RESEARCH CENTER FOR
SPACE AND COSMIC EVOLUTION

The faint end of the quasar luminosity function at *z*~5 explored with the Subaru Hyper Suprime-Cam data

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collaborators :

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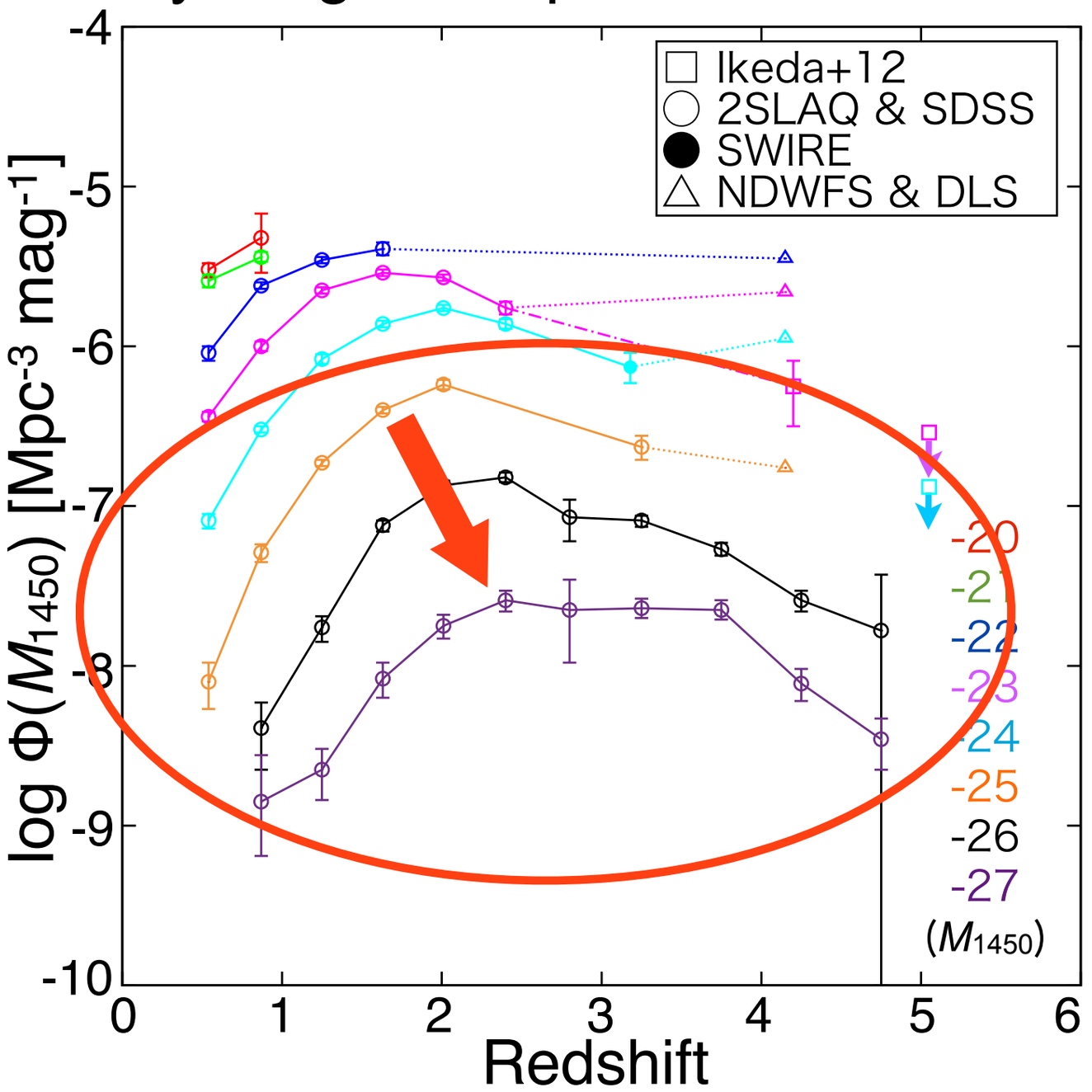
1. Introduction

The evolution of QSO number density

To study the evolution of SMBHs

→ Measuring the QSO luminosity function (QLF) at various redshifts over a wide luminosity range is important

Recent studies on QLF show the evolution of the QSO number density and its luminosity dependence (**AGN down-sizing**)



