

# KIC 008181646

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
008181646-01	OBS	No	2.354098	131.598372	15.8	16.008	7.2	7.7	0.74	5486	0.30	422.09
008181646-02	OBS	No	46.649767	174.321233	110.5	7.773	22.7	2.3	0.74	5486	0.88	7.87
008181646-03	OBS	No	40.939977	153.721226	224.5	5.088	20.0	6.5	0.74	5486	1.24	9.37
008181646-04	OBS	No	157.875096	208.123739	4505.6	54.343	17.3	12.4	0.74	5486	9.20	1.55
008181646-05	OBS	No	48.824583	164.751099	532.2	25.560	15.7	7.3	0.74	5486	3.40	7.41
008181646-06	OBS	No	59.244269	160.876125	298.1	38.985	14.2	4.7	0.74	5486	1.37	5.72
008181646-07	OBS	No	61.879706	179.179822	339.5	8.688	11.4	6.7	0.74	5486	1.45	5.40
008181646-08	OBS	No	42.732442	148.480323	161.0	5.821	11.3	4.3	0.74	5486	0.99	8.85

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
008181646-01	OBS	FP	0.00	1	0	0	0	LPP_DV
008181646-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_TRACKER—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV
008181646-03	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE_ZUMA—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_UNRESOLVED_OFFSET
008181646-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL_SKYE—TRANS_GAPPED—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—INCONSISTENT_TRANS
008181646-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV
008181646-06	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
008181646-07	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_FEW_DIFFS
008181646-08	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV

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

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

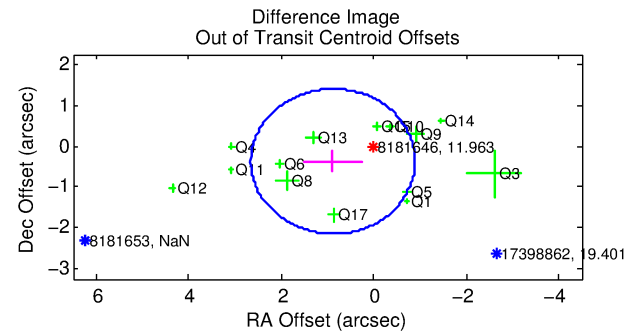
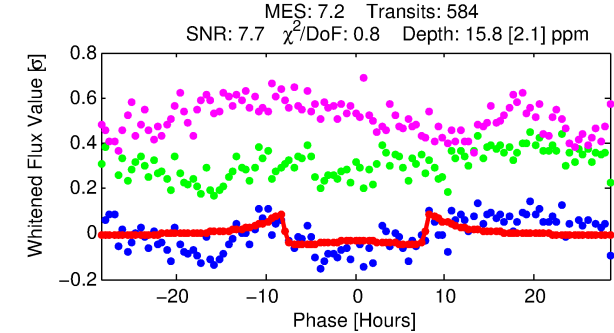
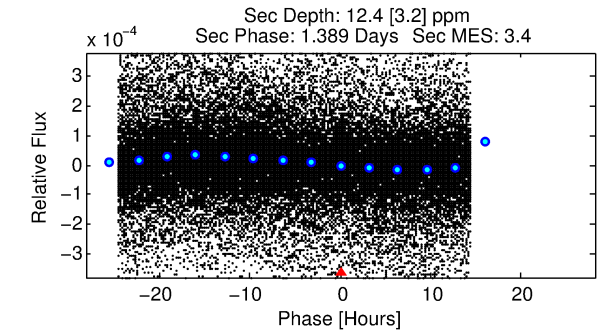
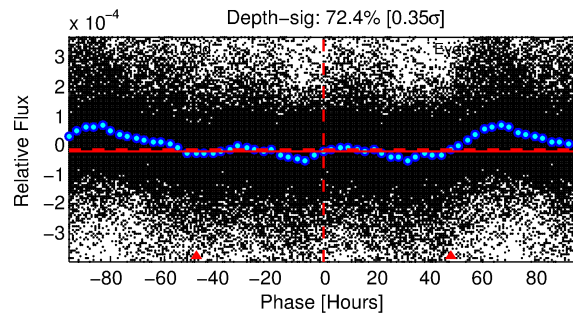
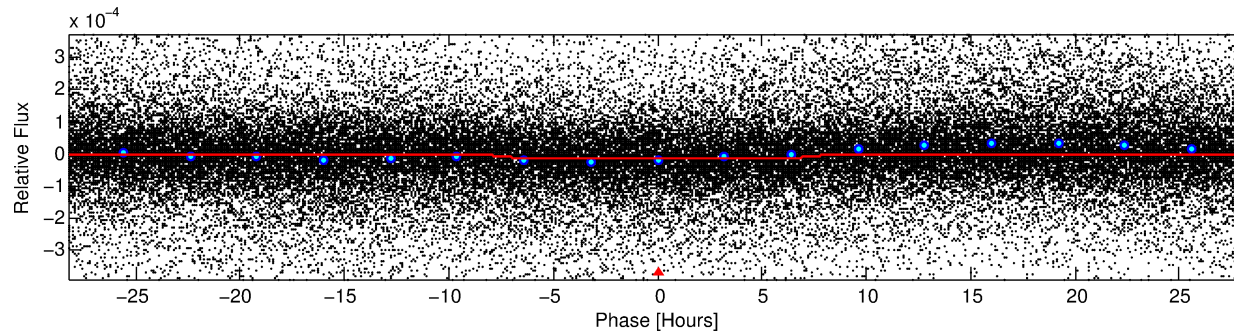
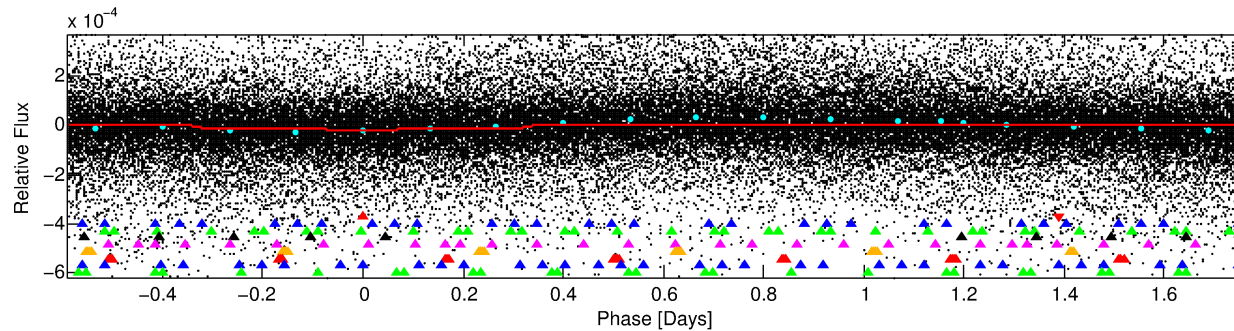
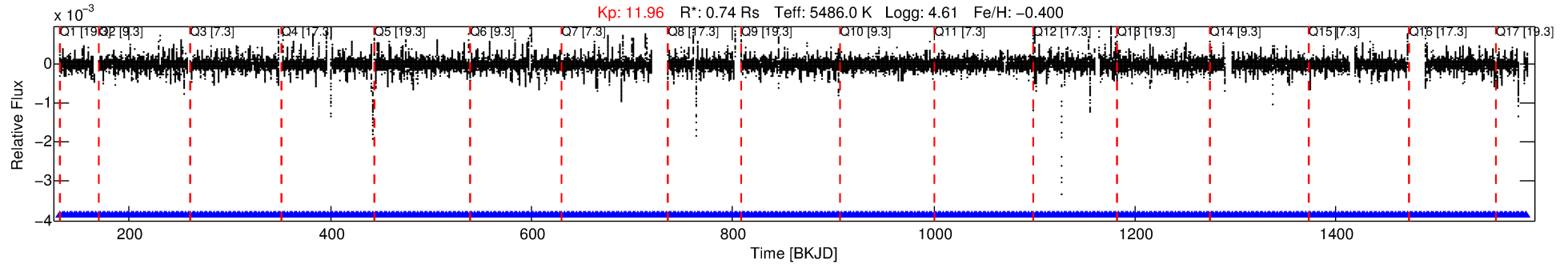
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 008181646-01

No Significant Match Found

# DV One-Page Summary

KIC: 8181646 Candidate: 1 of 9 Period: 2.354 d



## DV Fit Results:

Period = 2.35410 [0.00003] d  
Epoch = 131.5984 [0.0059] BKJD  
 $R_p/R^* = 0.0037$  [0.0016]  
 $a/R^* = 1.23$  [0.78]  
 $b = 0.50$  [2.87]  
 $S_{\text{eff}} = 422.09$  [98.96]  
 $T_{\text{eq}} = 1156$  [68] K  
 $R_p = 0.30$  [0.14]  $R_{\text{e}}$   
 $a = 0.0323$  [0.0047] AU  
 $A_g = 79.43$  [73.83] [1.06 $\sigma$ ]  
 $T_{\text{eff}} = 5335$  [1216] K [3.43 $\sigma$ ]

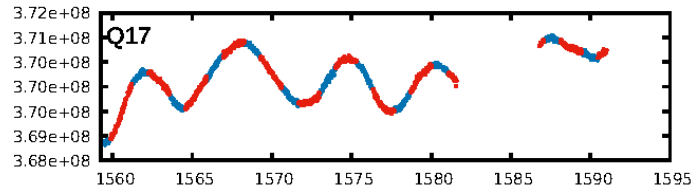
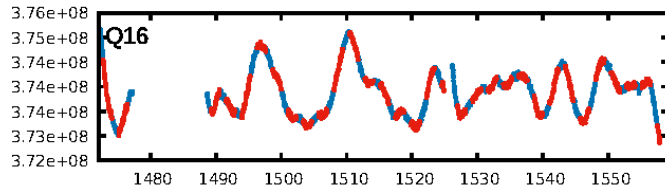
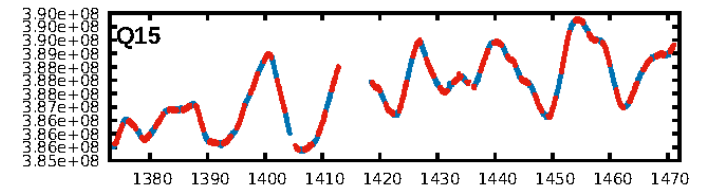
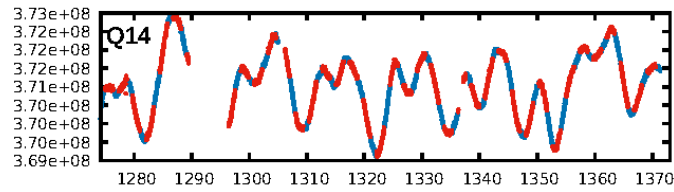
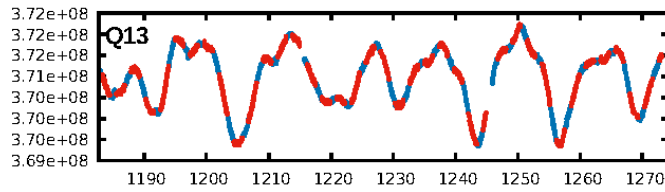
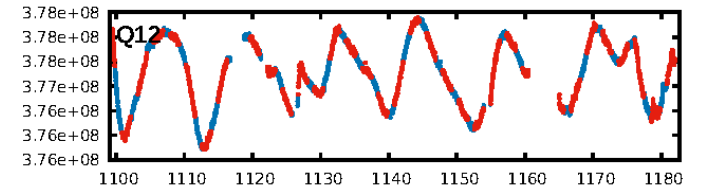
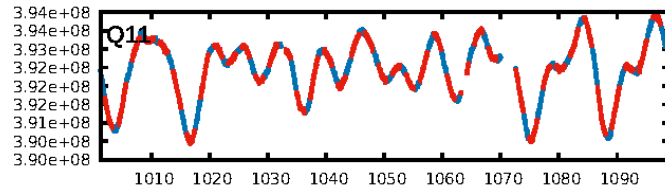
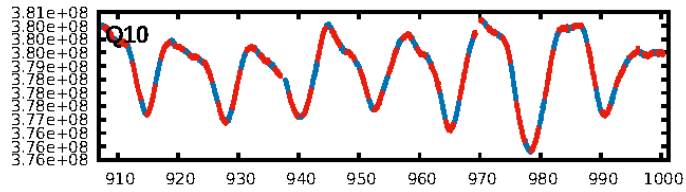
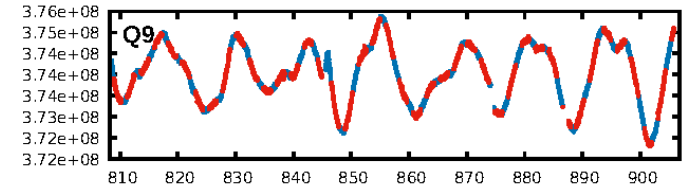
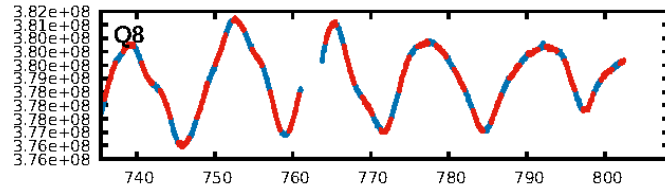
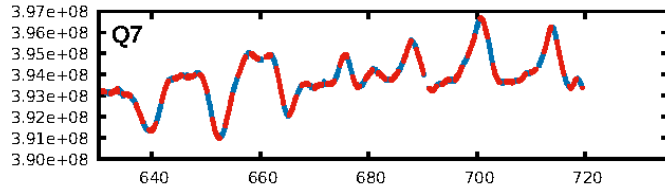
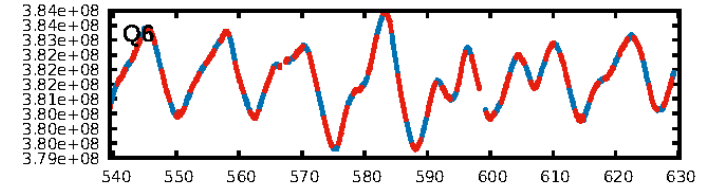
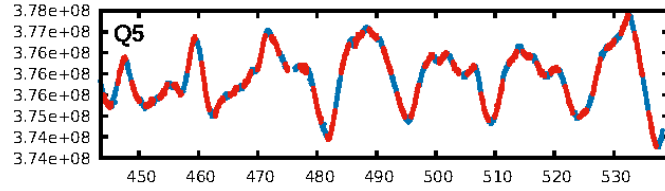
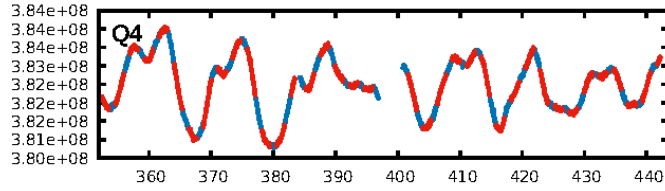
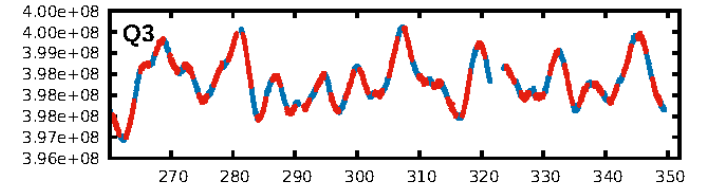
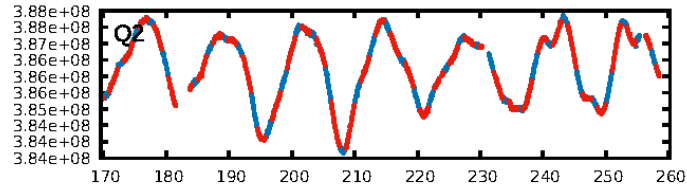
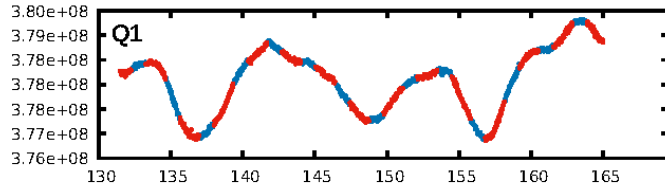
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [55.13 $\sigma$ ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [557/557]  
GhostDiagnostic-chr: 6.503  
Centroid-sig: 0.1%  
Centroid-so: 1.114 arcsec [2.02 $\sigma$ ]  
OotOffset-rm: 0.959 arcsec [1.62 $\sigma$ ]  
KicOffset-rm: 0.928 arcsec [1.76 $\sigma$ ]  
OotOffset-st: 3/3/3/5 [14]  
KicOffset-st: 3/3/3/5 [14]  
DiffImageQuality-fgm: 0.64 [9/14]  
DiffImageOverlap-fno: 1.00 [17/17]

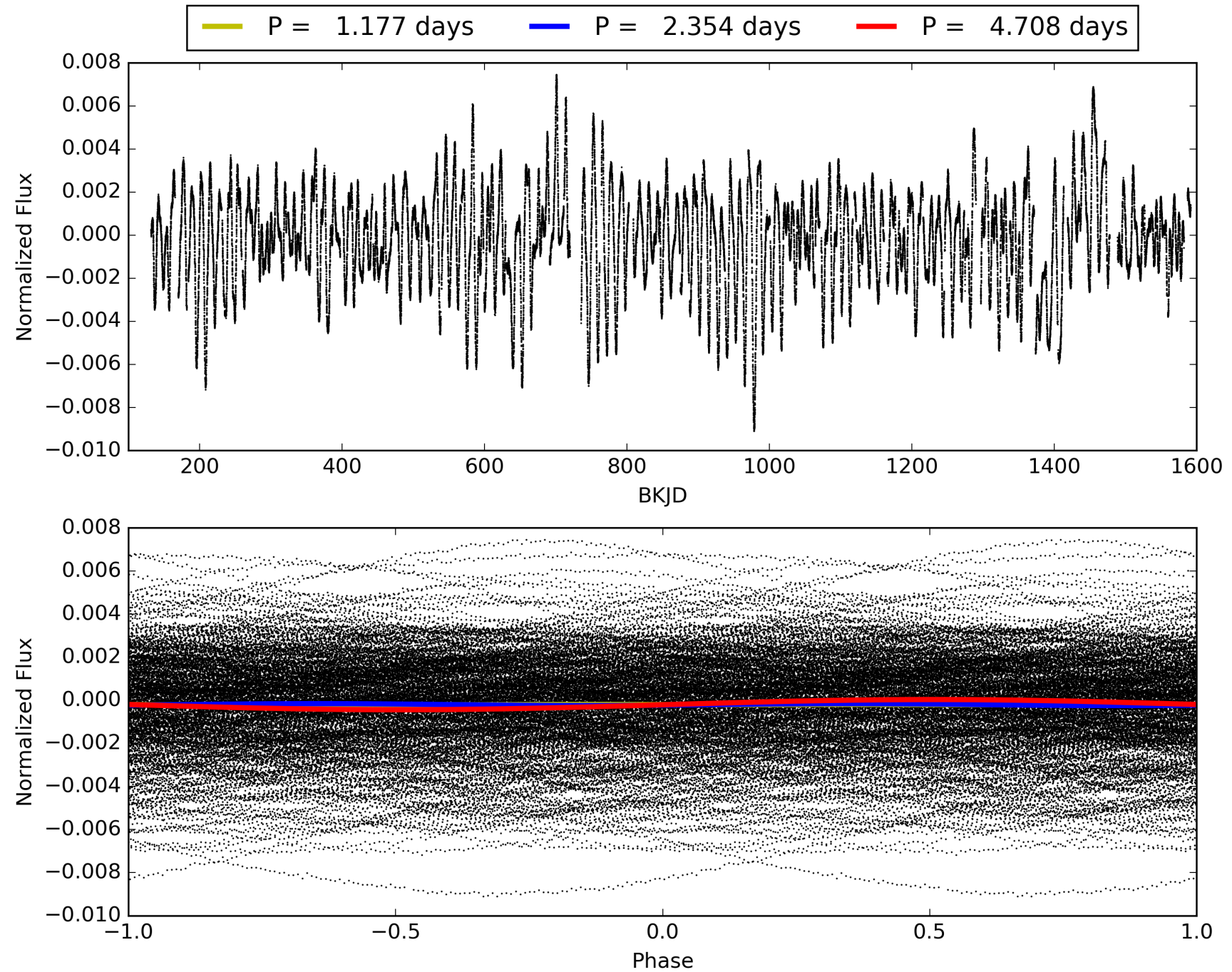
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This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 008181646-01, PDC Light Curves



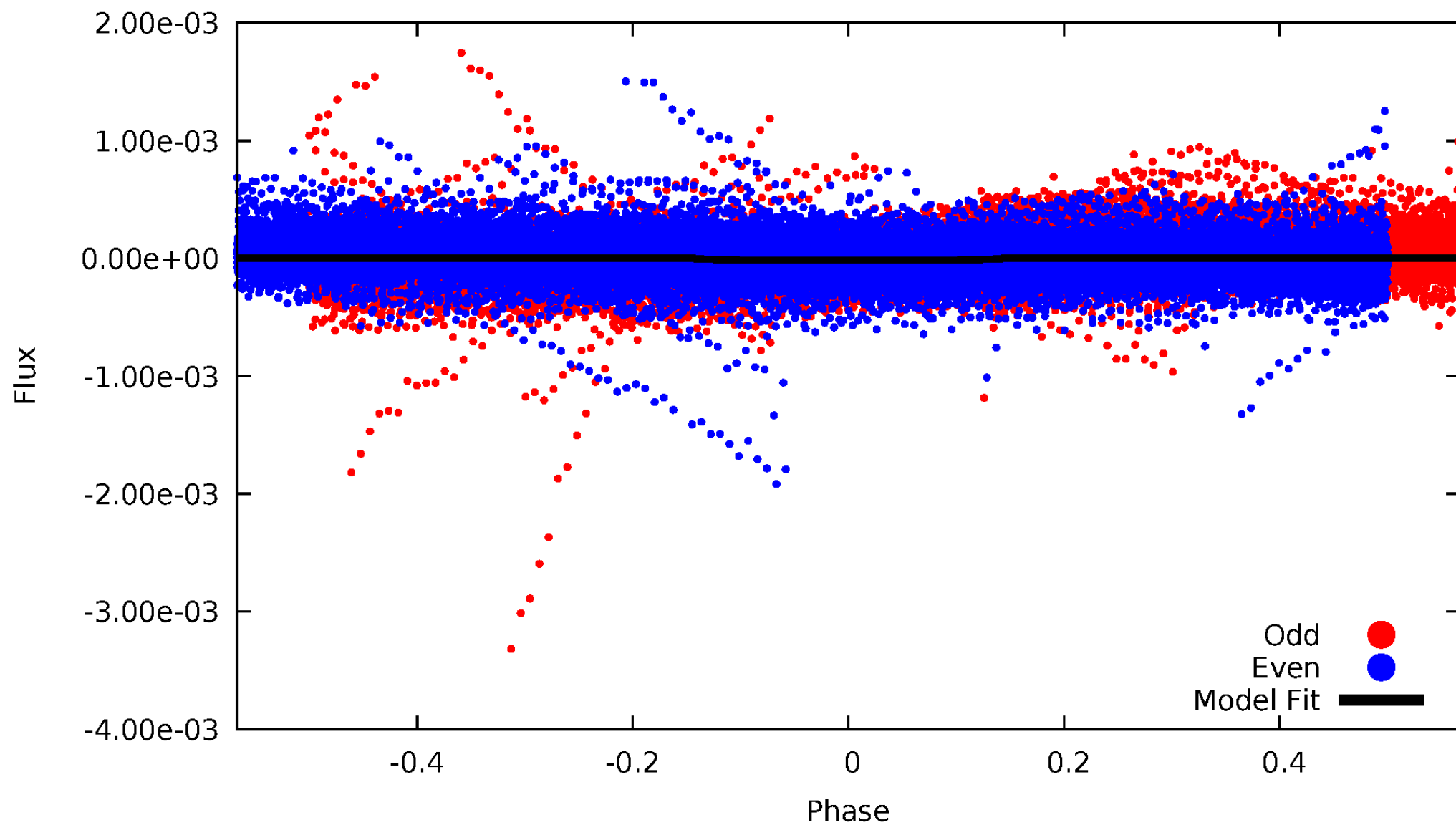
TCE 008181646-01





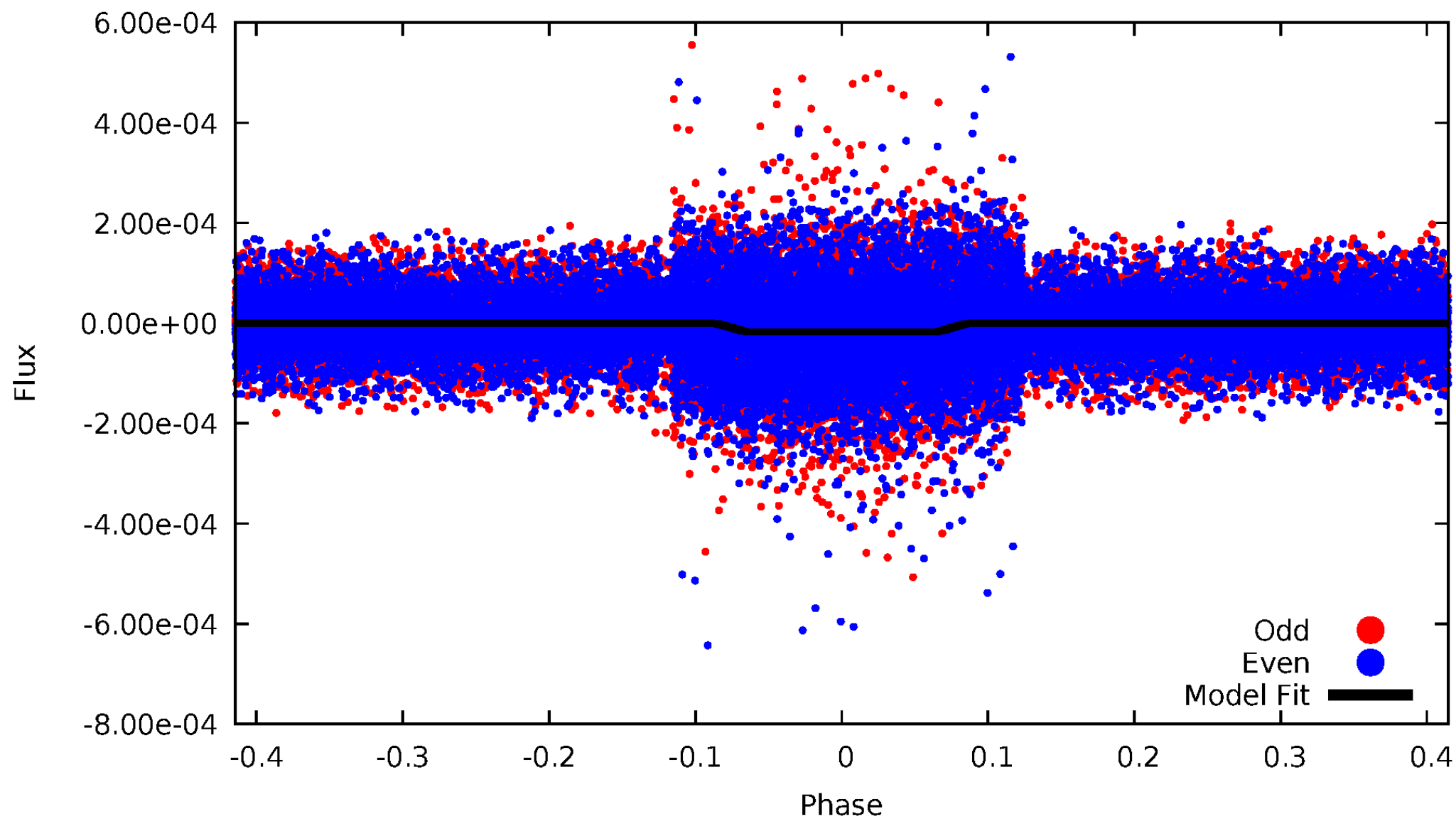
# DV Odd/Even

TCE 008181646-01



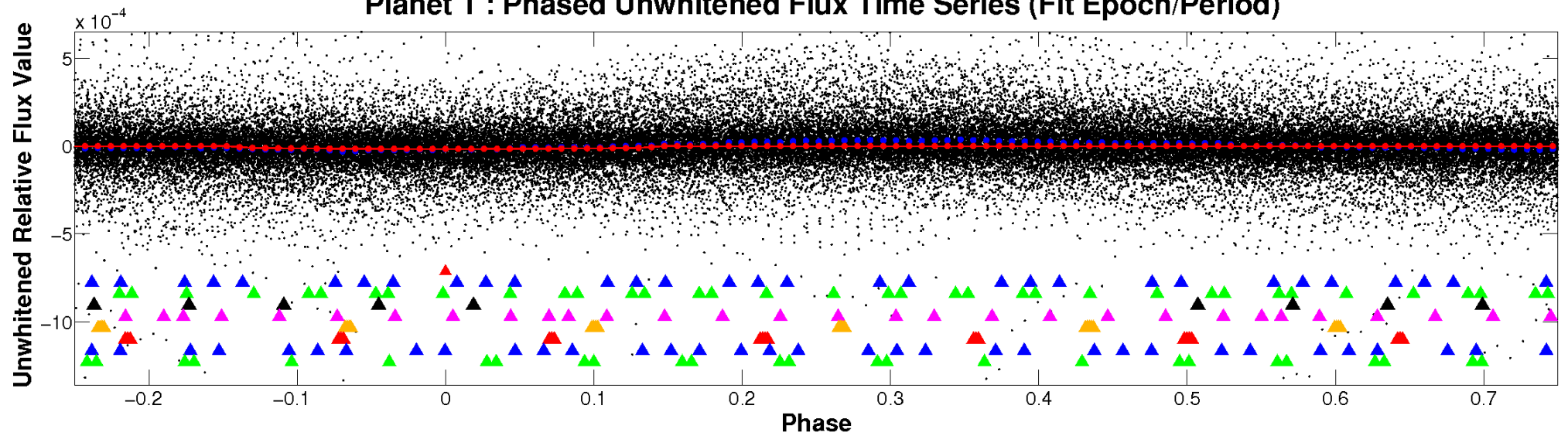
# ALT Odd/Even

TCE 008181646-01

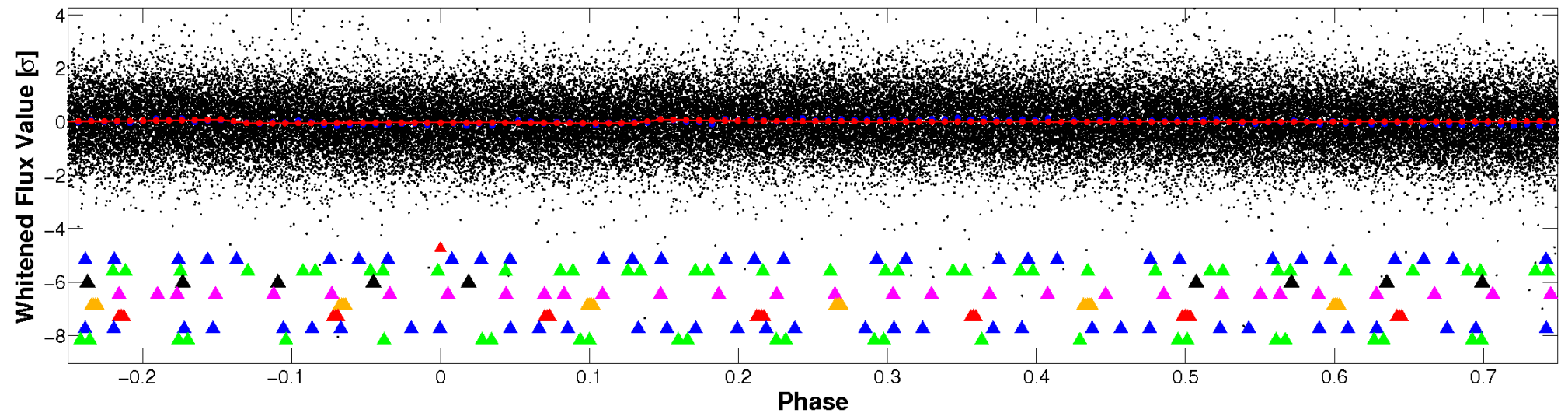


# Non-Whitened Vs. Whitened Light Curve

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

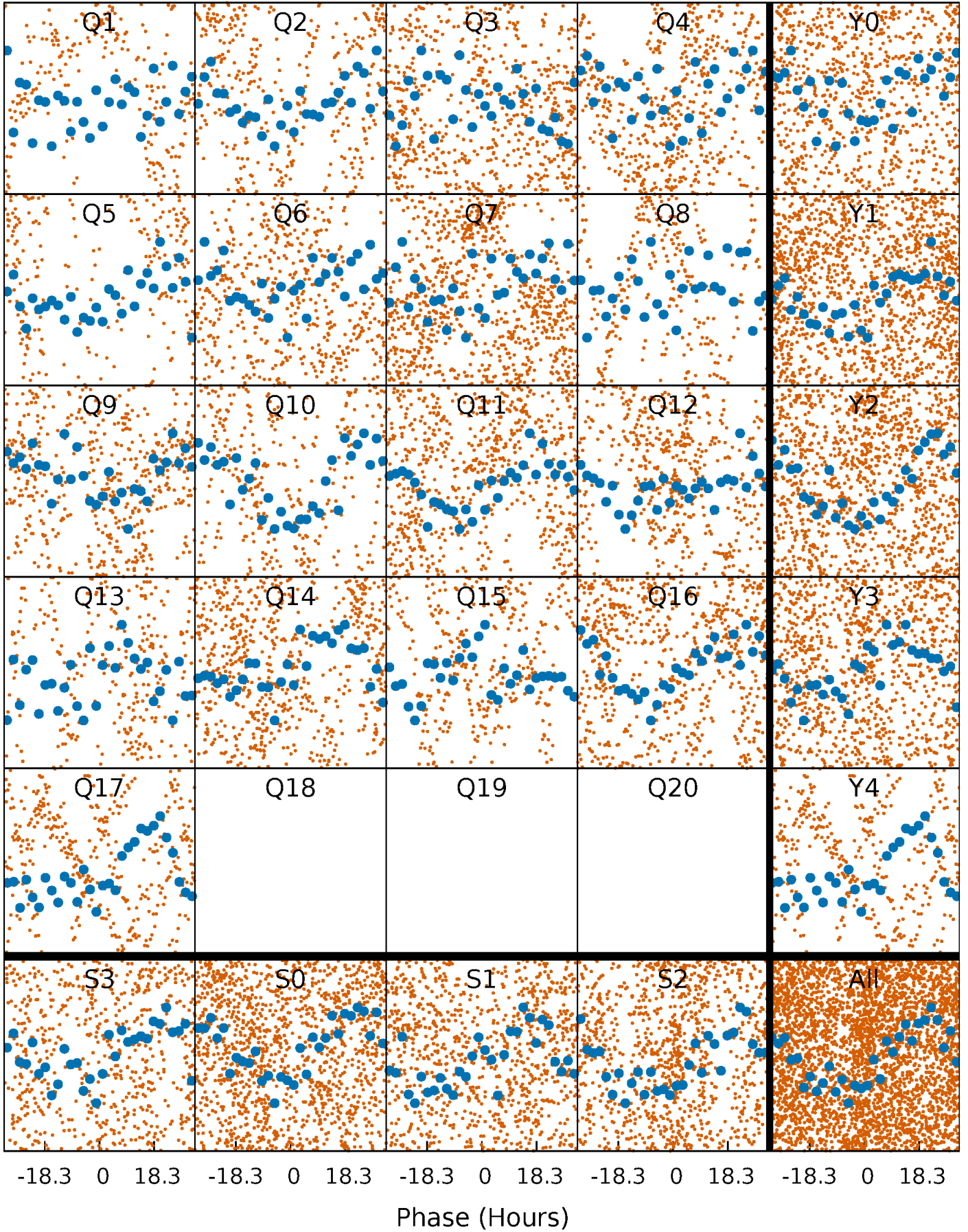


Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

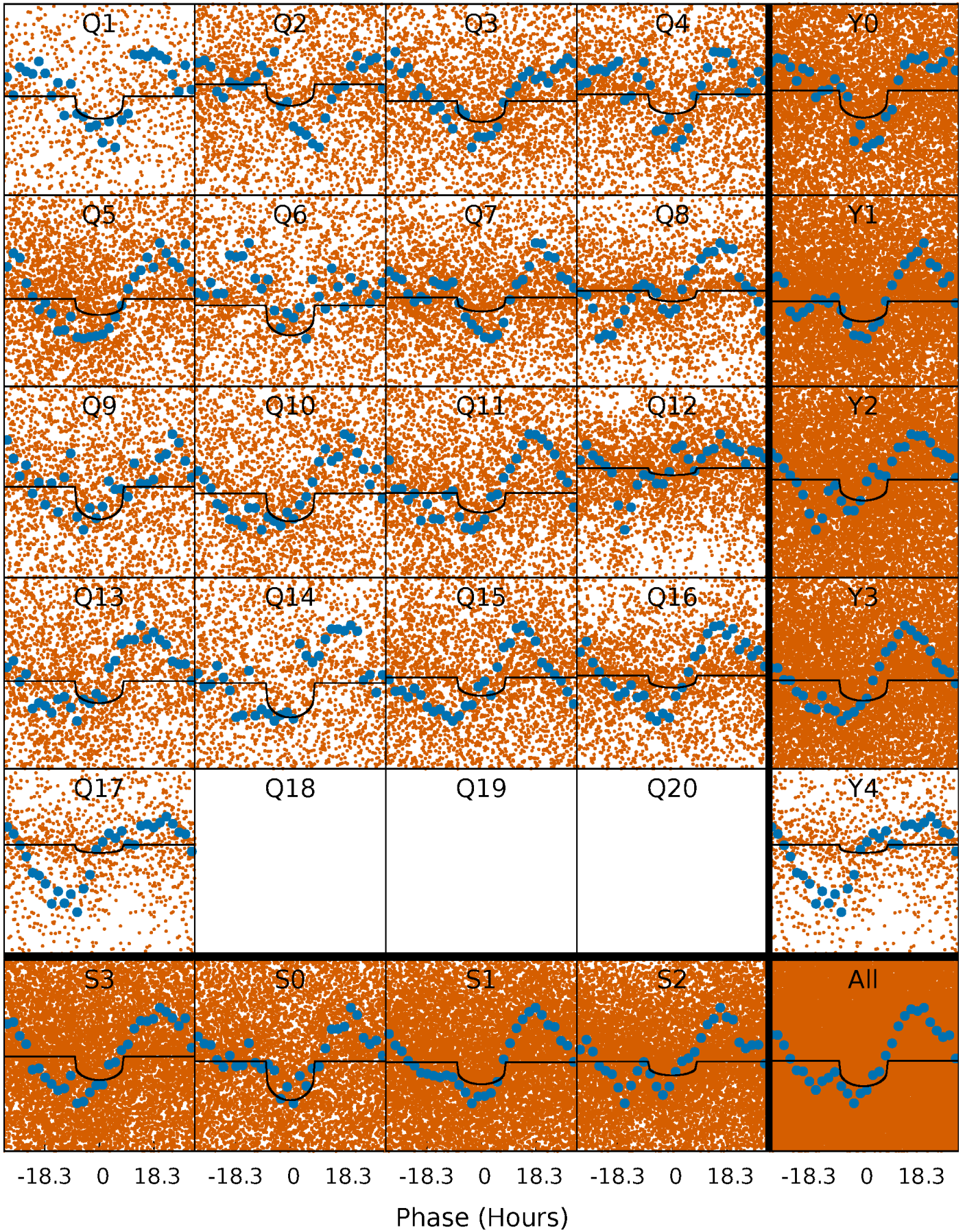
TCE 008181646-01   P= 2.354098 Days    $T_0=131.598372$  (BKJD)





# DV Quarter-Phased Transit Curves

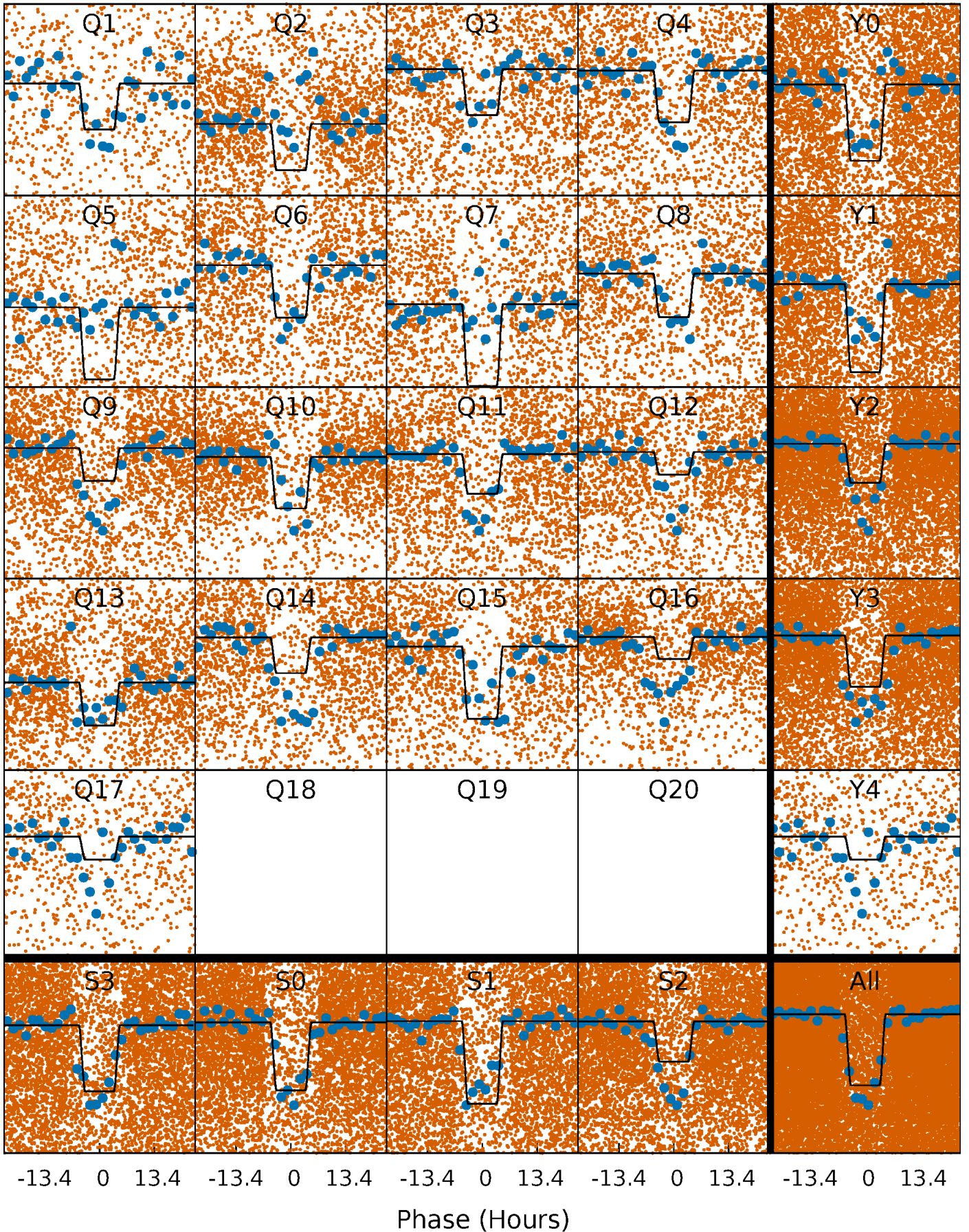
TCE 008181646-01 P= 2.354098 Days  $T_0=131.598372$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

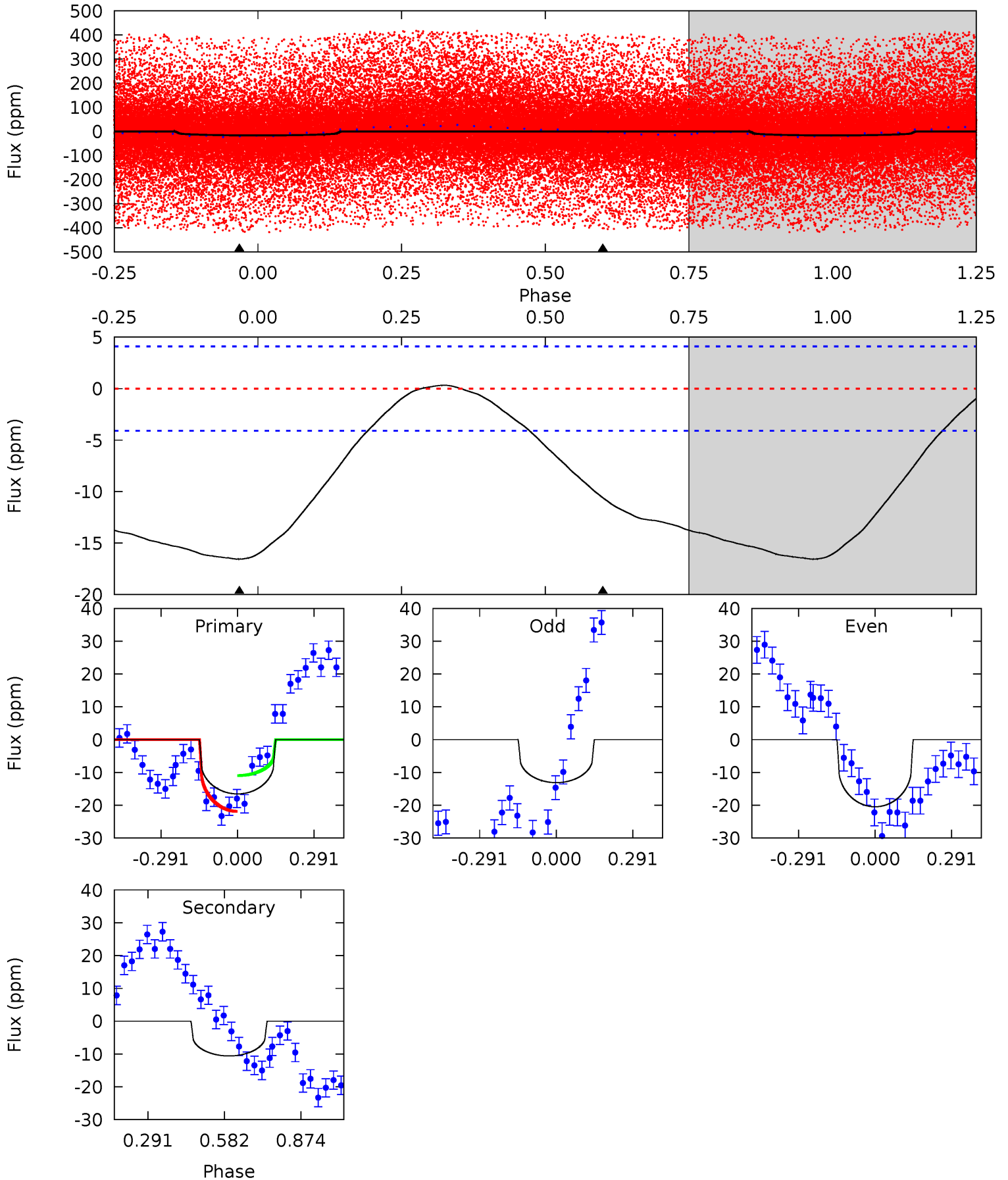
TCE 008181646-01 P= 2.353759 Days  $T_0=131.605084$  (BKJD)



# DV Model-Shift Uniqueness Test

008181646-01, P = 2.354098 Days, E = 129.244274 Days

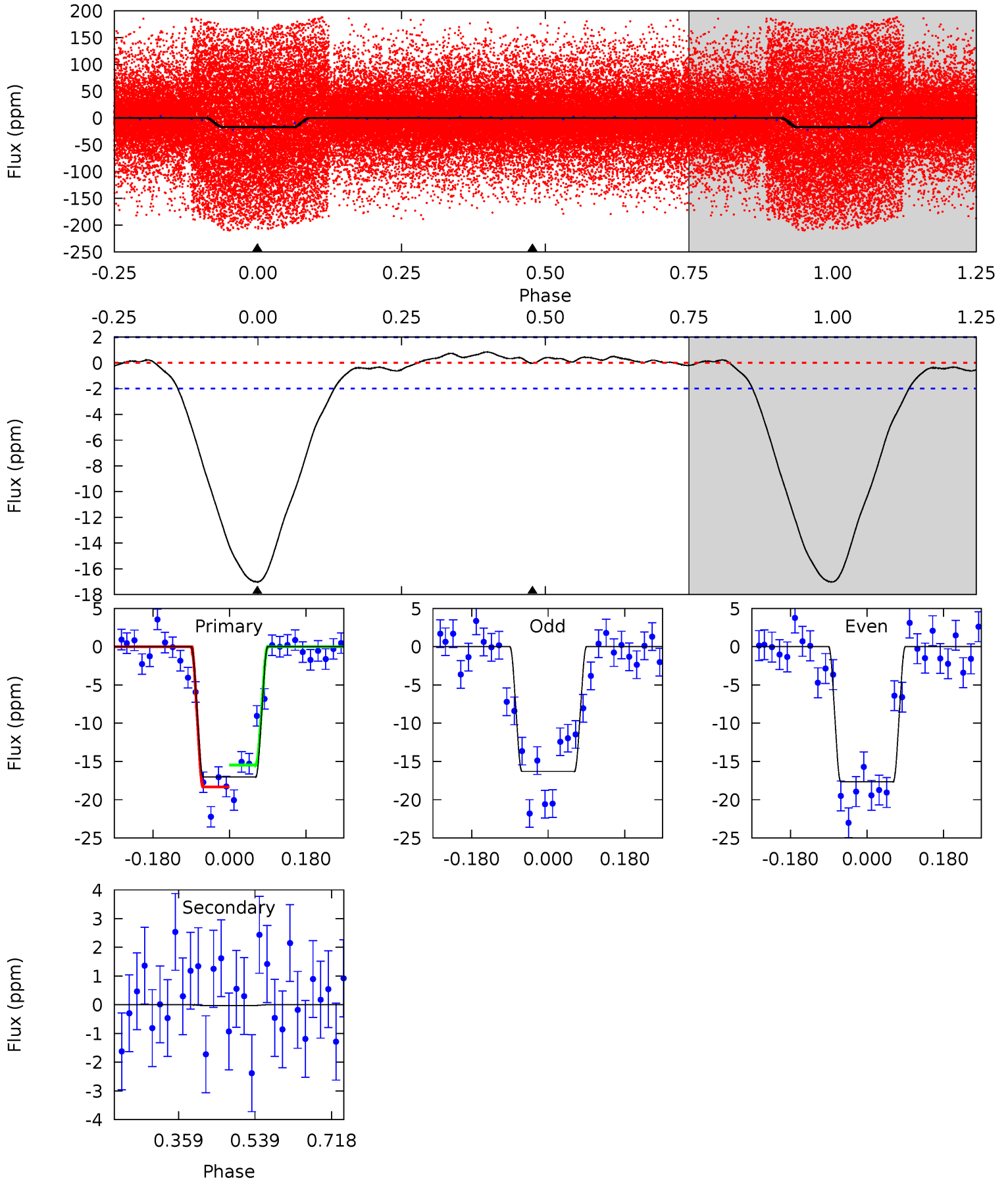
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
17.5	11.2	0	0	4.34	1.06	0.65	17.5	17.5	11.2	11.2	3.94	1.92	0.02	6.03



# Alt Model-Shift Uniqueness Test

008181646-01, P = 2.353759 Days, E = 131.605084 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
38.0	0.05	0	0	4.44	1.34	0.57	38.0	38.0	0.05	0.05	1.49	1.13	0.05	3.18





### Stellar Parameters For KIC 008181646

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5486^{+146}_{-146}$	$4.612^{+0.037}_{-0.112}$	$-0.400^{+0.300}_{-0.300}$	$0.736^{+0.131}_{-0.056}$	$0.824^{+0.075}_{-0.092}$	$2.905^{+0.476}_{-1.066}$
	+3%/-3%	+1%/-2%	+75%/-75%	+18%/-8%	+9%/-11%	+16%/-37%
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 008181646-01 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-11 \pm 1$	$0.31^{+0.13}_{-0.14}$	$1638^{+72}_{-60}$	$5151^{+1675}_{-731}$	$64^{+133}_{-33}$
Alt.	$-0 \pm 0$	$0.35^{+0.14}_{-0.13}$	$1639^{+71}_{-63}$	$-2134^{+5095}_{-815}$	$0.118^{+2.760}_{-2.183}$

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

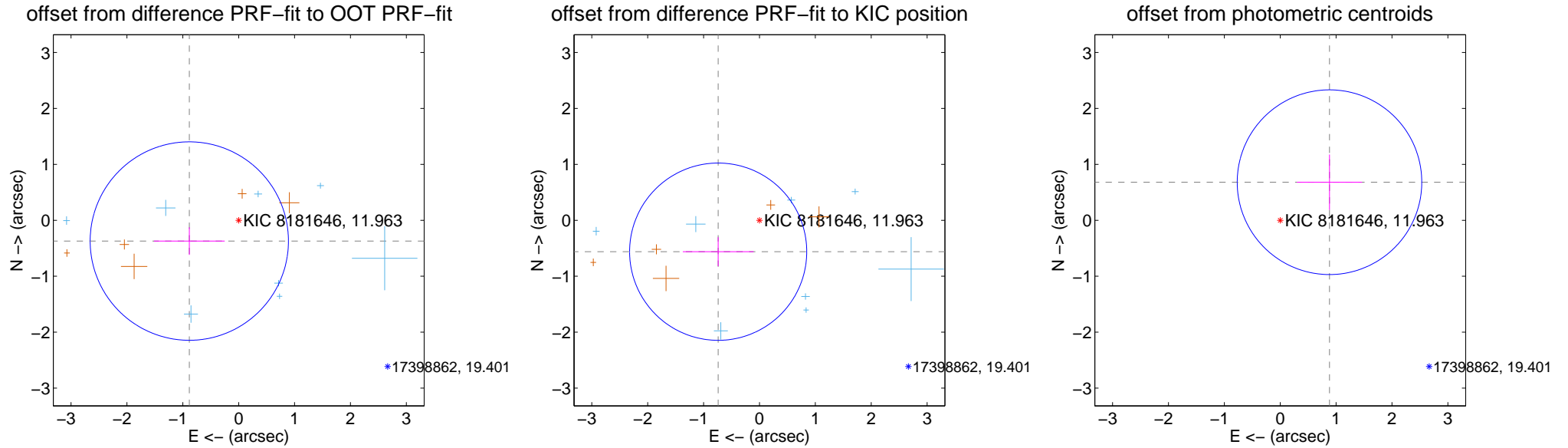
## DV Centroid Data

Supplemental centroid analysis for 008181646-01. **Kepler magnitude: 11.96.** Transit SNR 7.67

There are 9 quarters with good PRF difference image offsets

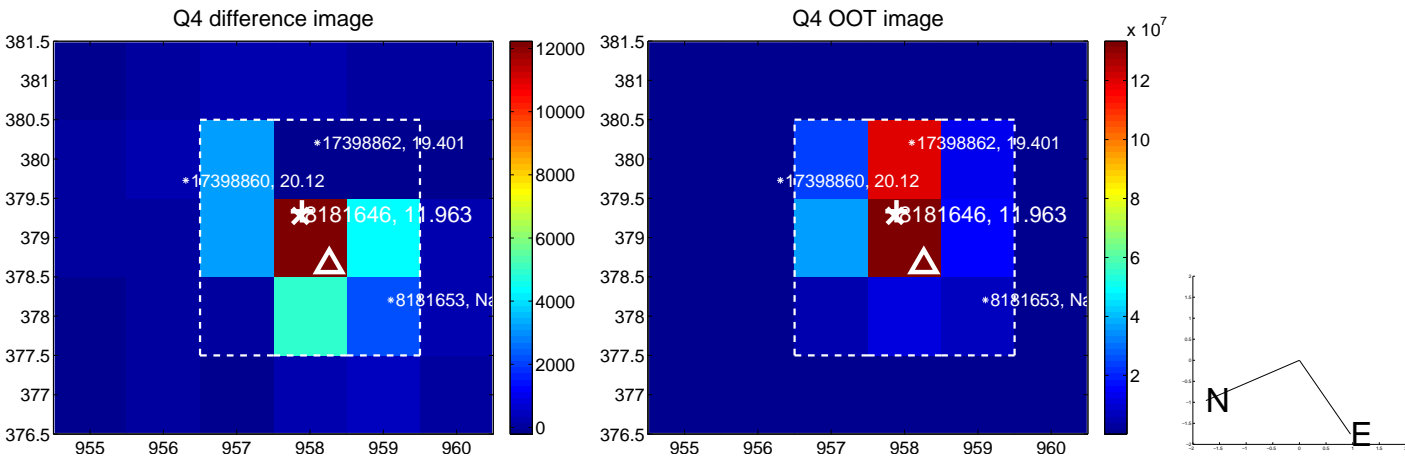
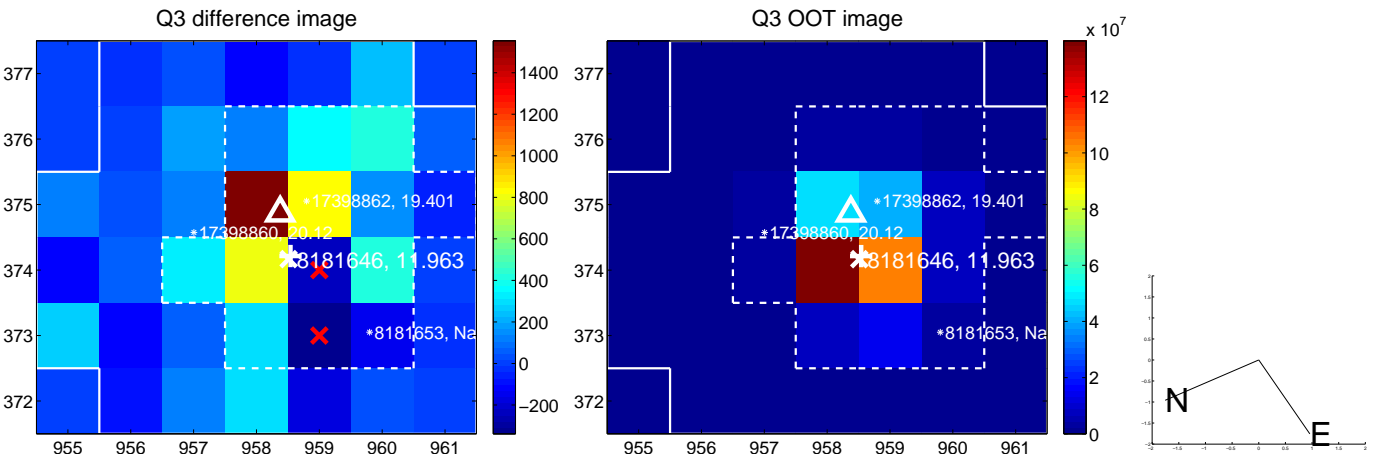
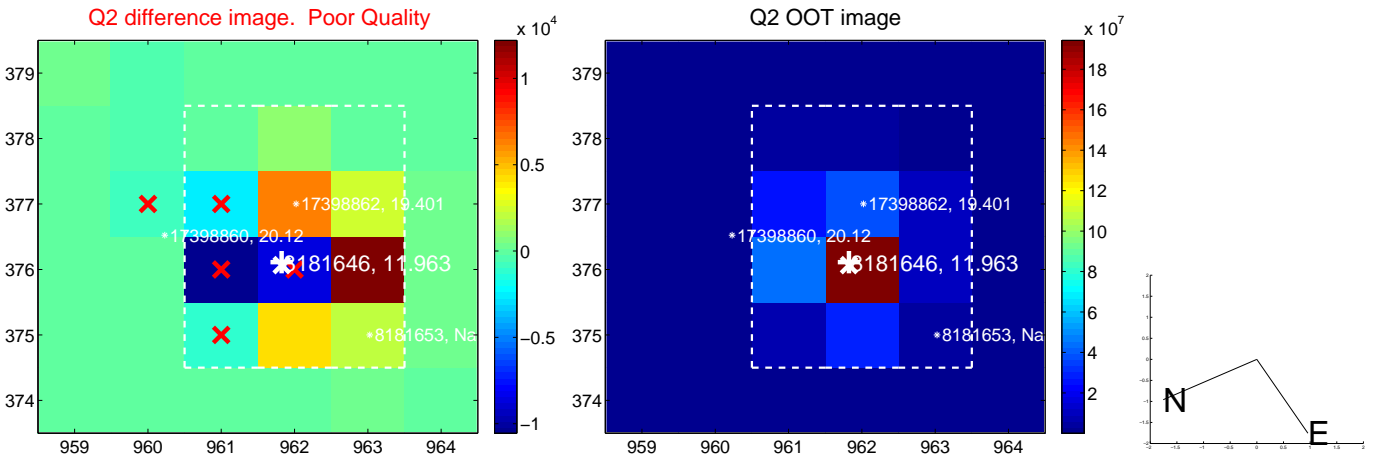
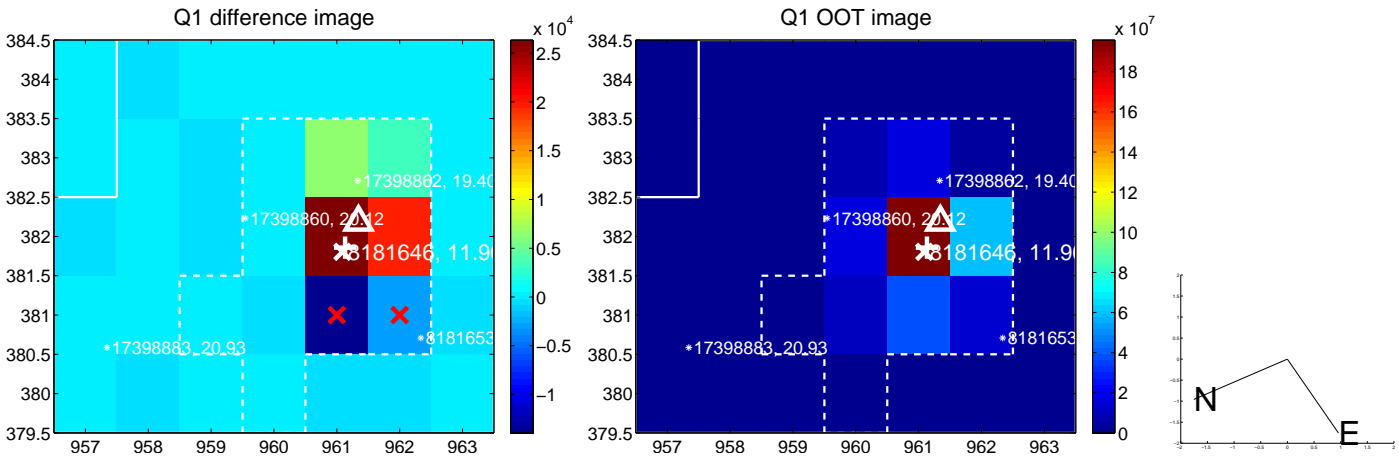
The direct PRF centroid is offset from the target star catalog position by about 0.34 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.959 \pm 0.591$	1.62	$0.884 \pm 0.633$	$-0.371 \pm 0.246$
PRF-fit source offset from KIC position	$0.928 \pm 0.528$	1.76	$0.739 \pm 0.634$	$-0.561 \pm 0.259$
photometric centroid source offset	$1.11 \pm 0.55$	2.02	$-0.88 \pm 0.58$	$0.68 \pm 0.49$

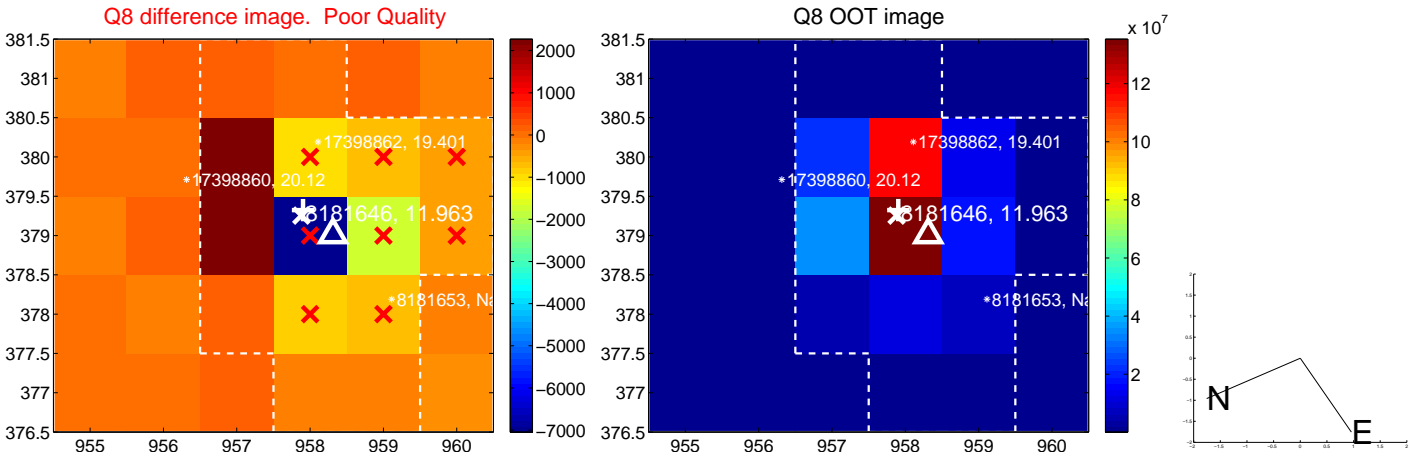
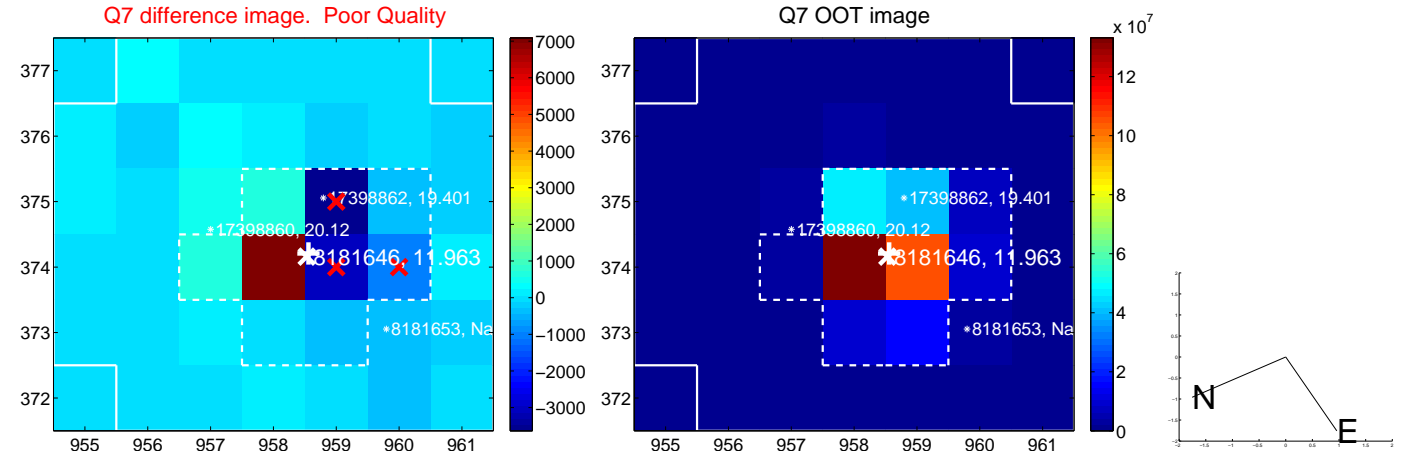
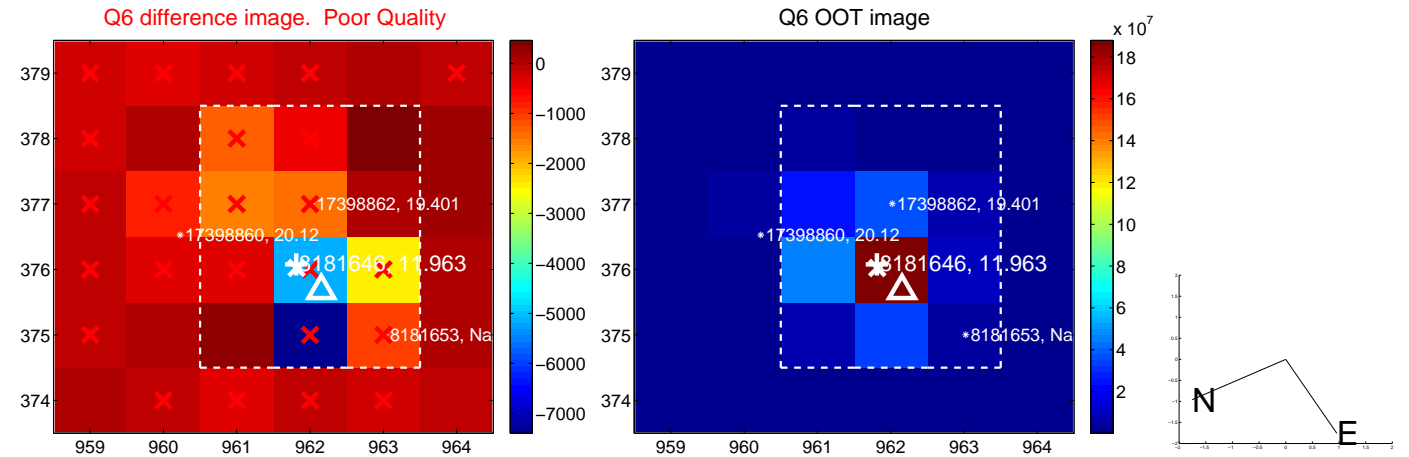
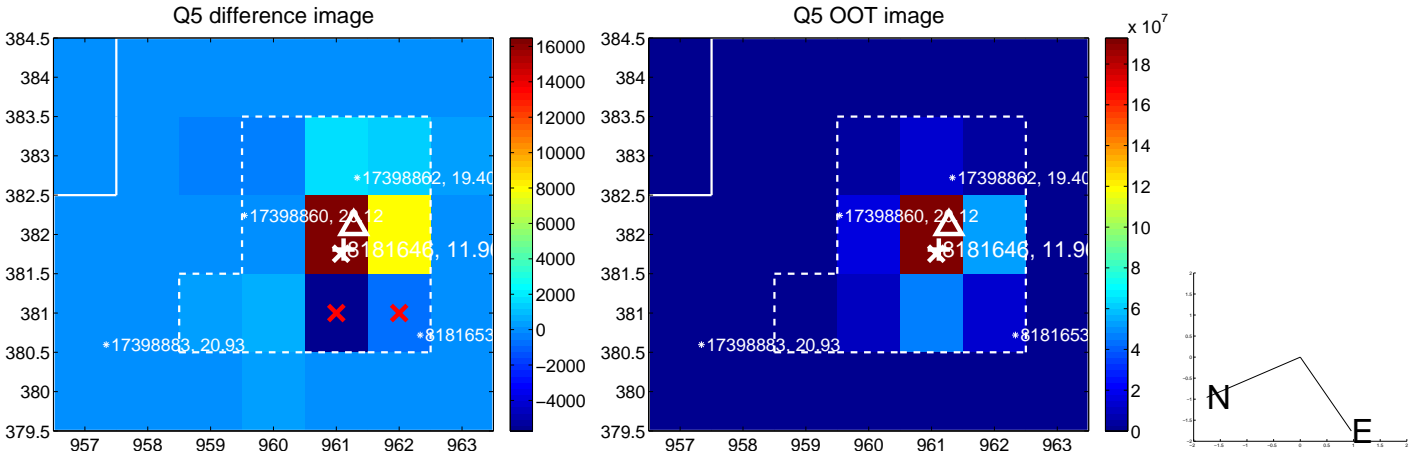


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets;** magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

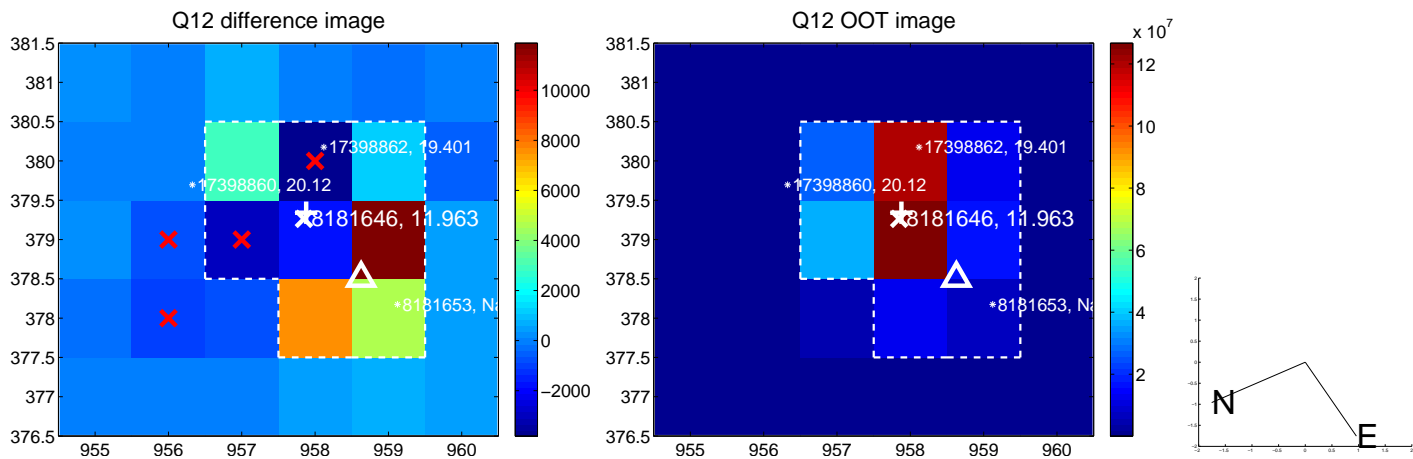
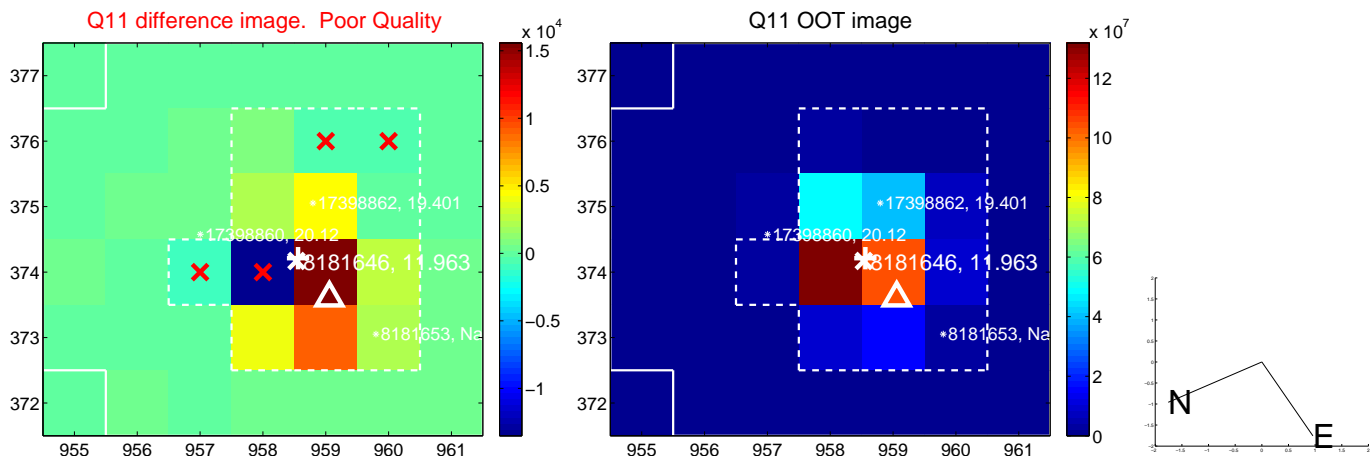
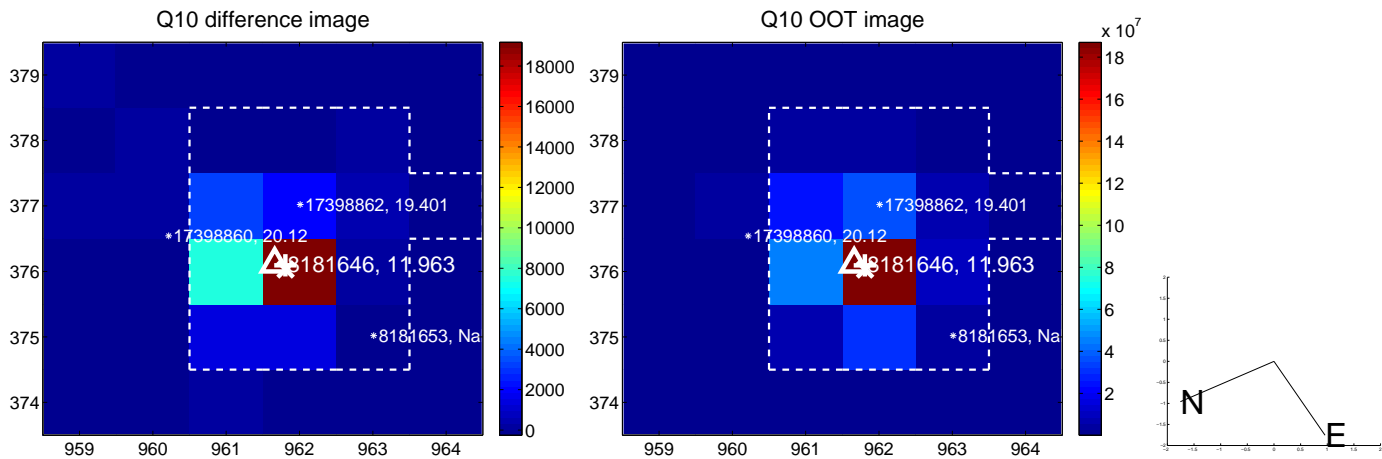
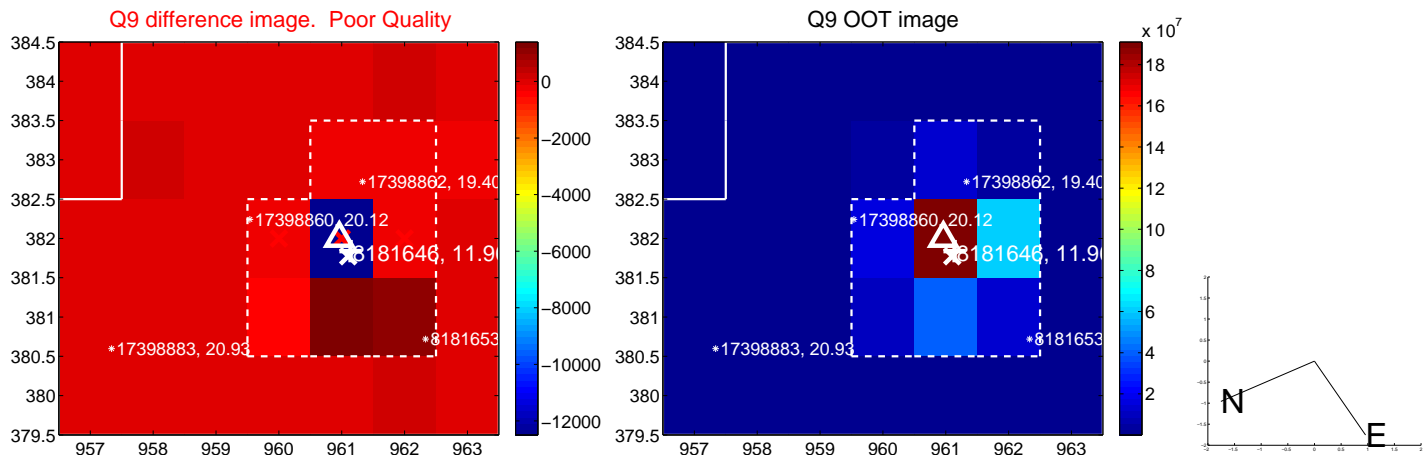


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

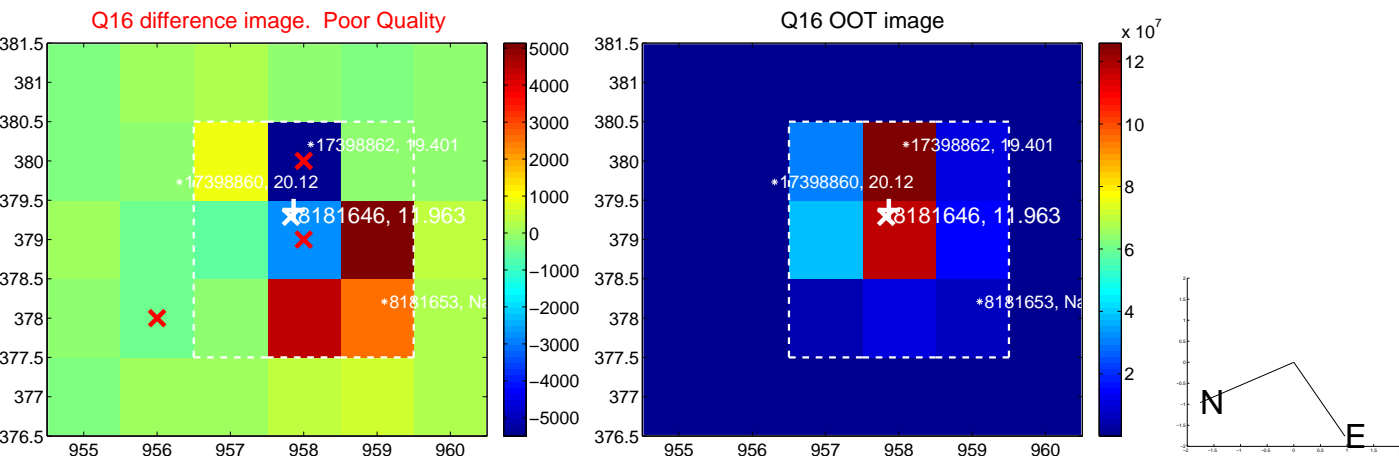
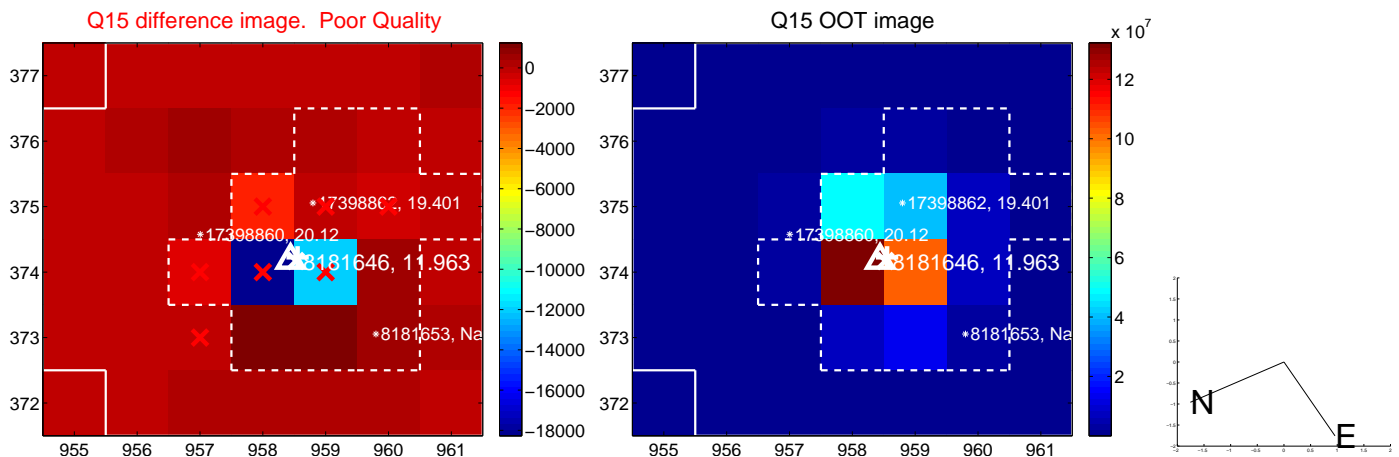
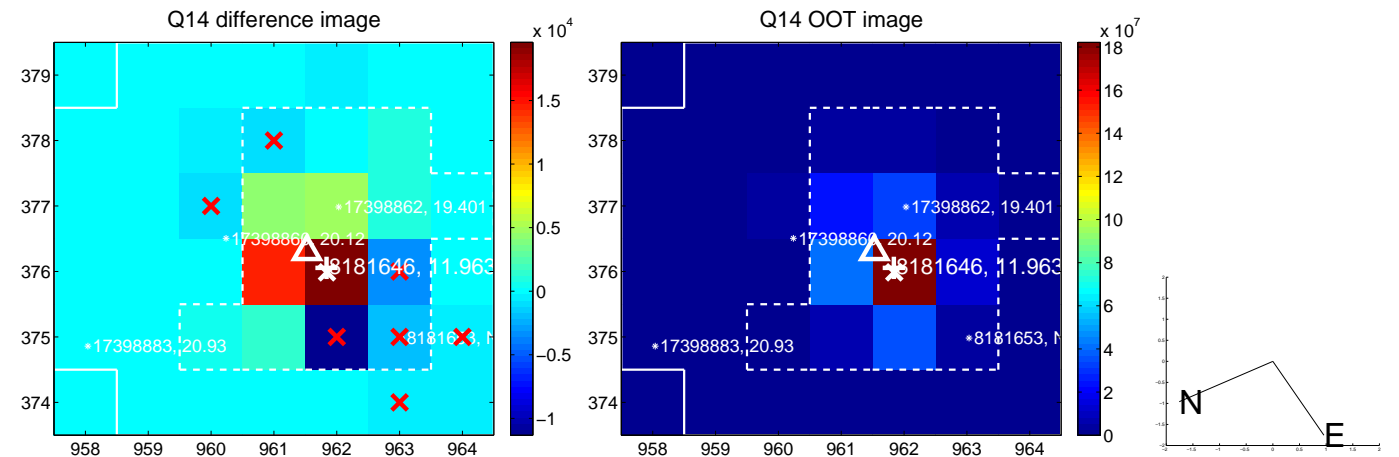
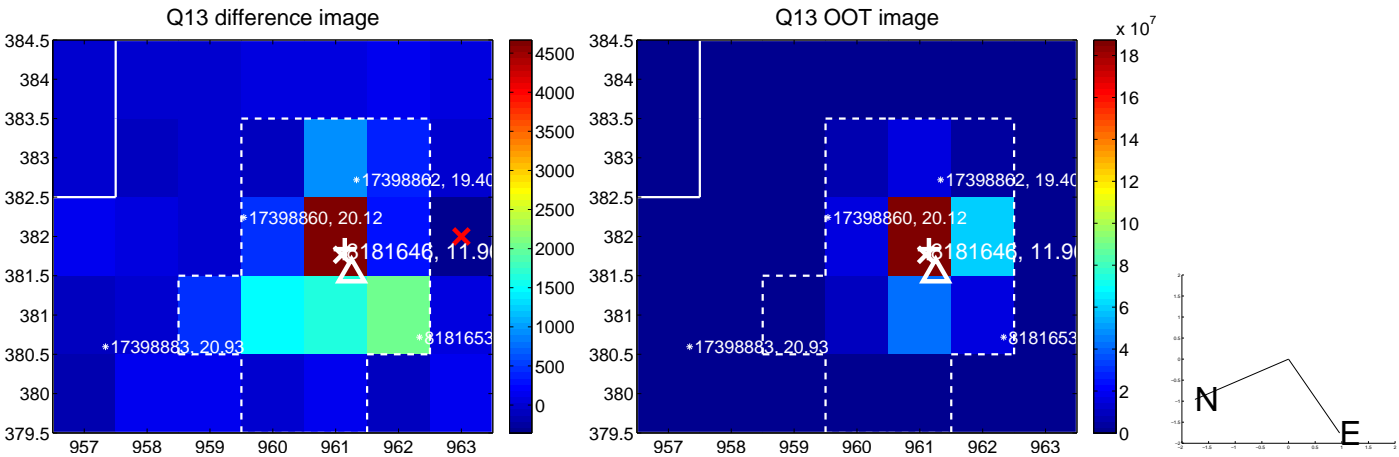




