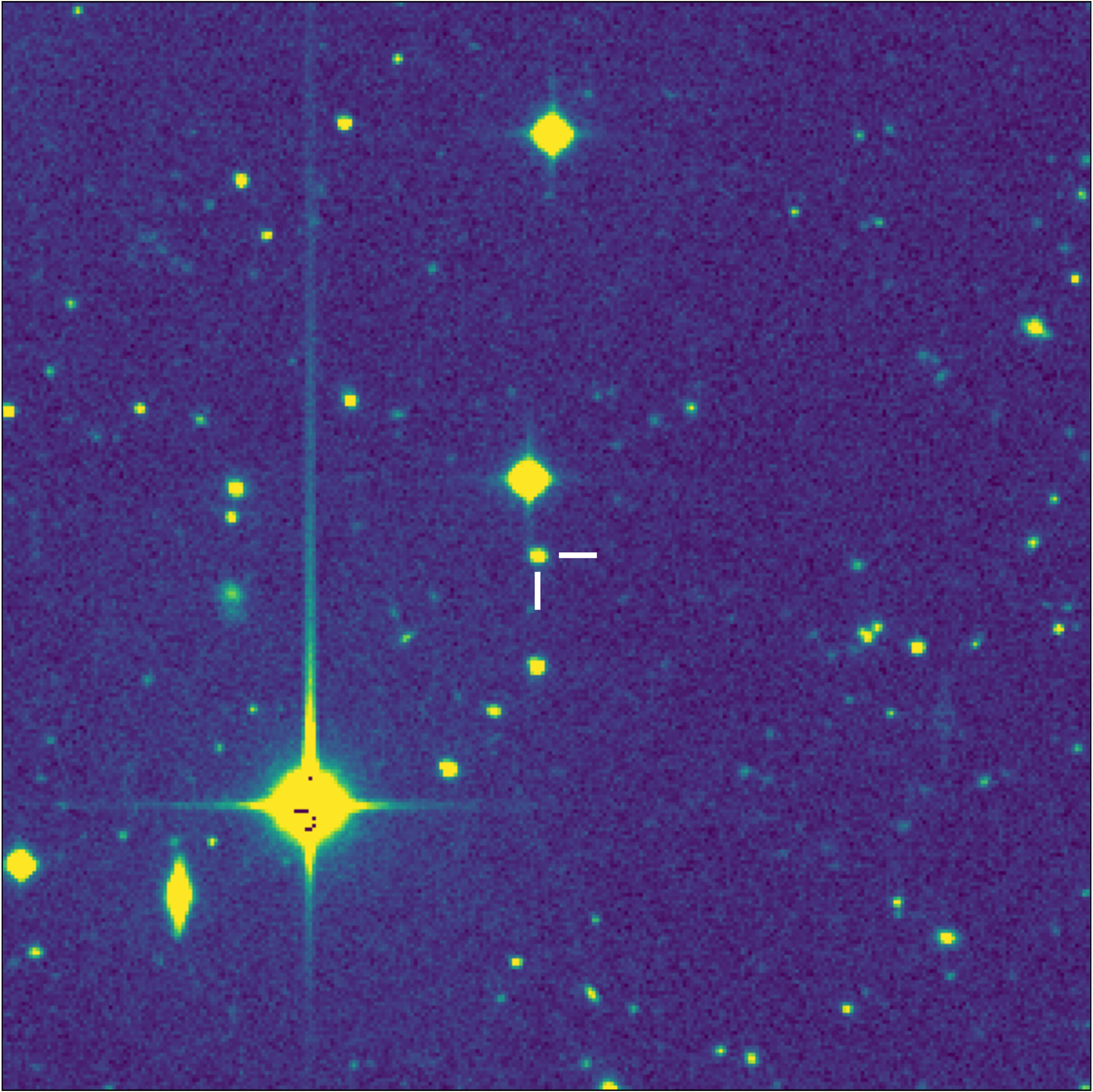
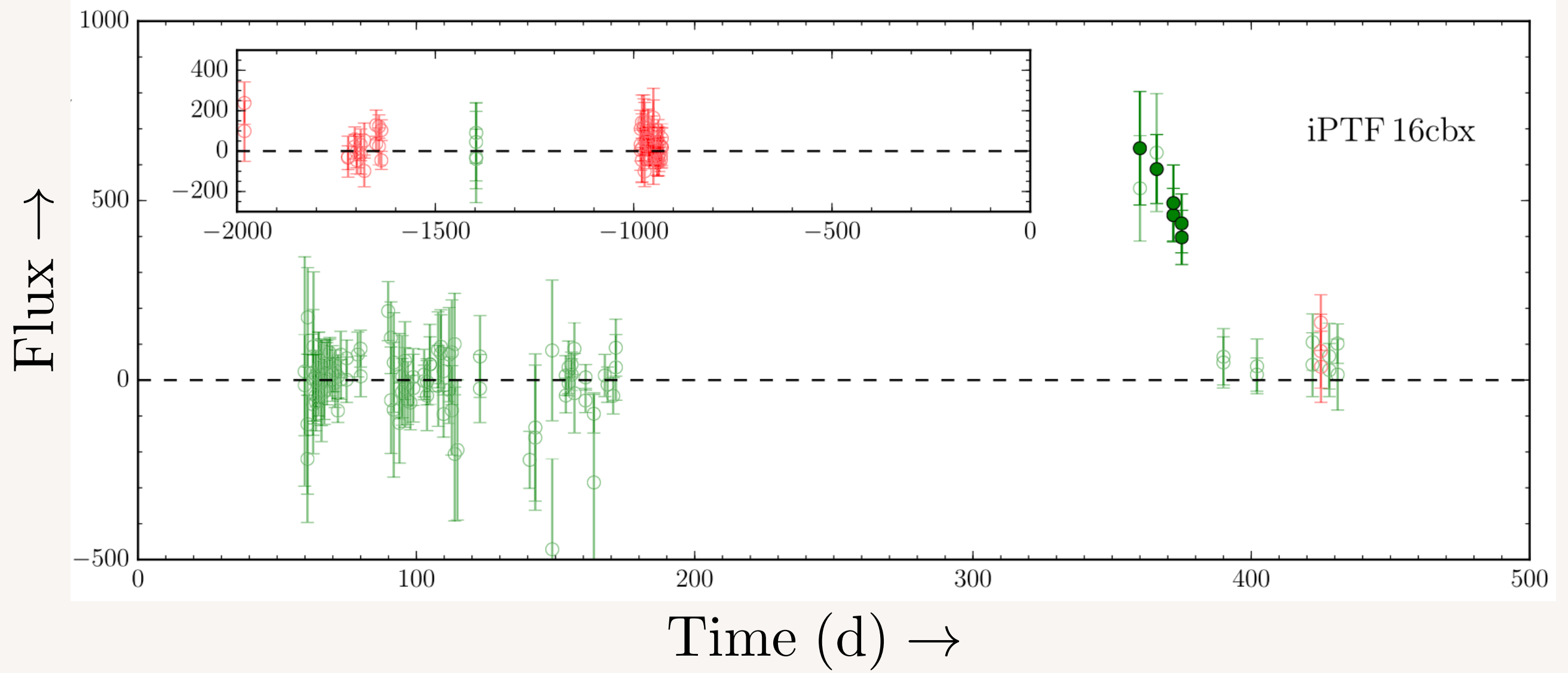
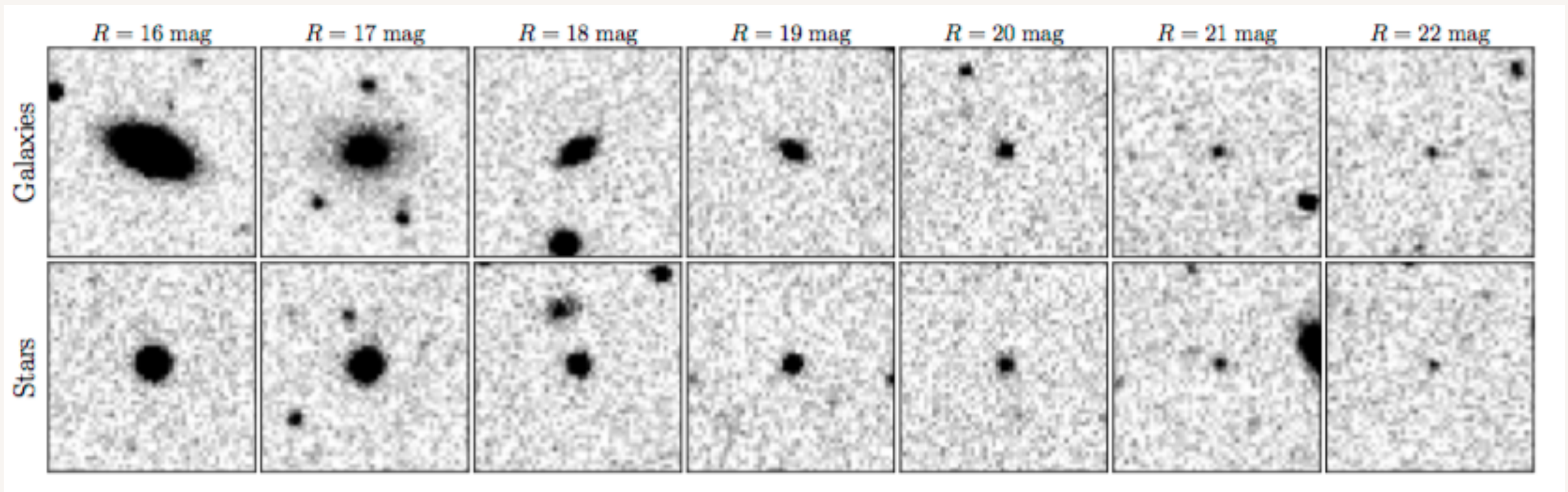






