

# KIC 004358571

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
004358571-01	OBS	No	2.800565	132.343736	70.6	10.485	8.4	7.3	2.08	7153	2.04	5005.84
004358571-02	OBS	No	1.400357	131.635992	78.8	9.633	9.7	10.2	2.08	7153	1.86	12613.04

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004358571-01	OBS	FP	0.00	1	0	0	0	LPP_DV—MOD_NONUNIQ_DV—CENT_SATURATED
004358571-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE_ZUMA—LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—SAME_NTL_PERIOD—CENT_SATURATED

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

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

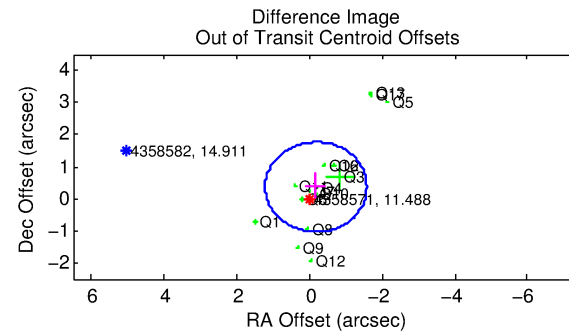
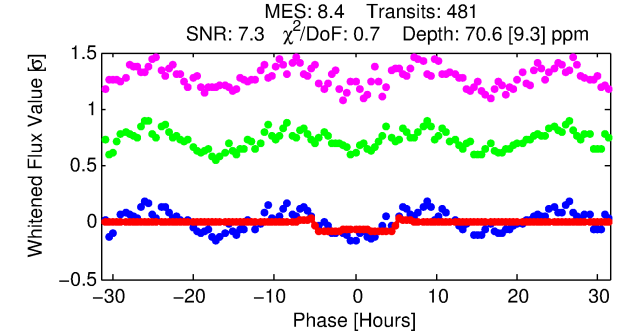
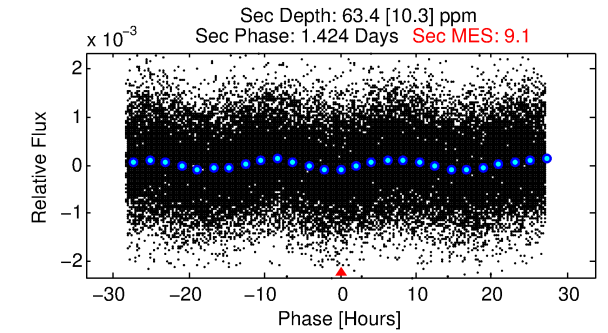
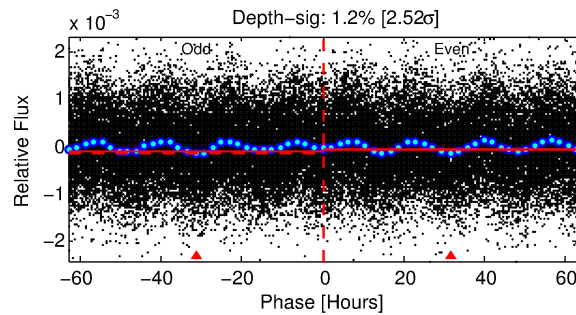
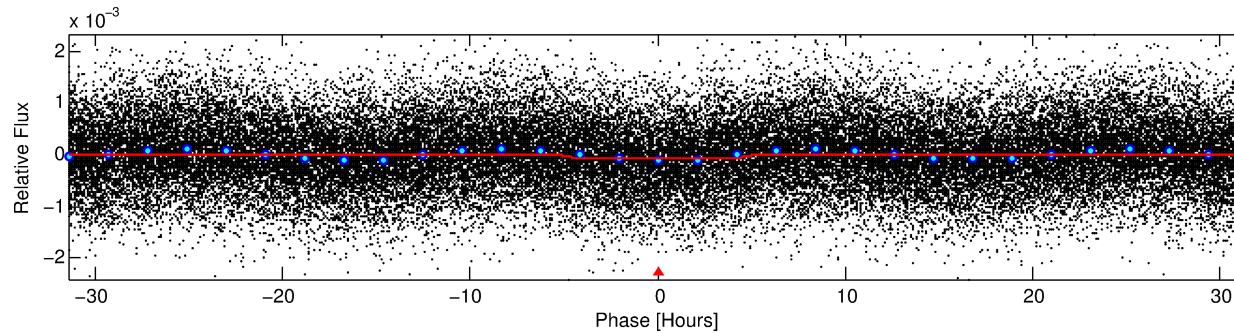
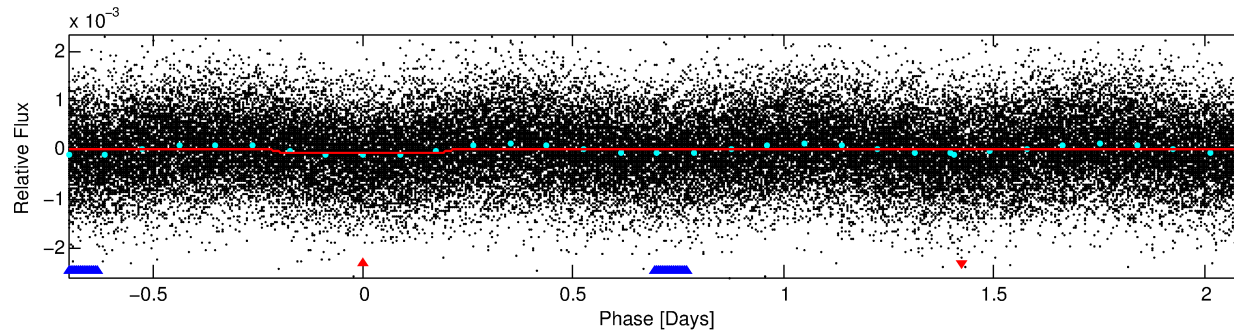
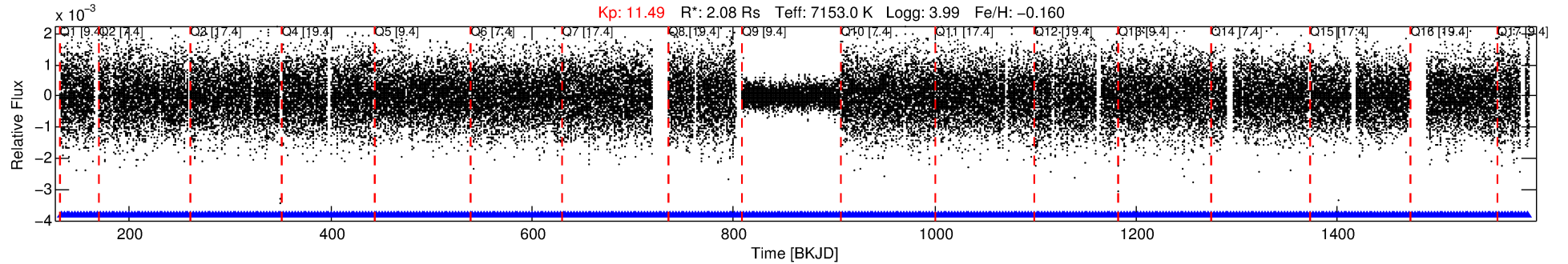
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 004358571-01

No Significant Match Found

# DV One-Page Summary

KIC: 4358571 Candidate: 1 of 2 Period: 2.801 d



## DV Fit Results:

Period = 2.80057 [0.00004] d  
Epoch = 132.3437 [0.0076] BKJD  
 $R_p/R^* = 0.0090$  [0.0011]  
 $a/R^* = 1.30$  [0.34]  
 $b = 0.91$  [0.12]  
 $\text{Seff} = 5005.84$  [2310.57]  
 $T_{\text{eq}} = 2145$  [248] K  
 $R_p = 2.04$  [0.71]  $R_e$   
 $a = 0.0450$  [0.0129] AU  
 $A_g = 16.95$  [8.89] [1.79 $\sigma$ ]  
 **$T_{\text{eff}} = 6729$  [556] K [7.53 $\sigma$ ]**

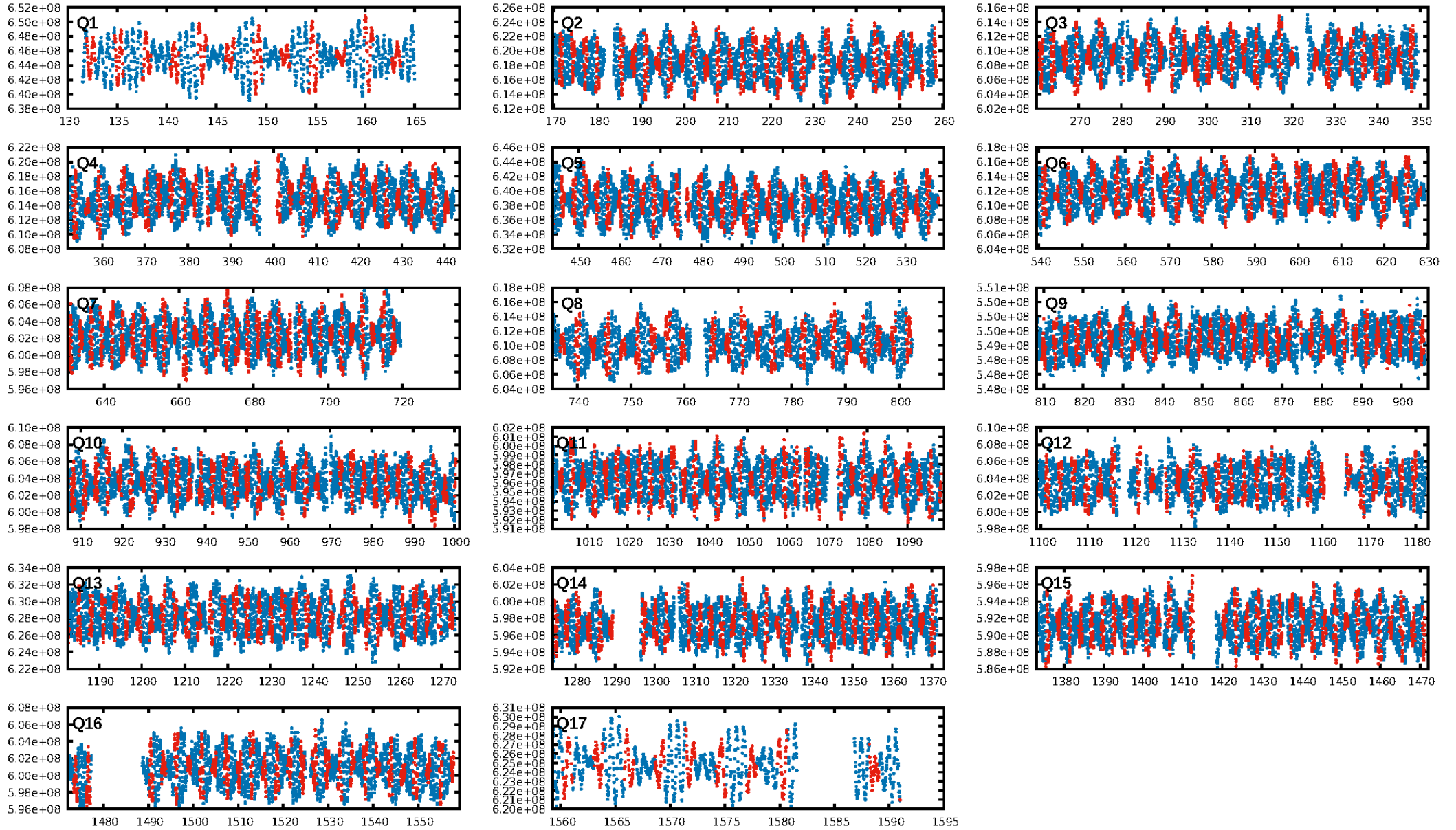
## DV Diagnostic Results:

ShortPeriod-sig: 98.2% [2.36 $\sigma$ ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [460/460]  
**GhostDiagnostic-chr: 0.8179**  
**Centroid-sig: 0.0%**  
Centroid-so: 0.571 arcsec [2.41 $\sigma$ ]  
OotOffset-rm: 0.408 arcsec [0.87 $\sigma$ ]  
OotOffset-st: 3/3/4/5 [15]  
KicOffset-rm: 0.511 arcsec [1.17 $\sigma$ ]  
KicOffset-st: 3/3/4/5 [15]  
DiffImageQuality-fgm: 0.80 [12/15]  
DiffImageOverlap-fno: 0.00 [0/17]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 05:51:03 Z

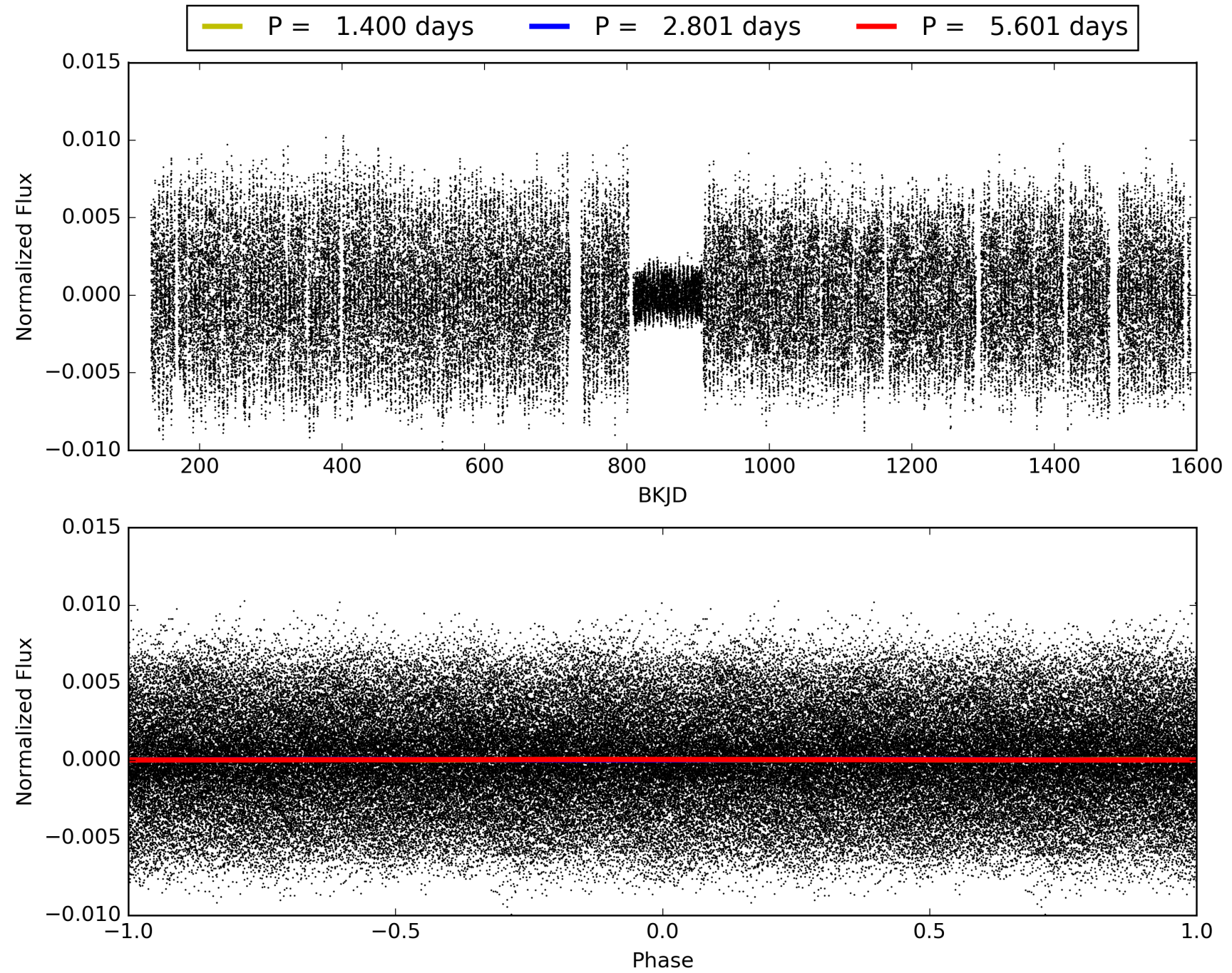
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 004358571-01, PDC Light Curves



