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

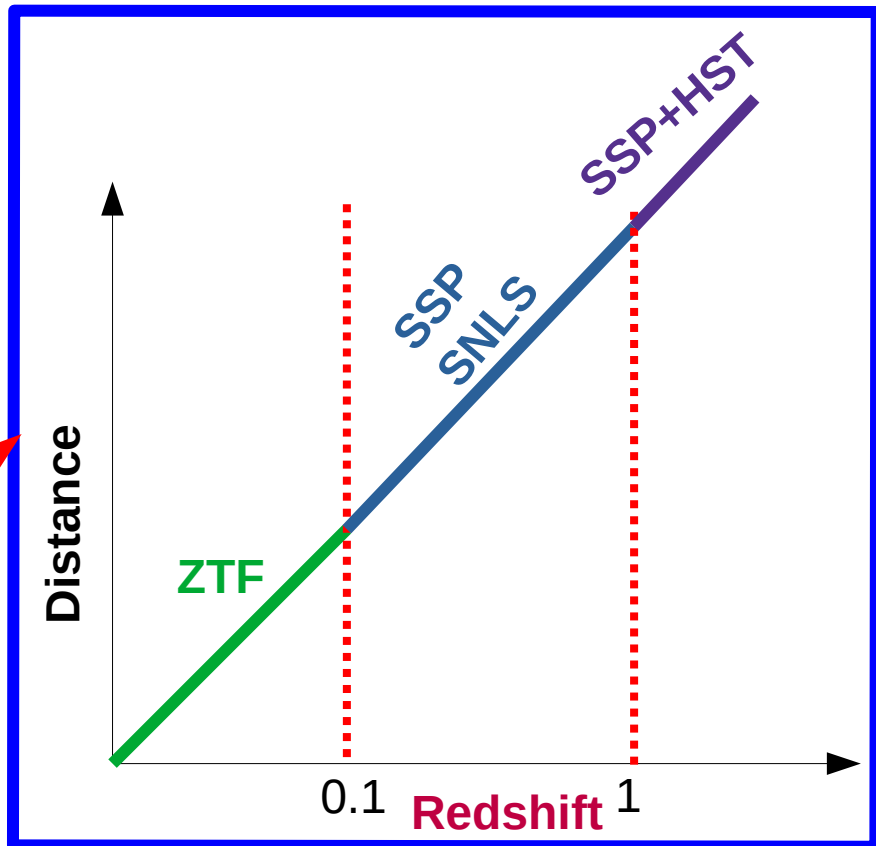
Toward the training and cosmology sample : ZTF+SNLS+Subaru

Training dataset

Training dataset:
ZTF, SNLS-5yr, HSC
Photometry & Spectroscopy

Light-curve fitter:
NaCl

Unbiased SN distances:
Dylan's talk



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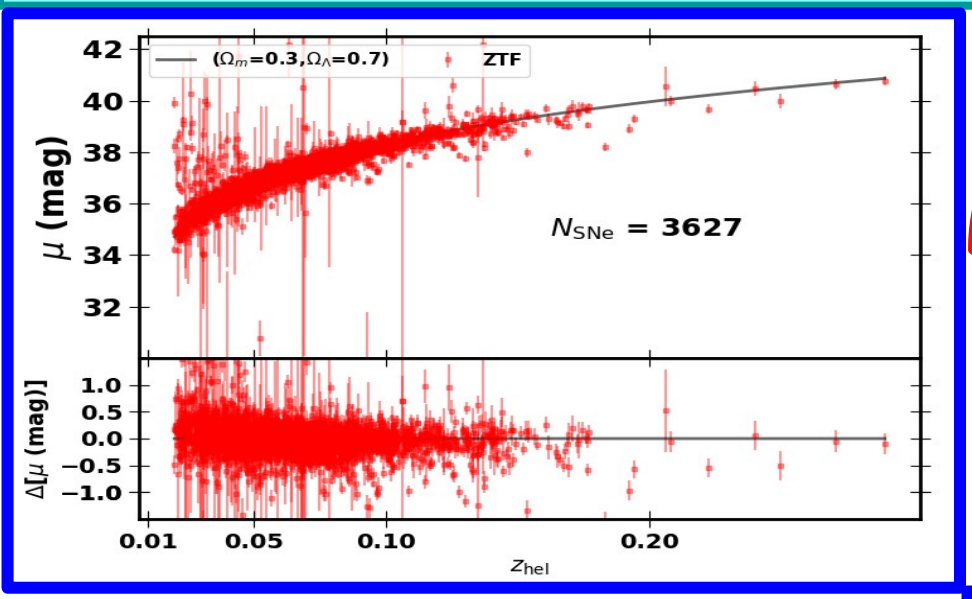
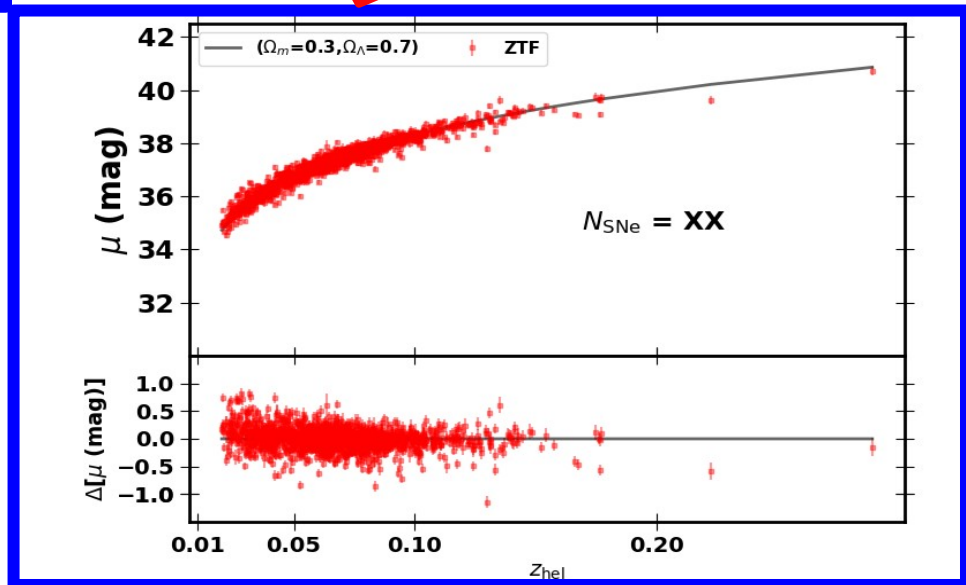


?



Problems

Cuts based on photometric observations

-> t0 and X1 to be well constrained to efficiently select light curves with good sampling
-> SNe with limited extinction by dust in the Milky-Way.
-> Select SNe within specific color, X1 range.

Cut based on spectroscopic observations

-> Remove peculiar SNe Ia

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Table 7. Number of SDSS-II supernovae discarded by the successive cuts applied before inclusion in the cosmology sample.

	Discarded	Remaining
Initial	-	507
$-3 < X_1 < 3$	20	487
$-0.3 < C < 0.3$	11	476
$E(B-V)_{\rm mw} < 0.15$	6	470
$\sigma(t_0) < 2$	19	451
$\sigma(X_1) < 1$	52	399
Other[a]	25	374

Betoule+14

Table 2
Cosmology Sample Cuts

Cut	Discarded	Remaining
SALT2 converged	...	2136
SNLS high-z	59	2077
$P_{\rm fit}$	16	2061
U-band sensitivity	59	2002
$\sigma(x_1) < 1.5$	85	1917
$\sigma_{\rm (pkmjd)} < 2$	10	1907
$-0.3 < c < 0.3$	98	1909
$-3 < x_1 < 3$	7	1802
$E(B-V)_{\rm MW} < 0.20$ mag	23	1779
$T_{\rm rest} < 5$	1	1778
Chauvenet's criterion	5	1773
Valid BiasCor	10	1763
Systematics	60	1701

Scolnic+22

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Scolnic+22

Problems

A SN can pass all the cuts but are poorly sampled which is not good for the training sample!!

-> Need a visual inspection… so it is not the best (Tmax wqs changing when changing ZP)

Last, a proper and stable determination of the date of maximum is necessary for SNe Ia entering in the training sample, because the date of maximum is held fixed in the training. We looked for remaining poorly sampled light curves in the training sample, and discarded the following nine SNe (only from the training sample):

1. Too few observations after the epoch of peak brightness (despite a reported uncertainty on t_0 passing the cuts): SDSS10434, SDSS19899, SDSS20470, SDSS21510.
2. Too few observations before the epoch of peak brightness: SDSS6780, SDSS12781, SDSS12853 (2006ey), SDSS13072, SDSS18768.

