The Hubble Constant

It only took 13 years!

CSP Meeting, Pasadena 2017


It’s been a long long road…

DR3 Is DONE!!!!

v3x

The Carnegie Supernova Project: Third Photometry Data Release of Low-Redshift Type Ia Supernovae and Related Subtypes

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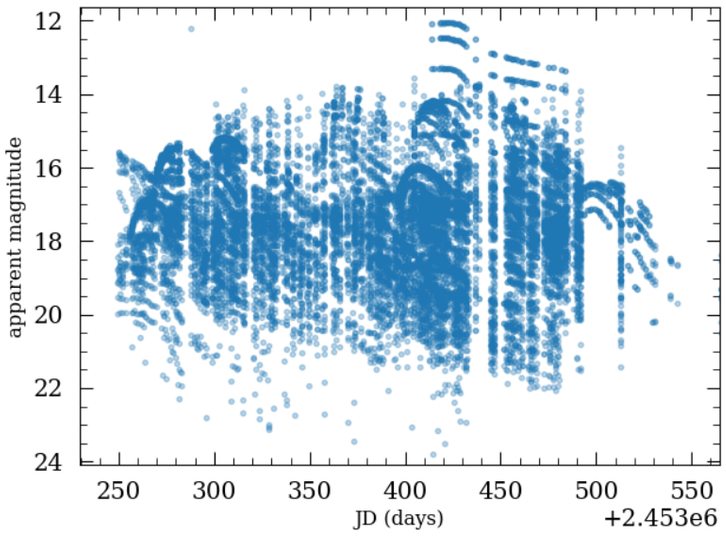
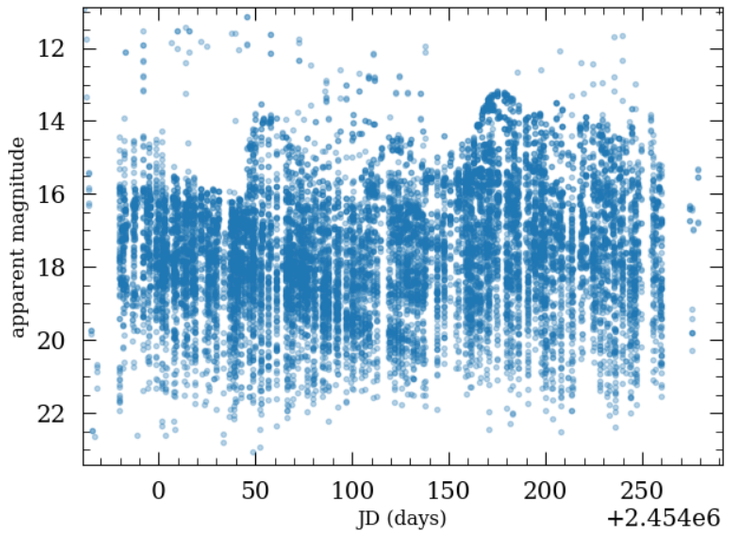
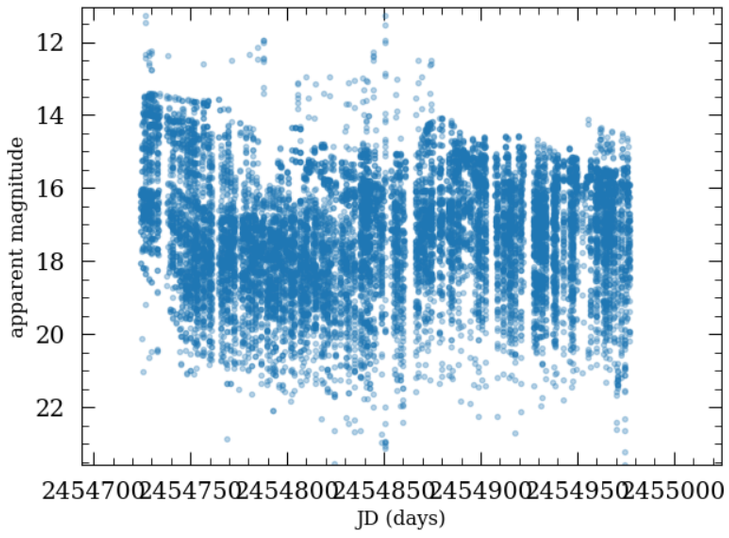
ABSTRACT

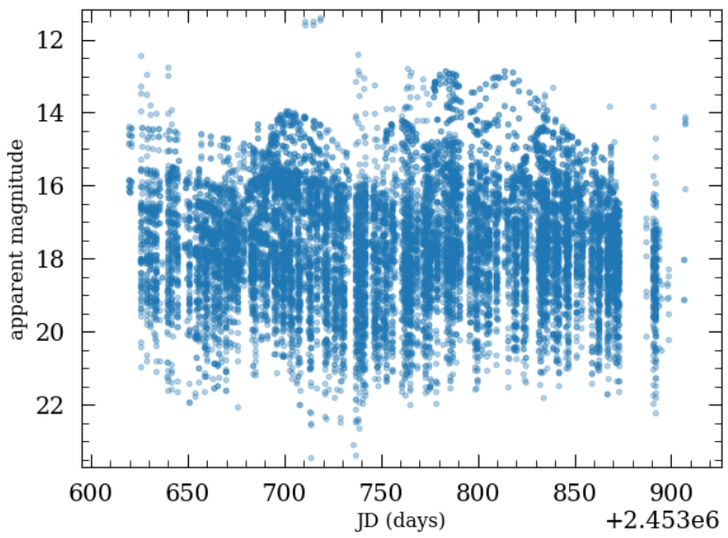
[Version of August 1, 2016. Not for general distribution. **(We are ready for the real abstract that Mark has promised.)**] We present previously unpublished photometry of all low redshift supernovae observed by the Carnegie Supernova Project (2004-2009). In all, 134 Type Ia supernovae were observed in optical bandpasses. NNN were measured in one or more near-infrared bands....

