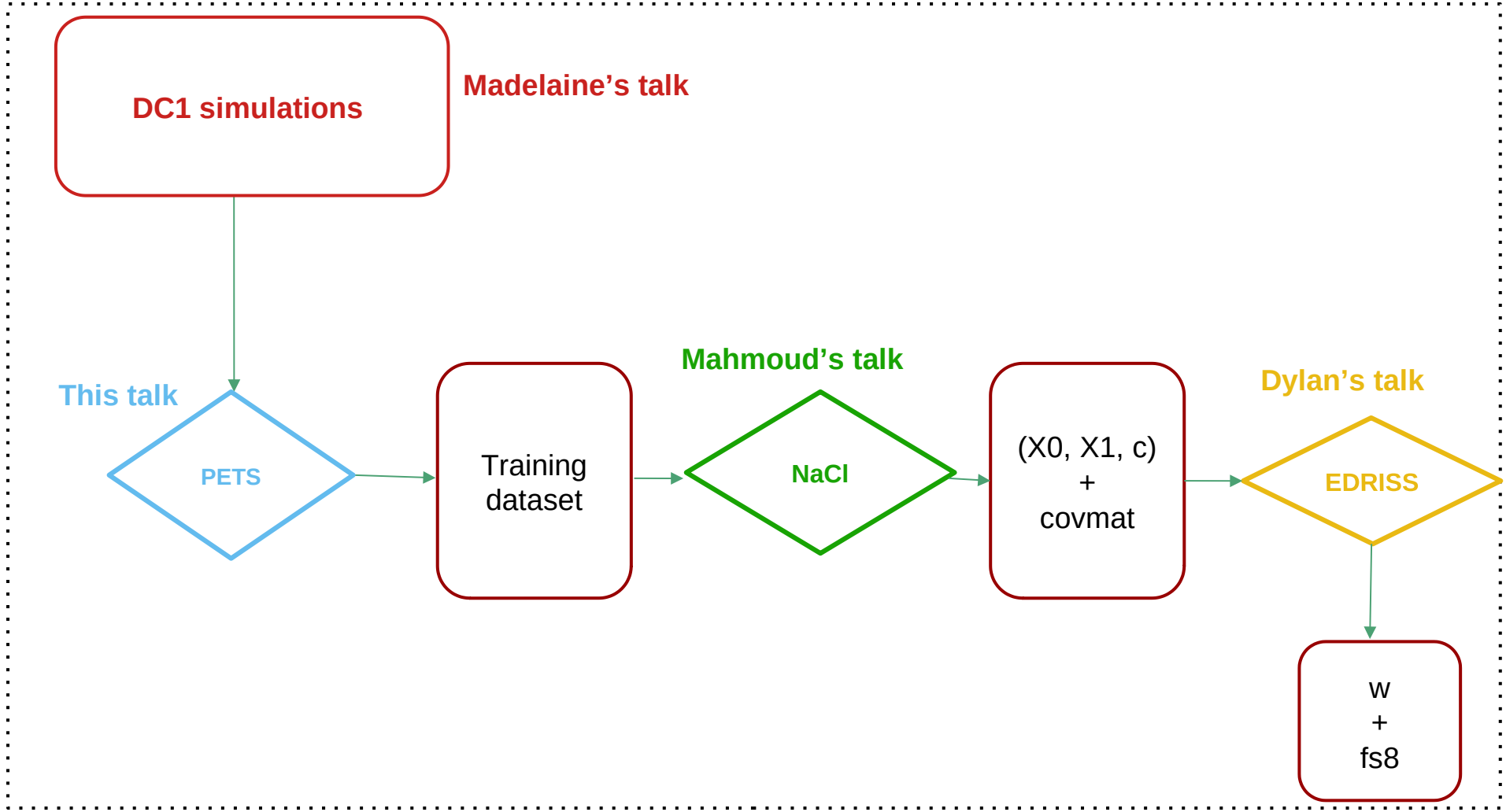
Thomas de Jaeger (LPNHE - CNRS - Université Pierre & Marie Curie)

PETS : building the Lemaitre cosmology sample

DC1 to test the LEMAITRE pipeline



PETS: Motivations

PETS: Preprocessing and sElection of a Training Sample

- **We want a method to select a training sample where all the SN have well defined Tmax.**

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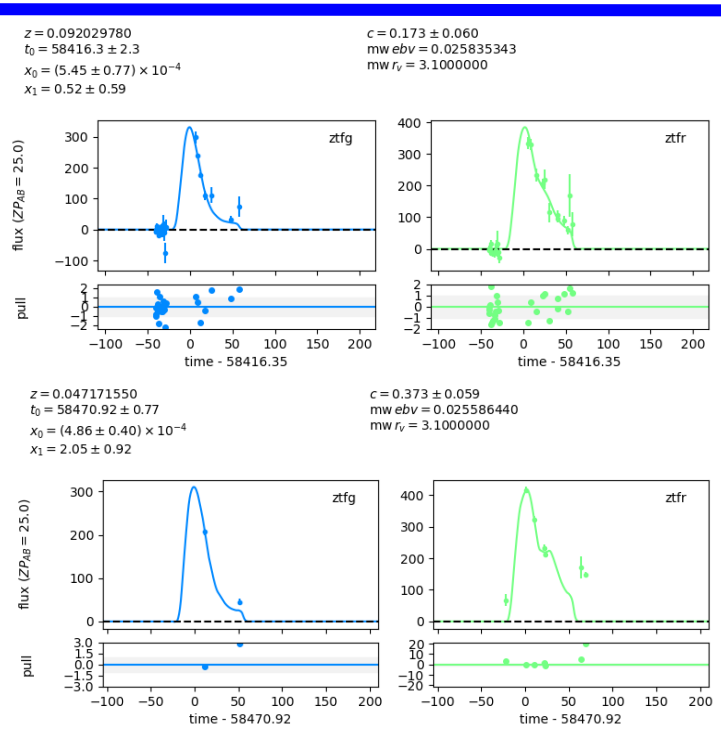

