

# KIC 009962455

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009962455-01	OBS	2748.01	23.198640	142.625364	213.8	10.405	22.4	23.1	1.76	5416	3.06	93.47
009962455-02	OBS	2748.02	5.777183	137.168973	128.1	2.380	13.9	15.5	1.76	5416	2.14	596.58

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009962455-01	OBS	PC	0.93	0	0	0	0	NO_COMMENT
009962455-02	OBS	PC	0.99	0	0	0	0	NO_COMMENT

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

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

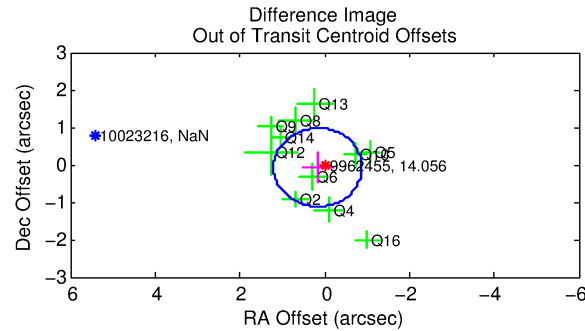
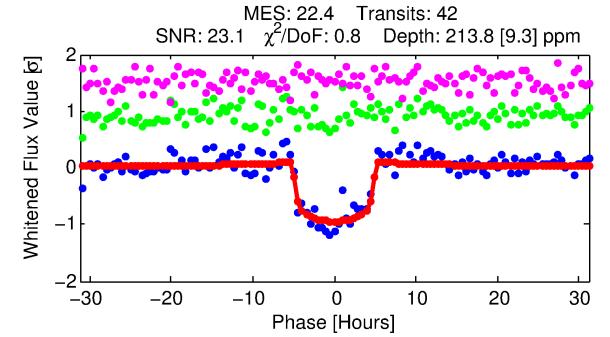
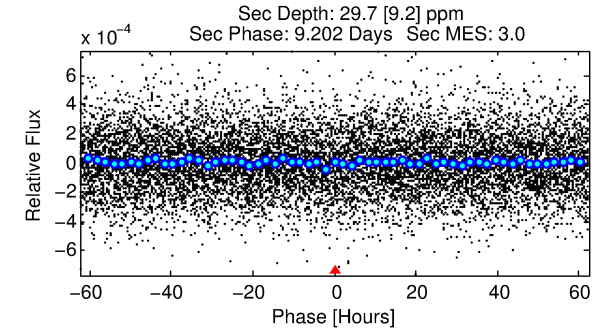
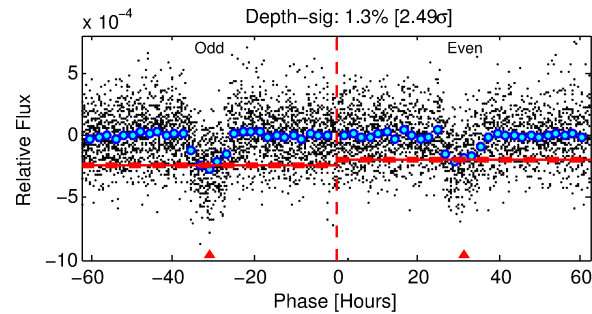
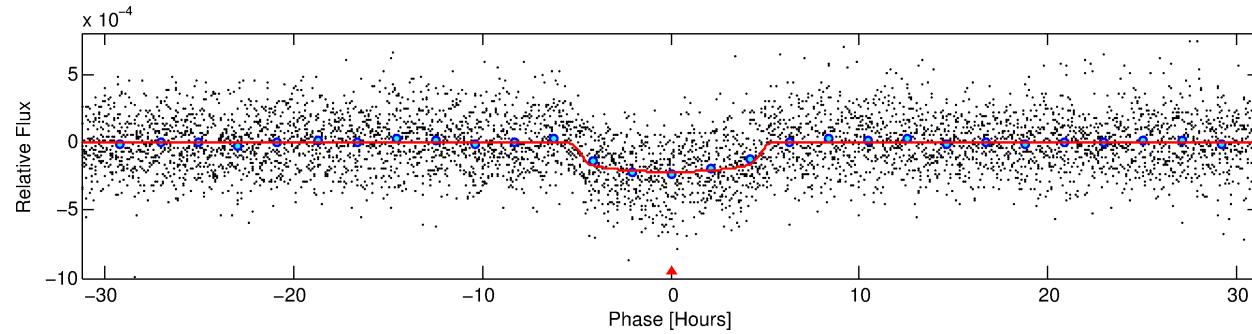
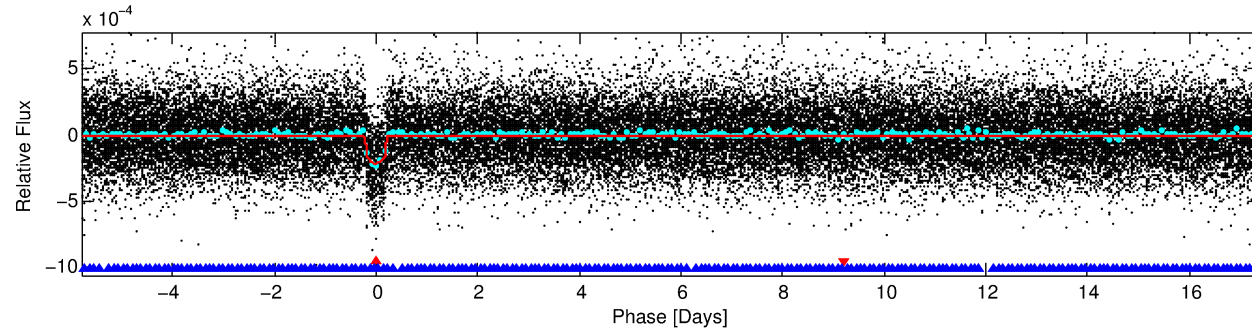
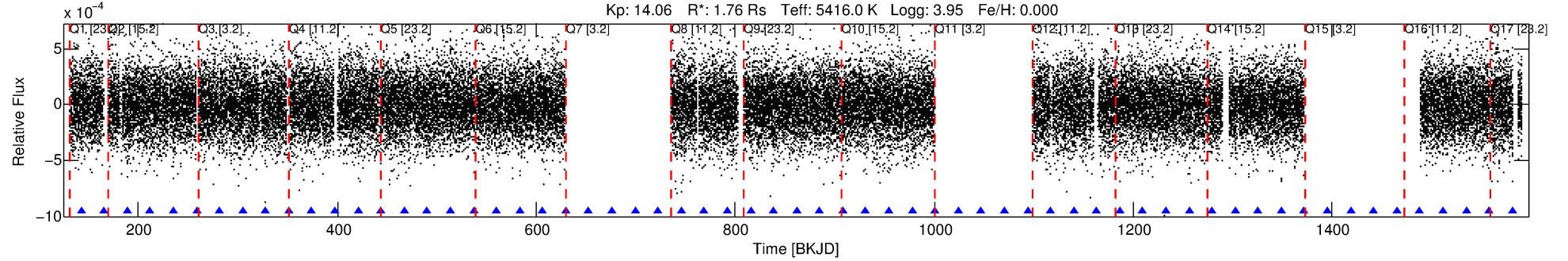
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 009962455-01

No Significant Match Found

# DV One-Page Summary

KIC: 9962455 Candidate: 1 of 2 Period: 23.199 d  
KOI: K02748.01 Corr: 0.967



## DV Fit Results:

Period = 23.19864 [0.00021] d  
Epoch = 142.6254 [0.0072] BKJD  
Rp/R\* = 0.0160 [0.0013]  
a/R\* = 8.29 [2.84]  
b = 0.89 [0.08]  
Seff = 93.47 [28.47]  
Teff = 793 [60] K  
Rp = 3.06 [0.65] Re  
a = 0.1595 [0.0293] AU  
Ag = 44.27 [20.15] [2.15 $\sigma$ ]  
Teffp = 3162 [288] K [8.05 $\sigma$ ]

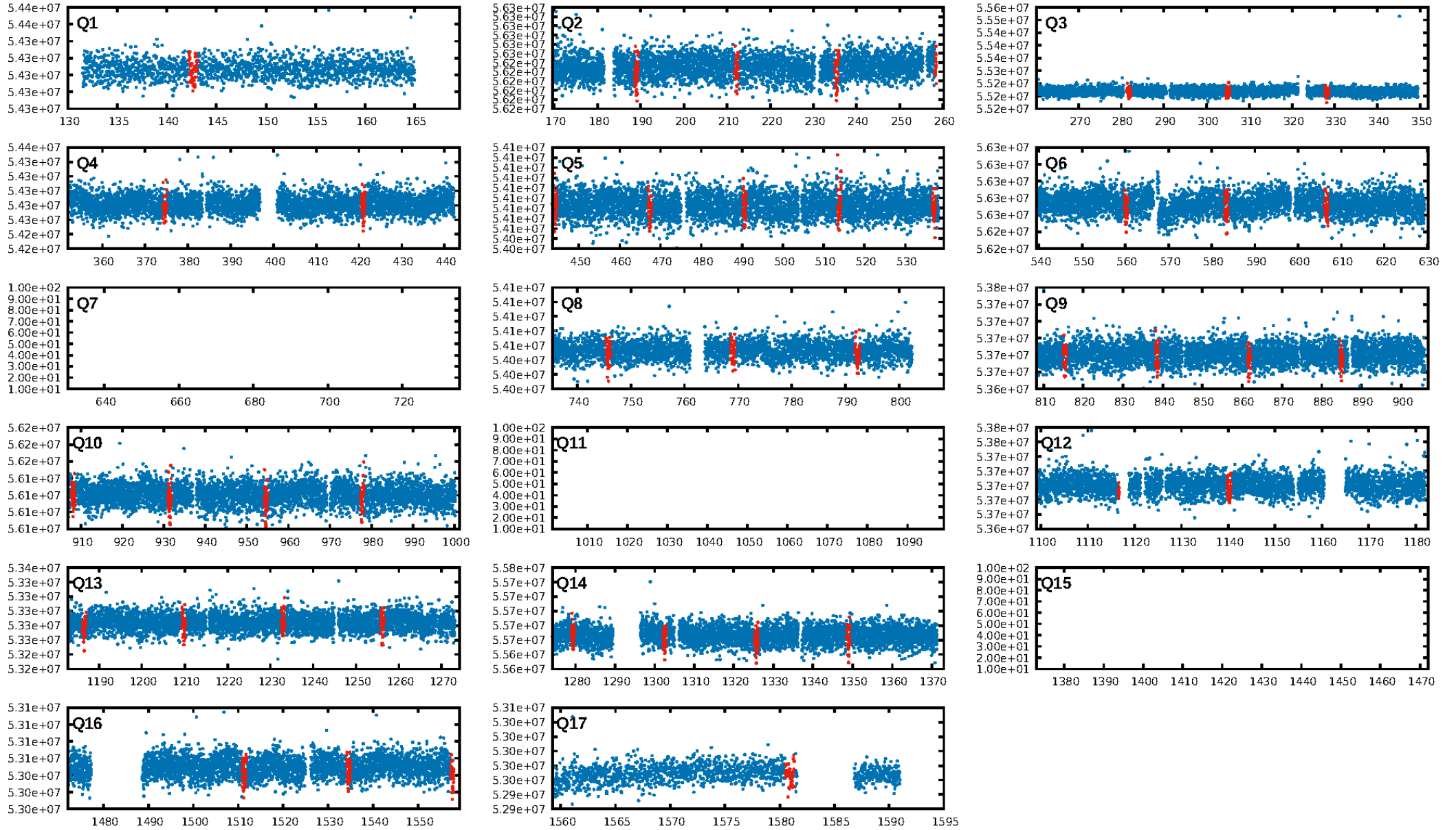
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [39.17 $\sigma$ ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 89.0%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 2.59e-104  
RollingBand-fgt: 1.00 [40/40]  
GhostDiagnostic-chr: 2.184  
Centroid-sig: 1.6%  
Centroid-so: 1.397 arcsec [2.60 $\sigma$ ]  
OotOffset-rm: 0.181 arcsec [0.52 $\sigma$ ]  
KicOffset-rm: 0.277 arcsec [0.71 $\sigma$ ]  
OotOffset-st: 4/0/4/3 [11]  
KicOffset-st: 4/0/4/3 [11]  
DiffImageQuality-fgm: 1.00 [11/11]  
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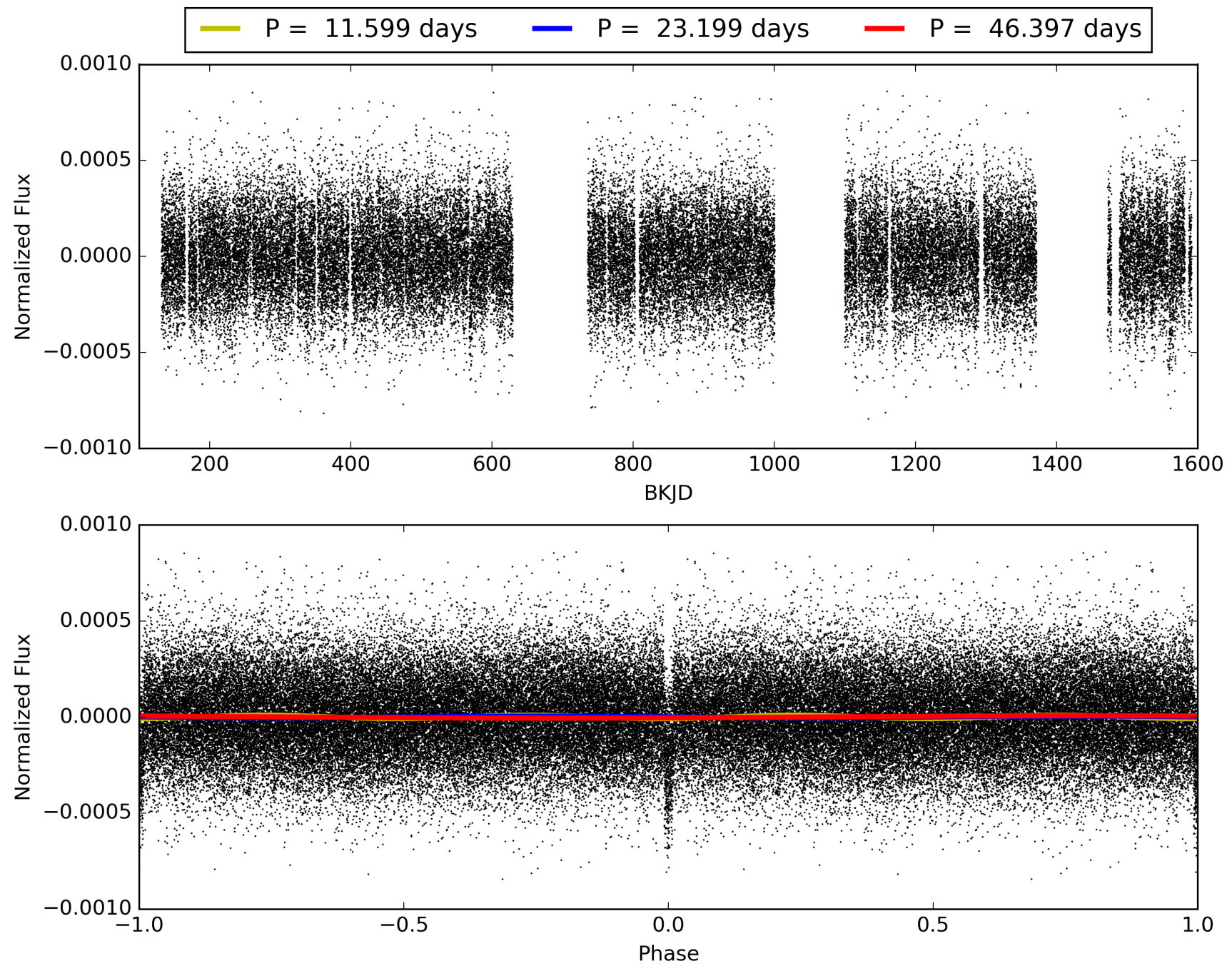
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This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 009962455-01, PDC Light Curves

