

# KIC 006688398

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
006688398-01	OBS	No	0.566802	131.826468	70.2	3.752	8.0	10.5	0.76	4885	0.70	2023.61
006688398-02	OBS	No	169.485065	161.003629	1440.3	3.224	9.9	8.0	0.76	4885	3.53	1.01
006688398-03	OBS	No	20.382964	138.330865	1552.2	1.897	12.7	9.3	0.76	4885	3.36	17.05
006688398-04	OBS	No	58.541662	180.146213	1785.2	1.617	8.6	7.4	0.76	4885	3.53	4.18

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
006688398-01	OBS	FP	0.00	1	0	1	0	LPP_DV—CENT_FEW_DIFFS—HALO_GHOST
006688398-02	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS—HALO_GHOST
006688398-03	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_FEW_DIFFS—HALO_GHOST
006688398-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_FEW_DIFFS

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

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

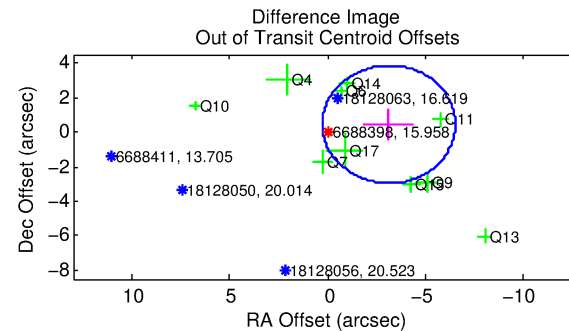
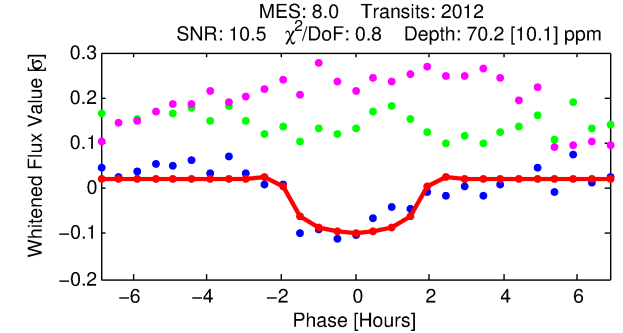
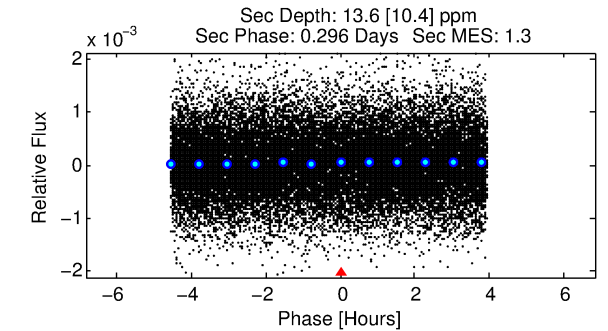
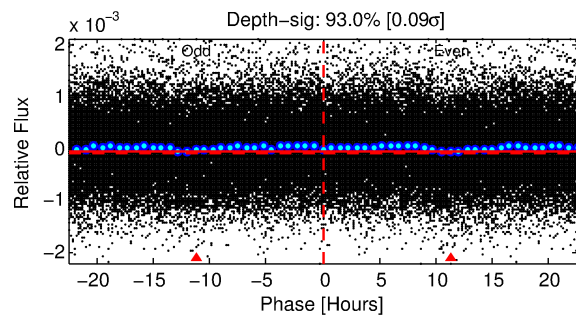
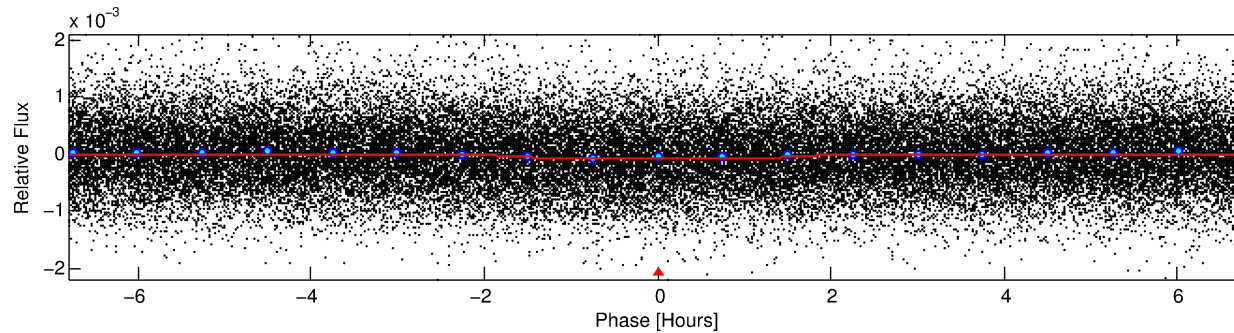
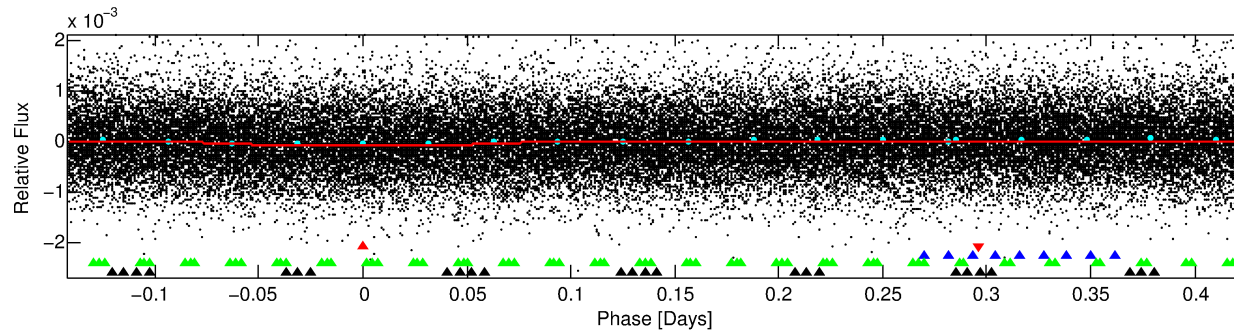
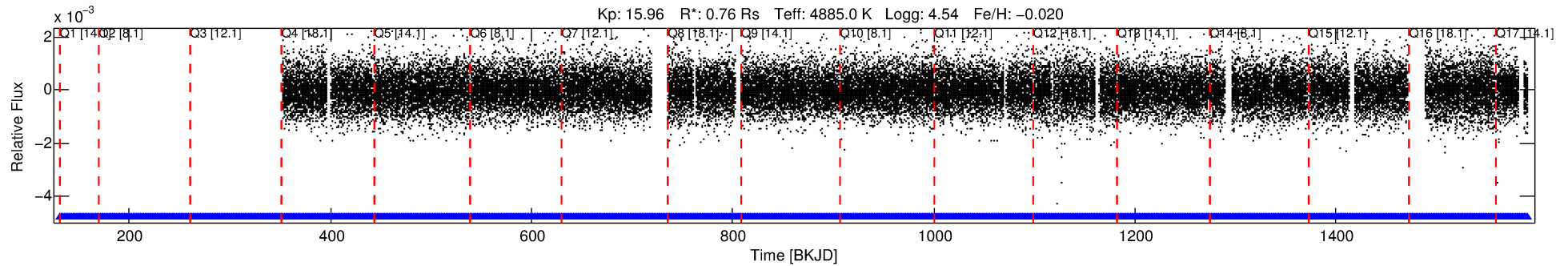
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 006688398-01

No Significant Match Found

# DV One-Page Summary

KIC: 6688398 Candidate: 1 of 4 Period: 0.567 d



## DV Fit Results:

Period = 0.56680 [0.00001] d  
Epoch = 131.8265 [0.0037] BKJD  
Rp/R\* = 0.0084 [0.0058]  
a/R\* = 1.16 [0.70]  
b = 0.75 [1.43]  
Seff = 2023.61 [392.58]  
Teq = 1710 [83] K  
Rp = 0.70 [0.49] Re  
a = 0.0121 [0.0011] AU  
Ag = 2.25 [3.56] [0.35 $\sigma$ ]  
Teffp = 3238 [1283] K [1.19 $\sigma$ ]

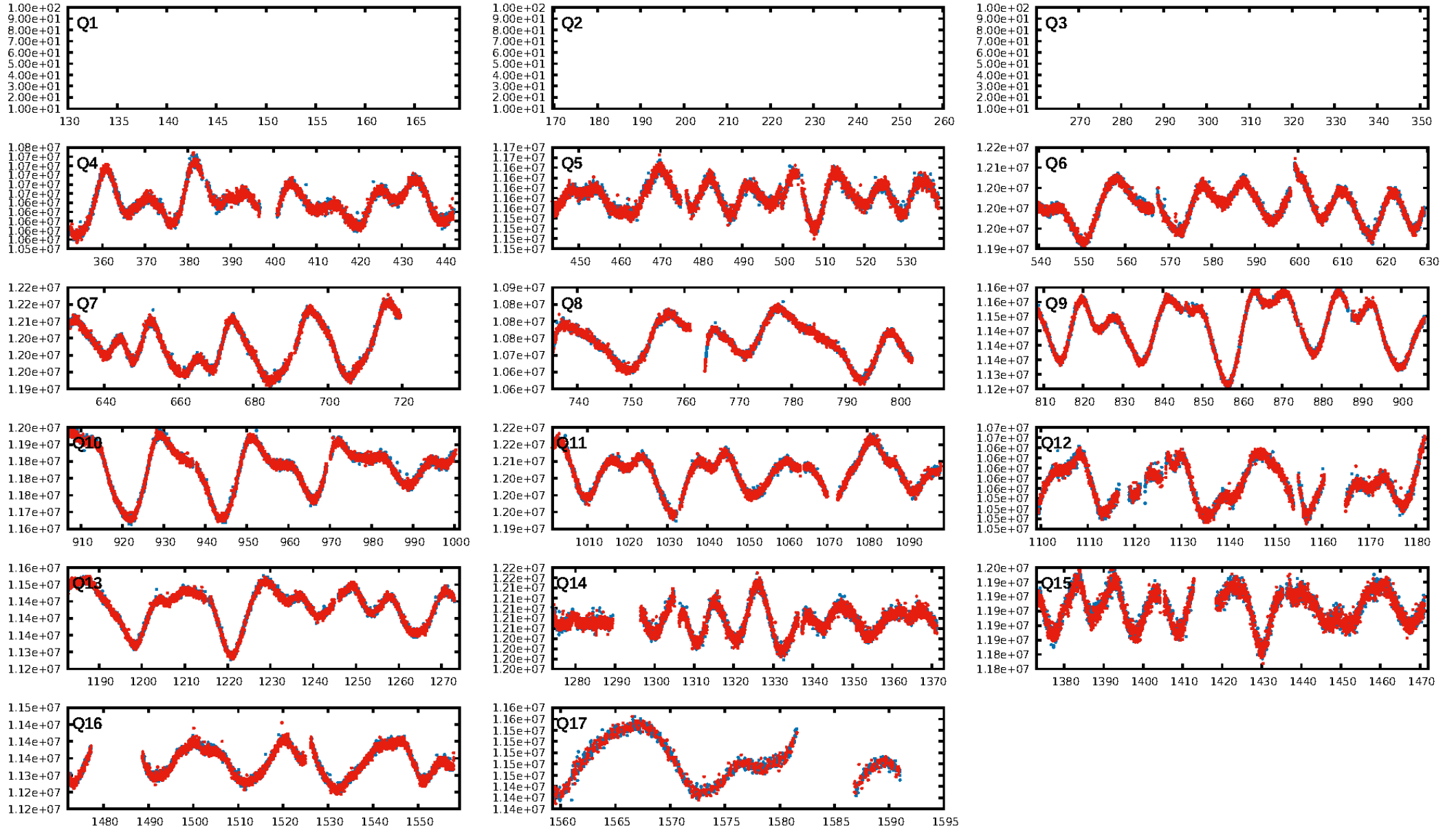
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [113.12 $\sigma$ ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 1.36e-08  
RollingBand-fgt: 1.00 [1965/1965]  
GhostDiagnostic-chr: -0.1202  
Centroid-sig: 0.0%  
Centroid-so: 1.279 arcsec [1.47 $\sigma$ ]  
OotOffset-rm: 3.160 arcsec [2.78 $\sigma$ ]  
KicOffset-rm: 2.745 arcsec [2.44 $\sigma$ ]  
OotOffset-st: 3/3/1/3 [10]  
KicOffset-st: 3/3/1/3 [10]  
DiffImageQuality-fgm: 0.20 [2/10]  
DiffImageOverlap-fno: 1.00 [14/14]

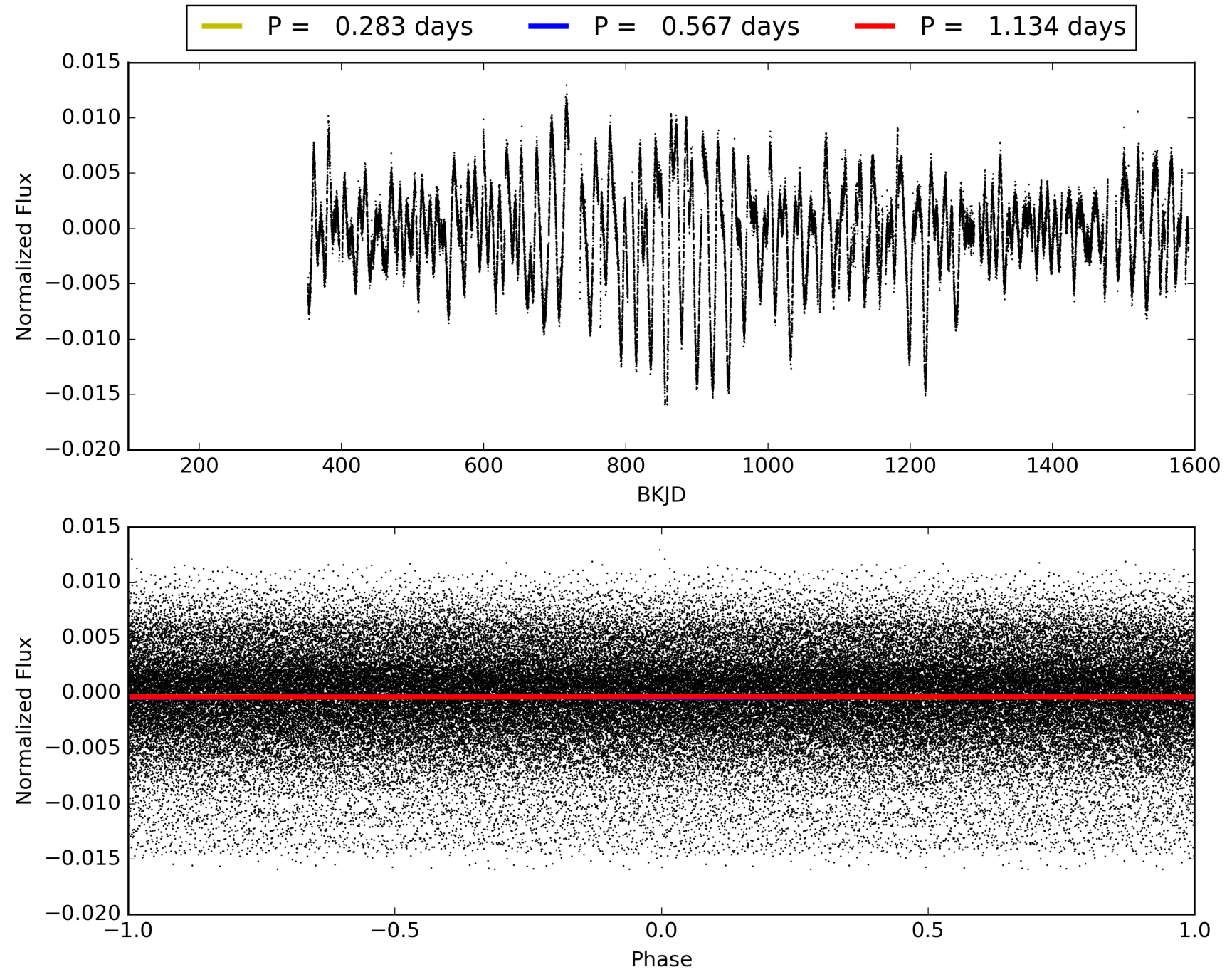
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 21:04:50 Z

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

# TCE 006688398-01, PDC Light Curves



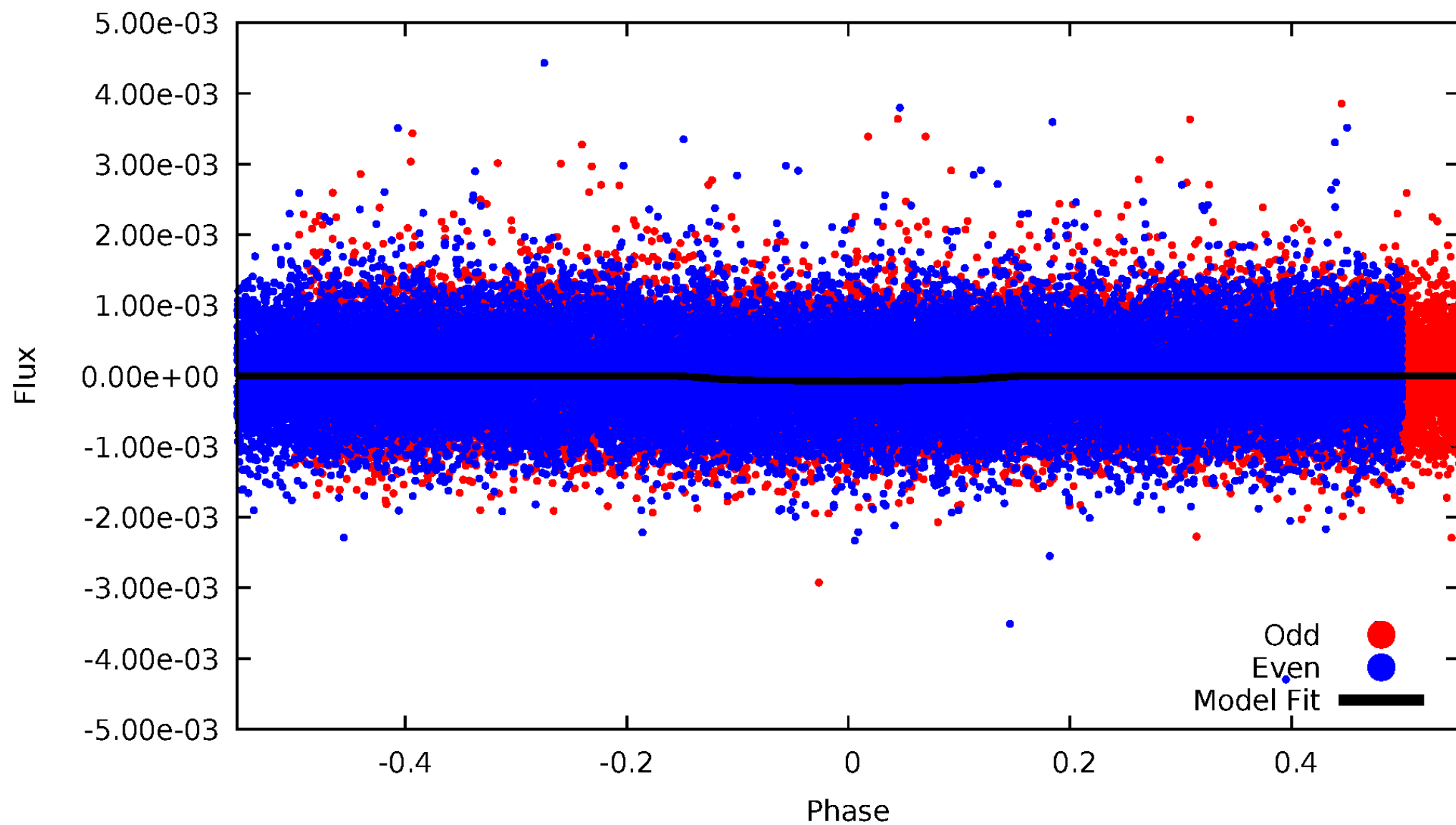
# TCE 006688398-01





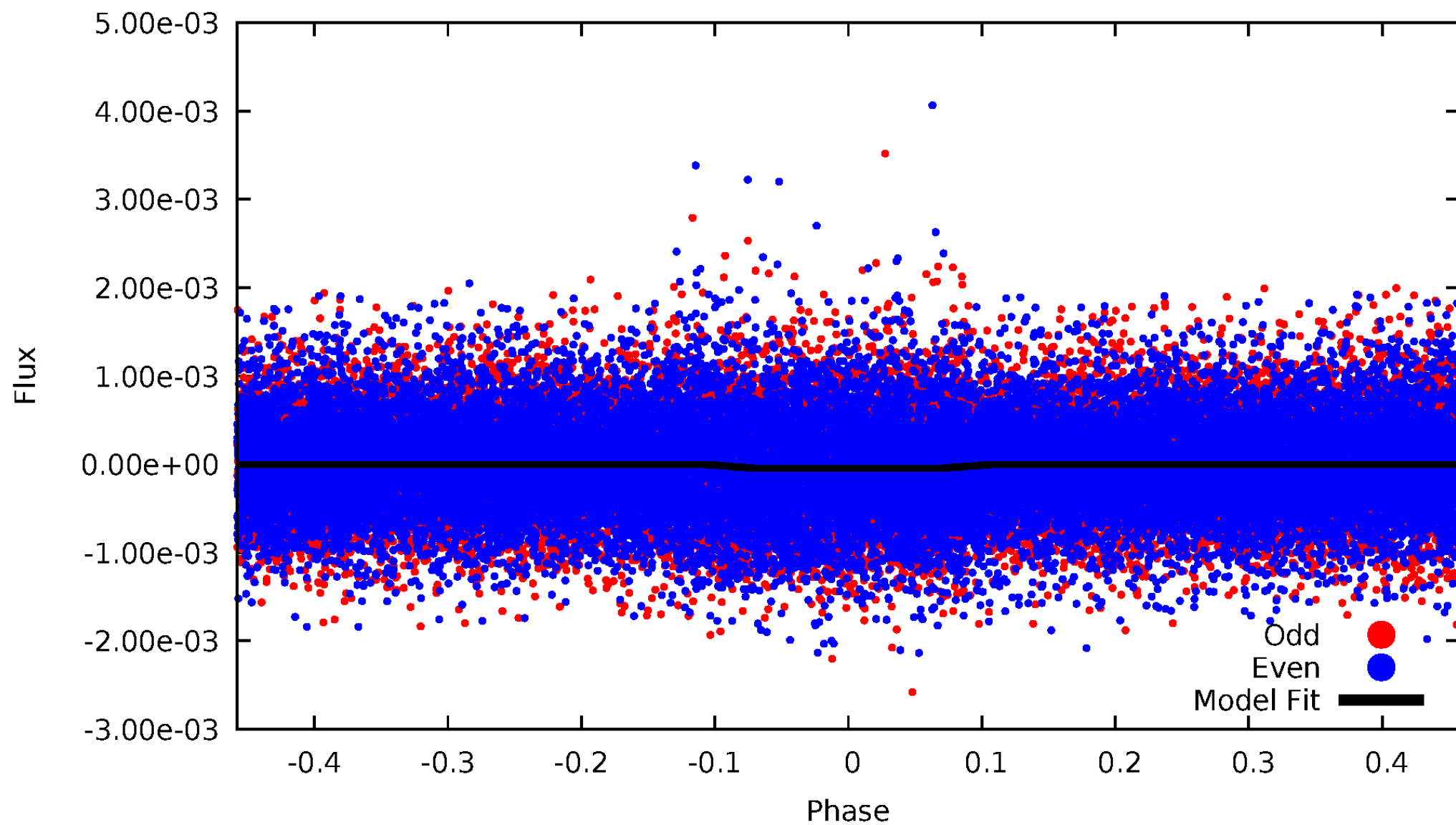
DV Odd/Even

TCE 006688398-01

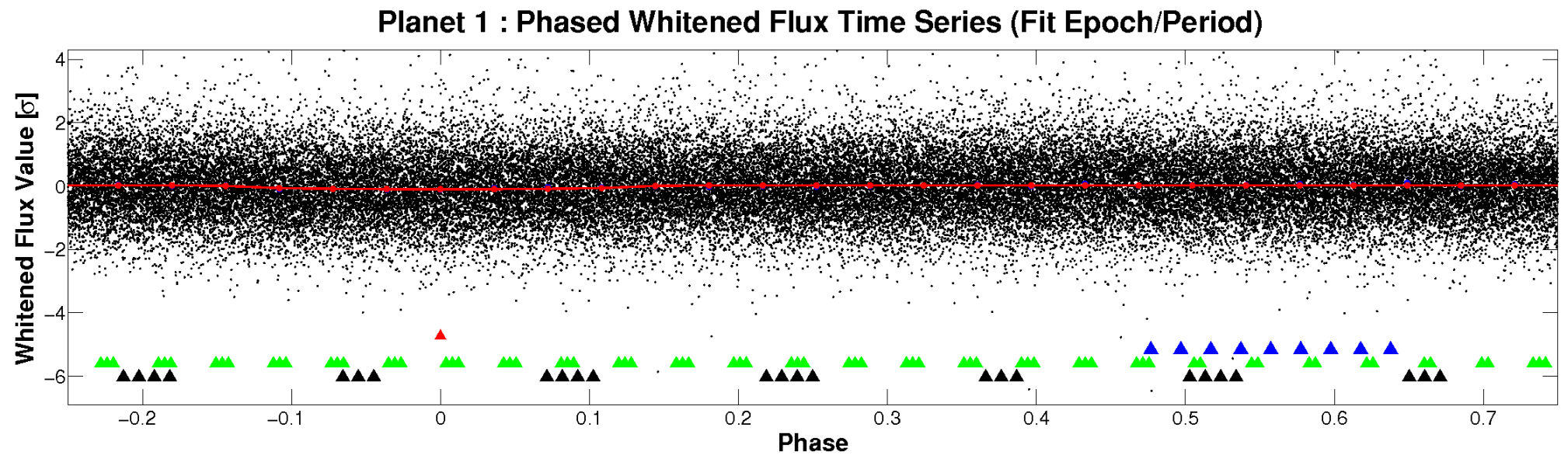
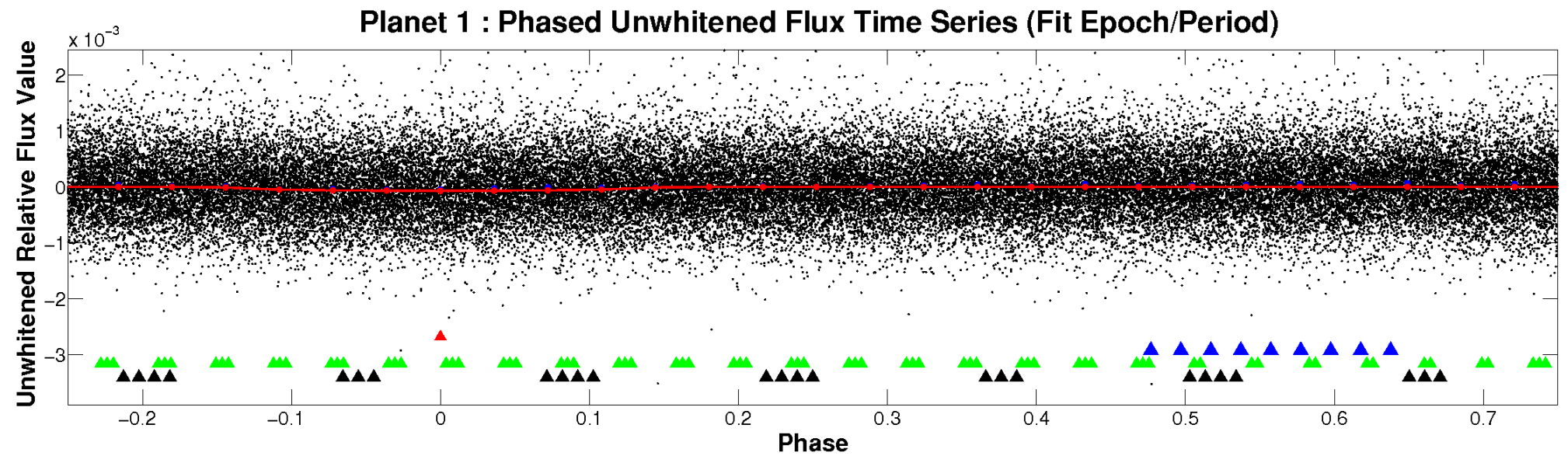


# ALT Odd/Even

TCE 006688398-01

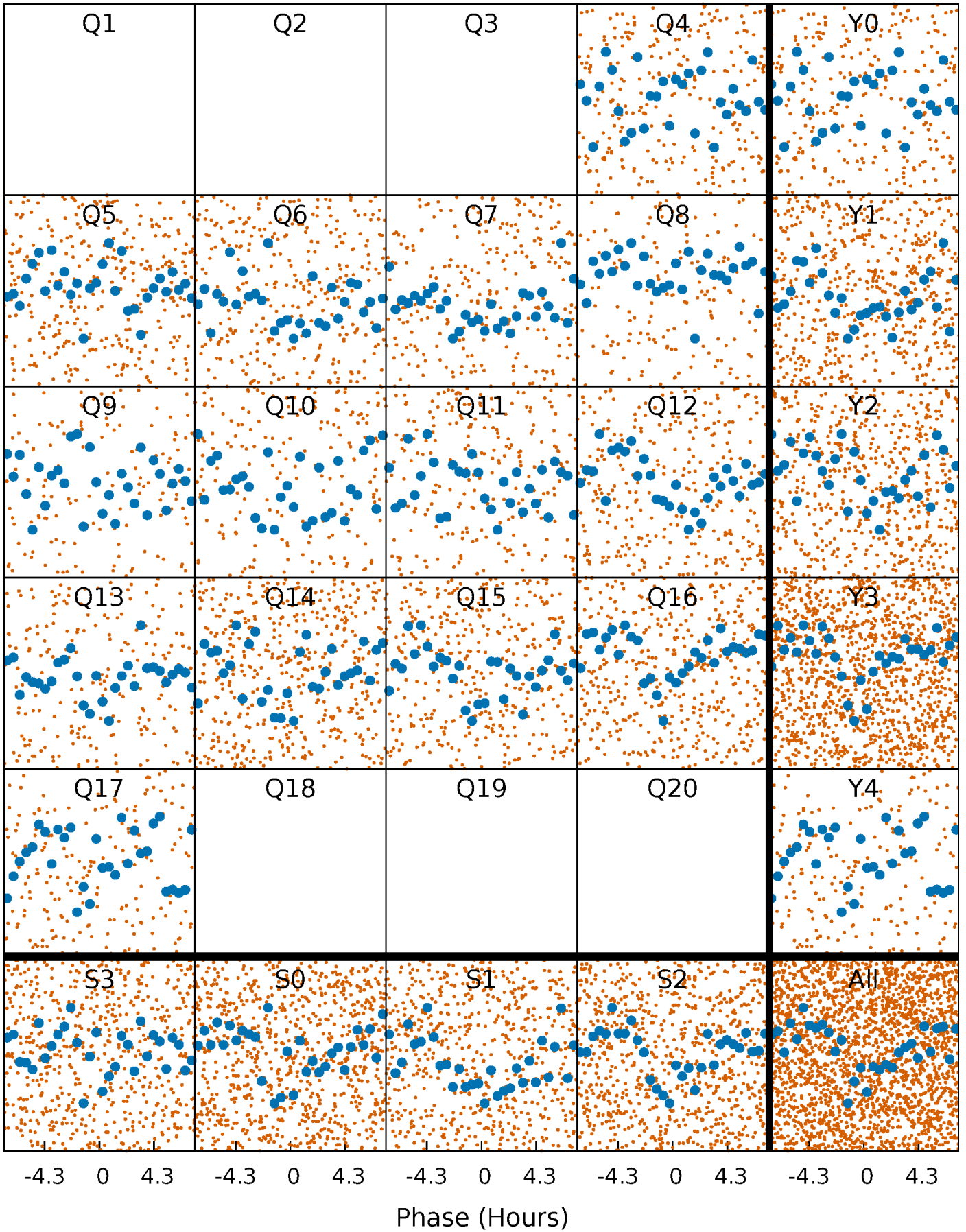


# Non-Whitened Vs. Whitened Light Curve



# PDC Quarter-Phased Transit Curves

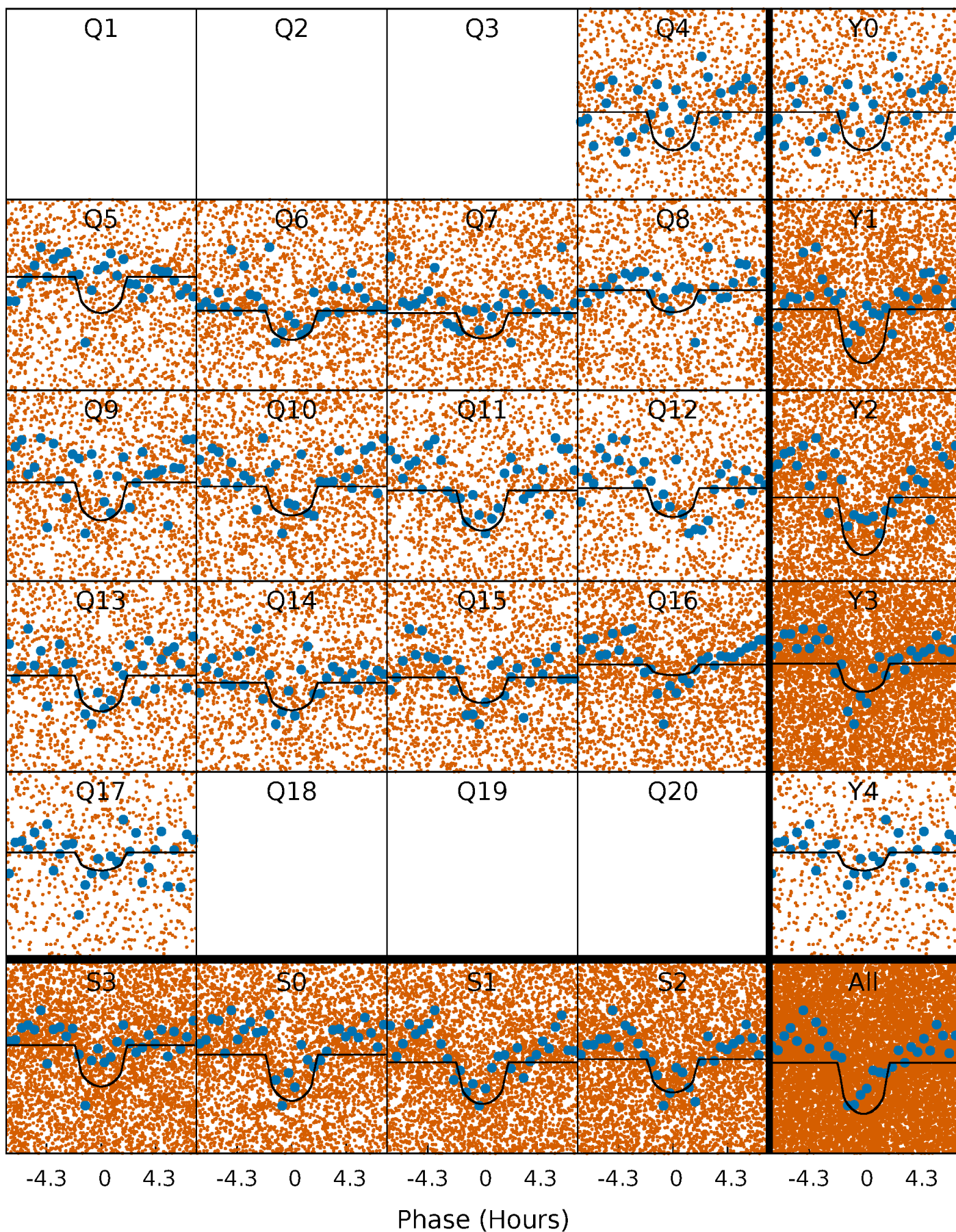
TCE 006688398-01   P= 0.566802 Days    $T_0=131.826468$  (BKJD)





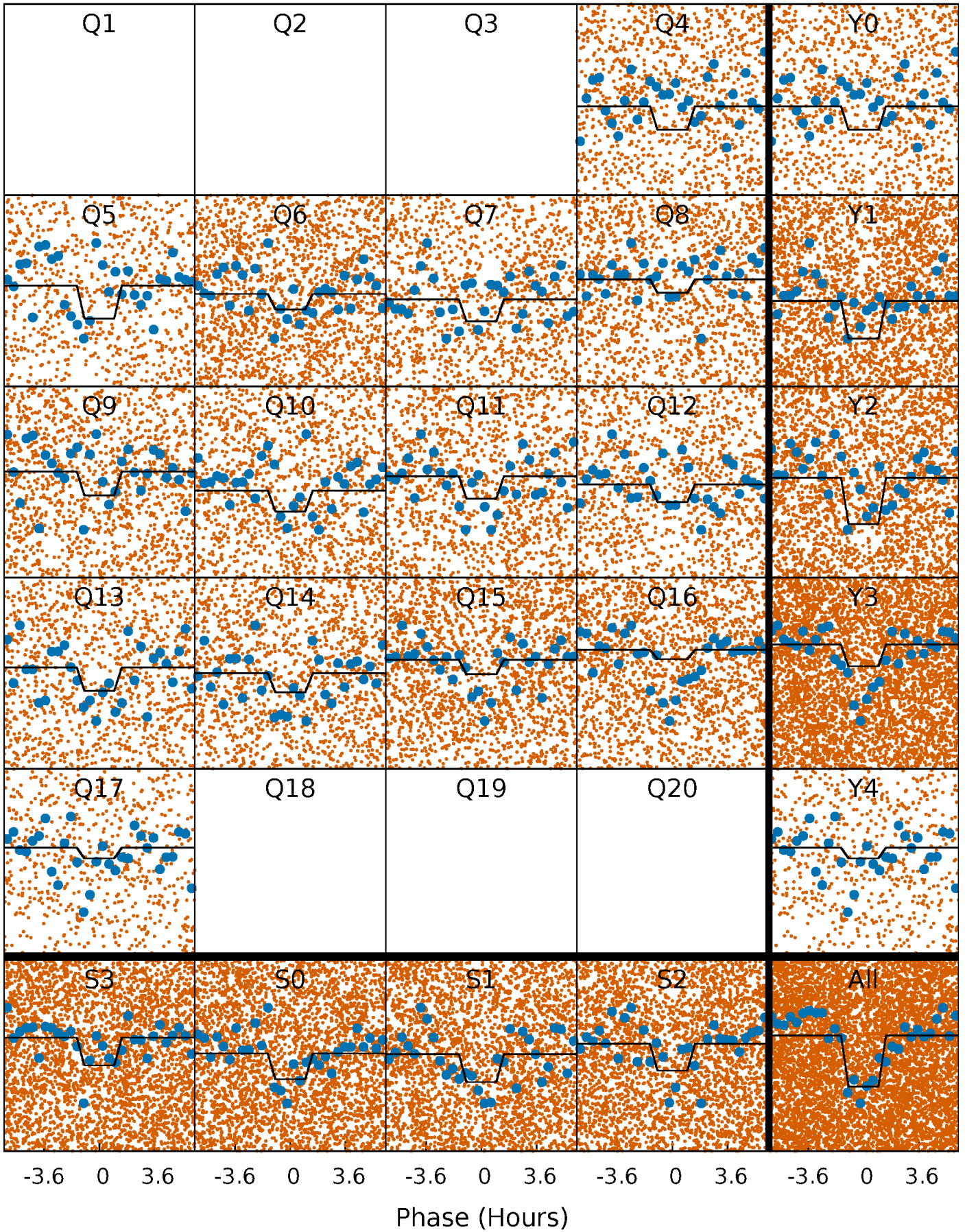
# DV Quarter-Phased Transit Curves

TCE 006688398-01   P= 0.566802 Days    $T_0=131.826468$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 006688398-01 P= 0.566788 Days  $T_0=131.831271$  (BKJD)

