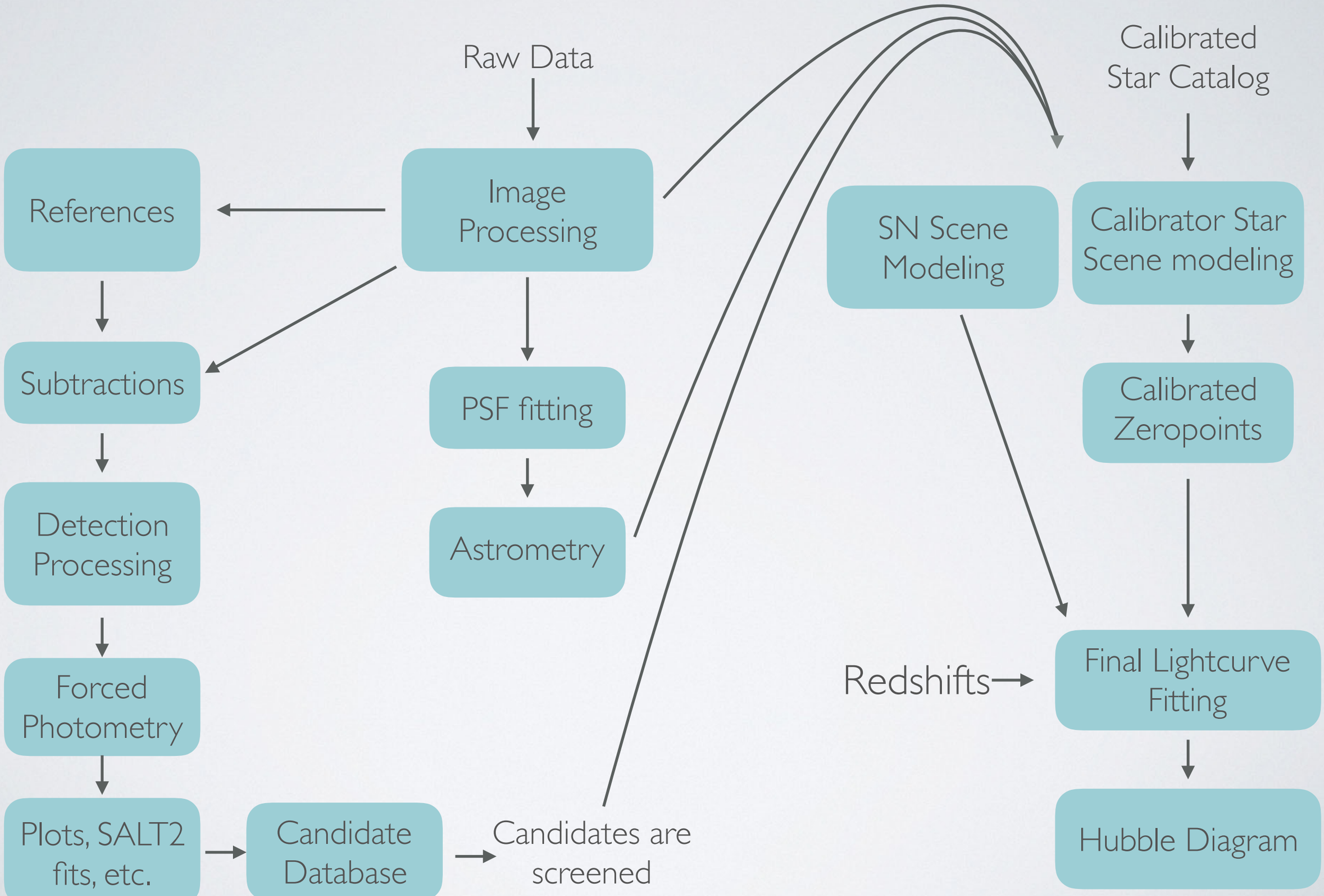
THE LPNHE CANDIDATES

Clare Saunders — Tuesday, March 12, 2019

THE LPNHE PIPELINE

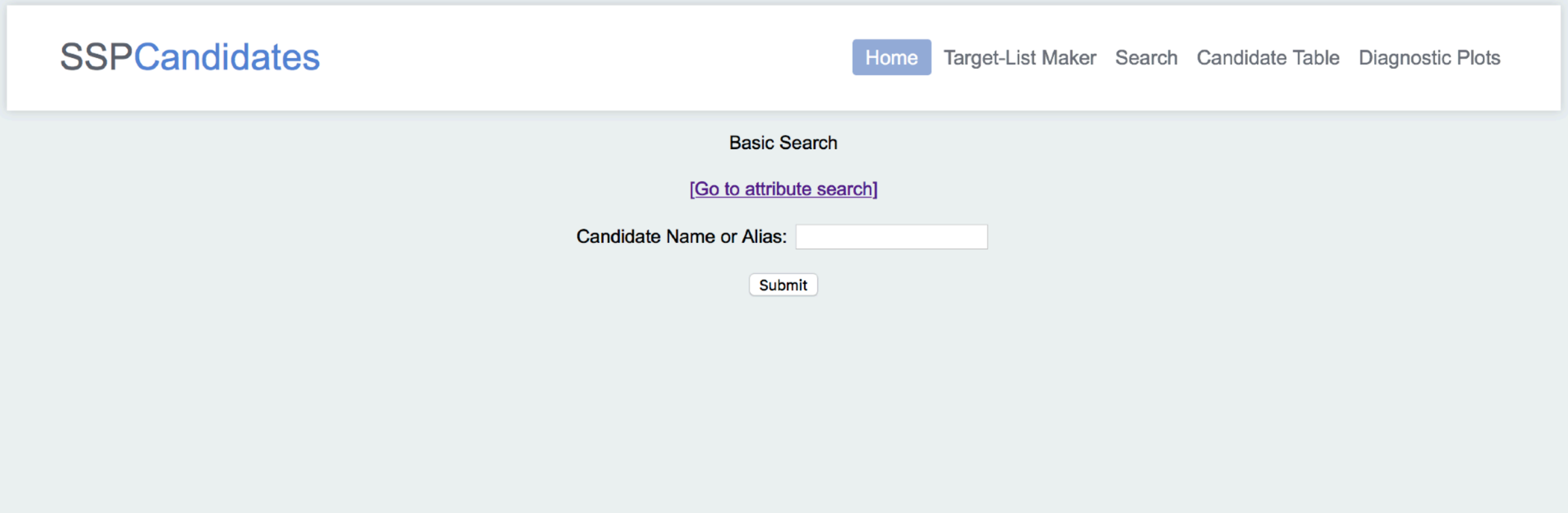


SELECTING CANDIDATES

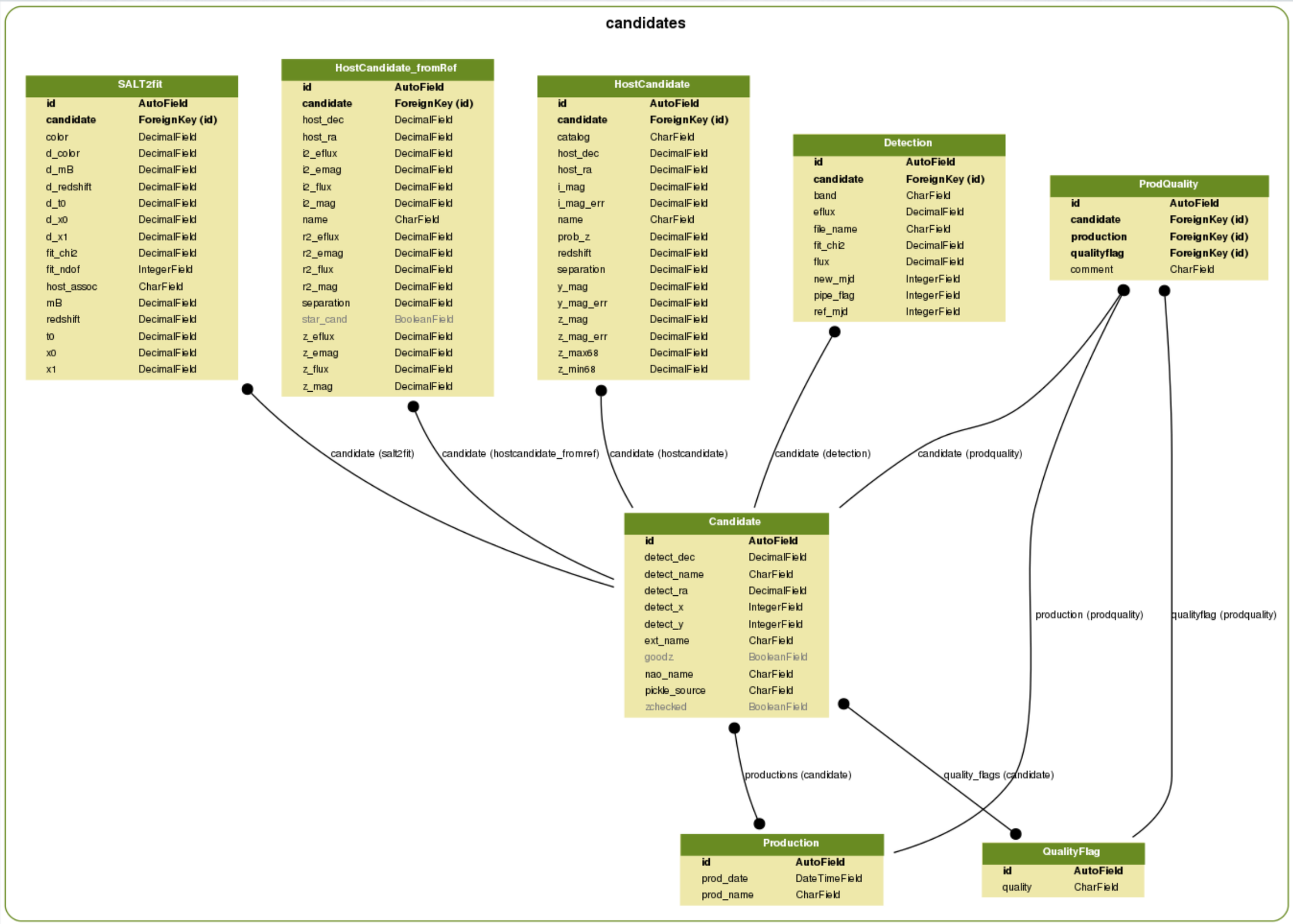
- For each detection:
    - S/N > 5
    - increase over ref > 5%
- For all associated detections:
    - Number of nights >= 2
    - Low scatter in detection positions
    - Uncertainty in object position < 1 arcsecond
    - No detections before 57700 (object appears during survey)

THE CANDIDATE DATABASE

- Candidates are organized in a django database.
- The primary mode of interacting with the database is through the website hizpipe.in2p3.fr



THE DATABASE SCHEMA



THE WEBSITE

http://hizpipe.in2p3.fr/candidates/cand_table/

SSPCandidates

Home | Target-List Maker | Search | Candidate Table | Diagnostic Plots

Key: SN-like Other variable object Bad Unclear Disagreement (maybe SN) Disagreement (not SN) ***Not in latest production*** *Rating not from latest production

