

# KIC 002307533

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
002307533-01	OBS	No	3.760695	133.676951	76.4	12.500	8.2	-1.0	2.88	7082	2.53	5925.92
002307533-02	OBS	No	444.797708	172.176211	123.5	1.680	17.6	2.5	2.88	7082	3.91	10.21
002307533-03	OBS	No	444.810634	172.796707	299.7	6.178	16.0	9.4	2.88	7082	5.82	10.21
002307533-04	OBS	No	0.537489	131.981218	25.6	6.450	9.9	16.3	2.88	7082	1.47	79302.53

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
002307533-01	OBS	FP	0.00	1	0	0	0	SWEET_NTL—LPP_DV—CENT_NOFITS
002307533-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL_TRACKER—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV— MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
002307533-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL_TRACKER—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT— INCONSISTENT_TRANS—SAME_NTL_PERIOD
002307533-04	OBS	FP	0.00	1	0	0	0	LPP_DV—CENT_FEW_DIFFS

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

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

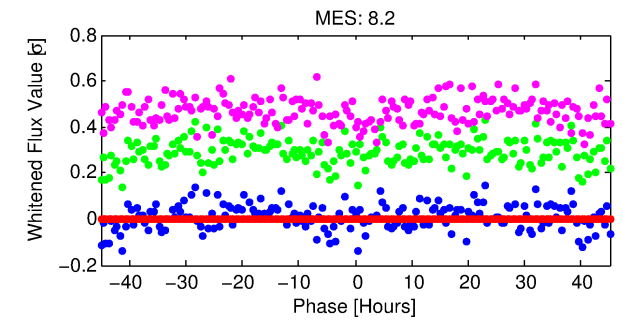
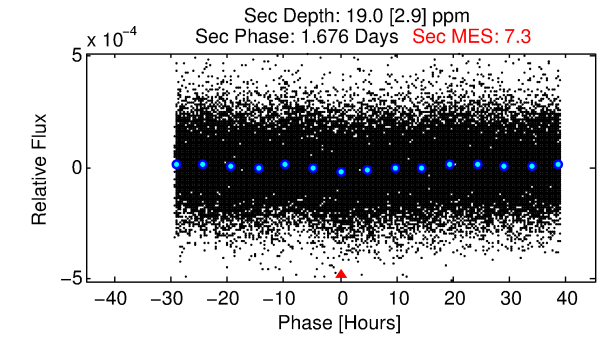
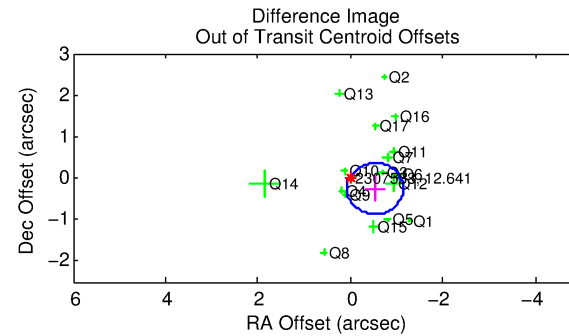
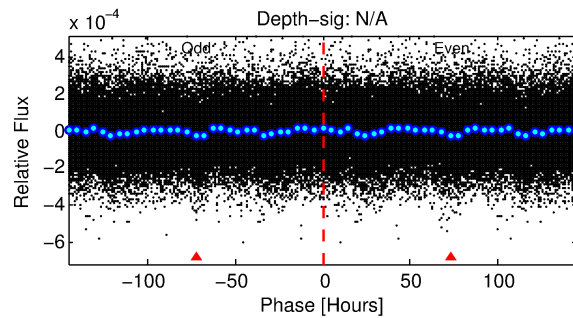
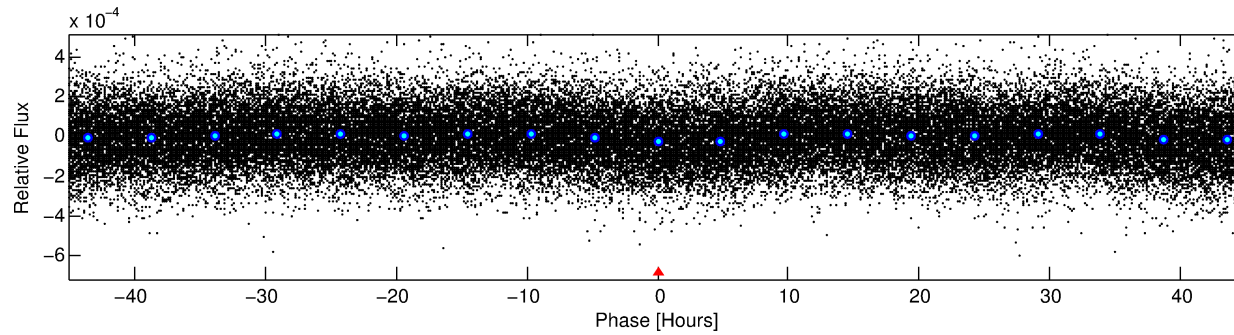
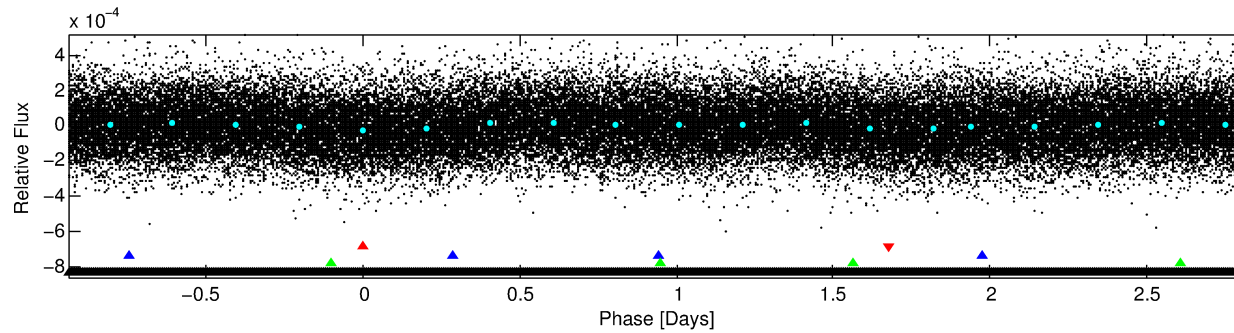
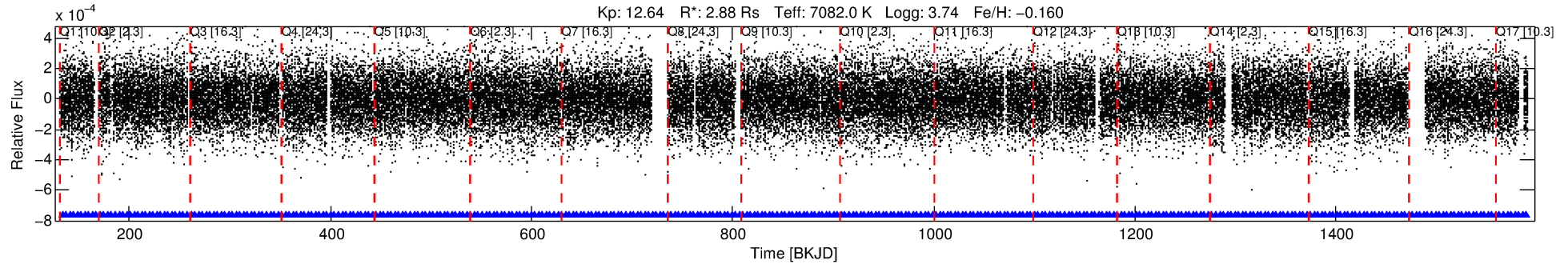
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 002307533-01

No Significant Match Found

# DV One-Page Summary

KIC: 2307533 Candidate: 1 of 4 Period: 3.761 d



## TPS TCE Results:

Period = 3.76070 d  
Epoch = 133.6770 BKJD

DV fit results are unavailable

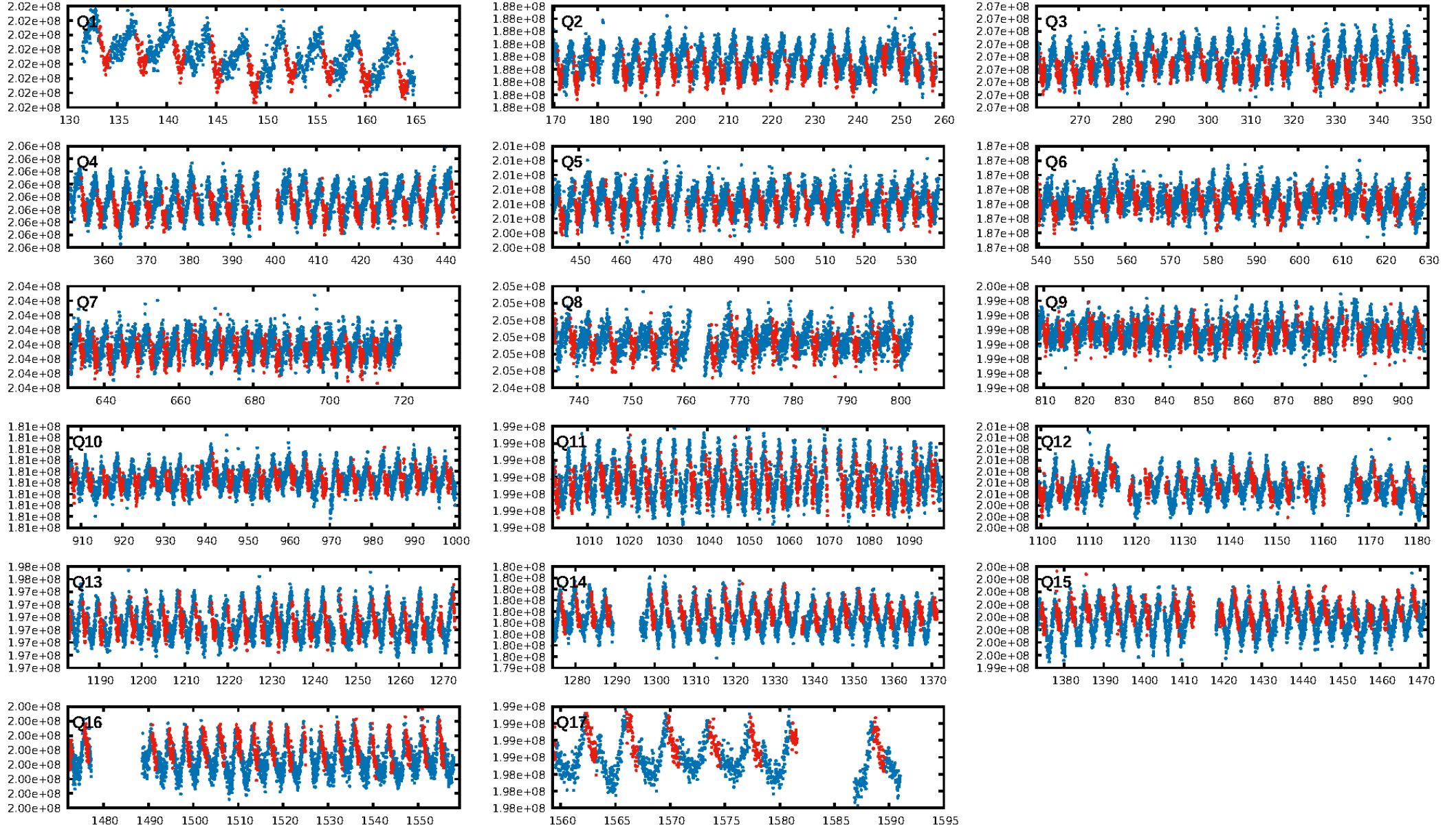
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [5.50σ]  
LongPeriod-sig: 100.0% [839.24σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [351/351]  
GhostDiagnostic-chr: 1.344  
Centroid-sig: 1.0%  
Centroid-so: 0.383 arcsec [3.47σ]  
OotOffset-rm: 0.583 arcsec [2.86σ]  
KicOffset-rm: 0.494 arcsec [2.73σ]  
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]

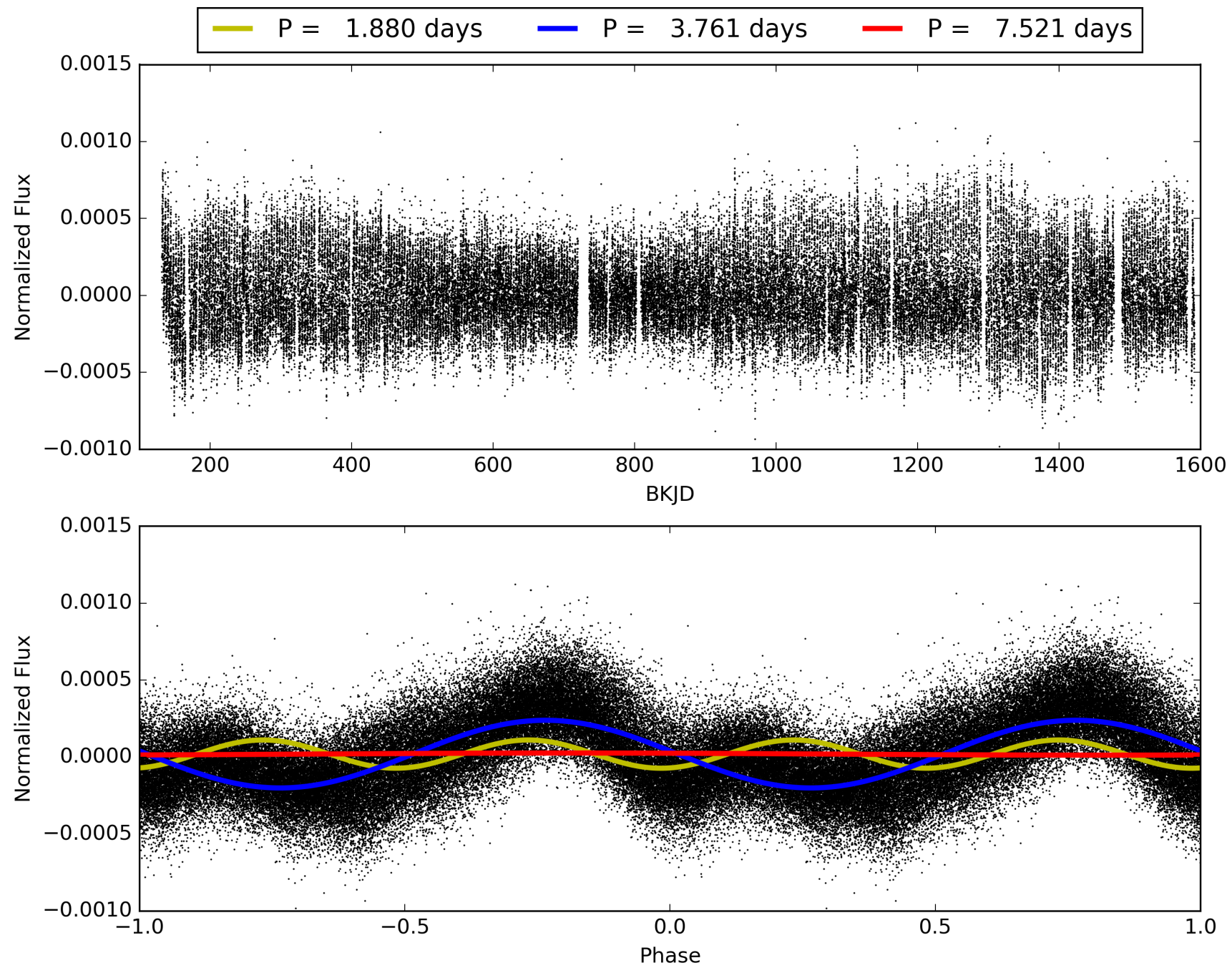
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 16:25:03 Z

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

# TCE 002307533-01, PDC Light Curves



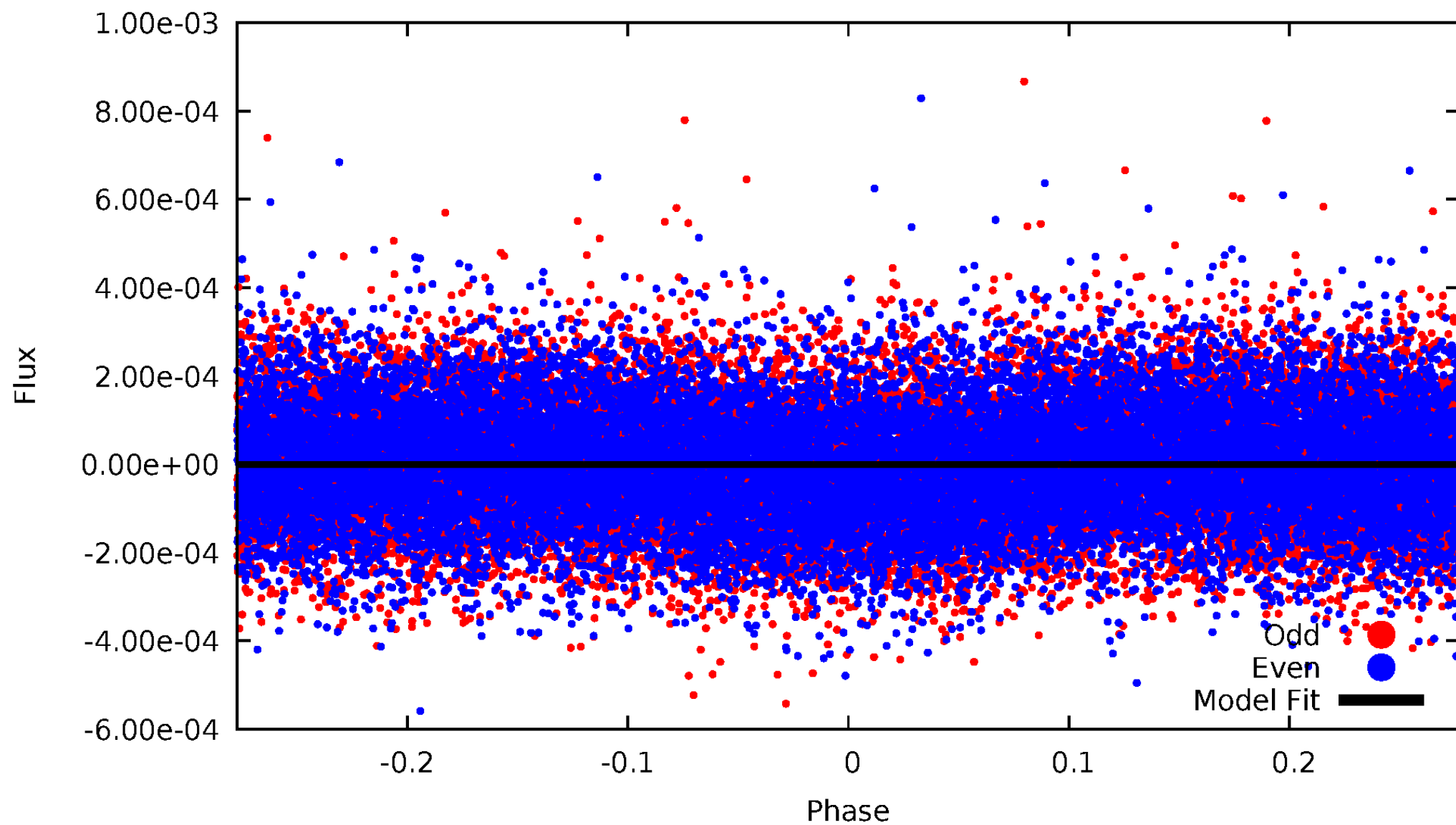
TCE 002307533-01





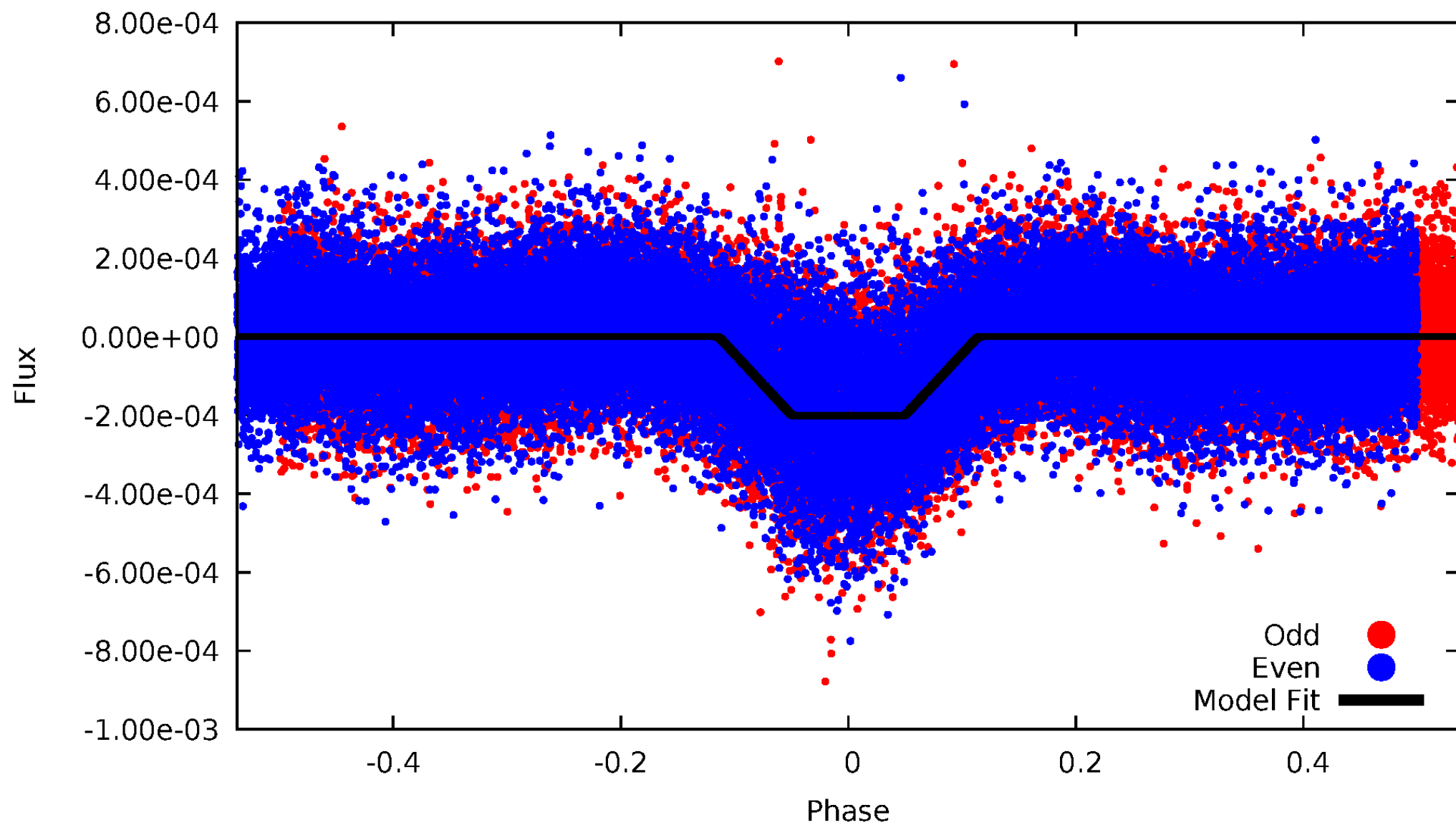
# DV Odd/Even

TCE 002307533-01

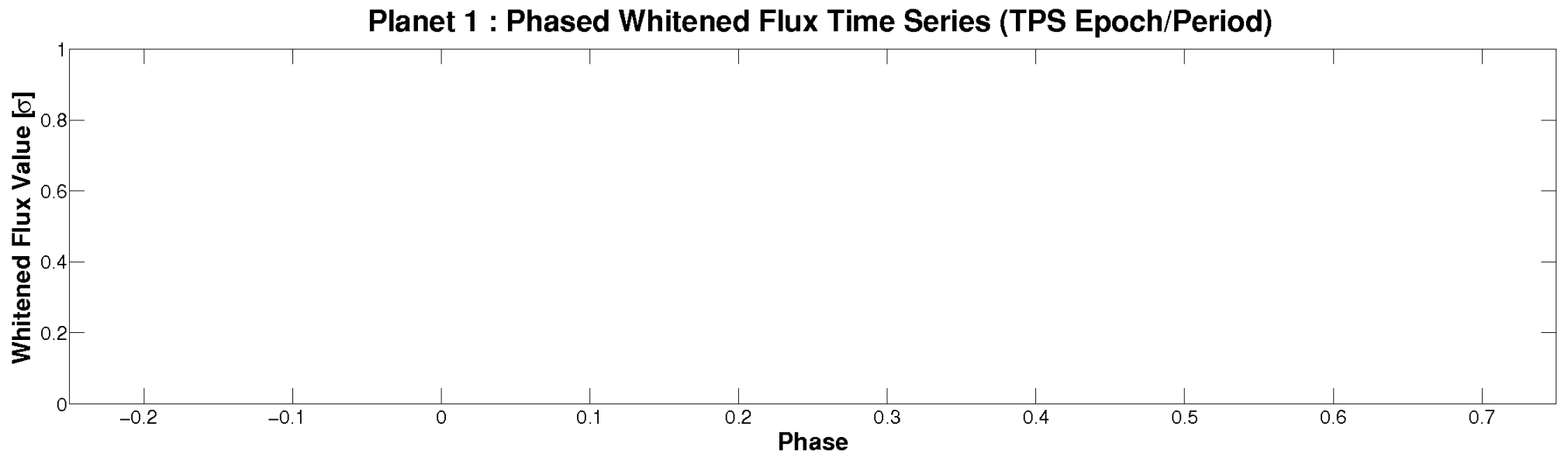
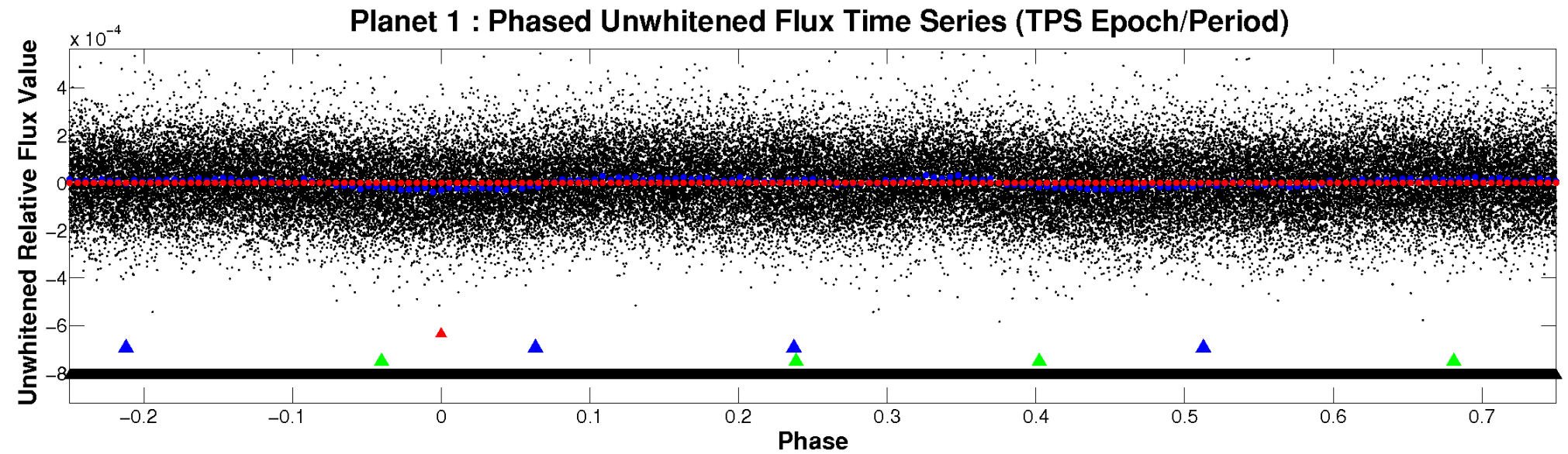


# ALT Odd/Even

TCE 002307533-01

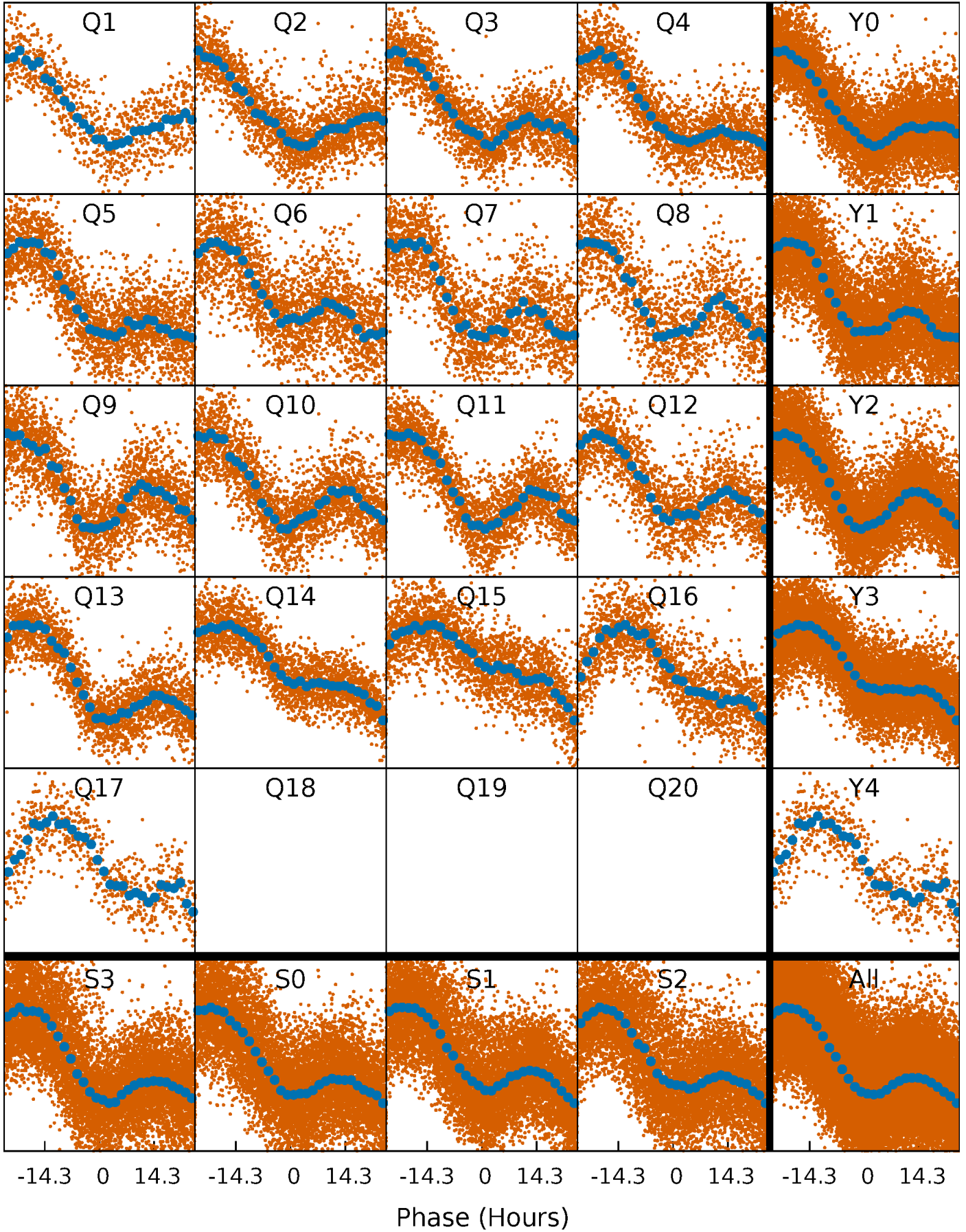


# Non-Whitened Vs. Whitened Light Curve



# PDC Quarter-Phased Transit Curves

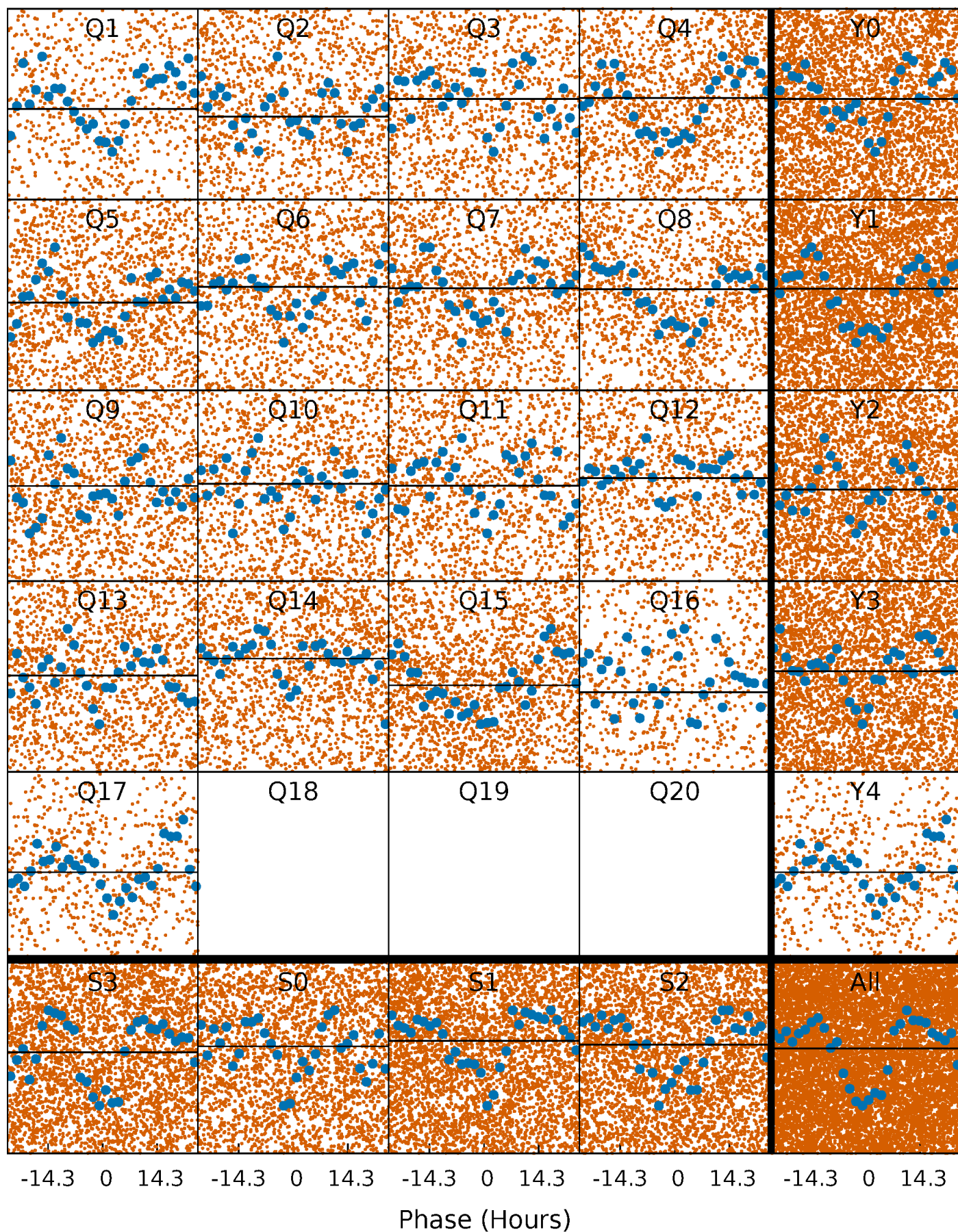
TCE 002307533-01 P= 3.760695 Days  $T_0=133.676951$  (BKJD)





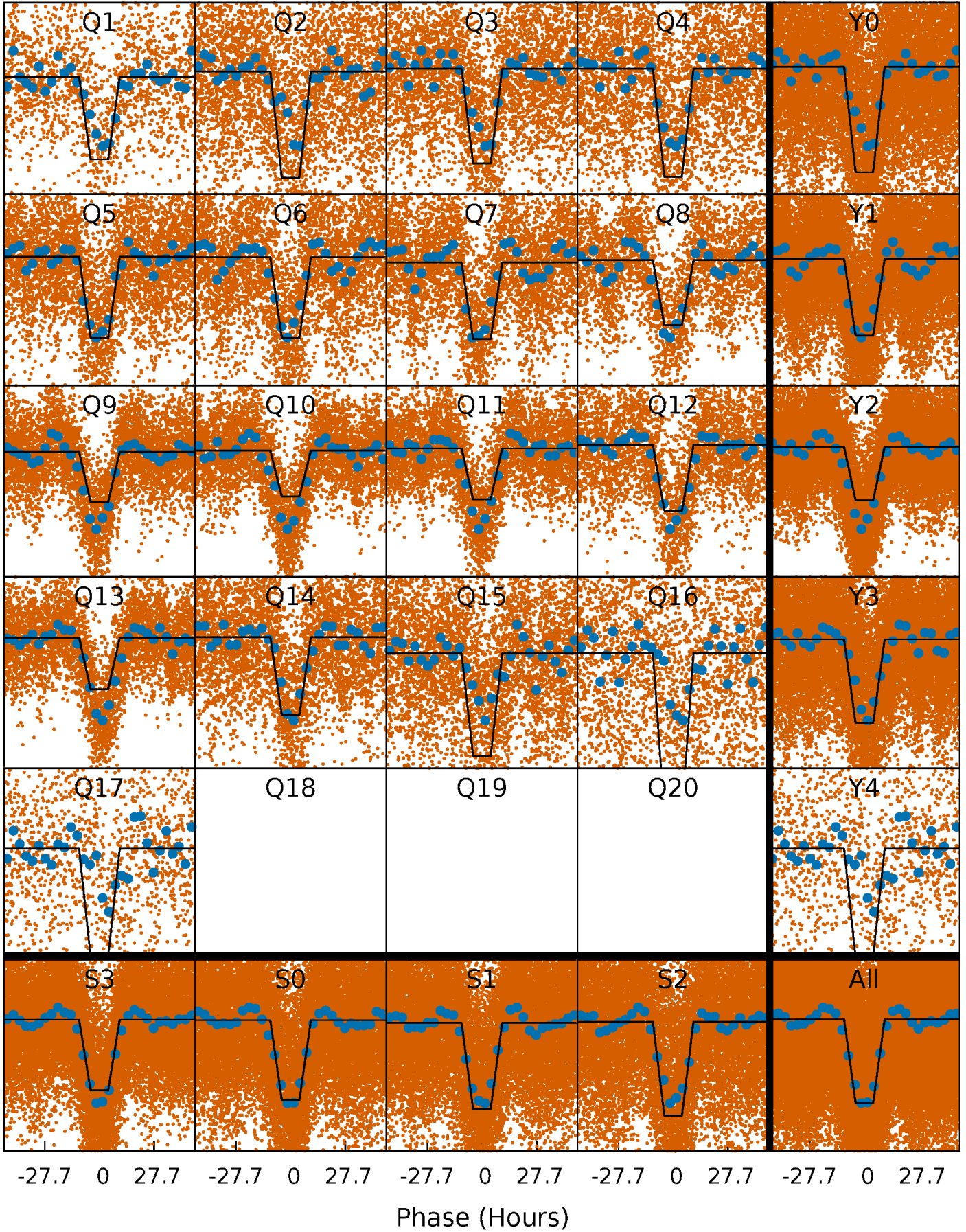
# DV Quarter-Phased Transit Curves

TCE 002307533-01 P= 3.760695 Days  $T_0=133.676951$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 002307533-01 P= 3.760695 Days  $T_0=133.628115$  (BKJD)

