Wide Imaging with Subaru HSC of the Euclid Sky (WISHES)

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on behalf of the WISHES team

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Team (Co-Is of the original proposal)

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Yusei Koyama	**observations**
Michitoshi Yoshida	**GW counterpart**
Nozomu Tominaga	**GW counterpart**
Masaomi Tanaka	**GW counterpart**
Yousuke Utsumi	**GW counterpart**
Nobuhiro Okabe	**clusters/galaxies**
Hironao Miyatake	**clusters/galaxies**
John Silverman	**clusters/galaxies**
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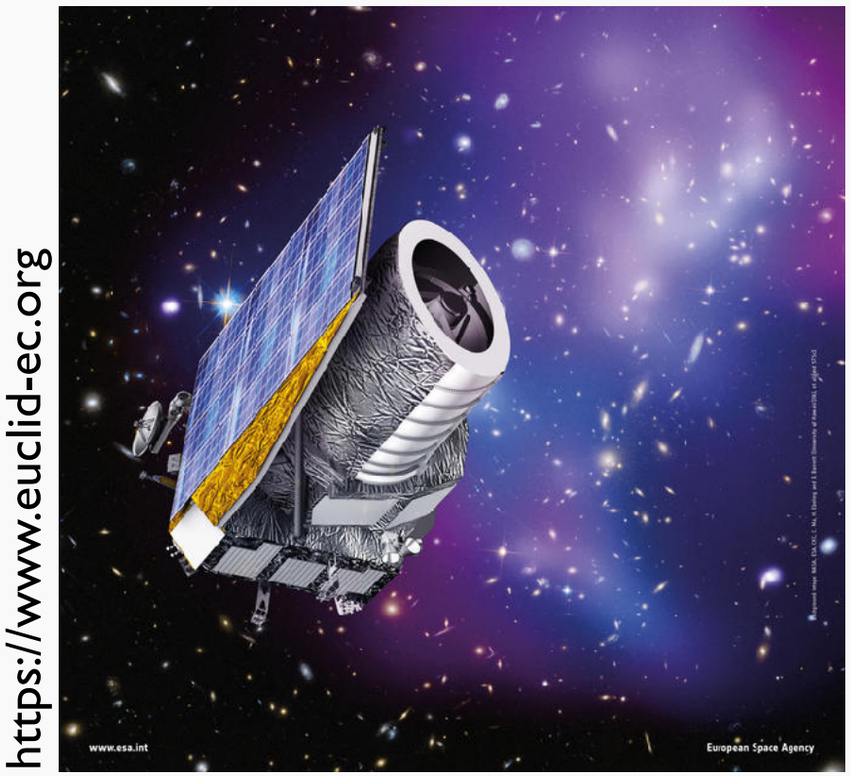
Masatoshi Imanishi	**AGNs**
Yoshiki Toba	**AGNs**
Masafusa Onoue	**AGNs**
Masashi Chiba	**Milky Way**
Kohei Hayashi	**Milky Way**
Nao Suzuki	**deep fields**
Tomo Goto	**deep fields**
Jean-Charles Cuillandre	**UNIONS/Euclid**
Alan McConnachie	**UNIONS/Euclid**
Eugene Magnier	**UNIONS/Euclid**
Ken Chambers	**UNIONS/Euclid**
Mike Hudson	**UNIONS/Euclid**
Jason Rhodes	**UNIONS/Euclid**
Stephane Arnouts	**UNIONS/Euclid**