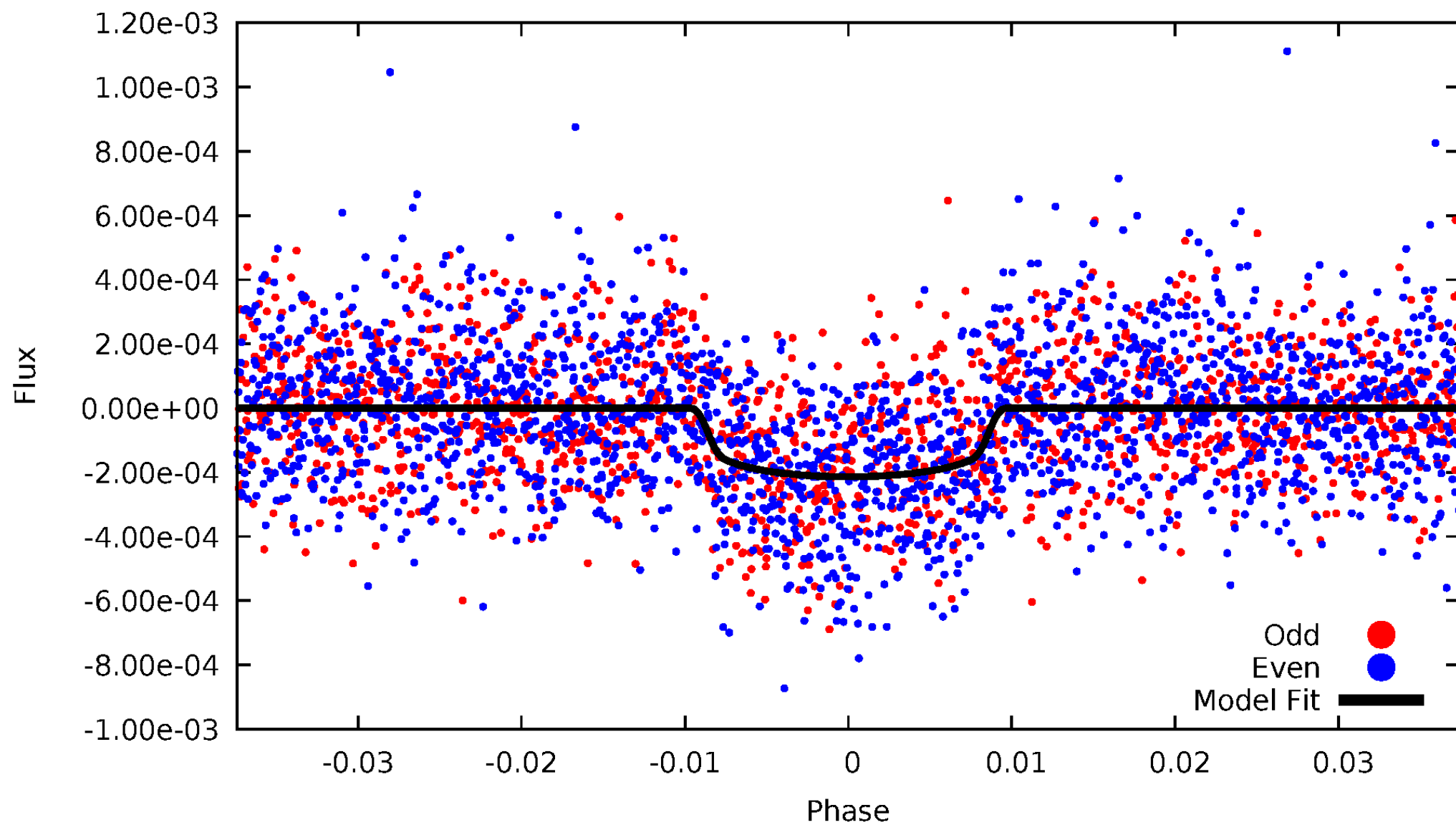


TCE 009962455-01



# DV Odd/Even

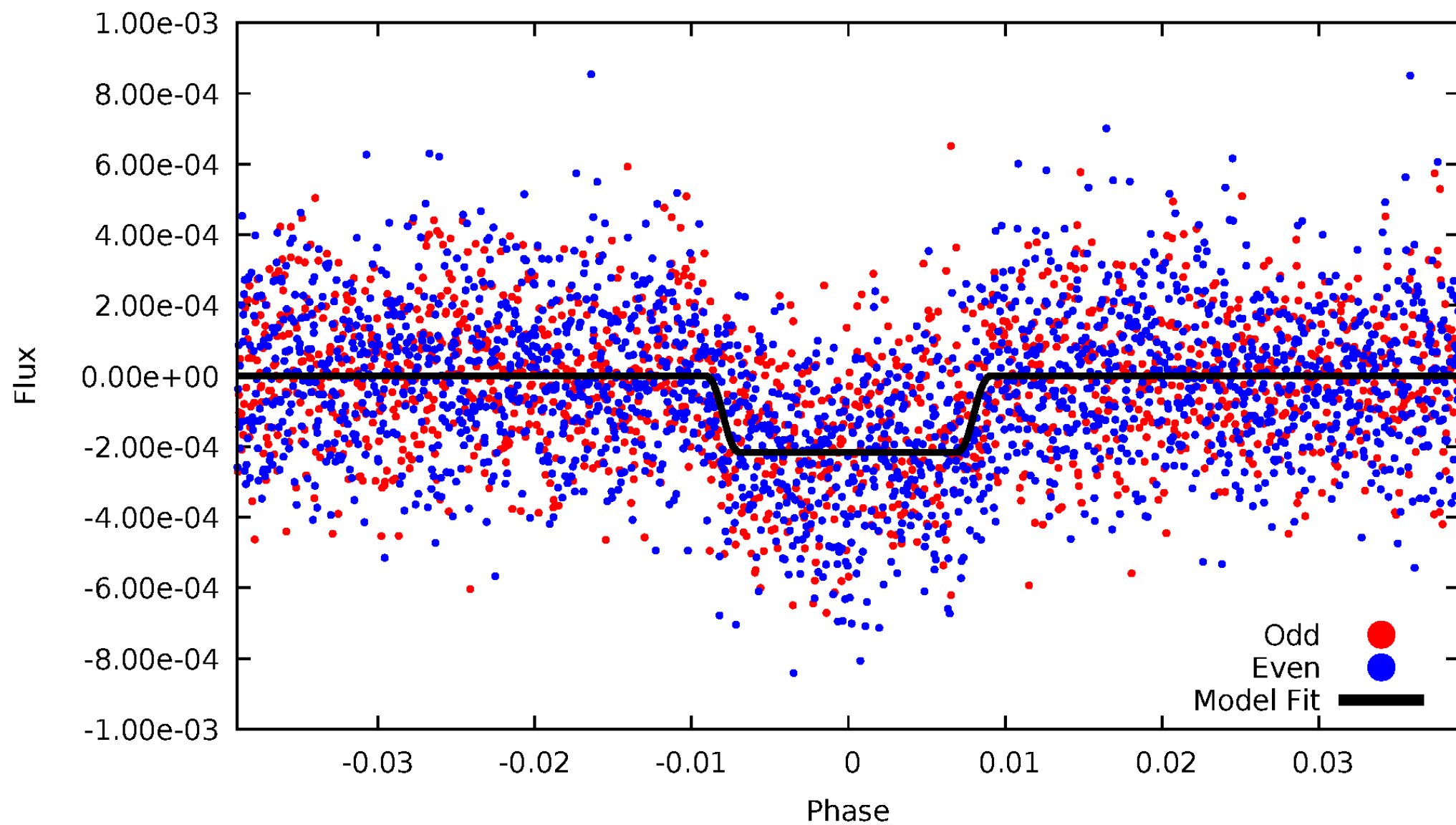
TCE 009962455-01





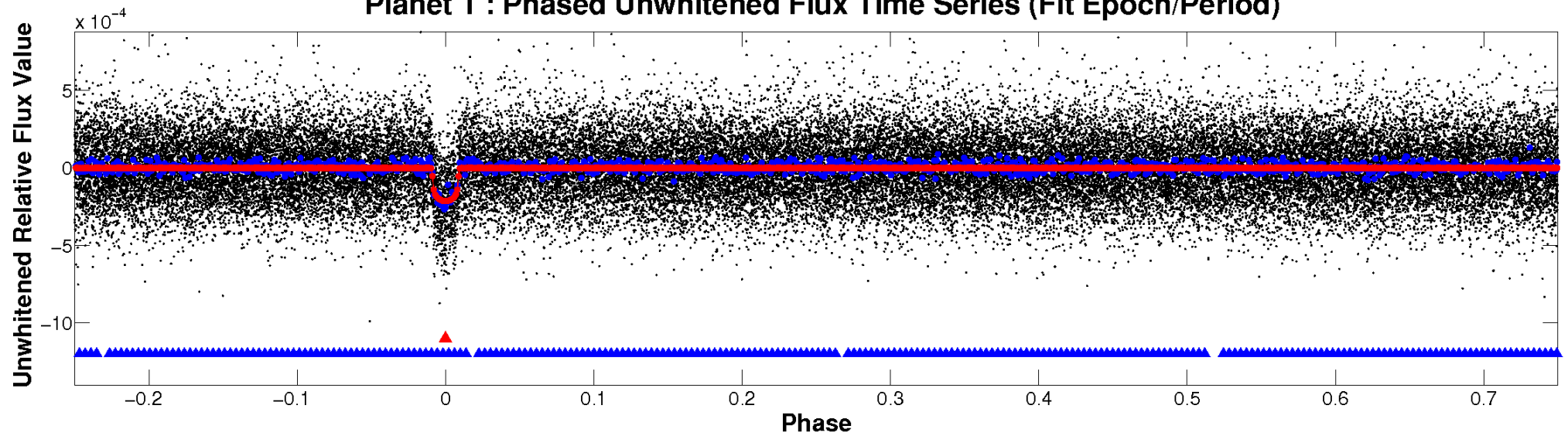
# ALT Odd/Even

TCE 009962455-01

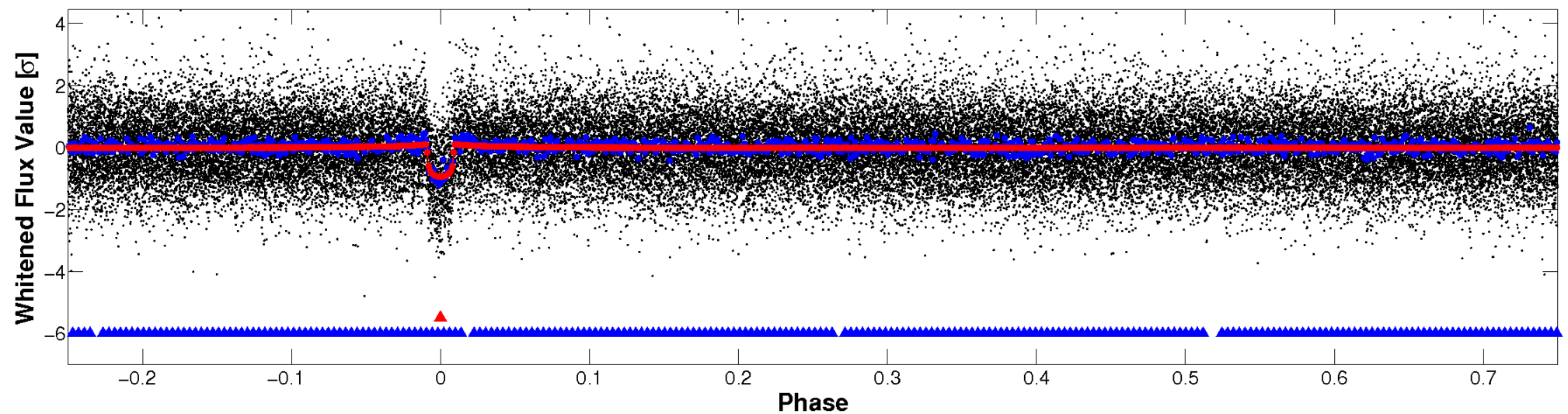


# Non-Whitened Vs. Whitened Light Curve

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

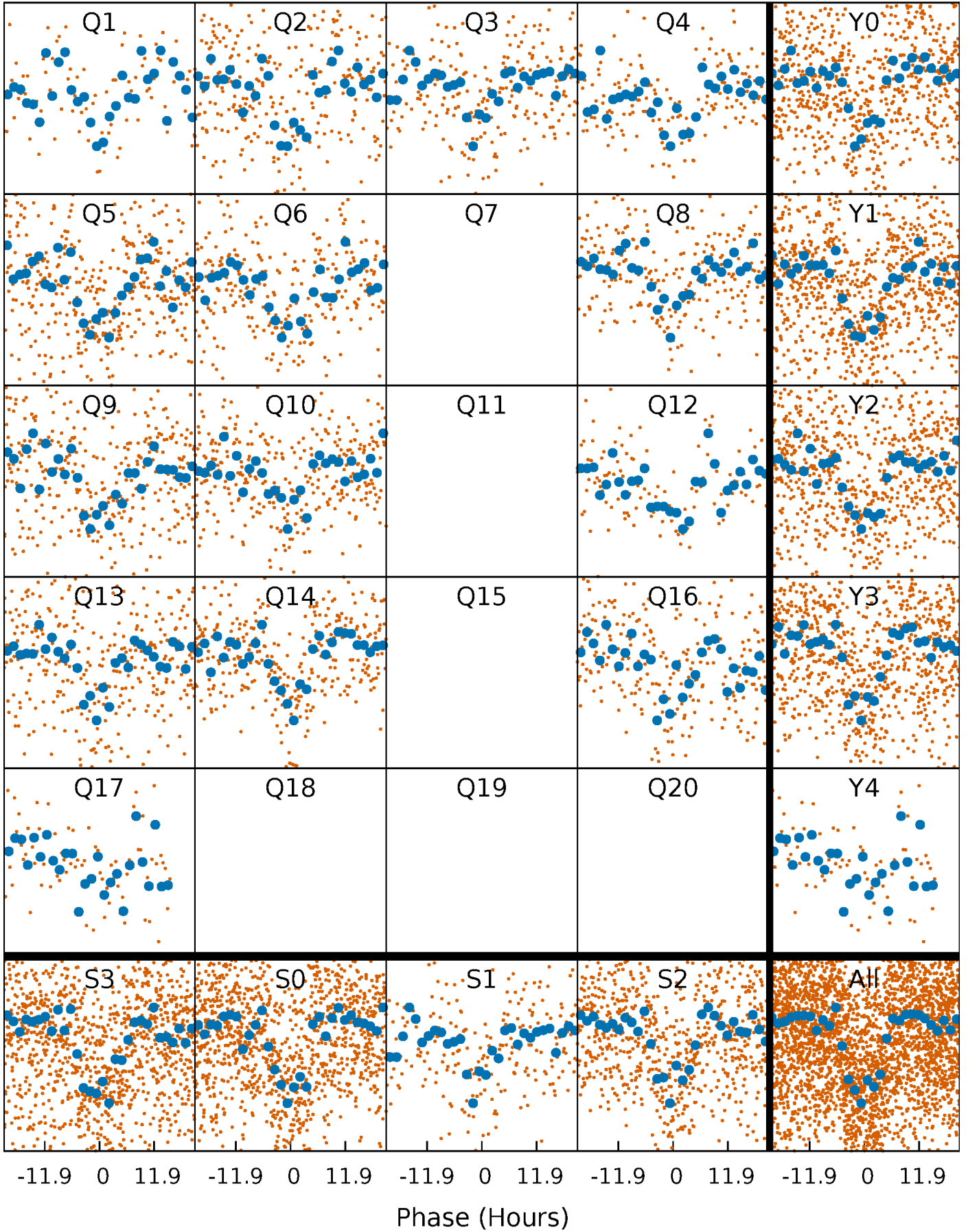


Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

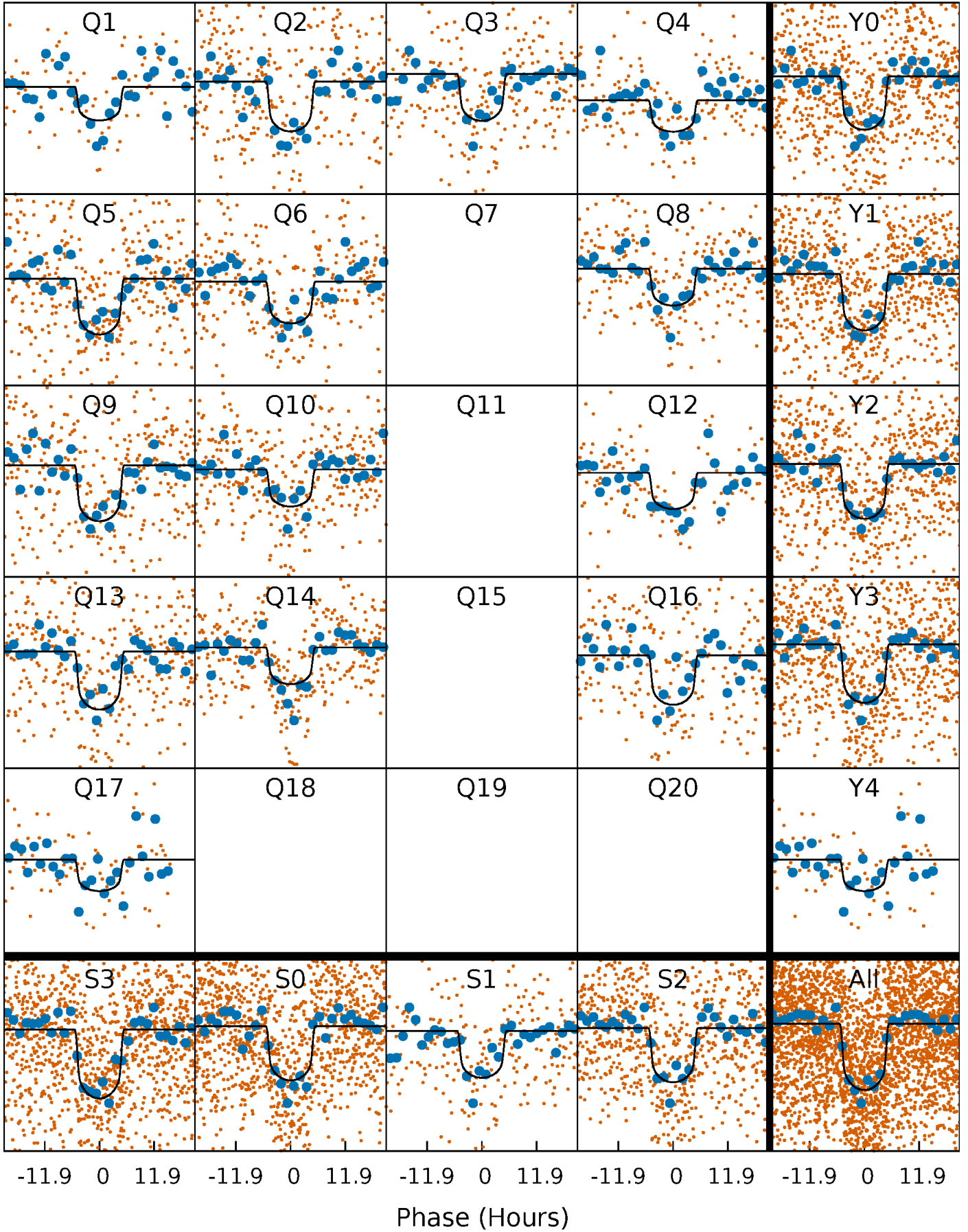
TCE 009962455-01 P= 23.198640 Days  $T_0=142.625364$  (BKJD)





