

KIC 009351316

Q1-17 DR25 TCE Parameters

TCE	Run Type	KOI?	Period (Days)	Epoch (BKJD)	Depth (ppm)	Duration (Hours)	MES	SNR	R_{\star} (R_{\odot})	T_{\star} (K)	R_p (R_{\oplus})	S_p (S_{\oplus})
009351316-01	OBS	2078.01	18.784252	137.882480	1022.3	3.193	26.6	28.4	0.64	4243	2.33	8.31
009351316-02	OBS	2078.02	161.515533	176.502531	1920.9	6.665	19.0	22.8	0.64	4243	3.07	0.47

Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009351316-01	OBS	PC	1.00	0	0	0	0	NO_COMMENT
009351316-02	OBS	PC	1.00	0	0	0	0	NO_COMMENT

Notes: OBS = Observed. INJ = Injected. INV = Inverted. SCR = Scrambled.

N = Not Transit-Like. S = Stellar Eclipse. C = Centroid Offset. E = Ephemeris Match.

See http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col for comment definitions.

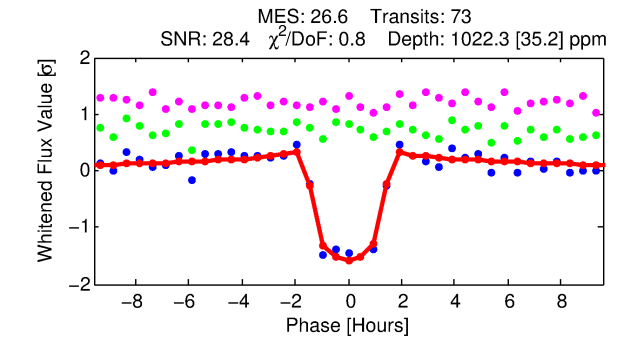
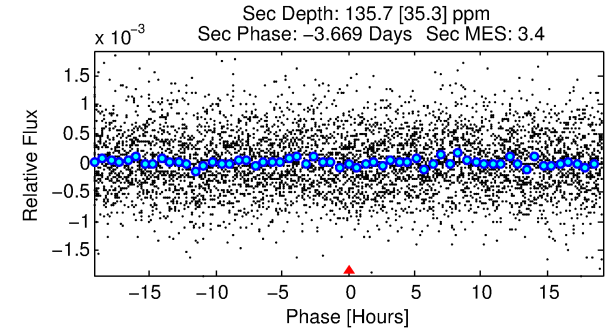
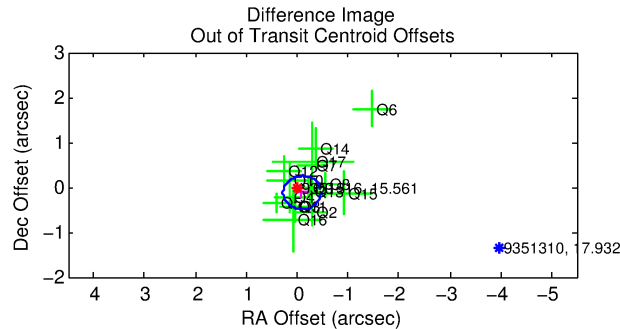
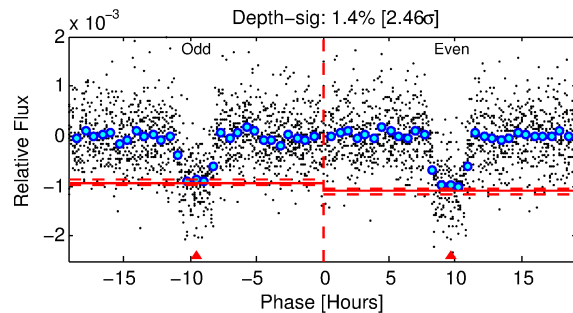
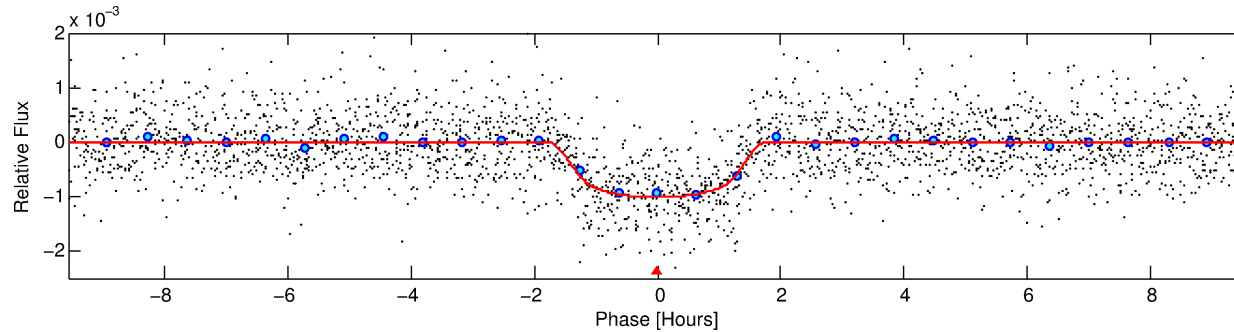
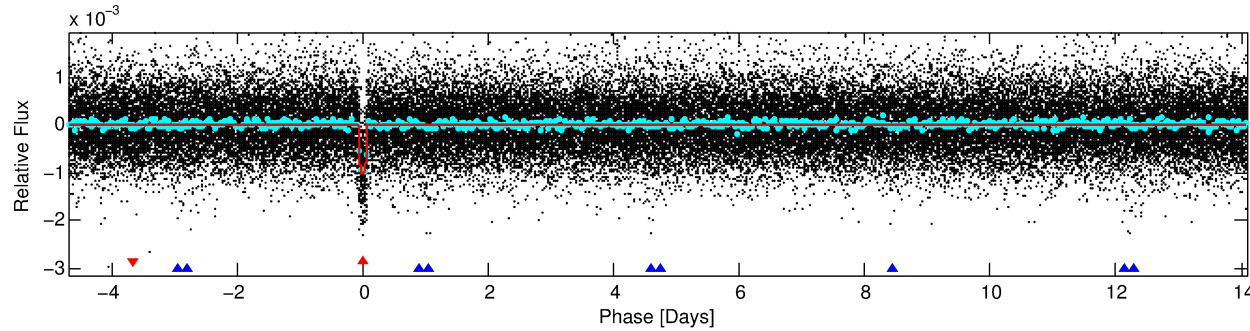
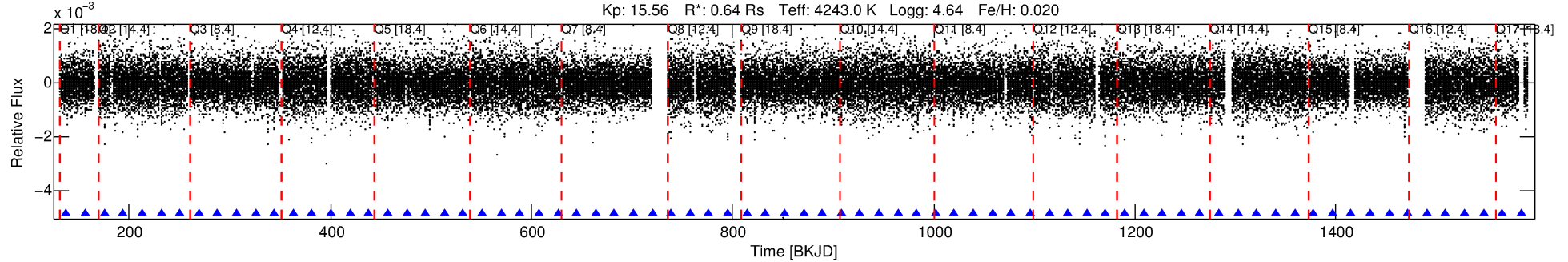
Ephemeris Match Information For 009351316-01

No Significant Match Found

DV One-Page Summary

KIC: 9351316 Candidate: 1 of 2 Period: 18.784 d
KOI: K02078.01 Corr: 0.994

Kp: 15.56 R*: 0.64 Rs Teff: 4243.0 K Logg: 4.64 Fe/H: 0.020



DV Fit Results:

Period = 18.78425 [0.00005] d
Epoch = 137.8825 [0.0022] BKJD
Rp/R* = 0.0333 [0.0079]
a/R* = 28.69 [22.76]
b = 0.81 [0.34]
Seff = 8.31 [0.79]
Teq = 433 [10] K
Rp = 2.33 [0.56] Re
a = 0.1198 [0.0045] AU
Ag = 197.73 [107.39] [1.83σ]
Teffp = 2510 [343] K [6.06σ]

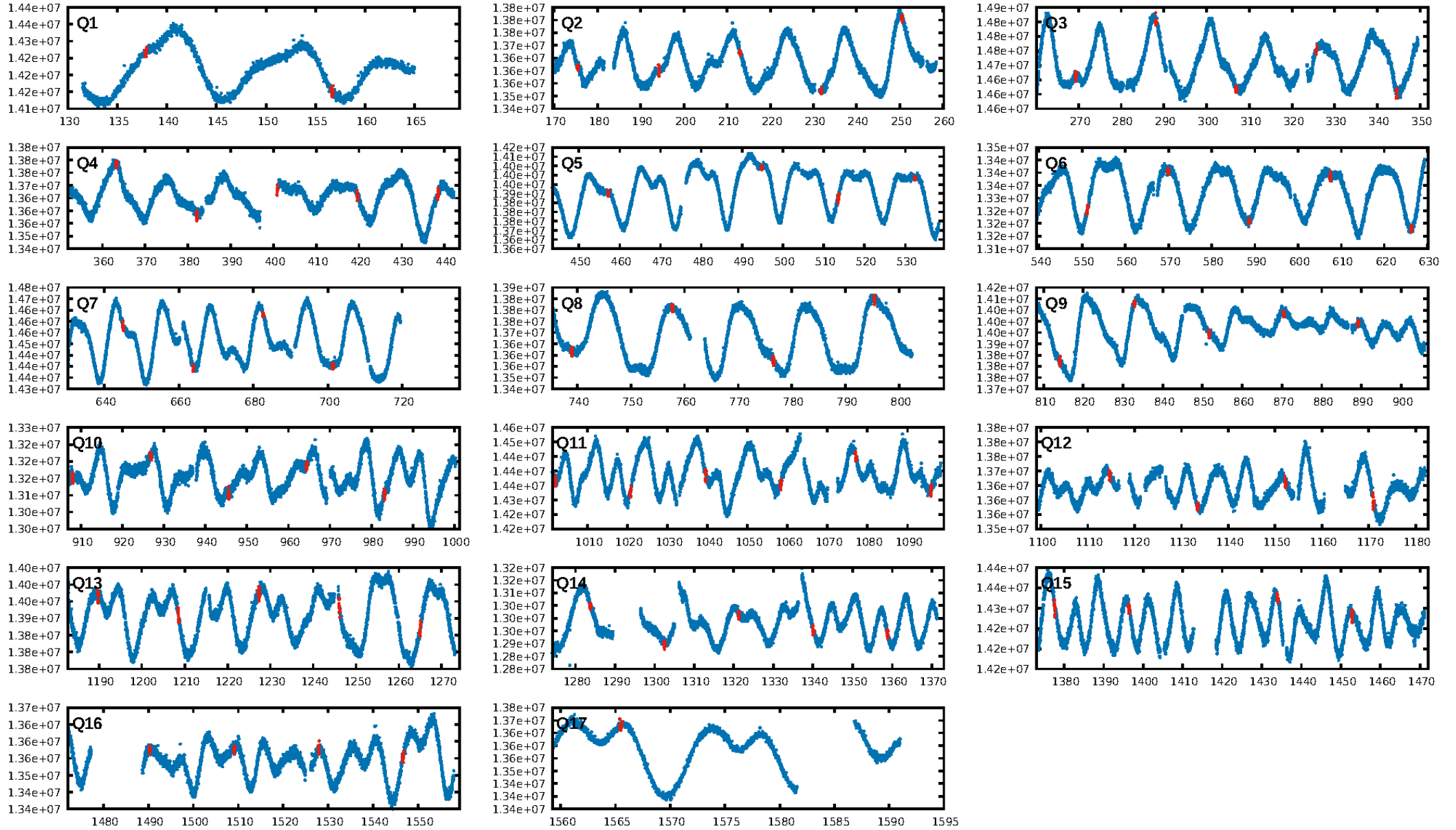
DV Diagnostic Results:

ShortPeriod-sig: N/A
LongPeriod-sig: 100.0% [463.54σ]
ModelChiSquare2-sig: 92.1%
ModelChiSquareGof-sig: 100.0%
Bootstrap-pfa: 1.42e-133
RollingBand-fgt: 1.00 [70/70]
GhostDiagnostic-chr: 3.128
Centroid-sig: 66.6%
Centroid-so: 0.237 arcsec [0.53σ]
OotOffset-rm: 0.152 arcsec [1.23σ]
KicOffset-rm: 0.191 arcsec [1.15σ]
OotOffset-st: 4/4/4/4 [16]
KicOffset-st: 4/4/4/4 [16]
DiffImageQuality-fgm: 1.00 [16/16]
DiffImageOverlap-fno: 1.00 [17/17]

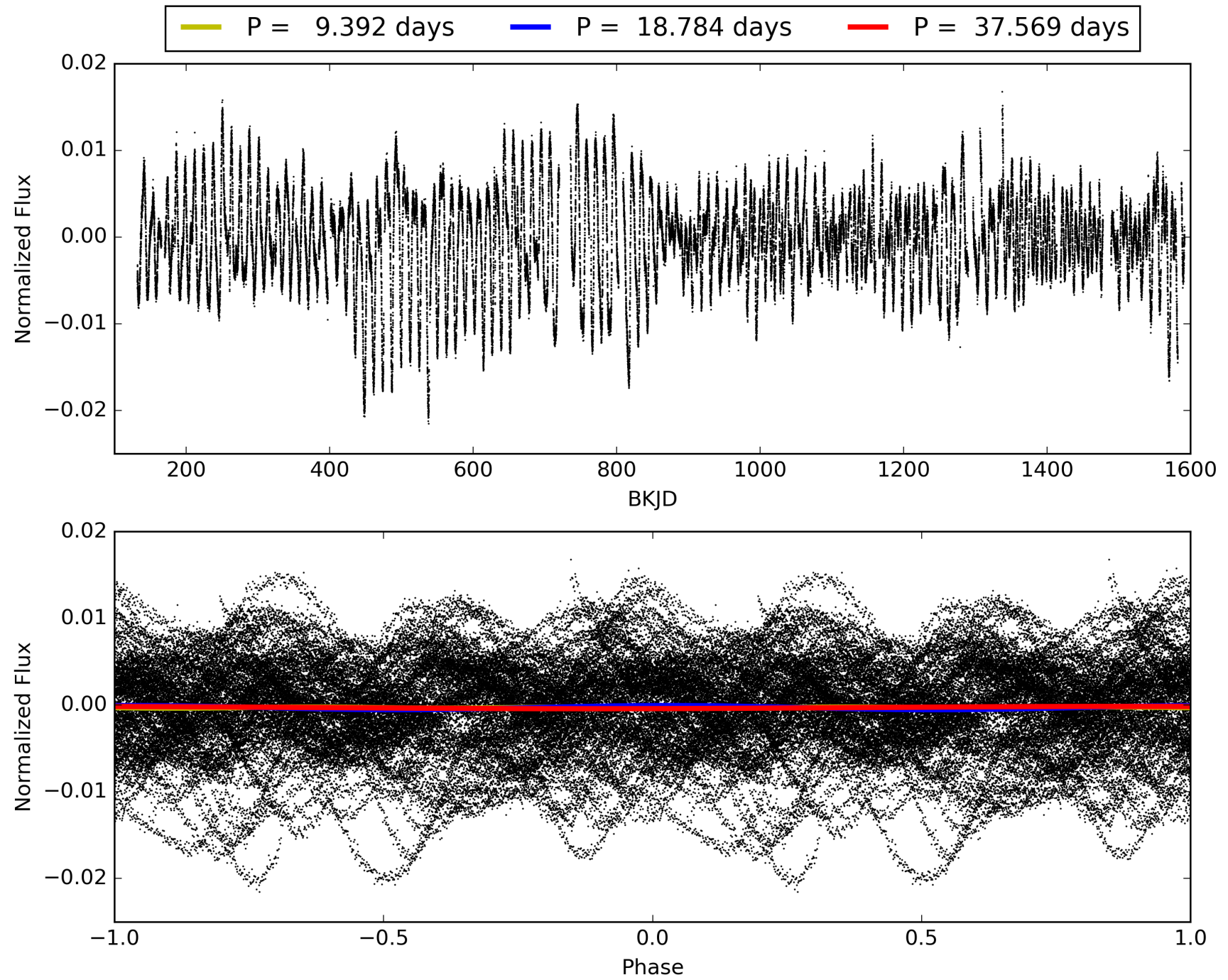
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 03:24:21 Z

