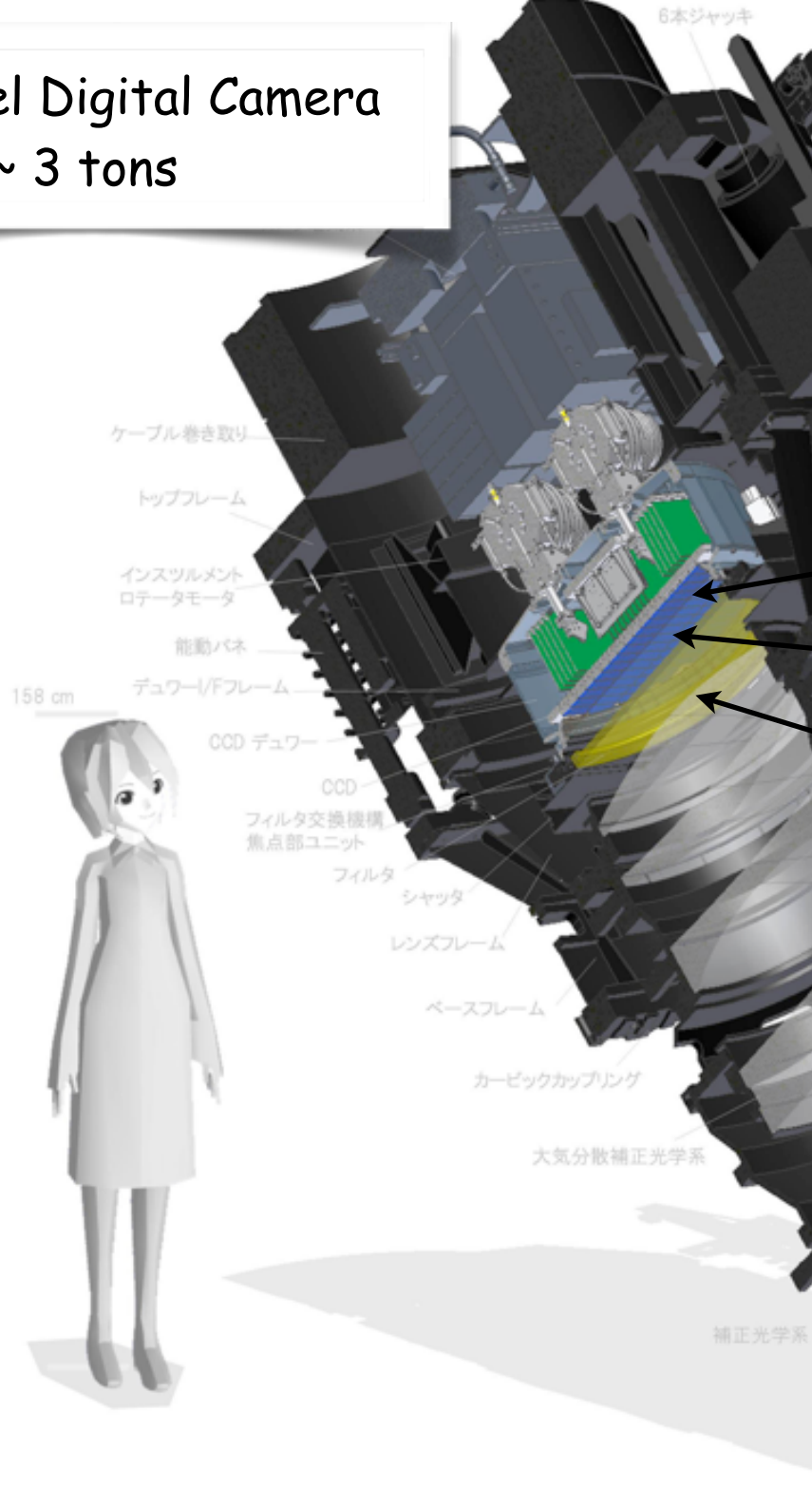
Status of SSP Survey

Satoshi Miyazaki

National Astronomical Observatory of Japan

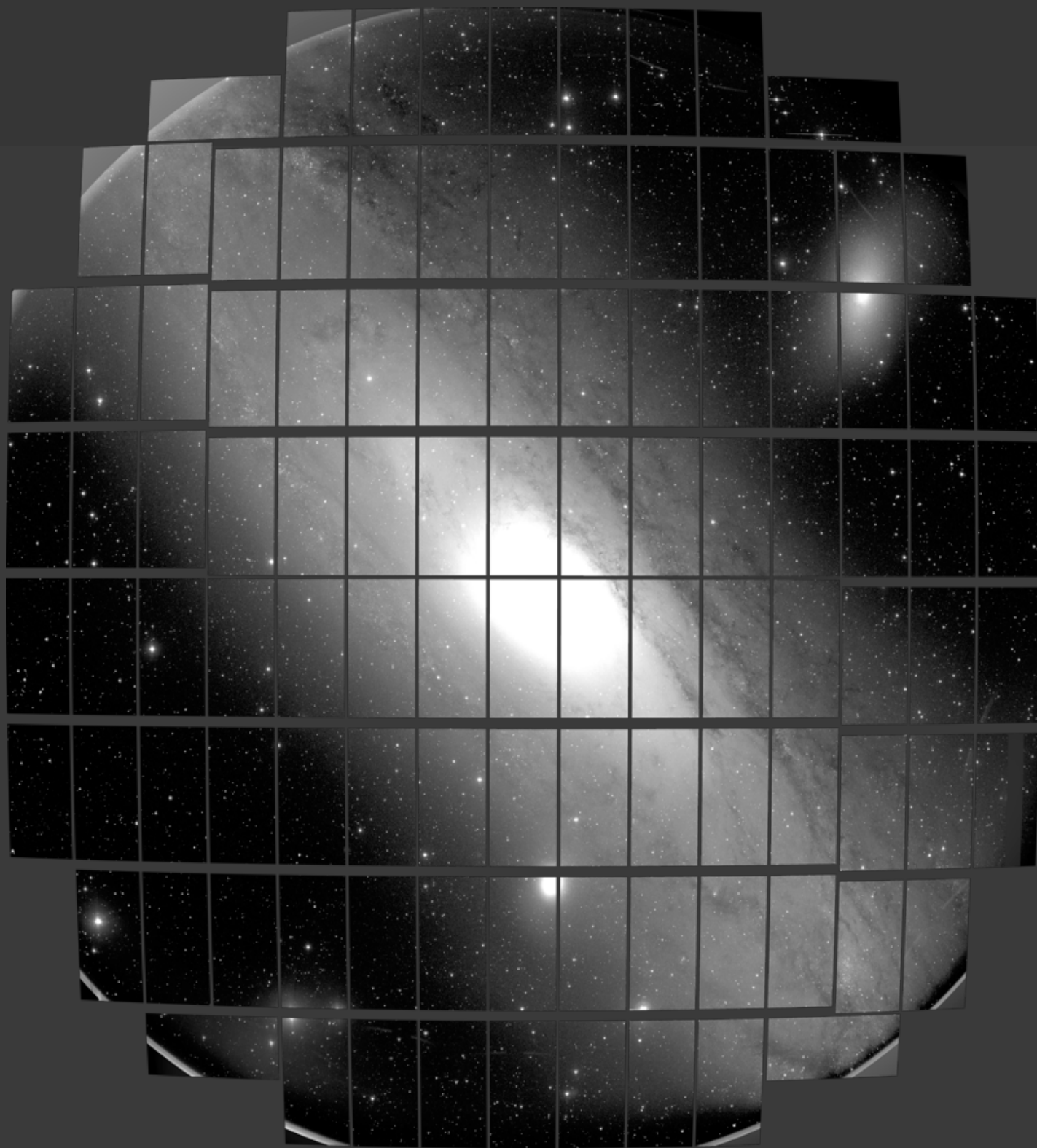
2018/02/10 Shingakujutsu Symposium @ Tohoku University

~ 1 G pixel Digital Camera
3 m tall ~ 3 tons



(c) MBTA Corporation, Japan #150132

← Lens





Summary




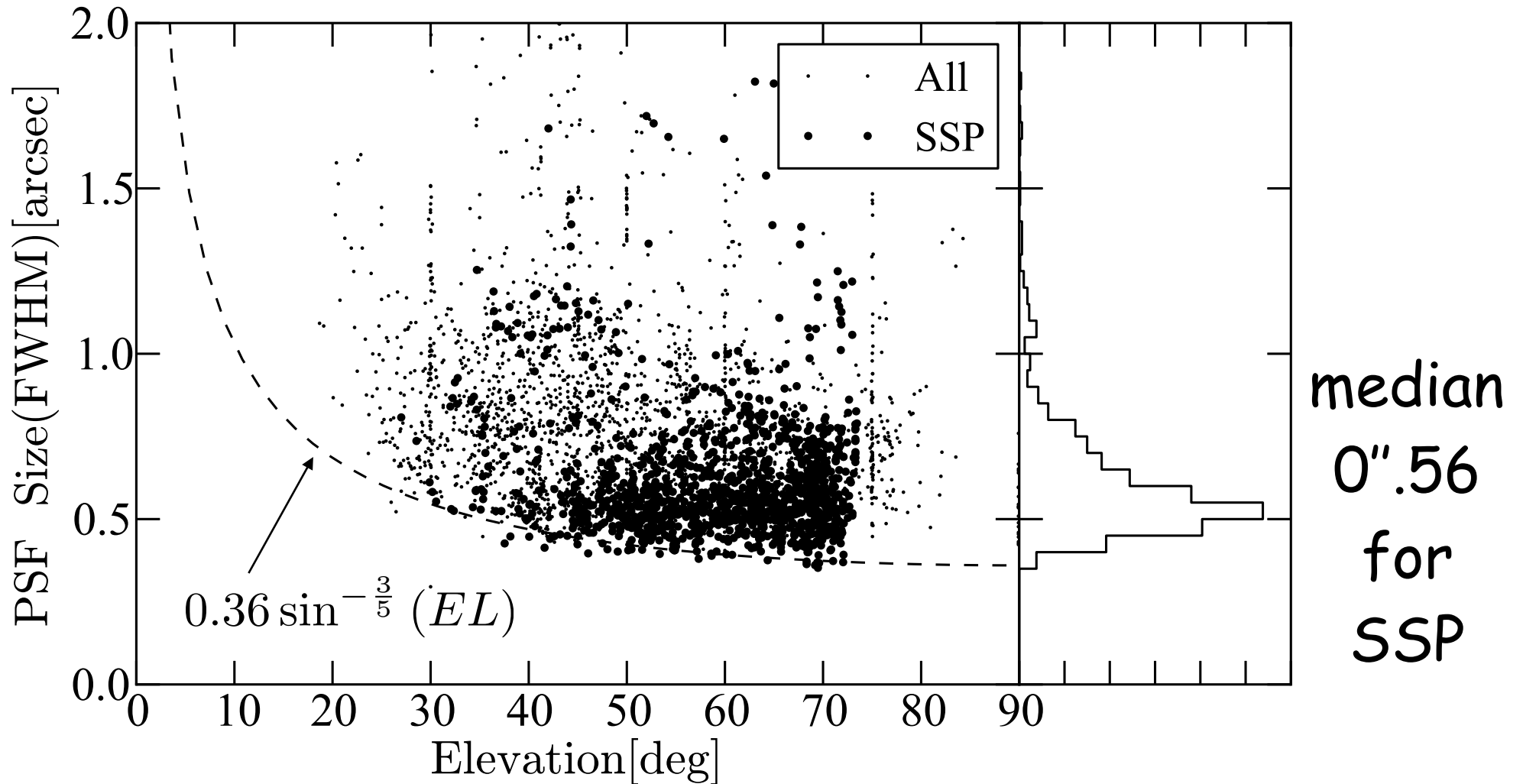
Camera	Survey Speed		
	CCD	AOmega	in operation
DECam	BI-FD 	30.0	2012
HSC	BI-FD 	91.3	2012
LSST	BI-DD 	347.8	(2020?)