Euclid mission



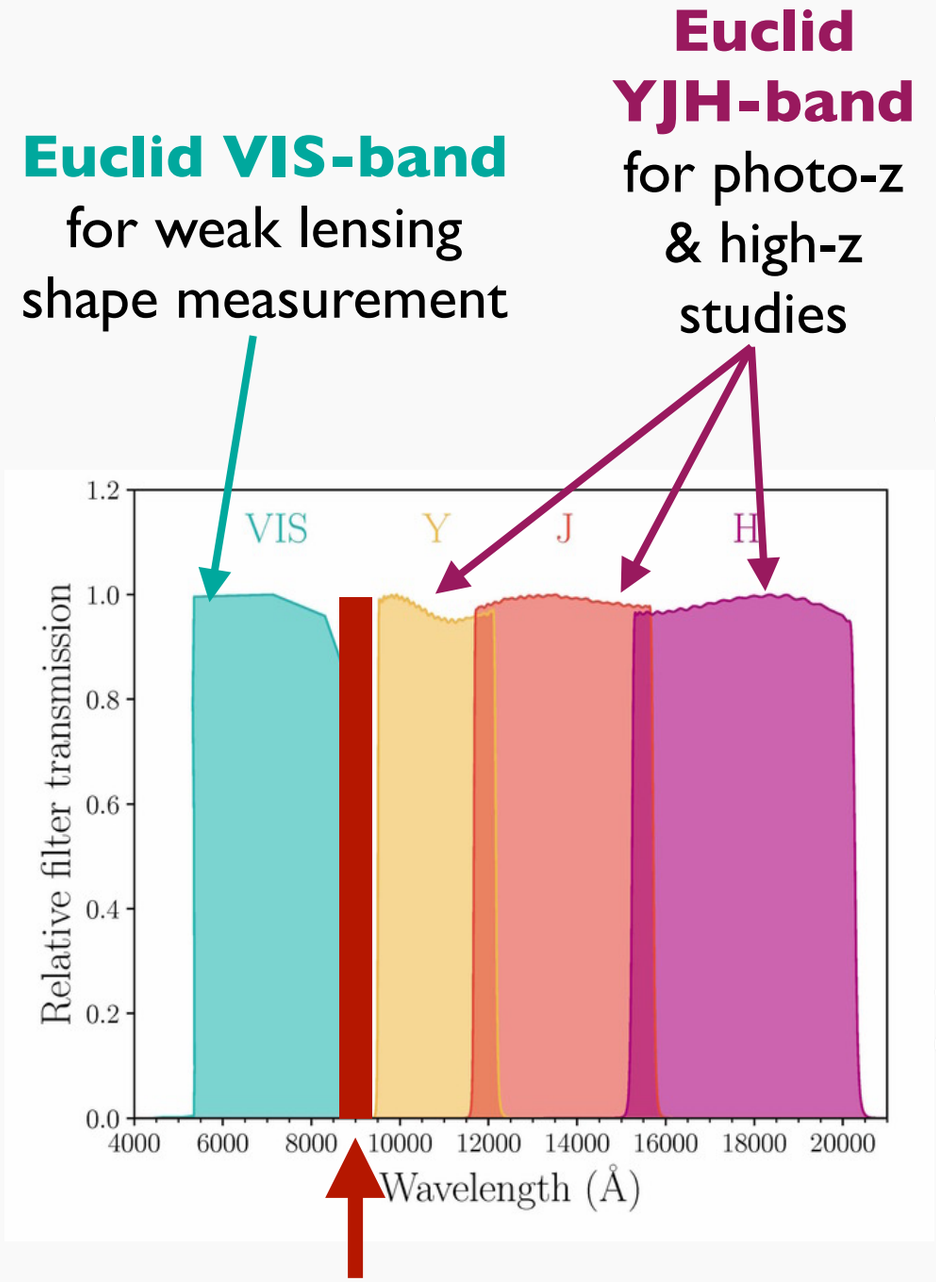
https://www.euclid-ec.org

ESA mission (~$1 billion), launch 2022

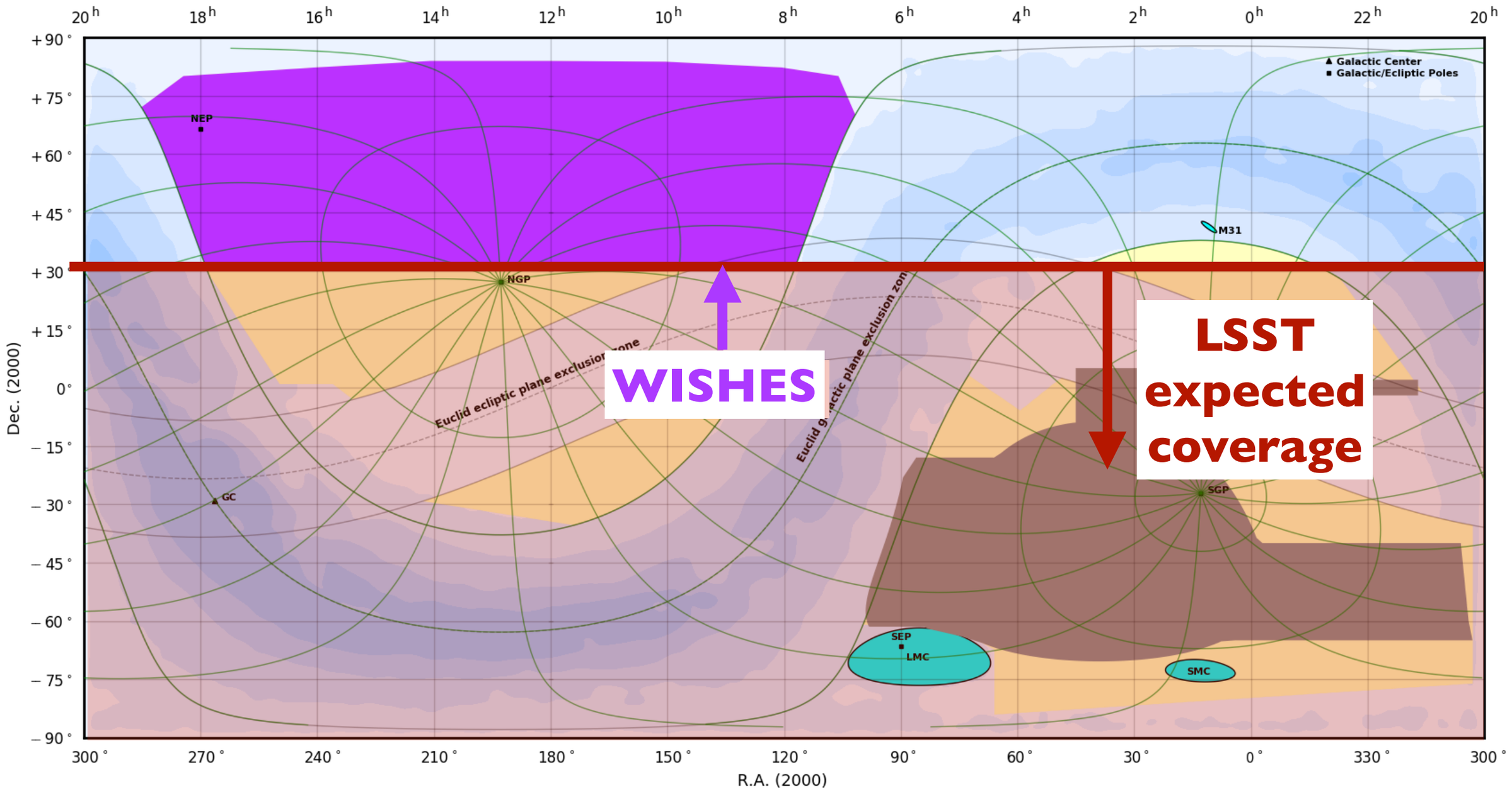
- **Wide imaging survey** (15000 deg^2, VIS+NIR)
- **Wide spectroscopic survey** (15000 deg^2, grism)
- **Deep survey** (3 patches, 40 deg^2, 2 mag deeper)