This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

TCE 009351316-01, PDC Light Curves

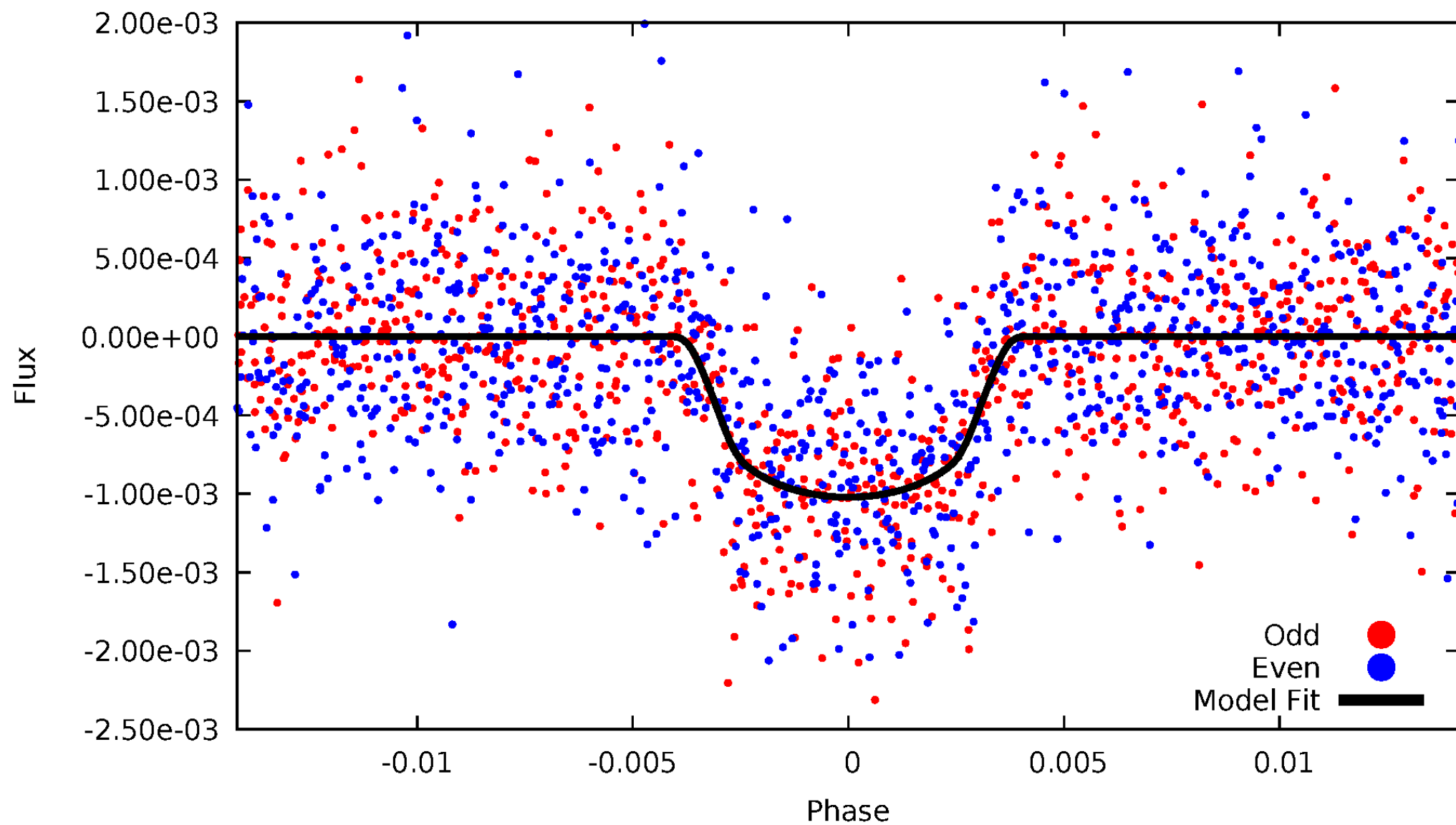


TCE 009351316-01



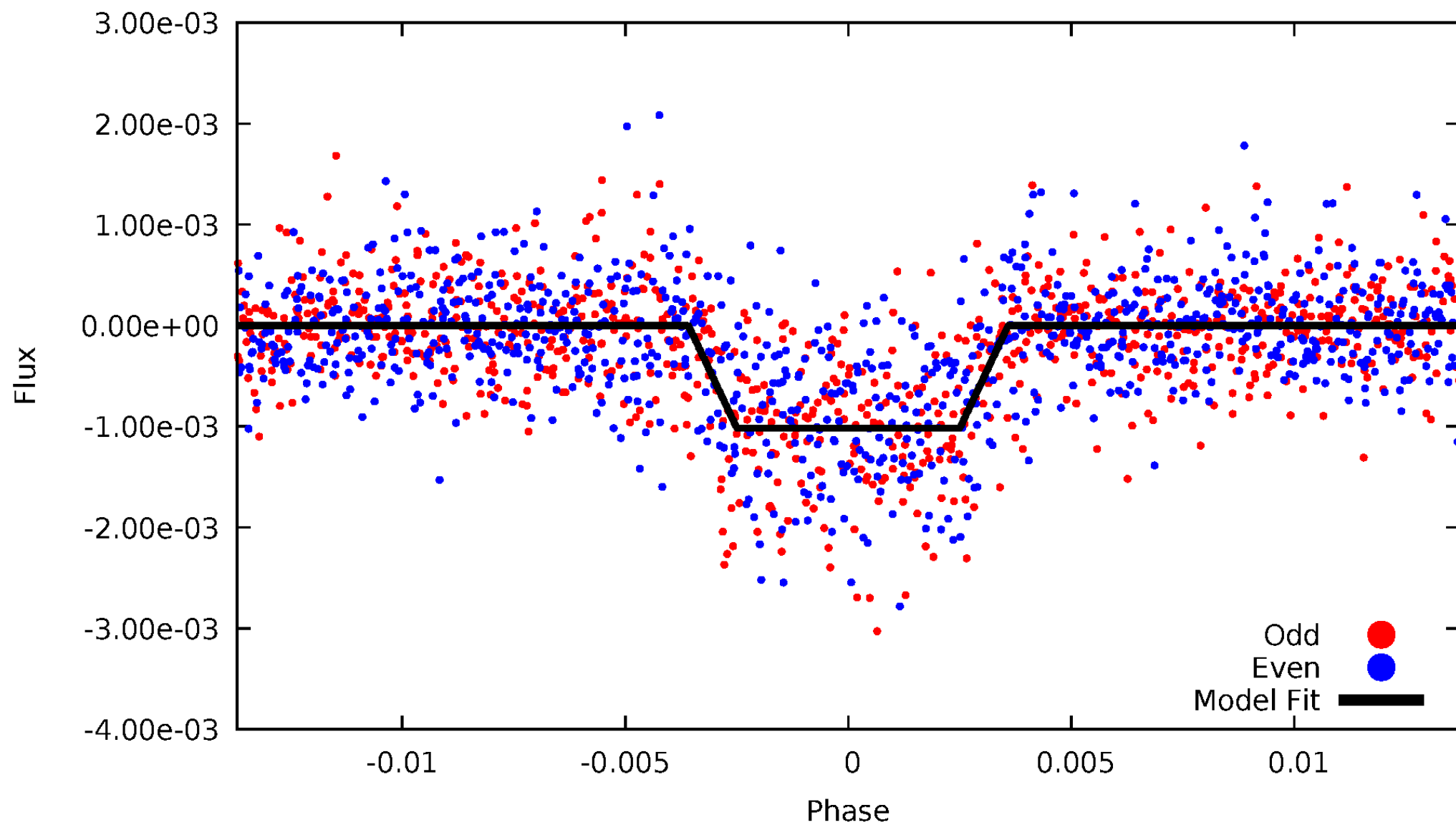
DV Odd/Even

TCE 009351316-01

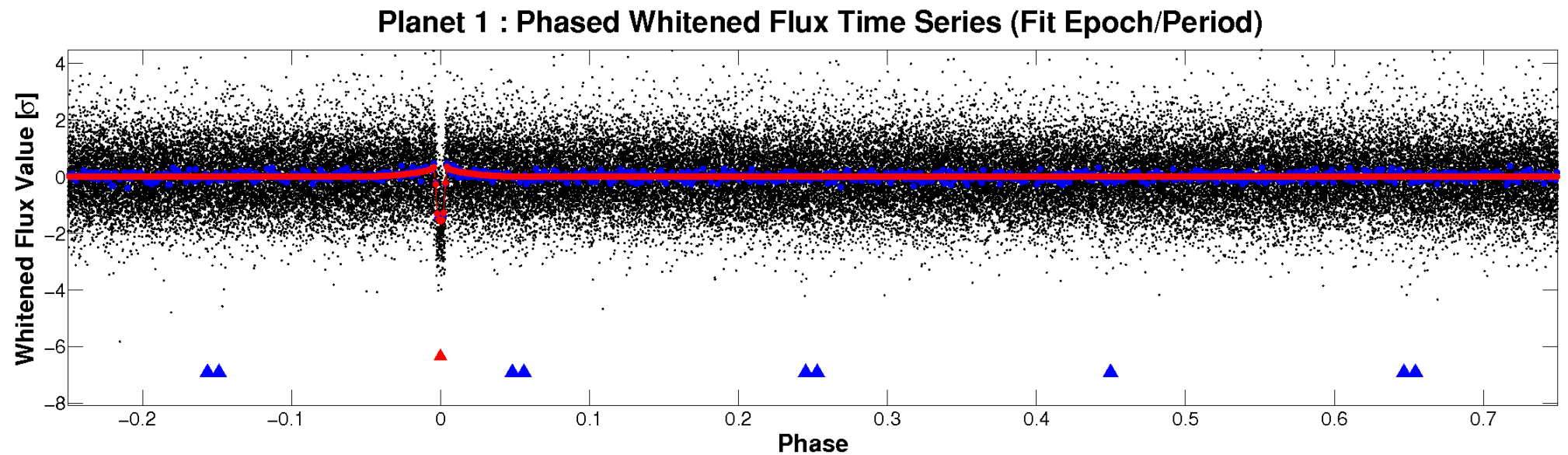
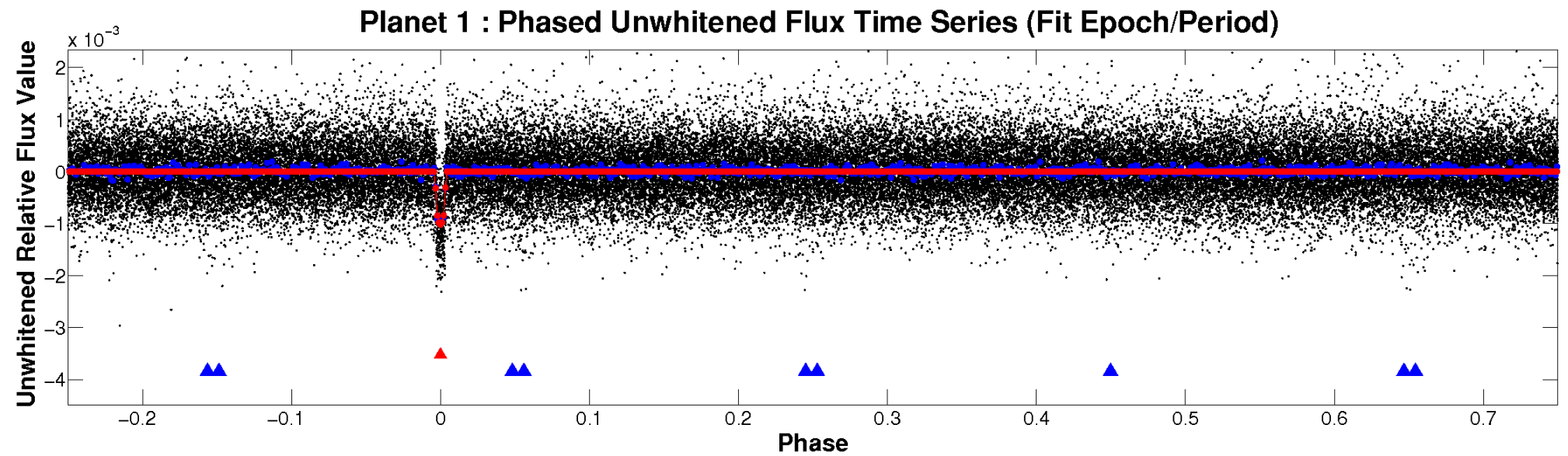


ALT Odd/Even

TCE 009351316-01

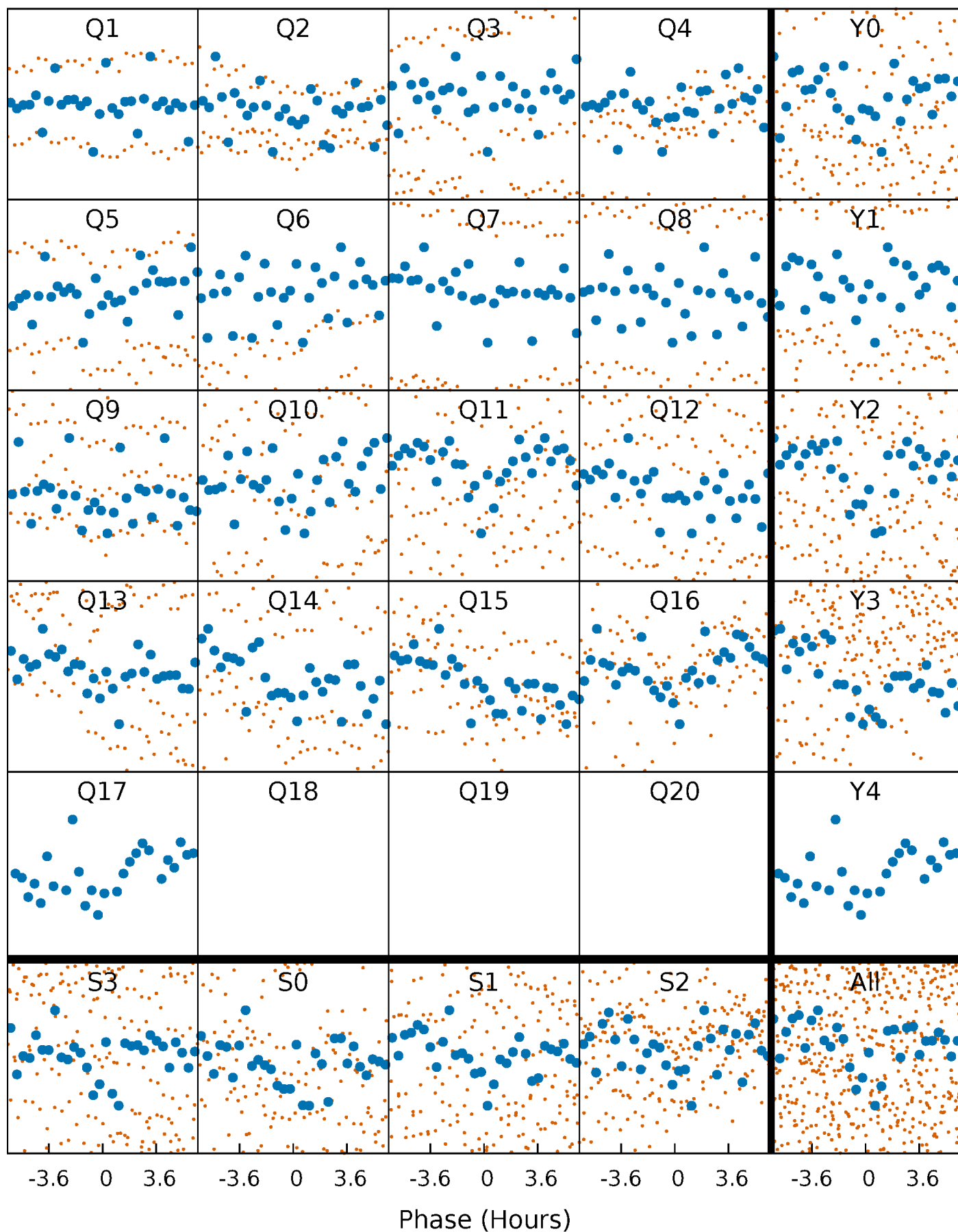


Non-Whitened Vs. Whitened Light Curve



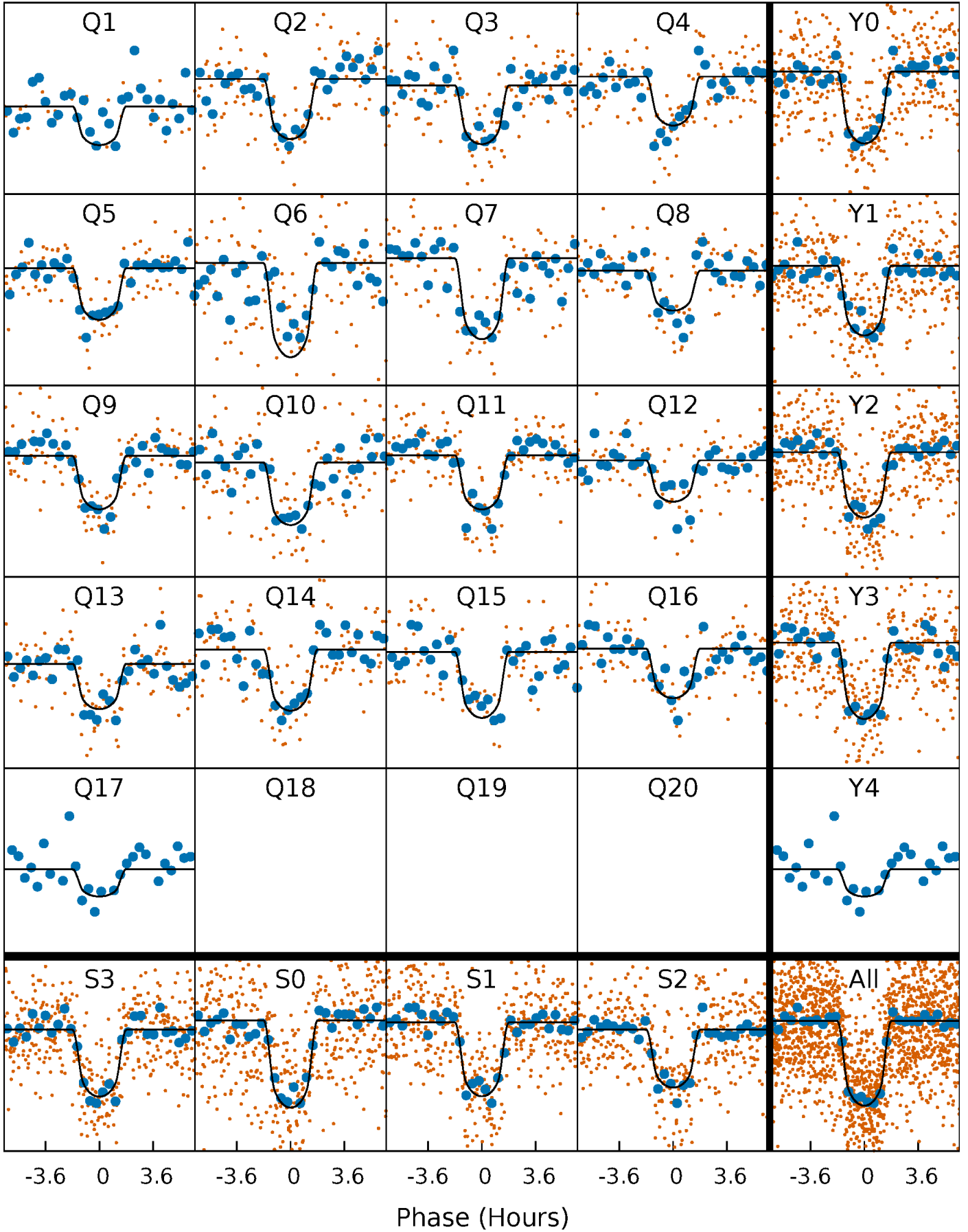
PDC Quarter-Phased Transit Curves

TCE 009351316-01 P= 18.784252 Days $T_0=137.882480$ (BKJD)



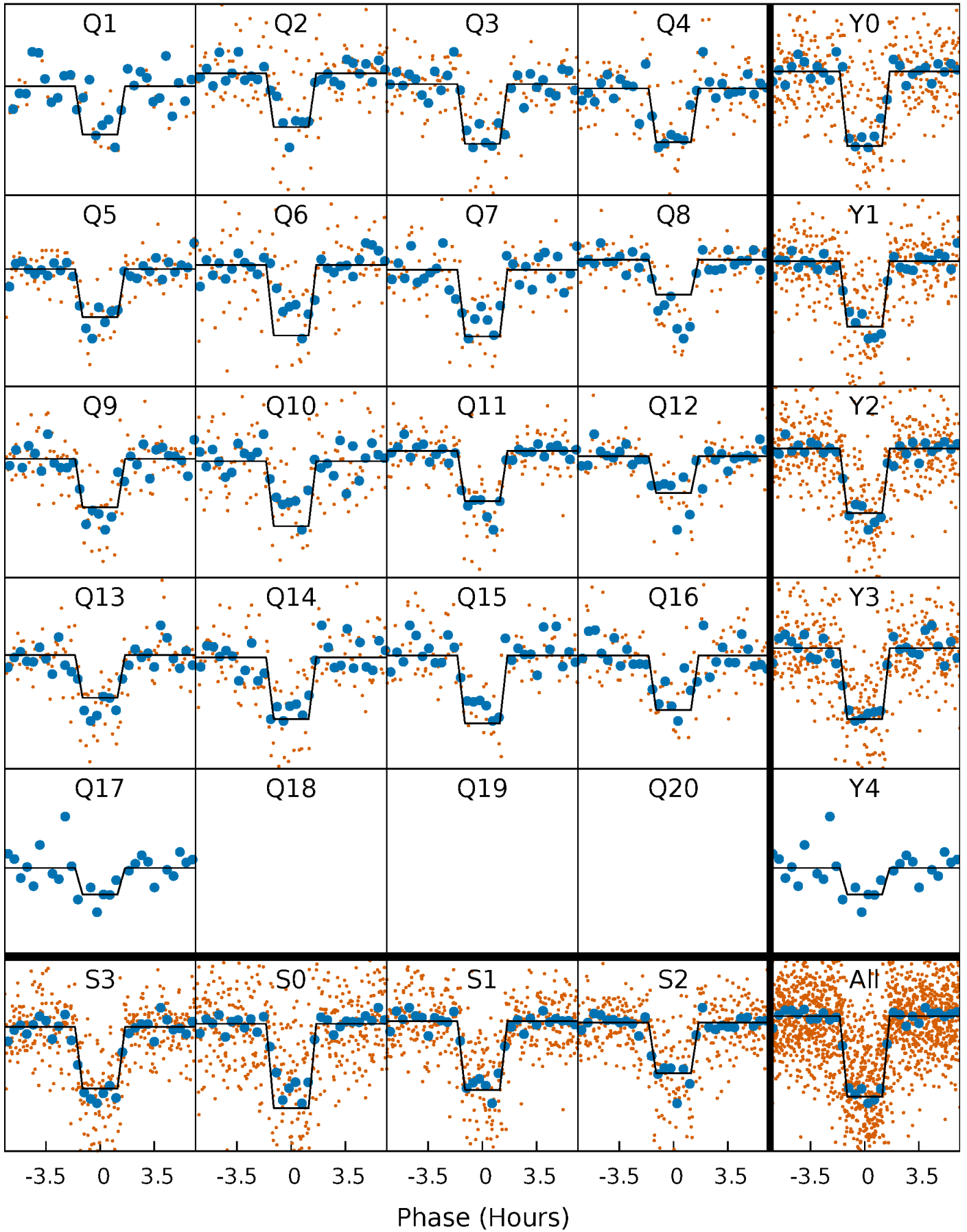
DV Quarter-Phased Transit Curves

TCE 009351316-01 P= 18.784252 Days $T_0=137.882480$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