Image Size Statistics

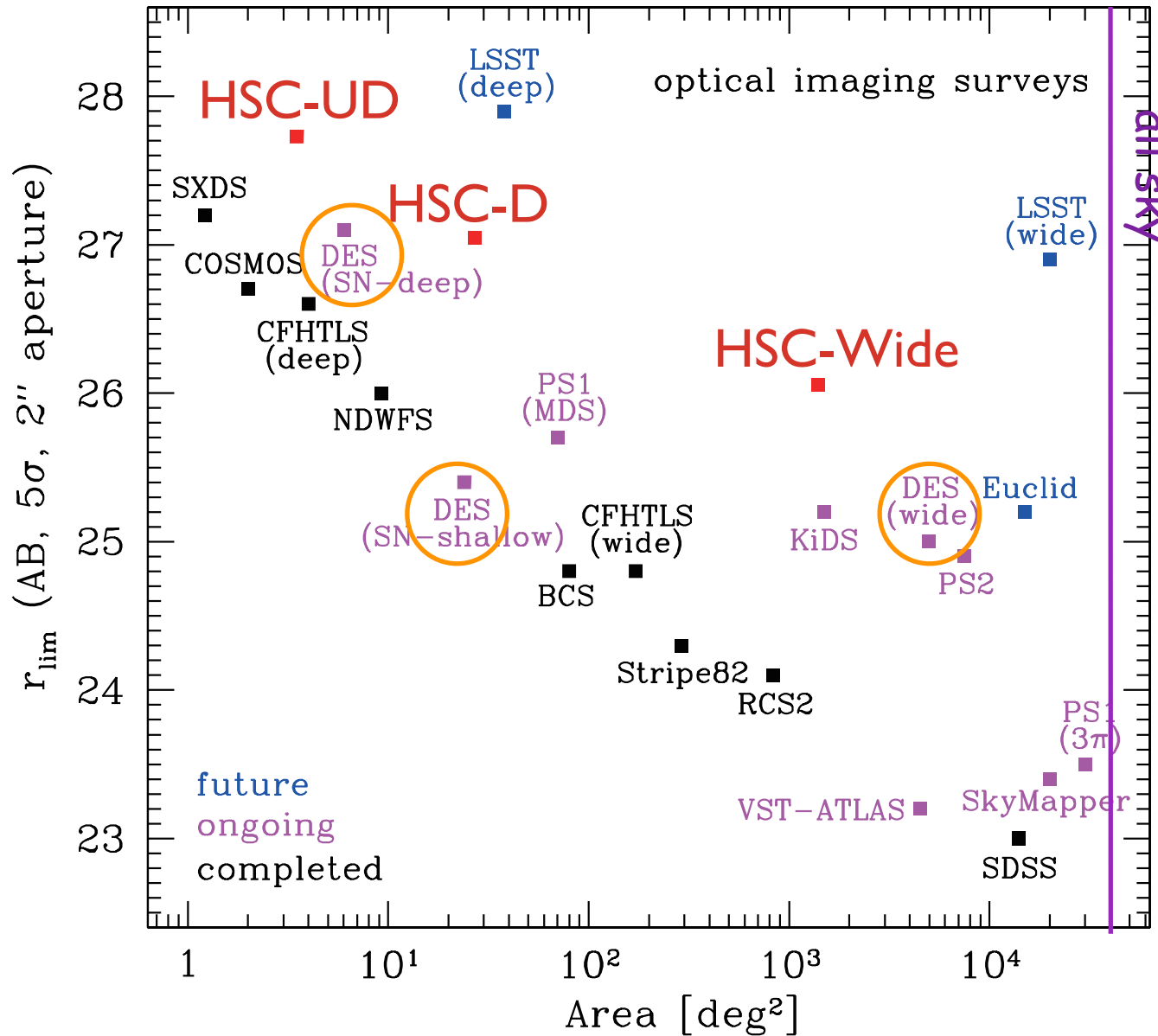
HSC-i band



Mostly seeing limited imaging realized



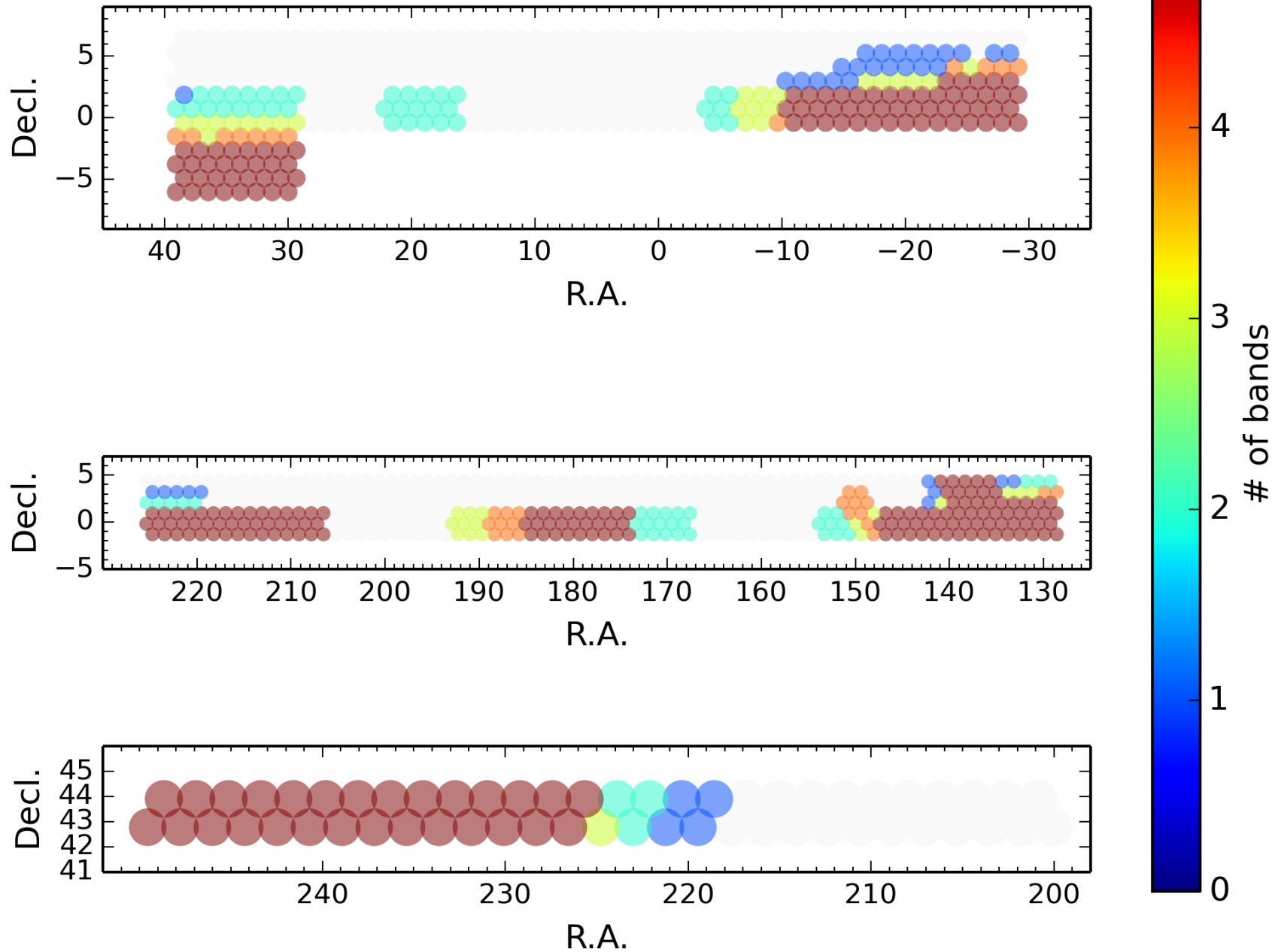
HSC SSP Survey: Three layers



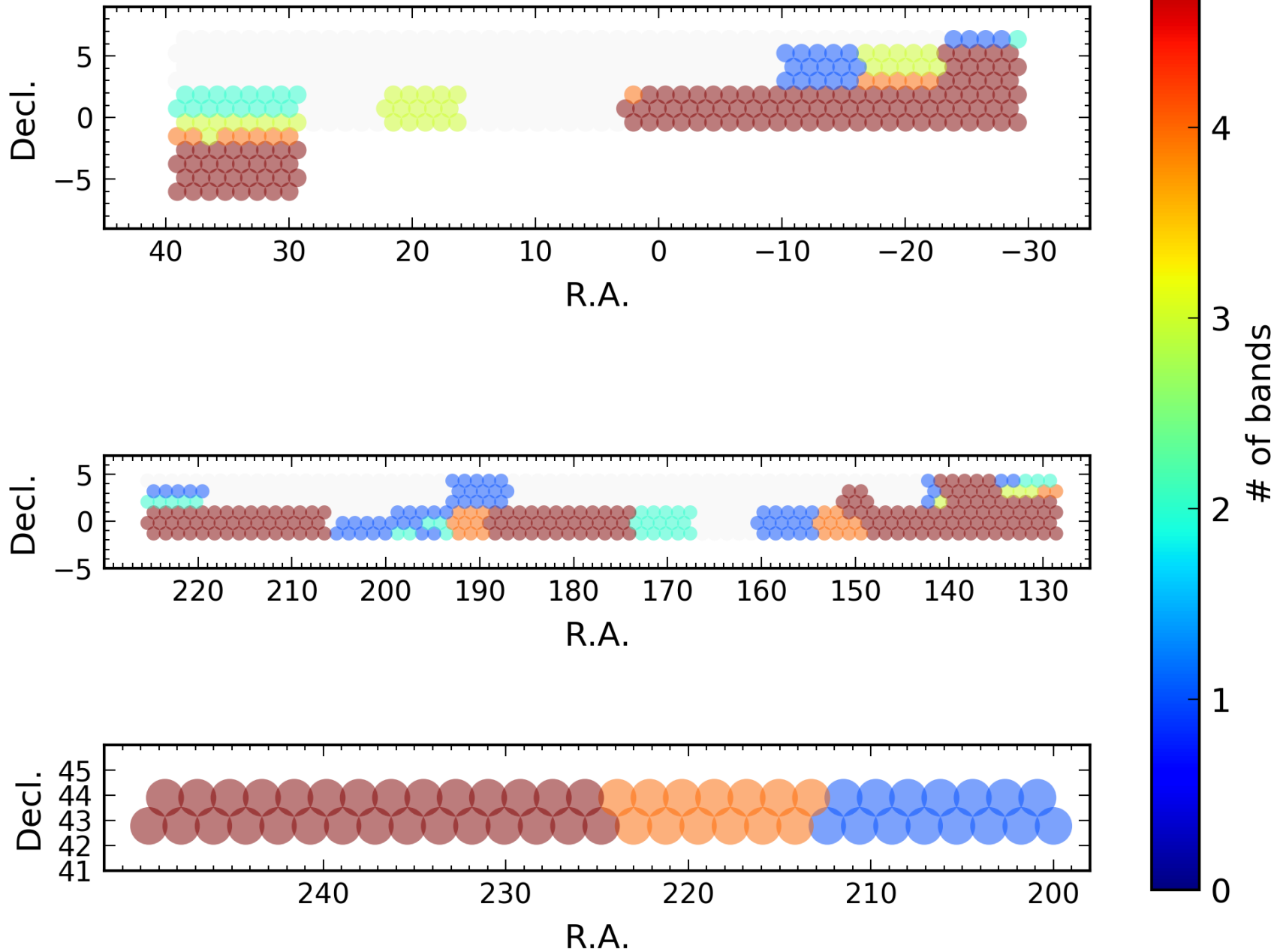
- Three-tier survey
 - Wide: 1400 sq. degs, $i \sim 26$
 - Deep: 28 sq. degs, $i \sim 27$
 - Ultradeep: 3 sq. degs, $i \sim 27.7$

