

KIC 004157325

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})
004157325-01	OBS	1860.01	6.319442	132.228054	578.2	3.504	45.6	50.4	1.02	5670	2.89	223.51
004157325-02	OBS	1860.02	12.209479	140.551770	546.0	4.468	32.0	36.2	1.02	5670	2.85	92.88
004157325-03	OBS	1860.03	3.076411	132.268316	201.3	2.779	22.4	23.8	1.02	5670	1.73	583.63
004157325-04	OBS	1860.04	24.843666	148.182722	190.0	5.562	8.8	9.3	1.02	5670	1.57	36.02

Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004157325-01	OBS	PC	1.00	0	0	0	0	CENT_KIC_POS
004157325-02	OBS	PC	1.00	0	0	0	0	CENT_KIC_POS
004157325-03	OBS	PC	1.00	0	0	0	0	CENT_KIC_POS
004157325-04	OBS	FP	0.09	0	0	1	0	CENT_RESOLVED_OFFSET

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.

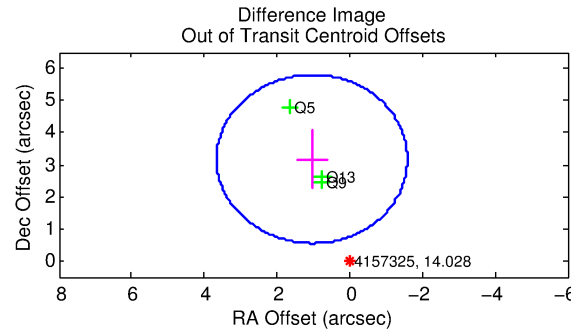
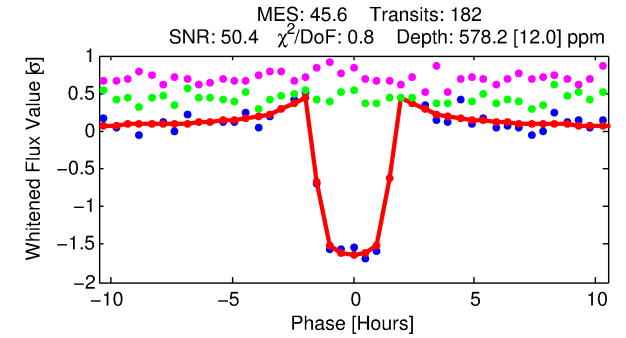
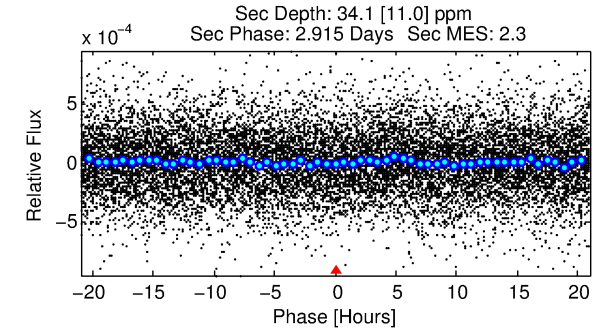
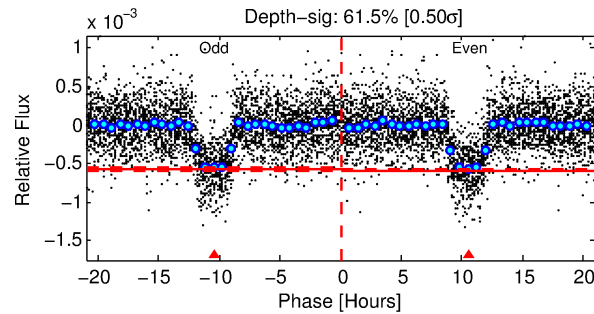
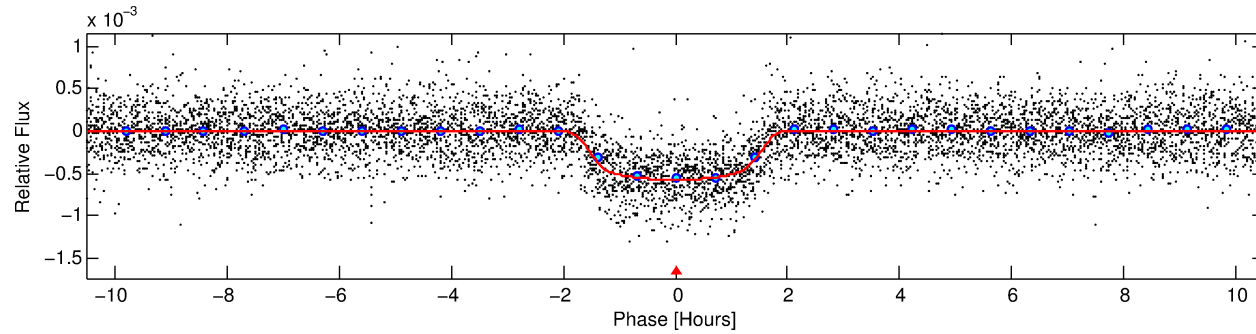
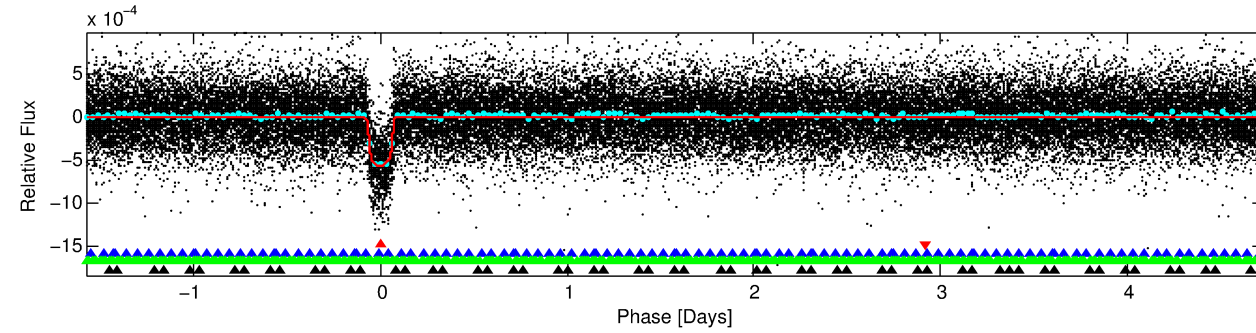
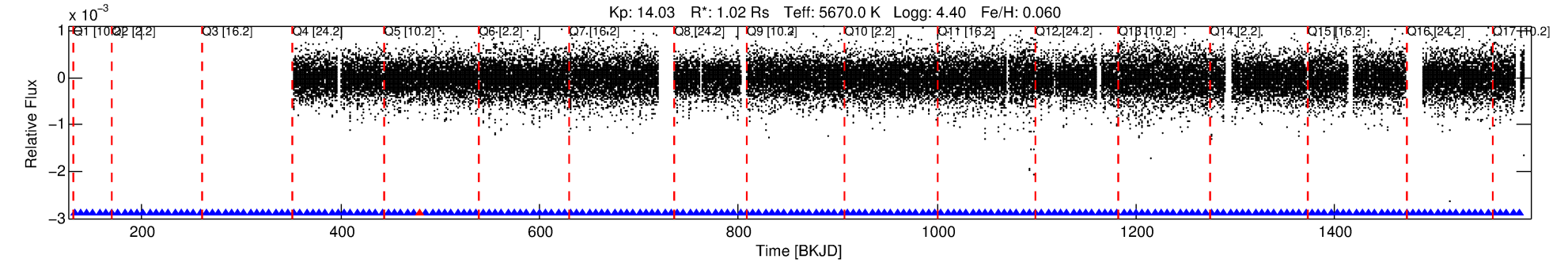
Ephemeris Match Information For 004157325-01

No Significant Match Found

DV One-Page Summary

KIC: 4157325 Candidate: 1 of 4 Period: 6.319 d
KOI: K01860.01 Name: Kepler-416b Corr: 0.956

Kp: 14.03 R*: 1.02 Rs Teff: 5670.0 K Logg: 4.40 Fe/H: 0.060



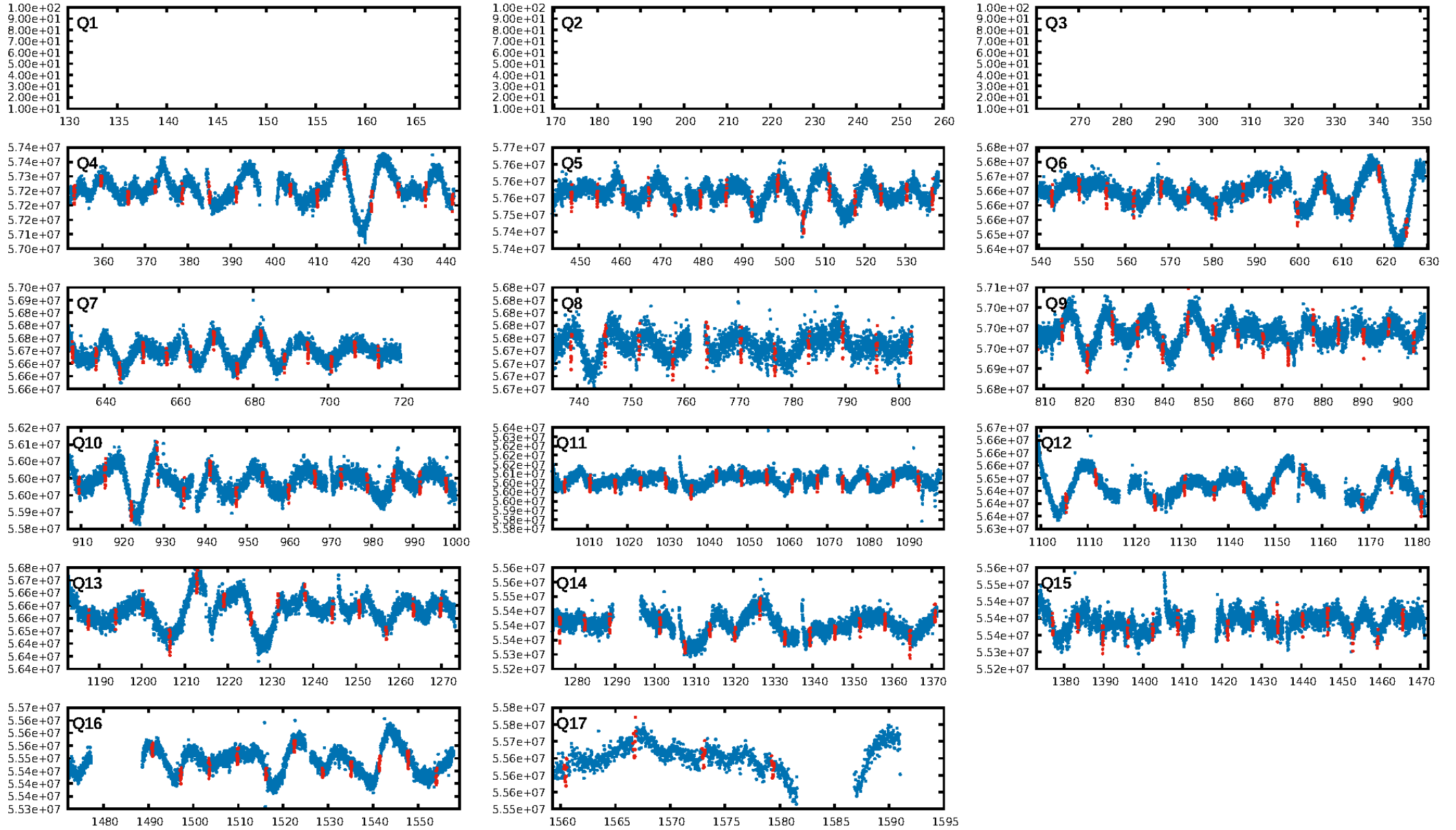
DV Fit Results:

Period = 6.31944 [0.00001] d
Epoch = 132.2281 [0.0012] BKJD
Rp/R* = 0.0259 [0.0014]
a/R* = 7.27 [1.73]
b = 0.88 [0.06]
Seff = 223.51 [45.68]
Teff = 986 [50] K
Rp = 2.89 [0.45] Re
a = 0.0658 [0.0083] AU
Ag = 9.75 [3.80] [2.30σ]
Teffp = 2693 [236] K [7.07σ]

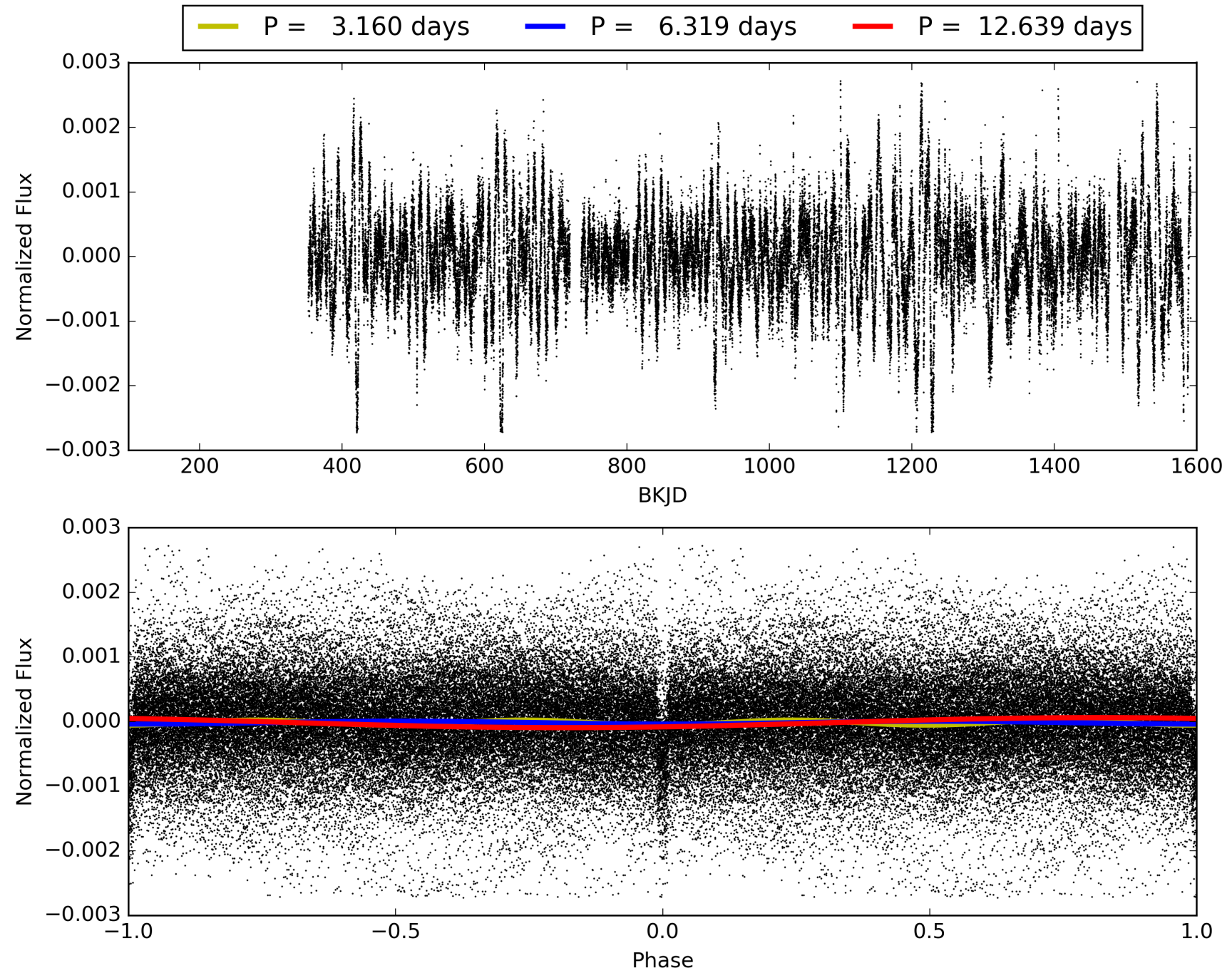
DV Diagnostic Results:

ShortPeriod-sig: 100.0% [17.40σ]
LongPeriod-sig: 100.0% [24.90σ]
ModelChiSquare2-sig: 99.9%
ModelChiSquareGof-sig: 100.0%
Bootstrap-pfa: 0.00e+00
RollingBand-fgt: 0.99 [177/178]
GhostDiagnostic-chr: 2.48
Centroid-sig: 0.0%
Centroid-so: 3.472 arcsec [29.33σ]
OotOffset-rm: 3.339 arcsec [3.82σ]
KicOffset-rm: 0.178 arcsec [0.35σ]
OotOffset-st: 0/0/0/3 [3]
KicOffset-st: 2/3/3/3 [11]
DiffImageQuality-fgm: 0.91 [10/11]
DiffImageOverlap-fno: 1.00 [14/14]

TCE 004157325-01, PDC Light Curves

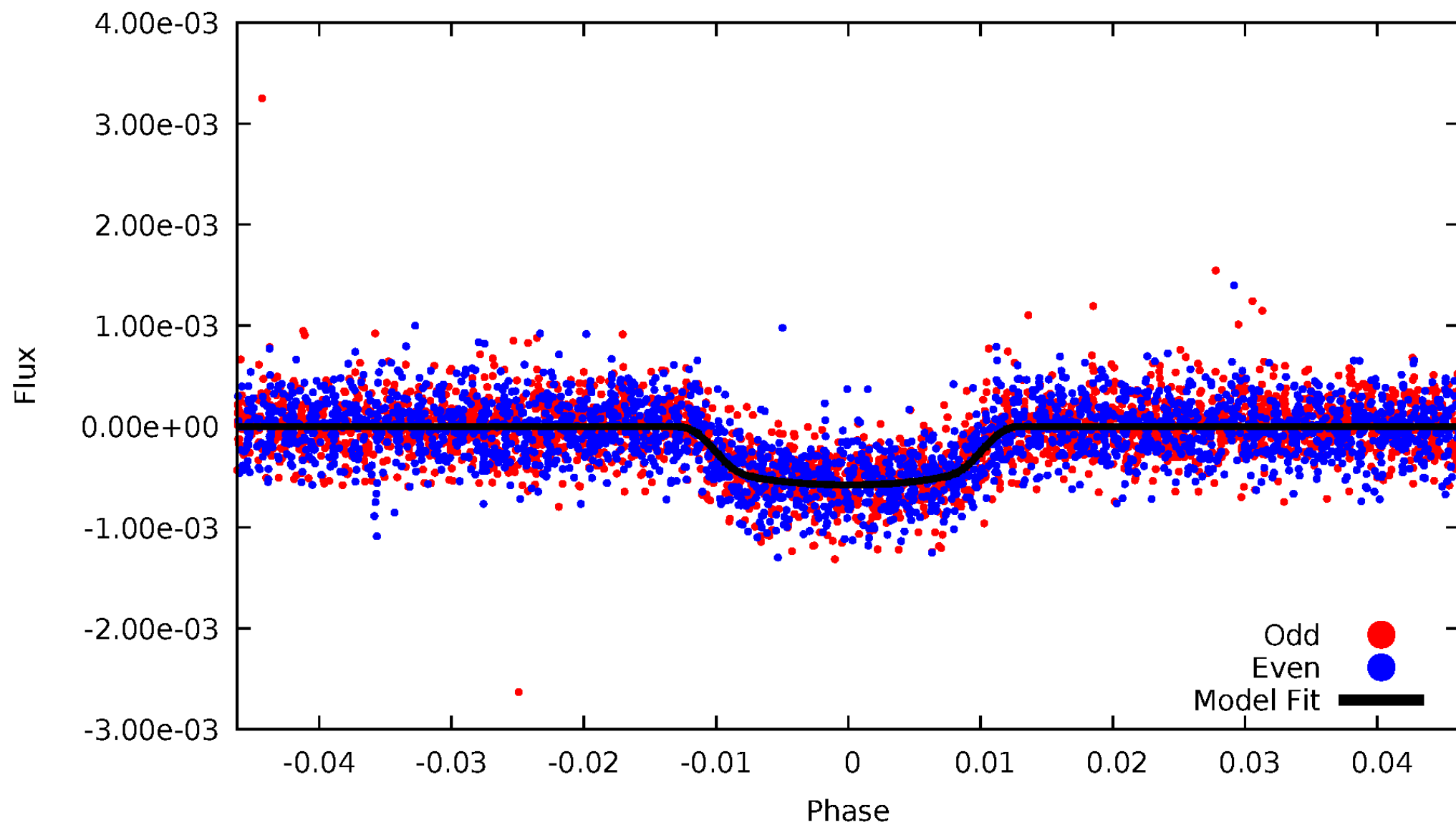


TCE 004157325-01



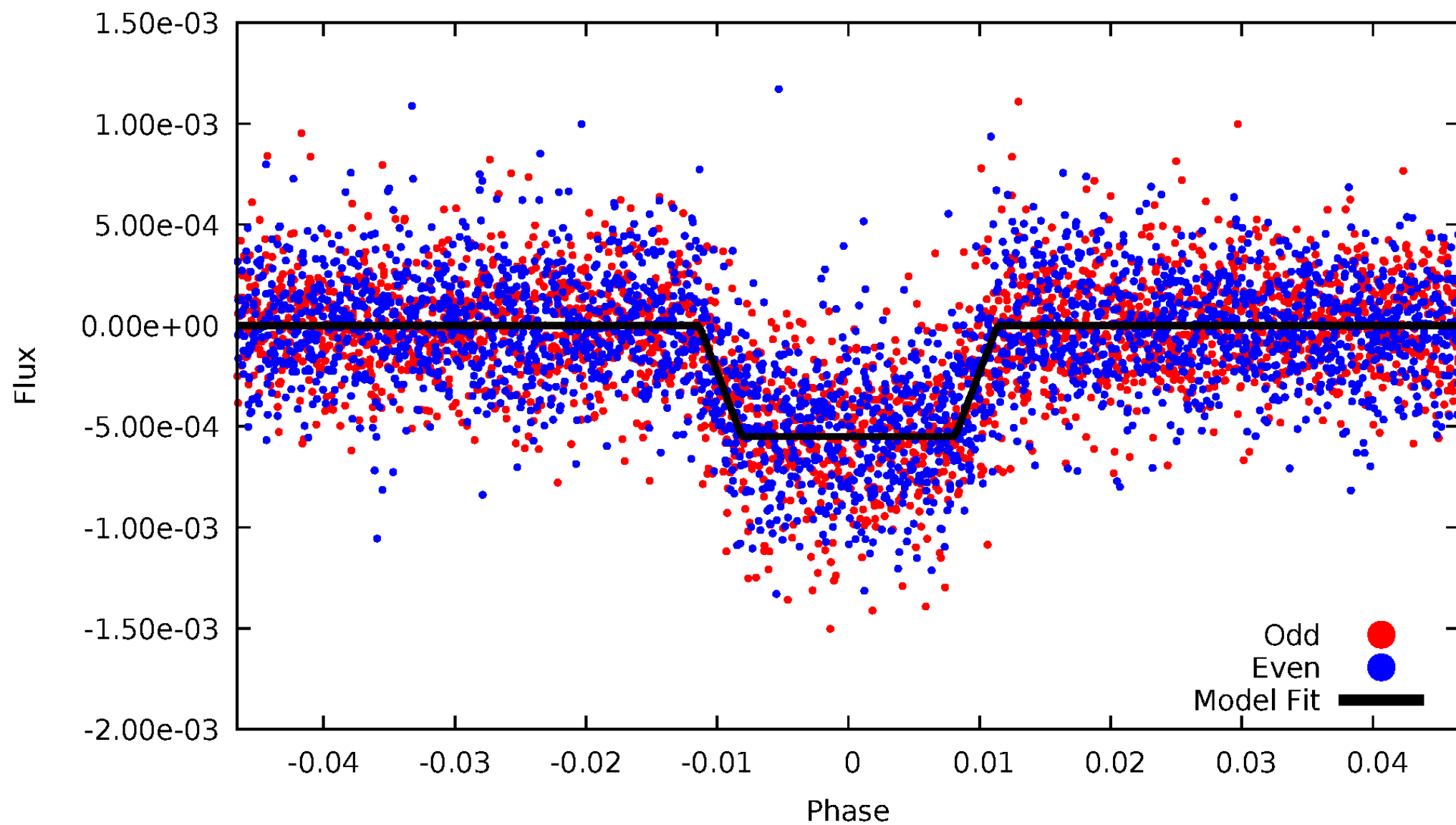
DV Odd/Even

TCE 004157325-01



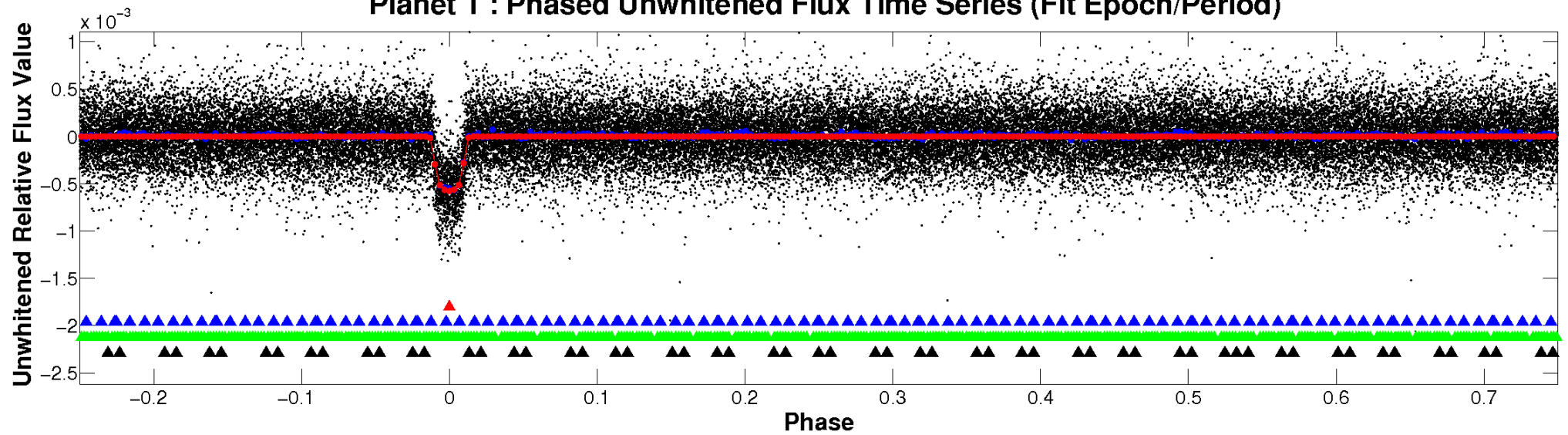
ALT Odd/Even

TCE 004157325-01

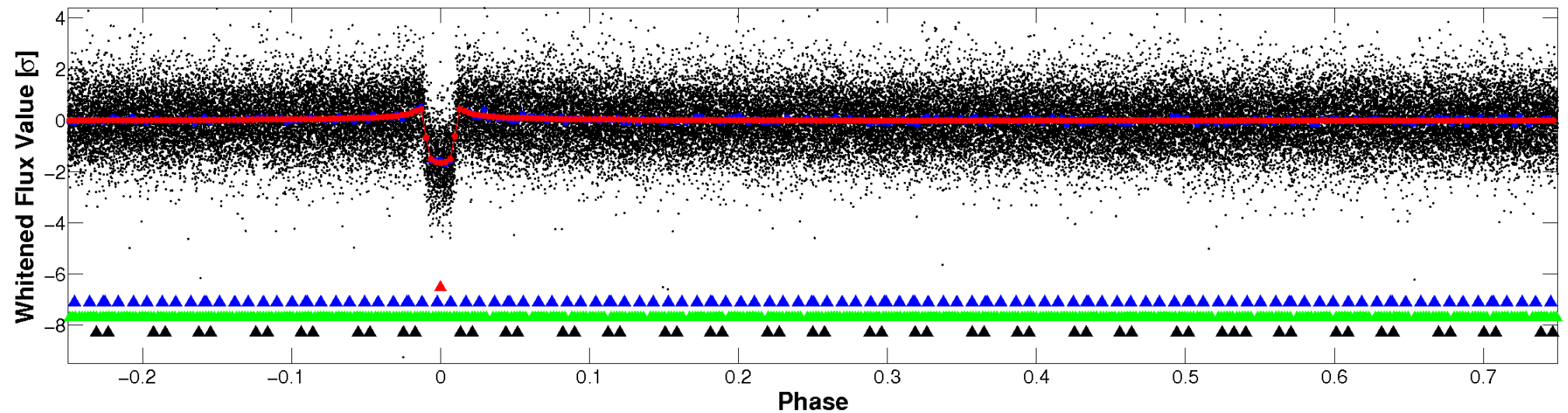


Non-Whitened Vs. Whitened Light Curve

Planet 1 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)

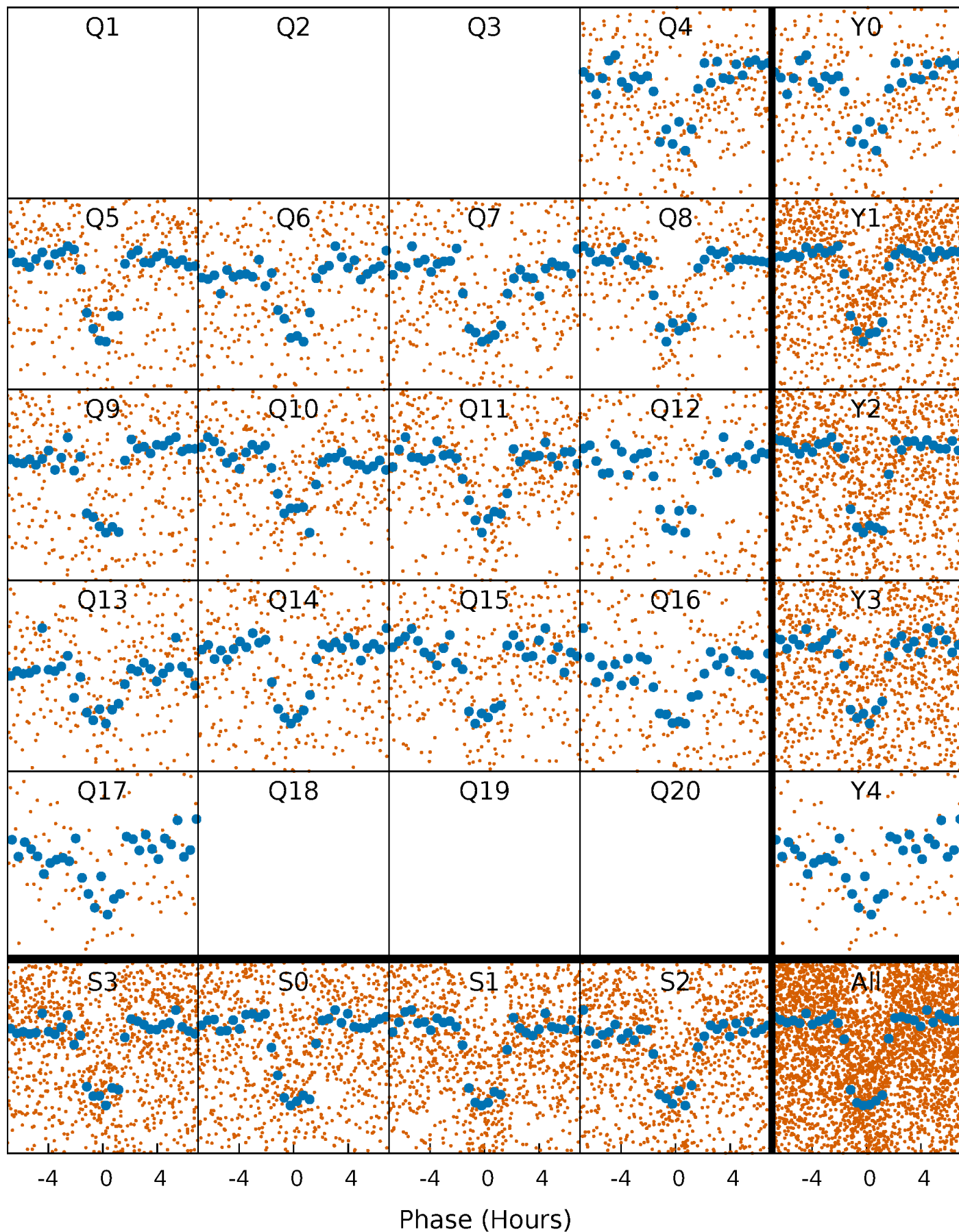


Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)



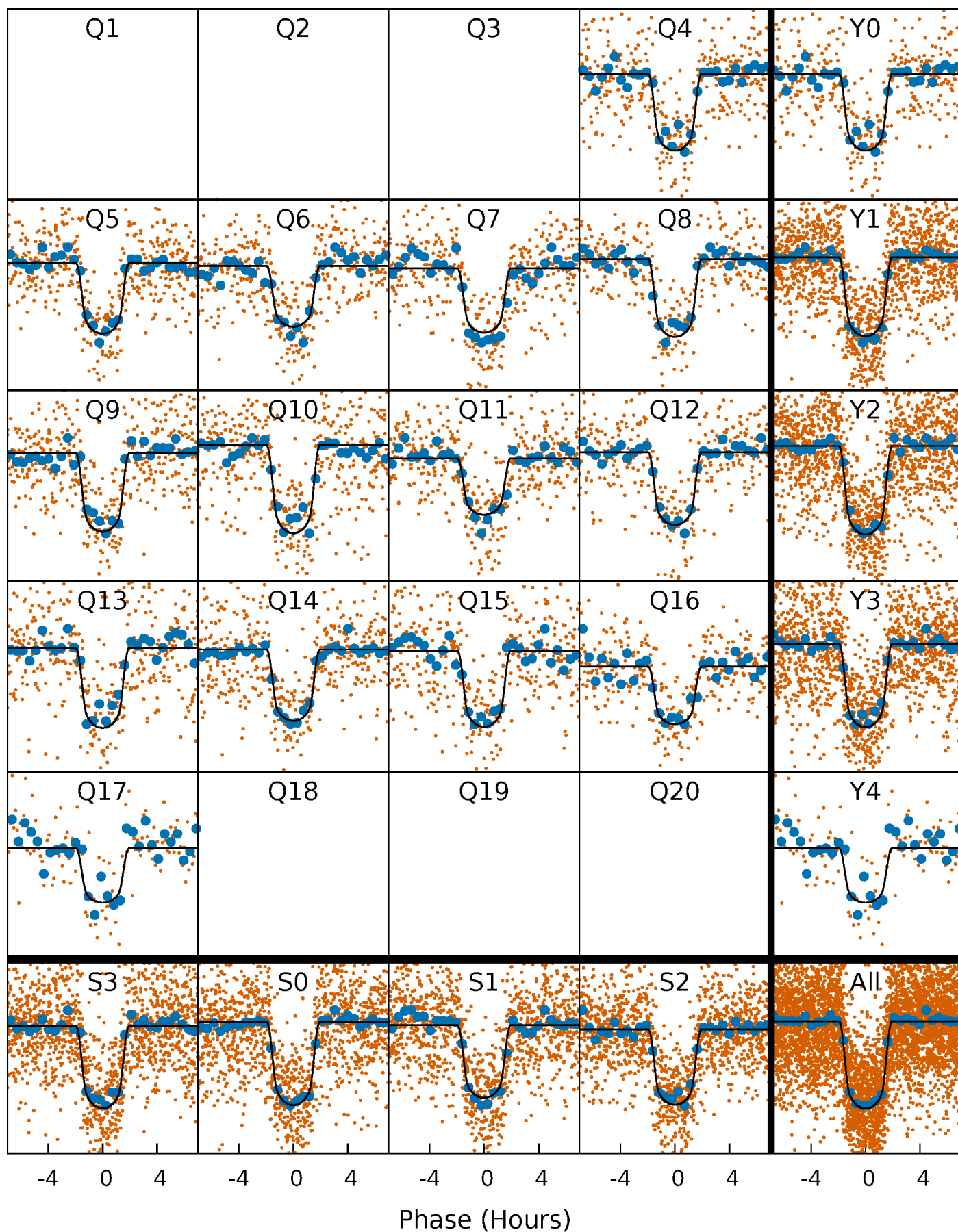
PDC Quarter-Phased Transit Curves

TCE 004157325-01 P= 6.319442 Days $T_0=132.228054$ (BKJD)



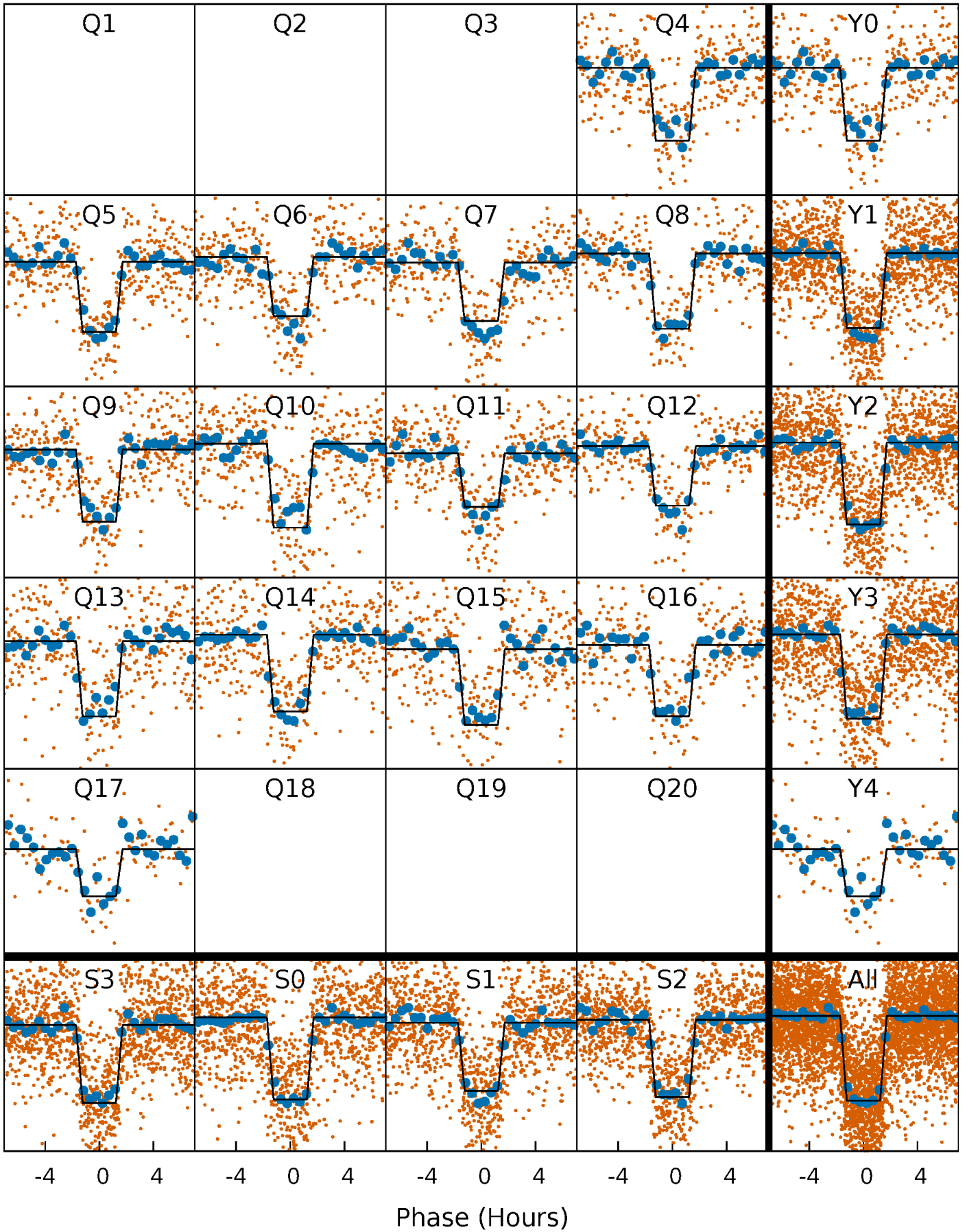
DV Quarter-Phased Transit Curves

TCE 004157325-01 P= 6.319442 Days $T_0=132.228054$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

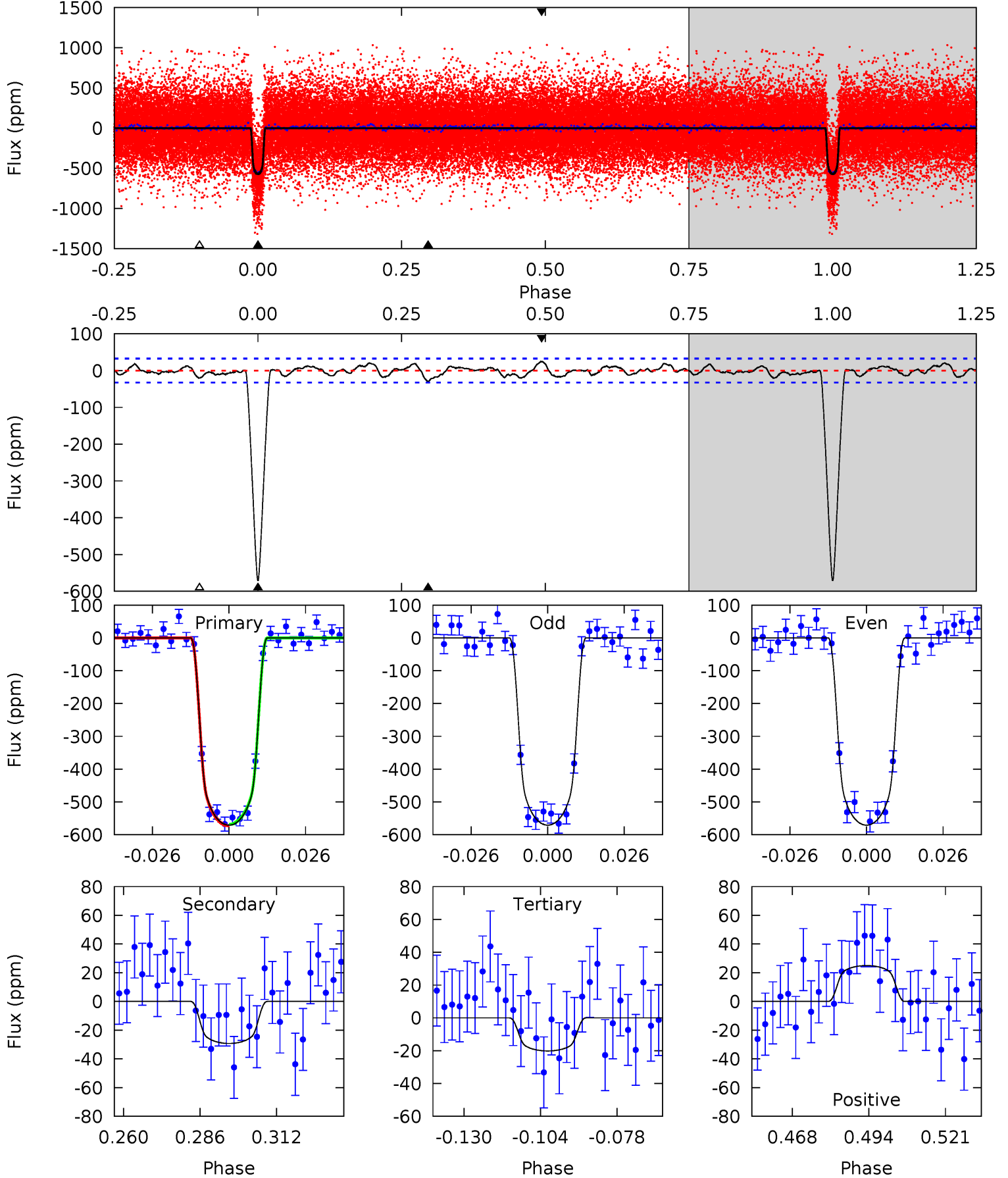
TCE 004157325-01 P= 6.319481 Days $T_0=132.223314$ (BKJD)