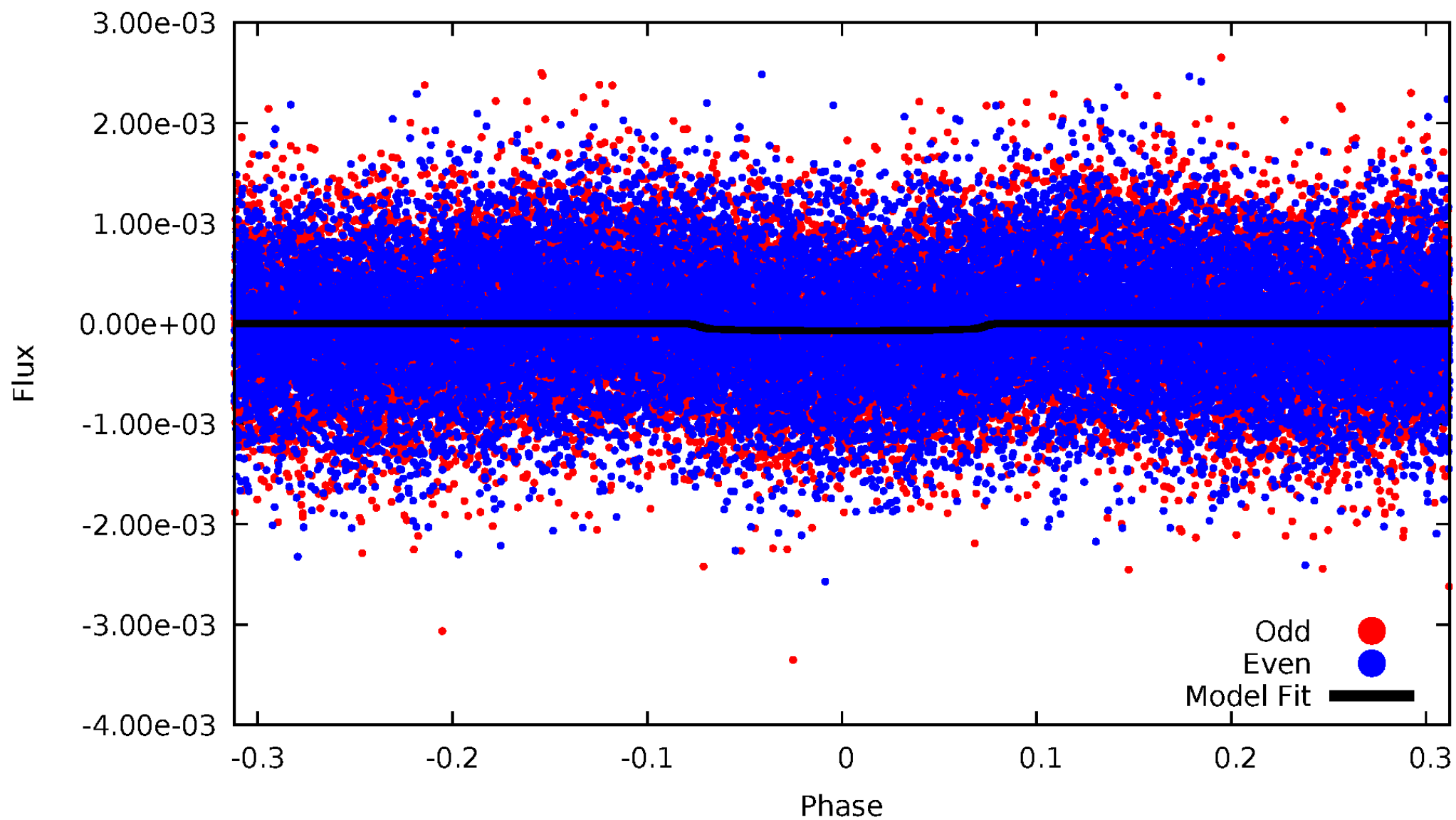


TCE 004358571-01



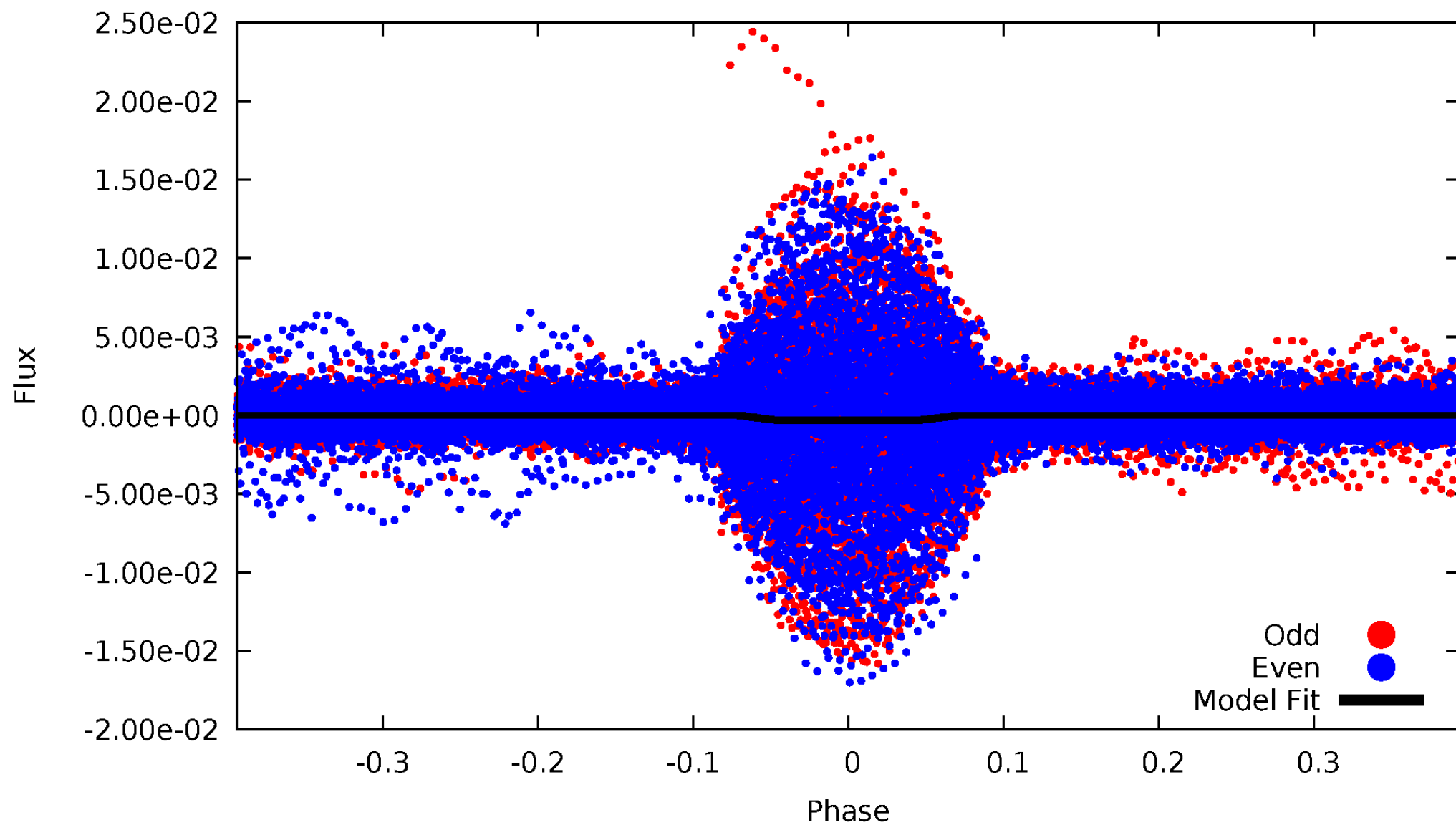
# DV Odd/Even

TCE 004358571-01

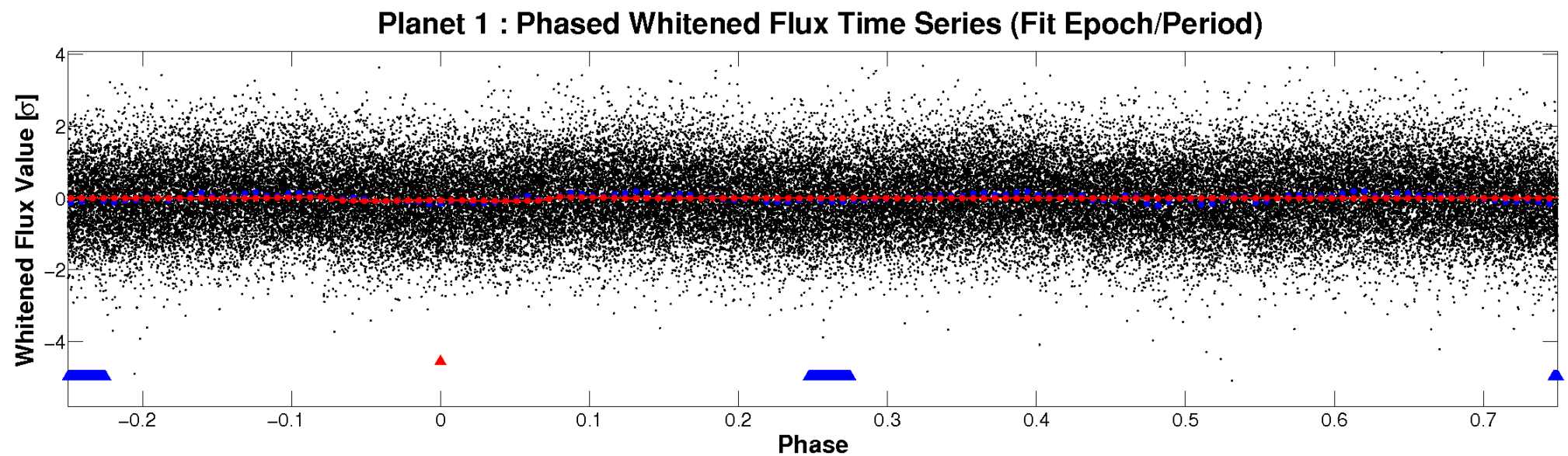
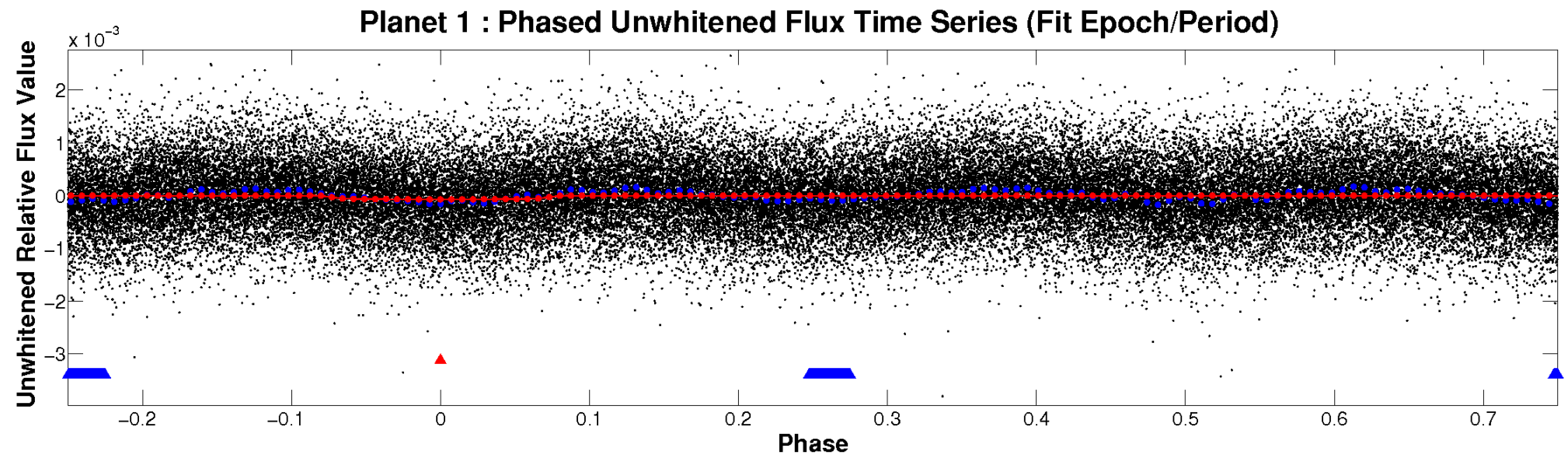


# ALT Odd/Even

TCE 004358571-01



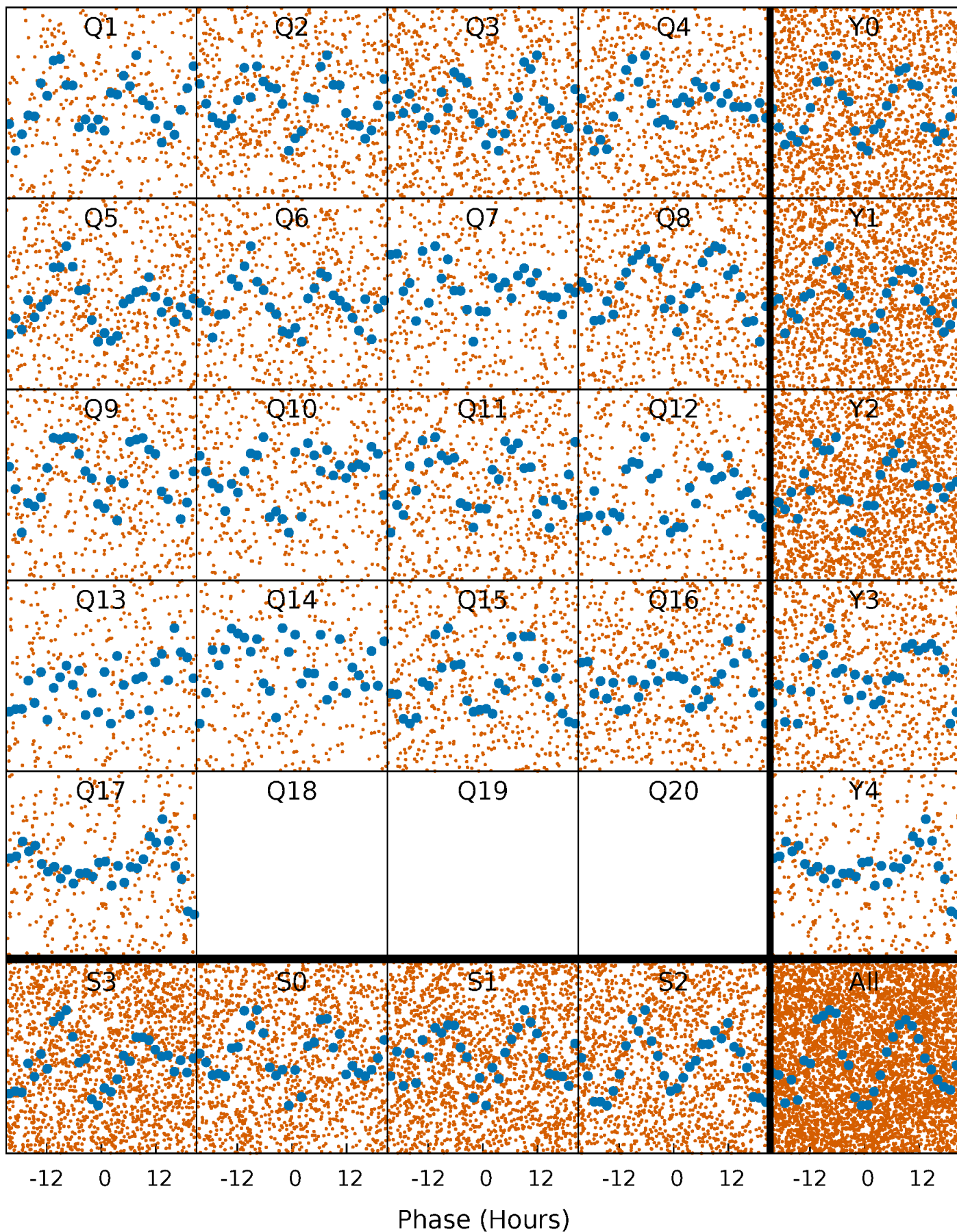
# Non-Whitened Vs. Whitened Light Curve





# PDC Quarter-Phased Transit Curves

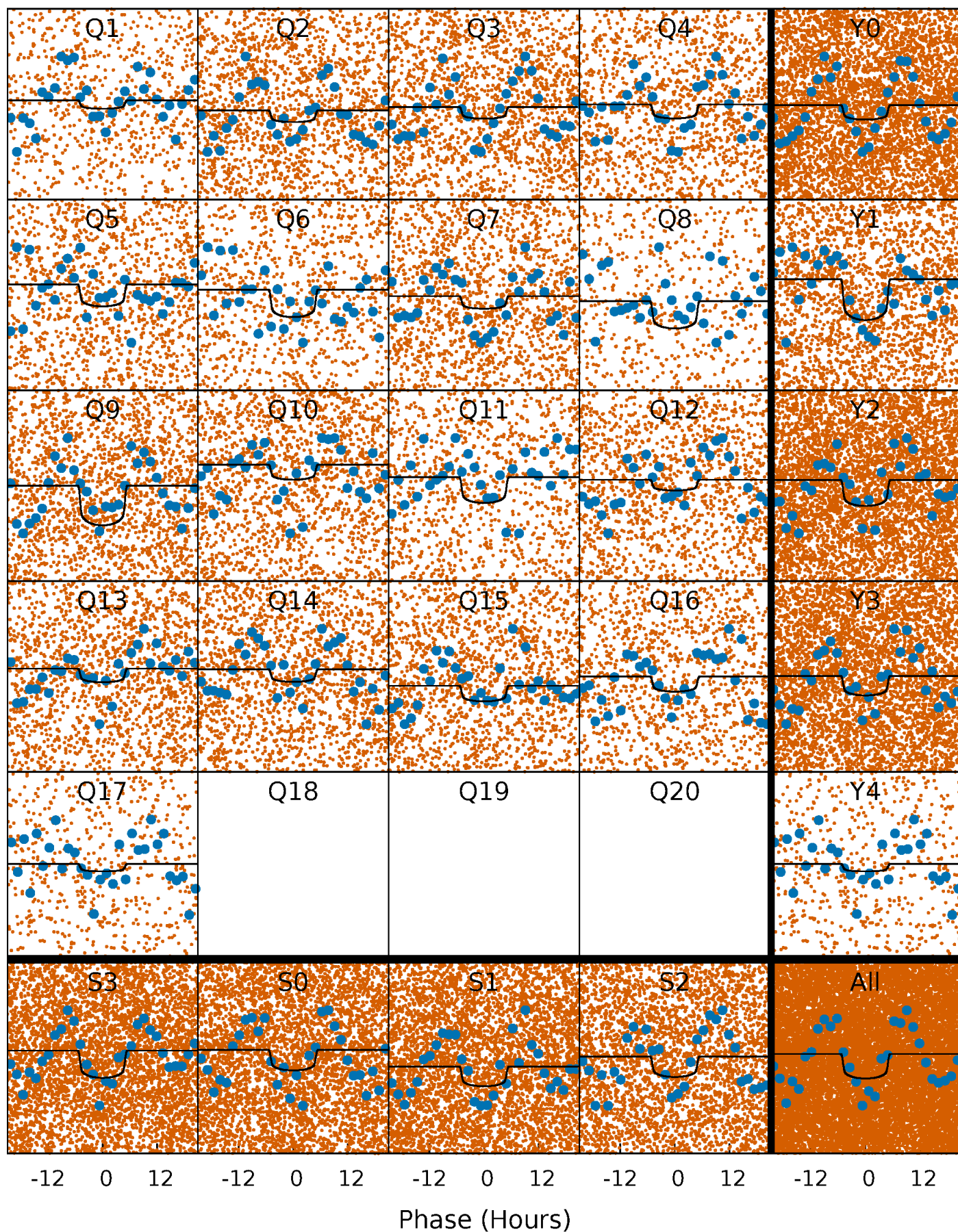
TCE 004358571-01 P= 2.800565 Days  $T_0=132.343736$  (BKJD)





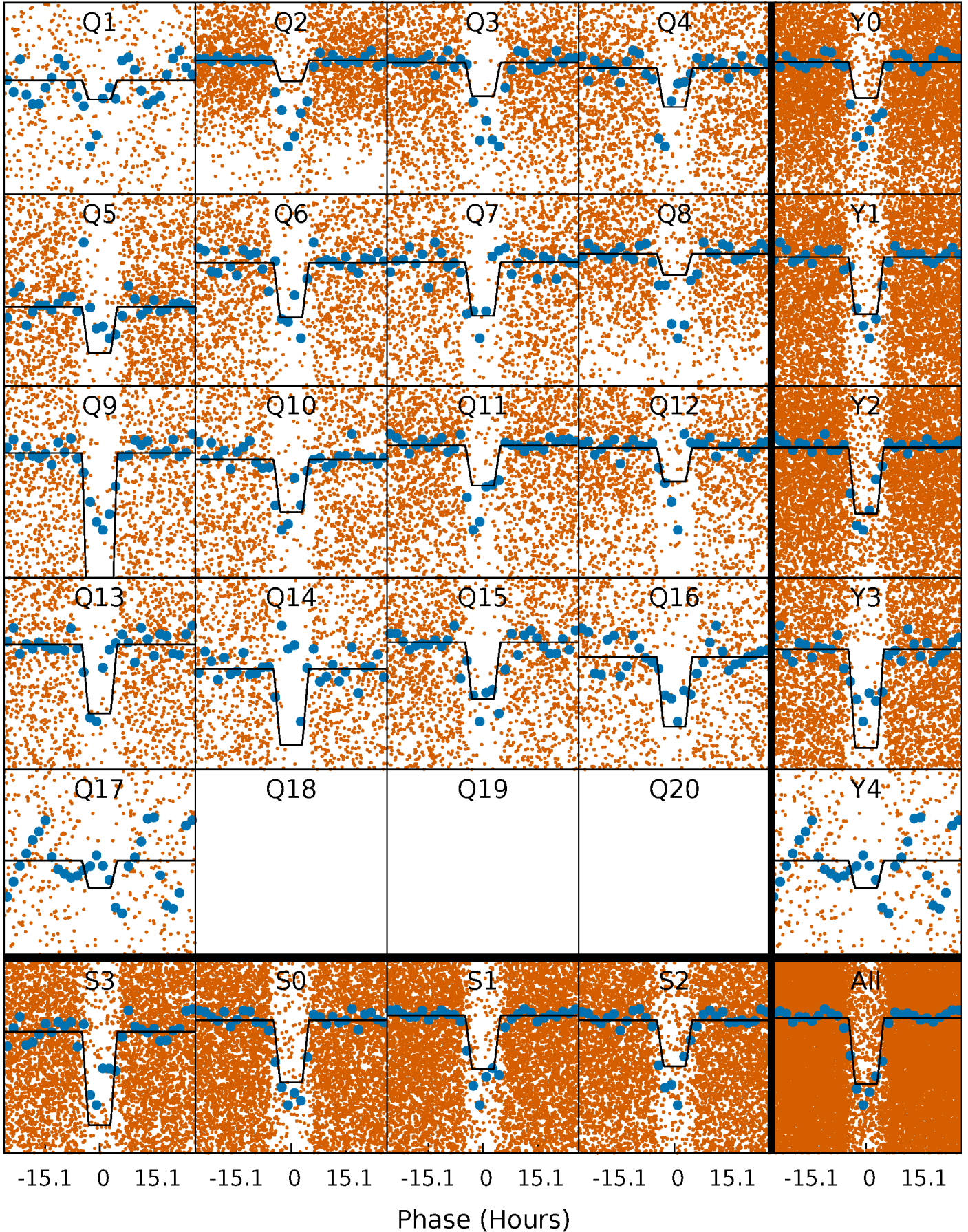
# DV Quarter-Phased Transit Curves

TCE 004358571-01 P= 2.800565 Days  $T_0=132.343736$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 004358571-01 P= 2.800584 Days  $T_0=132.345551$  (BKJD)

