BVRI Color Distributions of Classical Novae

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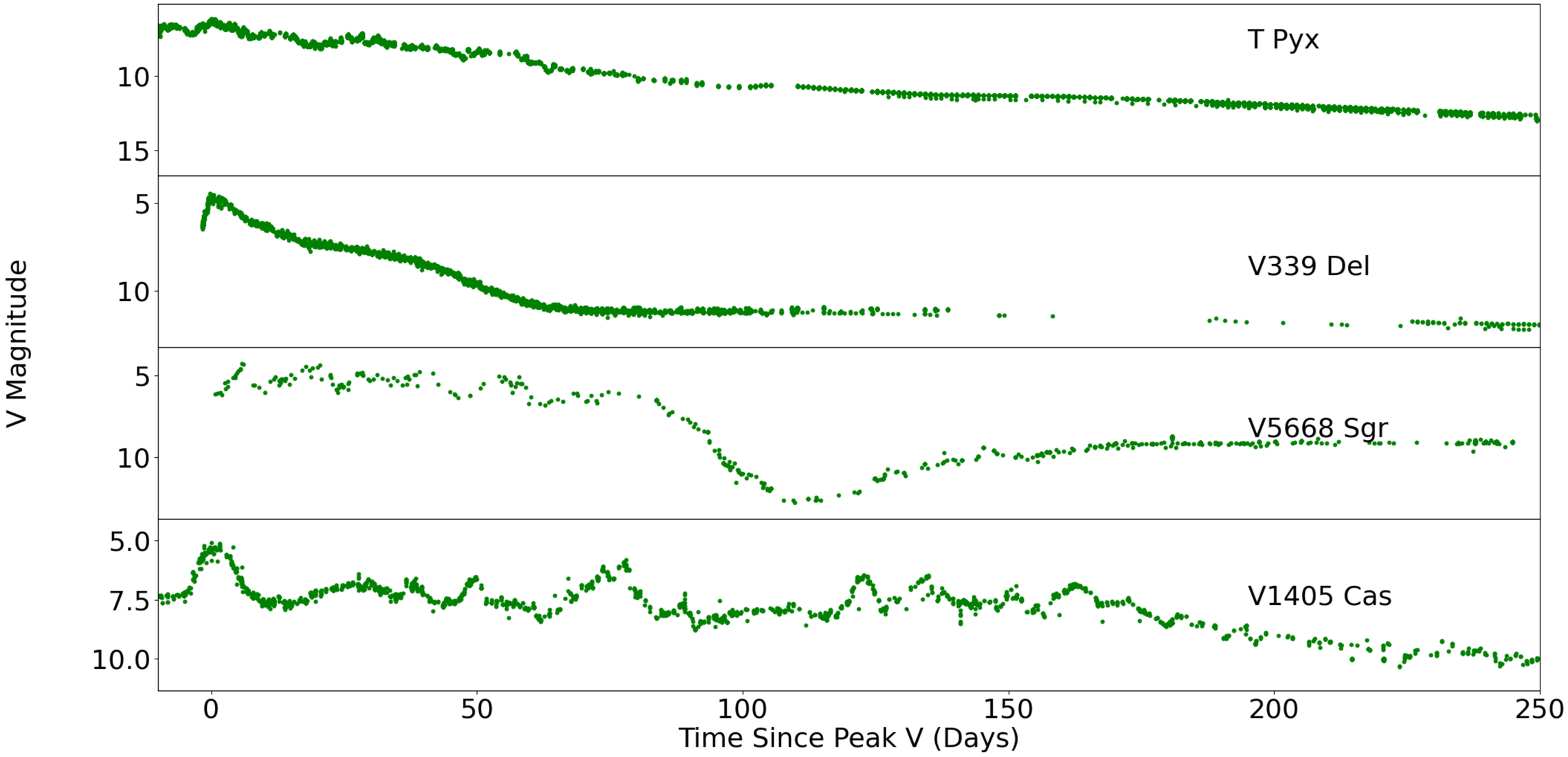
Symbiotic stars, weird novae, and related embarrassing binaries