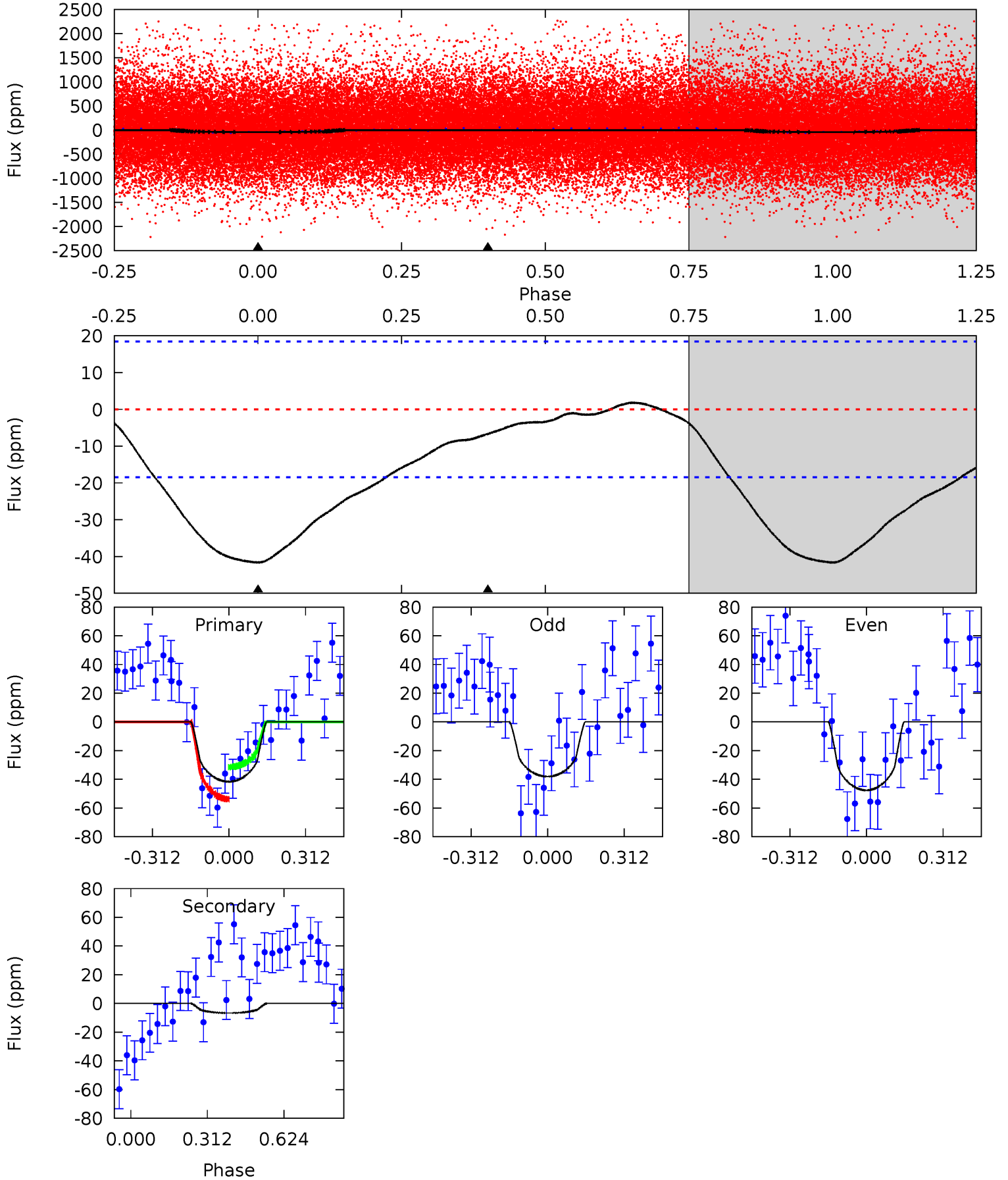




# DV Model-Shift Uniqueness Test

006688398-01, P = 0.566802 Days, E = 131.826468 Days

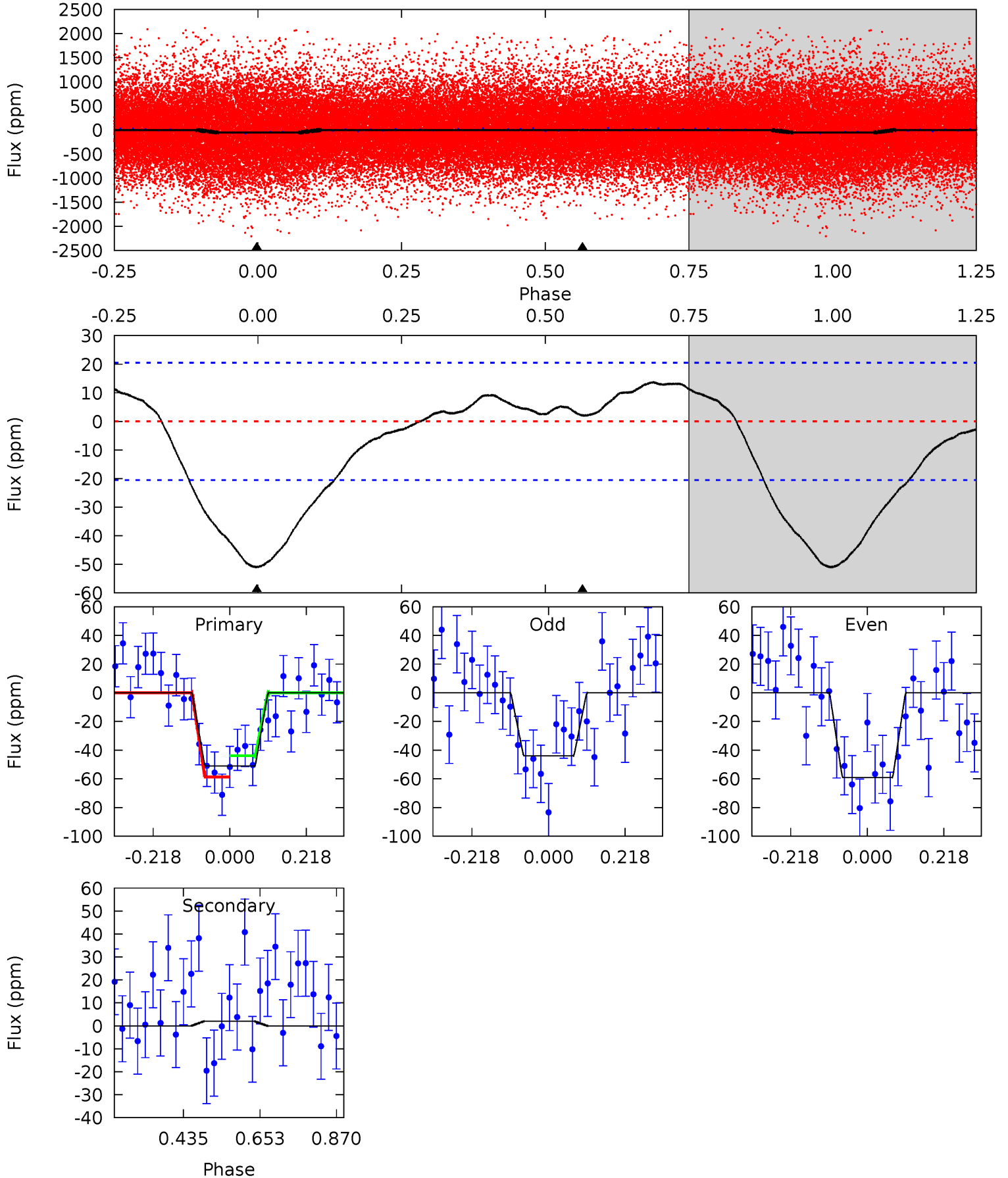
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
9.77	1.57	0	0	4.32	1.01	0.40	9.77	9.77	1.57	1.57	1.11	1.03	0.04	2.65



# Alt Model-Shift Uniqueness Test

006688398-01, P = 0.566788 Days, E = 131.831271 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
10.9	-0.43	0	0	4.40	1.23	0.60	10.9	10.9	-0.43	-0.43	1.62	1.08	0.21	1.59





### Stellar Parameters For KIC 006688398

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$4885^{+175}_{-175}$	$4.541^{+0.072}_{-0.044}$	$-0.020^{+0.300}_{-0.300}$	$0.763^{+0.062}_{-0.080}$	$0.738^{+0.083}_{-0.060}$	$2.337^{+0.705}_{-0.377}$
	+4%/-4%	+2%/-1%	+1500%/-1500%	+8%/-10%	+11%/-8%	+30%/-16%
Source	KIC0	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 006688398-01 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-7 \pm 4$	$0.73^{+0.43}_{-0.40}$	$2377^{+101}_{-97}$	$2988^{+1058}_{-5262}$	$0.926^{+3.867}_{-0.703}$
Alt.	$2 \pm 5$	$0.60^{+0.43}_{-0.37}$	$2378^{+90}_{-93}$	$-2973^{+5740}_{-935}$	$-0.318^{+0.986}_{-2.948}$

$T_{max}$  = 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

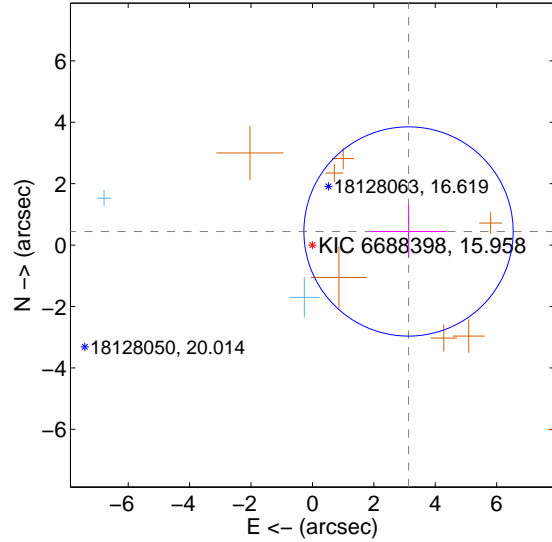
Supplemental centroid analysis for 006688398-01. Kepler magnitude: 15.96. Transit SNR 10.55

There are 2 quarters with good PRF difference image offsets

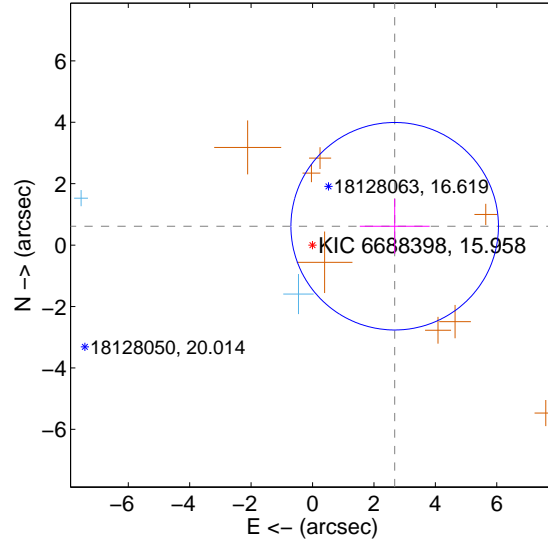
The direct PRF centroid is offset from the target star catalog position by about 0.68 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$3.160 \pm 1.135$	2.78	$-3.129 \pm 1.236$	$0.444 \pm 0.867$
PRF-fit source offset from KIC position	$2.745 \pm 1.126$	2.44	$-2.675 \pm 1.137$	$0.614 \pm 0.897$
photometric centroid source offset	$1.28 \pm 0.87$	1.47	$-0.84 \pm 1.08$	$-0.96 \pm 0.66$

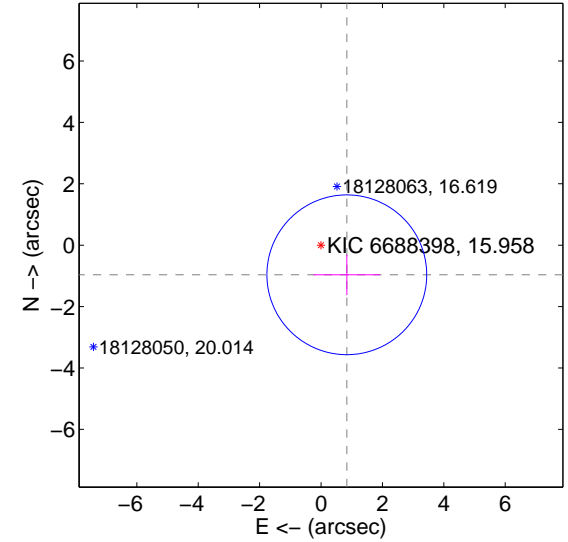
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

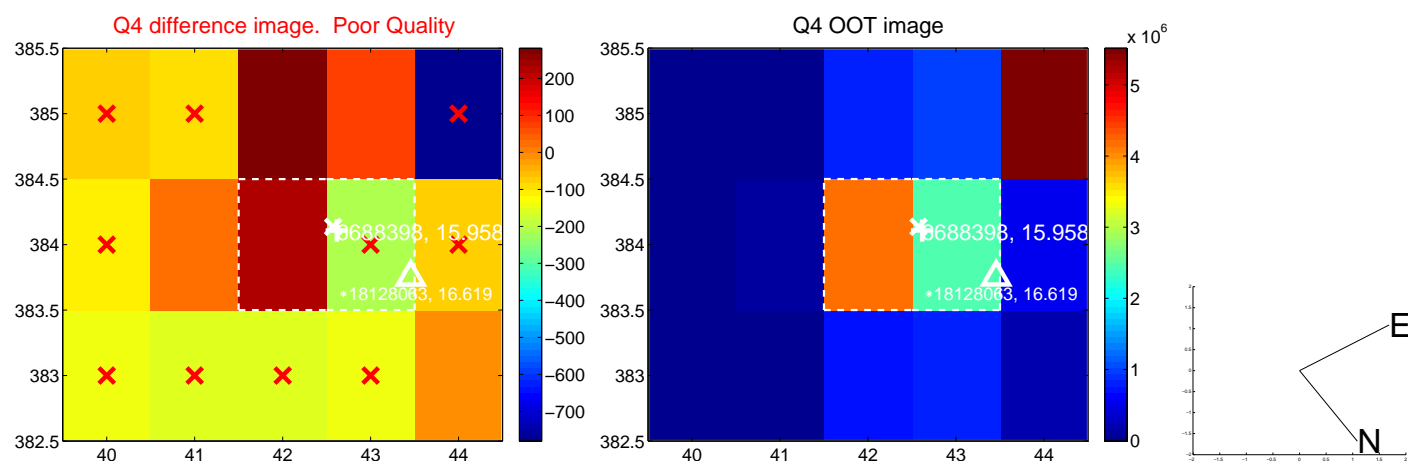
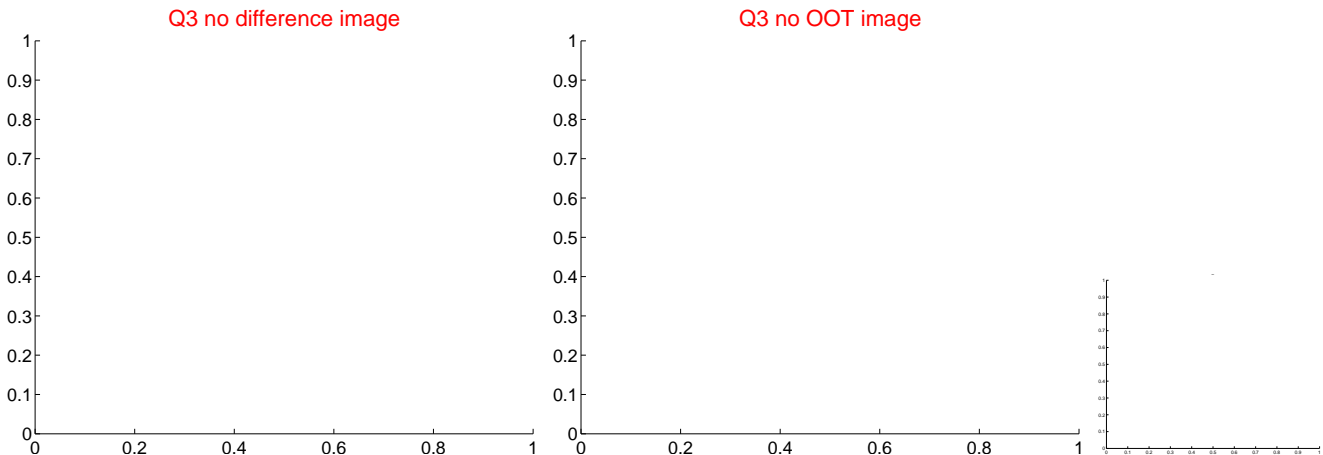


offset from photometric centroids

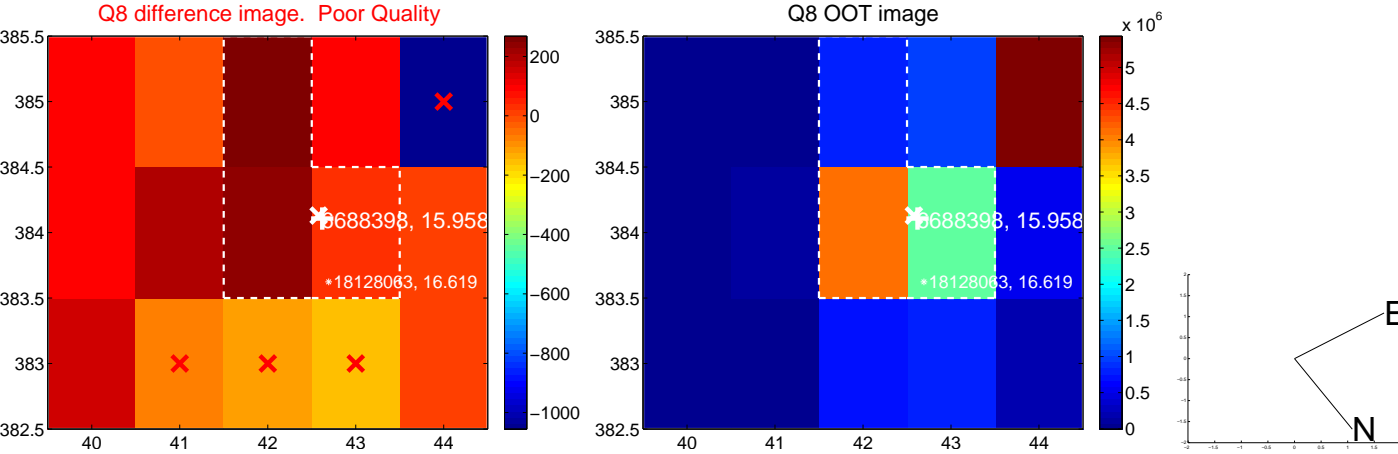
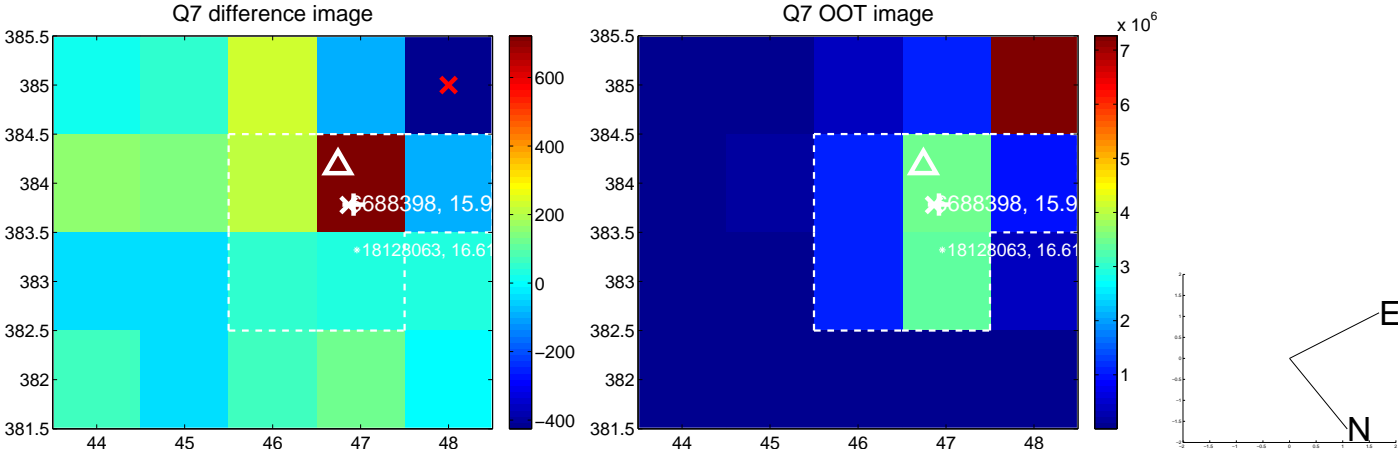
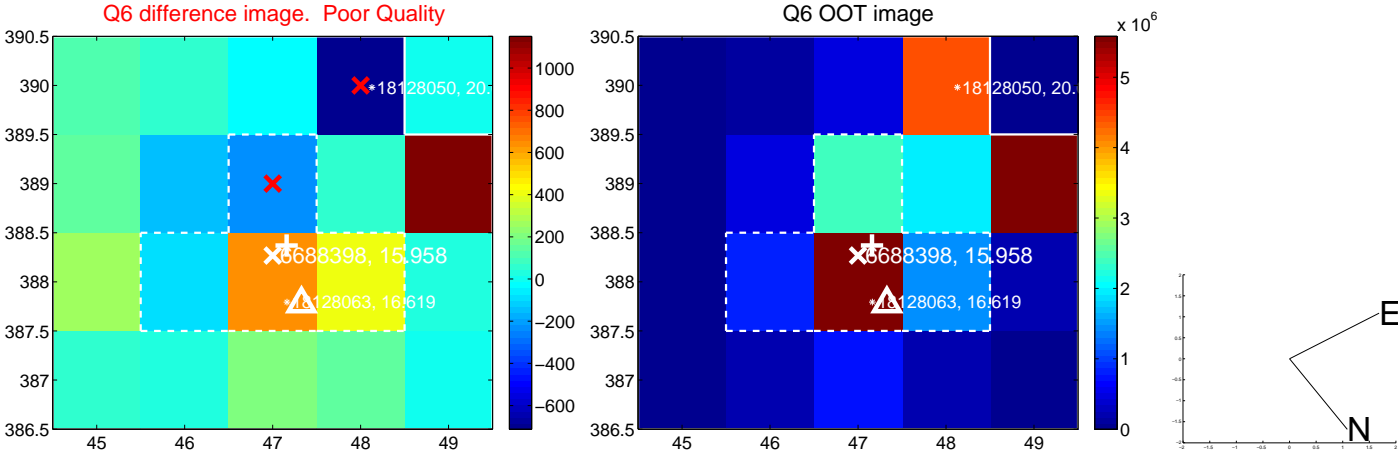
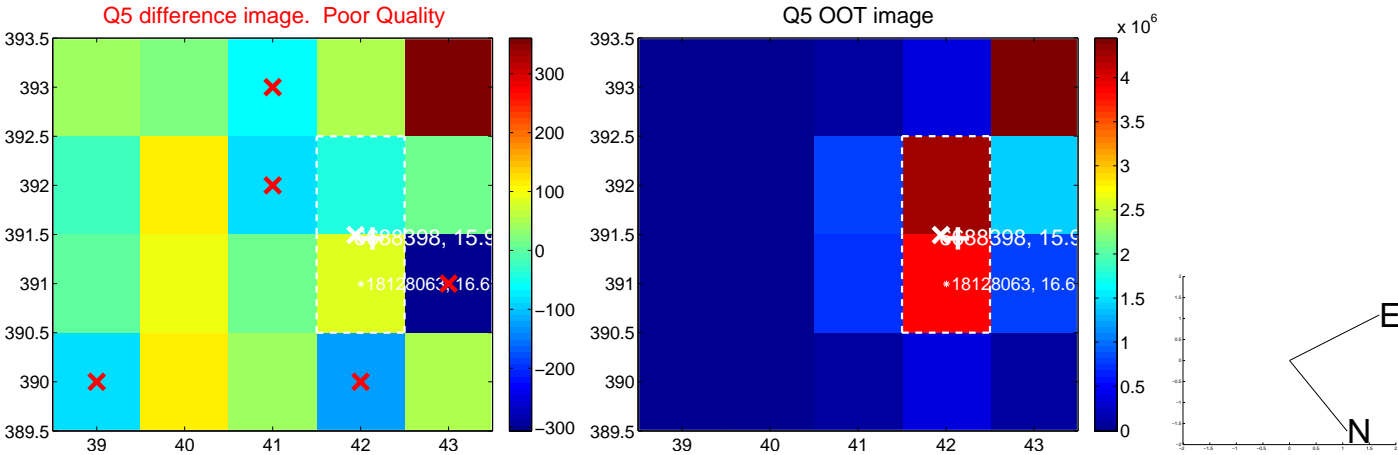


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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



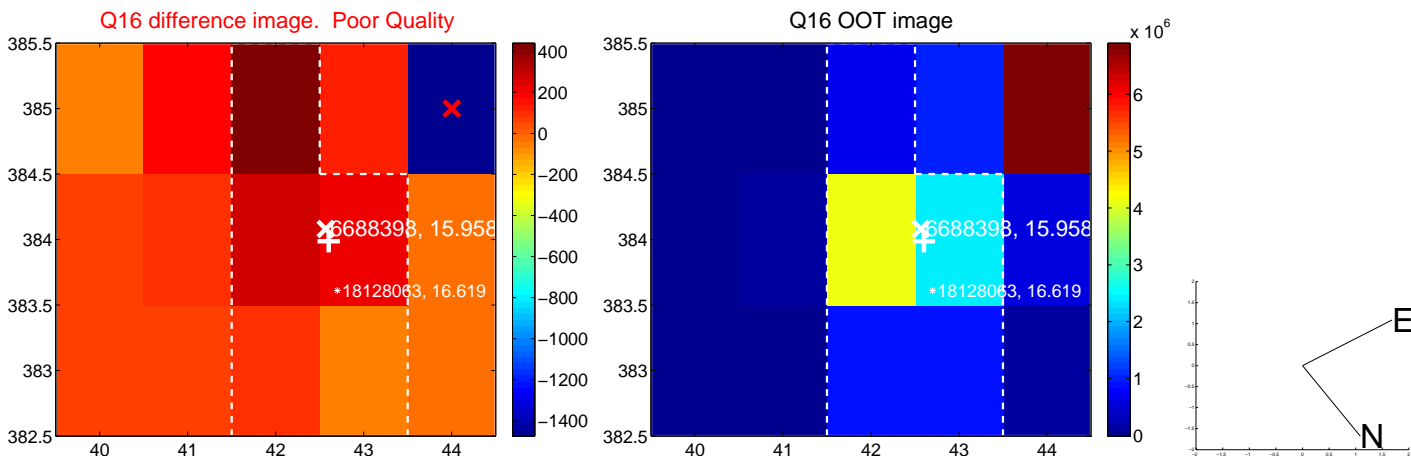
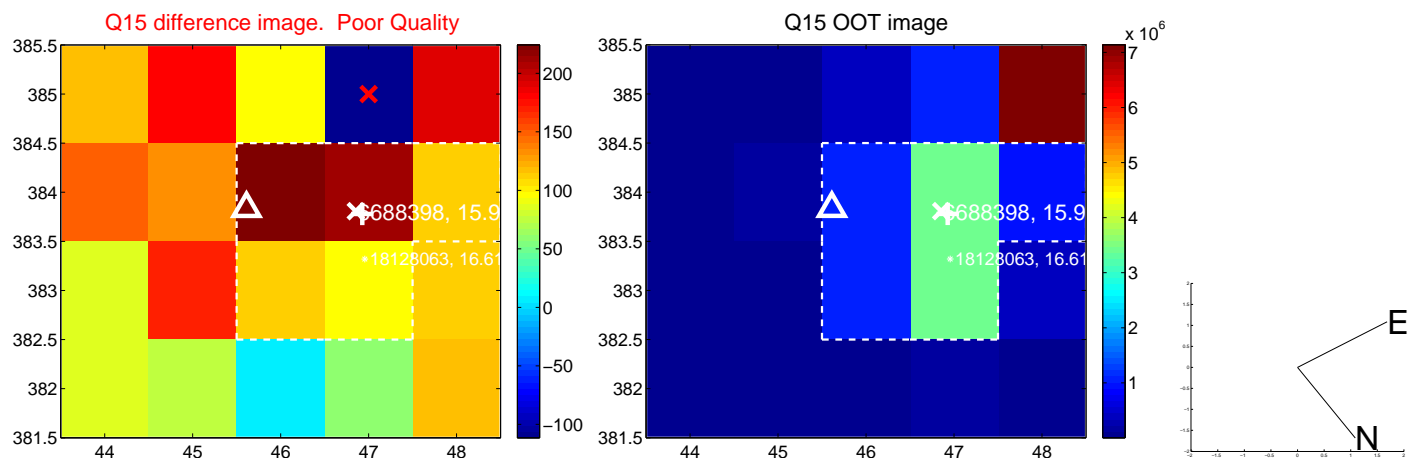
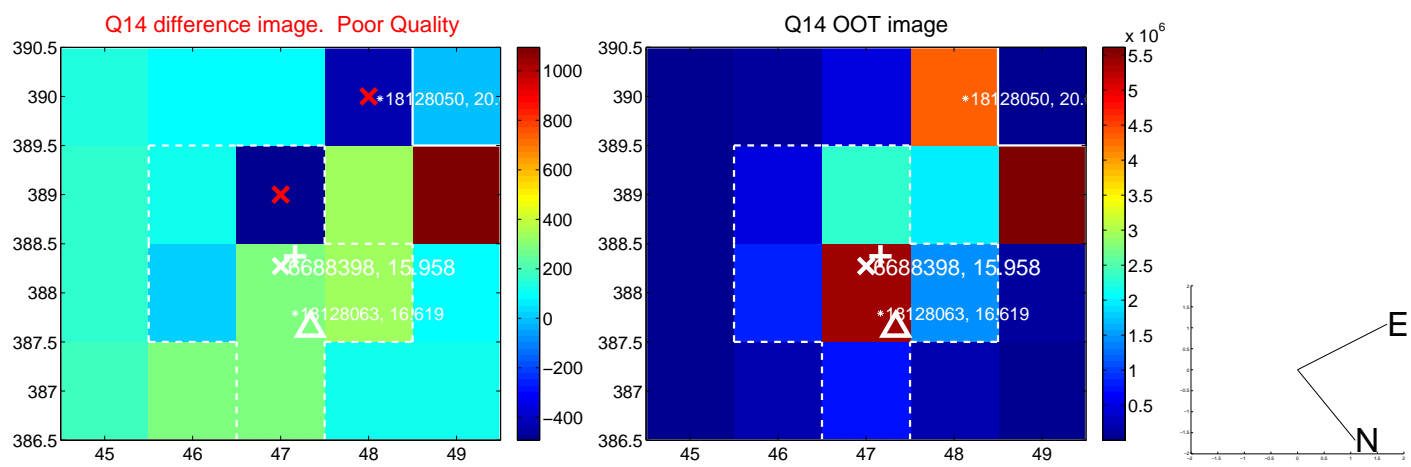
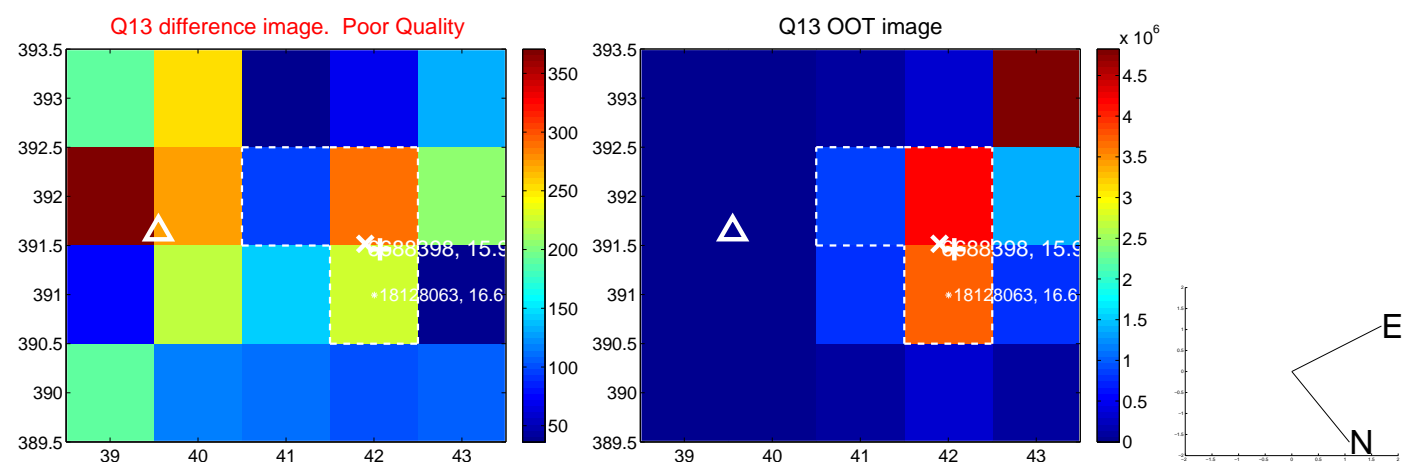
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



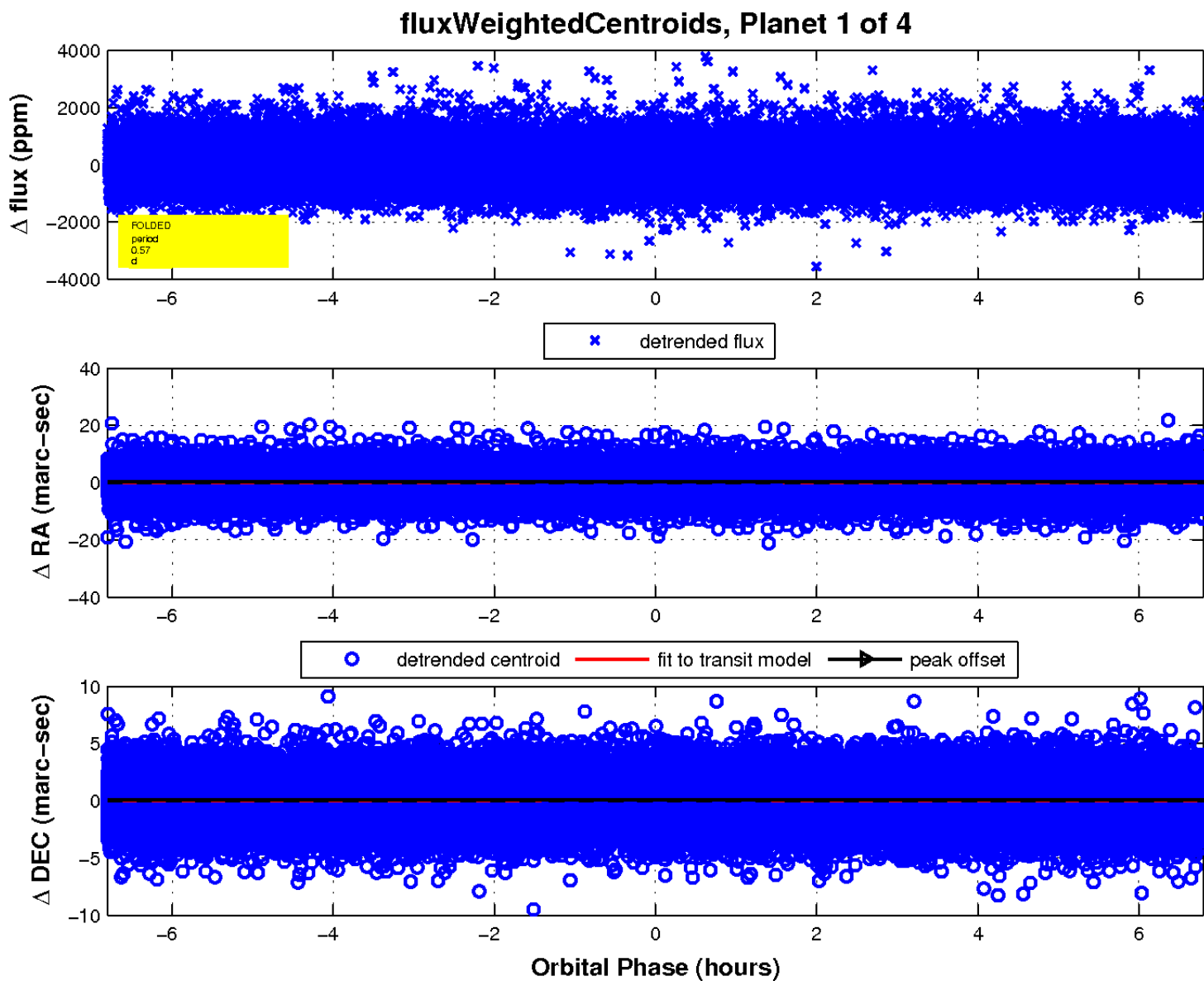
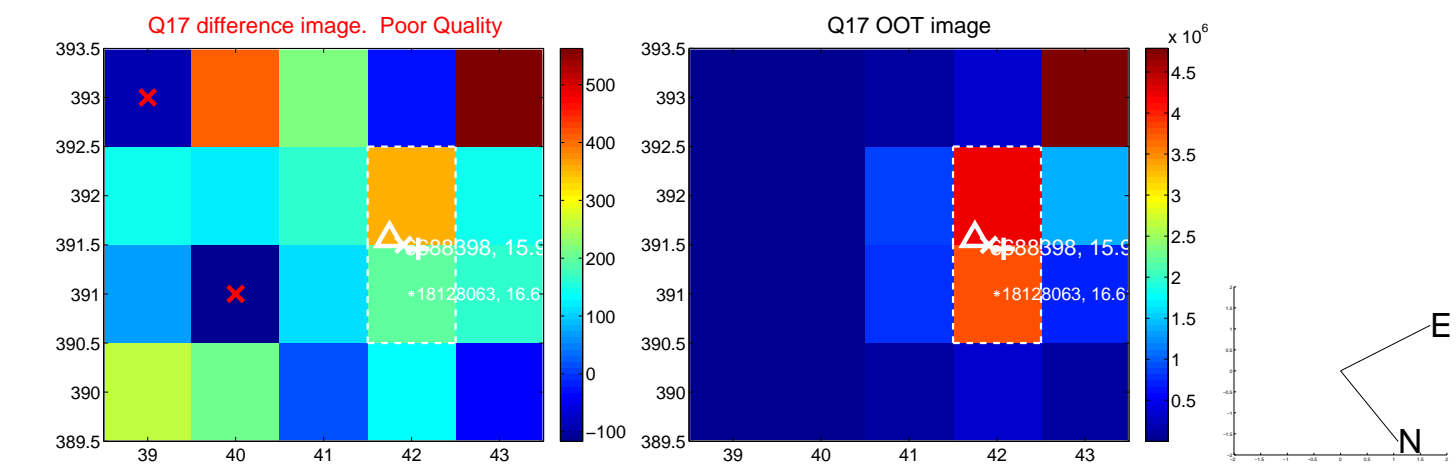




white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

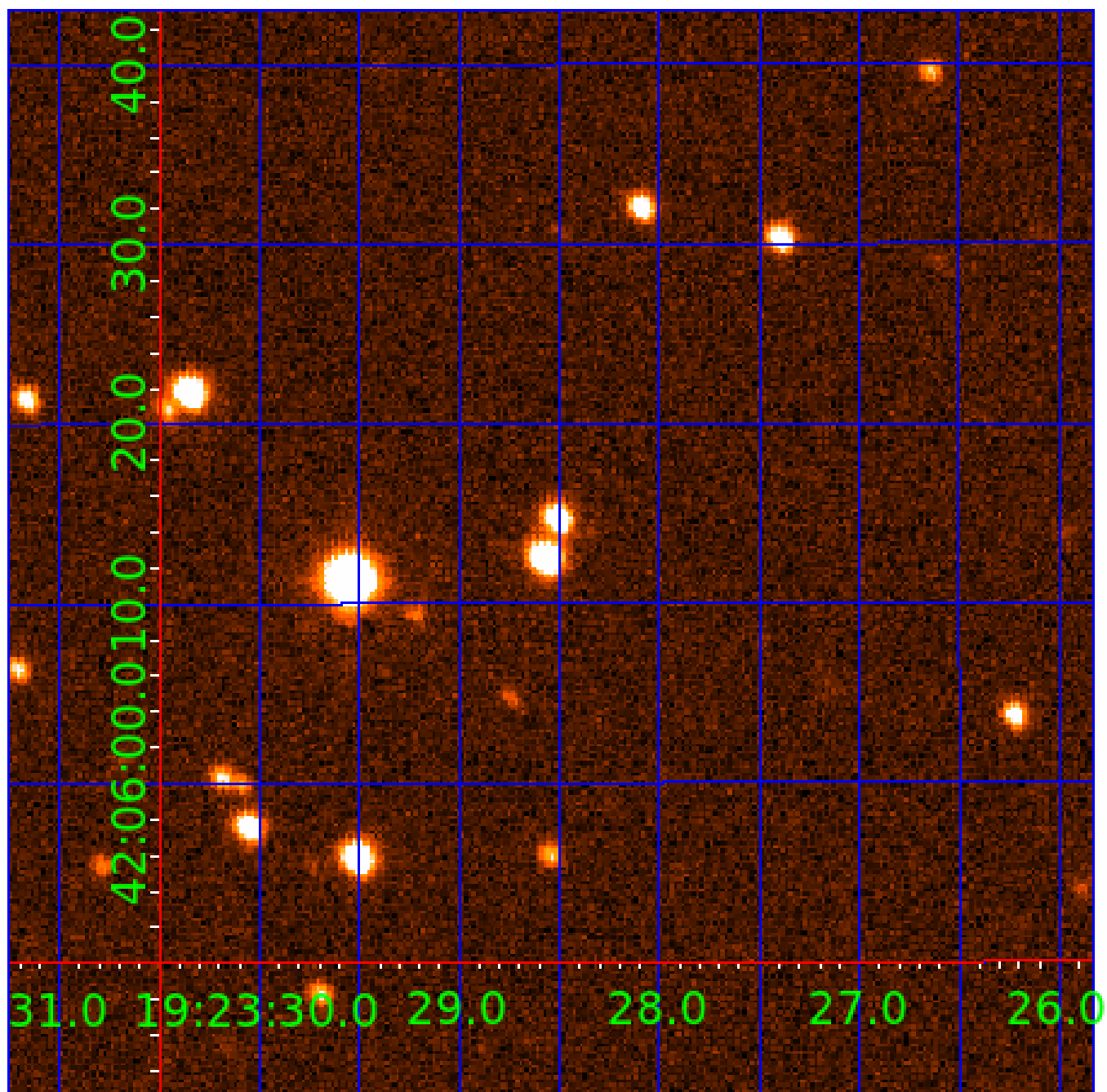


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 006688398

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
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006688398-04	OBS	No	58.541662	180.146213	1785.2	1.617	8.6	7.4	0.76	4885	3.53	4.18

