



Data Validation (DV) Report
for TESS ID 86396382
Sectors 20 - 20

This Data Validation Report was produced in the
TESS Science Processing Operations Center (SPOC) Pipeline
at NASA Ames Research Center

02-Feb-2020 10:24:42 Z

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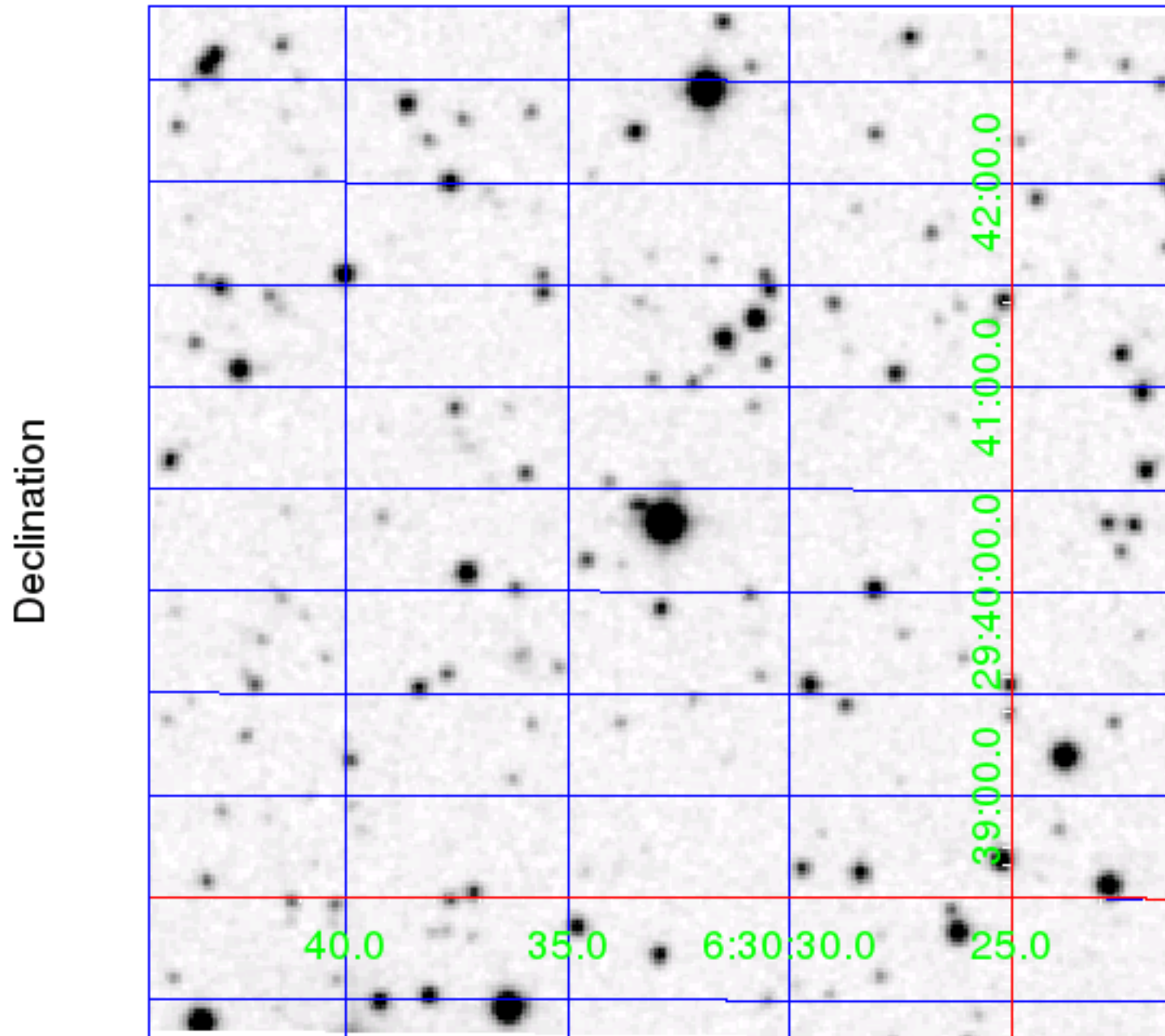
1 Summary

Target Properties	Value	Uncertainty	Units	Provenance
Catalog ID	86396382			
TOI ID	-			
TESS Name	-			
RA	97.63665283	0	degrees	TIC8
Dec	29.67229620	0	degrees	TIC8
Magnitude	11.0967	0.0126		TIC8
Radius	1.749	0.081	Solar radii	TIC8
Effective Temperature	6154	106	Kelvin	TIC8
log(g)	4.020	0.080303	cm/sec ²	TIC8
[M/H]	0.210	0.1	Solar metallicity	TIC8
Stellar Density	0.219	0.042	Solar density	TIC8-Derived
Limb Darkening Coefficient 1	0.5434			
Limb Darkening Coefficient 2	0.15953			
Limb Darkening Coefficient 3	0.0055546			
Limb Darkening Coefficient 4	-0.058631			
Number of Planet Candidates	1			
TOI Model	csv-file-toi-catalog-01-29-20-edited.csv			
TESS Names Model	-			
External TCE Model	-			
Software Revision	spoc-4.0.17-20200130			
Date Report Generated	02-Feb-2020 10:24:42 Z			

Sector	Target Table	Camera/ CCD	Crowding Metric	Flux Fraction
20	191	1:3	0.9898	0.8386

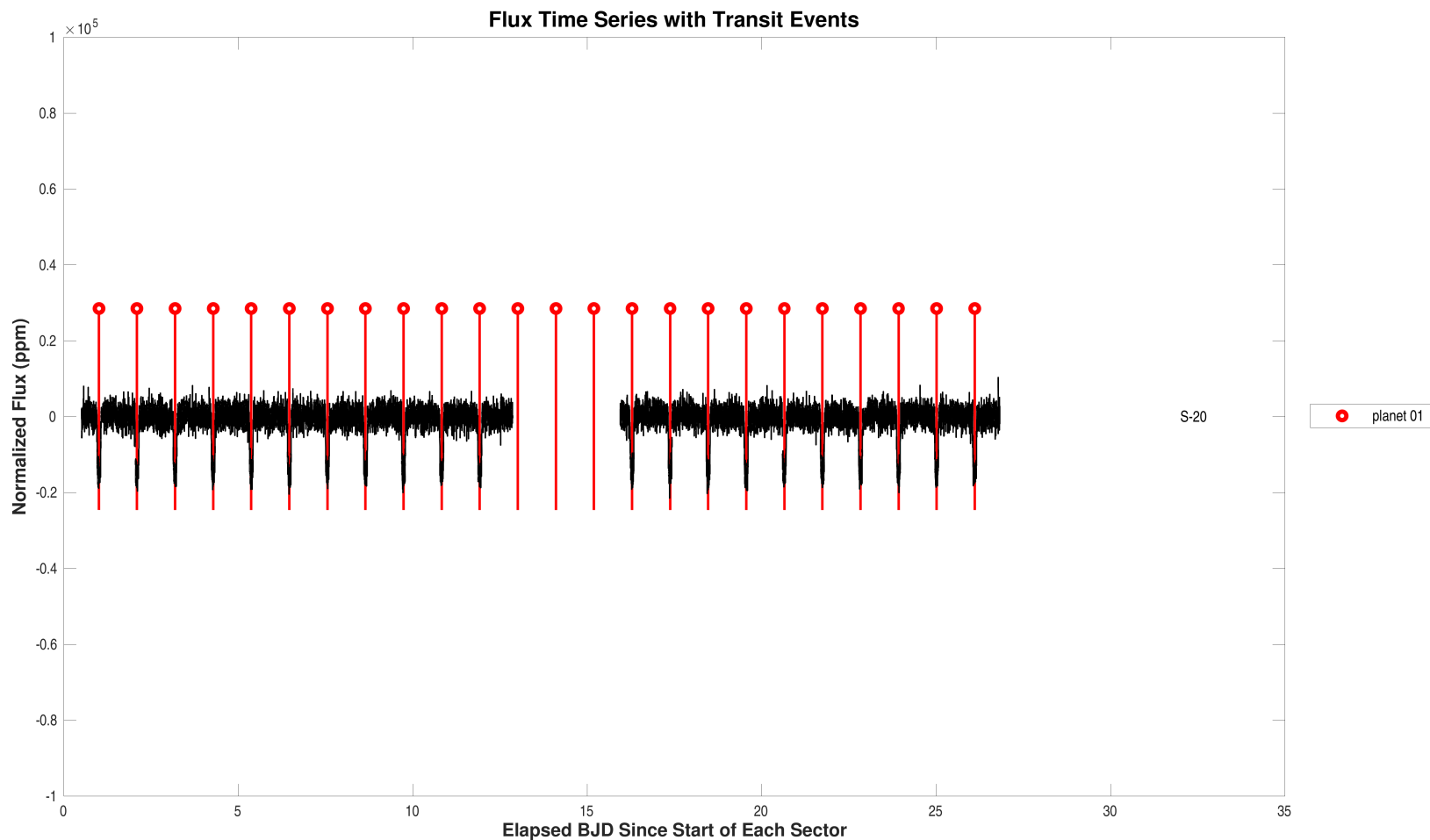
Planet Candidate	TOI ID	TESS Name	TOI Correlation	Period (days)	Period Ratio	Epoch (BTJD)	Semi-major Axis (AU)	Radius (Re)	Seff	Teq (K)	False Alarm	Suspected EB
1	-	-	-	1.091	1.00	1843.005	0.02	22.3	8220.8	2429	0.00e+00	false

2 Survey Image

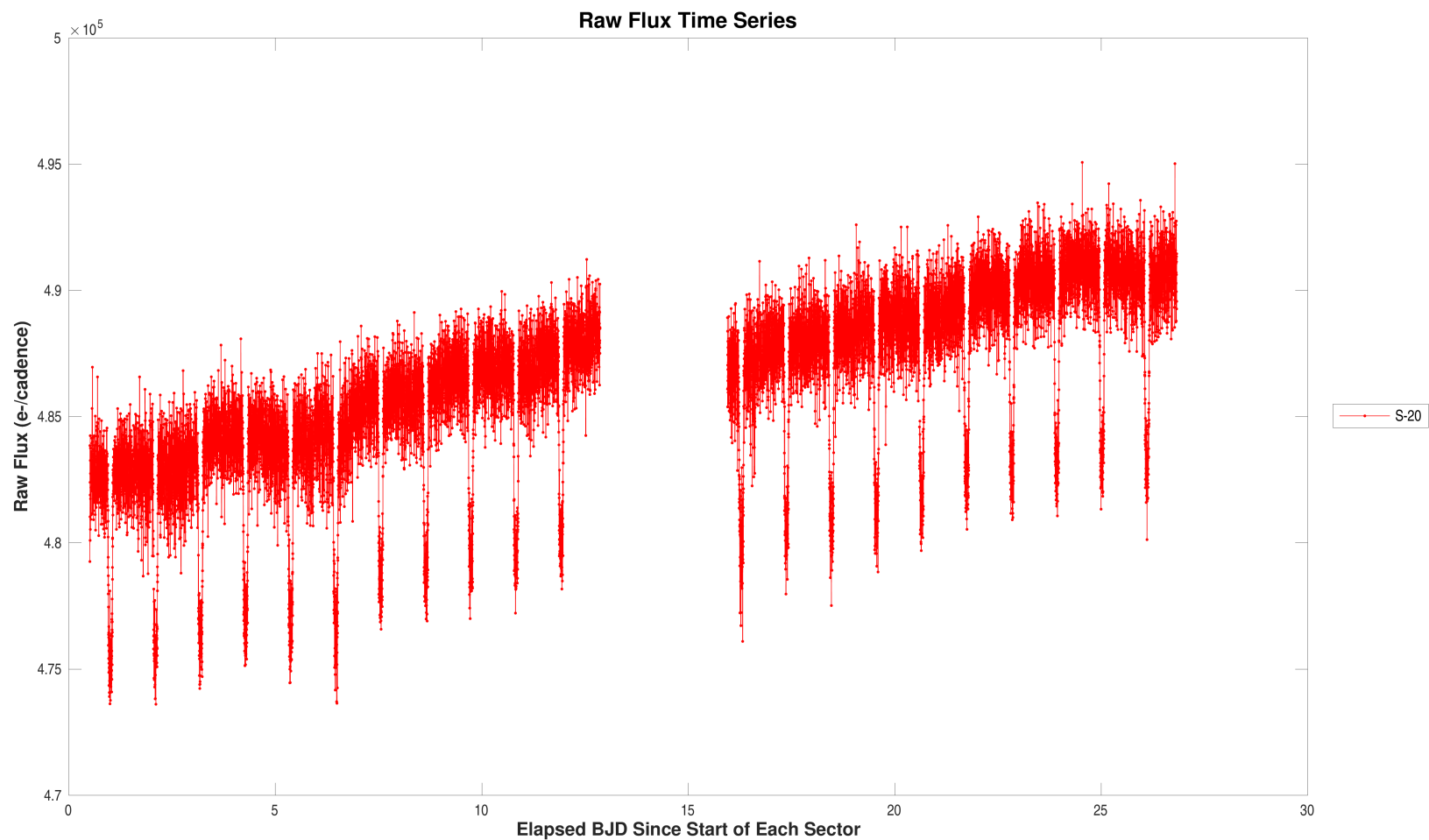


Digitized Sky Survey (DSS) red image. The 5' x 5' image is centered on the J2000 coordinates of target (86396382).

