

KIC 008521020

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})
008521020-01	OBS	No	0.599521	131.869201	0.5	3.212	7.7	0.3	3.50	7523	0.25	113701.59
008521020-02	OBS	No	27.155110	136.332219	75.8	4.036	8.5	6.5	3.50	7523	3.46	704.21
008521020-03	OBS	No	264.364254	153.797971	244.1	29.750	7.4	8.9	3.50	7523	6.40	33.88
008521020-04	OBS	No	84.635198	160.014583	171.4	2.280	7.1	6.9	3.50	7523	5.30	154.68

Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
008521020-01	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_SKYE_ZUMA_TRACKER—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—CENT_FEW_DIFFS
008521020-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_ZUMA—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
008521020-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_FEW_DIFFS
008521020-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT

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

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

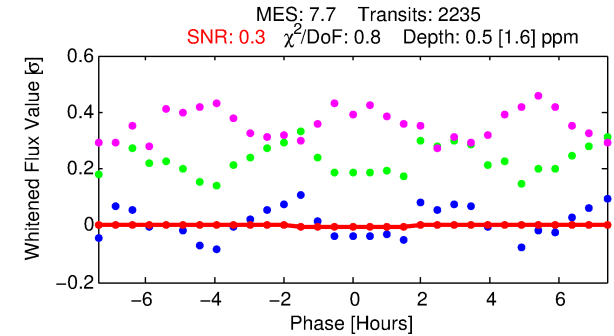
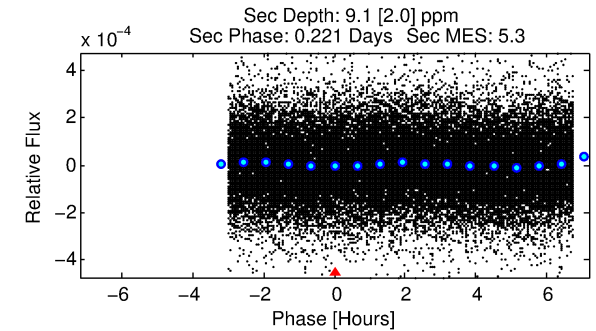
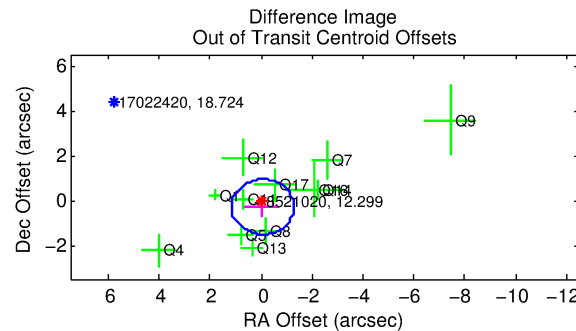
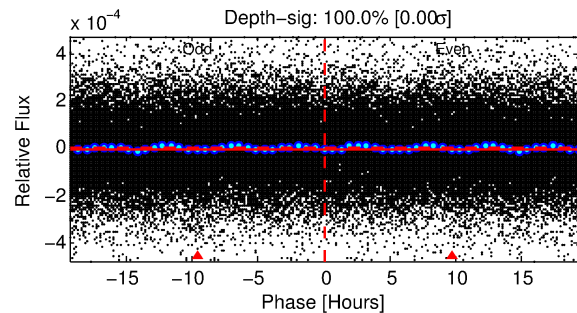
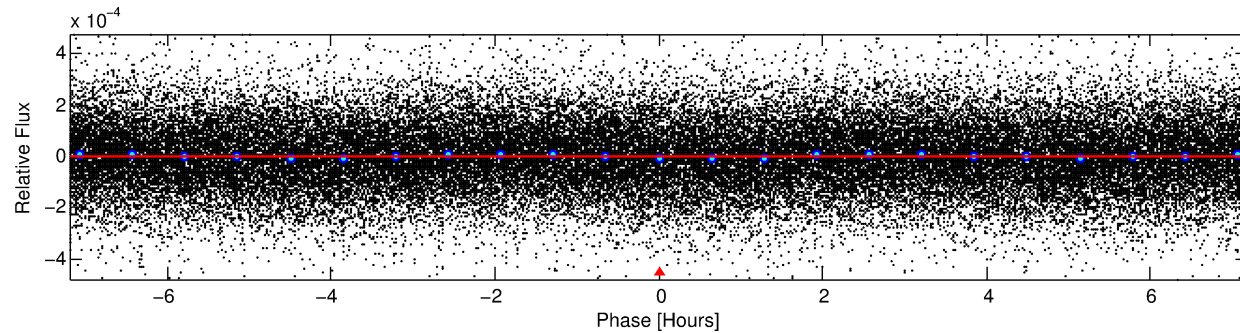
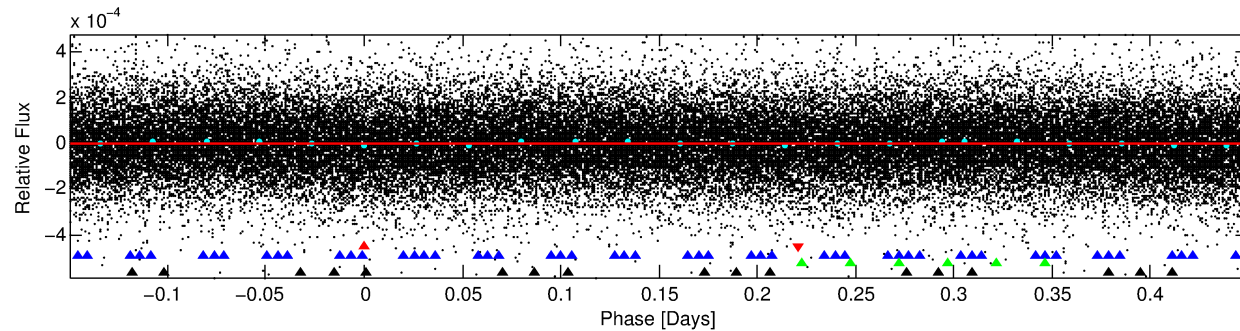
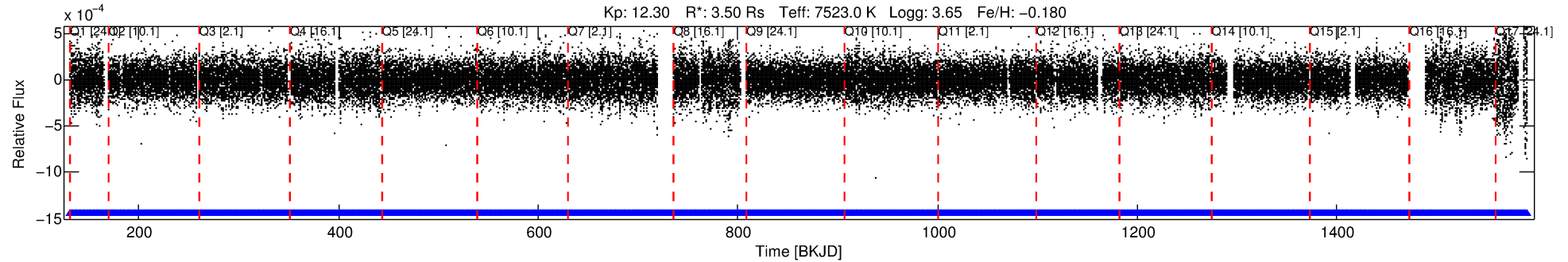
See http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col for comment definitions.

Ephemeris Match Information For 008521020-01

No Significant Match Found

DV One-Page Summary

KIC: 8521020 Candidate: 1 of 4 Period: 0.600 d



DV Fit Results:

Period = 0.59952 [0.00029] d
Epoch = 131.8692 [0.0899] BKJD
Rp/R* = 0.0007 [0.0013]
a/R* = 1.41 [3.89]
b = 0.54 [7.37]
Seff = 113701.59 [91819.13]
Teff = 4682 [945] K
Rp = 0.25 [0.50] Re
a = 0.0176 [0.0086] AU
Ag = 24.61 [98.15] [0.24σ]
Teffp = 16124 [15775] K [0.72σ]

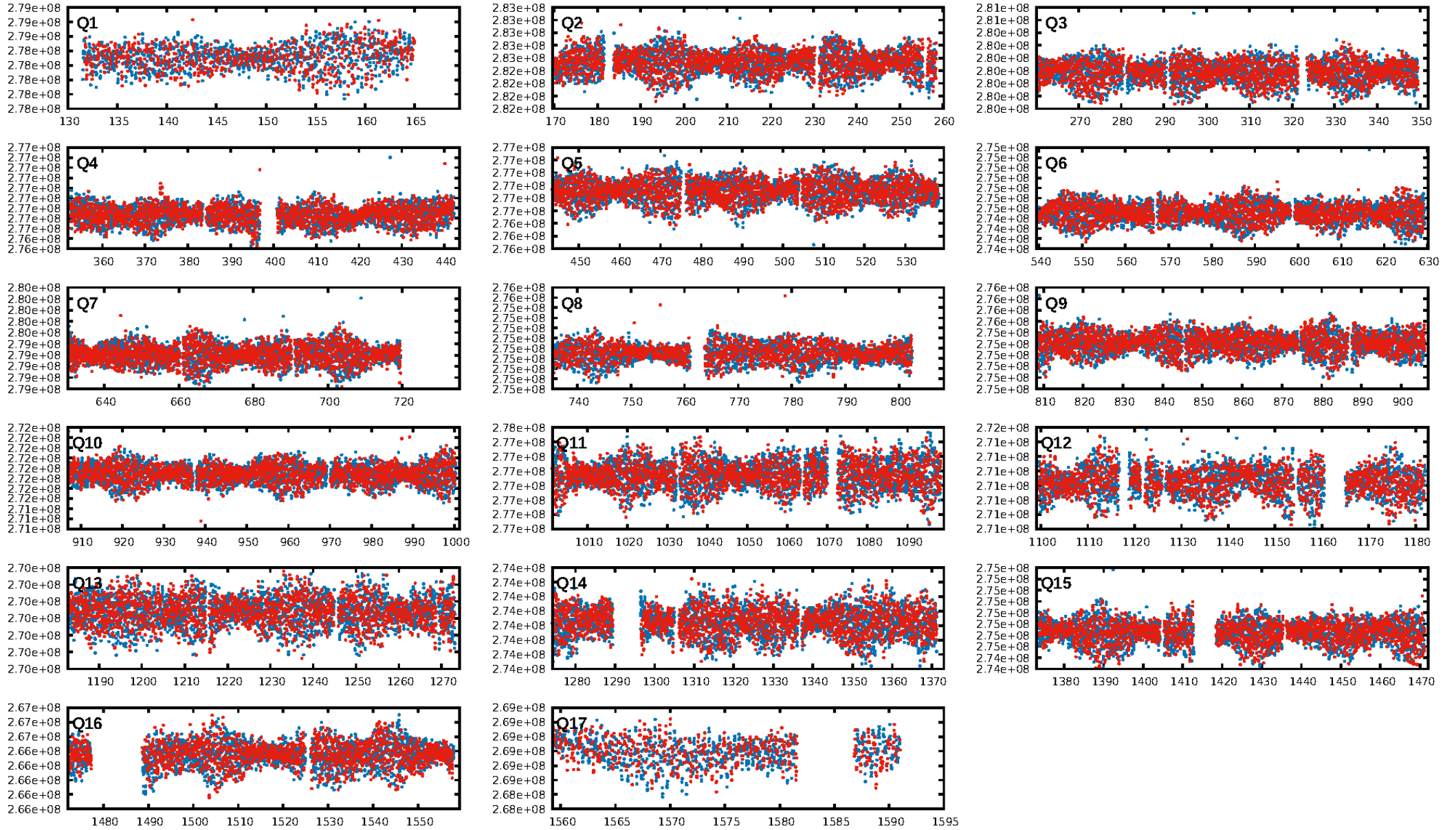
DV Diagnostic Results:

ShortPeriod-sig: N/A
LongPeriod-sig: 100.0% [123.55σ]
ModelChiSquare2-sig: N/A
ModelChiSquareGof-sig: N/A
Bootstrap-pfa: 2.31e-13
RollingBand-fgt: 1.00 [2134/2134]
GhostDiagnostic-chr: N/A
Centroid-sig: N/A
Centroid-so: N/A
OotOffset-rm: 0.297 arcsec [0.73σ]
KicOffset-rm: 0.350 arcsec [0.72σ]
OotOffset-st: 1/2/4/5 [12]
KicOffset-st: 1/2/4/5 [12]
DiffImageQuality-fgm: 0.25 [3/12]
DiffImageOverlap-fno: 1.00 [17/17]

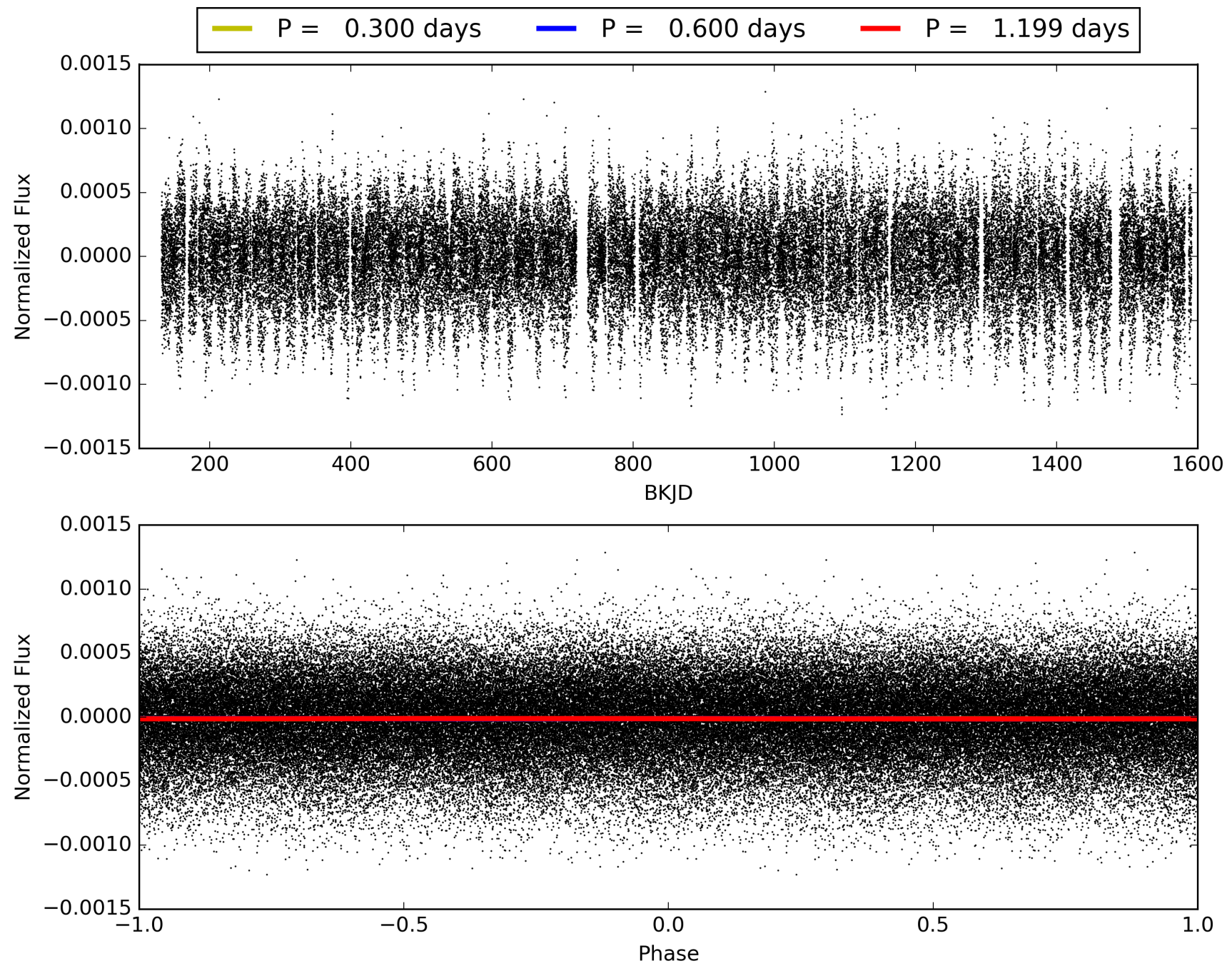
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This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

TCE 008521020-01, PDC Light Curves

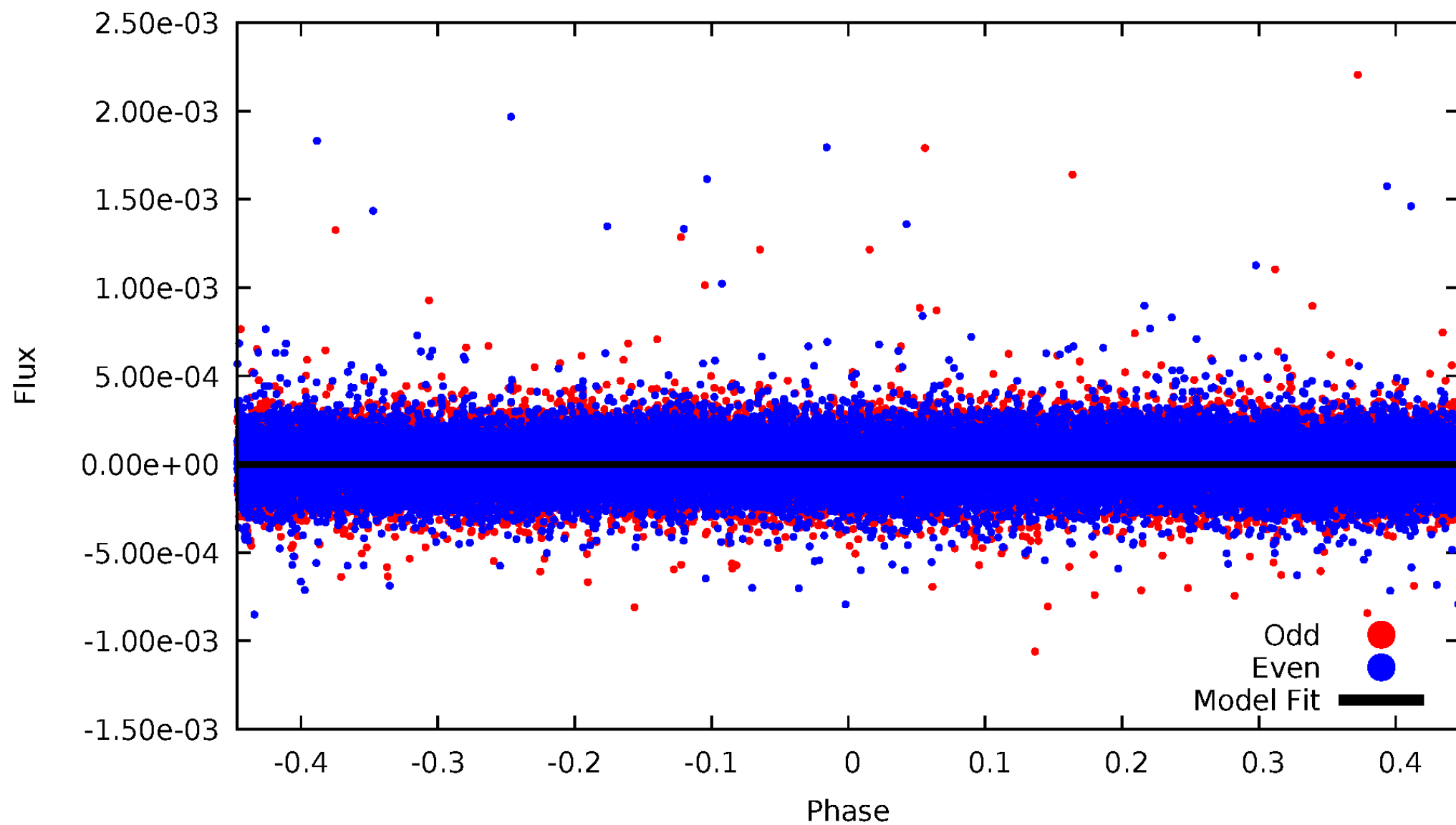


TCE 008521020-01



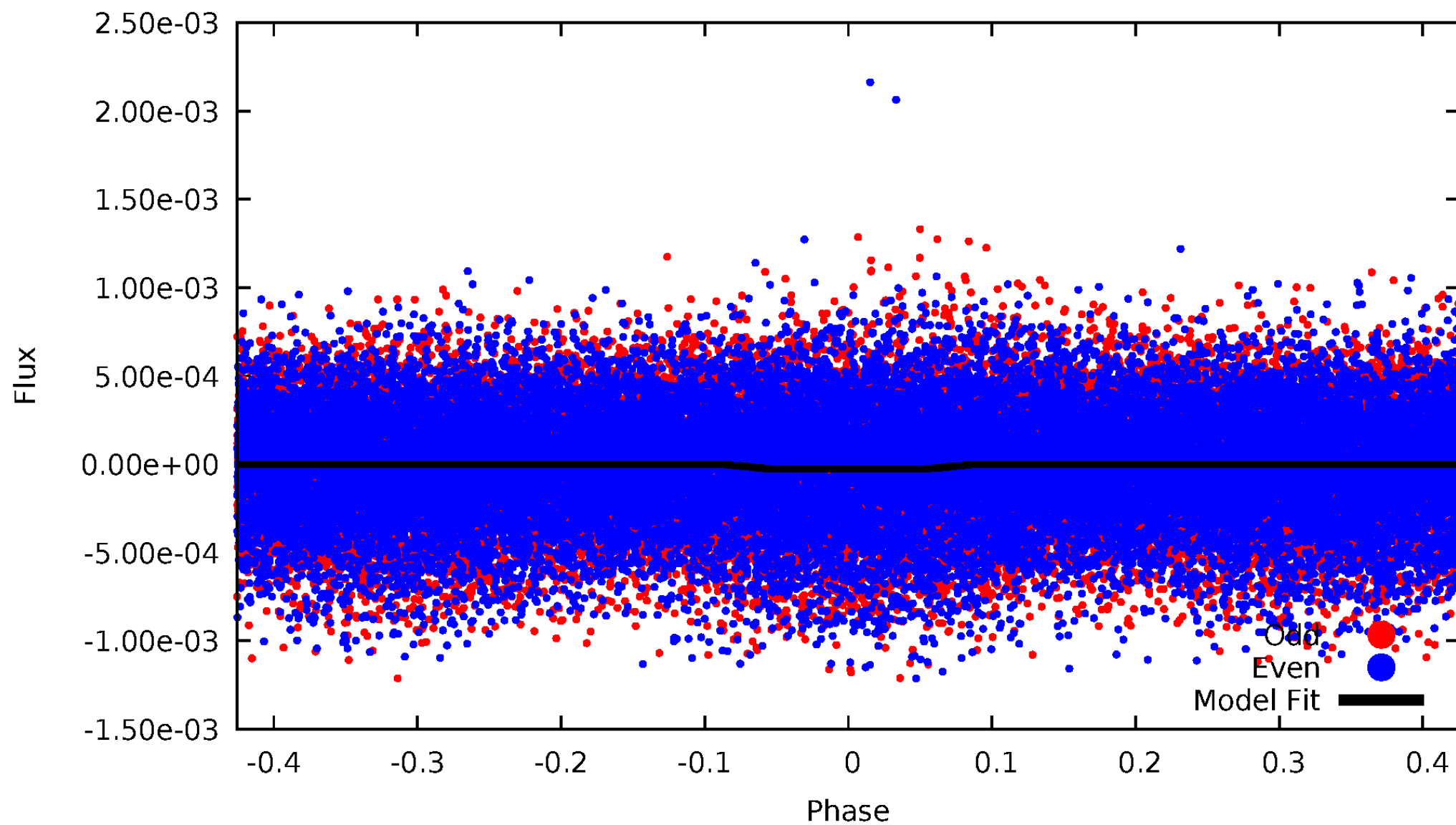
DV Odd/Even

TCE 008521020-01

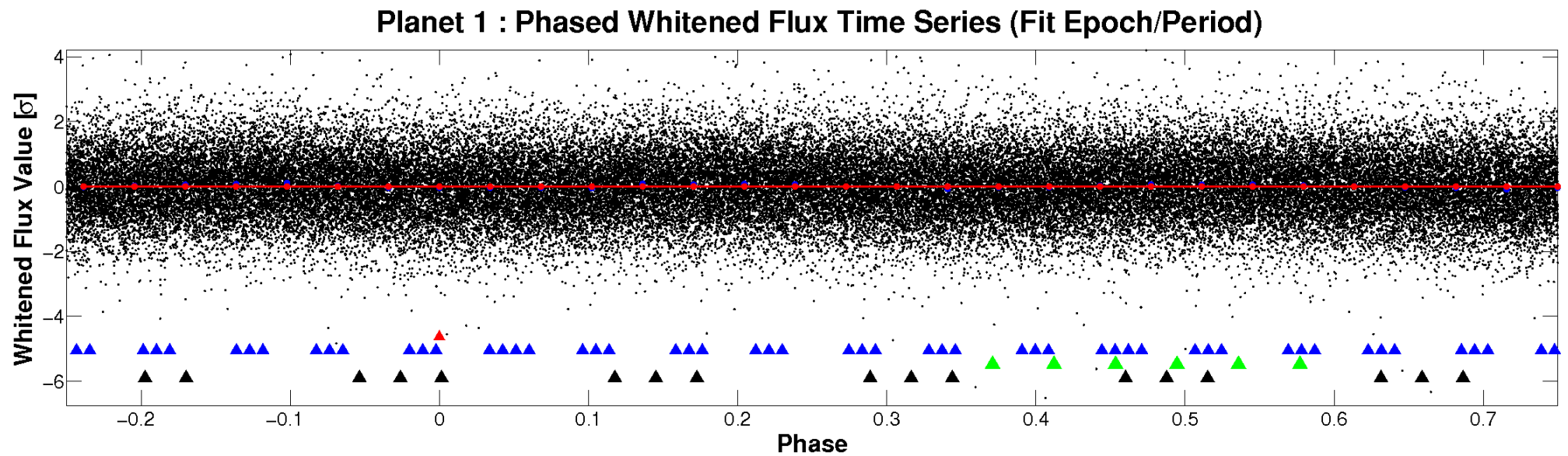
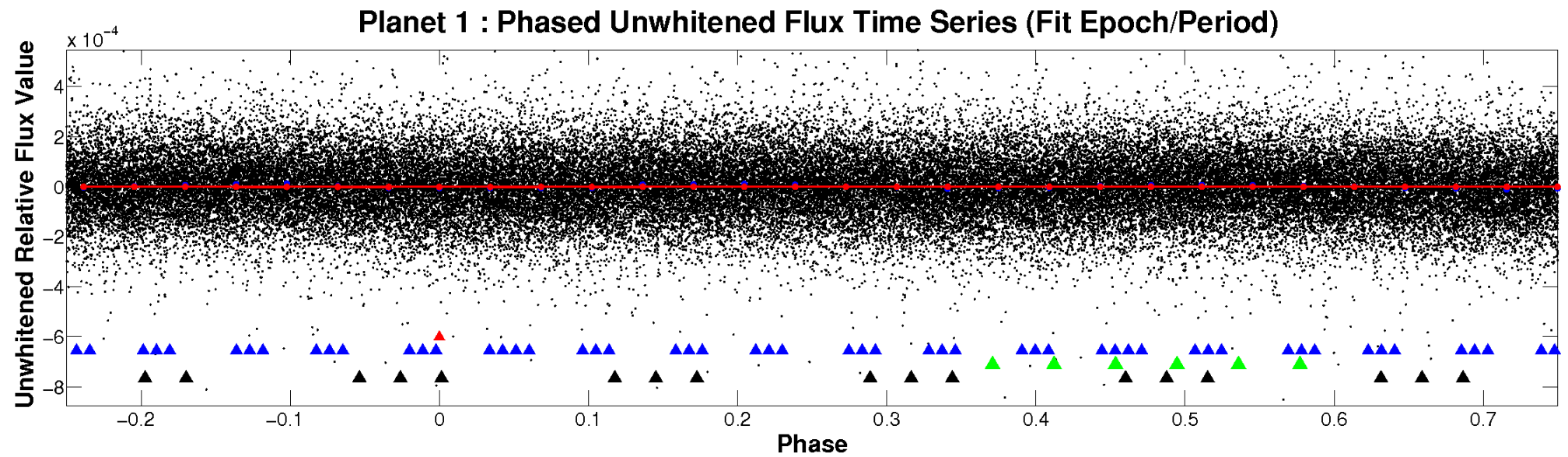


ALT Odd/Even

TCE 008521020-01

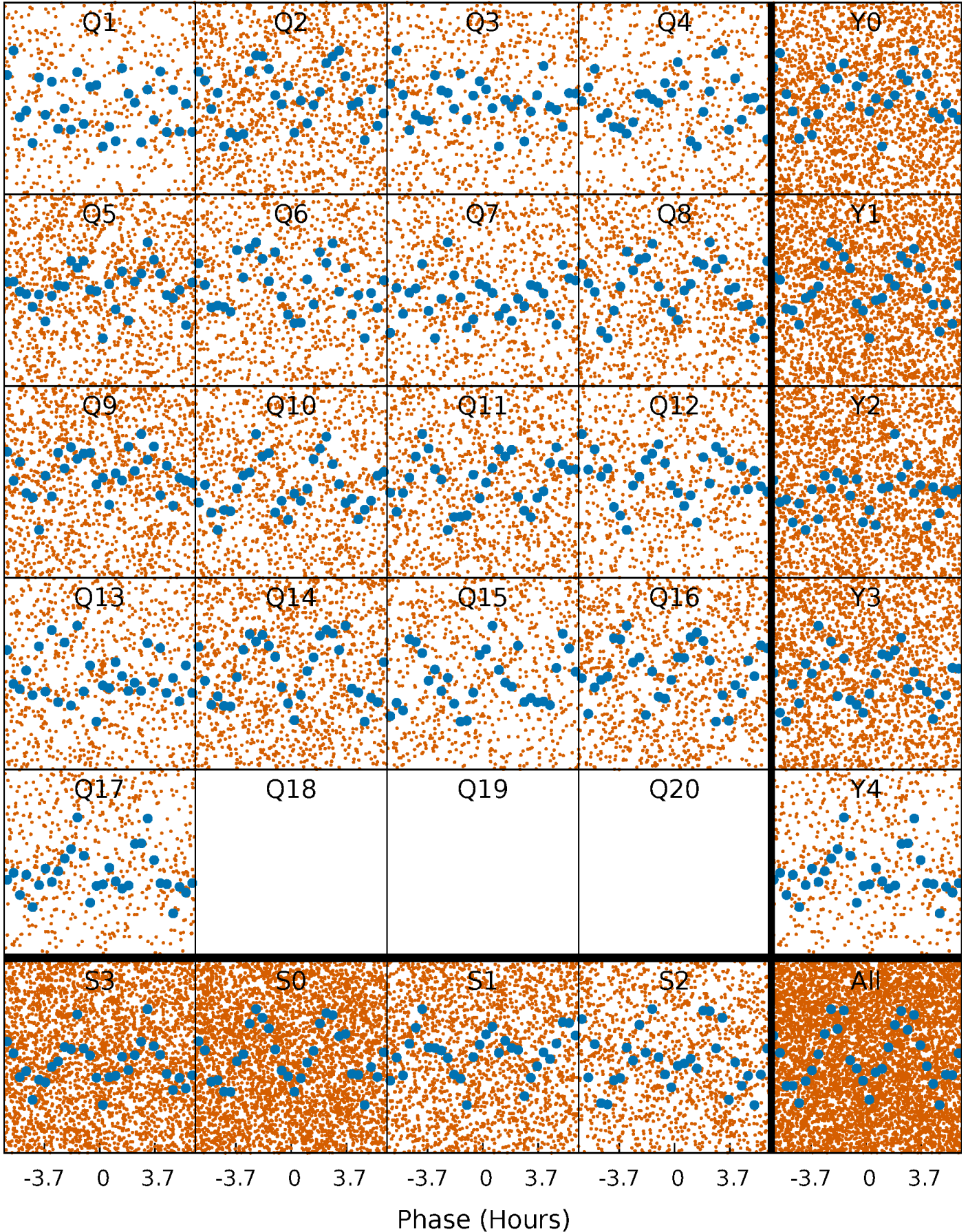


Non-Whitened Vs. Whitened Light Curve



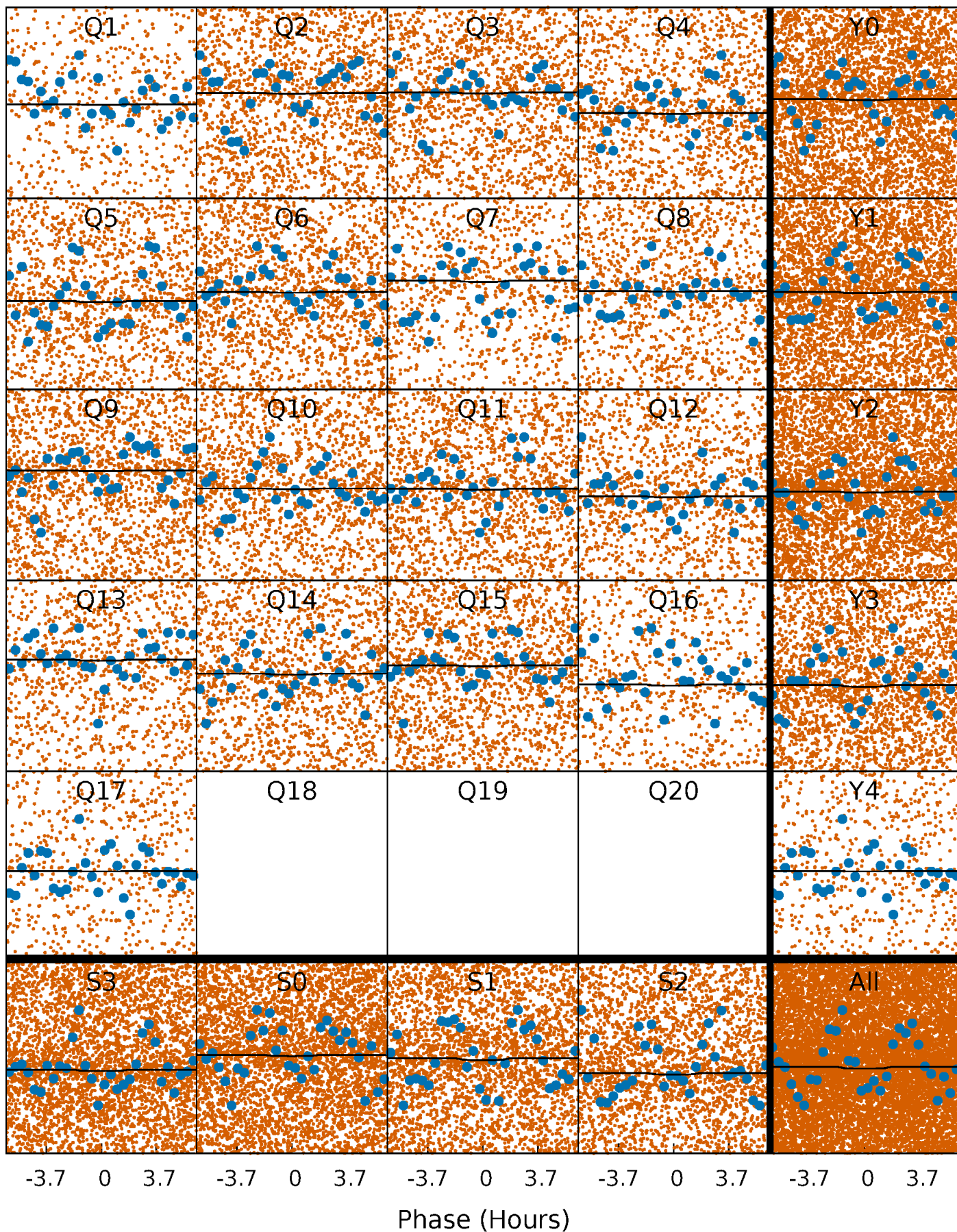
PDC Quarter-Phased Transit Curves

TCE 008521020-01 P= 0.599521 Days $T_0=131.869201$ (BKJD)



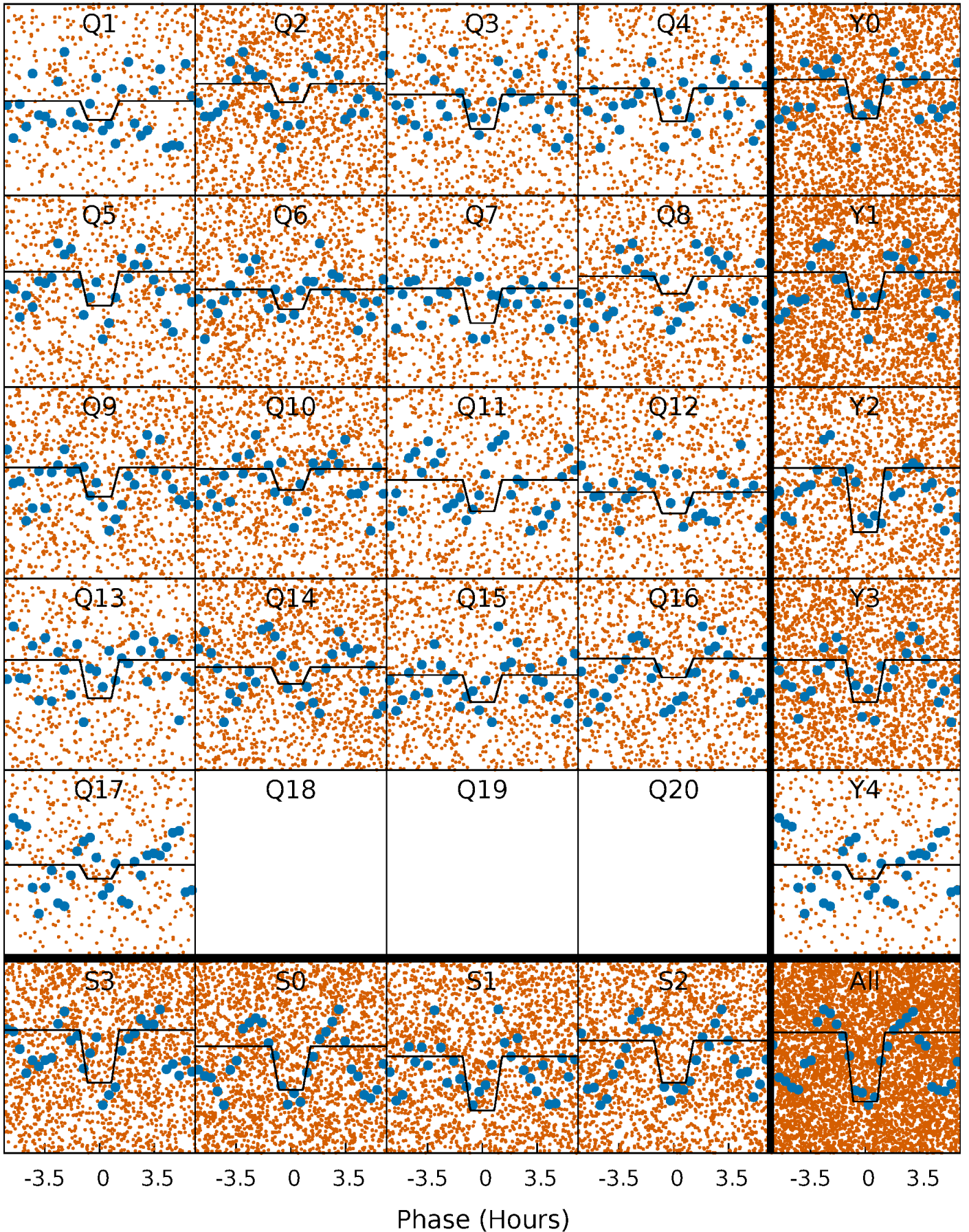
DV Quarter-Phased Transit Curves

TCE 008521020-01 P= 0.599521 Days $T_0=131.869201$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

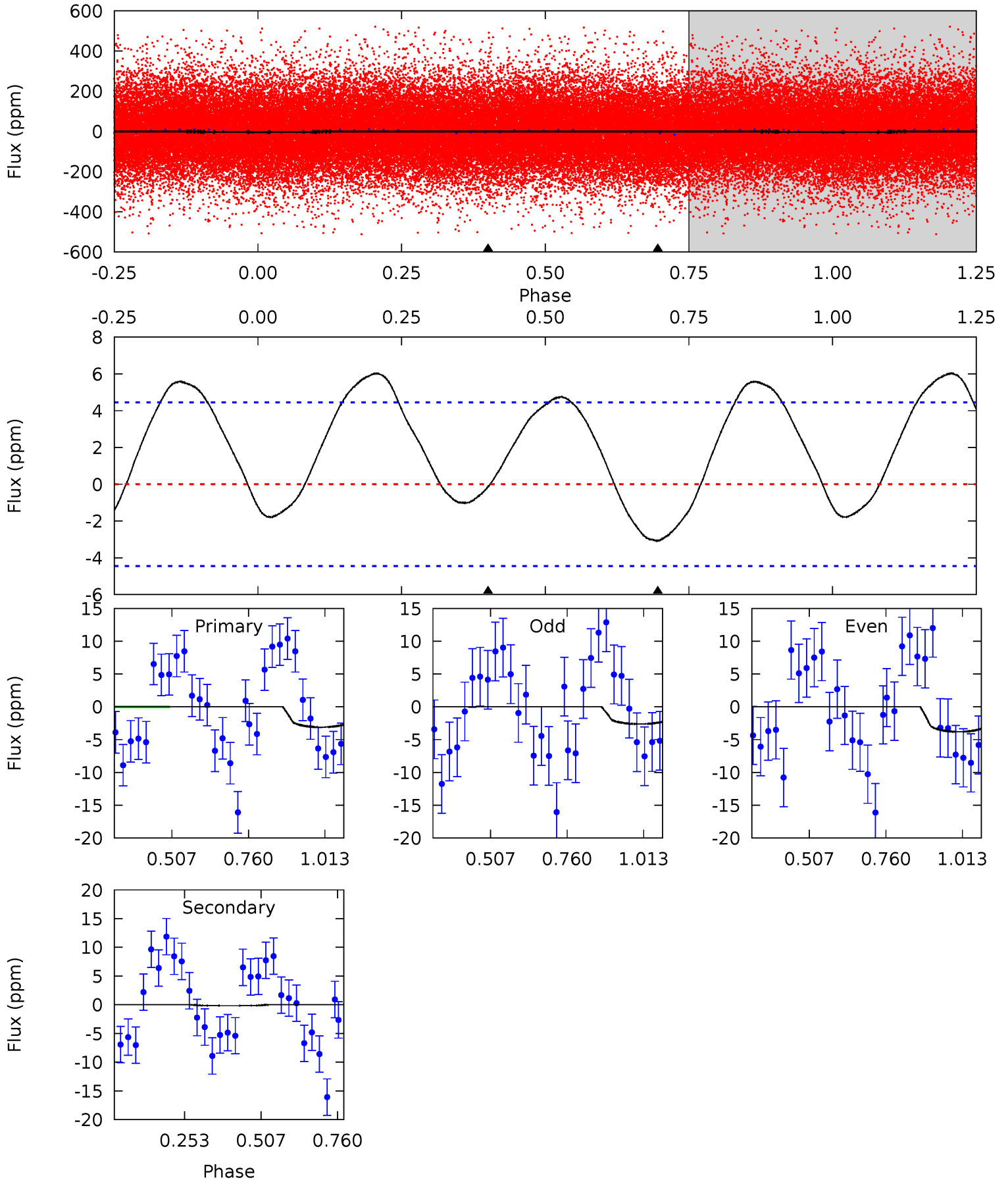
TCE 008521020-01 P= 0.599475 Days $T_0=131.724299$ (BKJD)