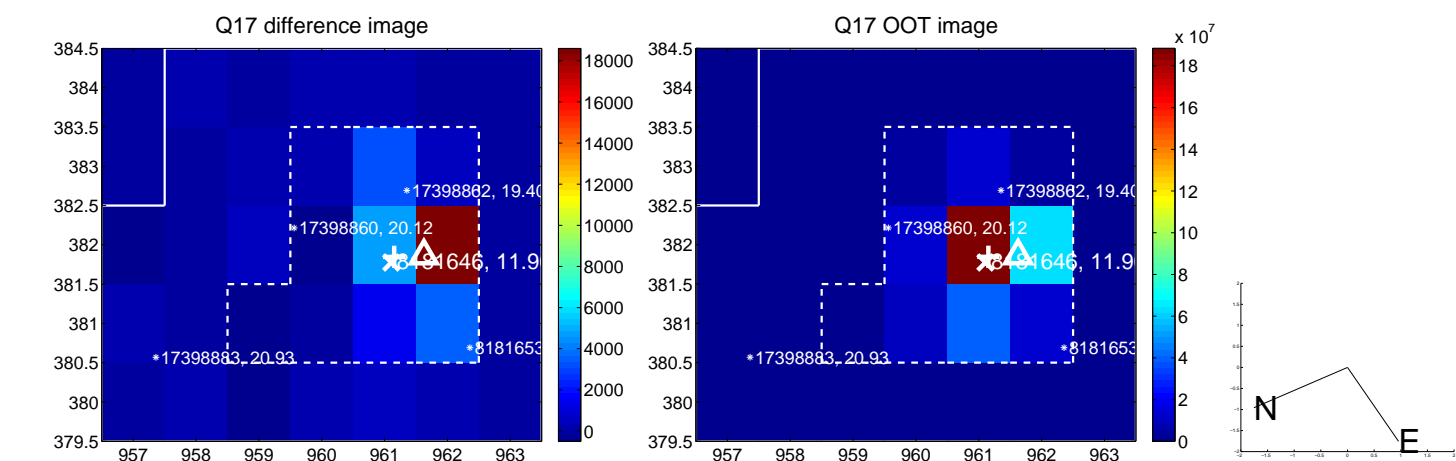
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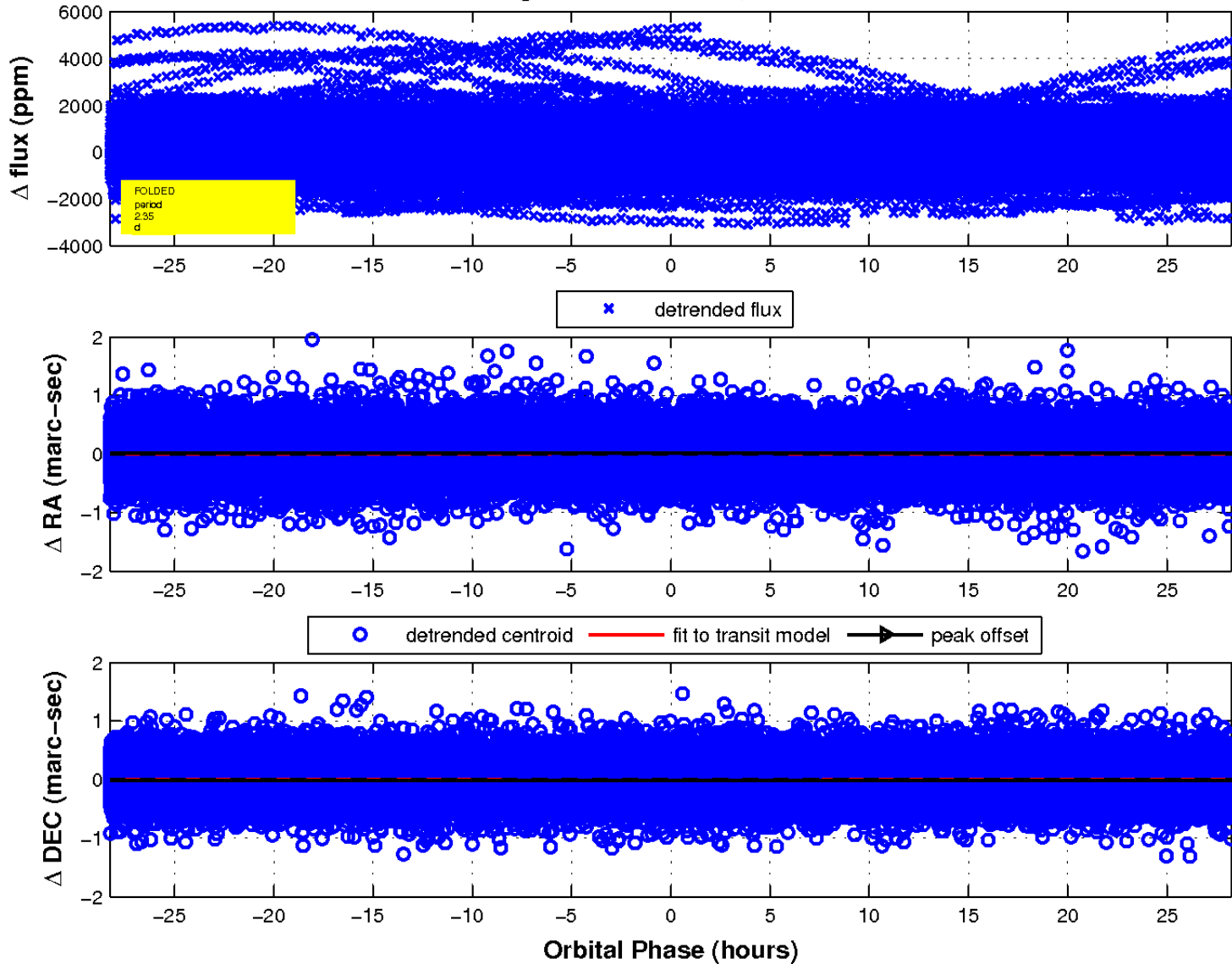
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

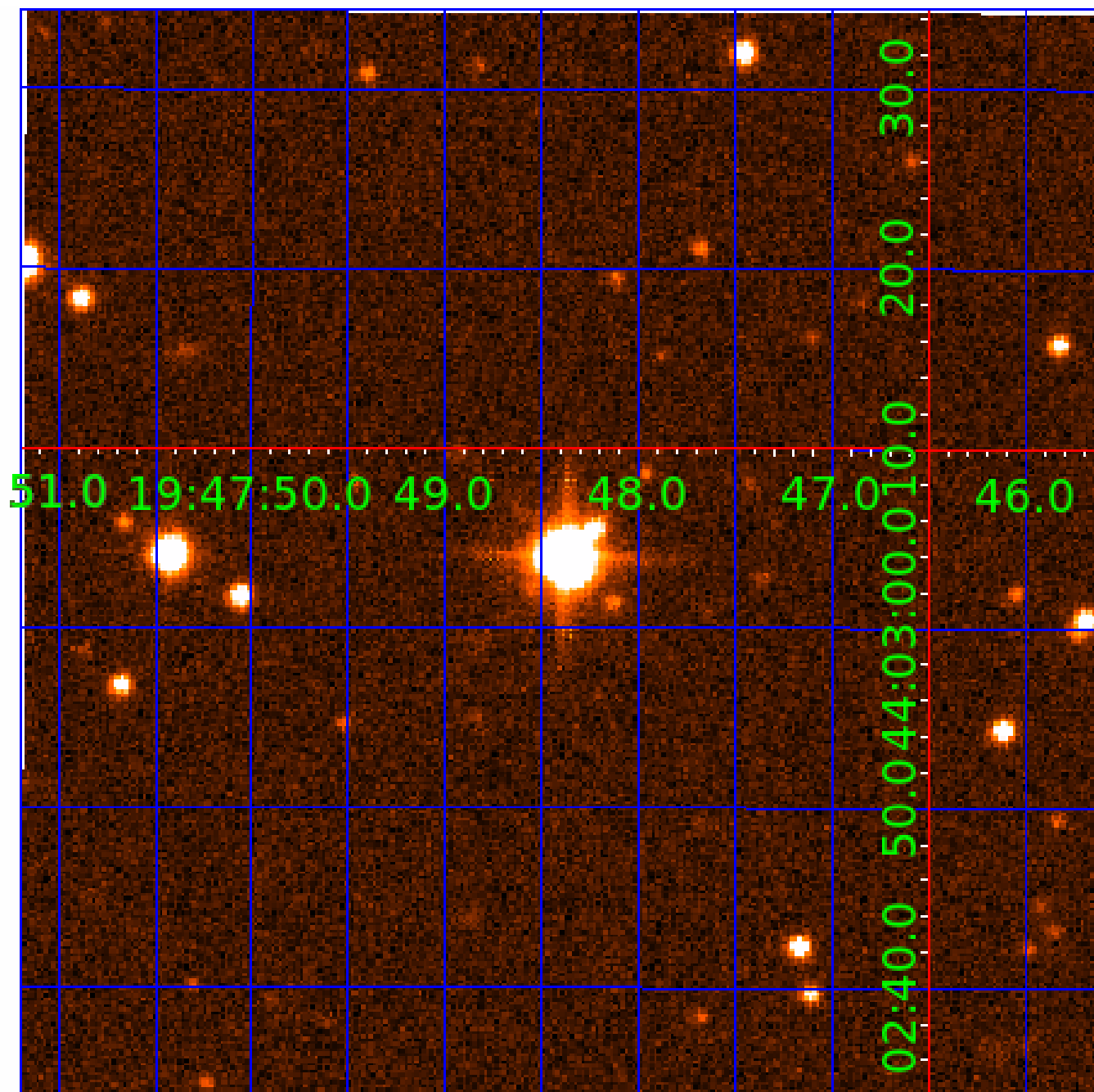


### fluxWeightedCentroids, Planet 1 of 9



UKIRT Image

Declination





# KIC 008181646

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
008181646-01	OBS	No	2.354098	131.598372	15.8	16.008	7.2	7.7	0.74	5486	0.30	422.09
008181646-02	OBS	No	46.649767	174.321233	110.5	7.773	22.7	2.3	0.74	5486	0.88	7.87
008181646-03	OBS	No	40.939977	153.721226	224.5	5.088	20.0	6.5	0.74	5486	1.24	9.37
008181646-04	OBS	No	157.875096	208.123739	4505.6	54.343	17.3	12.4	0.74	5486	9.20	1.55
008181646-05	OBS	No	48.824583	164.751099	532.2	25.560	15.7	7.3	0.74	5486	3.40	7.41
008181646-06	OBS	No	59.244269	160.876125	298.1	38.985	14.2	4.7	0.74	5486	1.37	5.72
008181646-07	OBS	No	61.879706	179.179822	339.5	8.688	11.4	6.7	0.74	5486	1.45	5.40
008181646-08	OBS	No	42.732442	148.480323	161.0	5.821	11.3	4.3	0.74	5486	0.99	8.85

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
008181646-01	OBS	FP	0.00	1	0	0	0	LPP_DV
008181646-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_TRACKER—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV
008181646-03	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE_ZUMA—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_UNRESOLVED_OFFSET
008181646-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL_SKYE—TRANS_GAPPED—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—INCONSISTENT_TRANS
008181646-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV
008181646-06	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
008181646-07	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_FEW_DIFFS
008181646-08	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV

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

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

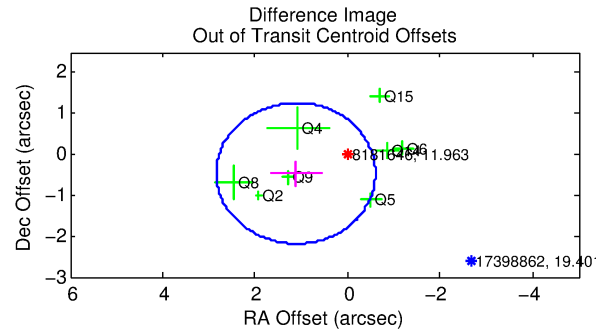
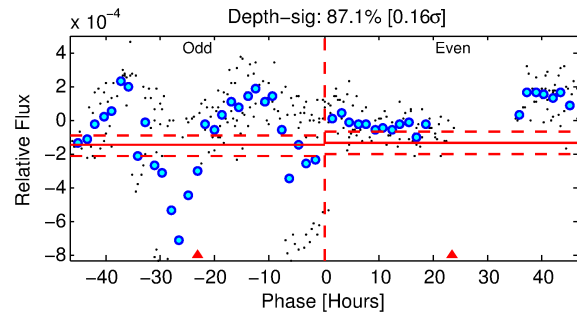
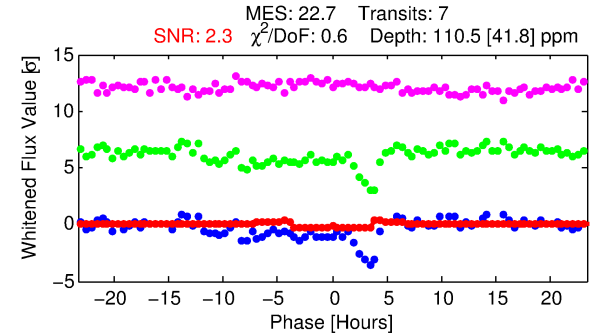
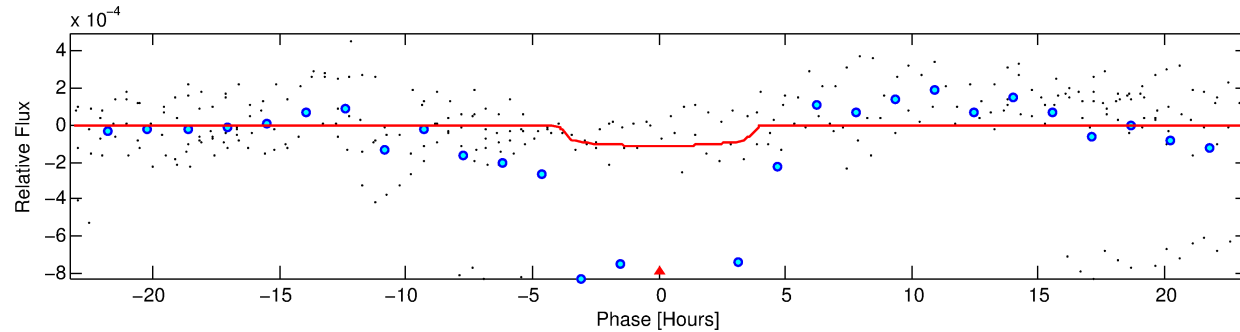
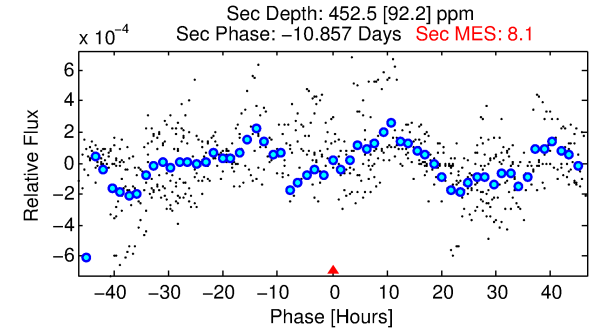
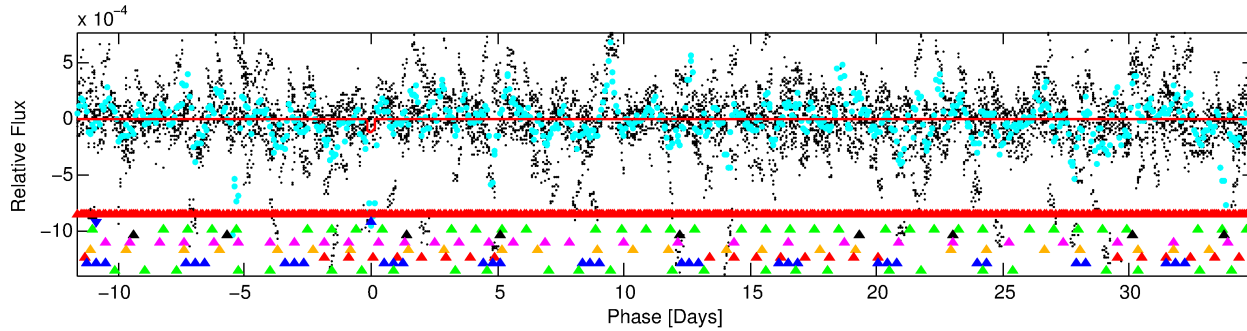
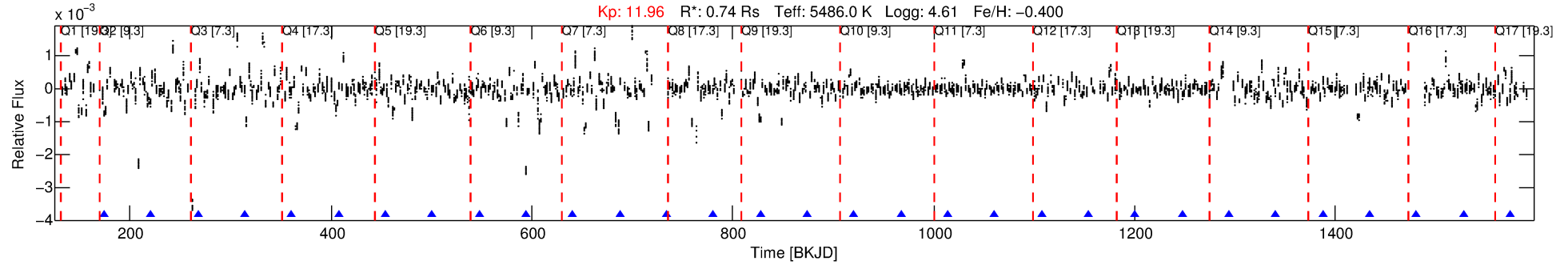
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 008181646-02

No Significant Match Found

# DV One-Page Summary

KIC: 8181646 Candidate: 2 of 9 Period: 46.650 d



## DV Fit Results:

Period = 46.64977 [0.00165] d  
Epoch = 174.3212 [0.0306] BKJD  
Rp/R\* = 0.0110 [0.0097]  
a/R\* = 25.53 [96.59]  
b = 0.84 [1.31]  
Seff = 7.87 [1.85]  
Teq = 427 [25] K  
Rp = 0.88 [0.80] Re  
a = 0.2363 [0.0346] AU  
Ag = 17916.91 [32176.38] [0.56σ]  
Teffp = 7640 [3413] K [2.11σ]

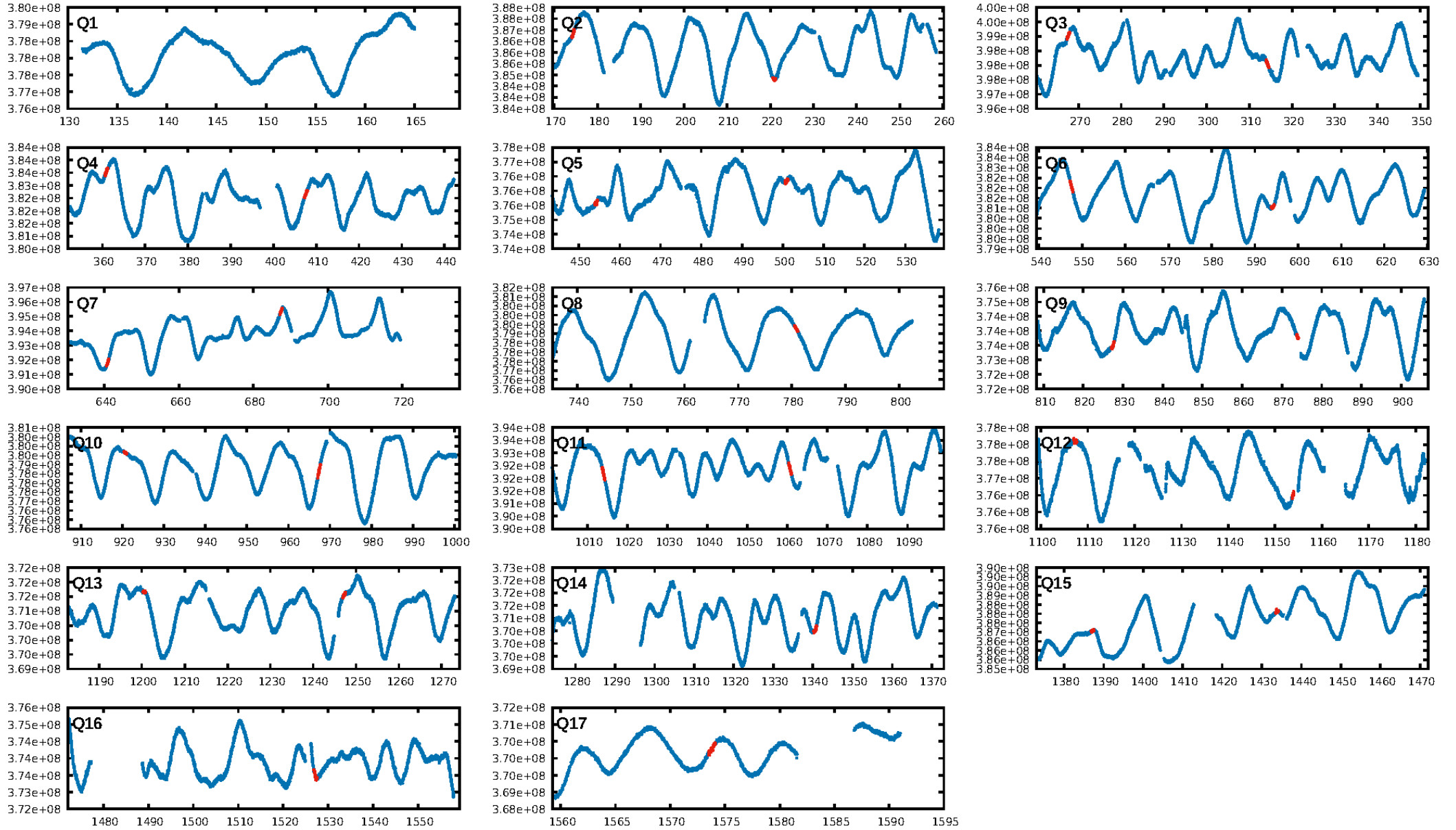
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [9.68σ]  
LongPeriod-sig: 94.9% [1.95σ]  
ModelChiSquare2-sig: 0.0%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [7/7]  
GhostDiagnostic-chr: 1.262  
Centroid-sig: 1.1%  
Centroid-so: 0.495 arcsec [1.12σ]  
OotOffset-rm: 1.214 arcsec [2.11σ]  
OotOffset-st: 3/1/2/2 [8]  
KicOffset-rm: 1.136 arcsec [2.46σ]  
KicOffset-st: 3/1/2/2 [8]  
DiffImageQuality-fgm: 0.62 [5/8]  
DiffImageOverlap-fno: 0.07 [1/14]

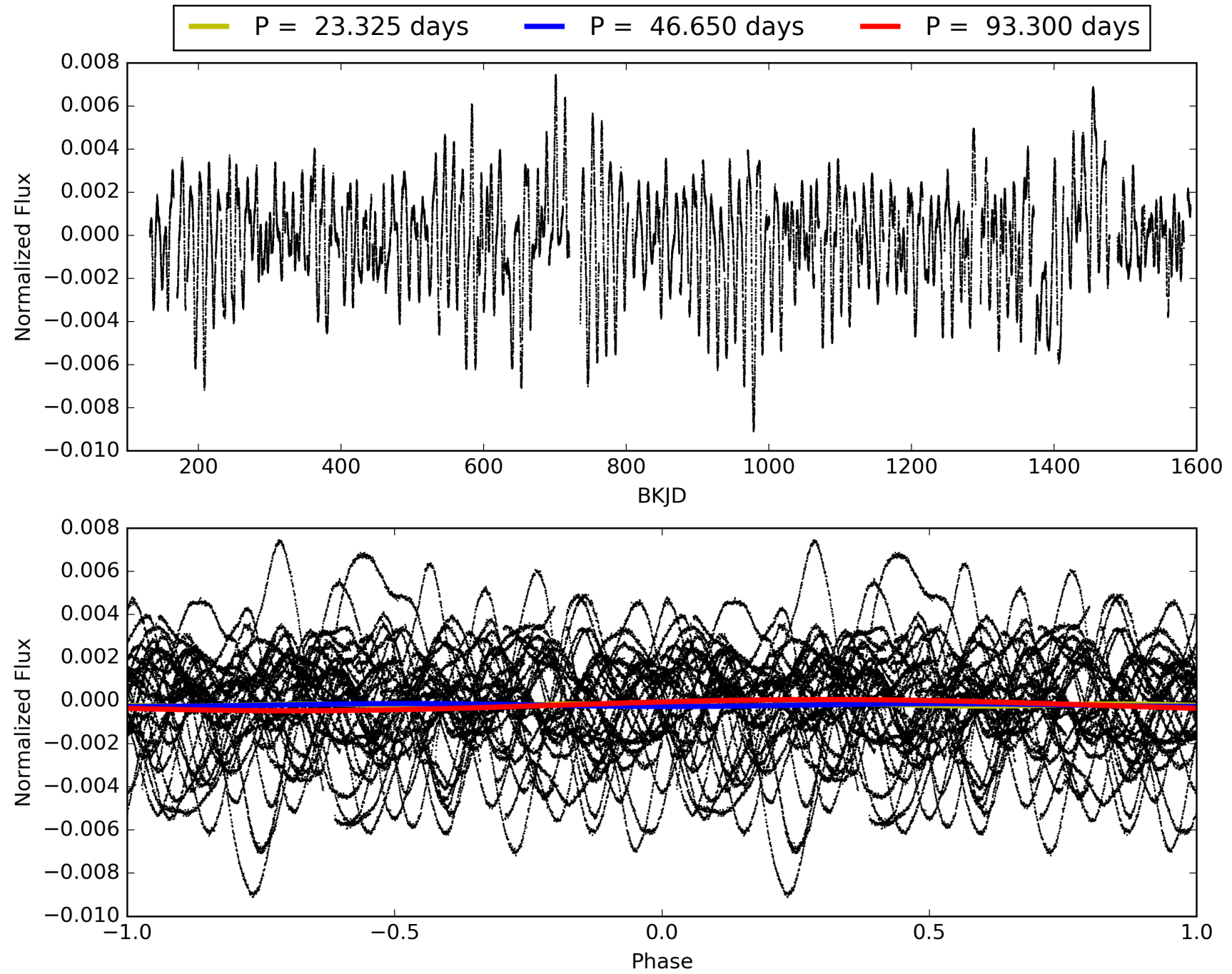
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 23:57:32 Z

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

# TCE 008181646-02, PDC Light Curves

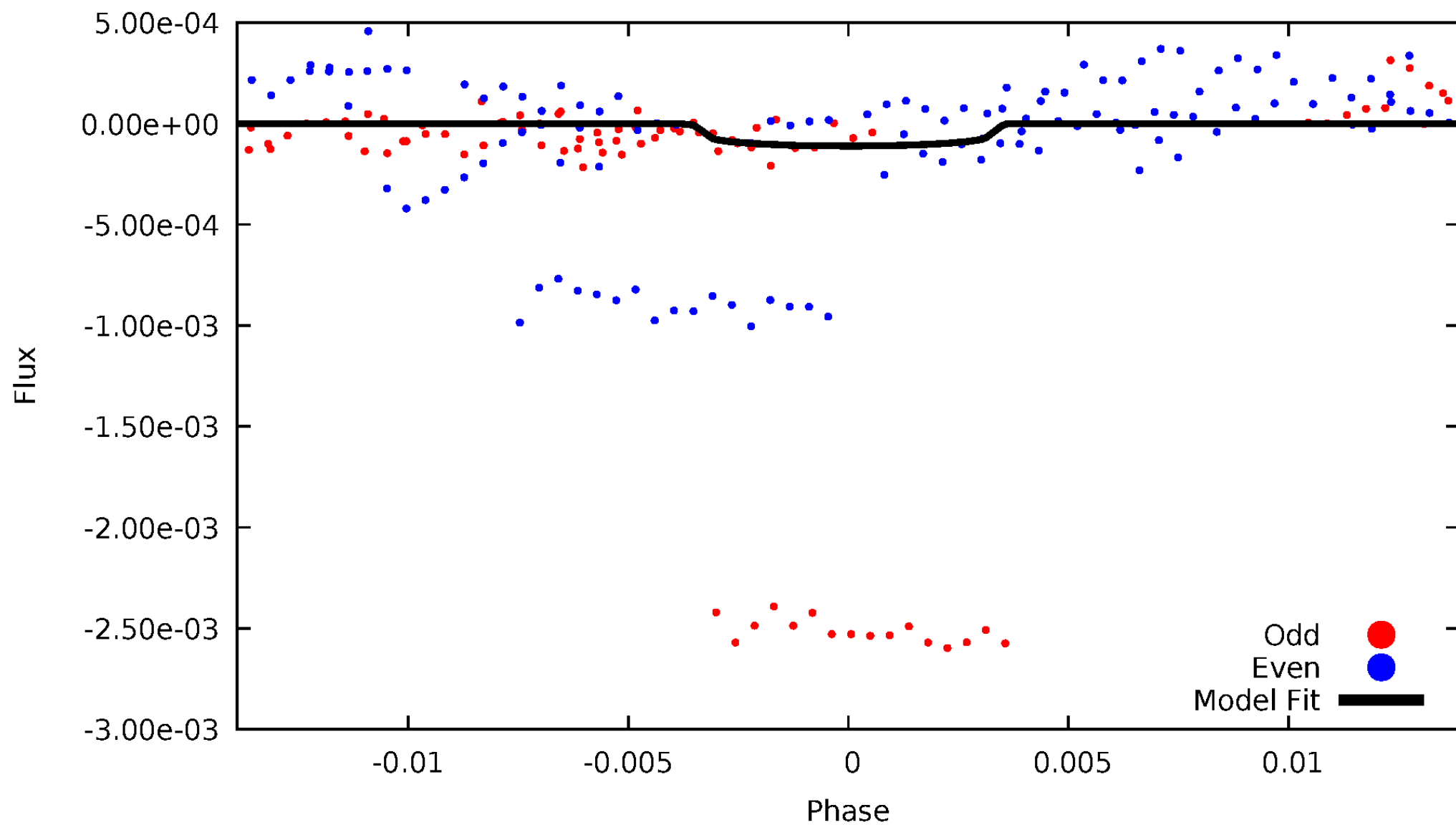


# TCE 008181646-02



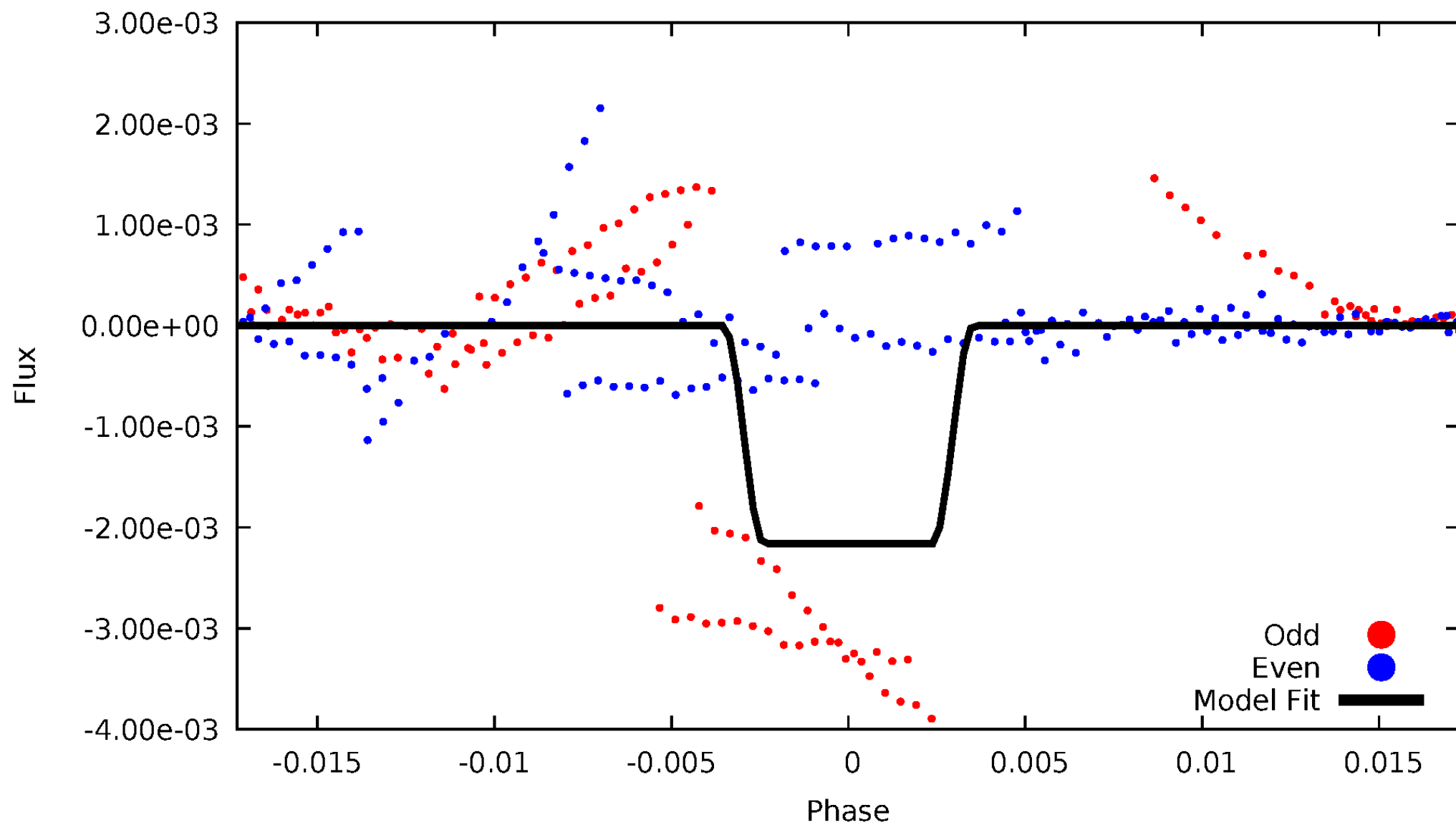
# DV Odd/Even

TCE 008181646-02



# ALT Odd/Even

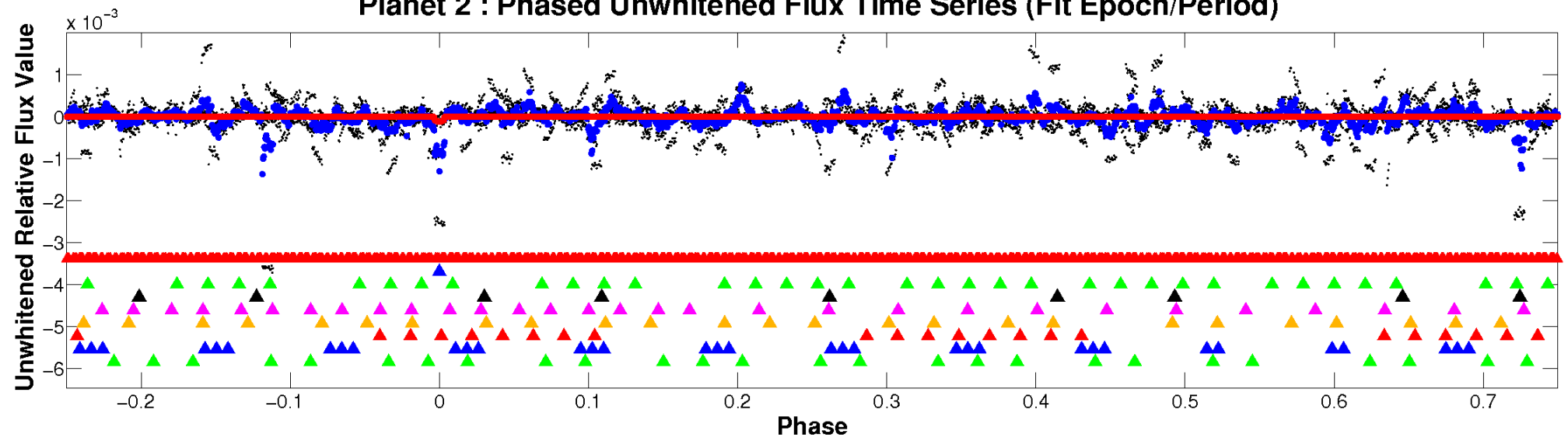
TCE 008181646-02



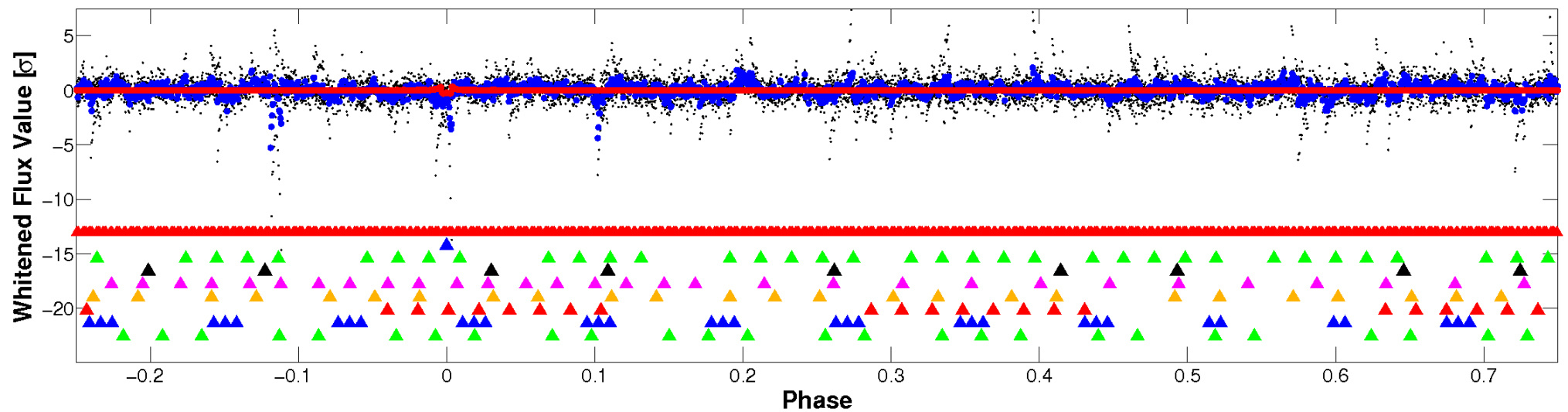


# Non-Whitened Vs. Whitened Light Curve

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

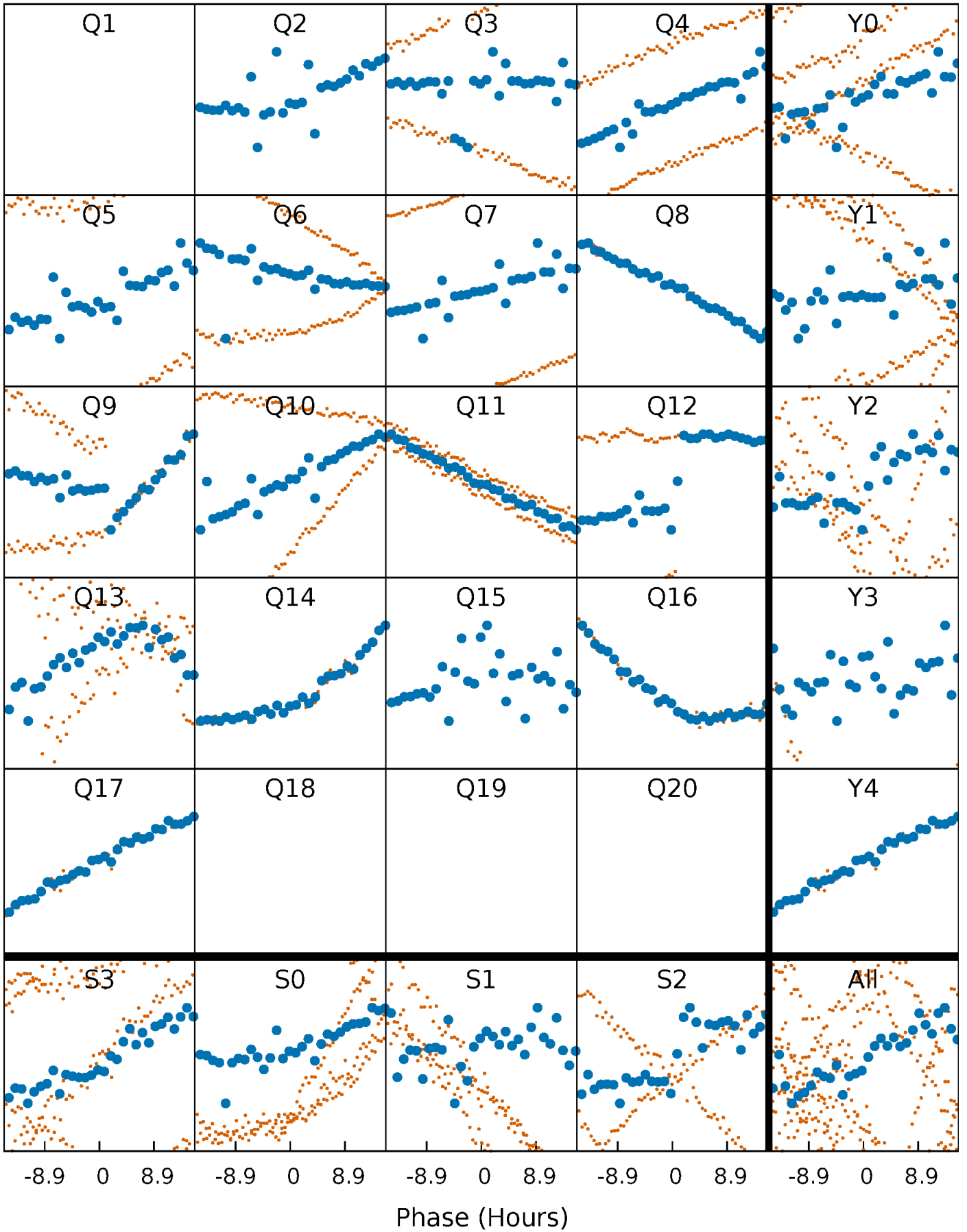


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



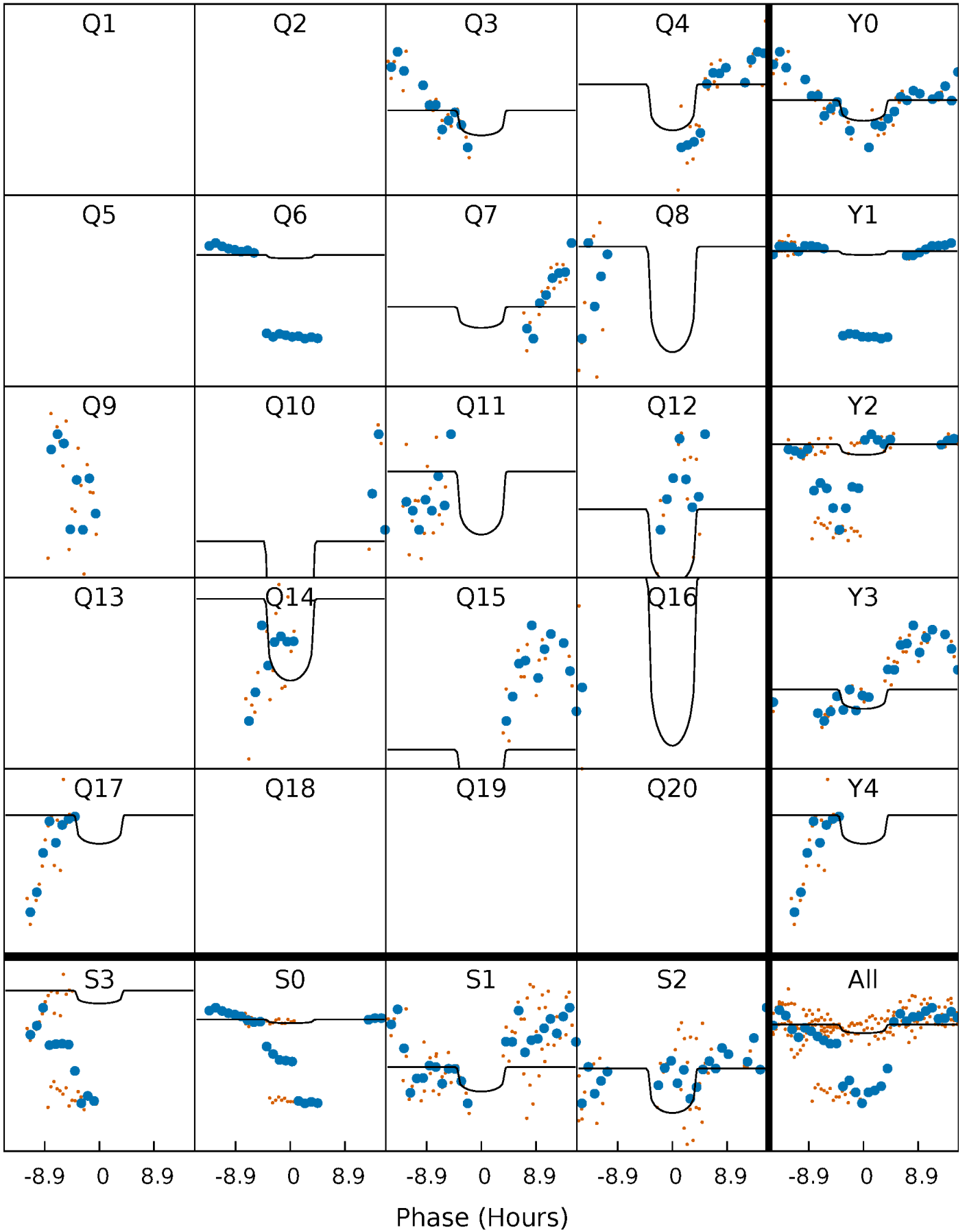
# PDC Quarter-Phased Transit Curves

TCE 008181646-02   P= 46.649767 Days    $T_0=174.321233$  (BKJD)



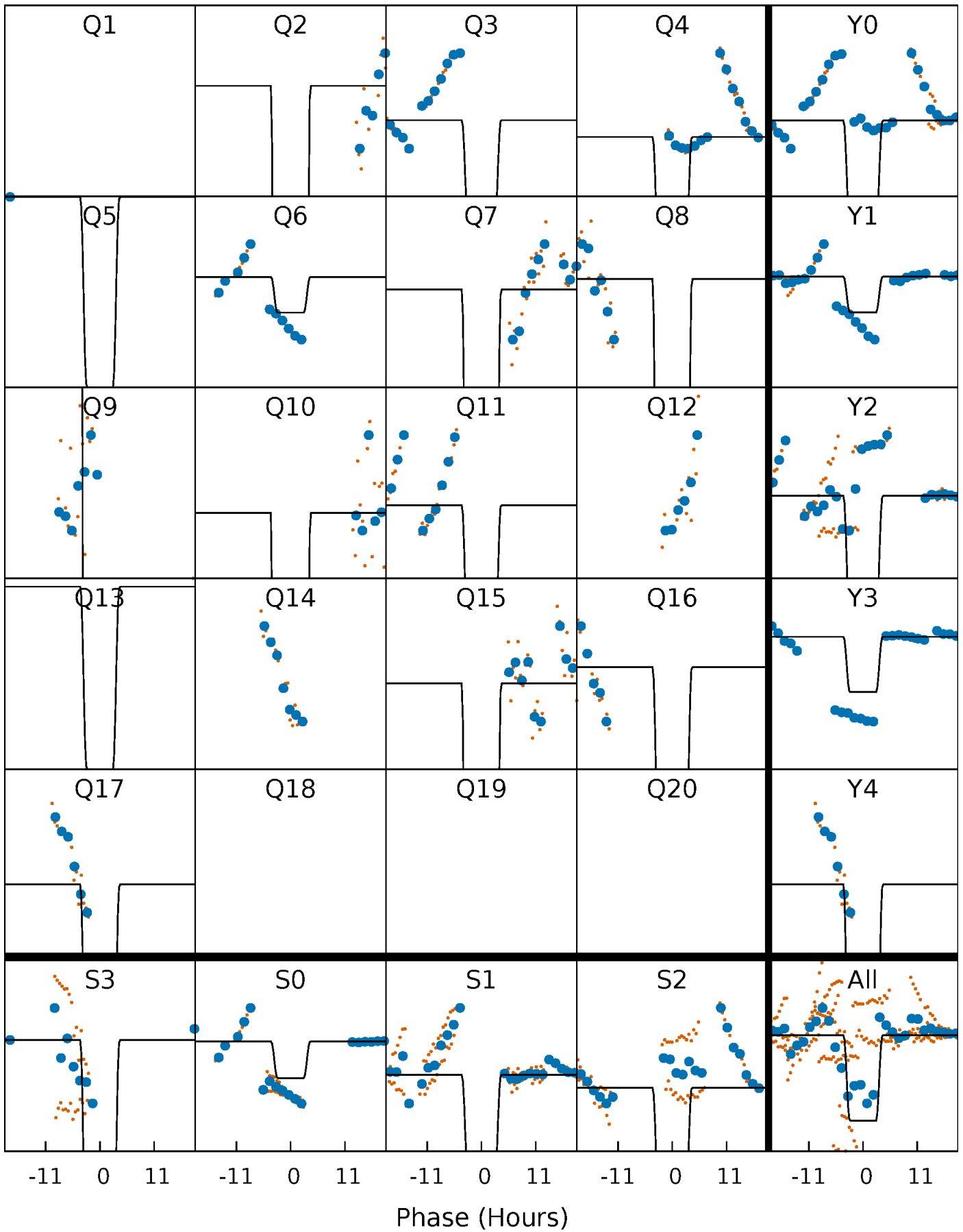
# DV Quarter-Phased Transit Curves

TCE 008181646-02   P= 46.649767 Days    $T_0=174.321233$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

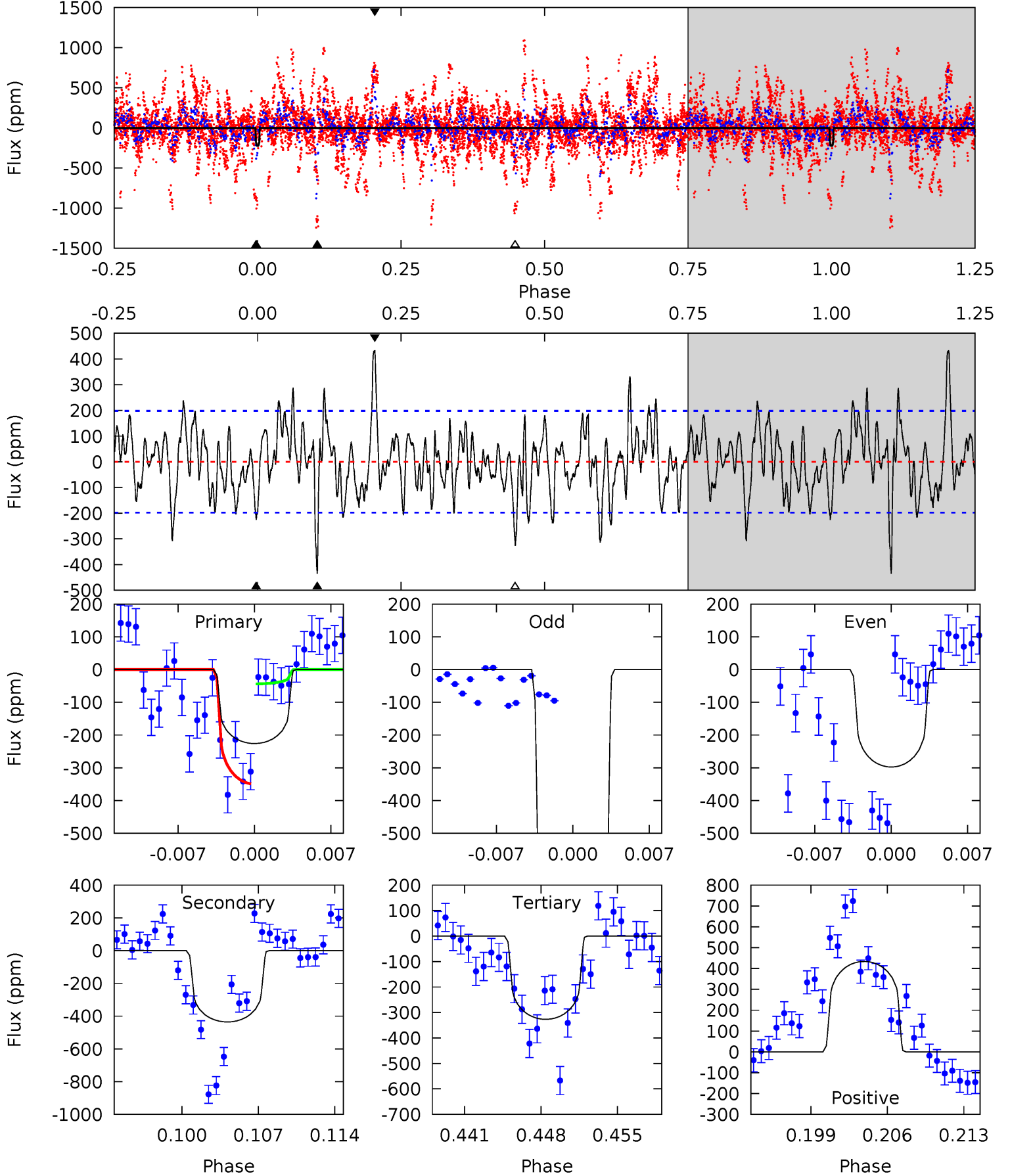
TCE 008181646-02   P= 46.642923 Days    $T_0=174.439441$  (BKJD)



# DV Model-Shift Uniqueness Test

008181646-02, P = 46.649767 Days, E = 127.671466 Days

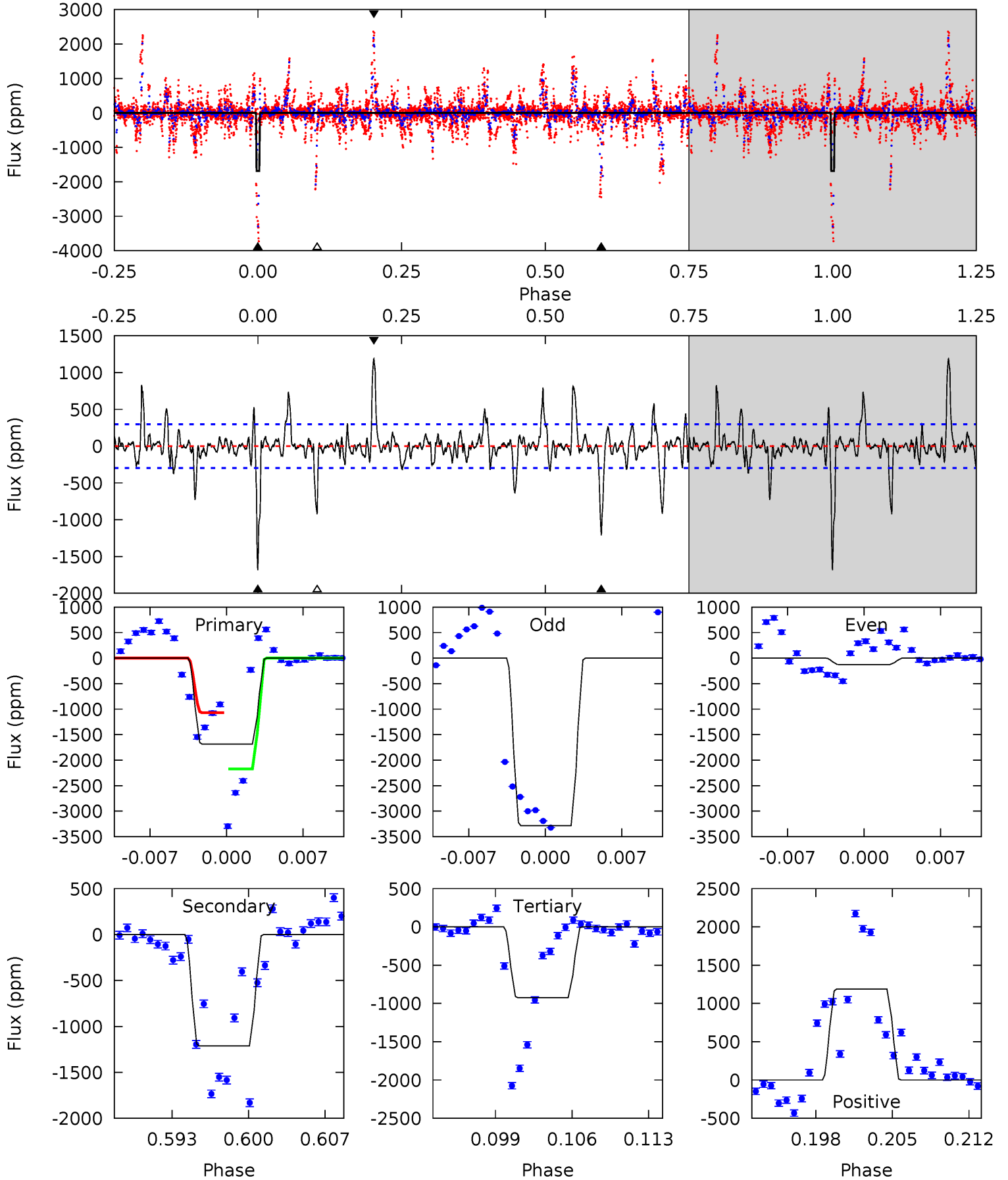
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
5.81	11.2	8.41	11.2	5.09	2.69	2.78	-2.60	-5.35	2.80	0.04	13.1	4.03	0.50	3.96



# Alt Model-Shift Uniqueness Test

008181646-02, P = 46.642923 Days, E = 127.796518 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
28.8	20.7	15.8	20.3	5.09	2.69	3.15	13.0	8.53	4.92	0.43	21.0	2.58	0.41	0



### Stellar Parameters For KIC 008181646

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M$ ( $M_{\odot}$ )	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5486^{+146}_{-146}$	$4.612^{+0.037}_{-0.112}$	$-0.400^{+0.300}_{-0.300}$	$0.736^{+0.131}_{-0.056}$	$0.824^{+0.075}_{-0.092}$	$2.905^{+0.476}_{-1.066}$
	+3%/-3%	+1%/-2%	+75%/-75%	+18%/-8%	+9%/-11%	+16%/-37%
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 008181646-02 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-435 \pm 39$	$1.01^{+0.79}_{-0.64}$	$604^{+28}_{-21}$	$7131^{+8136}_{-1736}$	$12782^{+88168}_{-8712}$
Alt.	$-1212 \pm 58$	$3.85^{+0.89}_{-0.81}$	$605^{+29}_{-22}$	$4850^{+536}_{-415}$	$2499^{+1529}_{-868}$

$T_{max}$  = 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

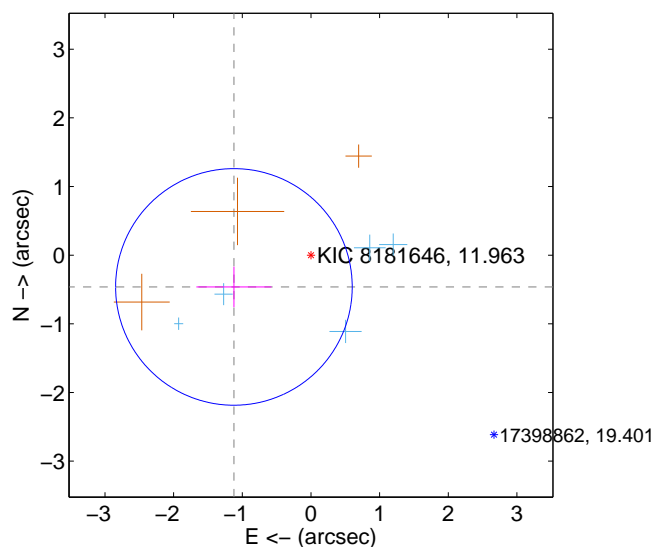
Supplemental centroid analysis for 008181646-02. **Kepler magnitude: 11.96.** Transit SNR 2.33

There are 5 quarters with good PRF difference image offsets

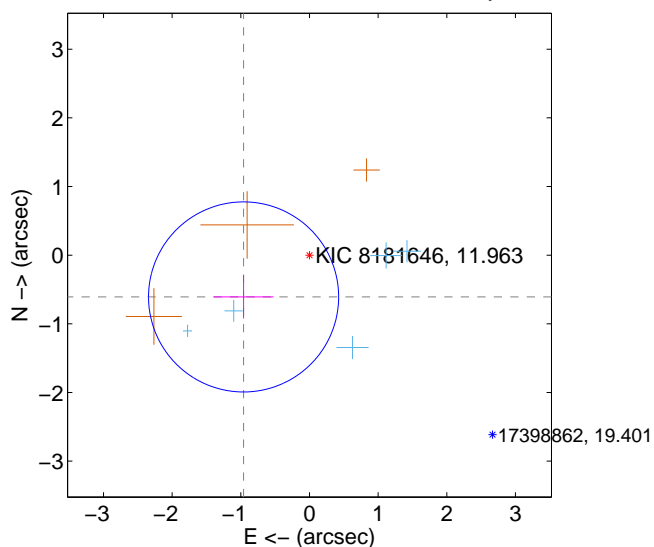
The direct PRF centroid is offset from the target star catalog position by about 0.24 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$1.214 \pm 0.574$	2.11	$1.122 \pm 0.547$	$-0.463 \pm 0.295$
PRF-fit source offset from KIC position	$1.136 \pm 0.461$	2.46	$0.960 \pm 0.437$	$-0.608 \pm 0.315$
photometric centroid source offset	$0.50 \pm 0.44$	1.12	$-0.06 \pm 0.48$	$0.49 \pm 0.44$

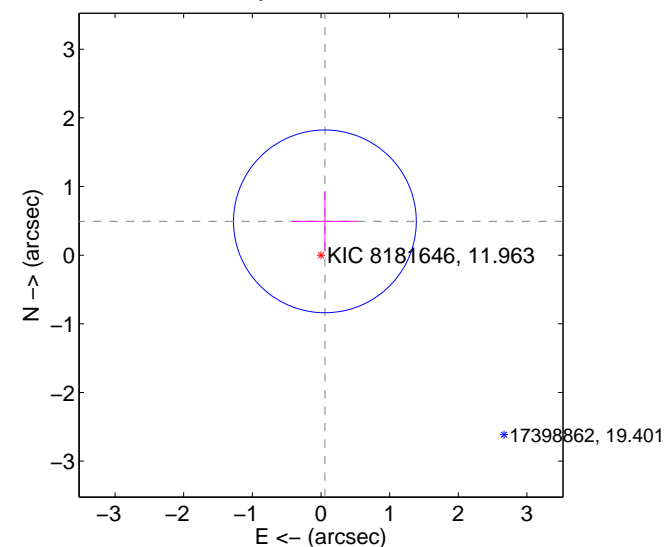
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

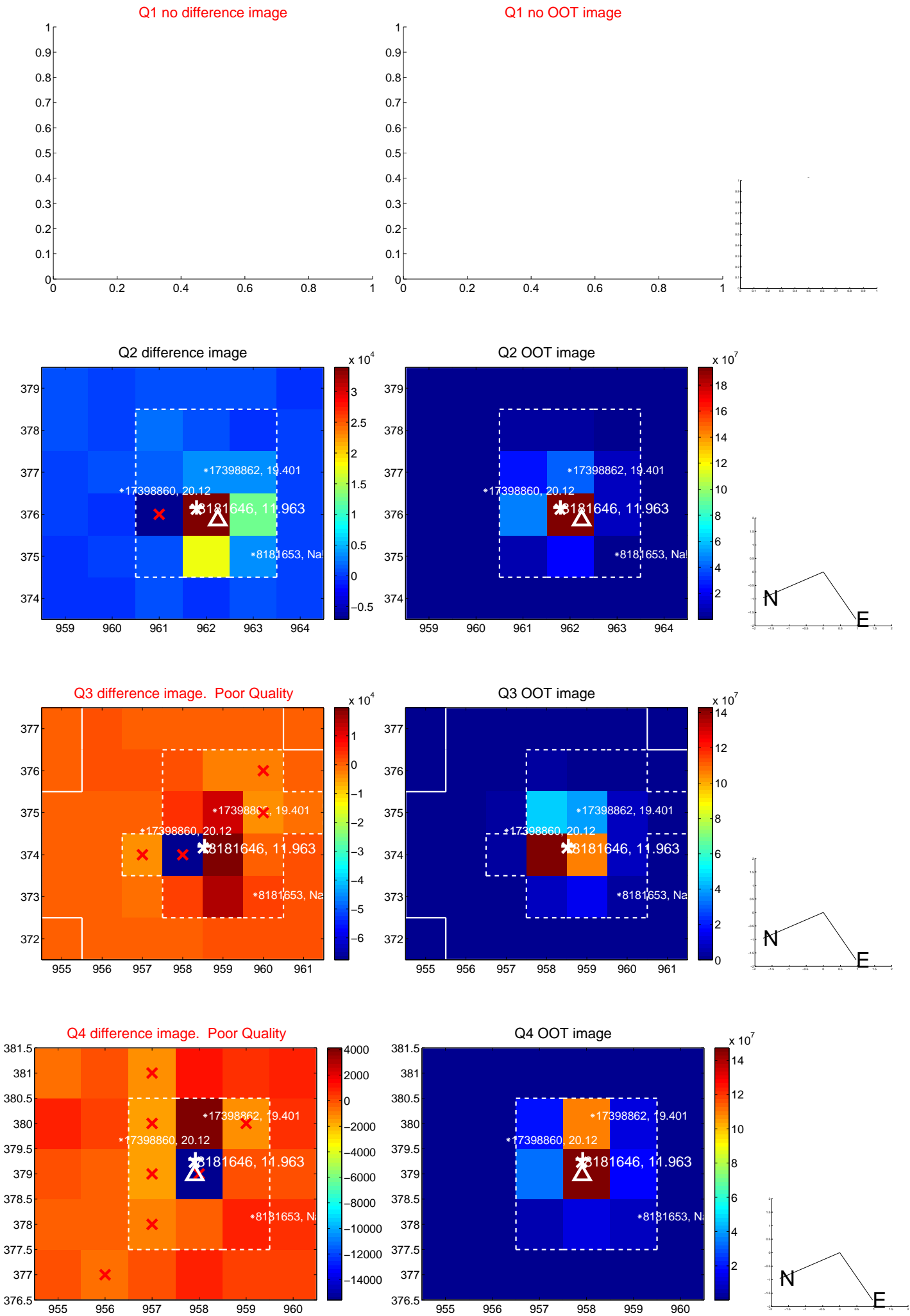


offset from photometric centroids

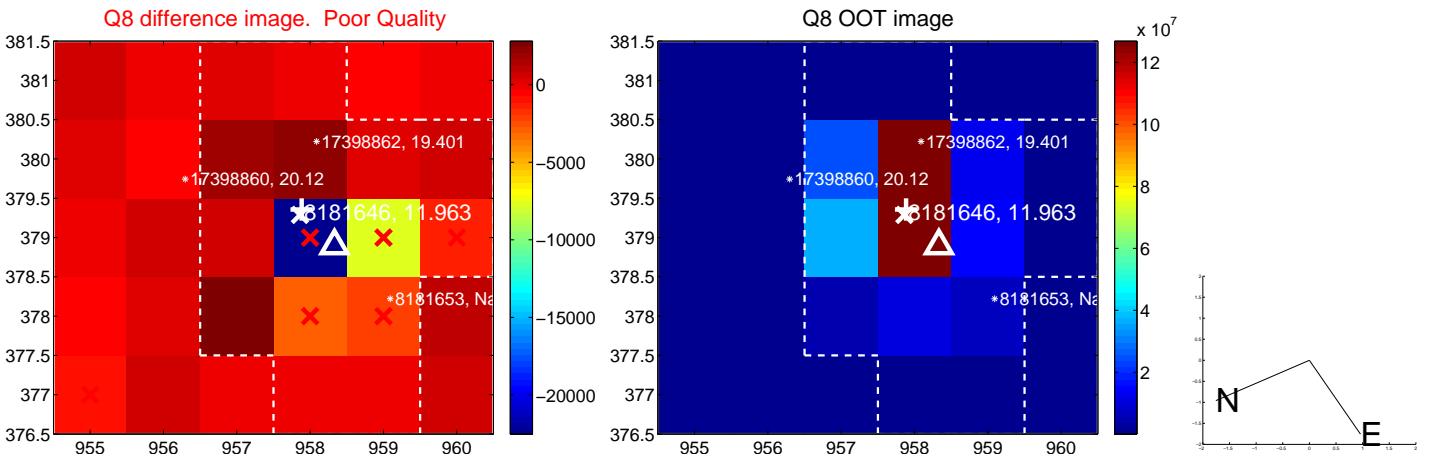
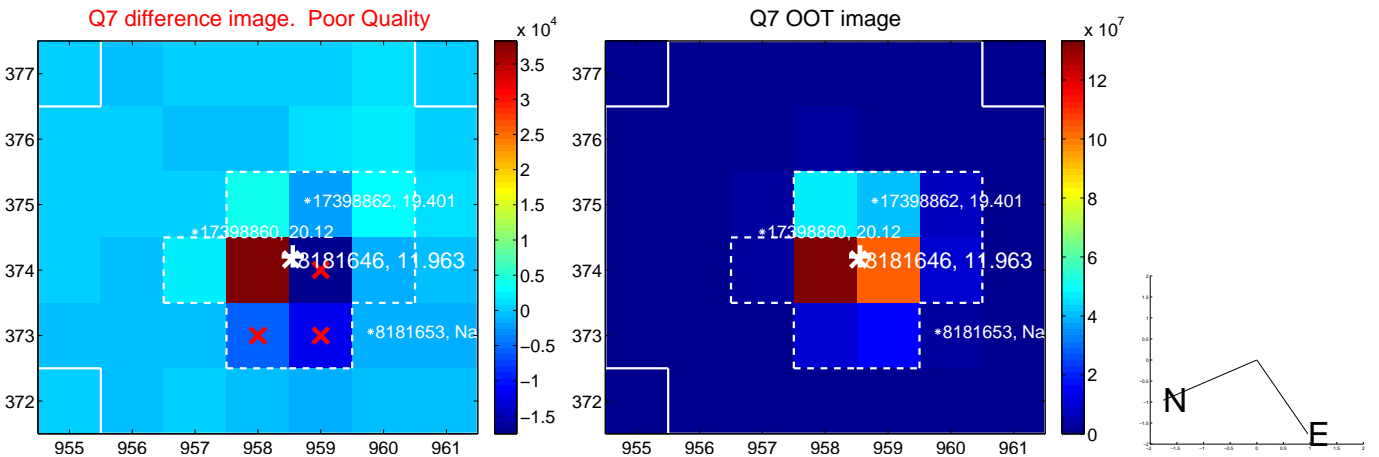
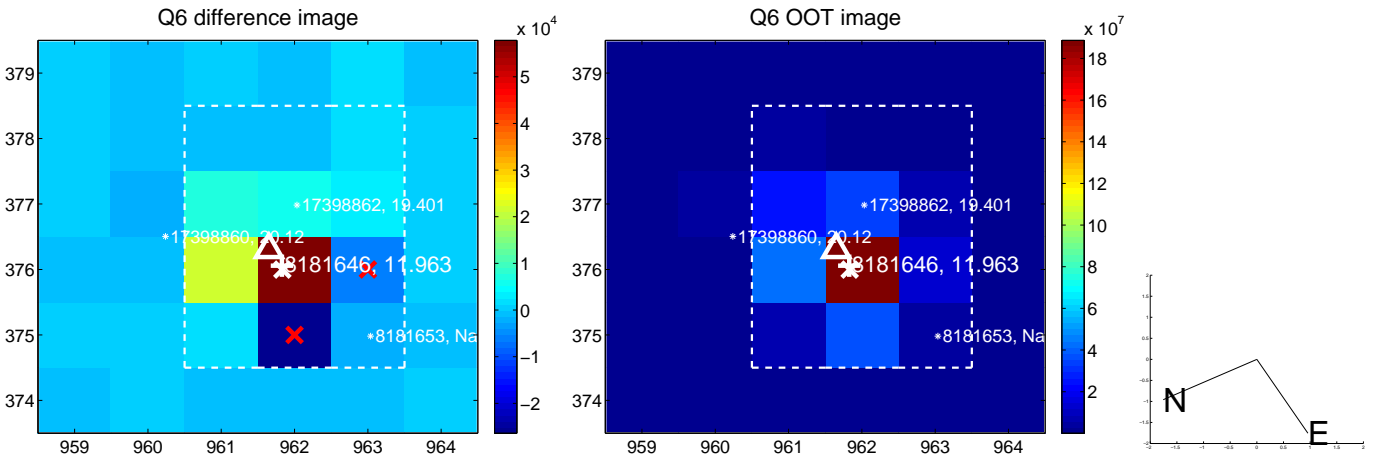
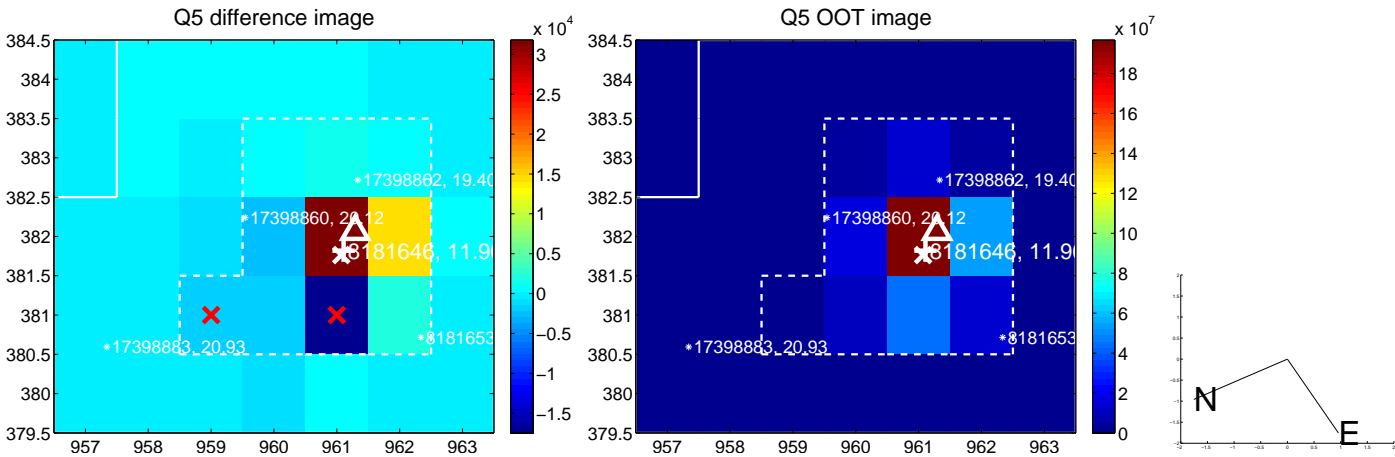


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

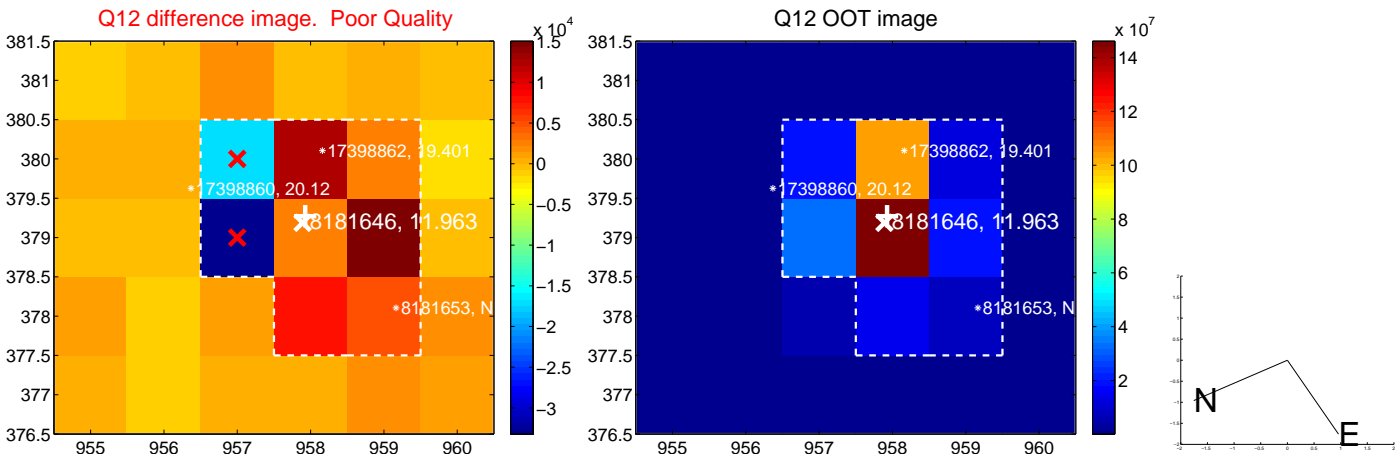
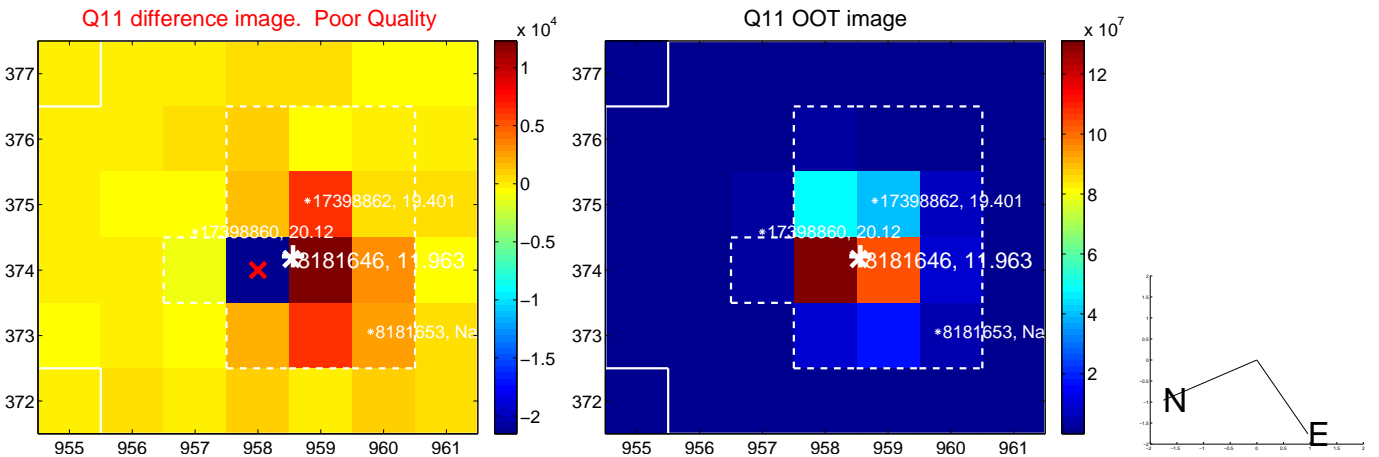
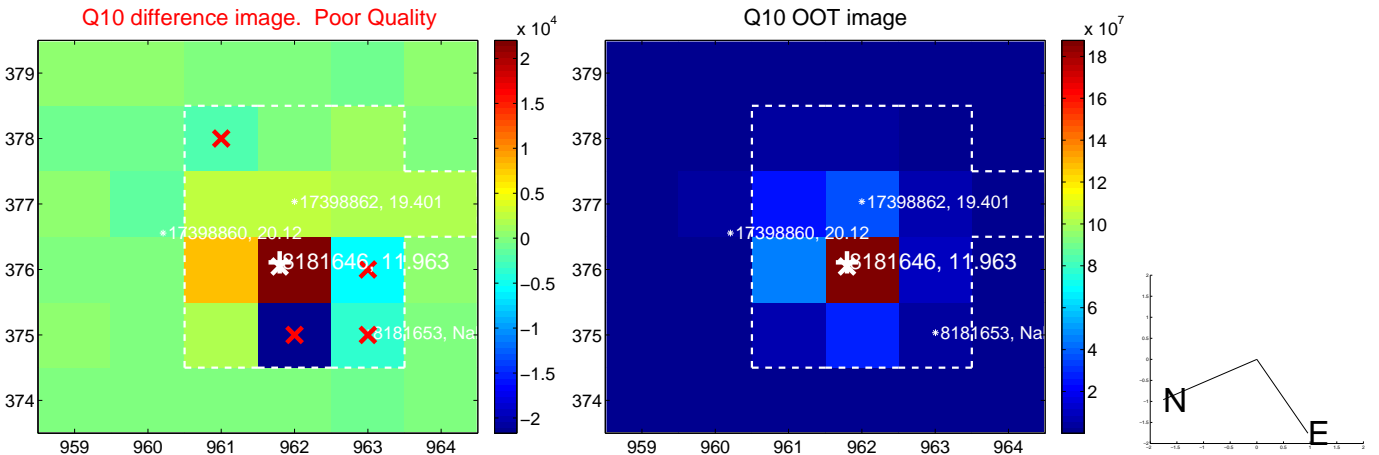
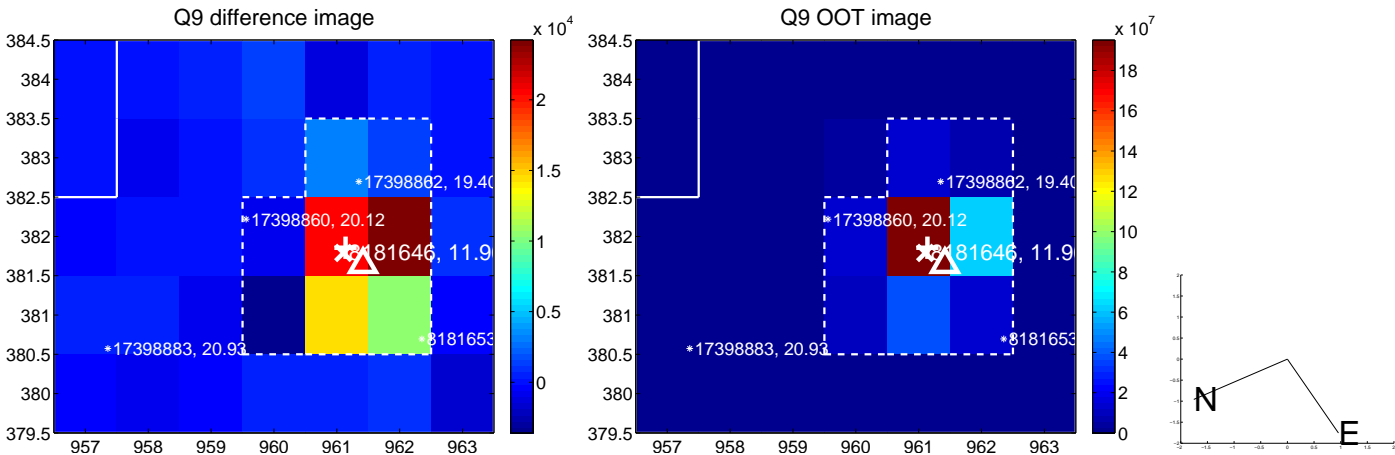
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



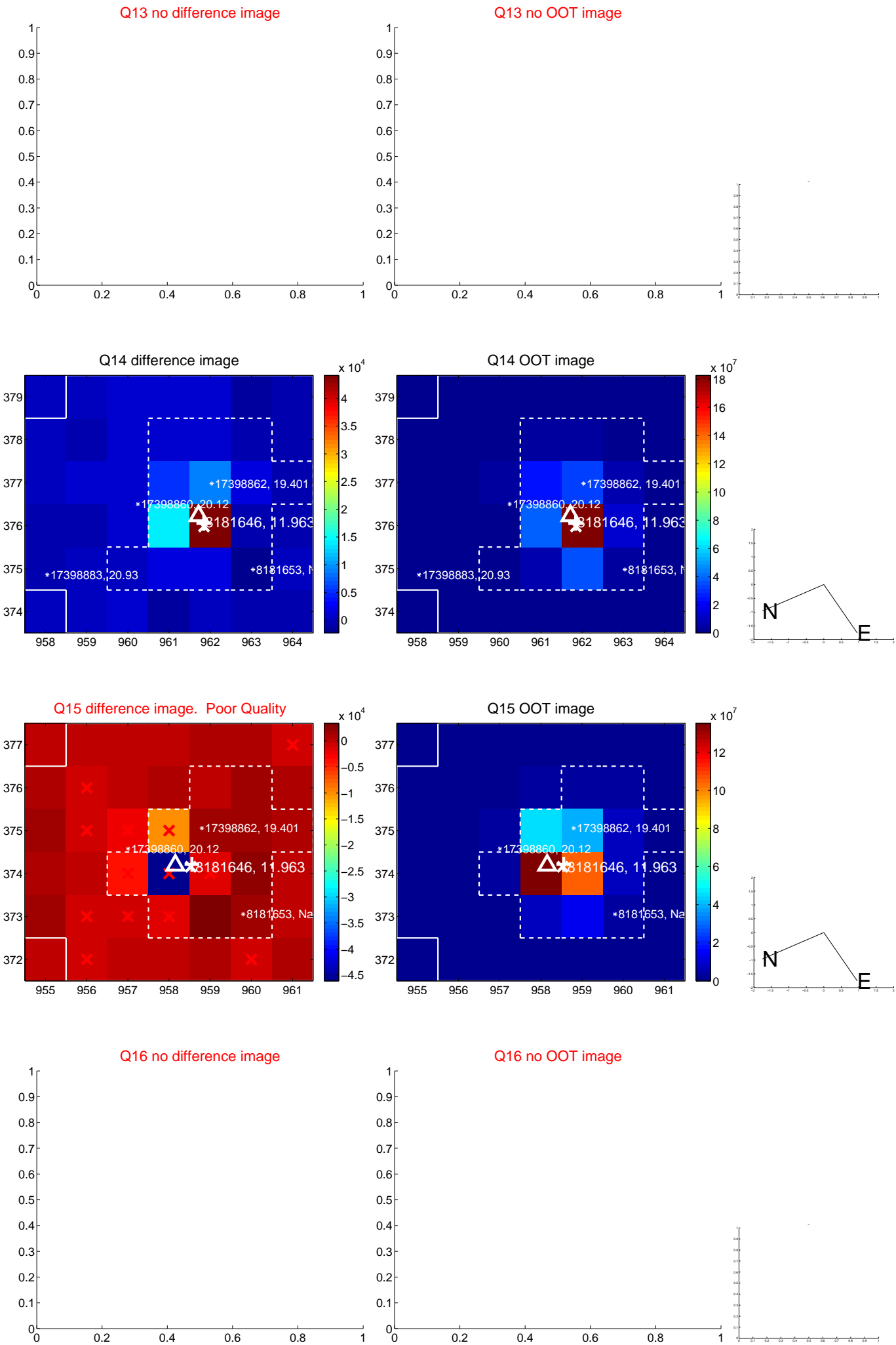
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



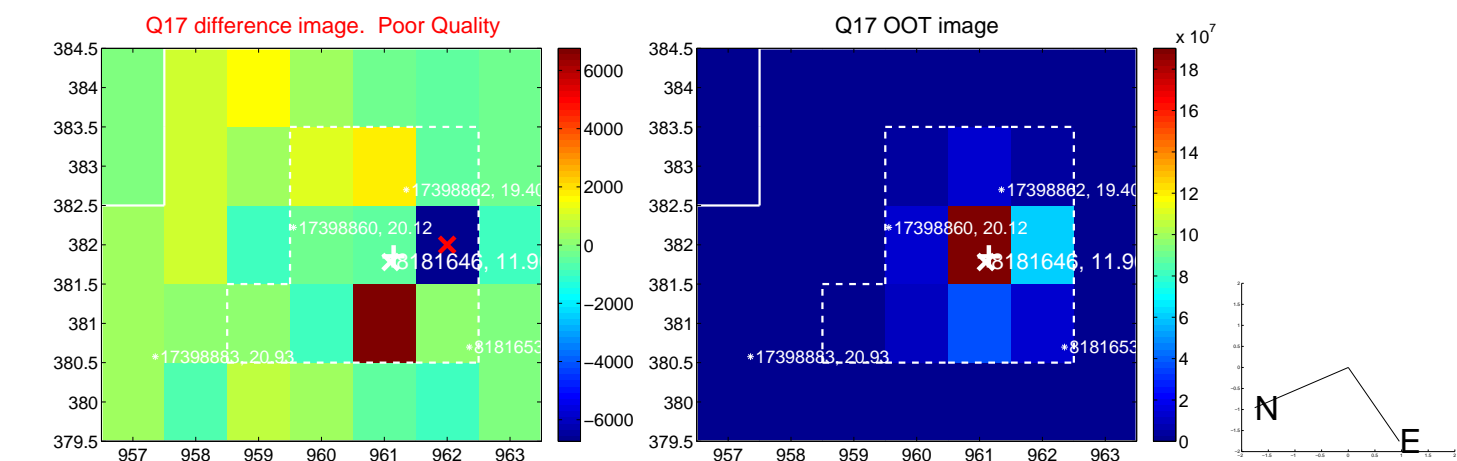
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



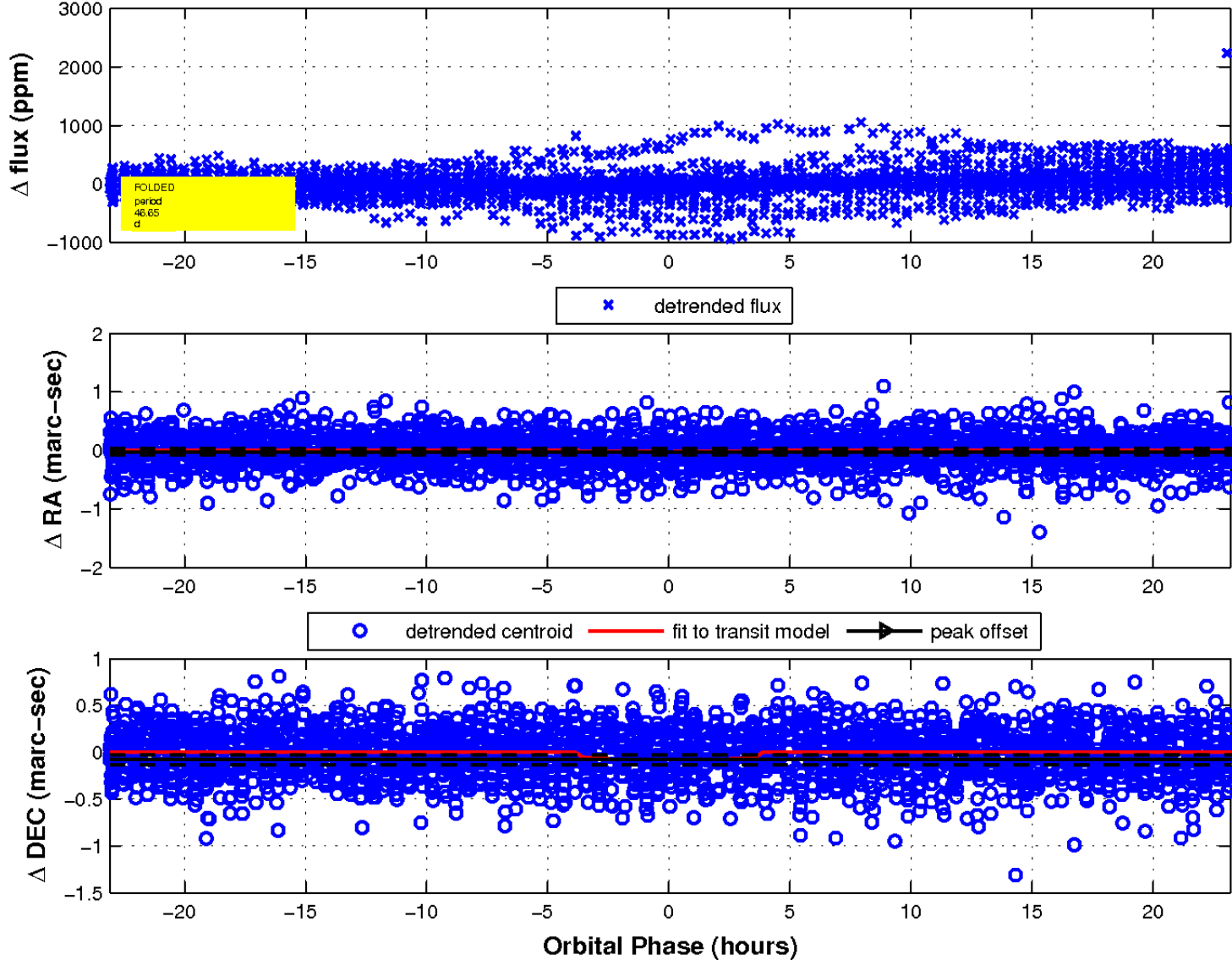
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