3 Flux Time Series



Summary plot of sector-stitched flux time series and transits for target 86396382, marked with DV fitted epoch/period (or TPS epoch/period if fit was not successful). Transits of identified planets are labeled with epoch BTJD and orbital period. For the data of sector 20, target table 191, start BJD is 2458842. Open `./summary-plots/0000000086396382-00-flux-dv-fit-20-191.fig`



Summary plot of raw flux time series. For the data of sector 20, target table 191, start BJD is 2458842.
Open `./summary-plots/000000086396382-00-raw-flux-20-191.fig`

4 Dashboards

Planet Candidate 1

Model Fitter	Stellar Radius 1.7 ± 0.1 Solar units		Core Aperture Correlation Statistic Value = 133.96 Significance = 100.00%		Ghost Diagnostic Test
	Period = 1.1 ± 0.0 days Depth = 15542 ± 76 ppm Planet Radius = 22.3 ± 1.0 Earth radii Semi-major Axis = 0.0 ± 0.0 AU Effective Stellar Flux = 8220.8 ± 1187.6 Equilibrium Temperature = 2429 ± 88 Kelvin Chi-squared/DoF = 0.8 SNR = 205.9		Halo Aperture Correlation Statistic Value = 21.05 Significance = 100.00% Core/Halo Ratio Ratio = 6.36		
Eclipsing Binary Discrimination Test	Odd-Even Depth Comparison Statistic Value = 6.59e-02 Significance = 79.74%		Offsets Relative to Out of Transit Centroid Source RA Offset = -1.04e-01 ± 2.50e+00 arcsec (-0.04 σ) Source Dec Offset = 1.39e-02 ± 2.50e+00 arcsec (0.01 σ) Source Offset Distance = 1.05e-01 ± 2.50e+00 arcsec (0.04 σ) Offsets Relative to TIC Position Source RA Offset = 6.09e-01 ± 2.50e+00 arcsec (0.24 σ) Source Dec Offset = 7.40e-01 ± 2.50e+00 arcsec (0.30 σ) Source Offset Distance = 9.59e-01 ± 2.50e+00 arcsec (0.38 σ)		Difference Image Centroid Offsets
	Shorter Period Comparison Statistic Value = <i>N/A</i> Significance = <i>N/A</i>	Longer Period Comparison Statistic Value = <i>N/A</i> Significance = <i>N/A</i>	False Alarm = 0.00e+00 Transit Count = 24 Max Multiple Event Statistic = 188.5		

Summary of model fitter results and validation test results for target 86396382, planet candidate 1. In general, green denotes that the candidate is likely a planet, while red denotes that the candidate is unlikely to be a planet. Cyan denotes that no data is available. The color of the Model Fitter block is: green, when the SNR of the fit is greater than or equal to 10; yellow, if the SNR is greater than or equal to 7.1 but less than 10; red, if the SNR is less than 7.1 or if the fitter failed. The color of the Ghost Diagnostic Test and Eclipsing Binary Discrimination Test blocks are: green, when the significance is within 2-sigma; yellow, when the significance is between 2- and 3-sigma; red when the significance is greater than 3-sigma. The color of the Difference Image Centroid Offsets block is: green, when the max offset distance sigma is less than or equal to 2; yellow, when the max sigma is between 2 and 3; red when the max sigma is greater than 3. The color of the Bootstrap Test block is green whenever the false alarm probability is less than 10^{-12} , low enough to limit the total number of false alarms from a four year mission to less than one. If the false alarm probability is greater than 10^{-12} , the color of the Bootstrap Test block is: green, when the false alarm probability is less than or equal to the CCDF of a Gaussian distribution at the observed maximum multiple event statistic; yellow when the false alarm probability is between 1 and 2 times that of a Gaussian distribution at the max multiple event statistic; and red when the false alarm probability is more than 2 times that of a Gaussian distribution at the max multiple event statistic.

5 Pixel Level Diagnostics

To reduce clutter, the catalog IDs in the difference images have been replaced by indices representing distance from the target star. The mapping between the indices and the catalog IDs is found in a table at the end of this section.

5.1 Planet Candidate 1

Multi-Sector Average PRF Fit of the Difference Images

Mean offset from the PRF fit to the out of transit image

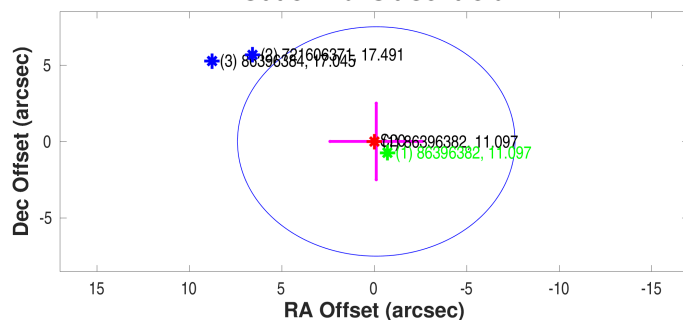
	RA	Dec	Units
Offset	$-0.1039 \pm 2.50e + 00$	$0.0139 \pm 2.50e + 00$	arcseconds
Offset/ σ	-0.04	0.01	
Offset Distance	$0.1048 \pm 2.50e + 00$		arcseconds
Offset Distance/ σ	0.04		
3σ Radius	7.5092		arcseconds

Mean offset from the TIC RA and Dec

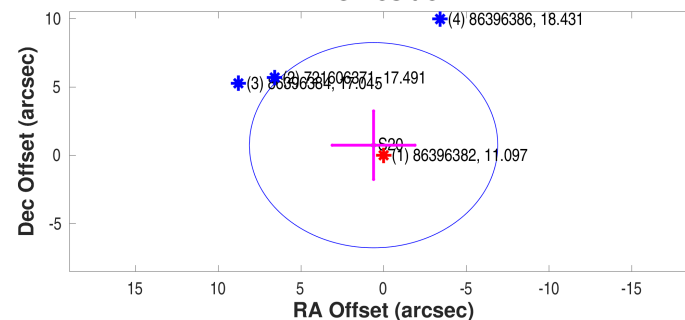
	RA	Dec	Units
Offset	$0.6095 \pm 2.50e + 00$	$0.7402 \pm 2.50e + 00$	arcseconds
Offset/ σ	0.24	0.30	
Offset Distance	$0.9588 \pm 2.50e + 00$		arcseconds
Offset Distance/ σ	0.38		
3σ Radius	7.5089		arcseconds

Planet Candidate 1

Offsets Relative to Out of Transit Centroid



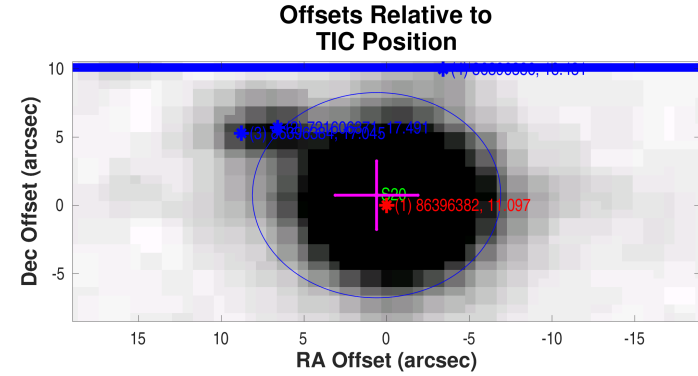
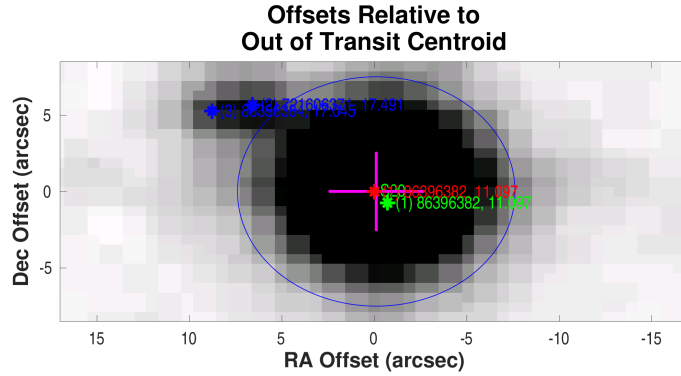
Offsets Relative to TIC Position



Difference image centroid offsets for target 86396382, planet candidate 1. Left: difference image PRF centroid offsets in RA and Dec with respect to the per sector out-of-transit centroids for the given target. Right: difference image PRF centroid offsets in RA and Dec with respect to the TIC coordinates of the given target. Symbol key: green cross: per sector centroid offsets with 1-sigma error bars in RA and Dec; magenta cross: robust weighted mean offset over all sectors with 1-sigma error bars in RA and Dec; blue circle: 3-sigma radius of confusion for weighted mean offset; red asterisk: location of target star (out-of-transit centroid in left panel and TIC position in right panel); green asterisk: TIC location of target star with respect to out-of-transit centroid; blue asterisk: location of other TIC objects in the neighborhood. TIC ID and magnitude are noted in the text associated with each marked object. A constant error term of 2.5000 arcseconds has been added in quadrature to the computed uncertainty in the RA and Dec components of the robust mean offset.

Open `./planet-01/difference-image/0000000086396382-01-difference-image-centroid-offsets.fig`

Planet Candidate 1



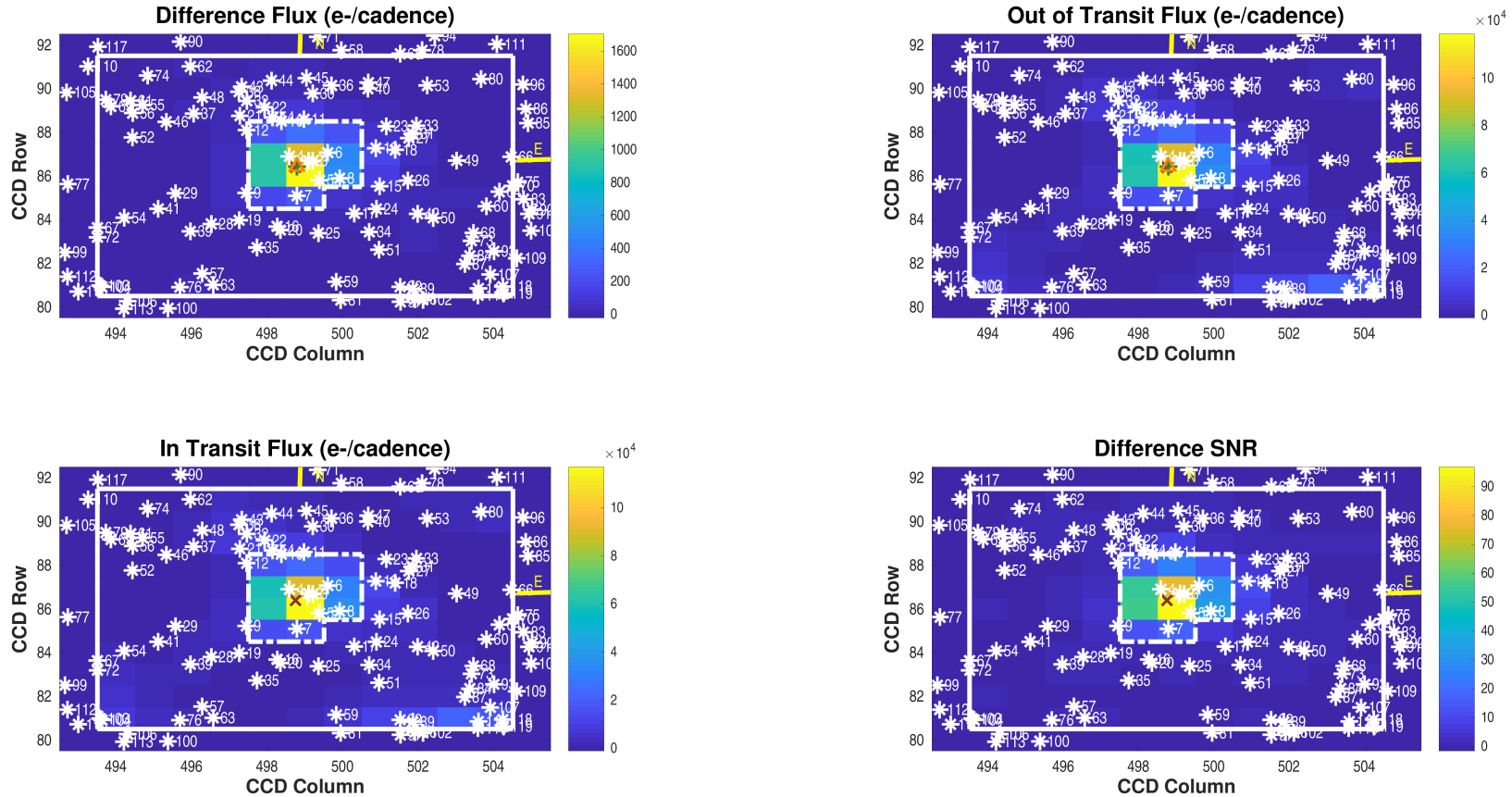
Difference image centroid offsets for target 86396382, planet candidate 1, displayed on survey image for given target. Left: difference image PRF centroid offsets in RA and Dec with respect to the per sector out-of-transit centroids for the given target. Right: difference image PRF centroid offsets in RA and Dec with respect to the TIC coordinates of the given target. Symbol key: green cross: per sector centroid offsets with 1-sigma error bars in RA and Dec; magenta cross: robust weighted mean offset over all sectors with 1-sigma error bars in RA and Dec; blue circle: 3-sigma radius of confusion for weighted mean offset; red asterisk: location of target star (out-of-transit centroid in left panel and TIC position in right panel); green asterisk: TIC location of target star with respect to out-of-transit centroid; blue asterisk: location of other TIC objects in the neighborhood. TIC ID and magnitude are noted in the text associated with each marked object. A constant error term of 2.5000 arcseconds has been added in quadrature to the computed uncertainty in the RA and Dec components of the robust mean offset.

Open `./planet-01/difference-image/0000000086396382-01-difference-image-centroid-offsets-survey.fig`

Difference Image Summary Metrics

Number of Difference Images	Number of Metrics	Number of Good Metrics	Fraction of Good Metrics	Quality Threshold
1	1	1	1.0000	0.70

Difference Image
Planet Candidate 1 / Sector 20 / Target Pixel Table 191



Difference image for target 86396382, planet candidate 1, sector 20, target pixel table 191. Upper left: difference between mean flux out-of-transit and in-transit; upper right: mean out-of-transit flux; lower left: mean in-transit flux; lower right: difference between mean flux out-of-transit and in-transit after normalizing by the uncertainty in the difference for each pixel. The optimal aperture is outlined with a white dash-dotted line in each panel and the target mask is outlined with a solid white line. Symbol key: x: target position from TIC RA and Dec converted to CCD coordinates via motion polynomials; *: position of nearby TIC objects converted to CCD coordinates via motion polynomials; +: PRF-fit location of target from out-of-transit image; triangle: PRF-fit location of transit source from the difference image. Number of transits = 21; number of valid in-transit cadences = 1440; number of in-transit cadence gaps = 9; number of valid out-of-transit cadences = 3877; number of out-of-transit cadence gaps = 25. Difference image quality metric = 1.00 (good).