**Do I care about
this thing?**

A **PS1** star/galaxy catalog for **ZTF**



AAM+17a

Adam A Miller
Yutaro Tachibana

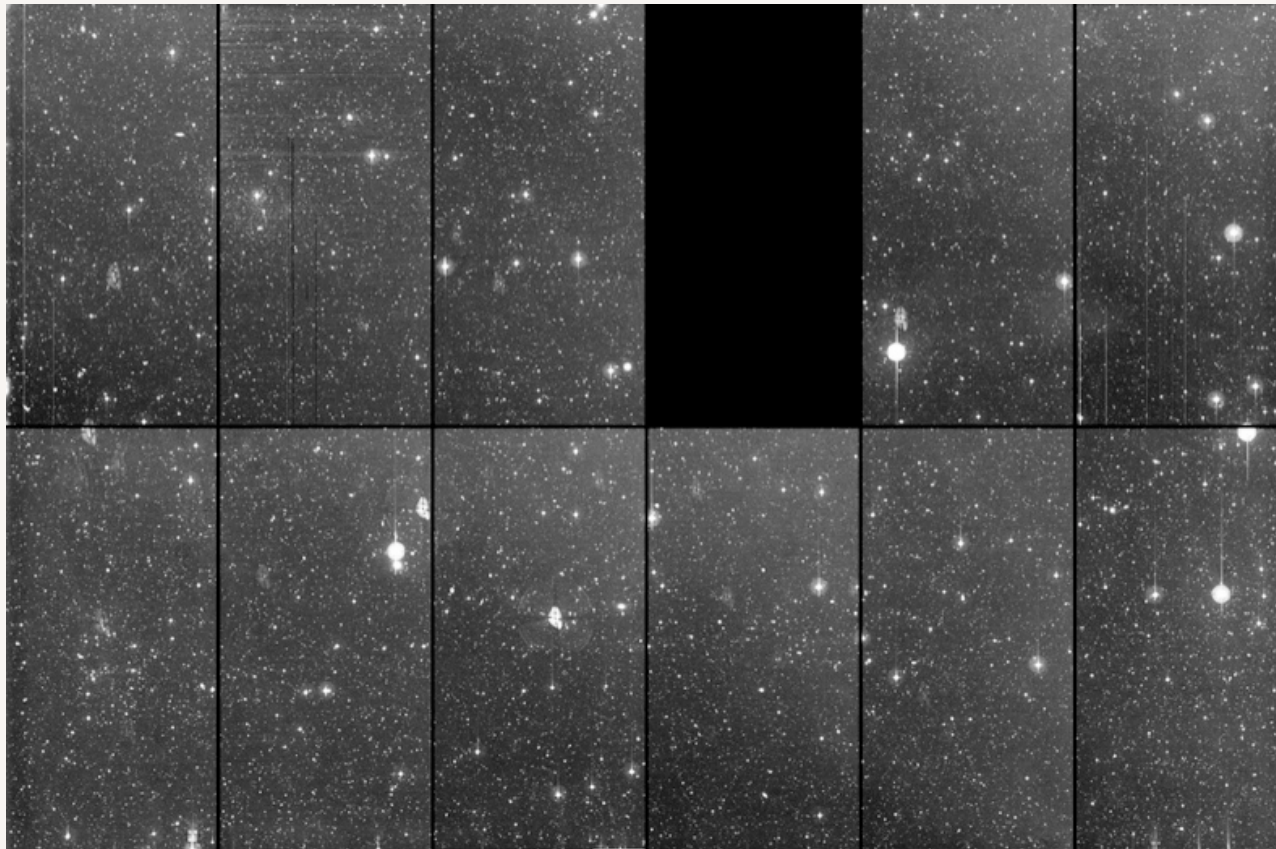
ZTF Team Meeting
20 Mar 2018



Yutaro Tachibana

Tokyo Institute of Technology

Seriously Adam - Do We Need This?!