DV Model-Shift Uniqueness Test

008521020-01, P = 0.599521 Days, E = 131.269680 Days

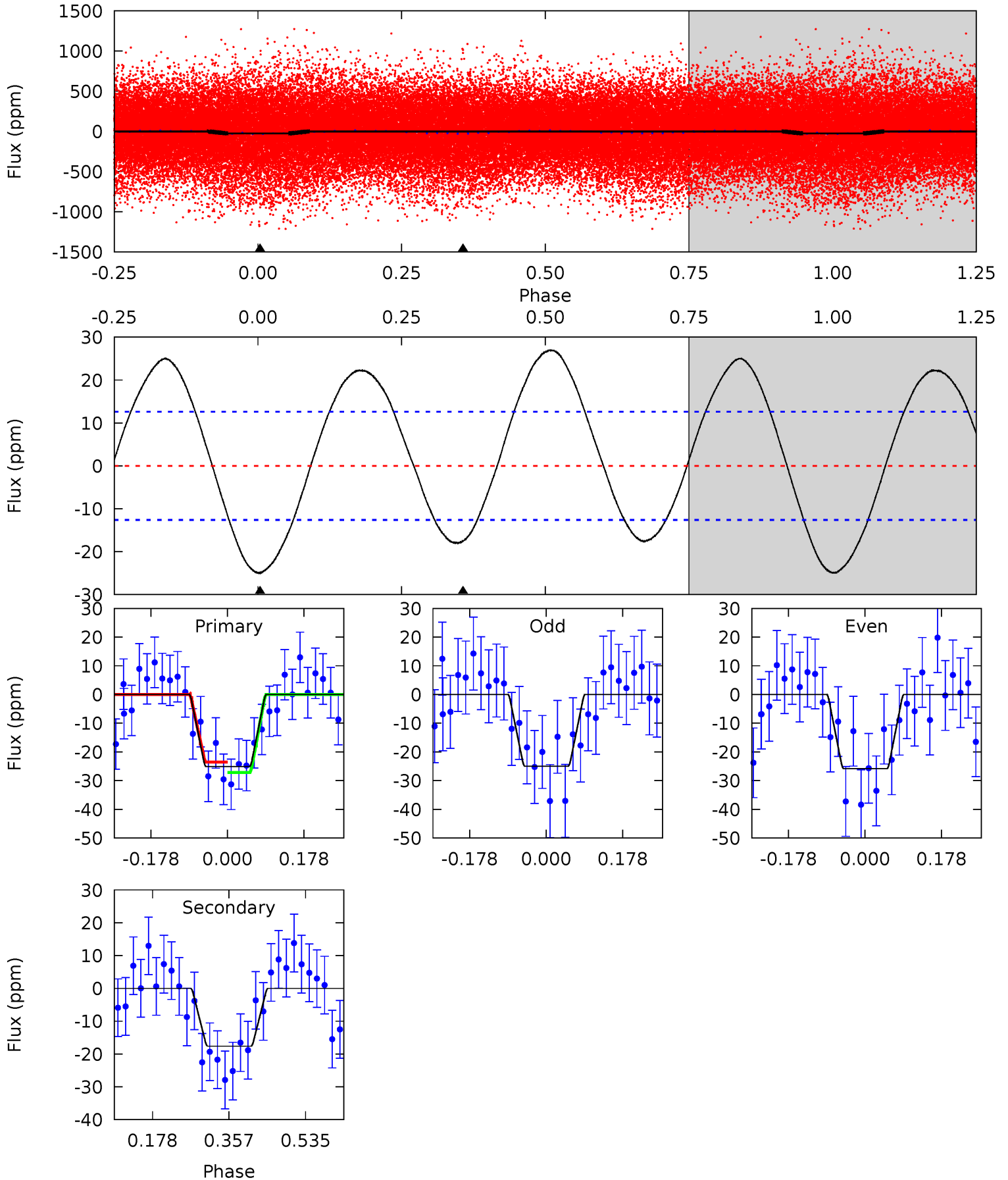
Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
3.05	0.15	0	0	4.37	1.14	1.79	3.05	3.05	0.15	0.15	0.59	0.54	0.66	3.13



Alt Model-Shift Uniqueness Test

008521020-01, P = 0.599475 Days, E = 131.124824 Days

Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
8.84	6.21	0	0	4.44	1.35	4.86	8.84	8.84	6.21	6.21	0.15	1.72	0.52	0.61



Stellar Parameters For KIC 008521020

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	7523^{+235}_{-314}	$3.654^{+0.467}_{-0.055}$	$-0.180^{+0.250}_{-0.300}$	$3.496^{+0.327}_{-1.742}$	$2.012^{+0.127}_{-0.571}$	$0.066^{+0.325}_{-0.013}$
	+3%/-4%	+13%/-2%	+139%/-167%	+9%/-50%	+6%/-28%	+490%/-19%
Source	KIC0	KIC0	KIC0	DSEP		

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

Secondary Eclipse Parameters for KIC 008521020-01 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	A_{obs}
DV	-0 ± 1	$0.39^{+0.36}_{-0.27}$	6274^{+438}_{-769}	-4452^{+12682}_{-3033}	$0.129^{+2.631}_{-1.279}$
Alt.	-18 ± 3	$1.75^{+0.61}_{-0.54}$	6263^{+448}_{-710}	6013^{+1247}_{-1098}	$0.927^{+1.059}_{-0.400}$

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 $A_{obs} \gg 1.0$

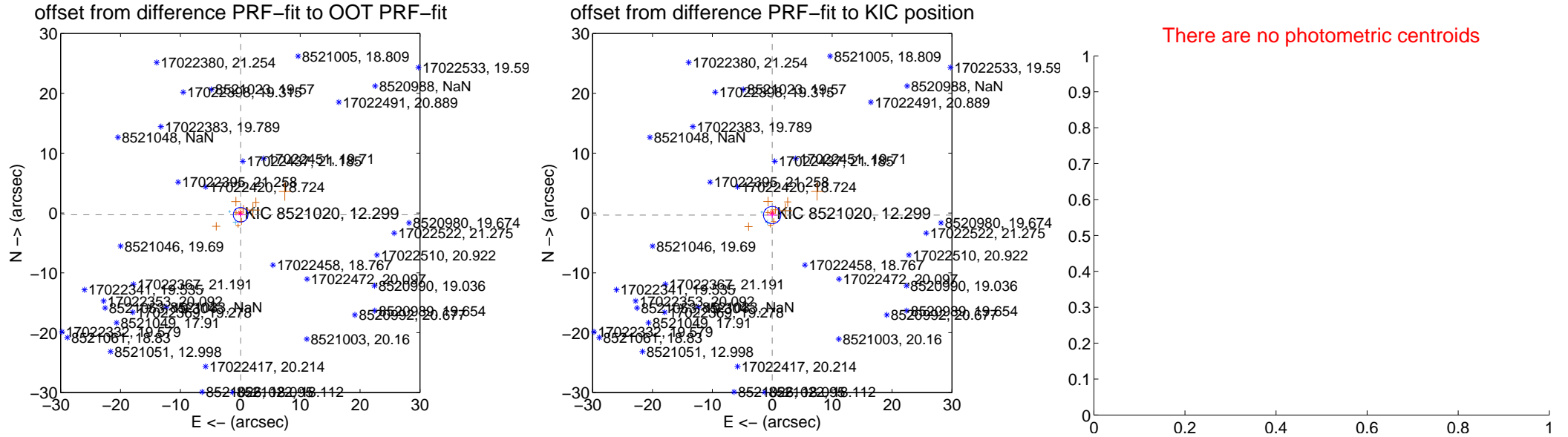
DV Centroid Data

Supplemental centroid analysis for 008521020-01. Kepler magnitude: 12.30. Transit SNR 0.35

There are 3 quarters with good PRF difference image offsets

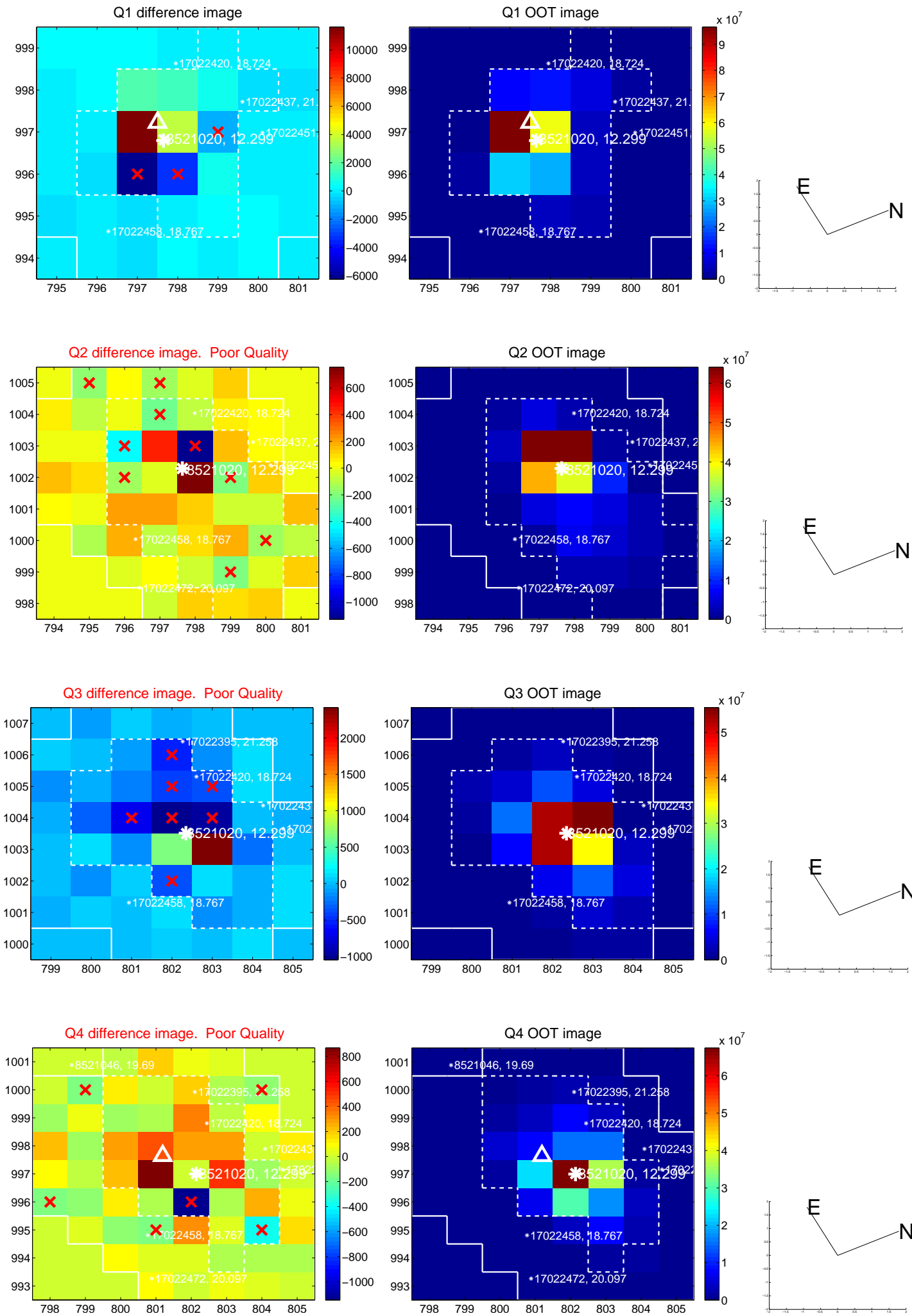
The direct PRF centroid is offset from the target star catalog position by about 0.13 arcsec

	Distance in arcsec	Distance / σ	Δ RA	Δ Dec
PRF-fit source offset from OOT	0.297 ± 0.409	0.73	-0.062 ± 0.673	-0.290 ± 0.393
PRF-fit source offset from KIC position	0.350 ± 0.483	0.72	0.014 ± 0.793	-0.349 ± 0.460
photometric centroid source offset	—	—	—	—

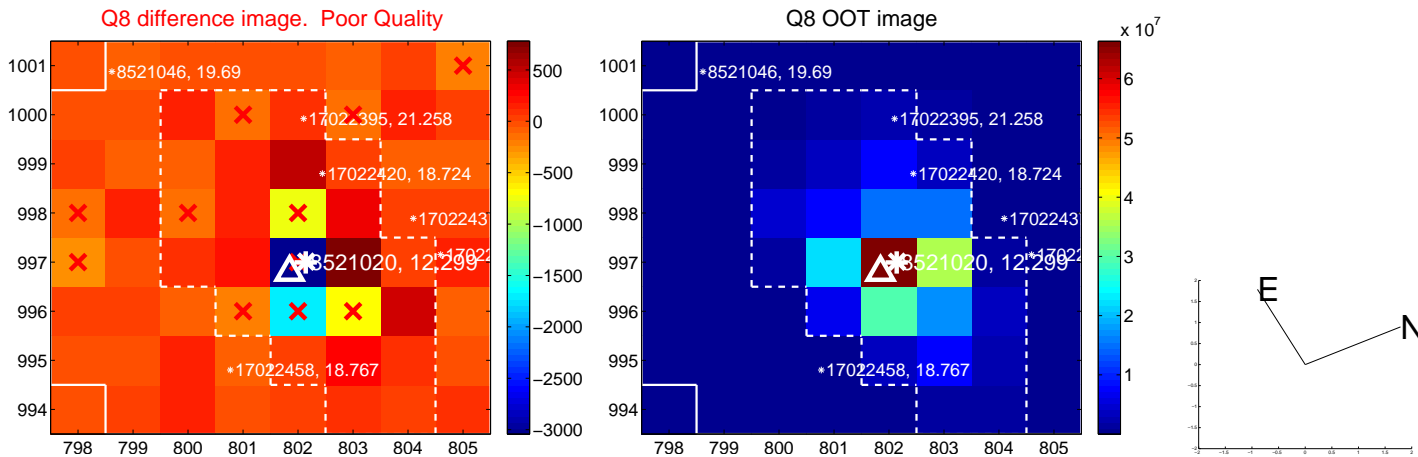
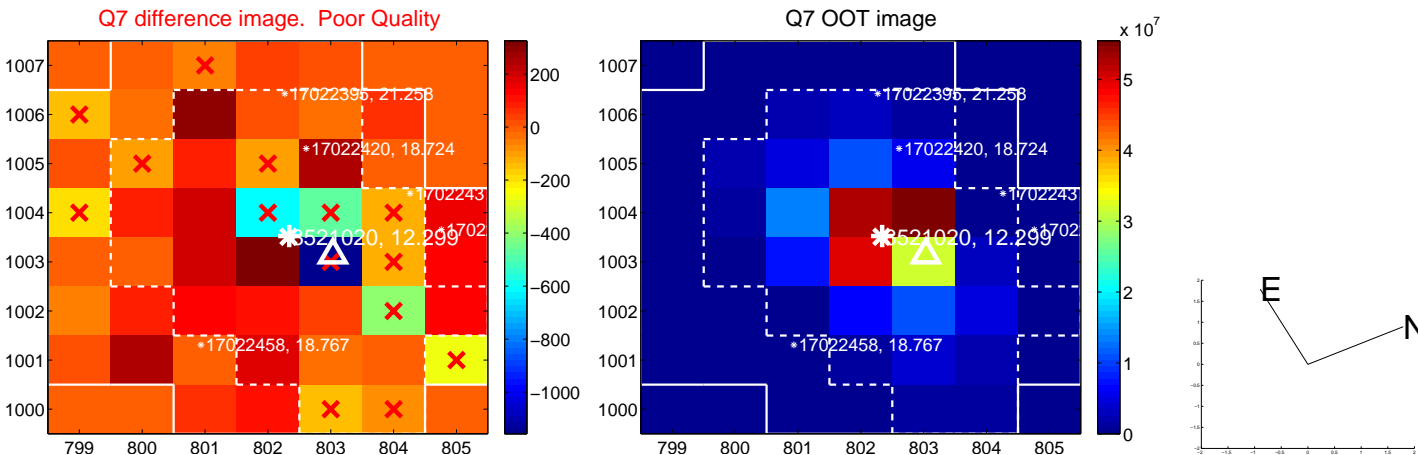
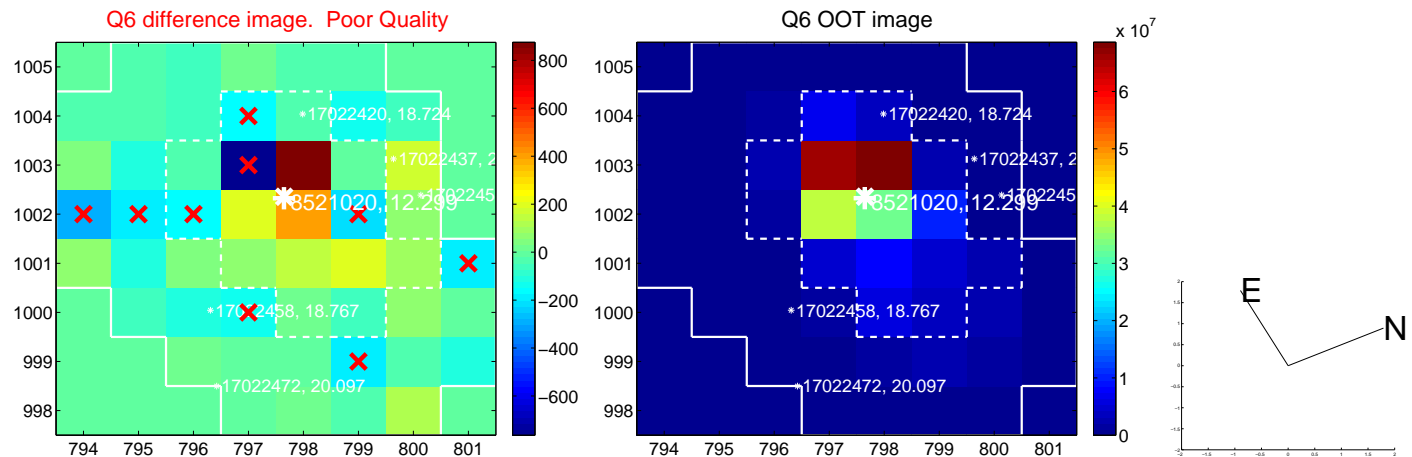
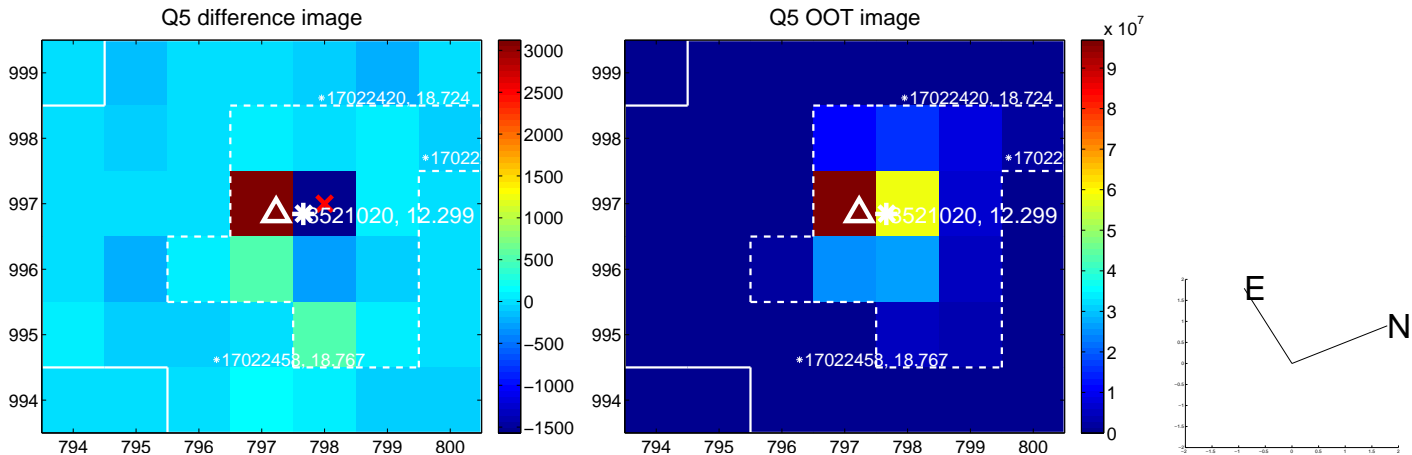


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three- σ . 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.

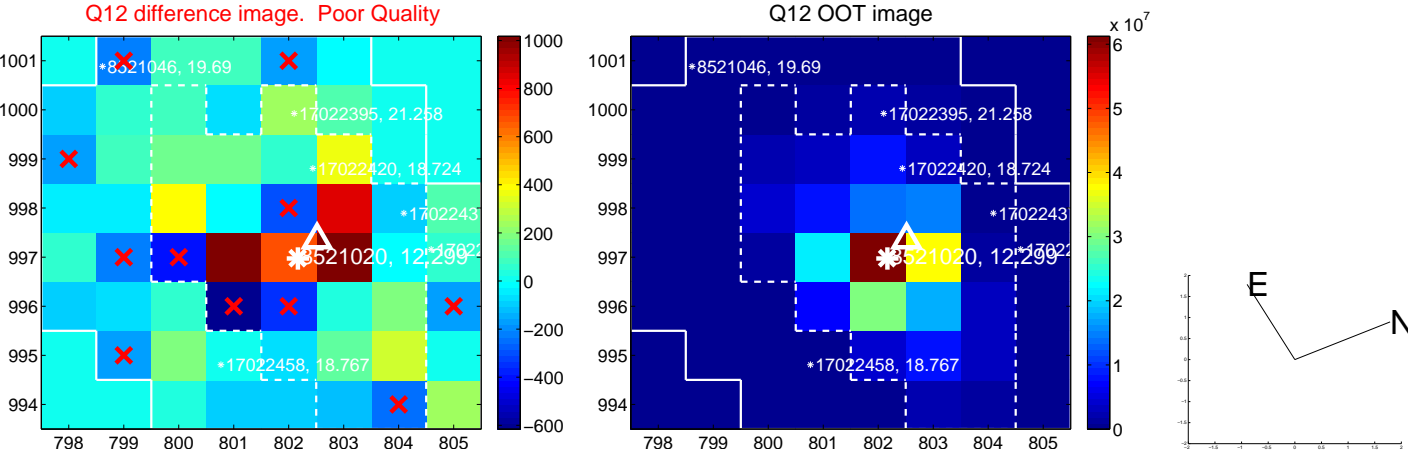
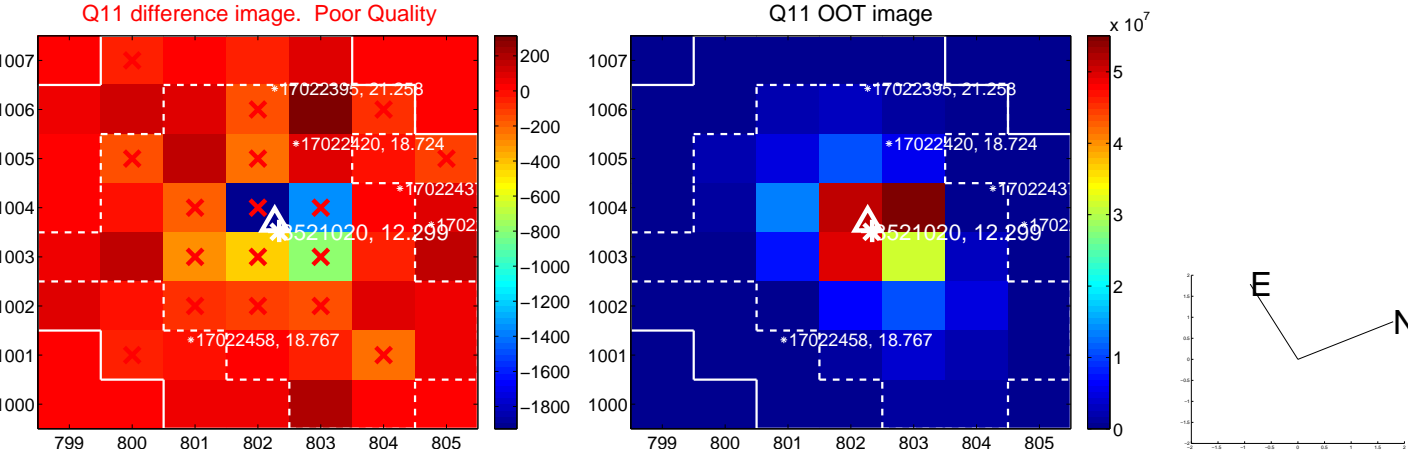
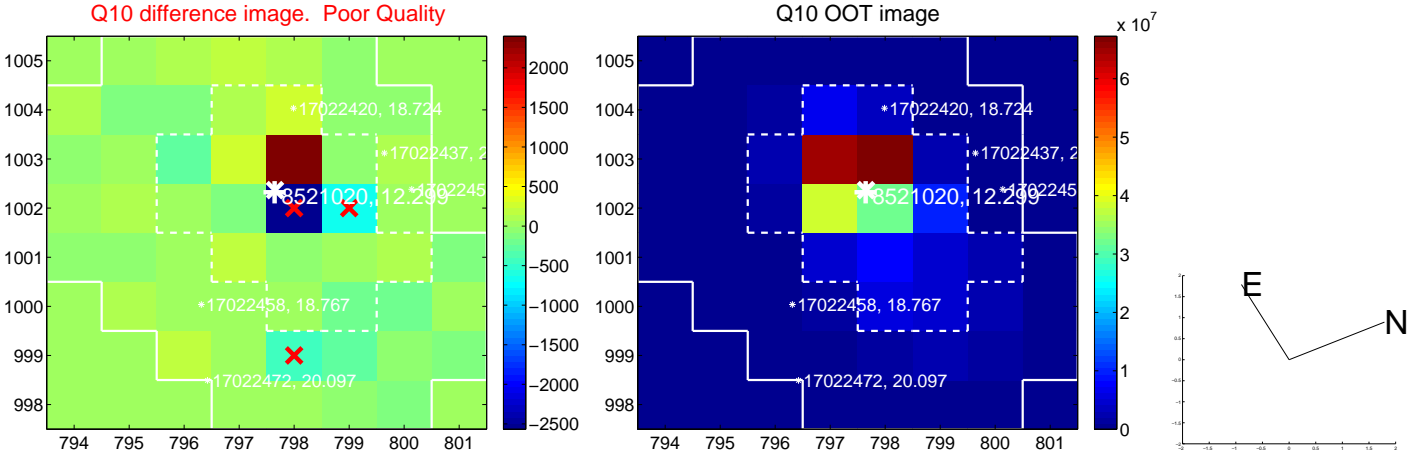
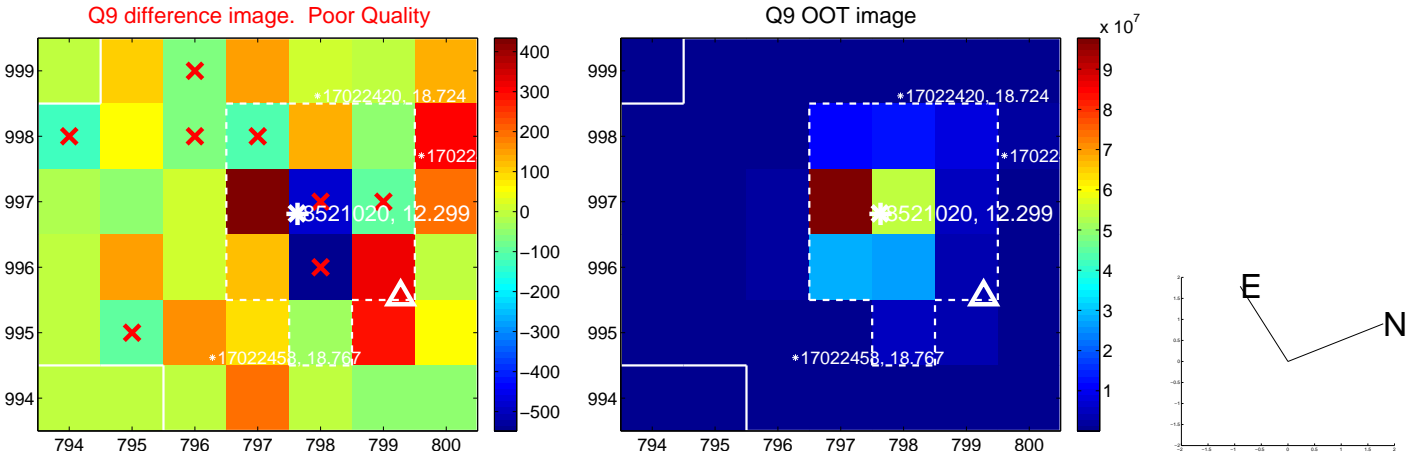
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



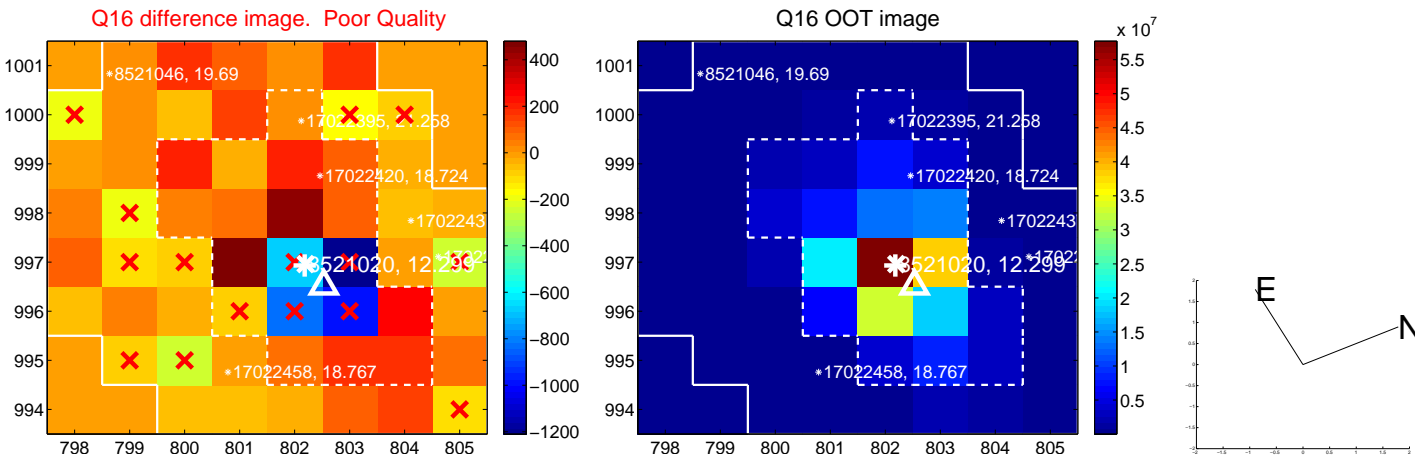
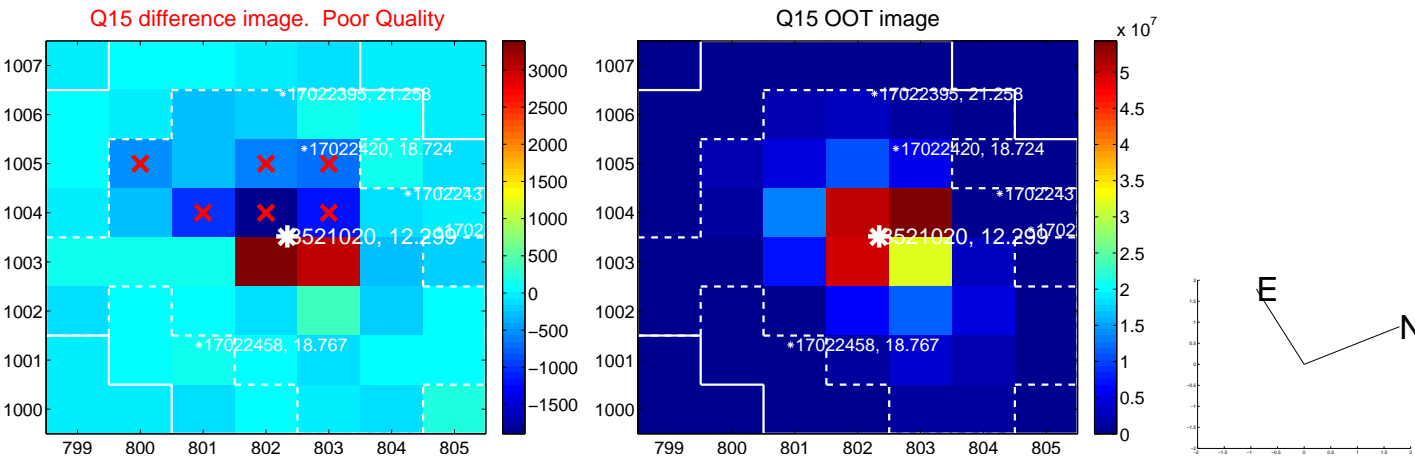
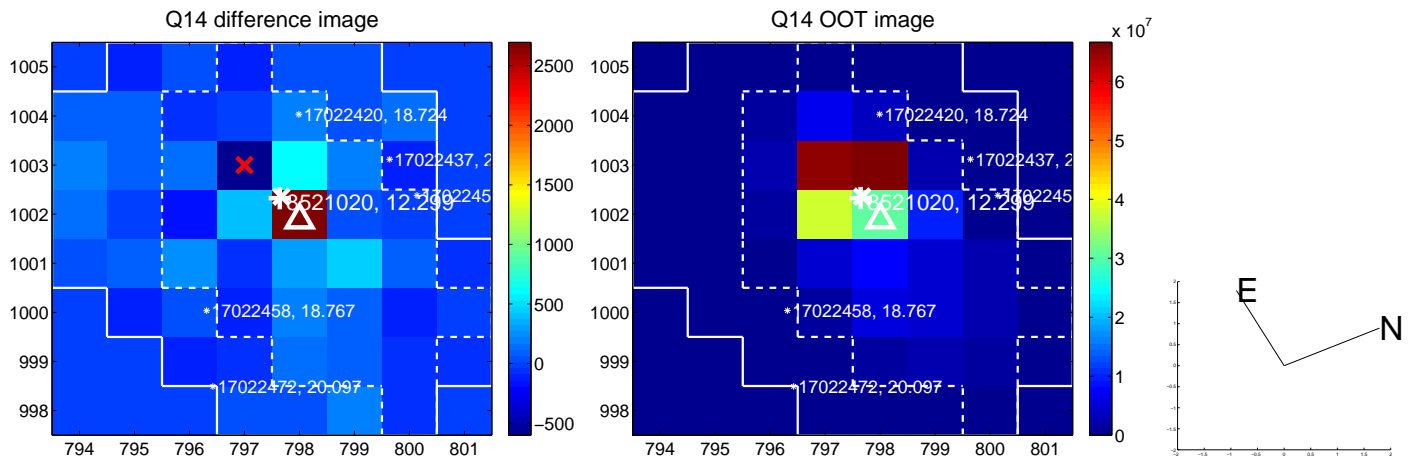
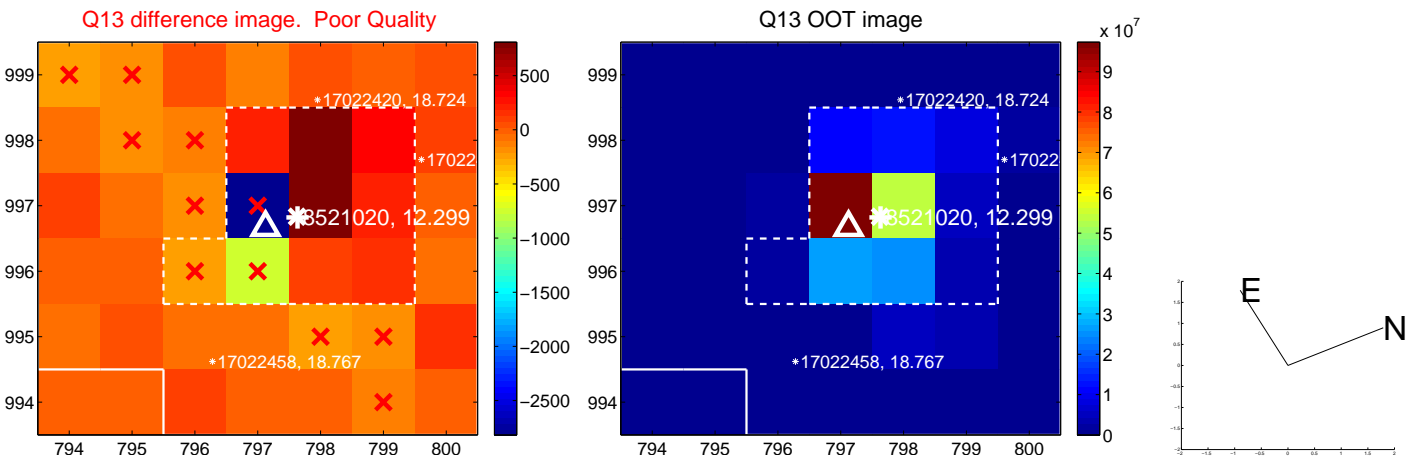
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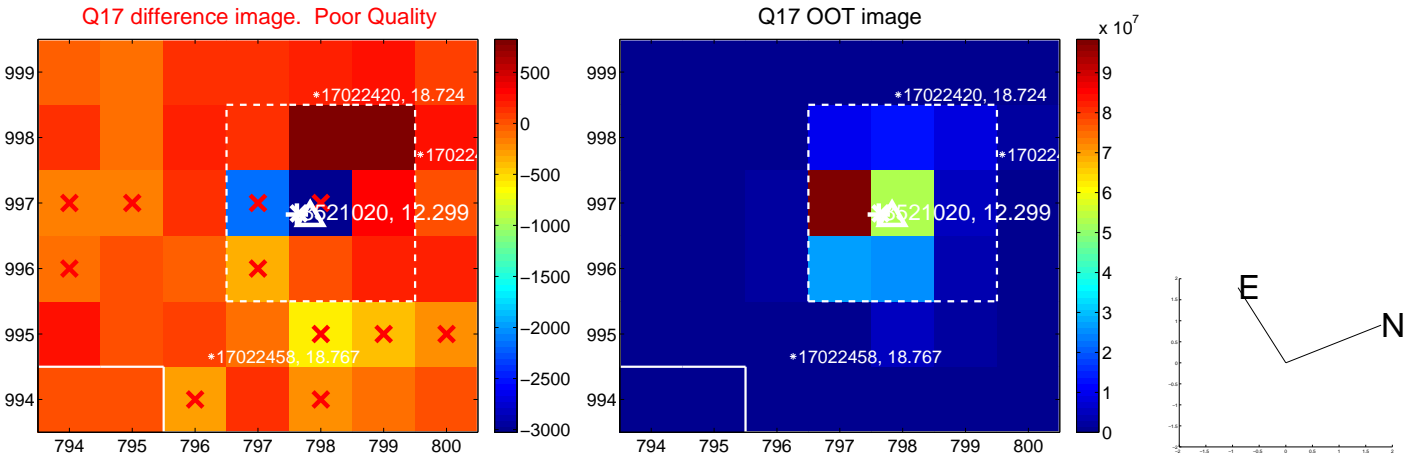
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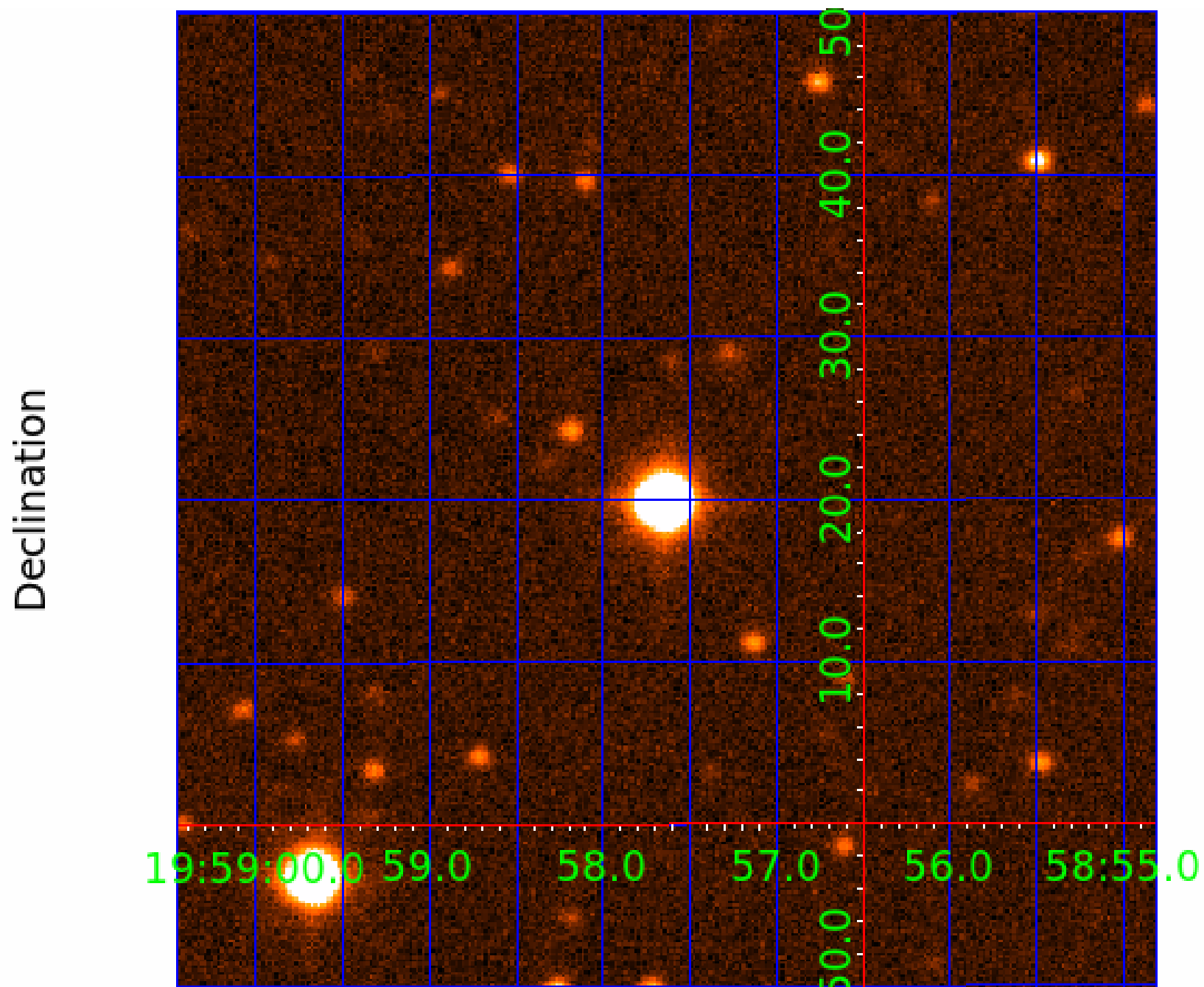


white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



folded centroid time series figure for this object.