WISHES for Euclid

- HSC z-band imaging survey (**40 nights, S20B-S23A**)
- improve photo-z of galaxies for **cosmic shear** to acceptable level
- enable studies of **high-z quasars** and **clusters** in comb. with Euclid YJH



Survey footprint



HSC Northern-hemisphere Ultra-Wide Survey footprint (HSC-NUWS) over the Euclid Wide Survey

WISHES [z] & UNIONS (CFHT [u,r] + Pan−STARRS [i] + HSC [g]) : 4,500 deg.^{2}

Euclid wide space survey : 15,000 deg.^{2} [Y,J,H + morphology + spectroscopy]

DES [g,r,i,z] : 4,500 deg.^{2}

Euclid exclusion zone : 26,000 deg.^{2} [galactic+ecliptic planes + dust]

Target depth

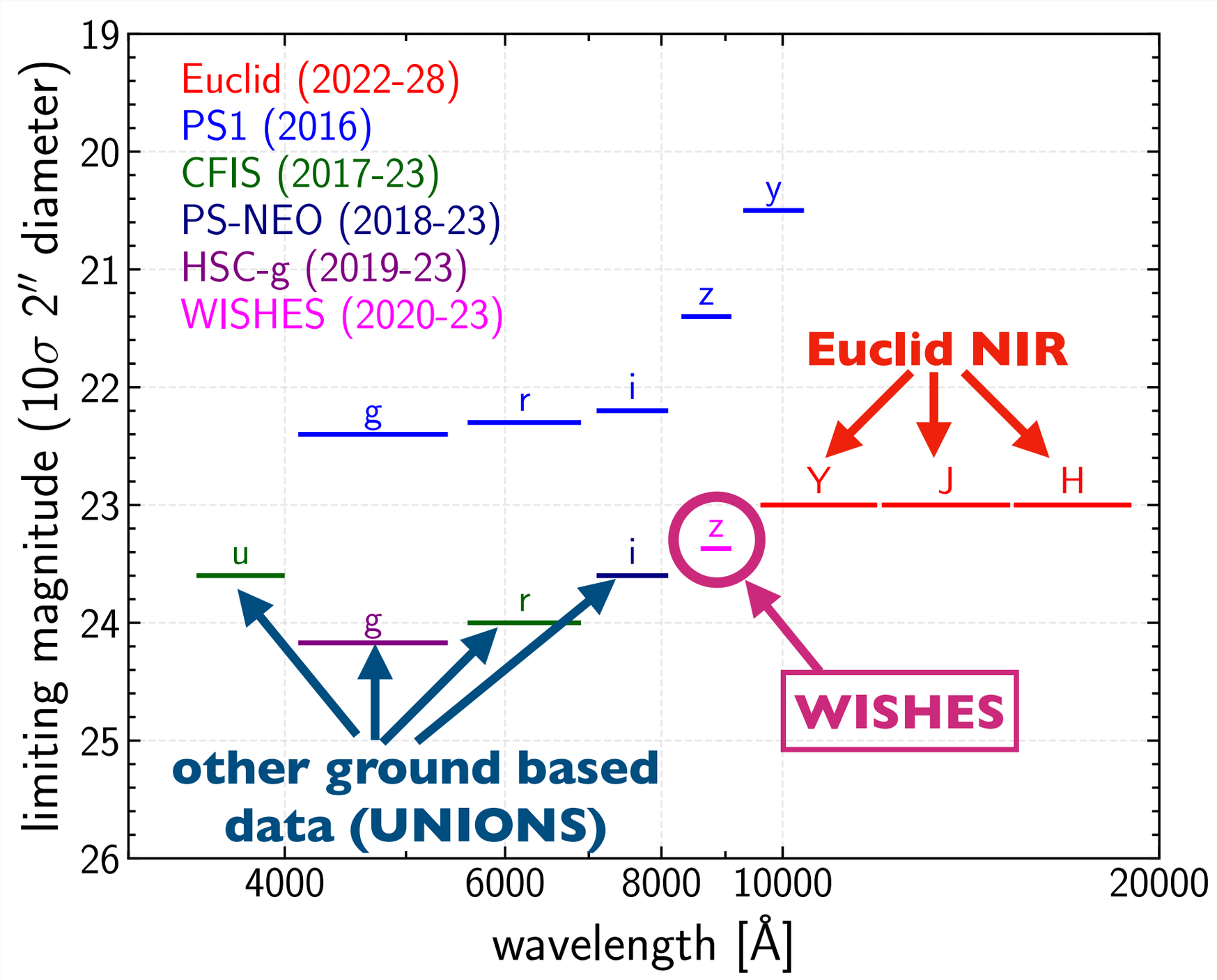
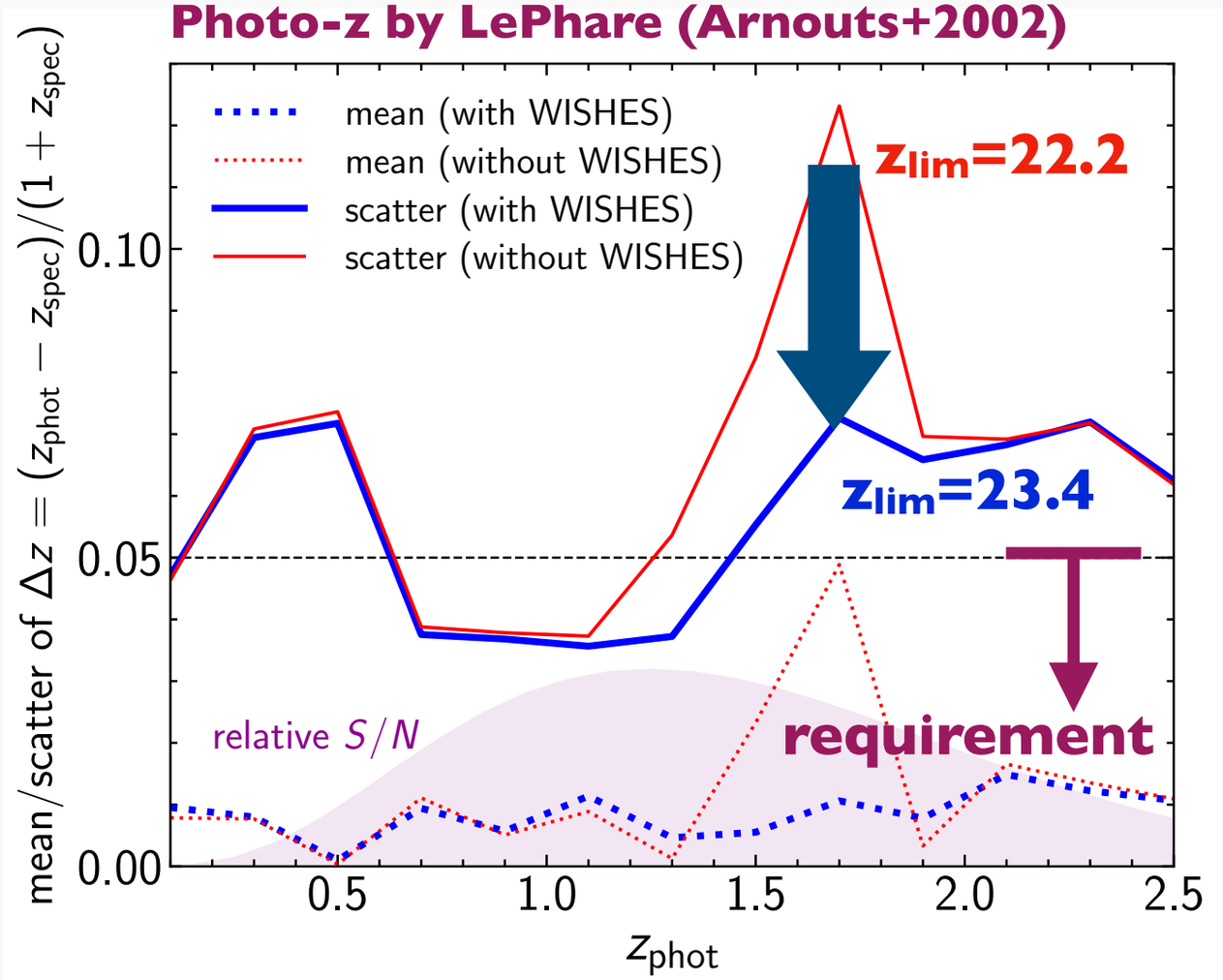
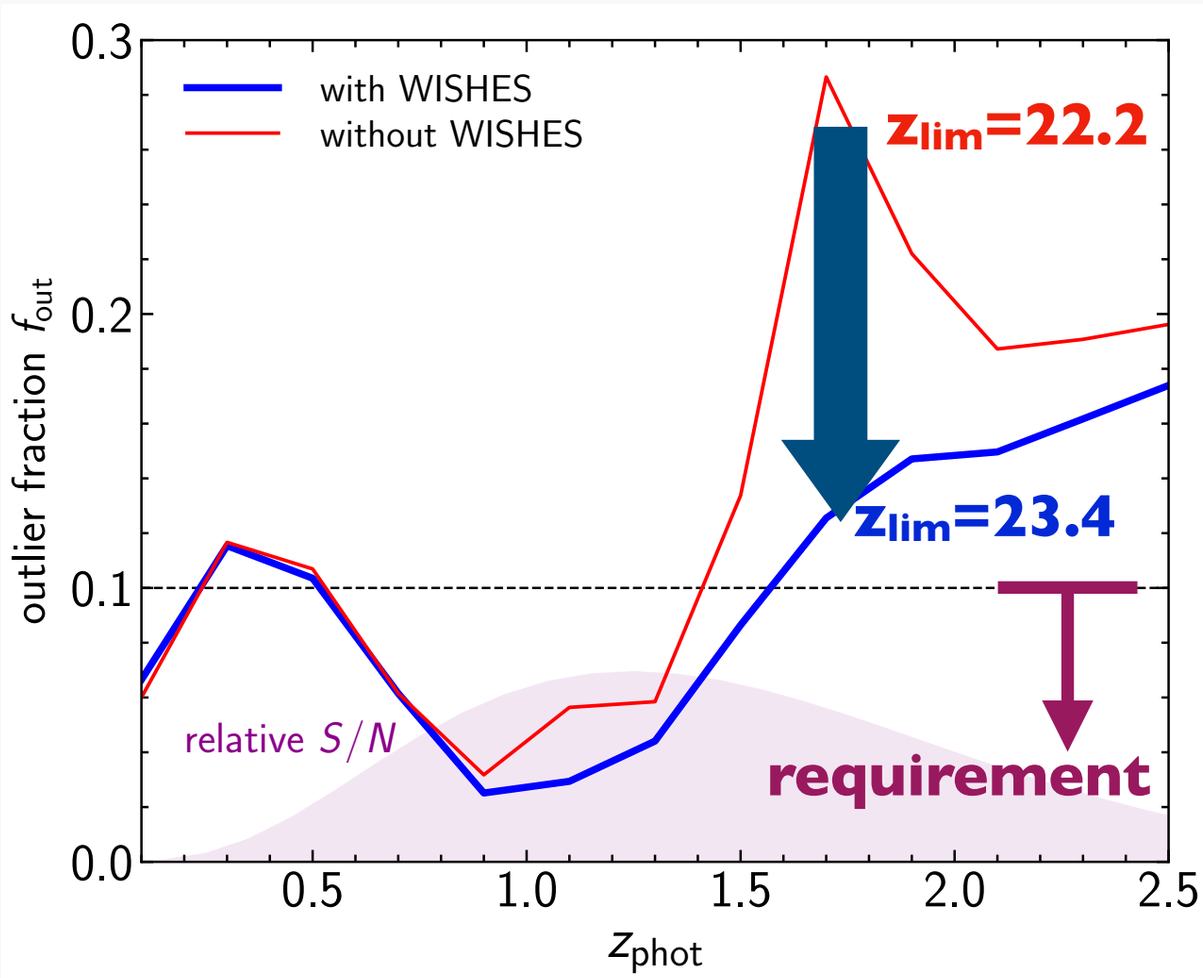


