

KIC 004158822

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})
004158822-01	OBS	No	2.213356	132.047298	72.5	7.198	8.8	8.4	10.32	6932	16.88	90803.52
004158822-02	OBS	No	205.482584	263.373448	351.0	6.308	13.0	4.5	10.32	6932	21.14	216.01
004158822-03	OBS	No	492.551527	594.046151	598.3	10.411	9.9	6.0	10.32	6932	30.35	67.33

Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004158822-01	OBS	FP	0.00	1	0	0	0	LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT
004158822-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—MARSHALL_TRACKER—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—INCONSISTENT_TRANS
004158822-03	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS—HALO_GHOST

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

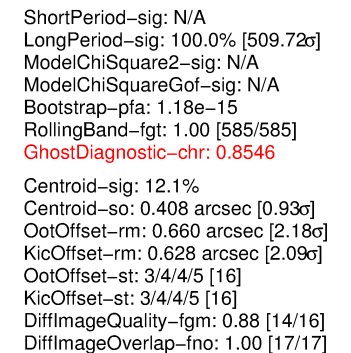
N = Not Transit-Like. S = Stellar Eclipse. C = Centroid Offset. E = Ephemeris Match.

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

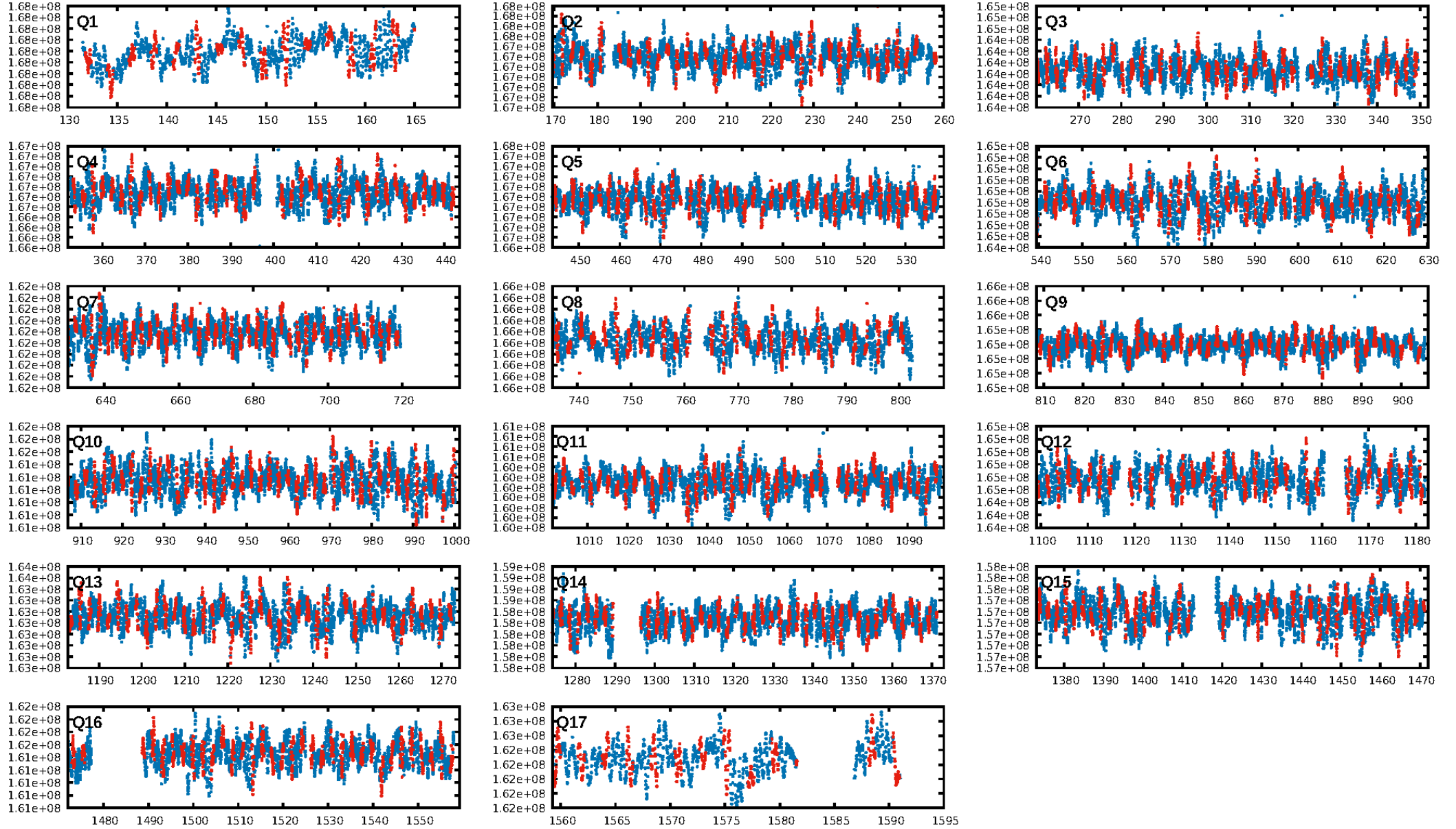
Ephemeris Match Information For 004158822-01

No Significant Match Found

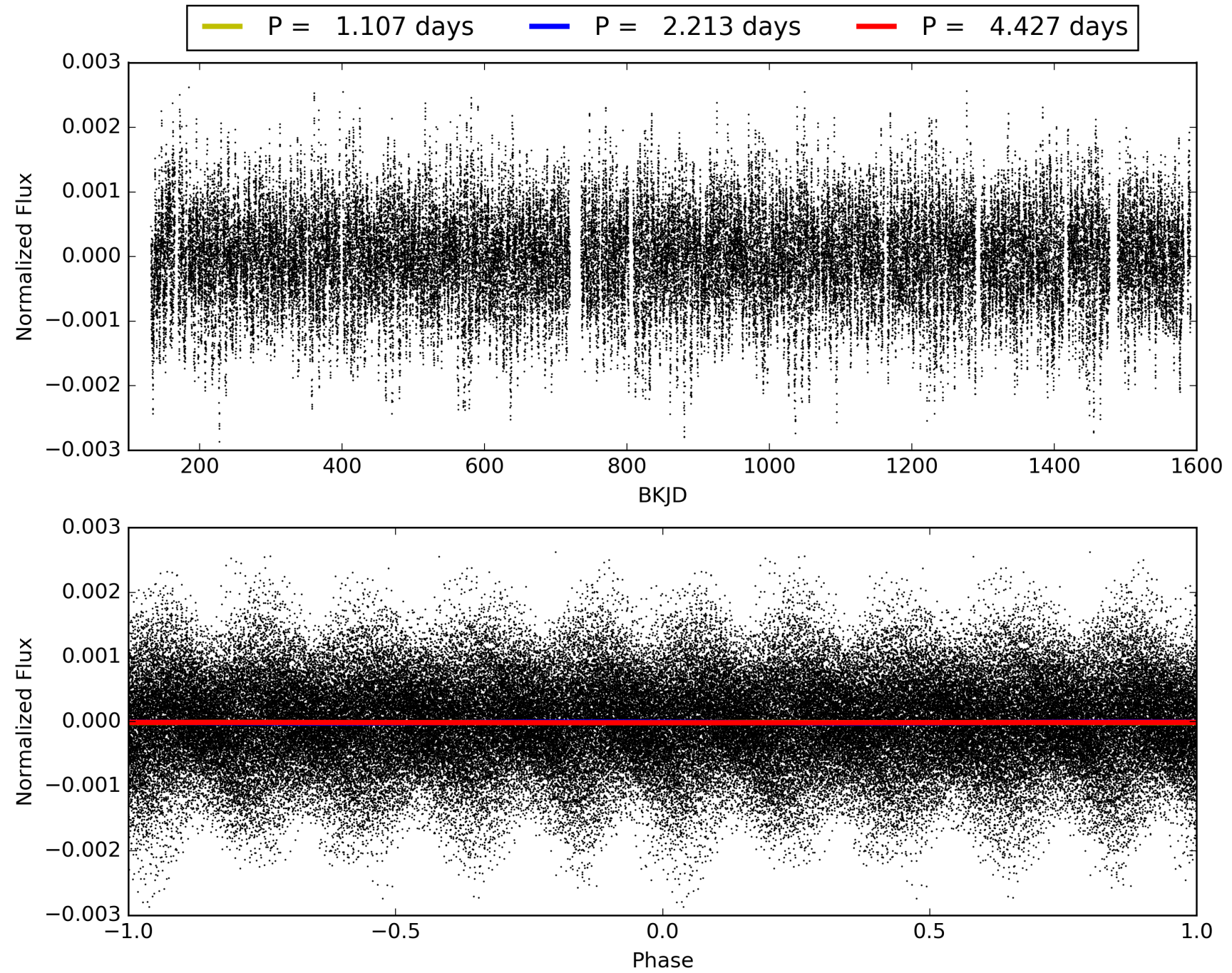
KIC: 4158822 Candidate: 1 of 3 Period: 2.213 d



TCE 004158822-01, PDC Light Curves

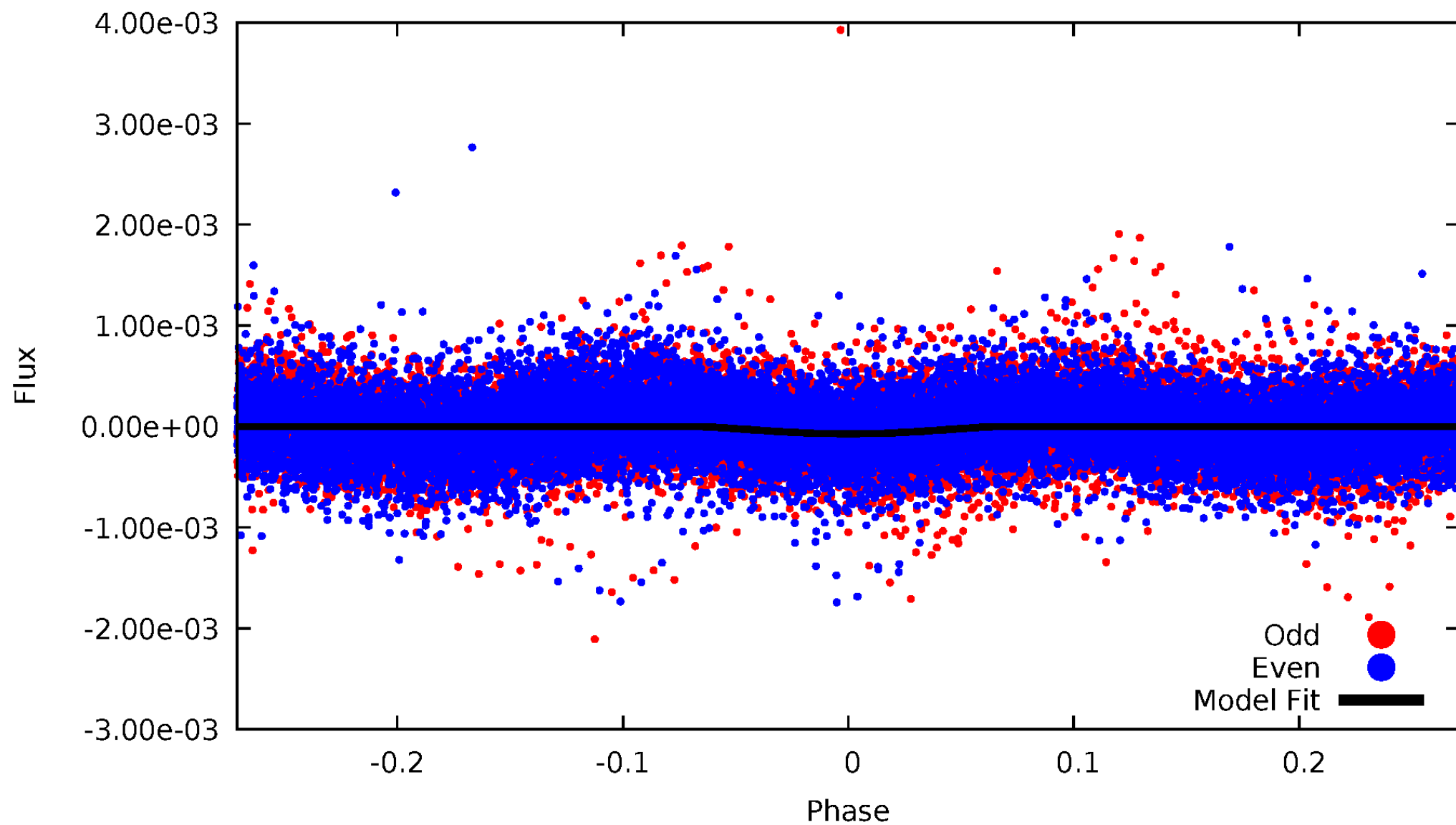


TCE 004158822-01



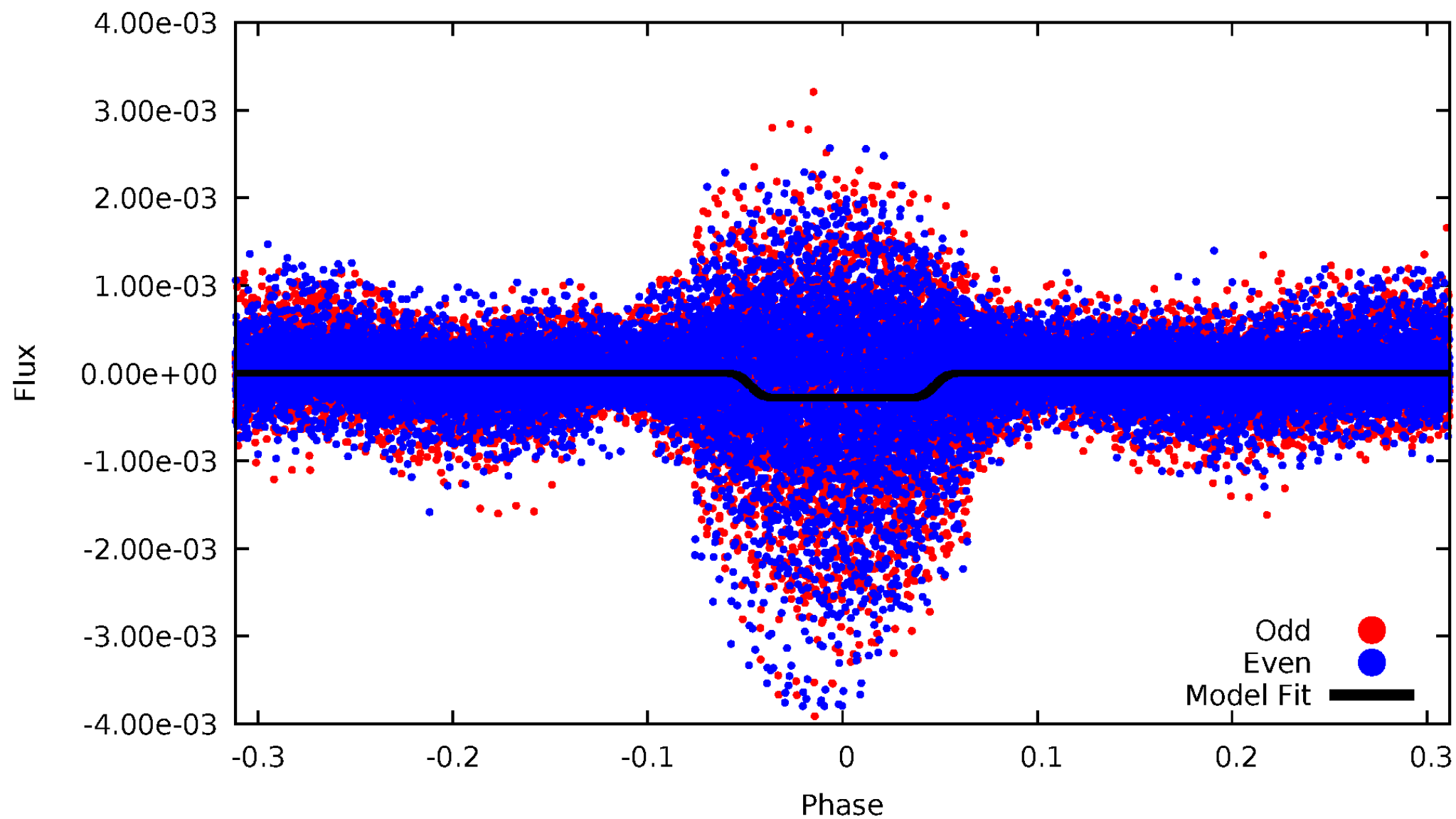
DV Odd/Even

TCE 004158822-01

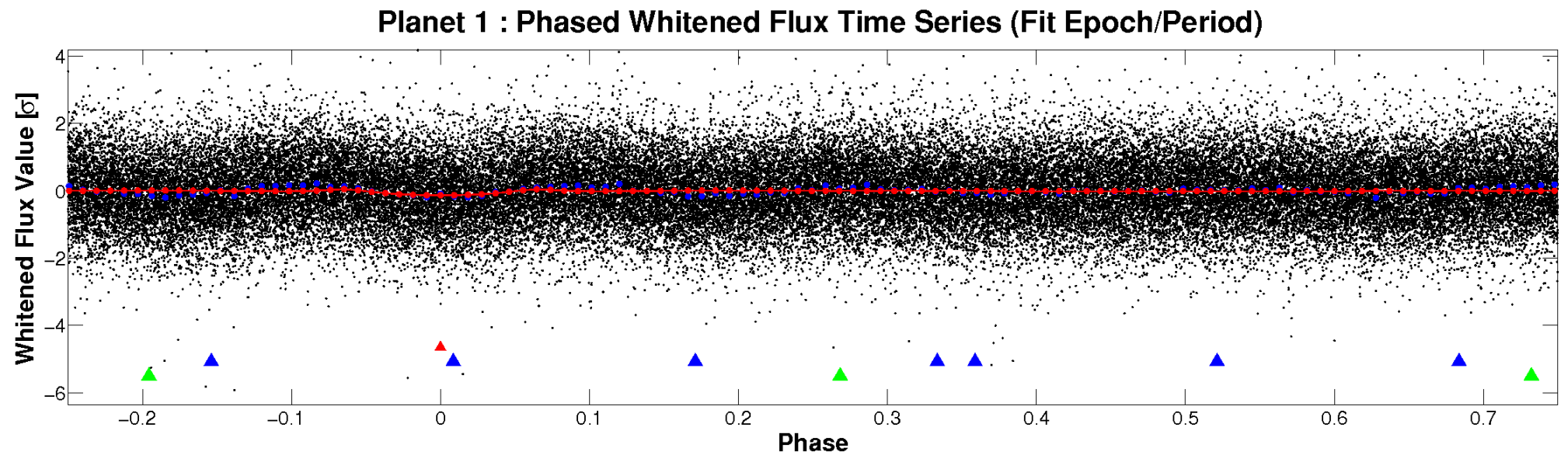
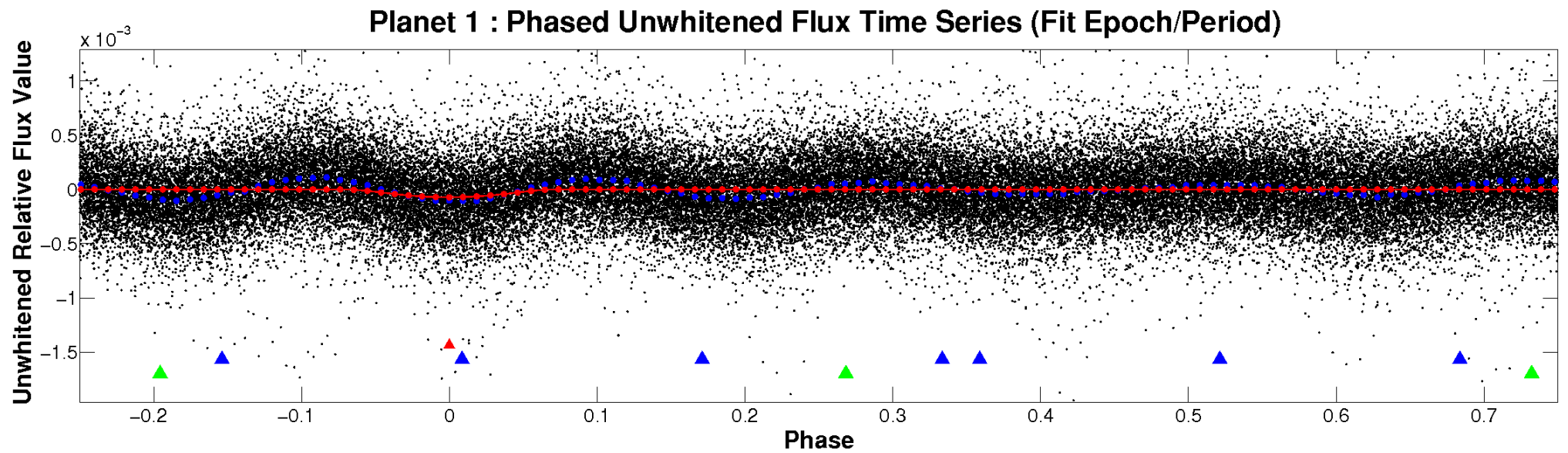


ALT Odd/Even

TCE 004158822-01

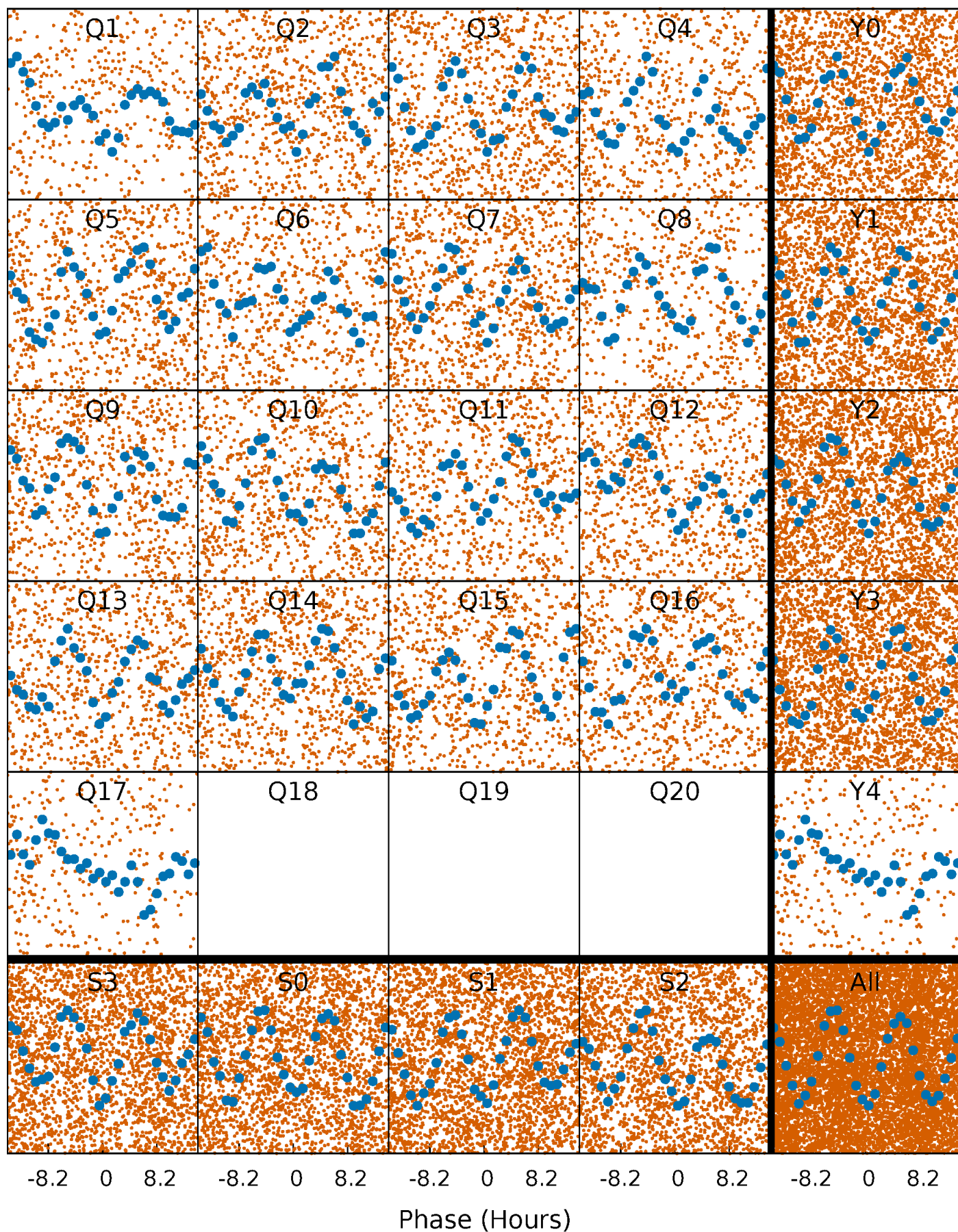


Non-Whitened Vs. Whitened Light Curve



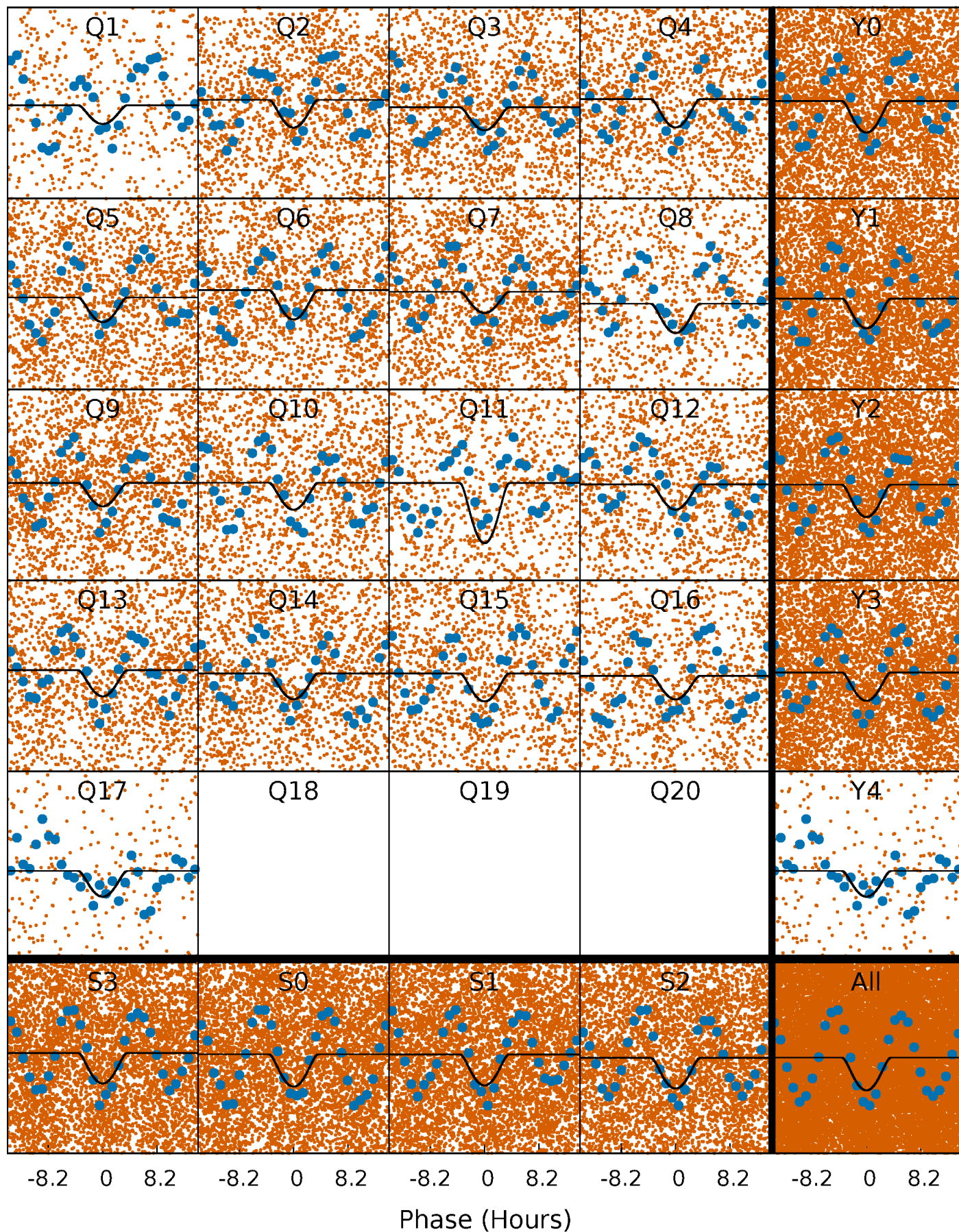
PDC Quarter-Phased Transit Curves

TCE 004158822-01 P= 2.213356 Days $T_0=132.047298$ (BKJD)



