

# KIC 007353970

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
007353970-01	OBS	3574.01	198.443668	155.615619	39392.2	10.034	1705.5	961.1	0.87	5420	30.11	1.44
007353970-02	OBS	No	198.443718	257.464874	20958.4	15.027	790.9	667.3	0.87	5420	22.39	1.44

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
007353970-01	OBS	FP	0.00	0	1	1	0	MOD_SEC_DV—MOD_SEC_ALT—DEEP_V_SHAPED—HAS_SEC_TCE—CENT_UNRESOLVED_OFFSET
007353970-02	OBS	FP	0.00	1	1	1	0	IS_SEC_TCE—CENT_UNRESOLVED_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](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

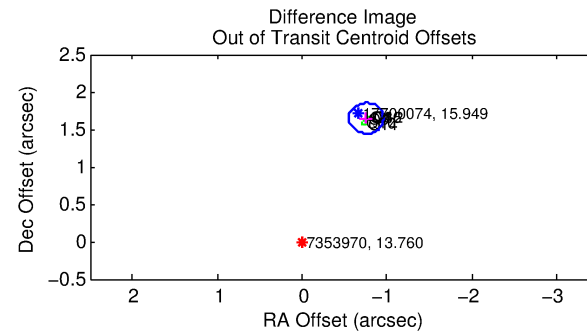
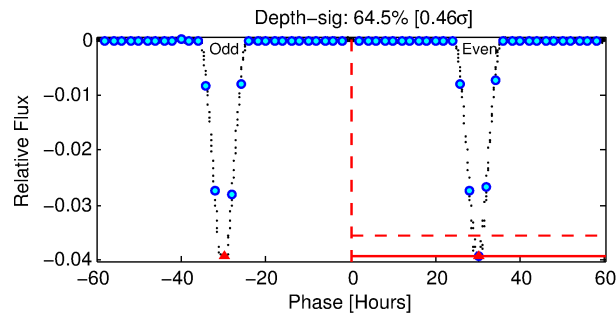
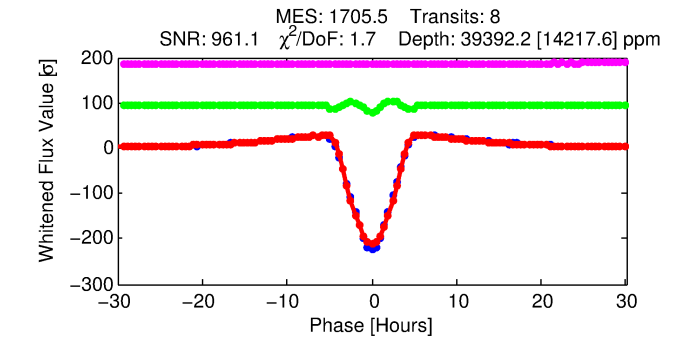
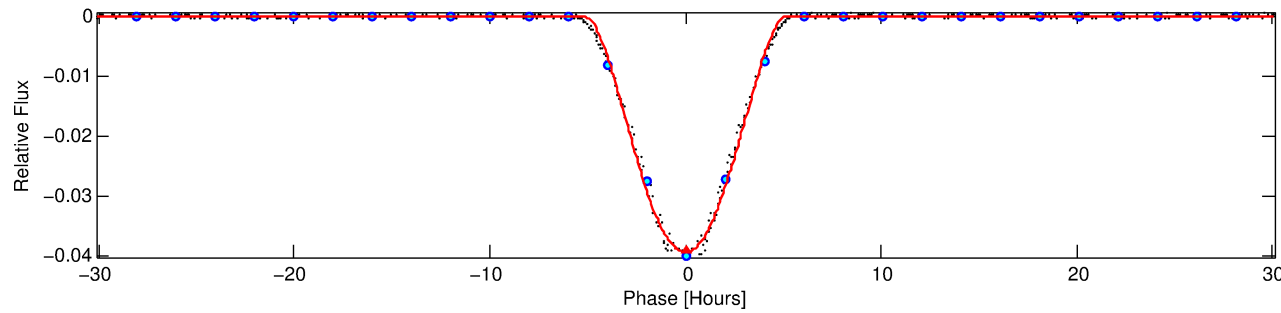
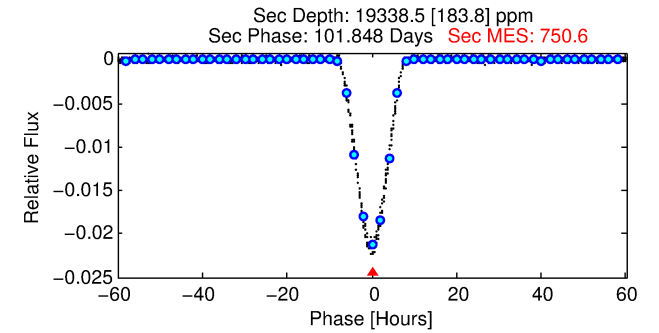
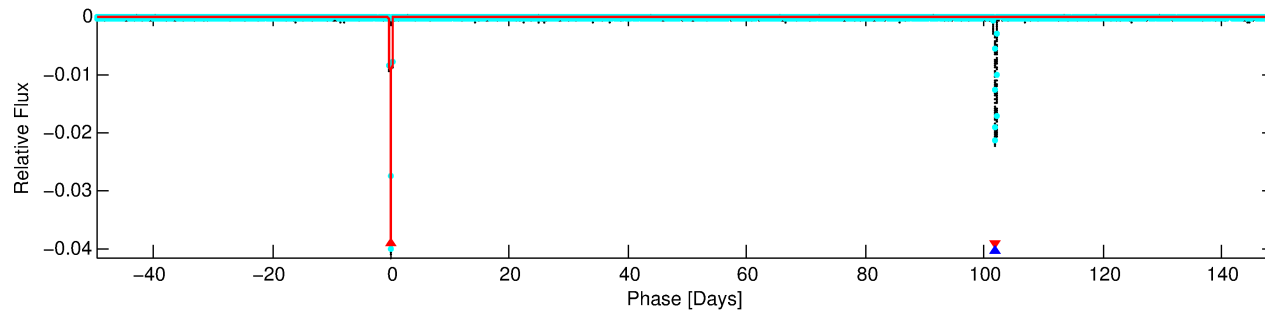
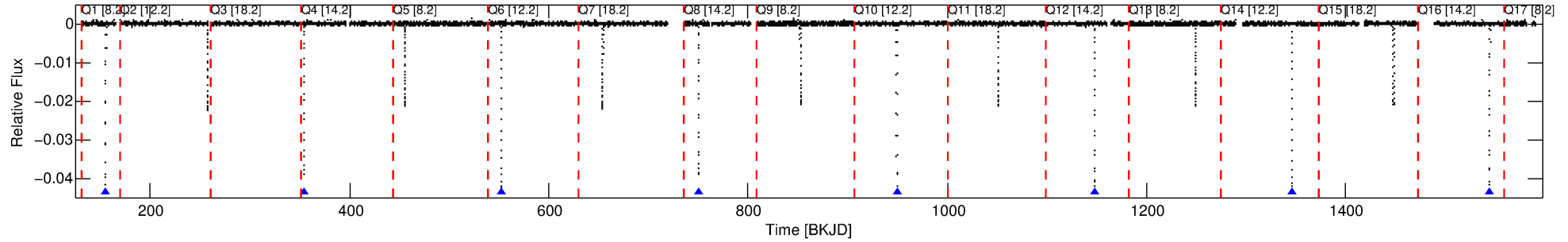
## Ephemeris Match Information For 007353970-01

No Significant Match Found

# DV One-Page Summary

KIC: 7353970 Candidate: 1 of 2 Period: 198.444 d  
KOI: K03574.01 Corr: 0.998

Kp: 13.76 R\*: 0.87 Rs Teff: 5420.0 K Logg: 4.50 Fe/H: 0.000



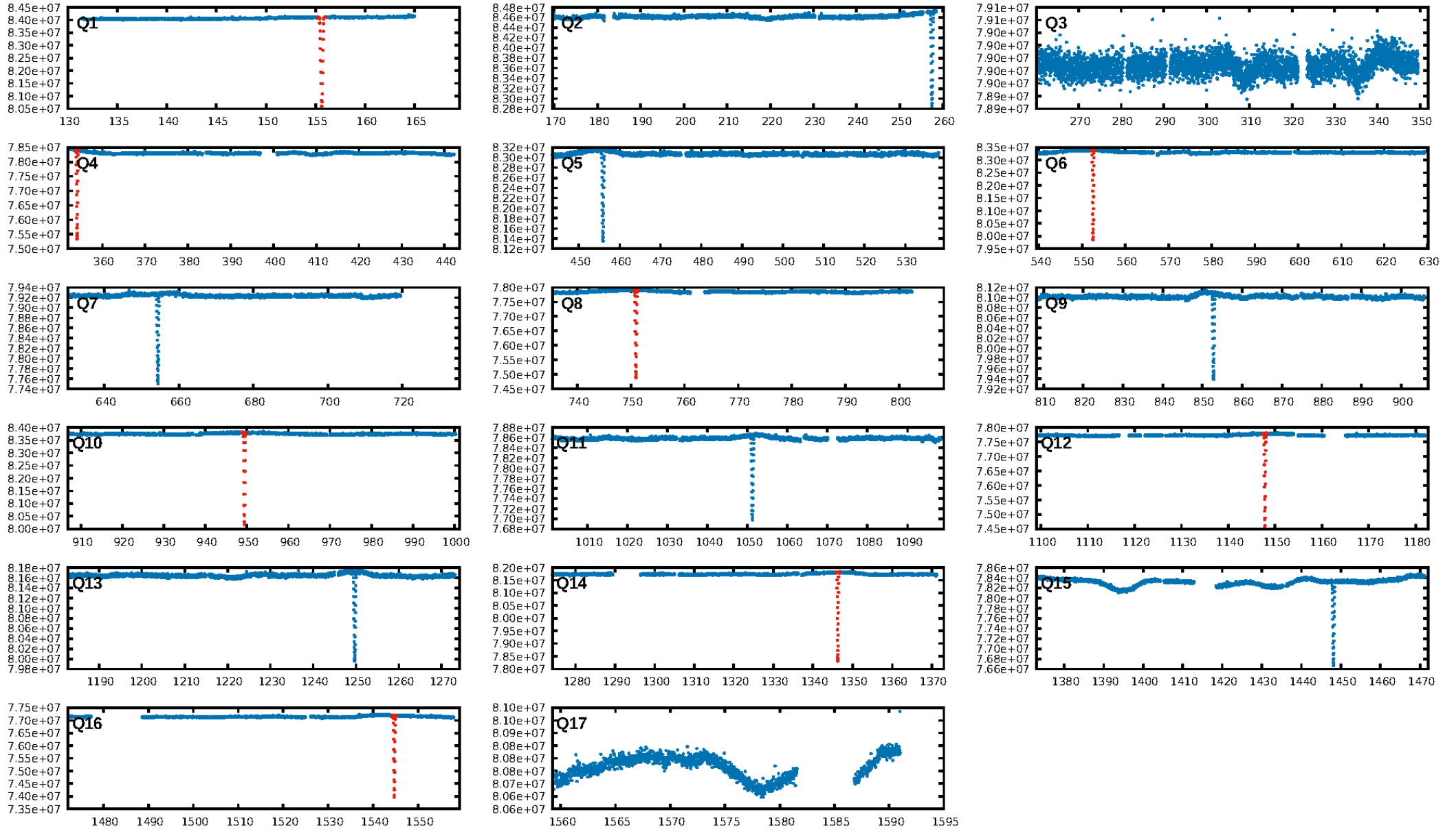
## DV Fit Results:

Period = 198.44367 [0.00004] d  
Epoch = 155.6156 [0.0002] BKJD  
Rp/R\* = 0.3179 [0.0283]  
a/R\* = 129.69 [0.36]  
b = 1.00 [0.03]  
Seff = 1.44 [0.23]  
Teq = 279 [11] K  
Rp = 30.11 [4.06] Re  
a = 0.6365 [0.0571] AU  
Ag = 4754.99 [1066.11] [4.46σ]  
Teffp = 3585 [175] K [18.89σ]

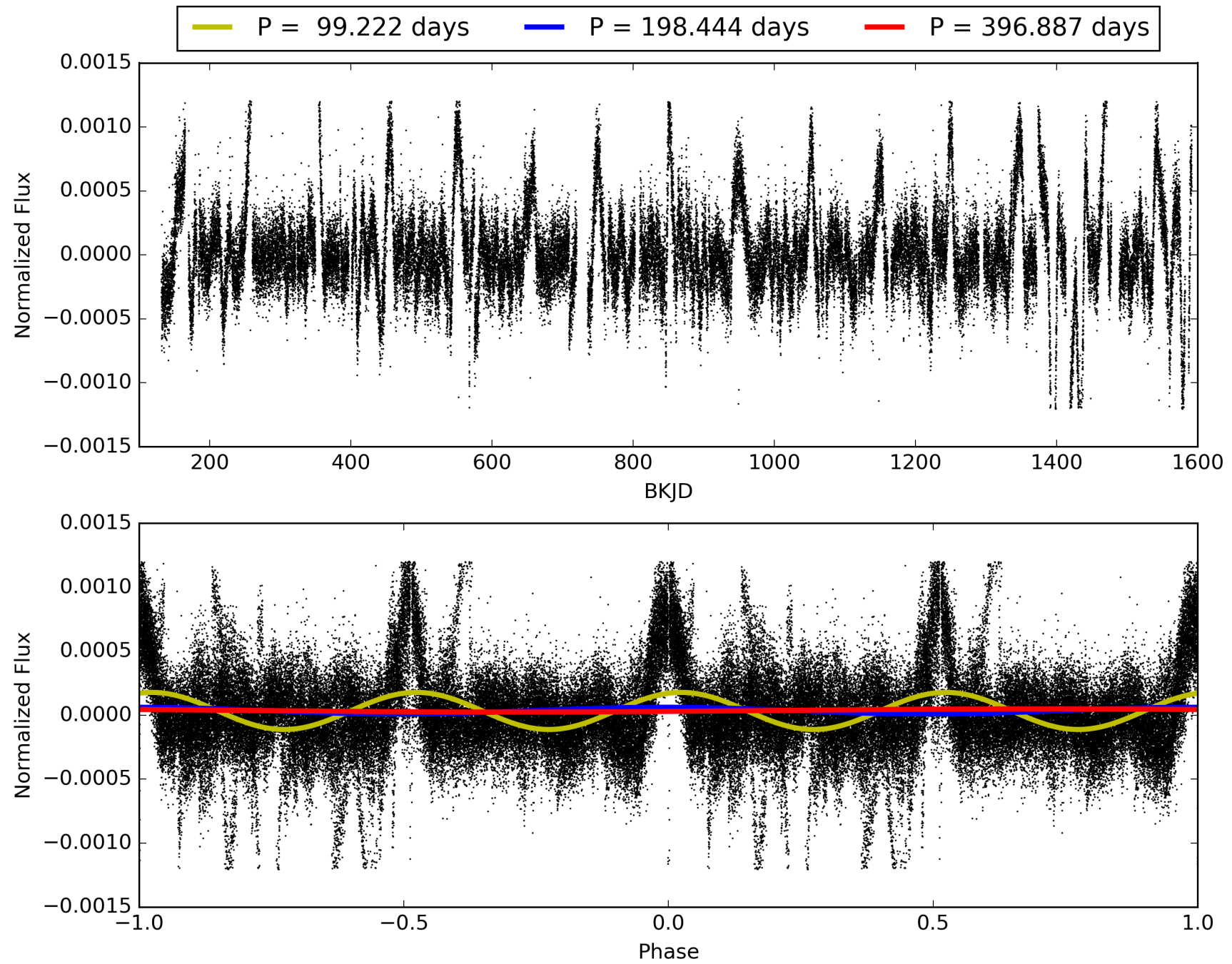
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 0.0% [0.00σ]  
ModelChiSquare2-sig: 1.2%  
ModelChiSquareGof-sig: 27.1%  
Bootstrap-pfa: 0.00e+00  
RollingBand-fgt: 1.00 [7/7]  
GhostDiagnostic-chr: 3.251  
Centroid-sig: 0.0%  
Centroid-so: 1.866 arcsec [273.68σ]  
OotOffset-rm: 1.814 arcsec [26.70σ]  
KicOffset-rm: 1.889 arcsec [27.52σ]  
OotOffset-st: 3/0/4/1 [8]  
KicOffset-st: 3/0/4/1 [8]  
DiffImageQuality-fgm: 1.00 [8/8]  
DiffImageOverlap-fno: 1.00 [8/8]