DV Model-Shift Uniqueness Test

004157325-01, P = 6.319442 Days, E = 132.228054 Days

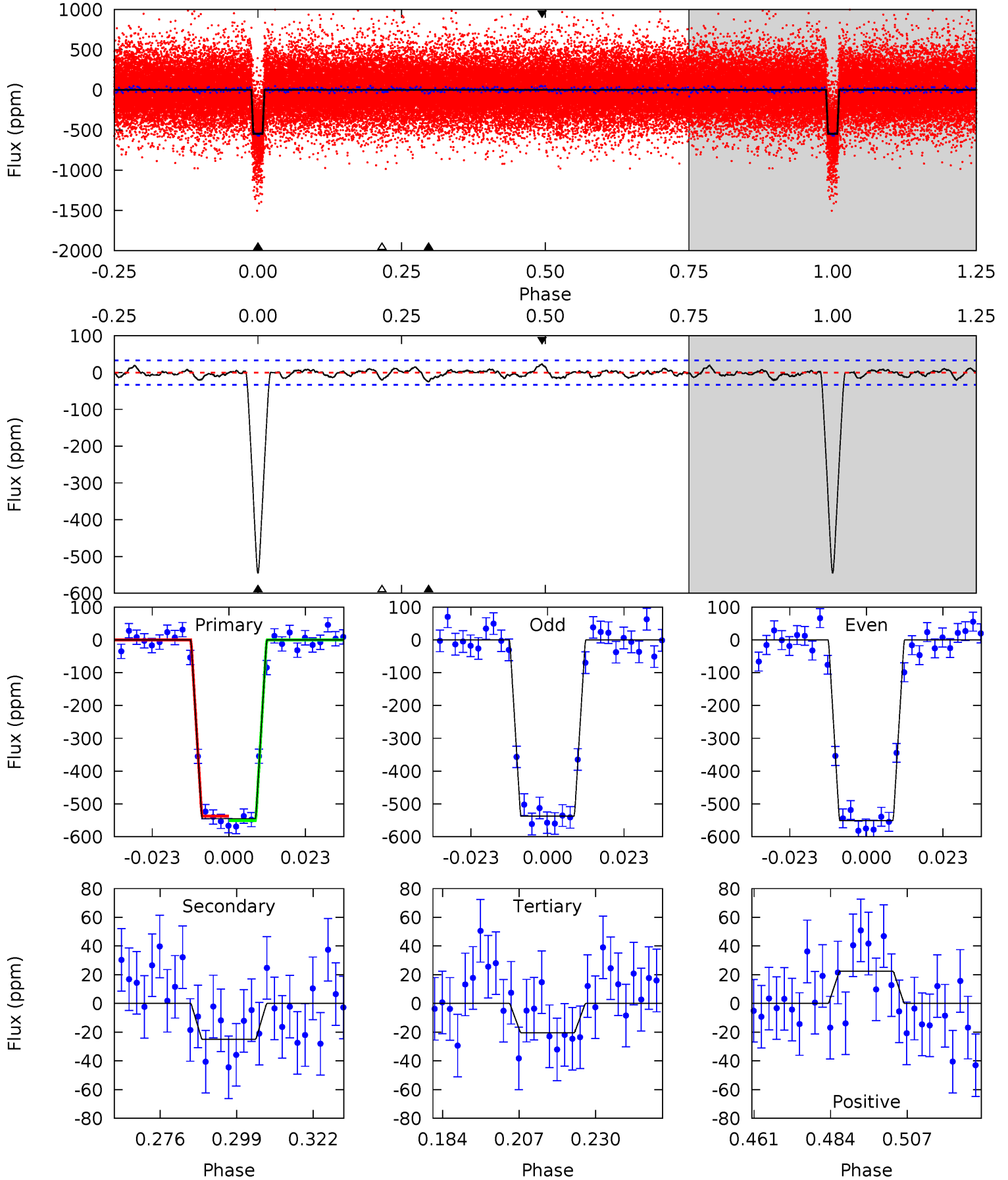
Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
85.1	4.36	3.01	3.73	4.84	2.23	1.40	82.1	81.4	1.36	0.64	0.00	1.01	0.04	0.32



Alt Model-Shift Uniqueness Test

004157325-01, P = 6.319481 Days, E = 132.223314 Days

Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
79.9	3.67	2.99	3.28	4.86	2.27	1.10	76.9	76.6	0.68	0.38	0.95	1.00	0.04	1.00



Stellar Parameters For KIC 004157325

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	5670^{+114}_{-114}	$4.397^{+0.095}_{-0.105}$	$0.060^{+0.150}_{-0.150}$	$1.022^{+0.148}_{-0.108}$	$0.949^{+0.067}_{-0.055}$	$1.254^{+0.475}_{-0.407}$
	+2%/-2%	+2%/-2%	+250%/-250%	+14%/-11%	+7%/-6%	+38%/-32%
Source	SPE58	SPE58	SPE58	DSEP		

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

Secondary Eclipse Parameters for KIC 004157325-01 / KOI 1860.01

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	A_{obs}
DV	-29 ± 7	$2.90^{+0.32}_{-0.27}$	1382^{+57}_{-53}	3167^{+124}_{-133}	$8.098^{+2.878}_{-2.165}$
Alt.	-25 ± 7	$2.62^{+0.26}_{-0.24}$	1376^{+61}_{-49}	3188^{+150}_{-162}	$8.646^{+2.993}_{-2.700}$

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

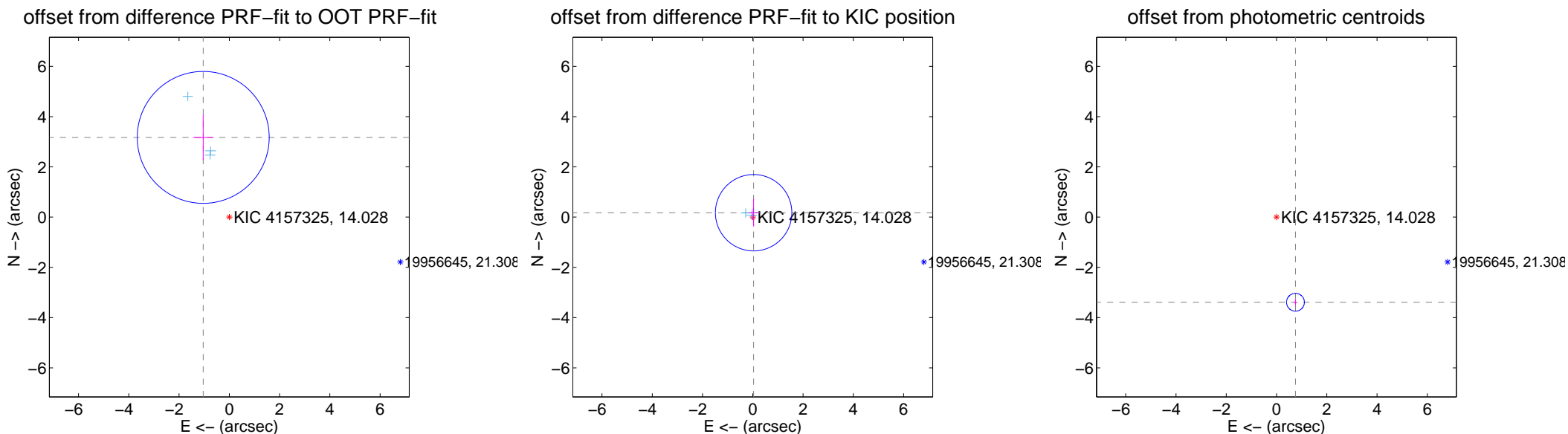
DV Centroid Data

Supplemental centroid analysis for 004157325-01. Kepler magnitude: 14.03. Transit SNR 50.40

There are 10 quarters with good PRF difference image offsets

The OOT PRF centroid is offset from the target star catalog position by about 2.58 arcsec so the offset from difference PRF-fit to OOT-fit may be invalid.

	Distance in arcsec	Distance / σ	Δ RA	Δ Dec
PRF-fit source offset from OOT	3.339 ± 0.875	3.82	1.039 ± 0.408	3.174 ± 0.911
PRF-fit source offset from KIC position	0.178 ± 0.507	0.35	-0.033 ± 0.206	0.175 ± 0.551
photometric centroid source offset	3.47 ± 0.12	29.33	-0.75 ± 0.06	-3.39 ± 0.12



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



Q2 no difference image



Q2 no OOT image



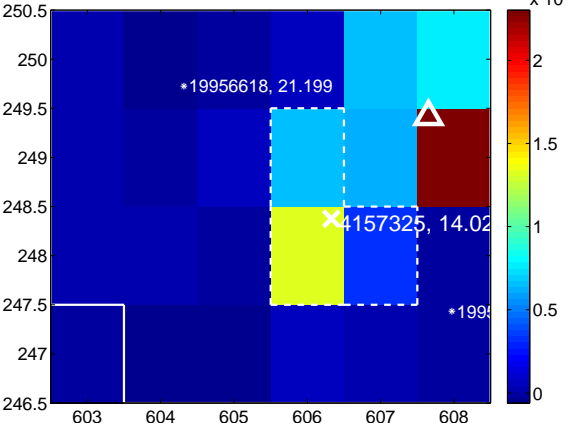
Q3 no difference image



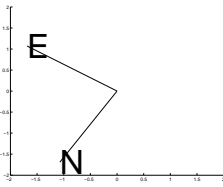
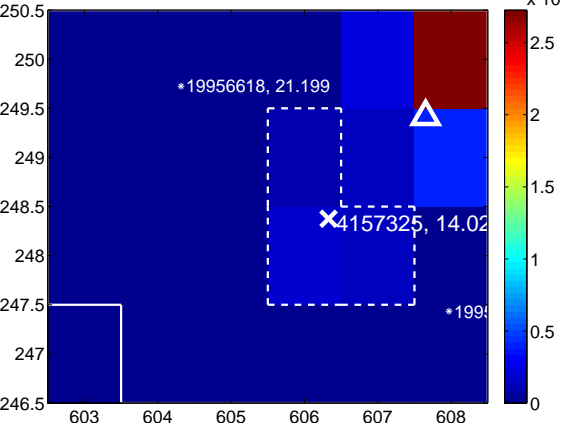
Q3 no OOT image



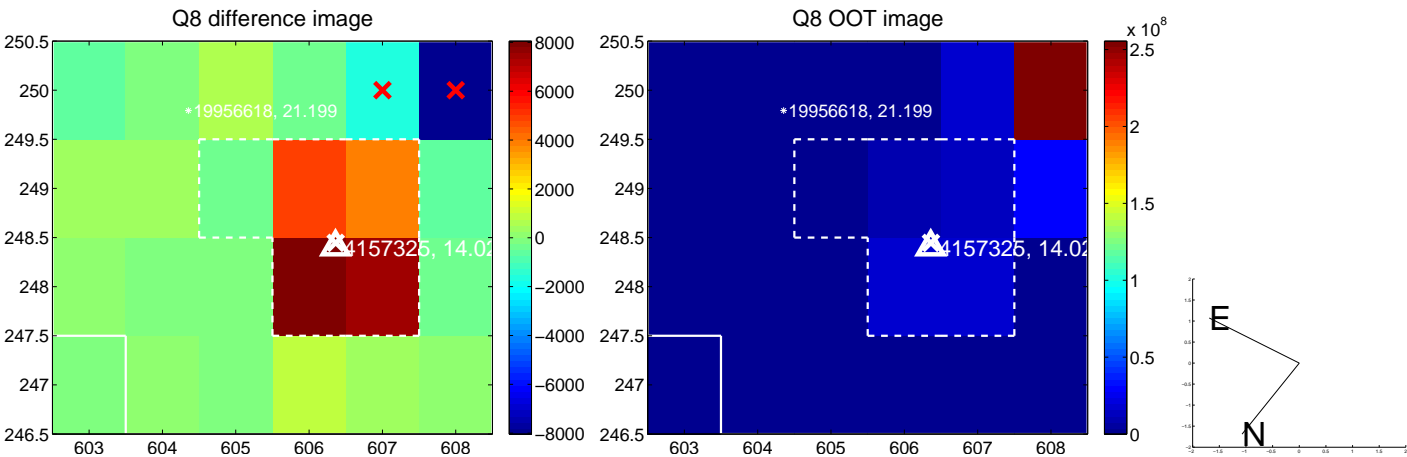
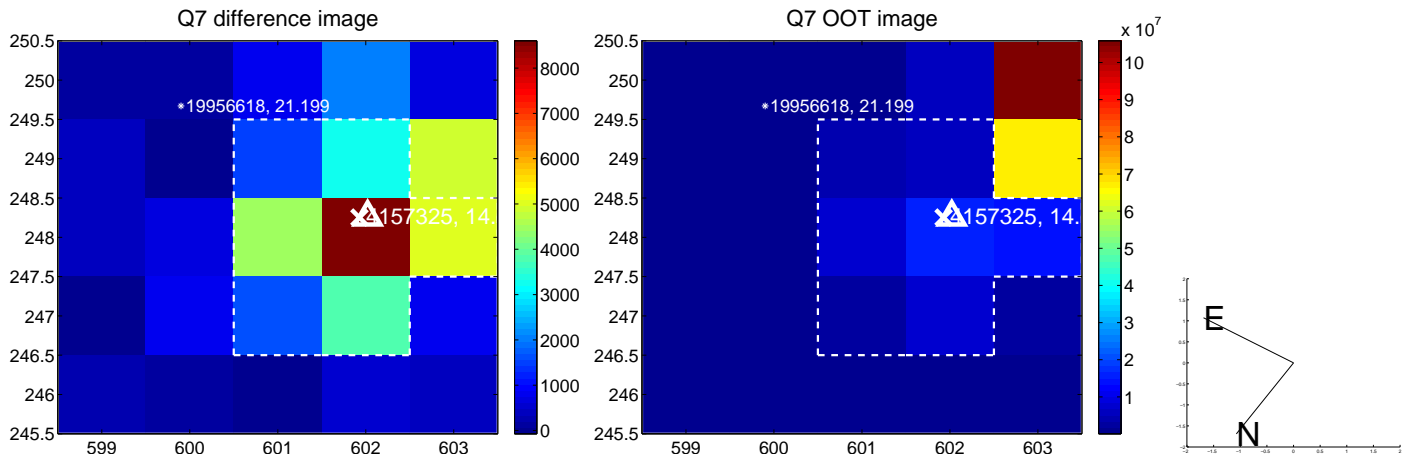
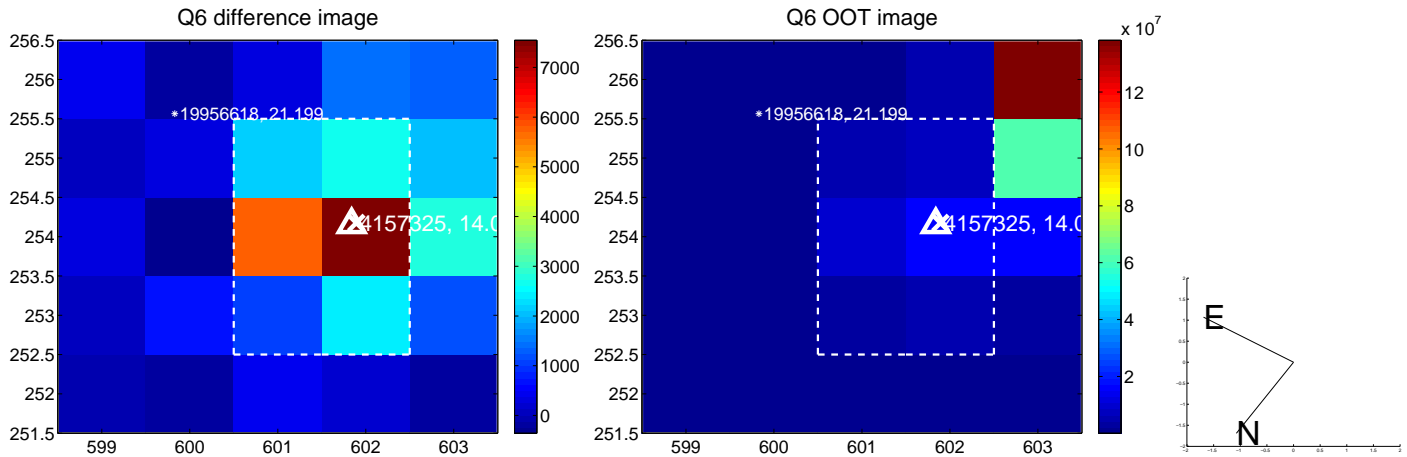
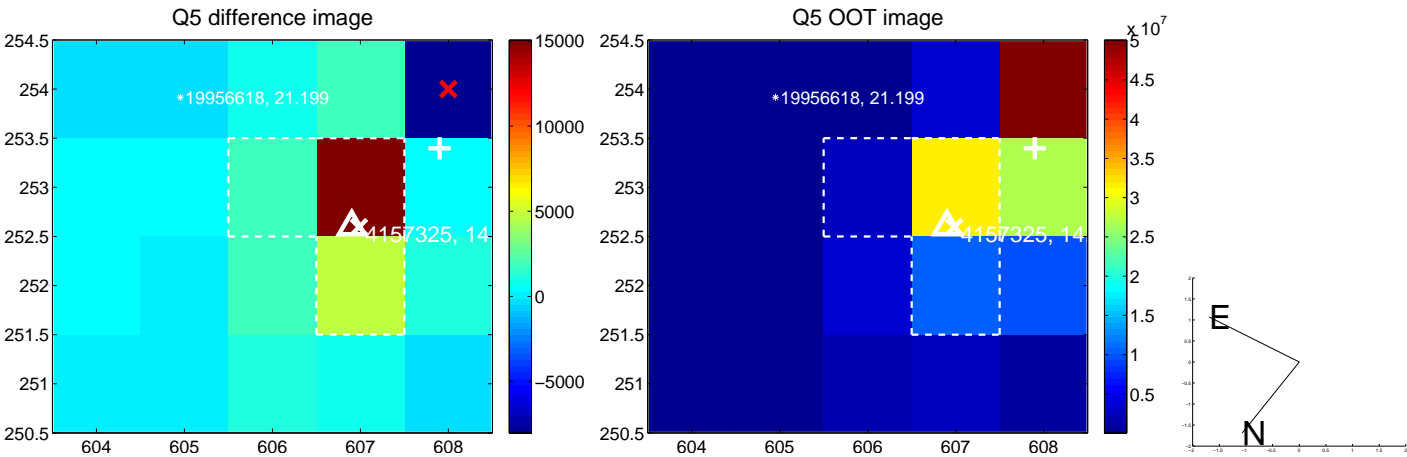
Q4 difference image



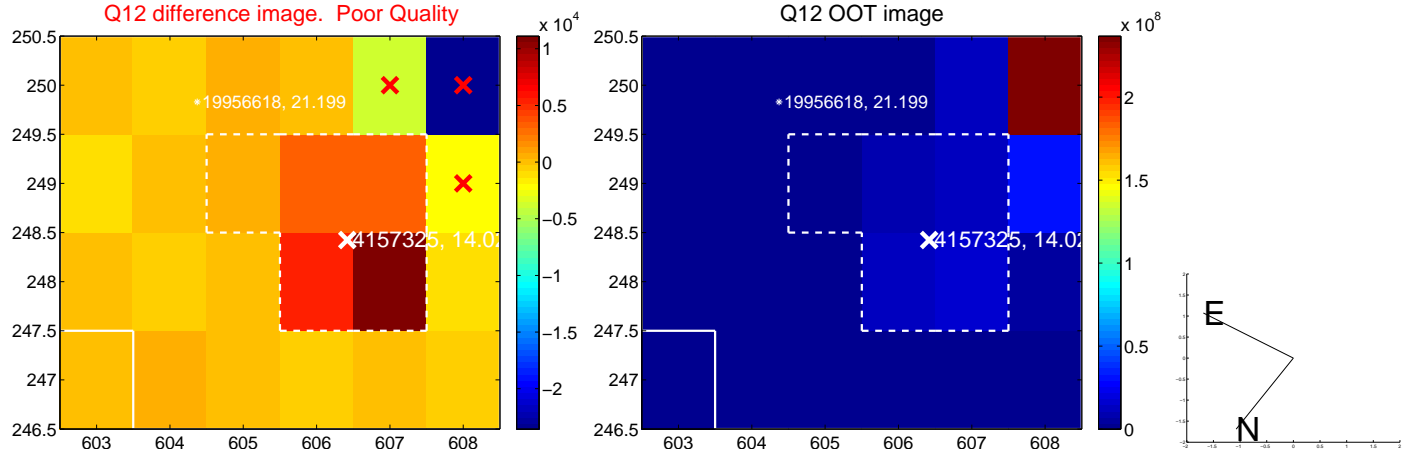
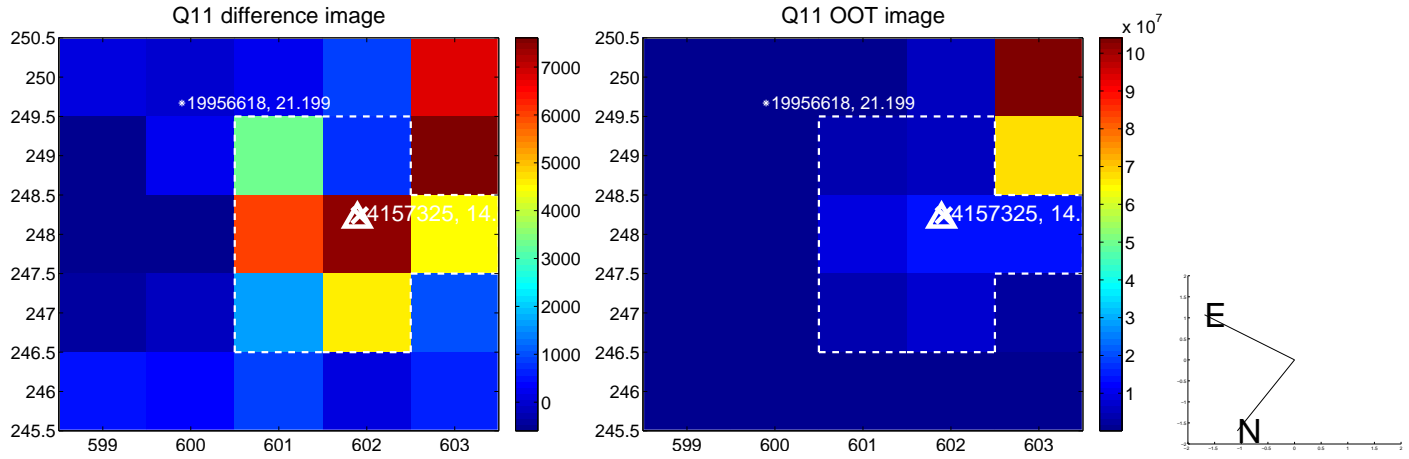
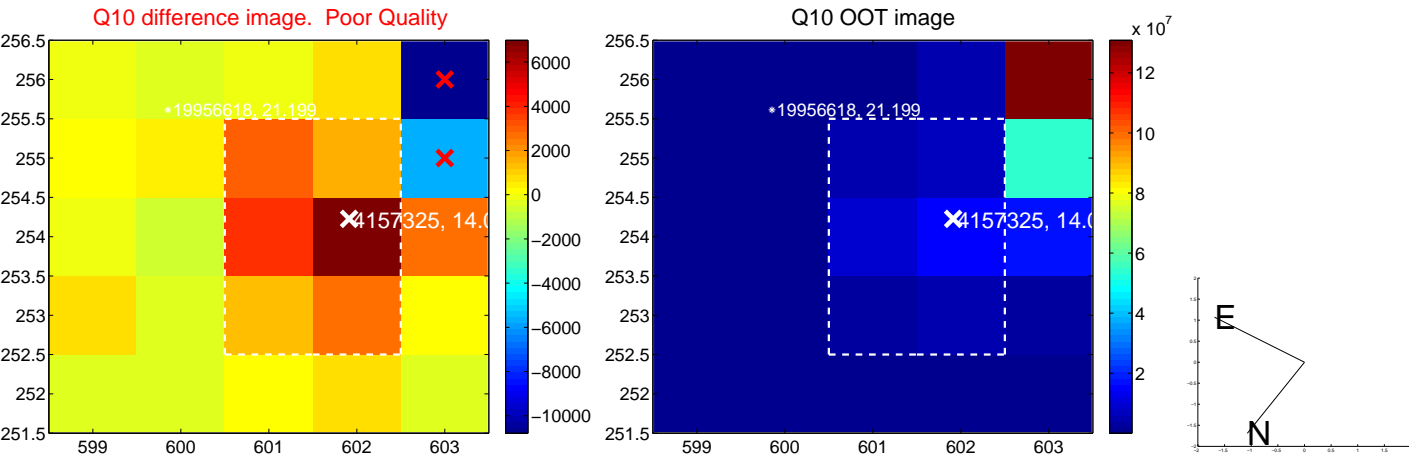
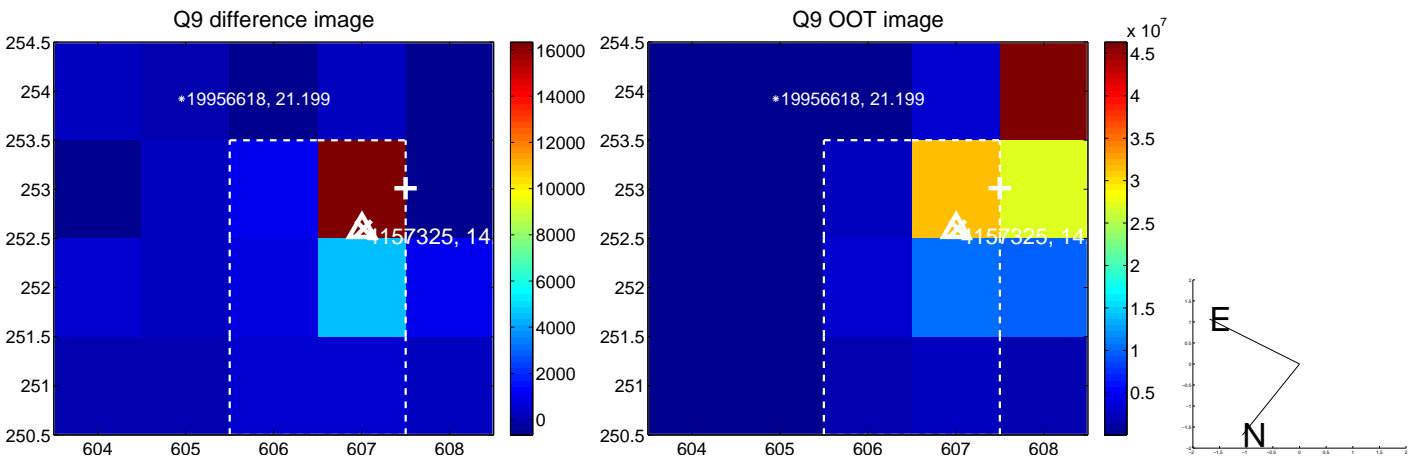
Q4 OOT image



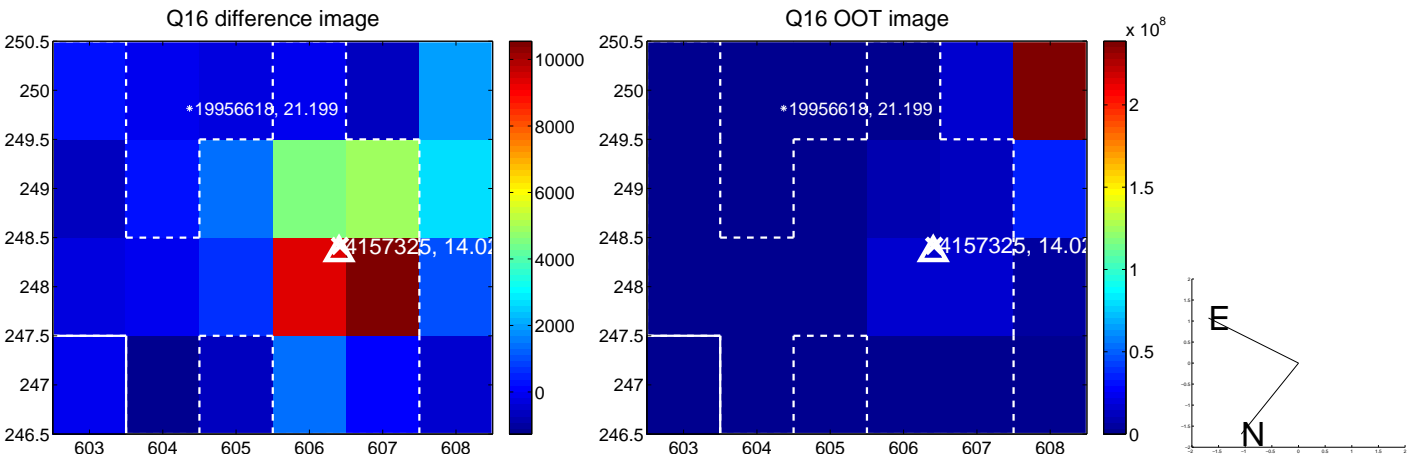
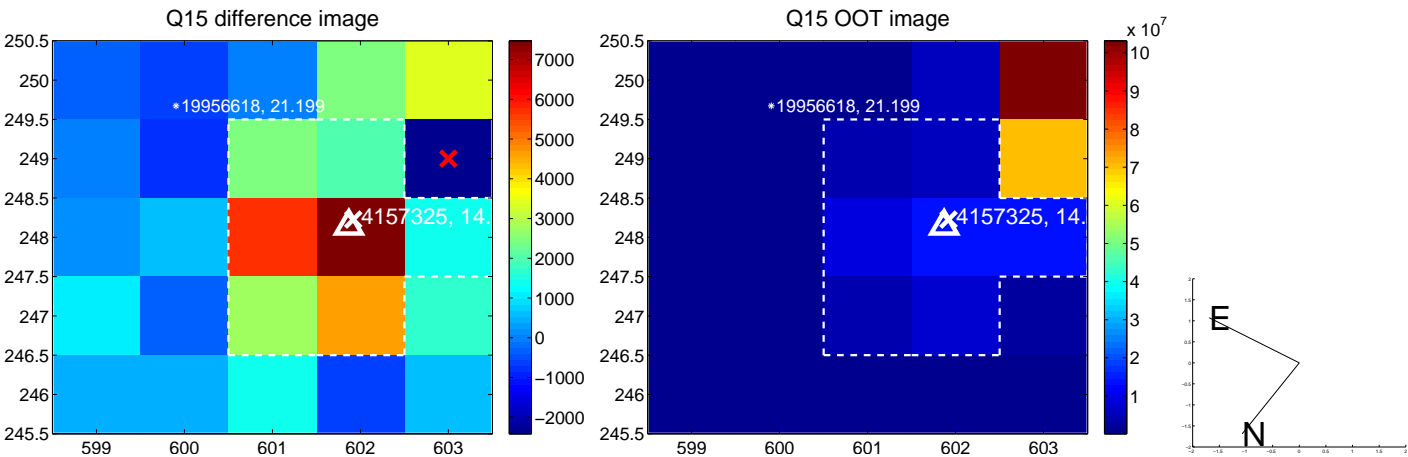
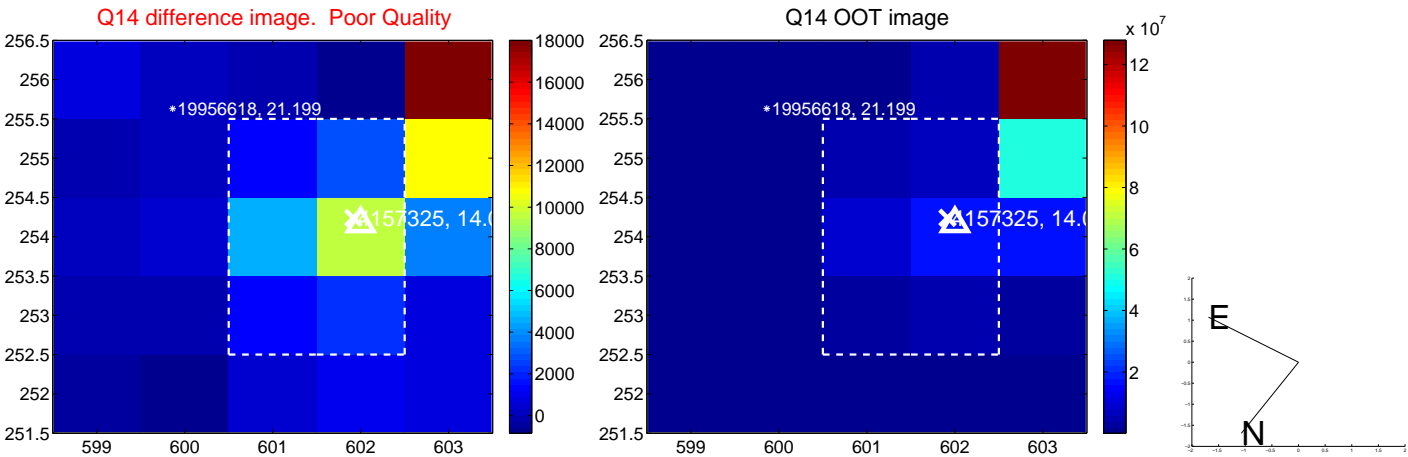
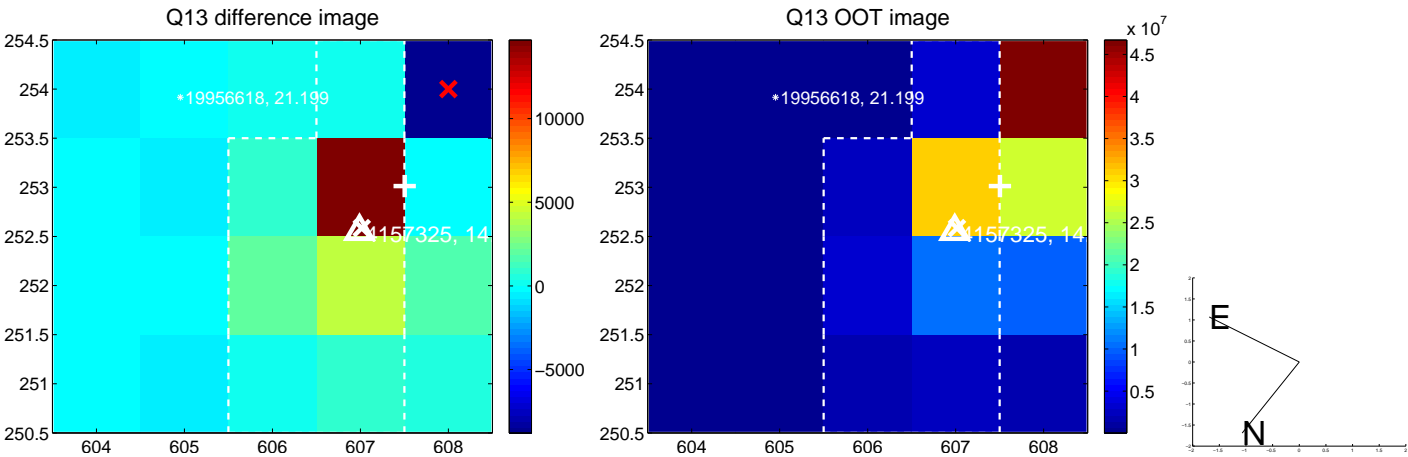
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



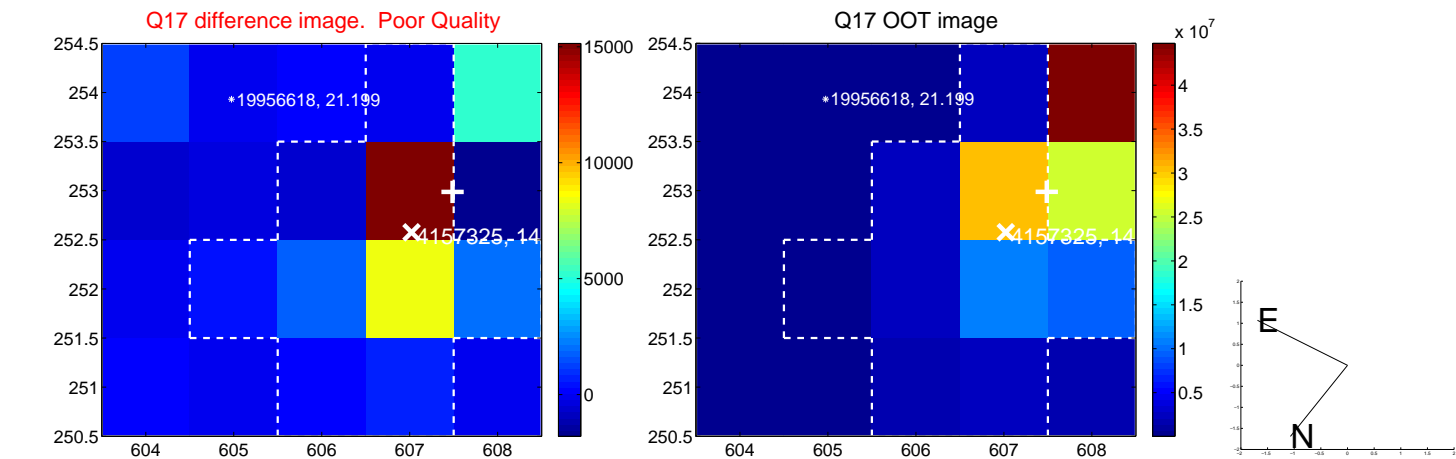
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



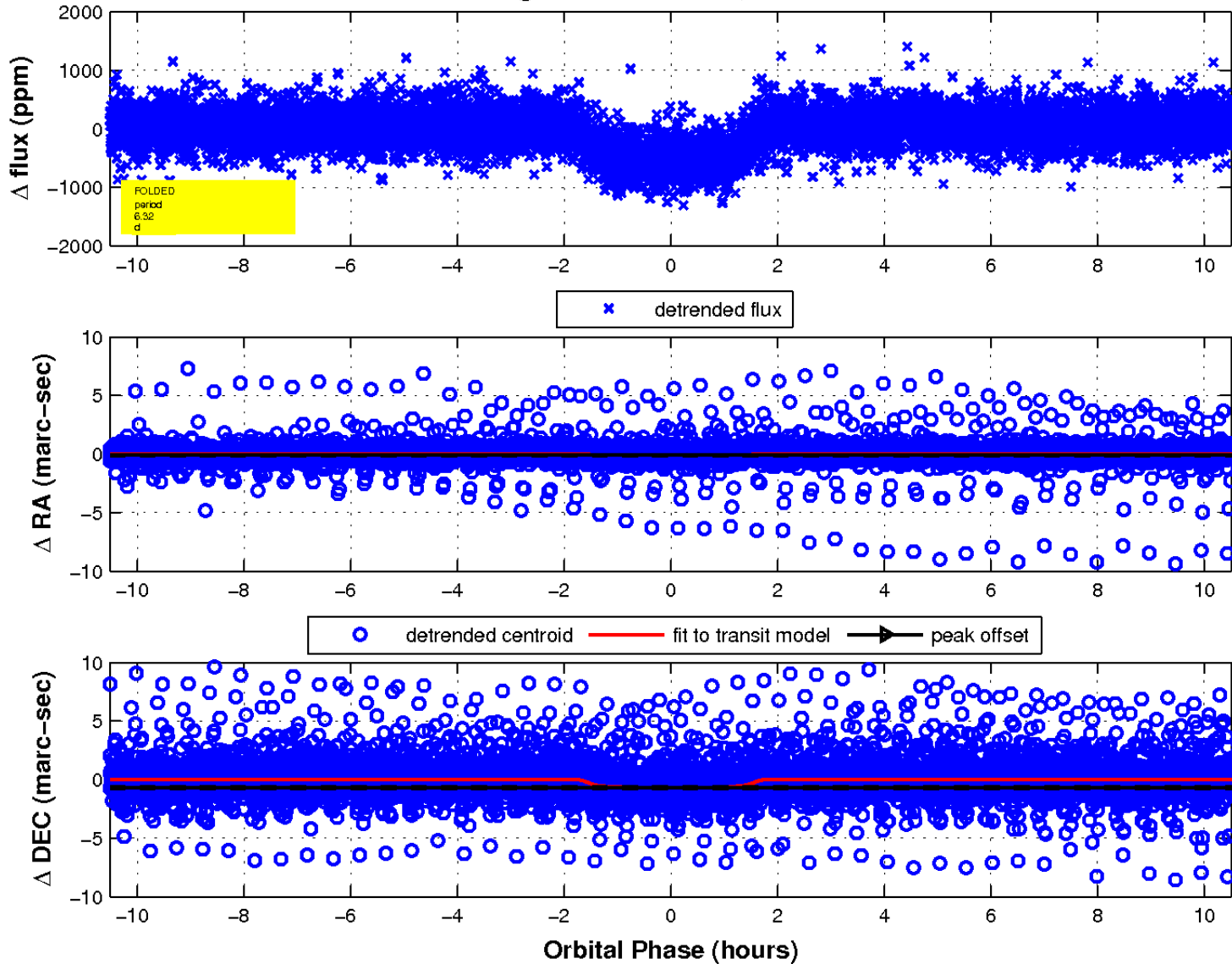
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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

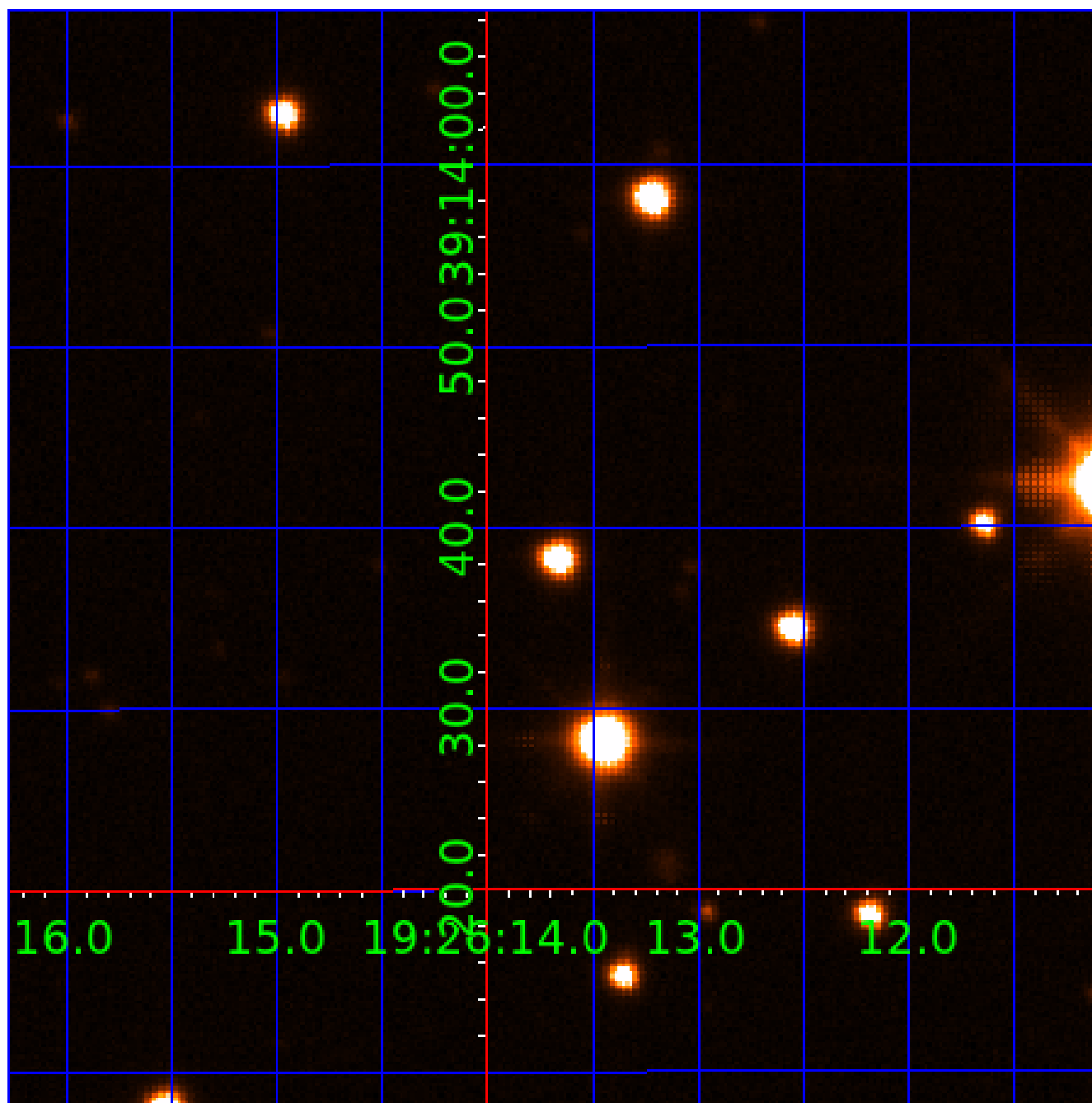


fluxWeightedCentroids, Planet 1 of 4



UKIRT Image

Declination



KIC 004157325

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})
004157325-01	OBS	1860.01	6.319442	132.228054	578.2	3.504	45.6	50.4	1.02	5670	2.89	223.51
004157325-02	OBS	1860.02	12.209479	140.551770	546.0	4.468	32.0	36.2	1.02	5670	2.85	92.88
004157325-03	OBS	1860.03	3.076411	132.268316	201.3	2.779	22.4	23.8	1.02	5670	1.73	583.63
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Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004157325-01	OBS	PC	1.00	0	0	0	0	CENT_KIC_POS
004157325-02	OBS	PC	1.00	0	0	0	0	CENT_KIC_POS
004157325-03	OBS	PC	1.00	0	0	0	0	CENT_KIC_POS
004157325-04	OBS	FP	0.09	0	0	1	0	CENT_RESOLVED_OFFSET