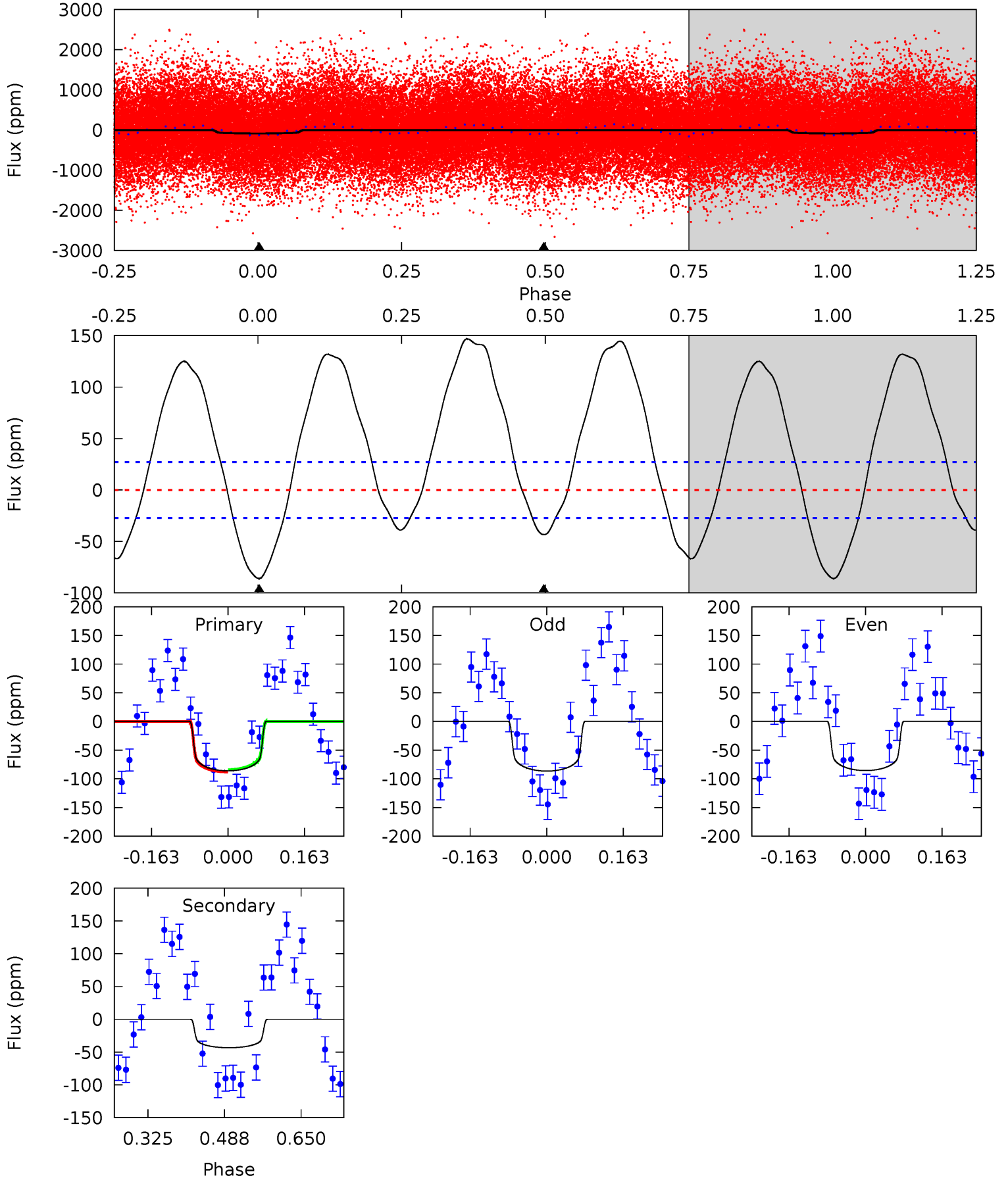




# DV Model-Shift Uniqueness Test

004358571-01, P = 2.800565 Days, E = 129.543171 Days

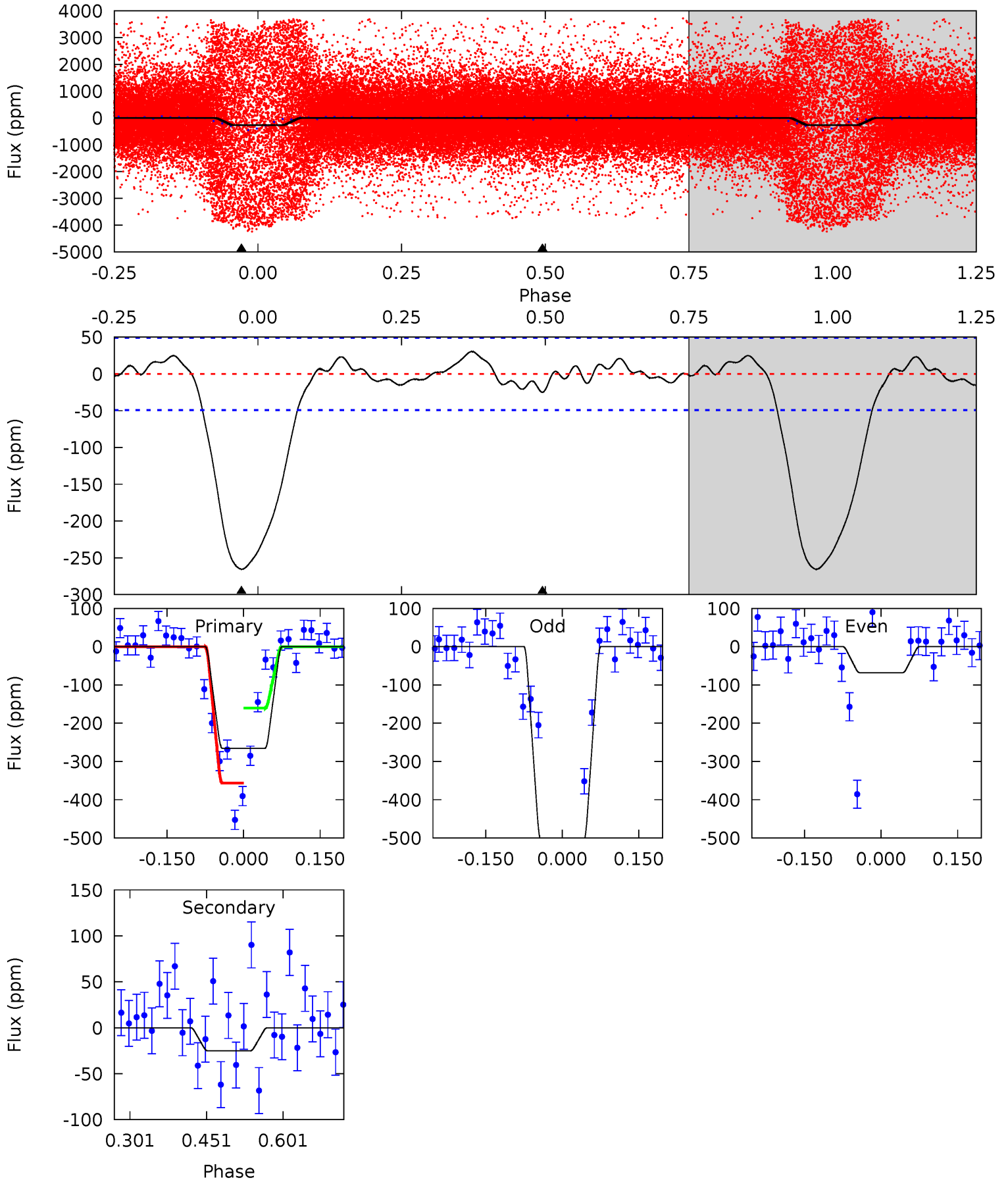
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
14.1	7.14	0	0	4.46	1.40	8.15	14.1	14.1	7.14	7.14	0.07	1.30	0.63	0.32



# Alt Model-Shift Uniqueness Test

004358571-01, P = 2.800584 Days, E = 129.544967 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
24.2	2.28	0	0	4.48	1.44	0.81	24.2	24.2	2.28	2.28	19.7	1.04	0.10	0





### Stellar Parameters For KIC 004358571

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$7153^{+175}_{-275}$	$3.992^{+0.246}_{-0.164}$	$-0.160^{+0.250}_{-0.350}$	$2.077^{+0.552}_{-0.674}$	$1.543^{+0.197}_{-0.296}$	$0.243^{+0.412}_{-0.110}$
	+2%/-4%	+6%/-4%	+156%/-219%	+27%/-32%	+13%/-19%	+170%/-45%
Source	PHO1	KIC0	KIC0	DSEP		

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

### Secondary Eclipse Parameters for KIC 004358571-01 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-43 \pm 6$	$2.02^{+0.39}_{-0.40}$	$2973^{+219}_{-250}$	$5966^{+556}_{-406}$	$12^{+7}_{-4}$
Alt.	$-25 \pm 11$	$4.02^{+0.69}_{-0.66}$	$2974^{+248}_{-250}$	$3888^{+340}_{-490}$	$1.674^{+1.085}_{-0.824}$

$T_{max}$  = Theoretical Maximum Planetary Temperature

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

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

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

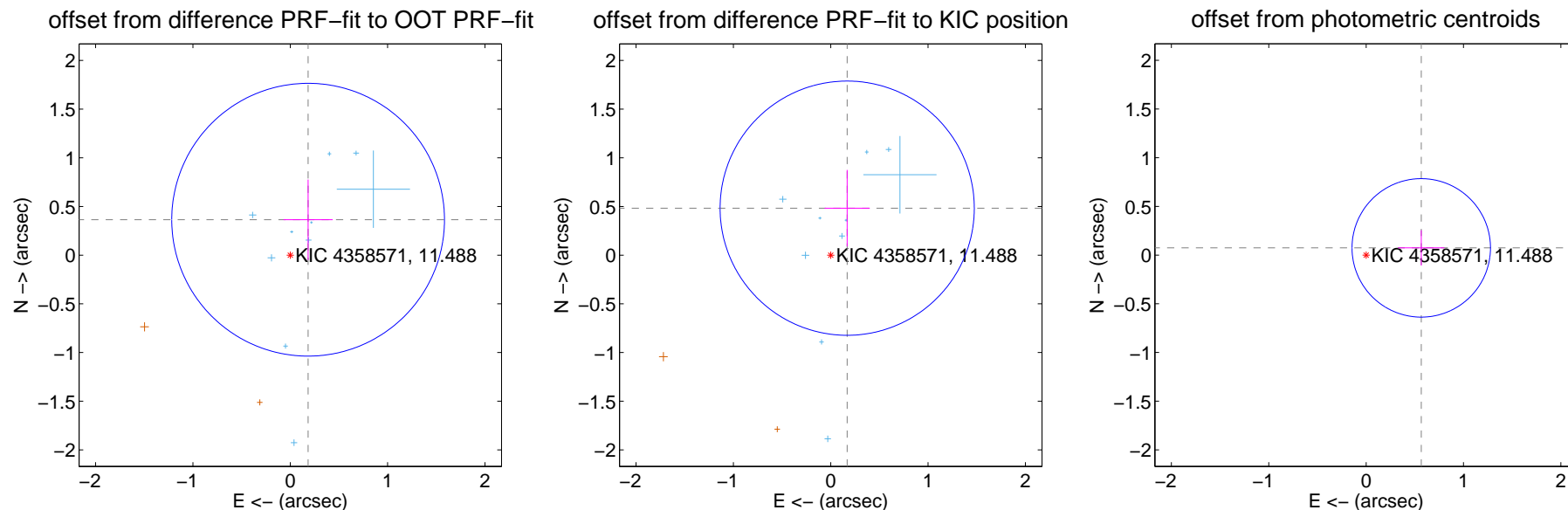
## DV Centroid Data

Supplemental centroid analysis for 004358571-01. **Kepler magnitude: 11.49.** Transit SNR 7.31

There are 12 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.38 arcsec

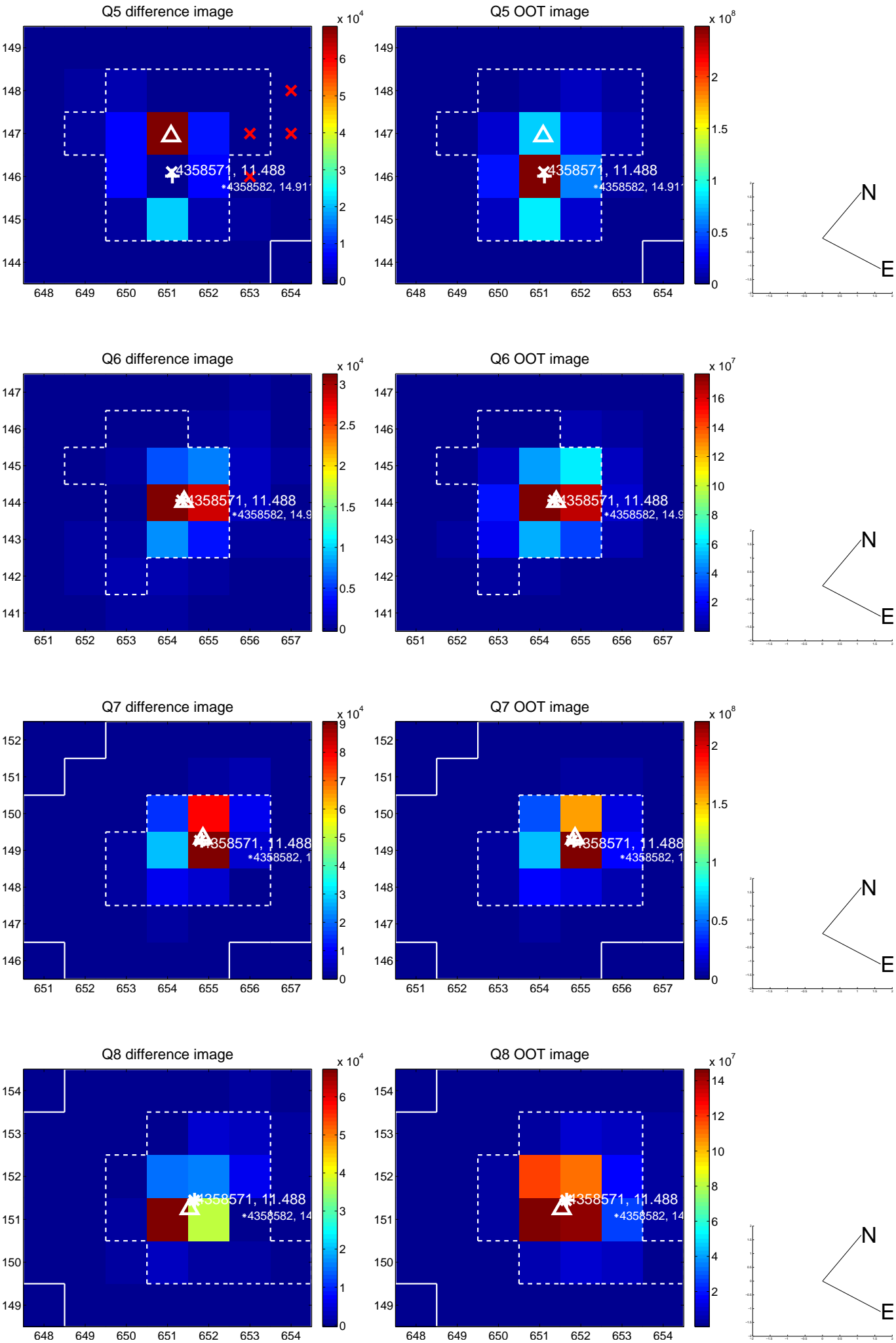
	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.408 \pm 0.467$	0.87	$-0.183 \pm 0.252$	$0.364 \pm 0.413$
PRF-fit source offset from KIC position	$0.511 \pm 0.435$	1.17	$-0.169 \pm 0.232$	$0.483 \pm 0.393$
photometric centroid source offset	$0.57 \pm 0.24$	2.41	$-0.57 \pm 0.24$	$0.07 \pm 0.18$



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.