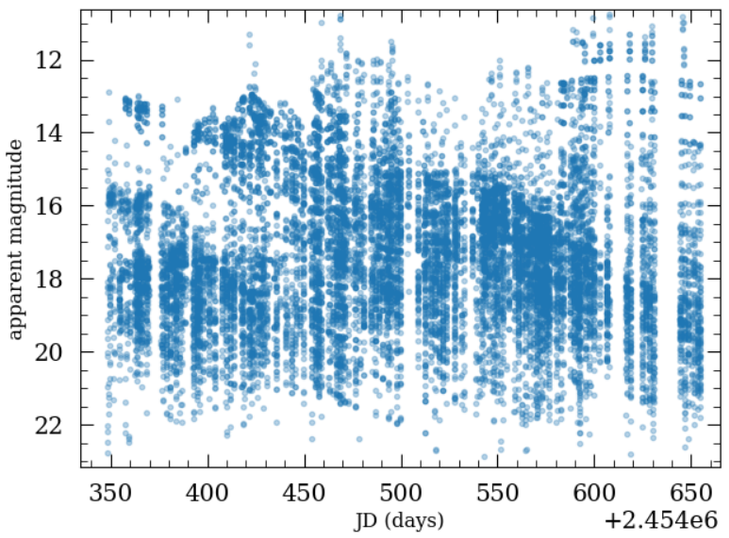
Observed Magnitudes for Campaigns 1-5



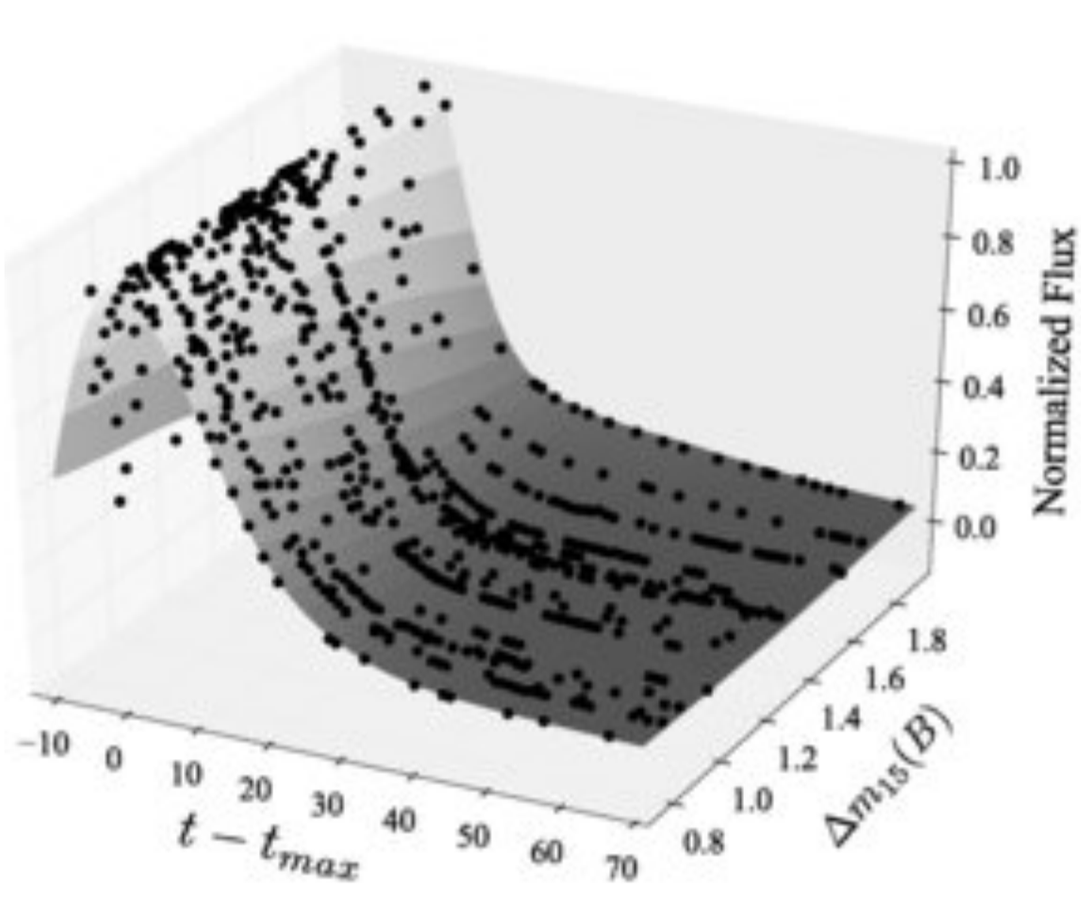


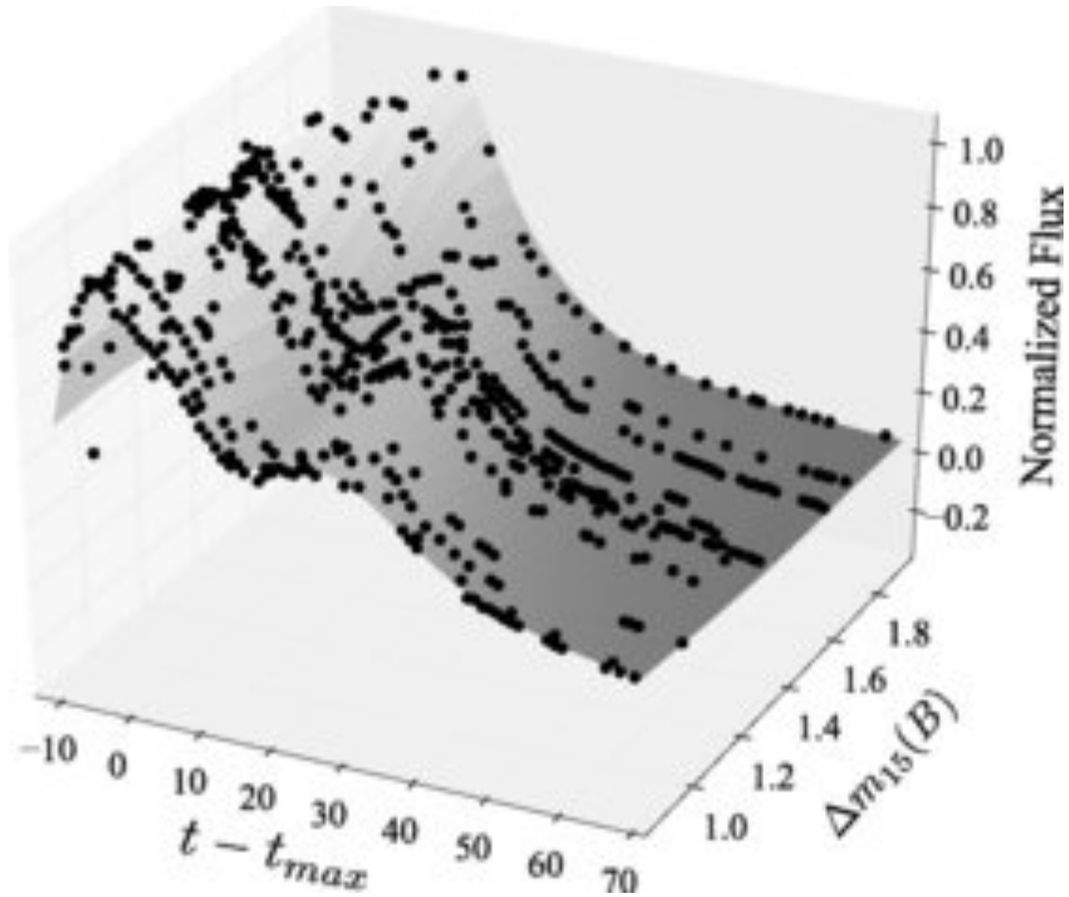


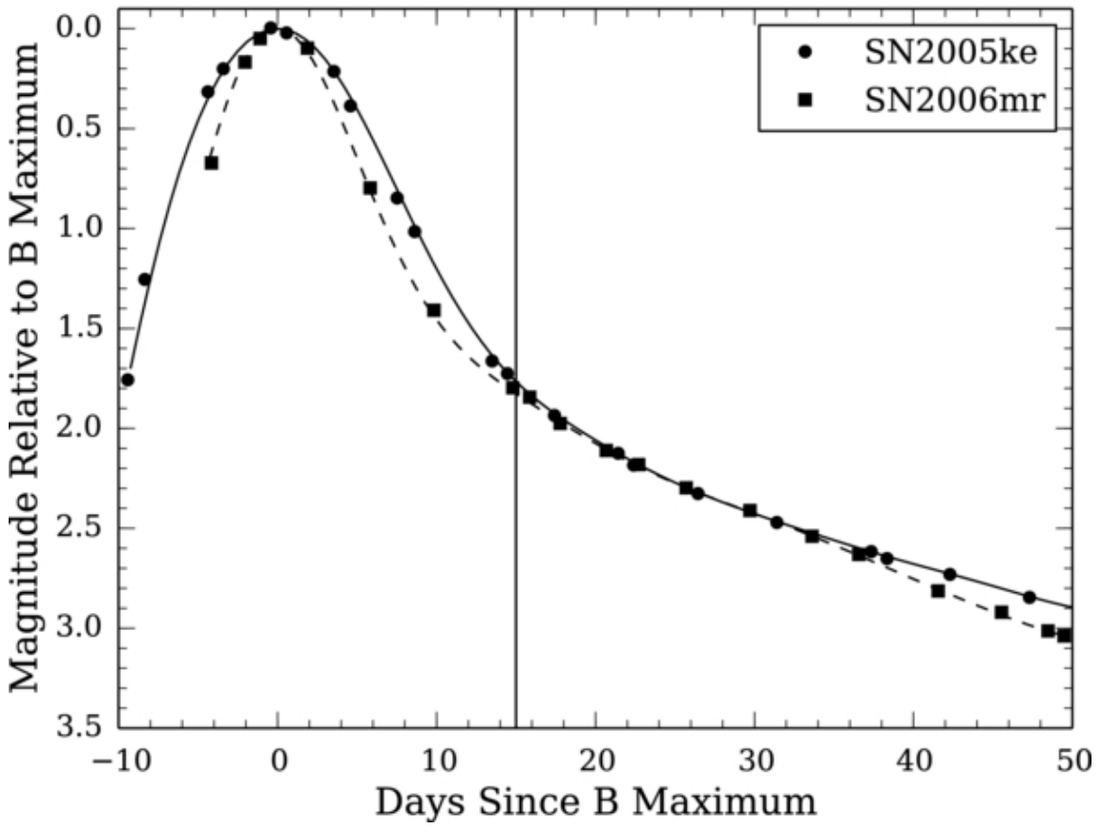


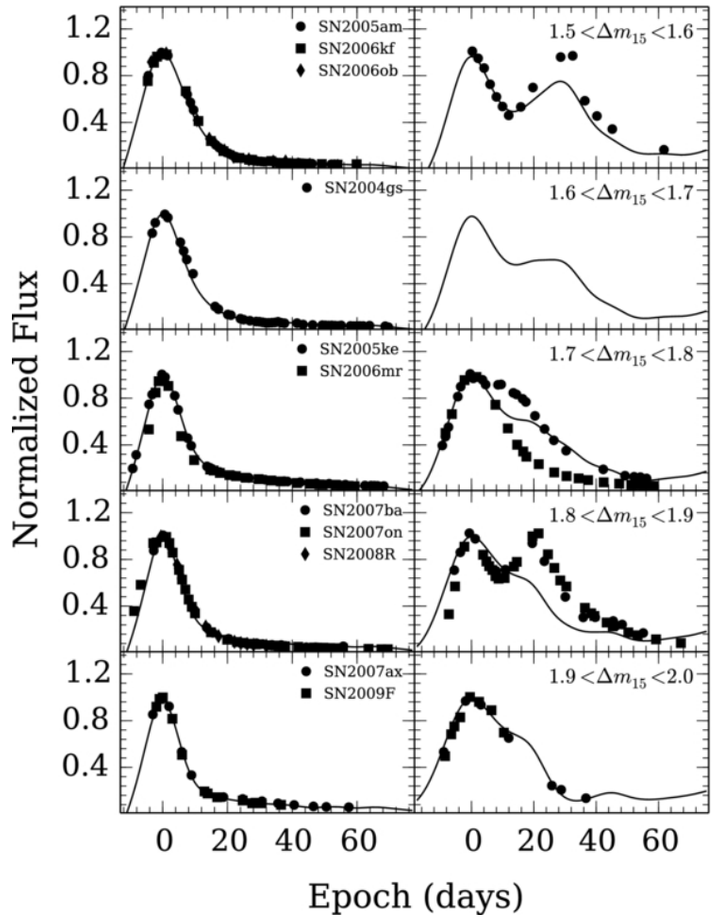


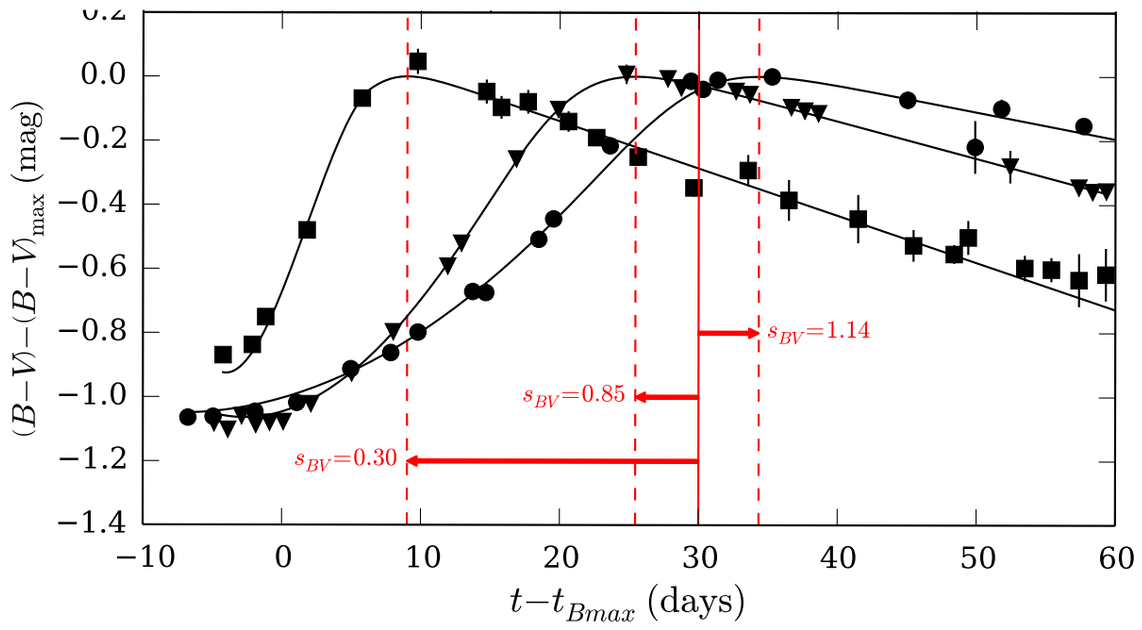
2.5-D Gaussian Process Surface

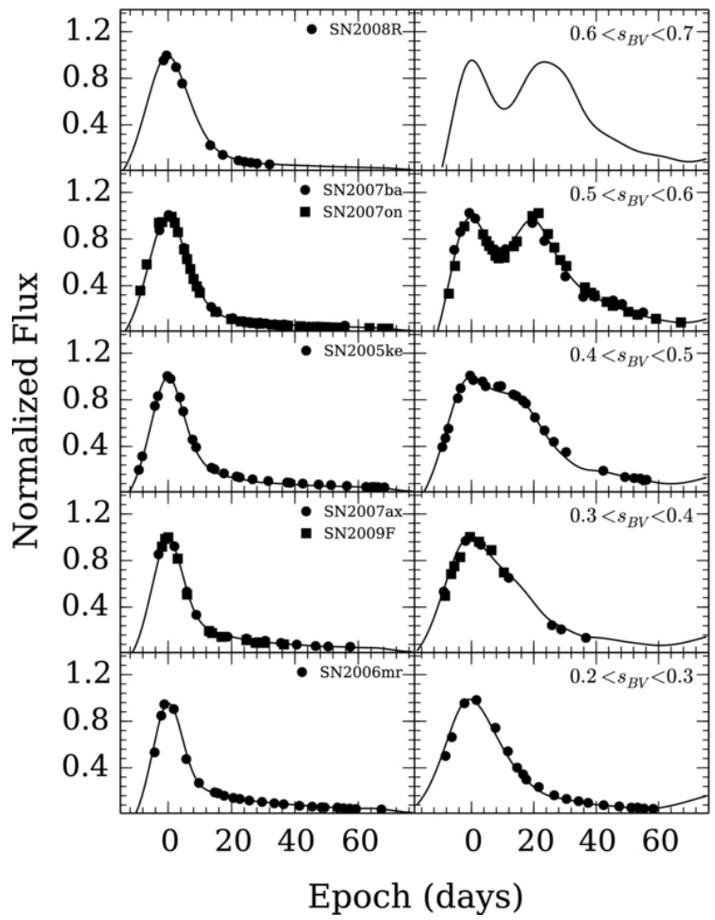




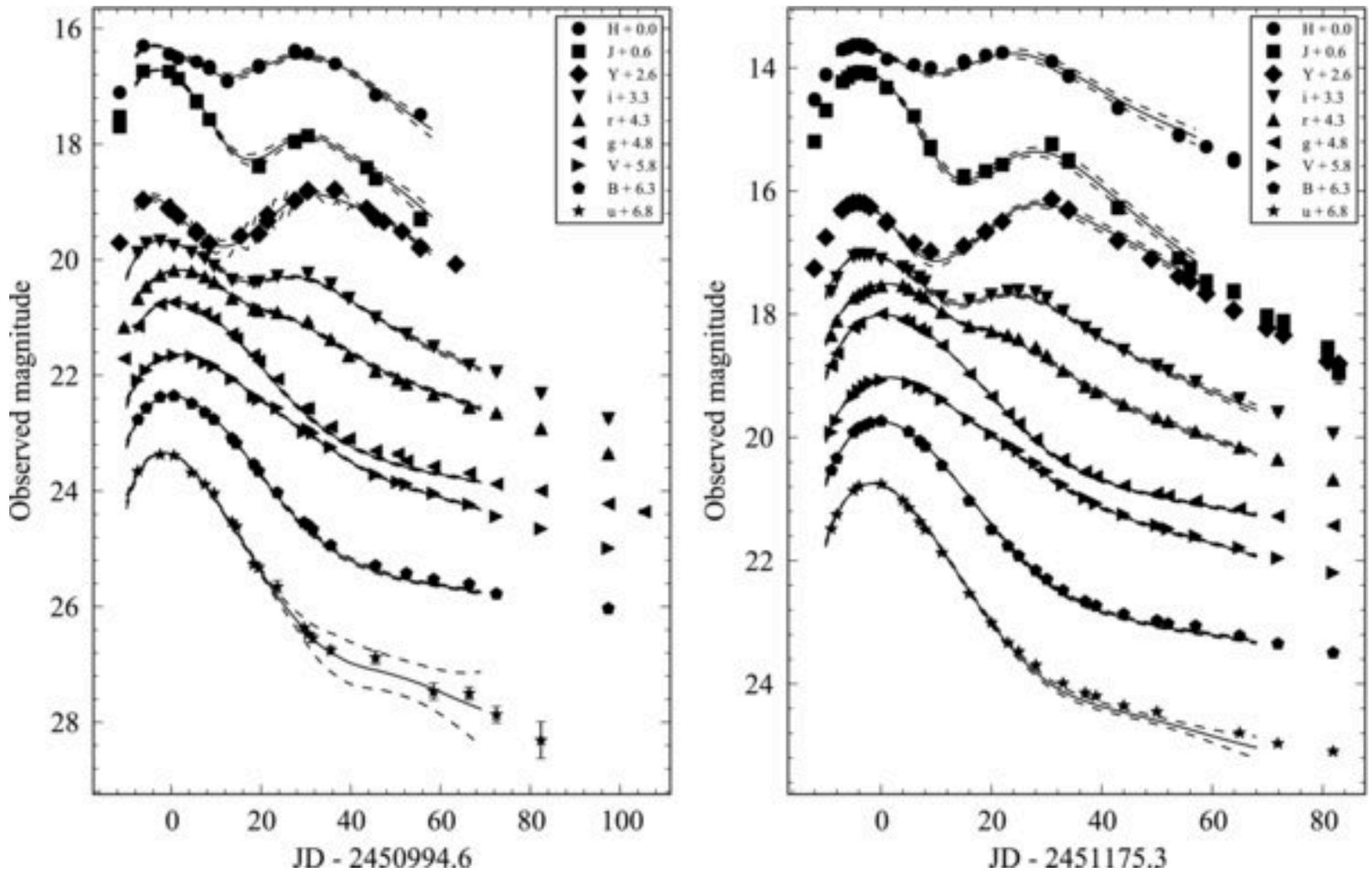