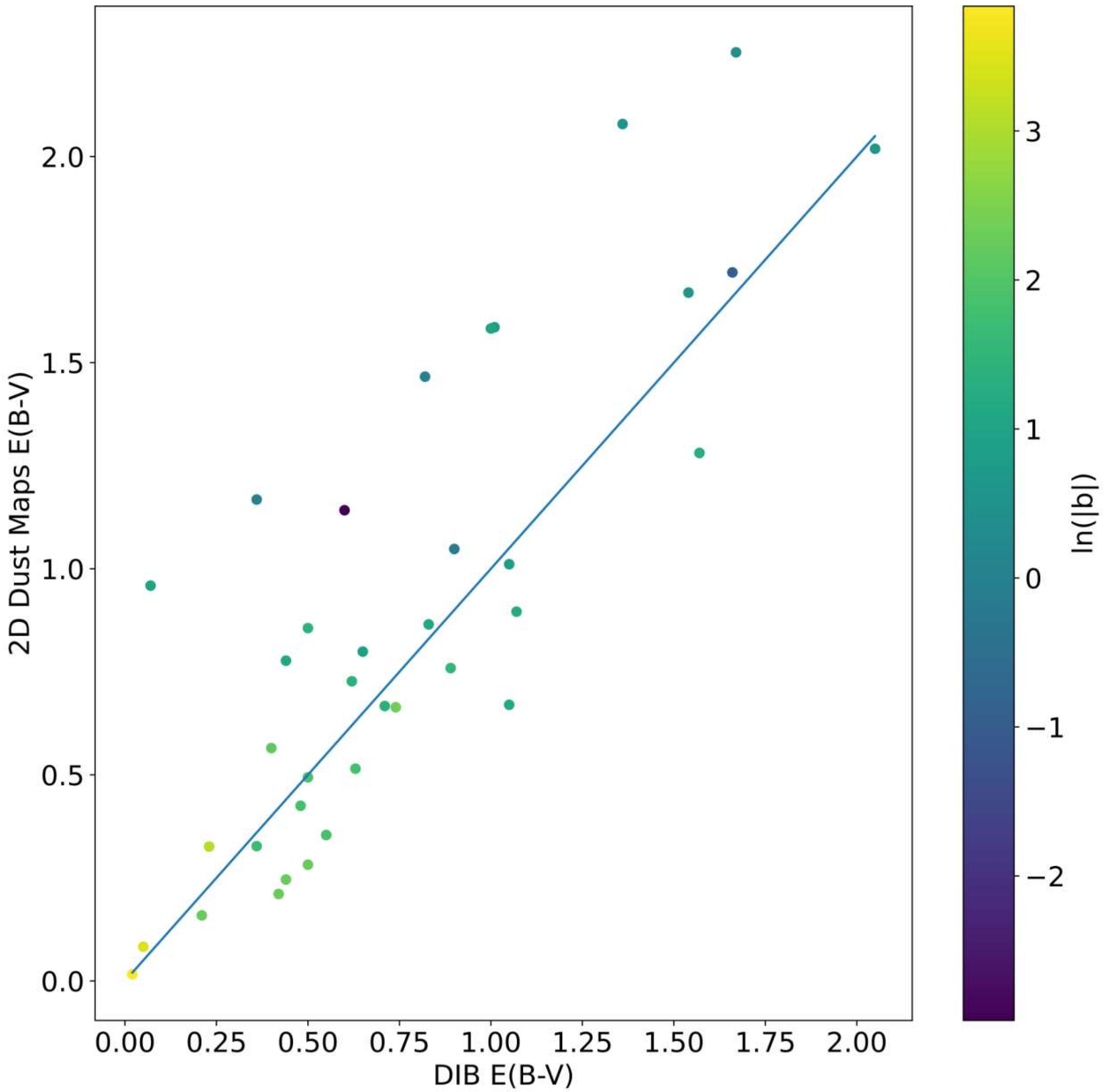
6/6/24


T Pyx
V339 Del
V5668 Sgr
V1405 Cas
V Magnitude
Time Since Peak V (Days)
10
15
5
10
5
10
5.0
7.5
10.0
0
50
100
150
200
250

33 Novae with Diffuse Interstellar Band (DIB) measurements

When we have parallaxes, 3D dust maps provide E(B-V)

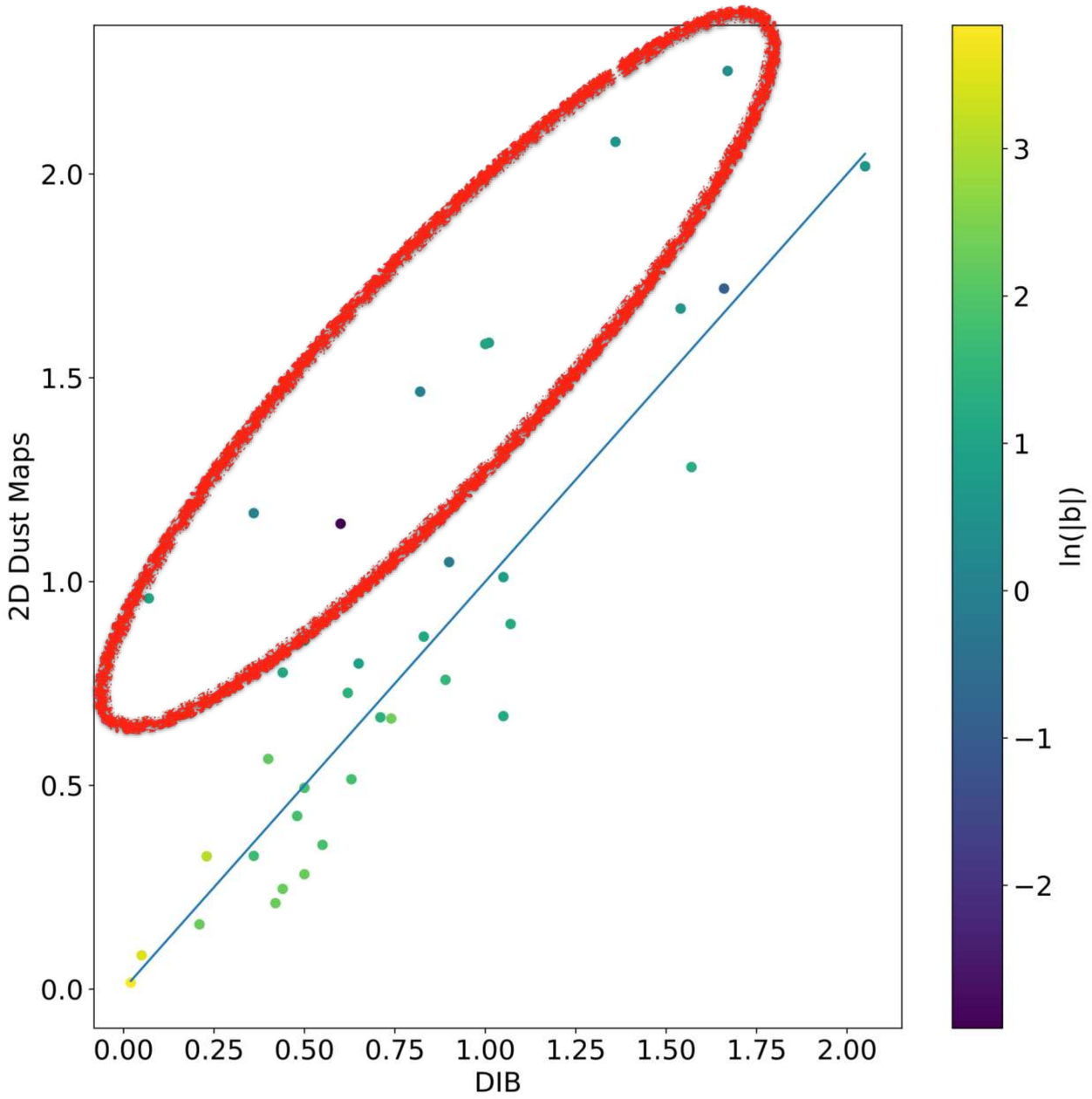
Otherwise, 2D dust maps are available, although only provide limits.