Photo-z for cosmic shear cosmology



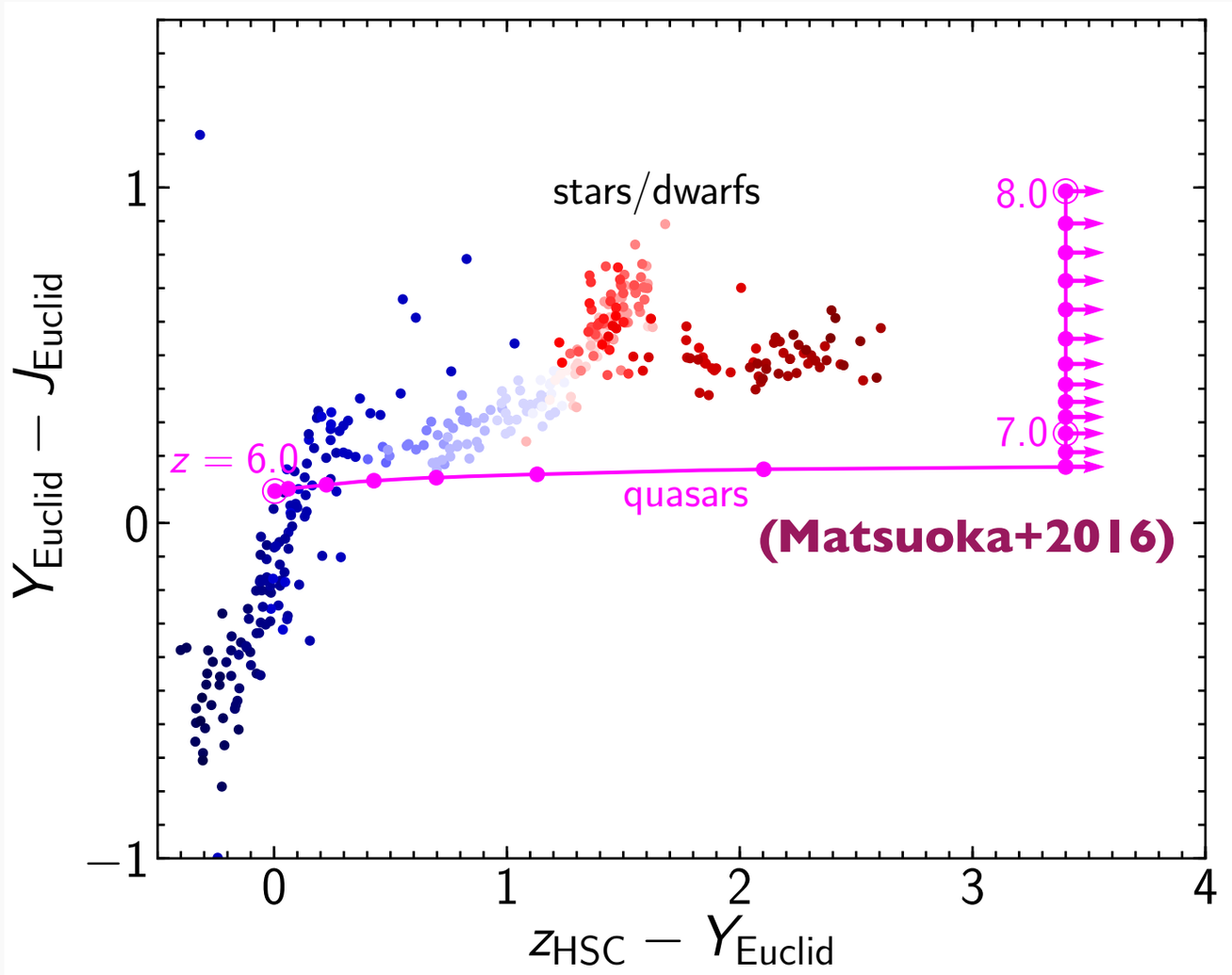


- same ugri+VIS+YJH depth, change only z depth
- huge impact at z~1.5-2, corresponding to factor ~2 degradation in cosmo. para. constraints

High-z quasars

- stars and quasars at z~6–8 are separated well in zYJ-plane
- **deep z-band images are *very* important for efficient quasar search from Euclid**

(see Euclid Collaboration 2019)