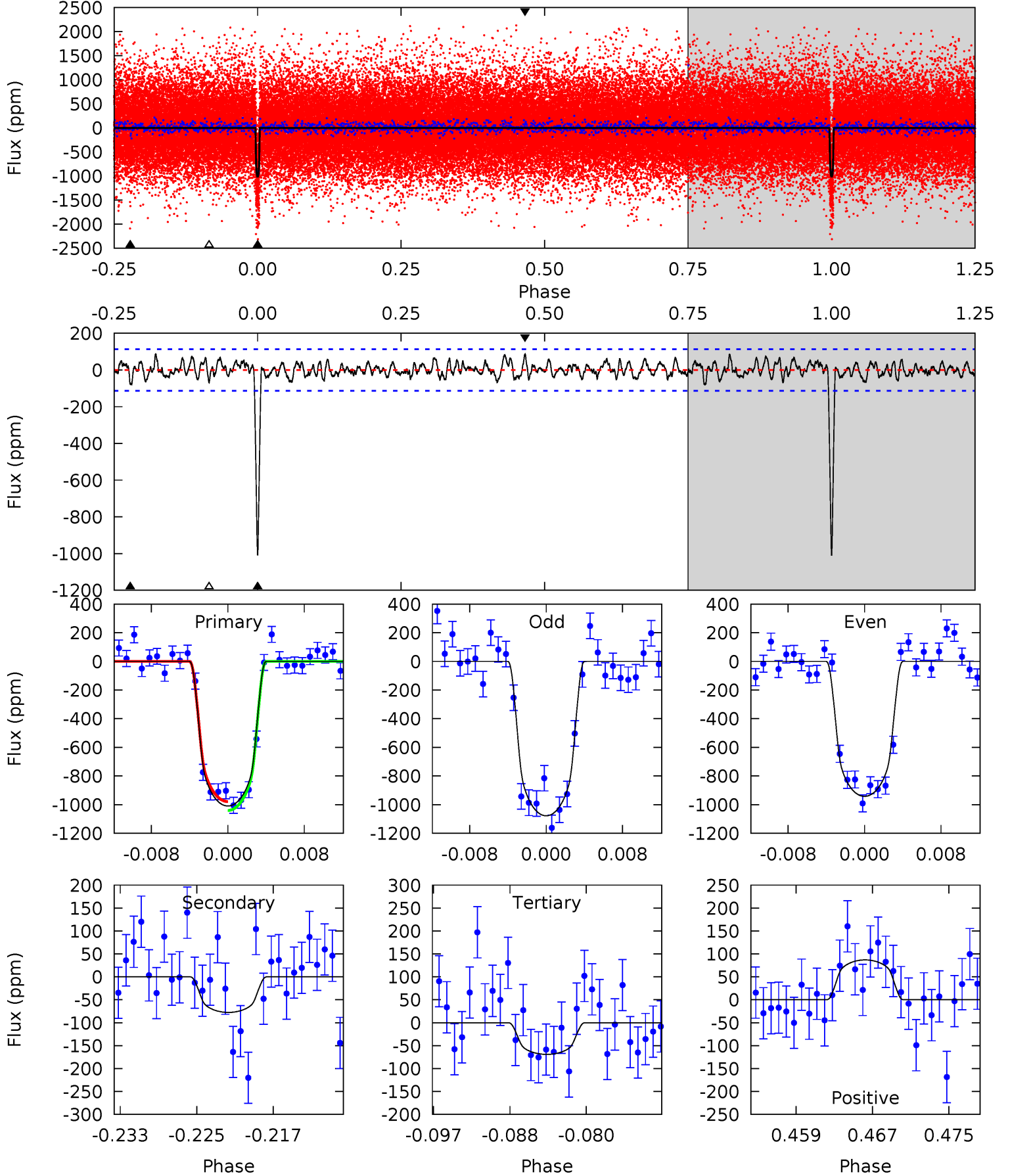
TCE 009351316-01 P= 18.784346 Days $T_0=137.879959$ (BKJD)



DV Model-Shift Uniqueness Test

009351316-01, $P = 18.784252$ Days, $E = 119.098228$ Days

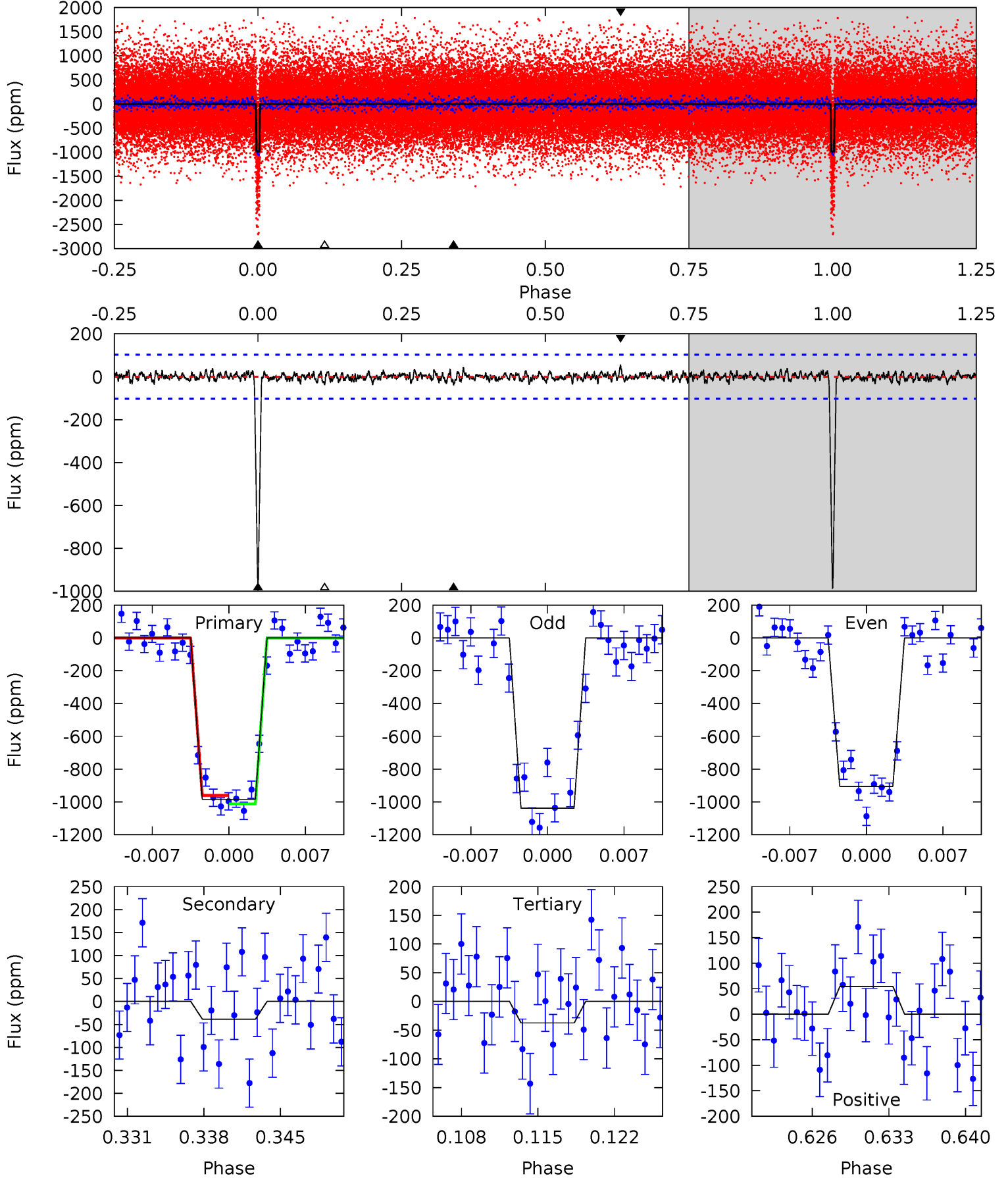
Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
45.1	3.47	3.09	3.88	5.07	2.65	1.33	42.0	41.2	0.38	-0.42	3.04	0.98	0.08	1.39



Alt Model-Shift Uniqueness Test

009351316-01, P = 18.784346 Days, E = 119.095613 Days

Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
48.7	1.90	1.85	2.69	5.09	2.69	0.63	46.8	46.0	0.05	-0.79	3.29	0.98	0.05	1.29



Stellar Parameters For KIC 009351316

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	4243^{+84}_{-84}	$4.637^{+0.027}_{-0.020}$	$0.020^{+0.150}_{-0.150}$	$0.641^{+0.025}_{-0.030}$	$0.651^{+0.034}_{-0.030}$	$3.475^{+0.406}_{-0.277}$
	+2%/-2%	+1%/-0%	+750%/-750%	+4%/-5%	+5%/-5%	+12%/-8%
Source	SPE60	SPE60	SPE60	DSEP		

KIC = Kepler Input Catalog; PHO = Photometry; SPE = Spectroscopy; AST = Asteroseismology
 TRA = Transits; DESP = Dartmouth Models; MULT = Multiple Models

Secondary Eclipse Parameters for KIC 009351316-01 / KOI 2078.01

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	A_{obs}
DV	-78 ± 22	$2.37^{+0.54}_{-0.58}$	605^{+12}_{-13}	2791^{+250}_{-190}	109^{+98}_{-44}
Alt.	-38 ± 20	$2.27^{+0.55}_{-0.56}$	605^{+13}_{-14}	2567^{+249}_{-271}	58^{+62}_{-35}

T_{max} = Theoretical Maximum Planetary Temperature

T_{obs} = Observed Planetary Temperature (Assuming $A=0.3$)

A_{obs} = Observed Albedo (Assuming $T=0$)

If a secondary eclipse is present, the system is likely an EB if $T_{\text{obs}} \gg T_{\text{max}}$ AND $A_{\text{obs}} \gg 1.0$

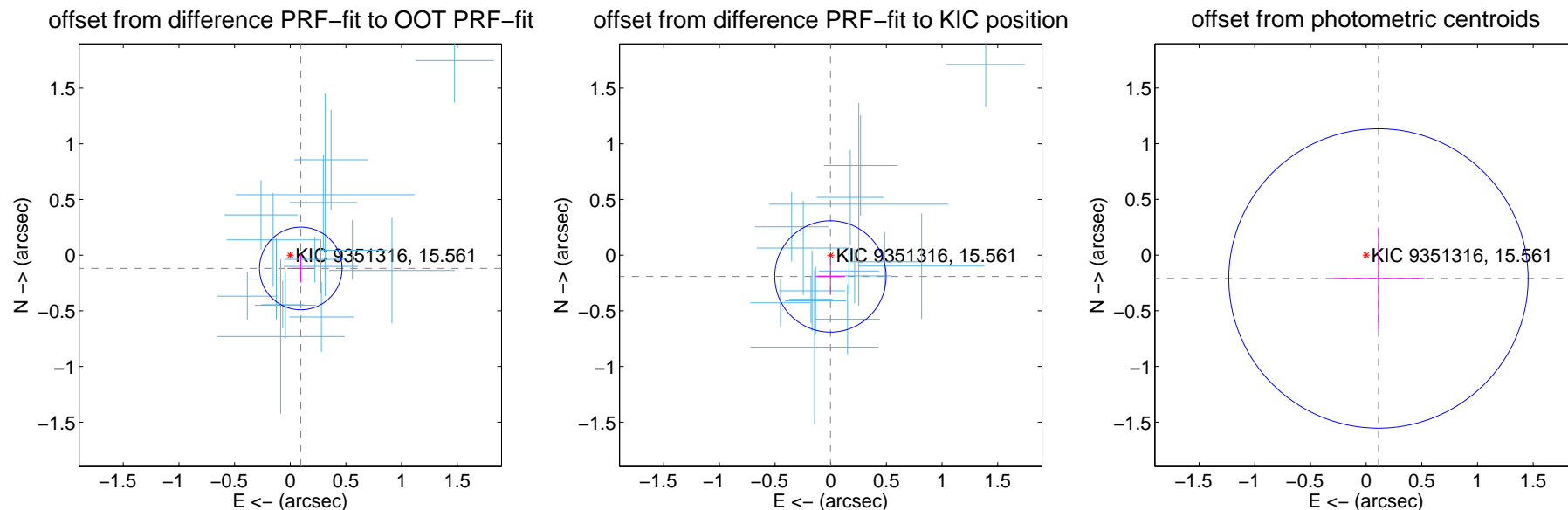
DV Centroid Data

Supplemental centroid analysis for 009351316-01. Kepler magnitude: 15.56. Transit SNR 28.39

There are 16 quarters with good PRF difference image offsets

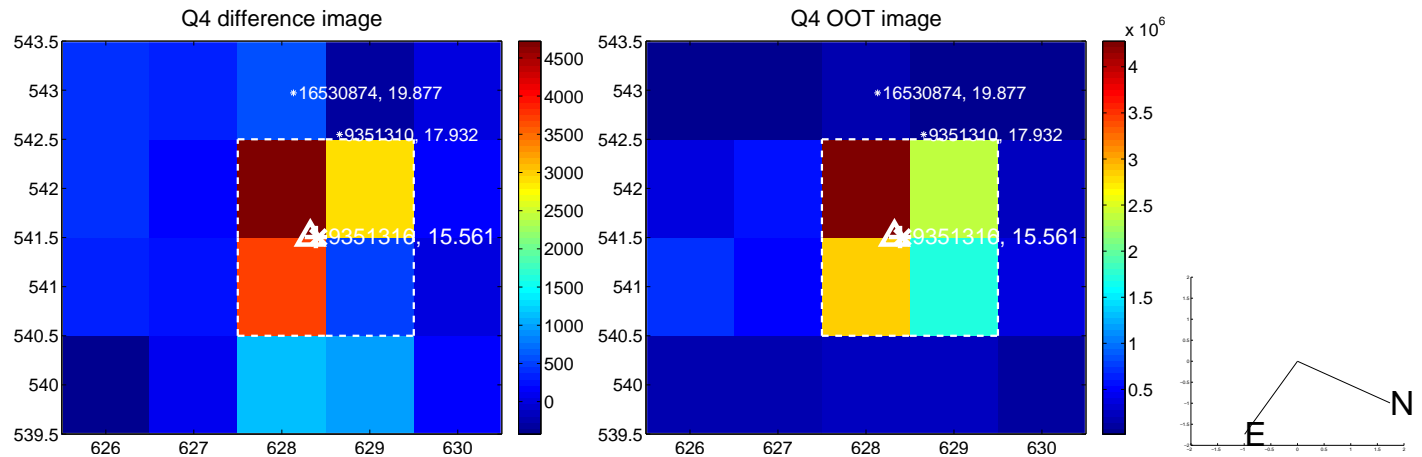
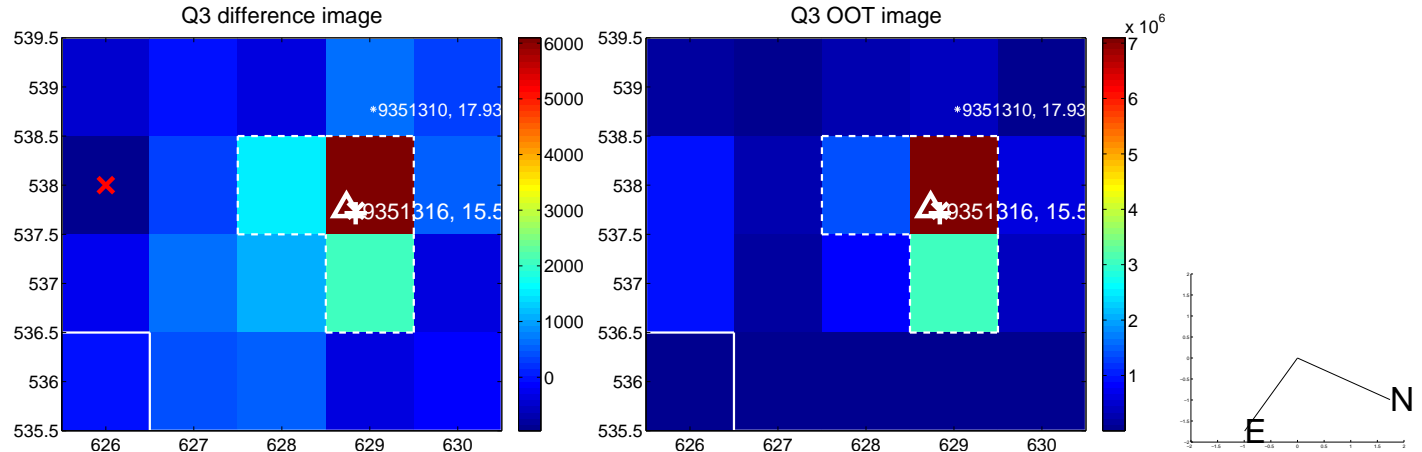
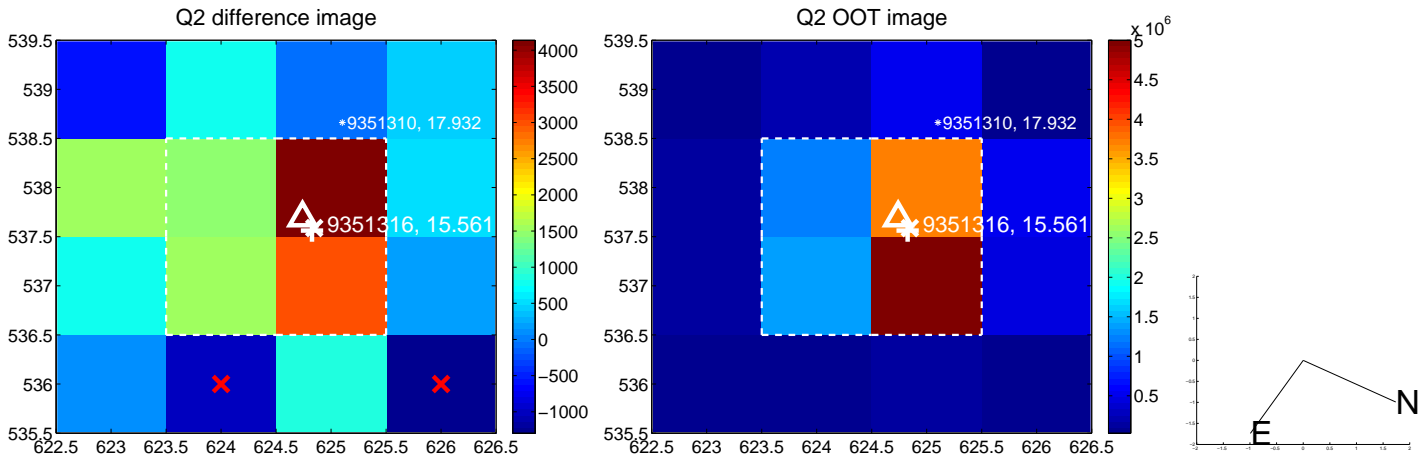
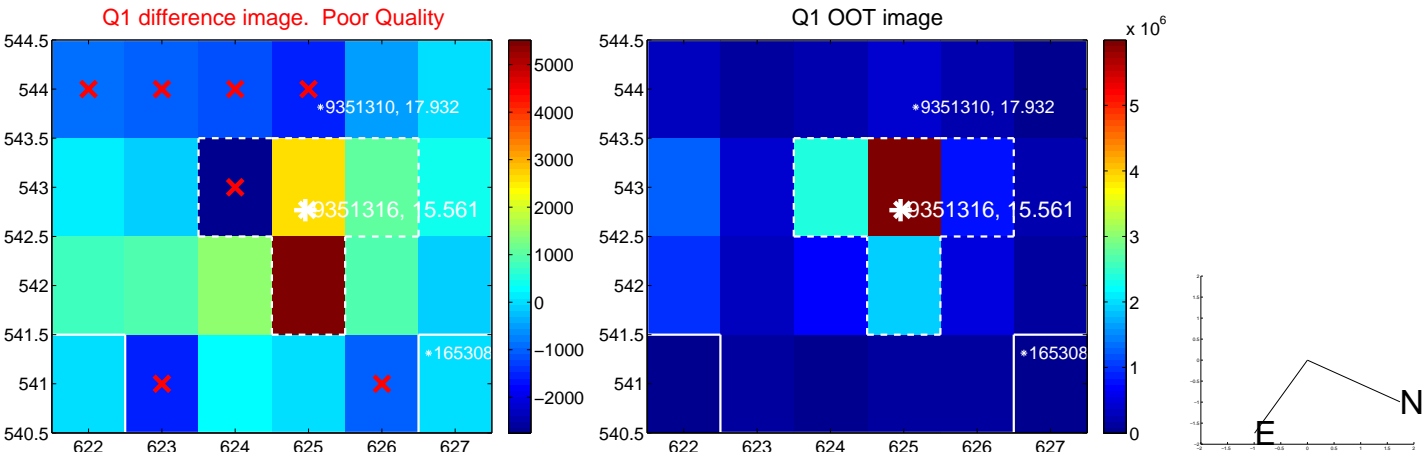
The direct PRF centroid is offset from the target star catalog position by about 0.10 arcsec