Open `./planet-01/difference-image/0000000086396382-01-difference-image-20-191.fig`

PRF Fit of the Difference Image

Offset from the PRF fit to the out of transit image

	Row	Column	Units	RA	Dec	Units
Out of Transit Image Centroid	$86.43 \pm 4.39e - 05$	$498.78 \pm 5.20e - 05$	pixels	$97.63687078 \pm 2.41e - 06$	$29.67245927 \pm 2.46e - 06$	degrees
Difference Image Centroid	$86.43 \pm 5.86e - 03$	$498.78 \pm 6.92e - 03$	pixels	$97.63683758 \pm 3.96e - 05$	$29.67246313 \pm 3.36e - 05$	degrees
Offset	$0.0004 \pm 5.86e - 03$	$-0.0053 \pm 6.92e - 03$	pixels	$-0.1039 \pm 1.24e - 01$	$0.0139 \pm 1.21e - 01$	arcseconds
Offset/ σ	0.07	-0.77		-0.84	0.11	
Offset Distance	$0.0053 \pm 6.89e - 03$		pixels	$0.1048 \pm 1.24e - 01$		arcseconds
Offset Distance/ σ	0.77			0.85		

Offset from the TIC RA and Dec converted to pixels via motion polynomials

	Row	Column	Units	RA	Dec	Units
TIC Reference Centroid	$86.39 \pm 4.28e - 04$	$498.75 \pm 4.19e - 04$	pixels	$97.63664272 \pm 0.00e + 00$	$29.67225752 \pm 0.00e + 00$	degrees
Difference Image Centroid	$86.43 \pm 5.86e - 03$	$498.78 \pm 6.92e - 03$	pixels	$97.63683758 \pm 3.96e - 05$	$29.67246313 \pm 3.36e - 05$	degrees
Offset	$0.0402 \pm 5.88e - 03$	$0.0321 \pm 6.93e - 03$	pixels	$0.6095 \pm 1.24e - 01$	$0.7402 \pm 1.21e - 01$	arcseconds
Offset/ σ	6.85	4.63		4.92	6.13	
Offset Distance	$0.0515 \pm 6.46e - 03$		pixels	$0.9588 \pm 1.23e - 01$		arcseconds
Offset Distance/ σ	7.96			7.82		

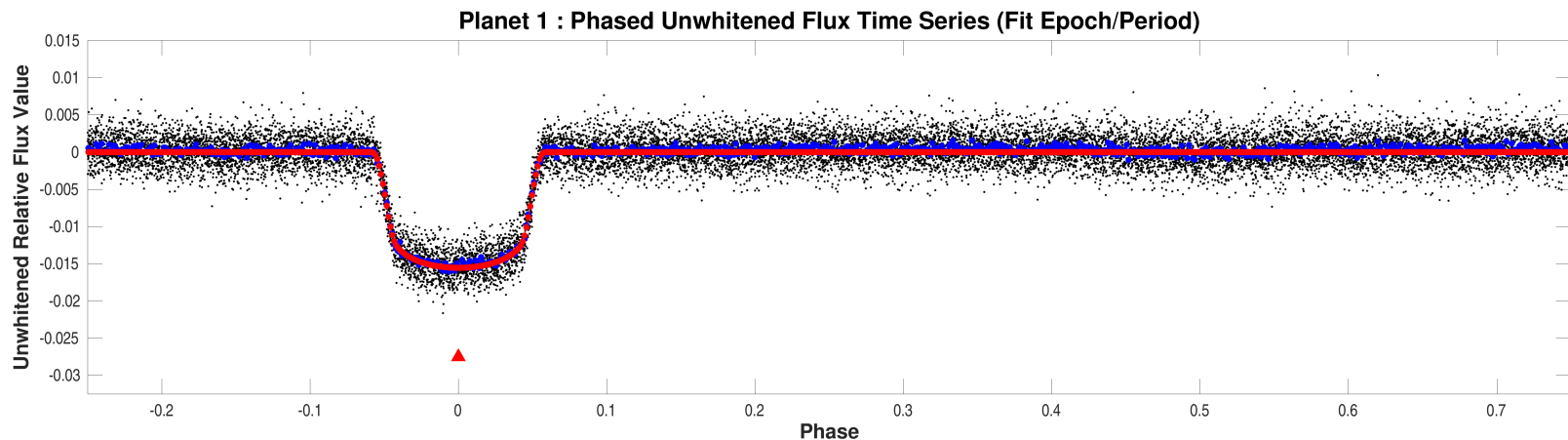
5.2 Difference Image TIC Key

Index	Catalog ID	Mag	RA (degrees)	Dec (degrees)	Distance (arcsec)
1	86396382	11.097	97.63664272	29.67225752	0.00
2	721606371	17.491	97.63875018	29.67383828	8.71
3	86396384	17.045	97.63945065	29.67372354	10.25
4	86396386	18.431	97.63555429	29.67502833	10.54
5	721606363	19.010	97.64066715	29.66892015	17.40
6	721606369	18.136	97.64187805	29.67561591	20.36
7	86396368	16.352	97.63705110	29.66530364	25.07
8	86396378	17.025	97.64399630	29.66927631	25.38
9	86396371	17.488	97.62866270	29.66641801	32.63
10	86396398	17.502	97.63401485	29.68369879	42.00
11	86396399	17.828	97.63775616	29.68400501	42.43
12	721606388	18.111	97.62834455	29.68173850	42.88
13	86396390	16.978	97.64977845	29.67634835	43.65
14	721606370	18.903	97.63254327	29.68467231	46.50
15	86396375	17.301	97.65063017	29.66698485	47.69
16	721606329	18.606	97.63395694	29.65794046	52.22
17	721606362	18.084	97.64661632	29.66053098	52.49
18	721606367	19.599	97.65298863	29.67576879	52.67
19	721606333	18.343	97.62763915	29.65978129	53.01
20	86396354	19.371	97.63451346	29.65704051	55.18
21	86396402	17.294	97.62713900	29.68533363	55.67
22	86396408	14.793	97.63118833	29.68718993	56.40
23	721606365	18.787	97.65135506	29.68164903	57.10
24	86396363	17.796	97.65022900	29.66147600	57.55
25	721606328	18.333	97.64079166	29.65599963	59.95
26	86396377	14.962	97.65524513	29.66818267	60.01
27	86396392	18.820	97.65517300	29.67855500	62.24
28	86396358	15.555	97.62307018	29.65907848	63.67
29	86396373	15.559	97.61699841	29.66687203	64.43
30	721606374	18.518	97.63901888	29.69025063	65.20
31	721606366	19.526	97.65580241	29.67960732	65.51
32	86396411	14.689	97.62818409	29.68894298	65.64
33	86396395	17.011	97.65636567	29.68156622	70.21
34	721606282	18.402	97.64918379	29.65589097	70.78
35	721606330	19.621	97.63077402	29.65296091	71.85
36	721606372	18.792	97.64209669	29.69205175	73.27
37	86396404	18.292	97.61948046	29.68624069	73.59
38	86396418	16.434	97.62684565	29.69122420	74.84

Index	Catalog ID	Mag	RA (degrees)	Dec (degrees)	Distance (arcsec)
39	86396355	16.934	97.61965899	29.65743384	75.30
40	86396415	16.663	97.64811810	29.69098214	76.37
41	86396366	17.995	97.61420658	29.66321313	77.36
42	86396360	17.120	97.65705941	29.65996244	77.70
43	86396422	17.338	97.62726139	29.69242380	78.30
44	721606390	18.453	97.63215242	29.69371113	78.50
45	721606391	19.094	97.63791187	29.69408517	78.68
46	86396400	16.066	97.61502847	29.68444466	80.60
47	86396421	17.445	97.64815929	29.69245953	81.16
48	86396412	17.092	97.62081067	29.69012317	81.17
49	721606364	18.447	97.66321684	29.67270250	83.14
50	86396356	16.299	97.65968663	29.65882651	86.80
51	721606243	18.416	97.65090727	29.65143107	87.25
52	721606349	19.926	97.60953191	29.68086484	90.28
53	721606383	19.696	97.65791263	29.69128746	95.50
54	721606331	18.455	97.60866301	29.66126106	96.06
55	721606355	18.849	97.61101273	29.68875818	99.78
56	86396407	19.091	97.60942569	29.68683592	100.01
57	721606327	19.357	97.62187131	29.64700775	101.97
58	721606392	18.907	97.64349630	29.70059931	104.26
59	721606244	19.124	97.64405086	29.64394710	104.52
60	721606284	18.851	97.66837733	29.66124885	106.88
61	721606356	18.931	97.60900525	29.68987639	107.22
62	721606393	18.671	97.61867304	29.69779593	107.76
63	86396343	16.512	97.62373196	29.64416923	108.88
64	721606286	19.313	97.67043443	29.66469689	109.15
65	721606380	19.195	97.65325348	29.69927072	110.26
66	721606288	18.770	97.67218311	29.67314228	111.21
67	86359992	16.585	97.60428531	29.65906923	111.79
68	721606283	19.149	97.66639026	29.65481968	112.24
69	721606357	18.534	97.60579205	29.68862733	113.07
70	721606287	18.729	97.67256674	29.66603680	114.58
71	86396436	15.777	97.63952757	29.70407615	114.90
72	86359995	17.727	97.60437368	29.65668743	115.45
73	86396349	16.996	97.66610446	29.65293682	115.46
74	86396425	17.443	97.61165277	29.69586942	115.48
75	721606289	19.750	97.67343203	29.66691836	116.67
76	86396342	15.724	97.61826365	29.64385040	117.32

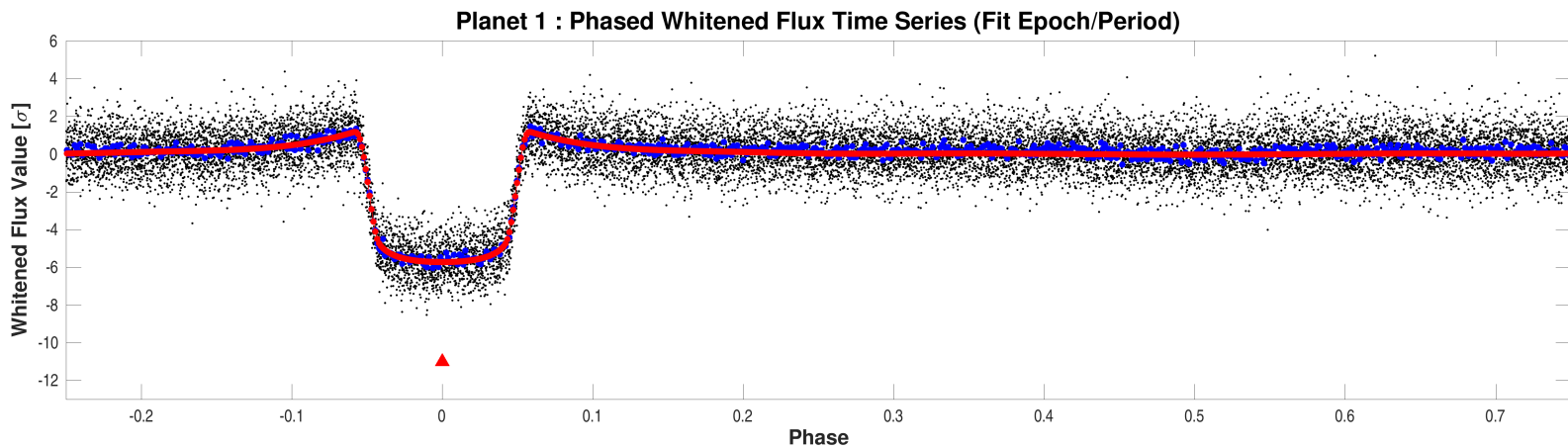
RA, Dec and Distances are corrected for proper motion. This table may not contain all of the objects shown.

6 Phased Light Curves



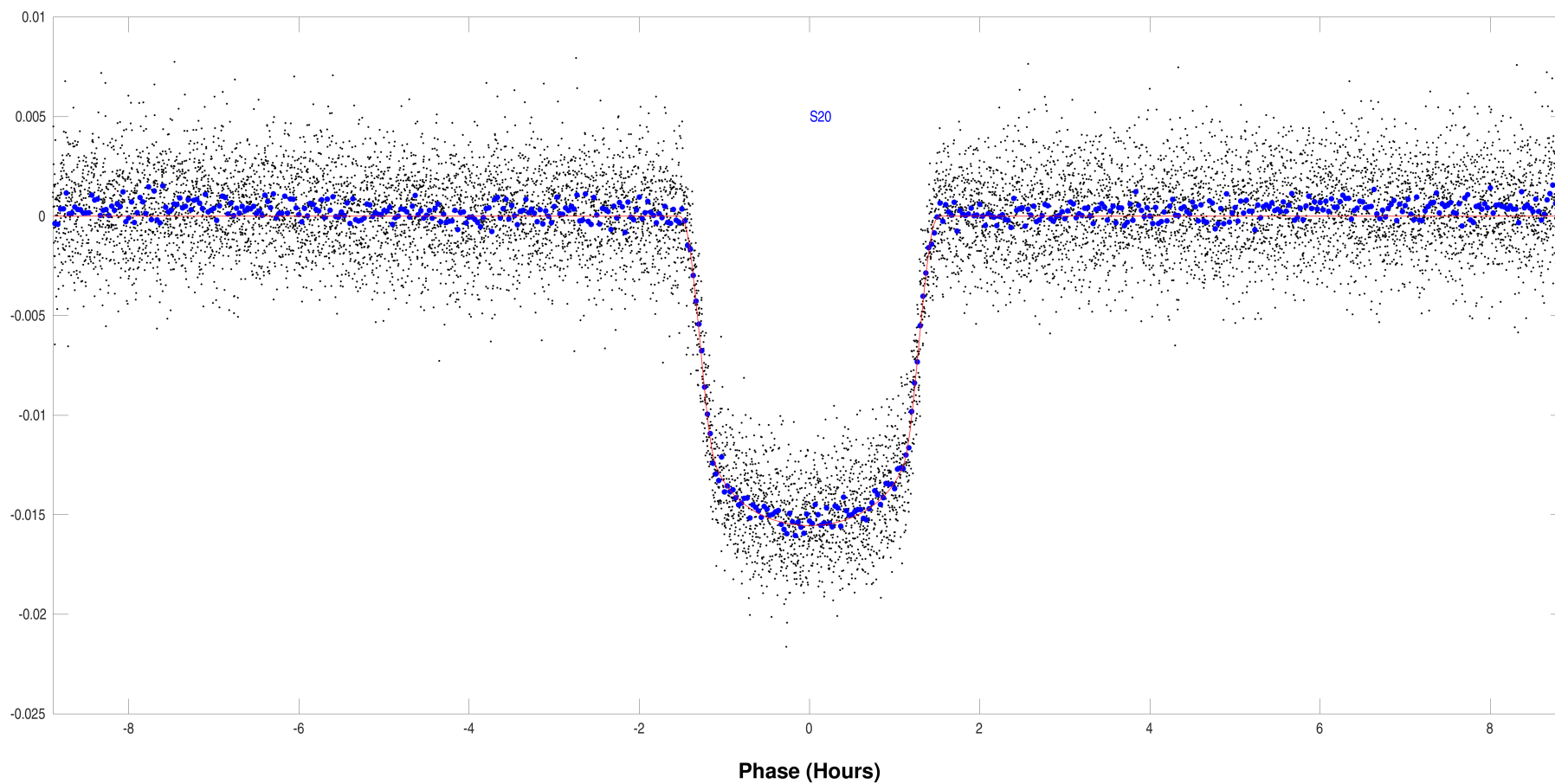
Phased unwhitened flux time series is plotted in black dots. When all transits fit completed with full or secondary convergence, the phase is determined with the fitted epoch and period; otherwise, the phase is determined with the TPS epoch and period. The values of the phased unwhitened flux time series averaged in one cadence wide bins are plotted in bigger blue dots. When all transits fit completes with full or secondary convergence, the averaged values of the phased unwhitened fitted model light curve are plotted in red dots. Transit event markers in different colors indicate the locations of the transits of all planet candidates. The transits of the same planet candidate are labeled with the markers of the same color, for example, blue markers for transits of plane candidate #1, red markers for transits of planet candidate #2, etc.

Open `./summary-plots/0000000086396382-01-phased-unwhitened-flux-time-series.fig`



Phased whitened flux time series is plotted in black dots. When all transits fit completed with full or secondary convergence, the phase is determined with the fitted epoch and period; otherwise, the phase is determined with the TPS epoch and period. The values of the phased whitened flux time series averaged in one cadence wide bins are plotted in bigger blue dots. When all transits fit completes with full or secondary convergence, the averaged values of the phased whitened fitted model light curve are plotted in red dots. Transit event markers in different colors indicate the locations of the transits of all planet candidates. The transits of the same planet candidate are labeled with the markers of the same color, for example, blue markers for transits of plane candidate #1, red markers for transits of planet candidate #2, etc.