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

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

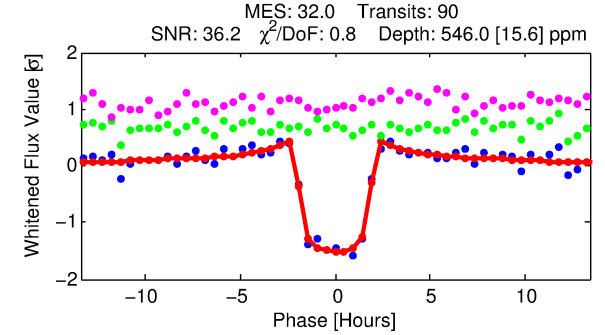
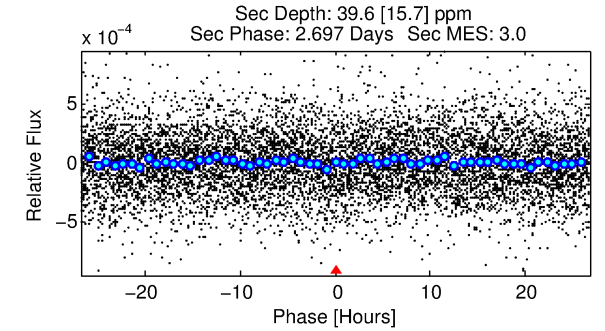
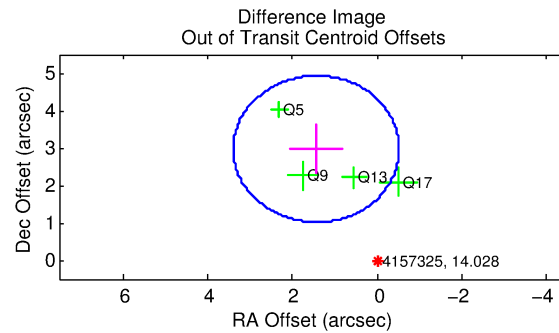
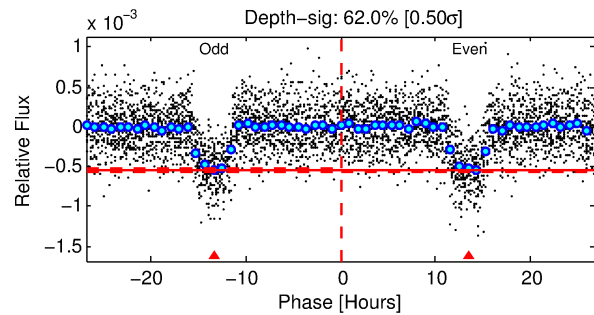
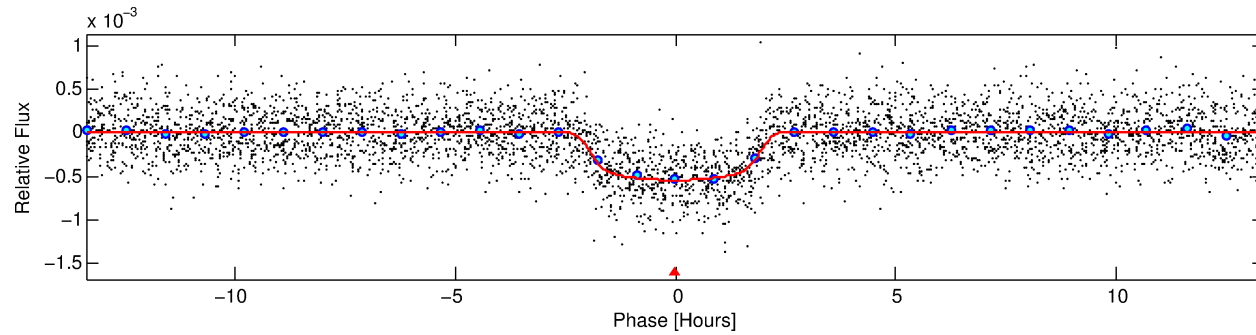
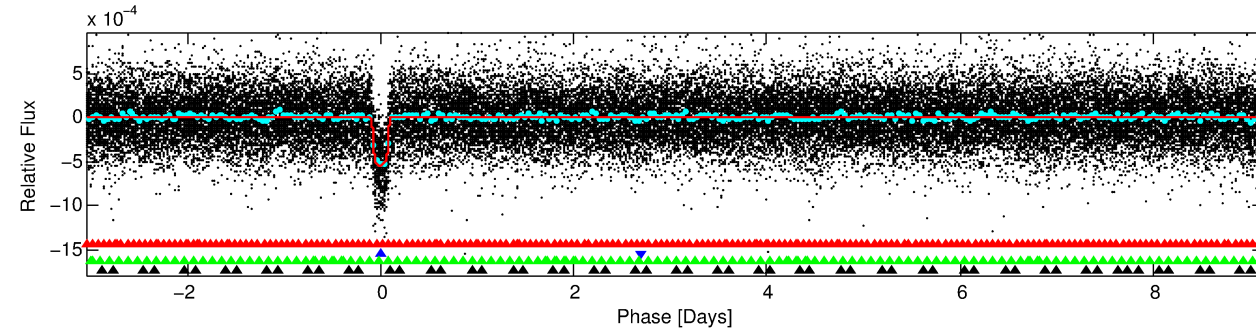
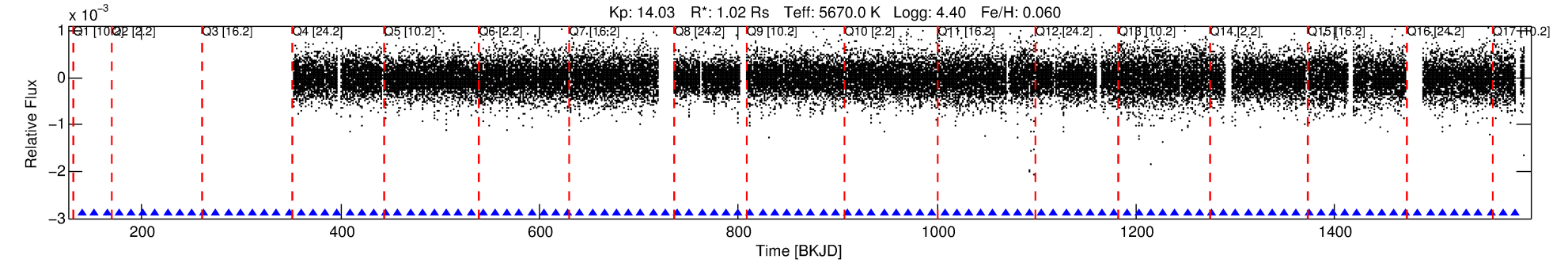
See http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col for comment definitions.

Ephemeris Match Information For 004157325-02

No Significant Match Found

DV One-Page Summary

KIC: 4157325 Candidate: 2 of 4 Period: 12.209 d
KOI: K01860.02 Name: Kepler-416c Corr: 0.938



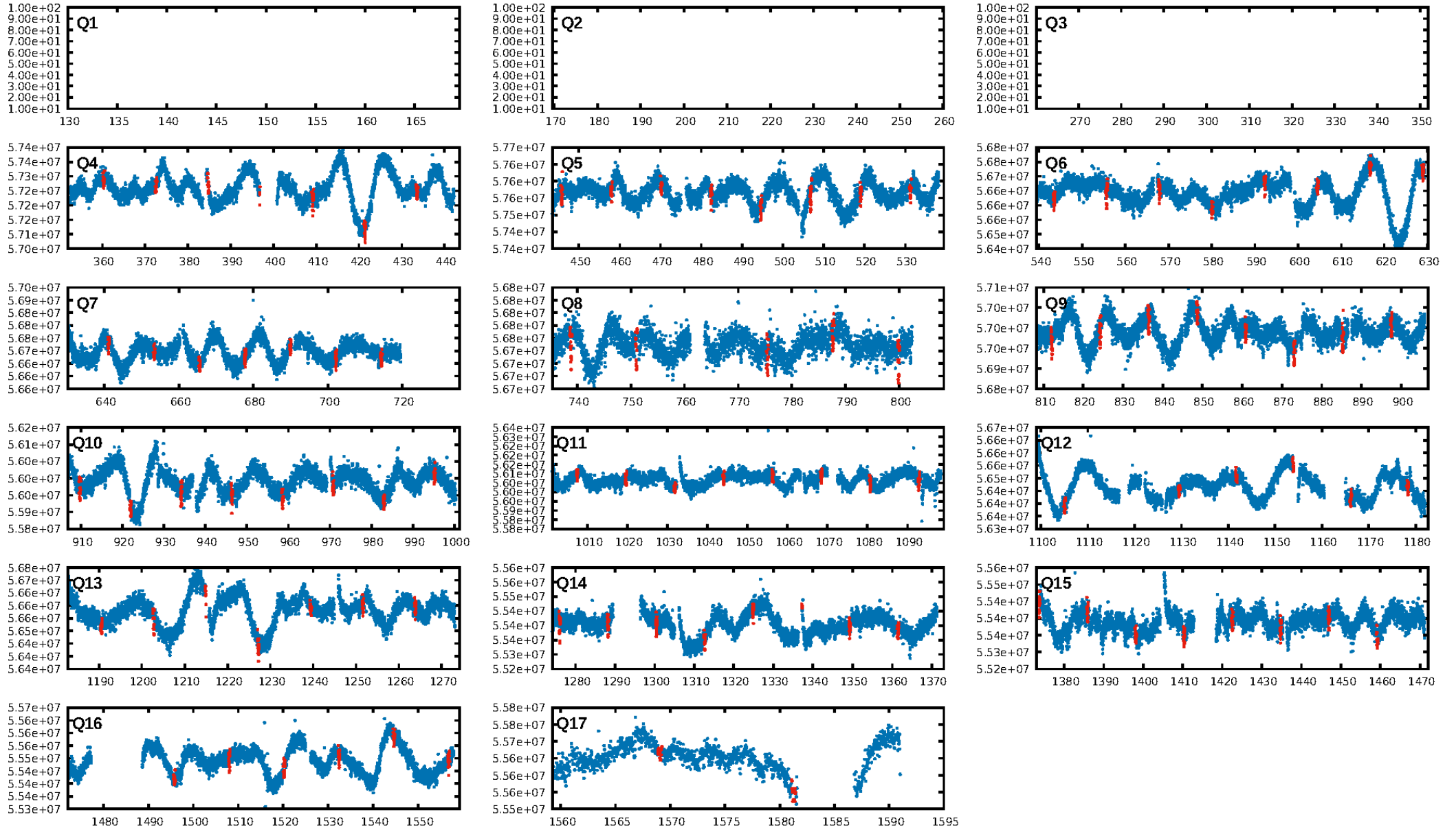
DV Fit Results:

Period = 12.20948 [0.00004] d
Epoch = 140.5518 [0.0026] BKJD
Rp/R* = 0.0256 [0.0013]
a/R* = 10.27 [2.07]
b = 0.90 [0.04]
Seff = 92.88 [18.98]
Teff = 792 [40] K
Rp = 2.85 [0.44] Re
a = 0.1020 [0.0128] AU
Ag = 27.86 [12.49] [2.15 σ]
Teffp = 2812 [292] K [6.86 σ]

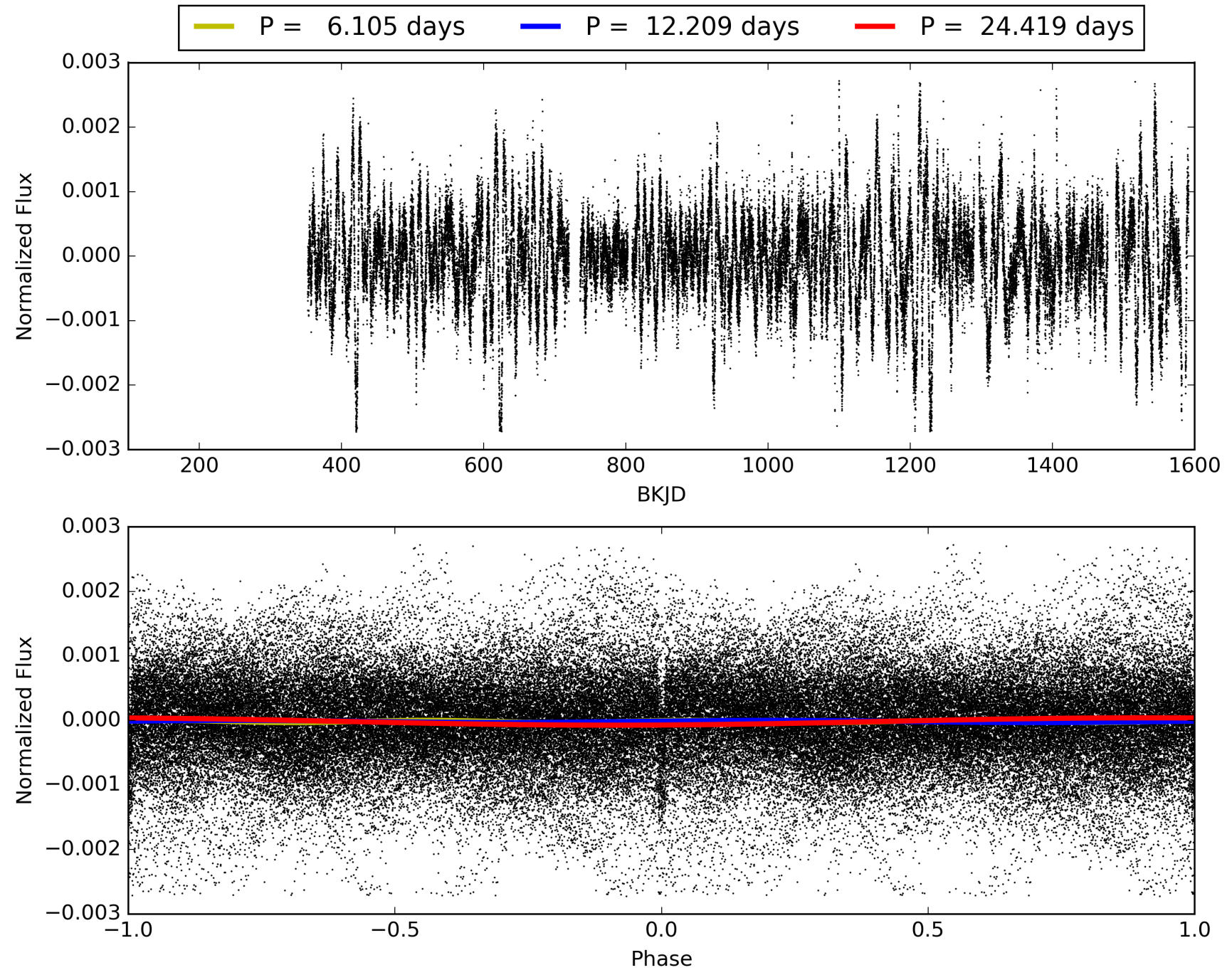
DV Diagnostic Results:

ShortPeriod-sig: 100.0% [24.90 σ]
LongPeriod-sig: 100.0% [42.50 σ]
ModelChiSquare2-sig: 55.2%
ModelChiSquareGof-sig: 100.0%
Bootstrap-pfa: 2.32e-189
RollingBand-fgt: 1.00 [88/88]
GhostDiagnostic-chr: 4.779
Centroid-sig: 0.0%
Centroid-so: 3.382 arcsec [19.81 σ]
OotOffset-rm: 3.300 arcsec [5.06 σ]
KicOffset-rm: 0.173 arcsec [0.94 σ]
OotOffset-st: 0/0/0/4 [4]
KicOffset-st: 2/3/3/4 [12]
DiffImageQuality-fgm: 0.58 [7/12]
DiffImageOverlap-fno: 0.79 [11/14]

TCE 004157325-02, PDC Light Curves

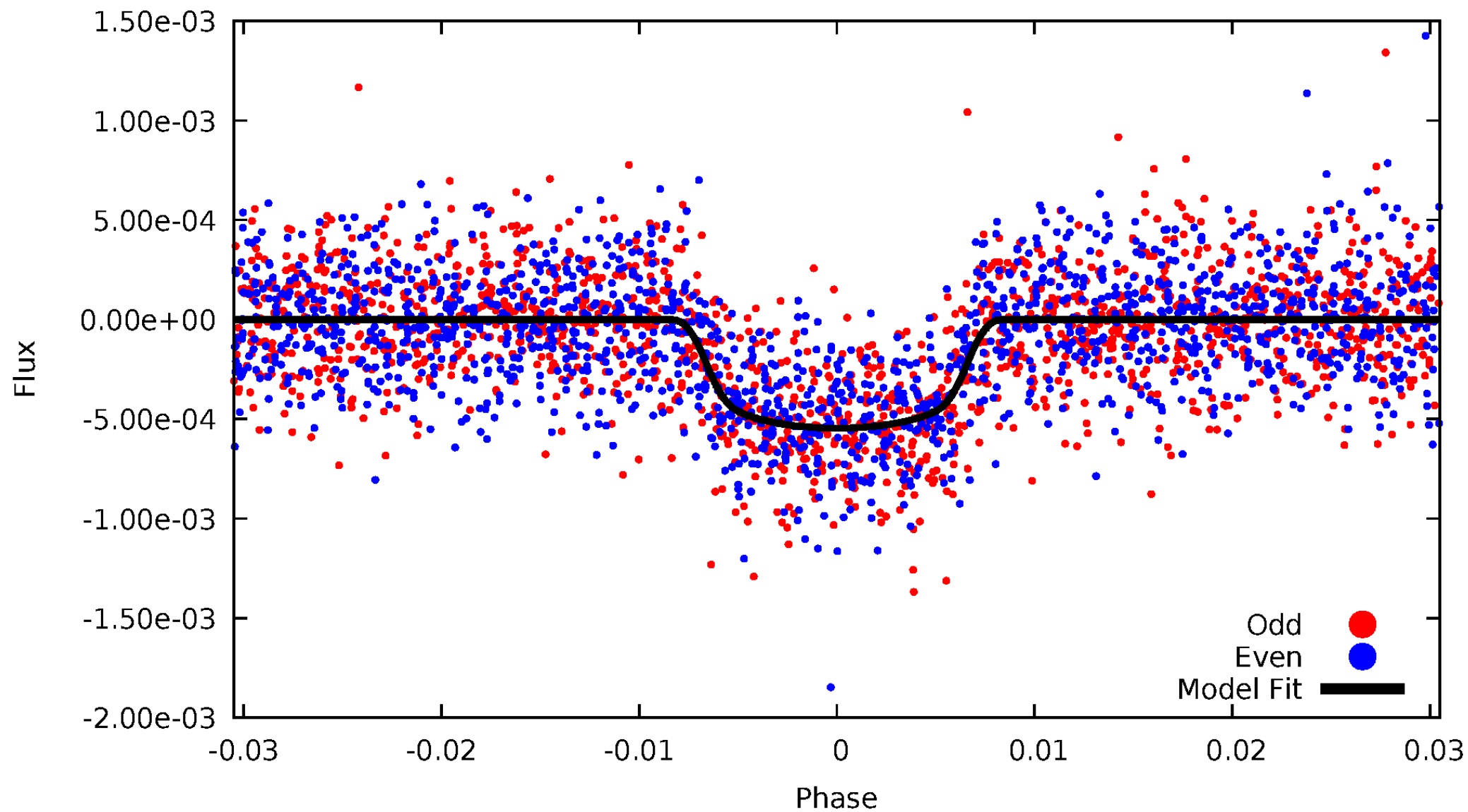


TCE 004157325-02



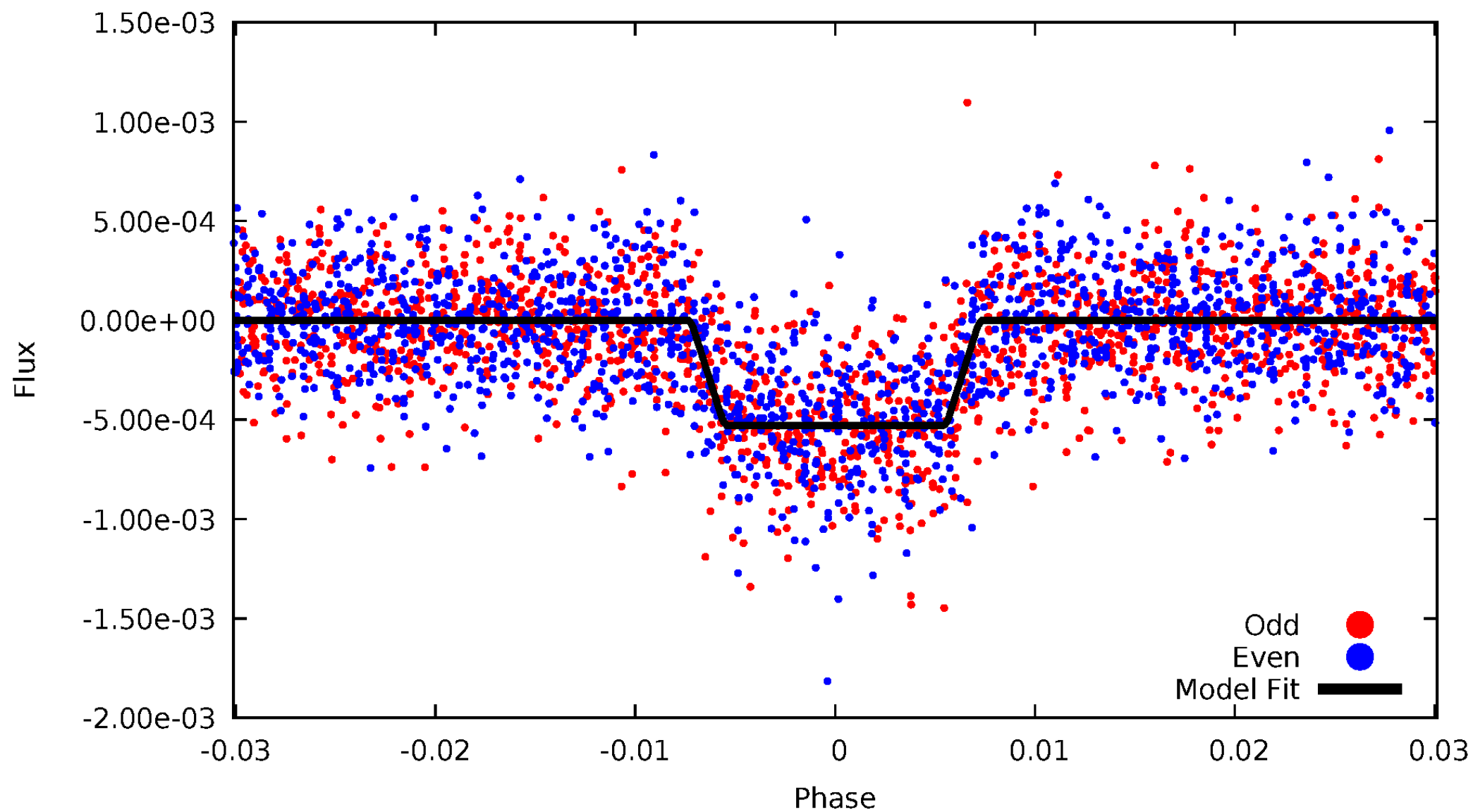
DV Odd/Even

TCE 004157325-02



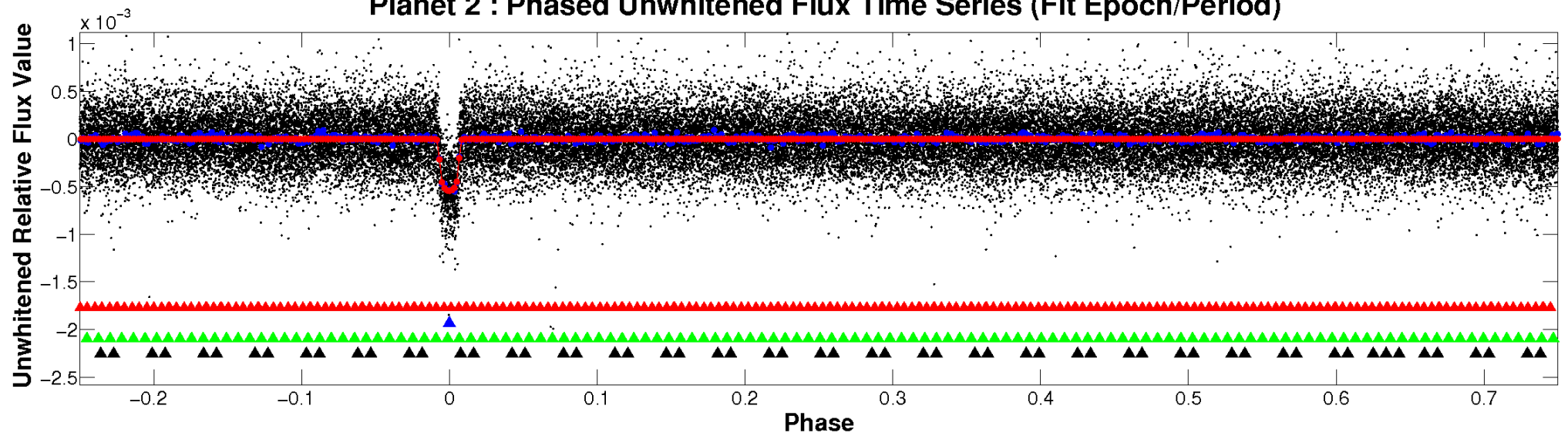
ALT Odd/Even

TCE 004157325-02

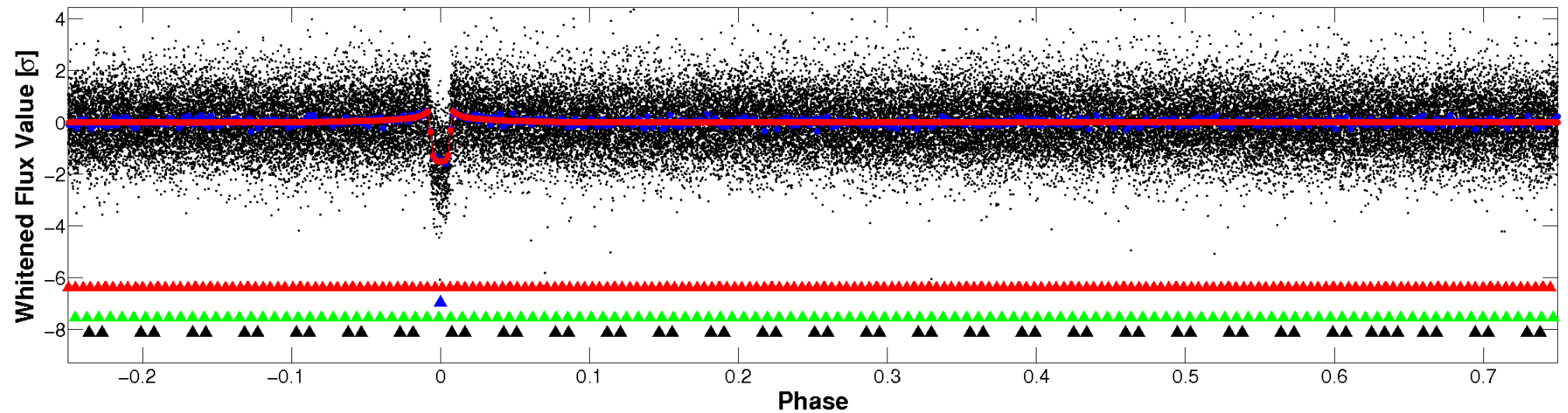


Non-Whitened Vs. Whitened Light Curve

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

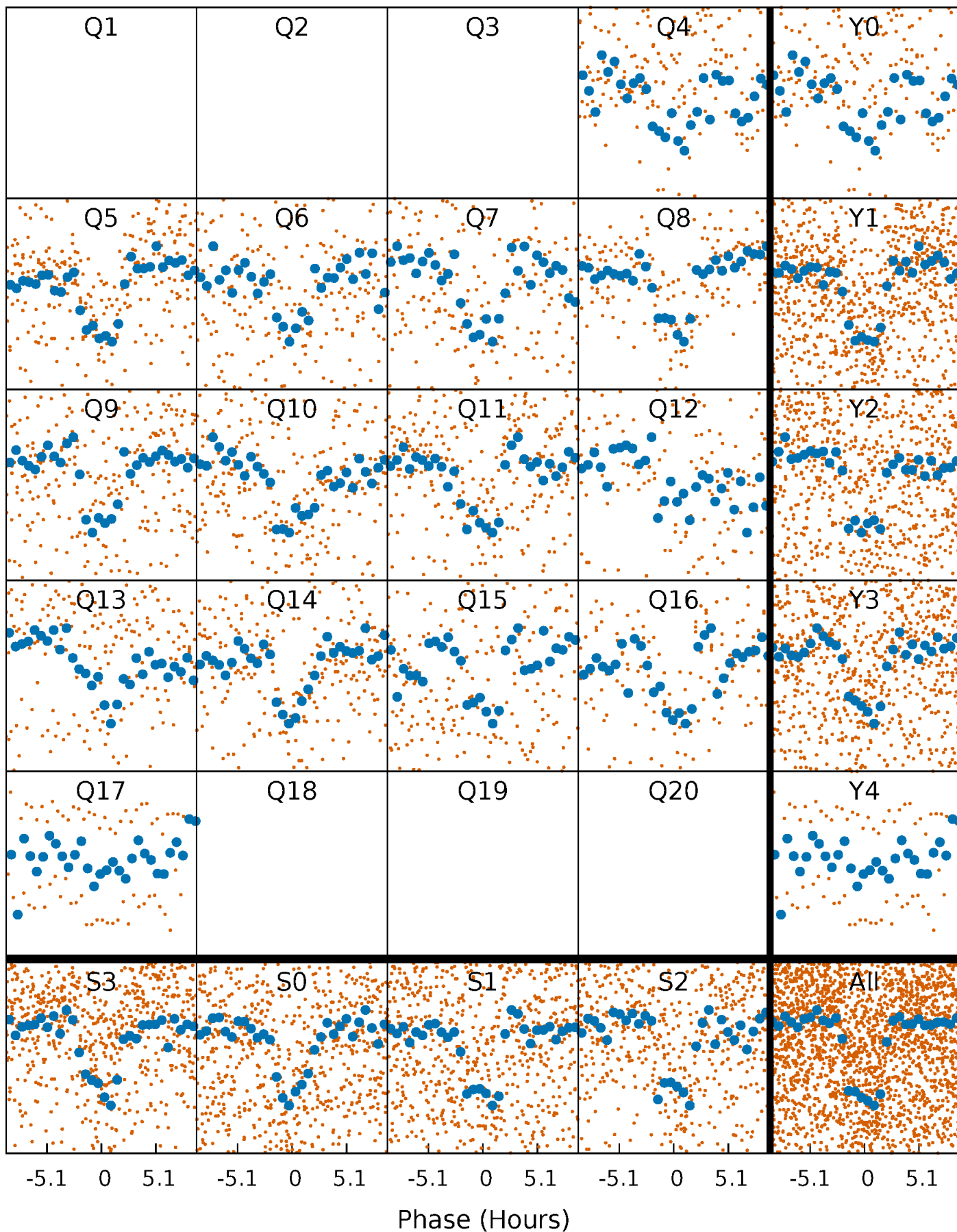


Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



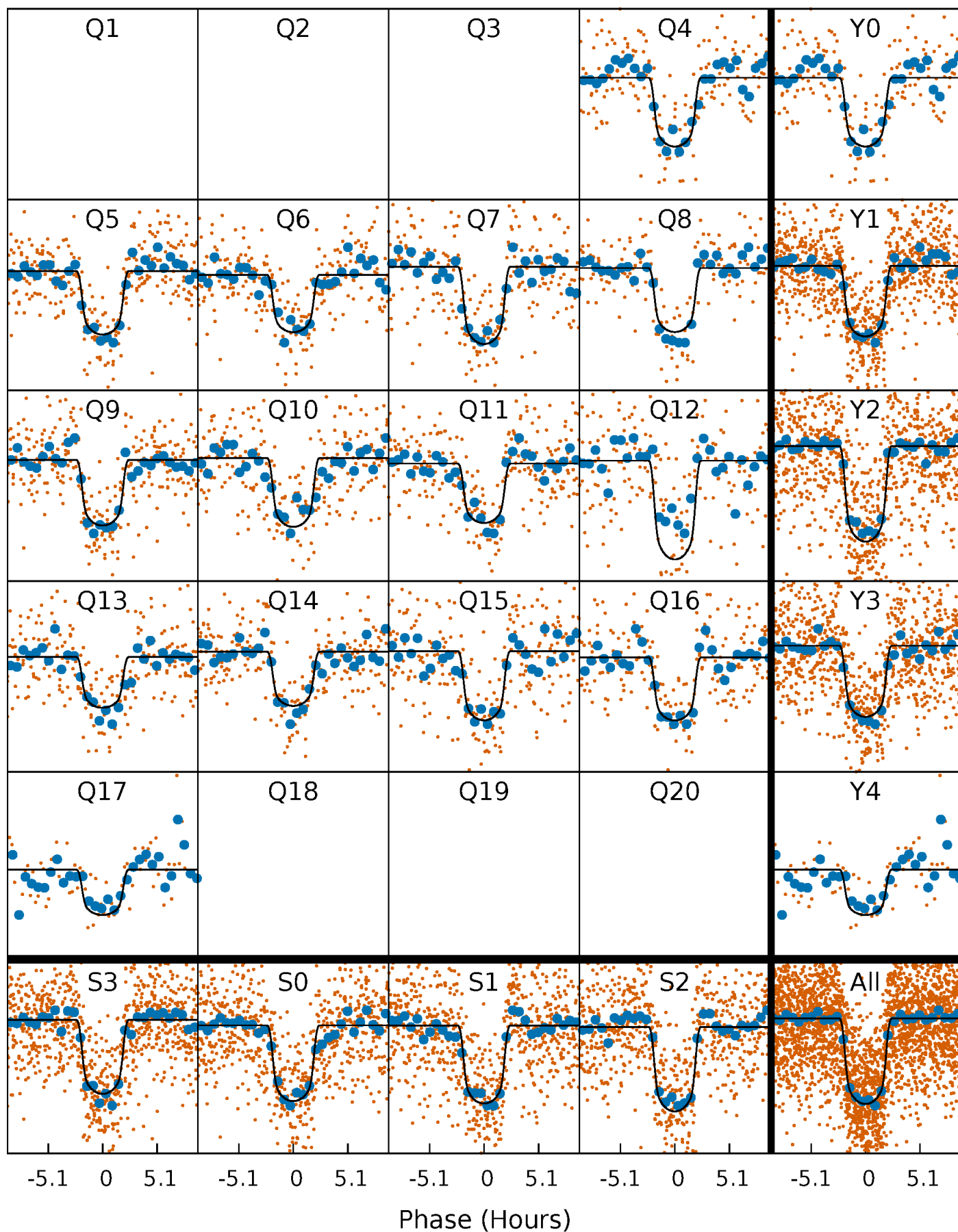
PDC Quarter-Phased Transit Curves

TCE 004157325-02 P= 12.209479 Days $T_0=140.551770$ (BKJD)



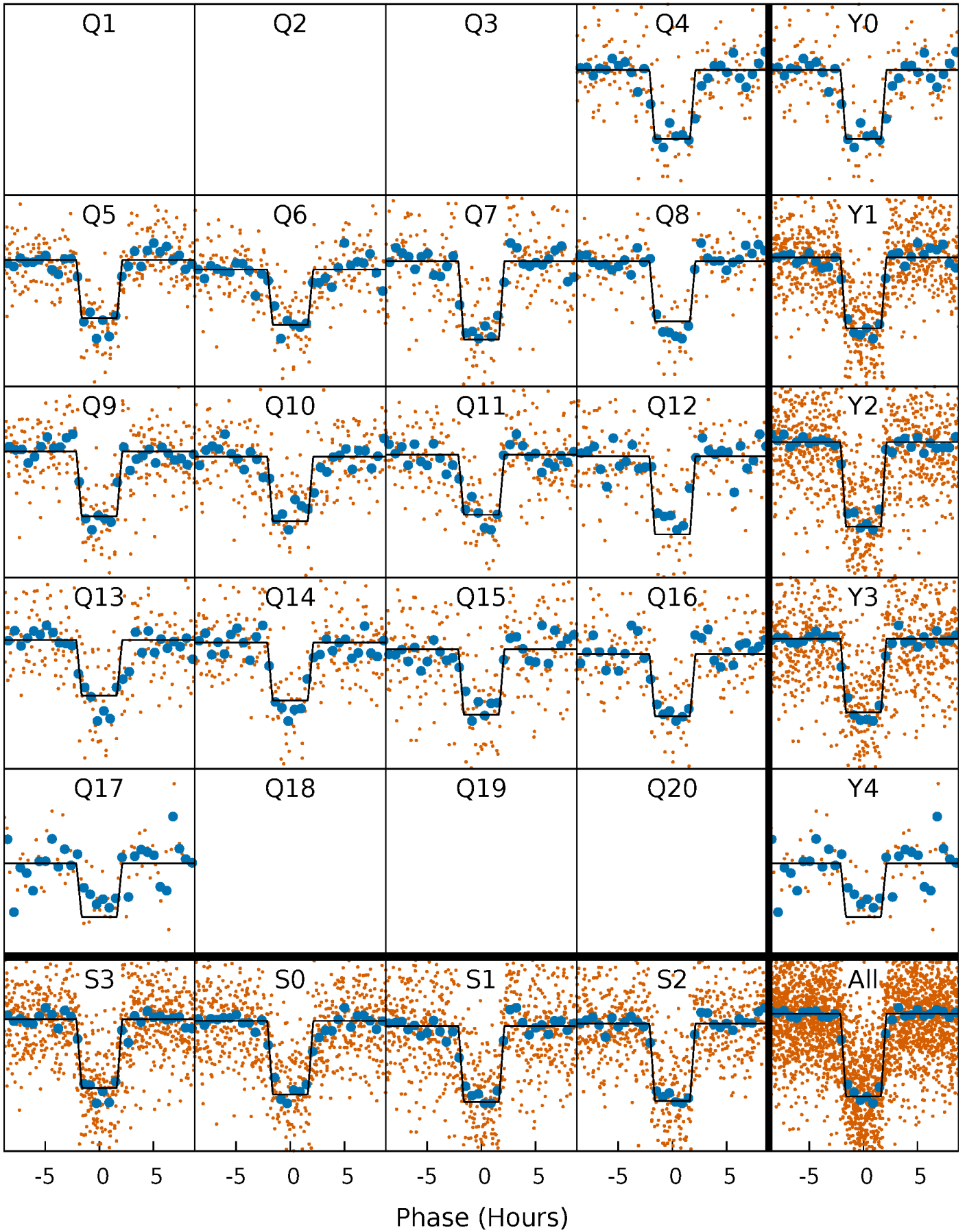
DV Quarter-Phased Transit Curves

TCE 004157325-02 P= 12.209479 Days $T_0=140.551770$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

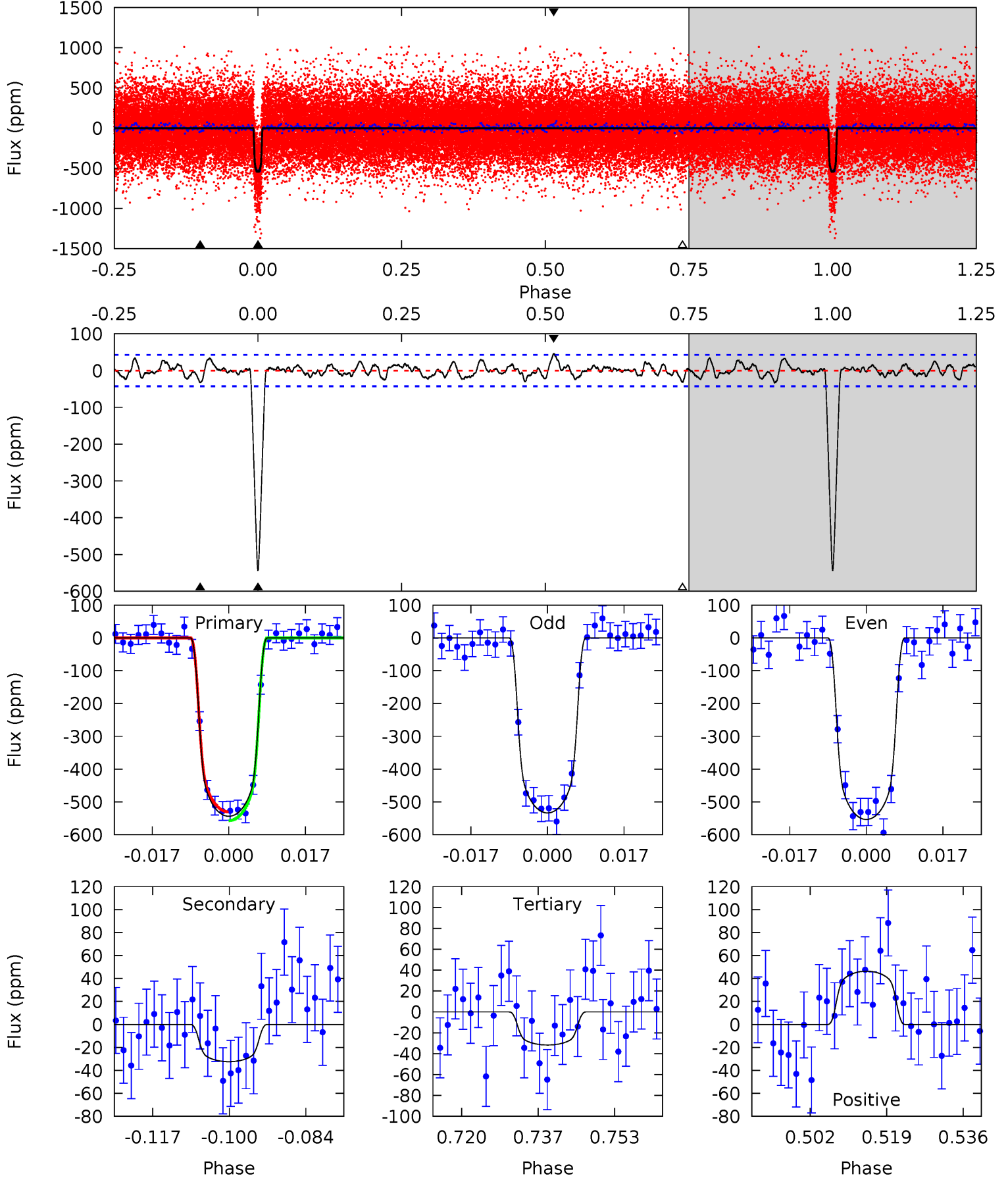
TCE 004157325-02 P= 12.209519 Days $T_0=140.549387$ (BKJD)