33 Novae with Diffuse Interstellar Band (DIB) measurements

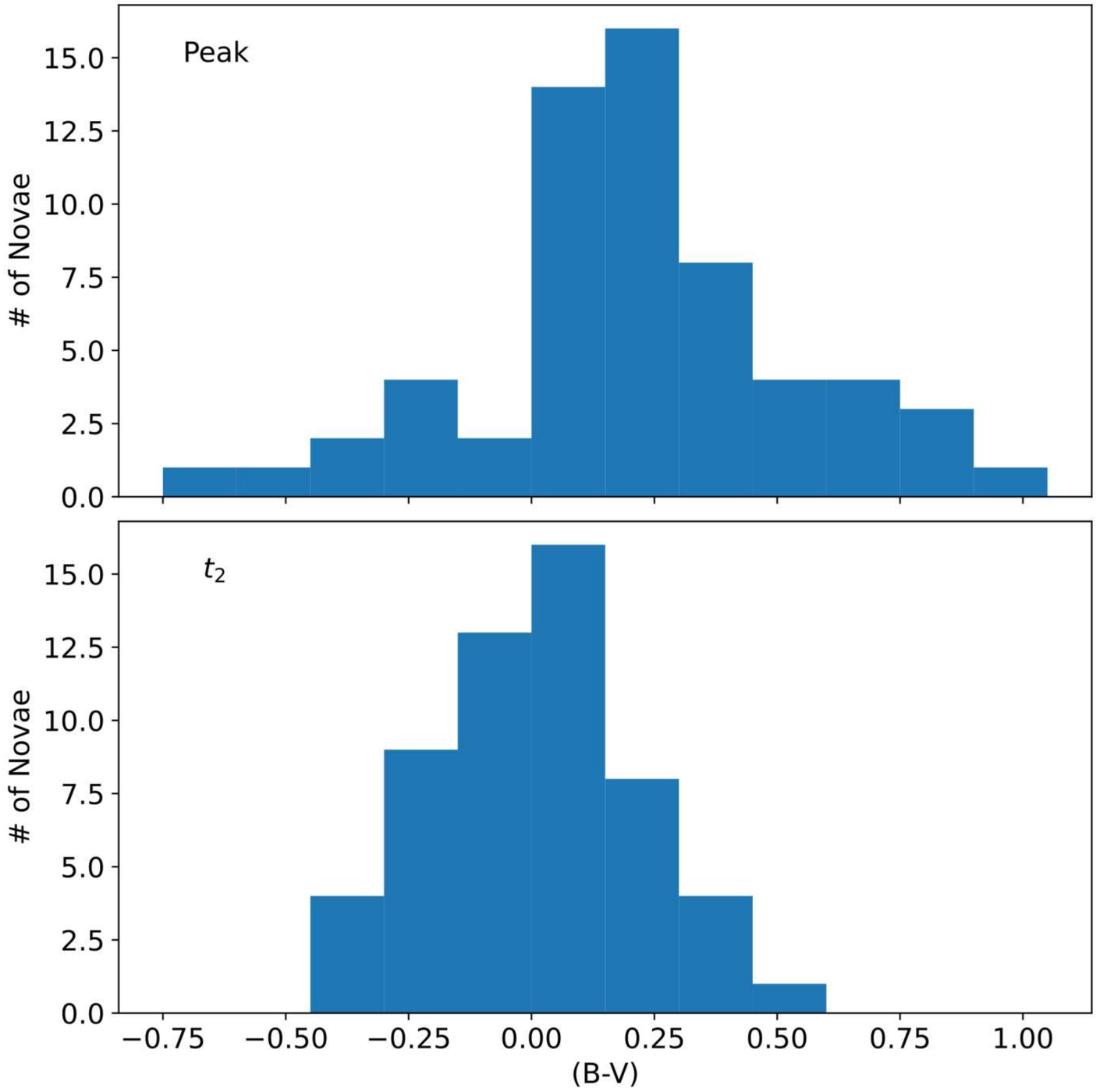
When we have distances, 3D dust maps provide E(B-V)

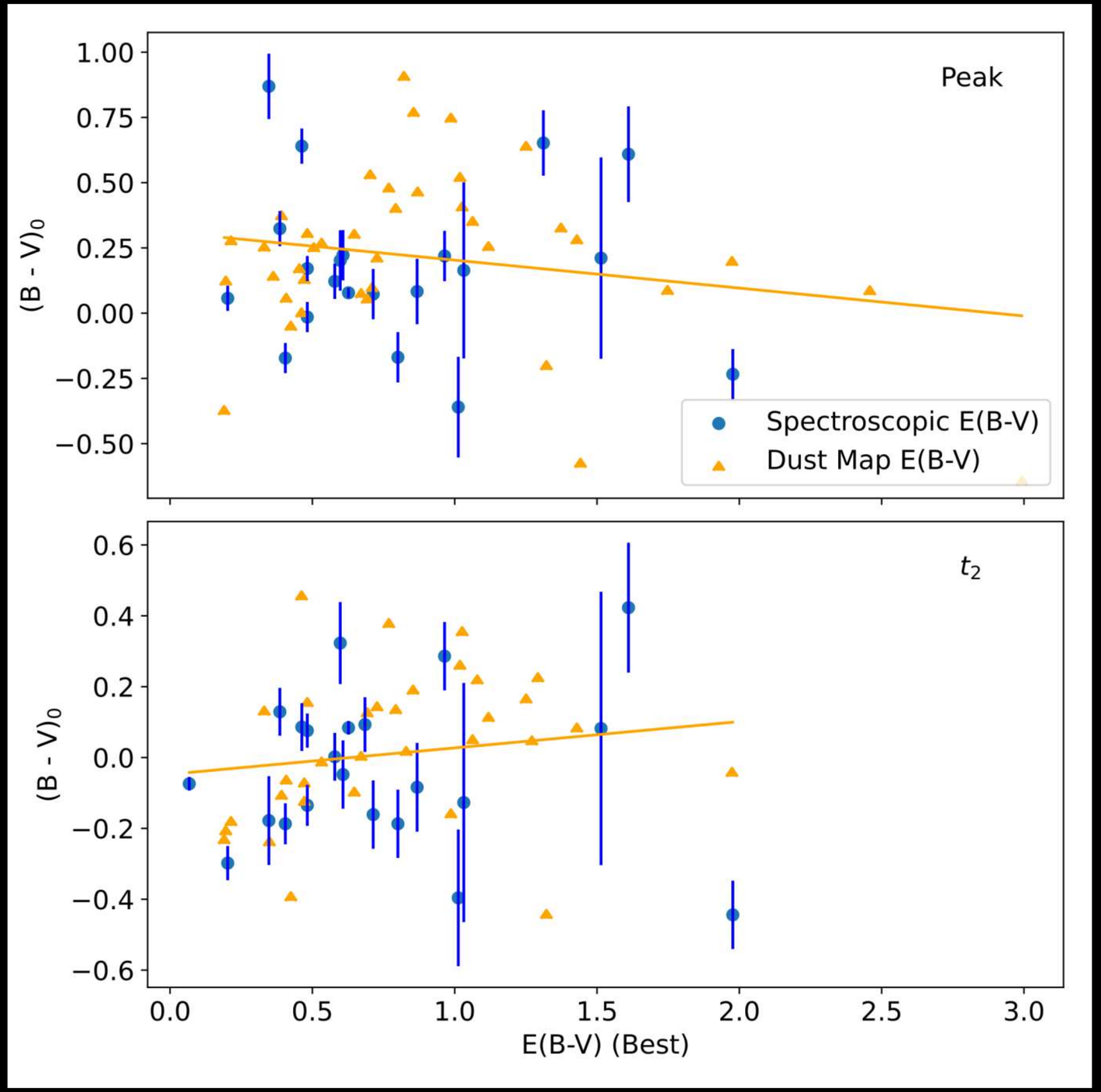
Otherwise, 2D dust maps are available, although only provide limits.