## Robovetter Results

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006688398-02	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS—HALO_GHOST
006688398-03	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_FEW_DIFFS—HALO_GHOST
006688398-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_FEW_DIFFS

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

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

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

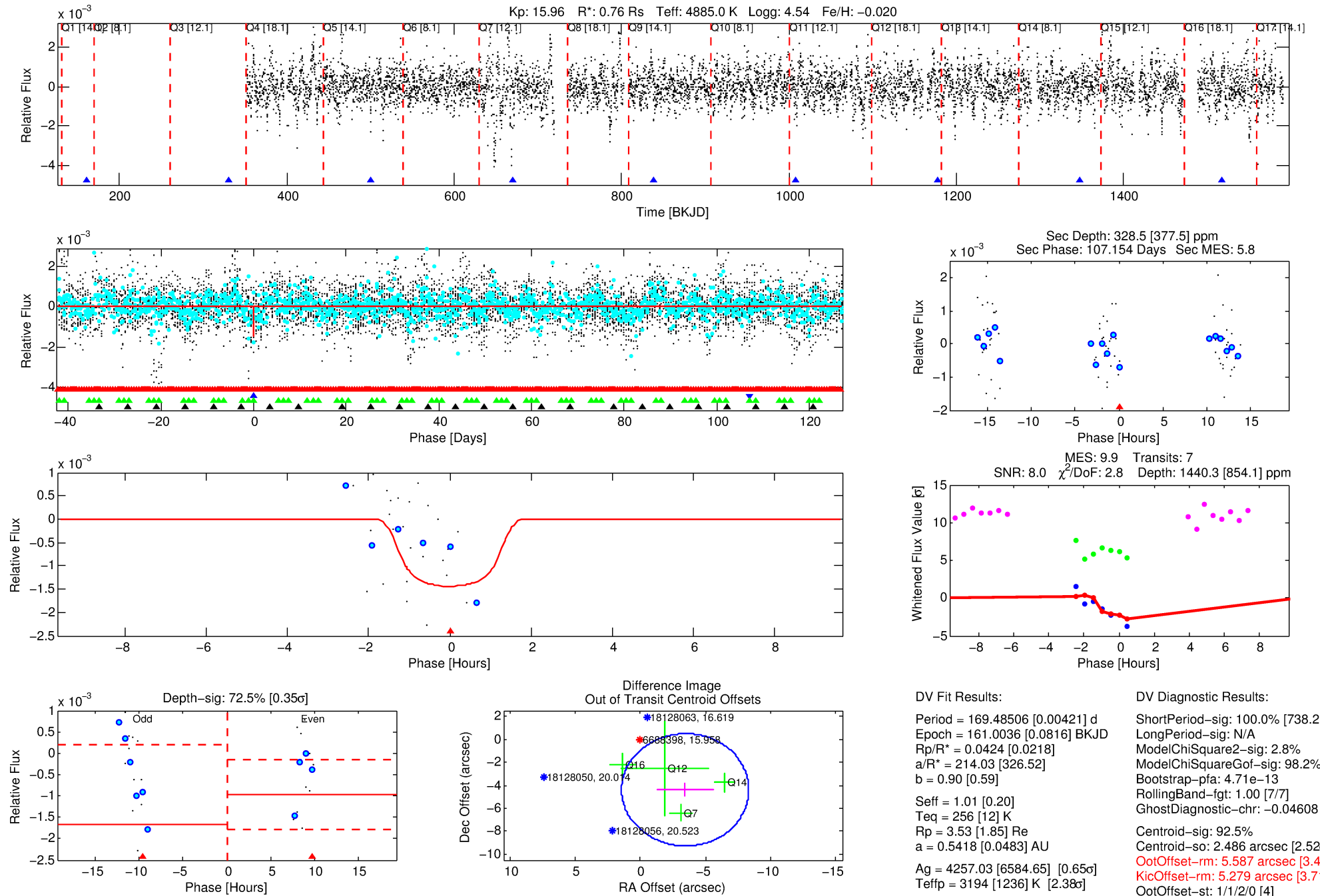
## Ephemeris Match Information For 006688398-02

No Significant Match Found



# DV One-Page Summary

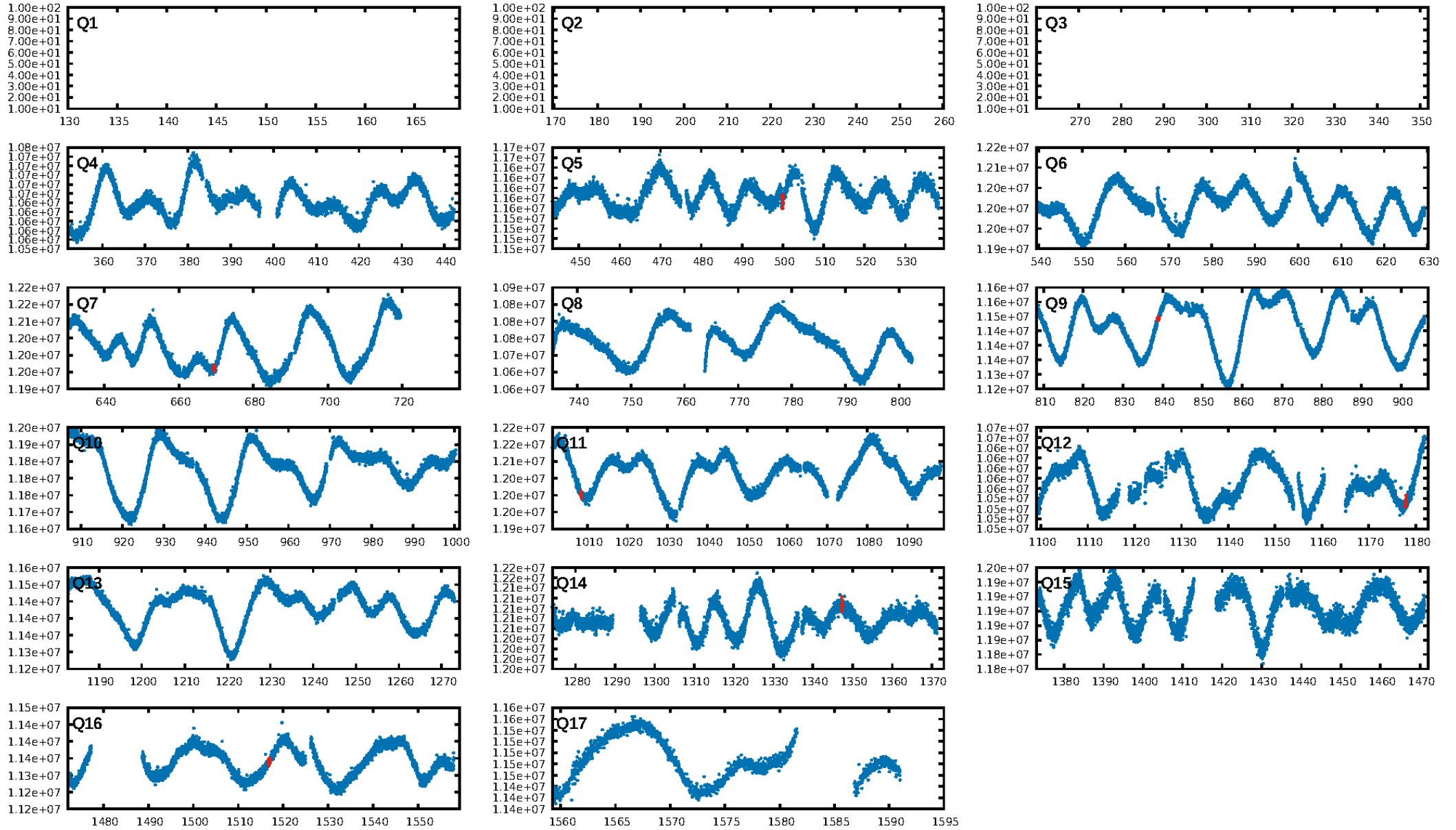
KIC: 6688398 Candidate: 2 of 4 Period: 169.485 d



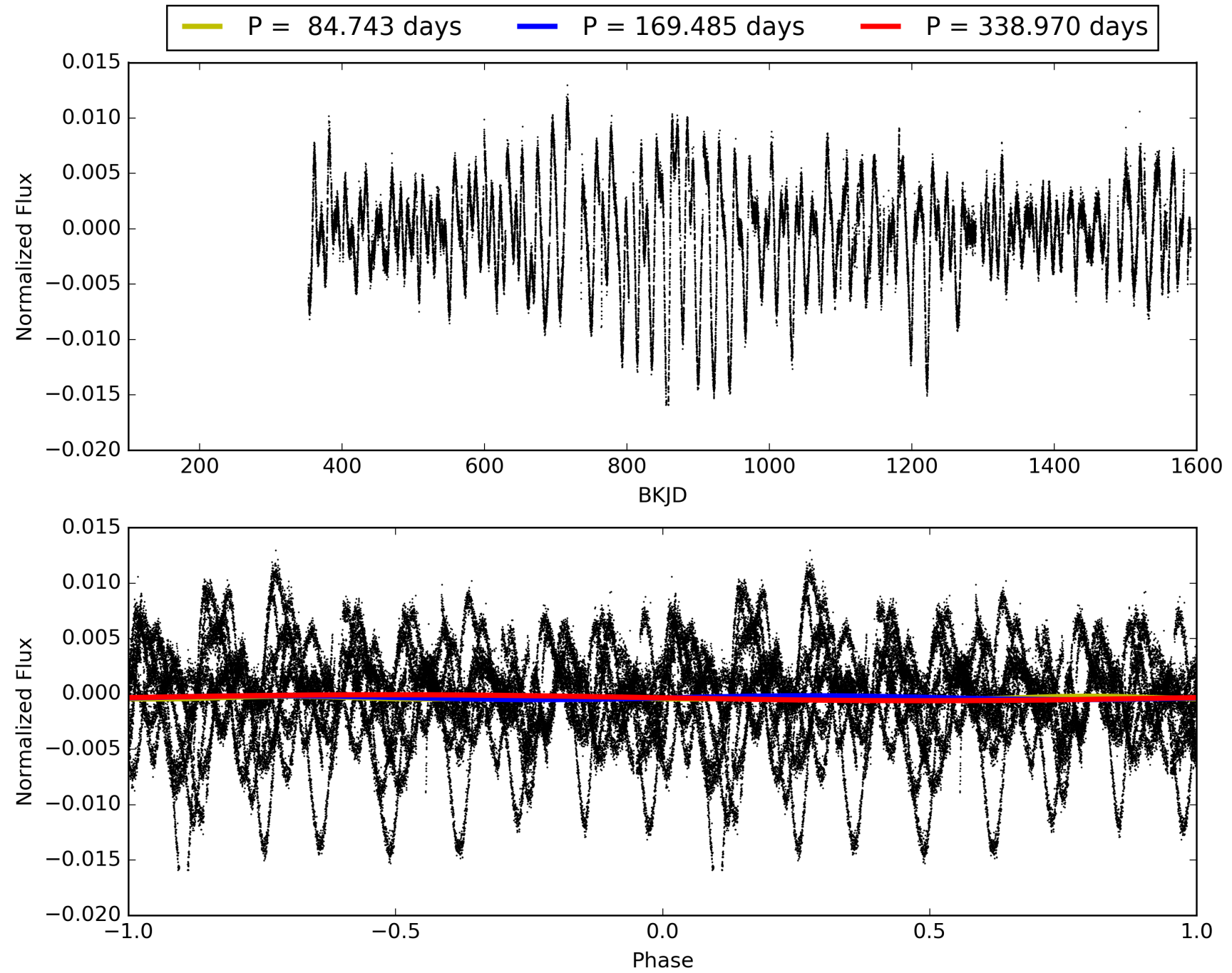
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 21:05:00 Z

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

# TCE 006688398-02, PDC Light Curves

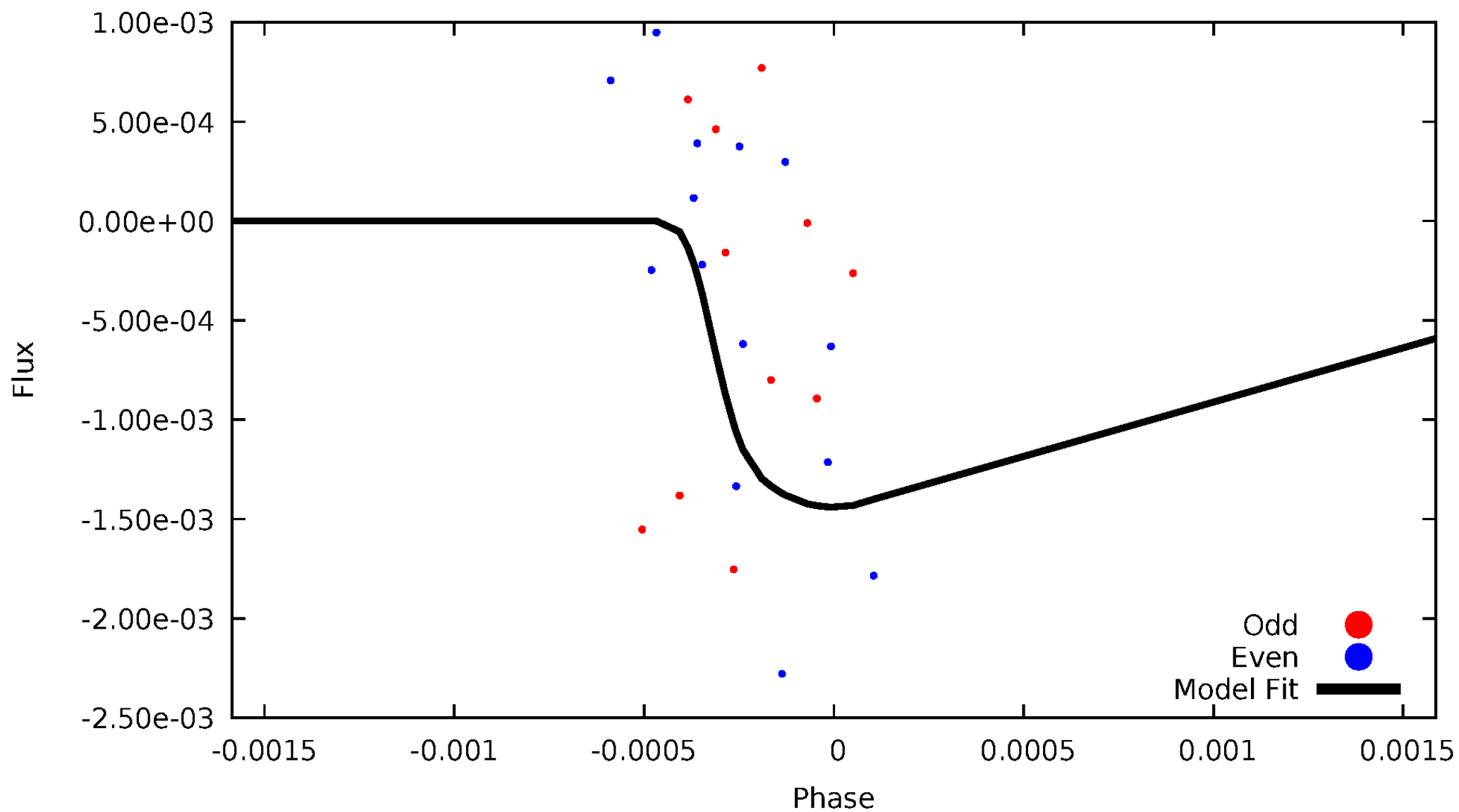


TCE 006688398-02



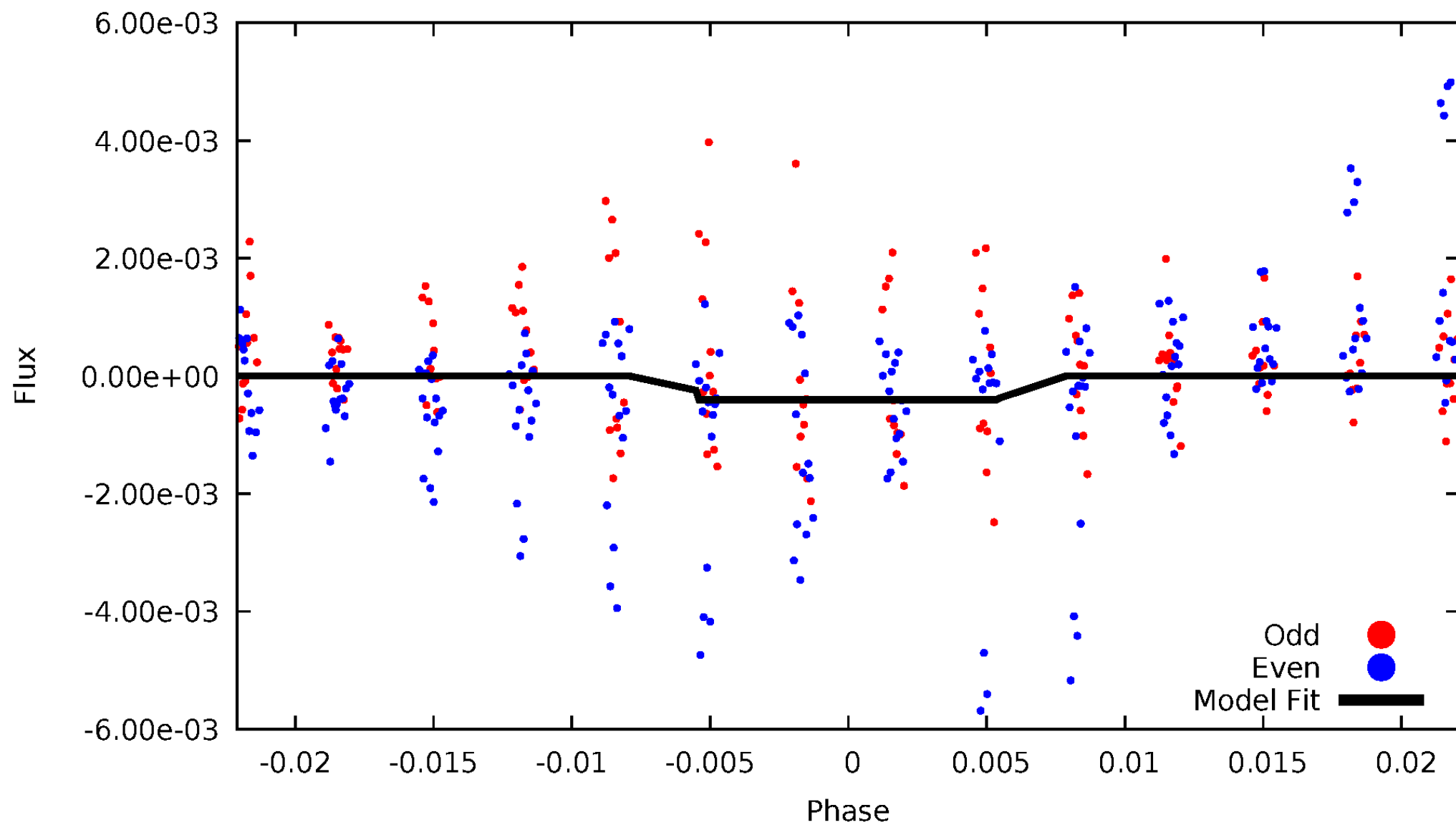
# DV Odd/Even

TCE 006688398-02



# ALT Odd/Even

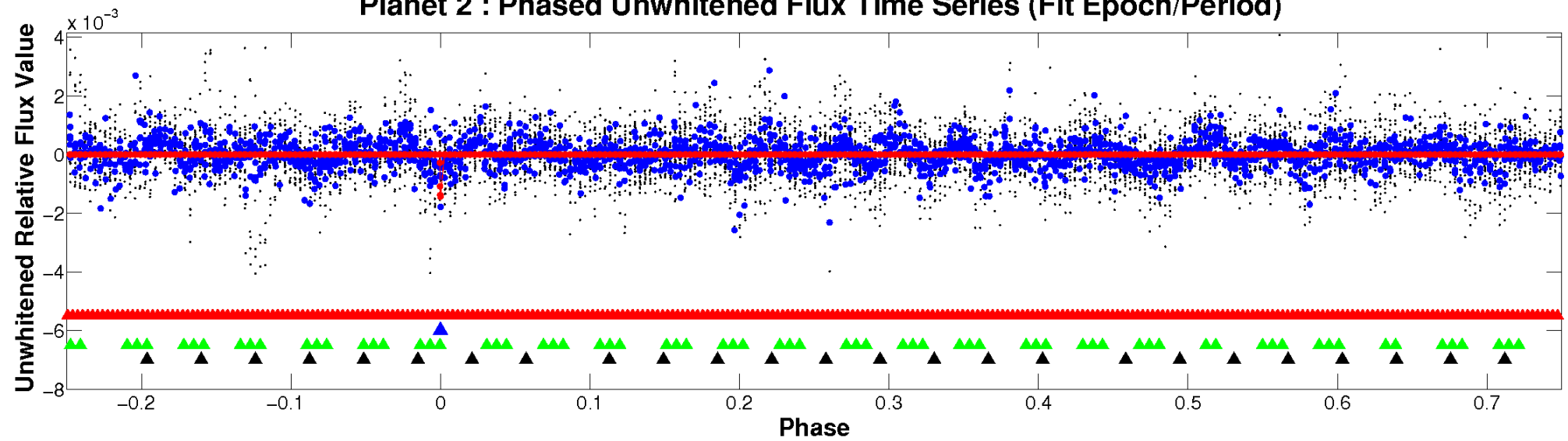
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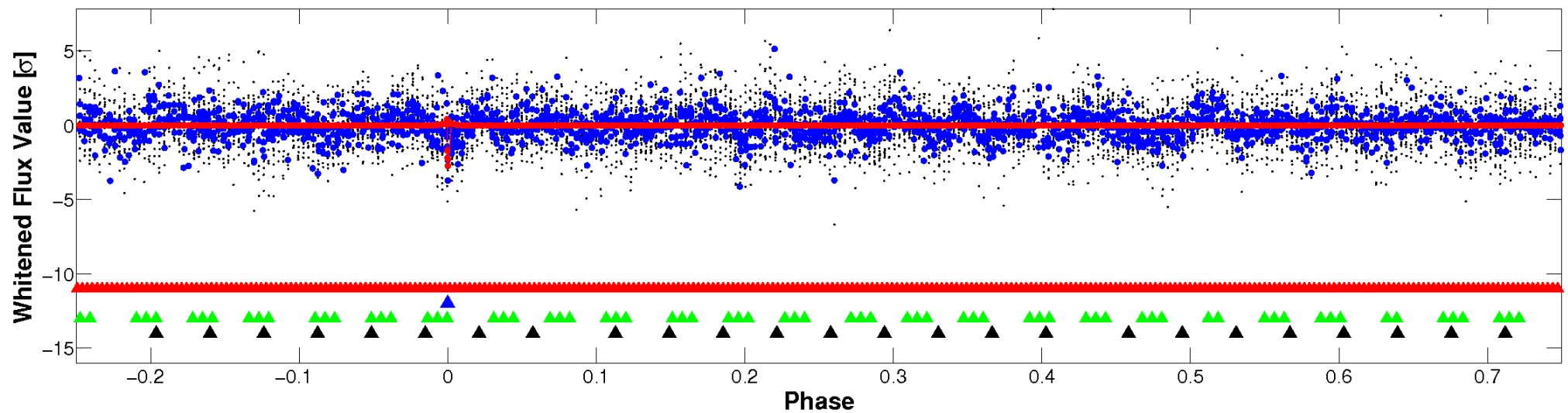


# Non-Whitened Vs. Whitened Light Curve

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

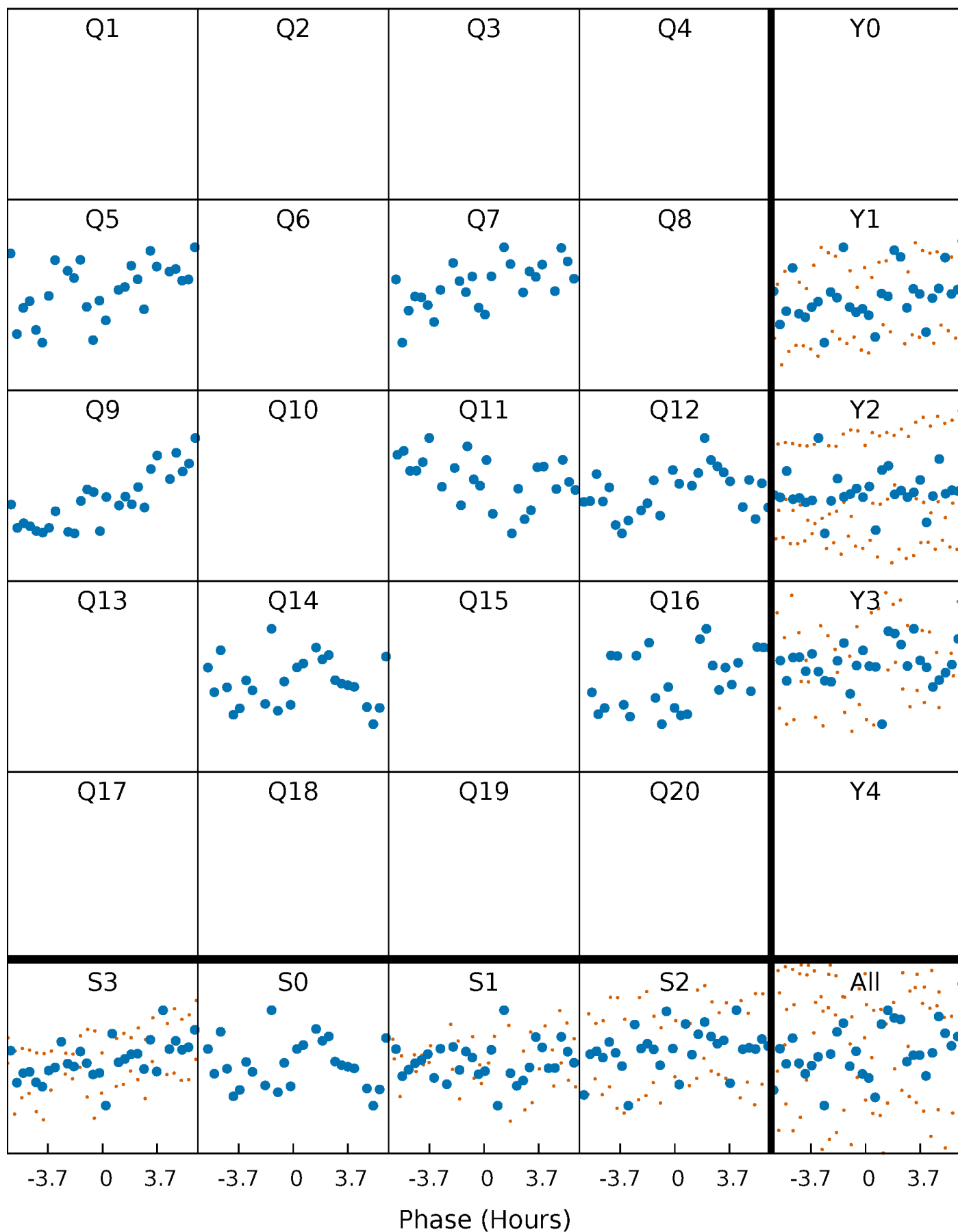


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



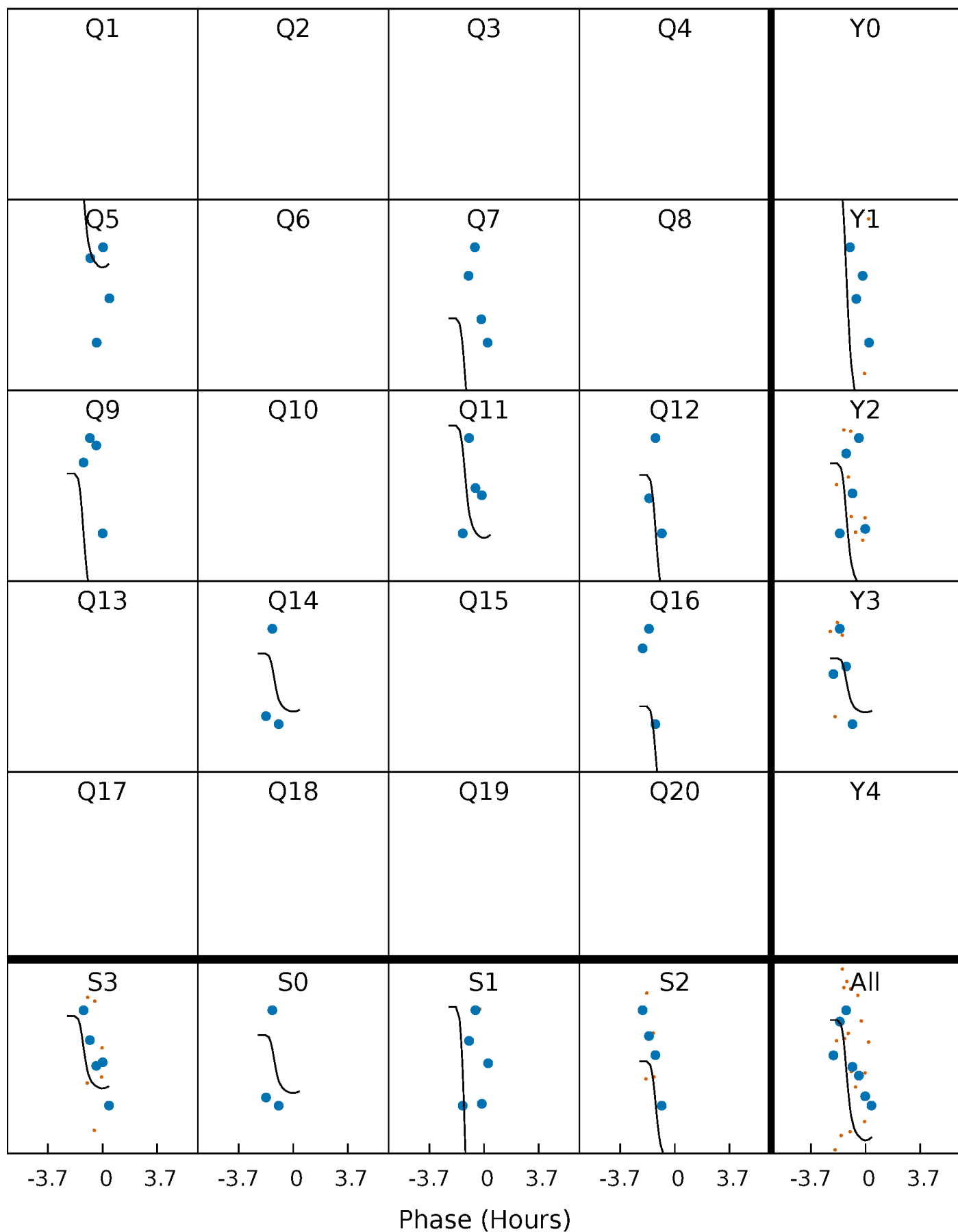
# PDC Quarter-Phased Transit Curves

TCE 006688398-02 P=169.485065 Days  $T_0=161.003629$  (BKJD)



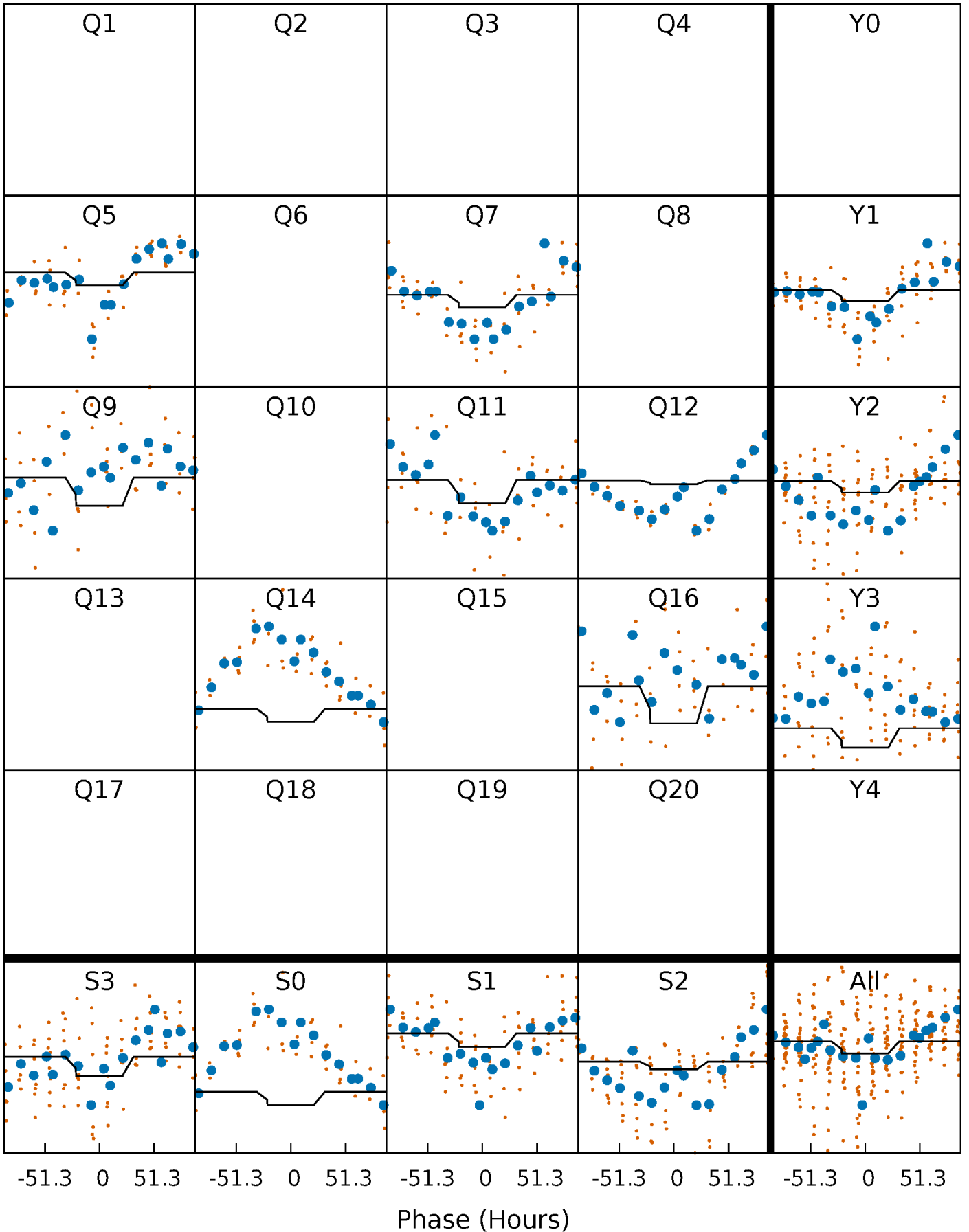
# DV Quarter-Phased Transit Curves

TCE 006688398-02 P=169.485065 Days  $T_0=161.003629$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

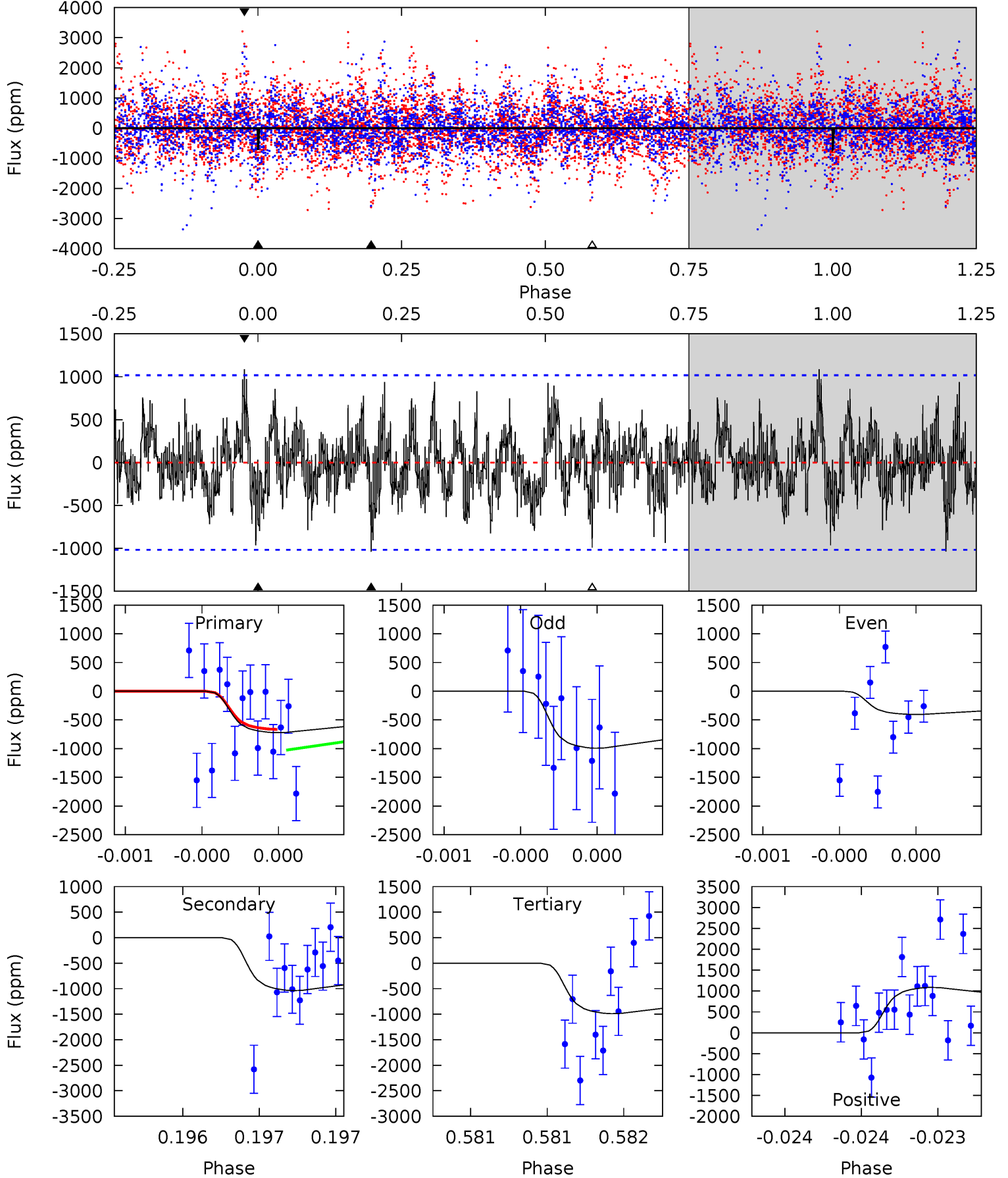
TCE 006688398-02   P=169.489569 Days    $T_0=161.229406$  (BKJD)



# DV Model-Shift Uniqueness Test

006688398-02, P = 169.485065 Days, E = 161.003629 Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
3.96	5.69	5.43	5.96	5.58	3.49	1.67	-1.46	-2.00	0.26	-0.27	1.62	1.25	0.51	0.46

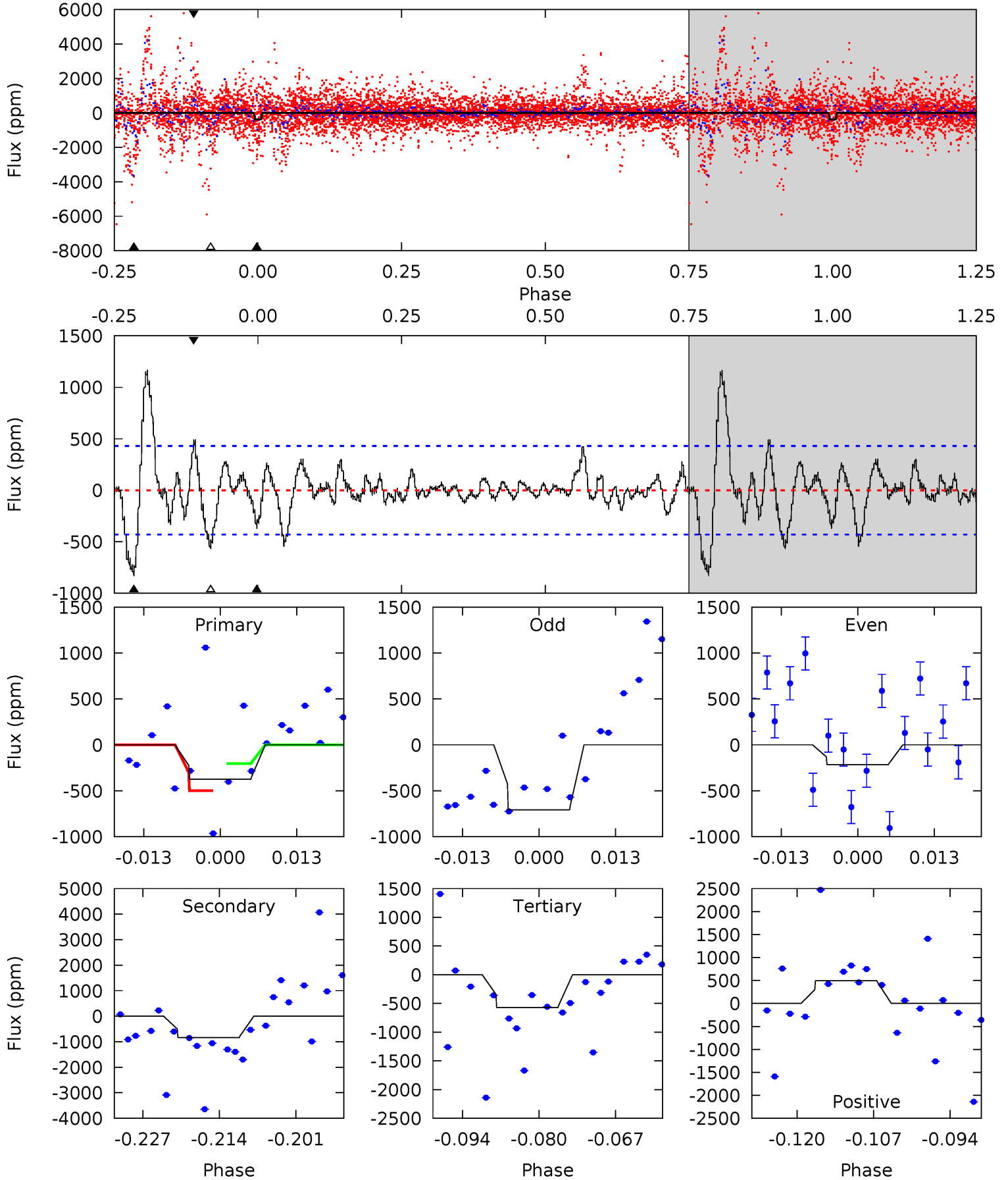




# Alt Model-Shift Uniqueness Test

006688398-02, P = 169.489569 Days, E = 161.229406 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
4.31	9.63	6.58	5.71	4.97	2.47	2.09	-2.26	-1.39	3.05	3.92	2.40	0.98	0.58	1.68



