

HSC SSP Data Release and Science Database Service

2019.3.3 @Kyoto

Hisanori Furusawa (NAOJ)

for HSC-Software/Data Release Team

HSC-SSP Data in FY2018 – FY2019

- Internal Data Release [S18A](#) – 2018.6-8
 - Products Summary
 - Pipeline Features
- Public Data Release (PDR) 2– 2019.5
 - Created based on DR-S18A
- Next Internal Data Release [S19A](#) – 2019.7
 - Will include data for 2014.3—2019.3-4?
 - Current Development
 - Updates in Science Database Service

1. DR-S18A

1. HSC-SSP DR-S18A

- DR-S18A on 2018.6.25 ; updated on 2018.8.9
- Dataset in S14A—S17B (2014.3—2018.1)
 - ~420 TB after compression
- Wide layer
 - g, r, i, z, y over 350 sq.degree in full quality
- Deep+UltraDeep layer
 - grizy + NB0921, NB0816, NB0387 (not include NB1010)
 - UH public data (S14B-S15A) on COSMOS combined
- hscPipe (Princeton, K-IPMU, NAOJ)
 - 6 versions: 6.1, 6.1.1., 6.3, 6.5.1, 6.5.3, 6.6

Improvements and New Features in S18A DR (2018.6.25)

■ Improvements

- **Global sky subtraction**
- **HSC-Y scattered light subtraction**
- **Better detection** (peak culling + dynamic threshold)
- **Improved PSF modeling** for superb seeing data
- New **artifacts removal** by warpCompare algorithm
- **Defects mask** updated
- **Bright star masks** set in **NB** data (was slipped off in S17A)

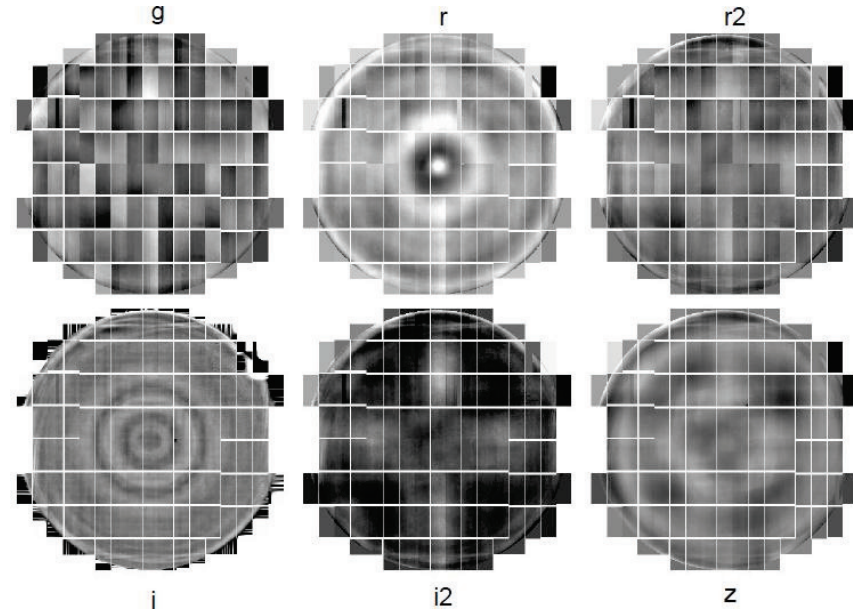
■ New Features

- **Effective transmission curve per object** (eff. exptime-weighted ratio of i/i_2 , r/r_2)
- Tiled-image **compression** (Lossless) for saving storage space