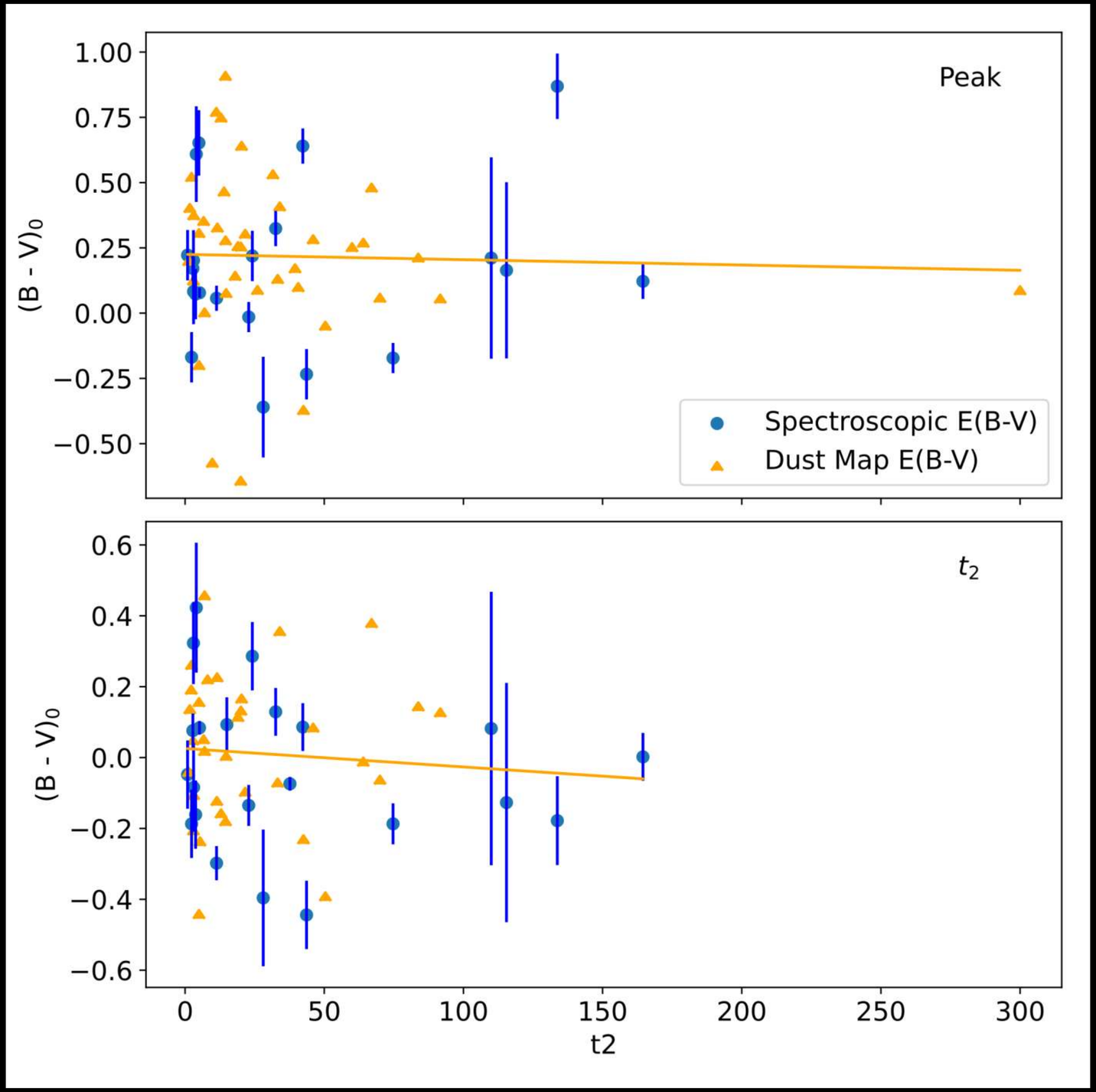


$(B-V)_0 \, at \, Peak$
$N = 60$
$\mu = 0.22$
$\sigma = 0.32$

$(B-V)_0 \, at \, t_2$
$N = 55$
$\mu = 0.01$
$\sigma = 0.22$




Peak
Spectroscopic E(B-V)
Dust Map E(B-V)
$(B - V)_0$
1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
t_2
$(B - V)_0$
0.6
0.4
0.2
0.0
−0.2
−0.4
−0.6
0.0
0.5
1.0
1.5
2.0
2.5
3.0
E(B-V) (Best)