Open `./summary-plots/000000086396382-01-phased-whitened-flux-time-series.fig`

Planet: 1 Phased Unwhitened Flux Time Series by Sector

Phased unwhitened flux time series by sector for target 86396382, planet candidate 1. Period = 1.0914 days; transit epoch = 1843.0052 BTJD.
Open `./summary-plots/000000086396382-01-phased-unwhitened-flux-time-series-by-sector.fig`

7 Planet Candidate 1

7.1 Model Fitter: All Transits

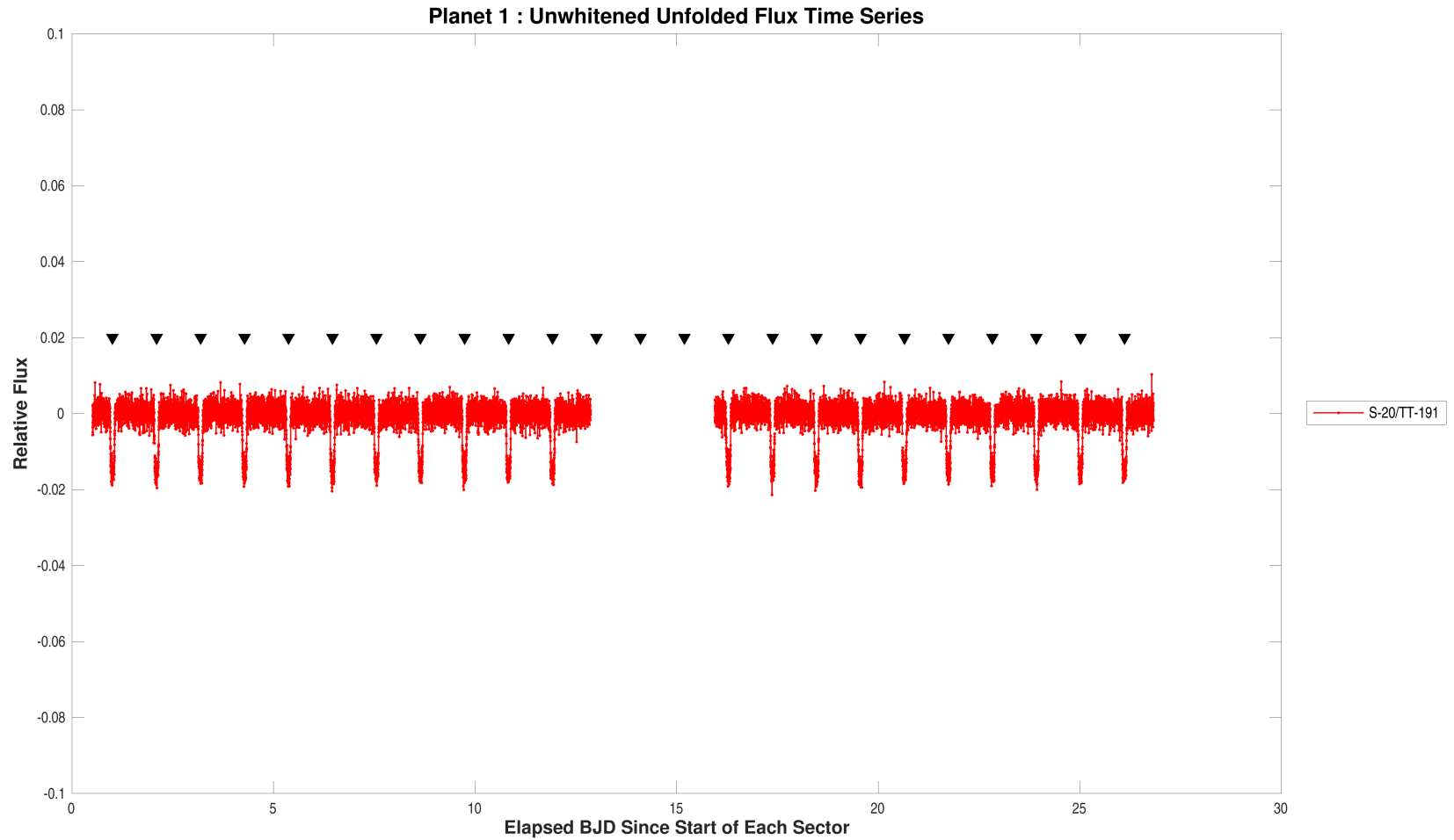
Model Characteristic	Name
Transit Model	mandel-agol_geometric_transit_model
Limb Darkening Model	claret_tess_nonlinear_limb_darkening_model

TCE Parameter	Value	Units
Trial Transit Pulse Duration	2.5	hours
Transit Epoch	1842.9969112	TJD
Orbital Period	1.0916548	days
Maximum SES	46.4	
Maximum MES	188.5	
Robust Statistic	182.3	
Chi Square Goodness of Fit Statistic (DoF)	2005.8 (1474)	
Chi Square2 Statistic (DoF)	283.3 (2959.5)	
Threshold for Desired PFA		

DoF: Degrees of Freedom

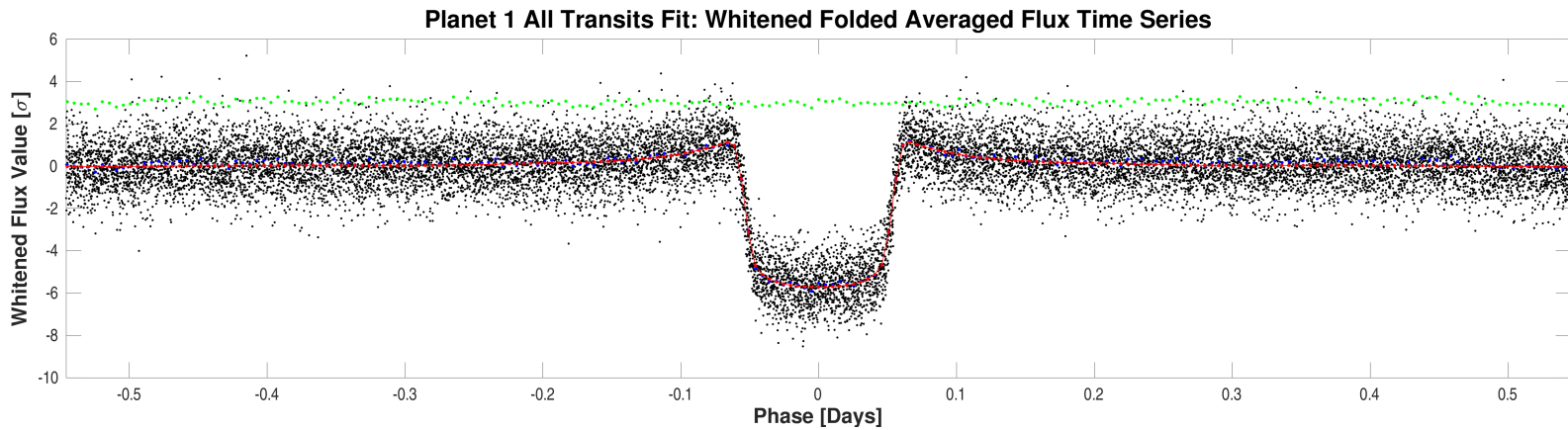
Parameter	Value	Uncertainty	Units
SNR	205.9		
Orbital Period	1.0914099	1.5624e-05	days
Transit Epoch	1843.0051838	2.1560e-04	BTJD
Impact Parameter	0.2525	8.5383e-02	
Planet Radius to Star Radius Ratio	0.1166512	5.6309e-04	
Semi-major Axis to Star Radius Ratio	3.1365	6.4790e-02	
Planet Radius	22.2785	1.0391e+00	Earth radii
Semi-major Axis	0.0219	1.5083e-03	AU
Effective Stellar Flux	8220.7904	1.1876e+03	Goldilocks
Equilibrium Temperature	2429	8.7711e+01	Kelvin
Stellar Density	0.3480	2.1565e-02	Solar density
Transit Depth	15542	7.6243e+01	ppm
Transit Duration	2.9629	1.7188e-02	hours
Transit Ingress Duration	0.3384	1.7109e-02	hours
Eccentricity	0.0000	0.0000e+00	
Peri Longitude	0.0000	0.0000e+00	degrees
Model Chi Square Statistic (DoF)	7355.9 (8982.1)		
Model Chi Square Goodness of Fit Statistic (DoF)	1115.4 (1936)		
Model Chi Square2 Statistic (DoF)	7.2 (20)		

DoF: Degrees of Freedom



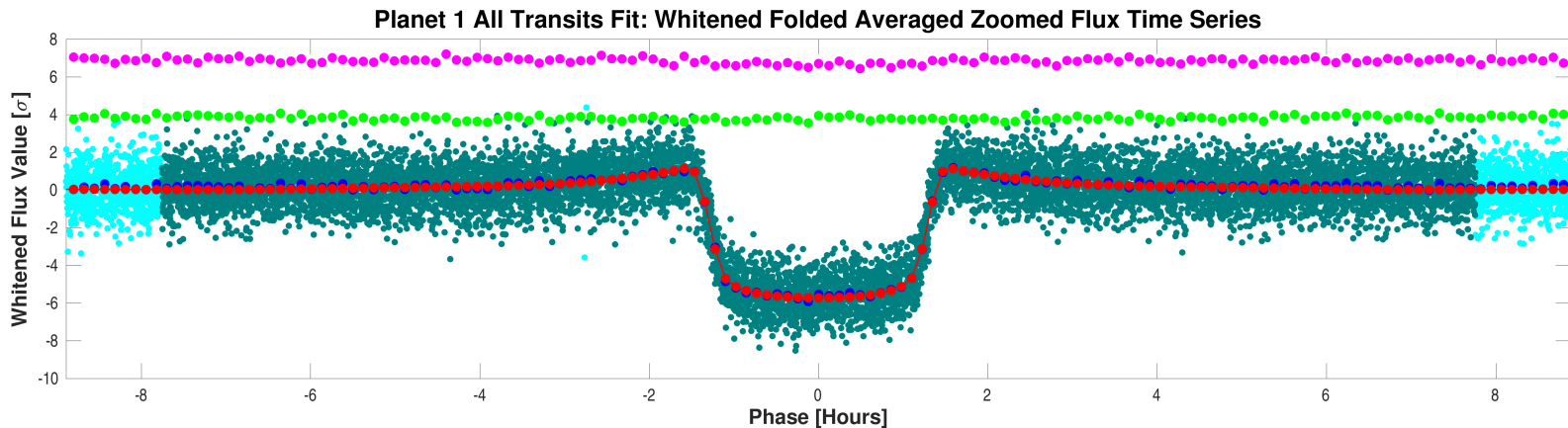
Flux time series for CatId 86396382, Planet candidate 1 in the unwhitened domain. For the data of Sector-20/TargetTableId-191, start BJD is 2458842. Transit event markers indicate the location of transits of the given planet candidate. All transits fit completed with full convergence.

Open `./planet-01/planet-search-and-model-fitting-results/all-transits-fit/000000086396382-01-all-unwhitened-20-191.fig`



Folded flux time series for CatId 86396382, Planet candidate 1 in the whitened domain is plotted in black dots. Values are averaged into 1 cadence wide bins. The blue dots represent the averaged values of the folded flux time series; the red dots represent the averaged values of the folded model light curve of the all transits fit; the green dots are the averaged folded fit residuals, vertically offset for clarity. All transits fit completed with full convergence.

Open `./planet-01/planet-search-and-model-fitting-results/all-transits-fit/000000086396382-01-all-whitened.fig`



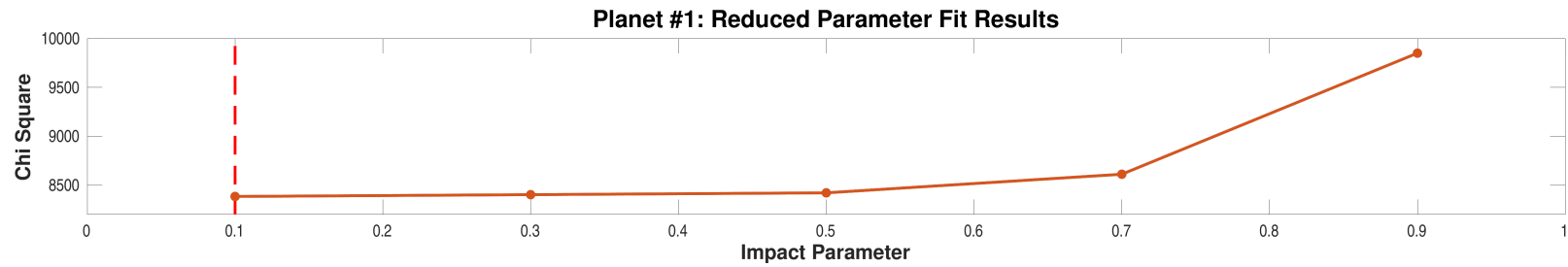
Folded flux time series for CatId 86396382, Planet candidate 1 in the whitened domain, zoomed on the transit. The flux data whose robust weights are larger/smaller than 0.1 are plotted in dark green/cyan dots, respectively. Values are averaged into 1 cadence wide bins. The blue dots represent the averaged values of the folded flux time series; the red dots represent the averaged values of the fitted model light curve of the all transits fit; the green dots are the averaged folded fit residuals, vertically offset for clarity. Magenta dots are the averaged values of the folded flux time series, with a phase shift of 0.5 relative to the blue dots, vertically offset for clarity. All transits fit completed with full convergence.

Open `./planet-01/planet-search-and-model-fitting-results/all-transits-fit/000000086396382-01-all-whitened-zoomed.fig`

7.2 Model Fitter: Reduced Parameter Fit Results

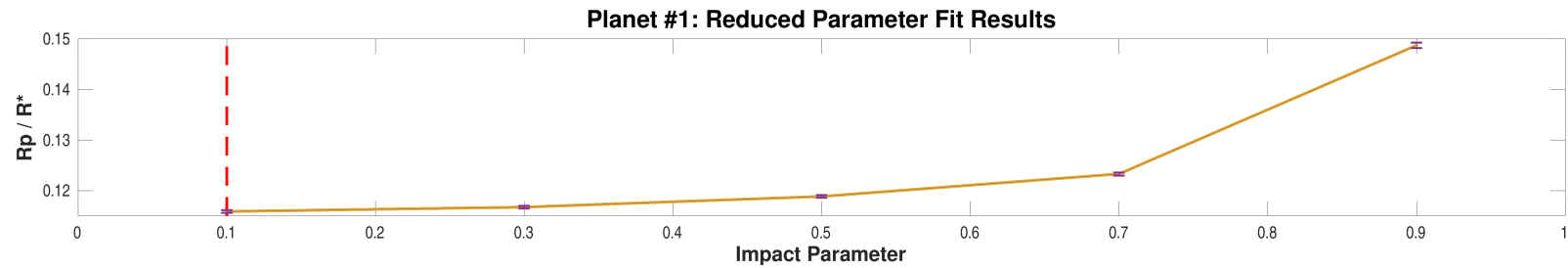
Impact Parameter	SNR	Model Chi Square	Planet Radius to Star Radius	Uncert	Semi-major Axis to Star Radius	Uncert	Transit Depth (ppm)	Uncert	Transit Duration (hours)	Uncert
0.10	214.6	8384.1	0.1159032	2.7510e-04	3.2141	6.7704e-03	15485	7.3056e+01	2.9455	6.4198e-03
0.30	215.8	8402.5	0.1167664	2.7641e-04	3.0947	6.6399e-03	15500	7.2921e+01	2.9746	6.6650e-03
0.50	217.2	8421.2	0.1188705	2.8175e-04	2.8415	6.4825e-03	15558	7.3236e+01	3.0511	7.4266e-03
0.70	217.7	8611.5	0.1233152	3.0050e-04	2.4200	6.3683e-03	15692	7.5753e+01	3.2432	9.6204e-03
0.90	211.6	9850.6	0.1487099	5.0151e-04	1.8694	7.7166e-03	17190	9.6337e+01	3.7584	1.9744e-02

Highlighted row is the best reduced-parameter model fit.