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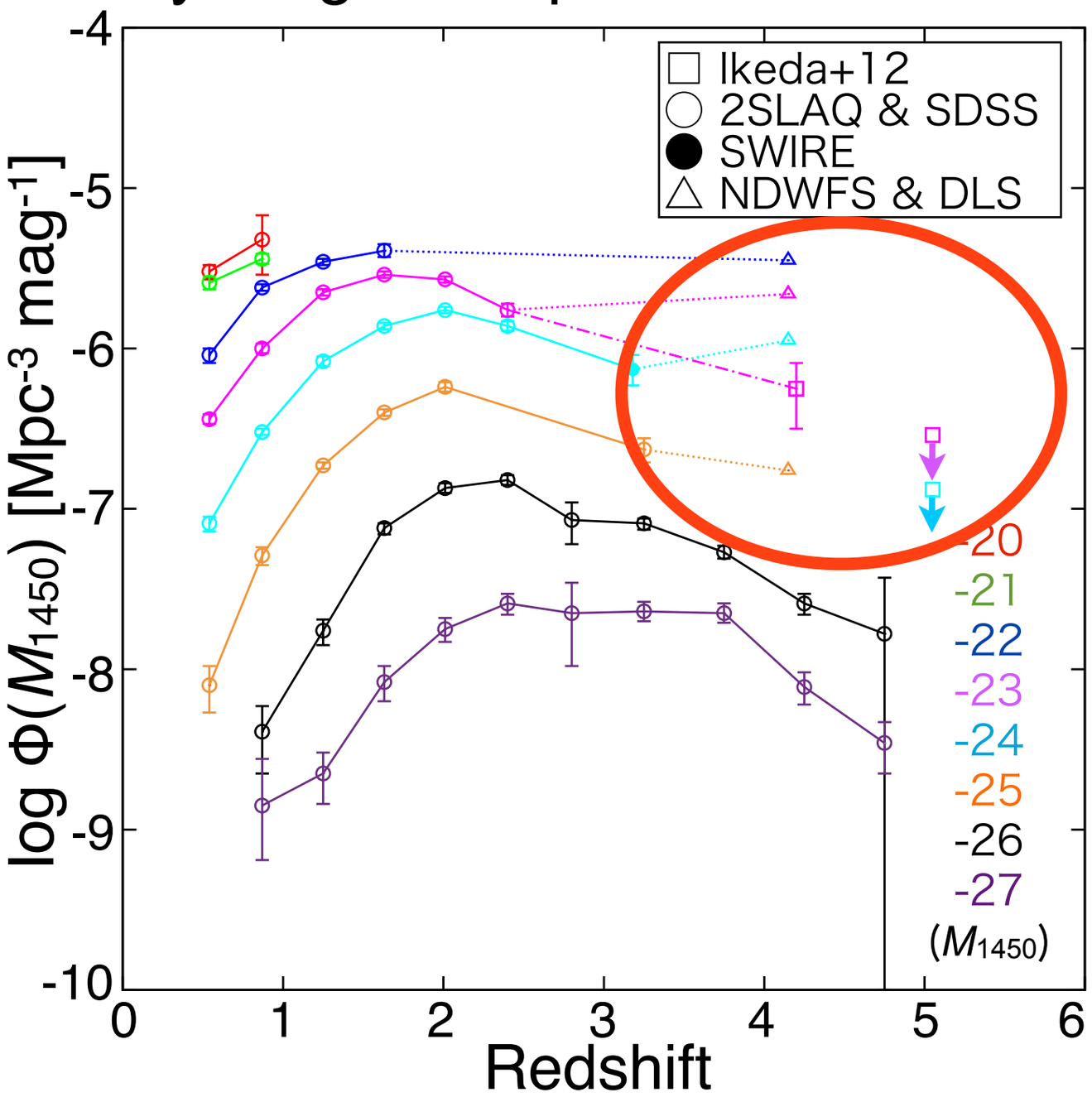
⬇ However

Low-luminous QSO number density at high-z is unclear due to the insufficient area and sensitivity



1. Introduction

The purpose of this study

To reveal the evolution of SMBHs,
we derive the faint end of the QLF at $z \sim 5$
based on the wide survey data with
Subaru / Hyper Suprime-Cam.