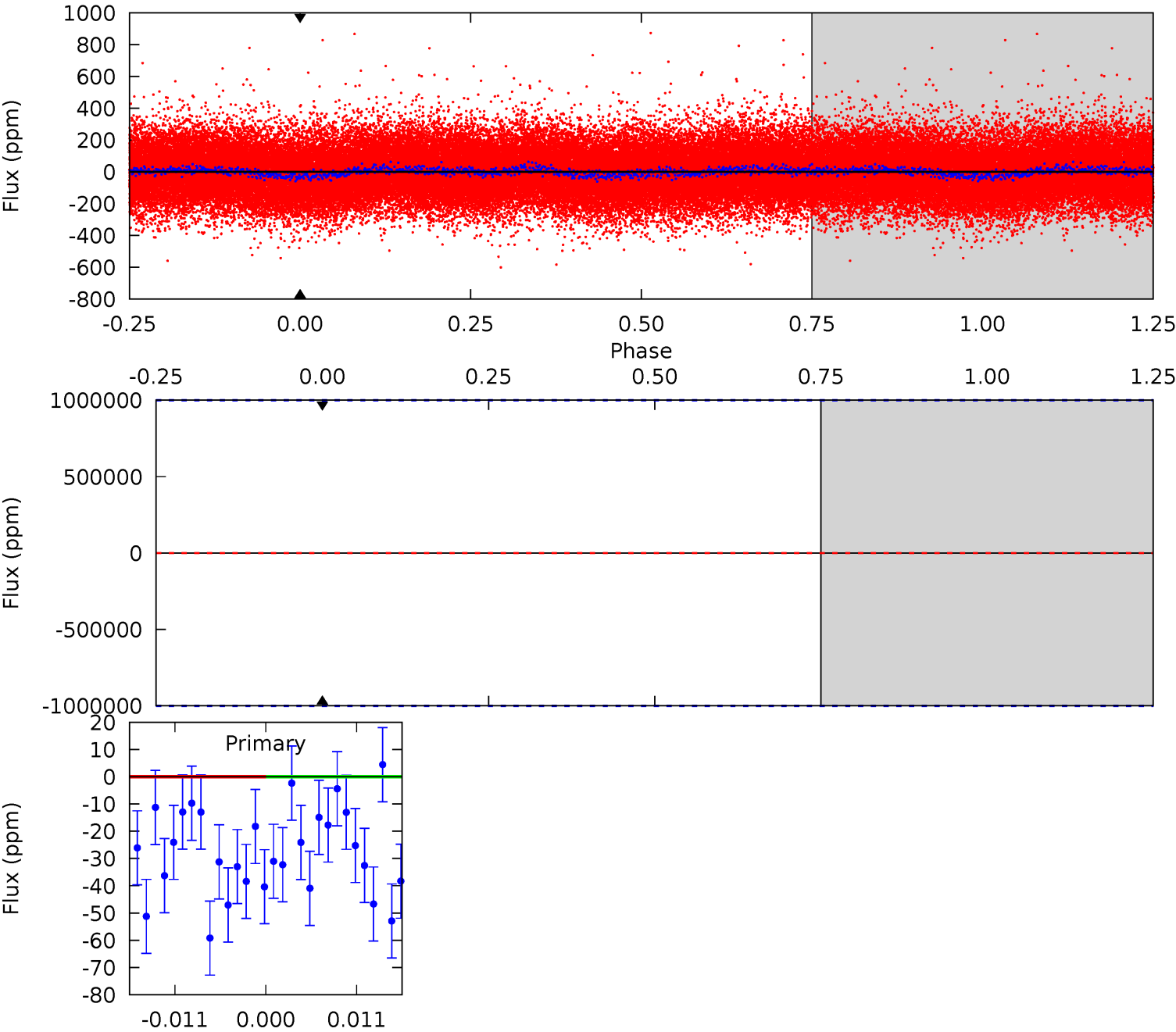




DV Model-Shift Uniqueness Test

002307533-01, P = 3.760695 Days, E = 129.916256 Days

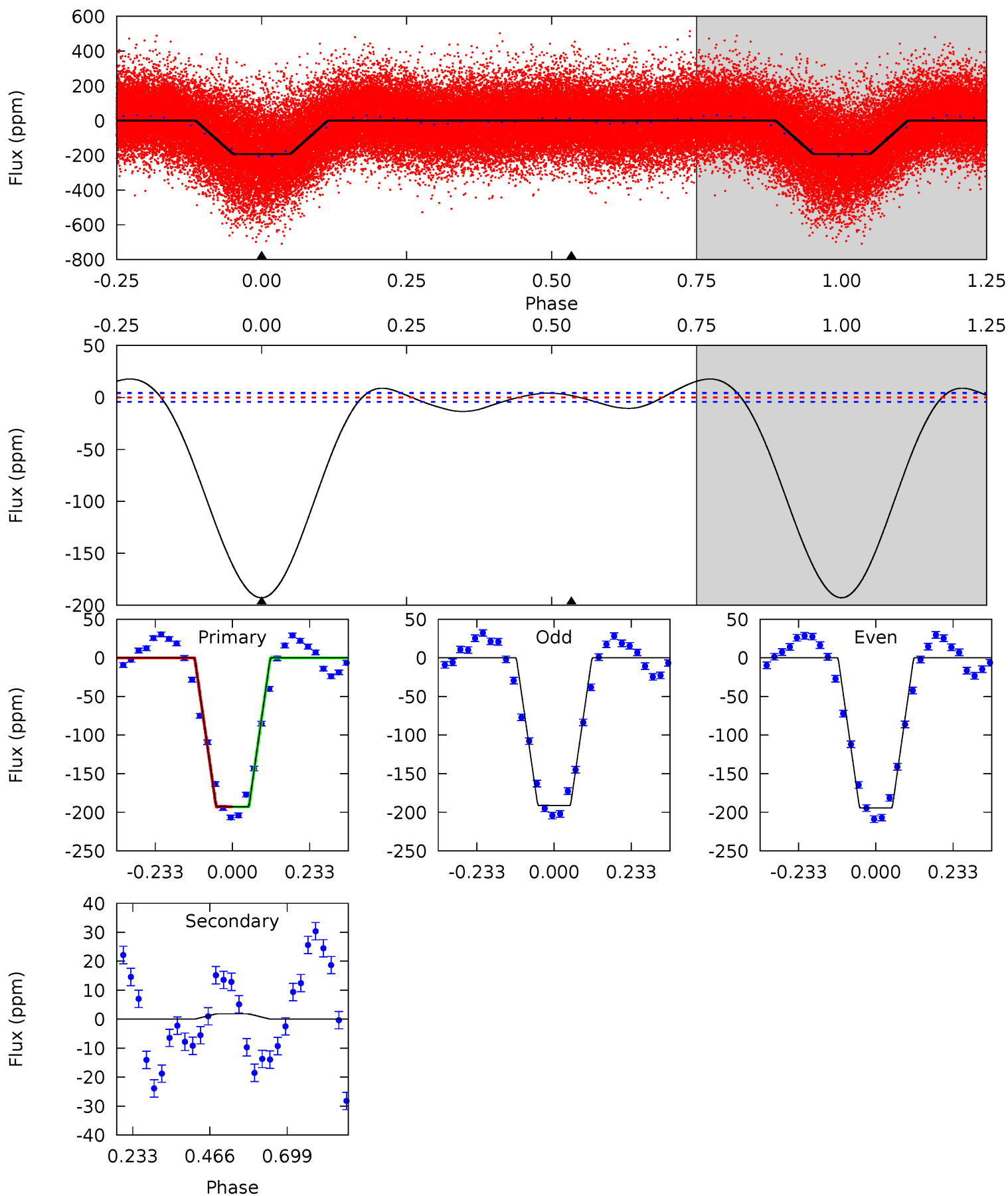
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
0	0	0	0	1.00	1.00	1.00	0	0	0	0	0	0	0	0



# Alt Model-Shift Uniqueness Test

002307533-01, P = 3.760695 Days, E = 129.867420 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
197.0	-1.87	0	0	4.38	1.19	8.71	197.0	197.0	-1.87	-1.87	1.63	1.04	0.08	0.06





### Stellar Parameters For KIC 002307533

	$T_{\text{eff}}(K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$7082^{+190}_{-253}$	$3.742^{+0.288}_{-0.072}$	$-0.160^{+0.250}_{-0.300}$	$2.880^{+0.428}_{-0.927}$	$1.669^{+0.197}_{-0.295}$	$0.098^{+0.180}_{-0.029}$
	+3%/-4%	+8%/-2%	+156%/-188%	+15%/-32%	+12%/-18%	+183%/-29%
Source	PHO1	FLK73	KIC0	DSEP		

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

### Secondary Eclipse Parameters for KIC 002307533-01 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$0 \pm 1000000$	$21.22^{+21.43}_{-15.07}$	$3043^{+172}_{-250}$	$3682^{+32124}_{-37867}$	$1.023^{+712.683}_{-693.438}$
Alt.	$2 \pm 1$	$19.69^{+22.51}_{-13.49}$	$3045^{+180}_{-253}$	$-3145^{+151}_{-130}$	$-0.008^{+0.006}_{-0.065}$

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

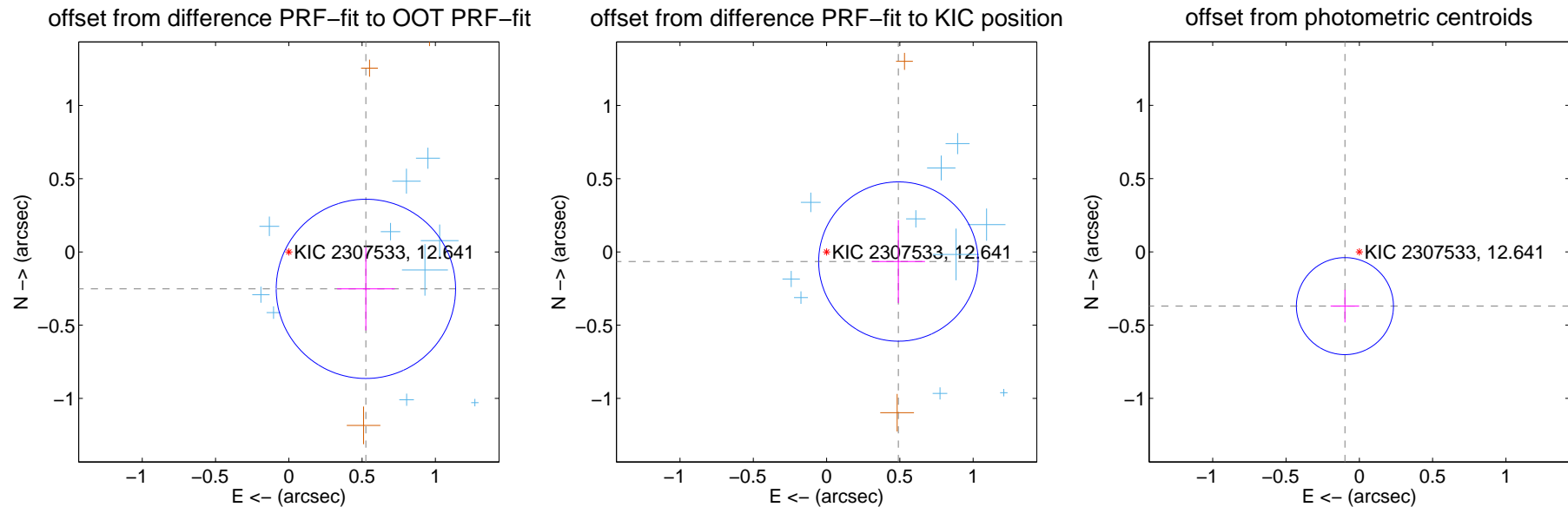
## DV Centroid Data

Supplemental centroid analysis for 002307533-01. Kepler magnitude: 12.64. Transit SNR -1.00

There are 13 quarters with good PRF difference image offsets

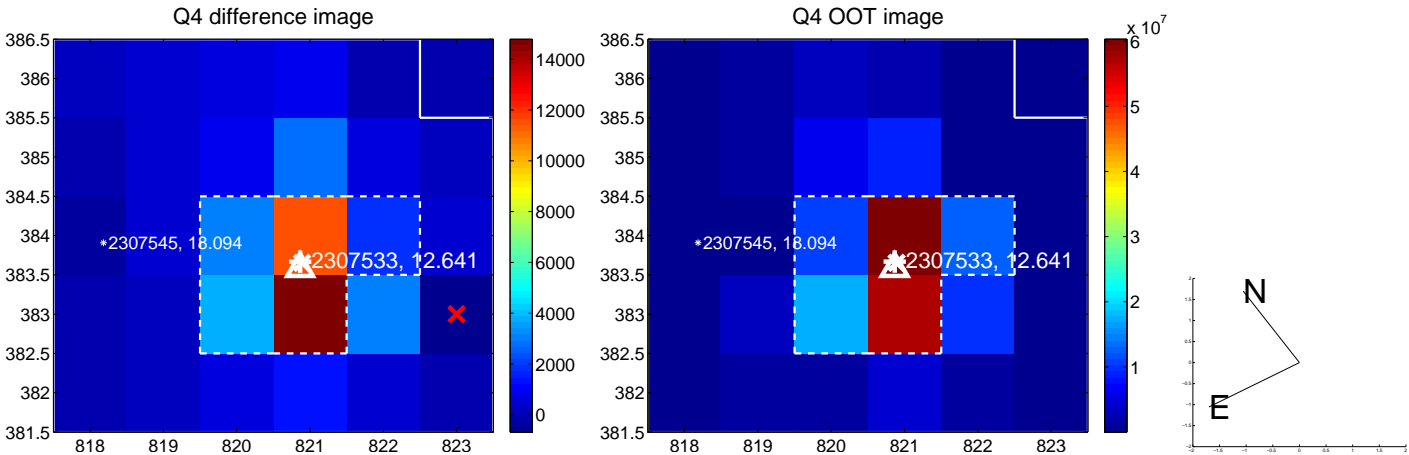
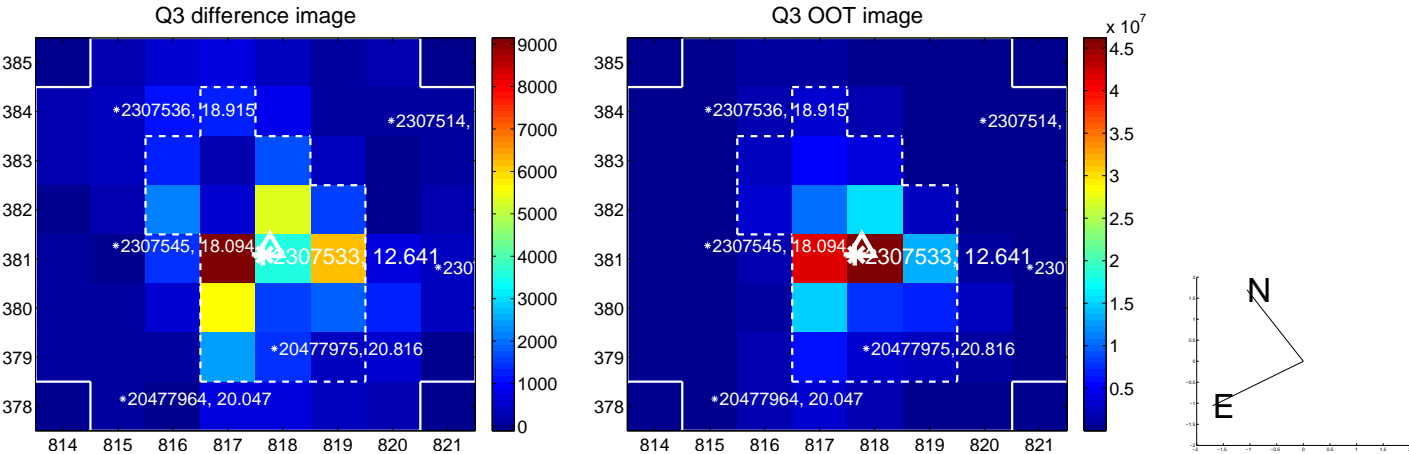
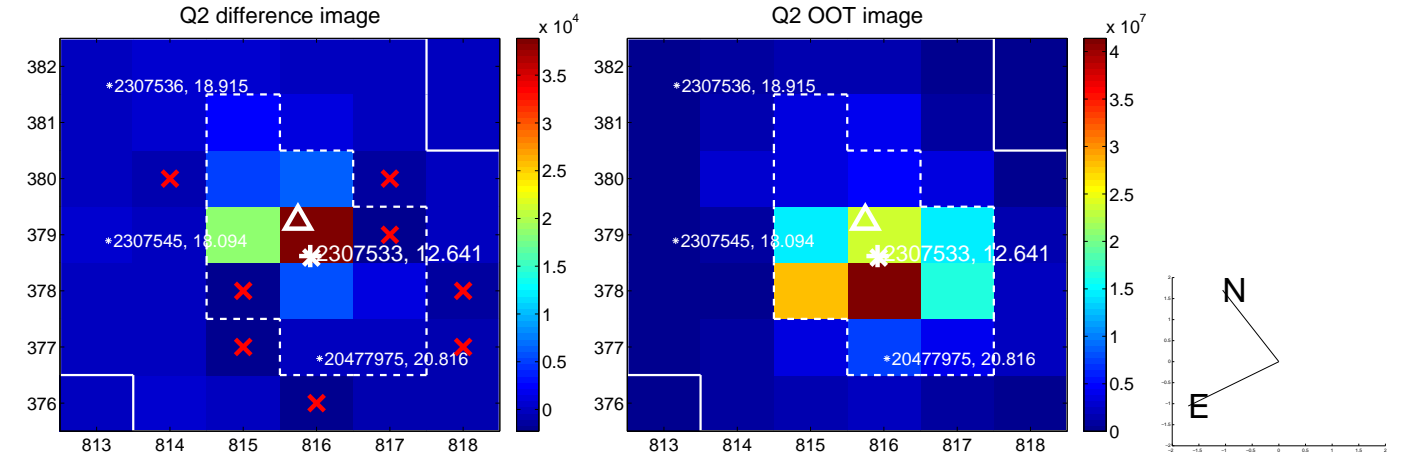
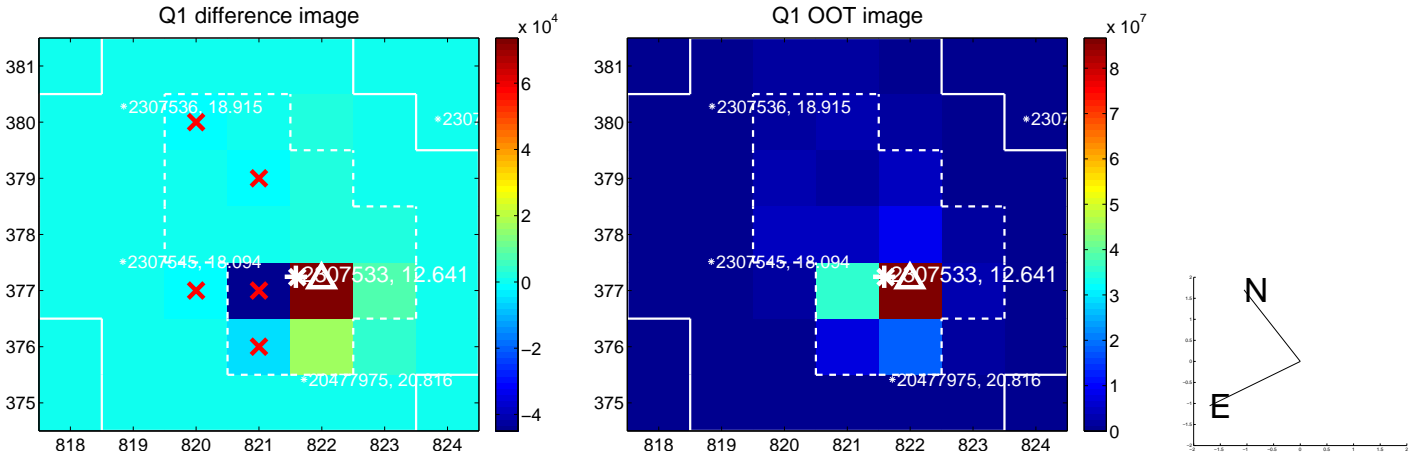
The direct PRF centroid is offset from the target star catalog position by about 0.05 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.583 \pm 0.204$	2.86	$-0.526 \pm 0.196$	$-0.252 \pm 0.283$
PRF-fit source offset from KIC position	$0.494 \pm 0.181$	2.73	$-0.490 \pm 0.182$	$-0.066 \pm 0.283$
photometric centroid source offset	$0.38 \pm 0.11$	3.47	$0.10 \pm 0.10$	$-0.37 \pm 0.11$

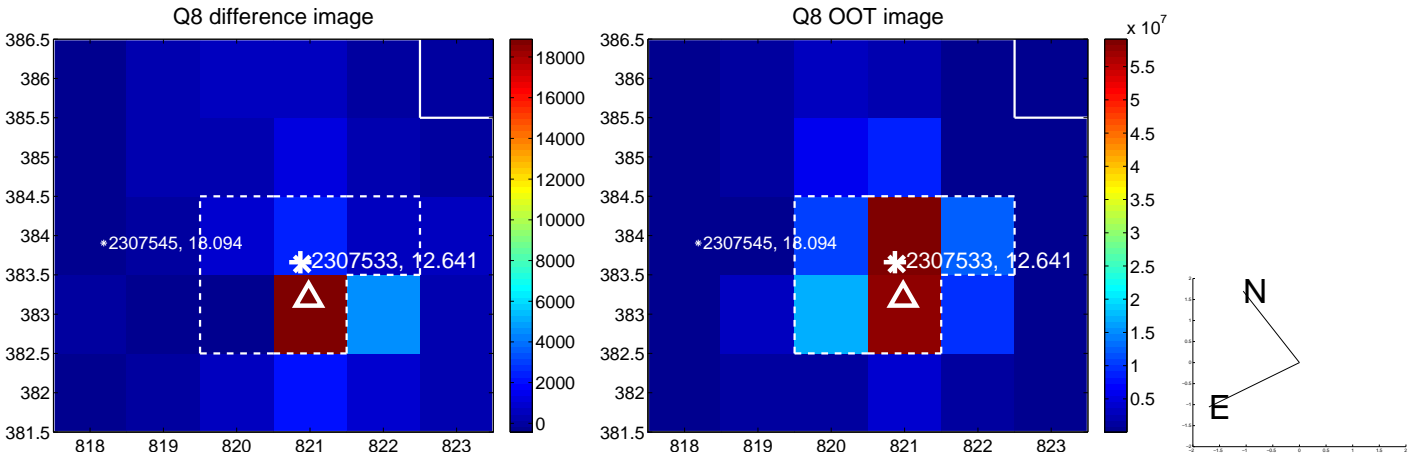
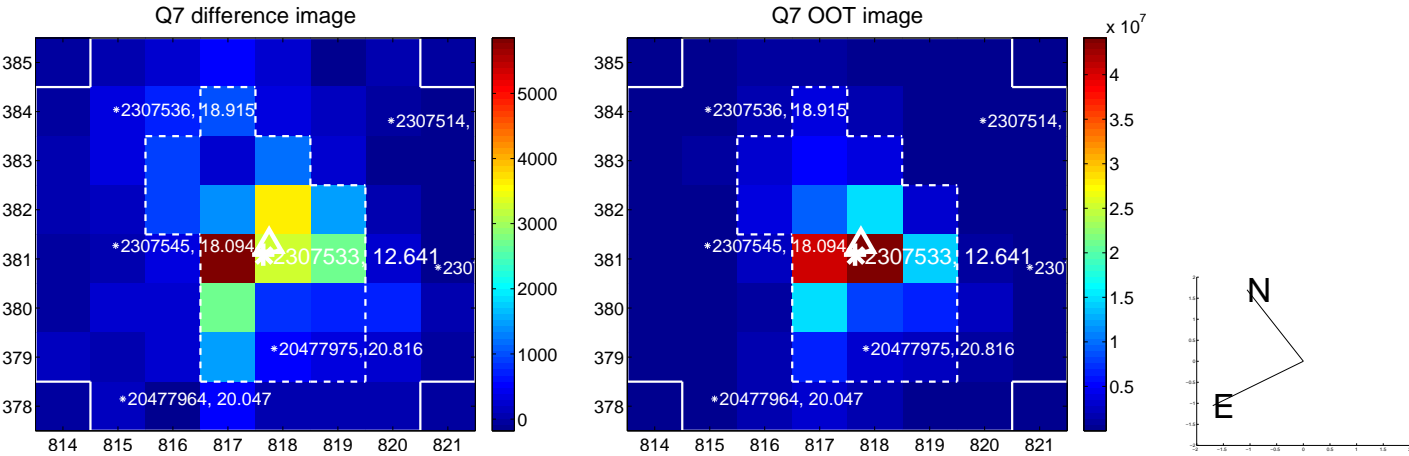
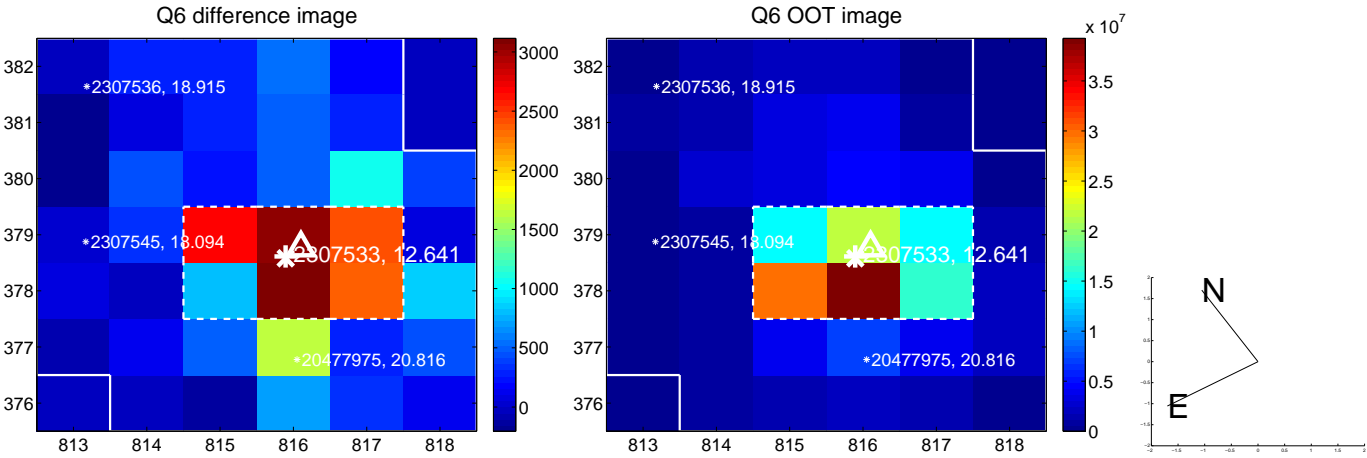
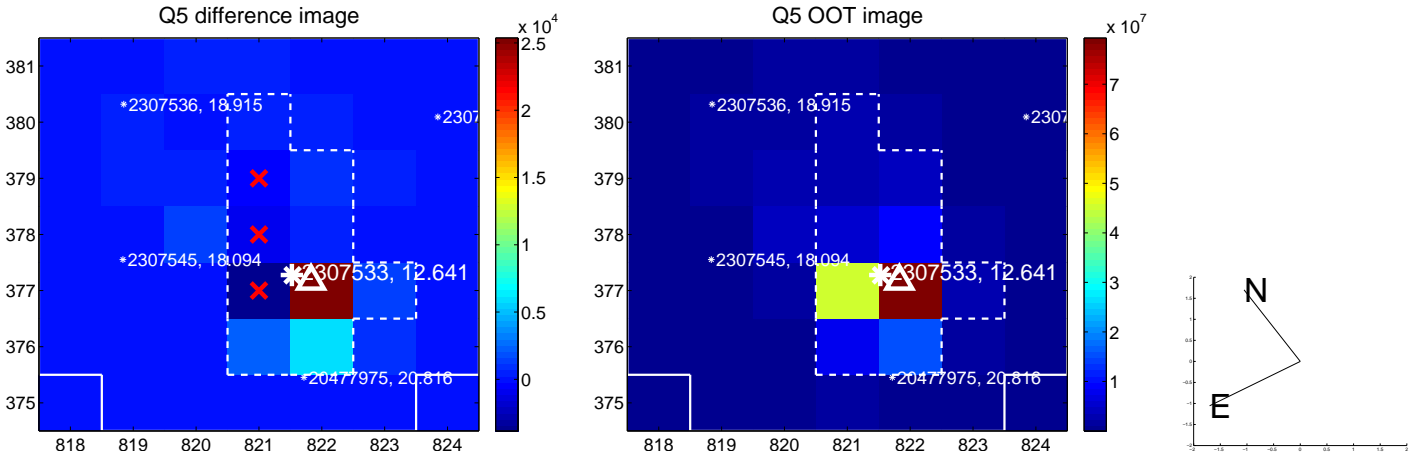


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets**; **Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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



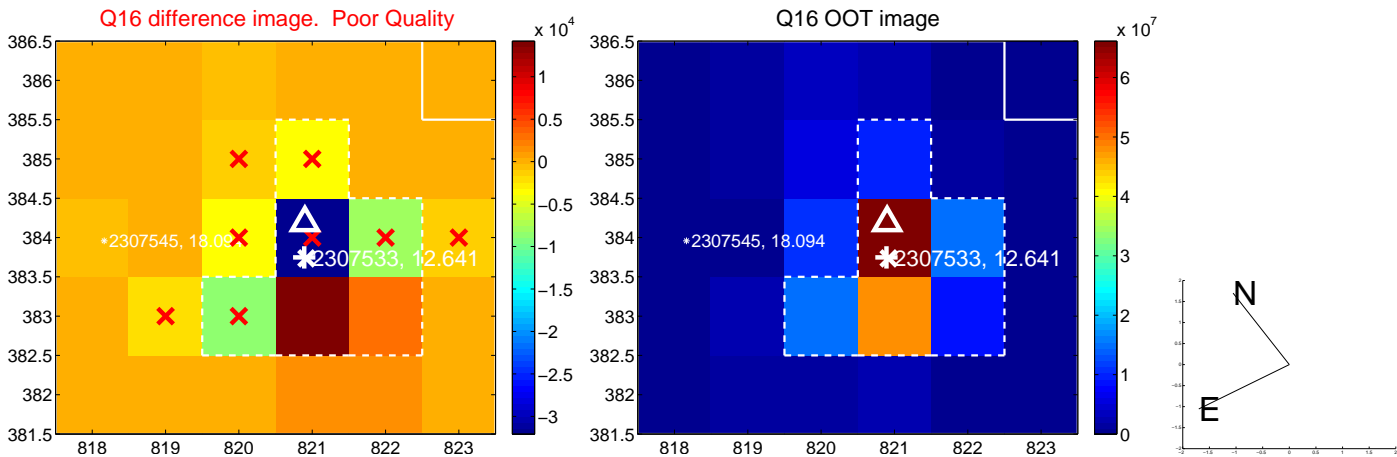
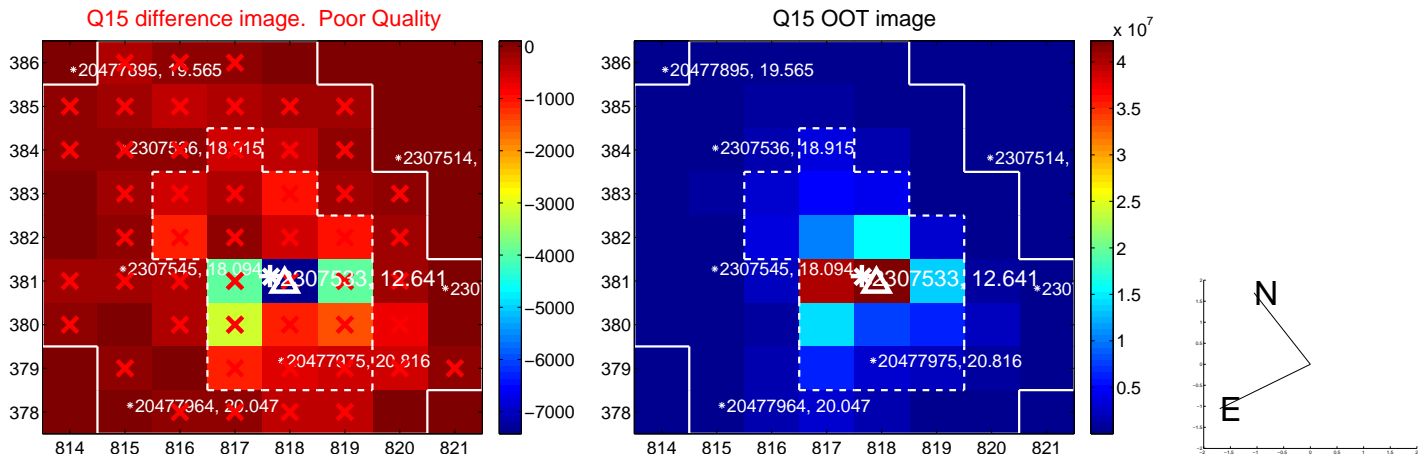
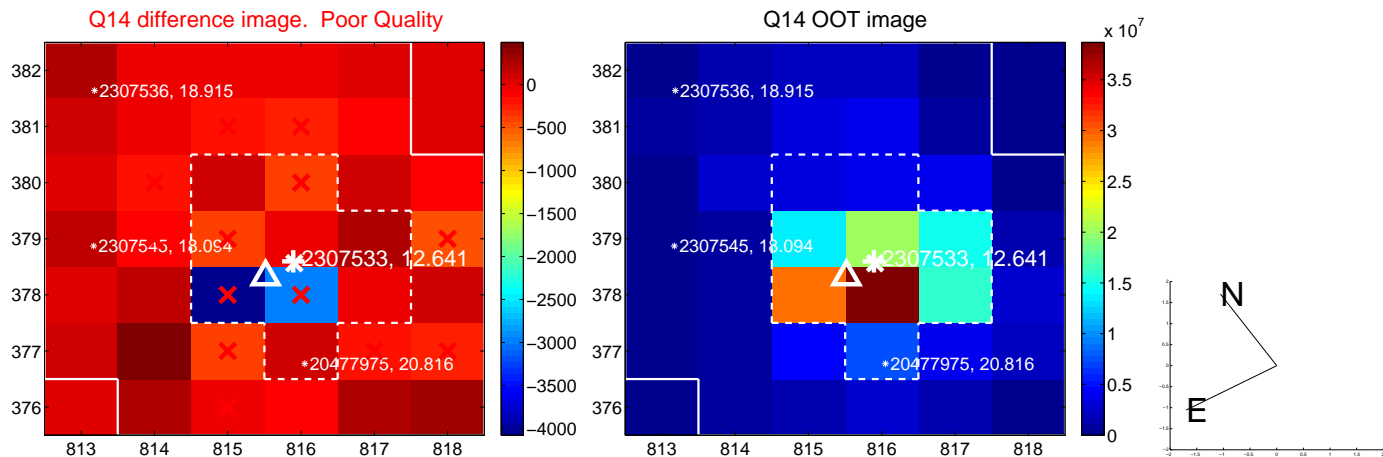
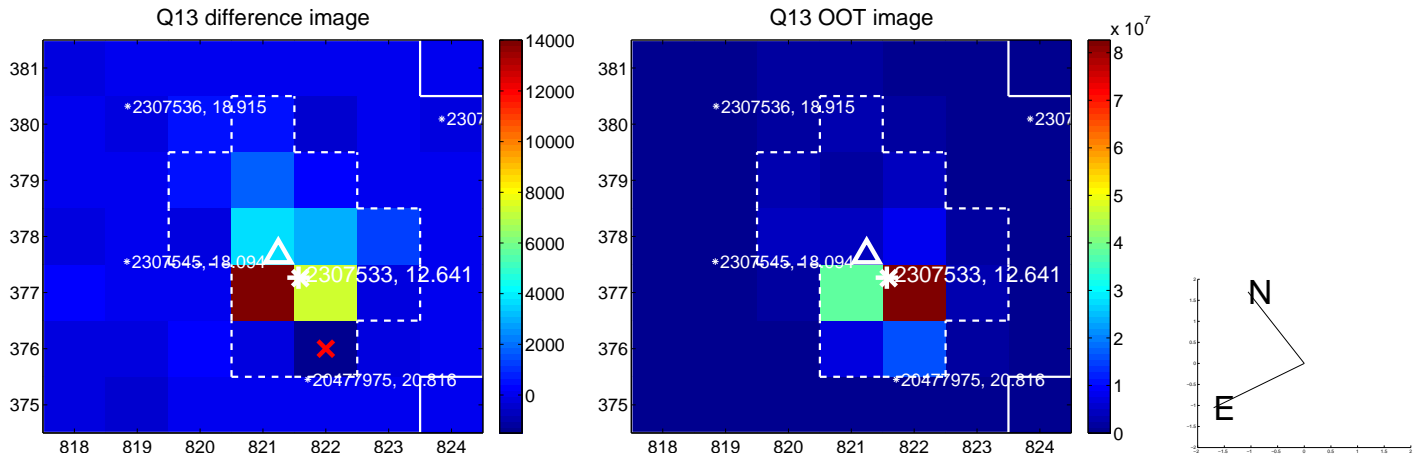
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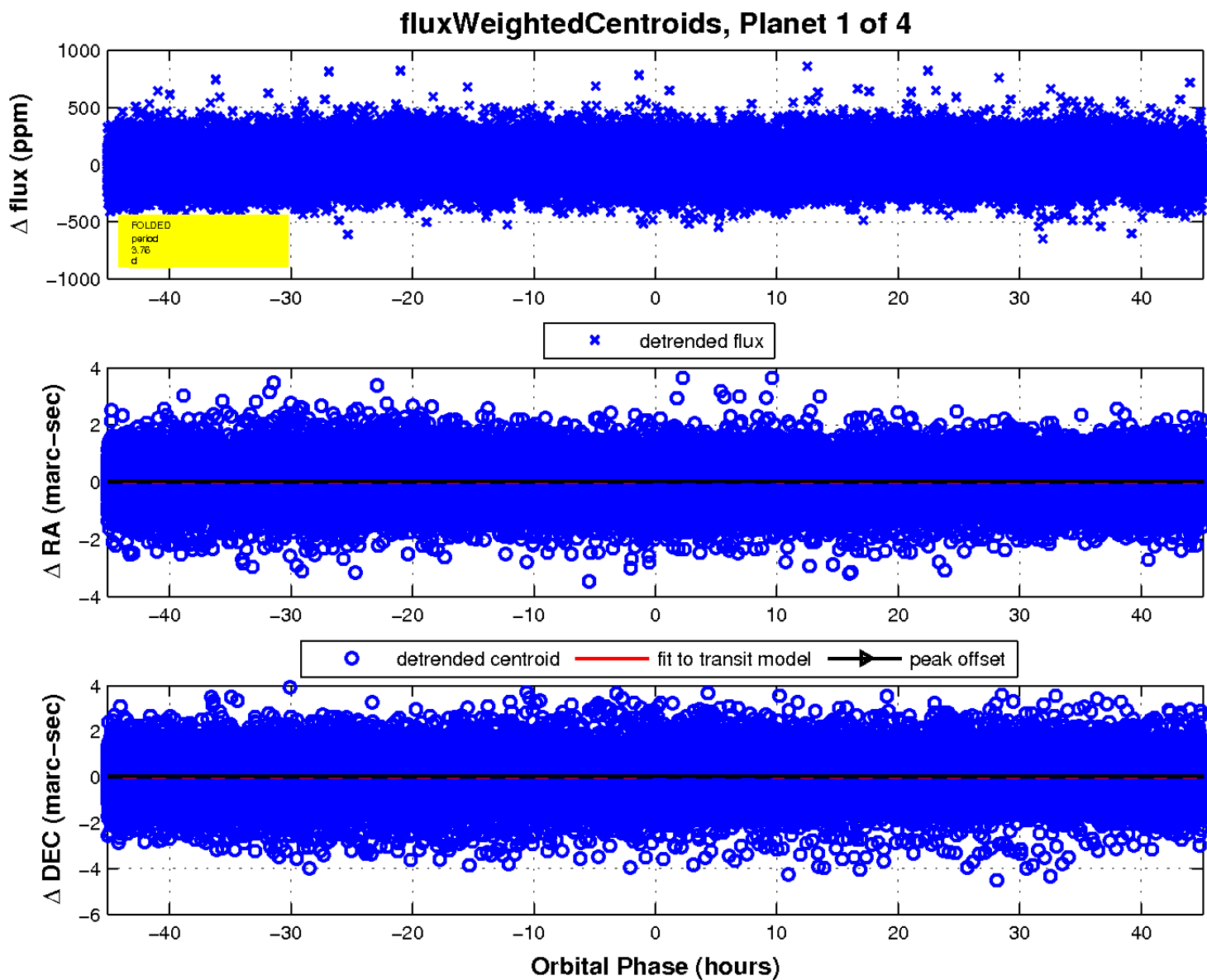
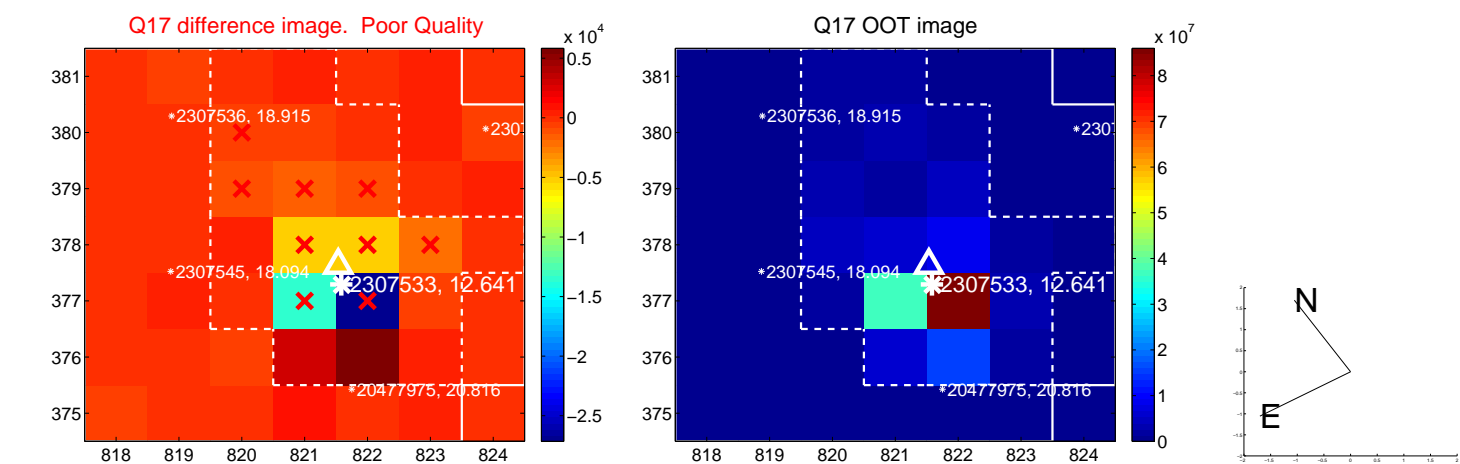




white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

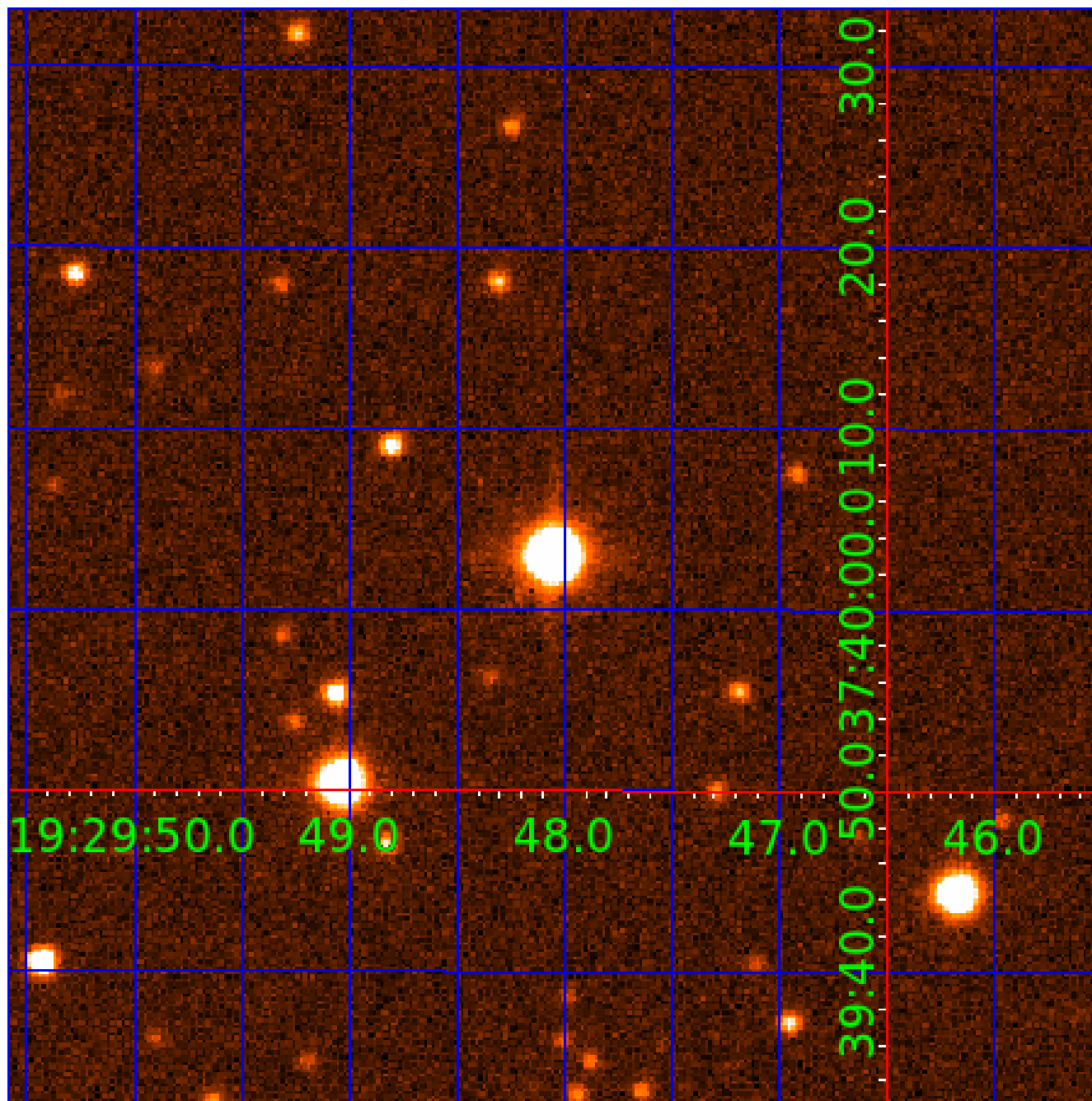


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination





# KIC 002307533

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
002307533-01	OBS	No	3.760695	133.676951	76.4	12.500	8.2	-1.0	2.88	7082	2.53	5925.92
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002307533-04	OBS	No	0.537489	131.981218	25.6	6.450	9.9	16.3	2.88	7082	1.47	79302.53