UKIRT Image



KIC 008521020

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})
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Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
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008521020-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_ZUMA—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
008521020-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_FEW_DIFFS
008521020-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT

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

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

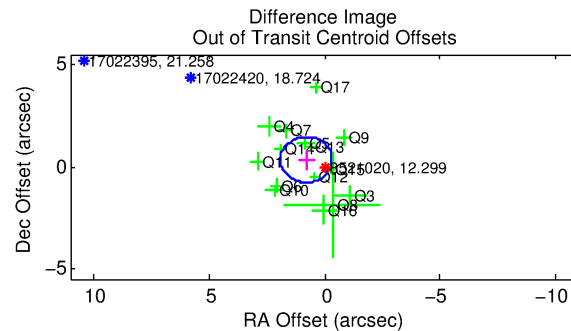
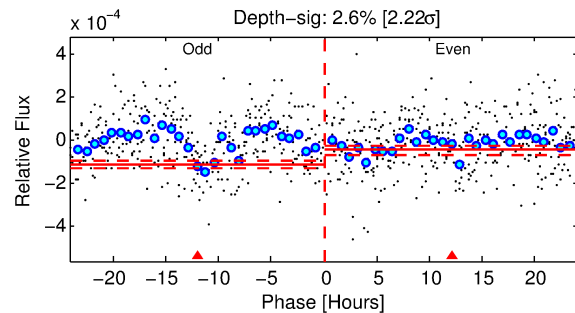
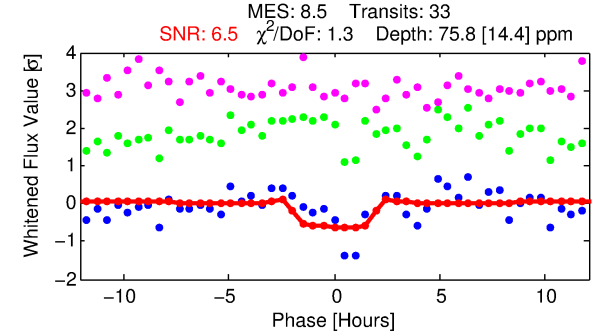
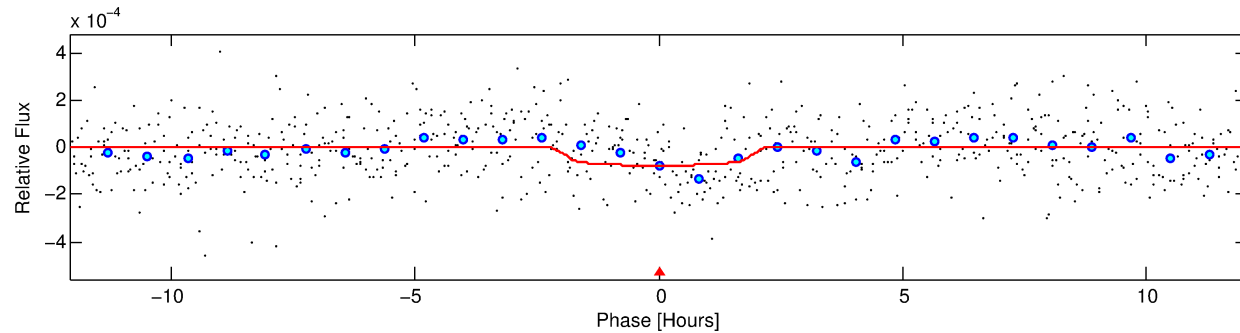
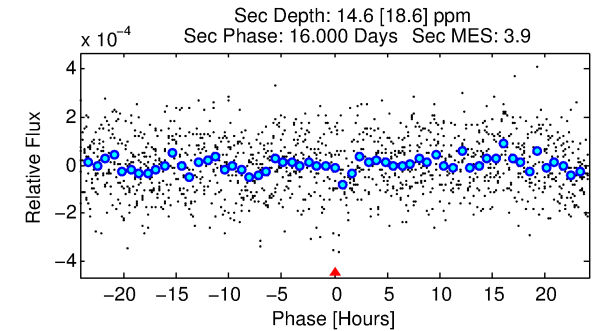
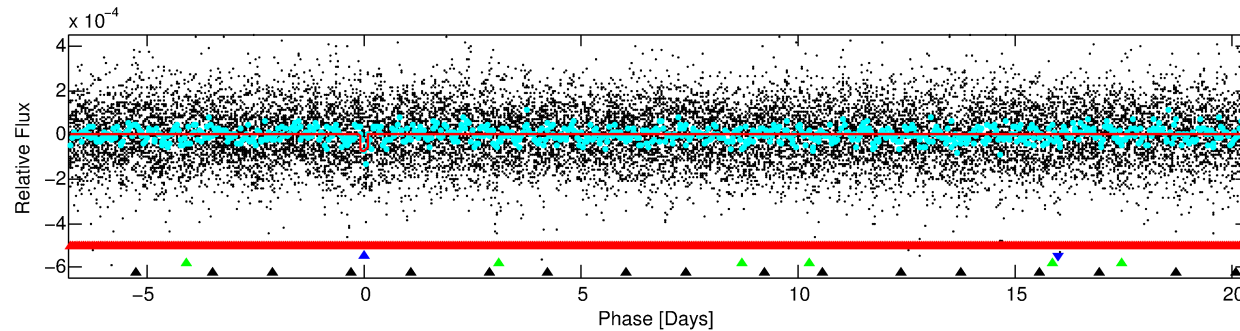
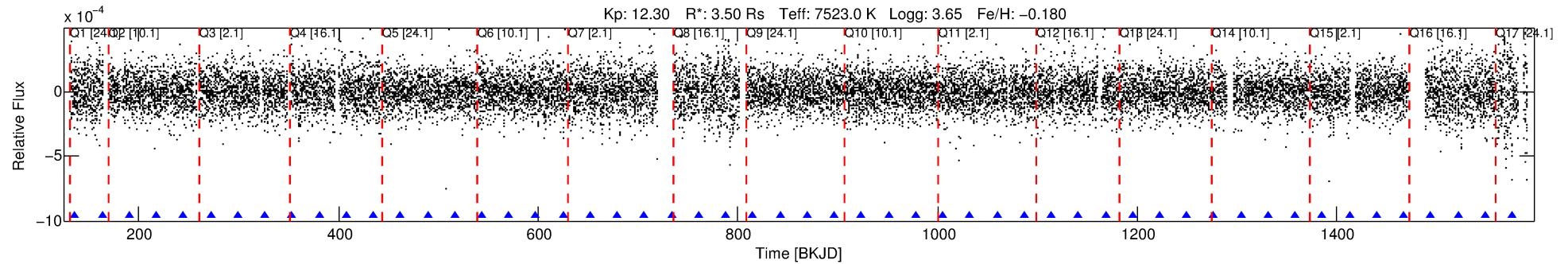
See http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col for comment definitions.

Ephemeris Match Information For 008521020-02

No Significant Match Found

DV One-Page Summary

KIC: 8521020 Candidate: 2 of 4 Period: 27.155 d



DV Fit Results:

Period = 27.15511 [0.00048] d
Epoch = 136.3322 [0.0145] BKJD
Rp/R* = 0.0091 [0.0067]
a/R* = 27.47 [111.73]
b = 0.86 [1.29]
Seff = 704.21 [568.68]
Teq = 1314 [265] K
Rp = 3.46 [3.09] Re
a = 0.2232 [0.1091] AU
Ag = 33.33 [70.32] [0.46σ]
Teffp = 4880 [2395] K [1.48σ]

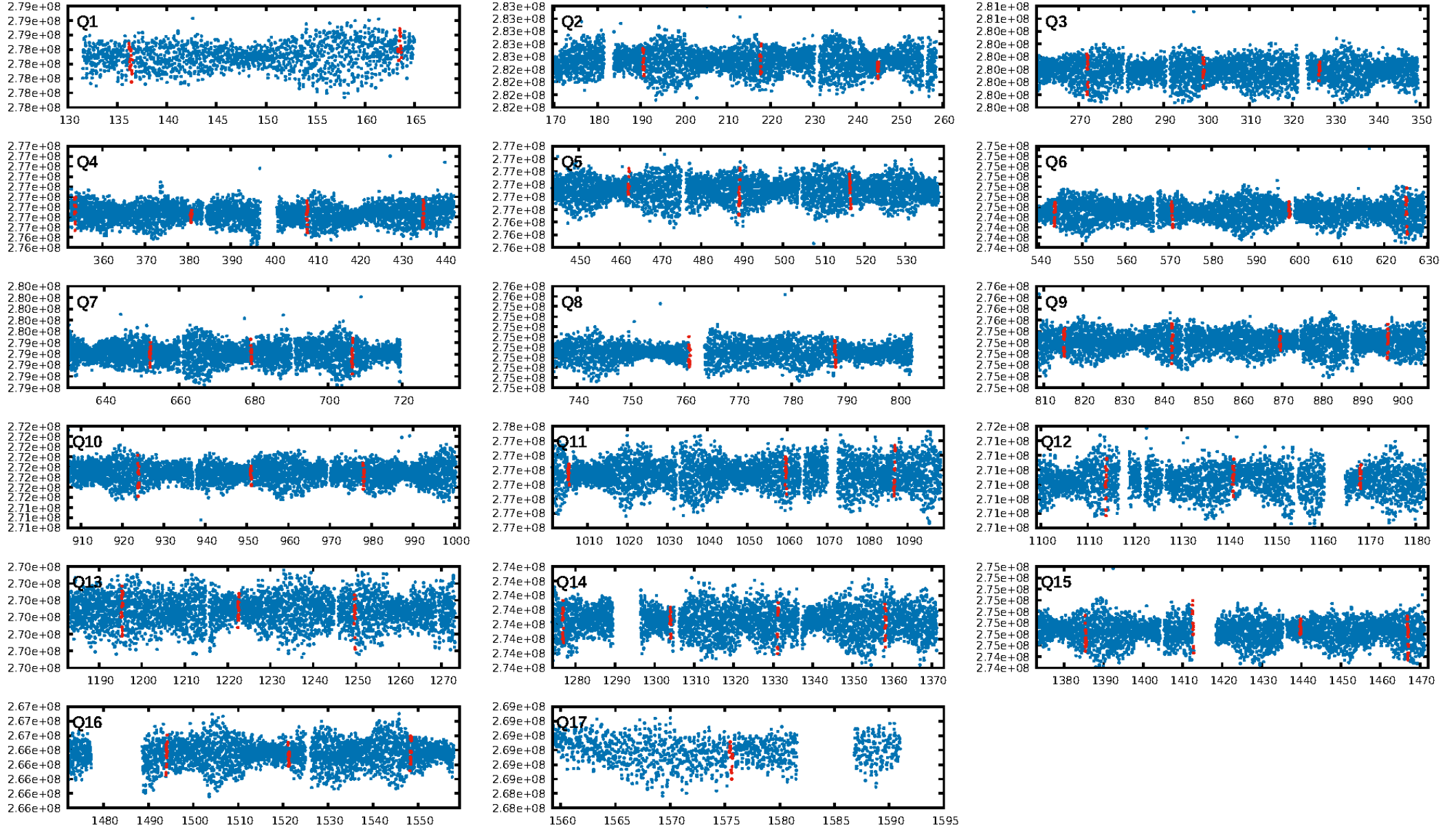
DV Diagnostic Results:

ShortPeriod-sig: 100.0% [123.55σ]
LongPeriod-sig: 100.0% [297.58σ]
ModelChiSquare2-sig: 14.5%
ModelChiSquareGoF-sig: 100.0%
Bootstrap-pfa: 5.39e-12
RollingBand-fgt: 1.00 [31/31]
GhostDiagnostic-chr: -0.7271
Centroid-sig: 16.0%
Centroid-so: 1.631 arcsec [1.34σ]
OotOffset-rm: 0.871 arcsec [2.35σ]
KicOffset-rm: 0.855 arcsec [2.39σ]
OotOffset-st: 3/4/4/4 [15]
KicOffset-st: 3/4/4/4 [15]
DiffImageQuality-fgm: 0.73 [11/15]
DiffImageOverlap-fno: 0.00 [0/17]

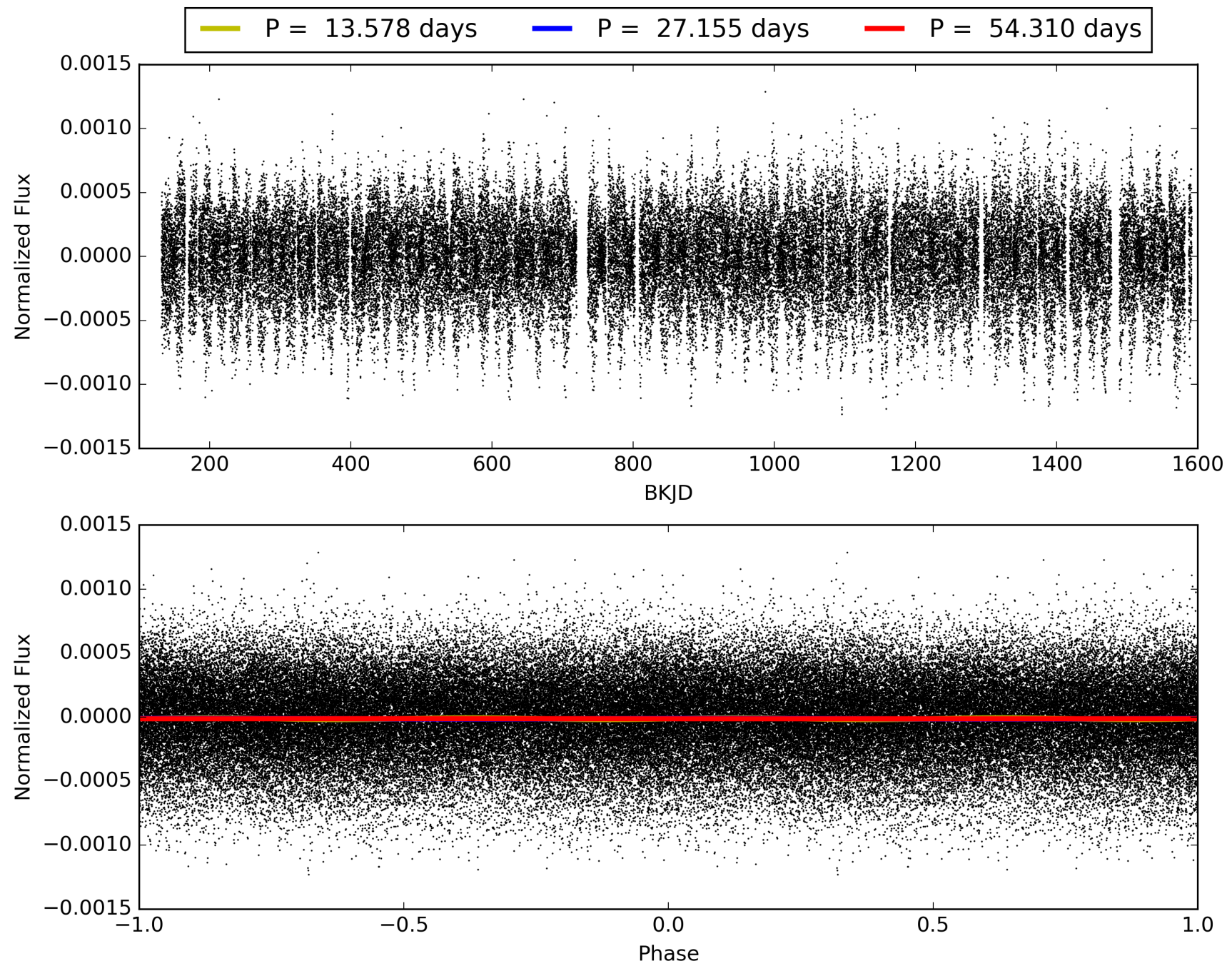
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 03:43:10 Z

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

TCE 008521020-02, PDC Light Curves

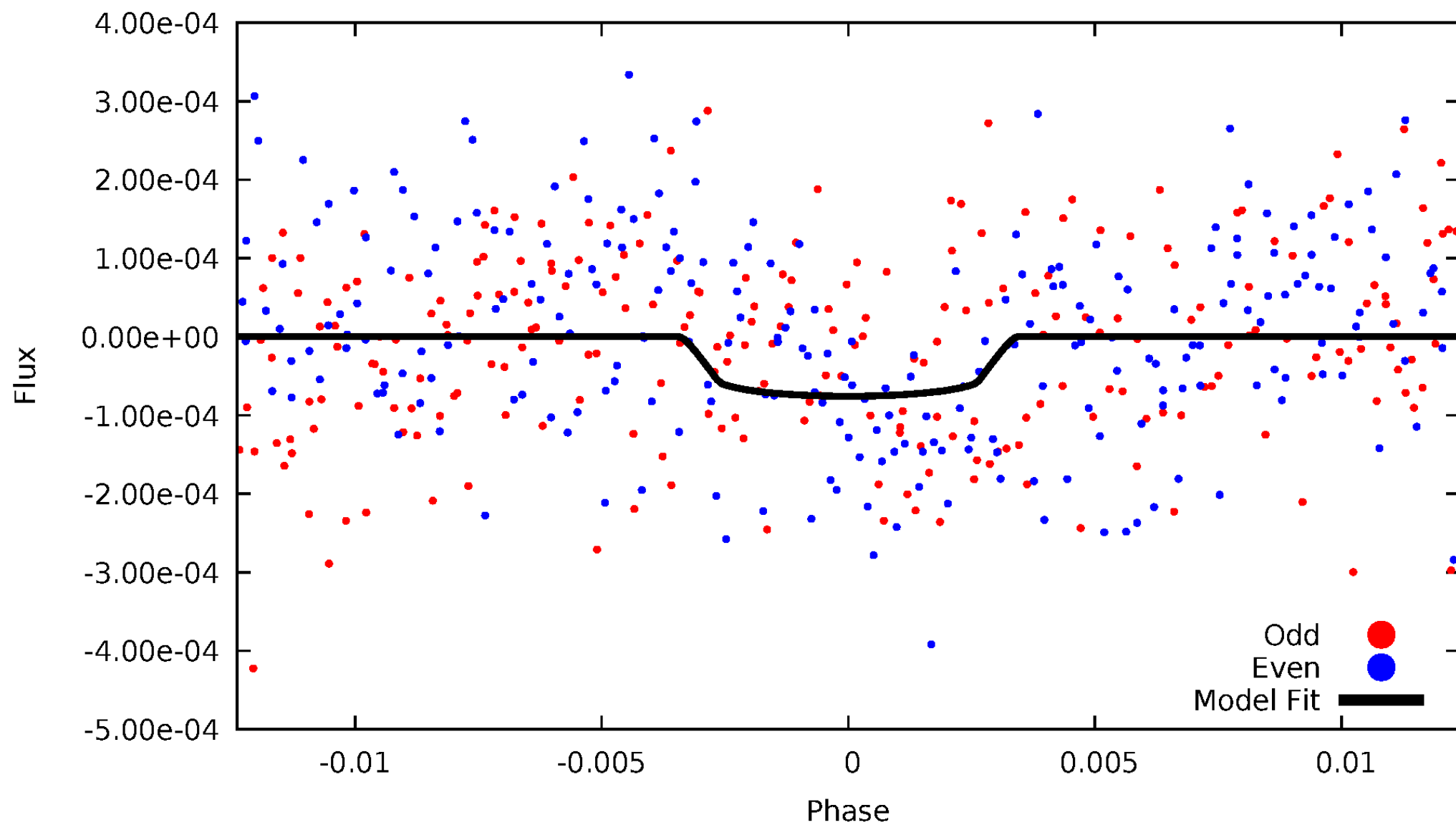


TCE 008521020-02



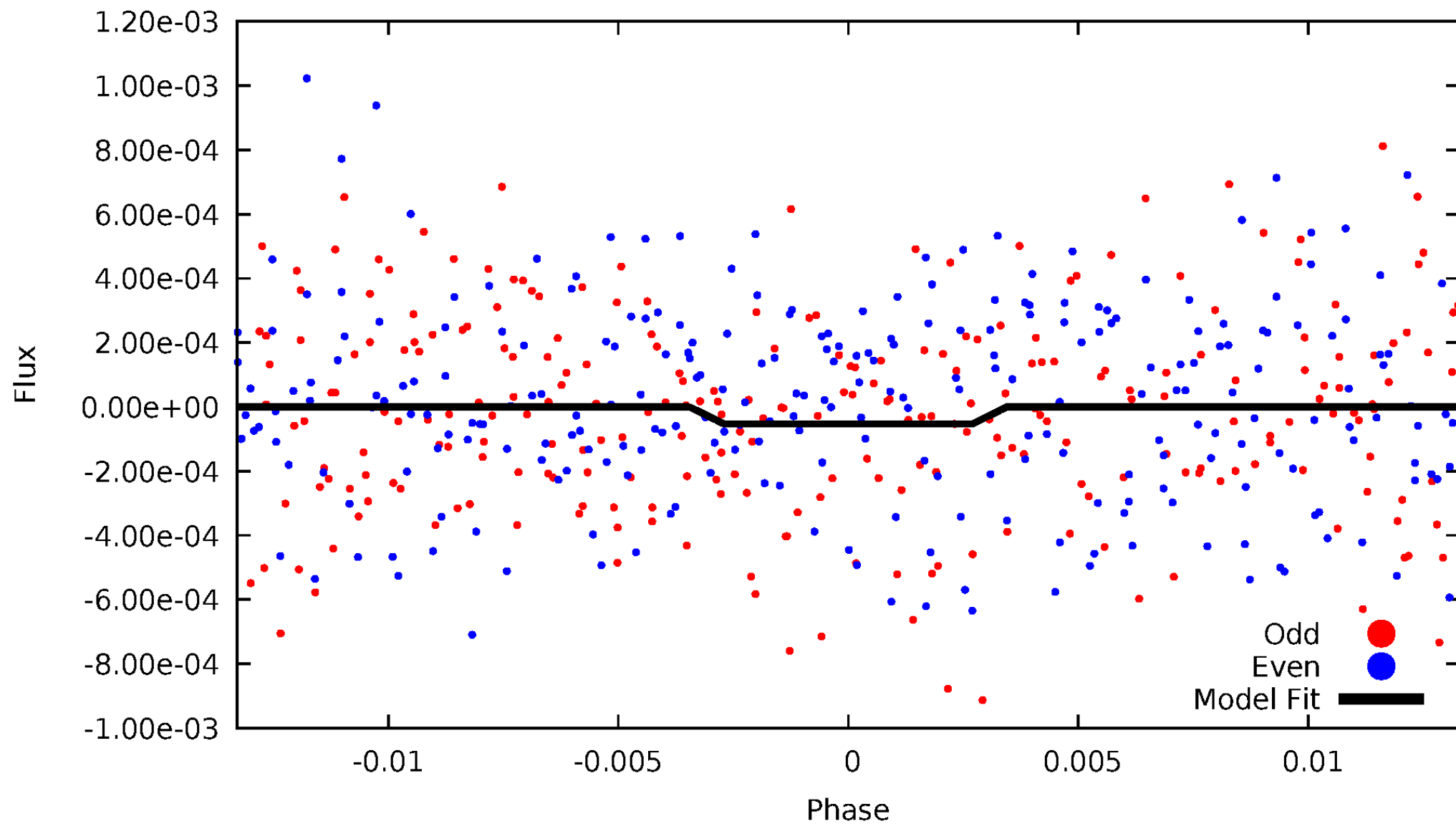
DV Odd/Even

TCE 008521020-02



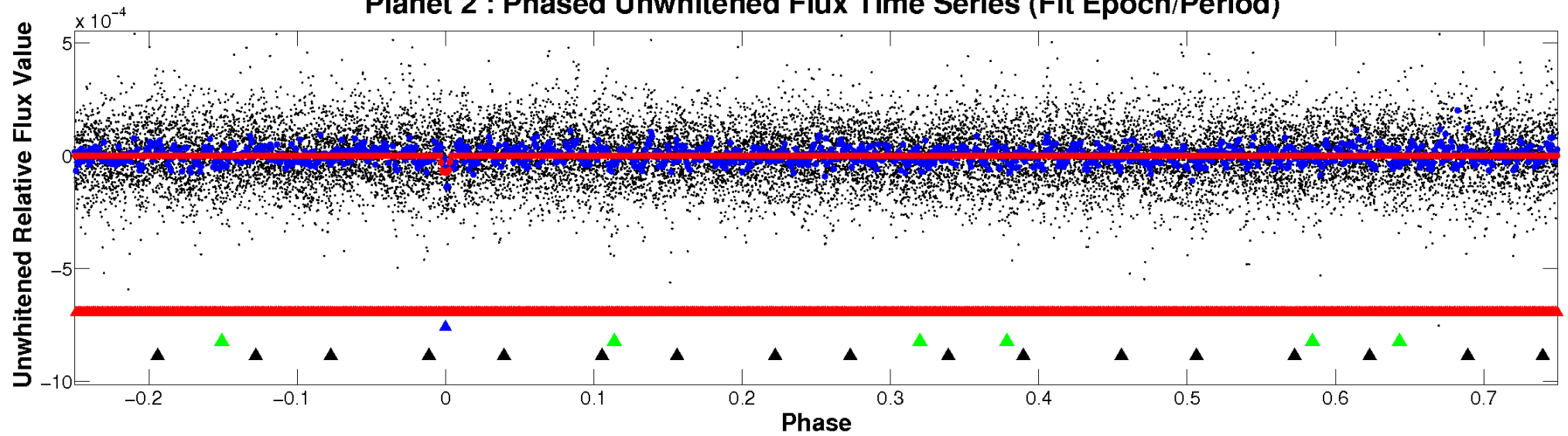
ALT Odd/Even

TCE 008521020-02

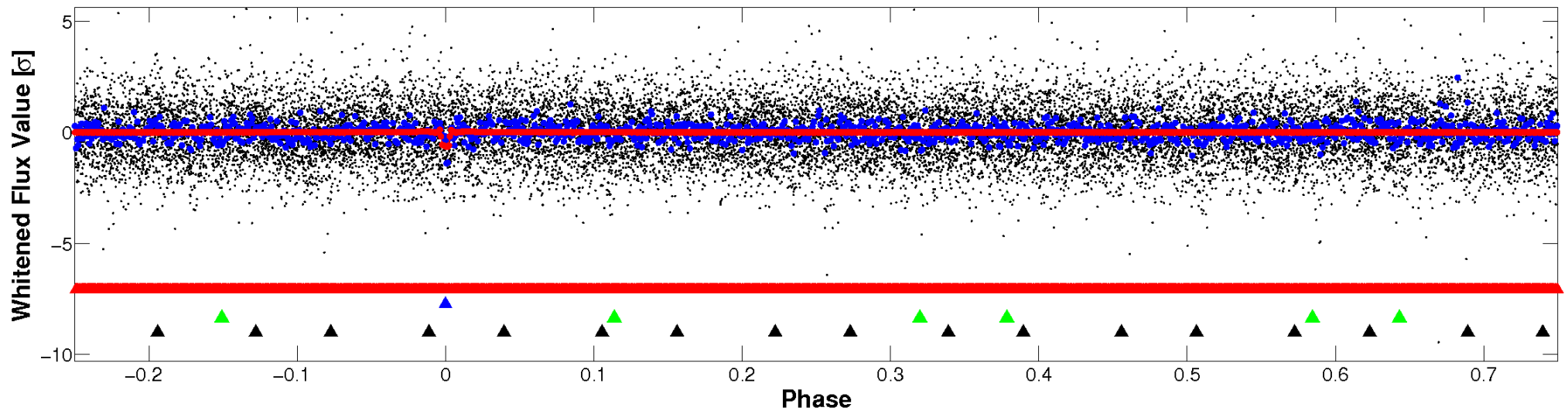


Non-Whitened Vs. Whitened Light Curve

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

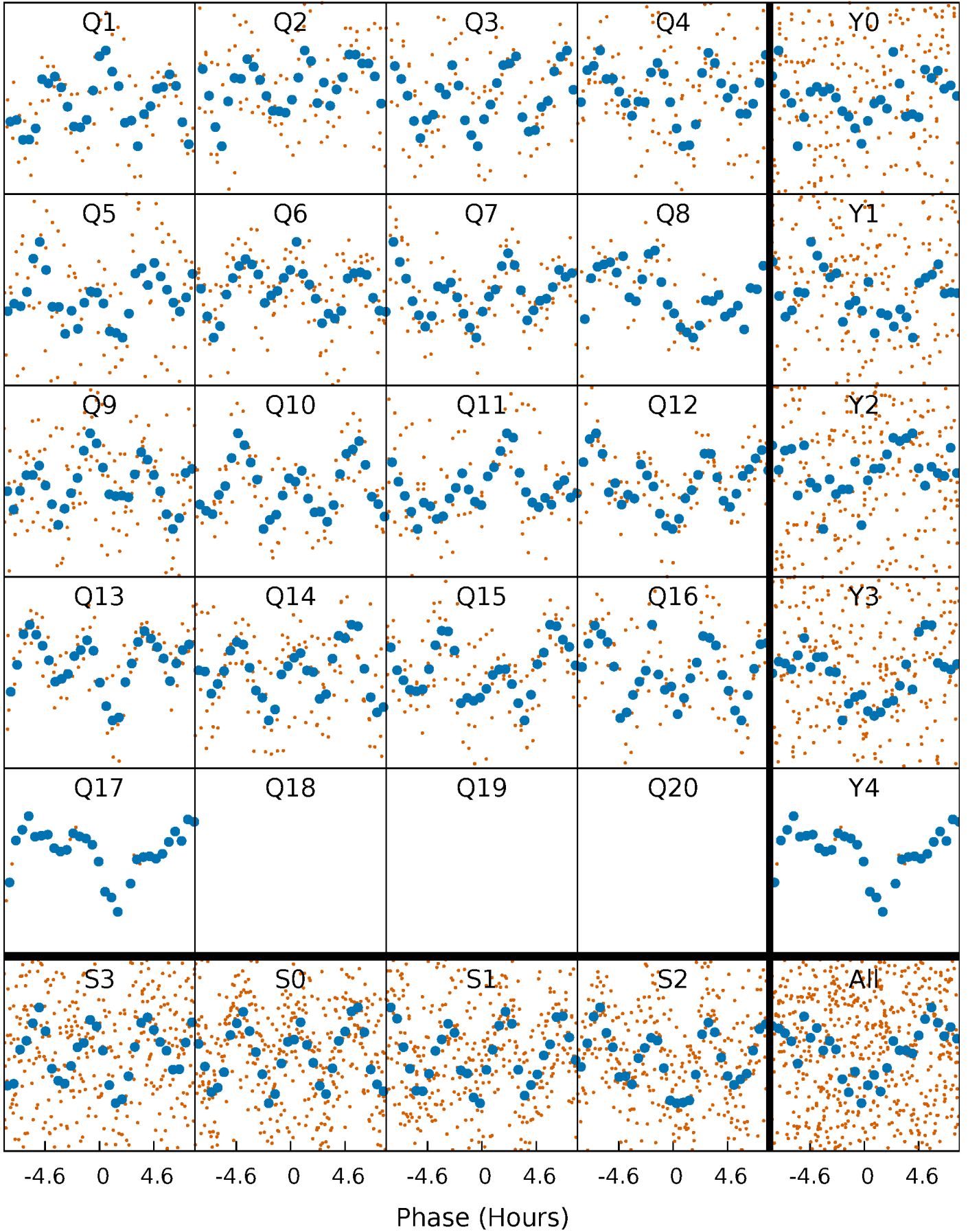


Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



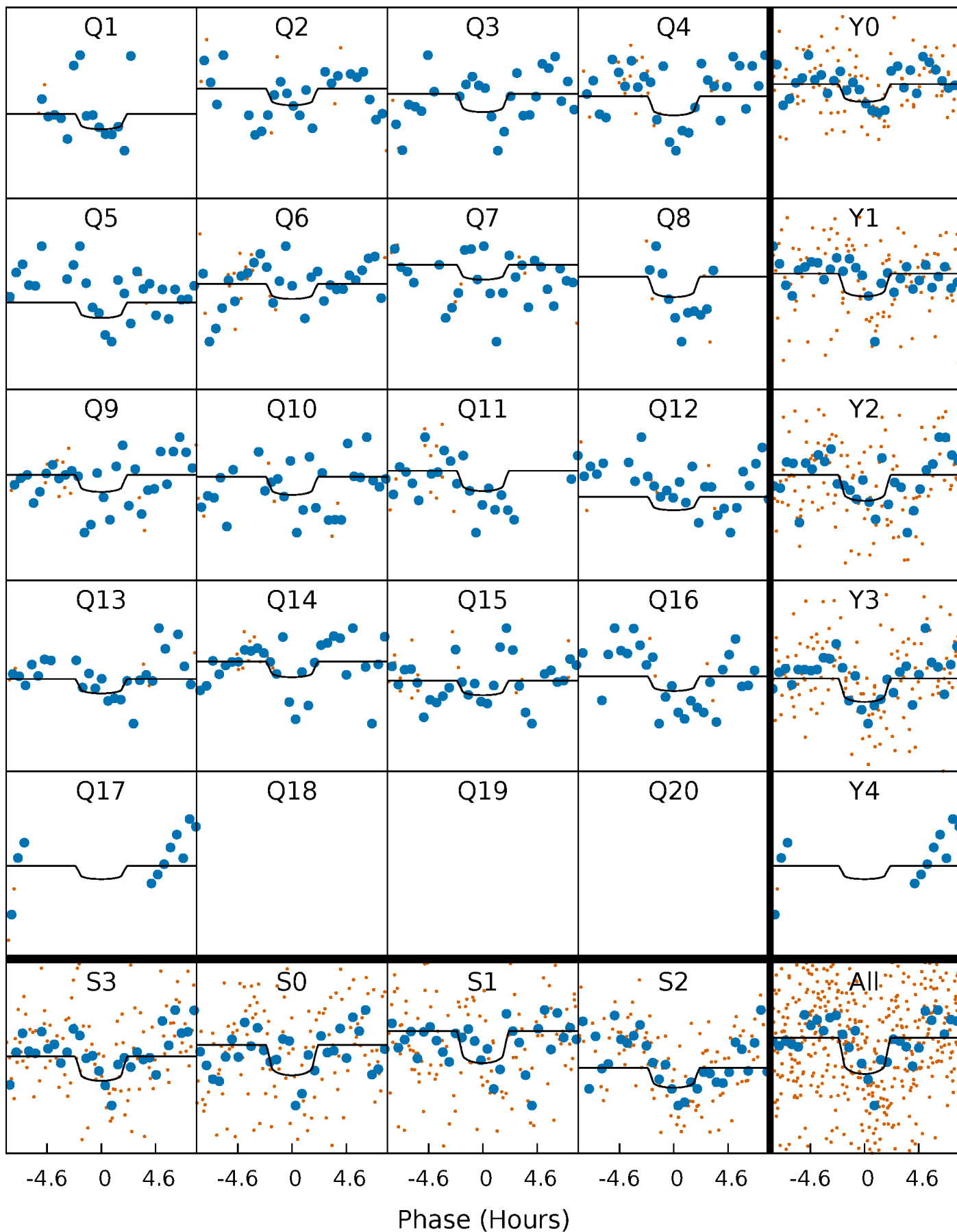
PDC Quarter-Phased Transit Curves

TCE 008521020-02 P= 27.155110 Days $T_0=136.332219$ (BKJD)



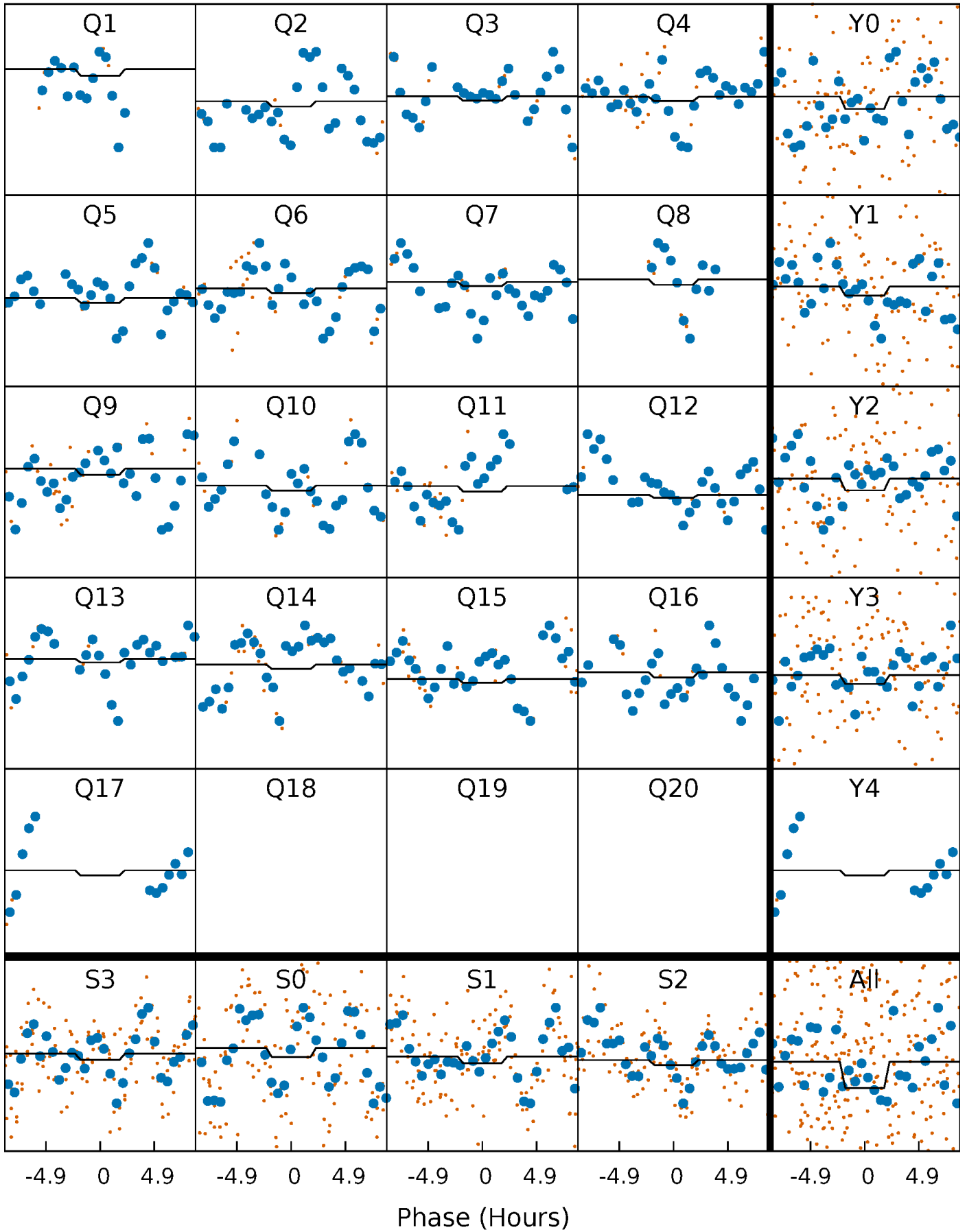
DV Quarter-Phased Transit Curves

TCE 008521020-02 P= 27.155110 Days $T_0=136.332219$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