# TCE 007353970-01, PDC Light Curves

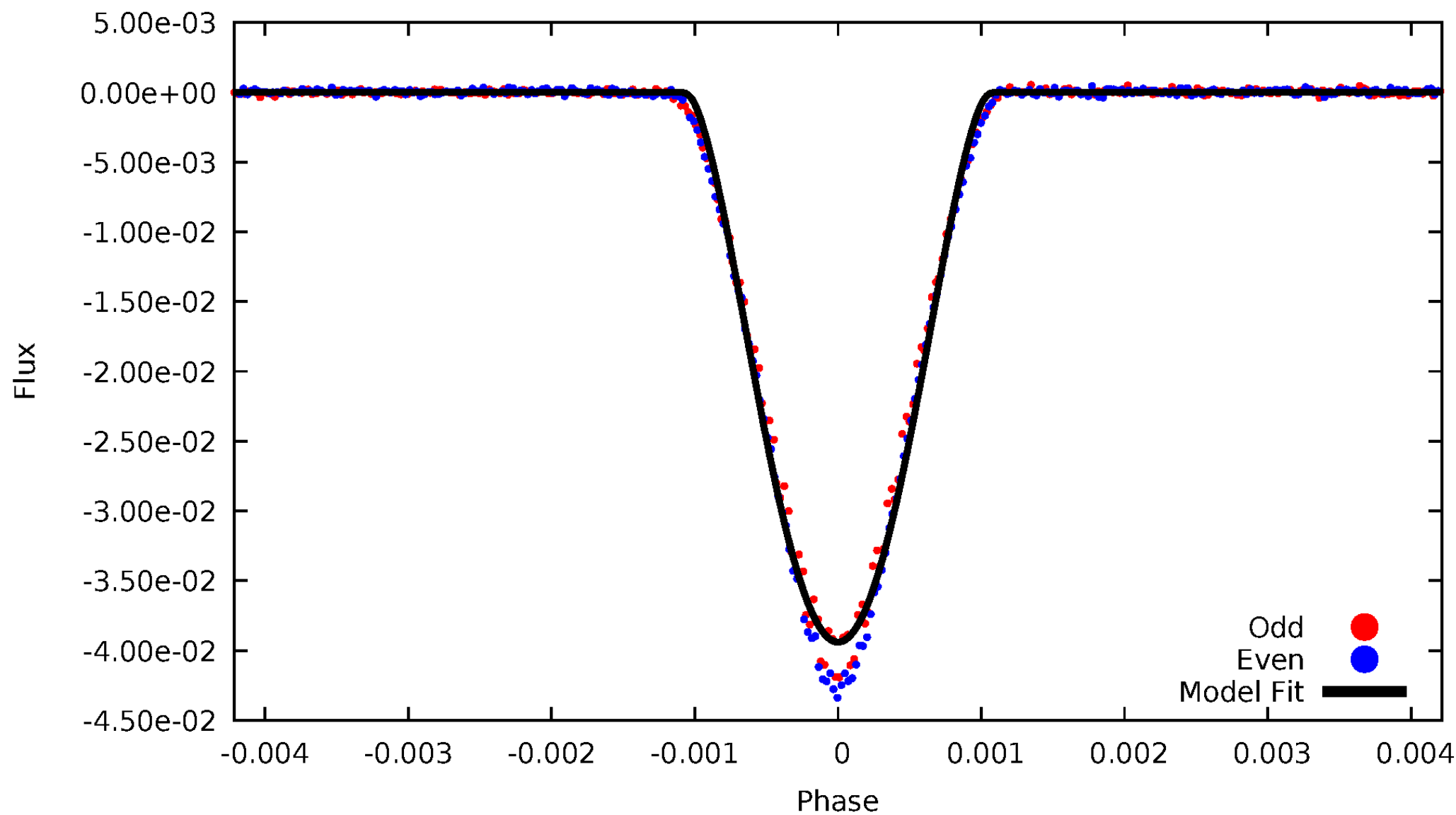


TCE 007353970-01



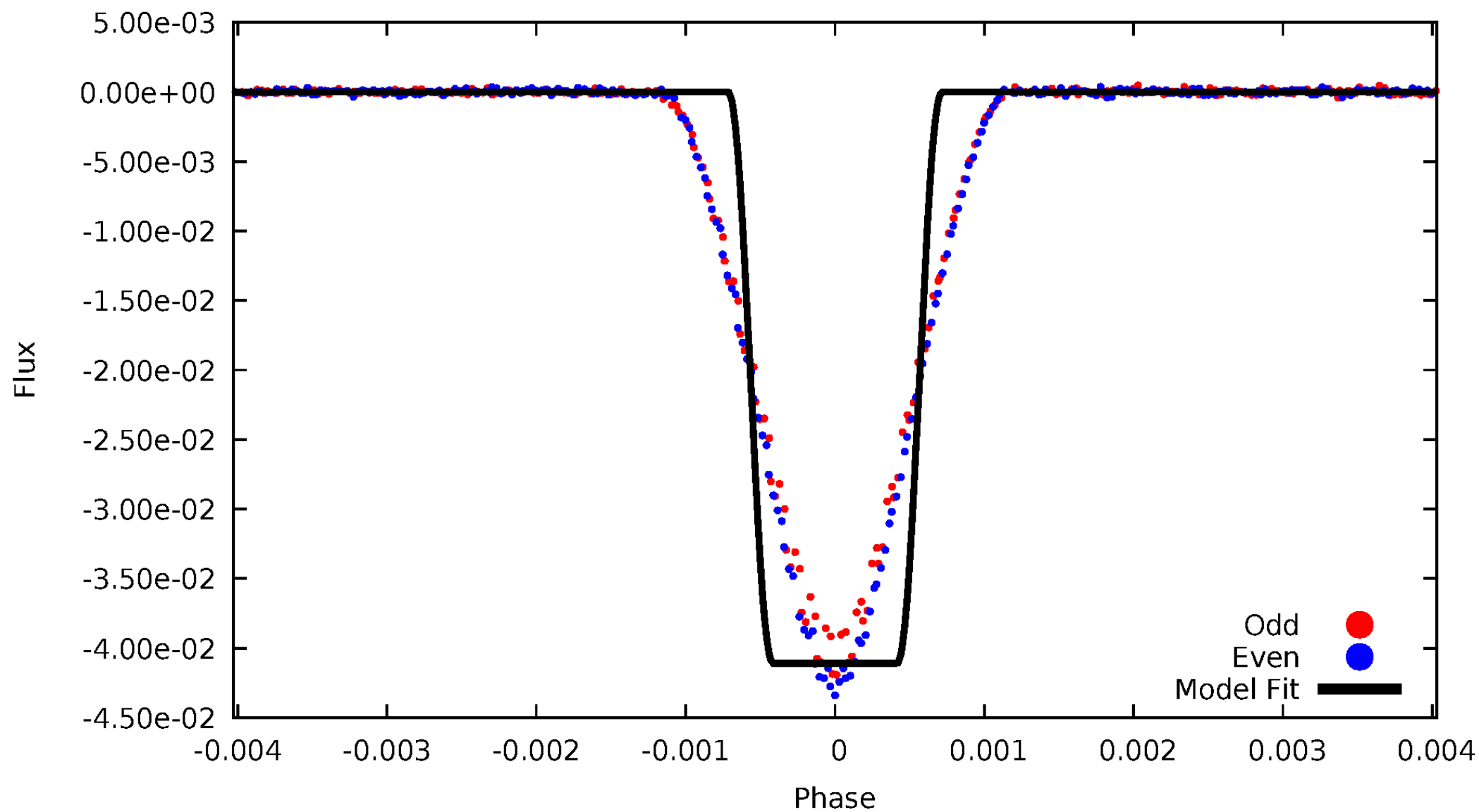
# DV Odd/Even

TCE 007353970-01



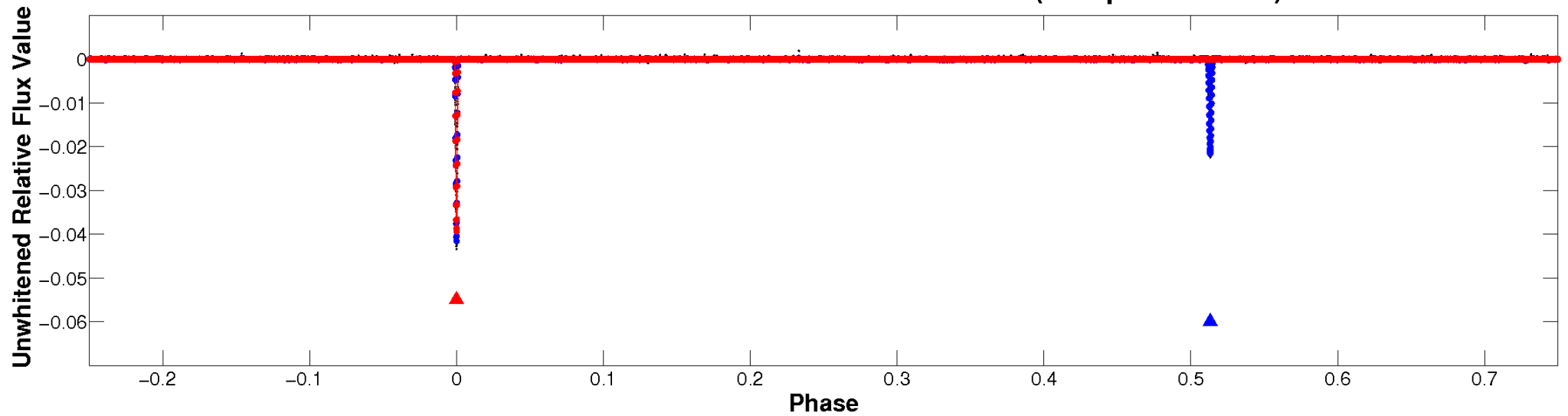
# ALT Odd/Even

TCE 007353970-01

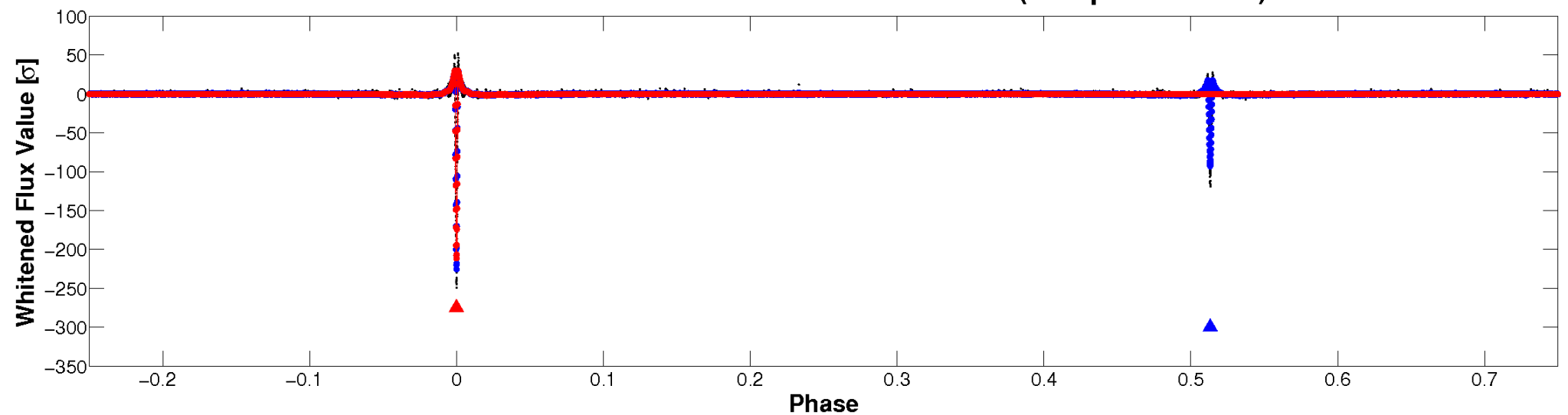


# Non-Whitened Vs. Whitened Light Curve

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

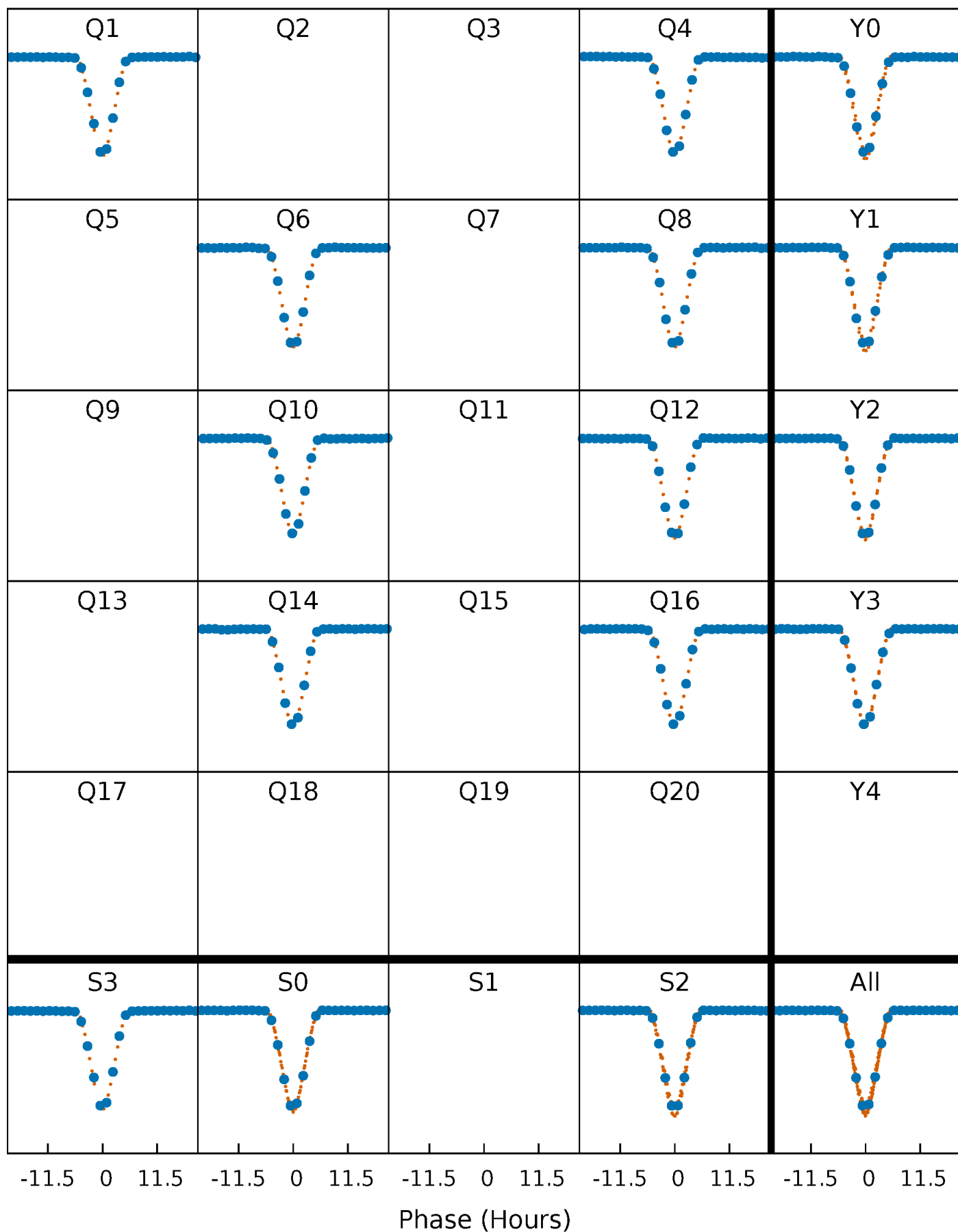


Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

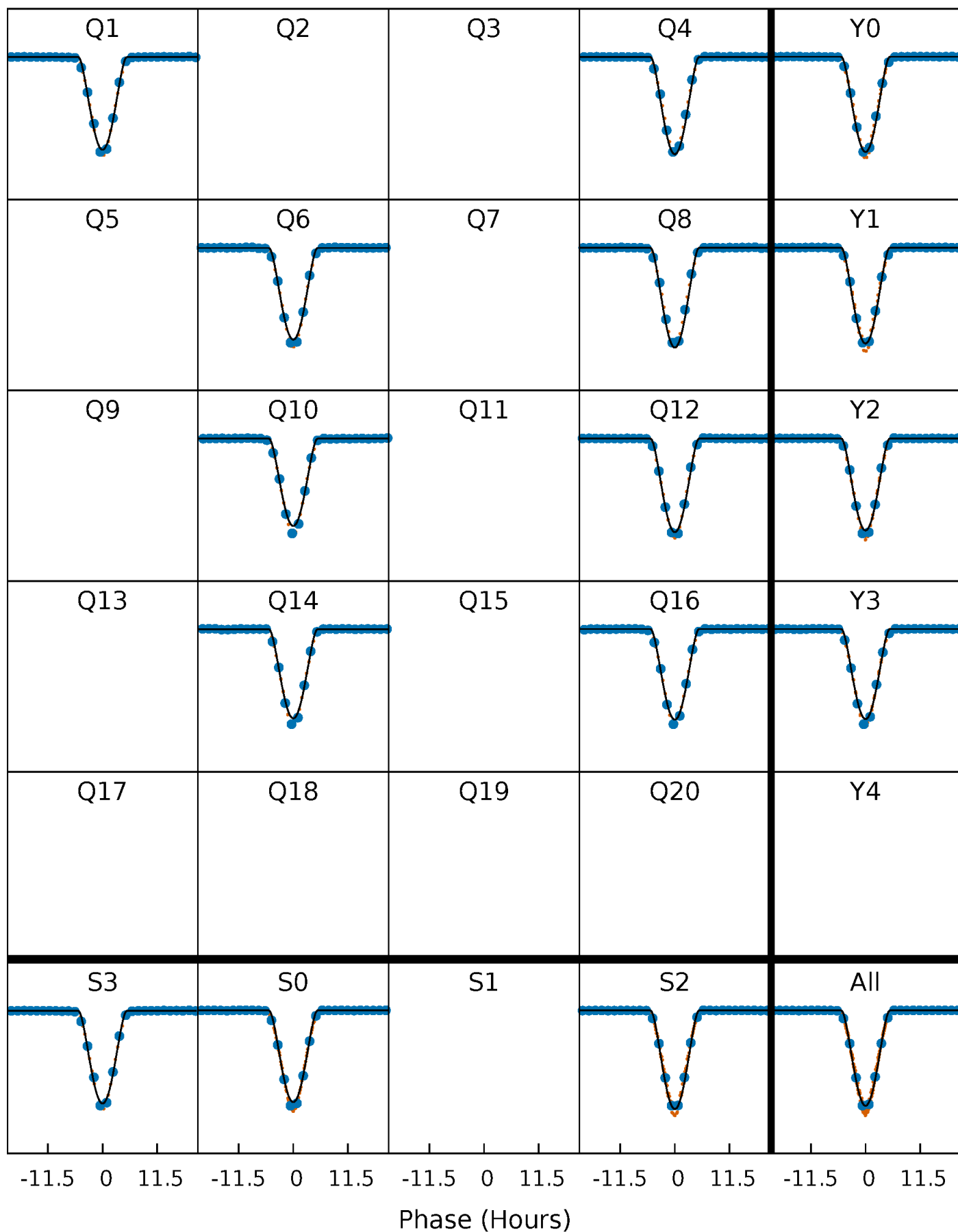
TCE 007353970-01 P=198.443668 Days  $T_0=155.615619$  (BKJD)





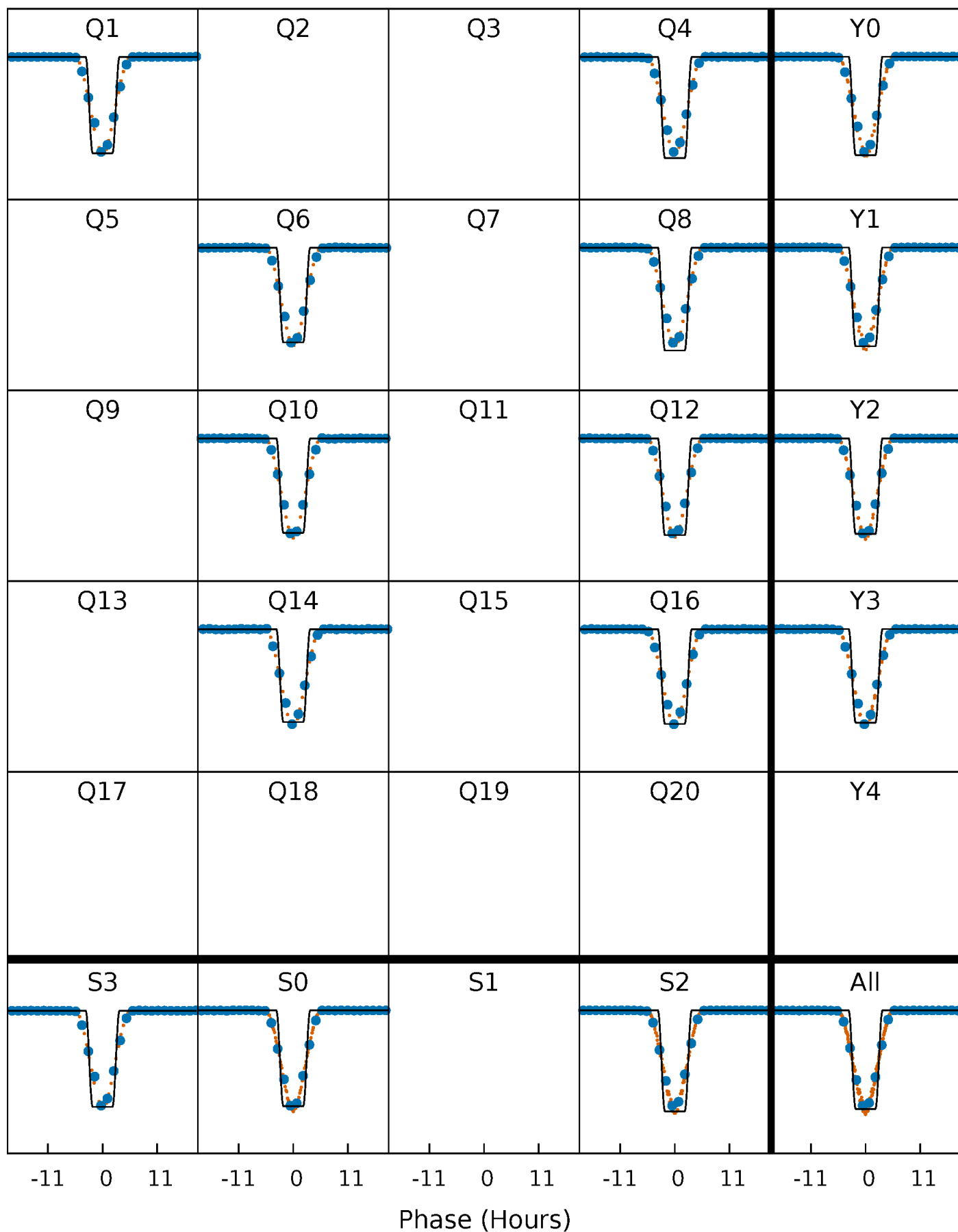
# DV Quarter-Phased Transit Curves

TCE 007353970-01 P=198.443668 Days  $T_0=155.615619$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