2. Data and Analysis

The data of HSC WIDE field

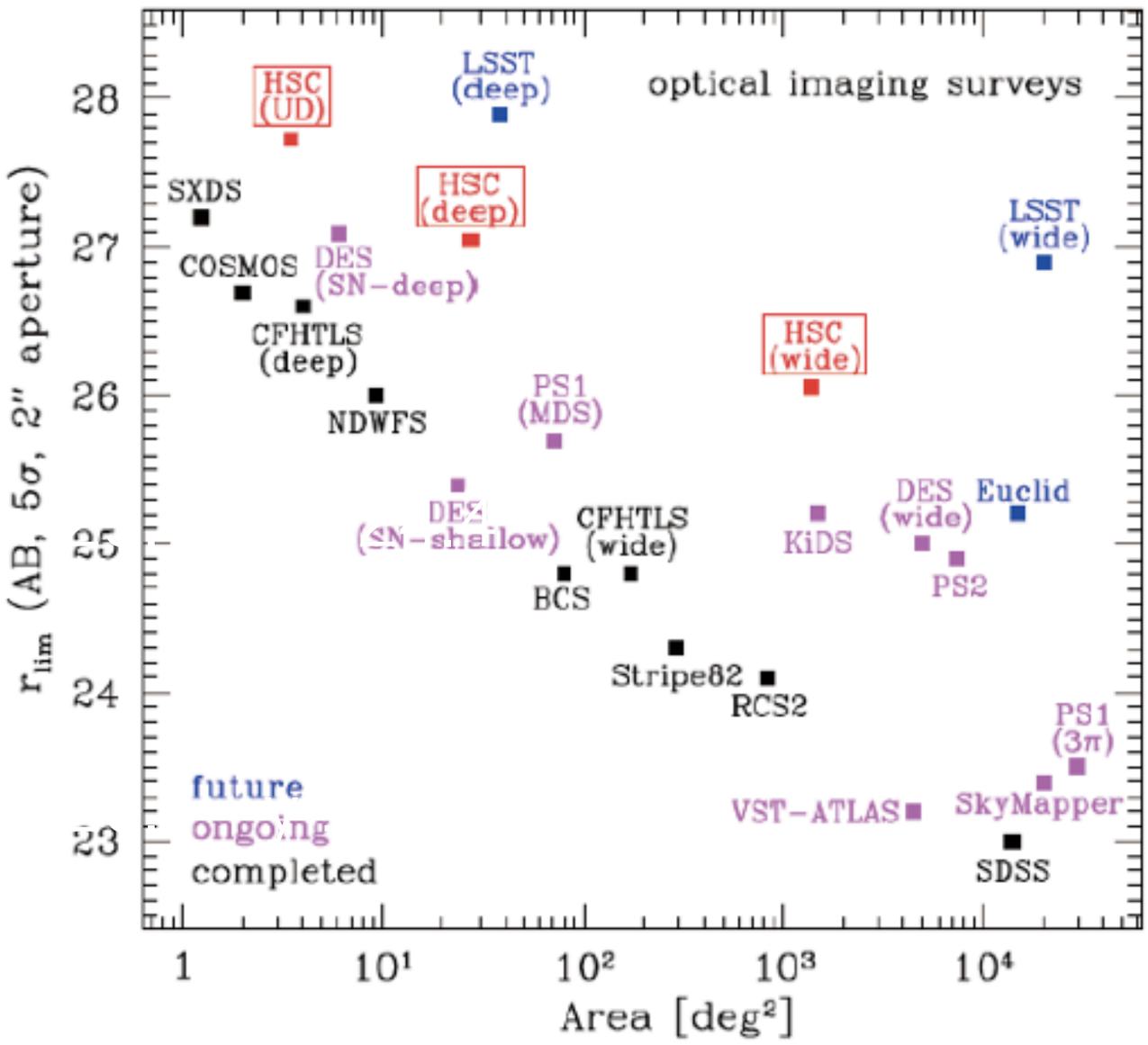
Instrument

- Subaru / Hyper Suprime-Cam (HSC)
- FoV : 1.5° diameter

Survey

- Subaru Strategic Program (SSP)
  - WIDE field (1400 deg^2)
  - Limiting magnitude
    (2σ, 2", AB)

g	r	i	z	y
27.5	27.1	26.9	26.1	25.4



2. Data and Analysis

The data of HSC WIDE field

HSC WIDE field catalog (~140 deg^2)

⬇

create the clean subsample with applying related flags

⬇

19 < *i*-psf < 24

⬇

stellar source

⬇

two color diagram (*i* - *y* vs. *r* - *i*)

⬇

g - *r* > 1.5

⬇

z ~ 5 QSO candidate

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color selection { **two color diagram (*i* - *y* vs. *r* - *i*)**

⬇

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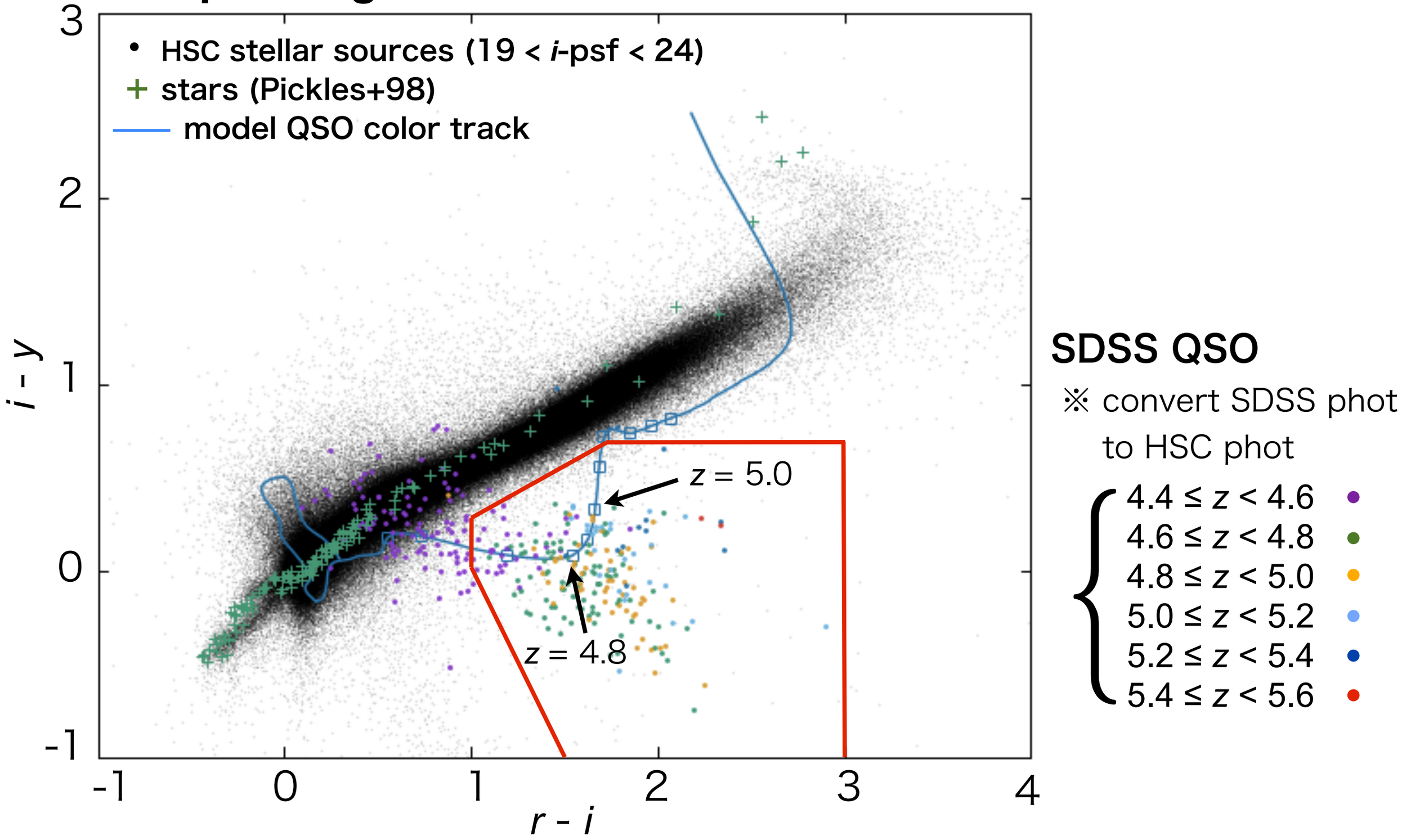
2. Data and Analysis

Sample selection by the two color diagram (*i* - *y* vs. *r* - *i*)