	Distance in arcsec	Distance / σ	Δ RA	Δ Dec
PRF-fit source offset from OOT	0.152 ± 0.124	1.23	-0.095 ± 0.120	-0.119 ± 0.126
PRF-fit source offset from KIC position	0.191 ± 0.167	1.15	0.003 ± 0.131	-0.191 ± 0.166
photometric centroid source offset	0.24 ± 0.45	0.53	-0.11 ± 0.41	-0.21 ± 0.46

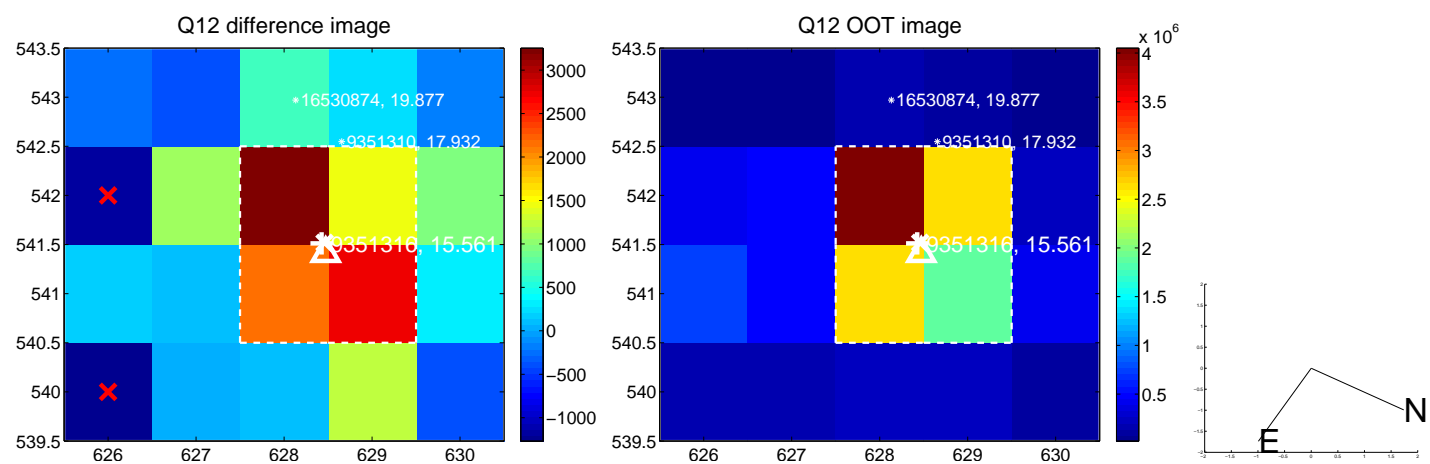
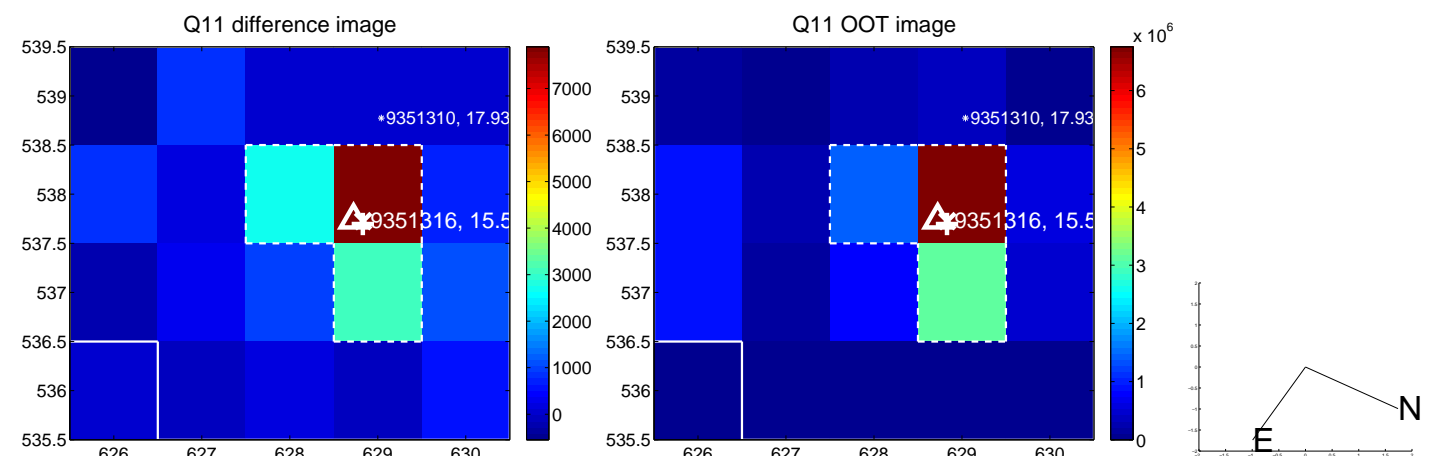
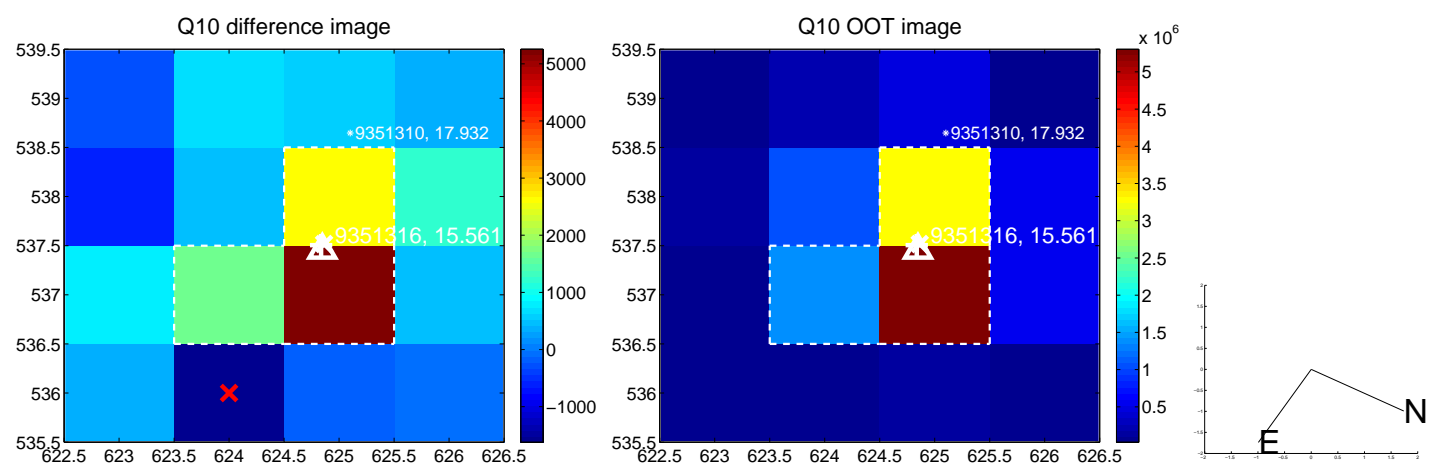
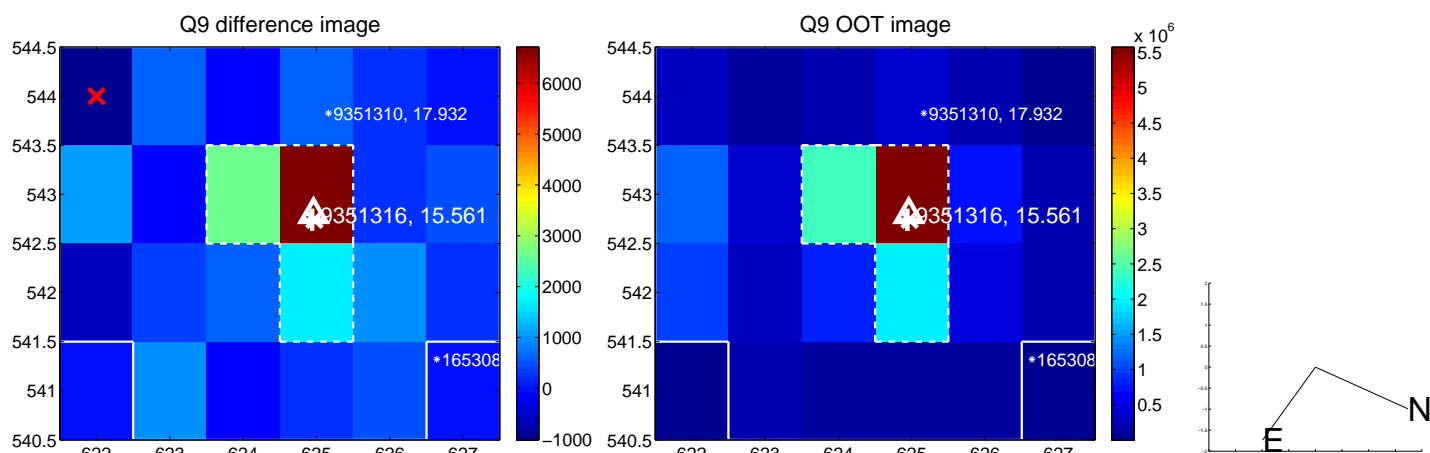


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three- σ . Red *: target star. Blue *: Other stars. Text next to a star gives its KIC ID and kepmag. KIC IDs > 15,000,000 are from the UKIRT catalog.

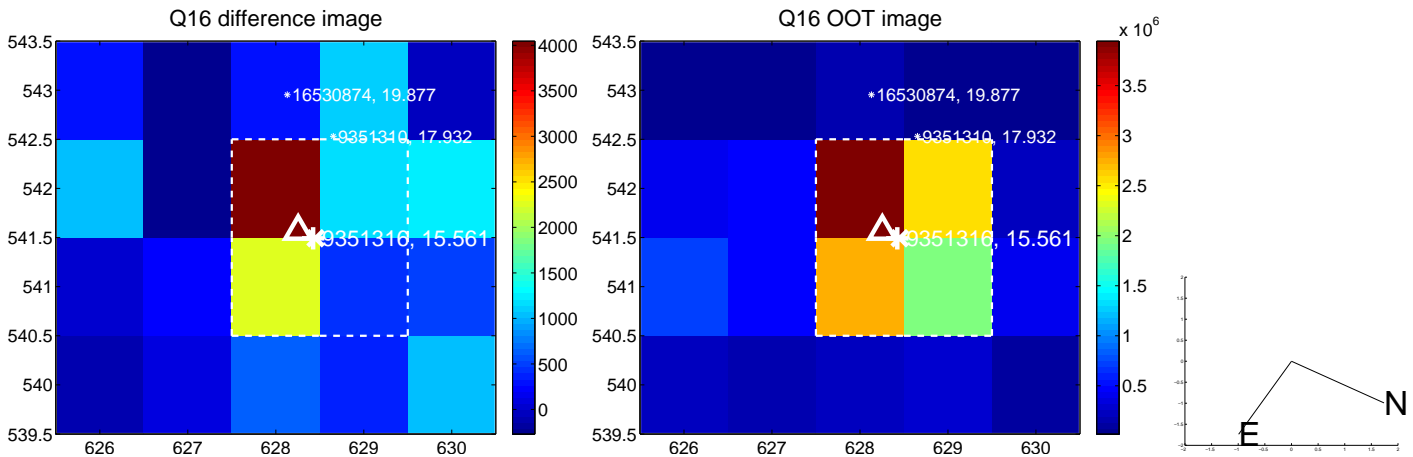
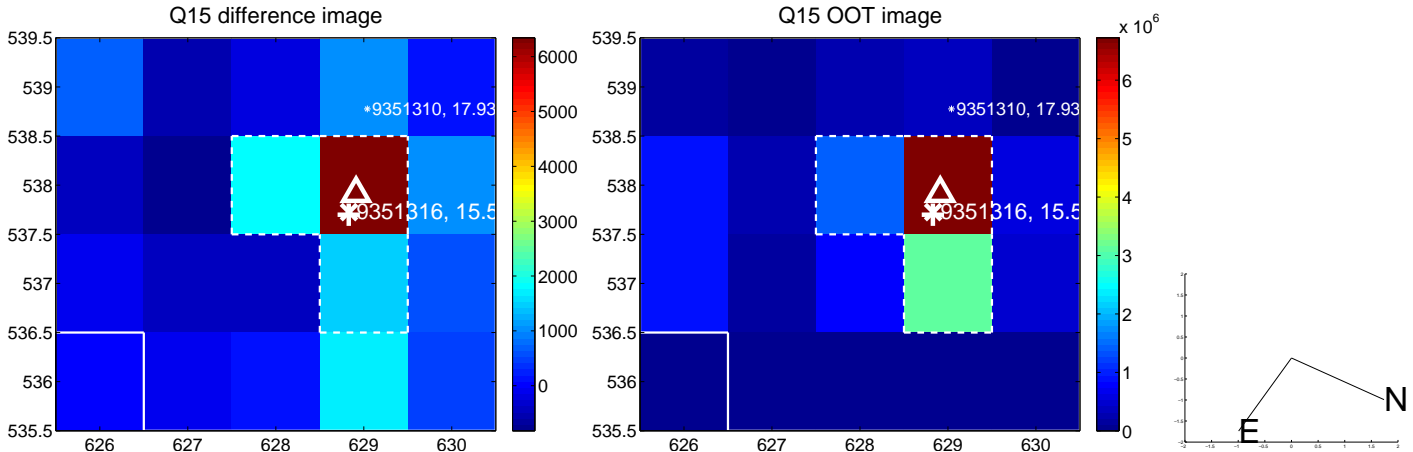
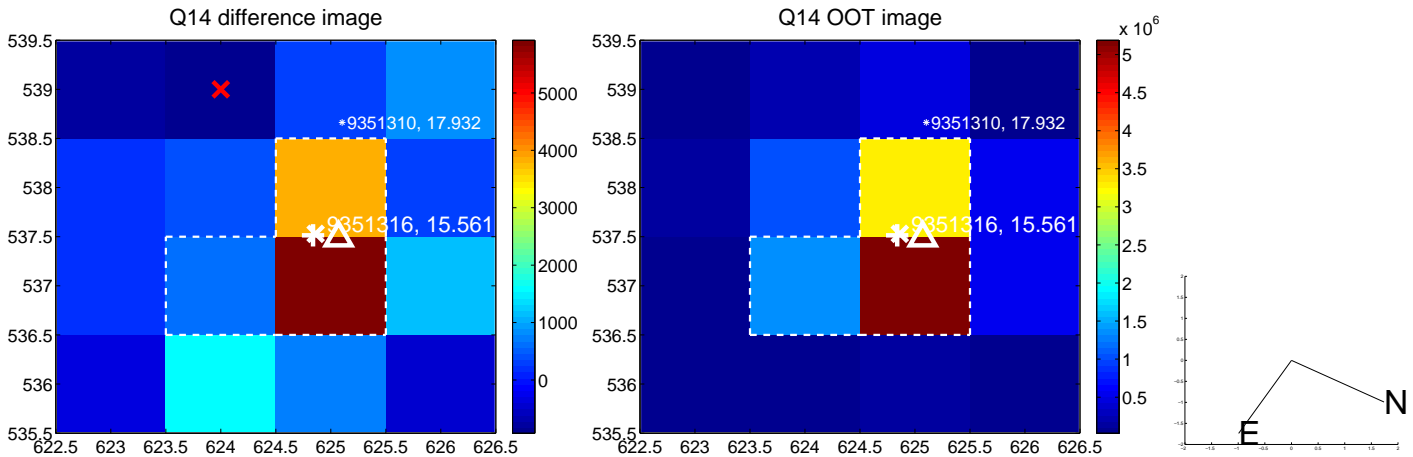
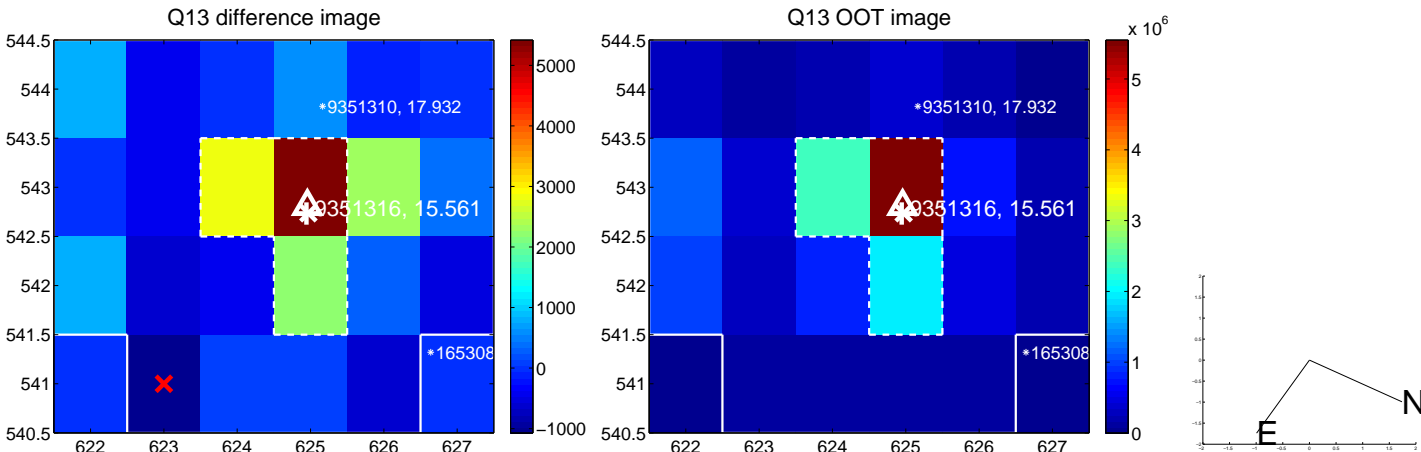
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.