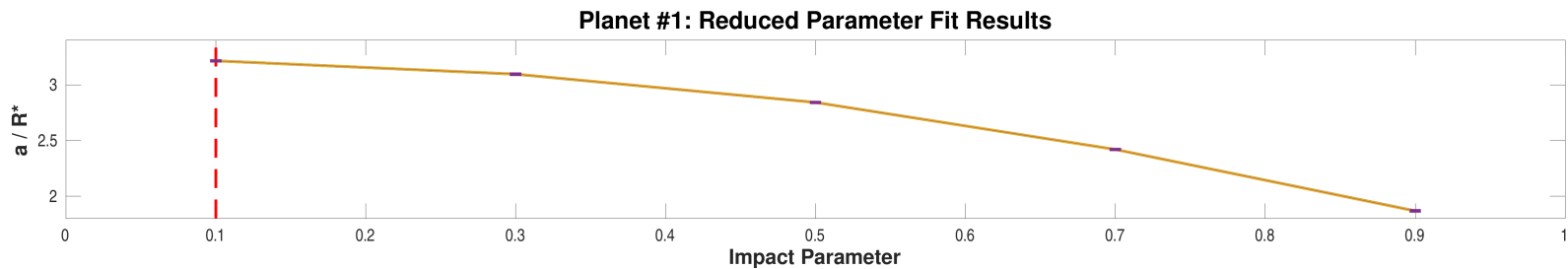
Model chi squares of reduced parameter fits vs. impact parameter for CatId 86396382, Planet candidate 1. The fit result with the minimum chi square is marked with a dashed line in the plot.

Open `./planet-01/planet-search-and-model-fitting-results/reduced-parameter-fits/000000086396382-01-reduced-fits-chi-square.fig`



Ratios of planet radius to star radius of reduced parameter fits vs. impact parameter for CatId 86396382, Planet candidate 1. The fit result with the minimum chi square is marked with a dashed line in the plot.

Open `./planet-01/planet-search-and-model-fitting-results/reduced-parameter-fits/000000086396382-01-reduced-fits-rp-over-rstar.fig`



Ratios of semimajor axis to star radius of reduced parameter fits vs. impact parameter for CatId 86396382, Planet candidate 1. The fit result with the minimum chi square is marked with a dashed line in the plot.

Open `./planet-01/planet-search-and-model-fitting-results/reduced-parameter-fits/000000086396382-01-reduced-fits-a-over-rstar.fig`

7.3 Model Fitter: Trapezoidal Fit Results

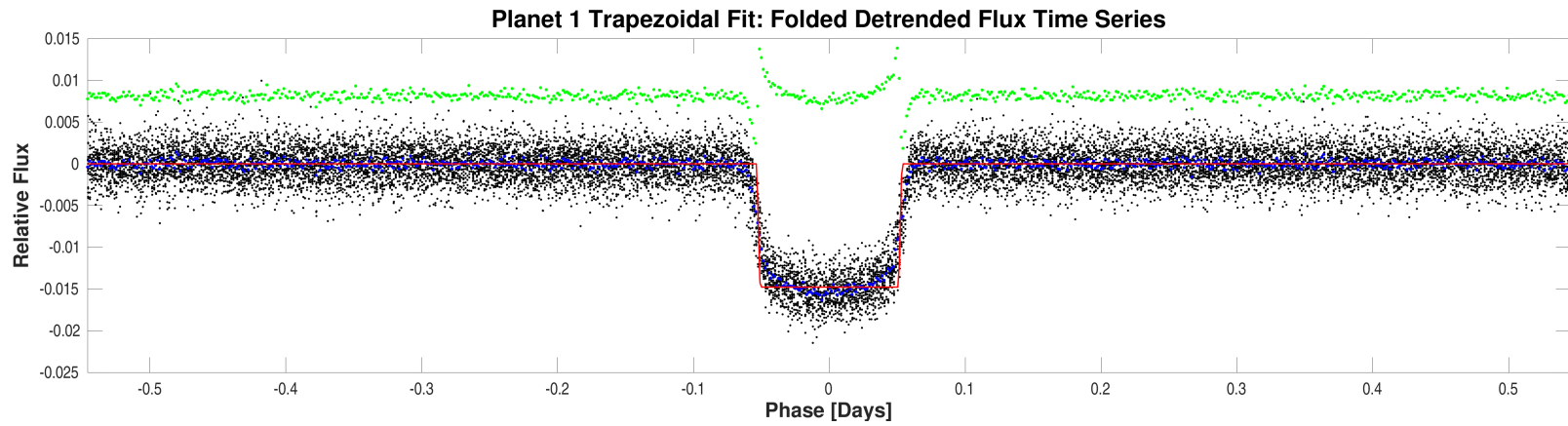
Model Characteristic	Name
Transit Model	trapezoidal_model
Limb Darkening Model	

TCE Parameter	Value	Units
Trial Transit Pulse Duration	2.5	hours
Transit Epoch	1842.9969112	TJD
Orbital Period	1.0916548	days
Maximum SES	46.4	
Maximum MES	188.5	
Robust Statistic	182.3	
Chi Square Goodness of Fit Statistic (DoF)	2005.8 (1474)	
Chi Square2 Statistic (DoF)	283.3 (2959.5)	
Threshold for Desired PFA		

DoF: Degrees of Freedom

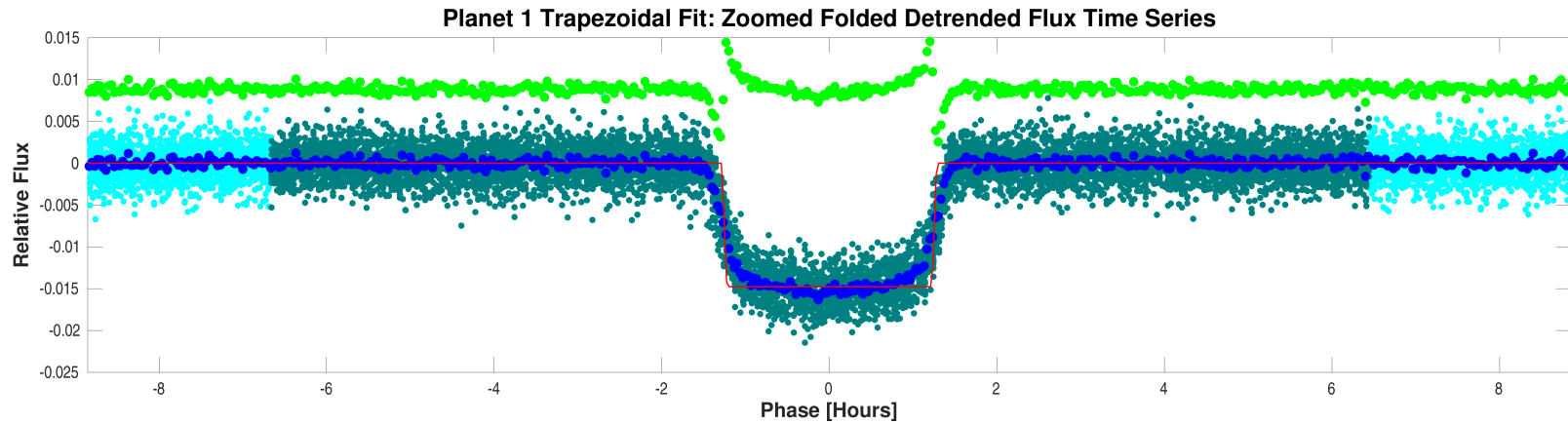
Parameter	Value	Uncertainty	Units
SNR	277.6		
Orbital Period	1.0916548		days
Transit Epoch	1843.0022583		BTJD
Transit Depth	14777		ppm
Transit Duration	2.9510		hours
Transit Ingress Duration	0.4445		hours
Model Chi Square Statistic (DoF)	17267.7 (8277)		

DoF: Degrees of Freedom



Folded detrended flux time series for CatId 86396382, Planet candidate 1 and folded trapezoidal model light curve.

Open `./planet-01/planet-search-and-model-fitting-results/trapezoidal-model-fit/000000086396382-01-all-trapezoidal.fig`



Zoomed folded detrended flux time series for CatId 86396382, Planet candidate 1 and folded trapezoidal model light curve.

Open `./planet-01/planet-search-and-model-fitting-results/trapezoidal-model-fit/000000086396382-01-all-trapezoidal-zoomed.fig`

7.4 Validation Tests

The Centroid Test and Eclipsing Binary Discrimination Test are chi-squared hypothesis tests. For these tests, a significance of 100% favors a planet, while 0% indicates an unlikely planet.

7.4.1 Weak Secondary Test

Result	Value	Uncertainty	Units	Statistic in Sigmas	Significance (%)
Orbital Period	1.0917		days		
Transit Duration	2.5		hours		
Maximum MES	188.5				
Secondary Phase	0.54306		days		
Secondary MES	5.5				
Minimum Phase	0.4125		days		
Minimum MES	-4.9				
Median MES	-1.5				
MAD MES	1.2472				
Robust Statistic	4.6				
Secondary Depth	364.1	7.7197e+01	ppm		
Geometric Albedo	0.2	4.7761e-02		-16.8954	100.00
Planet Effective Temperature	2489	1.3882e+02	Kelvin	0.3675	35.66

7.4.2 Eclipsing Binary Discrimination Test

Result	Value	Value in Sigmas	Significance (%)
Odd Even Transit Depth Comparison Statistic	6.5882e-02	0.2567	79.74

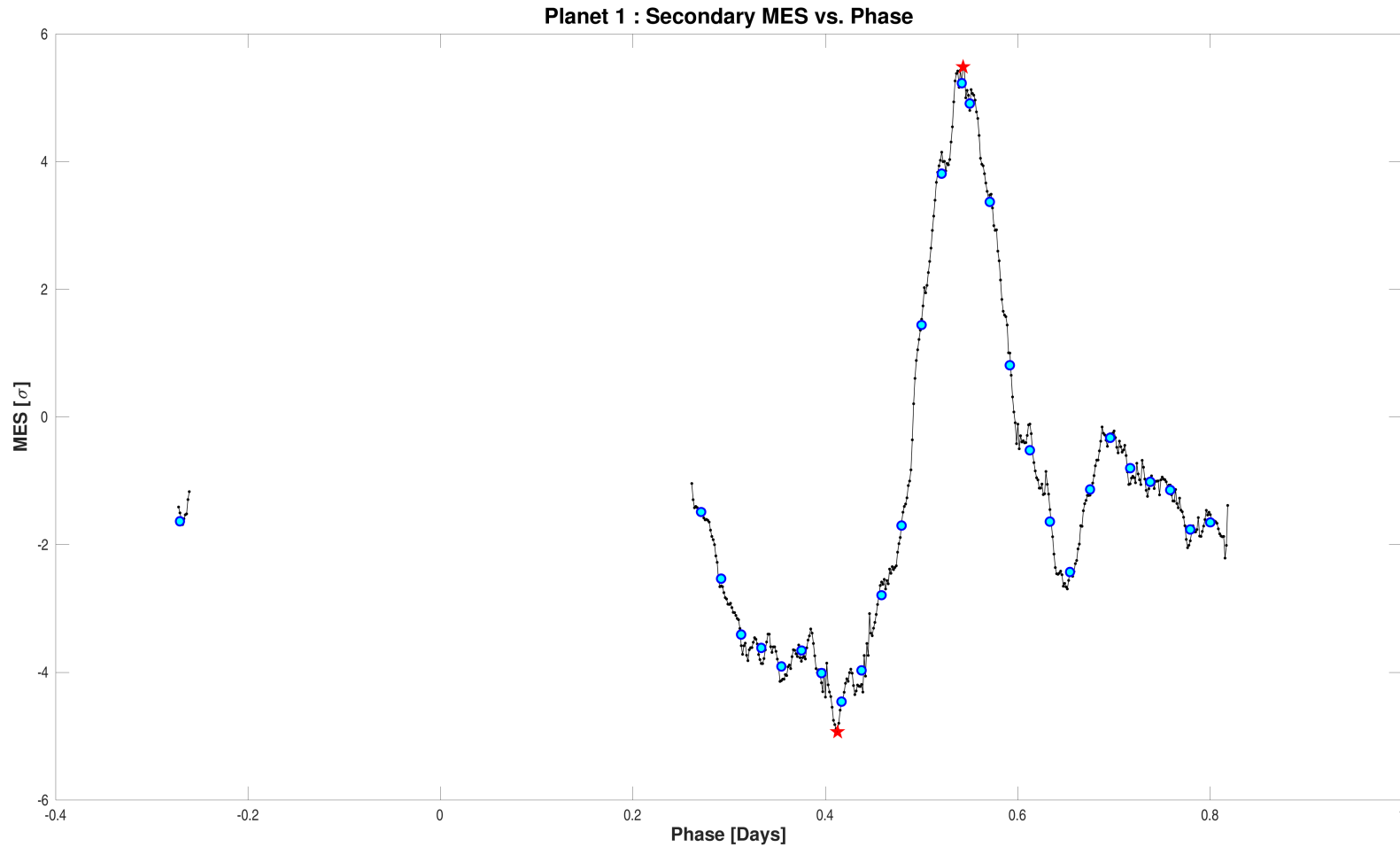
7.4.3 Bootstrap Test

Result	Value
False Alarm Probability	0.0000e+00
Bootstrap Threshold for Desired PFA	7.5
MES Mean	-0.21
MES Standard Deviation	1.09
Transit Count	24