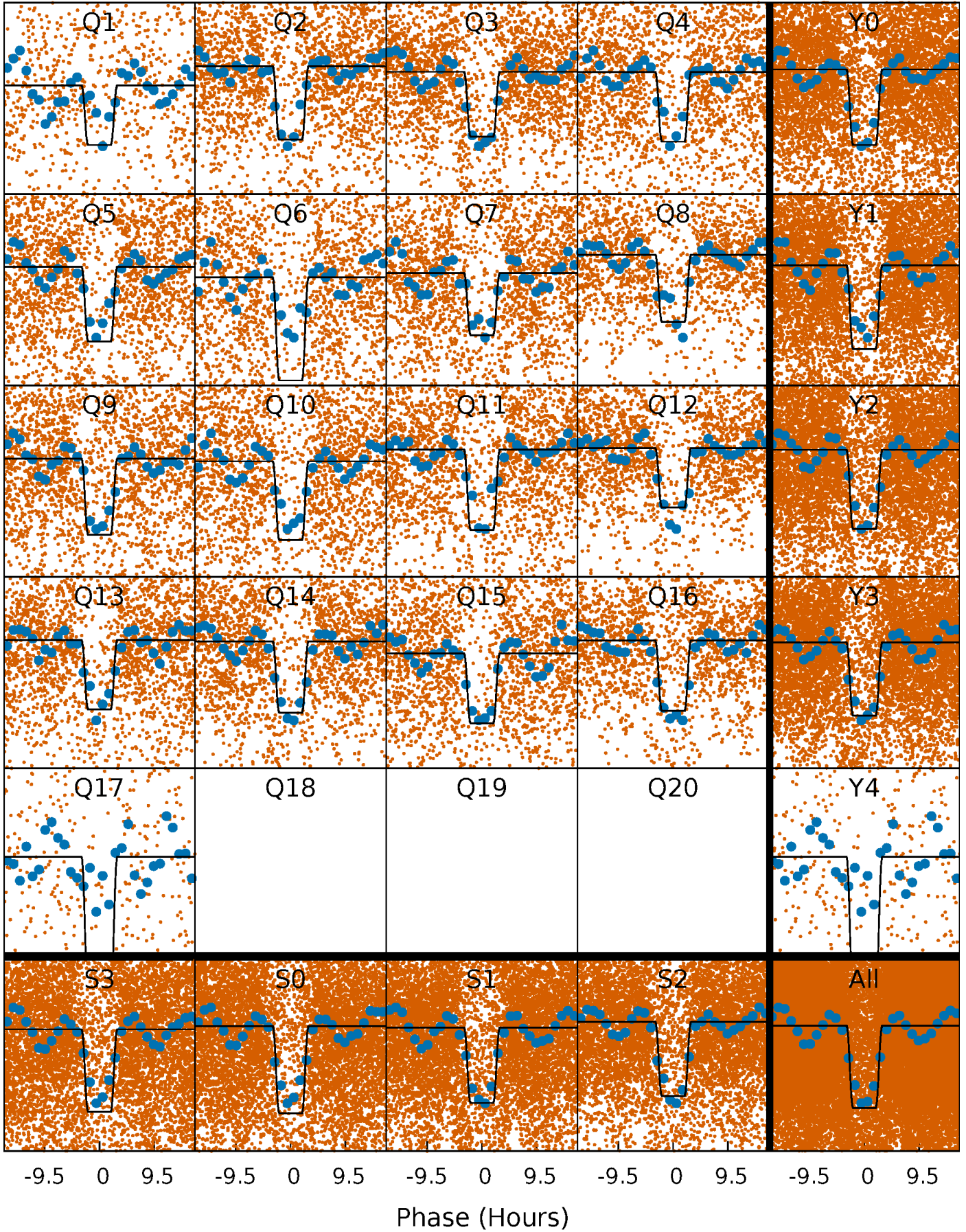
DV Quarter-Phased Transit Curves

TCE 004158822-01 P= 2.213356 Days $T_0=132.047298$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

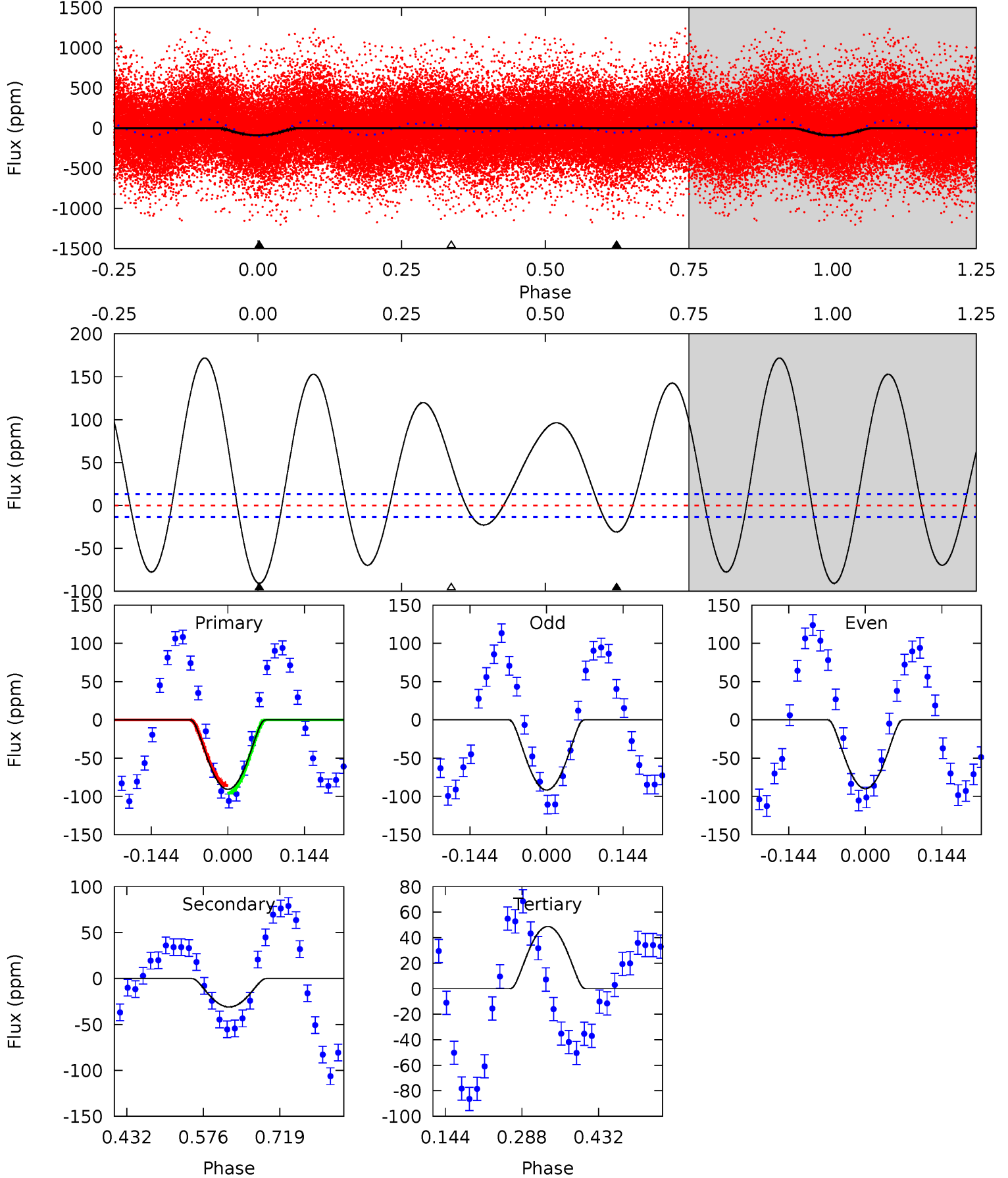
TCE 004158822-01 P= 2.213280 Days $T_0=132.076532$ (BKJD)



DV Model-Shift Uniqueness Test

004158822-01, P = 2.213356 Days, E = 129.833942 Days

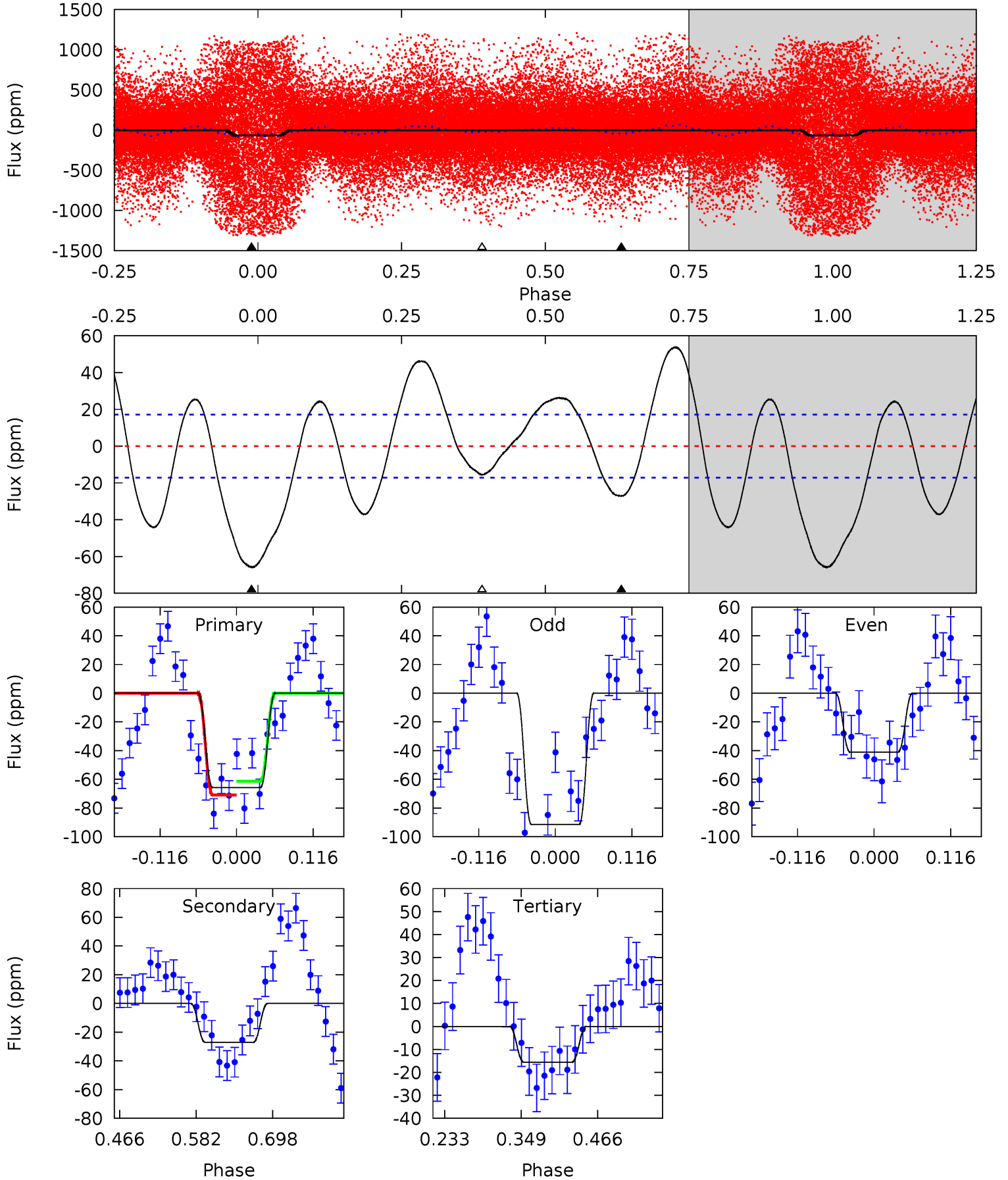
Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
30.3	10.4	-16.3	0	4.49	1.46	19.0	46.6	30.3	26.7	10.4	0.30	1.26	0.65	1.72



Alt Model-Shift Uniqueness Test

004158822-01, P = 2.213280 Days, E = 129.863252 Days

Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
17.4	7.16	4.12	0	4.53	1.57	6.59	13.3	17.4	3.04	7.16	5.95	2.19	0.45	1.24



Stellar Parameters For KIC 004158822

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	R (R_{\odot})	$M(M_{\odot})$	p_{\star} ($\text{g}\cdot\text{cm}^{-3}$)
	6932^{+168}_{-264}	$2.923^{+0.639}_{-0.071}$	$0.070^{+0.200}_{-0.550}$	$10.322^{+1.125}_{-6.373}$	$3.255^{+0.080}_{-1.439}$	$0.004^{+0.043}_{-0.001}$
	+2%/-4%	+22%/-2%	+286%/-786%	+11%/-62%	+2%/-44%	+1042%/-24%
Source	PHO1	FLK73	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 004158822-01 / KOI

Detrend	Depth (ppm)	R_p (R_{\oplus})	T_{max} (K)	T_{obs} (K)	A_{obs}
DV	-31 ± 3	$16.83^{+15.81}_{-11.70}$	5906^{+449}_{-982}	-4063^{+10123}_{-844}	$0.137^{+1.279}_{-0.099}$
Alt.	-27 ± 4	$17.83^{+17.17}_{-11.74}$	5910^{+482}_{-965}	-4280^{+9585}_{-707}	$0.104^{+0.798}_{-0.076}$

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 $A_{\text{obs}} \gg 1.0$

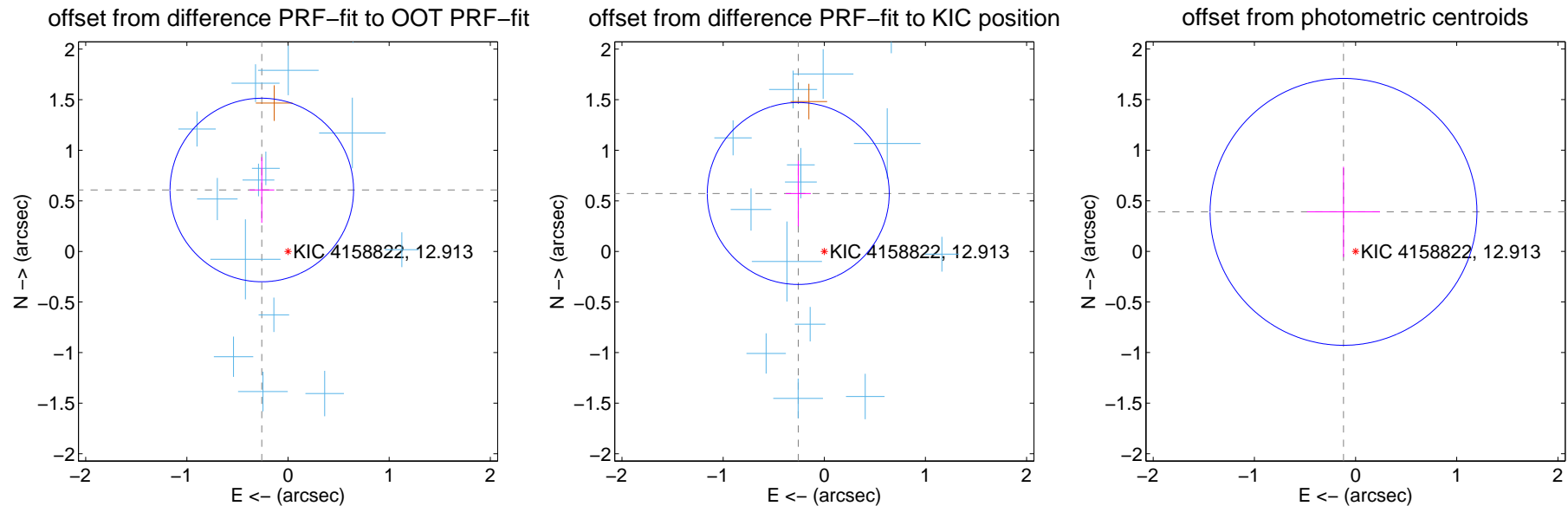
DV Centroid Data

Supplemental centroid analysis for 004158822-01. Kepler magnitude: 12.91. Transit SNR 8.35

There are 14 quarters with good PRF difference image offsets

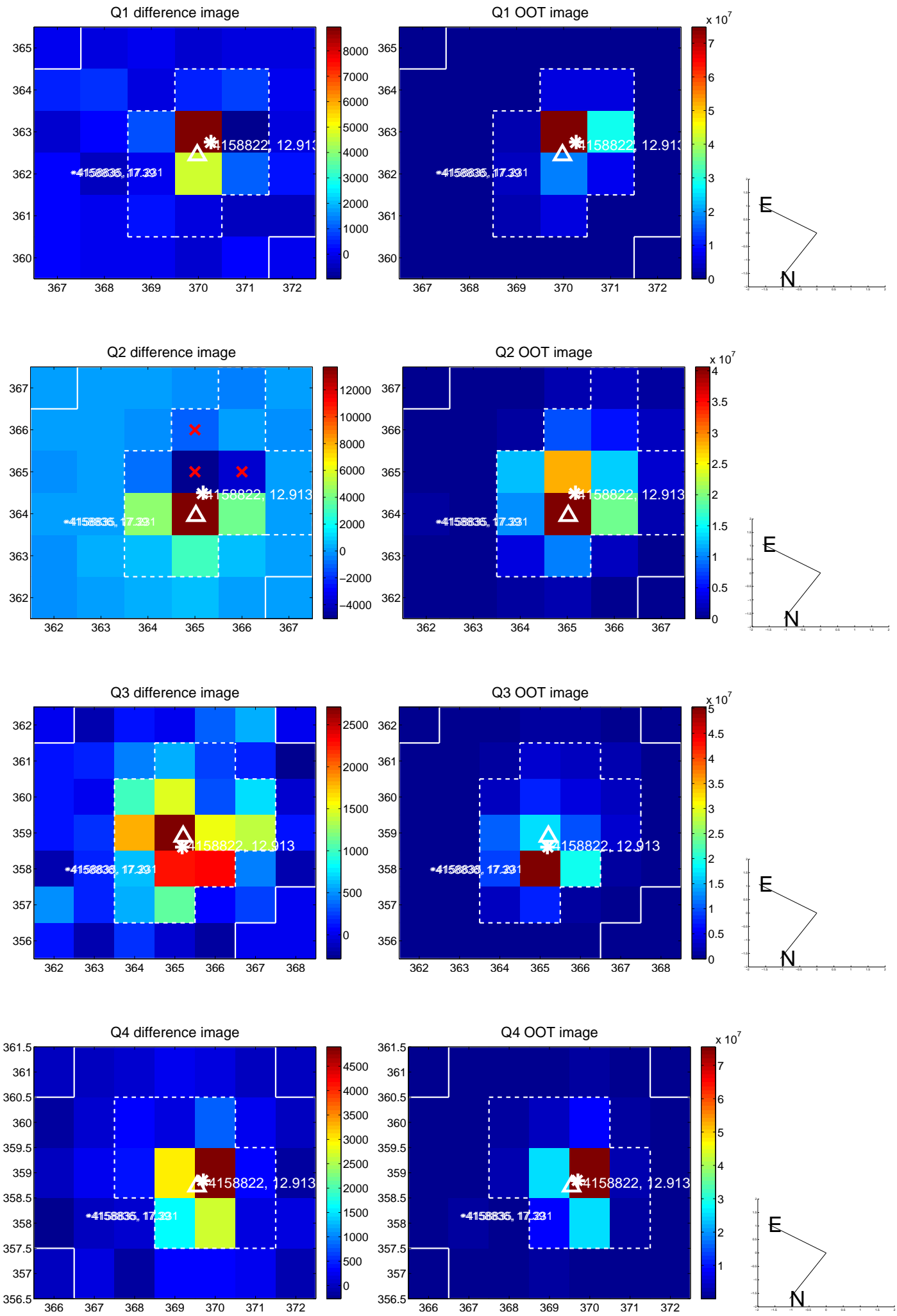
The direct PRF centroid is offset from the target star catalog position by about 0.04 arcsec

	Distance in arcsec	Distance / σ	Δ RA	Δ Dec
PRF-fit source offset from OOT	0.660 ± 0.302	2.18	0.259 ± 0.123	0.607 ± 0.325
PRF-fit source offset from KIC position	0.628 ± 0.300	2.09	0.257 ± 0.125	0.573 ± 0.324
photometric centroid source offset	0.41 ± 0.44	0.93	0.12 ± 0.36	0.39 ± 0.45

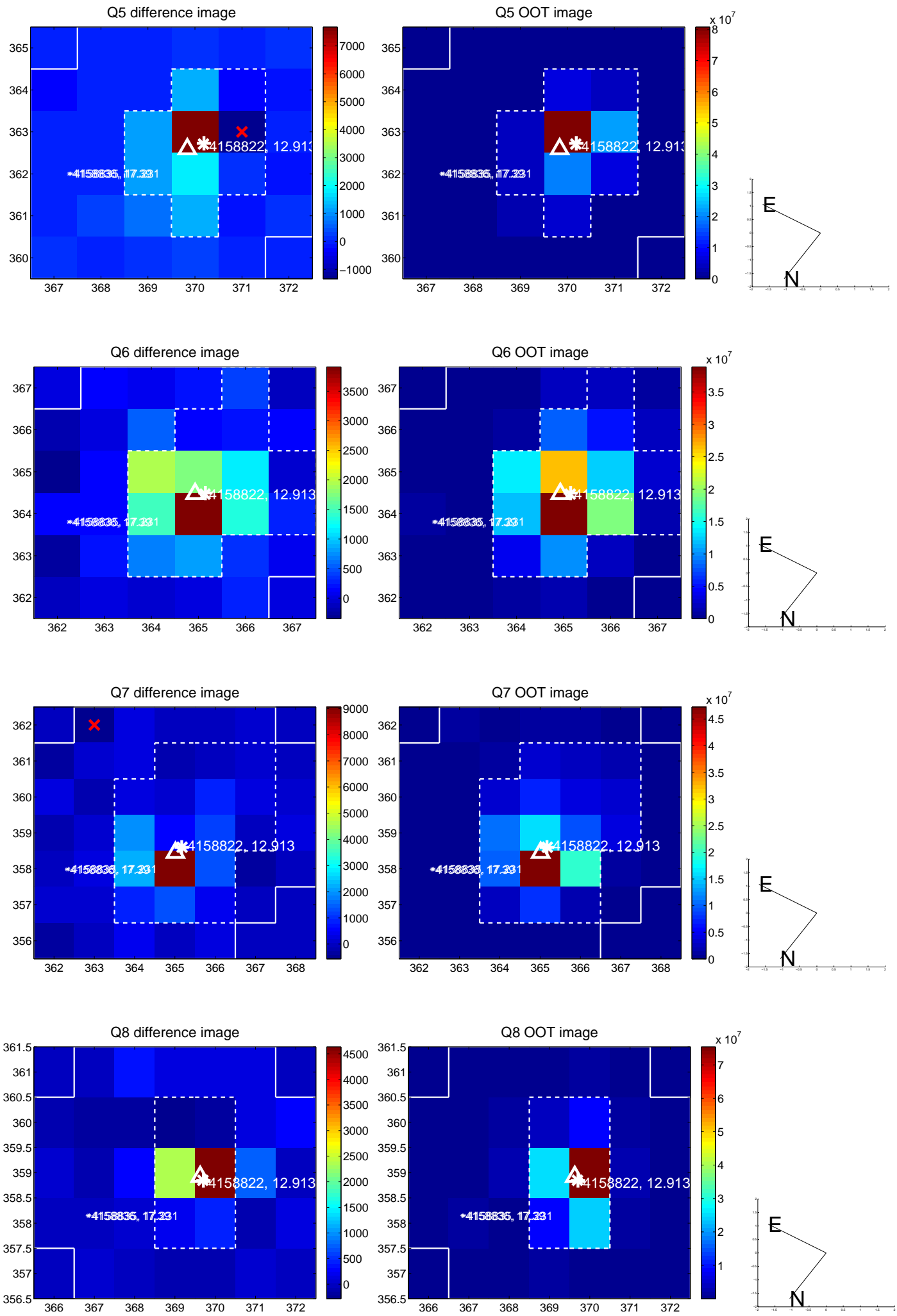


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three-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