Betoule+14

Ideas

Look at the chi2 for different Tmax

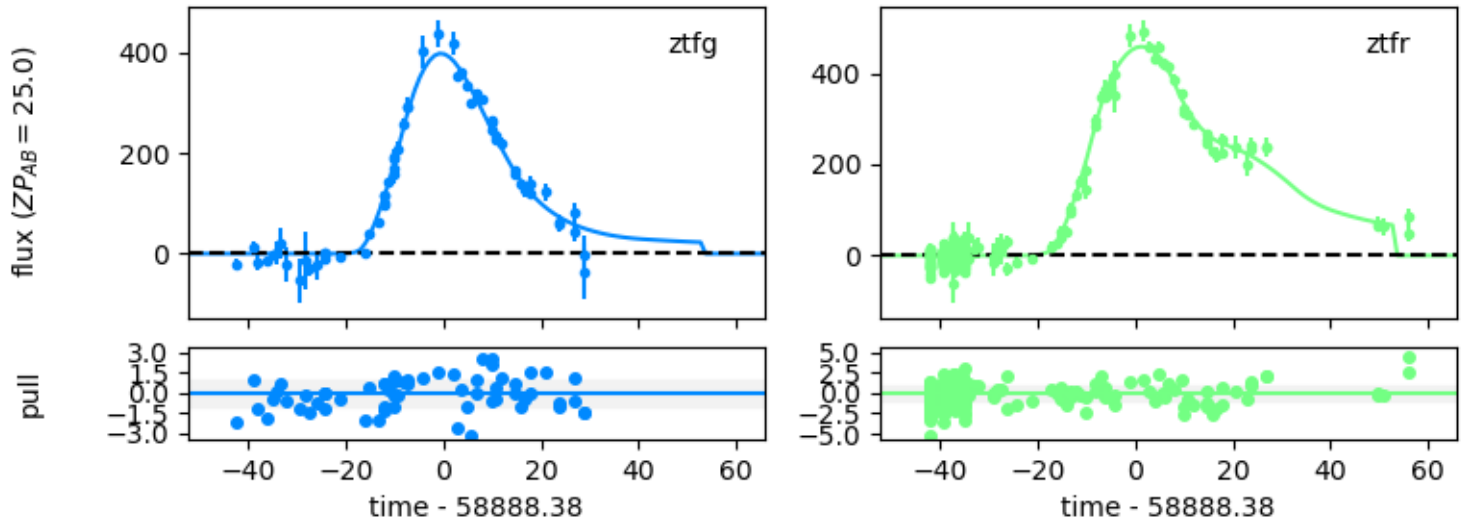
→ Using sncosmo fit all the LC with Tmax, x0, x1, c as free parameters

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

$z = 0.062131310$
$t_0 = 58888.375 \pm 0.080$
$x_0 = (8.03 \pm 0.25) \times 10^{-4}$
$x_1 = -0.31 \pm 0.11$

$c = 0.143 \pm 0.029$
mw $ebv = 0.087385627$
mw $r_v = 3.1000000$

ZTF18aadzfso



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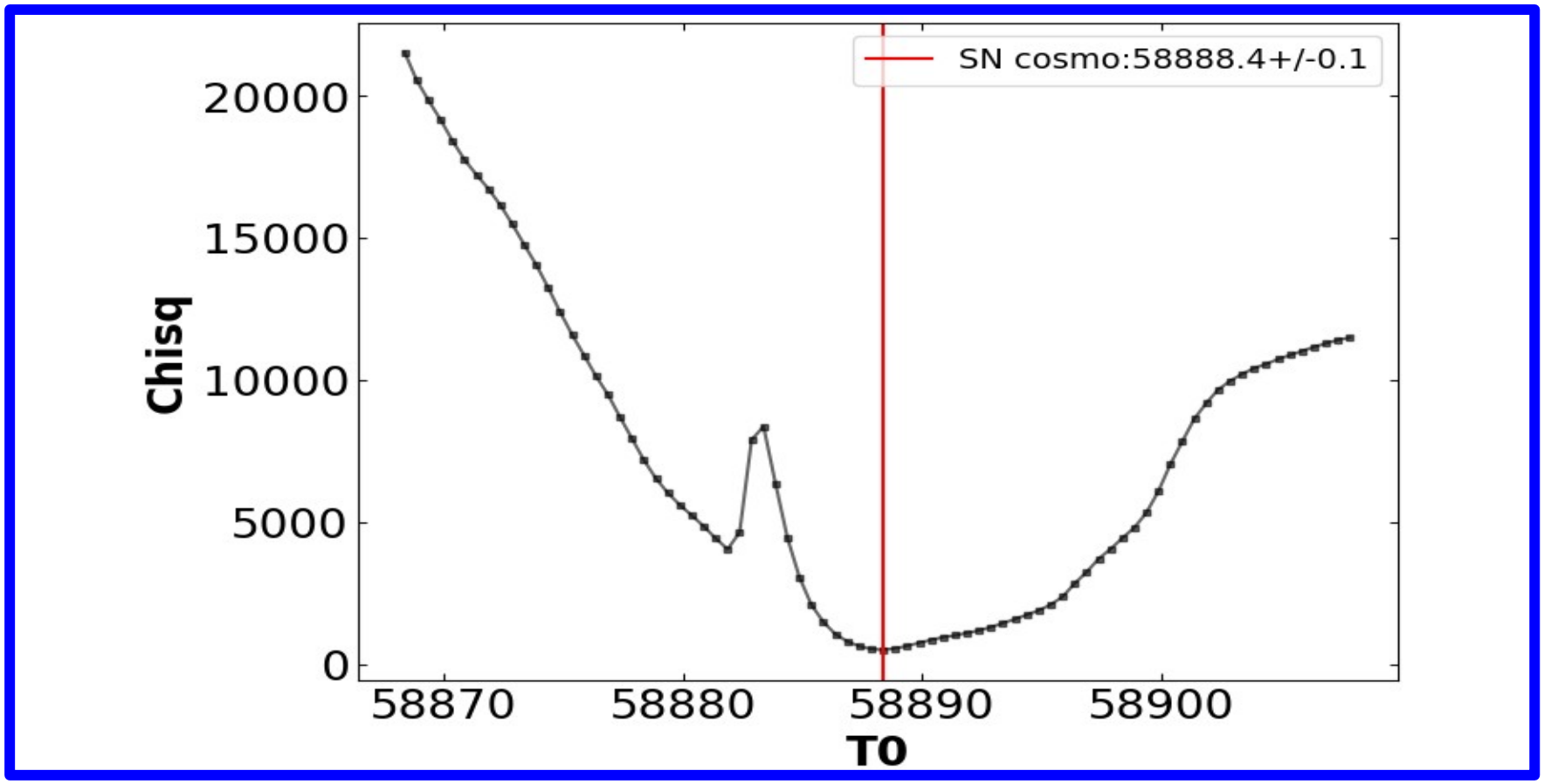

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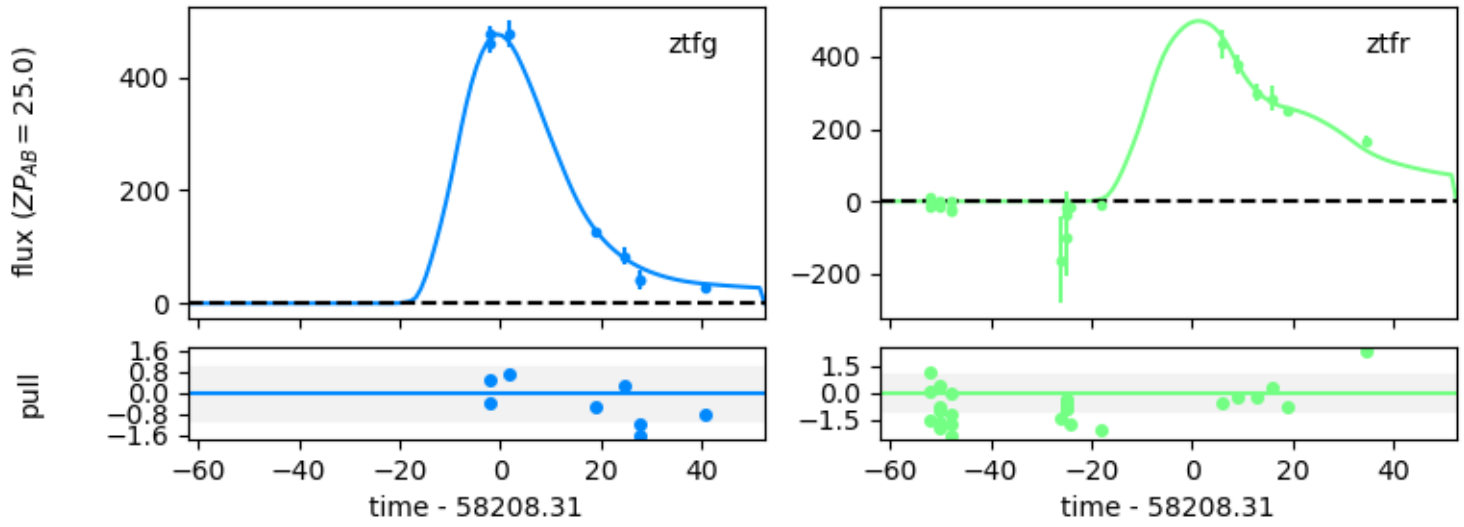
$z = 0.053200000$
$t_0 = 58208.31 \pm 0.57$
$x_0 = (8.08 \pm 0.33) \times 10^{-4}$
$x_1 = -0.30 \pm 0.33$