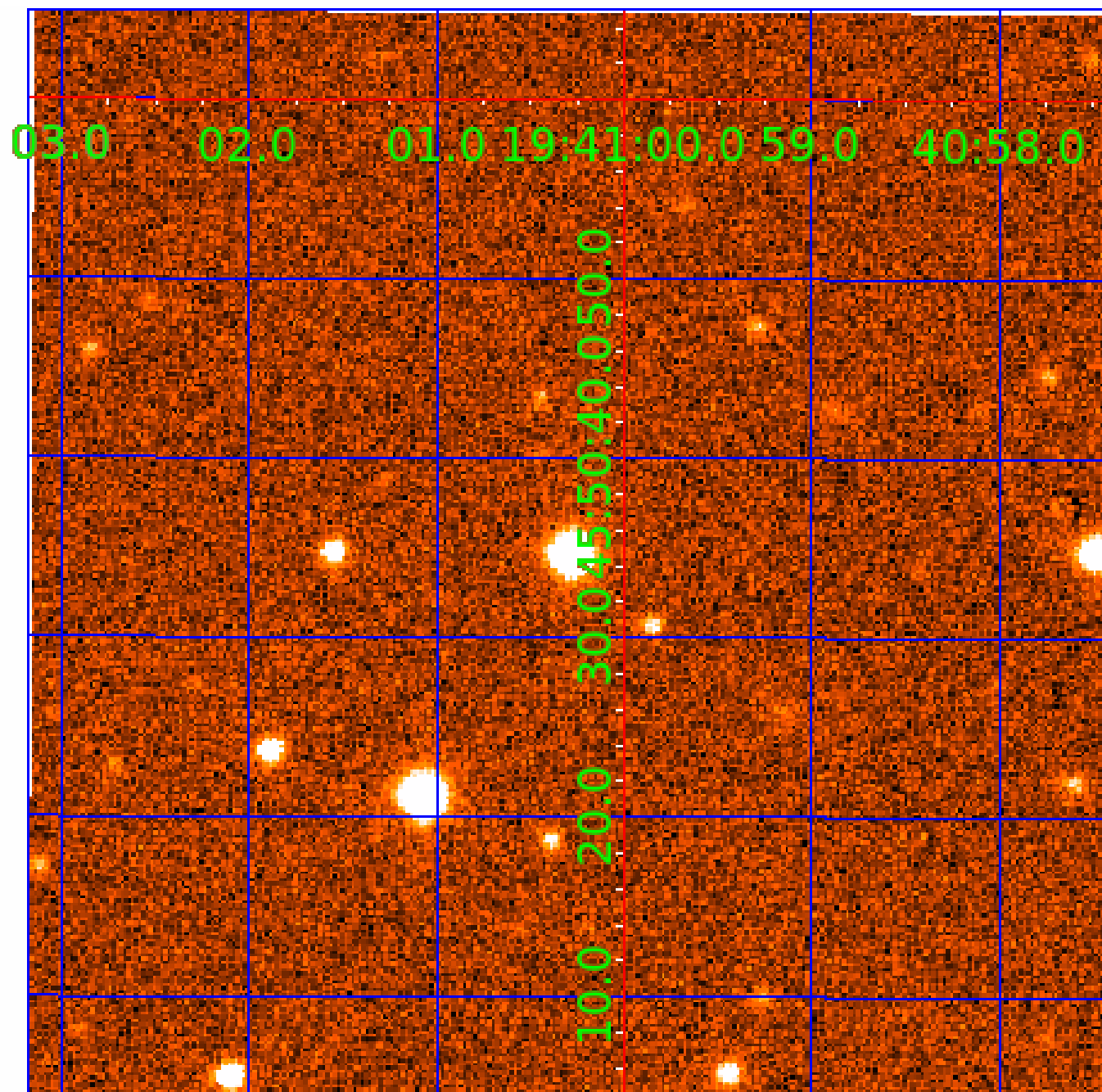


white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



UKIRT Image

Declination



KIC 009351316

Q1-17 DR25 TCE Parameters

TCE	Run Type	KOI?	Period (Days)	Epoch (BKJD)	Depth (ppm)	Duration (Hours)	MES	SNR	R_{\star} (R_{\odot})	T_{\star} (K)	R_p (R_{\oplus})	S_p (S_{\oplus})
009351316-01	OBS	2078.01	18.784252	137.882480	1022.3	3.193	26.6	28.4	0.64	4243	2.33	8.31
009351316-02	OBS	2078.02	161.515533	176.502531	1920.9	6.665	19.0	22.8	0.64	4243	3.07	0.47

Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009351316-01	OBS	PC	1.00	0	0	0	0	NO_COMMENT
009351316-02	OBS	PC	1.00	0	0	0	0	NO_COMMENT

Notes: OBS = Observed. INJ = Injected. INV = Inverted. SCR = Scrambled.

N = Not Transit-Like. S = Stellar Eclipse. C = Centroid Offset. E = Ephemeris Match.

See http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col for comment definitions.

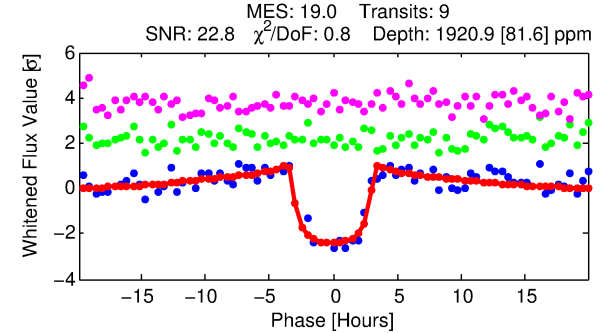
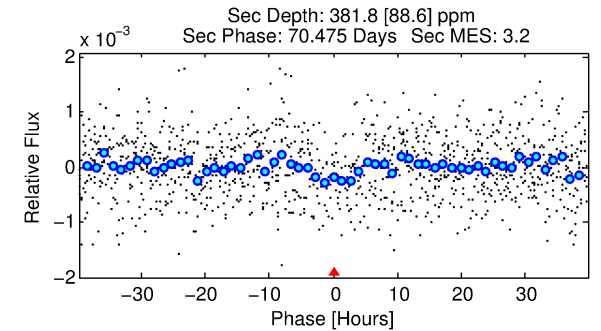
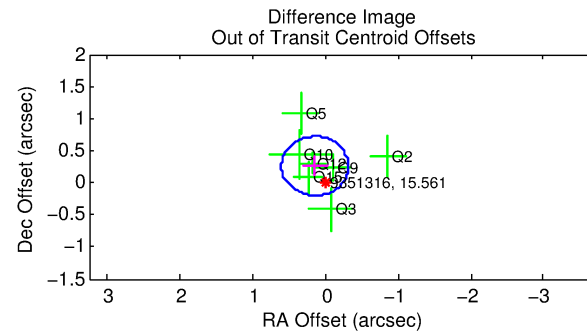
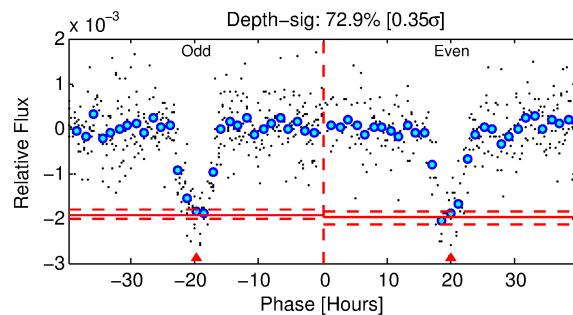
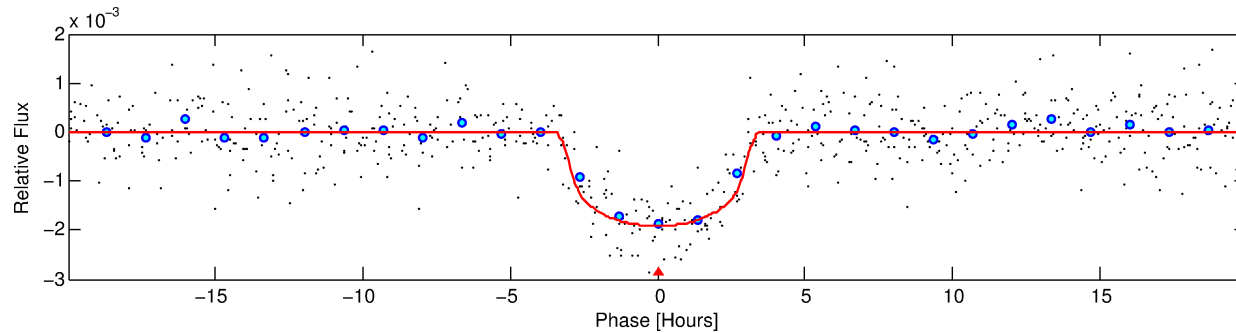
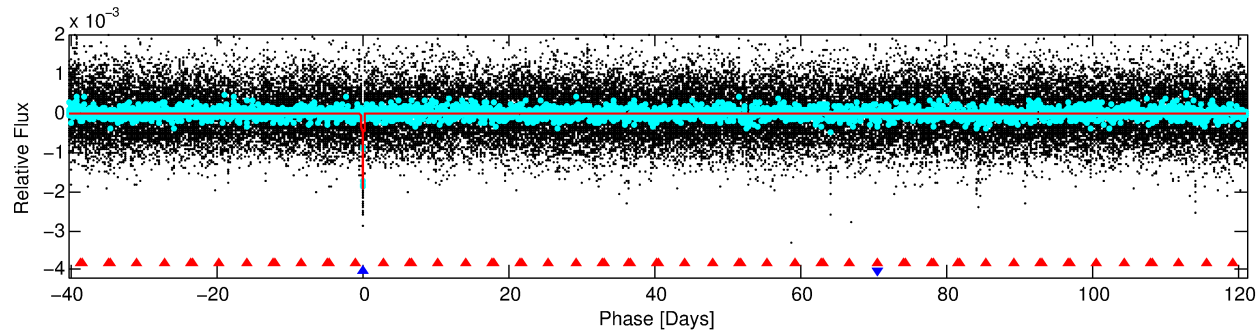
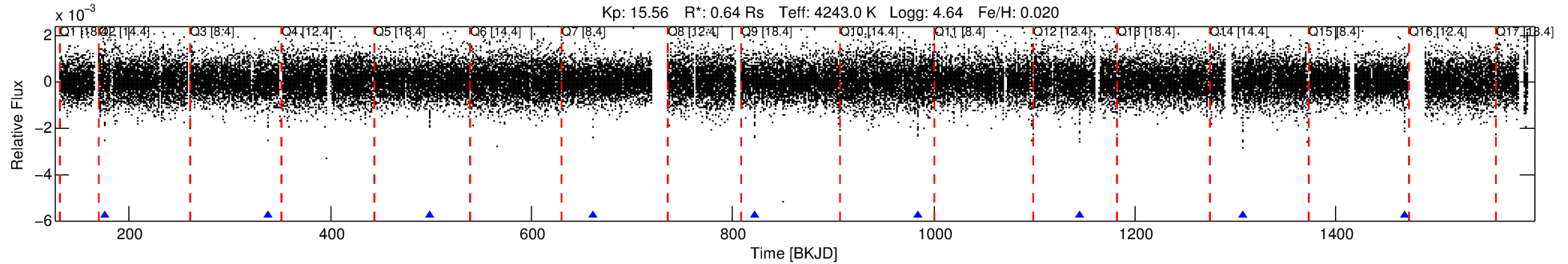
Ephemeris Match Information For 009351316-02

No Significant Match Found

DV One-Page Summary

KIC: 9351316 Candidate: 2 of 2 Period: 161.516 d

KOI: K02078.02 Corr: 0.983



DV Fit Results:

Period = 161.51553 [0.00089] d
Epoch = 176.5025 [0.0044] BKJD
Rp/R* = 0.0439 [0.0050]
a/R* = 134.73 [48.10]
b = 0.75 [0.22]
Seff = 0.47 [0.04]
Teq = 211 [5] K
Rp = 3.07 [0.38] Re
a = 0.5028 [0.0188] AU
Ag = 5642.29 [1864.67] [3.03 σ]
Teffp = 2832 [238] K [11.02 σ]

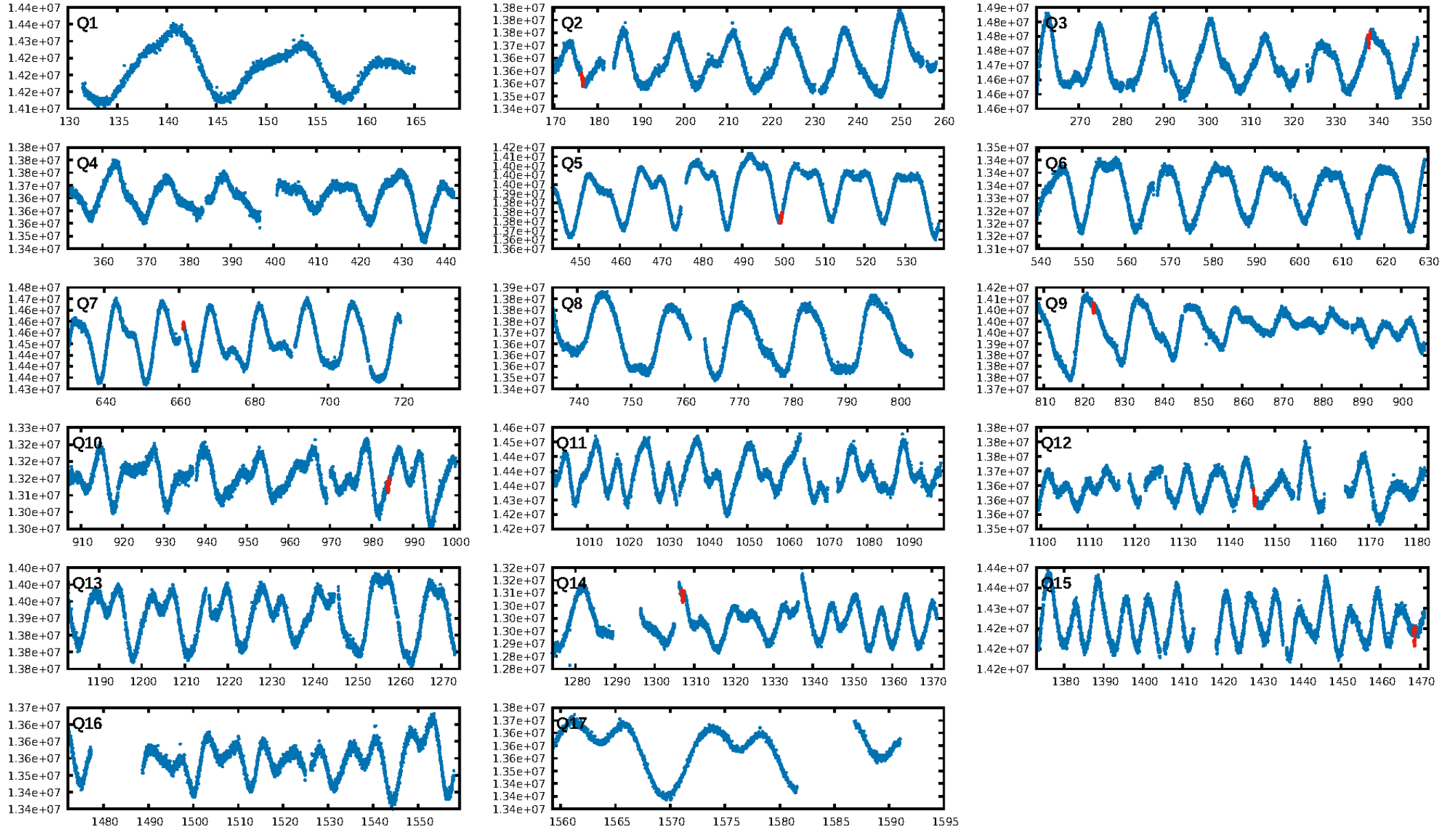
DV Diagnostic Results:

ShortPeriod-sig: 100.0% [463.54 σ]
LongPeriod-sig: N/A
ModelChiSquare2-sig: 65.2%
ModelChiSquareGof-sig: 100.0%
Bootstrap-pfa: 3.92e-63
RollingBand-fgt: 1.00 [9/9]
GhostDiagnostic-chr: 2.344
Centroid-sig: 95.6%
Centroid-so: 0.227 arcsec [0.43 σ]
OotOffset-rm: 0.297 arcsec [1.94 σ]
OotOffset-st: 2/2/1/2 [7]
KicOffset-rm: 0.280 arcsec [1.52 σ]
KicOffset-st: 2/2/1/2 [7]
DiffImageQuality-fgm: 1.00 [7/7]
DiffImageOverlap-fno: 1.00 [7/7]

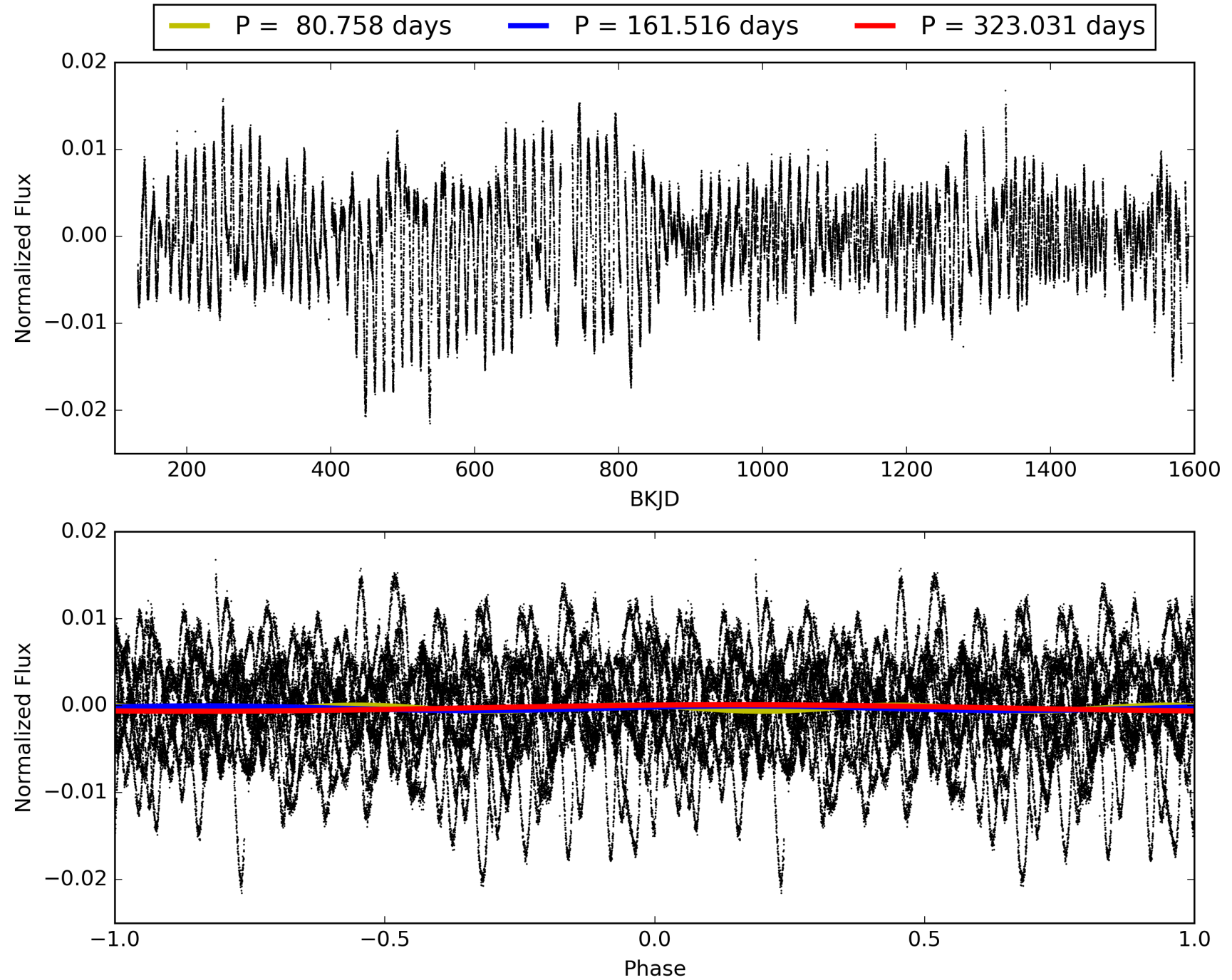
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 03:24:30 Z