618 SNe, 140 Unclear, 54 Disagreement (maybe SN), 1979 Unrated, 855 Other Variable, 34 Disagreement (not SN), 1032 Bad, 2100 not in pipeline (1352 not in UDeep field)

[Download Table]

RA	Dec	Local Name	David's Name	IPMU Name	AAT Obs	AAT z	Other obs	Other z	HST obs	COSMOS host	COSMOS host z	z ok
149.7923357245	2.5144180608	SSP1*	None	17dnhr						PHOTO	0.4934,0.497	
150.6055371478	1.9897942394	SSP4239	pns	16aplb	2					PHOTO	1.2526	
150.0429321238	1.6948848595	***SSP1107 ****	None	17bifs	3	1.3102				PHOTO	1.5756	✓
150.0353056006	1.7186171126	SSP1108	None	None						PHOTO	1.6113	✗
149.6767161376	2.1652894376	***SSP1110 ****	None	17bmby	1							
150.4373179518	1.5709301353	***SSP1121 ****	None	16aokd	3	0.9222						✓
149.8830995378	1.6140831115	SSP4127	None	17bhip						SPEC	0.5697	✓
150.5172205637	2.7371475719	***SSP4113 ****	ctyt	17ctyt(old_list)	1					PHOTO	1.5477,1.6027	
150.1686322495	1.8832055264	SSP4112	None	17cwym	3	1.1209				PHOTO	1.1492,1.1578	✓
150.6451223727	1.8475344989	SSP4267	None	17drmb						SPEC	0.4724	✓
150.8406570195	2.3748673938	SSP4110	None	None								✗
150.7516876254	2.208742456	SSP1140	None	None						PHOTO	1.2914	
149.6275969646	1.9911721882	SSP1144	bowl	17bivi	1					PHOTO	1.4811	
149.9505519731	2.9756429462	SSP4091	None	None								✗
150.5830721566	2.2594086302	SSP4045	dunm	None						PHOTO	2.102,0.1395	✗
150.4296356408	2.0402740794	SSP4035	frm	16aaqn	1					PHOTO	1.6832,2.636,1.0206,1.2338	
149.5997488981	2.7157237843	SSP4034	None	None						PHOTO,SPEC	1.4051,0.0	
149.8725029964	2.1812816687	SSP4028	None	None								
150.0426122416	2.1249896386	SSP4025*	None	17biyd	4	0.3399				PHOTO,SPEC	1.7595,0.3479,0.3398	✓
150.1019412246	2.5193458688	SSP4109	None	17cwng	1					PHOTO	2.0565,1.8365,1.1145	
149.9671125314	2.4419894793	SSP985*	qik	16apzy	3	0.8972				PHOTO,SPEC	0.8718,0.8467,0.8977	✓

sample Candidate page

RATING CANDIDATES

SSPCandidates

Home Target-List Maker Search Candidate Table Diagnostic Plots

Random Unrated Candidate

Detection SSP4260

Overview

Quality choice:

- ○ Likely SN (Ia or not)
- ○ Other Variable Object
- ○ Astrometry Issue (yin-yang appearance)
- ○ Satellite Issue
- ○ Problem with Reference
- ● Subtraction Problem
- ○ Other Issue
- ○ Unclear

Comment: Submit

Rating Comments: None

Redshift good:

- ○ Sufficient redshift exists
- ● Redshift not sufficient

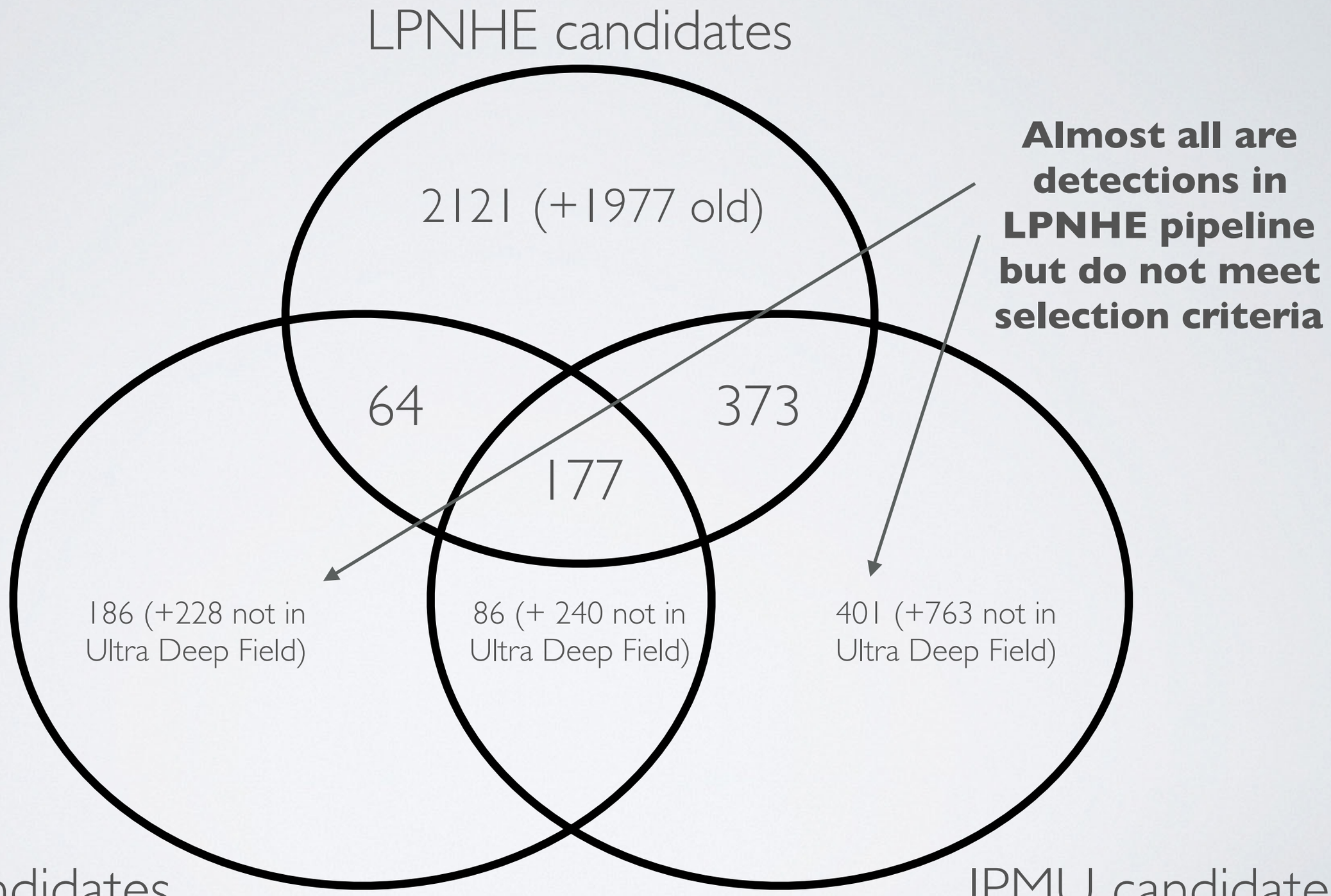
Submit

RA: 150.6997335892 Dec: 2.7021815062
Detections:
0 in g
0 in r
17 in r2

ALL RATED CANDIDATES

- 618 possible SNe
- 856 other variable objects
- 1033 bad (subtraction or astrometry problem, or other issue)
- ~230 unclear, or cases where different scanners disagreed.

COMPARISON WITH IPMU AND D.RUBIN CANDIDATES



OTHER VARIABLE OBJECTS

- 856 identified among LPNHE candidates
- There are ~1100 known variable stars, quasars, and AGN from the SIMBAD catalog in the Ultra Deep.
- 280 of LPNHE transients are already known from the SIMBAD catalog.

GETTING REDSHIFTS

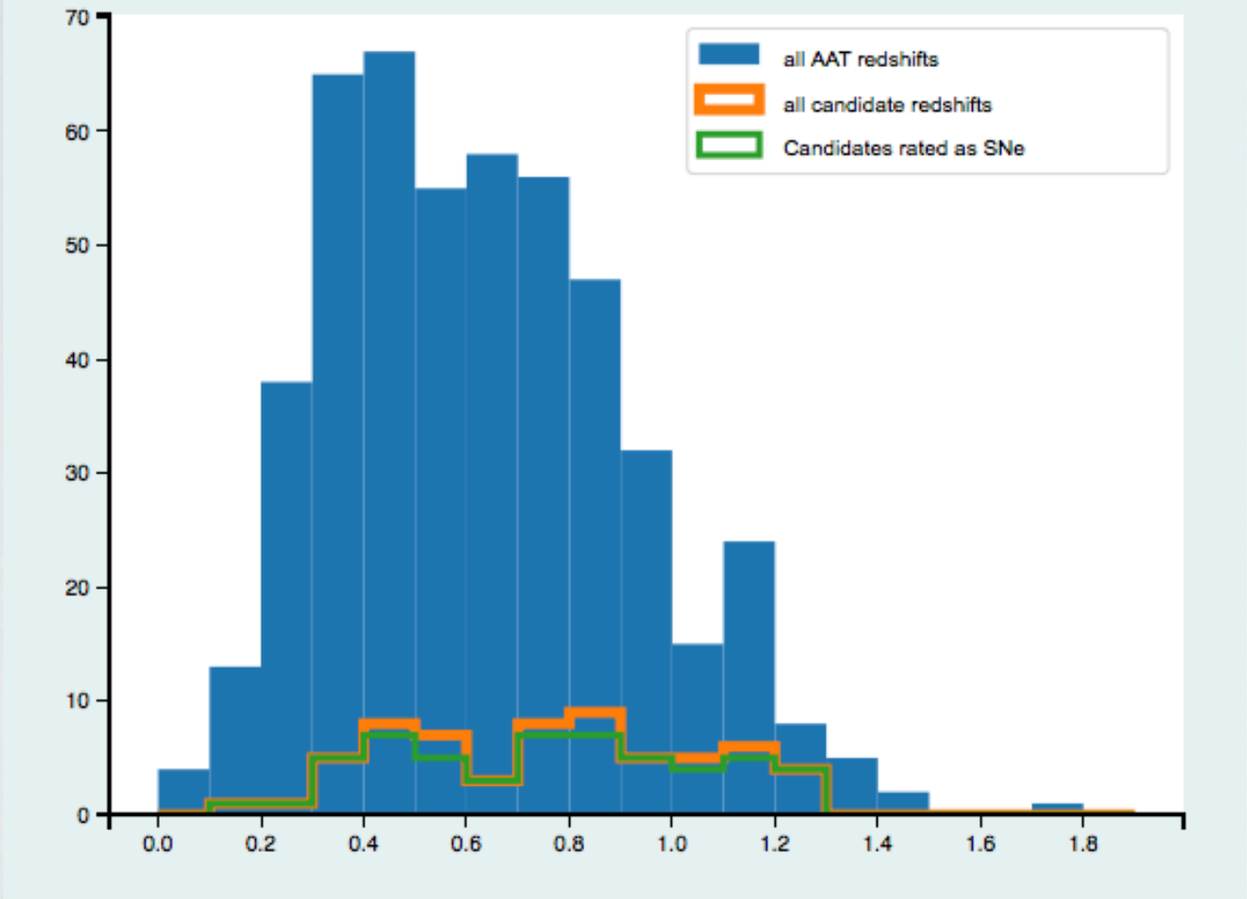
- Possible SNe: 149 with secure redshifts, 663 without
    - of likely SNe:143 with redshift, 475 without
- 500 candidates are within 3" of a COSMOS host (most only have a photometric redshift).
- **163 redshifts still needed or need to be reduced for best SN candidates (those with nice lightcurves)**
- Redshift sources:
    - AAT: 65 (with rating 3 or 4)
    - COSMOS spec-z: ~48
    - from Naoki's list: 36