$c = 0.114 \pm 0.046$
mw $ebv = 0.034747615$
mw $r_v = 3.1000000$

ZTF18aahesrp



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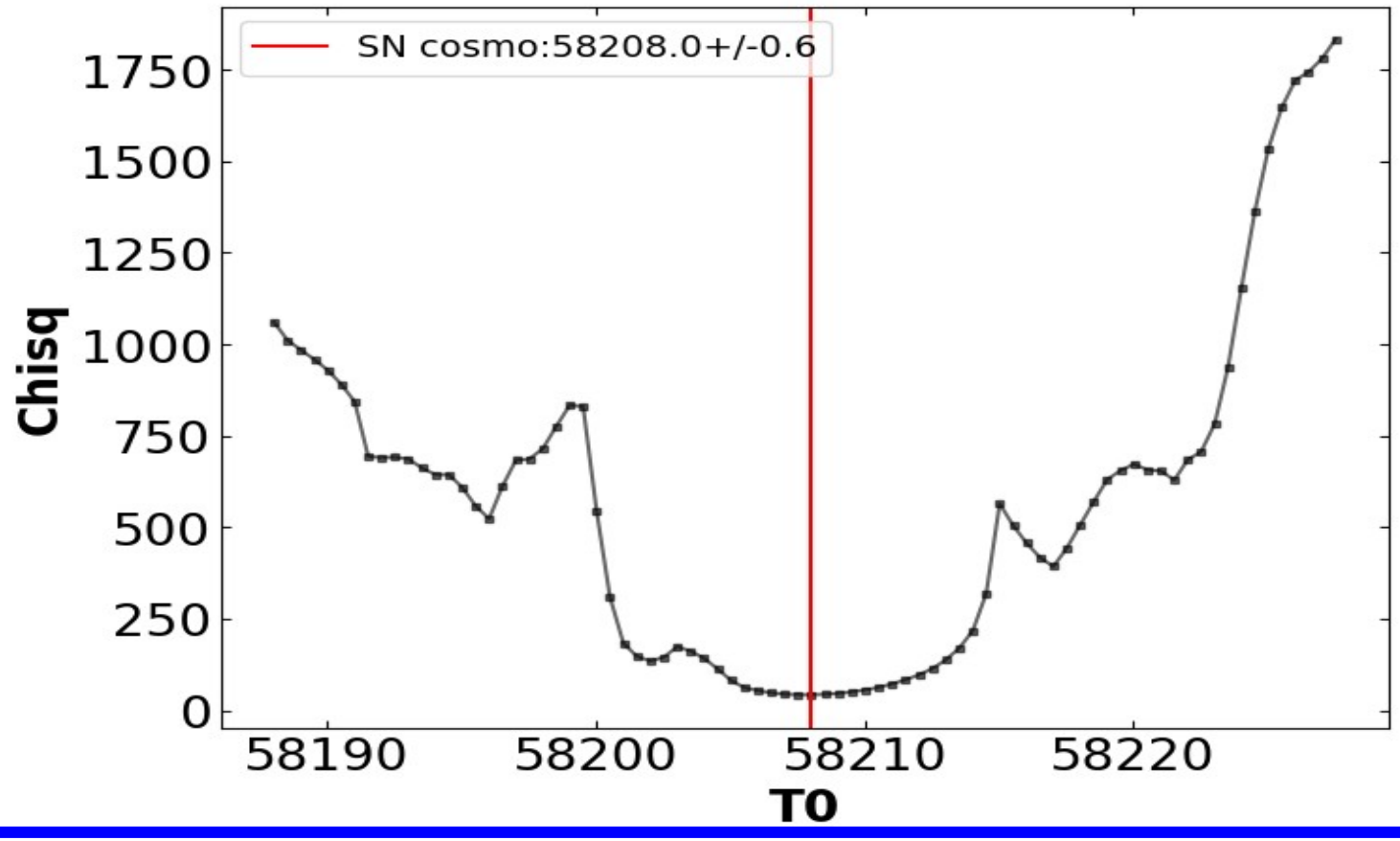

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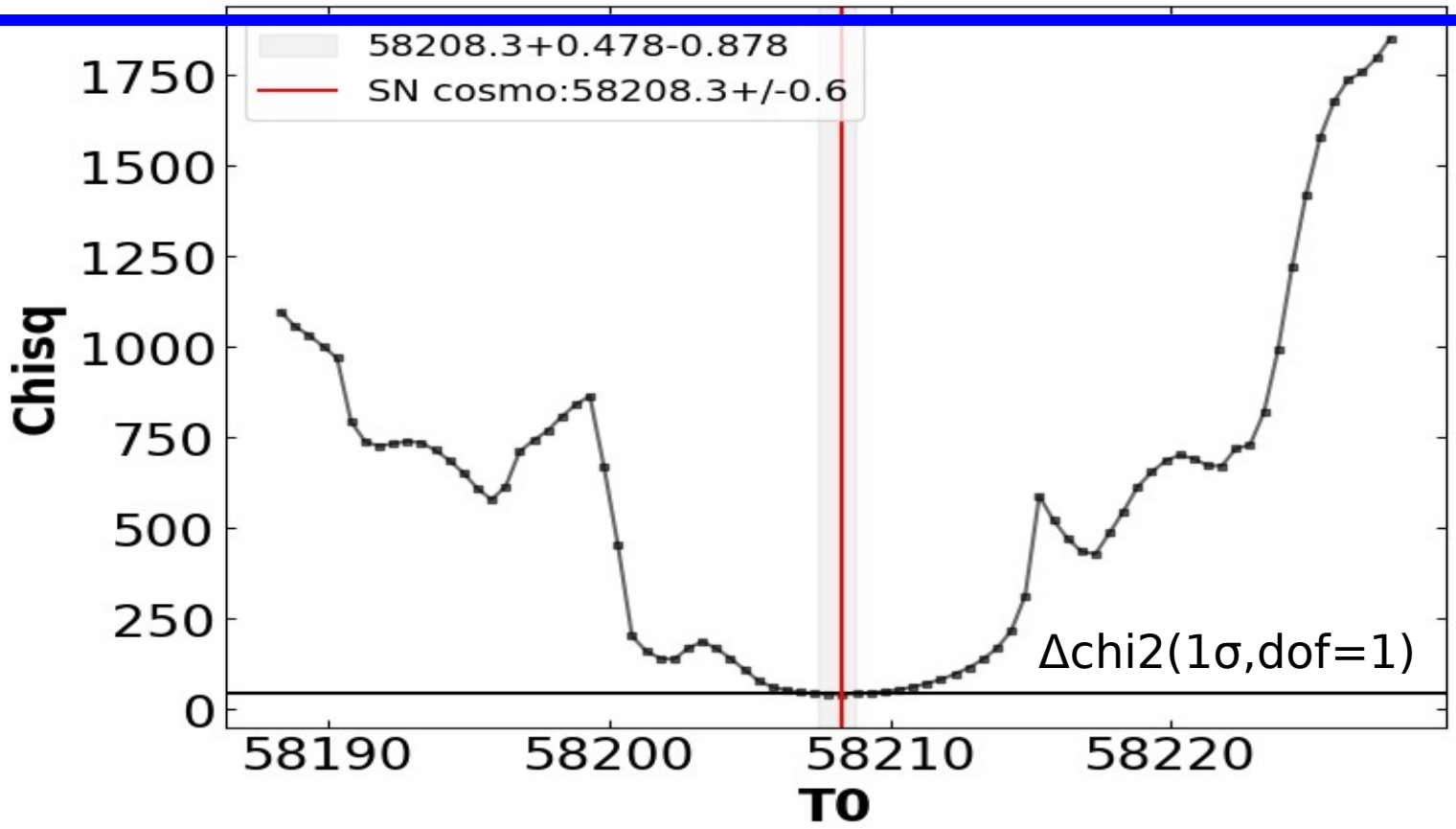
Compare uncertainties from sncosmo and from chi2 curve

→From chi2 curve look at the Tmax for chi2+Δchi2(1σ,dof)