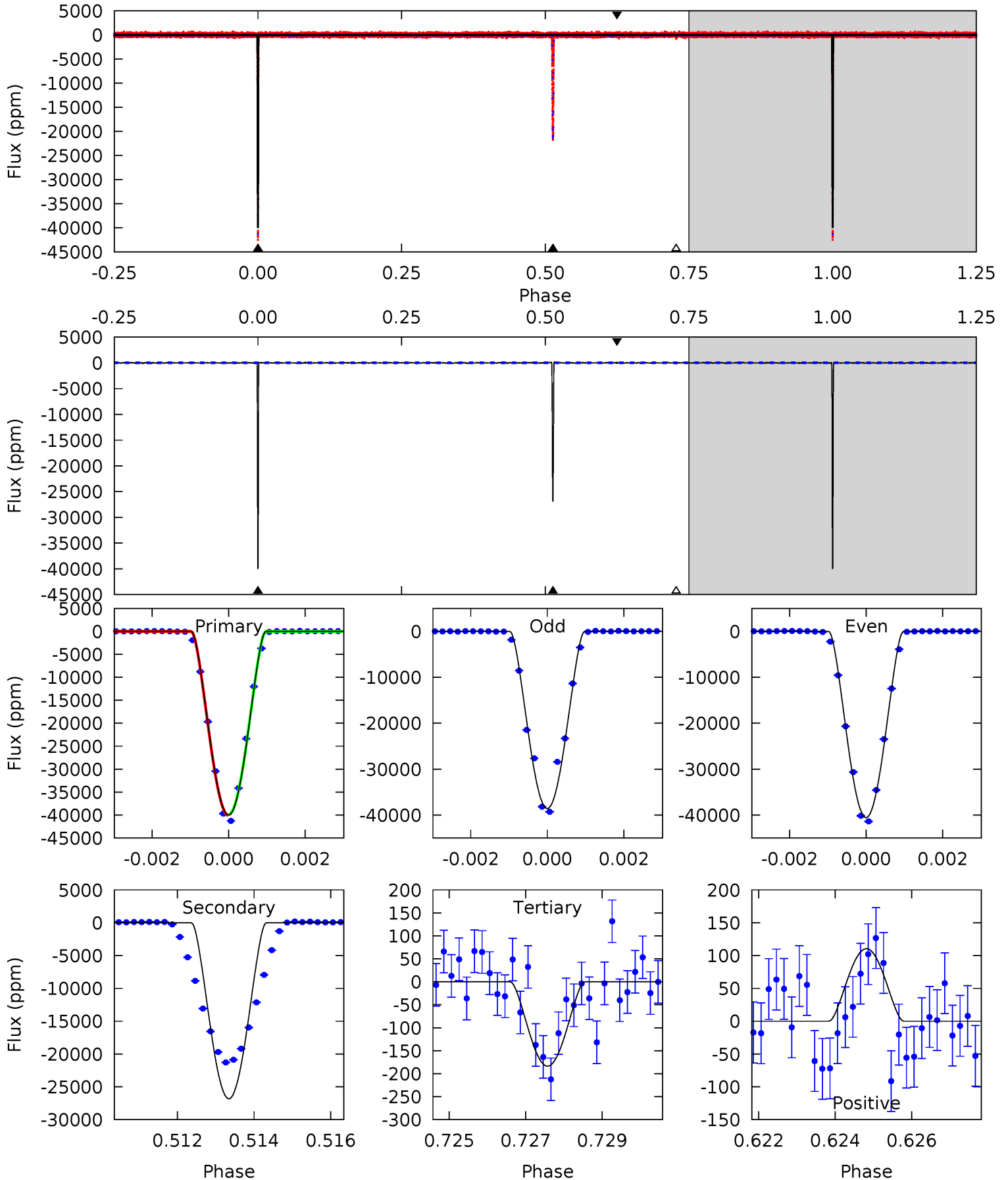
TCE 007353970-01 P=198.443924 Days  $T_0=155.613997$  (BKJD)



# DV Model-Shift Uniqueness Test

007353970-01, P = 198.443668 Days, E = 155.615619 Days

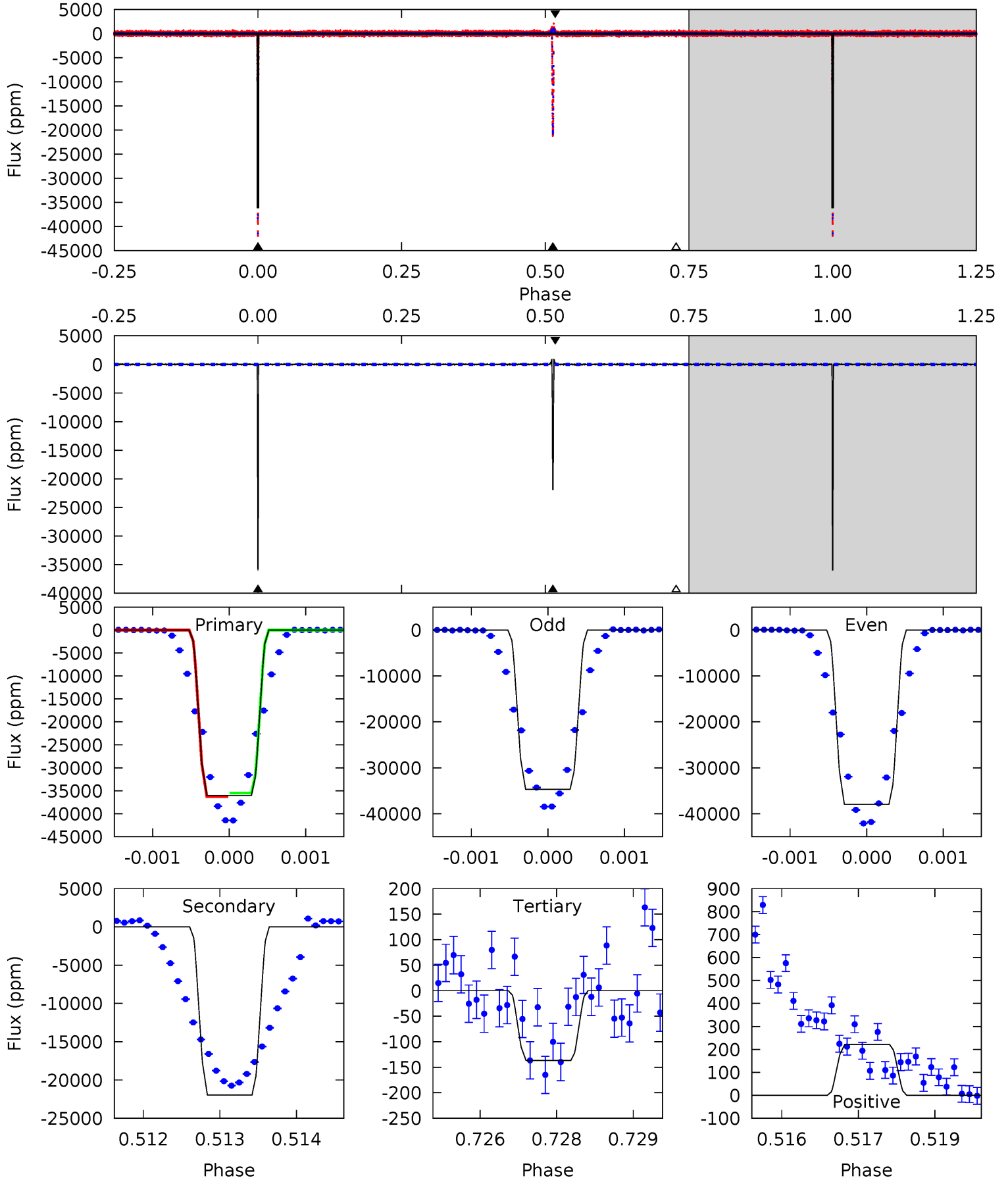
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
2712	1818	12.4	7.49	5.31	3.06	2.27	2700	2705	1806	1811	68.4	0.99	0.00	0



# Alt Model-Shift Uniqueness Test

007353970-01, P = 198.443924 Days, E = 155.613997 Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
1531	933.3	5.82	9.42	5.39	3.19	2.68	1525	1521	927.5	923.9	80.3	0.99	0.02	0



### Stellar Parameters For KIC 007353970

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5420^{+107}_{-107}$	$4.502^{+0.056}_{-0.077}$	$0.000^{+0.150}_{-0.150}$	$0.868^{+0.088}_{-0.058}$	$0.874^{+0.054}_{-0.049}$	$1.883^{+0.378}_{-0.451}$
	+2%/-2%	+1%/-2%	+inf%/-inf%	+10%/-7%	+6%/-6%	+20%/-24%
Source	SPE57	SPE57	SPE57	DSEP		

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

### Secondary Eclipse Parameters for KIC 007353970-01 / KOI 3574.01

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-26828 \pm 15$	$30.29^{+3.21}_{-2.95}$	$391^{+13}_{-12}$	$4164^{+159}_{-145}$	$6705^{+1526}_{-1176}$
Alt.	$-21964 \pm 24$	$19.28^{+3.25}_{-2.74}$	$391^{+12}_{-11}$	$4756^{+334}_{-258}$	$13489^{+4982}_{-3582}$

$T_{\text{max}}$  = Theoretical Maximum Planetary Temperature

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

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

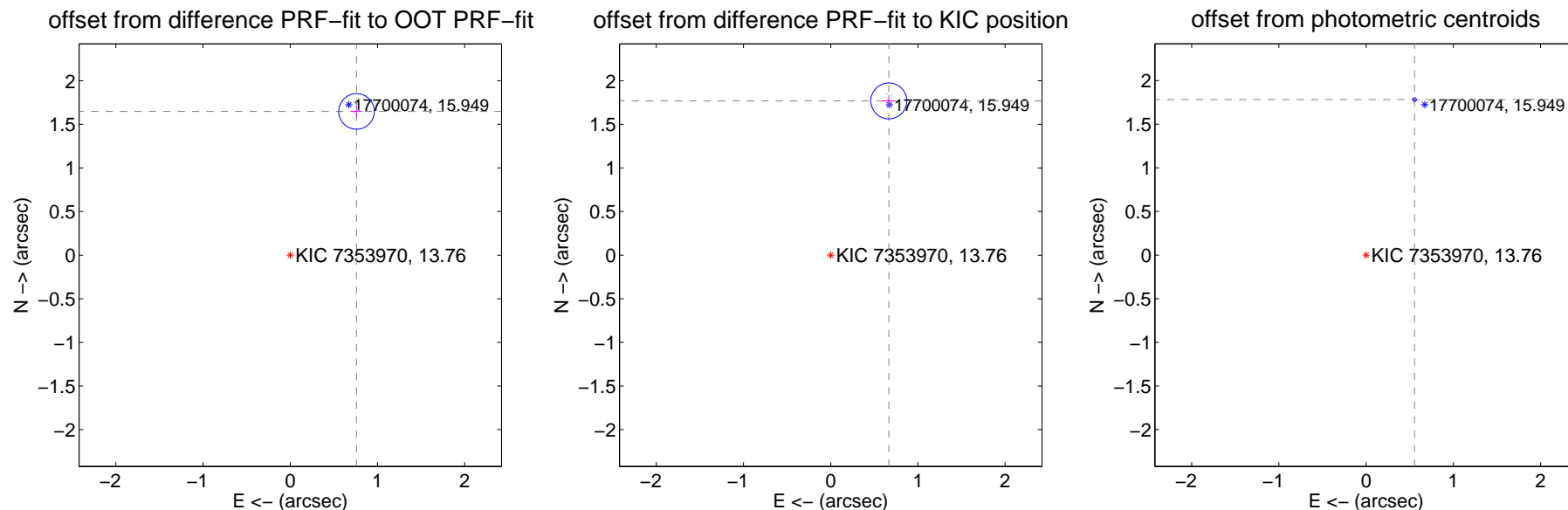
## DV Centroid Data

Supplemental centroid analysis for 007353970-01. Kepler magnitude: 13.76. Transit SNR 961.12

There are 8 quarters with good PRF difference image offsets

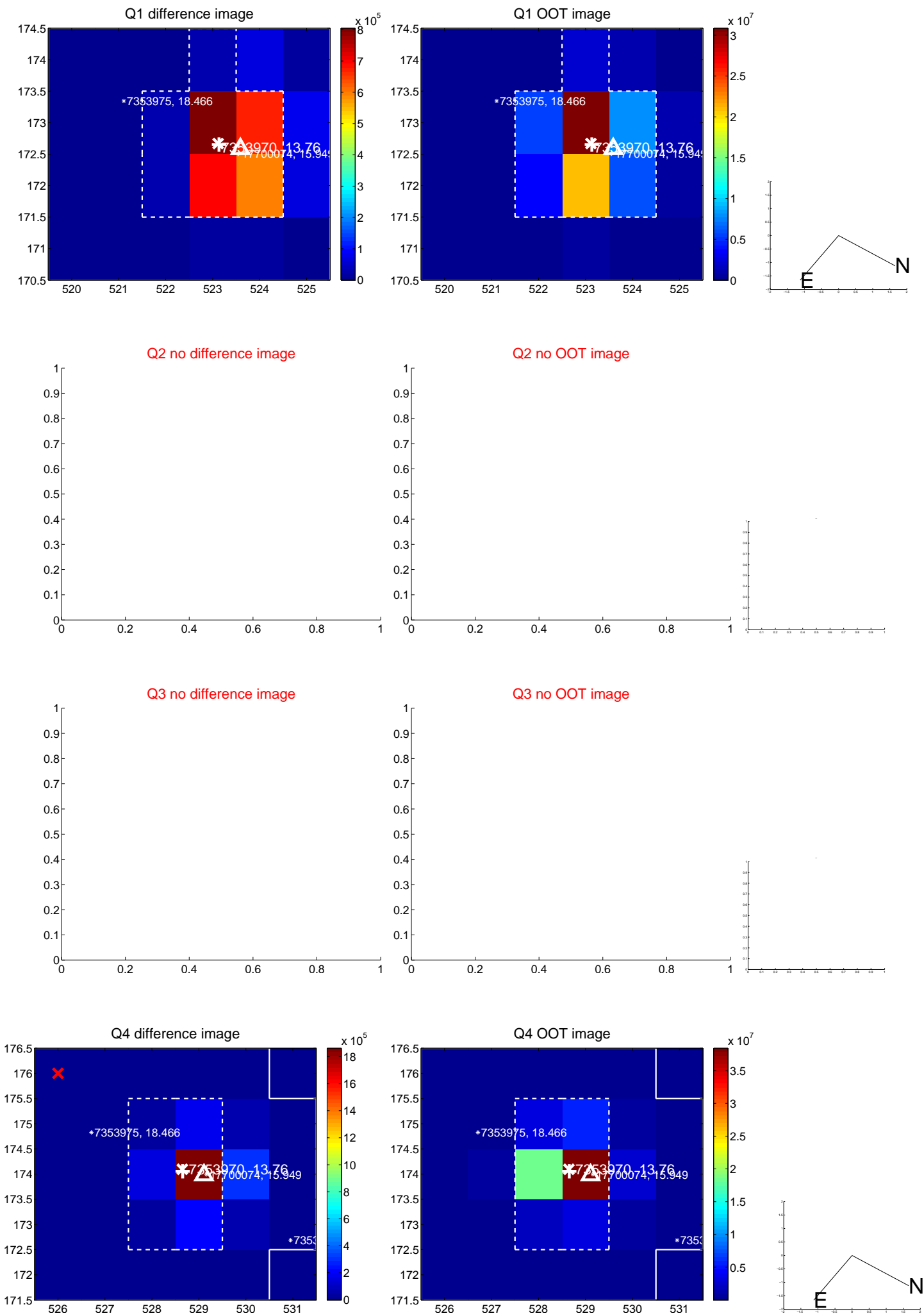
The direct PRF centroid is offset from the target star catalog position by about 0.16 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$1.814 \pm 0.068$	26.70	$-0.760 \pm 0.067$	$1.648 \pm 0.068$
PRF-fit source offset from KIC position	$1.889 \pm 0.069$	27.52	$-0.666 \pm 0.068$	$1.768 \pm 0.069$
photometric centroid source offset	$1.87 \pm 0.01$	273.68	$-0.55 \pm 0.01$	$1.78 \pm 0.01$



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- $\sigma$  uncertainty. Blue circle: three- $\sigma$ . 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.