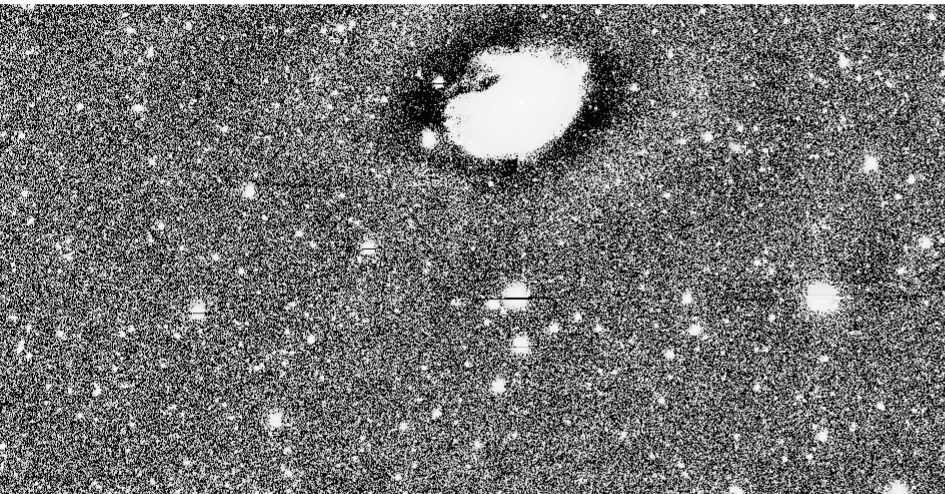
1. DR-S18A

Global Sky Subtraction

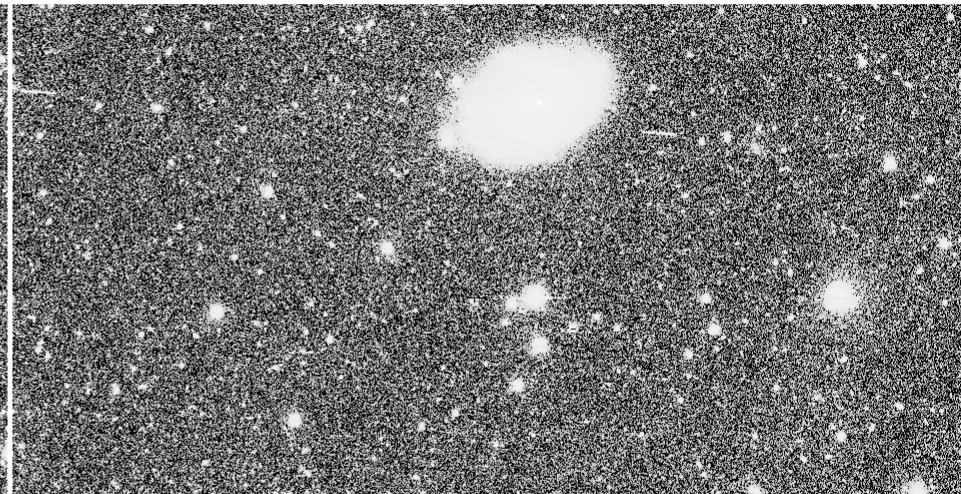
- To remove **large scale pattern**, conserving fluxes of **extended sources**, e.g., armin-scale galaxies



S17A



S18A

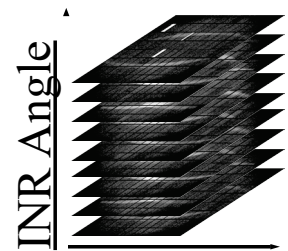
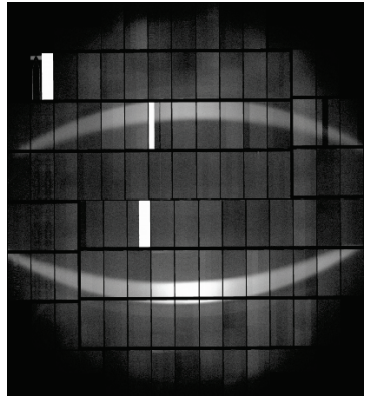


Price, Koike

HSC-Y scattered light correction

- Successful coordination of engineering with the camera and software efforts (also applied to N1010)
- Baffled on the camera side from 2017.12 data