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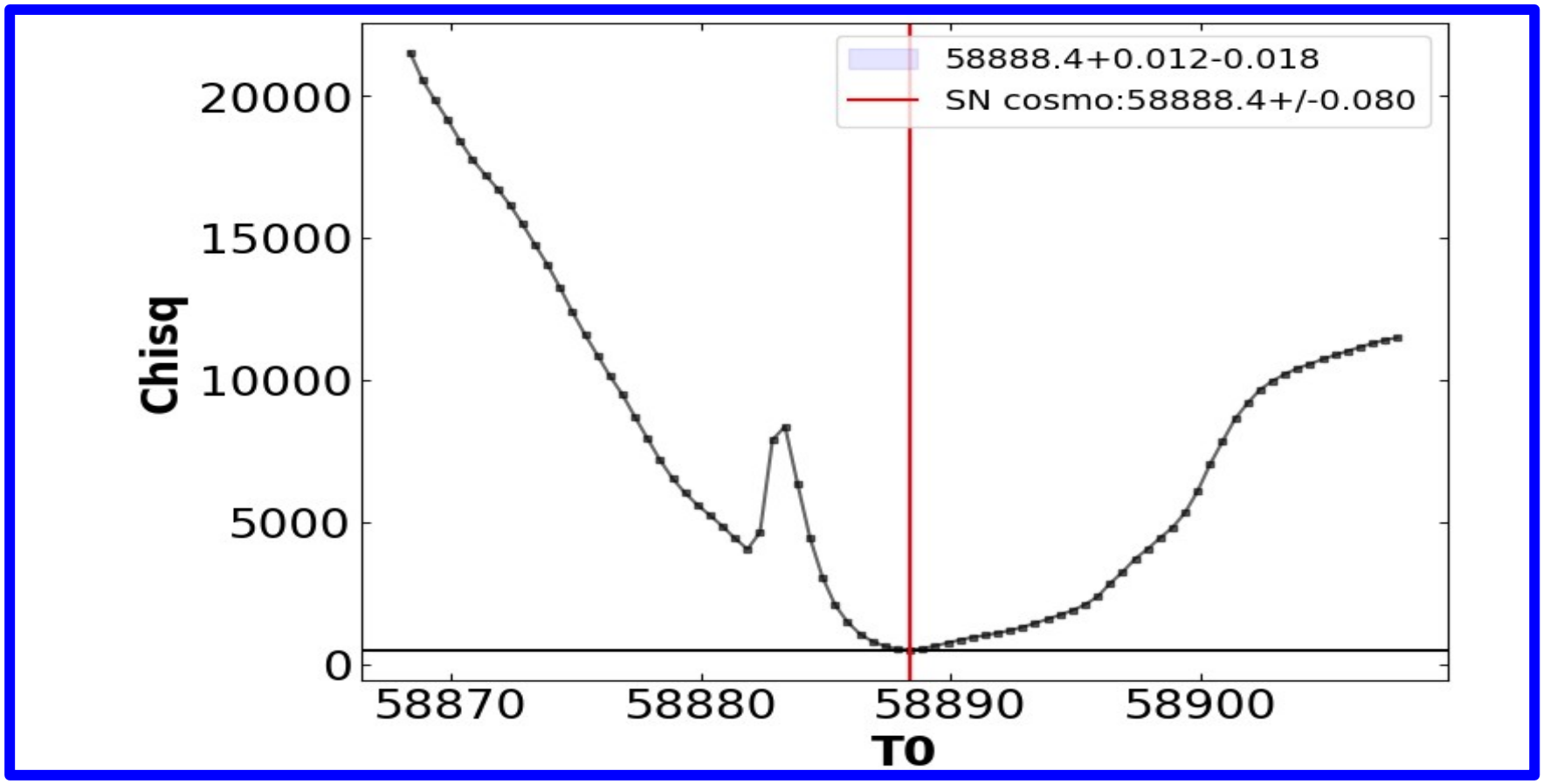
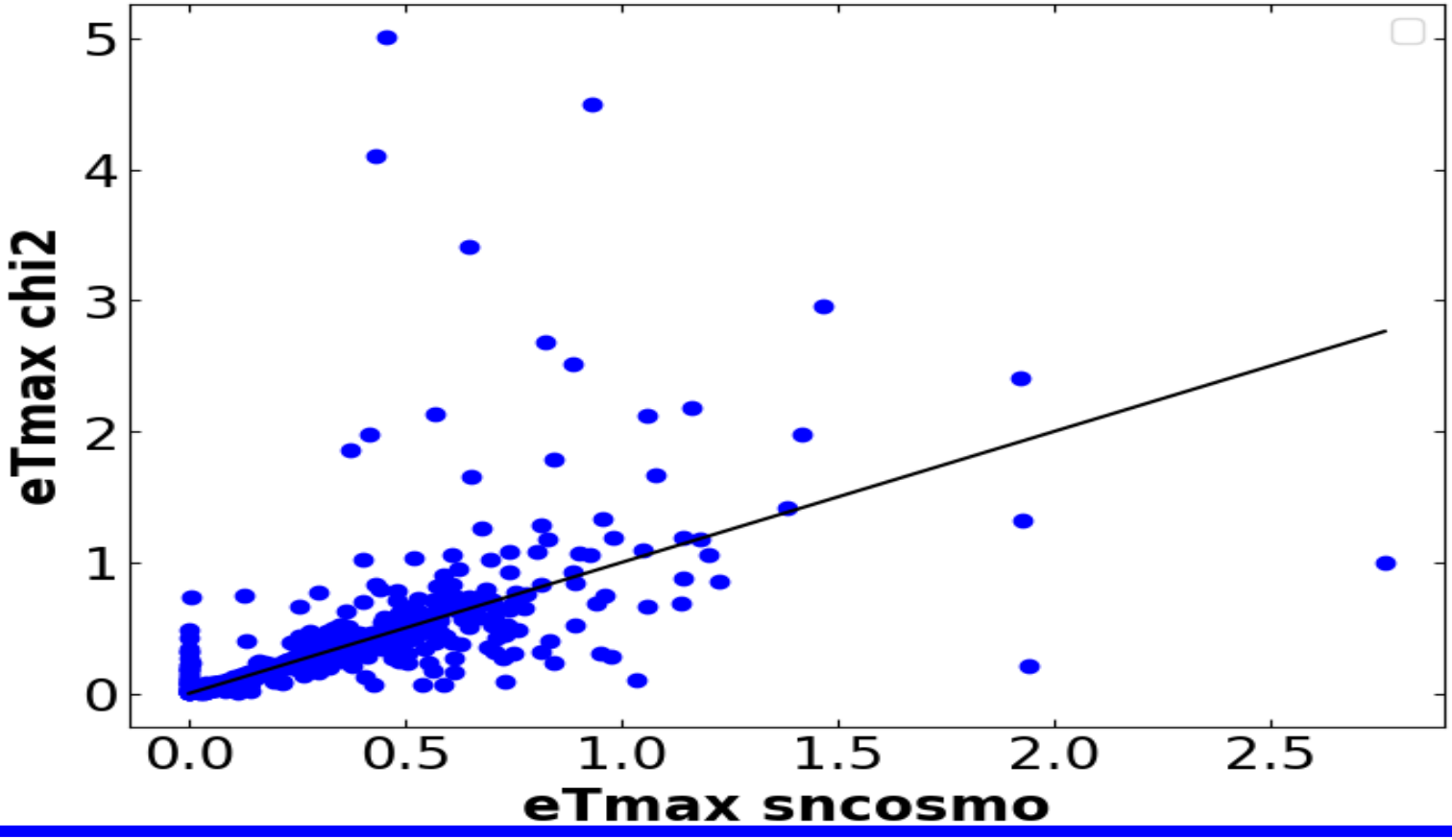