credit: PTF

PTF “holes” in coverage

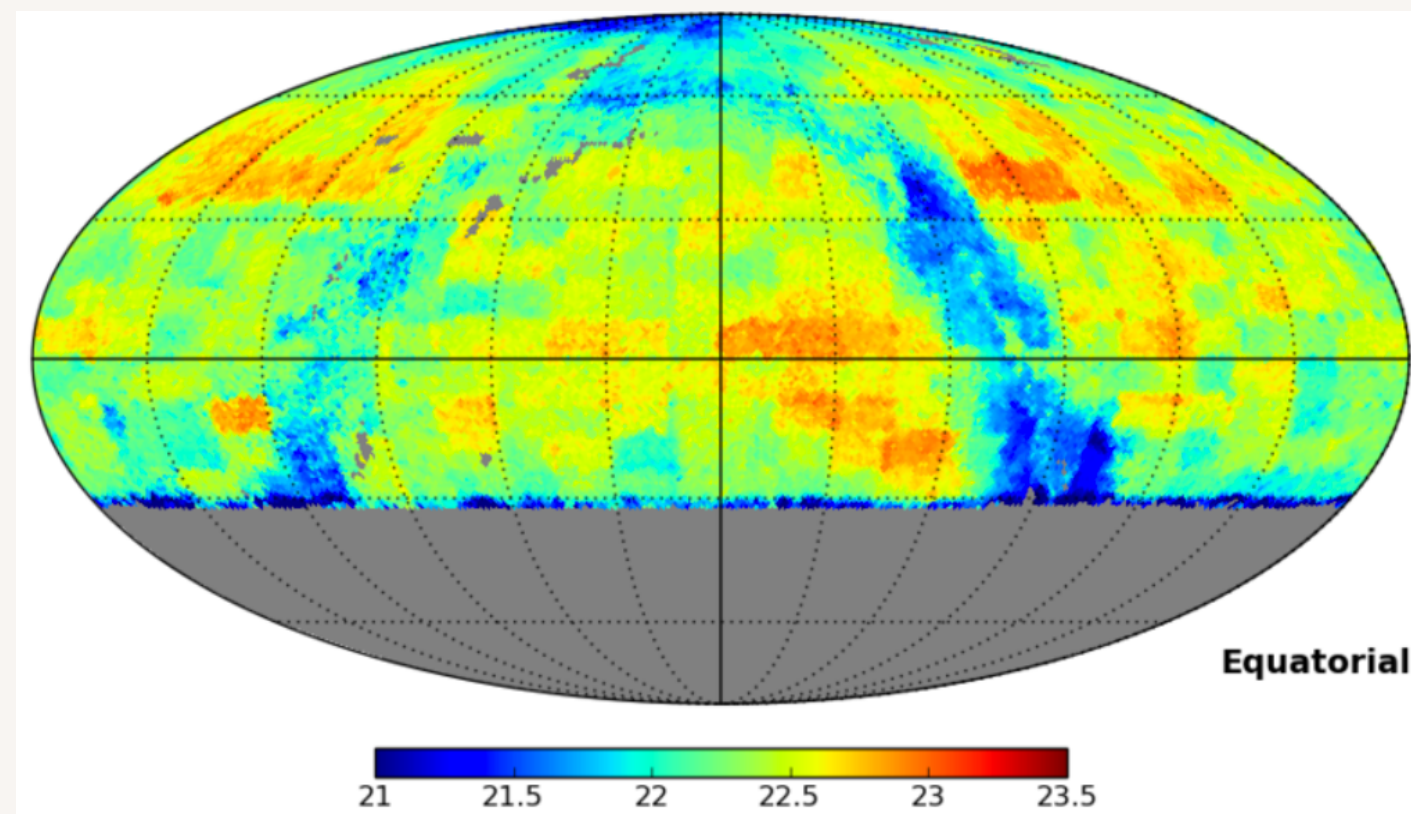
single filter

large depth variations

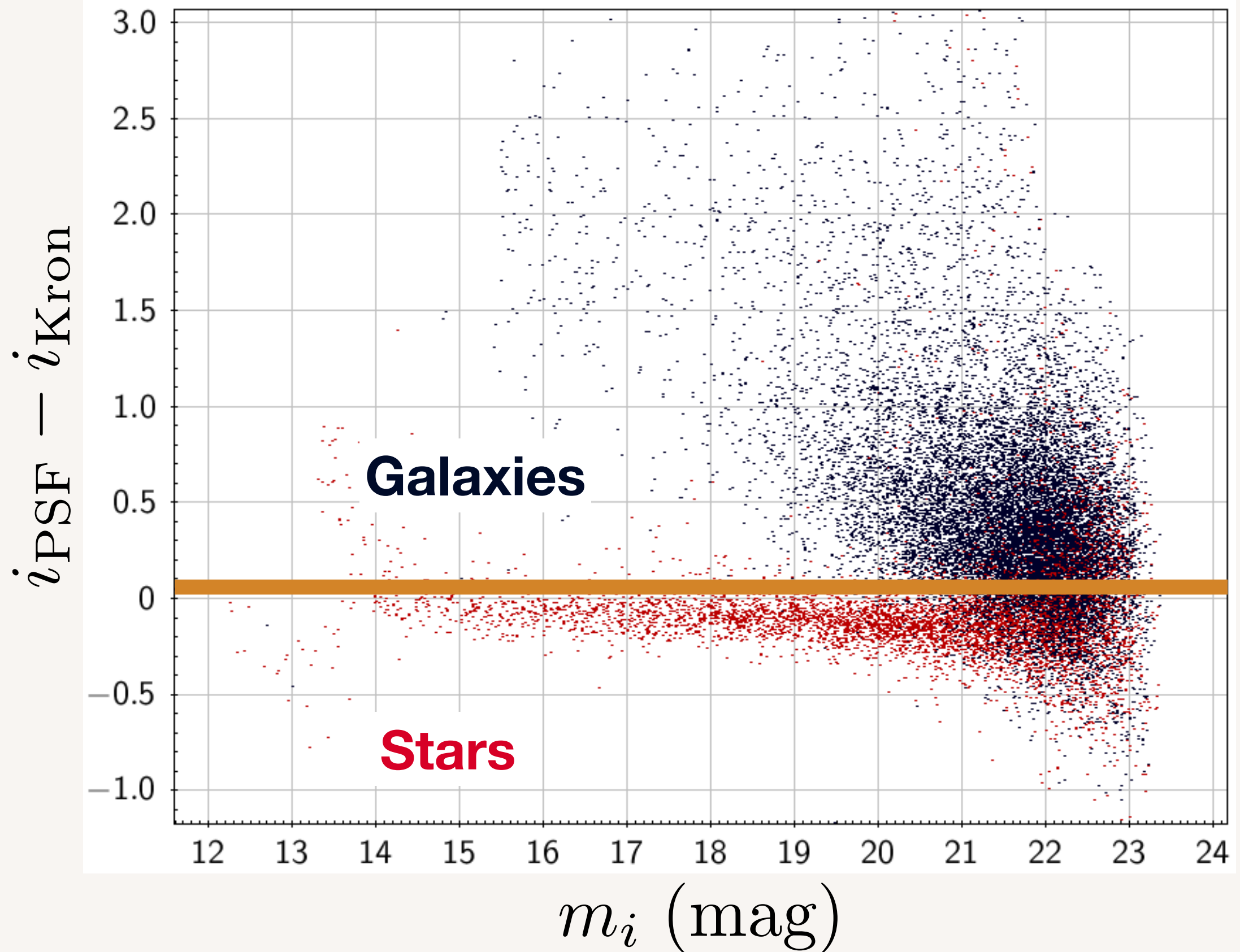
PS1 - full 3π coverage

5 filter coverage

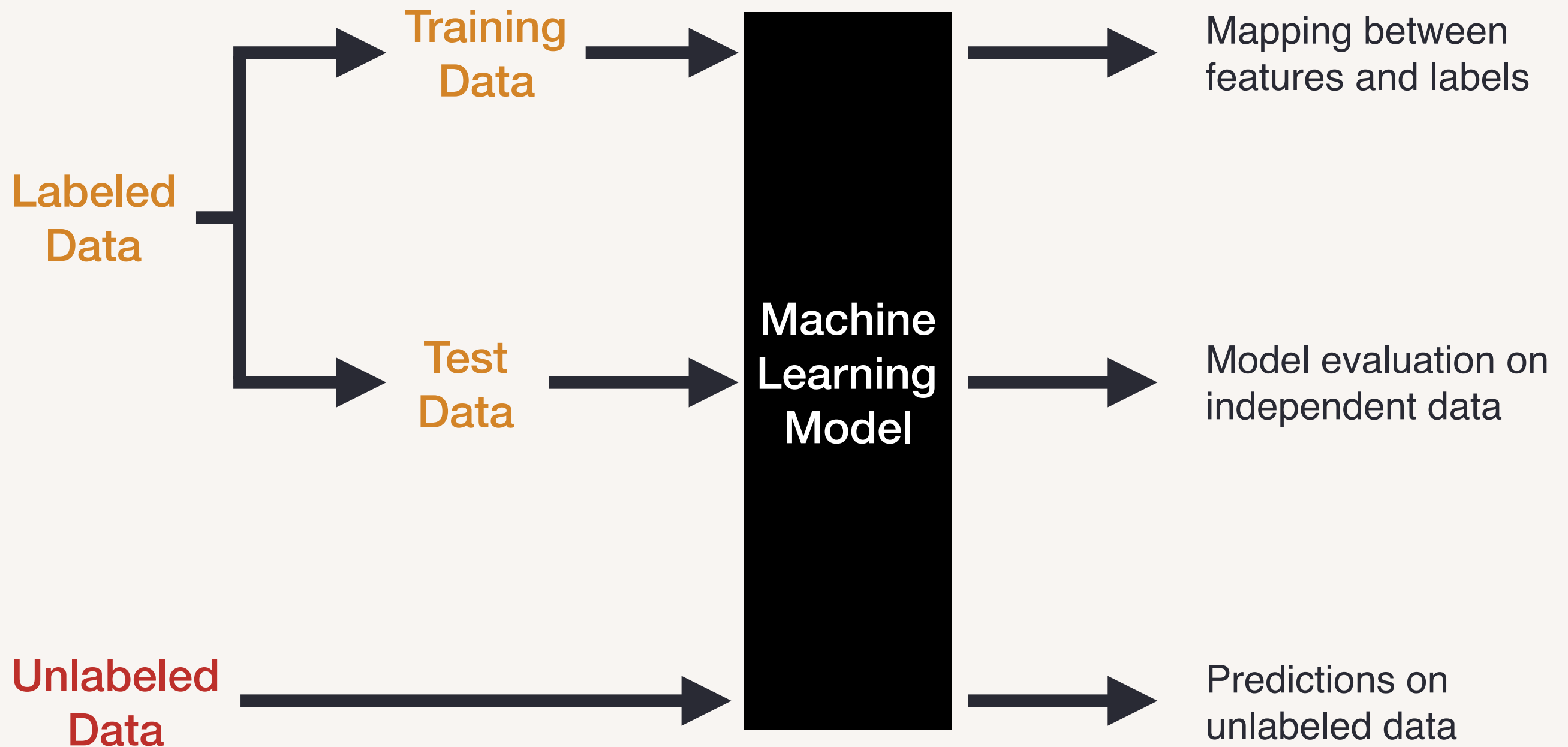
deep, “good” seeing



“Classic” s/g Method



(Brief) Intro to Machine Learning



Building a Training Set

HST/PS1

~75k sources

faint sources

small area (1 sq deg)

“unbiased”