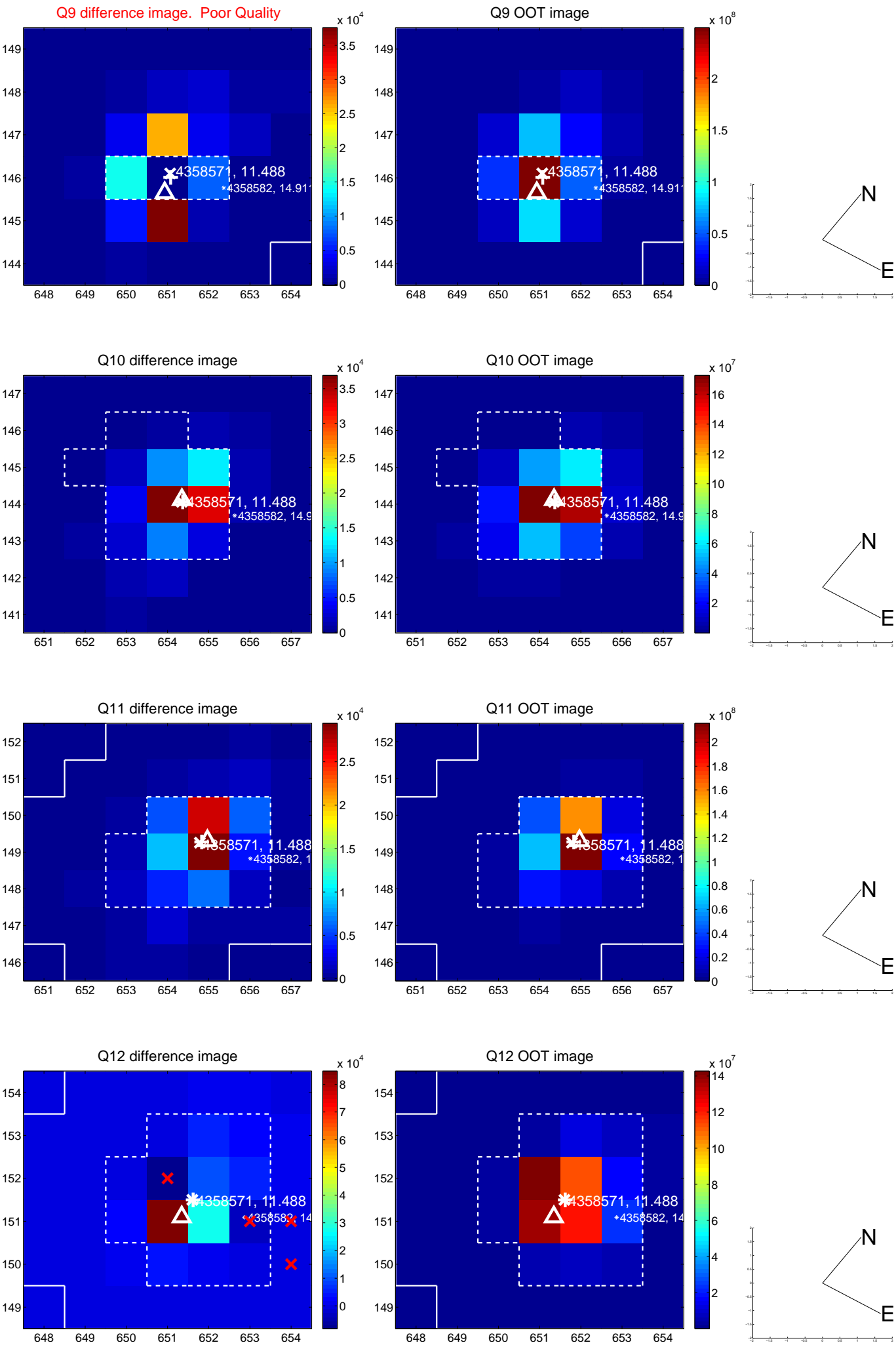


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

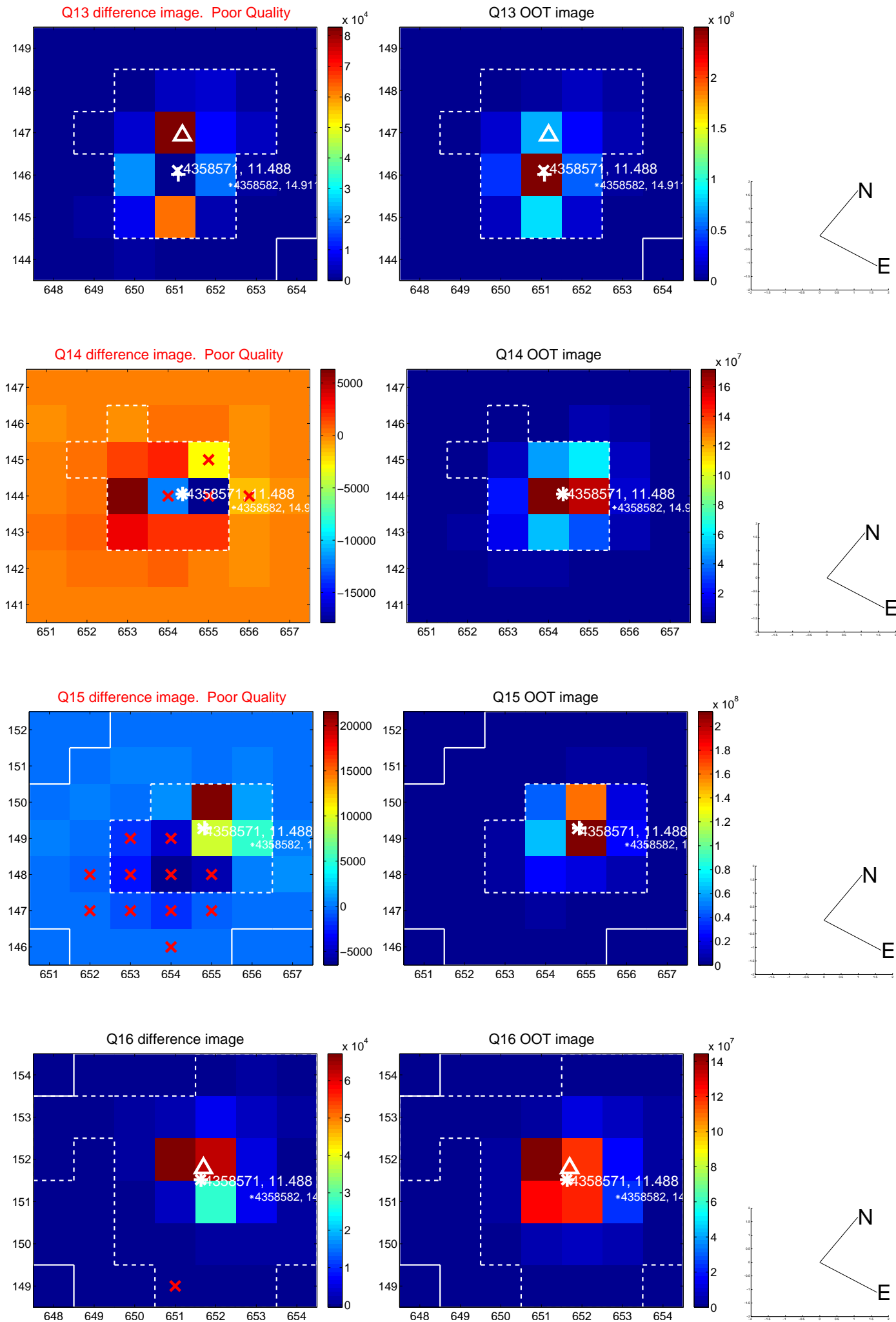




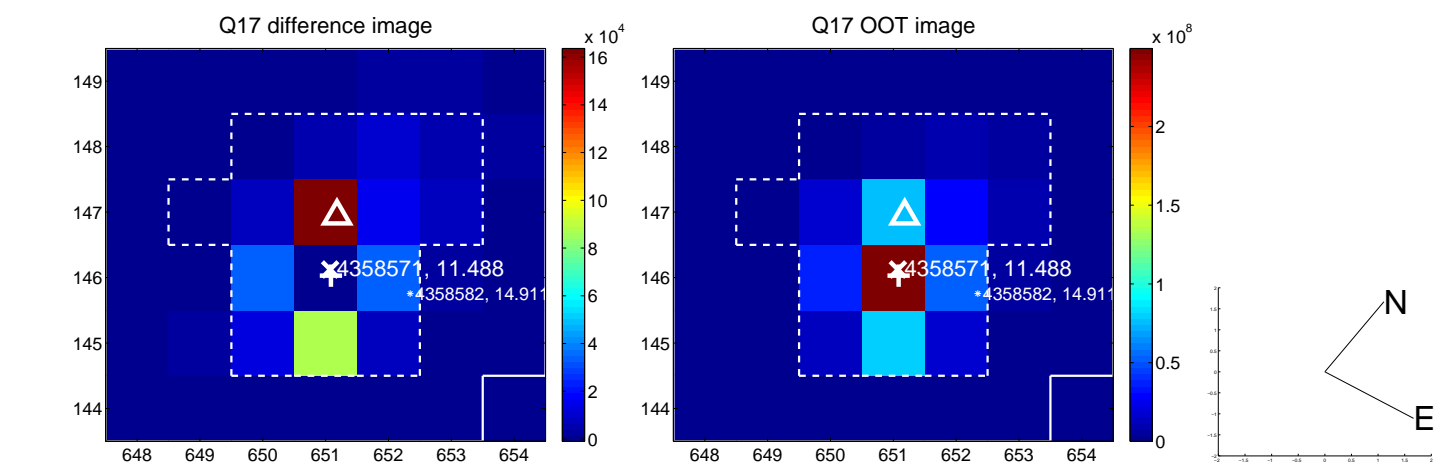
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



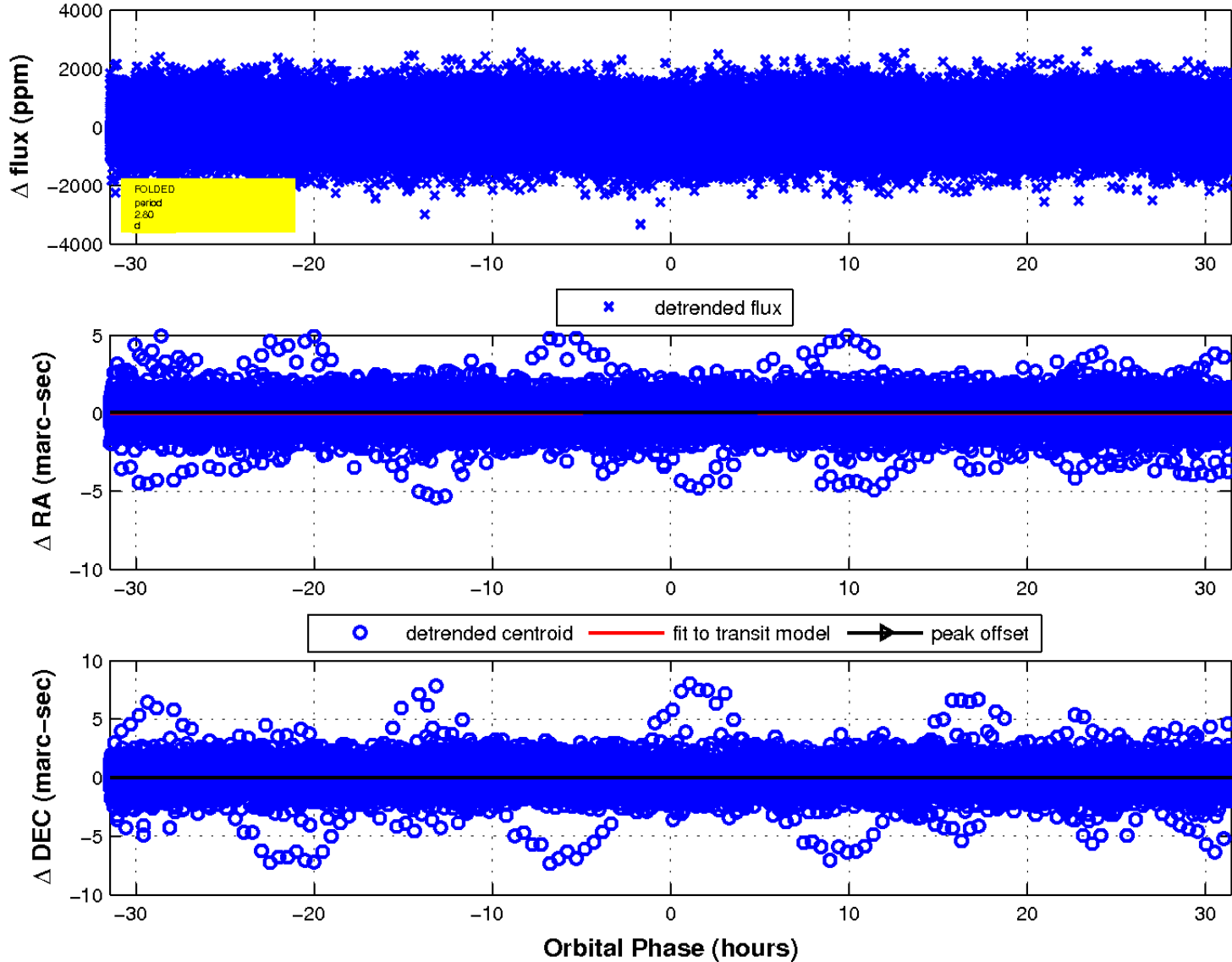
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



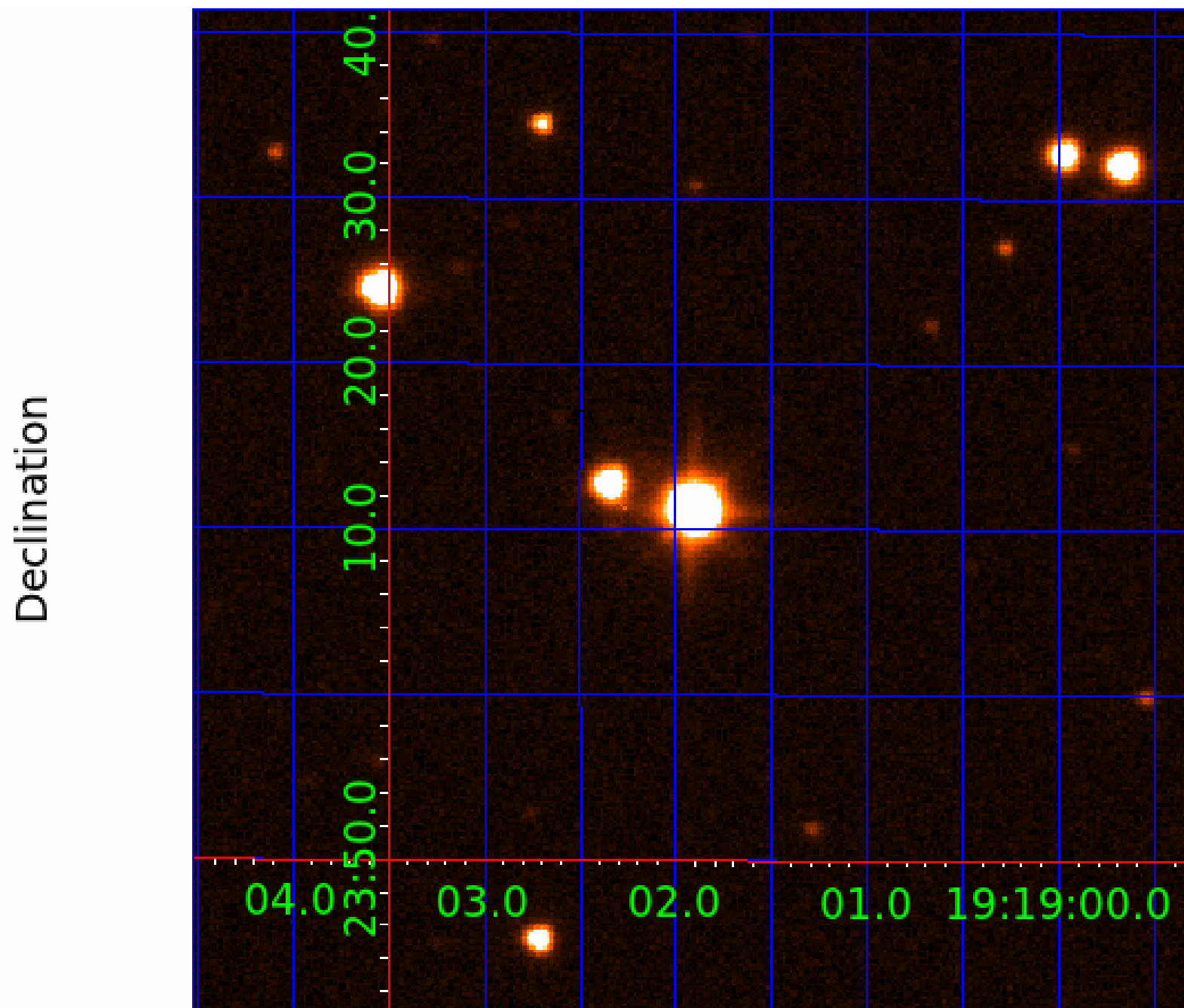
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



fluxWeightedCentroids, Planet 1 of 2



UKIRT Image





# KIC 004358571

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
004358571-01	OBS	No	2.800565	132.343736	70.6	10.485	8.4	7.3	2.08	7153	2.04	5005.84
004358571-02	OBS	No	1.400357	131.635992	78.8	9.633	9.7	10.2	2.08	7153	1.86	12613.04

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004358571-01	OBS	FP	0.00	1	0	0	0	LPP_DV—MOD_NONUNIQ_DV—CENT_SATURATED
004358571-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE_ZUMA—LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—SAME_NTL_PERIOD—CENT_SATURATED