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
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002307533-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL_TRACKER—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV— MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
002307533-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL_TRACKER—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT— INCONSISTENT_TRANS—SAME_NTL_PERIOD
002307533-04	OBS	FP	0.00	1	0	0	0	LPP_DV—CENT_FEW_DIFFS

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

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

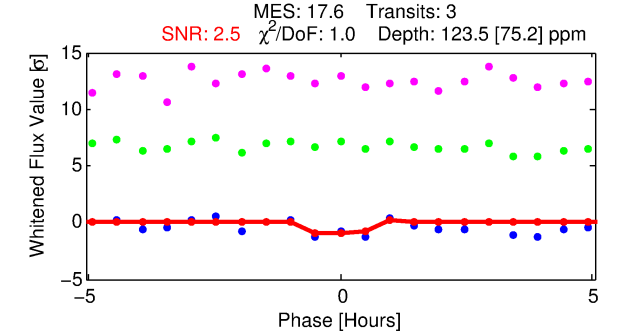
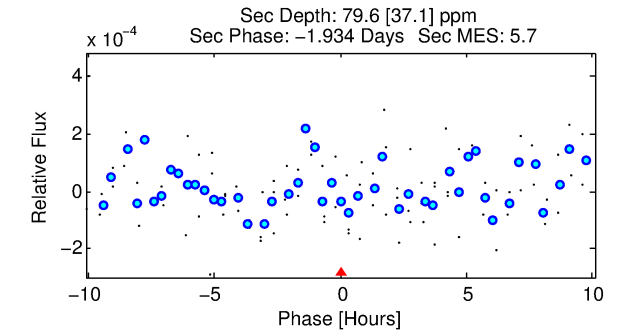
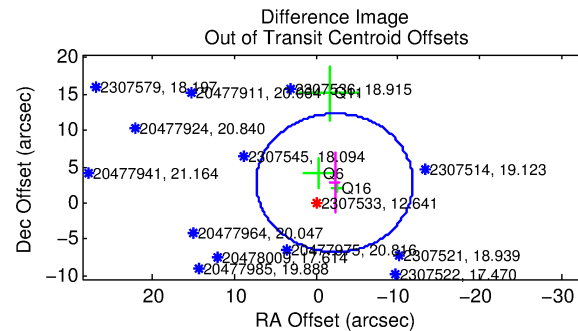
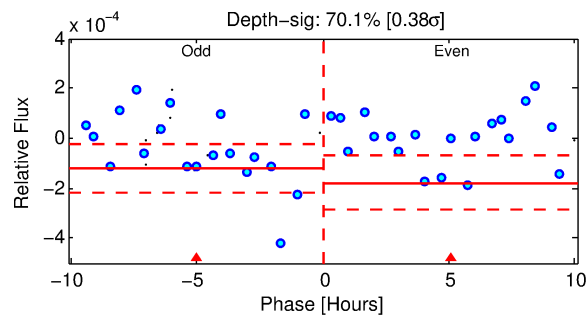
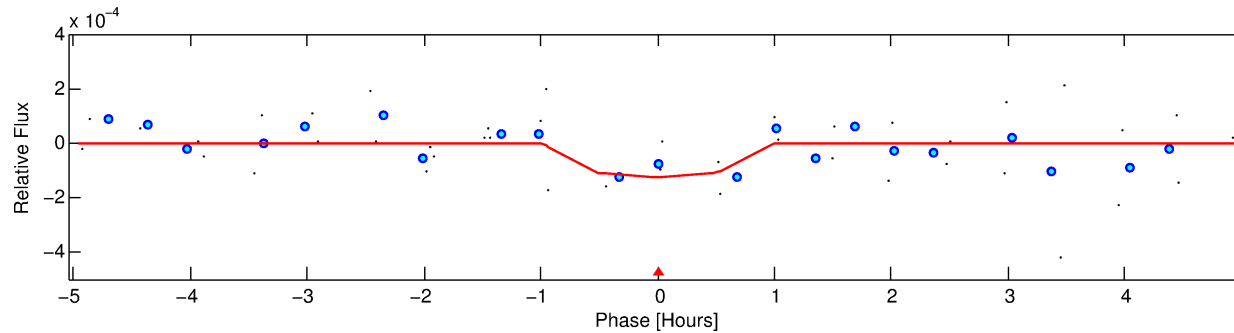
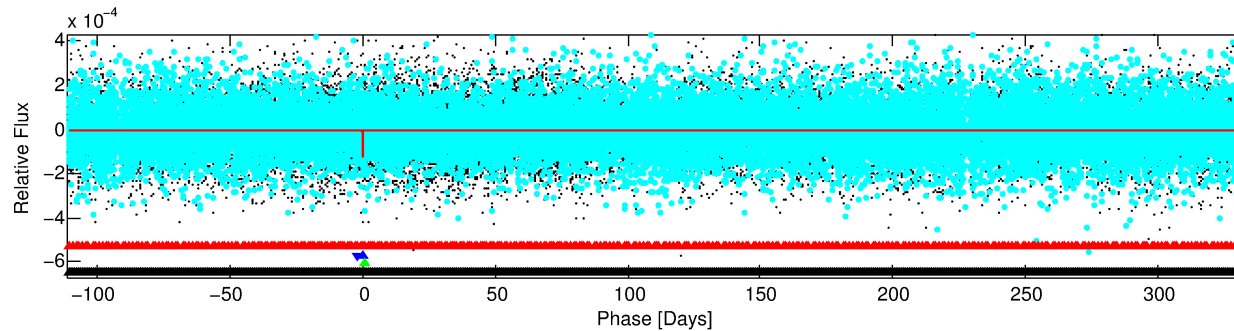
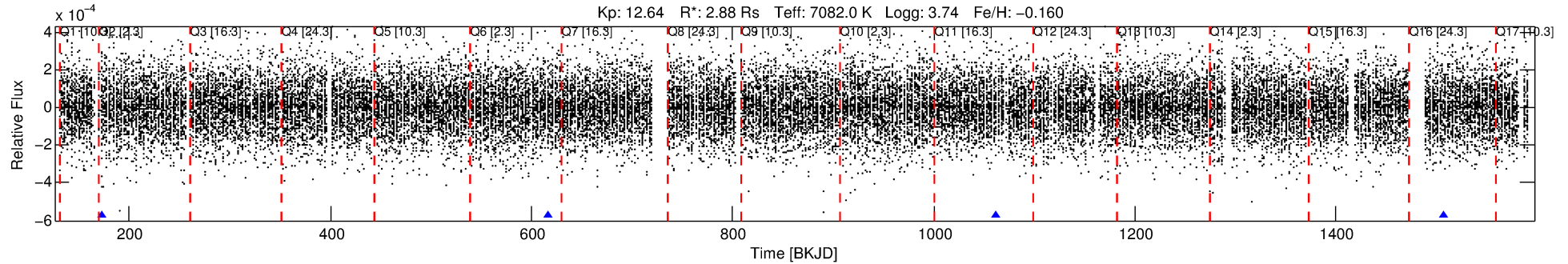
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 002307533-02

No Significant Match Found

# DV One-Page Summary

KIC: 2307533 Candidate: 2 of 4 Period: 444.798 d



## DV Fit Results:

Period = 444.79771 [0.01816] d  
Epoch = 172.1762 [0.0201] BKJD  
Rp/R\* = 0.0124 [0.0165]  
a/R\* = 753.97 [5567.45]  
b = 0.94 [0.91]  
Seff = 10.21 [5.22]  
Teq = 456 [58] K  
Rp = 3.91 [5.34] Re  
a = 1.3533 [0.4169] AU  
Ag = 5256.47 [14418.99] [0.36 $\sigma$ ]  
Teffp = 6000 [4054] K [1.37 $\sigma$ ]

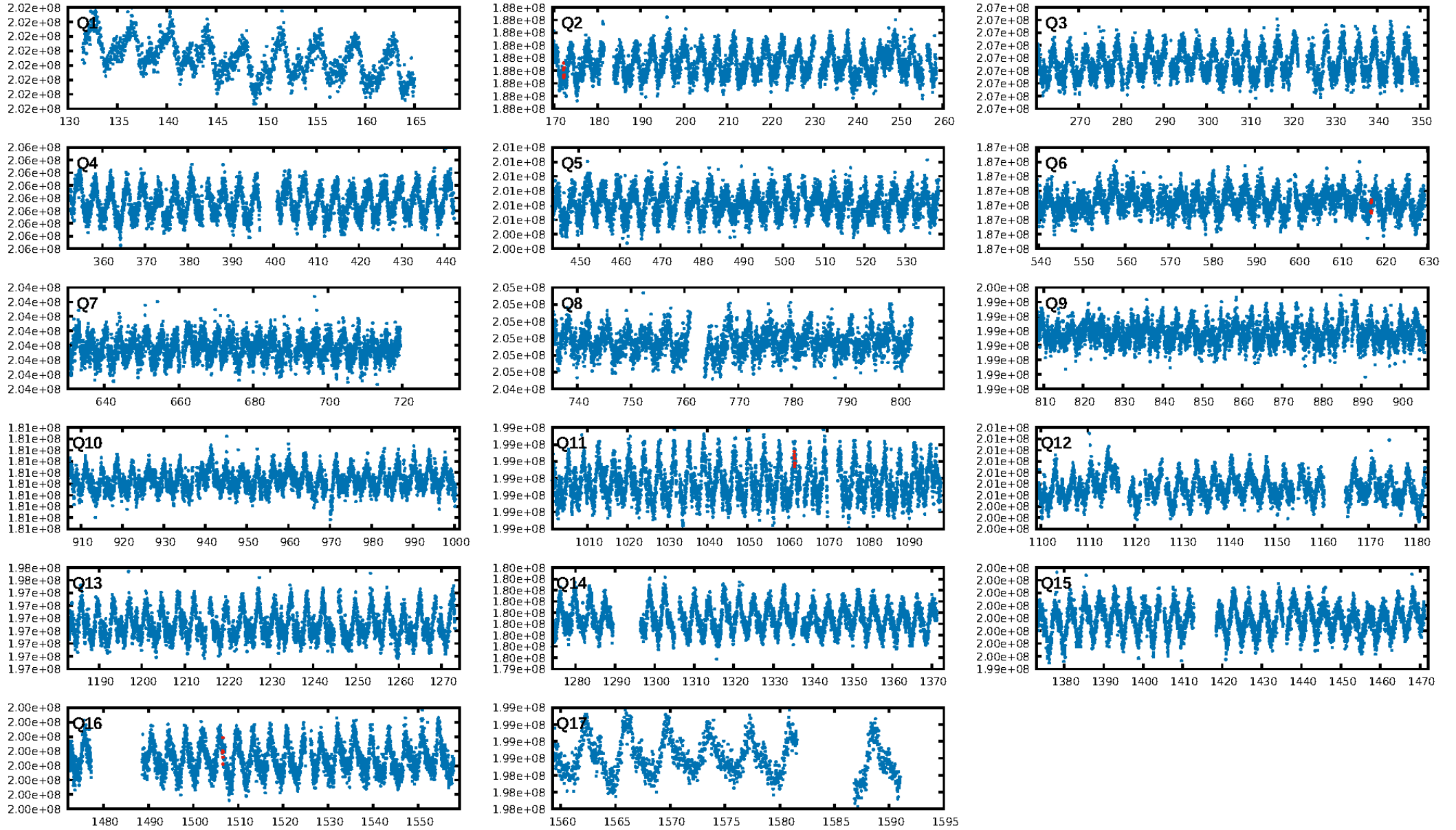
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [839.24 $\sigma$ ]  
LongPeriod-sig: 3.9% [0.05 $\sigma$ ]  
ModelChiSquare2-sig: 86.5%  
ModelChiSquareGof-sig: 95.9%  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [3/3]  
GhostDiagnostic-chr: -6.775  
Centroid-sig: 98.9%  
Centroid-so: 0.379 arcsec [0.09 $\sigma$ ]  
OotOffset-rm: 3.593 arcsec [1.13 $\sigma$ ]  
KicOffset-rm: 3.629 arcsec [1.03 $\sigma$ ]  
OotOffset-st: 1/1/1/0 [3]  
KicOffset-st: 1/1/1/0 [3]  
DiffImageQuality-fgm: 0.00 [0/3]  
DiffImageOverlap-fno: 0.00 [0/4]

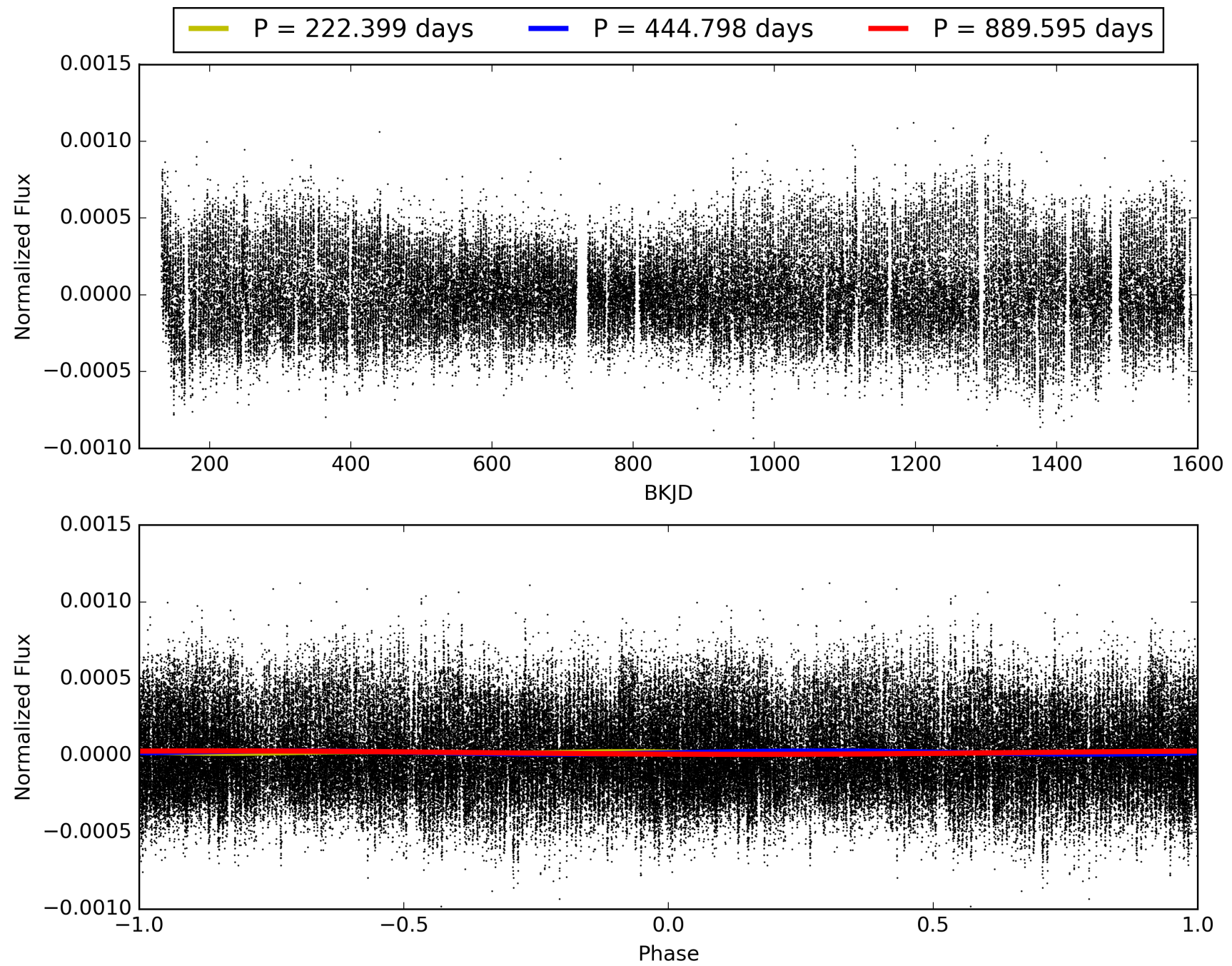
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 16:25:29 Z

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

# TCE 002307533-02, PDC Light Curves

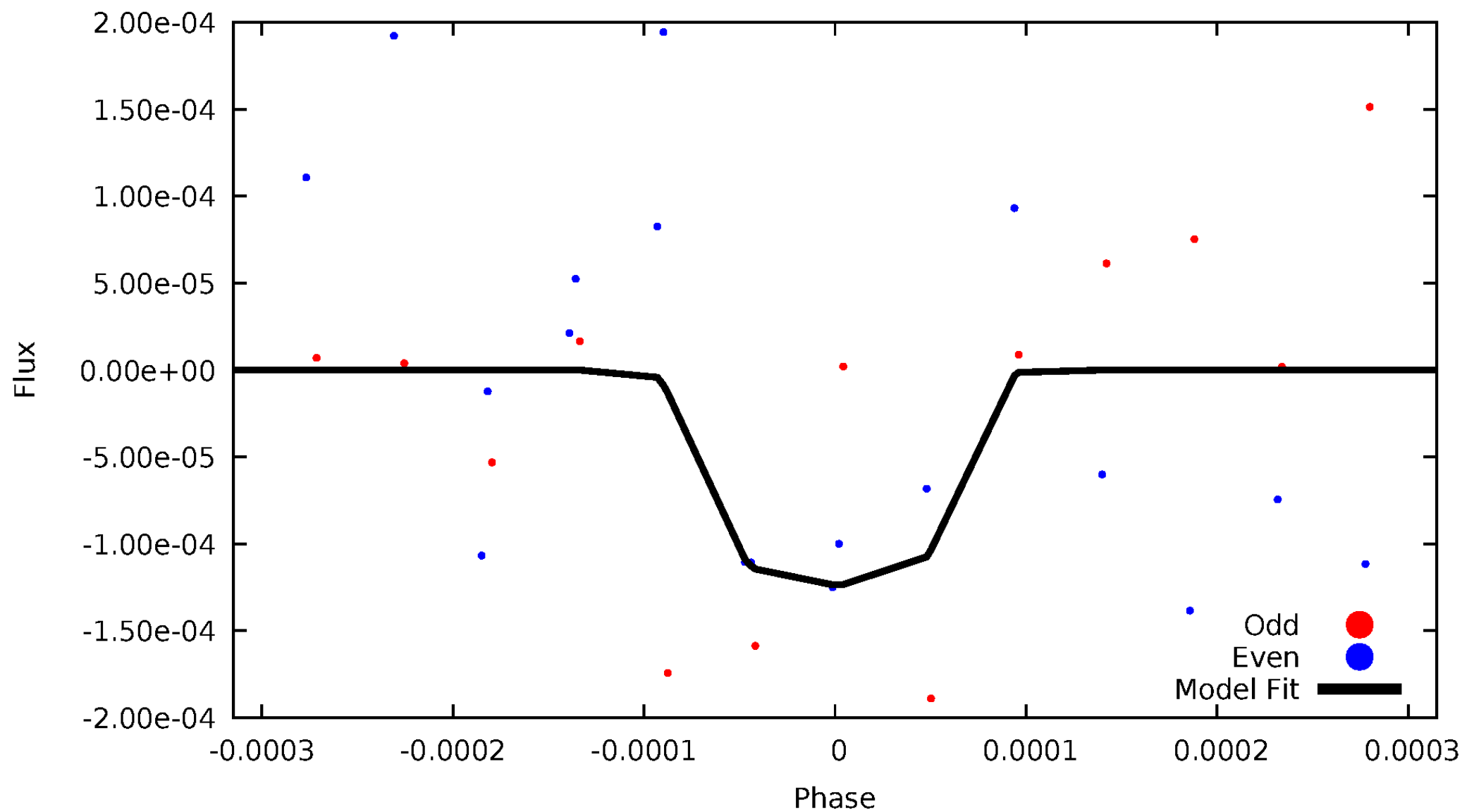


TCE 002307533-02



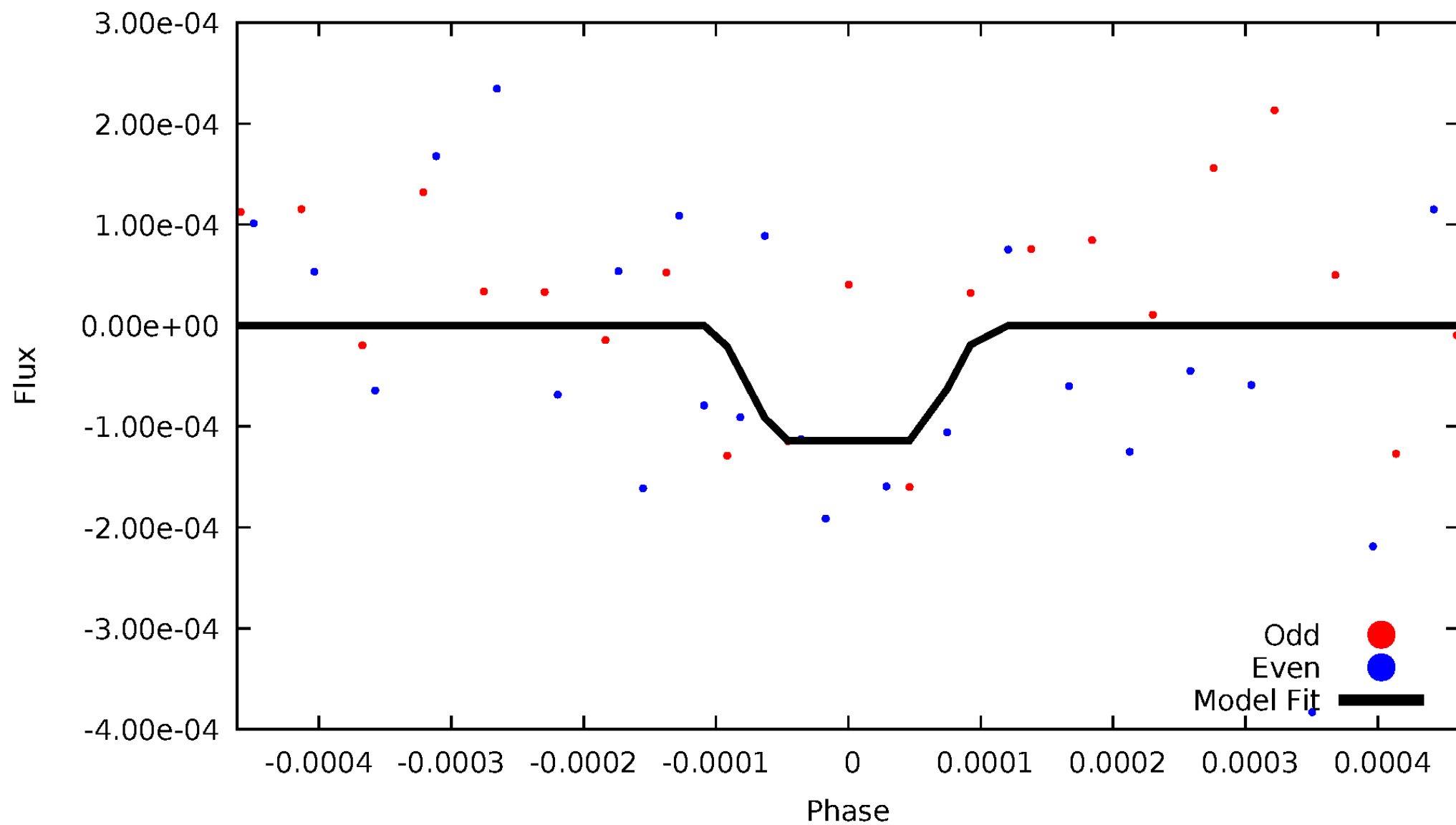
# DV Odd/Even

TCE 002307533-02



# ALT Odd/Even

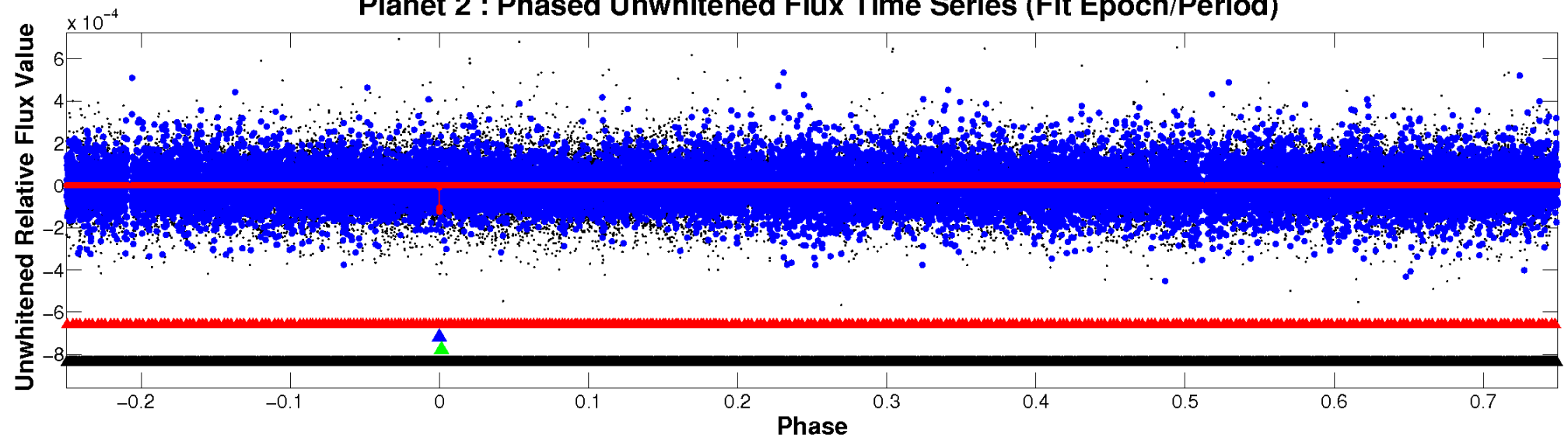
TCE 002307533-02



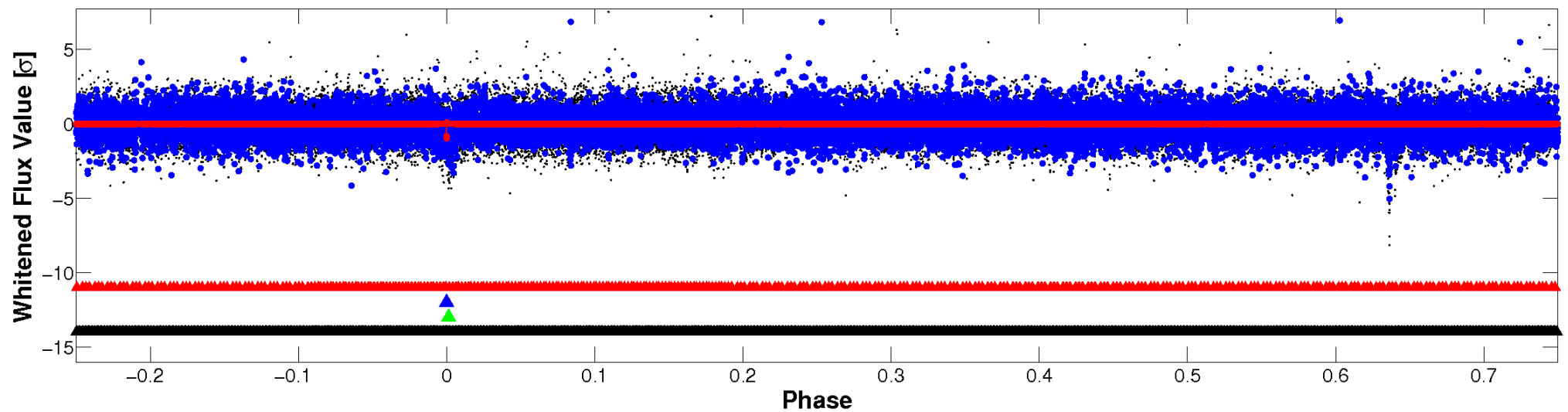


# Non-Whitened Vs. Whitened Light Curve

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

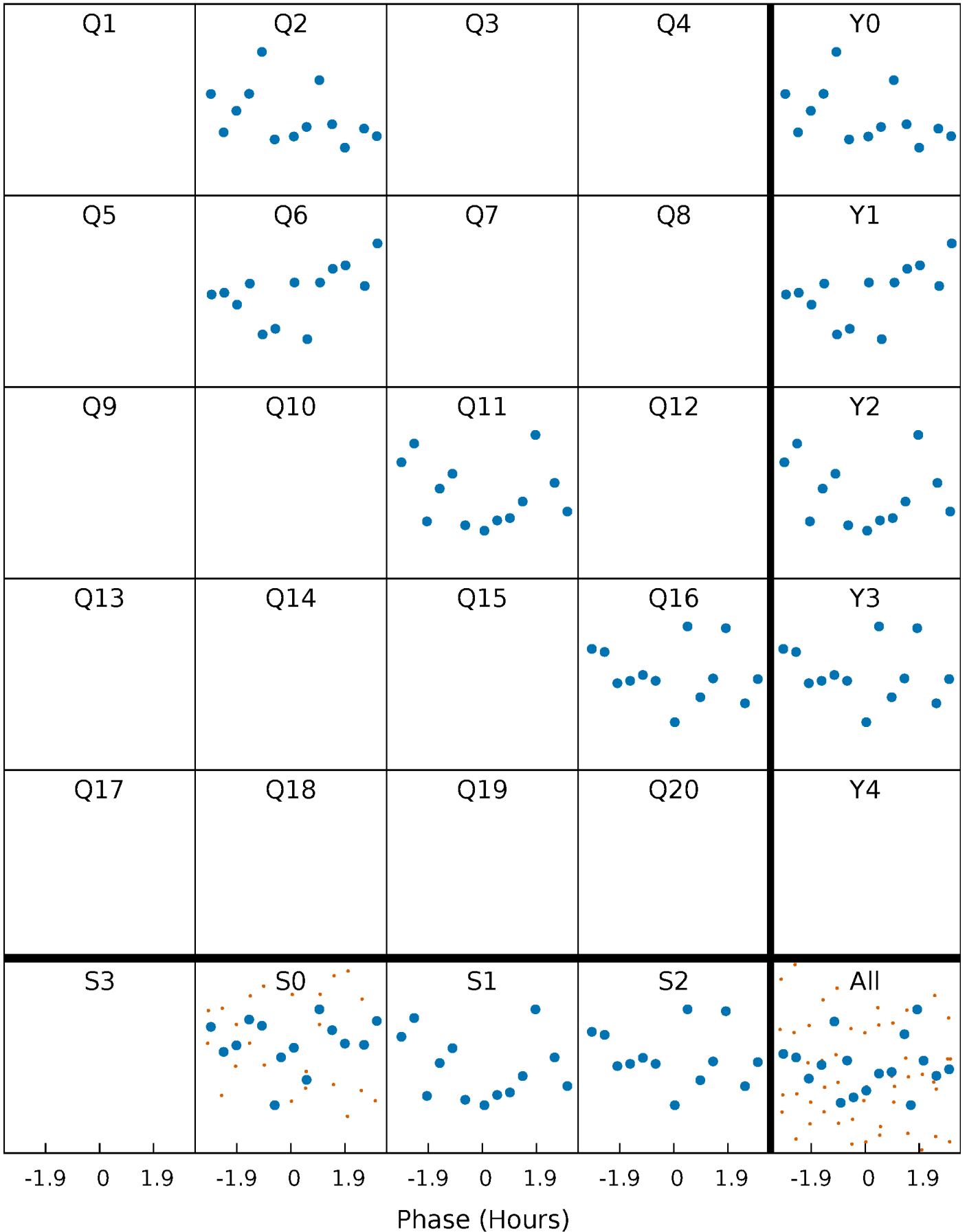


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

TCE 002307533-02 P=444.797708 Days  $T_0=172.176211$  (BKJD)



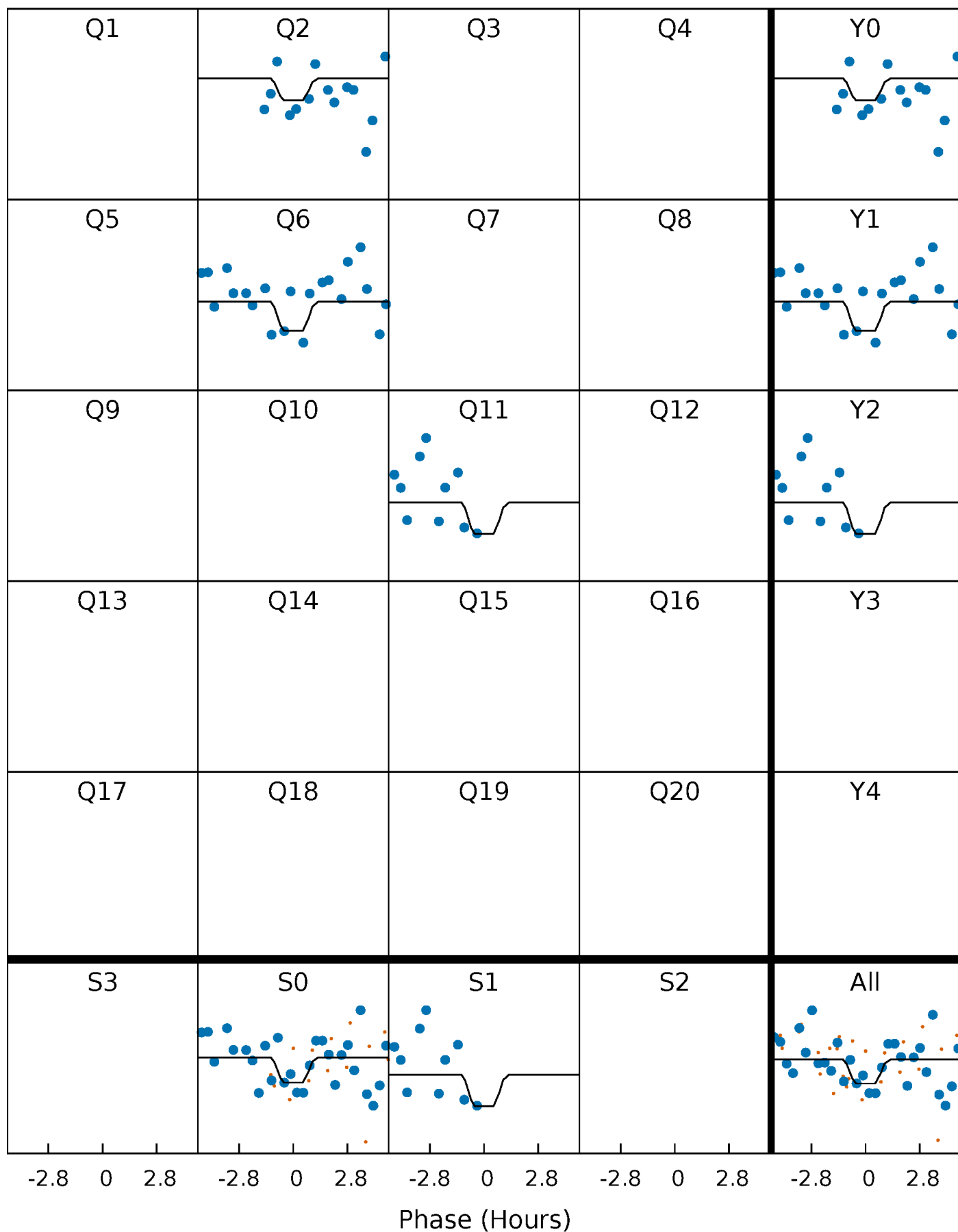
# DV Quarter-Phased Transit Curves

TCE 002307533-02 P=444.797708 Days  $T_0=172.176211$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