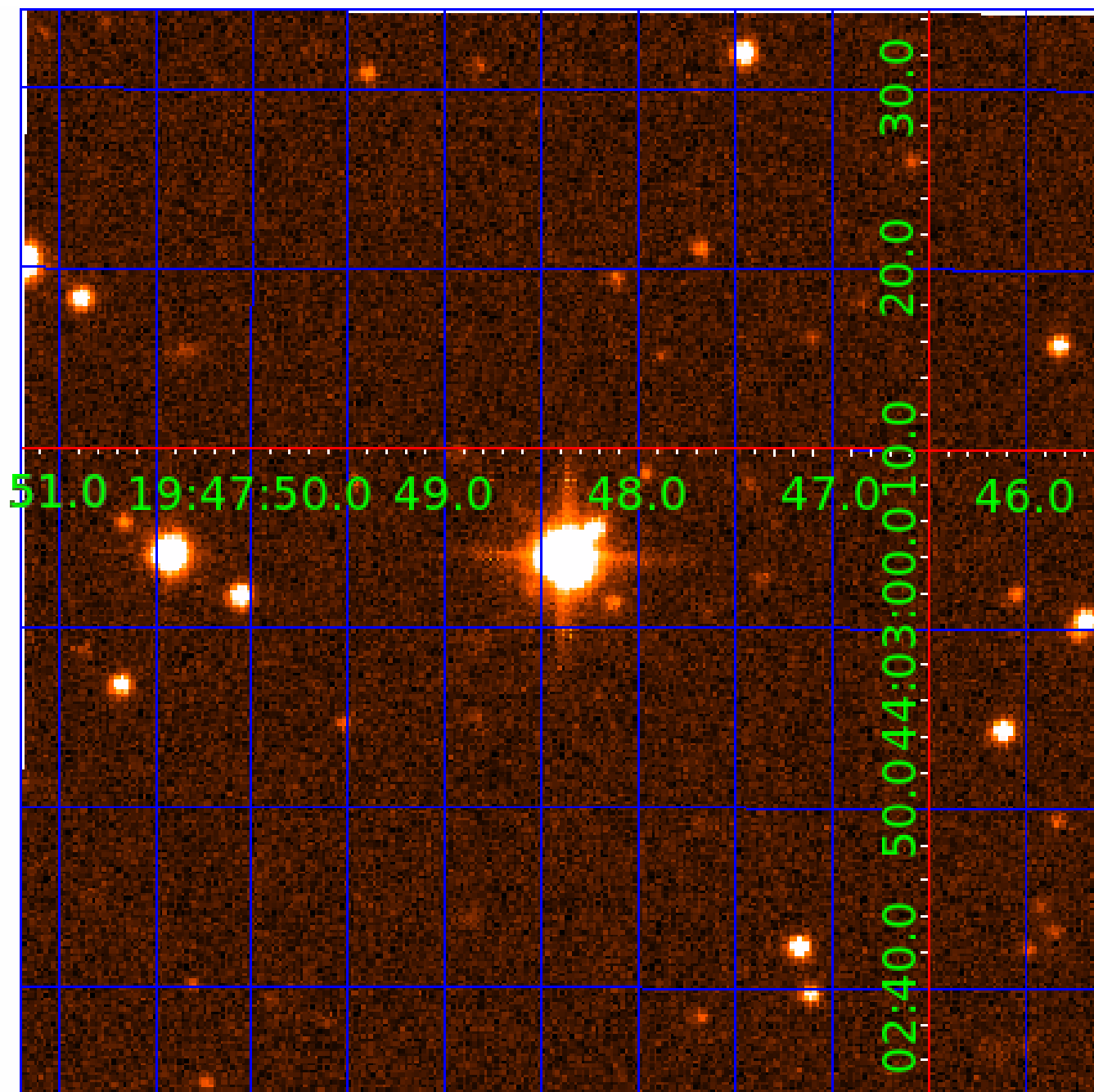


### fluxWeightedCentroids, Planet 2 of 9



UKIRT Image

Declination





# KIC 008181646

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
008181646-01	OBS	No	2.354098	131.598372	15.8	16.008	7.2	7.7	0.74	5486	0.30	422.09
008181646-02	OBS	No	46.649767	174.321233	110.5	7.773	22.7	2.3	0.74	5486	0.88	7.87
008181646-03	OBS	No	40.939977	153.721226	224.5	5.088	20.0	6.5	0.74	5486	1.24	9.37
008181646-04	OBS	No	157.875096	208.123739	4505.6	54.343	17.3	12.4	0.74	5486	9.20	1.55
008181646-05	OBS	No	48.824583	164.751099	532.2	25.560	15.7	7.3	0.74	5486	3.40	7.41
008181646-06	OBS	No	59.244269	160.876125	298.1	38.985	14.2	4.7	0.74	5486	1.37	5.72
008181646-07	OBS	No	61.879706	179.179822	339.5	8.688	11.4	6.7	0.74	5486	1.45	5.40
008181646-08	OBS	No	42.732442	148.480323	161.0	5.821	11.3	4.3	0.74	5486	0.99	8.85

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
008181646-01	OBS	FP	0.00	1	0	0	0	LPP_DV
008181646-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_TRACKER—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV
008181646-03	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE_ZUMA—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_UNRESOLVED_OFFSET
008181646-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL_SKYE—TRANS_GAPPED—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—INCONSISTENT_TRANS
008181646-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV
008181646-06	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
008181646-07	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_FEW_DIFFS
008181646-08	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV

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

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

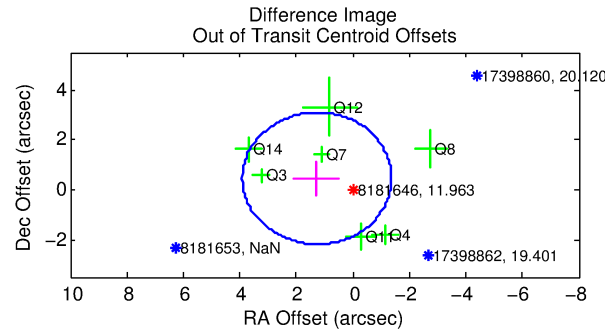
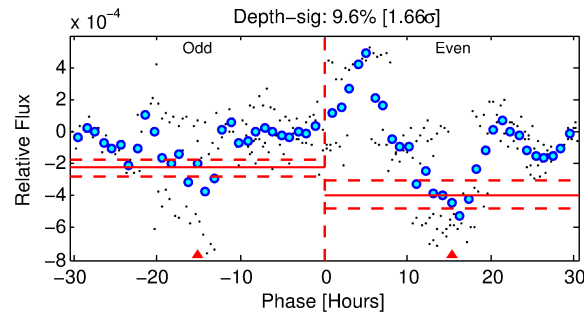
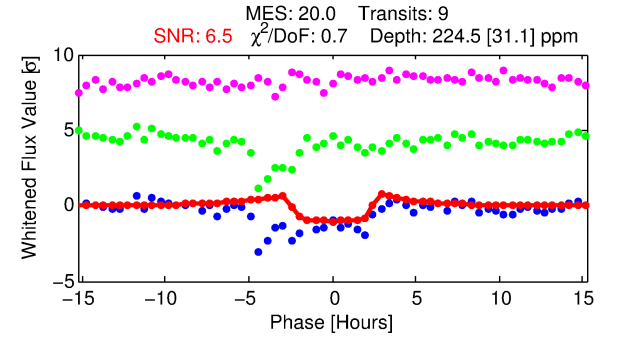
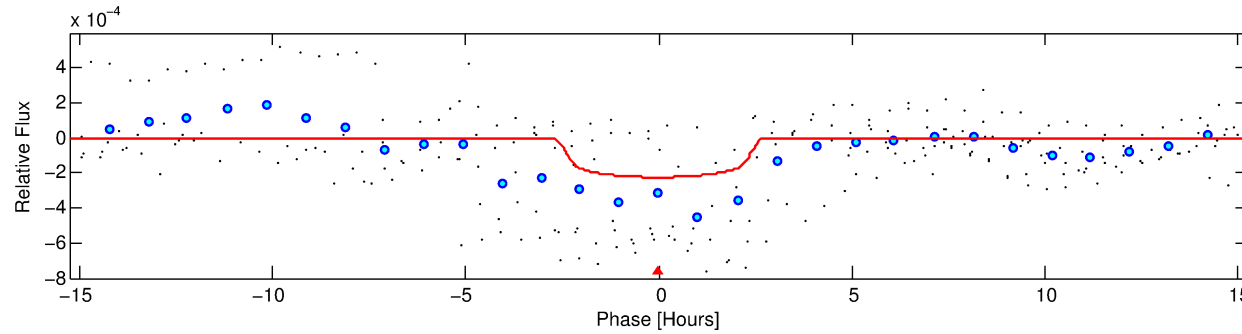
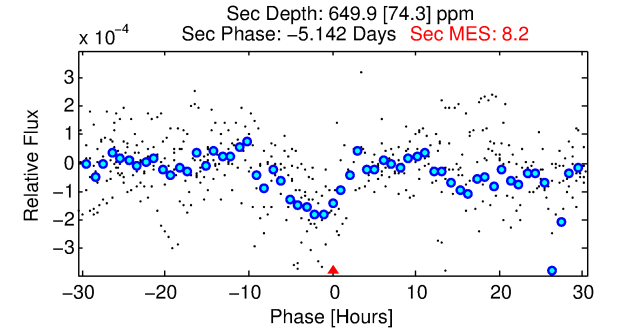
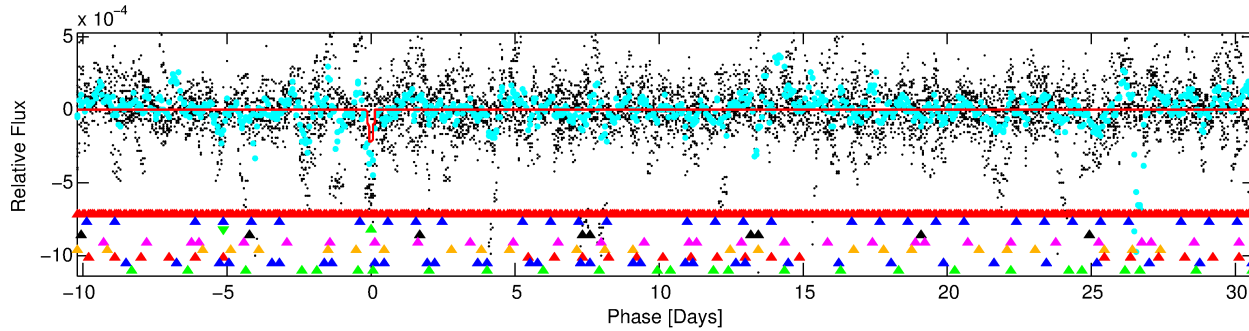
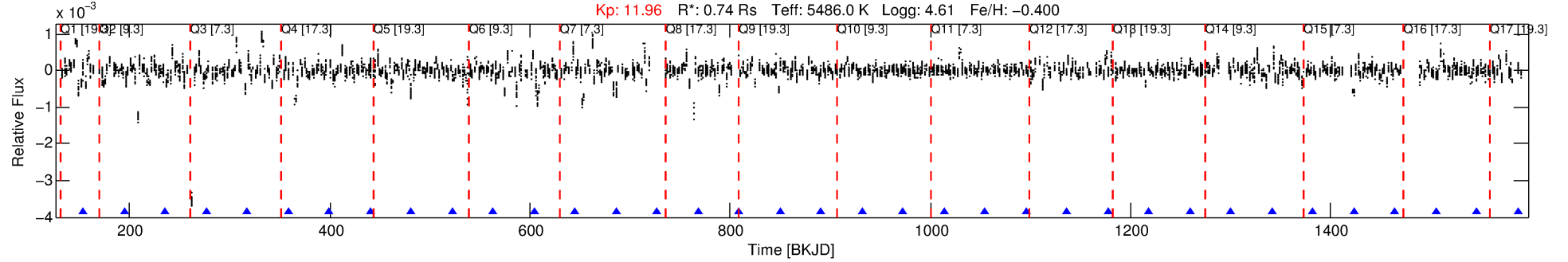
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 008181646-03

No Significant Match Found

# DV One-Page Summary

KIC: 8181646 Candidate: 3 of 9 Period: 40.940 d



## DV Fit Results:

Period = 40.93998 [0.00038] d  
Epoch = 153.7212 [0.0076] BKJD  
Rp/R\* = 0.0154 [0.0096]  
a/R\* = 36.74 [100.18]  
b = 0.82 [1.10]  
Seff = 9.37 [2.20]  
Teq = 446 [26] K  
Rp = 1.24 [0.80] Re  
a = 0.2166 [0.0317] AU  
Ag = 10939.46 [13883.44] [0.79σ]  
Teffp = 7054 [2215] K [2.98σ]

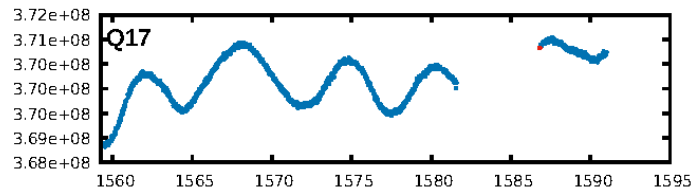
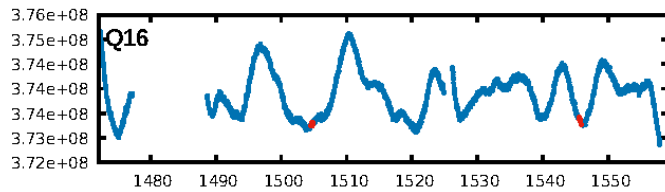
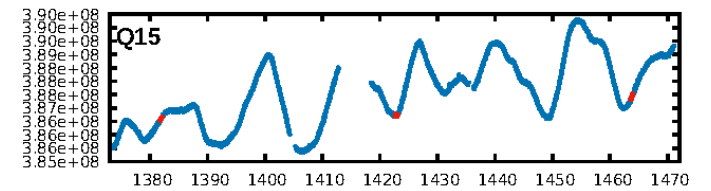
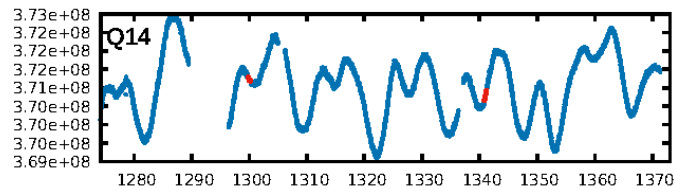
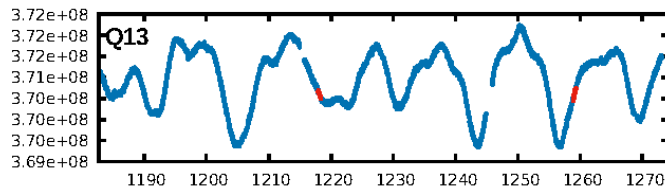
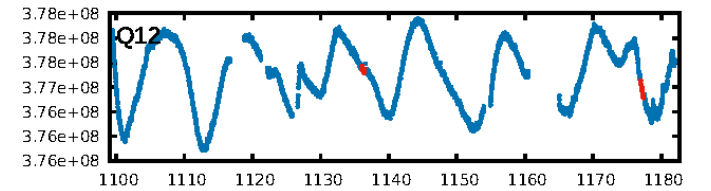
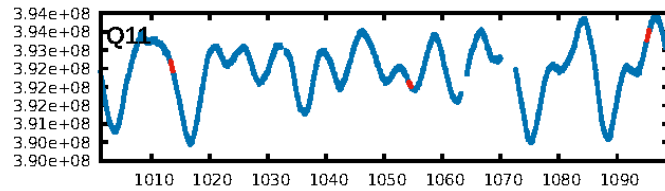
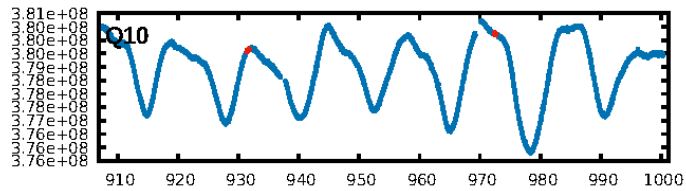
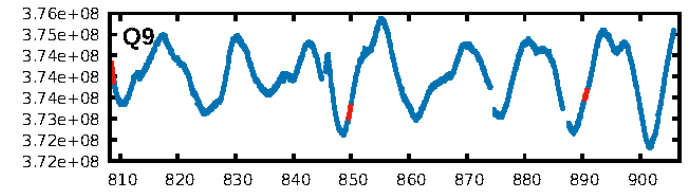
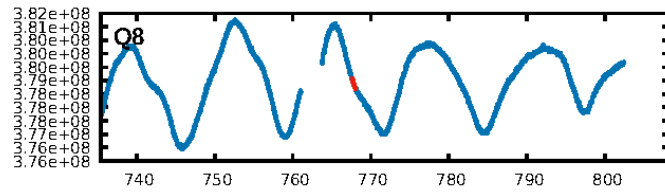
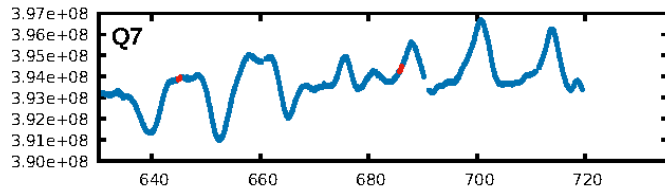
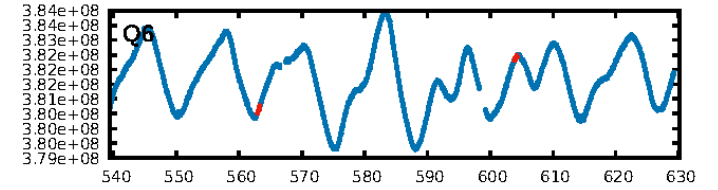
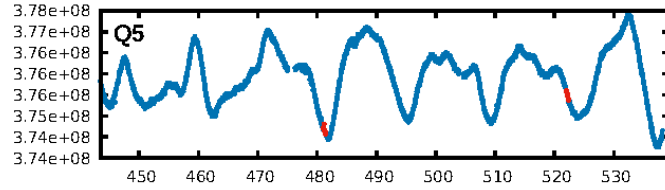
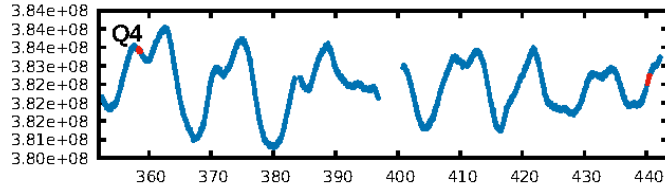
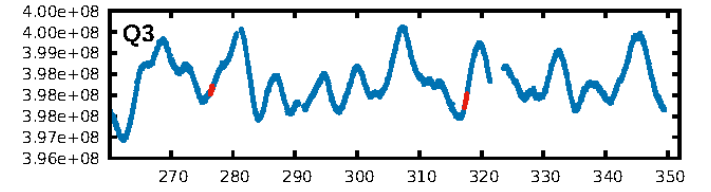
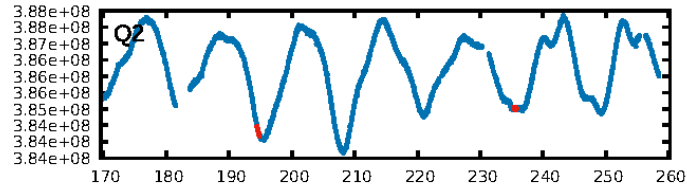
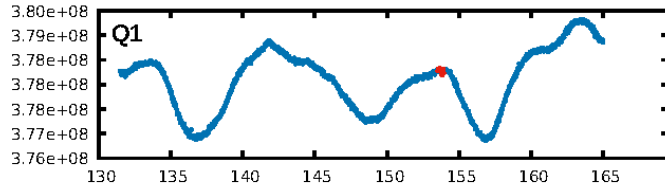
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [55.13σ]  
LongPeriod-sig: 100.0% [5.56σ]  
ModelChiSquare2-sig: 0.0%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [8/8]  
GhostDiagnostic-chr: -1.142  
Centroid-sig: 43.0%  
Centroid-so: 0.239 arcsec [1.02σ]  
OotOffset-rm: 1.351 arcsec [1.54σ]  
OotOffset-st: 1/3/3/0 [7]  
KicOffset-rm: 1.164 arcsec [1.33σ]  
KicOffset-st: 1/3/3/0 [7]  
DiffImageQuality-fgm: 0.43 [3/7]  
DiffImageOverlap-fno: 0.50 [8/16]

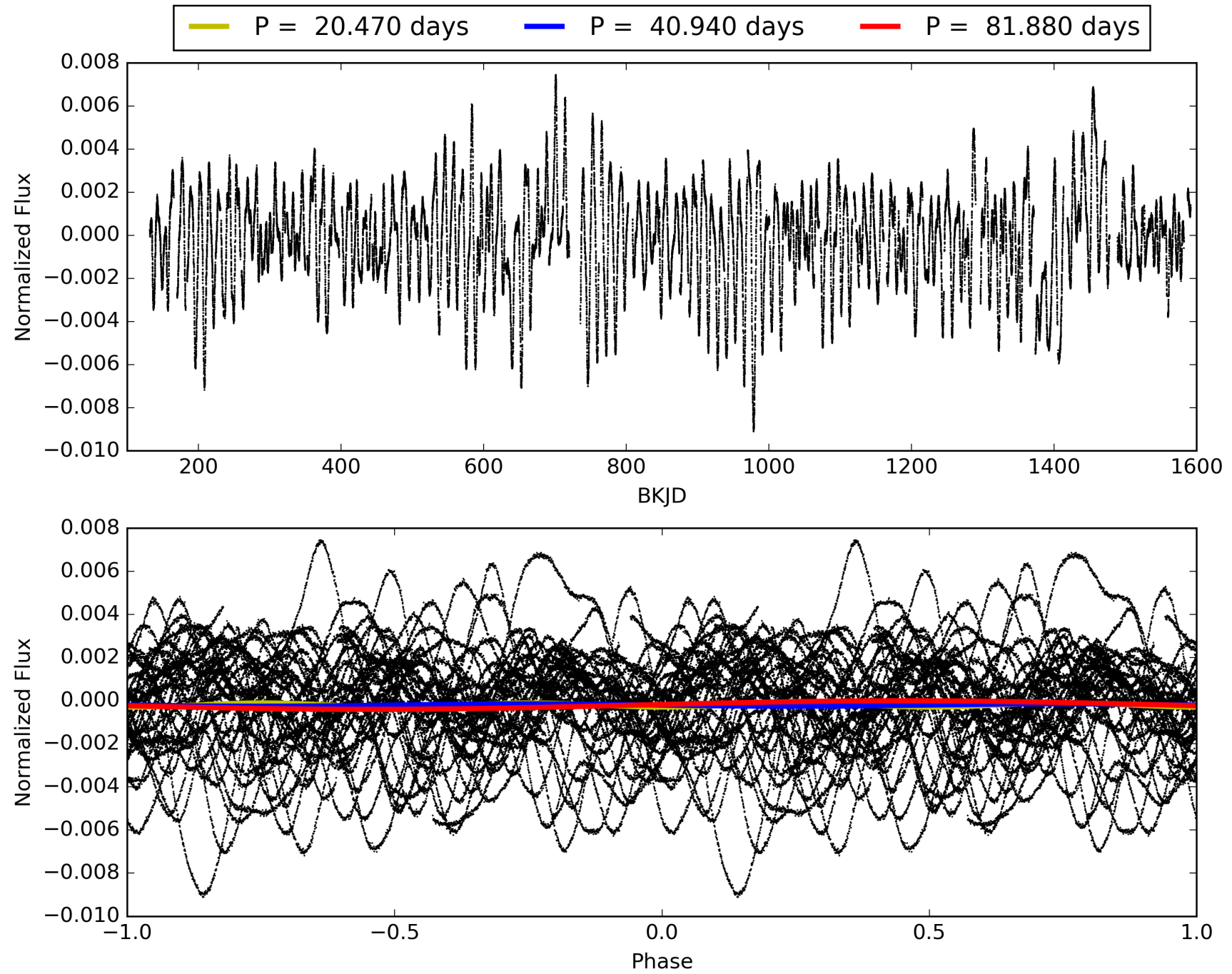
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 23:57:35 Z

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

# TCE 008181646-03, PDC Light Curves

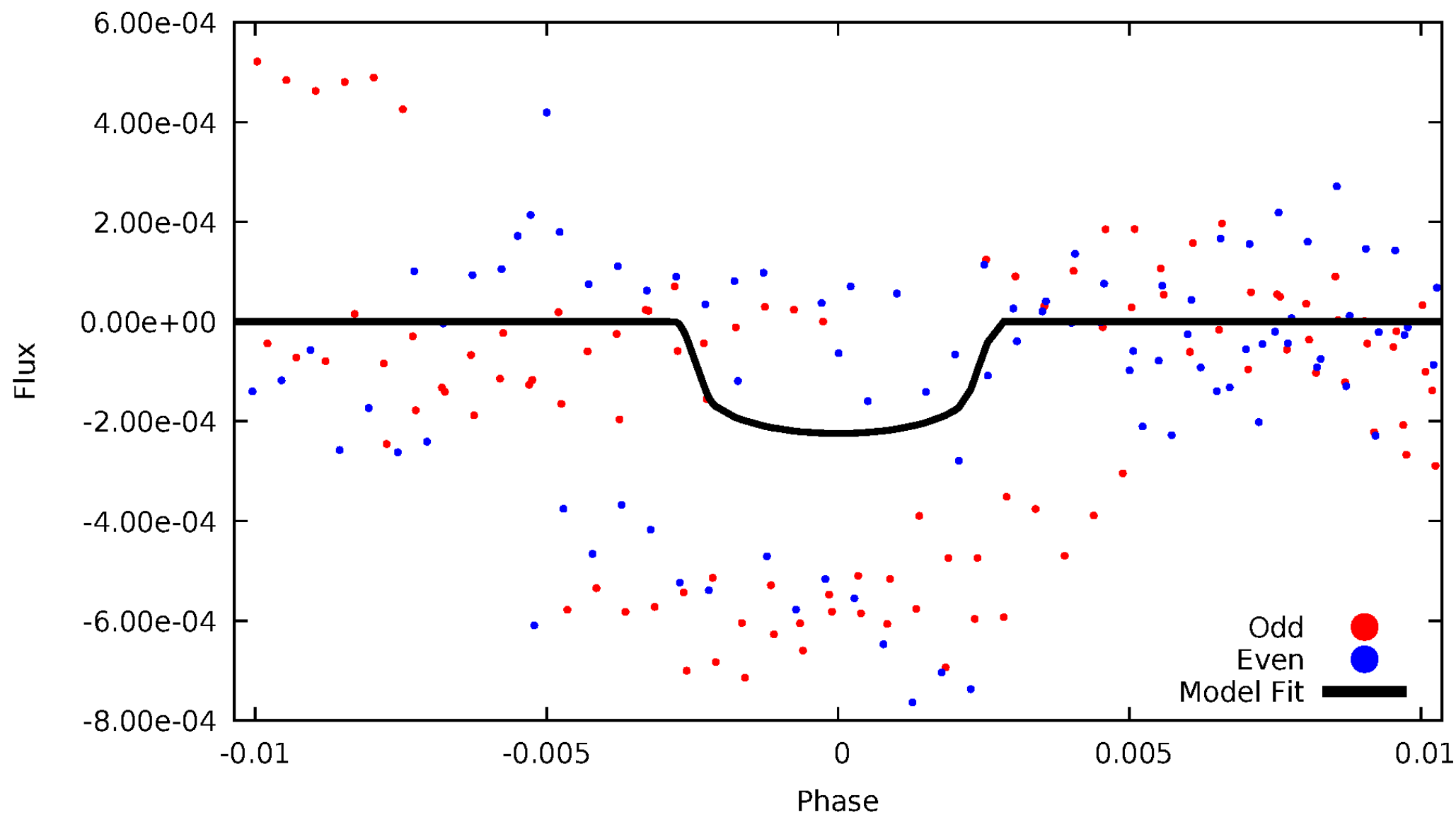


# TCE 008181646-03



# DV Odd/Even

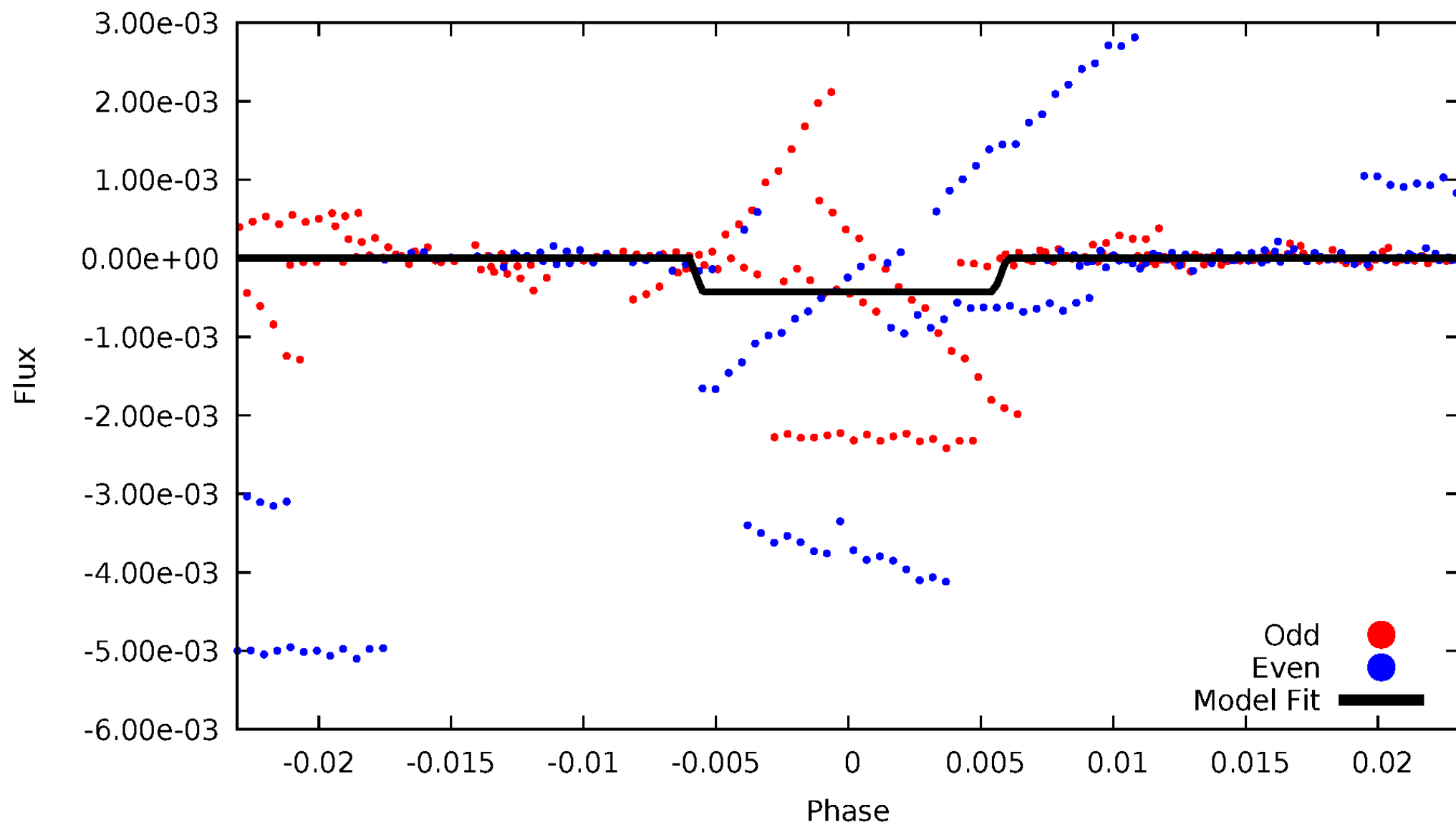
TCE 008181646-03





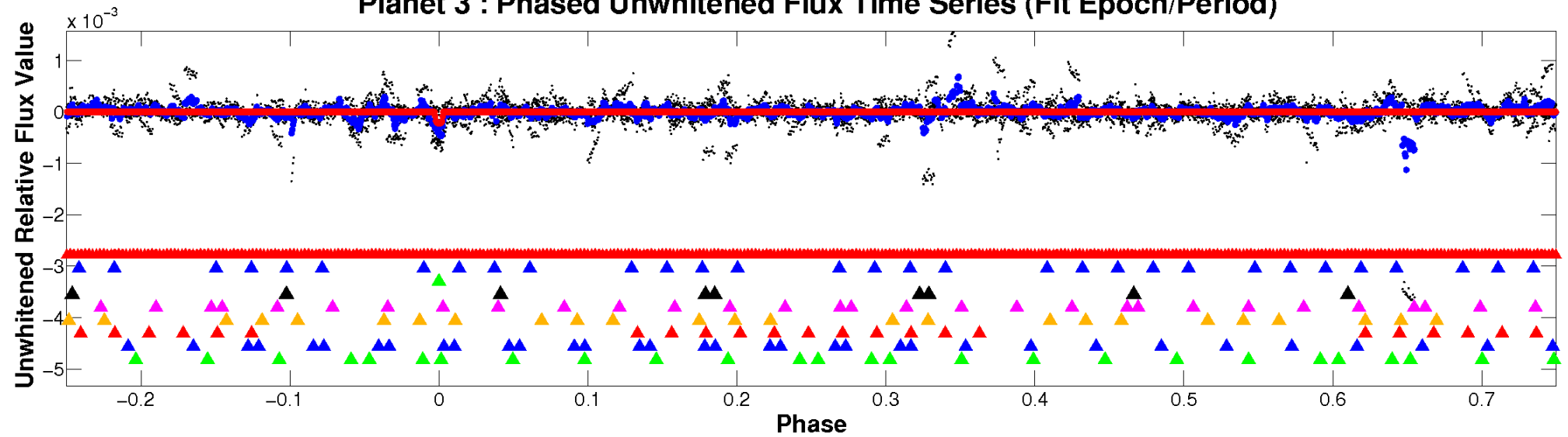
# ALT Odd/Even

TCE 008181646-03

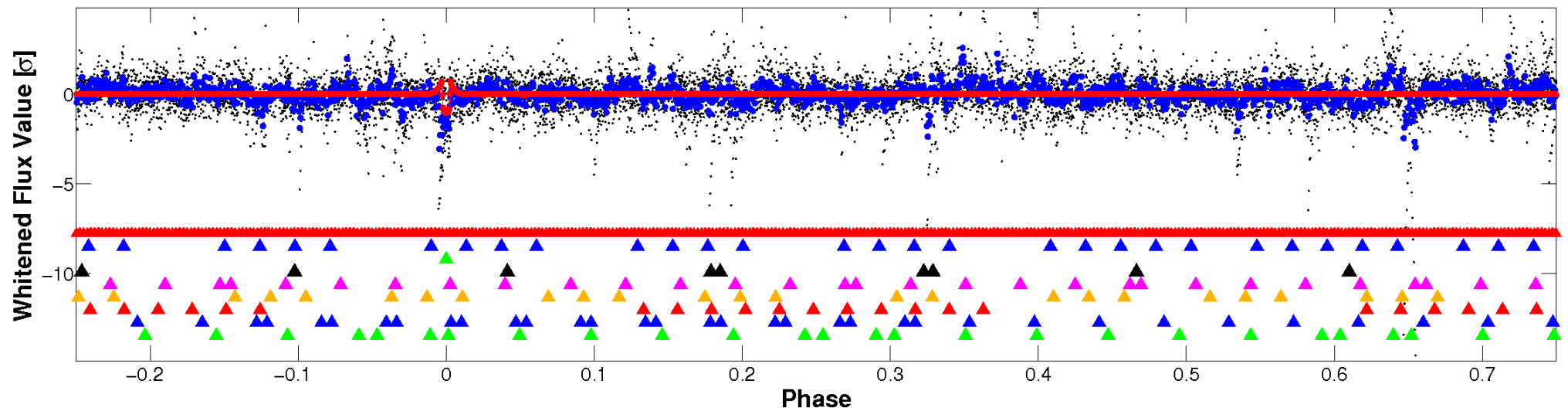


# Non-Whitened Vs. Whitened Light Curve

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

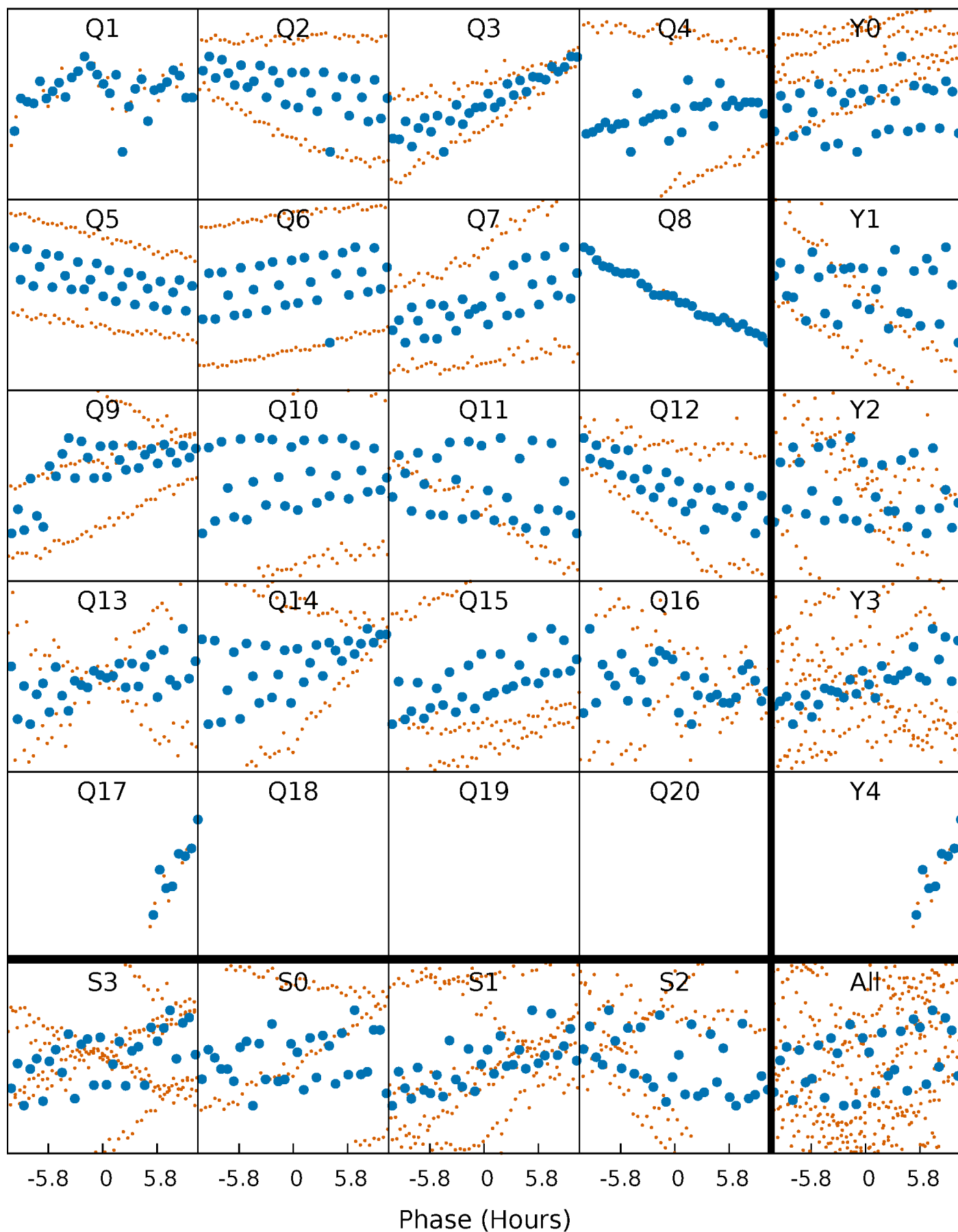


Planet 3 : Phased Whitened Flux Time Series (Fit Epoch/Period)



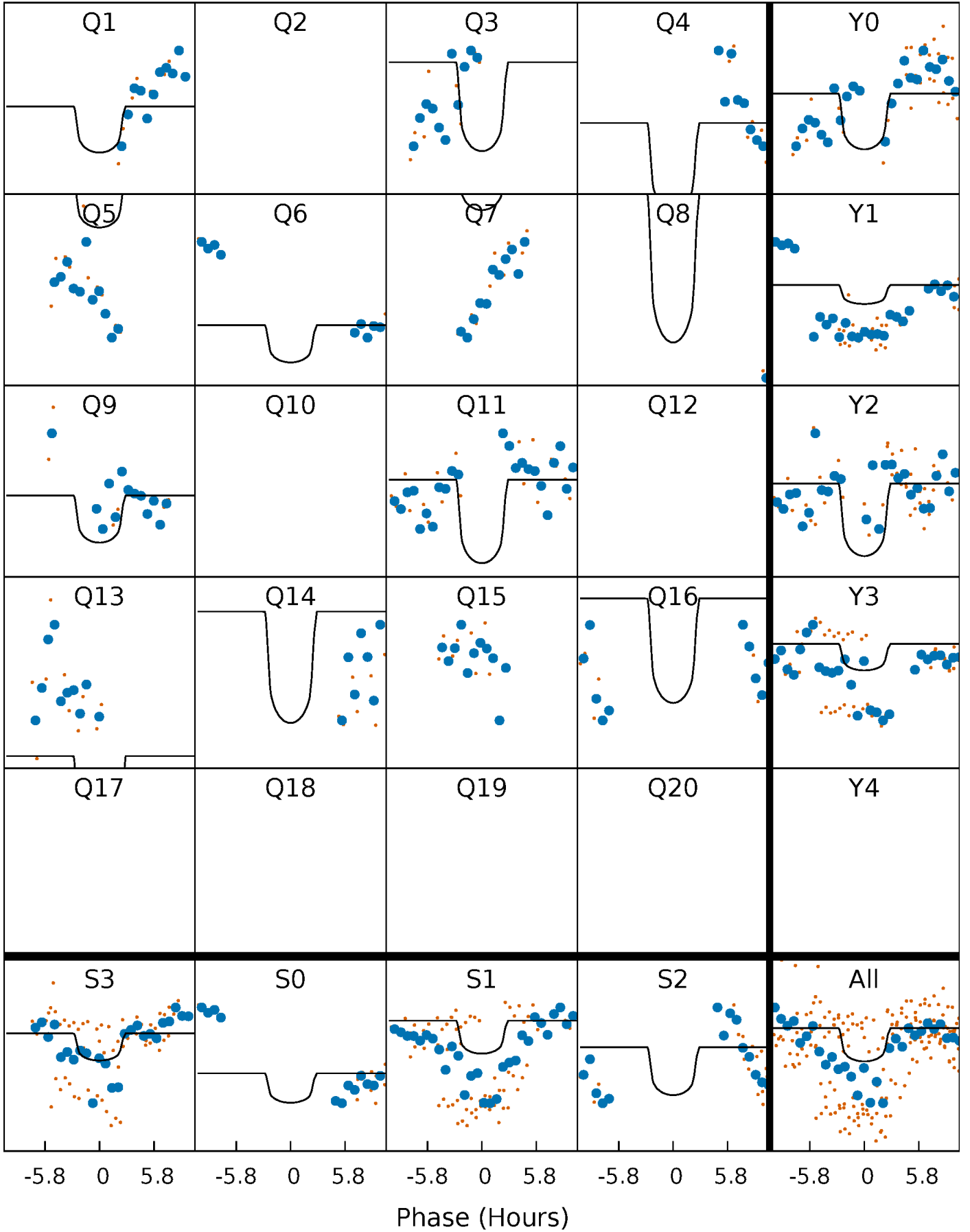
# PDC Quarter-Phased Transit Curves

TCE 008181646-03   P= 40.939977 Days    $T_0=153.721226$  (BKJD)



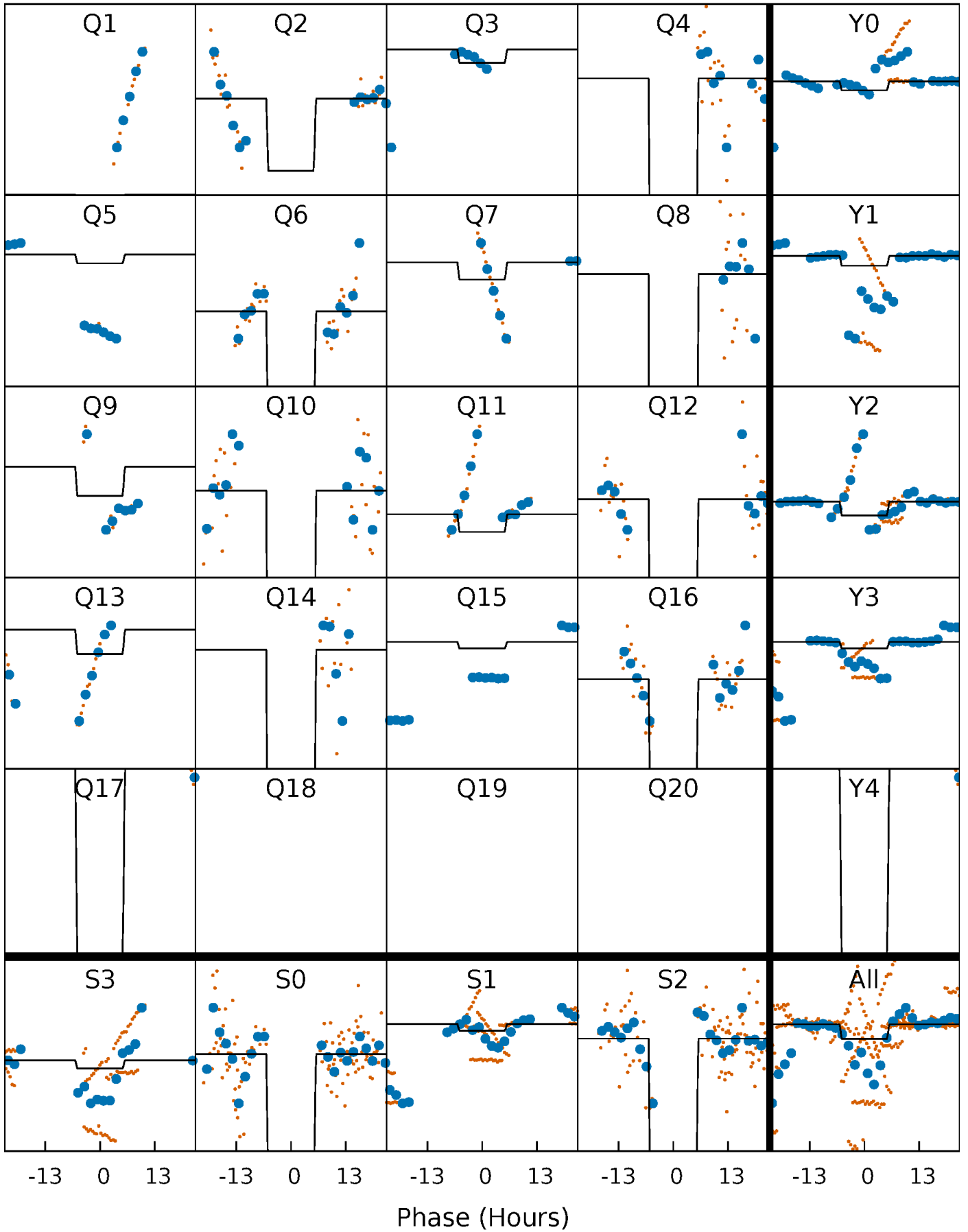
# DV Quarter-Phased Transit Curves

TCE 008181646-03   P= 40.939977 Days    $T_0=153.721226$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 008181646-03   P= 40.939186 Days    $T_0=153.669862$  (BKJD)

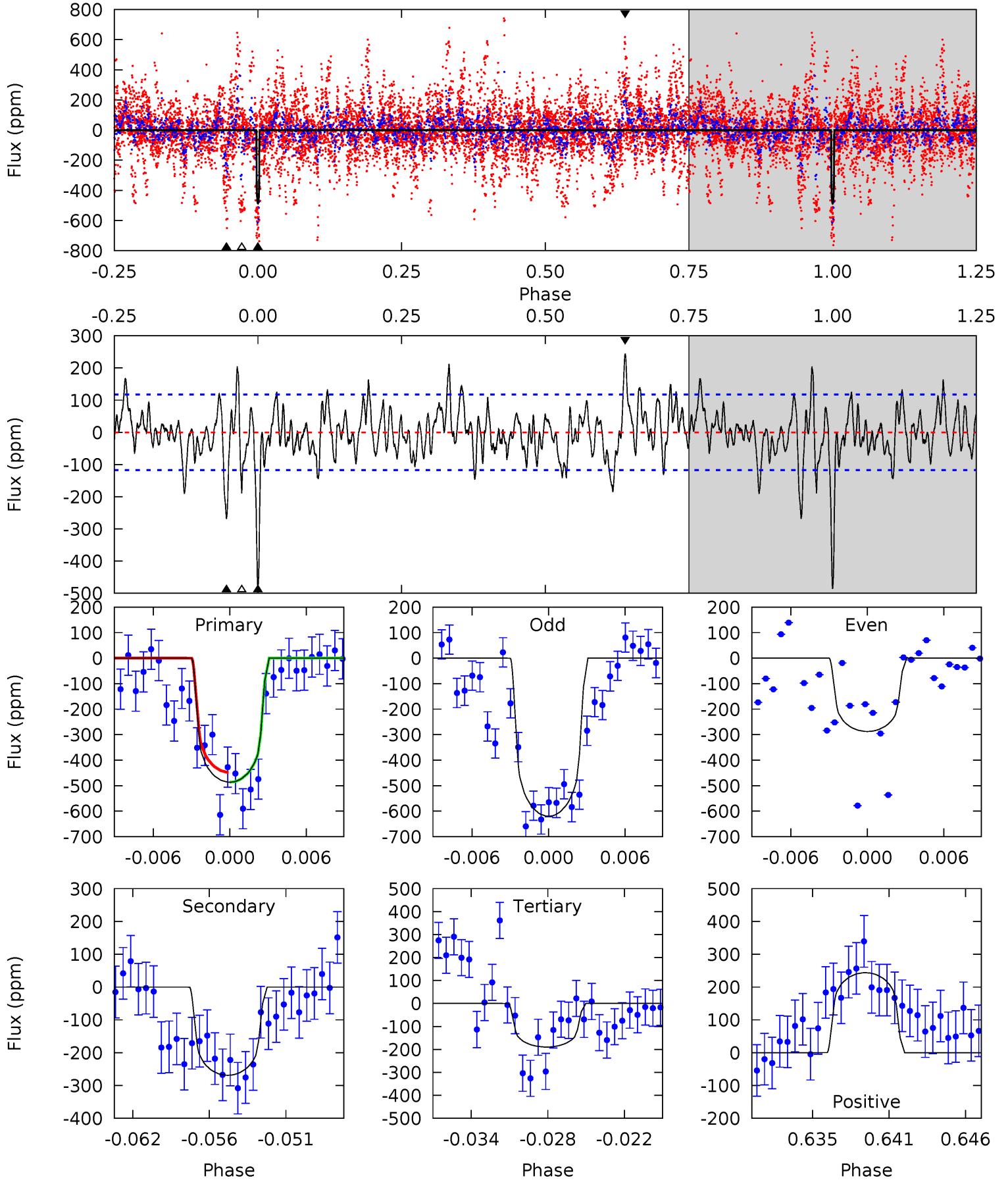




# DV Model-Shift Uniqueness Test

008181646-03,  $P = 40.939977$  Days,  $E = 112.781249$  Days

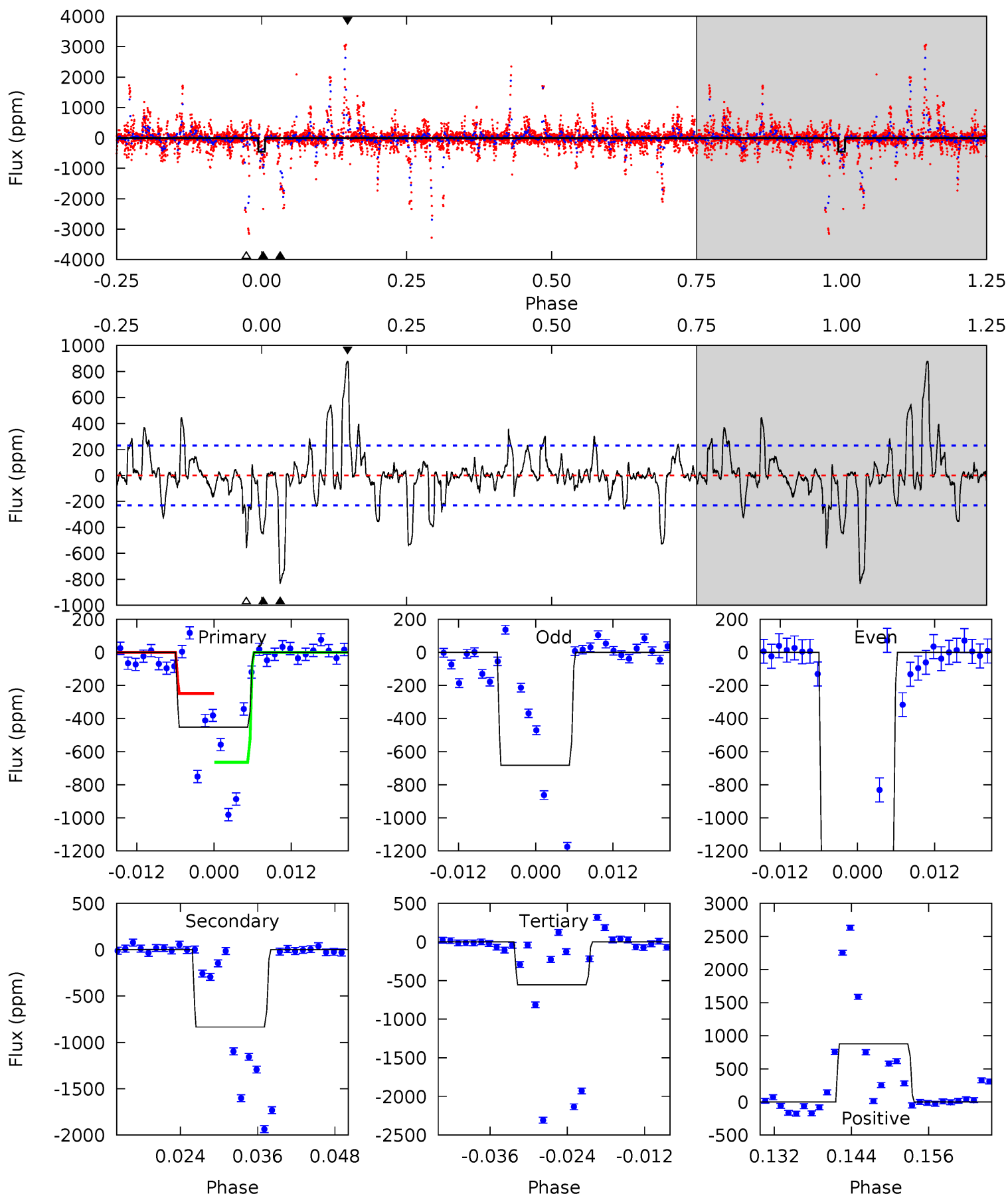
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
21.3	11.8	8.29	10.7	5.14	2.77	2.87	13.0	10.6	3.46	1.10	6.10	1.32	0.33	0.84



# Alt Model-Shift Uniqueness Test

008181646-03, P = 40.939186 Days, E = 112.730676 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
9.81	18.1	12.1	19.1	4.99	2.51	3.03	-2.27	-9.25	6.06	-0.93	5.95	1.87	0.51	4.89



### Stellar Parameters For KIC 008181646

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M$ ( $M_{\odot}$ )	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5486^{+146}_{-146}$	$4.612^{+0.037}_{-0.112}$	$-0.400^{+0.300}_{-0.300}$	$0.736^{+0.131}_{-0.056}$	$0.824^{+0.075}_{-0.092}$	$2.905^{+0.476}_{-1.066}$
	+3%/-3%	+1%/-2%	+75%/-75%	+18%/-8%	+9%/-11%	+16%/-37%
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 008181646-03 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-269 \pm 23$	$1.30^{+0.72}_{-0.67}$	$631^{+30}_{-22}$	$5585^{+2718}_{-1003}$	$4138^{+13369}_{-2507}$
Alt.	$-834 \pm 46$	$1.77^{+0.82}_{-0.71}$	$631^{+28}_{-23}$	$6357^{+2102}_{-1060}$	$6756^{+12740}_{-3489}$

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

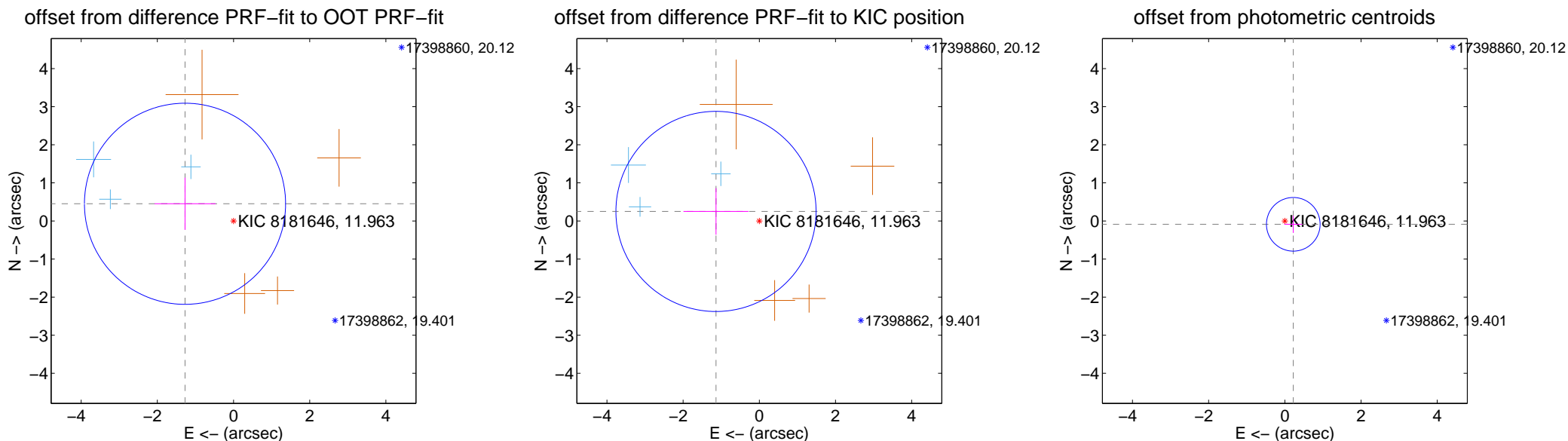
## DV Centroid Data

Supplemental centroid analysis for 008181646-03. **Kepler magnitude: 11.96.** Transit SNR 6.55

**There are 3 quarters with good PRF difference image offsets**

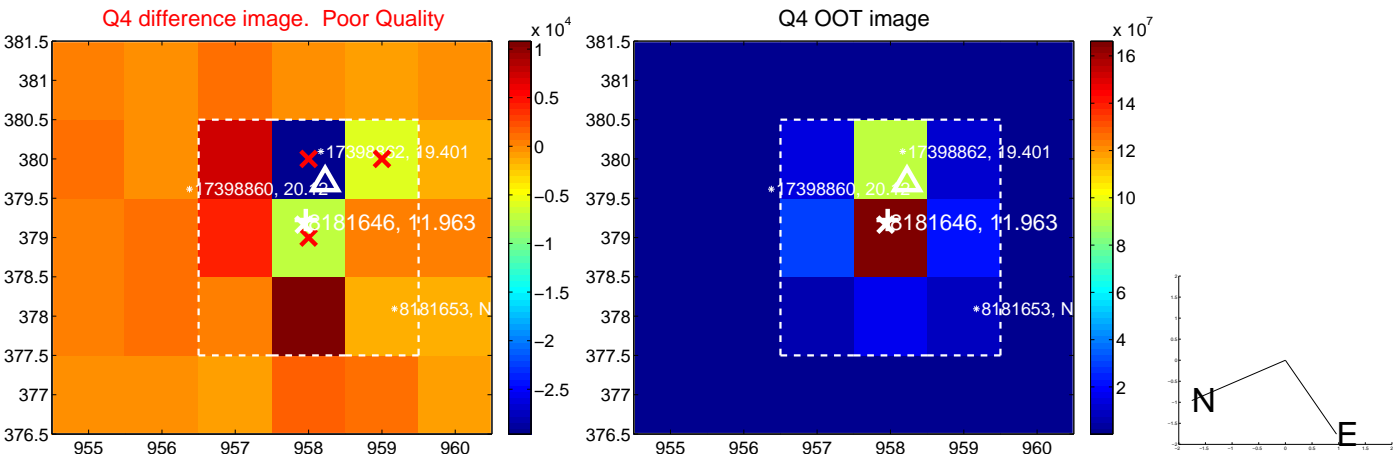
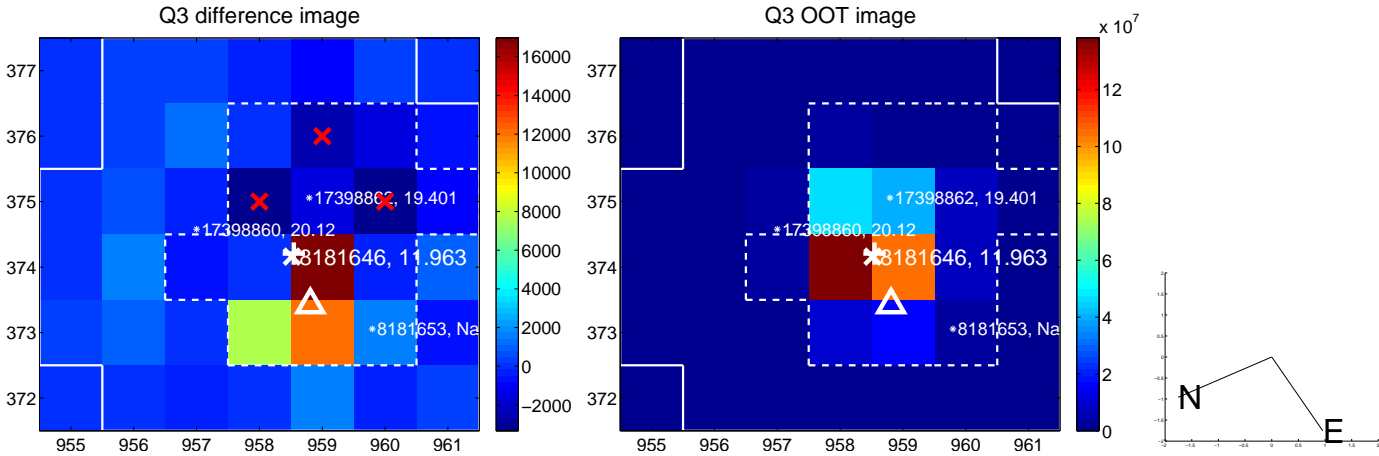
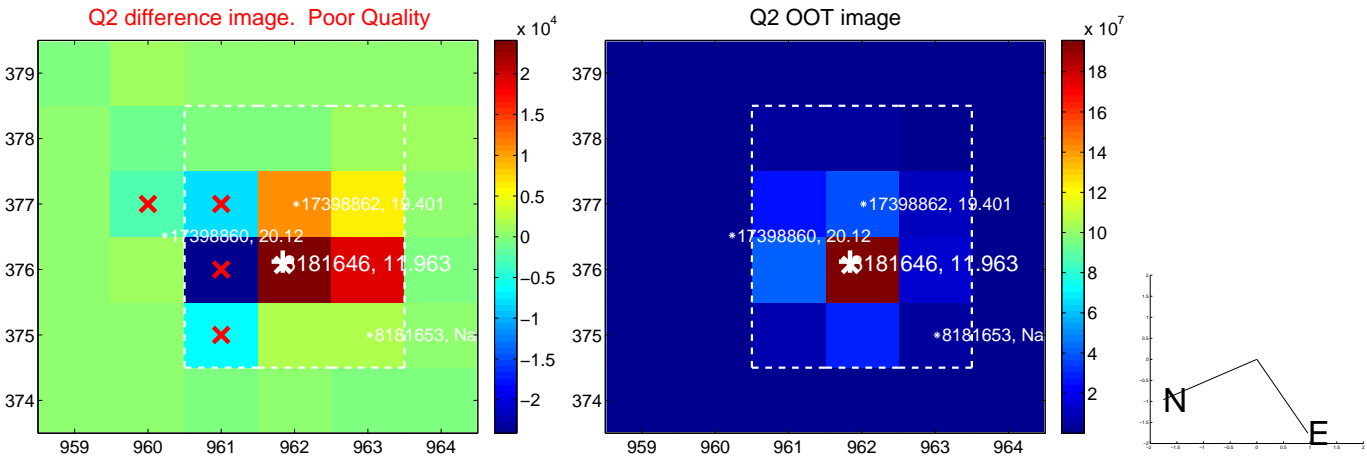
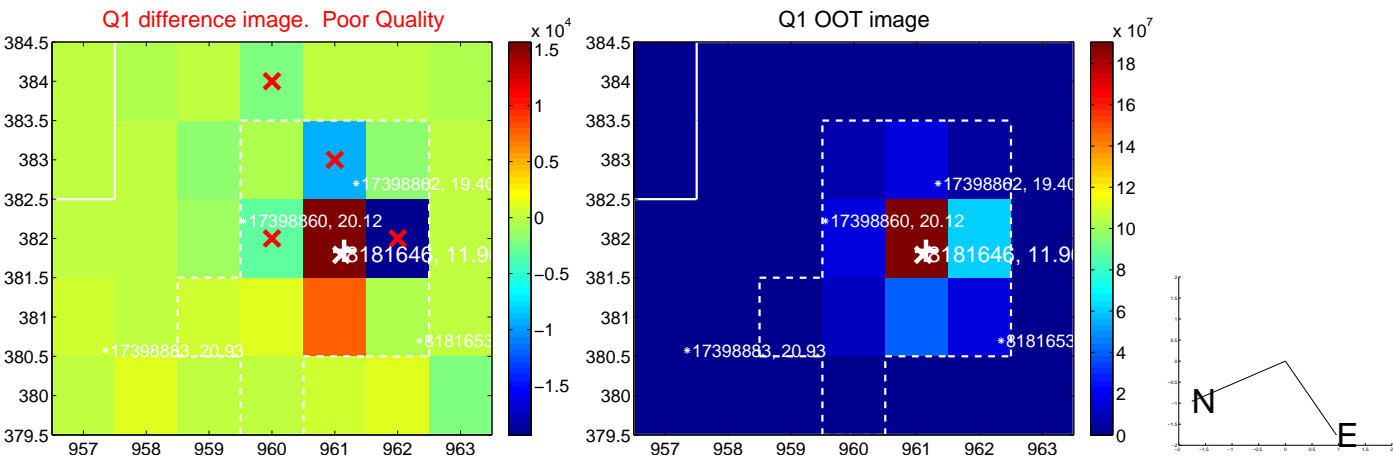
The direct PRF centroid is offset from the target star catalog position by about 0.28 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$1.351 \pm 0.880$	1.54	$1.274 \pm 0.800$	$0.451 \pm 0.685$
PRF-fit source offset from KIC position	$1.164 \pm 0.876$	1.33	$1.137 \pm 0.854$	$0.250 \pm 0.611$
photometric centroid source offset	$0.24 \pm 0.23$	1.02	$-0.22 \pm 0.24$	$-0.09 \pm 0.22$

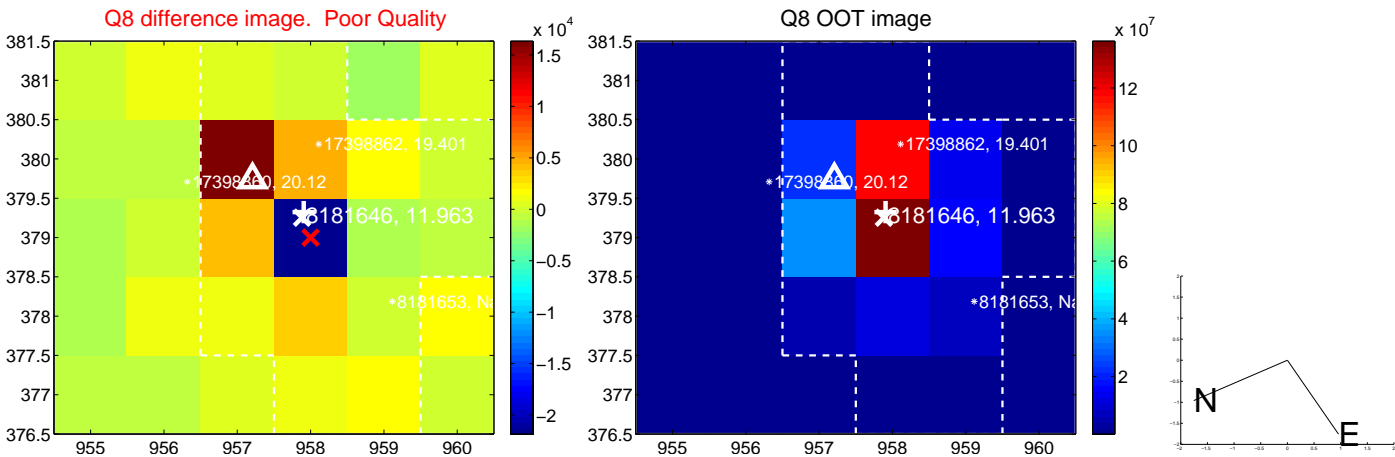
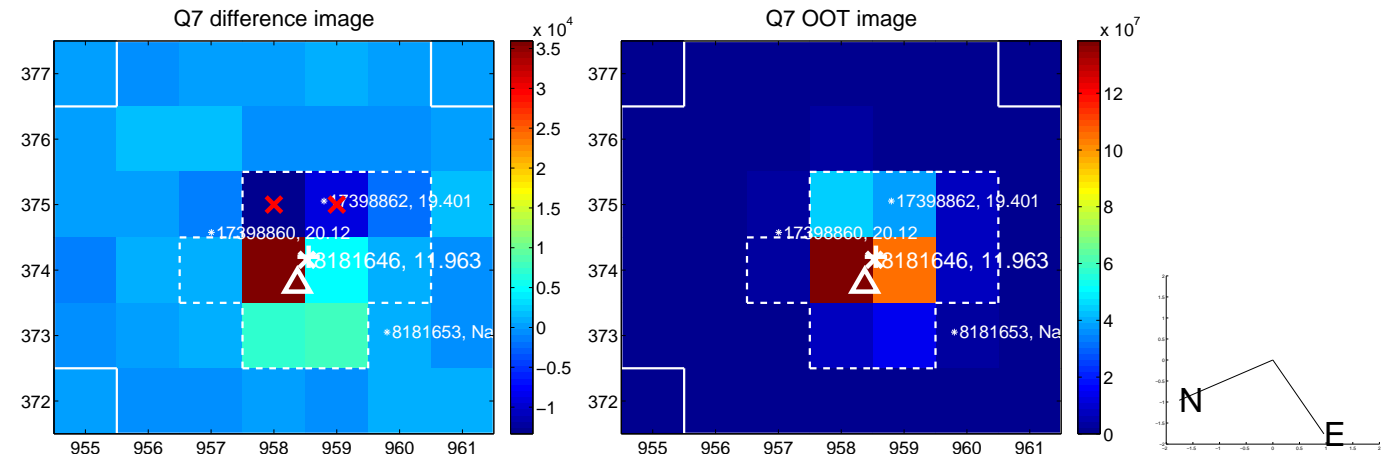
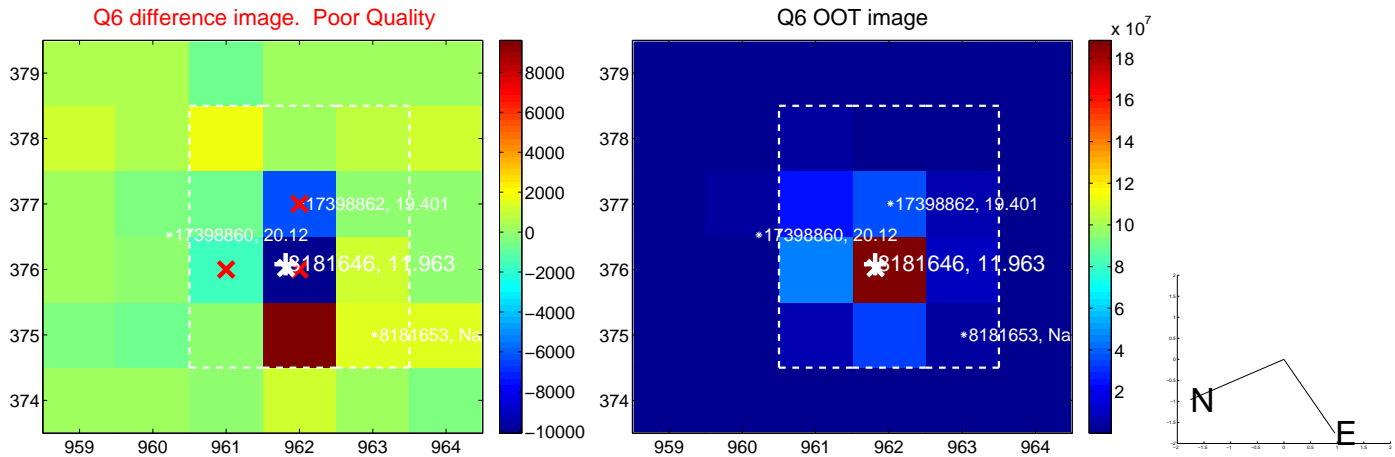
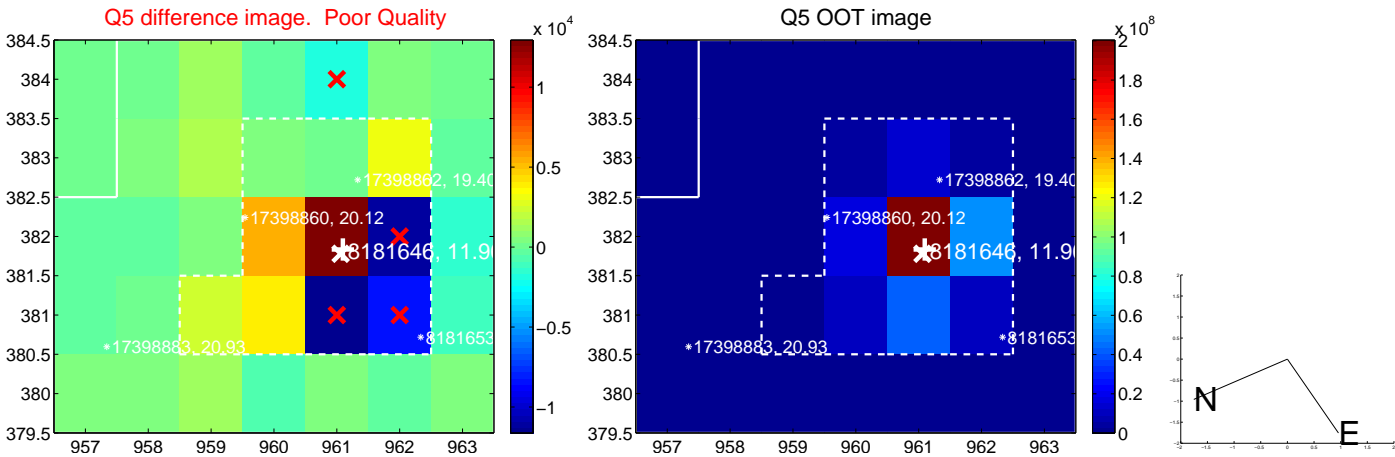


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets;** magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

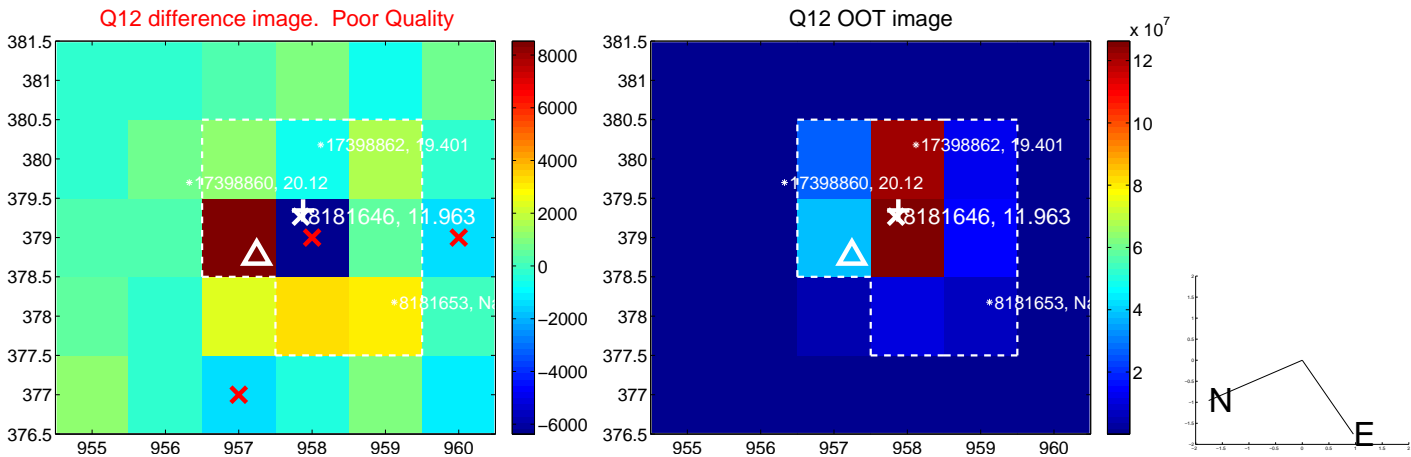
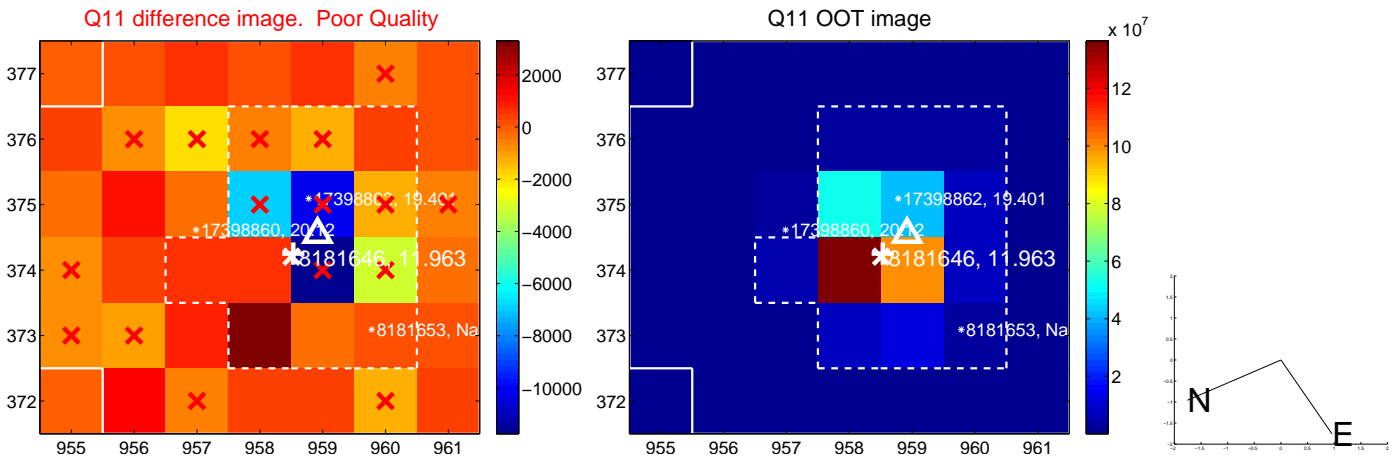
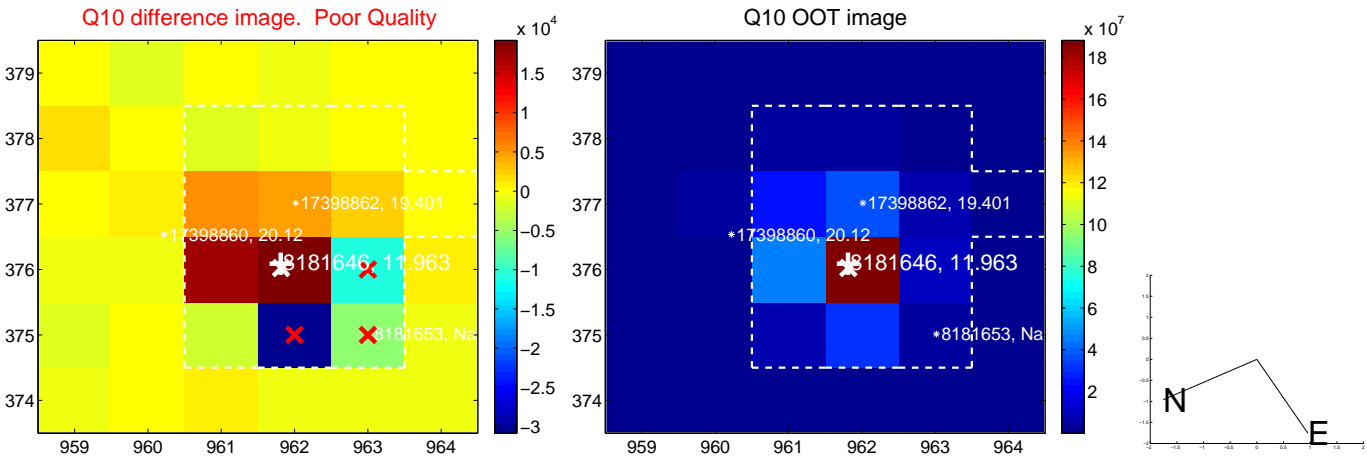
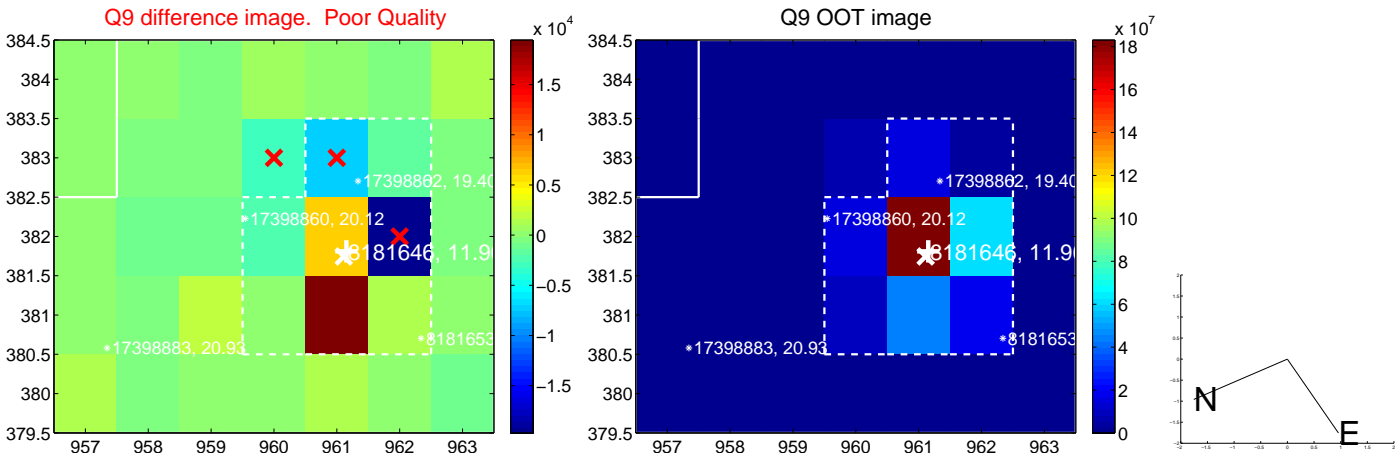
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

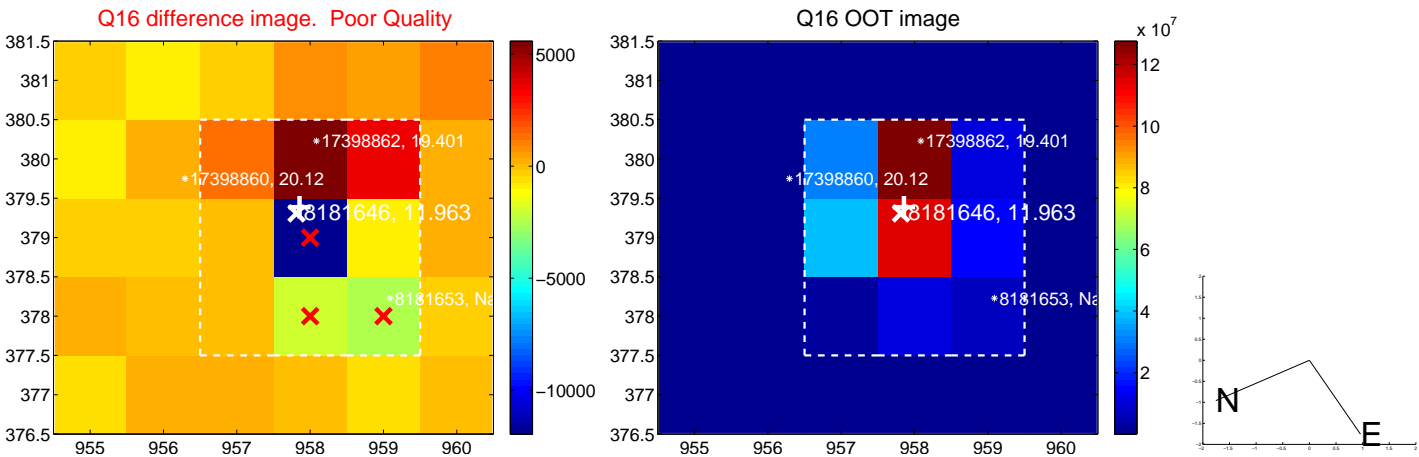
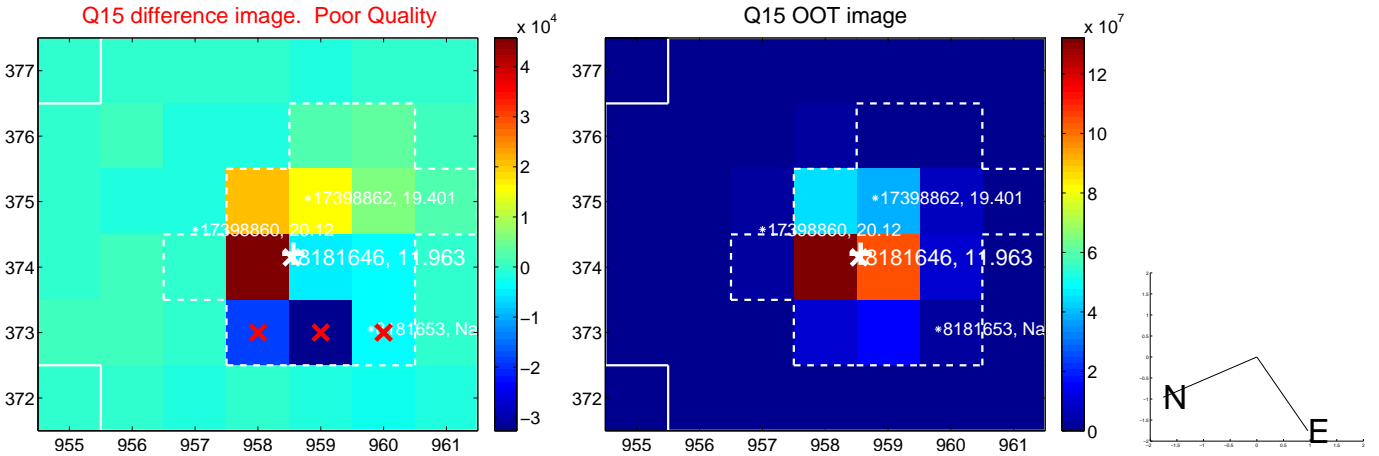
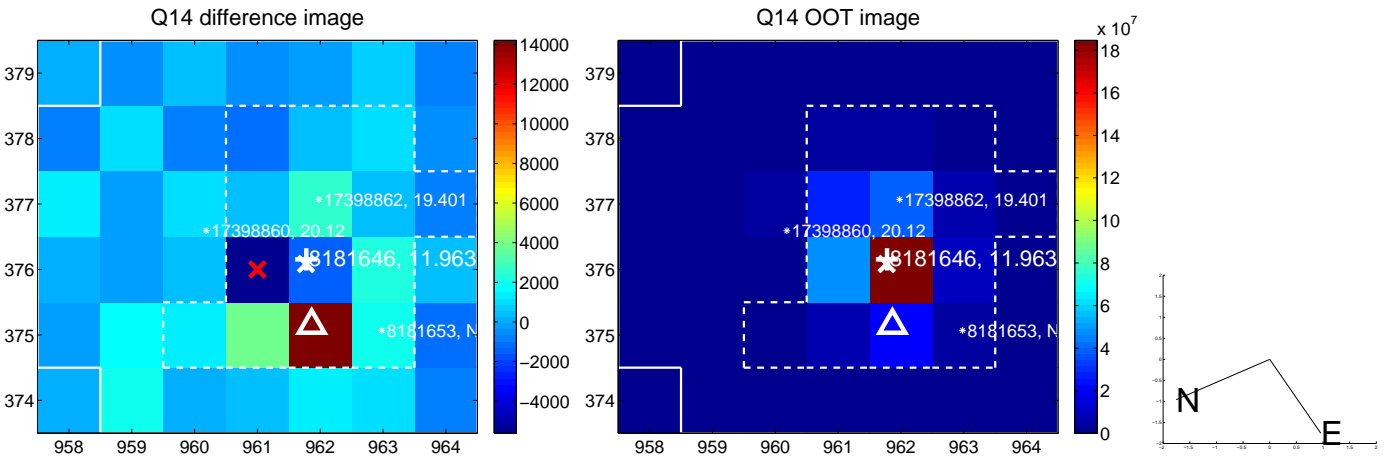
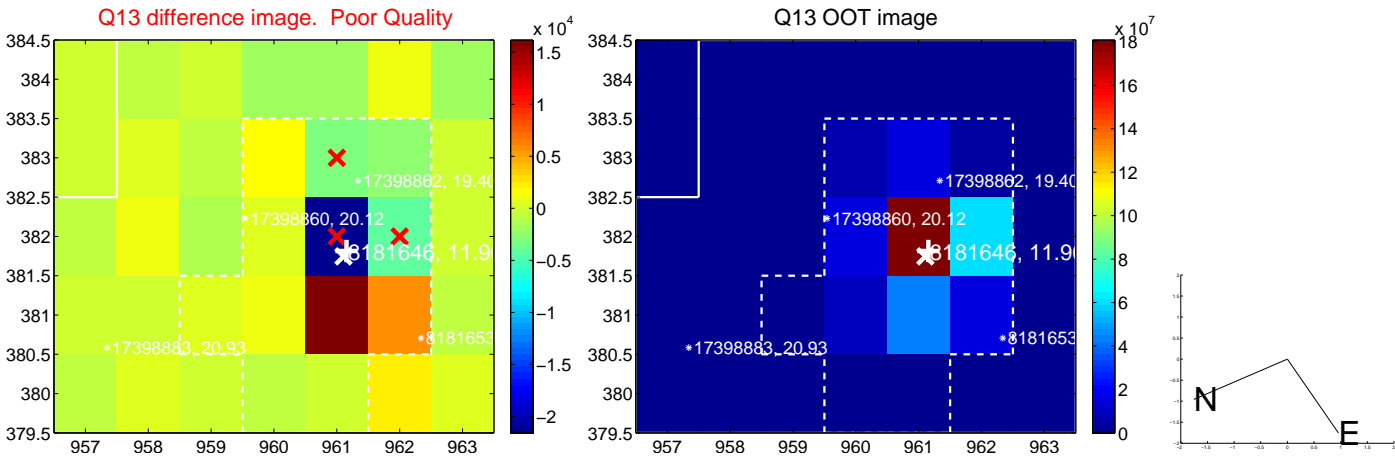