“eye of y band”
variable with INR

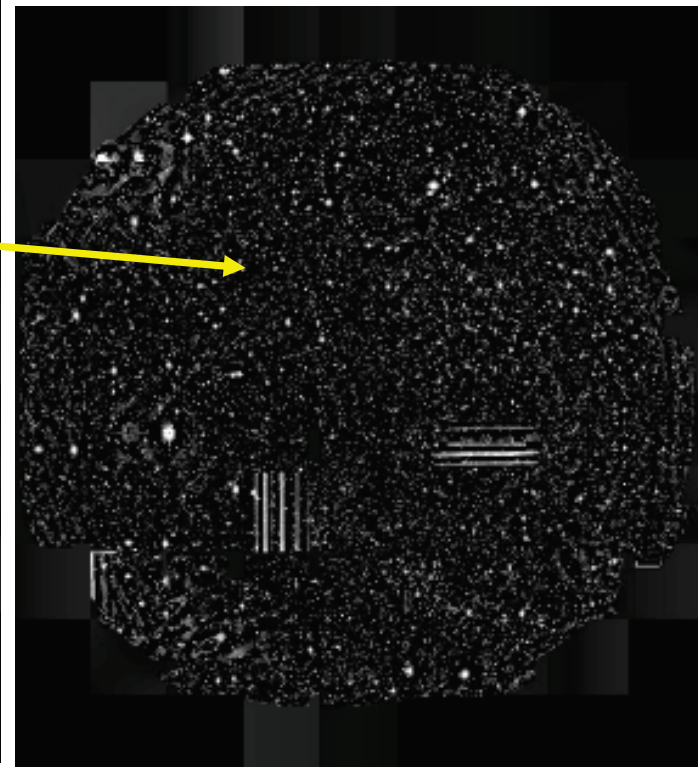


Mineo, Koike

S17A

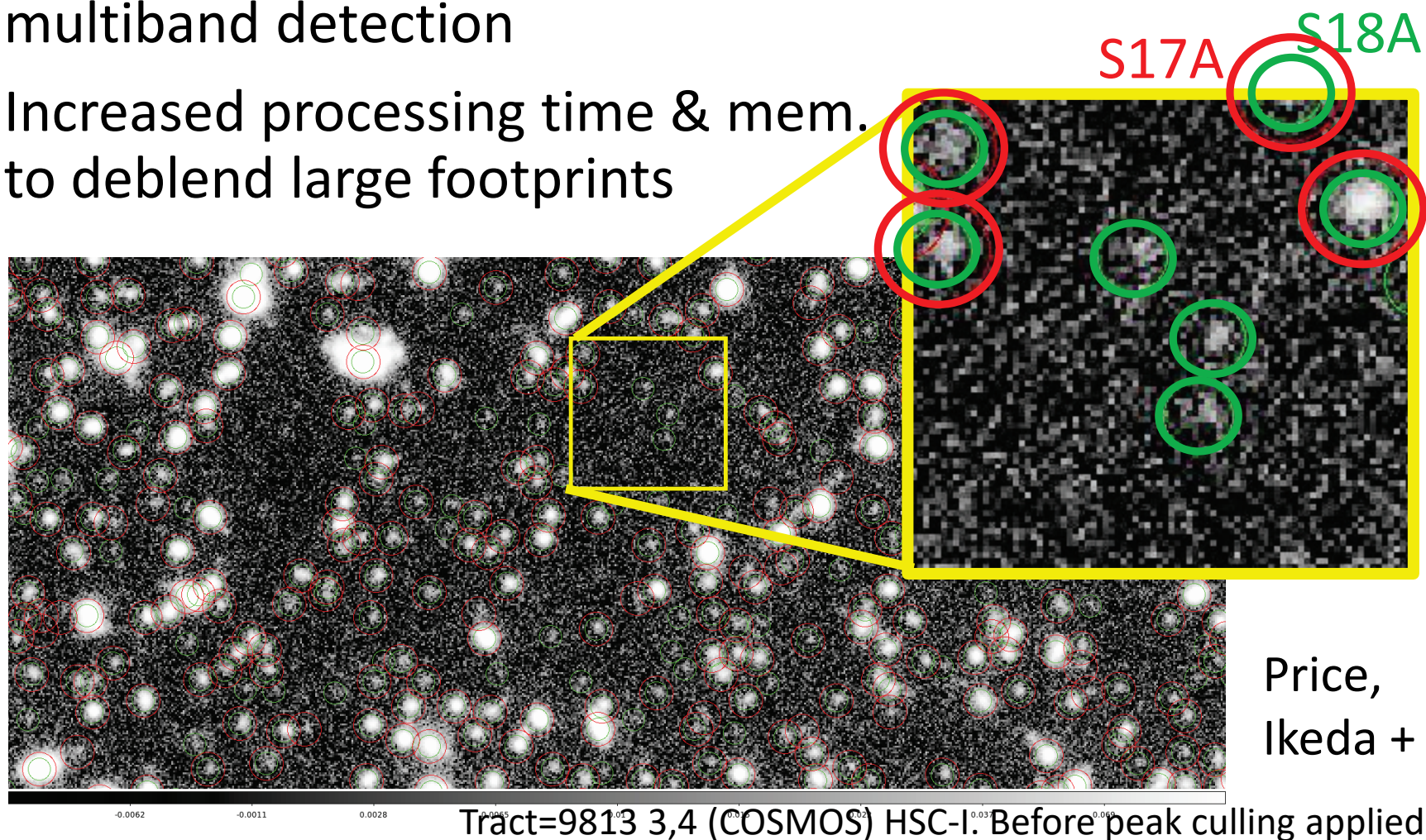


With Correction



Improved detection & Peak culling

- **Optimizing detection (skylevel, variance, threshold)**
- Relaxed & optimized config for peak culling using multiband detection
- Increased processing time & mem. to deblend large footprints



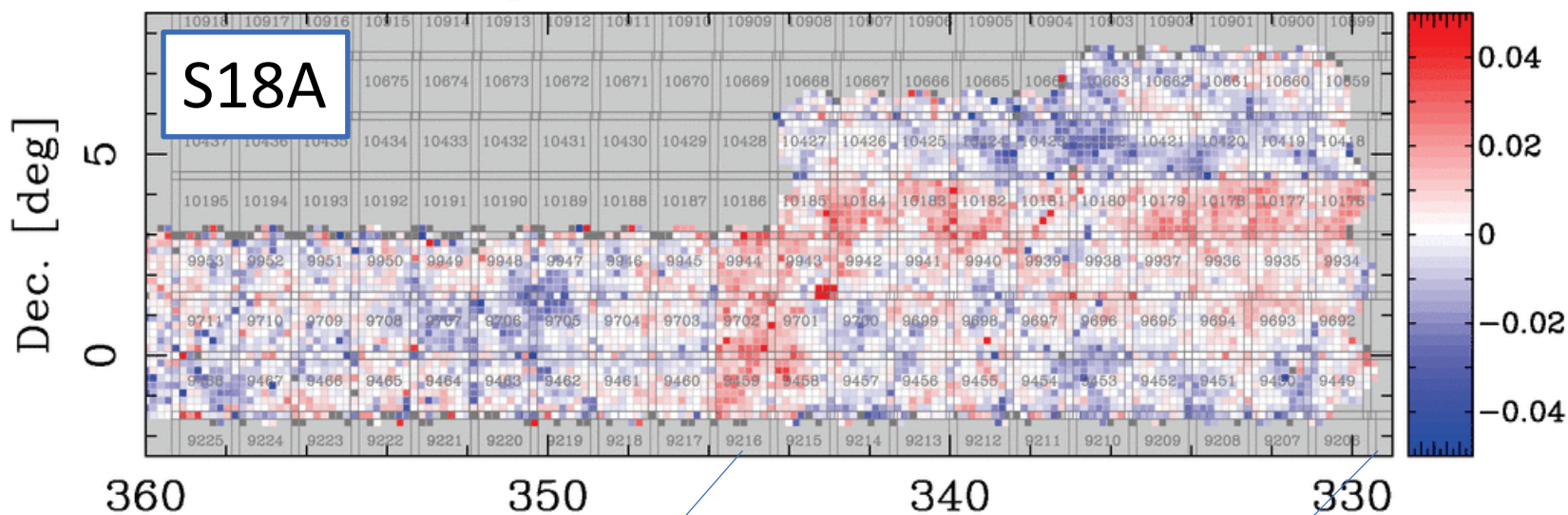
Price,
Ikeda +

1. DR-S18A

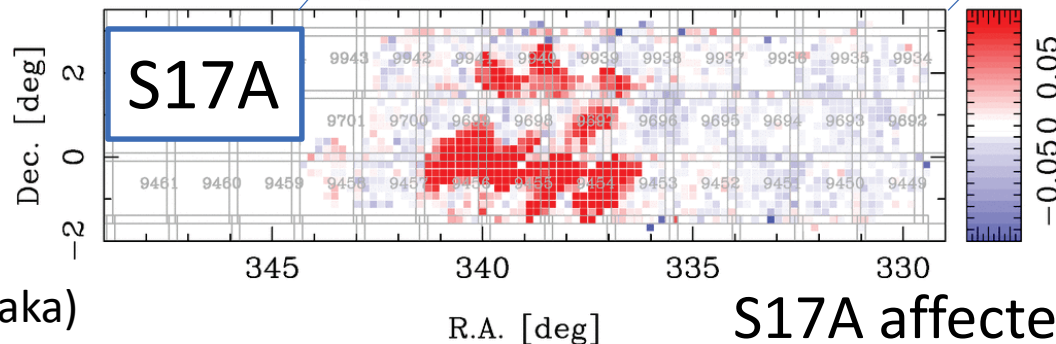
QA: Stellar colors in good seeing areas

- Improved PSF modeling - better measurements

W05: W-VVDS g-r-i
global offset = -0.012



W-VVDS r-i vs g-r
global offset = 0.025



(QA courtesy of M. Tanaka)