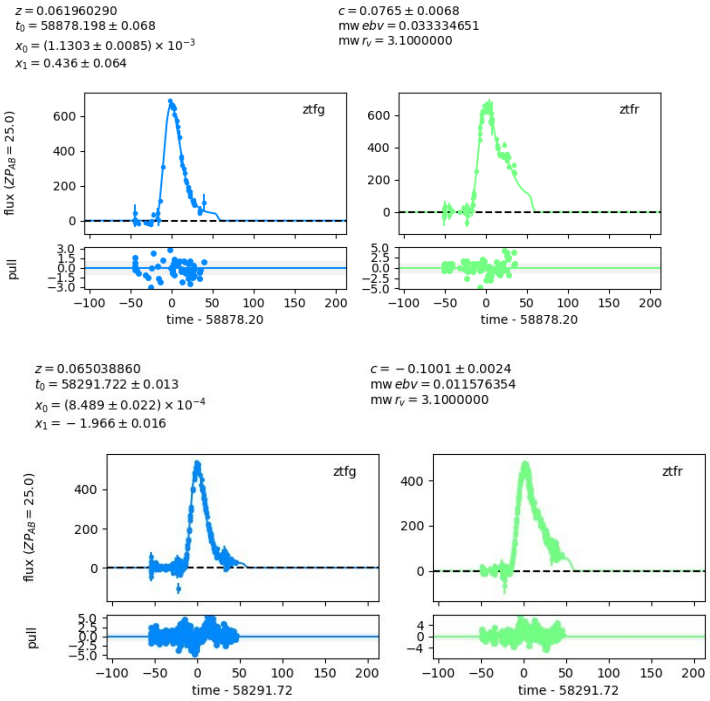

PETS: Motivations

PETS: Preprocessing and sElection of a Training Sample

- **We want a method to select a training sample where all the SN have well defined Tmax.**

  How do we define a well defined sampling light curve? Error Tmax <1day? 1-2 pts before and after maximum? Cuts in x1, c?

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- **We want a method to select a training sample where all the SN have well defined Tmax.**

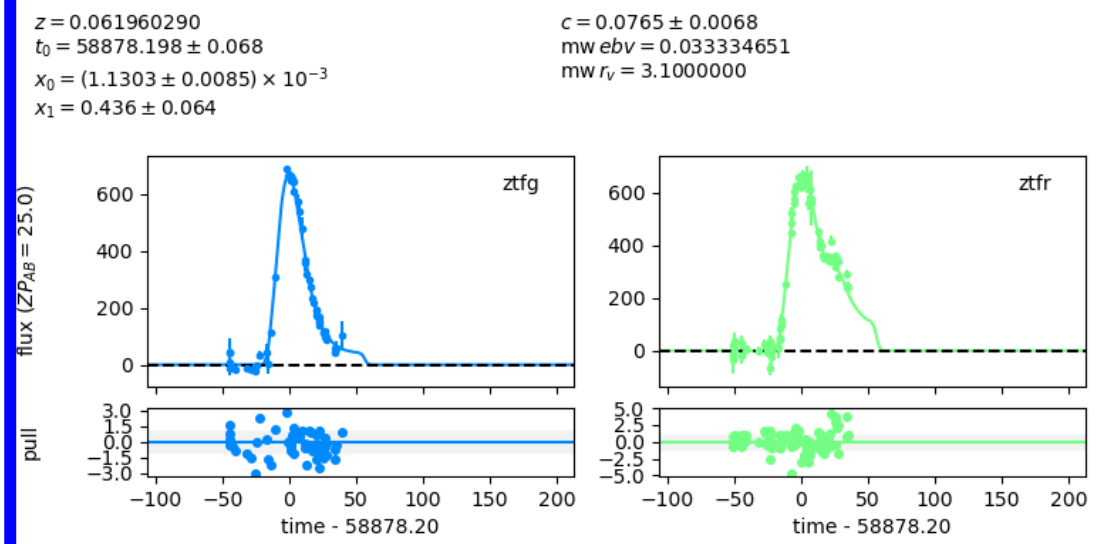
  How do we define a well defined sampling light curve? Error Tmax <1day? 1-2 pts before and after maximum? Cuts in x1, c?

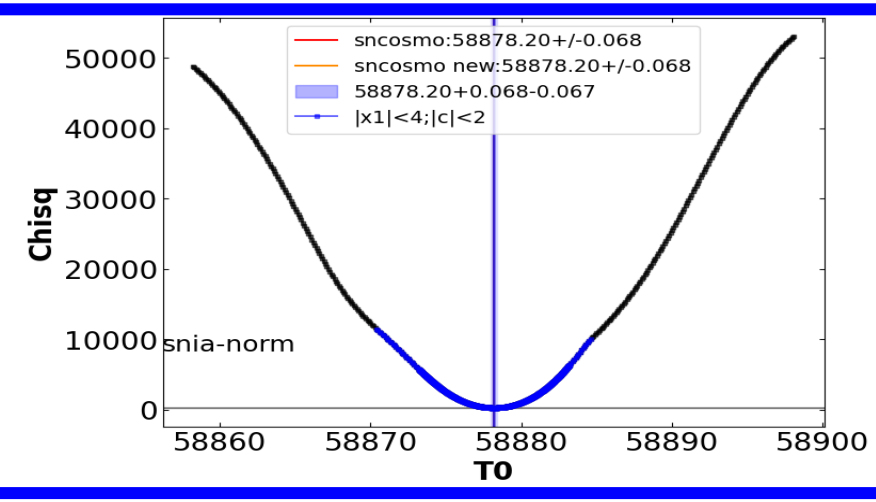
  We want a selection based only on the sampling, i.e., observations (like bad weather) not in population (x1,c, etc)