DV Model-Shift Uniqueness Test

004157325-02, P = 12.209479 Days, E = 140.551770 Days

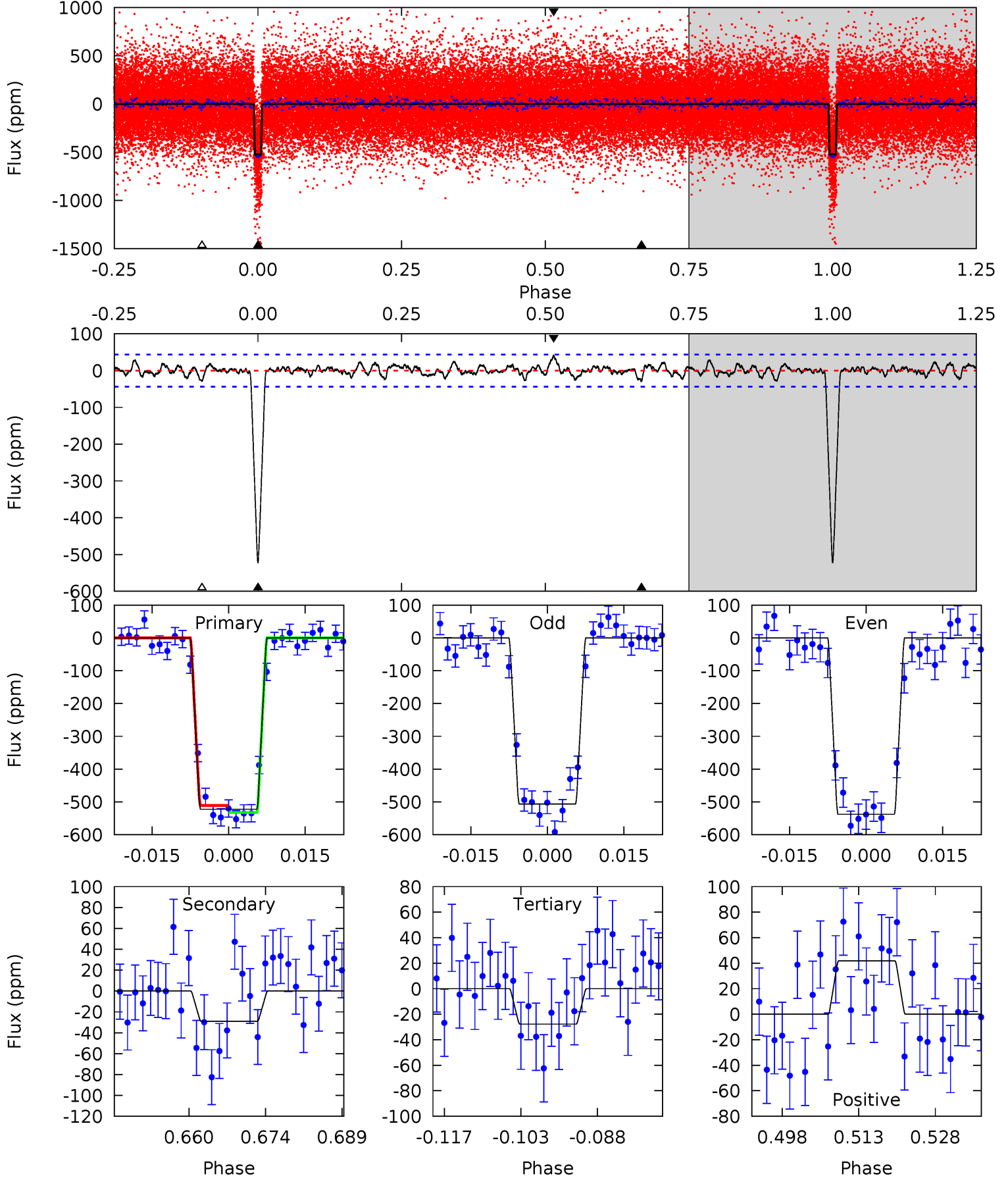
Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
62.9	3.75	3.67	5.37	4.93	2.39	1.49	59.3	57.6	0.08	-1.61	1.15	0.99	0.08	1.55



Alt Model-Shift Uniqueness Test

004157325-02, P = 12.209519 Days, E = 140.549387 Days

Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
59.2	3.29	3.14	4.75	4.95	2.44	1.18	56.1	54.5	0.15	-1.46	1.79	1.01	0.07	1.21



Stellar Parameters For KIC 004157325

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	5670^{+114}_{-114}	$4.397^{+0.095}_{-0.105}$	$0.060^{+0.150}_{-0.150}$	$1.022^{+0.148}_{-0.108}$	$0.949^{+0.067}_{-0.055}$	$1.254^{+0.475}_{-0.407}$
	+2%/-2%	+2%/-2%	+250%/-250%	+14%/-11%	+7%/-6%	+38%/-32%
Source	SPE58	SPE58	SPE58	DSEP		

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

Secondary Eclipse Parameters for KIC 004157325-02 / KOI 1860.02

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	A_{obs}
DV	-32 ± 9	$2.87^{+0.26}_{-0.23}$	1106^{+44}_{-41}	3240^{+141}_{-162}	23^{+7}_{-7}
Alt.	-29 ± 9	$2.56^{+0.24}_{-0.22}$	1106^{+48}_{-44}	3290^{+156}_{-198}	25^{+10}_{-9}

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

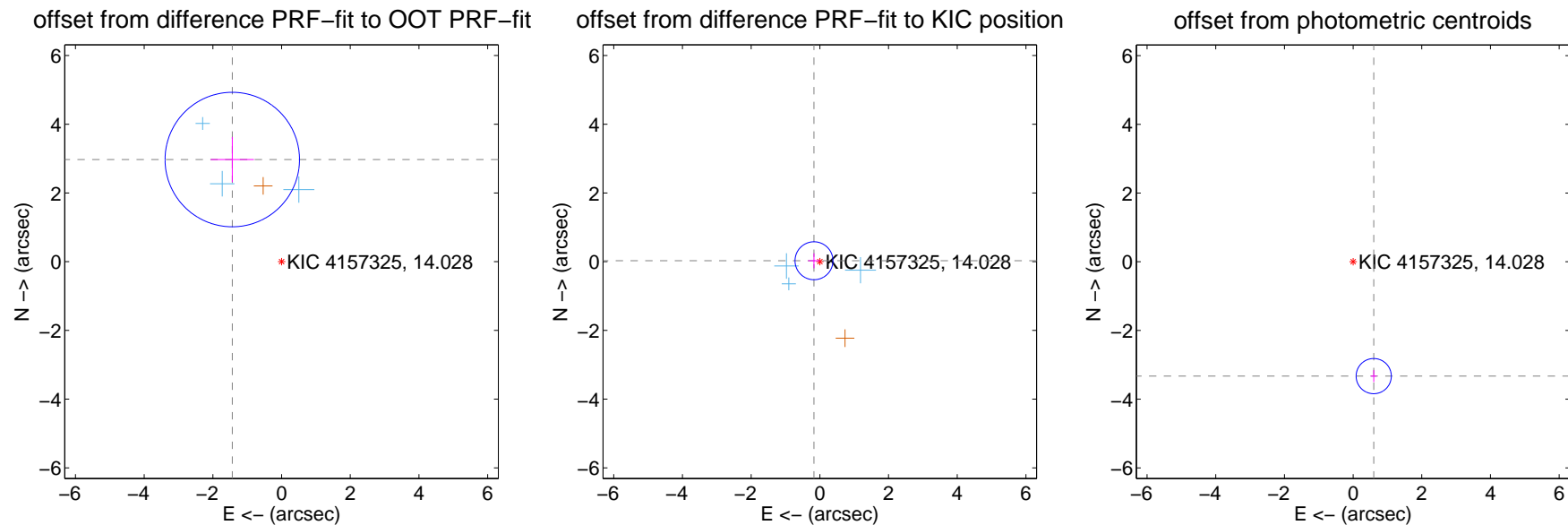
DV Centroid Data

Supplemental centroid analysis for 004157325-02. Kepler magnitude: 14.03. Transit SNR 36.16

There are 7 quarters with good PRF difference image offsets

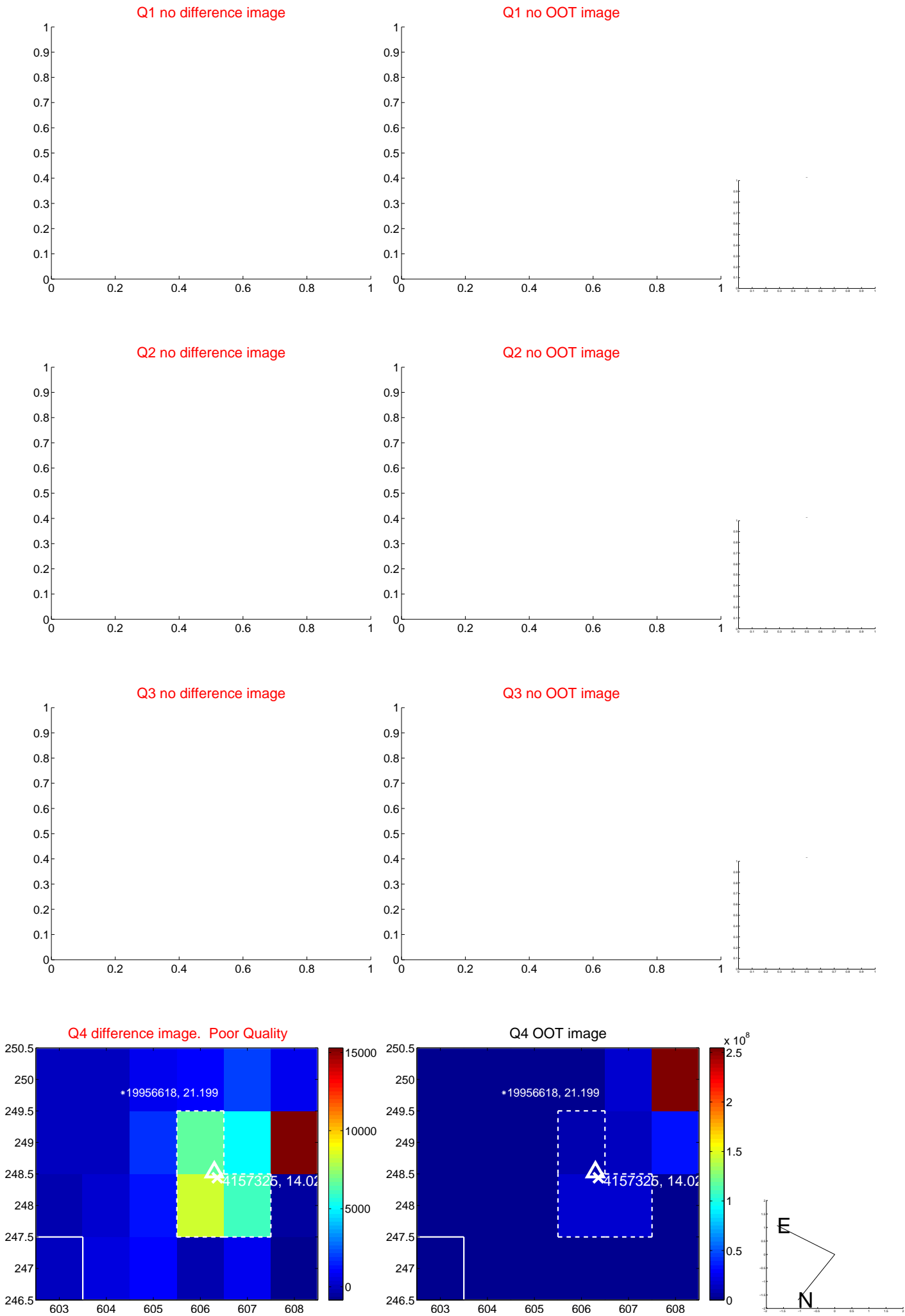
The OOT PRF centroid is offset from the target star catalog position by about 2.44 arcsec so the offset from difference PRF-fit to OOT-fit may be invalid.

	Distance in arcsec	Distance / σ	Δ RA	Δ Dec
PRF-fit source offset from OOT	3.300 ± 0.652	5.06	1.435 ± 0.629	2.972 ± 0.657
PRF-fit source offset from KIC position	0.173 ± 0.184	0.94	0.170 ± 0.172	0.027 ± 0.219
photometric centroid source offset	3.38 ± 0.17	19.81	-0.60 ± 0.09	-3.33 ± 0.17

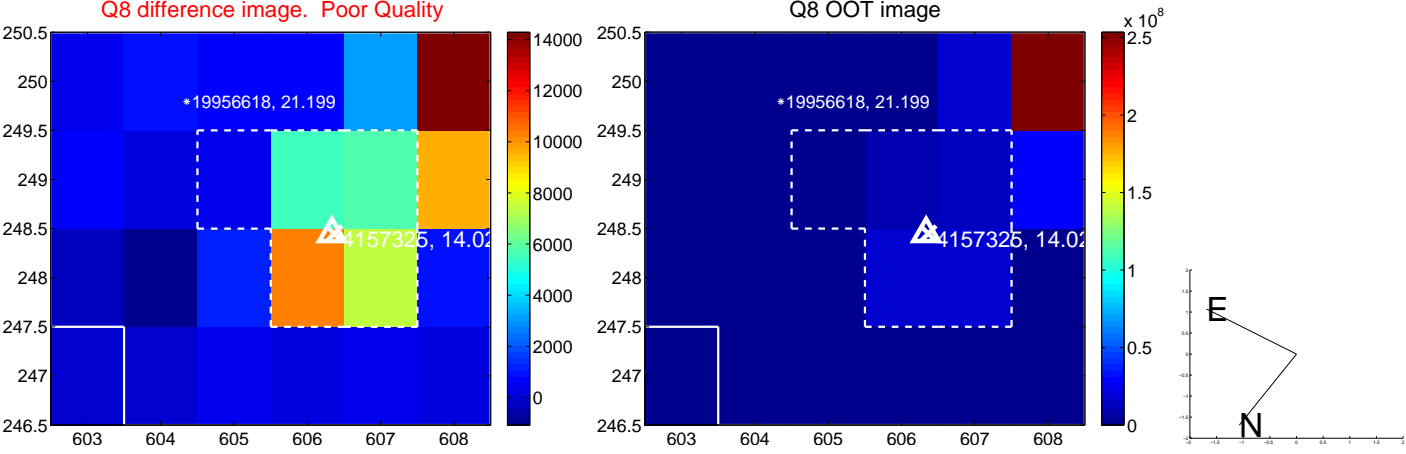
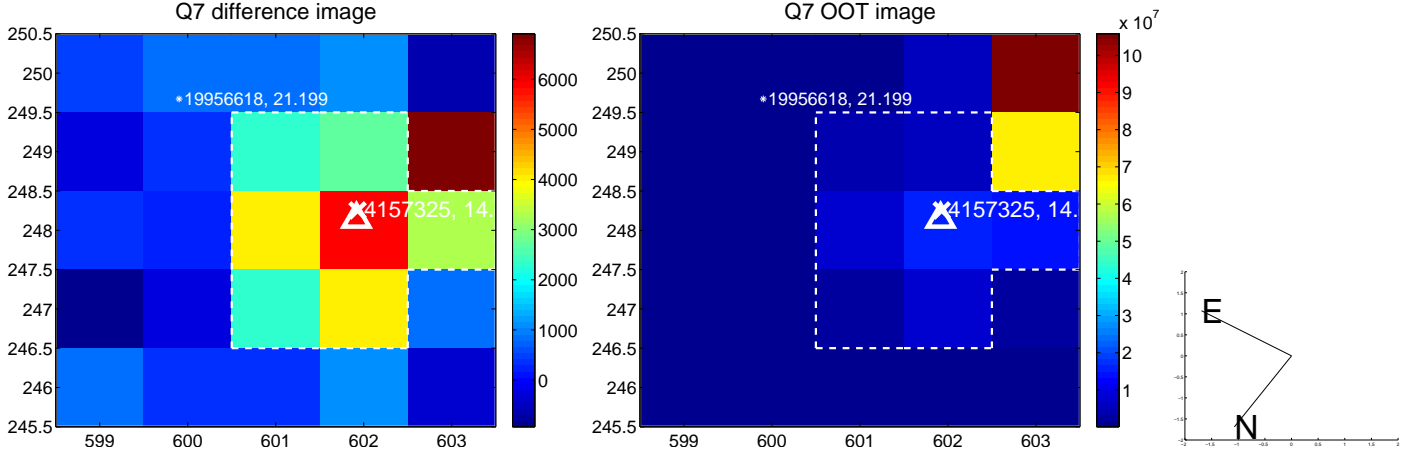
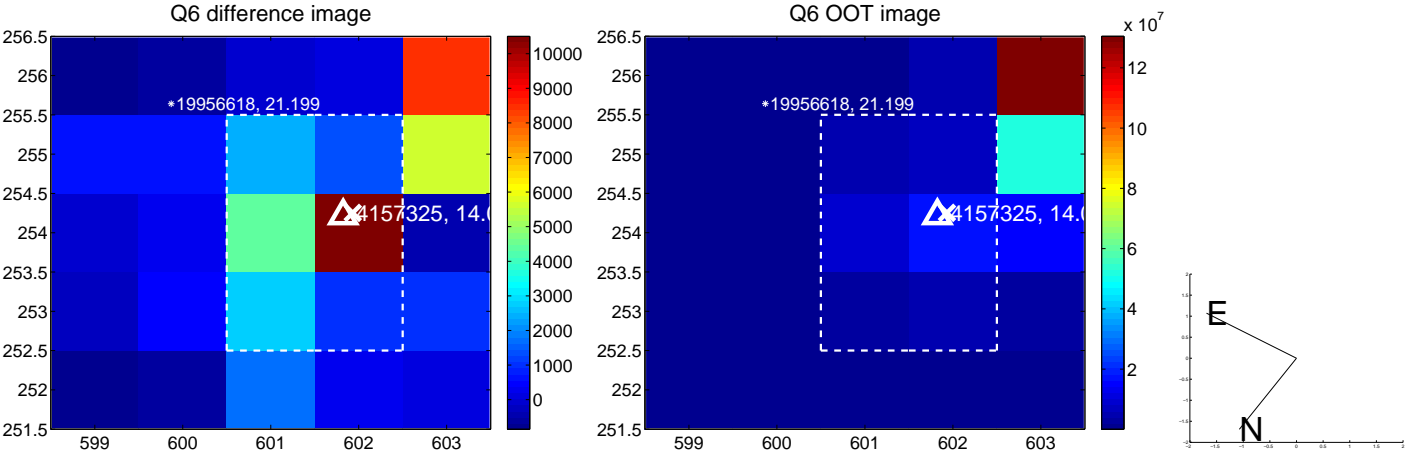
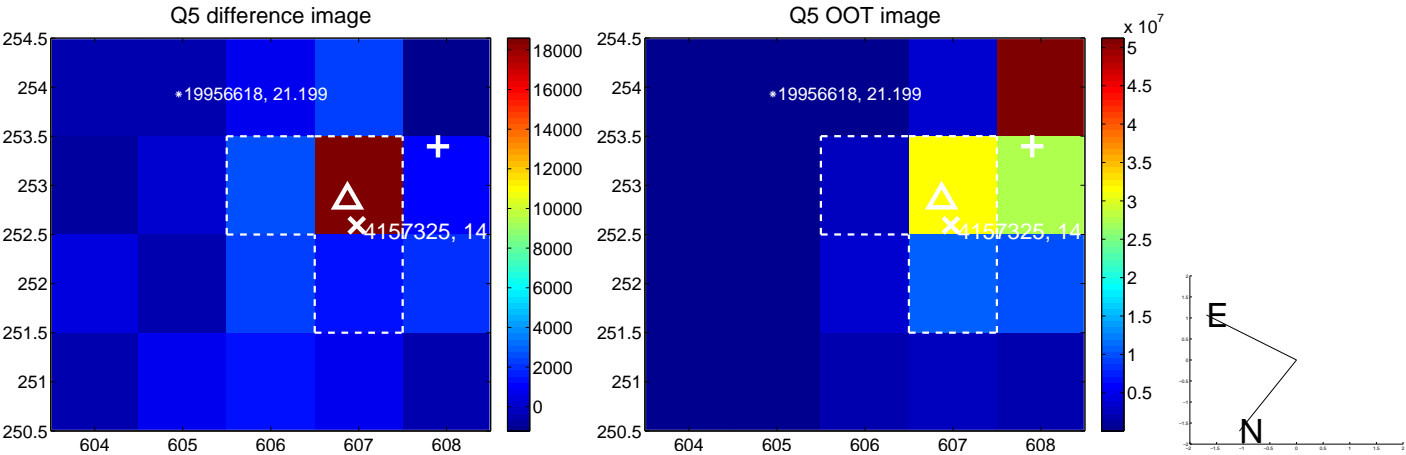


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets**; **Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three-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

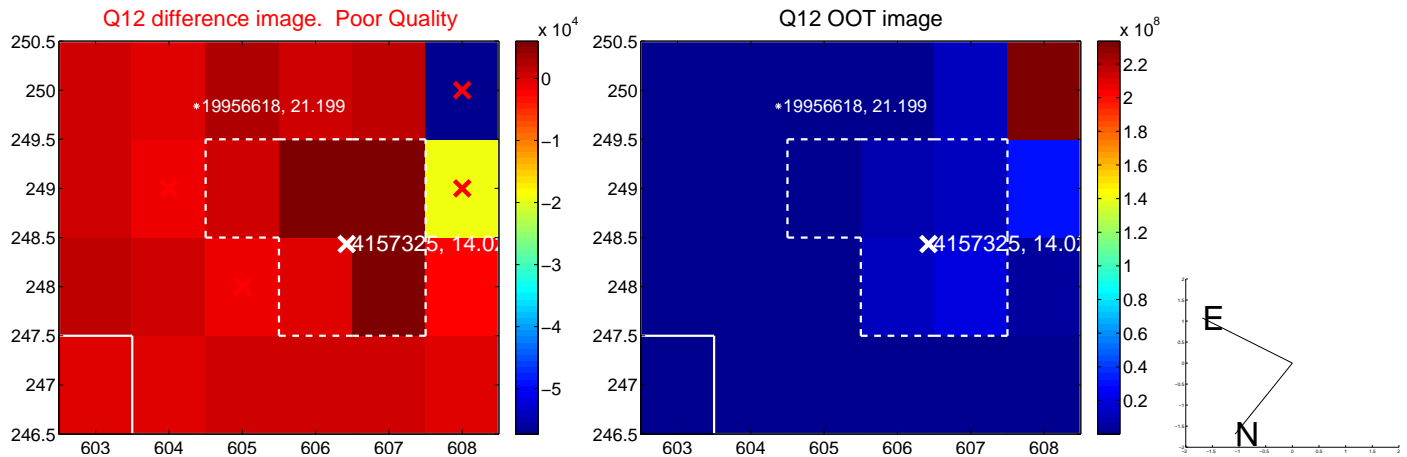
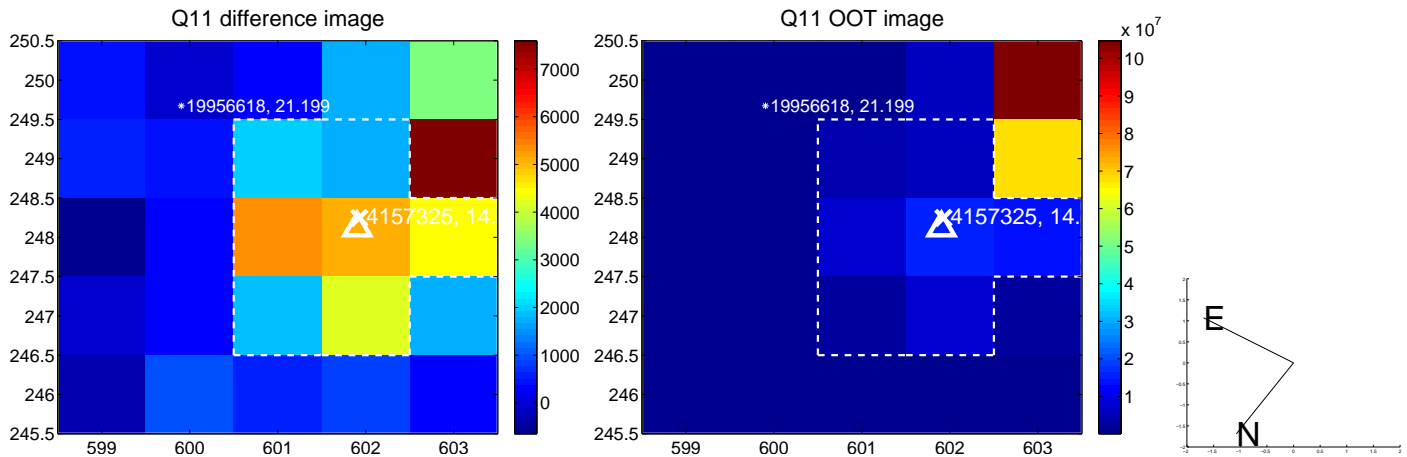
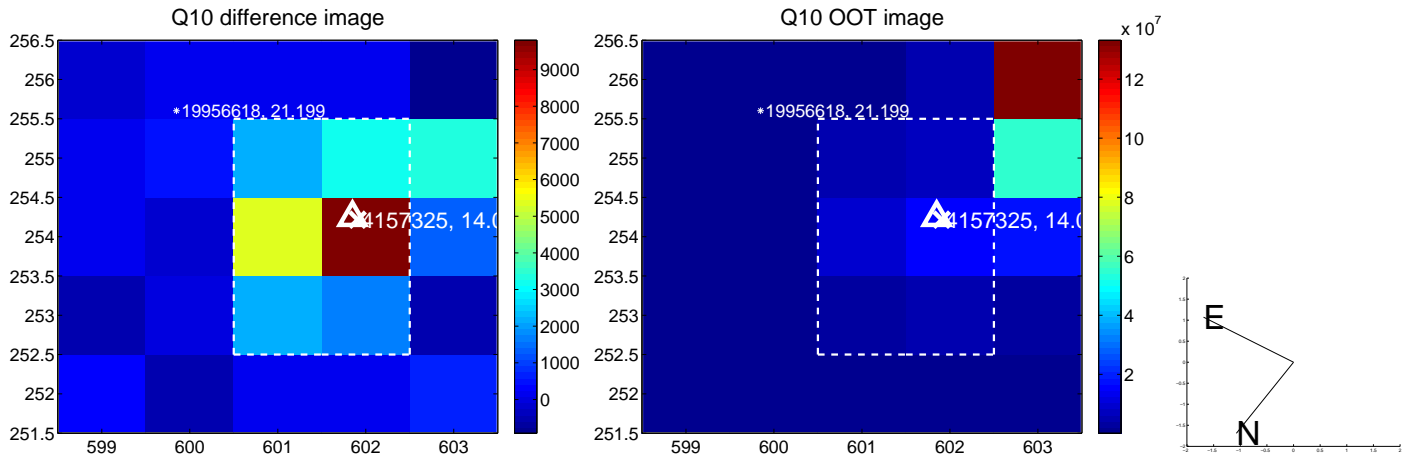
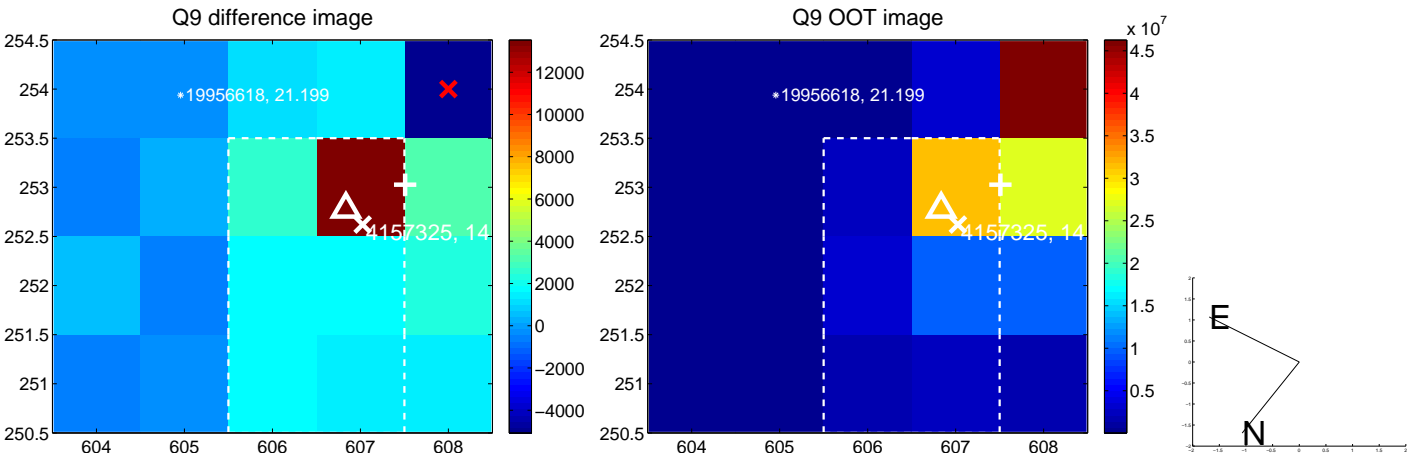
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



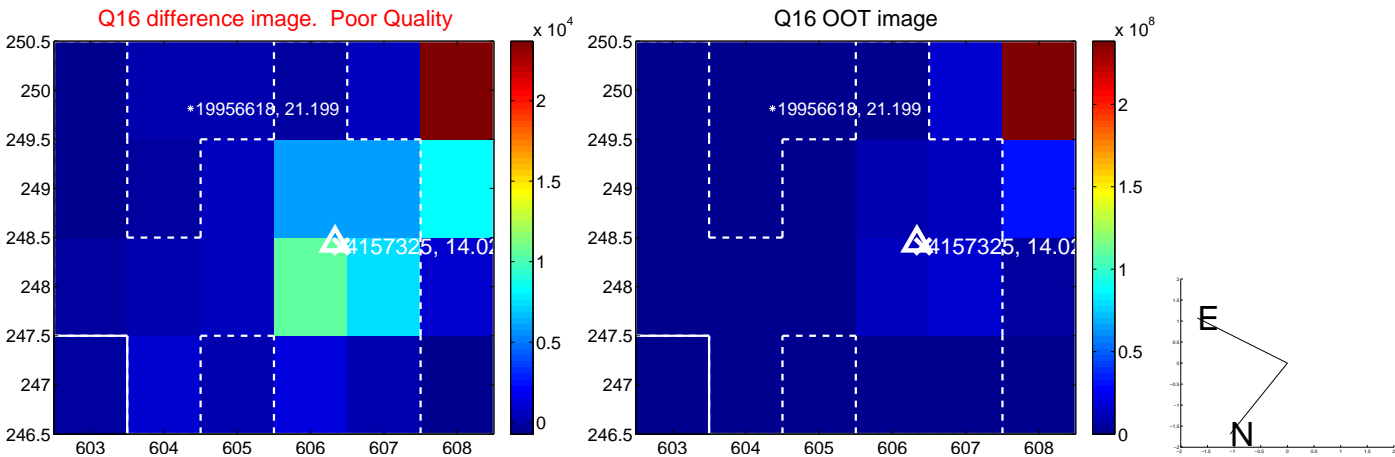
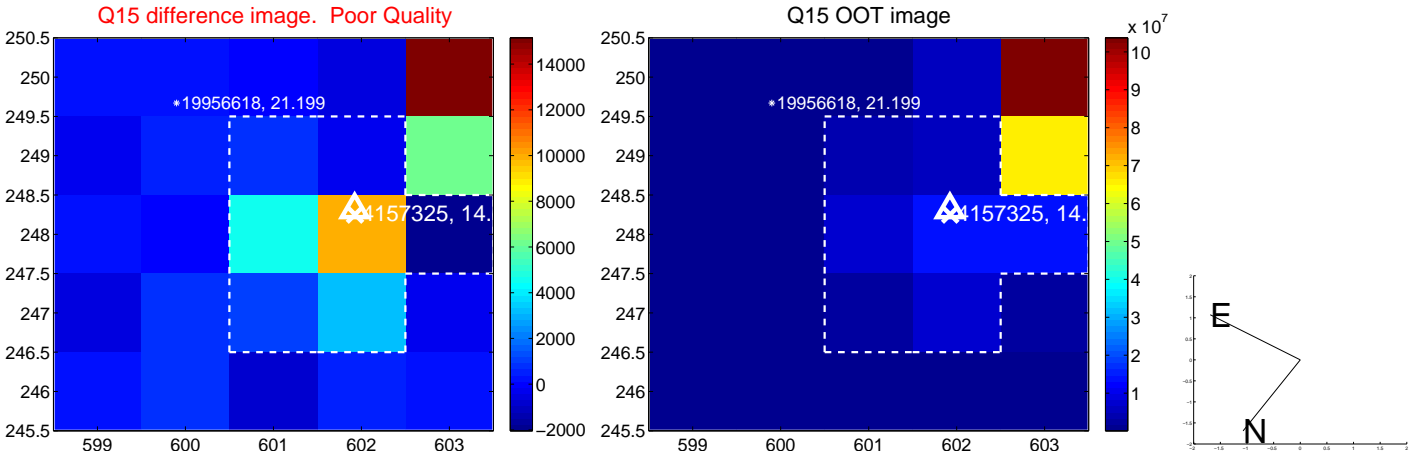
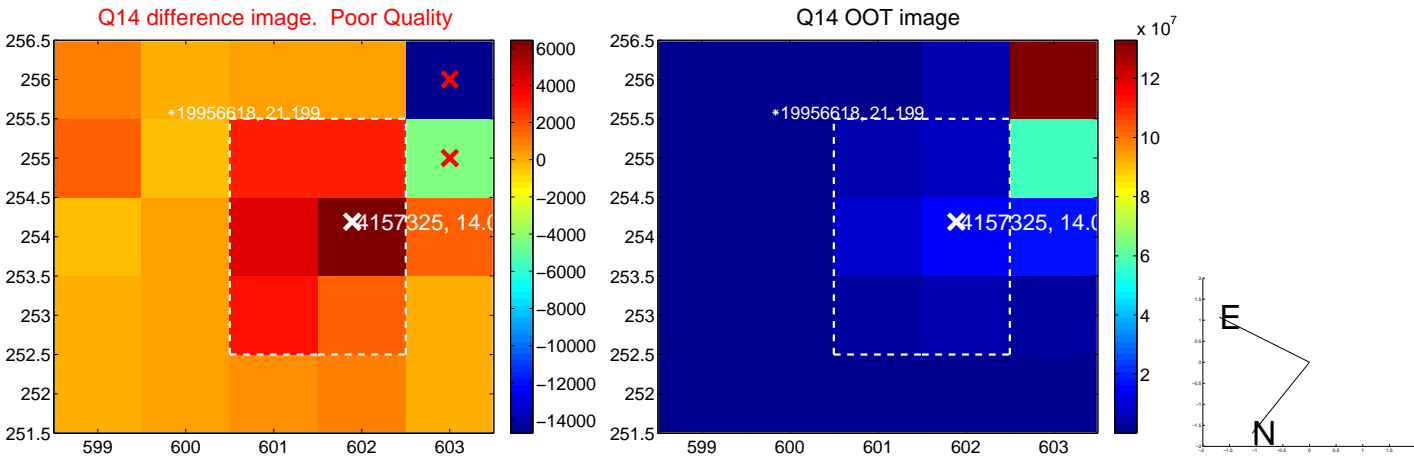
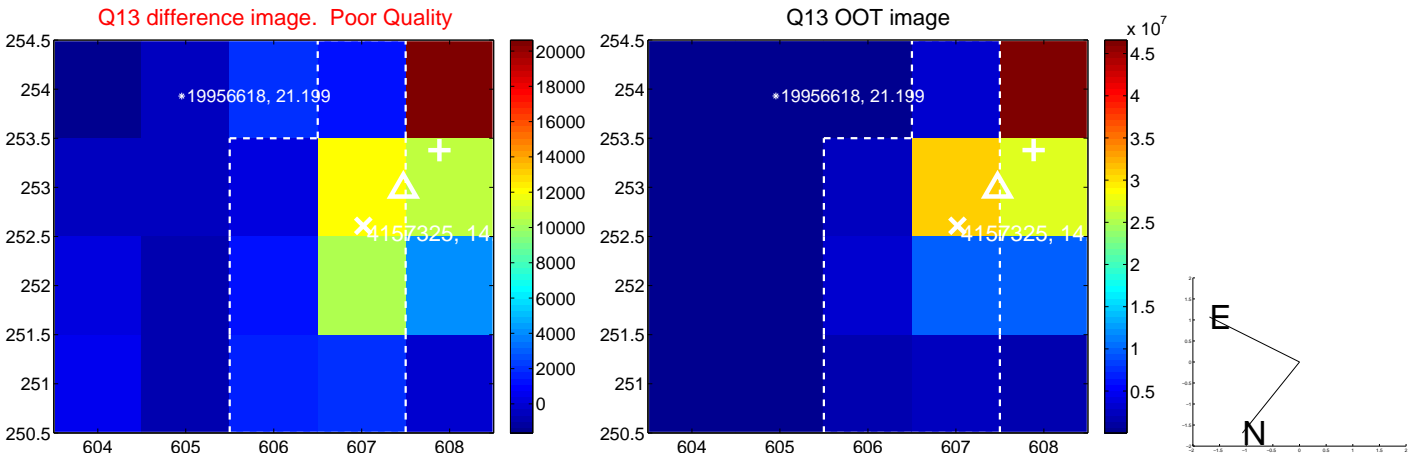
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



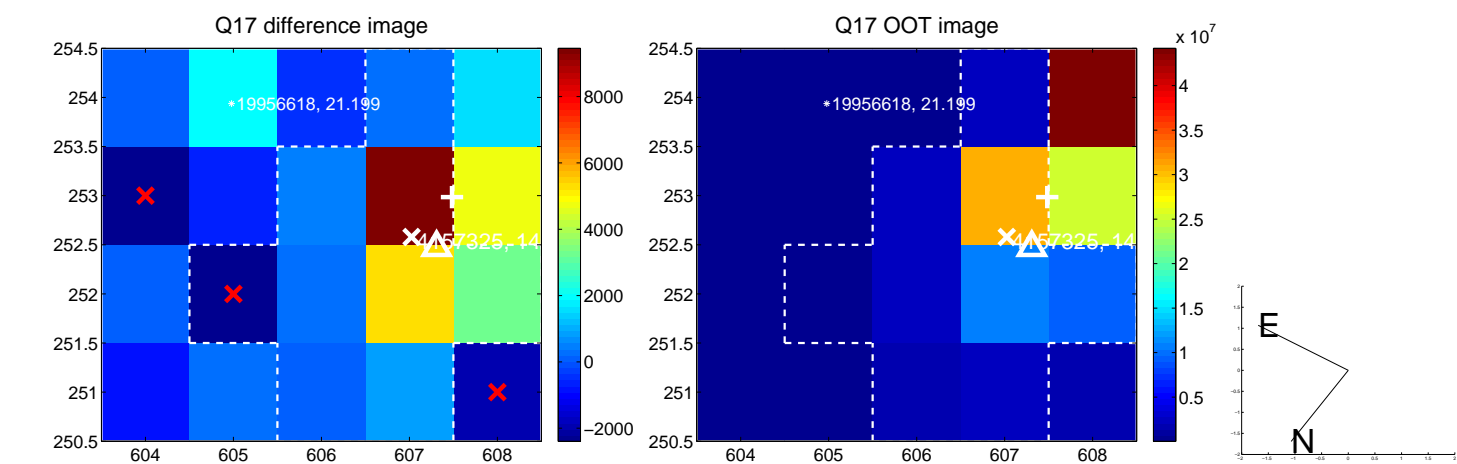
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



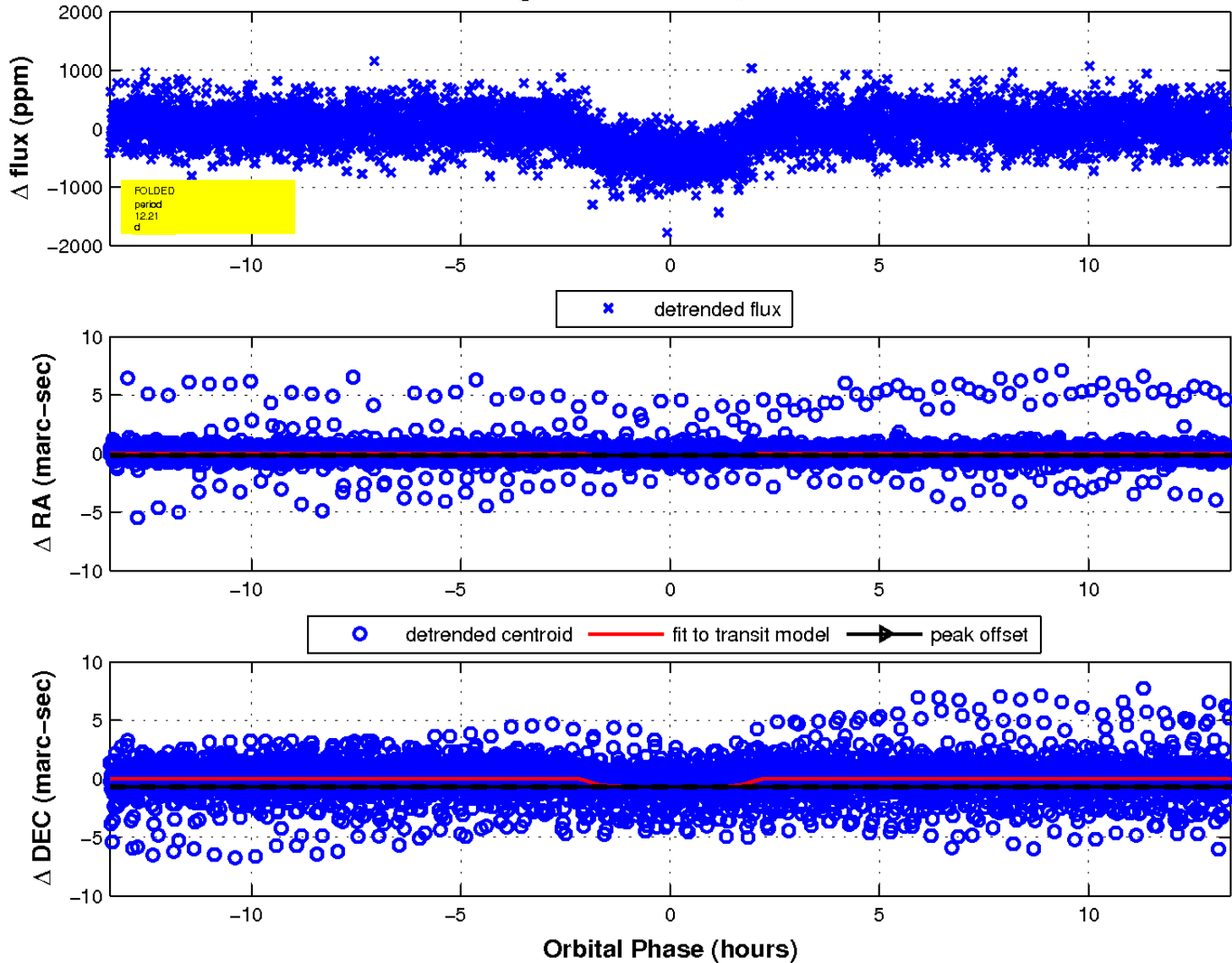
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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

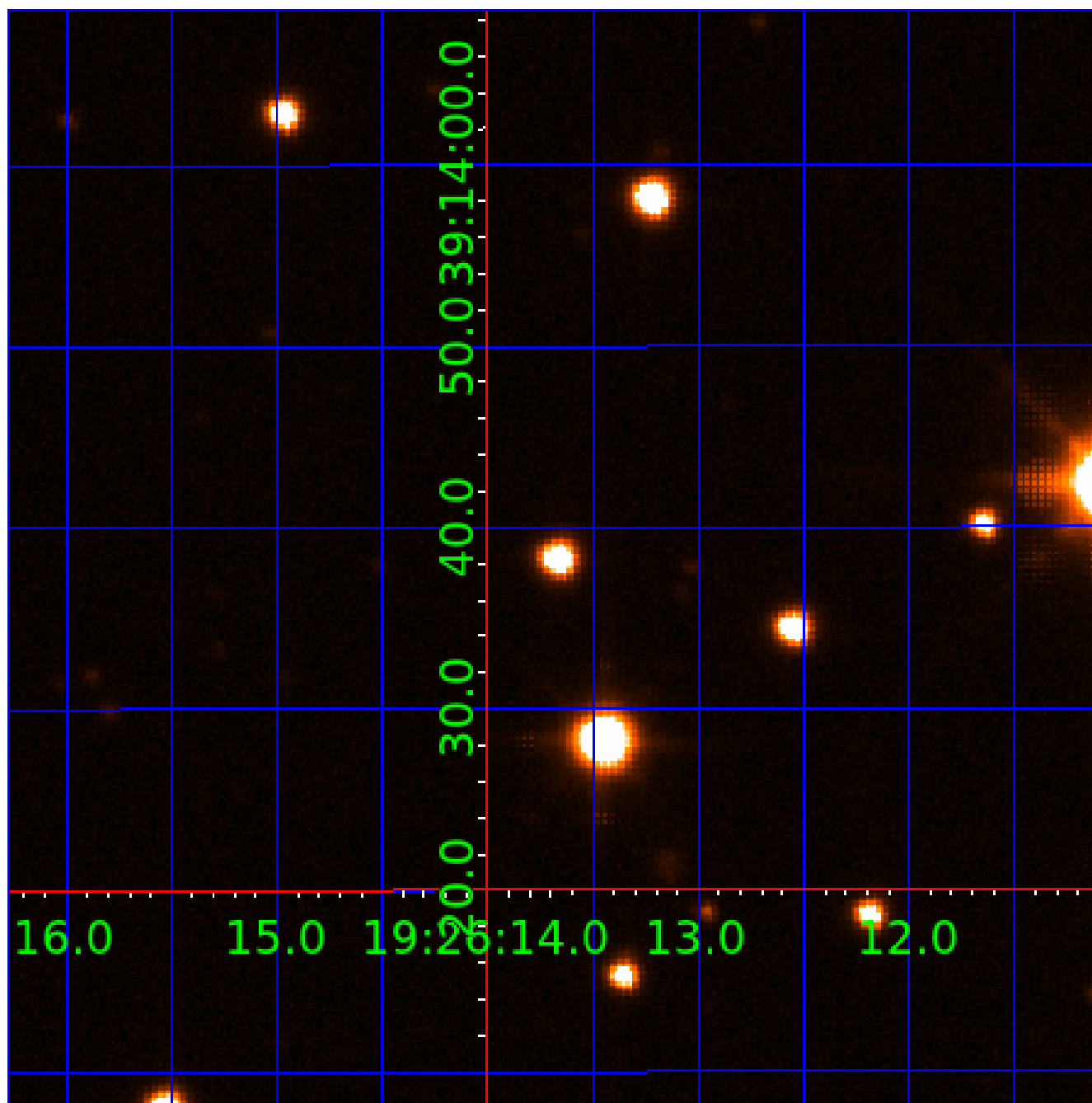


fluxWeightedCentroids, Planet 2 of 4



UKIRT Image

Declination



KIC 004157325

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})
004157325-01	OBS	1860.01	6.319442	132.228054	578.2	3.504	45.6	50.4	1.02	5670	2.89	223.51
004157325-02	OBS	1860.02	12.209479	140.551770	546.0	4.468	32.0	36.2	1.02	5670	2.85	92.88
004157325-03	OBS	1860.03	3.076411	132.268316	201.3	2.779	22.4	23.8	1.02	5670	1.73	583.63
004157325-04	OBS	1860.04	24.843666	148.182722	190.0	5.562	8.8	9.3	1.02	5670	1.57	36.02

Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004157325-01	OBS	PC	1.00	0	0	0	0	CENT_KIC_POS
004157325-02	OBS	PC	1.00	0	0	0	0	CENT_KIC_POS
004157325-03	OBS	PC	1.00	0	0	0	0	CENT_KIC_POS
004157325-04	OBS	FP	0.09	0	0	1	0	CENT_RESOLVED_OFFSET

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

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

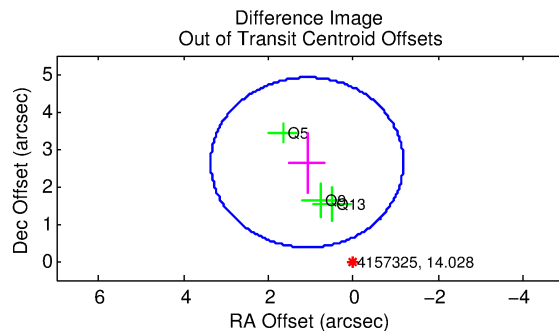
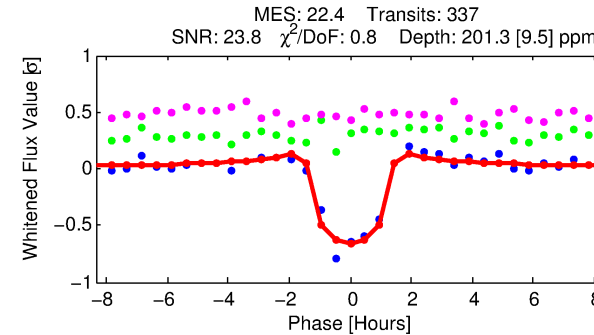
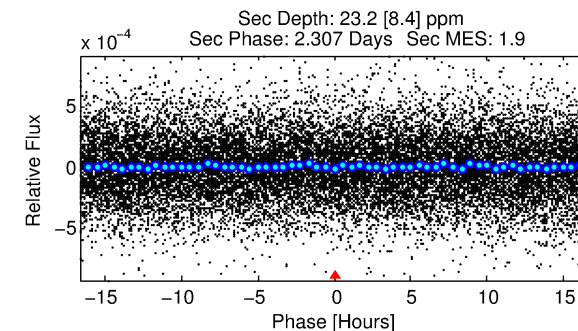
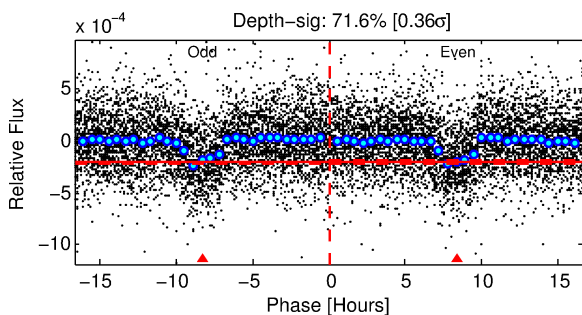
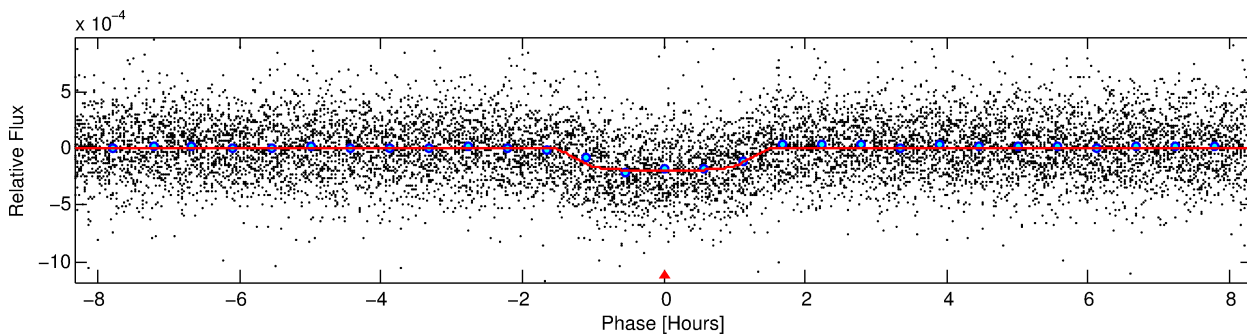
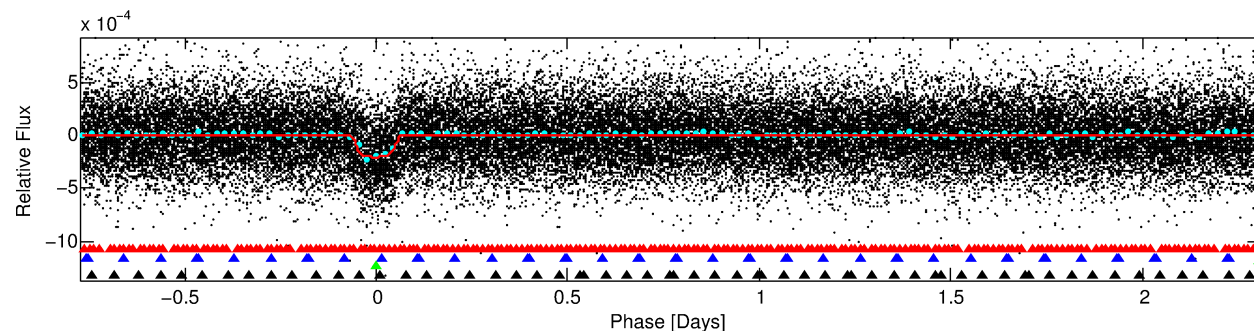
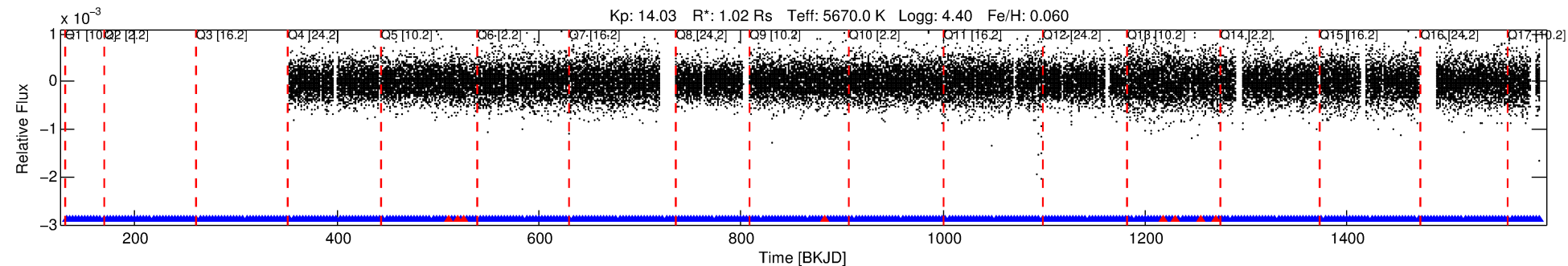
See http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col for comment definitions.

Ephemeris Match Information For 004157325-03

No Significant Match Found

DV One-Page Summary

KIC: 4157325 Candidate: 3 of 4 Period: 3.076 d
KOI: K01860.03 Corr: 0.948



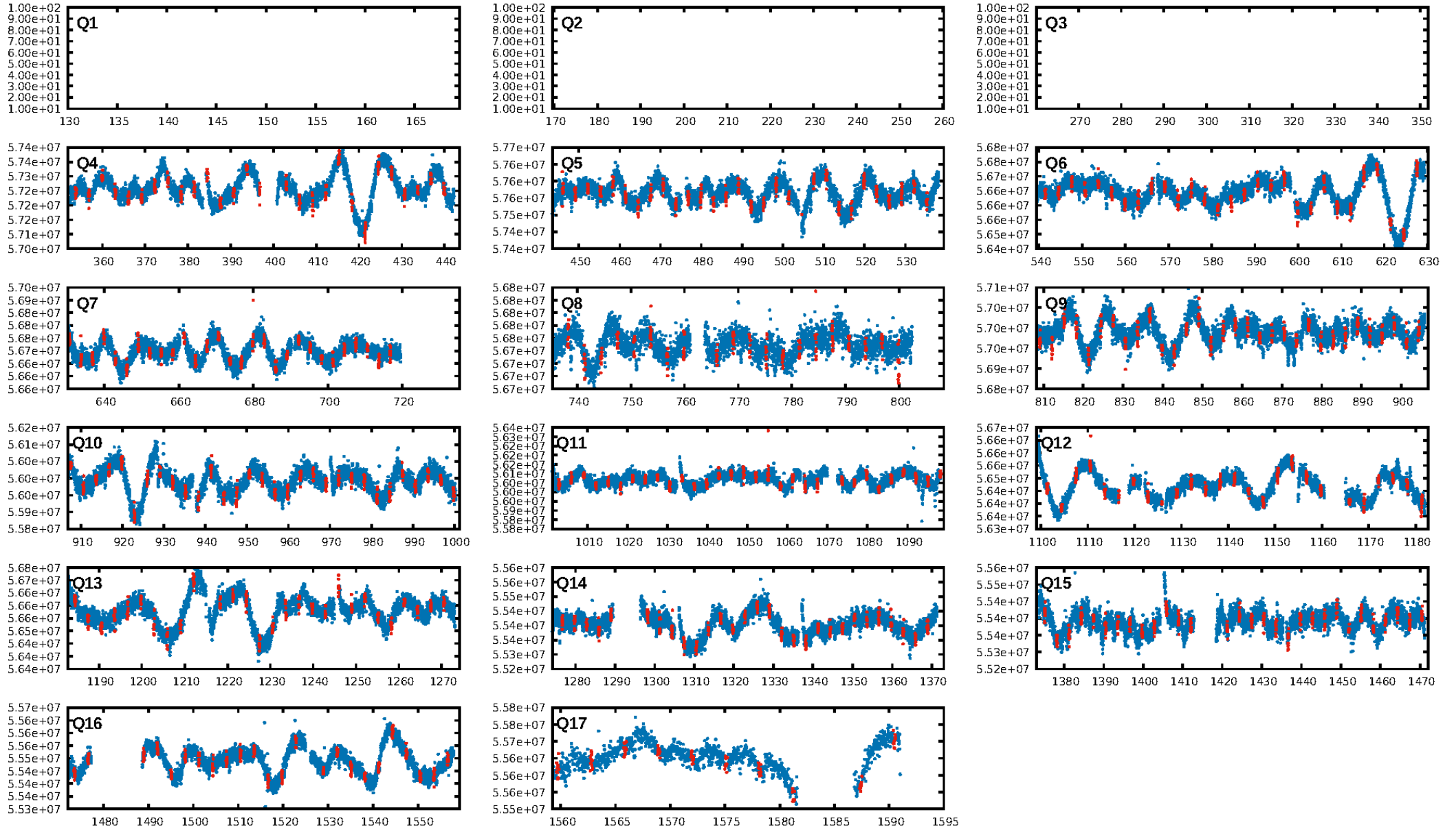
DV Fit Results:

Period = 3.07641 [0.00001] d
Epoch = 132.2683 [0.0016] BKJD
Rp/R* = 0.0155 [0.0035]
a/R* = 4.10 [3.98]
b = 0.90 [0.23]
Seff = 583.63 [119.28]
Teff = 1253 [64] K
Rp = 1.73 [0.46] Re
a = 0.0407 [0.0051] AU
Ag = 7.07 [4.29] [1.42 σ]
Teffp = 3160 [460] K [4.11 σ]

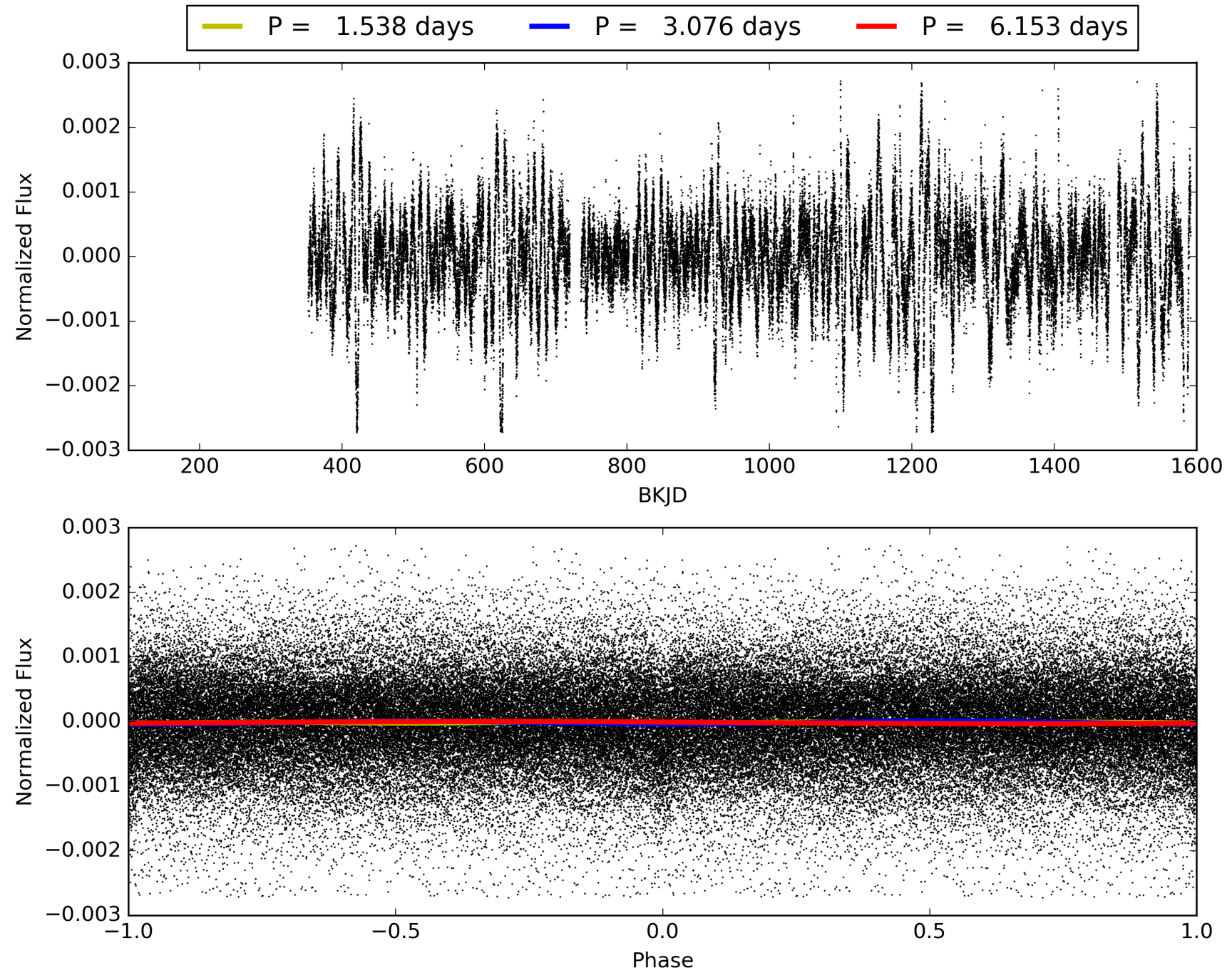
DV Diagnostic Results:

ShortPeriod-sig: N/A
LongPeriod-sig: 100.0% [17.40 σ]
ModelChiSquare2-sig: N/A
ModelChiSquareGof-sig: N/A
Bootstrap-pfa: 2.42e-101
RollingBand-fgt: 0.98 [321/329]
GhostDiagnostic-chr: 3.405
Centroid-sig: 0.0%
Centroid-so: 3.936 arcsec [16.01 σ]
OotOffset-rm: 2.851 arcsec [3.77 σ]
KicOffset-rm: 0.480 arcsec [0.84 σ]
OotOffset-st: 0/0/0/3 [3]
KicOffset-st: 3/2/3/3 [11]
DiffImageQuality-fgm: 0.64 [7/11]
DiffImageOverlap-fno: 1.00 [14/14]

TCE 004157325-03, PDC Light Curves

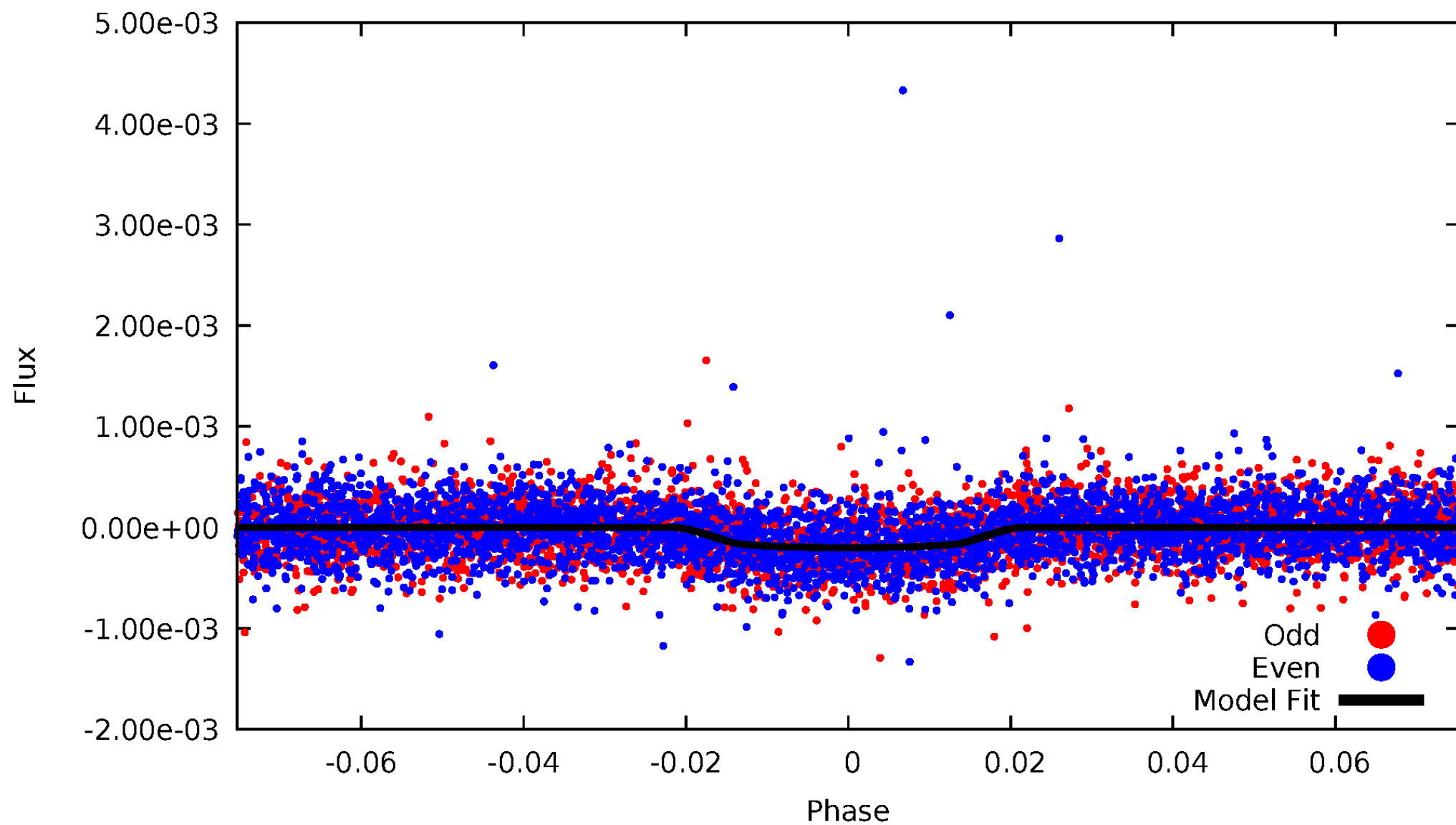


TCE 004157325-03



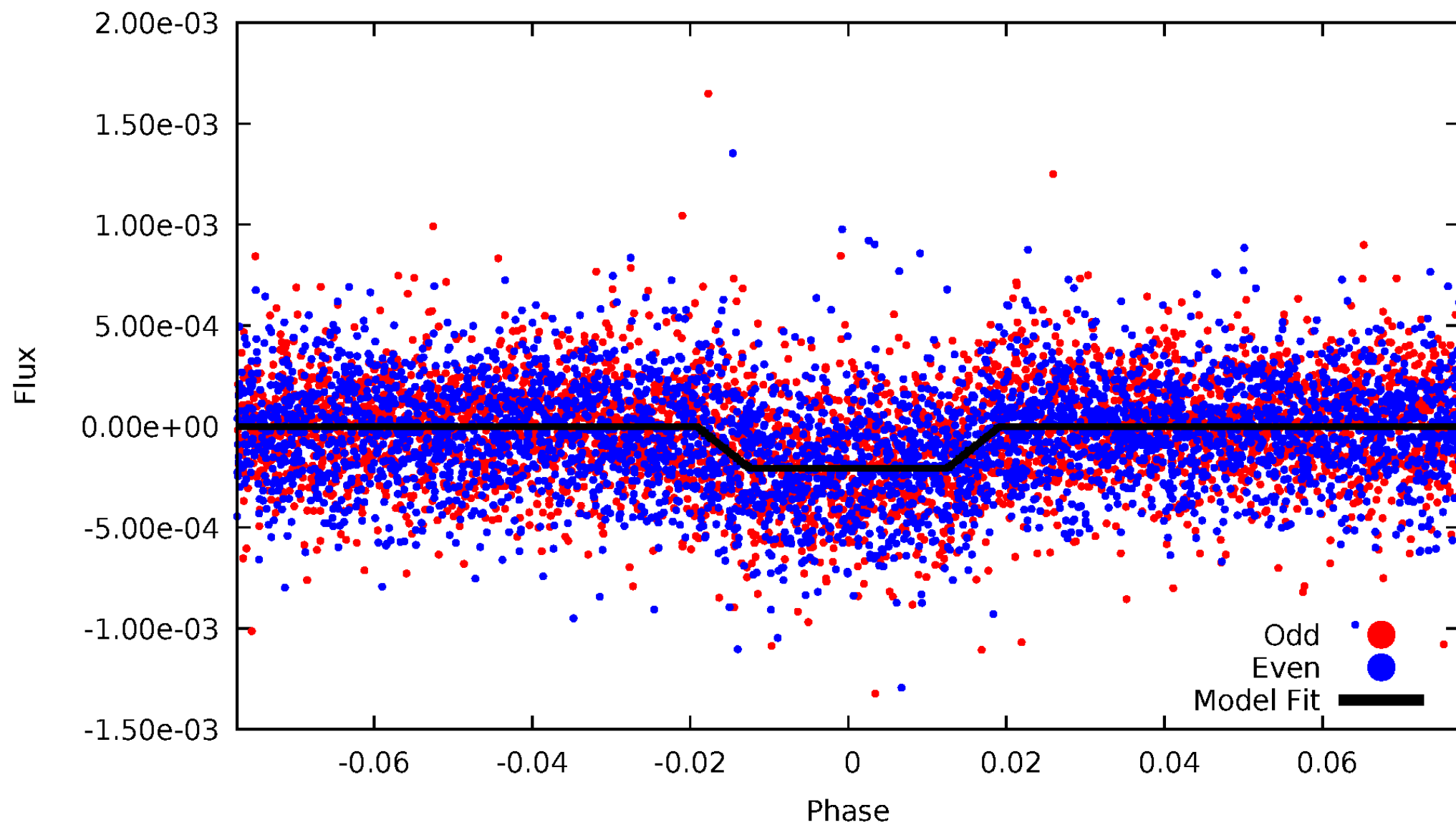
DV Odd/Even

TCE 004157325-03



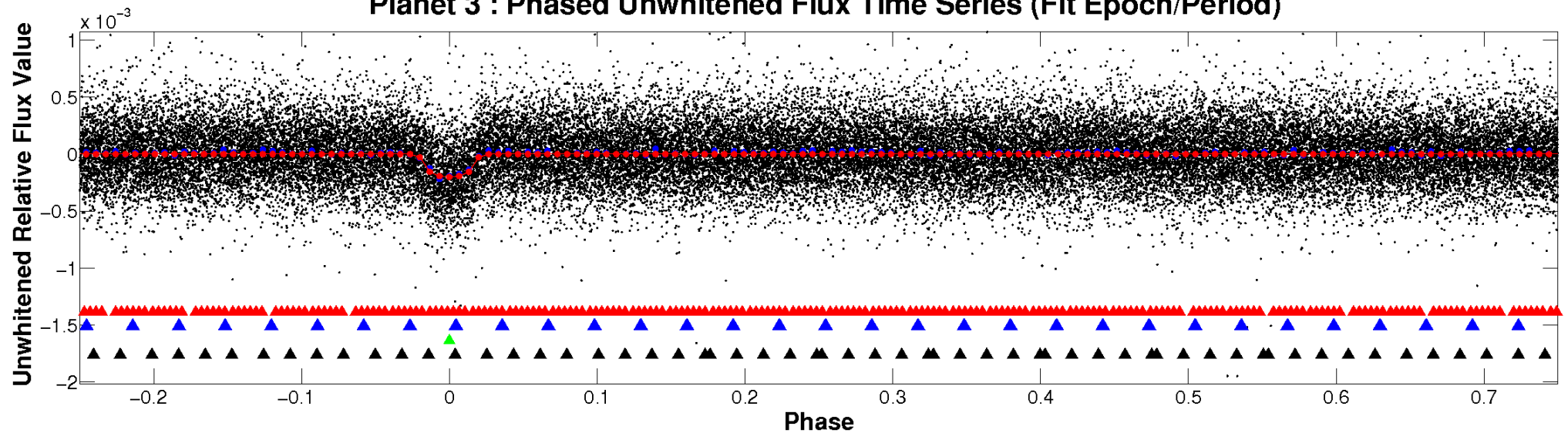
ALT Odd/Even

TCE 004157325-03

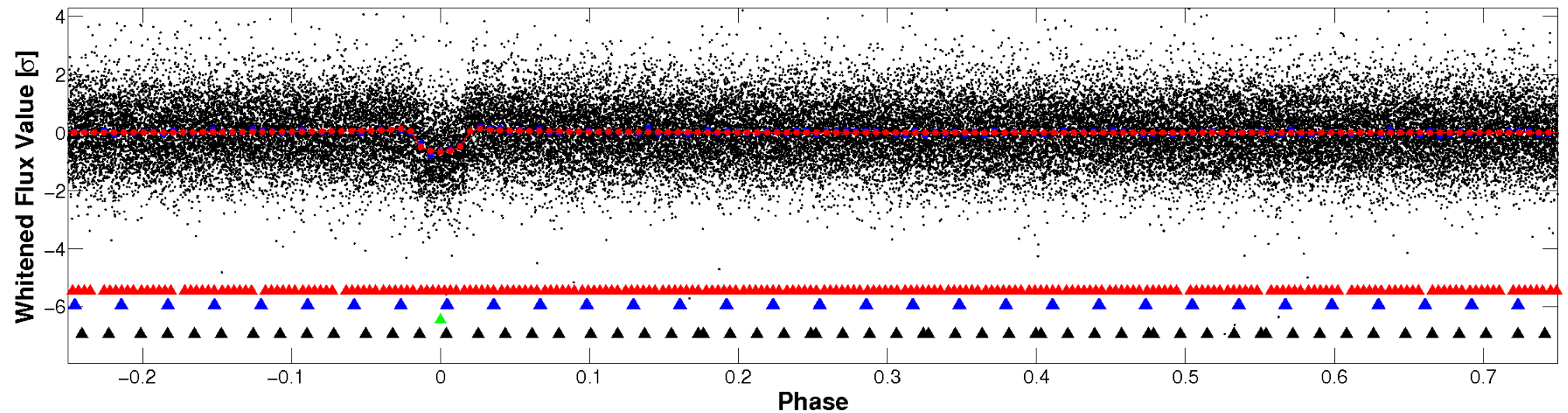


Non-Whitened Vs. Whitened Light Curve

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

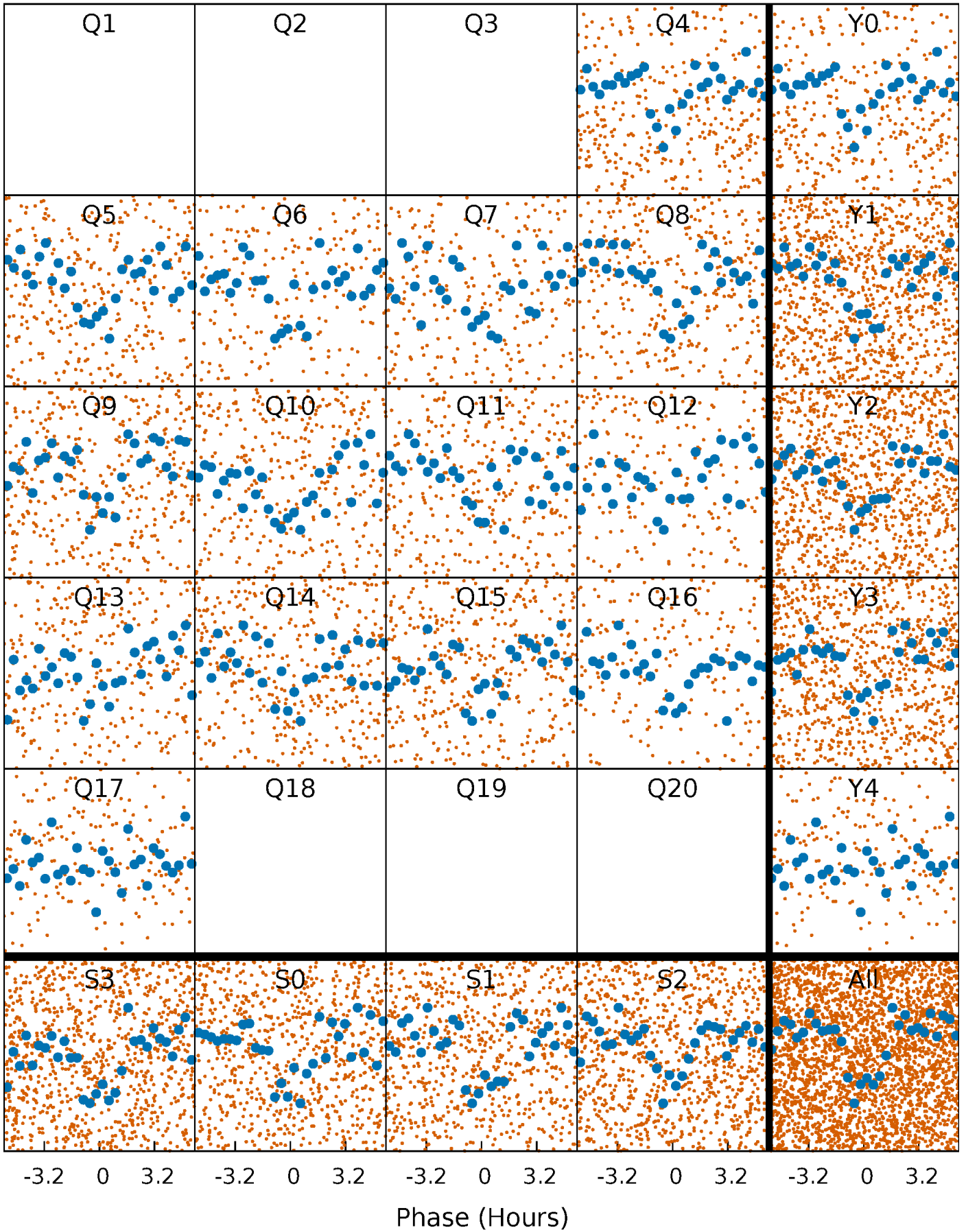


Planet 3 : Phased Whitened Flux Time Series (Fit Epoch/Period)



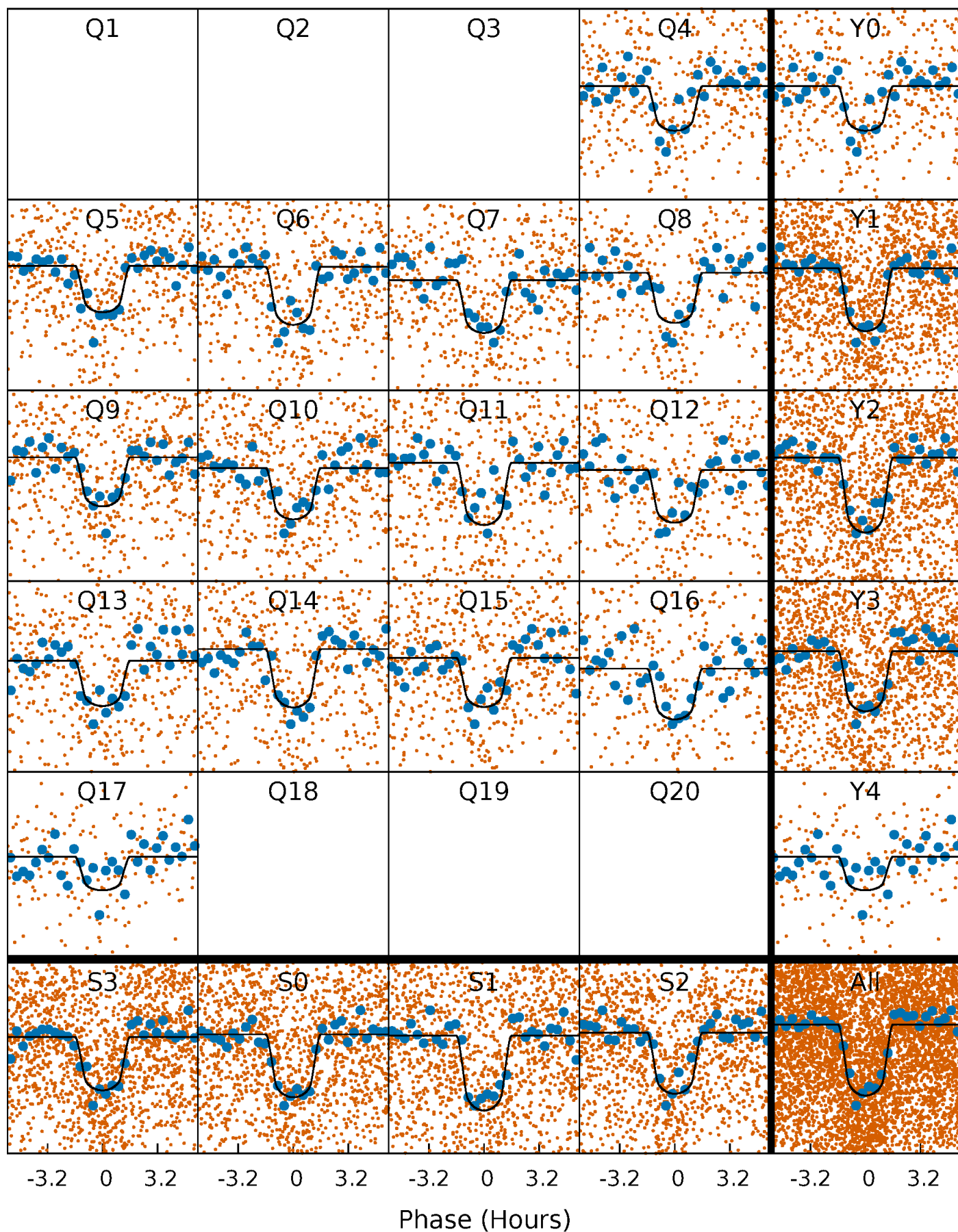
PDC Quarter-Phased Transit Curves

TCE 004157325-03 P= 3.076411 Days $T_0=132.268316$ (BKJD)



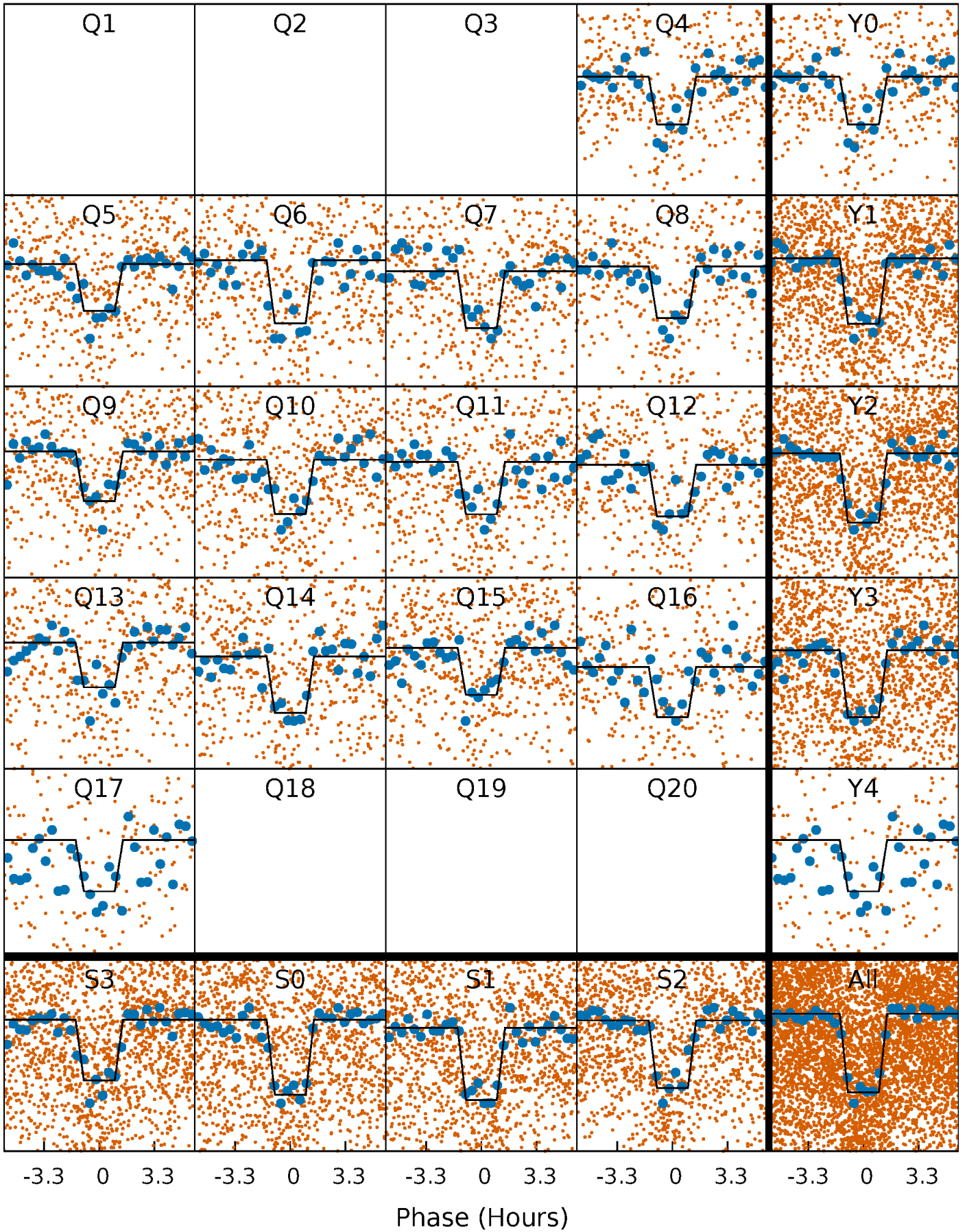
DV Quarter-Phased Transit Curves

TCE 004157325-03 P= 3.076411 Days $T_0=132.268316$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

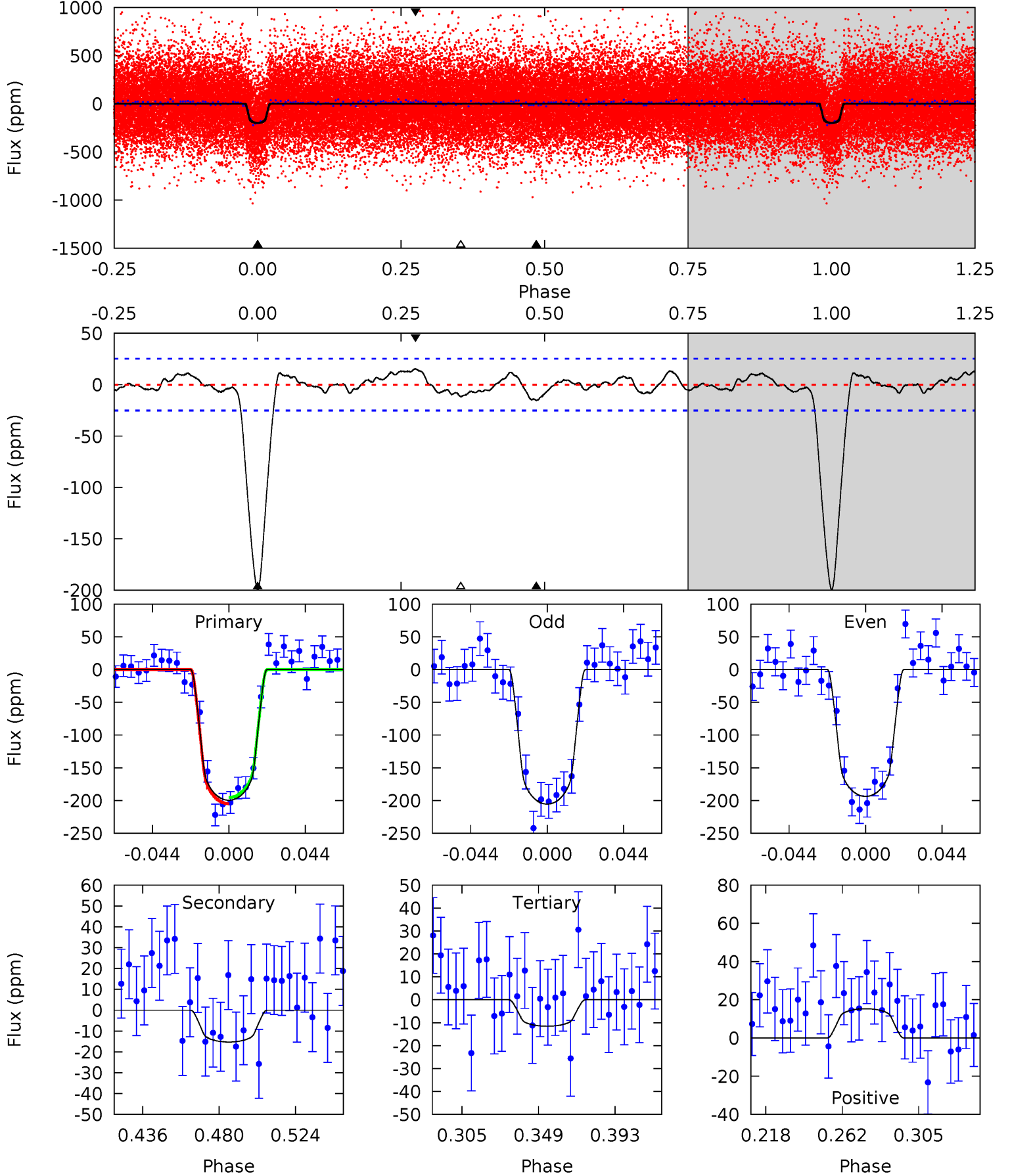
TCE 004157325-03 P= 3.076426 Days $T_0=132.266496$ (BKJD)