SN2005ke
SN2006mr
Magnitude Relative to B Maximum
Days Since B Maximum


SN2005am
SN2006kf
SN2006ob
SN2004gs
SN2005ke
SN2006mr
SN2007ba
SN2007on
SN2008R
SN2007ax
SN2009F
1.5 <Δm15 <1.6
1.6 <Δm15 <1.7
1.7 <Δm15 <1.8
1.8 <Δm15 <1.9
1.9 <Δm15 <2.0
Normalized Flux
Epoch (days)

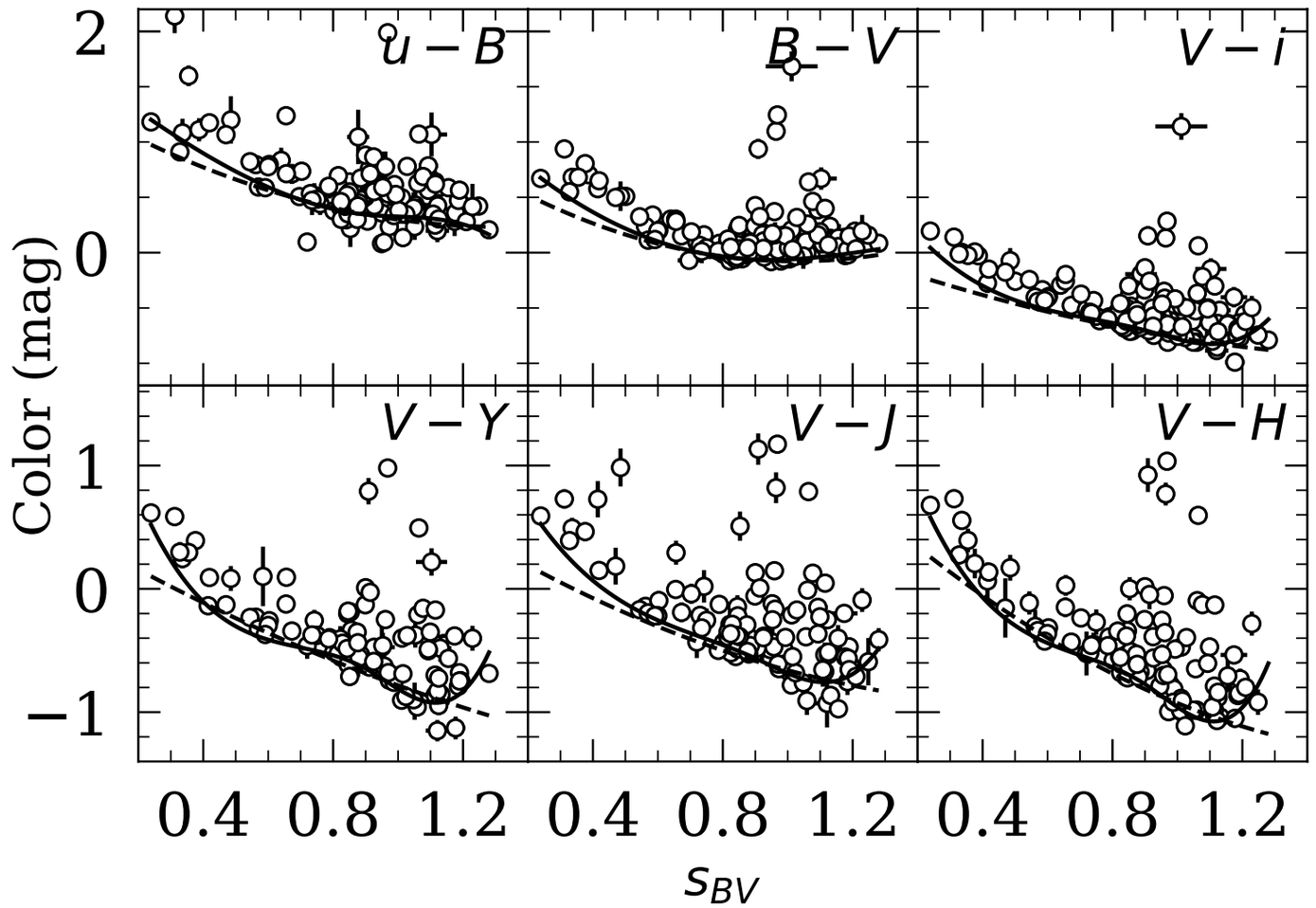

s_{BV}=1.14
s_{BV}=0.85
s_{BV}=0.30
$(B-V)-(B-V)_{\max}$ (mag)
$t-t_{Bmax}$ (days)