SPECTROSCOPIC FOLLOWUP

- VLT - 68 (some data not yet taken)
    - 47 of these are LPNHE good candidates
- SUBARU FOCAS - 4
- Keck - 2
- Gemini - 1
- AAOmega - 3
- GMT - 4 (?) candidates sent to Pilar

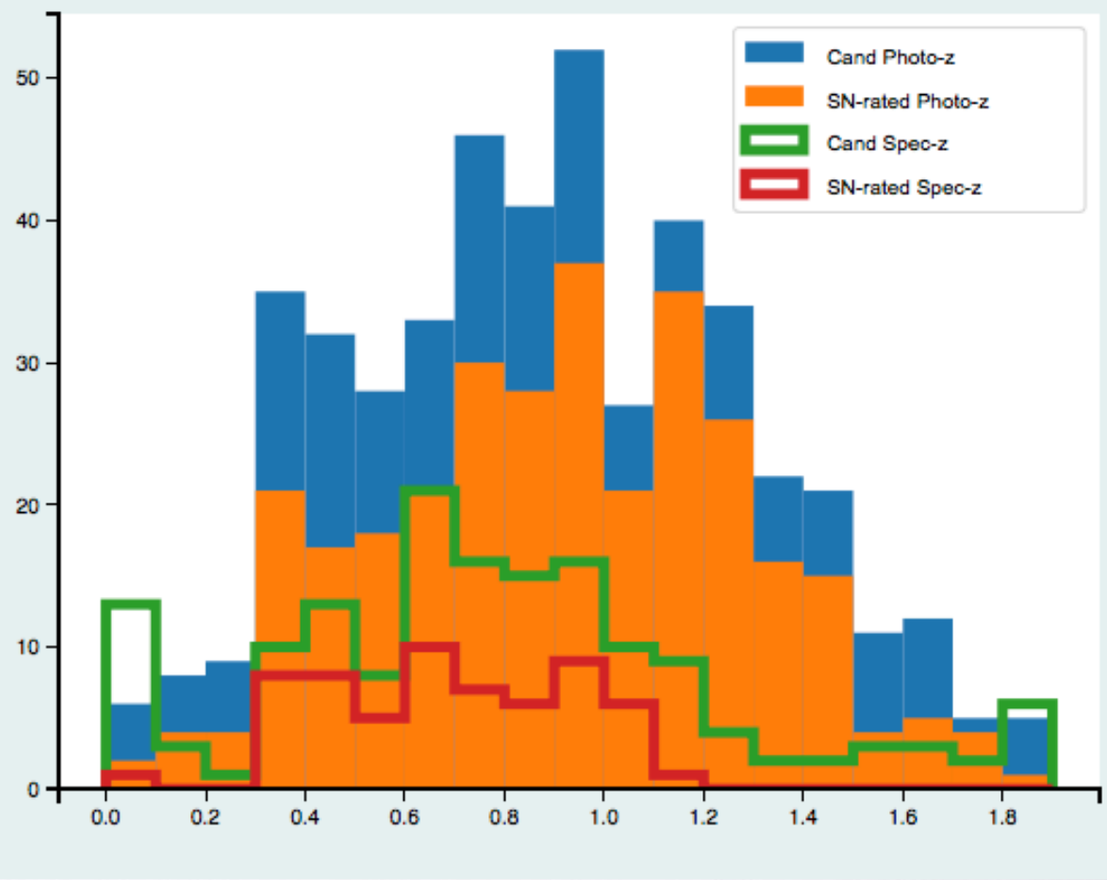
REDSHIFTS

AAT Redshifts



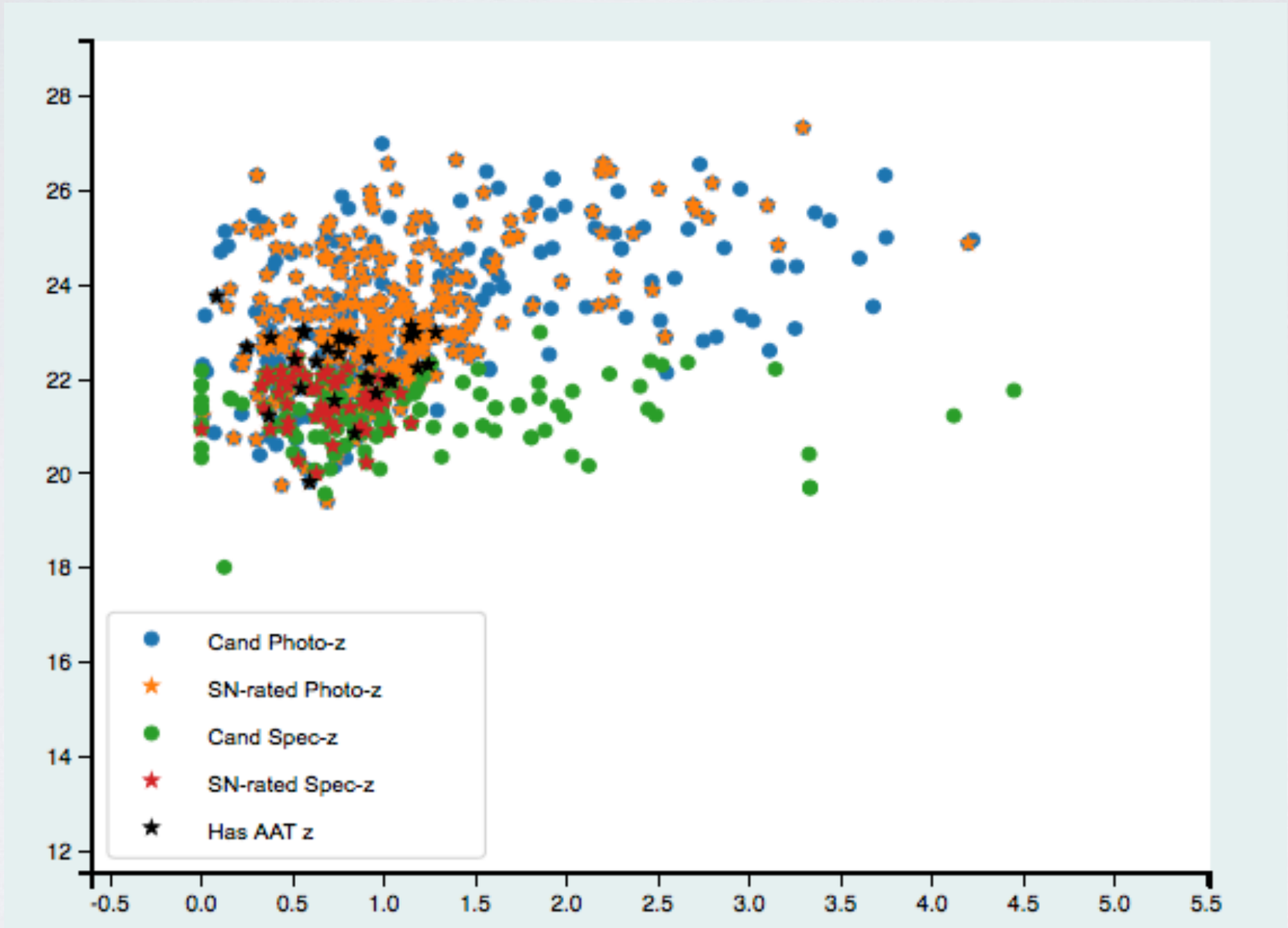
Redshift

COSMOS Redshifts



Redshift

HOST MAGNITUDES

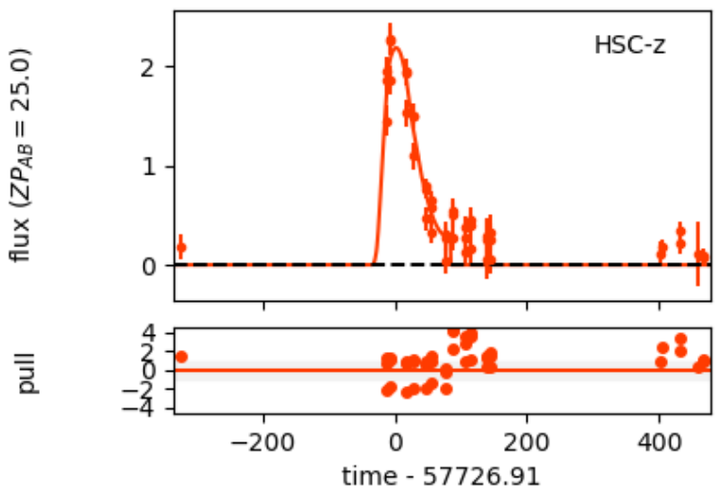


SOME PRELIMINARY LIGHTCURVE FITS

Low-z

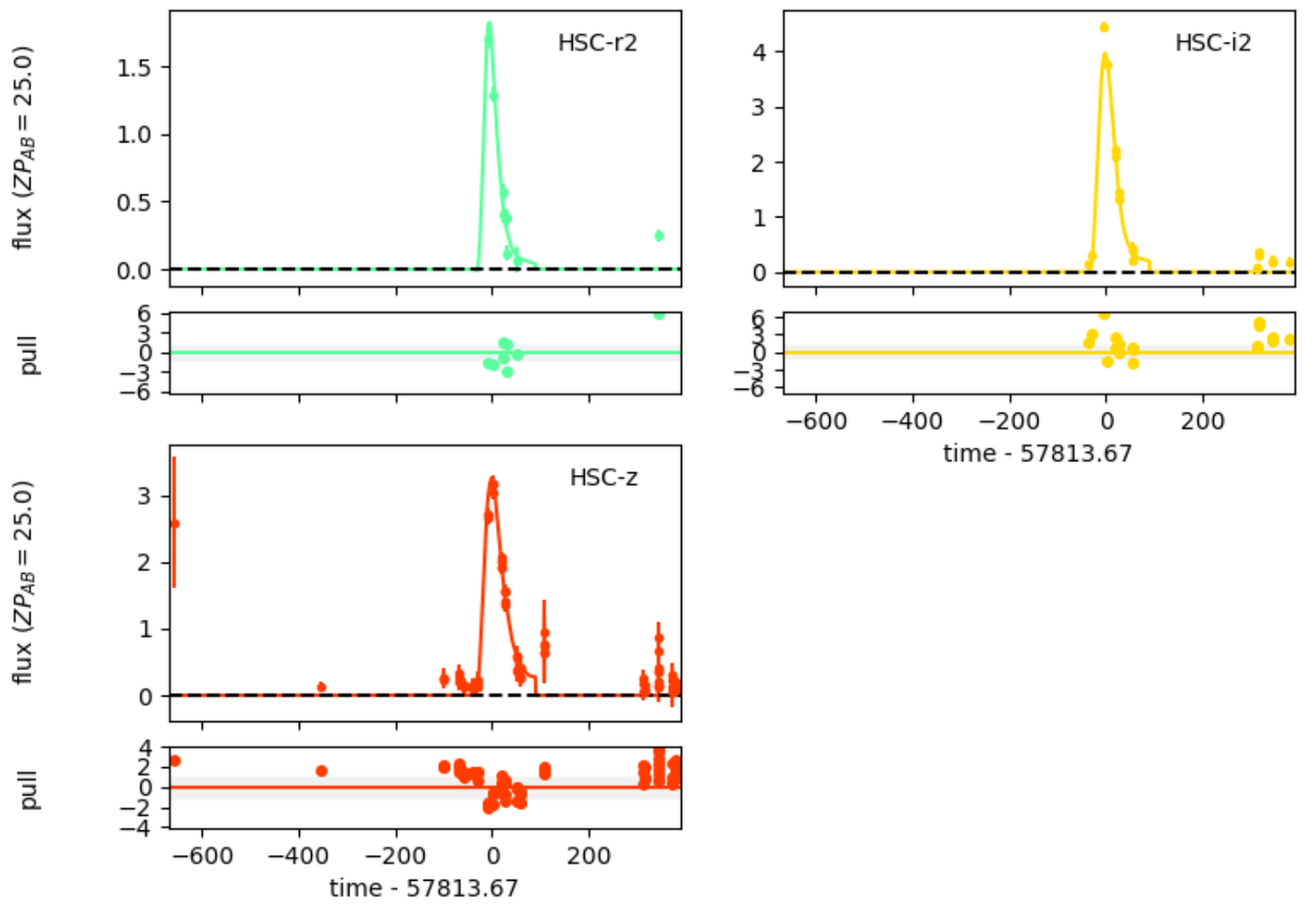
$z = 0.701 \pm 0.012$
$t_0 = 57726.91 \pm 0.94$
$x_0 = (2.30 \pm 0.71) \times 10^{-6}$