This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

TCE 009351316-02, PDC Light Curves

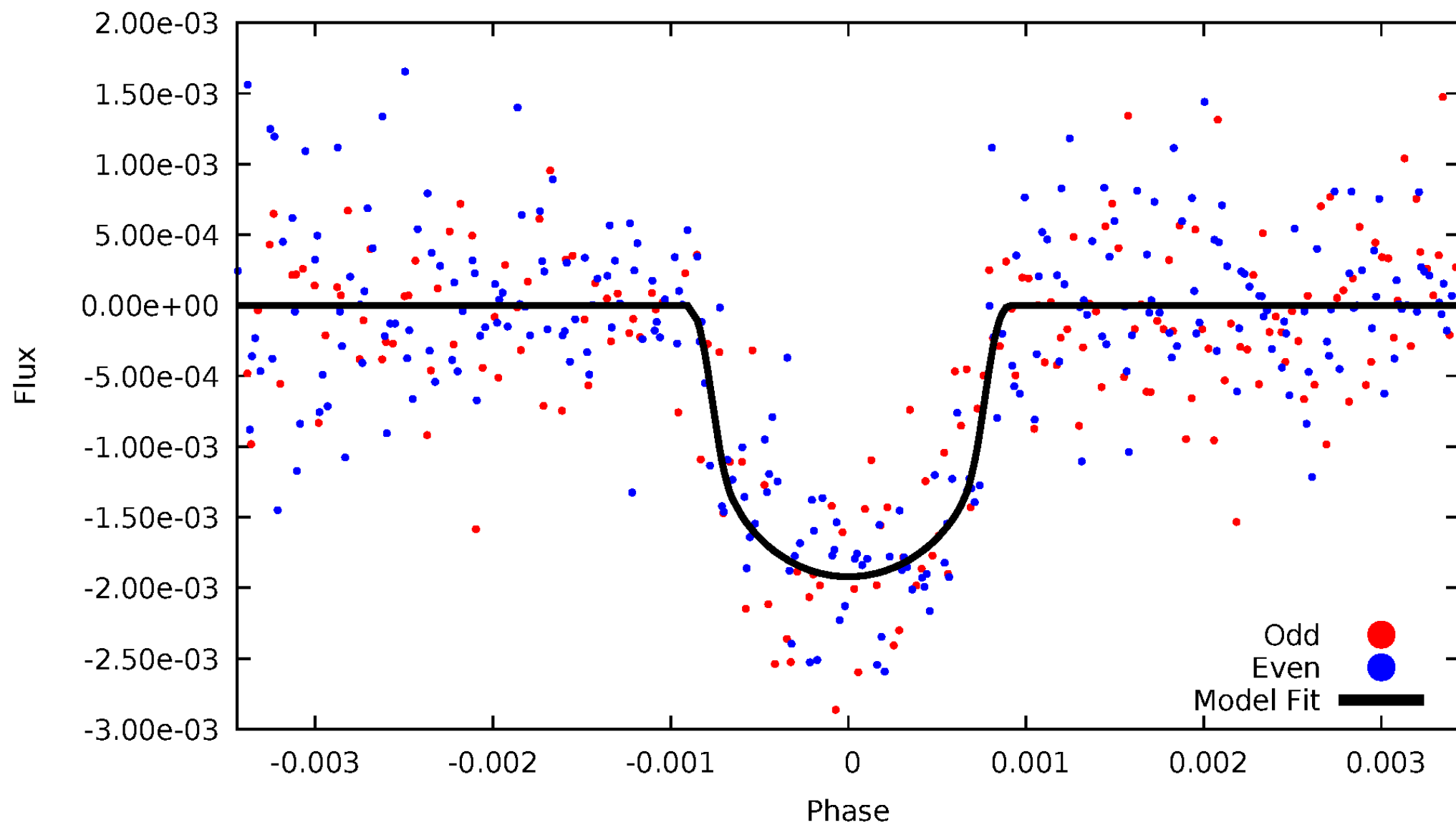


TCE 009351316-02



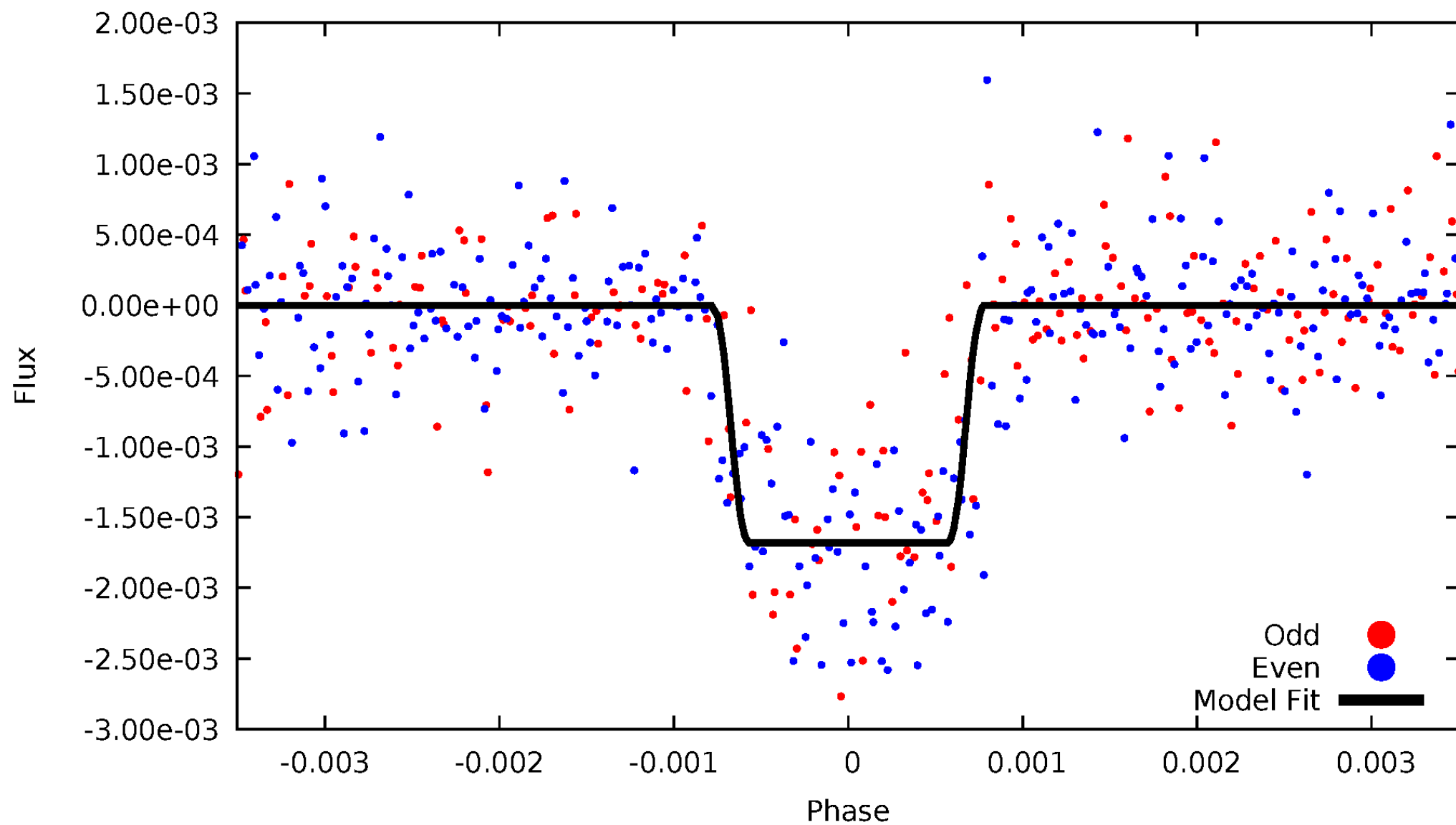
DV Odd/Even

TCE 009351316-02



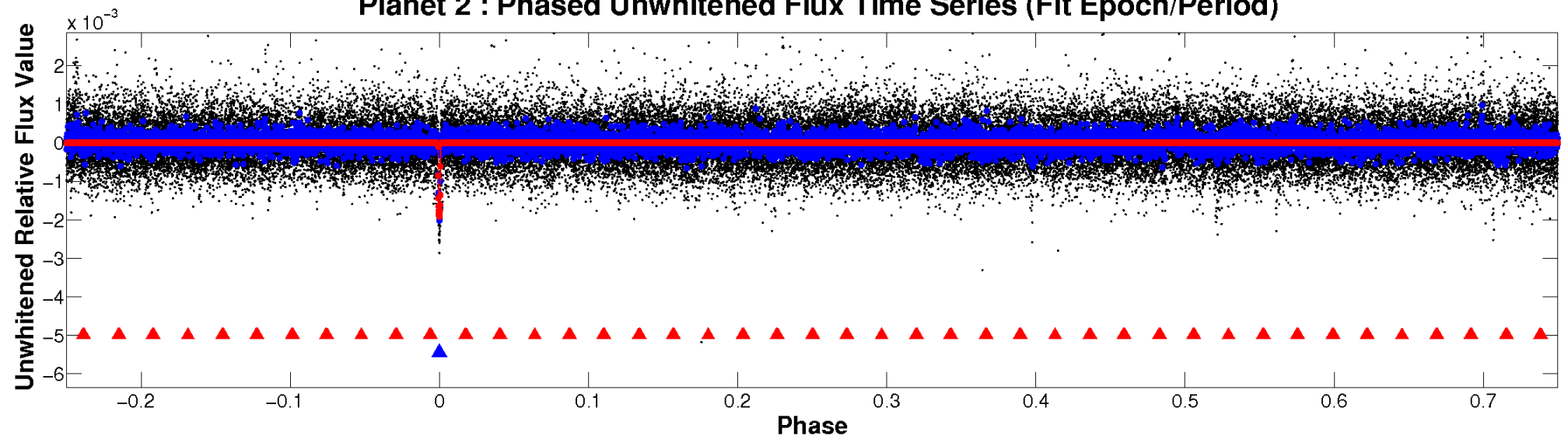
ALT Odd/Even

TCE 009351316-02

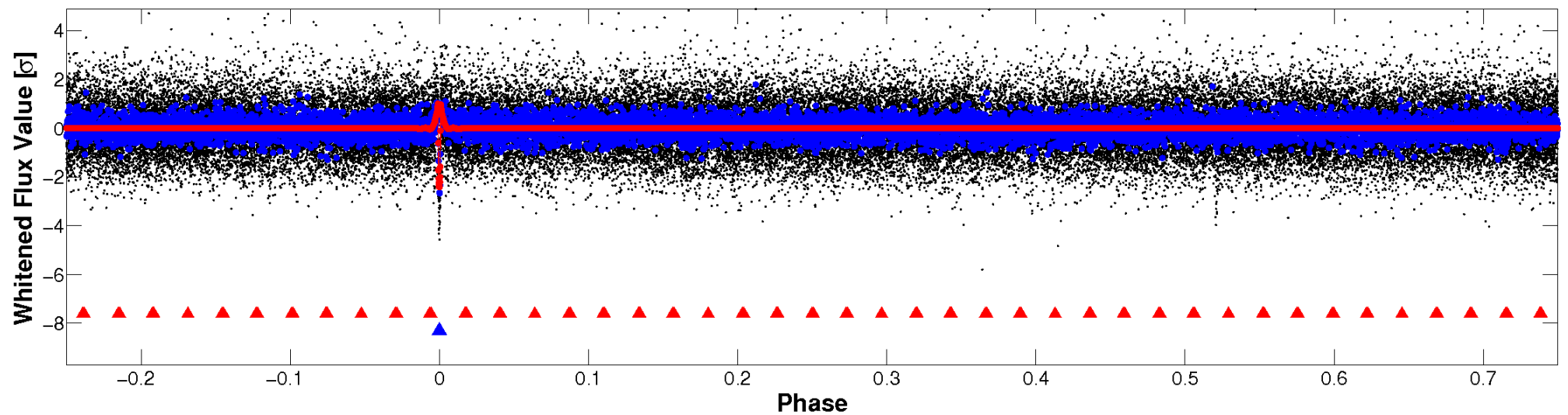


Non-Whitened Vs. Whitened Light Curve

Planet 2 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)

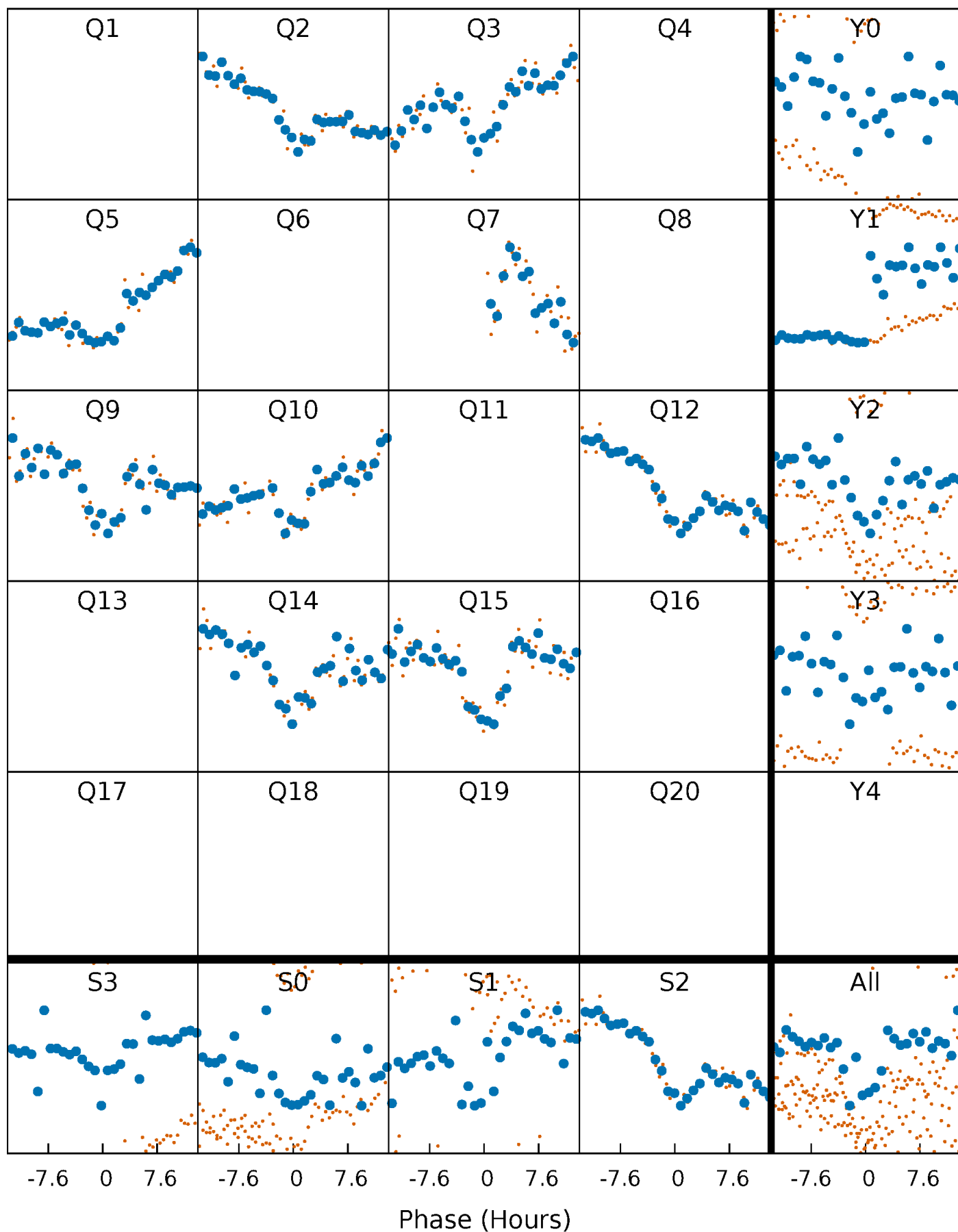


Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



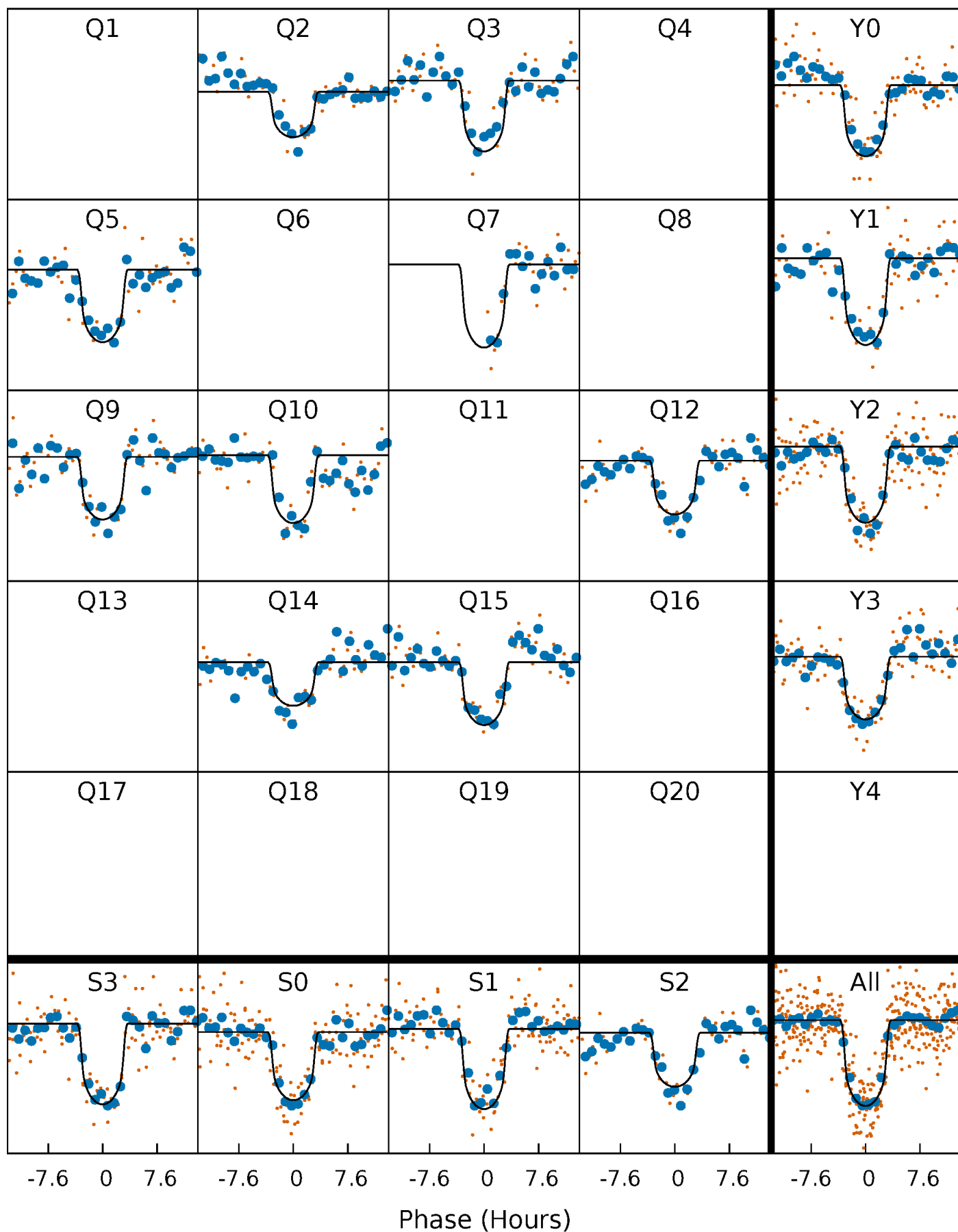
PDC Quarter-Phased Transit Curves

TCE 009351316-02 P=161.515533 Days $T_0=176.502531$ (BKJD)