DV Model-Shift Uniqueness Test

004157325-03, P = 3.076411 Days, E = 132.268316 Days

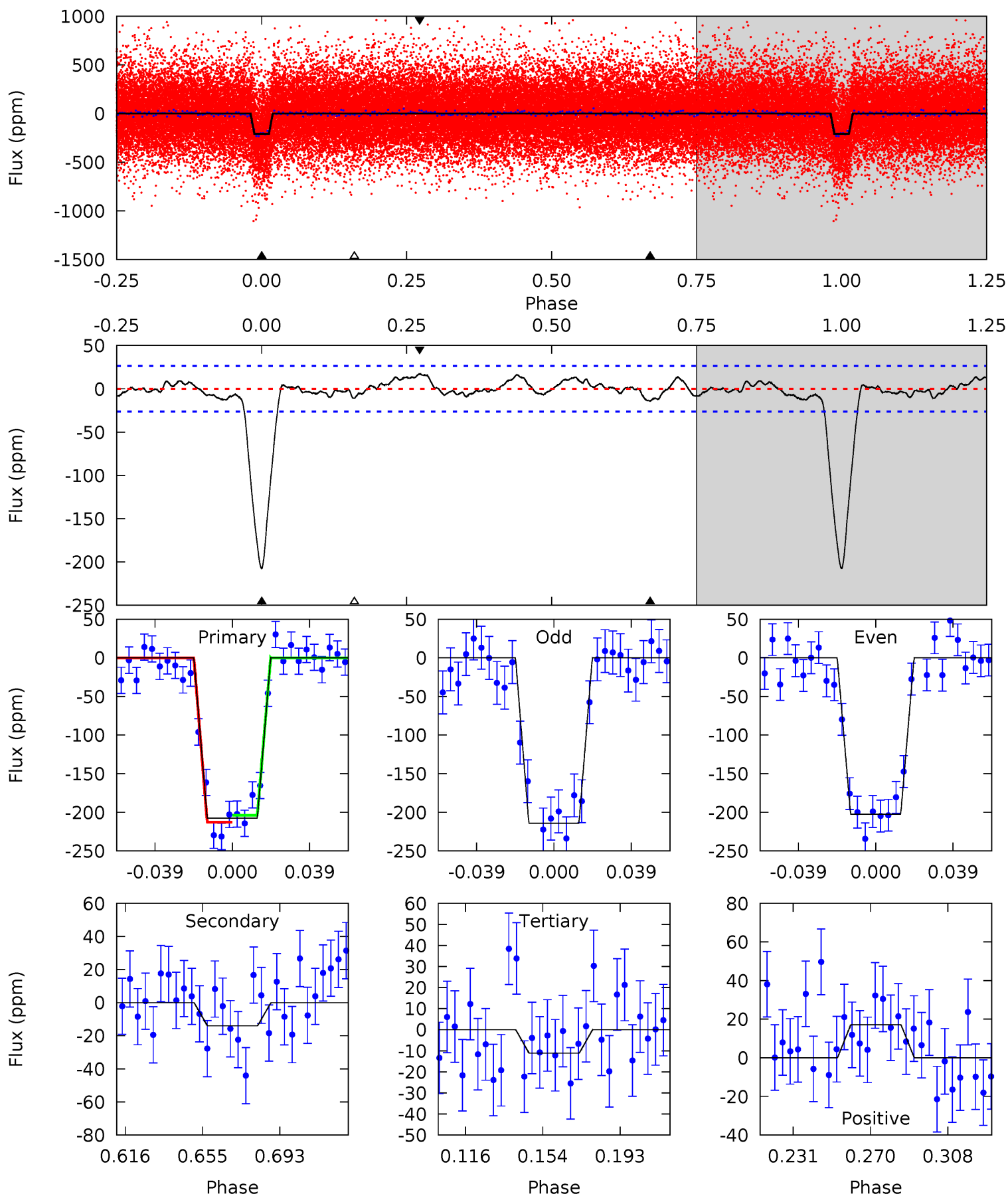
Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
37.4	2.86	2.16	2.87	4.74	2.02	1.19	35.2	34.5	0.70	-0.00	1.10	1.00	0.07	0.89



Alt Model-Shift Uniqueness Test

004157325-03, P = 3.076426 Days, E = 132.266496 Days

Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
37.4	2.53	2.01	3.09	4.76	2.07	1.26	35.4	34.3	0.52	-0.56	1.05	0.97	0.08	0.81



Stellar Parameters For KIC 004157325

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	5670^{+114}_{-114}	$4.397^{+0.095}_{-0.105}$	$0.060^{+0.150}_{-0.150}$	$1.022^{+0.148}_{-0.108}$	$0.949^{+0.067}_{-0.055}$	$1.254^{+0.475}_{-0.407}$
	+2%/-2%	+2%/-2%	+250%/-250%	+14%/-11%	+7%/-6%	+38%/-32%
Source	SPE58	SPE58	SPE58	DSEP		

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

Secondary Eclipse Parameters for KIC 004157325-03 / KOI 1860.03

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	A_{obs}
DV	-15 ± 5	$1.73^{+0.41}_{-0.39}$	1751^{+71}_{-67}	3340^{+338}_{-323}	$4.652^{+3.693}_{-2.164}$
Alt.	-14 ± 6	$1.63^{+0.44}_{-0.41}$	1754^{+74}_{-66}	3326^{+421}_{-337}	$4.592^{+4.866}_{-2.344}$

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

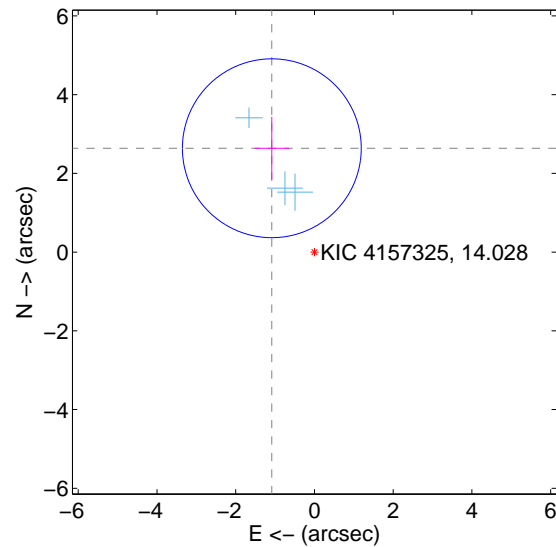
Supplemental centroid analysis for 004157325-03. Kepler magnitude: 14.03. Transit SNR 23.79

There are 7 quarters with good PRF difference image offsets

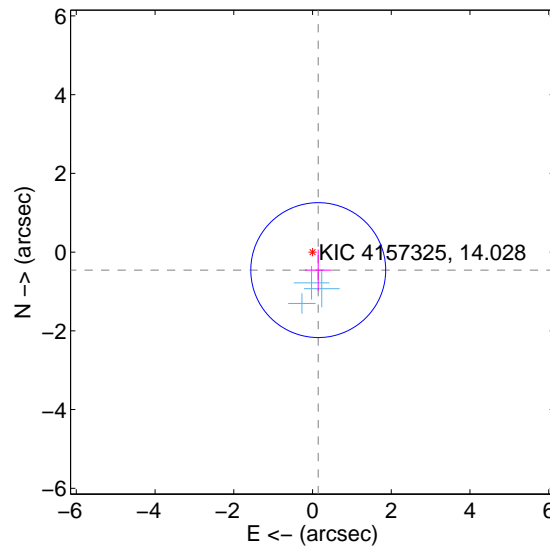
The OOT PRF centroid is offset from the target star catalog position by about 2.56 arcsec so the offset from difference PRF-fit to OOT-fit may be invalid.

	Distance in arcsec	Distance / σ	Δ RA	Δ Dec
PRF-fit source offset from OOT	2.851 ± 0.757	3.77	1.082 ± 0.434	2.638 ± 0.799
PRF-fit source offset from KIC position	0.480 ± 0.571	0.84	-0.145 ± 0.339	-0.457 ± 0.522
photometric centroid source offset	3.94 ± 0.25	16.01	-0.88 ± 0.14	-3.84 ± 0.25

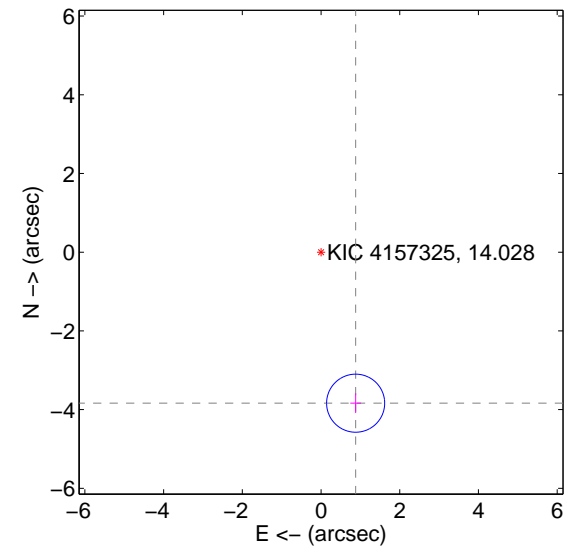
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

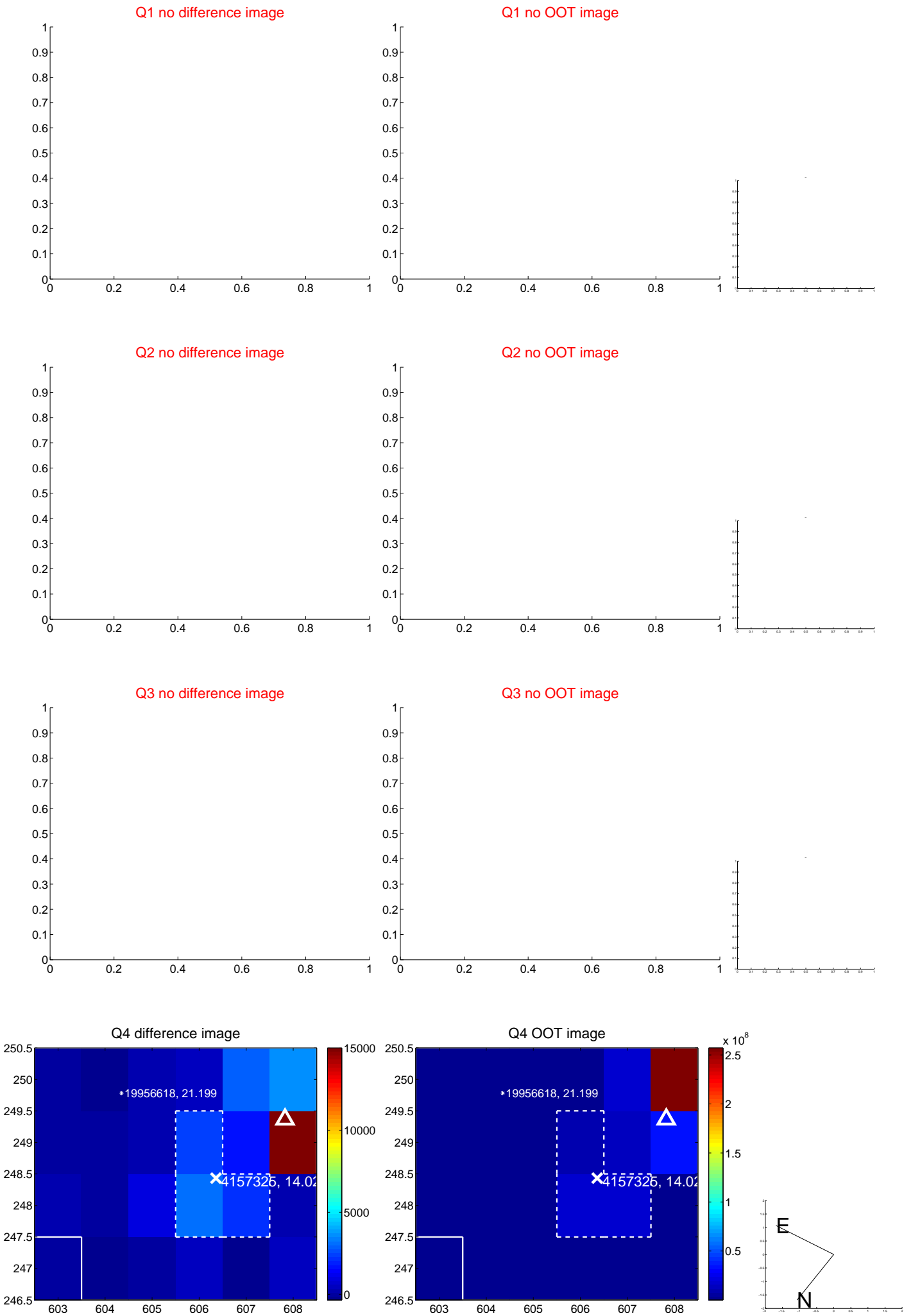


offset from photometric centroids

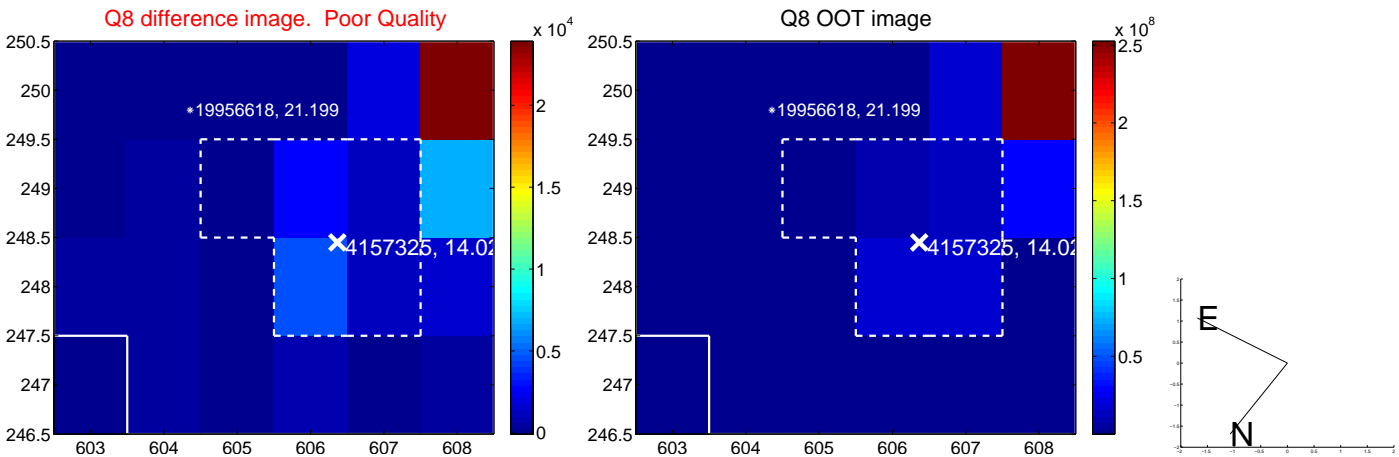
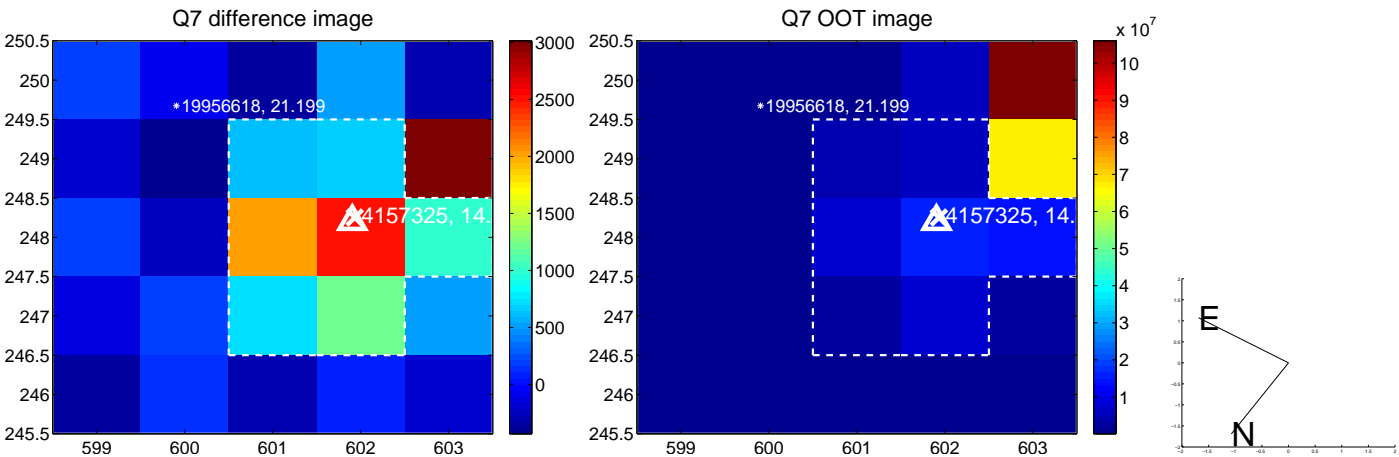
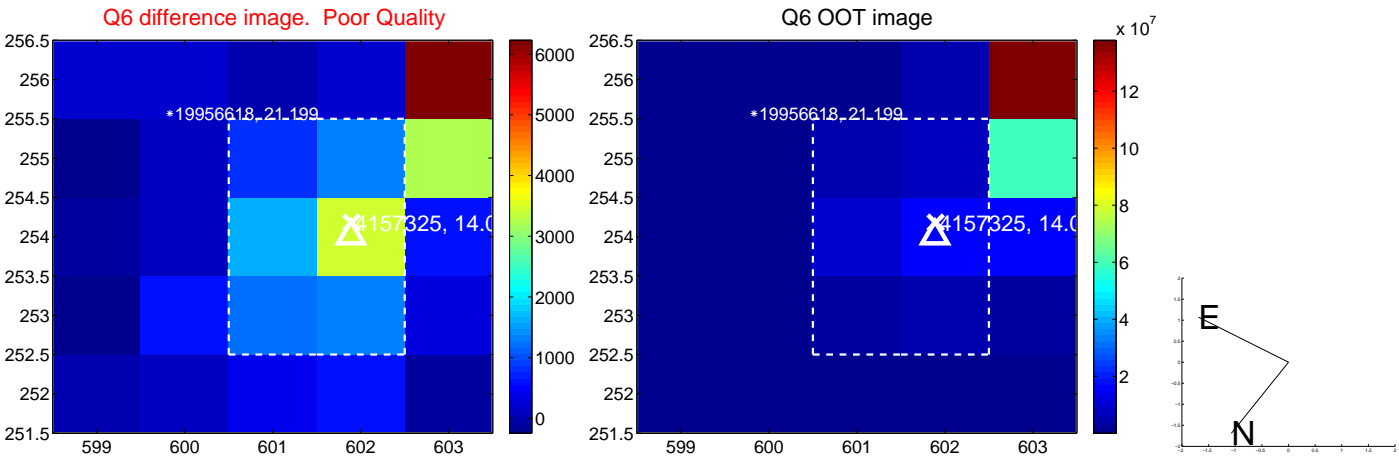
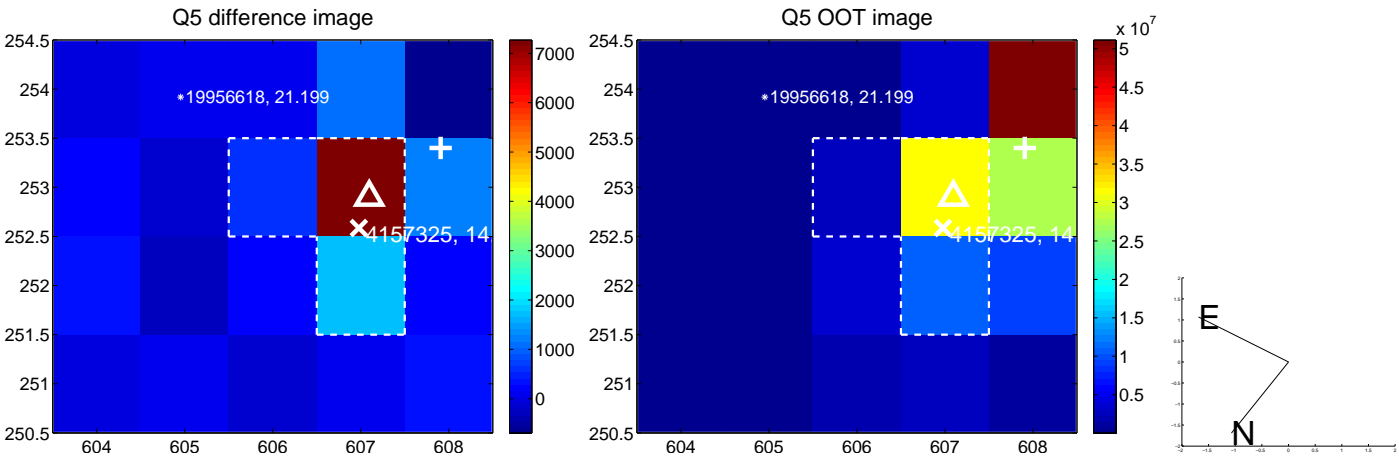


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three- σ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

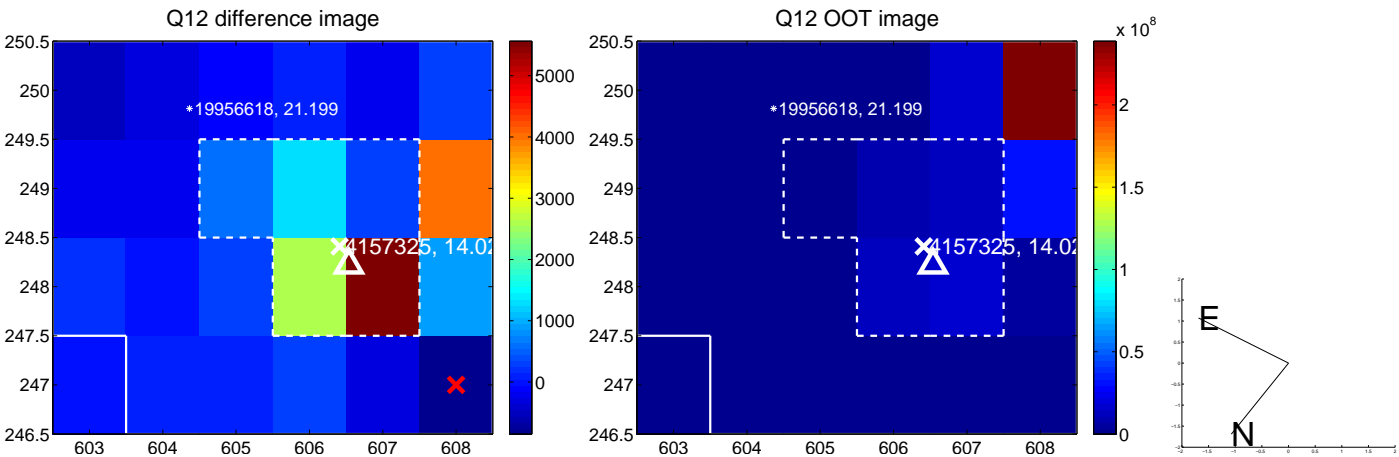
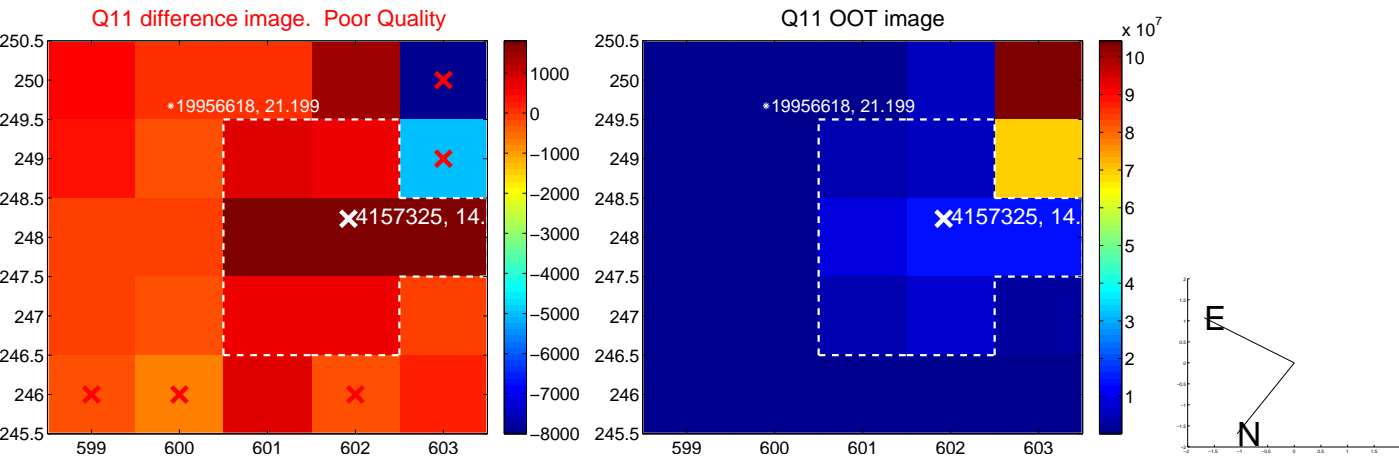
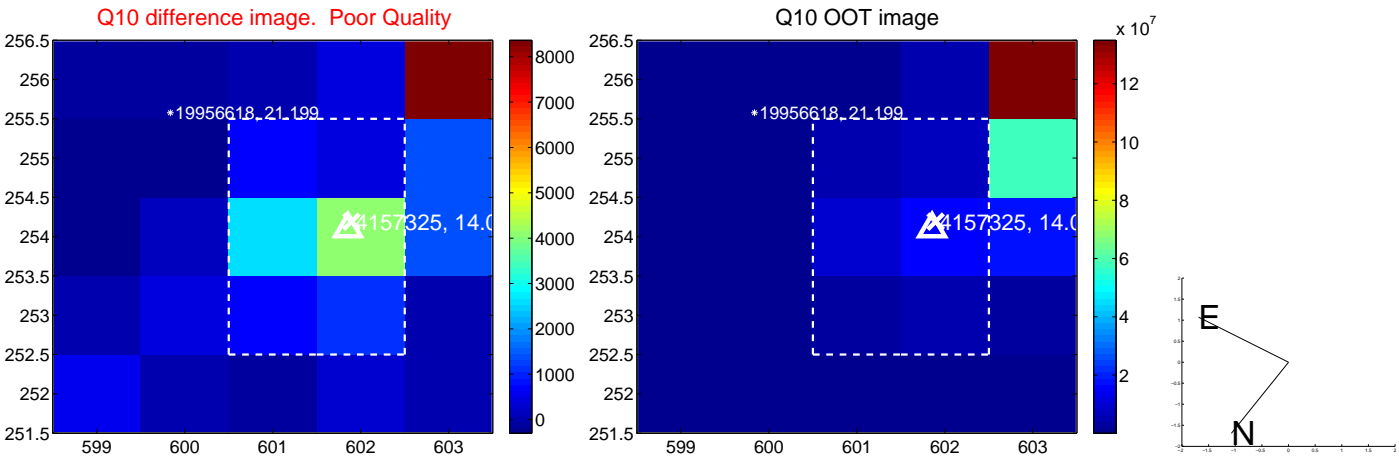
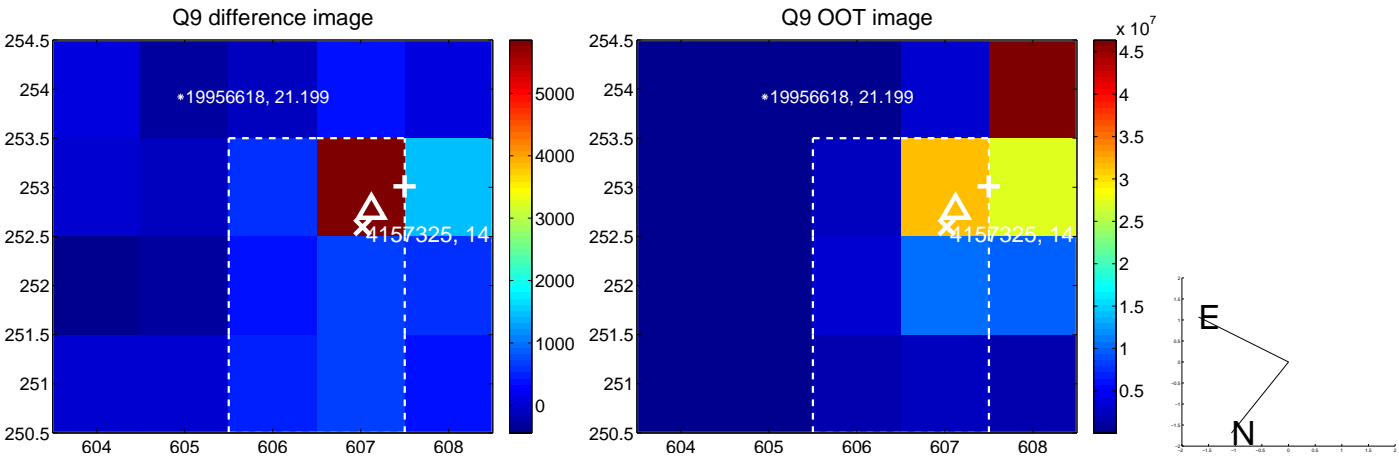
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



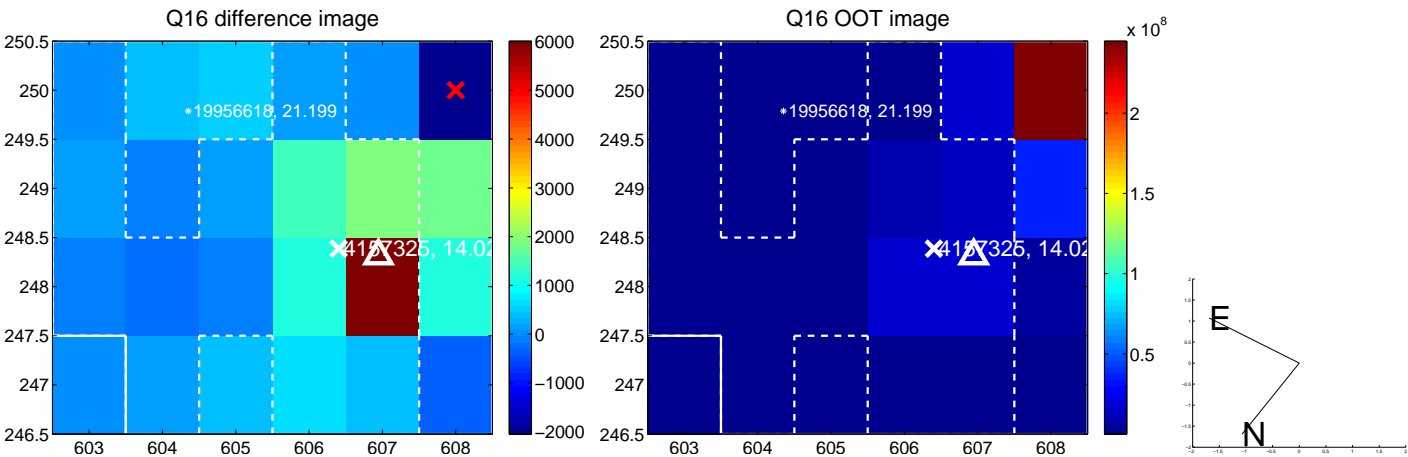
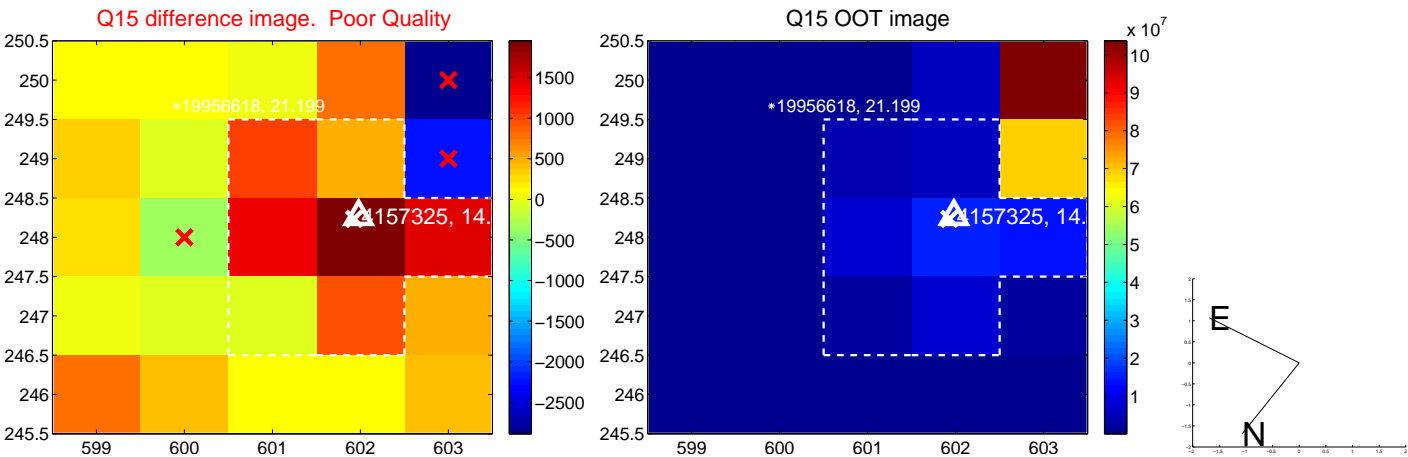
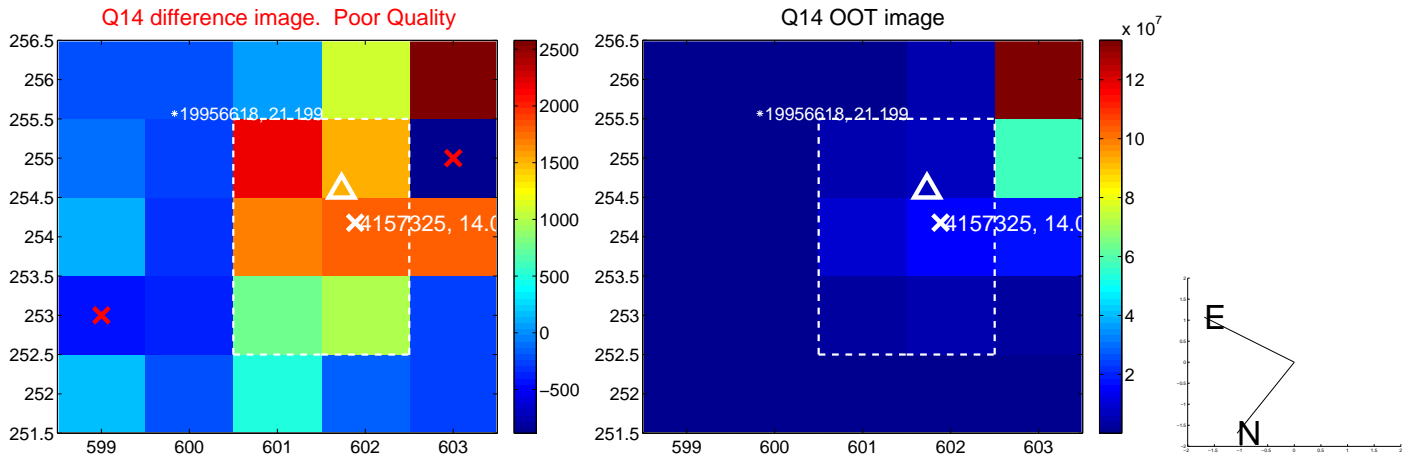
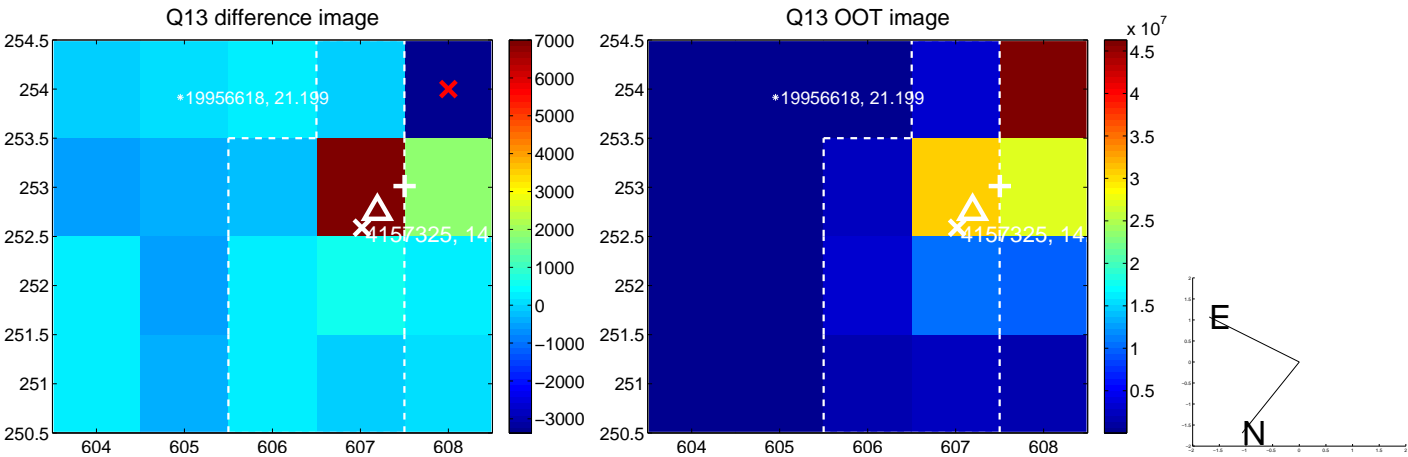
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



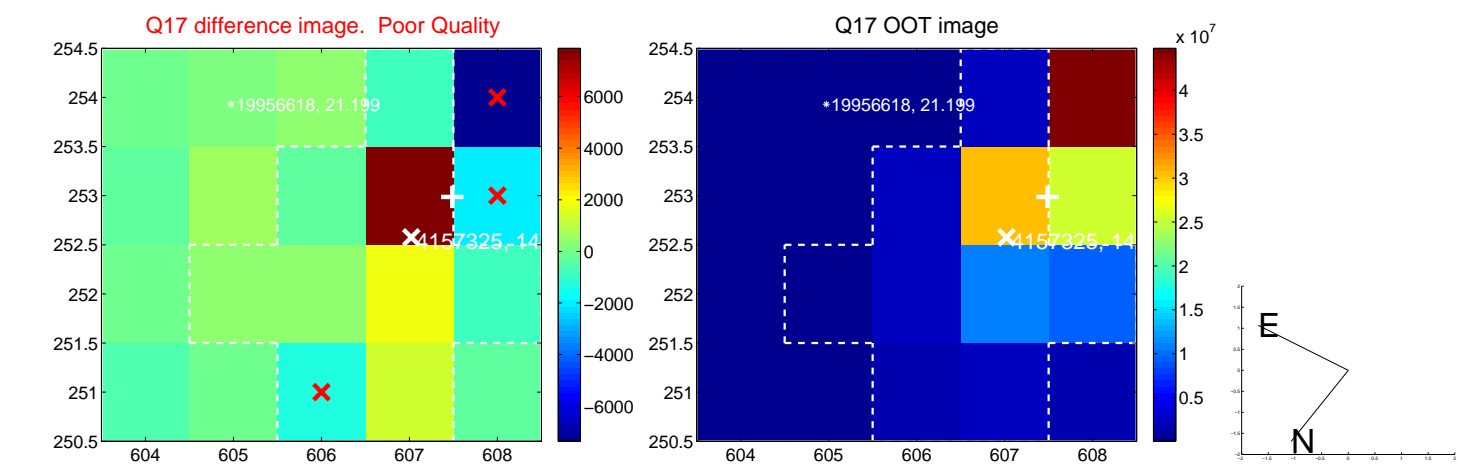
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



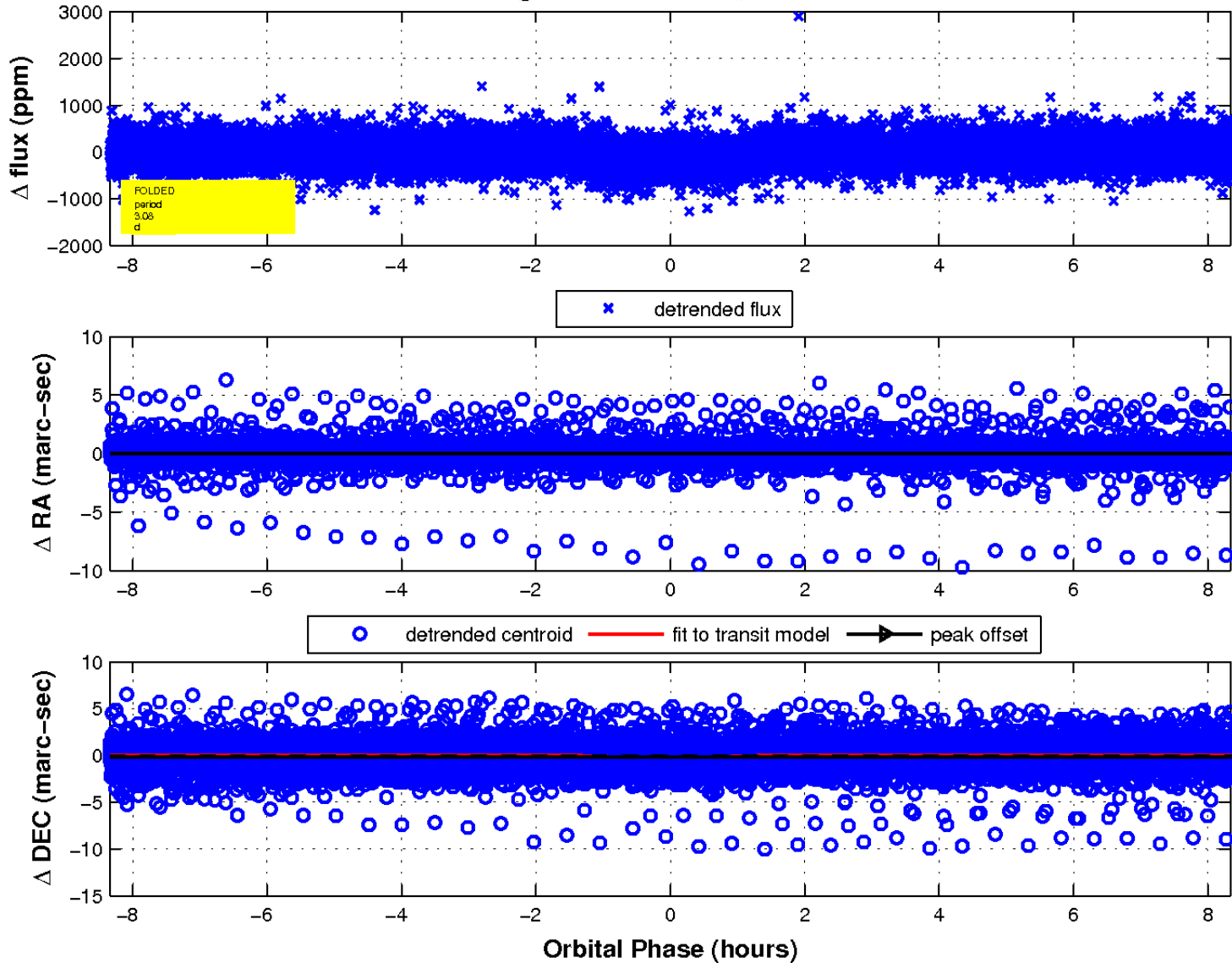
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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