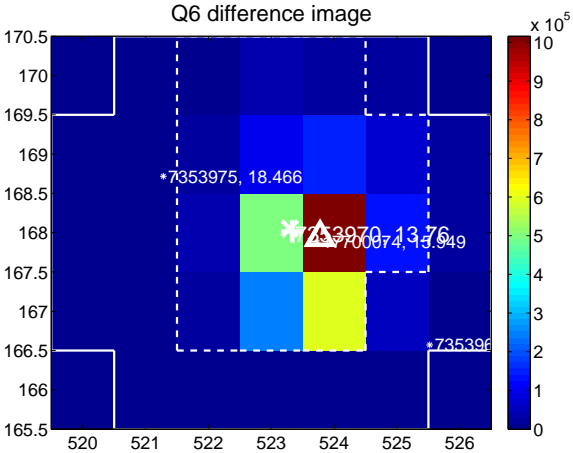
Q5 no difference image



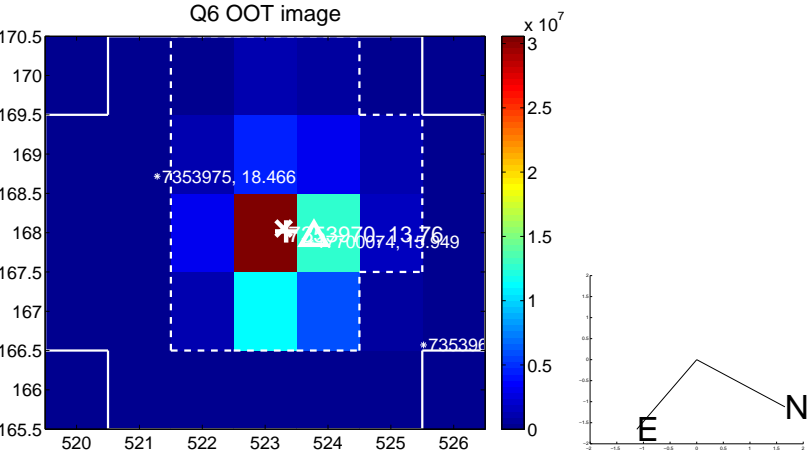
Q5 no OOT image



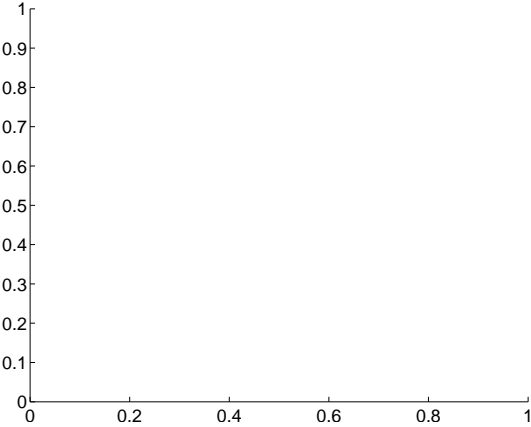
Q6 difference image



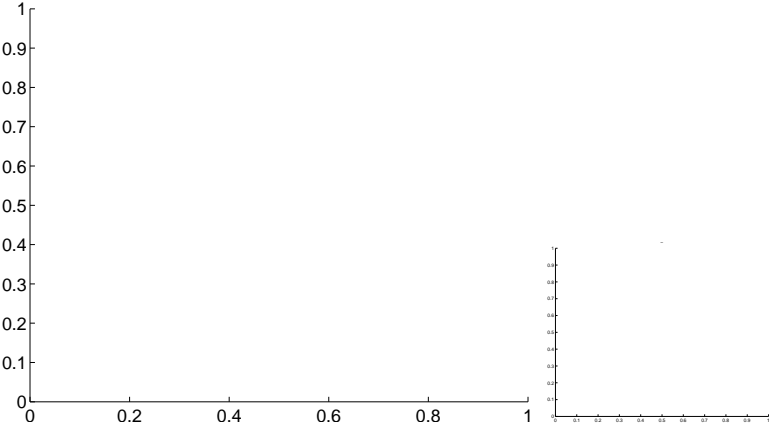
Q6 OOT image



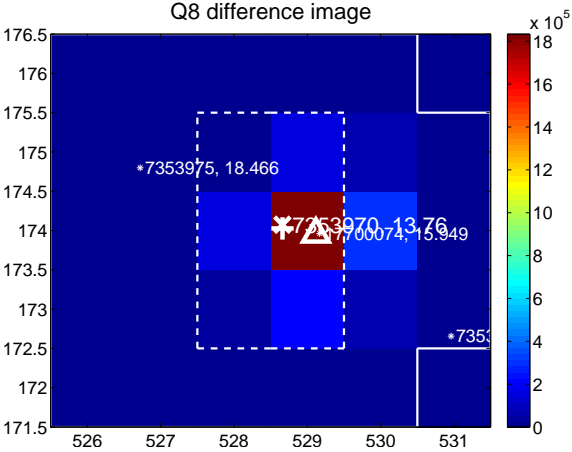
Q7 no difference image



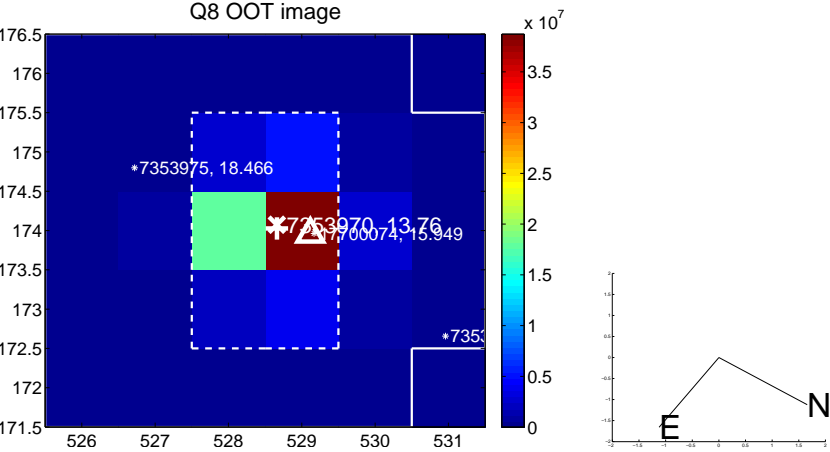
Q7 no OOT image



Q8 difference image



Q8 OOT image



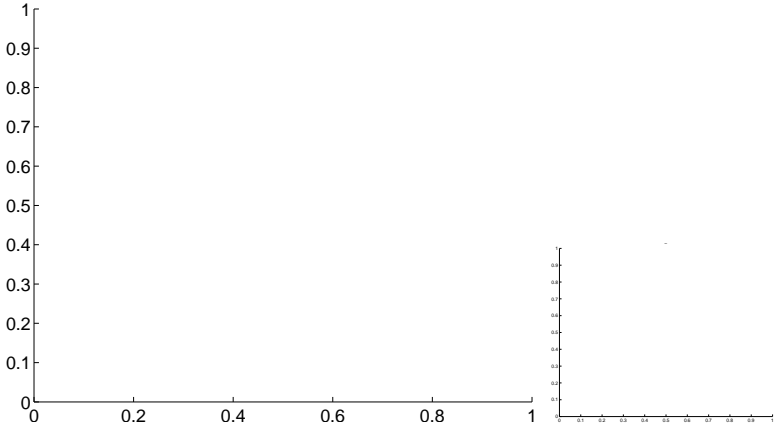


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

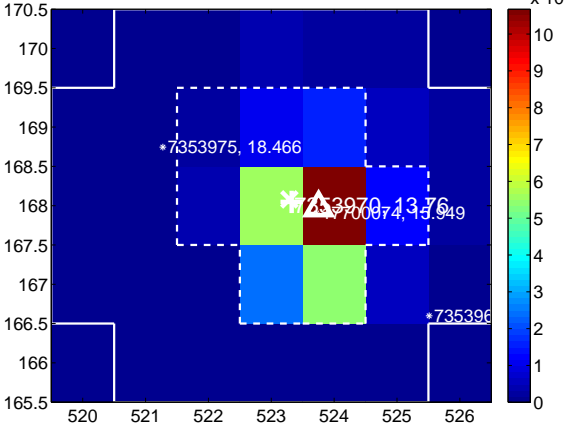
Q9 no difference image



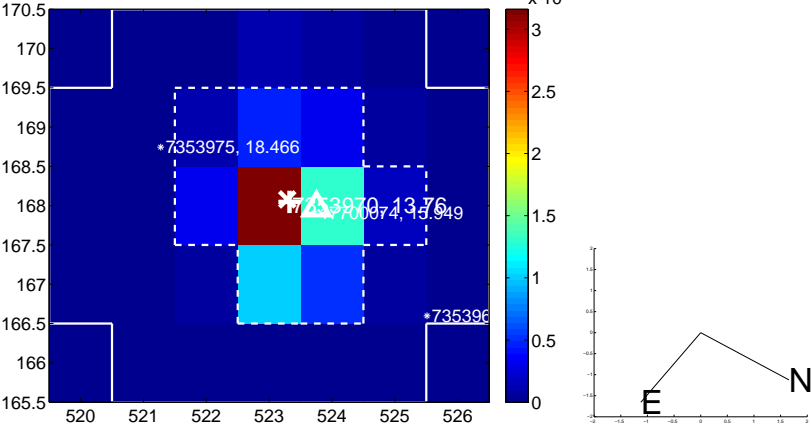
Q9 no OOT image



Q10 difference image



Q10 OOT image



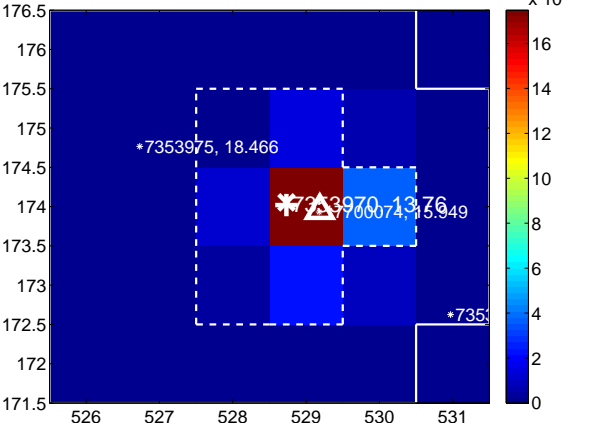
Q11 no difference image



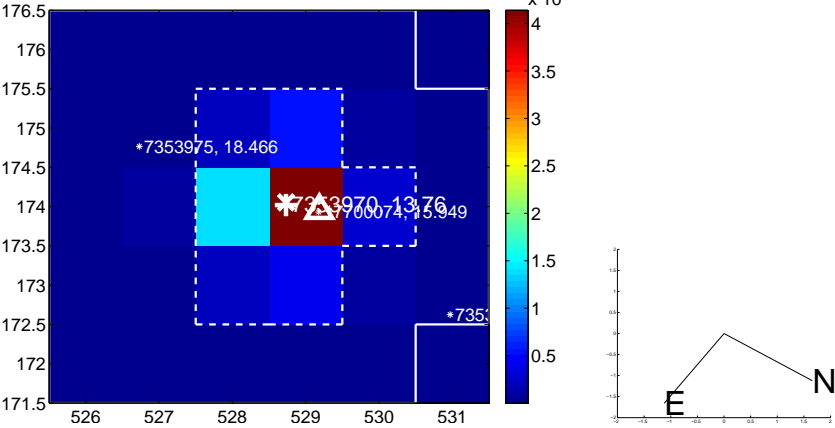
Q11 no OOT image



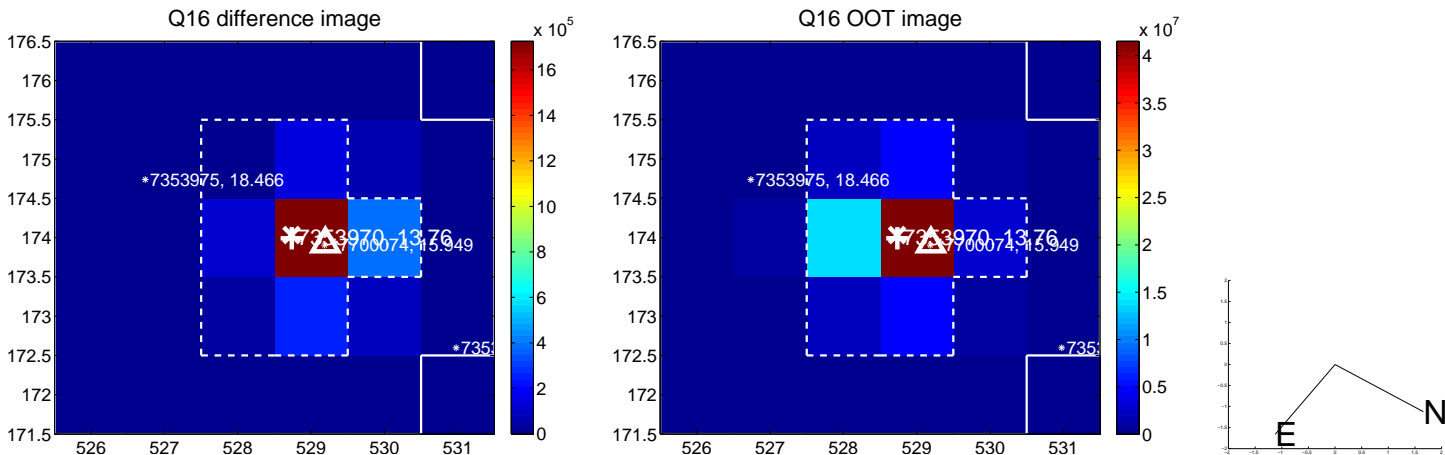
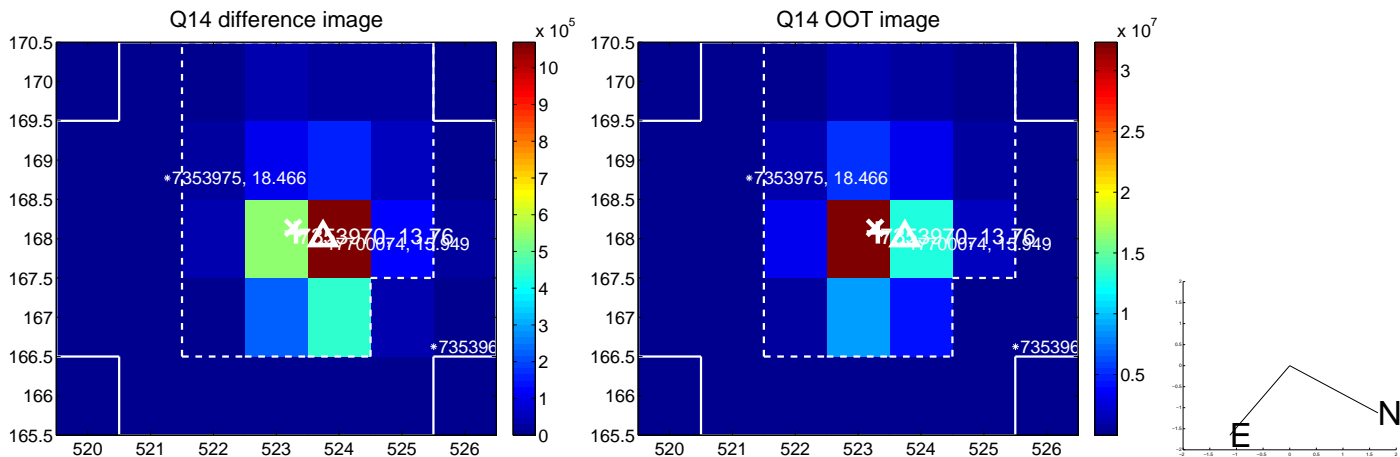
Q12 difference image



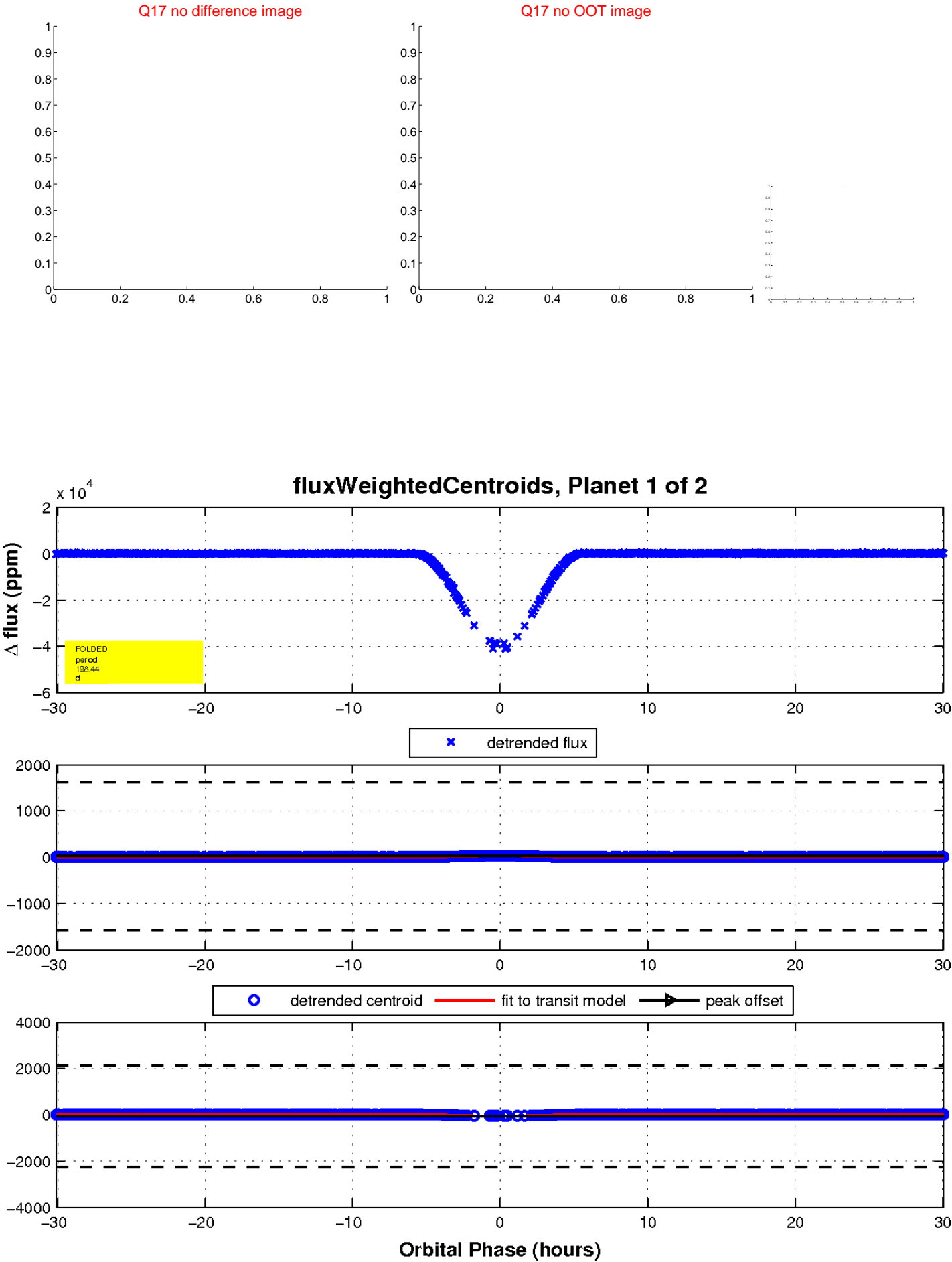
Q12 OOT image



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

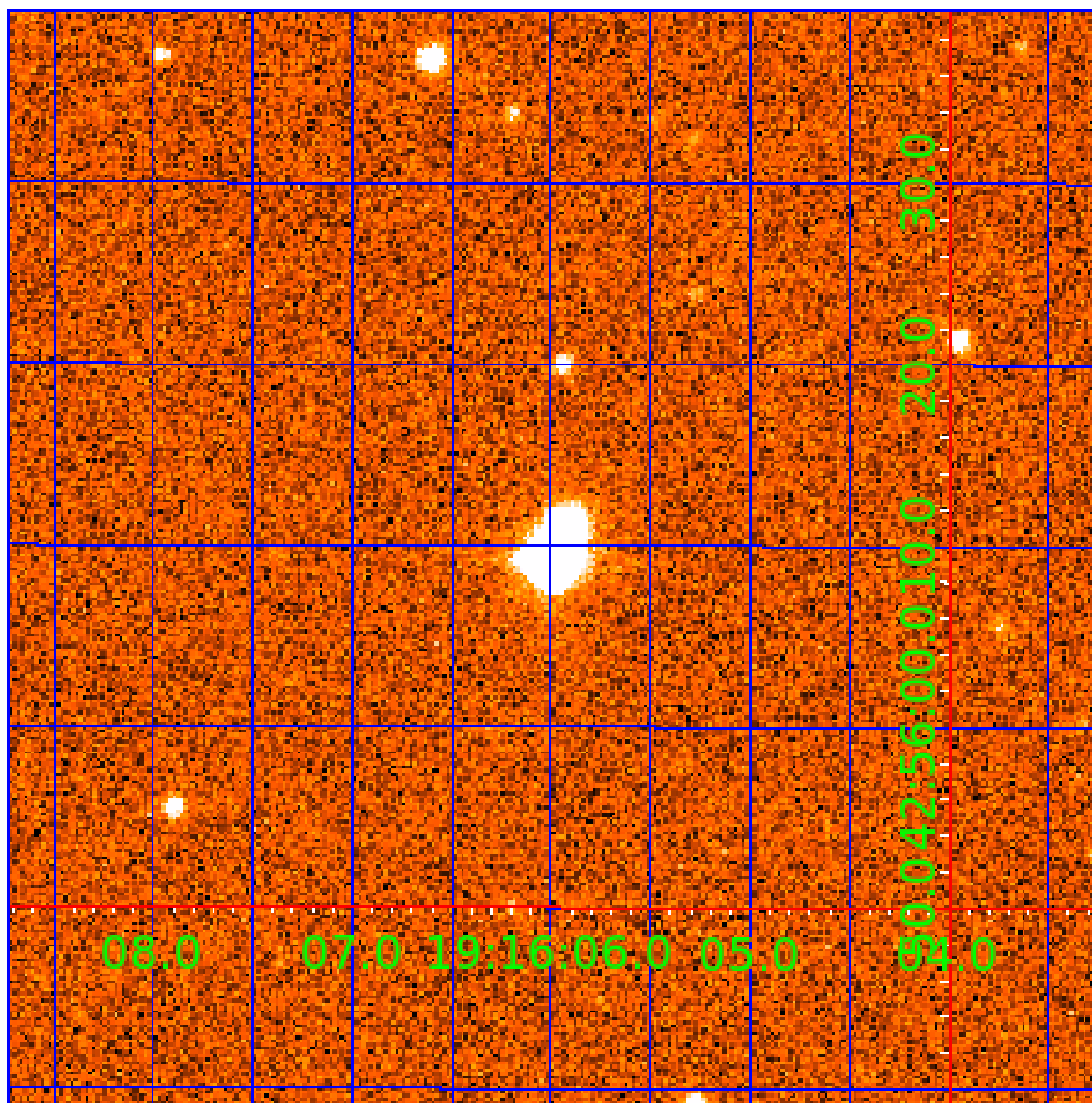


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 007353970

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
007353970-01	OBS	3574.01	198.443668	155.615619	39392.2	10.034	1705.5	961.1	0.87	5420	30.11	1.44
007353970-02	OBS	No	198.443718	257.464874	20958.4	15.027	790.9	667.3	0.87	5420	22.39	1.44