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

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

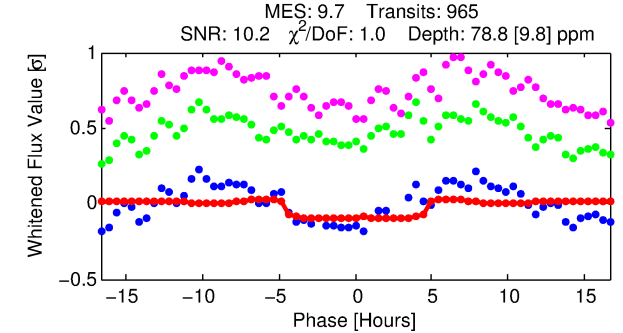
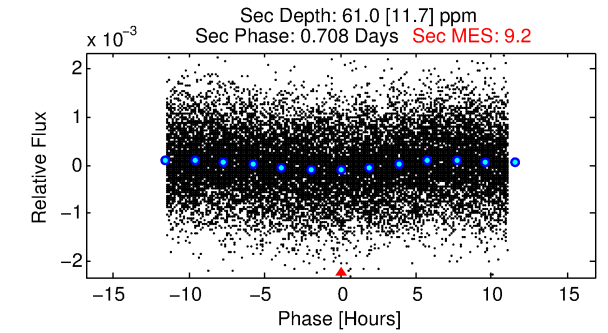
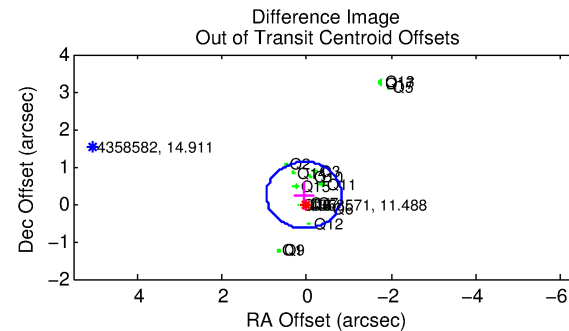
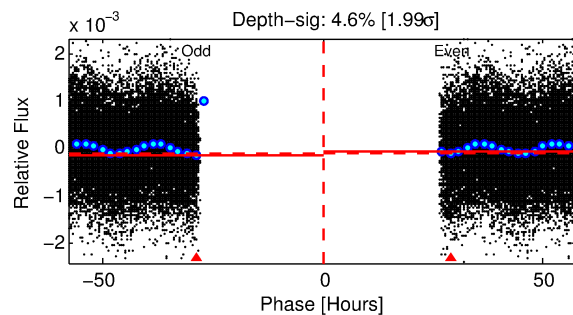
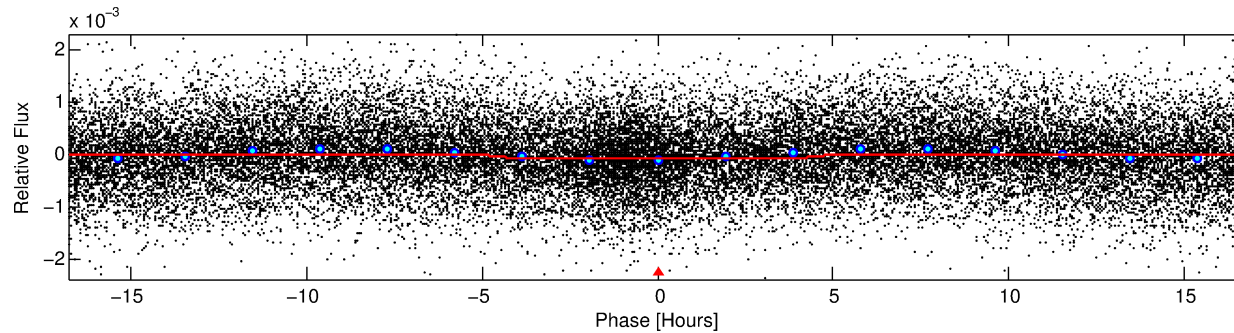
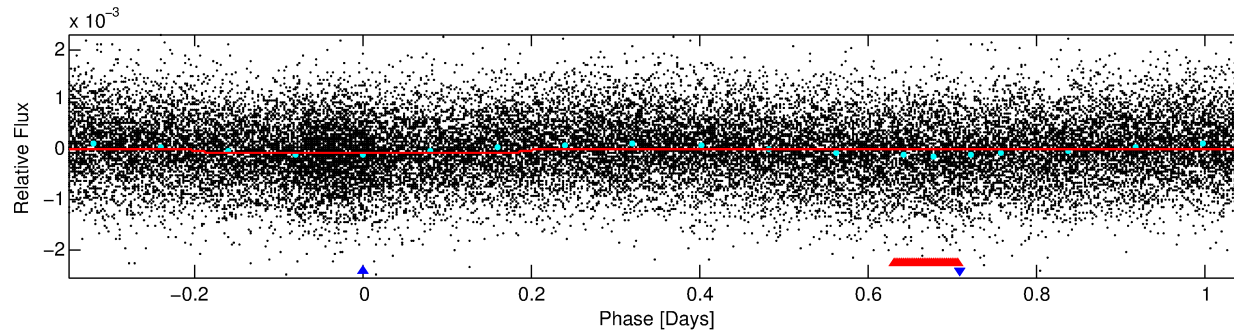
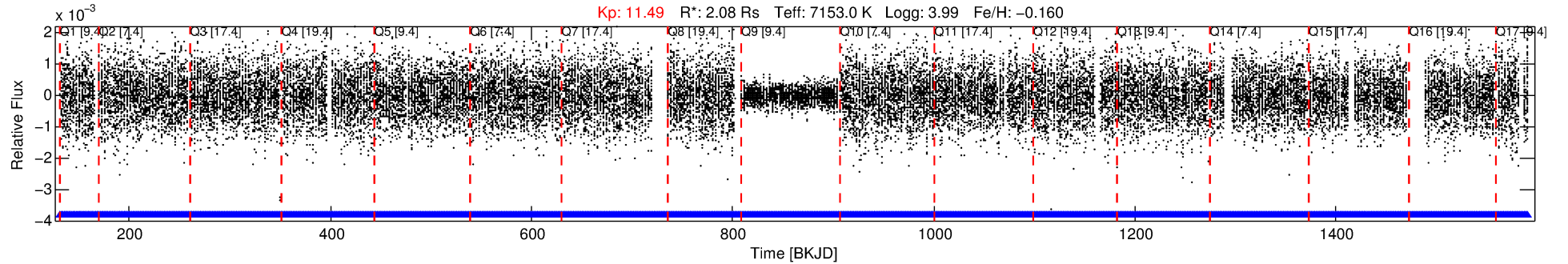
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 004358571-02

No Significant Match Found

# DV One-Page Summary

KIC: 4358571 Candidate: 2 of 2 Period: 1.400 d



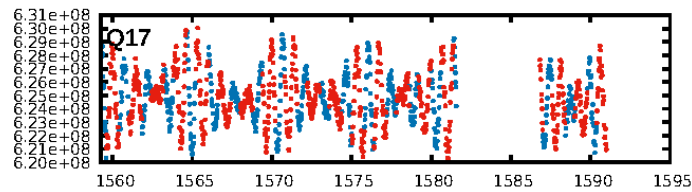
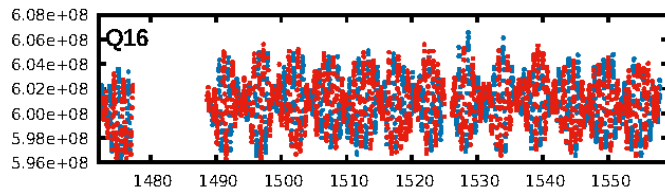
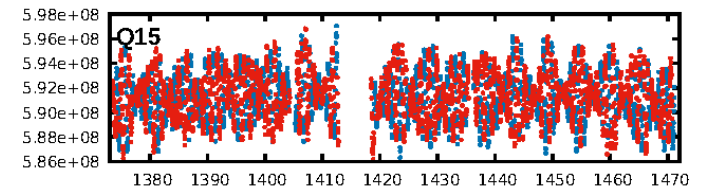
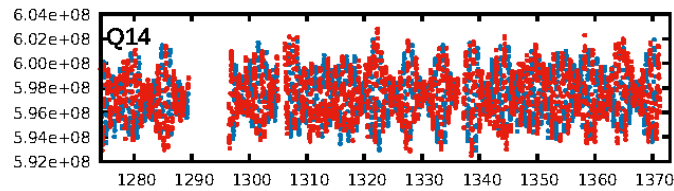
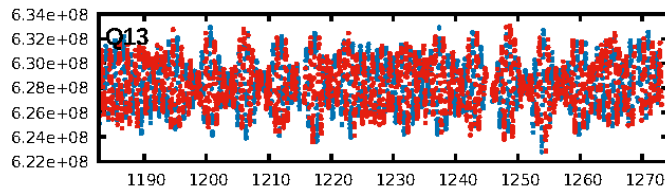
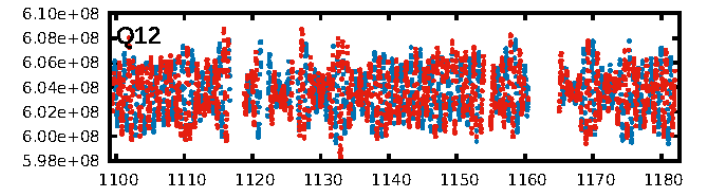
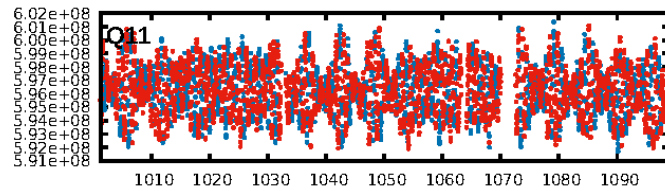
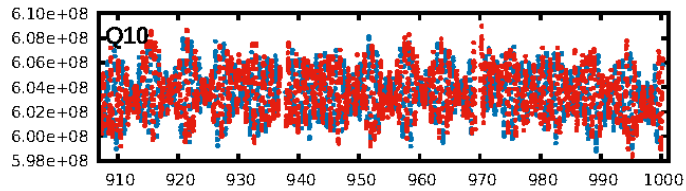
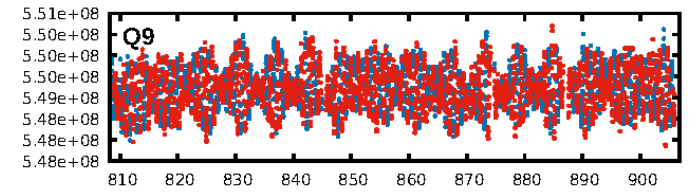
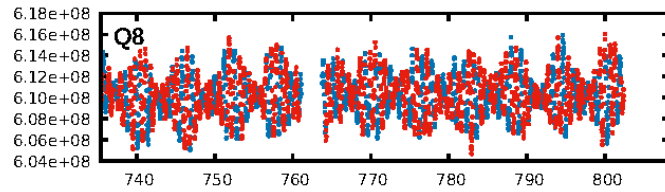
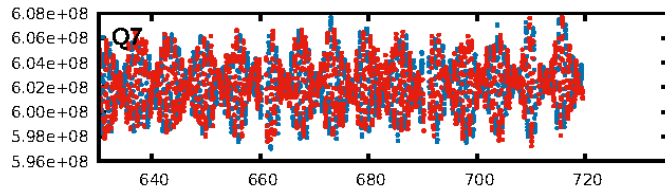
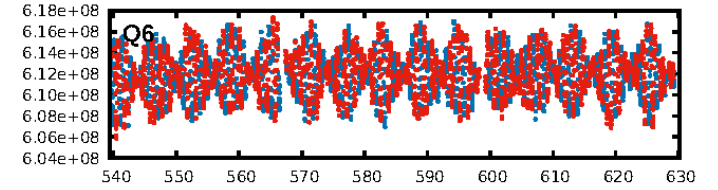
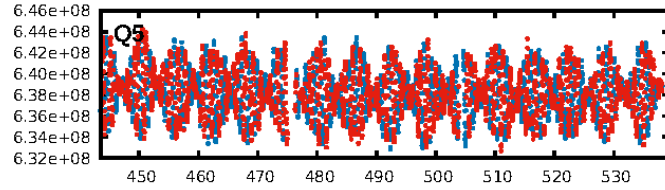
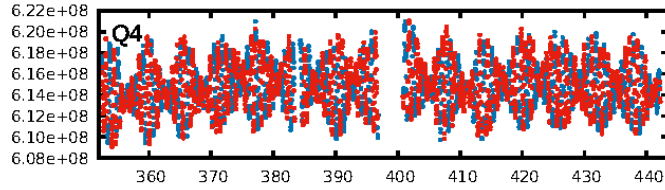
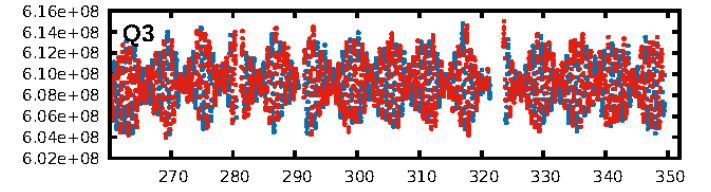
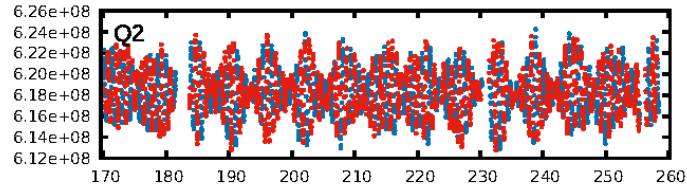
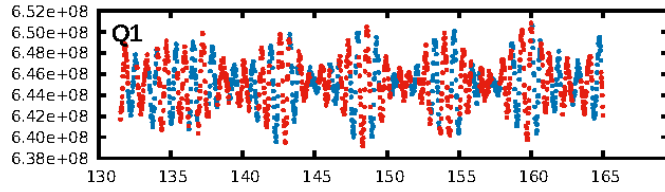
## DV Fit Results:

Period = 1.40036 [0.00002] d  
Epoch = 131.6360 [0.0064] BKJD  
Rp/R\* = 0.0082 [0.0062]  
a/R\* = 1.29 [2.22]  
b = 0.00 [21694.13]  
Seff = 12613.04 [5821.85]  
Teq = 2702 [312] K  
Rp = 1.86 [1.54] Re  
a = 0.0283 [0.0081] AU  
Ag = 7.74 [12.32] [0.55 $\sigma$ ]  
Teff = 6969 [2680] K [1.58 $\sigma$ ]

## DV Diagnostic Results:

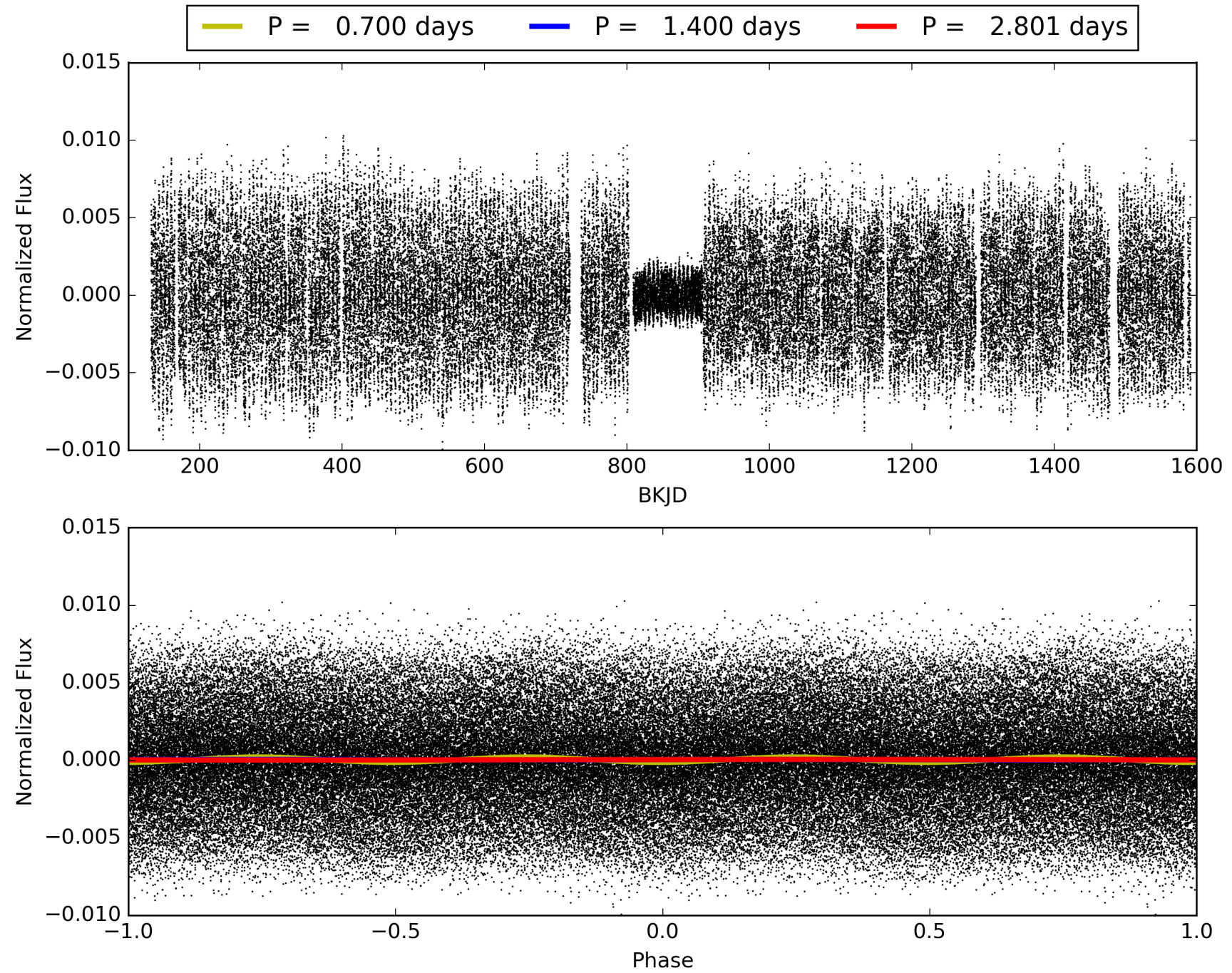
ShortPeriod-sig: N/A  
LongPeriod-sig: 98.2% [2.36 $\sigma$ ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [922/922]  
GhostDiagnostic-chr: 1.074  
Centroid-sig: 0.0%  
Centroid-so: 0.330 arcsec [2.45 $\sigma$ ]  
OotOffset-rm: 0.245 arcsec [0.83 $\sigma$ ]  
KicOffset-rm: 0.294 arcsec [1.20 $\sigma$ ]  
OotOffset-st: 4/4/4/5 [17]  
KicOffset-st: 4/4/4/5 [17]  
DiffImageQuality-fgm: 0.76 [13/17]  
DiffImageOverlap-fno: 0.00 [0/17]