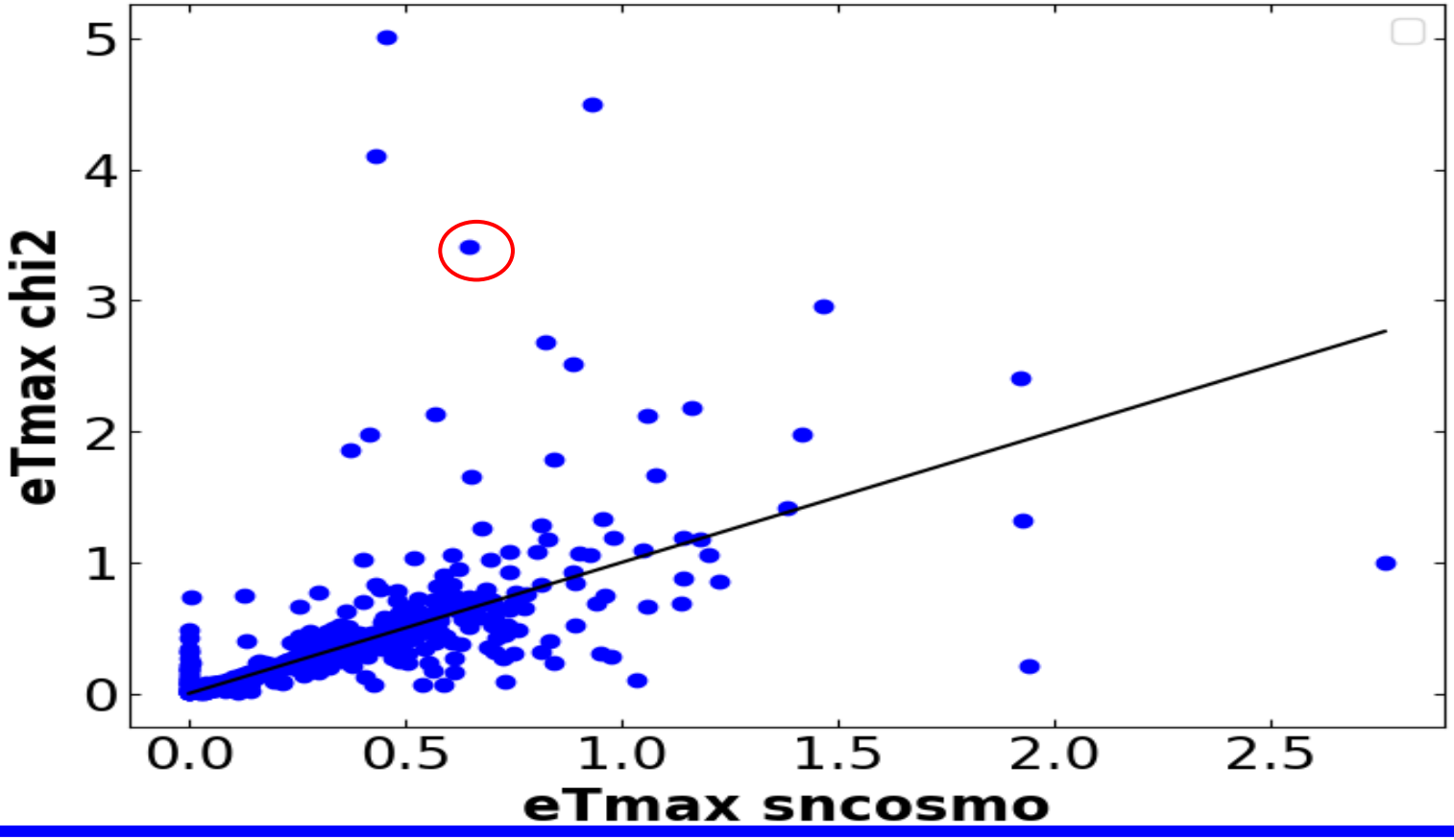
Future work

First use JLA

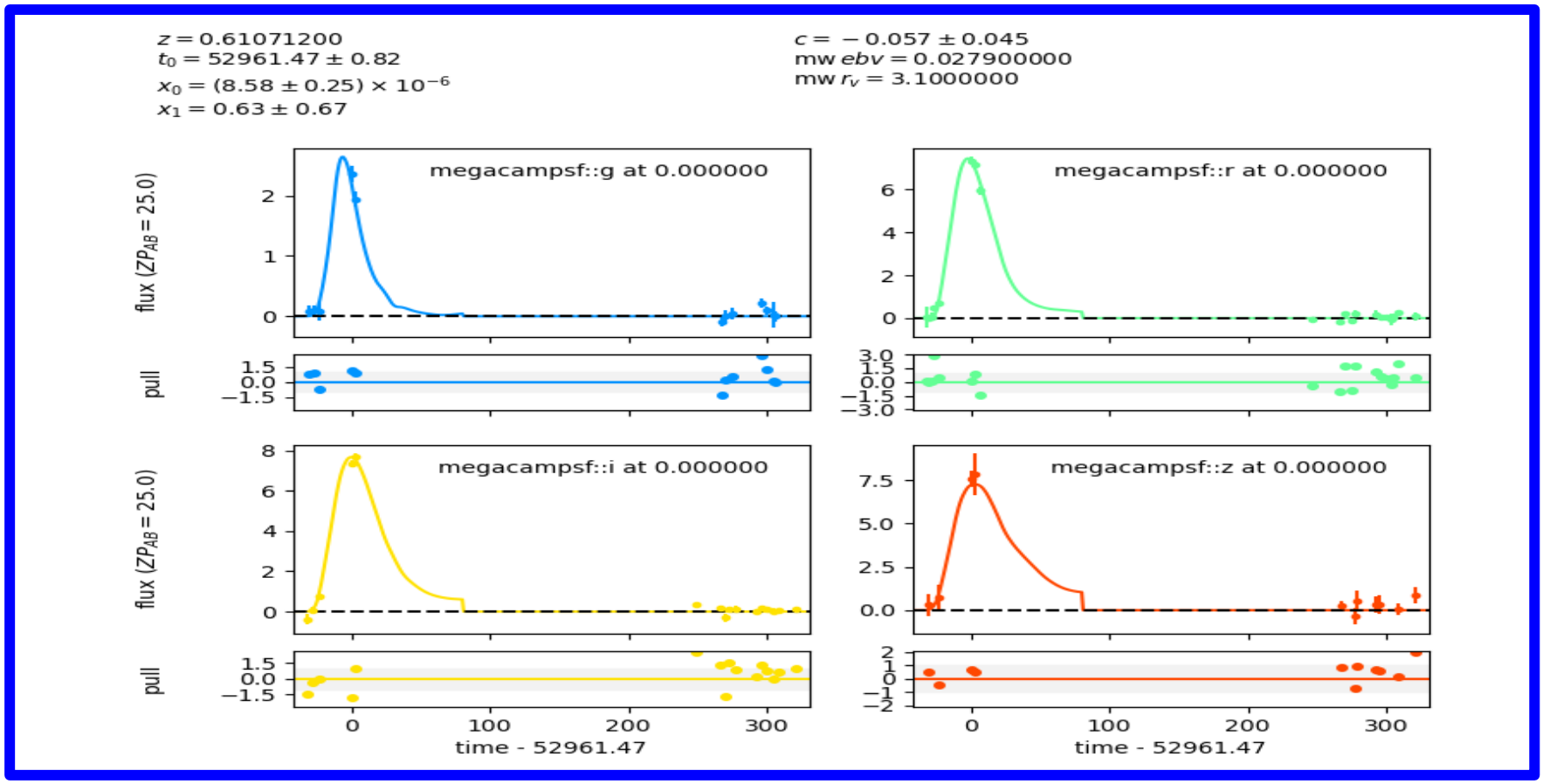


Future work

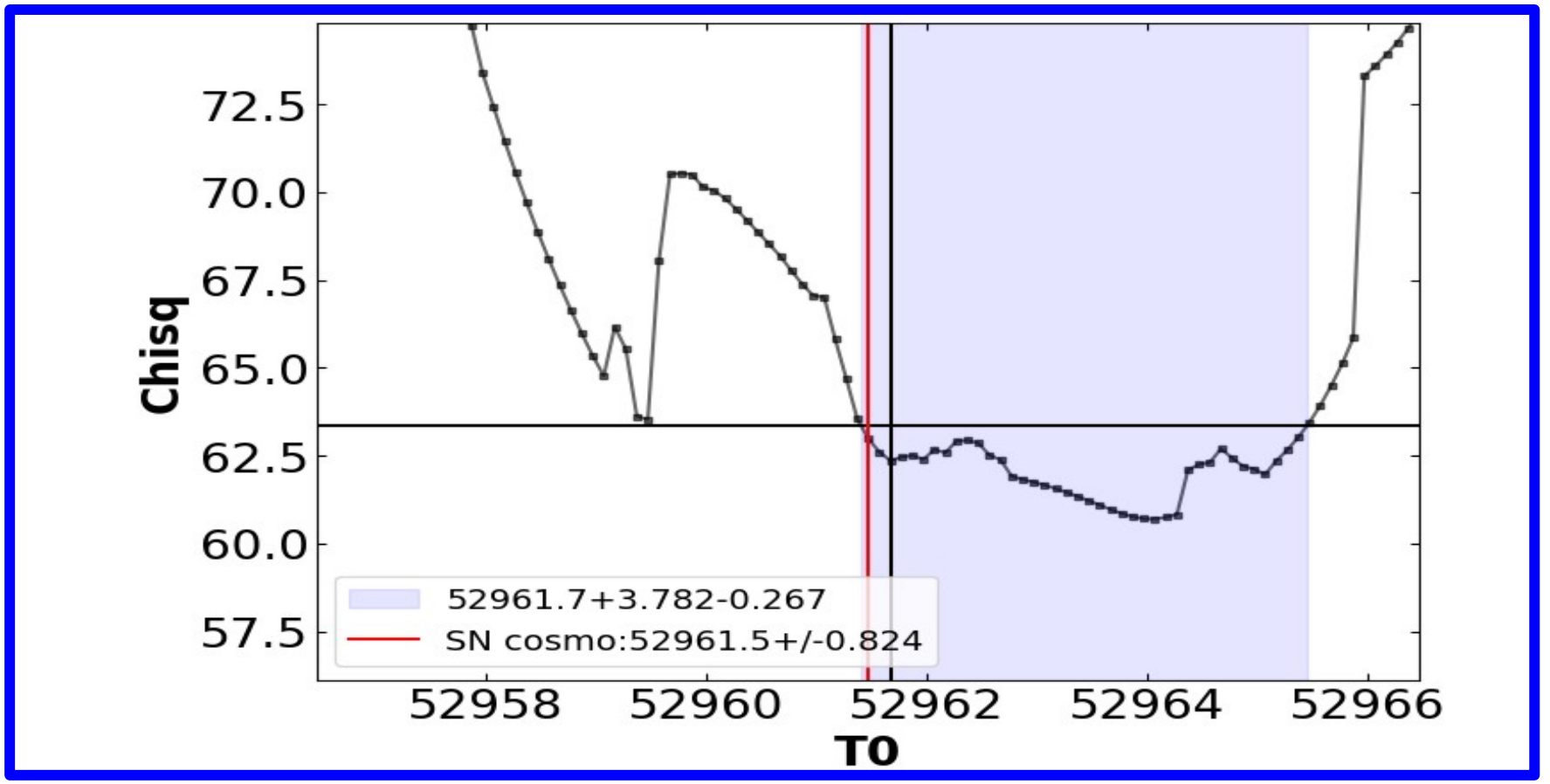
First use JLA



Future work


$z = 0.61071200$
$t_0 = 52961.47 \pm 0.82$
$x_0 = (8.58 \pm 0.25) \times 10^{-6}$
$x_1 = 0.63 \pm 0.67$
$c = -0.057 \pm 0.045$
mw $ebv = 0.027900000$
mw $r_v = 3.1000000$
megacampsf::g at 0.000000
megacampsf::r at 0.000000
megacampsf::i at 0.000000
megacampsf::z at 0.000000
flux ($ZP_{AB} = 25.0$)
pull
time - 52961.47

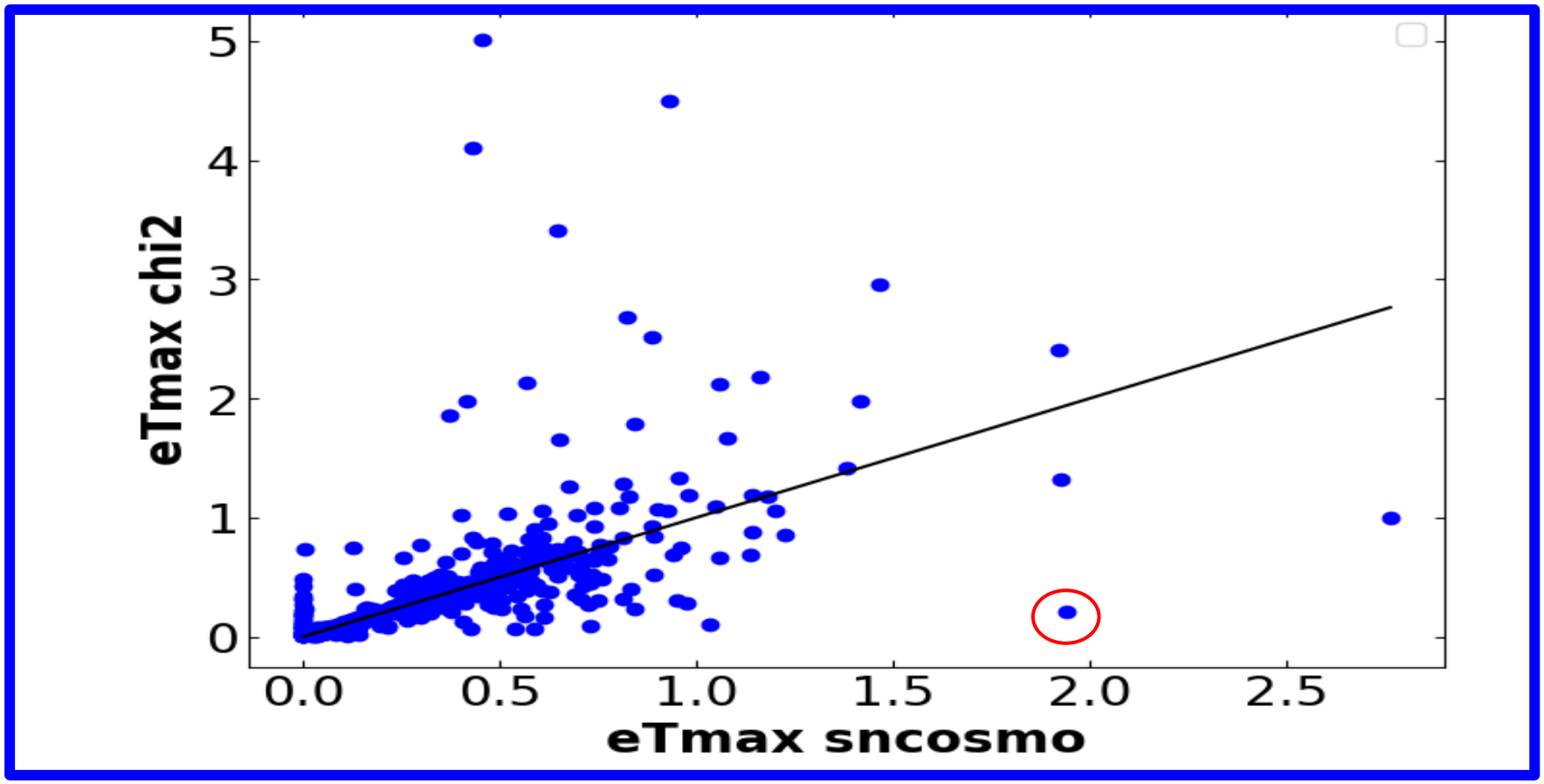
Future work


72.5
70.0
67.5
65.0
62.5
60.0
57.5
Chisq
52961.7+3.782-0.267
SN cosmo:52961.5+/-0.824
52958
52960
52962
52964
52966
T0