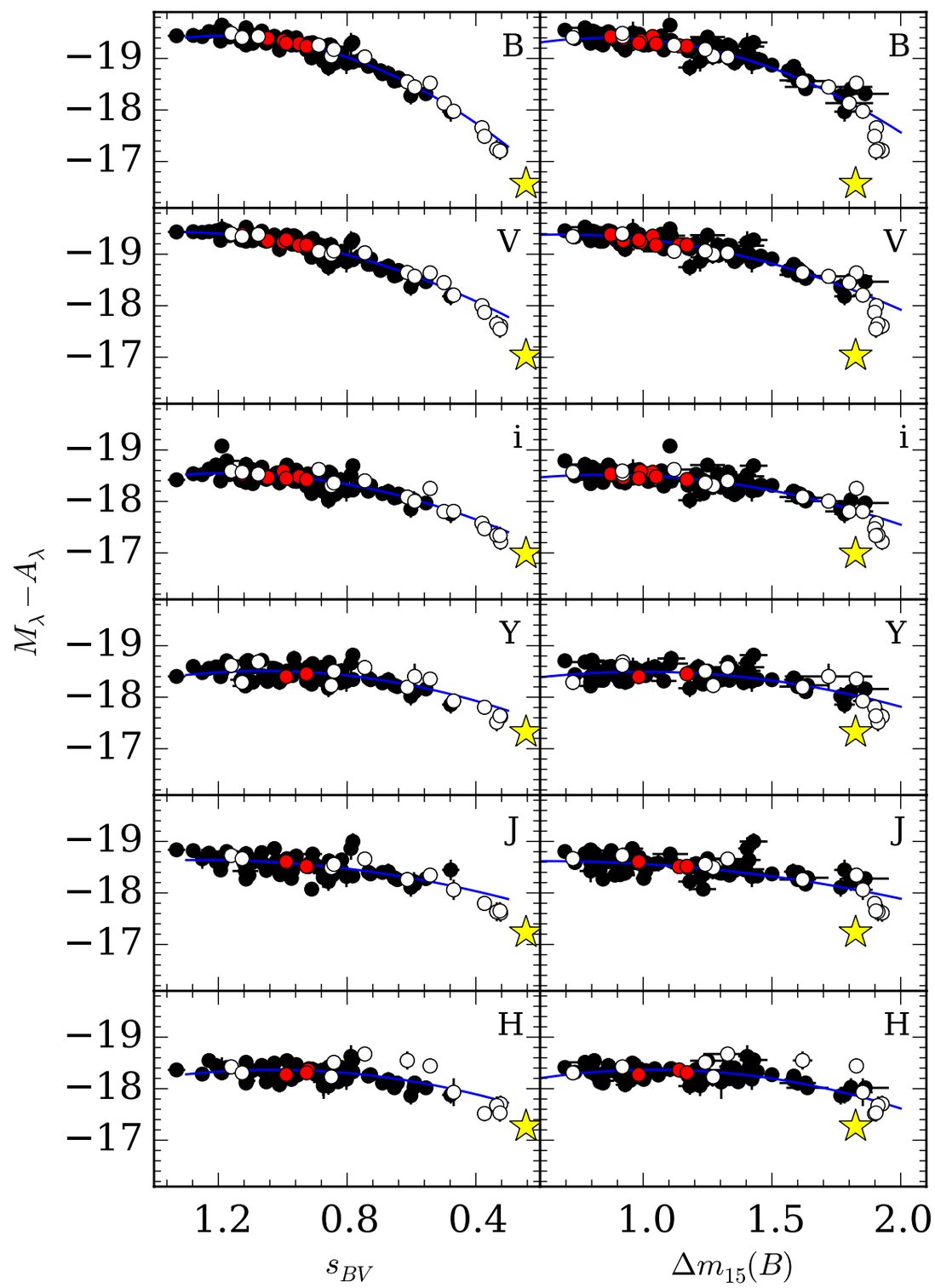

SN2008R
SN2007ba
SN2007on
SN2005ke
SN2007ax
SN2009F
SN2006mr
0.6 <s_{BV}<0.7
0.5 <s_{BV}<0.6
0.4 <s_{BV}<0.5
0.3 <s_{BV}<0.4
0.2 <s_{BV}<0.3
Normalized Flux
Epoch (days)