$x_1 = 1.5 \pm 2.0$
$c = -0.02 \pm 0.36$



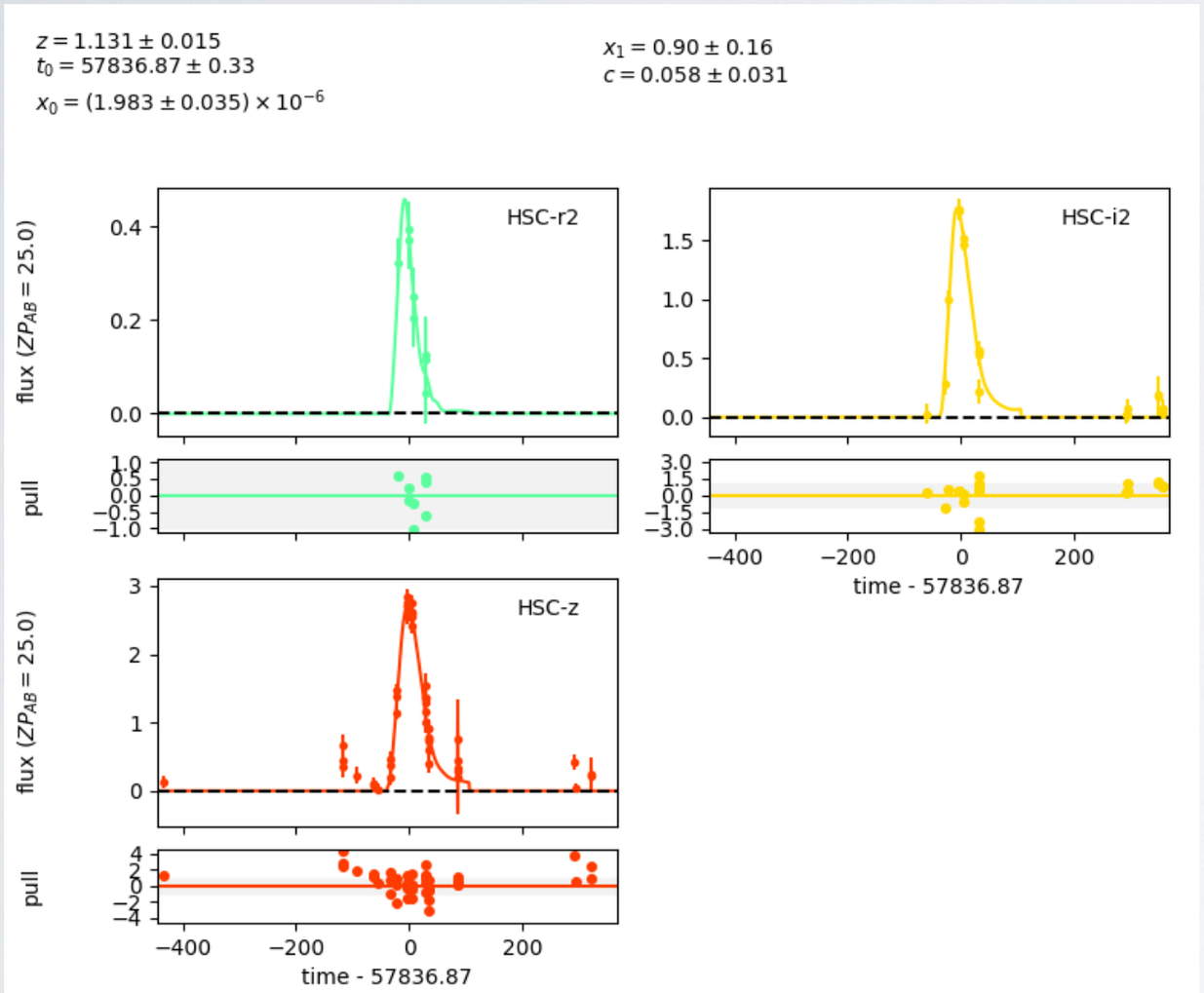
$z = 0.8179 \pm 0.0014$
$t_0 = 57813.67 \pm 0.35$
$x_0 = (3.337 \pm 0.036) \times 10^{-6}$

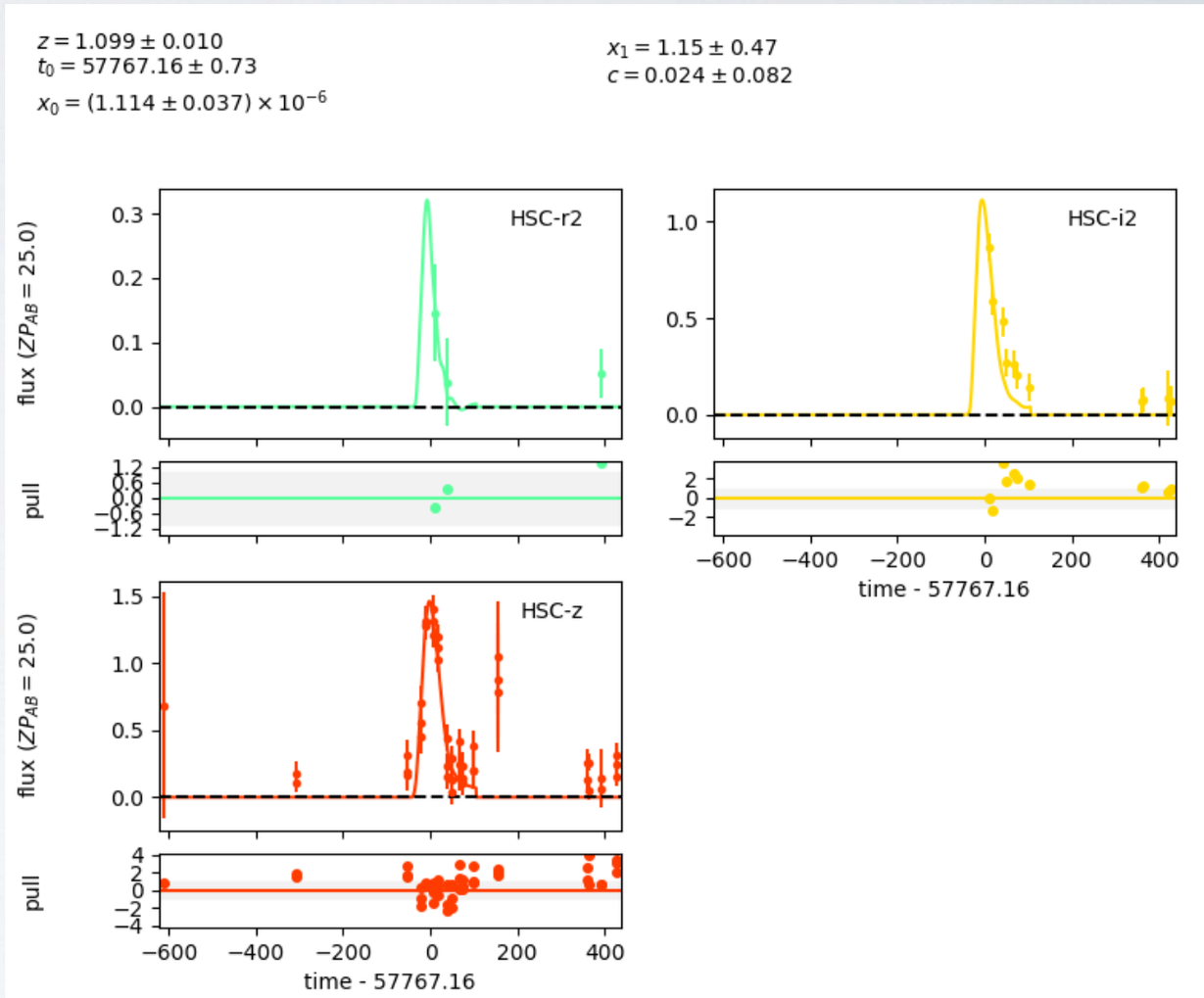
$x_1 = 0.27 \pm 0.17$
$c = 0.025 \pm 0.014$