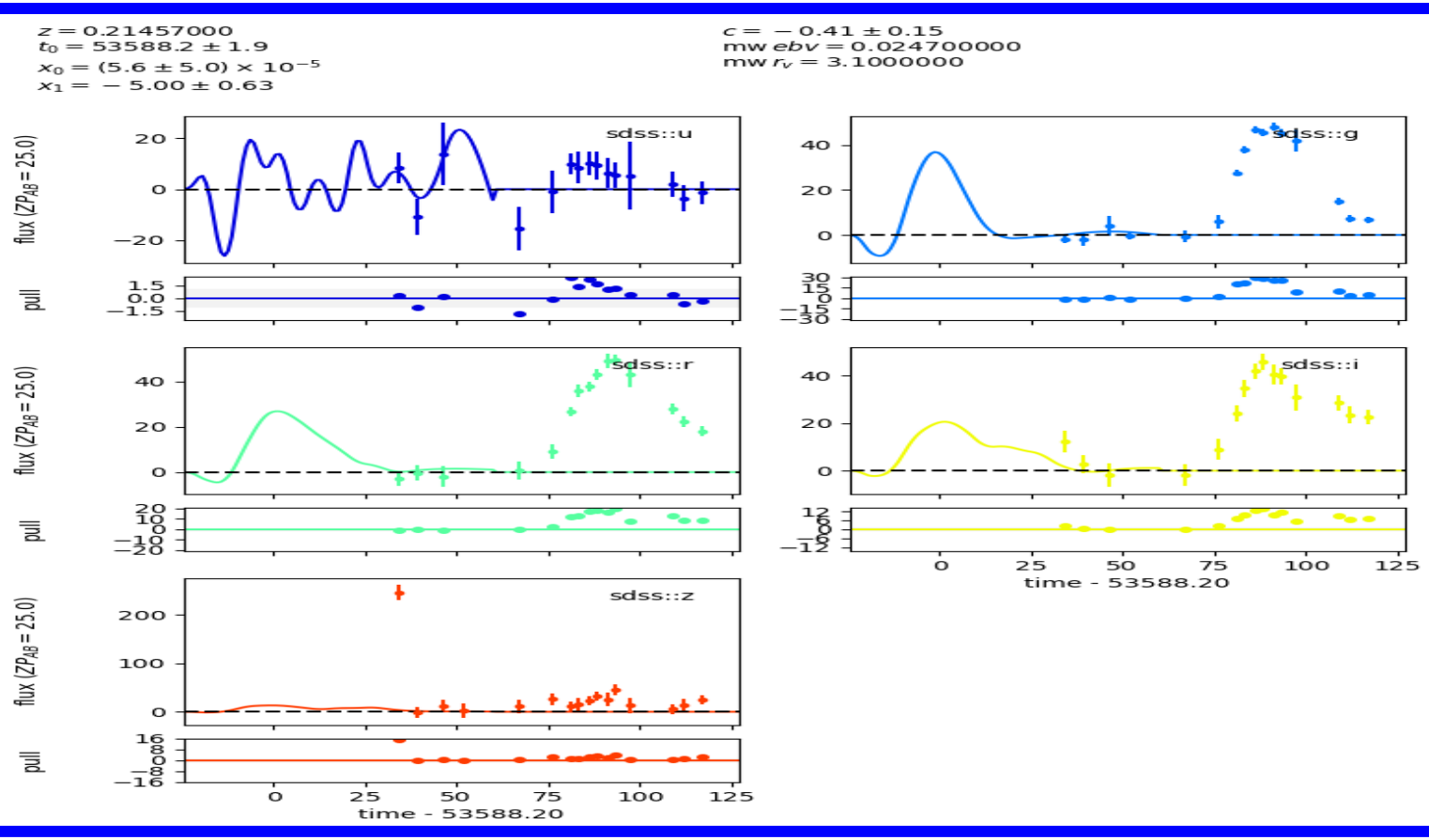
Future work

First use JLA

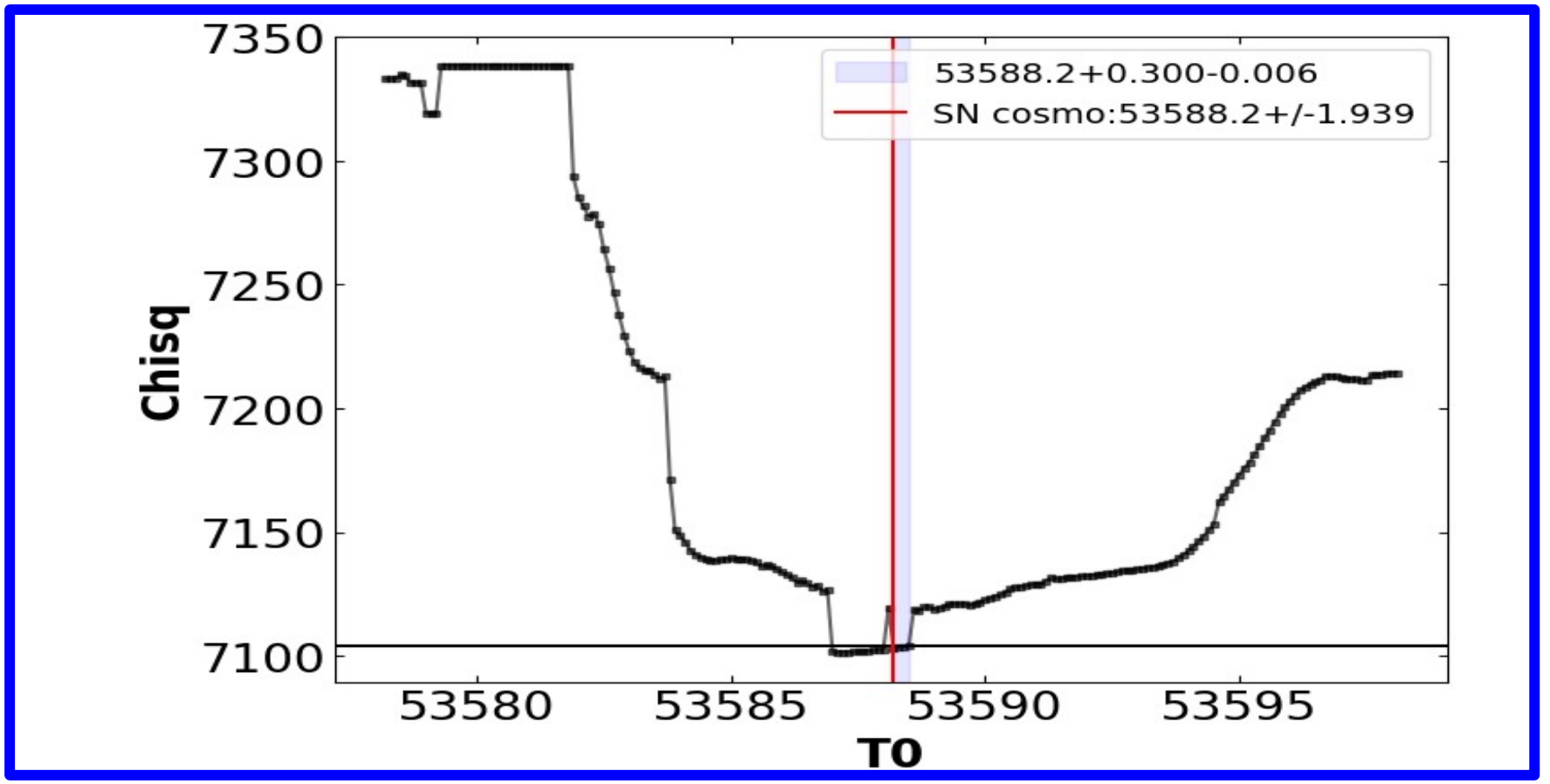
→ Understand weird cases



Future work

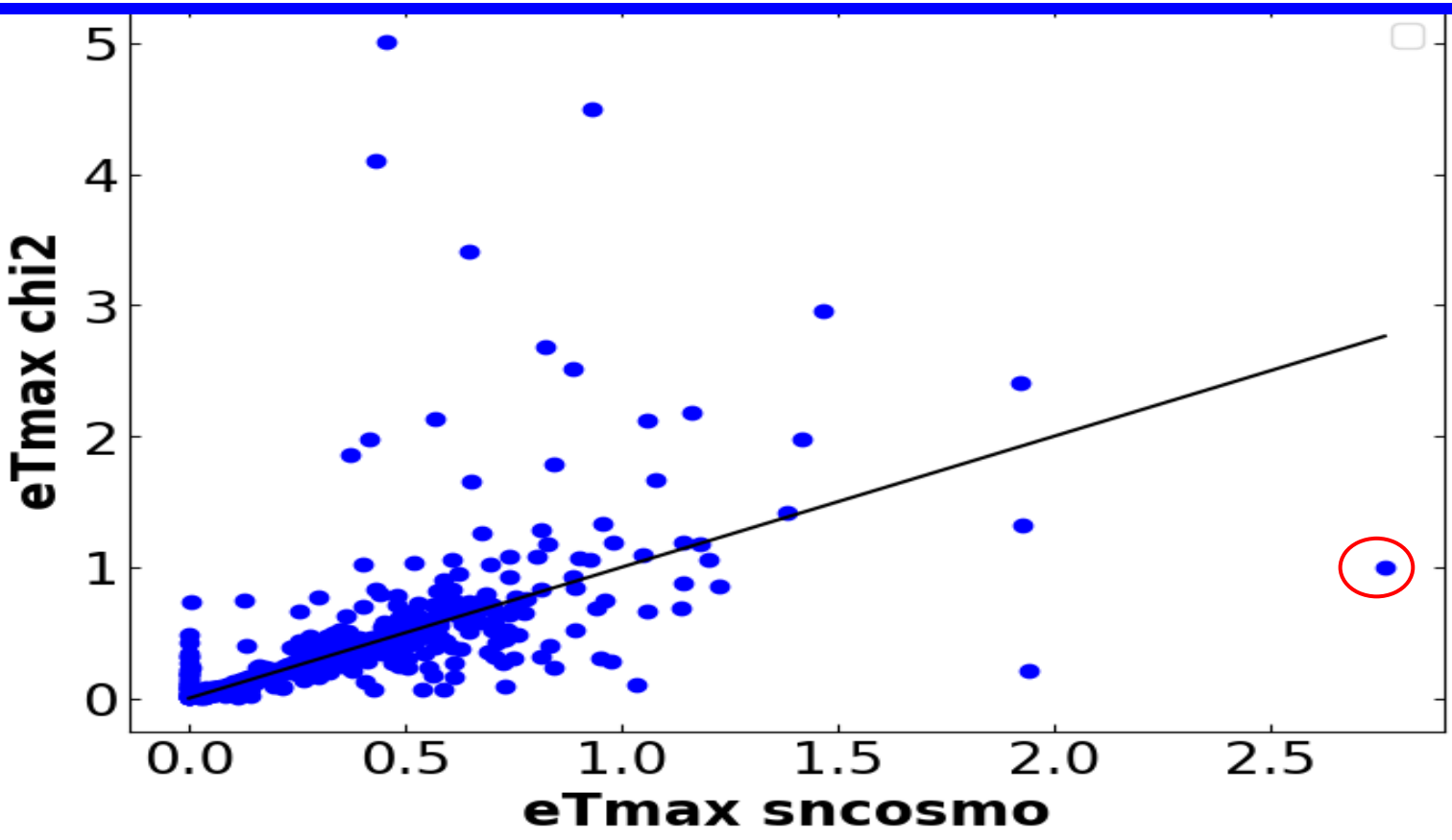

$z = 0.21457000$
$t_0 = 53588.2 \pm 1.9$
$x_0 = (5.6 \pm 5.0) \times 10^{-5}$
$x_1 = -5.00 \pm 0.63$
$c = -0.41 \pm 0.15$
mw $ebv = 0.024700000$
mw $r_v = 3.1000000$
sdss::u
sdss::g
sdss::r
sdss::i