morphological classifications

SDSS spec/PS1

~3.5M sources

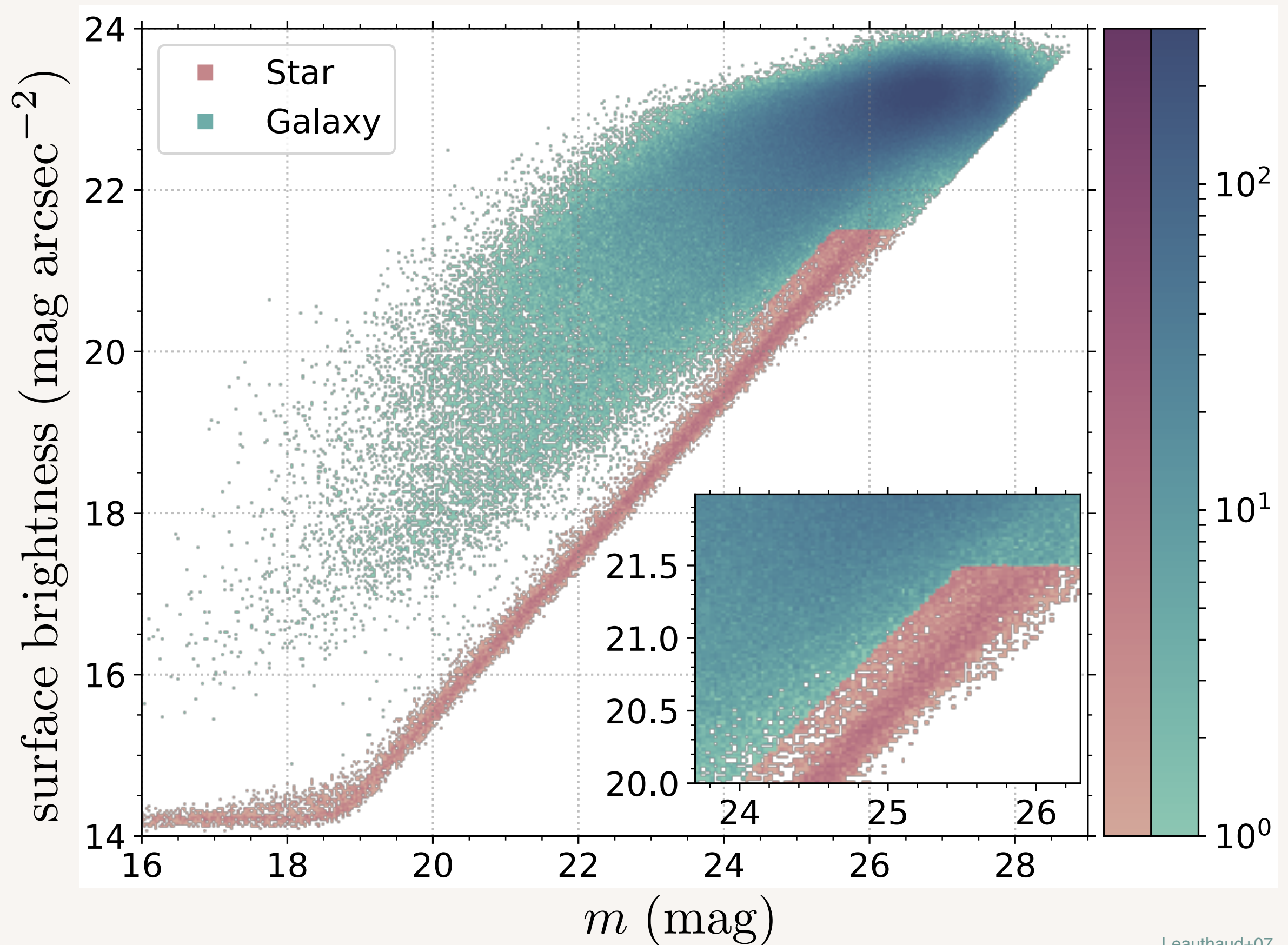
spec limit ~21 mag

large footprint

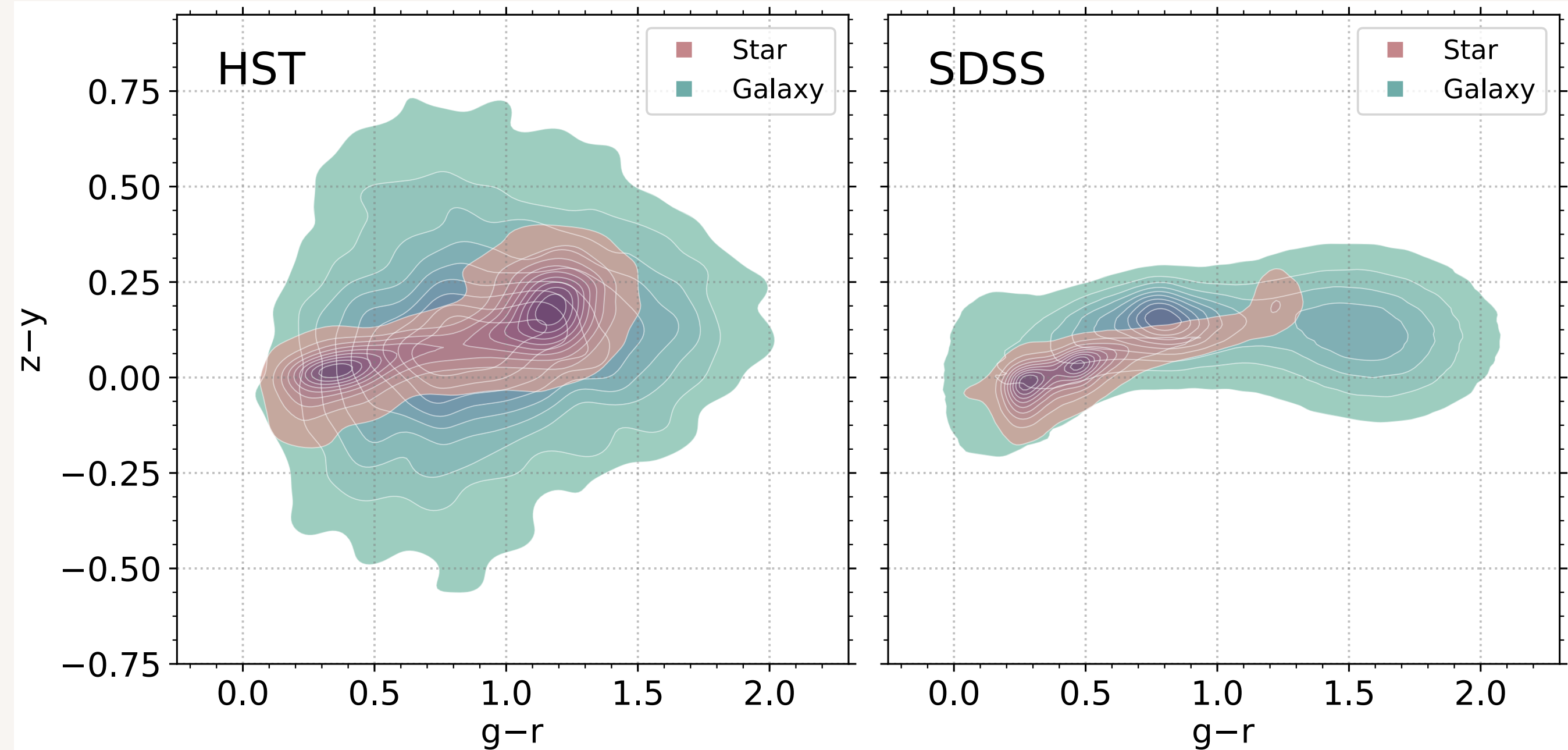
target selection bias

spectroscopic classifications