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

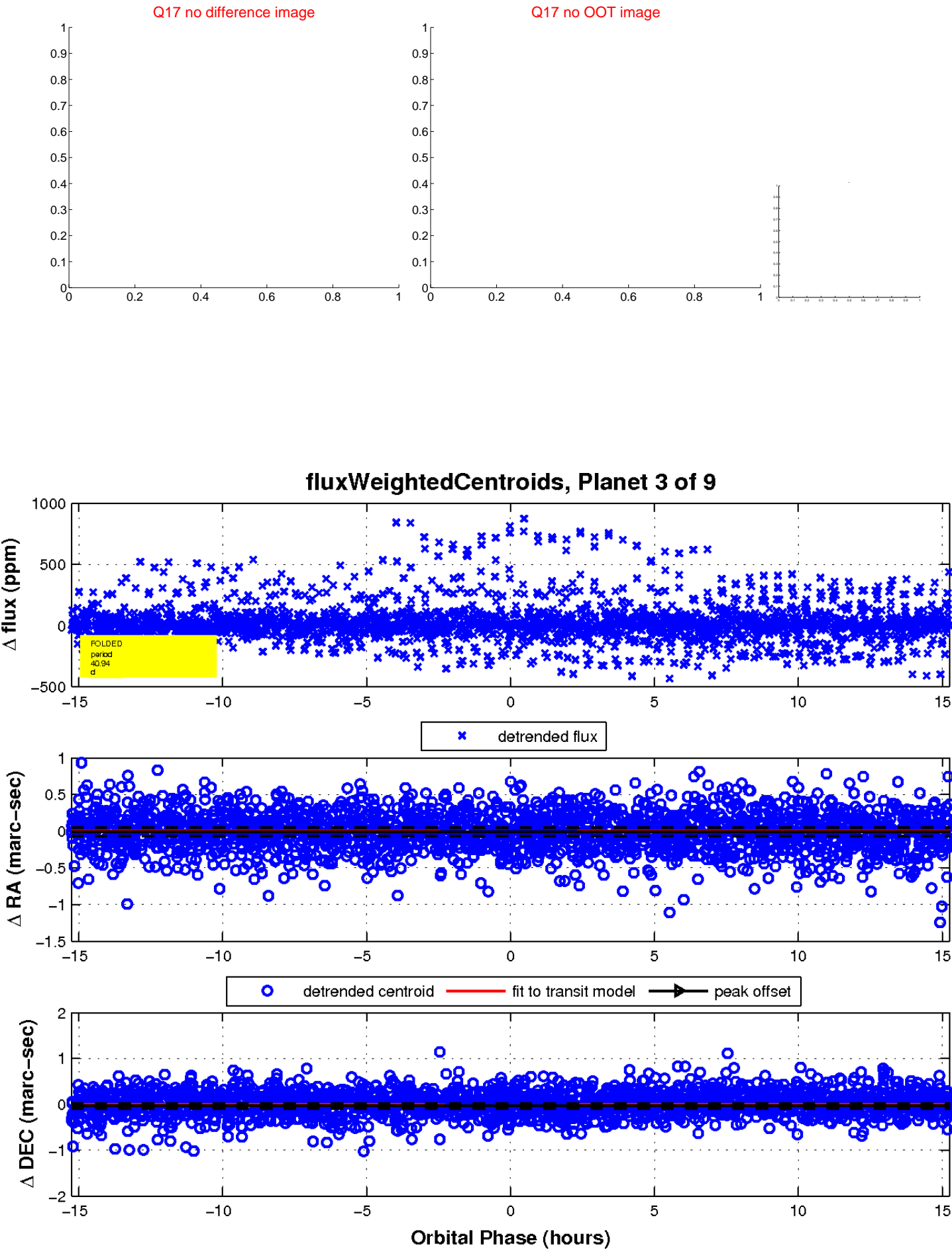




white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

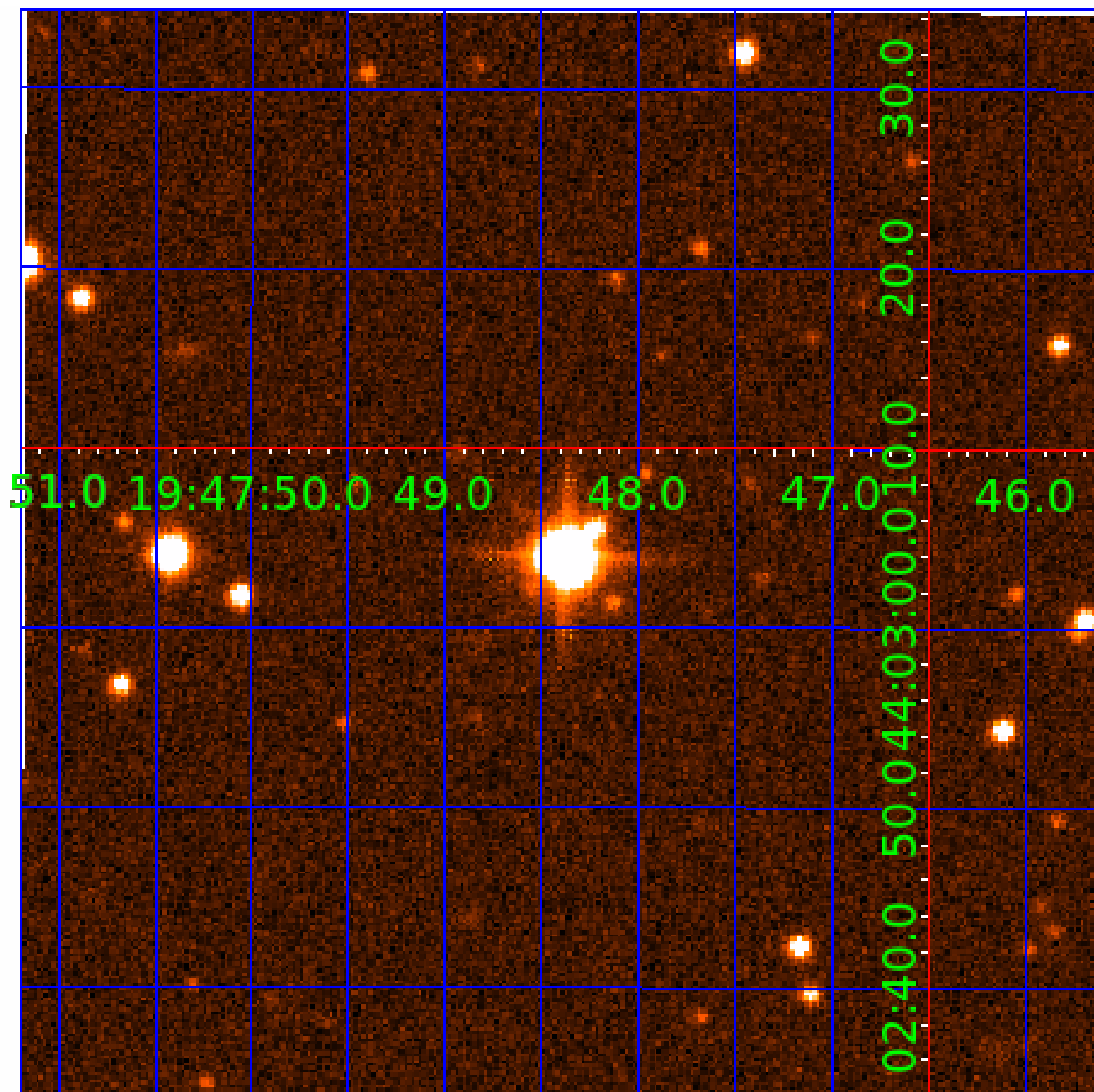


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 008181646

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
008181646-01	OBS	No	2.354098	131.598372	15.8	16.008	7.2	7.7	0.74	5486	0.30	422.09
008181646-02	OBS	No	46.649767	174.321233	110.5	7.773	22.7	2.3	0.74	5486	0.88	7.87
008181646-03	OBS	No	40.939977	153.721226	224.5	5.088	20.0	6.5	0.74	5486	1.24	9.37
008181646-04	OBS	No	157.875096	208.123739	4505.6	54.343	17.3	12.4	0.74	5486	9.20	1.55
008181646-05	OBS	No	48.824583	164.751099	532.2	25.560	15.7	7.3	0.74	5486	3.40	7.41
008181646-06	OBS	No	59.244269	160.876125	298.1	38.985	14.2	4.7	0.74	5486	1.37	5.72
008181646-07	OBS	No	61.879706	179.179822	339.5	8.688	11.4	6.7	0.74	5486	1.45	5.40
008181646-08	OBS	No	42.732442	148.480323	161.0	5.821	11.3	4.3	0.74	5486	0.99	8.85

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
008181646-01	OBS	FP	0.00	1	0	0	0	LPP_DV
008181646-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_TRACKER—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV
008181646-03	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE_ZUMA—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_UNRESOLVED_OFFSET
008181646-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL_SKYE—TRANS_GAPPED—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—INCONSISTENT_TRANS
008181646-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV
008181646-06	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
008181646-07	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_FEW_DIFFS
008181646-08	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV

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

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

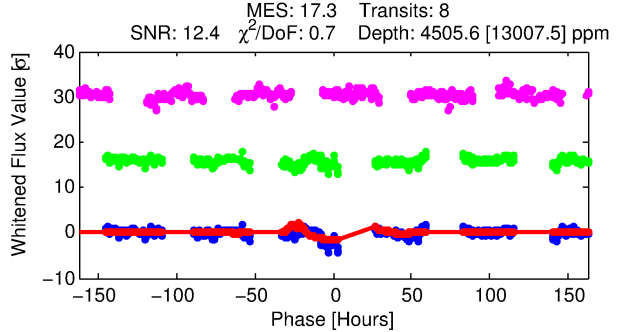
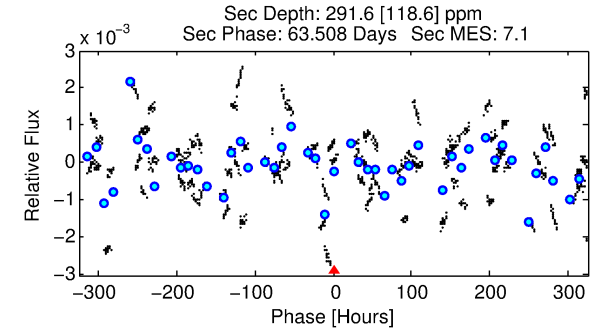
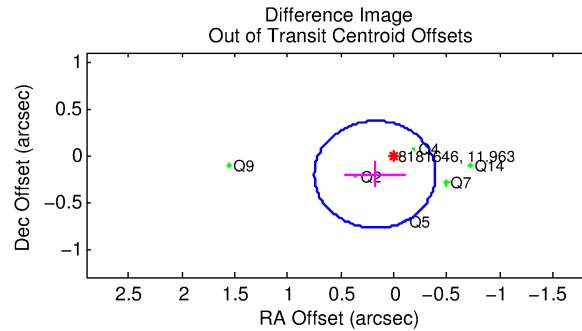
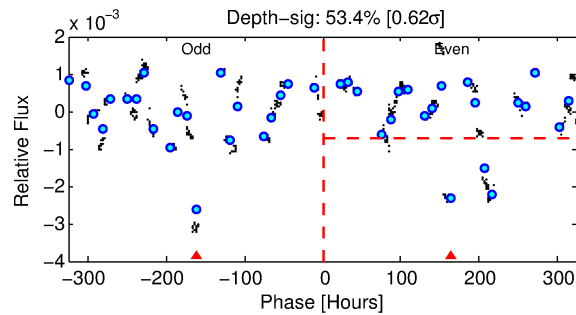
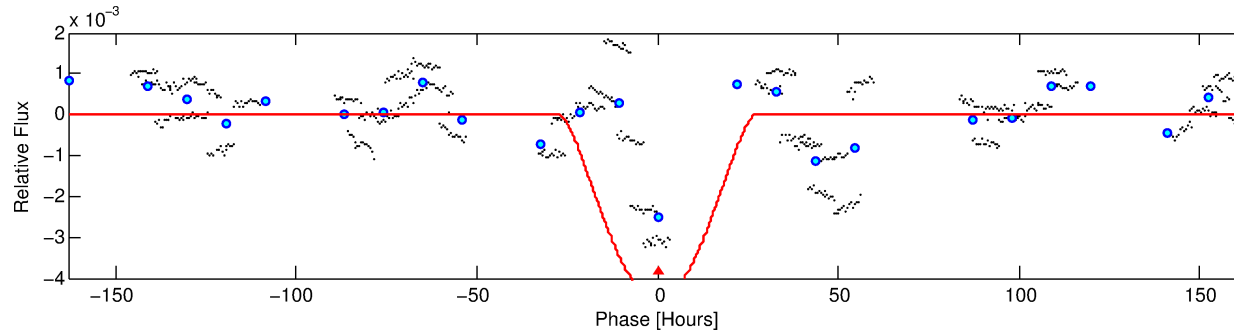
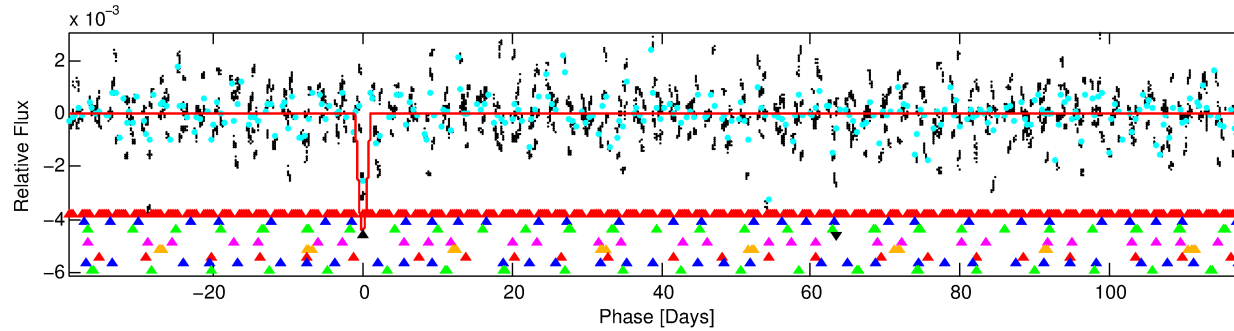
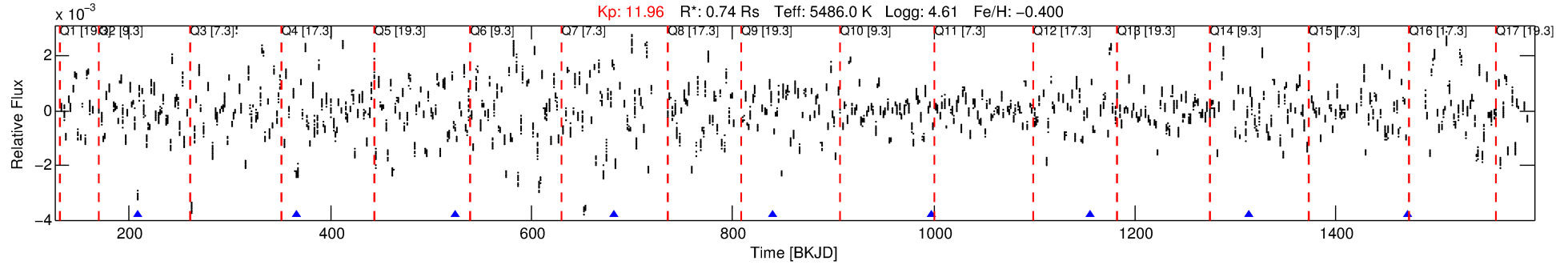
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 008181646-04

No Significant Match Found

# DV One-Page Summary

KIC: 8181646 Candidate: 4 of 9 Period: 157.875 d



## DV Fit Results:

Period = 157.87510 [0.01171] d  
Epoch = 208.1237 [0.0761] BKJD  
Rp/R\* = 0.1145 [0.0741]  
a/R\* = 10.97 [1.18]  
b = 1.00 [0.11]  
Seff = 1.55 [0.36]  
Teq = 284 [17] K  
Rp = 9.20 [6.17] Re  
a = 0.5327 [0.0781] AU  
Ag = 538.14 [738.79] [0.73 $\sigma$ ]  
Teffp = 2118 [721] K [2.54 $\sigma$ ]

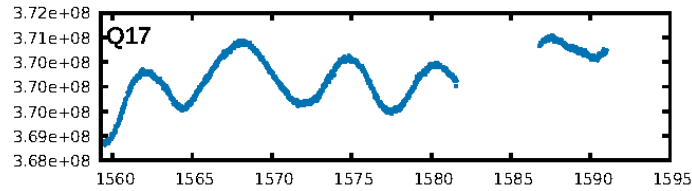
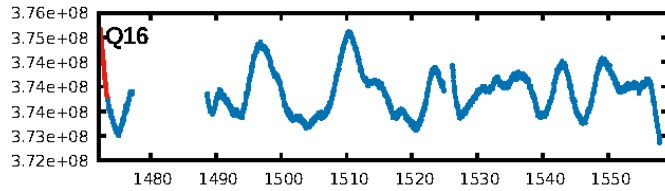
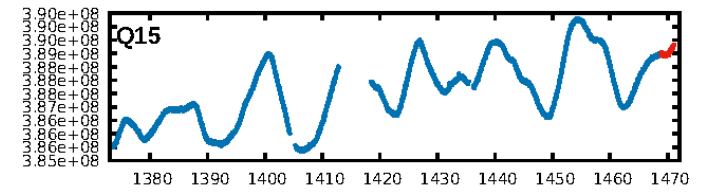
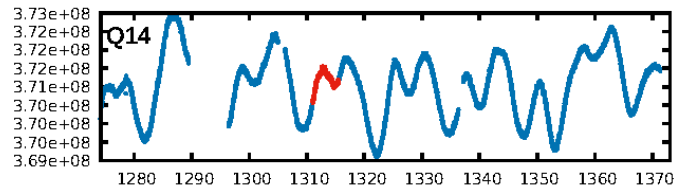
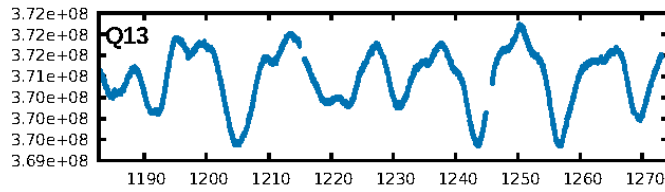
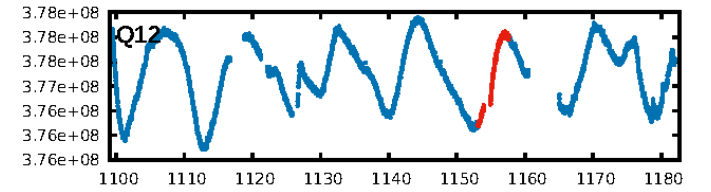
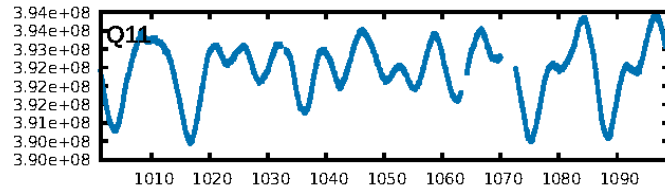
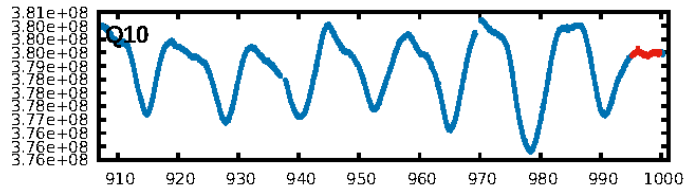
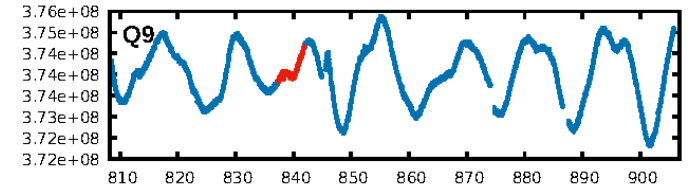
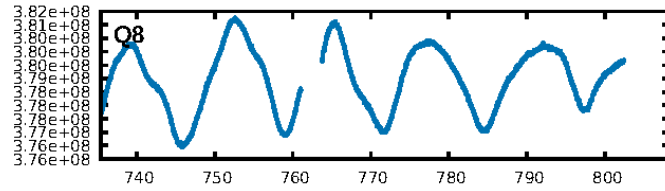
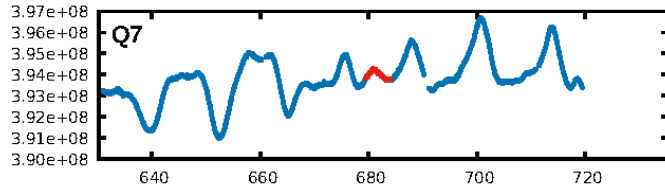
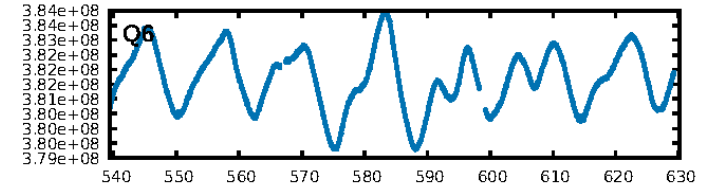
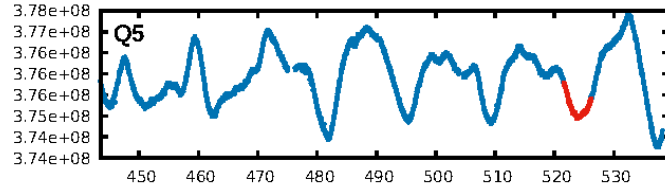
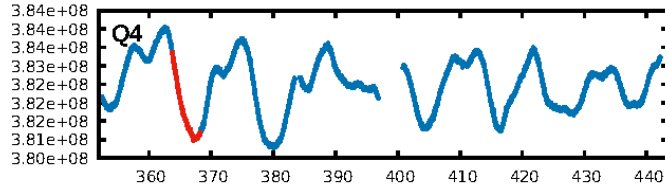
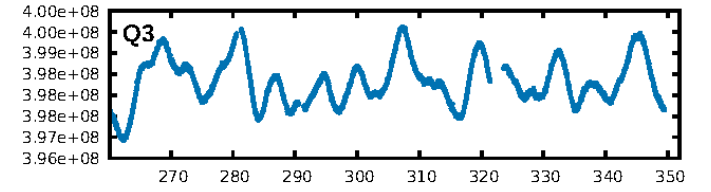
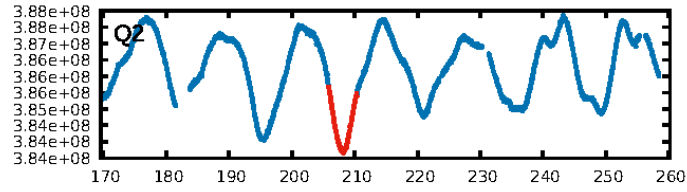
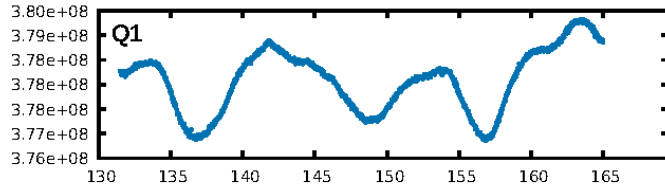
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [41.86 $\sigma$ ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 0.0%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [8/8]  
GhostDiagnostic-chr: 4.946  
Centroid-sig: 16.8%  
Centroid-so: 0.376 arcsec [19.35 $\sigma$ ]  
OotOffset-rm: 0.271 arcsec [1.42 $\sigma$ ]  
KicOffset-rm: 0.282 arcsec [2.54 $\sigma$ ]  
OotOffset-st: 2/1/1/2 [6]  
KicOffset-st: 2/1/1/2 [6]  
DiffImageQuality-fgm: 0.67 [4/6]  
DiffImageOverlap-fno: 0.00 [0/6]

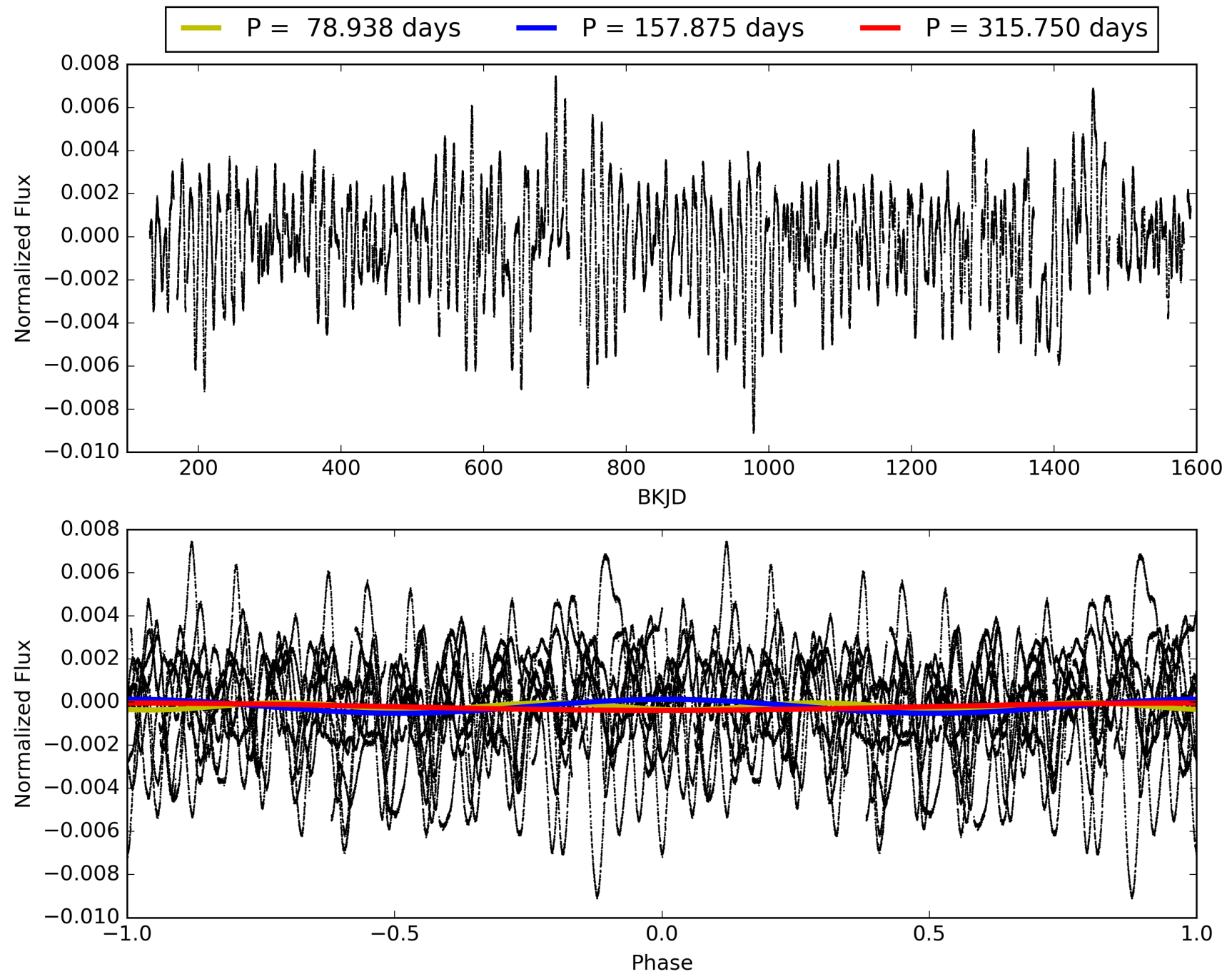
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 23:57:40 Z

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

# TCE 008181646-04, PDC Light Curves



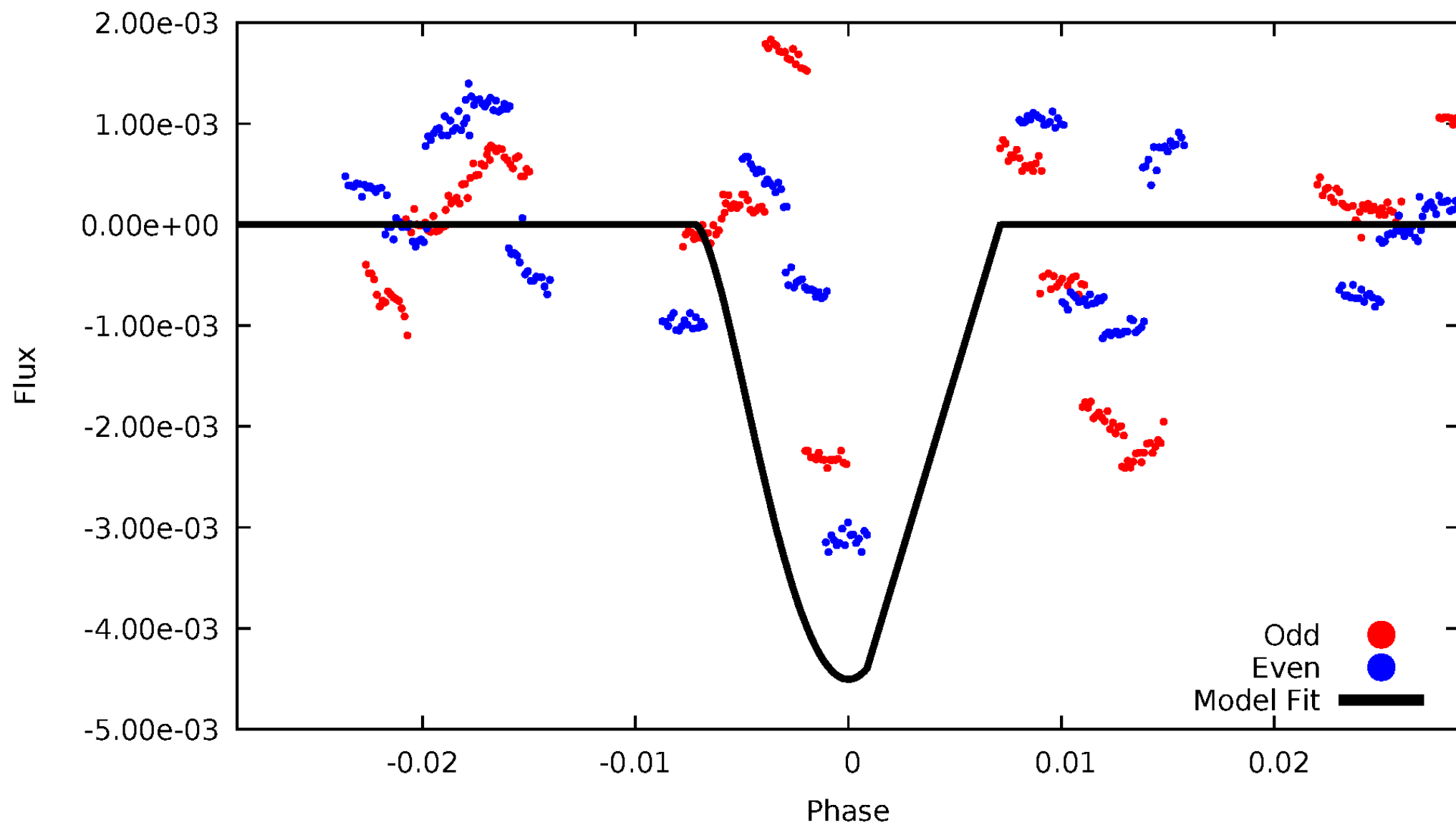
# TCE 008181646-04





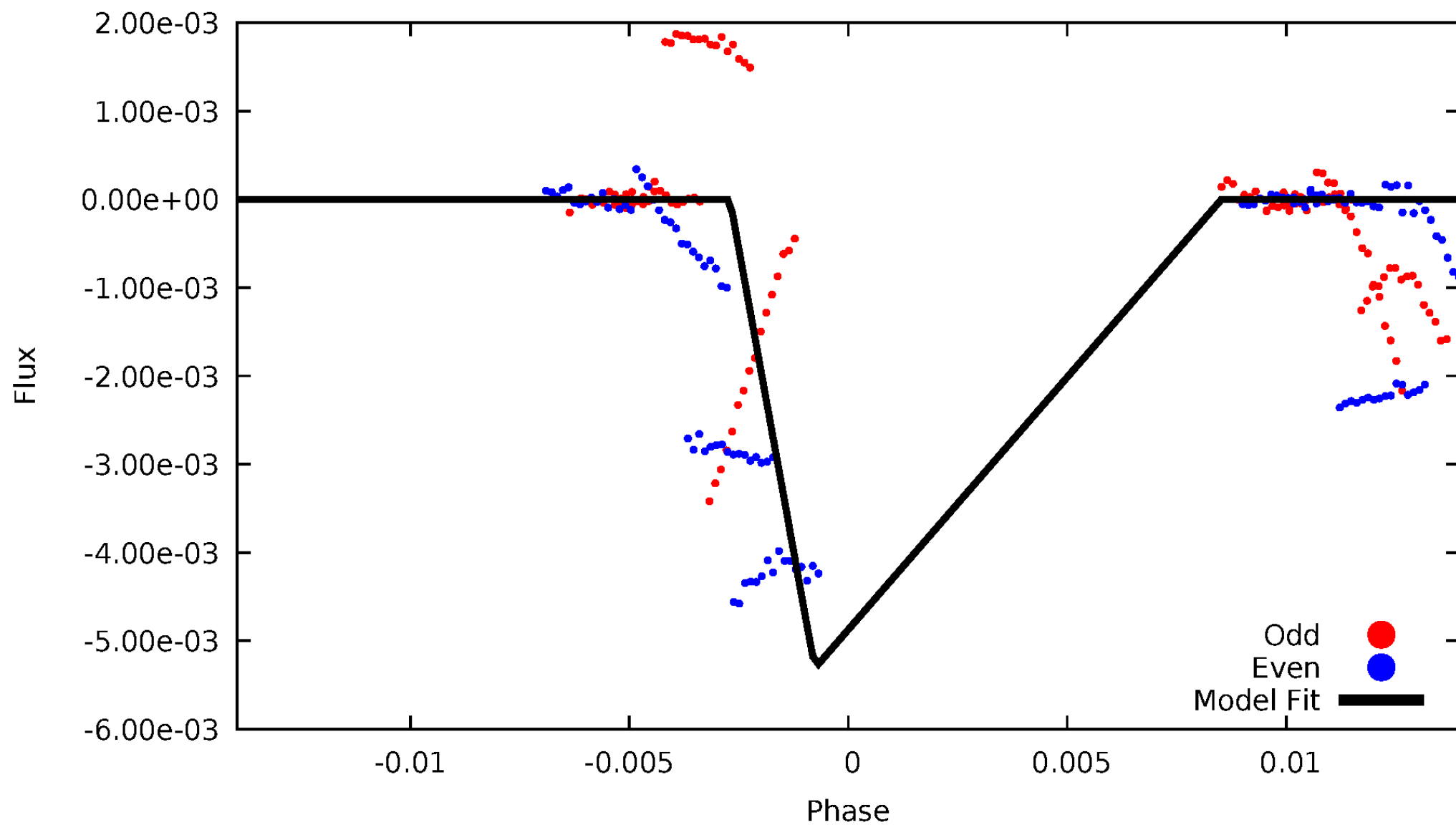
# DV Odd/Even

TCE 008181646-04



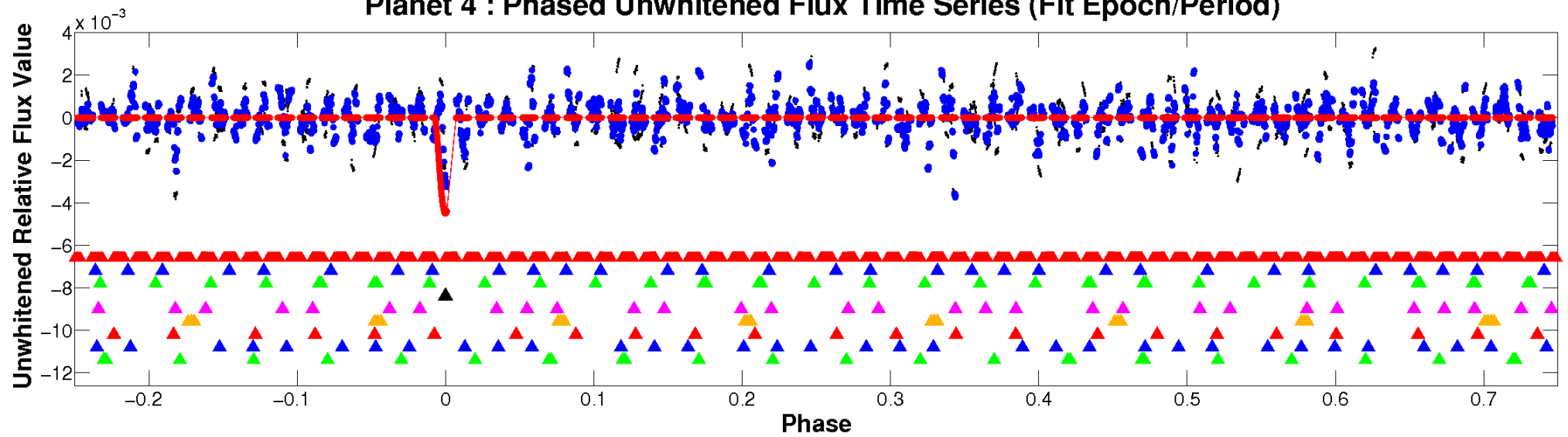
# ALT Odd/Even

TCE 008181646-04

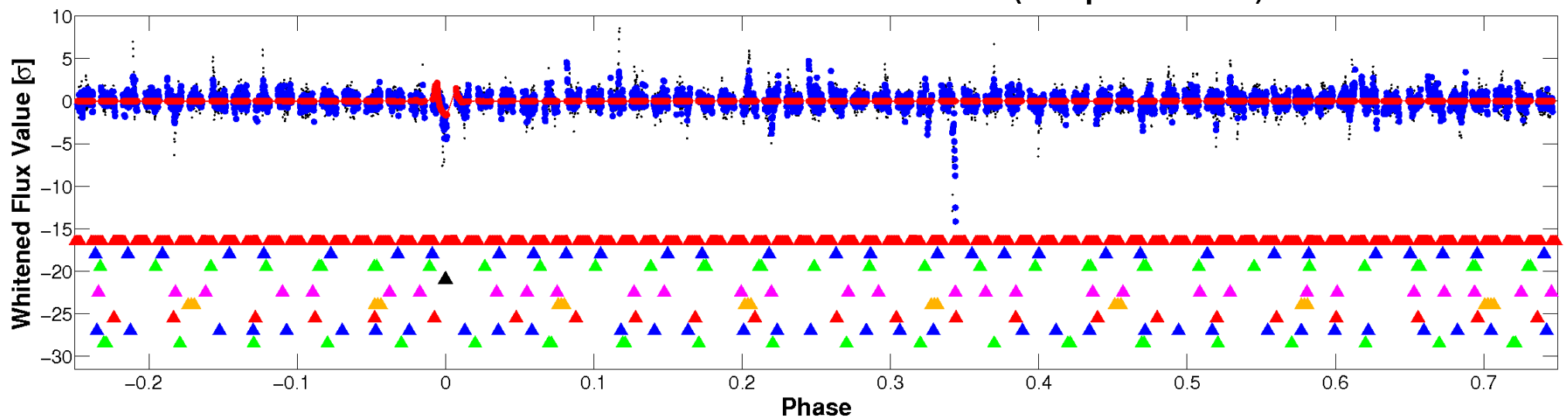


# Non-Whitened Vs. Whitened Light Curve

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

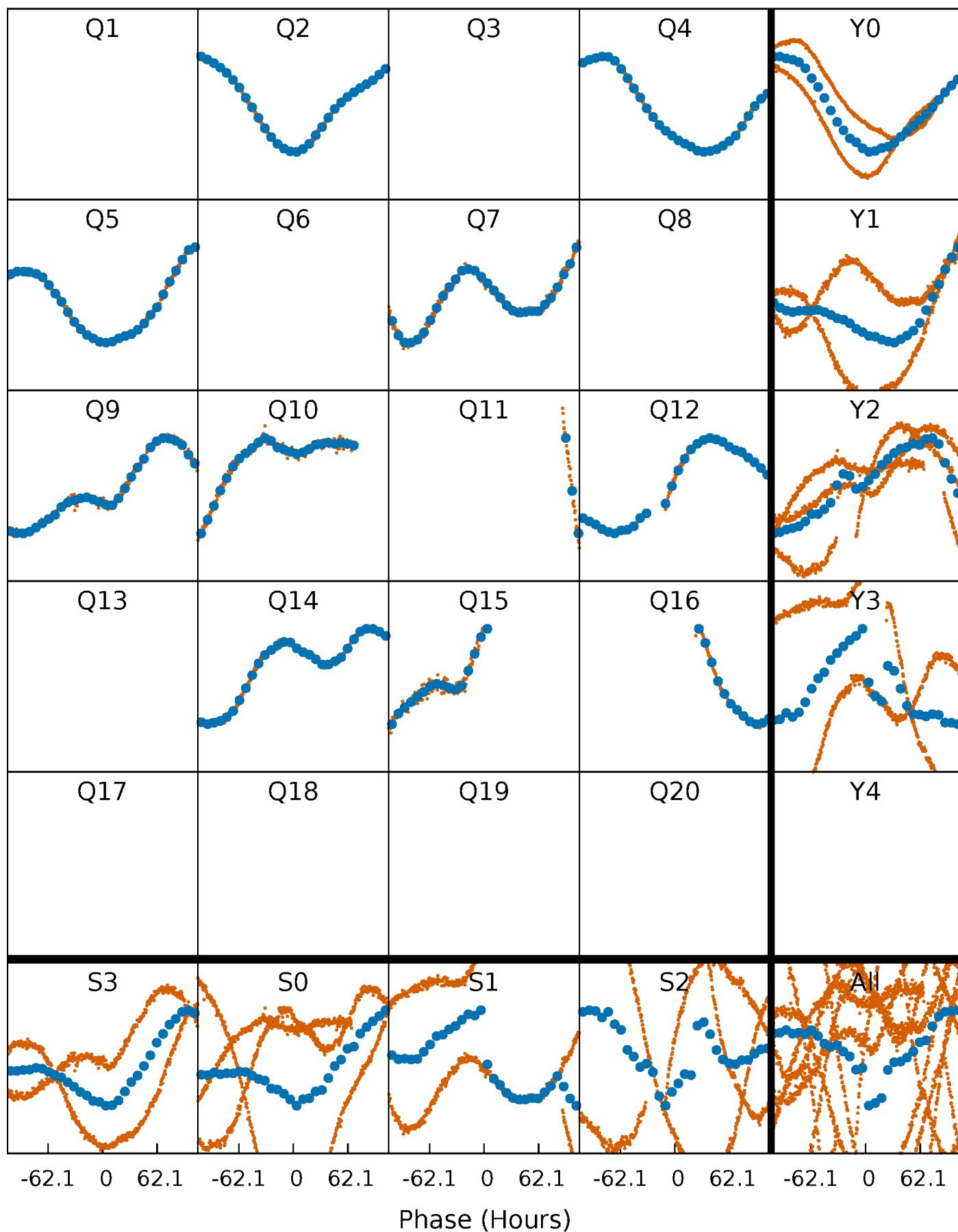


## Planet 4 : Phased Whitened Flux Time Series (Fit Epoch/Period)



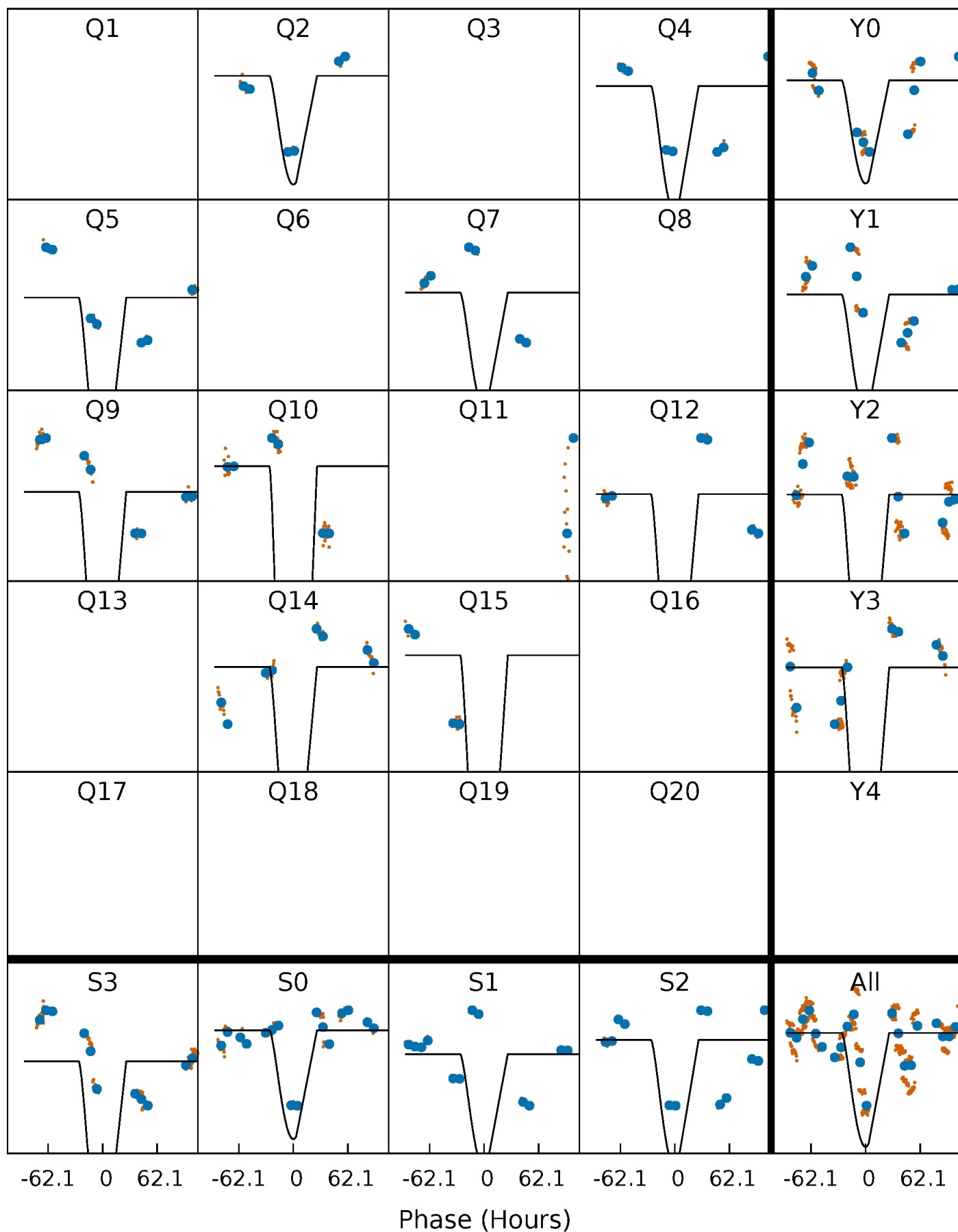
# PDC Quarter-Phased Transit Curves

TCE 008181646-04 P=157.875096 Days  $T_0=208.123739$  (BKJD)



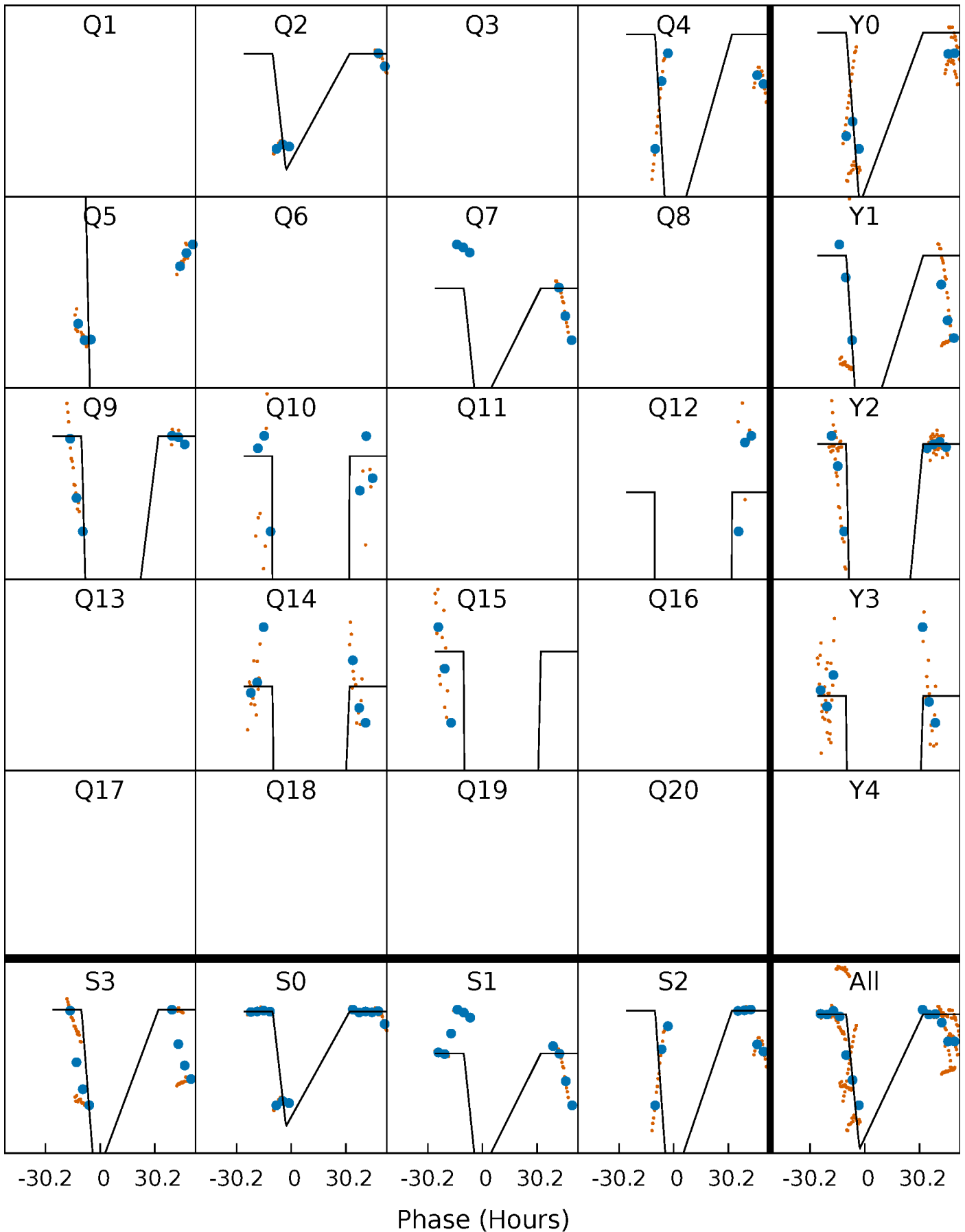
# DV Quarter-Phased Transit Curves

TCE 008181646-04 P=157.875096 Days  $T_0=208.123739$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

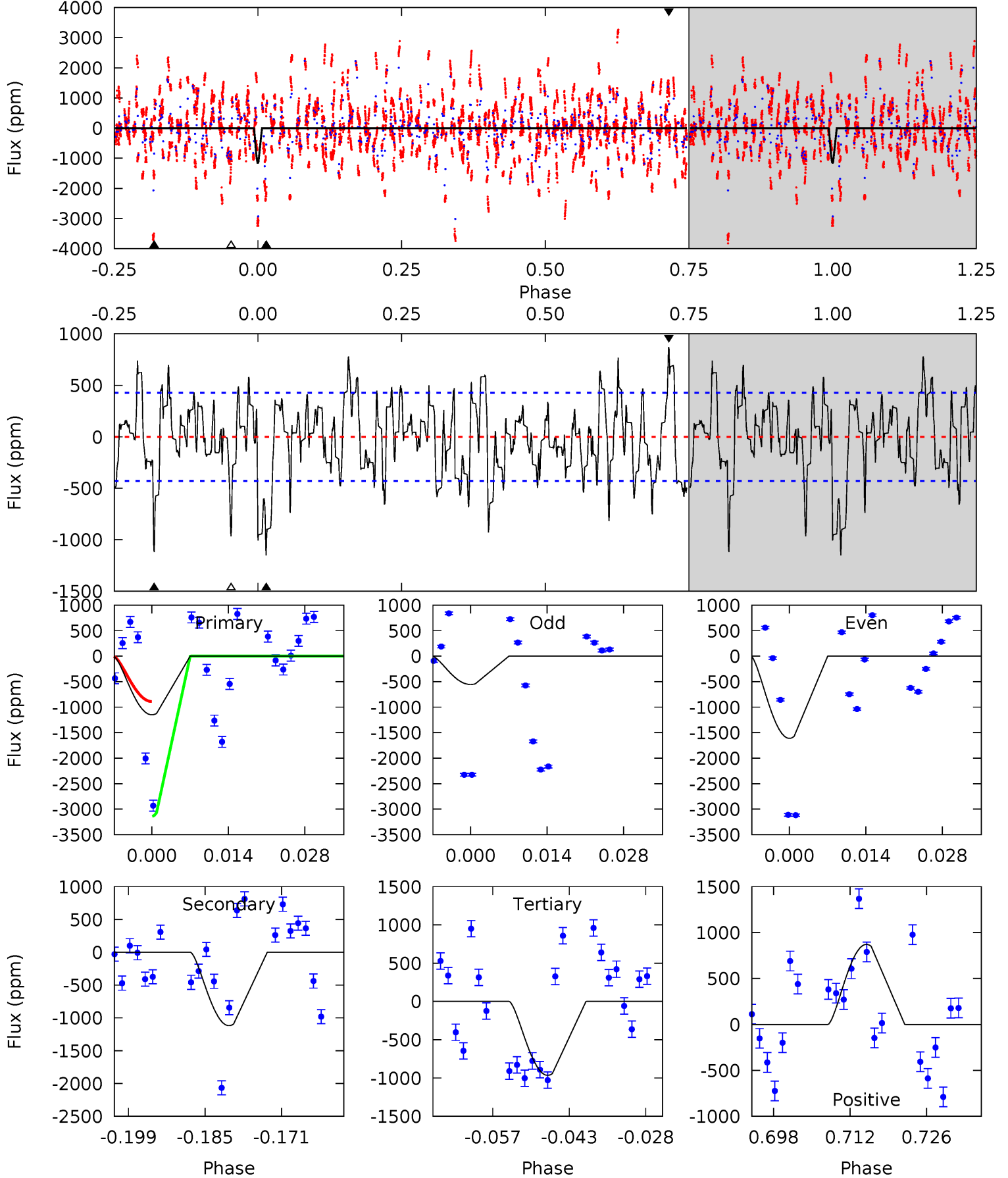
TCE 008181646-04 P=157.808384 Days  $T_0=208.370391$  (BKJD)



# DV Model-Shift Uniqueness Test

008181646-04,  $P = 157.875096$  Days,  $E = 50.248643$  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
13.3	13.0	11.2	10.1	4.96	2.45	3.68	2.15	3.24	1.78	2.87	6.18	16.3	0.43	6.34

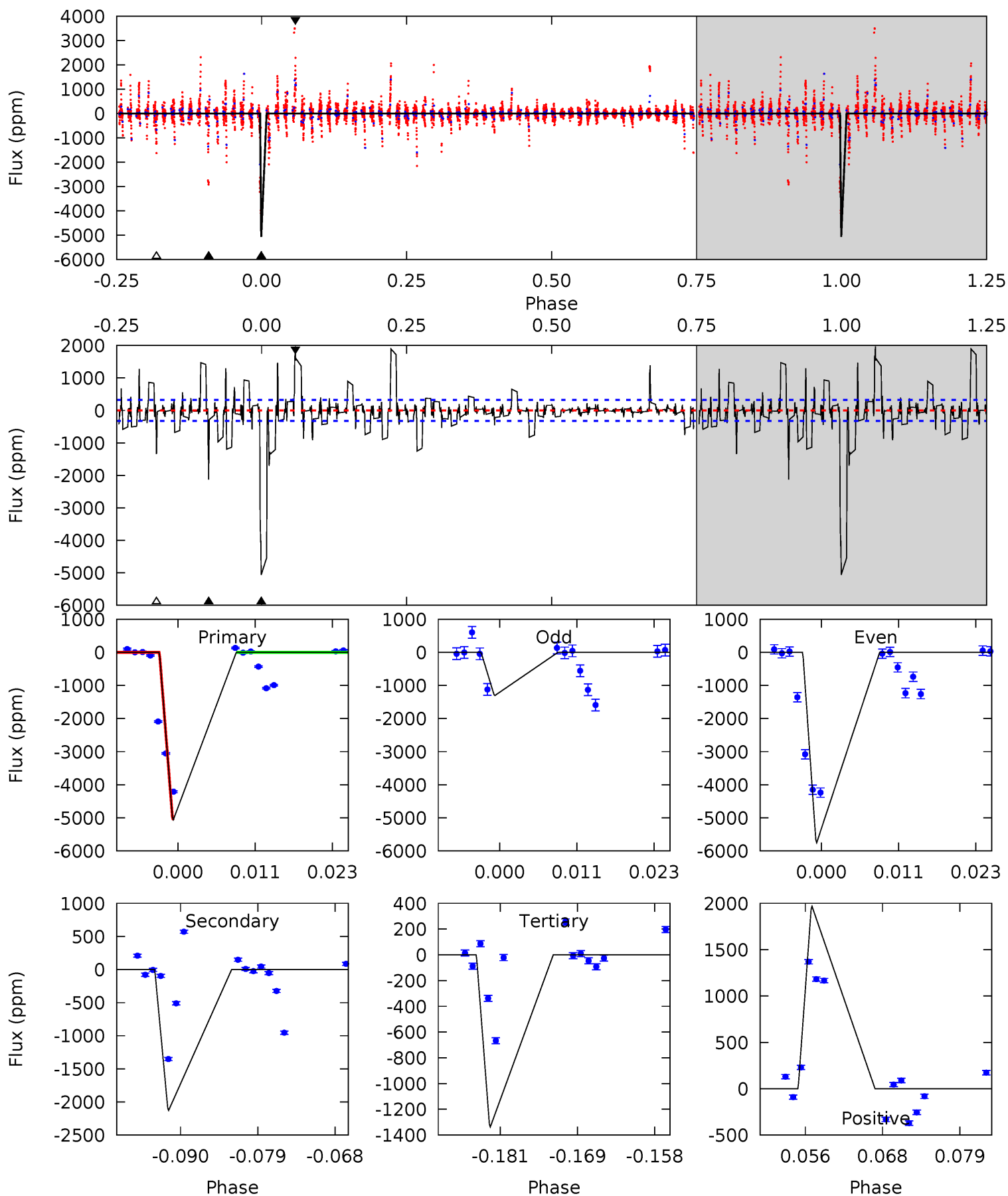




# Alt Model-Shift Uniqueness Test

008181646-04, P = 157.808384 Days, E = 50.562007 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
78.7	33.1	20.8	30.6	5.00	2.53	3.75	57.9	48.1	12.3	2.47	28.3	0	0.28	0



### Stellar Parameters For KIC 008181646

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5486^{+146}_{-146}$	$4.612^{+0.037}_{-0.112}$	$-0.400^{+0.300}_{-0.300}$	$0.736^{+0.131}_{-0.056}$	$0.824^{+0.075}_{-0.092}$	$2.905^{+0.476}_{-1.066}$
	+3%/-3%	+1%/-2%	+75%/-75%	+18%/-8%	+9%/-11%	+16%/-37%
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 008181646-04 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-1118 \pm 86$	$10.02^{+5.95}_{-5.71}$	$403^{+18}_{-16}$	$3408^{+1113}_{-453}$	$1718^{+7478}_{-1052}$
Alt.	$-2127 \pm 64$	$7.19^{+5.81}_{-4.56}$	$404^{+16}_{-16}$	$4241^{+2254}_{-768}$	$6448^{+39346}_{-4481}$

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

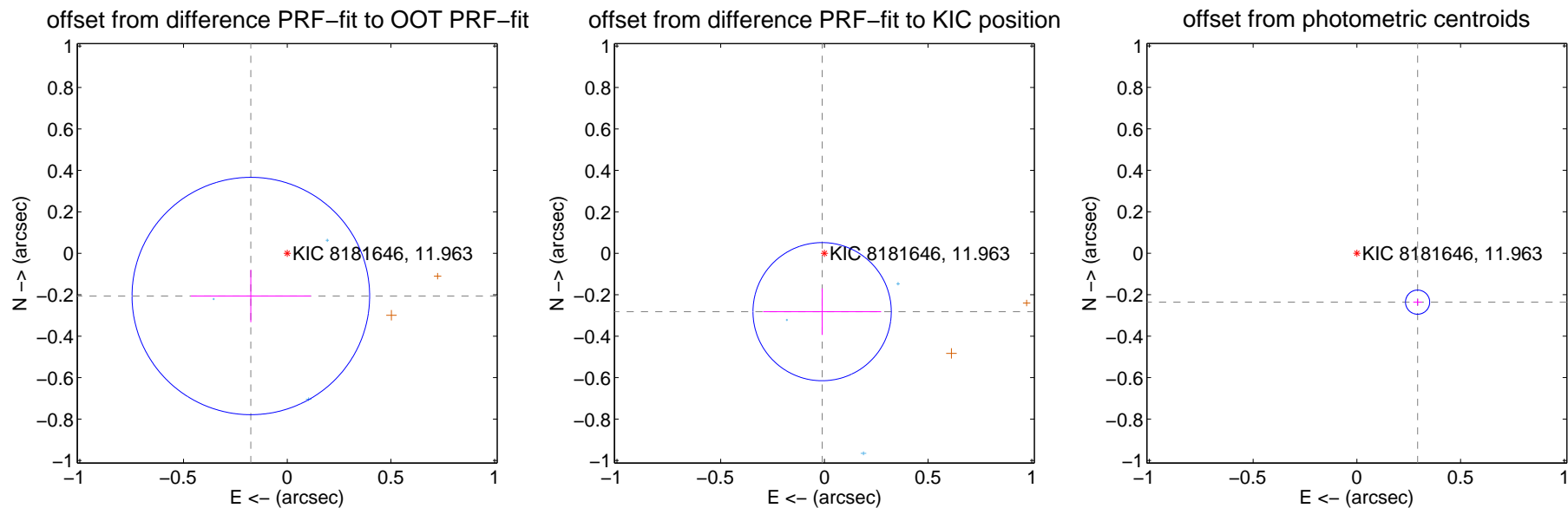
## DV Centroid Data

Supplemental centroid analysis for 008181646-04. **Kepler magnitude: 11.96.** Transit SNR 12.45

There are 4 quarters with good PRF difference image offsets

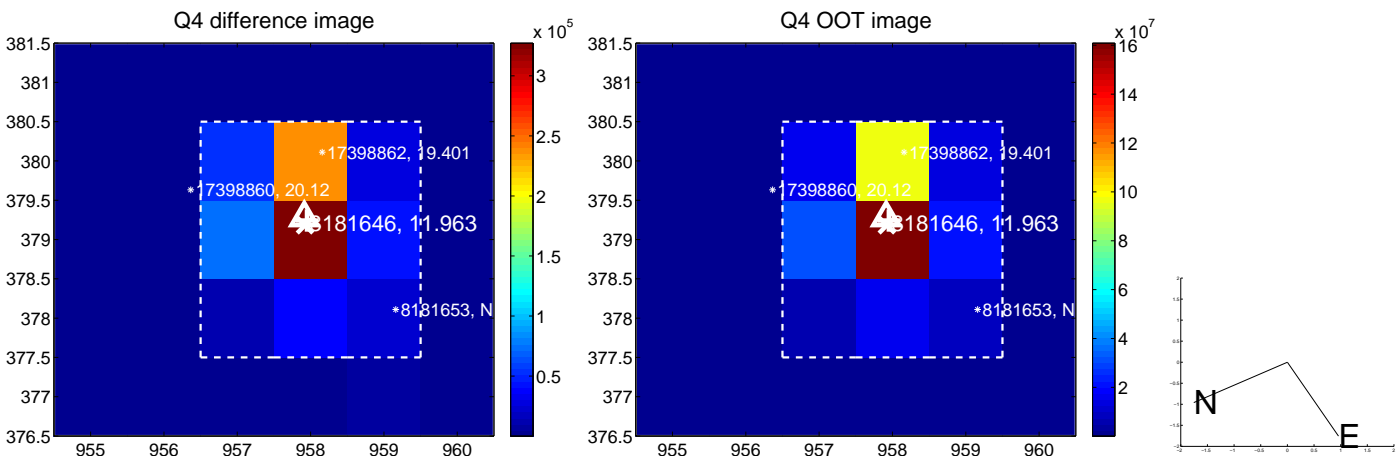
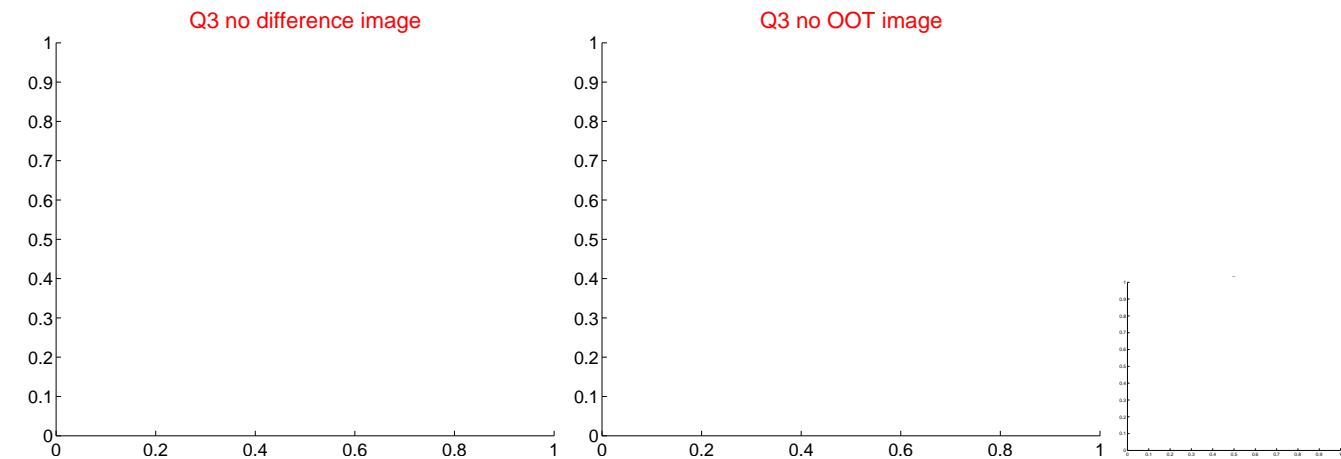
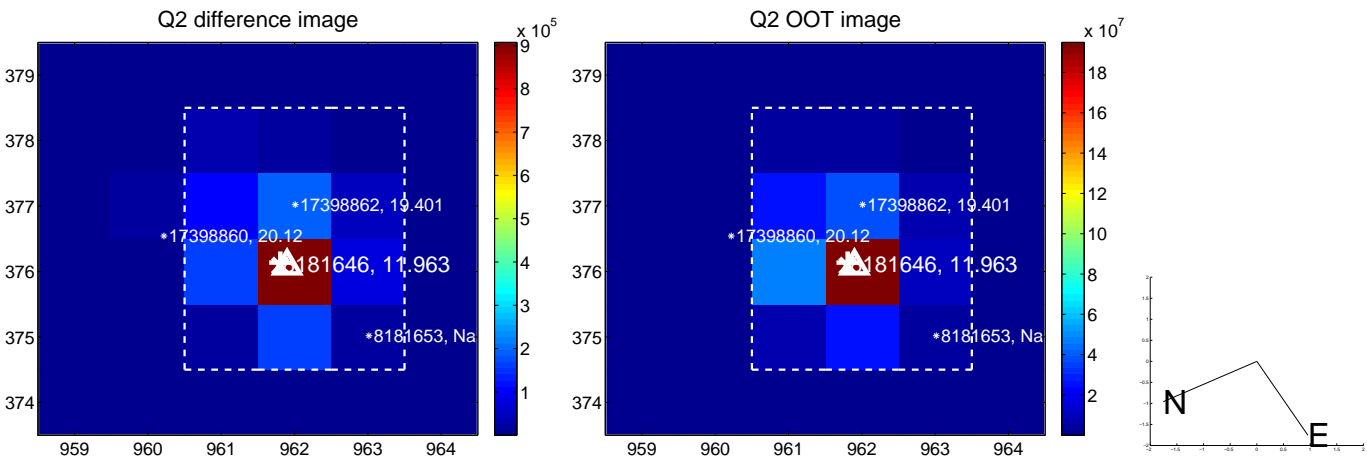
The direct PRF centroid is offset from the target star catalog position by about 0.28 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.271 \pm 0.191$	1.42	$0.175 \pm 0.289$	$-0.206 \pm 0.126$
PRF-fit source offset from KIC position	$0.282 \pm 0.111$	2.54	$0.011 \pm 0.285$	$-0.282 \pm 0.112$
photometric centroid source offset	<b><math>0.38 \pm 0.02</math></b>	<b>19.35</b>	$-0.29 \pm 0.02$	$-0.24 \pm 0.02$

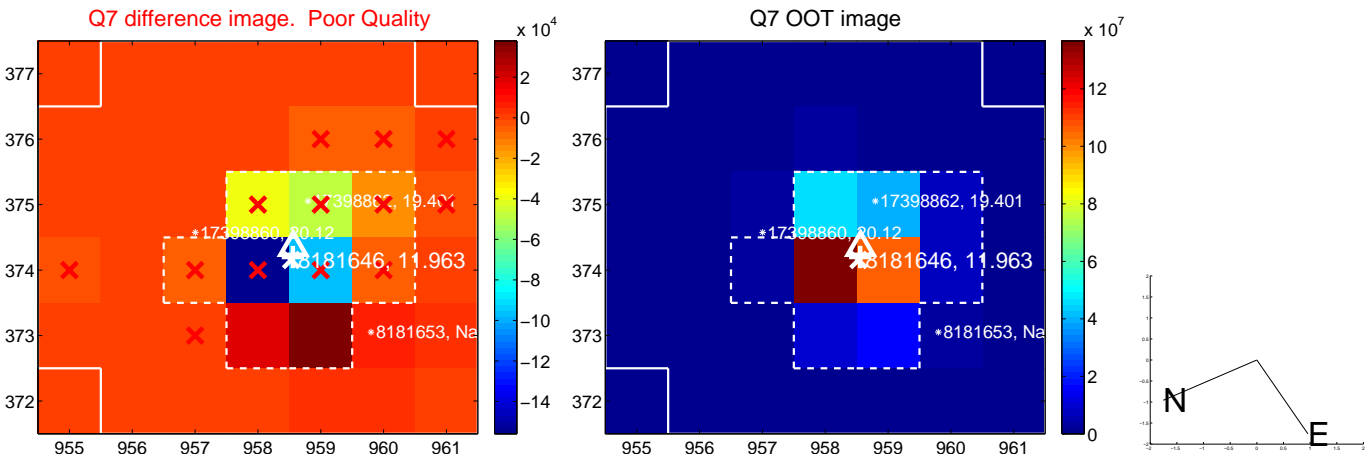
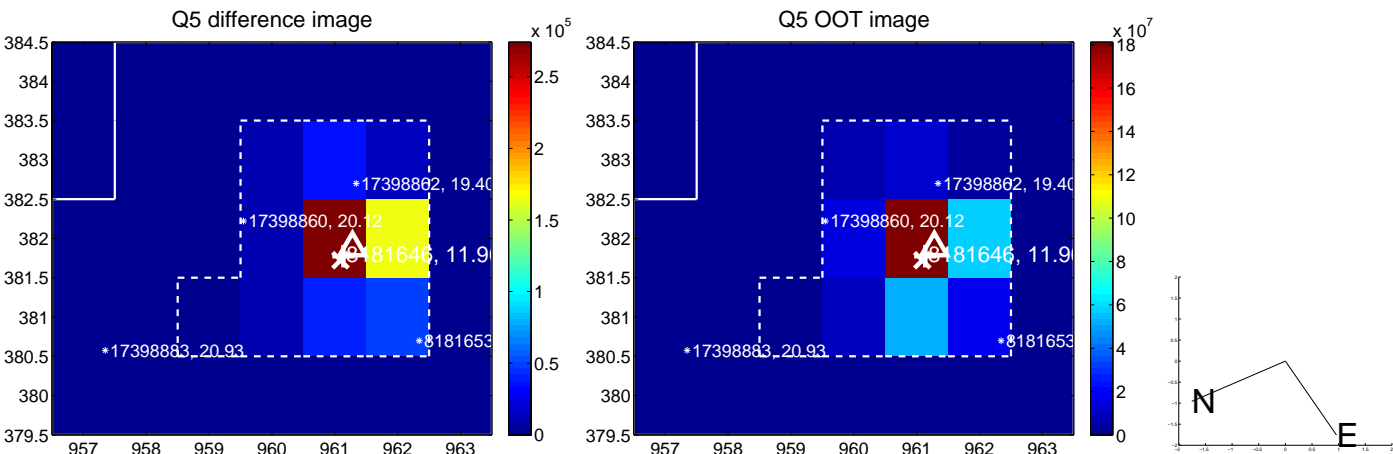


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets;** magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

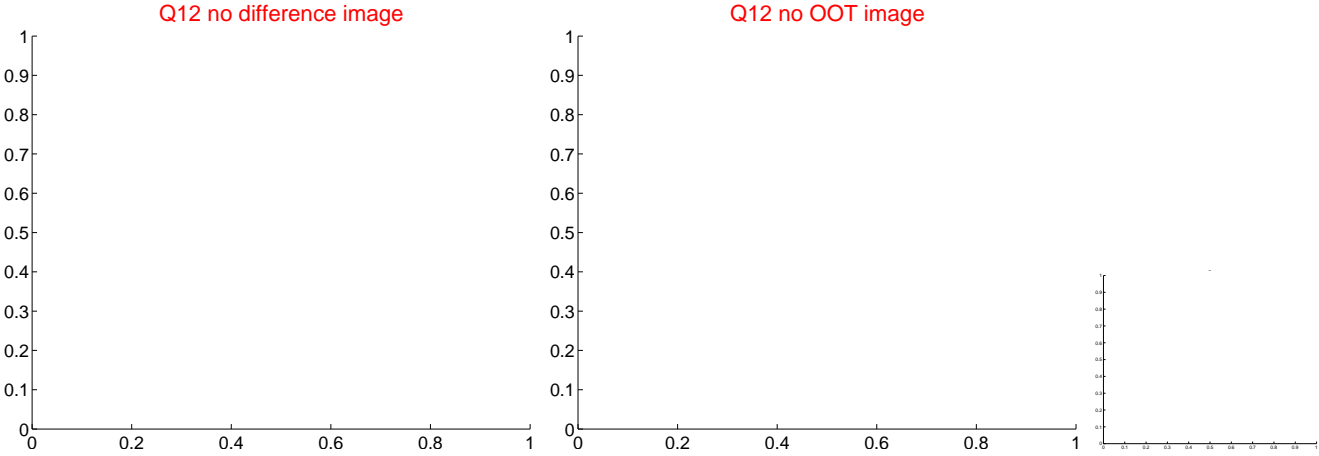
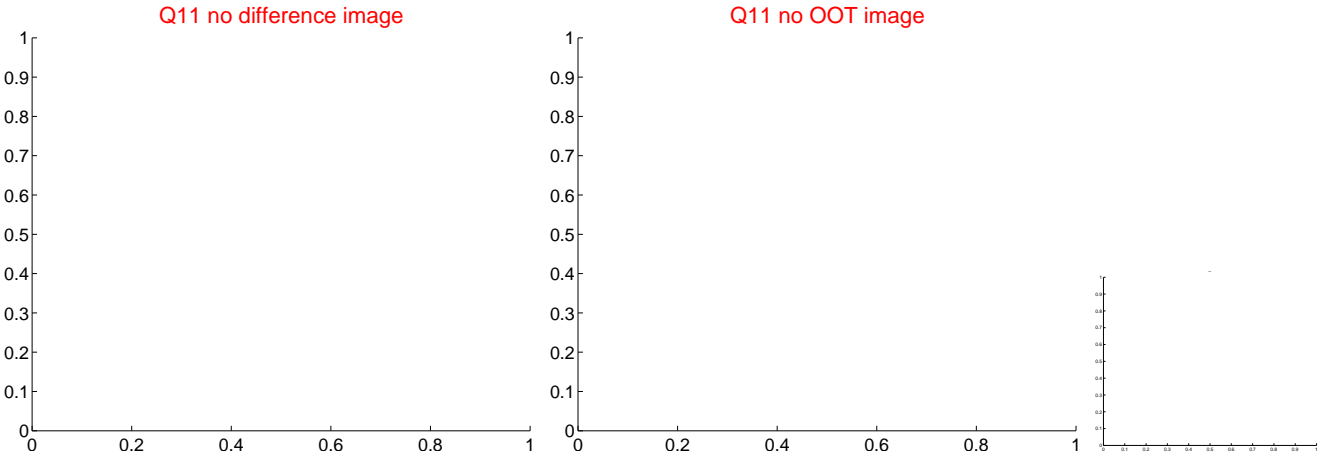
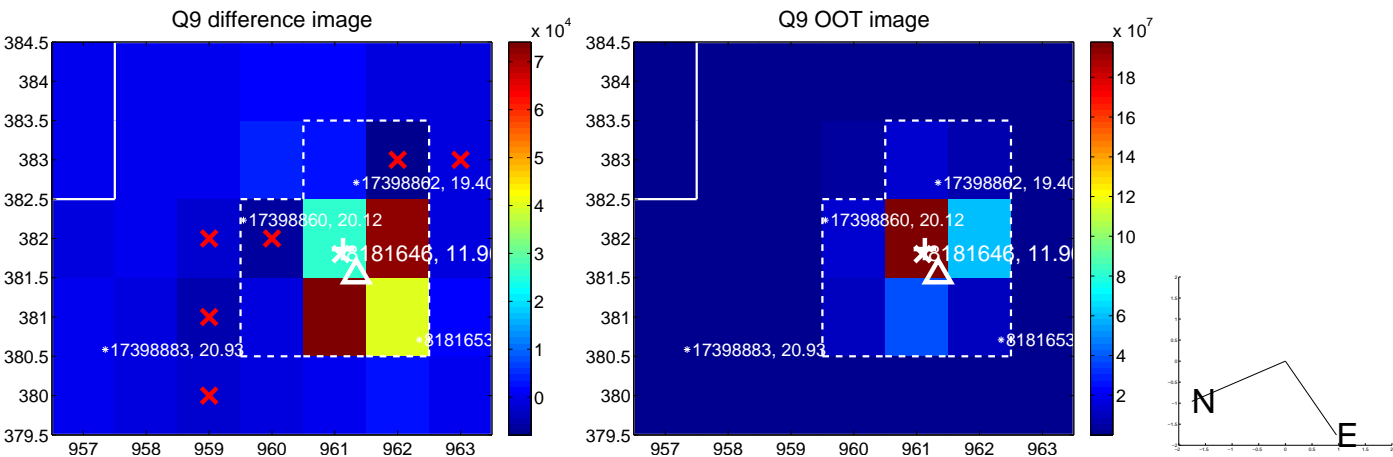
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



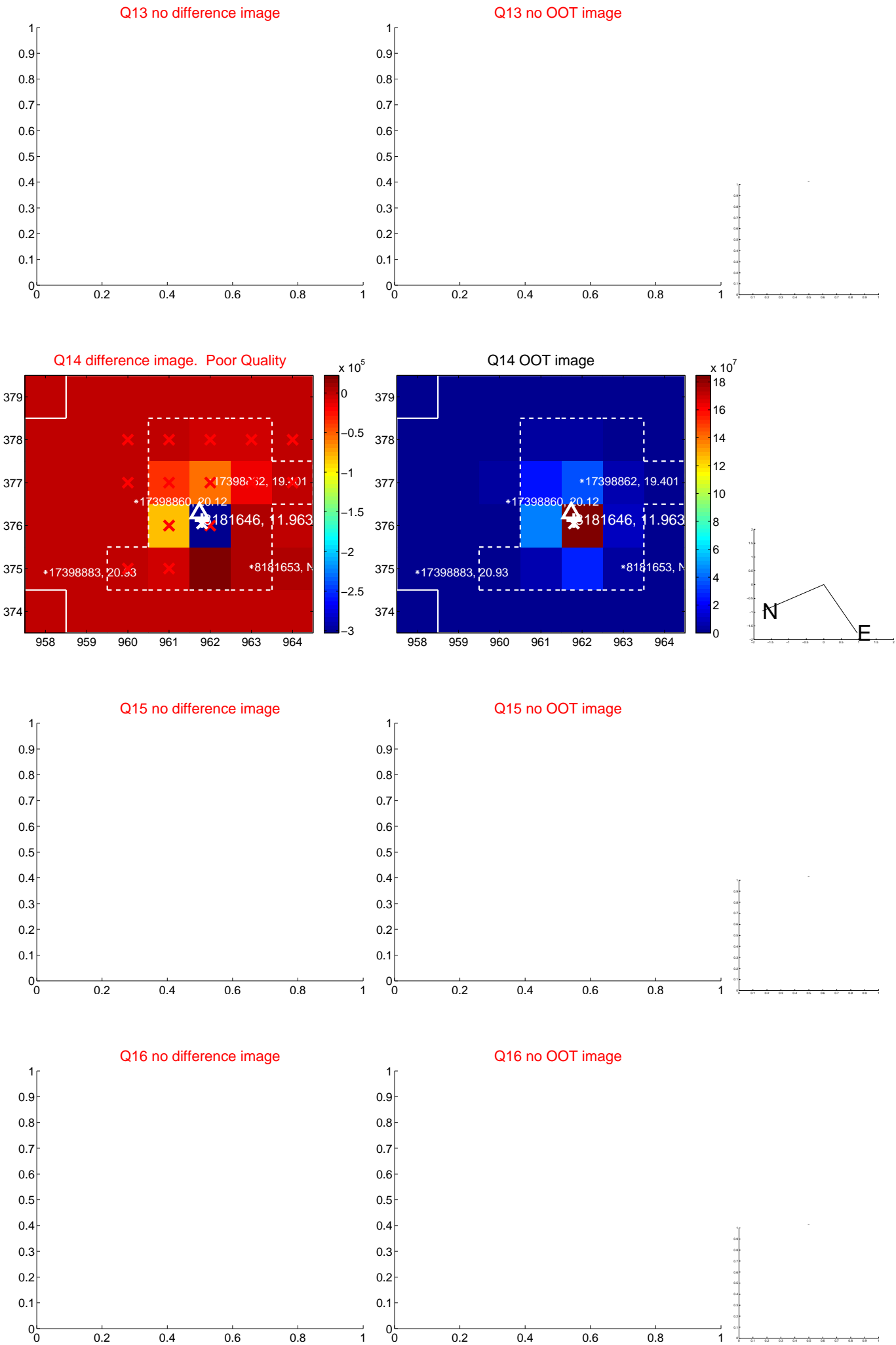
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

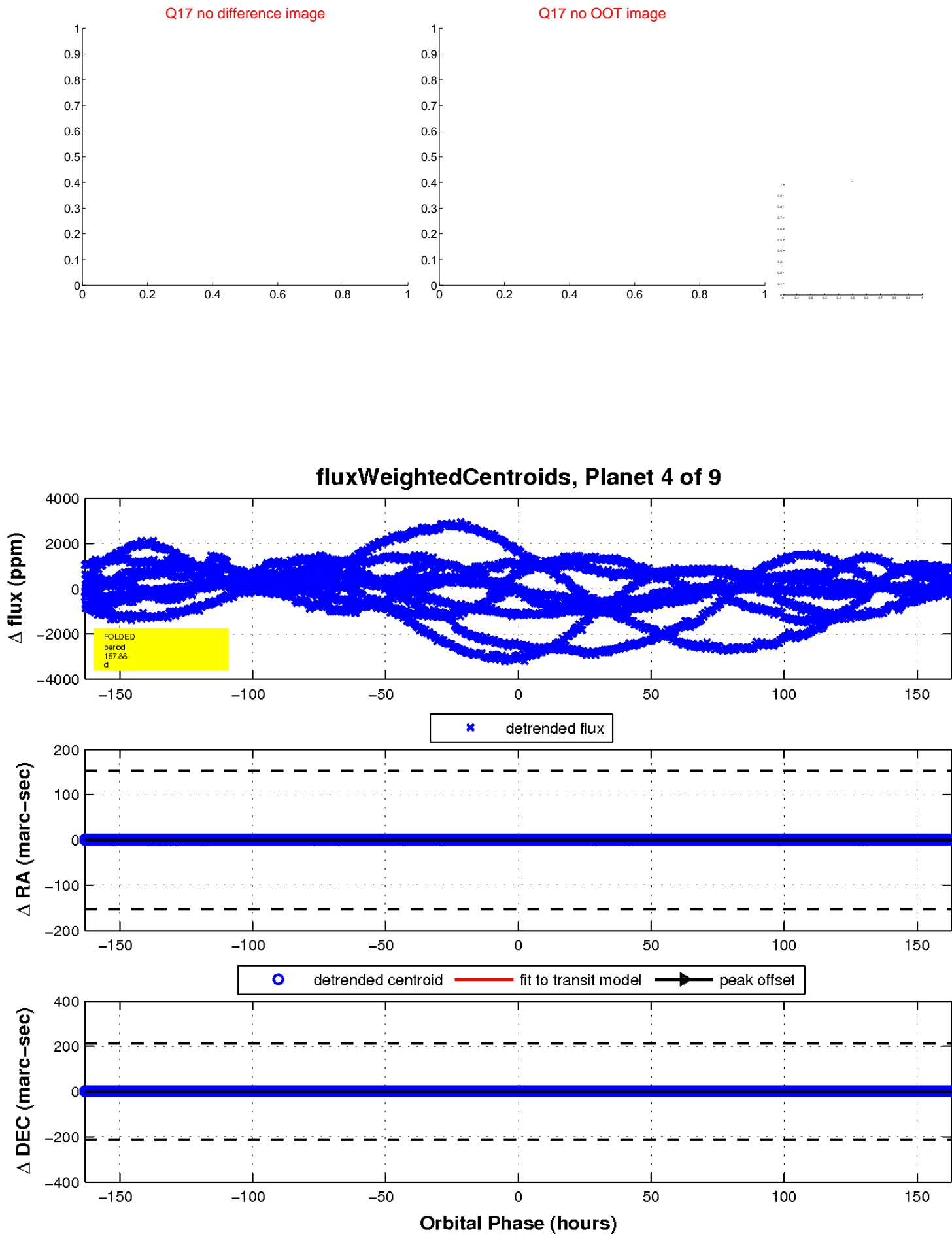


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



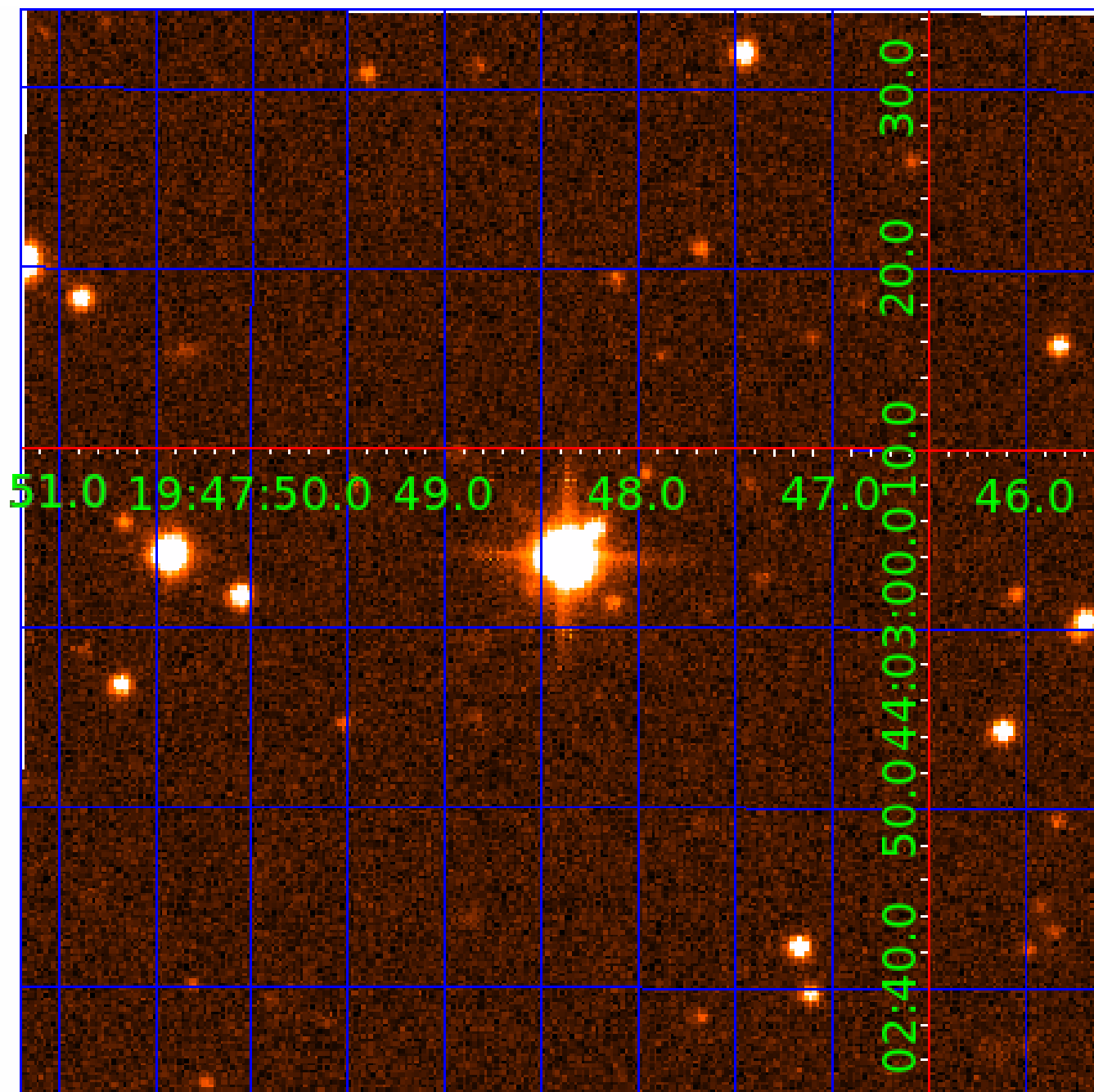


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 008181646

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
008181646-01	OBS	No	2.354098	131.598372	15.8	16.008	7.2	7.7	0.74	5486	0.30	422.09
008181646-02	OBS	No	46.649767	174.321233	110.5	7.773	22.7	2.3	0.74	5486	0.88	7.87
008181646-03	OBS	No	40.939977	153.721226	224.5	5.088	20.0	6.5	0.74	5486	1.24	9.37
008181646-04	OBS	No	157.875096	208.123739	4505.6	54.343	17.3	12.4	0.74	5486	9.20	1.55
008181646-05	OBS	No	48.824583	164.751099	532.2	25.560	15.7	7.3	0.74	5486	3.40	7.41
008181646-06	OBS	No	59.244269	160.876125	298.1	38.985	14.2	4.7	0.74	5486	1.37	5.72
008181646-07	OBS	No	61.879706	179.179822	339.5	8.688	11.4	6.7	0.74	5486	1.45	5.40
008181646-08	OBS	No	42.732442	148.480323	161.0	5.821	11.3	4.3	0.74	5486	0.99	8.85