300 nights
from 2014 - 2019

Wide Survey Status



Wide Survey Status





Progress of HSC SSP Survey

band	area (deg ²)	Finished ptgs	completeness	expected (ptgs)*	balance (ptgs)	balance (hours)**	Updated
g	548.2	1867 / 3672	0.51	1718	149	-6	2018 Jan 10
r	609.4	2071 / 3672	0.56	1718	353	-15	2017 Sep 20
i	386.1	2184 / 5508	0.40	2577	-393	22	2018 Jan 17
z	484.0	2603 / 5508	0.47	2577	26	-1	2017 Sep 27
y	453.5	2566 / 5508	0.47	2577	-11	1	2018 Jan 09

~ 170 nights (56 %) have been used

Status

- ~ 170 nights done with ~ 80 % of the planned pace
- Weather prospect was a bit optimistic.
- More frequency of the filter exchanges to carry out time-domain survey
- i-band requires good seeing, which causes more delay

Countermeasures being considered

- Reduction of CCD readout time
- relax seeing constraint in HSC-i band



Collaborations with external teams

- Established collaborations with external groups, initiated by approaches from the external groups (not from us)
- Exchanged MOU and now carrying out the collaboration
 - **Spitzer**/IRAC data (SPLASH; Peter Capak + COSMOS): 2012 Def -, UltraDeep fields, galaxy evolution
 - **CFHT** U-band data (scientists from Canada, France, China): 2014Aug -, ~320 CFHT hours (270hrs already taken), galaxy evolution, photo-z
 - **UKIRT** NIR (JHK) data (Arizona/Steward): 2014Aug-, ~240 UKIRT hours (205hrs taken), galaxy evolution, photo-z
 - **Keck** spectra (Caltech/JPL): 2016-, ~40 Keck nights (33 Keck nights+200hrs VLT+3 MMT nights), photo-z, galaxy evolution
 - Atacama Cosmology Telescope (**ACT**) CMB data (ACT group): Sunyaev-Zel'dovich clusters, CMB lensing
 - **XMM-XXL** X-ray data (XXL team): galaxy clusters, AGN



eROSITA

- MoU with eROSITA-DE (2017)
 - Collaboration on overlapped survey area
 - Shallow (Txmm ~ 2 ks) but wide ($> \sim 500$ deg²)



How is it like ?