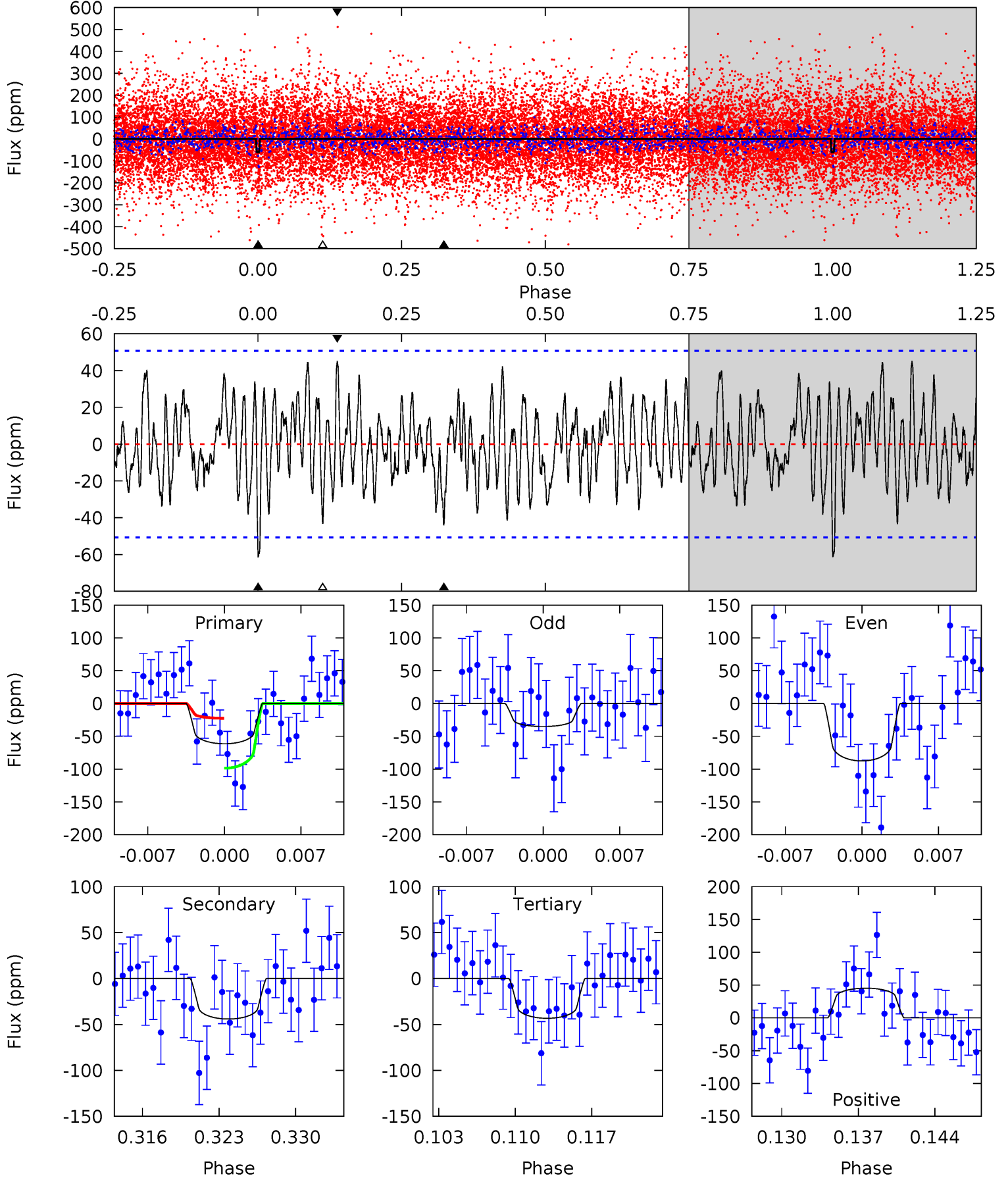
TCE 008521020-02 P= 27.154612 Days $T_0=136.342799$ (BKJD)



DV Model-Shift Uniqueness Test

008521020-02, P = 27.155110 Days, E = 109.177109 Days

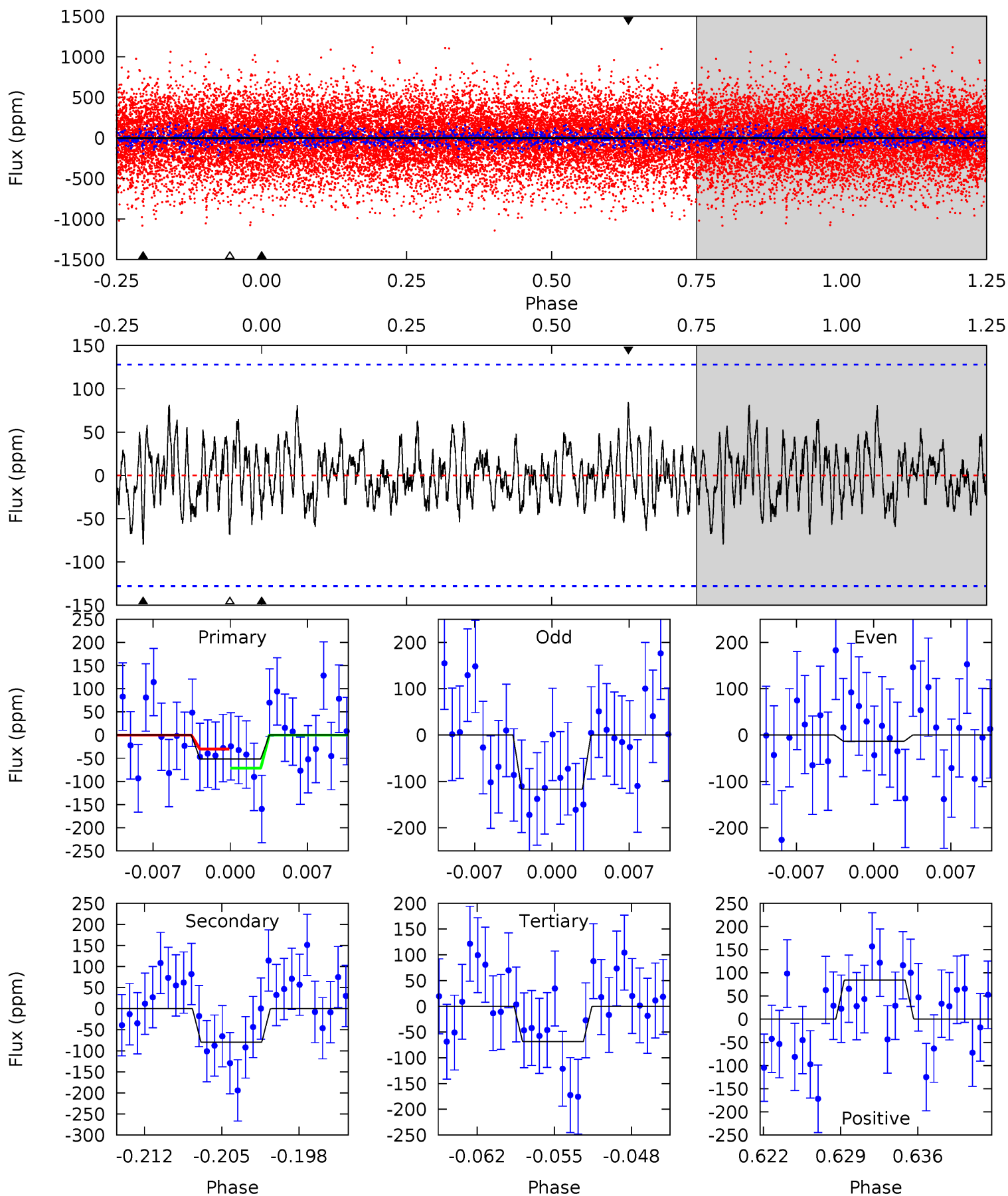
Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
6.16	4.43	4.35	4.54	5.10	2.70	1.78	1.81	1.62	0.08	-0.11	2.66	1.07	0.42	3.84



Alt Model-Shift Uniqueness Test

008521020-02, P = 27.154612 Days, E = 109.188187 Days

Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
2.05	3.18	2.73	3.37	5.10	2.70	1.06	-0.69	-1.33	0.45	-0.19	2.06	6.07	0.51	0.82



Stellar Parameters For KIC 008521020

	$T_{\text{eff}} (K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M (M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	7523^{+235}_{-314}	$3.654^{+0.467}_{-0.055}$	$-0.180^{+0.250}_{-0.300}$	$3.496^{+0.327}_{-1.742}$	$2.012^{+0.127}_{-0.571}$	$0.066^{+0.325}_{-0.013}$
	+3%/-4%	+13%/-2%	+139%/-167%	+9%/-50%	+6%/-28%	+490%/-19%
Source	KIC0	KIC0	KIC0	DSEP		

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

Secondary Eclipse Parameters for KIC 008521020-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	A_{obs}
DV	-44 ± 10	$3.39^{+2.42}_{-2.03}$	1770^{+115}_{-200}	5945^{+3967}_{-1230}	99^{+537}_{-65}
Alt.	-80 ± 25	$2.82^{+2.31}_{-1.86}$	1772^{+114}_{-229}	7633^{+9737}_{-2060}	257^{+1863}_{-186}

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 $A_{obs} \gg 1.0$

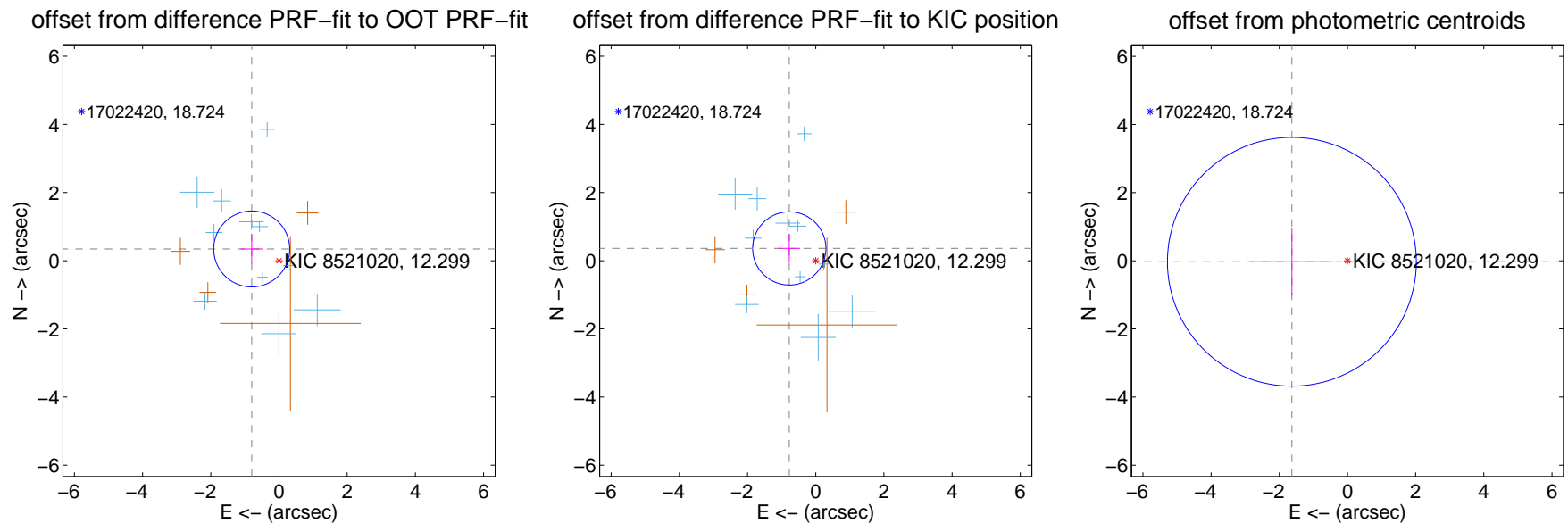
DV Centroid Data

Supplemental centroid analysis for 008521020-02. Kepler magnitude: 12.30. Transit SNR 6.47

There are 11 quarters with good PRF difference image offsets

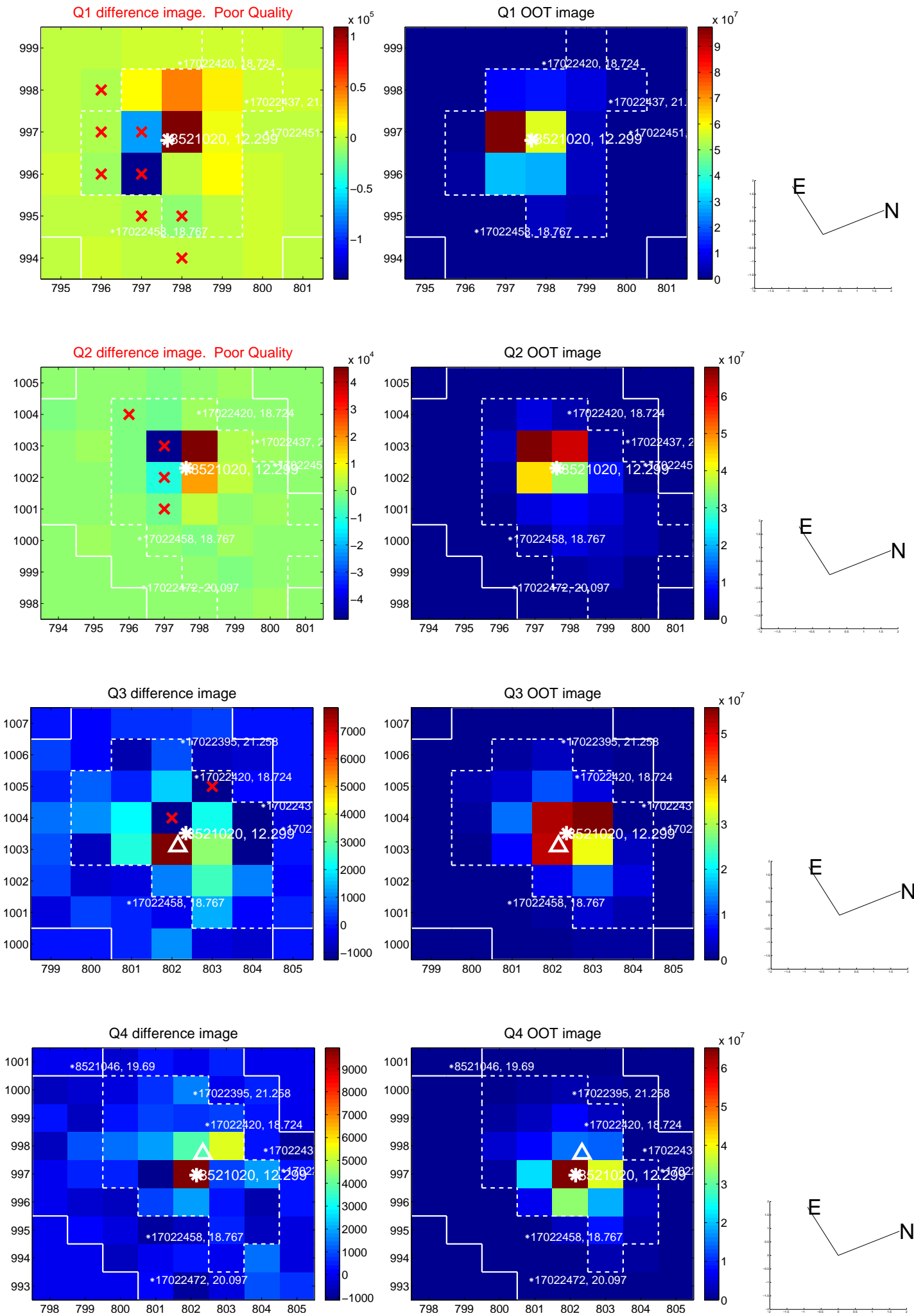
The direct PRF centroid is offset from the target star catalog position by about 0.13 arcsec

	Distance in arcsec	Distance / σ	Δ RA	Δ Dec
PRF-fit source offset from OOT	0.871 ± 0.371	2.35	0.800 ± 0.323	0.344 ± 0.438
PRF-fit source offset from KIC position	0.855 ± 0.358	2.39	0.775 ± 0.321	0.360 ± 0.423
photometric centroid source offset	1.63 ± 1.22	1.34	1.63 ± 1.22	-0.03 ± 0.99

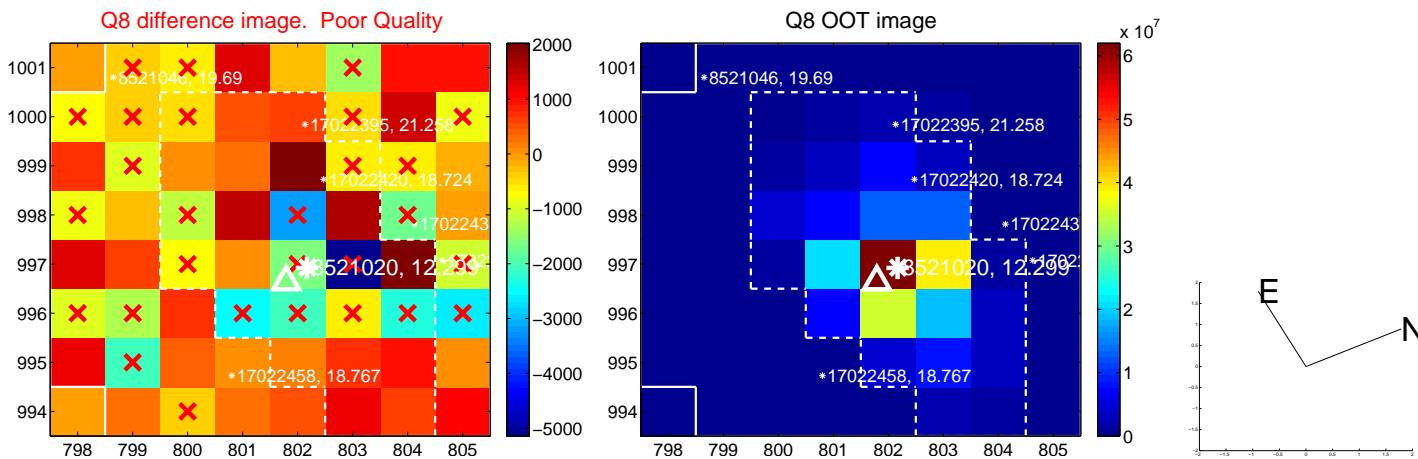
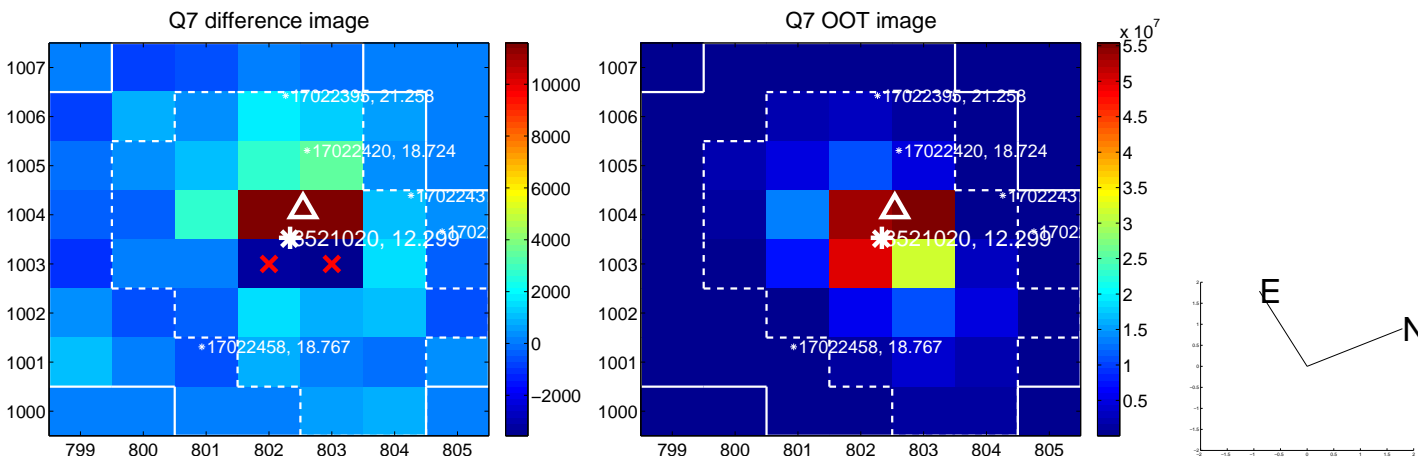
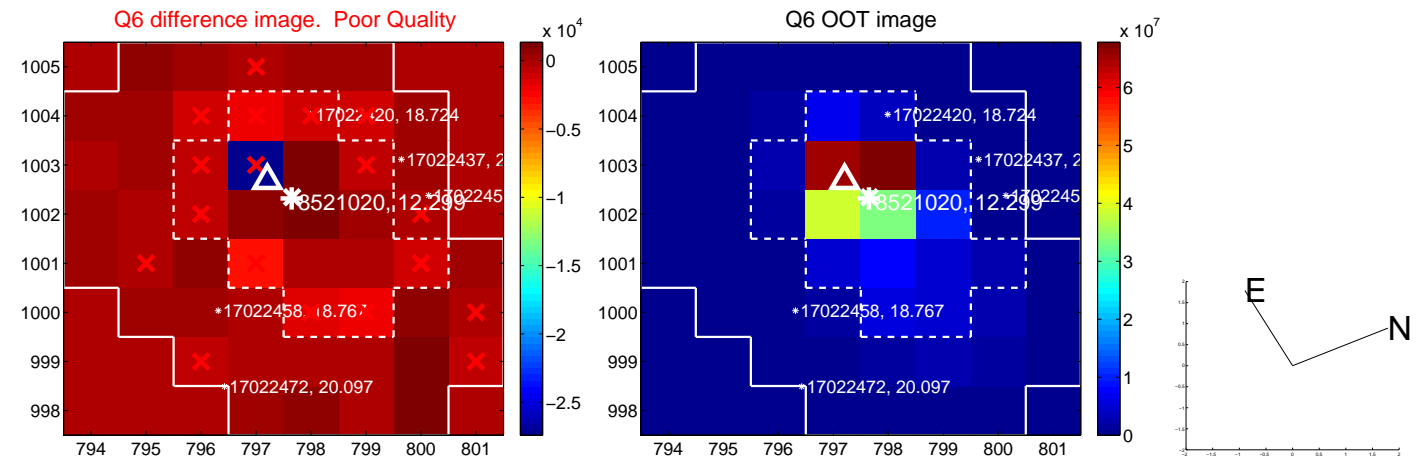
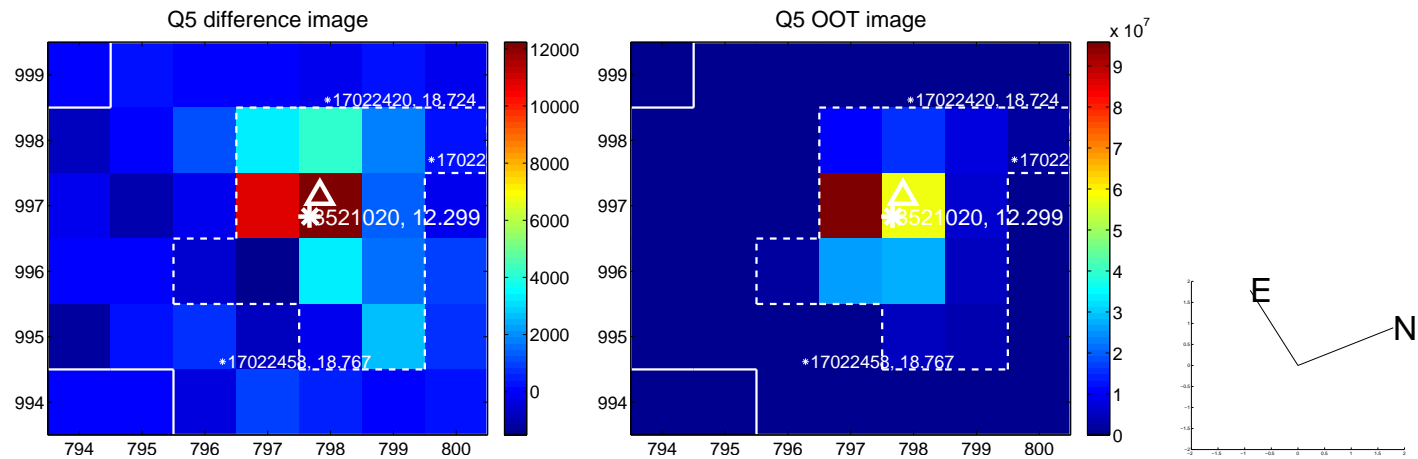


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three- 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.

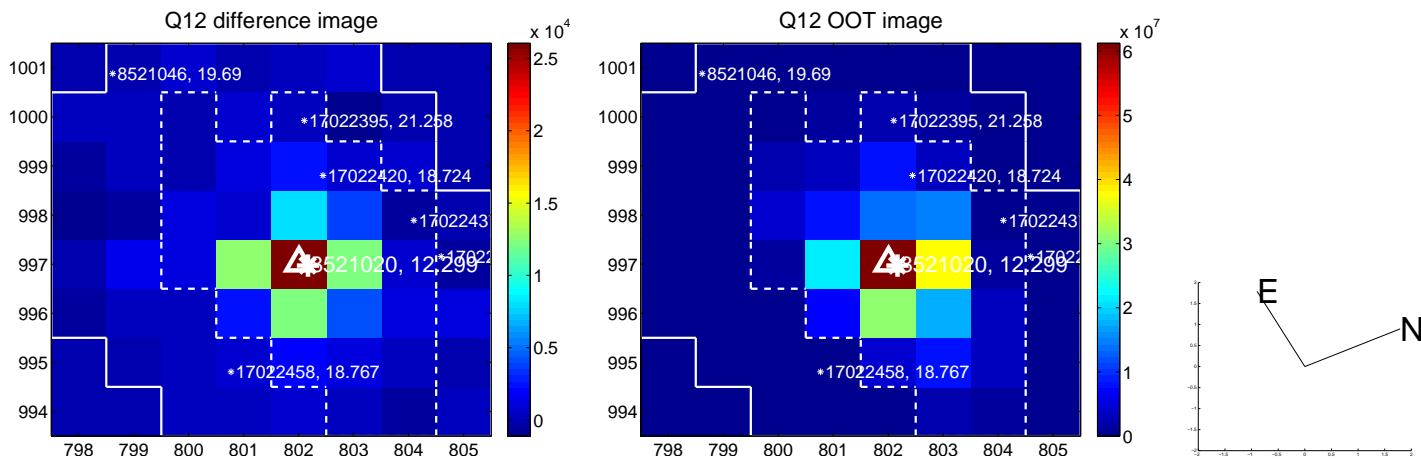
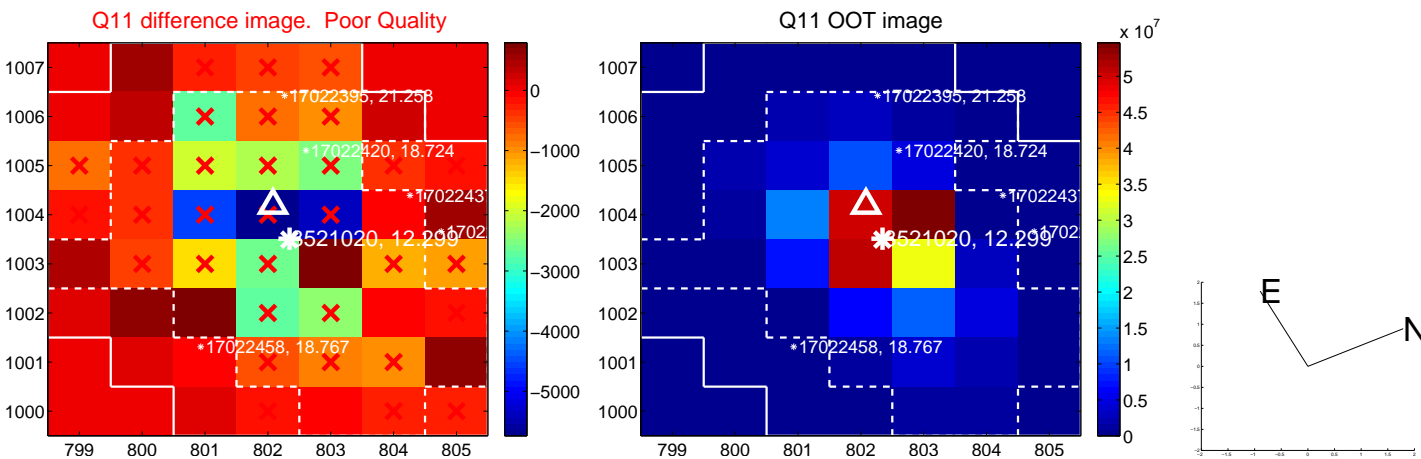
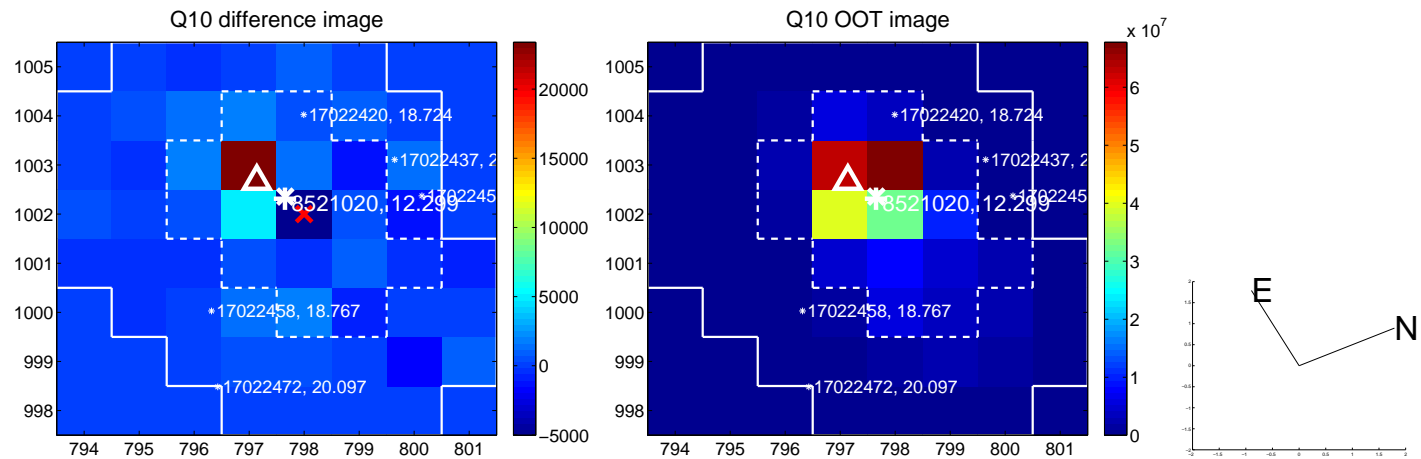
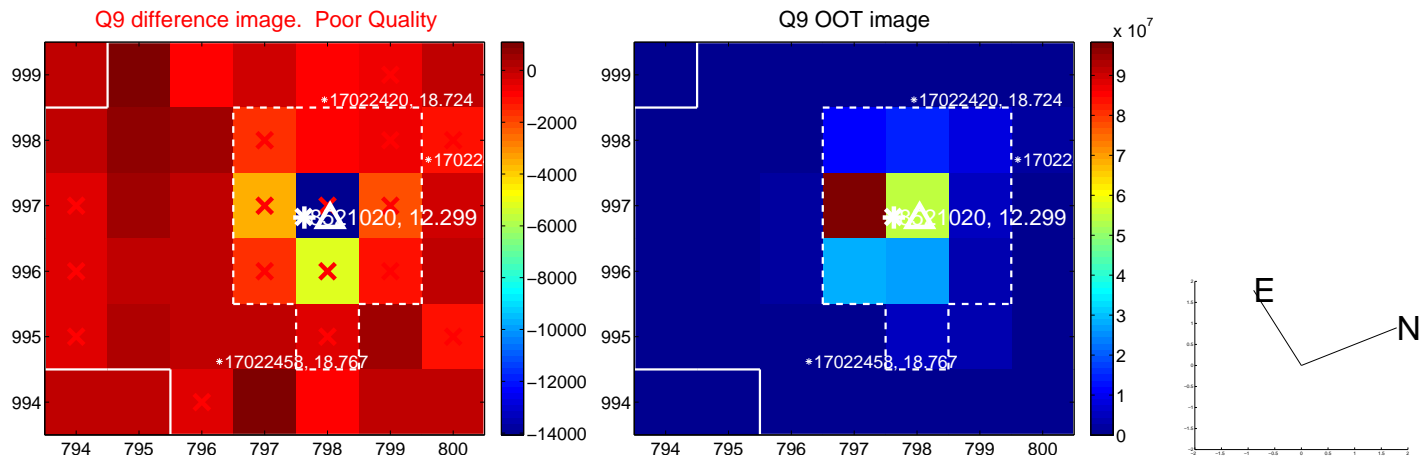
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



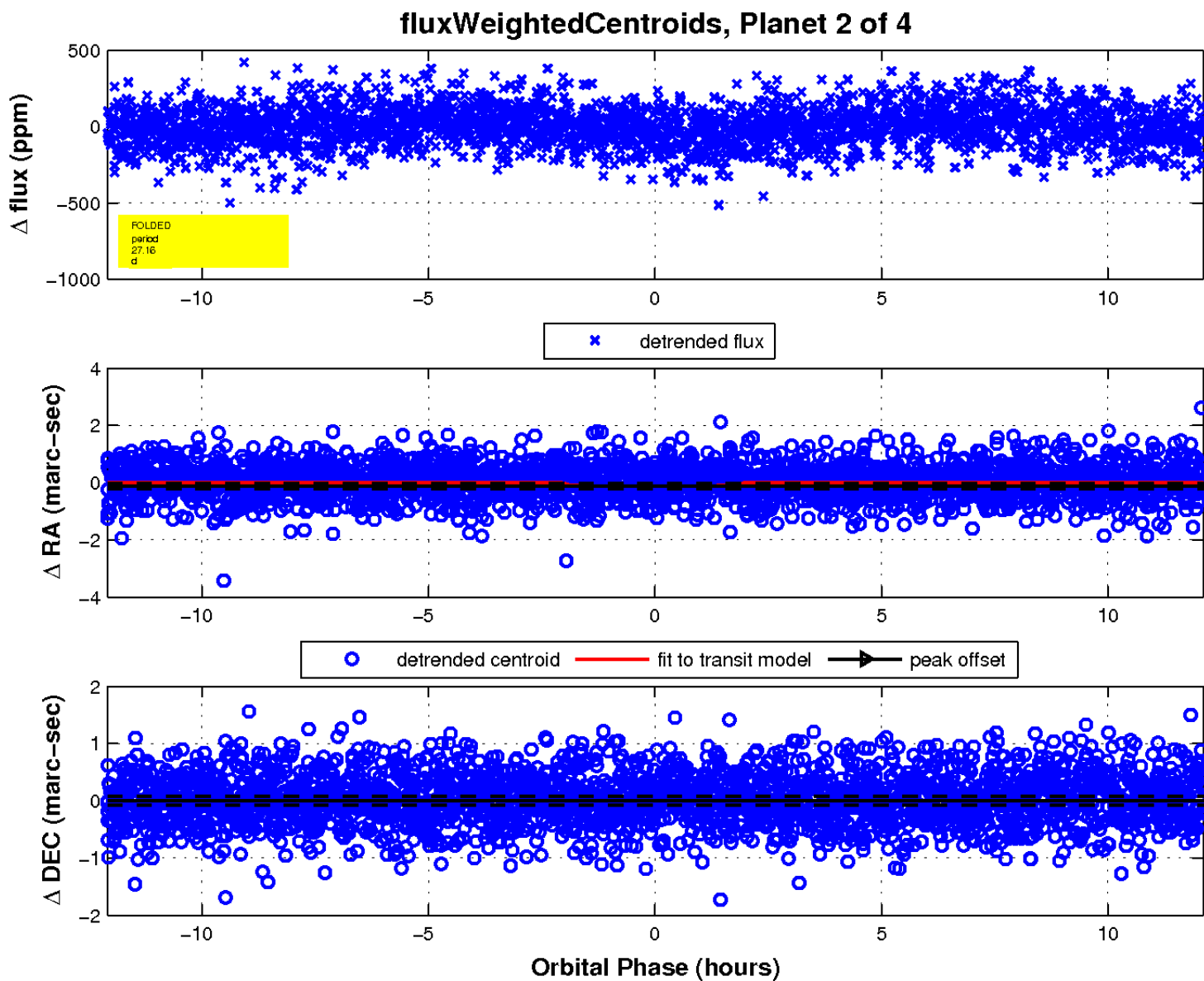
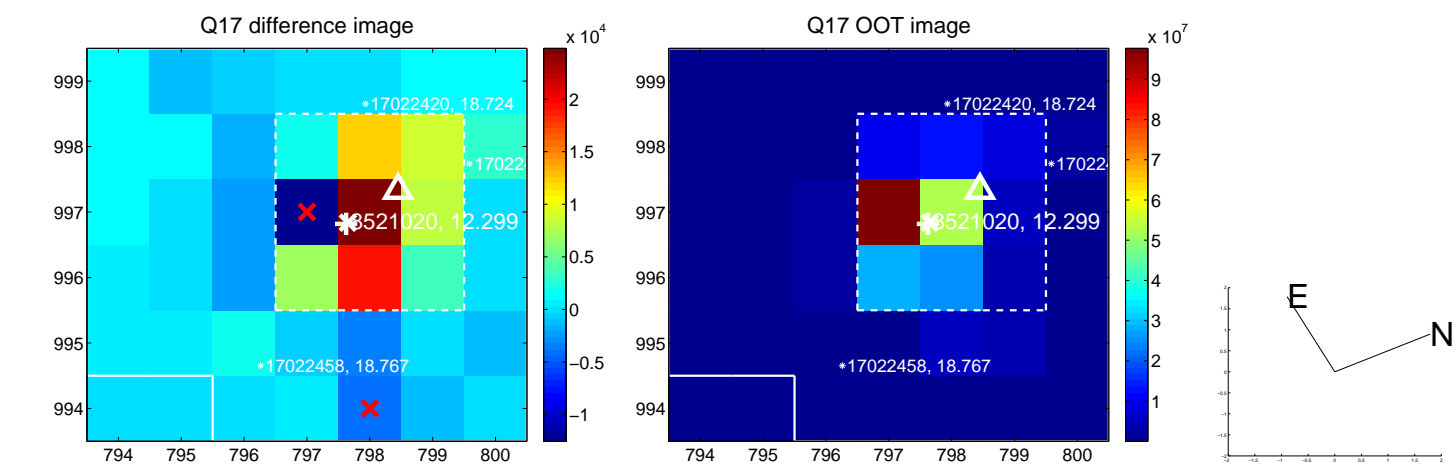
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



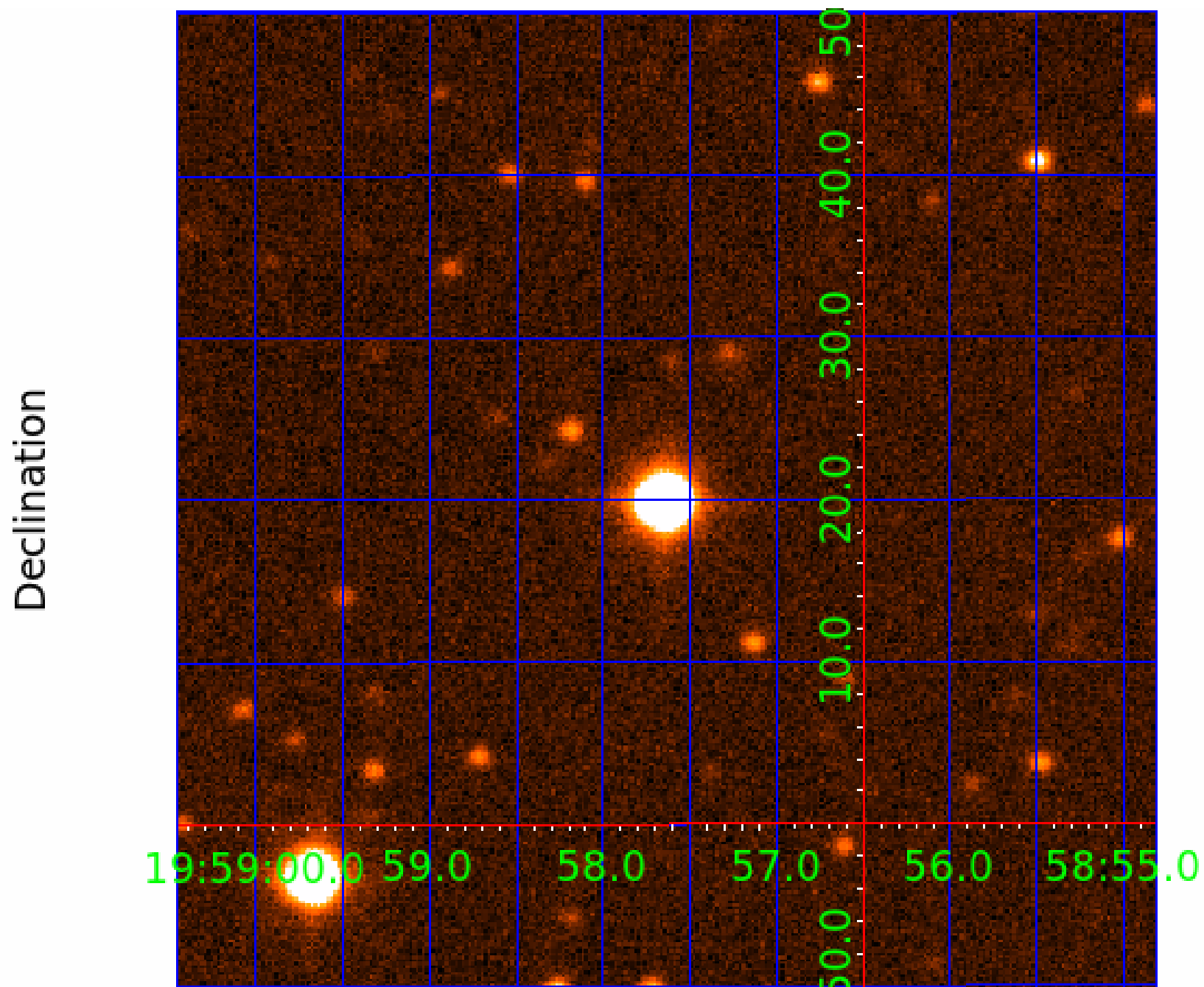
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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