S17A affected by PSFex bug

Updated S18A DR+ (2018.8.9 & onwards)

■ Improvements

- **Bug fix in Tract allocation** spanning around **RA=0**
- **Full deblending large footprints** (>1M pix) with relaxed configuration for ~1.5 months
- **Aperture flux measured on convolved & undeblended footprints** in afterburner (forced5 table)

■ New Features

- **Bright star masks based on GAIA DR2** in database

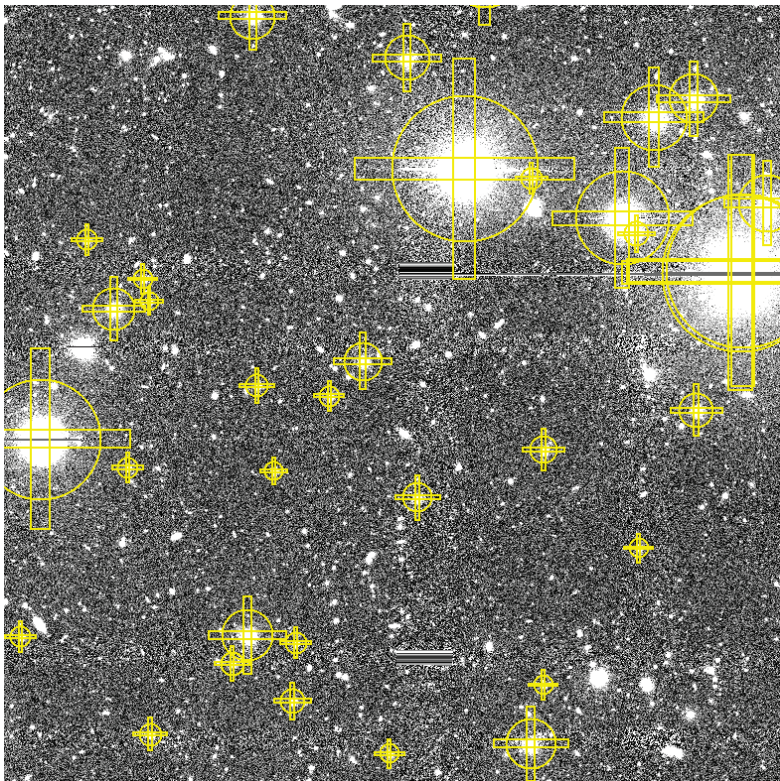
2. DR-S19A

2. Development for DR S19A

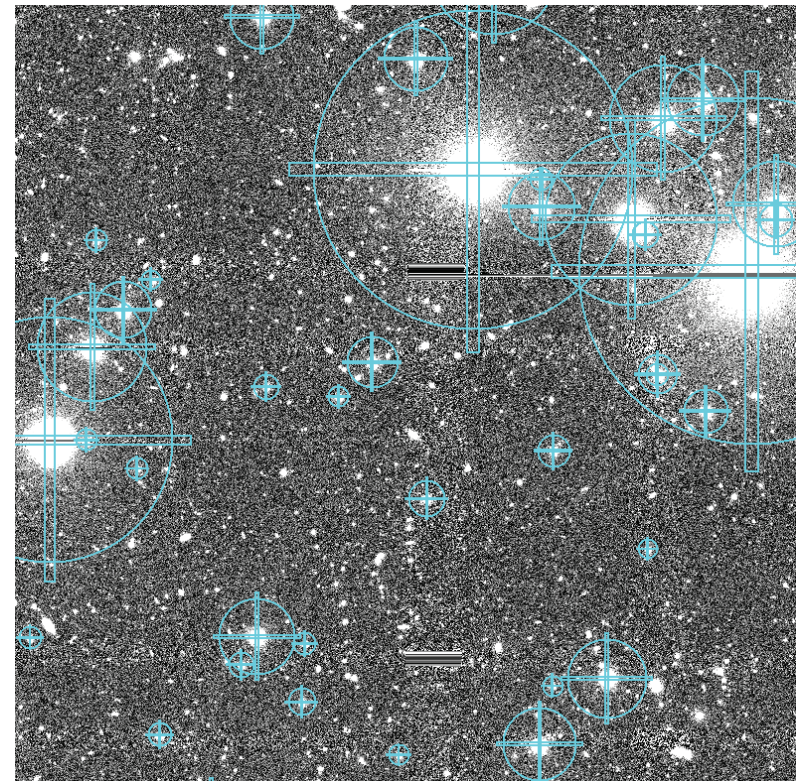
Improved Bright Star Masks

- Some interesting areas were unmasked in S18A
- Provide better masks based on [GAIA DR2 in Database](#) (now available in S18A CAS)