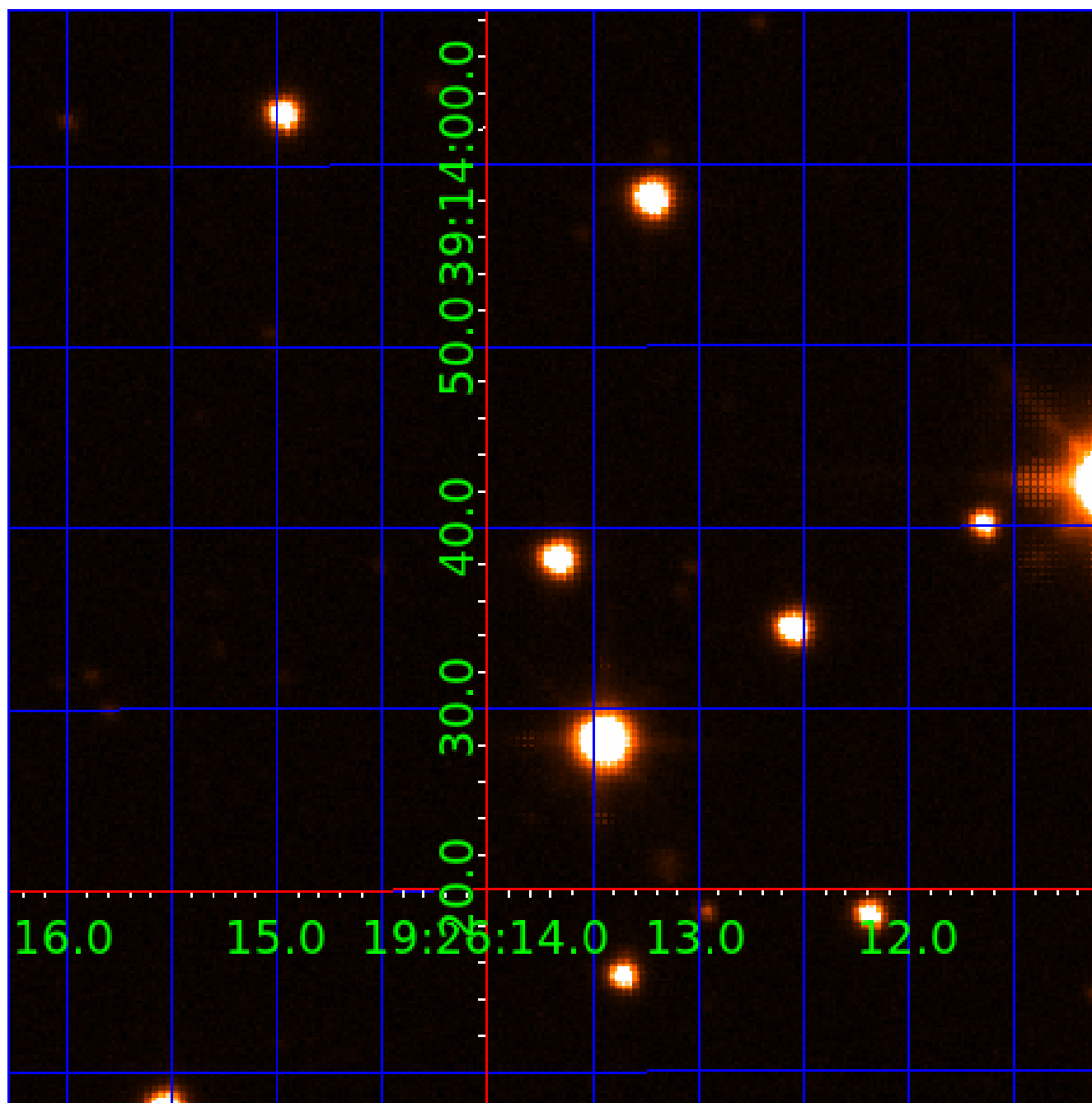


fluxWeightedCentroids, Planet 3 of 4



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KIC 004157325

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})
004157325-01	OBS	1860.01	6.319442	132.228054	578.2	3.504	45.6	50.4	1.02	5670	2.89	223.51
004157325-02	OBS	1860.02	12.209479	140.551770	546.0	4.468	32.0	36.2	1.02	5670	2.85	92.88
004157325-03	OBS	1860.03	3.076411	132.268316	201.3	2.779	22.4	23.8	1.02	5670	1.73	583.63
004157325-04	OBS	1860.04	24.843666	148.182722	190.0	5.562	8.8	9.3	1.02	5670	1.57	36.02

Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004157325-01	OBS	PC	1.00	0	0	0	0	CENT_KIC_POS
004157325-02	OBS	PC	1.00	0	0	0	0	CENT_KIC_POS
004157325-03	OBS	PC	1.00	0	0	0	0	CENT_KIC_POS
004157325-04	OBS	FP	0.09	0	0	1	0	CENT_RESOLVED_OFFSET

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 004157325-04

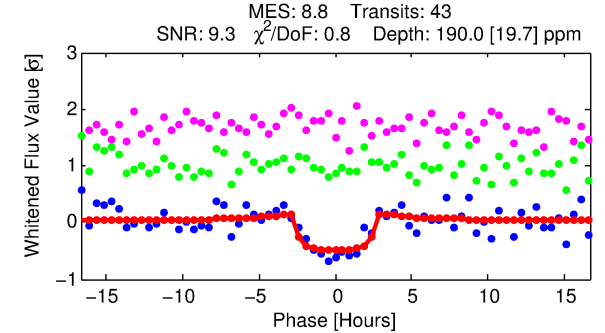
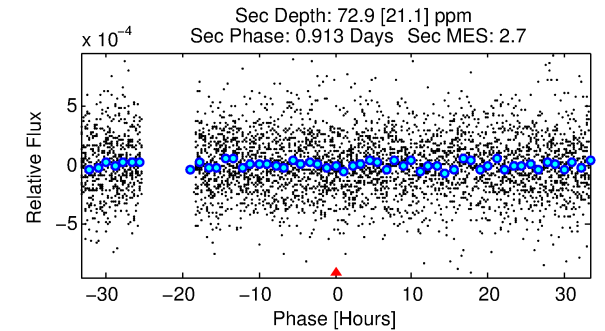
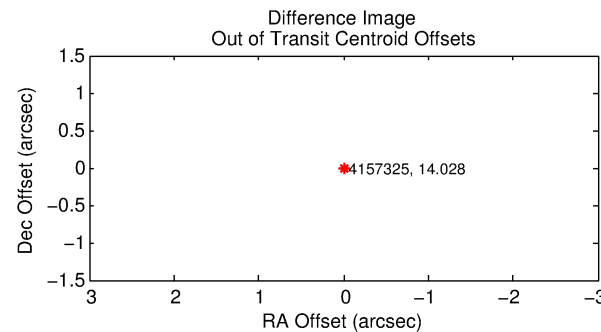
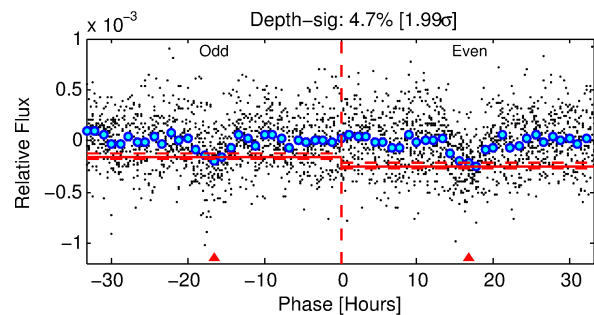
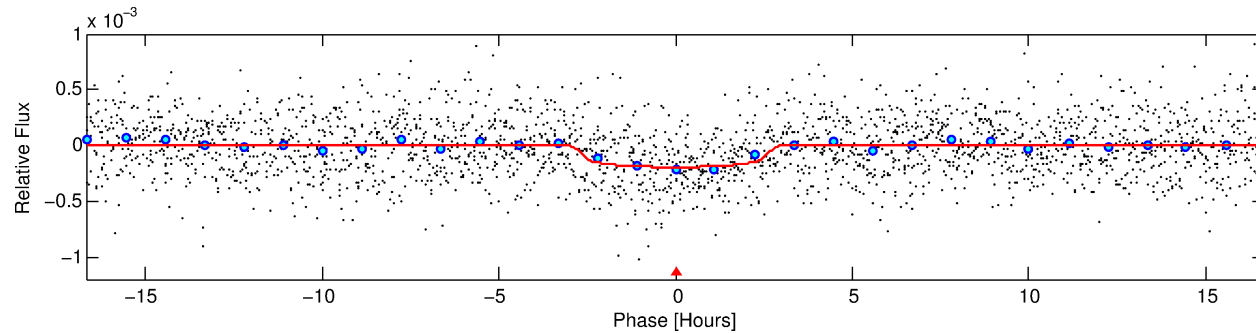
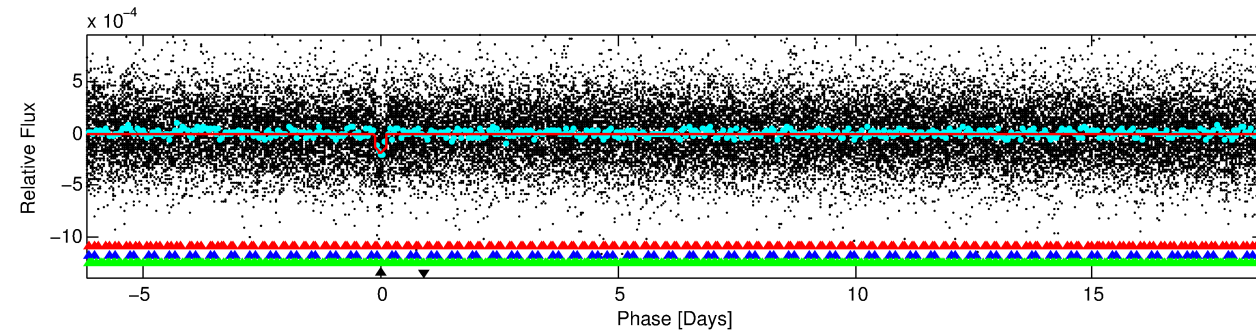
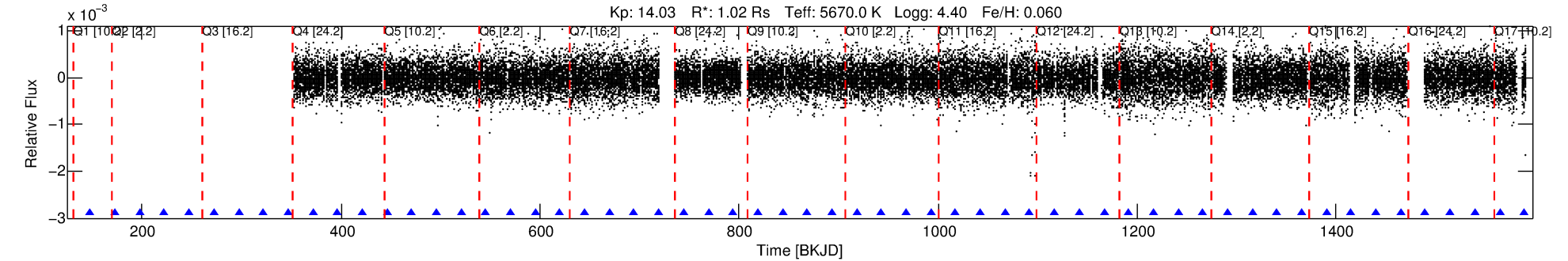
No Significant Match Found

DV One-Page Summary

KIC: 4157325 Candidate: 4 of 4 Period: 24.844 d

KOI: K01860.04 Corr: 0.928

Kp: 14.03 R*: 1.02 Rs Teff: 5670.0 K Logg: 4.40 Fe/H: 0.060



DV Fit Results:

Period = 24.84367 [0.00032] d
Epoch = 148.1827 [0.0111] BKJD
Rp/R* = 0.0141 [0.0081]
a/R* = 20.85 [52.58]
b = 0.81 [1.09]
Seff = 36.02 [7.36]
Teff = 625 [32] K
Rp = 1.57 [0.94] Re
a = 0.1639 [0.0206] AU
Ag = 435.06 [523.69] [0.83σ]
Teffp = 4411 [1314] K [2.88σ]

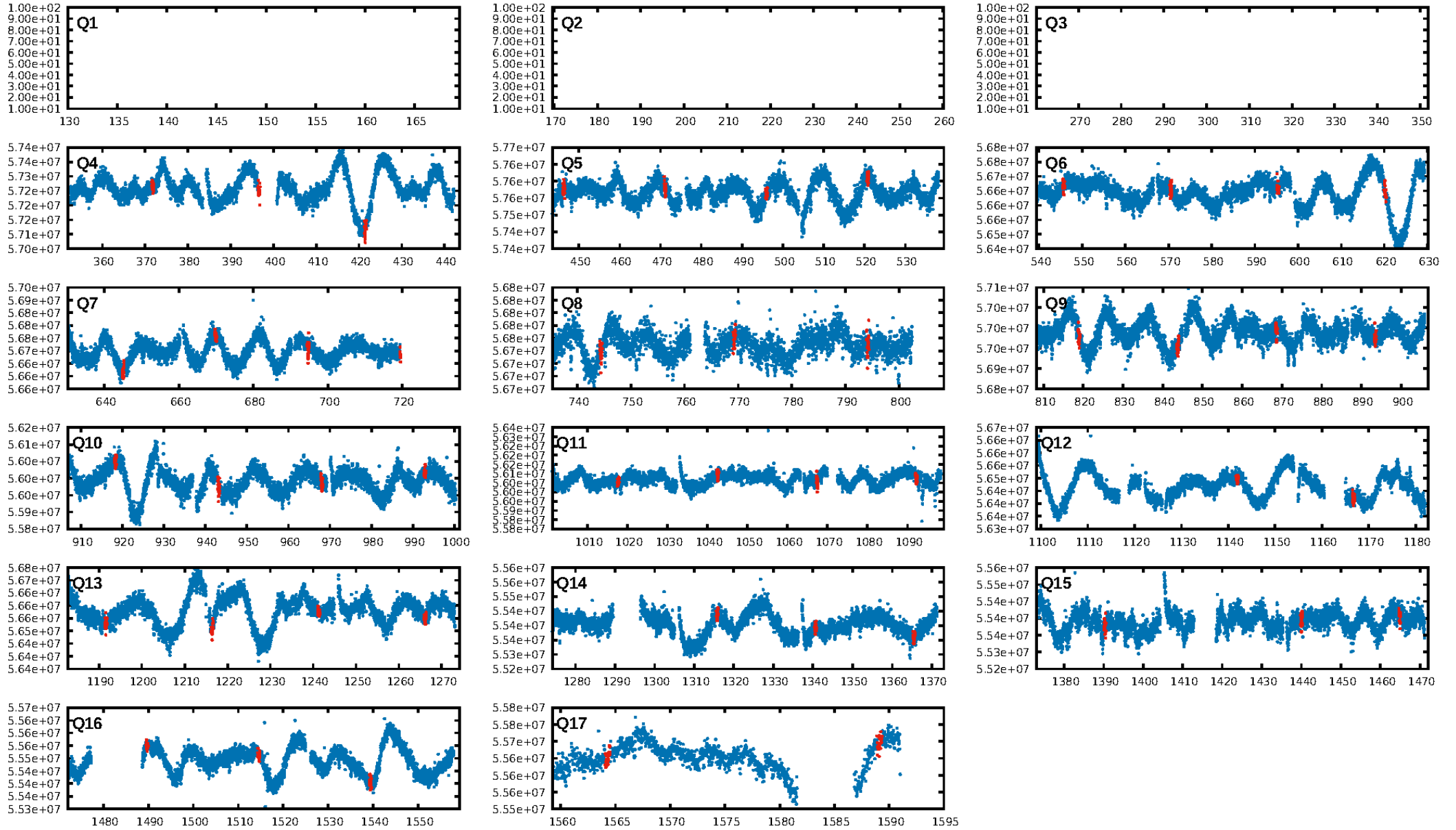
DV Diagnostic Results:

ShortPeriod-sig: 100.0% [42.50σ]
LongPeriod-sig: N/A
ModelChiSquare2-sig: 88.0%
ModelChiSquareGof-sig: 100.0%
Bootstrap-pfa: 4.07e-16
RollingBand-fgt: 1.00 [41/41]
GhostDiagnostic-chr: 15.3
Centroid-sig: 0.0%
Centroid-so: 2.273 arcsec [3.49σ]
OotOffset-rm: N/A
KicOffset-rm: 3.433 arcsec [6.17σ]
OotOffset-st: 0/0/0/0 [0]
KicOffset-st: 1/1/1/0 [3]
DiffImageQuality-fgm: 0.00 [0/3]
DiffImageOverlap-fno: 0.86 [12/14]

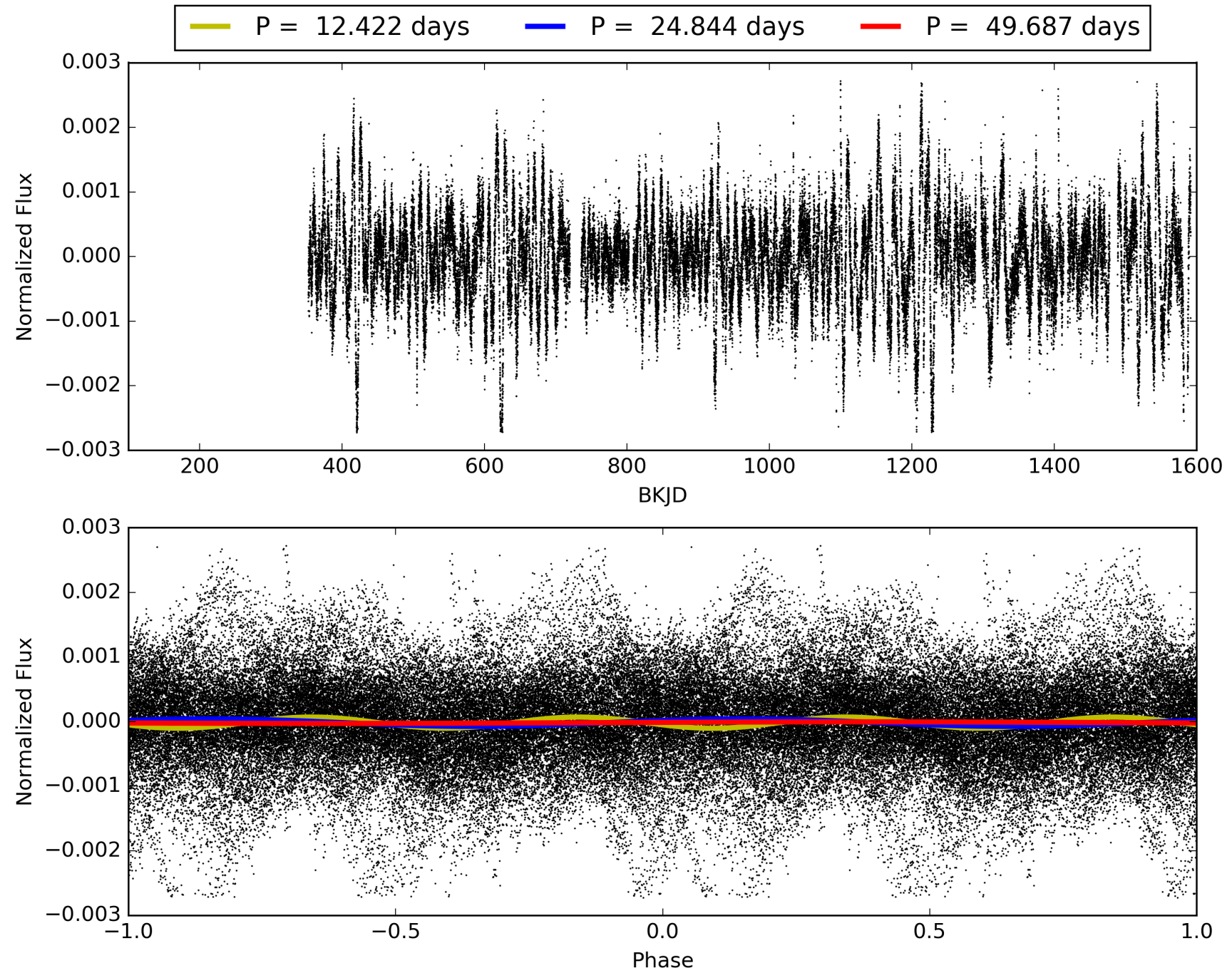
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 12:18:27 Z

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

TCE 004157325-04, PDC Light Curves

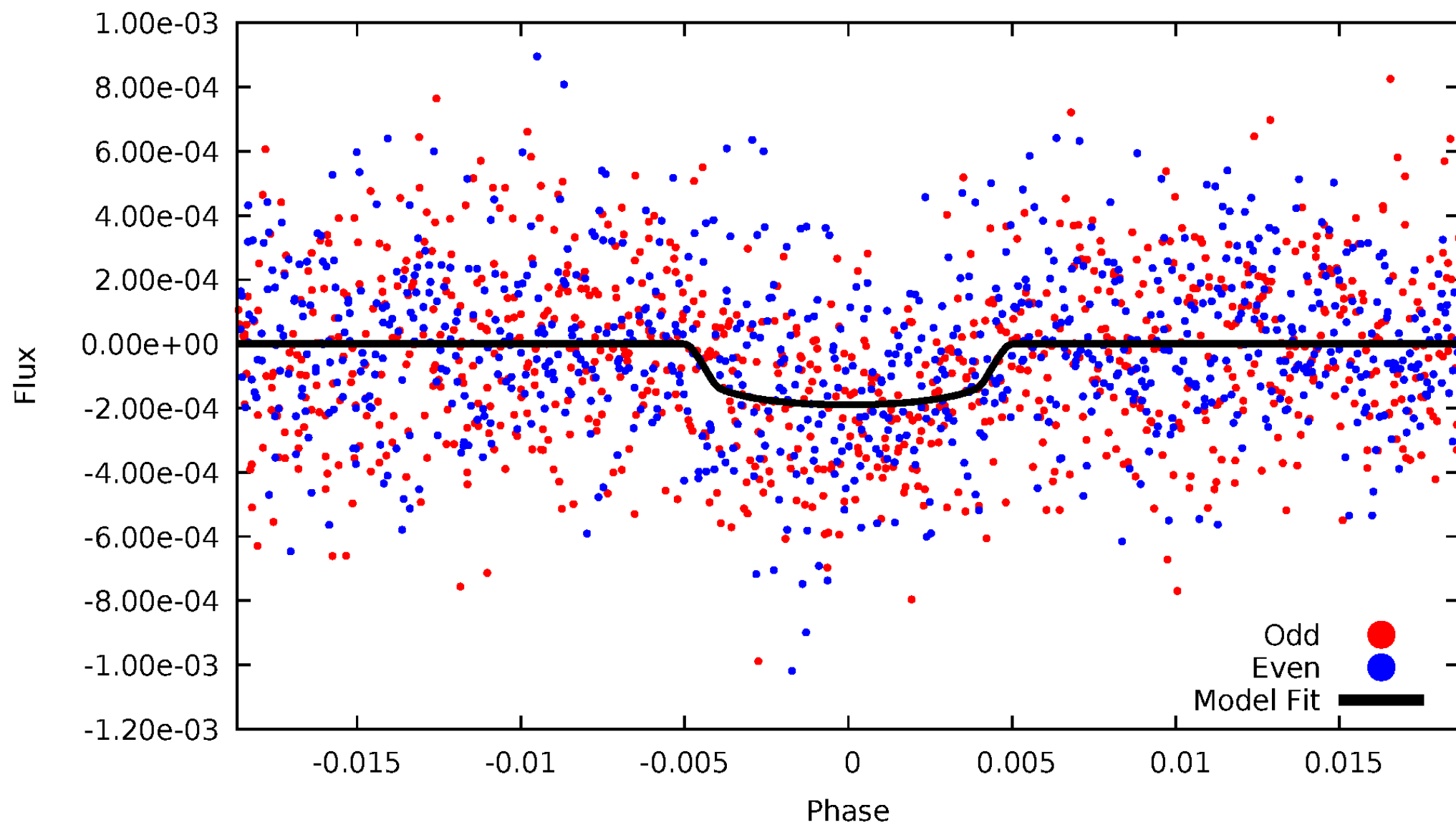


TCE 004157325-04



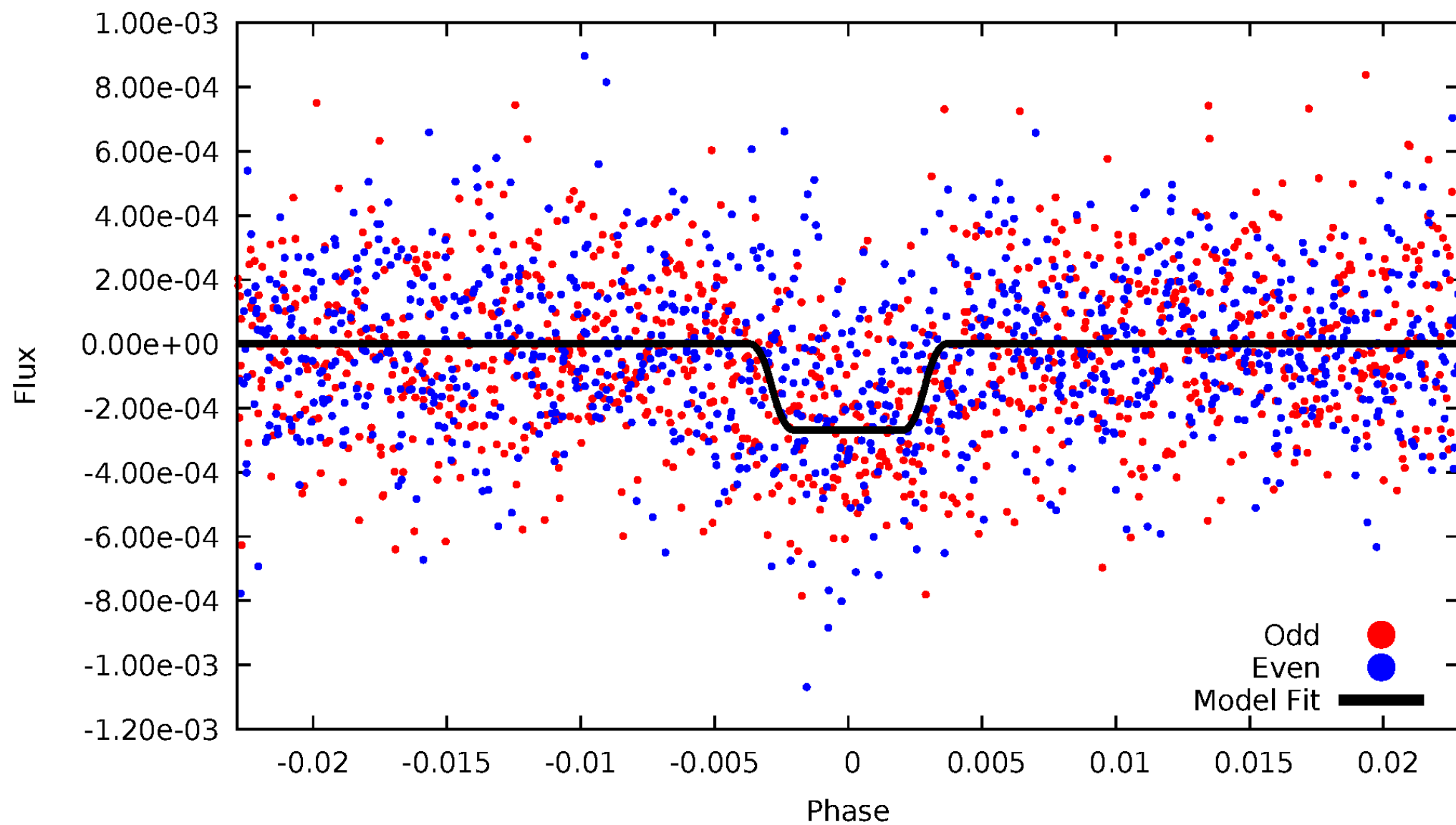
DV Odd/Even

TCE 004157325-04



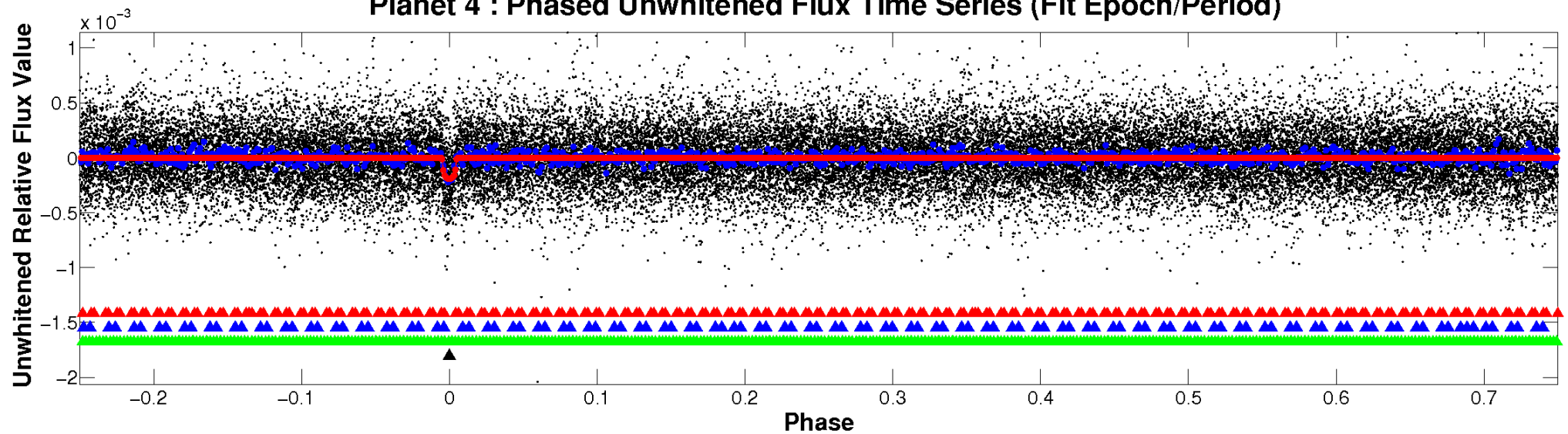
ALT Odd/Even

TCE 004157325-04

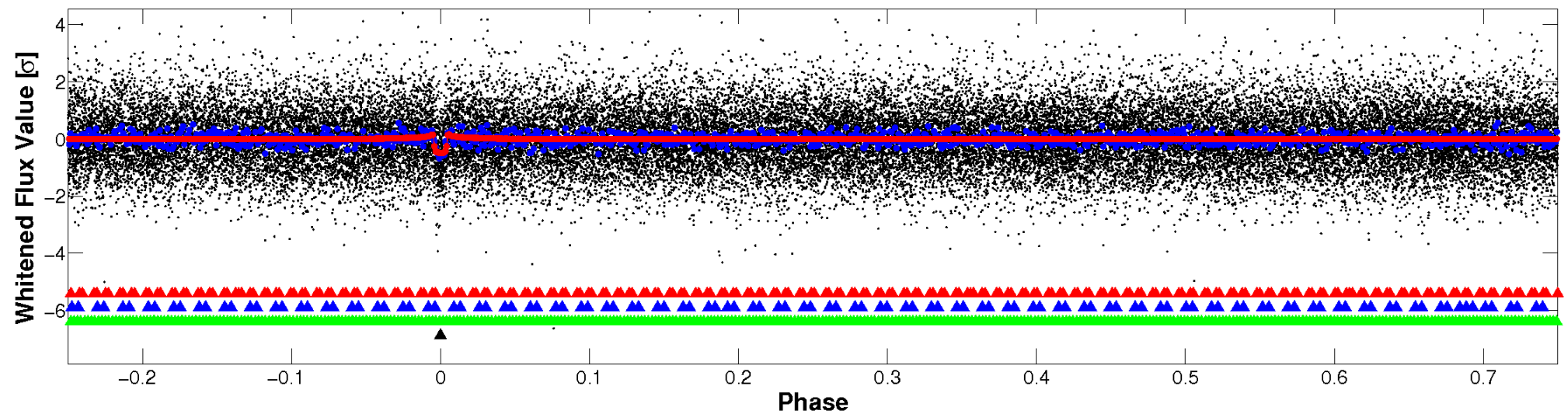


Non-Whitened Vs. Whitened Light Curve

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

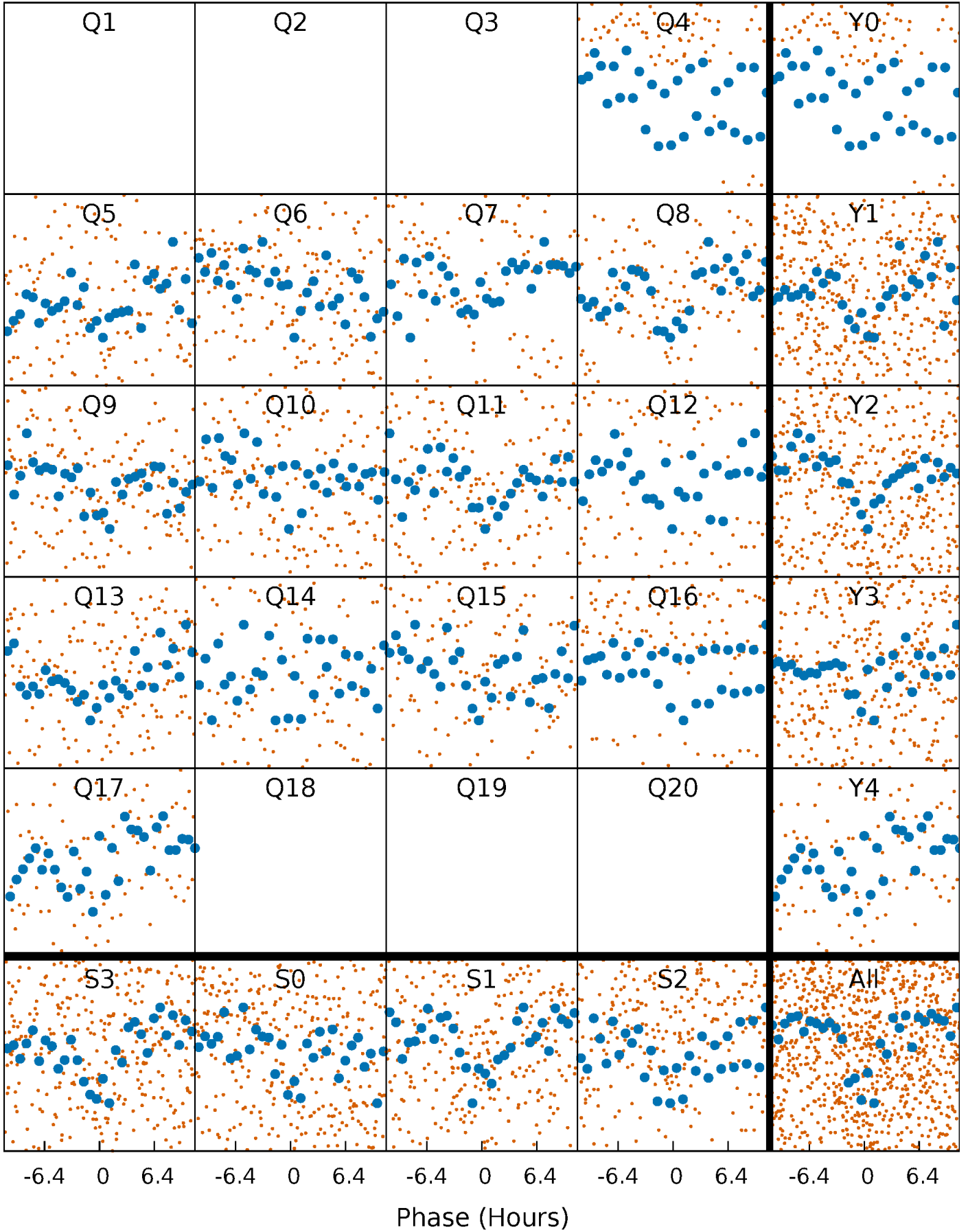


Planet 4 : Phased Whitened Flux Time Series (Fit Epoch/Period)



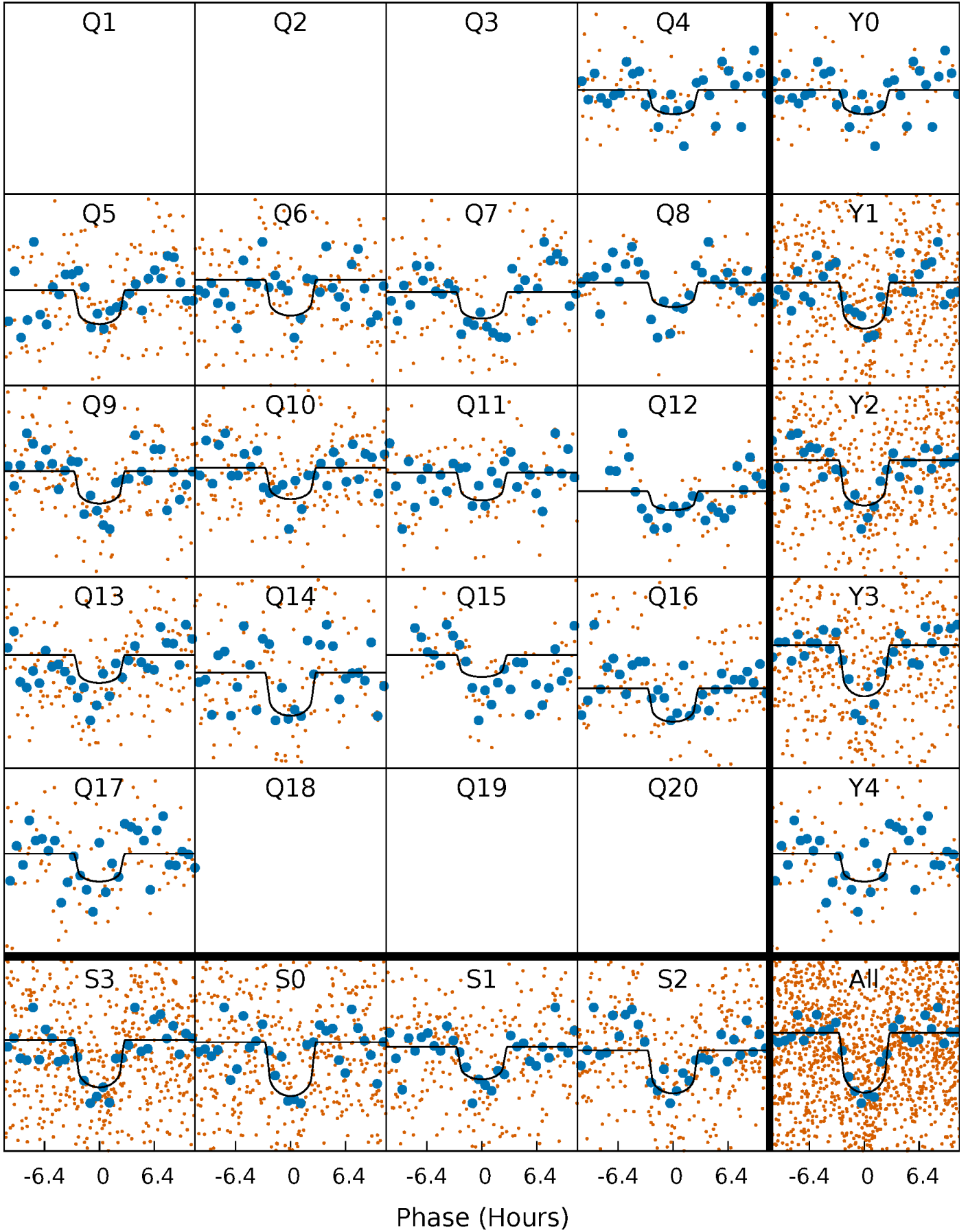
PDC Quarter-Phased Transit Curves

TCE 004157325-04 P= 24.843666 Days $T_0=148.182722$ (BKJD)



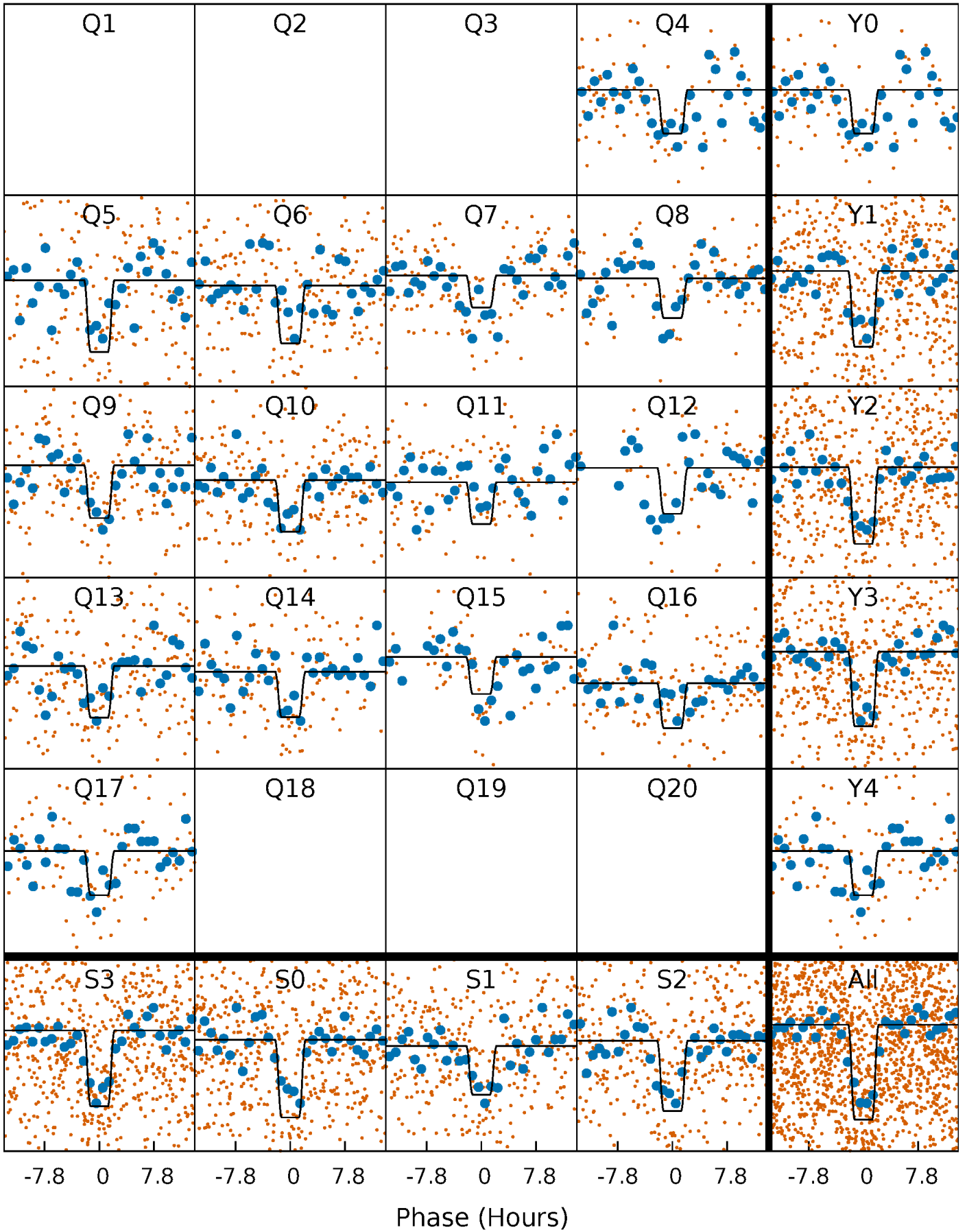
DV Quarter-Phased Transit Curves

TCE 004157325-04 P= 24.843666 Days $T_0=148.182722$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

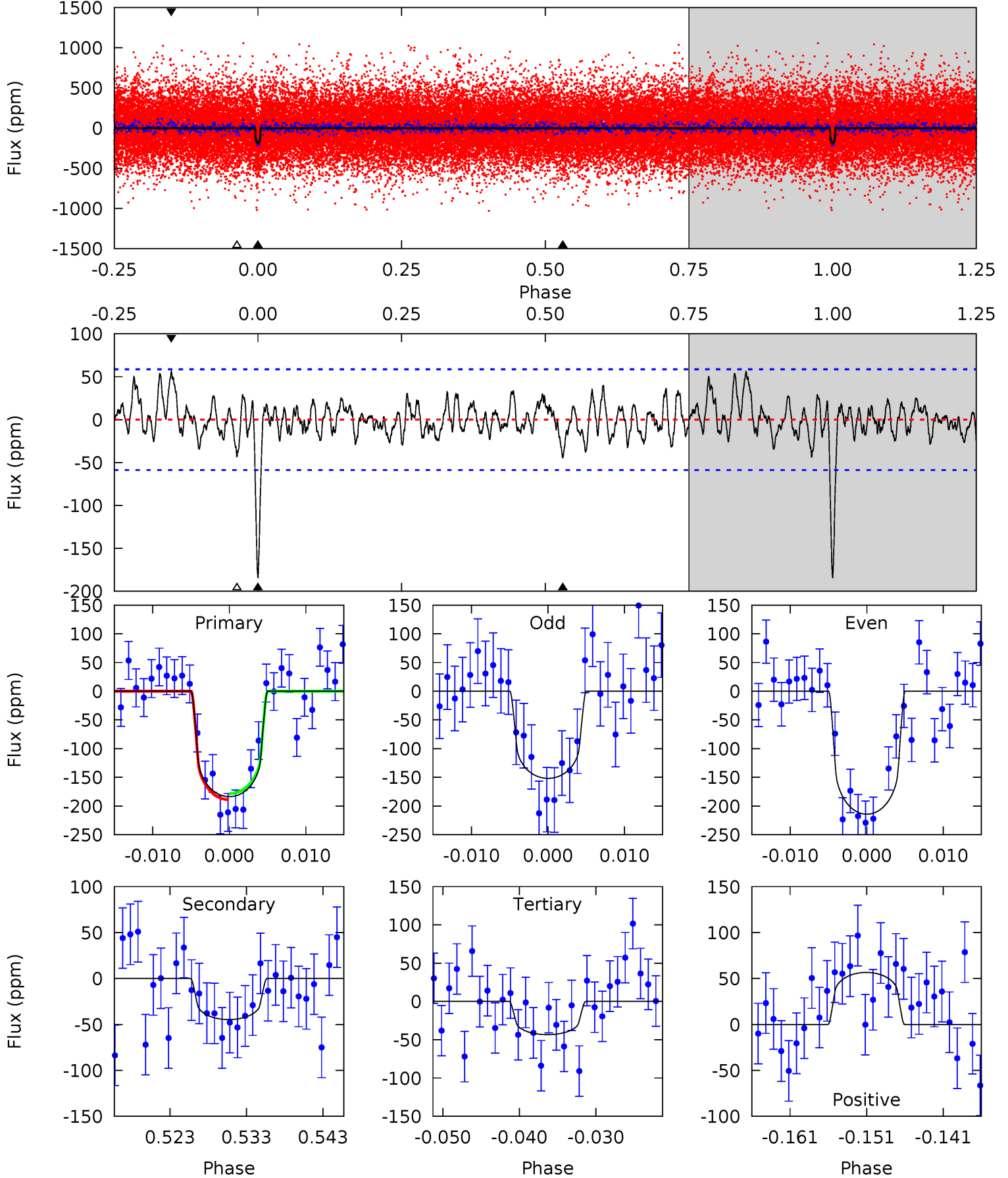
TCE 004157325-04 P= 24.842731 Days $T_0=148.208504$ (BKJD)