SOME PRELIMINARY LIGHTCURVE FITS

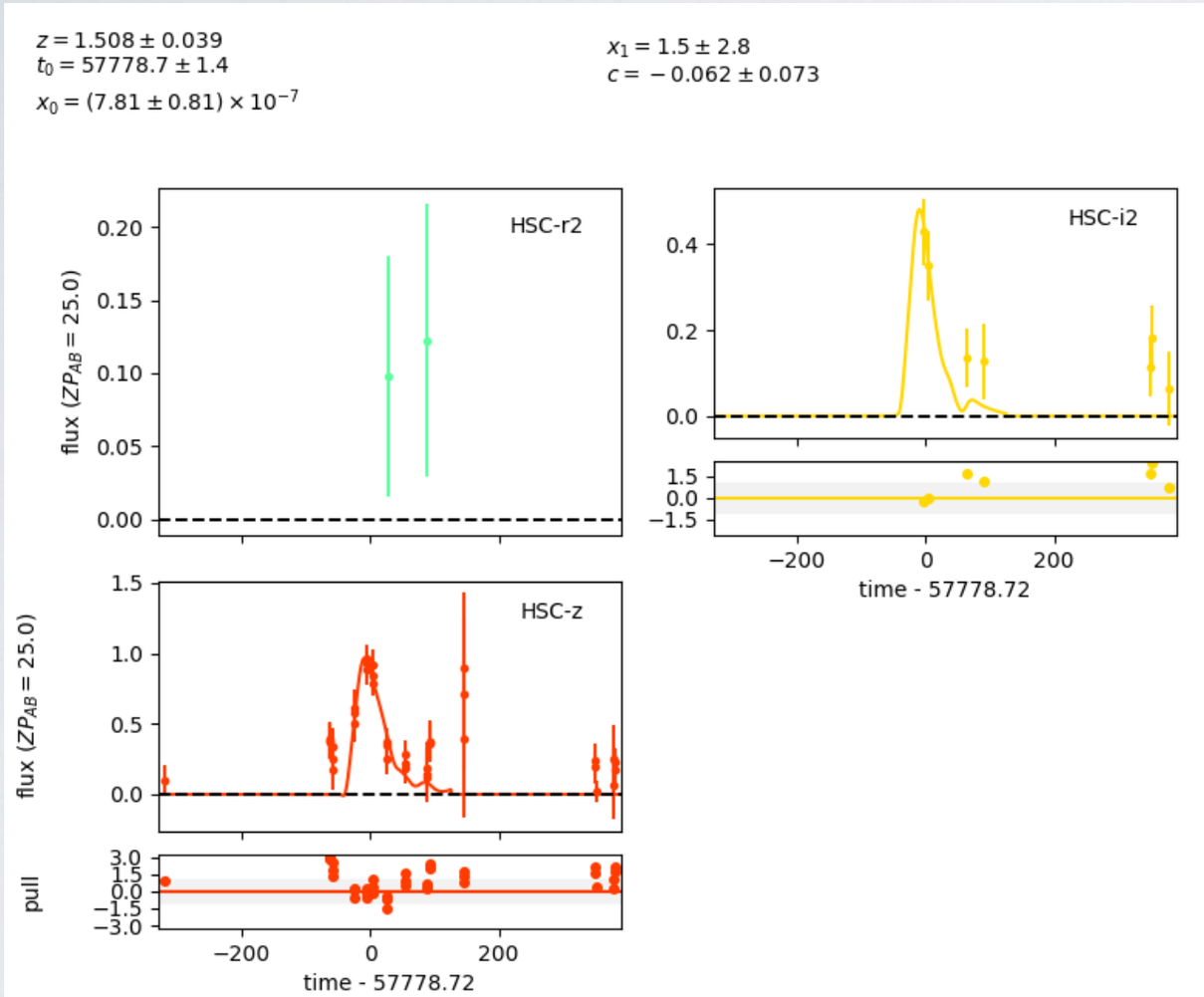
Medium-z

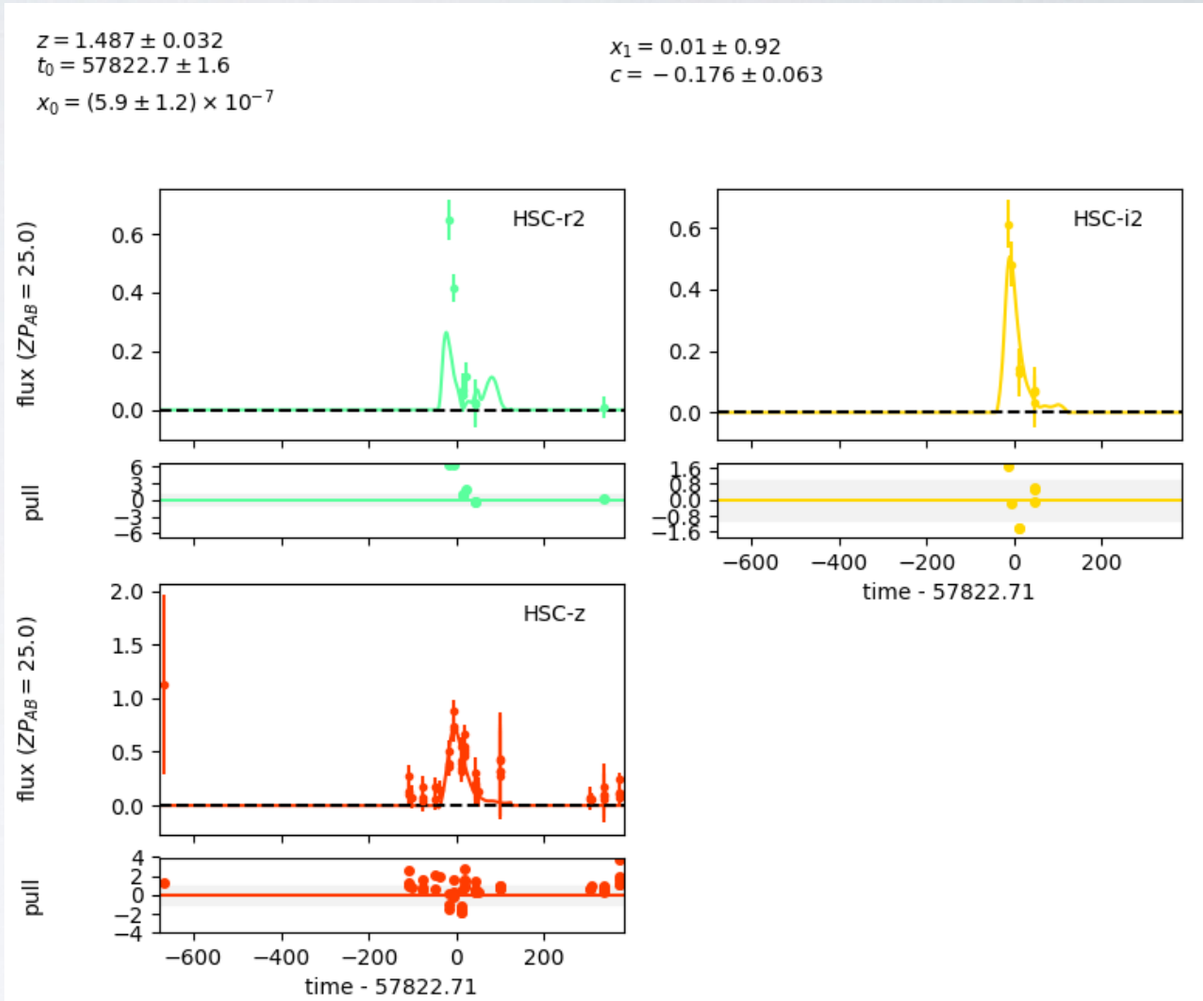




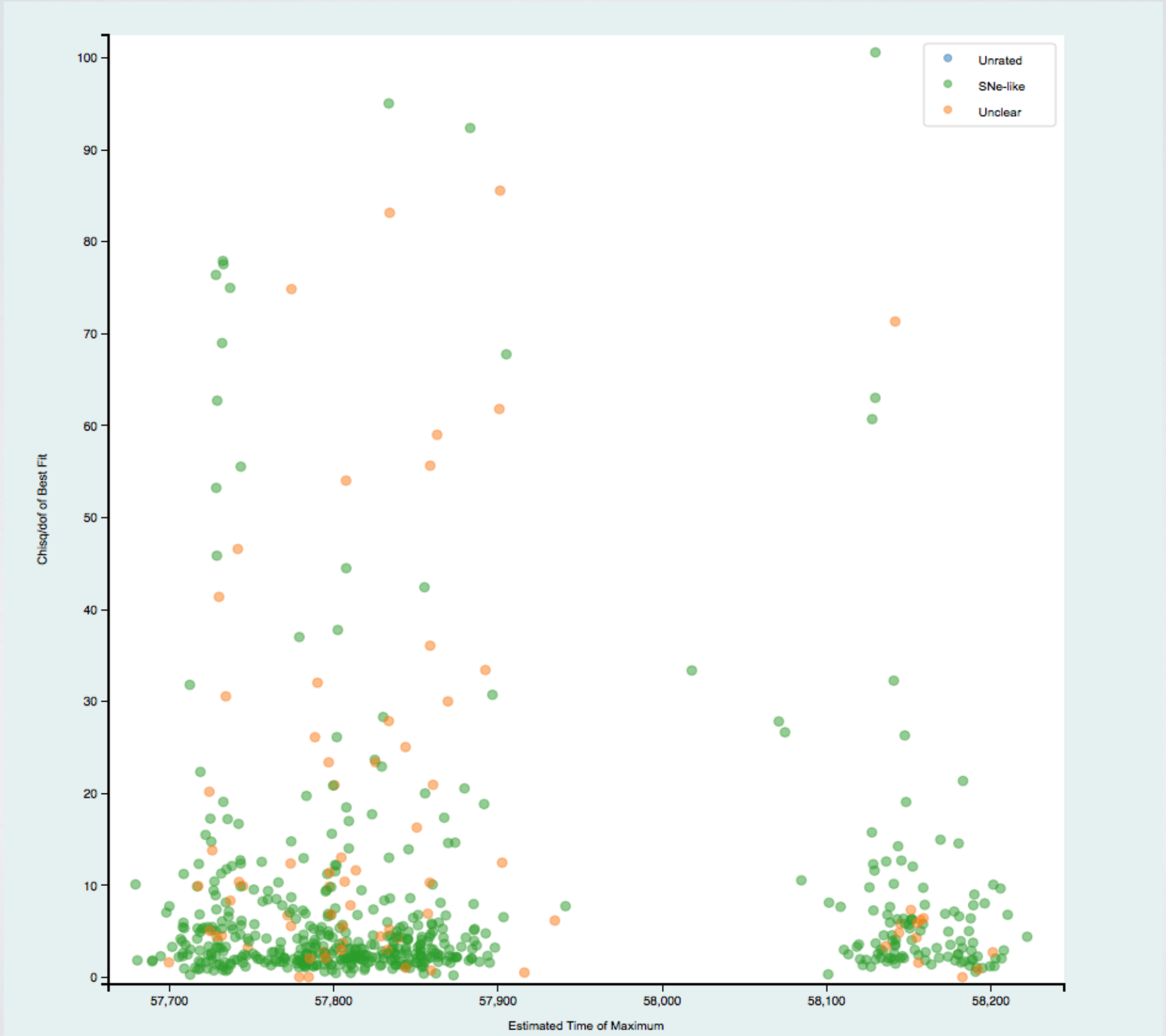
SOME PRELIMINARY LIGHTCURVE FITS

High-z

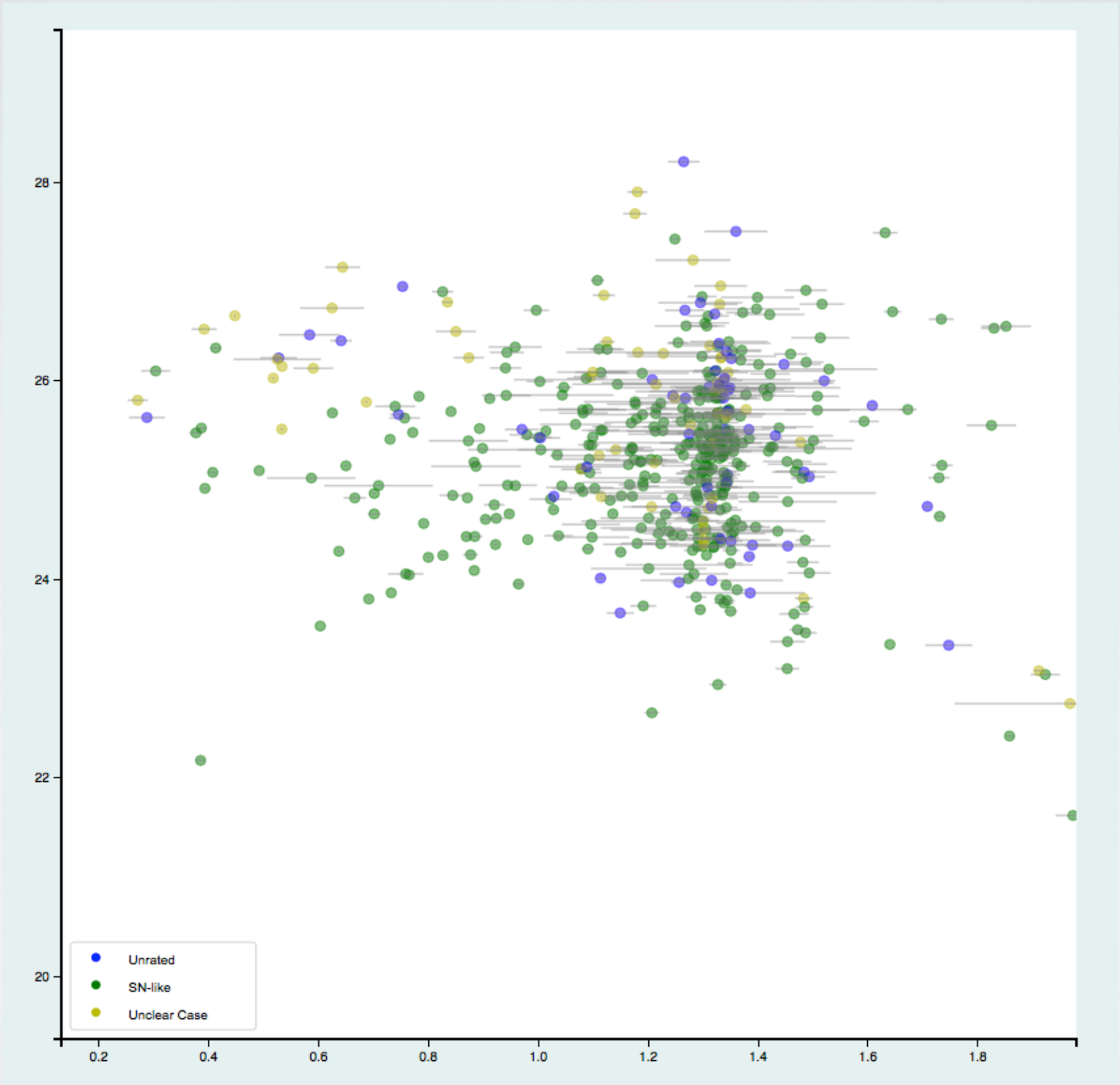




CANDIDATE DISTRIBUTION IN TIME



THE INITIAL HUBBLE DIAGRAM



m_g

Redshift

FINAL LIGHTCURVE CALIBRATION