sdss::z
flux ($ZP_{AB} = 25.0$)
pull
time - 53588.20

Future work


53588.2+0.300-0.006
SN cosmo:53588.2+/-1.939
Chisq
7350
7300
7250
7200
7150
7100
53580
53585
53590
53595
T0

Future work

First use JLA



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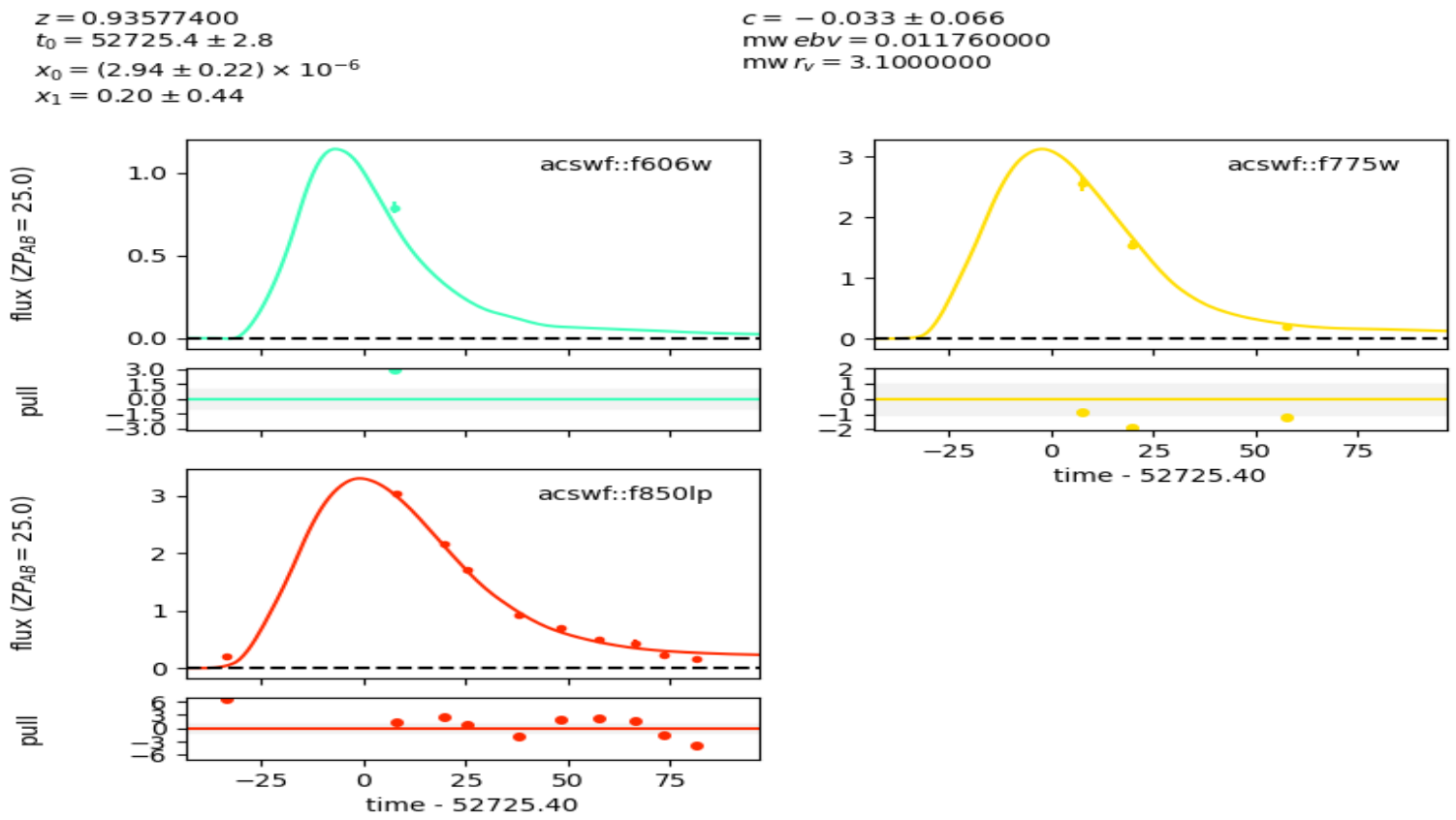
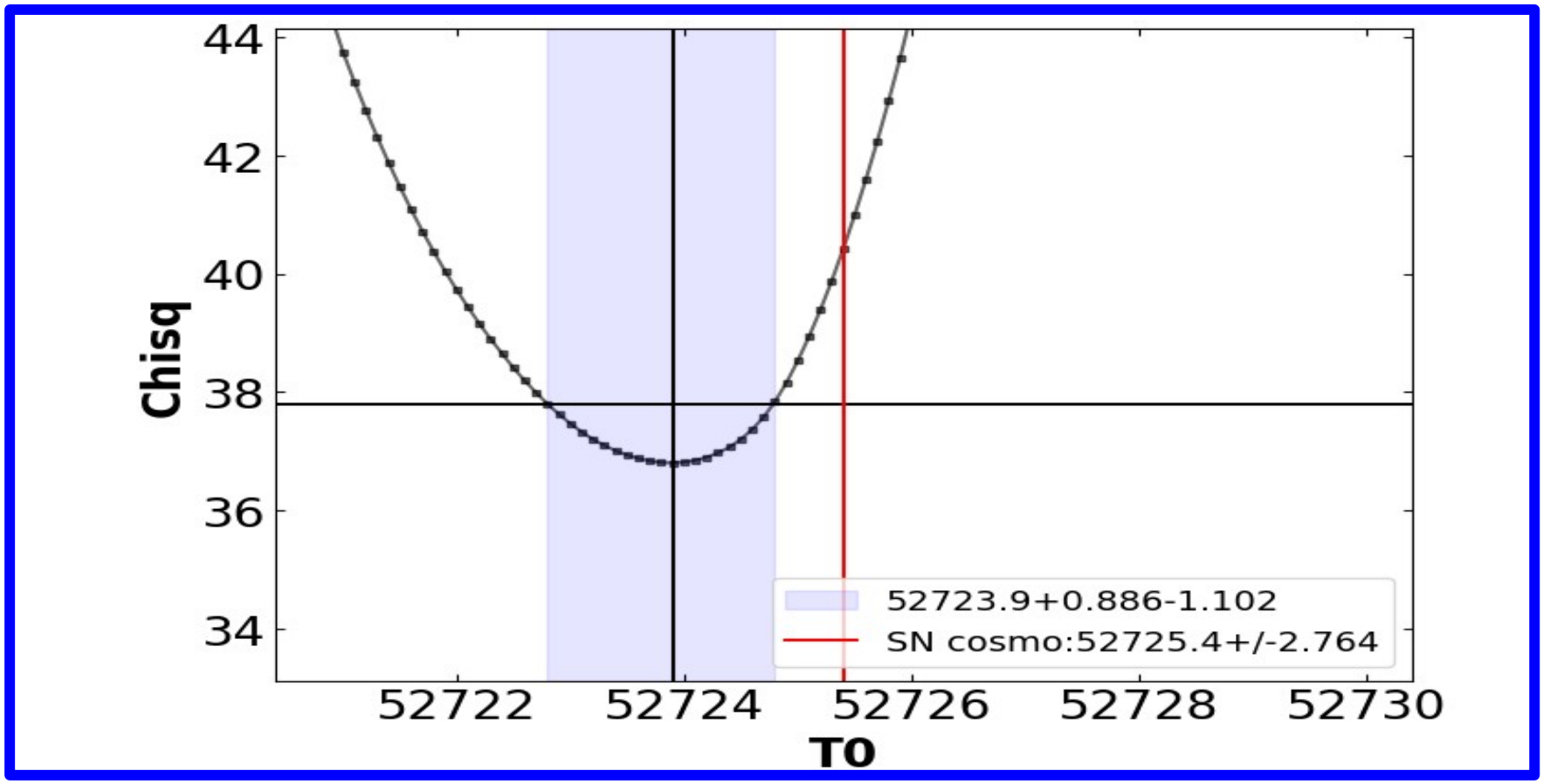
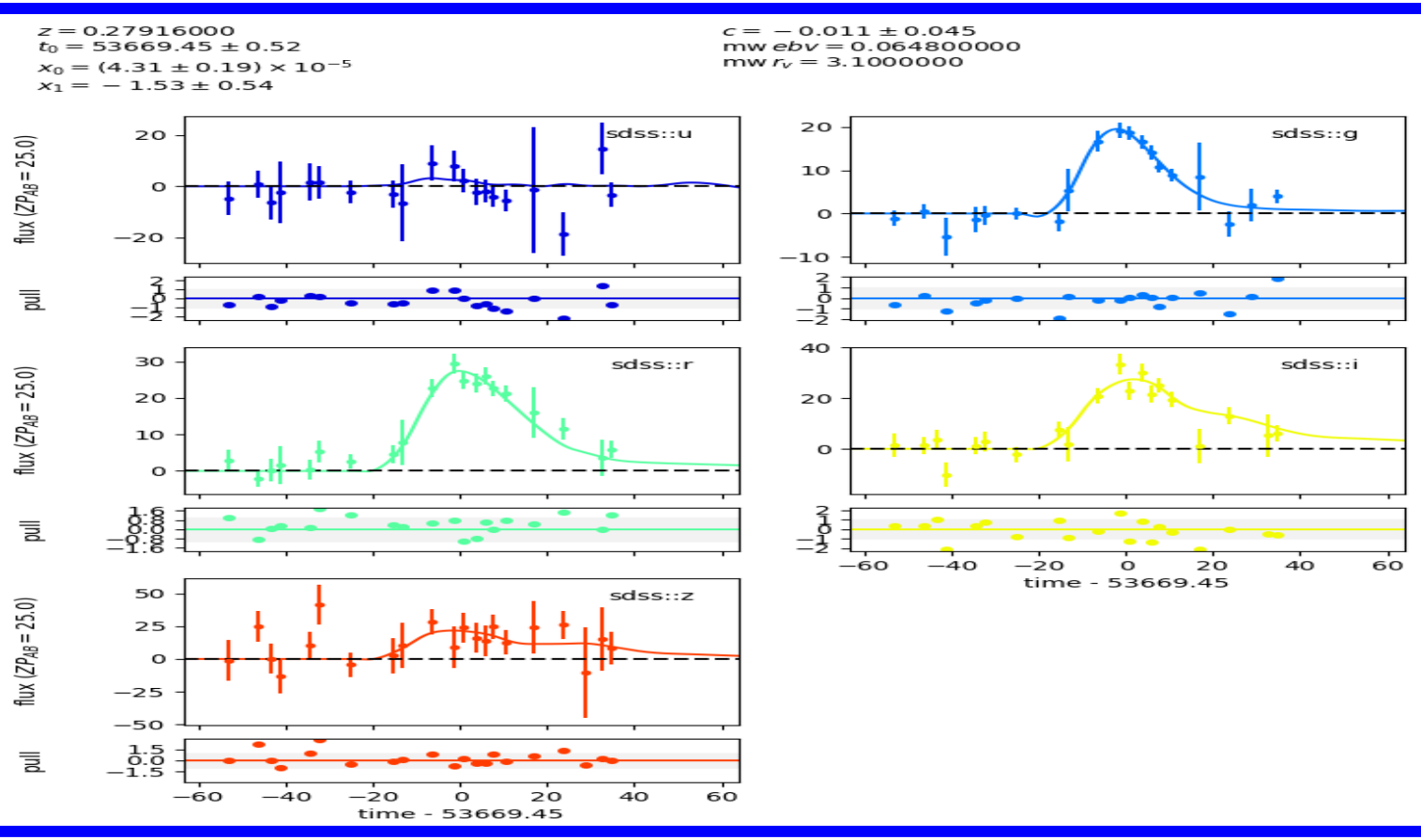