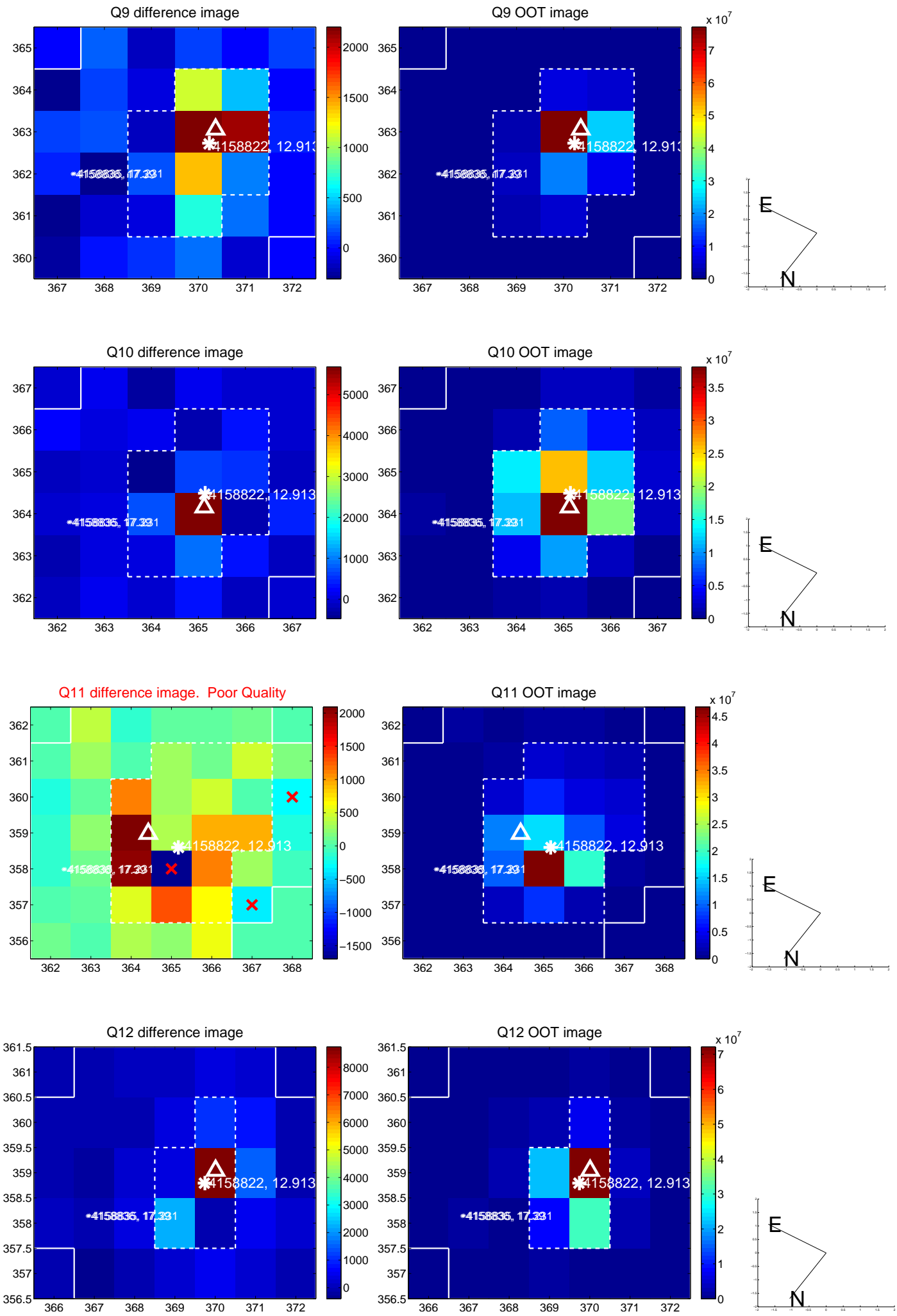
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



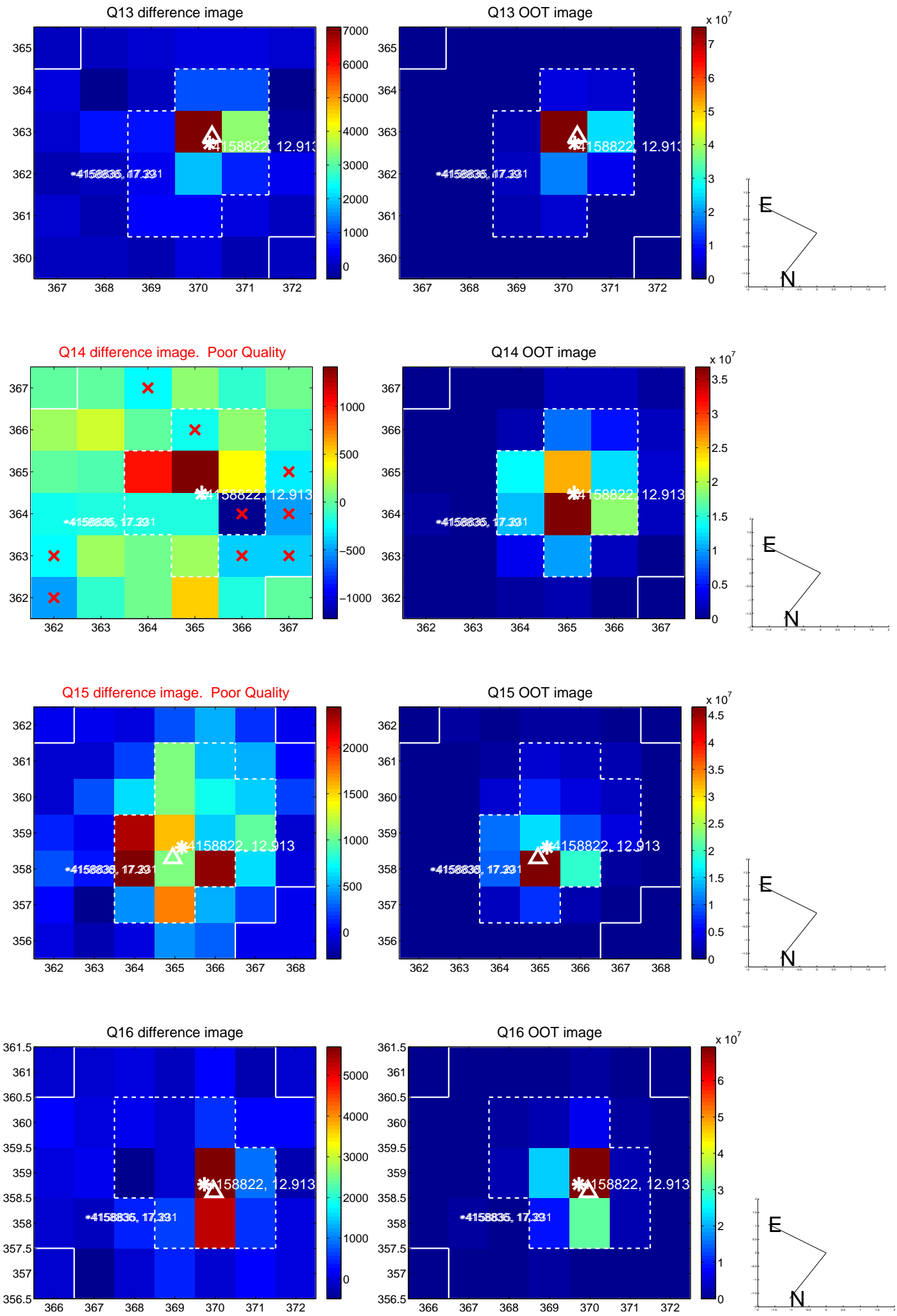
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



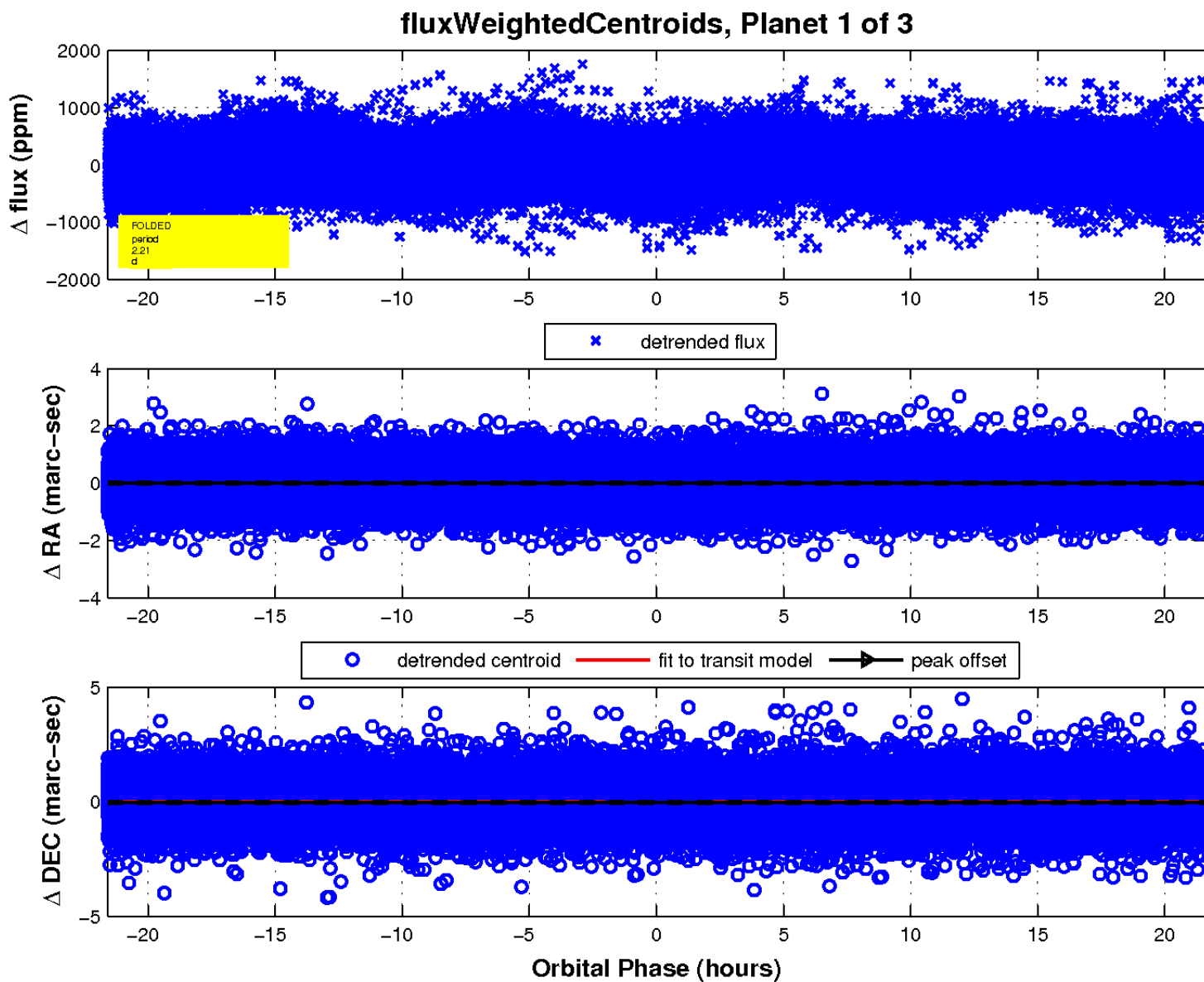
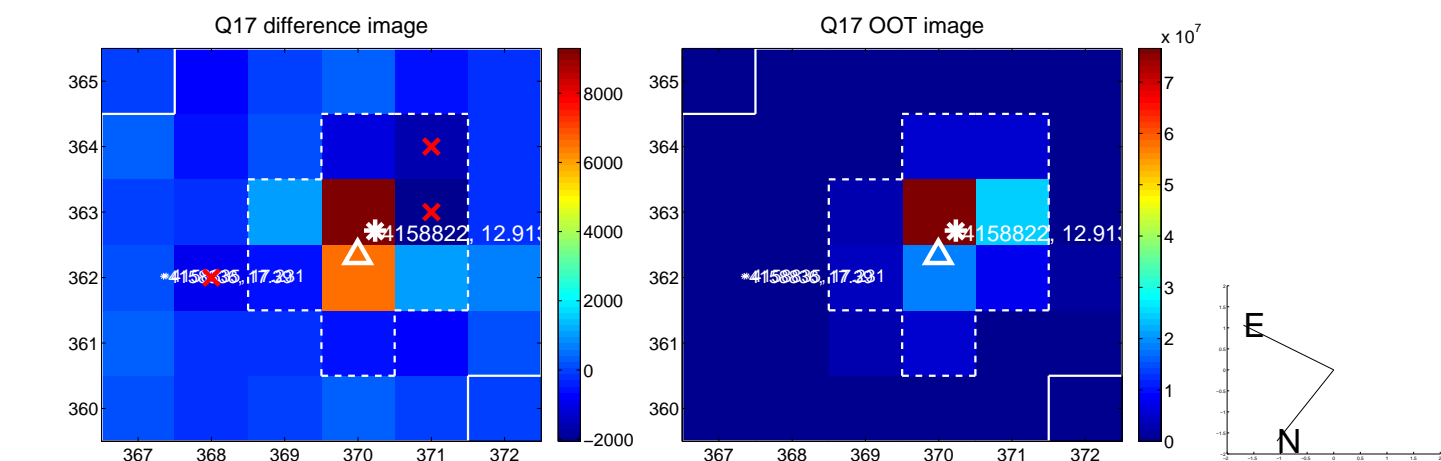
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white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.

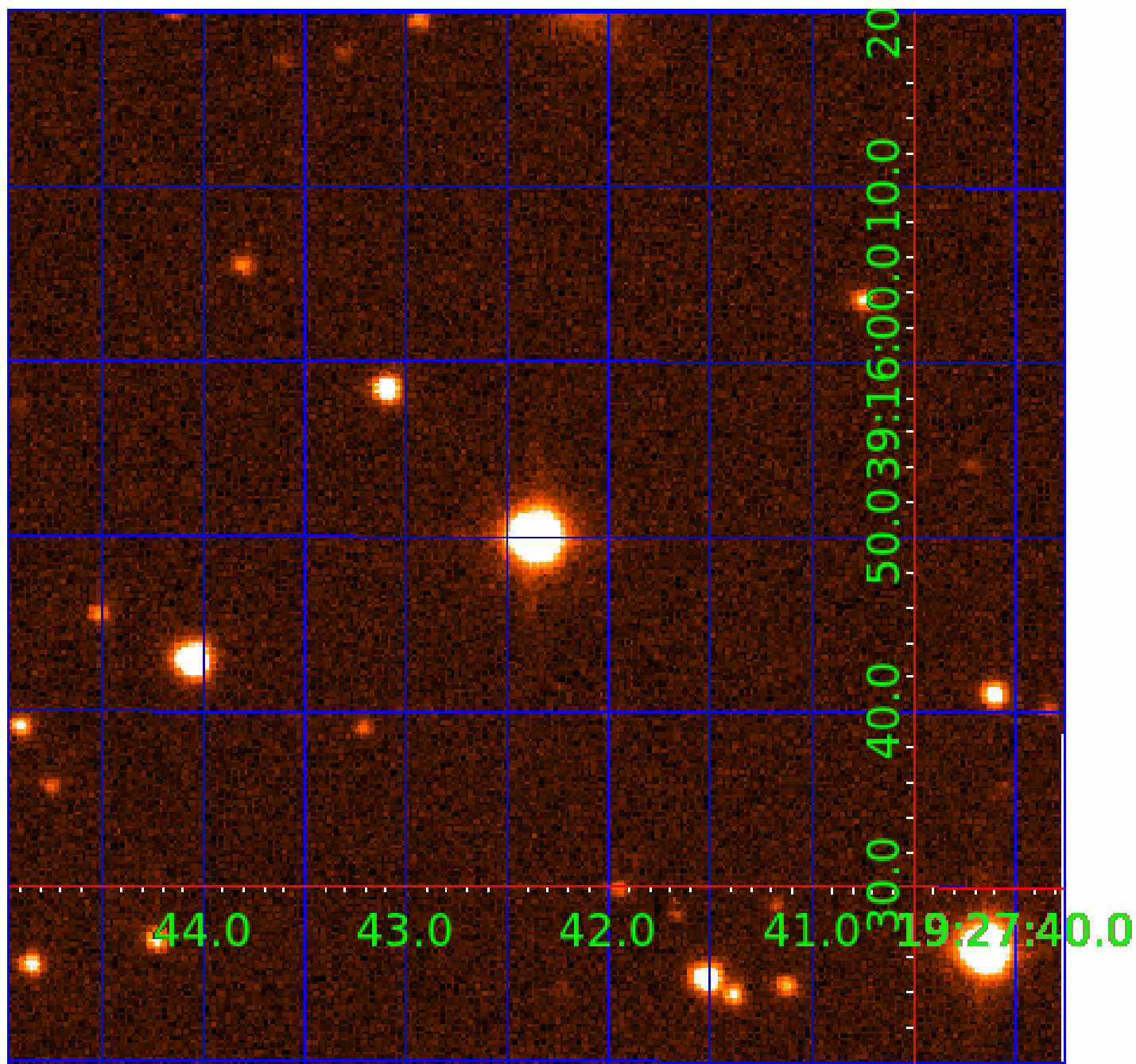


white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



UKIRT Image

Declination



KIC 004158822

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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004158822-02	OBS	No	205.482584	263.373448	351.0	6.308	13.0	4.5	10.32	6932	21.14	216.01
004158822-03	OBS	No	492.551527	594.046151	598.3	10.411	9.9	6.0	10.32	6932	30.35	67.33

Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
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004158822-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL_TRACKER—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—INCONSISTENT_TRANS
004158822-03	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS—HALO_GHOST

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

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

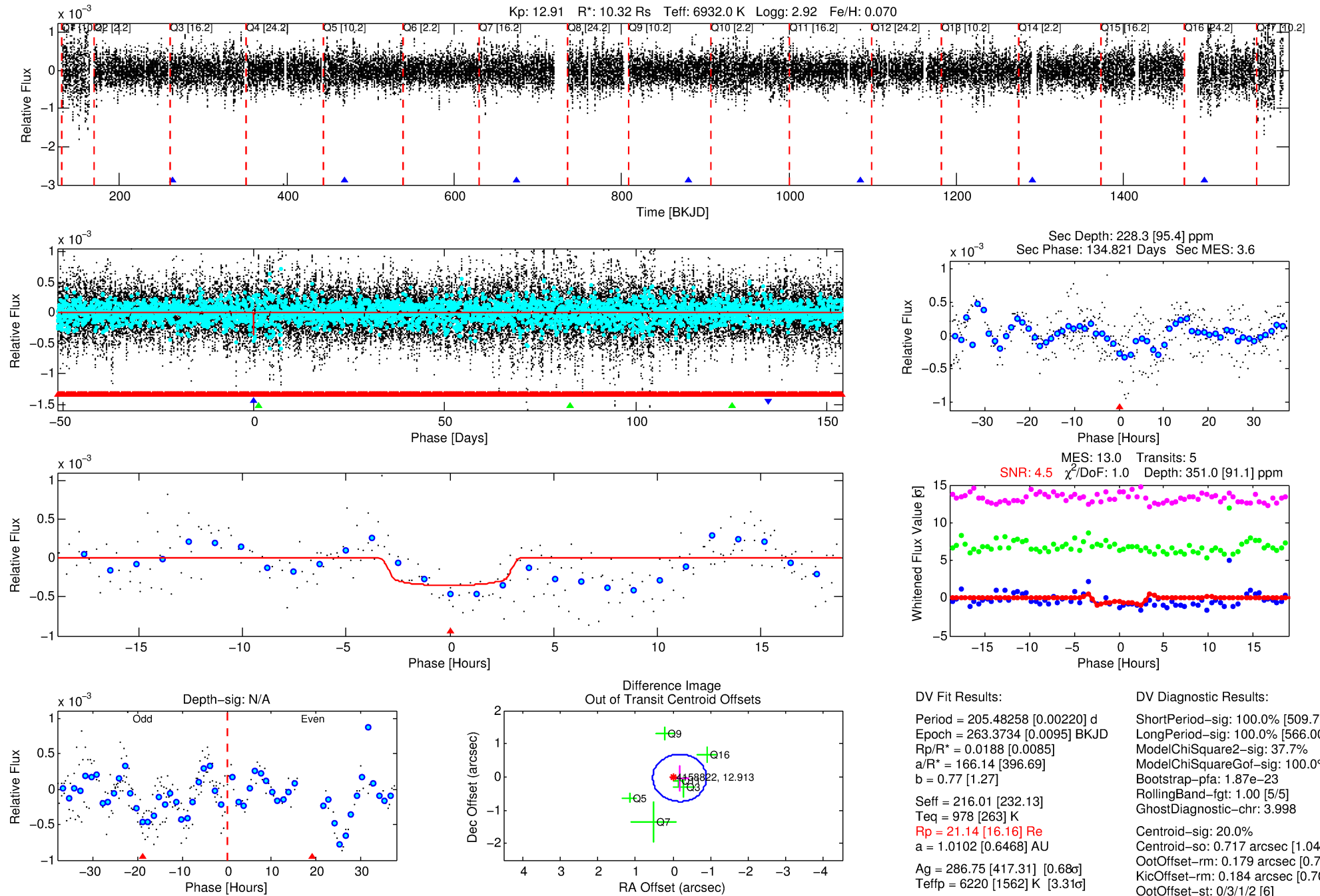
See http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col for comment definitions.

Ephemeris Match Information For 004158822-02

No Significant Match Found

DV One-Page Summary

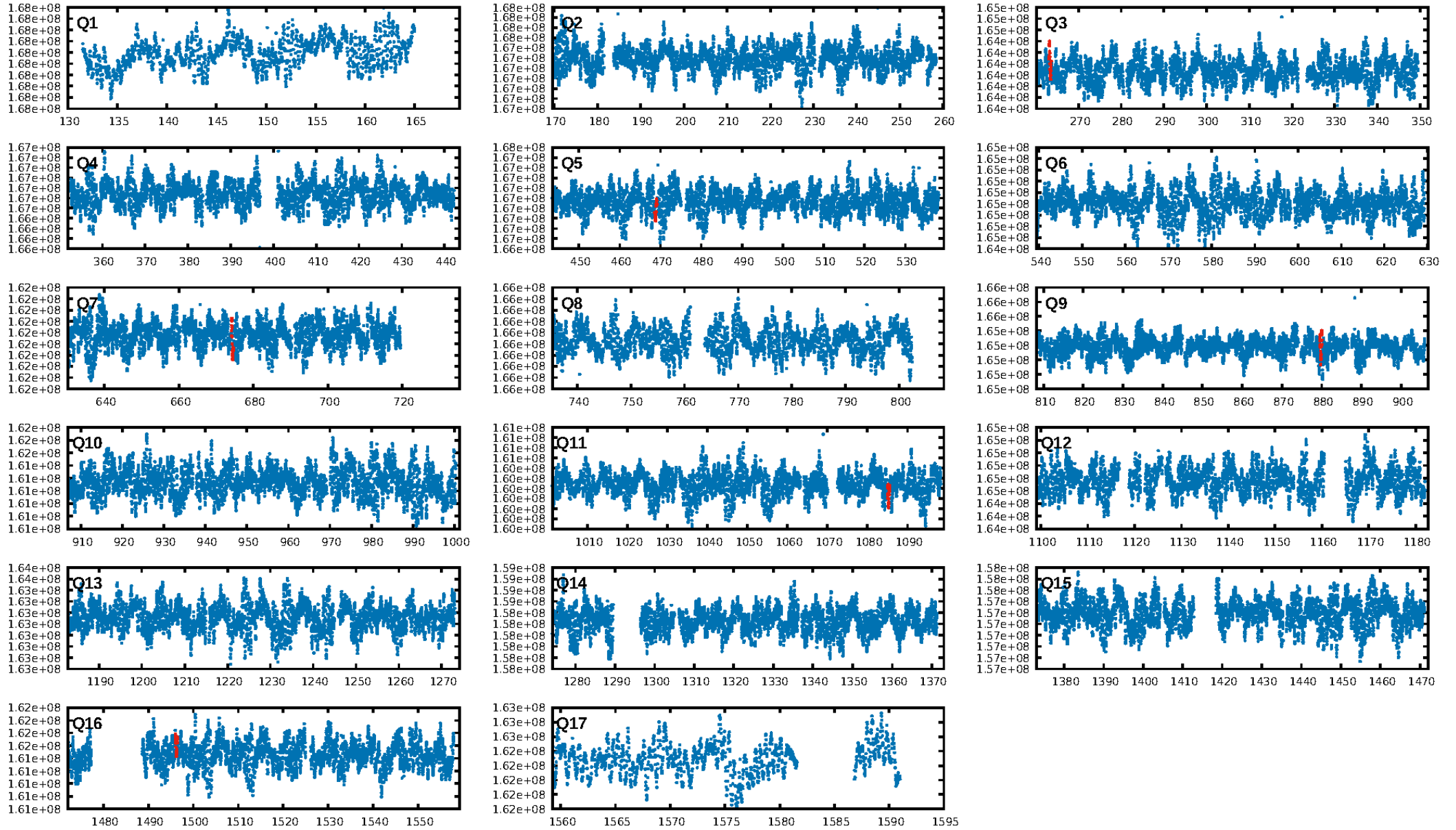
KIC: 4158822 Candidate: 2 of 3 Period: 205.483 d