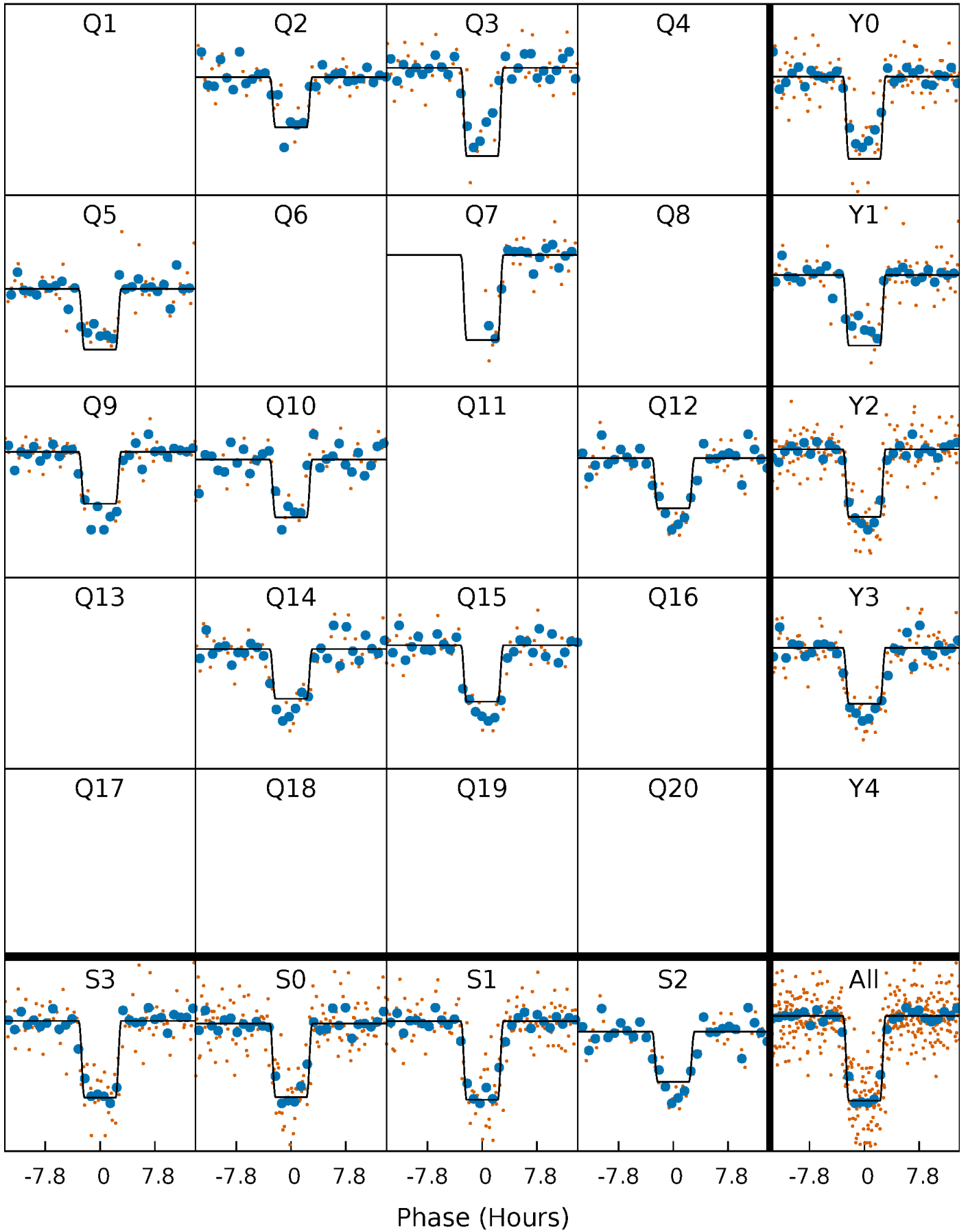
DV Quarter-Phased Transit Curves

TCE 009351316-02 P=161.515533 Days $T_0=176.502531$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

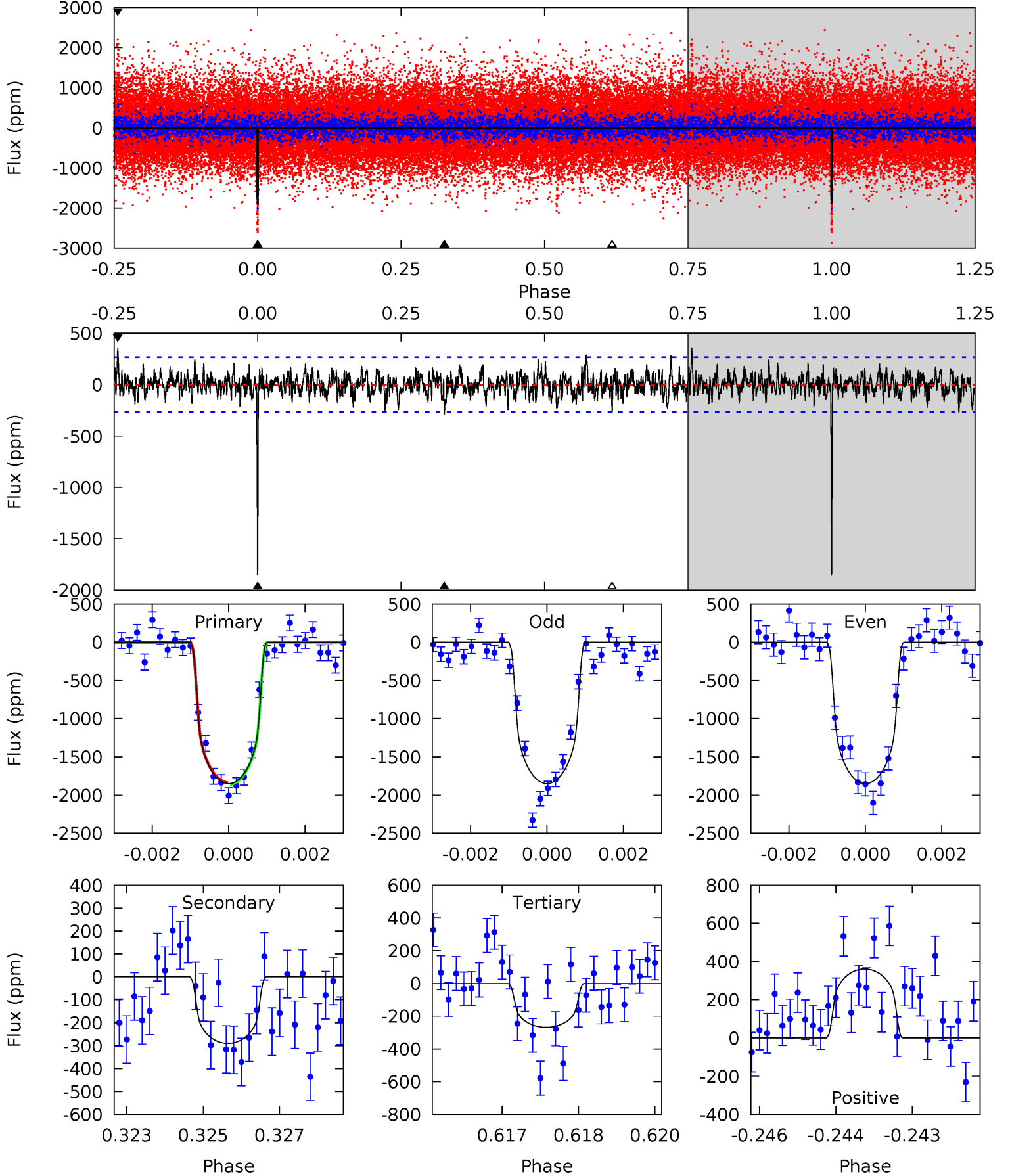
TCE 009351316-02 P=161.514245 Days $T_0=176.506937$ (BKJD)



DV Model-Shift Uniqueness Test

009351316-02, $P = 161.515533$ Days, $E = 14.986998$ Days

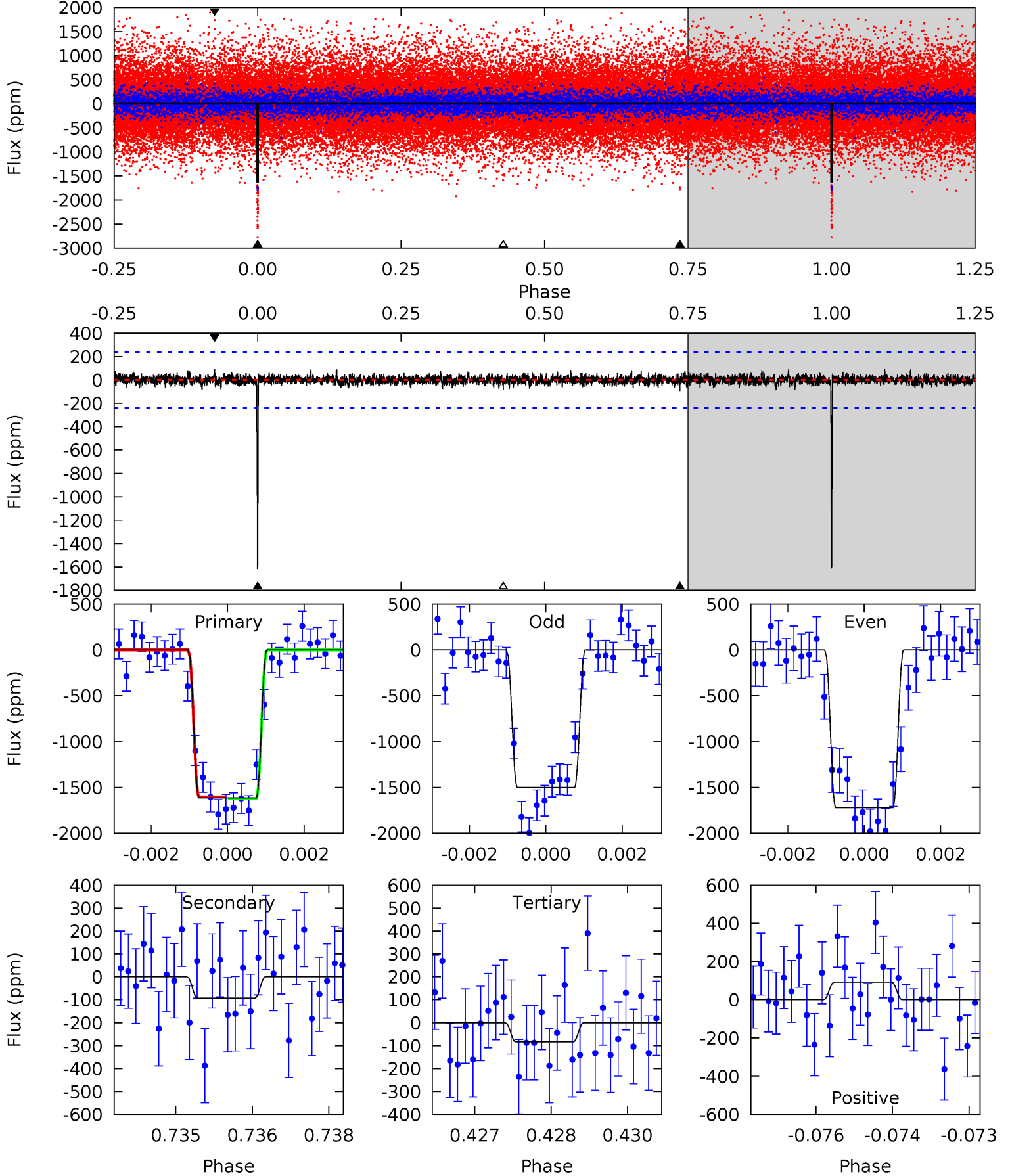
Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
37.1	5.84	5.39	7.25	5.34	3.12	1.66	31.8	29.9	0.45	-1.41	0.01	1.04	0.16	0.24



Alt Model-Shift Uniqueness Test

009351316-02, $P = 161.514245$ Days, $E = 14.992692$ Days

Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
36.3	2.09	1.89	2.07	5.38	3.17	0.51	34.4	34.2	0.20	0.02	2.45	1.11	0.05	0.19



Stellar Parameters For KIC 009351316

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	4243^{+84}_{-84}	$4.637^{+0.027}_{-0.020}$	$0.020^{+0.150}_{-0.150}$	$0.641^{+0.025}_{-0.030}$	$0.651^{+0.034}_{-0.030}$	$3.475^{+0.406}_{-0.277}$
	+2%/-2%	+1%/-0%	+750%/-750%	+4%/-5%	+5%/-5%	+12%/-8%
Source	SPE60	SPE60	SPE60	DSEP		

KIC = Kepler Input Catalog; PHO = Photometry; SPE = Spectroscopy; AST = Asteroseismology
 TRA = Transits; DESP = Dartmouth Models; MULT = Multiple Models

Secondary Eclipse Parameters for KIC 009351316-02 / KOI 2078.02

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	A_{obs}
DV	-291 ± 50	$3.05^{+0.41}_{-0.34}$	295^{+7}_{-6}	3121^{+153}_{-141}	4333^{+1510}_{-1107}
Alt.	-93 ± 44	$2.86^{+0.36}_{-0.35}$	295^{+6}_{-6}	2713^{+189}_{-227}	1590^{+945}_{-796}

T_{max} = Theoretical Maximum Planetary Temperature

T_{obs} = Observed Planetary Temperature (Assuming $A=0.3$)

A_{obs} = Observed Albedo (Assuming $T=0$)

If a secondary eclipse is present, the system is likely an EB if $T_{obs} \gg T_{max}$ AND $A_{obs} \gg 1.0$

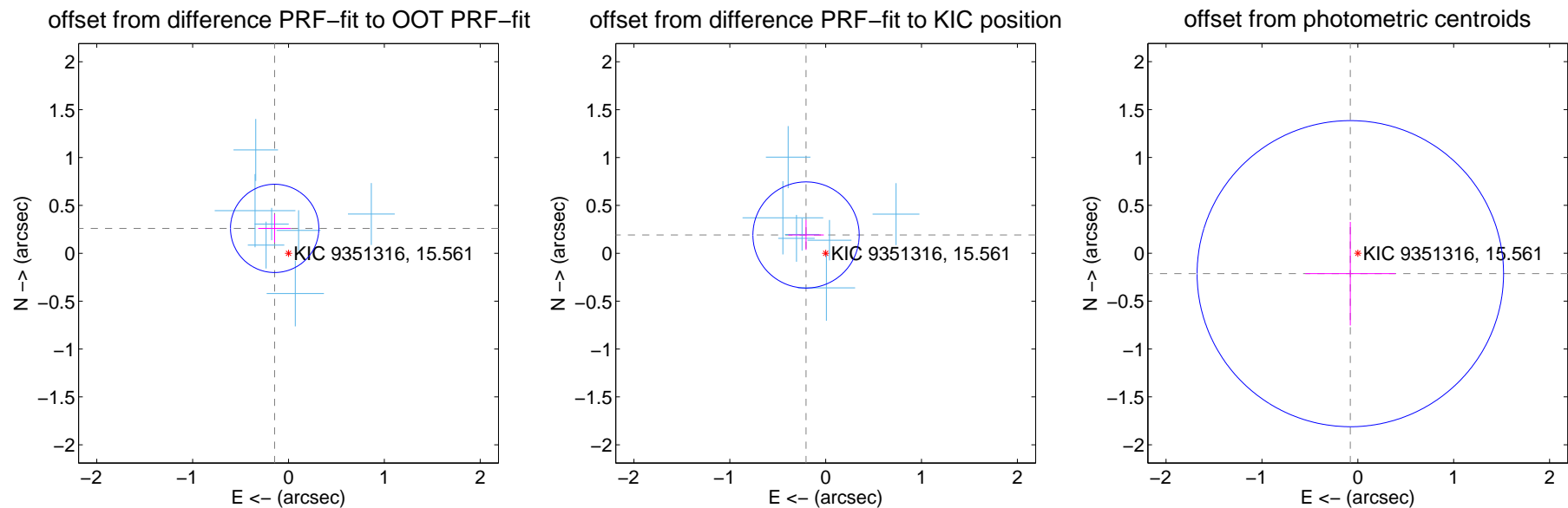
DV Centroid Data

Supplemental centroid analysis for 009351316-02. Kepler magnitude: 15.56. Transit SNR 22.83

There are 7 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.10 arcsec

	Distance in arcsec	Distance / σ	Δ RA	Δ Dec
PRF-fit source offset from OOT	0.297 ± 0.154	1.94	0.144 ± 0.171	0.260 ± 0.147
PRF-fit source offset from KIC position	0.280 ± 0.185	1.52	0.205 ± 0.185	0.191 ± 0.156
photometric centroid source offset	0.23 ± 0.53	0.43	0.08 ± 0.47	-0.21 ± 0.54



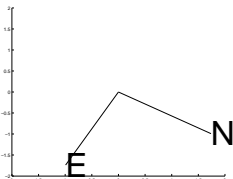
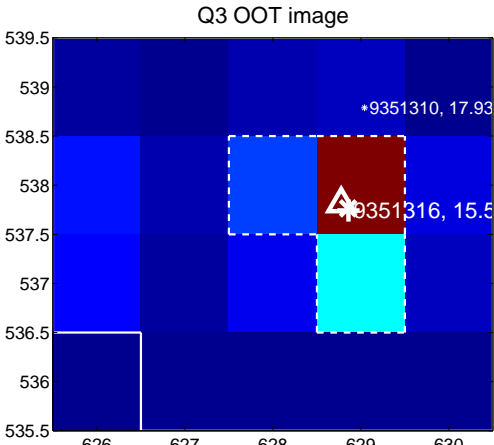
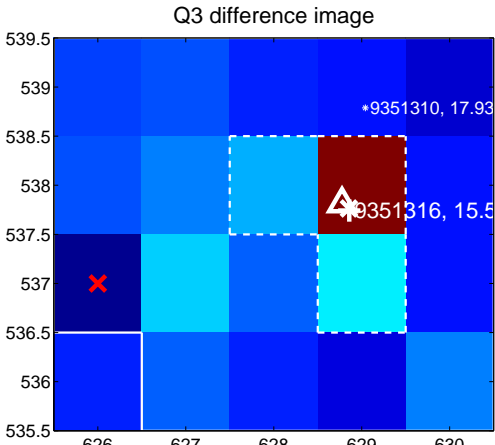
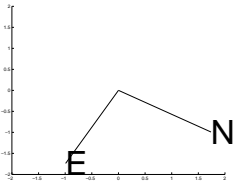
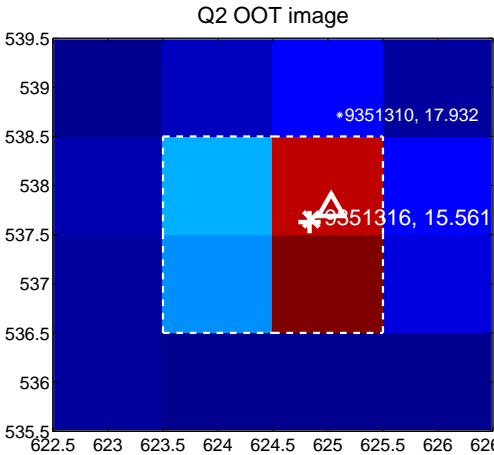
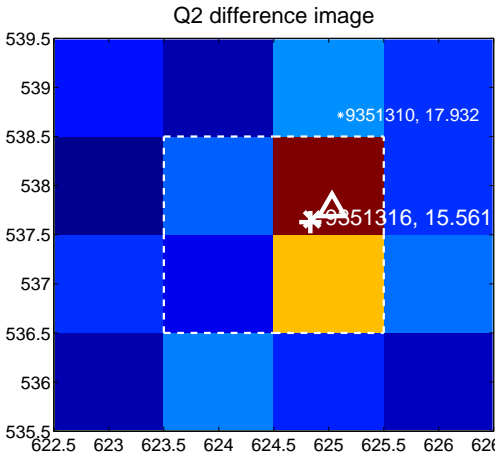
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three- σ . Red *: target star. Blue *: Other stars. Text next to a star gives its KIC ID and kepmag. KIC IDs > 15,000,000 are from the UKIRT catalog.

white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.