# TCE 004358571-02, PDC Light Curves





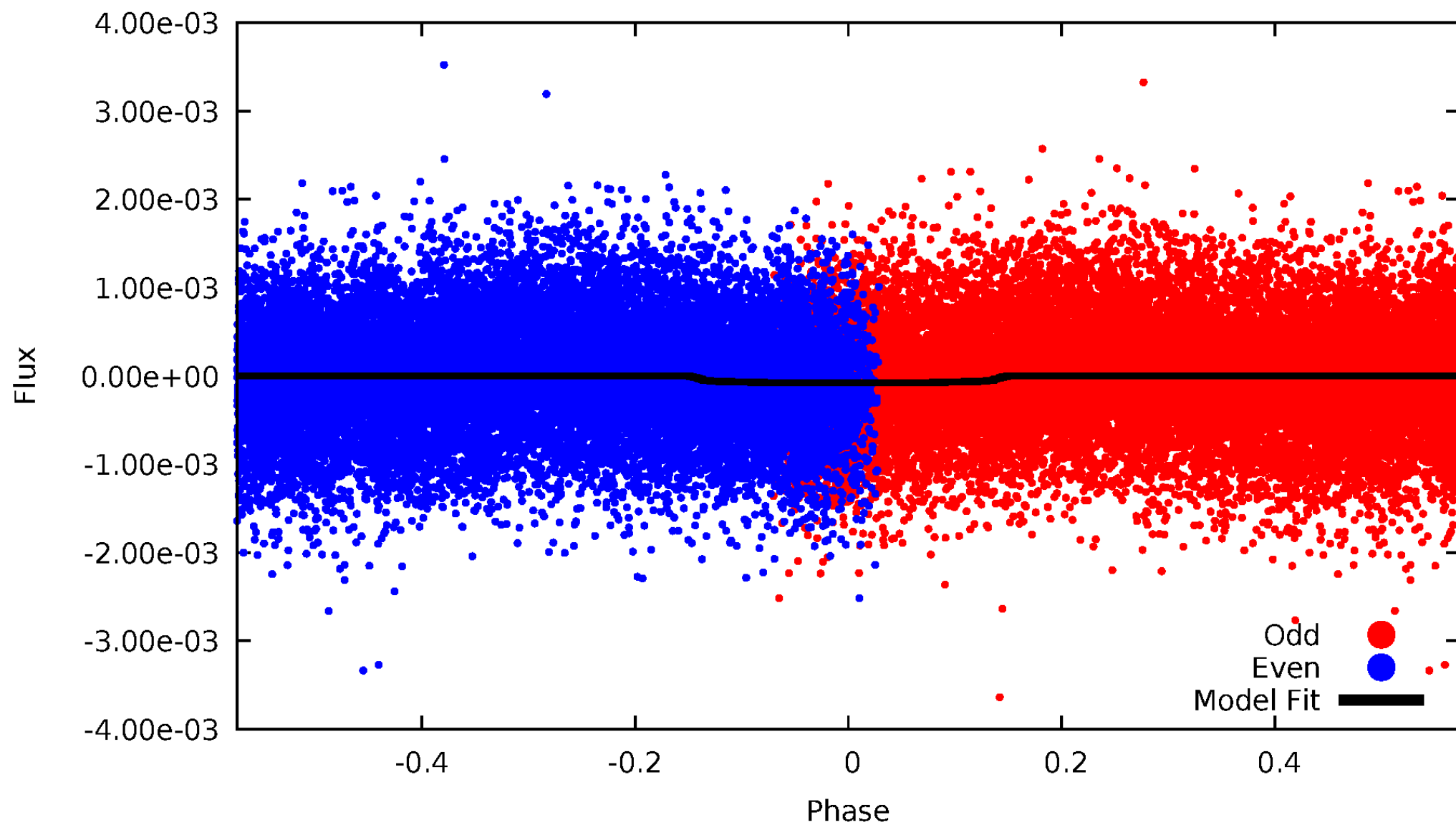
TCE 004358571-02





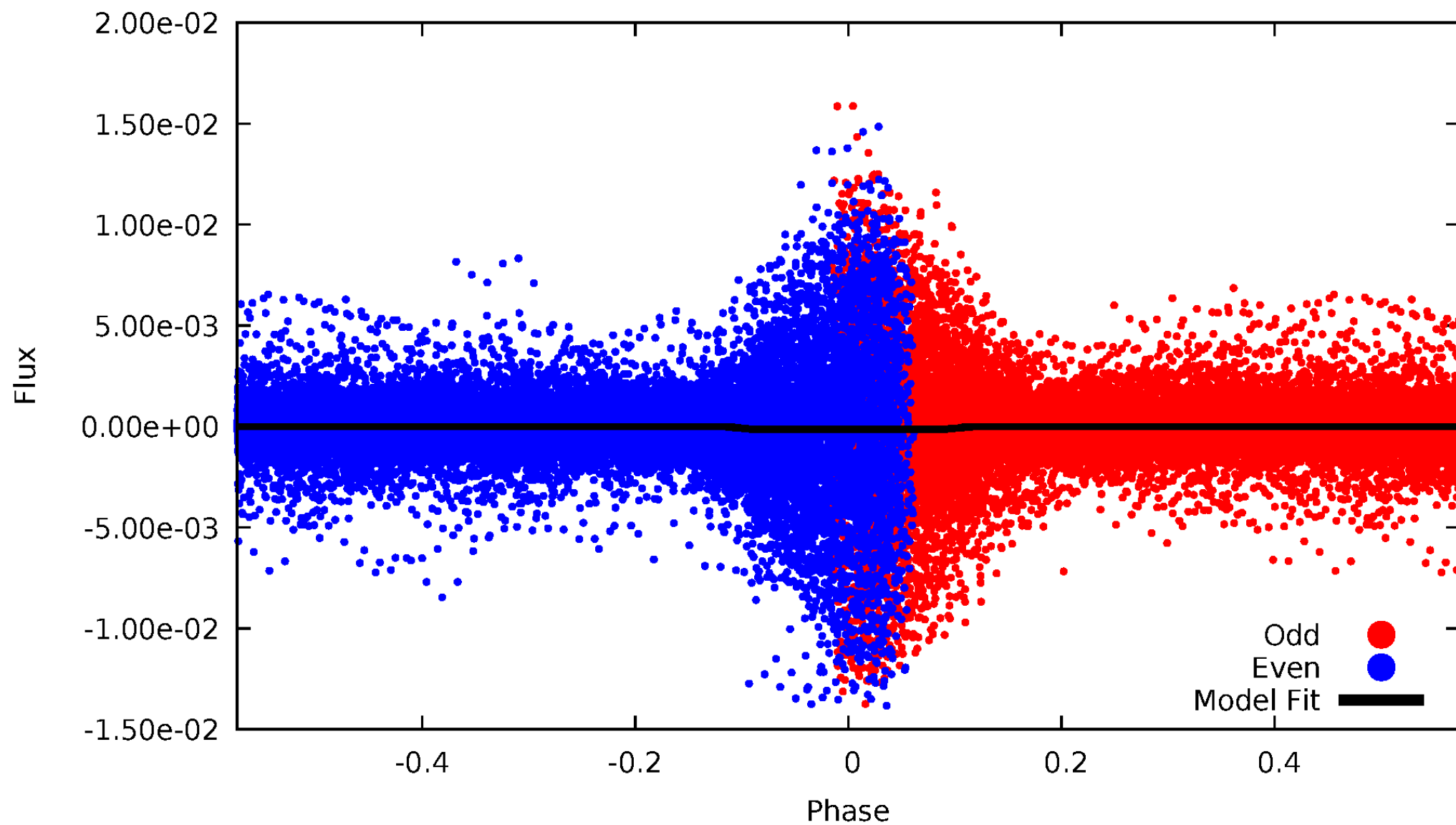
DV Odd/Even

TCE 004358571-02



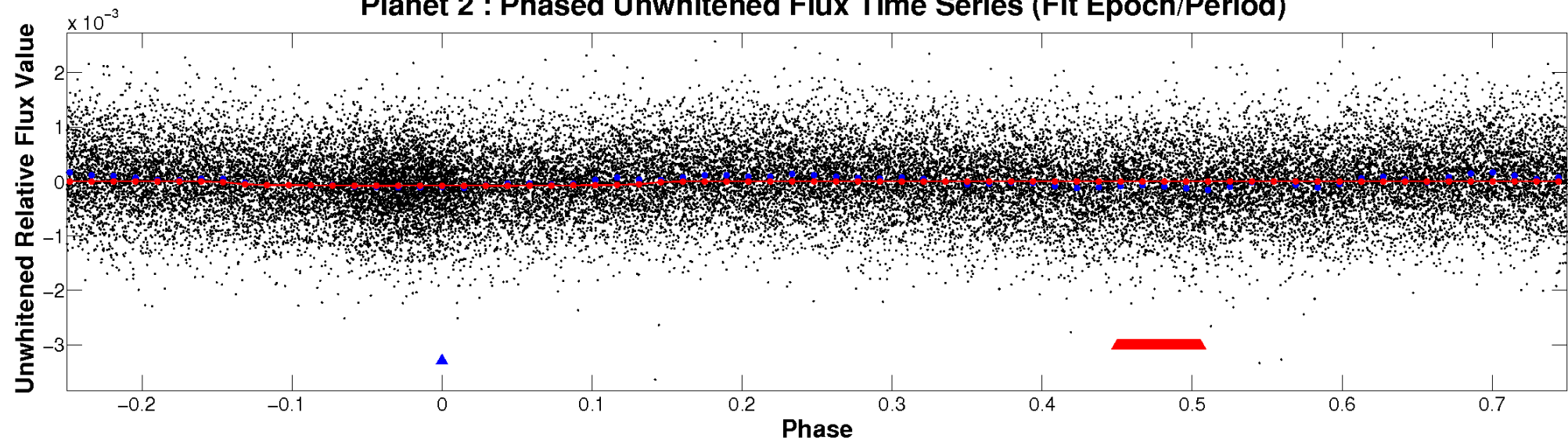
# ALT Odd/Even

TCE 004358571-02

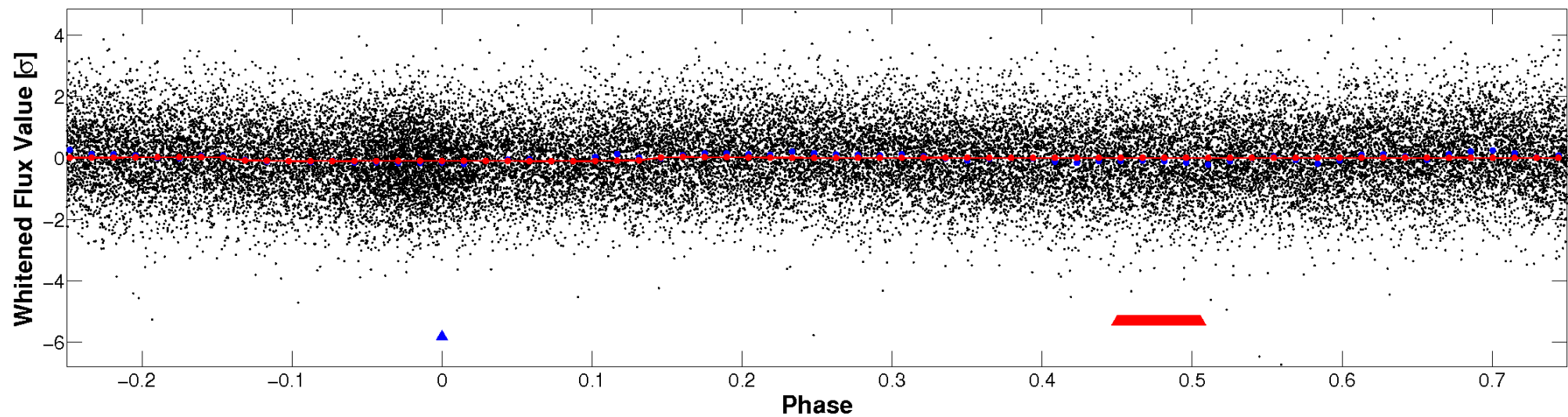


# Non-Whitened Vs. Whitened Light Curve

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

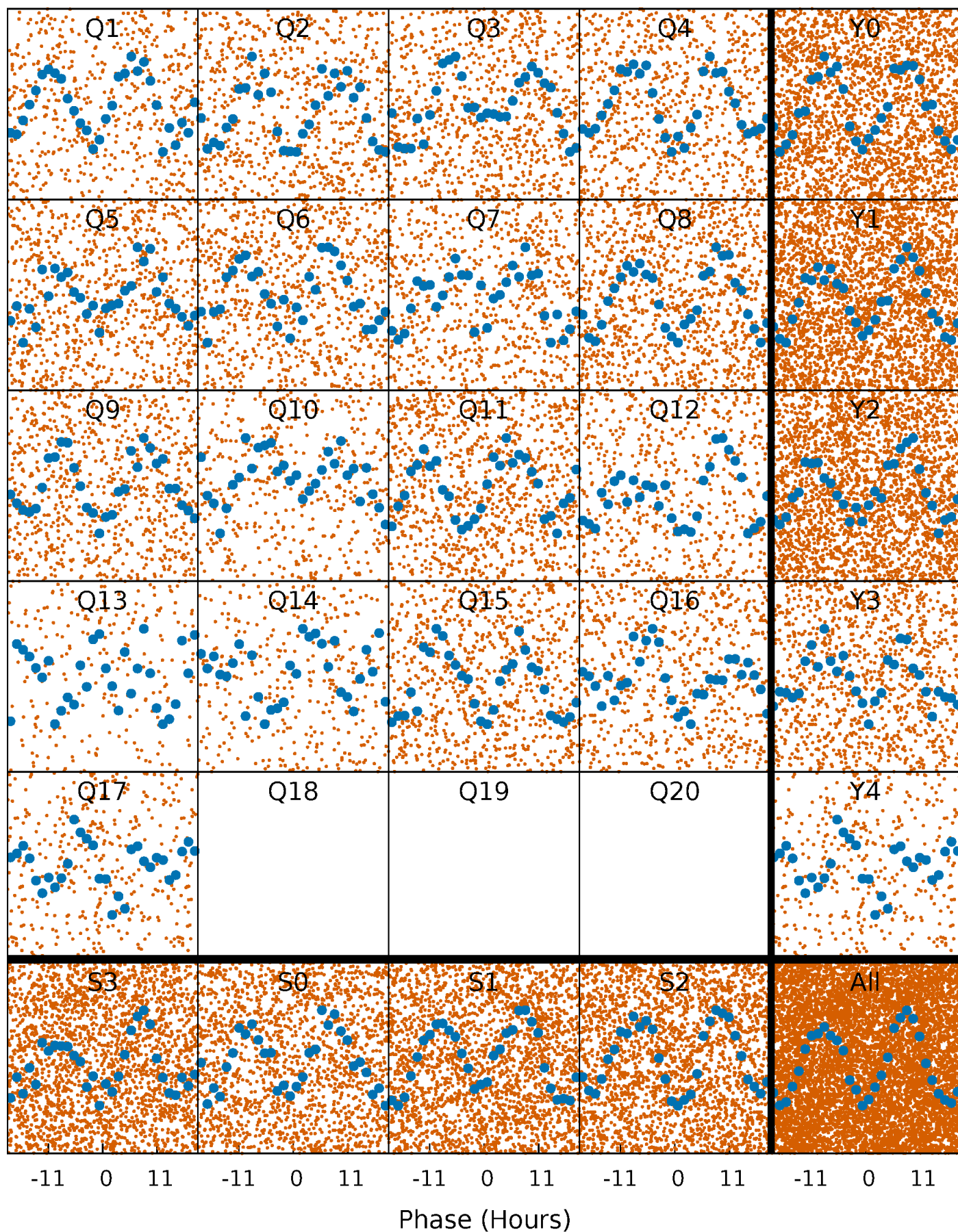


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

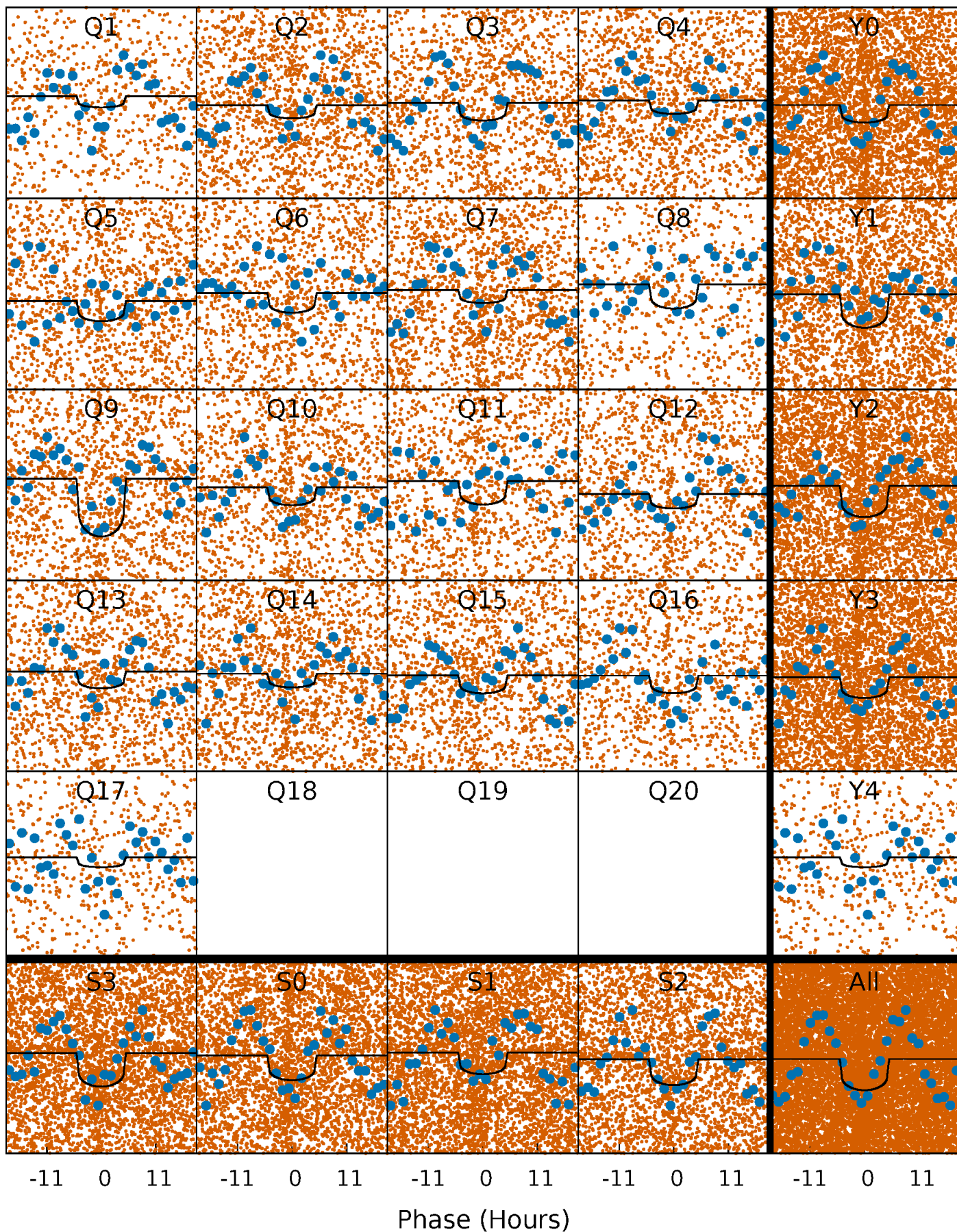
TCE 004358571-02   P= 1.400357 Days    $T_0=131.635992$  (BKJD)





# DV Quarter-Phased Transit Curves

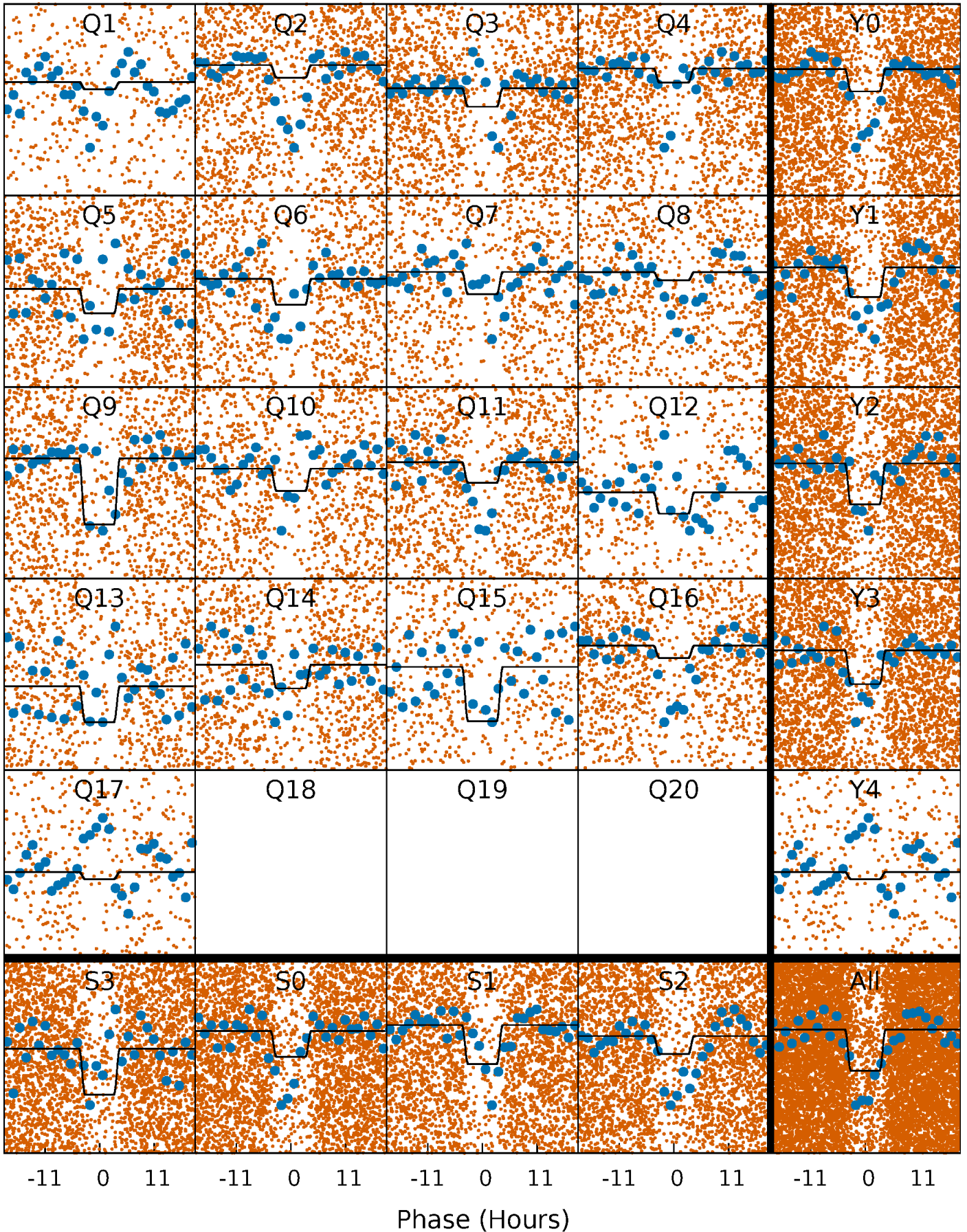
TCE 004358571-02   P= 1.400357 Days    $T_0=131.635992$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