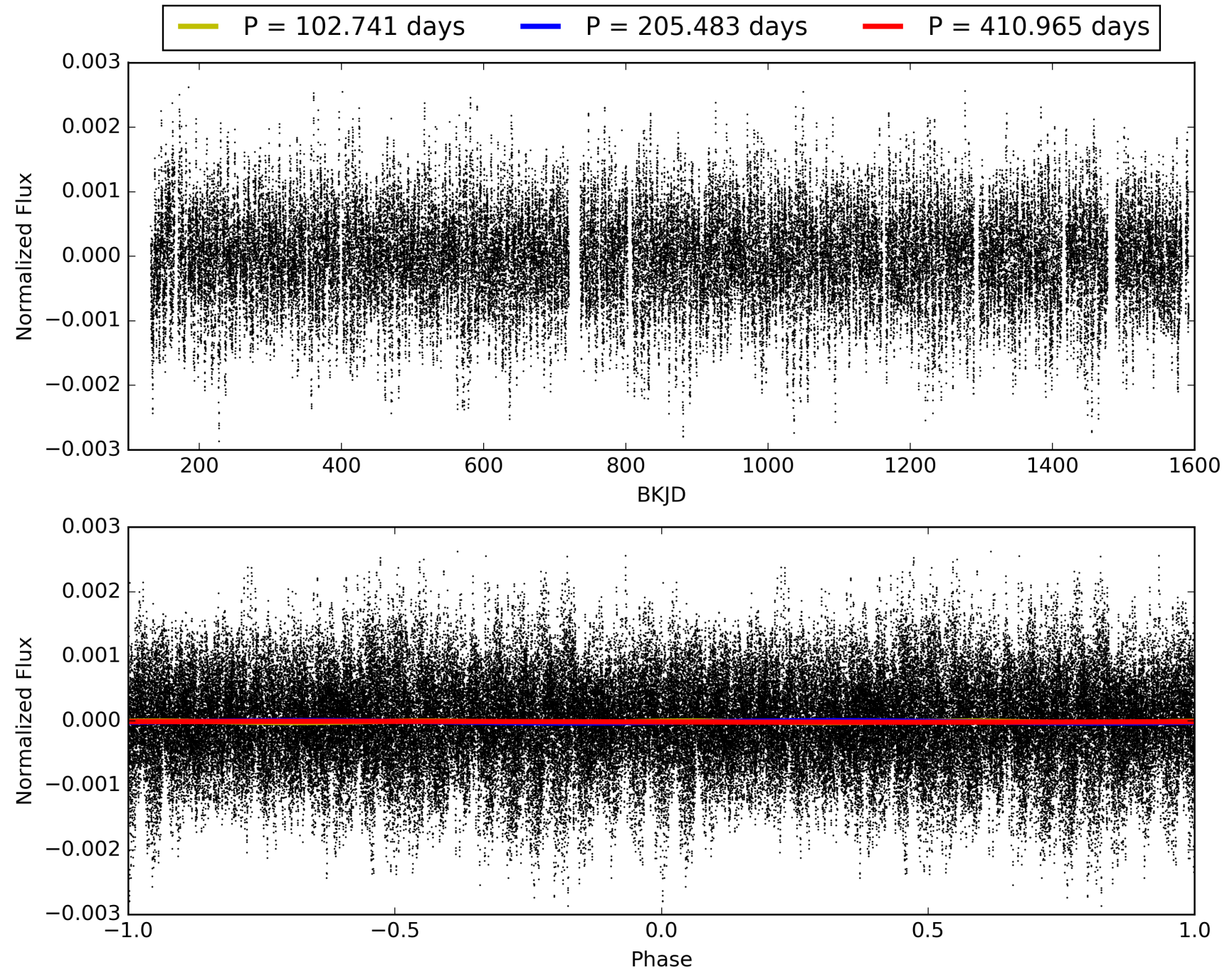
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 19:43:54 Z

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

TCE 004158822-02, PDC Light Curves

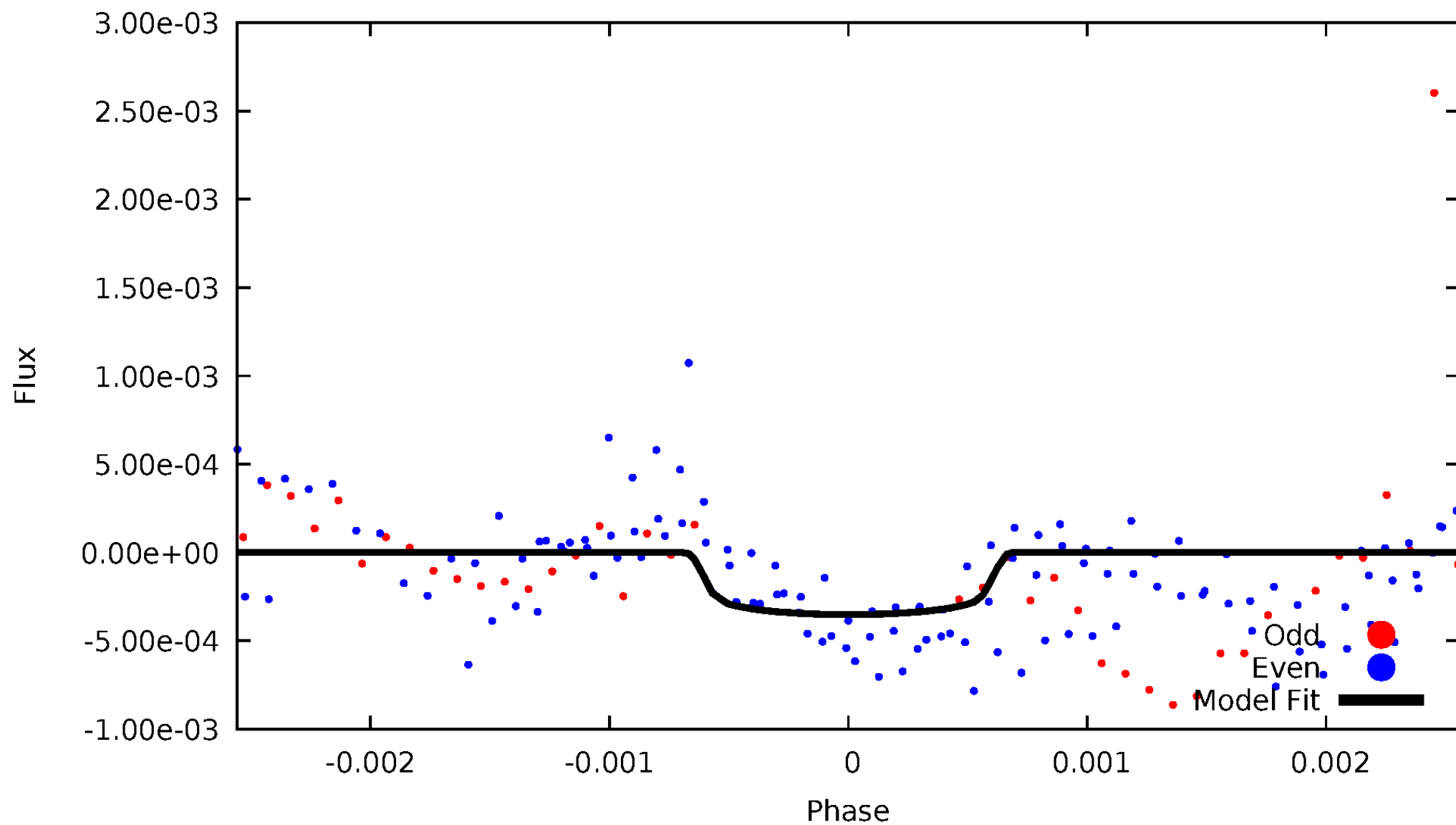


TCE 004158822-02



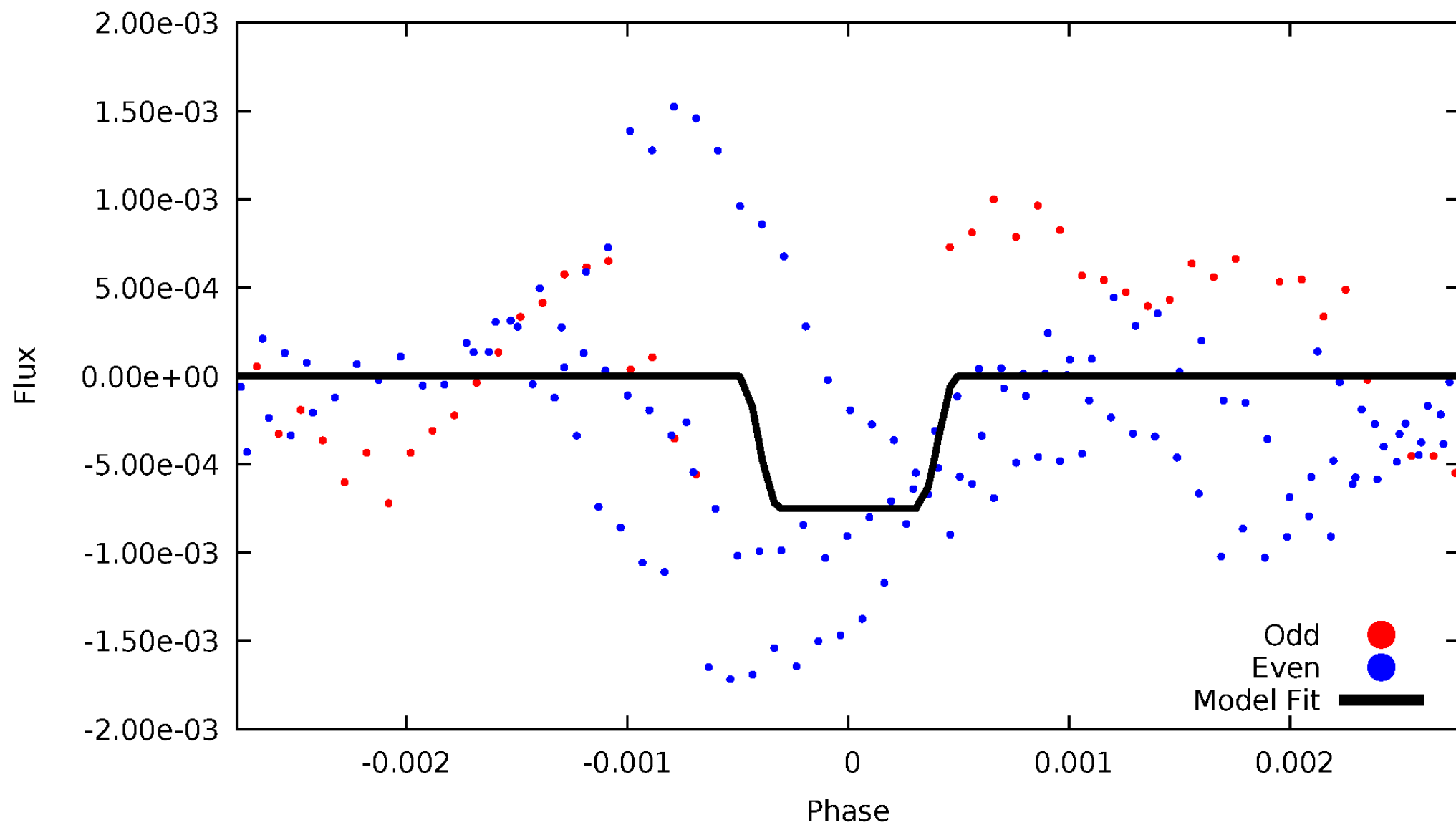
DV Odd/Even

TCE 004158822-02



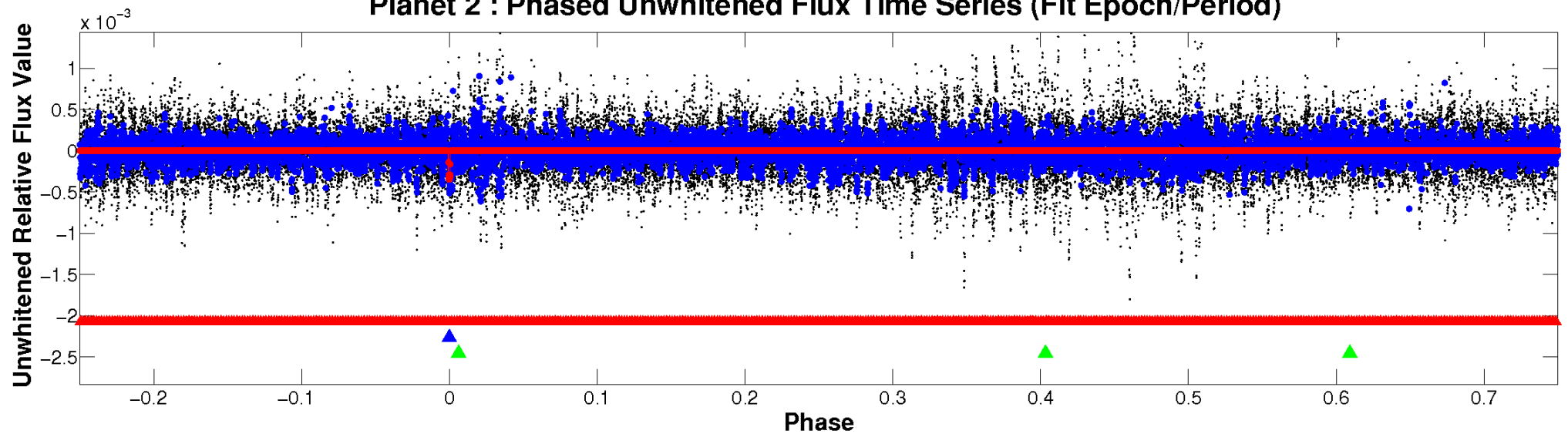
ALT Odd/Even

TCE 004158822-02

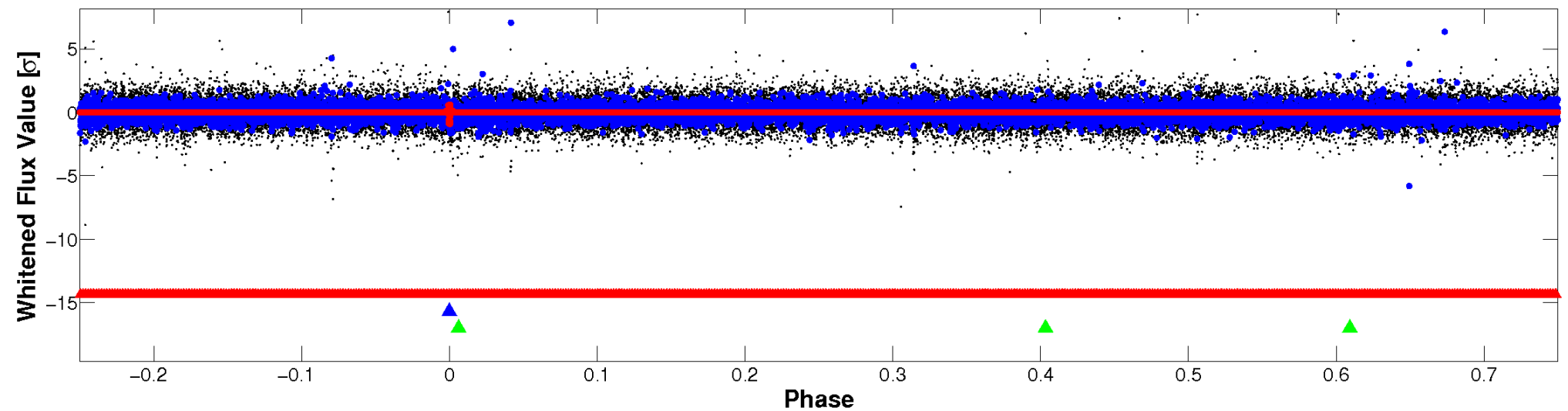


Non-Whitened Vs. Whitened Light Curve

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

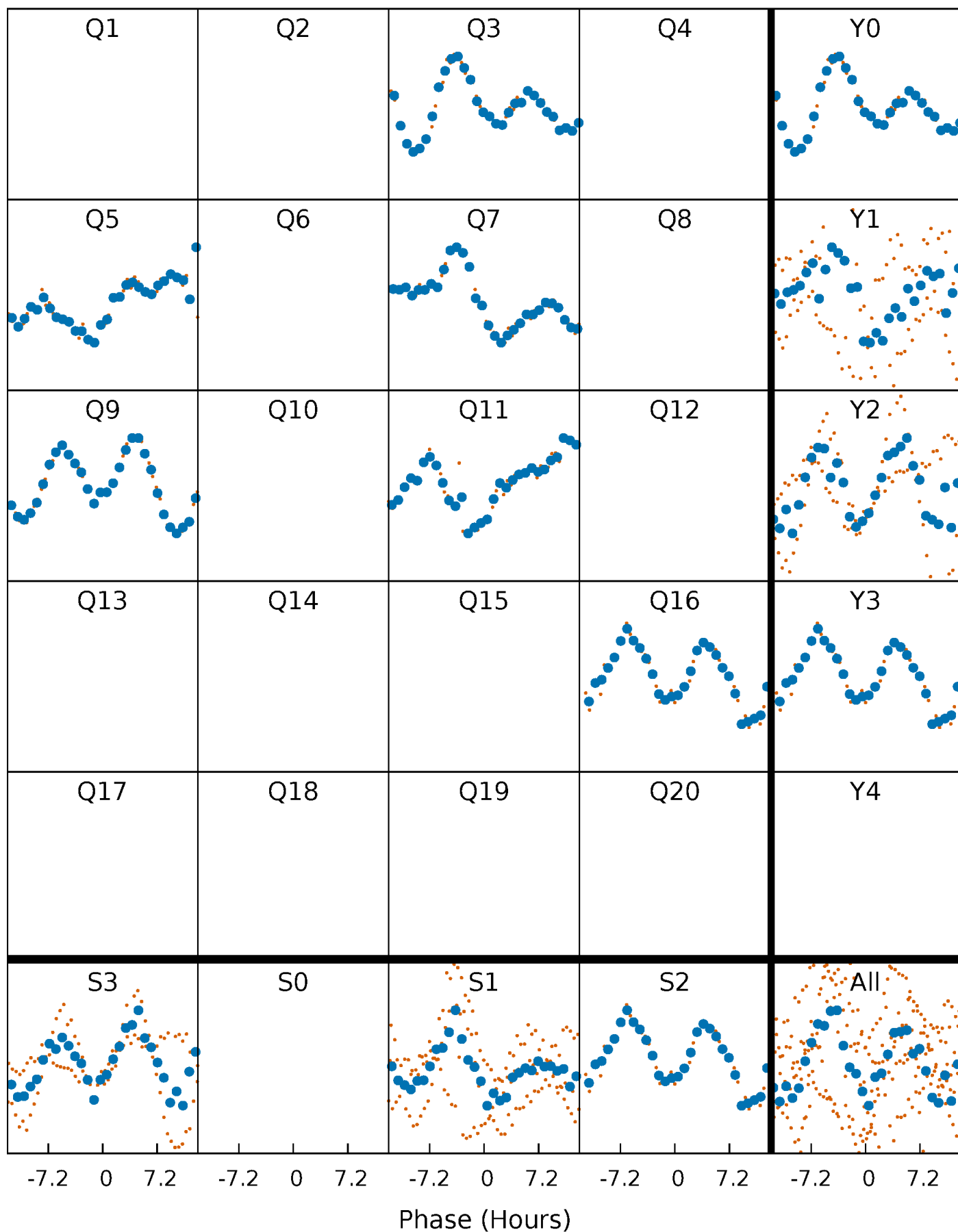


Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



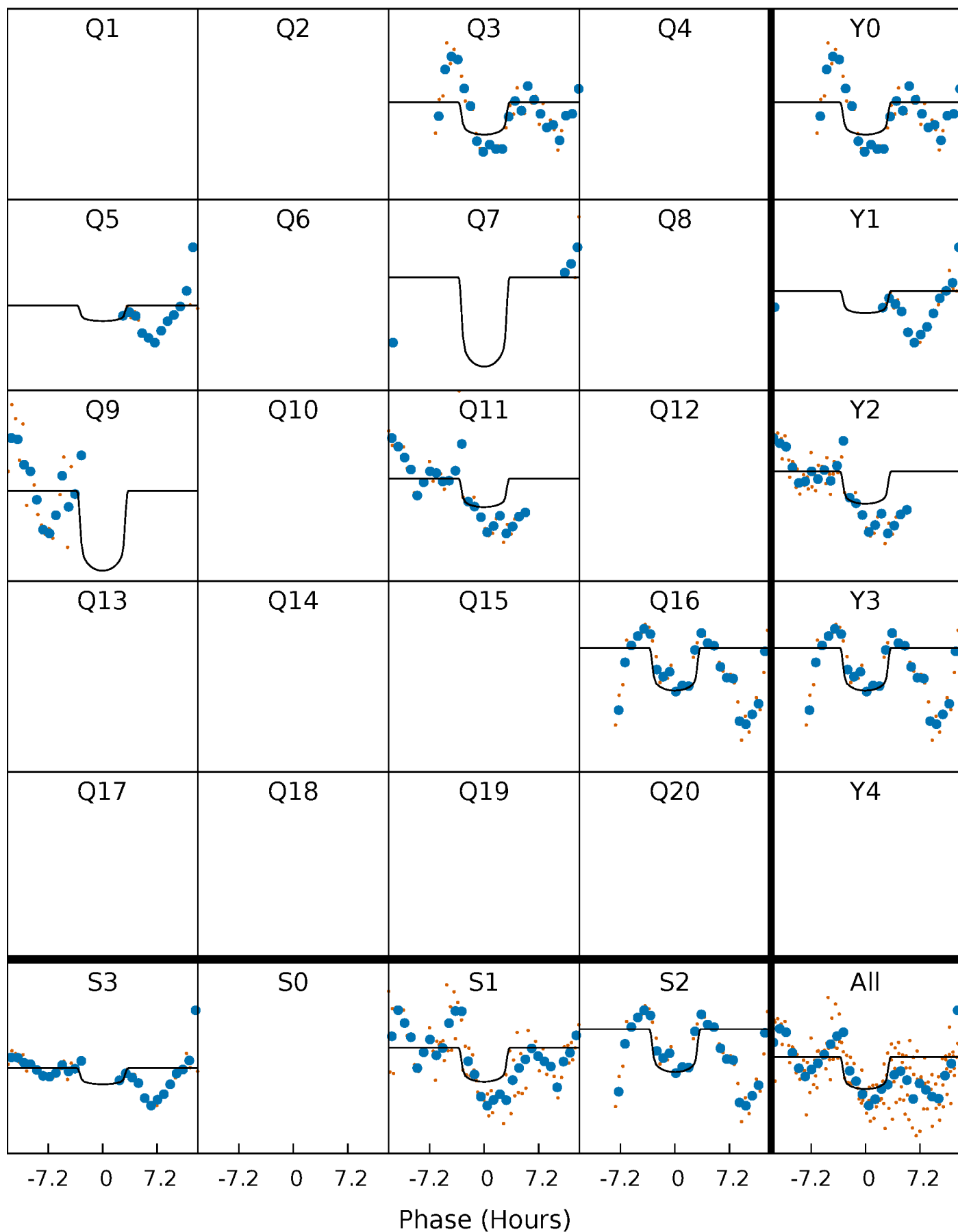
PDC Quarter-Phased Transit Curves

TCE 004158822-02 $P=205.482584$ Days $T_0=263.373448$ (BKJD)



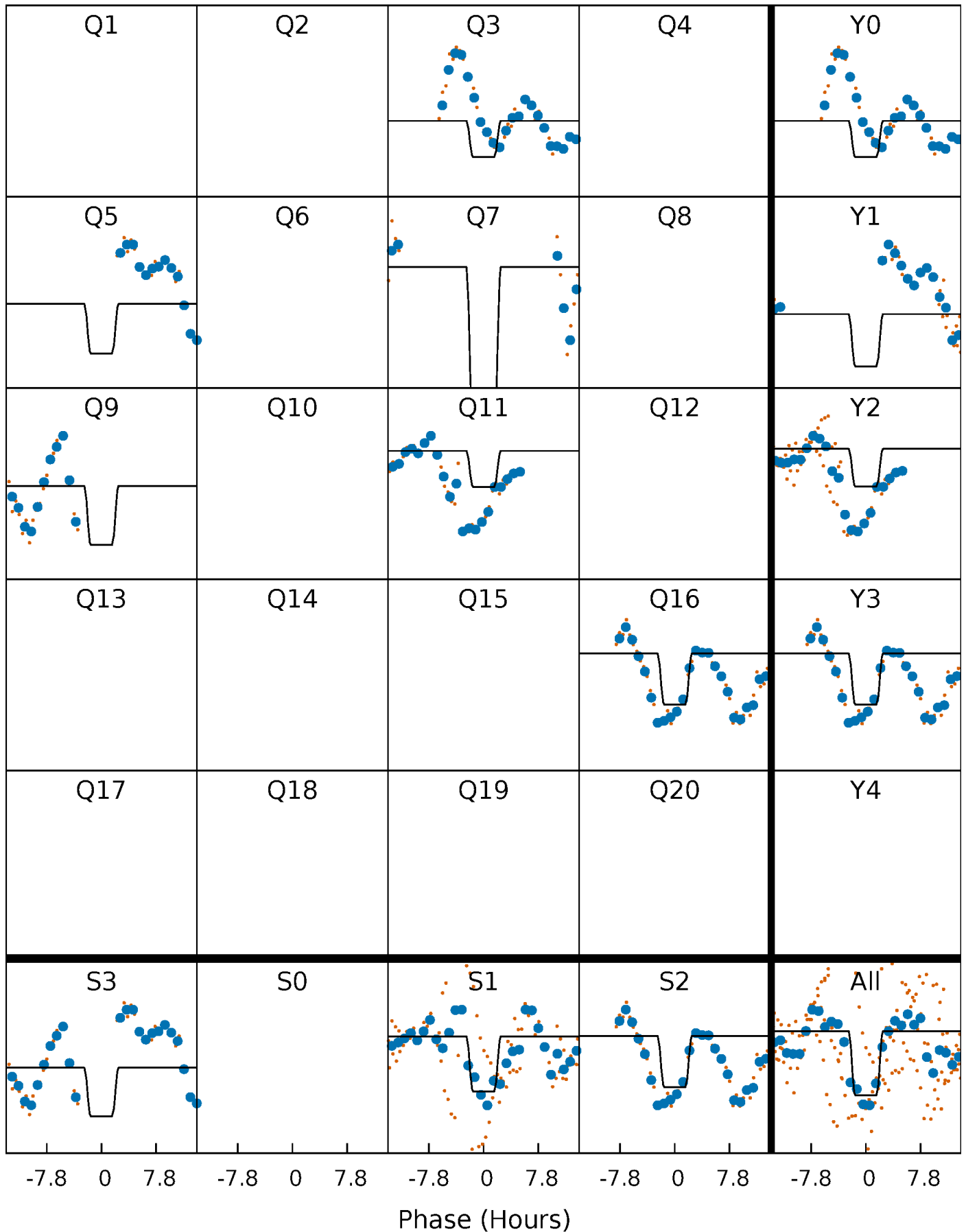
DV Quarter-Phased Transit Curves

TCE 004158822-02 $P=205.482584$ Days $T_0=263.373448$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