Try

hscmap.mtk.nao.ac.jp

and use the bookmarks its menu
to enjoy the uniqueness

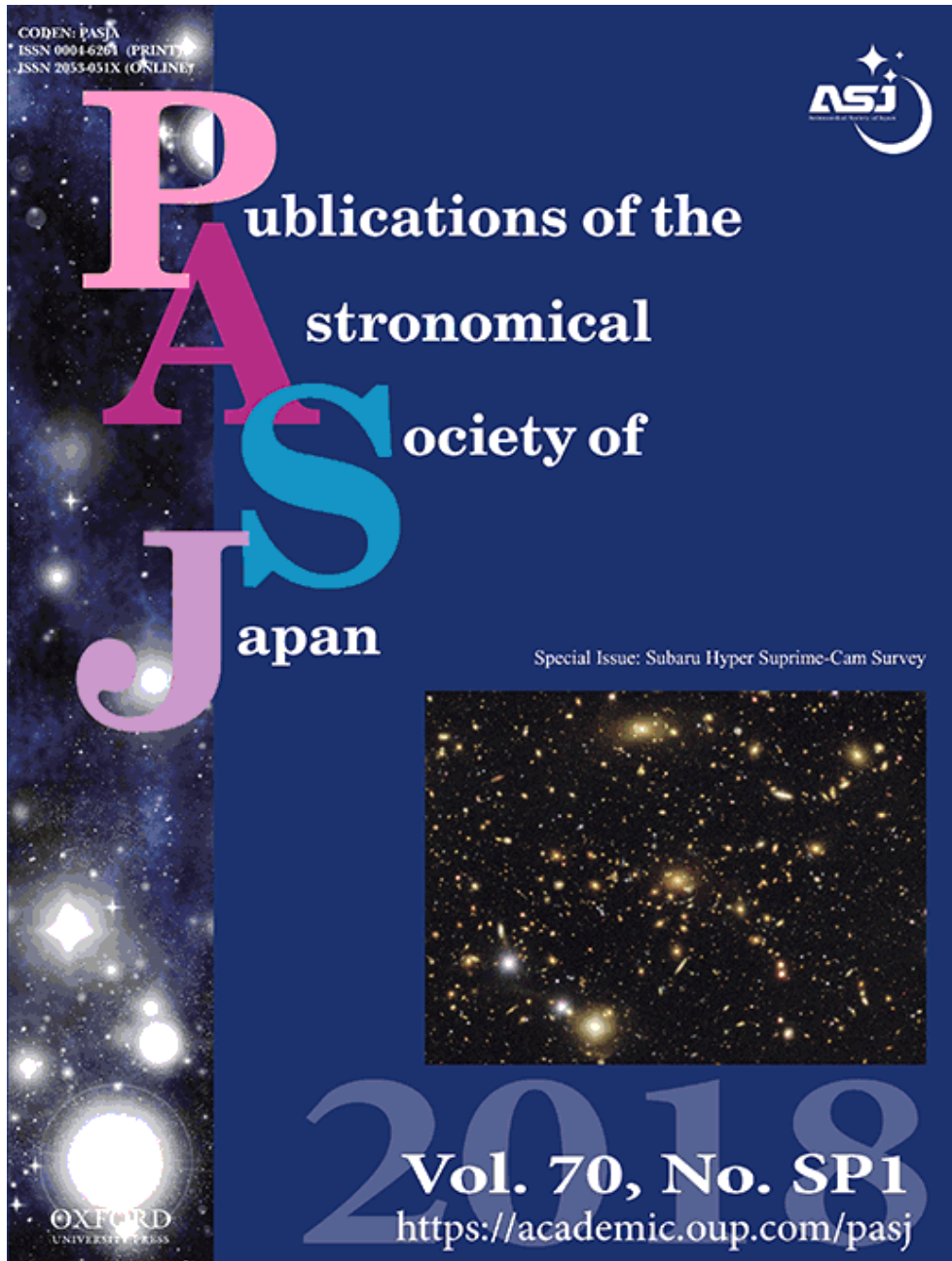


Public Data Release

February 2017

~ 100 deg² Full depth

<https://hsc-release.mtk.nao.ac.jp>

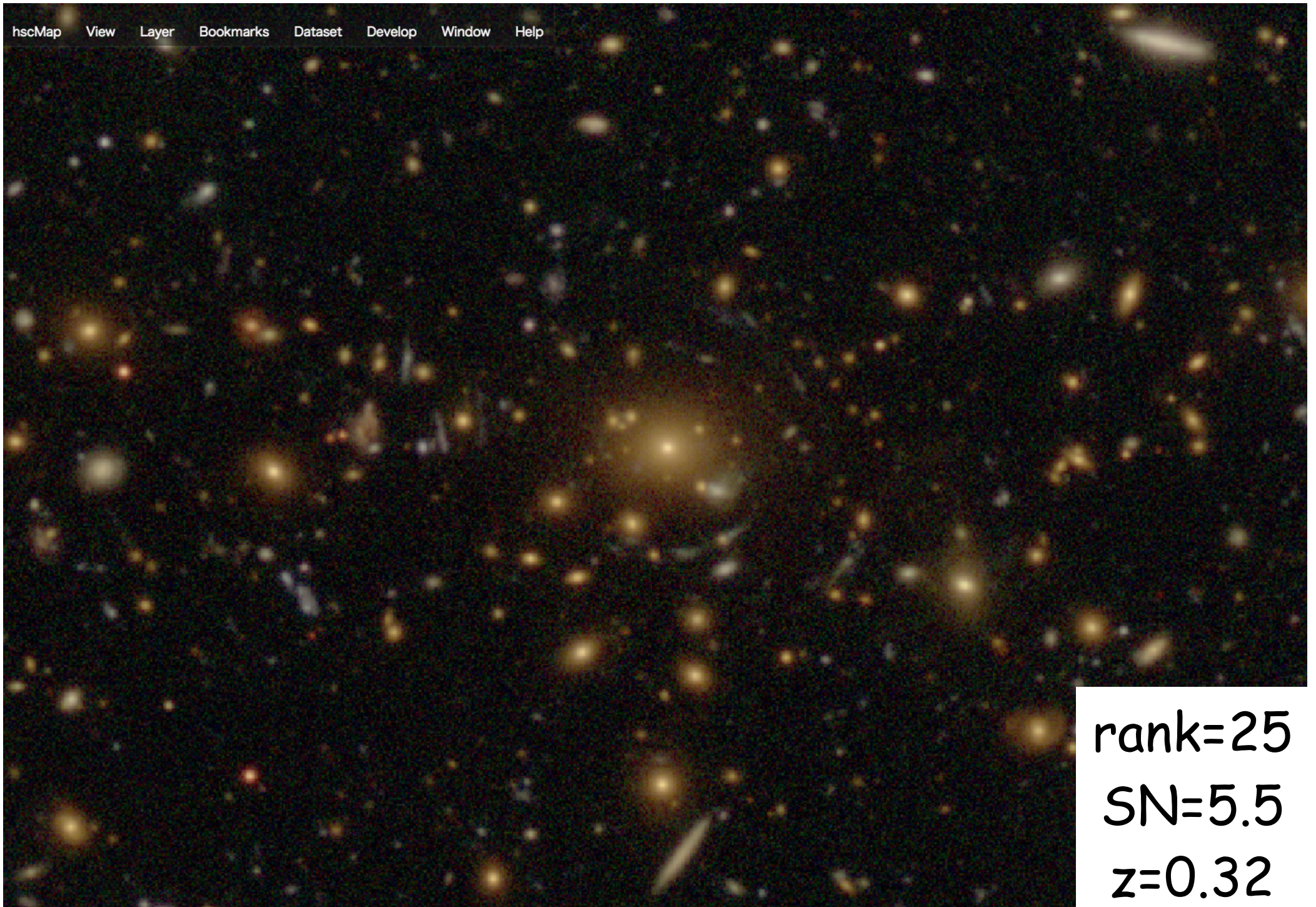


-
-
-

A data ($\sim 170 \text{ deg}^2$)
ology

$\sim 3 \text{ cm thick}$

$\sim 2 \text{ kg}$

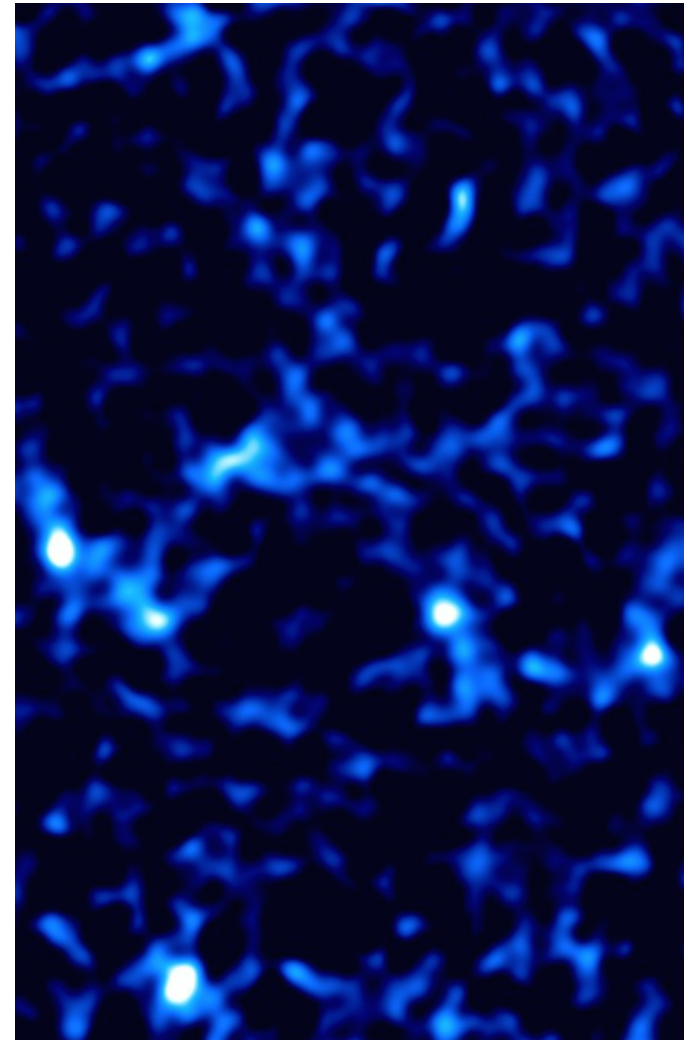
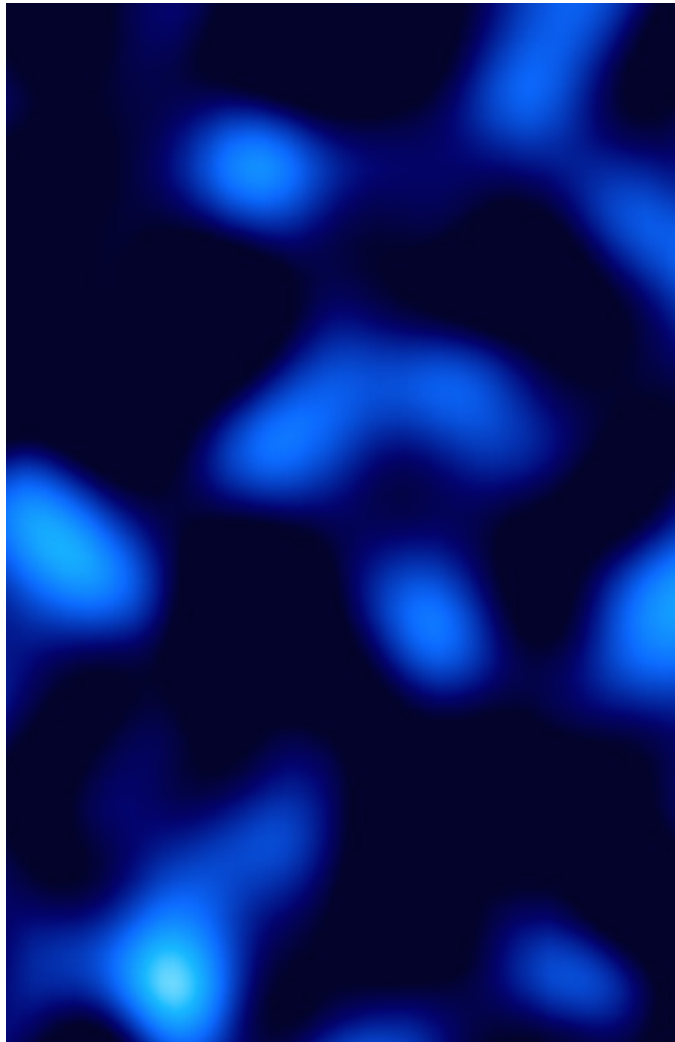




Advantage of HSC

Sharper image \rightarrow more resolved galaxies
 \rightarrow finer kappa maps

~ 1.3 deg

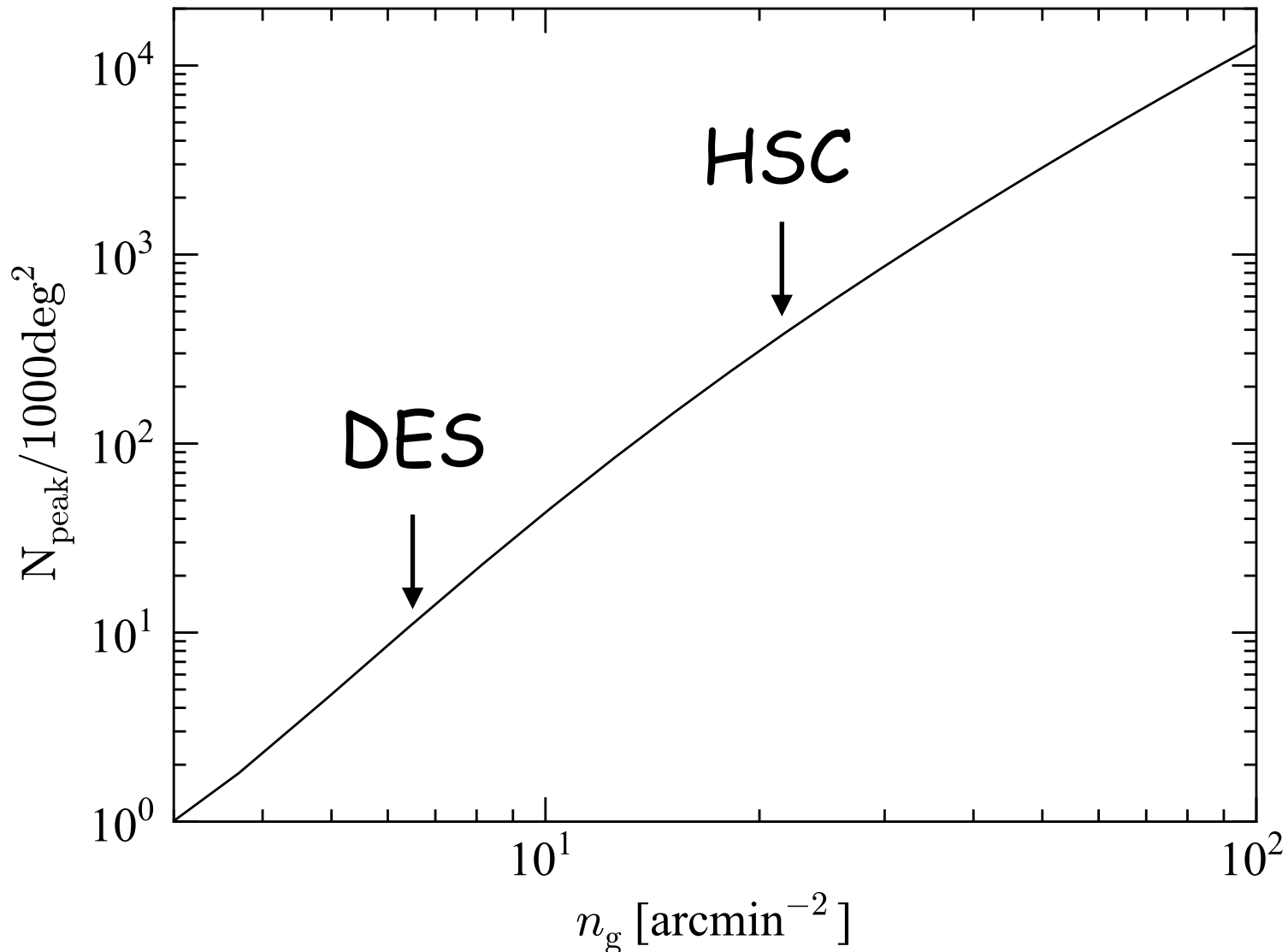


NAOJ DES-like (~ 7 gals/arcmin², $\sim 1''$)

HSC (~ 20 gals/arcmin², $\sim 0.6''$)