- **Method: Produce the likelihood profile, i.e., we look at the chi2 for different Tmax**

  → **Using sncosmo fit all the LC with Tmax, x0, x1, c as free parameters**
  → **Fit all the LC with Tmax fixed and x0, x1, c as free parameters**

PETS





- **sncosmo converged**
  → purpose: have data and found a minimum
- **eTmax from chi2<1 day**
  → purpose: Tmax well defined
- **abs(eTmax-eTmin) at 3sig<0.3**
  → purpose: having minimum symetric
- **Only 1 min at 3sig**
  → purpose: having only one clear minimum

PETS : DC1

ZTF

PeTS cuts

Cut	Discarded	Remaining
Tot	-	7386
2bd,5pts +-50d	2593	4793
sncosmo converged	165	4668
eTmax<1	331	4297
abs(eTmax-eTmin) 3sig<0.3	288	4009
Only 1 min at 3sig	8	4001
eX1_chi2<1.0	3	3998
ecol_chi2<0.3	2	3996

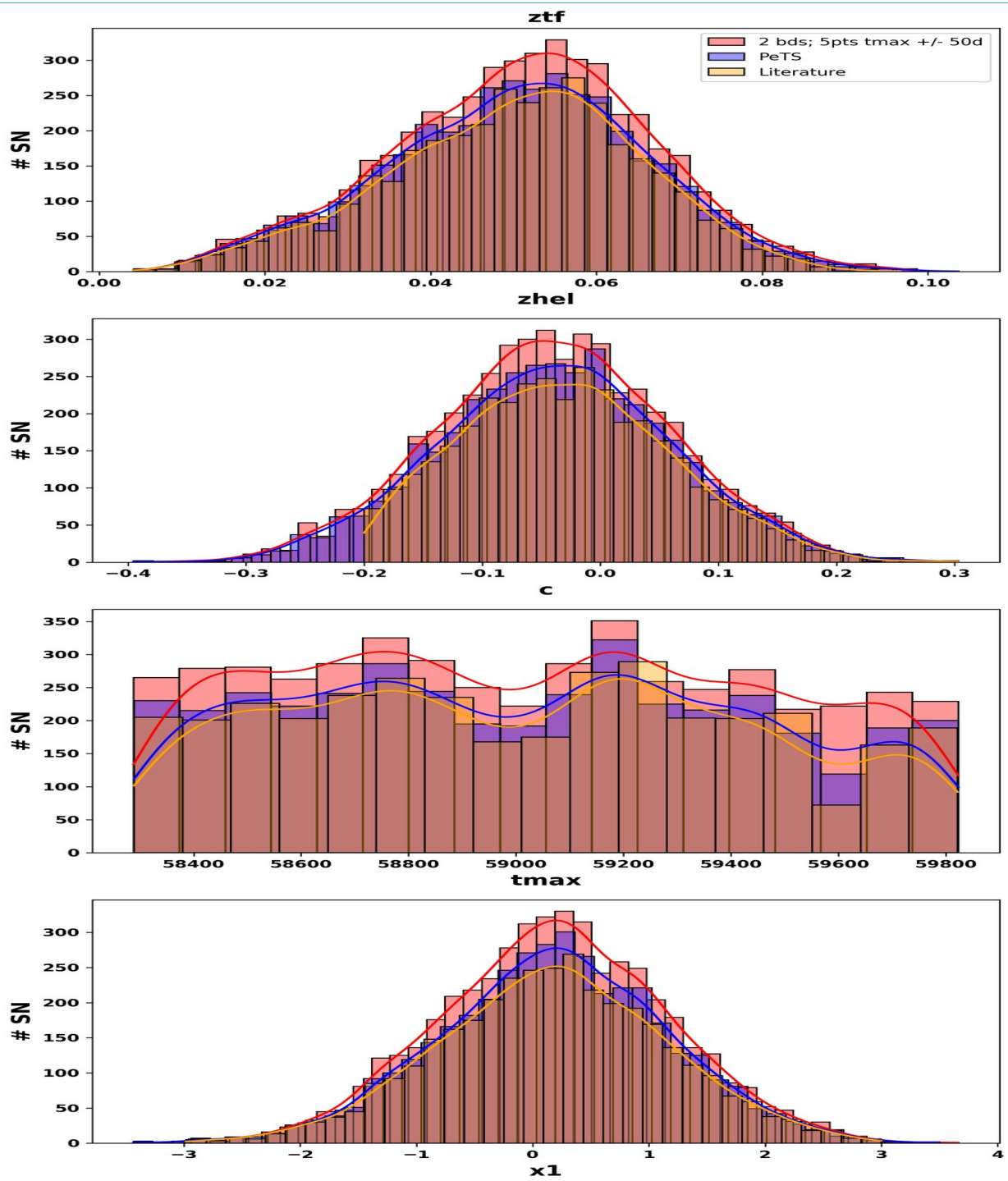
PETS : DC1 (ZTF)