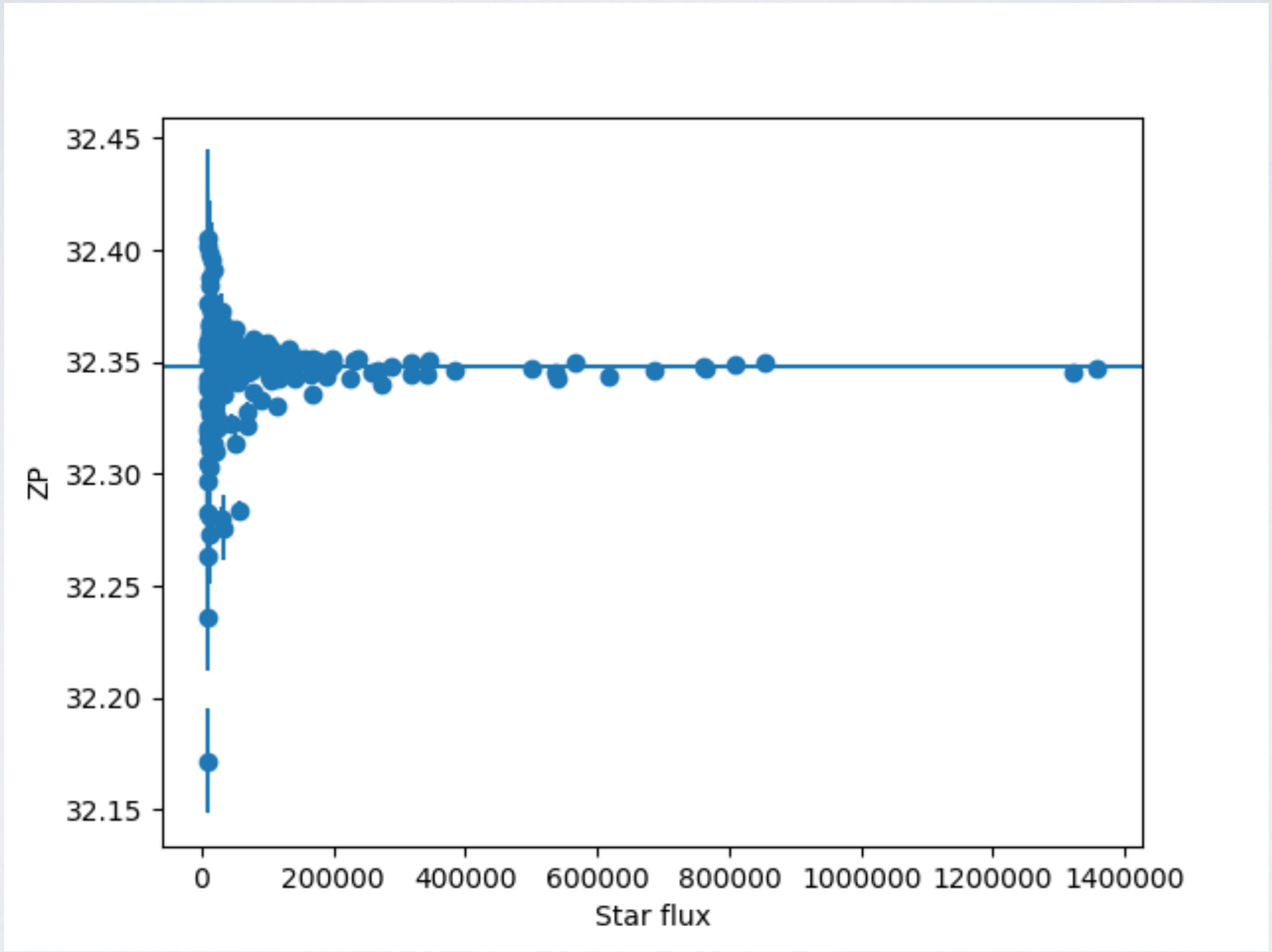
- Do scene-modeling on supernova.

- Do scene-modeling with same PSF and astrometry on stars with known magnitudes around the supernova.

  ➡ Use zeropoint from star magnitudes to calibrate SN magnitudes.

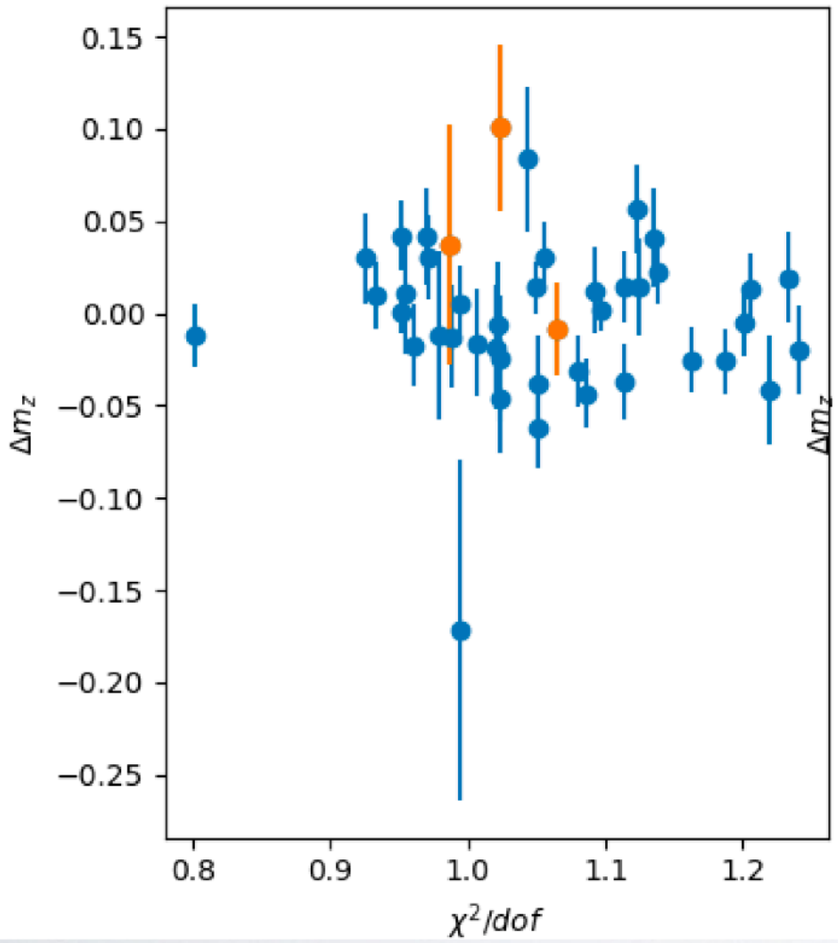
CALCULATING THE ZEROPOINT

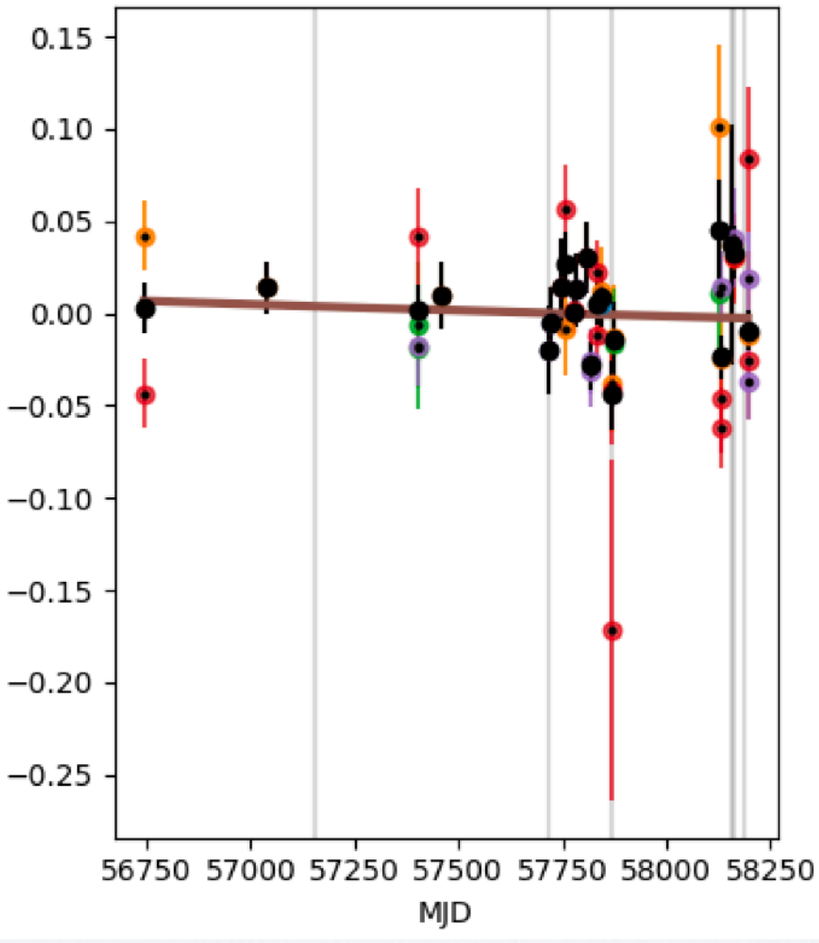
USING A PRELIMINARY CALIBRATED STAR CATALOG