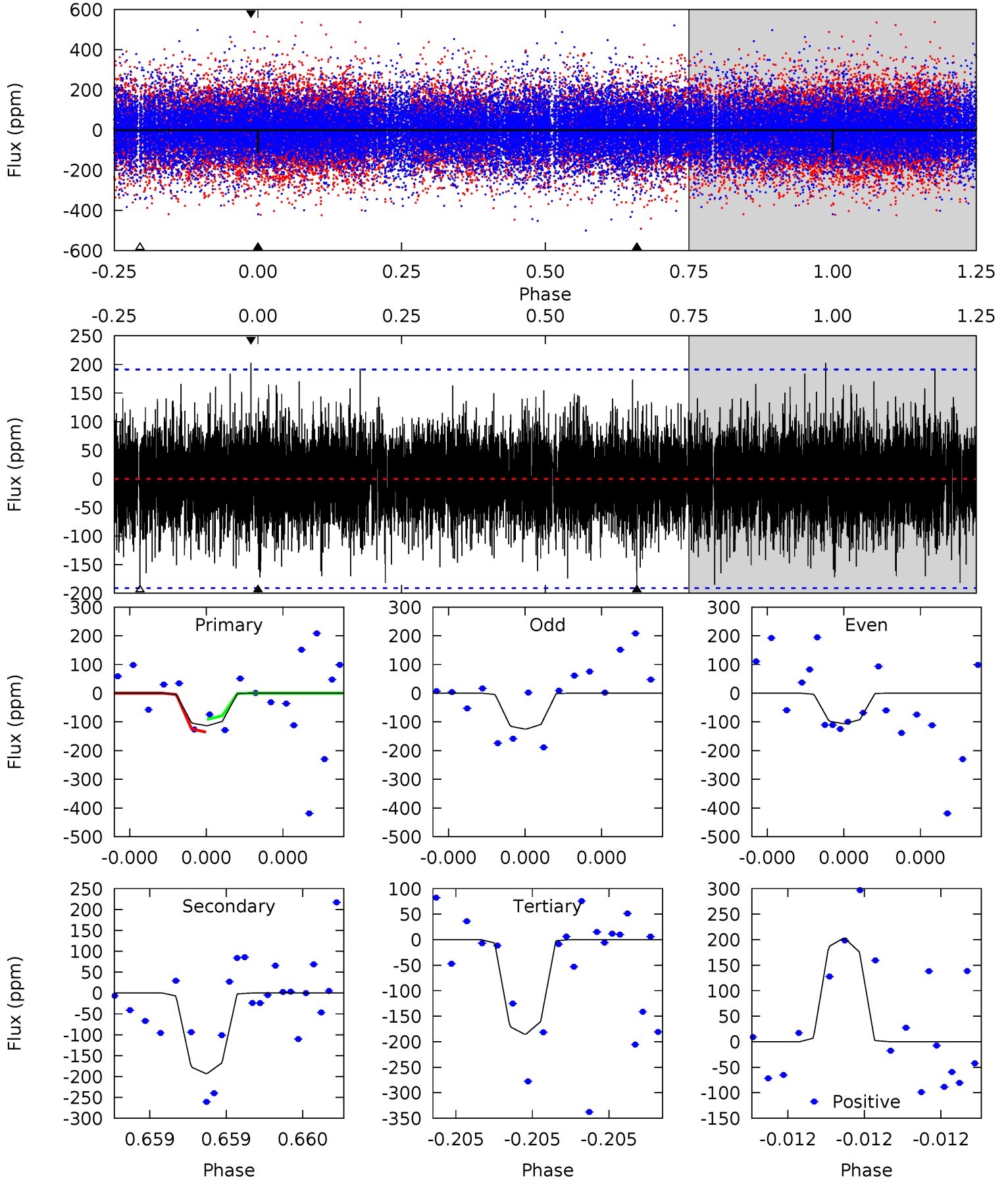
TCE 002307533-02 P=444.811356 Days  $T_0=172.164308$  (BKJD)



# DV Model-Shift Uniqueness Test

002307533-02, P = 444.797708 Days, E = 172.176211 Days

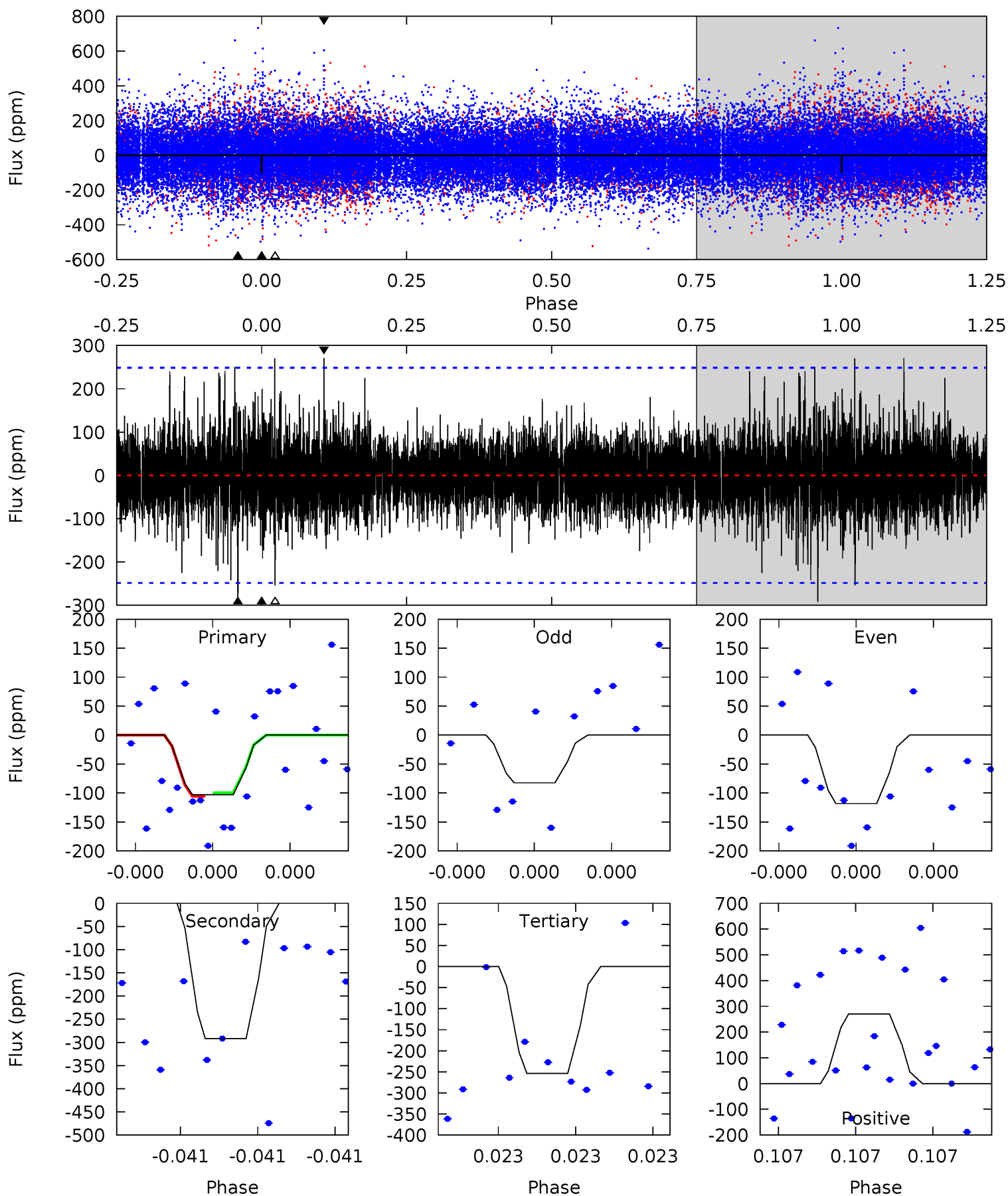
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
3.38	5.76	5.53	6.05	5.70	3.68	1.36	-2.15	-2.67	0.22	-0.29	0.29	0.93	0.51	0.67



# Alt Model-Shift Uniqueness Test

002307533-02, P = 444.811356 Days, E = 172.164308 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
2.39	6.77	5.88	6.26	5.75	3.75	1.22	-3.49	-3.88	0.89	0.50	0.40	0.95	0.48	0.07



### Stellar Parameters For KIC 002307533

	$T_{\text{eff}} (K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M (M_{\odot})$	$\rho_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$7082^{+190}_{-253}$	$3.742^{+0.288}_{-0.072}$	$-0.160^{+0.250}_{-0.300}$	$2.880^{+0.428}_{-0.927}$	$1.669^{+0.197}_{-0.295}$	$0.098^{+0.180}_{-0.029}$
	+3%/-4%	+8%/-2%	+156%/-188%	+15%/-32%	+12%/-18%	+183%/-29%
Source	PHO1	FLK73	KIC0	DSEP		

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

### Secondary Eclipse Parameters for KIC 002307533-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-193 \pm 33$	$5.13^{+4.24}_{-3.35}$	$622^{+34}_{-56}$	$6189^{+6739}_{-1493}$	$7223^{+59029}_{-5047}$
Alt.	$-292 \pm 43$	$4.86^{+4.16}_{-3.25}$	$624^{+35}_{-55}$	$7215^{+9285}_{-1977}$	$12293^{+100834}_{-8690}$

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



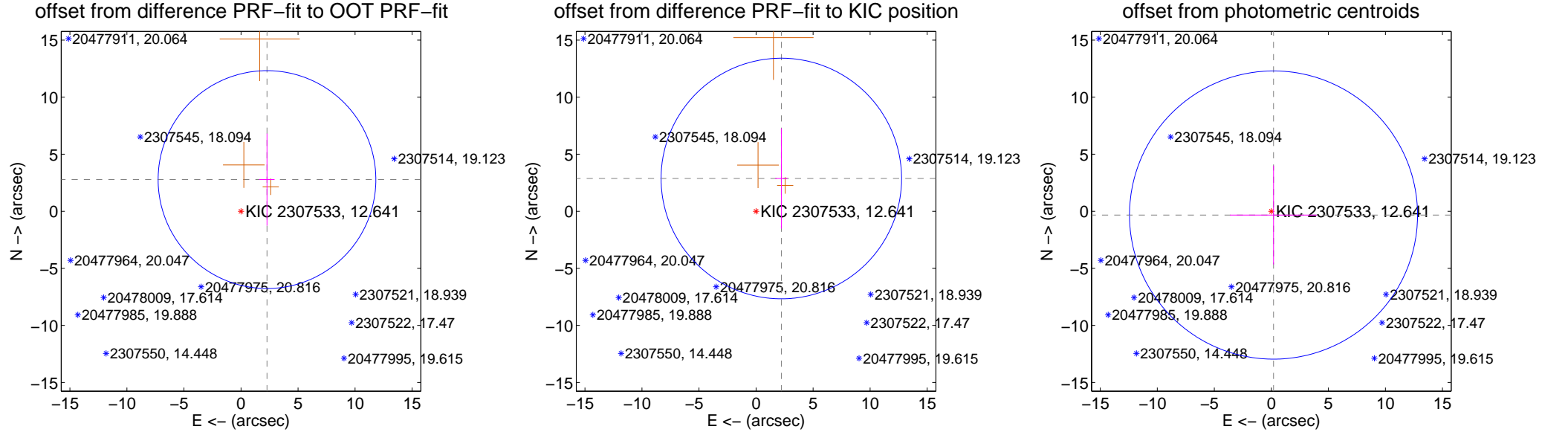
## DV Centroid Data

Supplemental centroid analysis for 002307533-02. Kepler magnitude: 12.64. Transit SNR 2.47

There are 0 quarters with good PRF difference image offsets

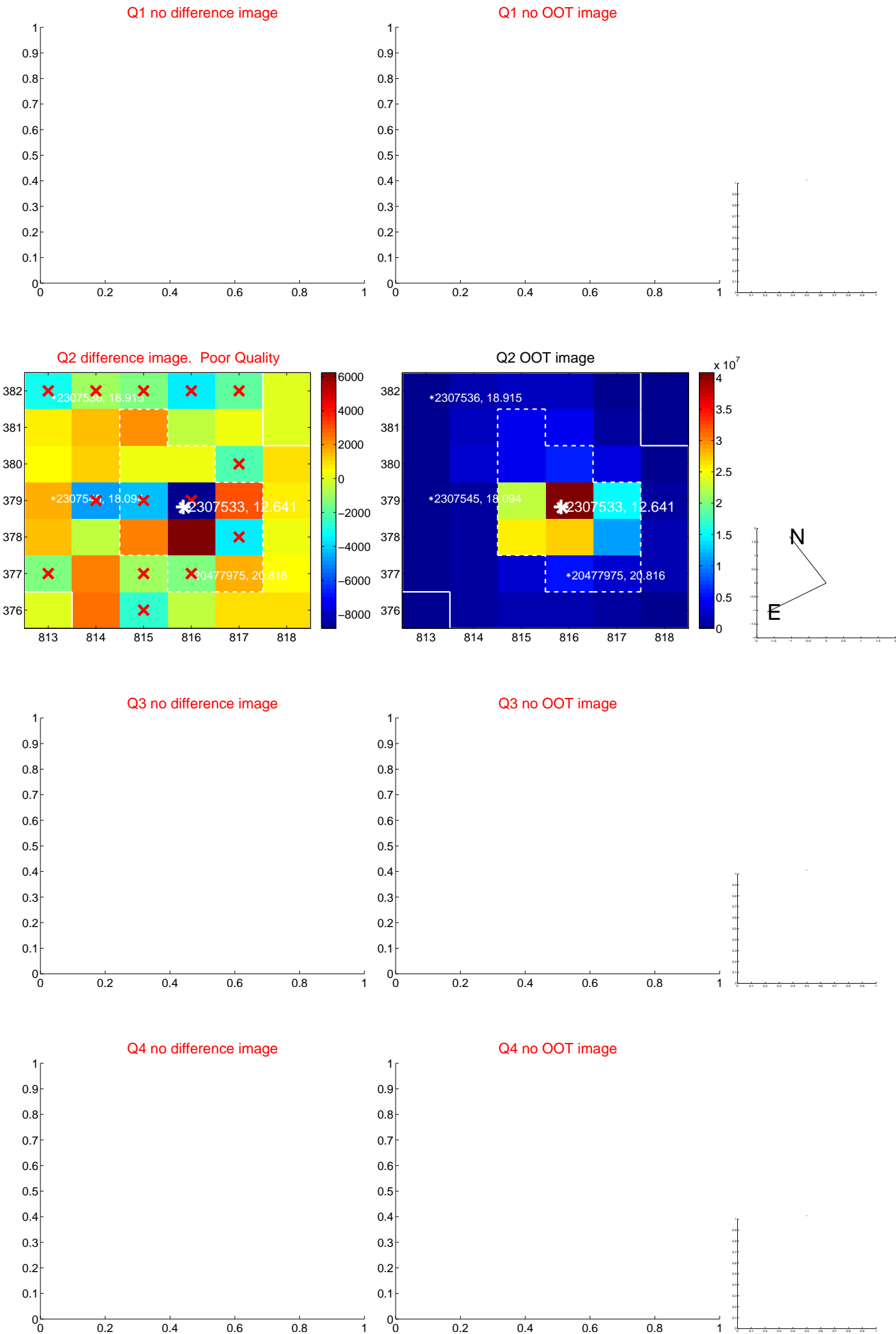
The direct PRF centroid is offset from the target star catalog position by about 0.13 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$3.593 \pm 3.181$	1.13	$-2.278 \pm 0.668$	$2.778 \pm 4.036$
PRF-fit source offset from KIC position	$3.629 \pm 3.514$	1.03	$-2.217 \pm 0.534$	$2.873 \pm 4.388$
photometric centroid source offset	$0.38 \pm 4.21$	0.09	$-0.19 \pm 3.82$	$-0.33 \pm 4.33$

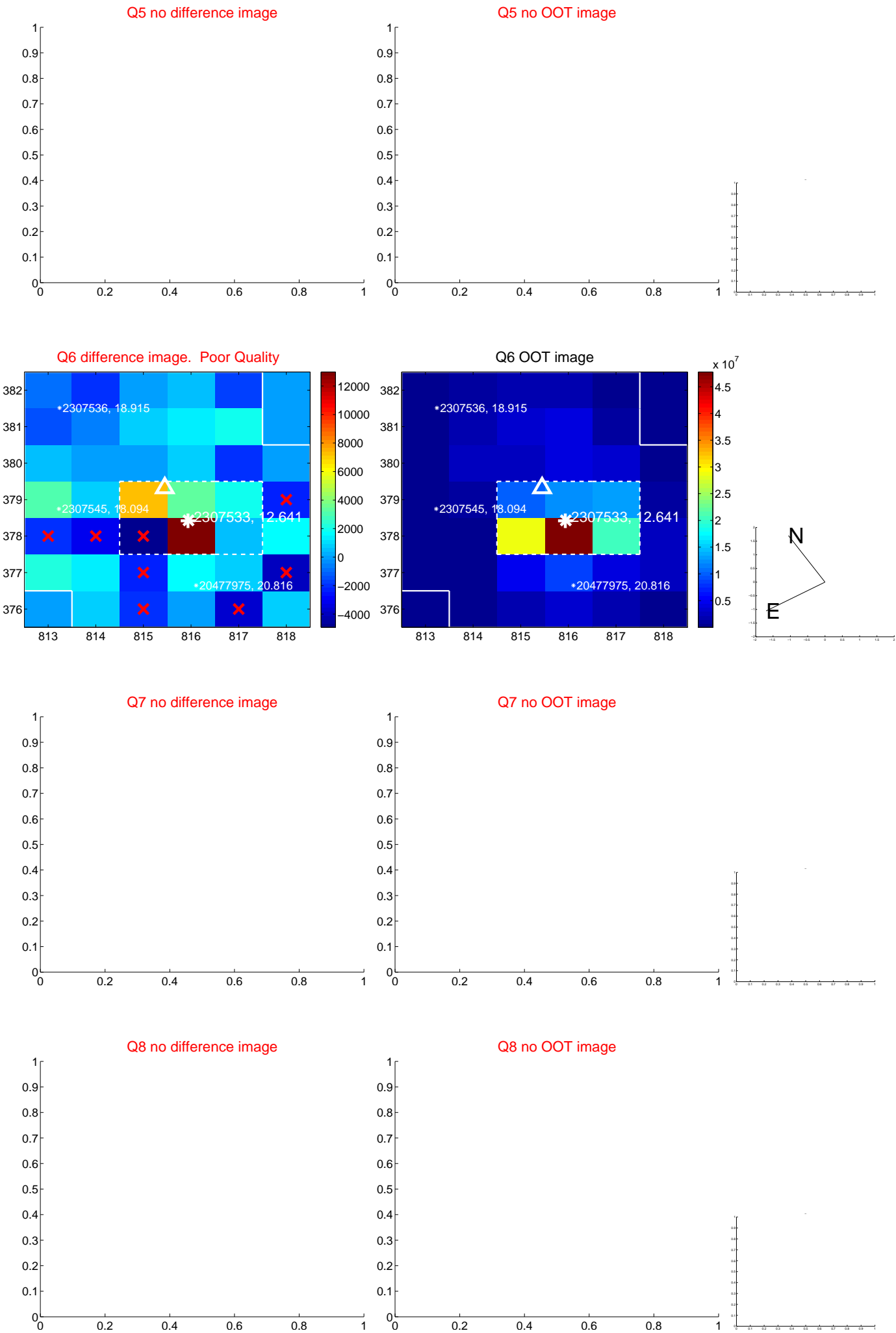


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

Q9 no difference image



Q9 no OOT image



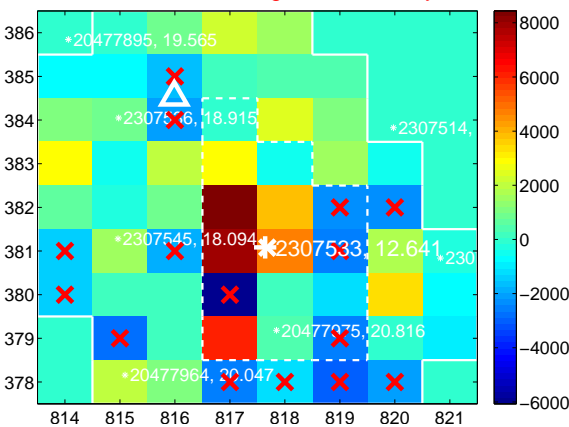
Q10 no difference image



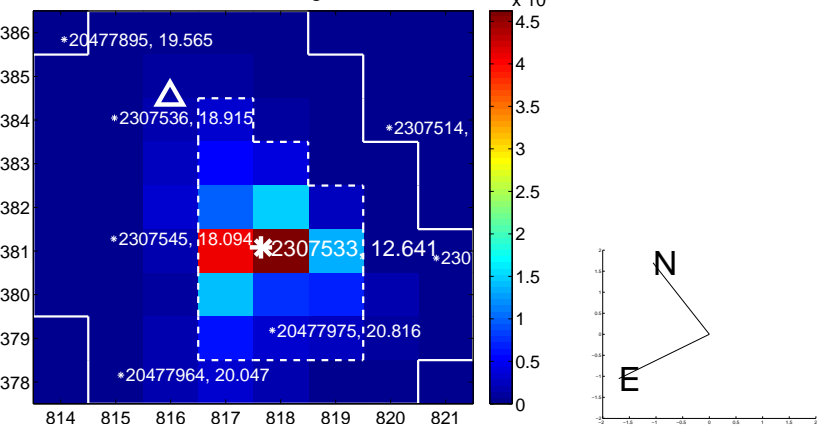
Q10 no OOT image



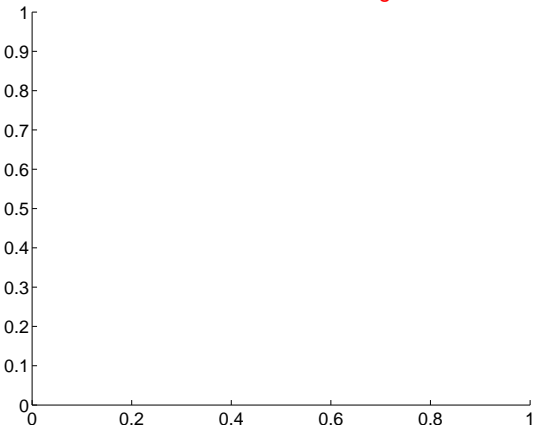
Q11 difference image. Poor Quality



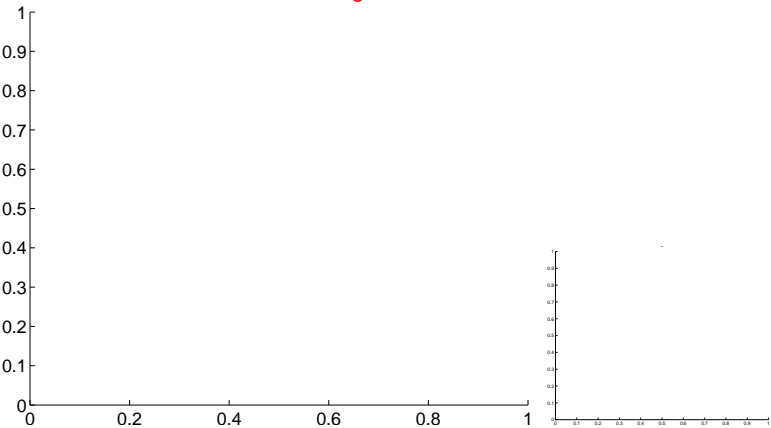
Q11 OOT image



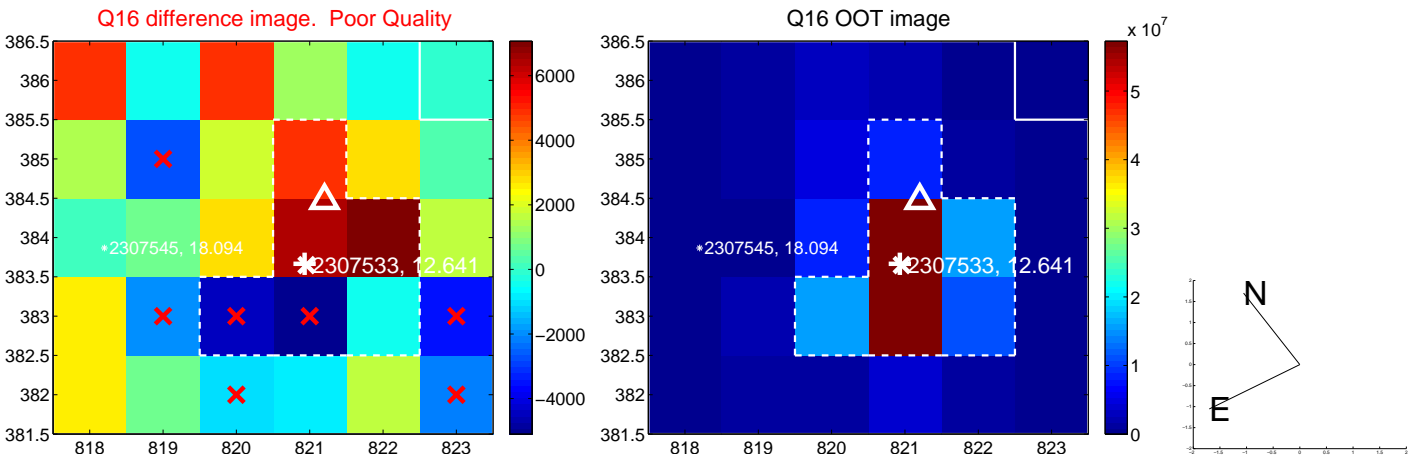
Q12 no difference image



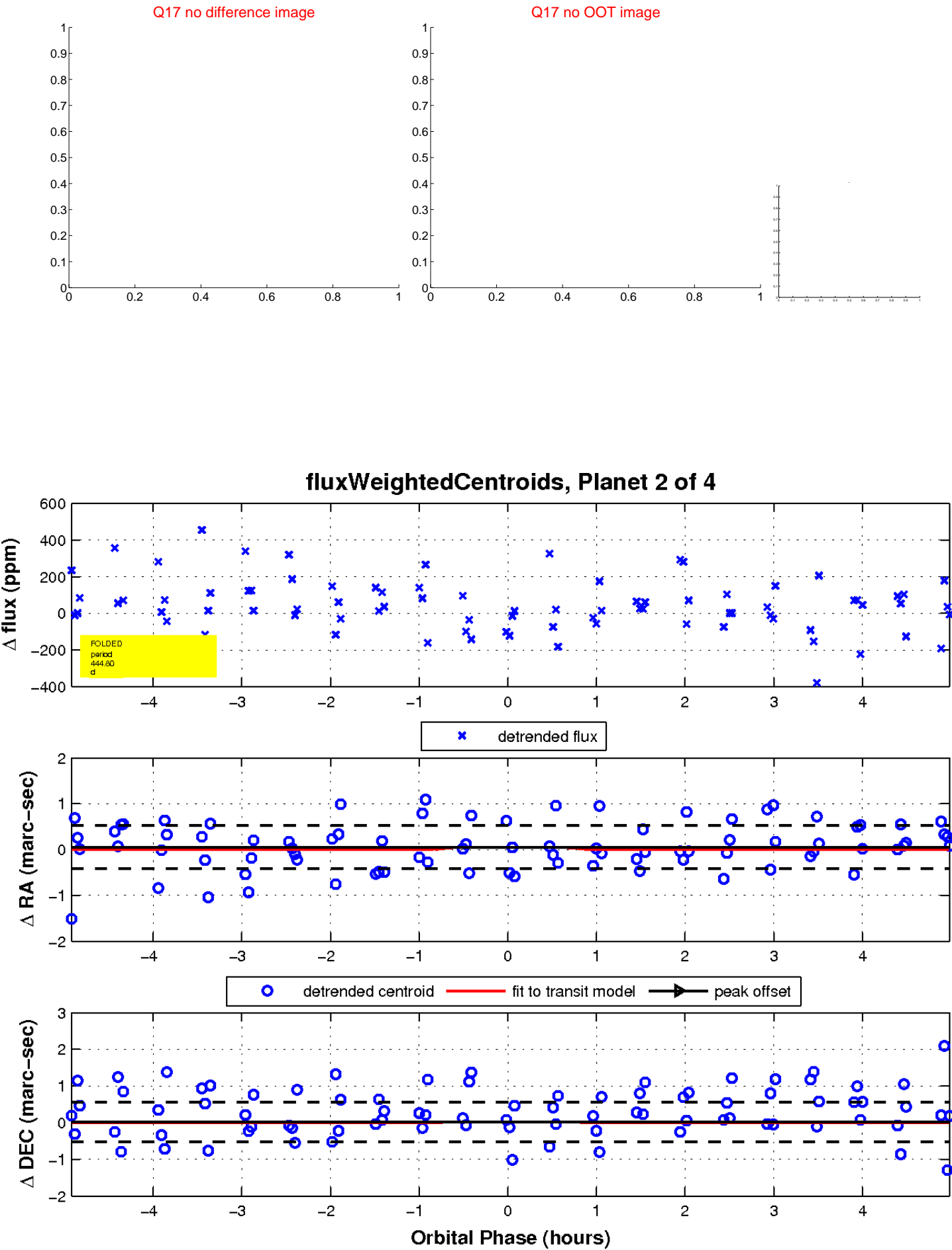
Q12 no OOT image



white ×: KIC target position; +: OOT centroid; △: difference centroid. red ✕: large negative pixel value.

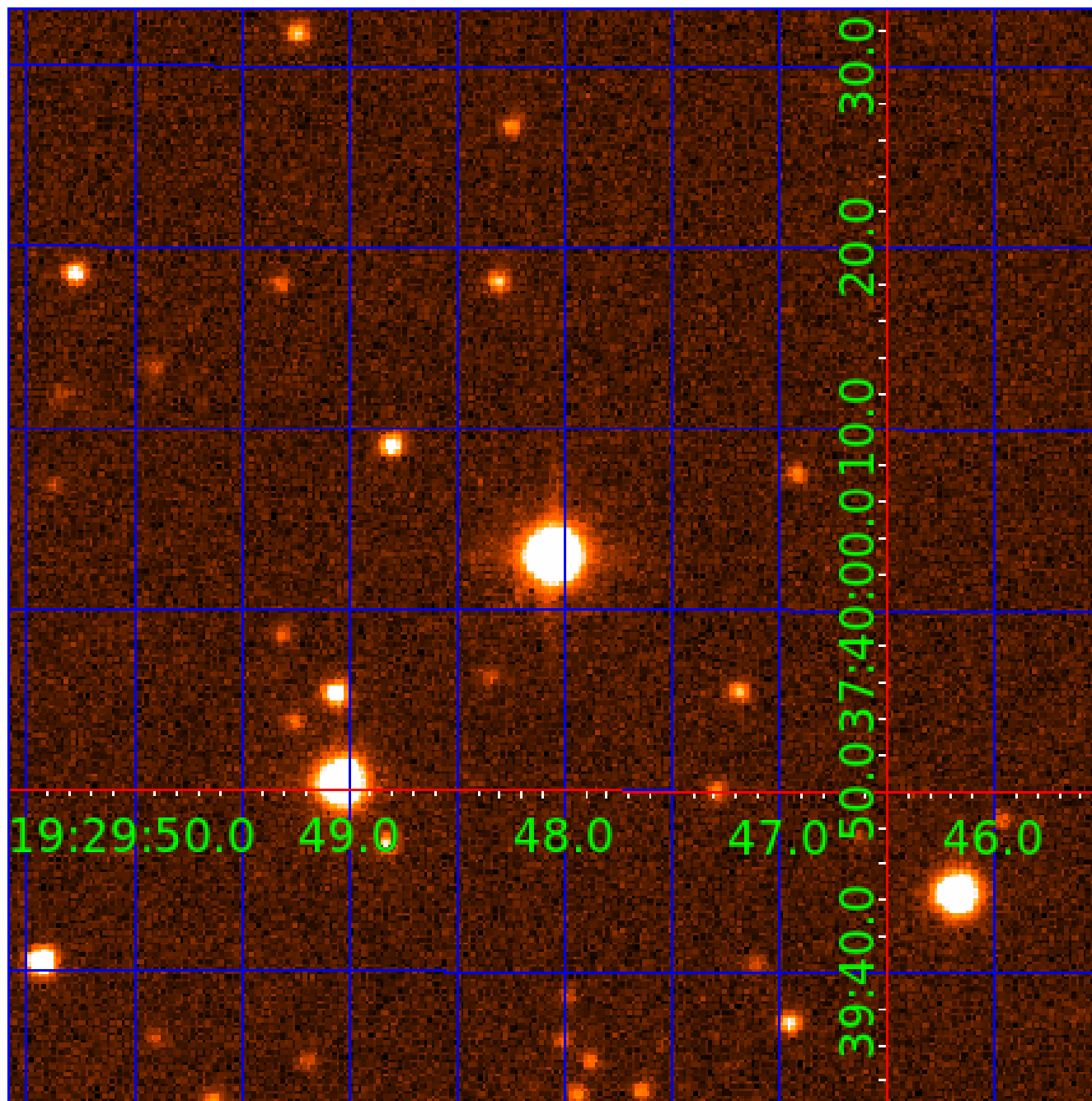


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination





# KIC 002307533

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
002307533-01	OBS	No	3.760695	133.676951	76.4	12.500	8.2	-1.0	2.88	7082	2.53	5925.92
002307533-02	OBS	No	444.797708	172.176211	123.5	1.680	17.6	2.5	2.88	7082	3.91	10.21
002307533-03	OBS	No	444.810634	172.796707	299.7	6.178	16.0	9.4	2.88	7082	5.82	10.21
002307533-04	OBS	No	0.537489	131.981218	25.6	6.450	9.9	16.3	2.88	7082	1.47	79302.53

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
002307533-01	OBS	FP	0.00	1	0	0	0	SWEET_NTL—LPP_DV—CENT_NOFITS
002307533-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL_TRACKER—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV— MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
002307533-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL_TRACKER—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT— INCONSISTENT_TRANS—SAME_NTL_PERIOD
002307533-04	OBS	FP	0.00	1	0	0	0	LPP_DV—CENT_FEW_DIFFS

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

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

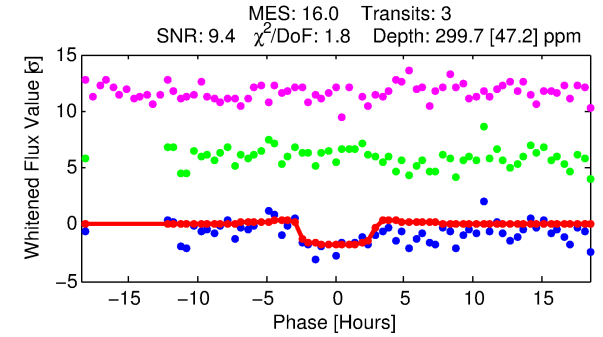
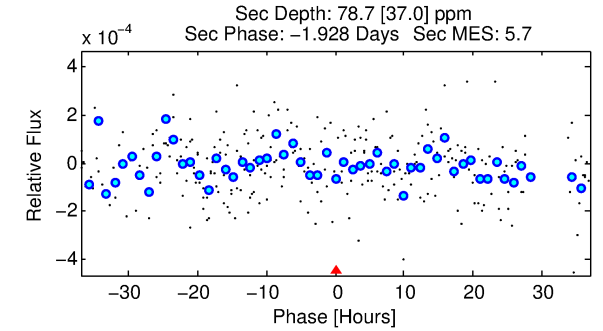
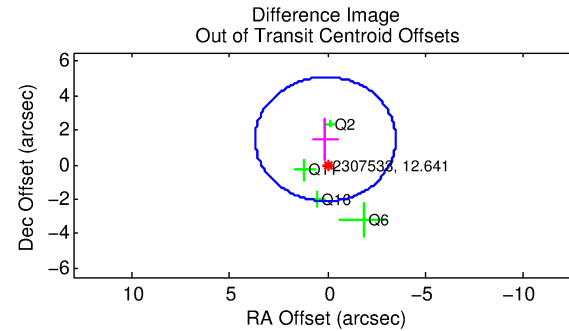
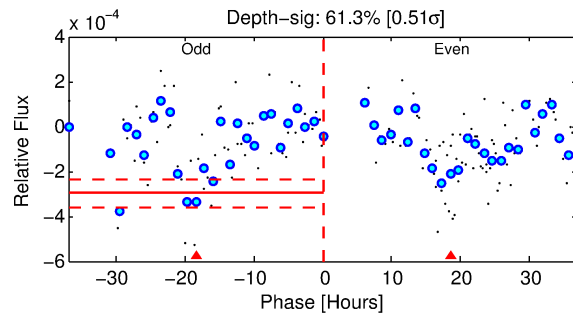
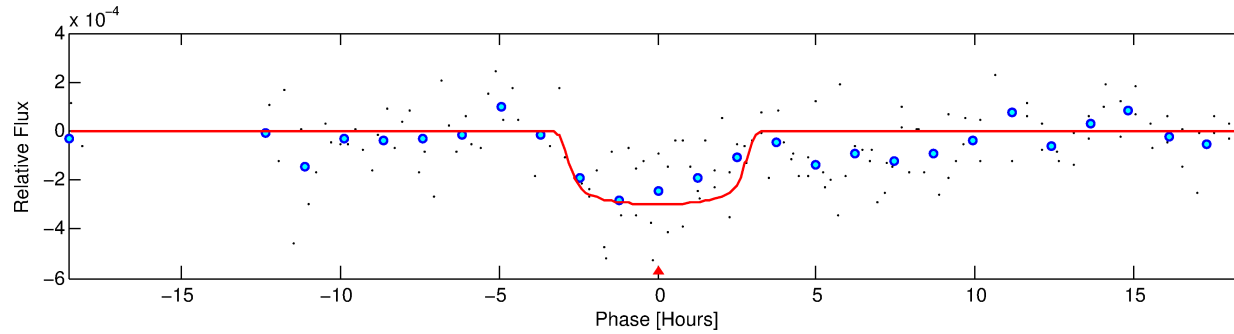
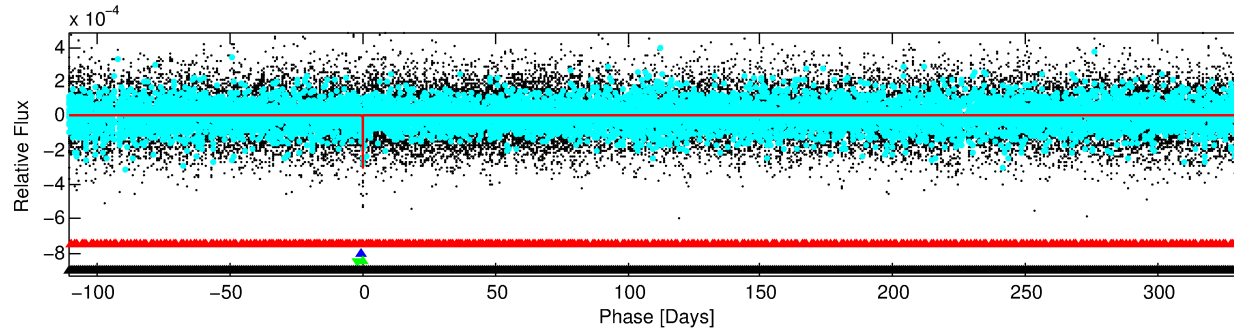
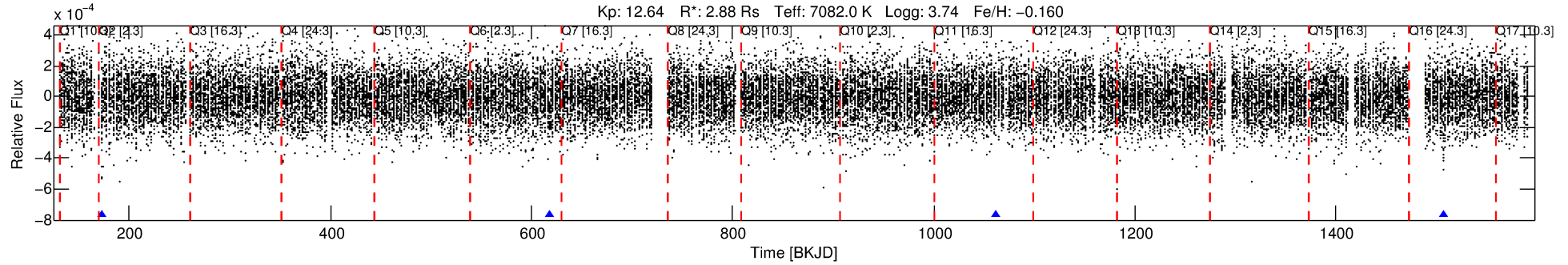
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 002307533-03