ZTF

Cut	Discarded	Remaining
Tot	-	7386
2bd,5pts +-50d	2078	5308
sncosmo converged	441	4867
eTmax<1	443	4424
abs(eTmax-eTmin) 3sig<0.3	386	4038
Only 1 min at 3sig	36	4002
eX1_chi2<1.0	3	3999
ecol_chi2<0.3	4	3995

Literature cuts 3519

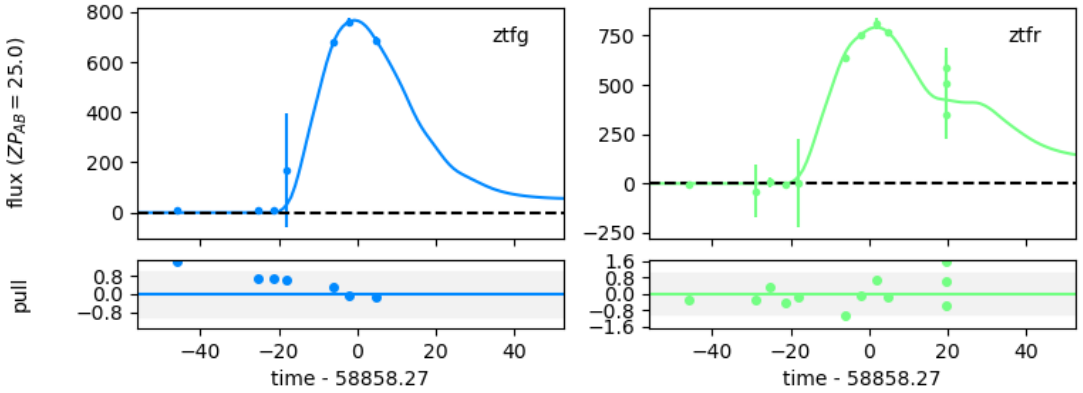
(2 bands, 7pts with SNR>5, 2 pts before and after Tmax, |x1|<3, -0.2<c<0.8)


ztf
2 bds; 5pts tmax +/- 50d
PeTS
Literature
SN
zhel
c
tmax
x1

PETS : DC1 (ZTF)

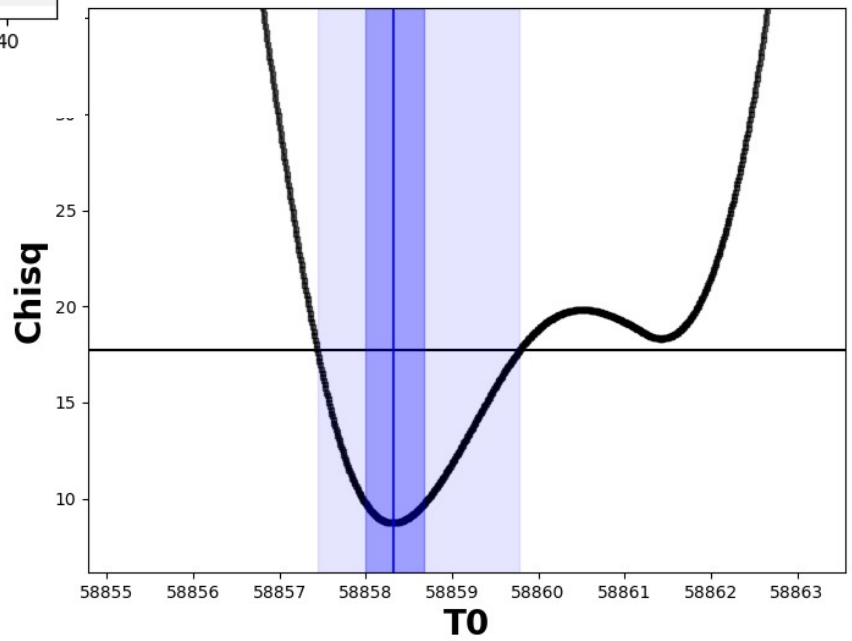
$z = 0.055250000$
$t_0 = 58858.27 \pm 0.40$
$x_0 = (1.131 \pm 0.047) \times 10^{-3}$

$x_1 = 1.64 \pm 0.80$
$c = 0.169 \pm 0.042$



Cutted by PeTS:

Profile not symetric at 3sig

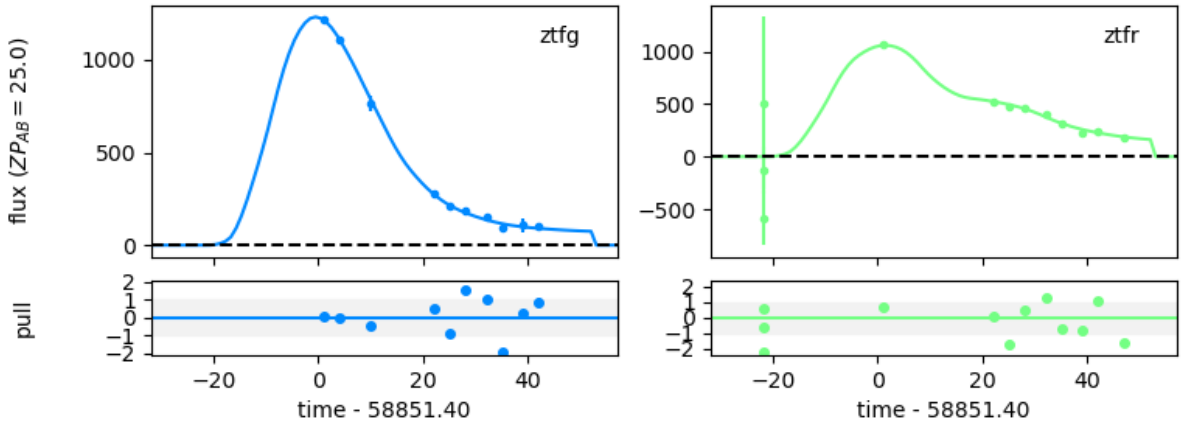


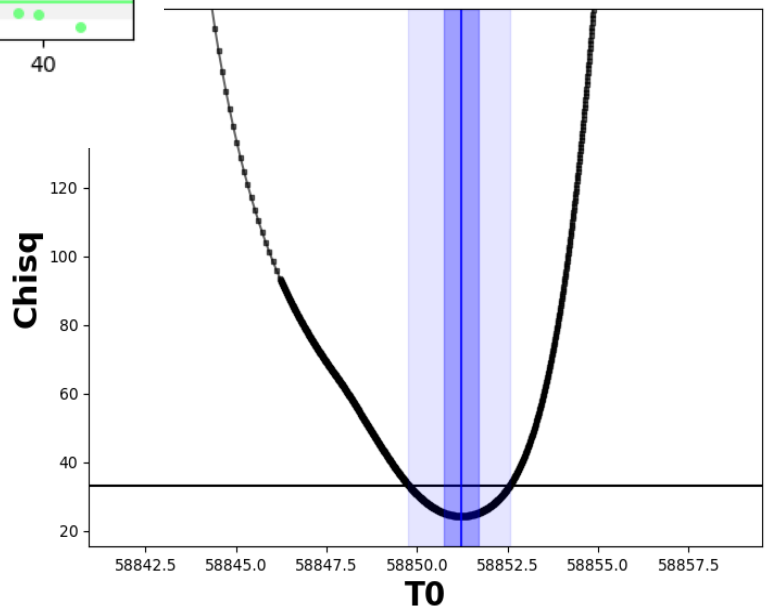
PETS : DC1 (ZTF)

$z = 0.048150000$
$t_0 = 58851.40 \pm 0.55$
$x_0 = (1.909 \pm 0.066) \times 10^{-3}$

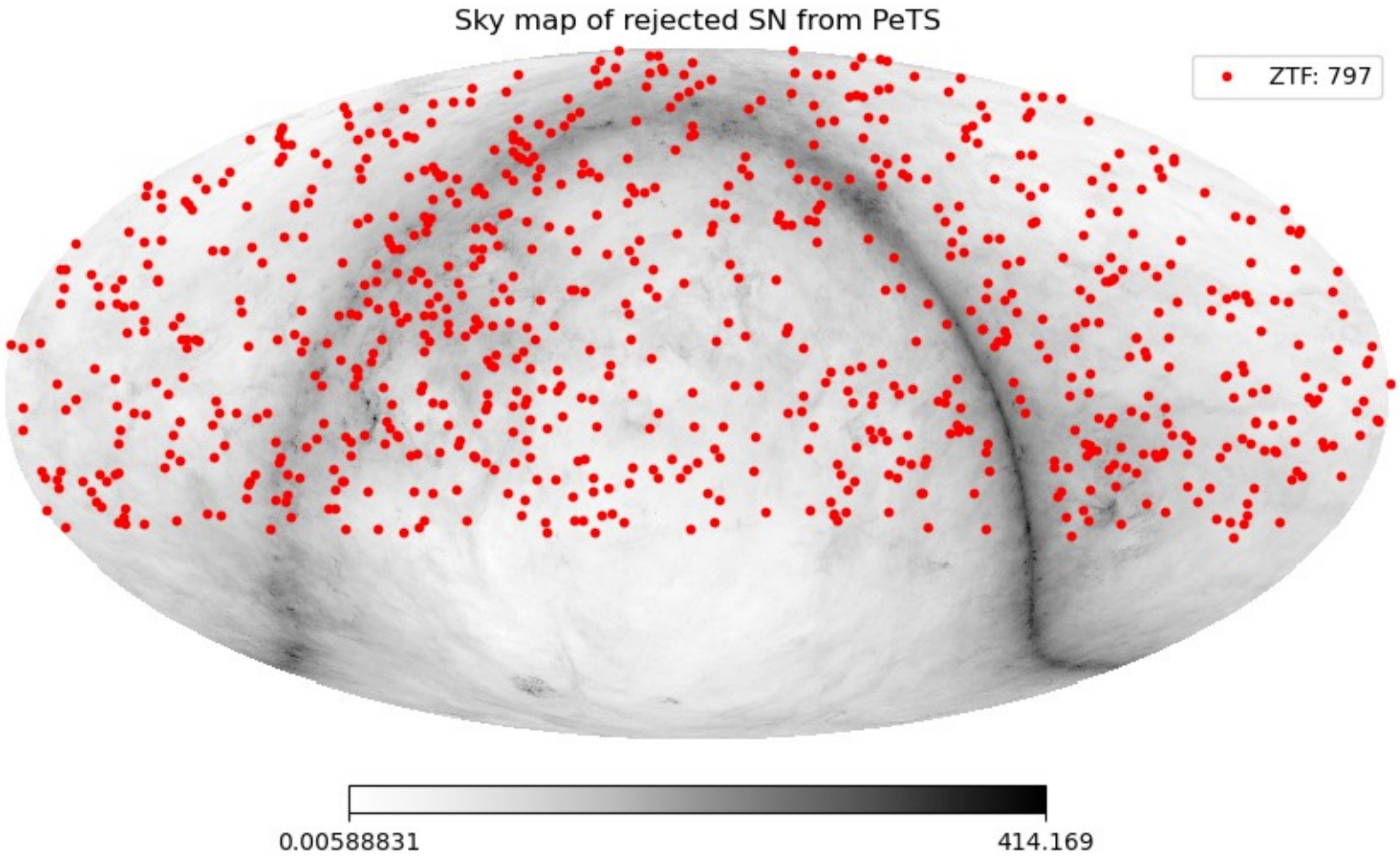
$x_1 = 0.15 \pm 0.19$
$c = -0.024 \pm 0.035$