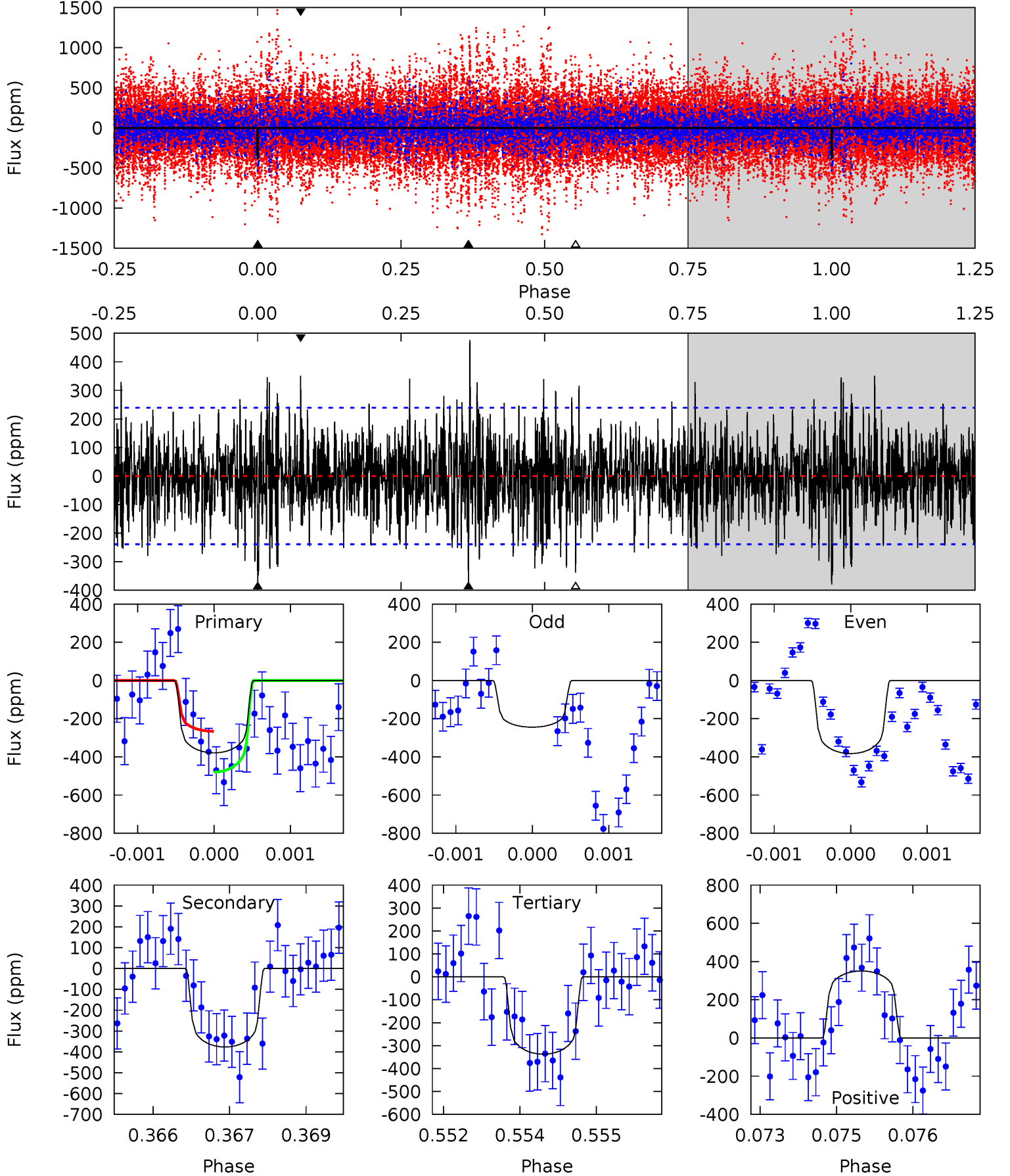
TCE 004158822-02 P=205.486691 Days $T_0=263.370245$ (BKJD)



DV Model-Shift Uniqueness Test

004158822-02, $P = 205.482584$ Days, $E = 57.890864$ Days

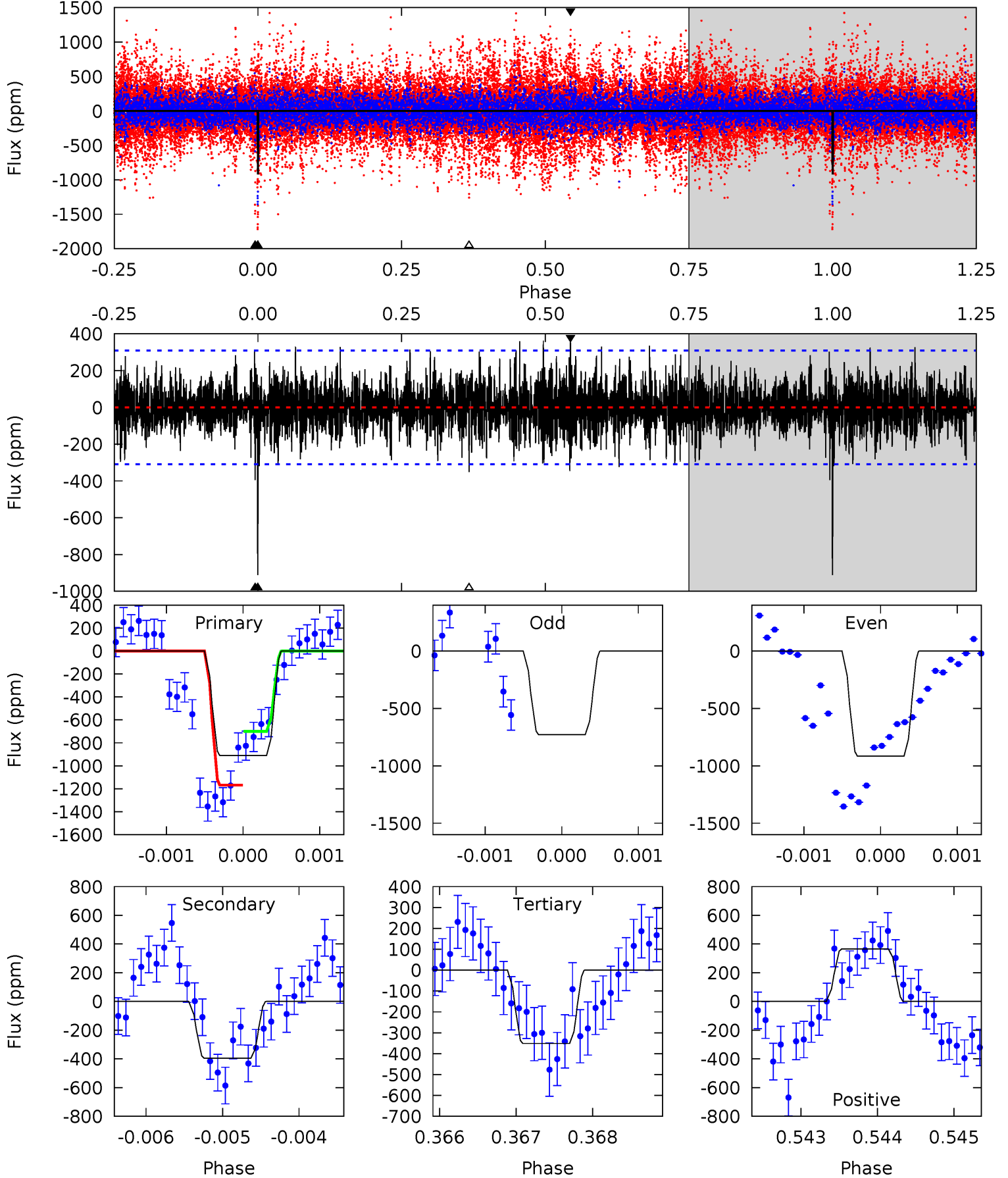
Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
8.57	8.52	7.63	7.93	5.40	3.21	2.31	0.94	0.64	0.89	0.59	0.83	1.08	0.56	2.42



Alt Model-Shift Uniqueness Test

004158822-02, P = 205.486691 Days, E = 57.883554 Days

Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
16.1	6.96	6.20	6.45	5.45	3.29	1.78	9.87	9.61	0.76	0.51	0.60	0.87	0.29	4.09



Stellar Parameters For KIC 004158822

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	R (R_{\odot})	$M(M_{\odot})$	p_{\star} ($\text{g}\cdot\text{cm}^{-3}$)
	6932^{+168}_{-264}	$2.923^{+0.639}_{-0.071}$	$0.070^{+0.200}_{-0.550}$	$10.322^{+1.125}_{-6.373}$	$3.255^{+0.080}_{-1.439}$	$0.004^{+0.043}_{-0.001}$
	+2%/-4%	+22%/-2%	+286%/-786%	+11%/-62%	+2%/-44%	+1042%/-24%
Source	PHO1	FLK73	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 004158822-02 / KOI

Detrend	Depth (ppm)	R_p (R_{\oplus})	T_{max} (K)	T_{obs} (K)	A_{obs}
DV	-377 ± 44	$17.34^{+11.19}_{-8.36}$	1306^{+93}_{-207}	7033^{+3222}_{-1330}	656^{+1733}_{-402}
Alt.	-395 ± 57	$26.12^{+11.07}_{-10.09}$	1312^{+92}_{-203}	5886^{+1196}_{-755}	308^{+477}_{-157}

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 $A_{\text{obs}} \gg 1.0$

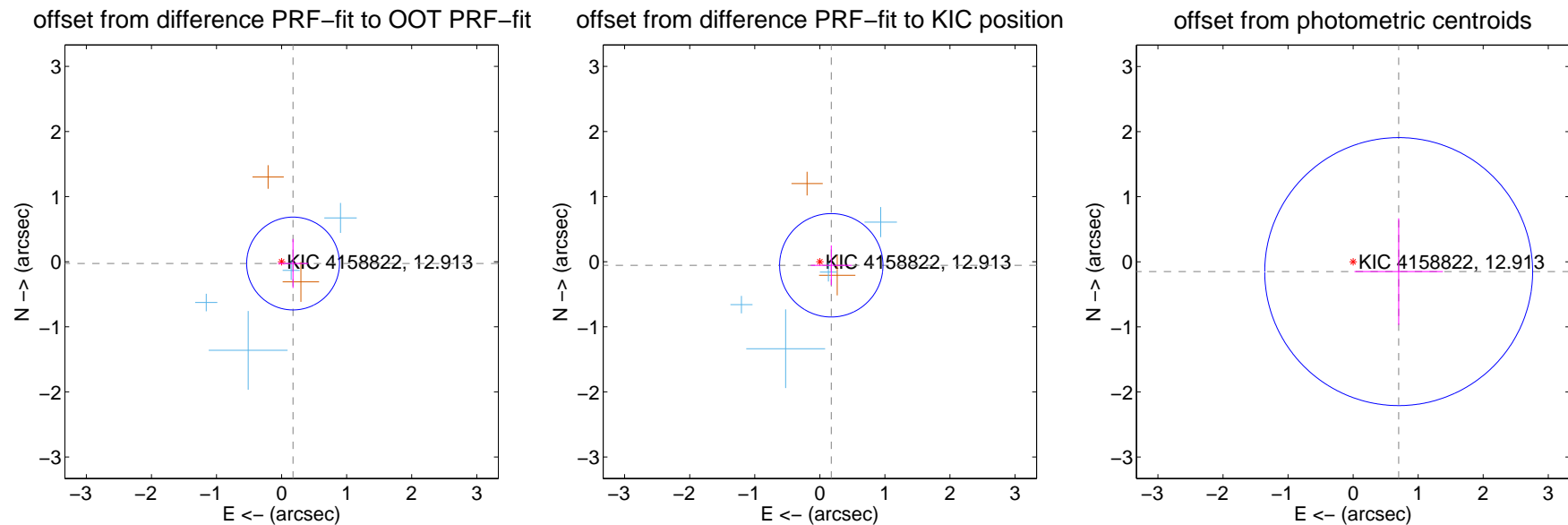
DV Centroid Data

Supplemental centroid analysis for 004158822-02. Kepler magnitude: 12.91. Transit SNR 4.48

There are 4 quarters with good PRF difference image offsets

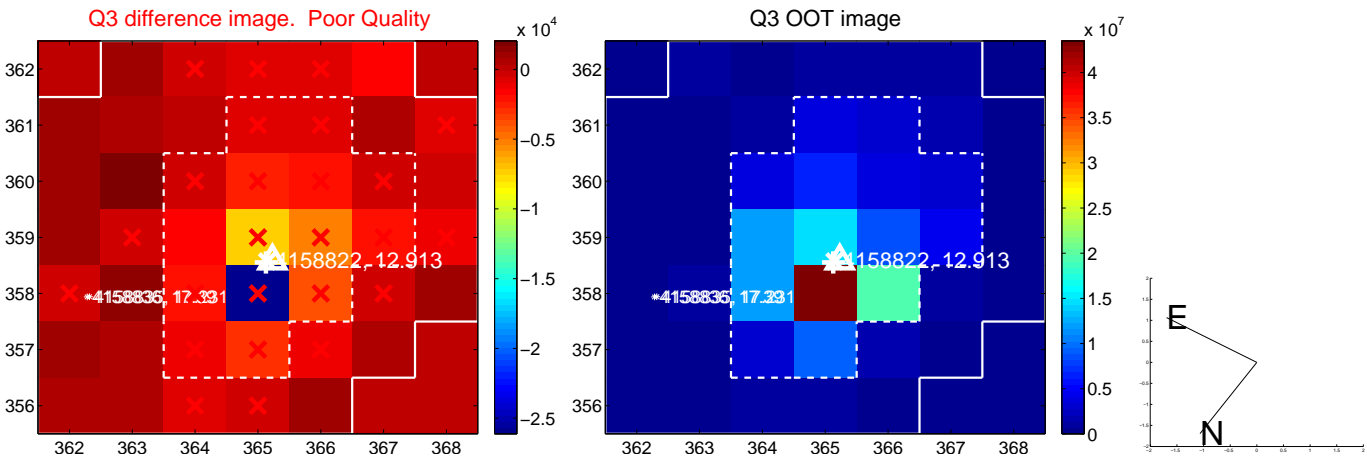
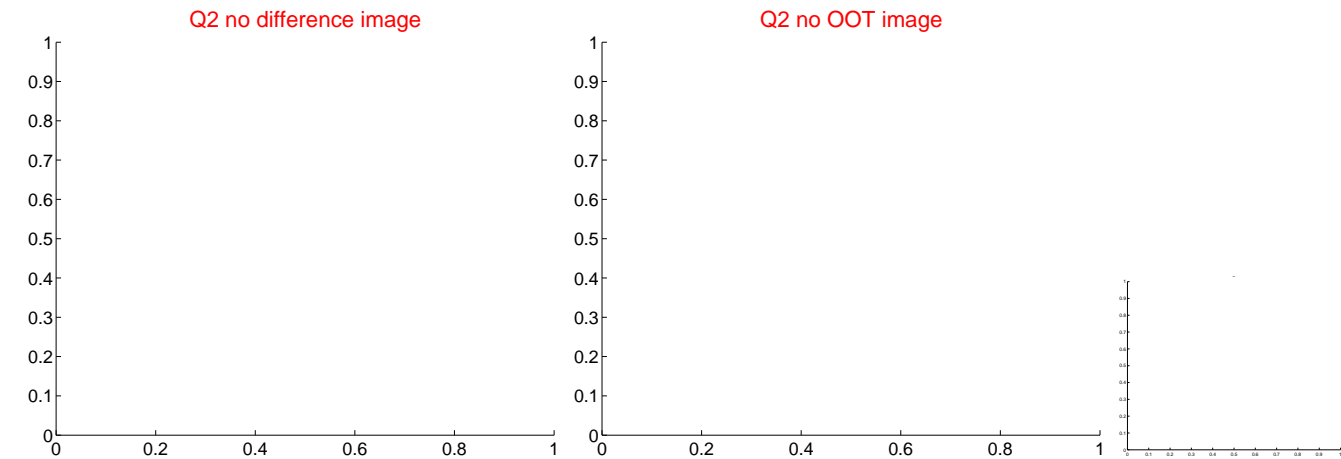
The direct PRF centroid is offset from the target star catalog position by about 0.07 arcsec

	Distance in arcsec	Distance / σ	Δ RA	Δ Dec
PRF-fit source offset from OOT	0.179 ± 0.238	0.75	-0.177 ± 0.233	-0.028 ± 0.377
PRF-fit source offset from KIC position	0.184 ± 0.265	0.70	-0.176 ± 0.315	-0.055 ± 0.305
photometric centroid source offset	0.72 ± 0.69	1.04	-0.70 ± 0.68	-0.15 ± 0.82

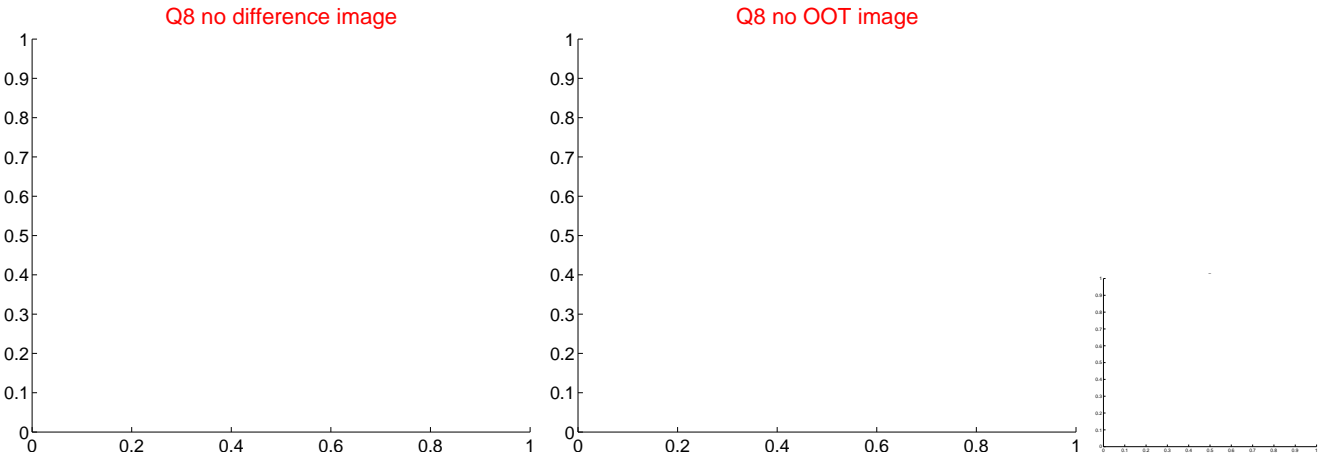
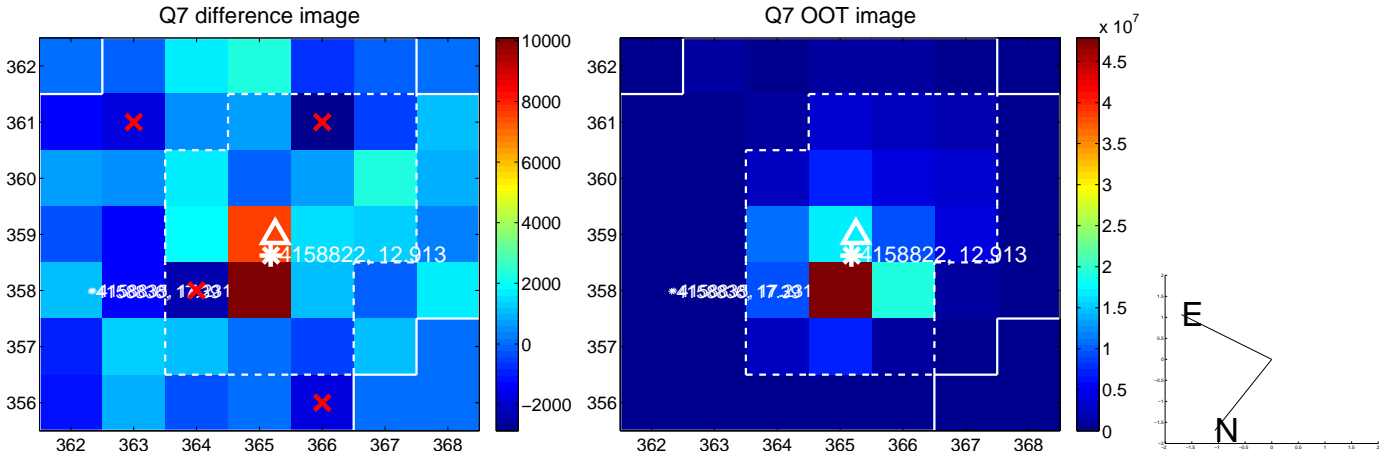
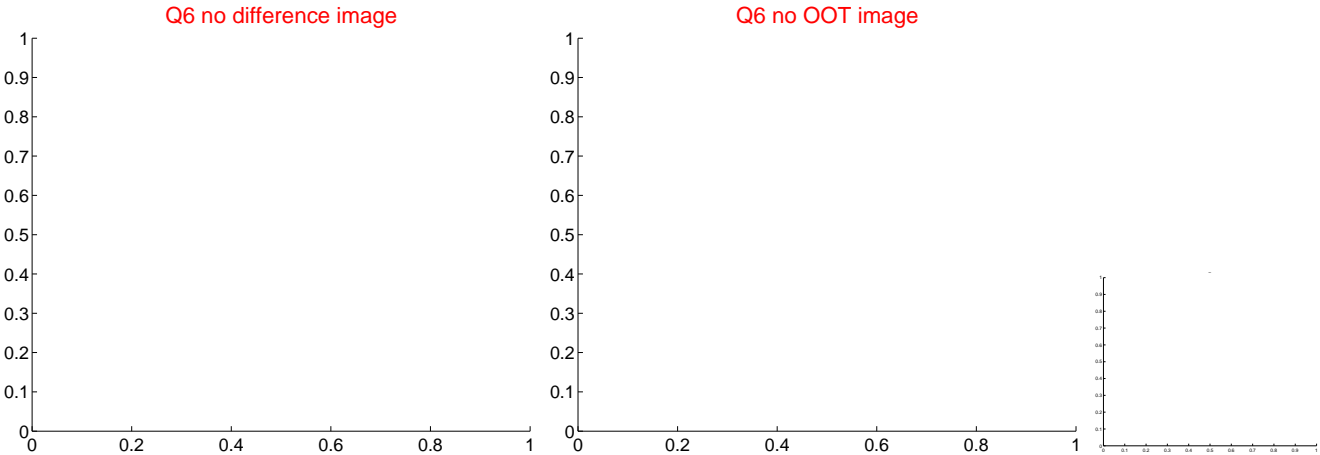
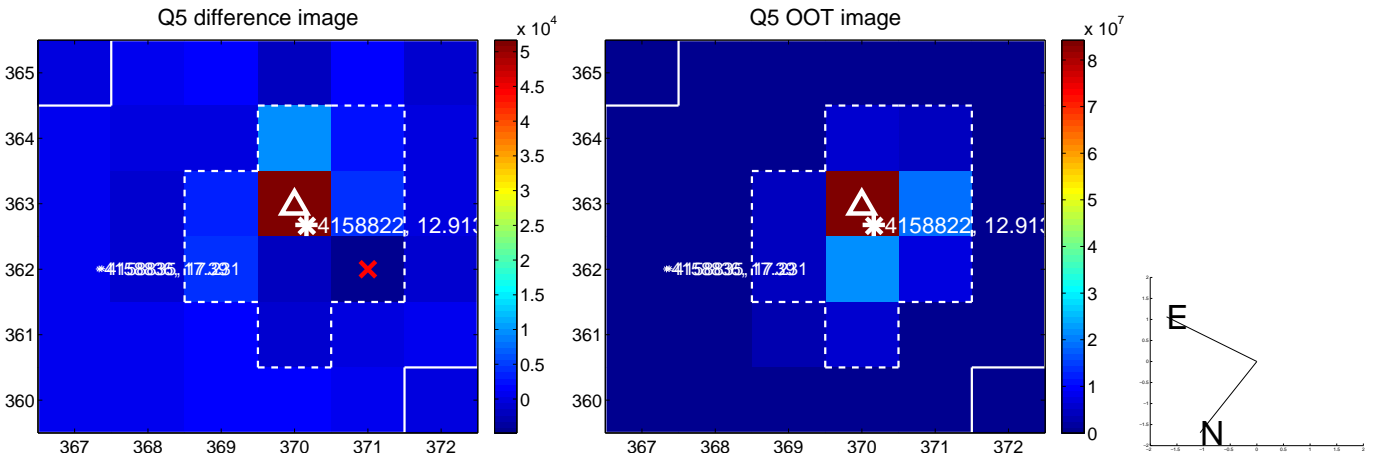


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three-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