### Stellar Parameters For KIC 006688398

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$4885^{+175}_{-175}$	$4.541^{+0.072}_{-0.044}$	$-0.020^{+0.300}_{-0.300}$	$0.763^{+0.062}_{-0.080}$	$0.738^{+0.083}_{-0.060}$	$2.337^{+0.705}_{-0.377}$
	+4%/-4%	+2%/-1%	+1500%/-1500%	+8%/-10%	+11%/-8%	+30%/-16%
Source	KIC0	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 006688398-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-1037 \pm 182$	$3.63^{+1.77}_{-1.70}$	$355^{+16}_{-13}$	$4310^{+1382}_{-599}$	$12395^{+31719}_{-6939}$
Alt.	$-834 \pm 87$	$2.05^{+1.72}_{-1.22}$	$356^{+16}_{-16}$	$5218^{+3331}_{-1145}$	$32184^{+169136}_{-22896}$

$T_{max}$  = 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

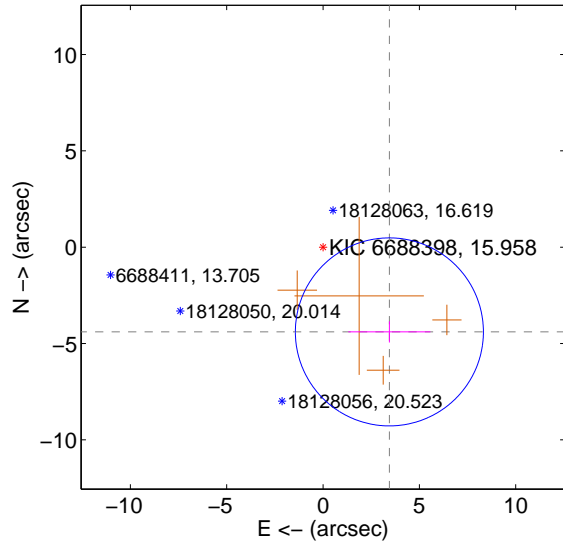
Supplemental centroid analysis for 006688398-02. Kepler magnitude: 15.96. Transit SNR 7.97

There are 0 quarters with good PRF difference image offsets

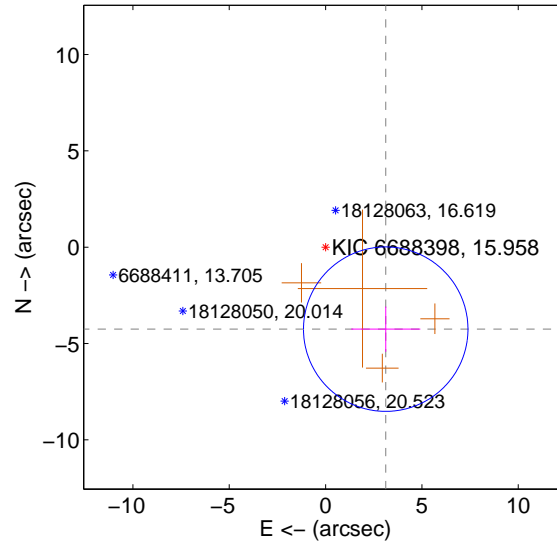
The direct PRF centroid is offset from the target star catalog position by about 0.39 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$5.587 \pm 1.627$	3.43	$-3.444 \pm 2.131$	$-4.399 \pm 0.548$
PRF-fit source offset from KIC position	$5.279 \pm 1.423$	3.71	$-3.123 \pm 1.796$	$-4.256 \pm 1.174$
photometric centroid source offset	$2.49 \pm 0.99$	2.52	$2.46 \pm 0.99$	$-0.37 \pm 0.64$

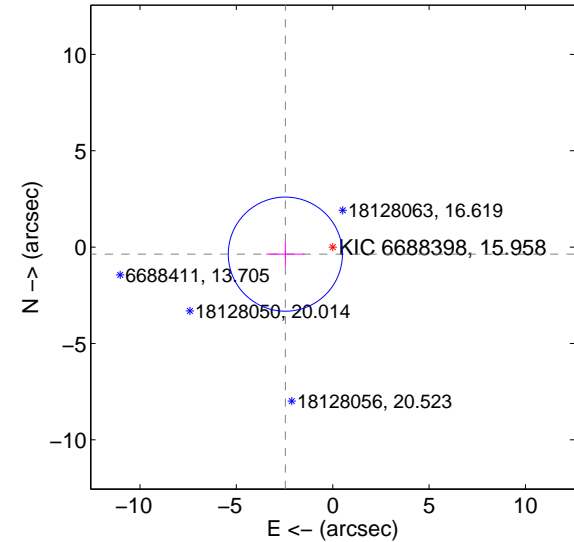
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

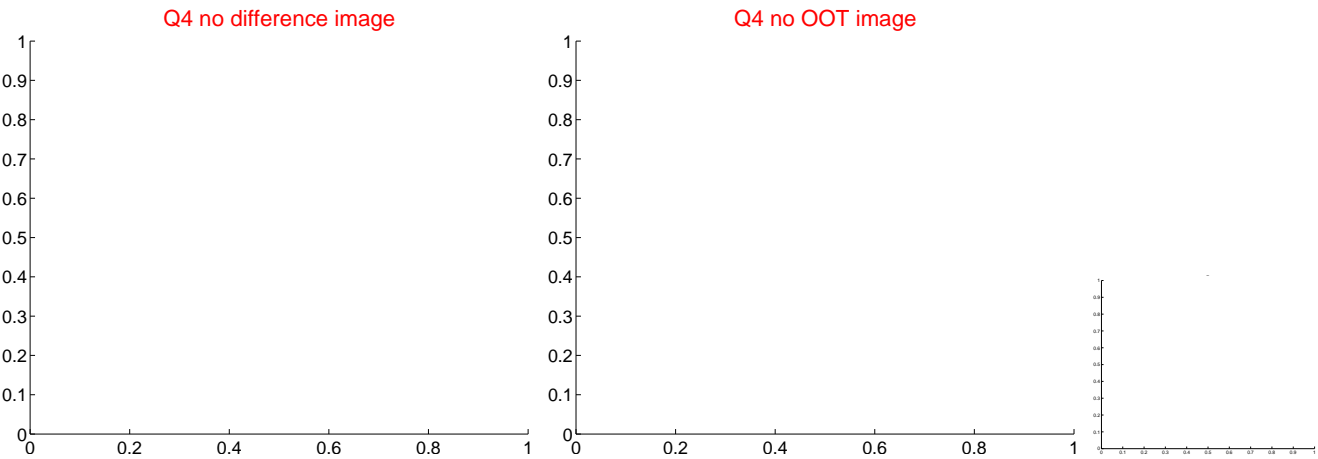
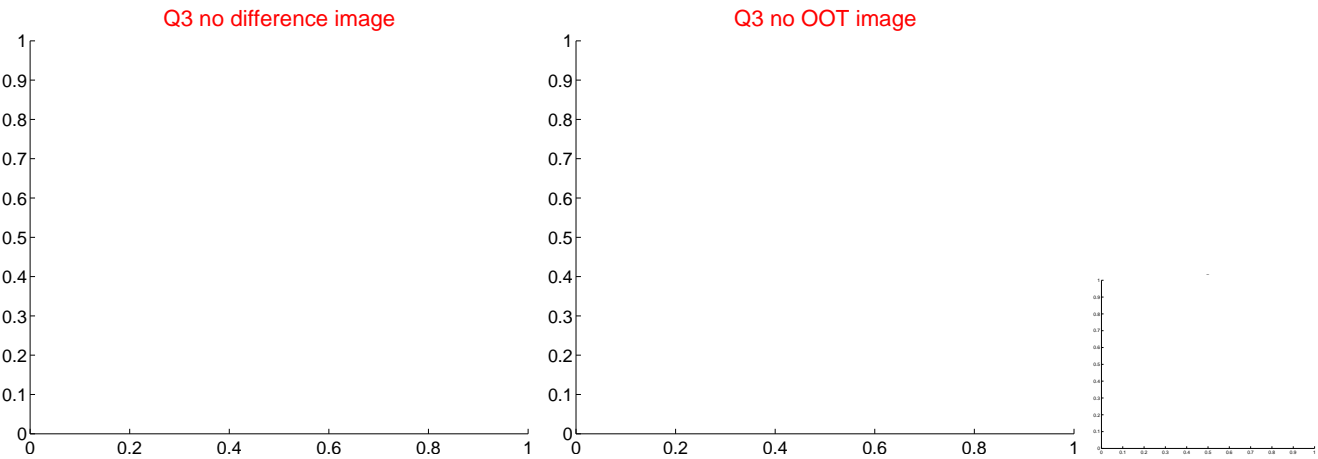
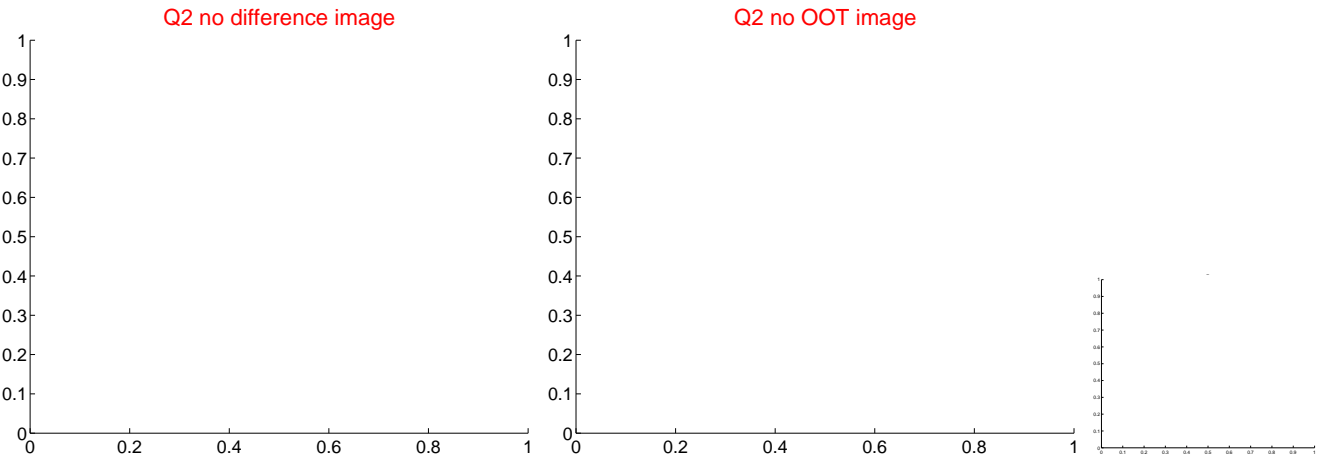
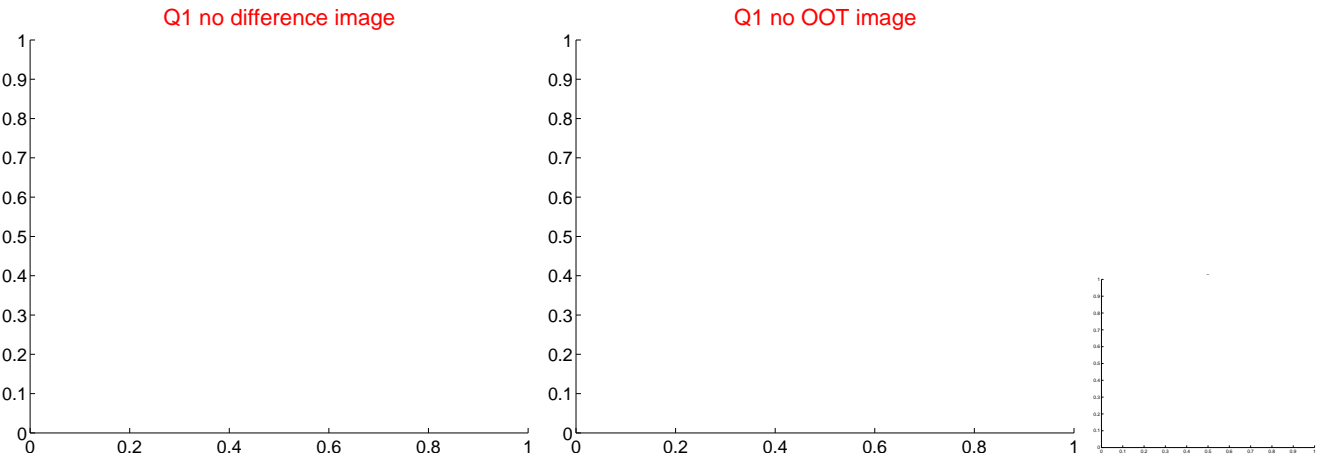


offset from photometric centroids

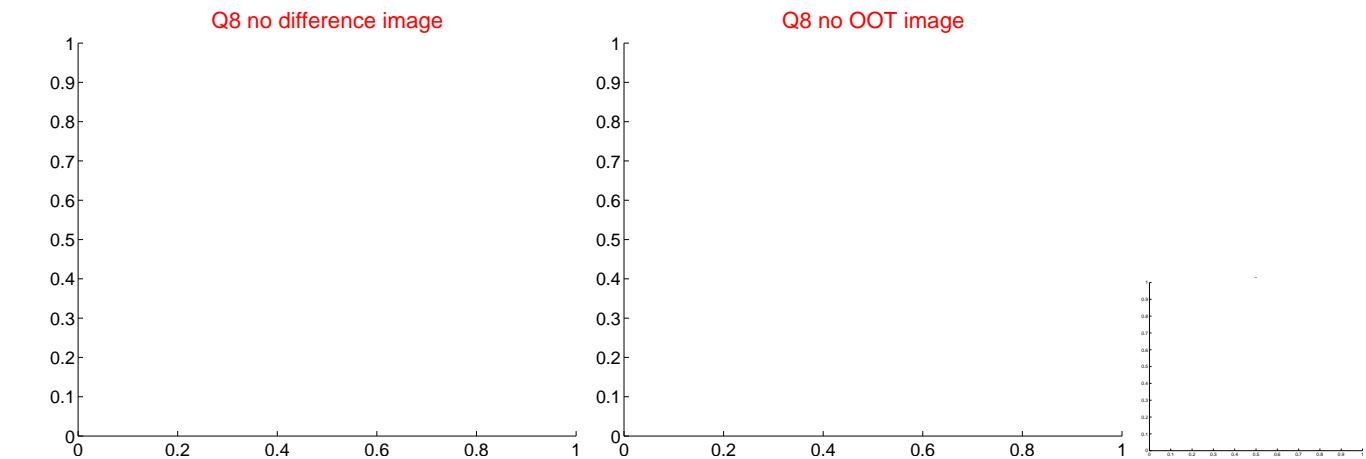
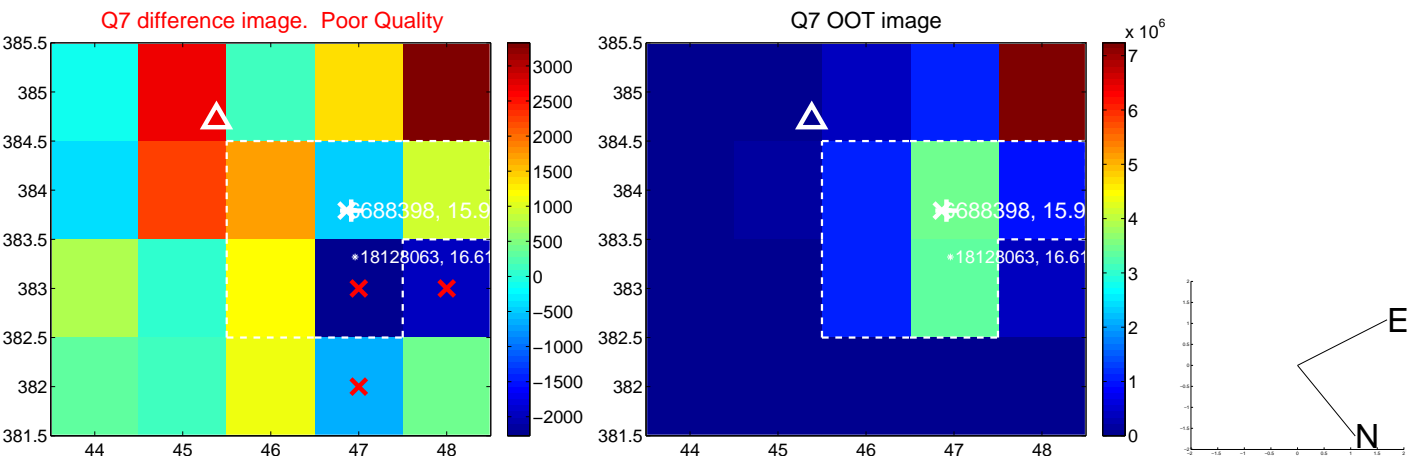
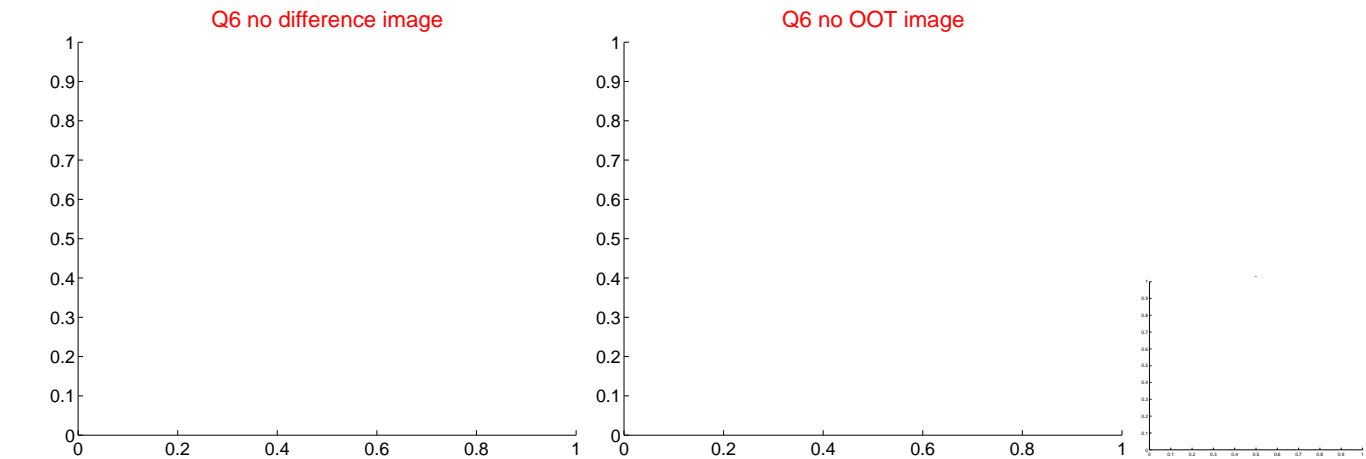
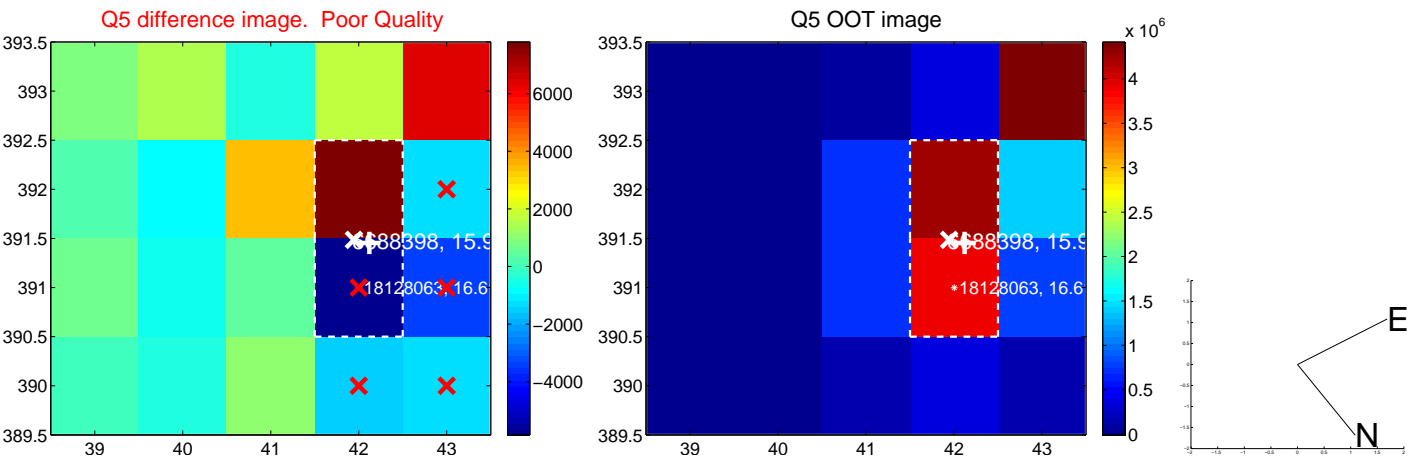


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

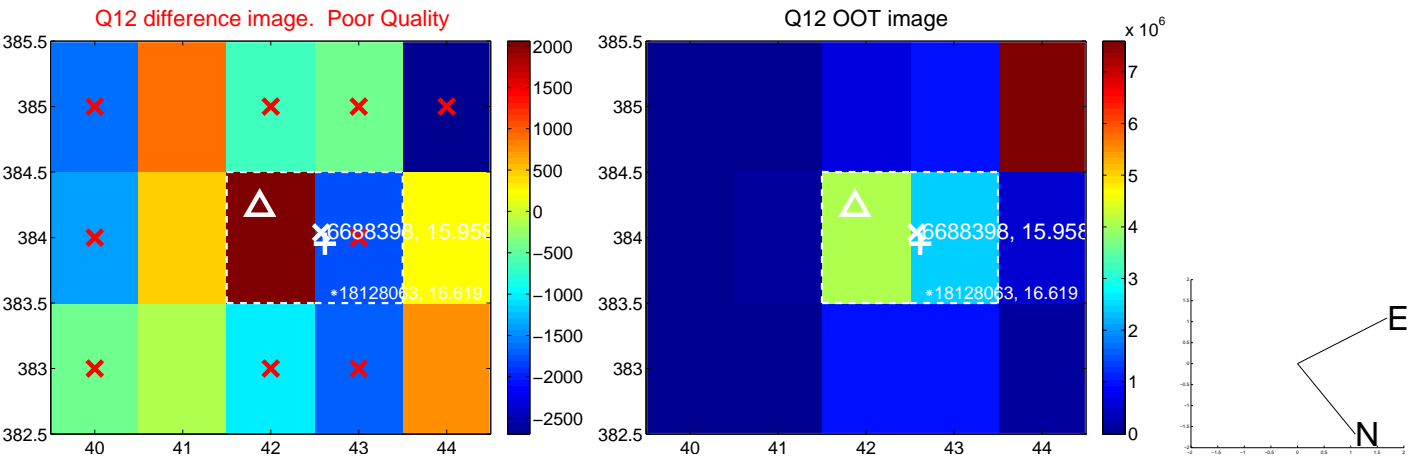
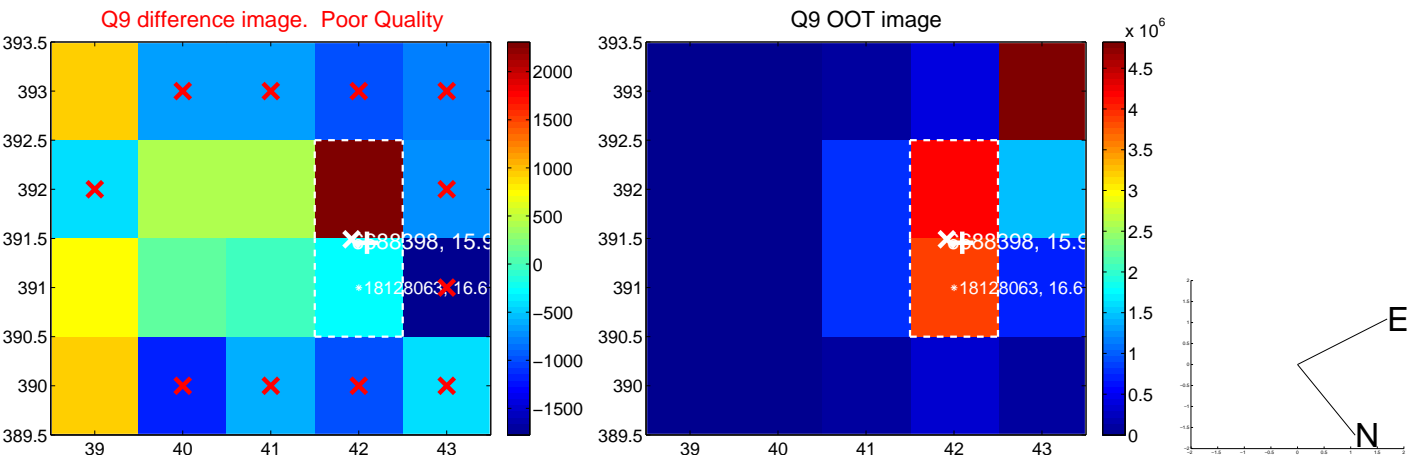


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

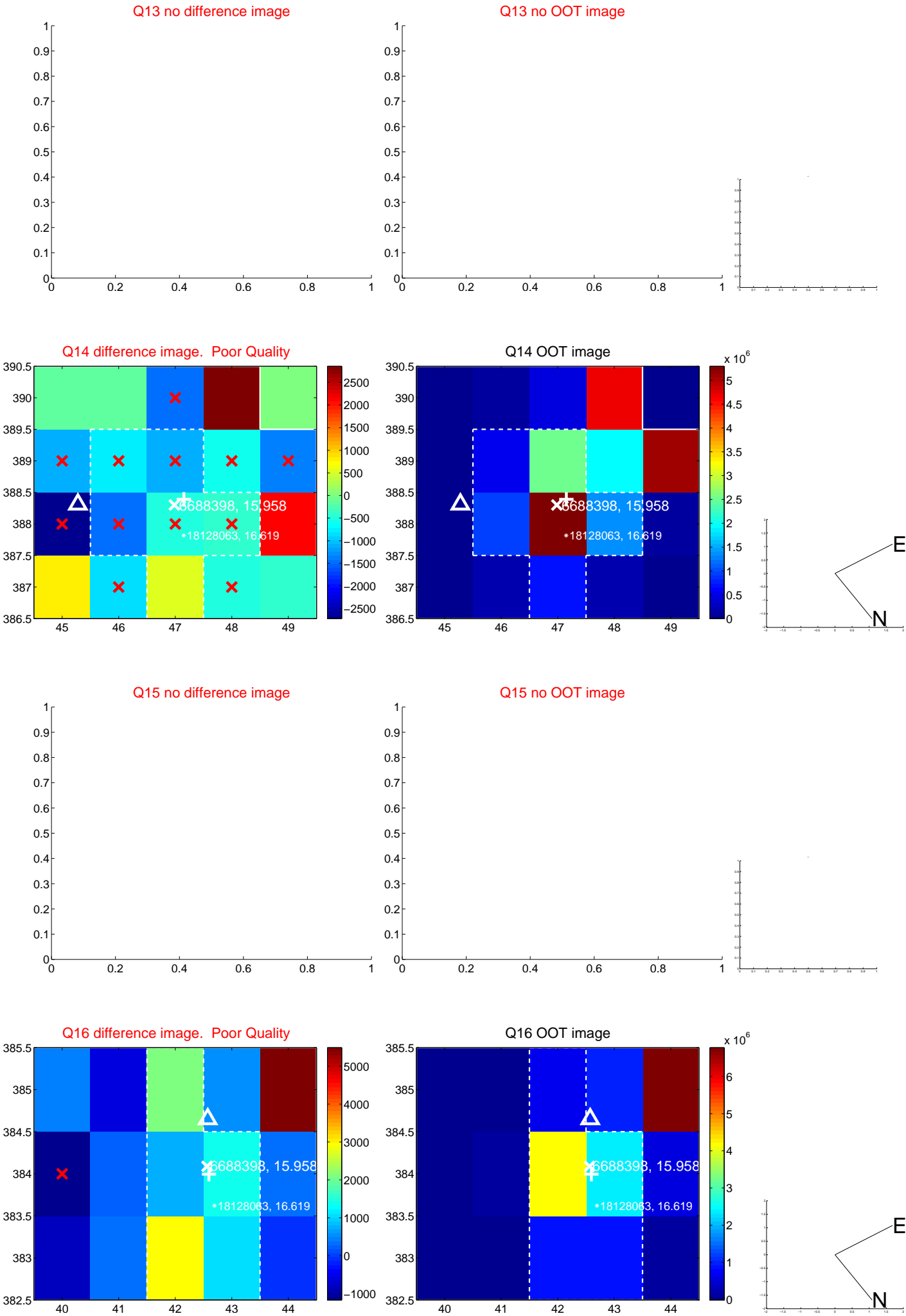




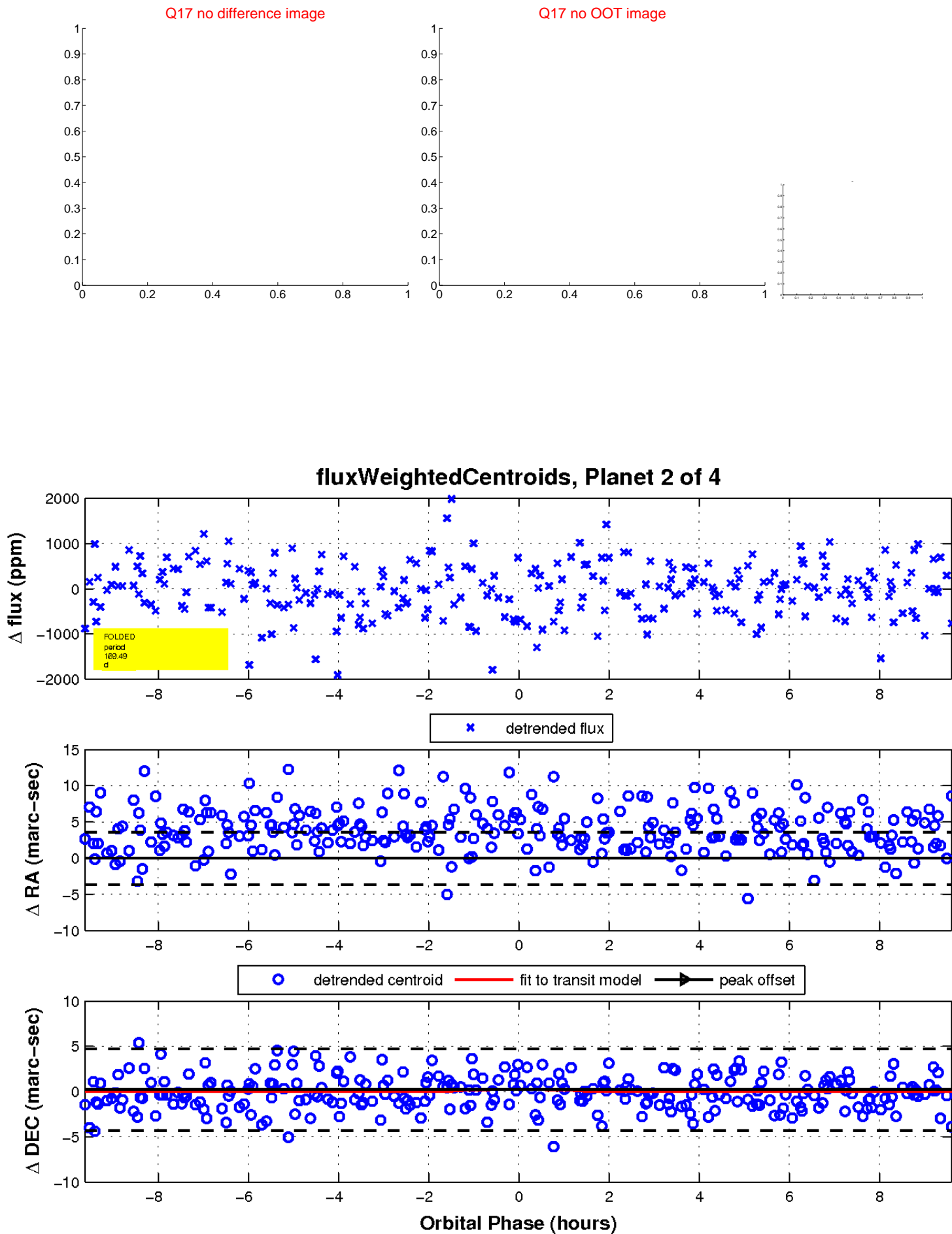
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

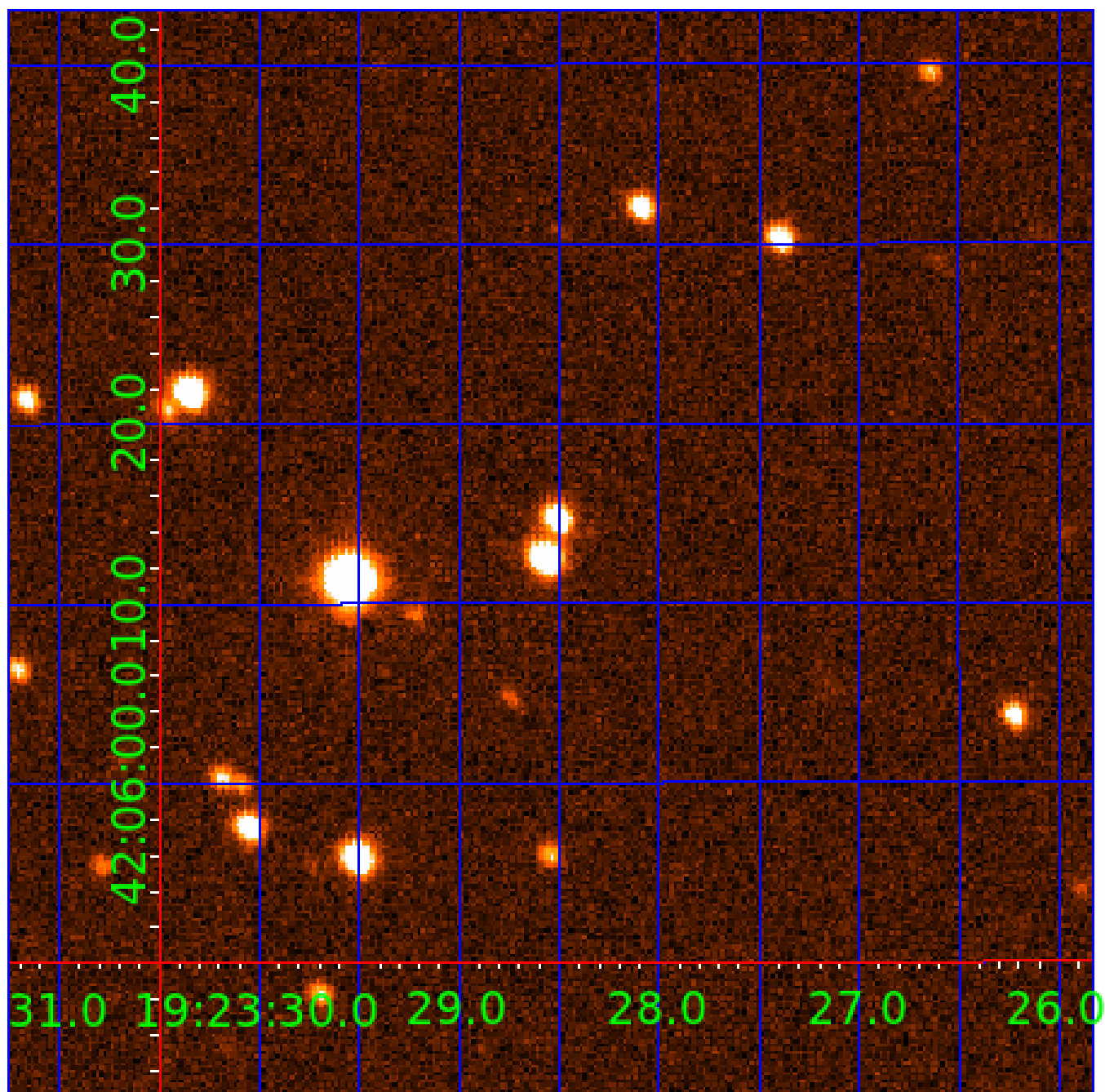


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 006688398

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
006688398-01	OBS	No	0.566802	131.826468	70.2	3.752	8.0	10.5	0.76	4885	0.70	2023.61
006688398-02	OBS	No	169.485065	161.003629	1440.3	3.224	9.9	8.0	0.76	4885	3.53	1.01
006688398-03	OBS	No	20.382964	138.330865	1552.2	1.897	12.7	9.3	0.76	4885	3.36	17.05
006688398-04	OBS	No	58.541662	180.146213	1785.2	1.617	8.6	7.4	0.76	4885	3.53	4.18

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
006688398-01	OBS	FP	0.00	1	0	1	0	LPP_DV—CENT_FEW_DIFFS—HALO_GHOST
006688398-02	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS—HALO_GHOST
006688398-03	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_FEW_DIFFS—HALO_GHOST
006688398-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_FEW_DIFFS