Not cutted by PeTS:





PETS : DC1 (ZTF)



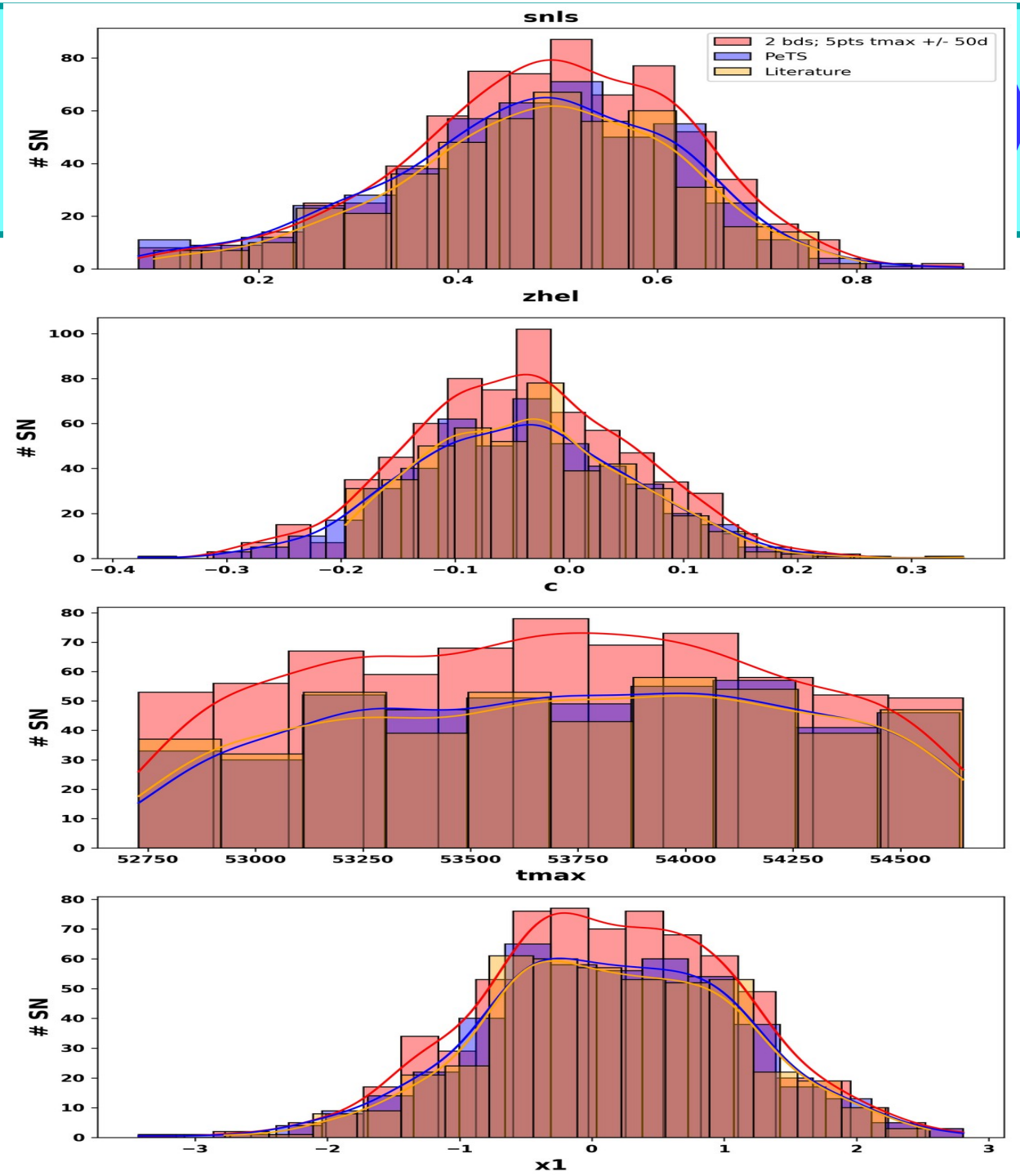
PETS : DC1 (SNLS)

SNLS

Cut	Discarded	Remaining
Tot	-	1452
2bd,5pts +-50d	768	684
sncosmo converged	70	614
eTmax<1	97	517
abs(eTmax-eTmin) 3sig<0.3	51	466
Only 1 min at 3sig	1	465
eX1_chi2<1.0	3	462
ecol_chi2<0.3	1	461

Literature cuts 455

(2 bands, 7pts with SNR>5, 2 pts before and after Tmax, |x1|<3, -0.2<c<0.8)


snls
2 bds; 5pts tmax +/- 50d
PeTS
Literature
SN
zhel
c
tmax
x1

PETS : DC1 (HSC)