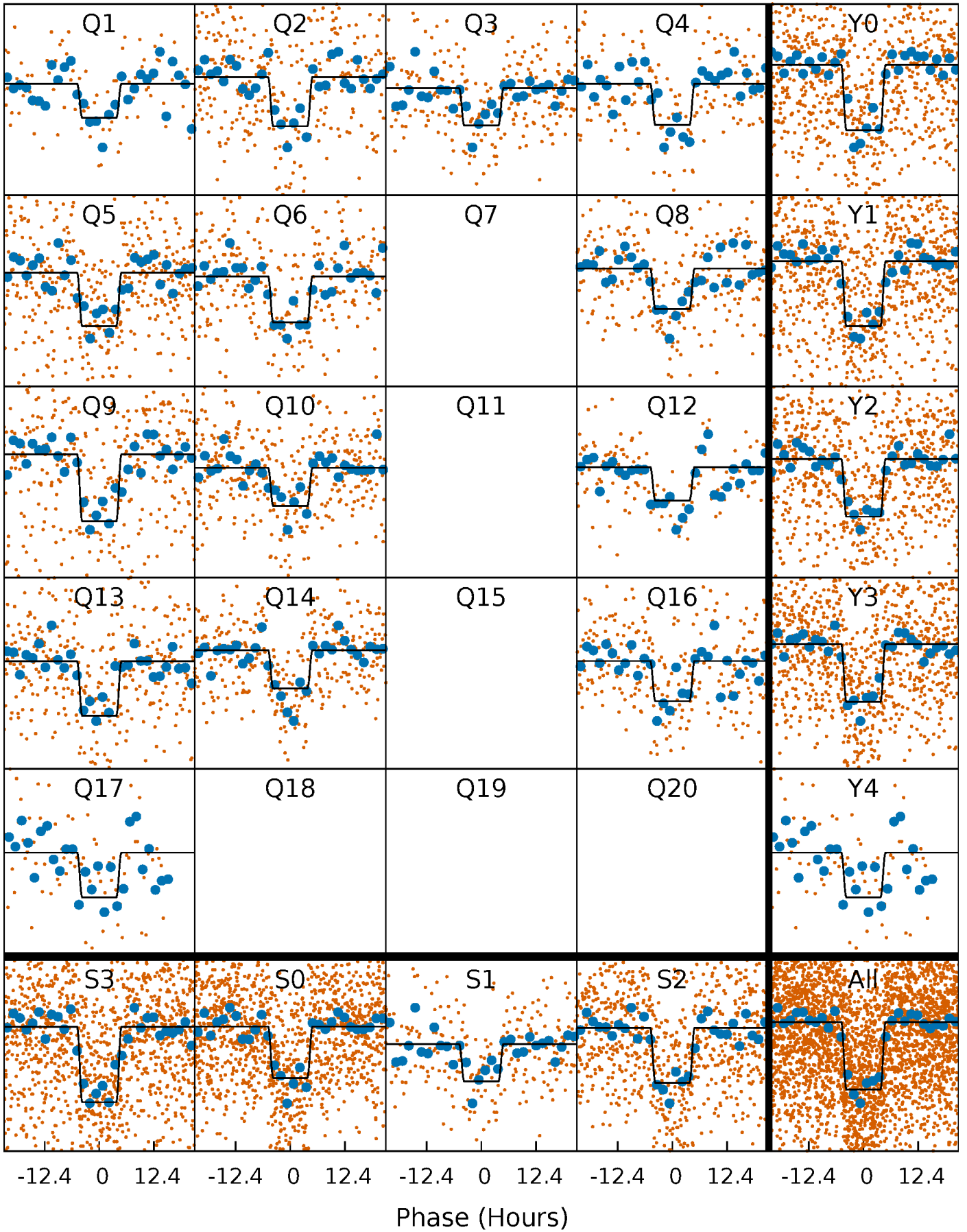
# DV Quarter-Phased Transit Curves

TCE 009962455-01   P= 23.198640 Days    $T_0=142.625364$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

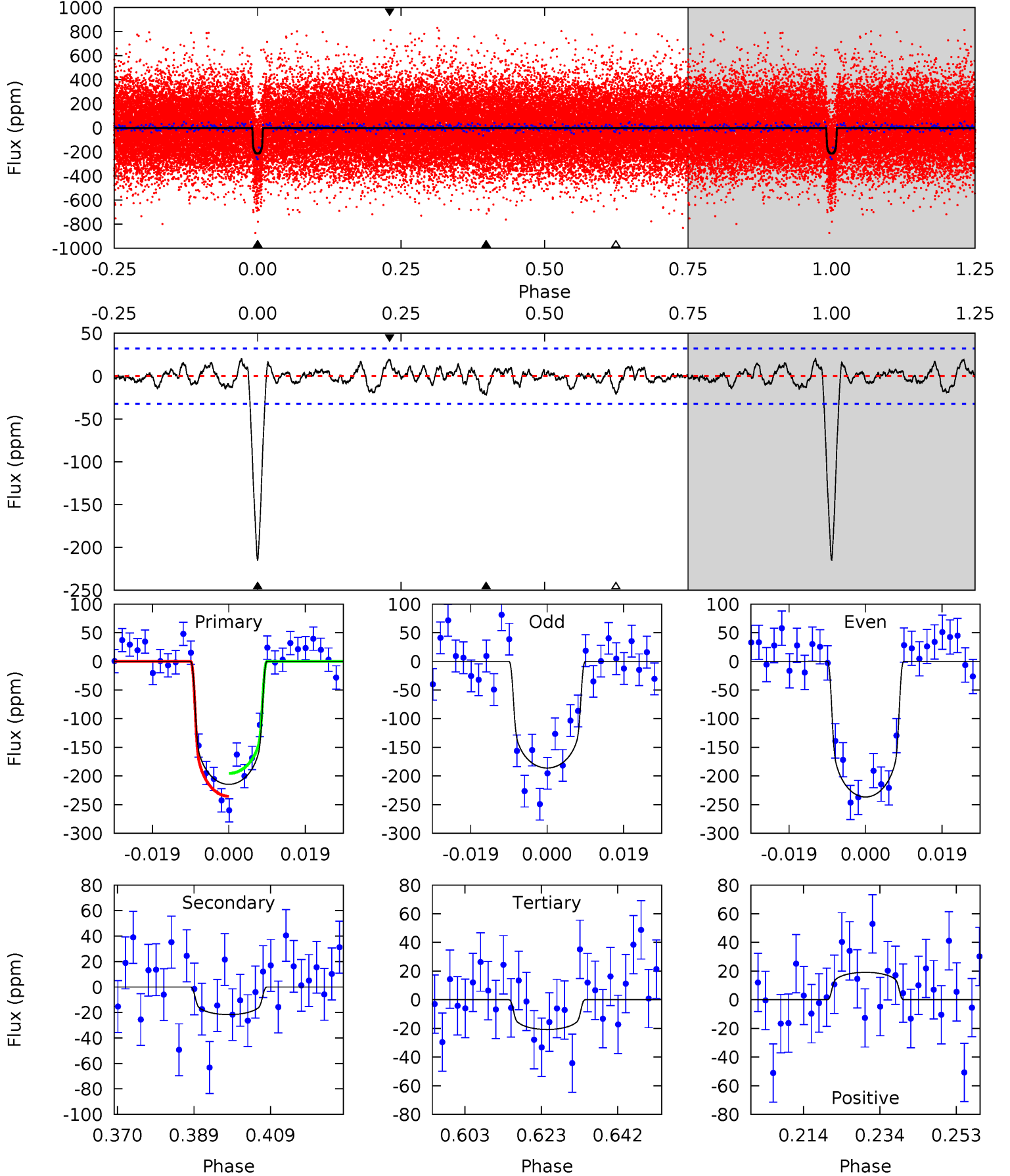
TCE 009962455-01 P= 23.199075 Days  $T_0=142.611515$  (BKJD)



# DV Model-Shift Uniqueness Test

009962455-01, P = 23.198640 Days, E = 119.426724 Days

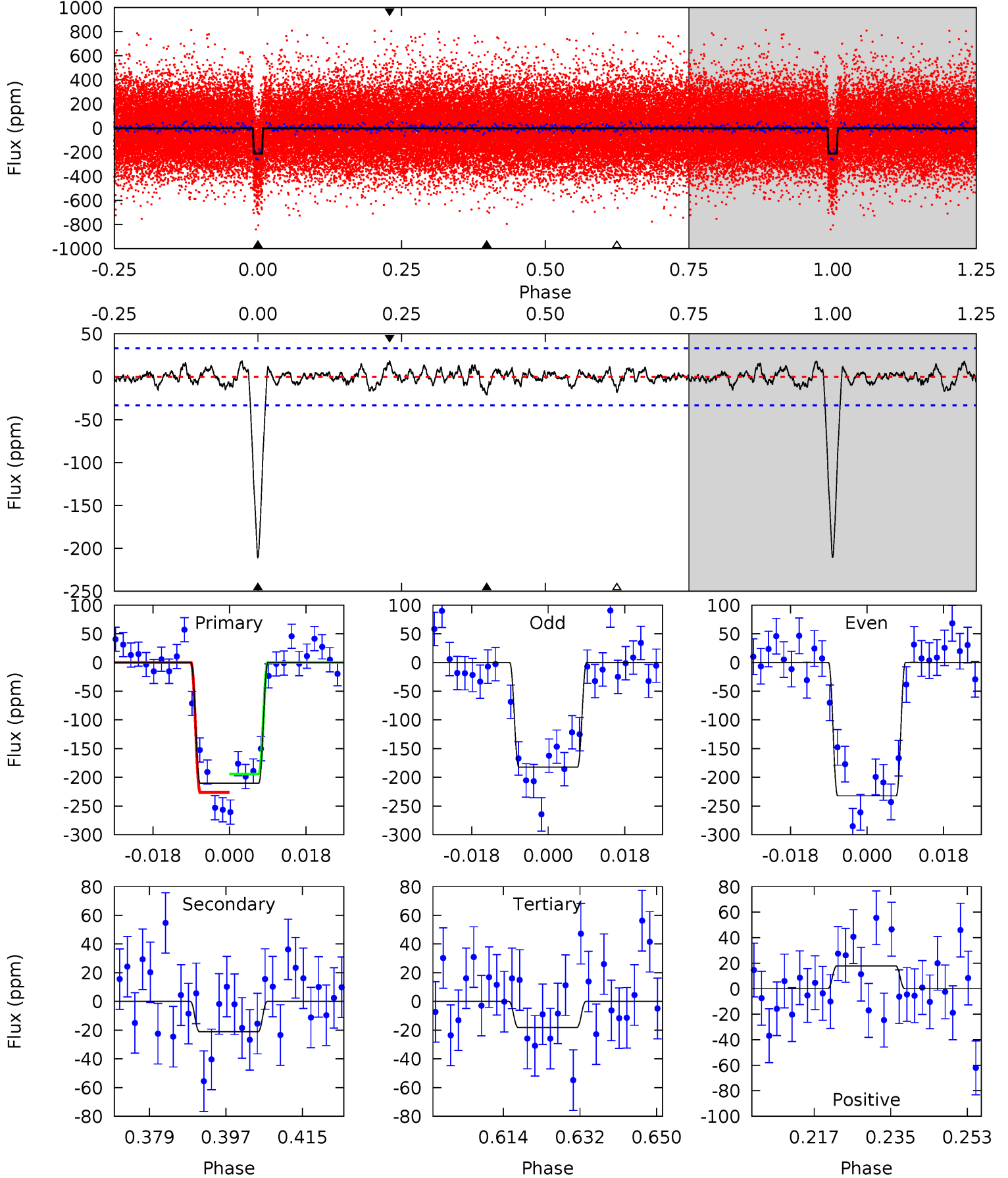
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
32.6	3.29	3.15	2.91	4.90	2.34	1.08	29.4	29.7	0.14	0.38	3.82	1.01	0.09	3.03