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
007353970-01	OBS	FP	0.00	0	1	1	0	MOD_SEC_DV—MOD_SEC_ALT—DEEP_V_SHAPED—HAS_SEC_TCE—CENT_UNRESOLVED_OFFSET
007353970-02	OBS	FP	0.00	1	1	1	0	IS_SEC_TCE—CENT_UNRESOLVED_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](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

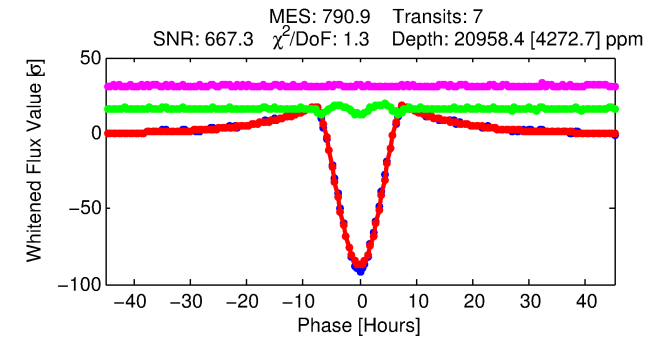
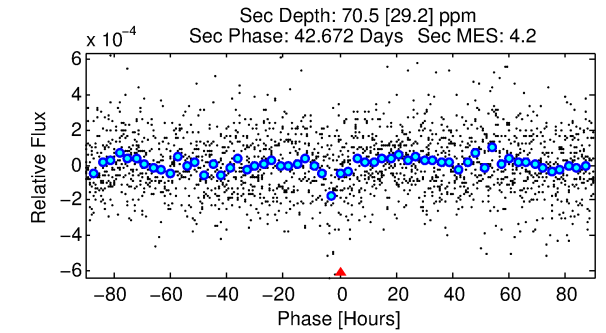
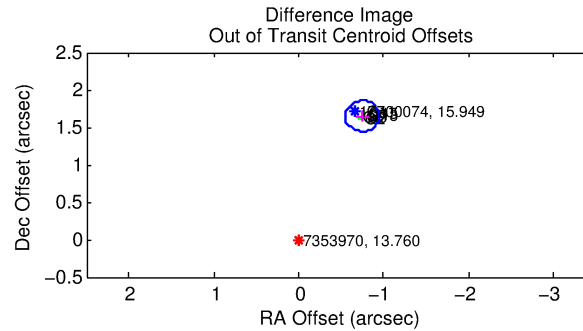
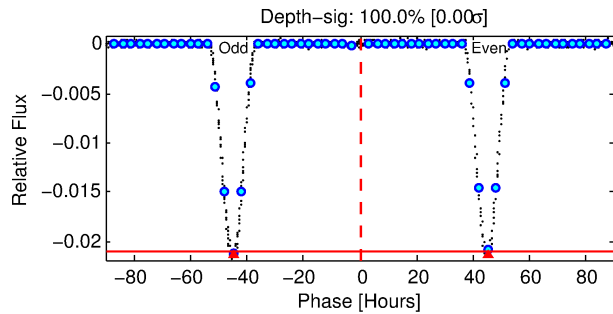
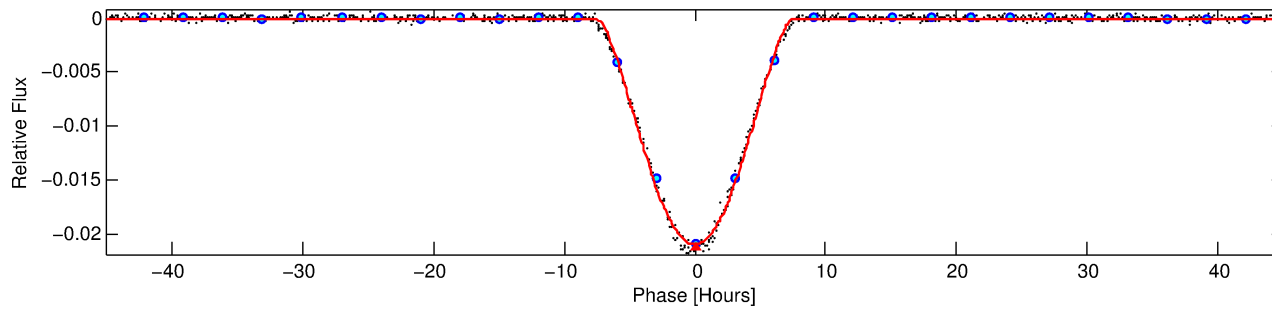
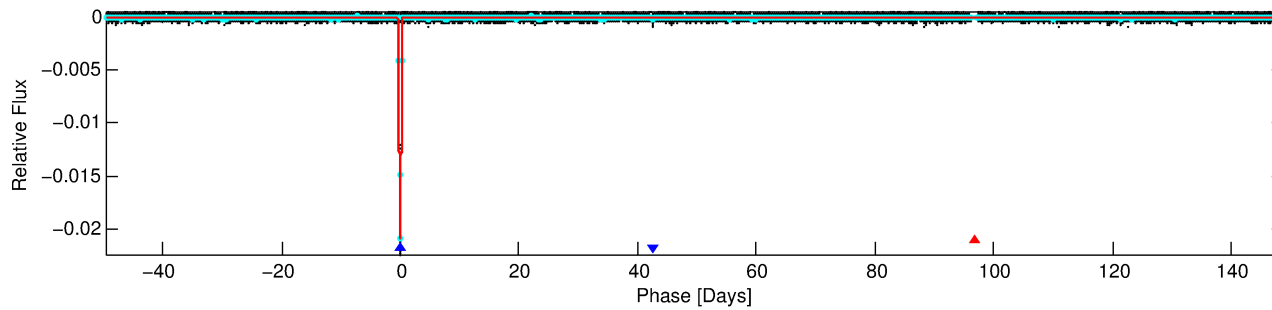
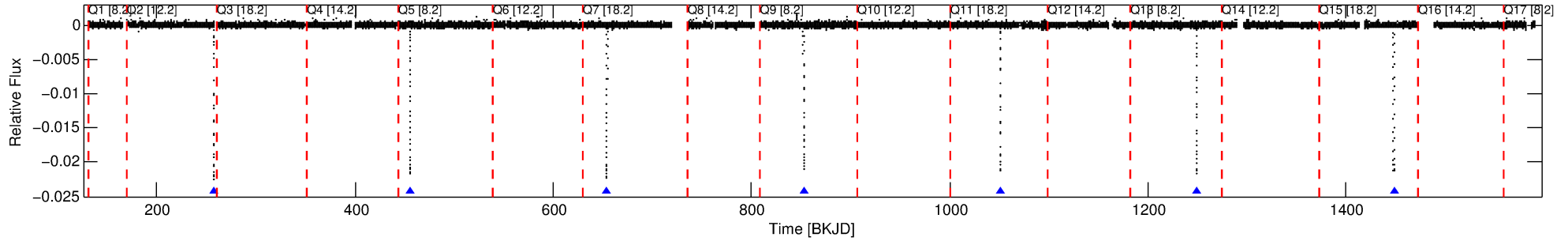
## Ephemeris Match Information For 007353970-02

No Significant Match Found

# DV One-Page Summary

KIC: 7353970 Candidate: 2 of 2 Period: 198.444 d  
KOI: K03574 Corr: No Ephemeris Match

Kp: 13.76 R\*: 0.87 Rs Teff: 5420.0 K Logg: 4.50 Fe/H: 0.000



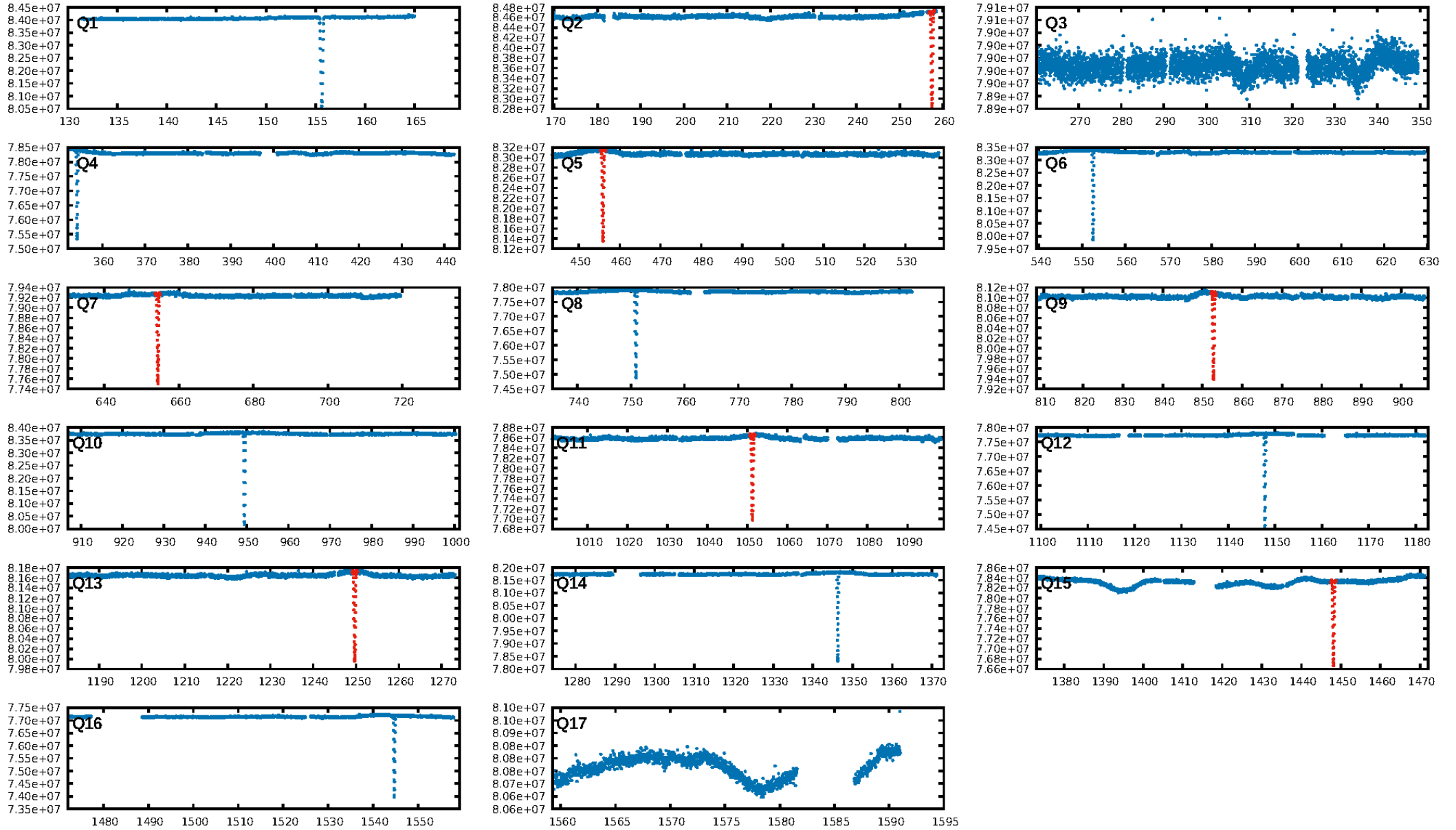
## DV Fit Results:

Period = 198.44372 [0.00011] d  
Epoch = 257.4649 [0.0004] BKJD  
Rp/R\* = 0.2364 [0.0218]  
a/R\* = 73.37 [0.59]  
b = 1.00 [0.00]  
Seff = 1.44 [0.23]  
Teq = 279 [11] K  
Rp = 22.39 [3.07] Re  
a = 0.6365 [0.0571] AU  
Ag = 31.35 [14.82] [2.05σ]  
Teffp = 1022 [117] K [6.30σ]

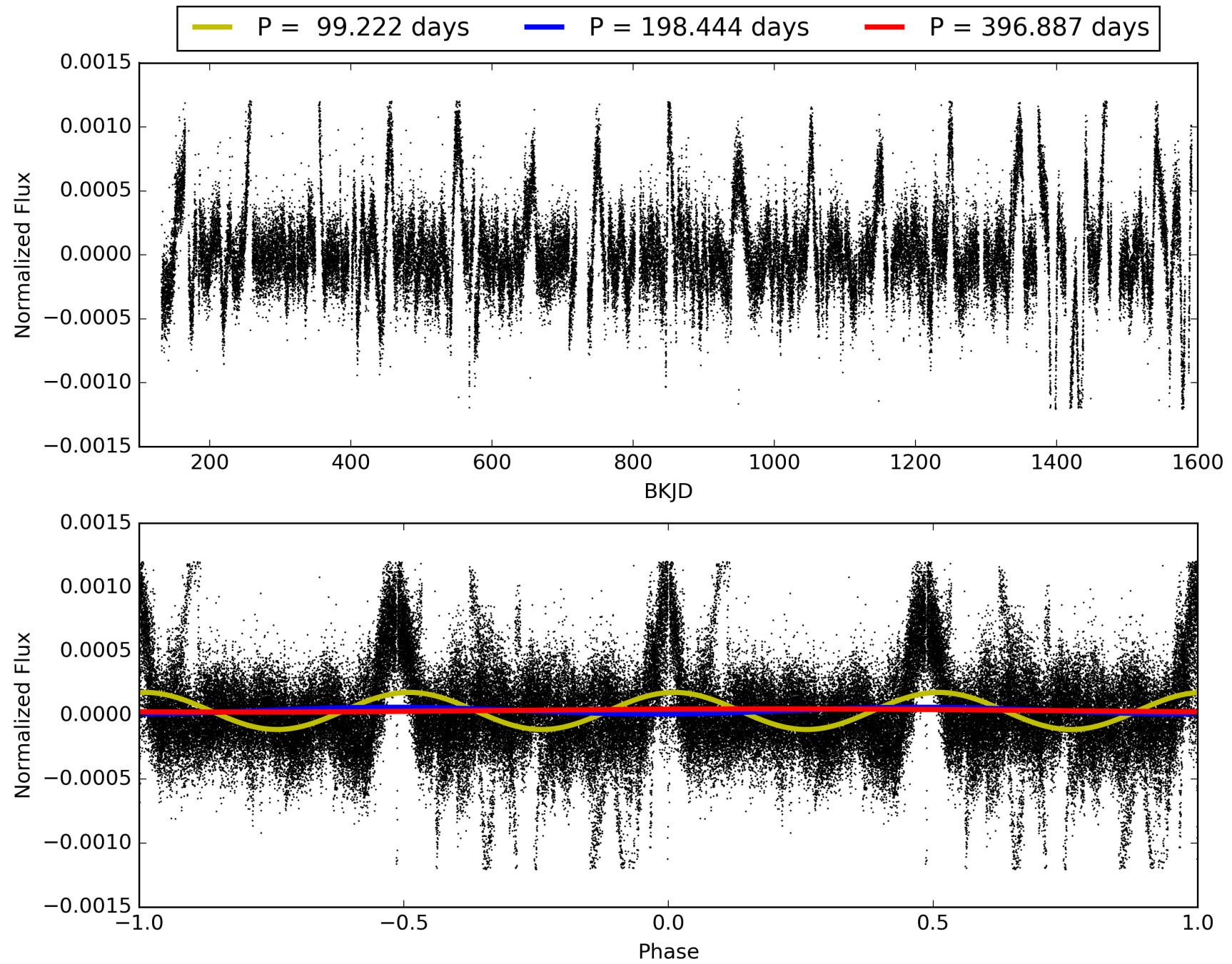
## DV Diagnostic Results:

ShortPeriod-sig: 0.0% [0.00σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 0.1%  
ModelChiSquareGof-sig: 0.5%  
Bootstrap-pfa: 0.00e+00  
RollingBand-fgt: 1.00 [7/7]  
GhostDiagnostic-chr: 2.447  
Centroid-sig: 0.0%  
Centroid-so: 1.963 arcsec [143.13σ]  
OotOffset-rm: 1.812 arcsec [26.57σ]  
KicOffset-rm: 1.918 arcsec [27.57σ]  
OotOffset-st: 1/3/0/3 [7]  
KicOffset-st: 1/3/0/3 [7]  
DiffImageQuality-fgm: 1.00 [7/7]  
DiffImageOverlap-fno: 1.00 [7/7]