Peak
Spectroscopic E(B-V)
Dust Map E(B-V)
$(B - V)_0$
1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
t_2
$(B - V)_0$
0.6
0.4
0.2
0.0
−0.2
−0.4
−0.6
0
50
100
150
200
250
300
t2

$(R-I)_0 \, at \, Peak$

$N = 45$

$\mu = 0.14$

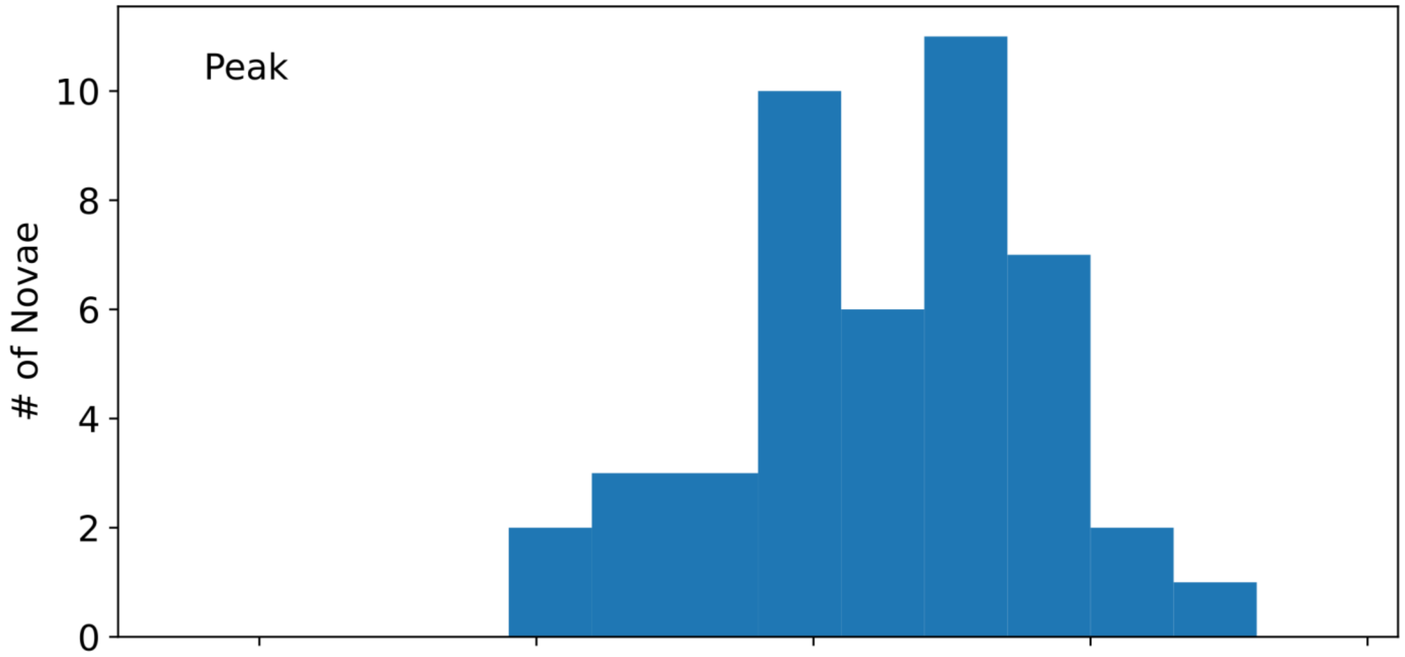
$\sigma = 0.27$

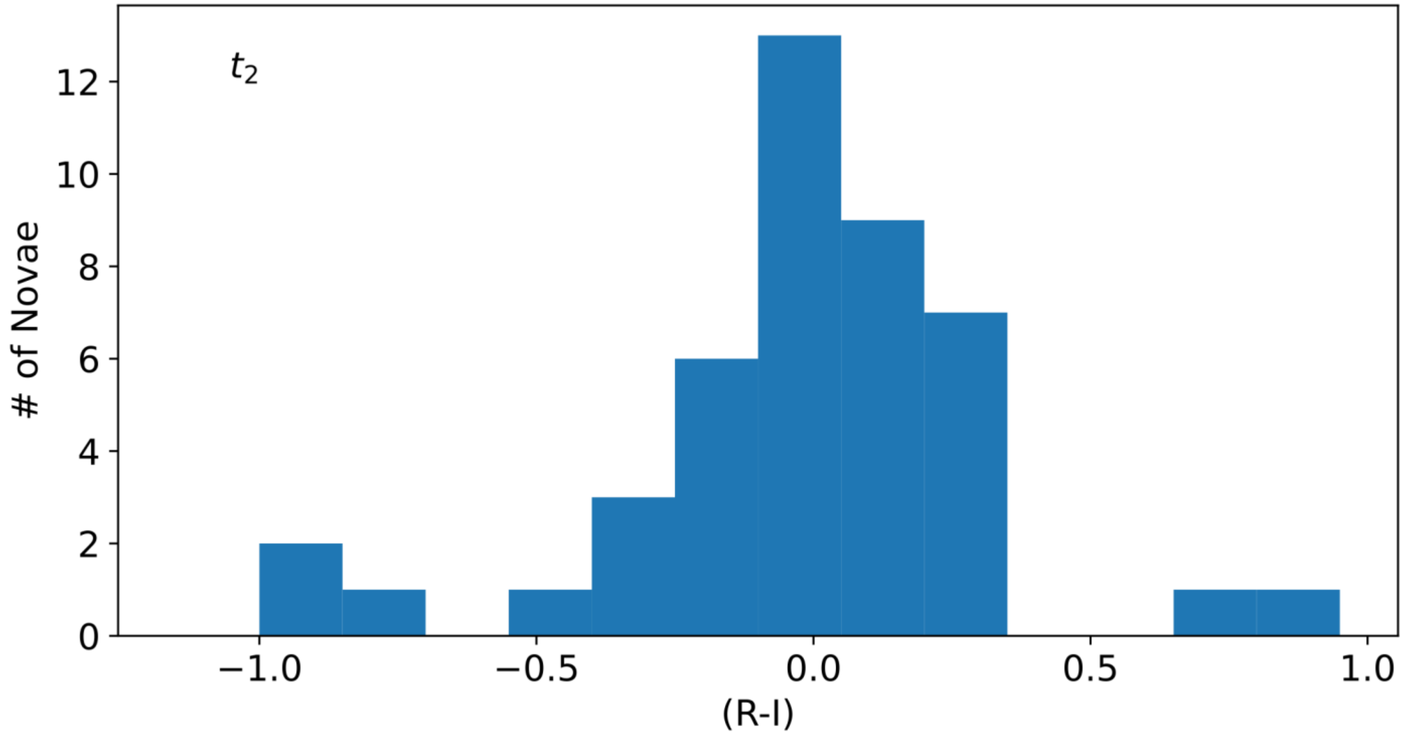
$(R-I)_0 \, att_2$

$N = 44$

$\mu = 0.00$

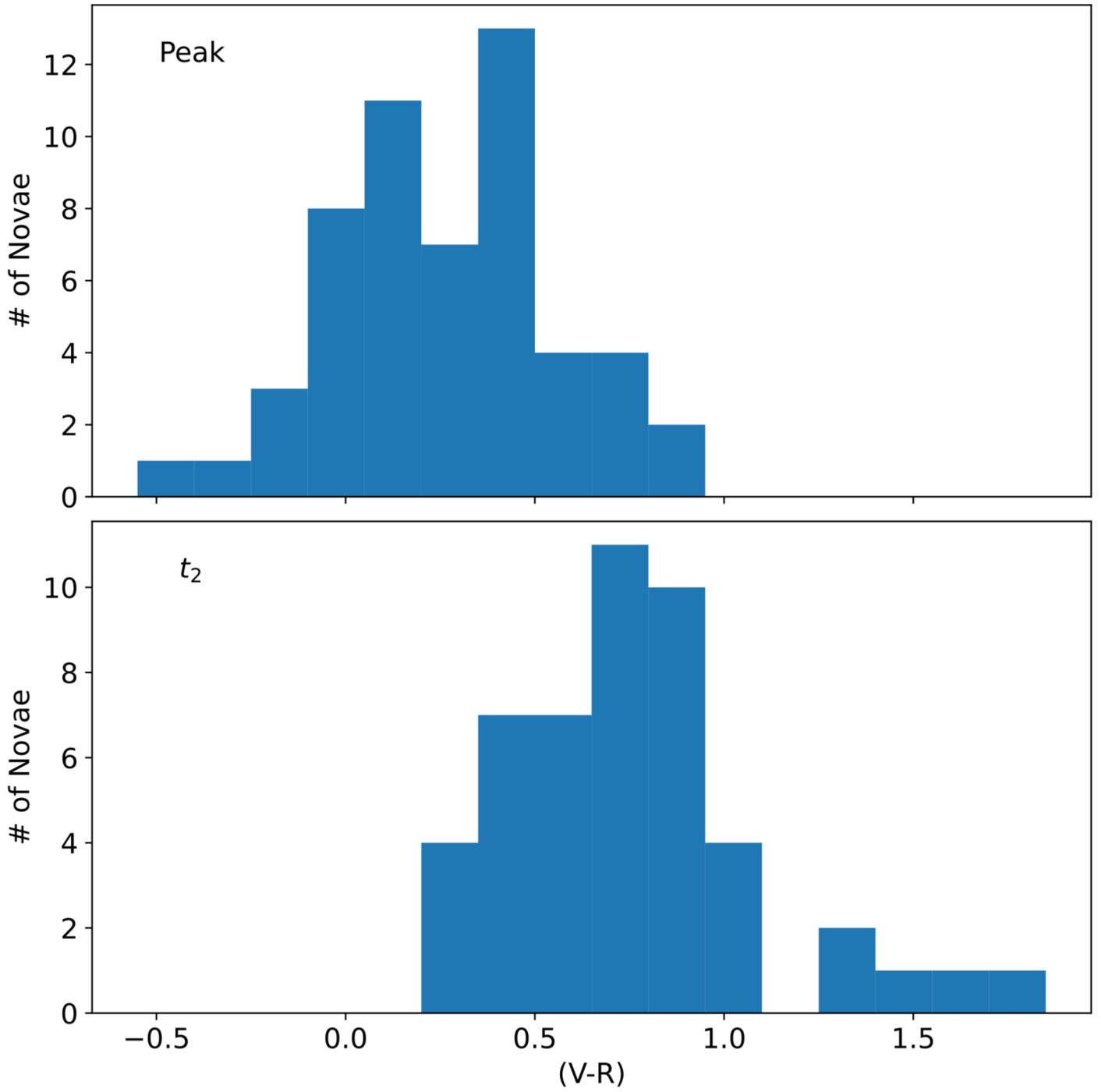
$\sigma = 0.33$



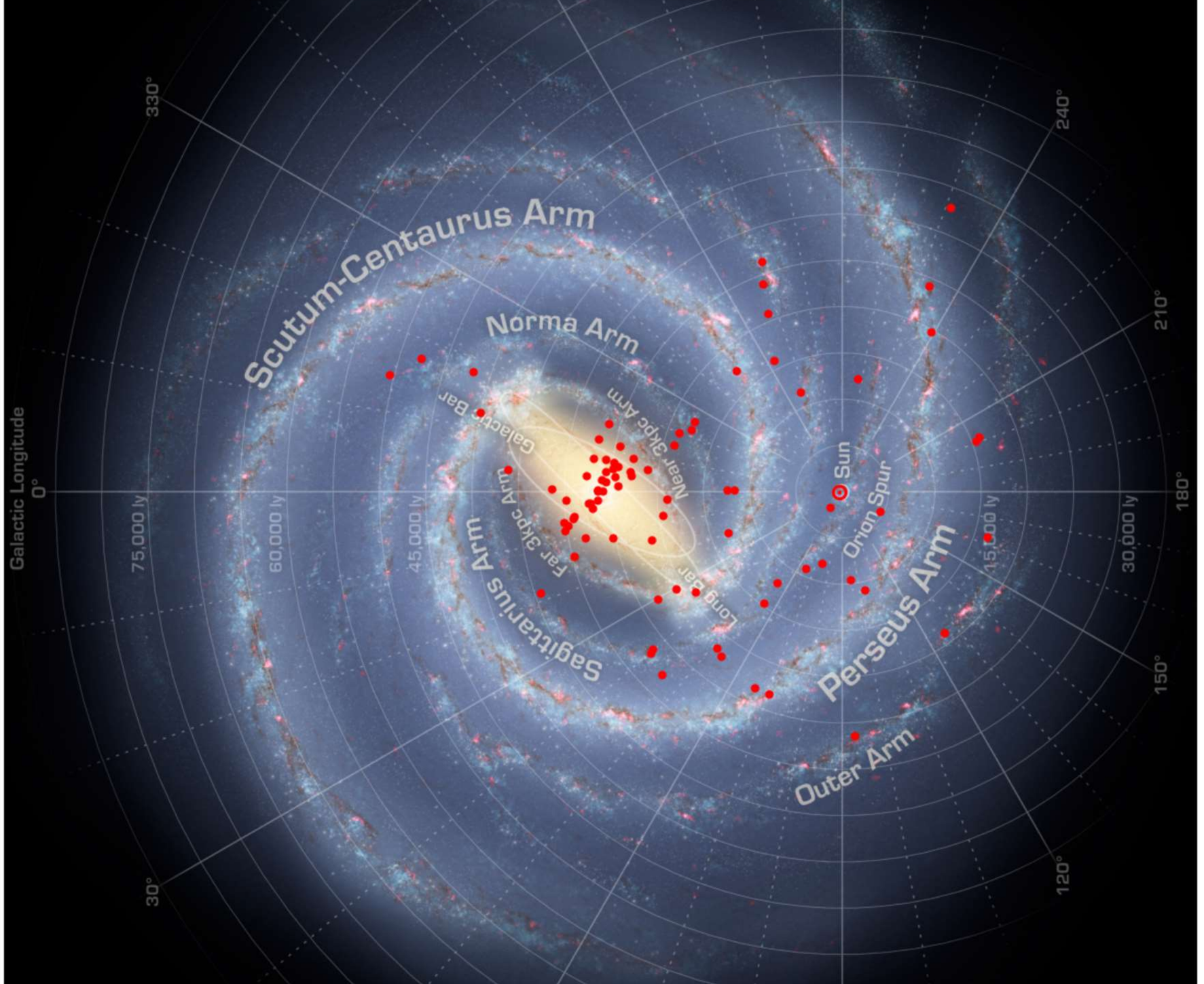