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
008181646-01	OBS	FP	0.00	1	0	0	0	LPP_DV
008181646-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_TRACKER—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV
008181646-03	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE_ZUMA—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_UNRESOLVED_OFFSET
008181646-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL_SKYE—TRANS_GAPPED—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—INCONSISTENT_TRANS
008181646-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV
008181646-06	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
008181646-07	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_FEW_DIFFS
008181646-08	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV

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

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

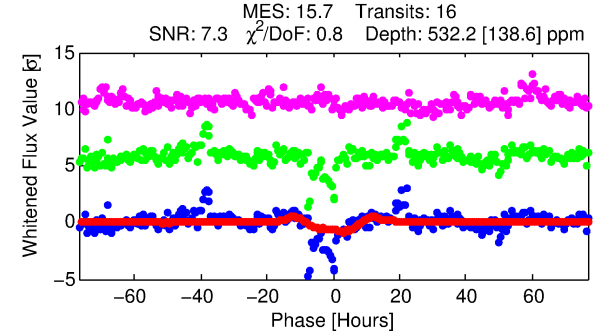
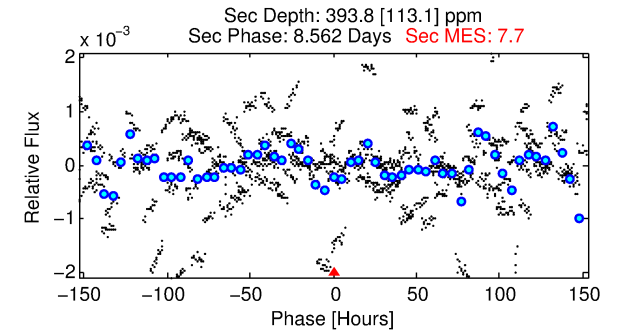
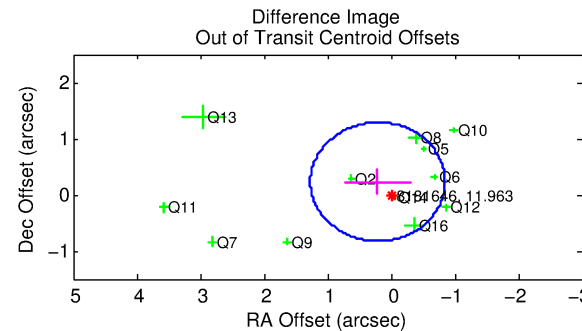
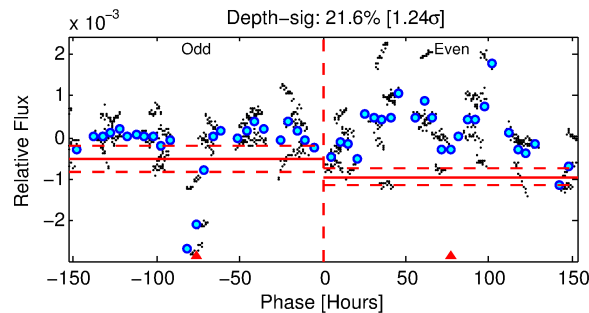
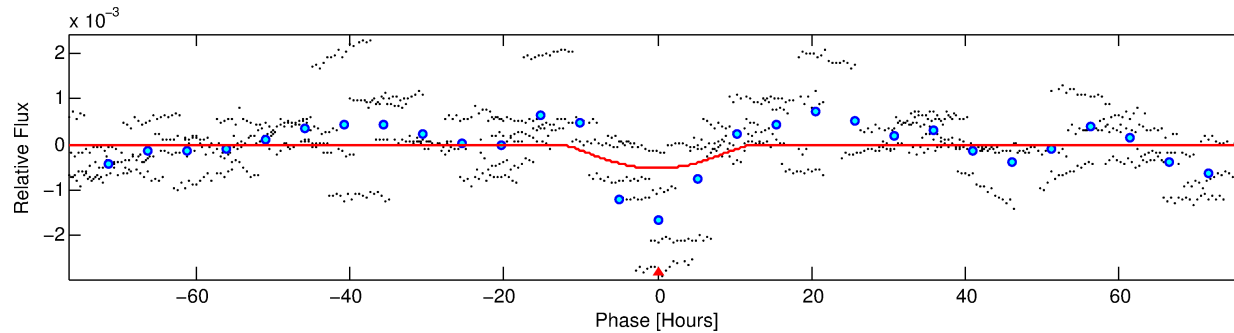
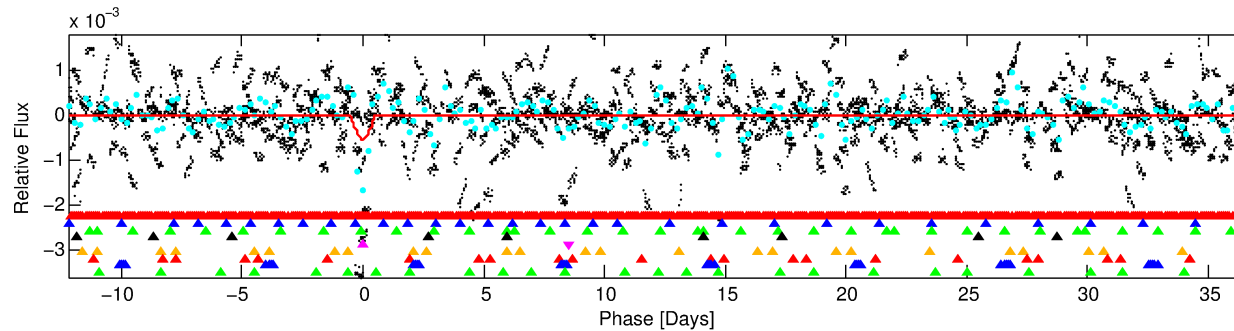
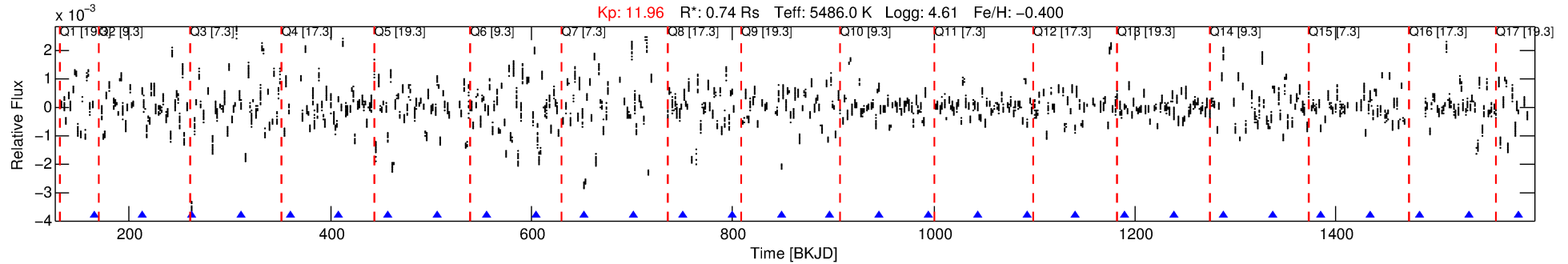
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 008181646-05

No Significant Match Found

# DV One-Page Summary

KIC: 8181646 Candidate: 5 of 9 Period: 48.825 d



## DV Fit Results:

Period = 48.82458 [0.00318] d  
Epoch = 164.7511 [0.0614] BKJD  
 $R_p/R^* = 0.0423$  [0.0611]  
 $a/R^* = 4.41$  [1.45]  
 $b = 1.00$  [0.08]  
 $\text{Seff} = 7.41$  [1.74]  
 $T_{\text{eq}} = 421$  [25] K  
 $R_p = 3.40$  [4.94]  $R_e$   
 $a = 0.2436$  [0.0357] AU  
 $A_g = 1112.50$  [3235.39] [0.34 $\sigma$ ]  
 $T_{\text{eff}} = 3756$  [2726] K [1.22 $\sigma$ ]

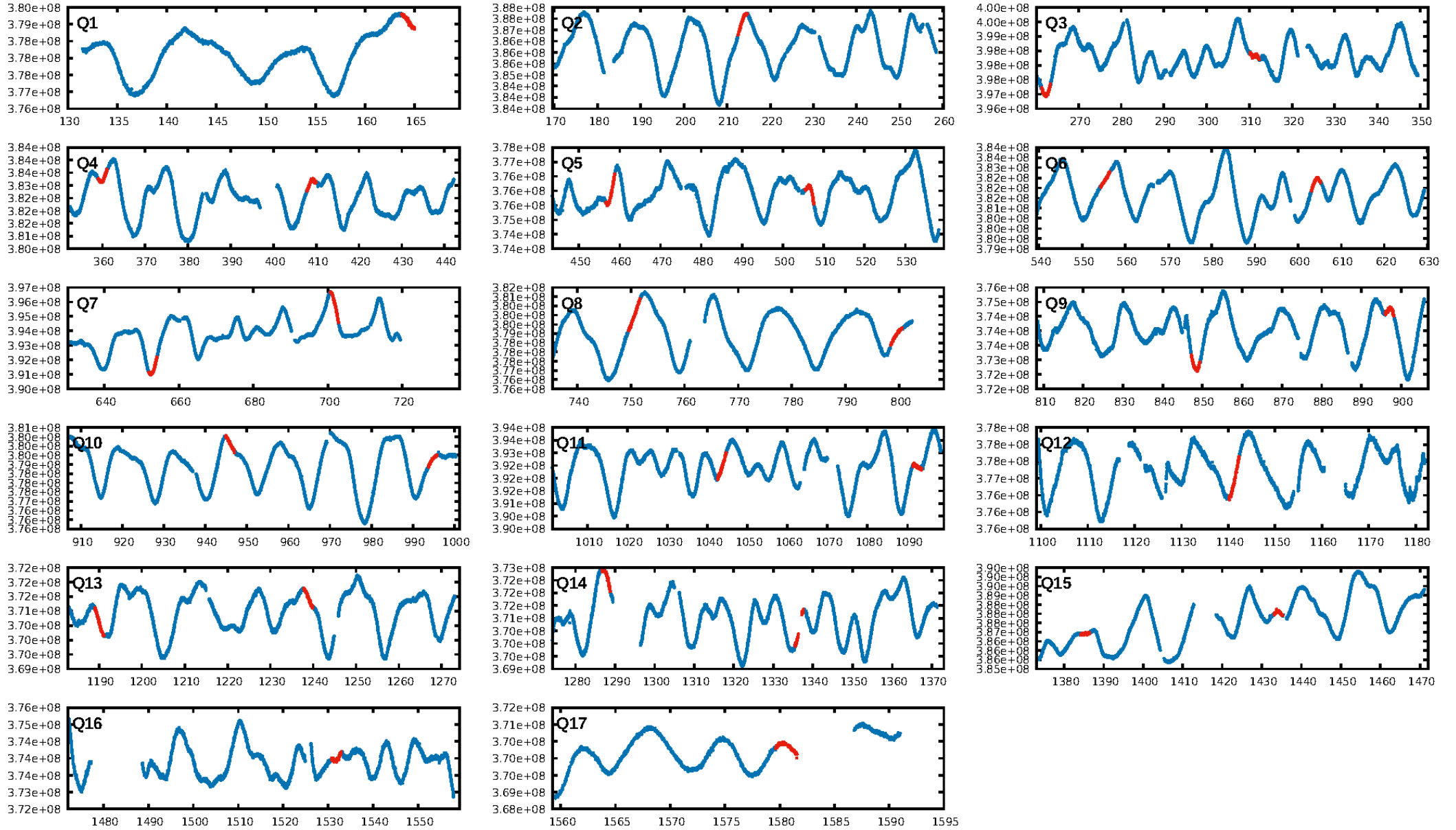
## DV Diagnostic Results:

ShortPeriod-sig: 94.9% [1.95 $\sigma$ ]  
LongPeriod-sig: 100.0% [5.63 $\sigma$ ]  
**ModelChiSquare2-sig: 0.0%**  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [15/15]  
**GhostDiagnostic-chr: -1.245**  
**Centroid-sig: 0.2%**  
**Centroid-so: 0.258 arcsec [3.13 $\sigma$ ]**  
OotOffset-rm: 0.313 arcsec [0.89 $\sigma$ ]  
KicOffset-rm: 0.082 arcsec [0.30 $\sigma$ ]  
OotOffset-st: 4/2/3/3 [12]  
KicOffset-st: 4/2/3/3 [12]  
DiffImageQuality-fgm: 0.33 [4/12]  
DiffImageOverlap-fno: 0.00 [0/15]

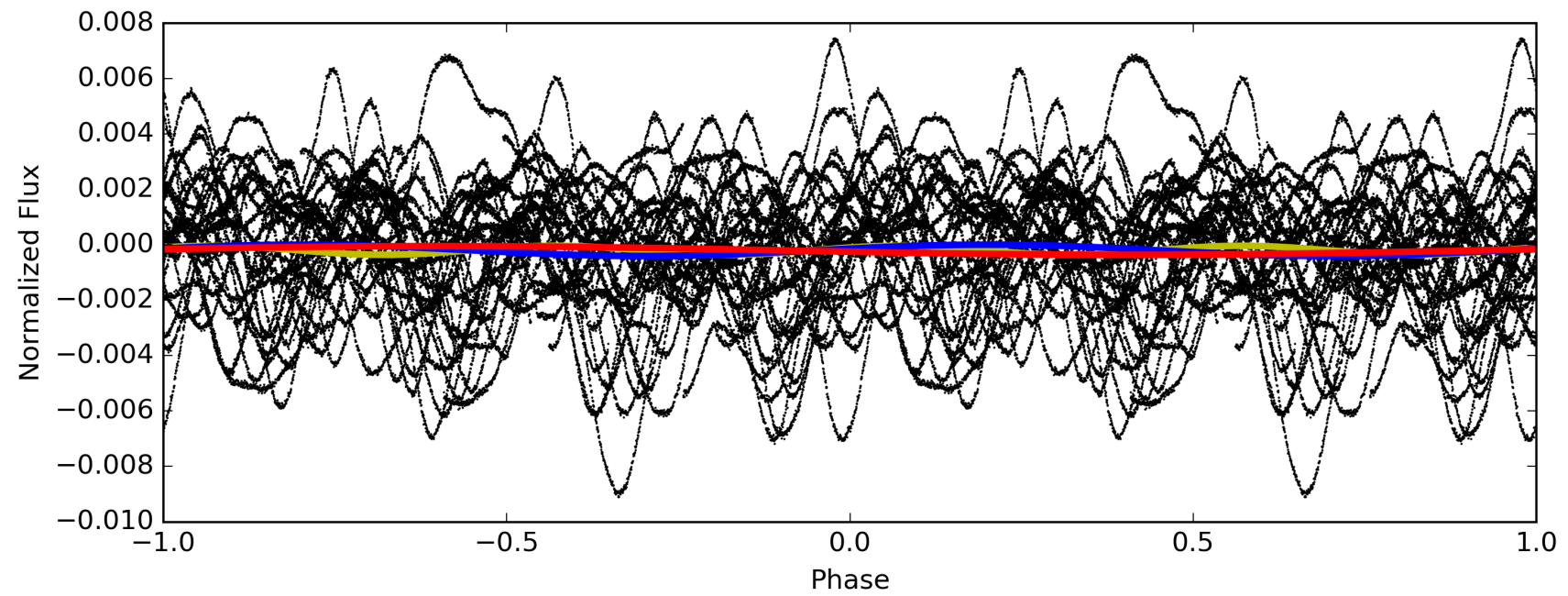
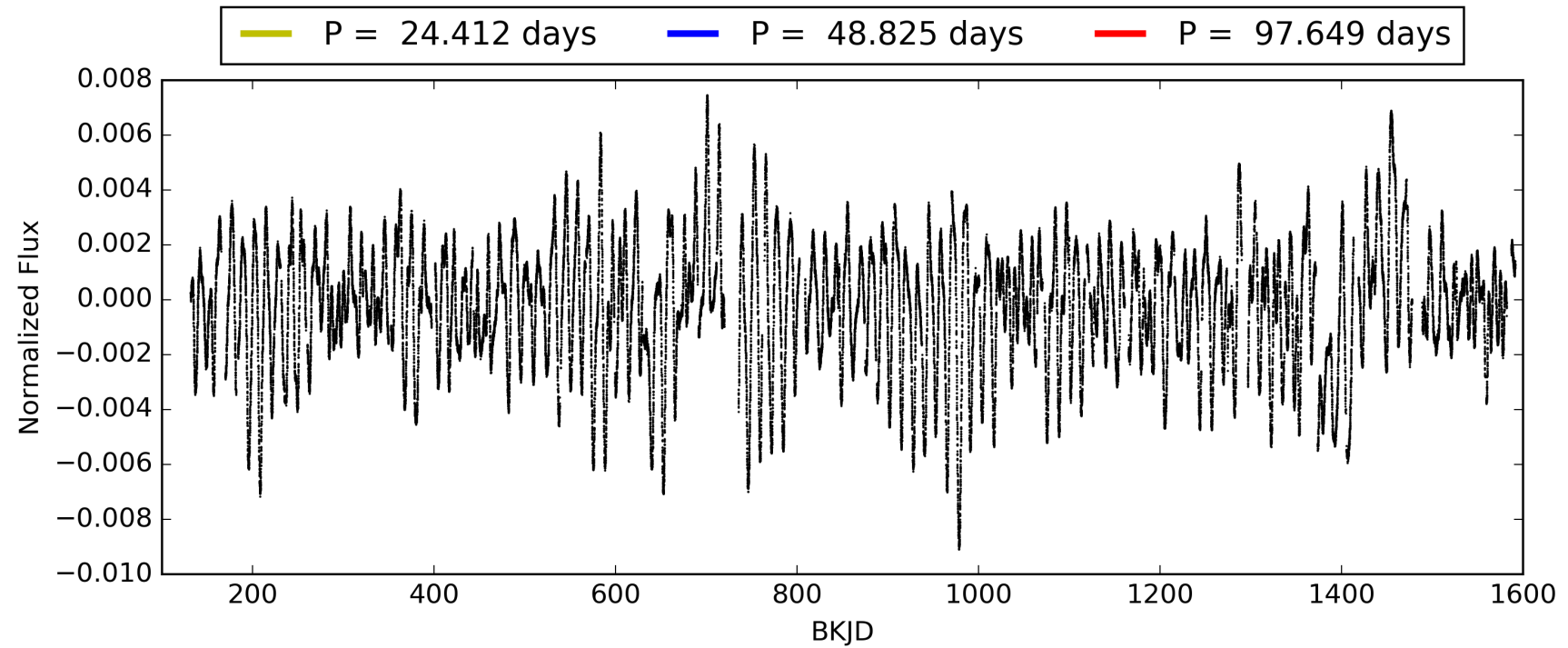
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 23:57:44 Z

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

# TCE 008181646-05, PDC Light Curves

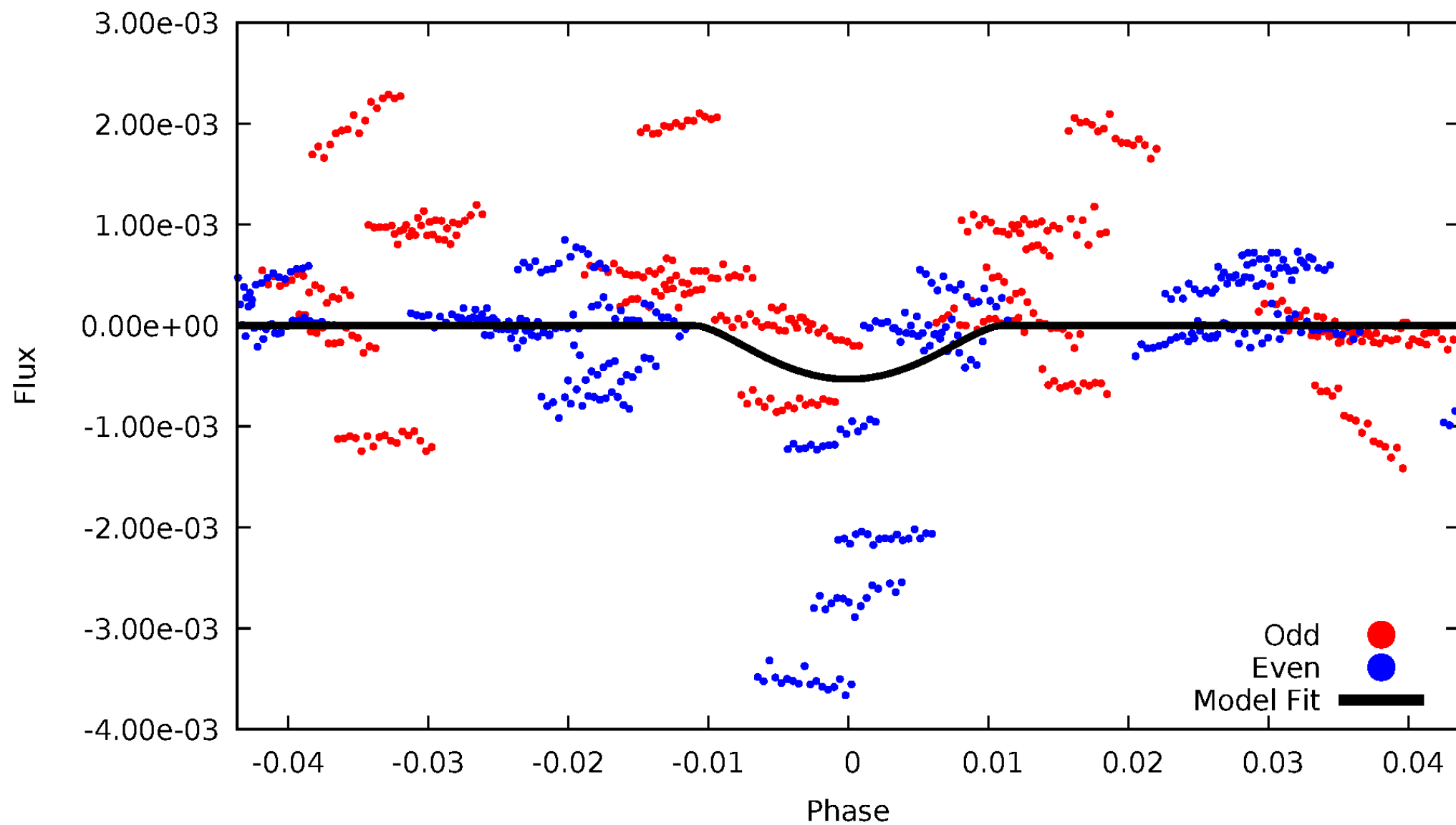


TCE 008181646-05



# DV Odd/Even

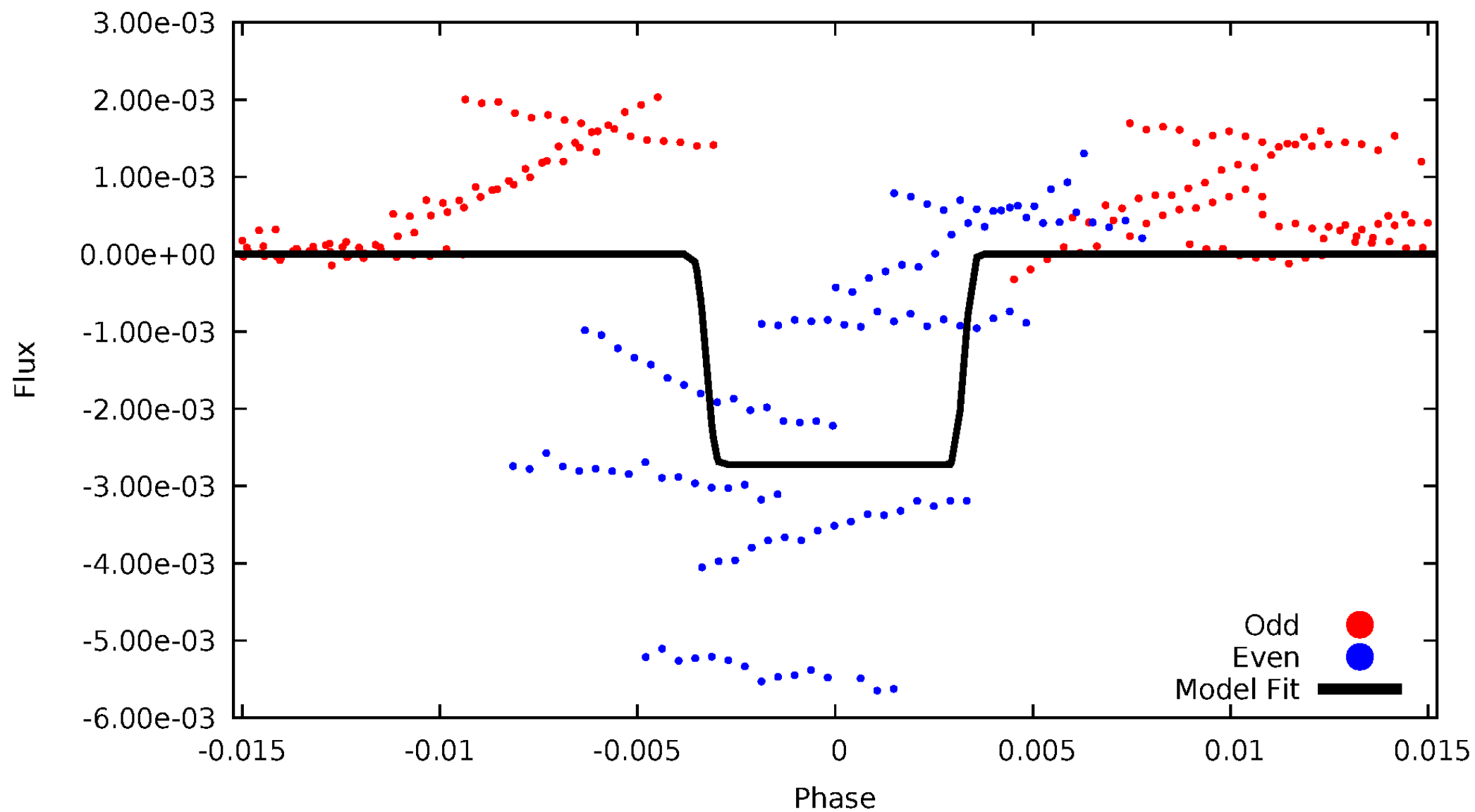
TCE 008181646-05





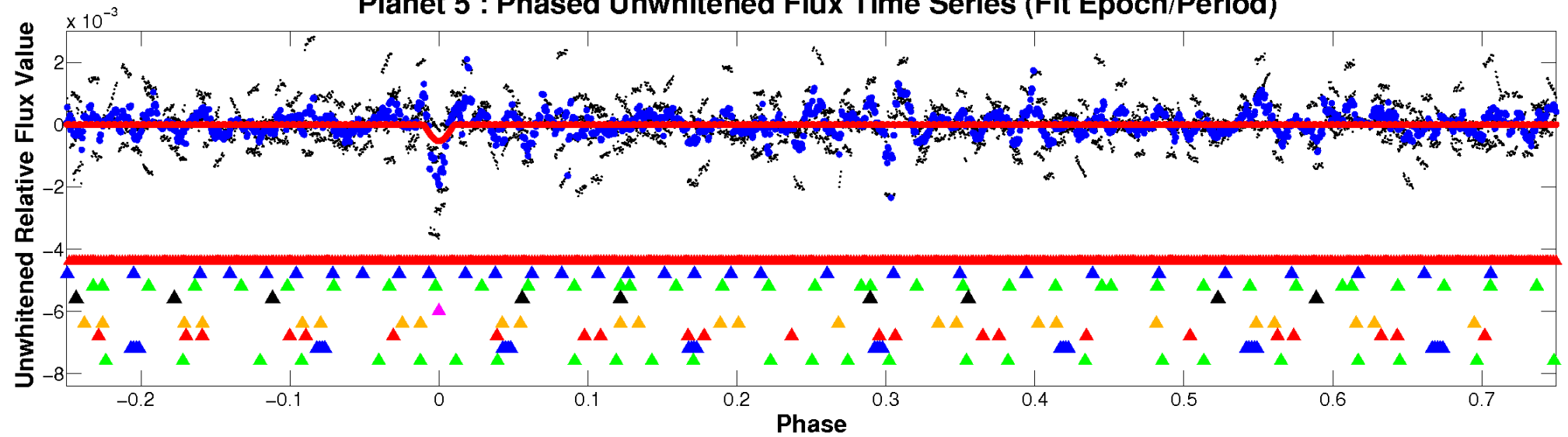
# ALT Odd/Even

TCE 008181646-05

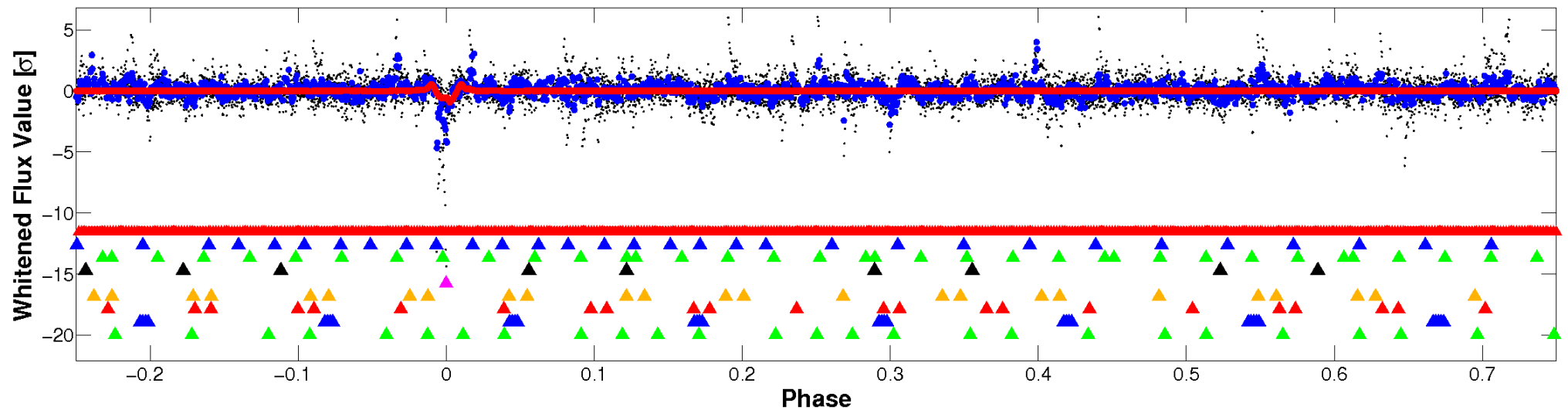


# Non-Whitened Vs. Whitened Light Curve

## Planet 5 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)

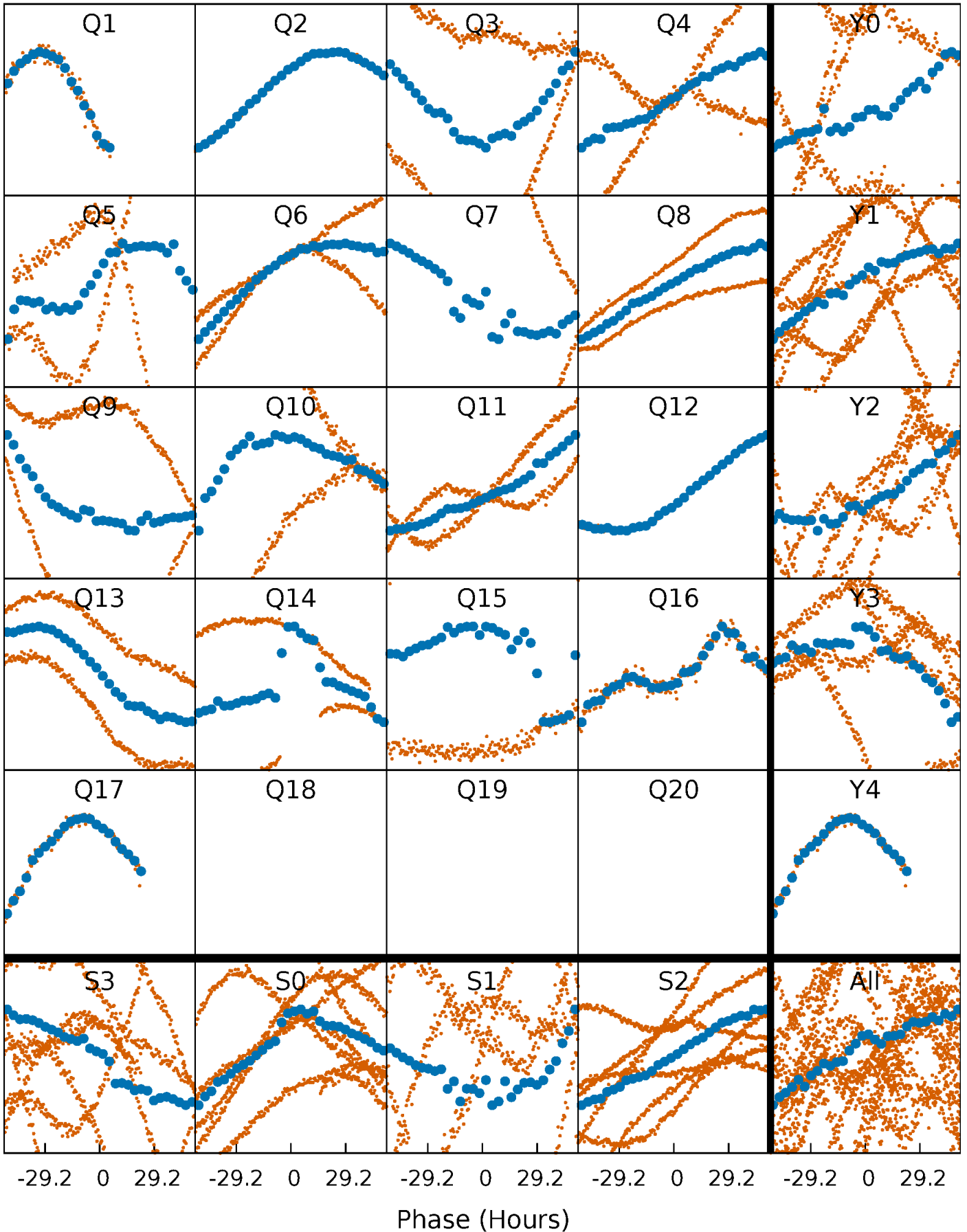


## Planet 5 : Phased Whitened Flux Time Series (Fit Epoch/Period)



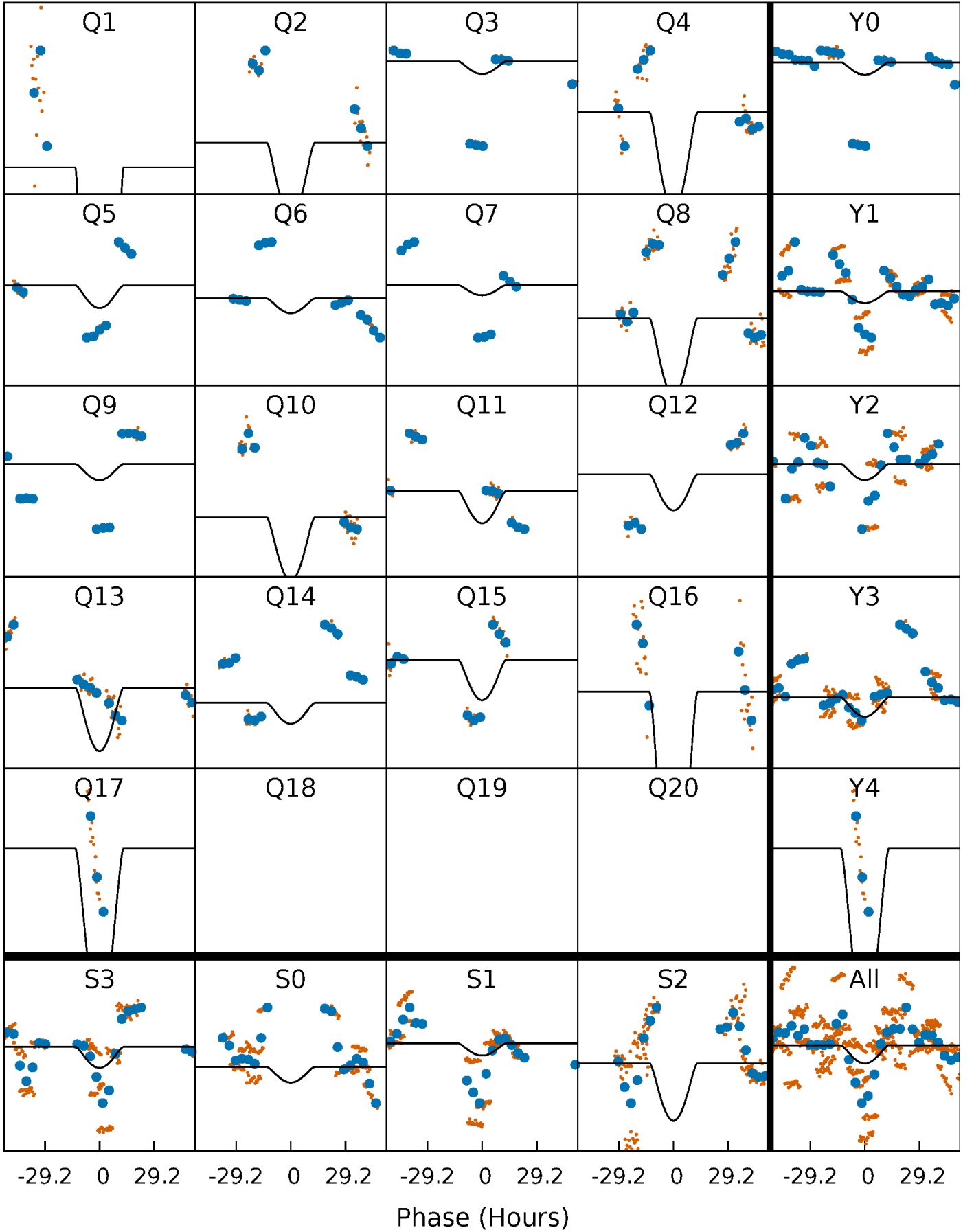
# PDC Quarter-Phased Transit Curves

TCE 008181646-05   P= 48.824583 Days    $T_0=164.751099$  (BKJD)



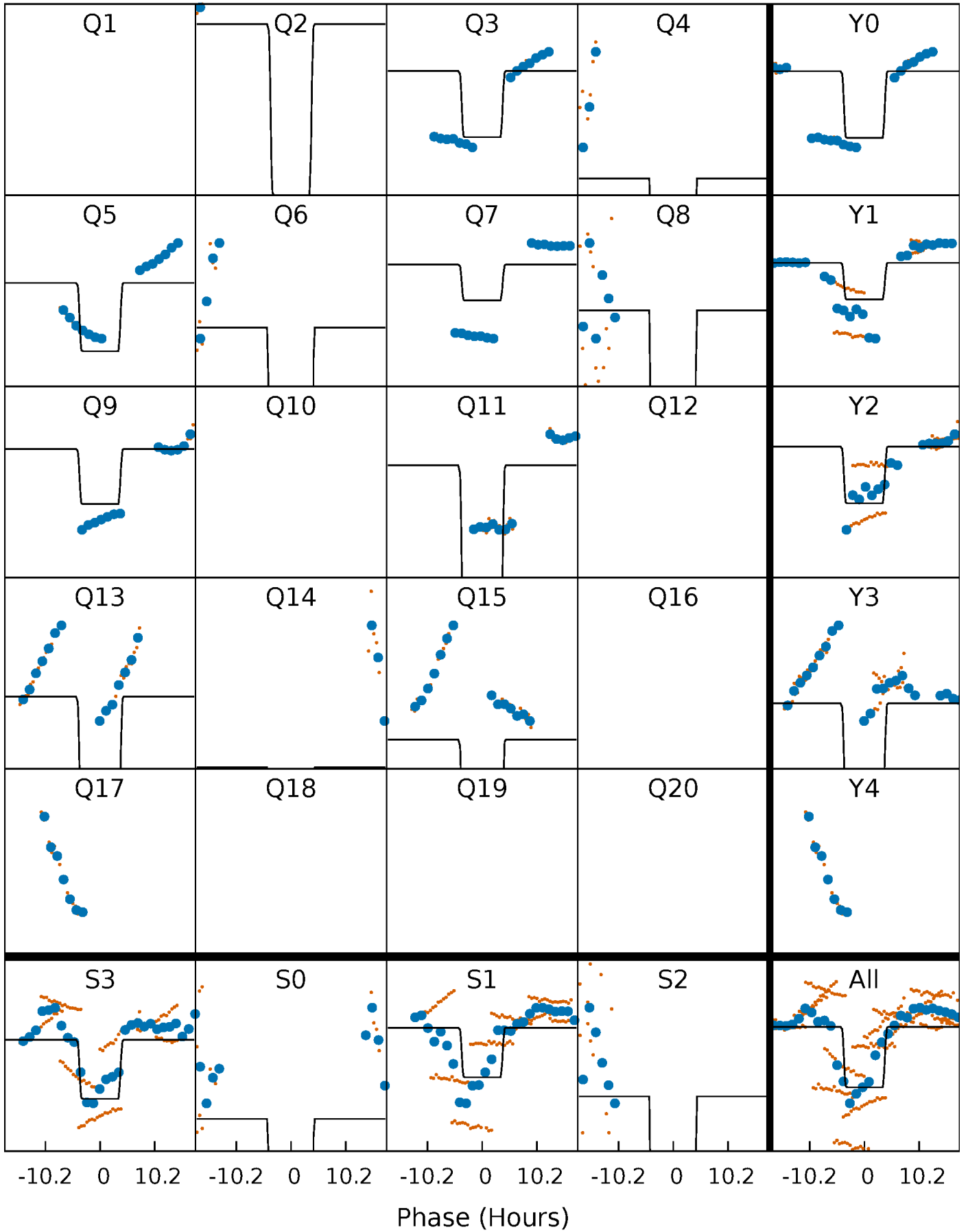
# DV Quarter-Phased Transit Curves

TCE 008181646-05   P= 48.824583 Days    $T_0=164.751099$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

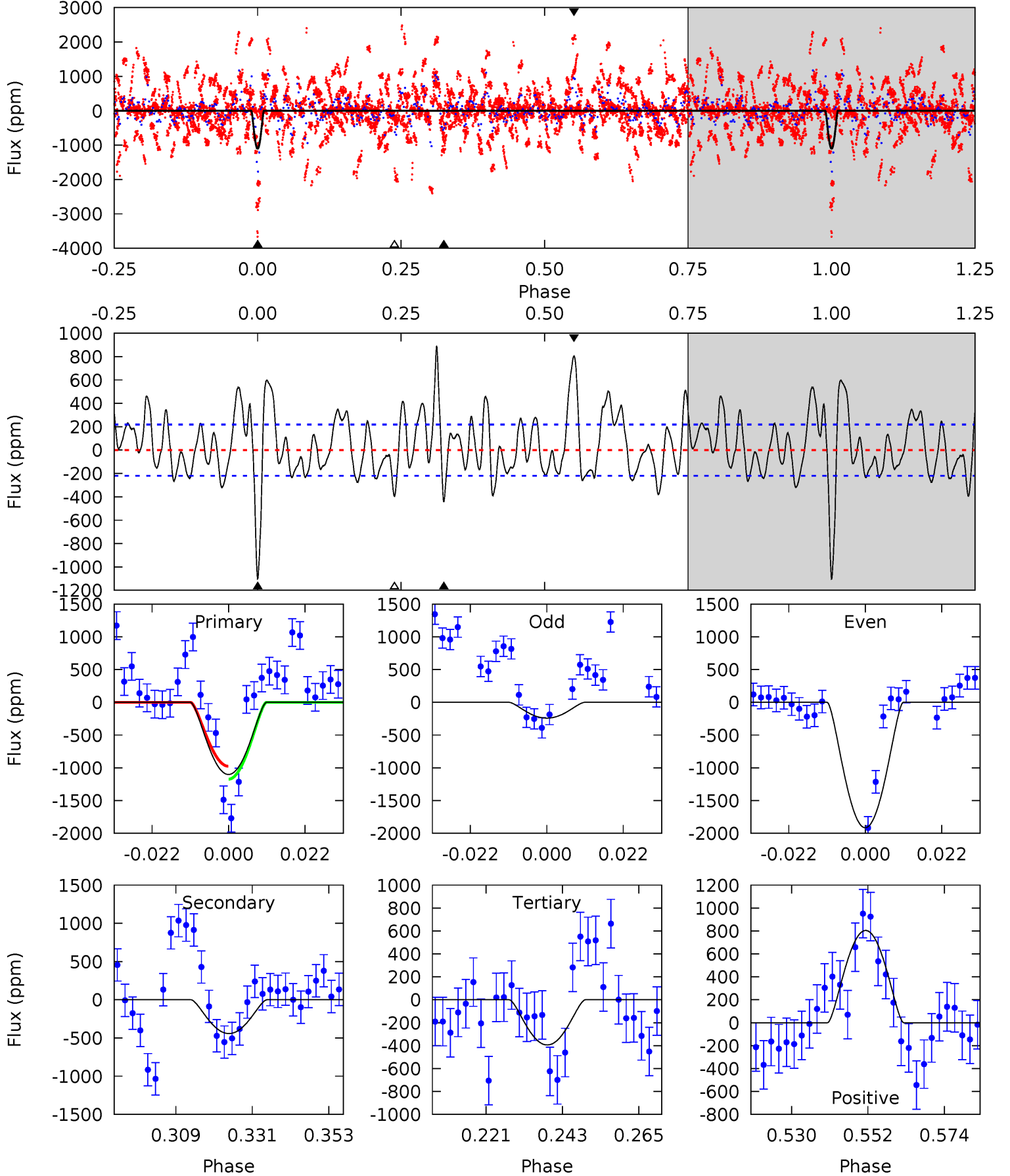
TCE 008181646-05     $P = 48.828515$  Days     $T_0 = 164.825449$  (BKJD)



# DV Model-Shift Uniqueness Test

008181646-05, P = 48.824583 Days, E = 115.926516 Days

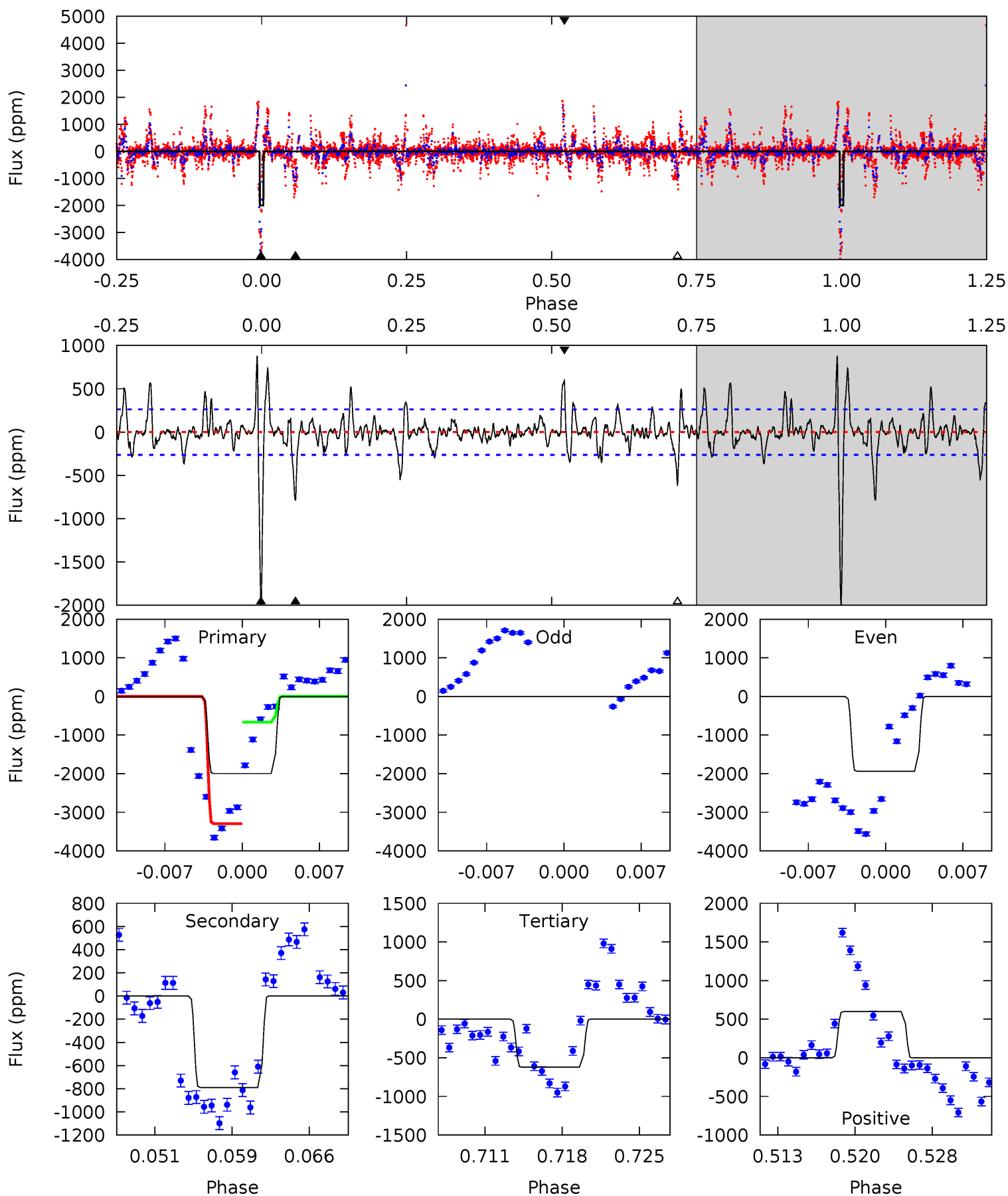
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
24.5	9.82	8.75	17.9	4.87	2.29	5.08	15.7	6.61	1.06	-8.04	18.7	348.4	0.45	2.16



# Alt Model-Shift Uniqueness Test

008181646-05, P = 48.828515 Days, E = 115.996934 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
38.5	15.2	12.0	11.5	5.09	2.68	2.78	26.6	27.0	3.25	3.72	0	1.09	0.31	25.3



### Stellar Parameters For KIC 008181646

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5486^{+146}_{-146}$	$4.612^{+0.037}_{-0.112}$	$-0.400^{+0.300}_{-0.300}$	$0.736^{+0.131}_{-0.056}$	$0.824^{+0.075}_{-0.092}$	$2.905^{+0.476}_{-1.066}$
	+3%/-3%	+1%/-2%	+75%/-75%	+18%/-8%	+9%/-11%	+16%/-37%
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 008181646-05 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-442 \pm 45$	$5.24^{+4.46}_{-3.49}$	$597^{+25}_{-21}$	$3588^{+1957}_{-600}$	$510^{+4269}_{-366}$
Alt.	$-789 \pm 52$	$5.58^{+4.41}_{-3.65}$	$597^{+27}_{-23}$	$3890^{+2145}_{-671}$	$839^{+5724}_{-583}$

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



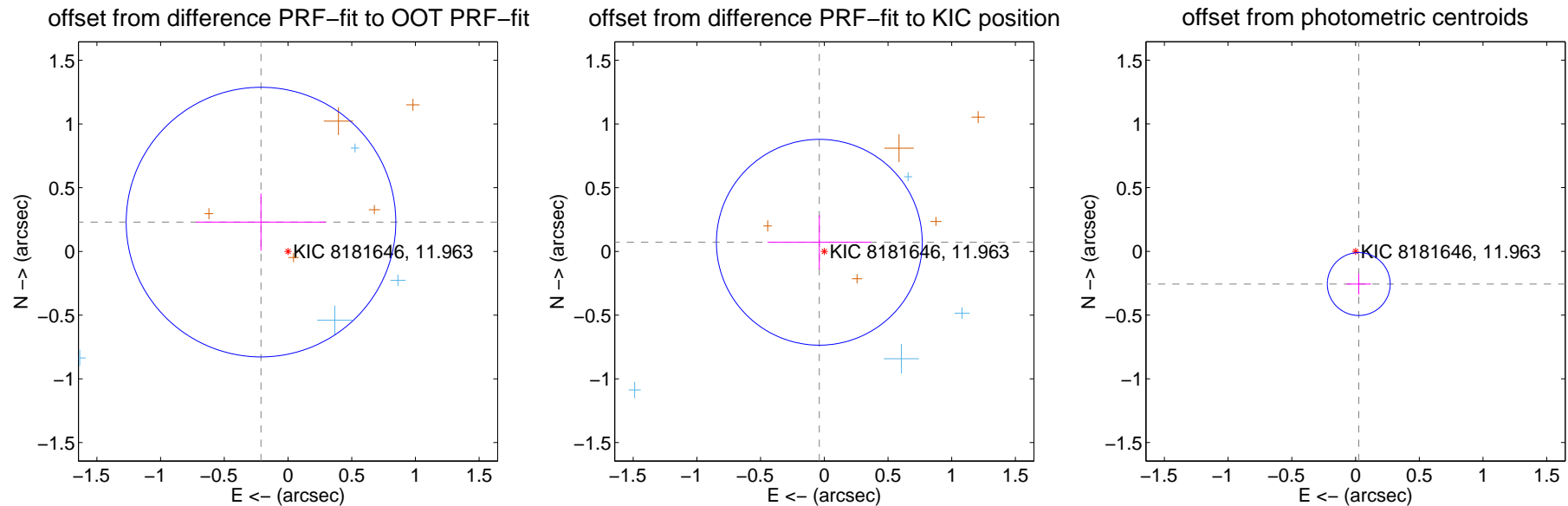
## DV Centroid Data

Supplemental centroid analysis for 008181646-05. **Kepler magnitude: 11.96.** Transit SNR 7.29

There are 4 quarters with good PRF difference image offsets

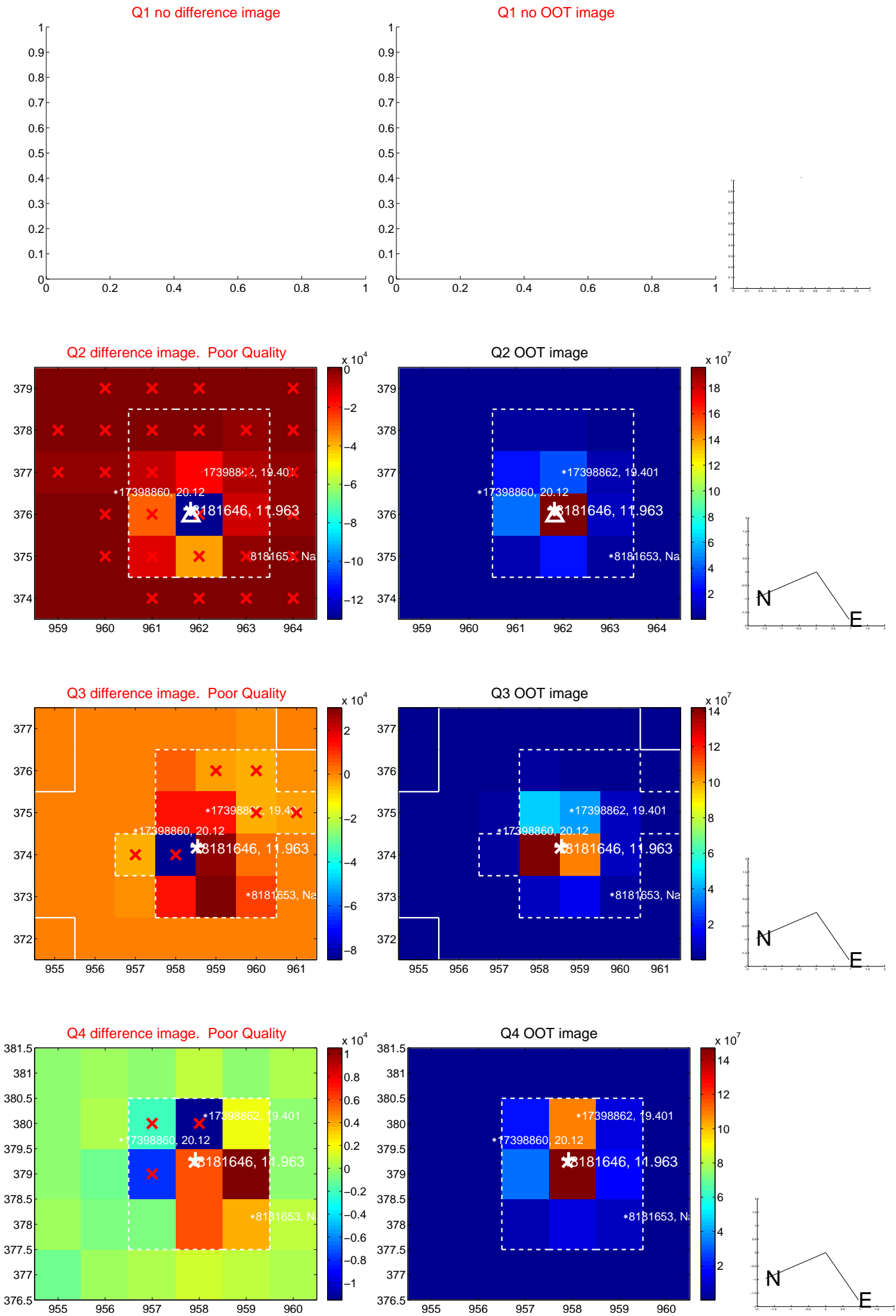
The direct PRF centroid is offset from the target star catalog position by about 0.38 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.313 \pm 0.353$	0.89	$0.212 \pm 0.510$	$0.230 \pm 0.224$
PRF-fit source offset from KIC position	$0.082 \pm 0.269$	0.30	$0.039 \pm 0.407$	$0.072 \pm 0.212$
photometric centroid source offset	$0.26 \pm 0.08$	<b>3.13</b>	$-0.03 \pm 0.10$	$-0.26 \pm 0.08$

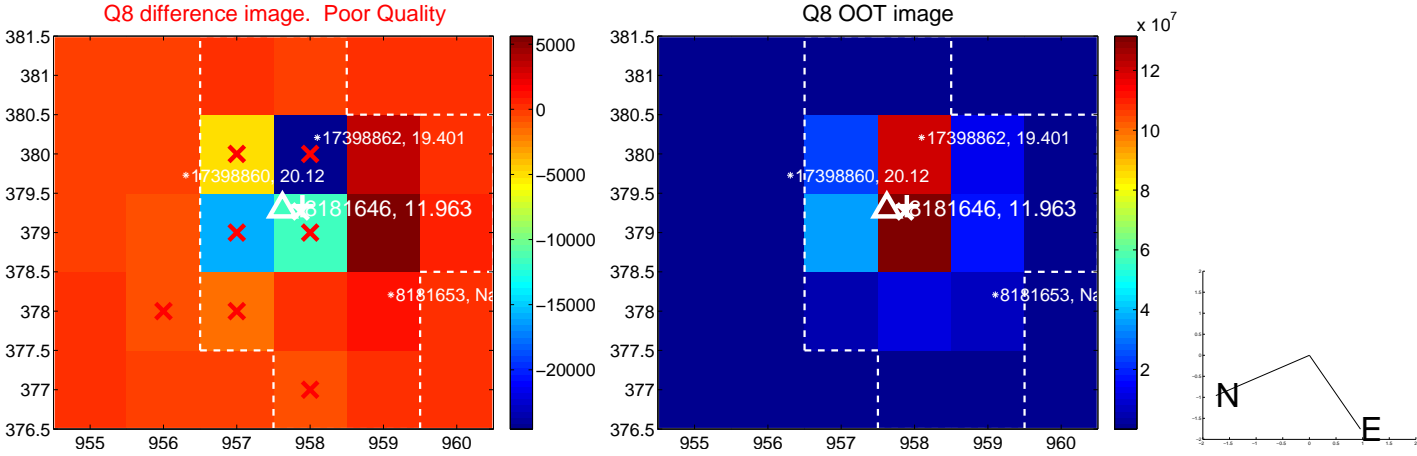
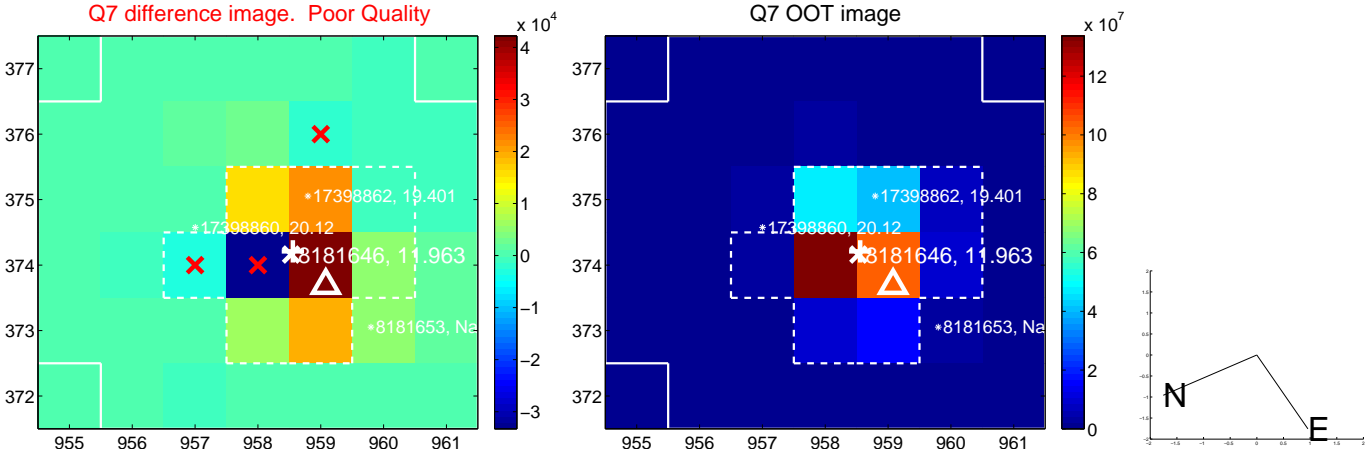
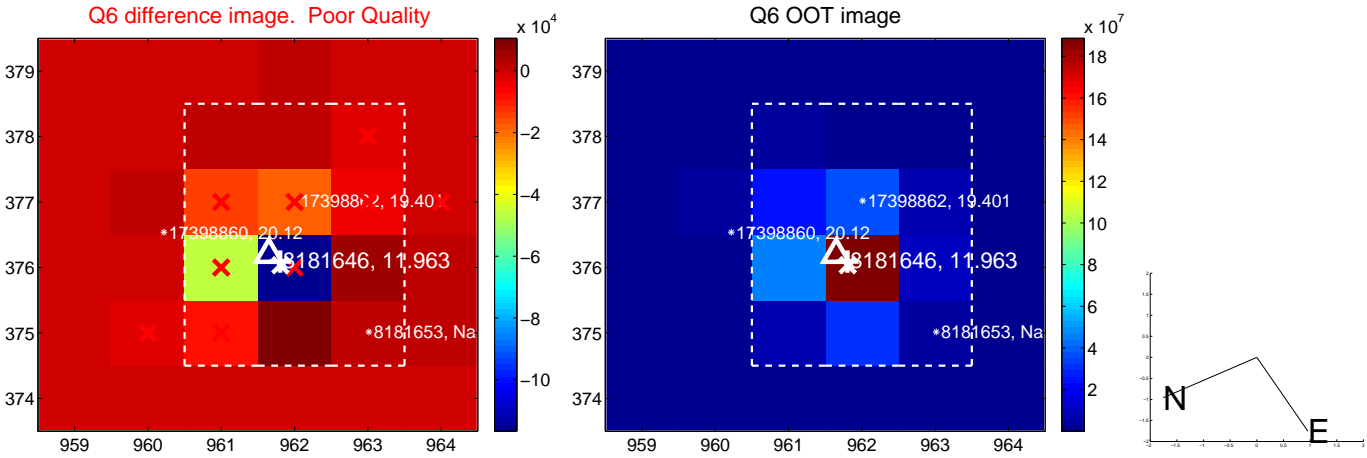
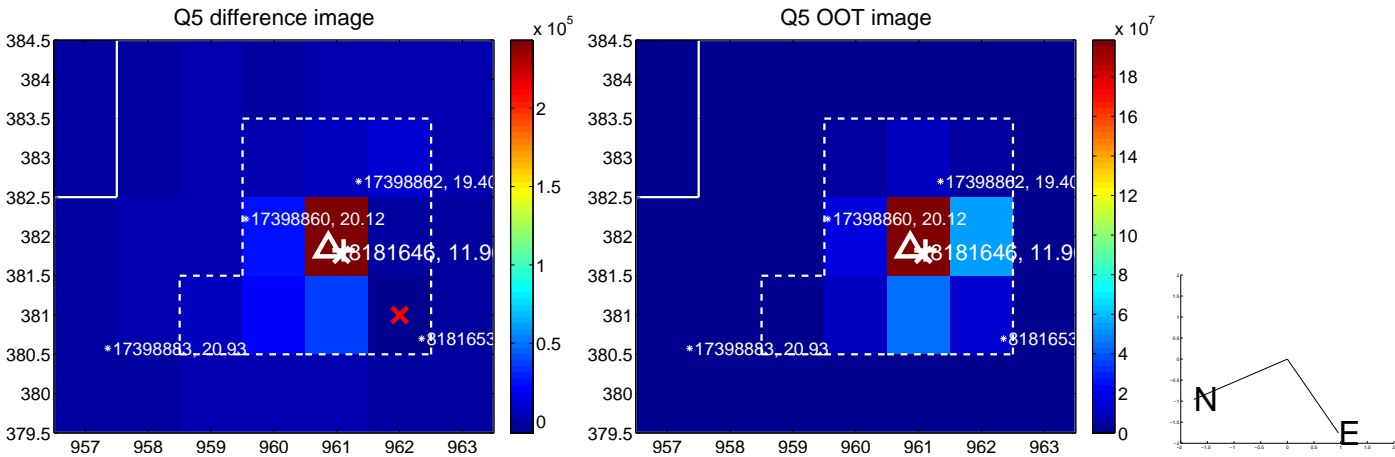


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets;** magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

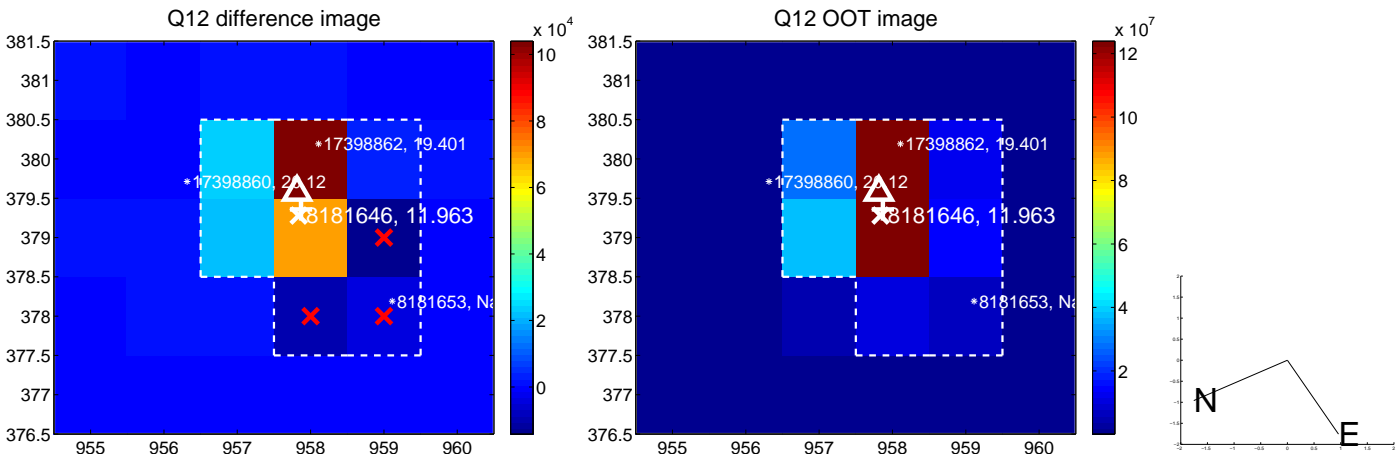
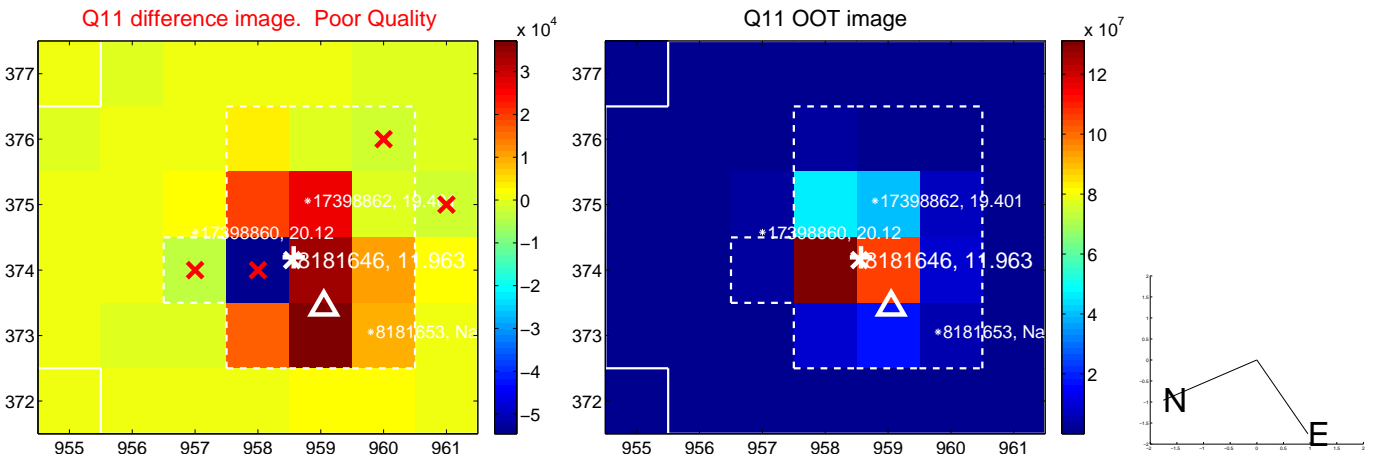
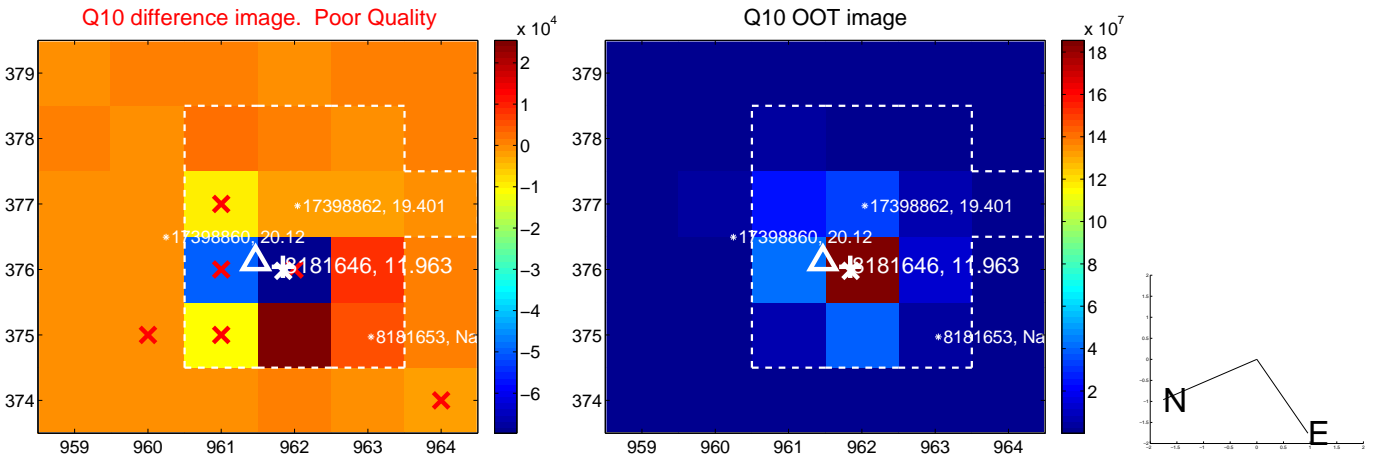
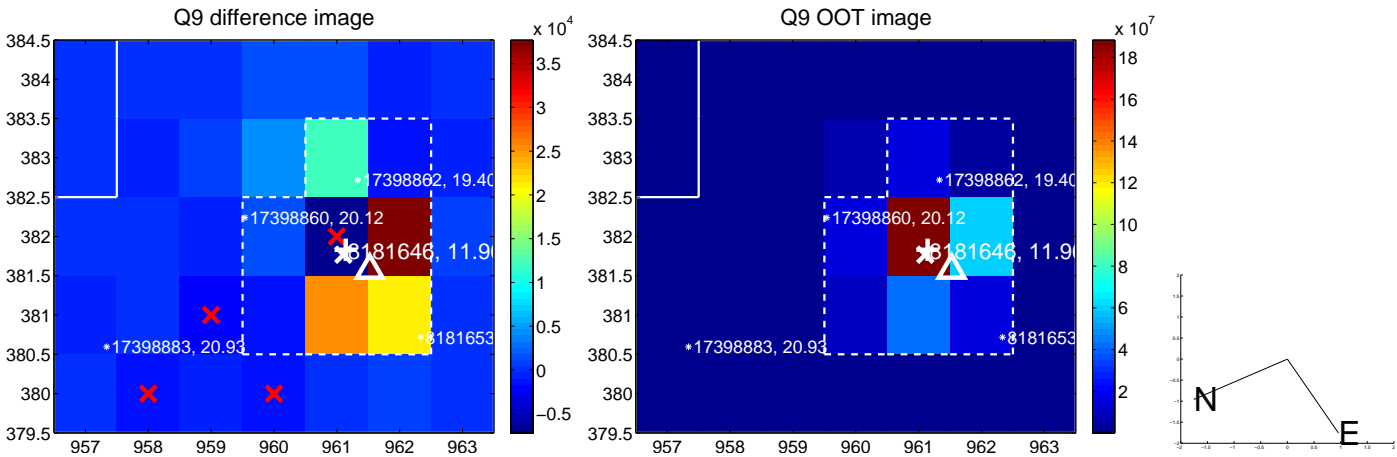
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



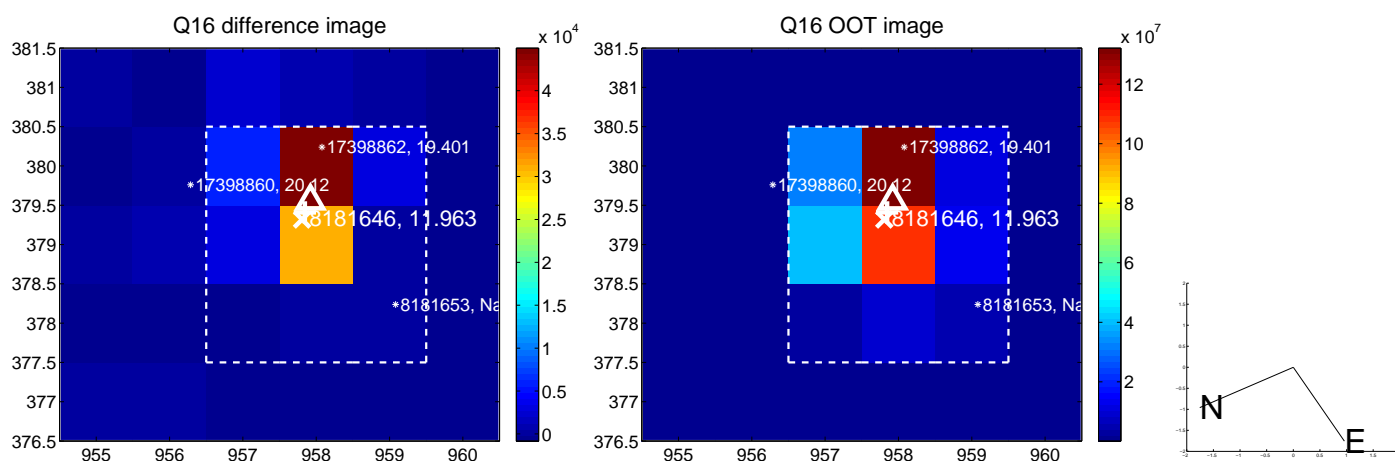
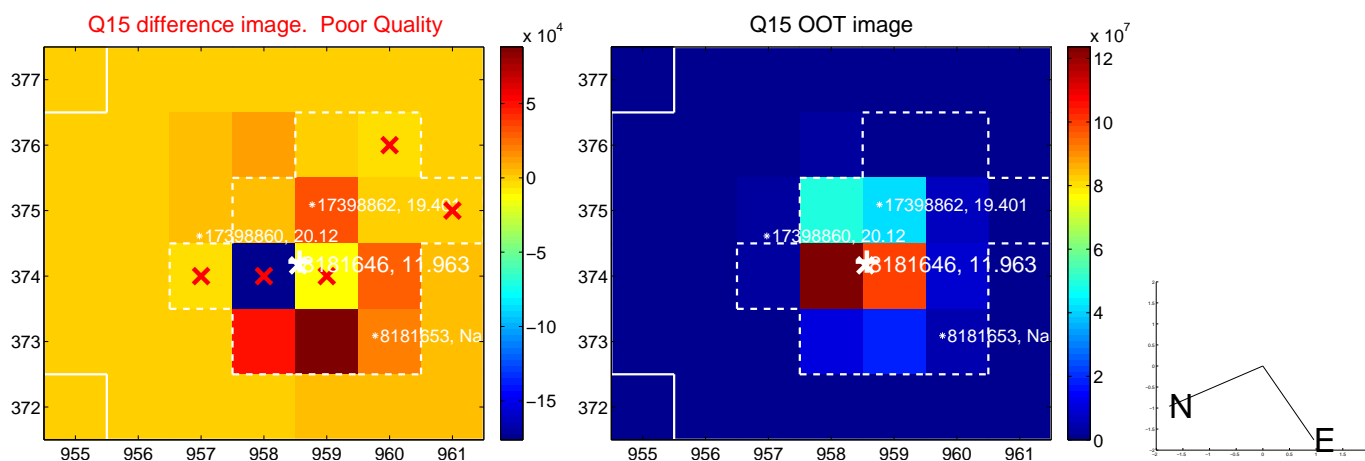
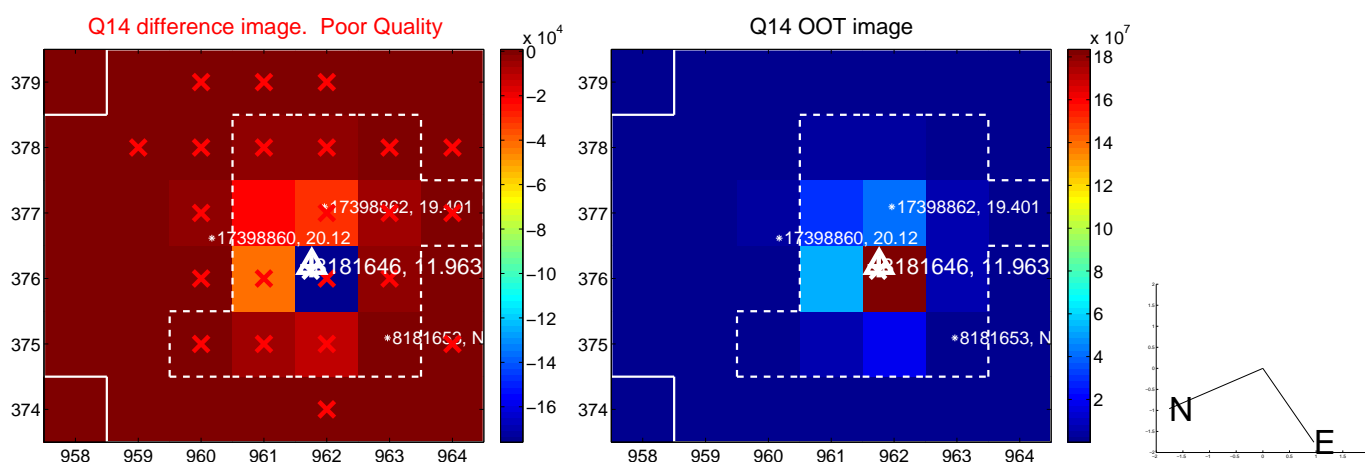
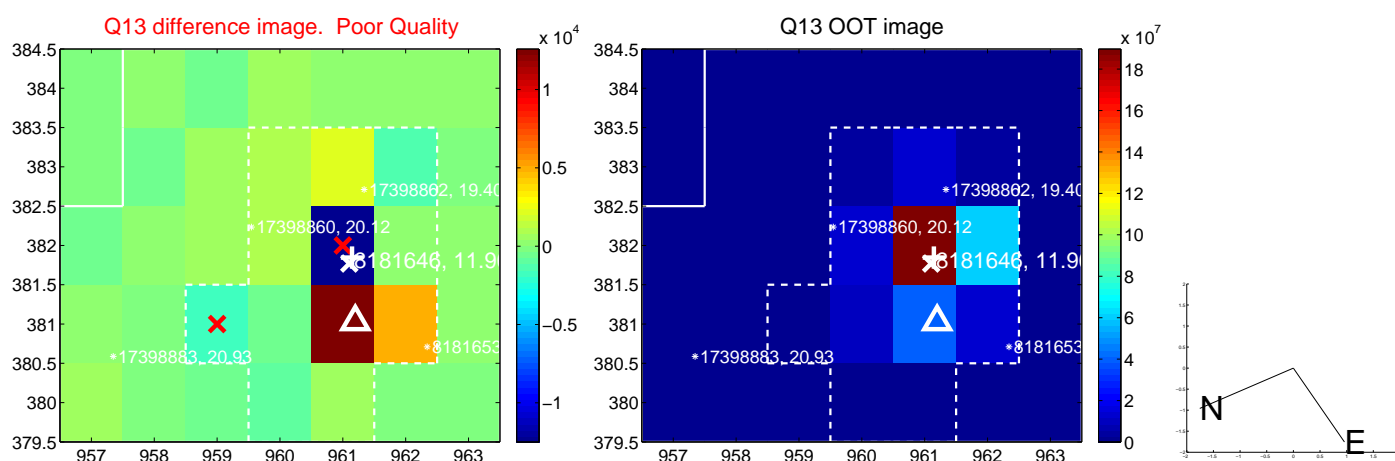
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



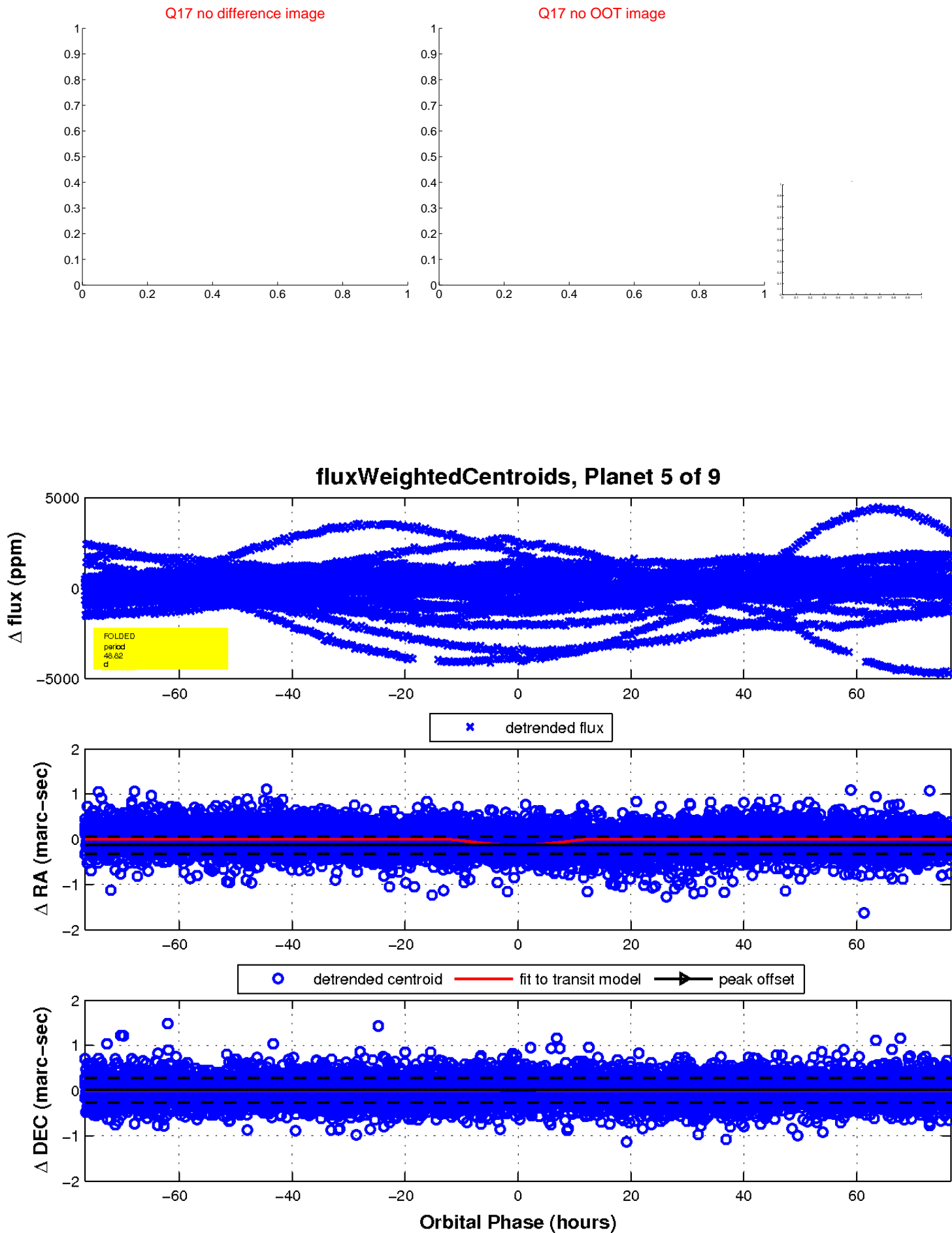
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

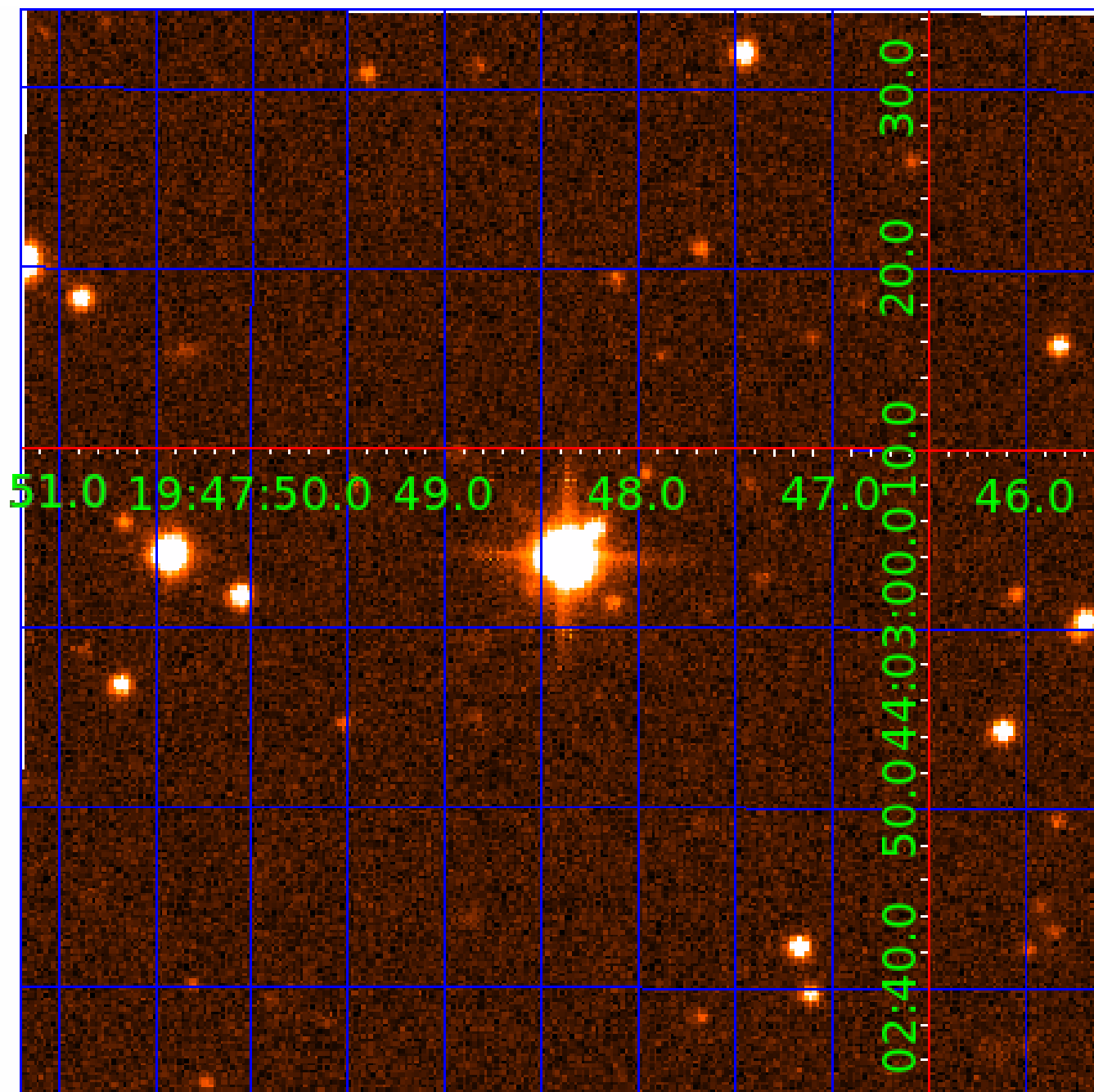


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 008181646

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
008181646-01	OBS	No	2.354098	131.598372	15.8	16.008	7.2	7.7	0.74	5486	0.30	422.09
008181646-02	OBS	No	46.649767	174.321233	110.5	7.773	22.7	2.3	0.74	5486	0.88	7.87
008181646-03	OBS	No	40.939977	153.721226	224.5	5.088	20.0	6.5	0.74	5486	1.24	9.37
008181646-04	OBS	No	157.875096	208.123739	4505.6	54.343	17.3	12.4	0.74	5486	9.20	1.55
008181646-05	OBS	No	48.824583	164.751099	532.2	25.560	15.7	7.3	0.74	5486	3.40	7.41
008181646-06	OBS	No	59.244269	160.876125	298.1	38.985	14.2	4.7	0.74	5486	1.37	5.72
008181646-07	OBS	No	61.879706	179.179822	339.5	8.688	11.4	6.7	0.74	5486	1.45	5.40
008181646-08	OBS	No	42.732442	148.480323	161.0	5.821	11.3	4.3	0.74	5486	0.99	8.85