# TCE 007353970-02, PDC Light Curves



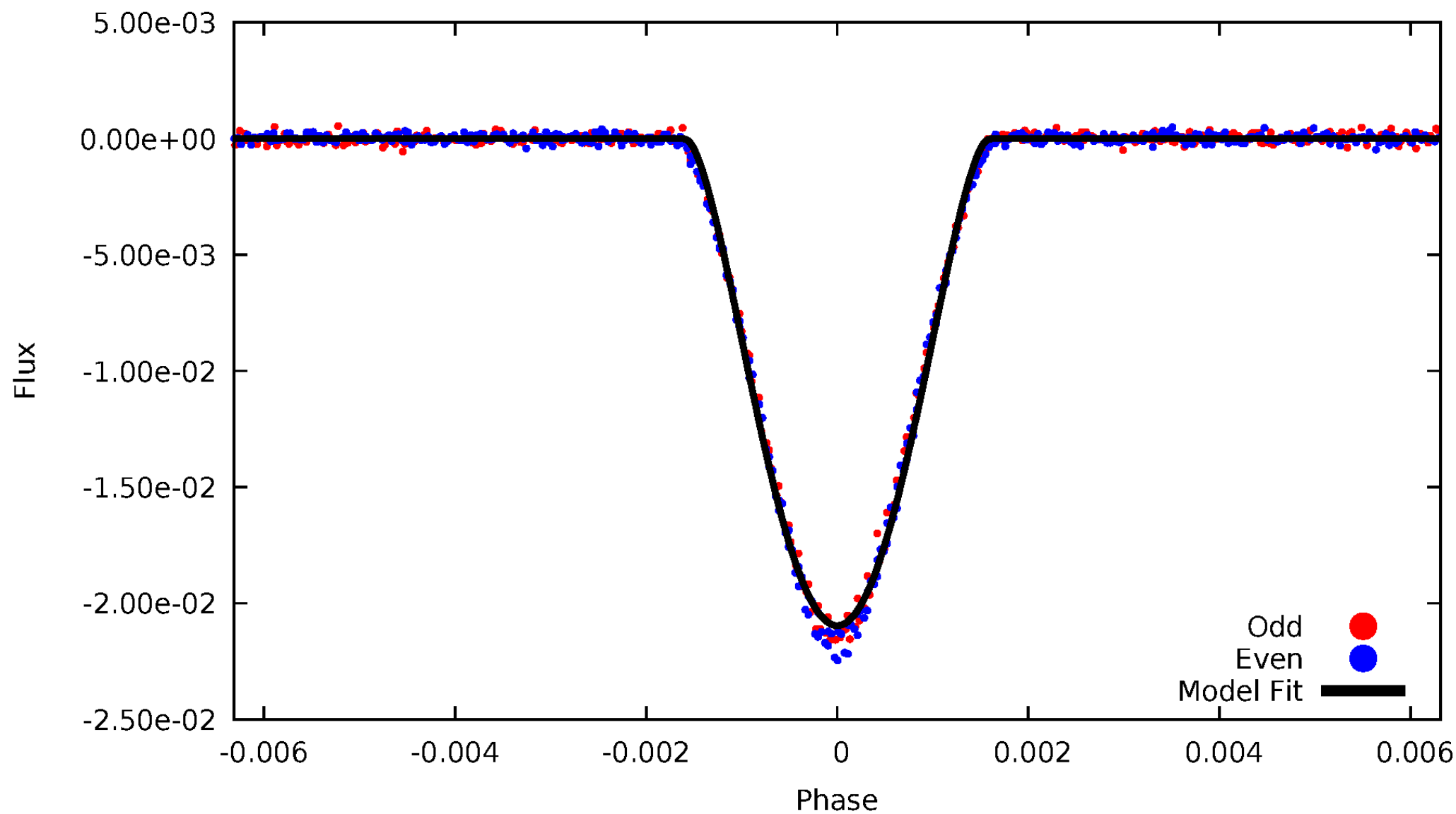
TCE 007353970-02





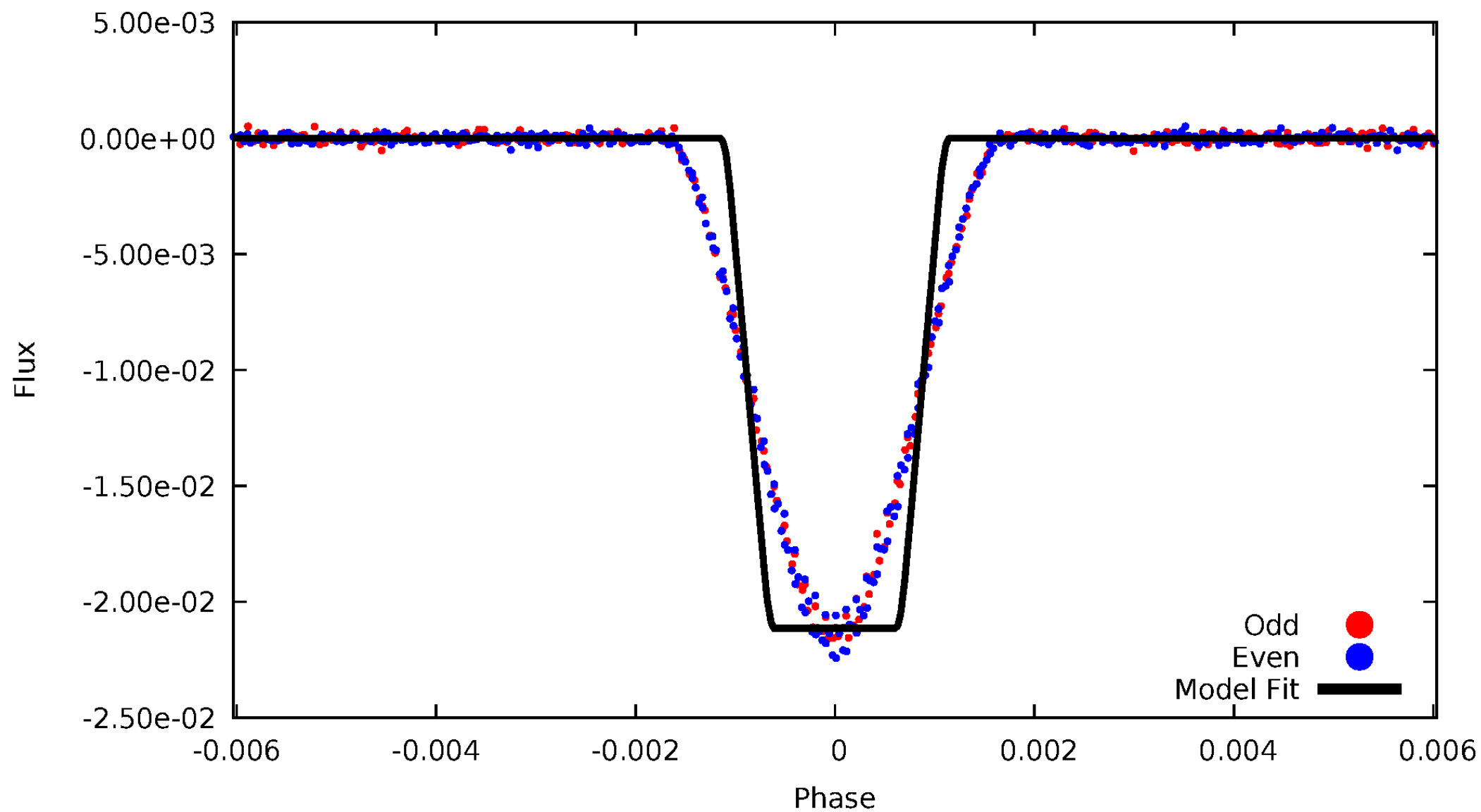
# DV Odd/Even

TCE 007353970-02



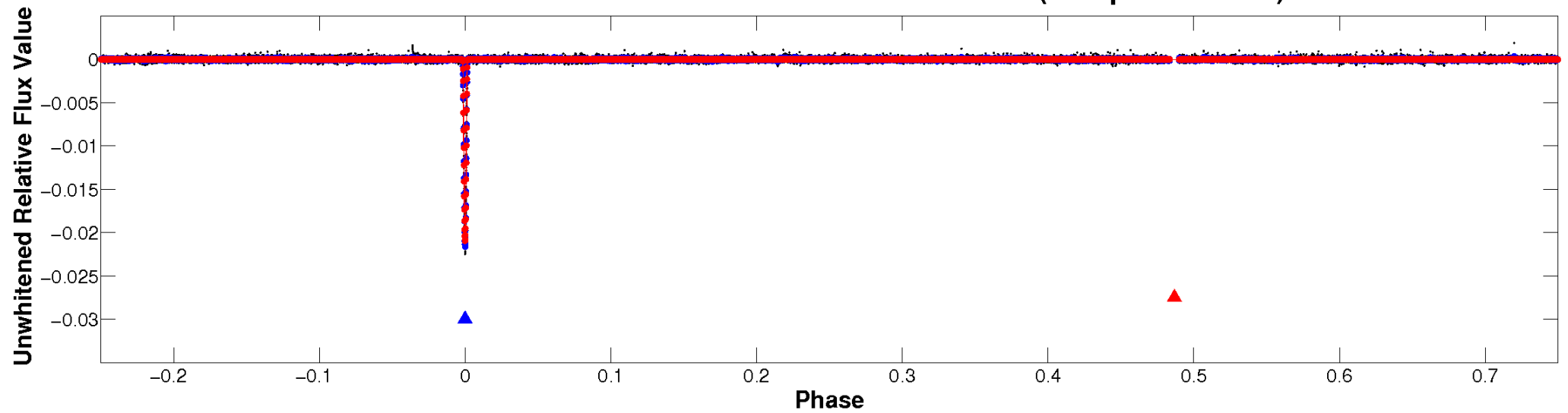
# ALT Odd/Even

TCE 007353970-02

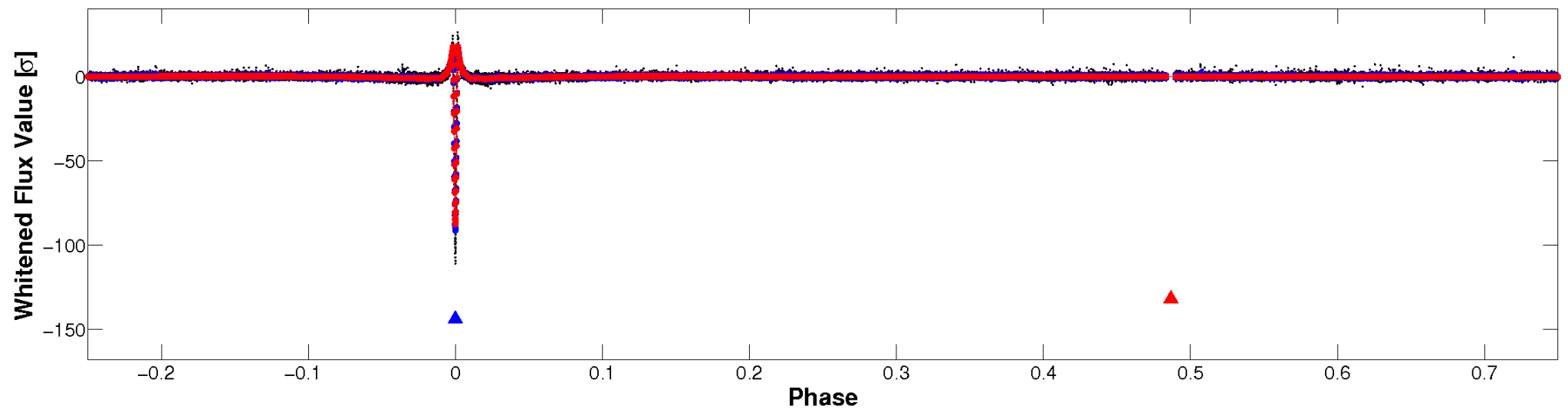


# Non-Whitened Vs. Whitened Light Curve

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

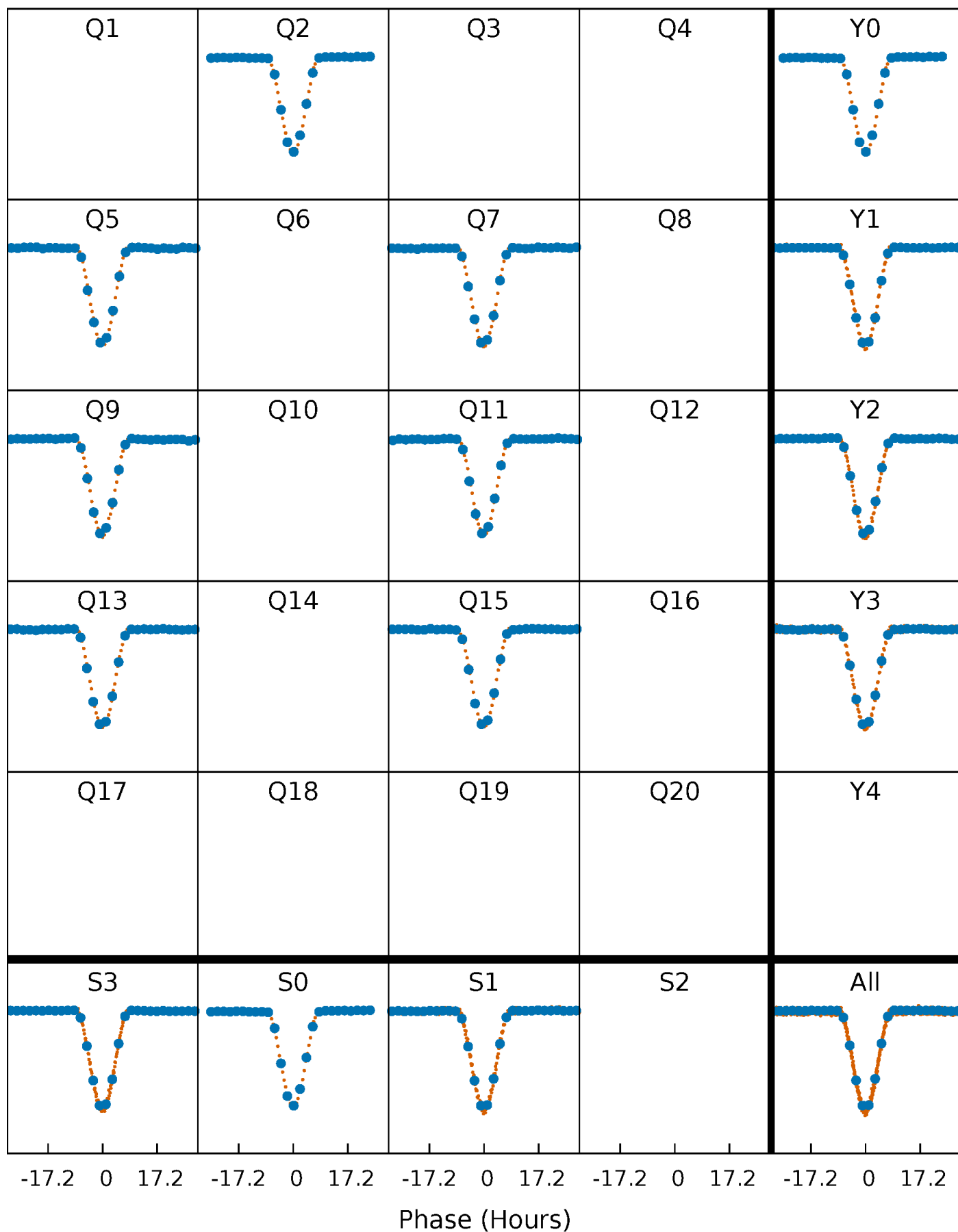


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



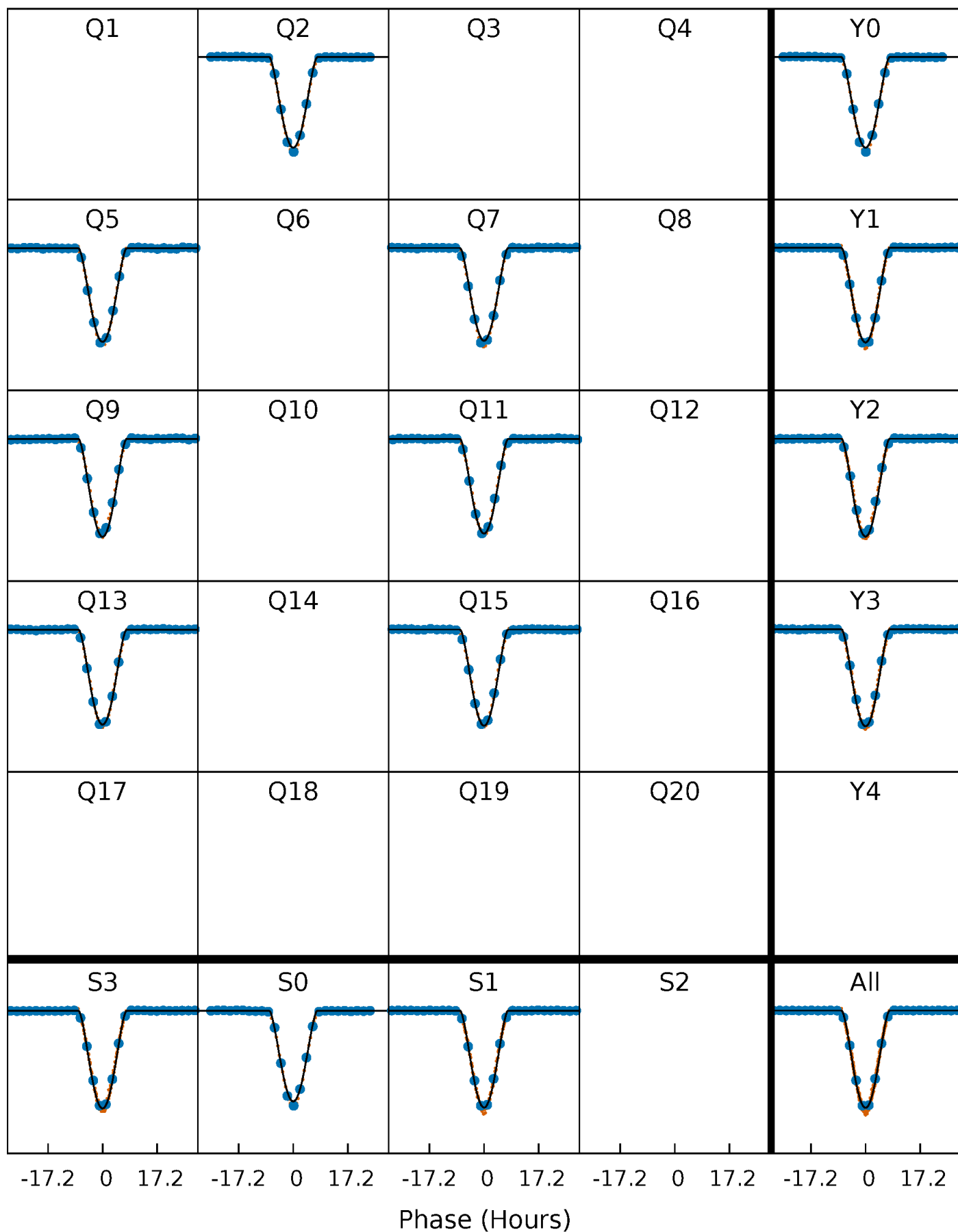
# PDC Quarter-Phased Transit Curves

TCE 007353970-02     $P=198.443718$  Days     $T_0=257.464874$  (BKJD)