Default Masks with GAIA DR1



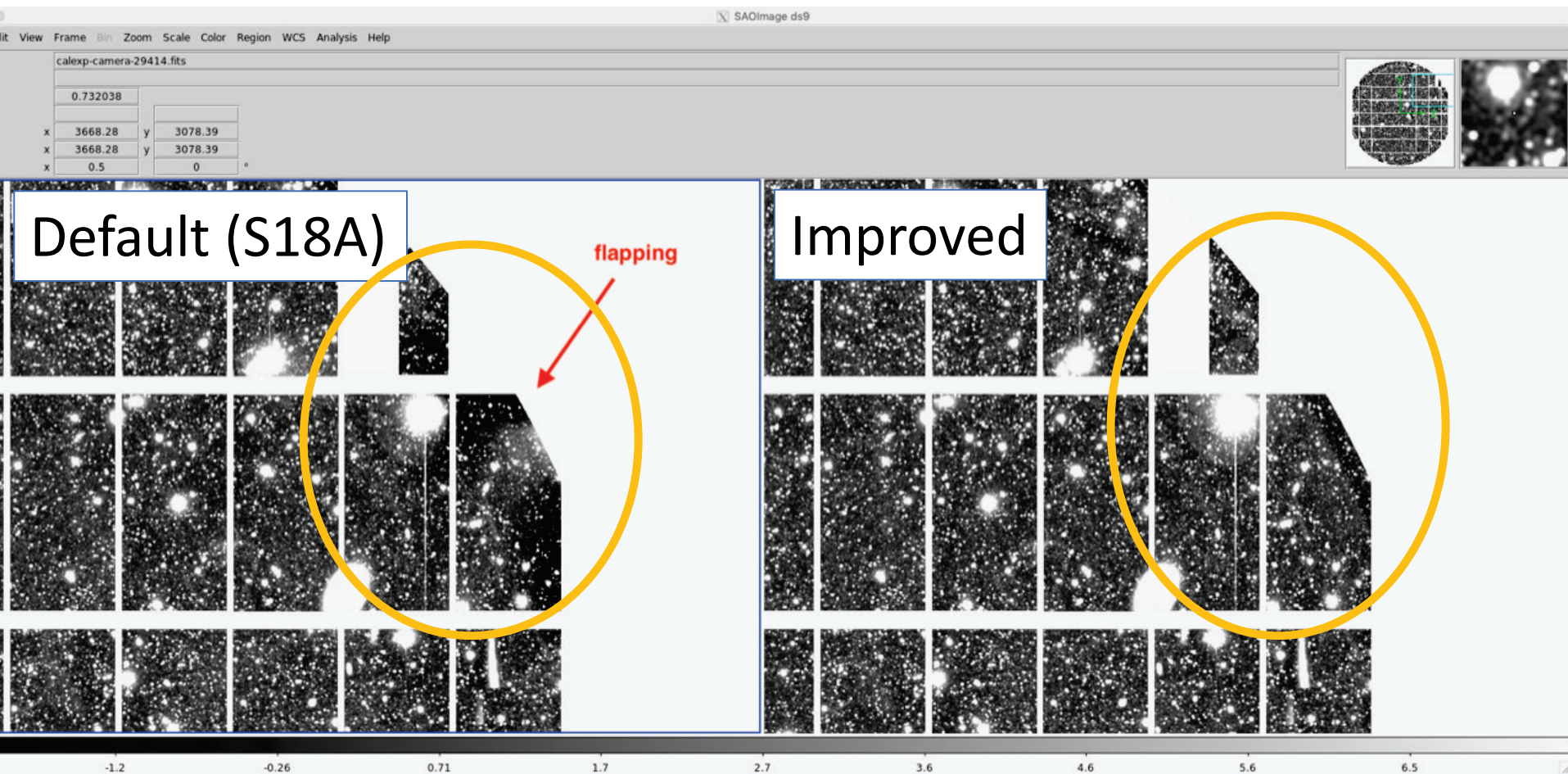
New Masks with GAIA DR2



2. DR-S19A

Improving Global Sky Subtraction

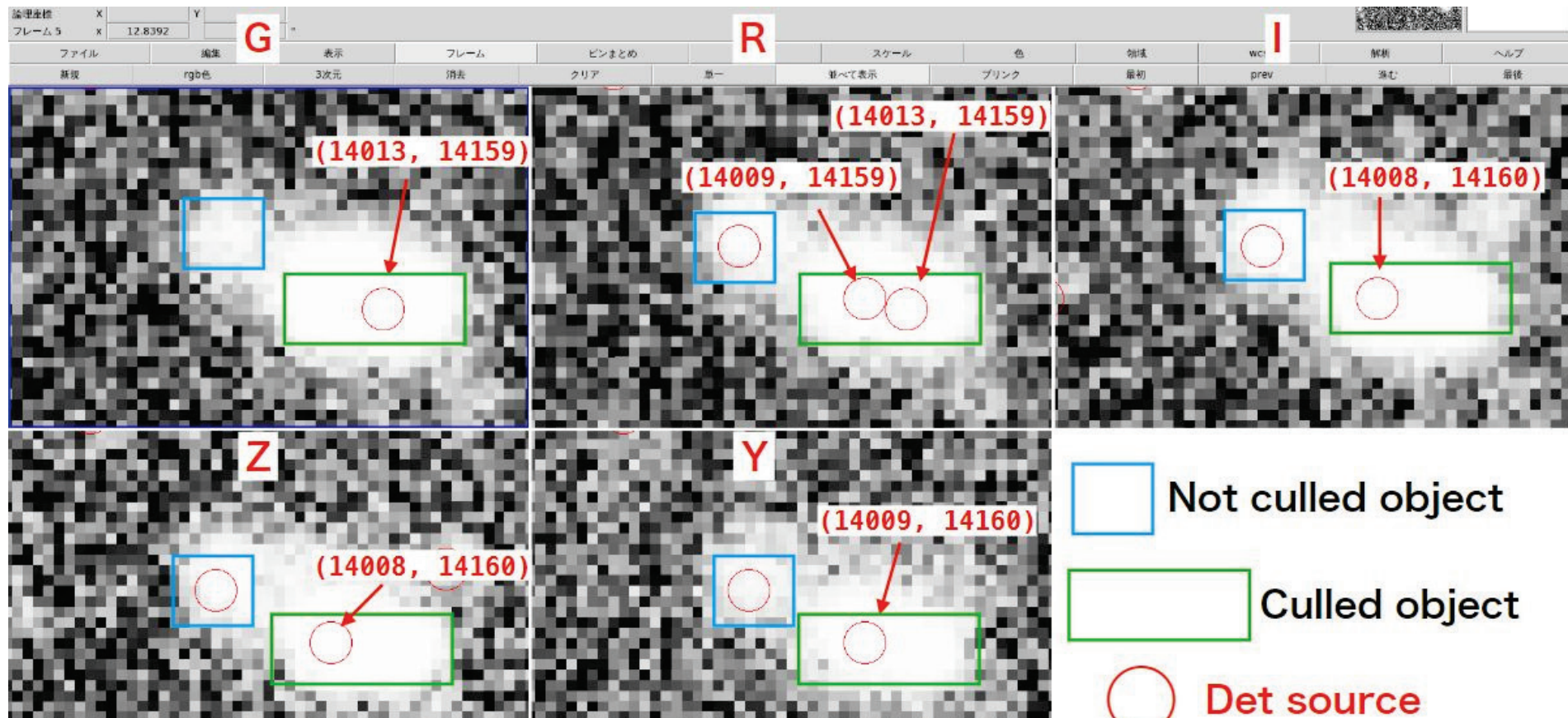
- larger spatial kernel (8k x 8k) with better object masking
- Improve over-sub. around bright sources & field edges