# Alt Model-Shift Uniqueness Test

009962455-01, P = 23.199075 Days, E = 119.412440 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
31.1	3.12	2.69	2.65	4.91	2.36	0.90	28.4	28.4	0.43	0.47	3.67	0.98	0.08	2.36



### Stellar Parameters For KIC 009962455

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5416^{+130}_{-87}$	$3.951^{+0.168}_{-0.112}$	$0.000^{+0.150}_{-0.150}$	$1.756^{+0.344}_{-0.344}$	$1.004^{+0.131}_{-0.081}$	$0.261^{+0.220}_{-0.087}$
	+2%/-2%	+4%/-3%	+inf%/-inf%	+20%/-20%	+13%/-8%	+84%/-33%
Source	SPE57	SPE57	SPE57	DSEP		

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

### Secondary Eclipse Parameters for KIC 009962455-01 / KOI 2748.01

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-22 \pm 7$	$3.03^{+0.42}_{-0.38}$	$1107^{+53}_{-65}$	$3423^{+185}_{-205}$	$34^{+15}_{-12}$
Alt.	$-21 \pm 7$	$2.79^{+0.43}_{-0.39}$	$1106^{+55}_{-61}$	$3487^{+222}_{-245}$	$37^{+19}_{-14}$

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



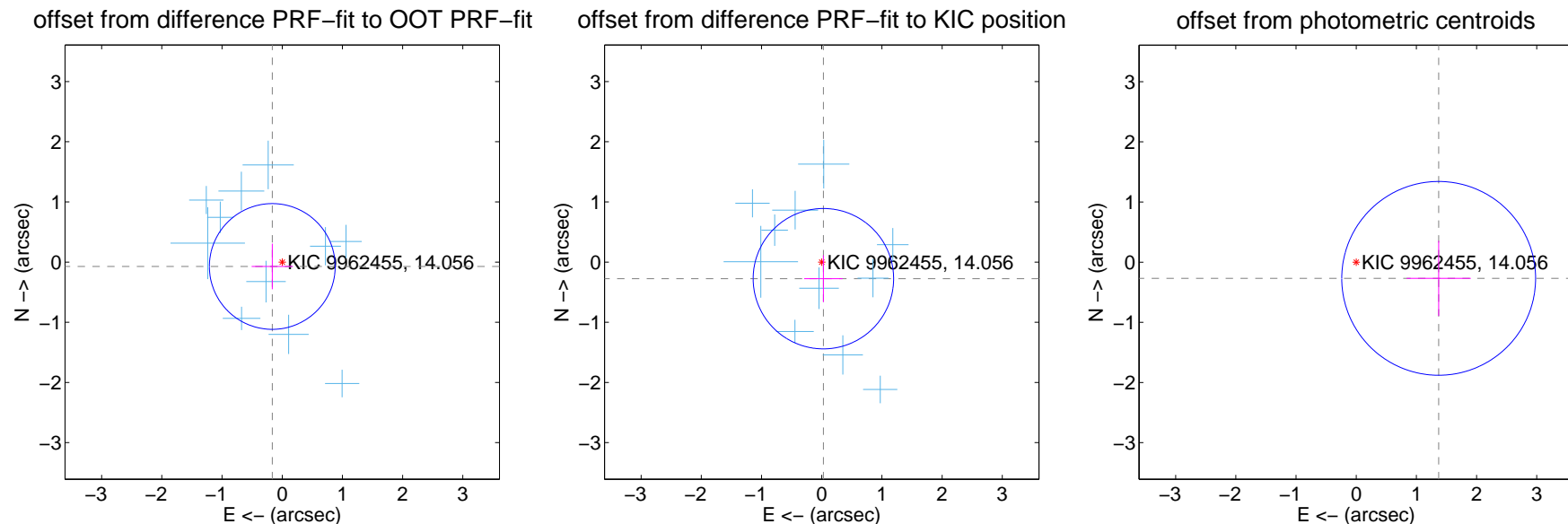
## DV Centroid Data

Supplemental centroid analysis for 009962455-01. Kepler magnitude: 14.06. Transit SNR 23.08

There are 11 quarters with good PRF difference image offsets

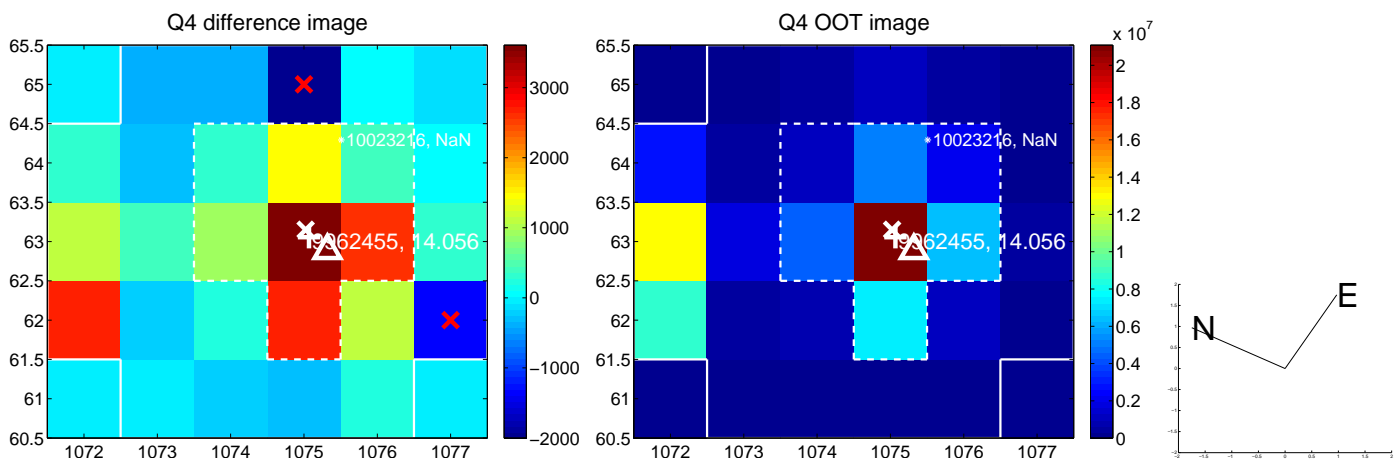
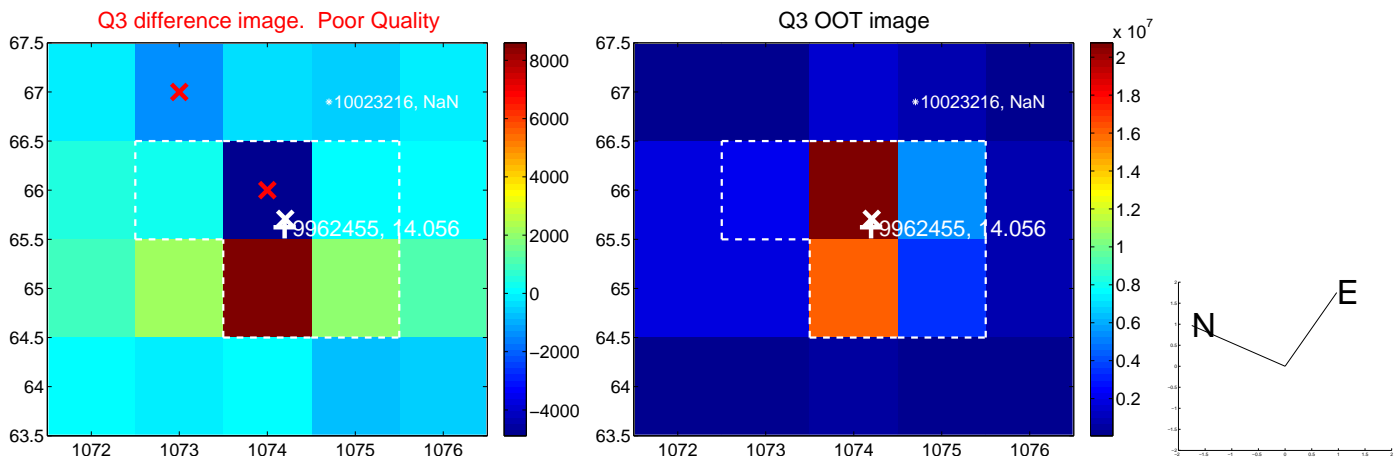
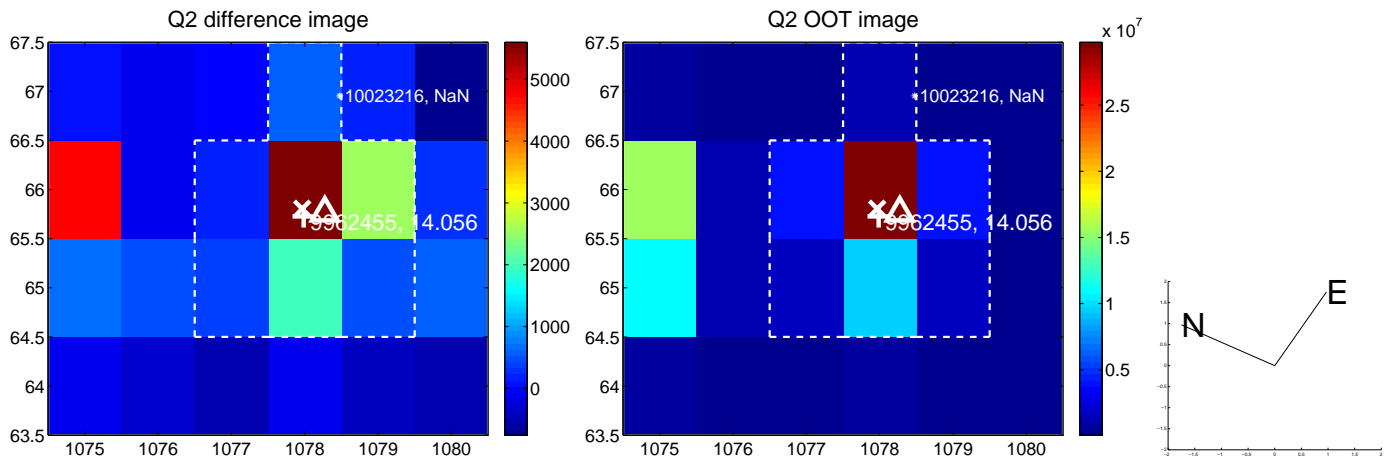
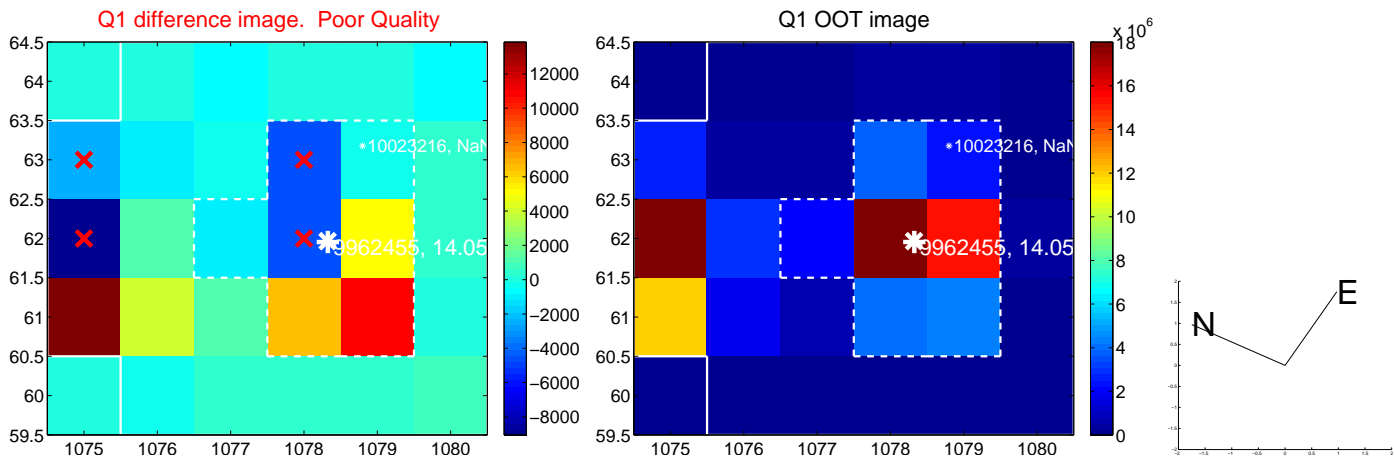
The direct PRF centroid is offset from the target star catalog position by about 0.10 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.181 \pm 0.348$	0.52	$0.165 \pm 0.342$	$-0.073 \pm 0.379$
PRF-fit source offset from KIC position	$0.277 \pm 0.389$	0.71	$-0.028 \pm 0.319$	$-0.276 \pm 0.389$
photometric centroid source offset	$1.40 \pm 0.54$	2.60	$-1.37 \pm 0.53$	$-0.27 \pm 0.62$