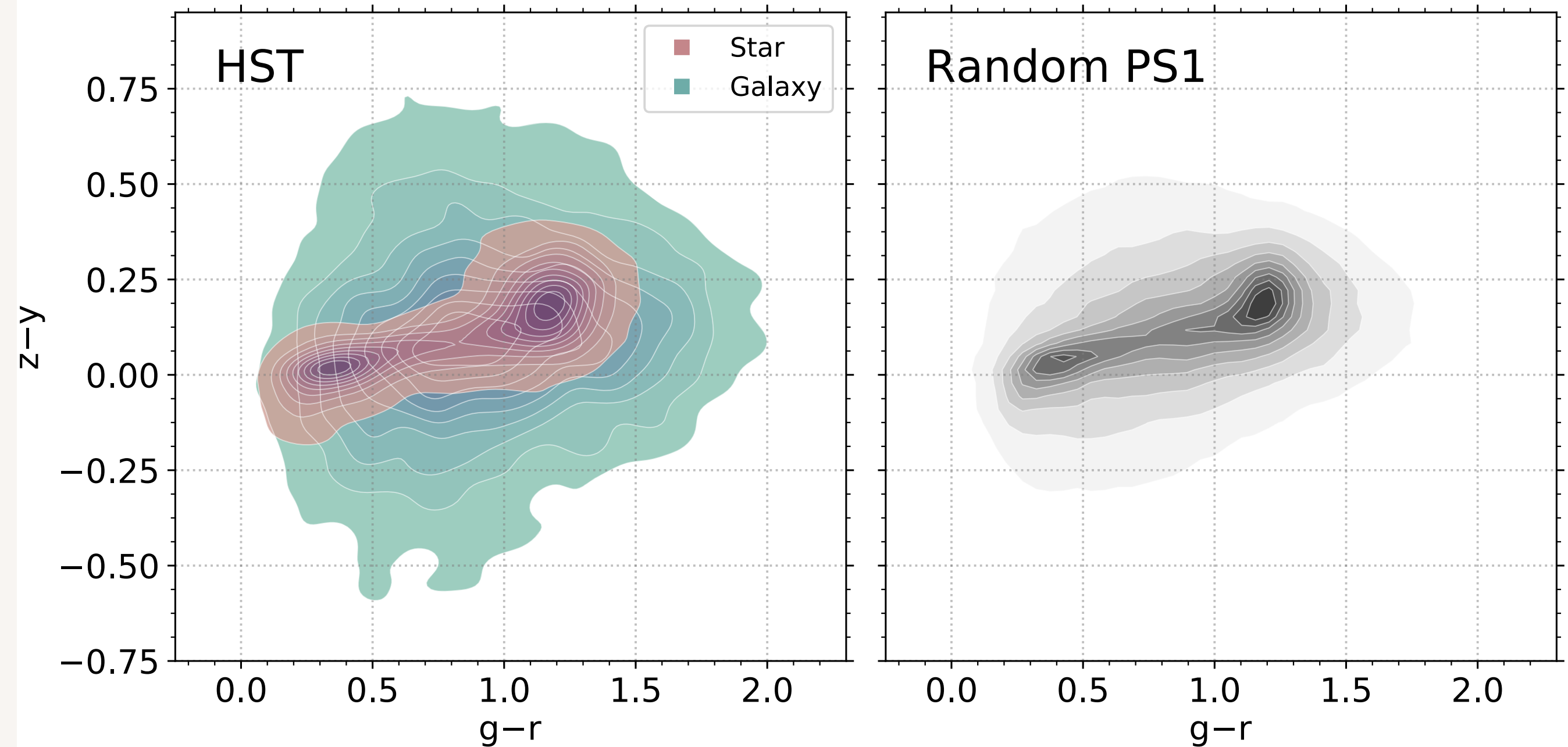
Building a Training Set



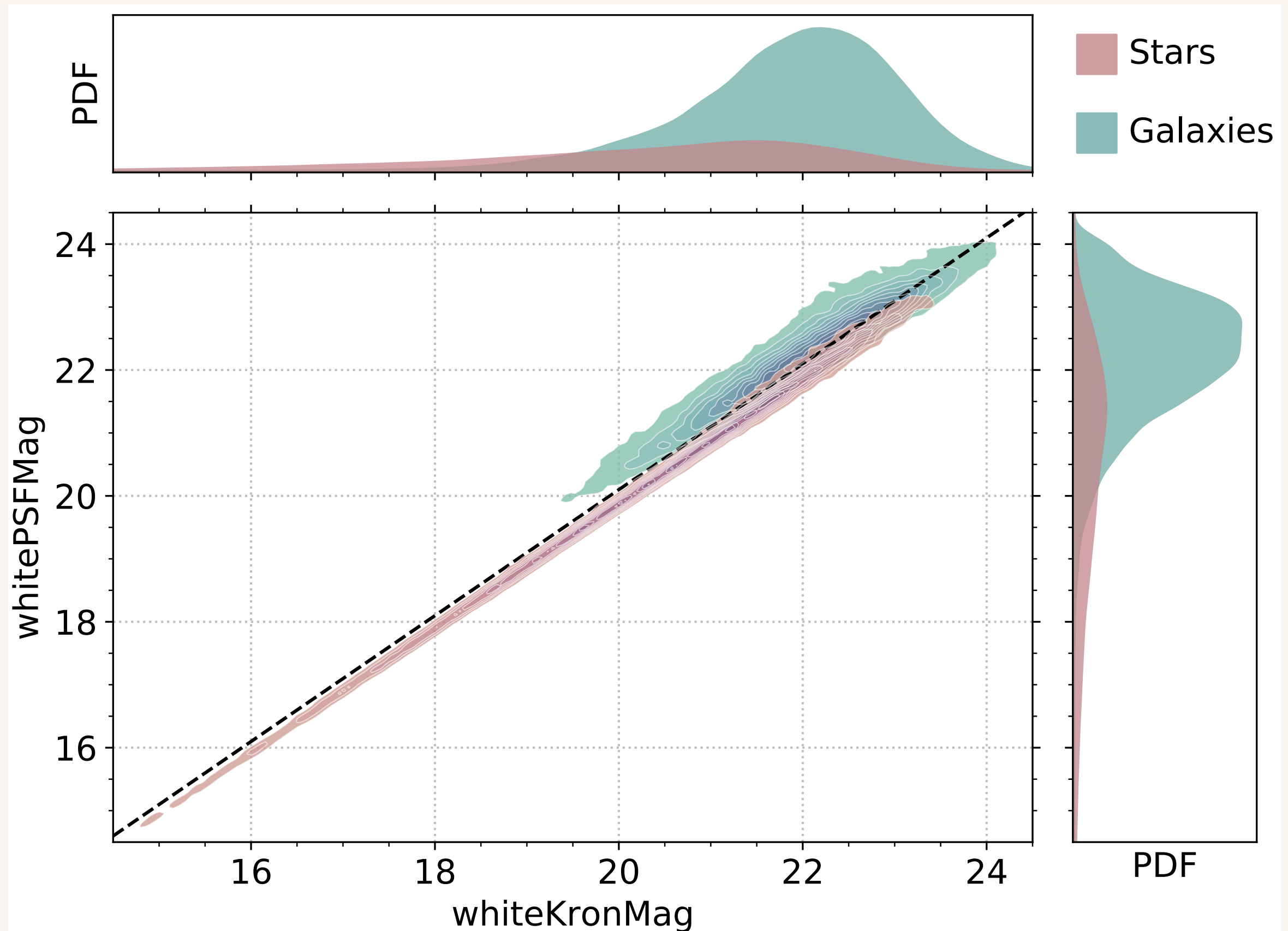
Building a Training Set



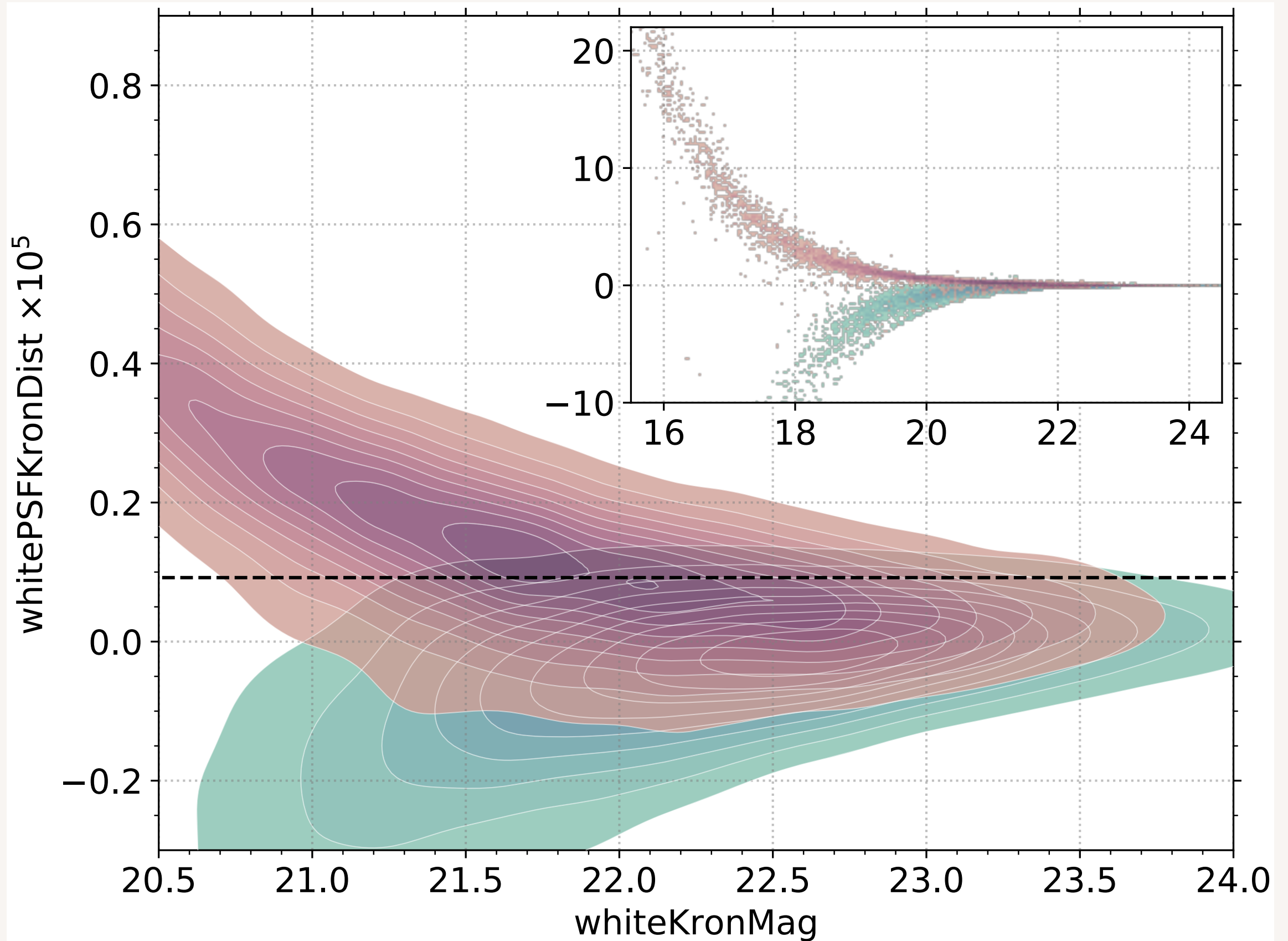
Building a Training Set



“Simple” Model



“Simple” Model