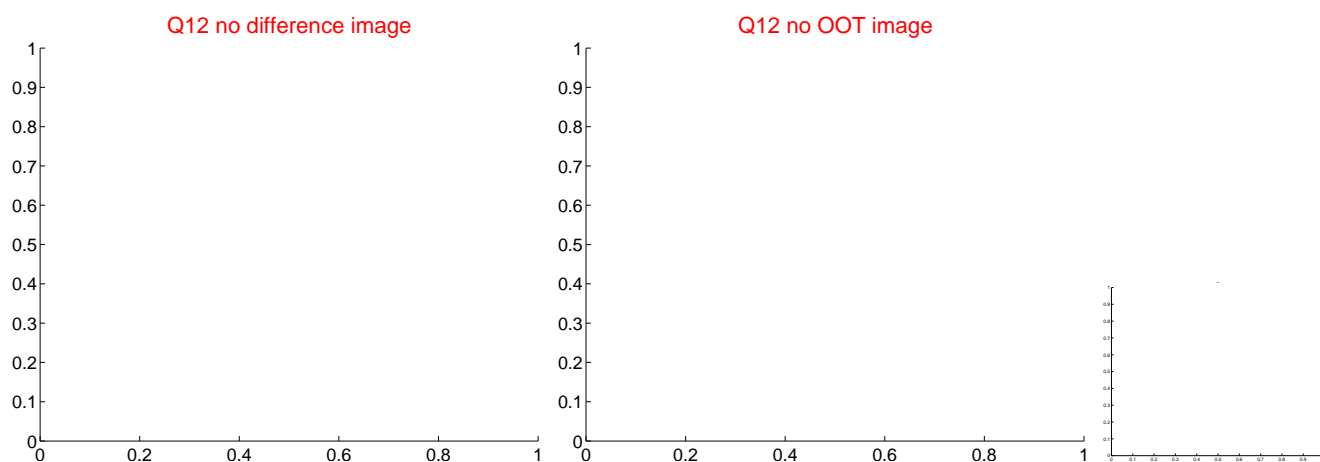
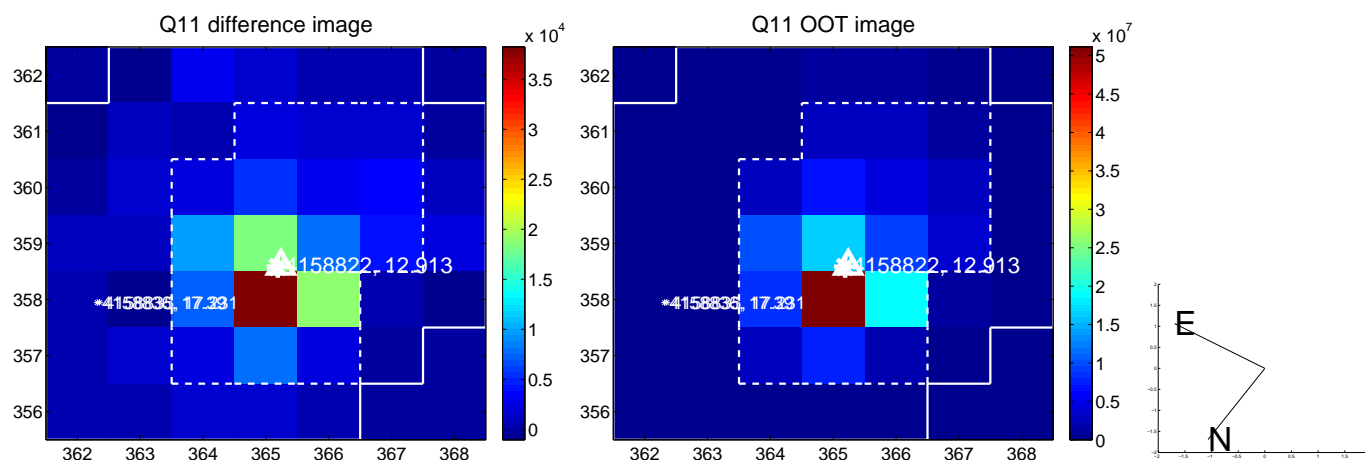
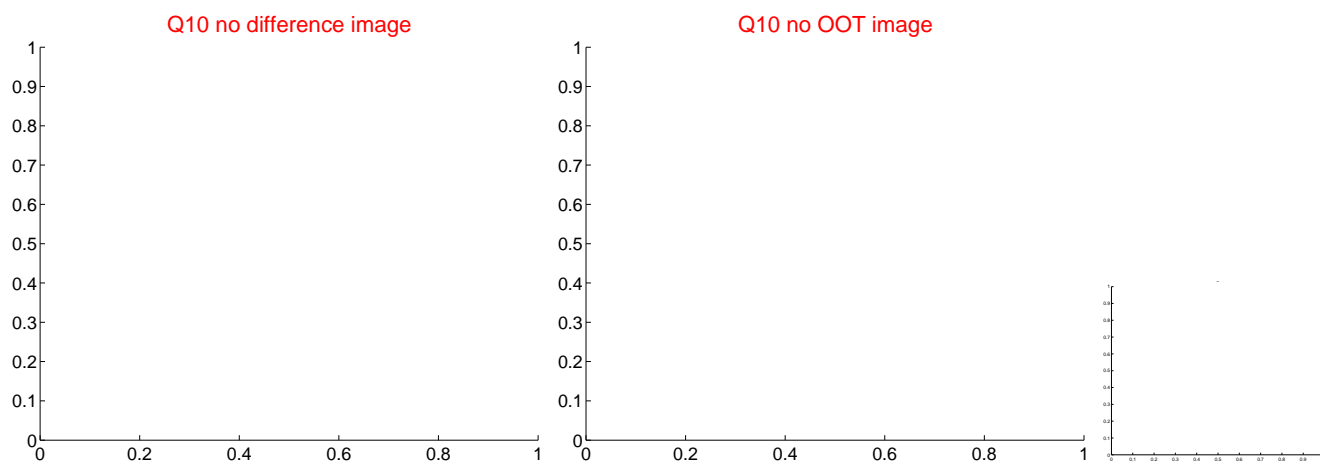
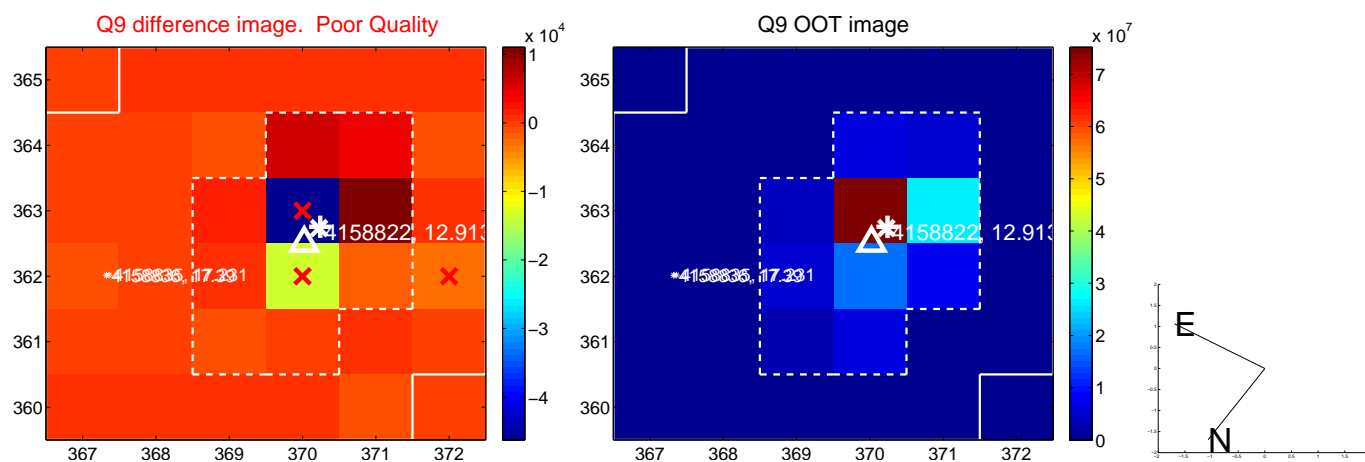
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



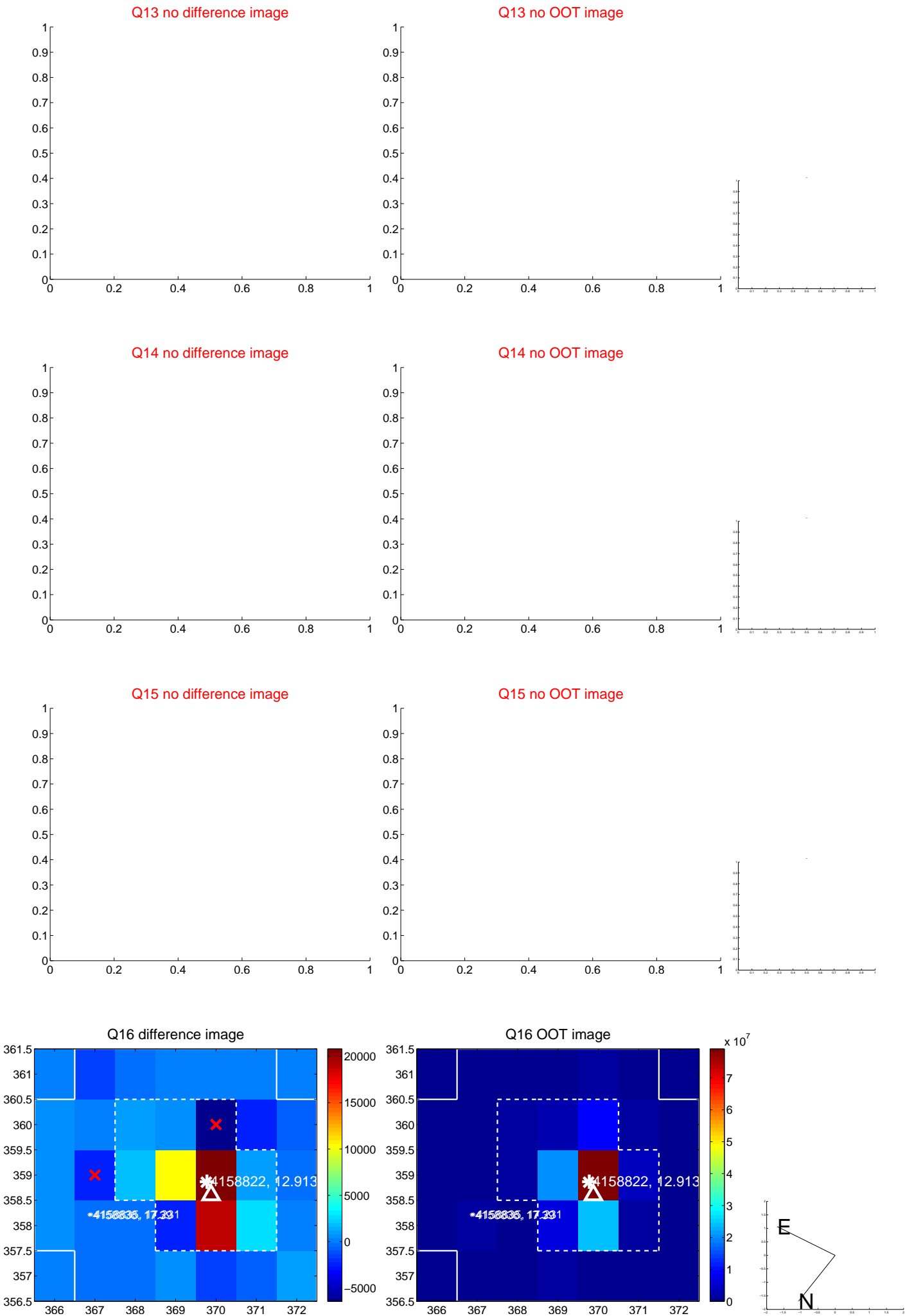
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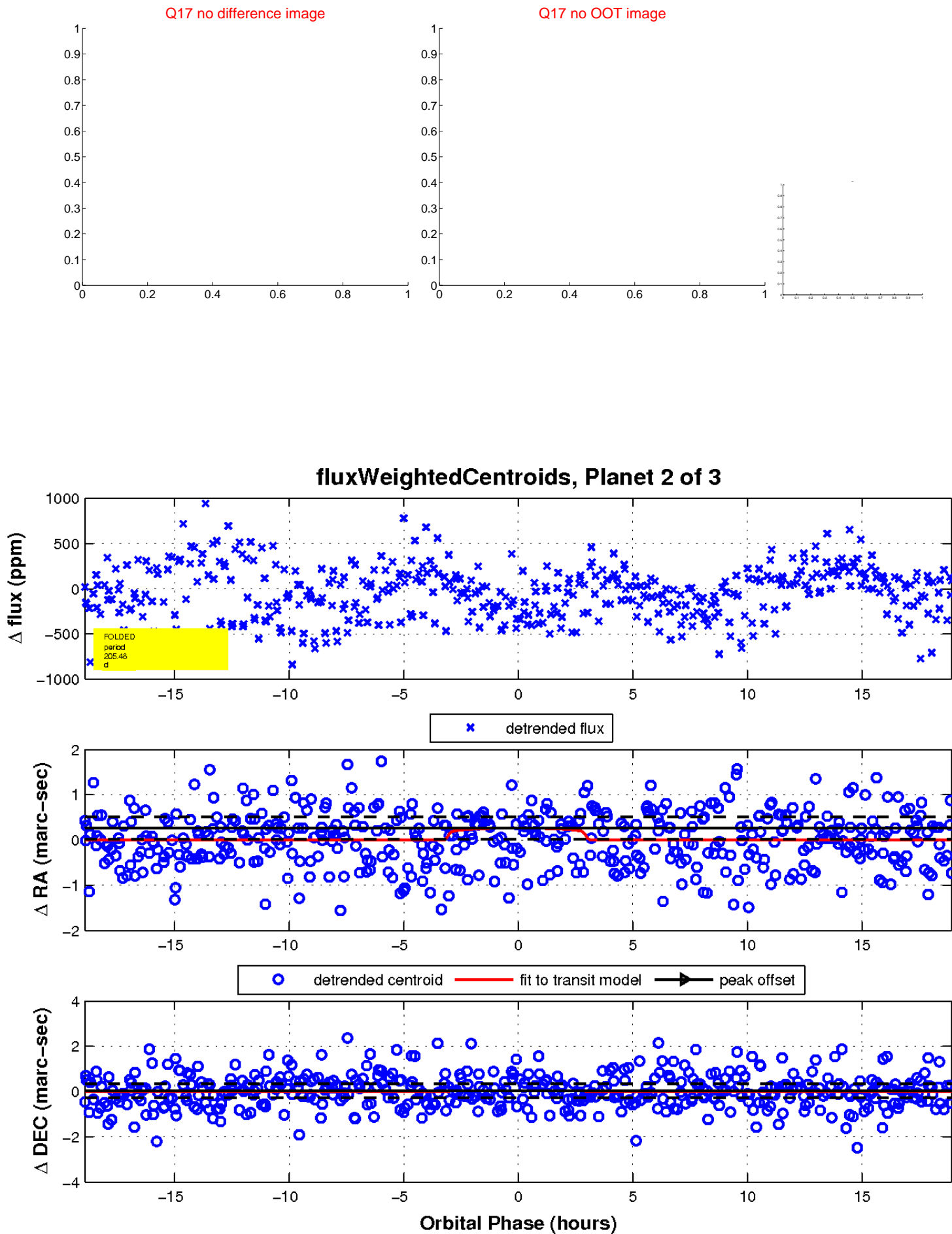
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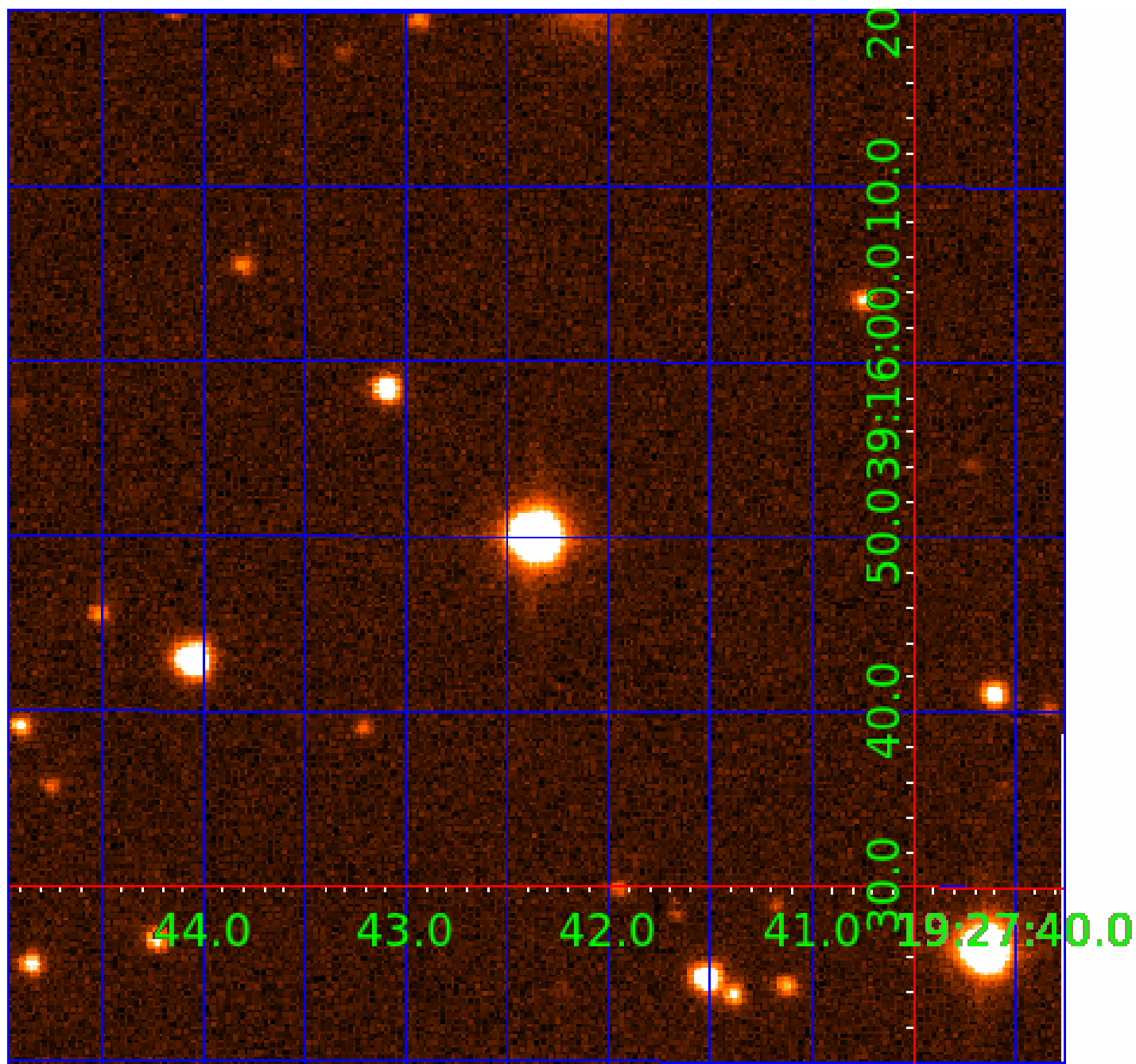


white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



UKIRT Image

Declination



KIC 004158822

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})
004158822-01	OBS	No	2.213356	132.047298	72.5	7.198	8.8	8.4	10.32	6932	16.88	90803.52
004158822-02	OBS	No	205.482584	263.373448	351.0	6.308	13.0	4.5	10.32	6932	21.14	216.01
004158822-03	OBS	No	492.551527	594.046151	598.3	10.411	9.9	6.0	10.32	6932	30.35	67.33

Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004158822-01	OBS	FP	0.00	1	0	0	0	LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT
004158822-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—MARSHALL_TRACKER—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—INCONSISTENT_TRANS
004158822-03	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS—HALO_GHOST

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

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

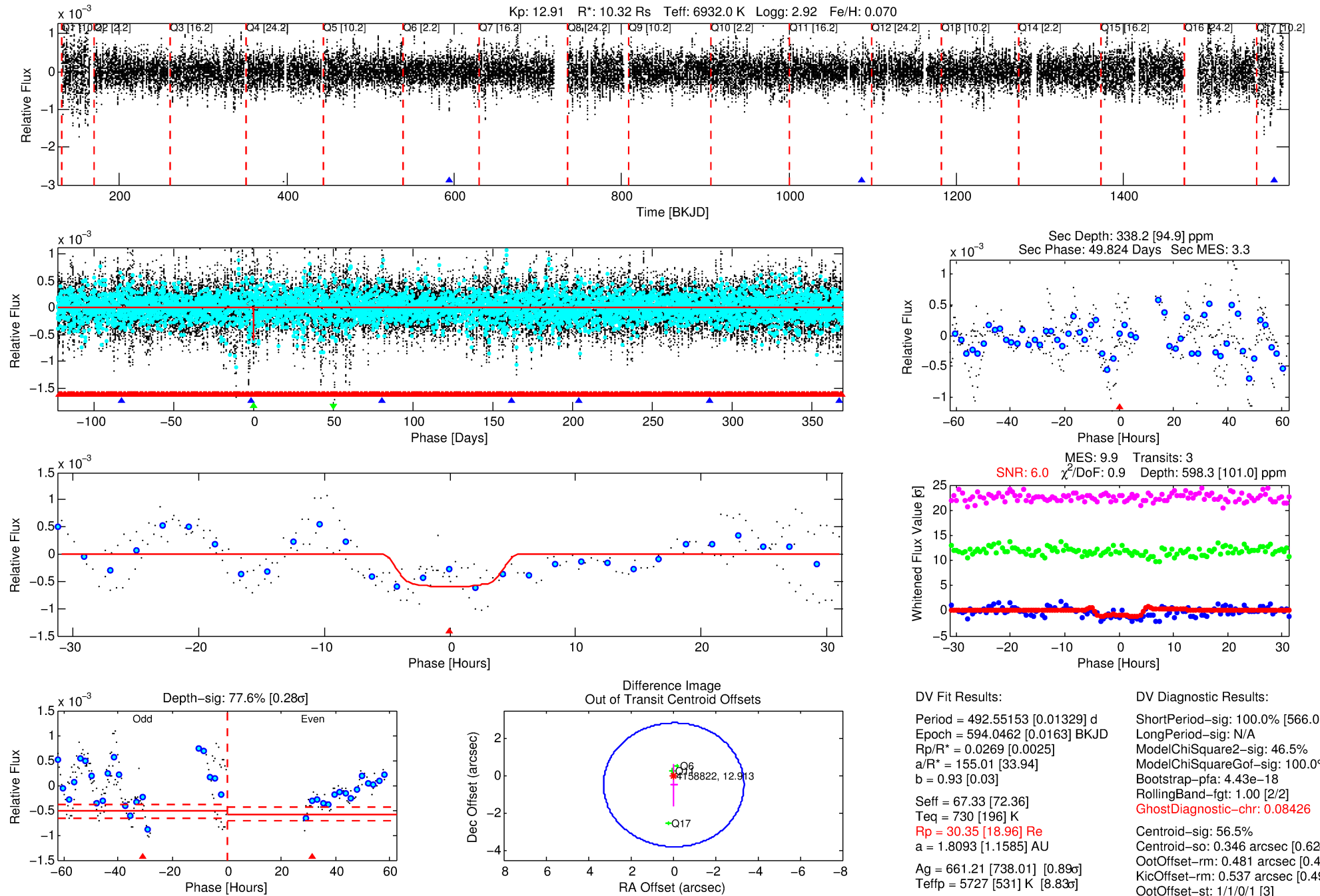
See http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col for comment definitions.