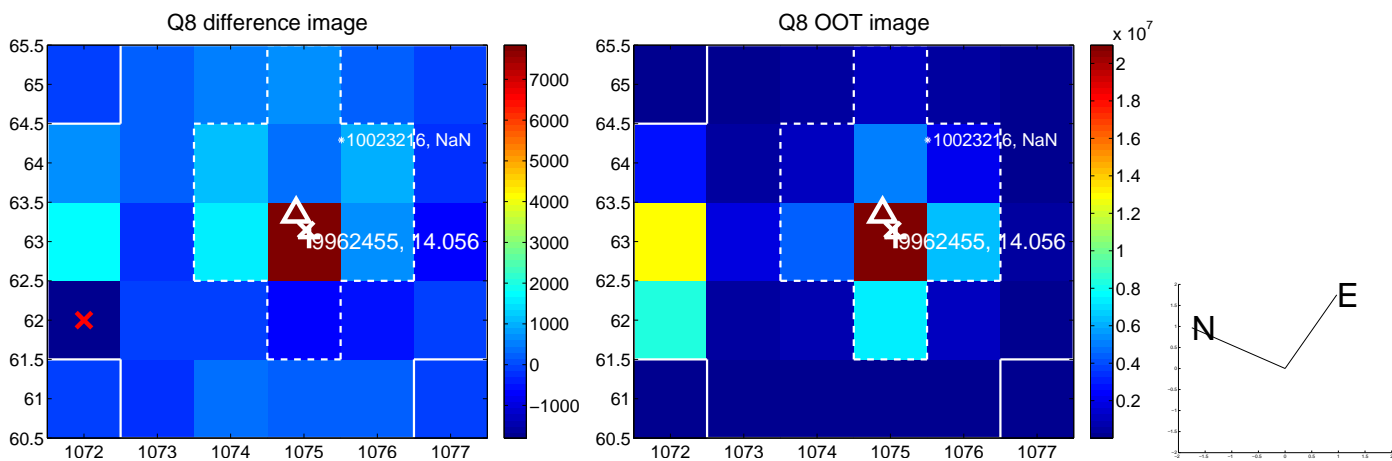
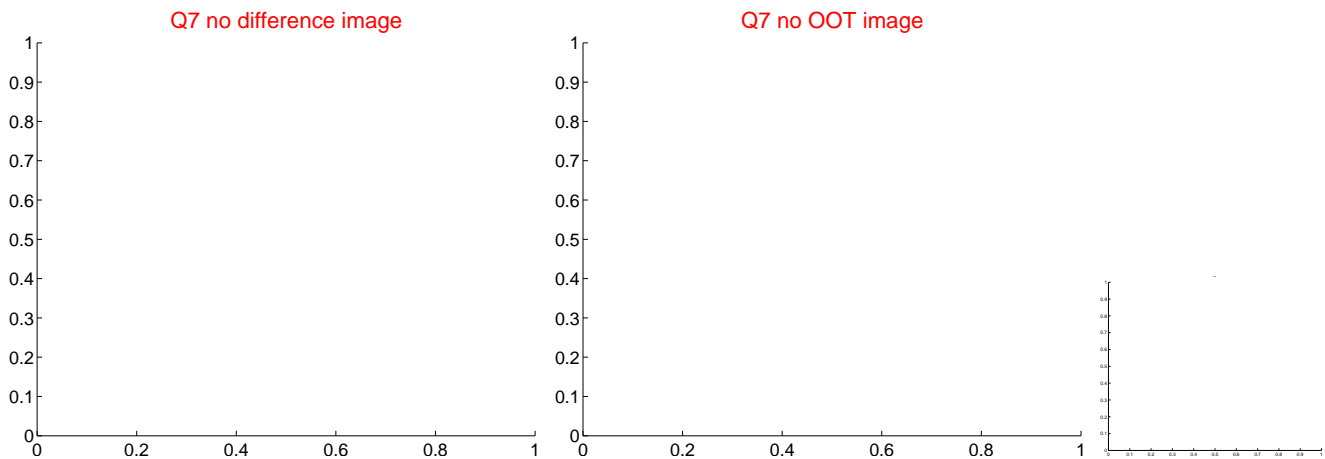
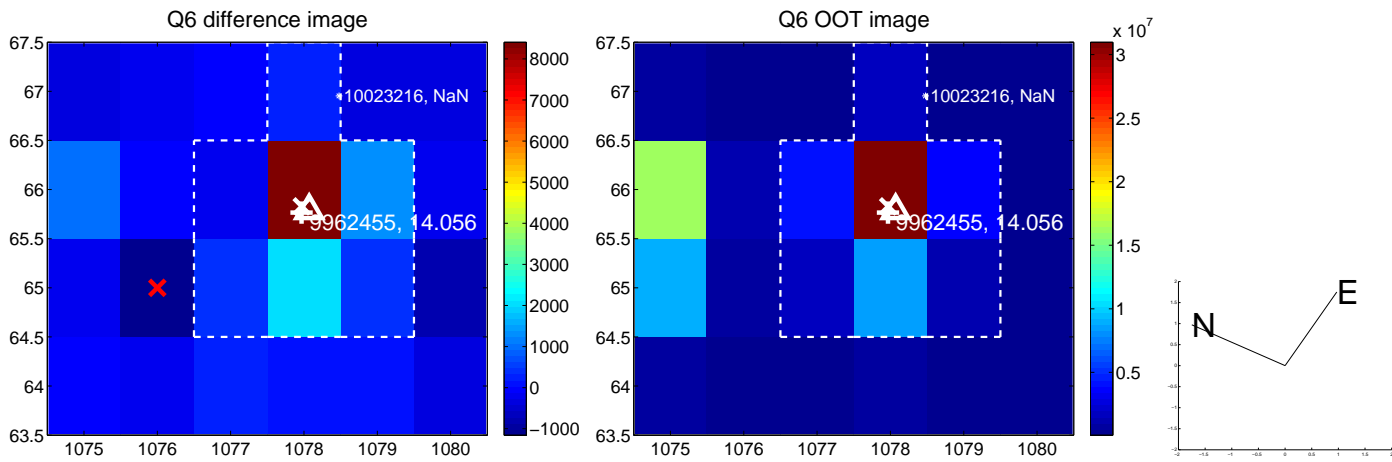
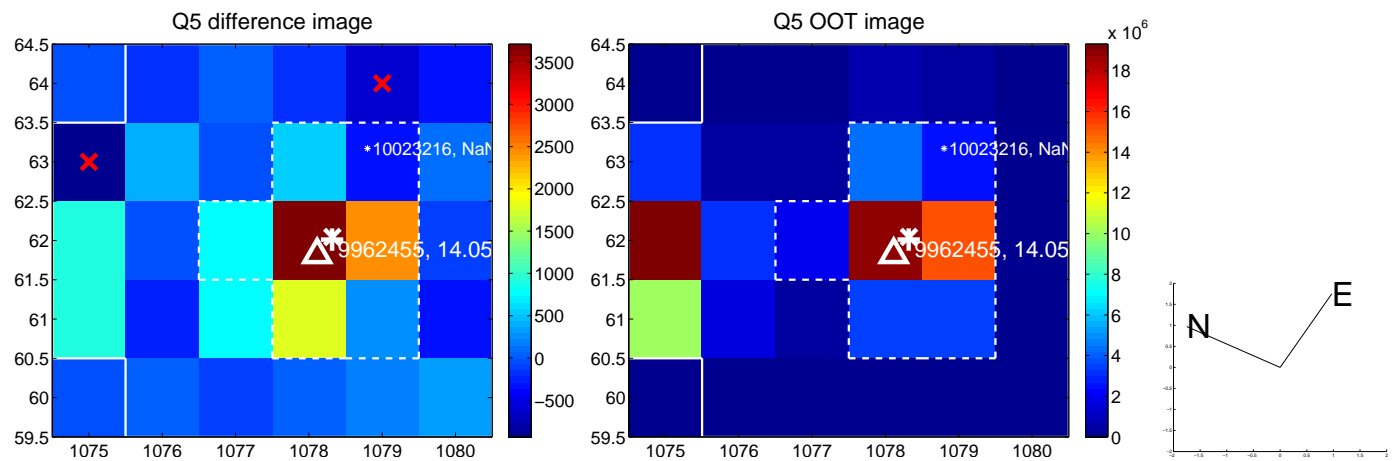


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

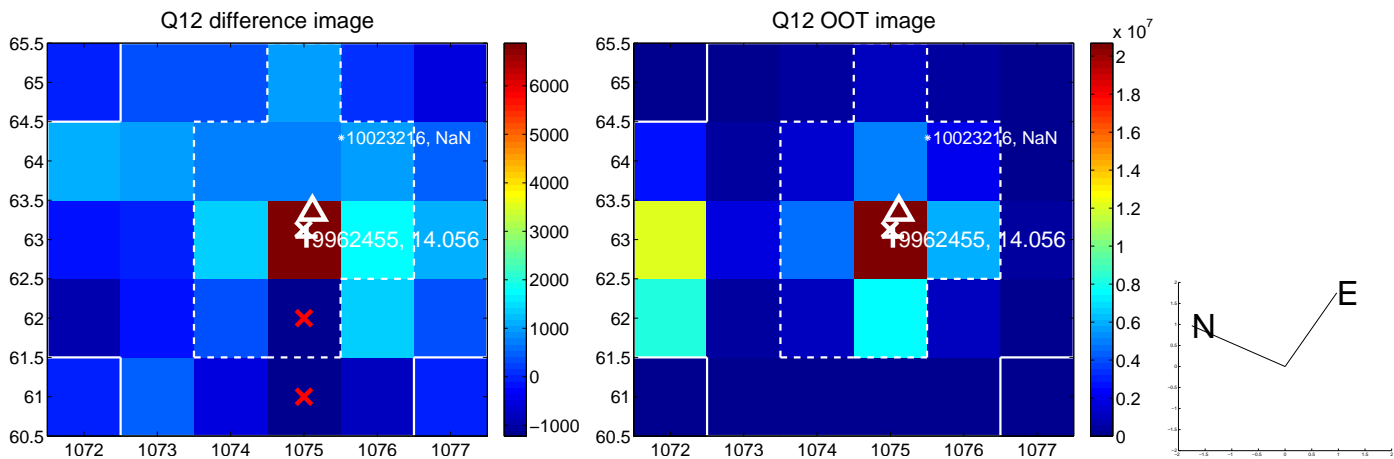
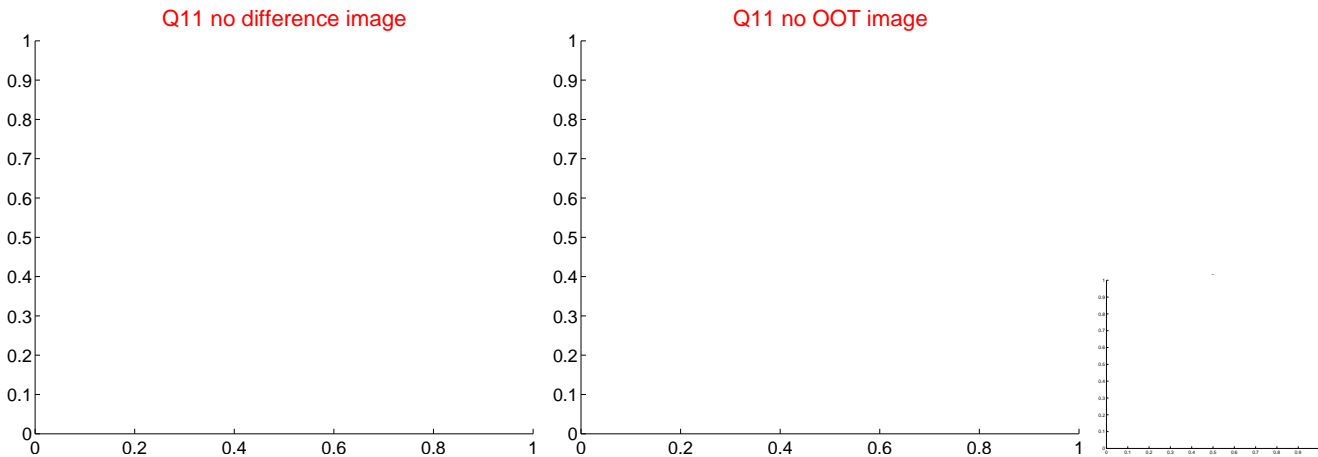
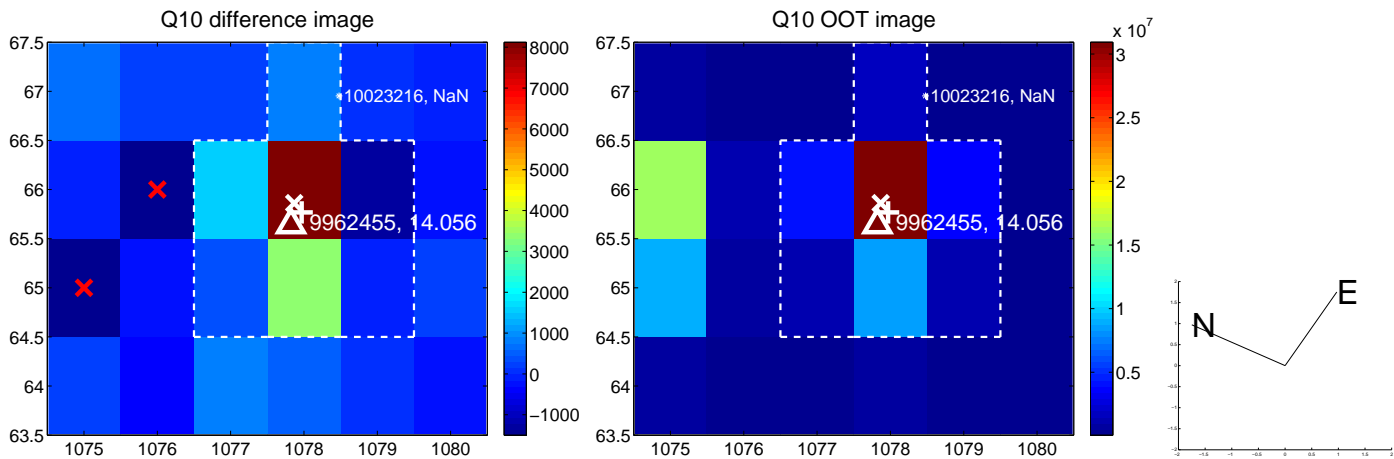
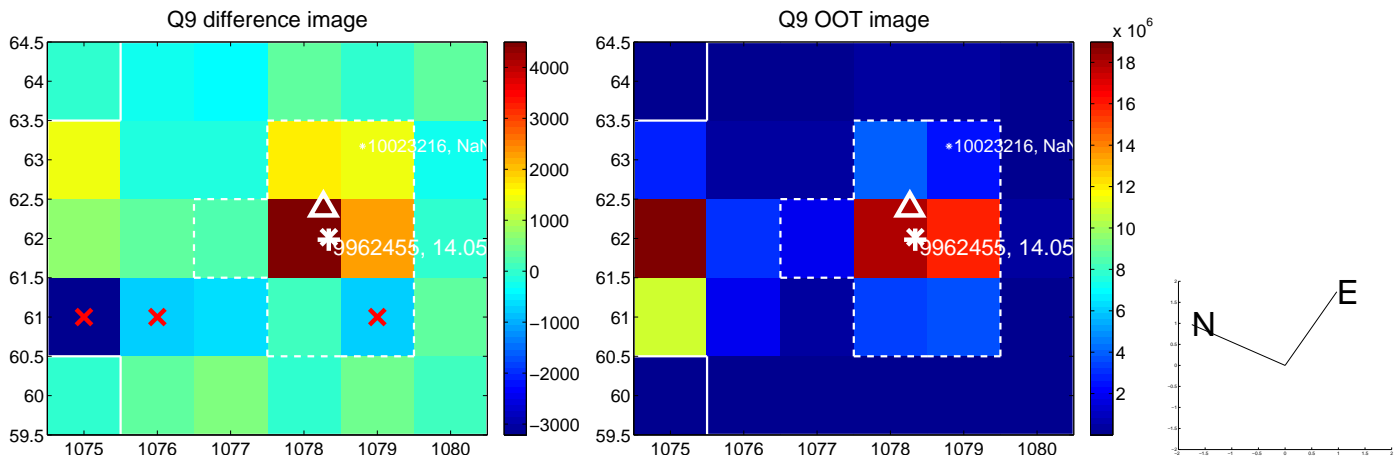
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