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

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

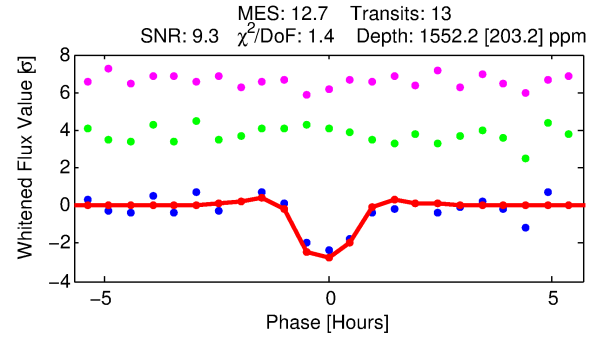
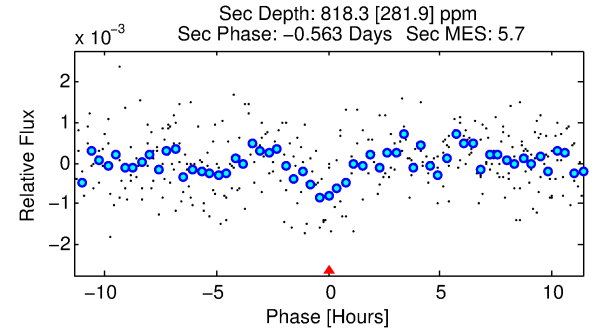
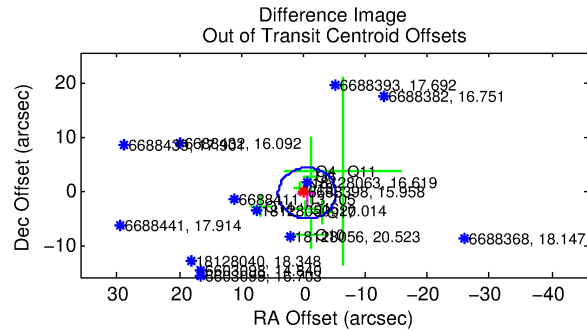
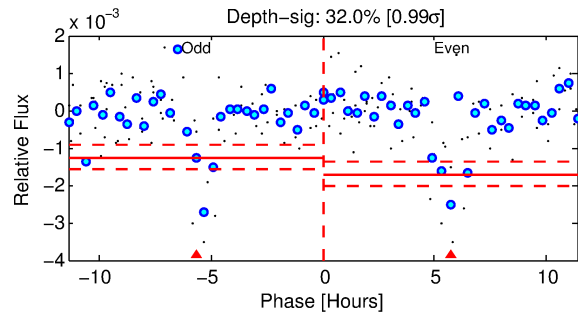
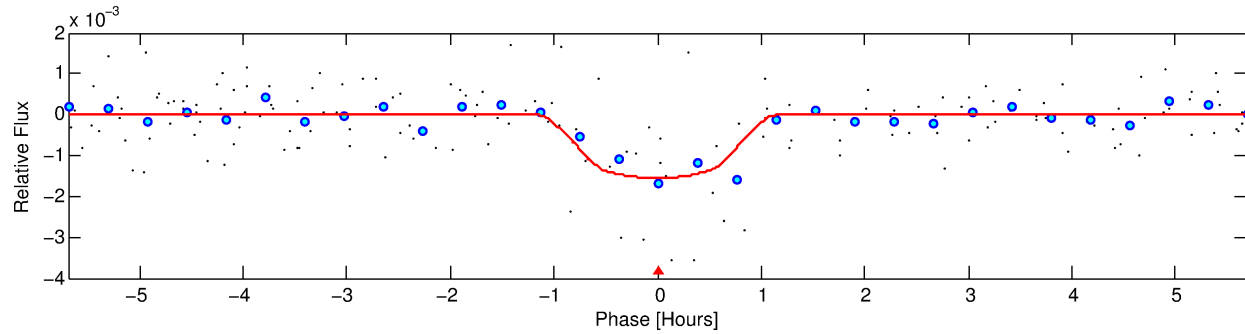
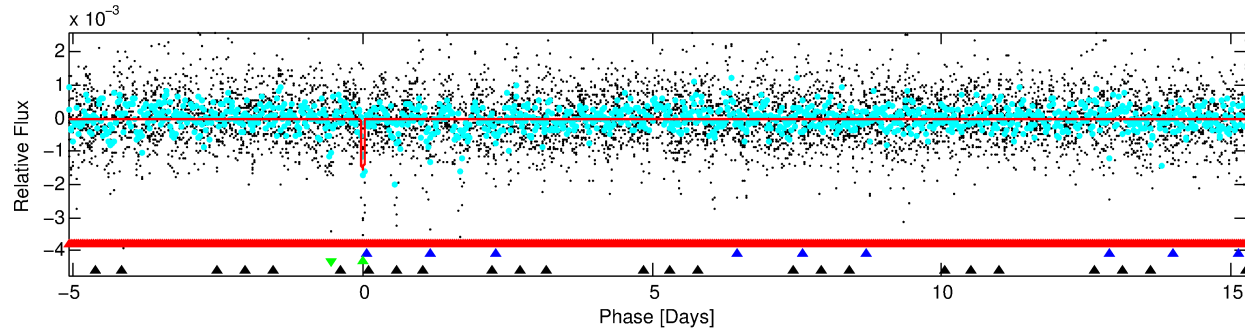
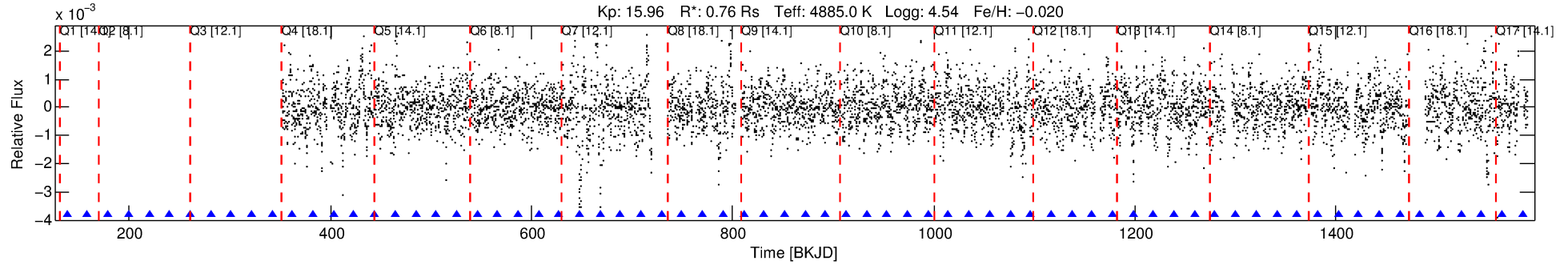
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 006688398-03

No Significant Match Found

# DV One-Page Summary

KIC: 6688398 Candidate: 3 of 4 Period: 20.383 d



## DV Fit Results:

Period = 20.38296 [0.00023] d  
Epoch = 138.3309 [0.0086] BKJD  
Rp/R\* = 0.0403 [0.0586]  
a/R\* = 55.81 [273.26]  
b = 0.79 [2.45]  
Seff = 17.05 [3.31]  
Teq = 518 [25] K  
Rp = 3.36 [4.89] Re  
a = 0.1320 [0.0118] AU  
Ag = 695.13 [2035.17] [0.34 $\sigma$ ]  
Teff = 4113 [3011] K [1.19 $\sigma$ ]

## DV Diagnostic Results:

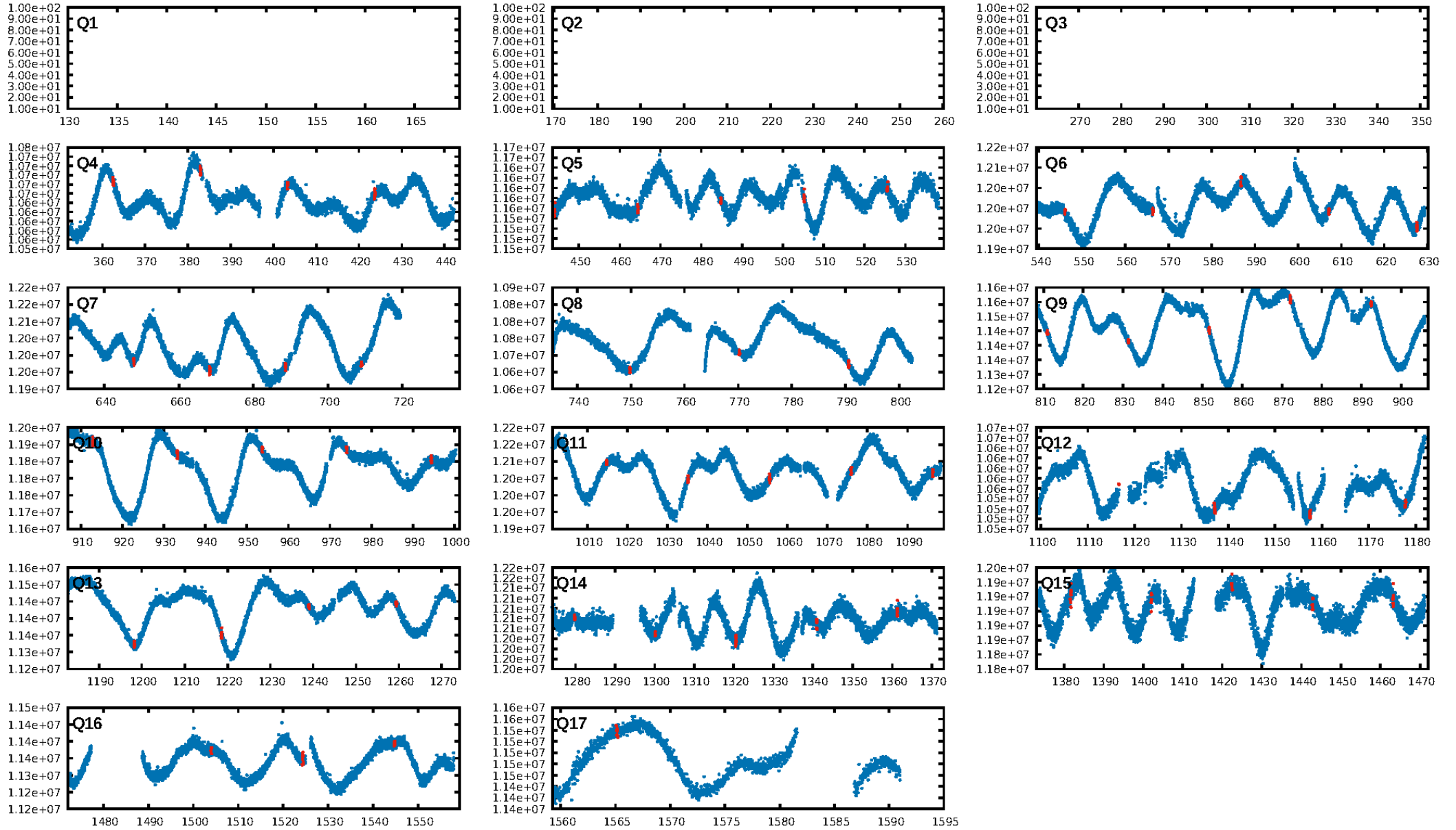
ShortPeriod-sig: 100.0% [113.12 $\sigma$ ]  
LongPeriod-sig: 100.0% [367.42 $\sigma$ ]  
ModelChiSquare2-sig: 0.3%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 3.96e-20  
RollingBand-fgt: 1.00 [13/13]  
**GhostDiagnostic-chr: -0.2374**  
Centroid-sig: 14.5%  
**Centroid-so: 1.975 arcsec [5.27 $\sigma$ ]**  
OotOffset-rm: 0.609 arcsec [0.39 $\sigma$ ]  
OotOffset-st: 3/1/2/2 [8]  
KicOffset-rm: 0.655 arcsec [0.46 $\sigma$ ]  
KicOffset-st: 3/1/2/2 [8]  
DiffImageQuality-fgm: 0.00 [0/8]  
DiffImageOverlap-fno: 0.00 [0/14]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 21:05:03 Z

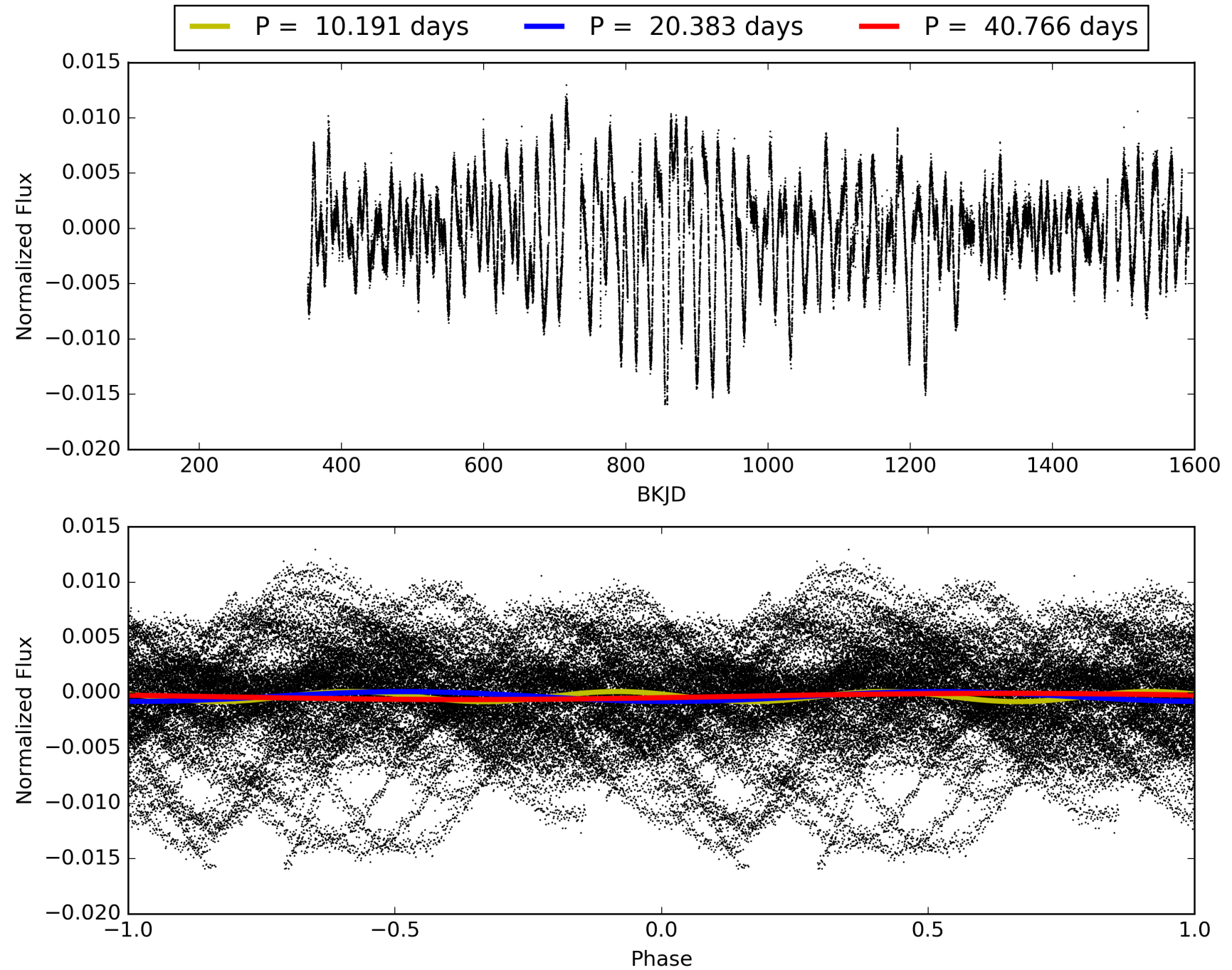
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center



# TCE 006688398-03, PDC Light Curves

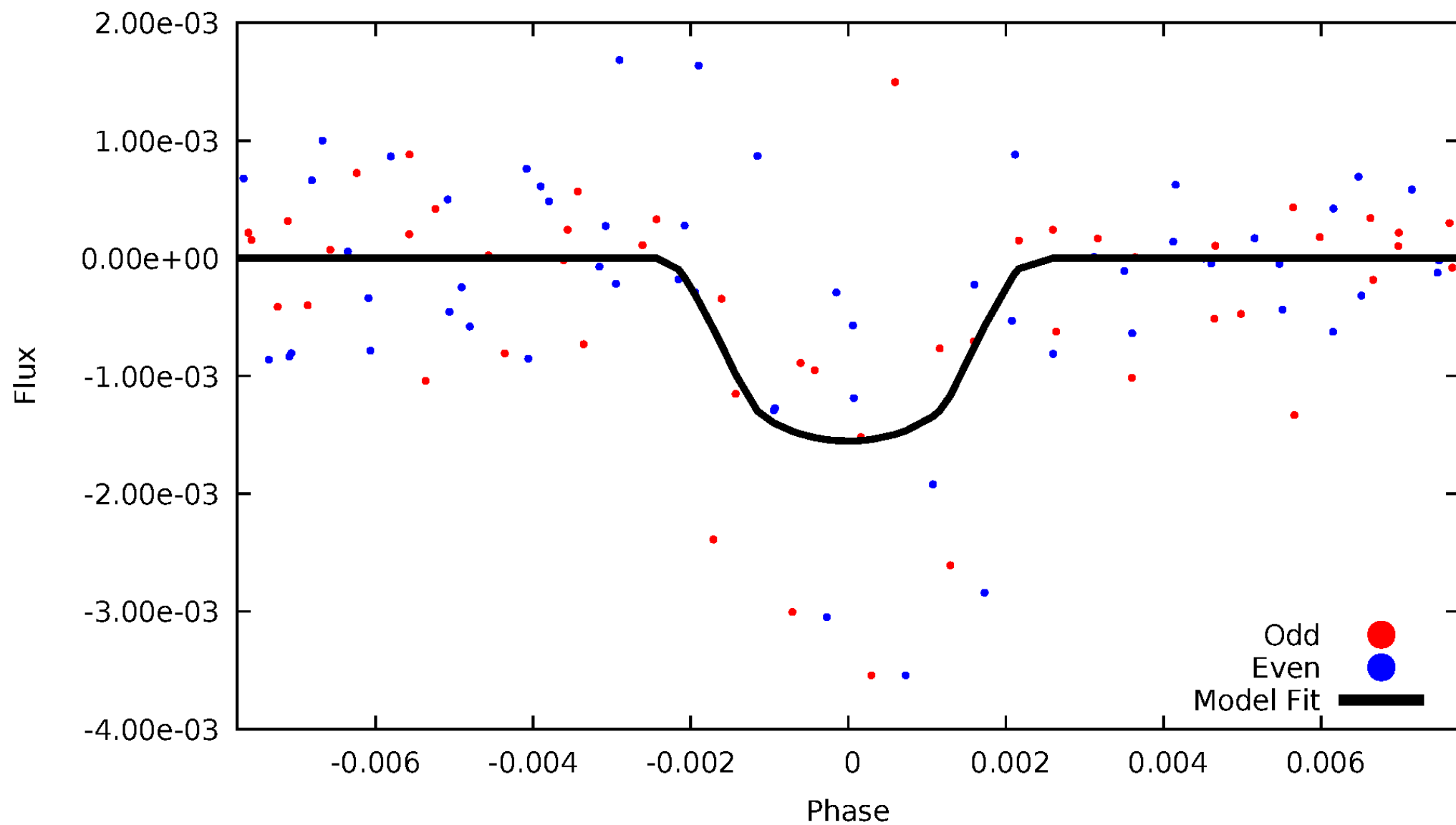


# TCE 006688398-03



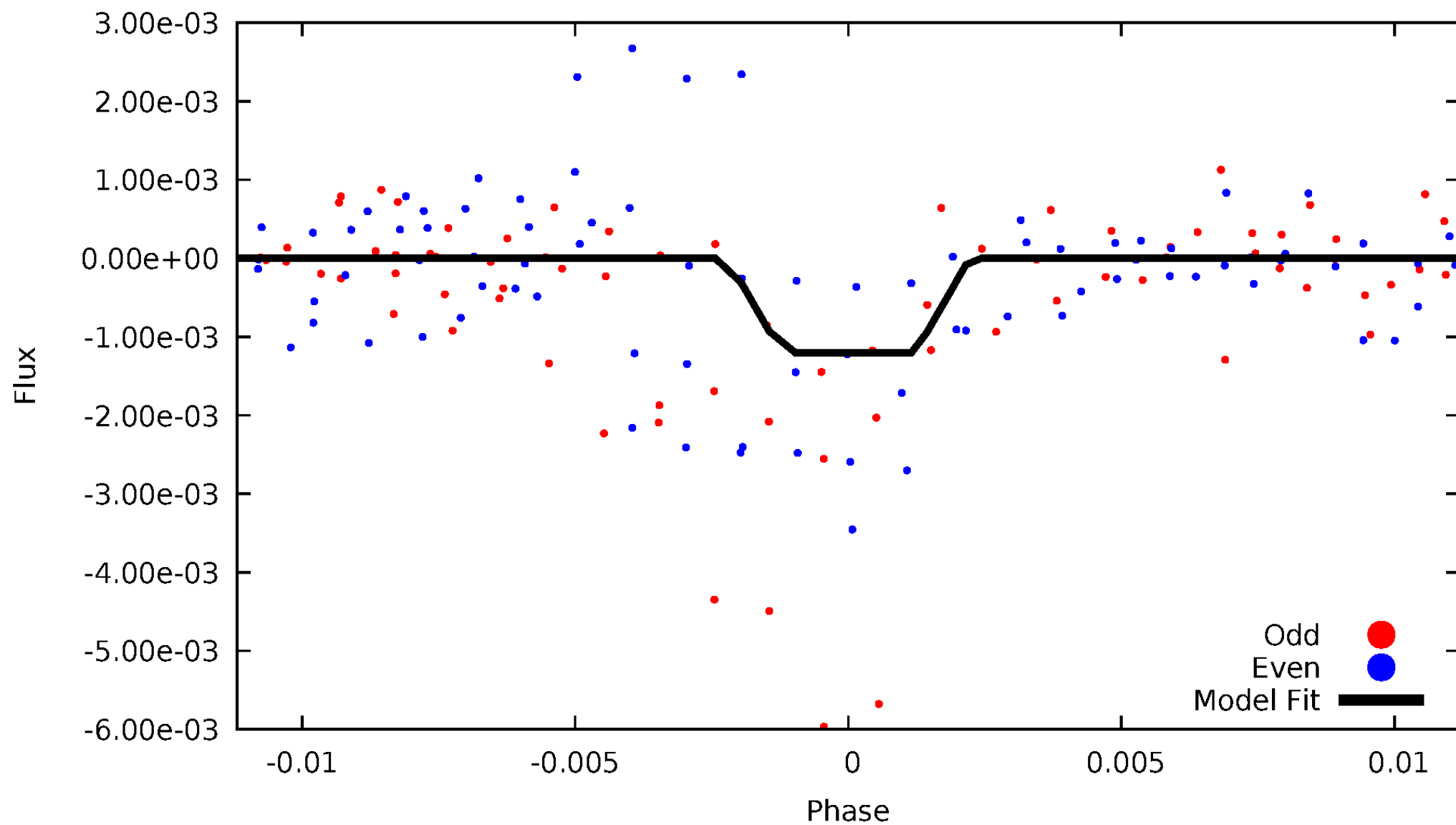
DV Odd/Even

TCE 006688398-03



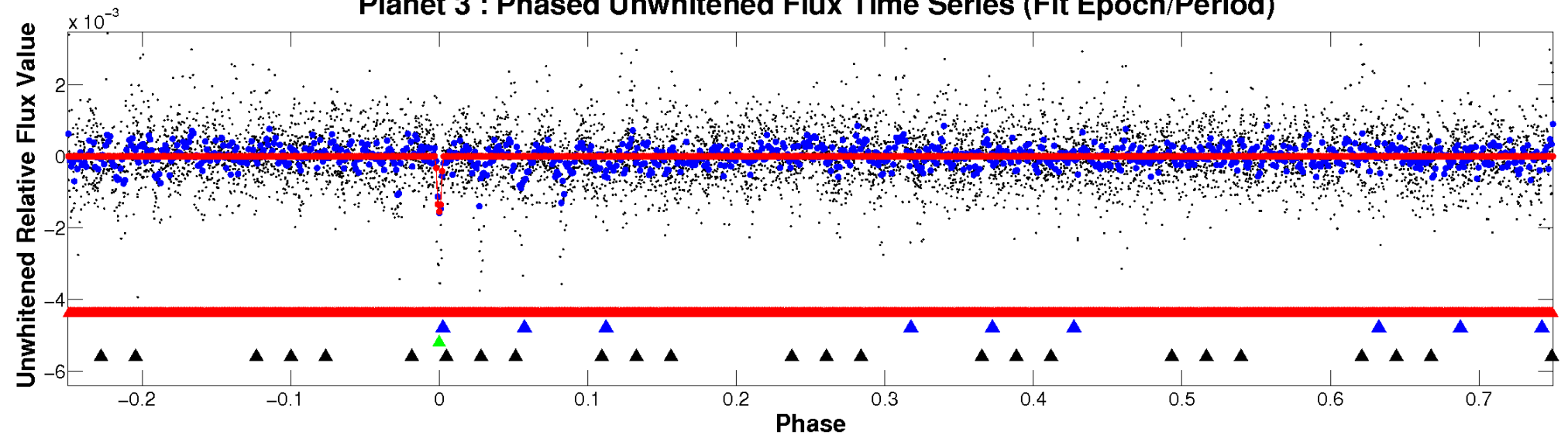
# ALT Odd/Even

TCE 006688398-03

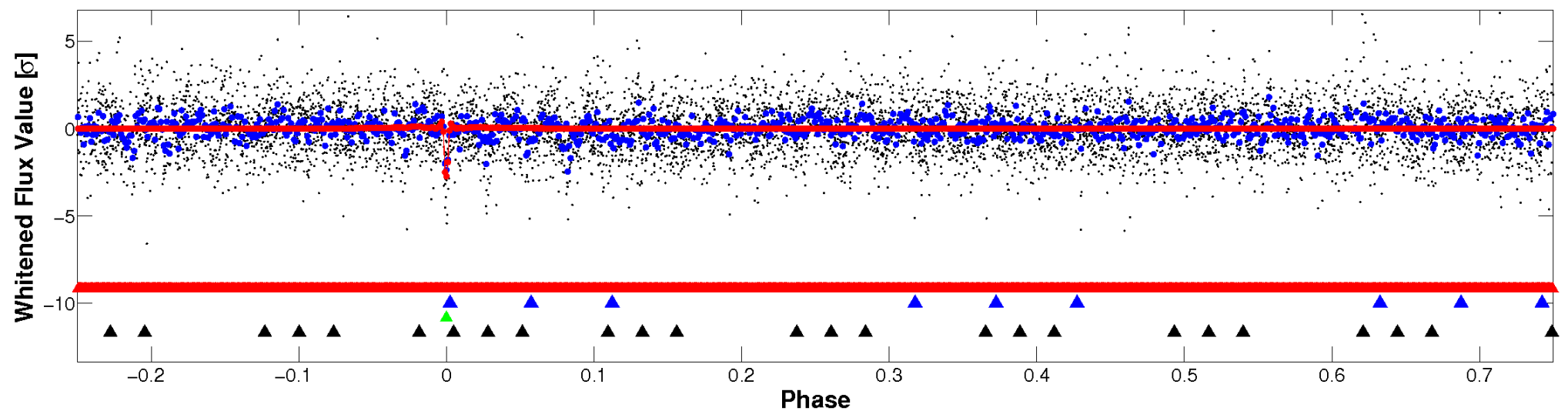


# Non-Whitened Vs. Whitened Light Curve

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

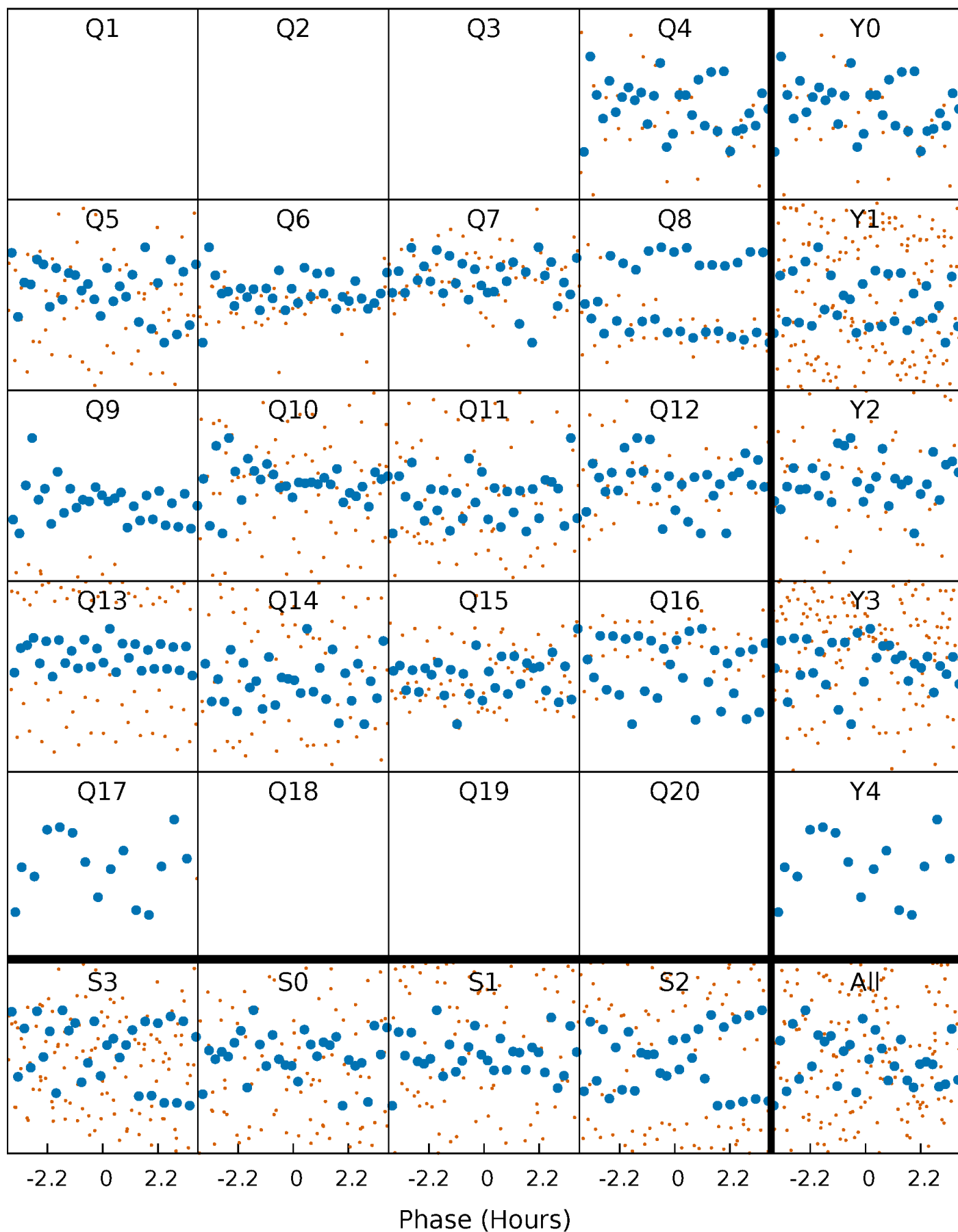


Planet 3 : Phased Whitened Flux Time Series (Fit Epoch/Period)



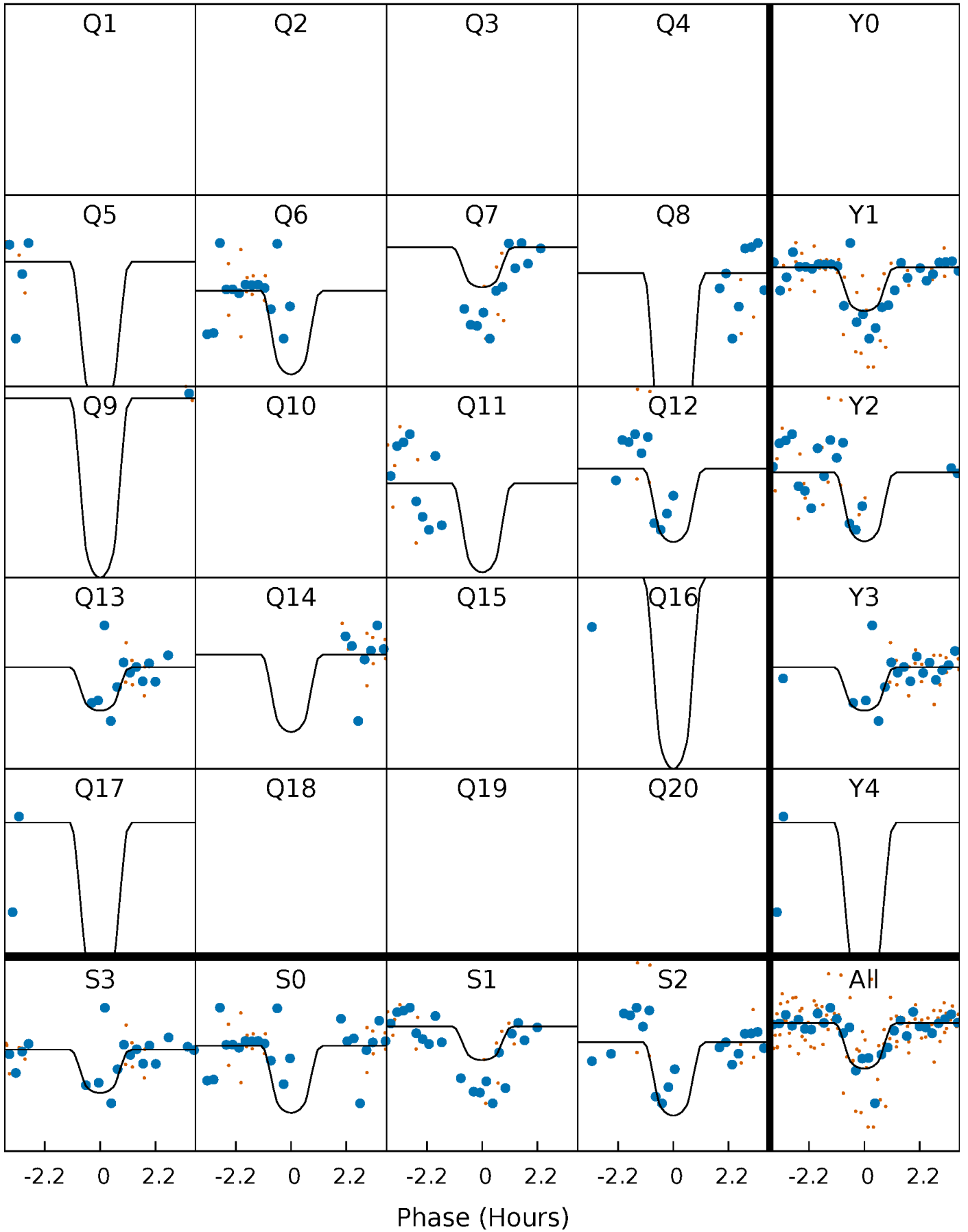
# PDC Quarter-Phased Transit Curves

TCE 006688398-03 P= 20.382964 Days  $T_0=138.330865$  (BKJD)



# DV Quarter-Phased Transit Curves

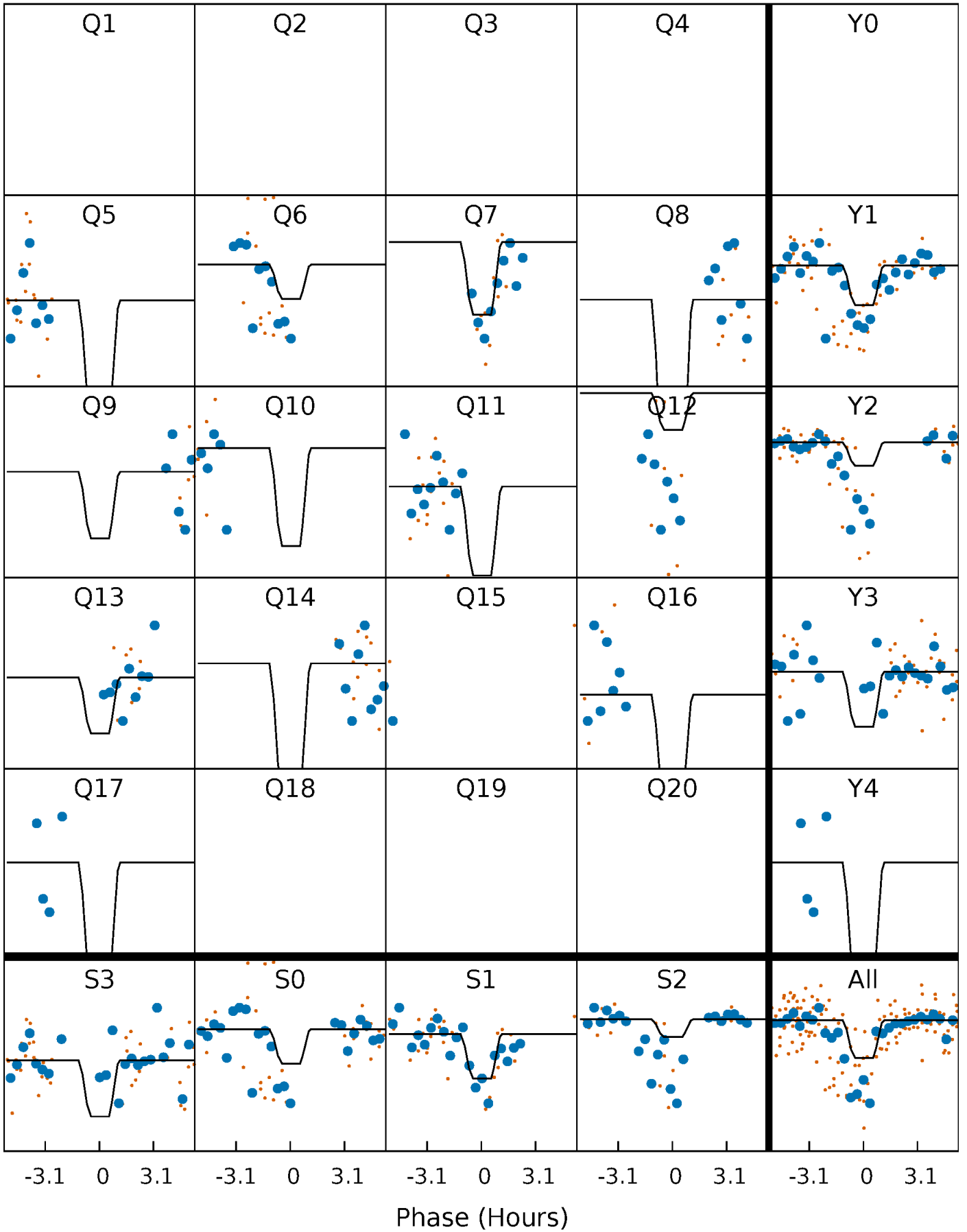
TCE 006688398-03   P= 20.382964 Days    $T_0=138.330865$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

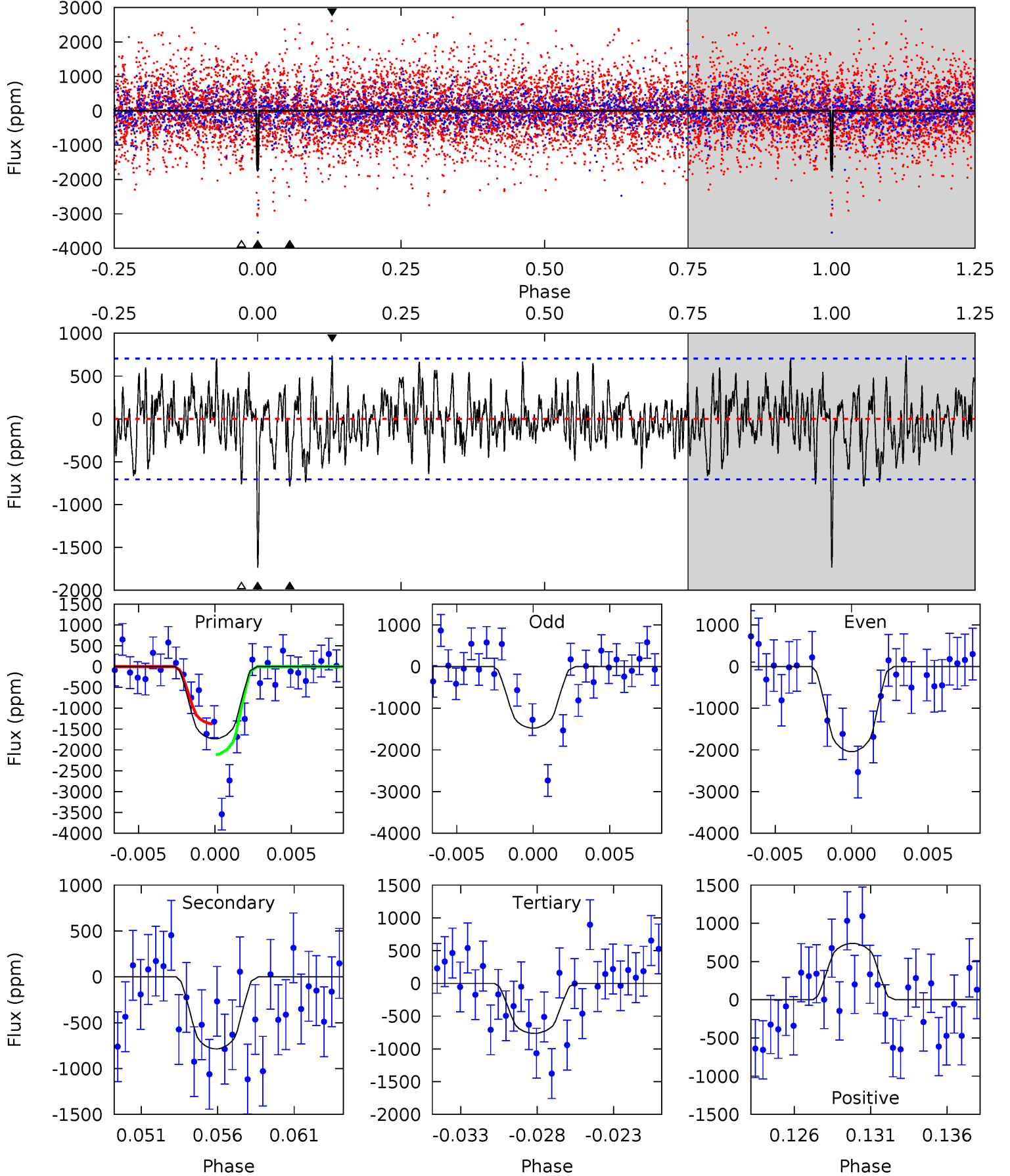
TCE 006688398-03   P= 20.382314 Days    $T_0=138.342674$  (BKJD)