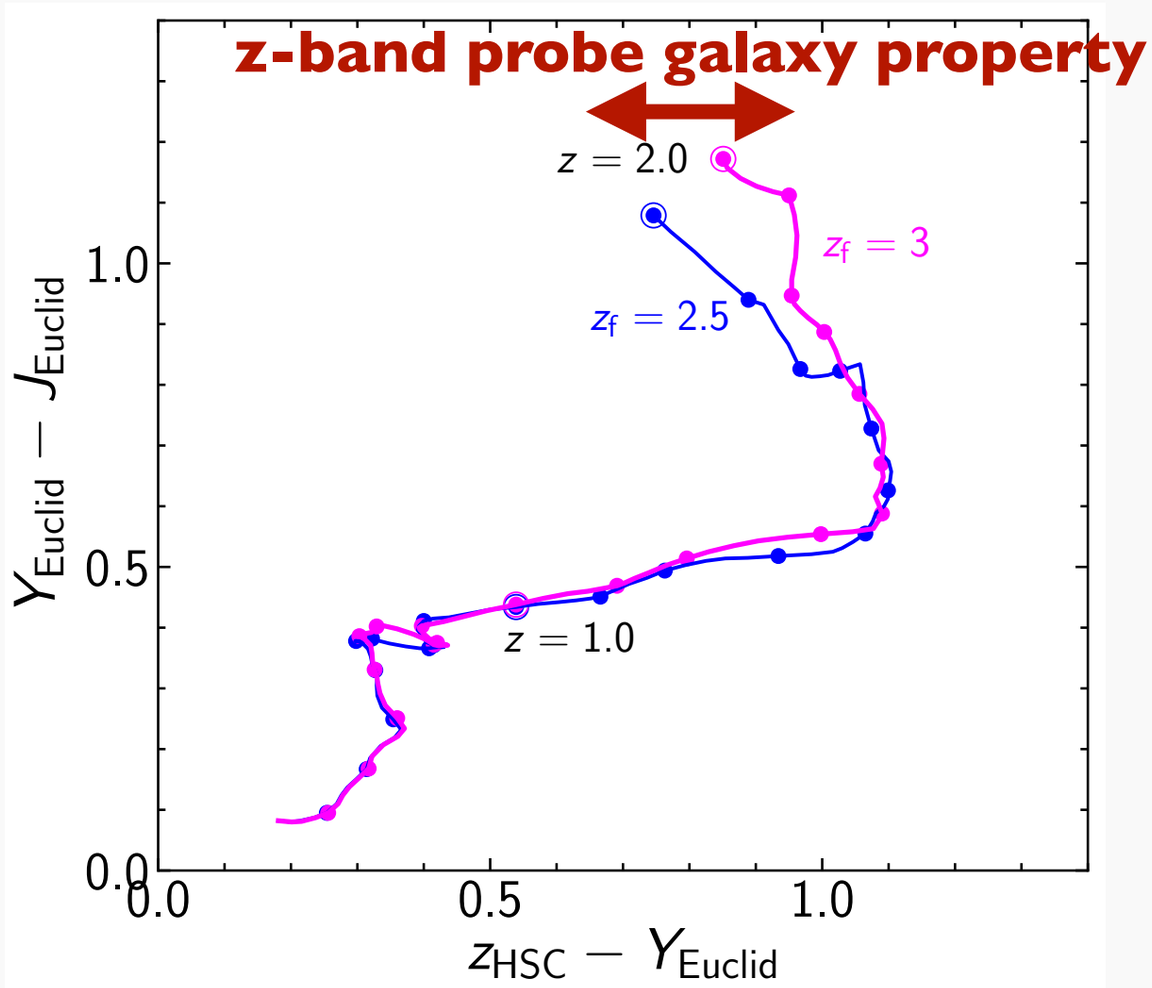


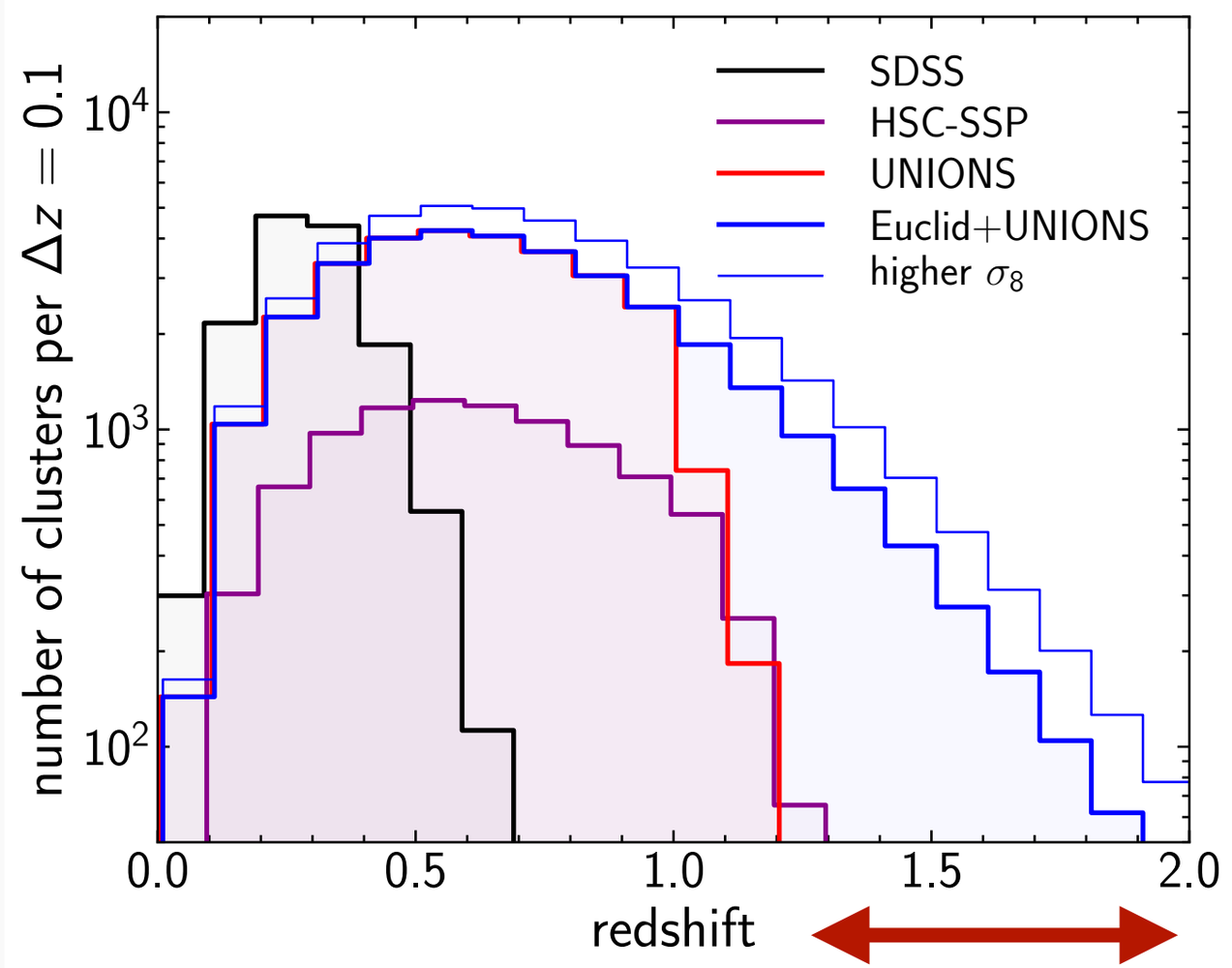
- **~20** quasars at 7<z<7.5, **~15** quasars at 7.54<z