DV Model-Shift Uniqueness Test

004157325-04, P = 24.843666 Days, E = 148.182722 Days

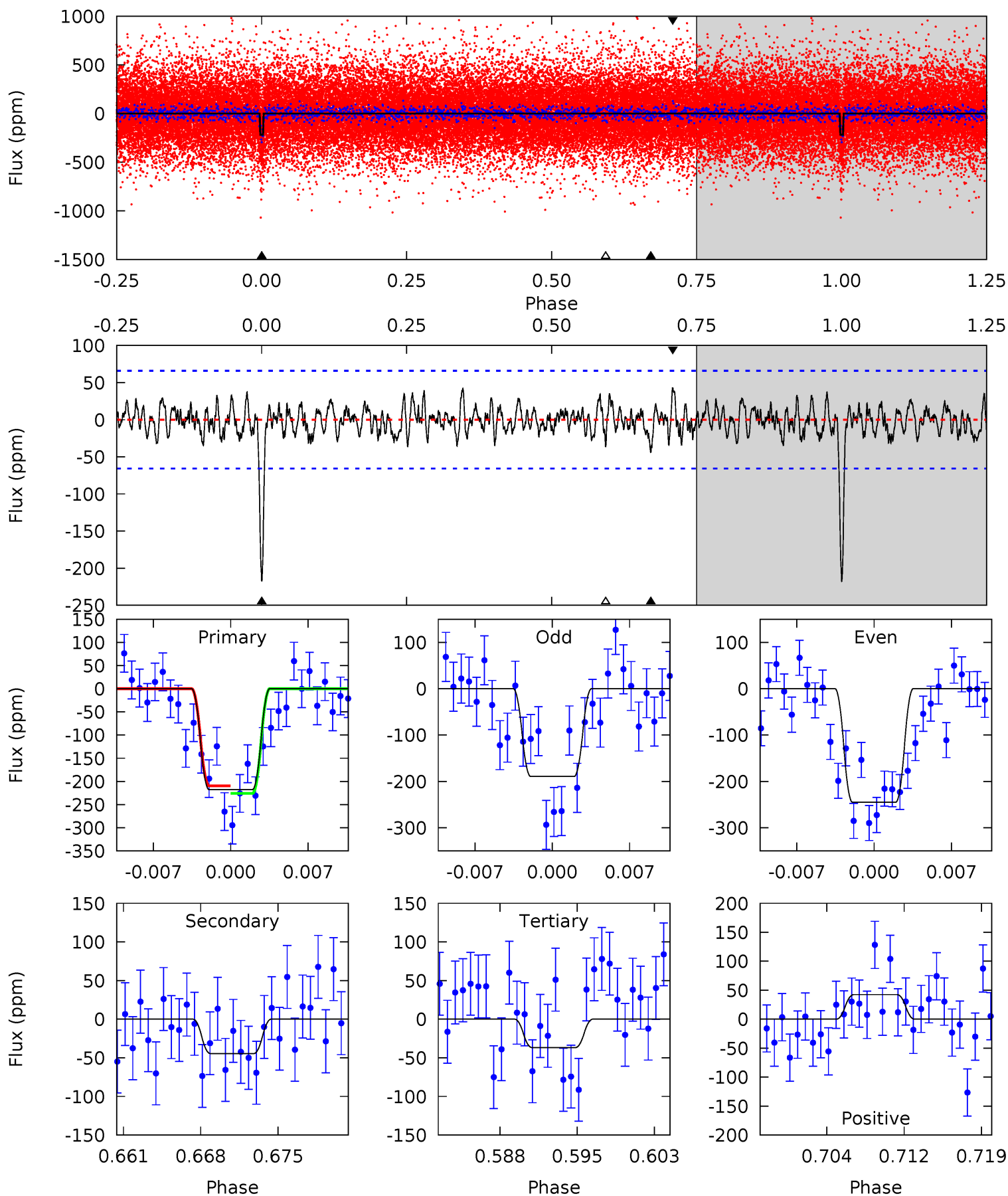
Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
15.7	3.82	3.70	4.84	5.03	2.57	1.41	12.0	10.9	0.12	-1.02	2.68	0.92	0.24	0.46



Alt Model-Shift Uniqueness Test

004157325-04, P = 24.842731 Days, E = 148.208504 Days

Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
16.8	3.44	2.84	3.28	5.09	2.68	1.15	14.0	13.5	0.60	0.16	2.15	0.99	0.16	0.64



Stellar Parameters For KIC 004157325

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	5670^{+114}_{-114}	$4.397^{+0.095}_{-0.105}$	$0.060^{+0.150}_{-0.150}$	$1.022^{+0.148}_{-0.108}$	$0.949^{+0.067}_{-0.055}$	$1.254^{+0.475}_{-0.407}$
	+2%/-2%	+2%/-2%	+250%/-250%	+14%/-11%	+7%/-6%	+38%/-32%
Source	SPE58	SPE58	SPE58	DSEP		

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

Secondary Eclipse Parameters for KIC 004157325-04 / KOI 1860.04

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	A_{obs}
DV	-45 ± 12	$1.61^{+0.97}_{-0.82}$	873^{+34}_{-34}	4122^{+1326}_{-619}	249^{+770}_{-154}
Alt.	-45 ± 13	$1.86^{+0.98}_{-0.89}$	874^{+37}_{-32}	3932^{+1039}_{-533}	194^{+433}_{-113}

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

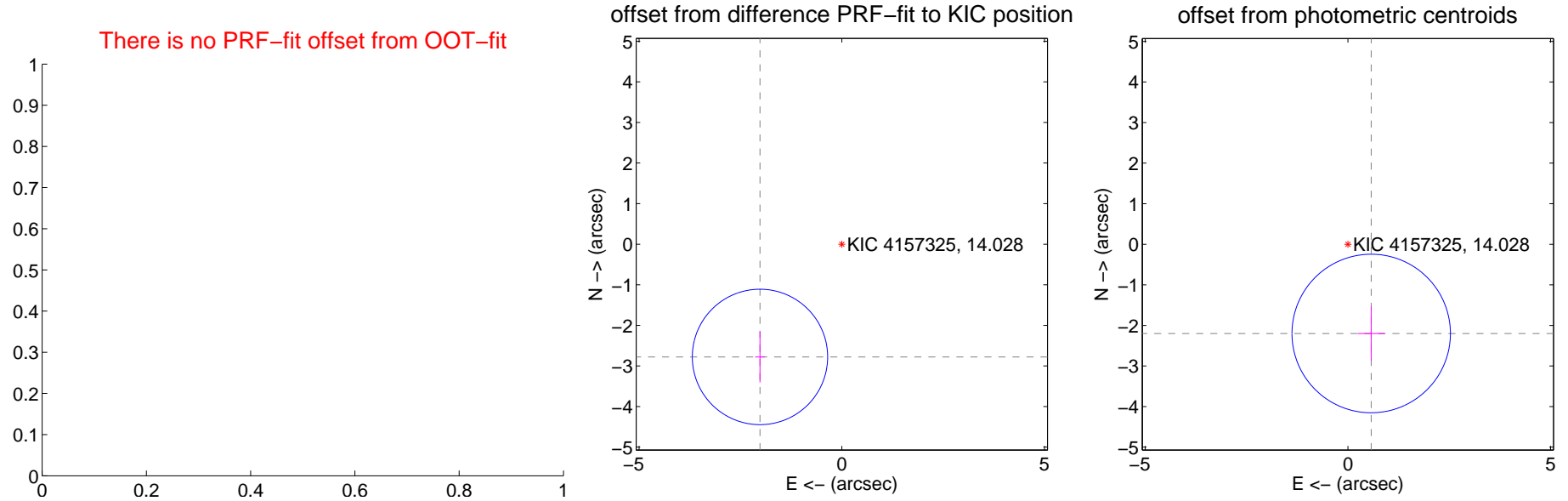
DV Centroid Data

Supplemental centroid analysis for 004157325-04. Kepler magnitude: 14.03. Transit SNR 9.31

There are 0 quarters with good PRF difference image offsets

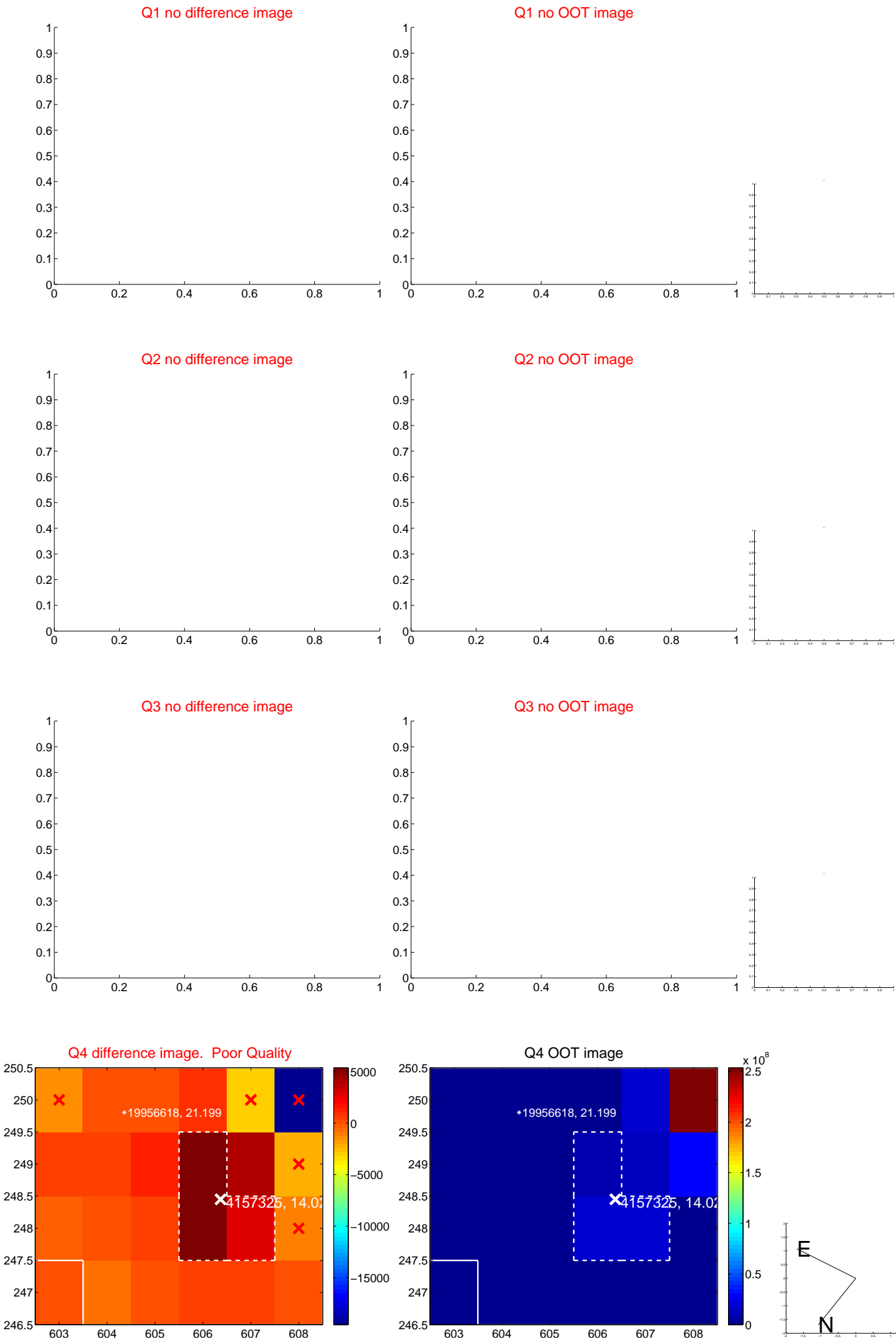
The direct PRF centroid is offset from the target star catalog position by about NaN arcsec

	Distance in arcsec	Distance / σ	Δ RA	Δ Dec
PRF-fit source offset from OOT	—	—	—	—
PRF-fit source offset from KIC position	3.433 ± 0.556	6.17	2.018 ± 0.120	-2.778 ± 0.631
photometric centroid source offset	2.27 ± 0.65	3.49	-0.57 ± 0.33	-2.20 ± 0.67

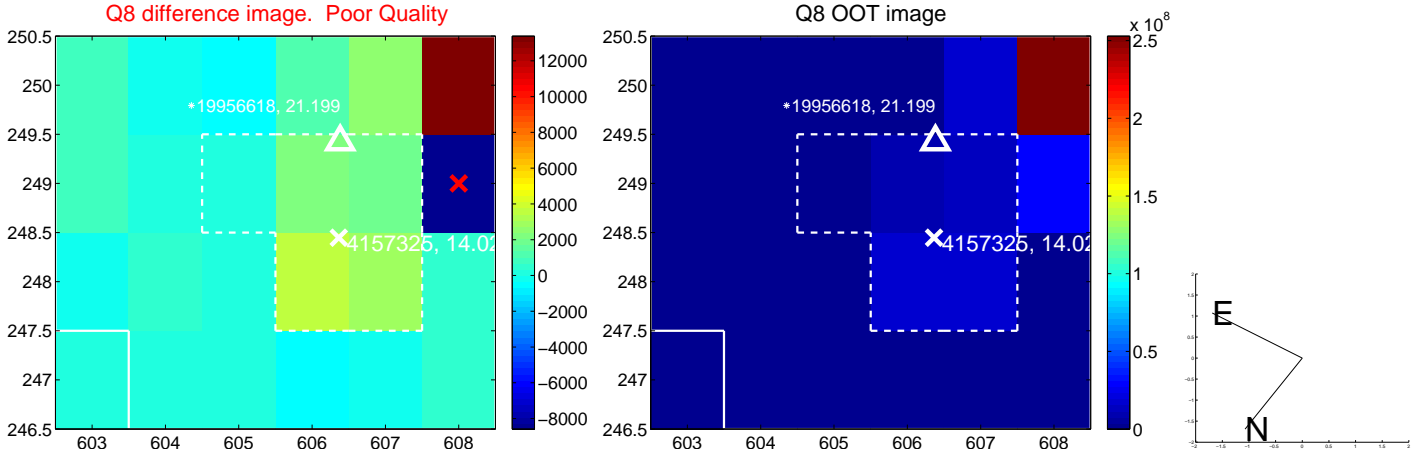
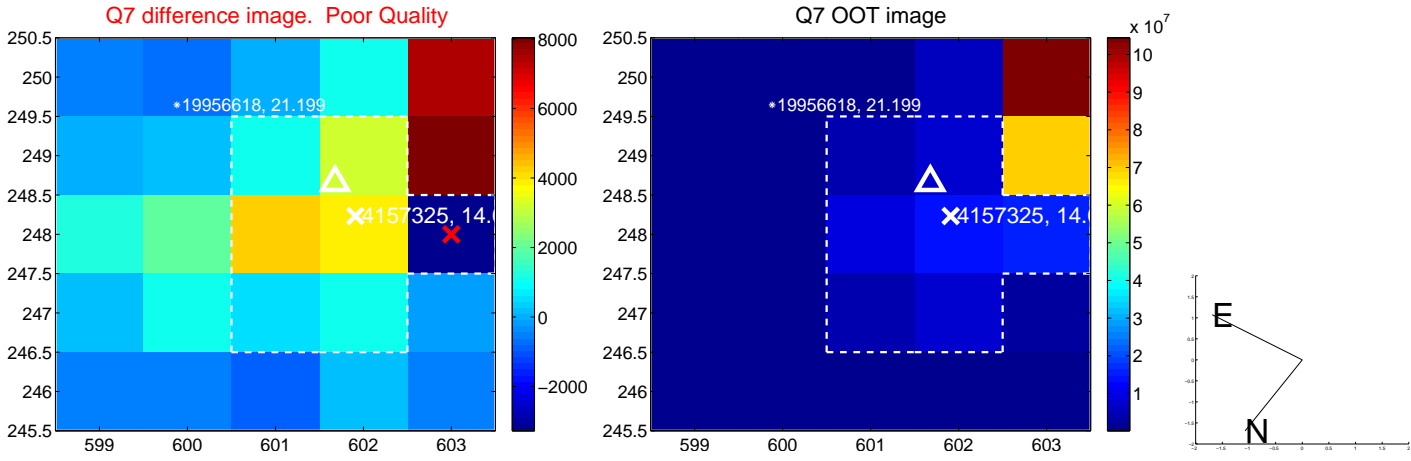
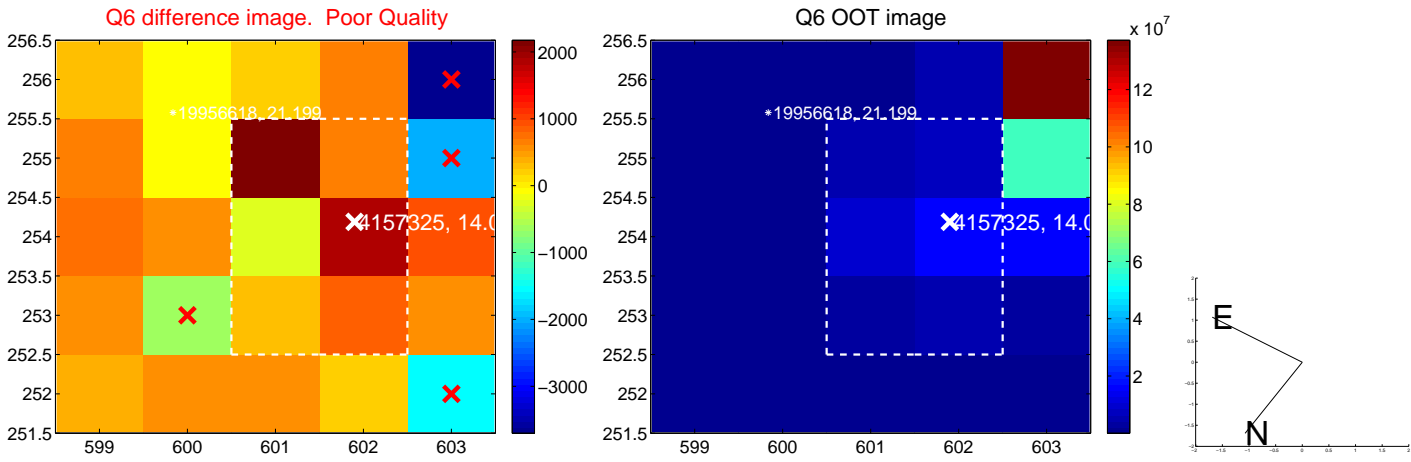
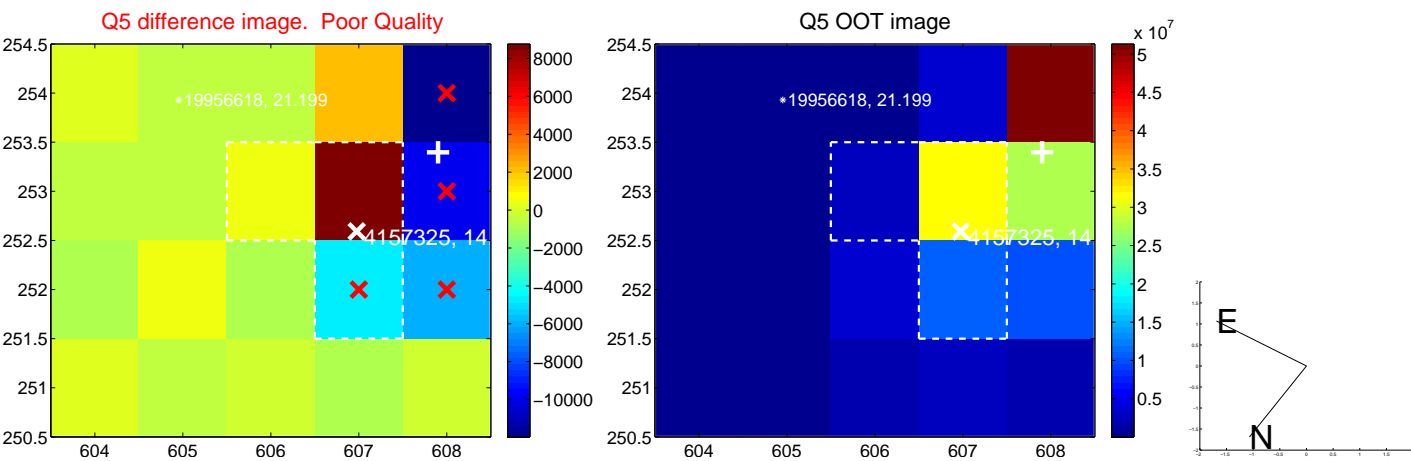


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three- σ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

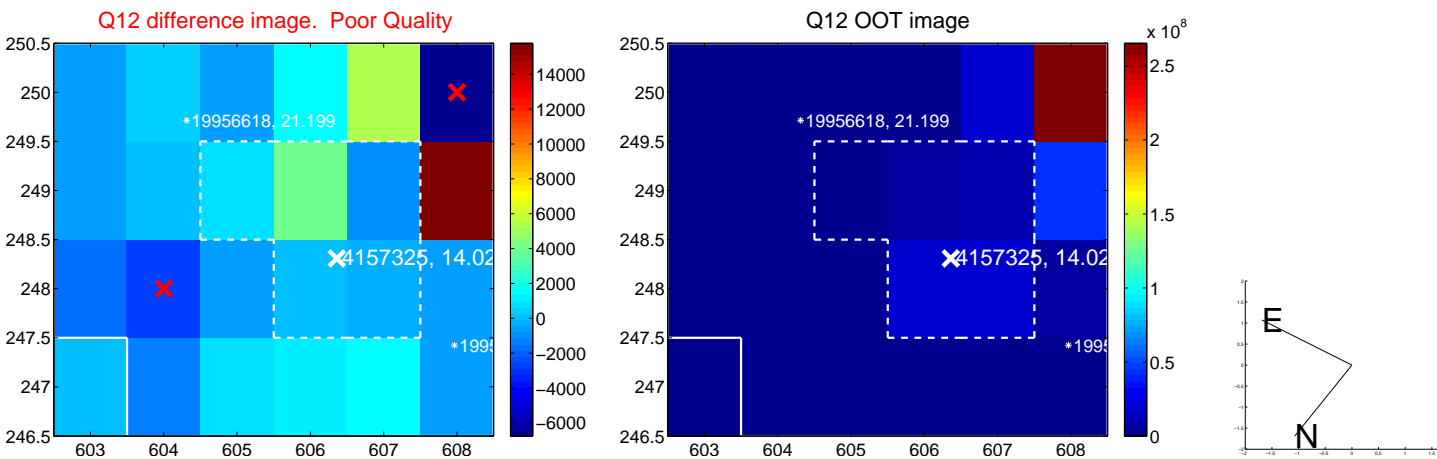
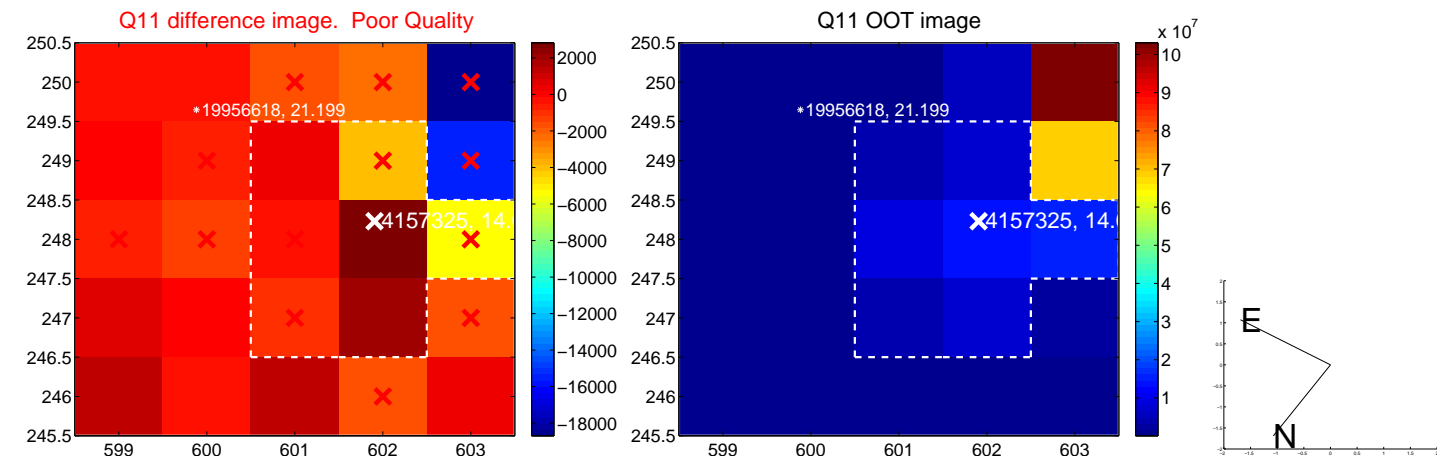
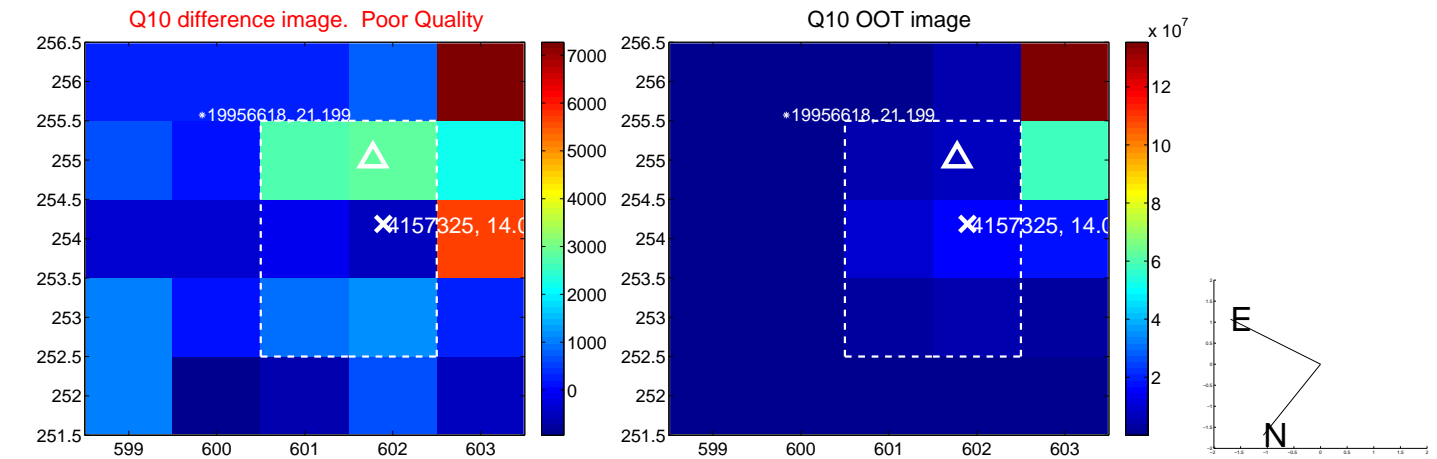
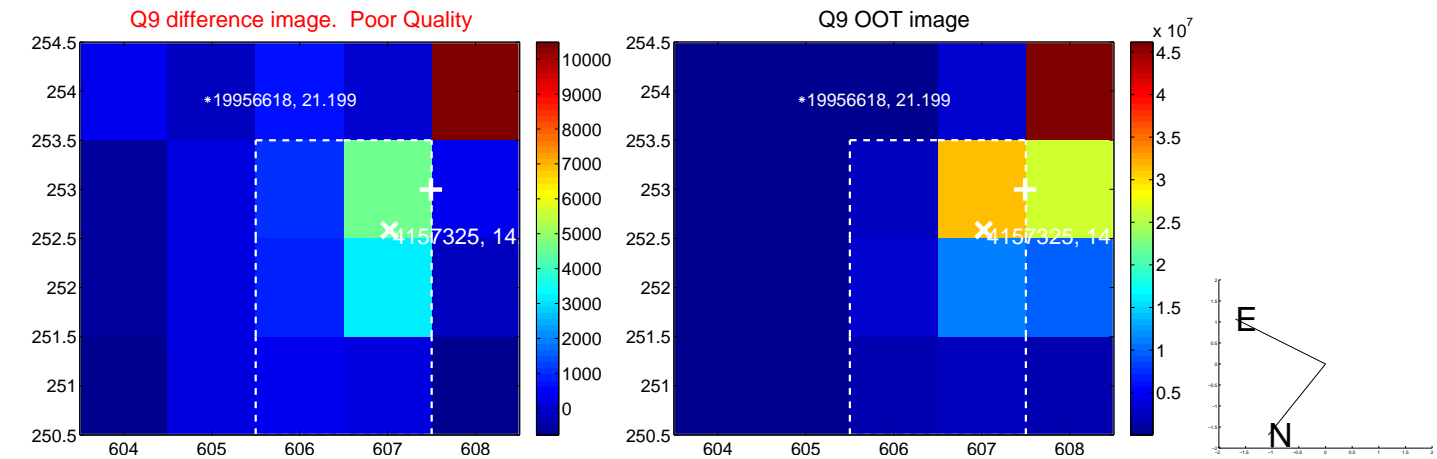
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



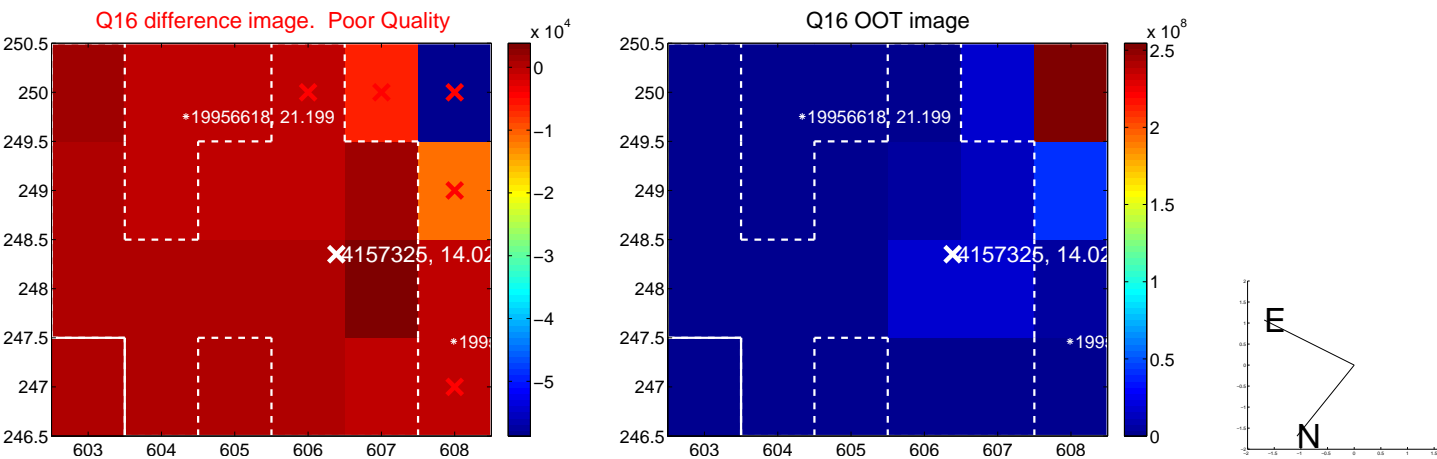
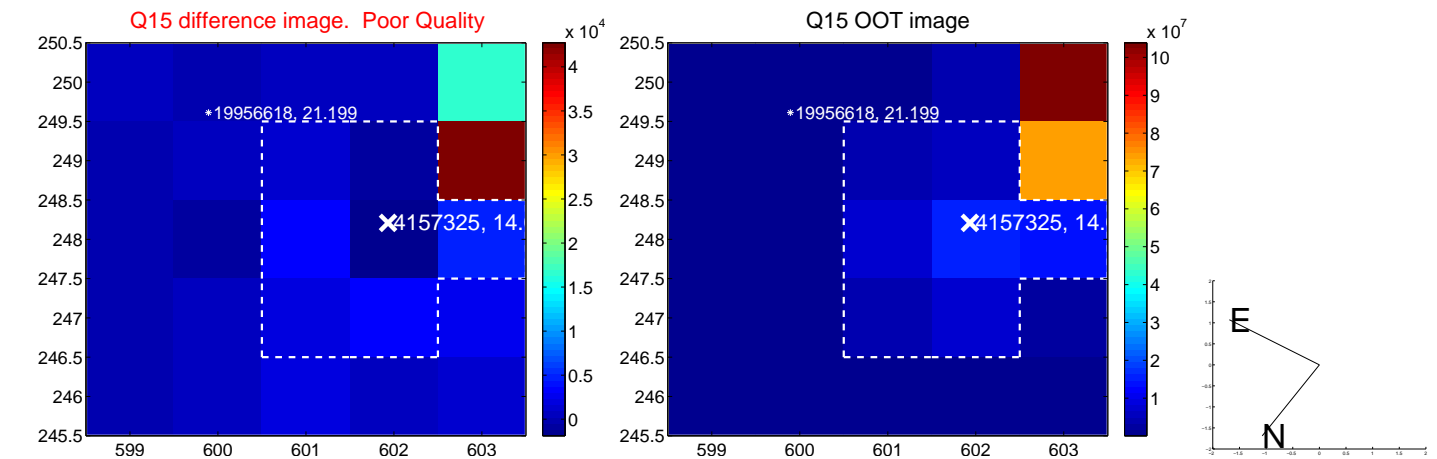
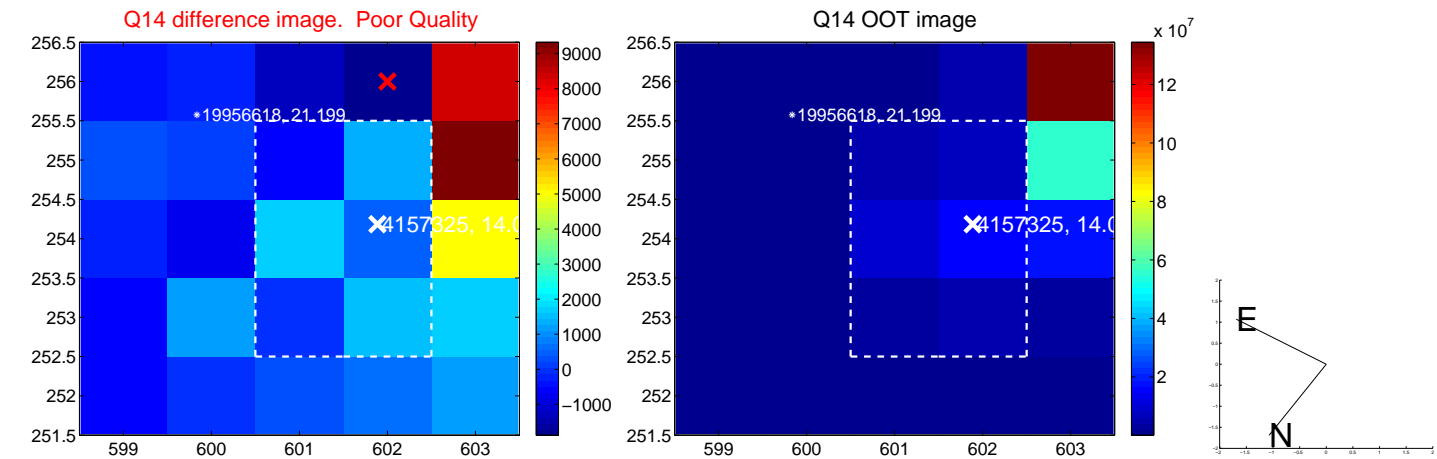
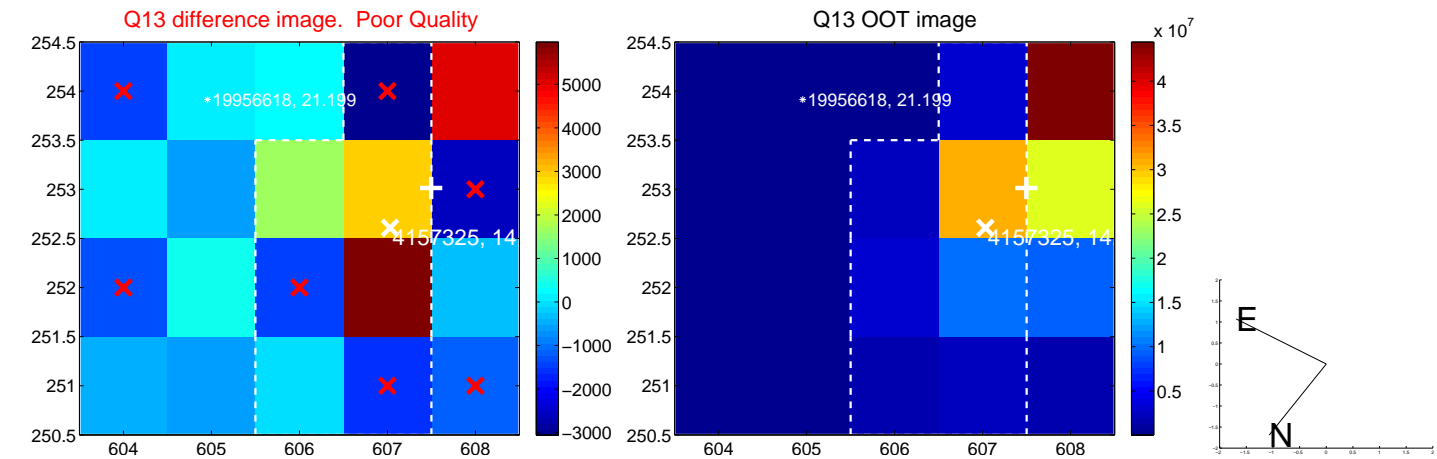
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



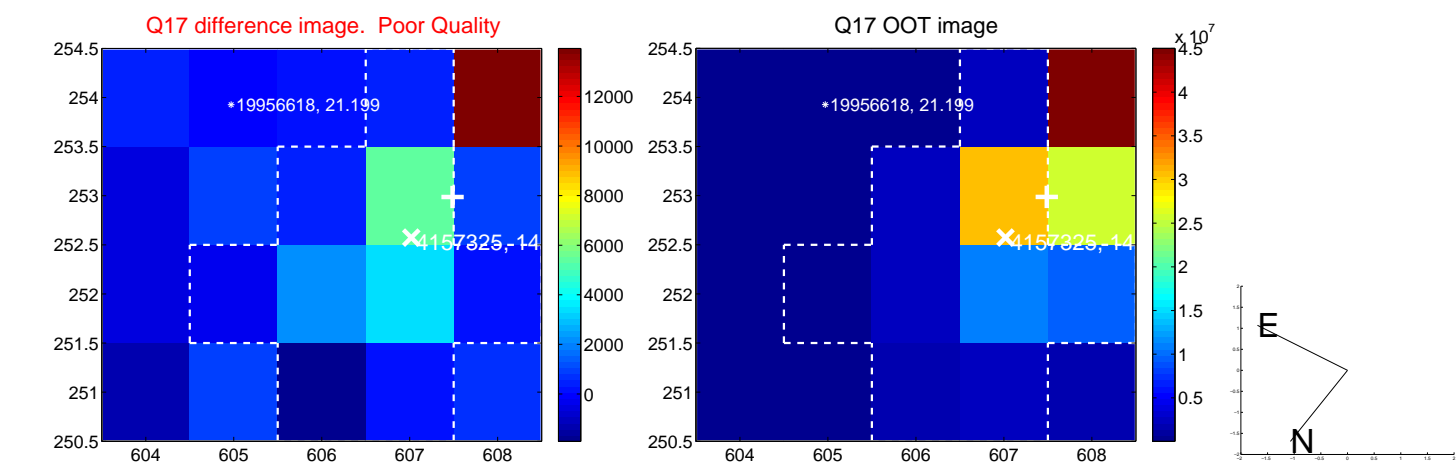
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



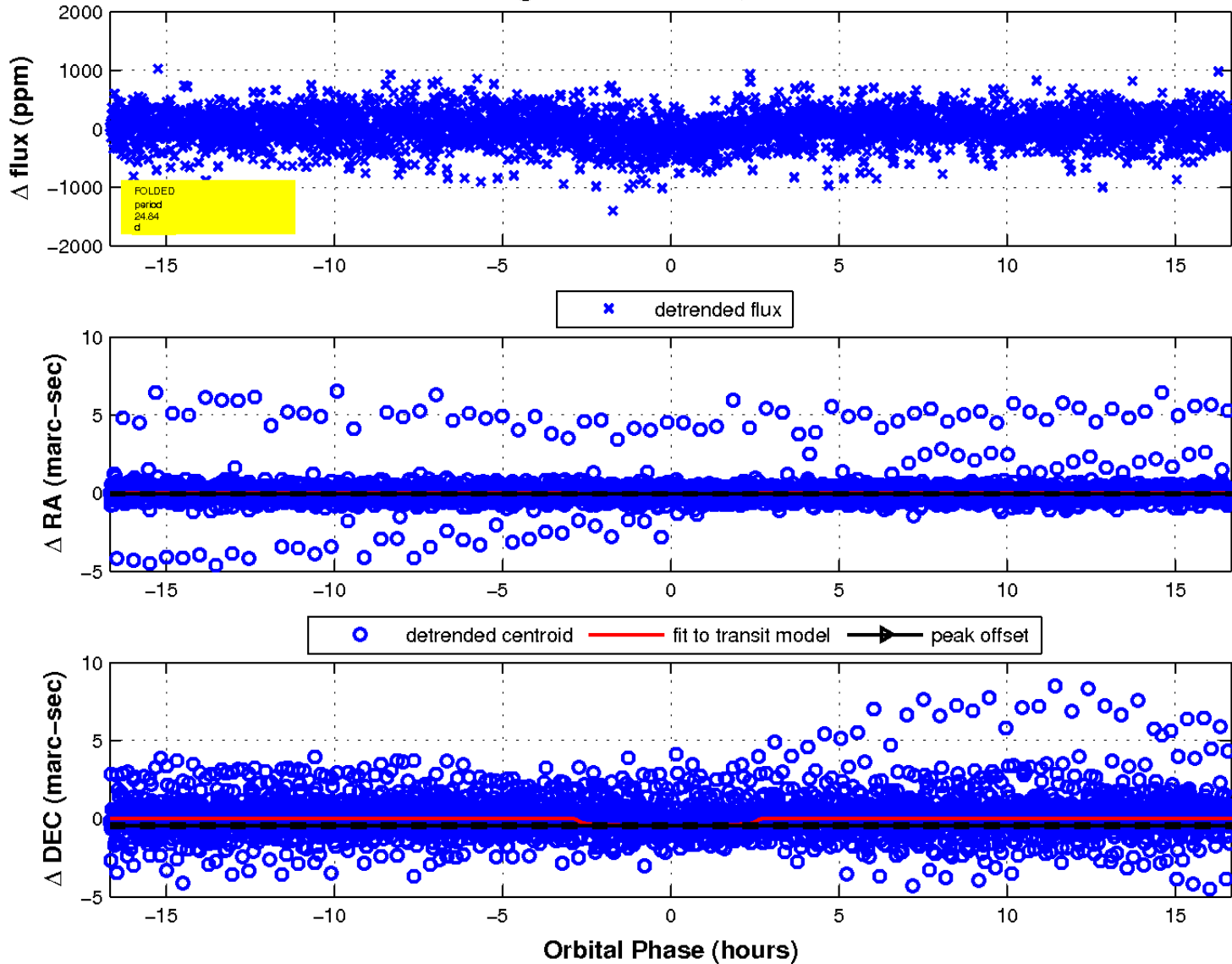
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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



fluxWeightedCentroids, Planet 4 of 4



UKIRT Image

Declination