Ephemeris Match Information For 004158822-03

No Significant Match Found

DV One-Page Summary

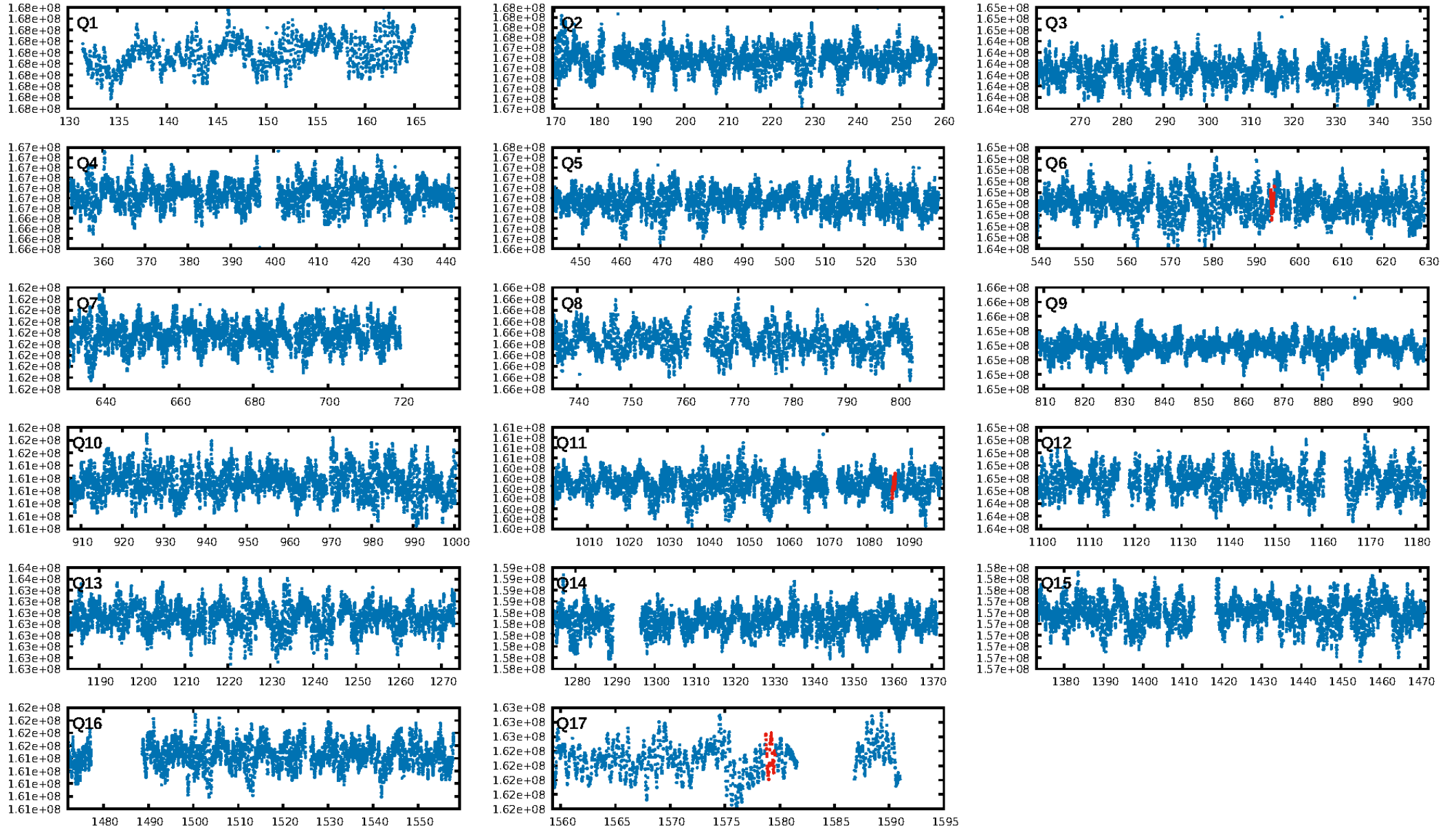
KIC: 4158822 Candidate: 3 of 3 Period: 492.552 d



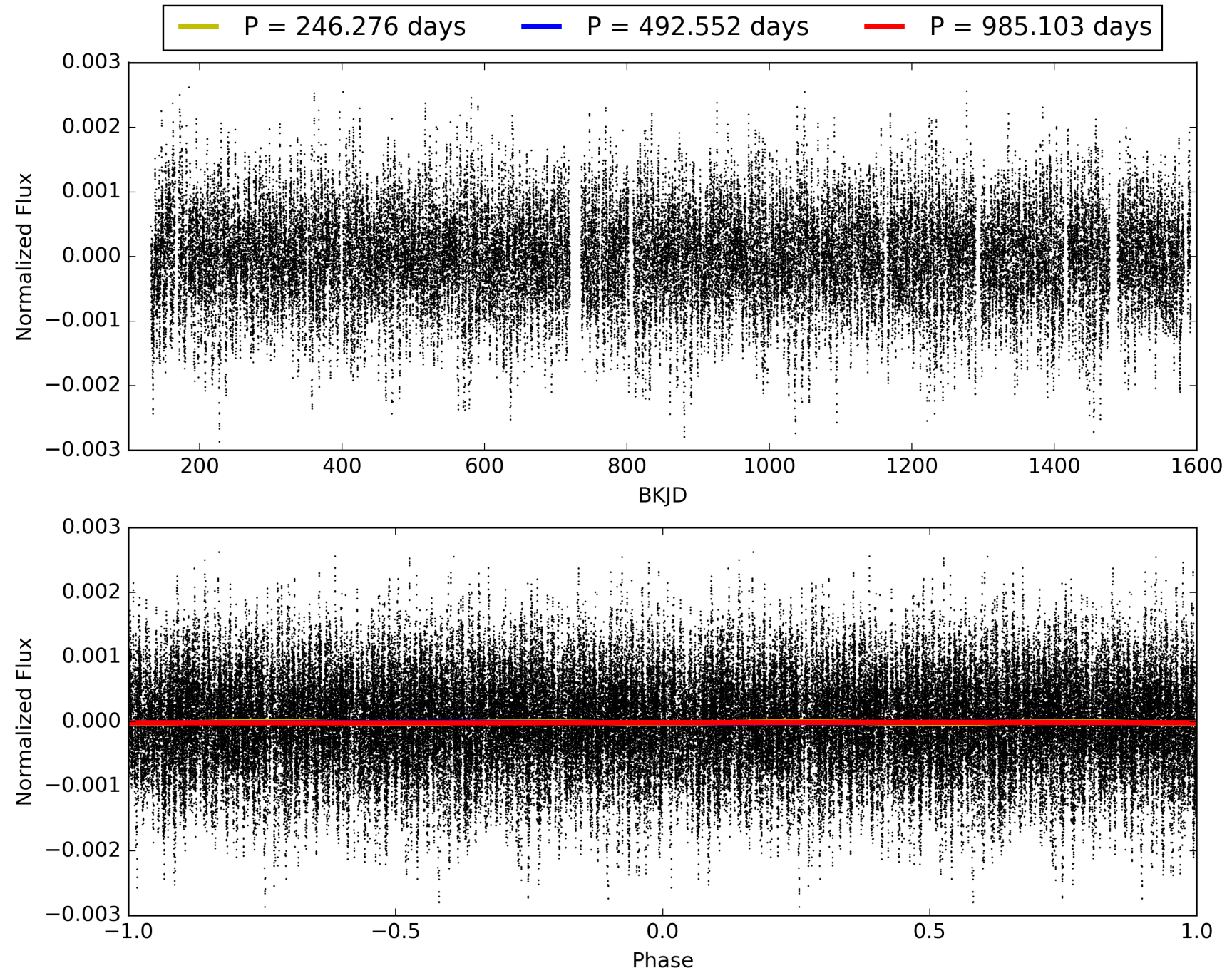
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 19:44:01 Z

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

TCE 004158822-03, PDC Light Curves

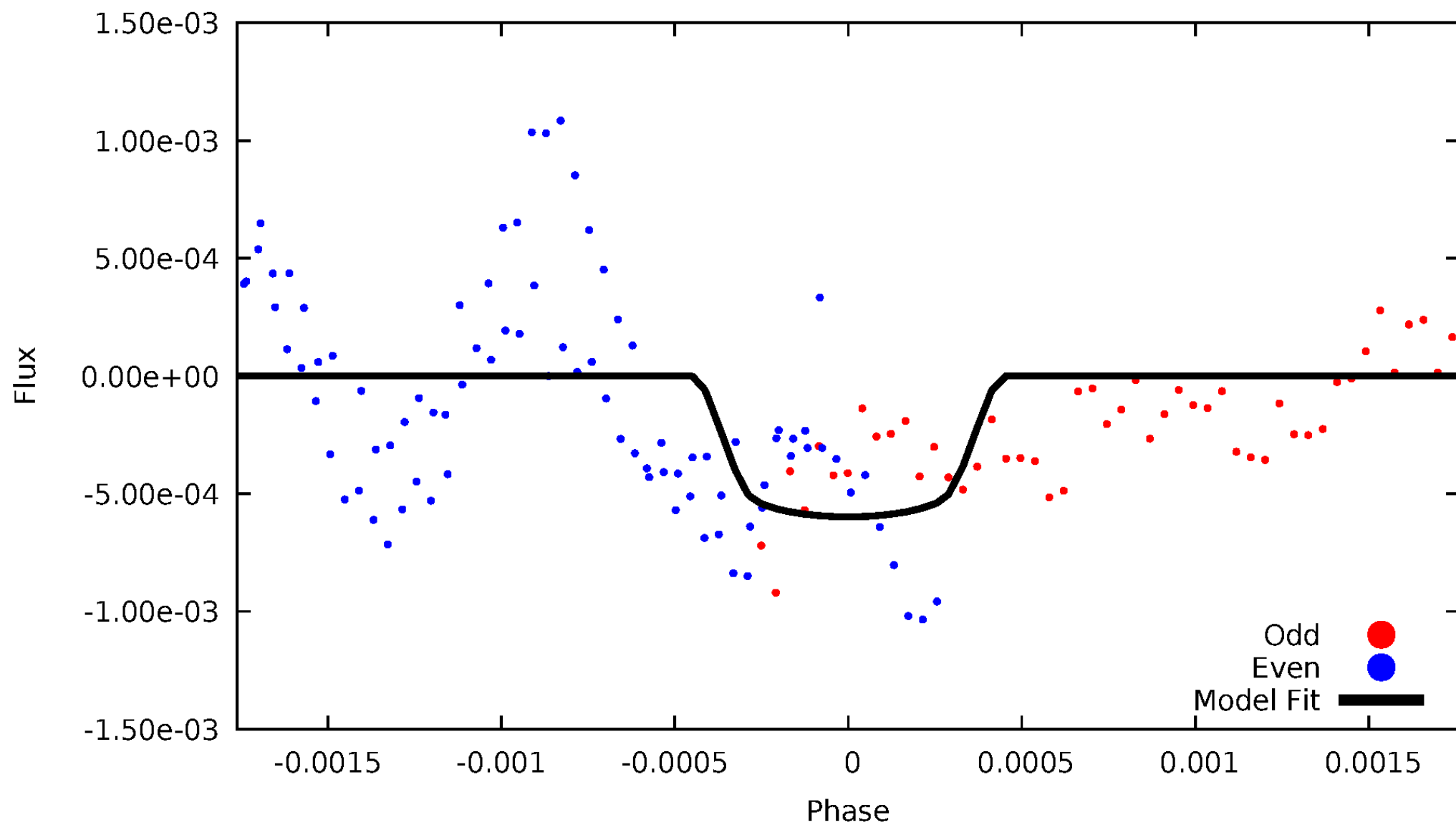


TCE 004158822-03



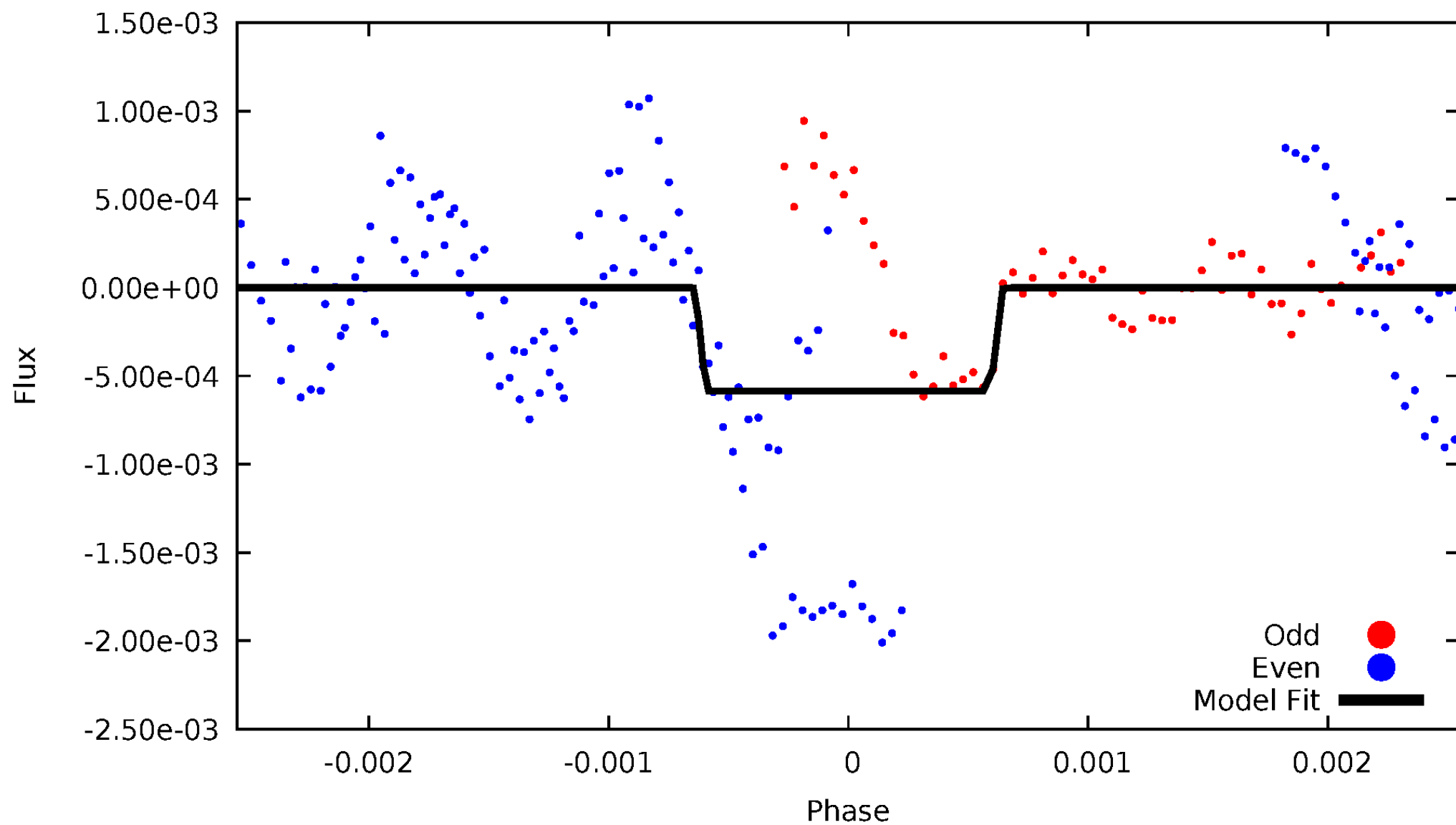
DV Odd/Even

TCE 004158822-03



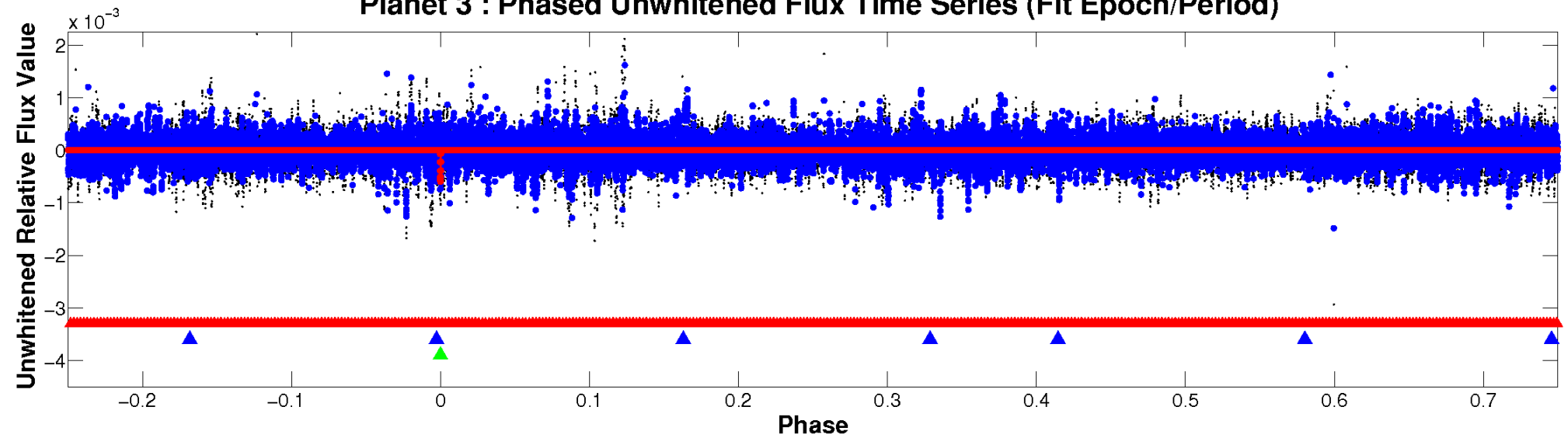
ALT Odd/Even

TCE 004158822-03

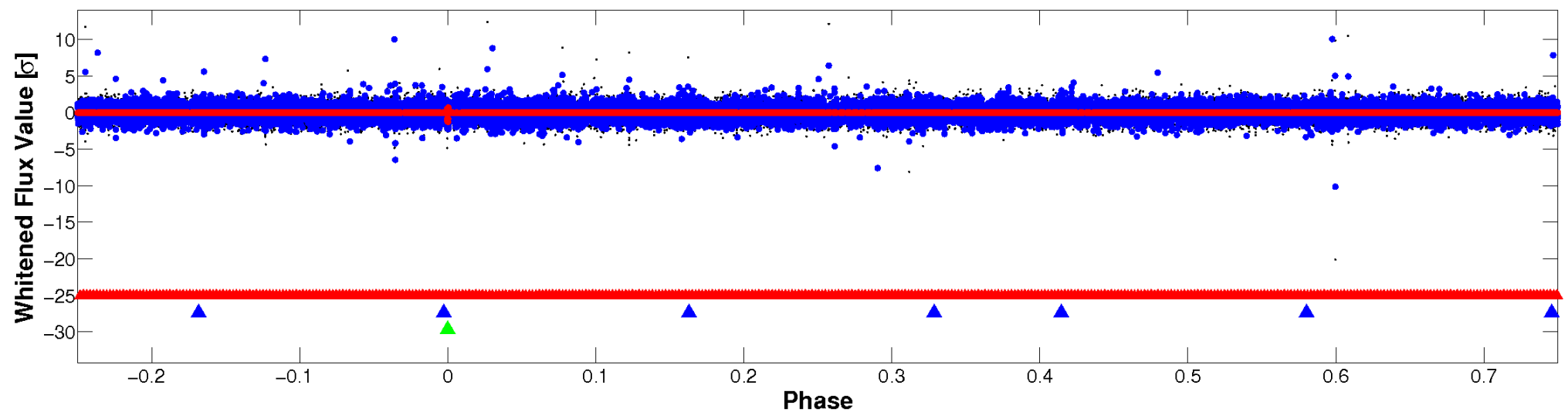


Non-Whitened Vs. Whitened Light Curve

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

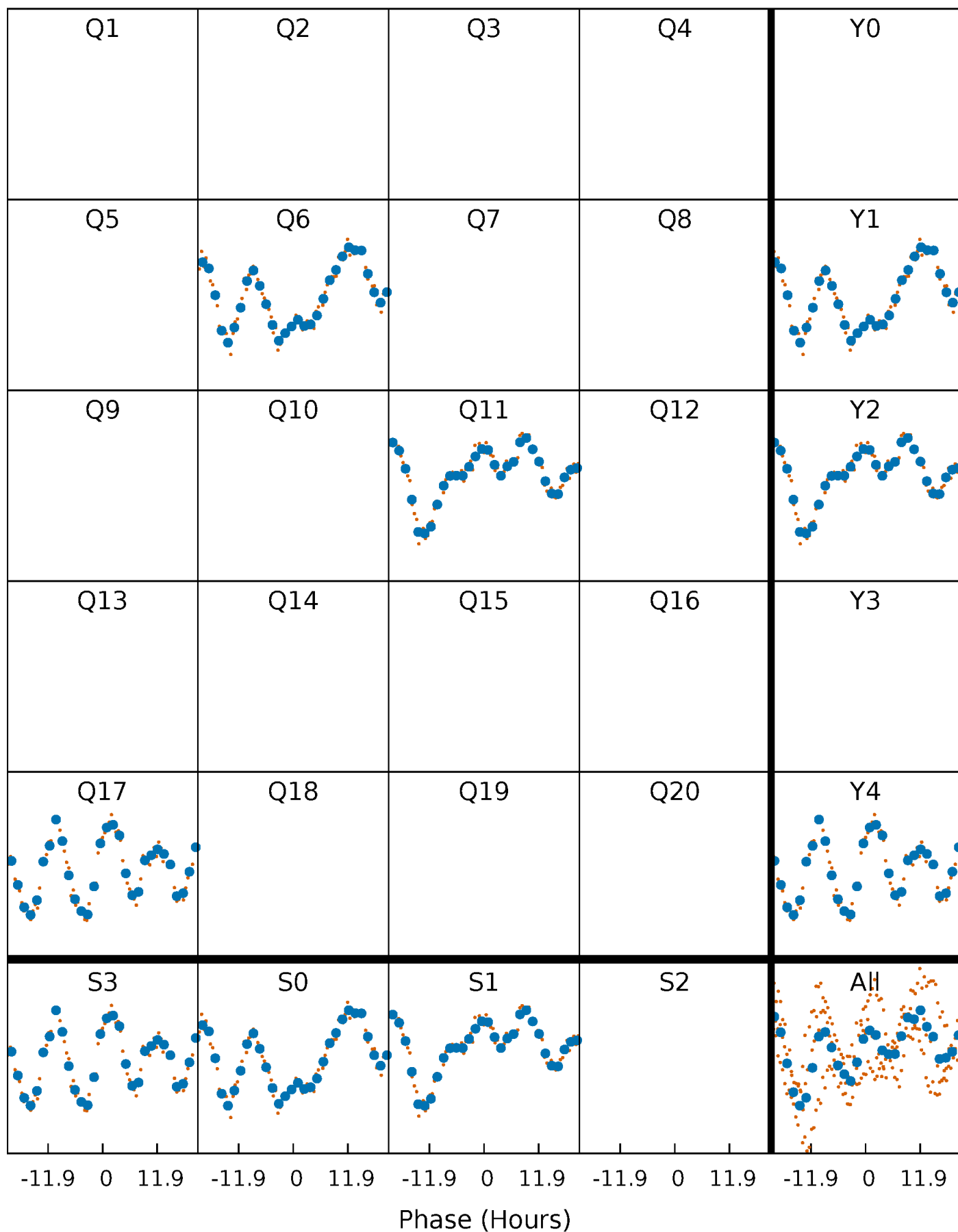


Planet 3 : Phased Whitened Flux Time Series (Fit Epoch/Period)



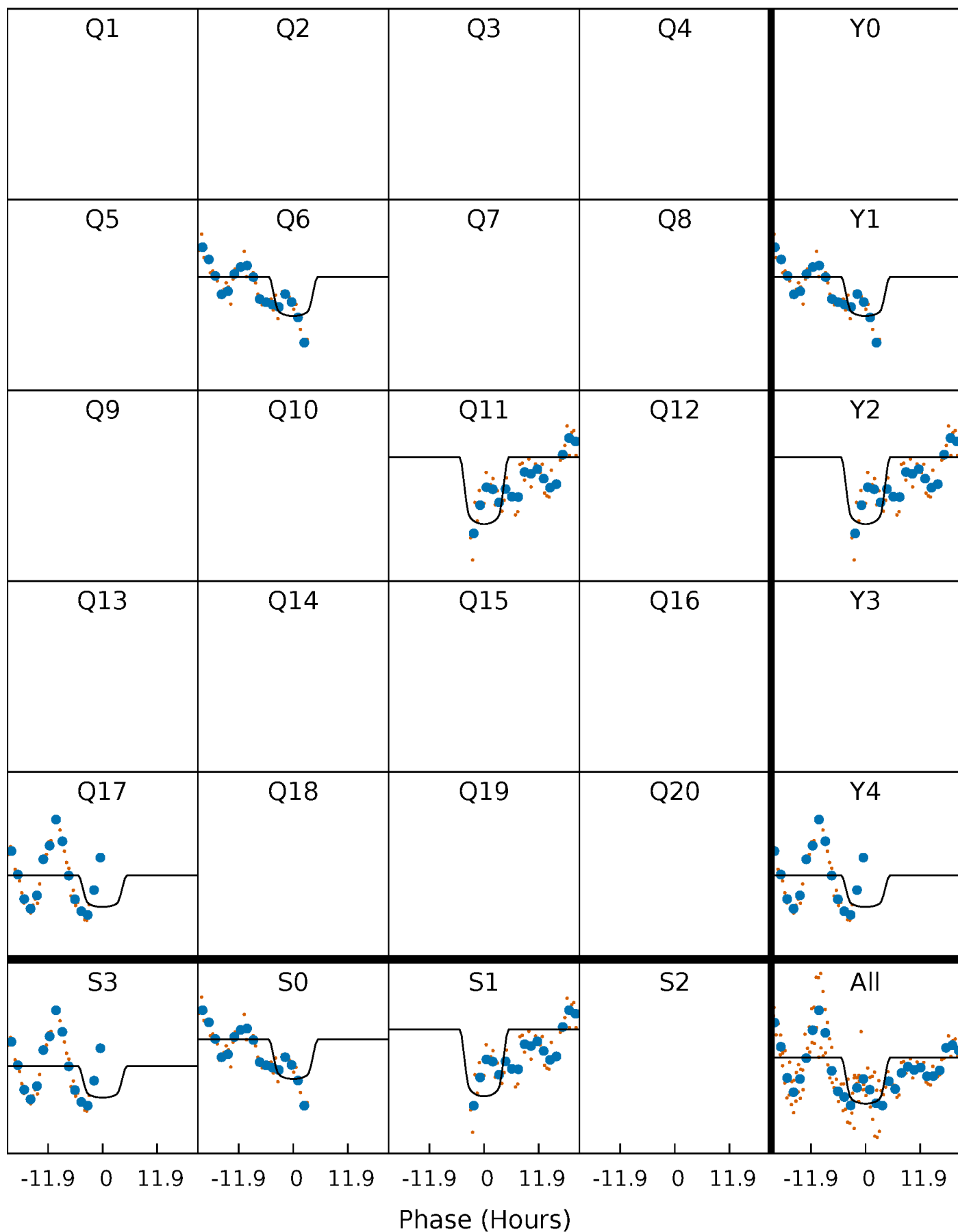
PDC Quarter-Phased Transit Curves

TCE 004158822-03 P=492.551527 Days $T_0=594.046151$ (BKJD)