Fit for s_{BV}, $T_{max}(B)$, $m_{max}(\lambda)$



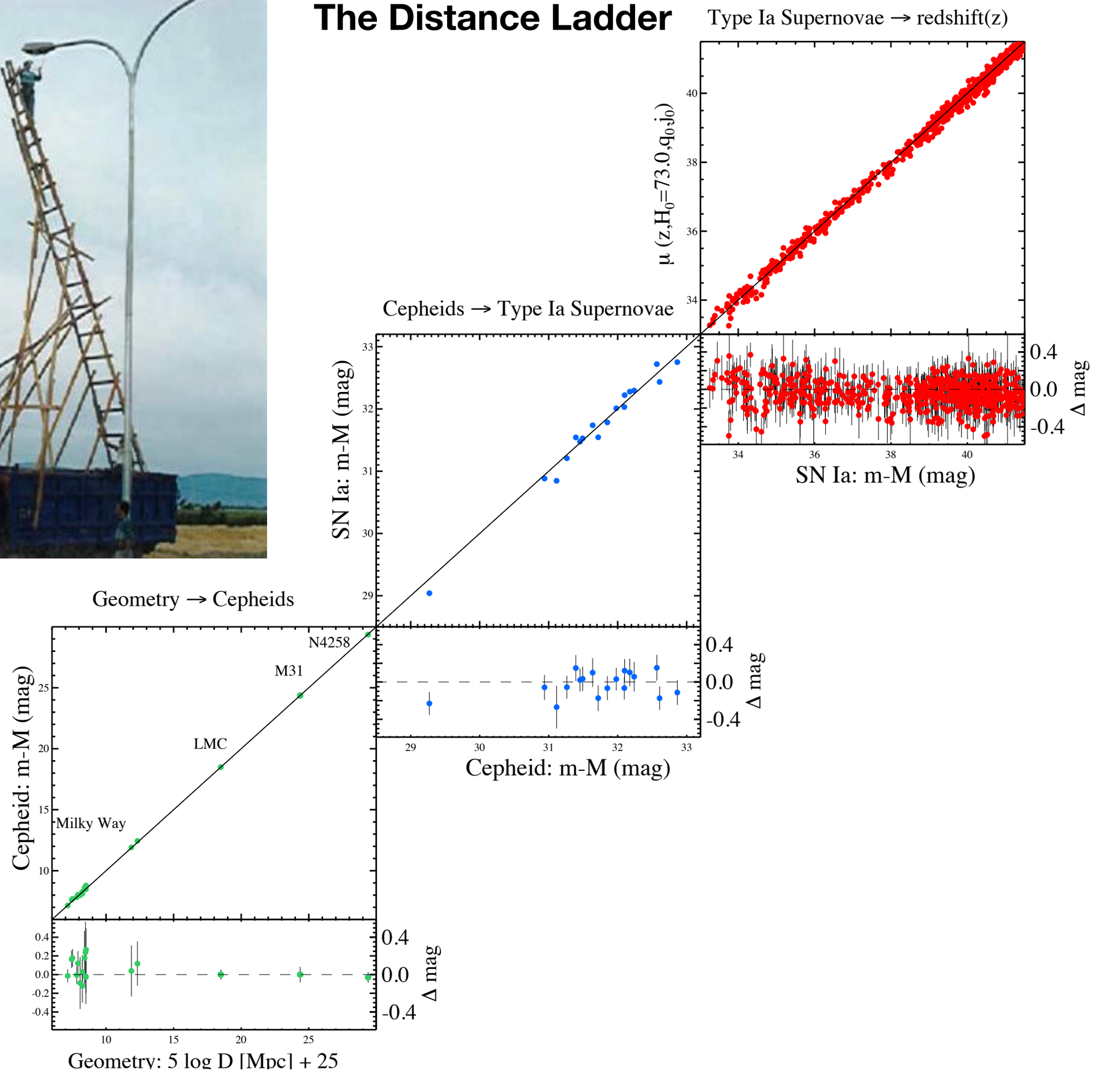
Intrinsic Colors and Extinctions



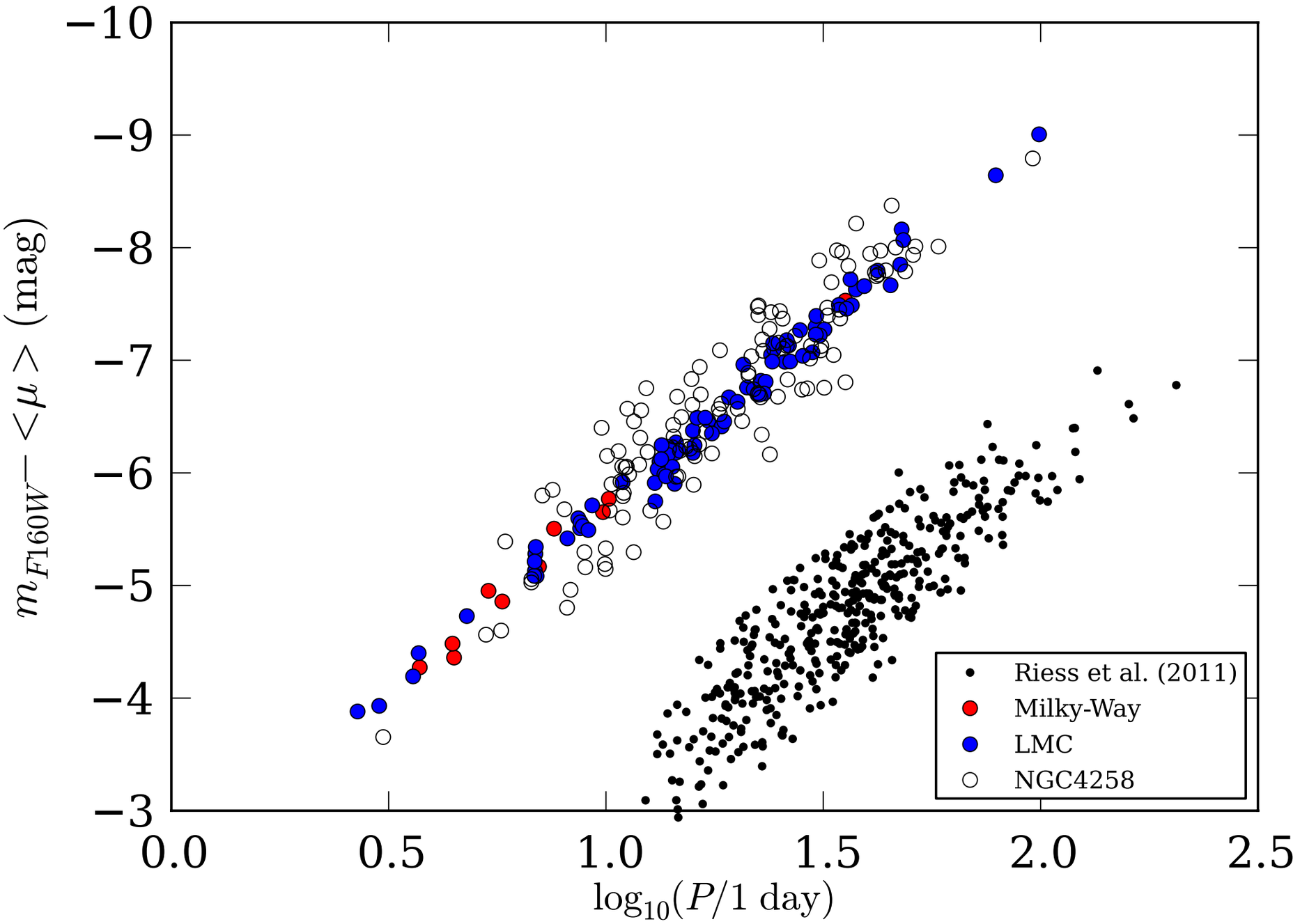


Assuming
H0 = 72 km/s/Mpc

The Distance Ladder

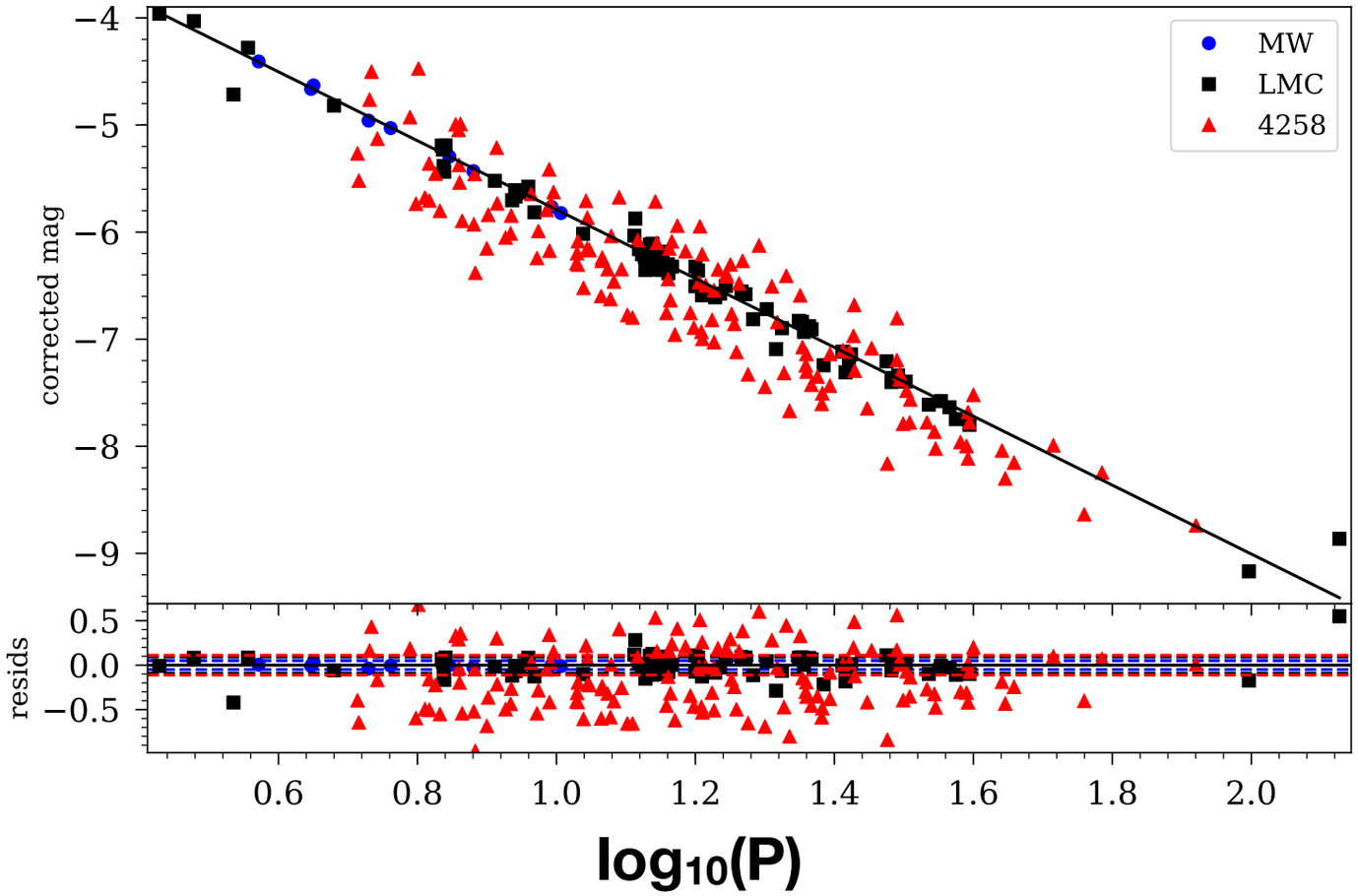


Calibrating the Ia's with Cepheid distances

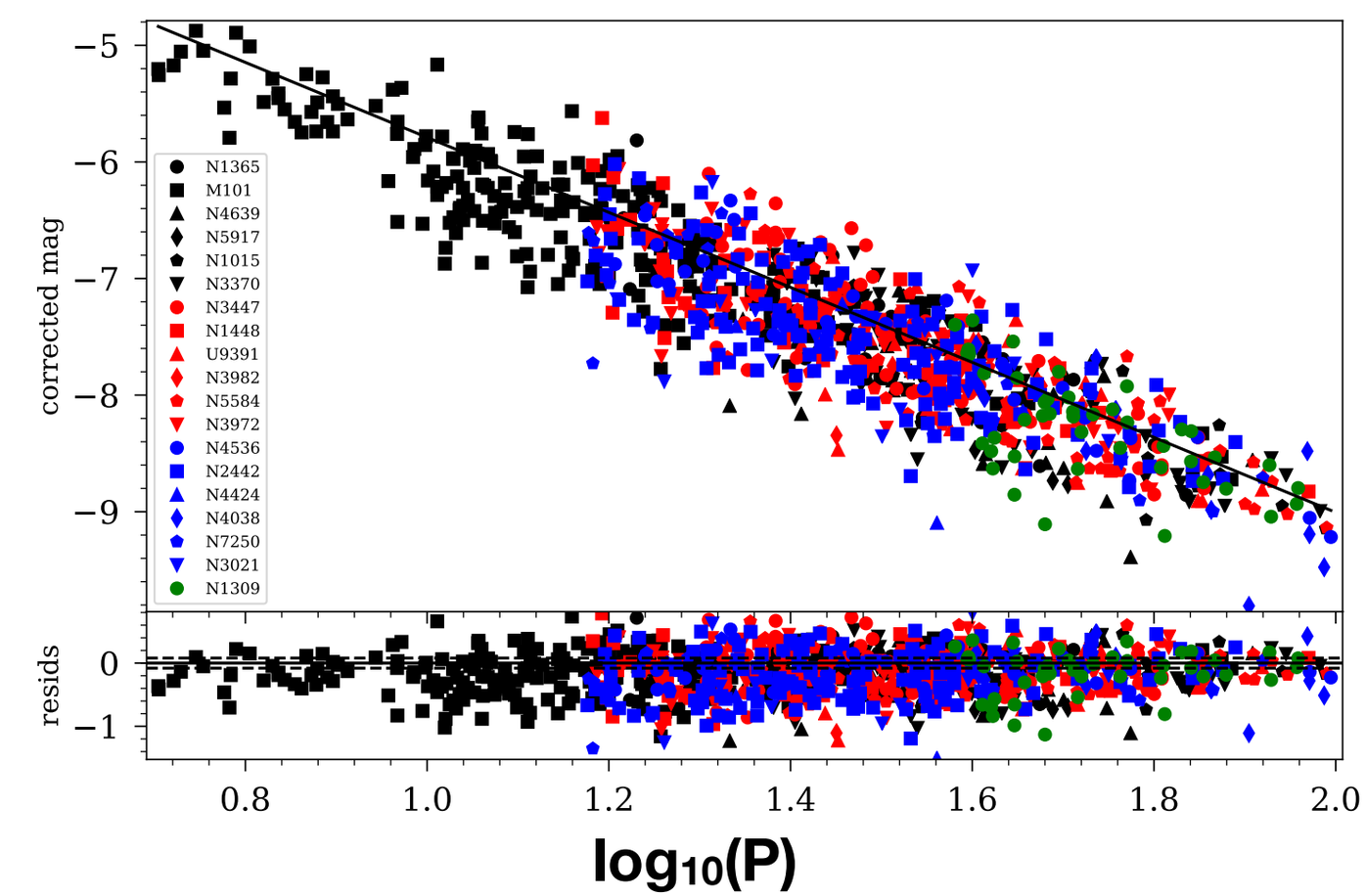


Anchors:

MW
LMC
NGC 4258



SN Hosts:



Anchors:

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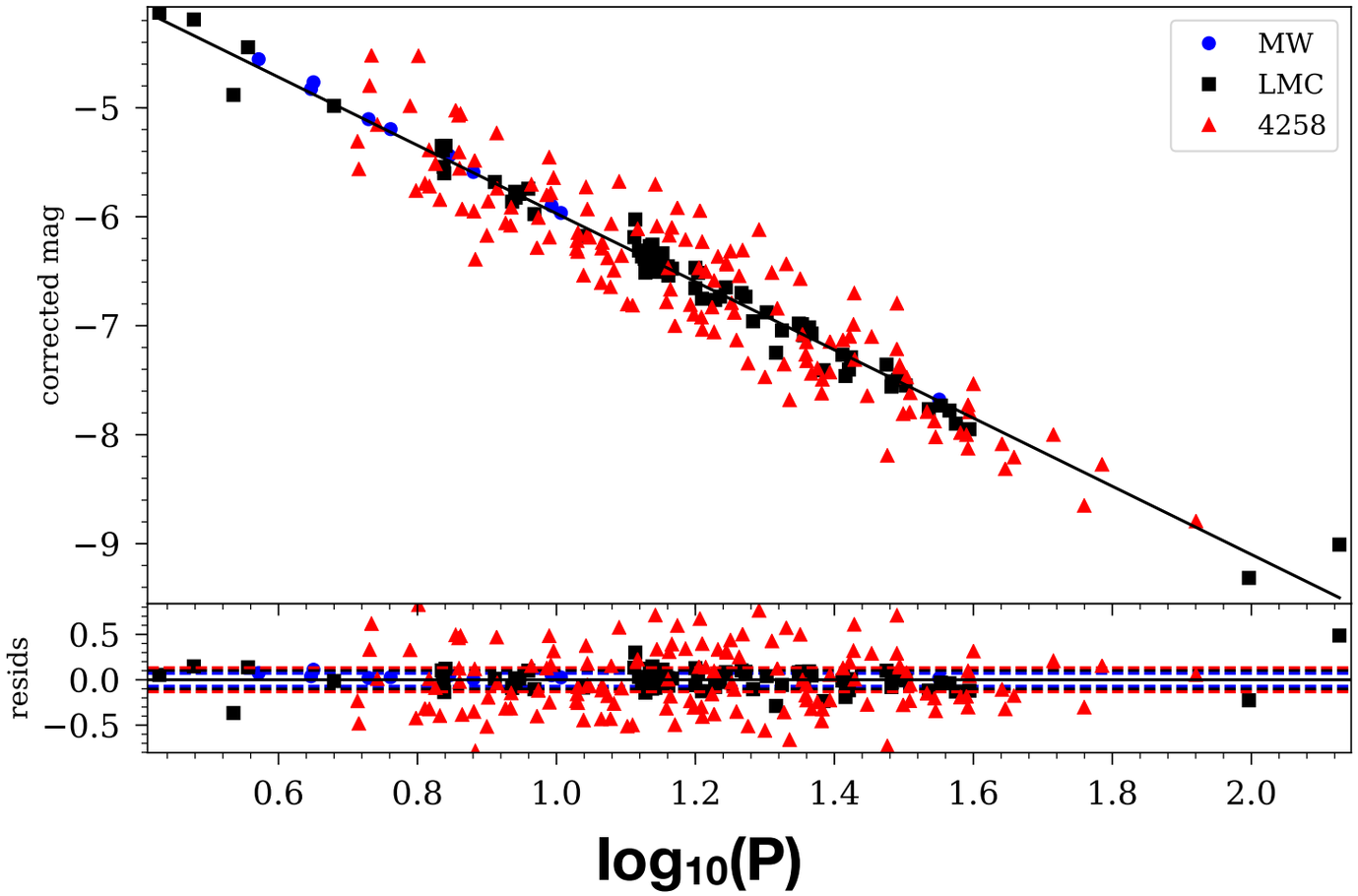
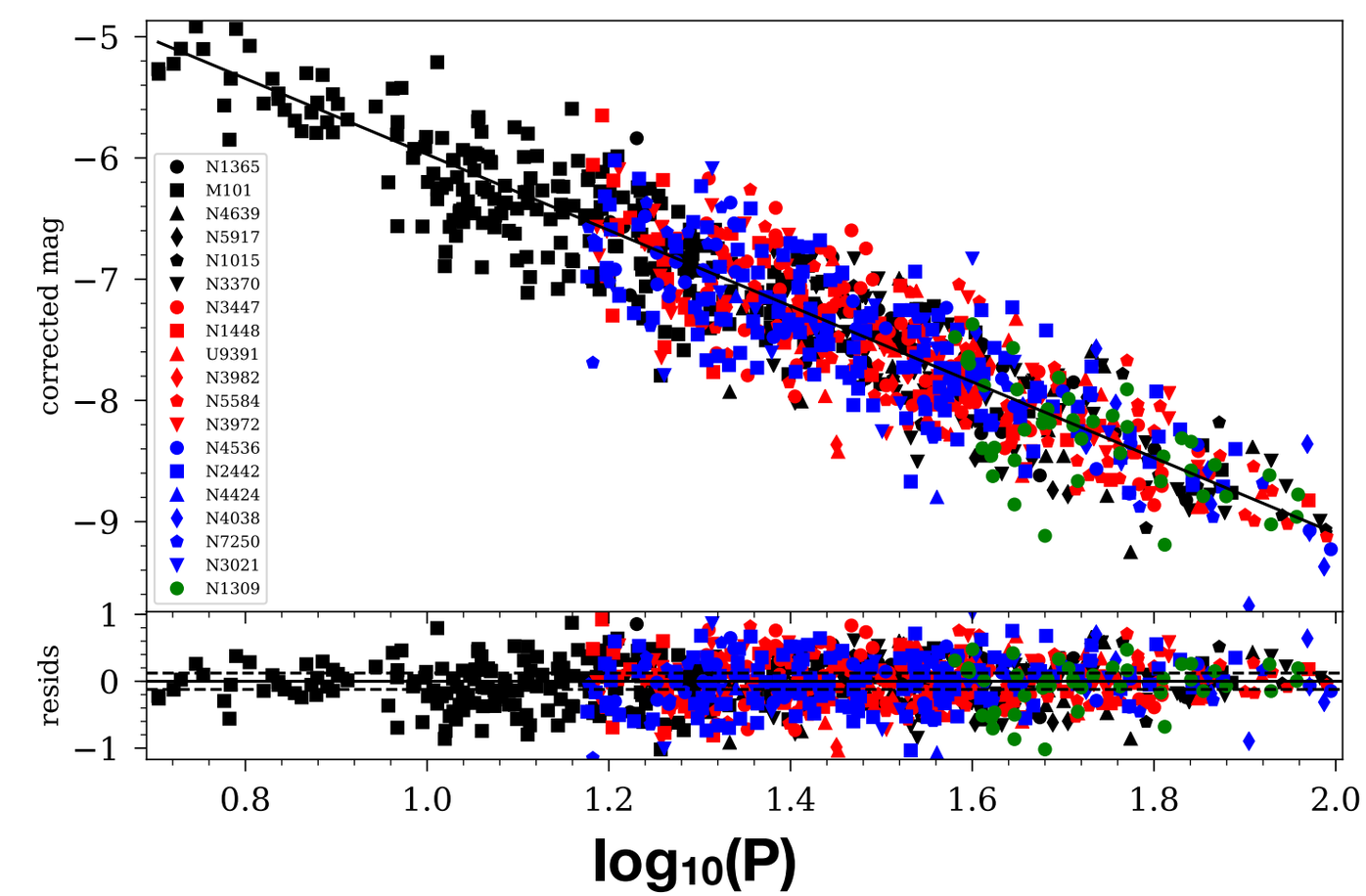
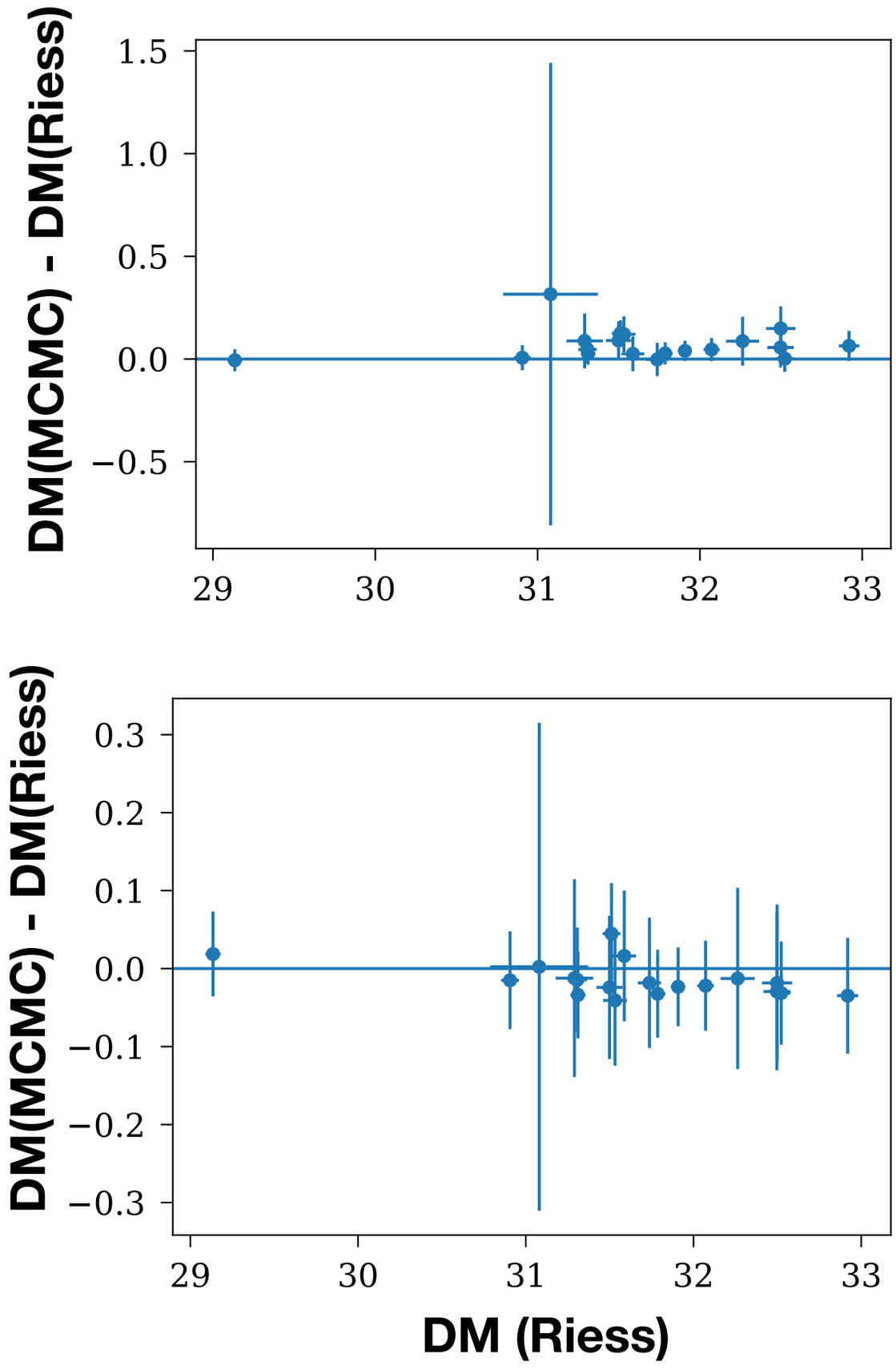
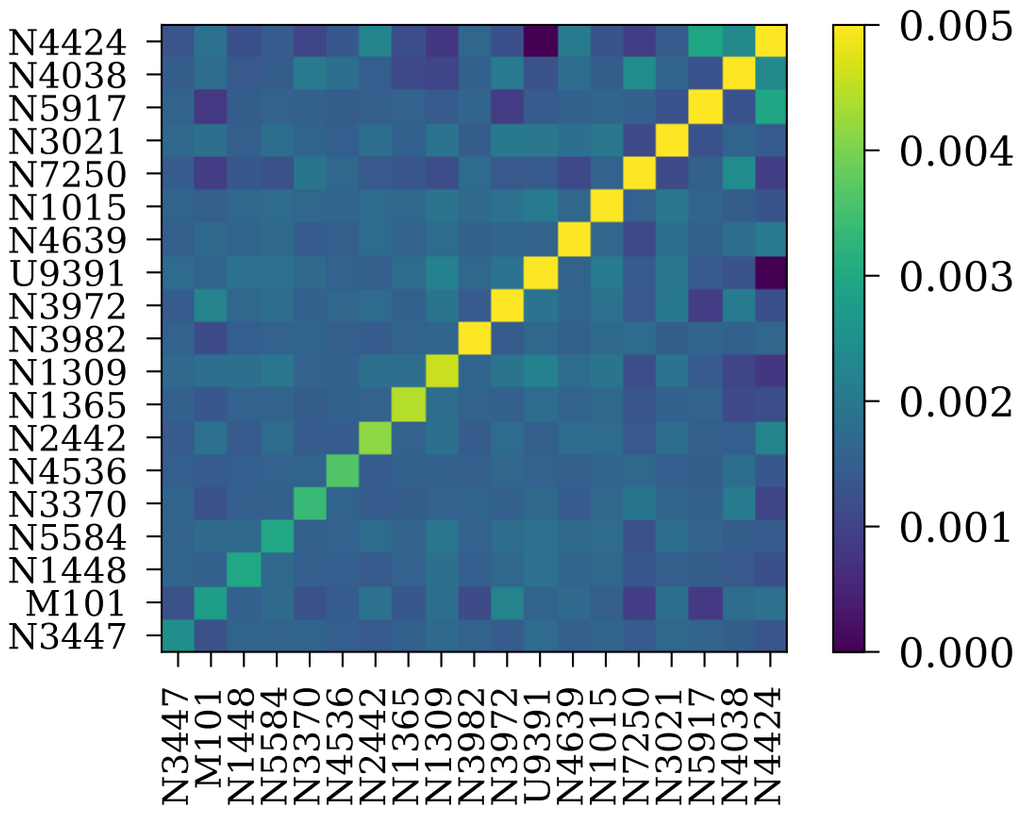
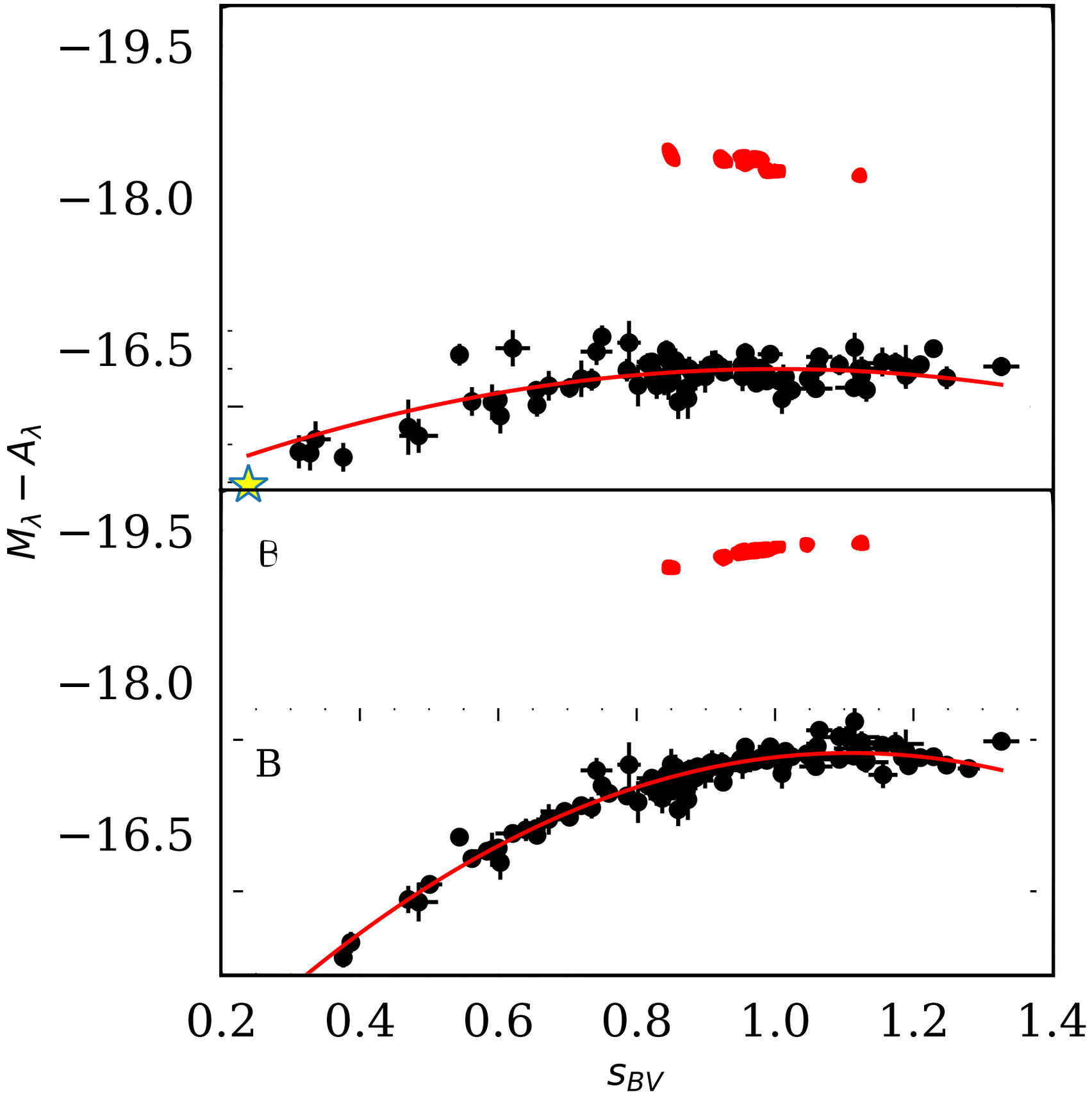