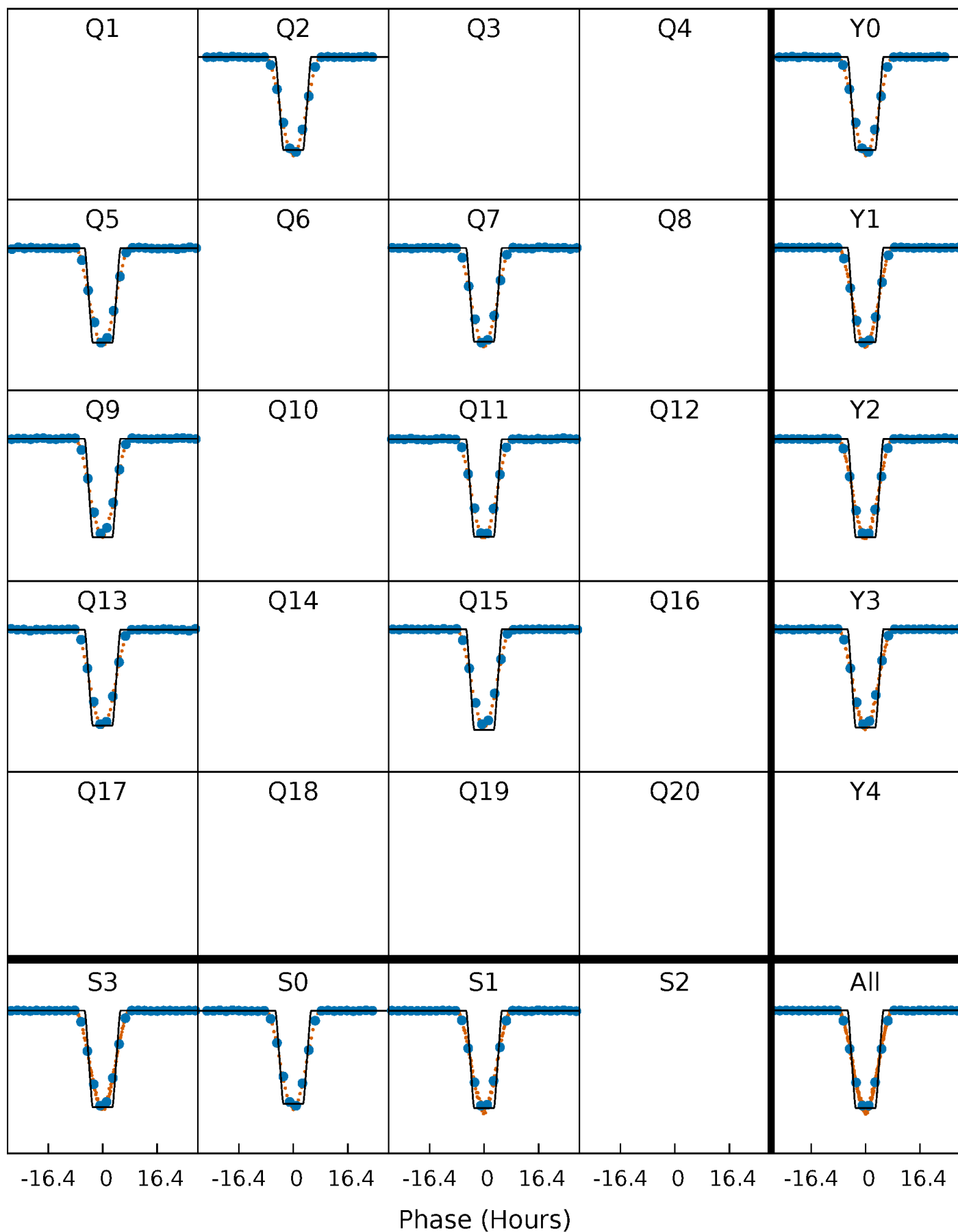
# DV Quarter-Phased Transit Curves

TCE 007353970-02 P=198.443718 Days  $T_0=257.464874$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

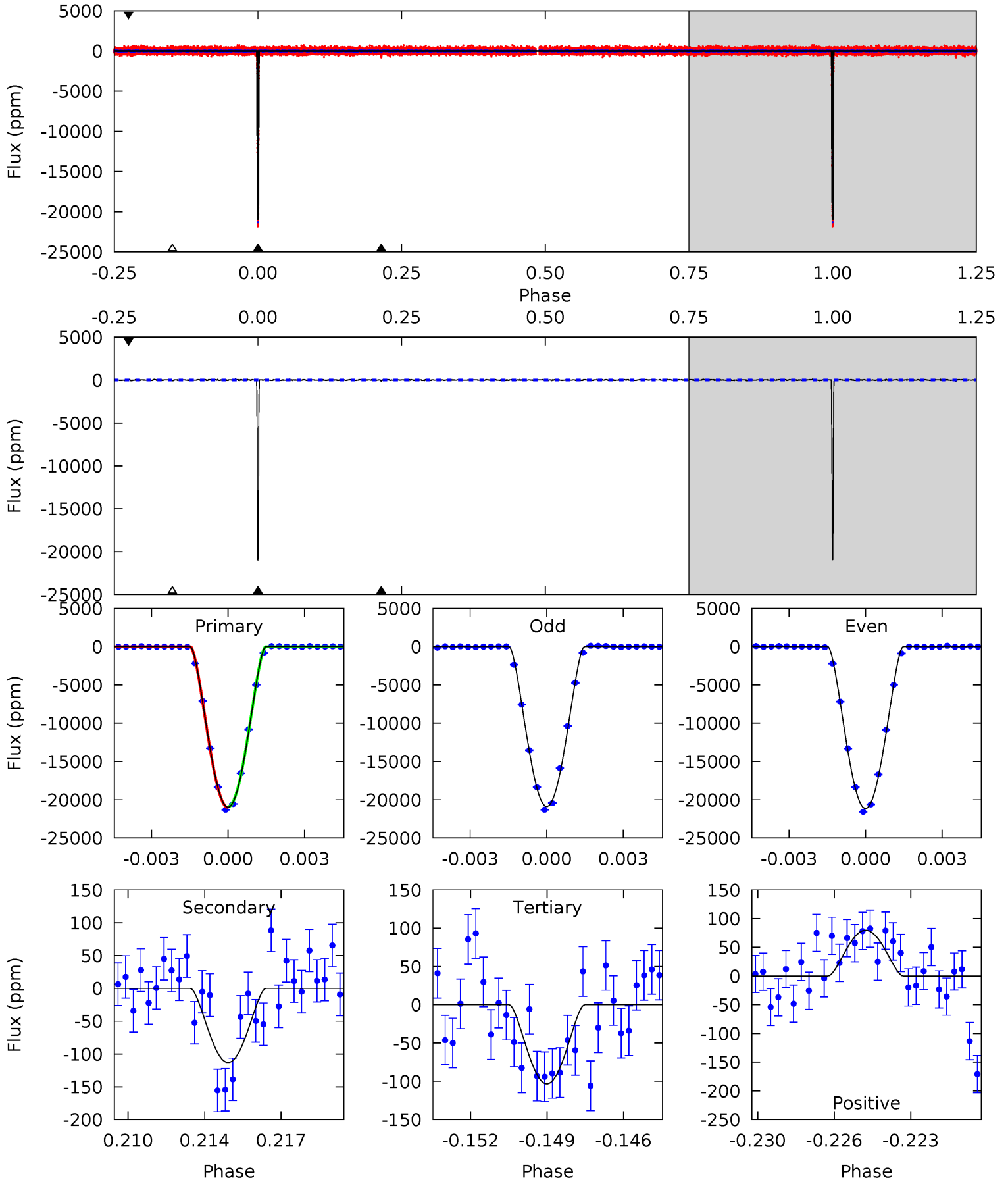
TCE 007353970-02 P=198.443924 Days  $T_0=257.463778$  (BKJD)



# DV Model-Shift Uniqueness Test

007353970-02, P = 198.443718 Days, E = 59.021156 Days

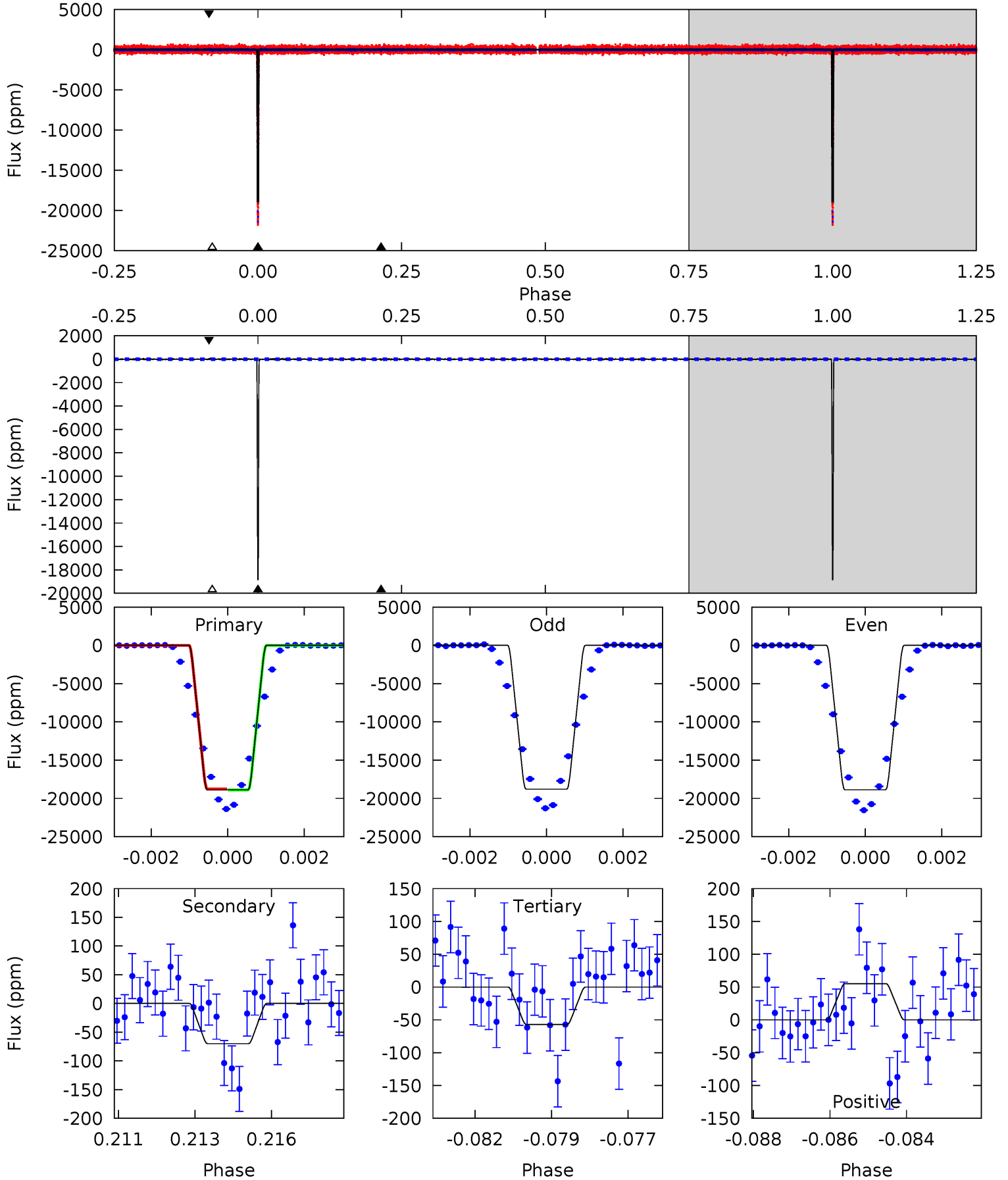
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
1816	9.79	8.94	6.89	5.24	2.94	2.29	1807	1809	0.85	2.89	11.1	1.00	0.00	4.13



# Alt Model-Shift Uniqueness Test

007353970-02, P = 198.443924 Days, E = 59.019854 Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
1298	4.81	3.91	3.80	5.30	3.05	1.02	1294	1295	0.90	1.02	3.07	0.99	0.00	3.63





### Stellar Parameters For KIC 007353970

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M$ ( $M_{\odot}$ )	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5420^{+107}_{-107}$	$4.502^{+0.056}_{-0.077}$	$0.000^{+0.150}_{-0.150}$	$0.868^{+0.088}_{-0.058}$	$0.874^{+0.054}_{-0.049}$	$1.883^{+0.378}_{-0.451}$
	+2%/-2%	+1%/-2%	+inf%/-inf%	+10%/-7%	+6%/-6%	+20%/-24%
Source	SPE57	SPE57	SPE57	DSEP		

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

### Secondary Eclipse Parameters for KIC 007353970-02 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{\text{max}}$ (K)	$T_{\text{obs}}$ (K)	$A_{\text{obs}}$
DV	$-113 \pm 12$	$22.52^{+2.39}_{-2.31}$	$391^{+11}_{-11}$	$2119^{+55}_{-51}$	$50^{+13}_{-10}$
Alt.	$-70 \pm 15$	$13.96^{+2.30}_{-2.21}$	$392^{+13}_{-11}$	$2229^{+103}_{-93}$	$80^{+37}_{-27}$

$T_{\text{max}}$  = Theoretical Maximum Planetary Temperature

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

$A_{\text{obs}}$  = 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

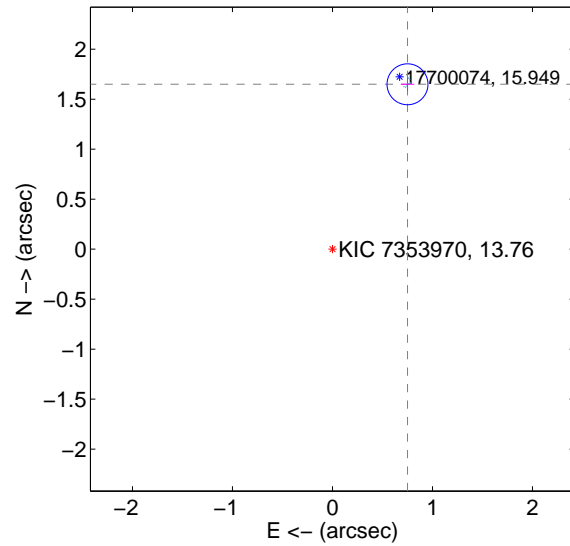
Supplemental centroid analysis for 007353970-02. Kepler magnitude: 13.76. Transit SNR 667.28

There are 7 quarters with good PRF difference image offsets

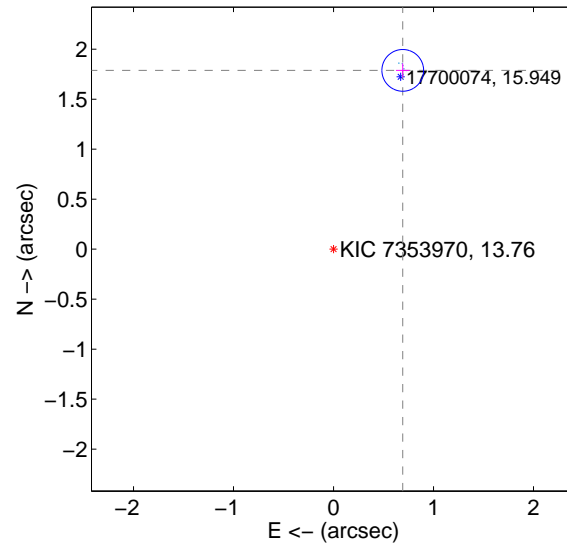
The direct PRF centroid is offset from the target star catalog position by about 0.20 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$1.812 \pm 0.068$	26.57	$-0.751 \pm 0.067$	$1.650 \pm 0.068$
PRF-fit source offset from KIC position	$1.918 \pm 0.070$	27.57	$-0.693 \pm 0.067$	$1.789 \pm 0.070$
photometric centroid source offset	$1.96 \pm 0.01$	143.13	$-0.60 \pm 0.01$	$1.87 \pm 0.01$

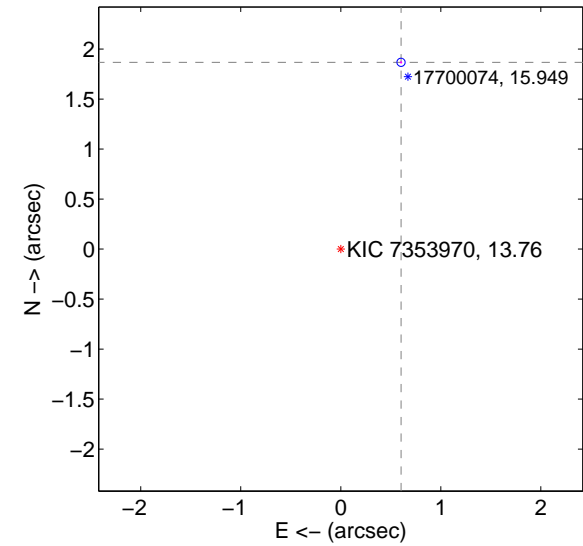
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