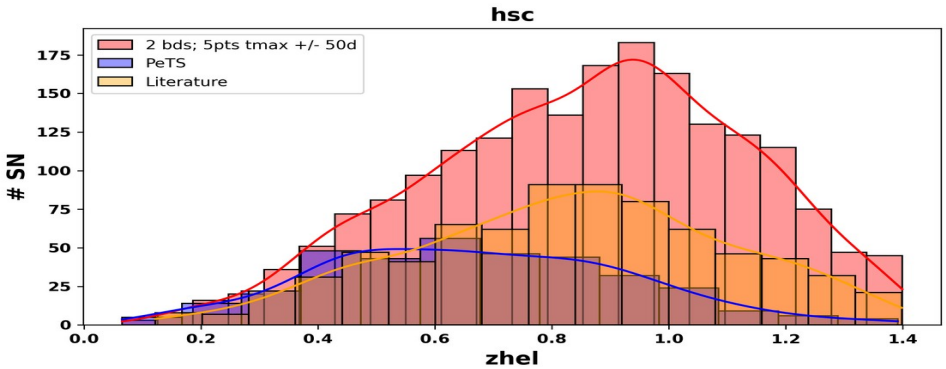
HSC

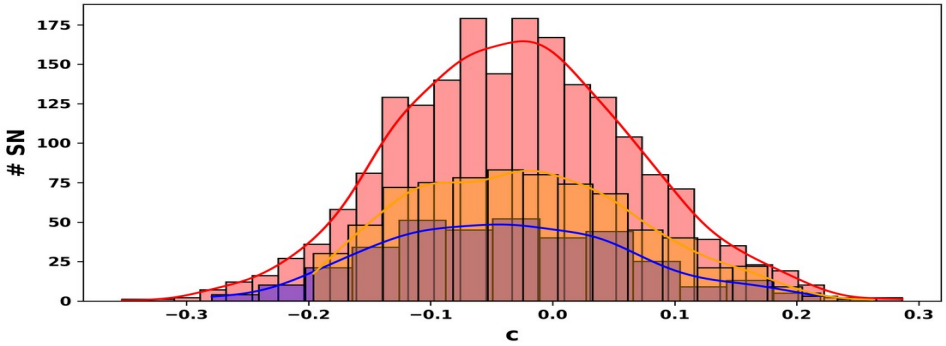
Cut	Discarded	Remaining
Tot	-	37510
2bd,5pts +-50d	35554	1956
sncosmo converged	410	1546
eTmax<1	755	719
abs(eTmax-eTmin) 3sig<0.3	262	529
Only 1 min at 3sig	9	520
eX1_chi2<1.0	161	359
ecol_chi2<0.3	6	353

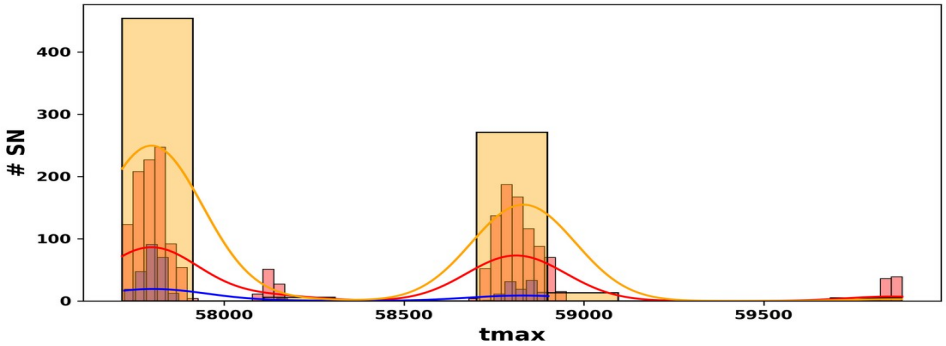
Literature cuts 749

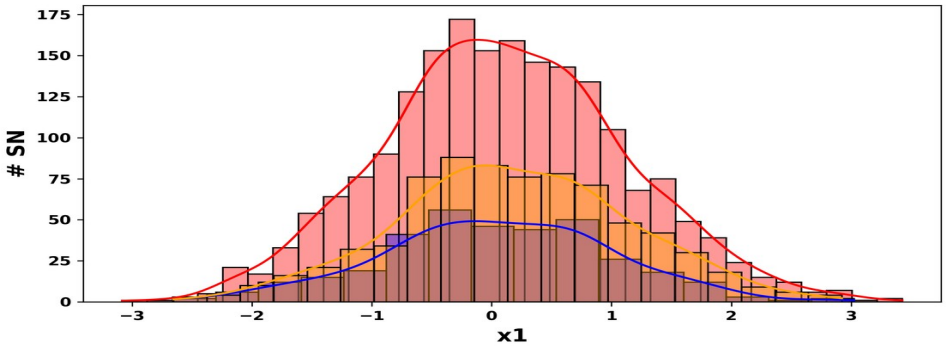
(2 bands, 7pts with SNR>5, 2 pts before and after Tmax, |x1|<3, -0.2<c<0.8)

P


hsc
2 bds; 5pts tmax +/- 50d
PeTS
Literature
SN
0
25
50
75
100
125
150
175
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4