No Significant Match Found

# DV One-Page Summary

KIC: 2307533 Candidate: 3 of 4 Period: 444.811 d



## DV Fit Results:

Period = 444.81063 [0.00774] d  
Epoch = 172.7967 [0.0116] BKJD  
Rp/R\* = 0.0185 [0.0045]  
a/R\* = 263.32 [343.31]  
b = 0.90 [0.28]  
Seff = 10.21 [5.22]  
Teq = 456 [58] K  
Rp = 5.82 [2.35] Re  
a = 1.3533 [0.4169] AU  
Ag = 2342.54 [1961.47] [1.19 $\sigma$ ]  
Teffp = 4902 [849] K [5.22 $\sigma$ ]

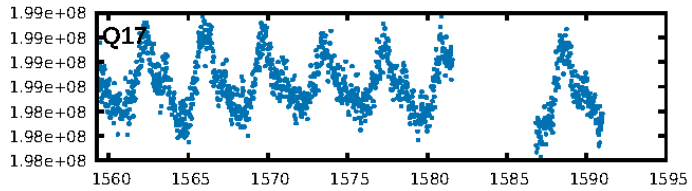
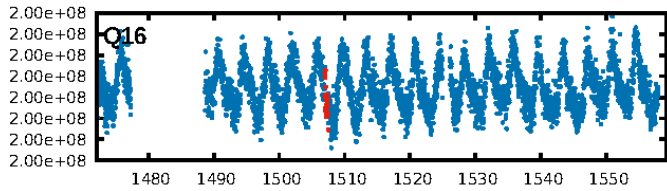
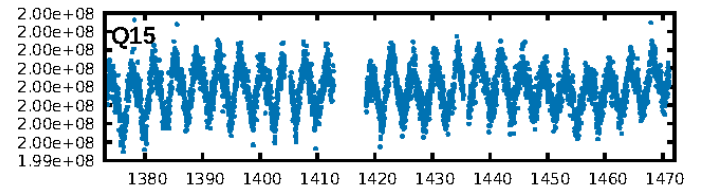
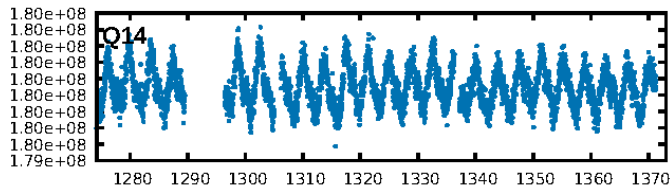
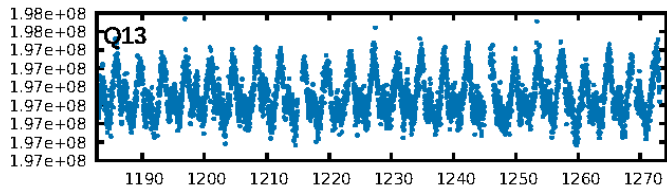
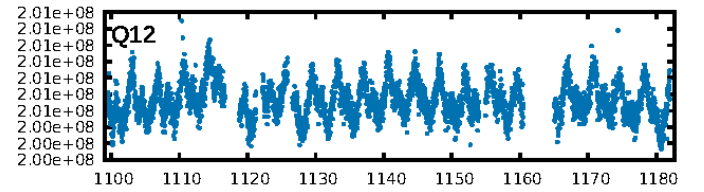
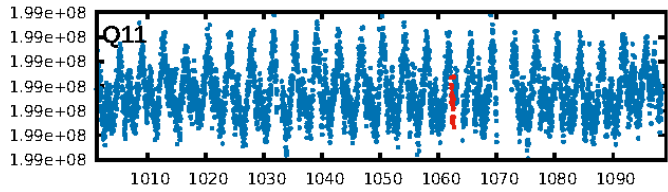
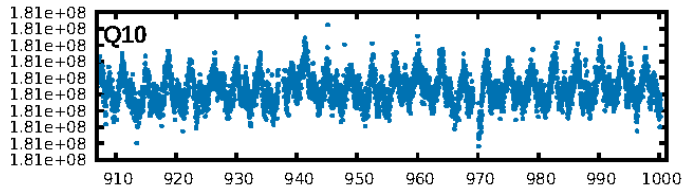
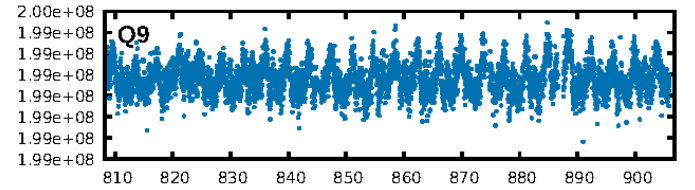
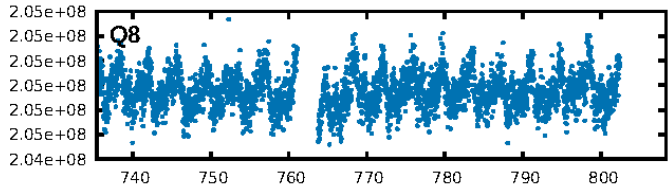
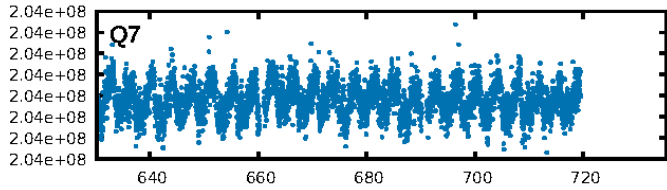
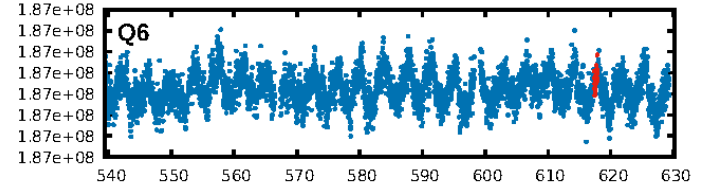
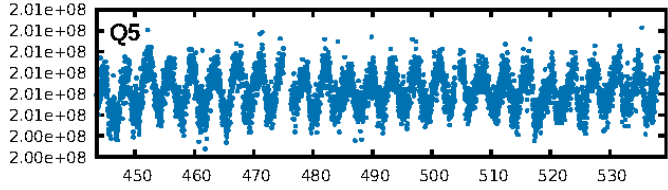
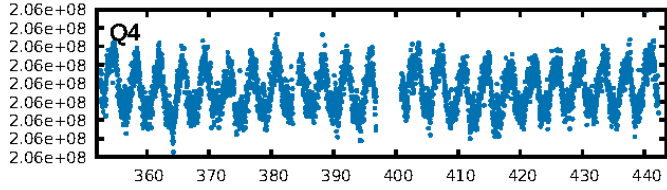
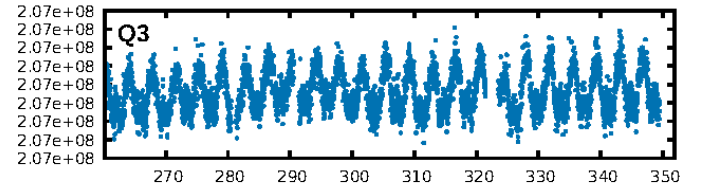
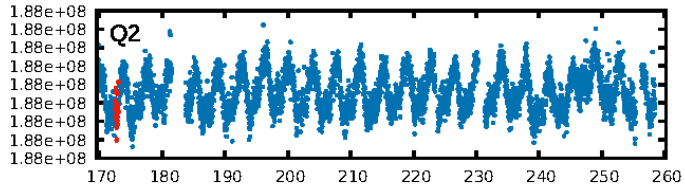
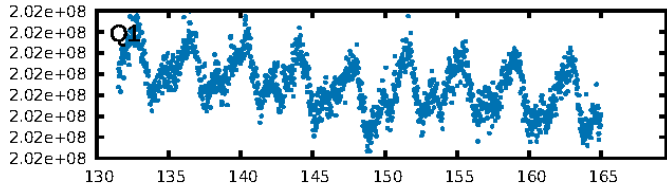
## DV Diagnostic Results:

ShortPeriod-sig: 3.9% [0.05 $\sigma$ ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 0.1%  
ModelChiSquareGof-sig: 57.3%  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [3/3]  
GhostDiagnostic-chr: -8.558  
Centroid-sig: 0.3%  
Centroid-so: 1.696 arcsec [1.58 $\sigma$ ]  
OotOffset-rm: 1.480 arcsec [1.24 $\sigma$ ]  
KicOffset-rm: 1.612 arcsec [1.29 $\sigma$ ]  
OotOffset-st: 2/1/1/0 [4]  
KicOffset-st: 2/1/1/0 [4]  
DiffImageQuality-fgm: 0.75 [3/4]  
DiffImageOverlap-fno: 0.00 [0/4]

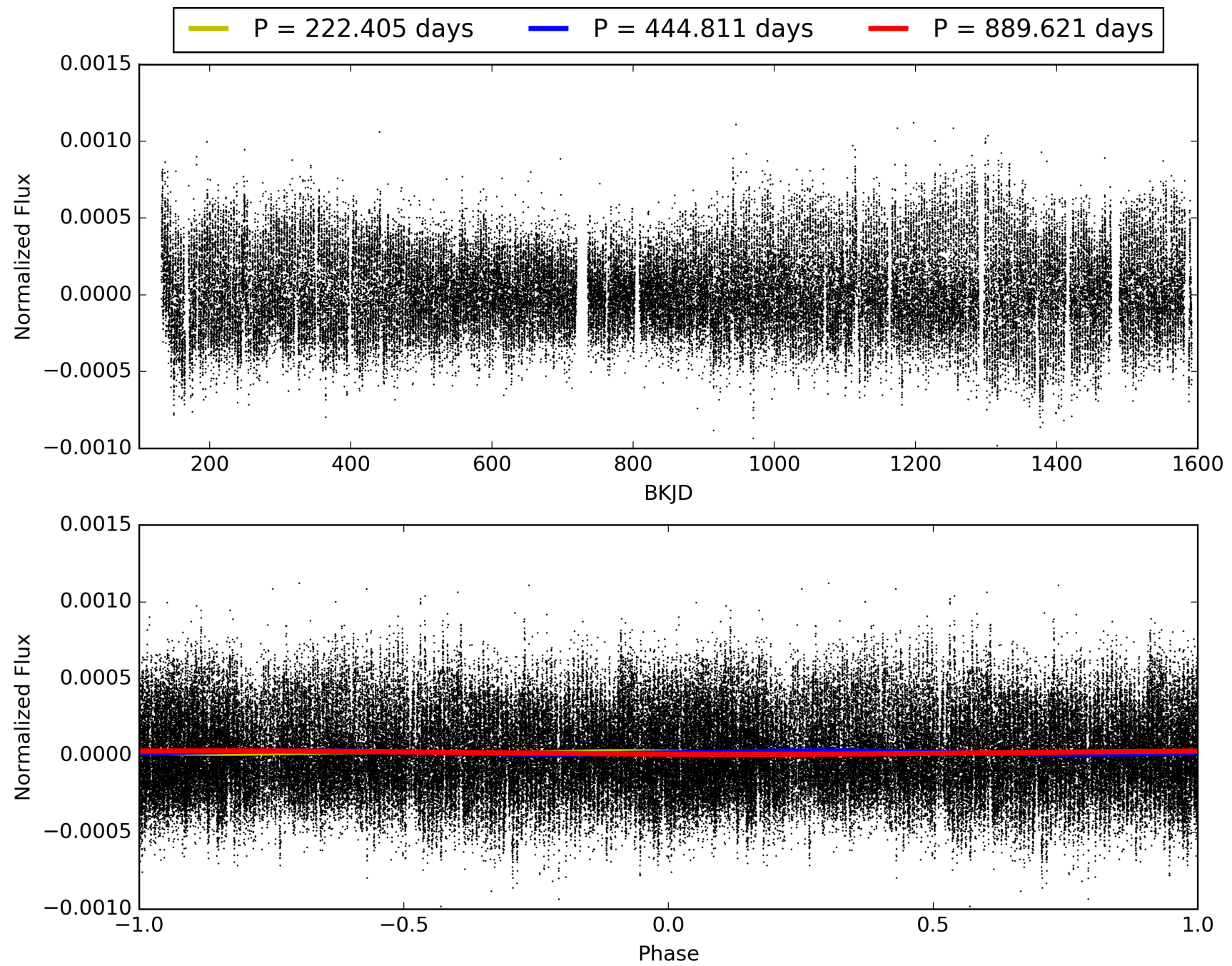
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 16:25:39 Z

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

## TCE 002307533-03, PDC Light Curves

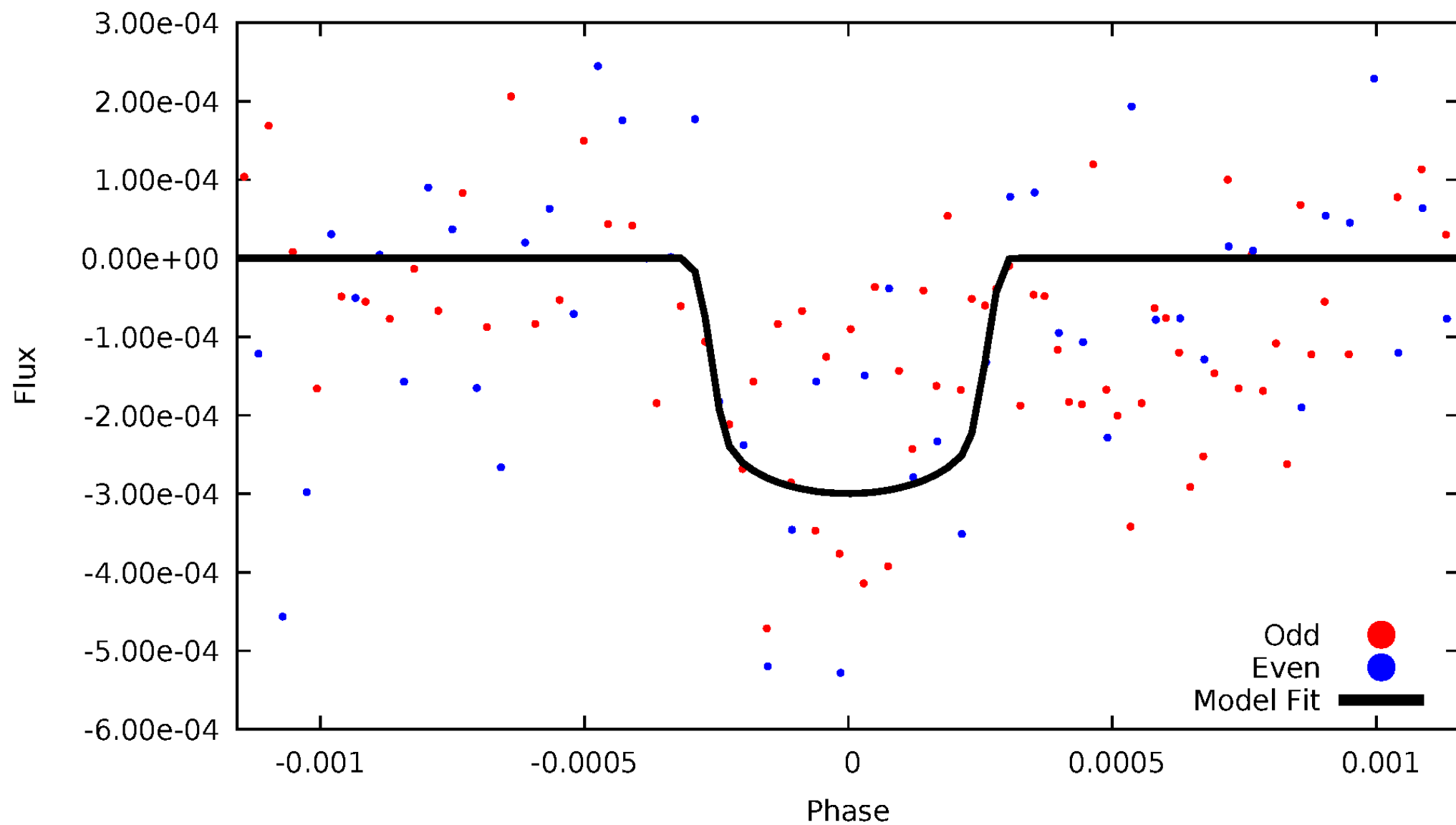


TCE 002307533-03



# DV Odd/Even

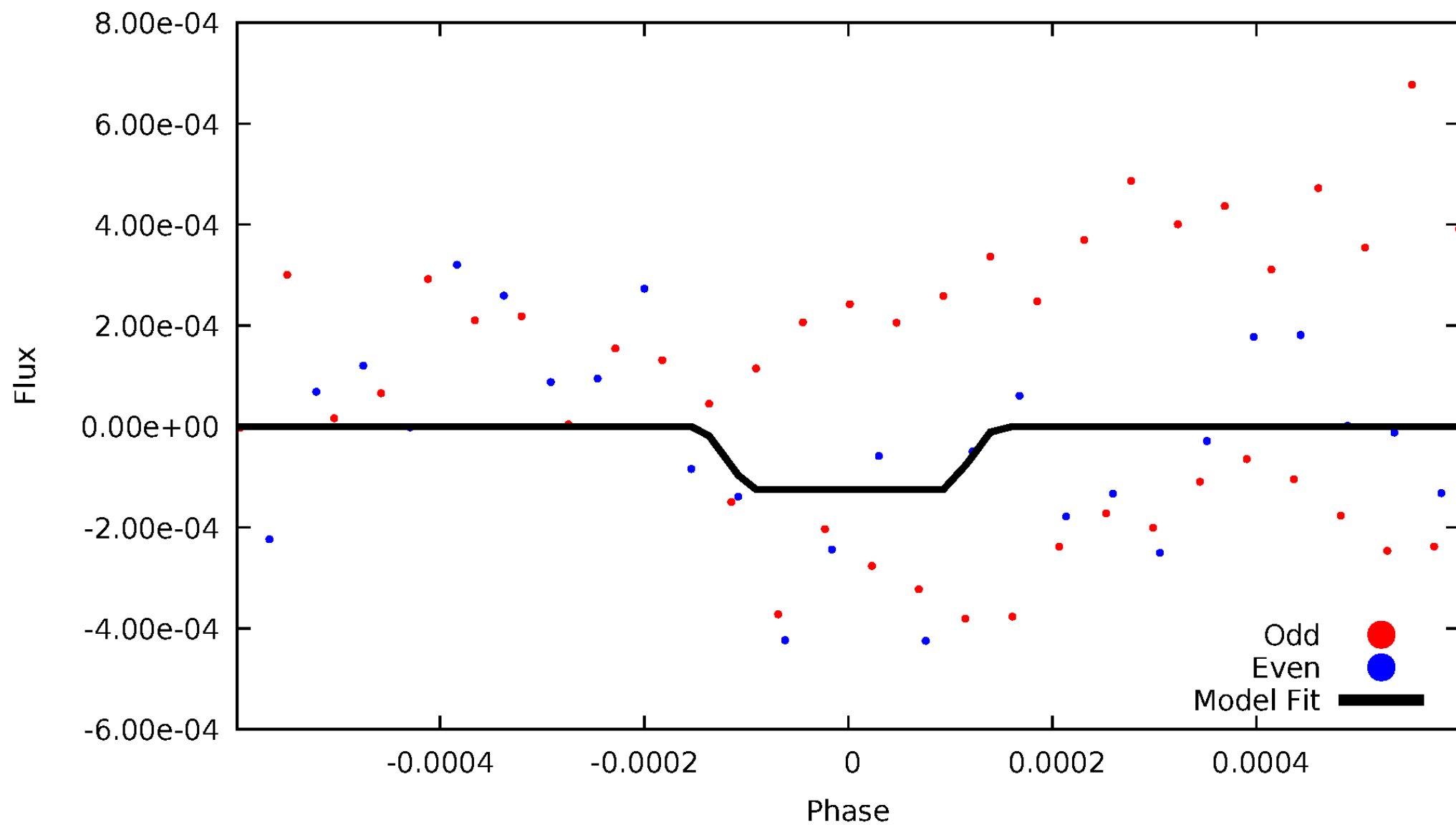
TCE 002307533-03





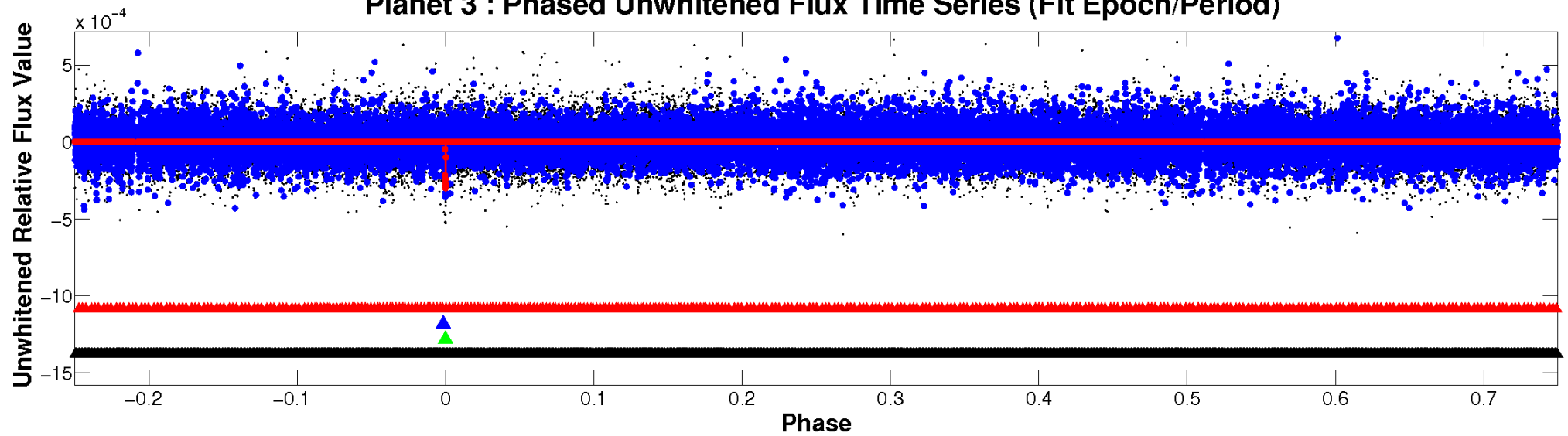
# ALT Odd/Even

TCE 002307533-03

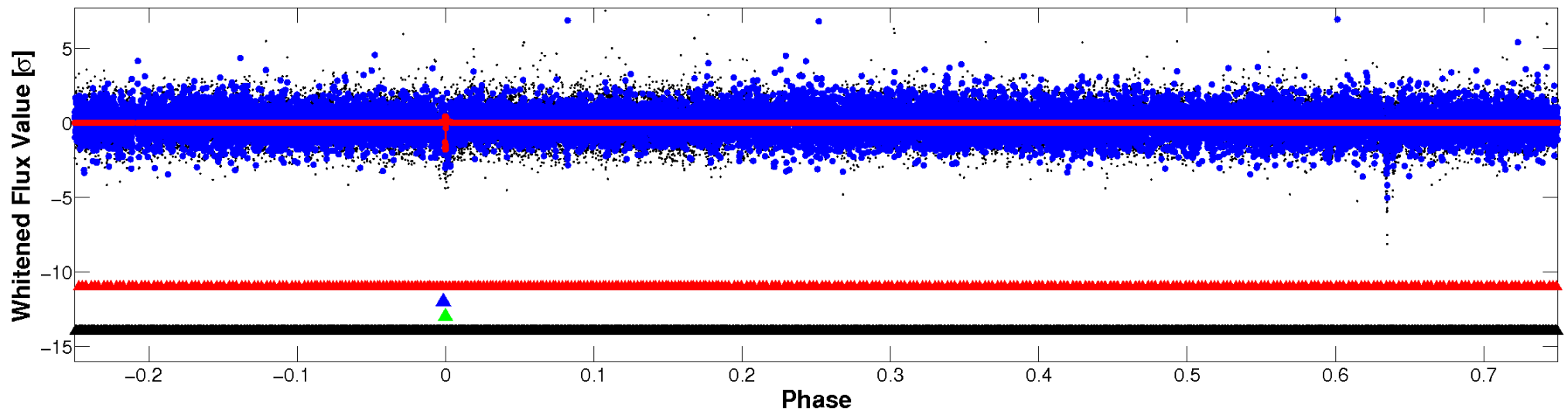


# Non-Whitened Vs. Whitened Light Curve

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

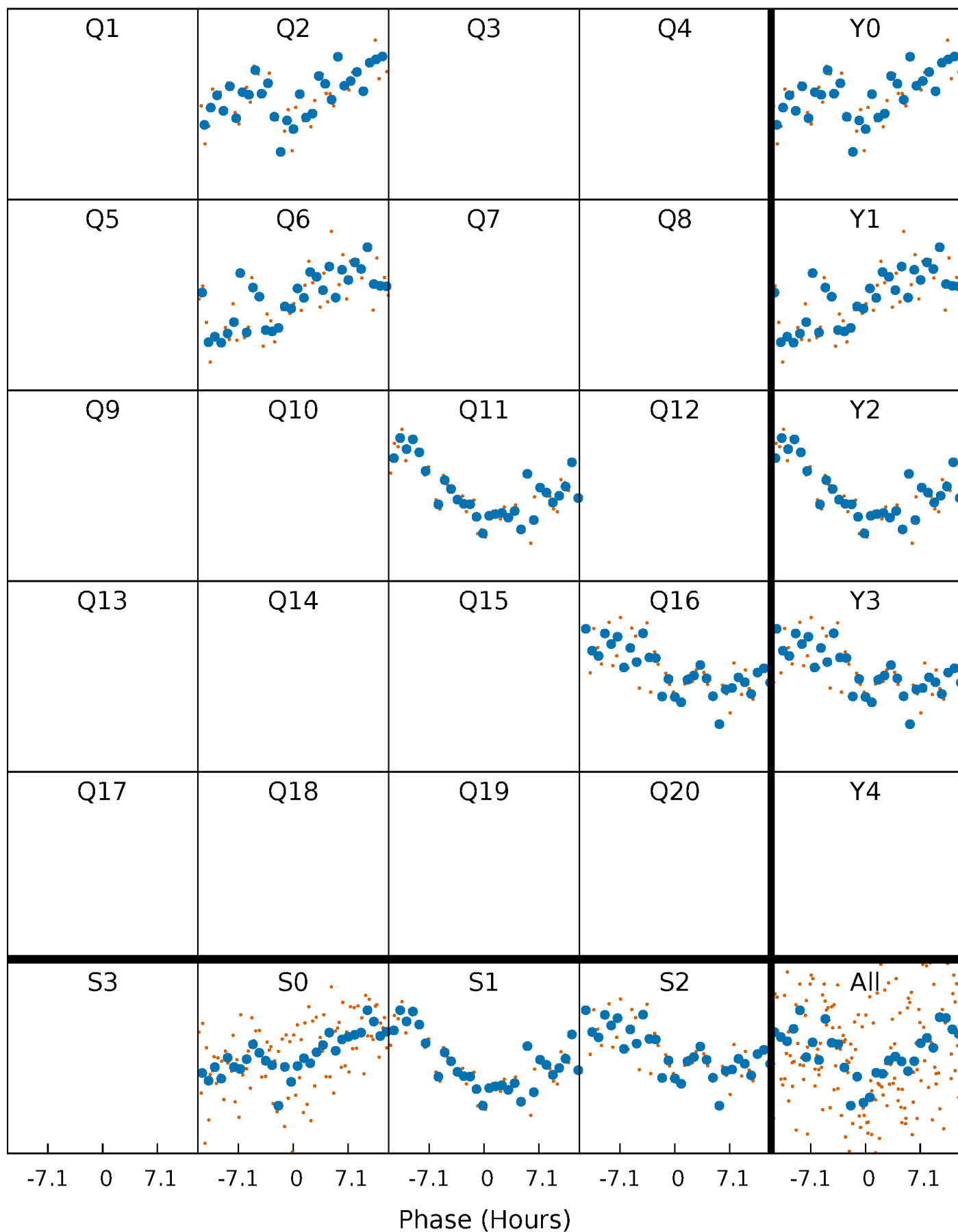


Planet 3 : Phased Whitened Flux Time Series (Fit Epoch/Period)



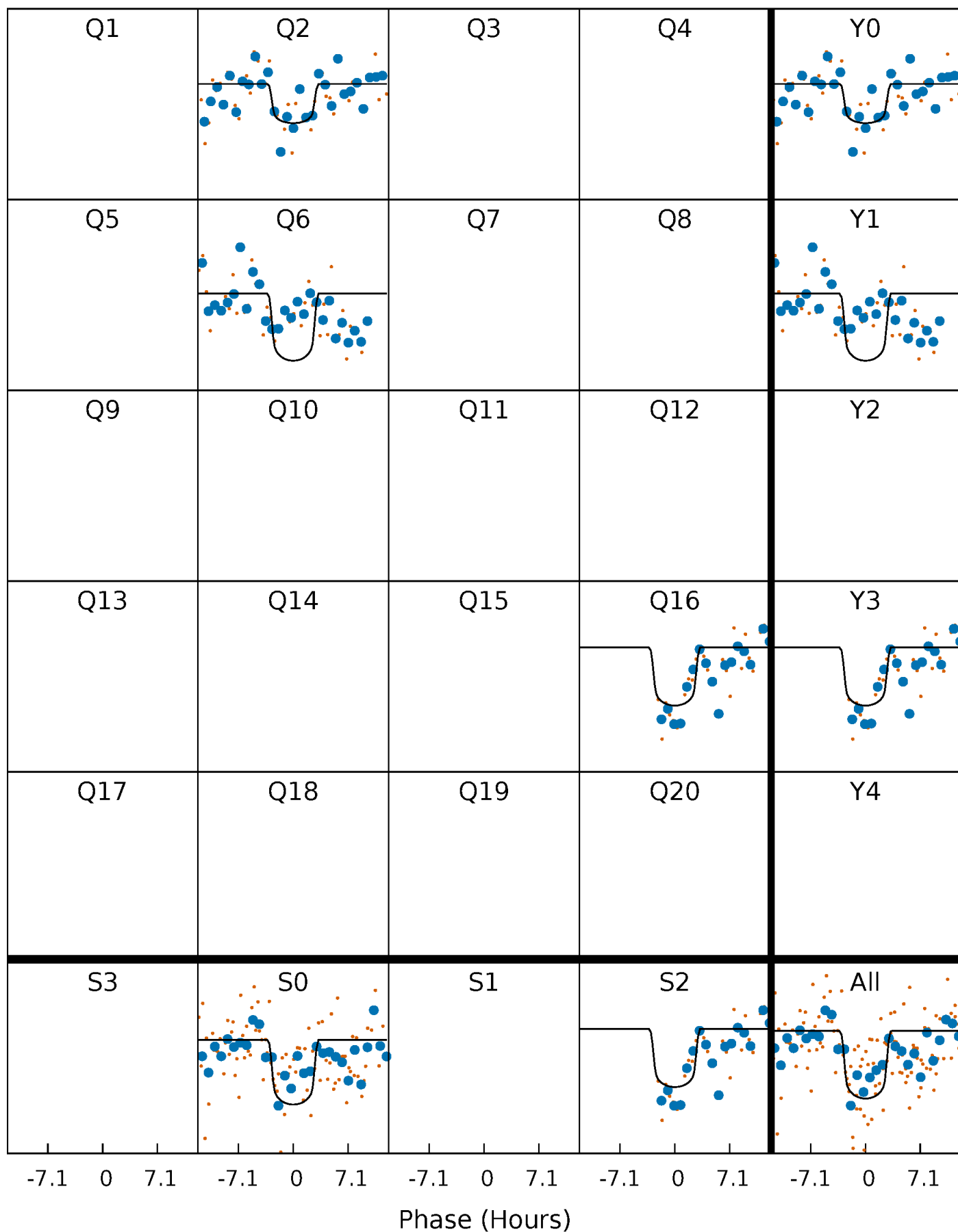
# PDC Quarter-Phased Transit Curves

TCE 002307533-03     $P=444.810634$  Days     $T_0=172.796707$  (BKJD)



# DV Quarter-Phased Transit Curves

TCE 002307533-03     $P=444.810634$  Days     $T_0=172.796707$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

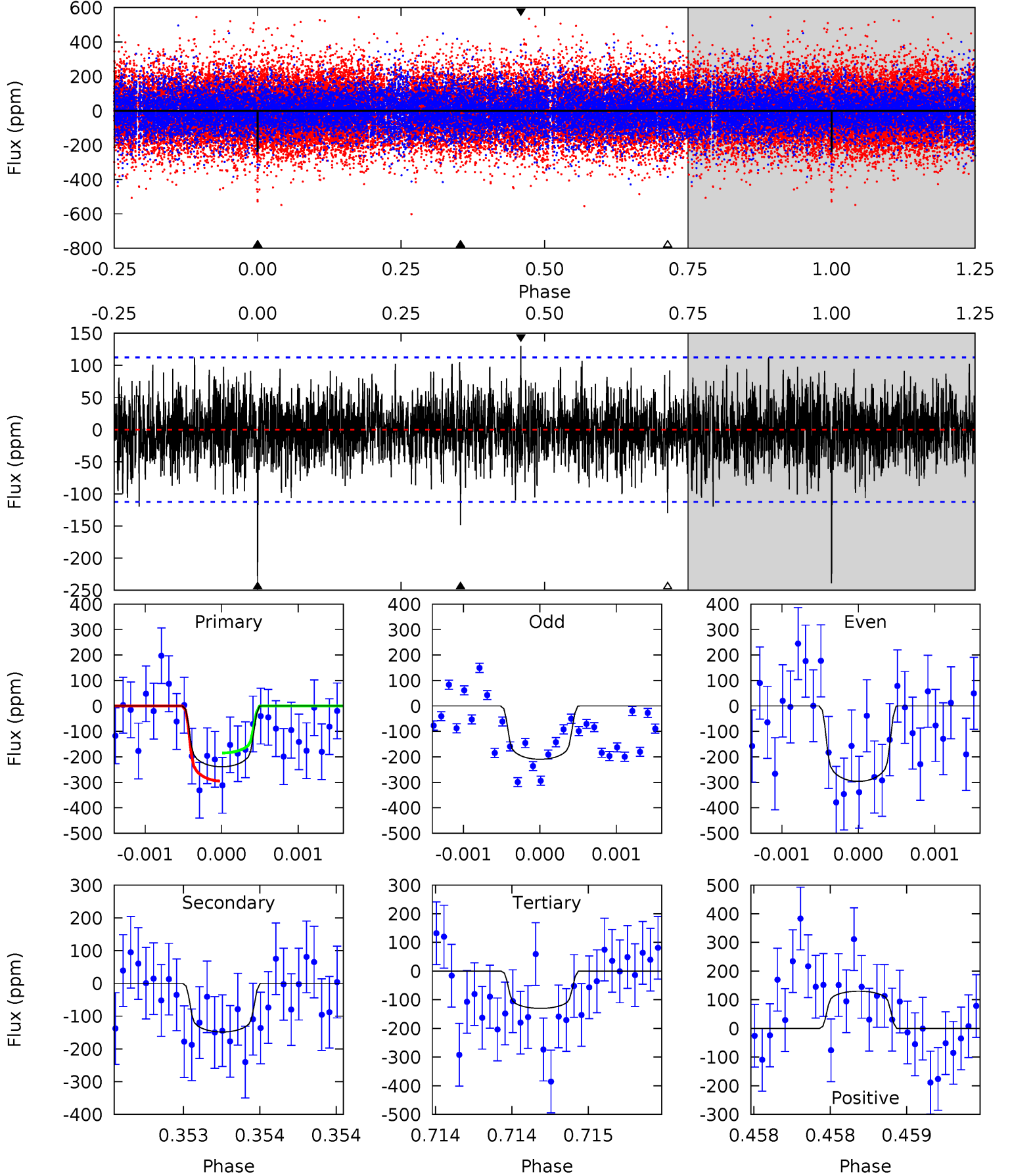
TCE 002307533-03 P=444.811356 Days  $T_0=172.756424$  (BKJD)



# DV Model-Shift Uniqueness Test

002307533-03, P = 444.810634 Days, E = 172.796707 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	7.31	6.41	6.40	5.54	3.42	1.66	5.36	5.36	0.91	0.91	2.02	0.81	0.35	2.69

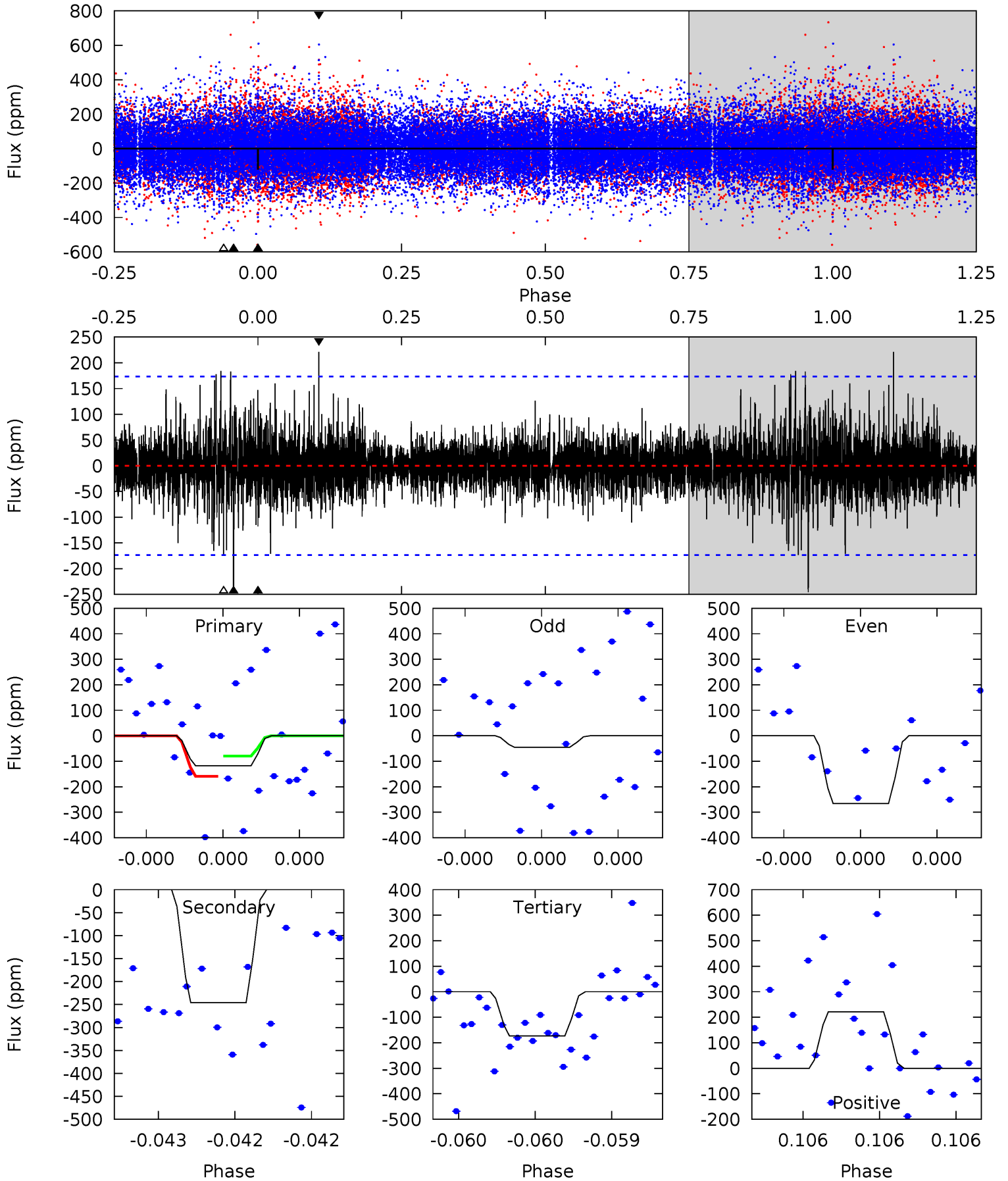




# Alt Model-Shift Uniqueness Test

002307533-03, P = 444.811356 Days, E = 172.756424 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
3.86	8.06	5.68	7.25	5.69	3.66	1.19	-1.82	-3.38	2.38	0.82	3.52	0.46	0.47	1.30