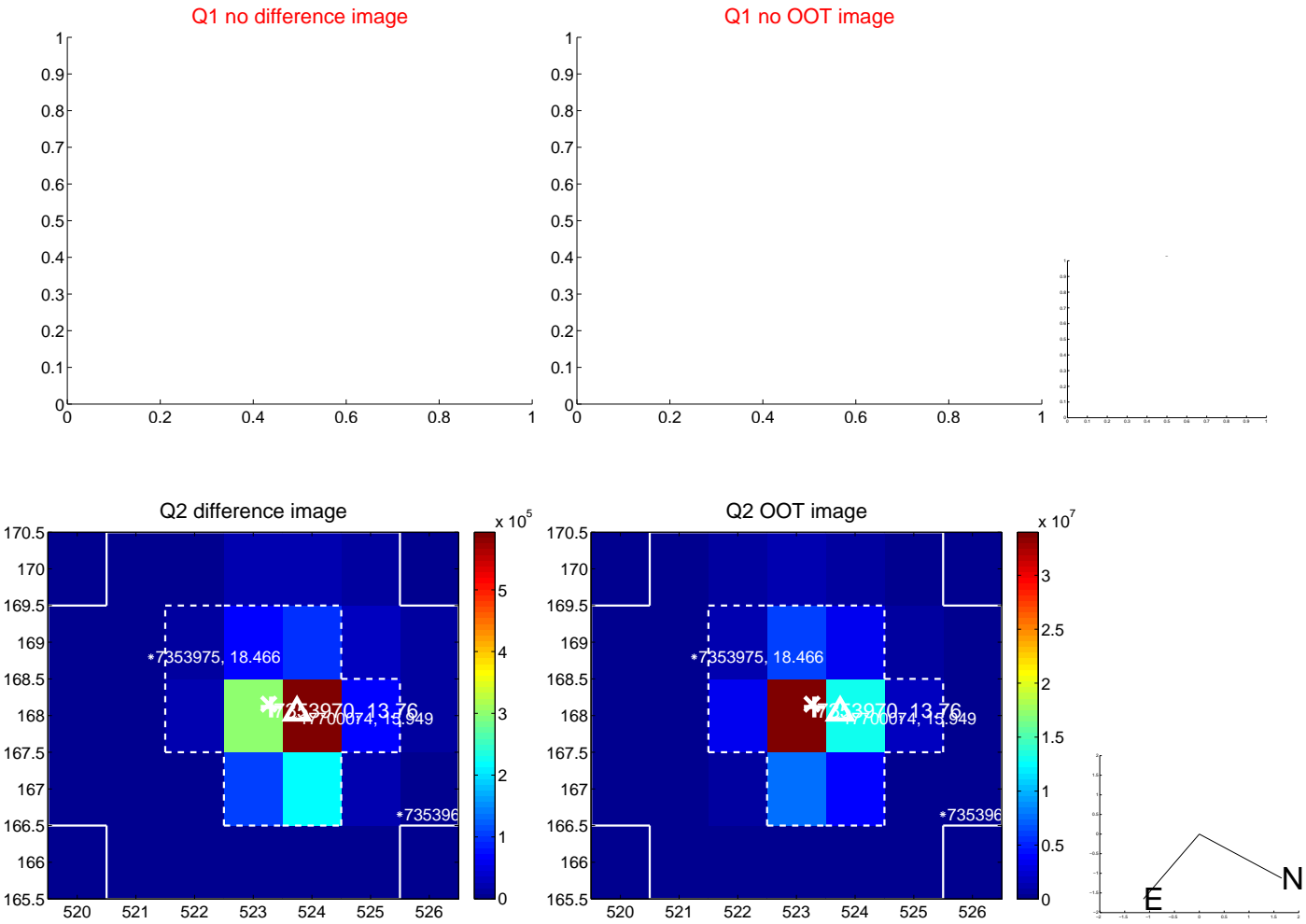


offset from photometric centroids

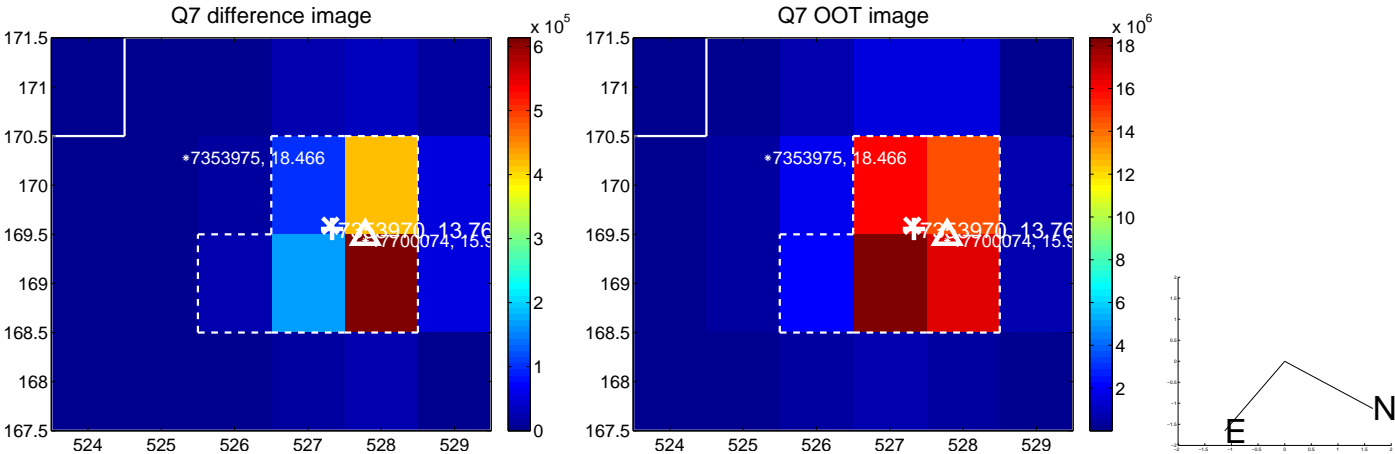
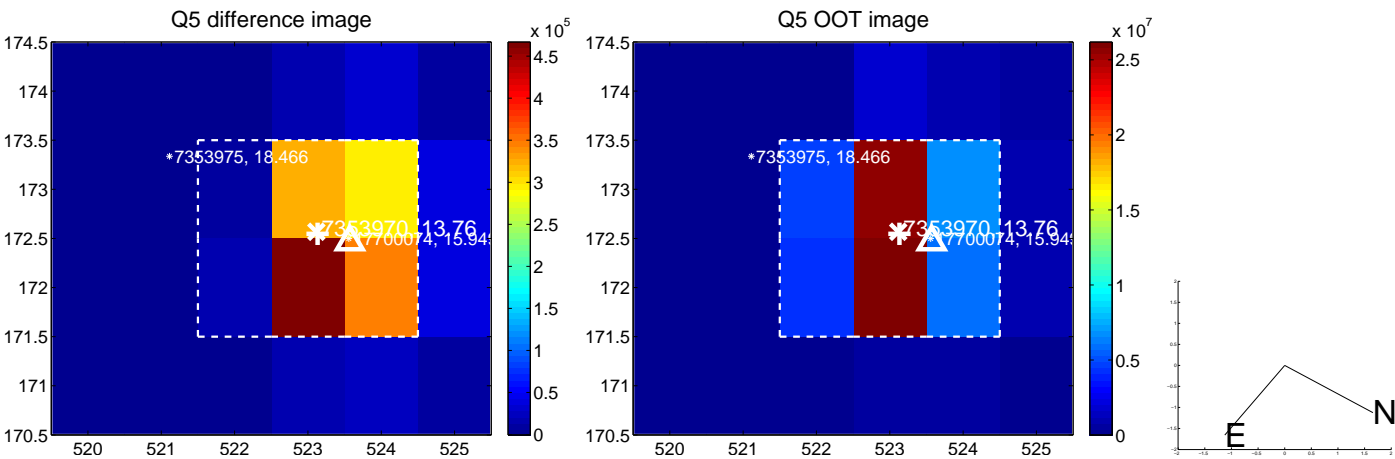


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

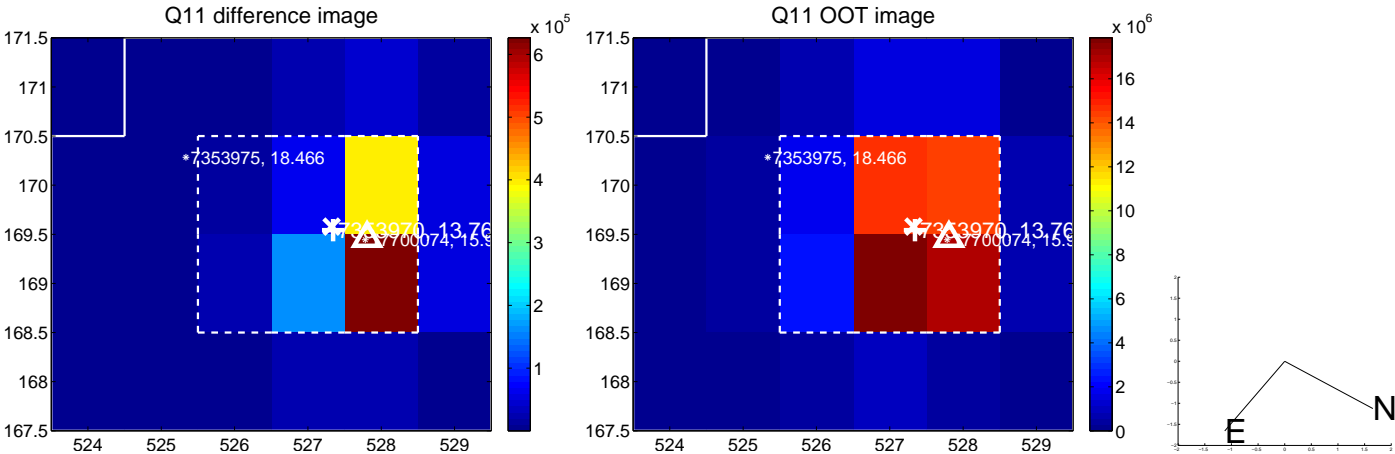
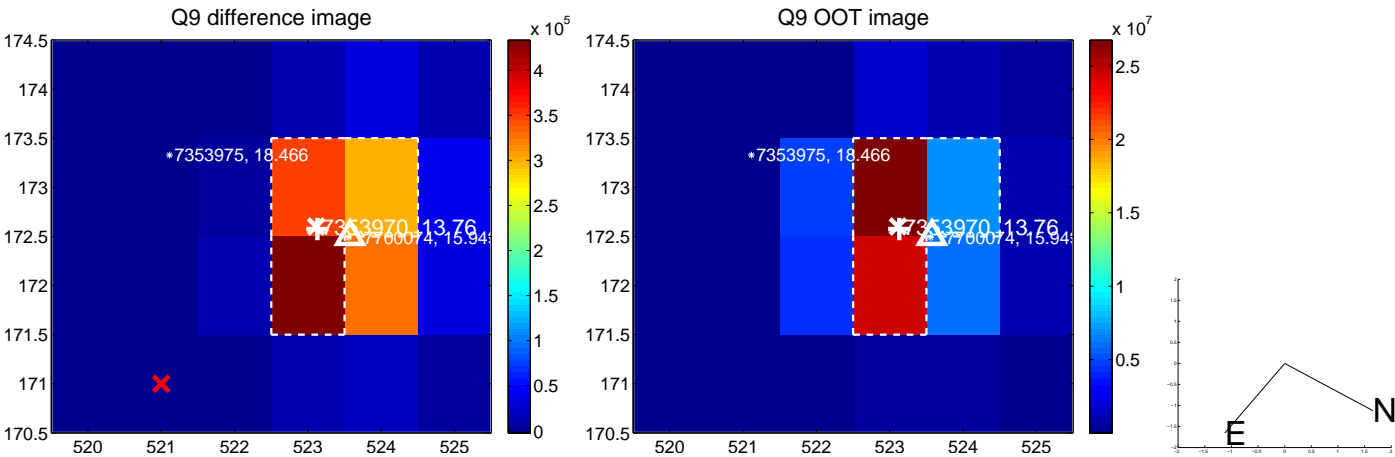
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



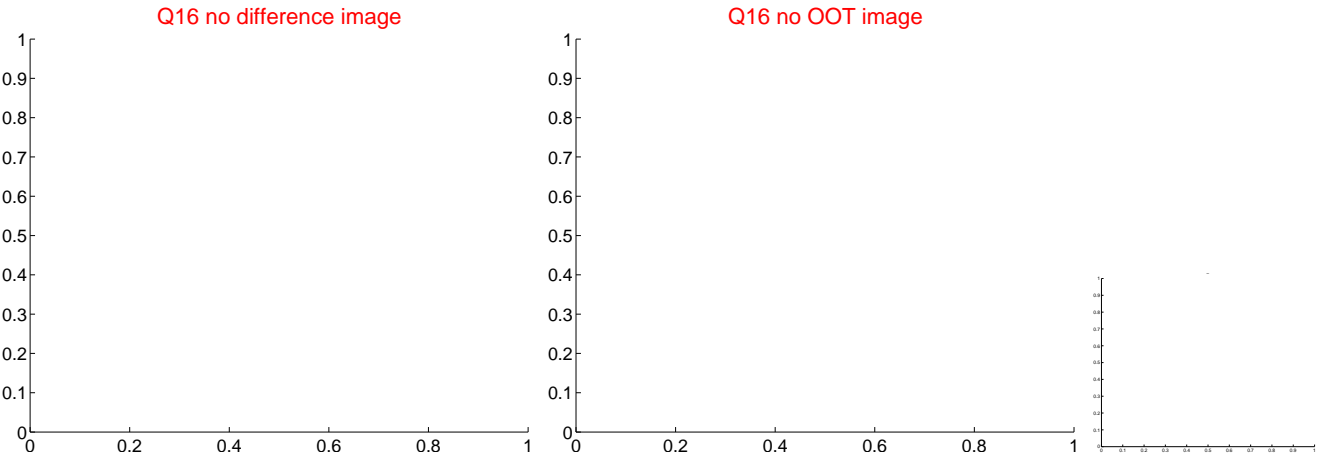
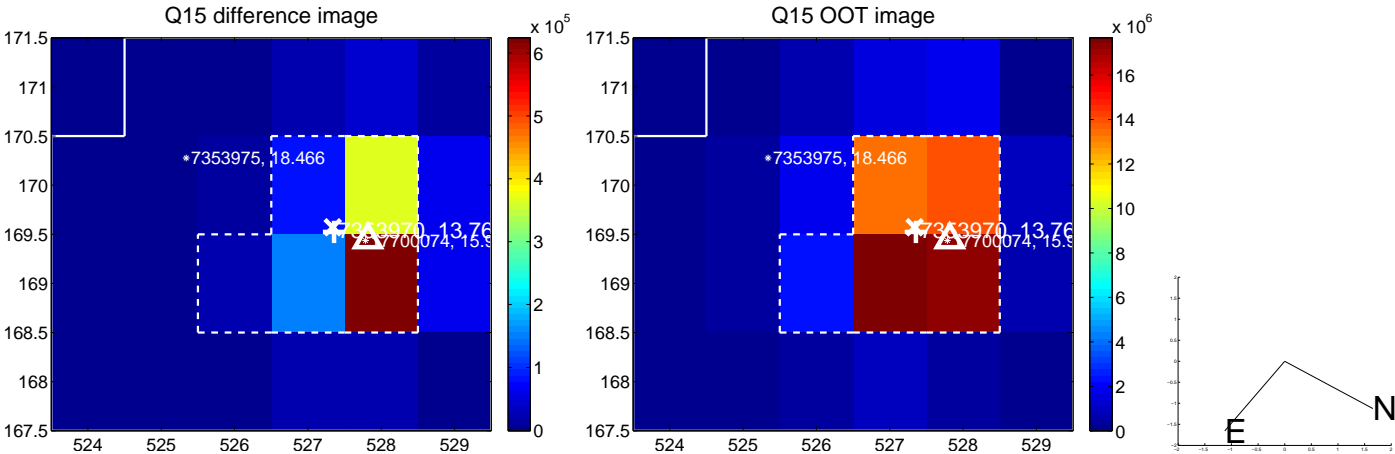
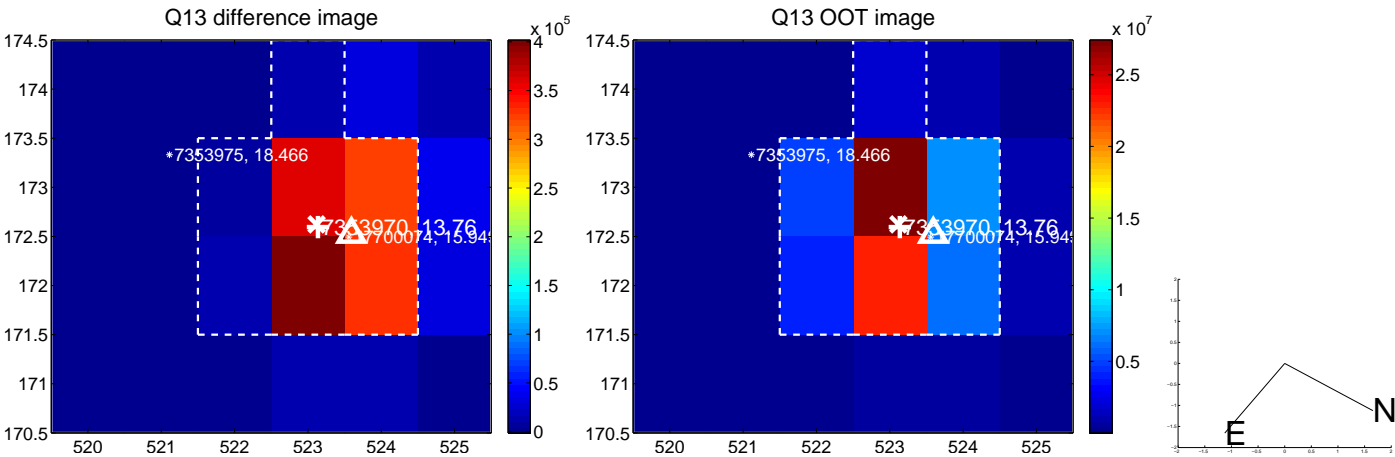
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



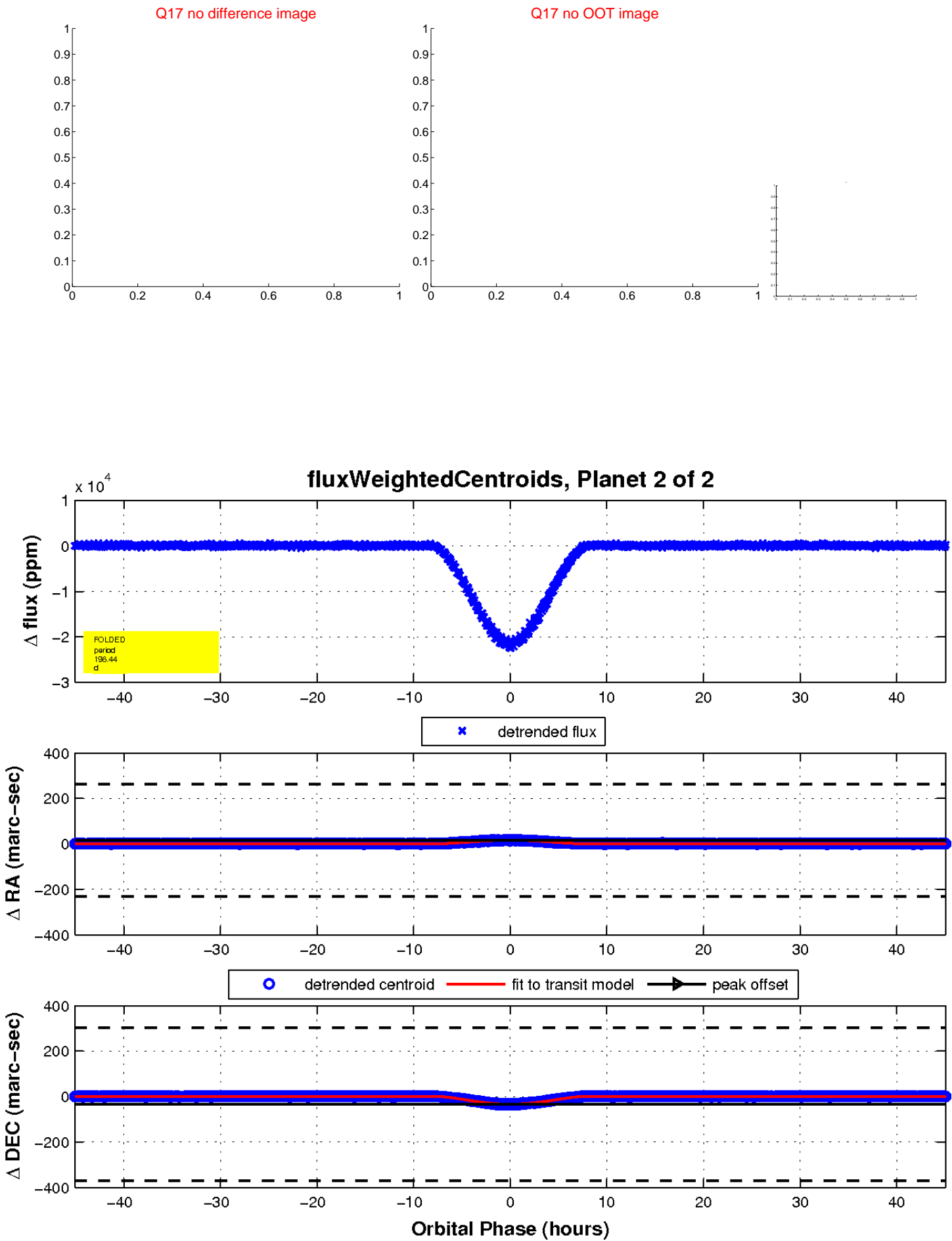
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



UKIRT Image

Declination