(Courtesy of Koike)

Improving Detection (1) Peak Culling

- Intended to remove false sources, but some **real sources still removed** in multiband process
- Investigating neighboring sources within $0.3\text{-}1''$ DM-17431

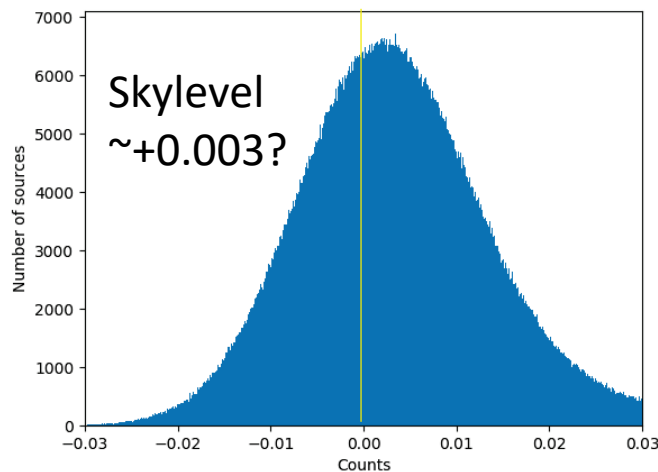


Improving Detection (2)

Tweaking Skylevel & Dynamic threshold

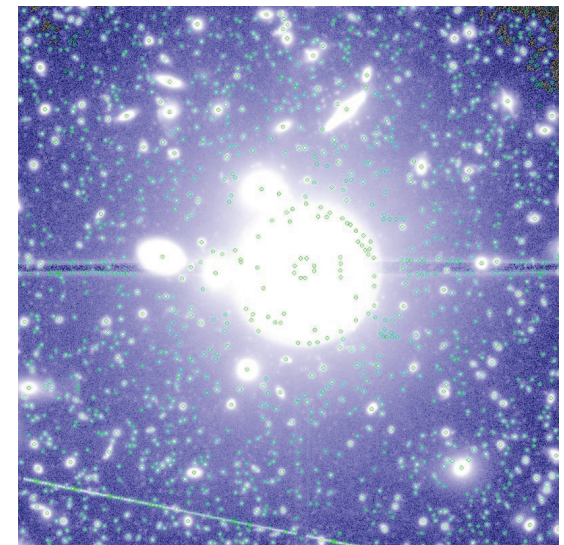
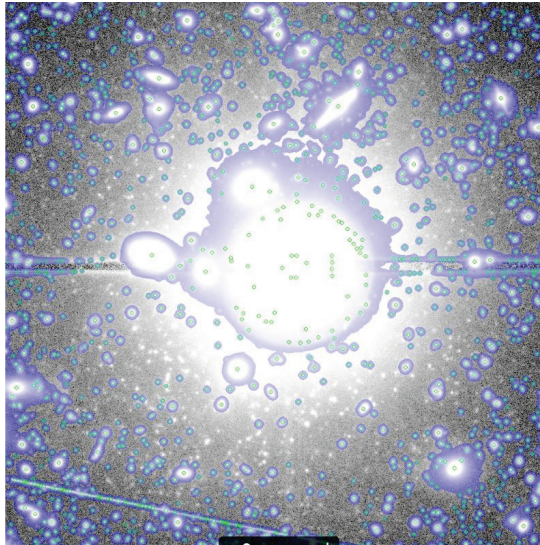
- **Skylevel tweak** and dynamic detection threshold need better understanding DM-17431
 - Always positive sky level on coadd
 - Possible **failure in the skylevel tweak & dynamic threshold logic** (tweak after detection, temporary subtraction etc)

Offset skylevel distribution on coadd



S18A

(doTempWideBackground=True) (doTempWideBackground=False)

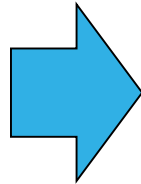
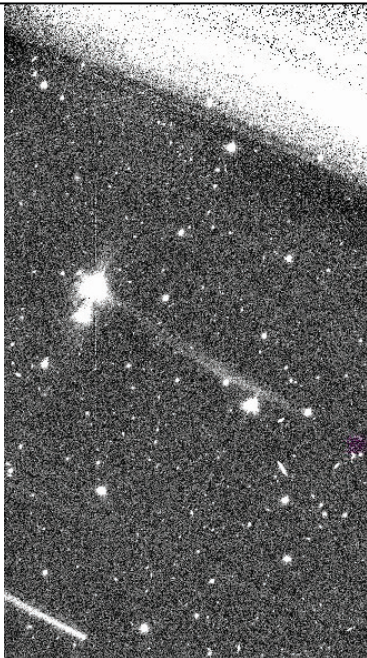