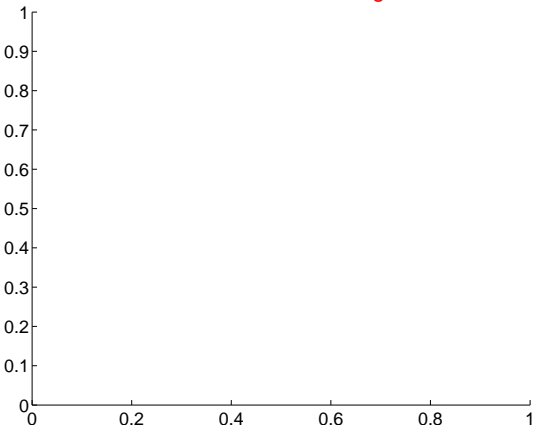
Q1 no difference image



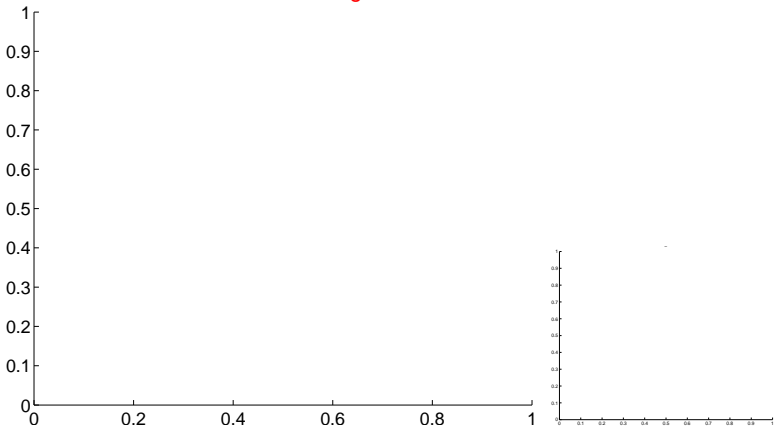
Q1 no OOT image



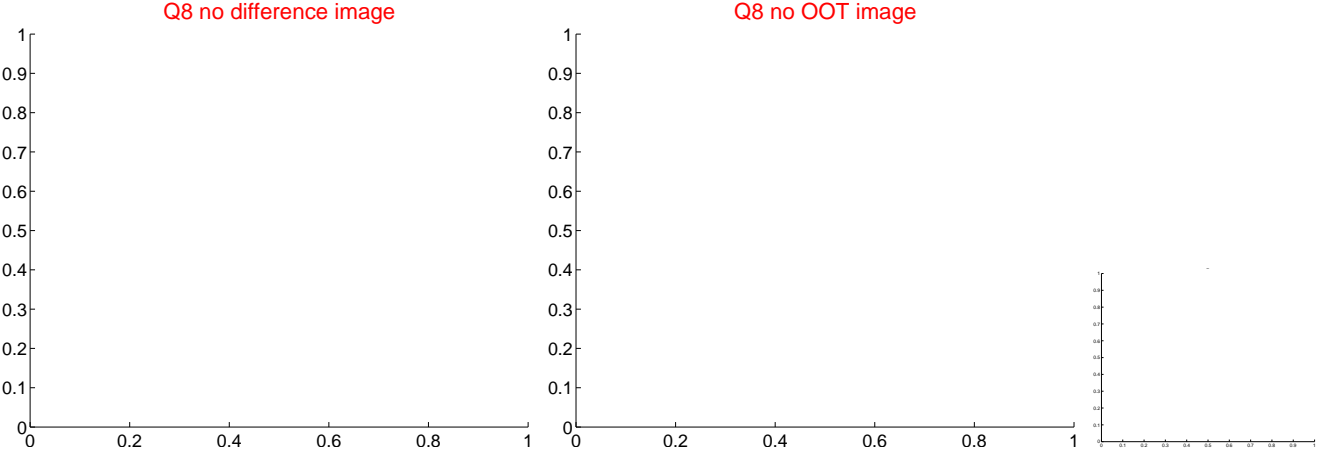
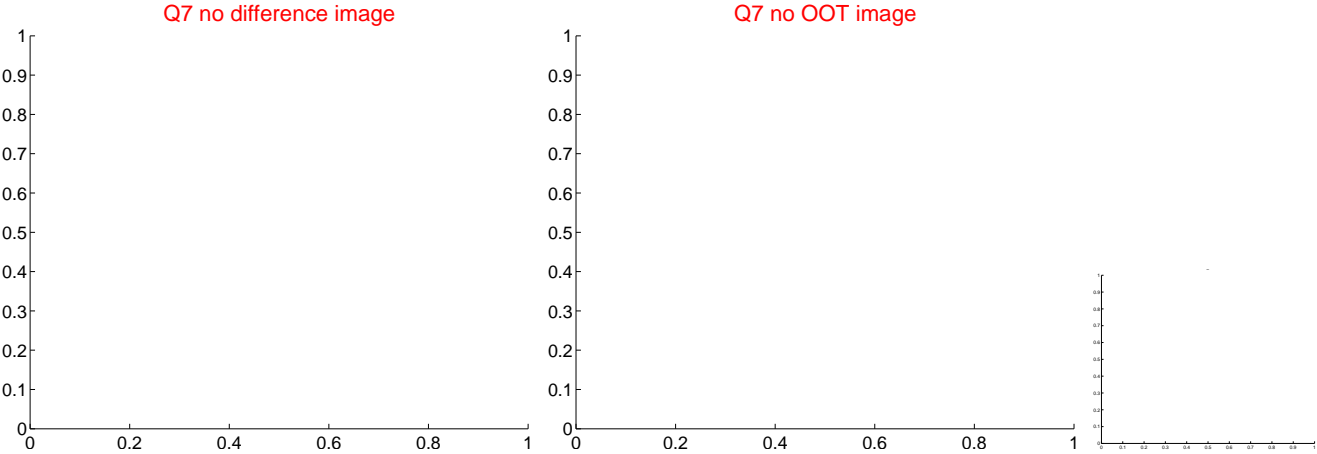
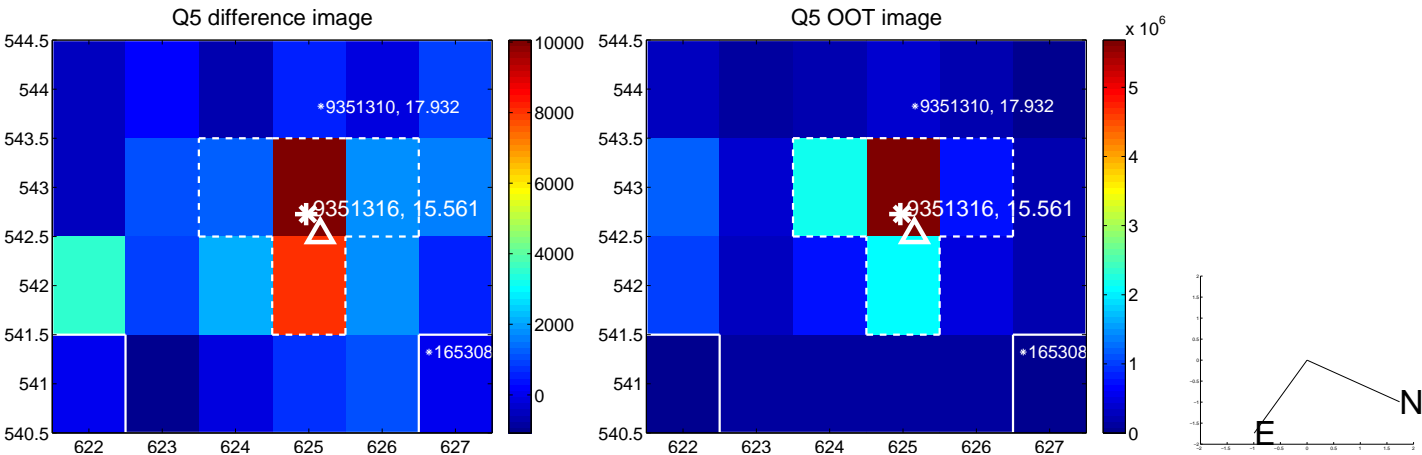
Q4 no difference image



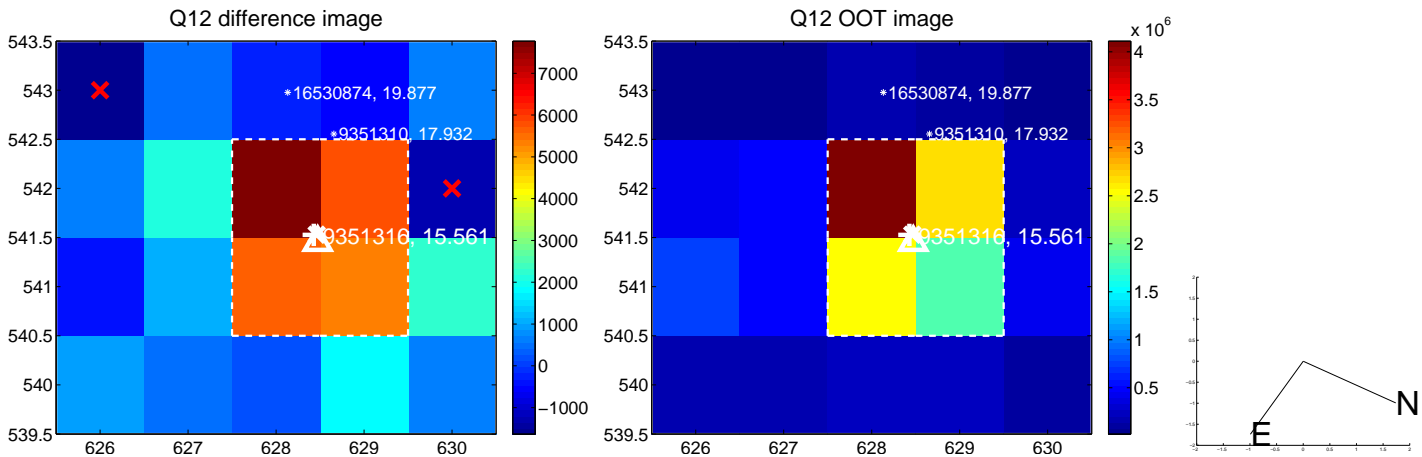
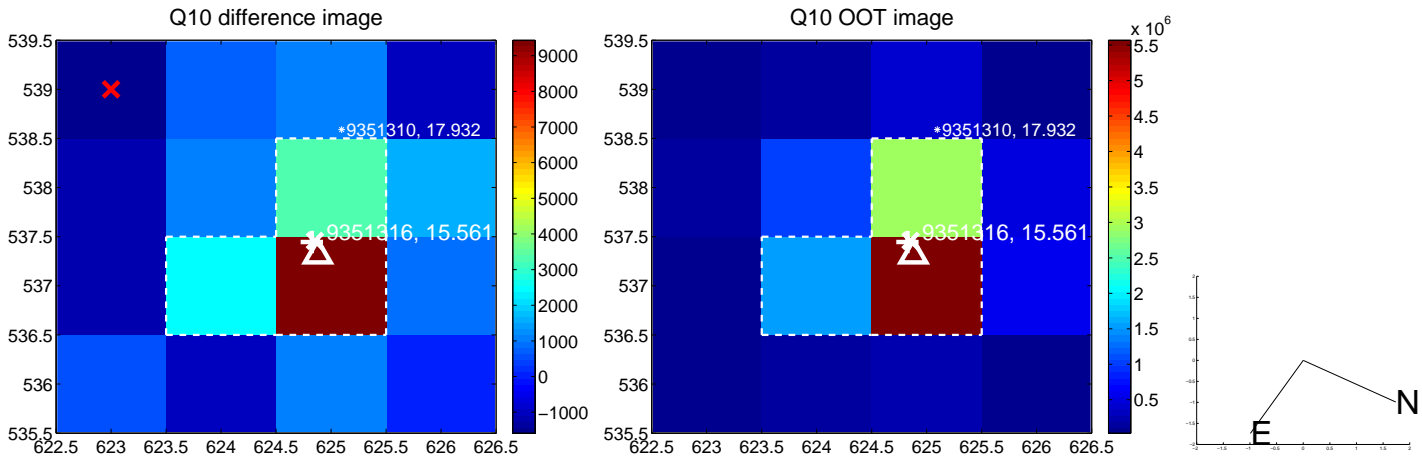
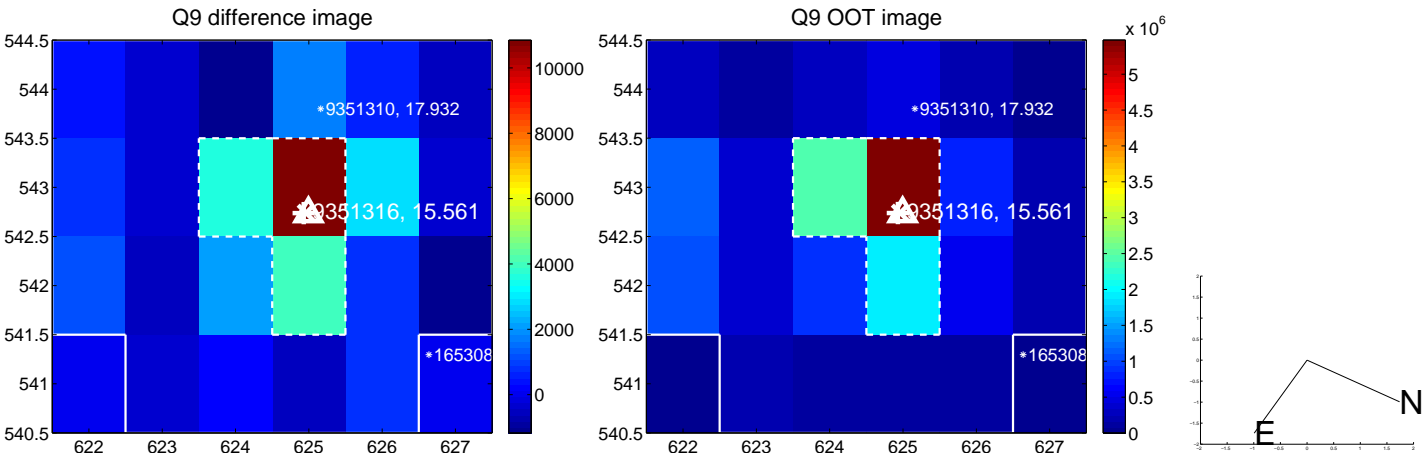
Q4 no OOT image



white ×: KIC target position; +: OOT centroid; △: difference centroid. red ×: large negative pixel value.



white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.

Q13 no difference image



Q13 no OOT image



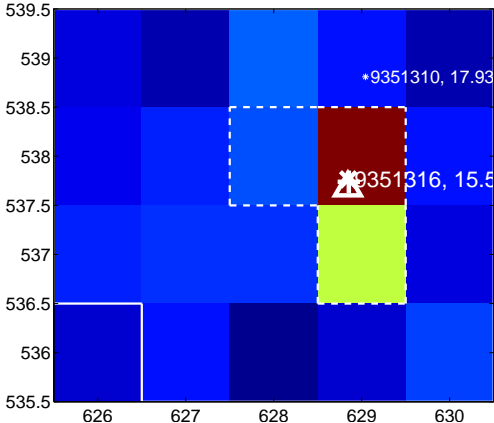
Q14 no difference image



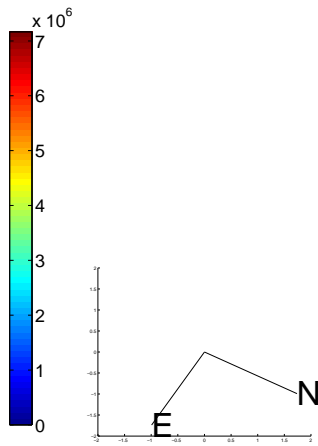
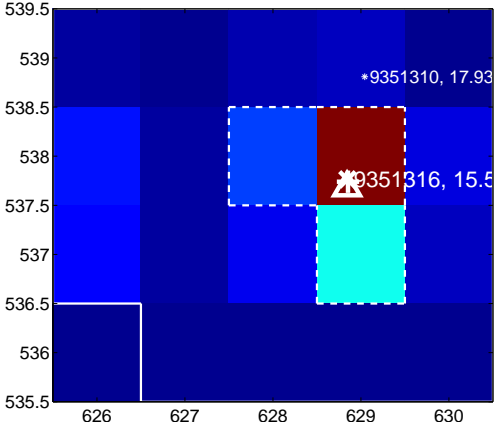
Q14 no OOT image



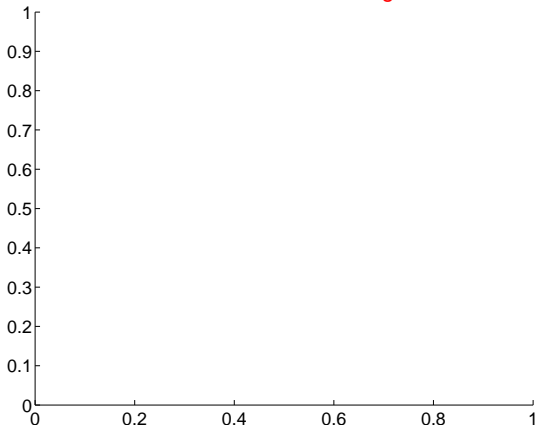
Q15 difference image



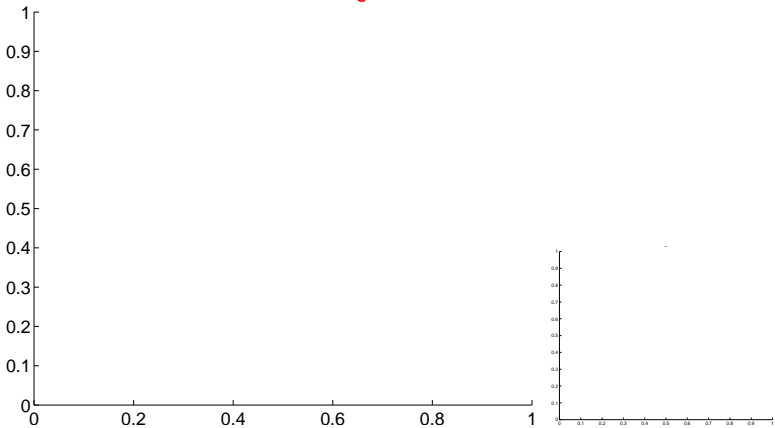
Q15 OOT image



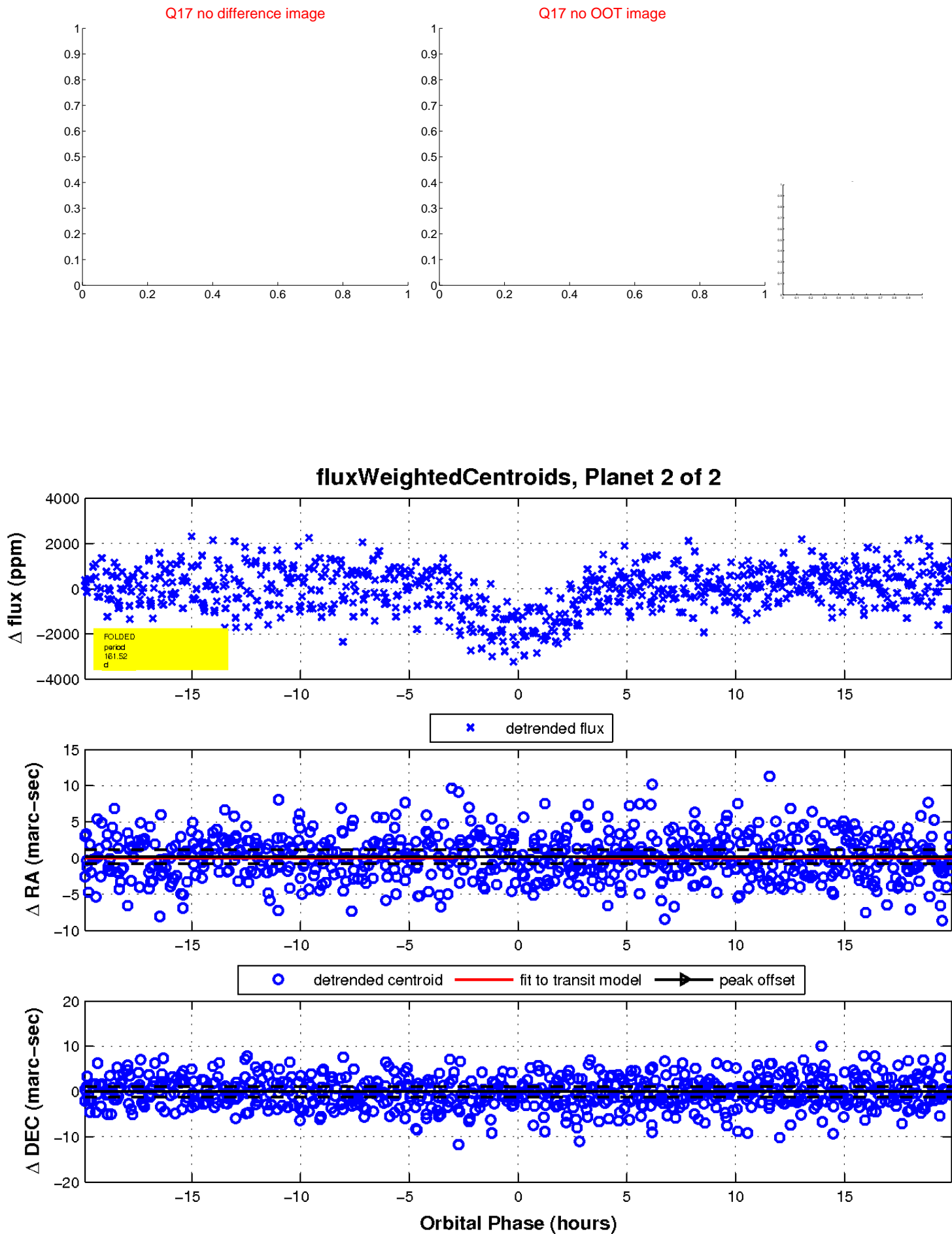
Q16 no difference image



Q16 no OOT image



white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



UKIRT Image

Declination