- **Separating the color of QSOs and stars**



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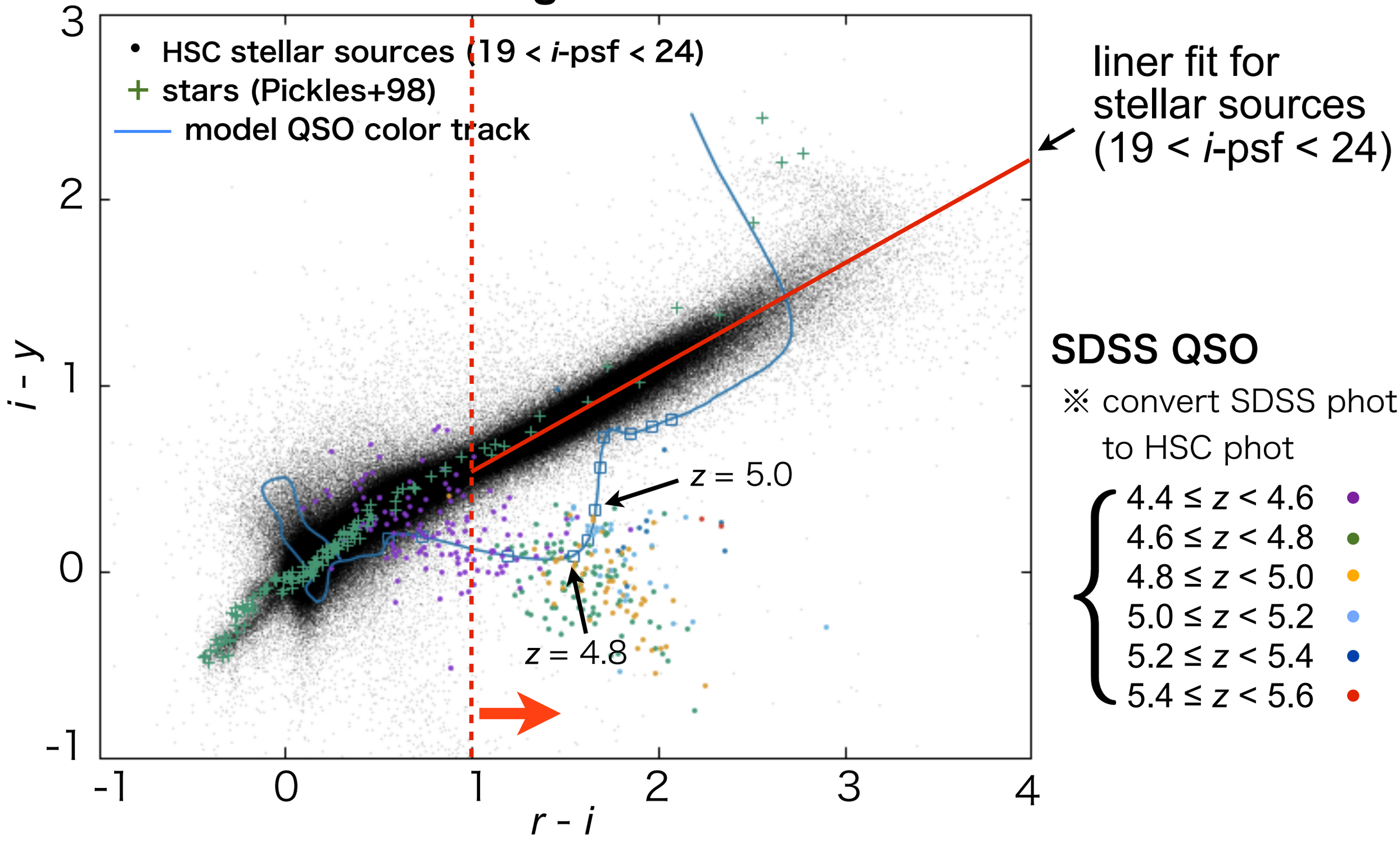
Sample selection by the two color diagram (*i* - *y* vs. *r* - *i*)

- **Method of deciding the selection criteria**



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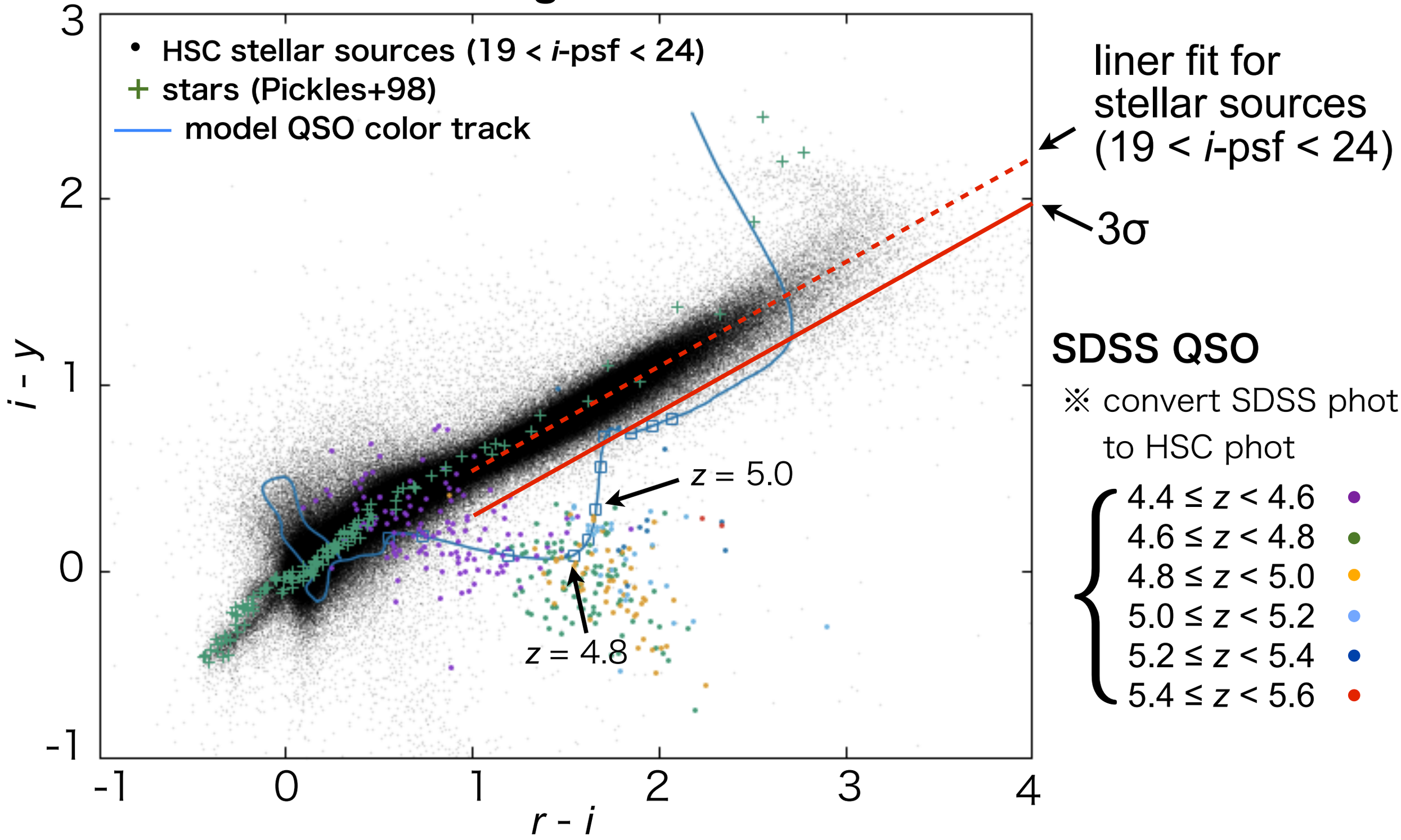