Ghost Masking Function

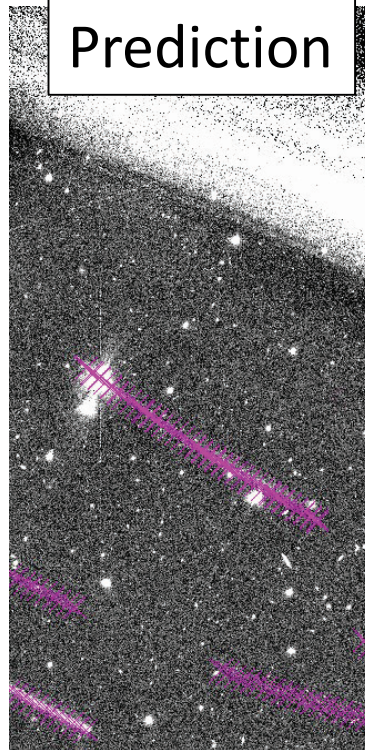
- Predict ghosts based on optical design
- Provide masks for ghost footprints

Ghost Type 1

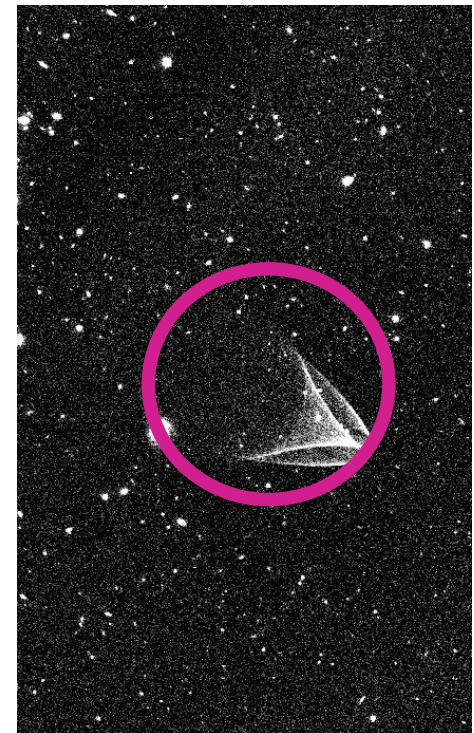
Corrected image



Prediction



Ghost Type 2



Other Miscellaneous Efforts

- Reducing processing time & memory for deblender
 - Using smaller patches?
- Updating CCD defect lists
- New astrometric match & mosaic algorithms
- Joint processing work with external collaborations
 - **CLAUDS** for MegaCam u-band + some NIR data
 - **Arizona** for UKIRT NIR data
 - **CHORUS** for various NB data
 - **UH** data on COSMOS

3. Science Database Service

- **No significant change** from S17A
 - Splitting growing tables (forced/meas) into 4 - 5
- Better interface of Schema Browser (search, folded cols)
- R&D's for improving **Query Performance** under way
 - parallel queries, distributed database, optimizing DB planner etc...
- **hscMap** interactive viewer being updated for better usability towards HSC+PFS science archive

3. DB Service

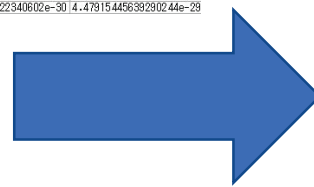
Improving Query Performance

- **Database sharding** (Citrus PostgreSQL extension)
 - Splitting catalog tables into multiple (8) CPU nodes
- **Selecting clean objects responds faster by a factor of 12**
 - Single node DBMS: 27m20s (1640s)
 - Citrus over 4 nodes: 4m29s (269s)
 - Citrus over 8 nodes: 2m12s (132s)

(Takita, Mineo, Koike)

object_id	ra	dec
36407046198788387	29.1159630754958911	-6.77514062483932467
36407046198788393	29.0970109639666628	-6.77468833995015998
36407046198788394	29.1266656260642023	-6.77473859426080979
36407046198788405	29.1084394235900774	-6.77393155380989859
36407046198788408	29.109846487464619	-6.77363160849894896
36407046198788413	29.0963872077951748	-6.7732540819775533
36407046198788416	29.0498945963513258	-6.7734294596736131
36407046198788419	29.1188003424259811	-6.77294321014939129
36407046198788424	29.0683293441205752	-6.77305830409151149
36407046198788434	29.1000803387613303	-6.77273723717555232

object_id	ra	dec	g_cmodel_flux	g_cmodel_fluxsma	r_cmodel_flux	r_cmodel_fluxsma	i_cmodel_flux
36407046198788387	29.1159630754958911	-6.77514062483932467	4.64893981605354625e-30	4.95629500099585979e-31	1.93187402500665039e-29	9.44395599445300658e-31	5.42595624661994493e-29
36407046198788393	29.0970109639666628	-6.77468833995015998	9.90573543681255026e-30	4.68450885746891646e-31	2.53811940311451919e-29	8.81938003689291283e-31	3.3371525620705388e-29
36407046198788394	29.1266656260642023	-6.77473859426080979	2.01787640107658948e-30	3.06393030110553577e-31	4.28519165751693896e-30	6.87830267625797171e-31	8.51145292329063636e-30
36407046198788405	29.1084394235900774	-6.77393155380989859	3.21913440845441486e-30	4.49898193555555555e-31	1.18013931914428111e-29	1.01017329130547608e-30	2.5829447722721897e-29
36407046198788408	29.109846487464619	-6.77363160849894896	3.56796380738751706e-29	4.68450885746891646e-31	4.01326726884468762e-29	7.8955594938948938e-31	5.310322891123875e-29
36407046198788413	29.0963872077951748	-6.7732540819775533	1.36461761517182936e-29	4.41762103493193636e-30	1.4418812564656813e-30	5.7686255664025006e-29	4.49989133019603331e-29
36407046198788416	29.0498945963513258	-6.7734294596736131	5.20729416317351e-29	1.7295211784570051e-29	8.86812102735873604e-31	1.0890178610485088e-29	7.51708e-29
36407046198788419	29.1188003424259811	-6.77294321014939129	1.53832911439212	2.0899152089591233e-29	1.07293903949191101e-30	4.0942950329289256e-29	1.82596e-29
36407046198788424	29.0683293441205752	-6.77305830409151149	3.63677638688449	2.2858506986209319e-29	8.325959020018165e-31	2.082406339655741e-29	3.51539e-30
36407046198788434	29.1000803387613303	-6.77273723717555232	8.52247205556814	8.47010108025848789e-30	1.86408970622340602e-30	4.47915445639292044e-29	5.19286e-29