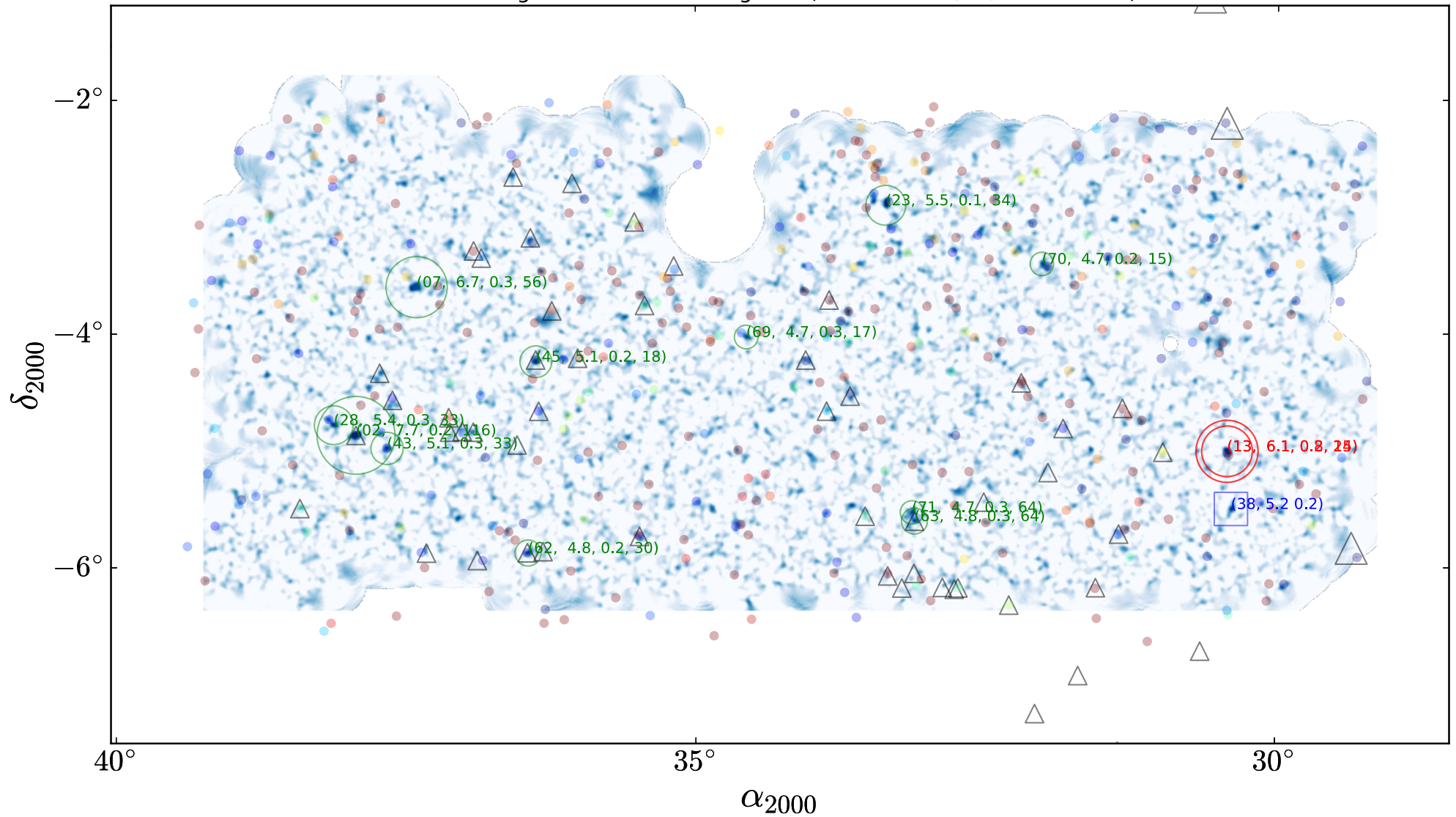
Advantage of HSC

More peaks identified on the kappa map



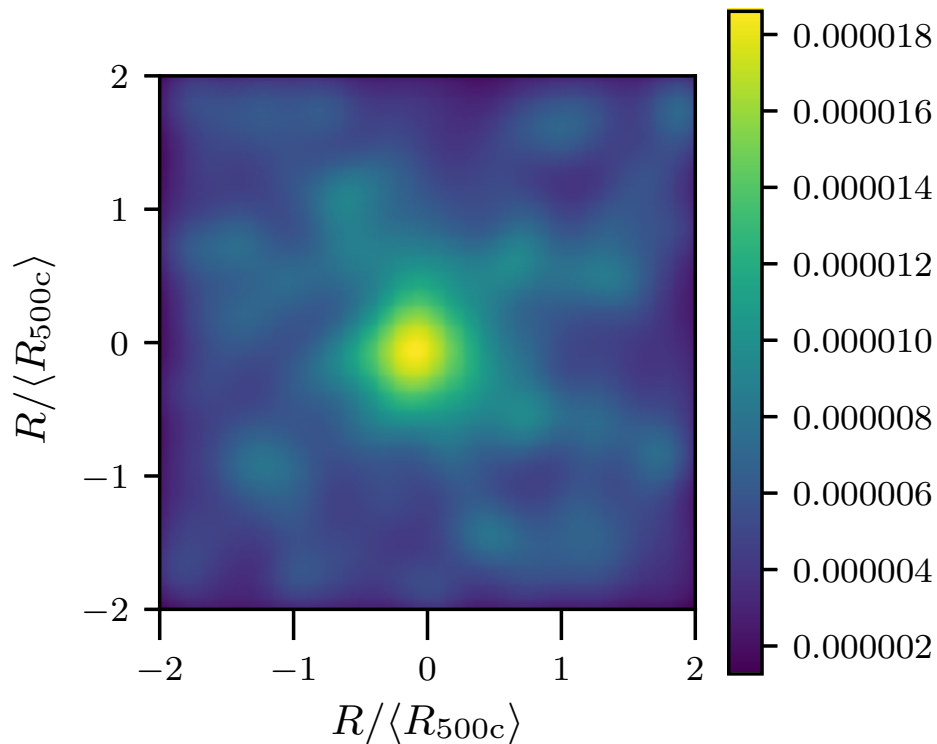
Aperture Mass Map

XMM magLimit=24.5 r0=1.5 gauss (satoshi 2017/02/01 16:42:45)



Stacking of RASS images

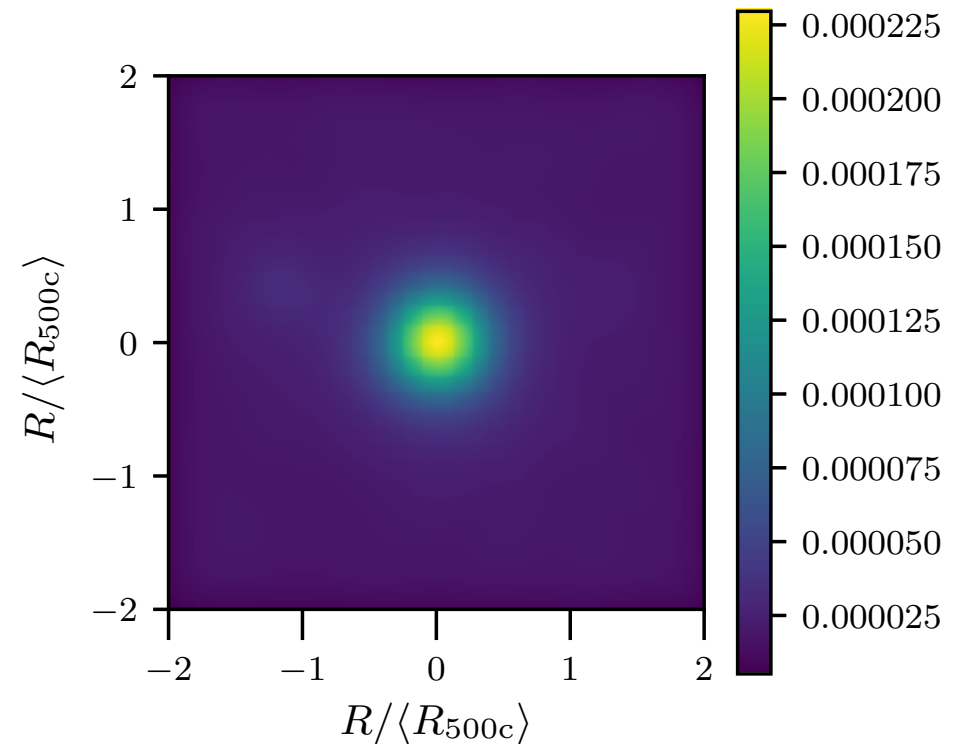
Stack around shear selected clusters



$$L_X = (1.5 \pm 0.3) \times 10^{44} \text{ erg s}^{-1}$$

Stack around selected MCXC clusters

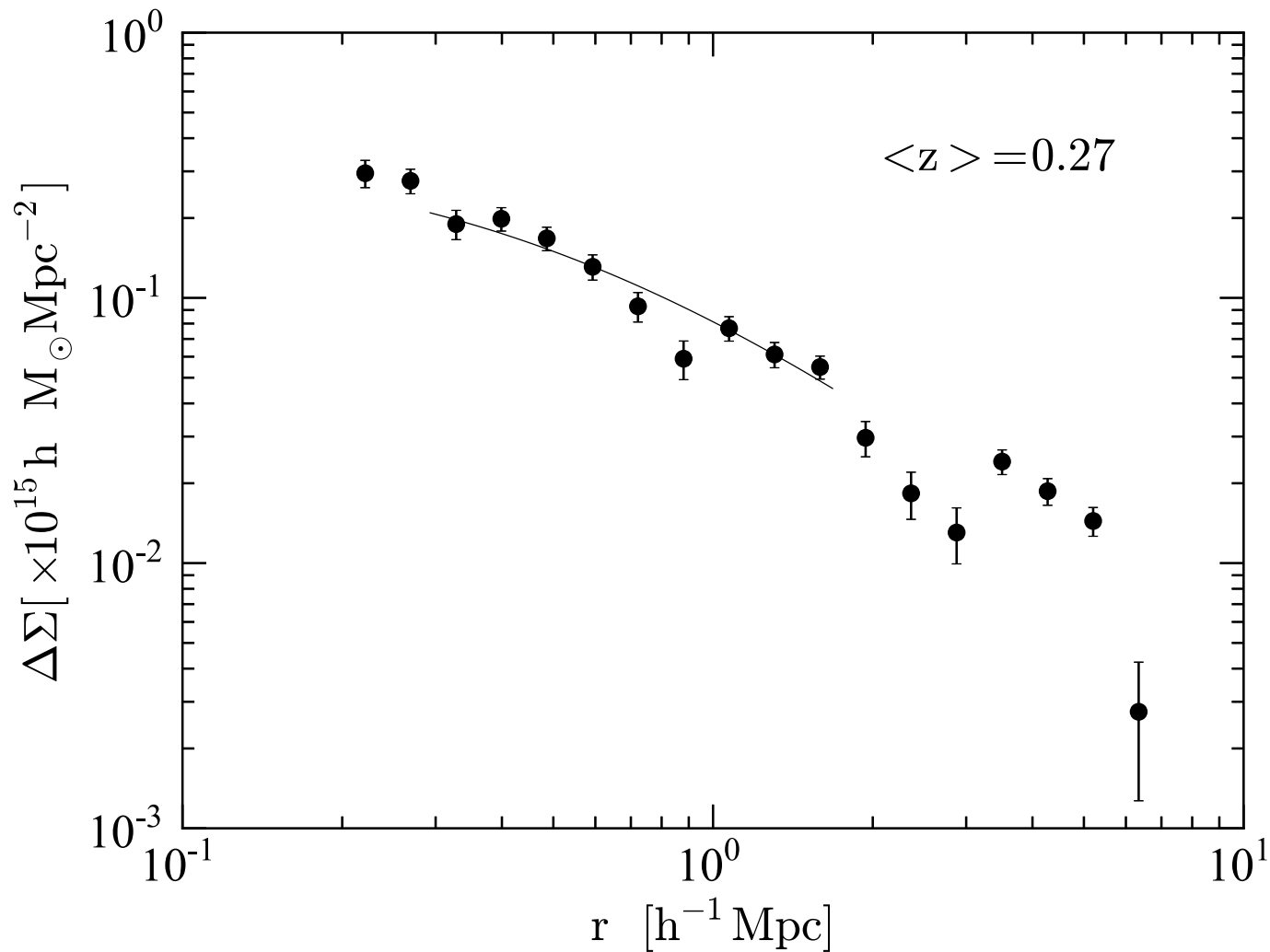
($L_X > L$ expected from M_{th})