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
008181646-01	OBS	FP	0.00	1	0	0	0	LPP_DV
008181646-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_TRACKER—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV
008181646-03	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE_ZUMA—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_UNRESOLVED_OFFSET
008181646-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL_SKYE—TRANS_GAPPED—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—INCONSISTENT_TRANS
008181646-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV
008181646-06	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
008181646-07	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_FEW_DIFFS
008181646-08	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV

**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.

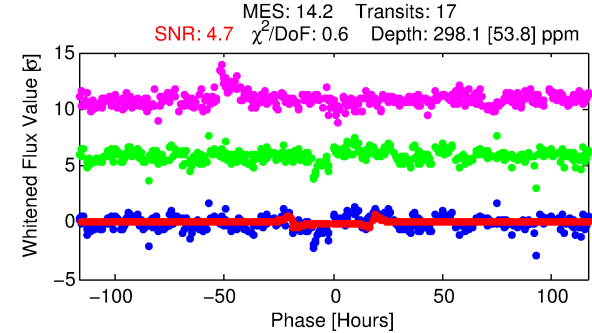
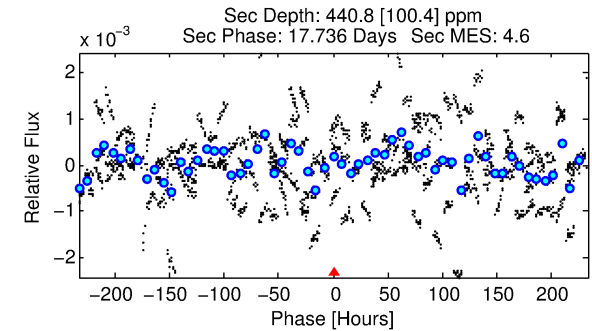
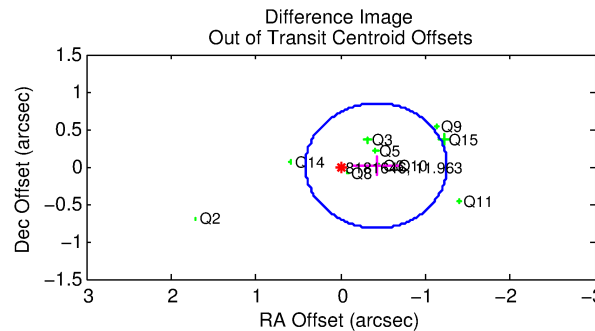
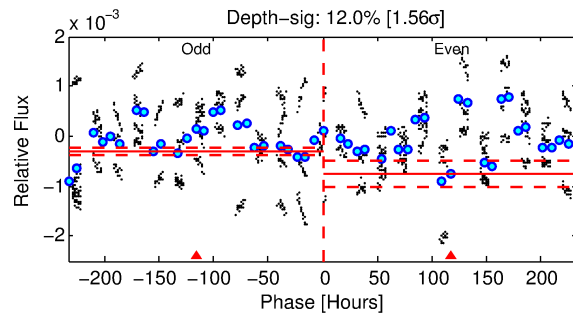
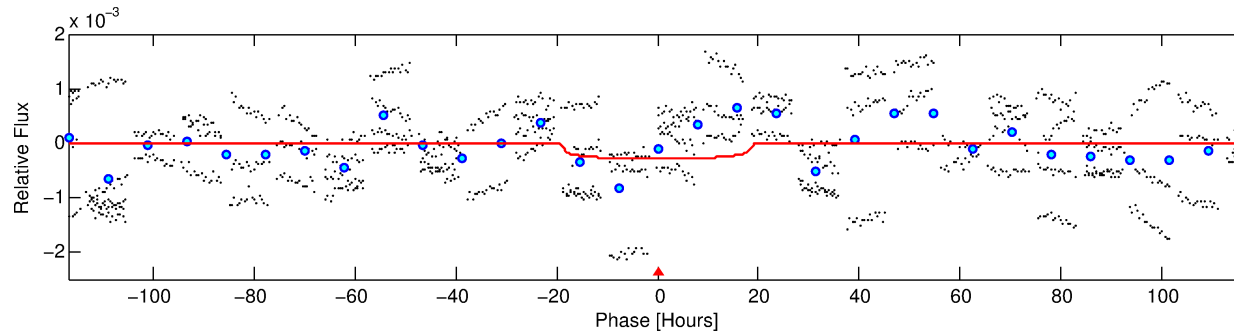
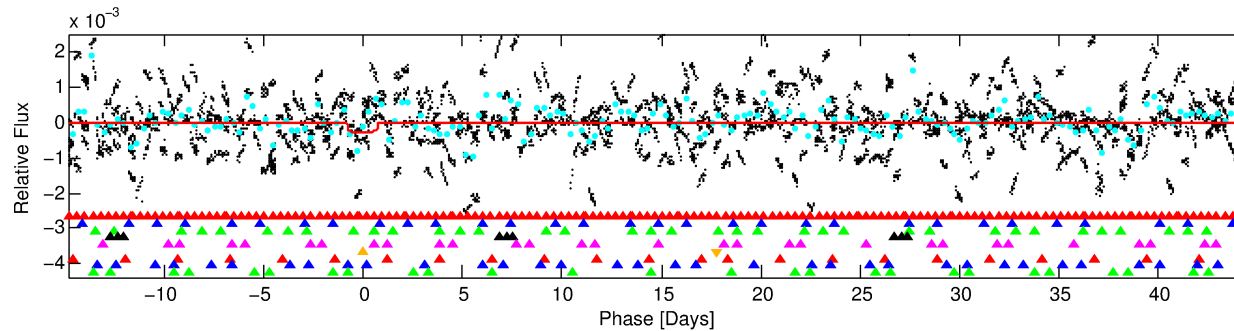
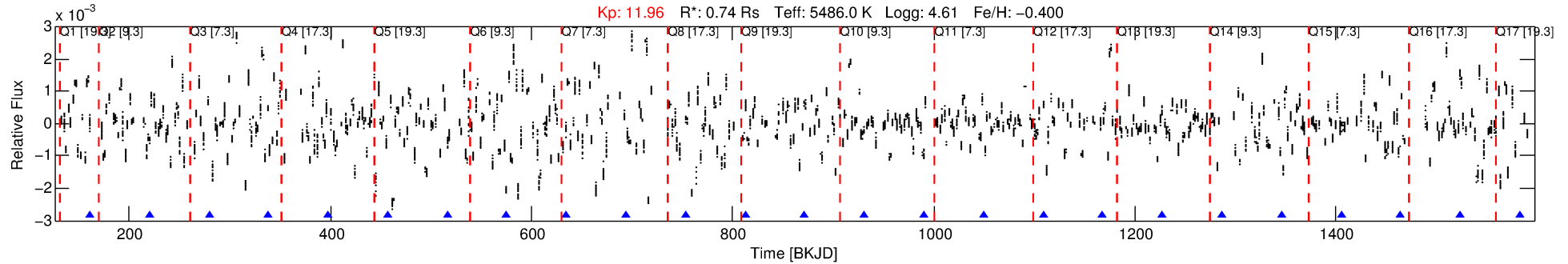
Ephemeris Match Information For 008181646-06

No Significant Match Found



# DV One-Page Summary

KIC: 8181646 Candidate: 6 of 9 Period: 59.244 d



## DV Fit Results:

Period = 59.24427 [0.00176] d  
Epoch = 160.8761 [0.0264] BKJD  
Rp/R\* = 0.0171 [0.0023]  
a/R\* = 8.21 [3.35]  
b = 0.73 [0.26]  
Seff = 5.72 [1.34]  
Teq = 394 [23] K  
Rp = 1.37 [0.31] Re  
a = 0.2771 [0.0406] AU  
Ag = 9898.36 [4050.83] [2.44 $\sigma$ ]  
Teffp = 6082 [559] K [10.17 $\sigma$ ]

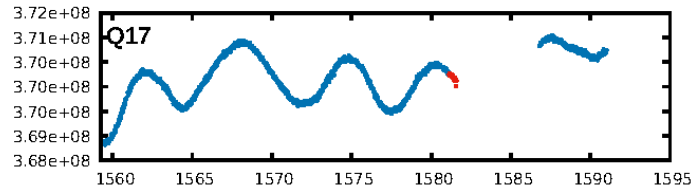
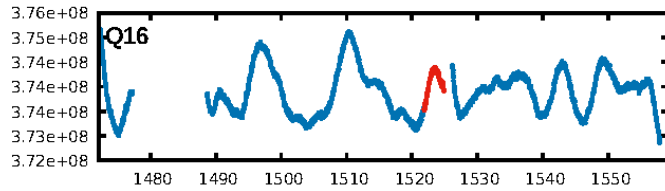
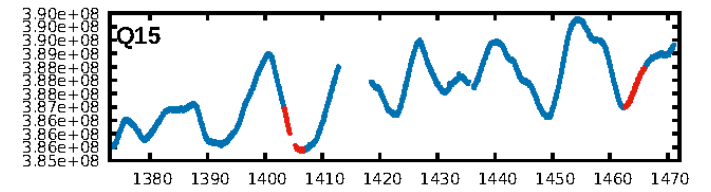
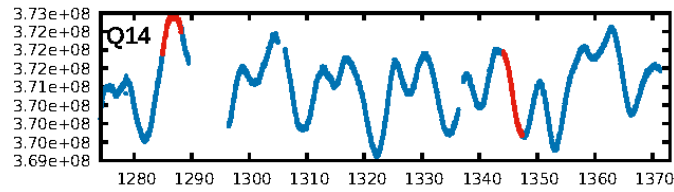
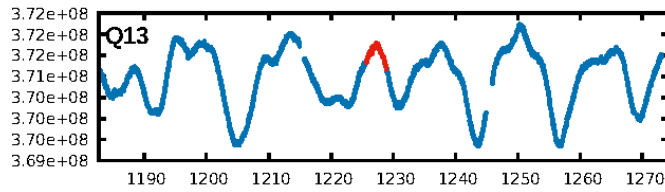
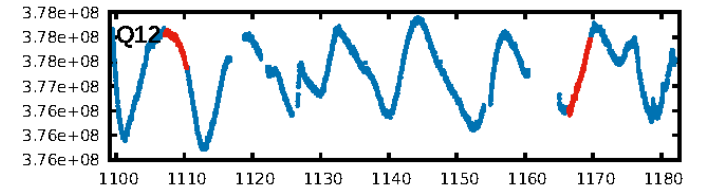
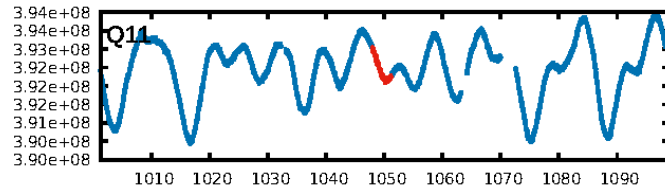
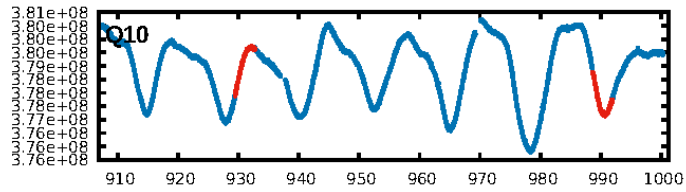
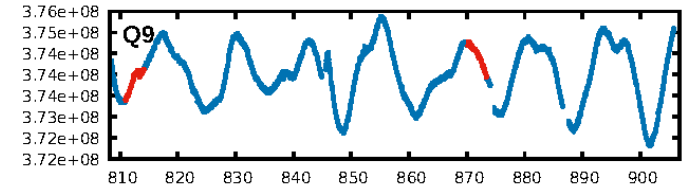
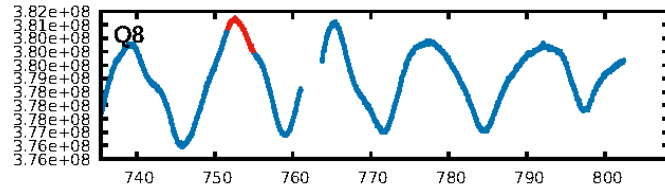
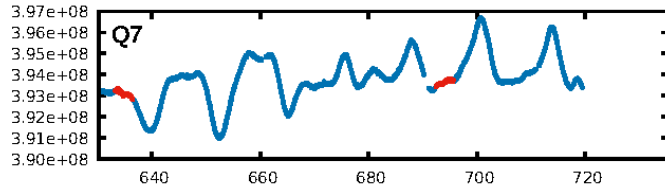
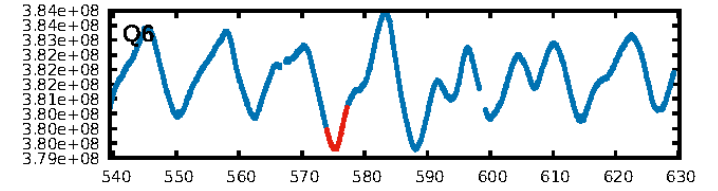
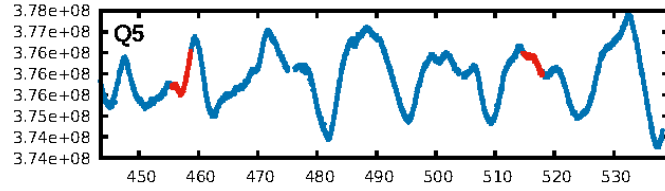
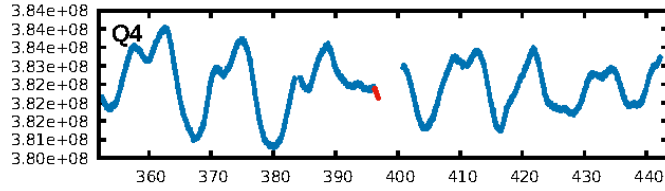
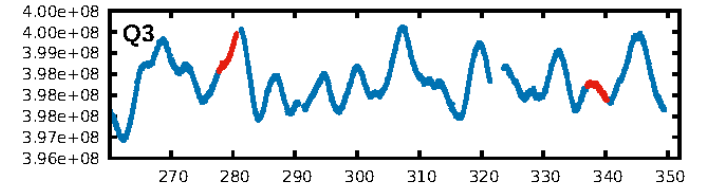
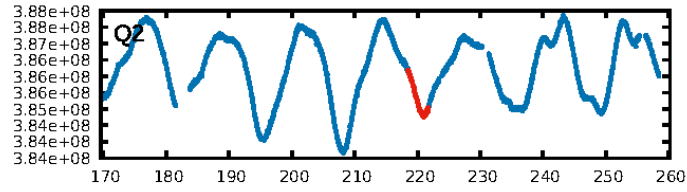
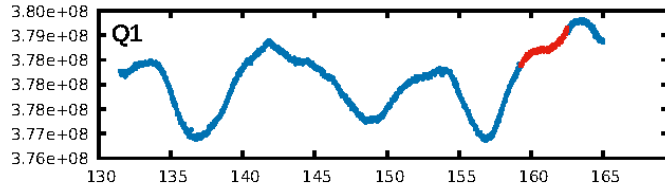
## DV Diagnostic Results:

ShortPeriod-sig: 98.3% [2.39 $\sigma$ ]  
LongPeriod-sig: 88.7% [1.58 $\sigma$ ]  
ModelChiSquare2-sig: 0.0%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [16/16]  
GhostDiagnostic-chr: 3.472  
Centroid-sig: 0.0%  
Centroid-so: 0.577 arcsec [4.73 $\sigma$ ]  
OotOffset-rm: 0.421 arcsec [1.52 $\sigma$ ]  
KicOffset-rm: 0.638 arcsec [2.68 $\sigma$ ]  
OotOffset-st: 4/3/1/2 [10]  
KicOffset-st: 4/3/1/2 [10]  
DiffImageQuality-fgm: 0.60 [6/10]  
DiffImageOverlap-fno: 0.00 [0/11]

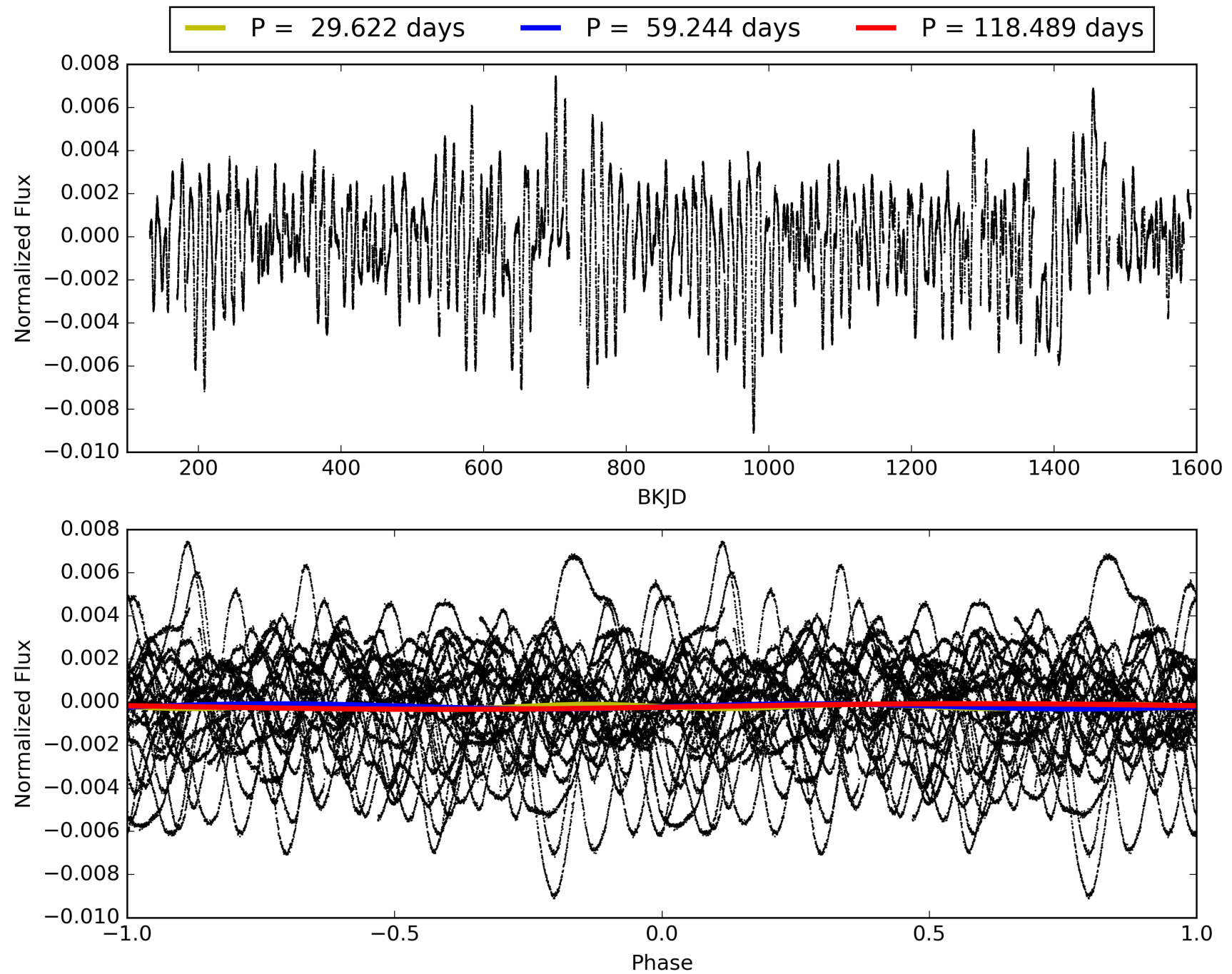
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 23:57:49 Z

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

# TCE 008181646-06, PDC Light Curves

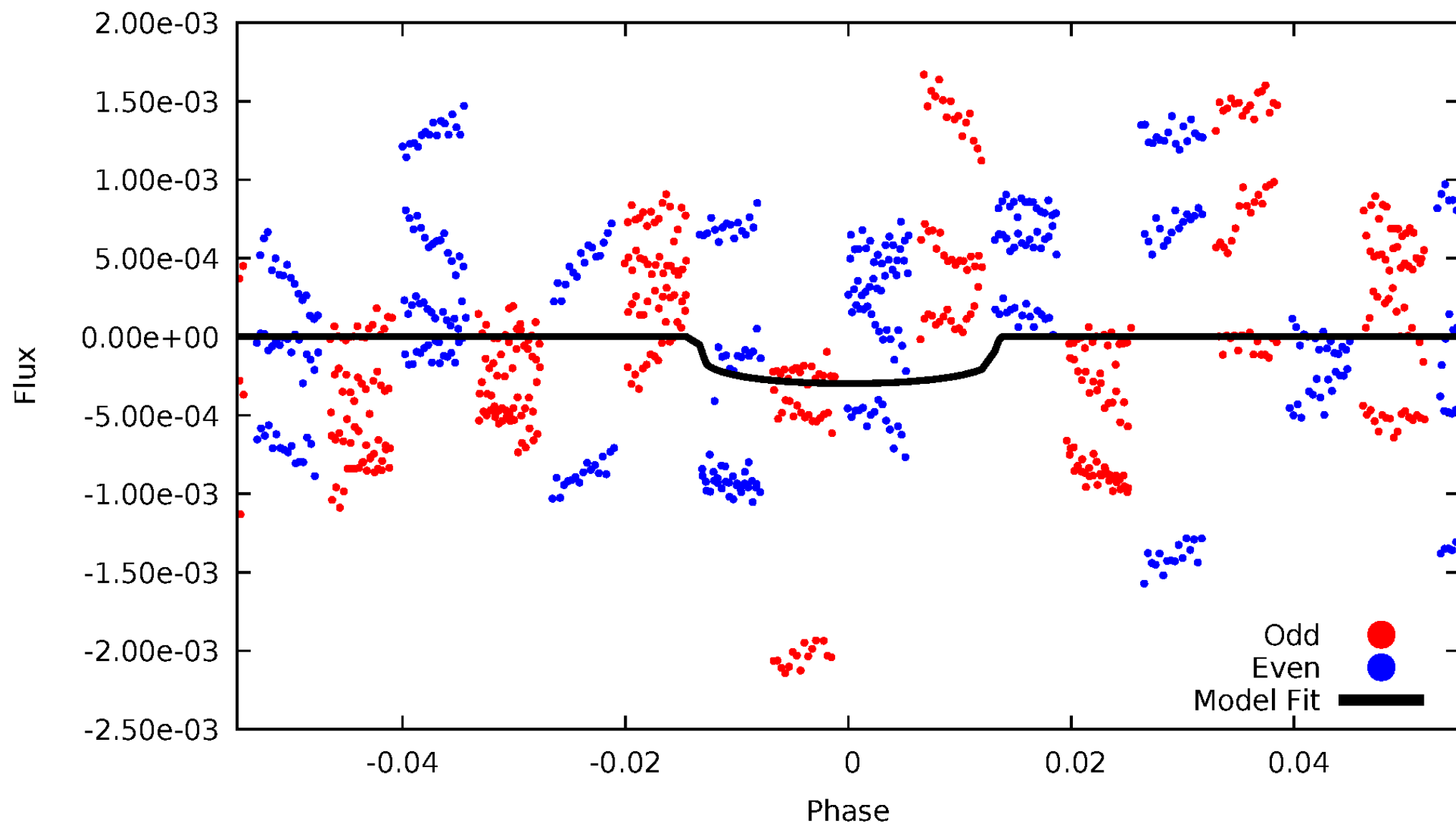


# TCE 008181646-06



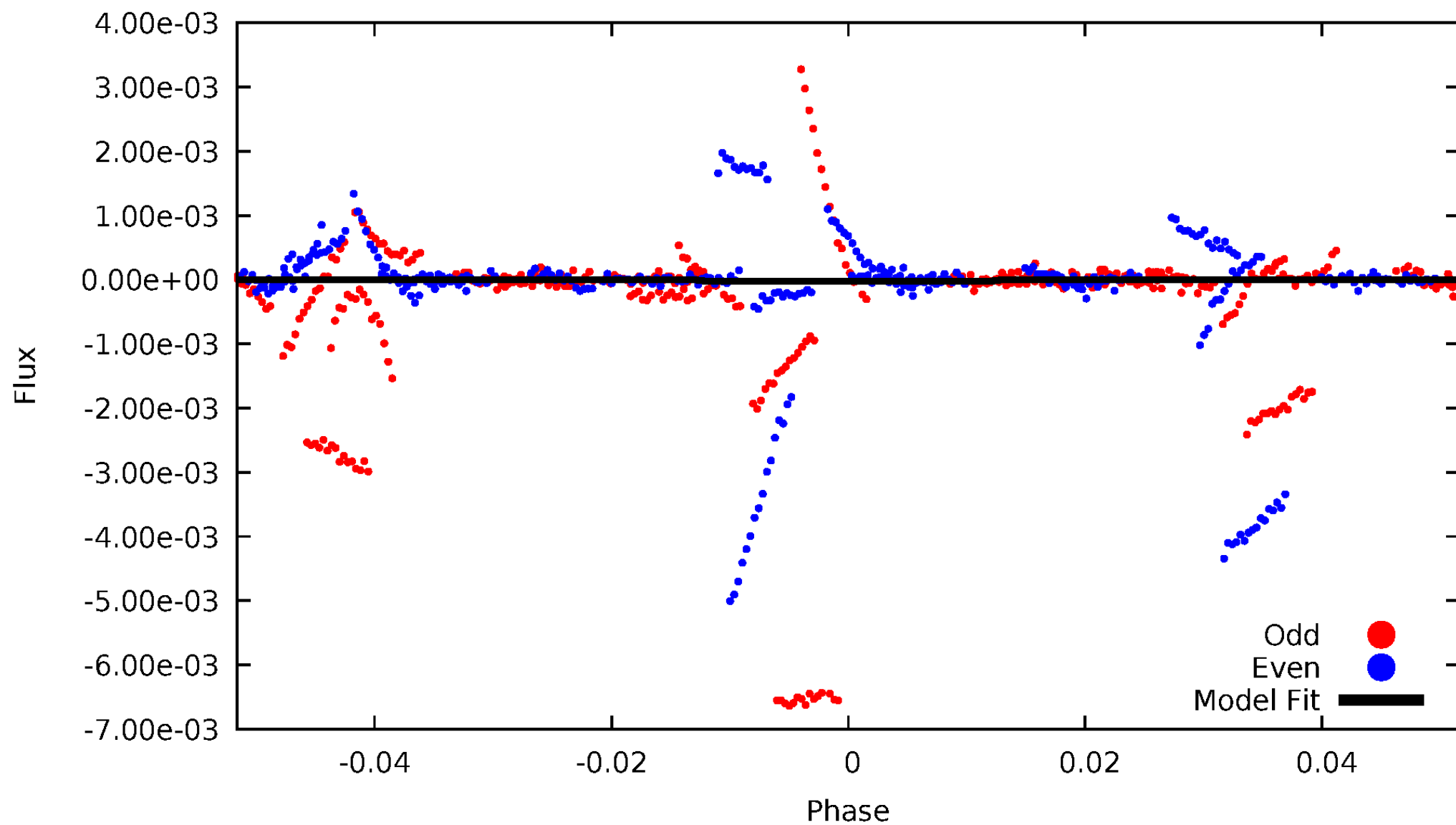
# DV Odd/Even

TCE 008181646-06



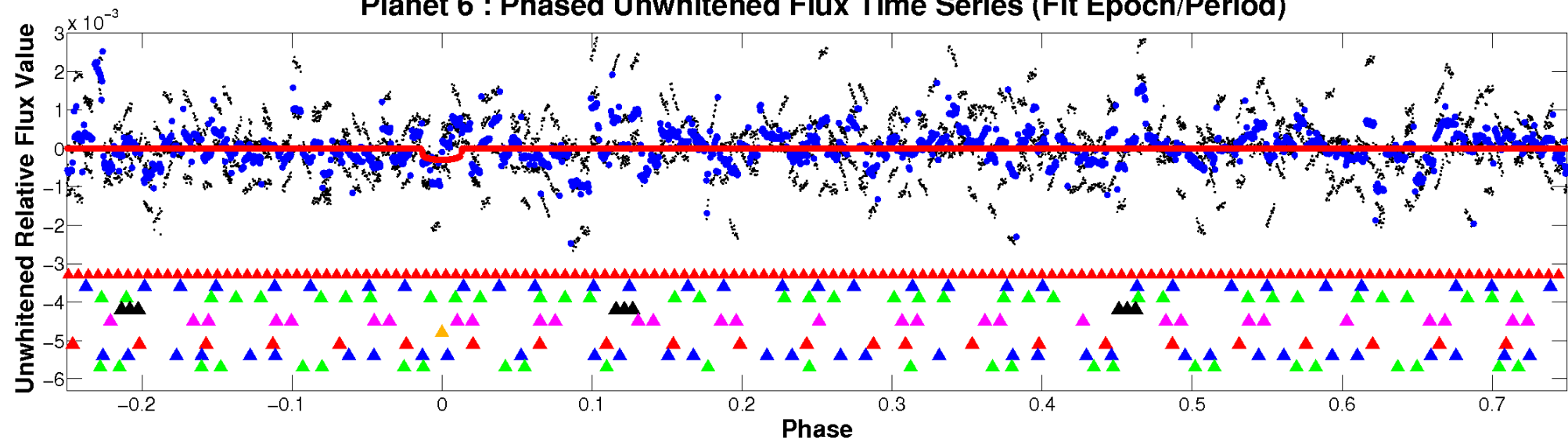
# ALT Odd/Even

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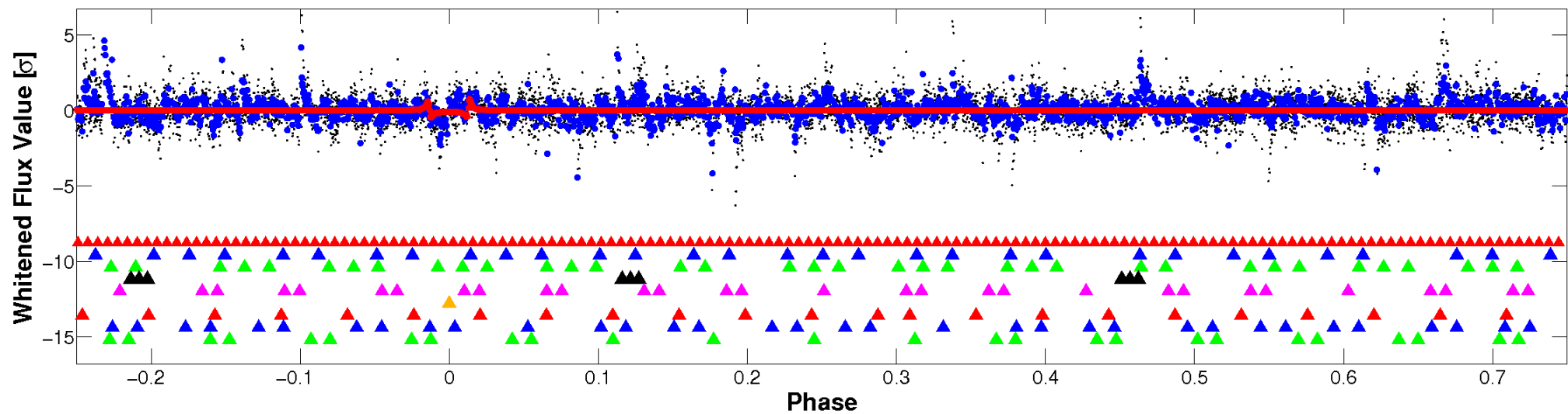


# Non-Whitened Vs. Whitened Light Curve

## Planet 6 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)

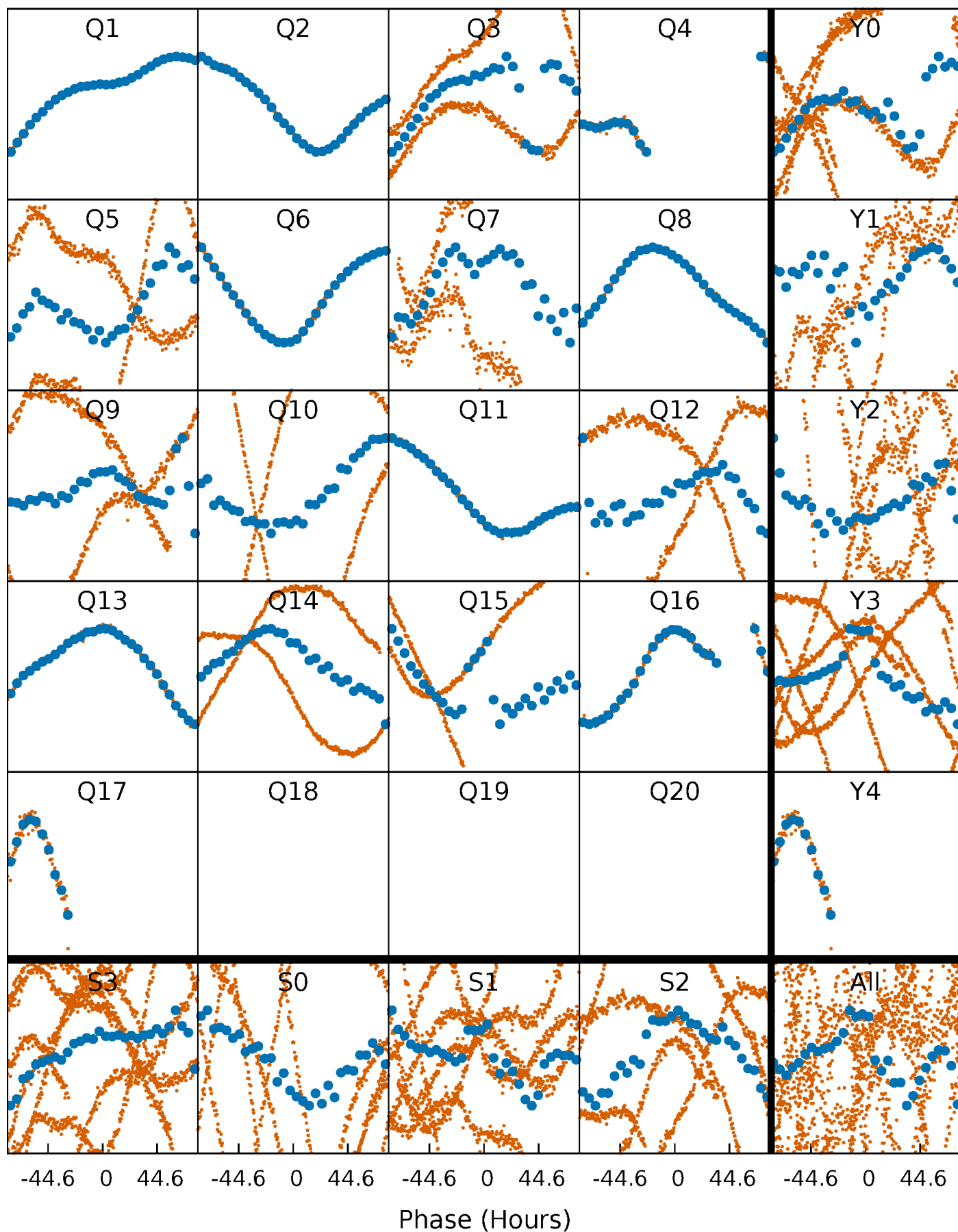


## Planet 6 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

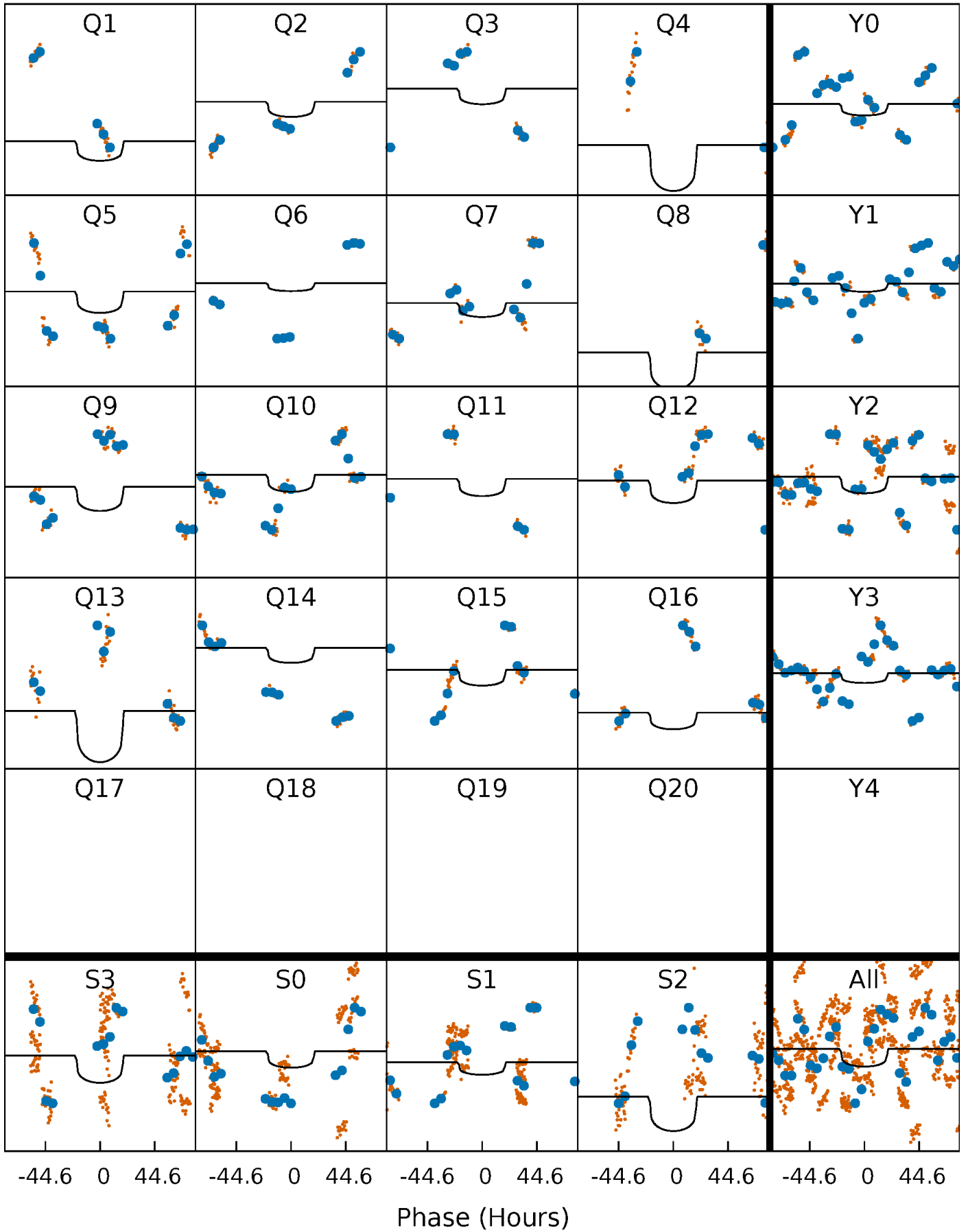
TCE 008181646-06 P= 59.244269 Days  $T_0=160.876125$  (BKJD)





# DV Quarter-Phased Transit Curves

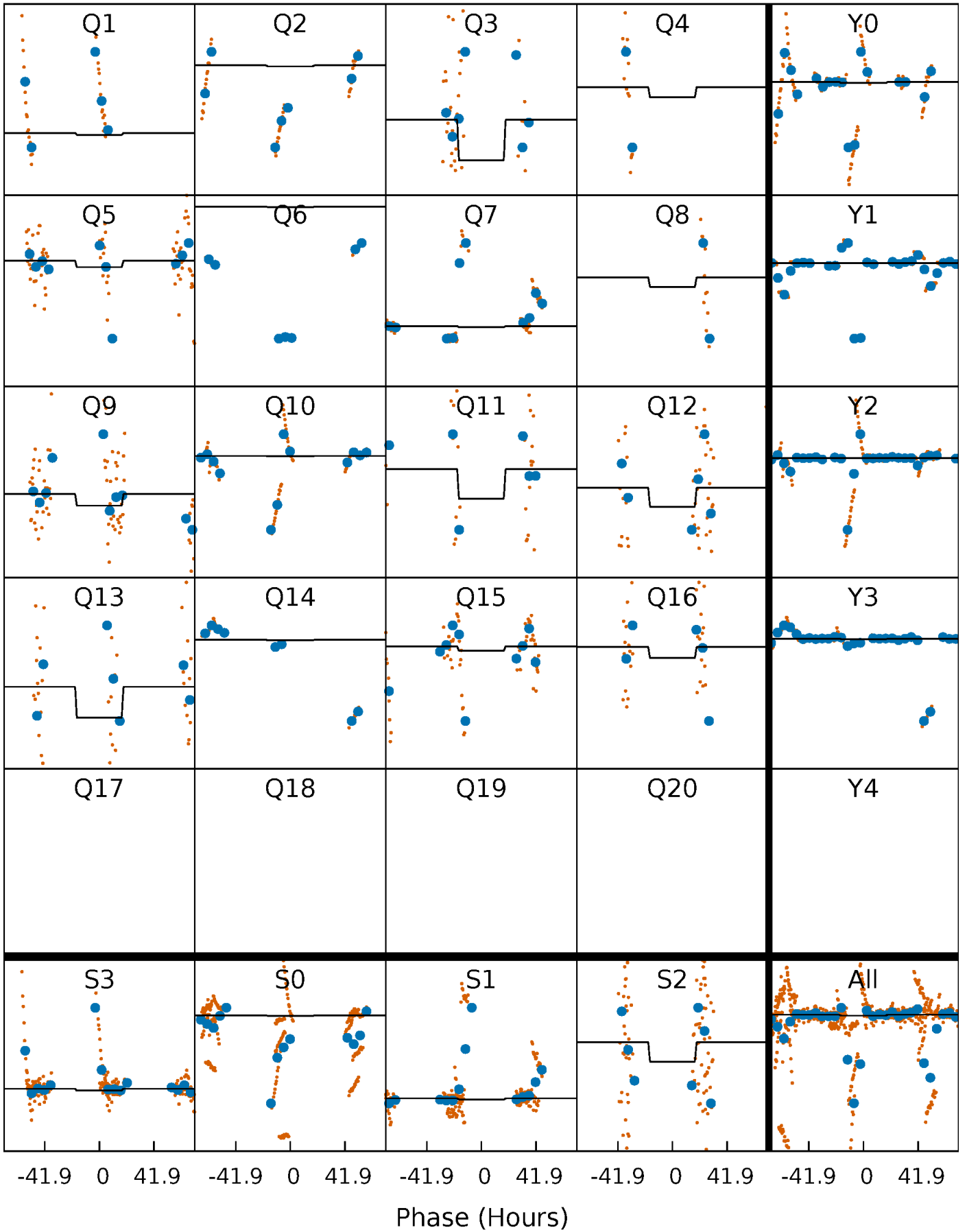
TCE 008181646-06 P= 59.244269 Days  $T_0=160.876125$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

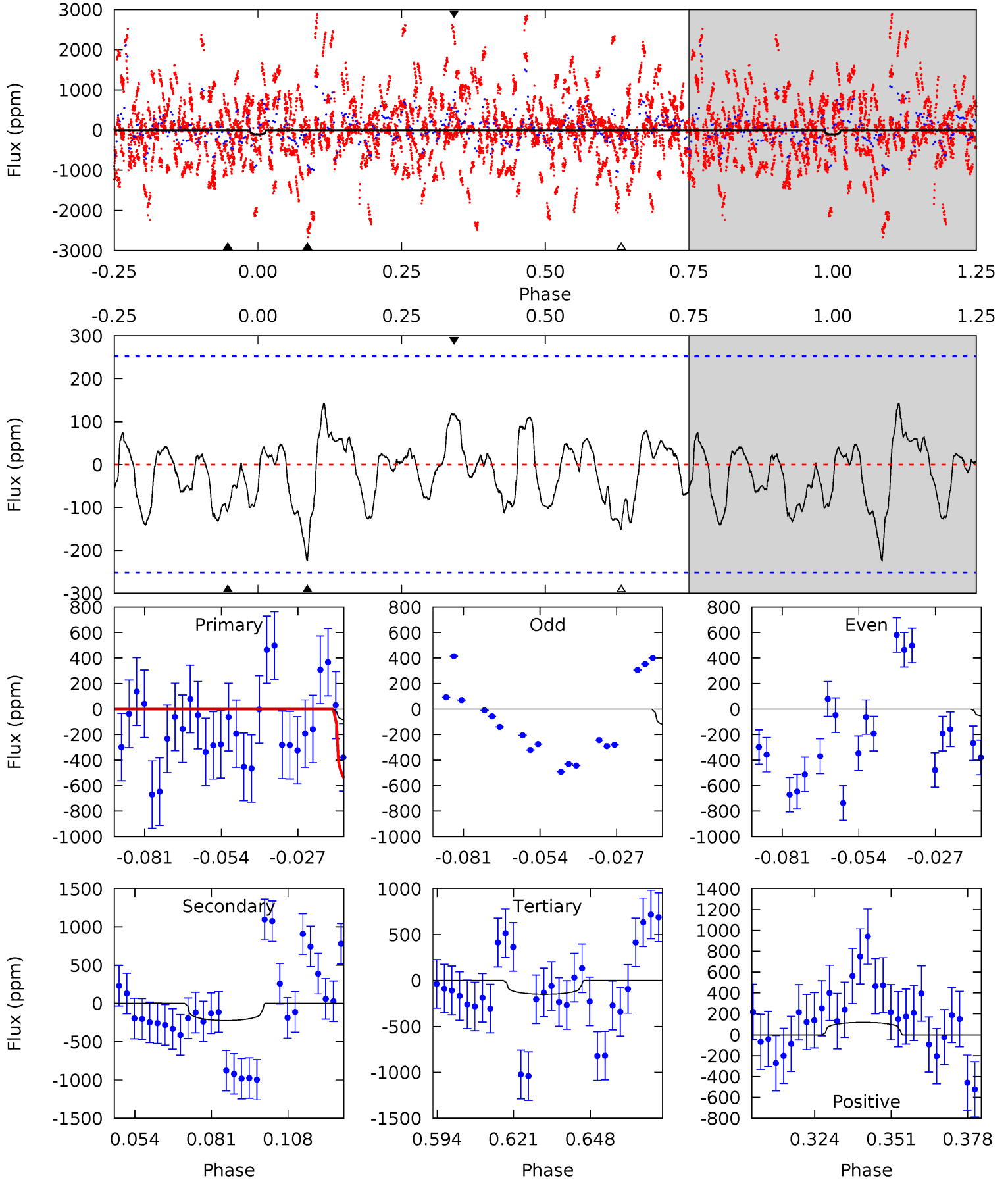
TCE 008181646-06   P= 59.223788 Days    $T_0=160.979311$  (BKJD)



# DV Model-Shift Uniqueness Test

008181646-06, P = 59.244269 Days, E = 101.631856 Days

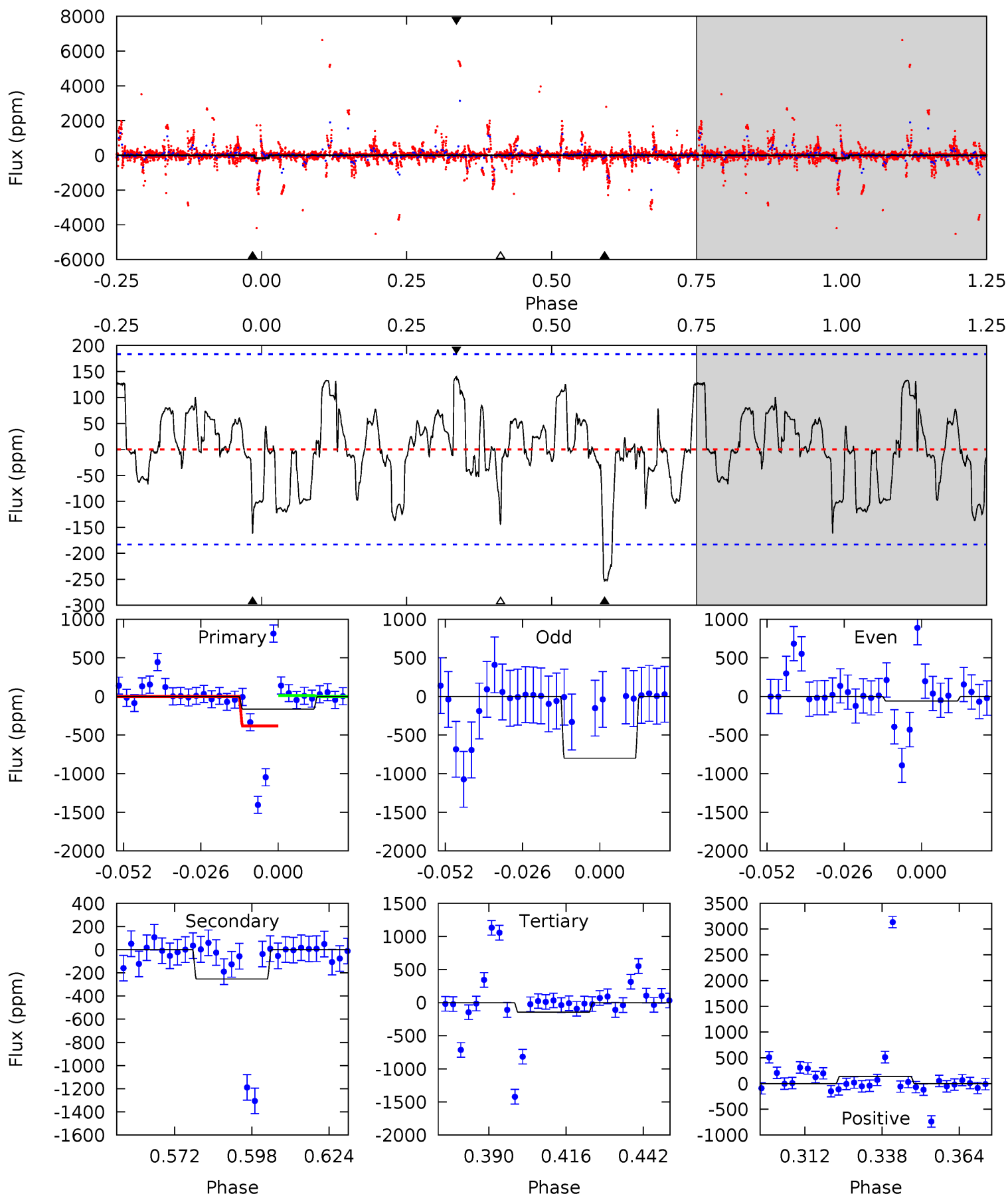
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
2.04	4.28	2.89	2.27	4.83	2.21	1.21	-0.85	-0.23	1.39	2.01	0.79	3.93	0.39	2.86



# Alt Model-Shift Uniqueness Test

008181646-06, P = 59.223788 Days, E = 101.755523 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
4.28	6.68	3.79	3.70	4.84	2.23	1.57	0.49	0.58	2.89	2.98	6.74	43.1	0.36	5.30



### Stellar Parameters For KIC 008181646

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5486^{+146}_{-146}$	$4.612^{+0.037}_{-0.112}$	$-0.400^{+0.300}_{-0.300}$	$0.736^{+0.131}_{-0.056}$	$0.824^{+0.075}_{-0.092}$	$2.905^{+0.476}_{-1.066}$
	+3%/-3%	+1%/-2%	+75%/-75%	+18%/-8%	+9%/-11%	+16%/-37%
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 008181646-06 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-223 \pm 52$	$1.42^{+0.21}_{-0.22}$	$558^{+24}_{-20}$	$5151^{+471}_{-406}$	$4660^{+2093}_{-1545}$
Alt.	$-253 \pm 38$	$0.39^{+0.19}_{-0.18}$	$558^{+24}_{-21}$	$11602^{+9501}_{-3099}$	$71239^{+190349}_{-40113}$

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

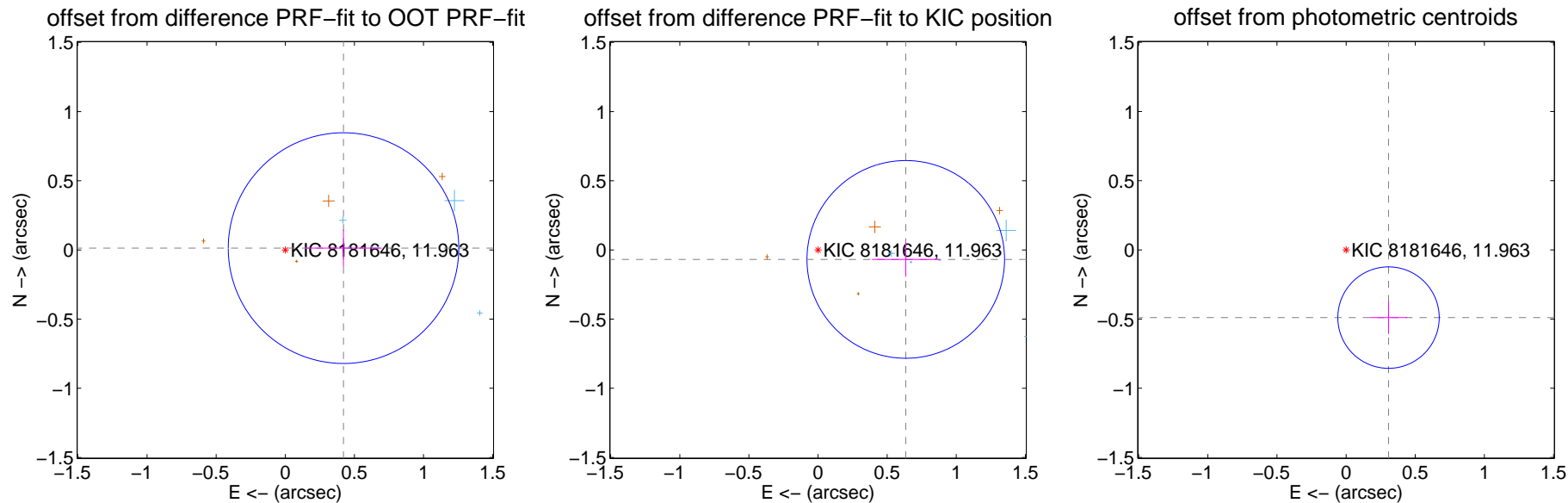
## DV Centroid Data

Supplemental centroid analysis for 008181646-06. **Kepler magnitude: 11.96.** Transit SNR 4.66

There are 6 quarters with good PRF difference image offsets

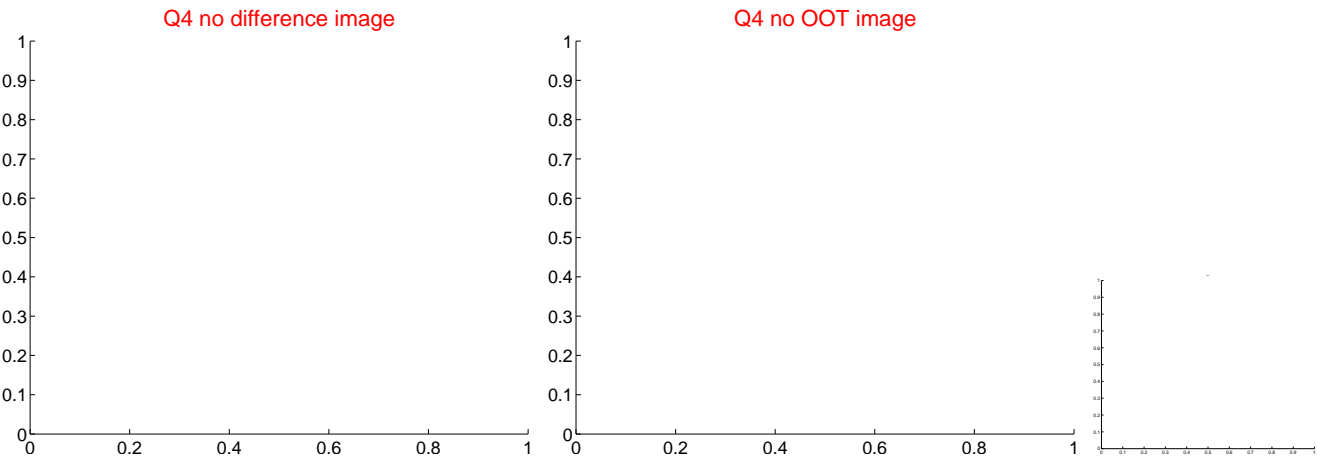
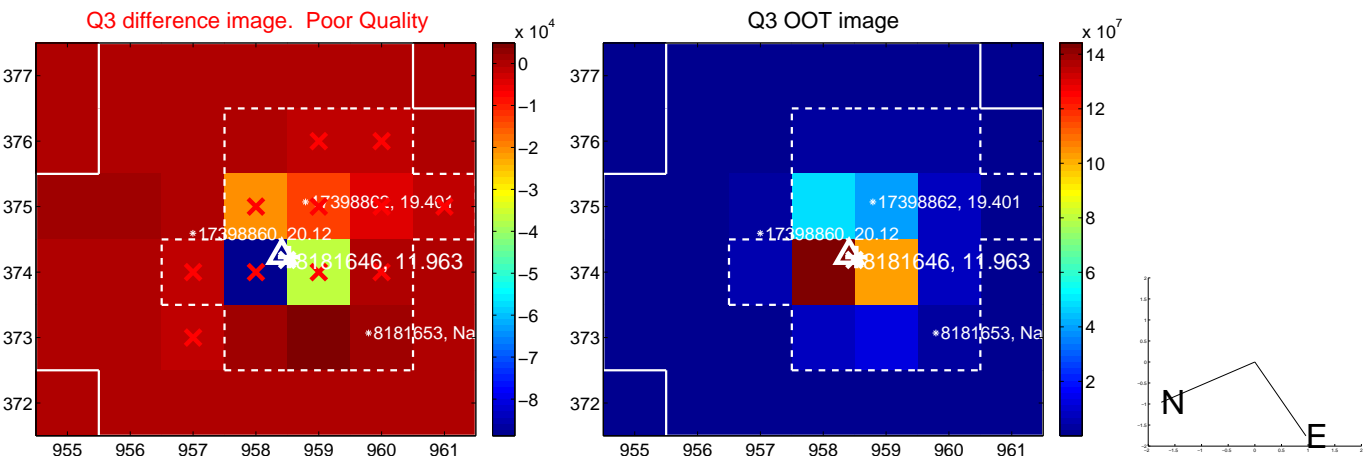
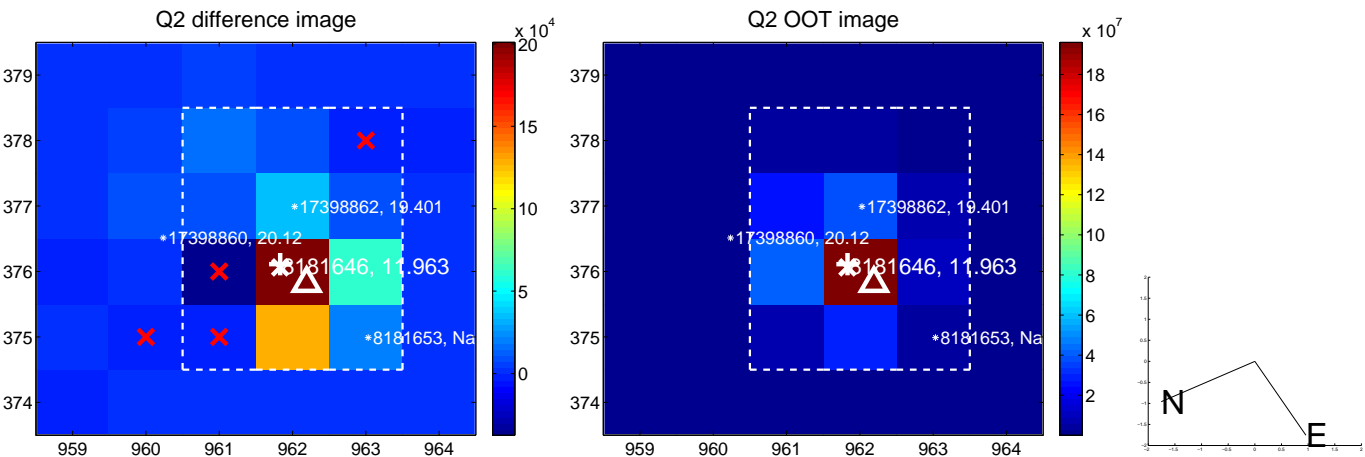
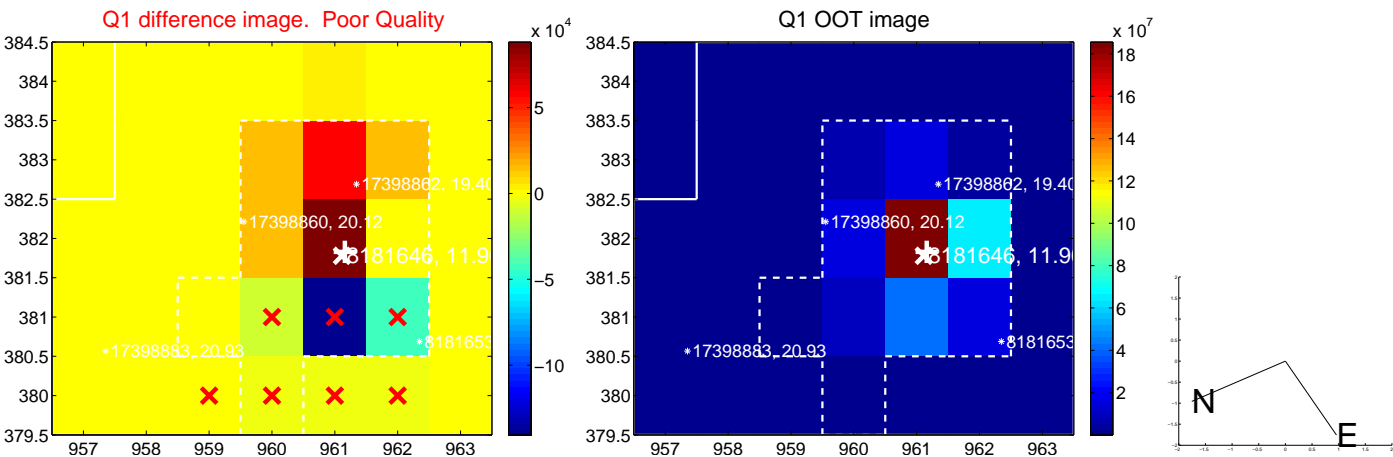
The direct PRF centroid is offset from the target star catalog position by about 0.26 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.421 \pm 0.278$	1.52	$-0.421 \pm 0.276$	$0.013 \pm 0.134$
PRF-fit source offset from KIC position	$0.638 \pm 0.238$	2.68	$-0.634 \pm 0.244$	$-0.069 \pm 0.125$
photometric centroid source offset	<b><math>0.58 \pm 0.12</math></b>	<b>4.73</b>	$-0.31 \pm 0.13$	$-0.49 \pm 0.12$

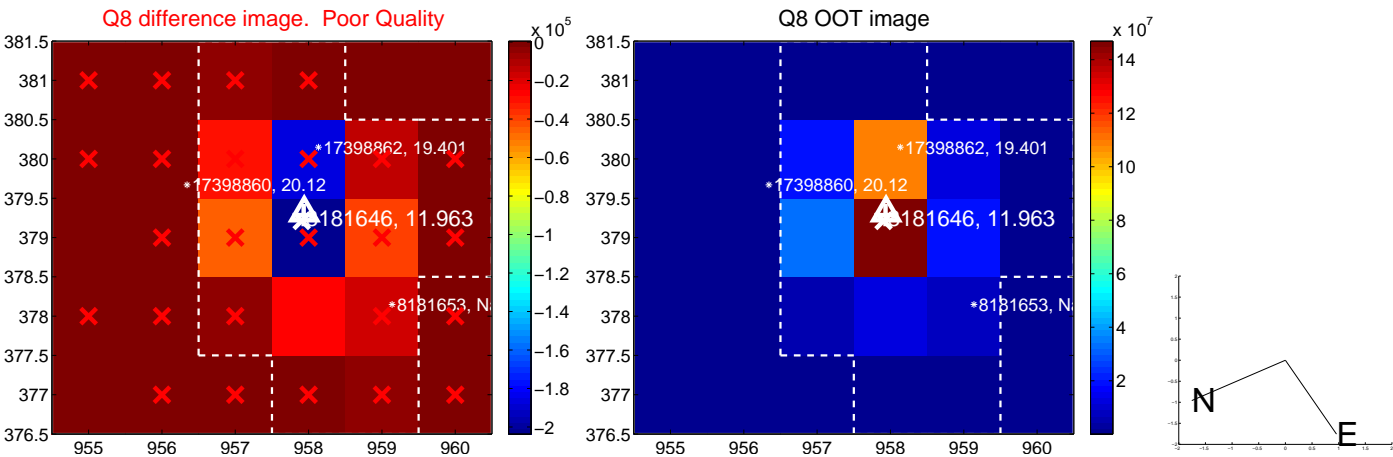
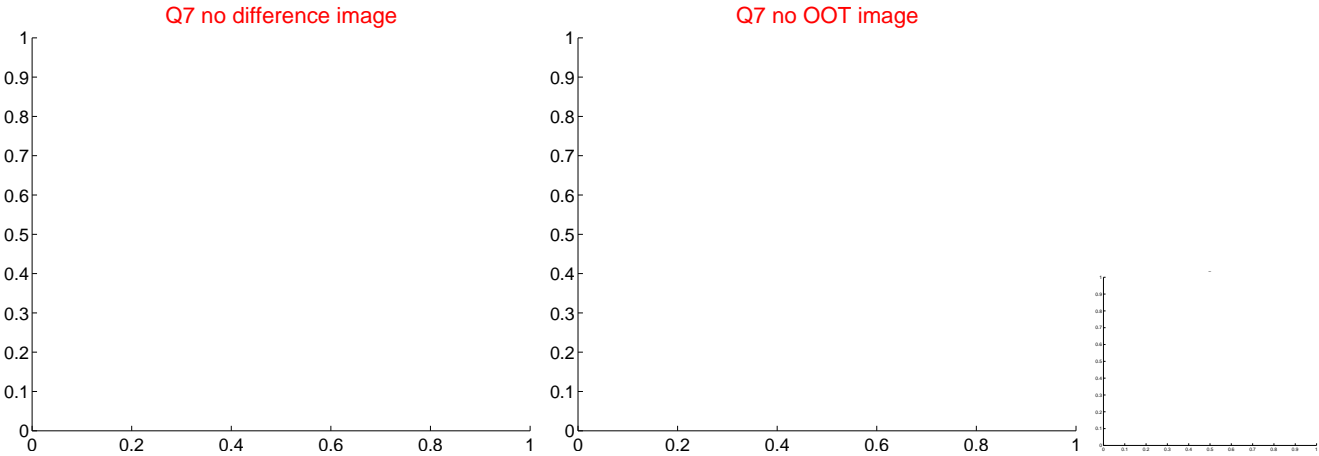
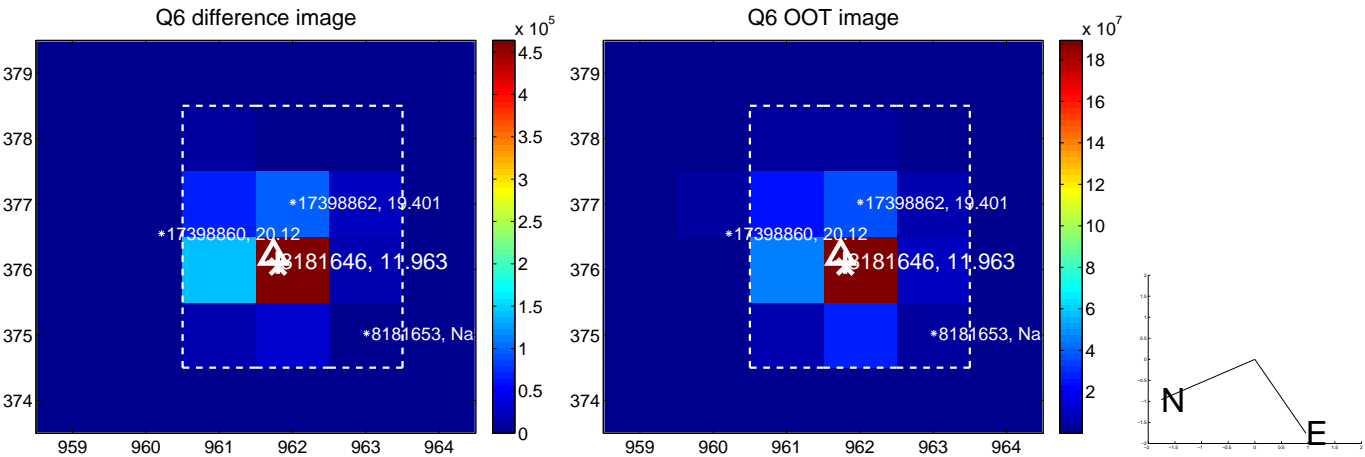
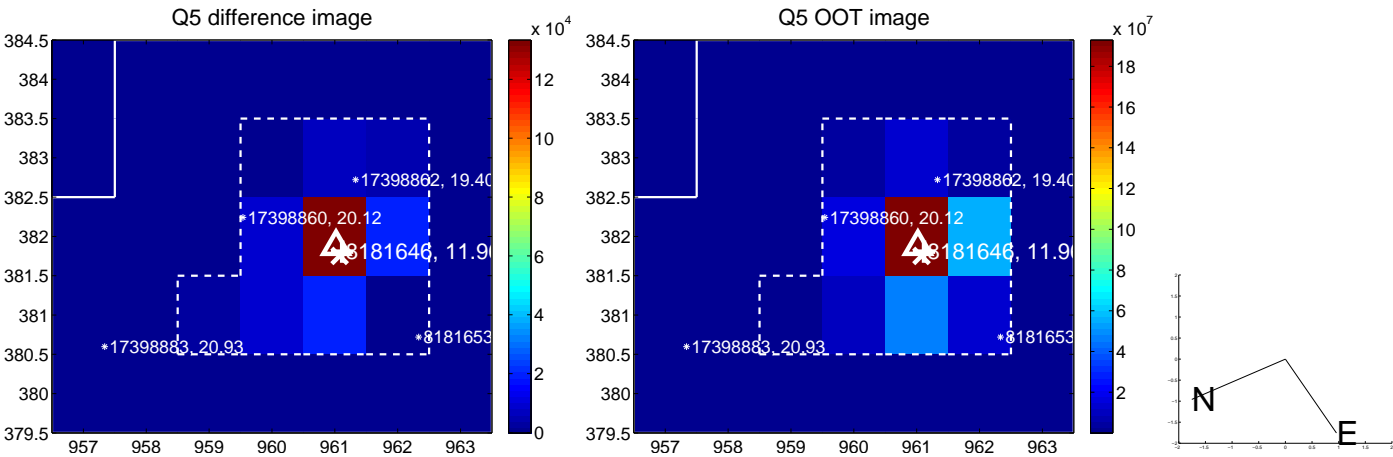


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets;** magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

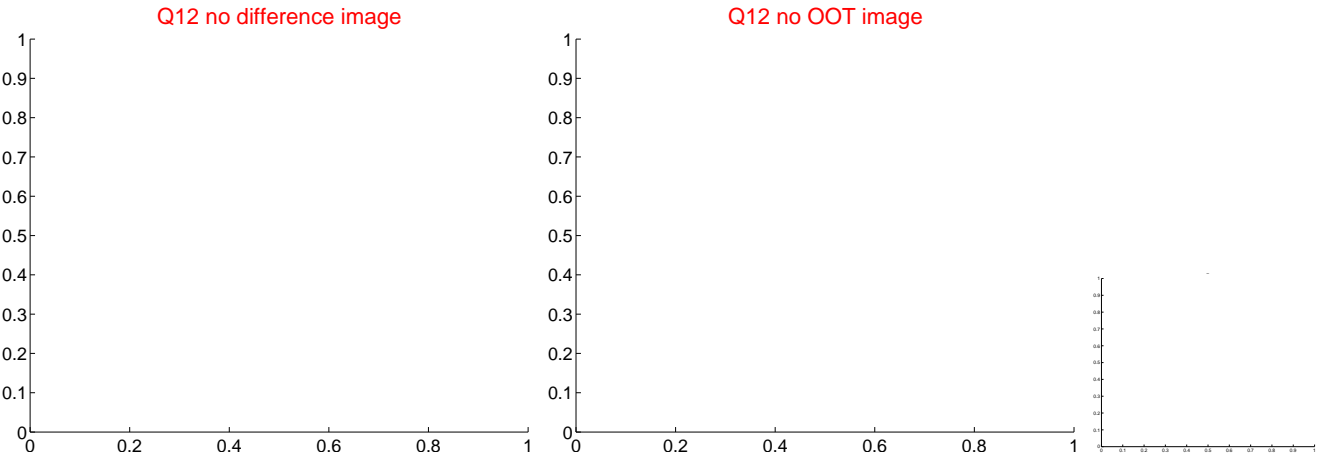
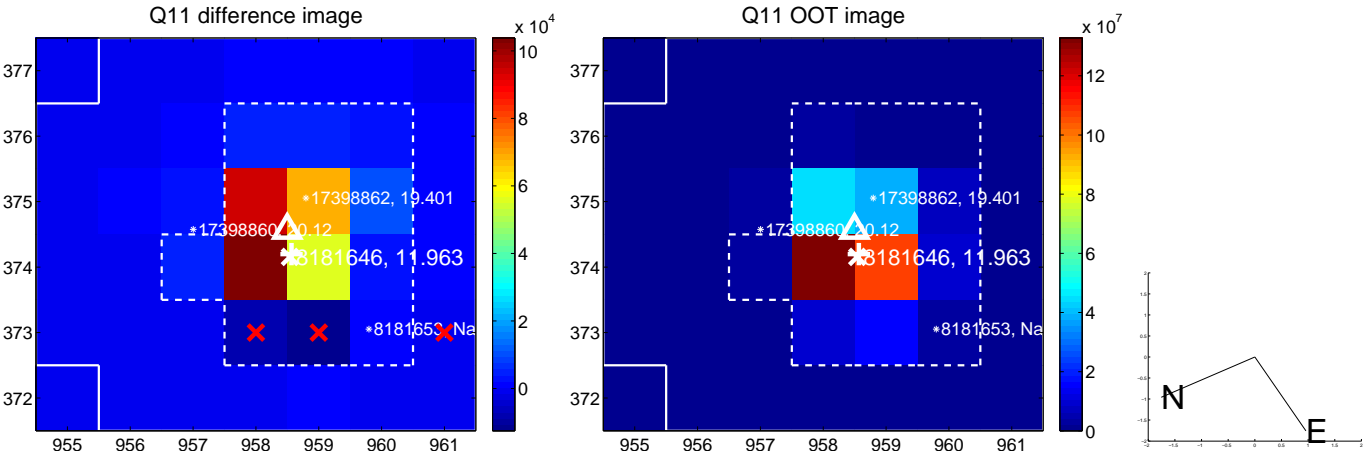
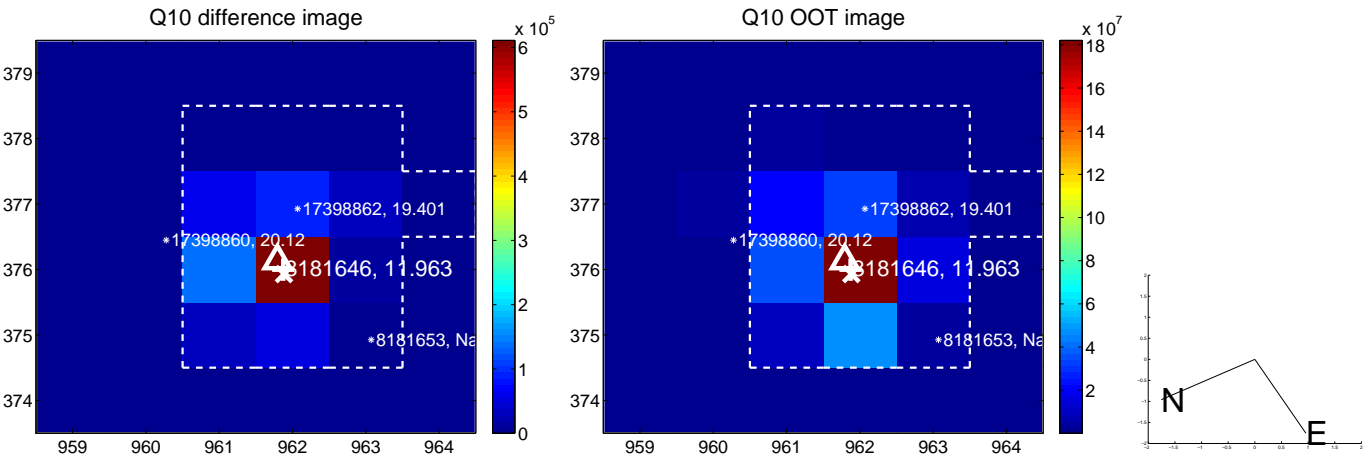
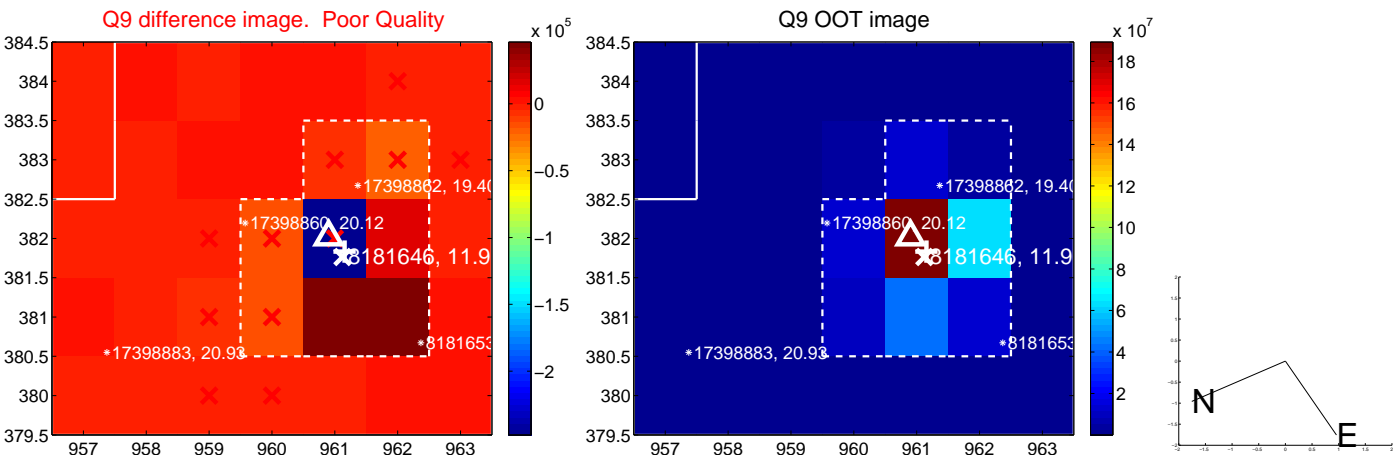
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

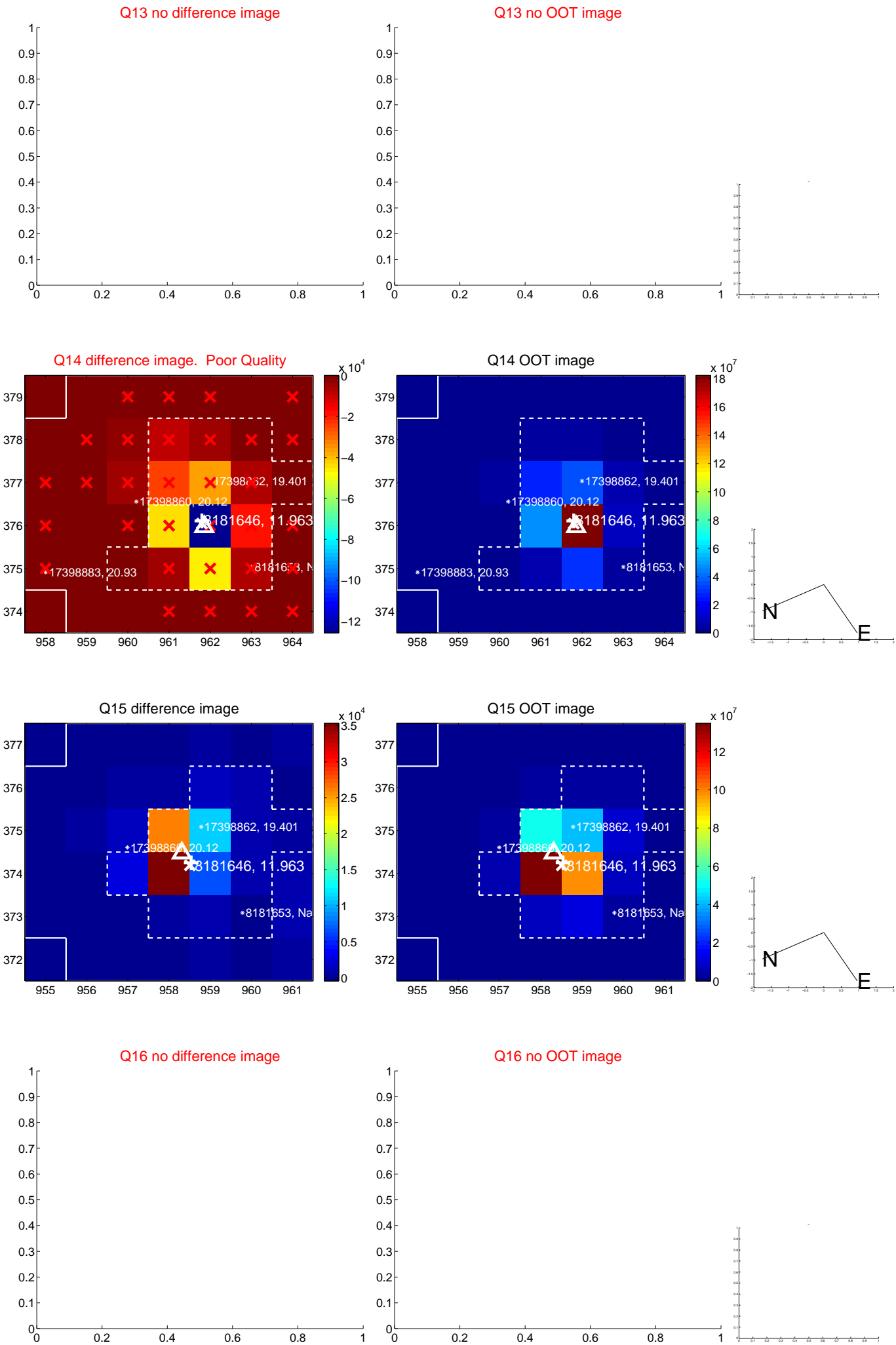


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

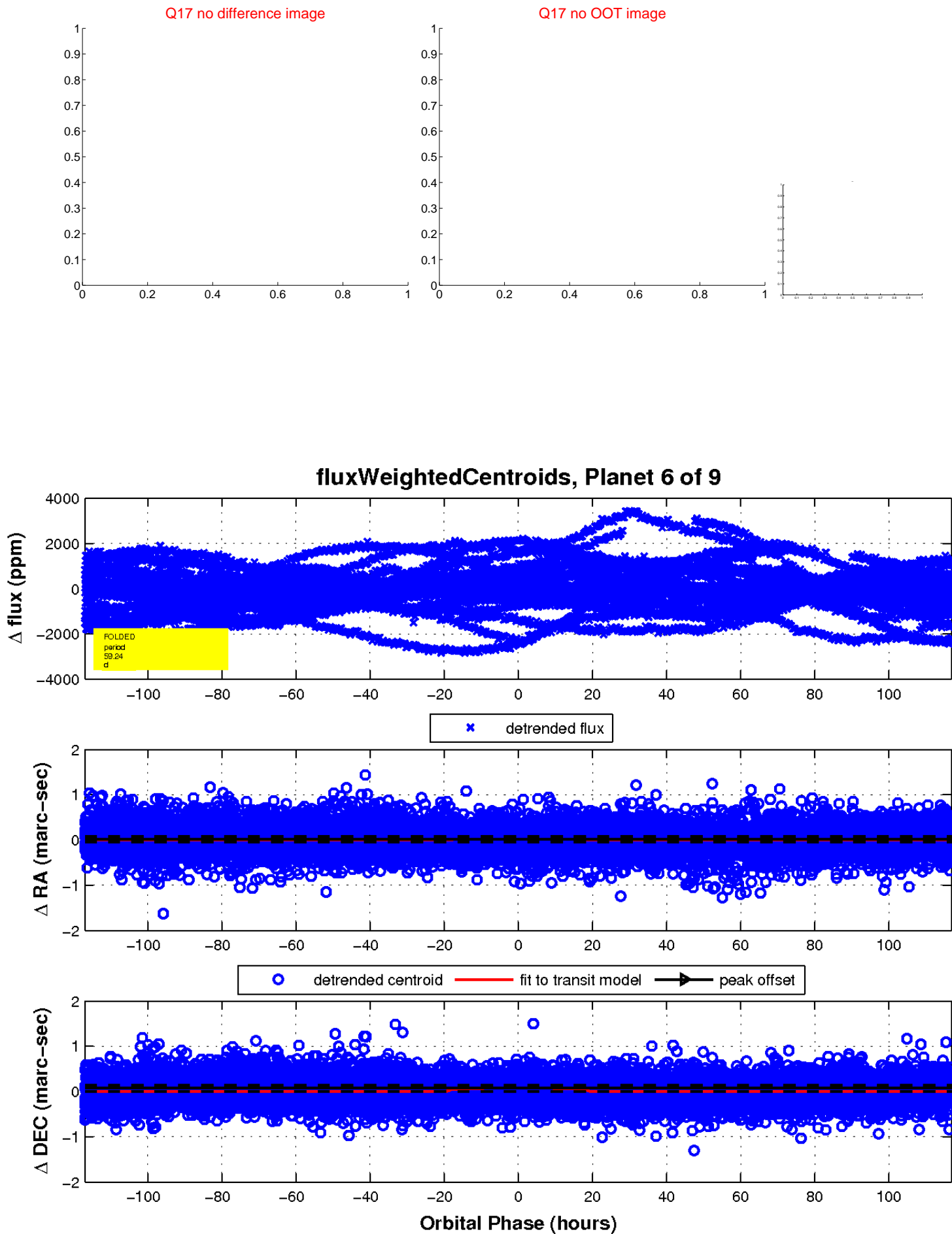




white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

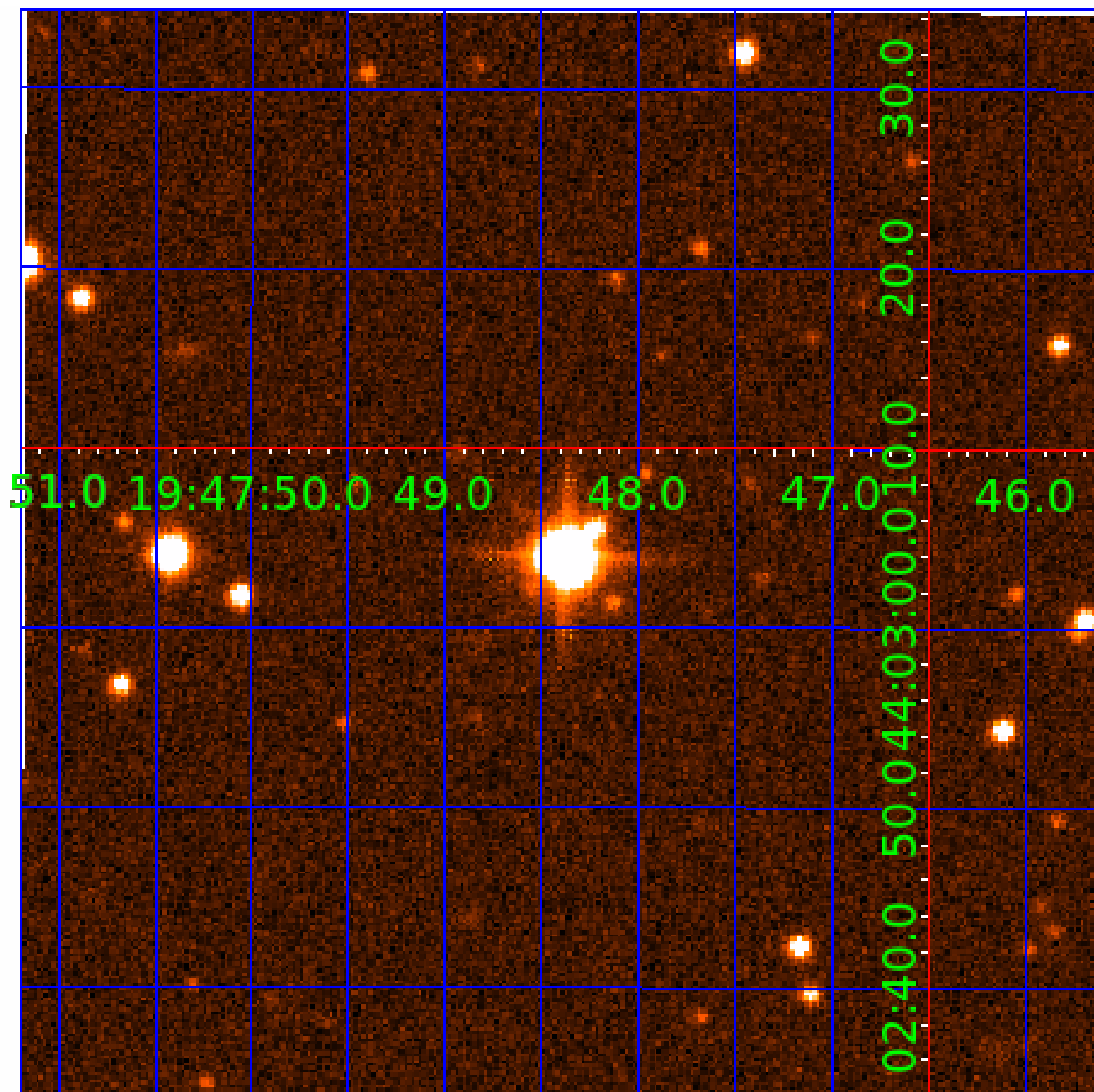


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 008181646

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
008181646-01	OBS	No	2.354098	131.598372	15.8	16.008	7.2	7.7	0.74	5486	0.30	422.09
008181646-02	OBS	No	46.649767	174.321233	110.5	7.773	22.7	2.3	0.74	5486	0.88	7.87
008181646-03	OBS	No	40.939977	153.721226	224.5	5.088	20.0	6.5	0.74	5486	1.24	9.37
008181646-04	OBS	No	157.875096	208.123739	4505.6	54.343	17.3	12.4	0.74	5486	9.20	1.55
008181646-05	OBS	No	48.824583	164.751099	532.2	25.560	15.7	7.3	0.74	5486	3.40	7.41
008181646-06	OBS	No	59.244269	160.876125	298.1	38.985	14.2	4.7	0.74	5486	1.37	5.72
008181646-07	OBS	No	61.879706	179.179822	339.5	8.688	11.4	6.7	0.74	5486	1.45	5.40
008181646-08	OBS	No	42.732442	148.480323	161.0	5.821	11.3	4.3	0.74	5486	0.99	8.85