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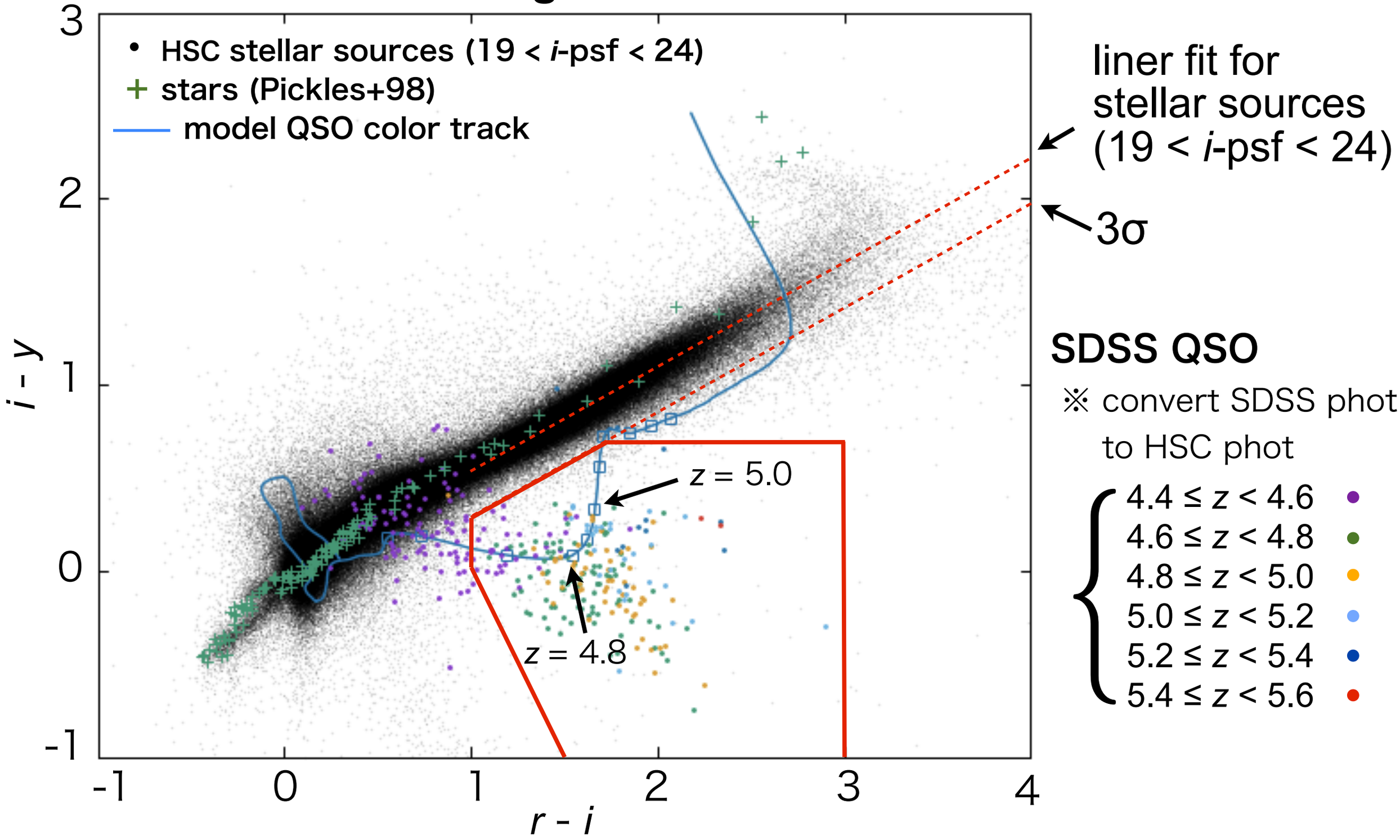

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⬇

color selection { two color diagram (*i* - *y* vs. *r* - *i*)