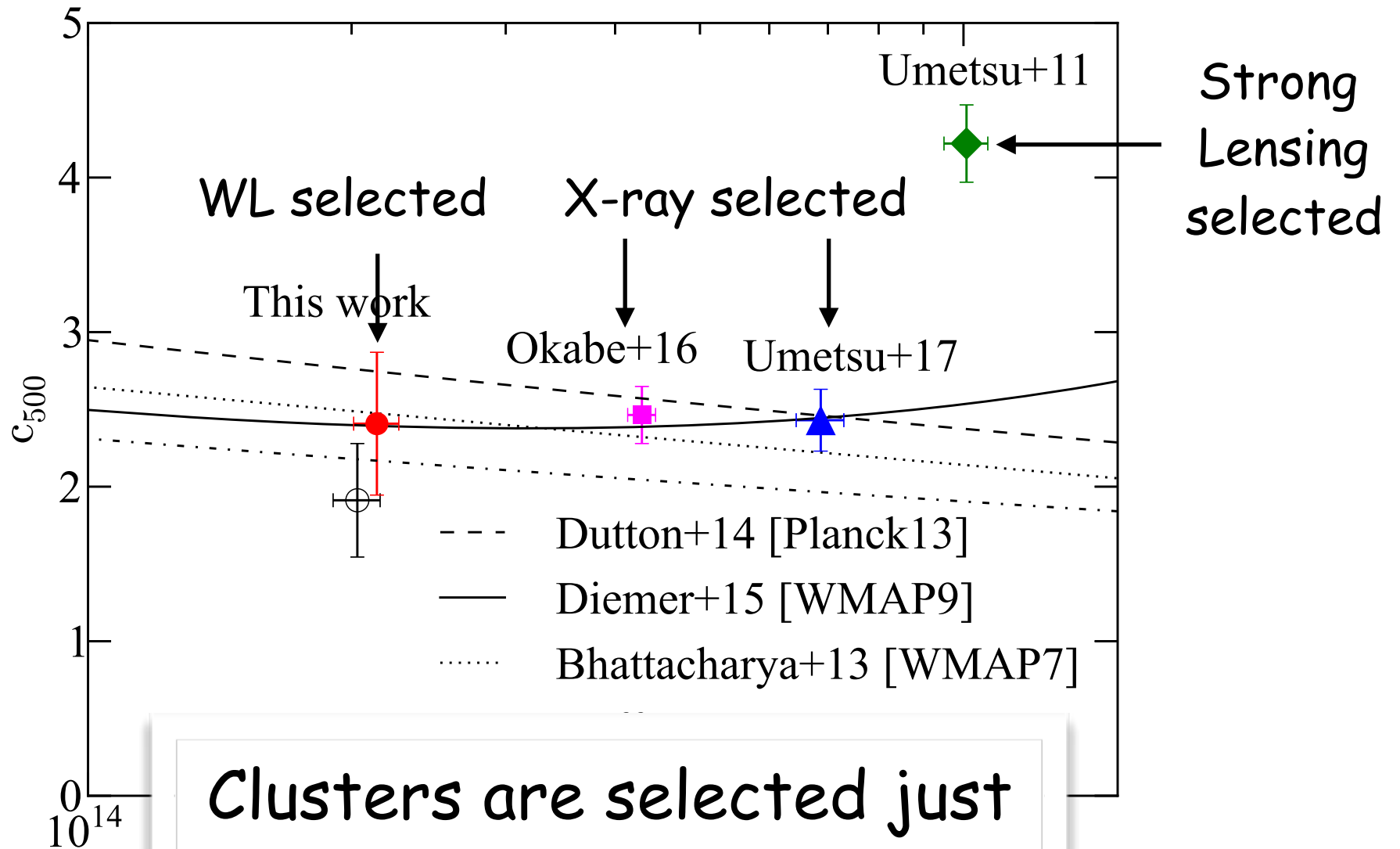
$$L_X = (3.1 \pm 0.2) \times 10^{44} \text{ erg s}^{-1}$$

Radial Mass Profile of DM halo

Stack of shear selected clusters

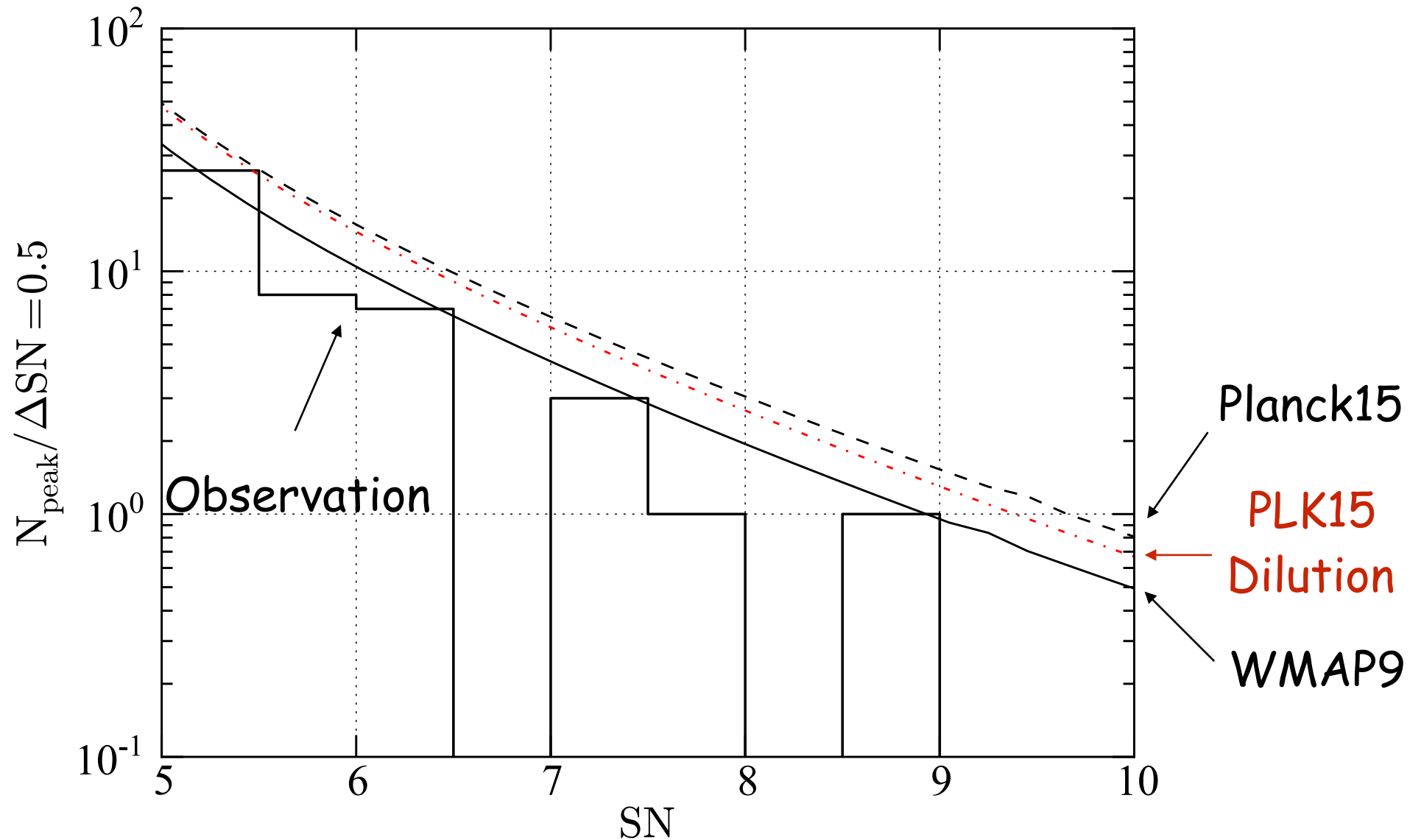


M-c Relation



Clusters are selected just because they are massive.

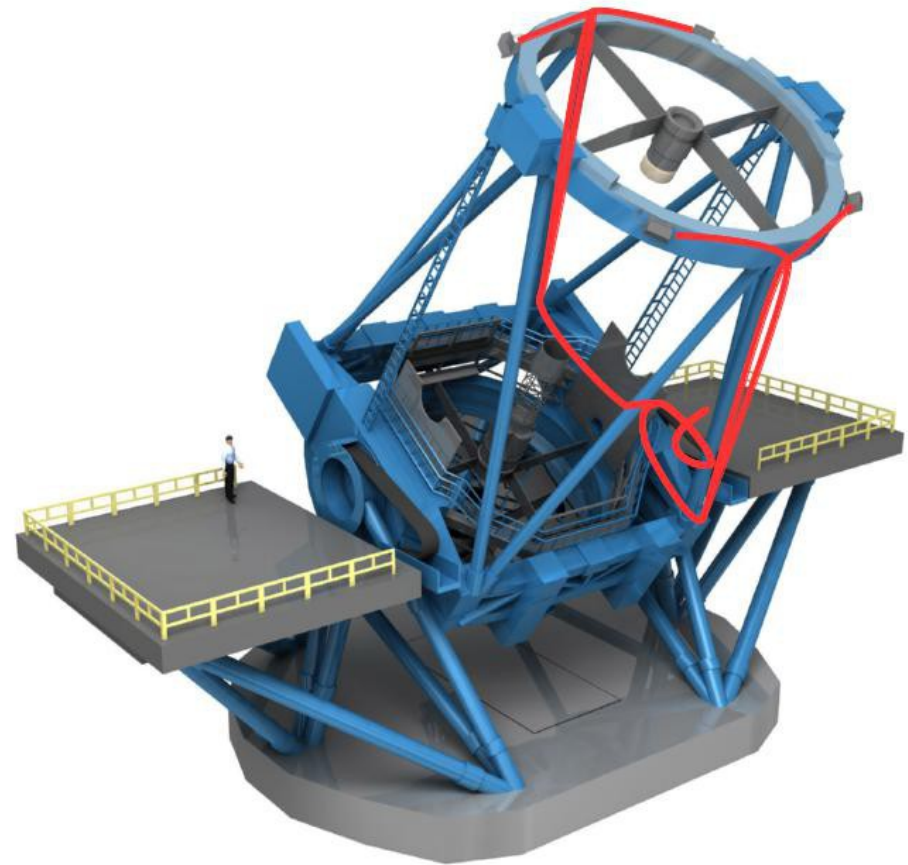
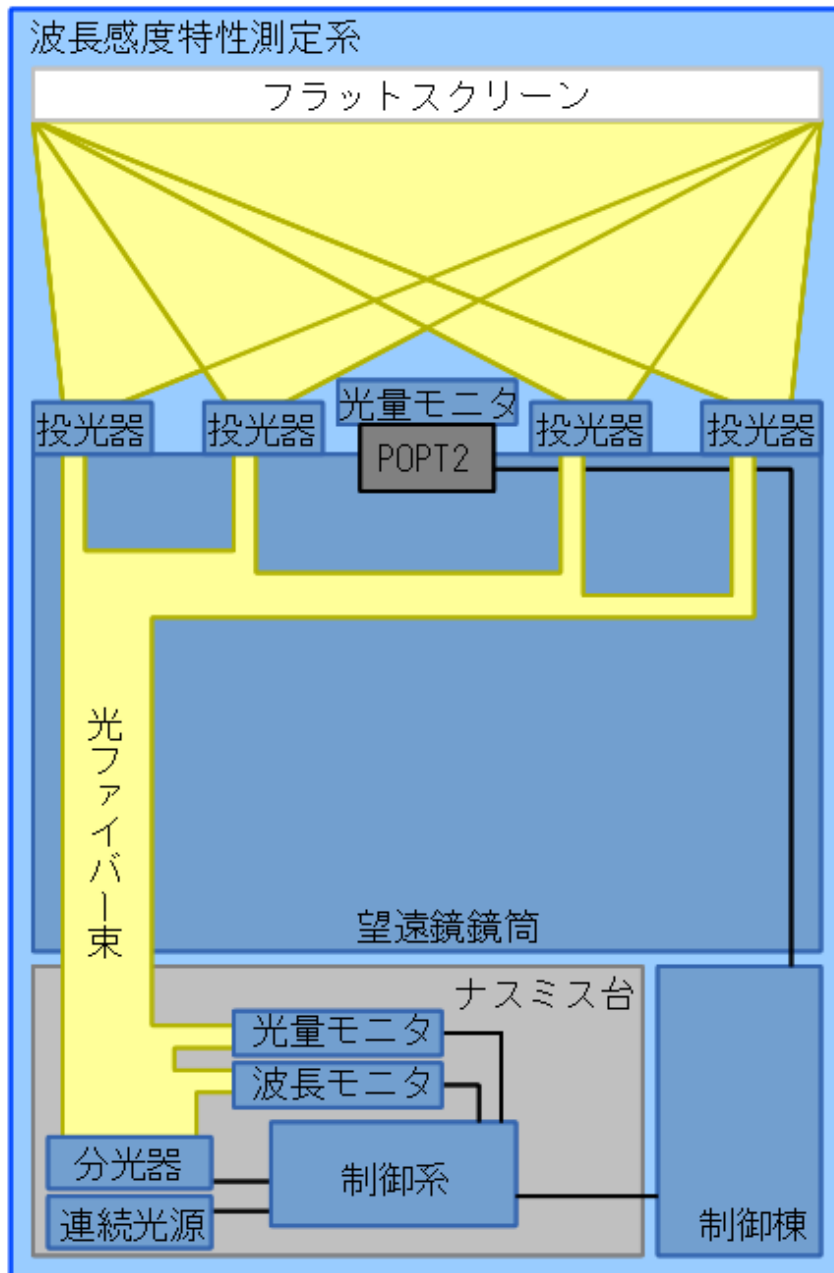
Expected Peak Counts