$z = 0.93577400$
$t_0 = 52725.4 \pm 2.8$
$x_0 = (2.94 \pm 0.22) \times 10^{-6}$
$x_1 = 0.20 \pm 0.44$
$c = -0.033 \pm 0.066$
mw $ebv = 0.011760000$
mw $r_v = 3.1000000$
acswf::f606w
acswf::f775w
acswf::f850lp
flux ($ZP_{AB} = 25.0$)
pull
time - 52725.40

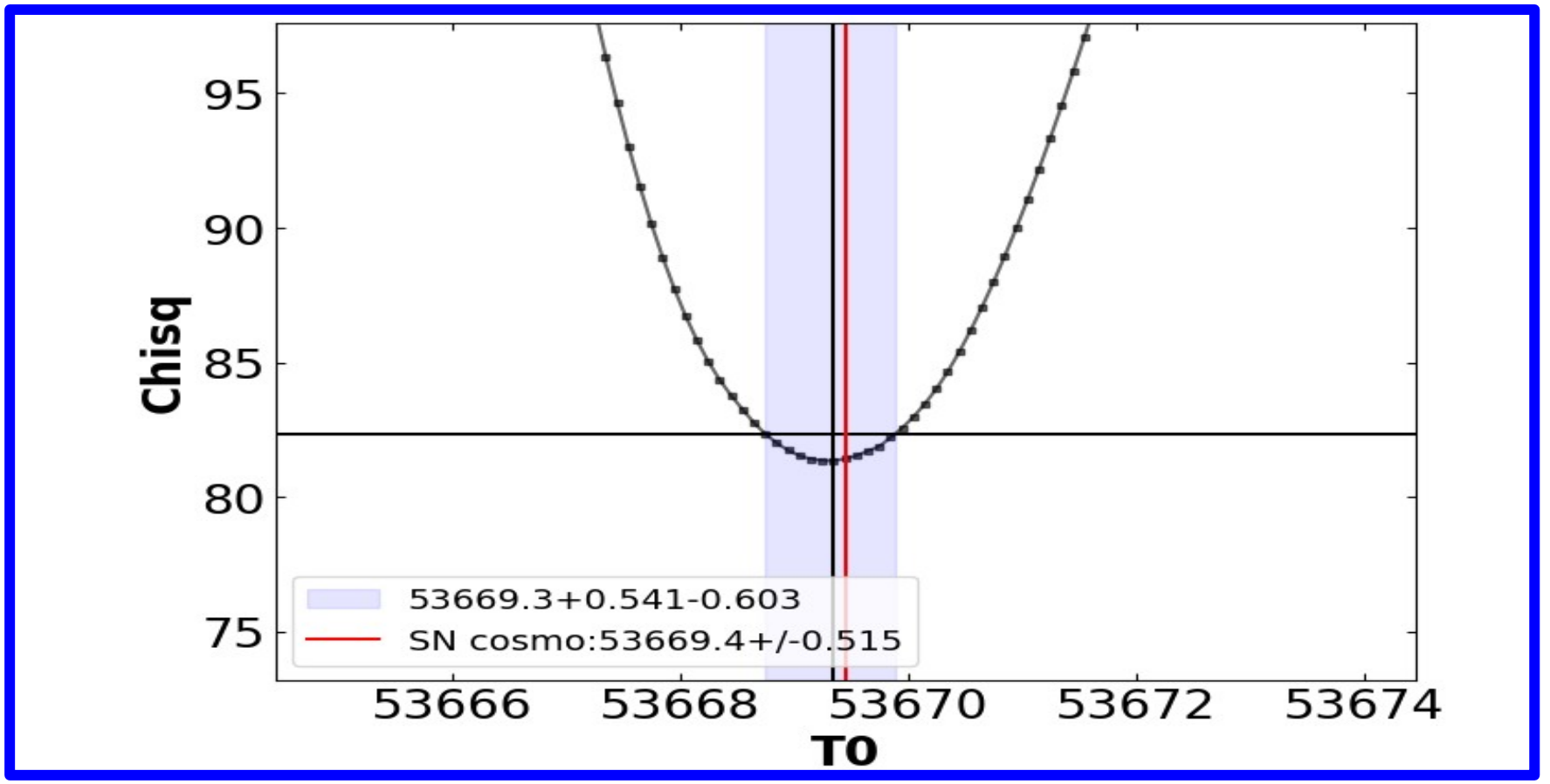
Future work


44
42
40
38
36
34
Chisq
52722
52724
52726
52728
52730
T0
52723.9+0.886-1.102
SN cosmo:52725.4+/-2.764

Future work


z = 0.27916000
t0 = 53669.45 ± 0.52
x0 = (4.31 ± 0.19) × 10−5
x1 = − 1.53 ± 0.54
c = − 0.011 ± 0.045
mw ebv = 0.064800000
mw rv = 3.1000000
sdss::u
sdss::g
sdss::r
sdss::i
sdss::z
flux (ZPAB = 25.0)
pull
time - 53669.45

Future work


95
90
85
80
75
Chisq
53669.3+0.541-0.603
SN cosmo:53669.4+/-0.515
53666
53668
53670
53672
53674
T0