UKIRT Image



KIC 008521020

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})
008521020-01	OBS	No	0.599521	131.869201	0.5	3.212	7.7	0.3	3.50	7523	0.25	113701.59
008521020-02	OBS	No	27.155110	136.332219	75.8	4.036	8.5	6.5	3.50	7523	3.46	704.21
008521020-03	OBS	No	264.364254	153.797971	244.1	29.750	7.4	8.9	3.50	7523	6.40	33.88
008521020-04	OBS	No	84.635198	160.014583	171.4	2.280	7.1	6.9	3.50	7523	5.30	154.68

Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
008521020-01	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_SKYE_ZUMA_TRACKER—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—CENT_FEW_DIFFS
008521020-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_ZUMA—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
008521020-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_FEW_DIFFS
008521020-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT

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

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

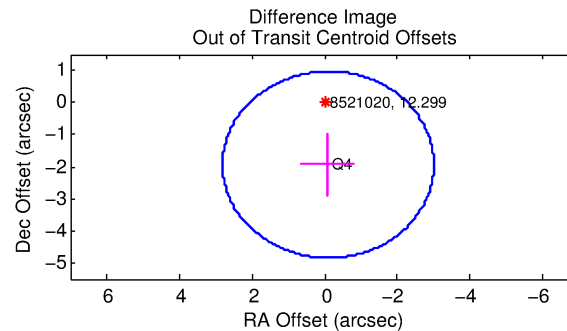
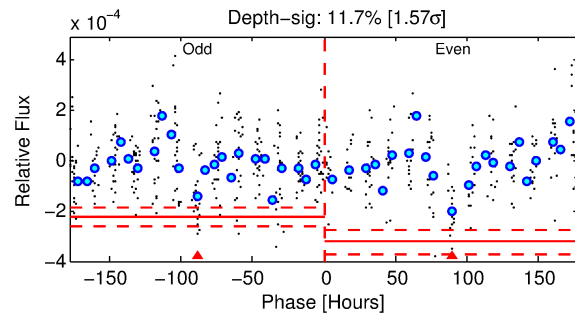
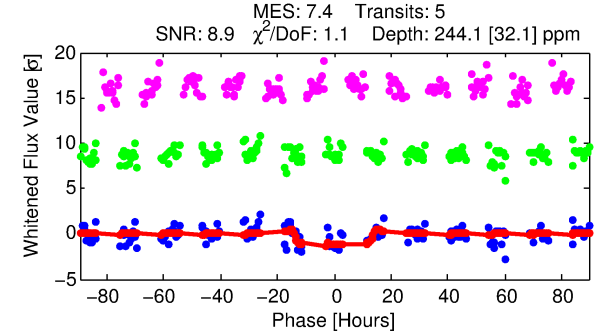
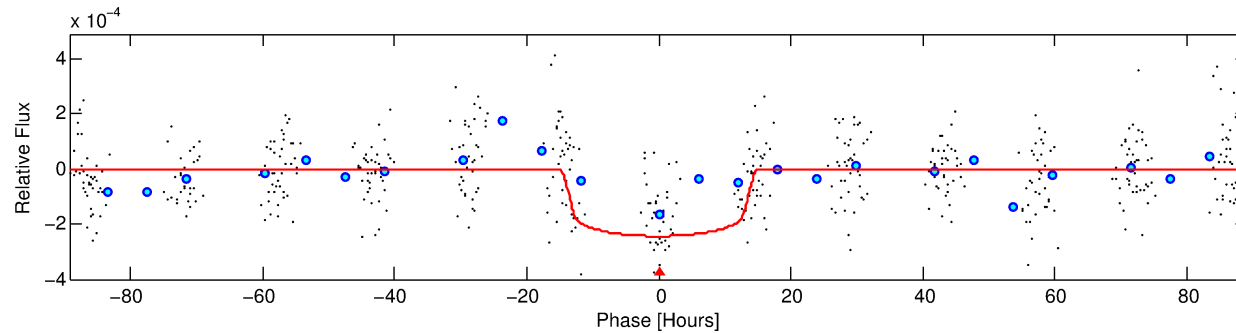
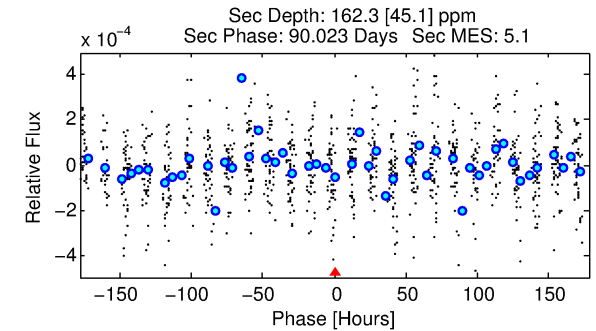
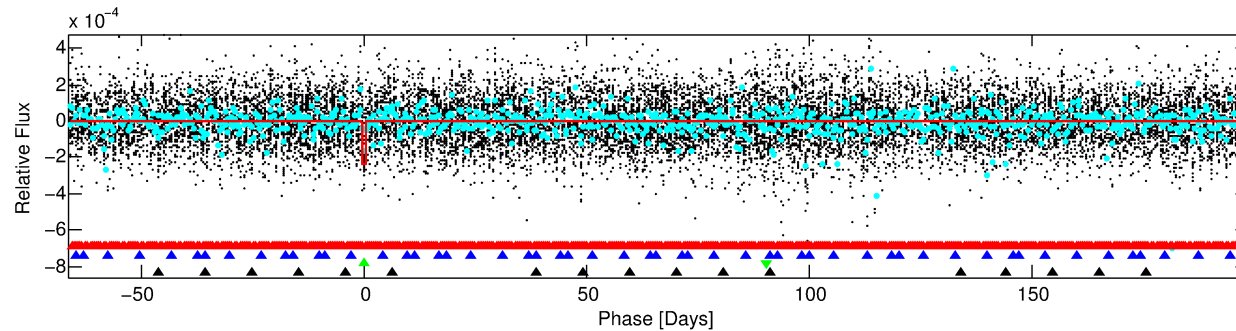
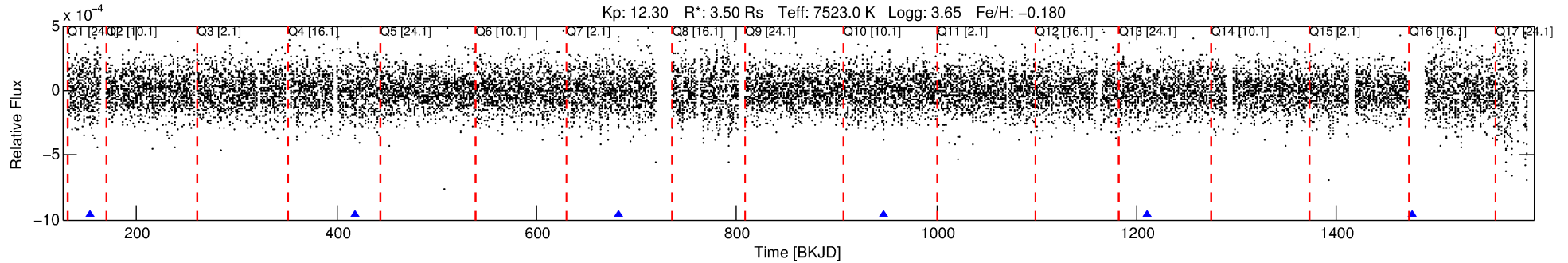
See http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col for comment definitions.

Ephemeris Match Information For 008521020-03

No Significant Match Found

DV One-Page Summary

KIC: 8521020 Candidate: 3 of 4 Period: 264.364 d



DV Fit Results:

Period = 264.36425 [0.00855] d
Epoch = 153.7980 [0.0208] BKJD
Rp/R* = 0.0168 [0.0014]
a/R* = 32.20 [6.42]
b = 0.90 [0.04]
Seff = 33.88 [27.36]
Teq = 615 [124] K
Rp = 6.40 [3.23] Re
a = 1.0175 [0.4973] AU
Ag = 2259.58 [1927.29] [1.17 σ]
Teffp = 6558 [594] K [9.80 σ]

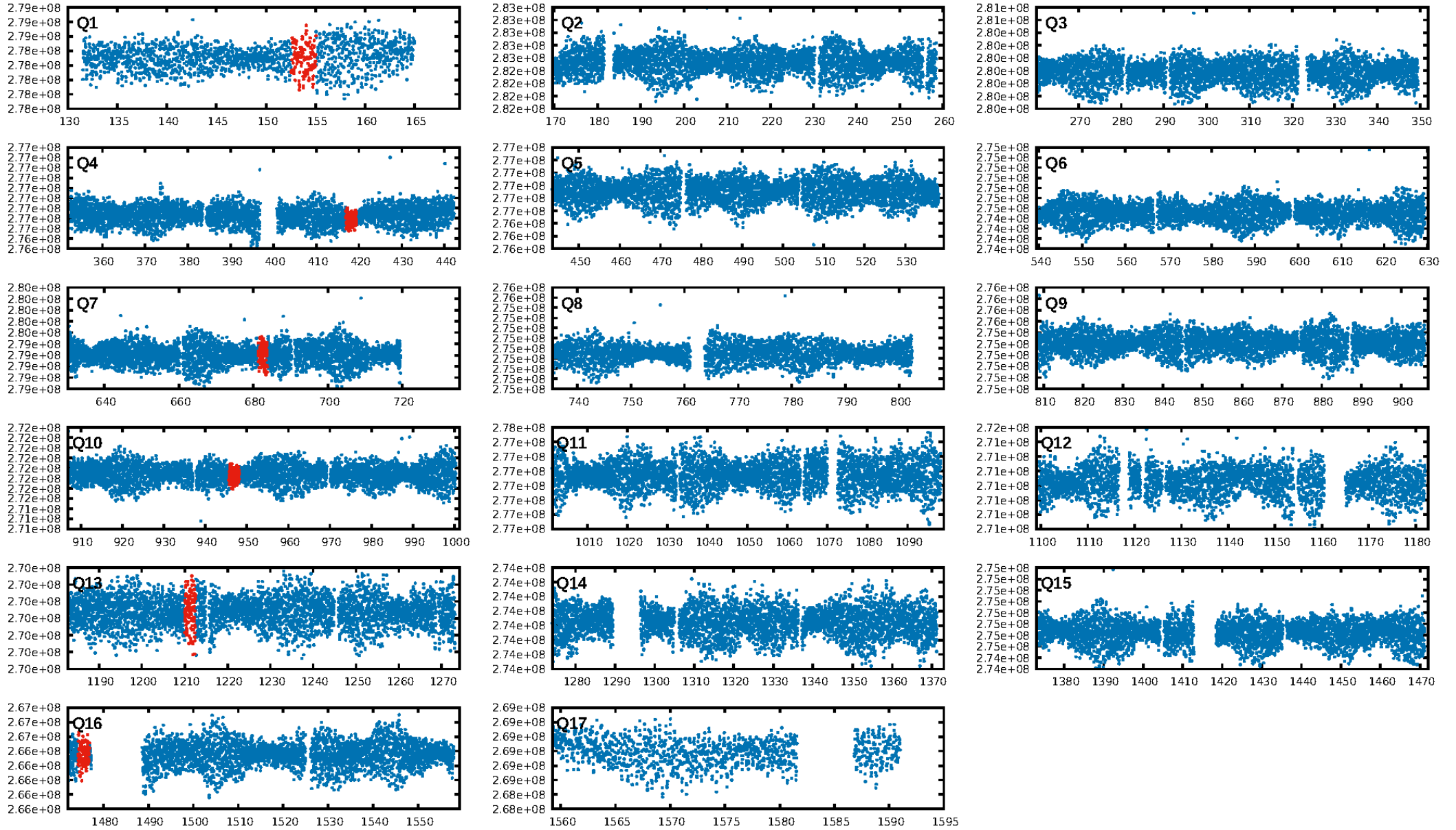
DV Diagnostic Results:

ShortPeriod-sig: 100.0% [144.56 σ]
LongPeriod-sig: N/A
ModelChiSquare2-sig: 10.4%
ModelChiSquareGof-sig: 100.0%
Bootstrap-pfa: 4.64e-09
RollingBand-fgt: 1.00 [4/4]
GhostDiagnostic-chr: 1.707
Centroid-sig: 29.9%
Centroid-so: 0.466 arcsec [0.95 σ]
OotOffset-rm: 1.942 arcsec [2.00 σ]
KicOffset-rm: 1.987 arcsec [2.05 σ]
OotOffset-st: 0/0/1/0 [1]
KicOffset-st: 0/0/1/0 [1]
DiffImageQuality-fgm: 0.00 [0/1]
DiffImageOverlap-fno: 0.00 [0/5]

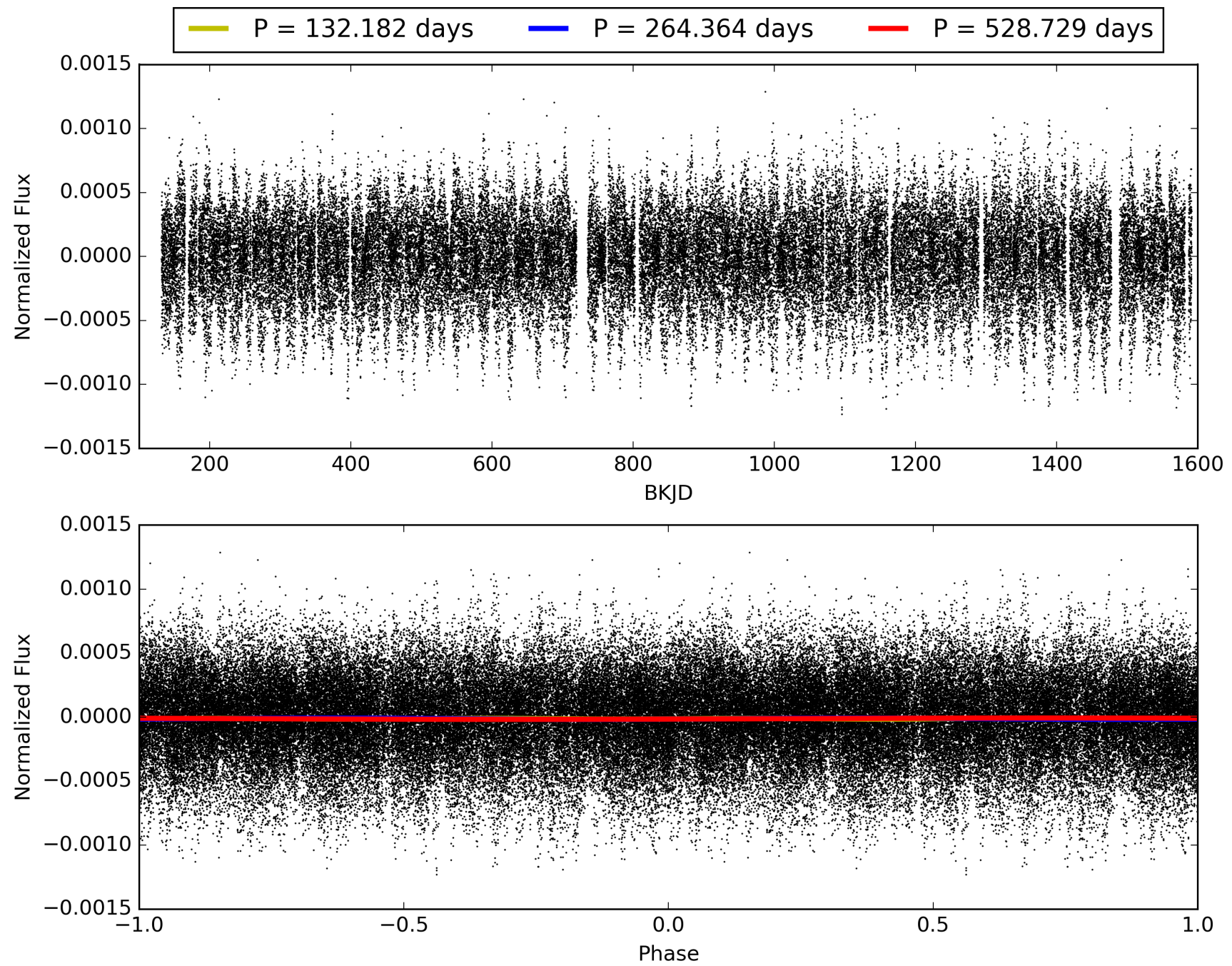
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 03:43:15 Z

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

TCE 008521020-03, PDC Light Curves

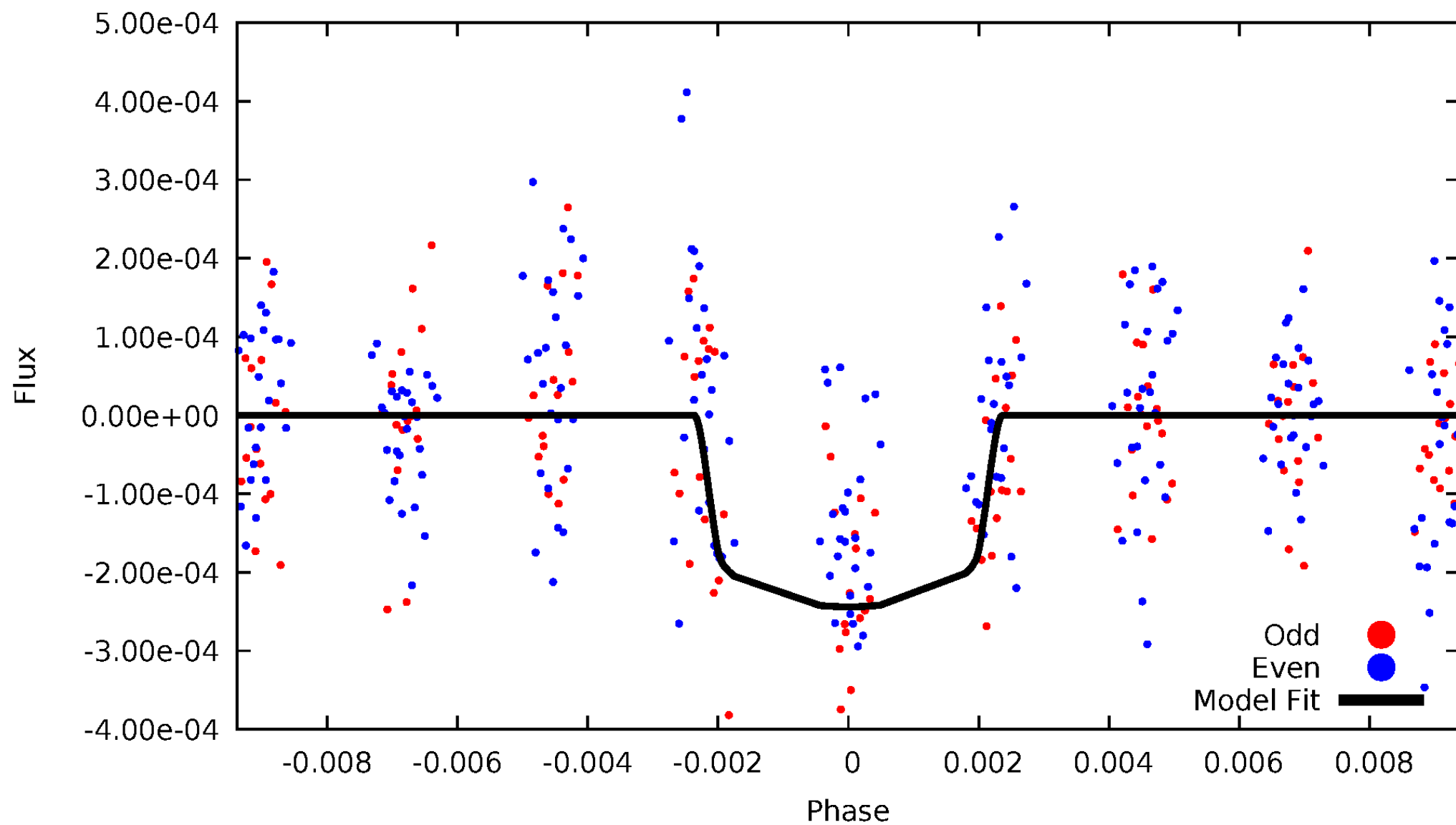


TCE 008521020-03



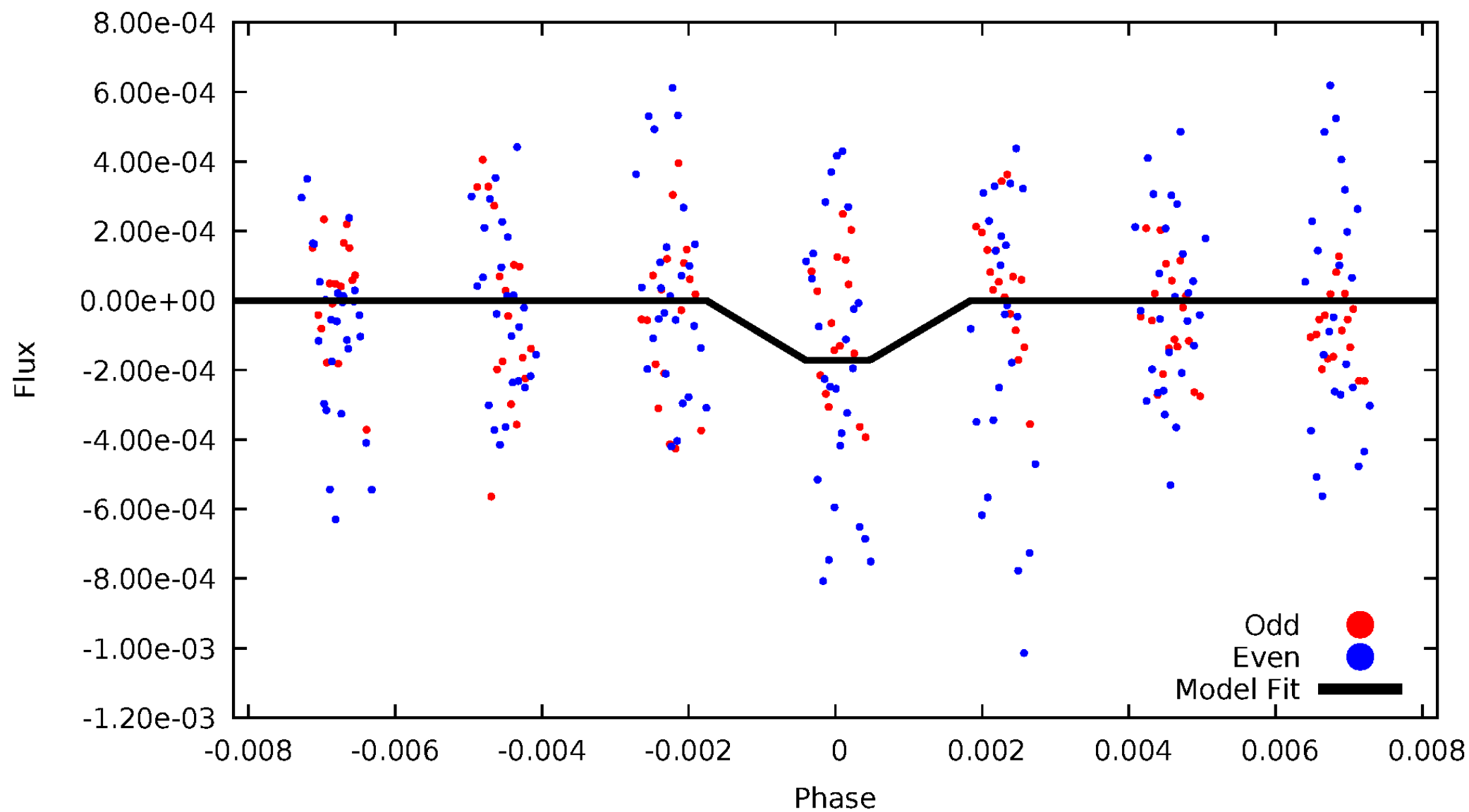
DV Odd/Even

TCE 008521020-03



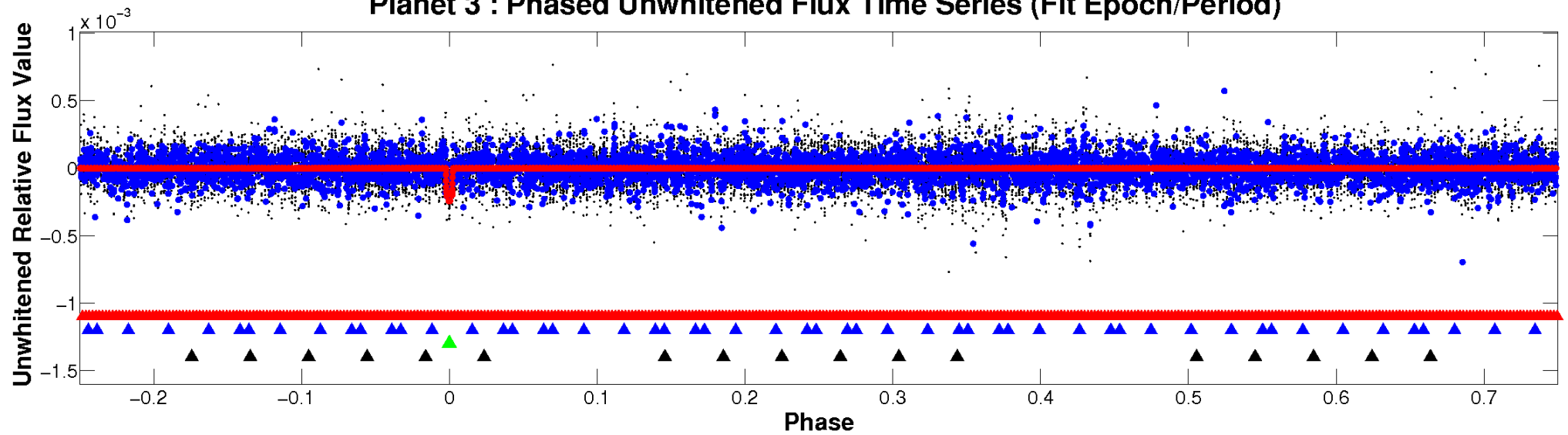
ALT Odd/Even

TCE 008521020-03

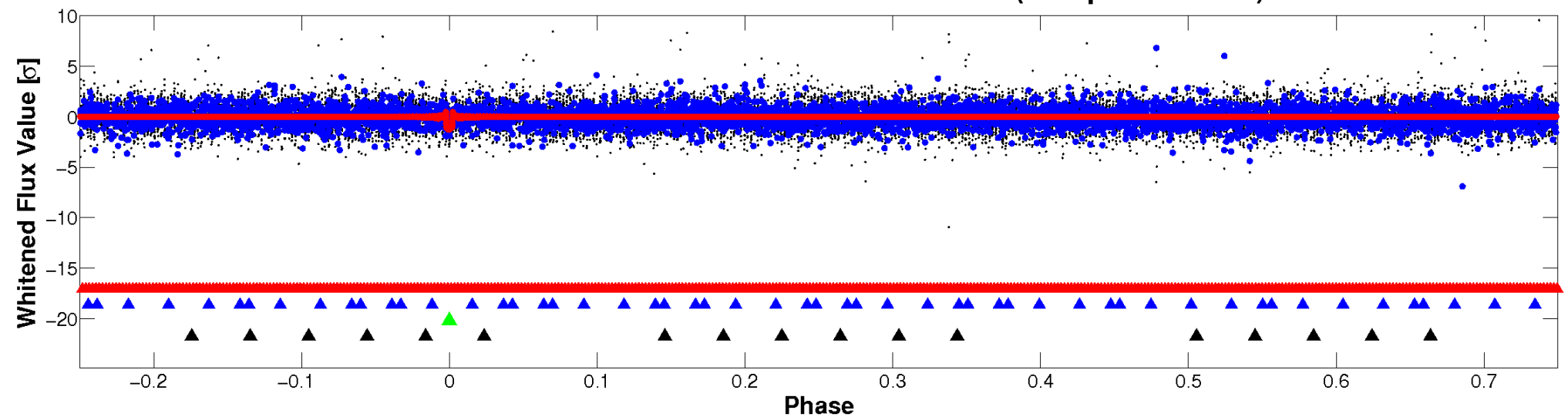


Non-Whitened Vs. Whitened Light Curve

Planet 3 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)

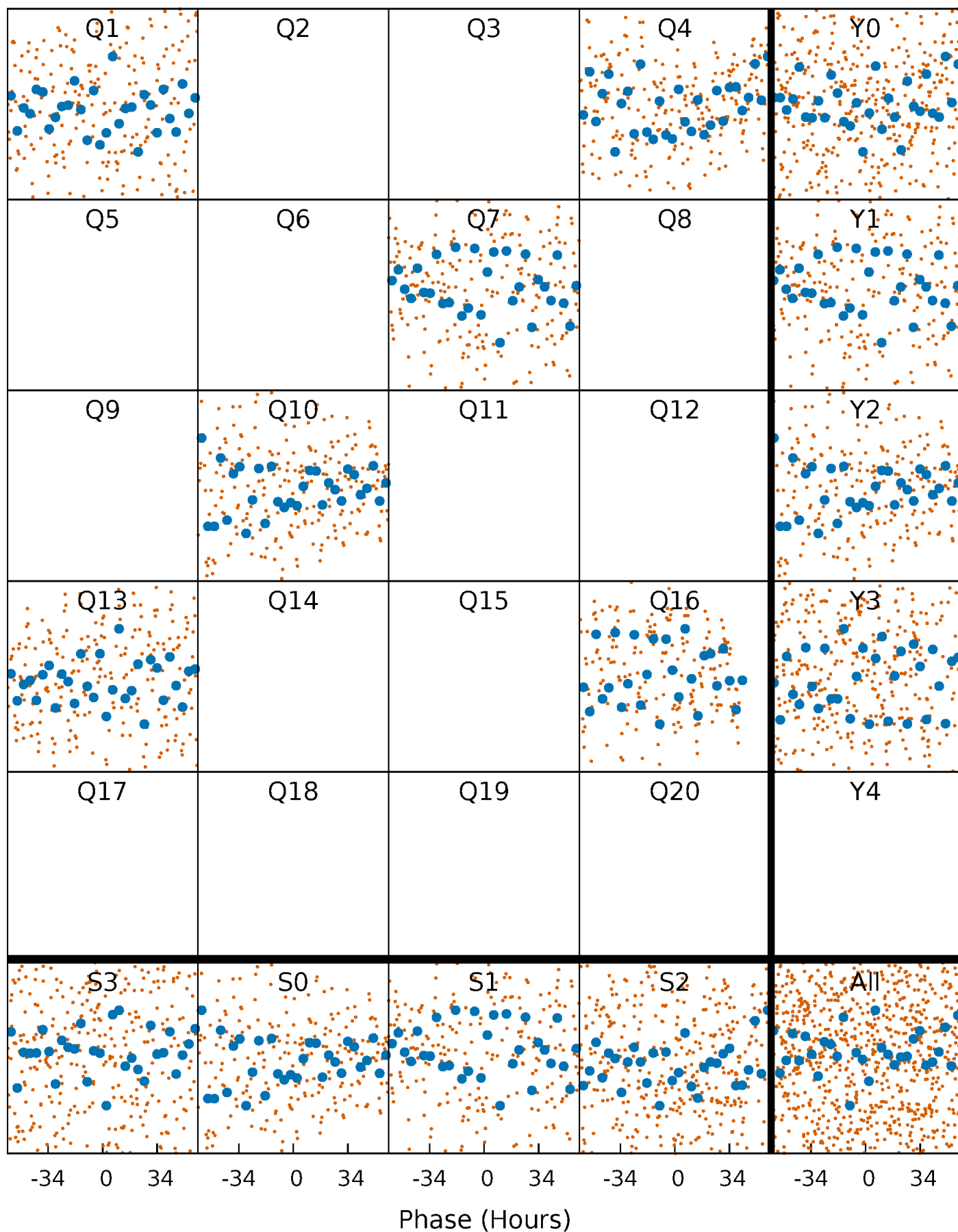


Planet 3 : Phased Whitened Flux Time Series (Fit Epoch/Period)



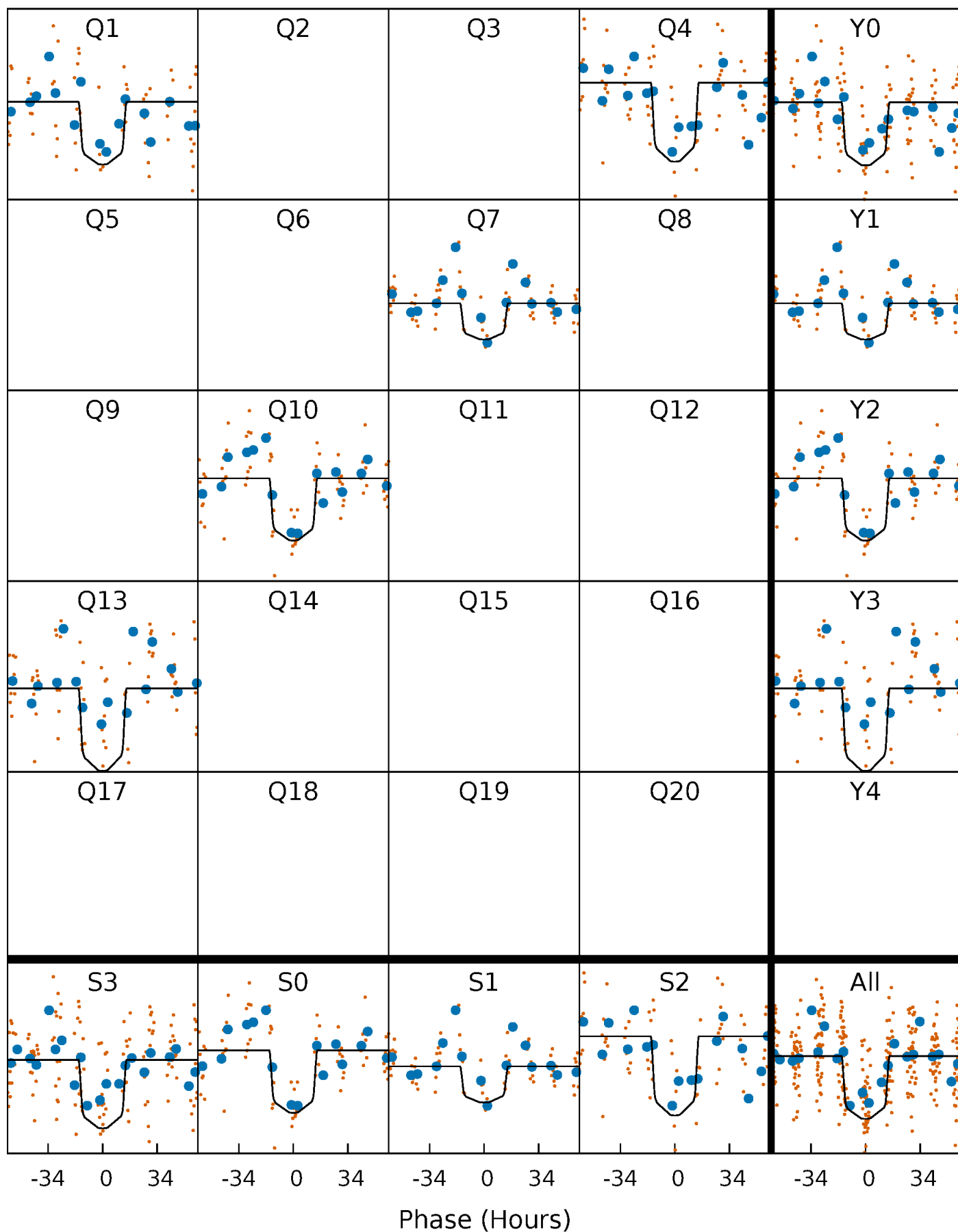
PDC Quarter-Phased Transit Curves

TCE 008521020-03 P=264.364254 Days $T_0=153.797971$ (BKJD)



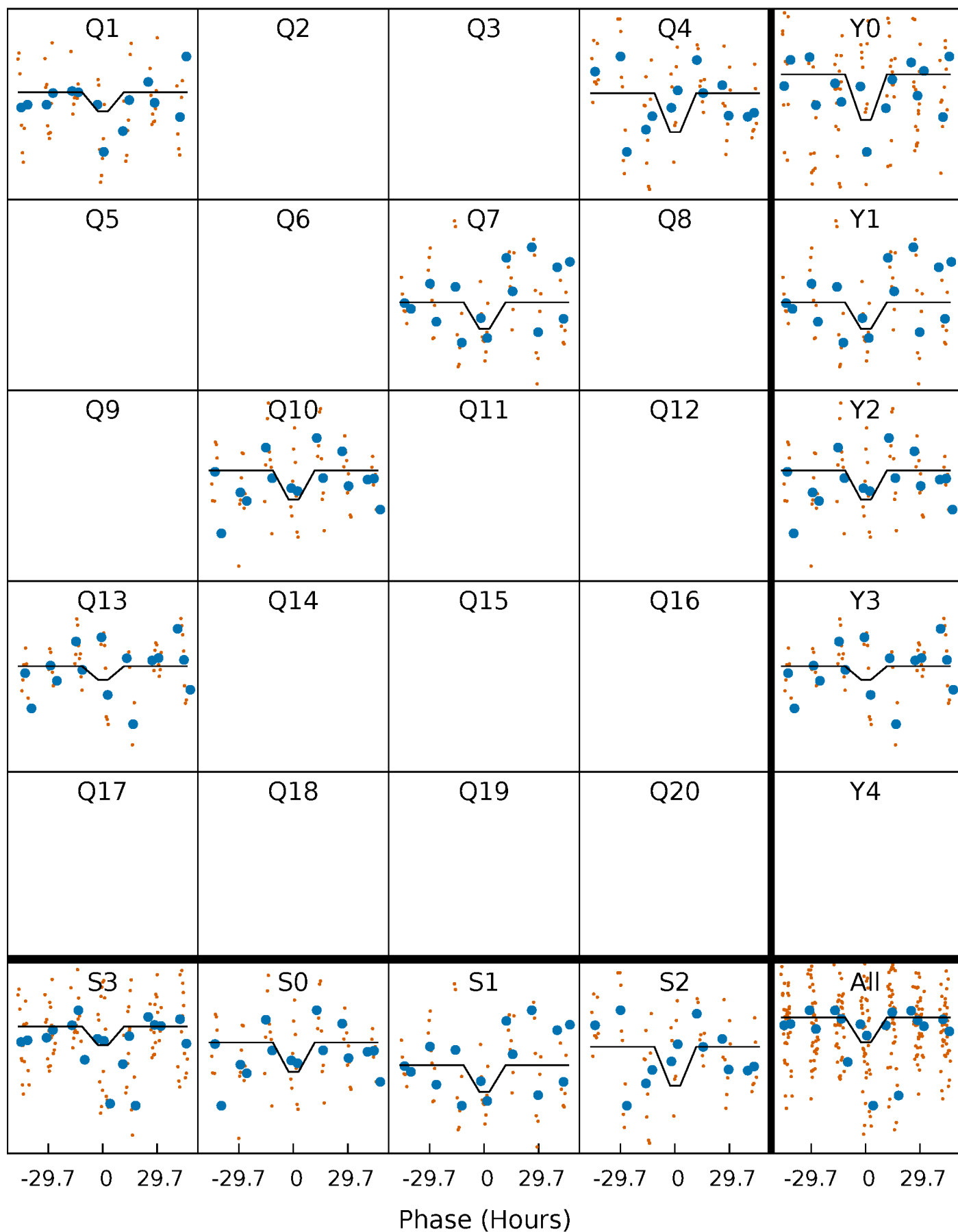
DV Quarter-Phased Transit Curves

TCE 008521020-03 $P=264.364254$ Days $T_0=153.797971$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

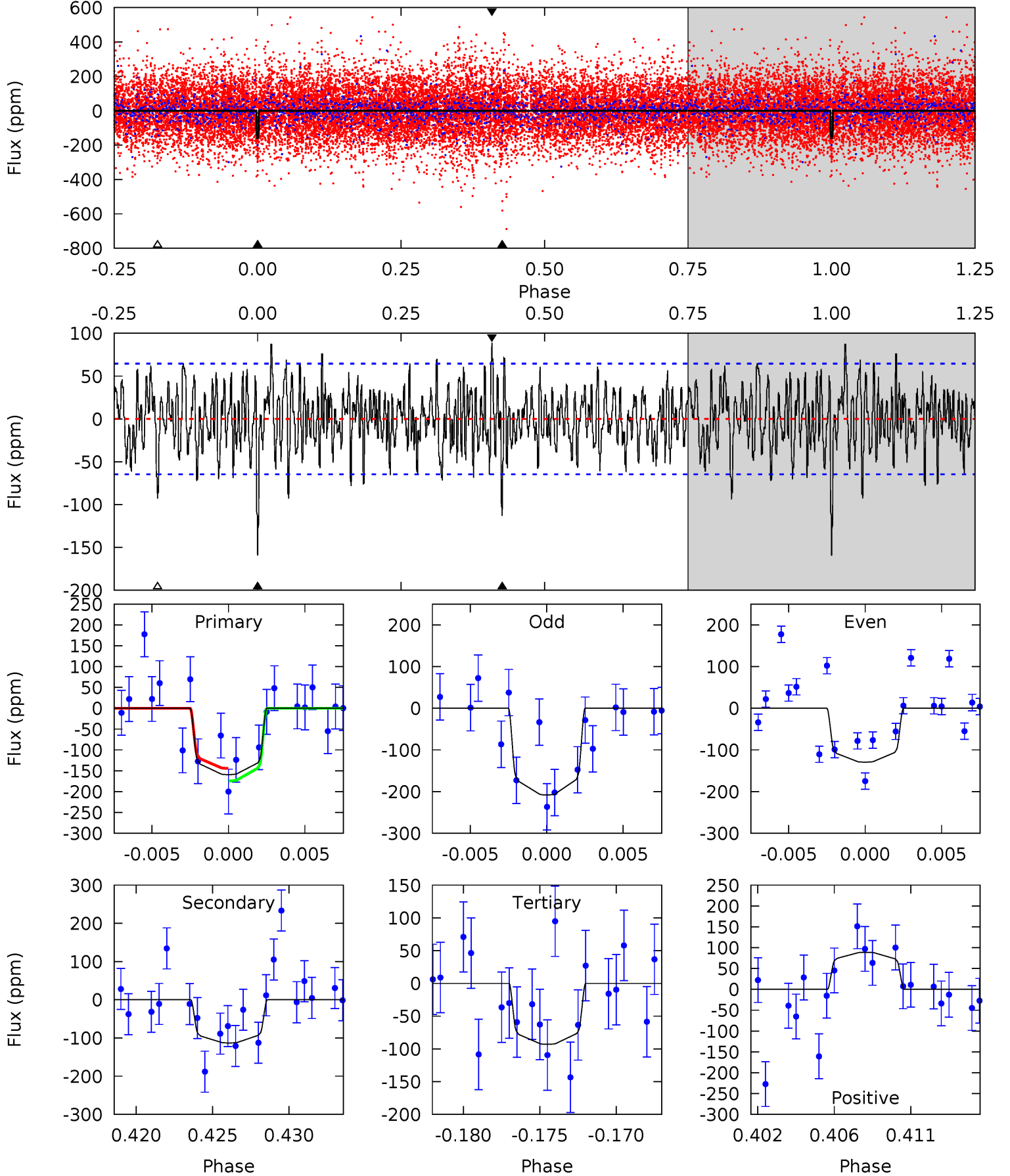
TCE 008521020-03 P=264.367299 Days $T_0=153.788103$ (BKJD)