Peak less than expected from Planck 15 Cosmology

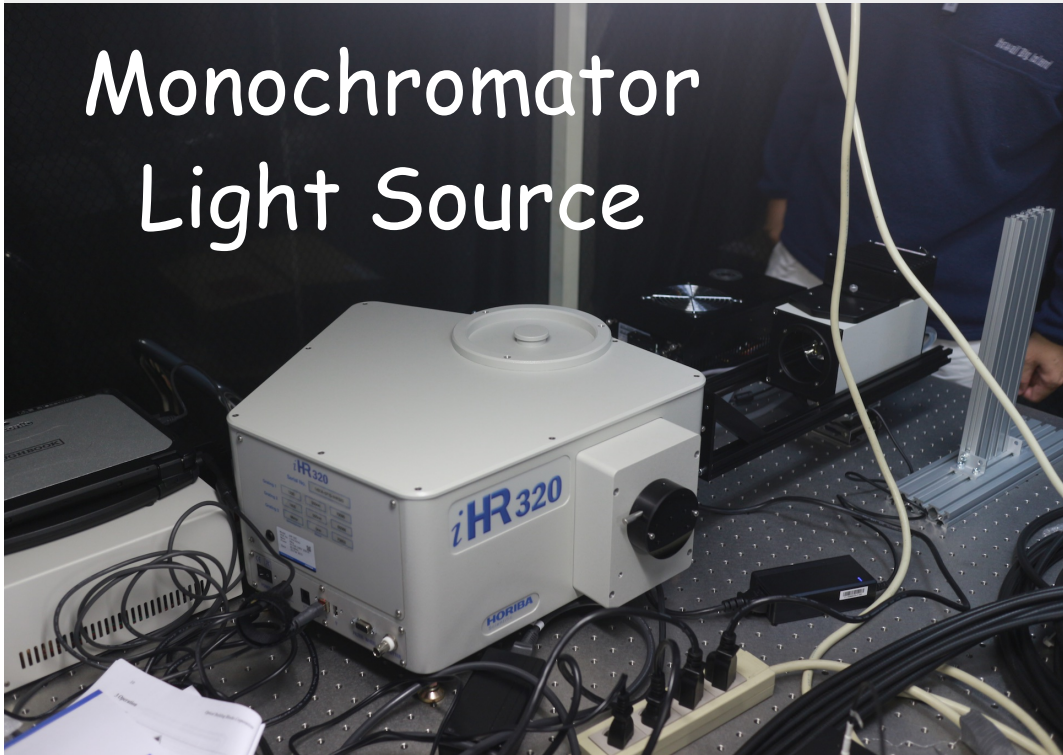
Miyazaki et al. (2018b)

Throughput Monitor of HSC



Throughput Monitor

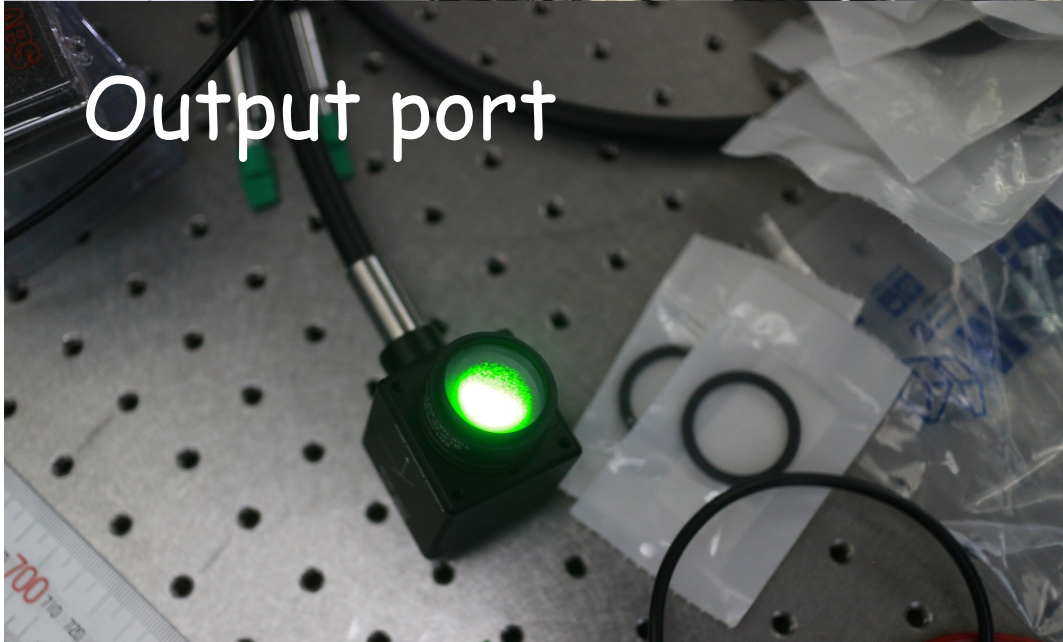
Monochromator
Light Source



Fiber Bundles



Output port

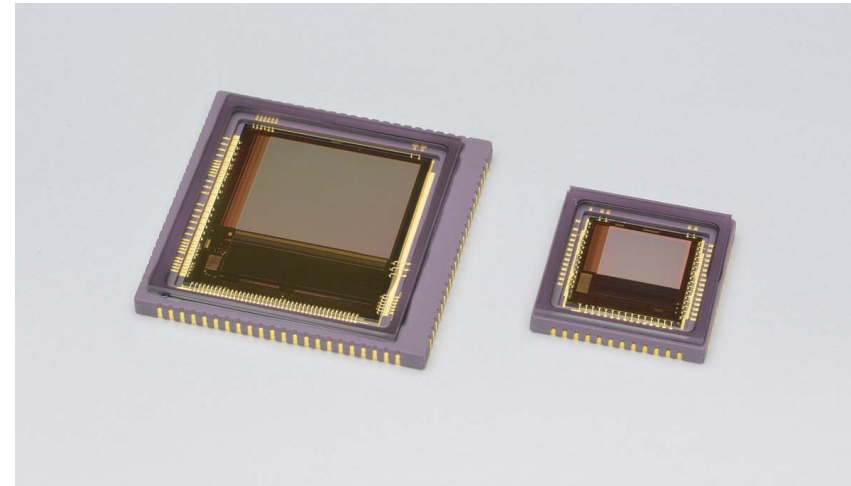




Ready for Installation
but delayed due to the M1
coating rescheduled...
Should be ON this fall.



CMOSエリアイメージセンサ

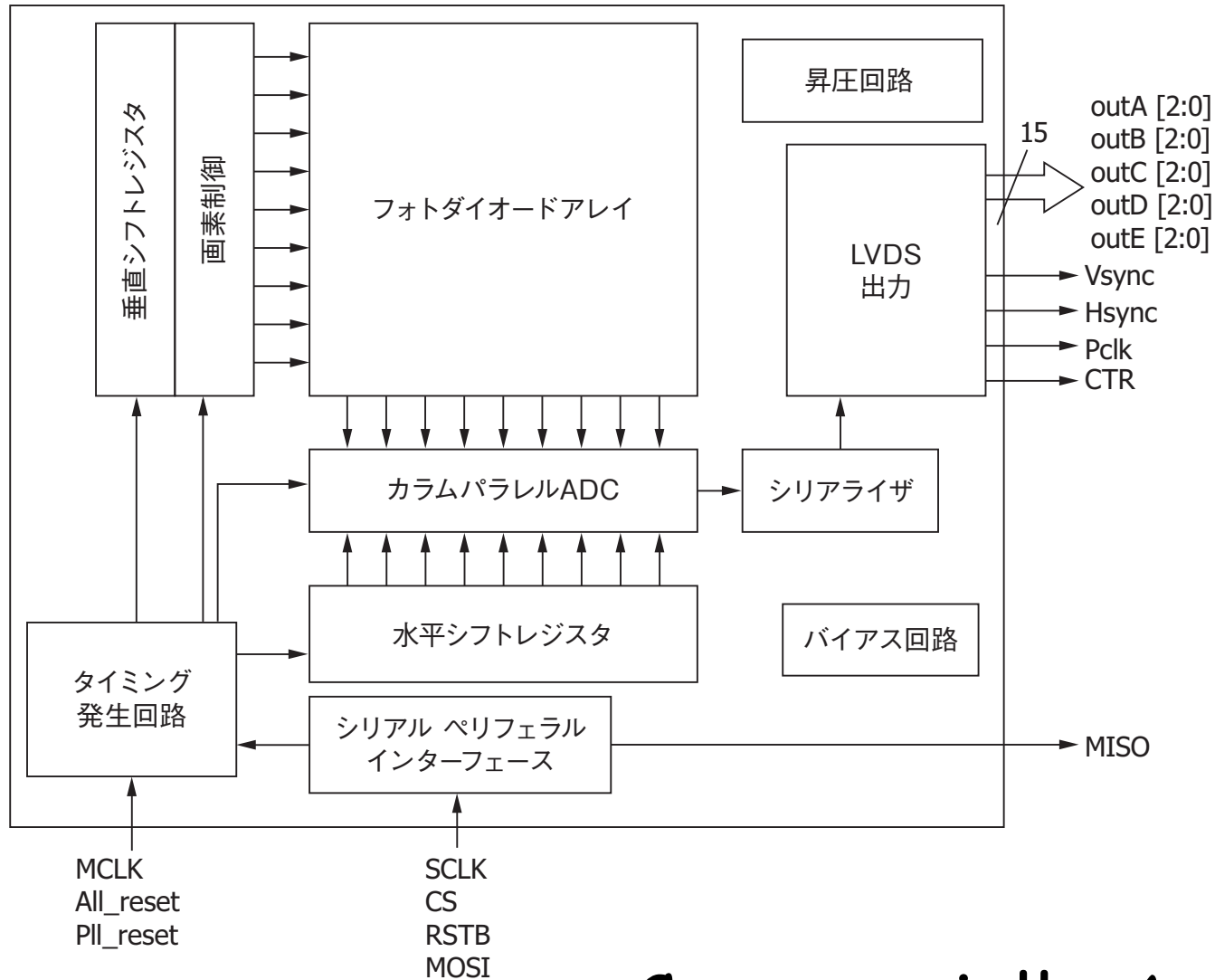
近赤外に高い感度をもつ APS (Active Pixel Sensor)タイプの CMOS エリアイメージセンサです。タイミング発生回路、バイアス発生回路、アンプ、A/D変換器を内蔵しており、オールデジタル入出力のため取り扱いが容易です。