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
008181646-01	OBS	FP	0.00	1	0	0	0	LPP_DV
008181646-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_TRACKER—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV
008181646-03	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE_ZUMA—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_UNRESOLVED_OFFSET
008181646-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL_SKYE—TRANS_GAPPED—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—INCONSISTENT_TRANS
008181646-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV
008181646-06	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
008181646-07	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_FEW_DIFFS
008181646-08	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV

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

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

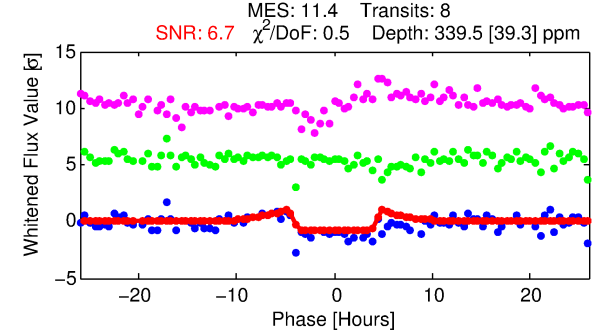
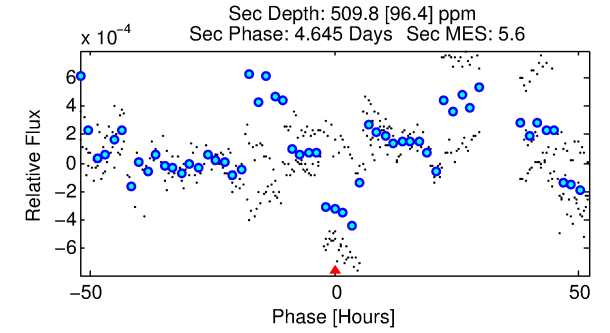
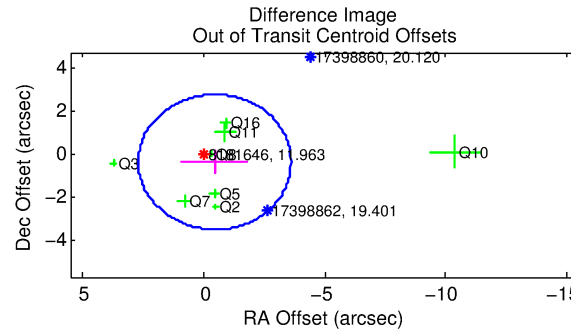
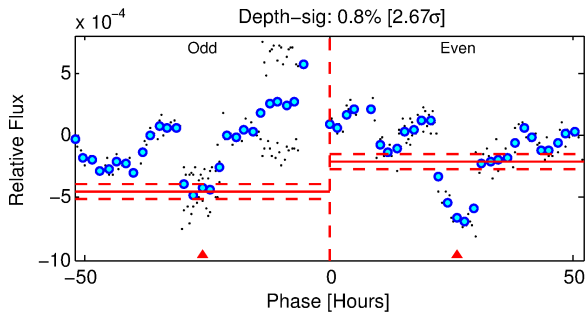
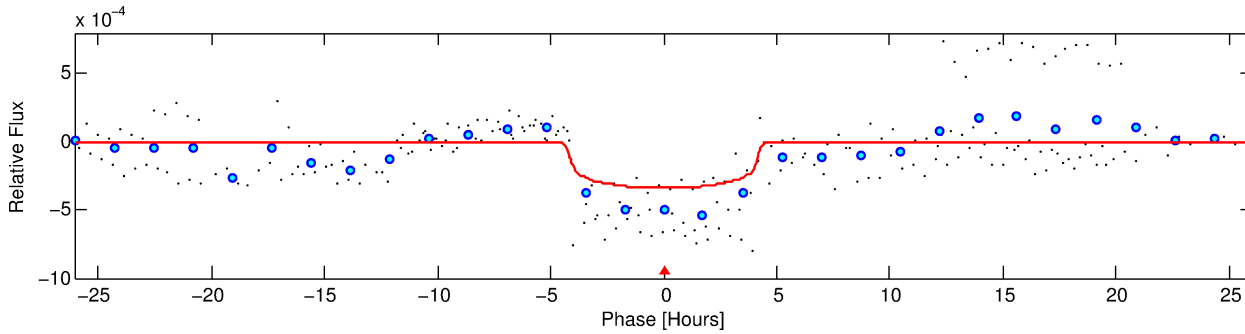
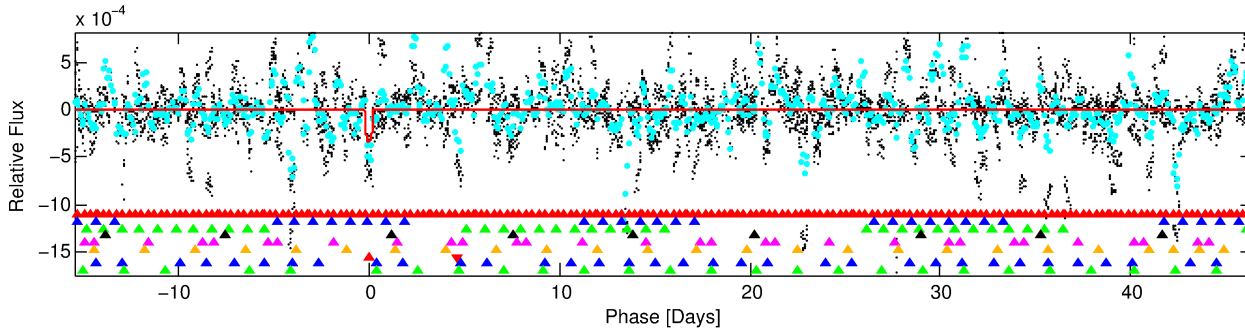
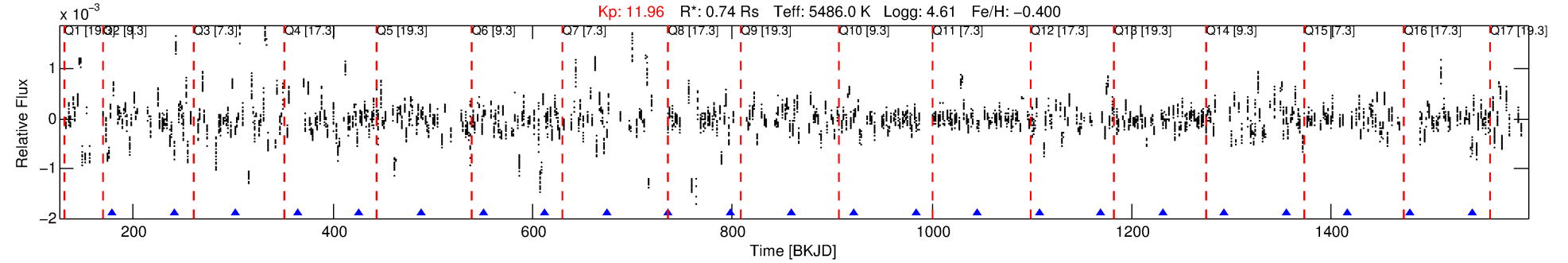
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 008181646-07

No Significant Match Found

# DV One-Page Summary

KIC: 8181646 Candidate: 7 of 9 Period: 61.880 d



## DV Fit Results:

Period = 61.87971 [0.00071] d  
Epoch = 179.1798 [0.0090] BKJD  
Rp/R\* = 0.0181 [0.0068]  
a/R\* = 39.64 [63.63]  
b = 0.71 [1.12]  
Seff = 5.40 [1.27]  
Teq = 389 [23] K  
Rp = 1.45 [0.61] Re  
a = 0.2853 [0.0418] AU  
Ag = 10824.25 [8718.18] [1.24 $\sigma$ ]  
Teffp = 6130 [1203] K [4.77 $\sigma$ ]

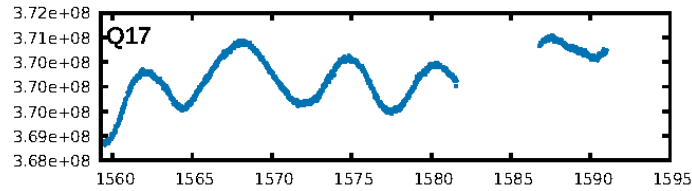
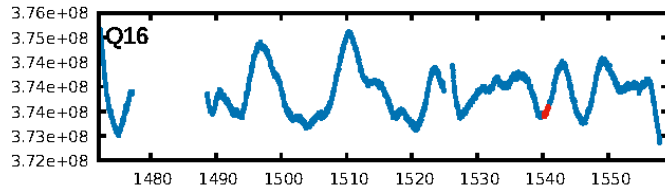
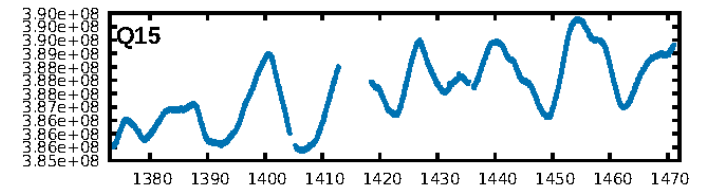
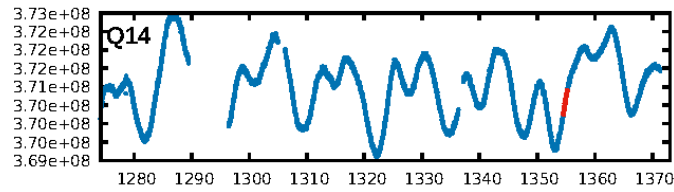
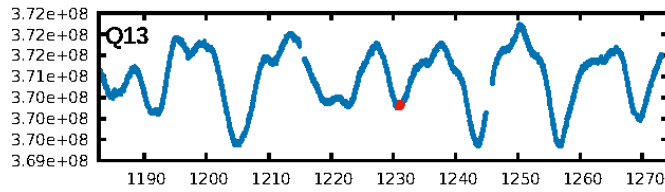
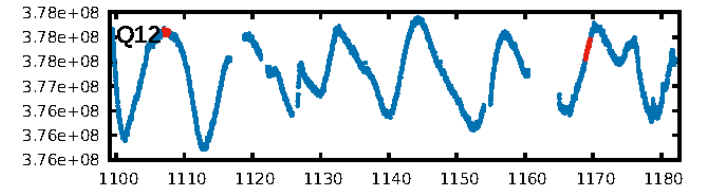
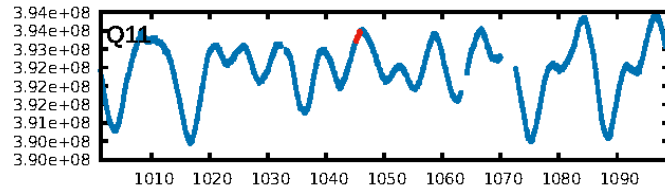
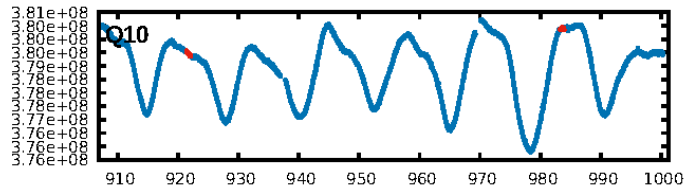
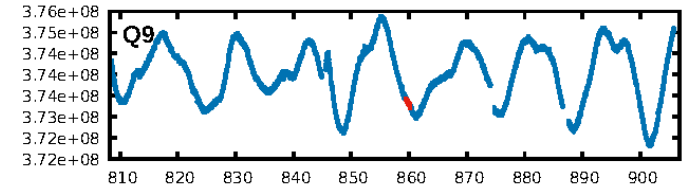
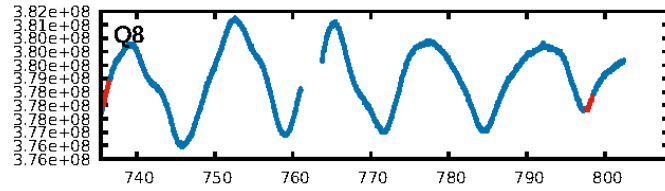
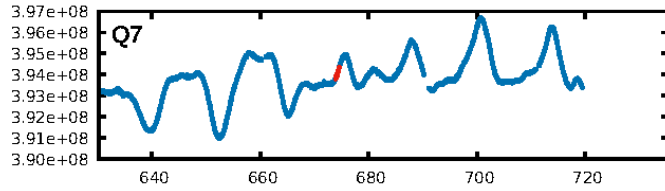
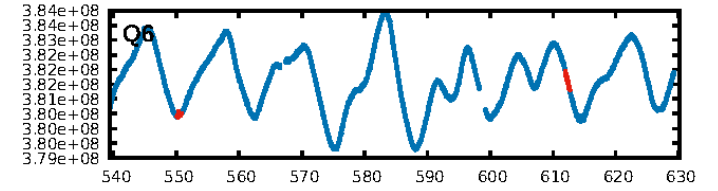
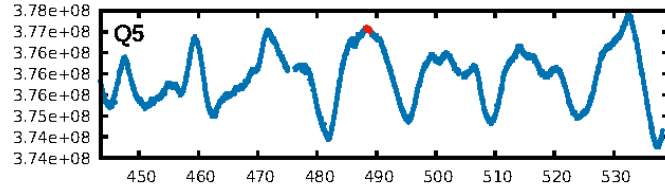
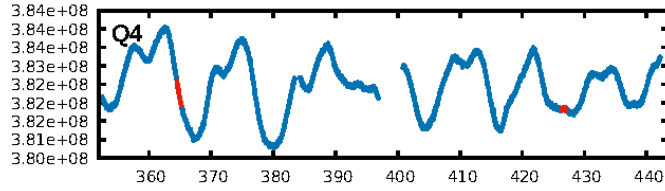
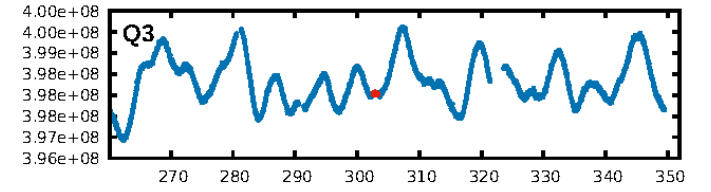
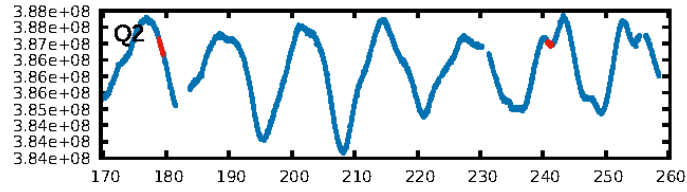
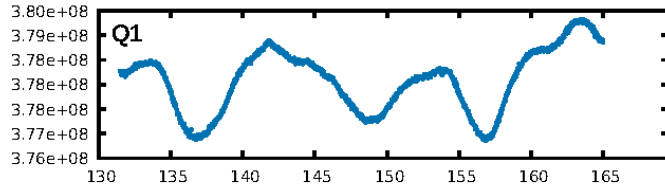
## DV Diagnostic Results:

ShortPeriod-sig: 88.7% [1.58 $\sigma$ ]  
LongPeriod-sig: 100.0% [41.86 $\sigma$ ]  
ModelChiSquare2-sig: 74.9%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [8/8]  
GhostDiagnostic-chr: 0.3229  
Centroid-sig: 4.9%  
Centroid-so: 0.344 arcsec [2.12 $\sigma$ ]  
OotOffset-rm: 0.597 arcsec [0.57 $\sigma$ ]  
OotOffset-st: 2/3/2/1 [8]  
KicOffset-rm: 0.876 arcsec [0.97 $\sigma$ ]  
KicOffset-st: 2/3/2/1 [8]  
DiffImageQuality-fgm: 0.50 [4/8]  
DiffImageOverlap-fno: 0.23 [3/13]

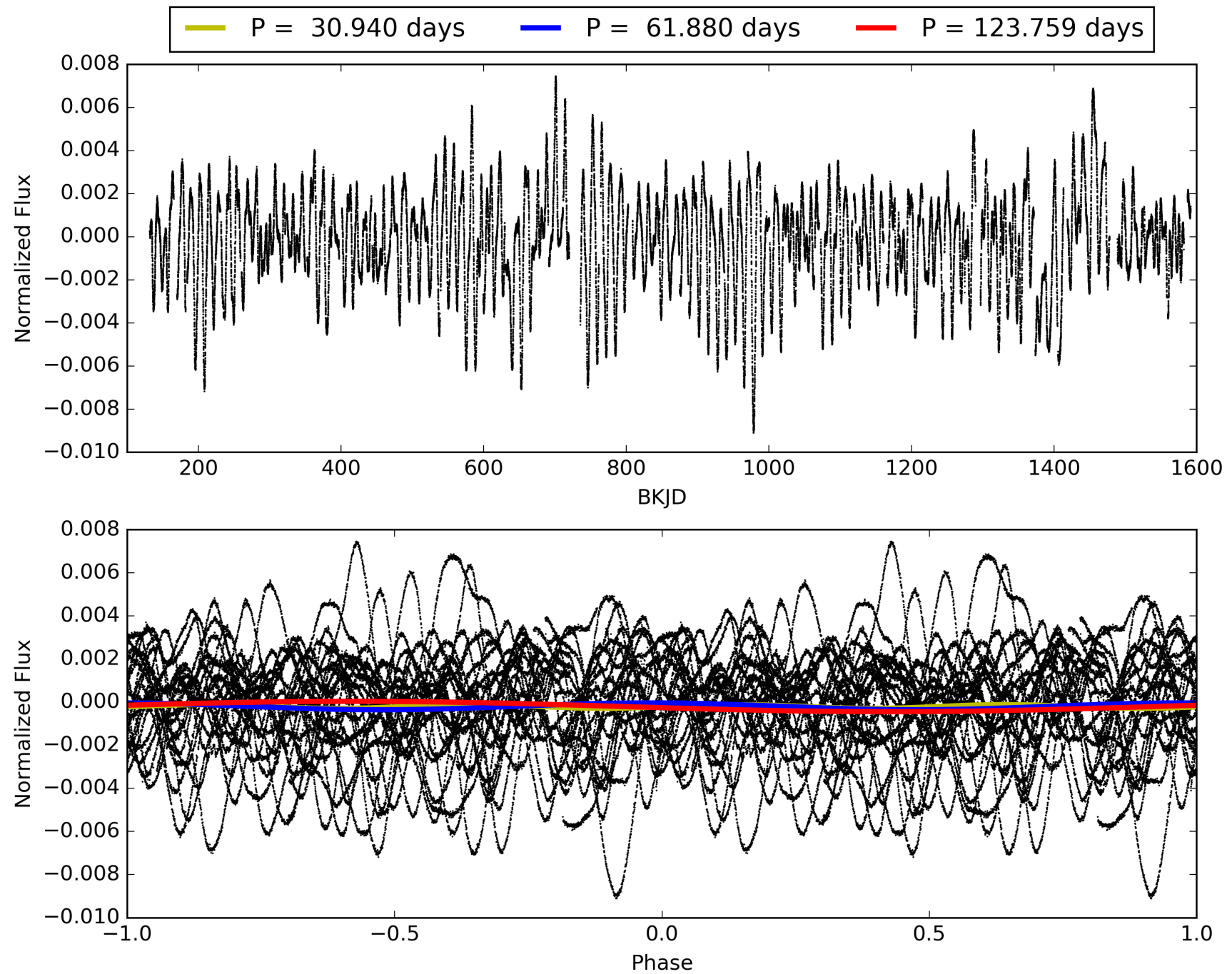
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 23:57:52 Z

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

# TCE 008181646-07, PDC Light Curves

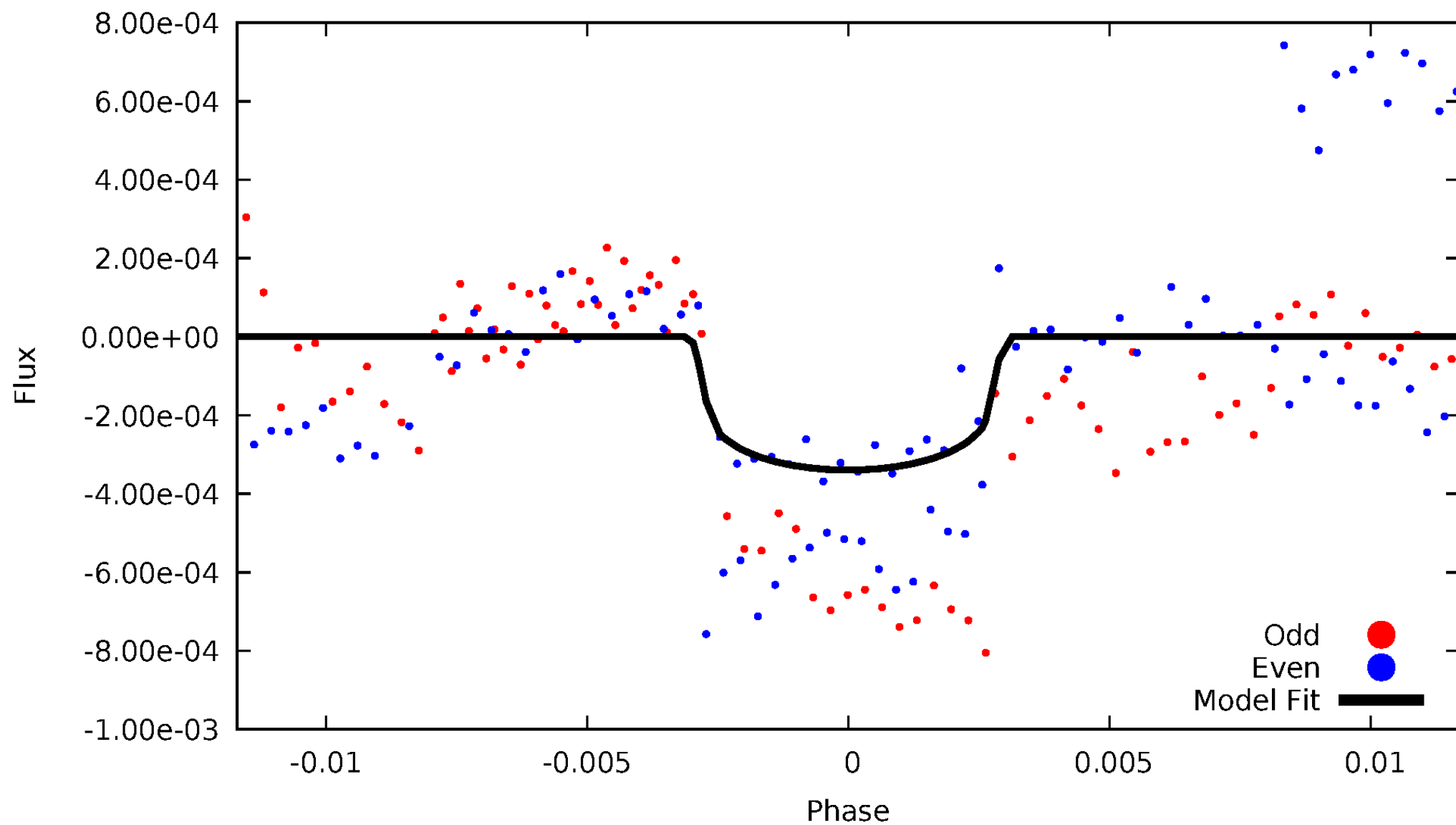


# TCE 008181646-07



# DV Odd/Even

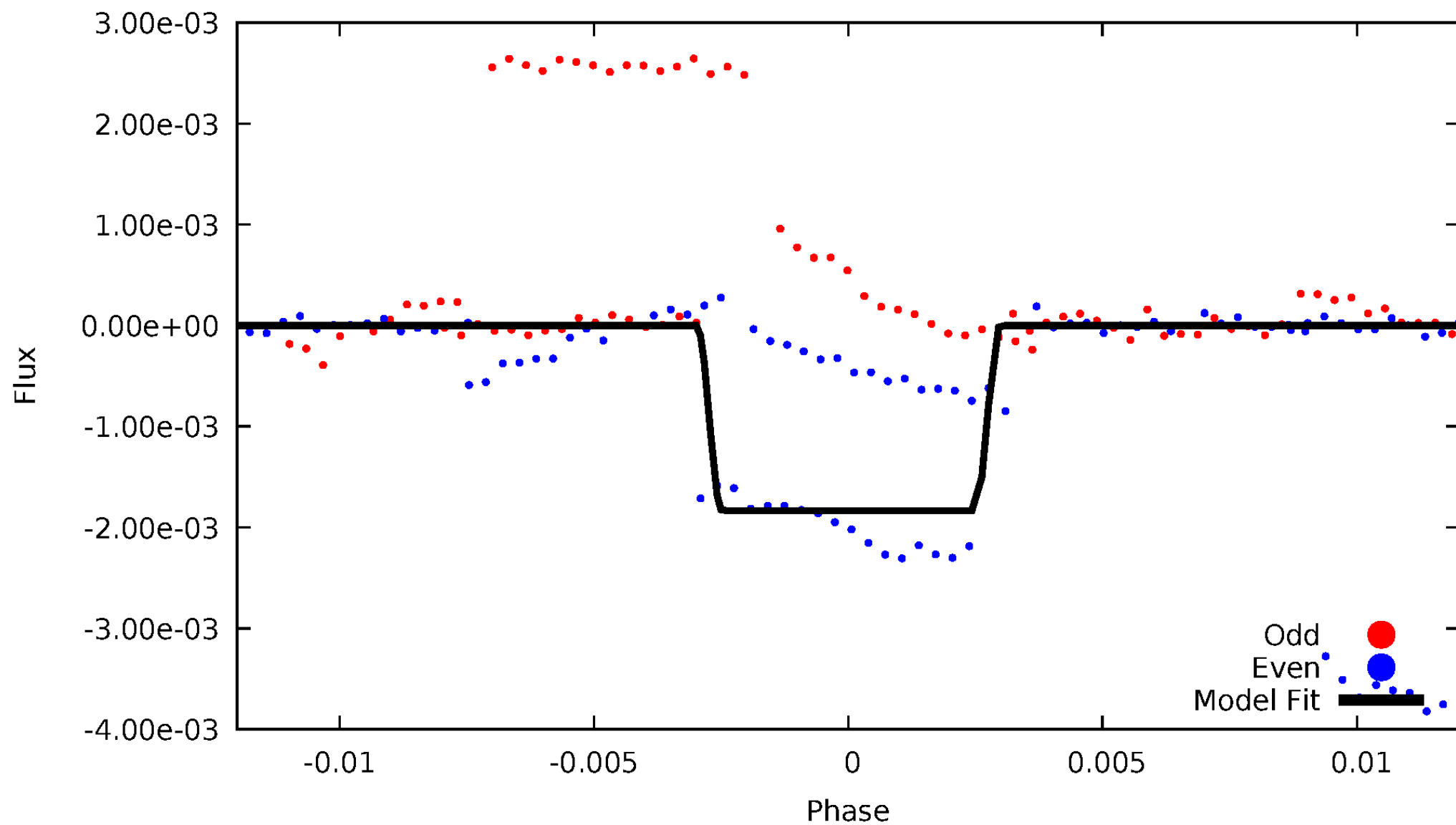
TCE 008181646-07





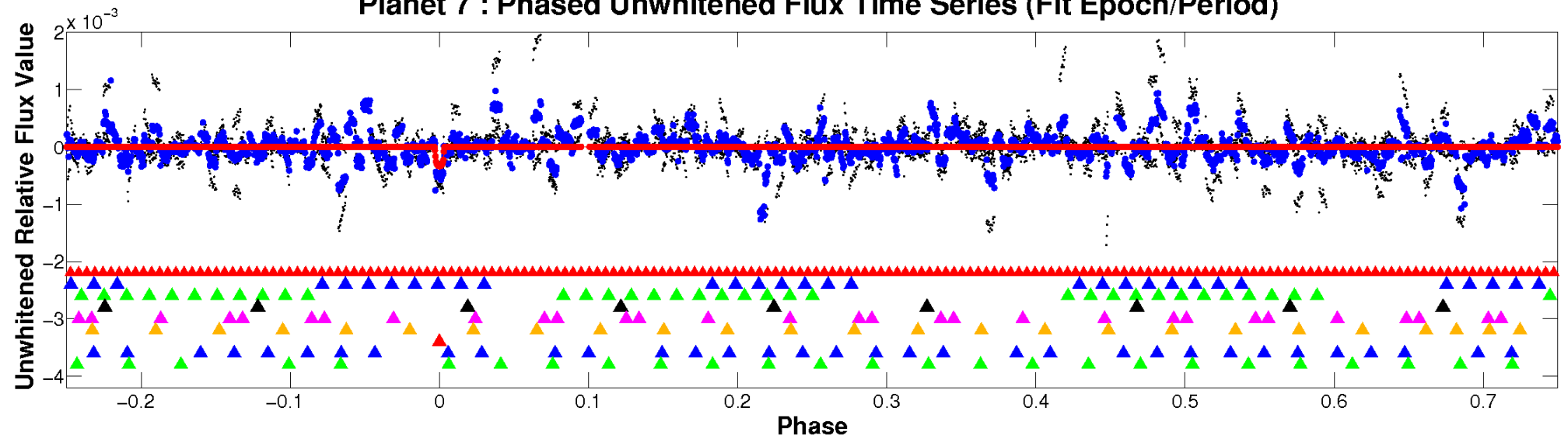
# ALT Odd/Even

TCE 008181646-07

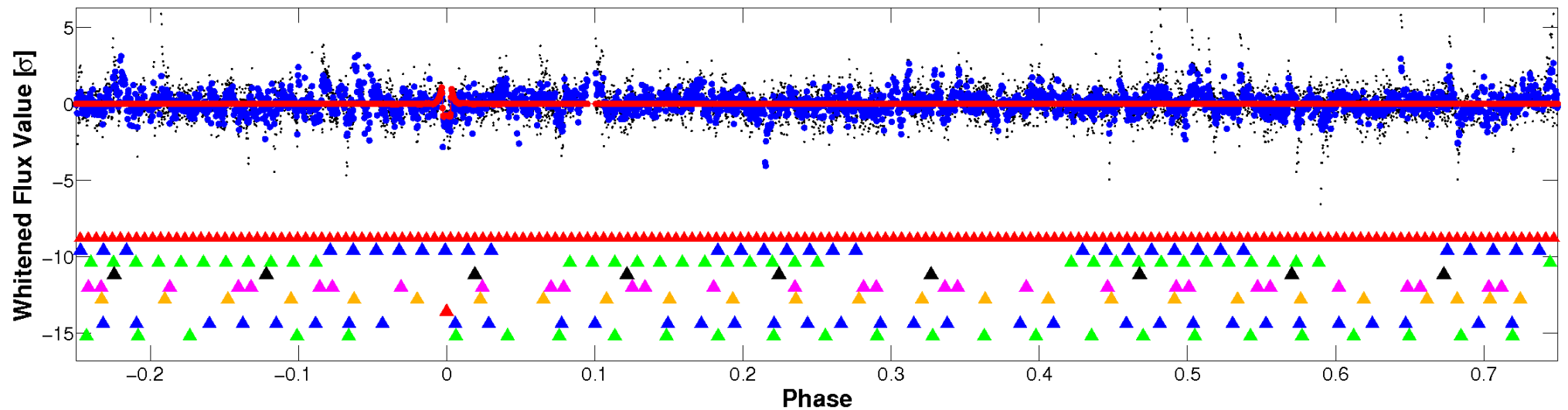


# Non-Whitened Vs. Whitened Light Curve

## Planet 7 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)

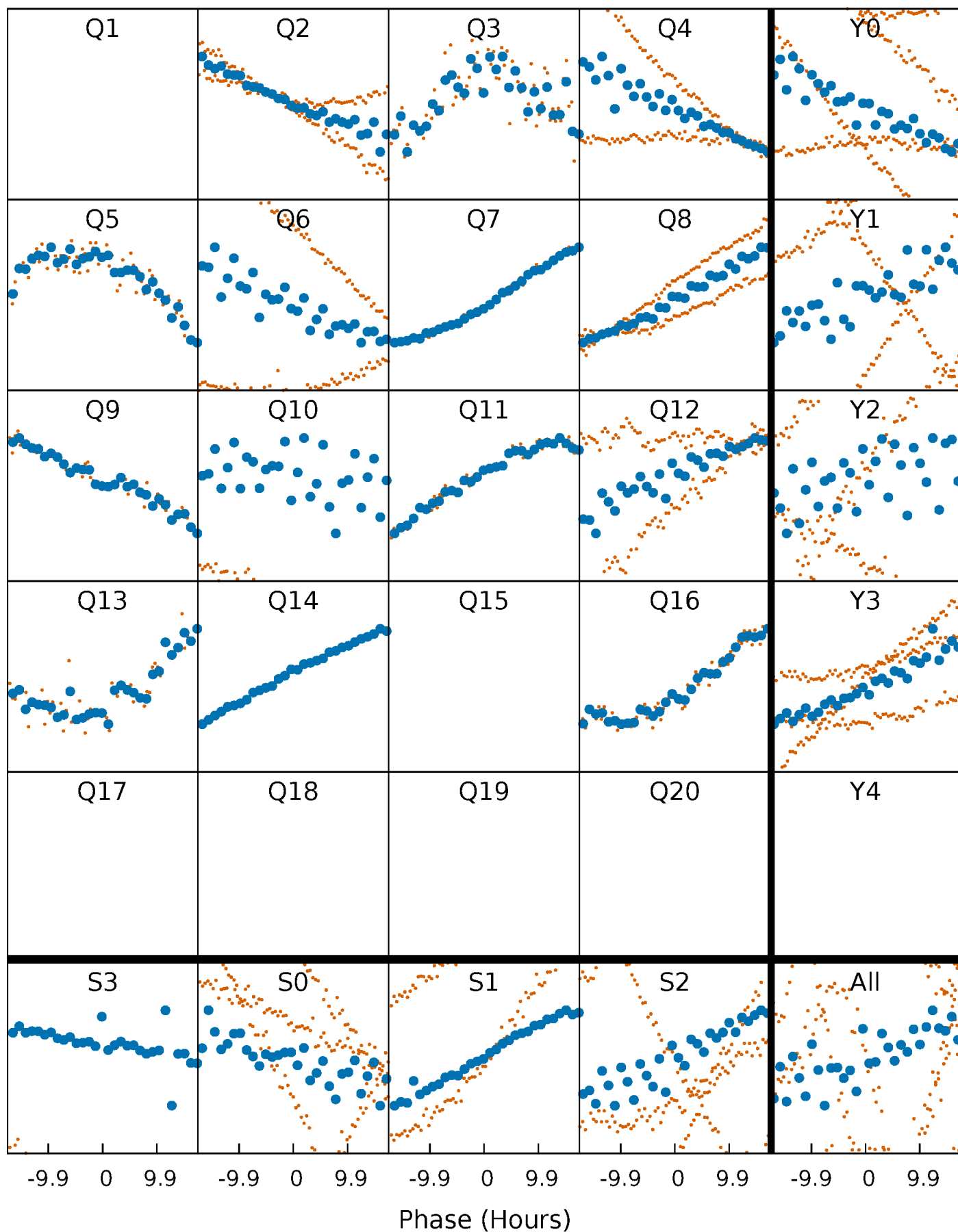


## Planet 7 : Phased Whitened Flux Time Series (Fit Epoch/Period)



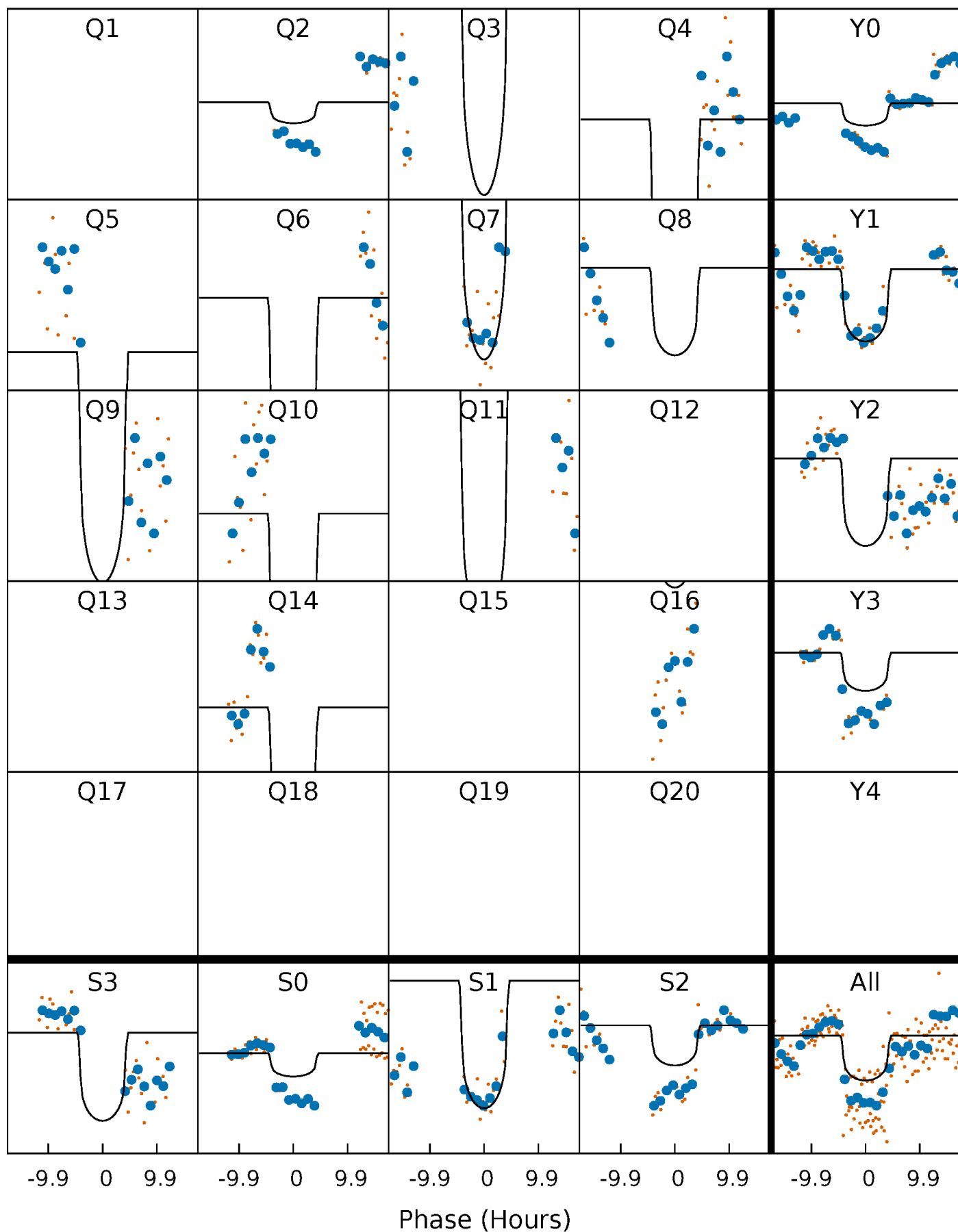
# PDC Quarter-Phased Transit Curves

TCE 008181646-07 P= 61.879706 Days  $T_0=179.179822$  (BKJD)



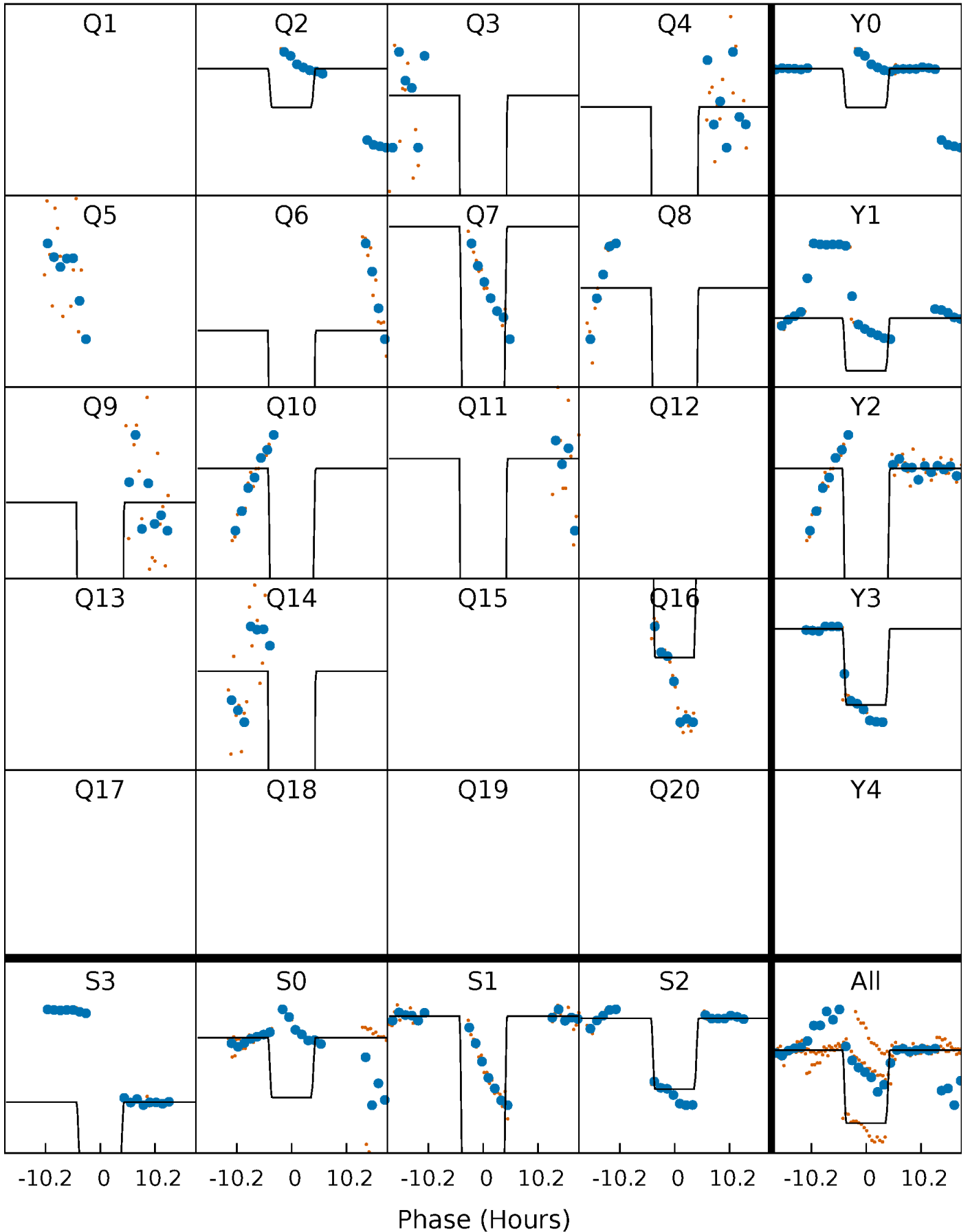
# DV Quarter-Phased Transit Curves

TCE 008181646-07   P= 61.879706 Days    $T_0=179.179822$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

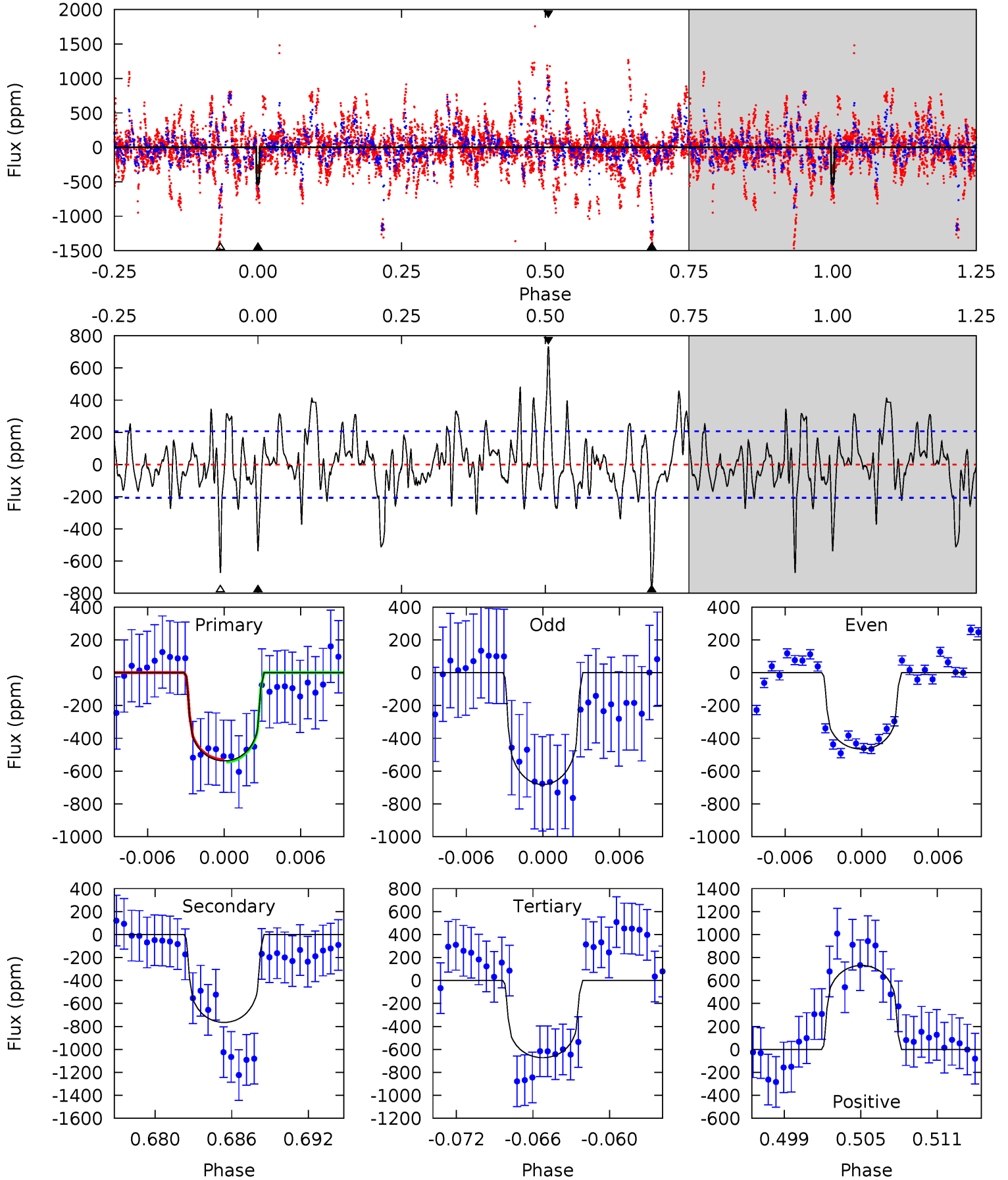
TCE 008181646-07   P= 61.883163 Days    $T_0=179.115397$  (BKJD)



# DV Model-Shift Uniqueness Test

008181646-07, P = 61.879706 Days, E = 117.300116 Days

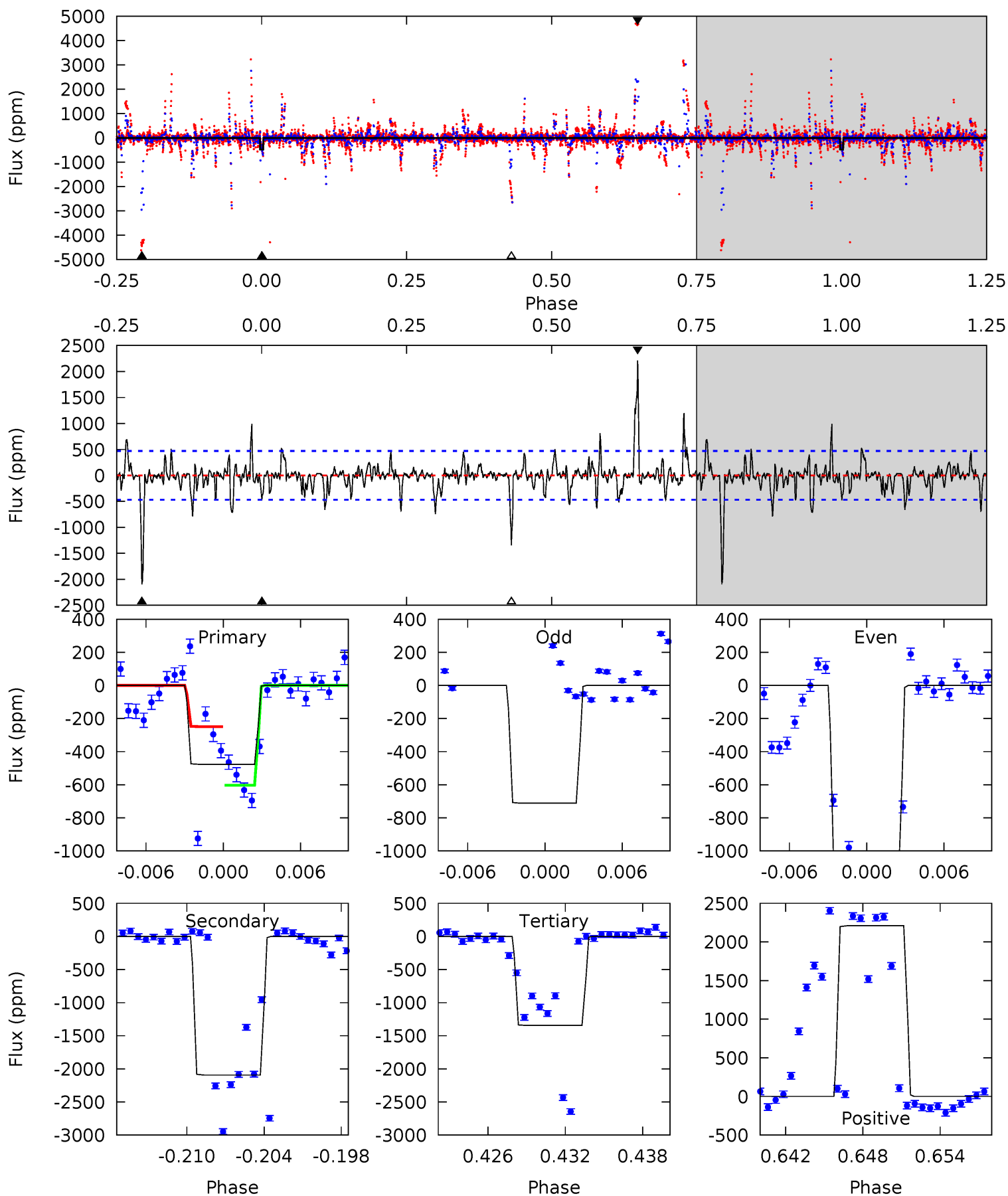
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
13.3	19.0	16.6	18.1	5.12	2.75	3.99	-3.33	-4.78	2.31	0.85	2.22	0.87	0.49	0.19



# Alt Model-Shift Uniqueness Test

008181646-07, P = 61.883163 Days, E = 117.232234 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
5.18	22.8	14.6	24.1	5.12	2.75	2.39	-9.45	-18.9	8.16	-1.27	2.81	0.63	0.51	2.03



### Stellar Parameters For KIC 008181646

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M$ ( $M_{\odot}$ )	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5486^{+146}_{-146}$	$4.612^{+0.037}_{-0.112}$	$-0.400^{+0.300}_{-0.300}$	$0.736^{+0.131}_{-0.056}$	$0.824^{+0.075}_{-0.092}$	$2.905^{+0.476}_{-1.066}$
	+3%/-3%	+1%/-2%	+75%/-75%	+18%/-8%	+9%/-11%	+16%/-37%
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 008181646-07 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-765 \pm 40$	$1.53^{+0.58}_{-0.59}$	$550^{+25}_{-18}$	$6700^{+2184}_{-1007}$	$14794^{+23992}_{-7163}$
Alt.	$-2095 \pm 92$	$3.54^{+0.65}_{-0.58}$	$550^{+26}_{-19}$	$5658^{+501}_{-392}$	$7489^{+3044}_{-2127}$

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



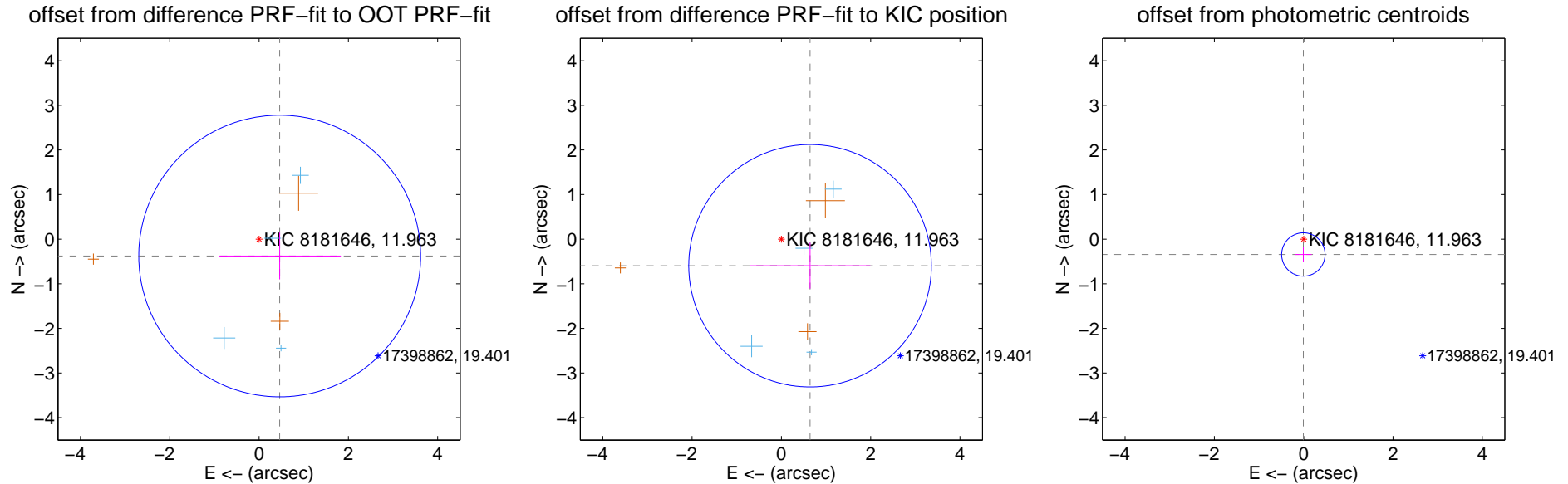
## DV Centroid Data

Supplemental centroid analysis for 008181646-07. **Kepler magnitude: 11.96.** Transit SNR 6.70

There are 4 quarters with good PRF difference image offsets

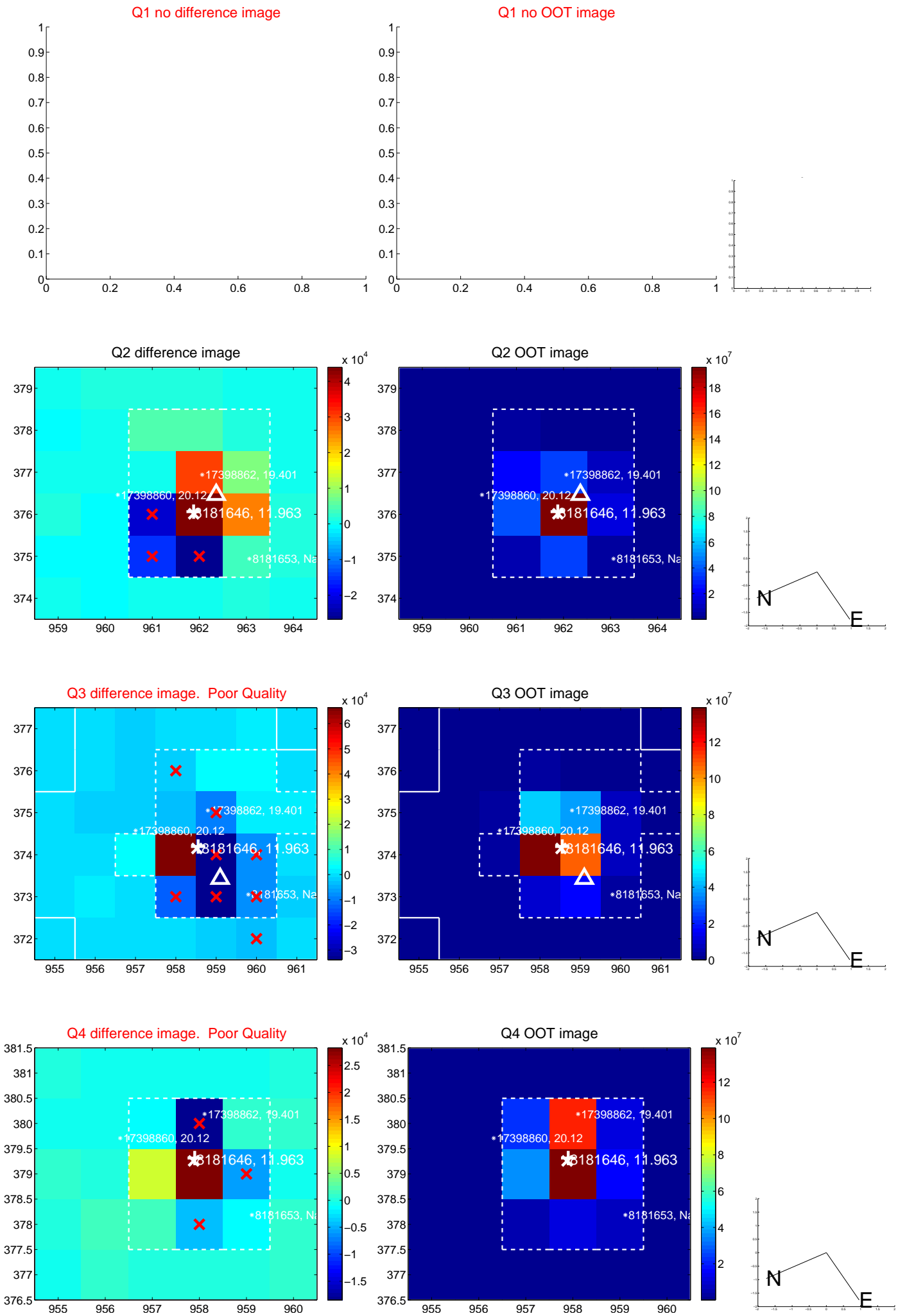
The direct PRF centroid is offset from the target star catalog position by about 0.39 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.597 \pm 1.052$	0.57	$-0.462 \pm 1.370$	$-0.378 \pm 0.525$
PRF-fit source offset from KIC position	$0.876 \pm 0.906$	0.97	$-0.642 \pm 1.350$	$-0.595 \pm 0.515$
photometric centroid source offset	$0.34 \pm 0.16$	2.12	$0.01 \pm 0.19$	$-0.34 \pm 0.16$

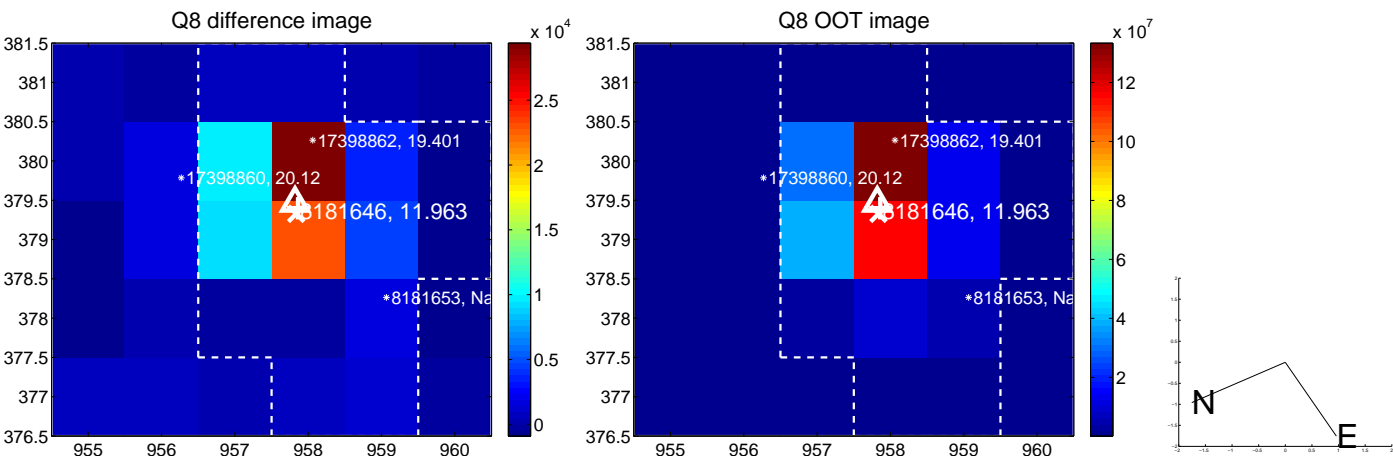
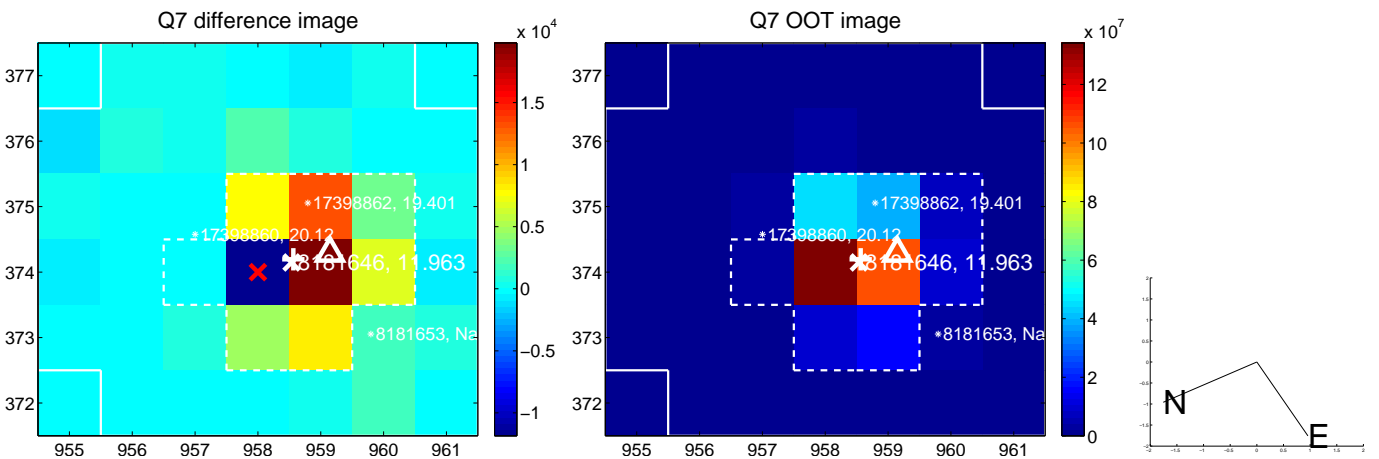
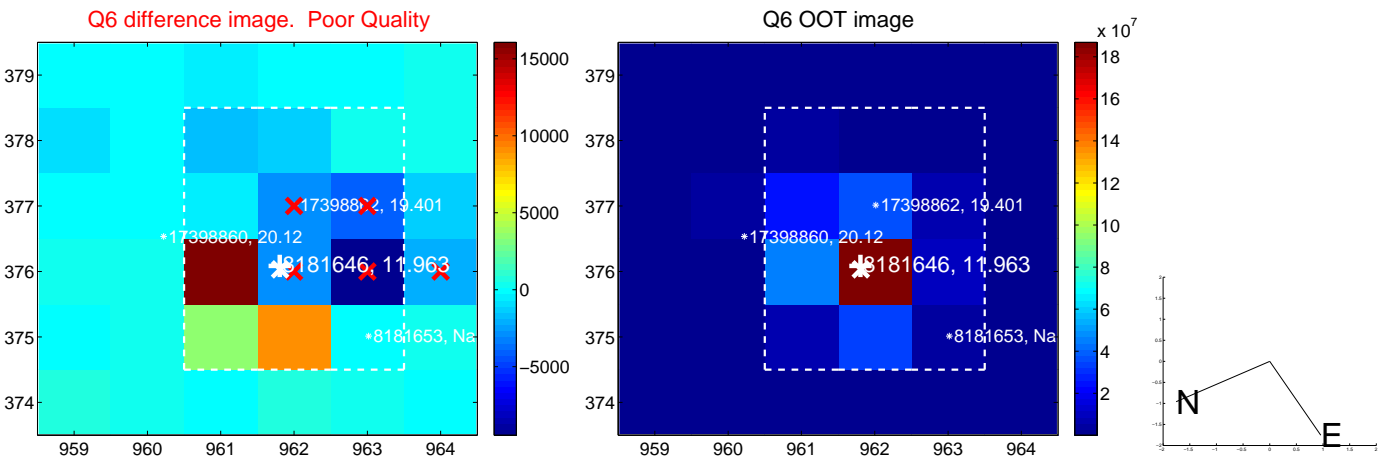
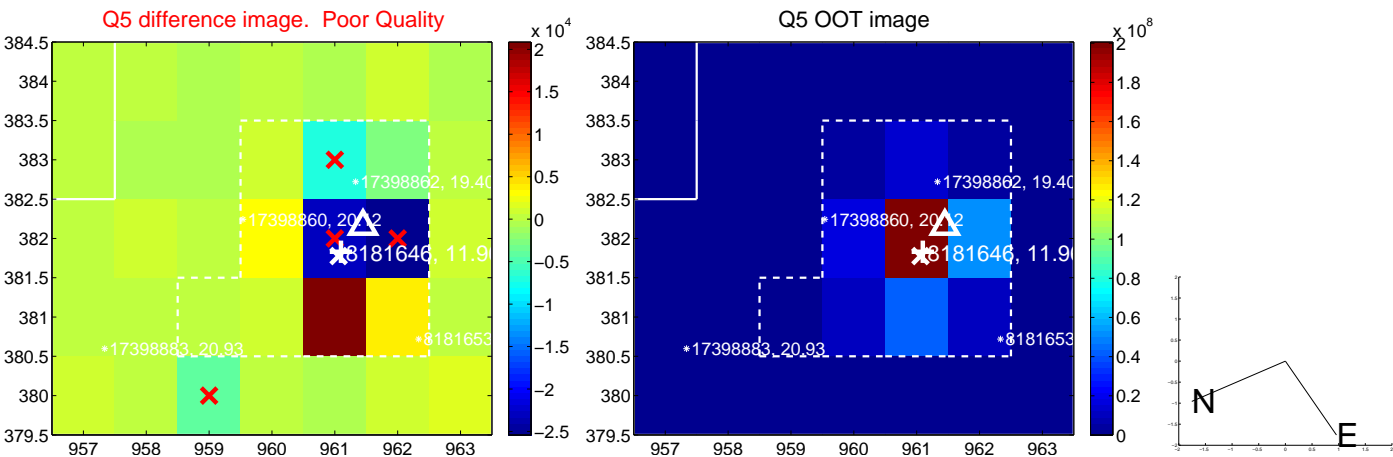


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets;** magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

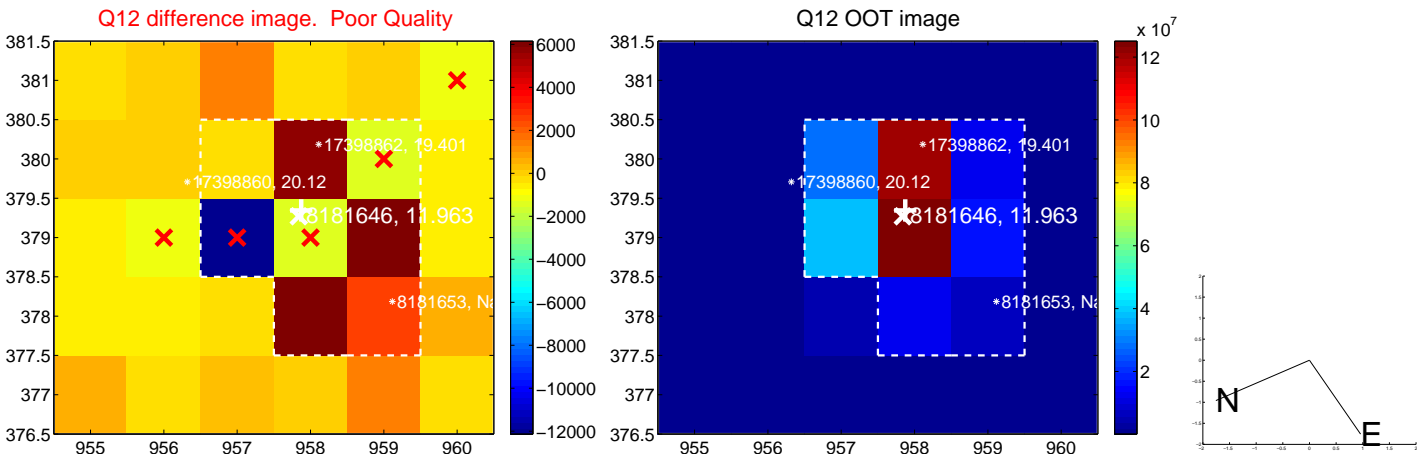
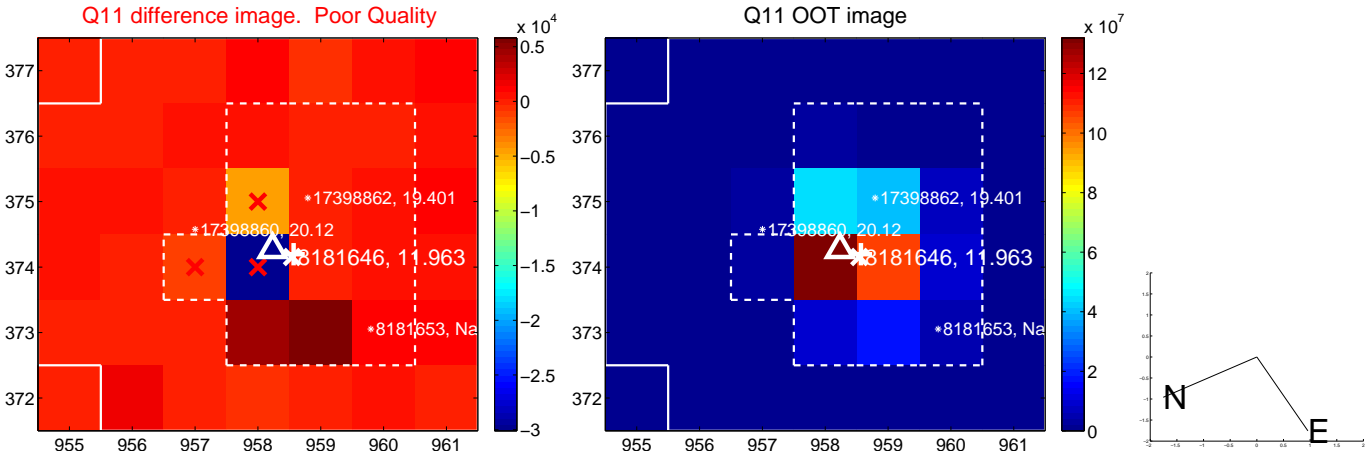
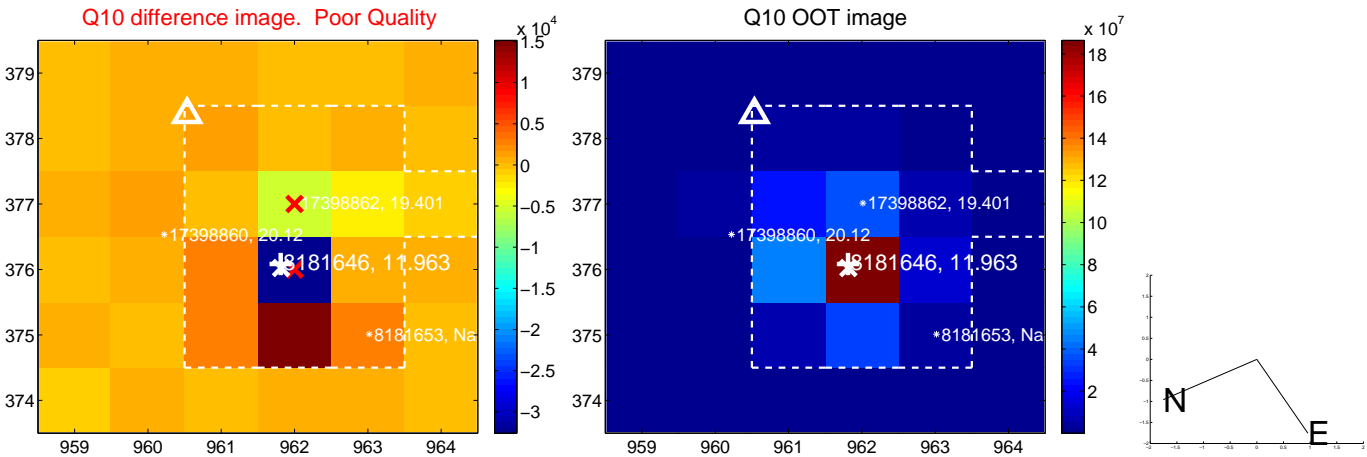
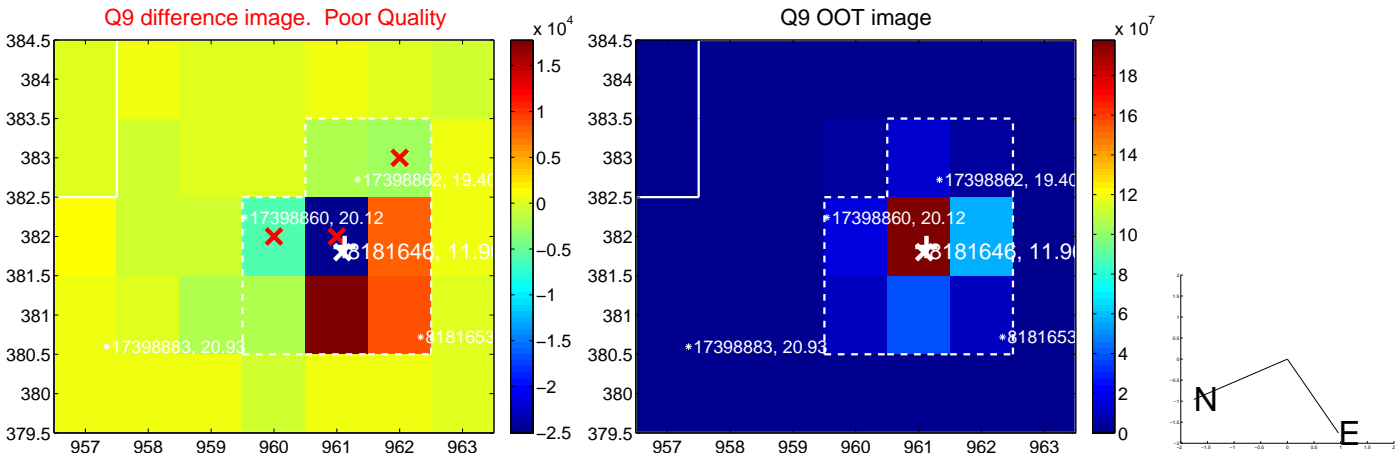
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



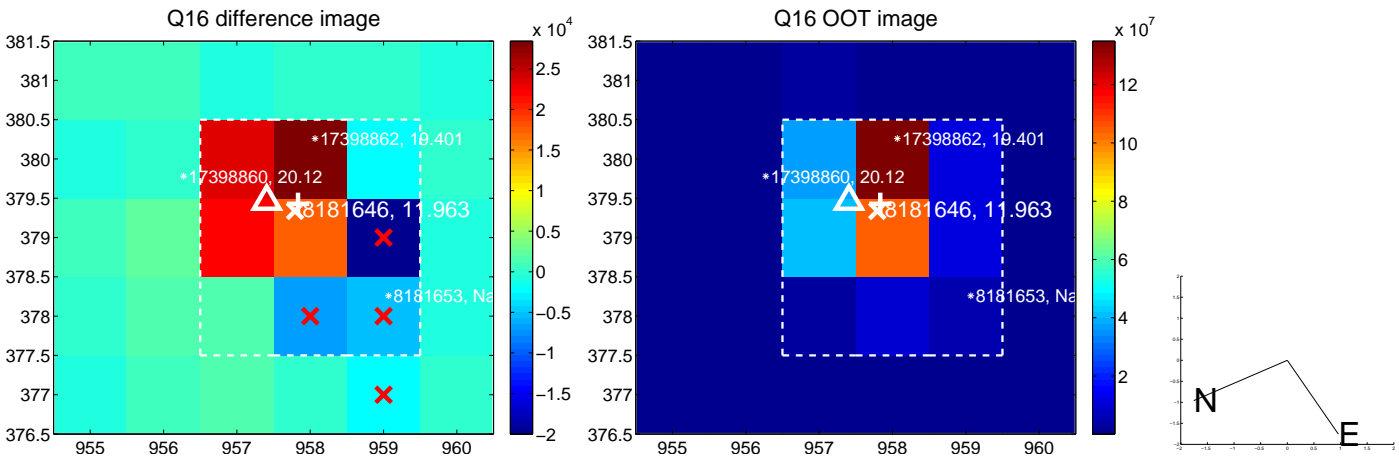
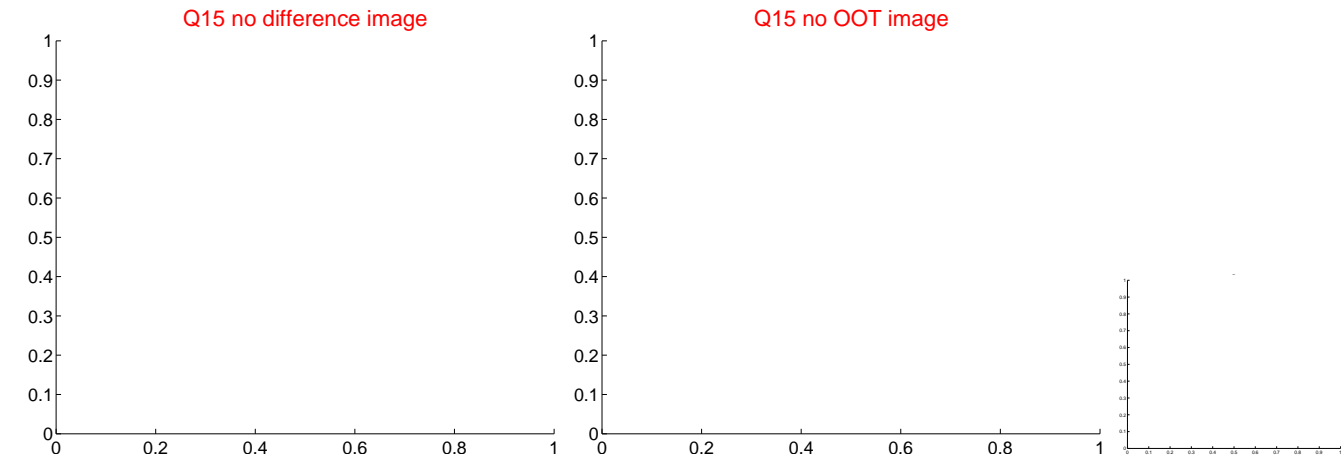
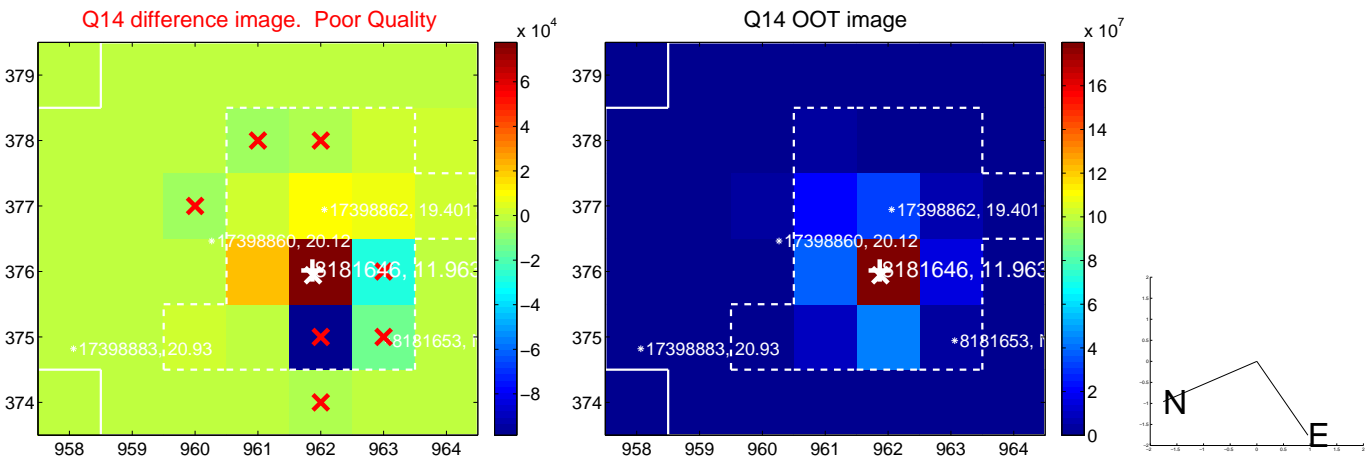
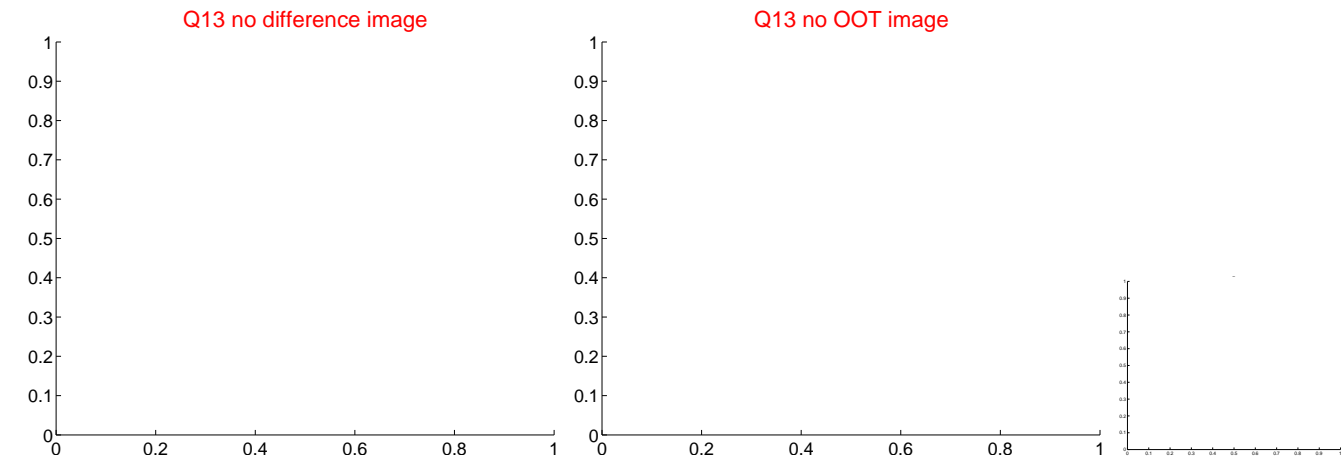
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



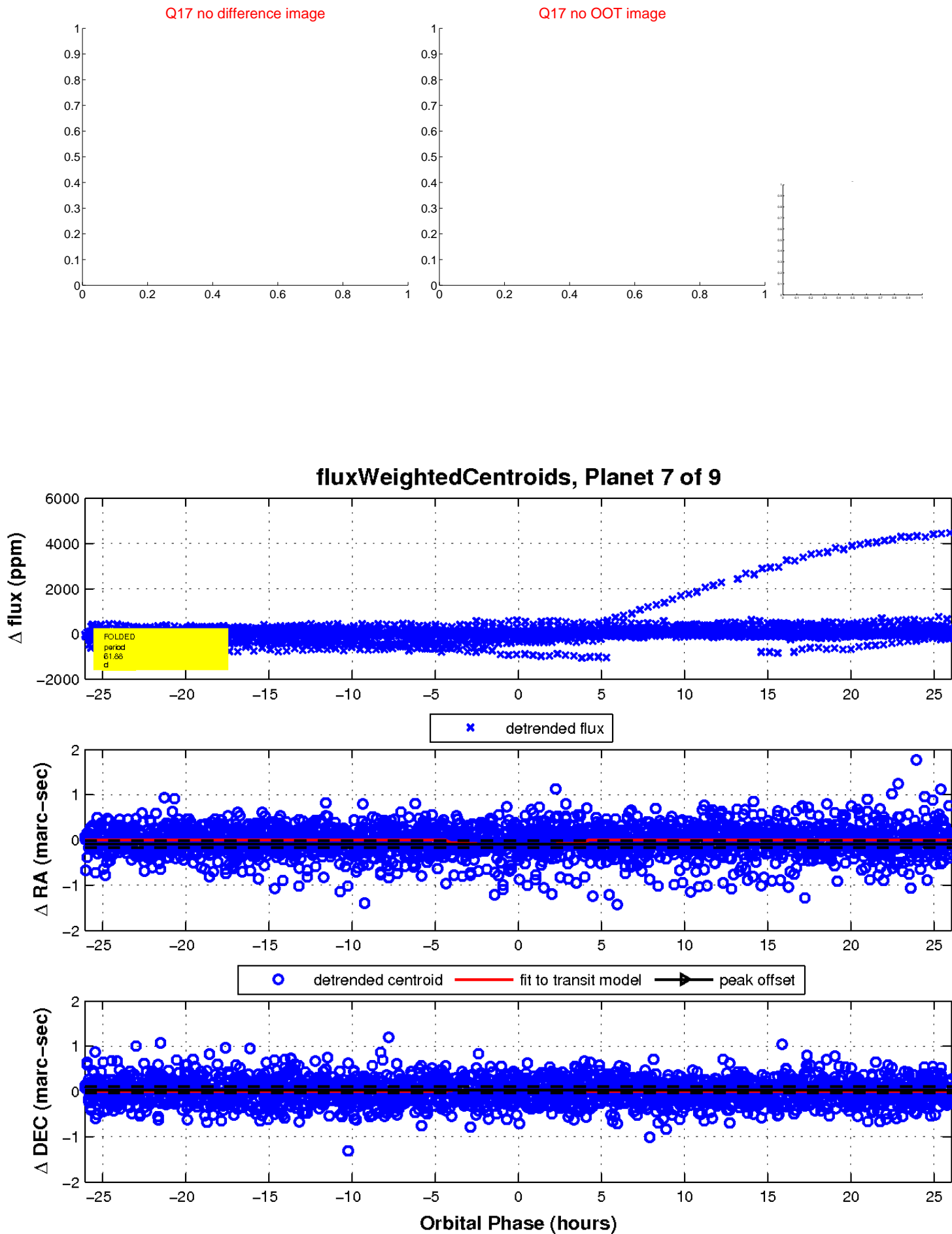
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