(**these numbers are limited by z-band depth!**)

[cf. ≲ 1 if we use current optical images]

High-z clusters





unique cluster sample to z~2

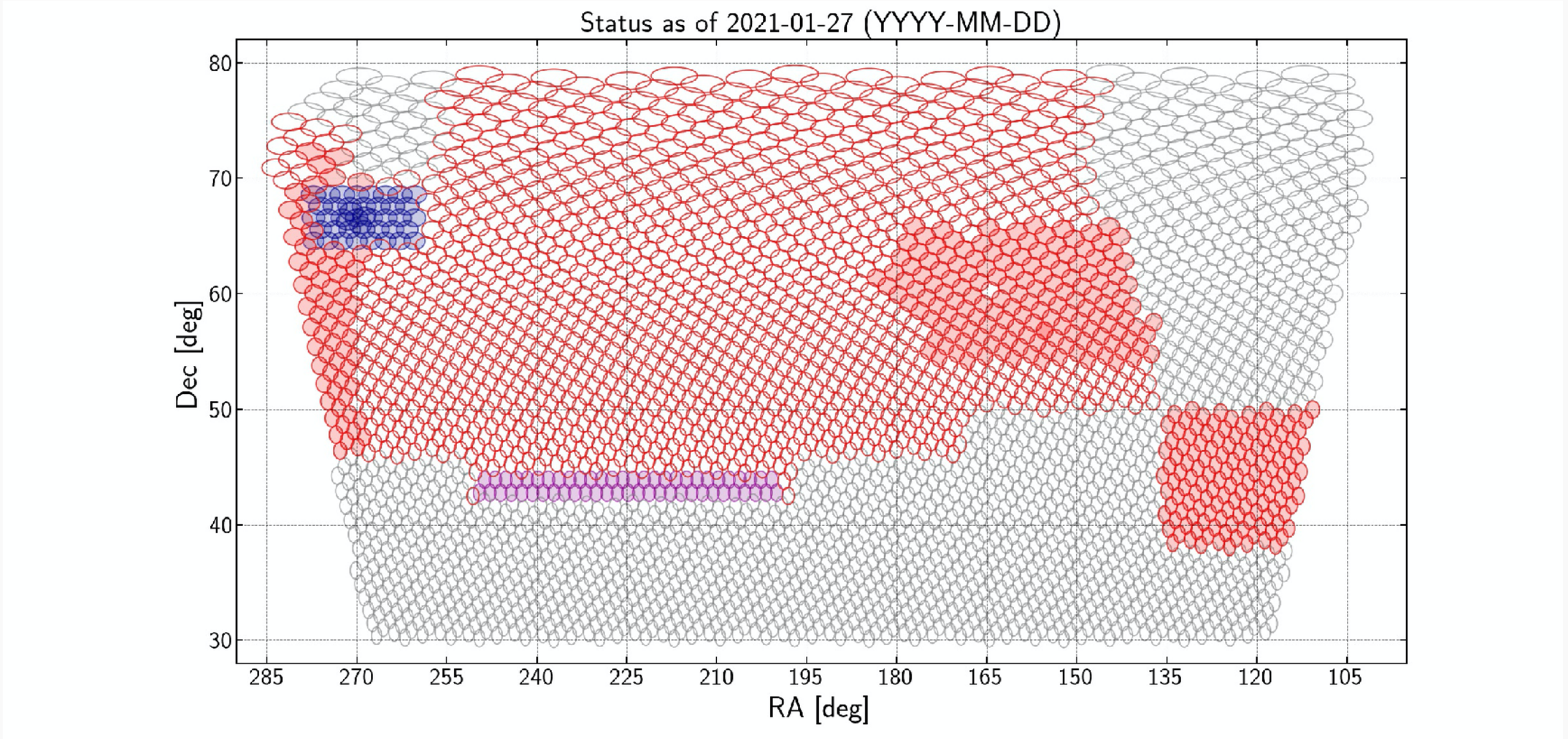
- very unique studies of clusters at z~1.4-1.9
- grism (Hα) also very unique, synergy w/ eROSITA

Science before Euclid

- UNIONS (**CFHT+Pan-STARRS+Subaru**)
  → *ugriz*-band data over ~5,000 deg^2

- a wide range of science cases
  - search for GW counterparts (reference images)
  - search for rare AGNs
  - 3D Milky Way structure from BHB stars
  - large cluster sample up to z~1
  - finding strong gravitational lenses
  - …

Current status



red open circles: pointings in queue
red filled circles: pointings that were already observed

We appreciate the HSC queue team for the big help and support!

Collaboration policy

- WISHES/UNIONS is open to any Japanese researches just like HSC-SSP
- please let me know if you are interested in (although the first internal data release has not happened yet)

Access to Euclid data

- our WISHES contribution to Euclid enables **25 members** (1 PD + 1 student for each member) to formally join Euclid with **full access to the data**
- call for proposals to select these members from the Japanese astronomical community (coming very soon!)

Summary

- WISHES is an HSC z-band imaging survey over 4,500 deg^2 of the northern sky
- crucial for the success of the Euclid satellite mission (→access to the Euclid data)
- so far we have good progress of observations