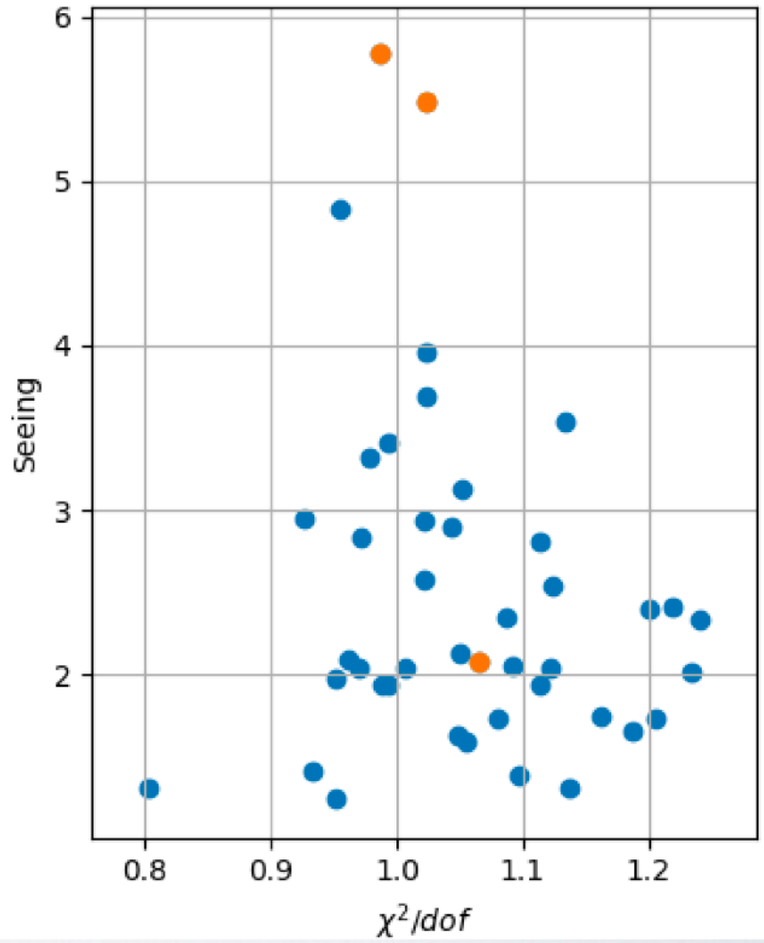


CALCULATING THE ZEROPOINT

Low flux star

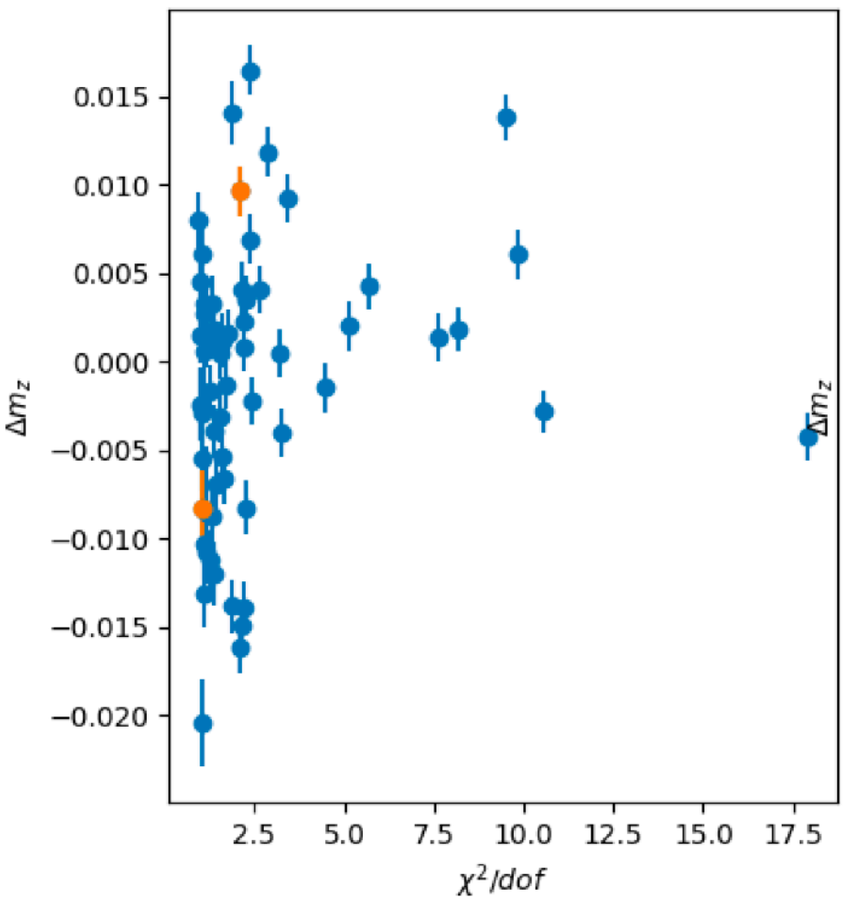


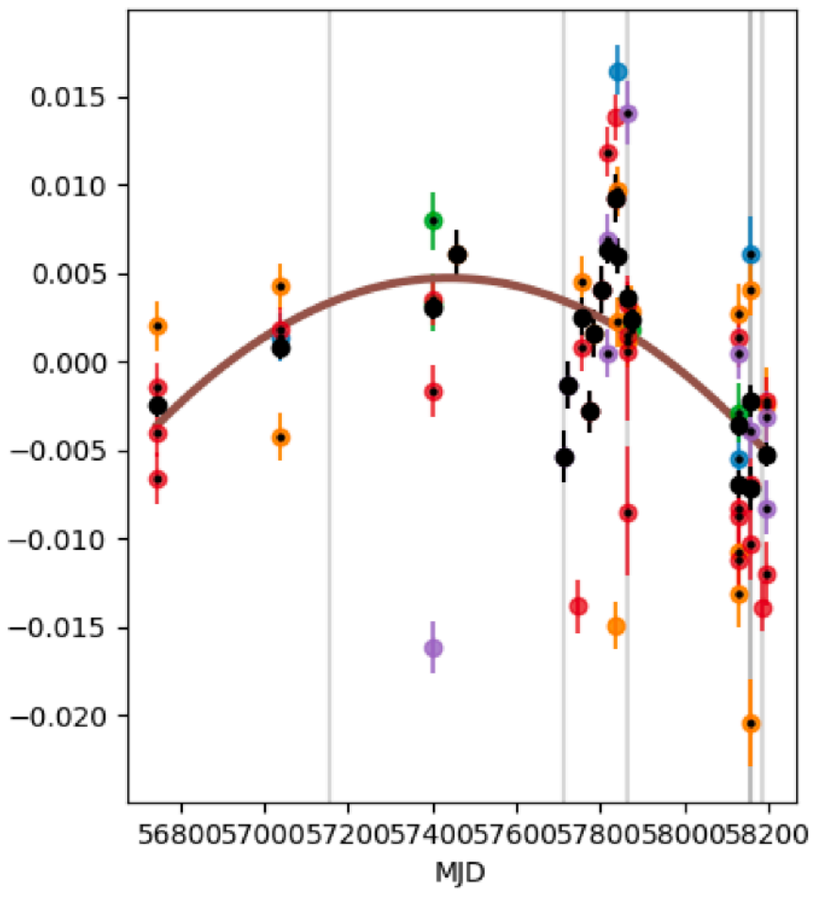


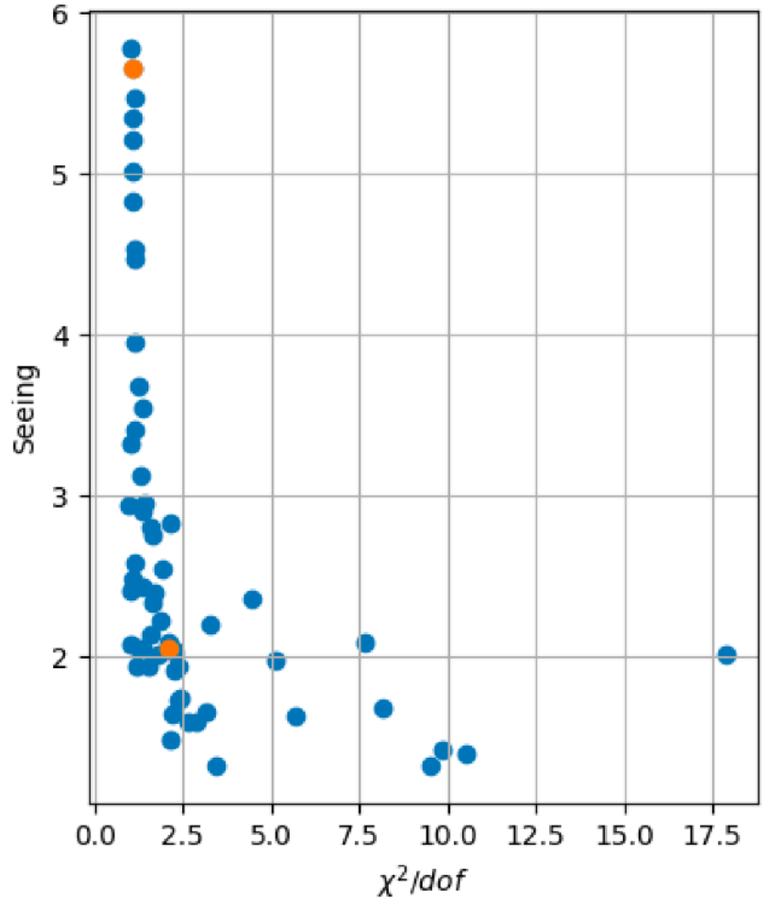


CALCULATING THE ZEROPOINT

High flux star

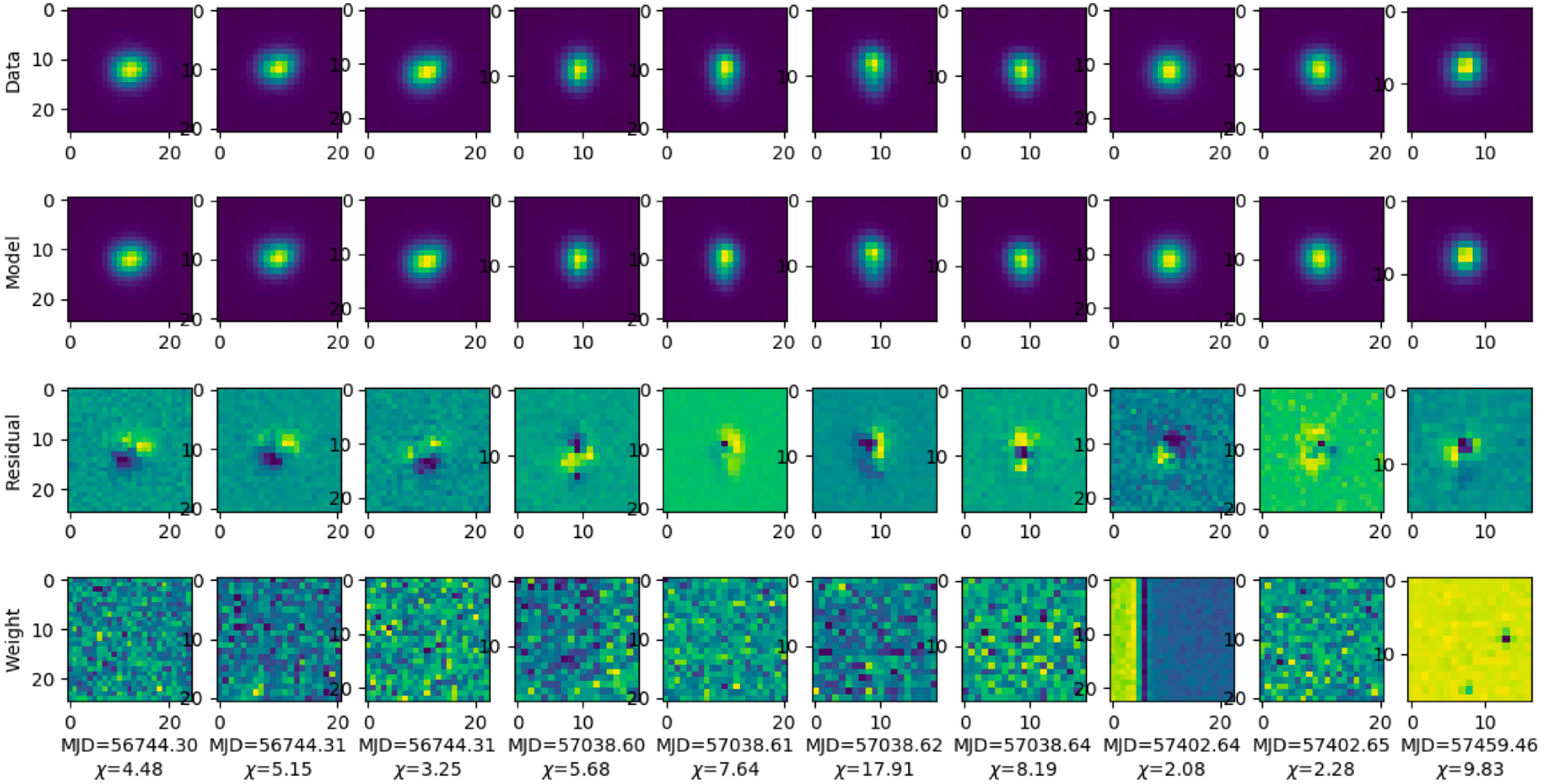




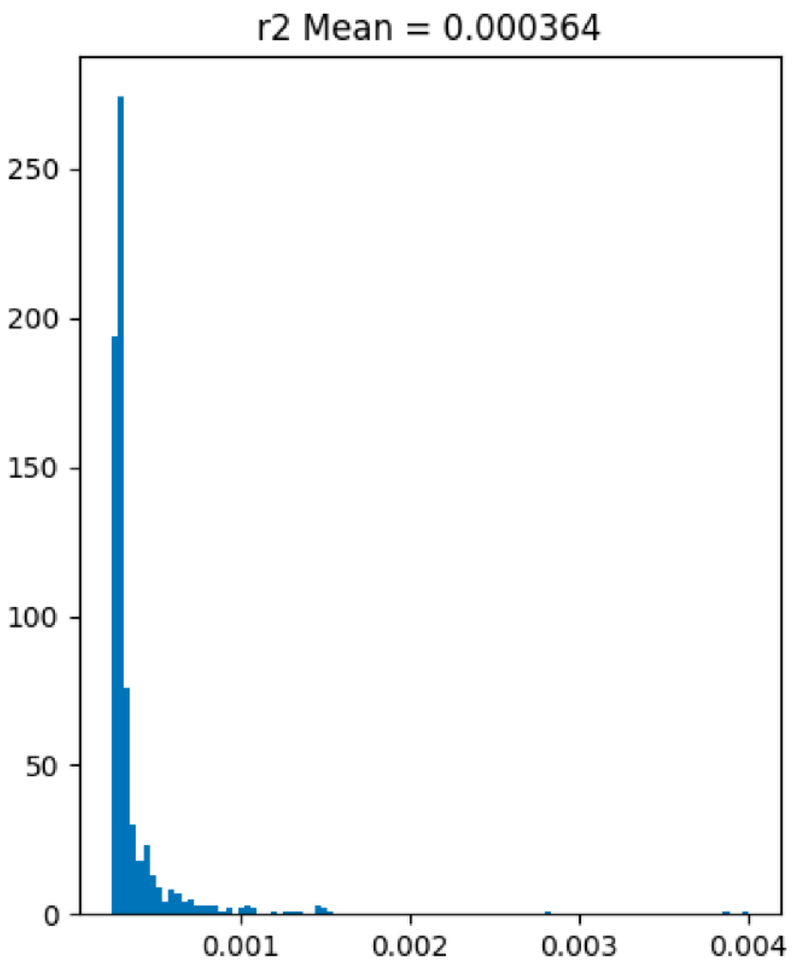


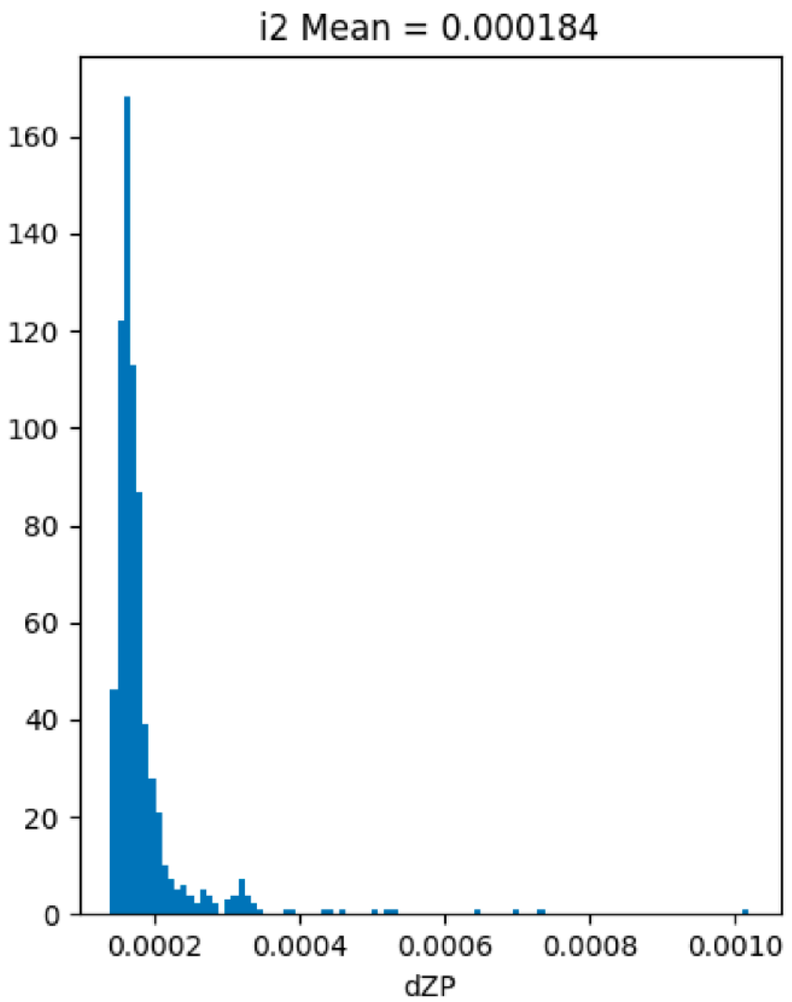
CALCULATING THE ZEROPOINT