$(V-R)_0 at\ Peak$
$N = 54$
$\mu = 0.26$
$\sigma = 0.25$

$(V-R)_0 at t_2$
$N = 48$
$\mu = 0.75$
$\sigma = 0.33$

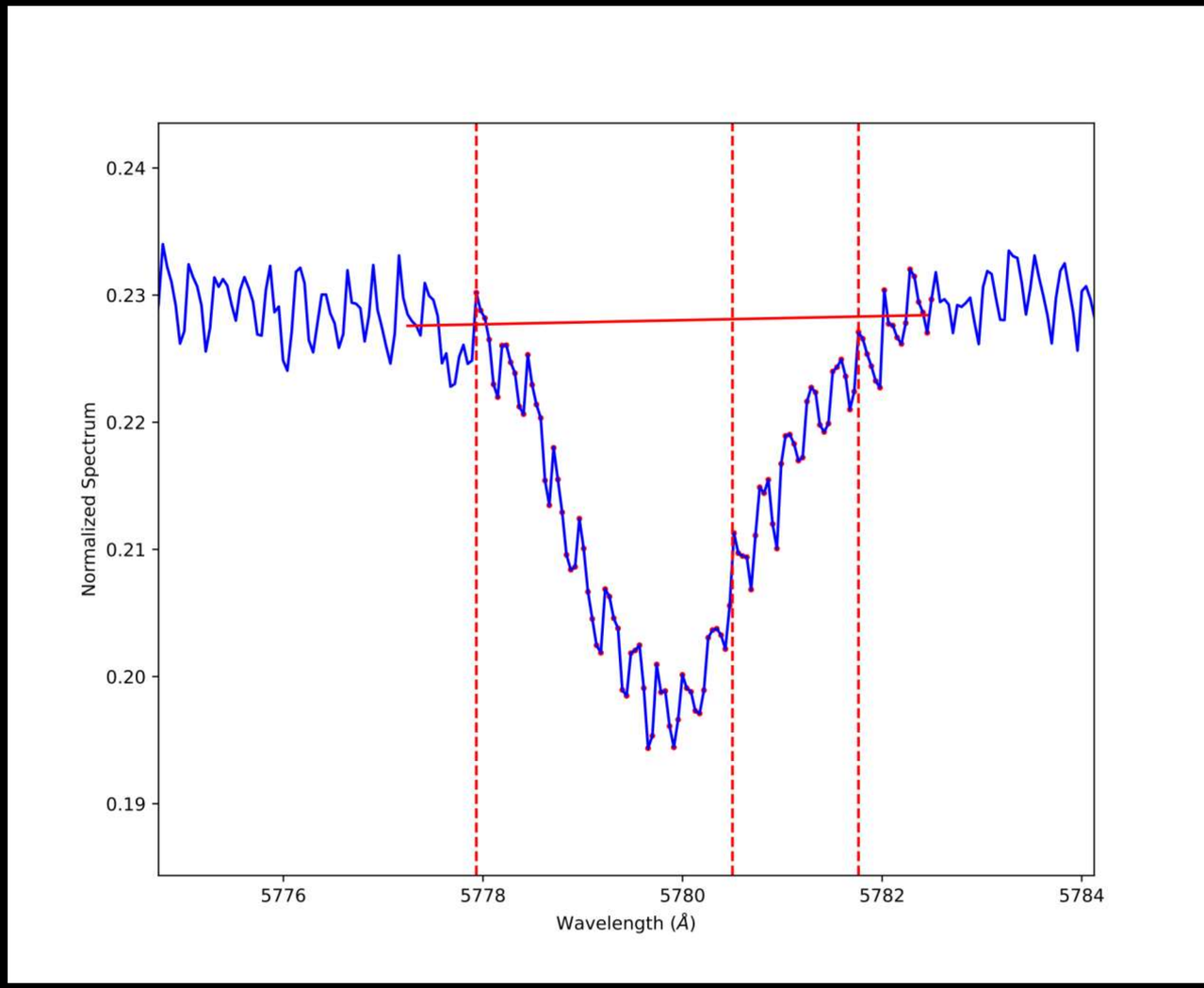


Background Image Credit: NASA/JPL-Caltech/R. Hurt (SSC/Caltech)