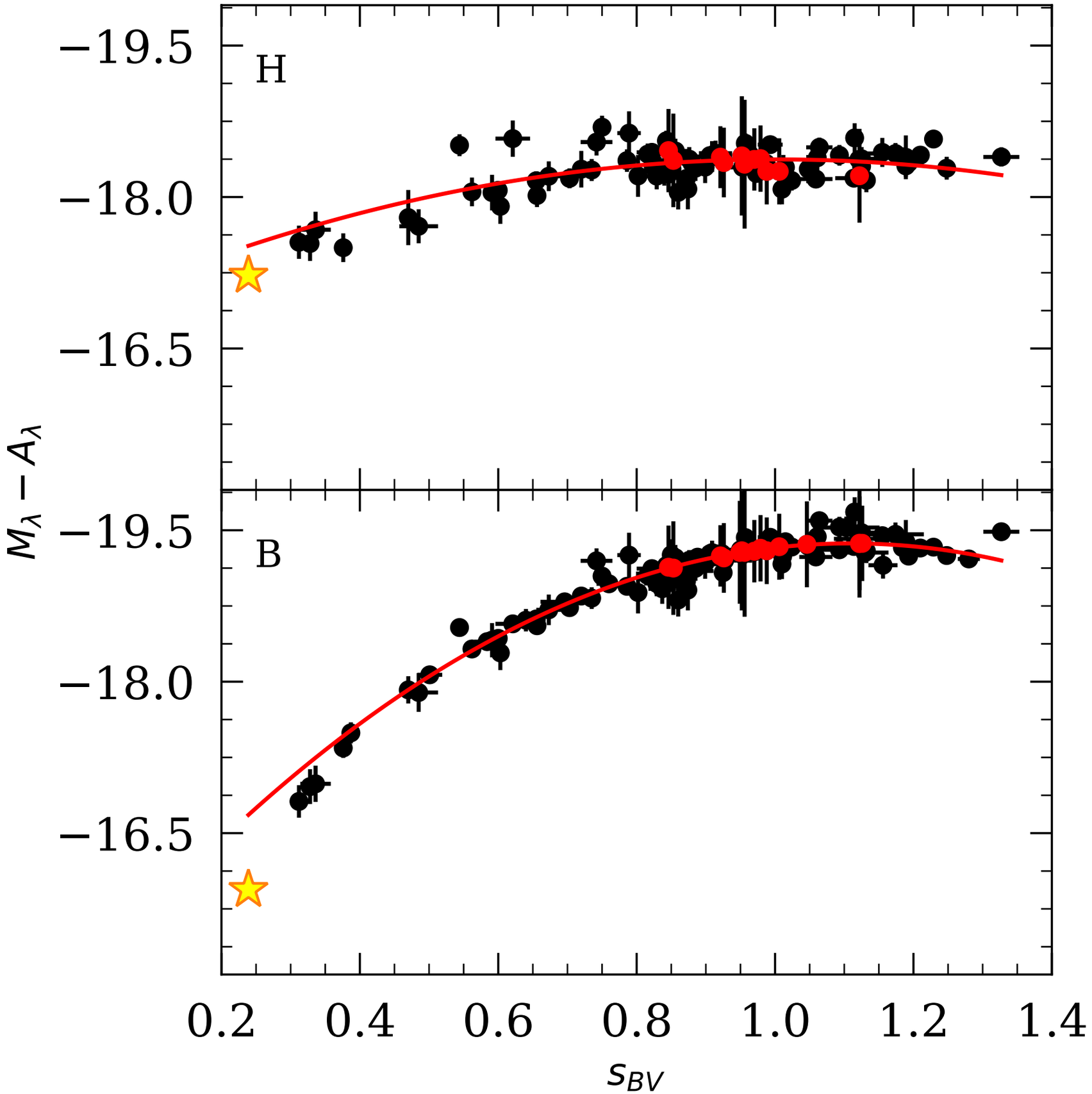
SN Hosts:

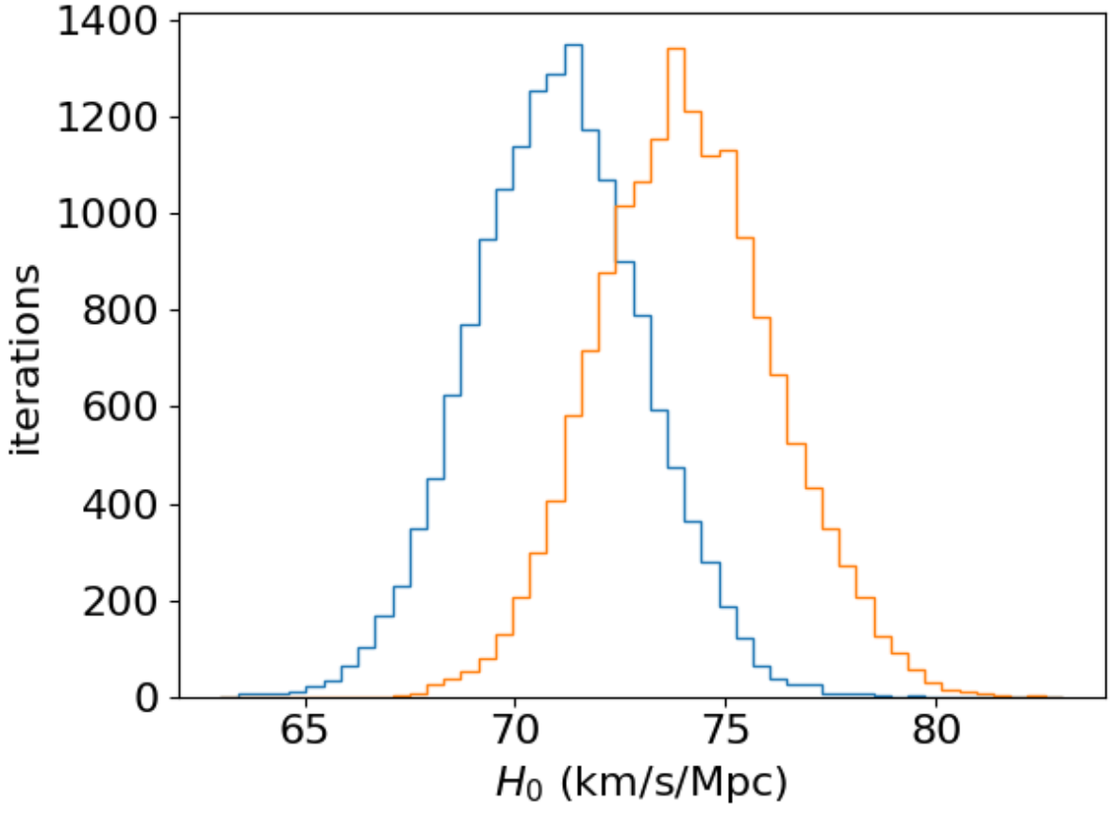


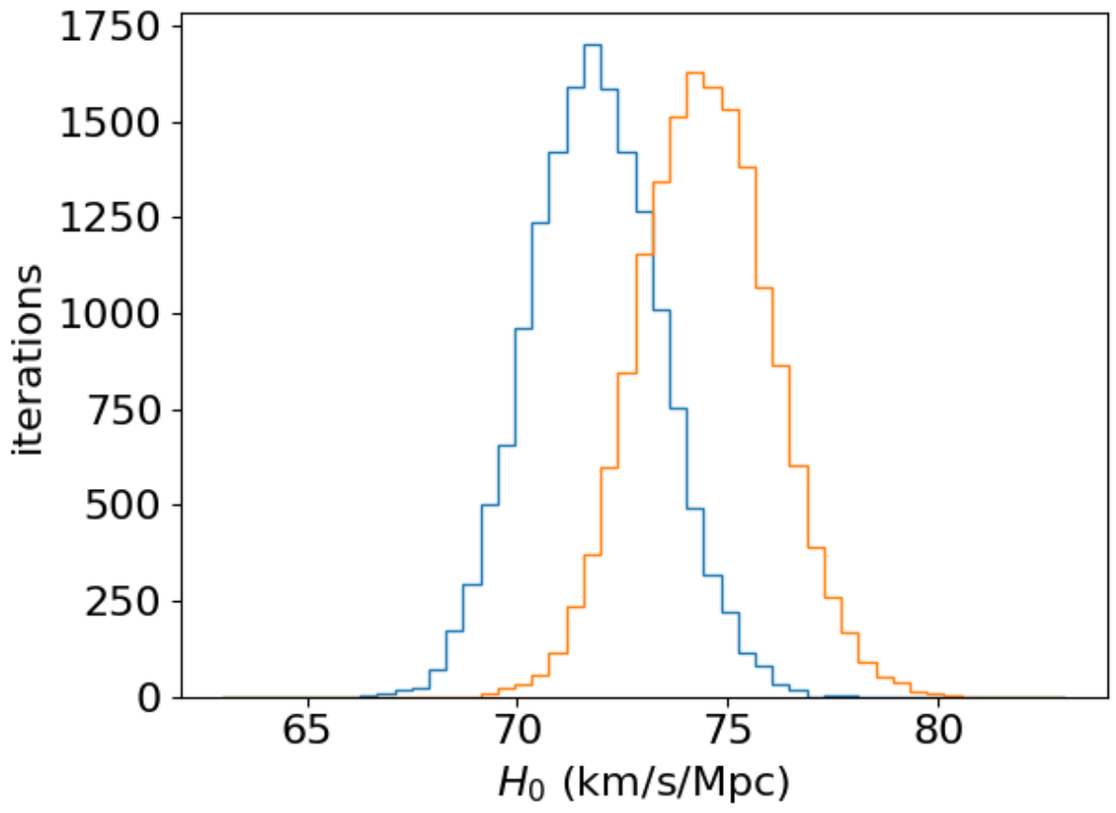

DM(MCMC) - DM(Riess)
1.5
1.0
0.5
0.0
−0.5
29
30
31
32
33
DM(MCMC) - DM(Riess)
0.3
0.2
0.1
0.0
−0.1
−0.2
−0.3
29
30
31
32
33
DM (Riess)

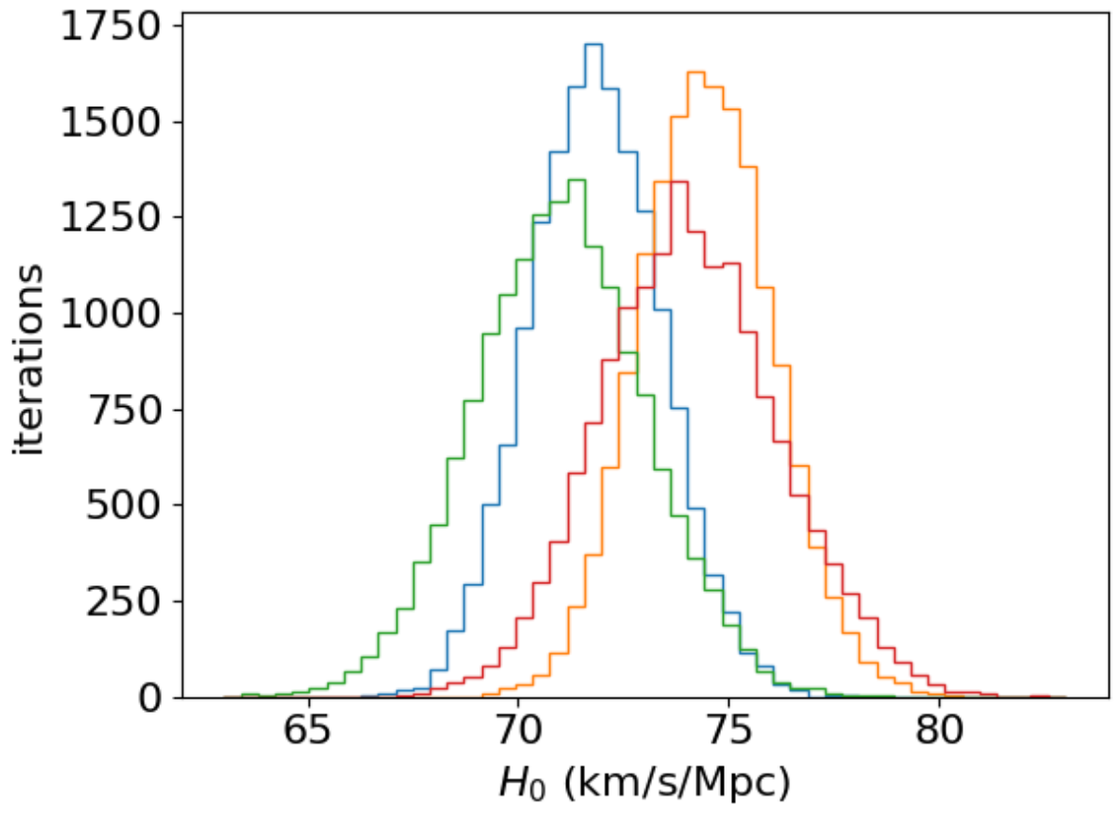

SN Host Covariance Matrix
N4424
N4038
N5917
N3021
N7250
N1015
N4639
U9391
N3972
N3982
N1309
N1365
N2442
N4536
N3370
N5584
N1448
M101
N3447
N3447
M101
N1448
N5584
N3370
N4536
N2442
N1365
N1309
N3982
N3972
U9391
N4639
N1015
N7250
N3021
N5917
N4038
N4424
0.005
0.004
0.003
0.002
0.001
0.000


−19.5
−18.0
−16.5
−19.5
−18.0
−16.5
$M_\lambda - A_\lambda$
U
B
B
0.2
0.4
0.6
0.8
1.0
1.2
1.4
s_{BV}


H
B
−19.5
−18.0
−16.5
−19.5
−18.0
−16.5
$M_\lambda - A_\lambda$
0.2
0.4
0.6
0.8
1.0
1.2
1.4
s_{BV}


1400
1200
1000
800
600
400
200
0
iterations
65
70
75
80
H_0 (km/s/Mpc)


1750
1500
1250
1000
750
500
250
0
iterations
65
70
75
80
H_0 (km/s/Mpc)


1750
1500
1250
1000
750
500
250
0
iterations
65
70
75
80
H_0 (km/s/Mpc)

What’s Left

- Distribute first draft via overleaf
- Better Phillips relation fitting function (?)
- CSP zero-point errors
- Fresh eyes to tell me what’s missing in the paper.