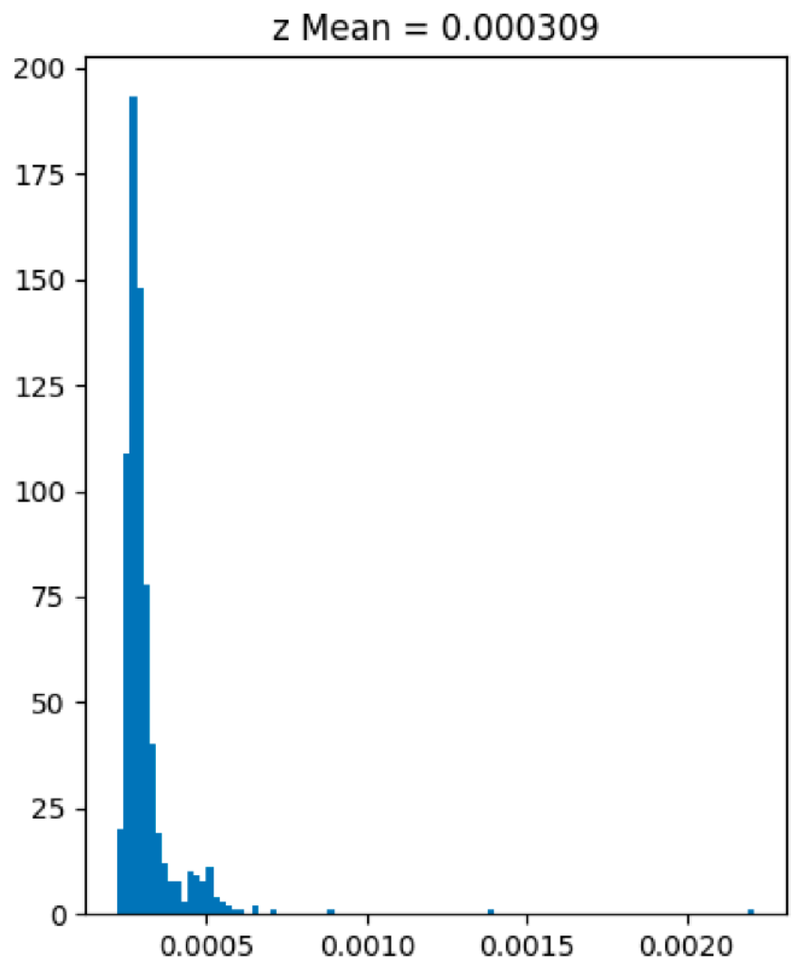
High flux star



DISTRIBUTION IN ZEROPOINT UNCERTAINTIES







PRELIMINARY-FINAL LIGHTCURVE FITS TOMORROW…

PARTIAL LIST OF PIPELINE IMPROVEMENTS AND NEXT STEPS

- Revise detection criteria for SN candidates based on human ratings, etc.
- Global solution for astrometry and photometric calibration.
- Improved model for PSF
- Add g and Y bands
- Add Deep fields