### Stellar Parameters For KIC 002307533

	$T_{\text{eff}} (K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M (M_{\odot})$	$\rho_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$7082^{+190}_{-253}$	$3.742^{+0.288}_{-0.072}$	$-0.160^{+0.250}_{-0.300}$	$2.880^{+0.428}_{-0.927}$	$1.669^{+0.197}_{-0.295}$	$0.098^{+0.180}_{-0.029}$
	+3%/-4%	+8%/-2%	+156%/-188%	+15%/-32%	+12%/-18%	+183%/-29%
Source	PHO1	FLK73	KIC0	DSEP		

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

### Secondary Eclipse Parameters for KIC 002307533-03 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-148 \pm 20$	$5.37^{+1.61}_{-1.53}$	$621^{+38}_{-53}$	$5722^{+918}_{-573}$	$5198^{+4887}_{-2112}$
Alt.	$-246 \pm 30$	$3.28^{+1.46}_{-1.32}$	$621^{+35}_{-54}$	$8600^{+4145}_{-1607}$	$22619^{+44216}_{-11869}$

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

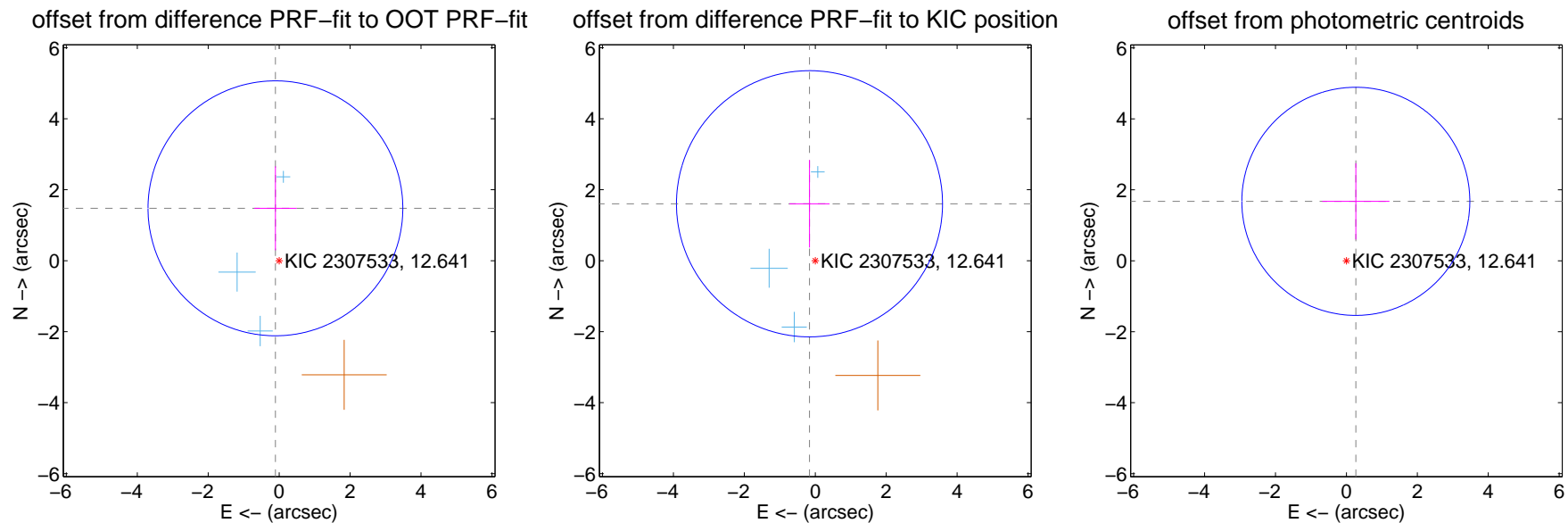
## DV Centroid Data

Supplemental centroid analysis for 002307533-03. Kepler magnitude: 12.64. Transit SNR 9.44

There are 3 quarters with good PRF difference image offsets

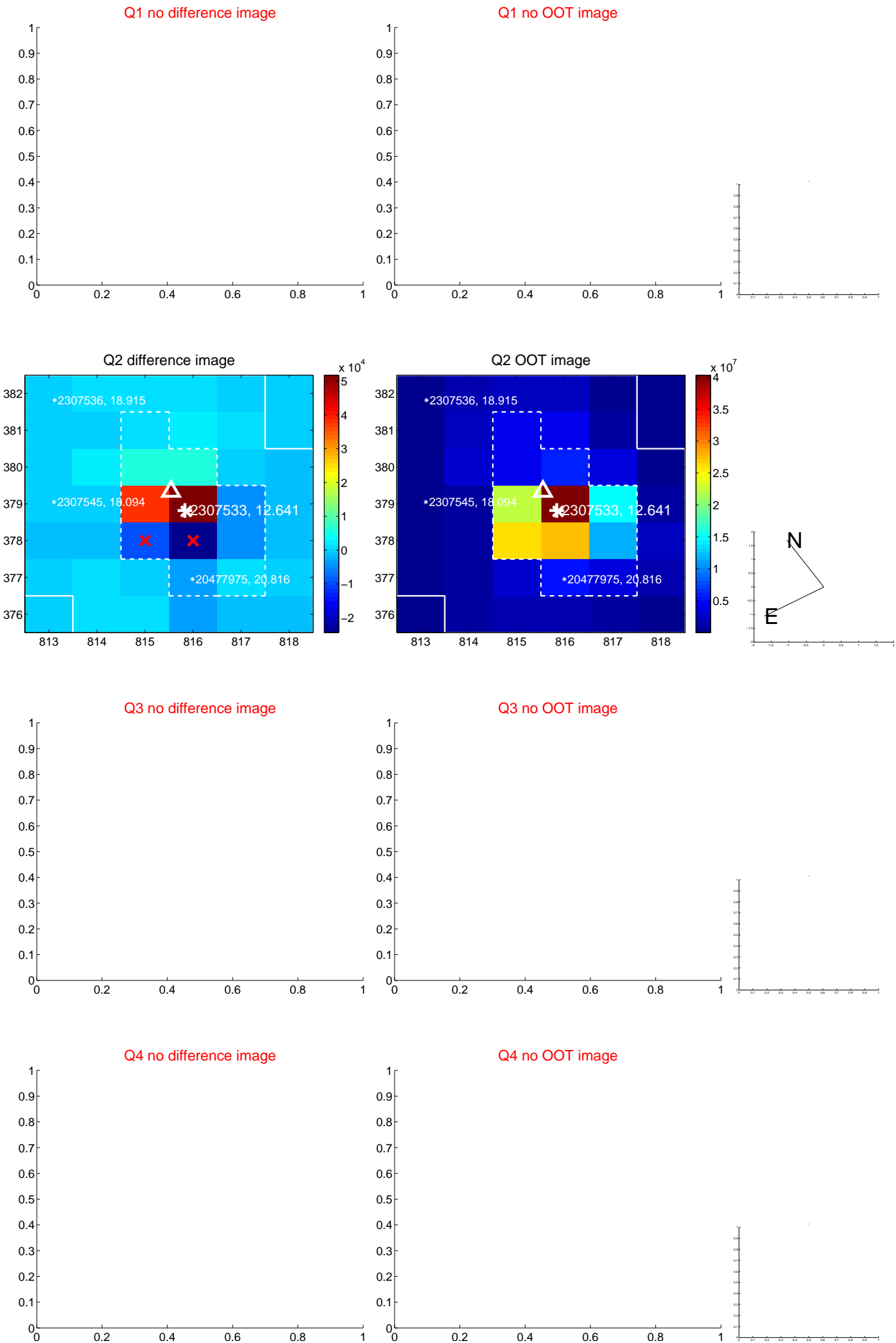
The direct PRF centroid is offset from the target star catalog position by about 0.13 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$1.480 \pm 1.197$	1.24	$0.105 \pm 0.596$	$1.476 \pm 1.183$
PRF-fit source offset from KIC position	$1.612 \pm 1.250$	1.29	$0.163 \pm 0.567$	$1.604 \pm 1.235$
photometric centroid source offset	$1.70 \pm 1.07$	1.58	$-0.27 \pm 0.95$	$1.68 \pm 1.07$

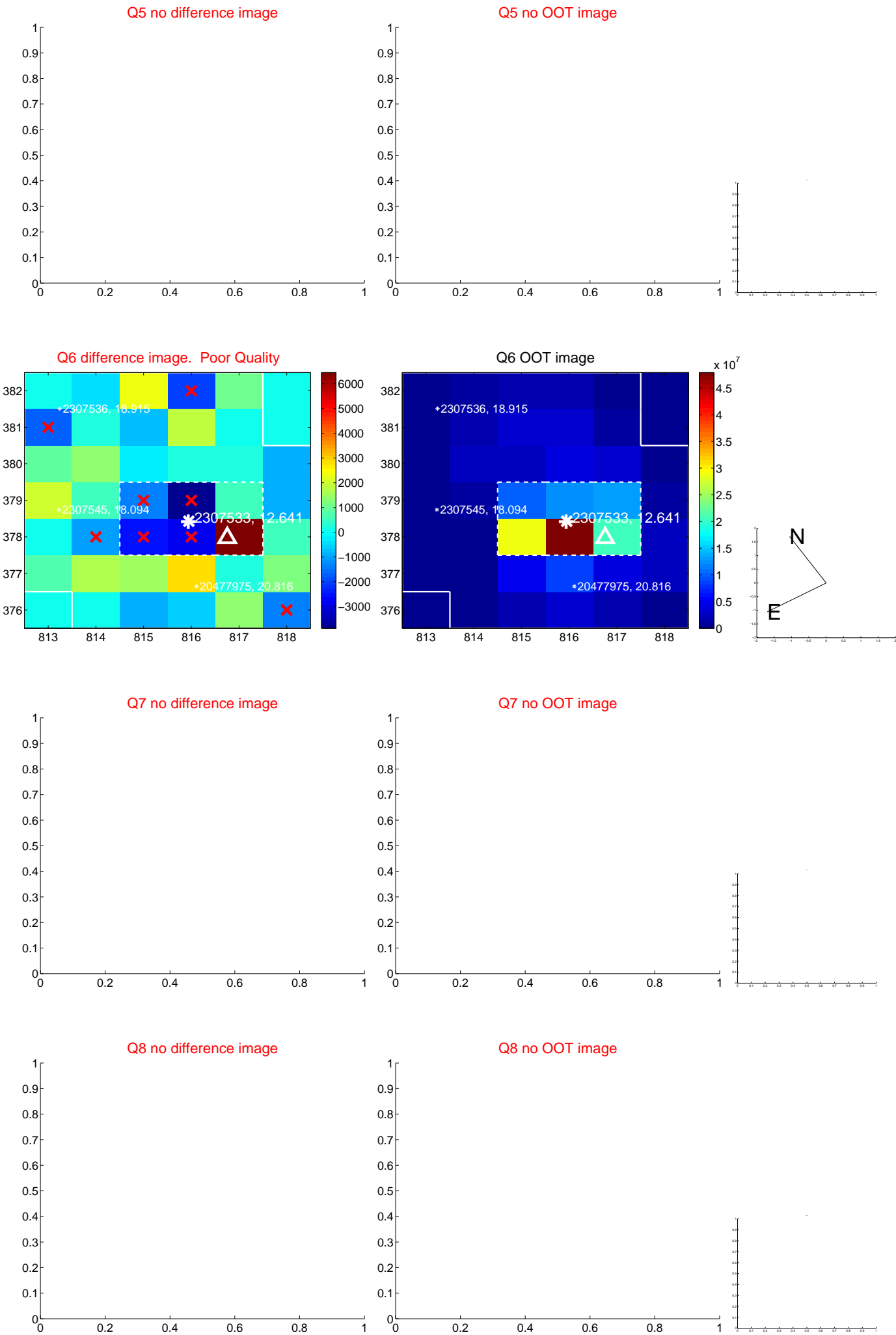


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

Q9 no difference image



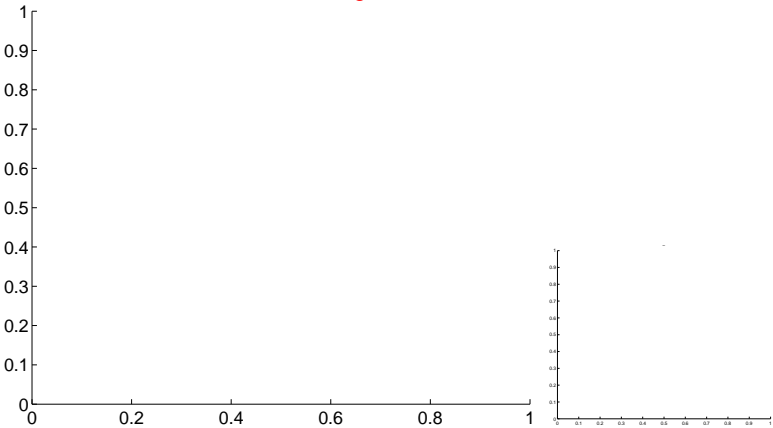
Q9 no OOT image



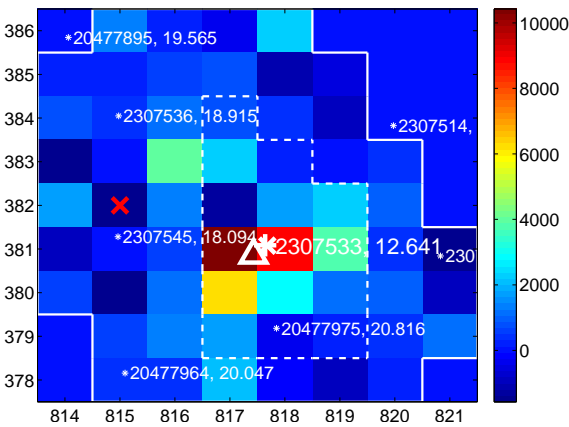
Q10 no difference image



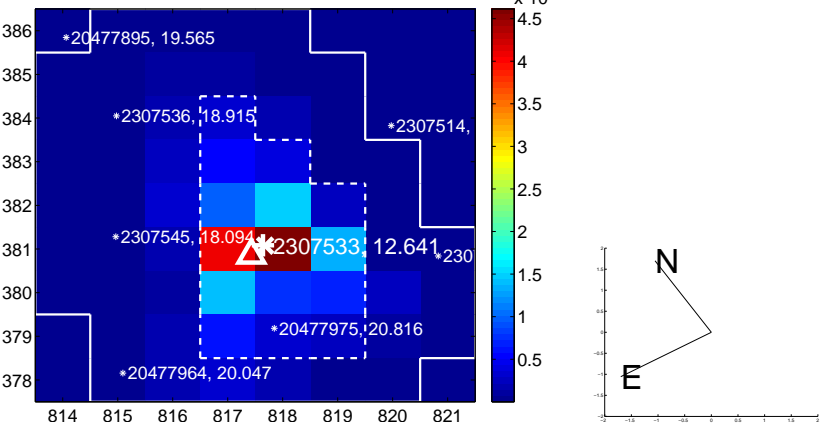
Q10 no OOT image



Q11 difference image



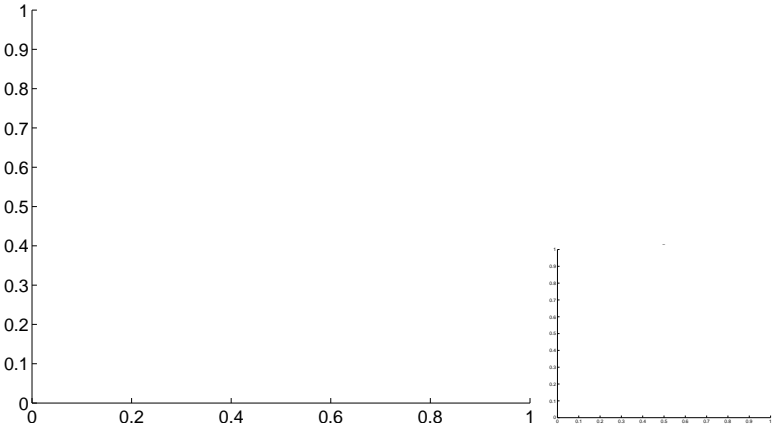
Q11 OOT image



Q12 no difference image

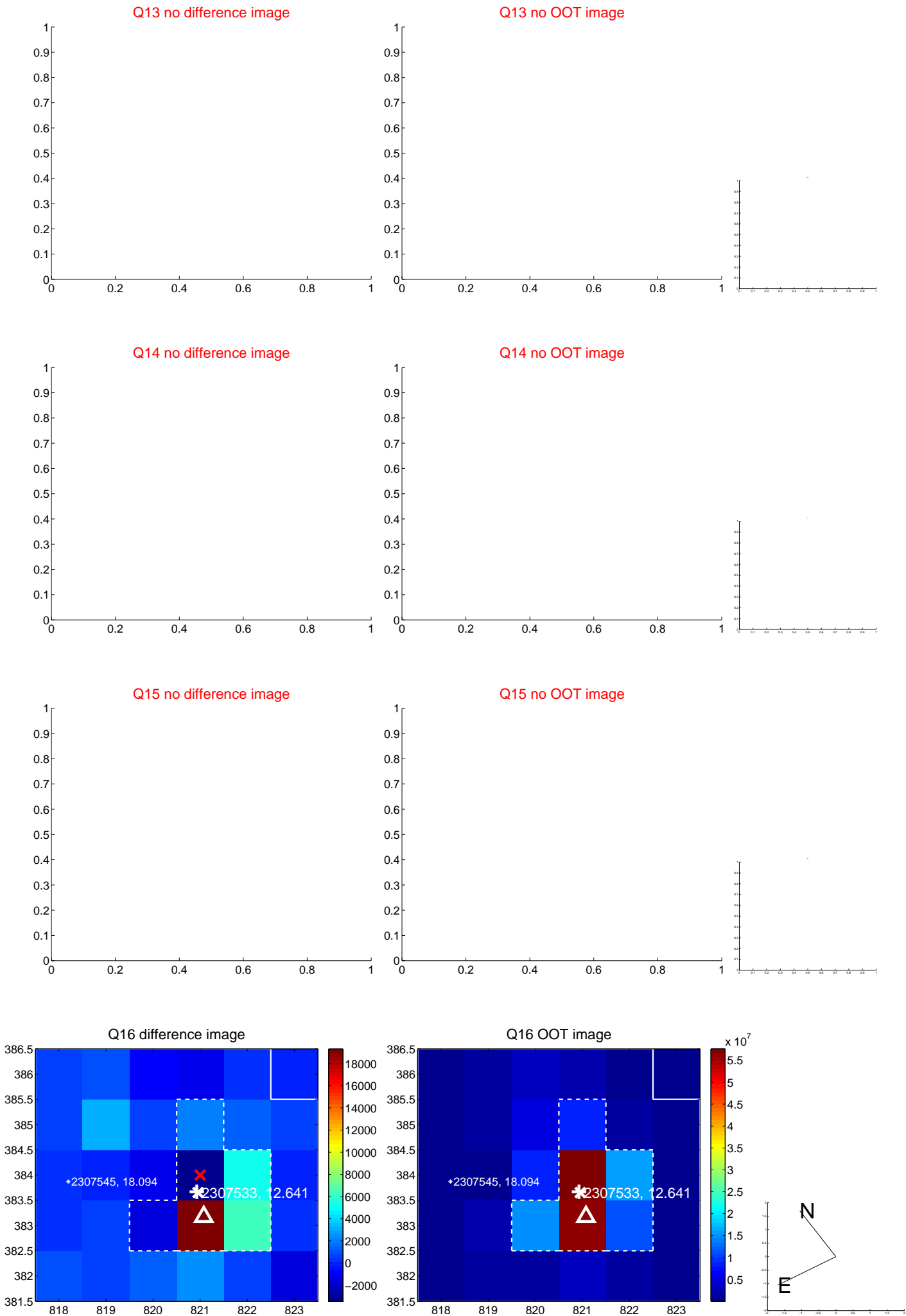


Q12 no OOT image

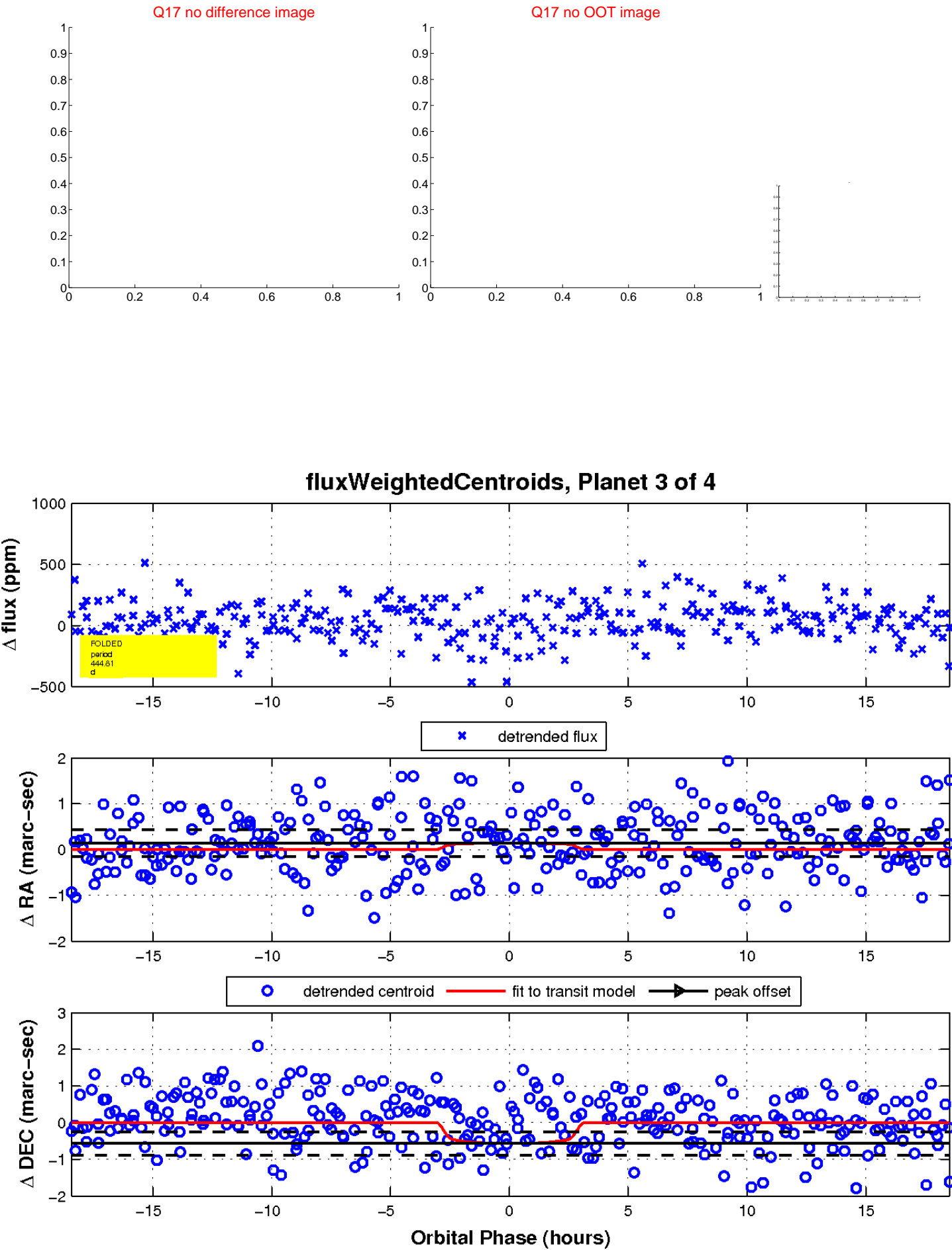




white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

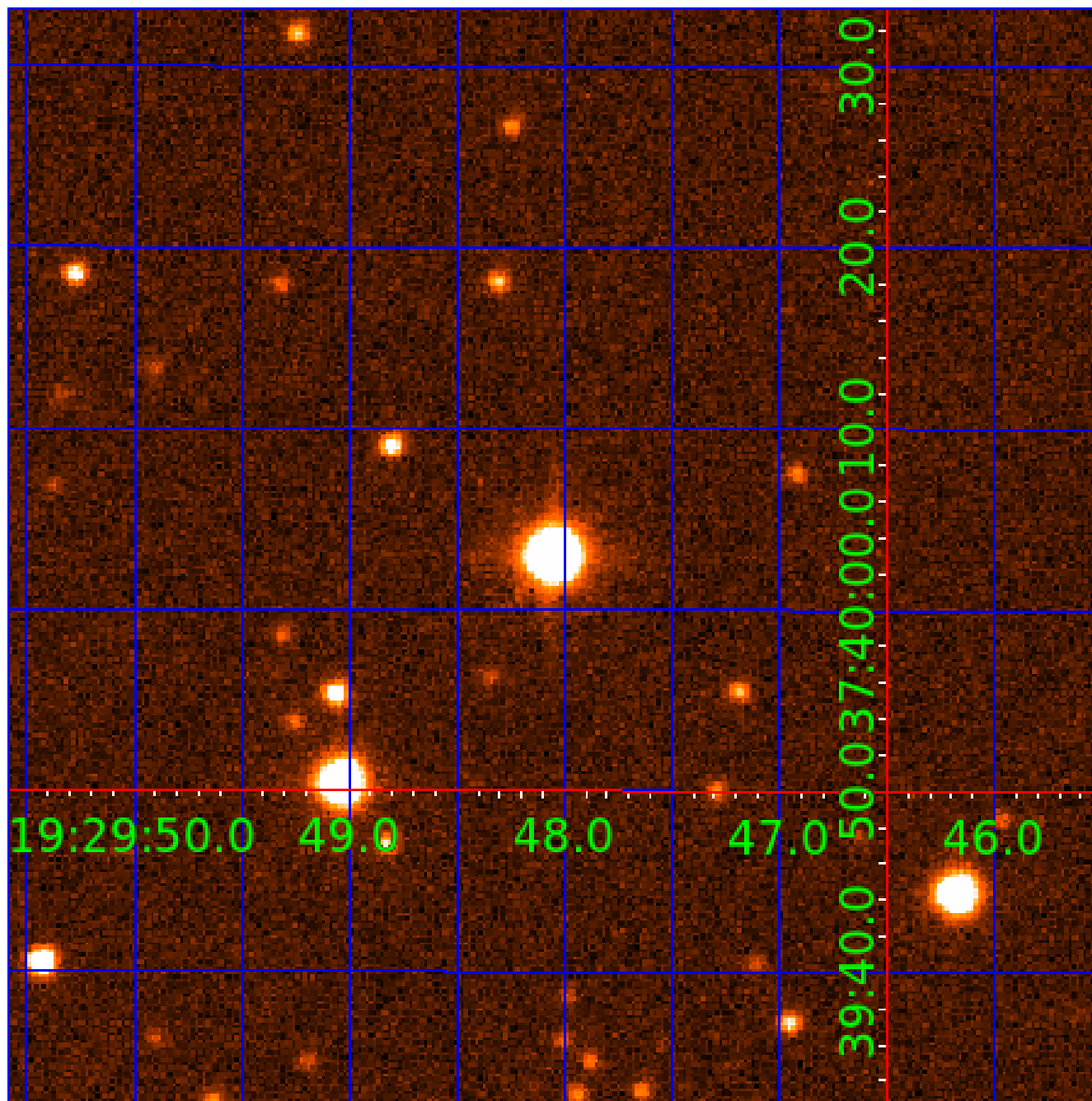


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 002307533

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
002307533-01	OBS	No	3.760695	133.676951	76.4	12.500	8.2	-1.0	2.88	7082	2.53	5925.92
002307533-02	OBS	No	444.797708	172.176211	123.5	1.680	17.6	2.5	2.88	7082	3.91	10.21
002307533-03	OBS	No	444.810634	172.796707	299.7	6.178	16.0	9.4	2.88	7082	5.82	10.21
002307533-04	OBS	No	0.537489	131.981218	25.6	6.450	9.9	16.3	2.88	7082	1.47	79302.53

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
002307533-01	OBS	FP	0.00	1	0	0	0	SWEET_NTL—LPP_DV—CENT_NOFITS
002307533-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL_TRACKER—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV— MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
002307533-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL_TRACKER—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT— INCONSISTENT_TRANS—SAME_NTL_PERIOD
002307533-04	OBS	FP	0.00	1	0	0	0	LPP_DV—CENT_FEW_DIFFS

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

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

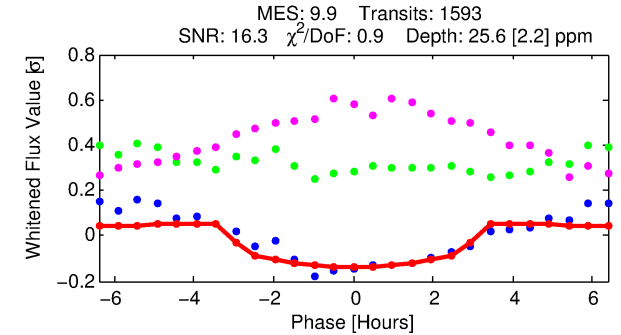
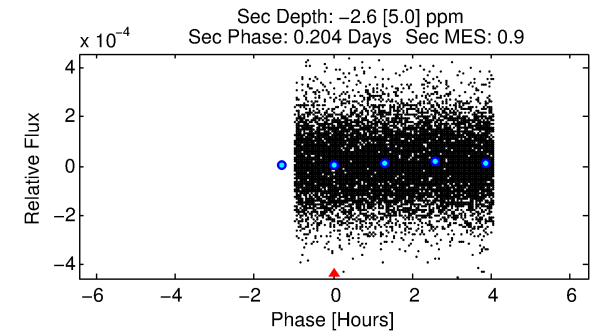
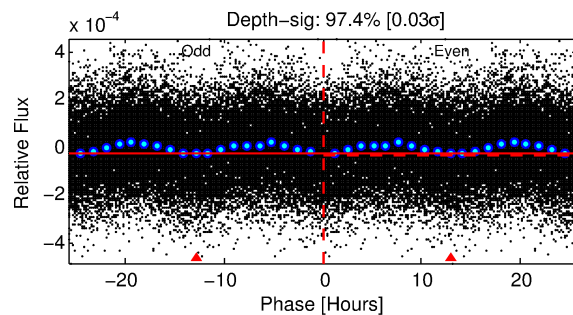
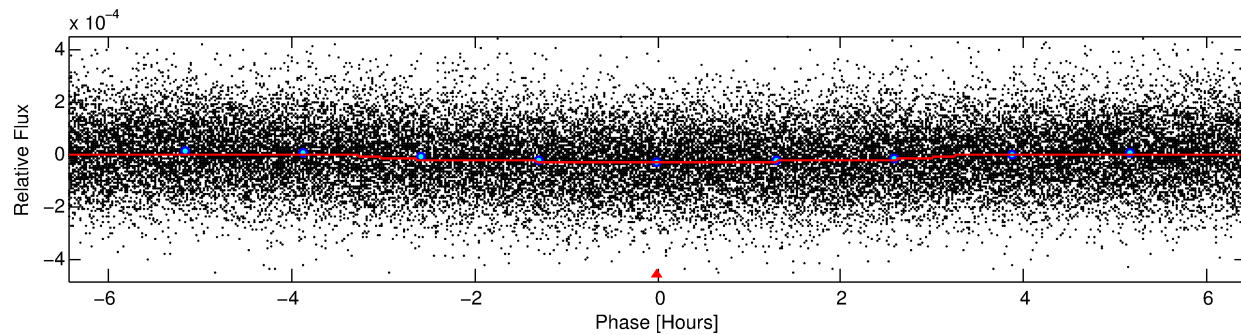
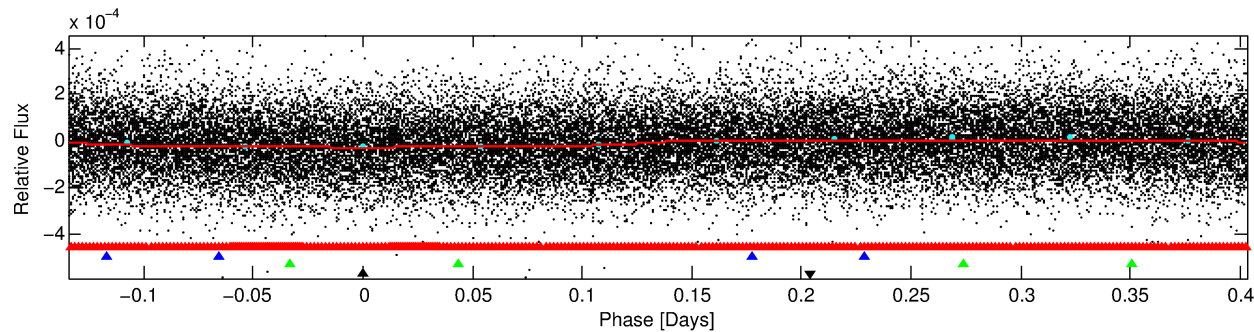
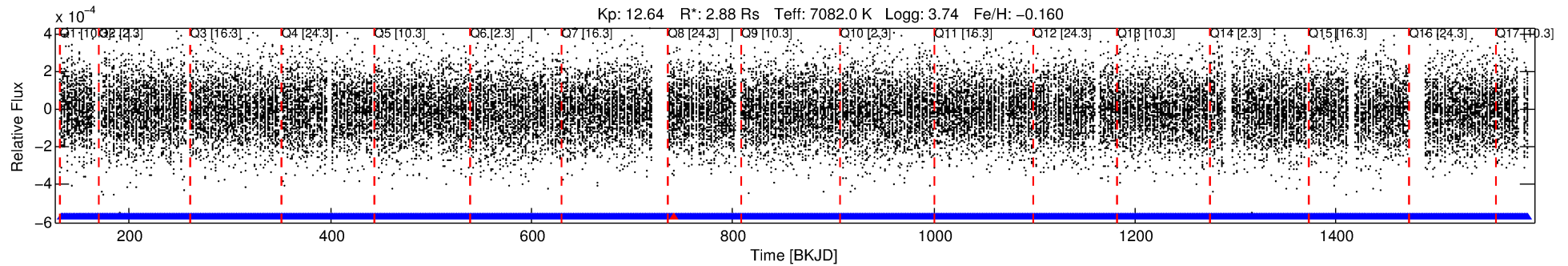
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 002307533-04

No Significant Match Found

# DV One-Page Summary

KIC: 2307533 Candidate: 4 of 4 Period: 0.537 d



## DV Fit Results:

Period = 0.53749 [0.00001] d  
Epoch = 131.9812 [0.0034] BKJD  
Rp/R\* = 0.0047 [0.0018]  
a/R\* = 1.00 [0.01]  
b = 0.00 [569.55]  
Seff = 79302.53 [40585.15]  
Teff = 4279 [547] K  
Rp = 1.47 [0.73] Re  
a = 0.0154 [0.0047] AU  
Ag = N/A  
Teffp = N/A

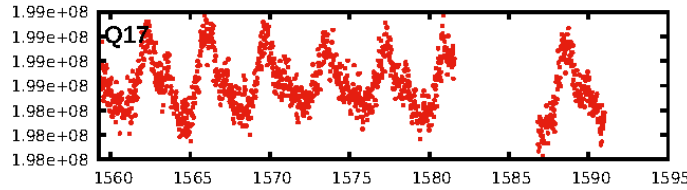
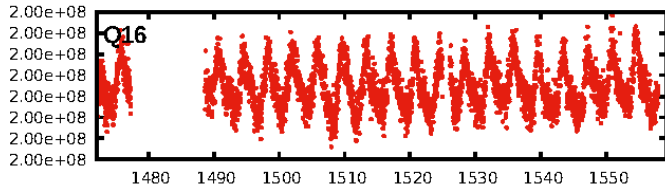
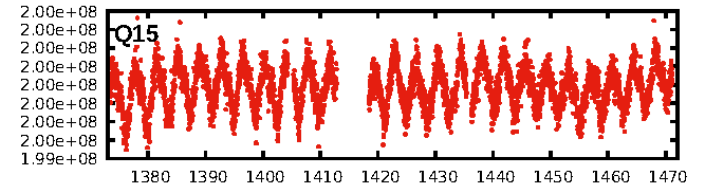
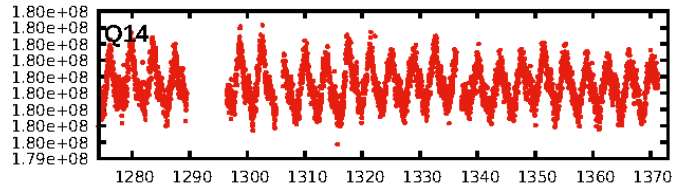
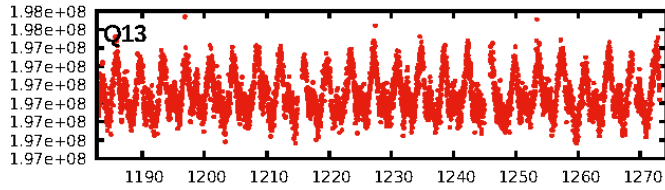
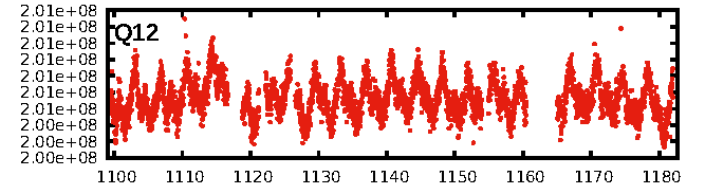
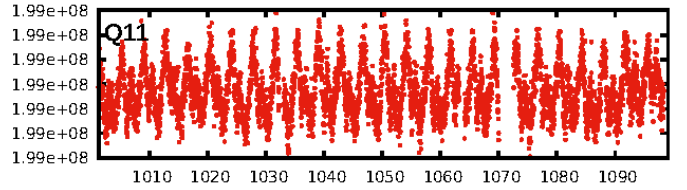
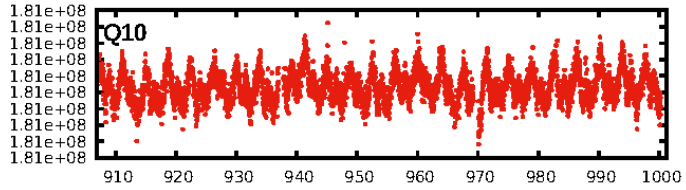
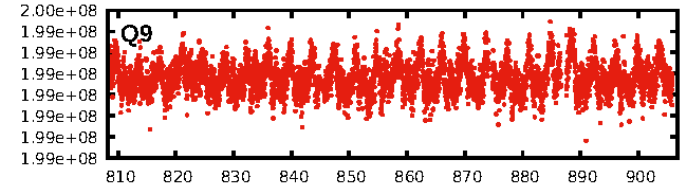
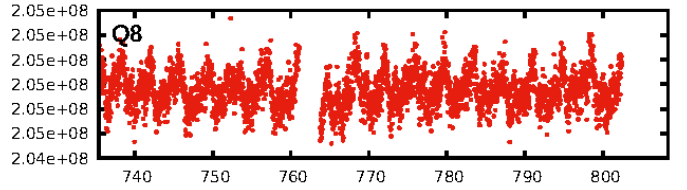
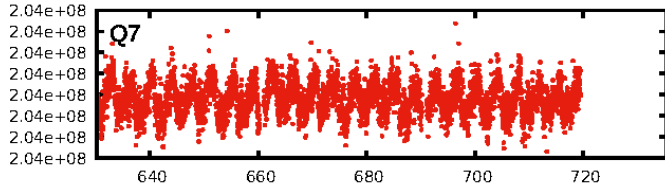
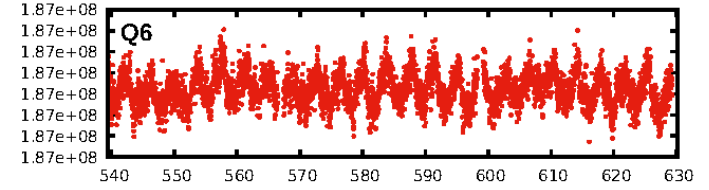
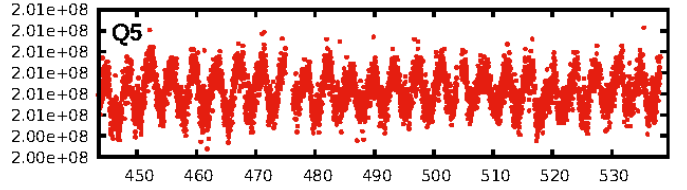
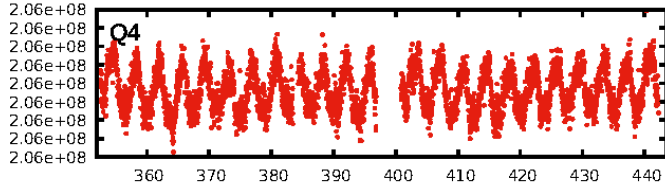
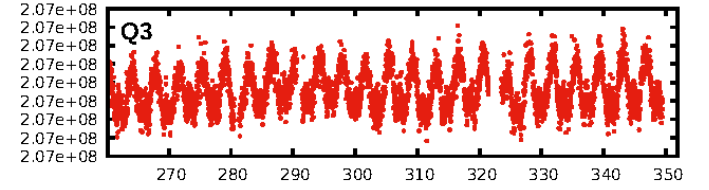
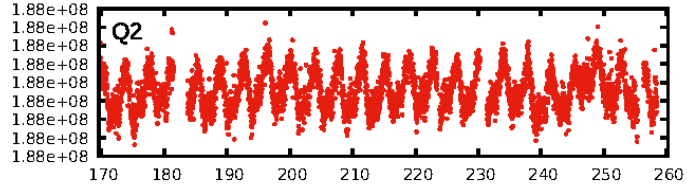
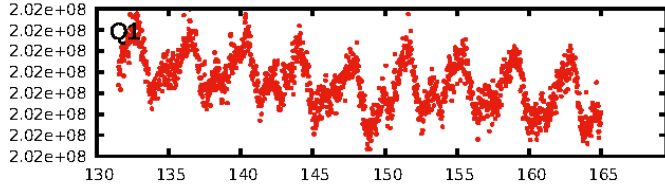
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [5.50σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [1527/1528]  
GhostDiagnostic-chr: 1.233  
Centroid-sig: 0.2%  
Centroid-so: 0.704 arcsec [1.75σ]  
OotOffset-rm: N/A  
KicOffset-rm: N/A  
OotOffset-st: 0/0/0/0 [0]  
KicOffset-st: 0/0/0/0 [0]  
DiffImageQuality-fgm: N/A  
DiffImageOverlap-fno: 1.00 [17/17]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 16:25:51 Z