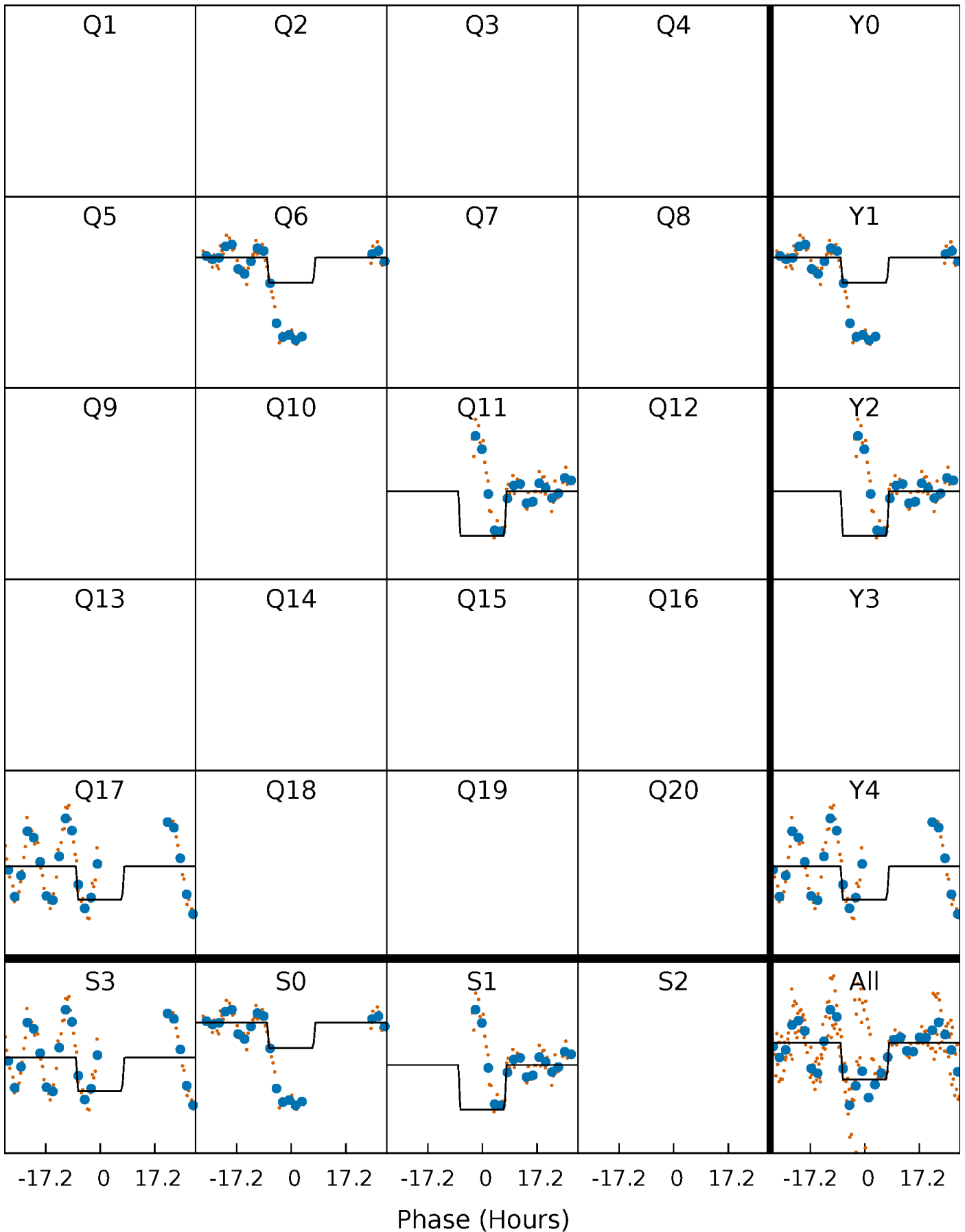
DV Quarter-Phased Transit Curves

TCE 004158822-03 P=492.551527 Days $T_0=594.046151$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

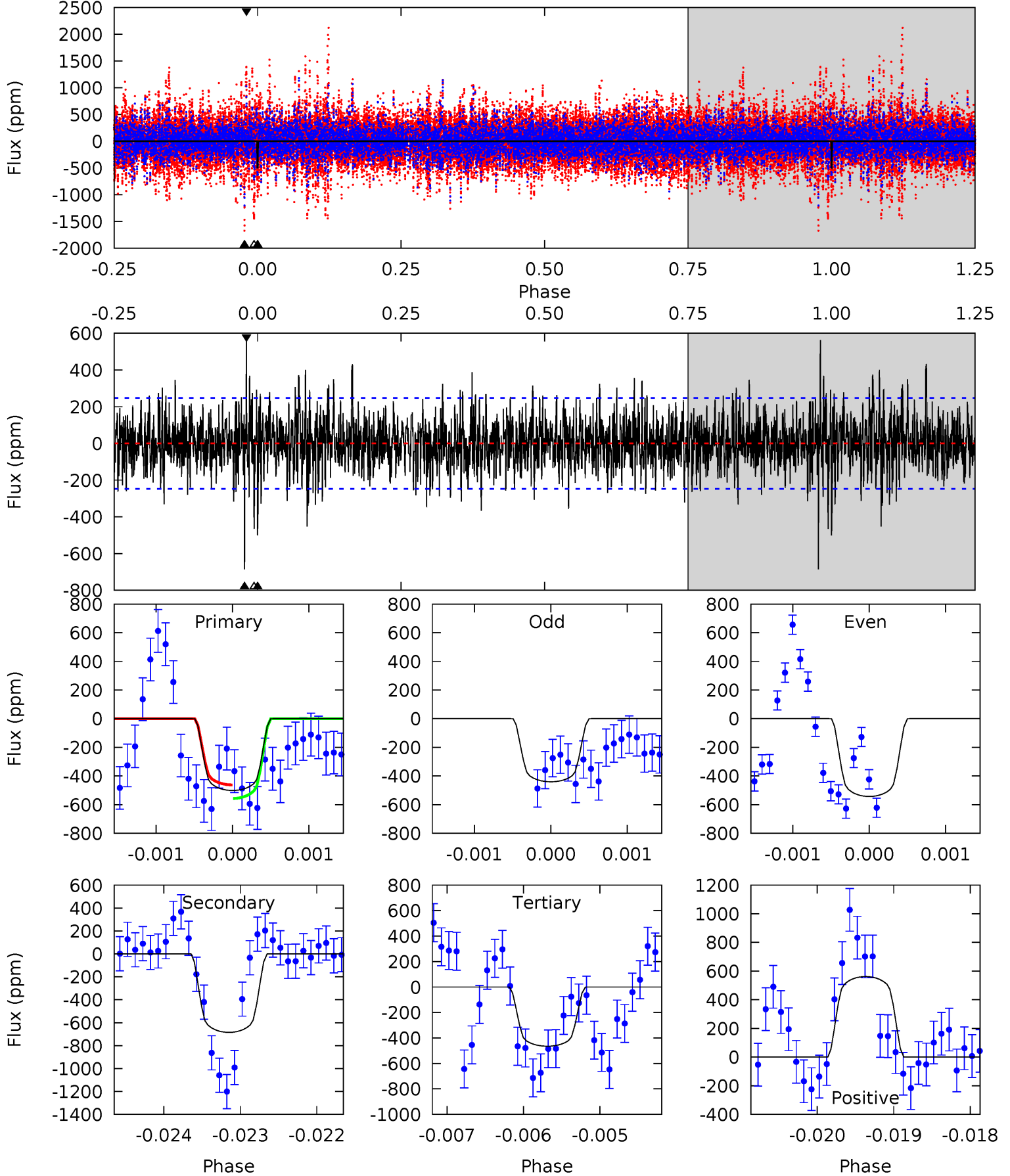
TCE 004158822-03 P=492.544153 Days $T_0=594.061902$ (BKJD)



DV Model-Shift Uniqueness Test

004158822-03, P = 492.551527 Days, E = 101.494624 Days

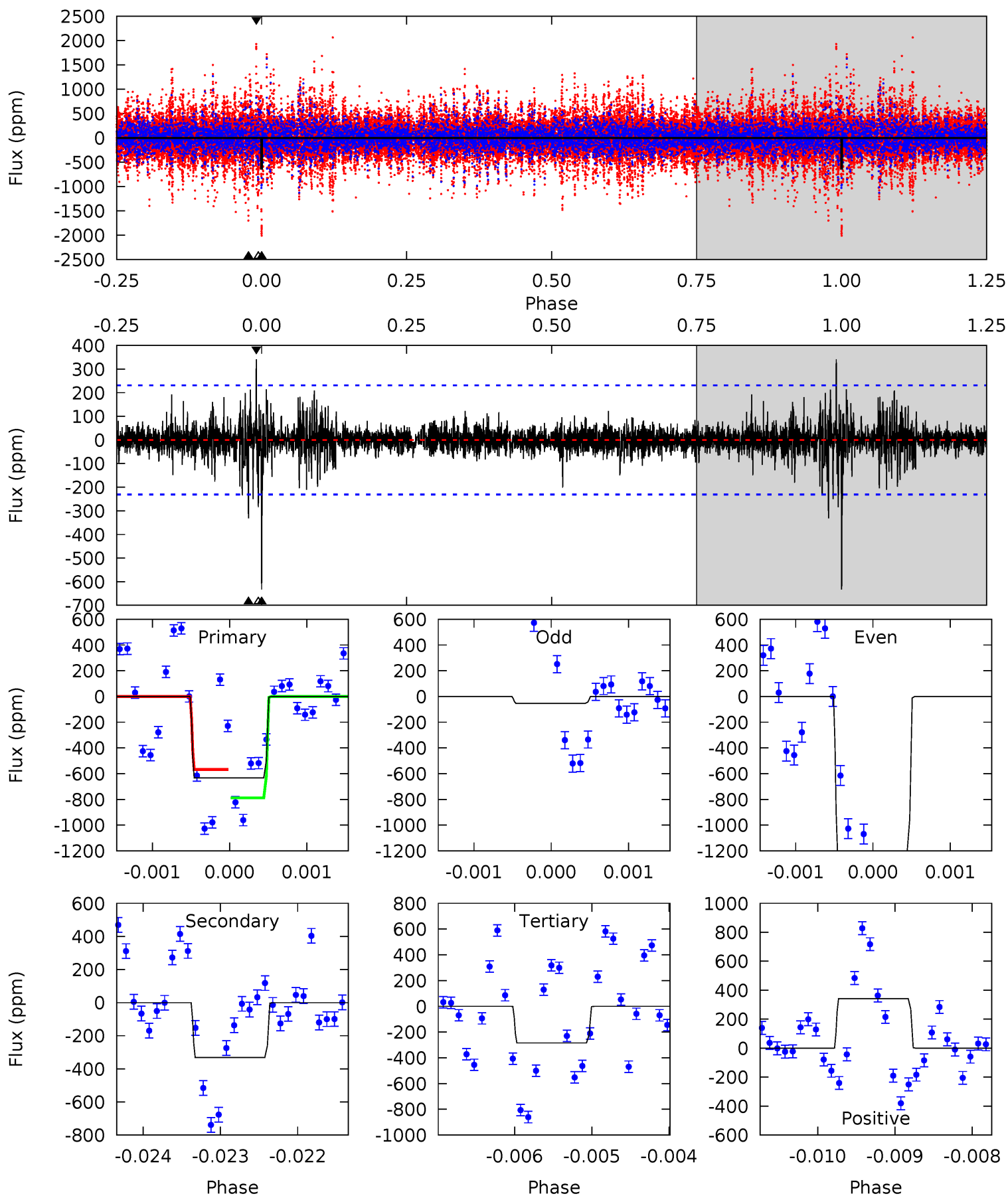
Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
11.1	15.1	10.3	12.4	5.47	3.32	2.43	0.81	-1.34	4.86	2.71	1.11	1.11	0.45	1.02



Alt Model-Shift Uniqueness Test

004158822-03, P = 492.544153 Days, E = 101.517749 Days

Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
14.8	7.74	6.65	7.99	5.41	3.22	1.02	8.14	6.80	1.09	-0.25	14.3	1.38	0.35	2.55



Stellar Parameters For KIC 004158822

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	R (R_{\odot})	$M(M_{\odot})$	p_{\star} ($\text{g}\cdot\text{cm}^{-3}$)
	6932^{+168}_{-264}	$2.923^{+0.639}_{-0.071}$	$0.070^{+0.200}_{-0.550}$	$10.322^{+1.125}_{-6.373}$	$3.255^{+0.080}_{-1.439}$	$0.004^{+0.043}_{-0.001}$
	+2%/-4%	+22%/-2%	+286%/-786%	+11%/-62%	+2%/-44%	+1042%/-24%
Source	PHO1	FLK73	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 004158822-03 / KOI

Detrend	Depth (ppm)	R_p (R_{\oplus})	T_{max} (K)	T_{obs} (K)	A_{obs}
DV	-685 ± 45	$27.04^{+5.69}_{-8.55}$	973^{+76}_{-156}	6814^{+450}_{-418}	1637^{+1667}_{-493}
Alt.	-331 ± 43	$24.35^{+5.44}_{-8.58}$	972^{+74}_{-163}	5949^{+426}_{-373}	987^{+1054}_{-329}

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 $A_{\text{obs}} \gg 1.0$

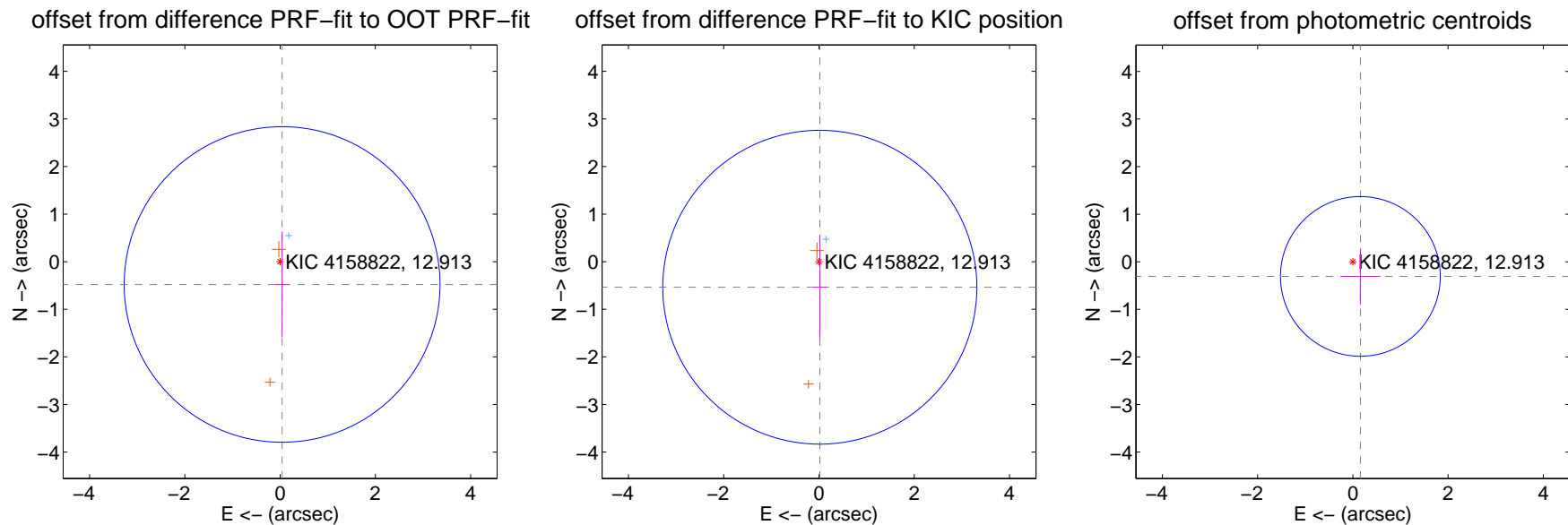
DV Centroid Data

Supplemental centroid analysis for 004158822-03. Kepler magnitude: 12.91. Transit SNR 6.04

There are 1 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.04 arcsec

	Distance in arcsec	Distance / σ	Δ RA	Δ Dec
PRF-fit source offset from OOT	0.481 ± 1.105	0.43	-0.042 ± 0.148	-0.479 ± 1.109
PRF-fit source offset from KIC position	0.537 ± 1.099	0.49	-0.017 ± 0.140	-0.536 ± 1.099
photometric centroid source offset	0.35 ± 0.56	0.62	-0.16 ± 0.42	-0.31 ± 0.59



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.

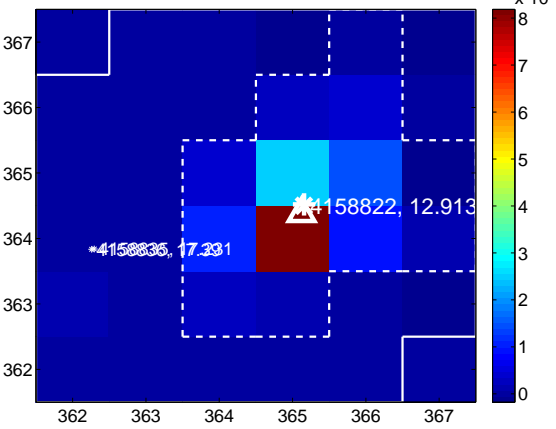
Q5 no difference image



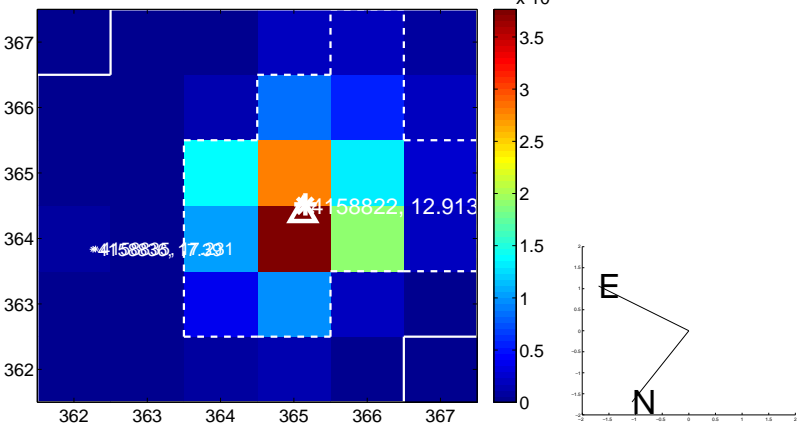
Q5 no OOT image



Q6 difference image



Q6 OOT image



Q7 no difference image



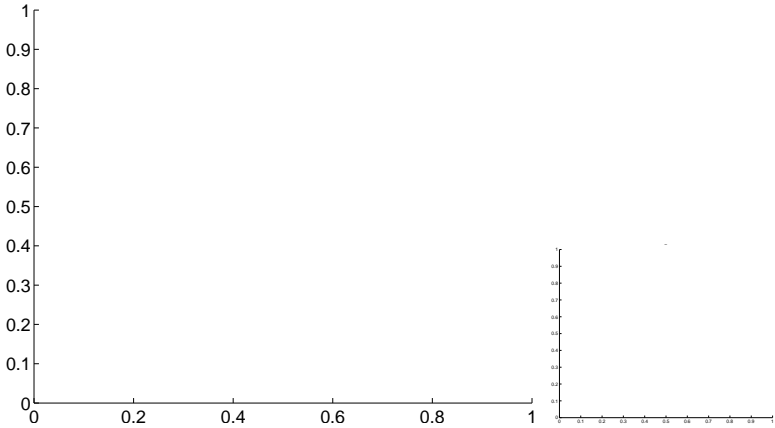
Q7 no OOT image



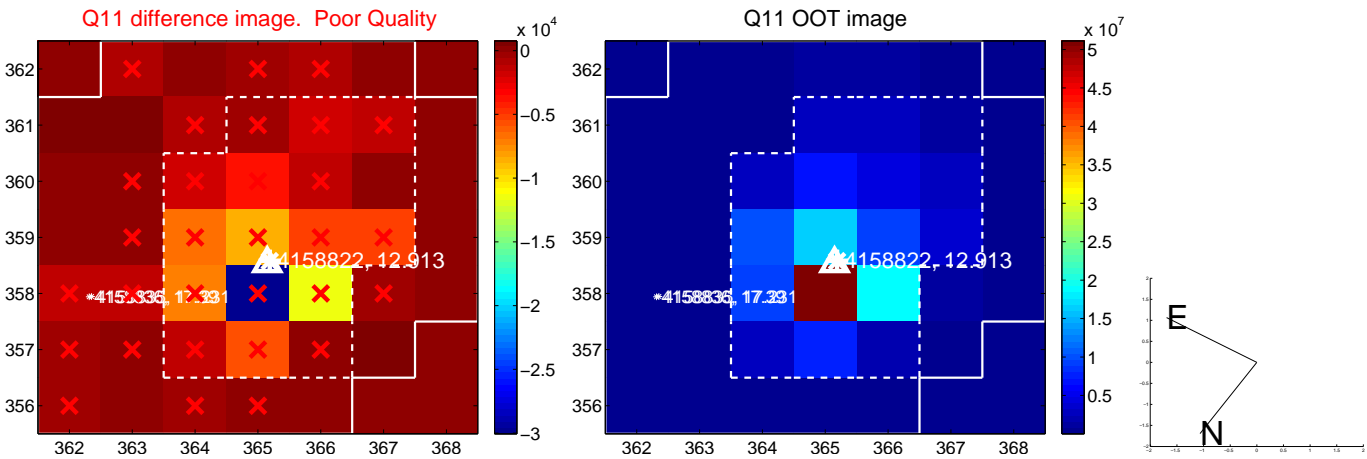
Q8 no difference image



Q8 no OOT image



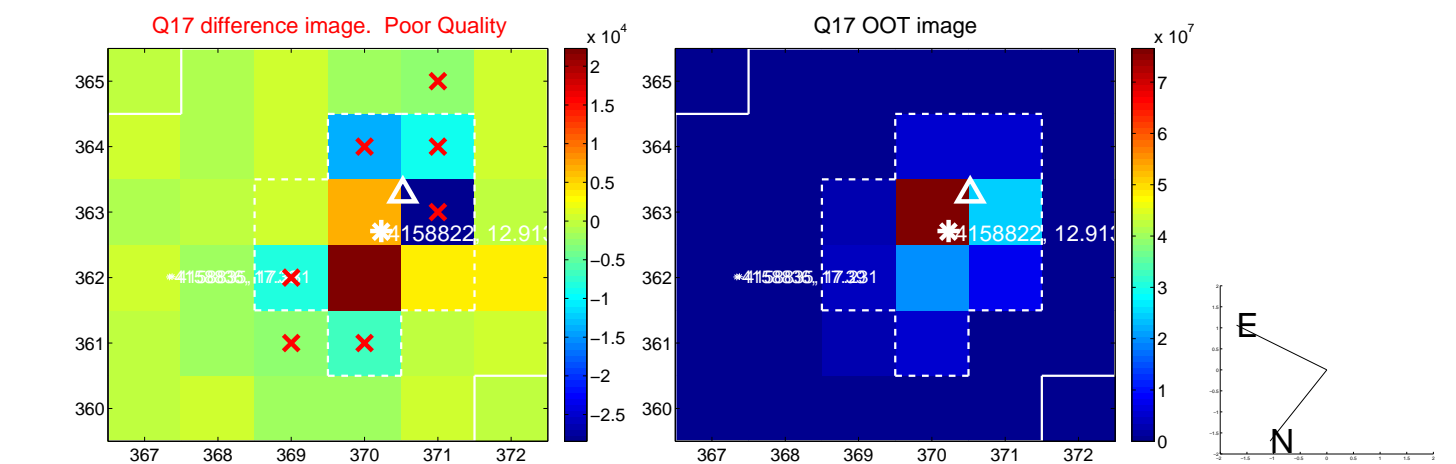
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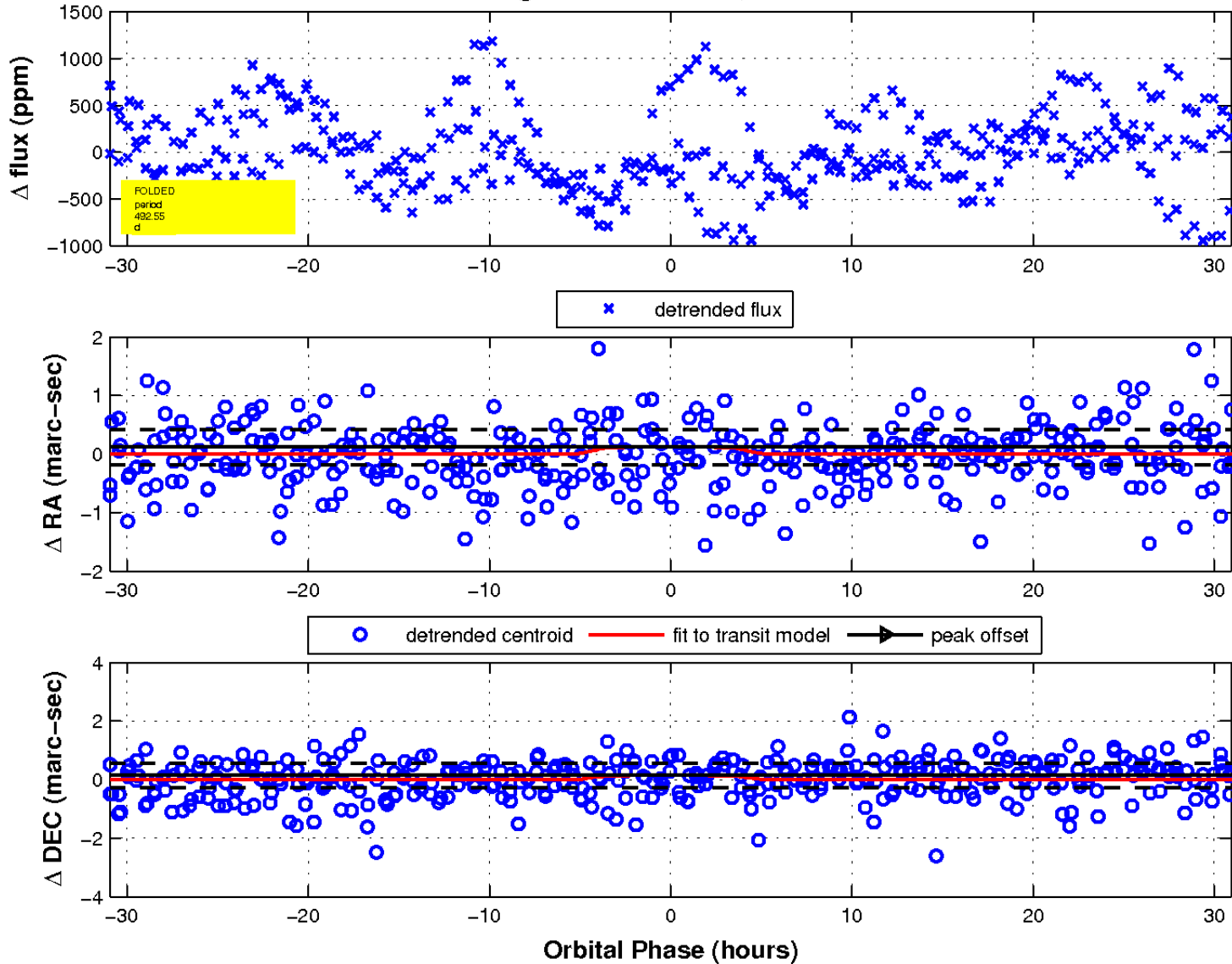
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fluxWeightedCentroids, Planet 3 of 3



UKIRT Image

Declination