⬇

***g* - *r* > 1.5**

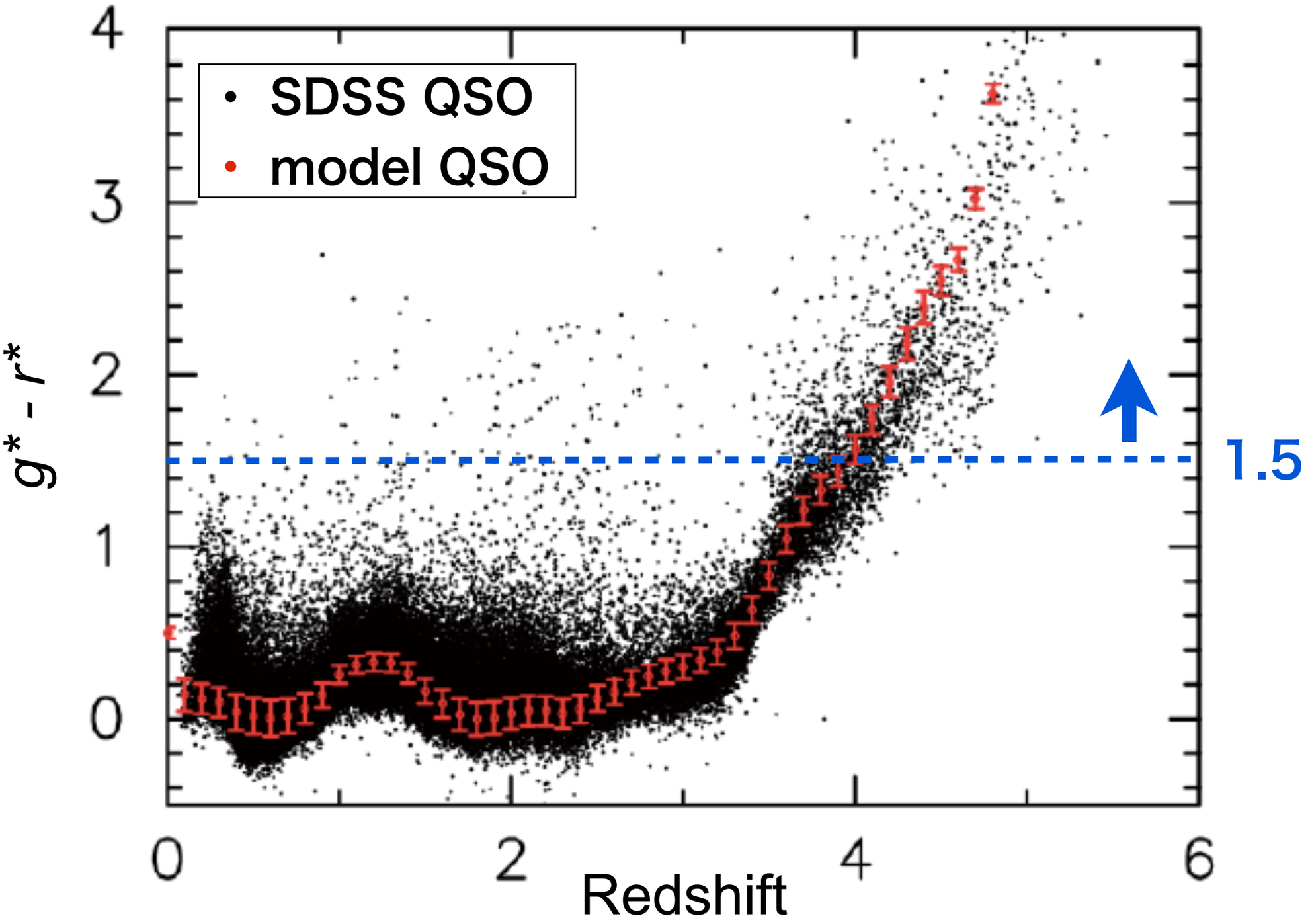
⬇

z ~ 5 QSO candidate

2. Data and Analysis

Sample selection by *g* - *r* color

- The SDSS study indicates that color (*g* - *r*) of the high-*z* QSOs is **redder** than that of the low-*z* QSOs