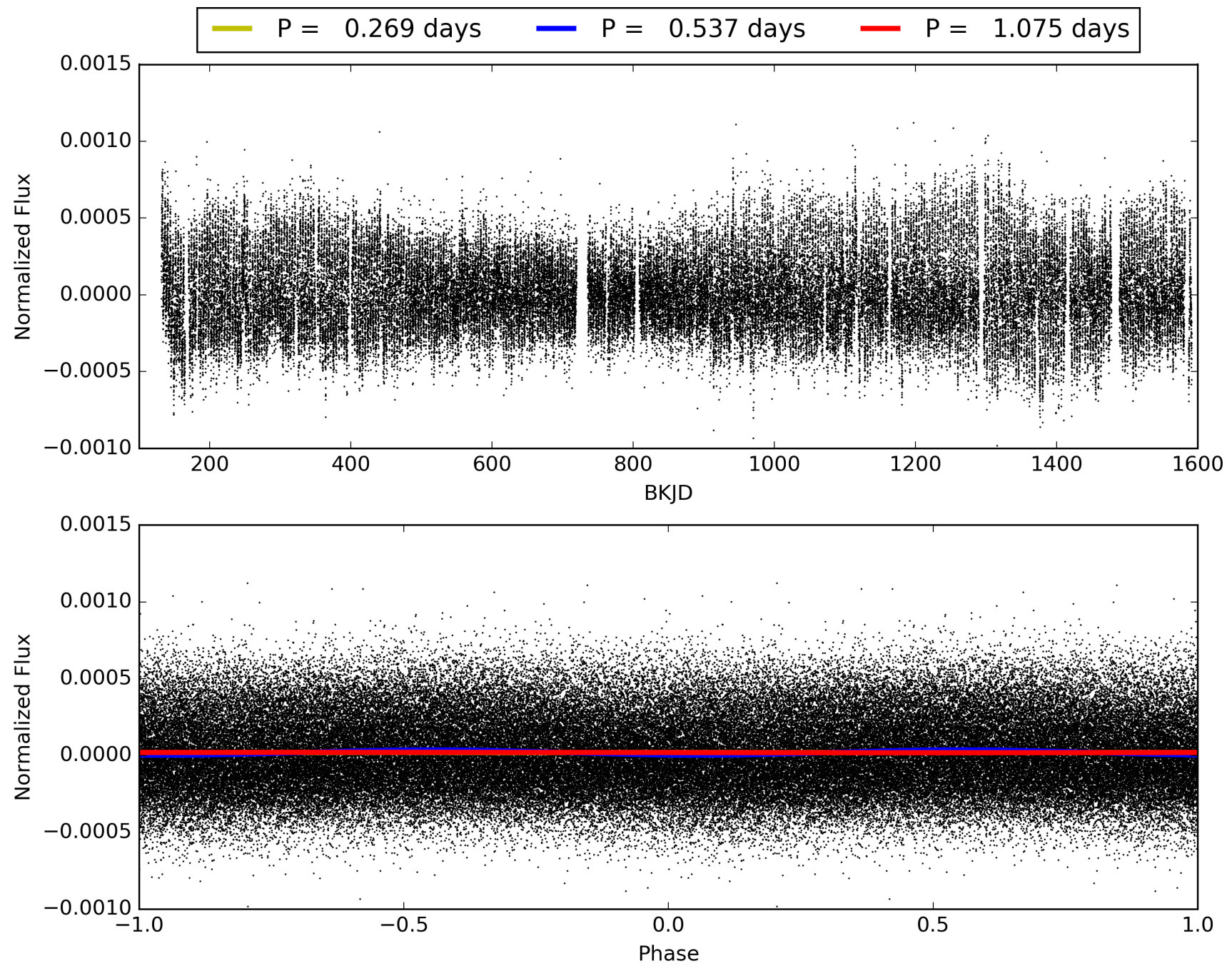
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

## TCE 002307533-04, PDC Light Curves





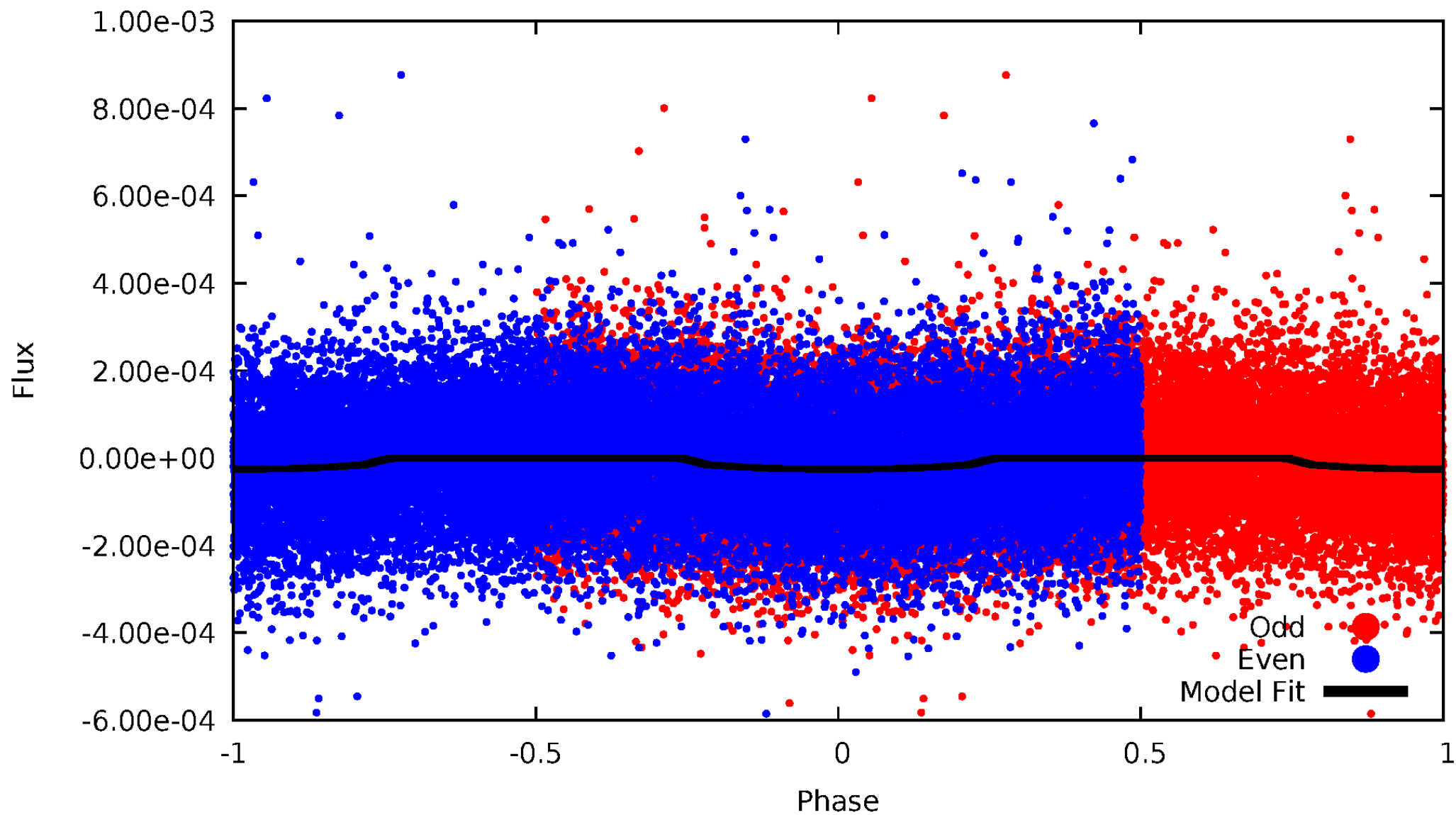
TCE 002307533-04





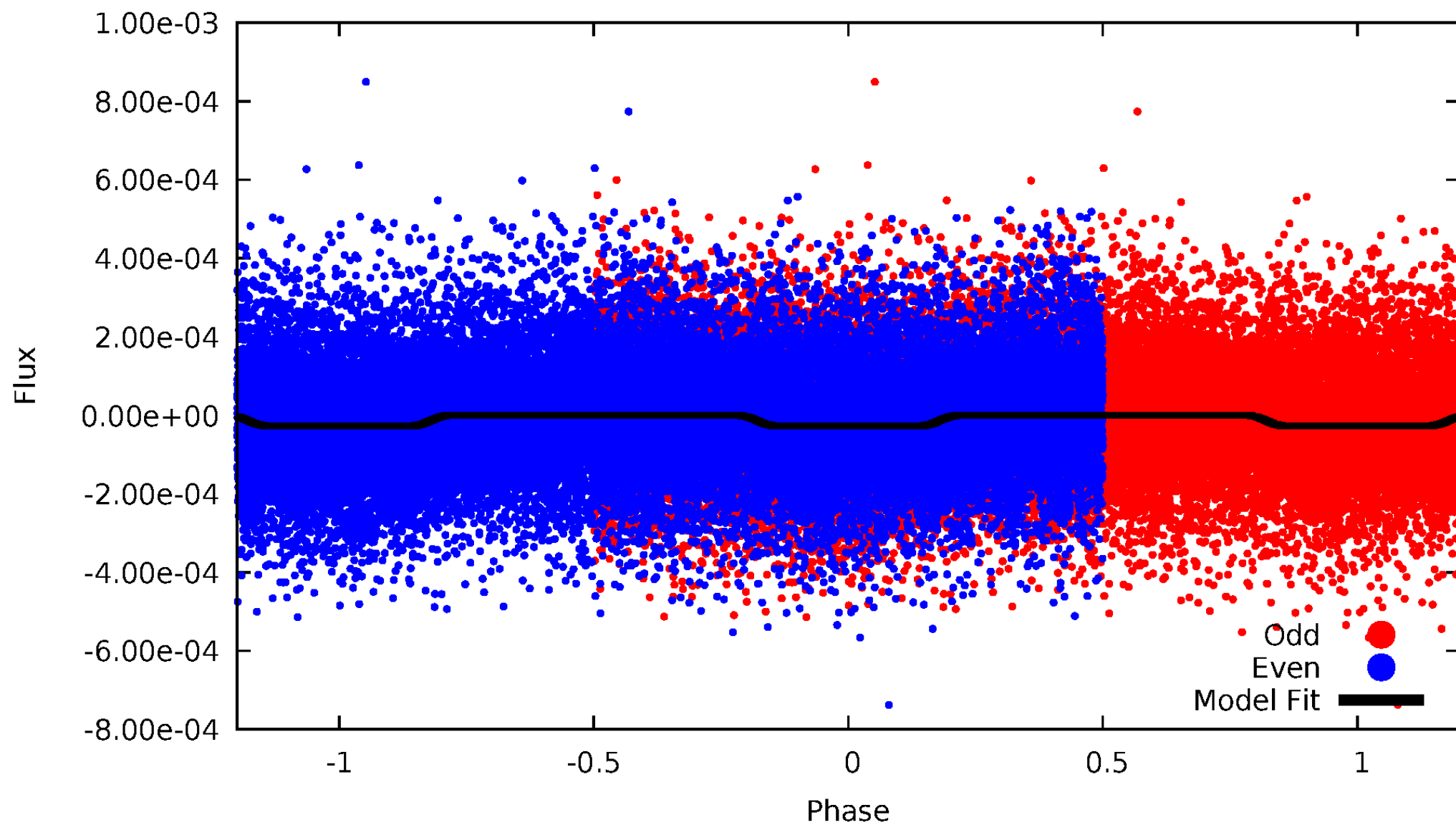
# DV Odd/Even

TCE 002307533-04



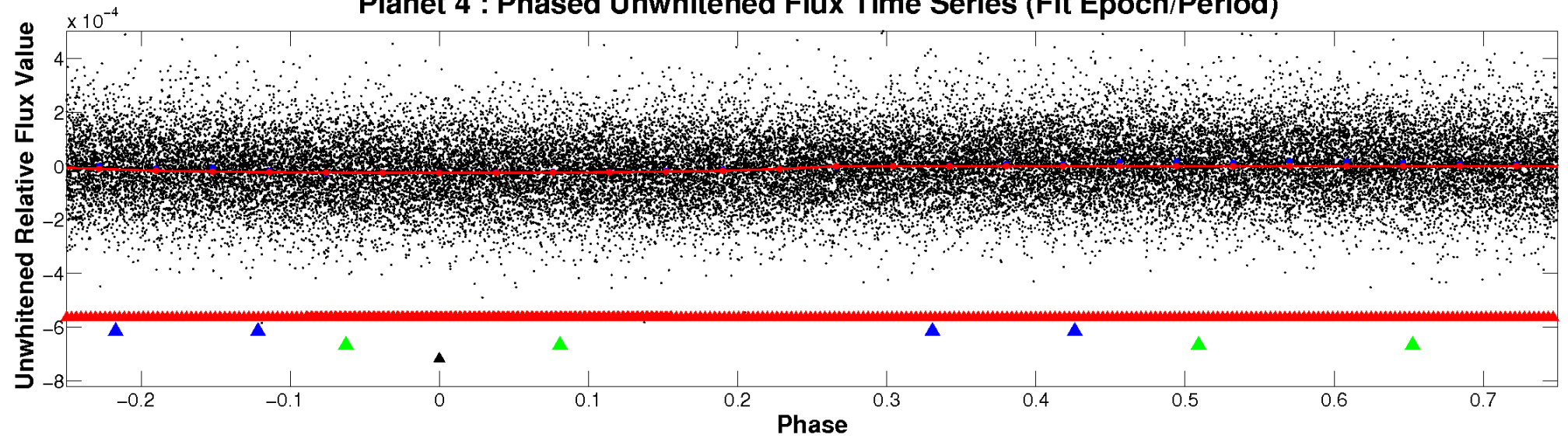
# ALT Odd/Even

TCE 002307533-04

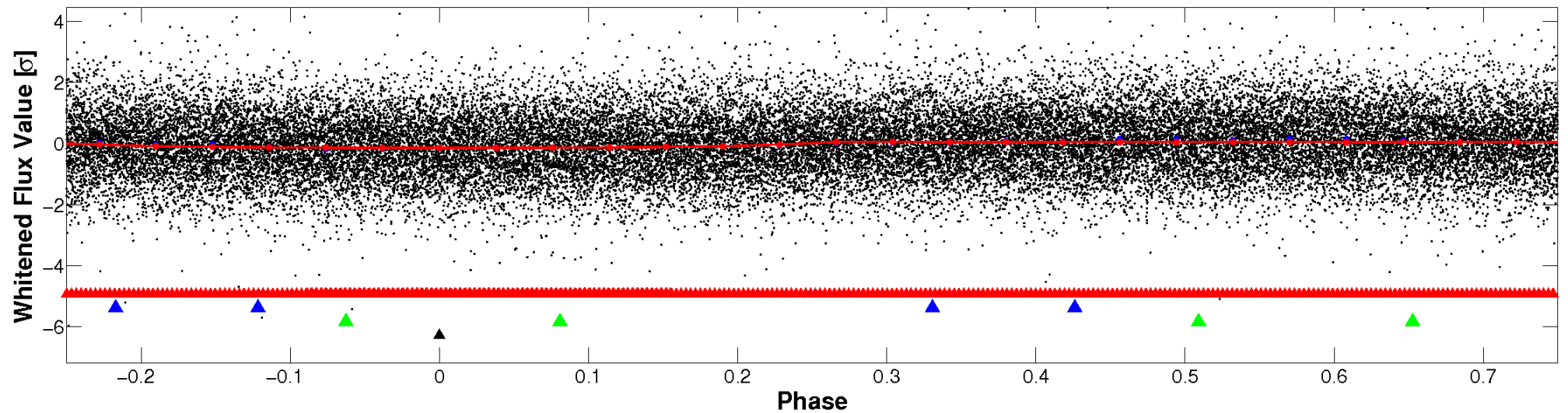


# Non-Whitened Vs. Whitened Light Curve

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

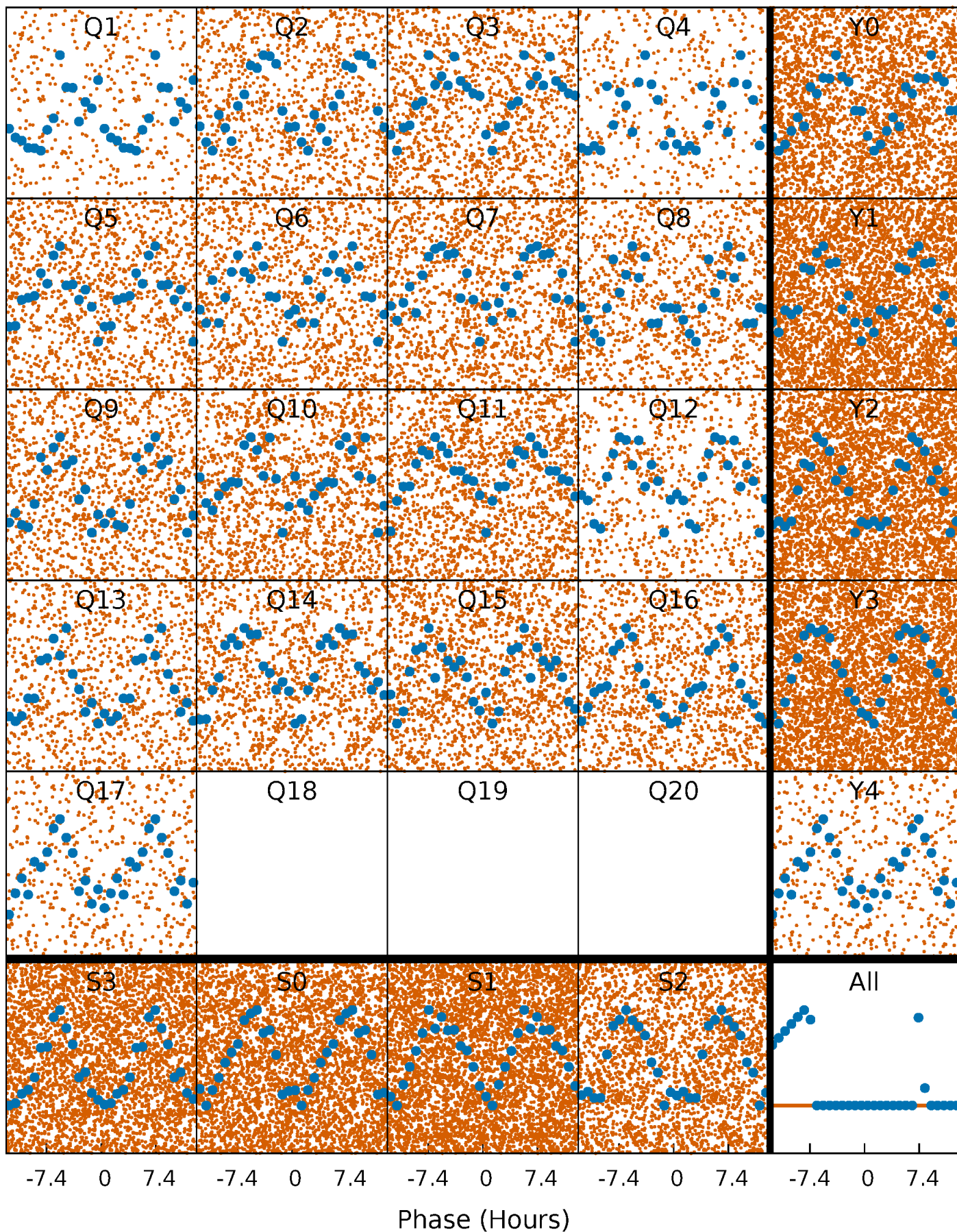


## Planet 4 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

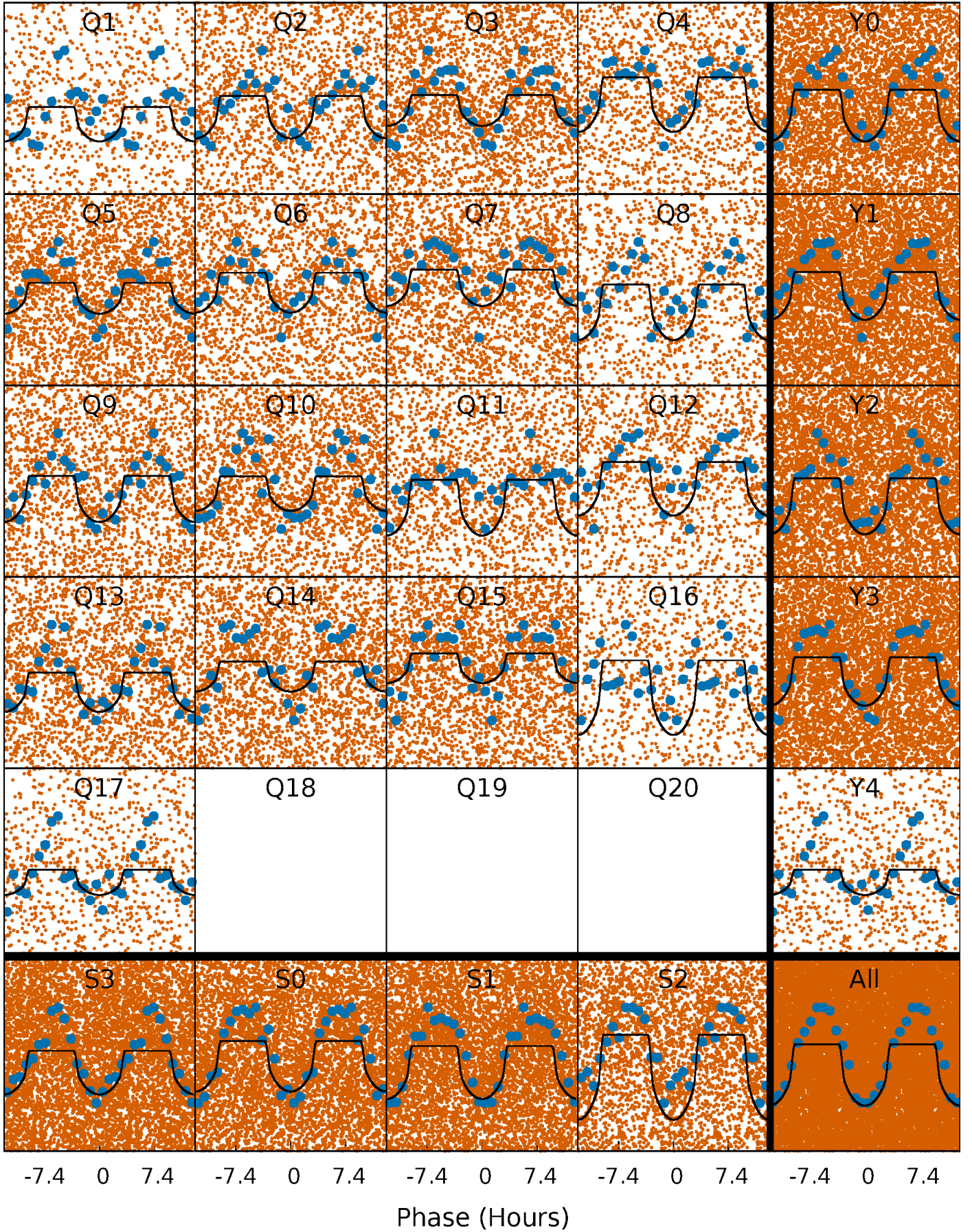
TCE 002307533-04   P= 0.537489 Days    $T_0=131.981219$  (BKJD)





# DV Quarter-Phased Transit Curves

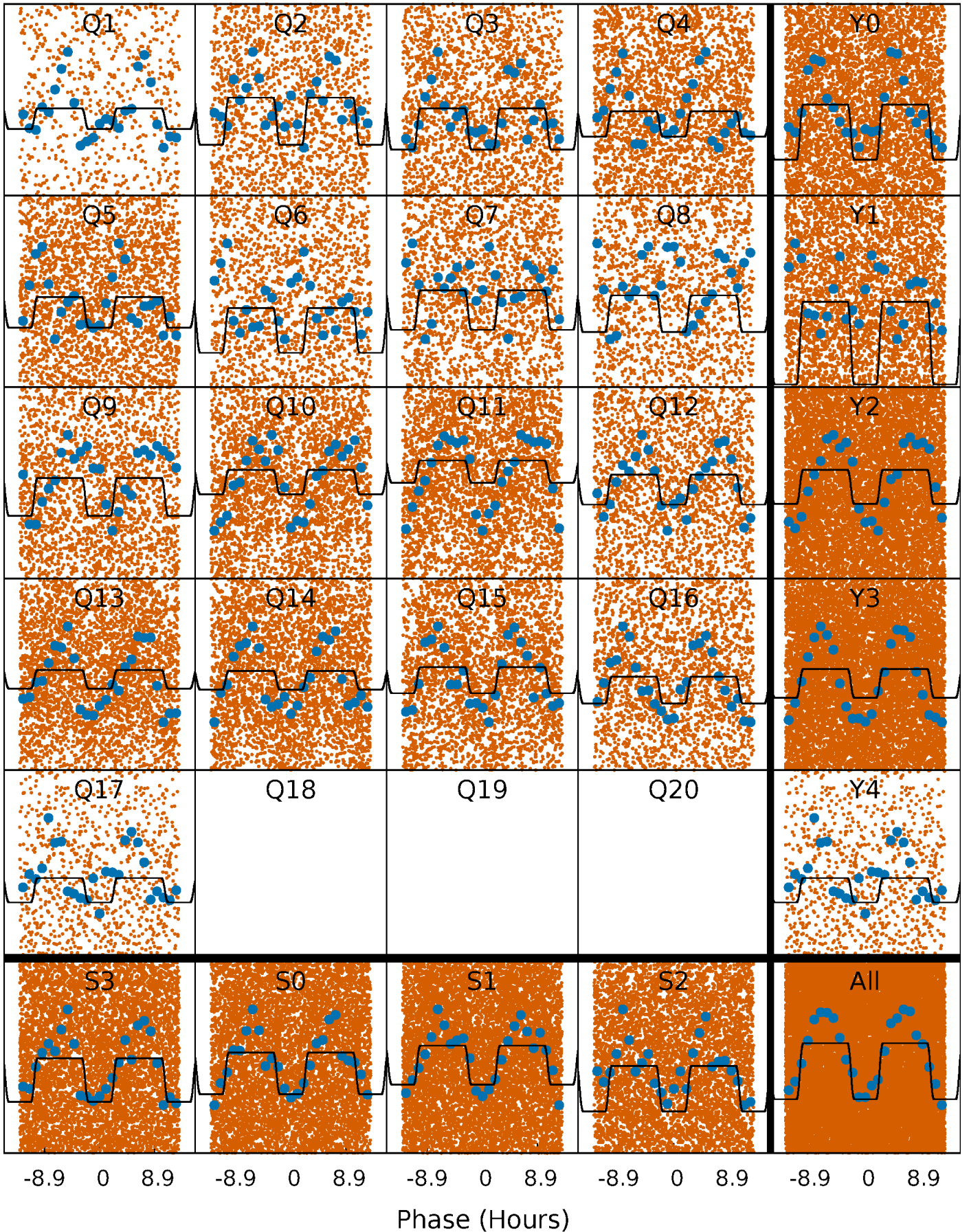
TCE 002307533-04   P= 0.537489 Days    $T_0=131.981219$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

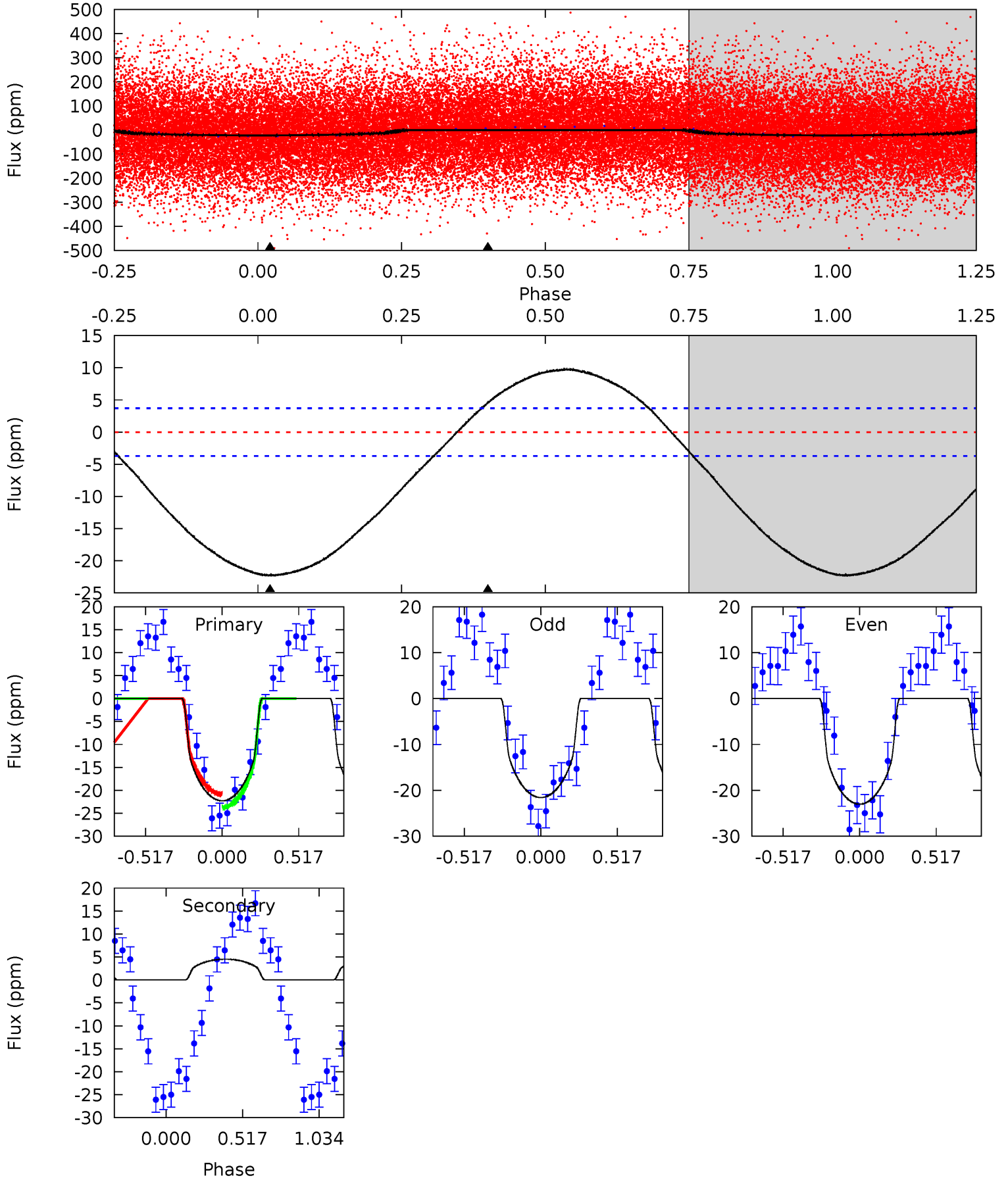
TCE 002307533-04   P= 0.537501 Days    $T_0=131.964691$  (BKJD)



# DV Model-Shift Uniqueness Test

002307533-04, P = 0.537489 Days, E = 131.443730 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
25.3	-5.14	0	0	4.21	0.65	3.30	25.3	25.3	-5.14	-5.14	0.81	1.08	0.31	1.76

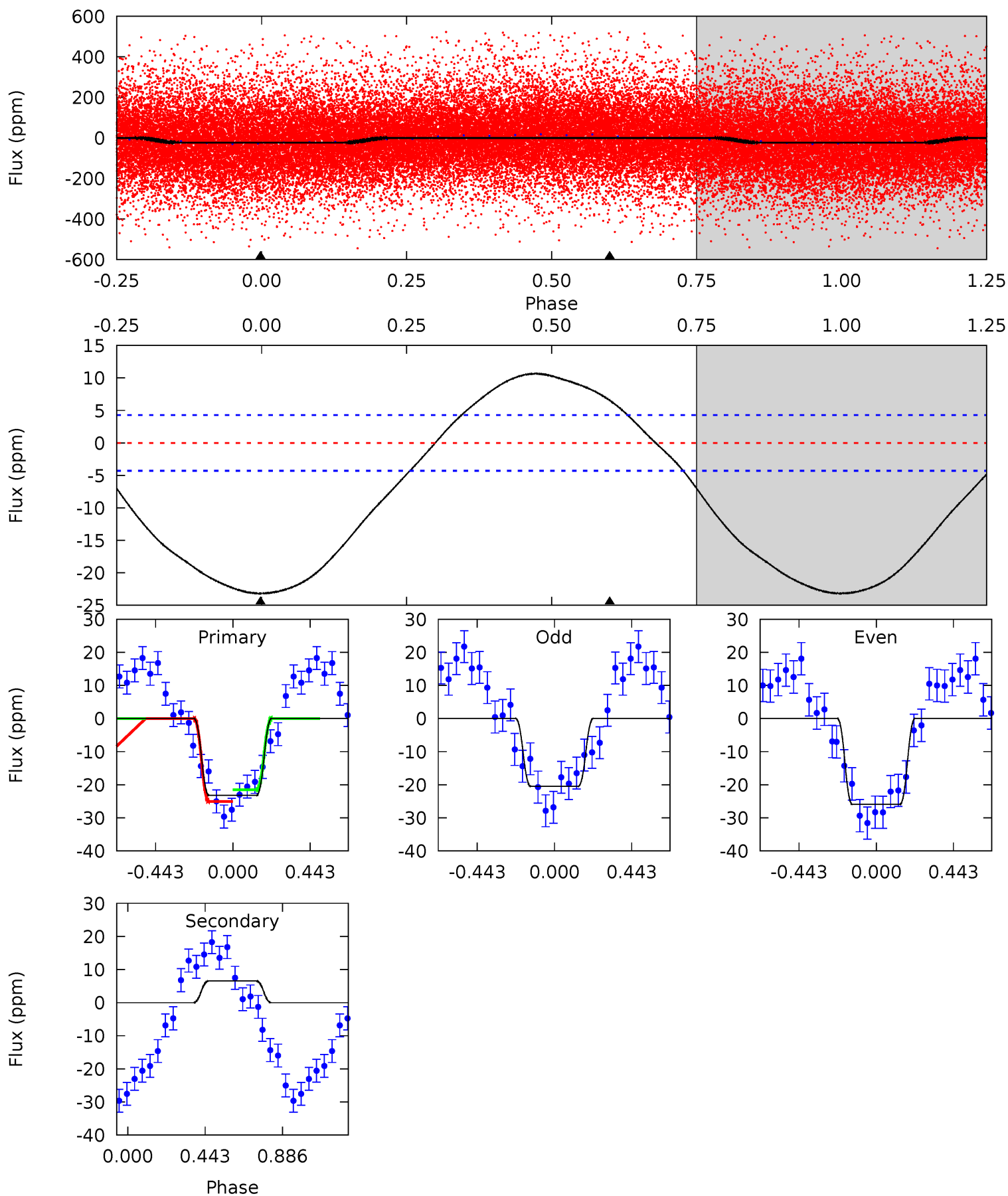




# Alt Model-Shift Uniqueness Test

002307533-04, P = 0.537501 Days, E = 131.427190 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
22.9	-6.49	0	0	4.24	0.77	2.83	22.9	22.9	-6.49	-6.49	2.70	0.69	0.32	1.72



### Stellar Parameters For KIC 002307533

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M$ ( $M_{\odot}$ )	$\rho_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$7082^{+190}_{-253}$	$3.742^{+0.288}_{-0.072}$	$-0.160^{+0.250}_{-0.300}$	$2.880^{+0.428}_{-0.927}$	$1.669^{+0.197}_{-0.295}$	$0.098^{+0.180}_{-0.029}$
	+3%/-4%	+8%/-2%	+156%/-188%	+15%/-32%	+12%/-18%	+183%/-29%
Source	PHO1	FLK73	KIC0	DSEP		

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

### Secondary Eclipse Parameters for KIC 002307533-04 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{\text{max}}$ (K)	$T_{\text{obs}}$ (K)	$A_{\text{obs}}$
DV	$5 \pm 1$	$1.32^{+0.58}_{-0.56}$	$5836^{+320}_{-479}$	$-5701^{+459}_{-1072}$	$-0.328^{+0.180}_{-0.639}$
Alt.	$7 \pm 1$	$1.52^{+0.64}_{-0.57}$	$5855^{+344}_{-507}$	$-5784^{+441}_{-841}$	$-0.353^{+0.176}_{-0.553}$

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

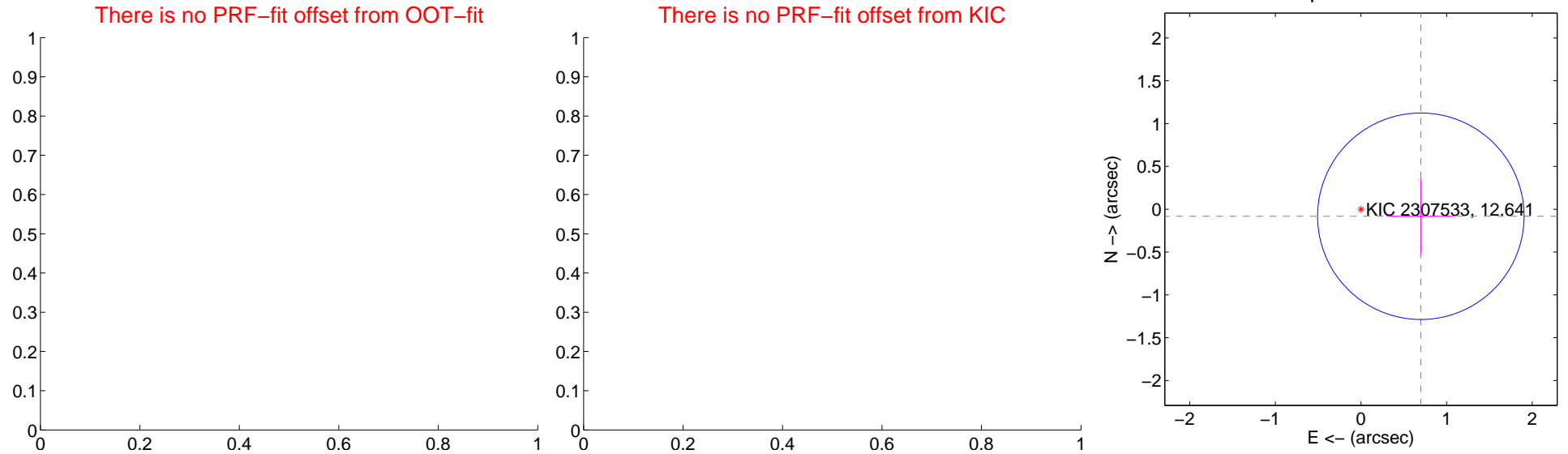
## DV Centroid Data

Supplemental centroid analysis for 002307533-04. Kepler magnitude: 12.64. Transit SNR 16.25