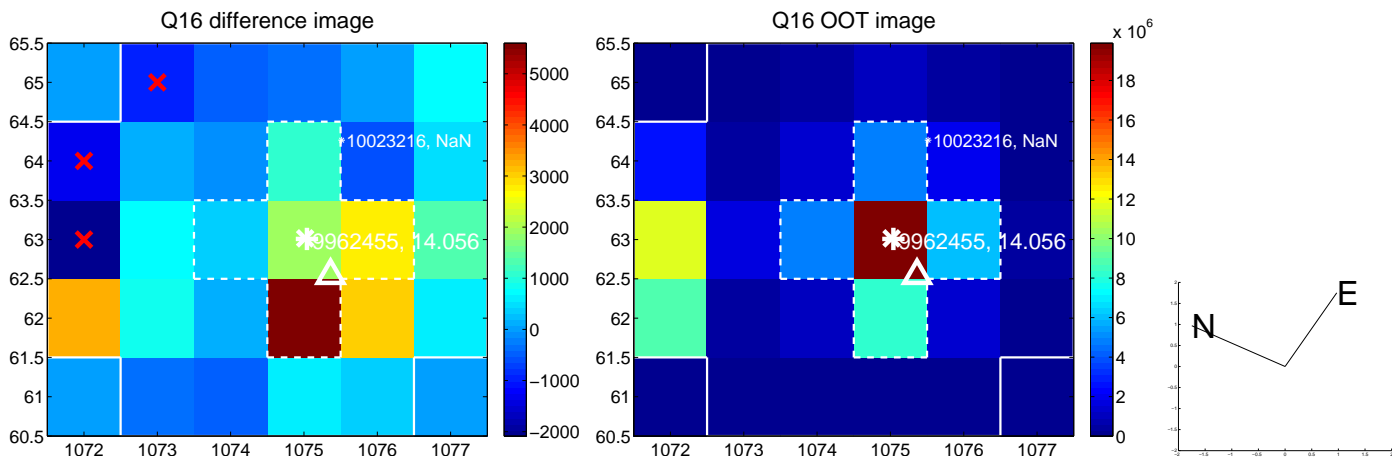
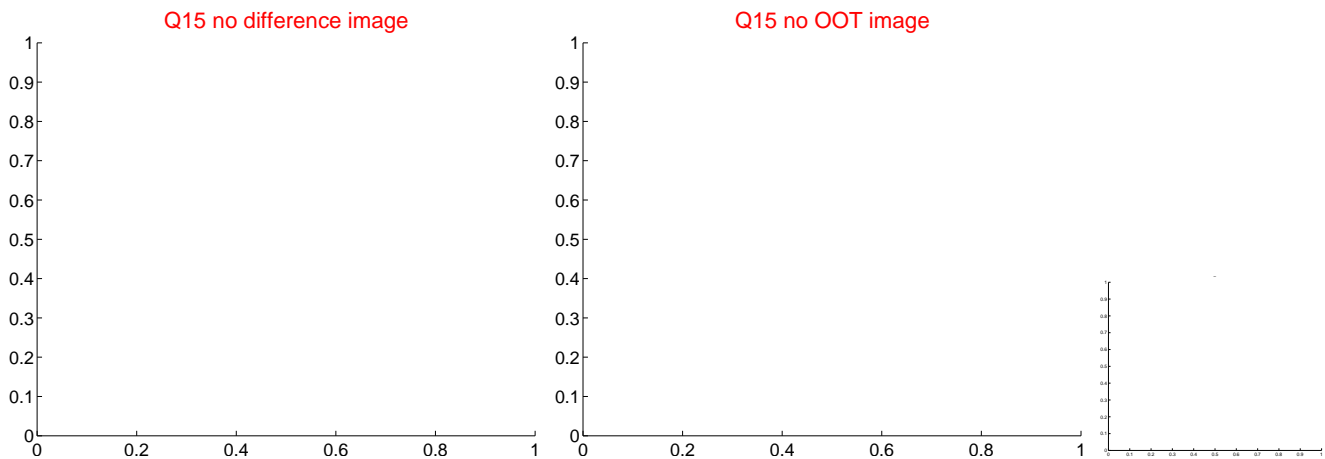
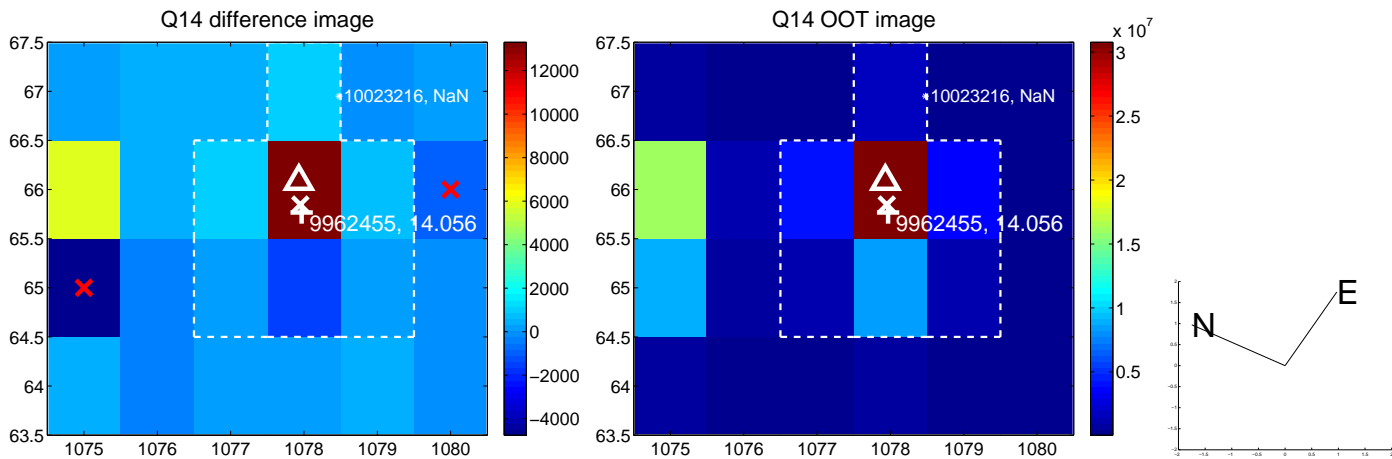
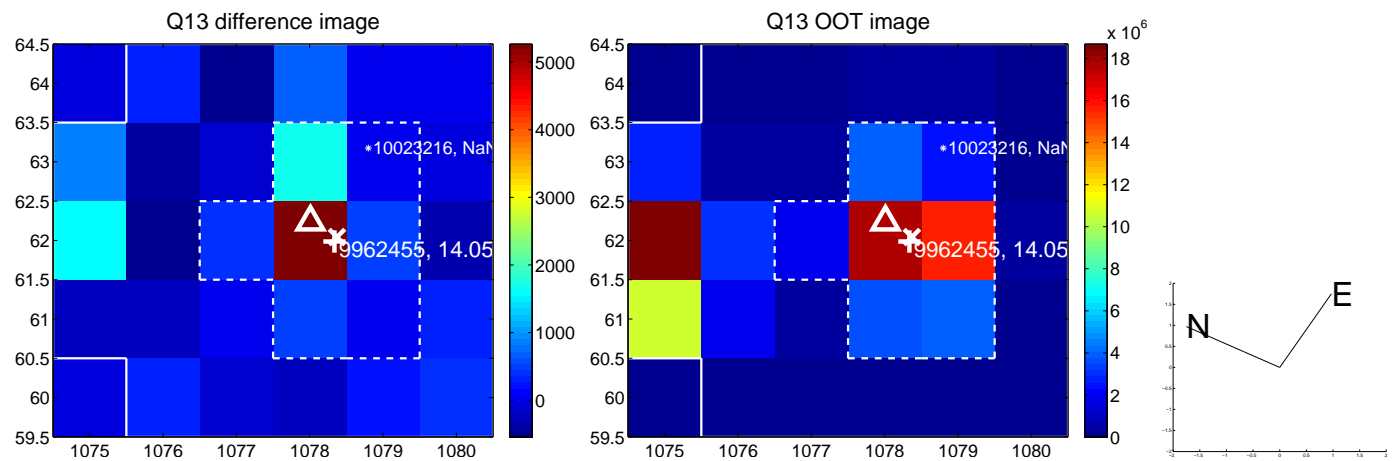
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

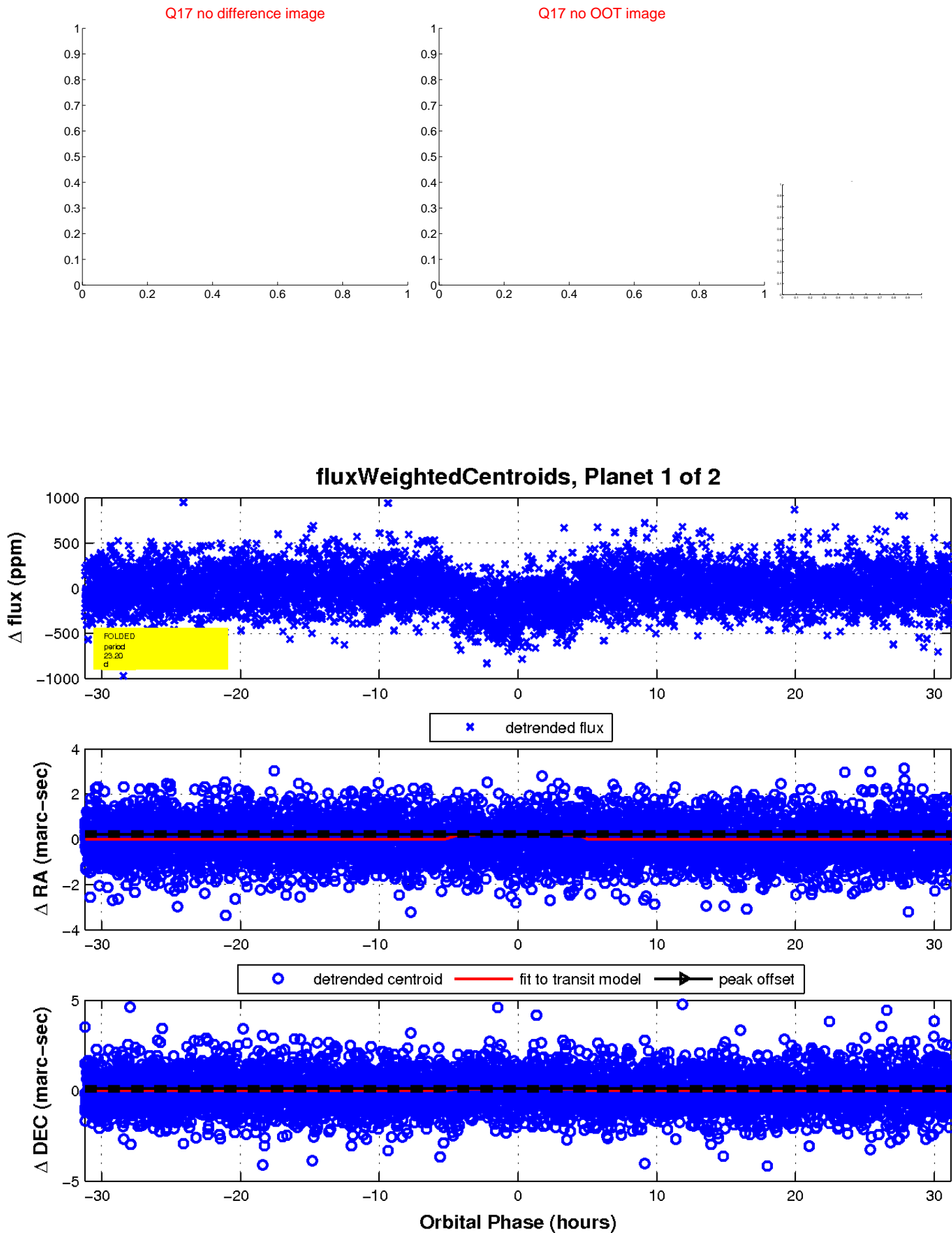


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



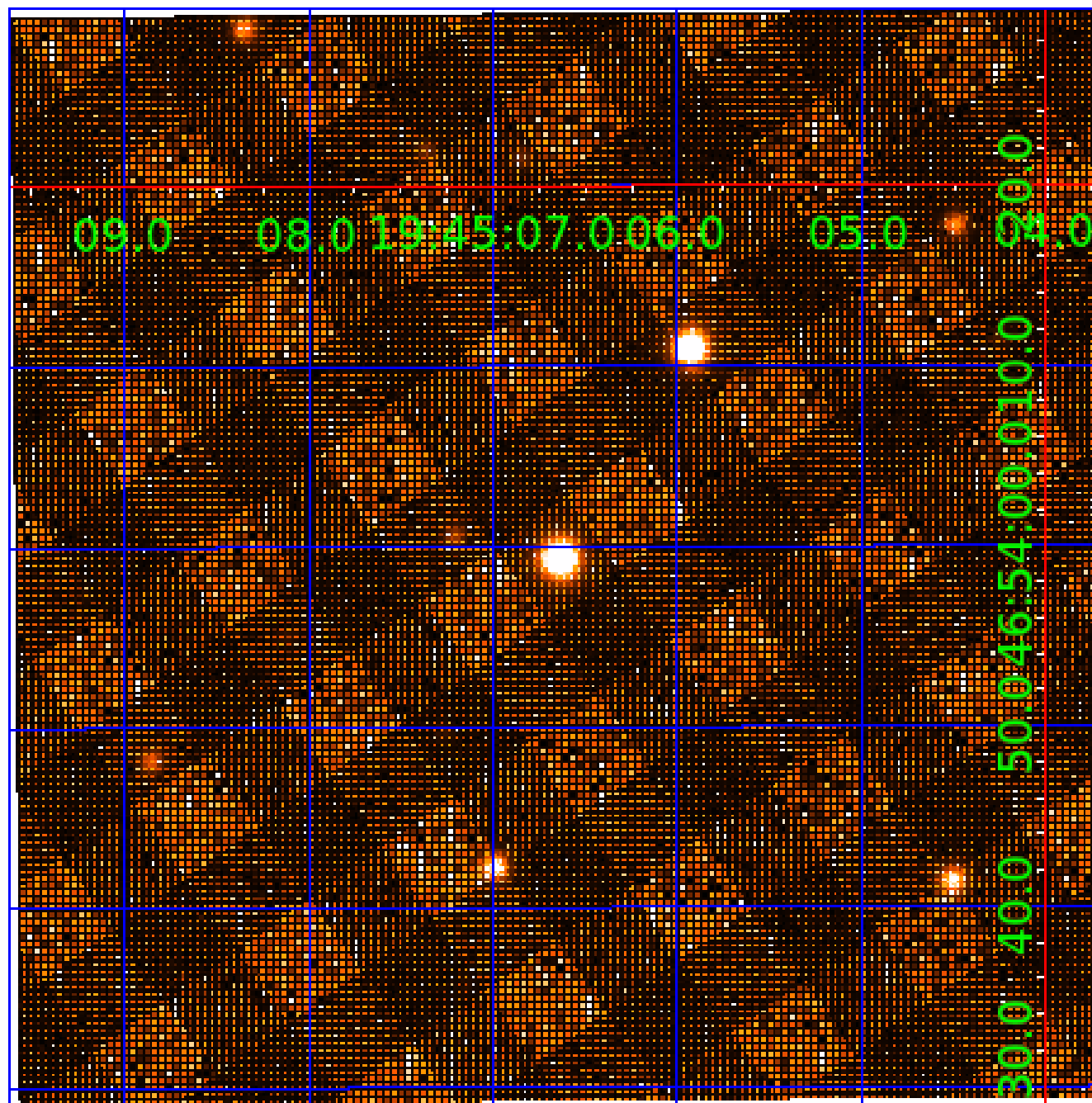


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 009962455

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009962455-01	OBS	2748.01	23.198640	142.625364	213.8	10.405	22.4	23.1	1.76	5416	3.06	93.47
009962455-02	OBS	2748.02	5.777183	137.168973	128.1	2.380	13.9	15.5	1.76	5416	2.14	596.58

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009962455-01	OBS	PC	0.93	0	0	0	0	NO_COMMENT
009962455-02	OBS	PC	0.99	0	0	0	0	NO_COMMENT