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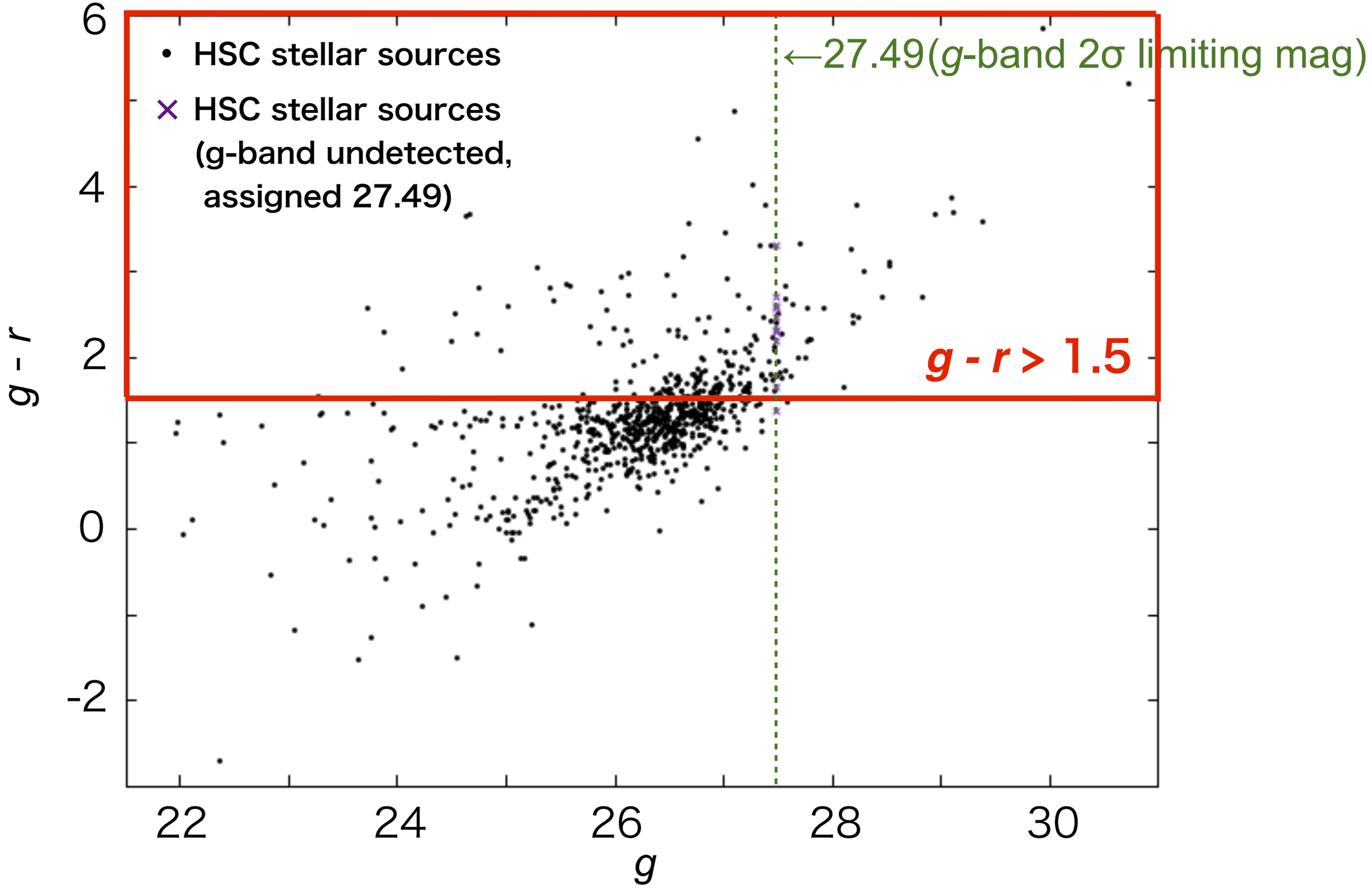
Sample selection by *g* - *r* color

・We remove the contamination by low-*z* QSOs by *g* - *r*



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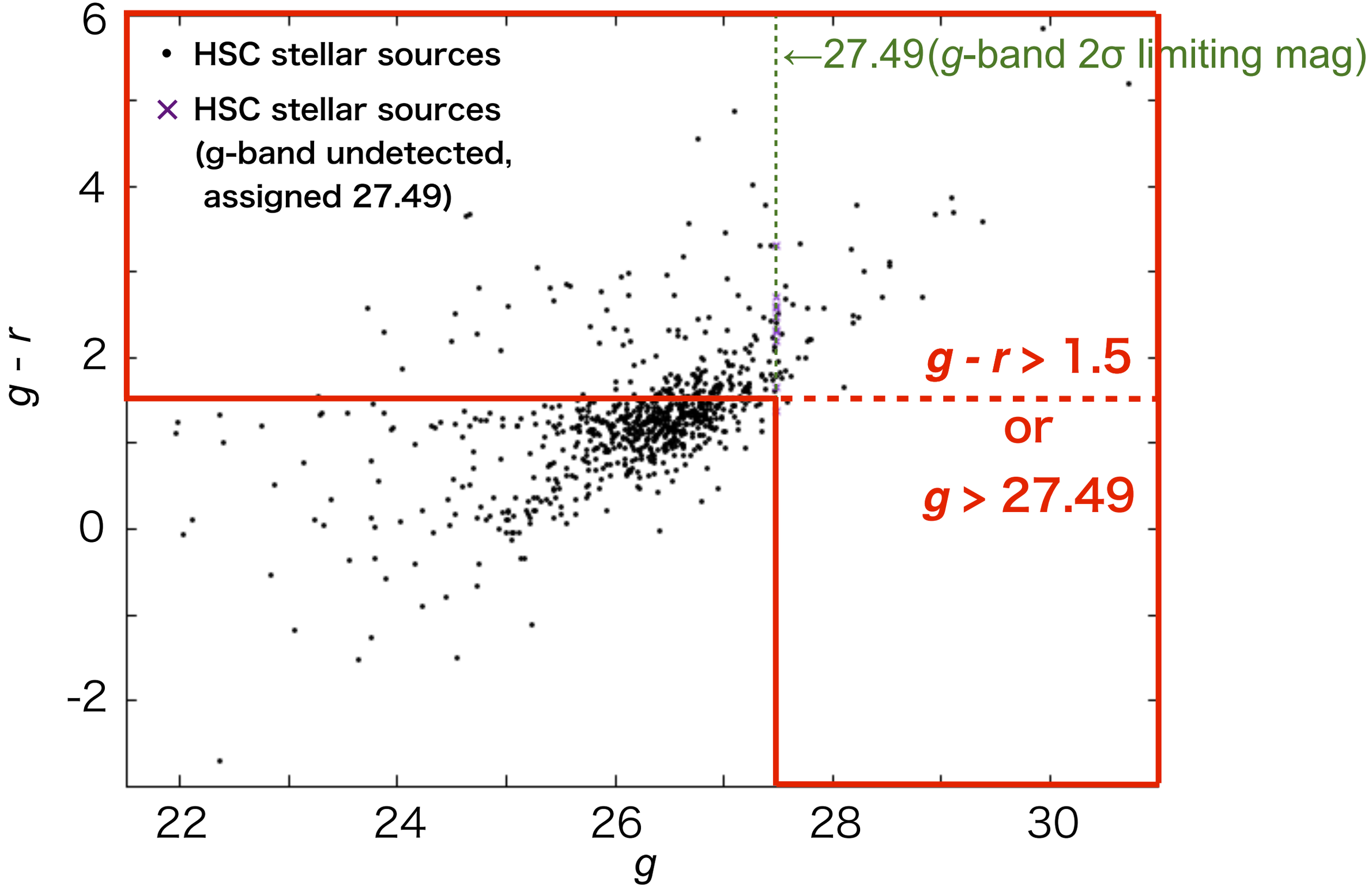