# DV Model-Shift Uniqueness Test

006688398-03, P = 20.382964 Days, E = 138.330865 Days

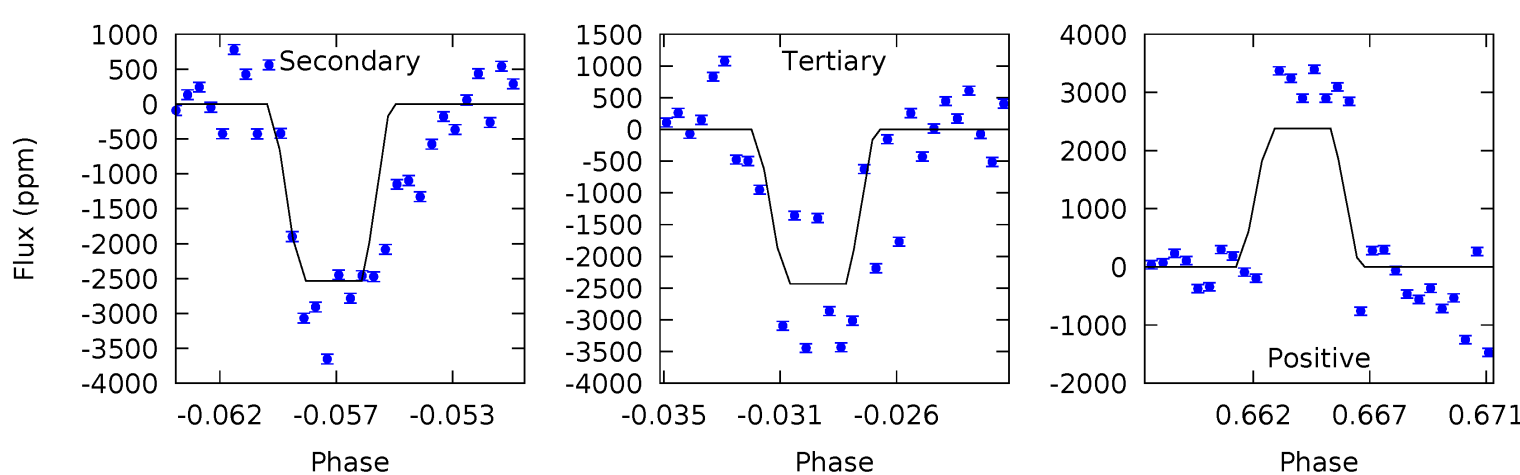
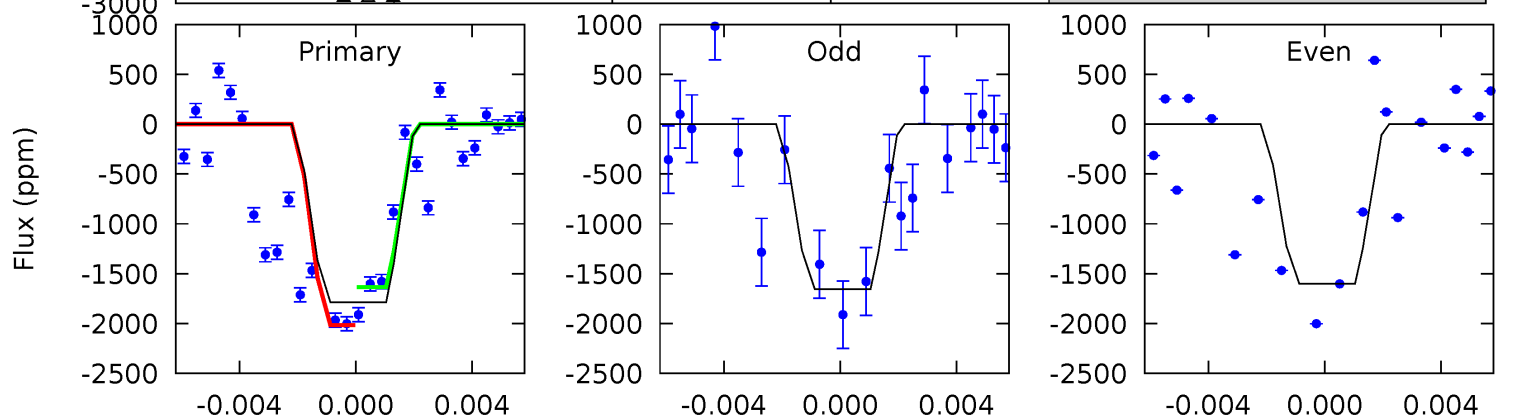
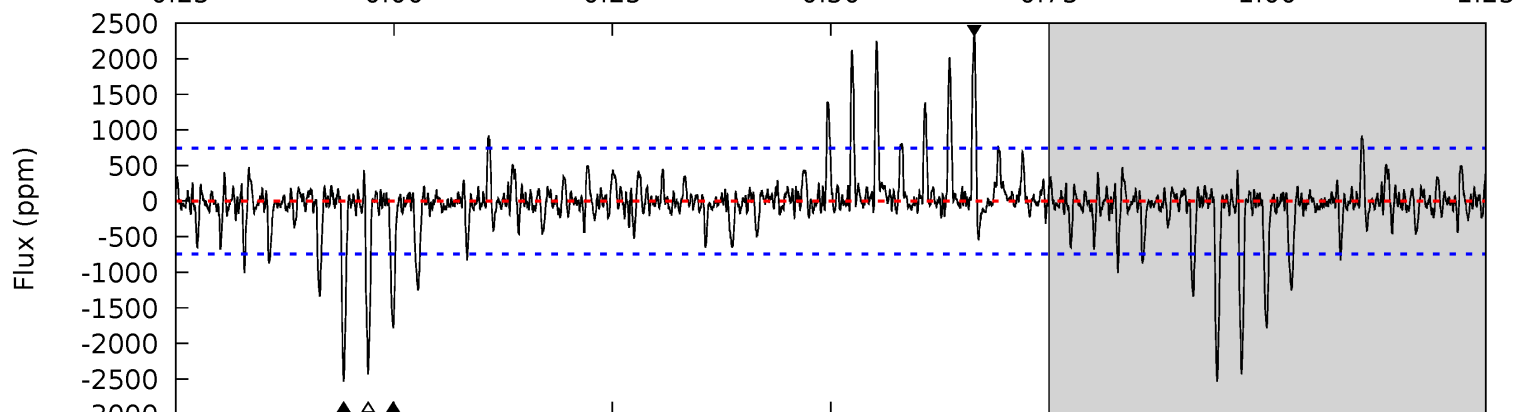
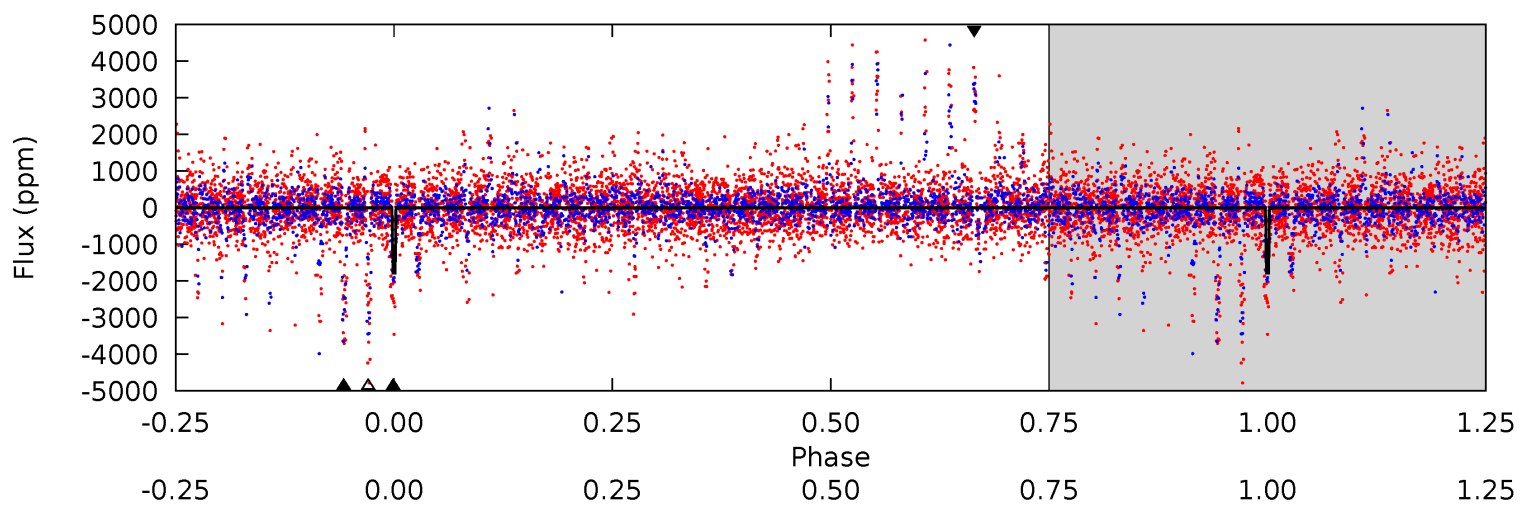
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
12.7	5.76	5.60	5.41	5.17	2.83	1.74	7.12	7.31	0.17	0.35	2.06	1.09	0.30	2.71



# Alt Model-Shift Uniqueness Test

006688398-03, P = 20.382314 Days, E = 138.342674 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
12.5	17.7	17.0	16.6	5.18	2.85	2.17	-4.52	-4.14	0.69	1.07	0.18	1.27	0.48	1.28



### Stellar Parameters For KIC 006688398

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$4885^{+175}_{-175}$	$4.541^{+0.072}_{-0.044}$	$-0.020^{+0.300}_{-0.300}$	$0.763^{+0.062}_{-0.080}$	$0.738^{+0.083}_{-0.060}$	$2.337^{+0.705}_{-0.377}$
	+4%/-4%	+2%/-1%	+1500%/-1500%	+8%/-10%	+11%/-8%	+30%/-16%
Source	KIC0	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 006688398-03 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-786 \pm 136$	$5.12^{+3.87}_{-3.27}$	$721^{+31}_{-33}$	$3643^{+1823}_{-588}$	$279^{+1875}_{-189}$
Alt.	$-2534 \pm 143$	$4.35^{+3.90}_{-2.65}$	$723^{+28}_{-31}$	$4787^{+2754}_{-1035}$	$1291^{+7355}_{-949}$

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

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

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

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

## DV Centroid Data

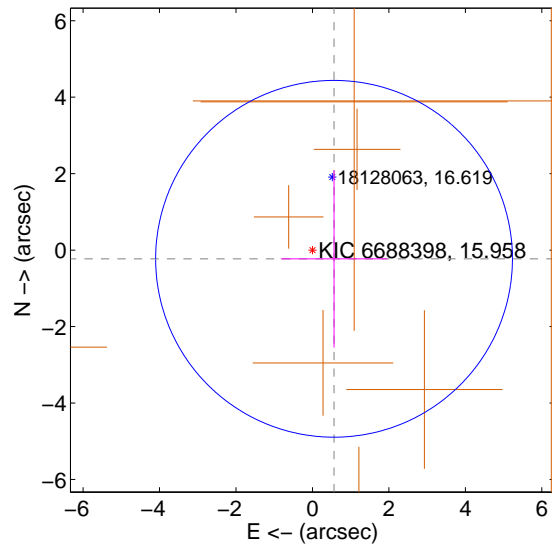
Supplemental centroid analysis for 006688398-03. Kepler magnitude: 15.96. Transit SNR 9.34

There are 0 quarters with good PRF difference image offsets

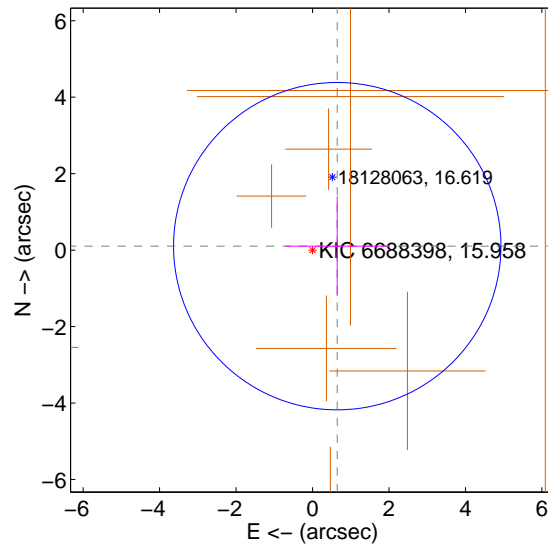
The direct PRF centroid is offset from the target star catalog position by about 0.66 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.609 \pm 1.556$	0.39	$-0.565 \pm 1.391$	$-0.228 \pm 2.323$
PRF-fit source offset from KIC position	$0.655 \pm 1.427$	0.46	$-0.647 \pm 1.358$	$0.103 \pm 1.304$
photometric centroid source offset	$1.98 \pm 0.37$	5.27	$1.97 \pm 0.37$	$-0.09 \pm 0.25$

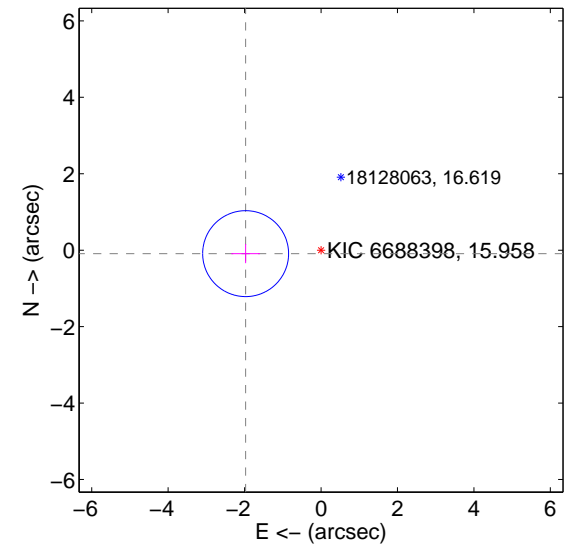
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

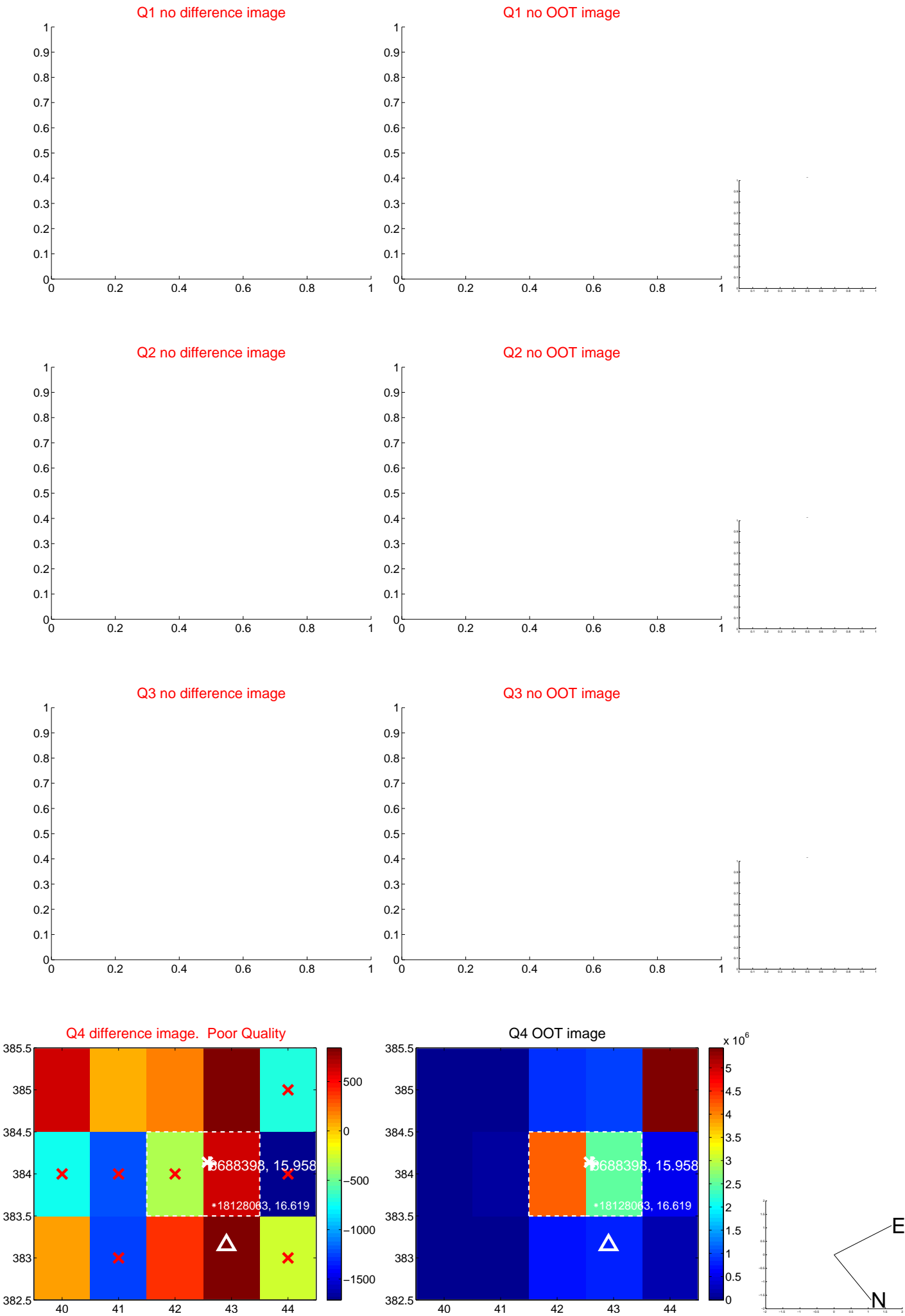


offset from photometric centroids

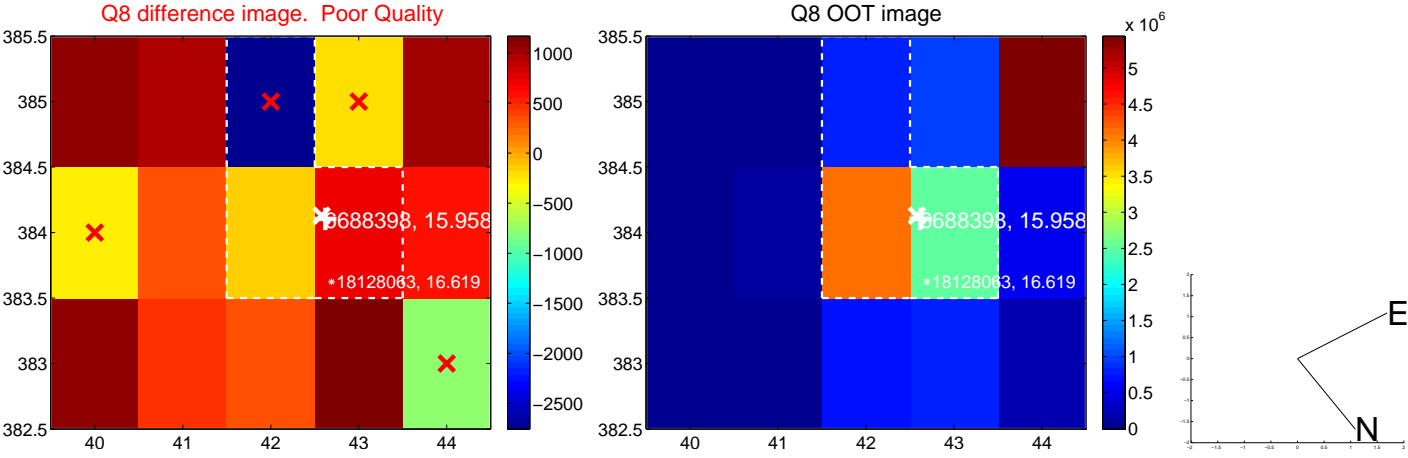
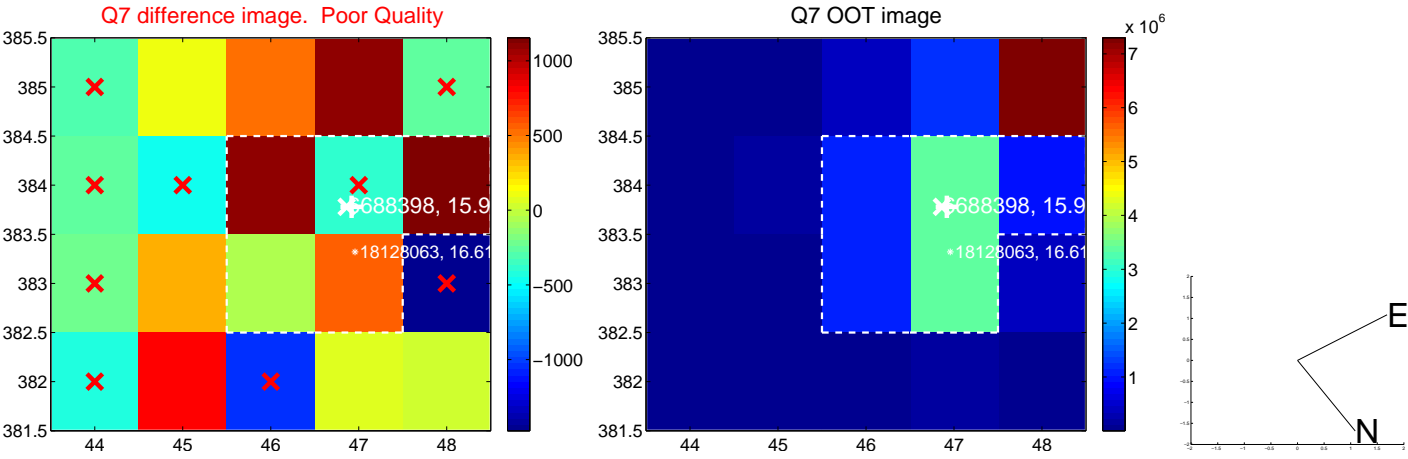
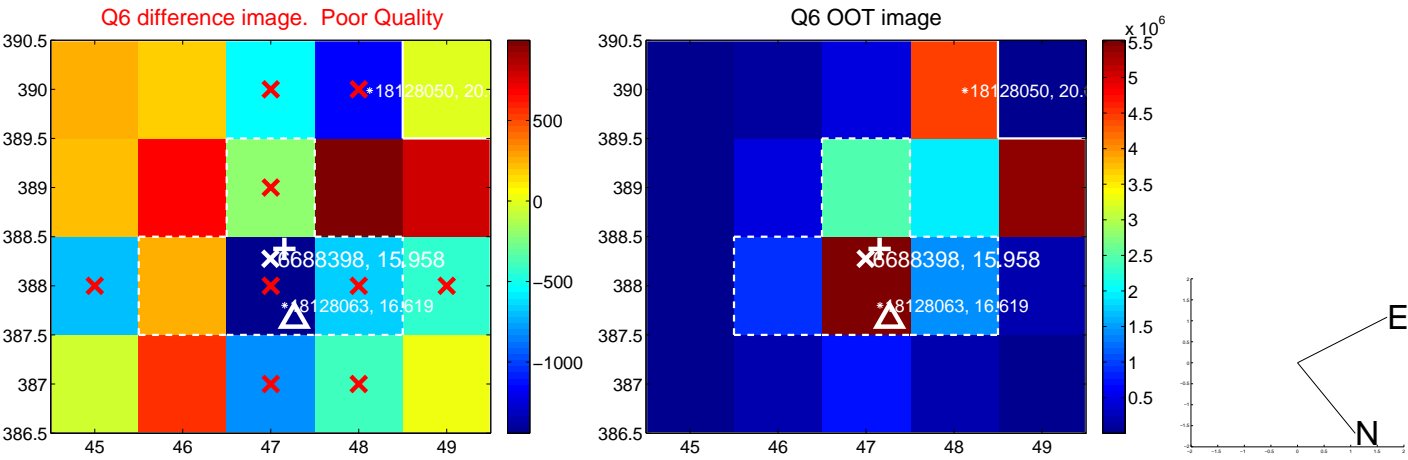
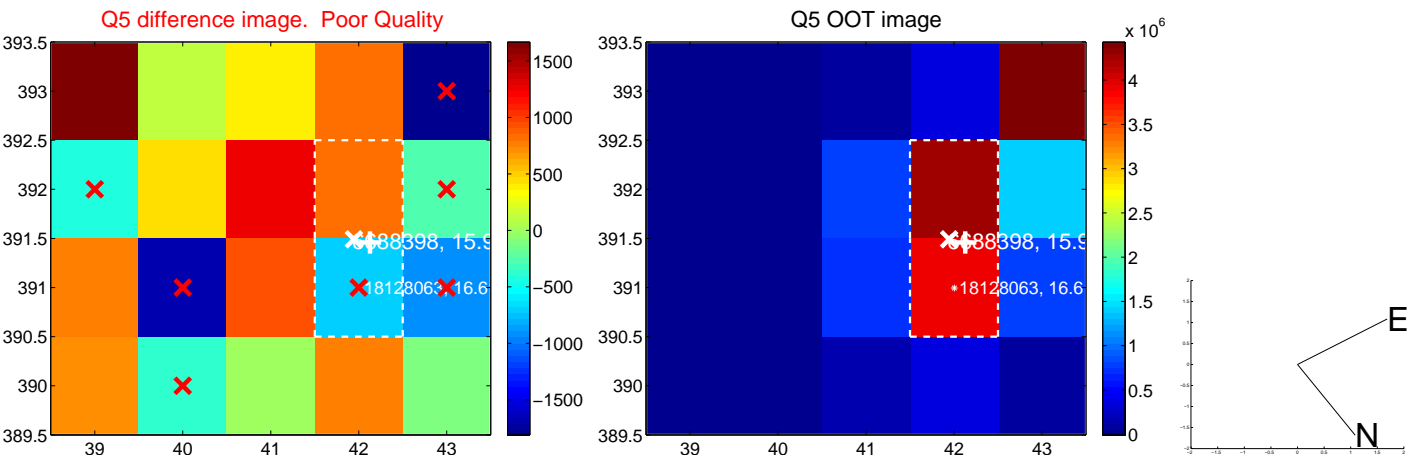


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three- $\sigma$ . 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 ×: KIC target position; +: OOT centroid; △: difference centroid. red ✕: large negative pixel value.

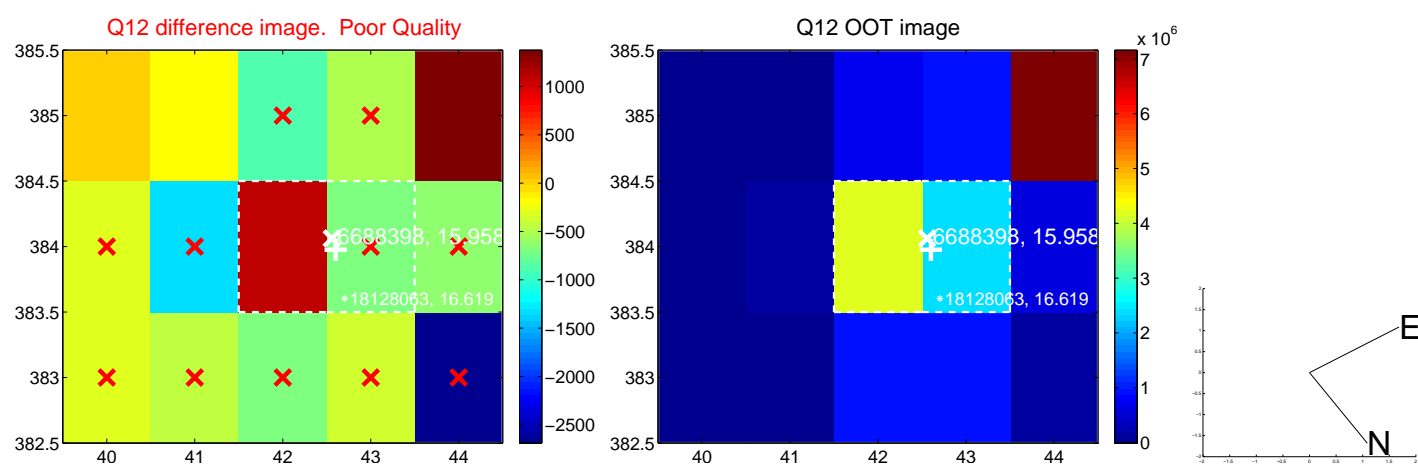
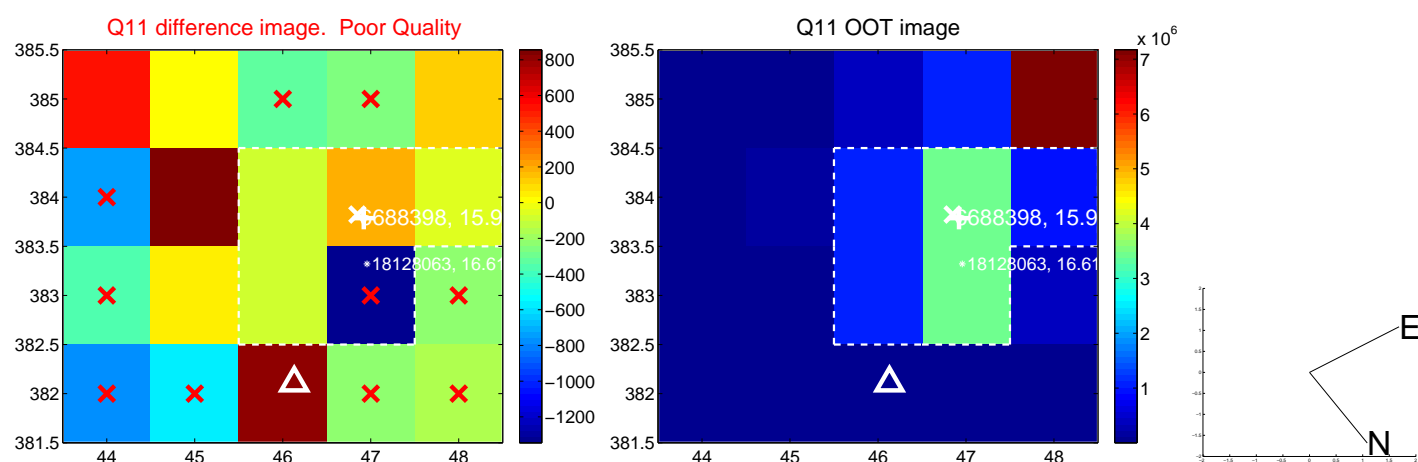
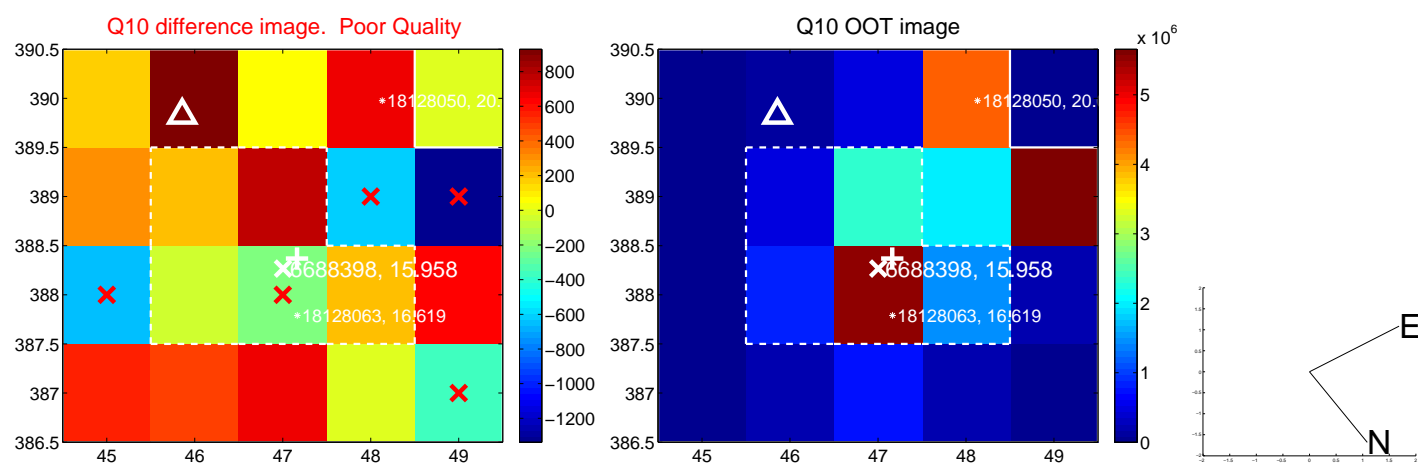
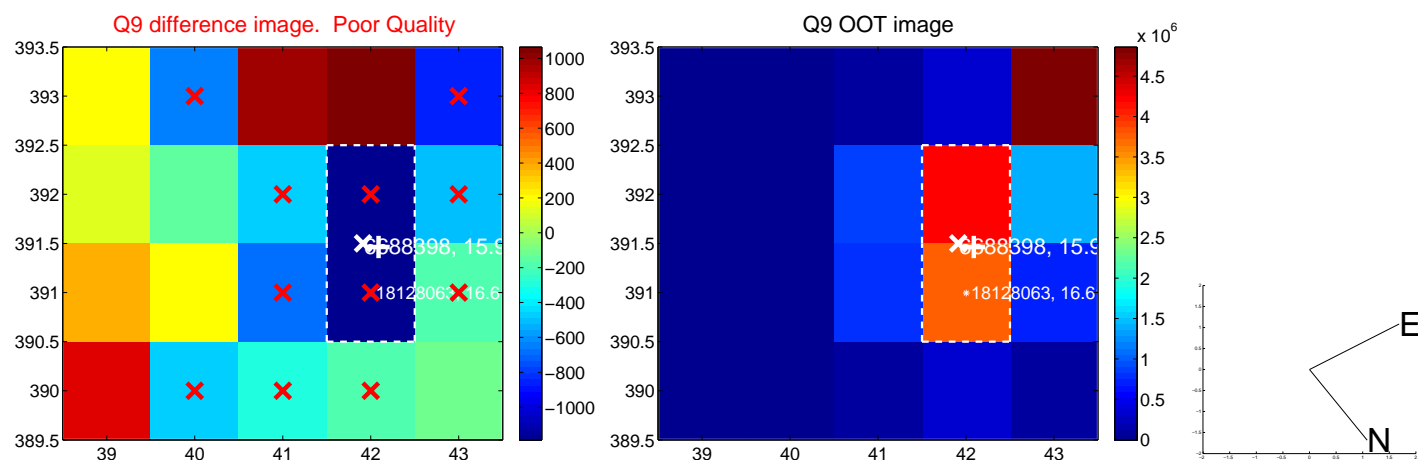


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



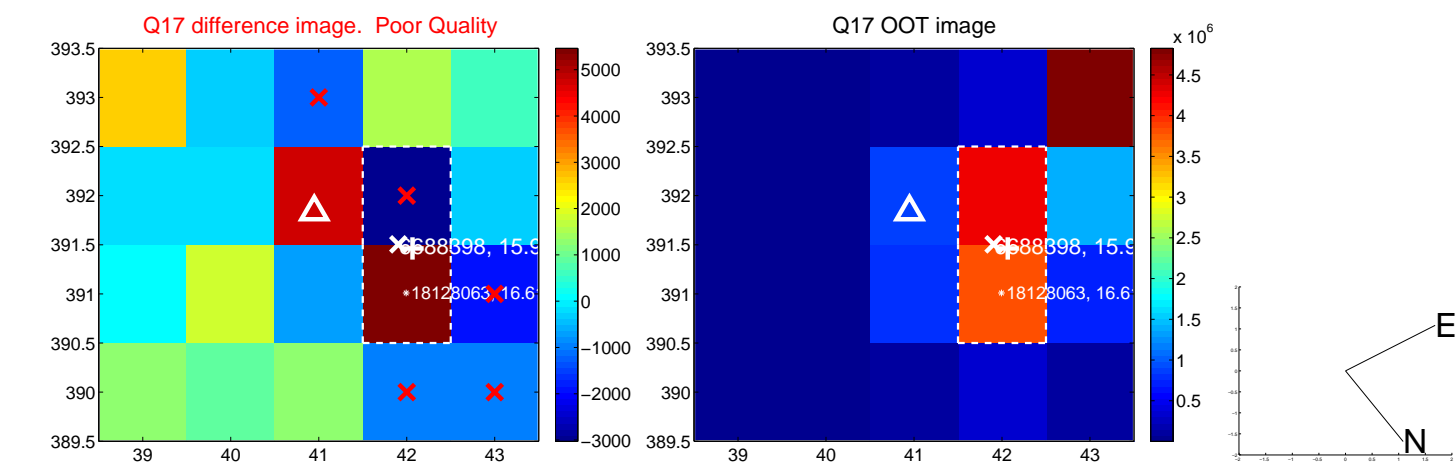


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

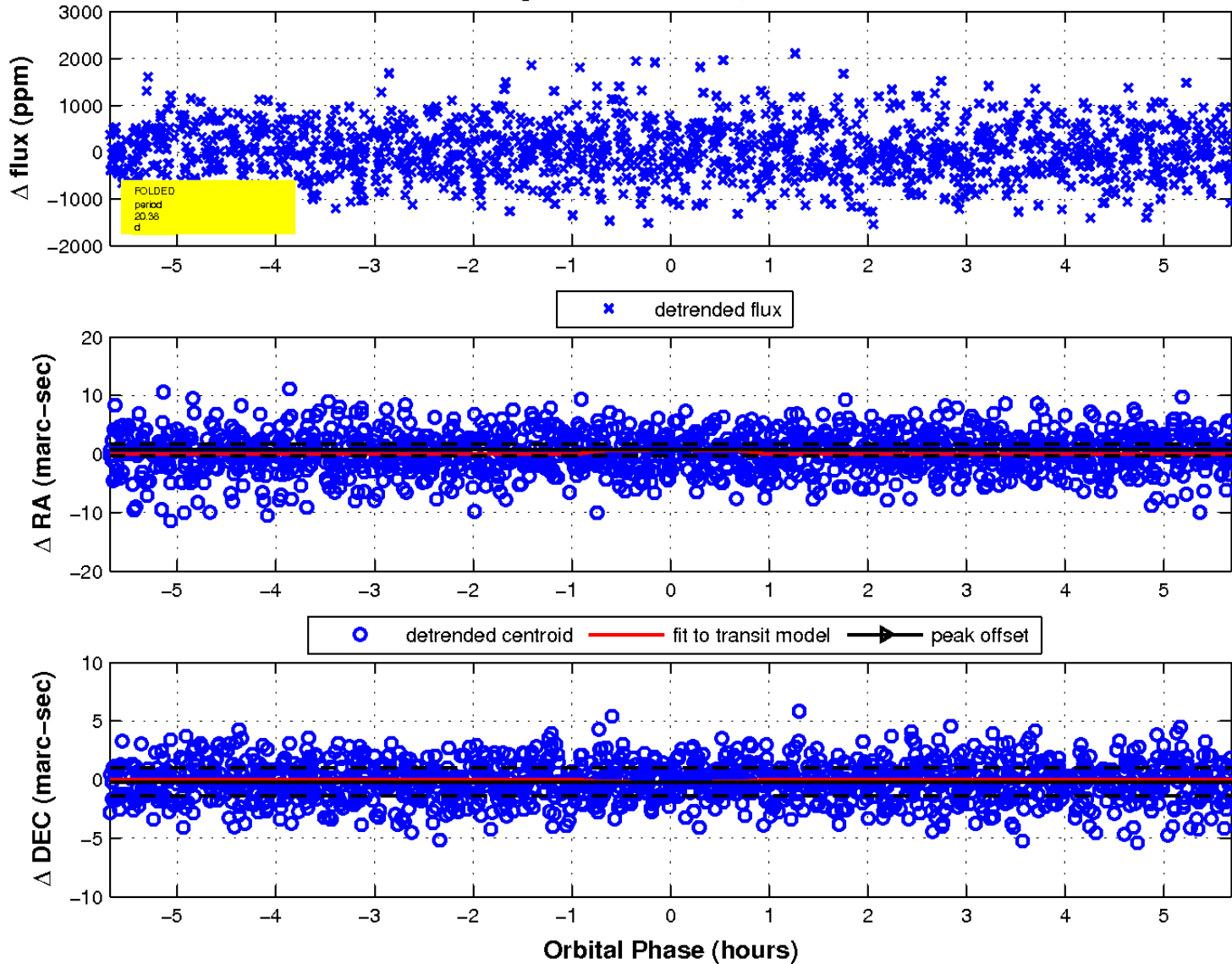




white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

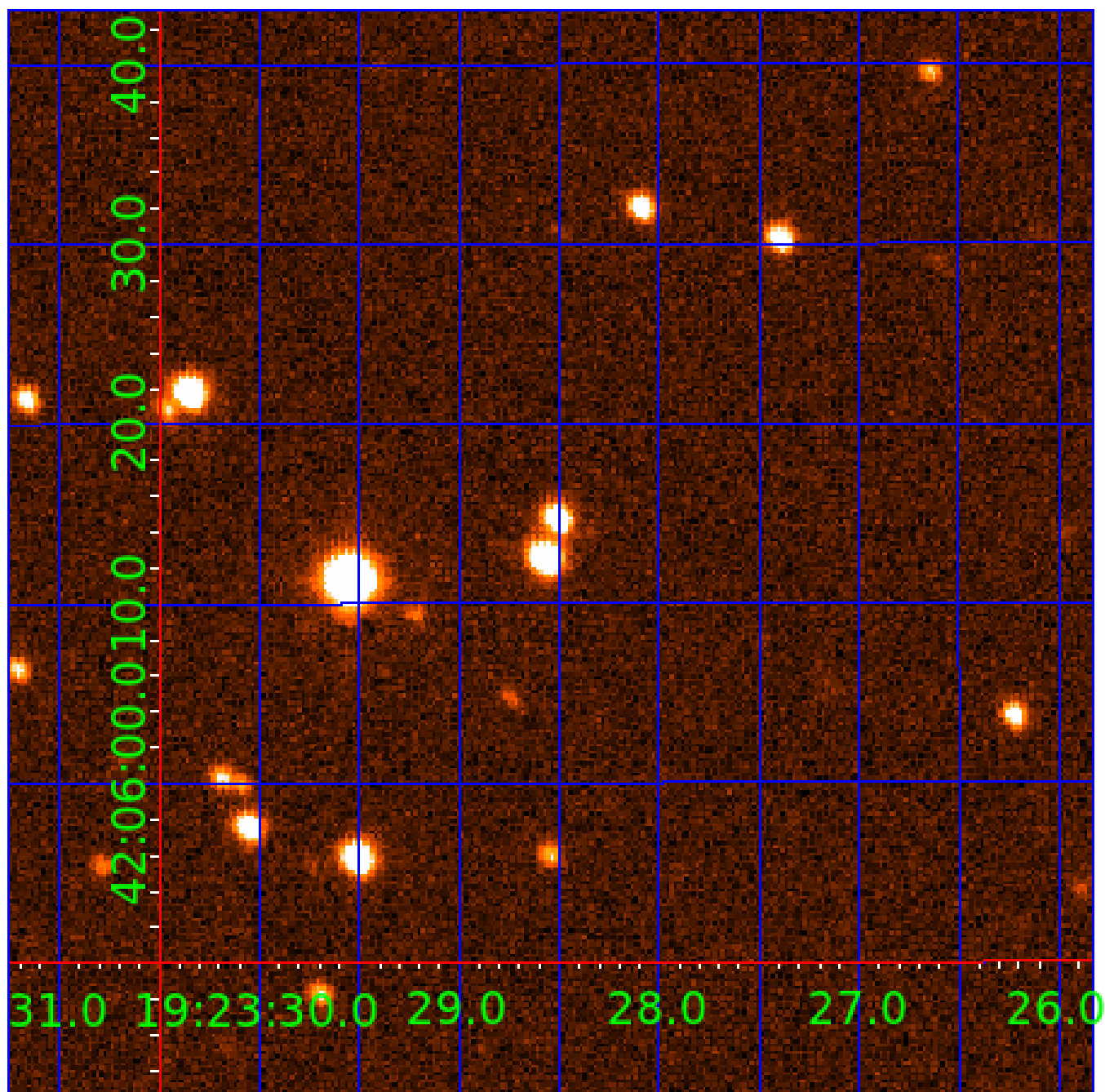


fluxWeightedCentroids, Planet 3 of 4



UKIRT Image

Declination



# KIC 006688398

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
006688398-01	OBS	No	0.566802	131.826468	70.2	3.752	8.0	10.5	0.76	4885	0.70	2023.61
006688398-02	OBS	No	169.485065	161.003629	1440.3	3.224	9.9	8.0	0.76	4885	3.53	1.01
006688398-03	OBS	No	20.382964	138.330865	1552.2	1.897	12.7	9.3	0.76	4885	3.36	17.05
006688398-04	OBS	No	58.541662	180.146213	1785.2	1.617	8.6	7.4	0.76	4885	3.53	4.18