7.4.4 Ghost Diagnostic Test

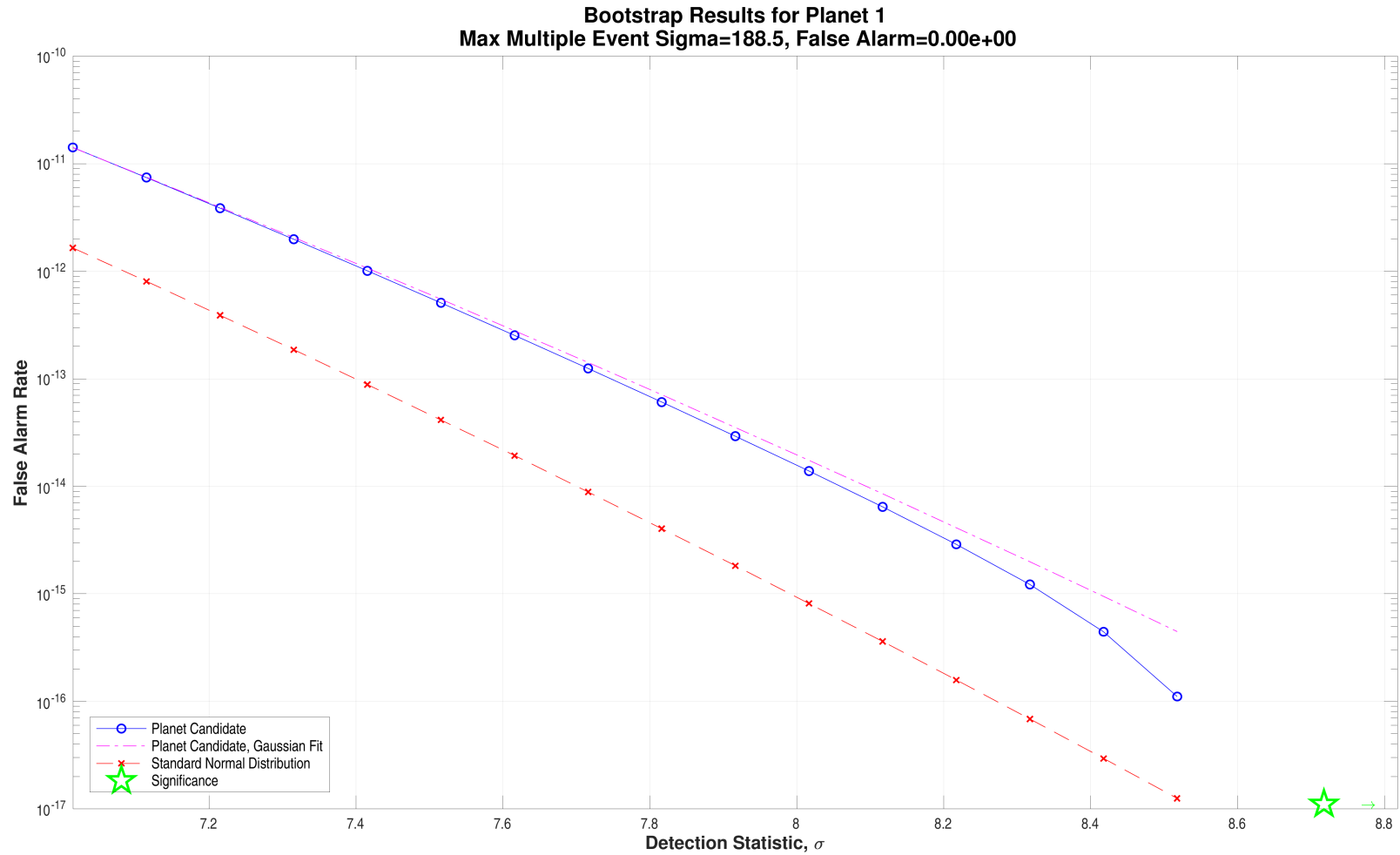
Result	Value	Significance (%)
Maximum MES	188.5	
SNR	205.9	
Core Aperture Statistic	1.3396e+02	100.00
Halo Aperture Statistic	2.1051e+01	100.00
Ratio of Core/Halo Aperture Statistics	6.3638e+00	

7.4.5 Validation Test Figures



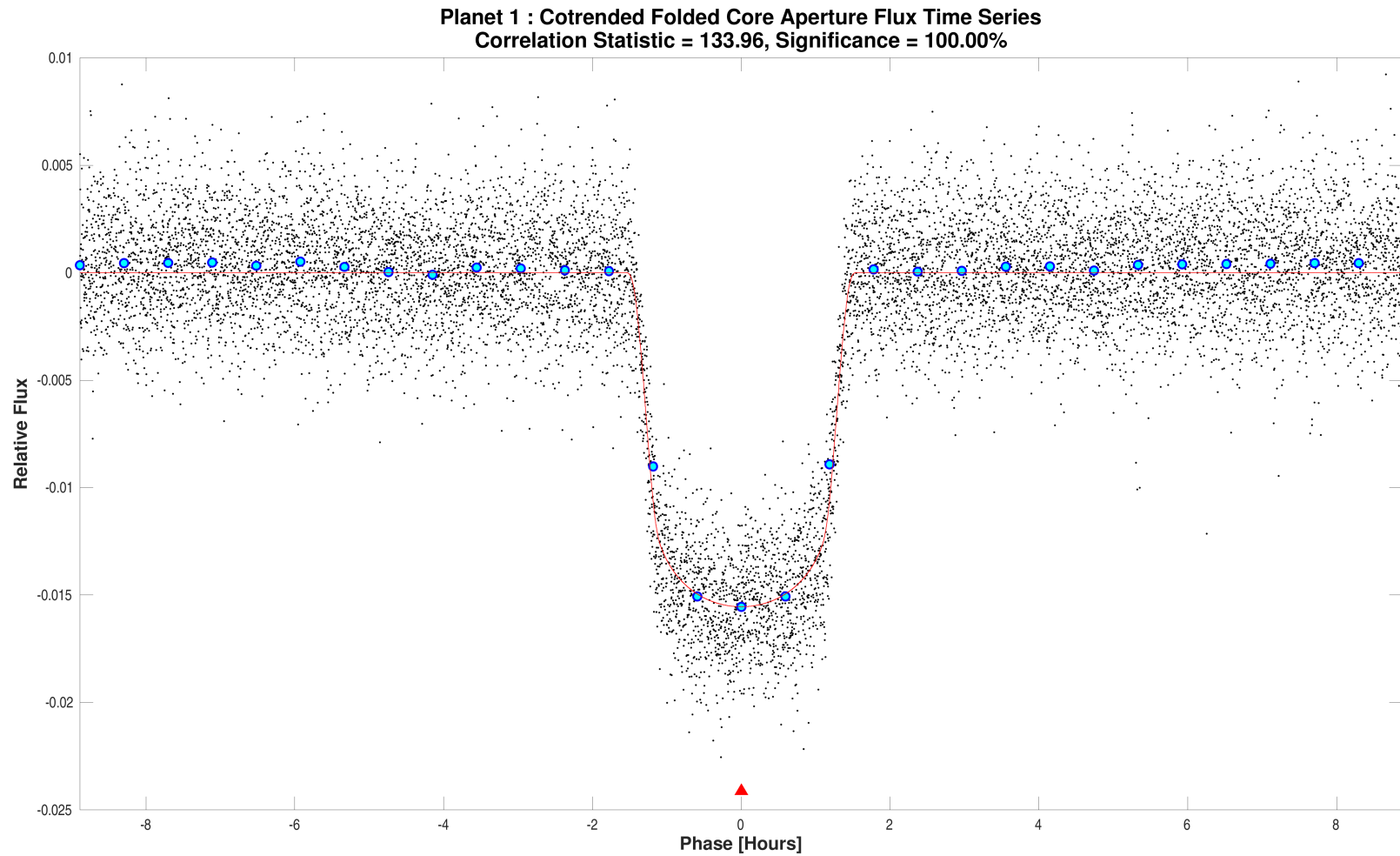
The primary event has been set to zero and both the max and min of the resulting MES vs. Phase are marked with a red star. The best matched pulse duration in hours is 2.5. The maximum secondary MES and corresponding phase are 5.4848 and 0.54306 days respectively. The minimum secondary MES and corresponding phase are -4.9306 and 0.4125 days respectively.

Open `./planet-01/report-summary/000000086396382-01-weak-secondary-diagnostic.fig`



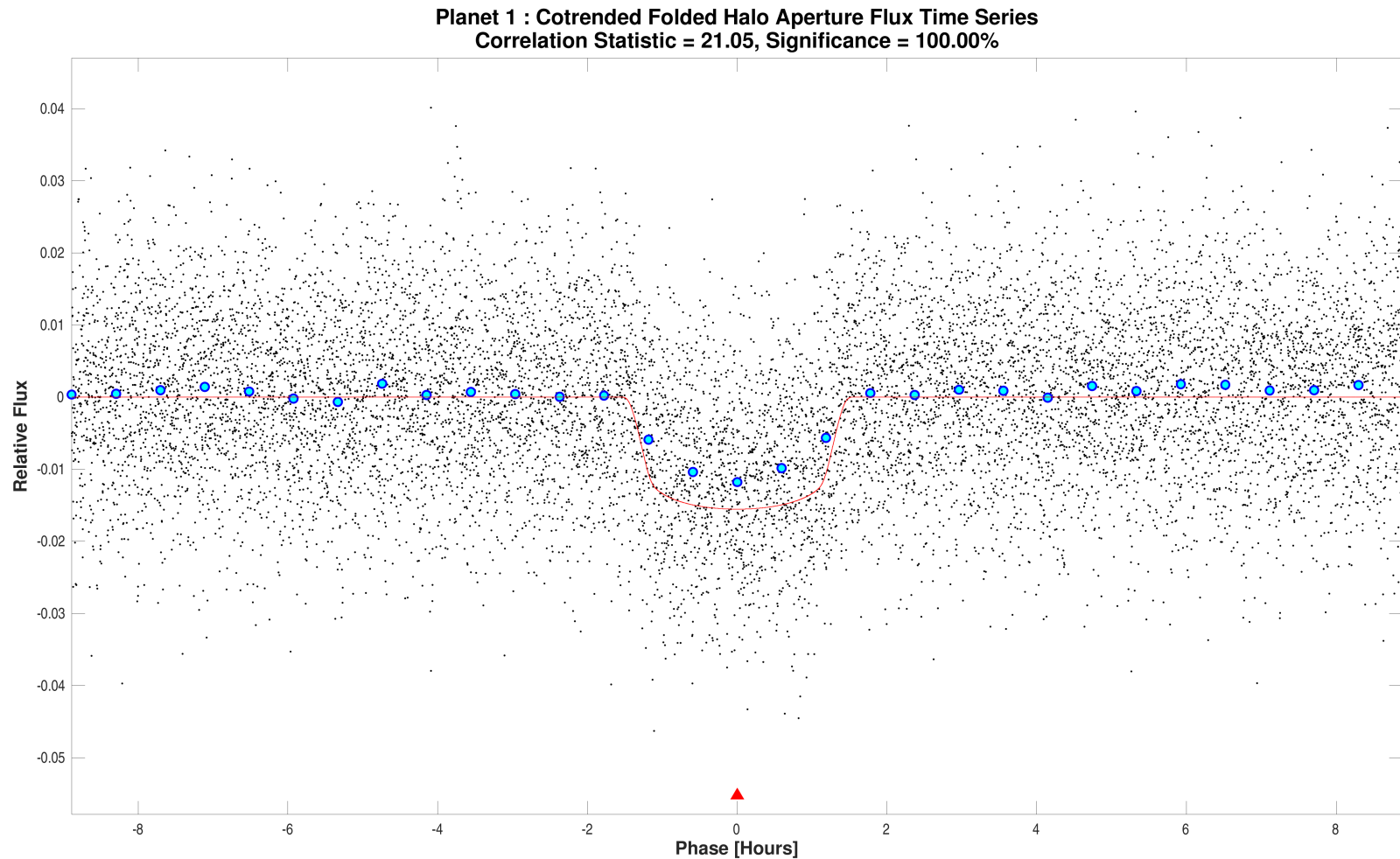
Bootstrap results for target 86396382, planet 1. Cumulative sum of the probabilities (derived from the histogram of counts) from upper tail to the search transit threshold; false alarm probability is indicated by the star. The Gaussian equivalent threshold for this false alarm probability is Inf. The threshold on this distribution that achieves the same false alarm rate as a 7.1 sigma threshold on a Gaussian distribution is 7.4926.

Open `./planet-01/bootstrap-results/000000086396382-01-bootstrap-false-alarm.fig`



Optical ghost diagnostic core aperture flux time series for target 86396382, planet candidate 1. The unwhitened time series is phase folded at the orbital period associated with the planet candidate and centered on the epoch of the first transit. The time series was first cotrended against spacecraft engineering data, motion proxies, and/or cotrending basis vectors (CBVs) to remove systematic effects. Flux time series data represent the mean per pixel flux in the core or haloaperture; phase folded data points are shown in the figure with black dots. Binned and averaged phase folded flux values are marked with filled blue circles. The unwhitened transit model light curve is displayed in the figure with a red line. The value and significance of the core aperture correlation statistic are displayed in the figure title if the statistic was successfully computed.

Open `./planet-01/ghost-diagnostic-results/000000086396382-01-core-unwhitened-cotrended-zoomed-model.fig`

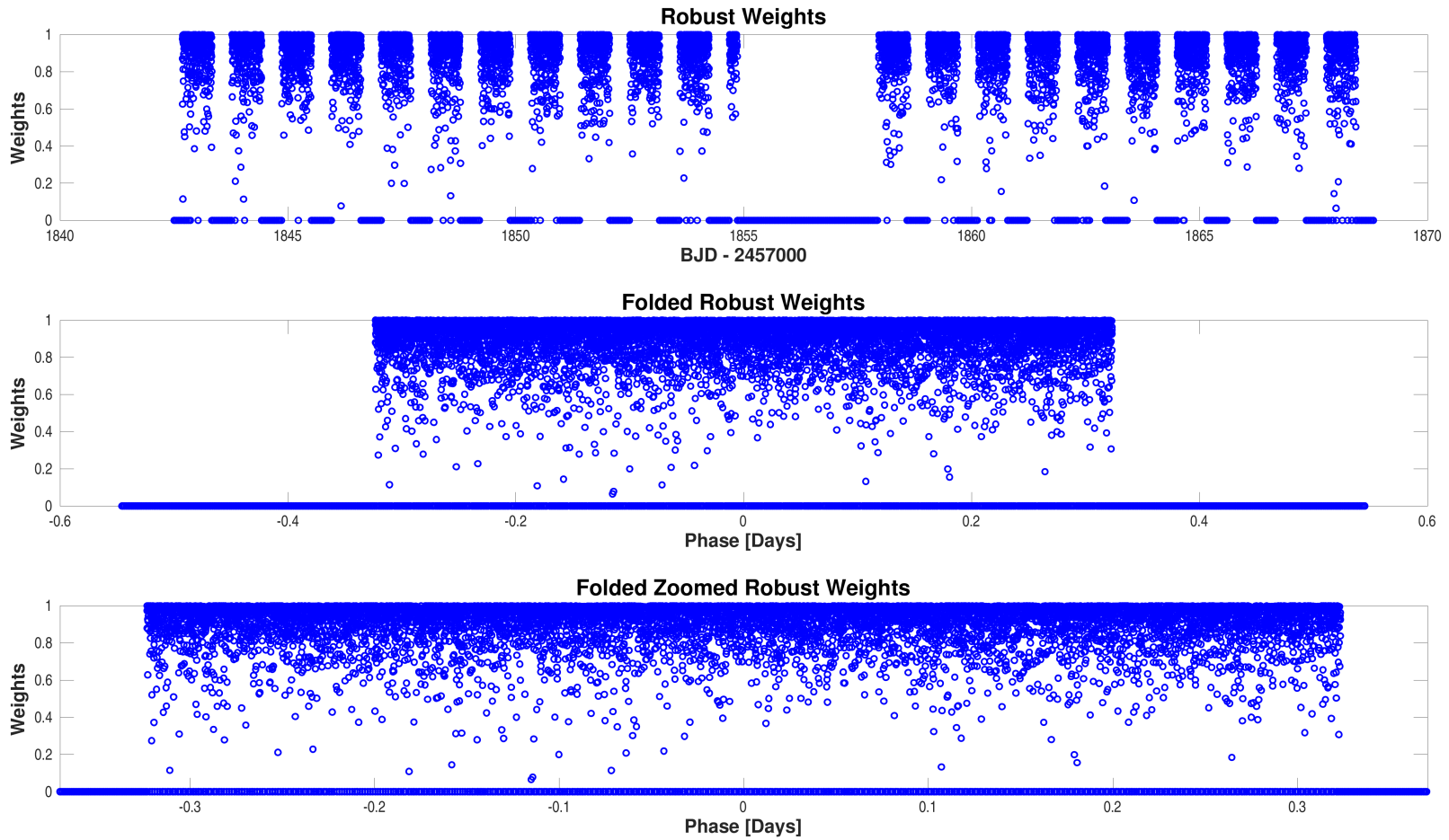


Optical ghost diagnostic halo aperture flux time series for target 86396382, planet candidate 1. The unwhitened time series is phase folded at the orbital period associated with the planet candidate and centered on the epoch of the first transit. The time series was first cotrended against spacecraft engineering data, motion proxies, and/or cotrending basis vectors (CBVs) to remove systematic effects. Flux time series data represent the mean per pixel flux in the core or haloaperture; phase folded data points are shown in the figure with black dots. Binned and averaged phase folded flux values are marked with filled blue circles. The unwhitened transit model light curve is displayed in the figure with a red line. The value and significance of the halo aperture correlation statistic are displayed in the figure title if the statistic was successfully computed.