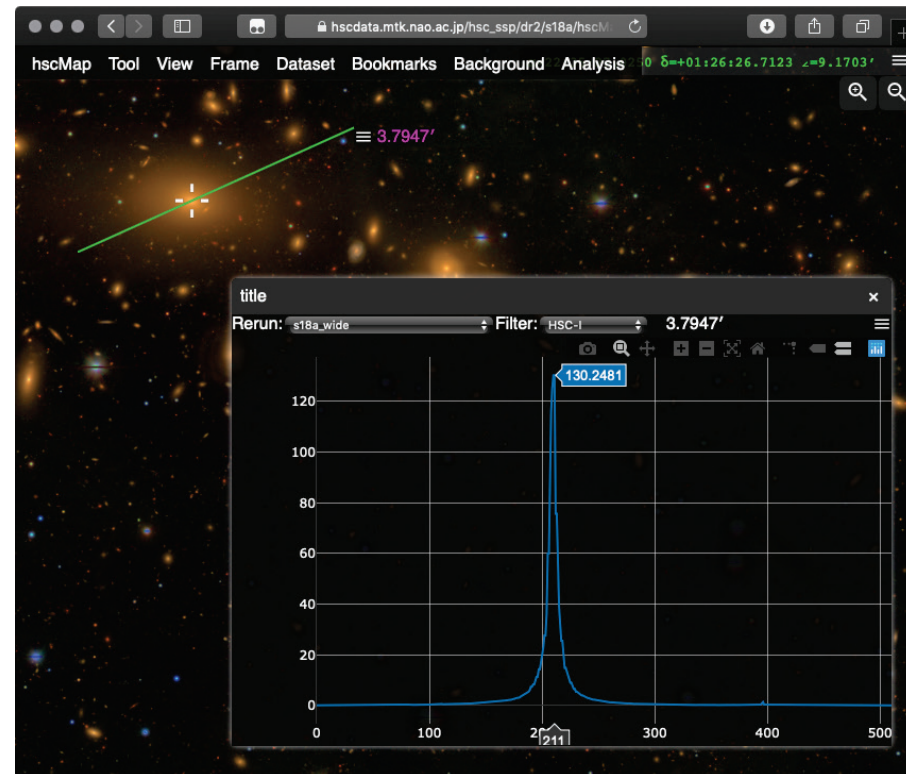
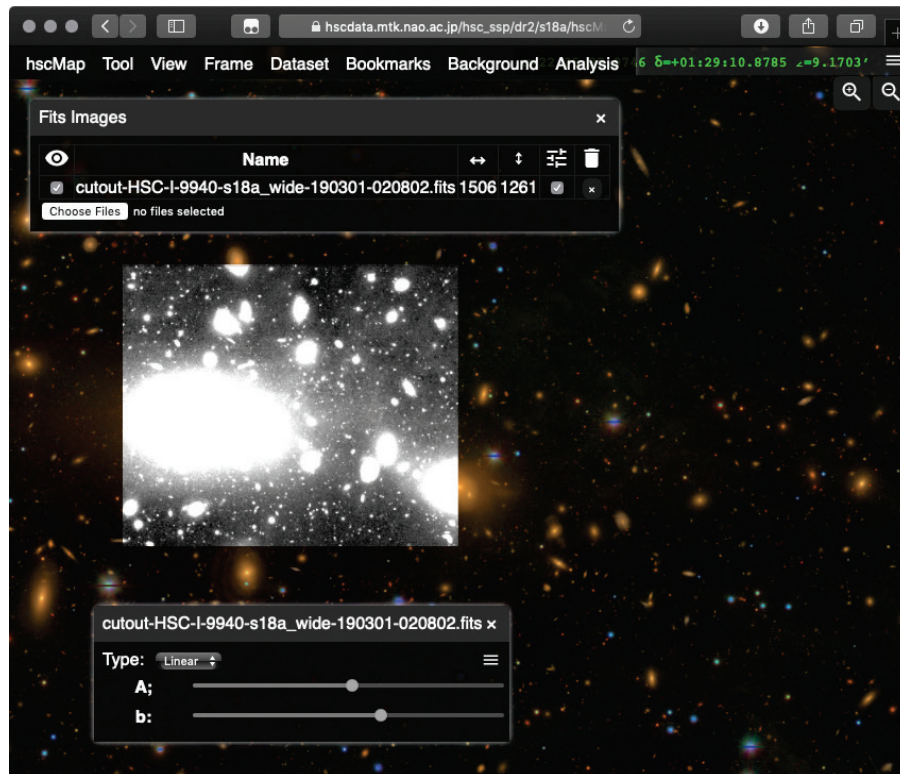


Not perfect for all SQLs, but experimental version is available

3. DB Service

Upgrading hscMap

- Capable to load **FITS files** by drag & drop
- Plot flux **profiles of sources**
- **APIs for external processes** with Python/Jupyter notebook



Summary

- Data Release S18A came out and updated
- Development for S19A is underway
- Database service is being improved
- Upcoming important events are PDR2 and IDR-S19A

EOF