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
006688398-01	OBS	FP	0.00	1	0	1	0	LPP_DV—CENT_FEW_DIFFS—HALO_GHOST
006688398-02	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS—HALO_GHOST
006688398-03	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_FEW_DIFFS—HALO_GHOST
006688398-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_FEW_DIFFS

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

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

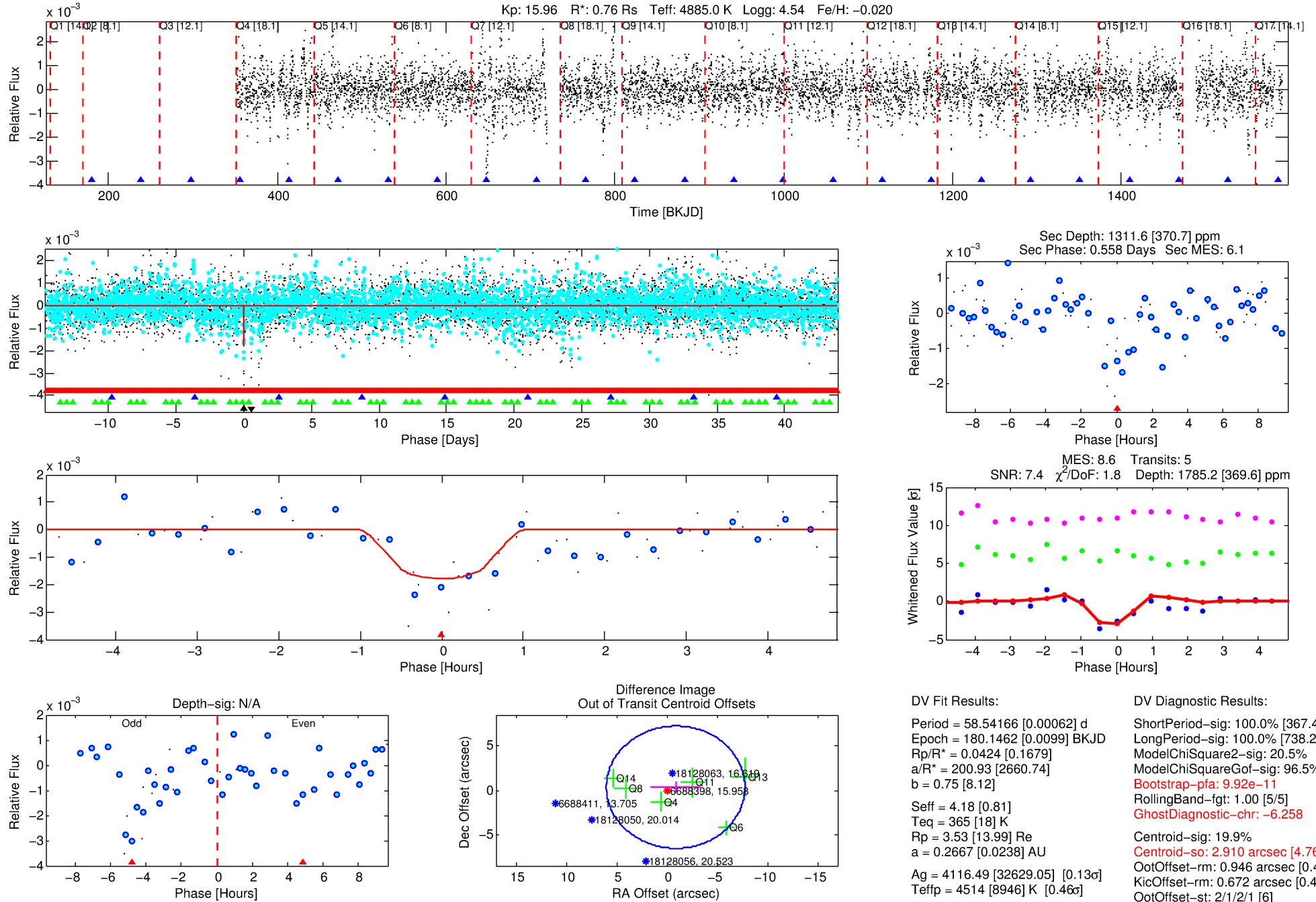
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 006688398-04

No Significant Match Found

# DV One-Page Summary

KIC: 6688398 Candidate: 4 of 4 Period: 58.542 d



## DV Fit Results:

Period = 58.54166 [0.00062] d  
Epoch = 180.1462 [0.0099] BKJD  
Rp/R\* = 0.0424 [0.1679]  
a/R\* = 200.93 [2660.74]  
b = 0.75 [8.12]  
Seff = 4.18 [0.81]  
Teq = 365 [18] K  
Rp = 3.53 [13.99] Re  
a = 0.2667 [0.0238] AU  
Ag = 4116.49 [32629.05] [0.13σ]  
Teffp = 4514 [8946] K [0.46σ]

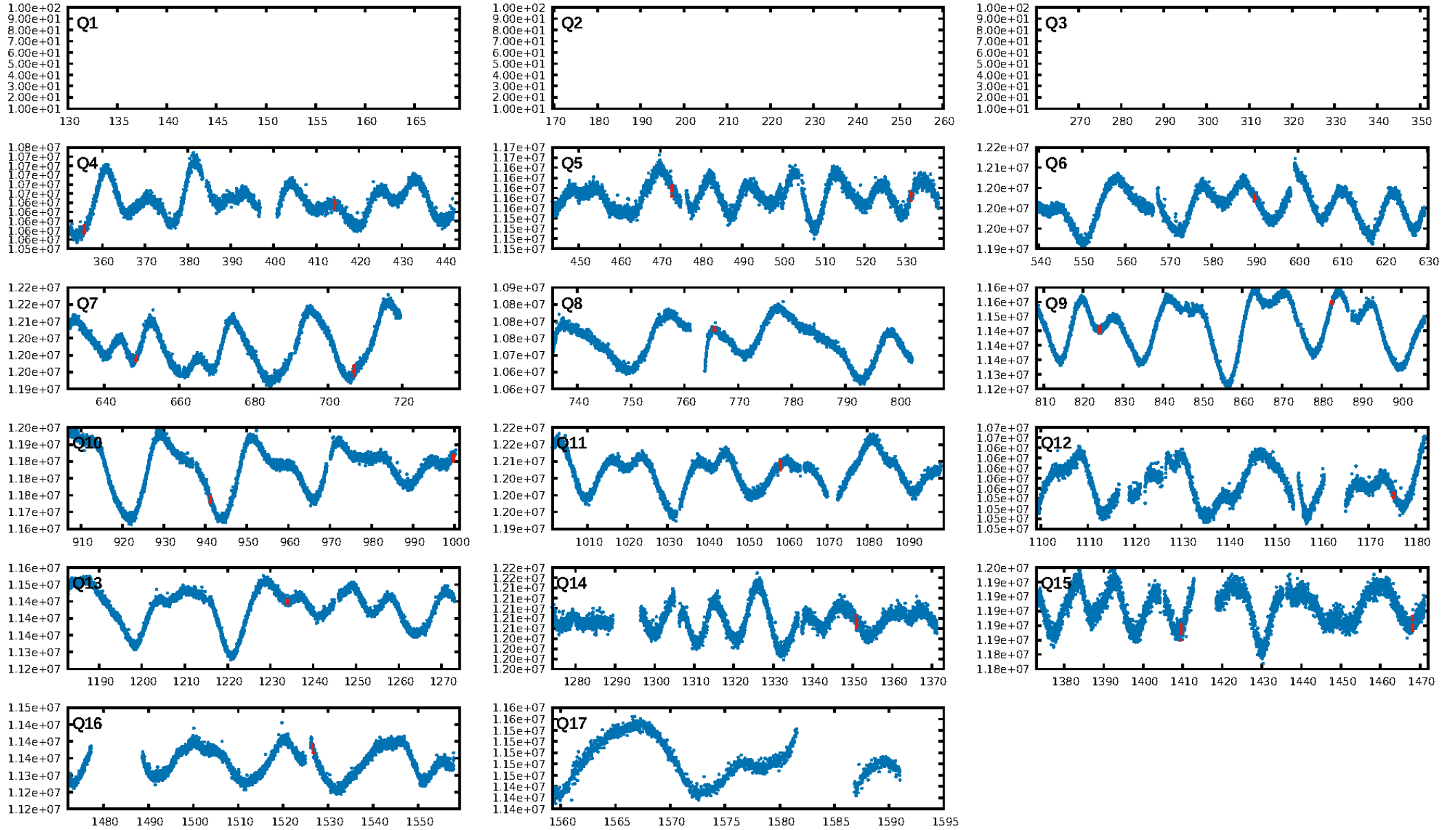
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [367.42σ]  
LongPeriod-sig: 100.0% [738.27σ]  
ModelChiSquare2-sig: 20.5%  
ModelChiSquareGof-sig: 96.5%  
**Bootstrap-pfa: 9.92e-11**  
RollingBand-fgt: 1.00 [5/5]  
**GhostDiagnostic-chr: -6.258**  
Centroid-sig: 19.9%  
**Centroid-so: 2.910 arcsec [4.76σ]**  
OotOffset-rm: 0.946 arcsec [0.41σ]  
KicOffset-rm: 0.672 arcsec [0.40σ]  
OotOffset-st: 2/1/2/1 [6]  
KicOffset-st: 2/1/2/1 [6]  
DiffImageQuality-fgm: 0.17 [1/6]  
DiffImageOverlap-fno: 0.00 [0/12]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 21:05:07 Z

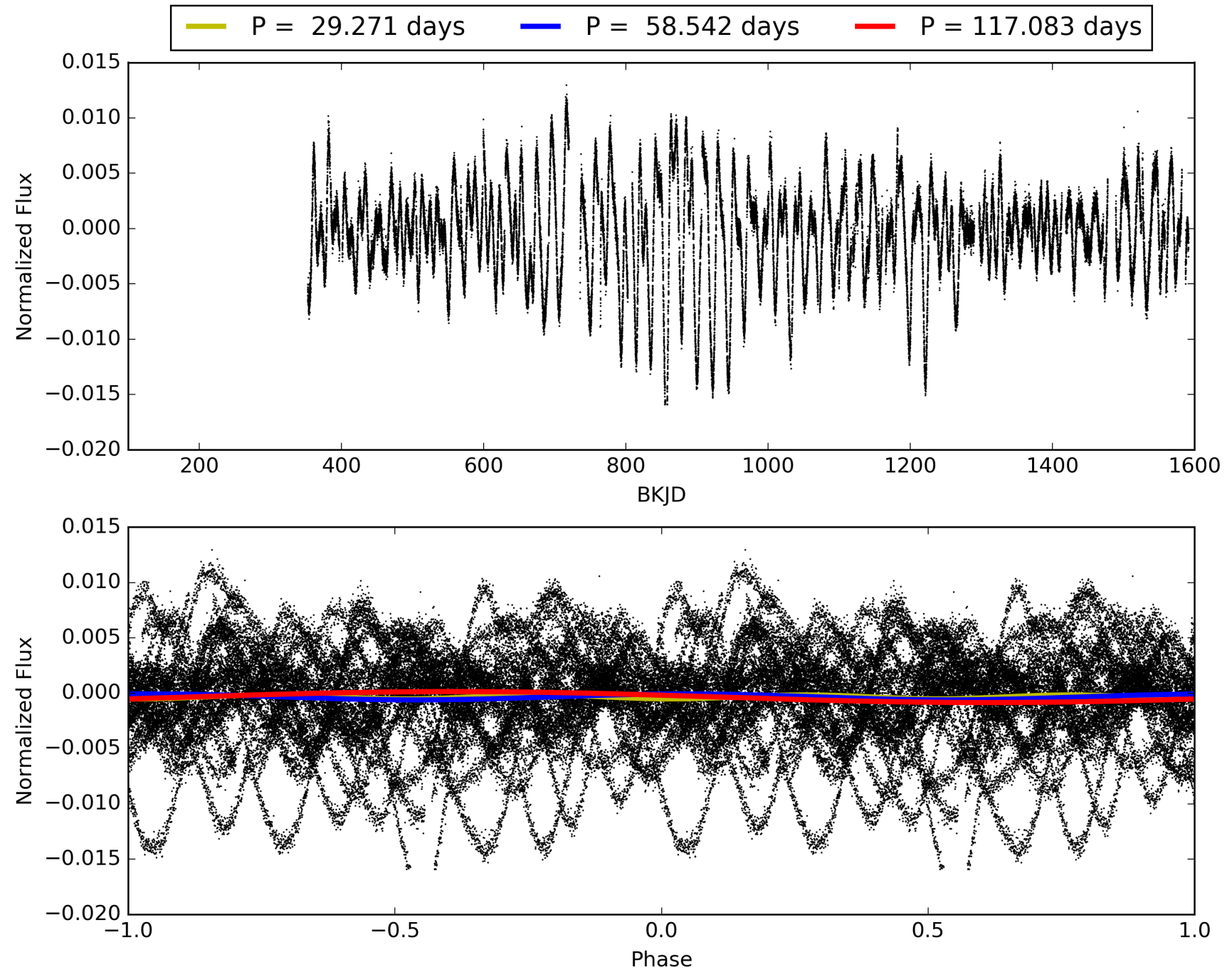
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 006688398-04, PDC Light Curves



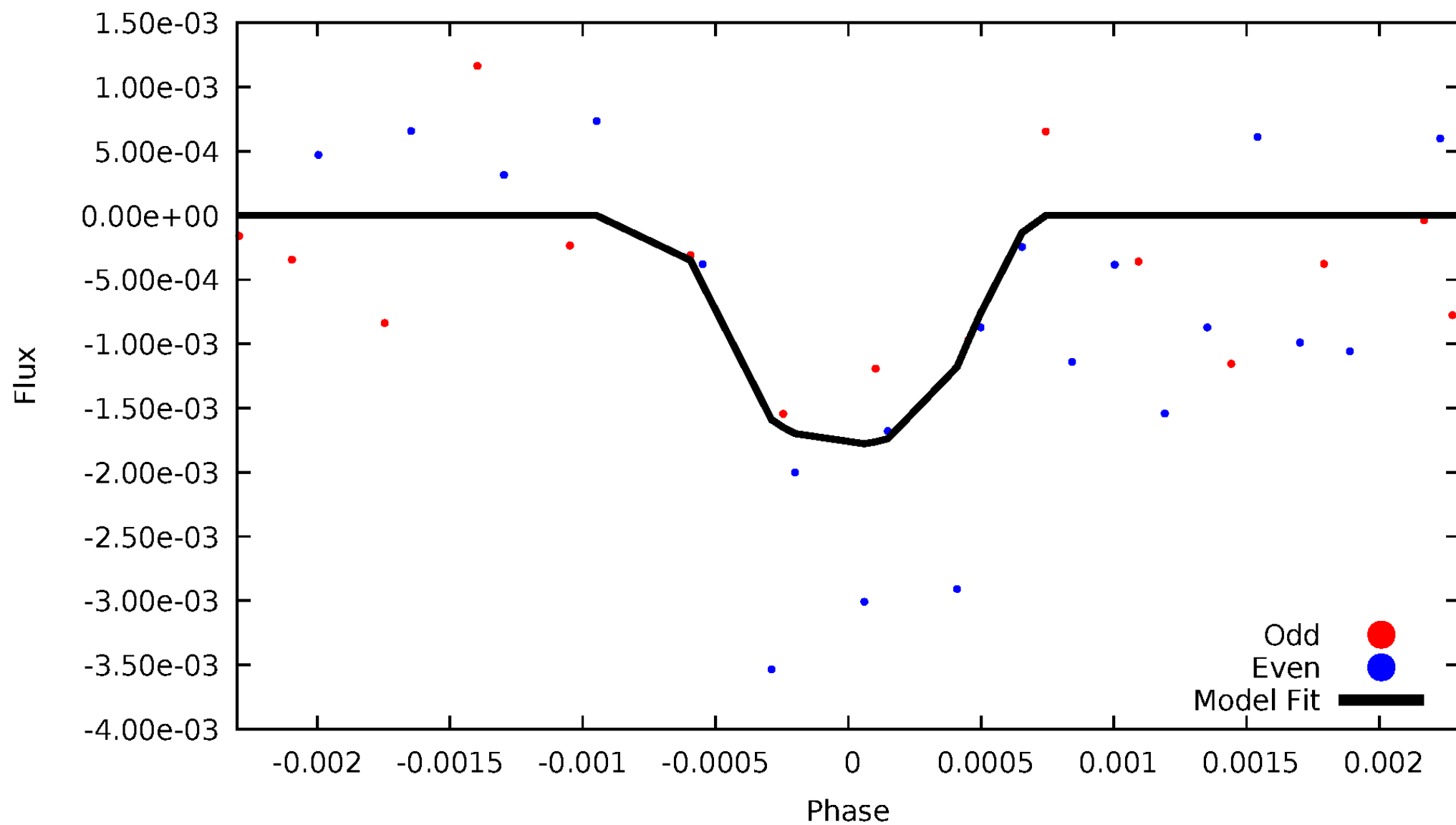


# TCE 006688398-04



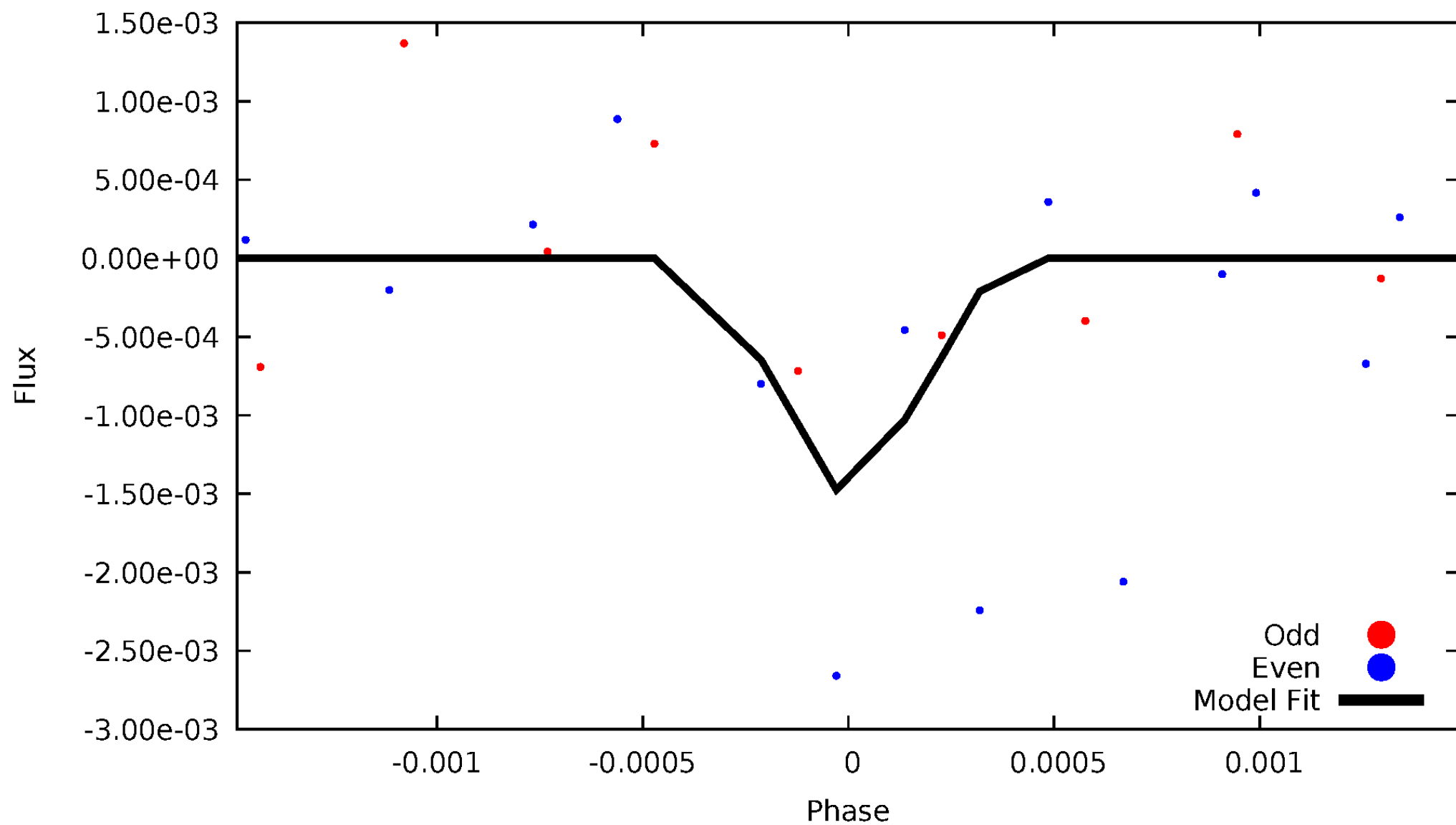
# DV Odd/Even

TCE 006688398-04



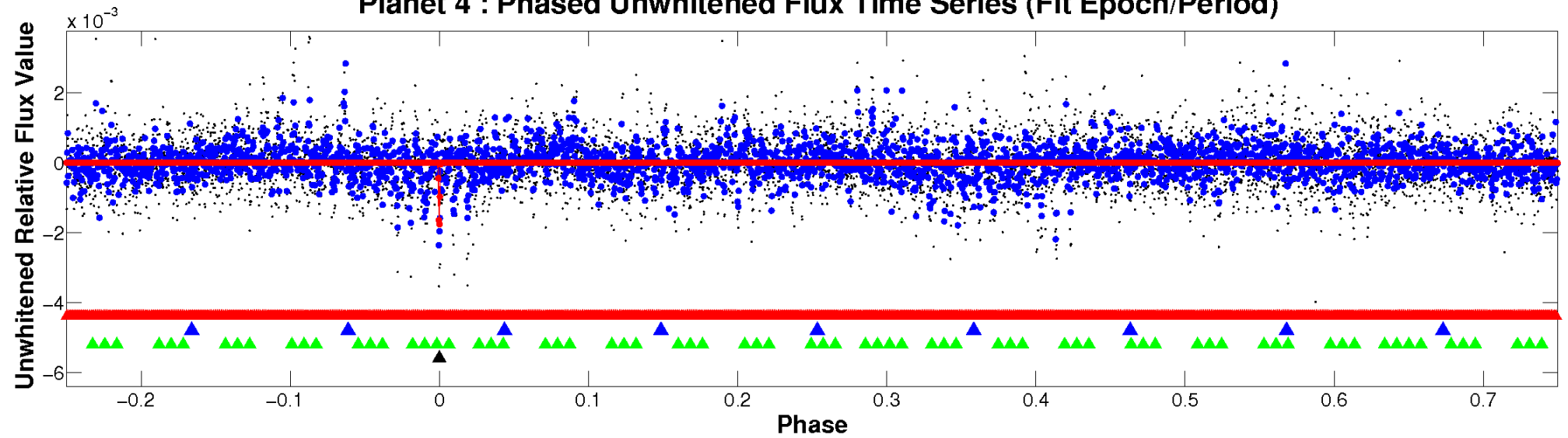
# ALT Odd/Even

TCE 006688398-04

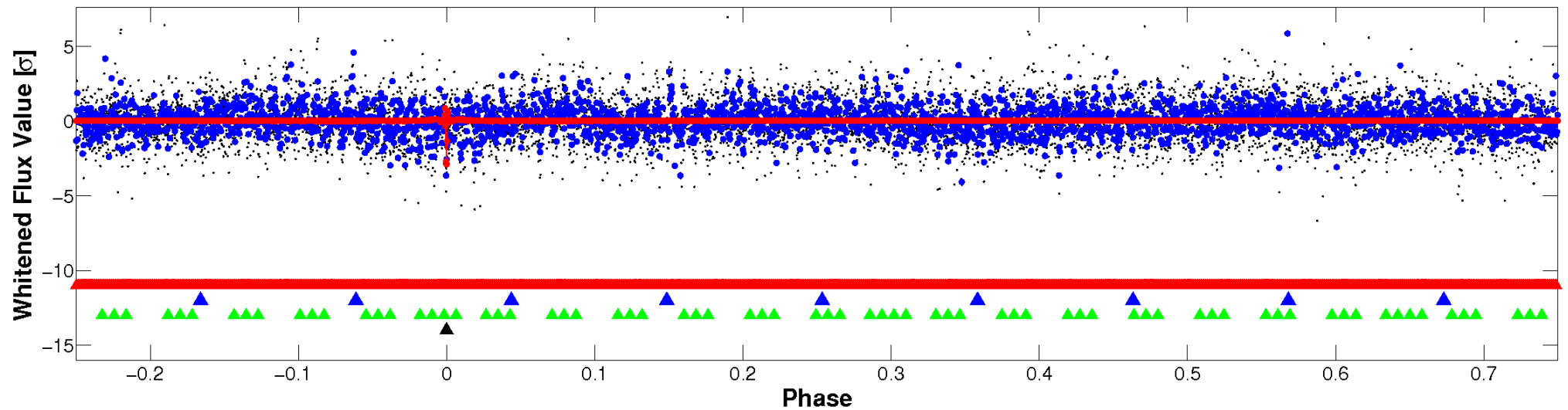


# Non-Whitened Vs. Whitened Light Curve

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

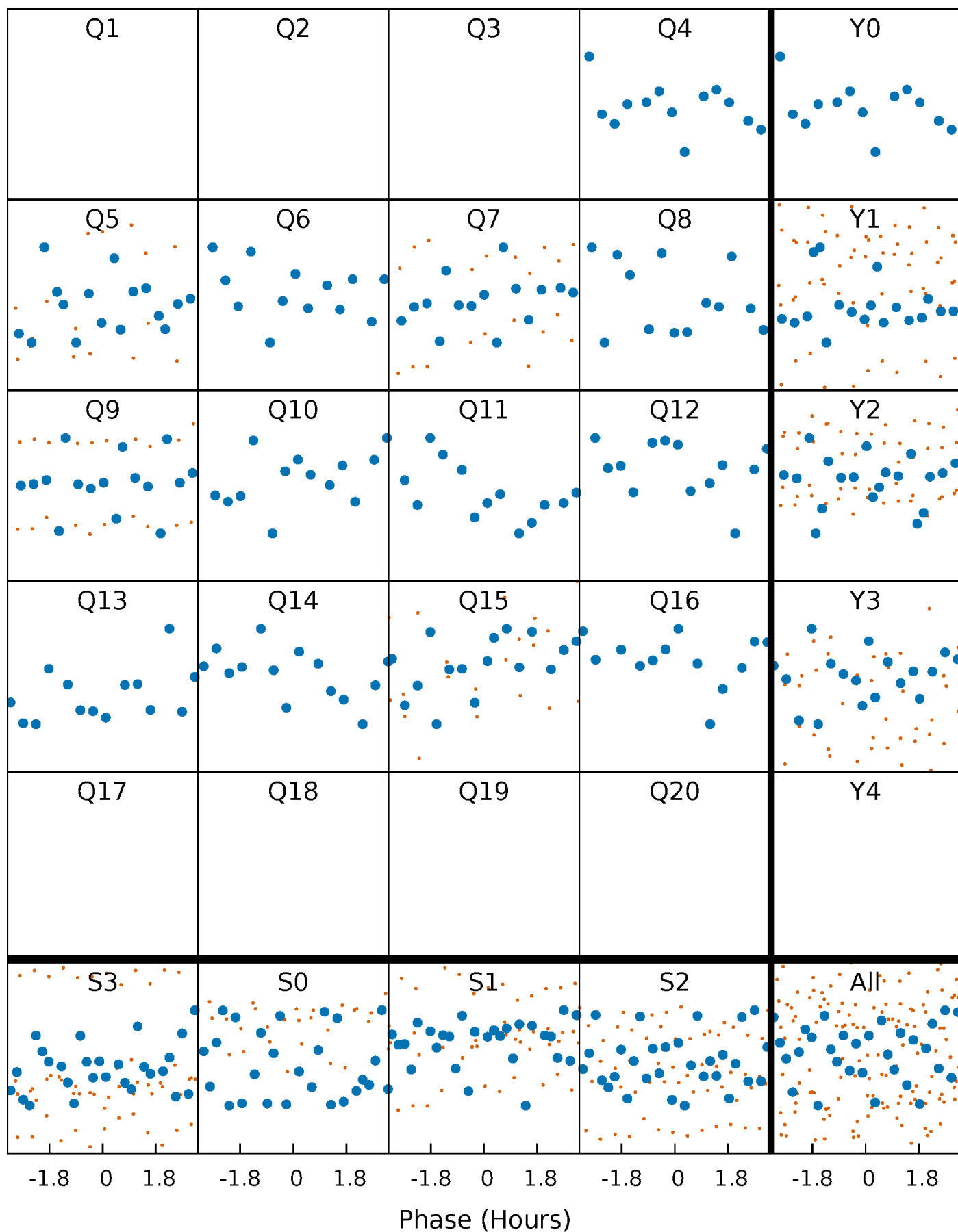


## Planet 4 : Phased Whitened Flux Time Series (Fit Epoch/Period)



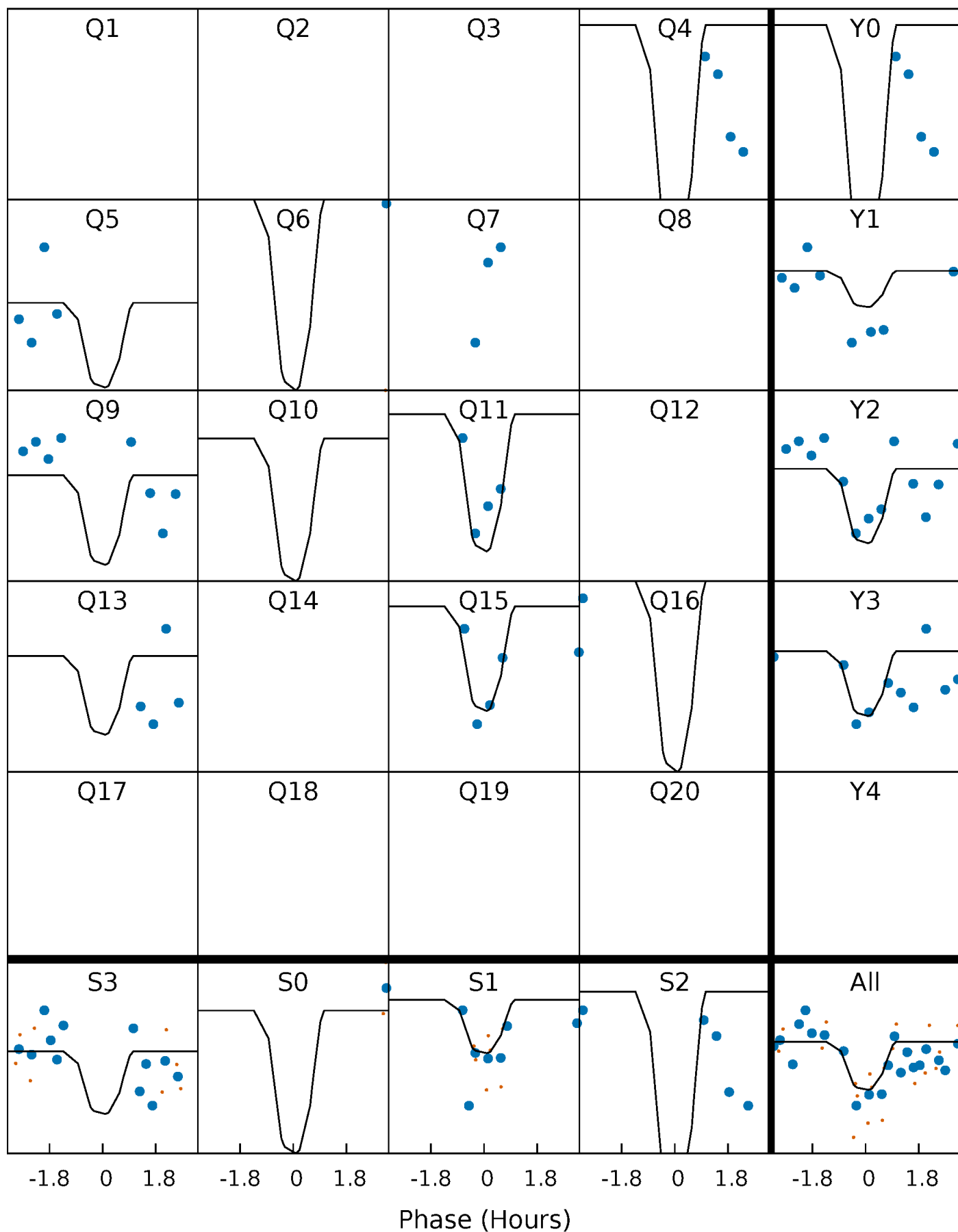
# PDC Quarter-Phased Transit Curves

TCE 006688398-04 P= 58.541662 Days  $T_0=180.146213$  (BKJD)



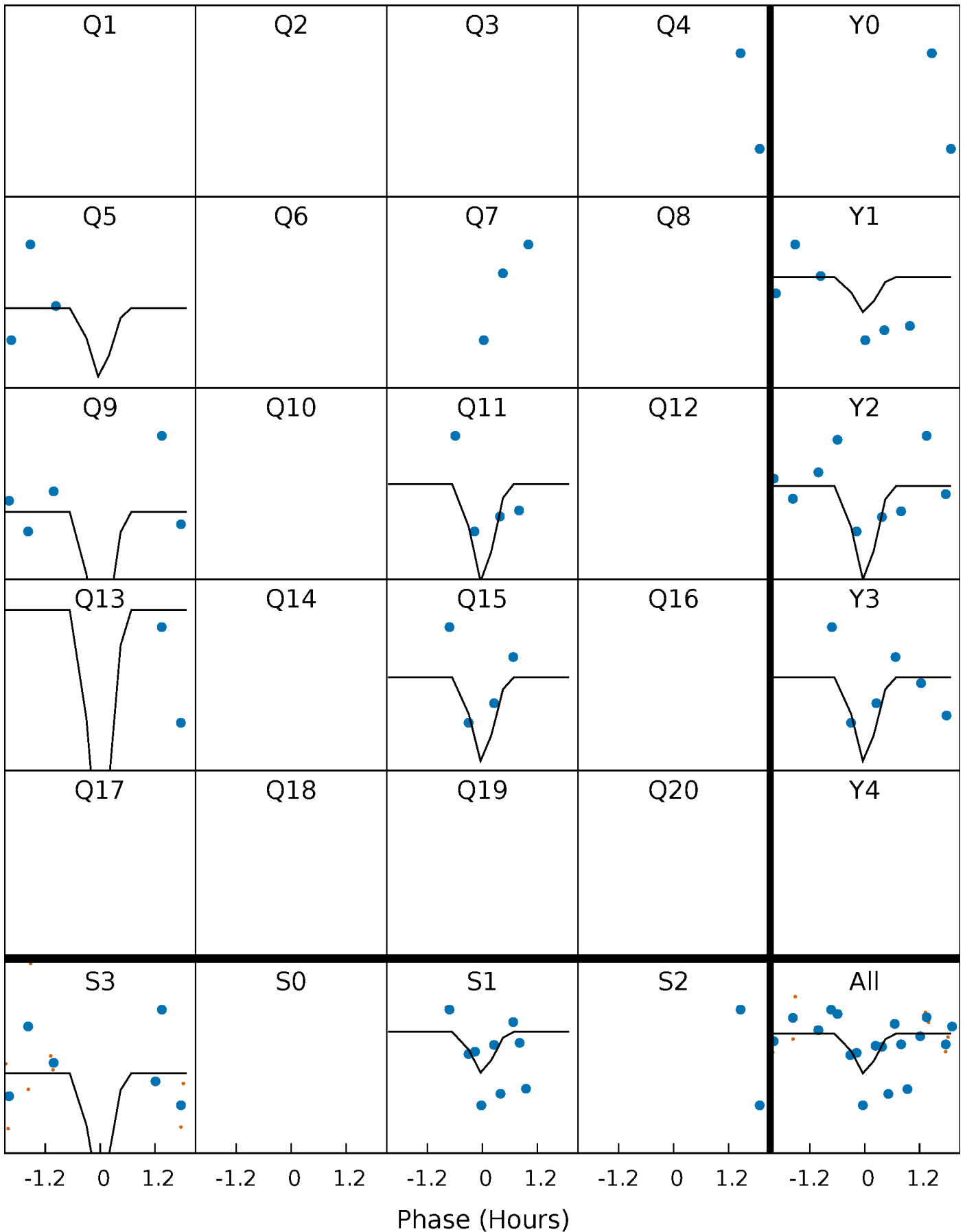
# DV Quarter-Phased Transit Curves

TCE 006688398-04 P= 58.541662 Days  $T_0=180.146213$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

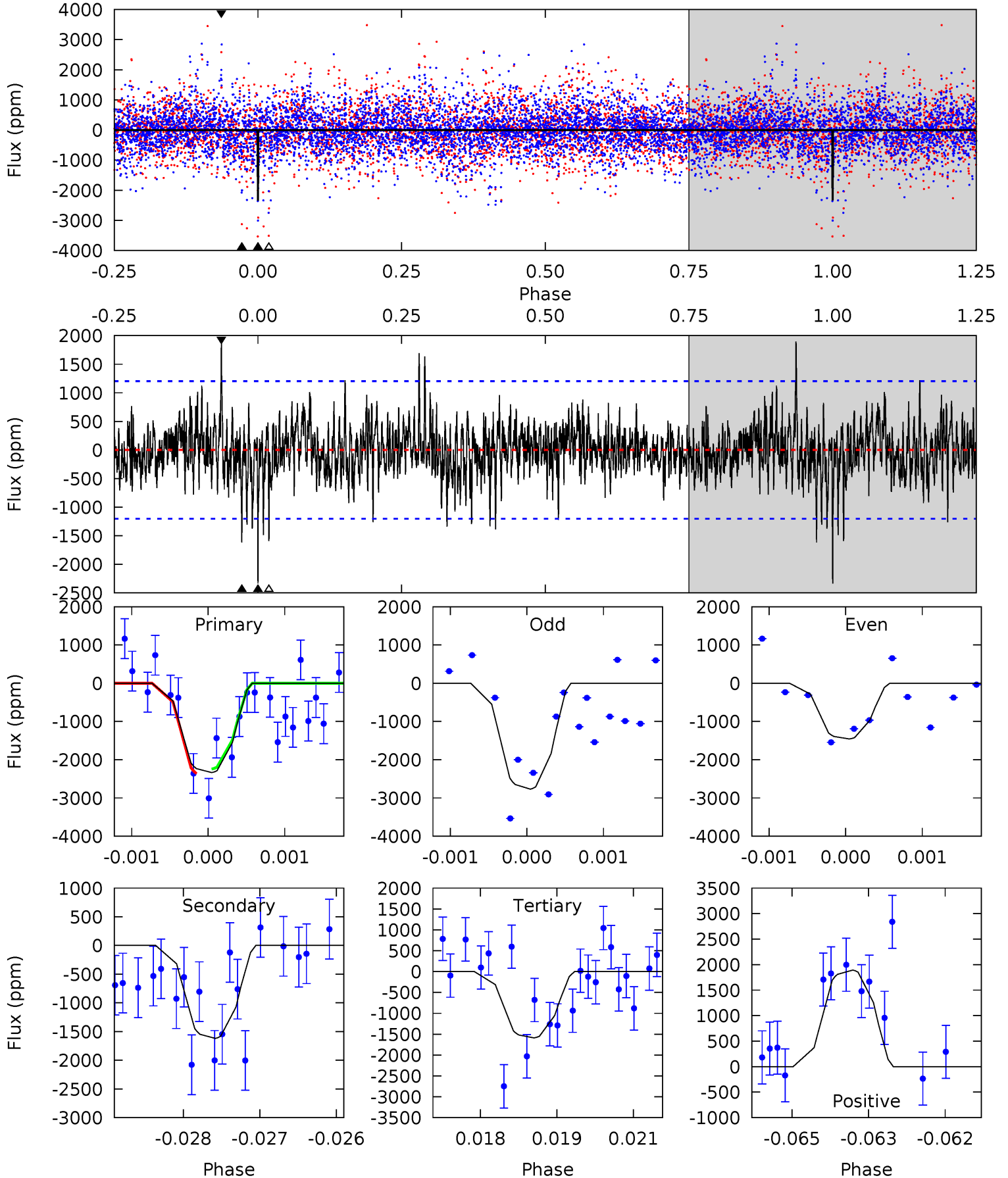
TCE 006688398-04   P= 58.542796 Days    $T_0=180.121952$  (BKJD)