型名	画素サイズ [μm (H) \times μm (V)]	有効画素数	フレームレート (フレーム/s)	パッケージ	写真	専用駆動回路
 S13101	7.4 \times 7.4	1280 \times 1024	146	セラミック		—
 S13102		640 \times 480	78			

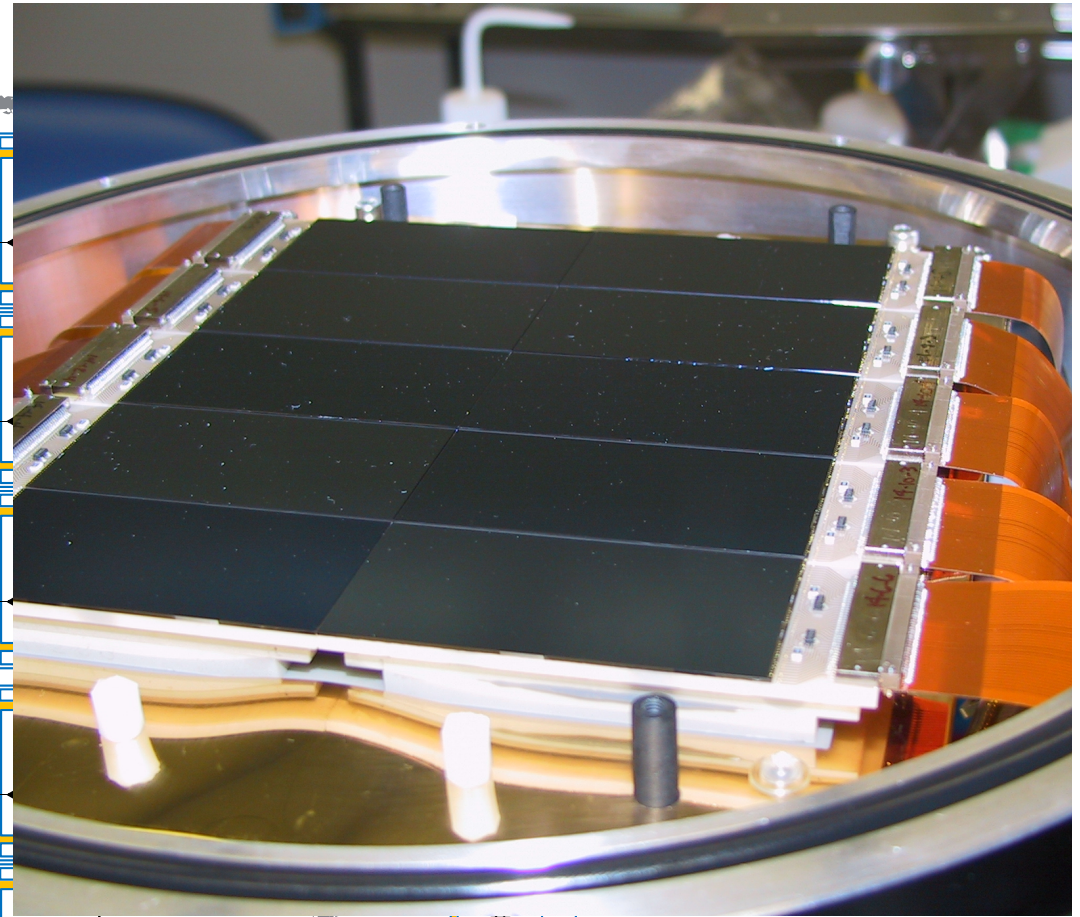
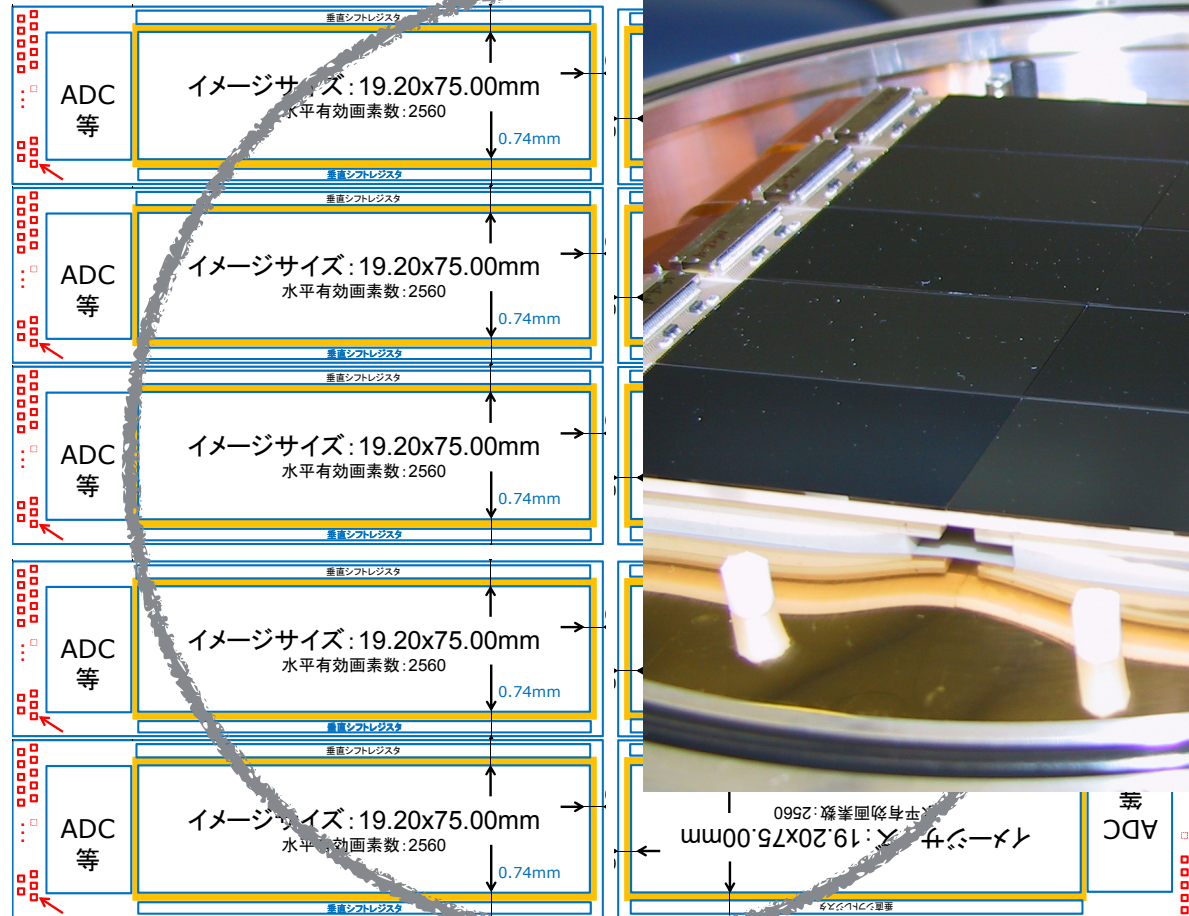
Commercially Available

HPK CMOS



Commercially Available

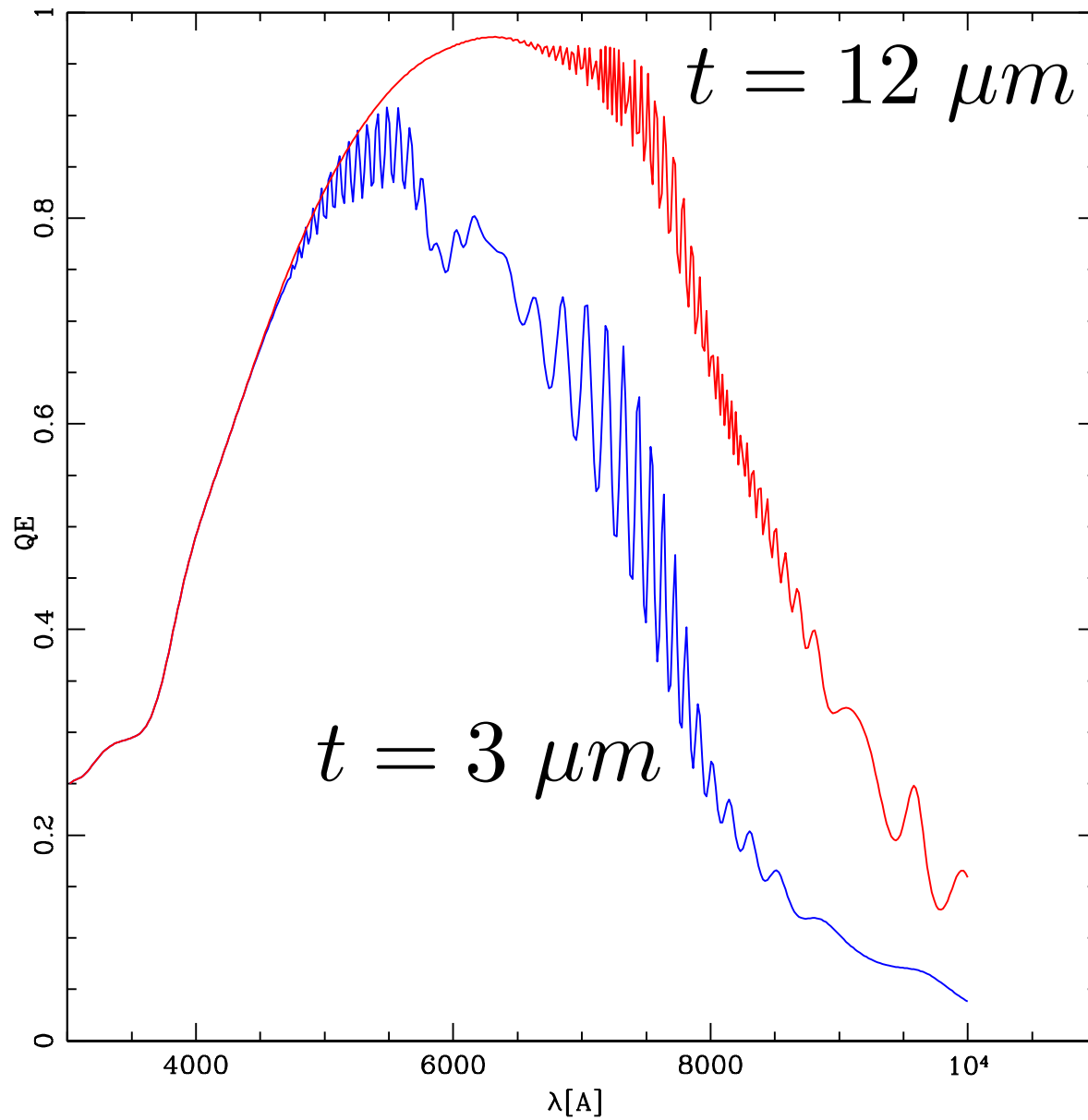
~ 2019



FR: 10 Hz
 RN < 4 e

Subaru Prime Focus 30 arcmin diameter

Expected QE





Thank you