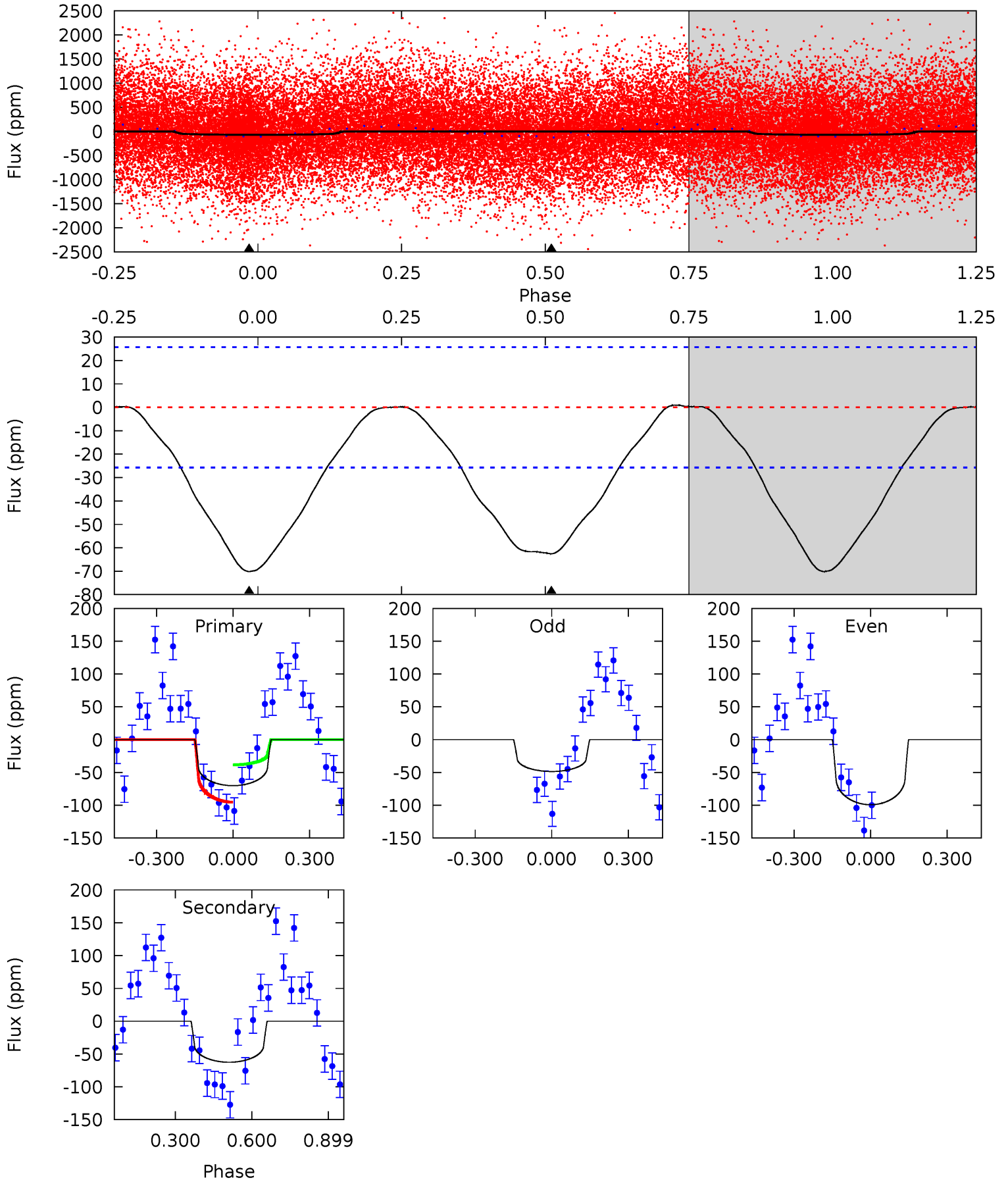
TCE 004358571-02   P= 1.400240 Days    $T_0=131.633944$  (BKJD)



# DV Model-Shift Uniqueness Test

004358571-02, P = 1.400357 Days, E = 130.235635 Days

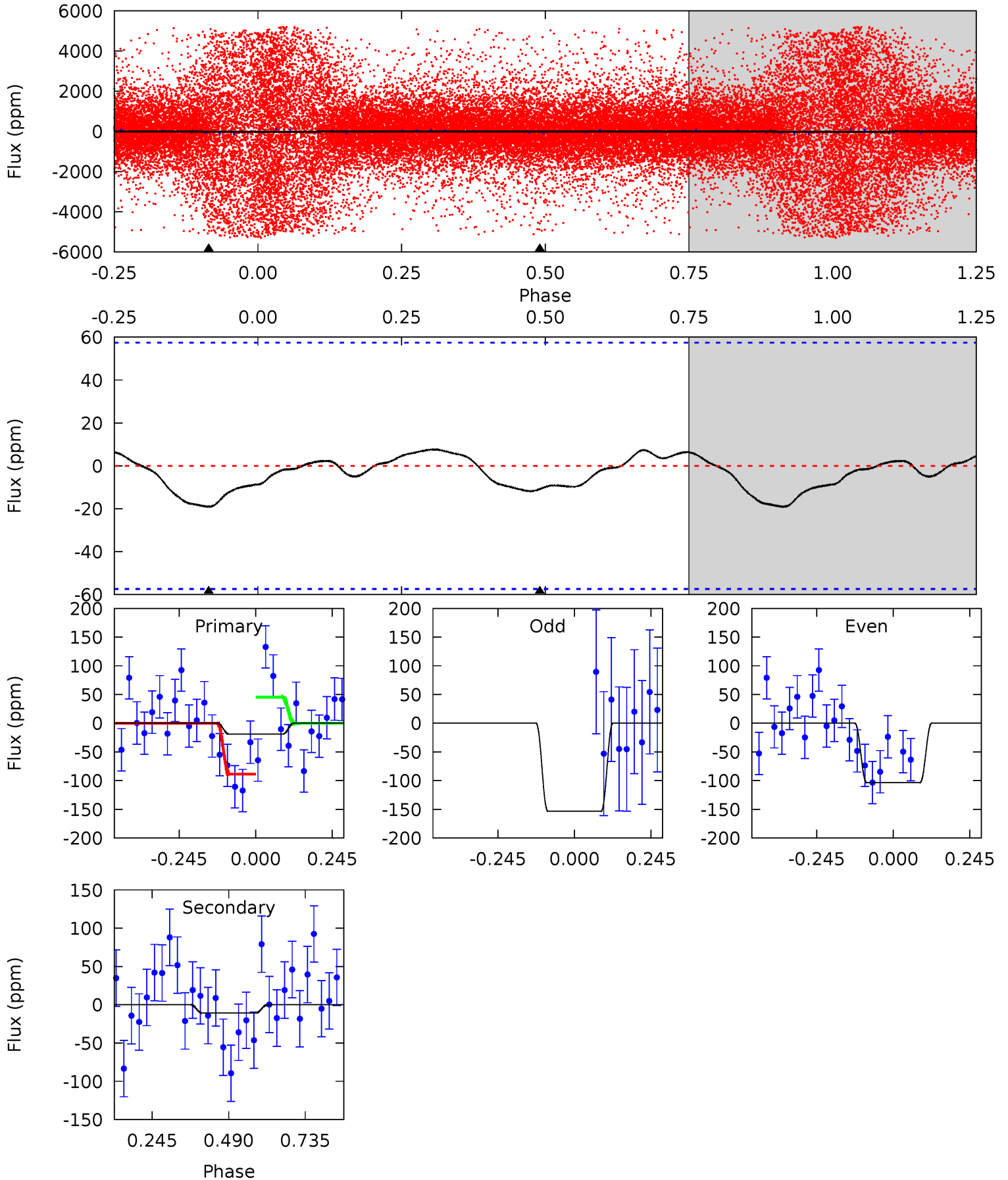
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
11.8	10.5	0	0	4.33	1.04	0.21	11.8	11.8	10.5	10.5	4.39	0.98	0.01	4.99



# Alt Model-Shift Uniqueness Test

004358571-02, P = 1.400240 Days, E = 130.233704 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
1.45	0.82	0	0	4.37	1.16	0.24	1.45	1.45	0.82	0.82	1.92	3.79	0.29	1.68



### Stellar Parameters For KIC 004358571

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M$ ( $M_{\odot}$ )	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$7153^{+175}_{-275}$	$3.992^{+0.246}_{-0.164}$	$-0.160^{+0.250}_{-0.350}$	$2.077^{+0.552}_{-0.674}$	$1.543^{+0.197}_{-0.296}$	$0.243^{+0.412}_{-0.110}$
	+2%/-4%	+6%/-4%	+156%/-219%	+27%/-32%	+13%/-19%	+170%/-45%
Source	PHO1	KIC0	KIC0	DSEP		

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

### Secondary Eclipse Parameters for KIC 004358571-02 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{\text{max}}$ (K)	$T_{\text{obs}}$ (K)	$A_{\text{obs}}$
DV	$-63 \pm 6$	$1.96^{+1.29}_{-1.10}$	$3720^{+301}_{-306}$	$6551^{+4737}_{-1455}$	$7.183^{+31.425}_{-4.655}$
Alt.	$-11 \pm 13$	$2.61^{+1.48}_{-1.30}$	$3722^{+288}_{-305}$	$3451^{+1612}_{-7209}$	$0.584^{+2.091}_{-0.719}$

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

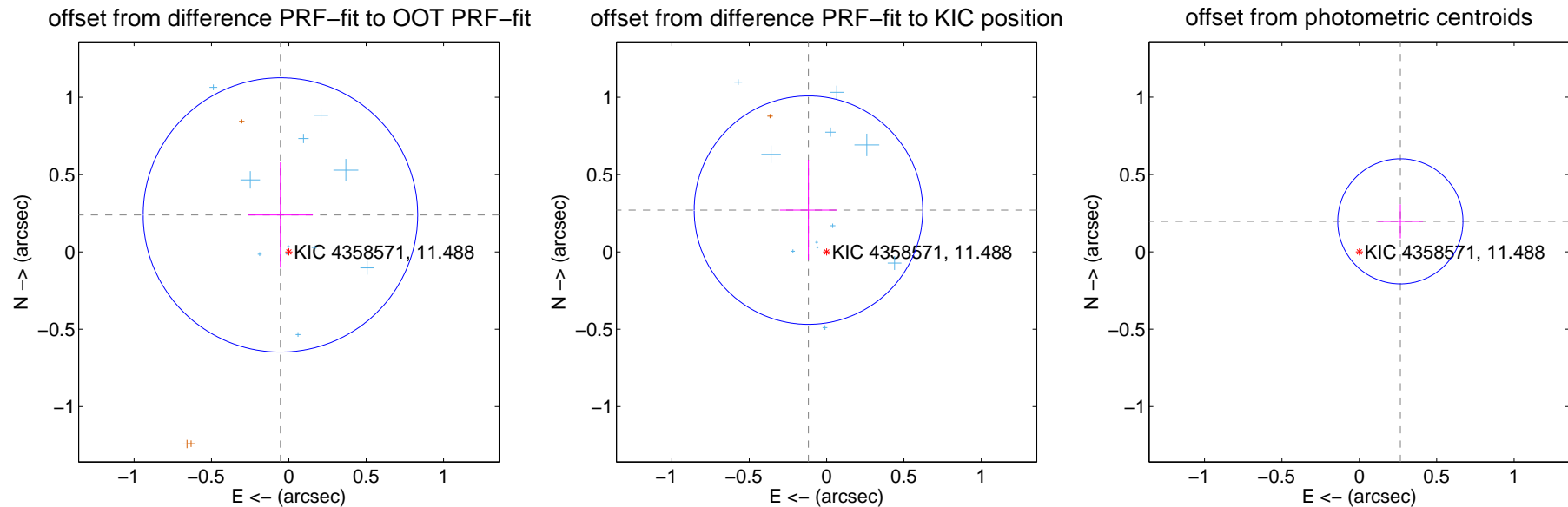
## DV Centroid Data

Supplemental centroid analysis for 004358571-02. **Kepler magnitude: 11.49.** Transit SNR 10.17

There are 13 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.37 arcsec

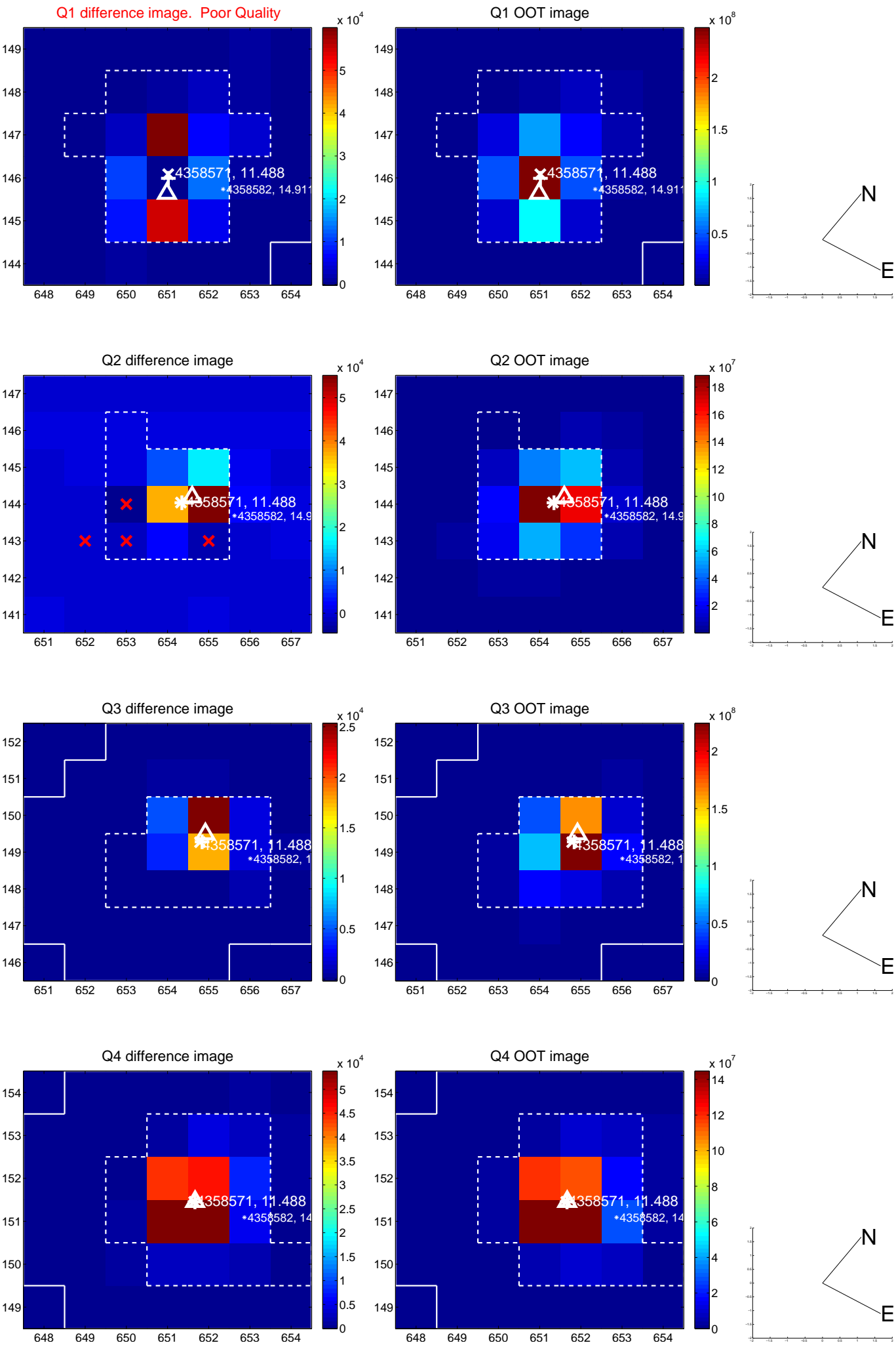
	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.245 \pm 0.296$	0.83	$0.054 \pm 0.209$	$0.239 \pm 0.341$
PRF-fit source offset from KIC position	$0.294 \pm 0.246$	1.20	$0.117 \pm 0.185$	$0.270 \pm 0.325$
photometric centroid source offset	$0.33 \pm 0.13$	2.45	$-0.27 \pm 0.15$	$0.20 \pm 0.11$



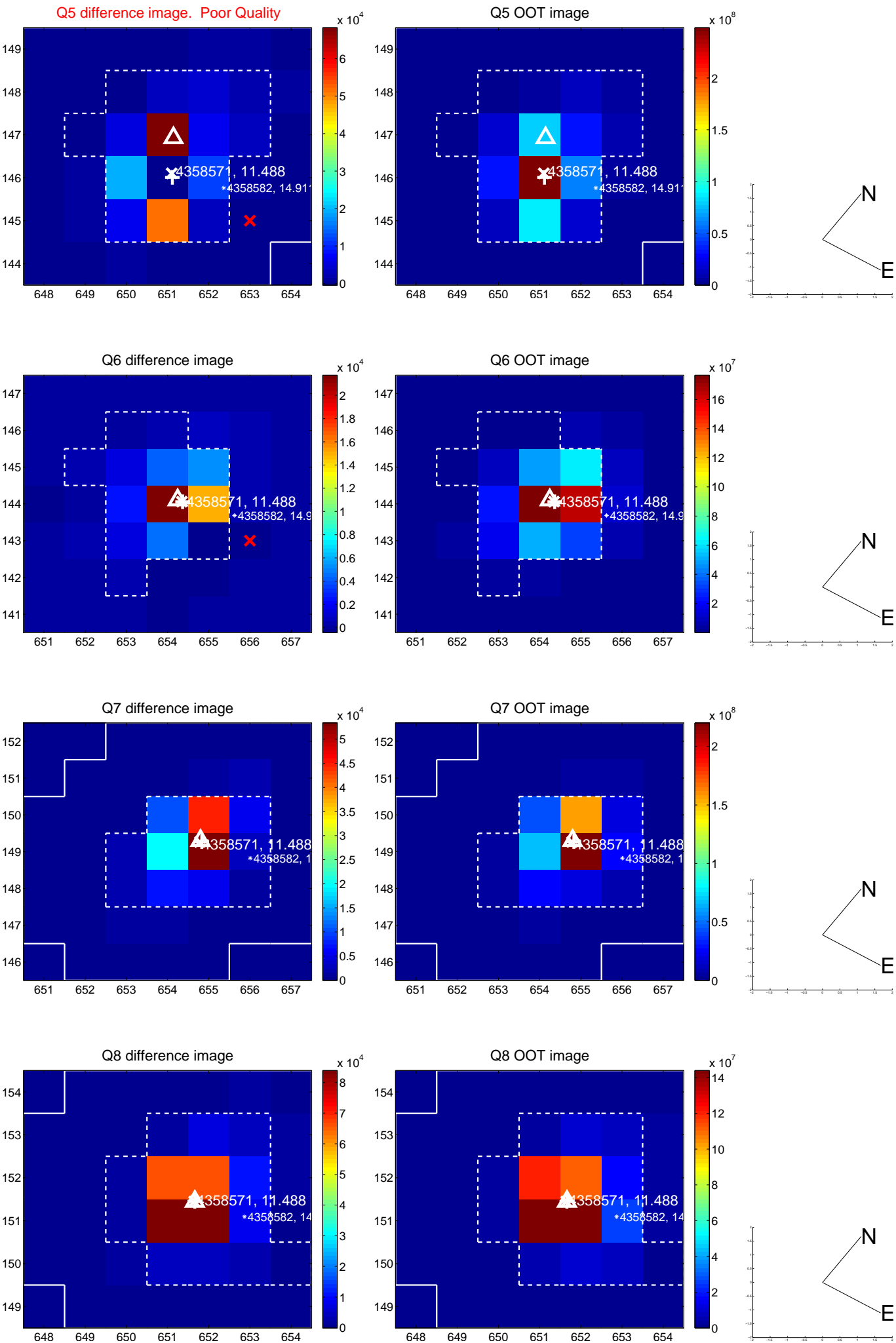
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets;** magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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