# DV Model-Shift Uniqueness Test

006688398-04, P = 58.541662 Days, E = 180.146213 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
10.5	7.27	7.14	8.50	5.41	3.22	1.66	3.36	1.99	0.13	-1.23	2.70	1.23	0.45	0.25

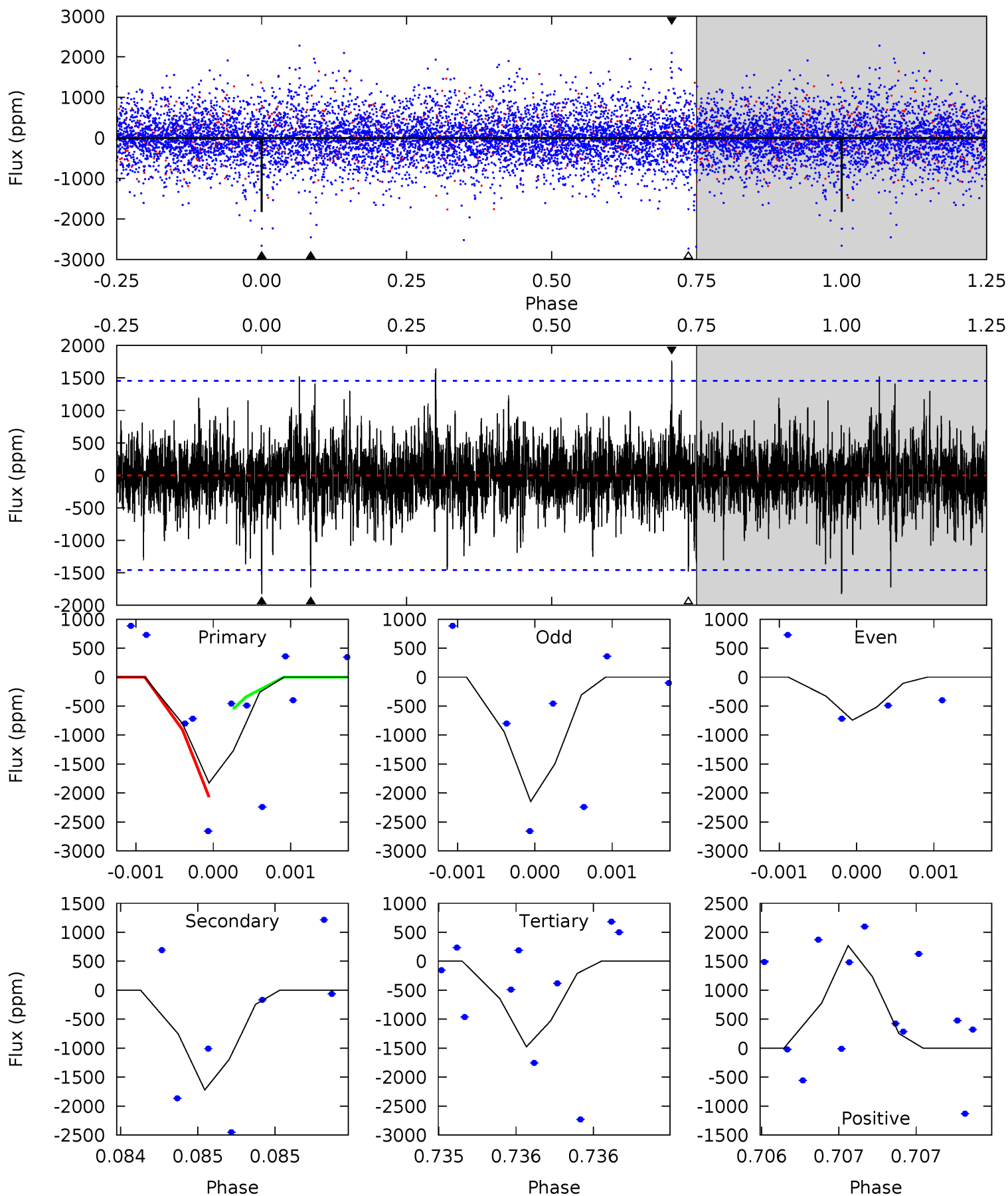




# Alt Model-Shift Uniqueness Test

006688398-04, P = 58.542796 Days, E = 180.121952 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
6.98	6.57	5.64	6.76	5.56	3.46	1.40	1.34	0.21	0.94	-0.19	2.67	1.58	0.49	2.93



### Stellar Parameters For KIC 006688398

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$4885^{+175}_{-175}$	$4.541^{+0.072}_{-0.044}$	$-0.020^{+0.300}_{-0.300}$	$0.763^{+0.062}_{-0.080}$	$0.738^{+0.083}_{-0.060}$	$2.337^{+0.705}_{-0.377}$
	+4%/-4%	+2%/-1%	+1500%/-1500%	+8%/-10%	+11%/-8%	+30%/-16%
Source	KIC0	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 006688398-04 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-1619 \pm 223$	$11.33^{+10.86}_{-7.52}$	$506^{+21}_{-21}$	$3195^{+1447}_{-553}$	$483^{+4080}_{-357}$
Alt.	$-1721 \pm 262$	$10.20^{+11.41}_{-6.46}$	$508^{+22}_{-23}$	$3325^{+1437}_{-646}$	$653^{+4385}_{-516}$

$T_{max}$  = 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

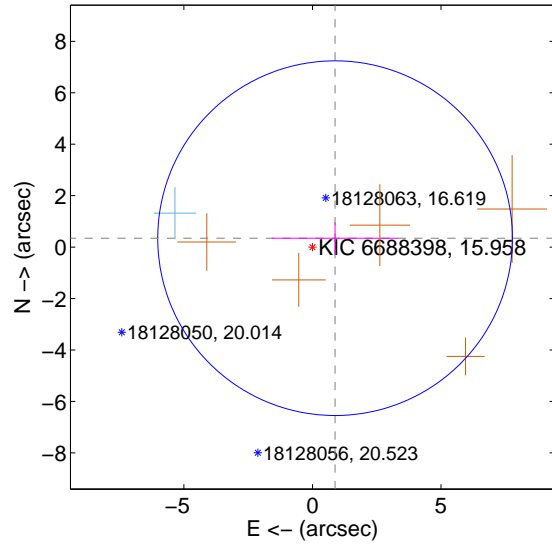
Supplemental centroid analysis for 006688398-04. Kepler magnitude: 15.96. Transit SNR 7.42

There are 1 quarters with good PRF difference image offsets

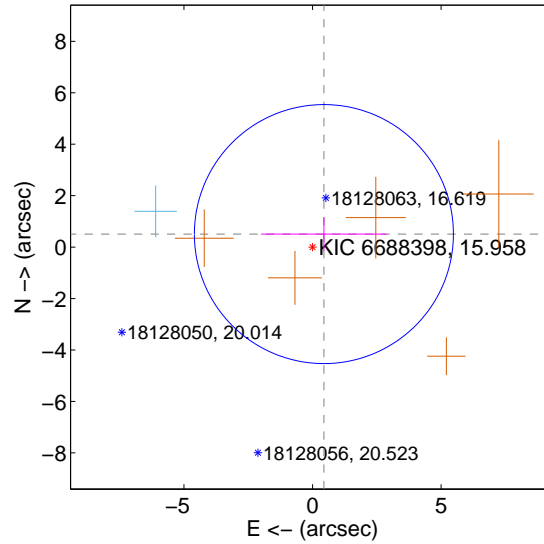
The direct PRF centroid is offset from the target star catalog position by about 0.76 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.946 \pm 2.298$	0.41	$-0.880 \pm 2.458$	$0.347 \pm 0.617$
PRF-fit source offset from KIC position	$0.672 \pm 1.678$	0.40	$-0.442 \pm 2.442$	$0.506 \pm 0.646$
photometric centroid source offset	$2.91 \pm 0.61$	4.76	$2.91 \pm 0.61$	$0.08 \pm 0.40$

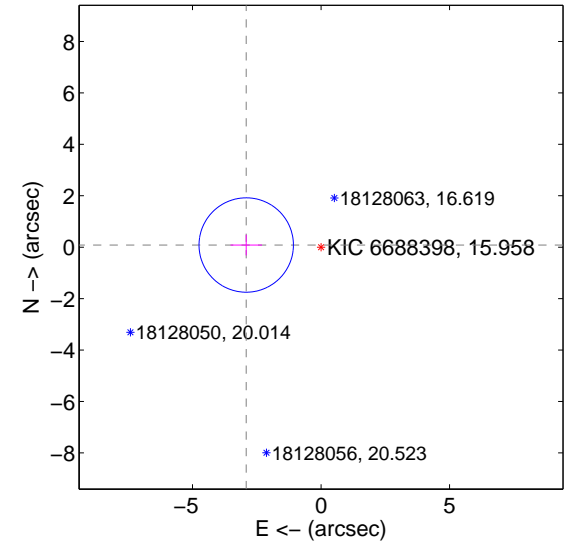
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

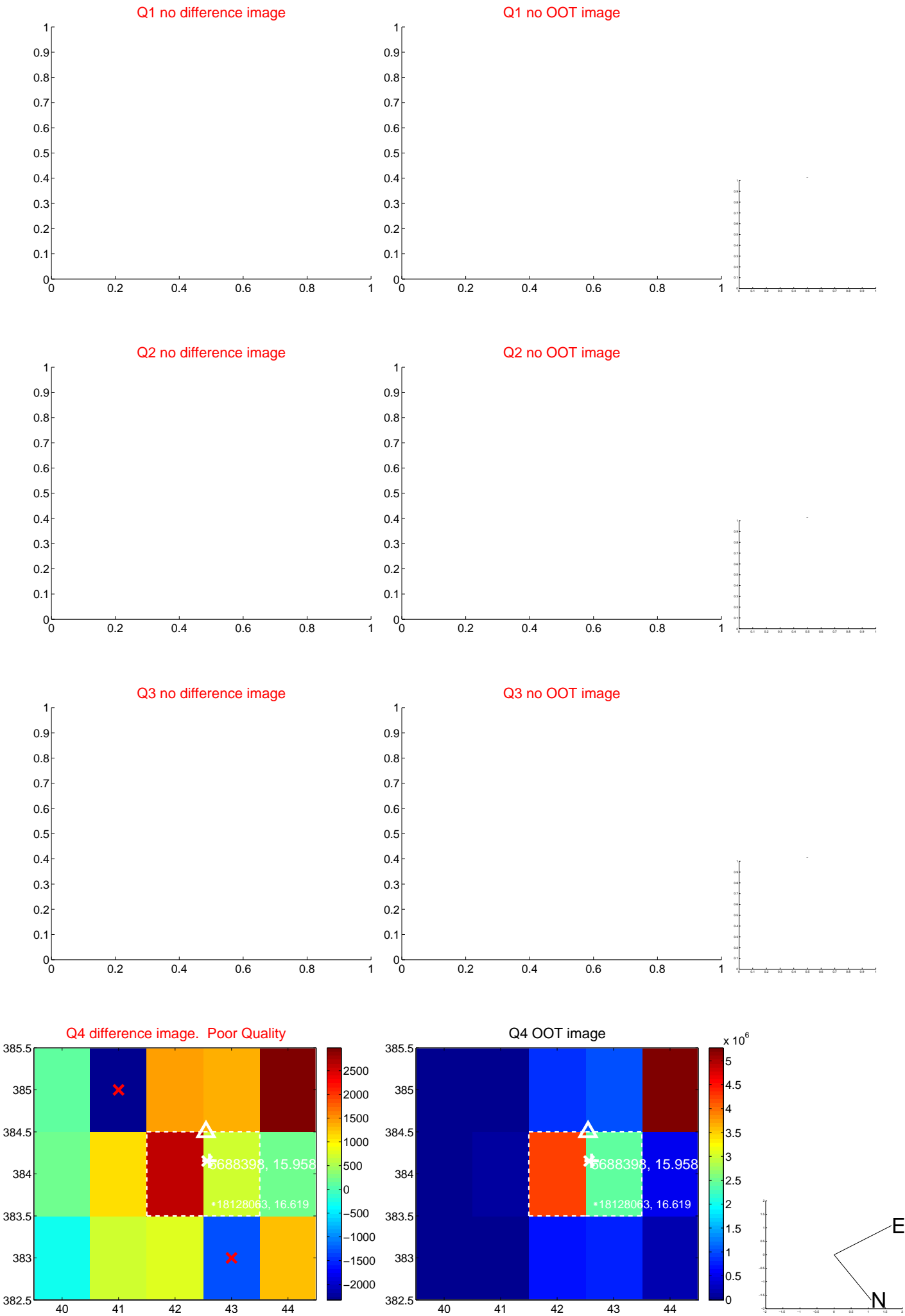


offset from photometric centroids

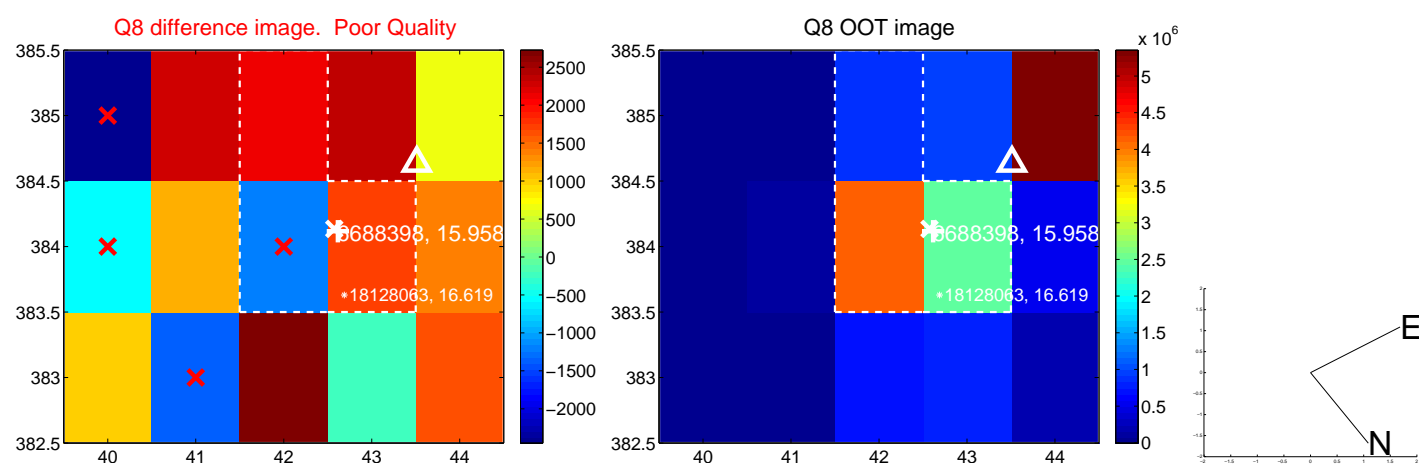
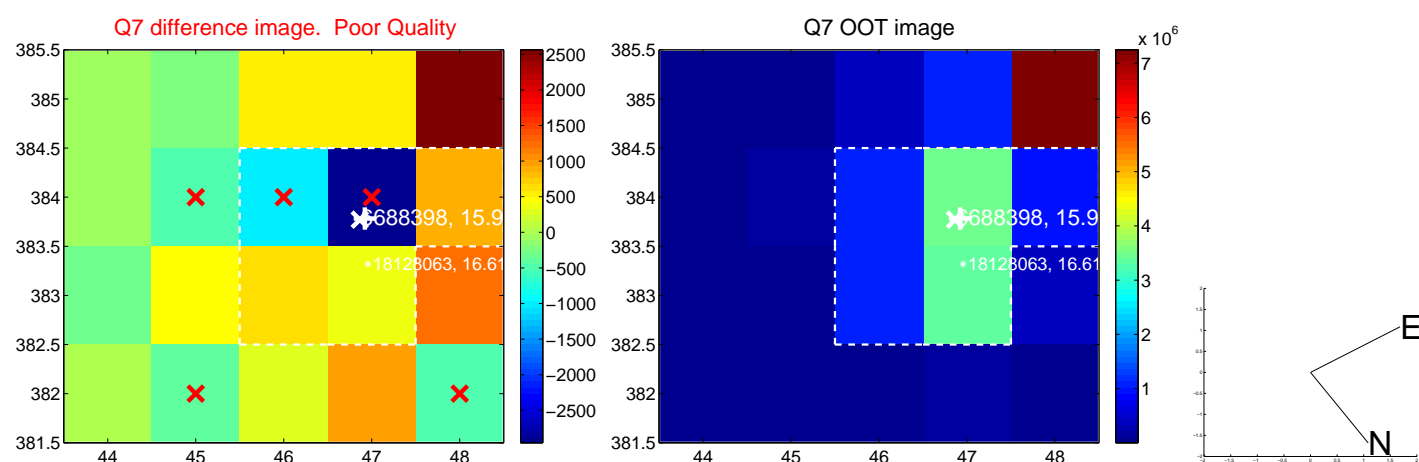
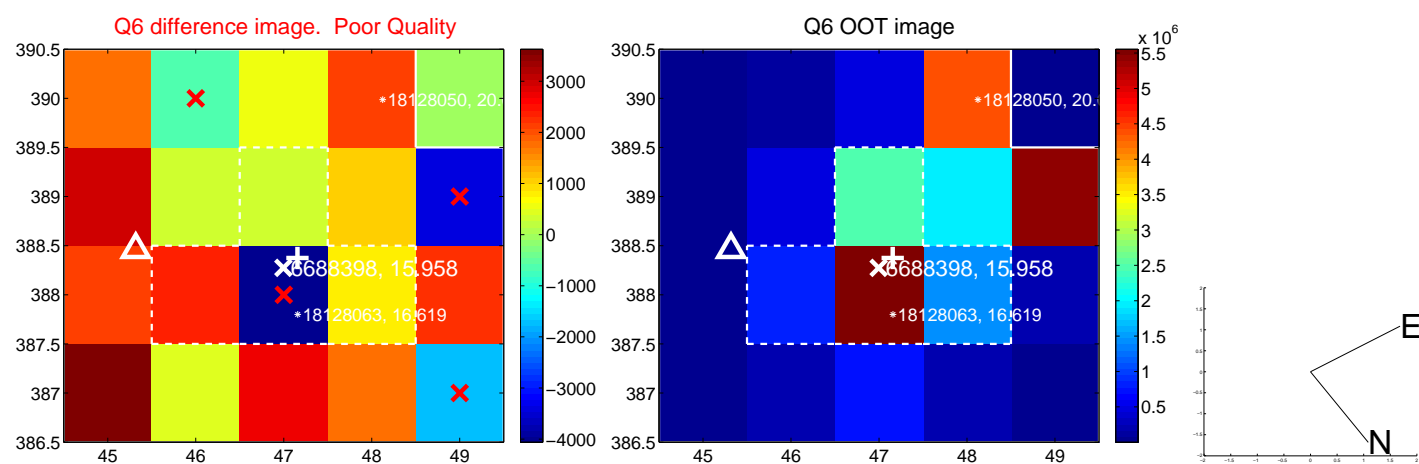
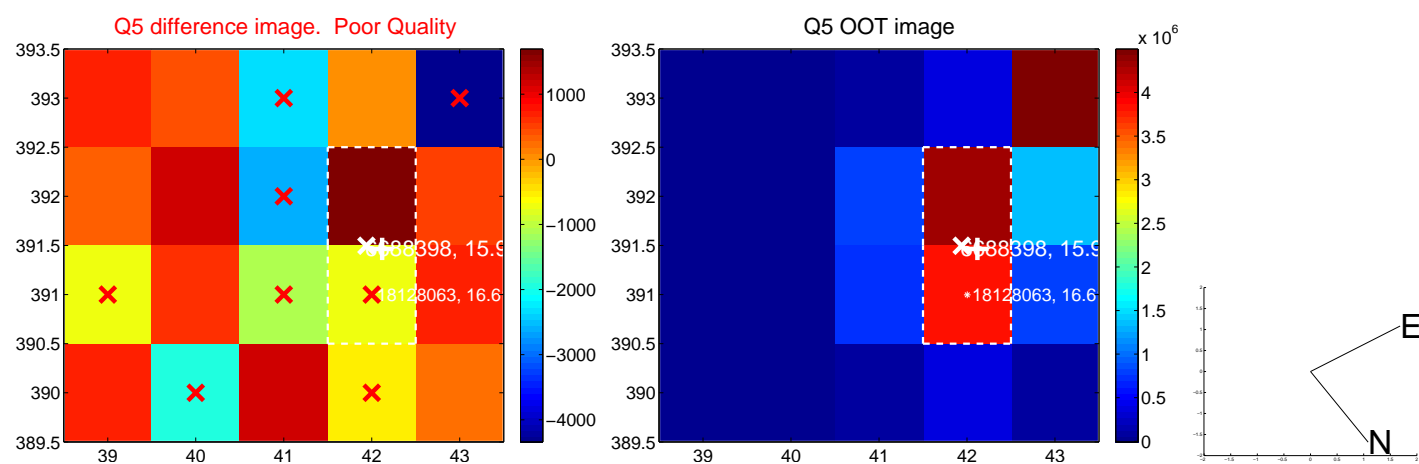


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

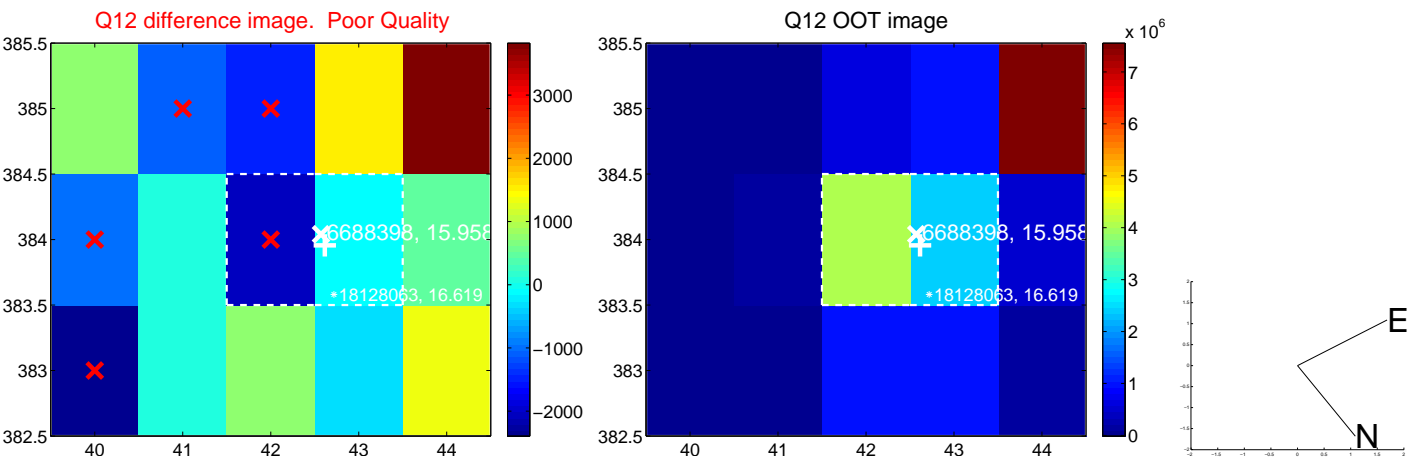
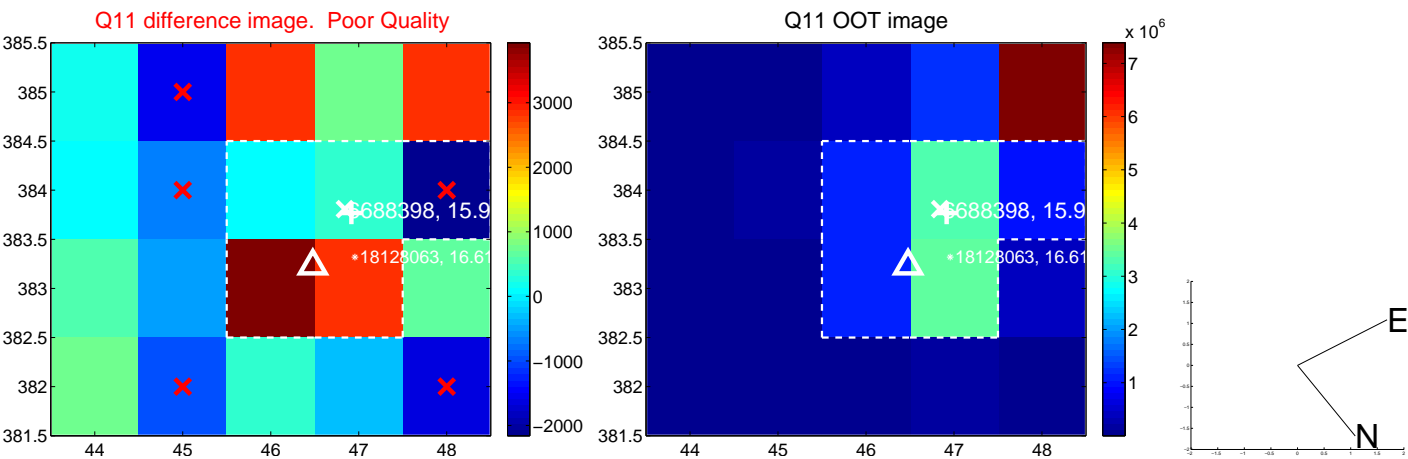
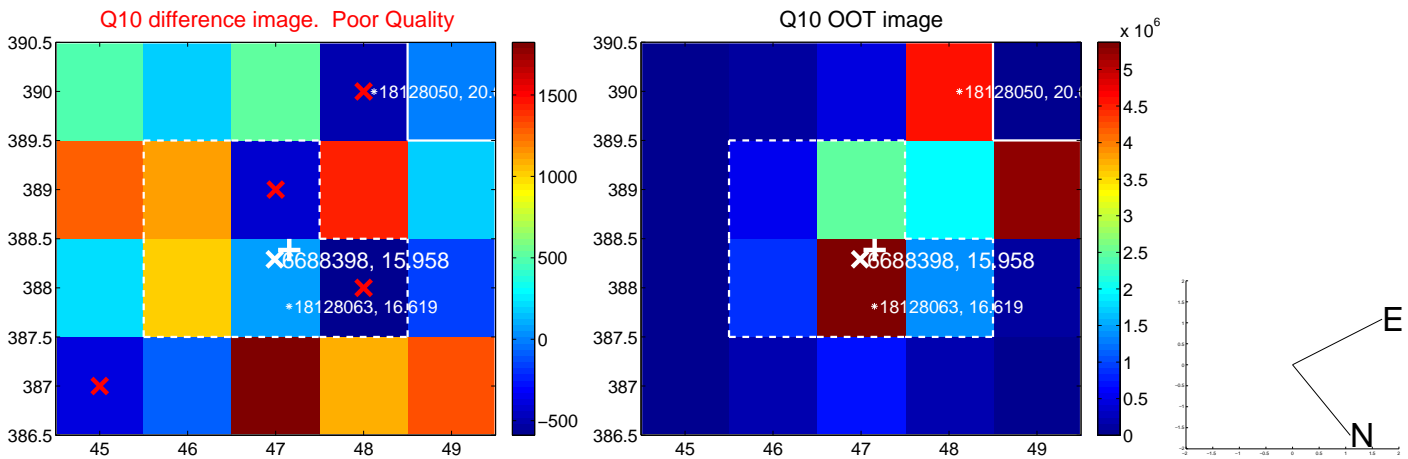
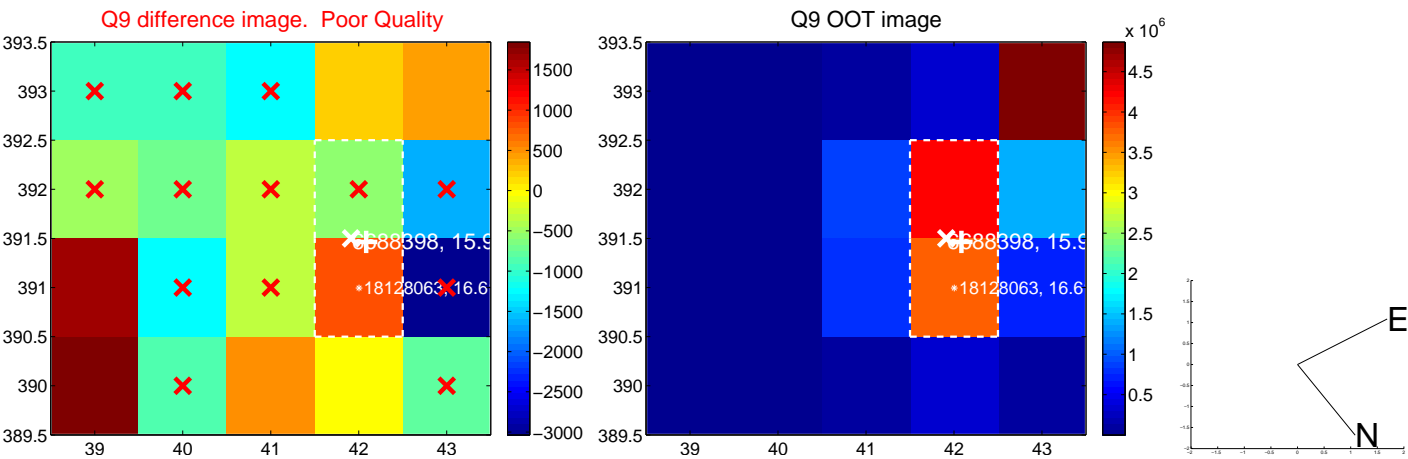
white ×: KIC target position; +: OOT centroid; △: difference centroid. red ✕: large negative pixel value.



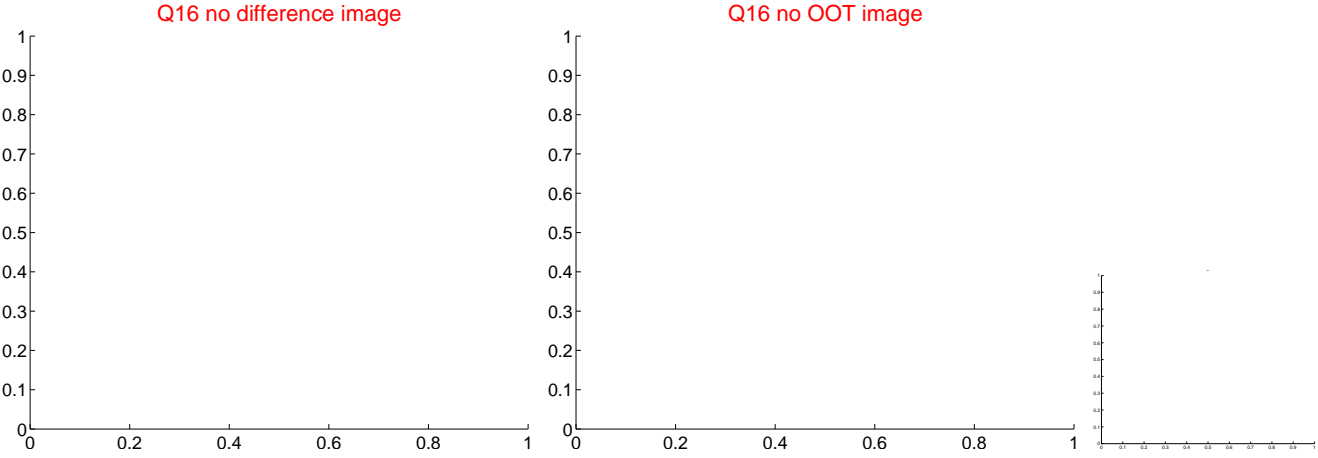
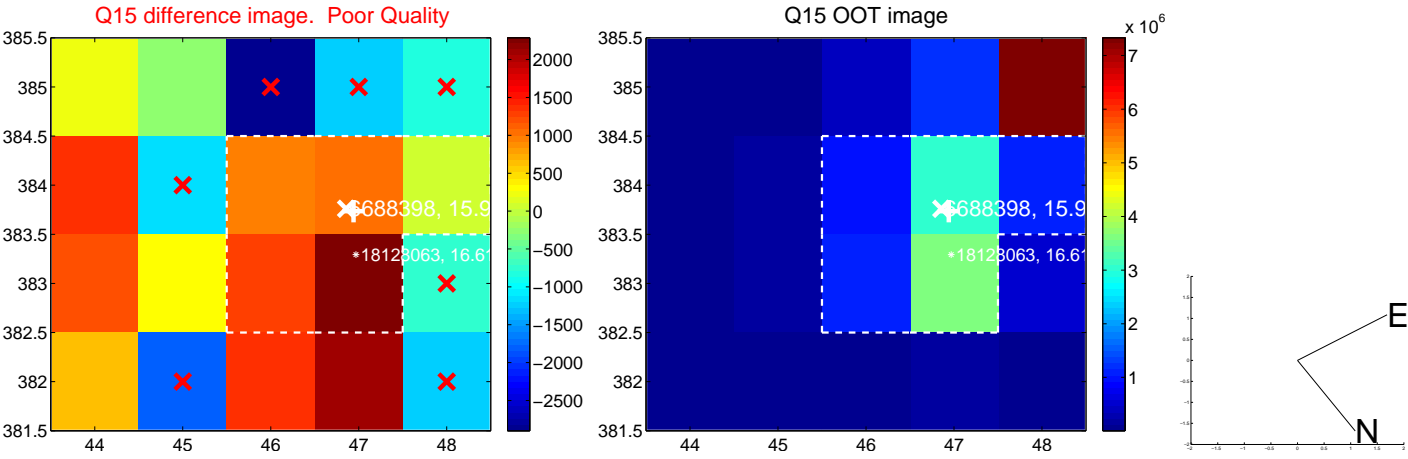
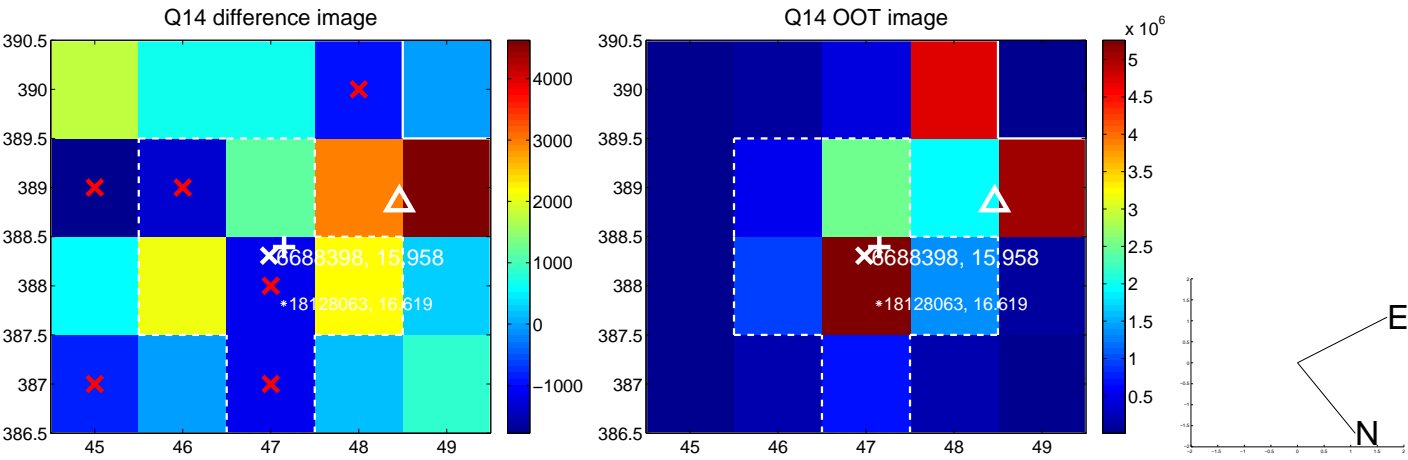
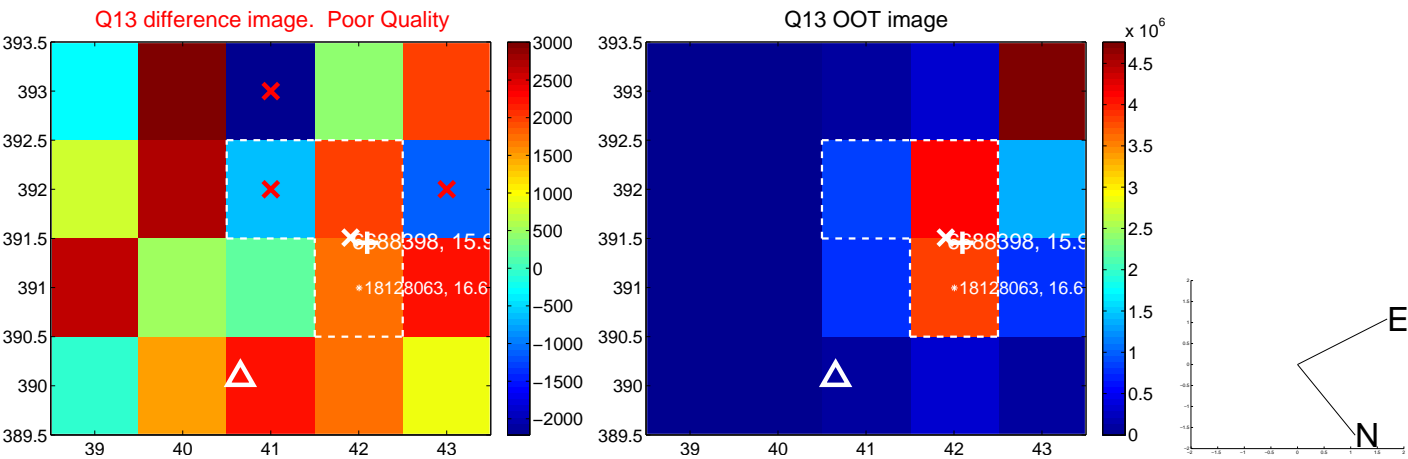
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



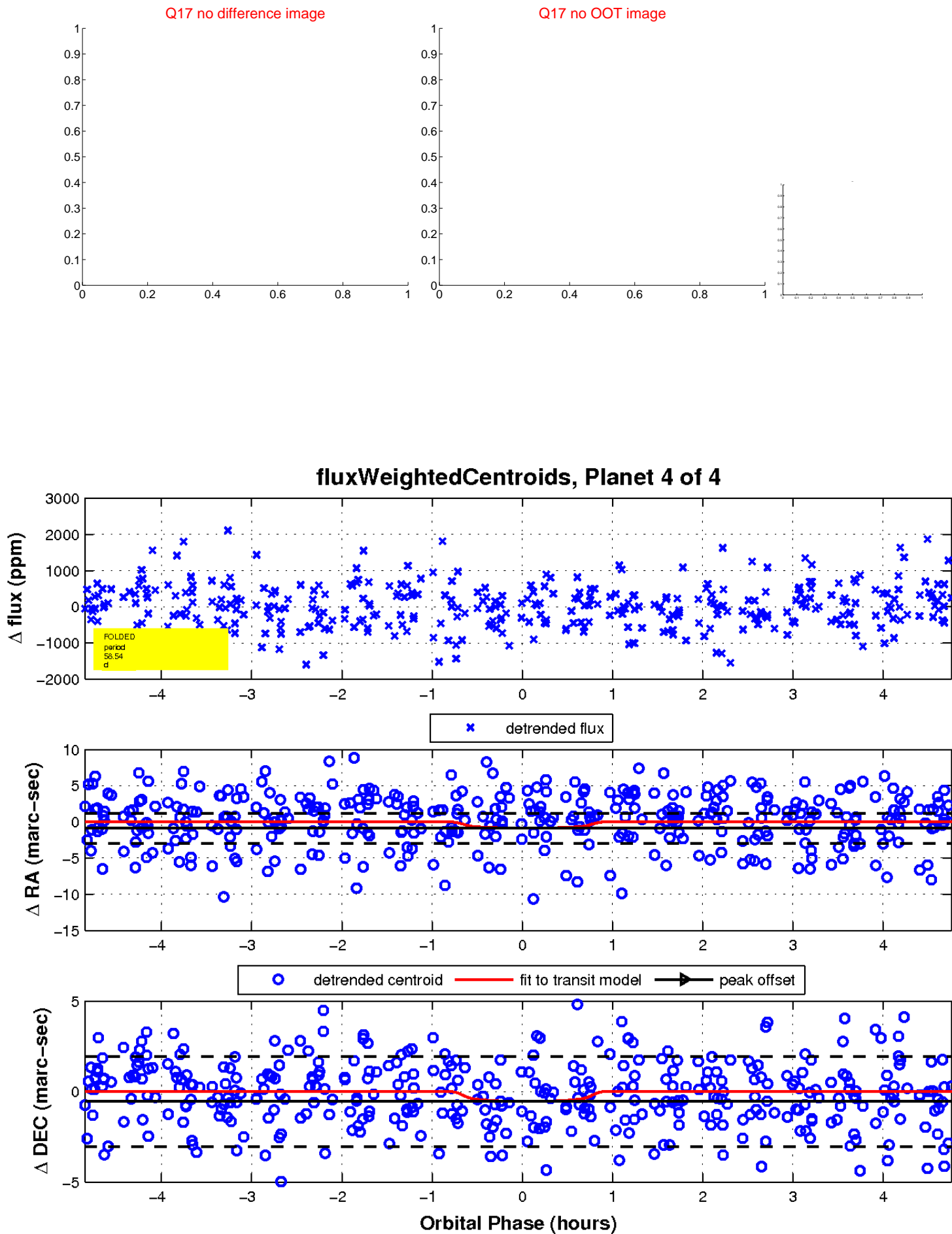
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