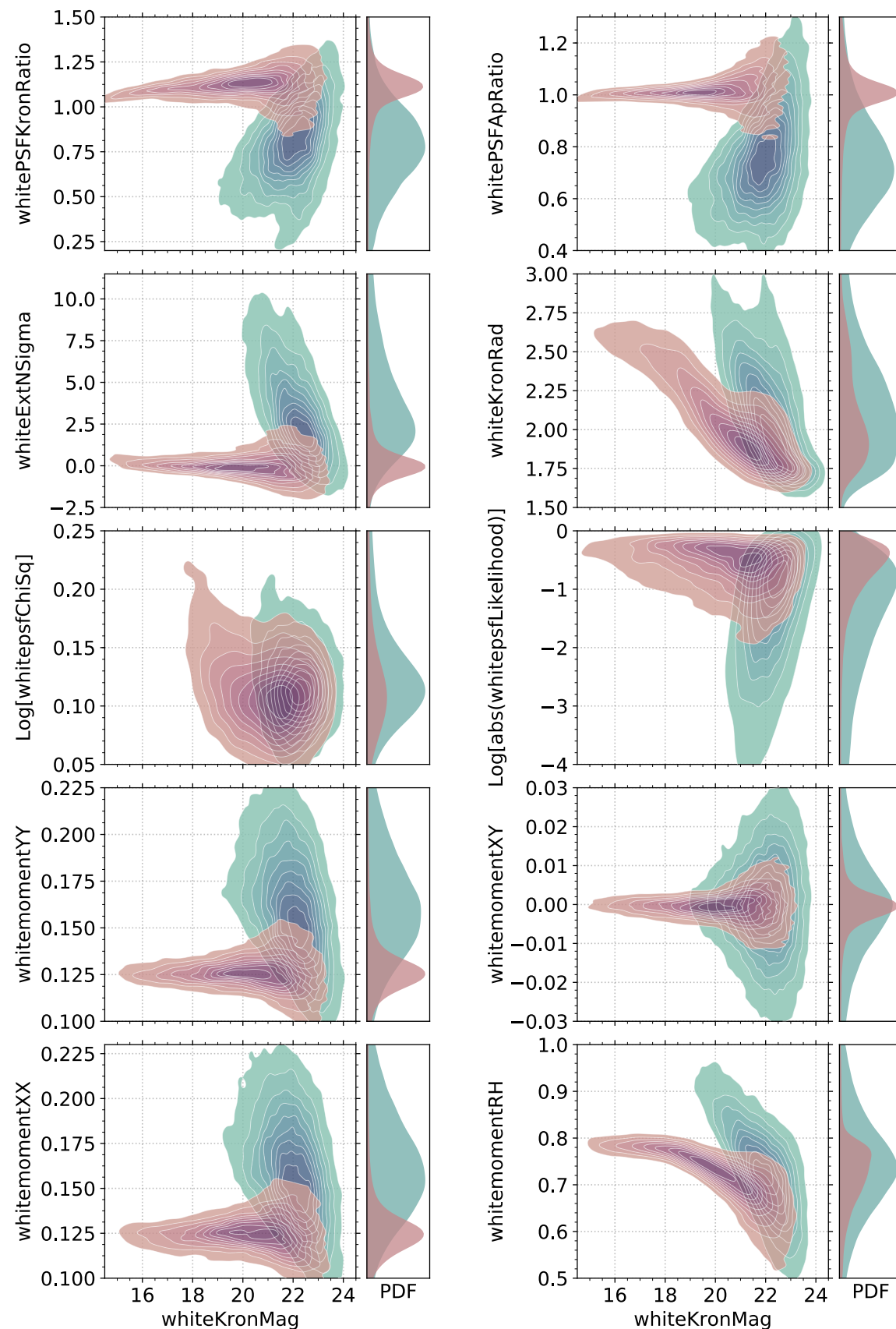


Creating Features

Shape parameters from PS1 stack images

$$\text{white feat} = \frac{\sum_f^{g,r,i,z,y} \text{feat}_f \times \text{SNR}_f^2 \times \delta_f}{\sum_f^{g,r,i,z,y} \text{SNR}_f^2}$$