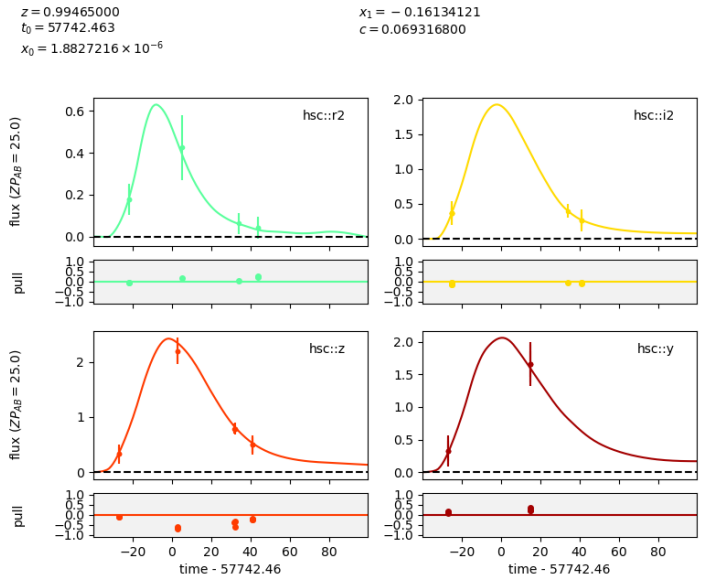

zhel
SN
0
25
50
75
100
125
150
175
−0.3
−0.2
−0.1
0.0
0.1
0.2
0.3


c
SN
0
100
200
300
400
58000
58500
59000
59500


tmax
SN
0
25
50
75
100
125
150
175
−3
−2
−1
0
1
2
3
x1

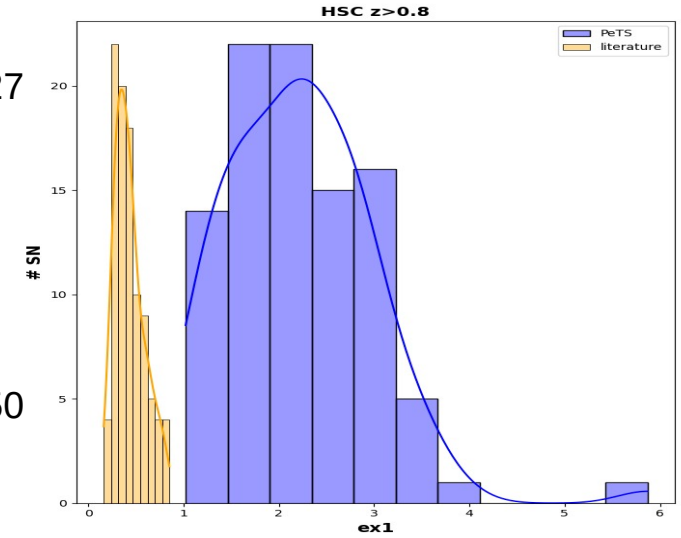
PETS : DC1 (HSC)

True values

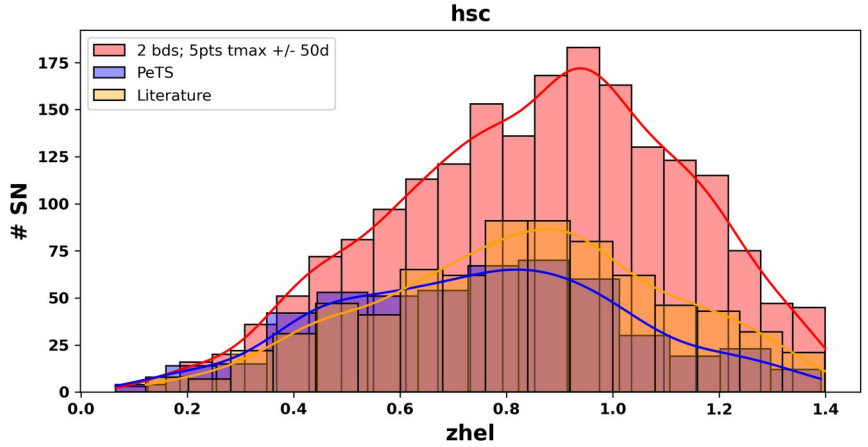


bounds=x1,c → eX1=0.27

bounds=x0,x1,c → eX1=2.50



Without ex1 cuts

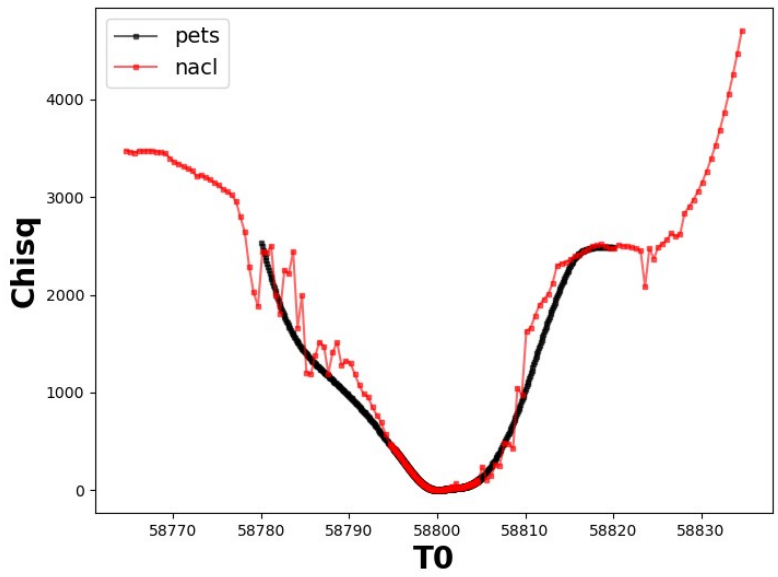


PETS +NaCl

PETS: Preprocessing and sElection of a Training Sample

- Currently computationally expensive (>7000 SNe, 1300 different Tmax)
- Issues with sncosmo (bounds or not)

→ We use NaCl and reduce the grid (1h in total)



Only 1 min at 3sig	9	520
eX1_chi2<1.0	161	359
ecol_chi2<0.3	6	353

Only 1 min at 3sig	20	507
eX1_chi2<1.0	0	507
ecol_chi2<0.3	0	507