3. Result and Discussion

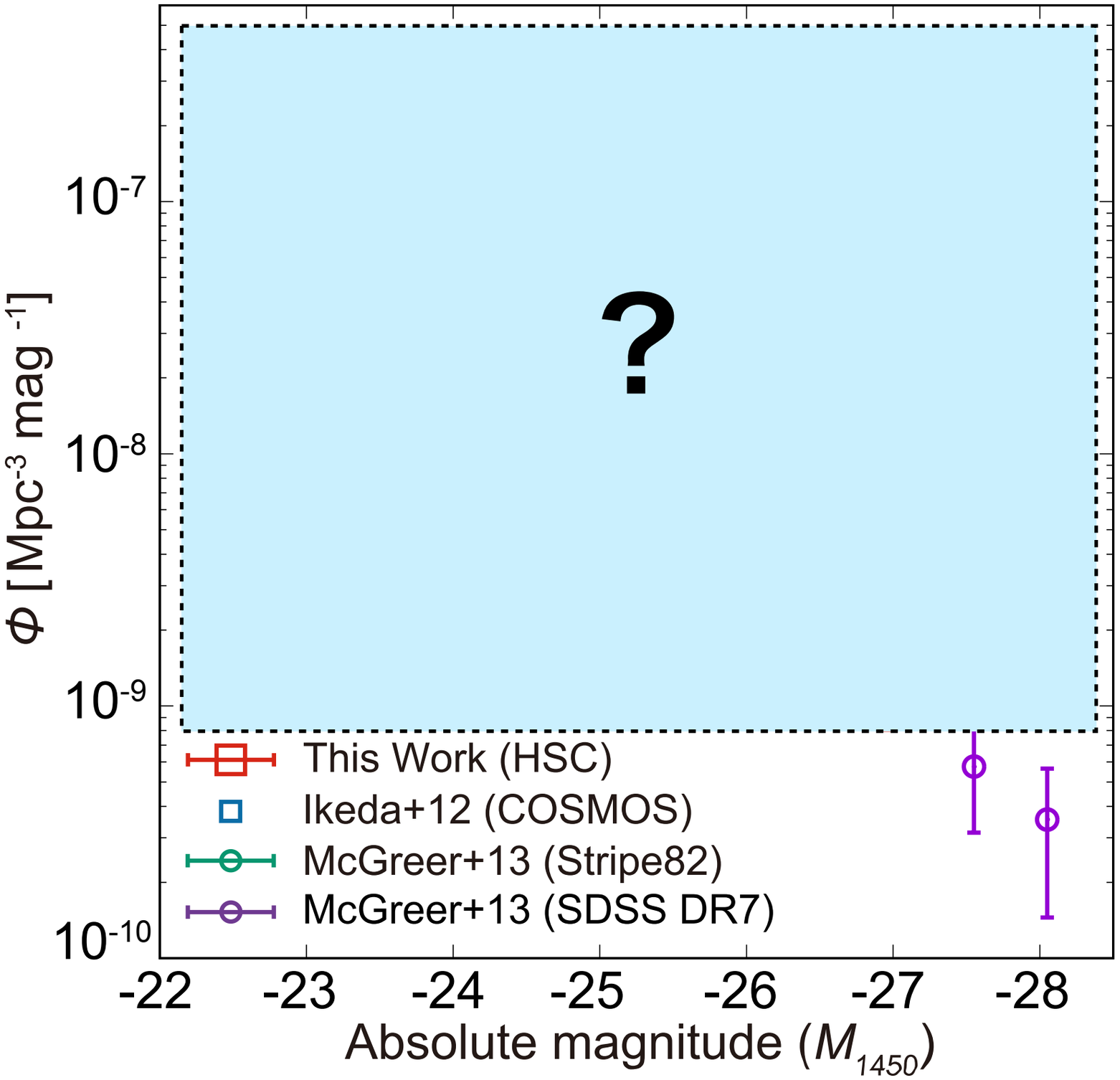
Candidates of low-luminosity QSOs at z ~ 5

	i-psf					total
	19 < *i* < 20	20 < *i* < 21	21 < *i* < 22	22 < *i* < 23	23 < *i* < 24	
	M_{1450}					
	-26.96	-25.96	-24.96	-23.96	-22.96	
riy	?					
g- r						
Φ[10^{-7} Mpc^{-3} mag^{-1}]						

※ We calculate the number density based on the comoving volume at $4.7 \leq z \leq 5.2$ (i.e., 72.32×10^7 [Mpc^3])

3. Result and Discussion

The QLF at $z \sim 5$



3. Result and Discussion

Follow-up observation

- **instrument** : Cerro Tololo Inter-American Observatory (CTIO) / 4m Blanco telescope (COSMOS)
- **date** : 2016/4/12-15
- **target** : 4 objects (20 < *i*-psf < 22)

4. Summary

○ **Deriving the QLF at $z \sim 5$ in the HSC wide field**

- By the color selection, we selected QSO candidates ($19 < i\text{-psf} < 24$)
- We need to estimate the detection completeness and the selection completeness

○ **follow-up spectroscopic observations**

- We conducted follow-up observations for 4 candidates with CTIO/4m Blanco telescope
- future follow-up observation
  - 16B accepted : Subaru/FOCAS
  - 17A ~ : Planing additional follow-up observations
- We will derive more accurate QLF with considering the contamination rate based on the results of our spectroscopic observations