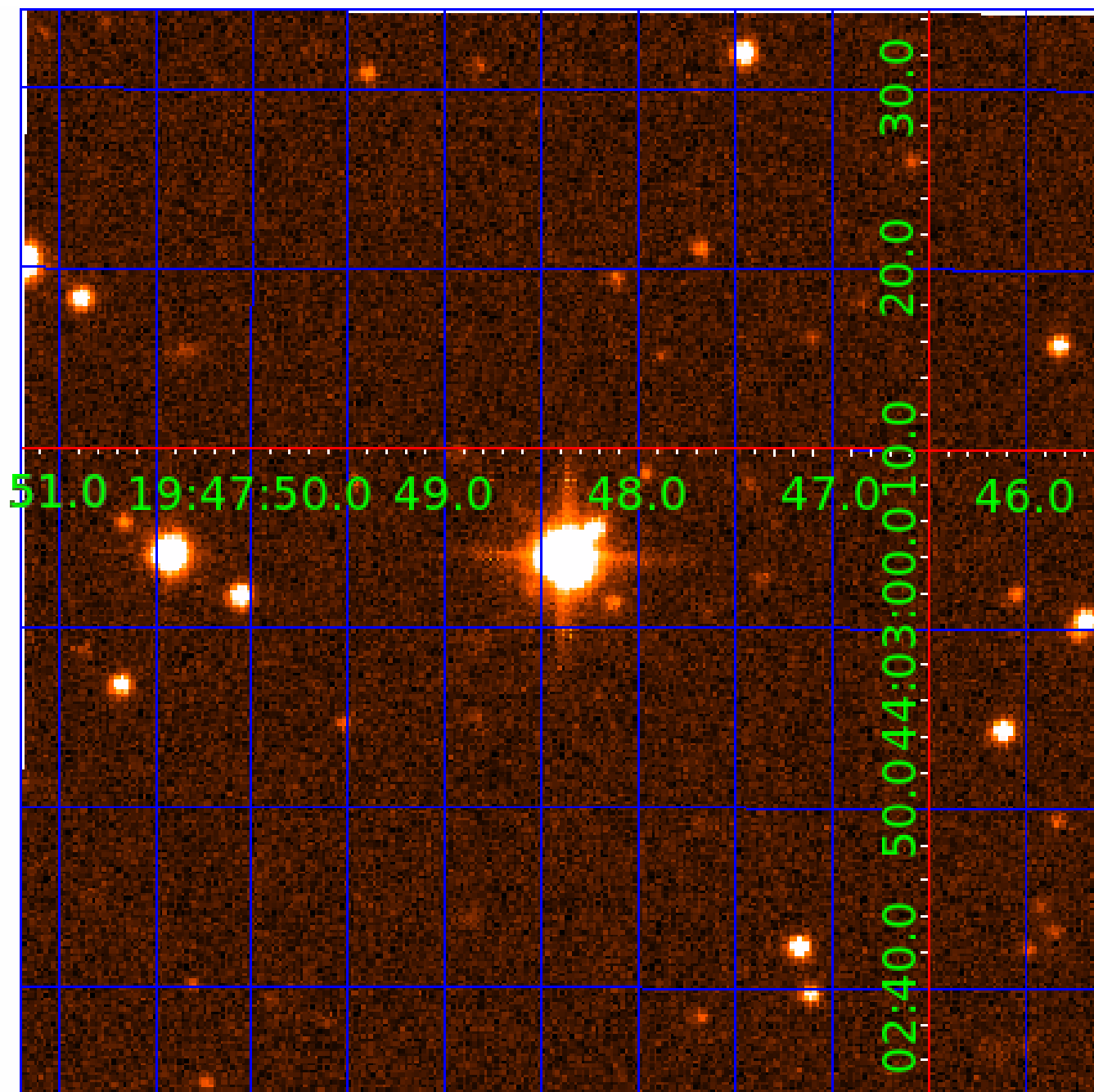


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 008181646

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
008181646-01	OBS	No	2.354098	131.598372	15.8	16.008	7.2	7.7	0.74	5486	0.30	422.09
008181646-02	OBS	No	46.649767	174.321233	110.5	7.773	22.7	2.3	0.74	5486	0.88	7.87
008181646-03	OBS	No	40.939977	153.721226	224.5	5.088	20.0	6.5	0.74	5486	1.24	9.37
008181646-04	OBS	No	157.875096	208.123739	4505.6	54.343	17.3	12.4	0.74	5486	9.20	1.55
008181646-05	OBS	No	48.824583	164.751099	532.2	25.560	15.7	7.3	0.74	5486	3.40	7.41
008181646-06	OBS	No	59.244269	160.876125	298.1	38.985	14.2	4.7	0.74	5486	1.37	5.72
008181646-07	OBS	No	61.879706	179.179822	339.5	8.688	11.4	6.7	0.74	5486	1.45	5.40
008181646-08	OBS	No	42.732442	148.480323	161.0	5.821	11.3	4.3	0.74	5486	0.99	8.85

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
008181646-01	OBS	FP	0.00	1	0	0	0	LPP_DV
008181646-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_TRACKER—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV
008181646-03	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE_ZUMA—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_UNRESOLVED_OFFSET
008181646-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL_SKYE—TRANS_GAPPED—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—INCONSISTENT_TRANS
008181646-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV
008181646-06	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
008181646-07	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_FEW_DIFFS
008181646-08	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV

**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.

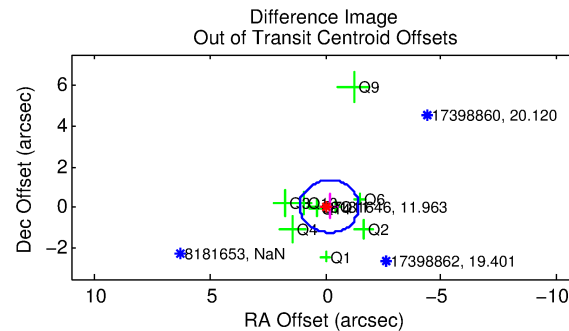
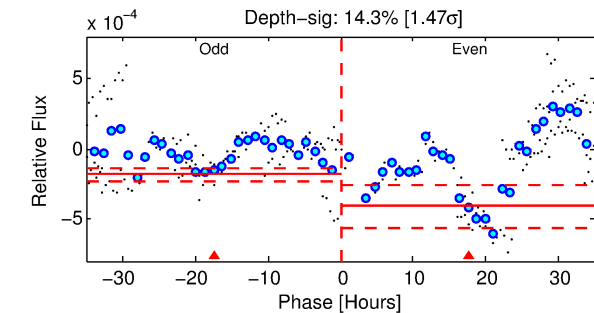
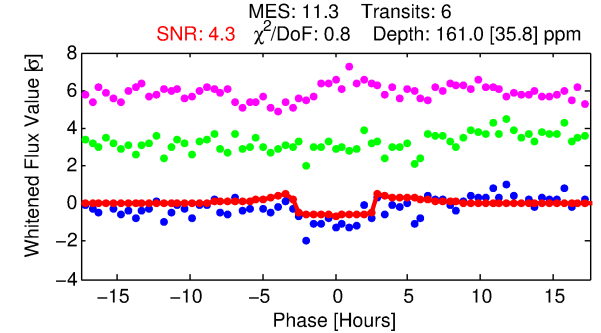
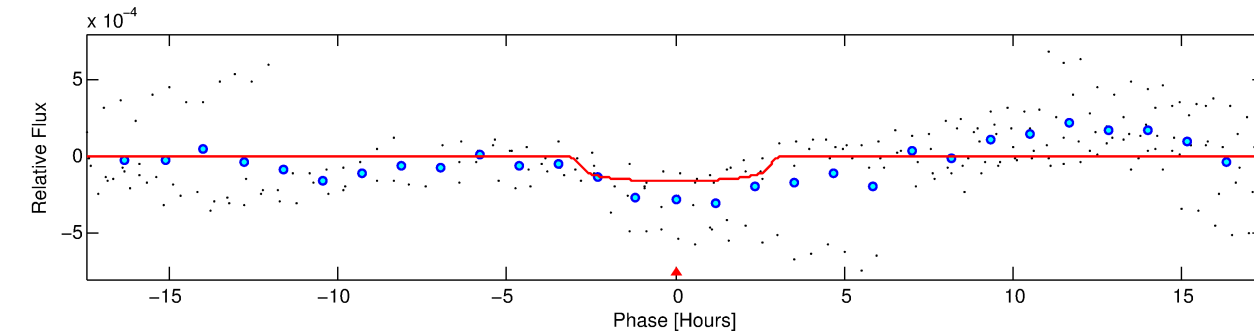
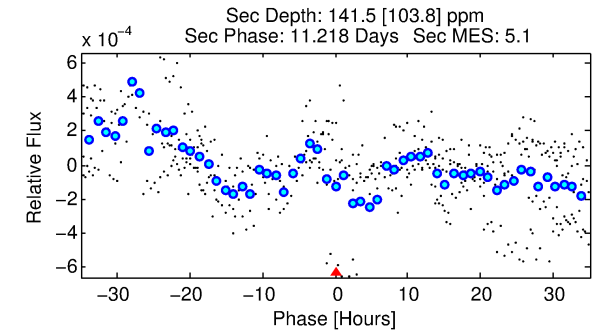
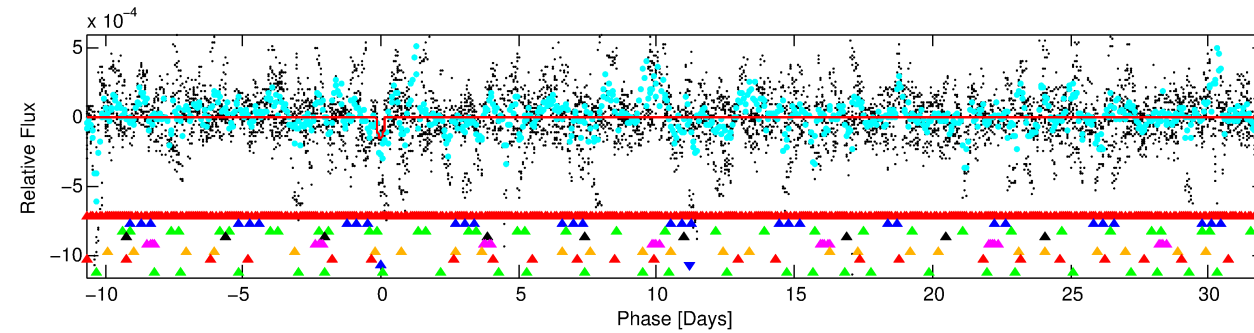
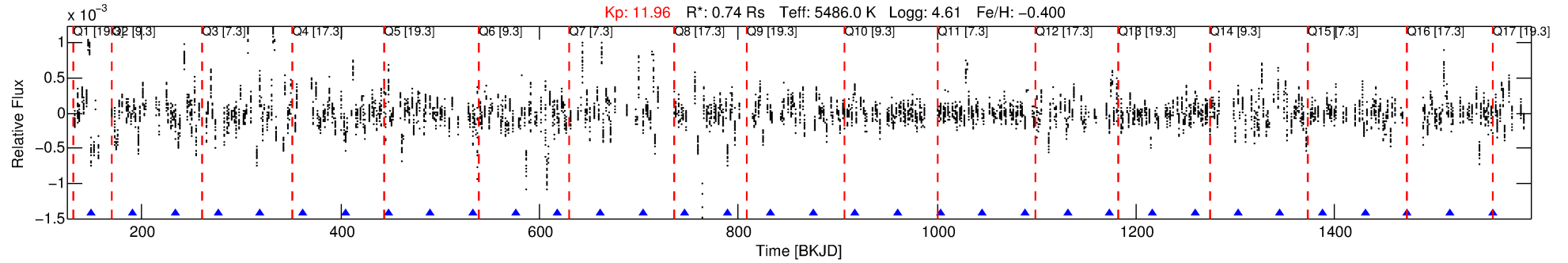
Ephemeris Match Information For 008181646-08

No Significant Match Found



# DV One-Page Summary

KIC: 8181646 Candidate: 8 of 9 Period: 42.732 d



## DV Fit Results:

Period = 42.73244 [0.00124] d  
Epoch = 148.4803 [0.0188] BKJD  
Rp/R\* = 0.0123 [0.0130]  
a/R\* = 42.50 [192.59]  
b = 0.67 [3.75]  
Seff = 8.85 [2.07]  
Teq = 440 [26] K  
Rp = 0.99 [1.06] Re  
a = 0.2229 [0.0327] AU  
Ag = 3962.82 [8932.90] [0.44σ]  
Teffp = 5395 [3031] K [1.63σ]

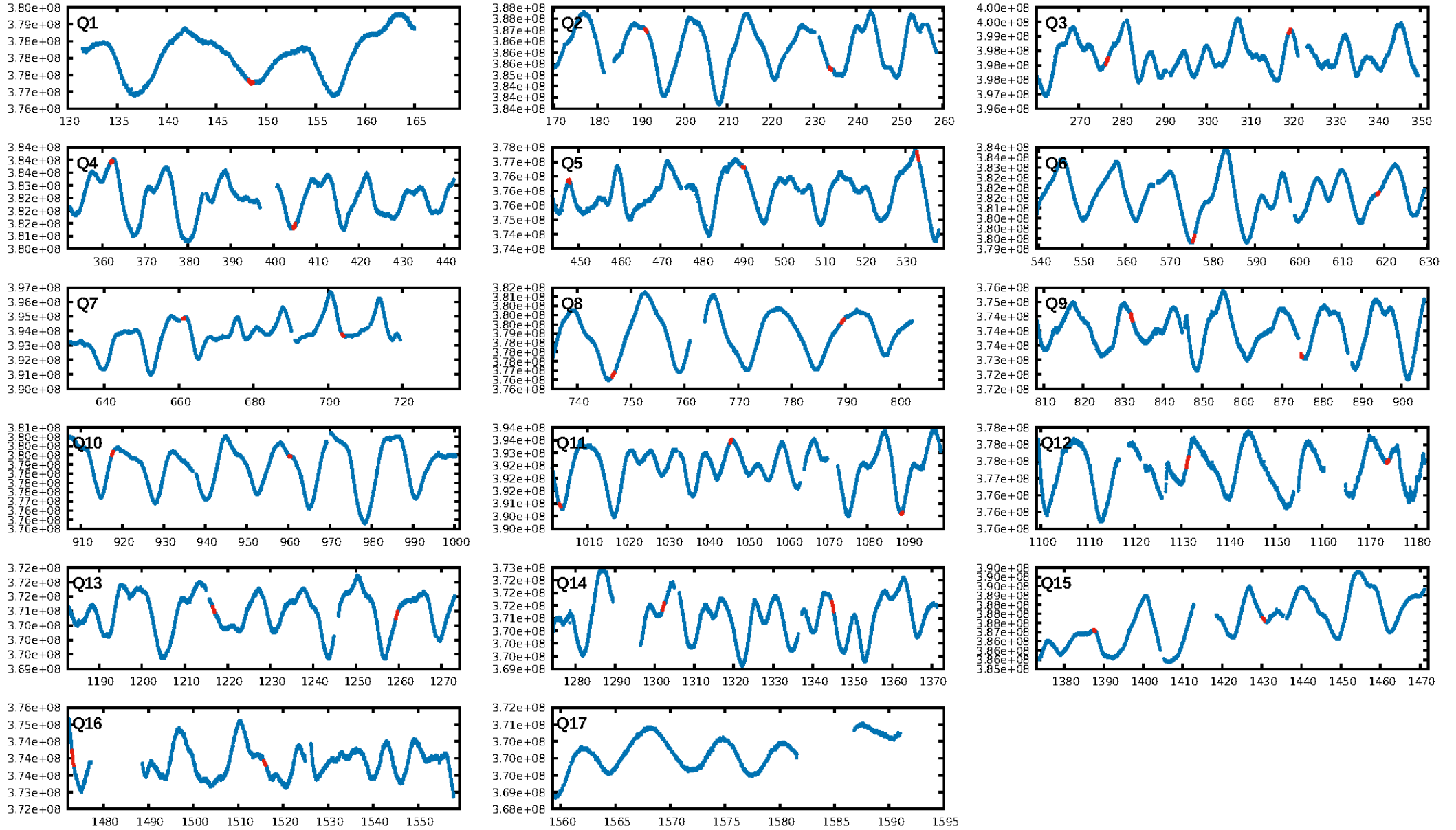
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [5.56σ]  
LongPeriod-sig: 100.0% [9.68σ]  
ModelChiSquare2-sig: 35.7%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [6/6]  
GhostDiagnostic-chr: -3.654  
Centroid-sig: 35.8%  
Centroid-so: 0.144 arcsec [0.48σ]  
OotOffset-rm: 0.174 arcsec [0.41σ]  
KicOffset-rm: 0.311 arcsec [0.92σ]  
OotOffset-st: 4/3/1/2 [10]  
KicOffset-st: 4/3/1/2 [10]  
DiffImageQuality-fgm: 0.60 [6/10]  
DiffImageOverlap-fno: 0.33 [5/15]

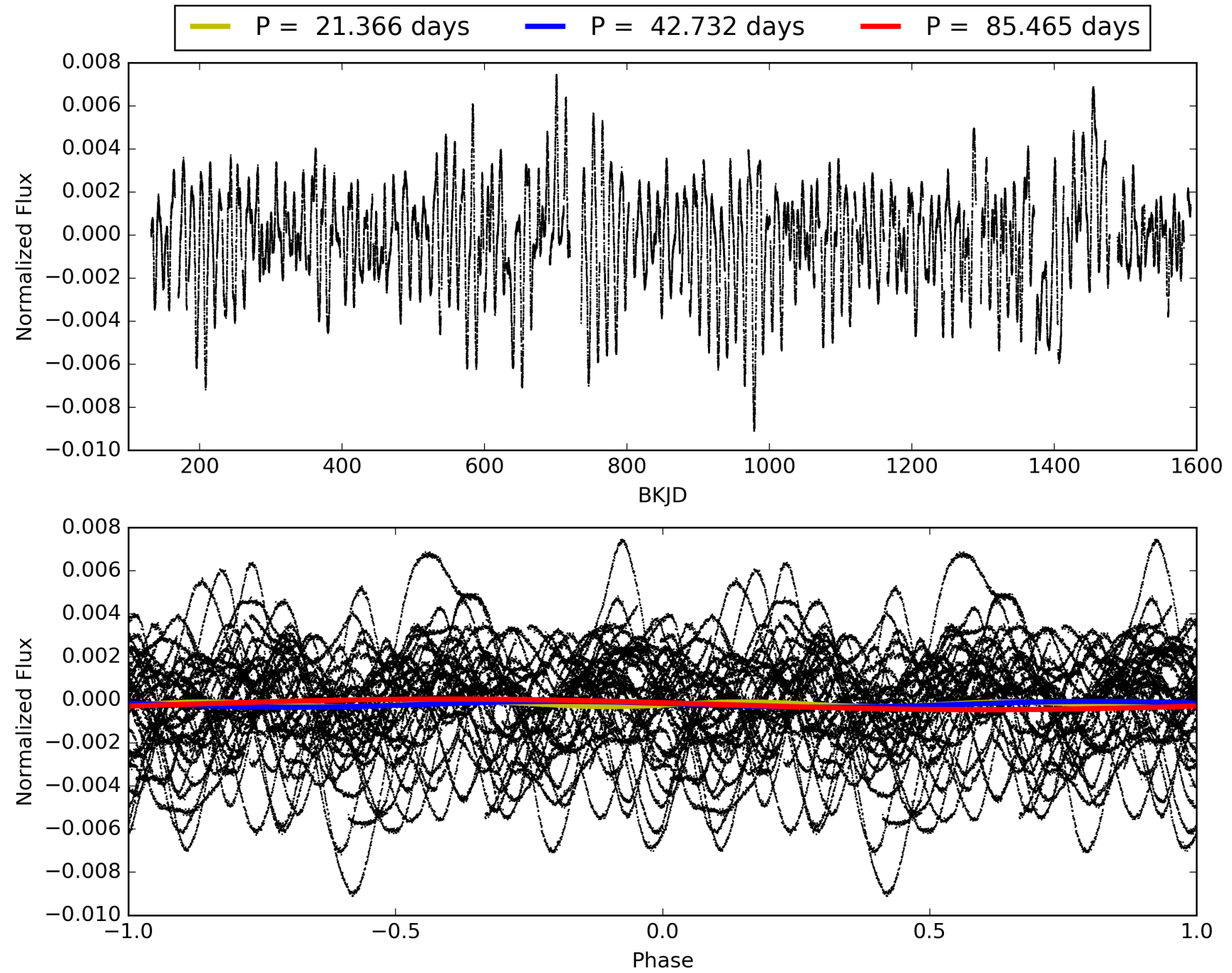
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 23:57:55 Z

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

# TCE 008181646-08, PDC Light Curves

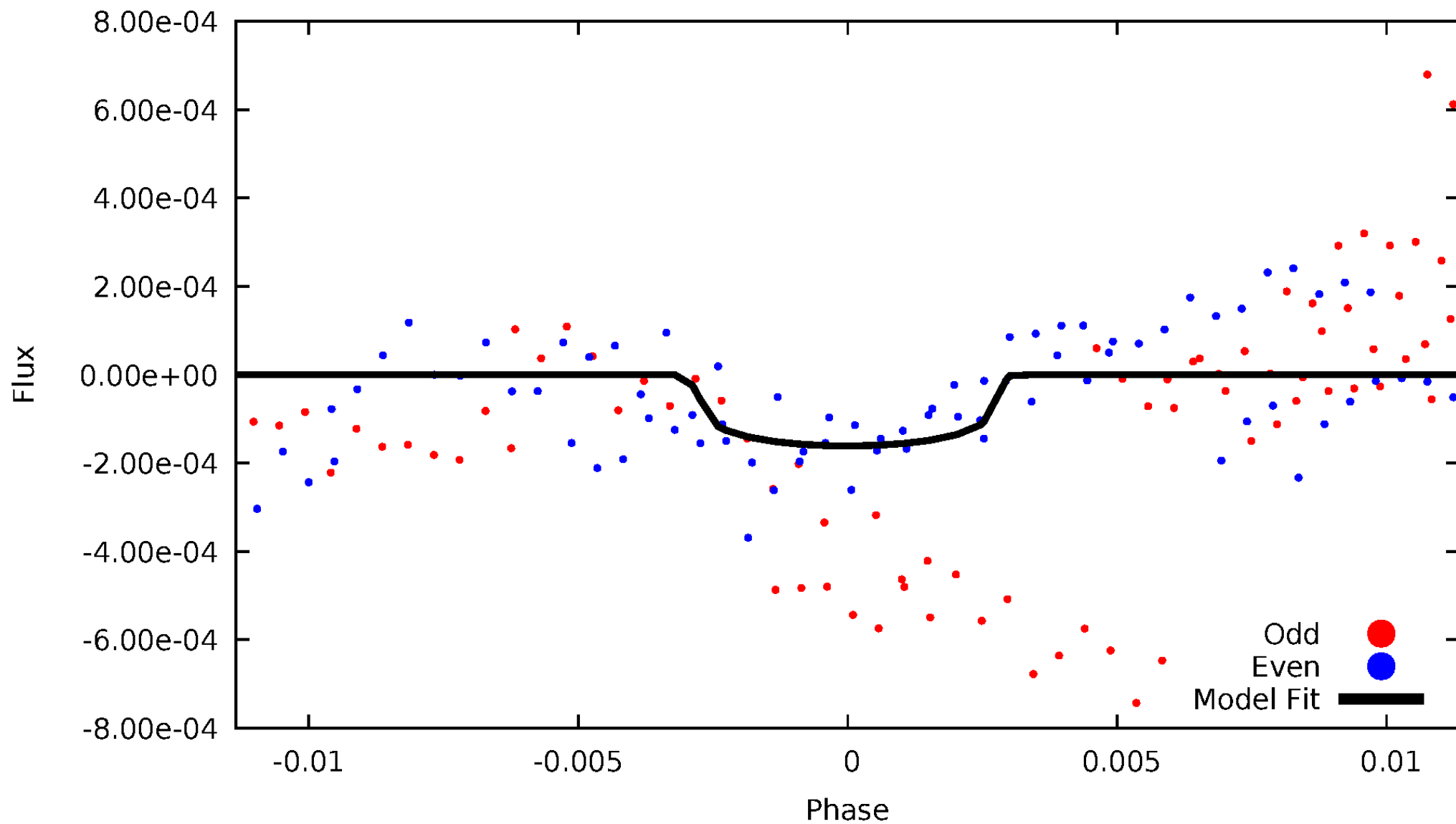


# TCE 008181646-08



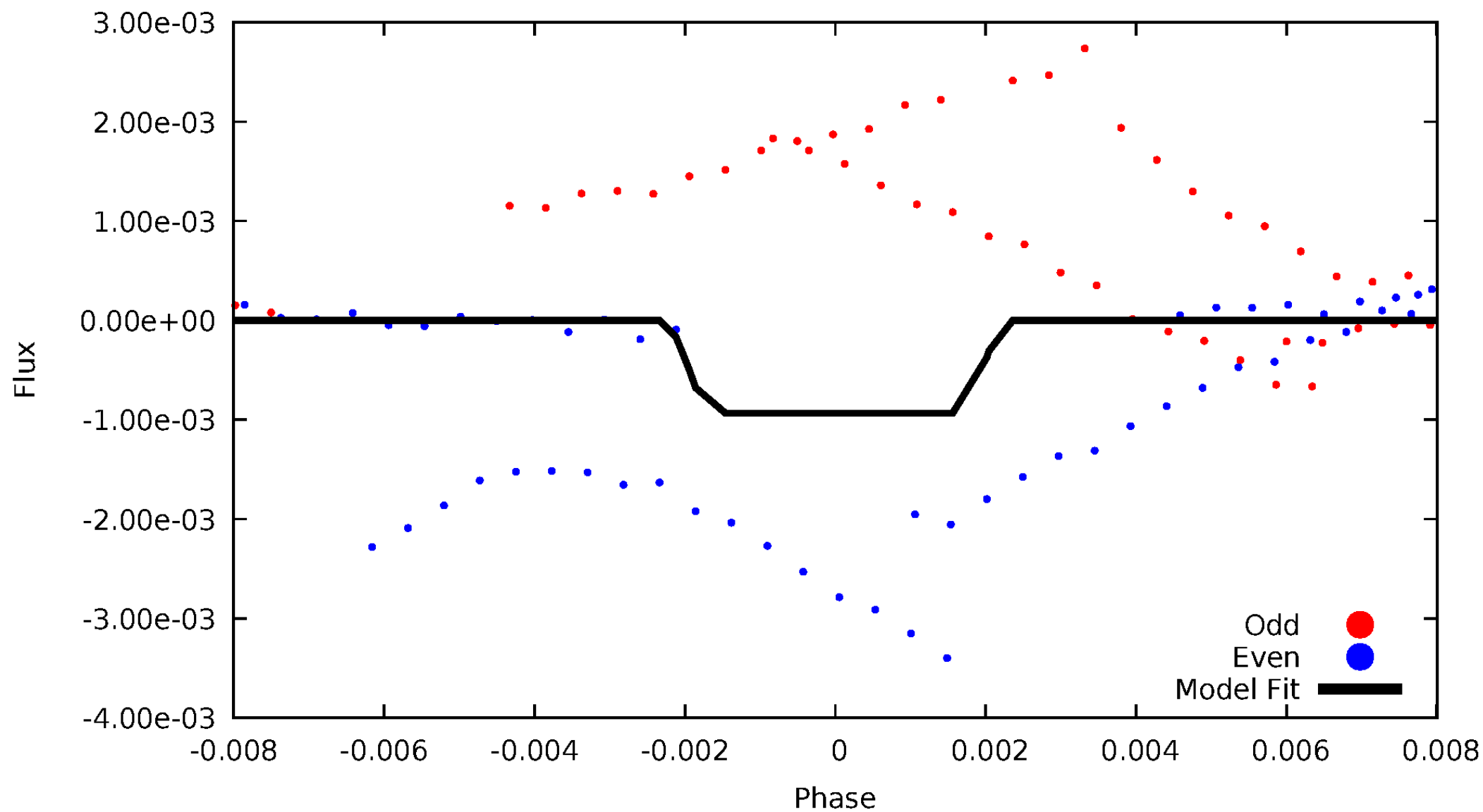
# DV Odd/Even

TCE 008181646-08



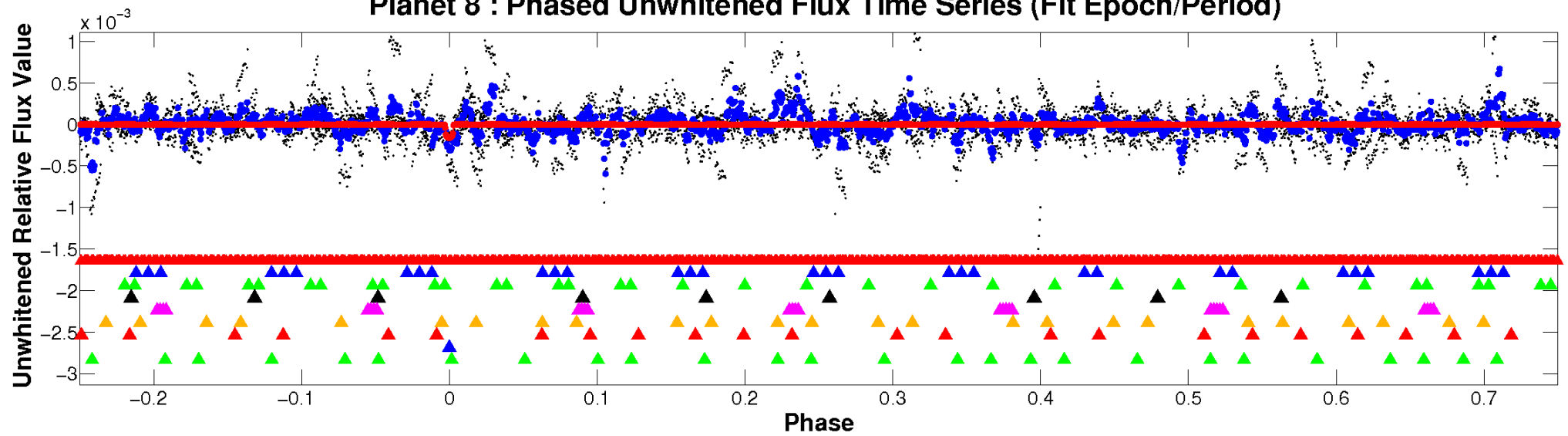
# ALT Odd/Even

TCE 008181646-08

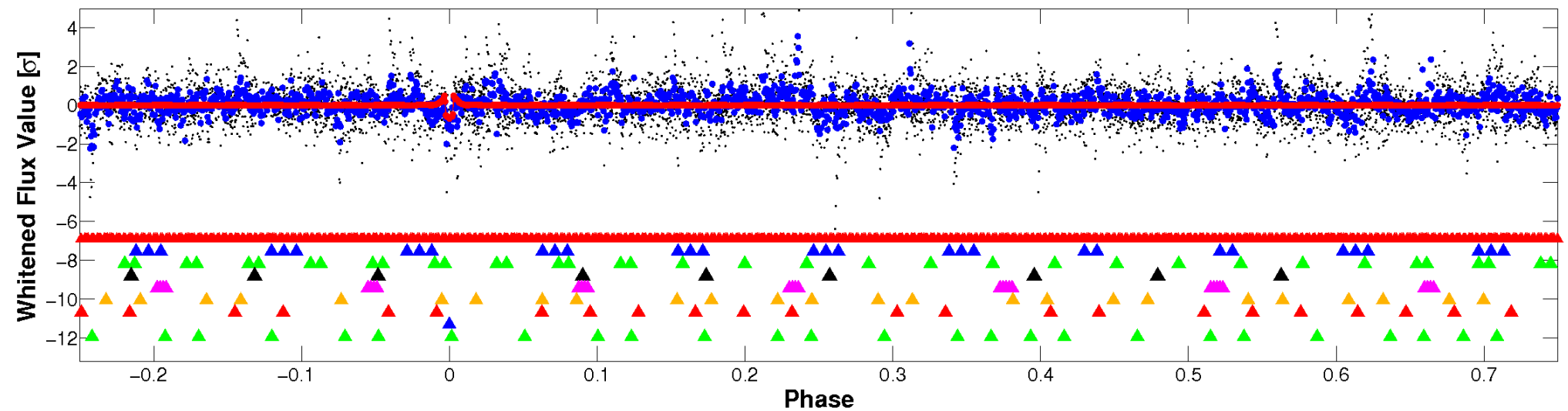


# Non-Whitened Vs. Whitened Light Curve

## Planet 8 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)

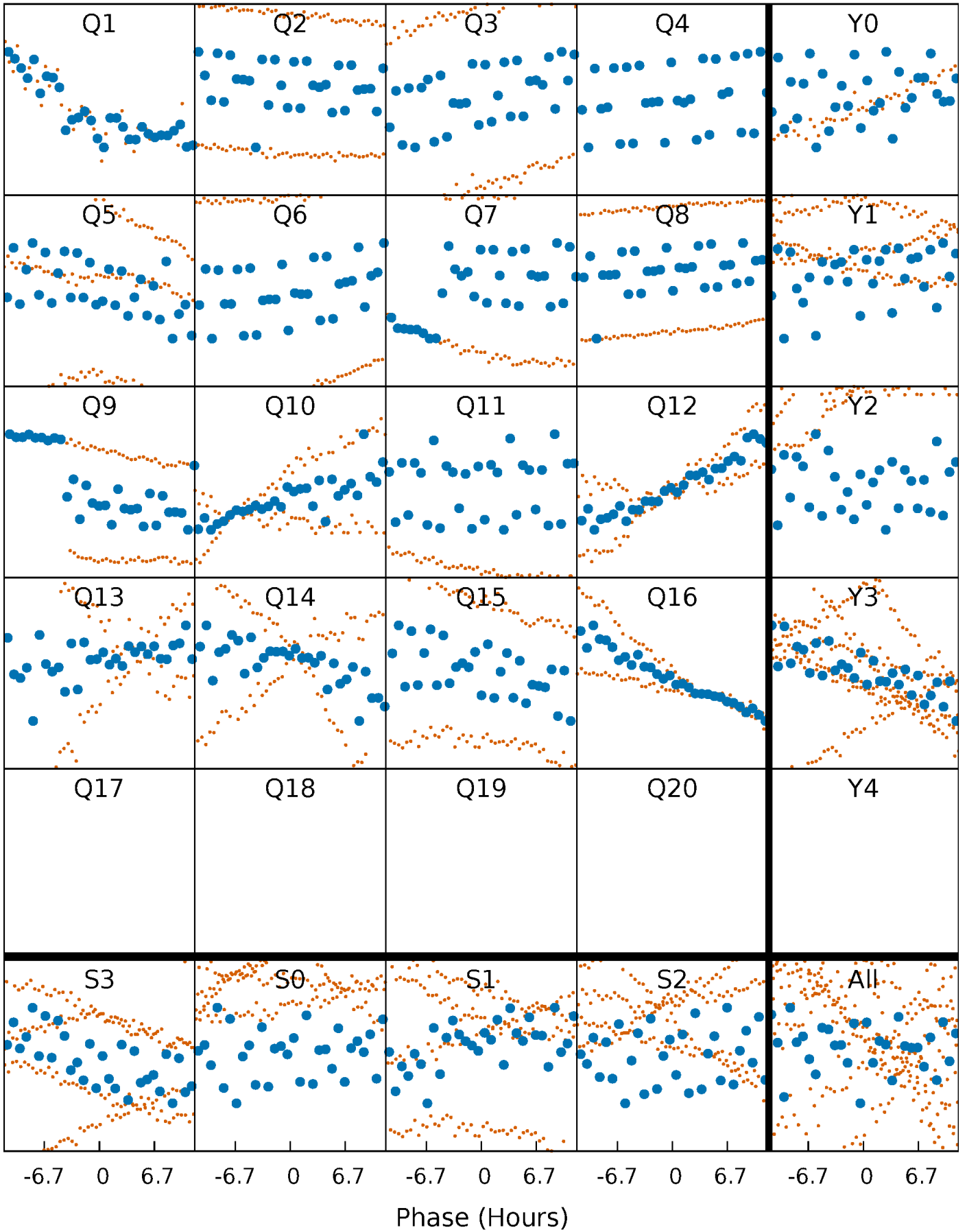


## Planet 8 : Phased Whitened Flux Time Series (Fit Epoch/Period)



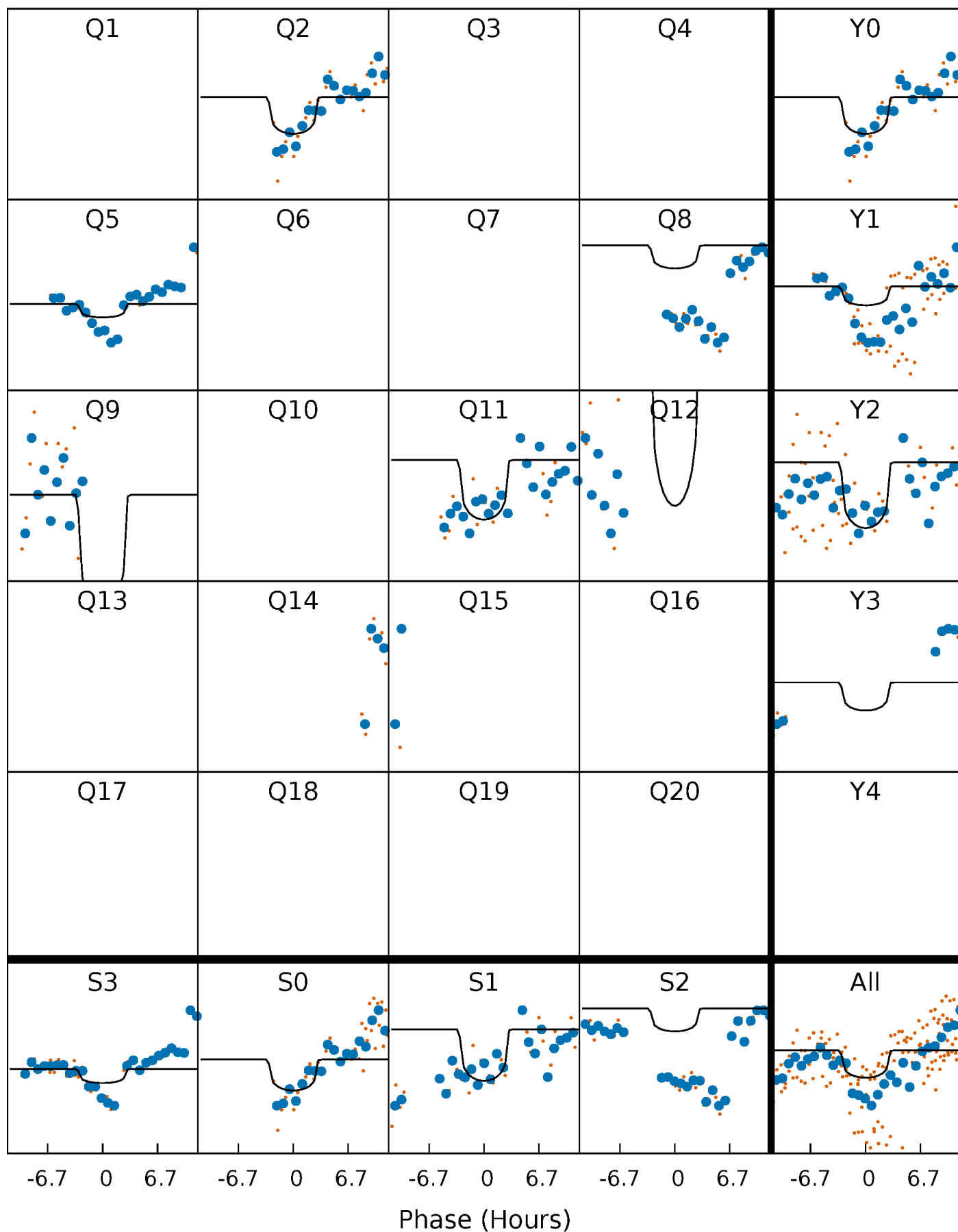
# PDC Quarter-Phased Transit Curves

TCE 008181646-08   P= 42.732442 Days    $T_0=148.480323$  (BKJD)



# DV Quarter-Phased Transit Curves

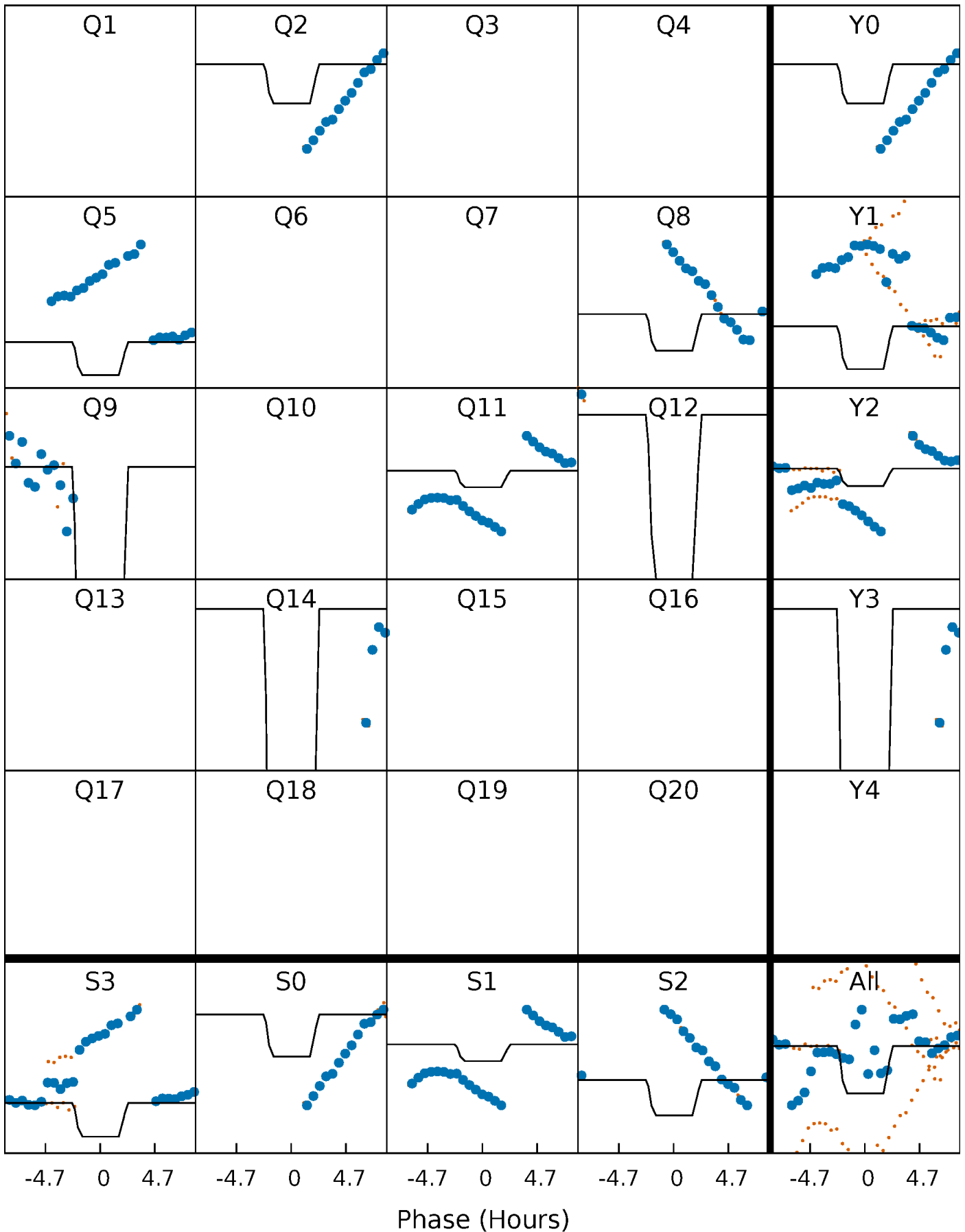
TCE 008181646-08   P= 42.732442 Days    $T_0=148.480323$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

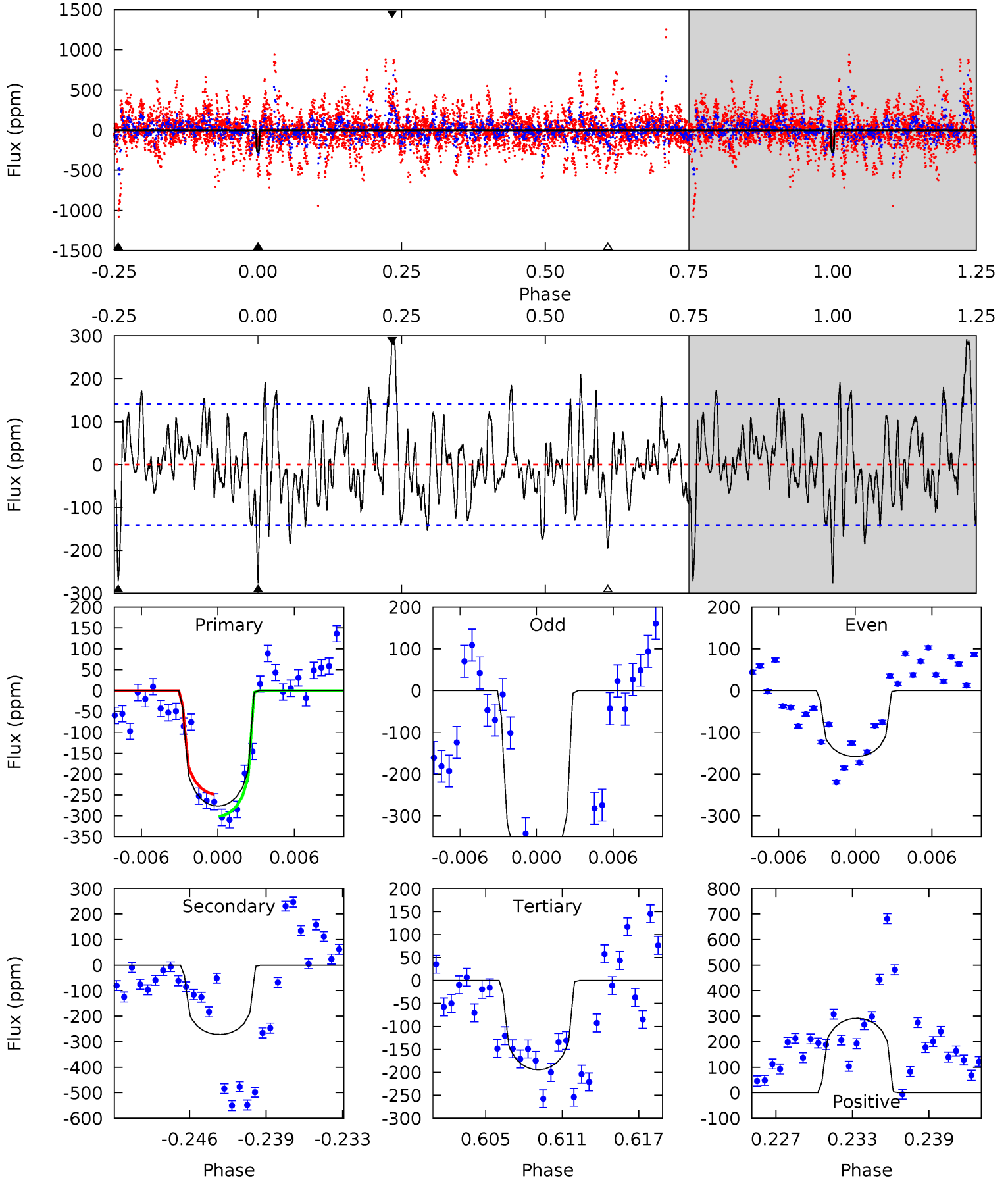
TCE 008181646-08   P= 42.741896 Days    $T_0=148.316734$  (BKJD)



# DV Model-Shift Uniqueness Test

008181646-08, P = 42.732442 Days, E = 105.747881 Days

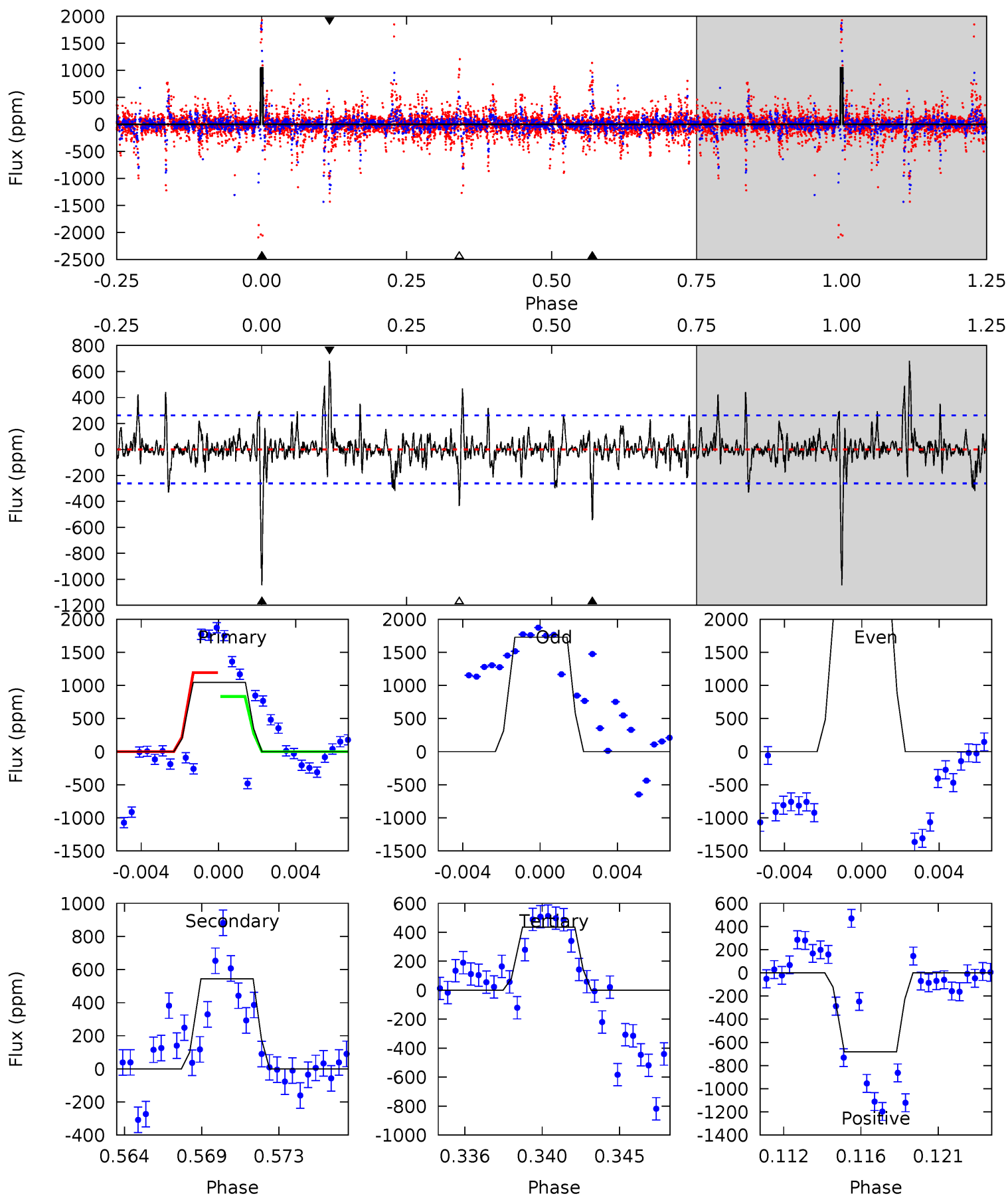
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
10.0	9.84	7.04	10.6	5.11	2.73	2.69	2.98	-0.55	2.80	-0.73	4.47	1.20	0.51	0.97



# Alt Model-Shift Uniqueness Test

008181646-08, P = 42.741896 Days, E = 105.574838 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
20.7	10.7	8.61	13.5	5.18	2.84	1.69	12.1	7.20	2.12	-2.72	7.14	1.06	0.39	3.42



### Stellar Parameters For KIC 008181646

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5486^{+146}_{-146}$	$4.612^{+0.037}_{-0.112}$	$-0.400^{+0.300}_{-0.300}$	$0.736^{+0.131}_{-0.056}$	$0.824^{+0.075}_{-0.092}$	$2.905^{+0.476}_{-1.066}$
	+3%/-3%	+1%/-2%	+75%/-75%	+18%/-8%	+9%/-11%	+16%/-37%
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 008181646-08 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-272 \pm 28$	$1.27^{+0.90}_{-0.81}$	$624^{+27}_{-23}$	$5669^{+4581}_{-1167}$	$4536^{+30954}_{-2972}$
Alt.	$-543 \pm 51$	$2.55^{+1.07}_{-1.10}$	$622^{+28}_{-22}$	$4870^{+1391}_{-647}$	$2298^{+4774}_{-1214}$

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

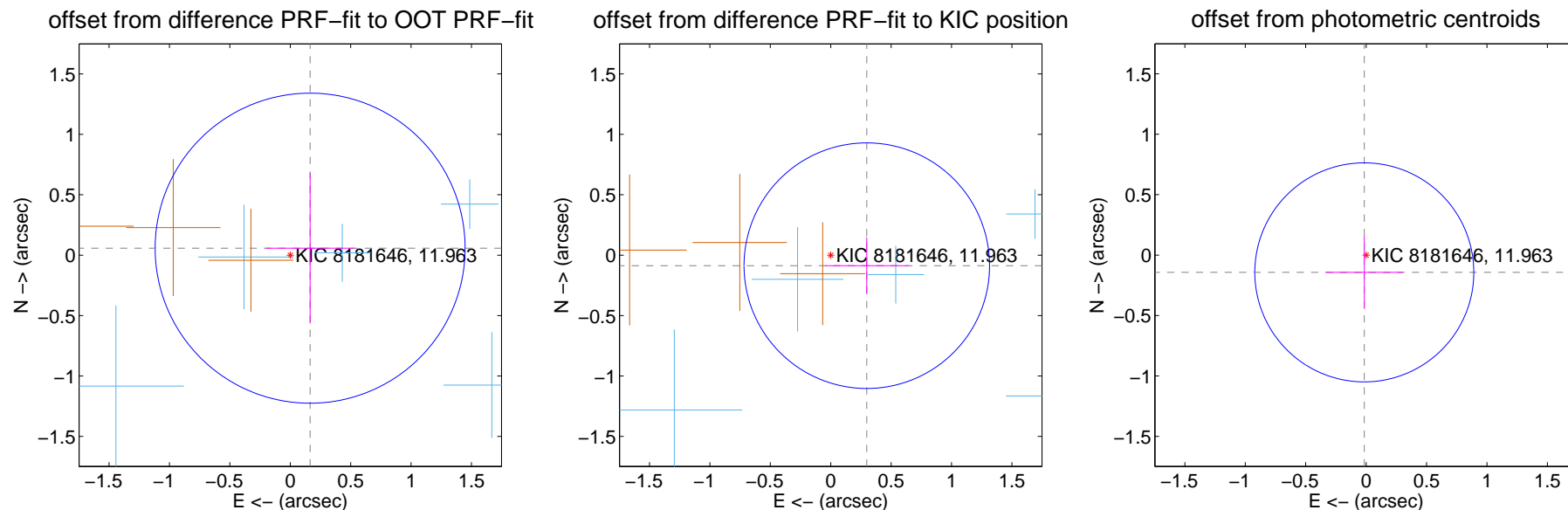
## DV Centroid Data

Supplemental centroid analysis for 008181646-08. **Kepler magnitude: 11.96.** Transit SNR 4.30

There are 6 quarters with good PRF difference image offsets

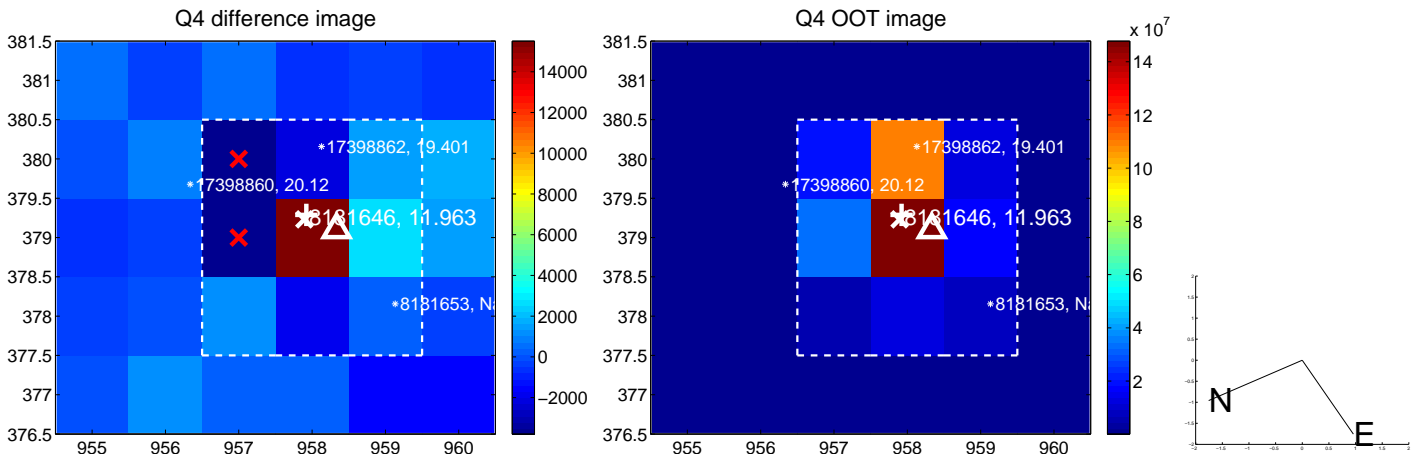
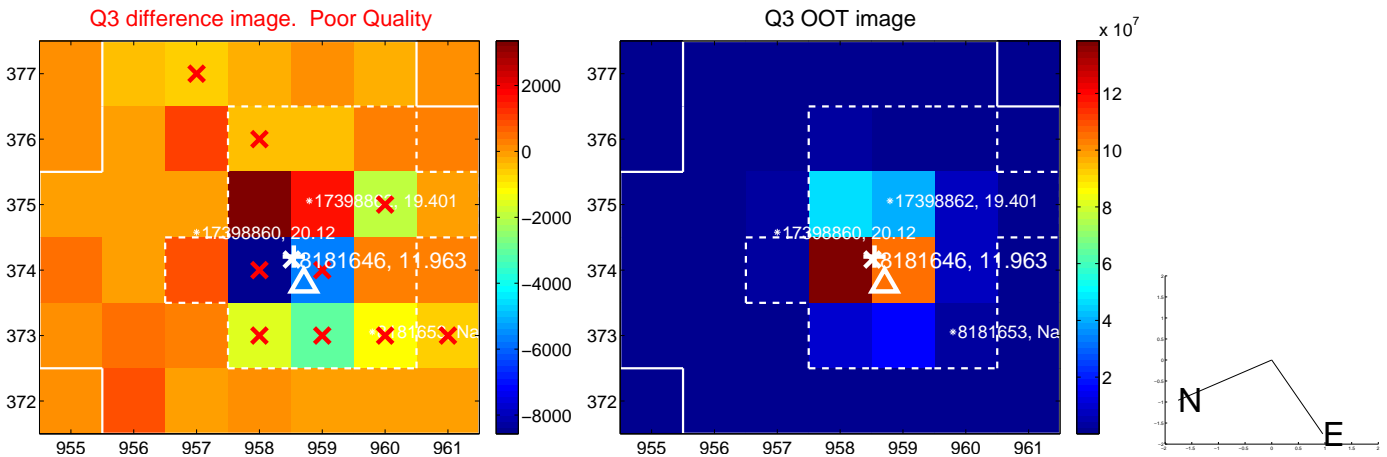
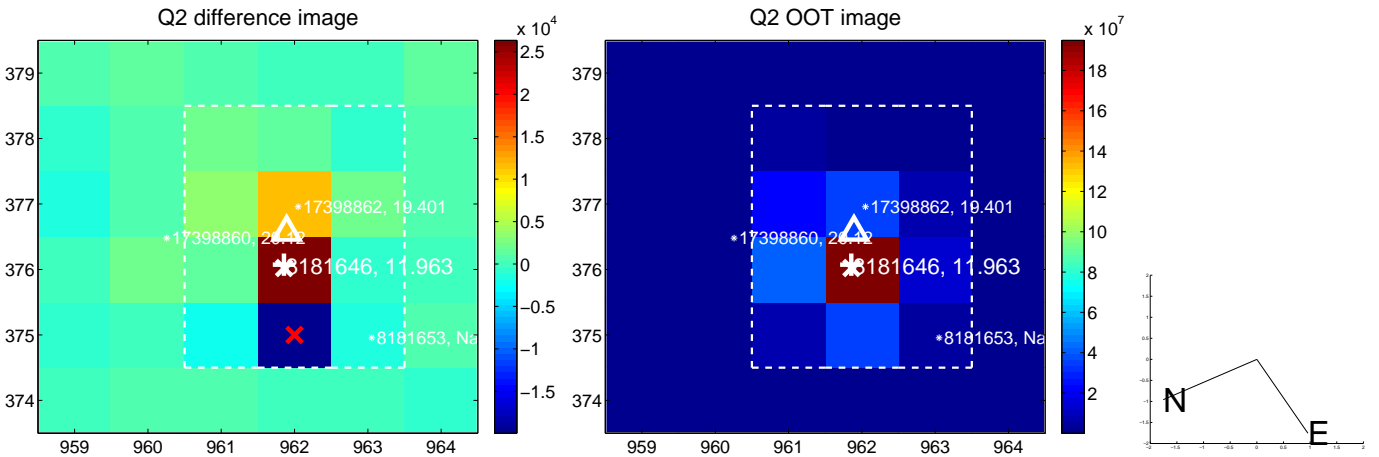
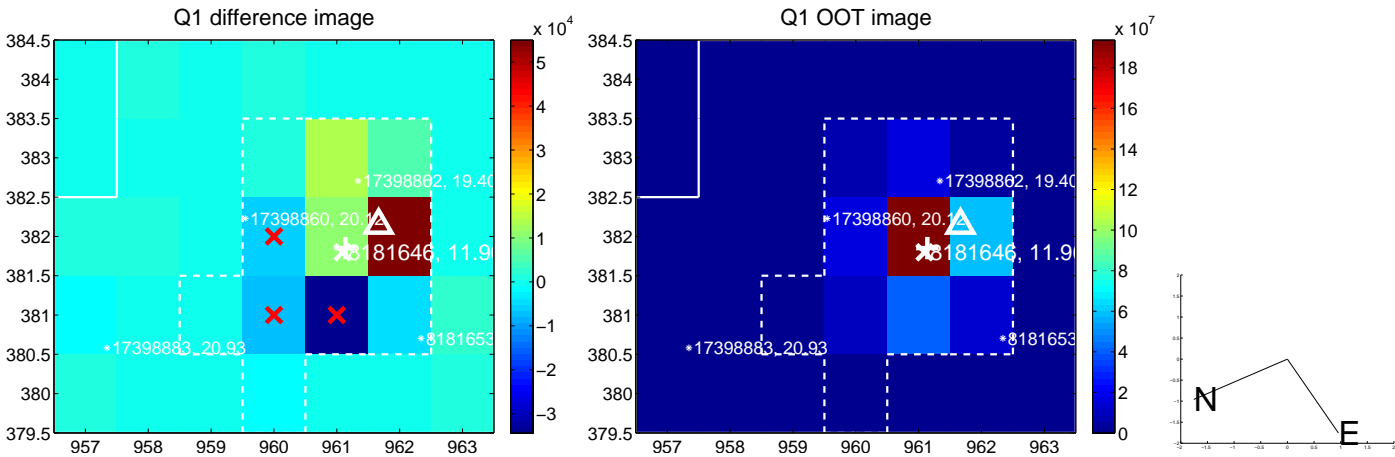
The direct PRF centroid is offset from the target star catalog position by about 0.28 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.174 \pm 0.428$	0.41	$-0.164 \pm 0.366$	$0.058 \pm 0.622$
PRF-fit source offset from KIC position	$0.311 \pm 0.339$	0.92	$-0.299 \pm 0.346$	$-0.087 \pm 0.236$
photometric centroid source offset	$0.14 \pm 0.30$	0.48	$0.02 \pm 0.32$	$-0.14 \pm 0.30$

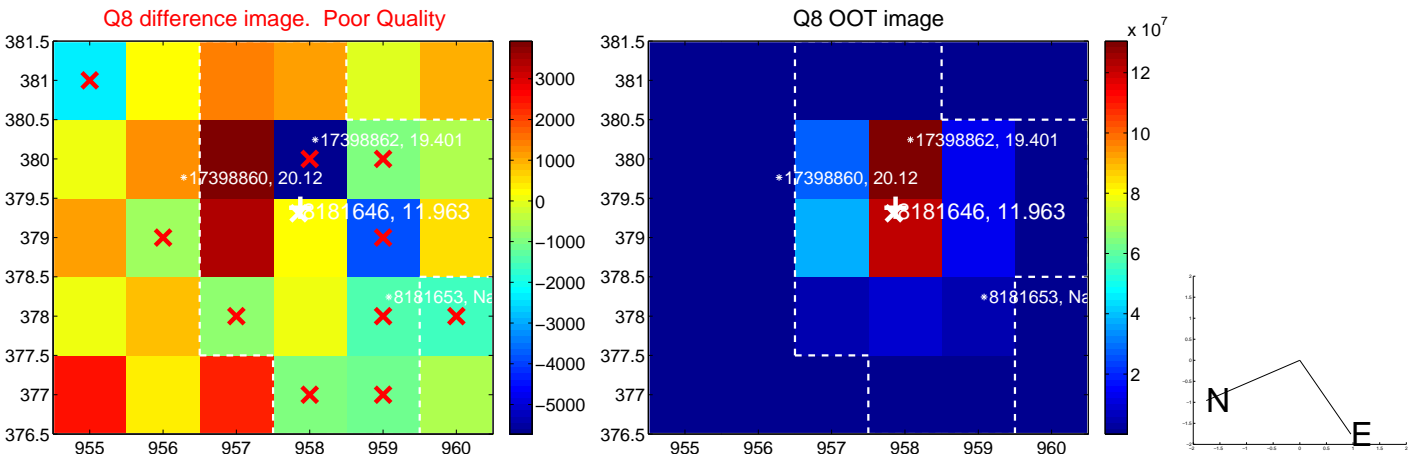
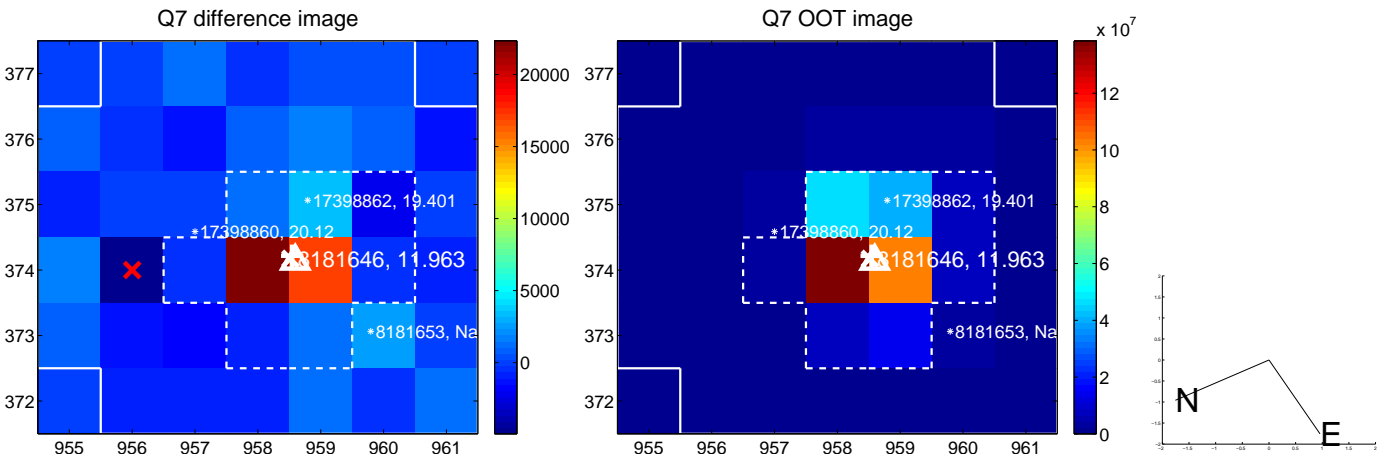
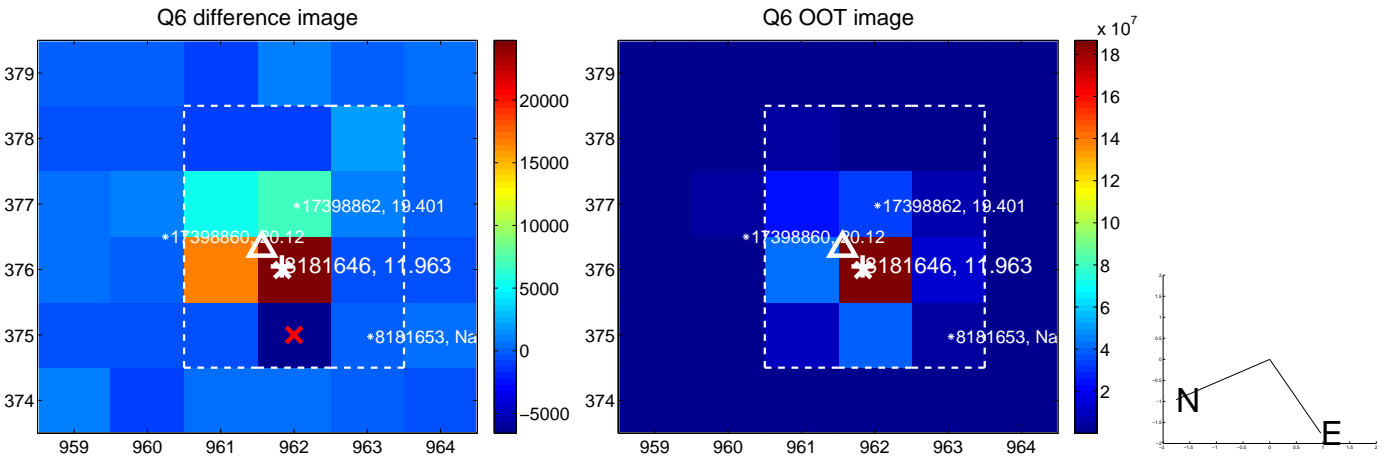
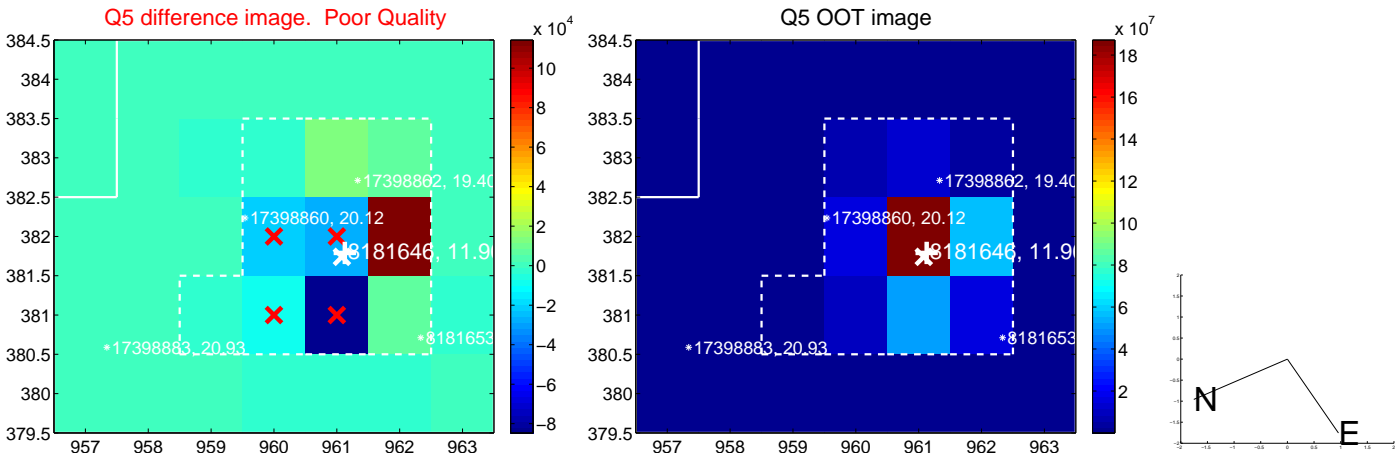


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets;** magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

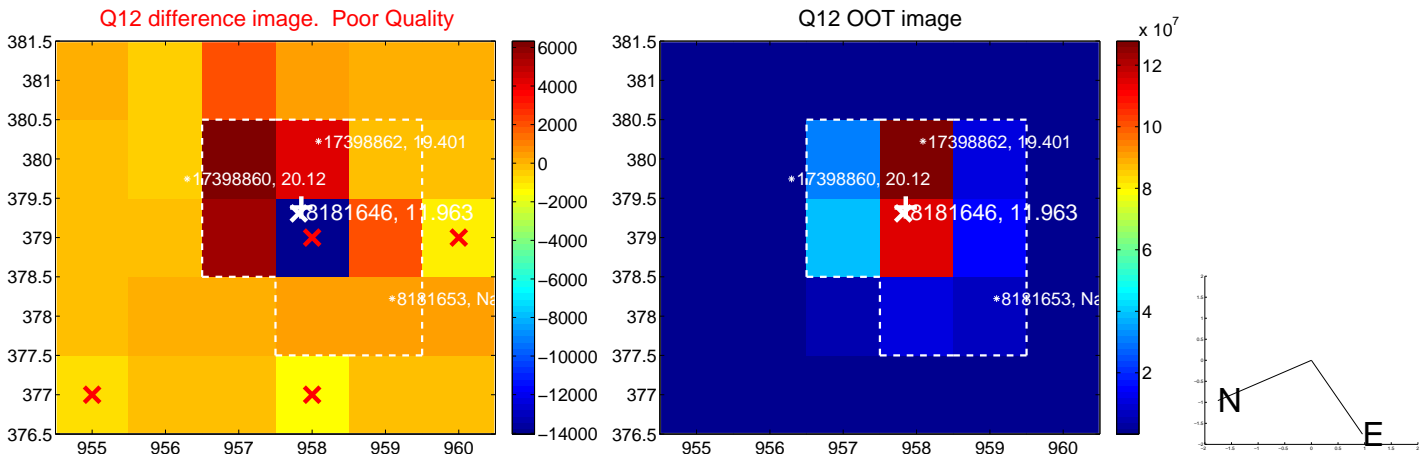
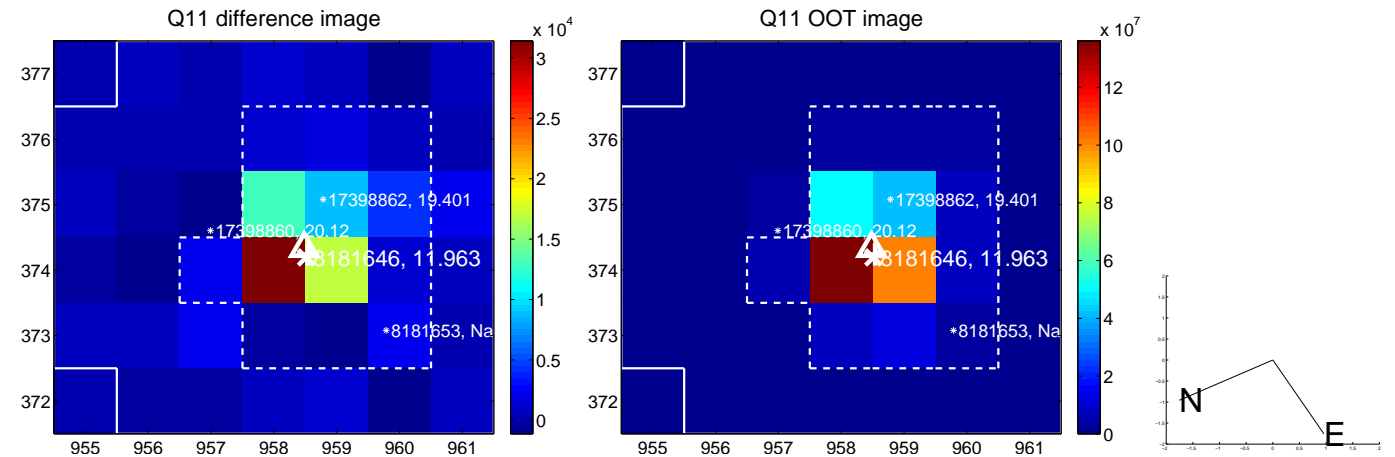
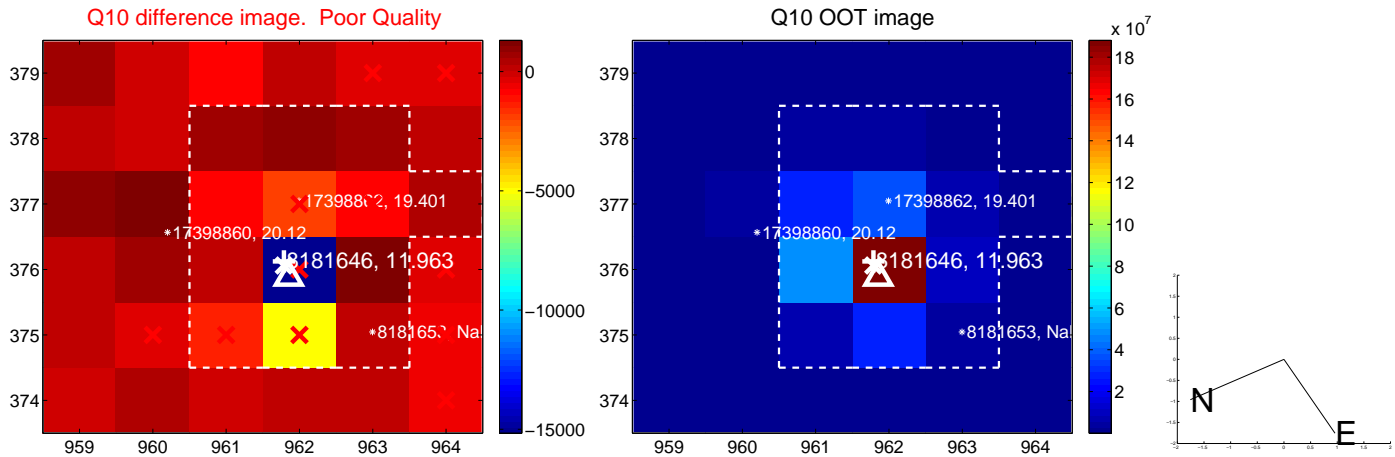
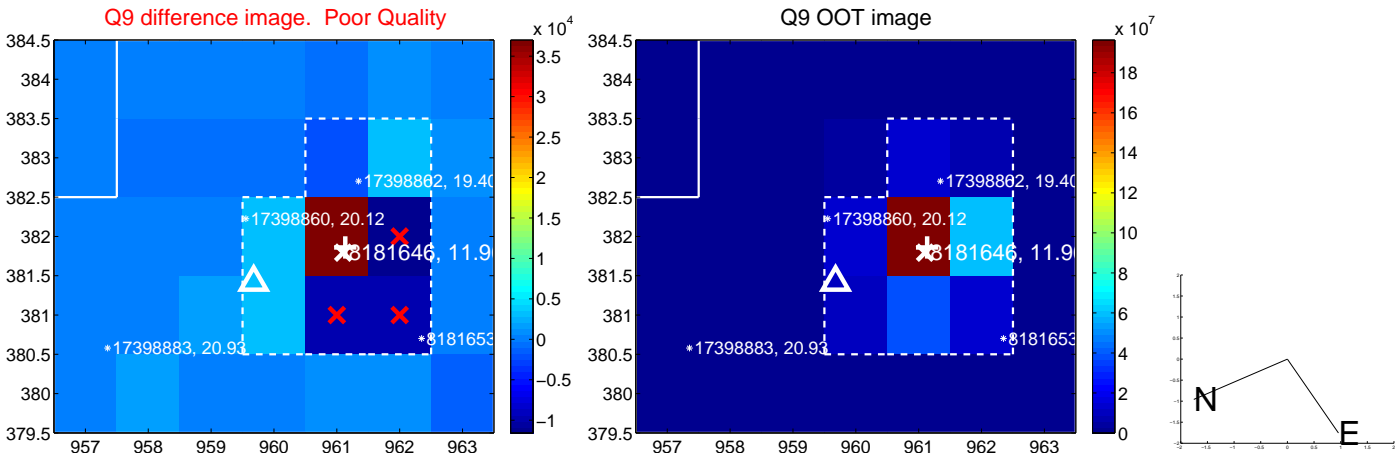
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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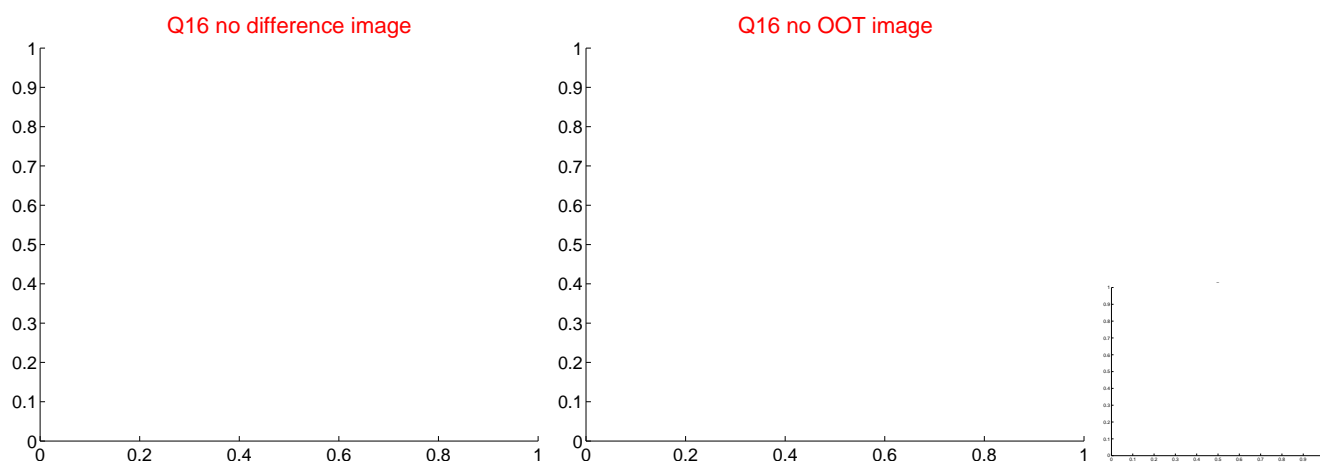
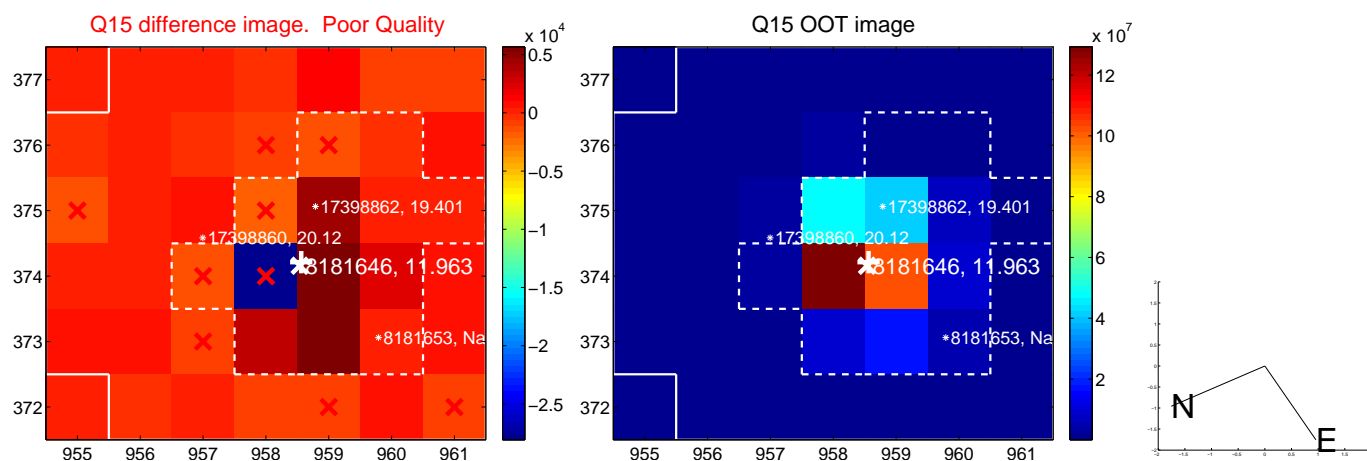
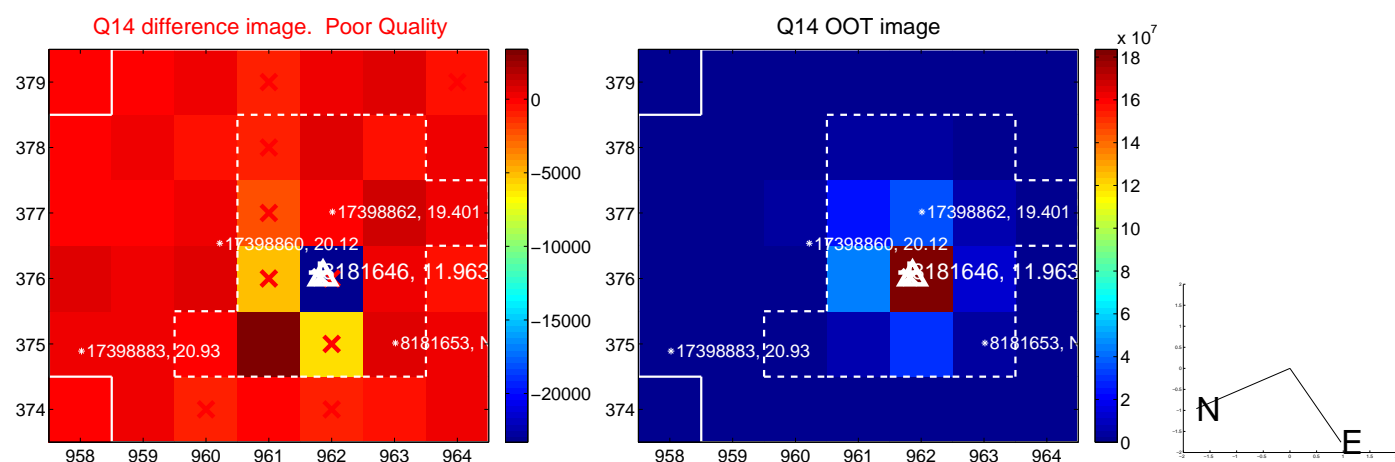
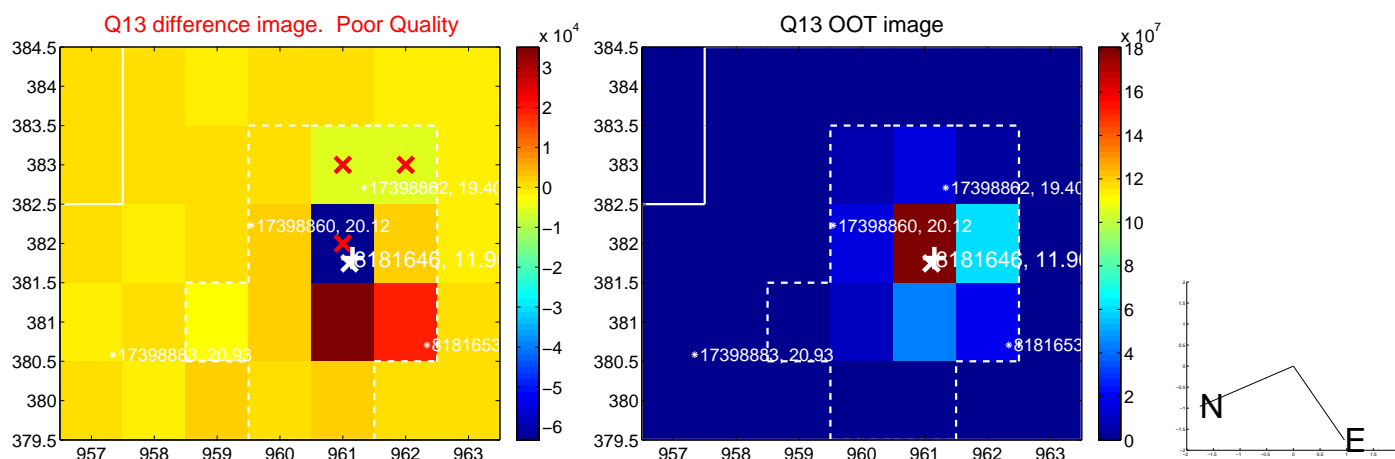


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

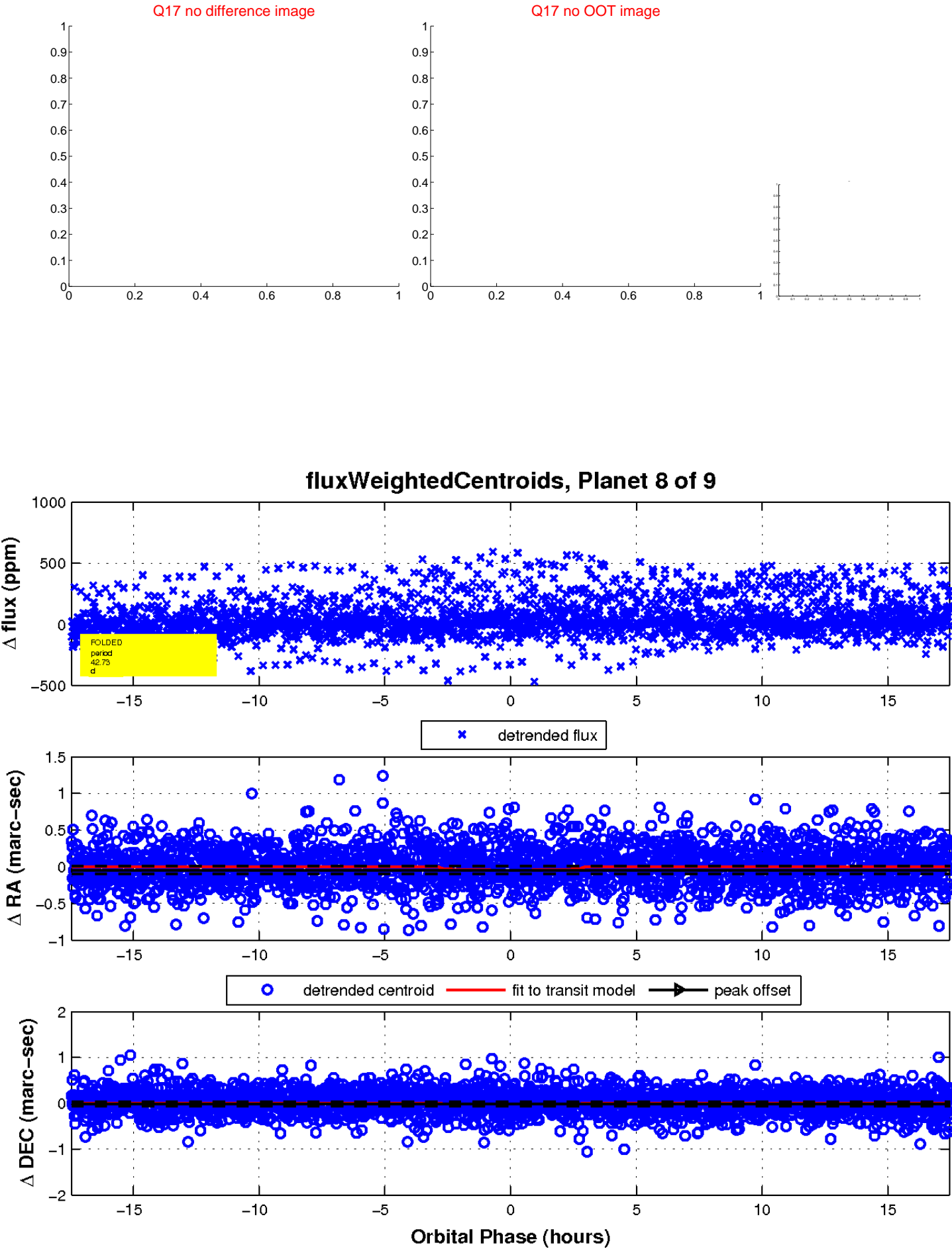




white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



UKIRT Image

Declination