Open `./planet-01/ghost-diagnostic-results/000000086396382-01-halo-unwhitened-cotrended-zoomed-model.fig`

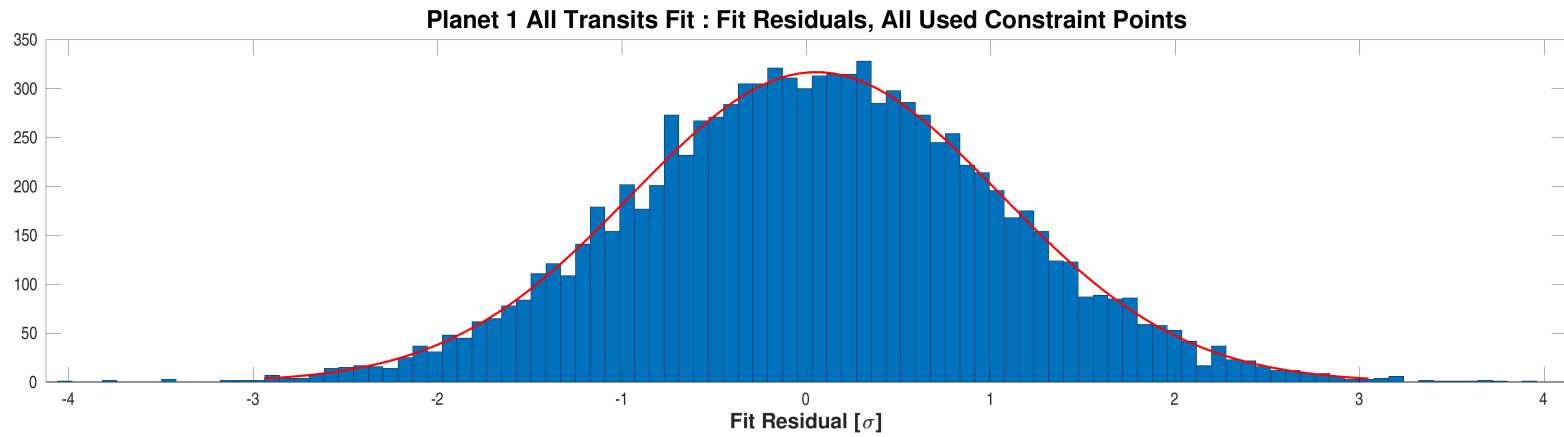
Appendix A Planet Candidate 1

A.1 Model Fitter: All Transits



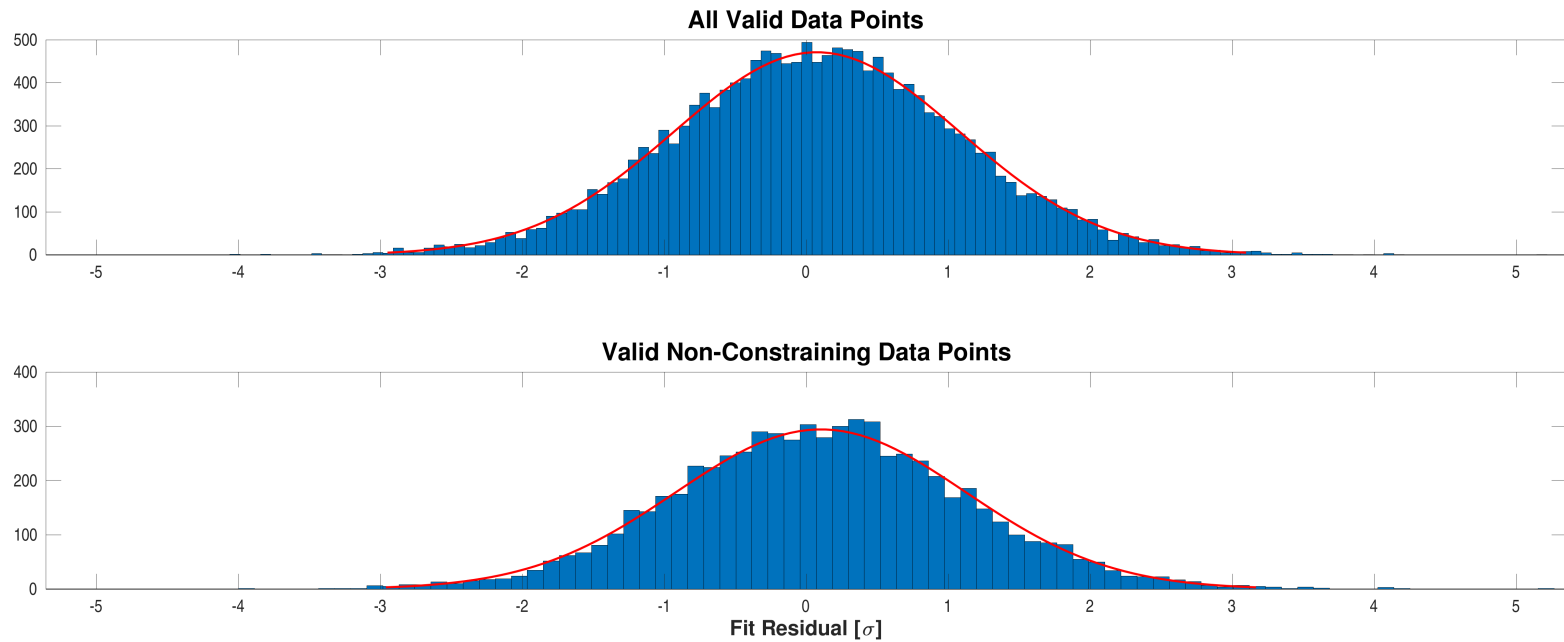
Robust weights distribution for CatId 86396382, Planet candidate 1. Top plot: all data points. Middle plot: all data points, folded per the fitted period and epoch. Bottom plot: all data points, folded and zoomed.

Open `./planet-01/planet-search-and-model-fitting-results/all-transits-fit/0000000086396382-01-all-robust-weights.fig`



Fit residuals distribution for CatId 86396382, Planet candidate 1. Only the valid data points used to constrain the fit are shown here. A Gaussian fit to the histogram is shown in red.

Open `./planet-01/planet-search-and-model-fitting-results/all-transits-fit/000000086396382-01-all-histo-used.fig`



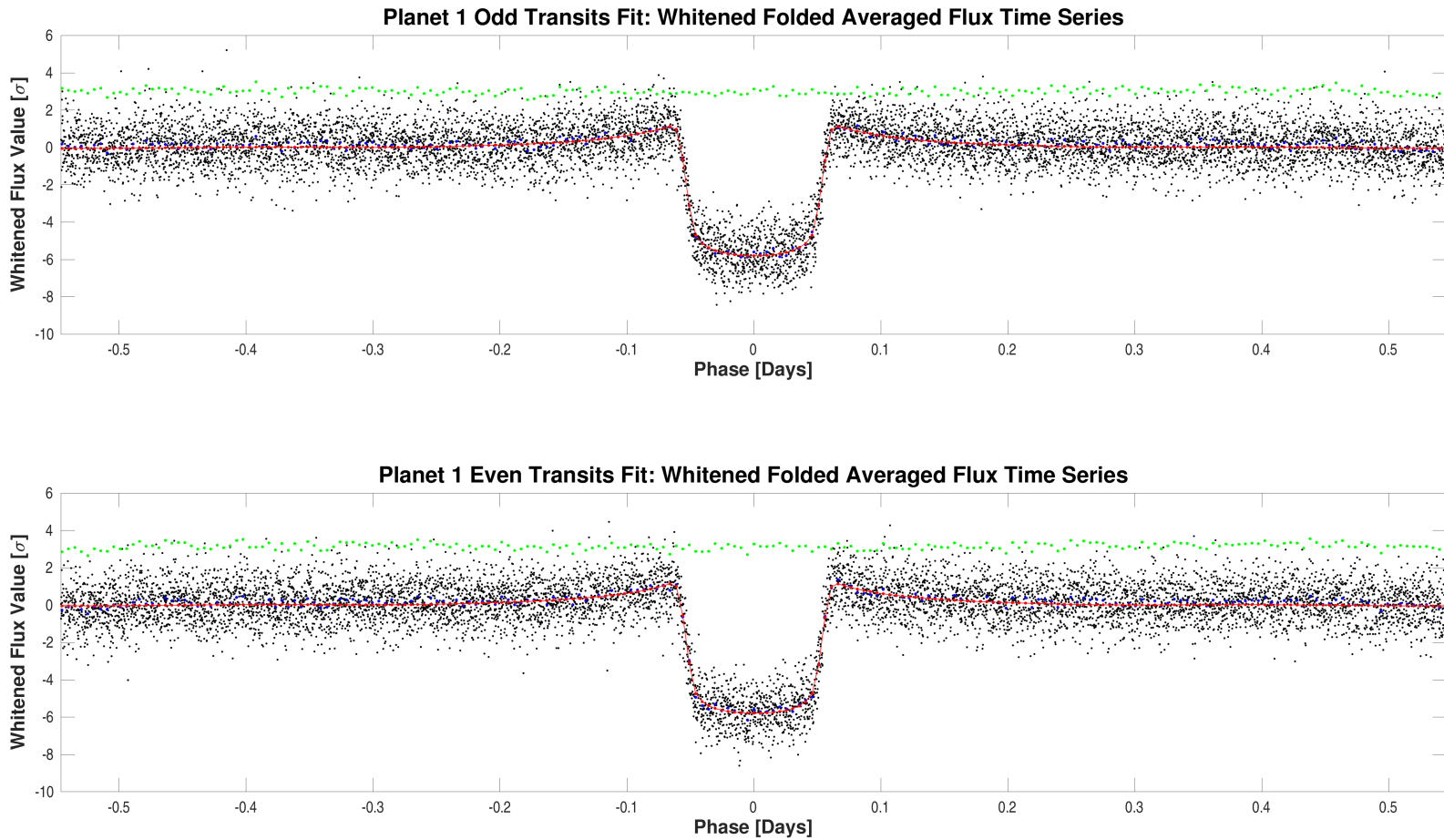
Fit residuals distribution for CatId 86396382, Planet candidate 1. Top plot: all valid data. Bottom plot: valid data not used to constrain fit (due to distance from a transit). Gaussian fits to the histograms are shown in red.

Open `./planet-01/planet-search-and-model-fitting-results/all-transits-fit/000000086396382-01-all-histo-all-and-unused.fig`

A.2 Model Fitter: Odd & Even Transits

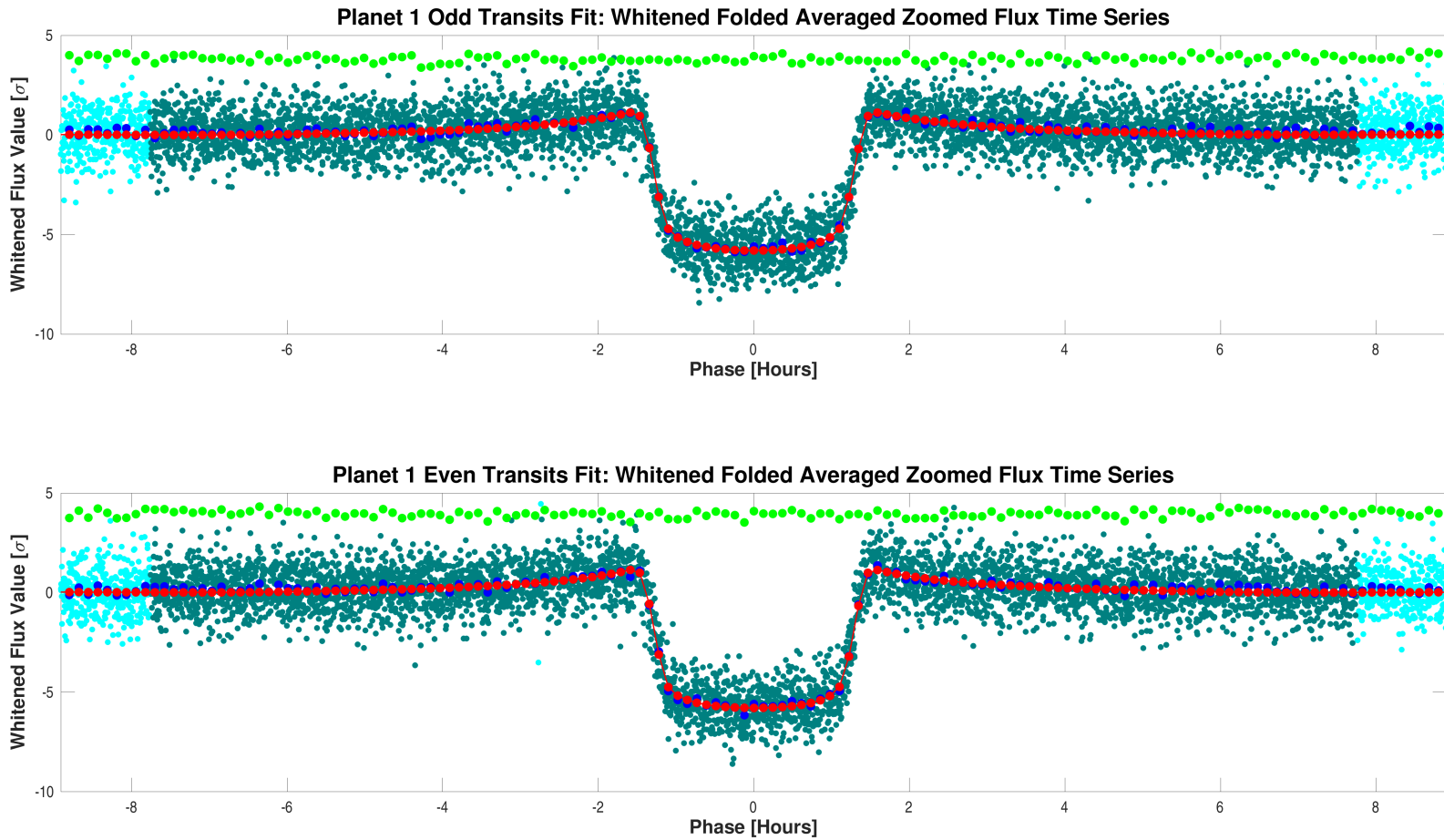
Parameter	Odd Transits Value	Odd Transits Uncertainty	Even Transits Value	Even Transits Uncertainty	Units	$\frac{\text{Difference}}{\ \text{Uncertainty}\ }$
SNR	150.3		144.2			
Orbital Period	1.0914341	2.2197e-05	1.0913841	2.1868e-05	days	1.6030e+00
Transit Epoch	1843.0048987	2.9332e-04	1844.0968923	2.9761e-04	BTJD	1.3968e+00
Impact Parameter	0.2833	1.0099e-01	0.1760	1.9160e-01		4.9560e-01
Planet Radius to Star Radius Ratio	0.1167327	7.6290e-04	0.1163777	8.3021e-04		3.1489e-01
Semi-major Axis to Star Radius Ratio	3.1111	8.6631e-02	3.1879	9.9853e-02		5.8108e-01
Planet Radius	22.2941	1.0445e+00	22.2263	1.0433e+00	Earth radii	4.5932e-02
Semi-major Axis	0.0219	1.5083e-03	0.0219	1.5083e-03	AU	3.1285e-04
Effective Stellar Flux	8220.5475	1.1876e+03	8221.0491	1.1877e+03	Goldilocks	2.9868e-04
Equilibrium Temperature	2429	8.7710e+01	2429	8.7712e+01	Kelvin	2.9868e-04
Stellar Density	0.3396	2.8368e-02	0.3654	3.4335e-02	Solar density	5.7962e-01
Transit Depth	15518	1.0335e+02	15557	1.0838e+02	ppm	2.5667e-01
Transit Duration	2.9695	2.3640e-02	2.9488	2.5009e-02	hours	6.0228e-01
Transit Ingress Duration	0.3448	2.3557e-02	0.3258	2.4848e-02	hours	5.5565e-01
Eccentricity	0.0000	0.0000e+00	0.0000	0.0000e+00		
Peri Longitude	0.0000	0.0000e+00	0.0000	0.0000e+00	degrees	
Model Chi Square Statistic (DoF)	7366.2 (8979.6)		7366.2 (8979.6)			