DV Model-Shift Uniqueness Test

008521020-03, P = 264.364254 Days, E = 153.797971 Days

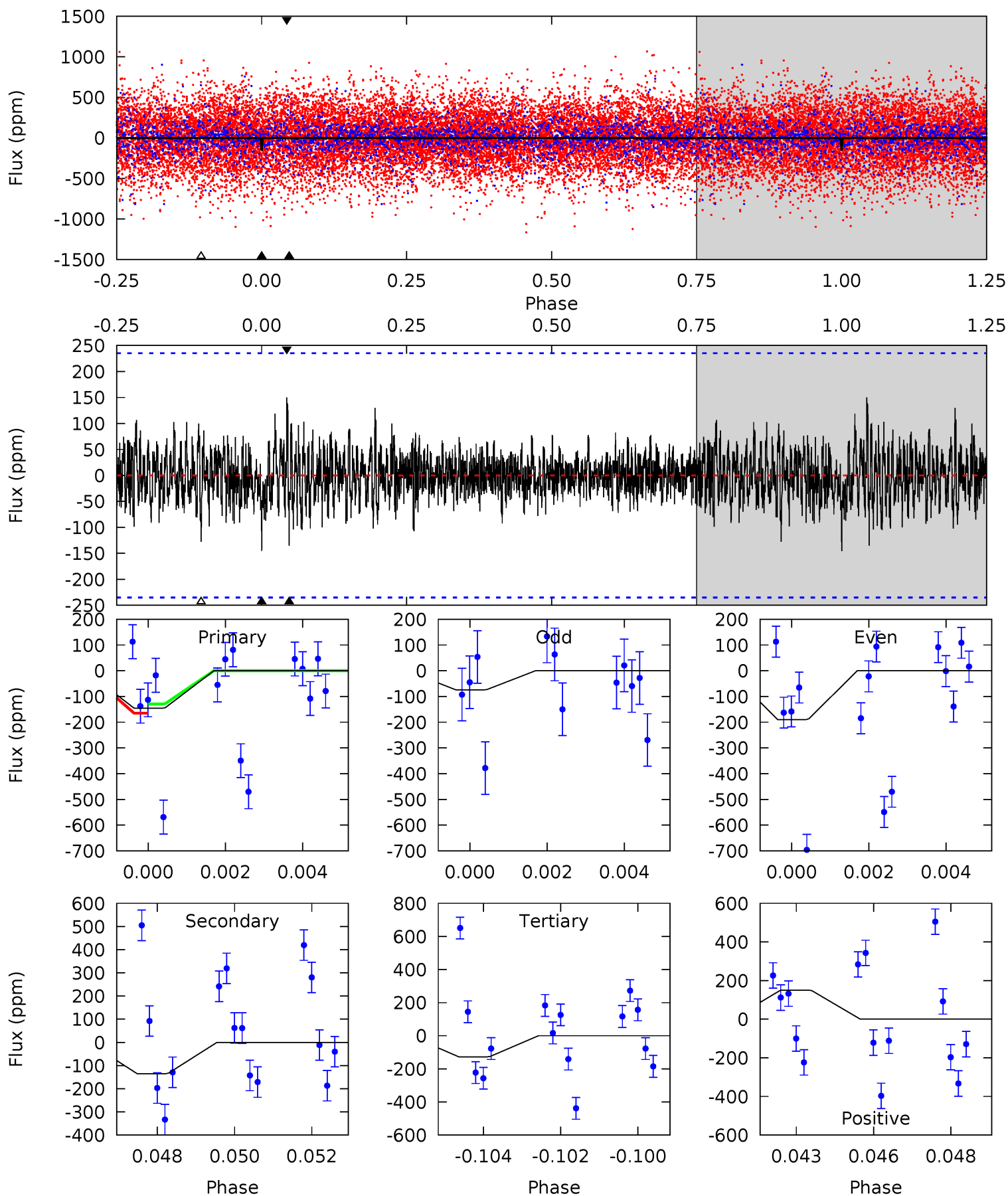
Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
12.8	9.04	7.45	7.11	5.17	2.83	2.37	5.31	5.65	1.60	1.94	3.07	0.97	0.36	1.21



Alt Model-Shift Uniqueness Test

008521020-03, P = 264.367299 Days, E = 153.788103 Days

Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
3.29	3.05	2.88	3.39	5.31	3.07	0.77	0.41	-0.10	0.17	-0.34	1.26	1.26	0.51	0.40



Stellar Parameters For KIC 008521020

	$T_{\text{eff}} (K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M (M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	7523^{+235}_{-314}	$3.654^{+0.467}_{-0.055}$	$-0.180^{+0.250}_{-0.300}$	$3.496^{+0.327}_{-1.742}$	$2.012^{+0.127}_{-0.571}$	$0.066^{+0.325}_{-0.013}$
	+3%/-4%	+13%/-2%	+139%/-167%	+9%/-50%	+6%/-28%	+490%/-19%
Source	KIC0	KIC0	KIC0	DSEP		

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

Secondary Eclipse Parameters for KIC 008521020-03 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	A_{obs}
DV	-113 ± 12	$5.98^{+0.89}_{-1.52}$	827^{+56}_{-98}	5901^{+326}_{-313}	1824^{+1231}_{-447}
Alt.	-135 ± 44	$4.61^{+0.86}_{-1.17}$	830^{+51}_{-110}	6948^{+816}_{-752}	3679^{+2694}_{-1389}

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 $A_{obs} \gg 1.0$

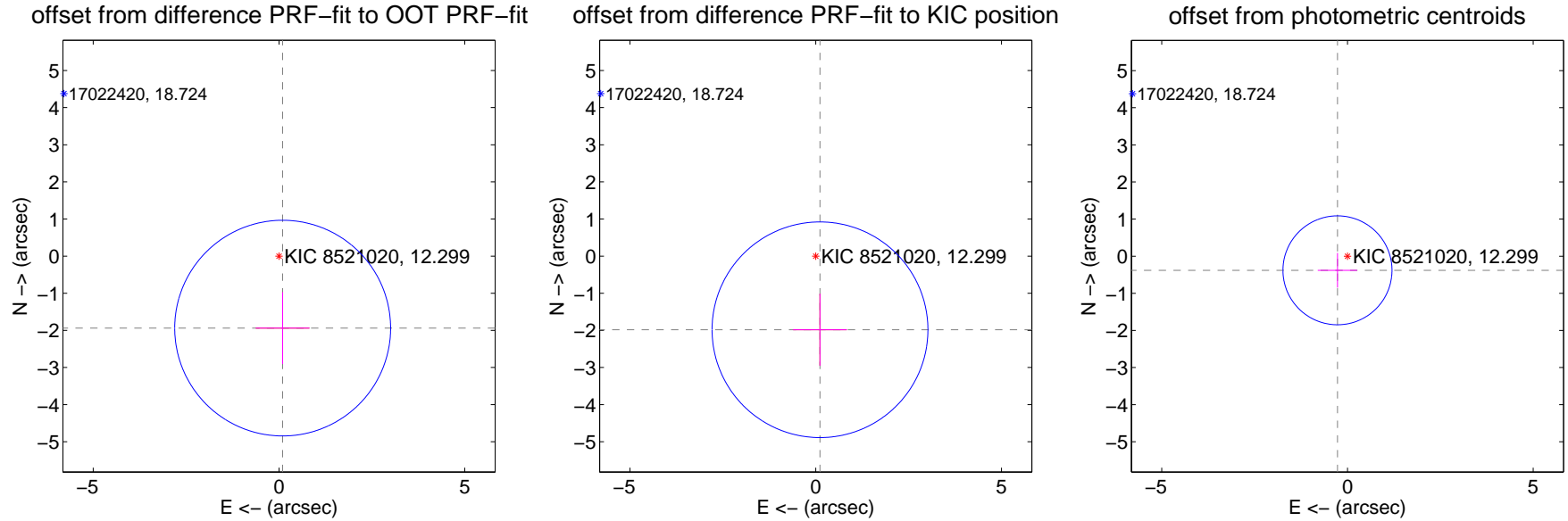
DV Centroid Data

Supplemental centroid analysis for 008521020-03. Kepler magnitude: 12.30. Transit SNR 8.91

There are 0 quarters with good PRF difference image offsets

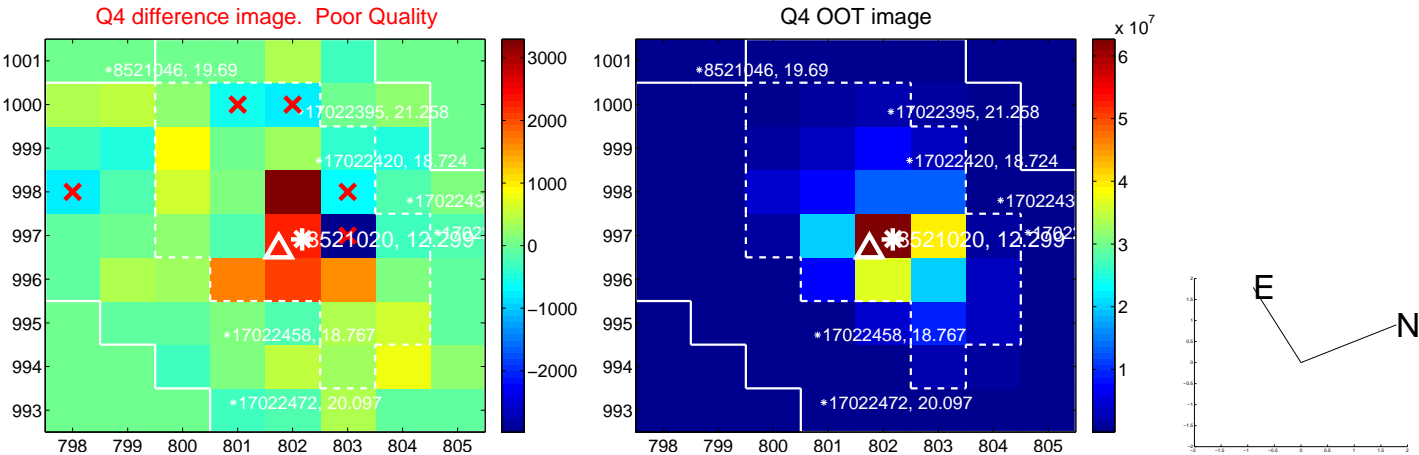
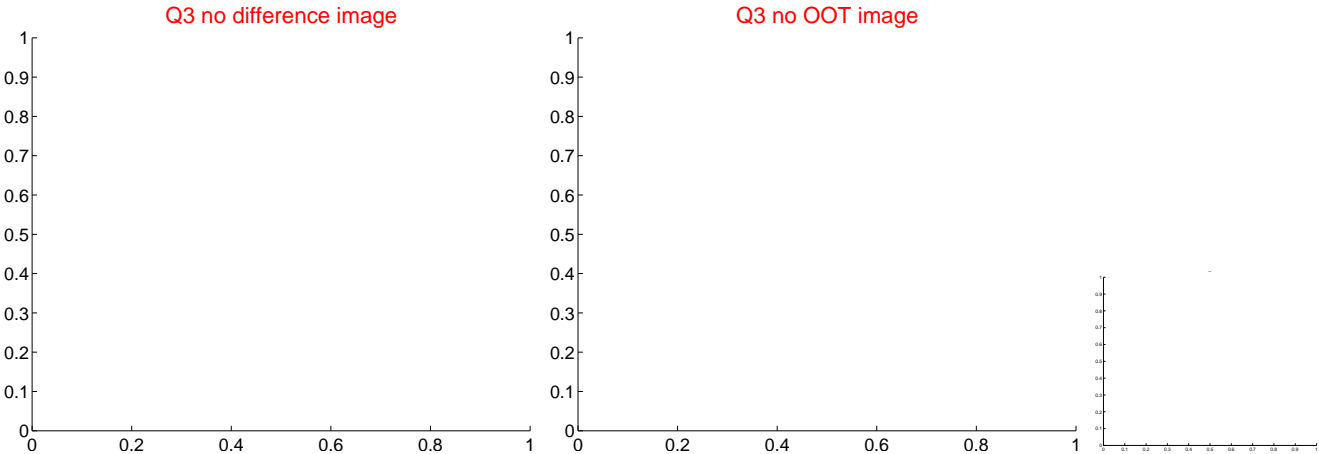
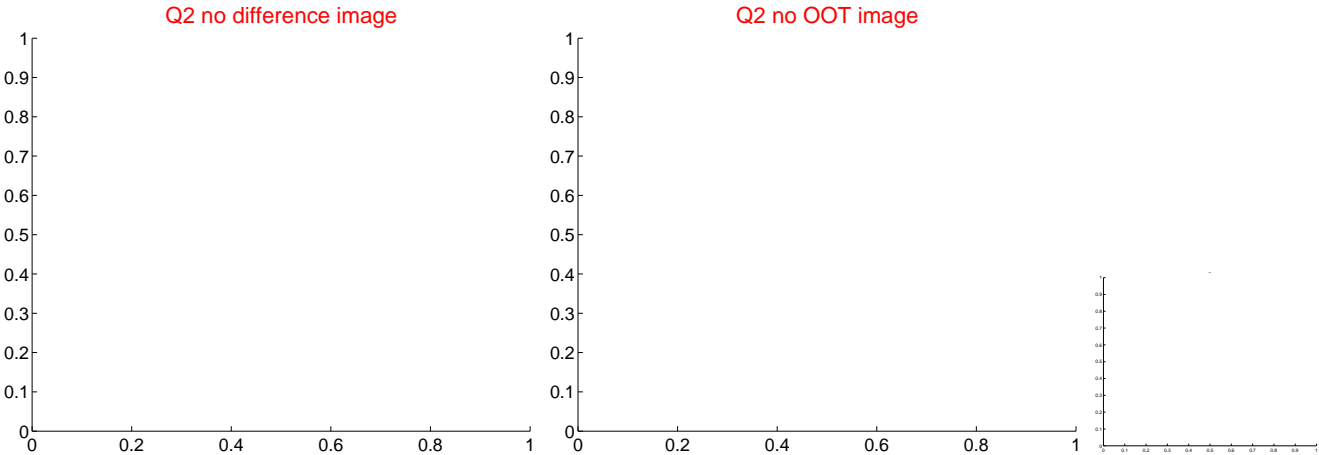
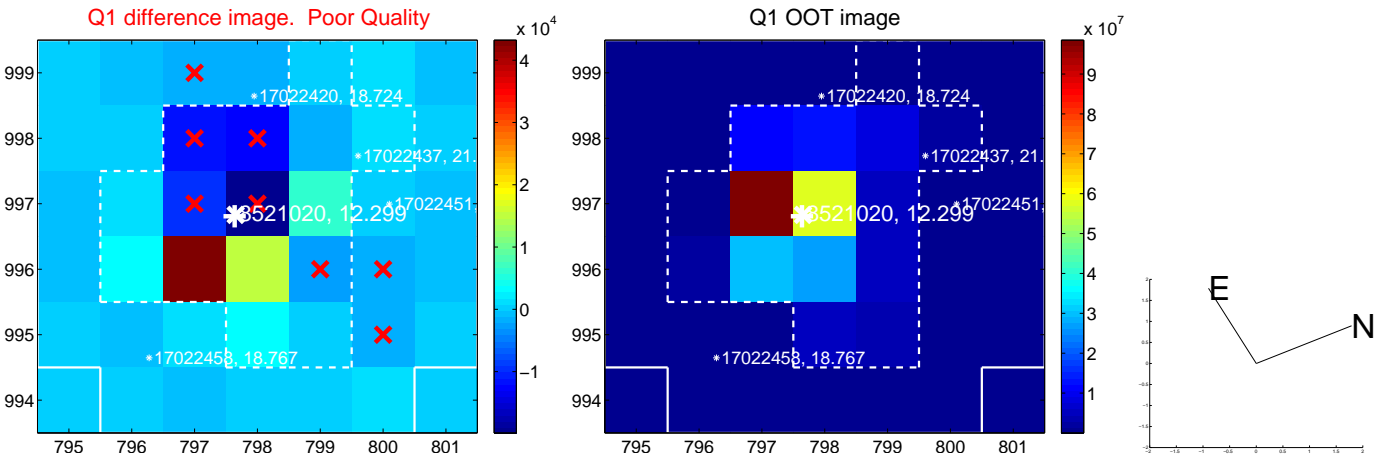
The direct PRF centroid is offset from the target star catalog position by about 0.05 arcsec

	Distance in arcsec	Distance / σ	Δ RA	Δ Dec
PRF-fit source offset from OOT	1.942 ± 0.969	2.00	-0.099 ± 0.724	-1.939 ± 0.969
PRF-fit source offset from KIC position	1.987 ± 0.968	2.05	-0.115 ± 0.724	-1.984 ± 0.969
photometric centroid source offset	0.47 ± 0.49	0.95	0.27 ± 0.53	-0.38 ± 0.47

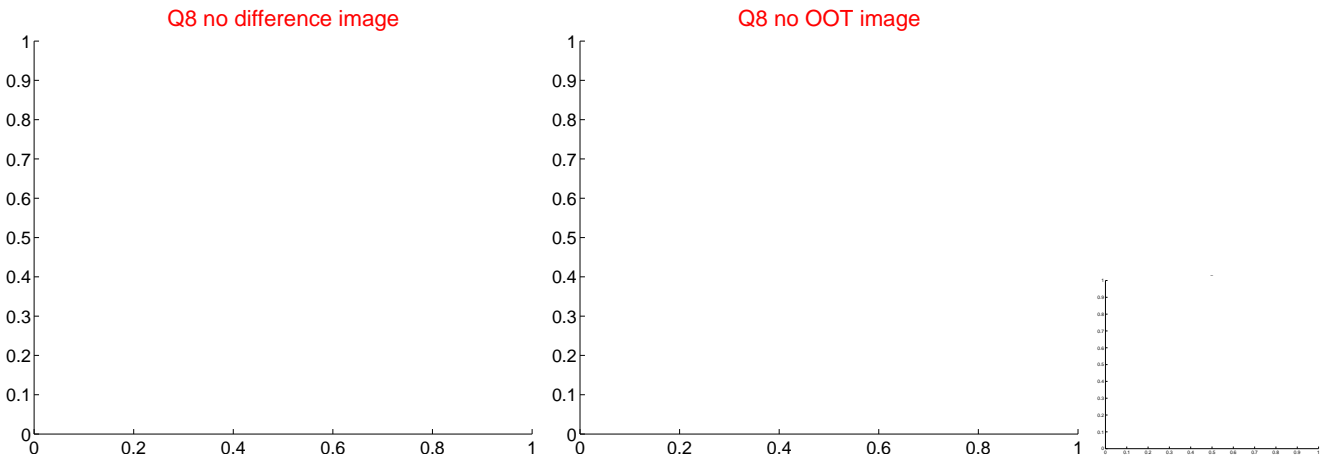
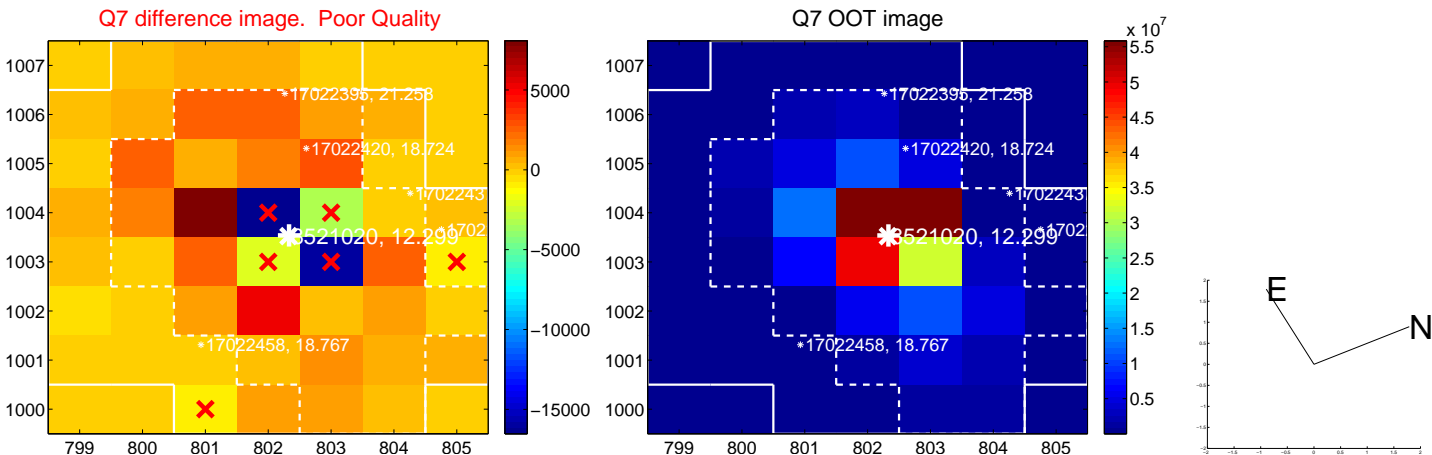
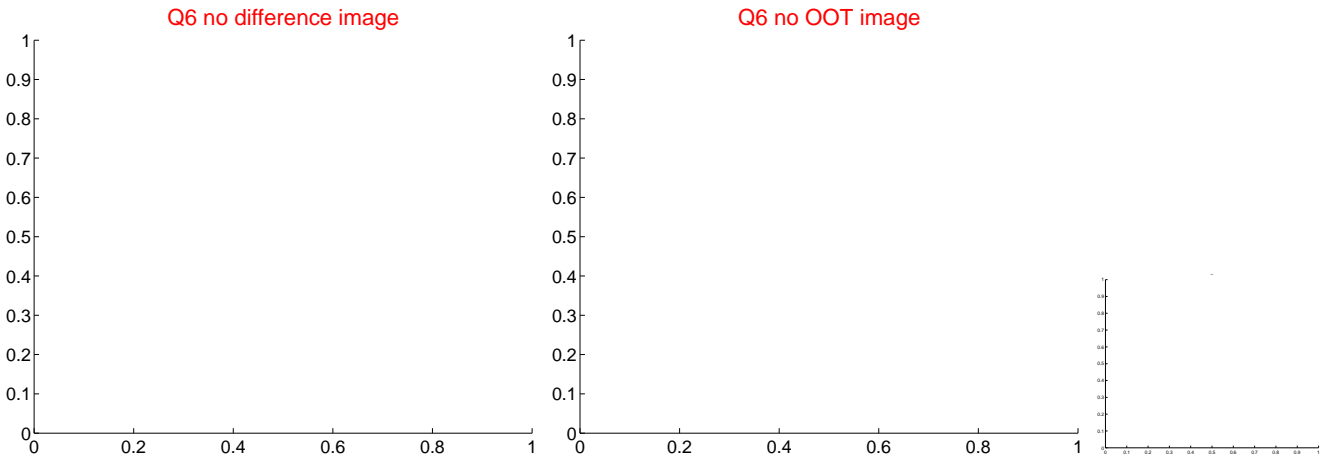
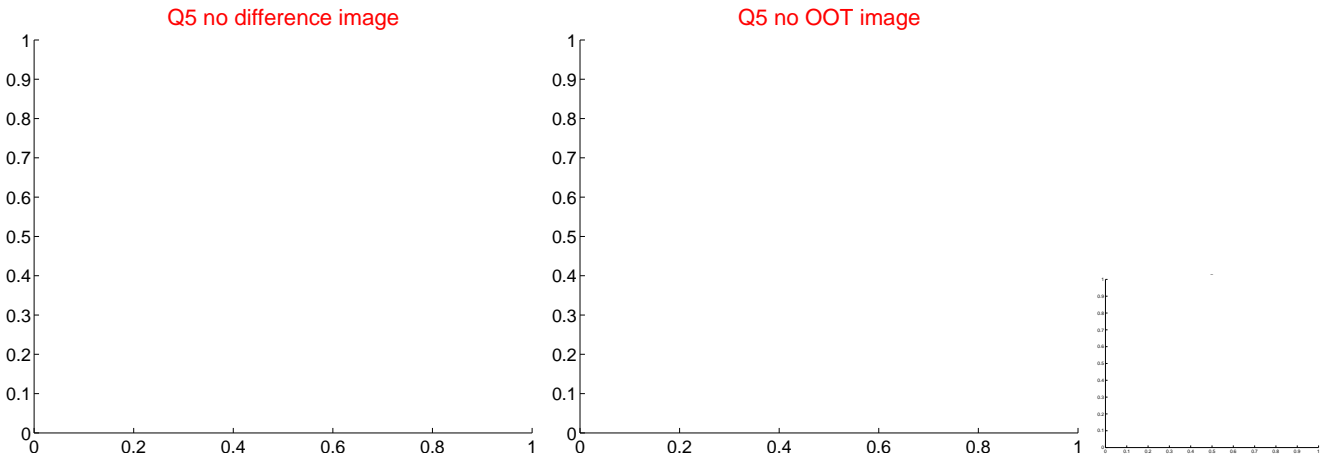


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three- σ . 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.

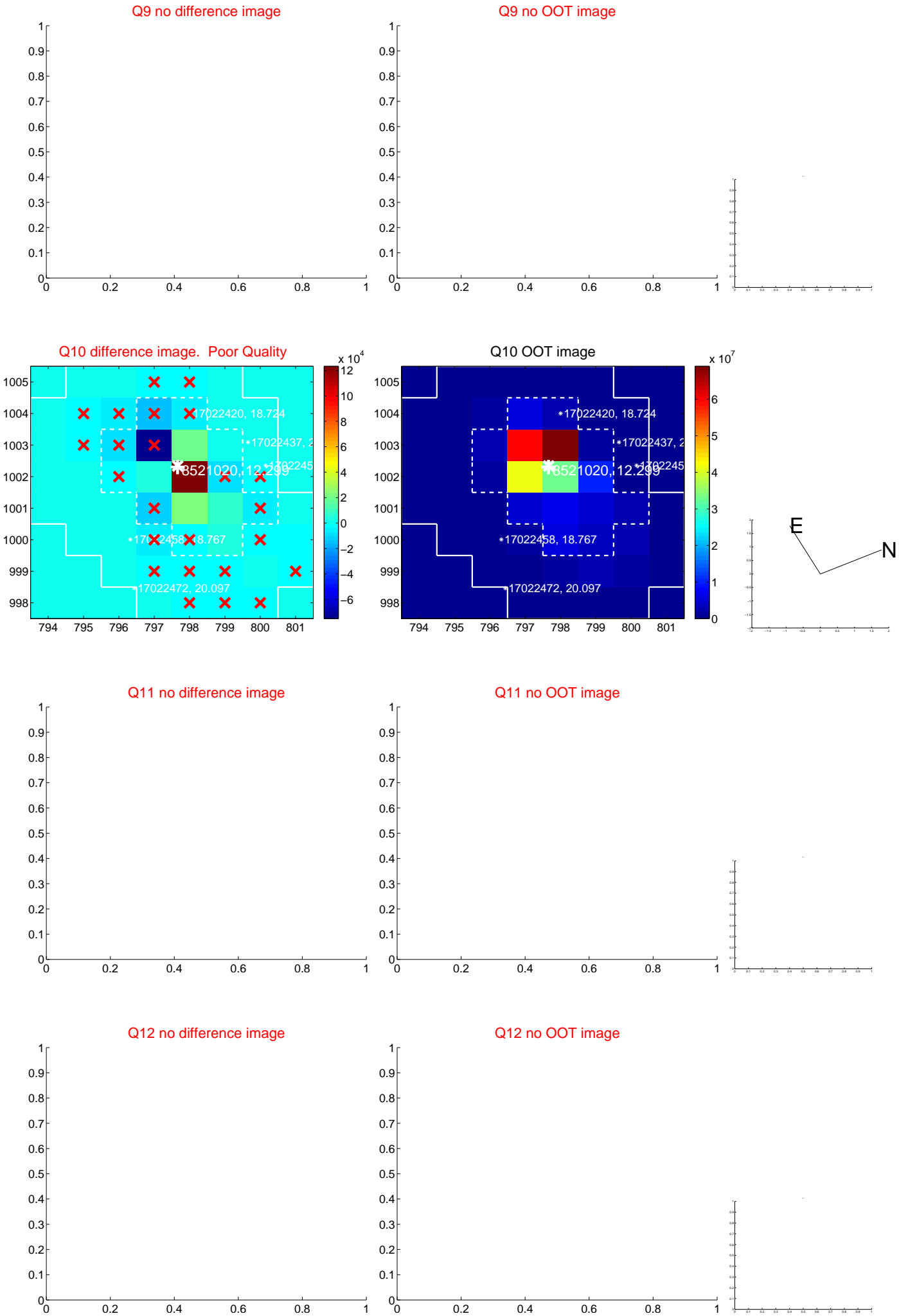
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



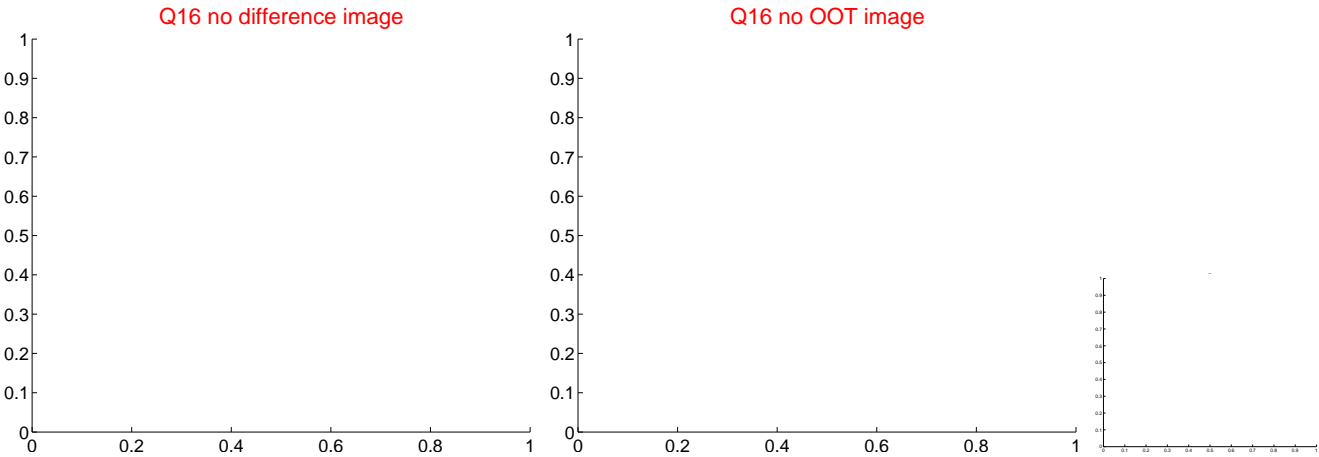
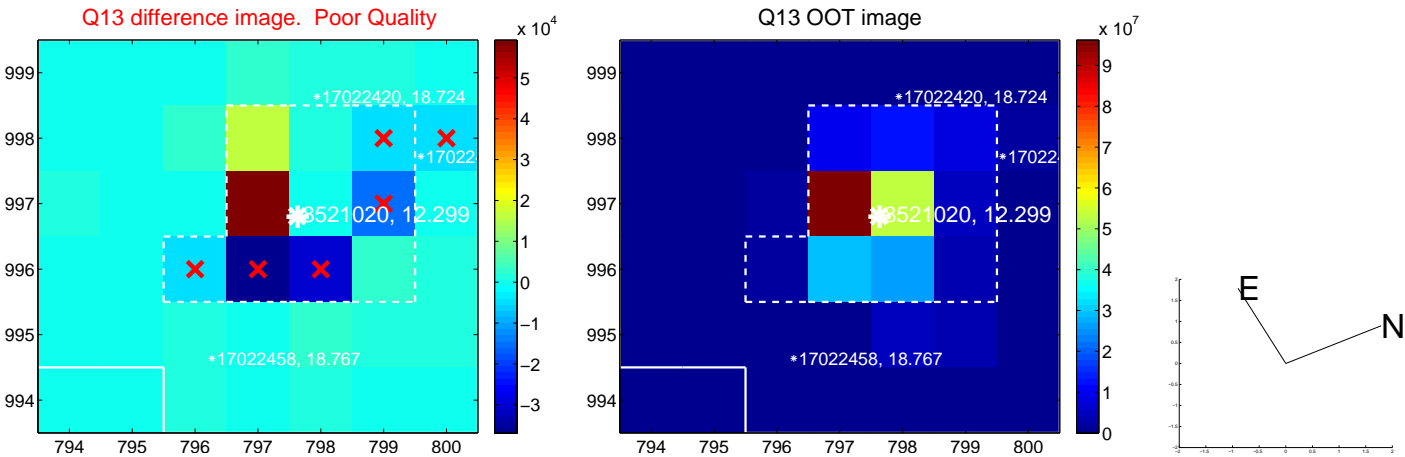
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value



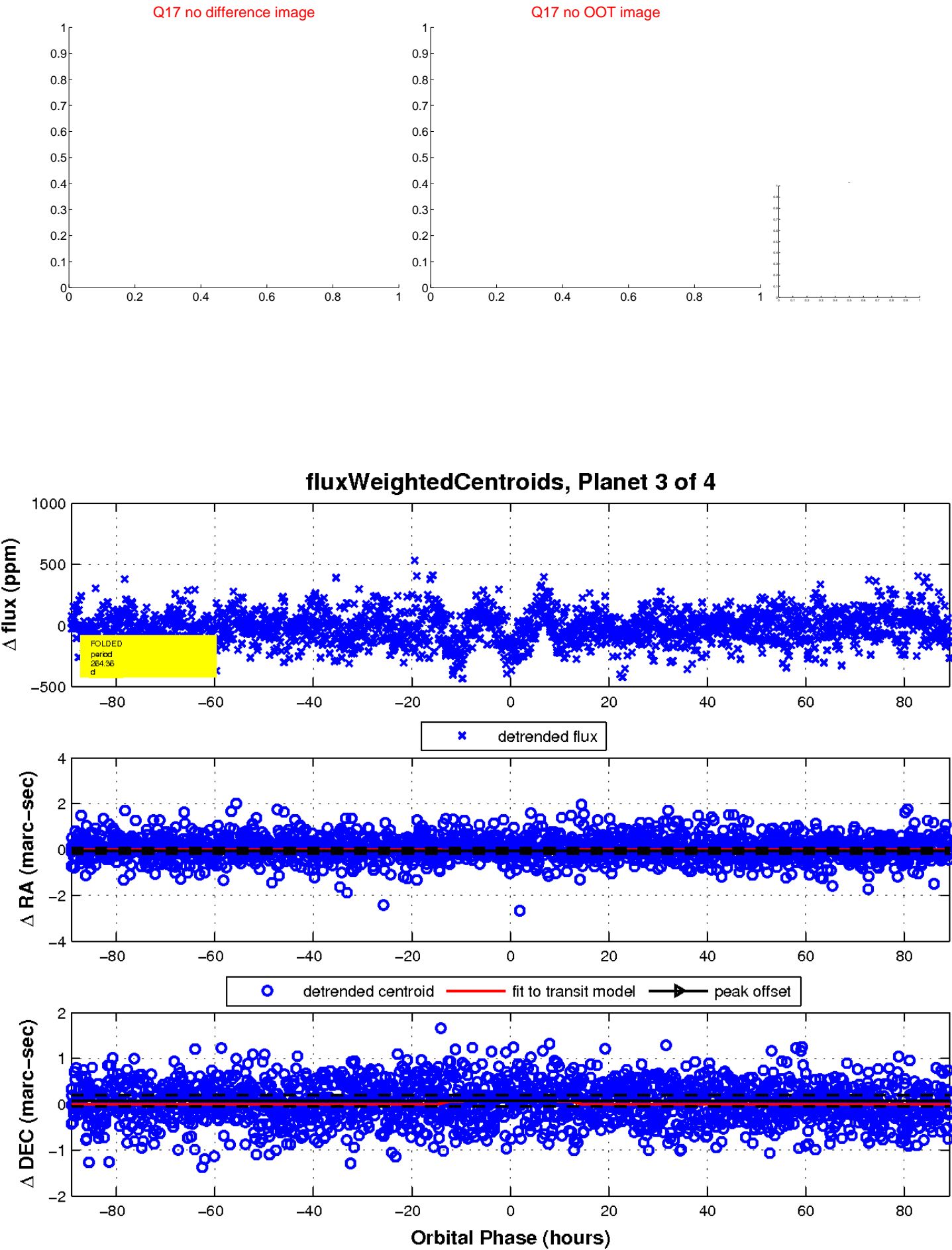
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



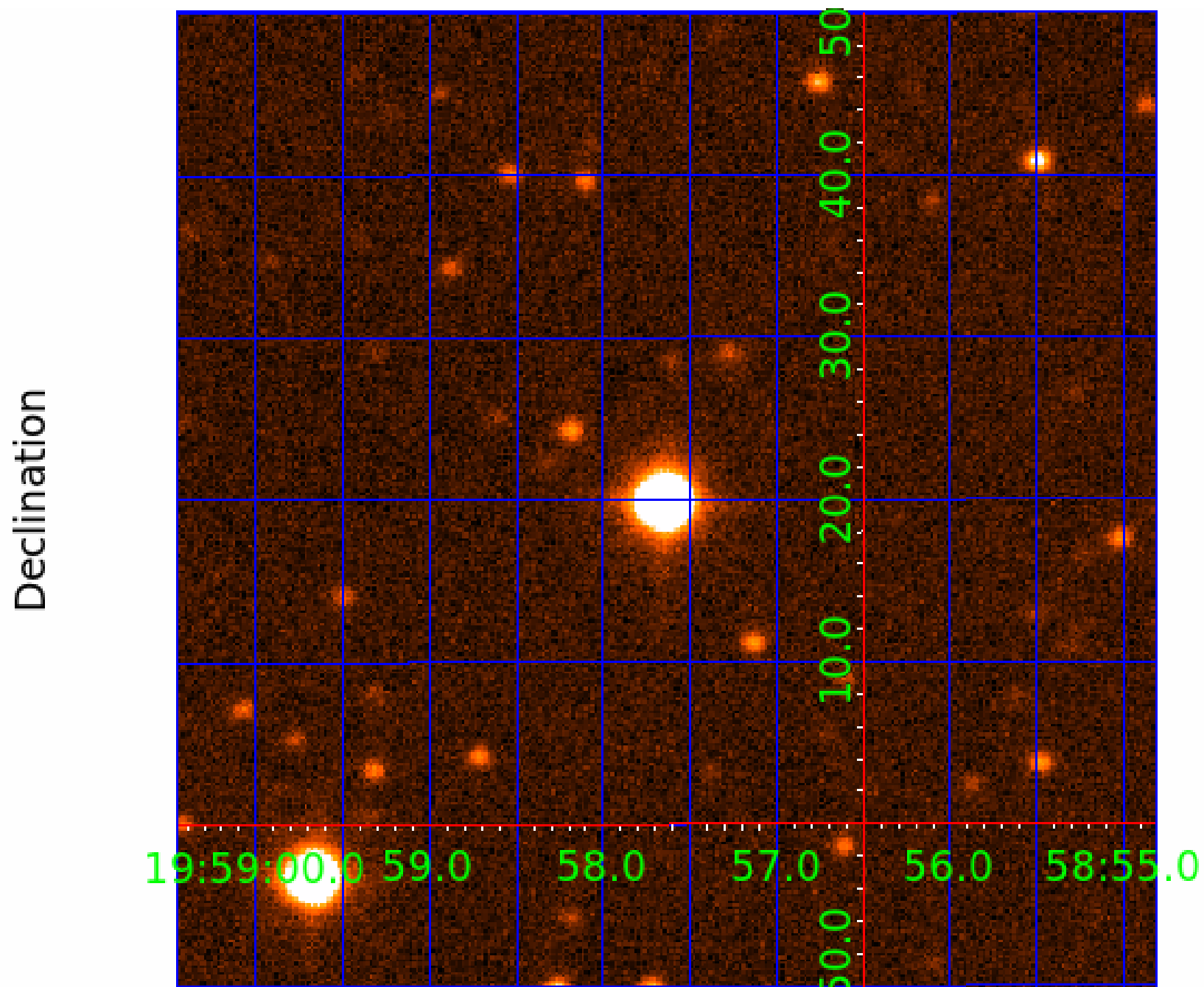
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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



UKIRT Image



KIC 008521020

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})
008521020-01	OBS	No	0.599521	131.869201	0.5	3.212	7.7	0.3	3.50	7523	0.25	113701.59
008521020-02	OBS	No	27.155110	136.332219	75.8	4.036	8.5	6.5	3.50	7523	3.46	704.21
008521020-03	OBS	No	264.364254	153.797971	244.1	29.750	7.4	8.9	3.50	7523	6.40	33.88
008521020-04	OBS	No	84.635198	160.014583	171.4	2.280	7.1	6.9	3.50	7523	5.30	154.68

Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
008521020-01	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_SKYE_ZUMA_TRACKER—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—CENT_FEW_DIFFS
008521020-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_ZUMA—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
008521020-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_FEW_DIFFS
008521020-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT

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

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

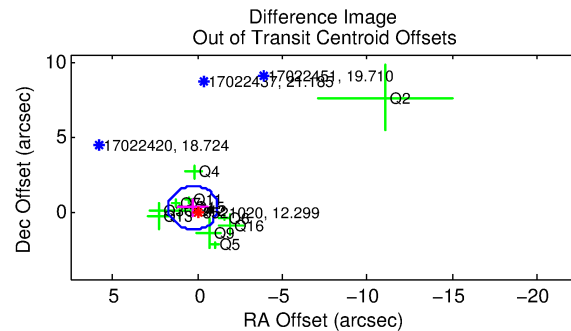
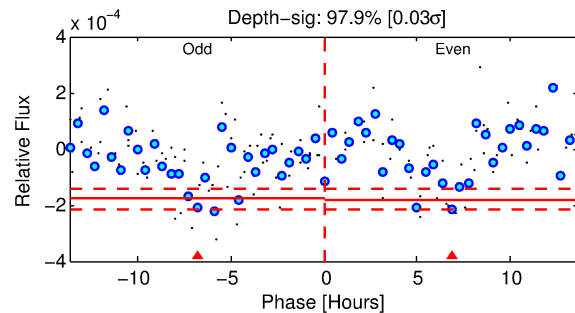
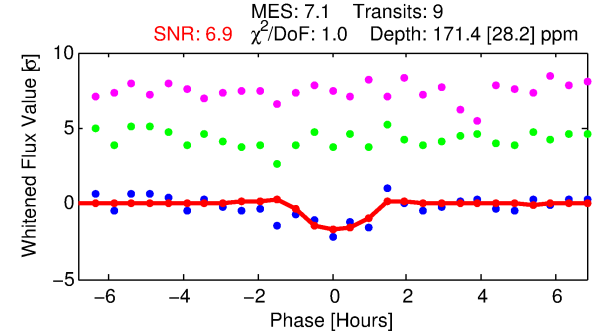
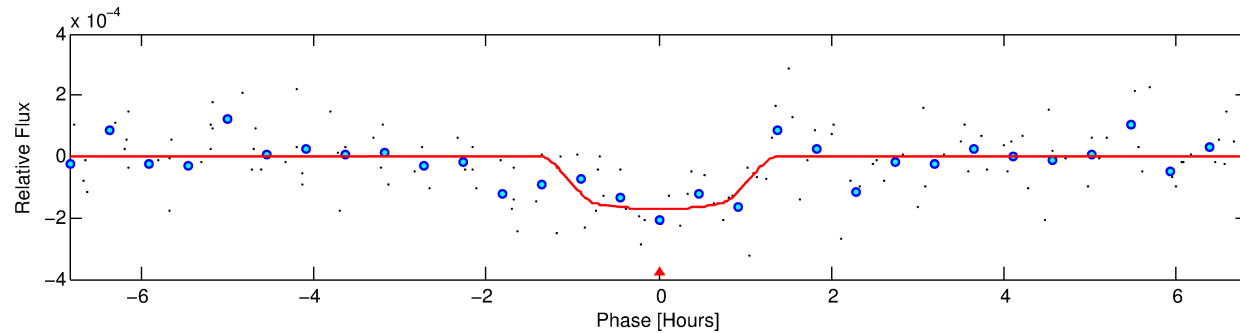
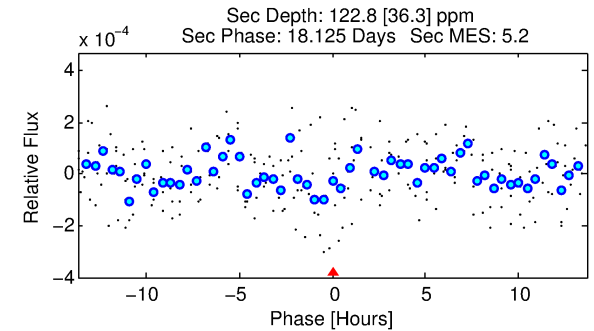
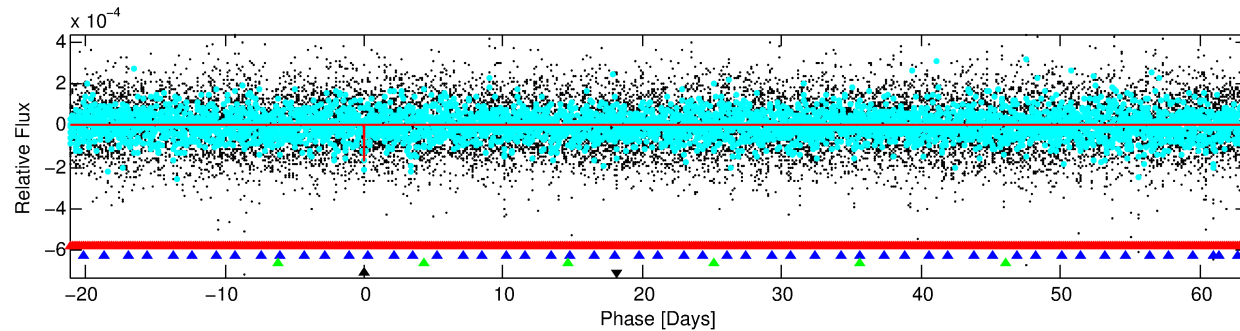
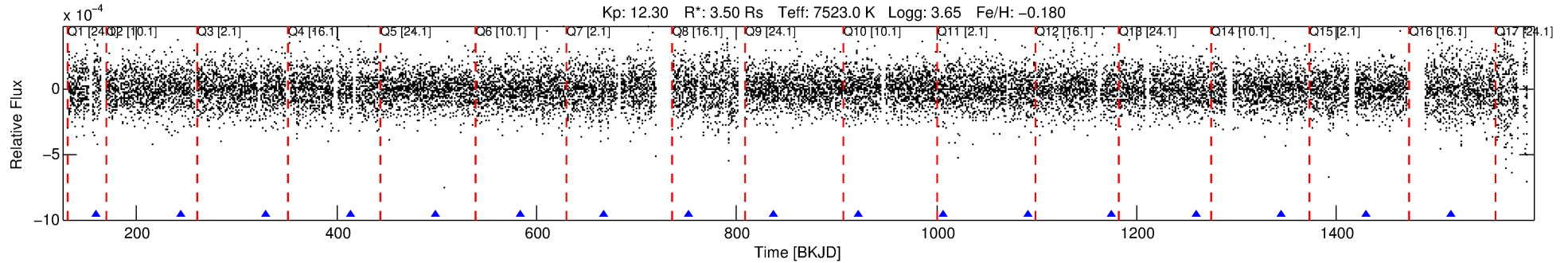
See http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col for comment definitions.

Ephemeris Match Information For 008521020-04

No Significant Match Found

DV One-Page Summary

KIC: 8521020 Candidate: 4 of 4 Period: 84.635 d



DV Fit Results:

Period = 84.63520 [0.00082] d
Epoch = 160.0146 [0.0083] BKJD
Rp/R* = 0.0139 [0.0109]
a/R* = 141.50 [623.39]
b = 0.88 [1.12]
Seff = 154.68 [124.91]
Teq = 899 [182] K
Rp = 5.30 [4.92] Re
a = 0.4762 [0.2327] AU
Ag = 545.48 [969.66] [0.56σ]
Teffp = 6719 [2690] K [2.16σ]

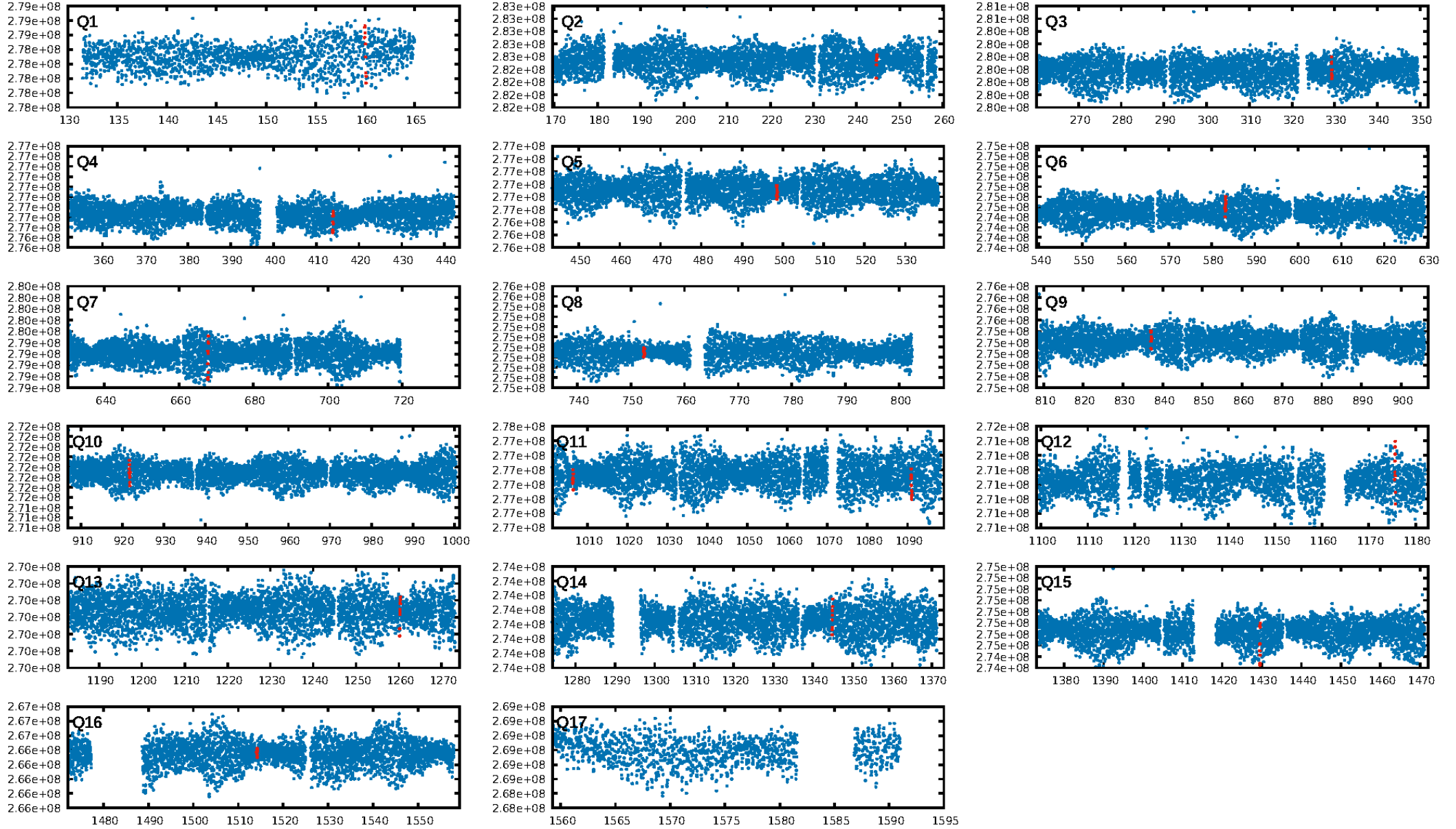
DV Diagnostic Results:

ShortPeriod-sig: 100.0% [297.58σ]
LongPeriod-sig: 100.0% [144.56σ]
ModelChiSquare2-sig: 77.9%
ModelChiSquareGof-sig: 100.0%
Bootstrap-pfa: 1.13e-08
RollingBand-fgt: 1.00 [9/9]
GhostDiagnostic-chr: -7.45
Centroid-sig: 2.3%
Centroid-so: 1.983 arcsec [1.67σ]
OotOffset-rm: 0.361 arcsec [0.74σ]
KicOffset-rm: 0.411 arcsec [0.89σ]
OotOffset-st: 3/4/3/3 [13]
KicOffset-st: 3/4/3/3 [13]
DiffImageQuality-fgm: 0.46 [6/13]
DiffImageOverlap-fno: 0.00 [0/16]

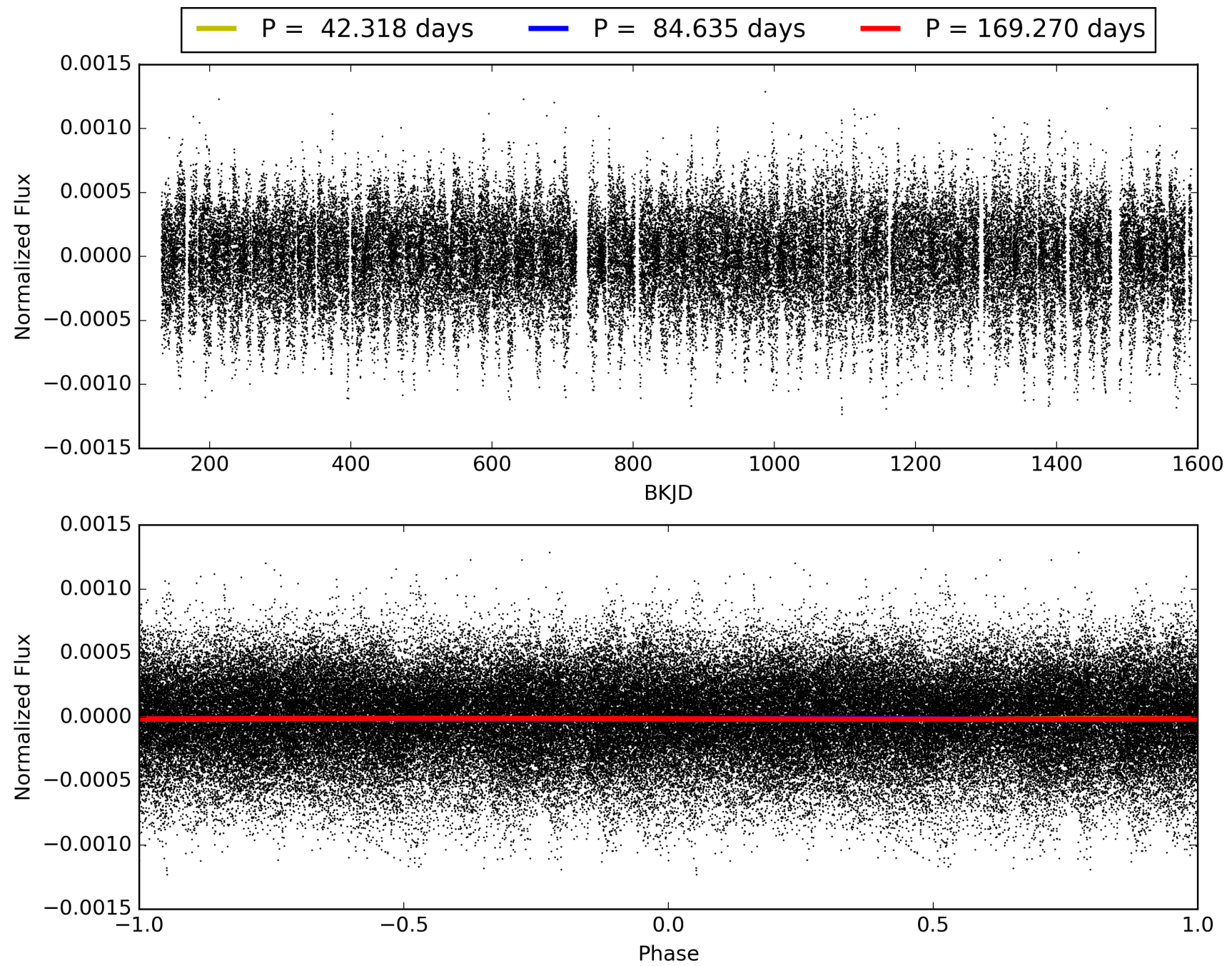
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 03:43:20 Z

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

TCE 008521020-04, PDC Light Curves

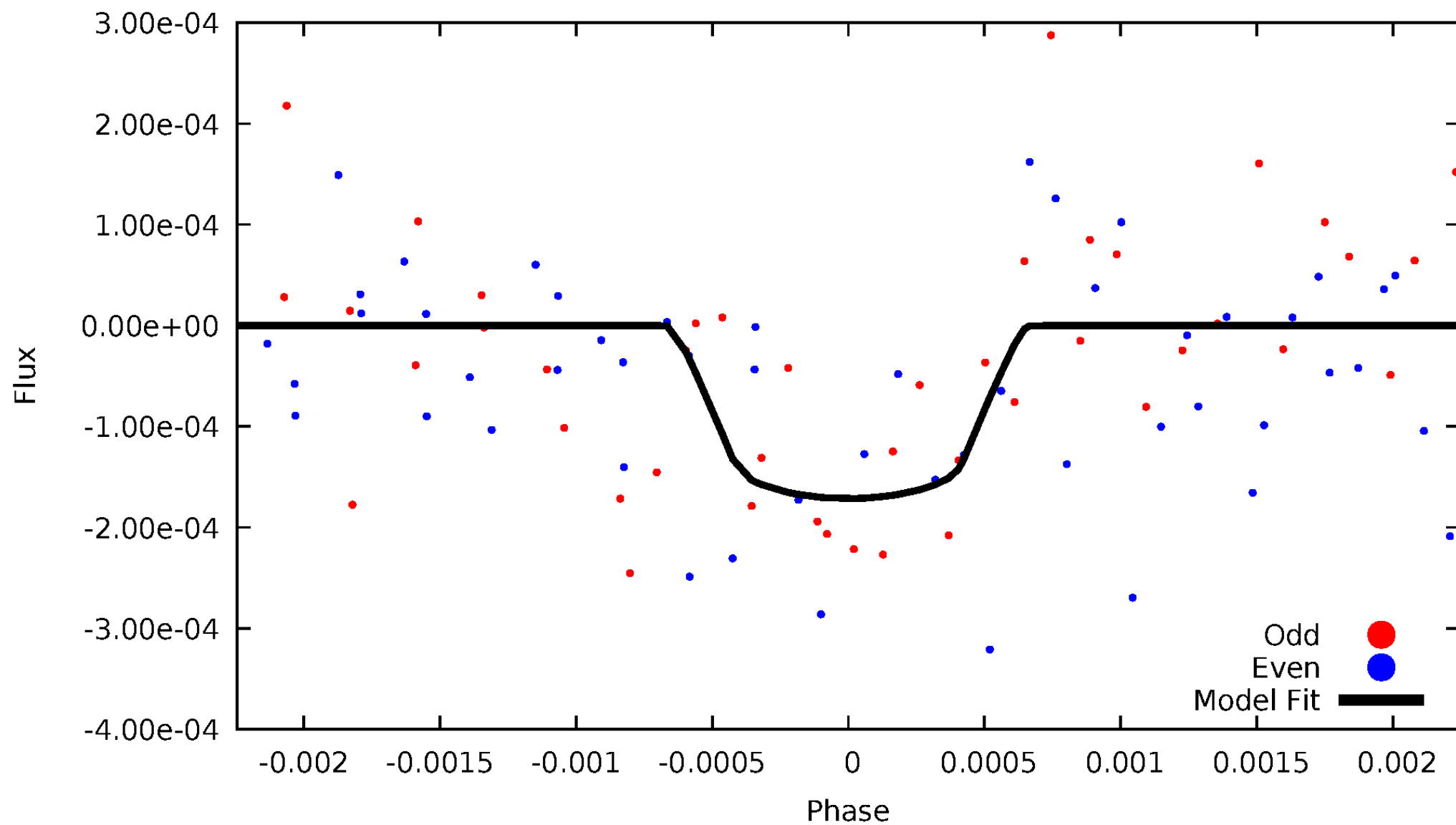


TCE 008521020-04



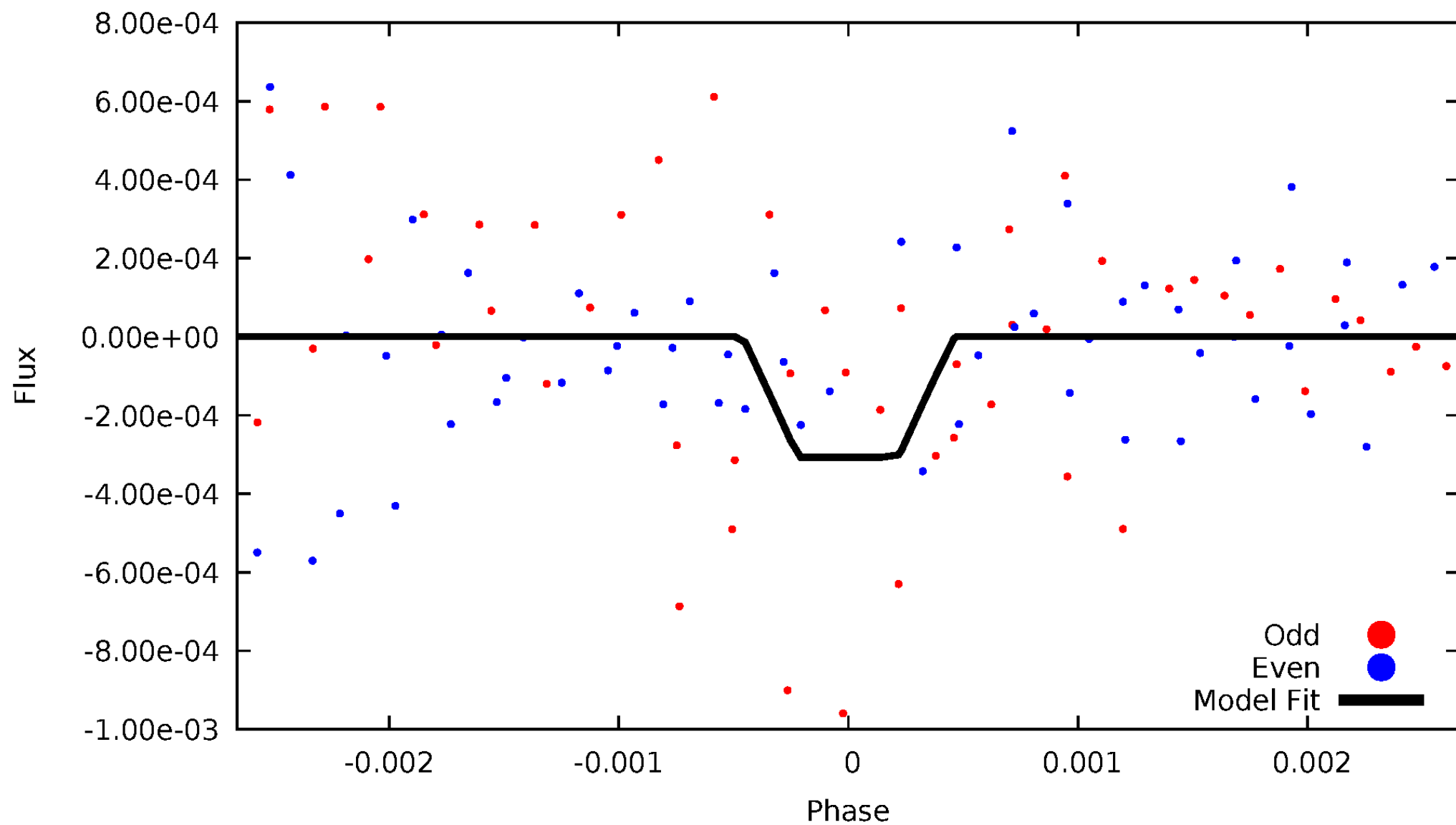
DV Odd/Even

TCE 008521020-04



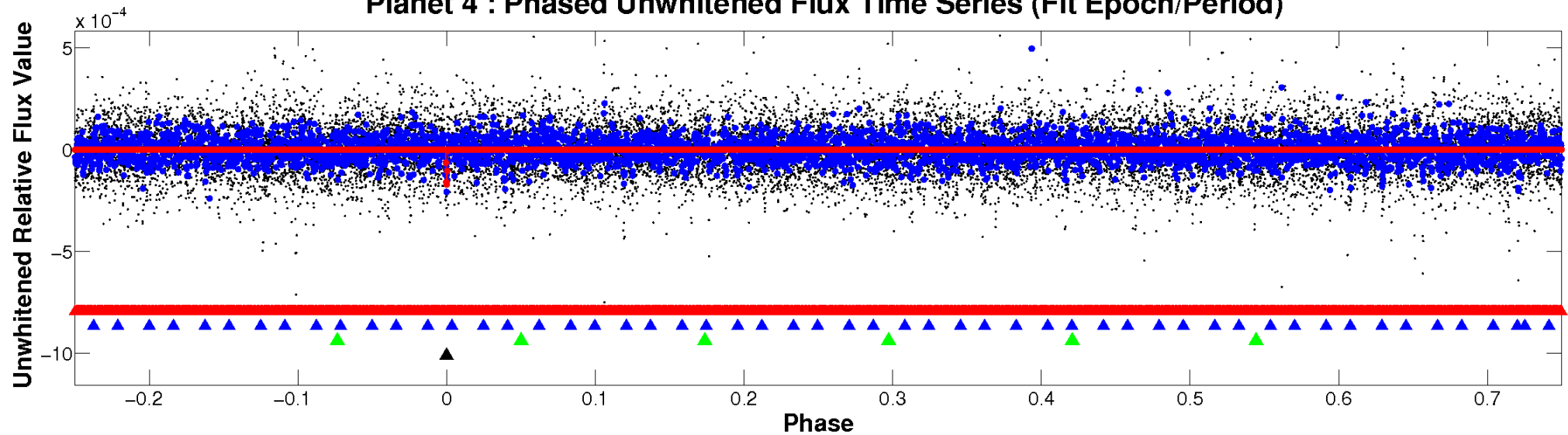
ALT Odd/Even

TCE 008521020-04

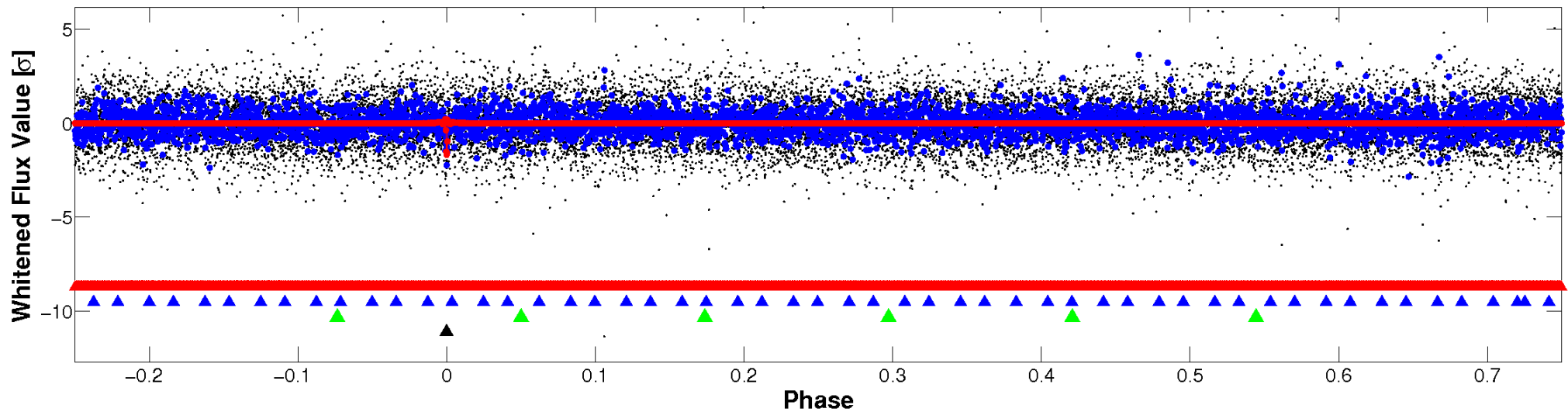


Non-Whitened Vs. Whitened Light Curve

Planet 4 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)

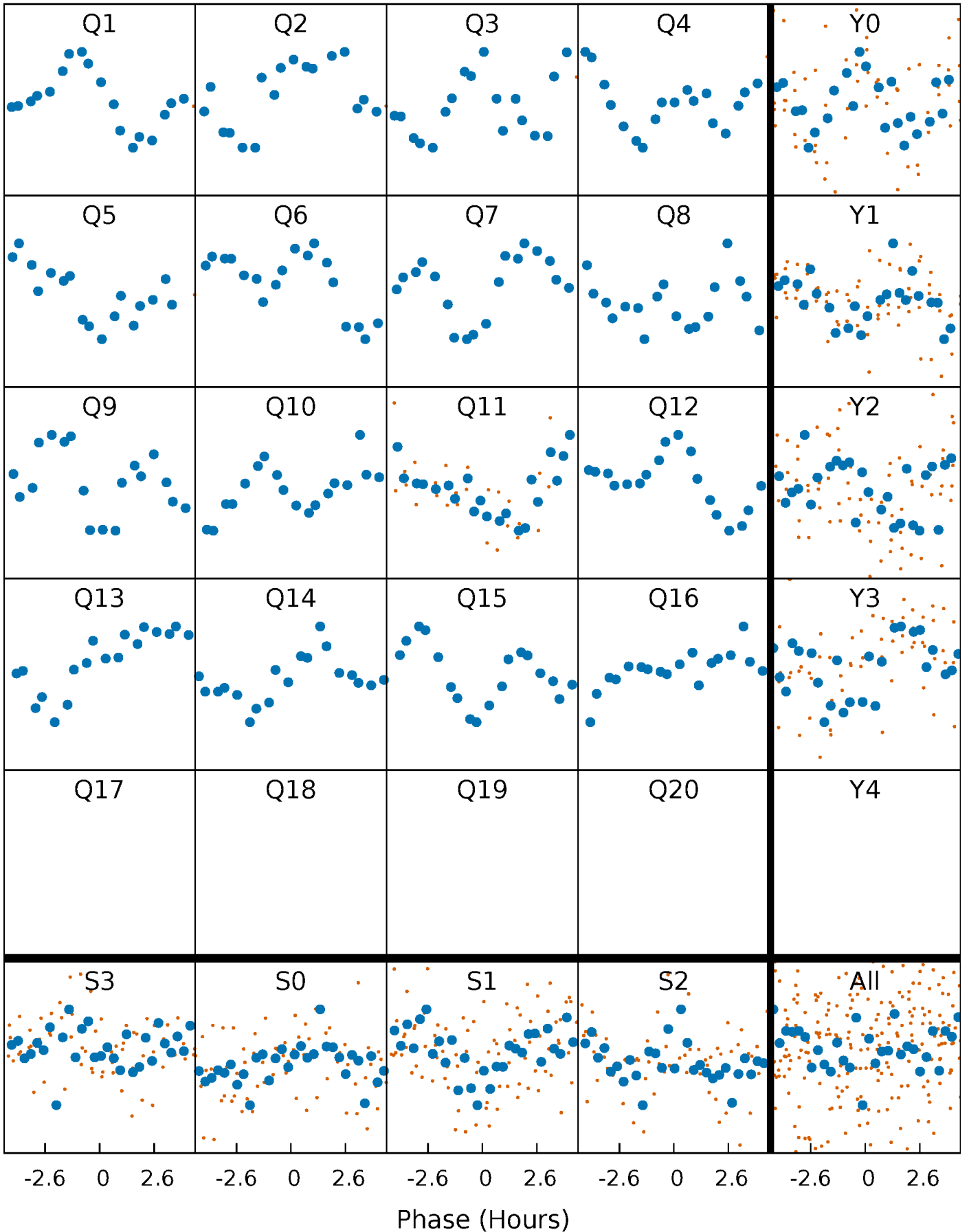


Planet 4 : Phased Whitened Flux Time Series (Fit Epoch/Period)



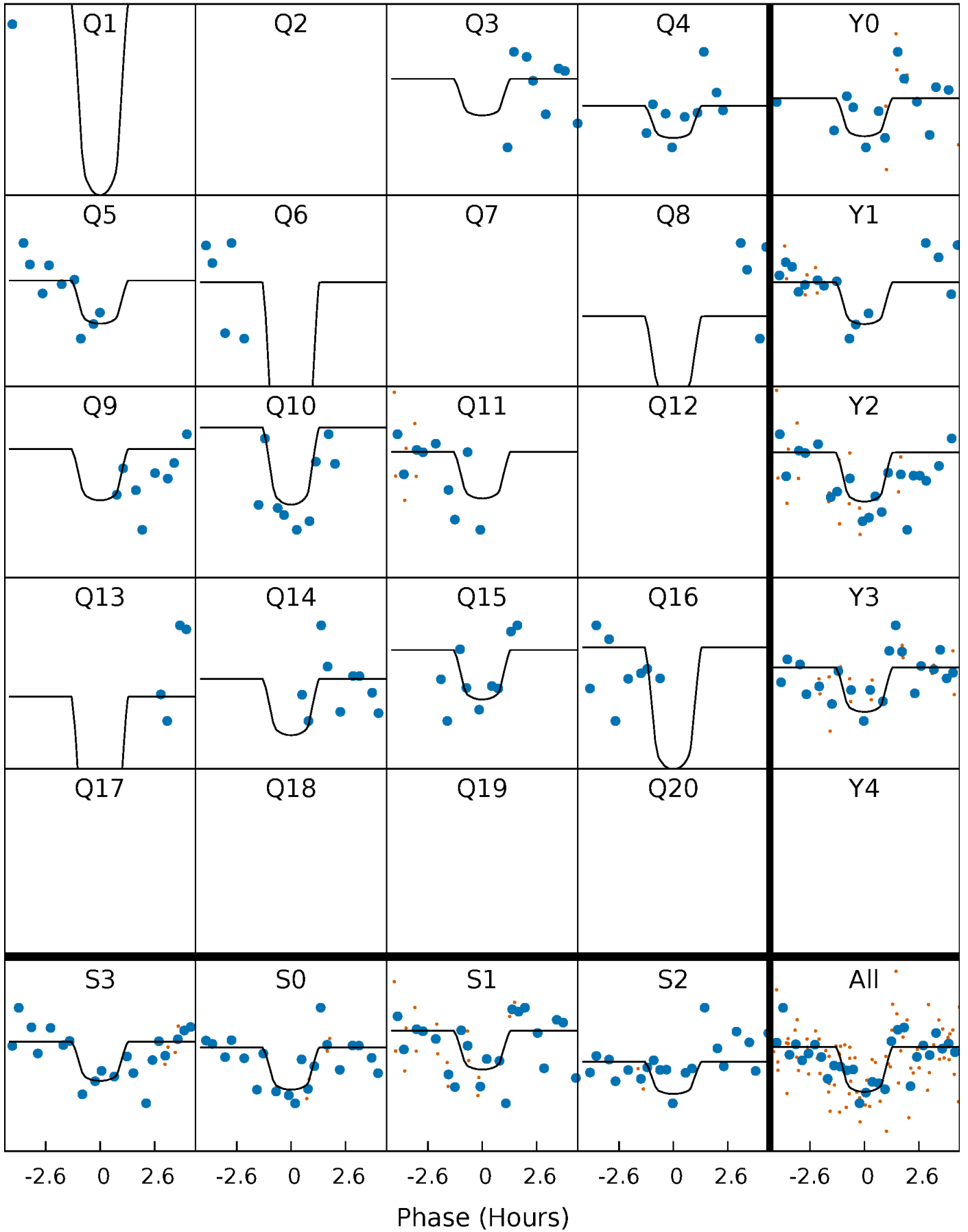
PDC Quarter-Phased Transit Curves

TCE 008521020-04 P= 84.635198 Days $T_0=160.014583$ (BKJD)



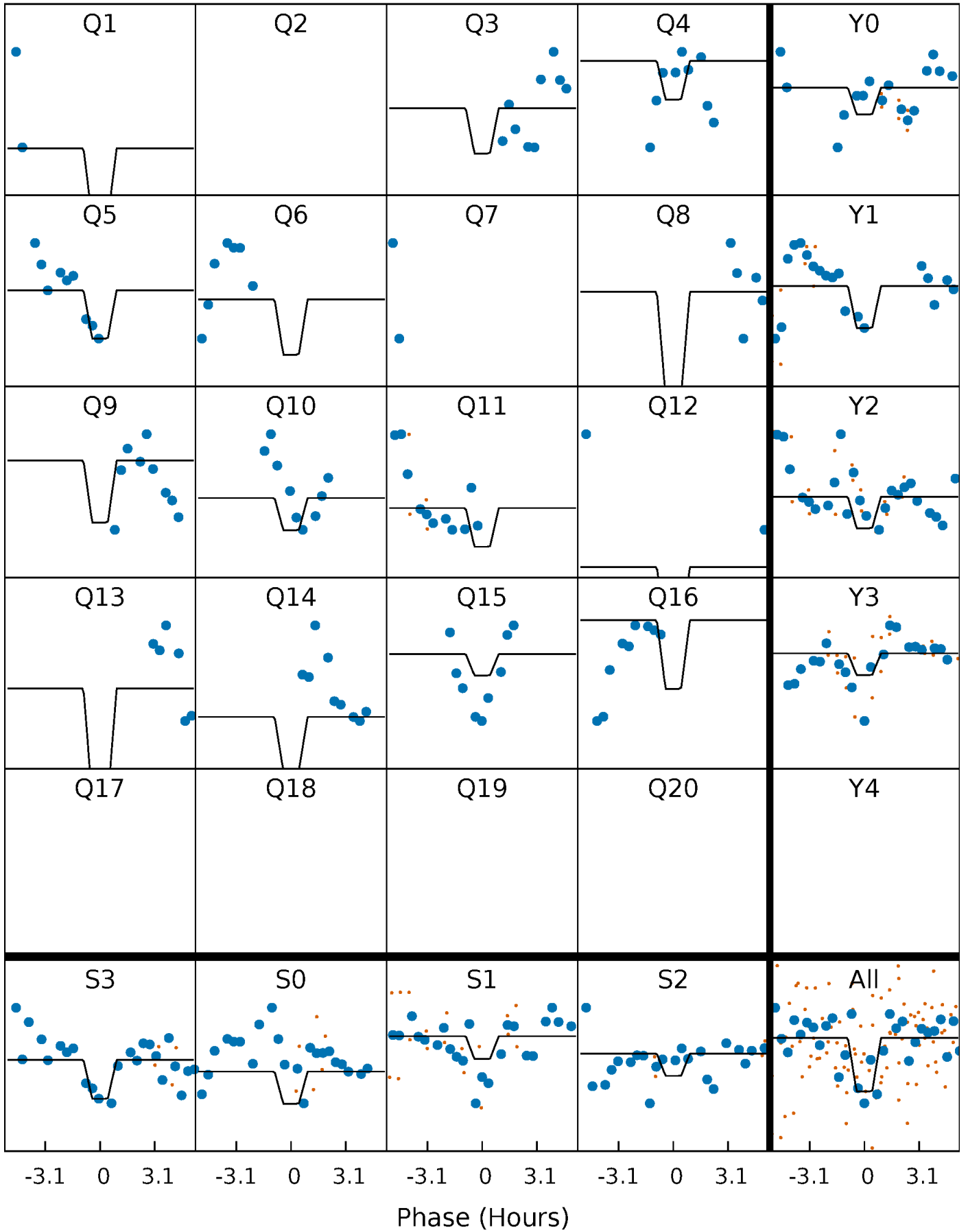
DV Quarter-Phased Transit Curves

TCE 008521020-04 $P = 84.635198$ Days $T_0 = 160.014583$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

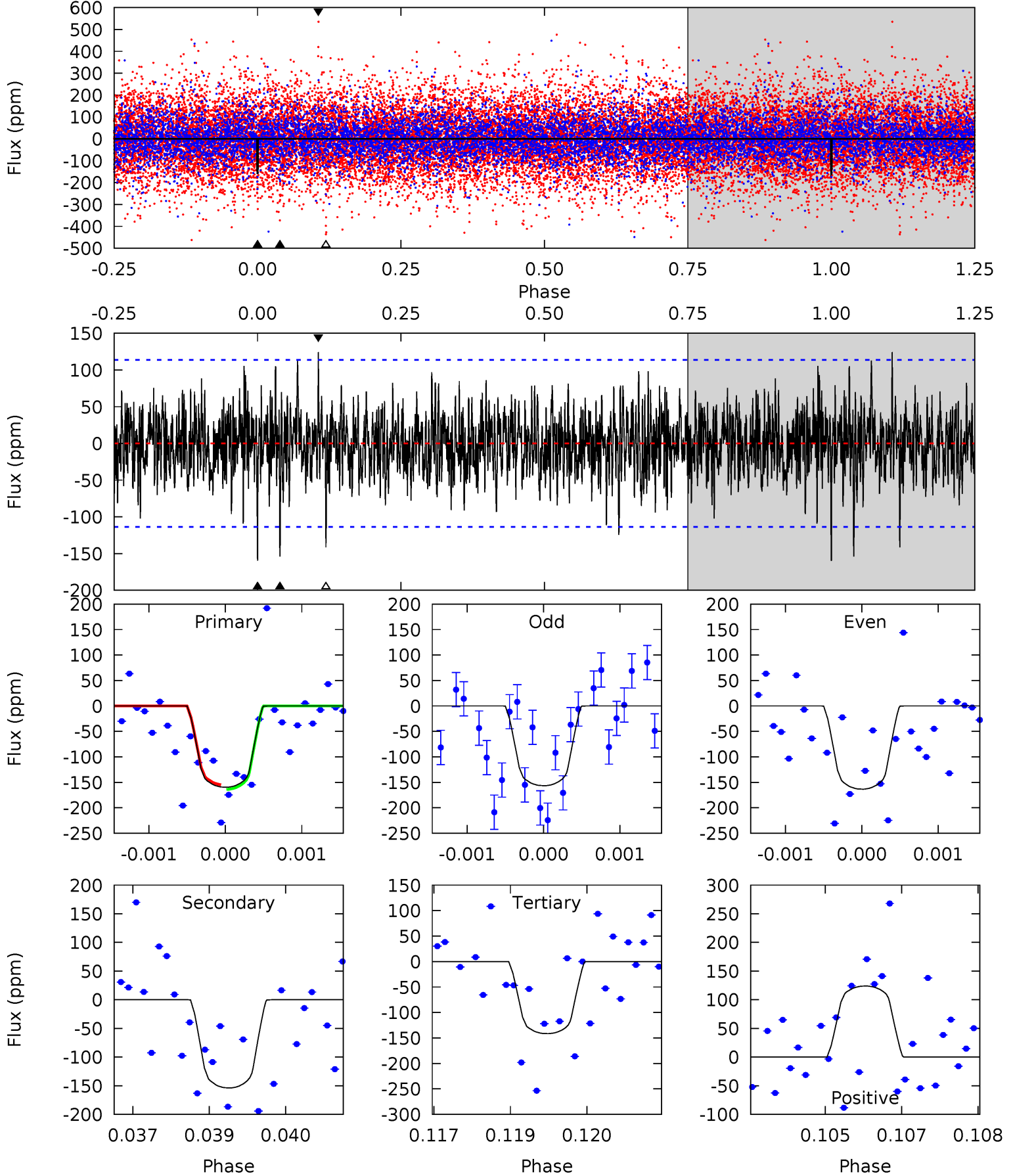
TCE 008521020-04 P= 84.634590 Days $T_0=160.019058$ (BKJD)