There are 0 quarters with good PRF difference image offsets

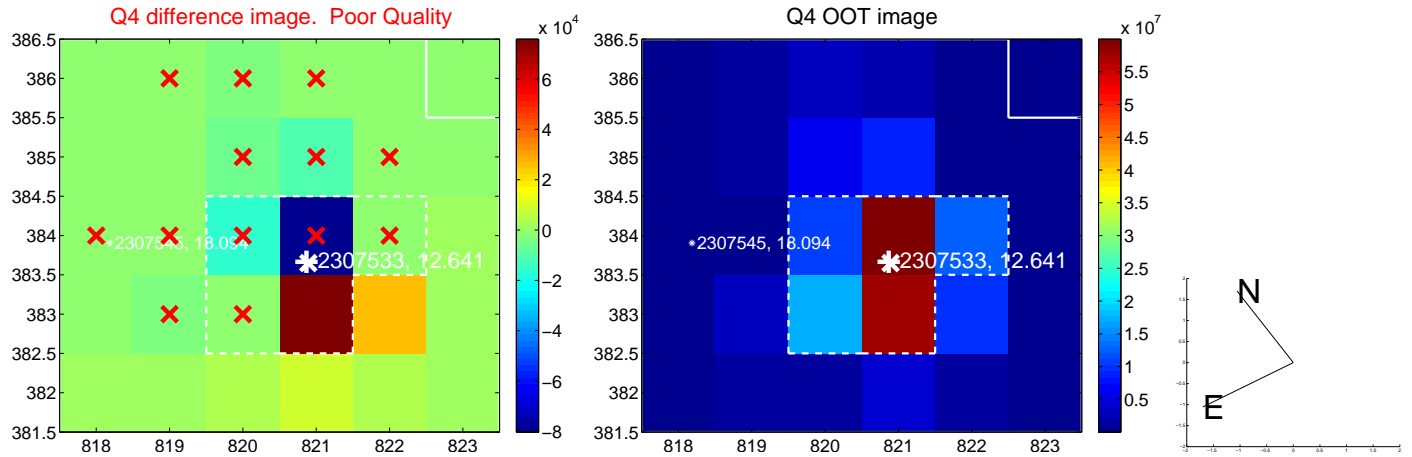
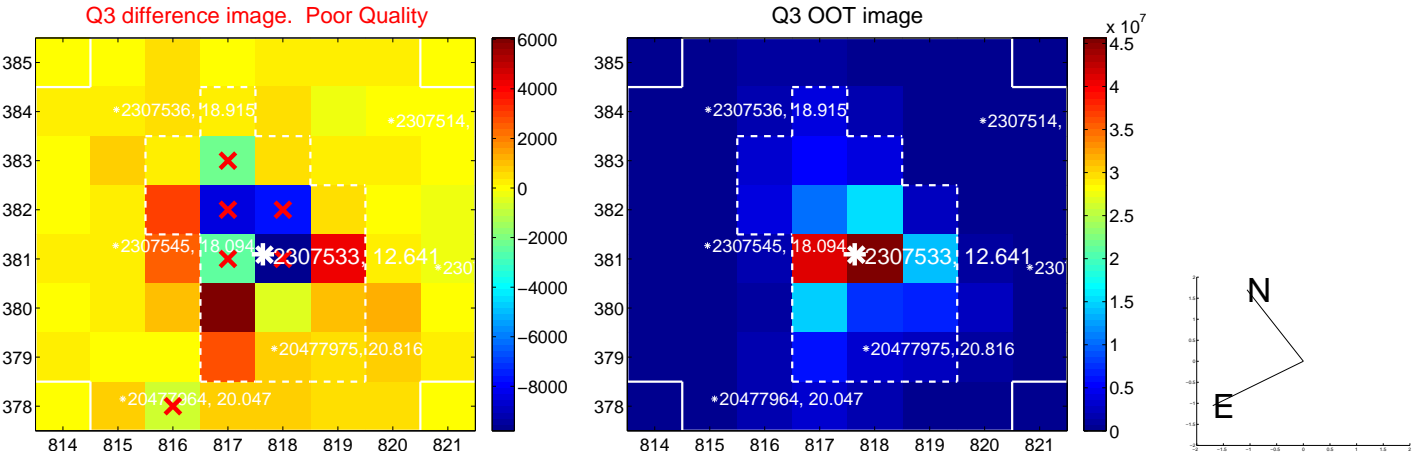
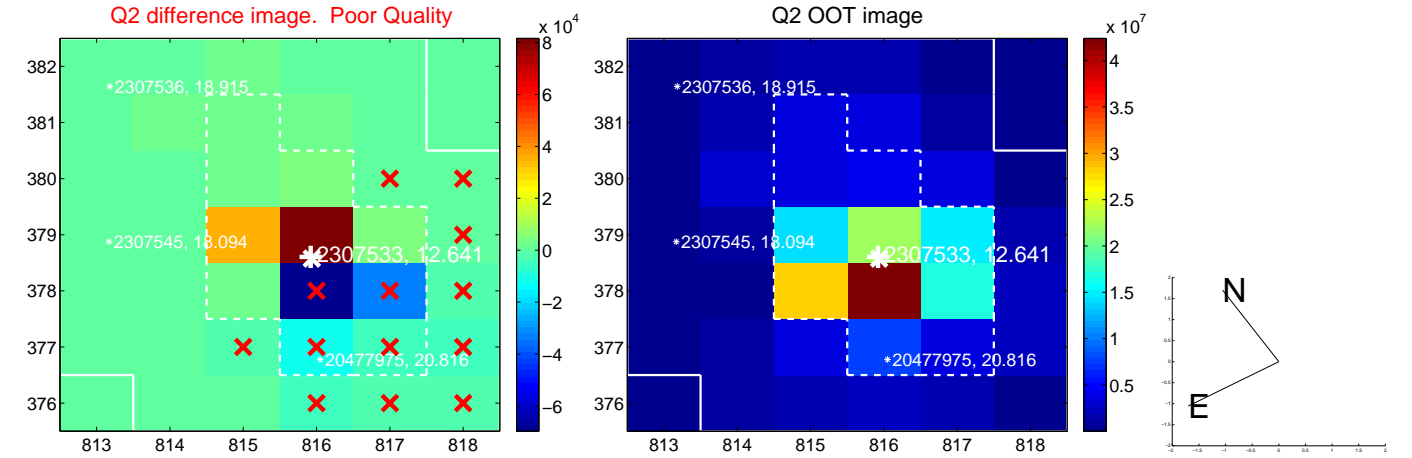
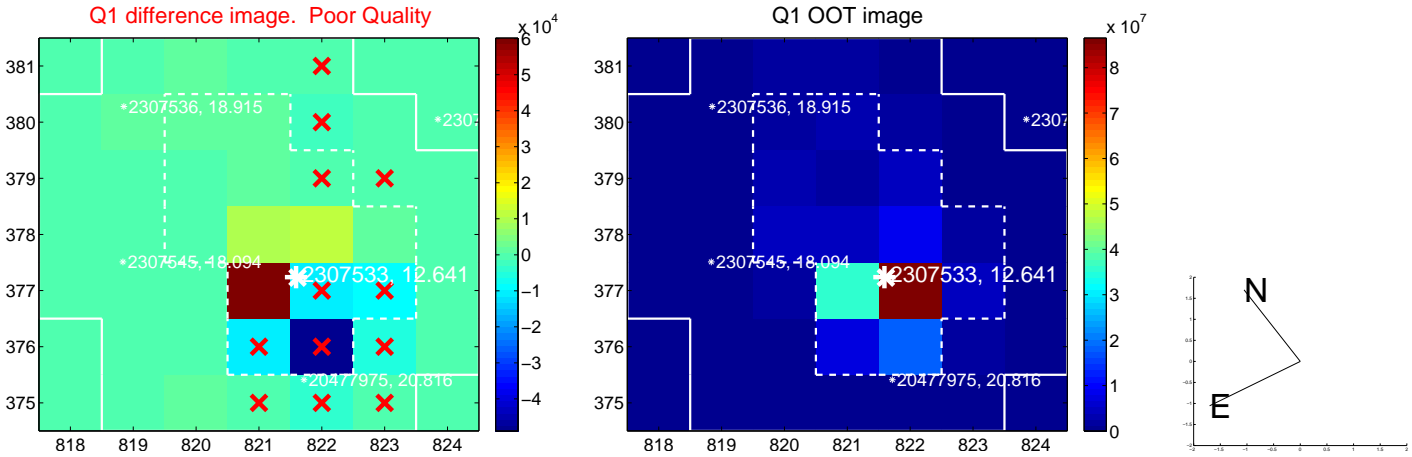
The direct PRF centroid is offset from the target star catalog position by about NaN arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	—	—	—	—
PRF-fit source offset from KIC position	—	—	—	—
photometric centroid source offset	$0.70 \pm 0.40$	1.75	$-0.70 \pm 0.40$	$-0.08 \pm 0.45$

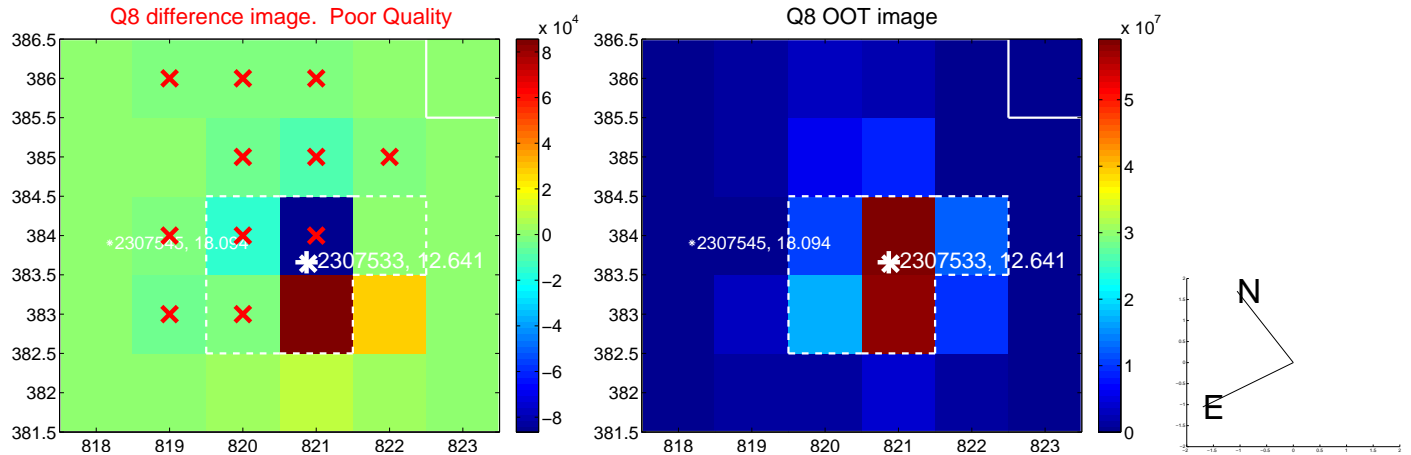
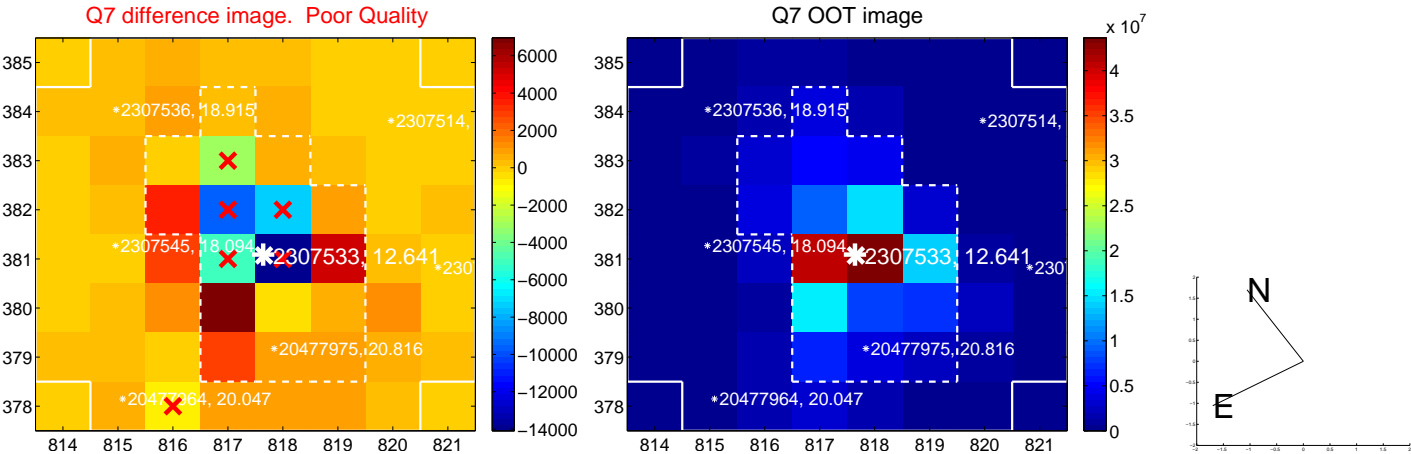
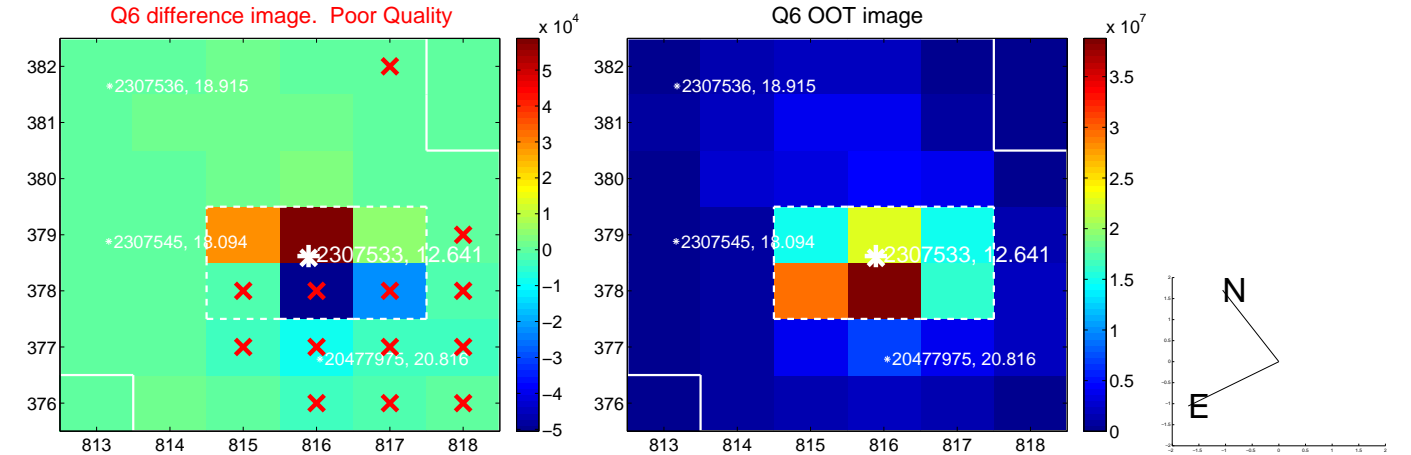
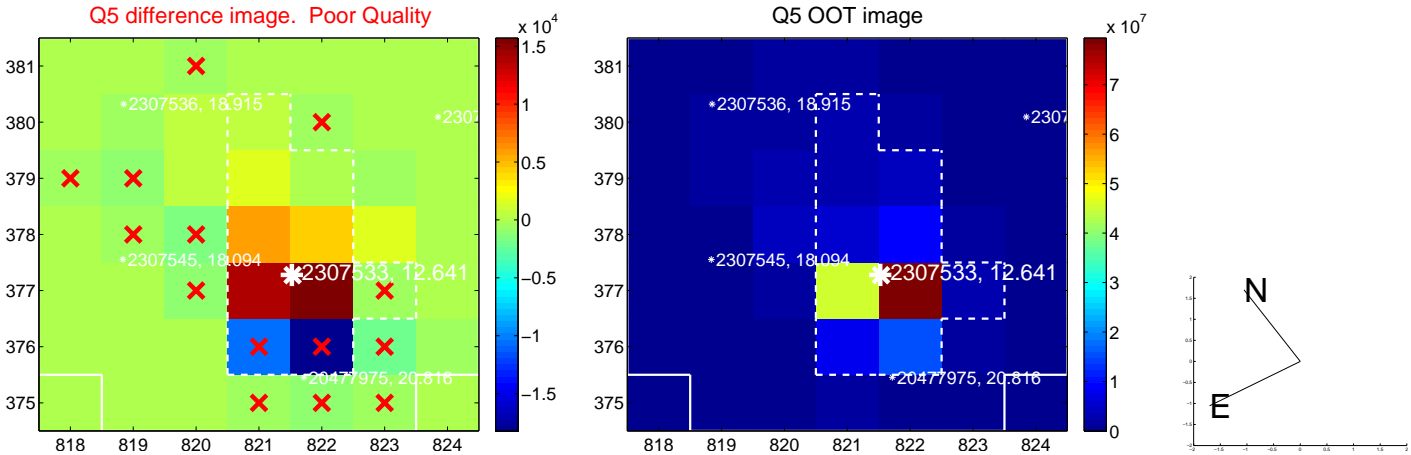


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

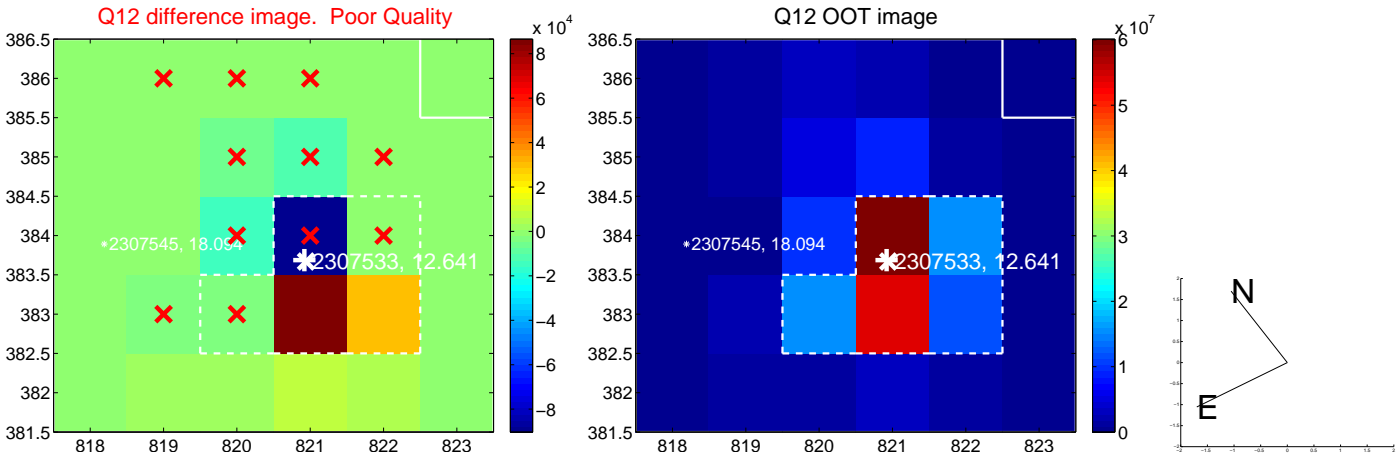
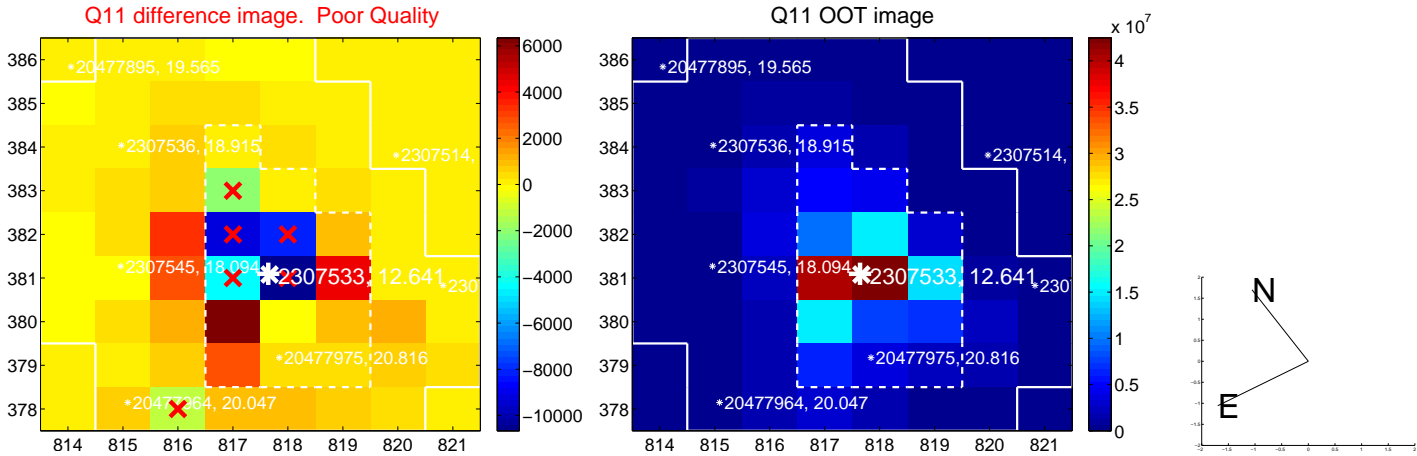
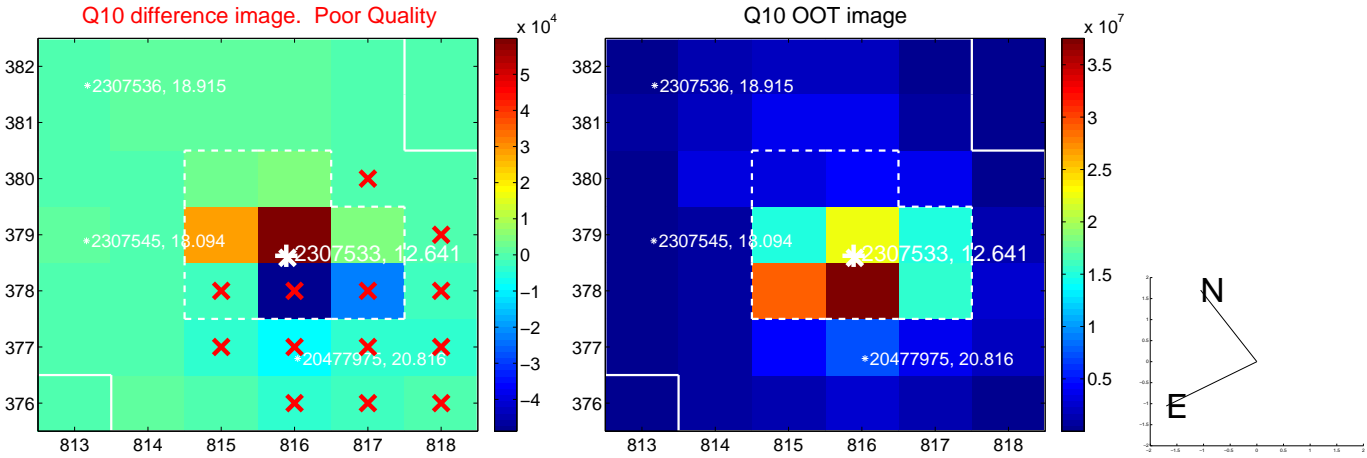
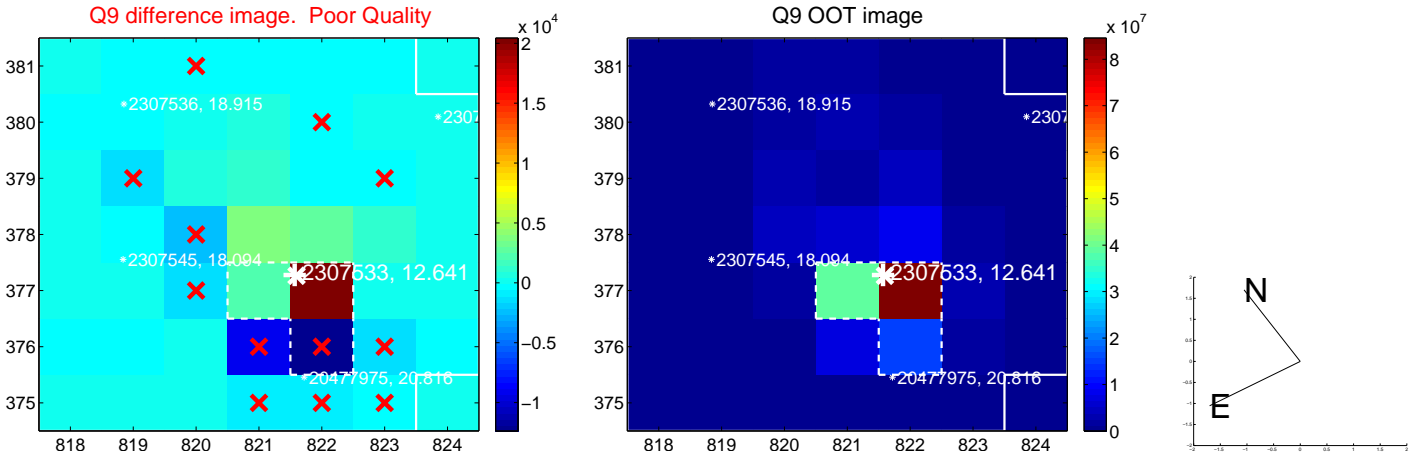
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



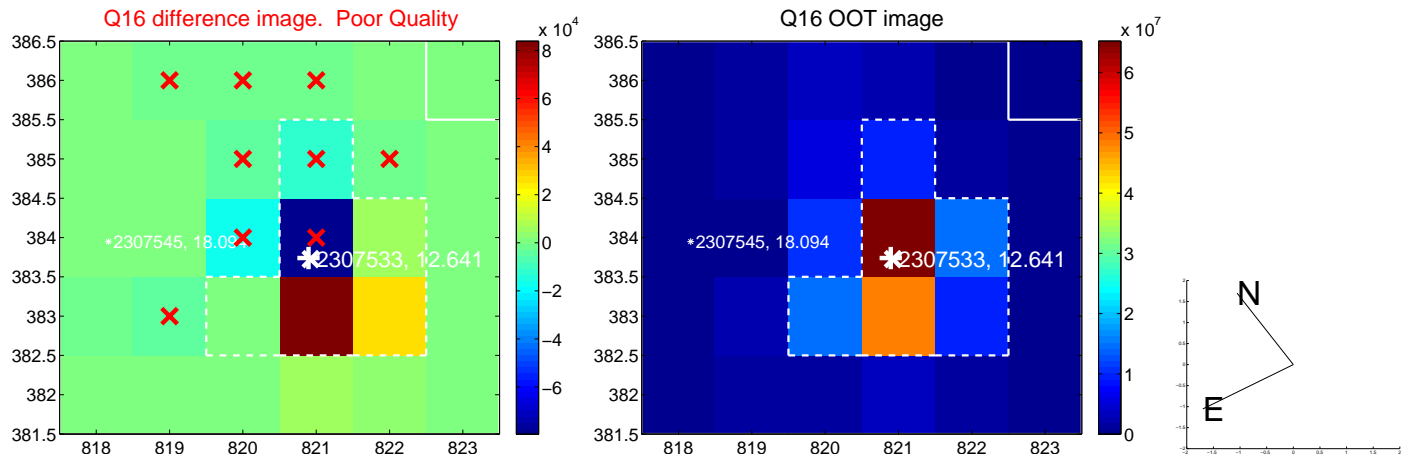
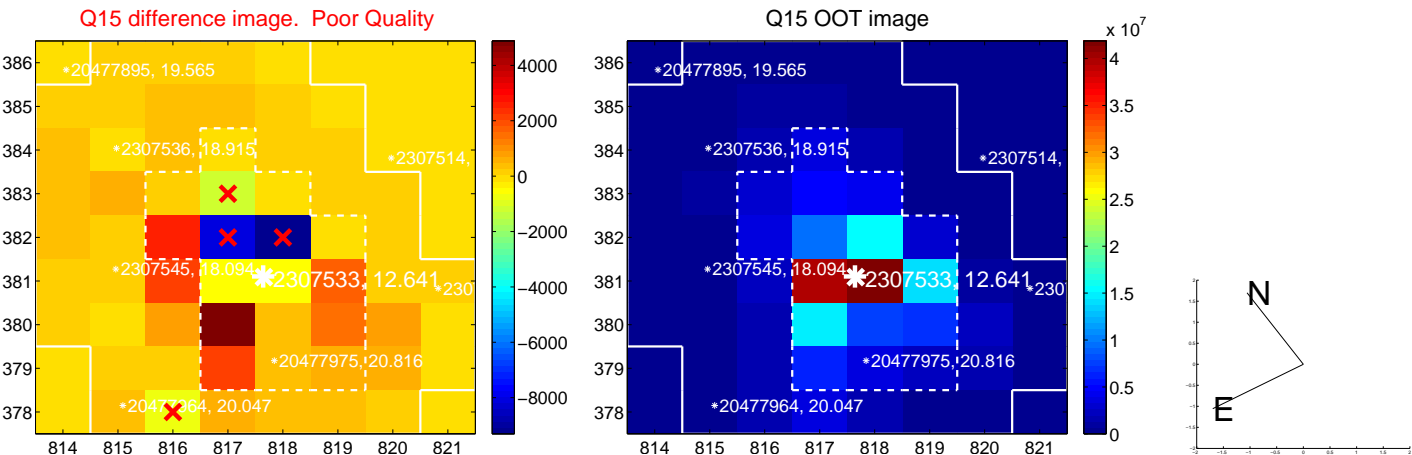
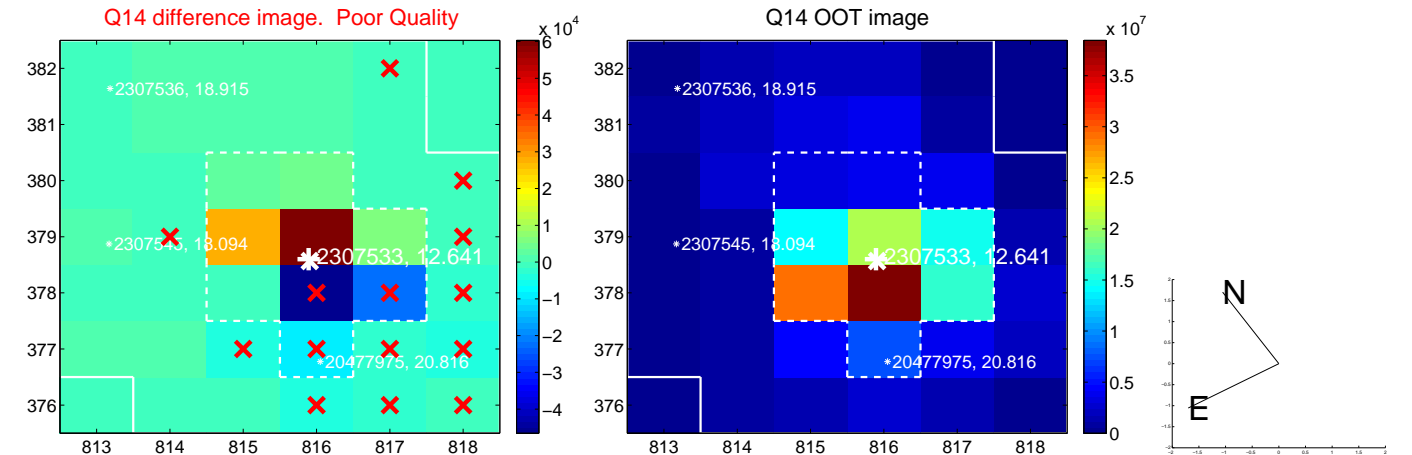
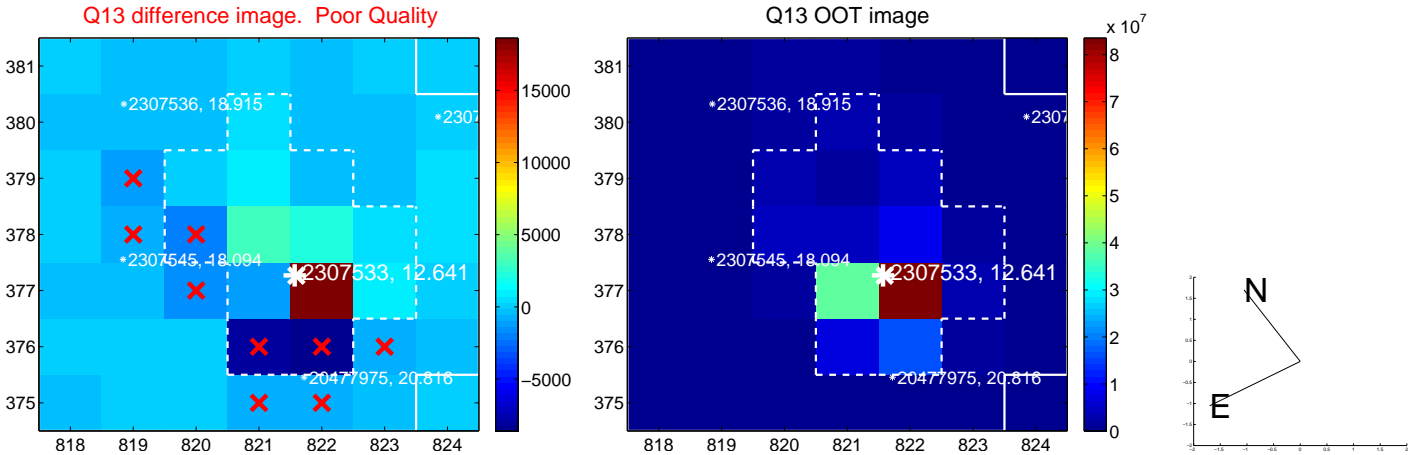
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



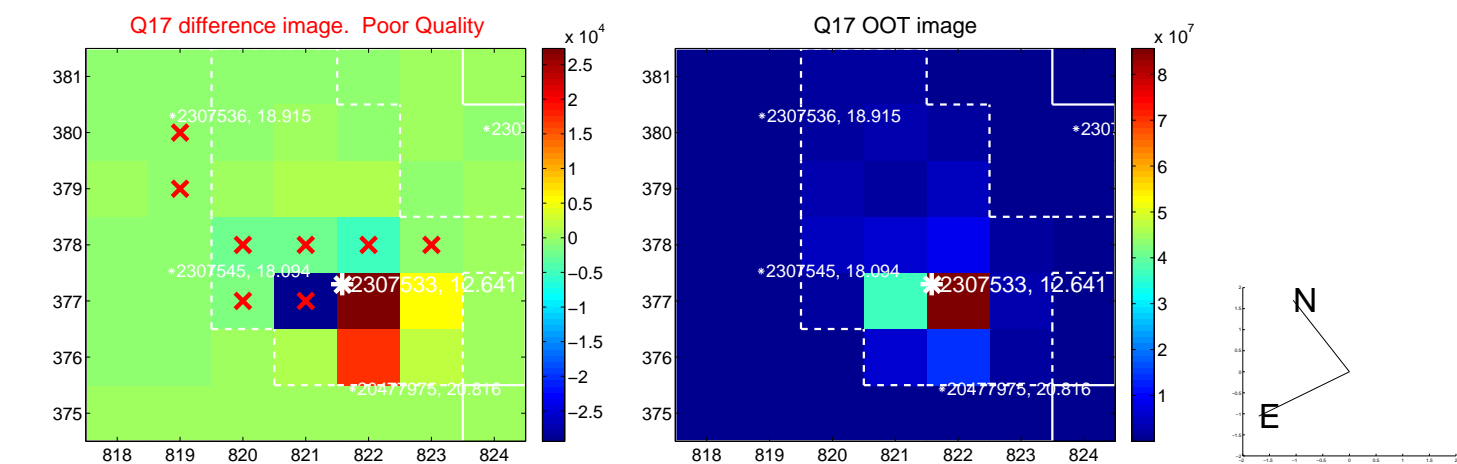
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



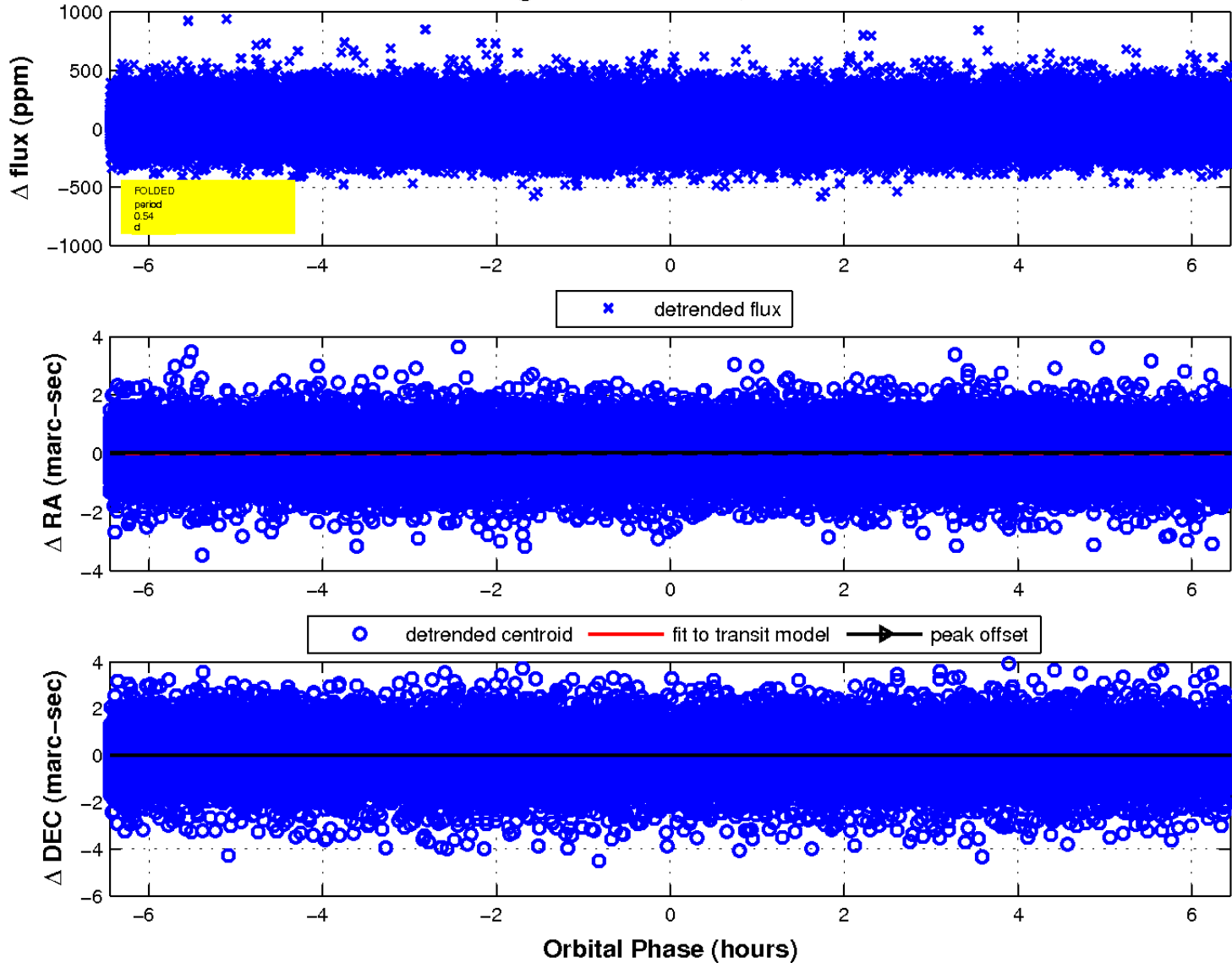
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



fluxWeightedCentroids, Planet 4 of 4





UKIRT Image

Declination