Python code for E(B-V) Measurements

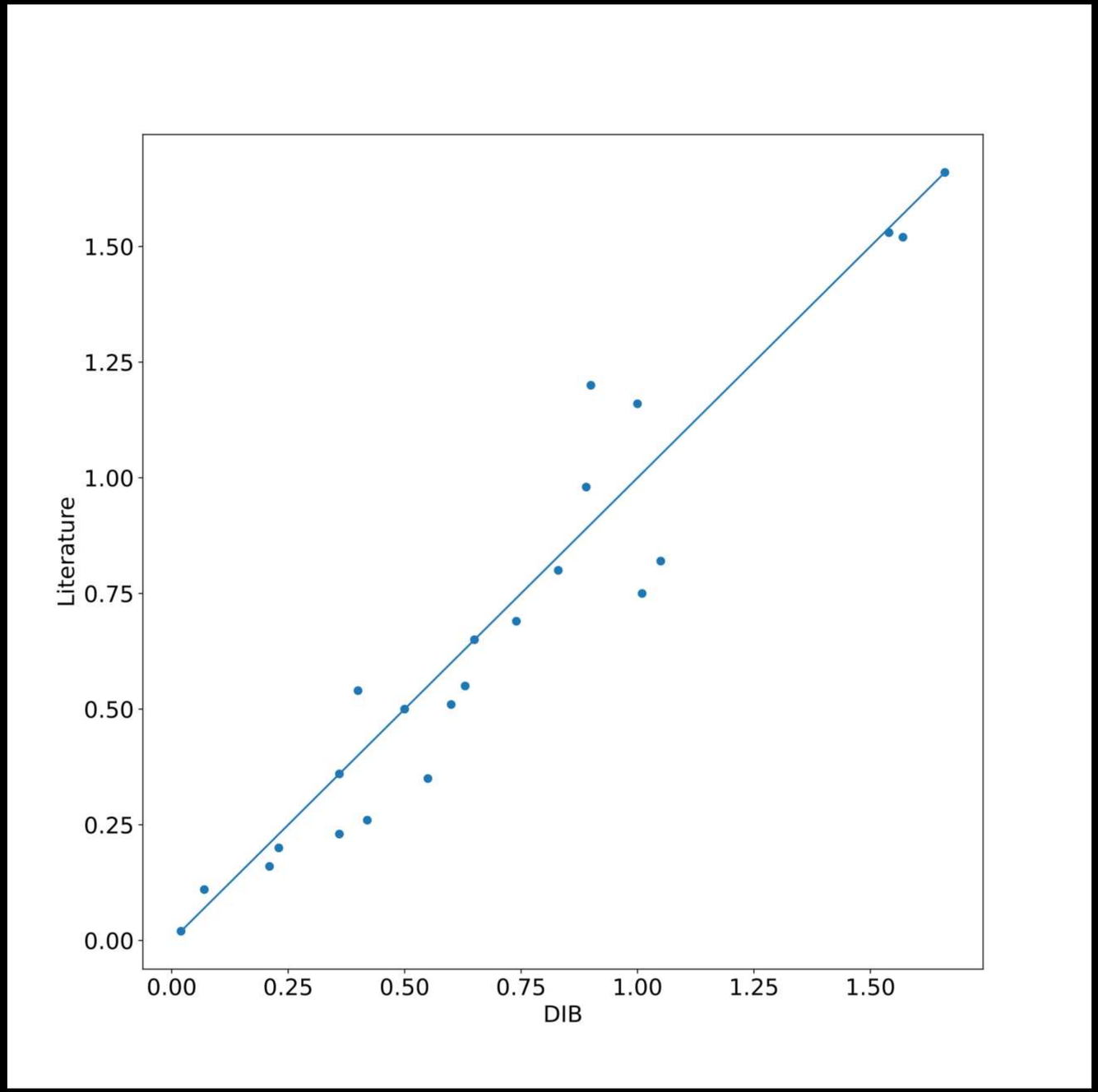
We will provide a tool for using available distances, light curves, and spectra to make E(B-V) measurements for novae



Conclusions

- Photometric colors of novae are fairly stable
- Dispersion is still ~0.2 magnitudes for our best samples
- Photometry likely won’t give the most accurate measure of E(B-V)
- Is good enough to provide a decent estimate though, and a distance measure too

Sample	N	Mean	+/- Mean	Median	Sigma
(B-V) Peak Bronze	60	0.22	0.04	0.21	0.31
(B-V) Peak Silver	22	0.17	0.07	0.14	0.3
(B-V) Peak Gold	16	0.11	0.08	0.08	0.3
(B-V) t_2 Bronze	55	0.01	0.03	0.02	0.21
(B-V) t_2 Silver	24	-0.04	0.05	-0.06	0.22
(B-V) t_2 Gold	16	-0.12	0.05	-0.13	0.2
(R-I) Peak Bronze	45	0.14	0.04	0.16	0.27
(R-I) Peak Silver	18	0.09	0.06	0.06	0.27
(R-I) Peak Gold	10	0.05	0.09	0.03	0.27
(R-I) t_2 Bronze	44	0.0	0.05	0.03	0.33
(R-I) t_2 Silver	17	0.03	0.04	0.09	0.17
(R-I) t_2 Gold	10	-0.09	0.1	-0.03	0.31
(V-R) Peak Bronze	54	0.26	0.04	0.28	0.29
(V-R) Peak Silver	21	0.19	0.06	0.18	0.25
(V-R) Peak Gold	13	0.16	0.08	0.12	0.27
(V-R) t_2 Bronze	48	0.76	0.05	0.72	0.33
(V-R) t_2 Silver	20	0.64	0.06	0.65	0.27
(V-R) t_2 Gold	13	0.58	0.07	0.64	0.24


Literature
DIB
0.00
0.25
0.50
0.75
1.00
1.25
1.50

Novae on the Sky