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

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

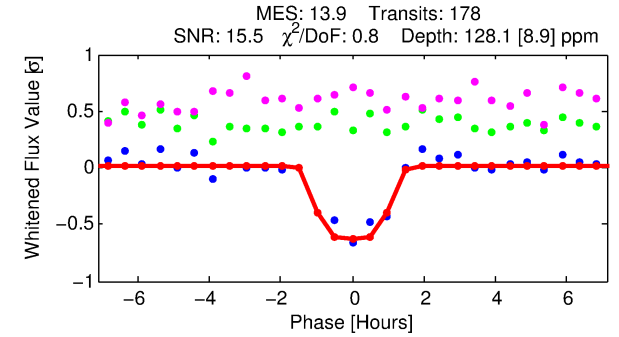
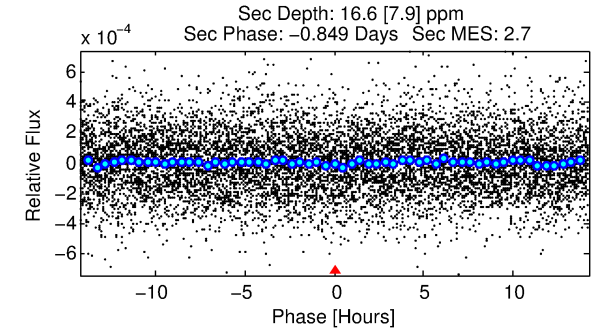
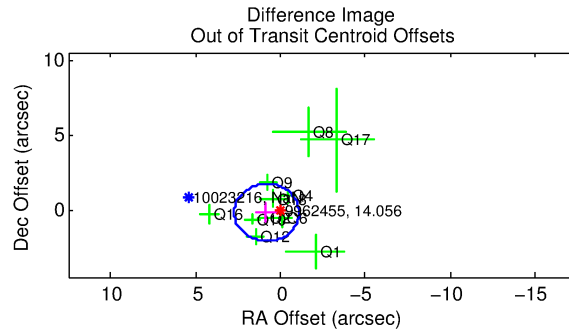
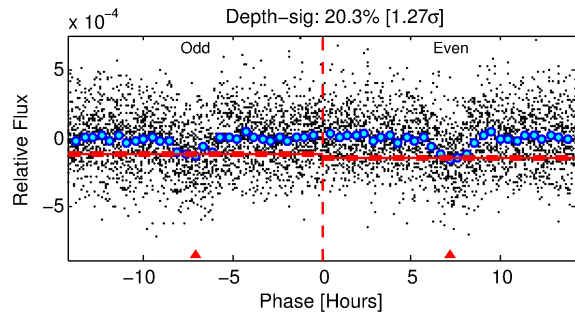
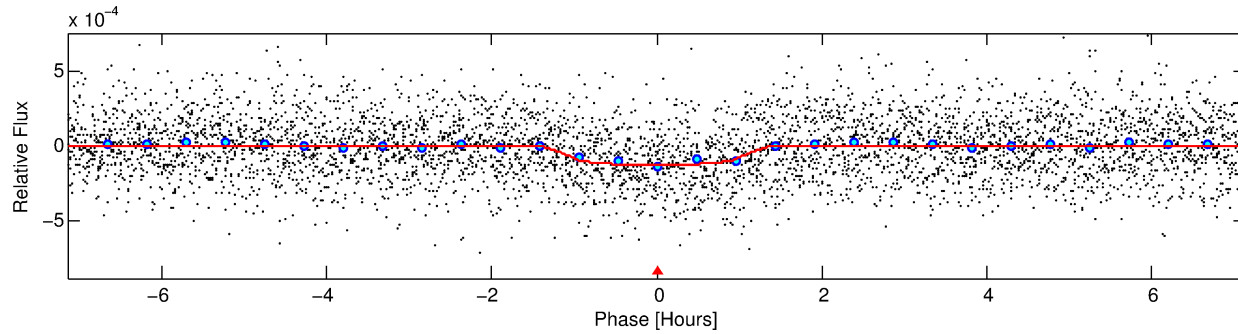
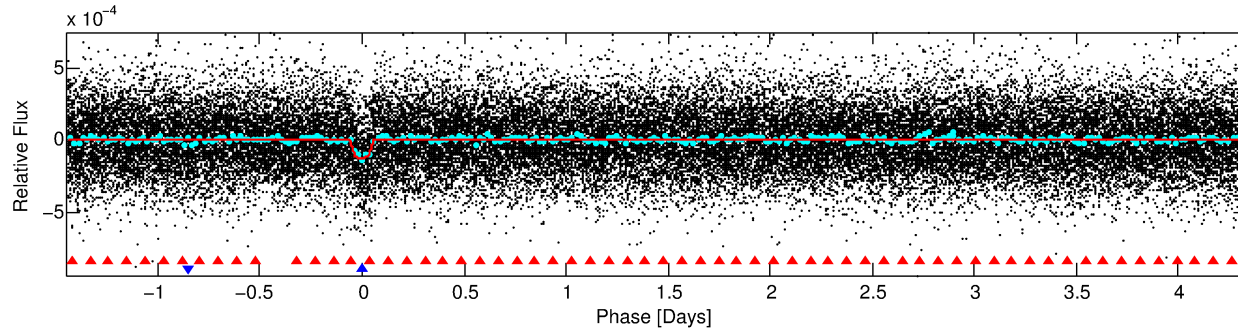
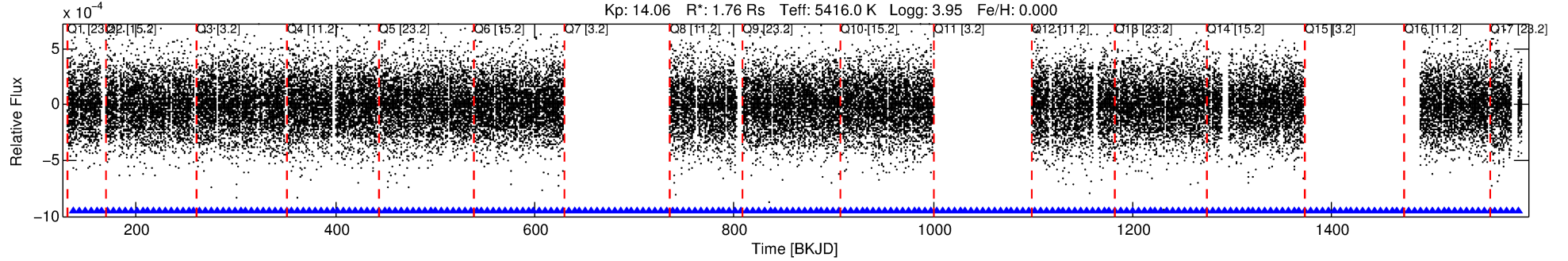
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 009962455-02

No Significant Match Found

# DV One-Page Summary

KIC: 9962455 Candidate: 2 of 2 Period: 5.777 d  
KOI: K02748.02 Corr: 0.978



## DV Fit Results:

Period = 5.77718 [0.00003] d  
Epoch = 137.1690 [0.0032] BKJD  
Rp/R\* = 0.0112 [0.0071]  
a/R\* = 13.21 [33.25]  
b = 0.72 [1.73]  
Seff = 596.58 [181.72]  
Teq = 1260 [96] K  
Rp = 2.14 [1.43] Re  
a = 0.0631 [0.0116] AU  
Ag = 7.97 [11.10] [0.63 $\sigma$ ]  
Teffp = 3274 [1118] K [1.80 $\sigma$ ]

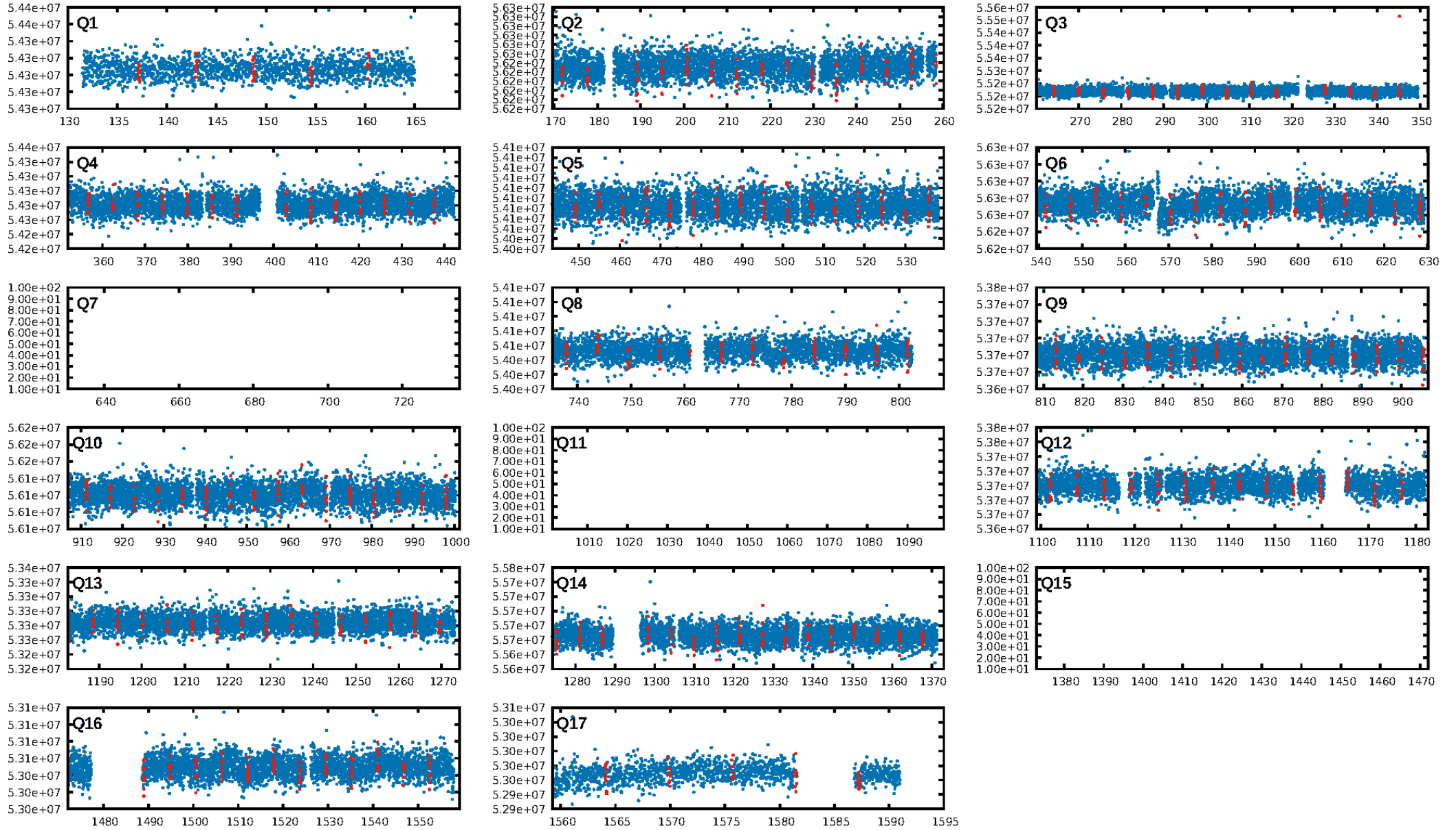
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [39.17 $\sigma$ ]  
ModelChiSquare2-sig: 100.0%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 4.25e-42  
RollingBand-fgt: 1.00 [170/170]  
GhostDiagnostic-chr: 3.544  
Centroid-sig: 50.3%  
Centroid-so: 1.099 arcsec [1.36 $\sigma$ ]  
OotOffset-rm: 0.836 arcsec [1.31 $\sigma$ ]  
KicOffset-rm: 0.734 arcsec [0.95 $\sigma$ ]  
OotOffset-st: 3/0/4/4 [11]  
KicOffset-st: 3/0/4/4 [11]  
DiffImageQuality-fgm: 0.73 [8/11]  
DiffImageOverlap-fno: 1.00 [14/14]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 00:59:50 Z

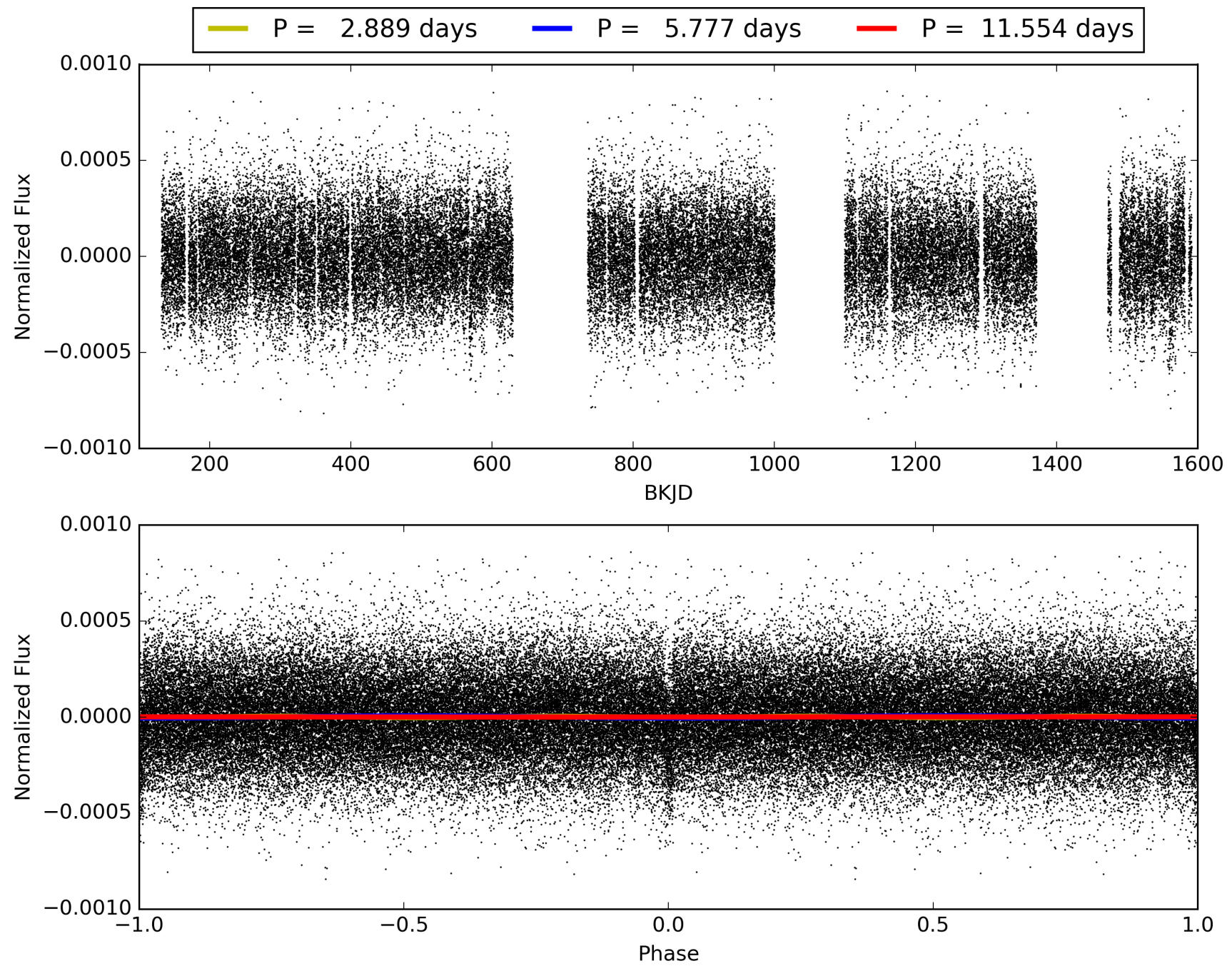
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 009962455-02, PDC Light Curves