DV Model-Shift Uniqueness Test

008521020-04, P = 84.635198 Days, E = 75.379385 Days

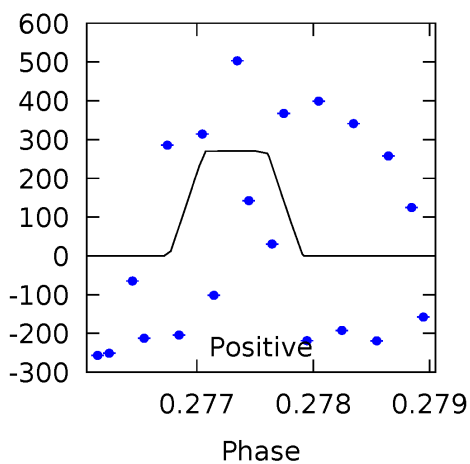
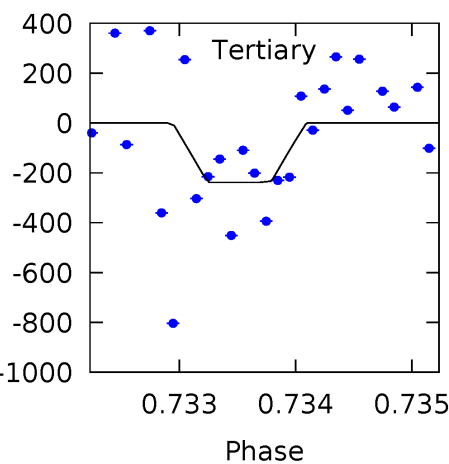
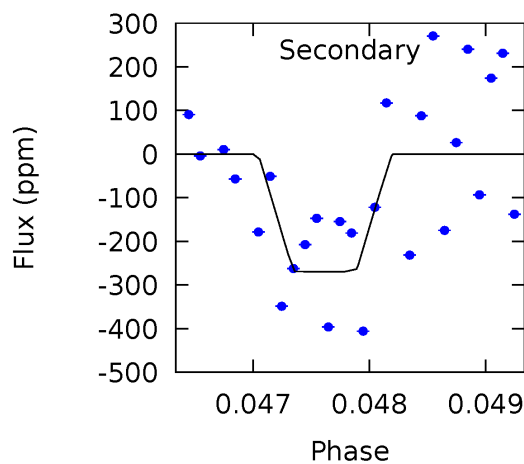
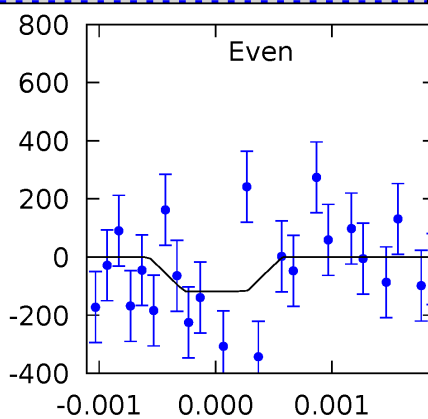
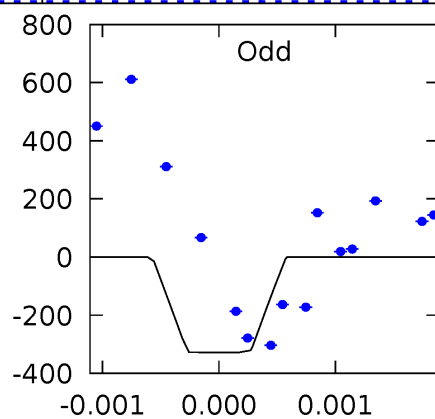
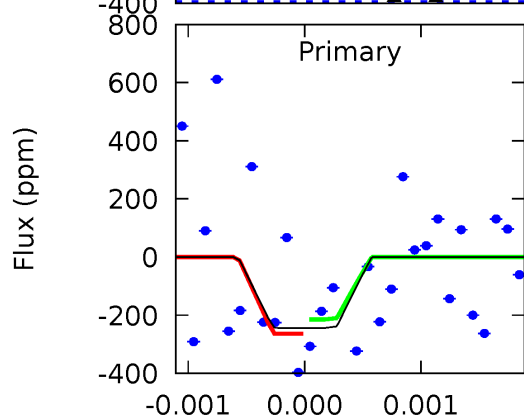
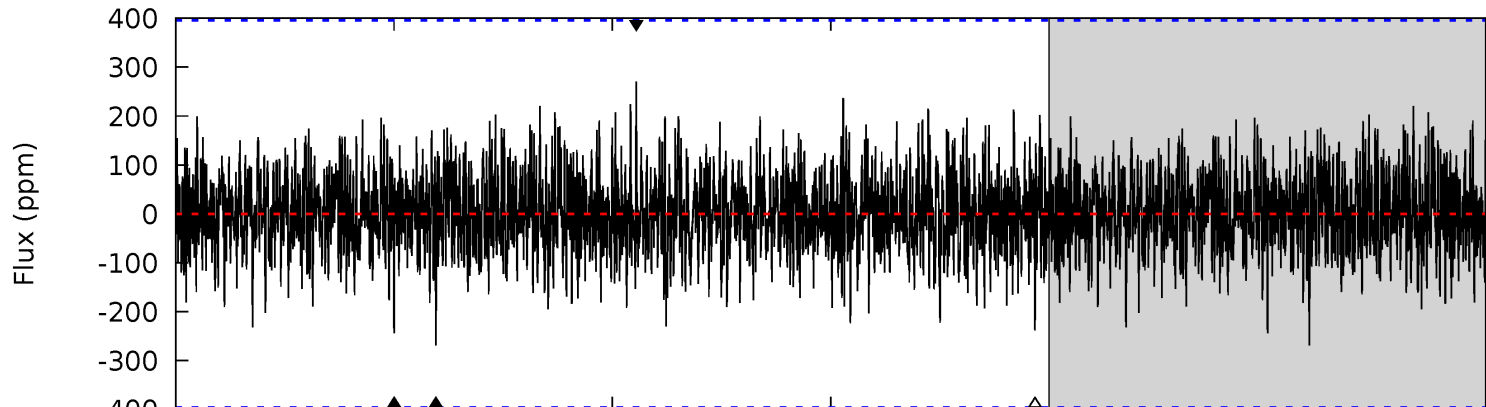
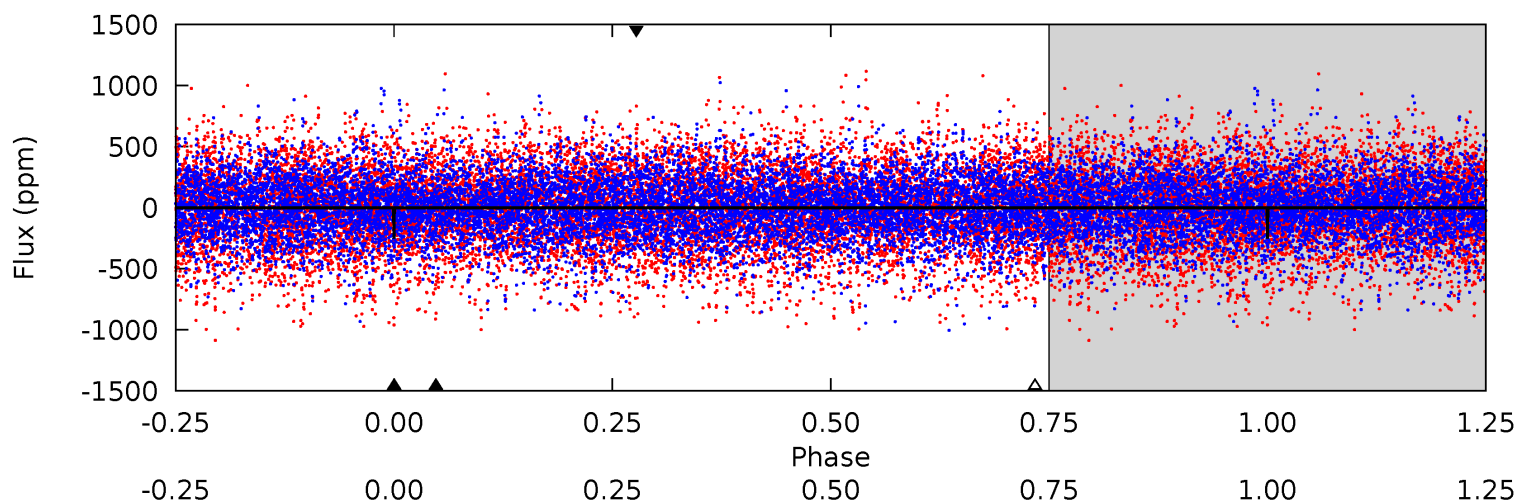
Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
7.59	7.31	6.73	5.89	5.40	3.21	1.66	0.86	1.69	0.59	1.42	0.16	0.88	0.44	0.22



Alt Model-Shift Uniqueness Test

008521020-04, P = 84.634590 Days, E = 75.384468 Days

Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
3.38	3.73	3.31	3.74	5.49	3.35	1.00	0.07	-0.36	0.42	-0.01	1.45	6.43	0.50	0.34



Stellar Parameters For KIC 008521020

	$T_{\text{eff}} (K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M (M_{\odot})$	$p_{\star} (g \cdot \text{cm}^{-3})$
	7523^{+235}_{-314}	$3.654^{+0.467}_{-0.055}$	$-0.180^{+0.250}_{-0.300}$	$3.496^{+0.327}_{-1.742}$	$2.012^{+0.127}_{-0.571}$	$0.066^{+0.325}_{-0.013}$
	+3%/-4%	+13%/-2%	+139%/-167%	+9%/-50%	+6%/-28%	+490%/-19%
Source	KIC0	KIC0	KIC0	DSEP		

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

Secondary Eclipse Parameters for KIC 008521020-04 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	A_{obs}
DV	-154 ± 21	$4.94^{+3.69}_{-3.16}$	1211^{+81}_{-150}	6772^{+6844}_{-1574}	771^{+5069}_{-512}
Alt.	-269 ± 72	$5.83^{+4.13}_{-3.27}$	1204^{+86}_{-153}	7022^{+4805}_{-1575}	947^{+3502}_{-638}

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 $A_{obs} \gg 1.0$

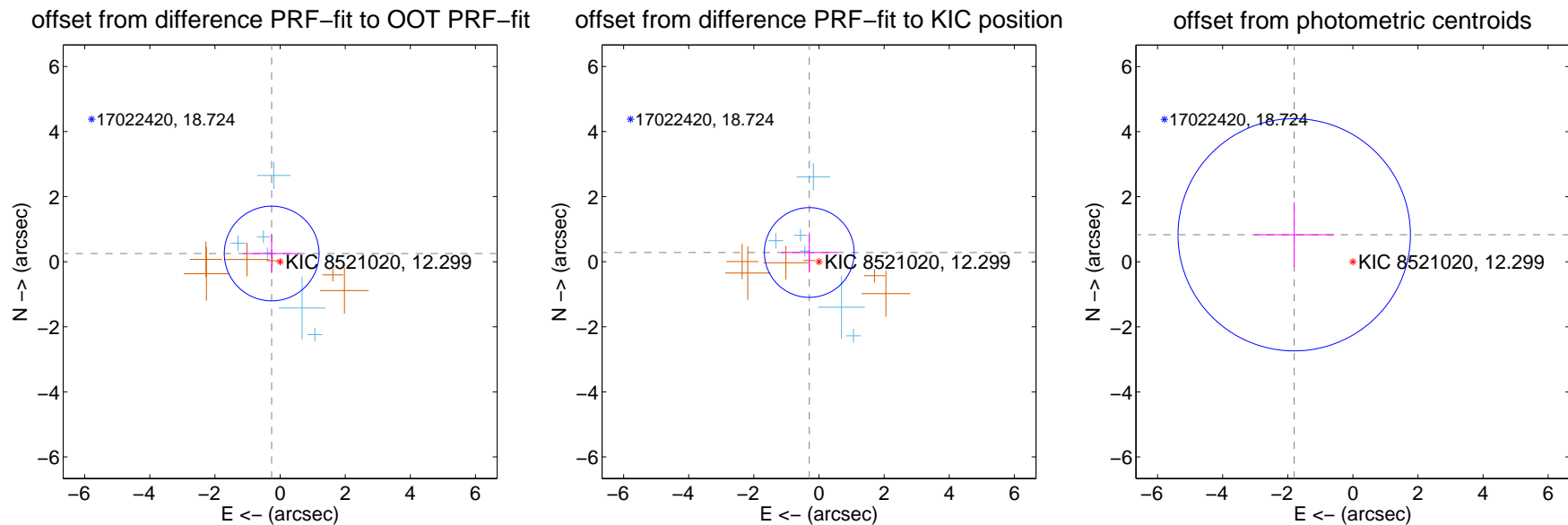
DV Centroid Data

Supplemental centroid analysis for 008521020-04. Kepler magnitude: 12.30. Transit SNR 6.91

There are 6 quarters with good PRF difference image offsets

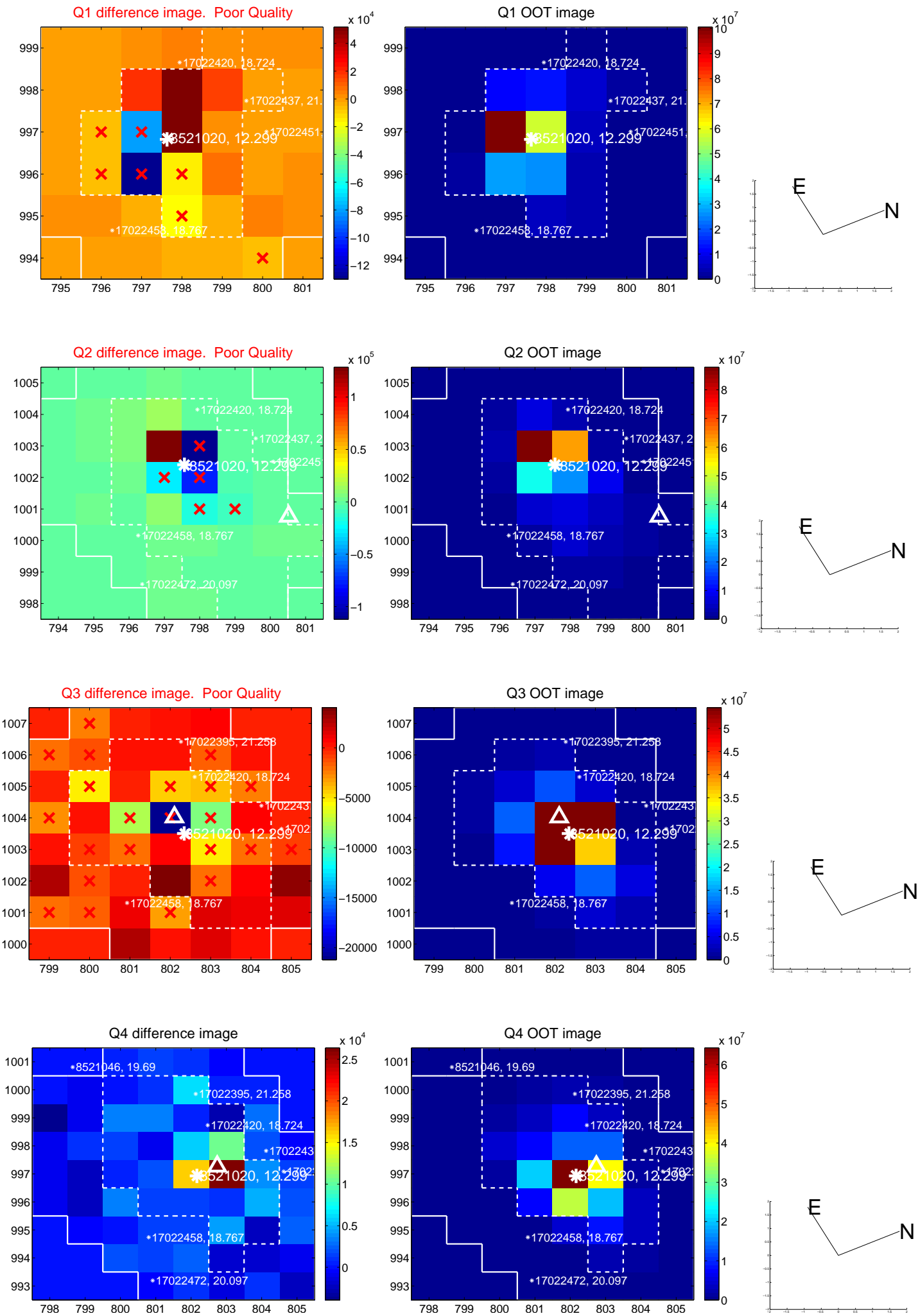
The direct PRF centroid is offset from the target star catalog position by about 0.12 arcsec

	Distance in arcsec	Distance / σ	Δ RA	Δ Dec
PRF-fit source offset from OOT	0.361 ± 0.485	0.74	0.259 ± 0.867	0.251 ± 0.610
PRF-fit source offset from KIC position	0.411 ± 0.459	0.89	0.298 ± 0.857	0.283 ± 0.614
photometric centroid source offset	1.98 ± 1.19	1.67	1.80 ± 1.23	0.83 ± 1.00

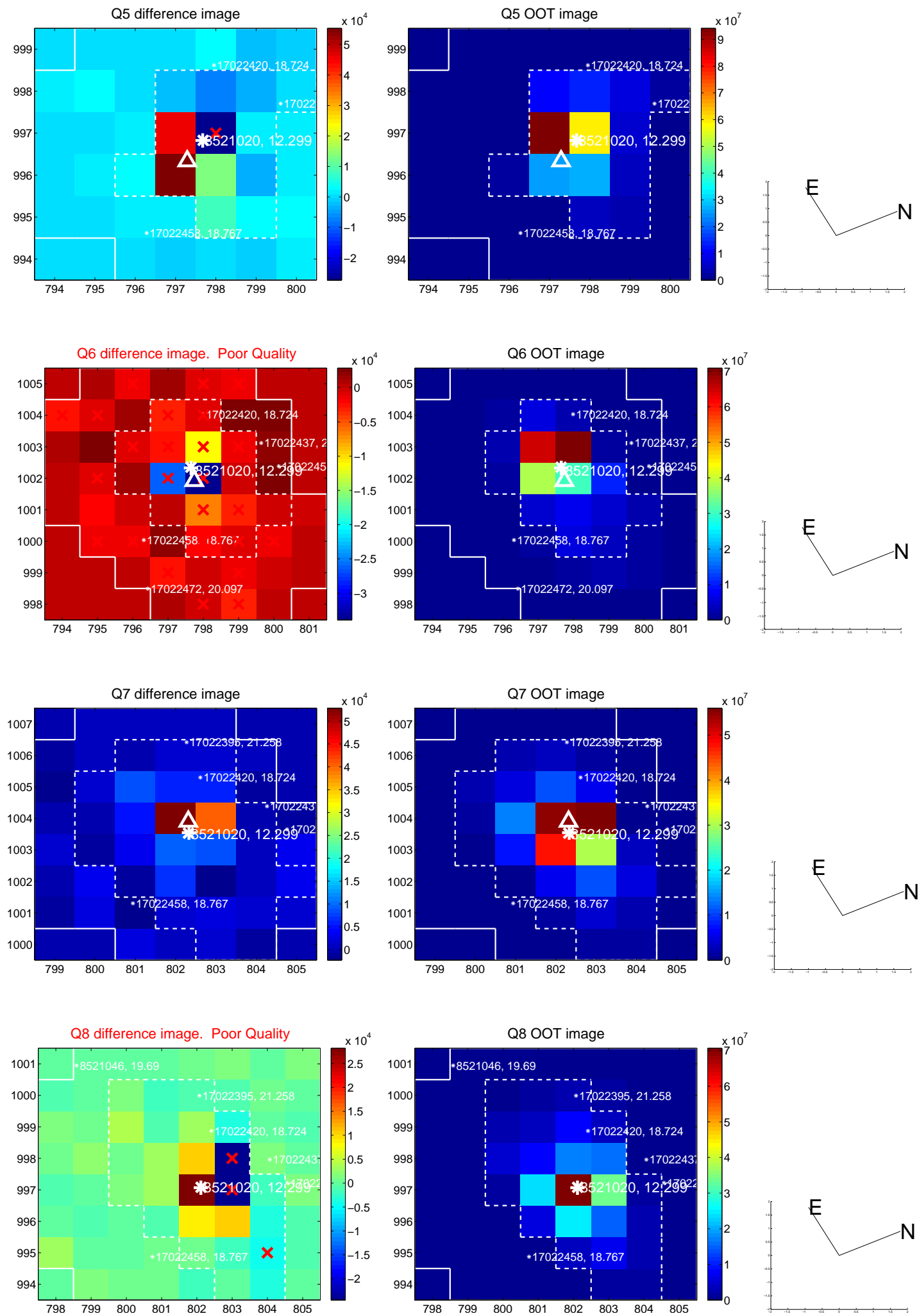


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three- 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.

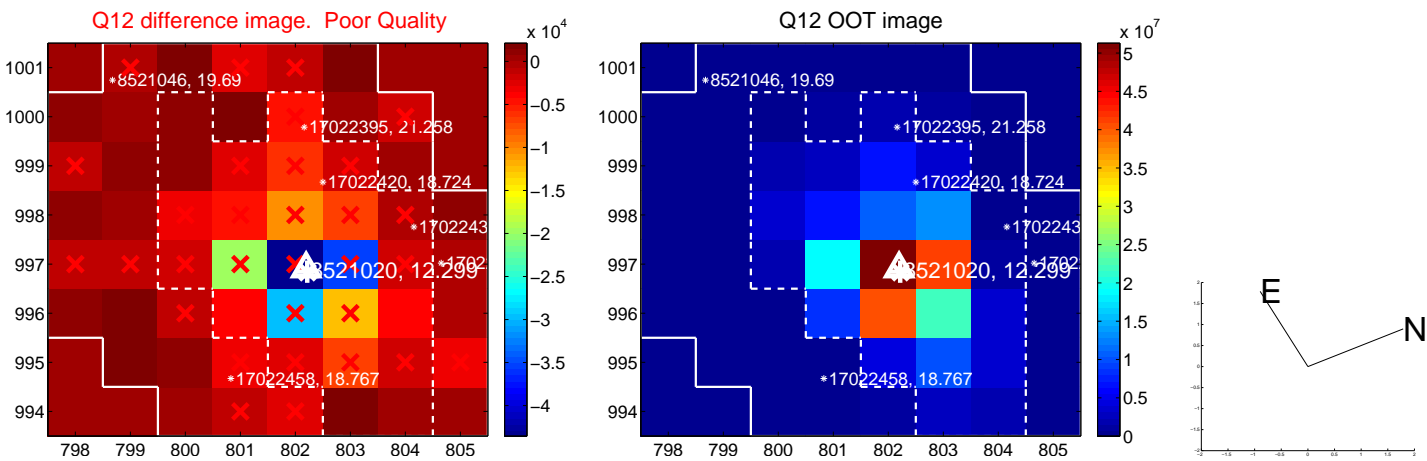
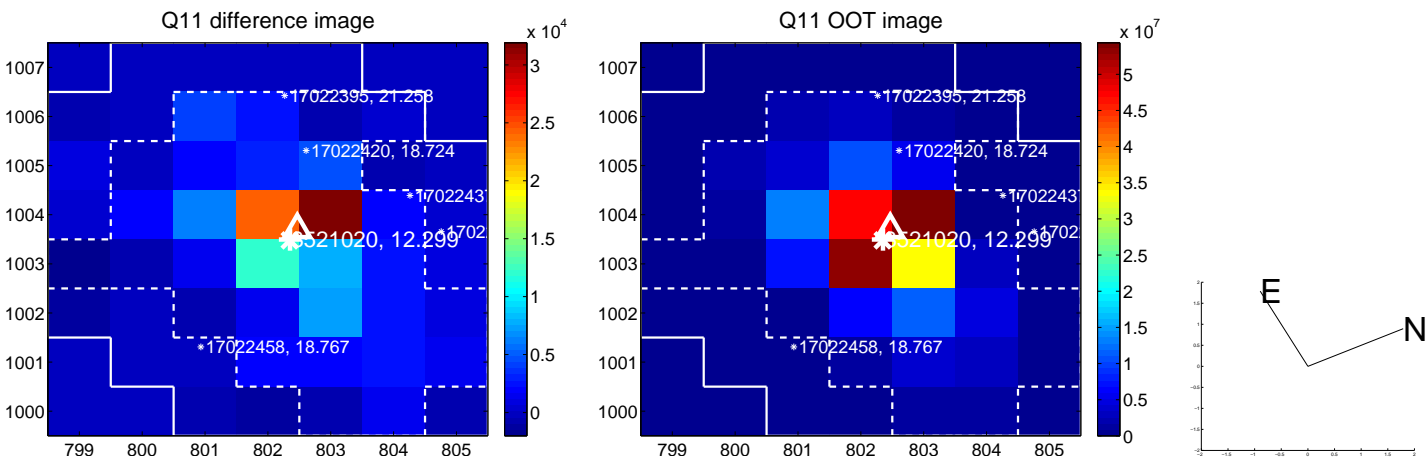
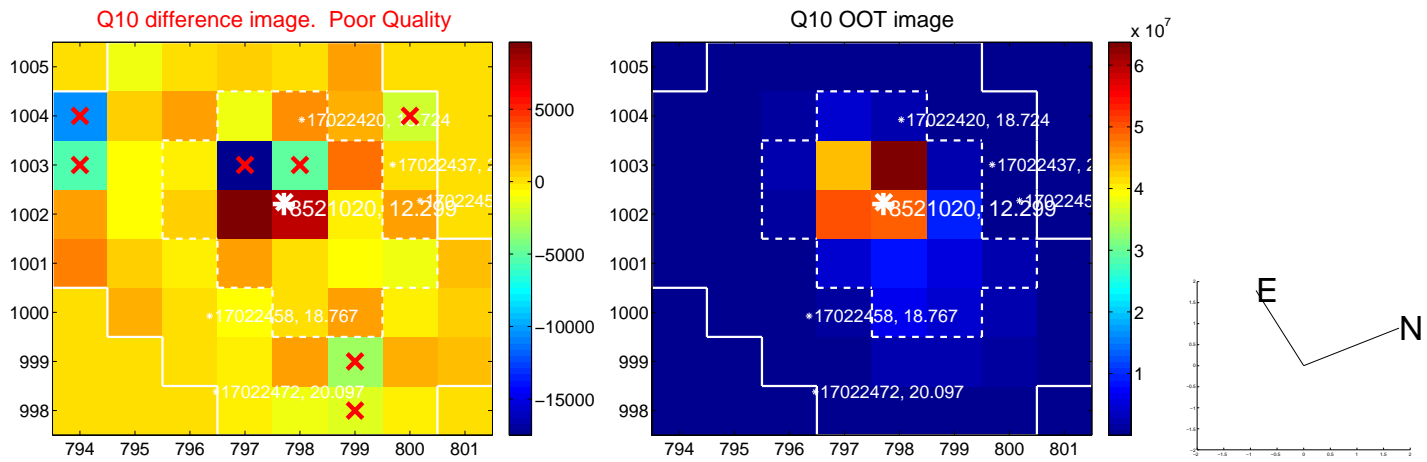
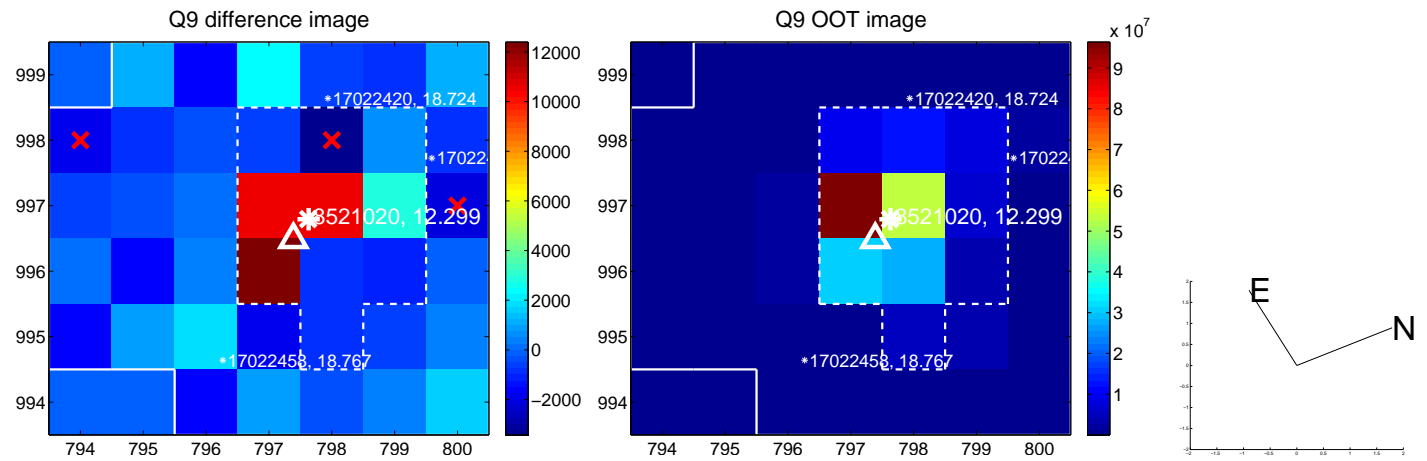
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



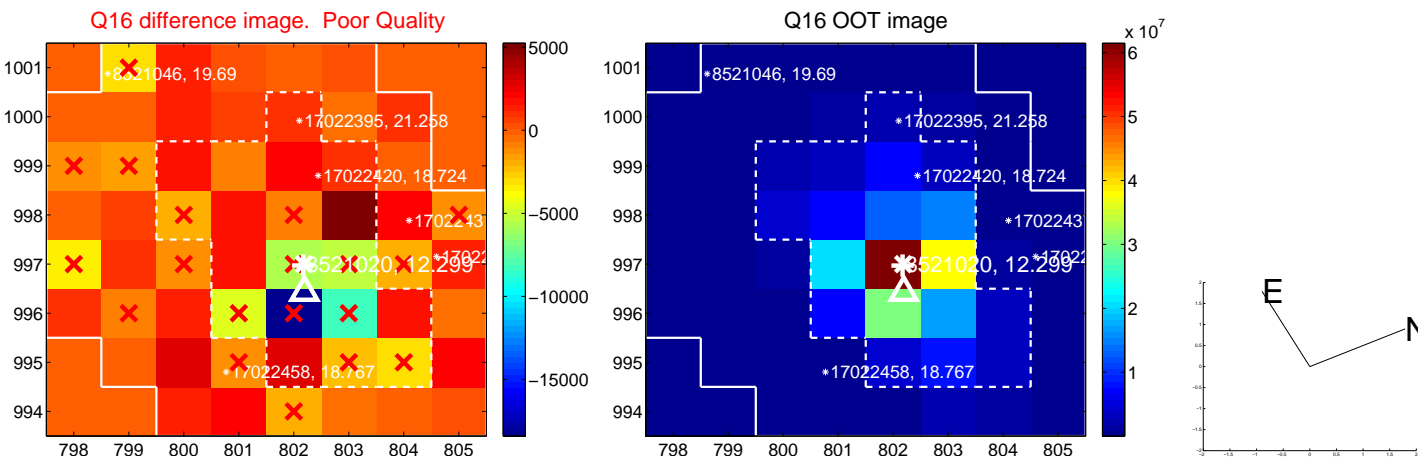
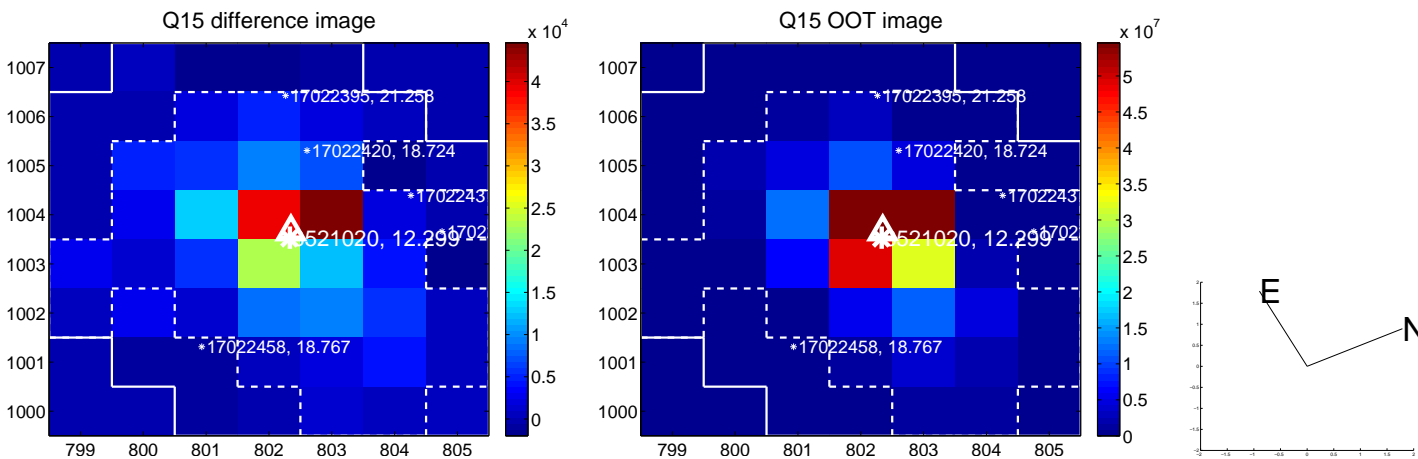
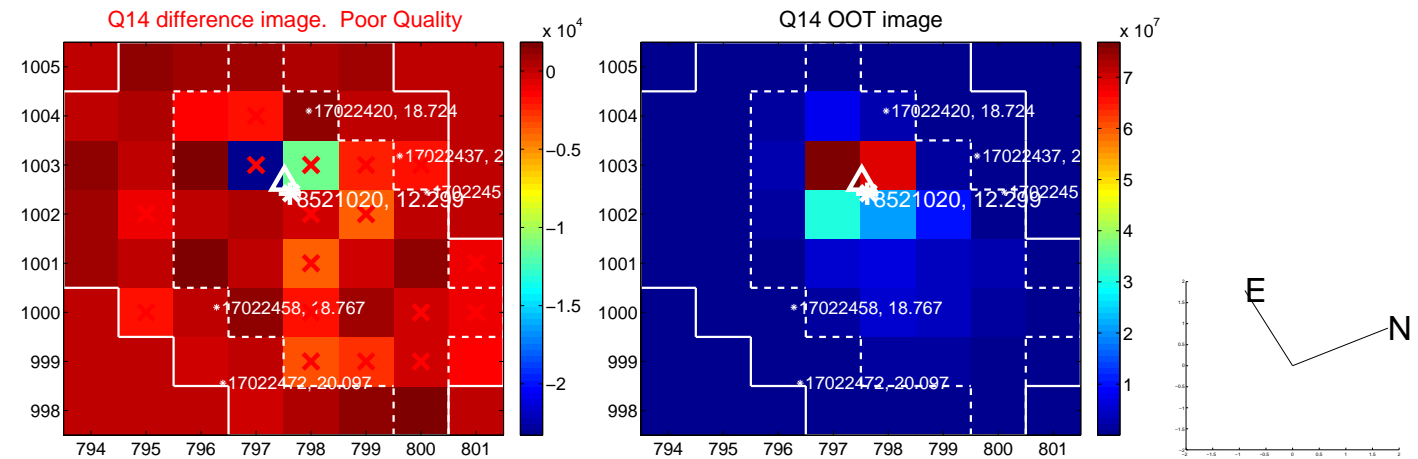
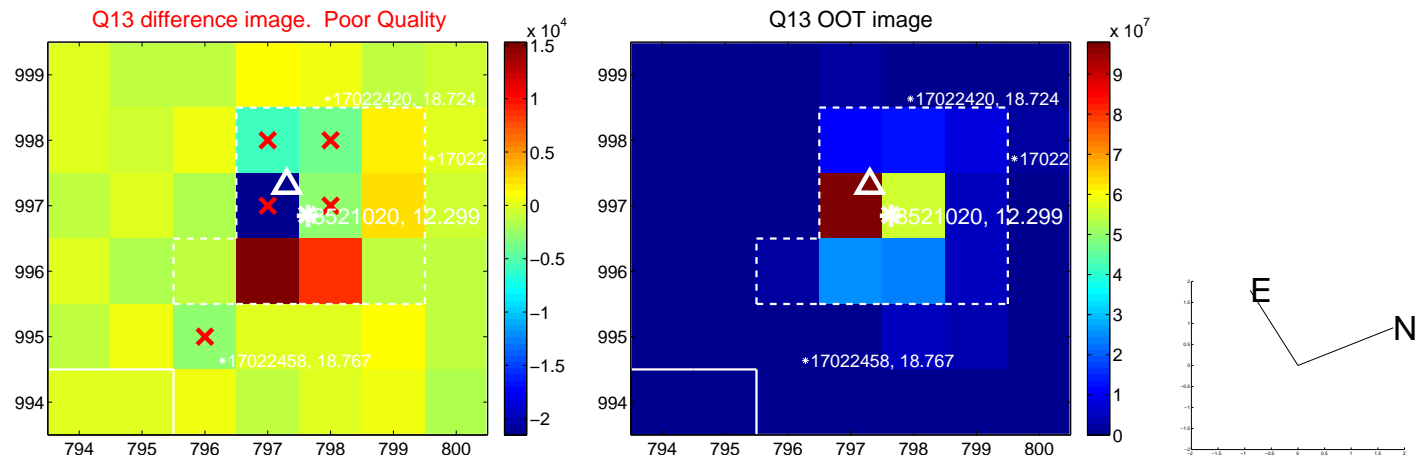
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



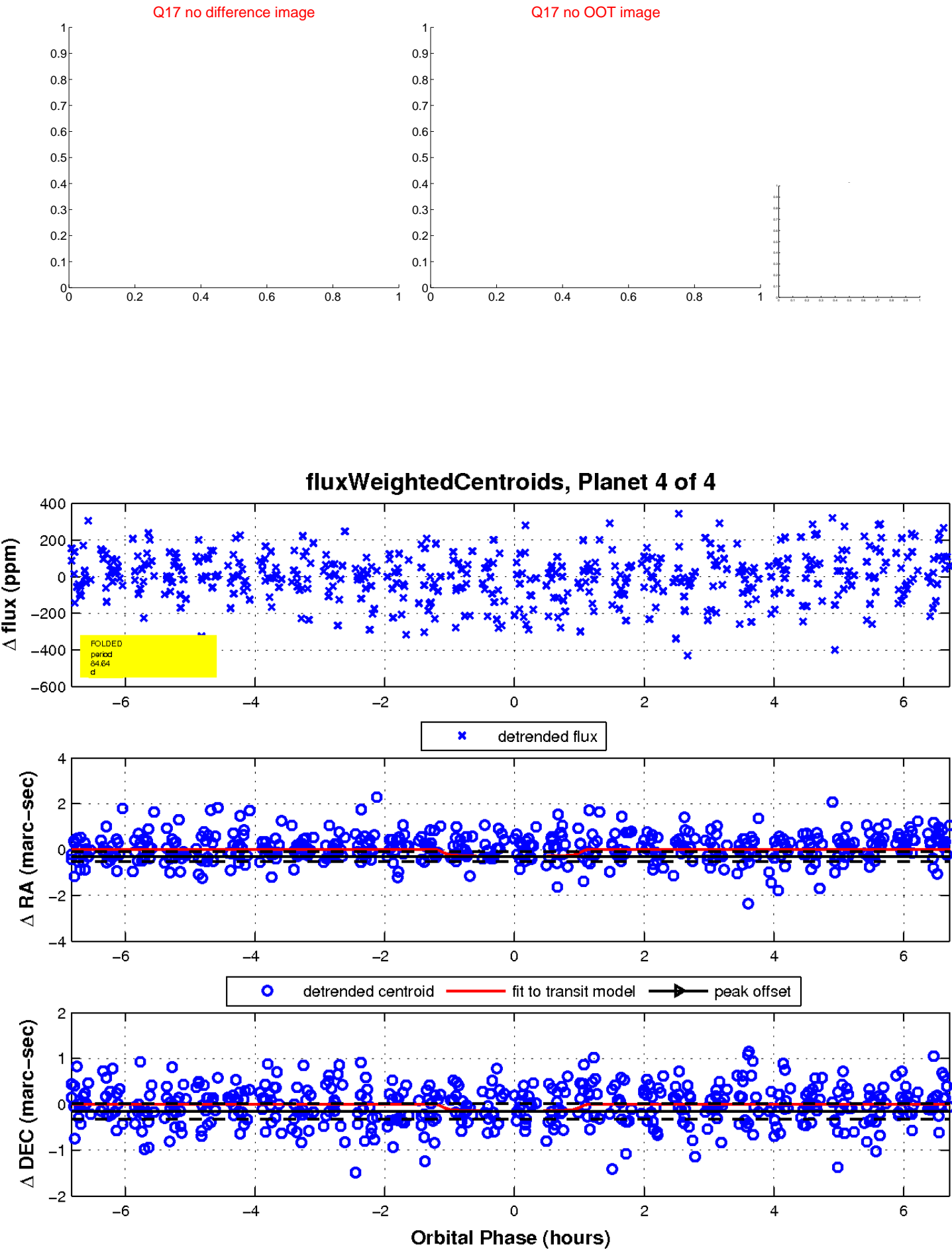
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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