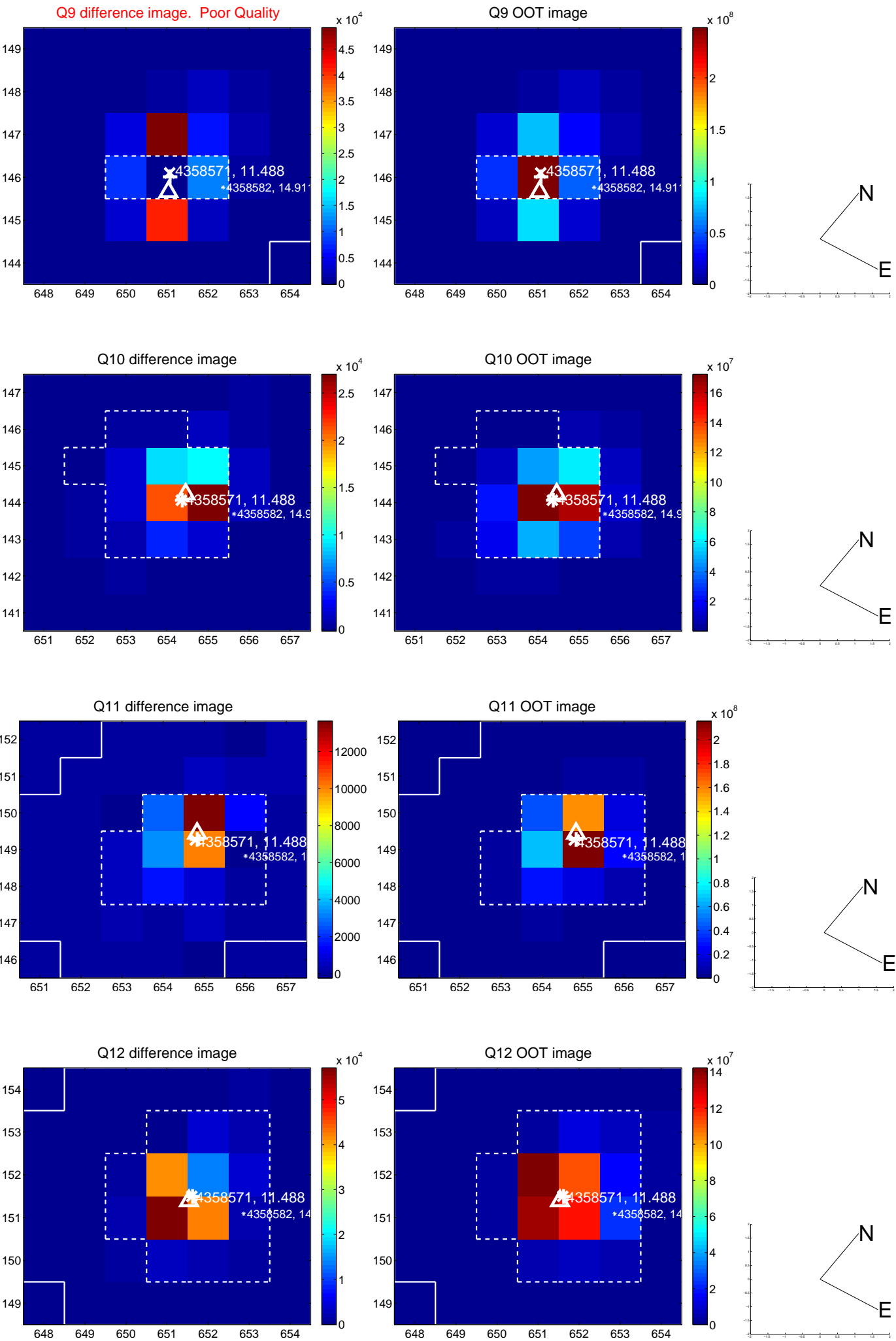
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



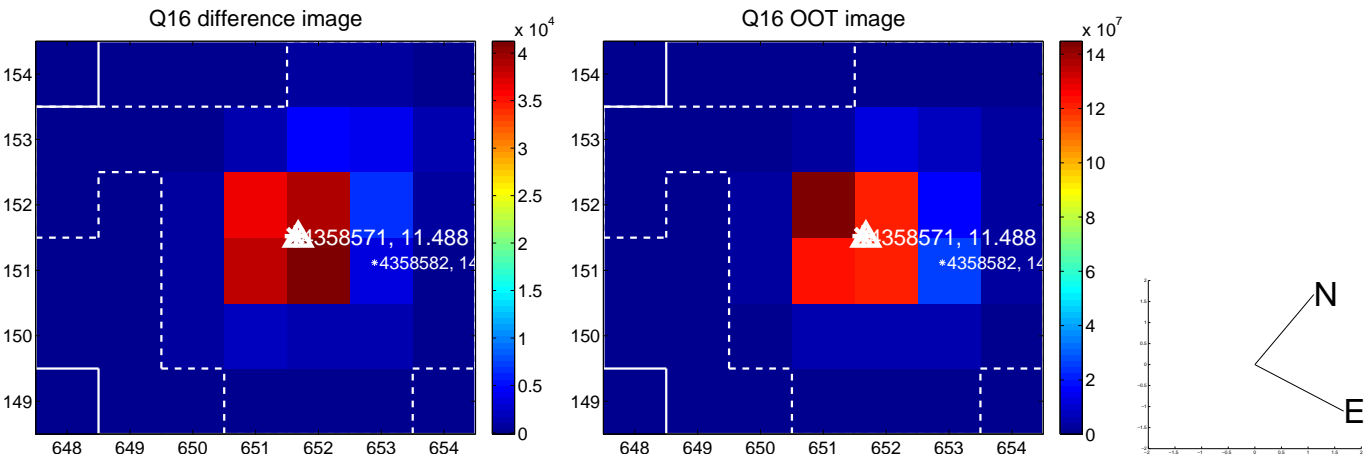
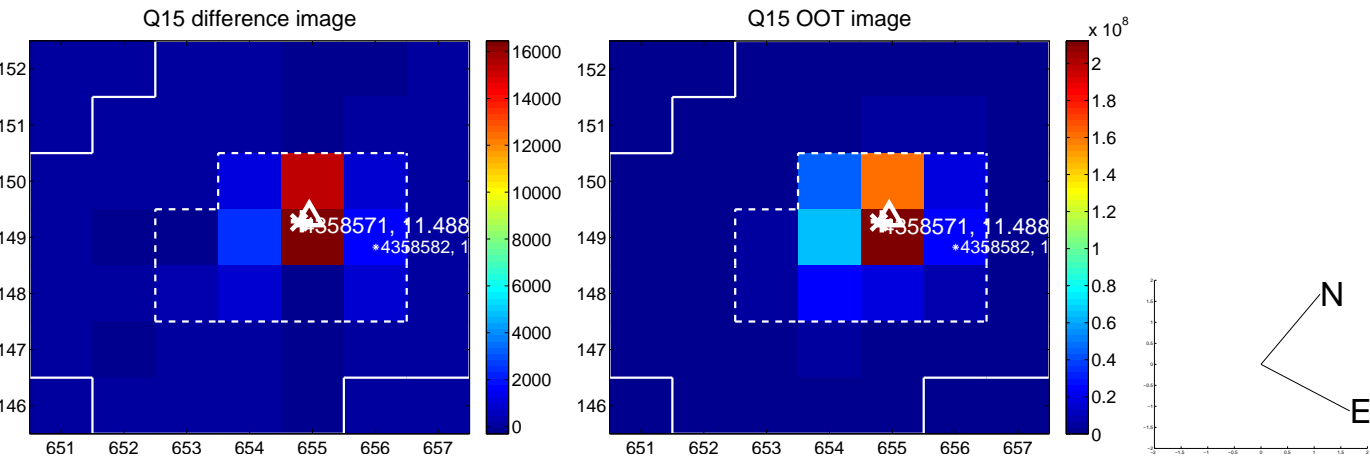
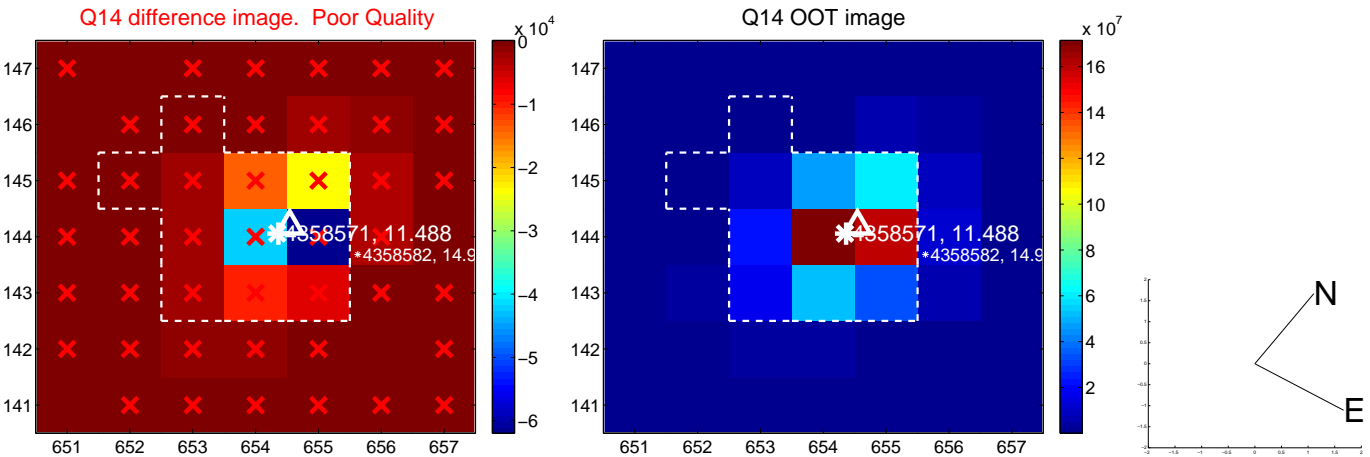
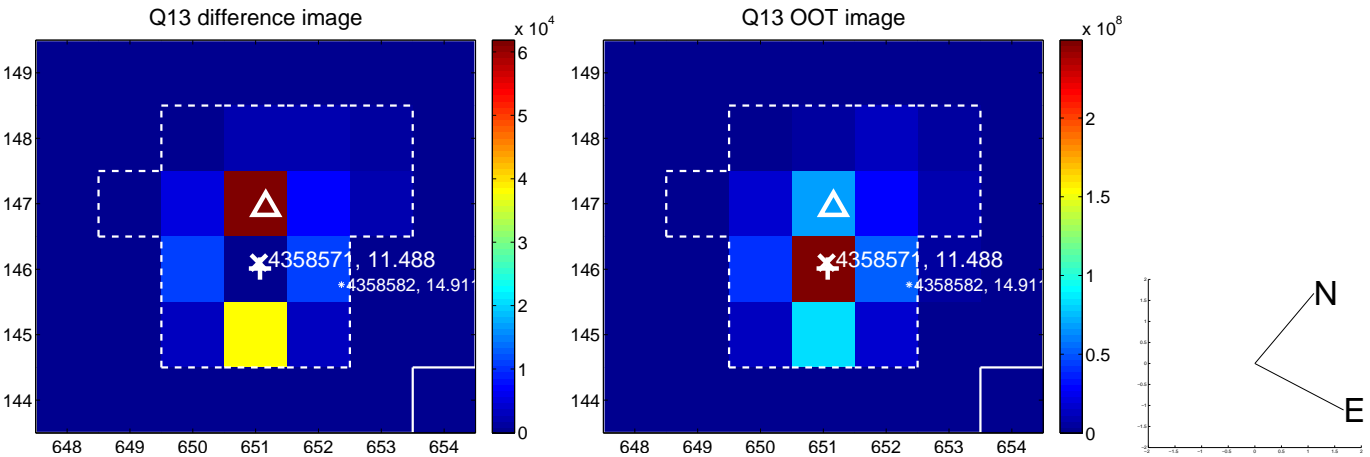
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



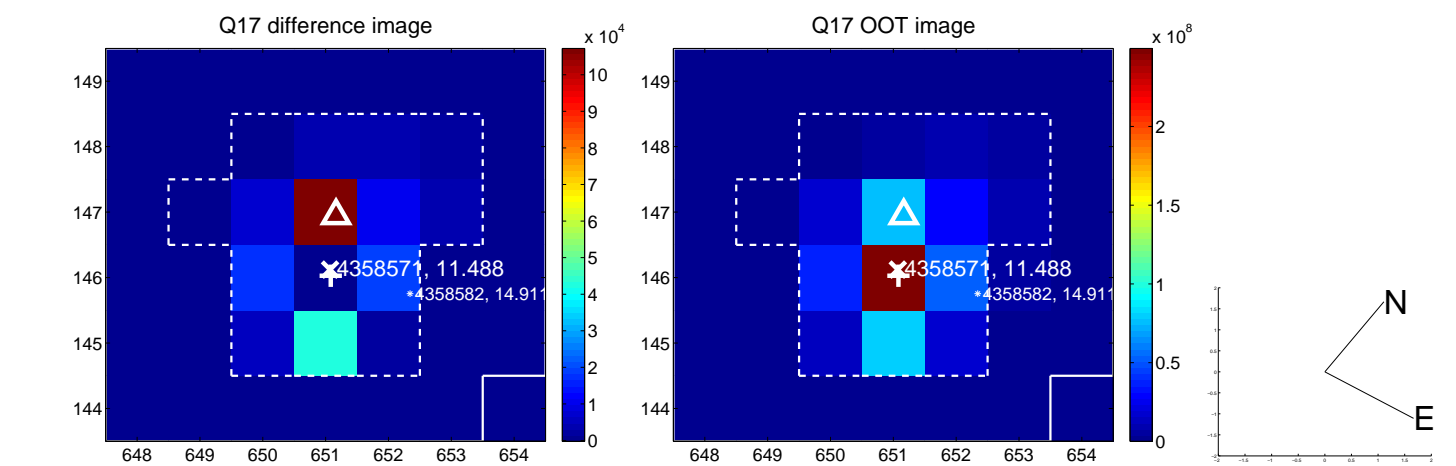
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



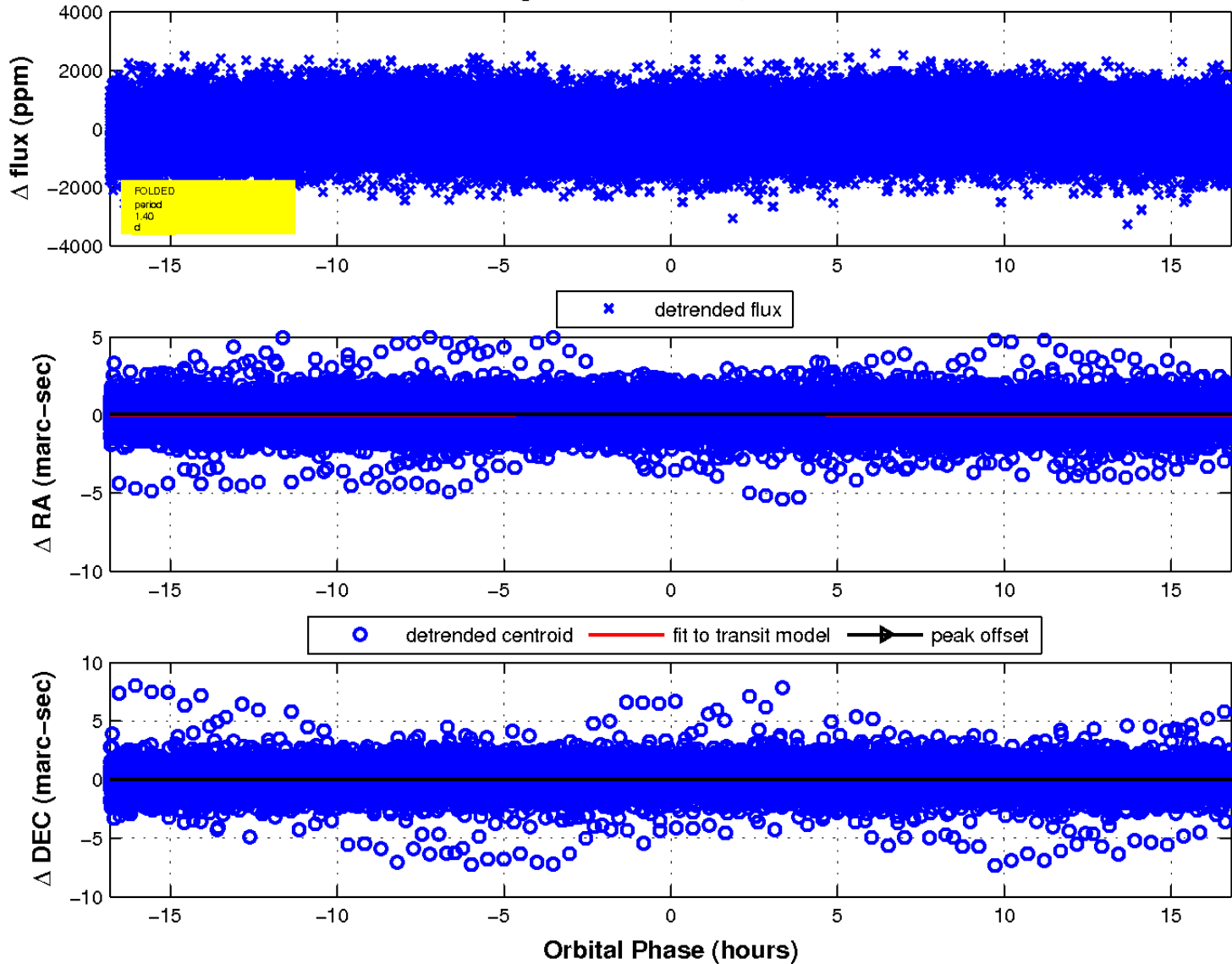
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



fluxWeightedCentroids, Planet 2 of 2





UKIRT Image