DoF: Degrees of Freedom



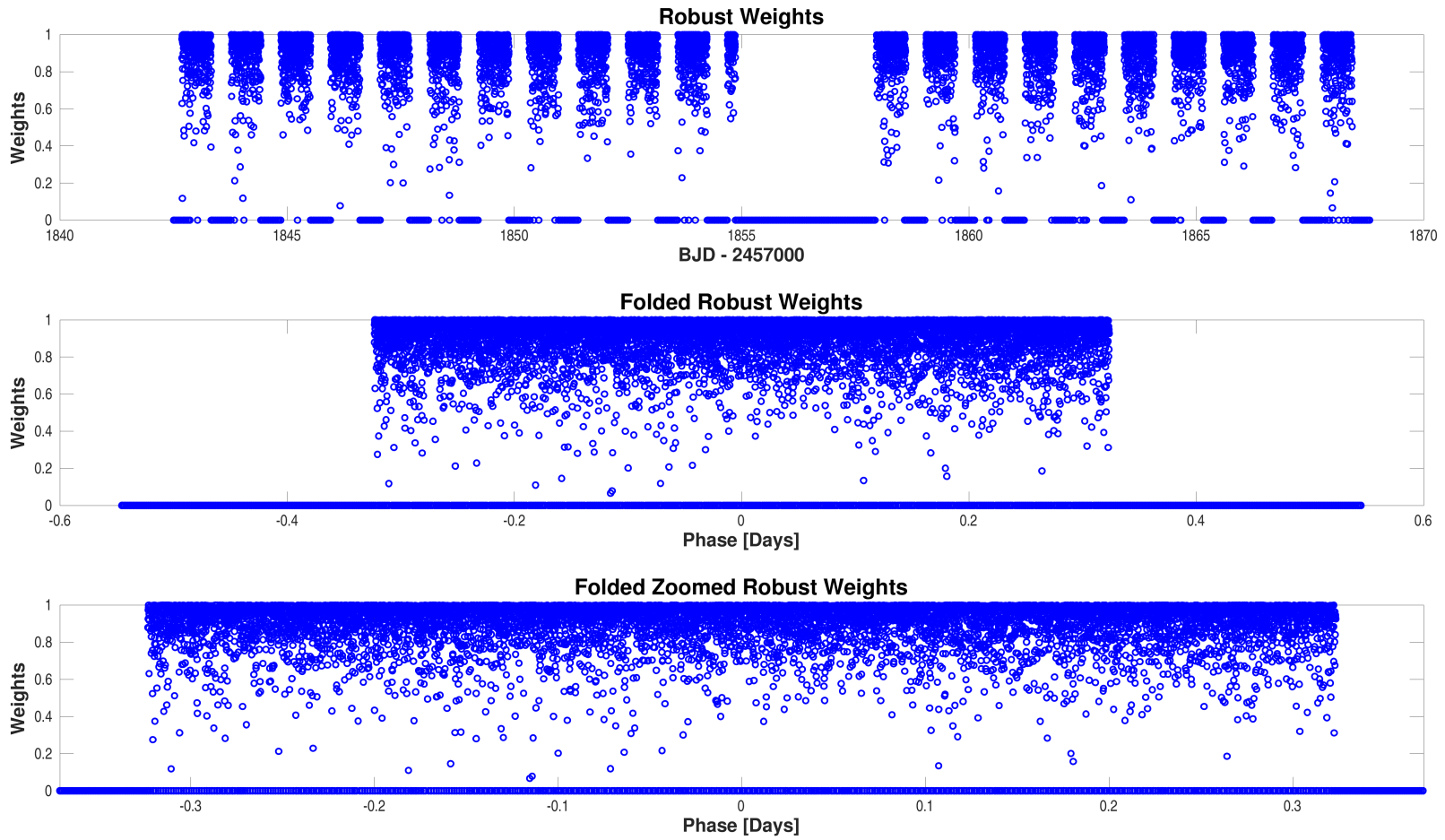
Folded flux time series for CatId 86396382, Planet candidate 1 in the whitened domain is plotted in black dots. Values are averaged into 1 cadence wide bins. The blue dots represent the averaged values of the folded flux time series; the red dots represent the averaged values of the folded model light curve of the odd/even transits fit; the green dots are the averaged folded fit residuals, vertically offset for clarity. Odd-even transits fit completed with full convergence.

Open `./planet-01/planet-search-and-model-fitting-results/odd-even-transits-fit/000000086396382-01-odd-even-whitened.fig`



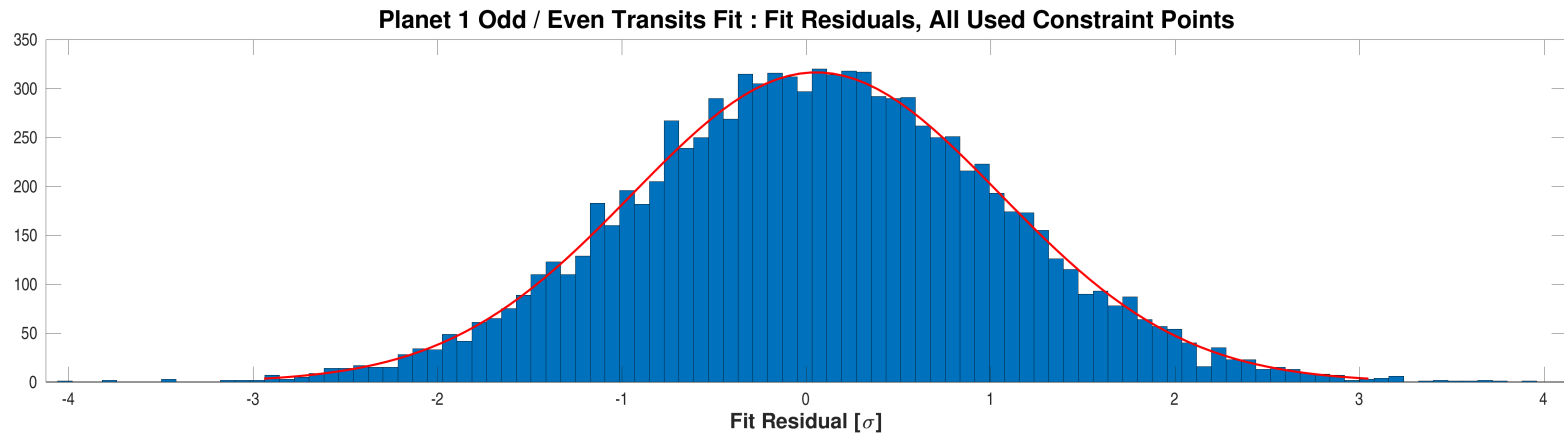
Folded flux time series for CatId 86396382, Planet candidate 1 in the whitened domain, zoomed on the transit. The flux data whose robust weights are larger/smaller than 0.1 are plotted in dark green/cyan dots, respectively. Values are averaged into 1 cadence wide bins. The blue dots represent the averaged values of the folded flux time series; the red dots represent the averaged values of the fitted model light curve of the odd/even transits fit; the green dots are the averaged folded fit residuals, vertically offset for clarity. Magenta dots are the averaged values of the folded flux time series, with a phase shift of 0.5 relative to the blue dots, vertically offset for clarity. Odd-even transits fit completed with full convergence.

Open `./planet-01/planet-search-and-model-fitting-results/odd-even-transits-fit/0000000086396382-01-odd-even-whitened-zoomed.fig`



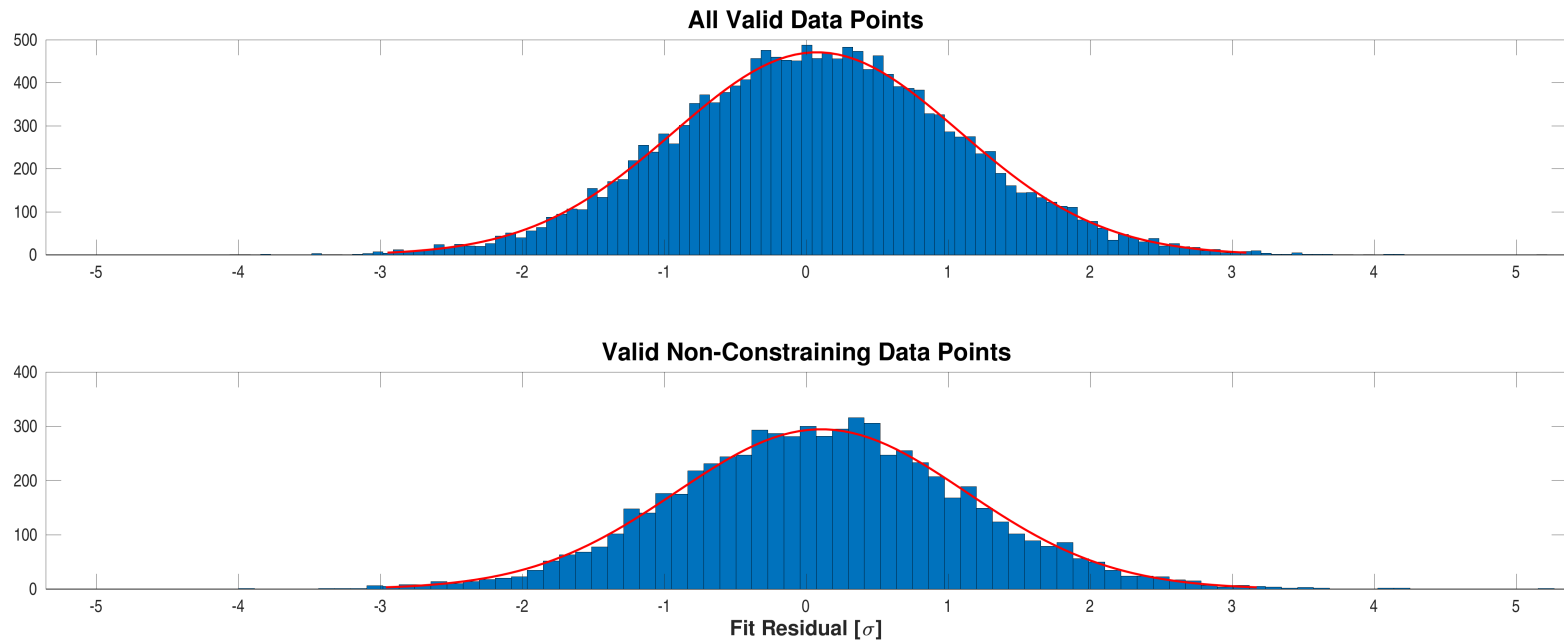
Robust weights distribution for CatId 86396382, Planet candidate 1. Top plot: all data points. Middle plot: all data points, folded per the fitted period and epoch. Bottom plot: all data points, folded and zoomed.

Open `./planet-01/planet-search-and-model-fitting-results/odd-even-transits-fit/000000086396382-01-odd-even-robust-weights.fig`



Fit residuals distribution for CatId 86396382, Planet candidate 1. Only the valid data points used to constrain the fit are shown here. A Gaussian fit to the histogram is shown in red.

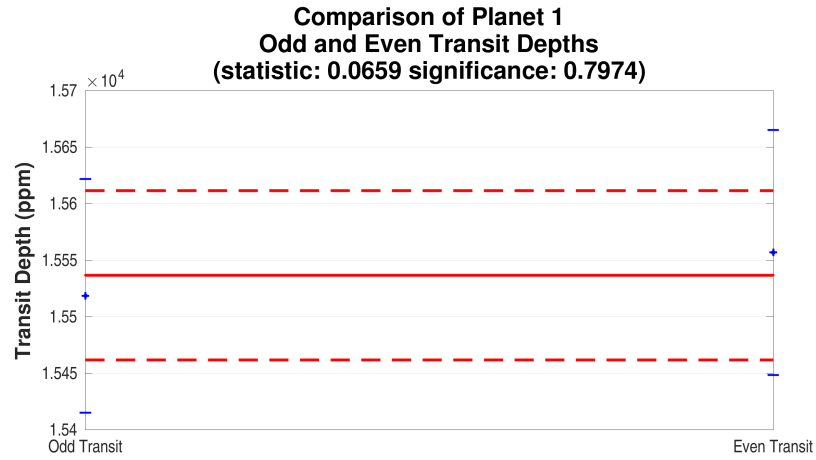
Open `./planet-01/planet-search-and-model-fitting-results/odd-even-transits-fit/0000000086396382-01-odd-even-histo-used.fig`



Fit residuals distribution for CatId 86396382, Planet candidate 1. Top plot: all valid data. Bottom plot: valid data not used to constrain fit (due to distance from a transit). Gaussian fits to the histograms are shown in red.

Open `./planet-01/planet-search-and-model-fitting-results/odd-even-transits-fit/0000000086396382-01-odd-even-histo-all-and-unused.fig`

A.3 Eclipsing Binary Discrimination Test



Top-left: Diagnostic plot of Odd/Even Transit Depth Test for catId 86396382, planet 1. A significance level close to 1/0 favors a transiting planet/an eclipsing binary. Open `./planet-01/binary-discrimination-test-results/0000000086396382-01-eclipsing-binary-discrimination-tests.fig`

Appendix B Alerts

This target did not trigger any alerts.