Creating Features



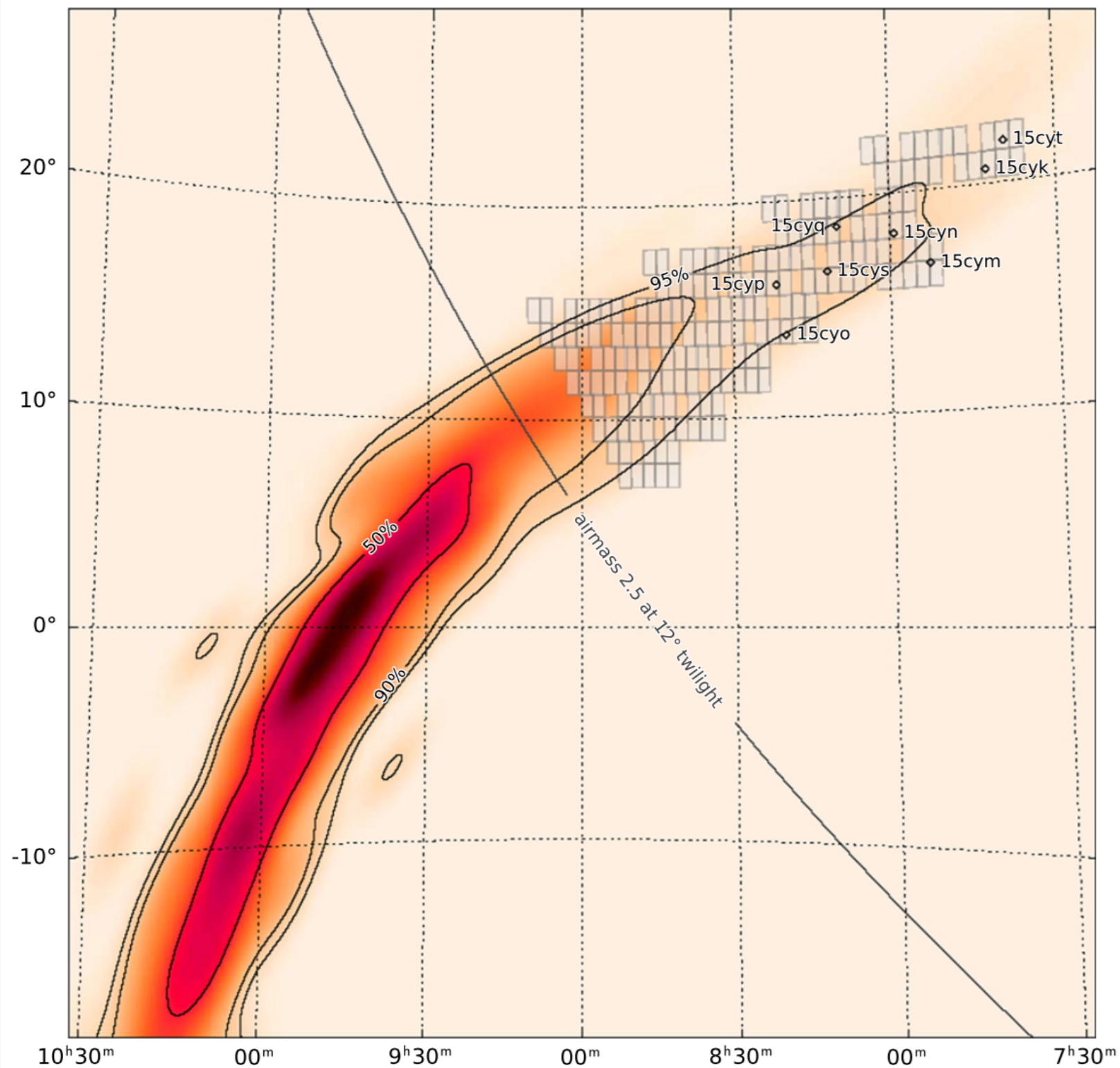
11 "white" features

reduce color dependency

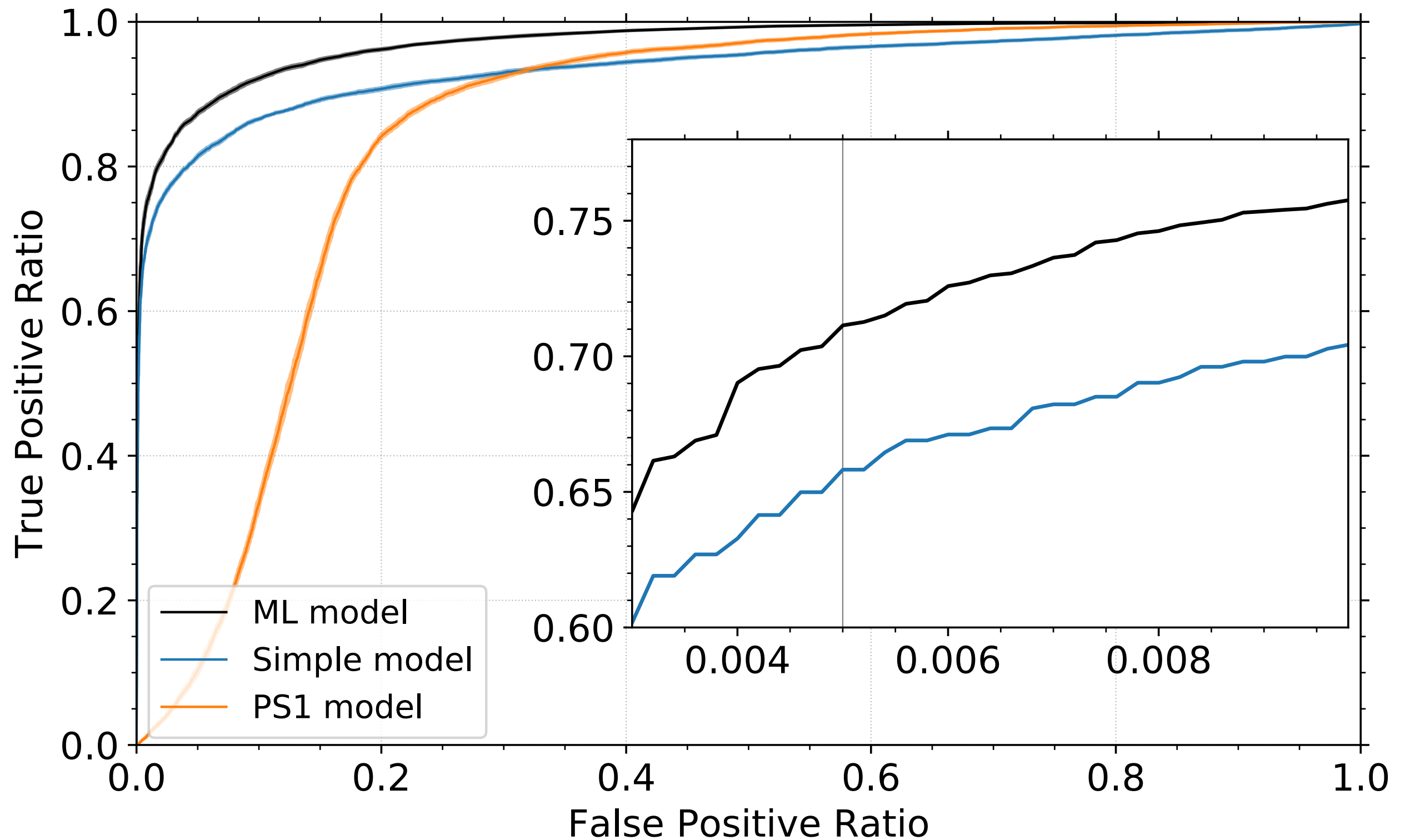
no mag measurements

Figure of Merit

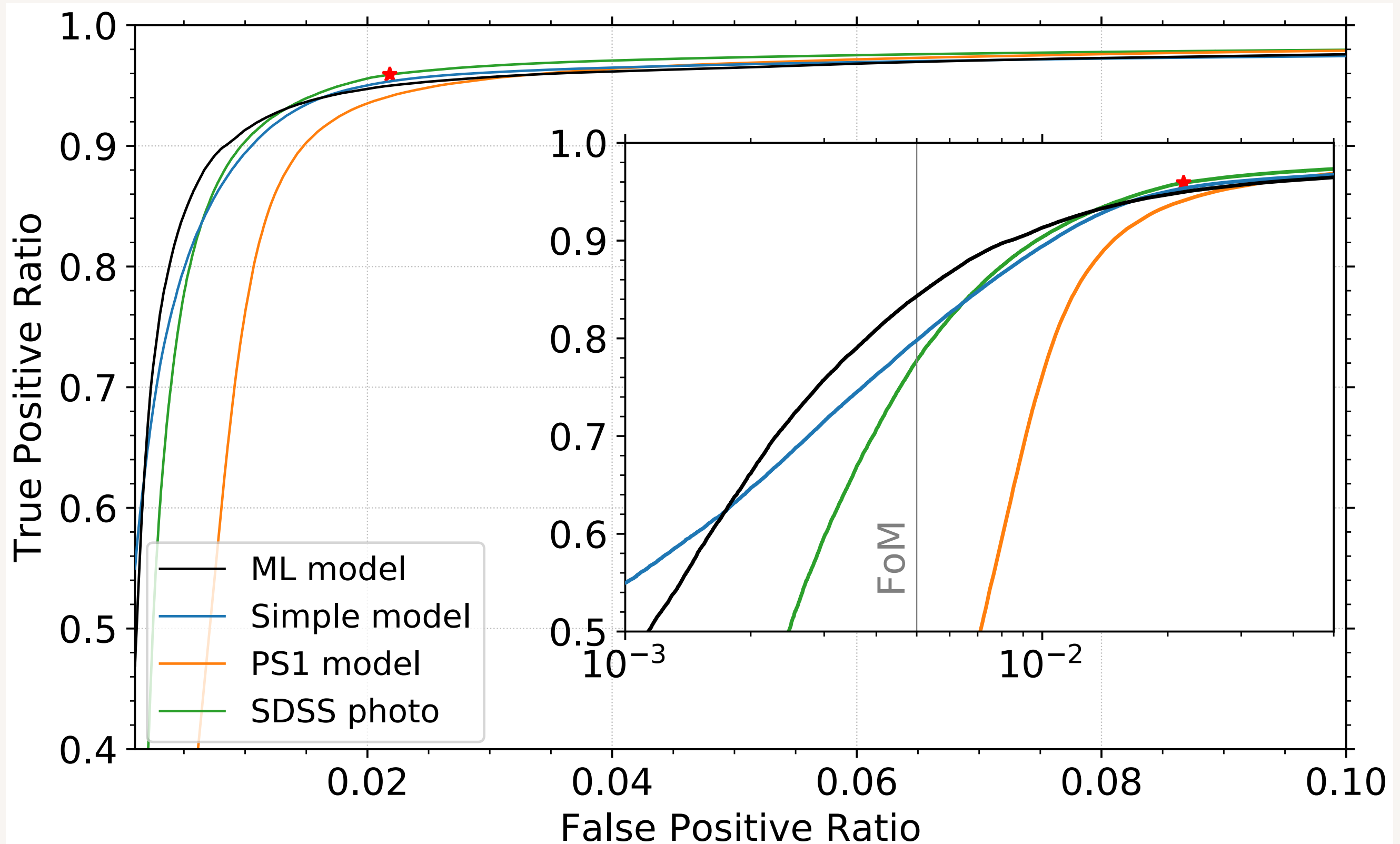
Maximize TPR @ FPR = 0.005



Results



Results



Blah
Blah
Frickin
Blah

Tell me what I need to know

s/g Scores

~ 1 >> likely star

$= 0.5$ >> absolutely no idea

~ 0 >> likely galaxy

Note - all bets are off near Galactic plane

s/g Scores

<i>FPR</i>	<i>TPR</i>	s/g score
0.005	0.7	0.76
0.01	0.74	0.65
0.02	0.79	0.53
0.05	0.85	0.36
0.10	0.90	0.24

Conclusions

(imperfect) ML models are superior to low-dimensional cuts

Never, ever, ever, ever, ever use hard cuts

PS1 provides ideal dataset for ZTF s/g separation

3π , 5 filters (red coverage very important), deep, high quality

HST training set > SDSS training set

Less biased

Model optimized for LIGO follow up

FoM = TPR @ FPR = 0.005 (we can provide you with alternate thresholds)

70% of stars removed while rejecting only ~0.5% of galaxies