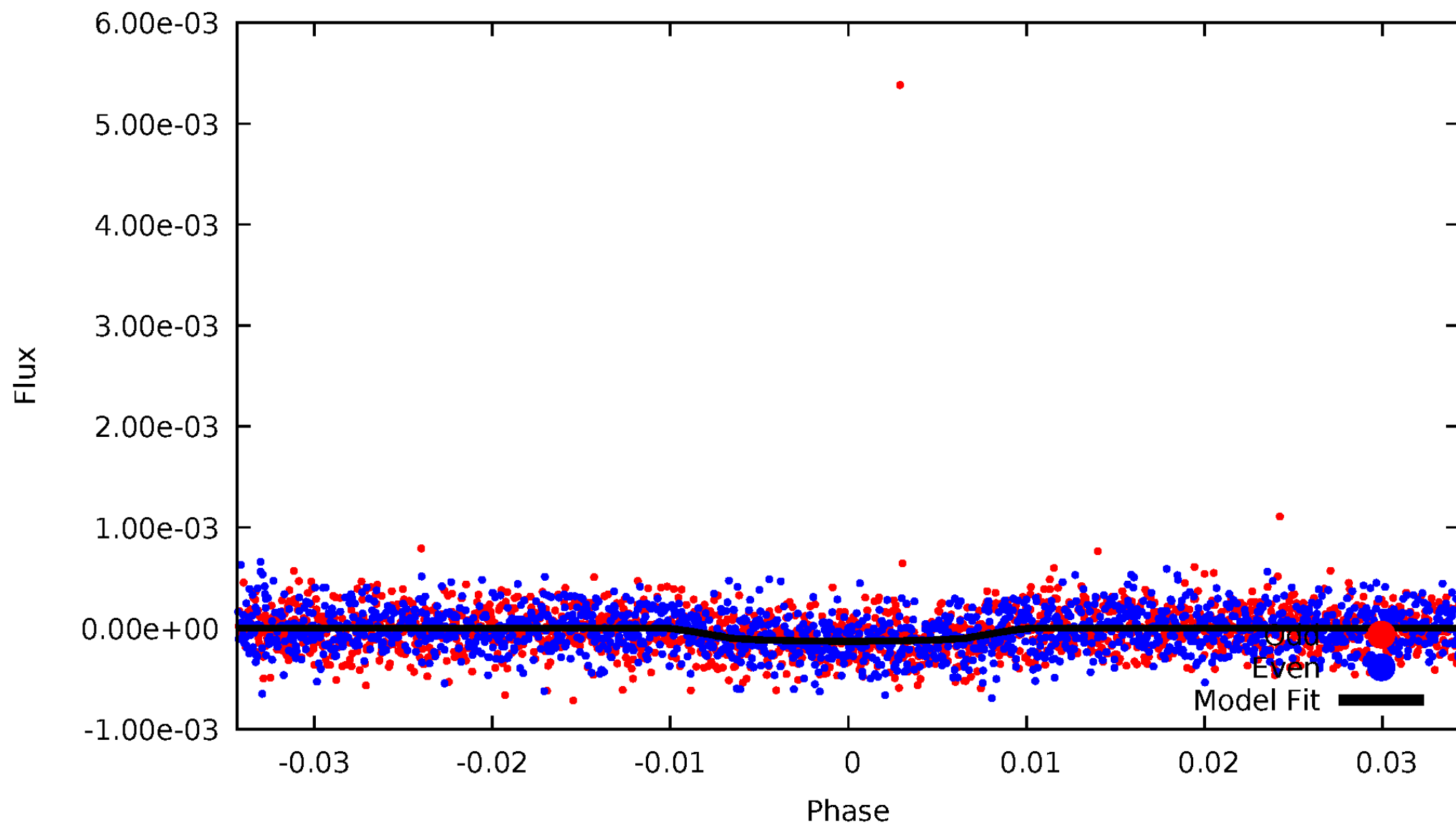


TCE 009962455-02



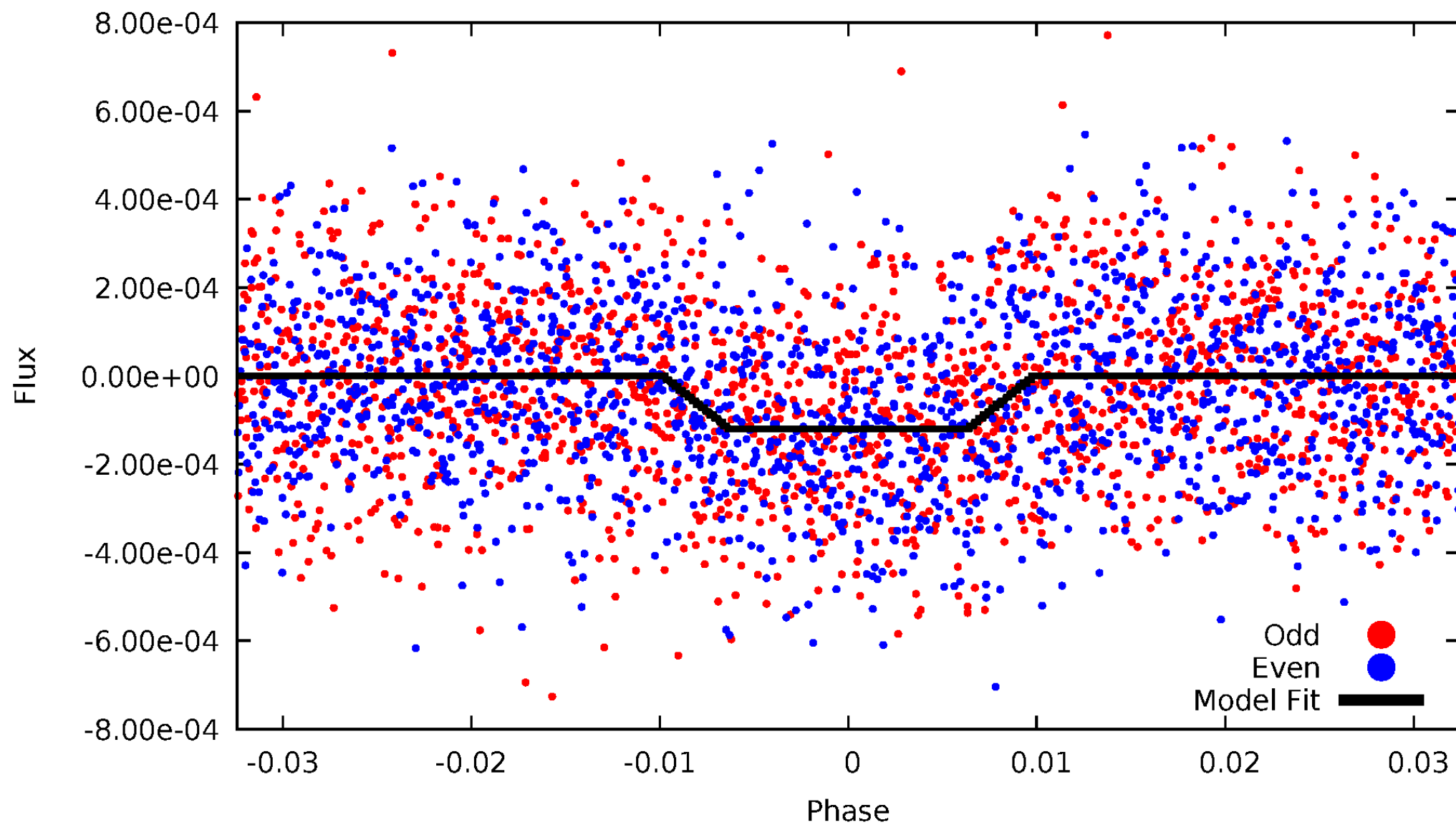
# DV Odd/Even

TCE 009962455-02



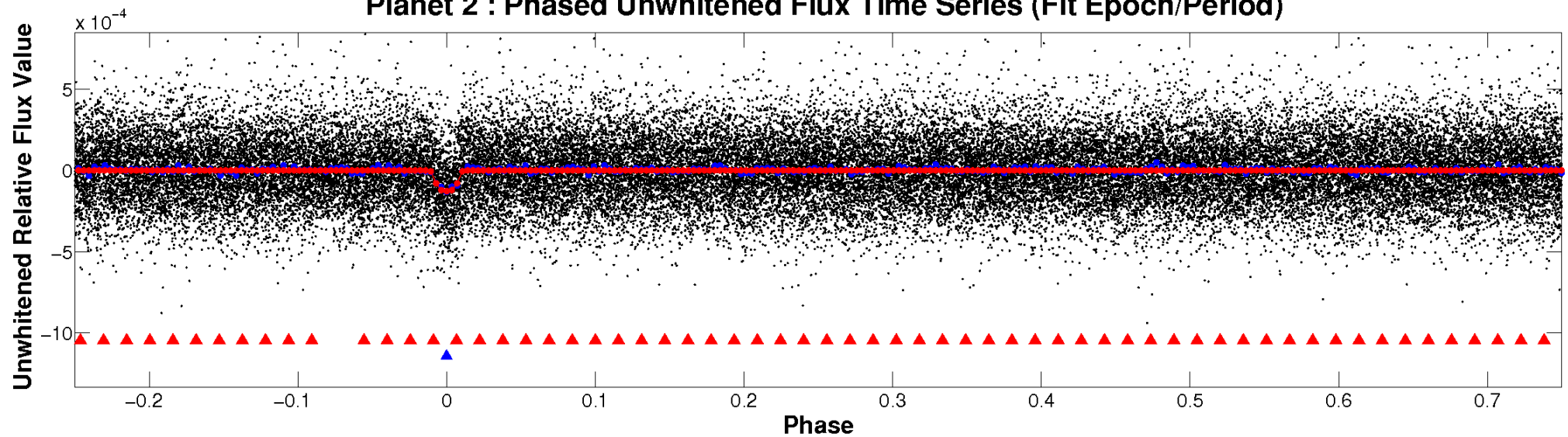
# ALT Odd/Even

TCE 009962455-02

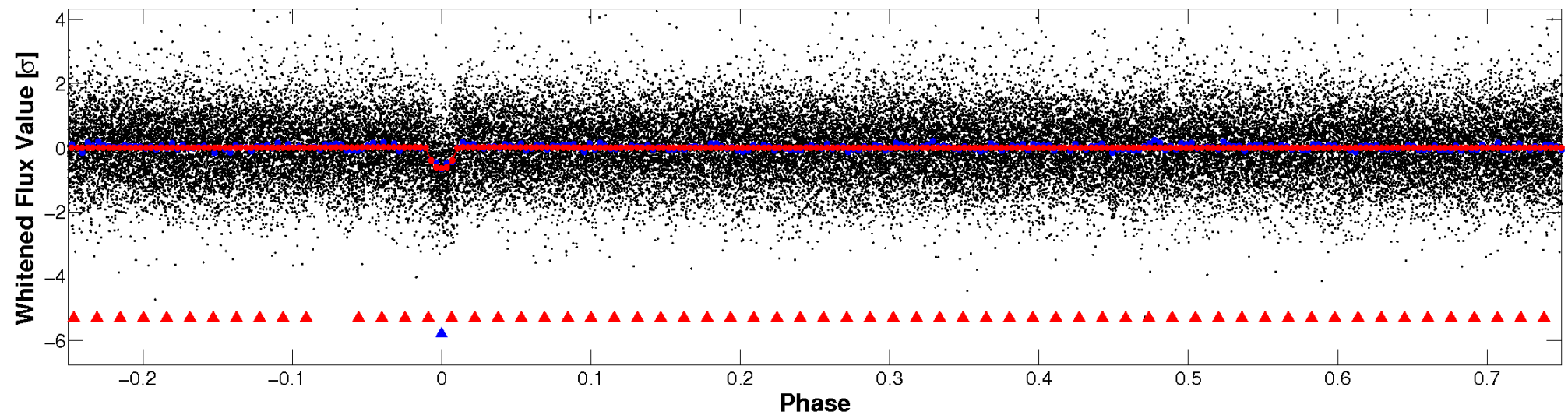


# Non-Whitened Vs. Whitened Light Curve

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

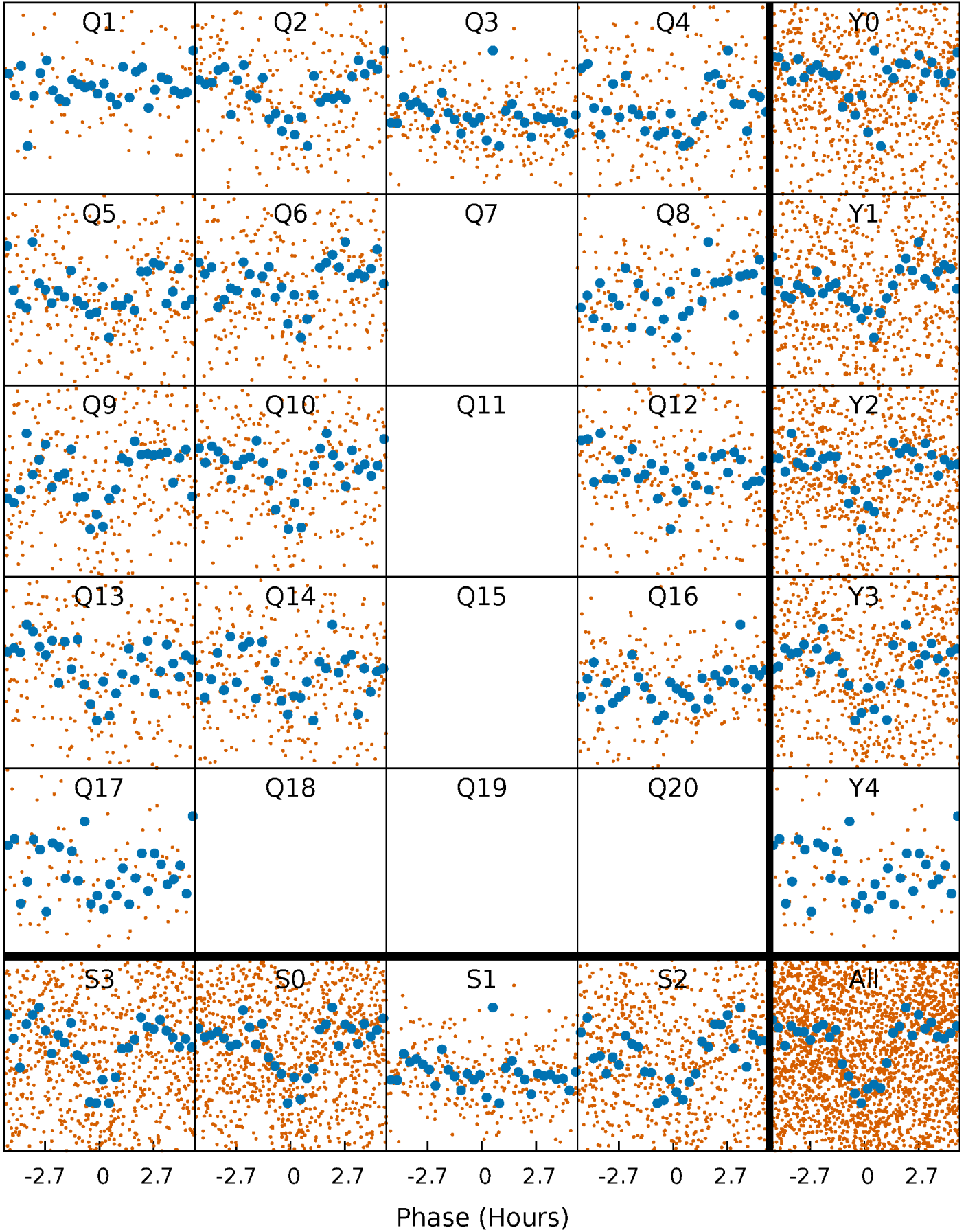


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

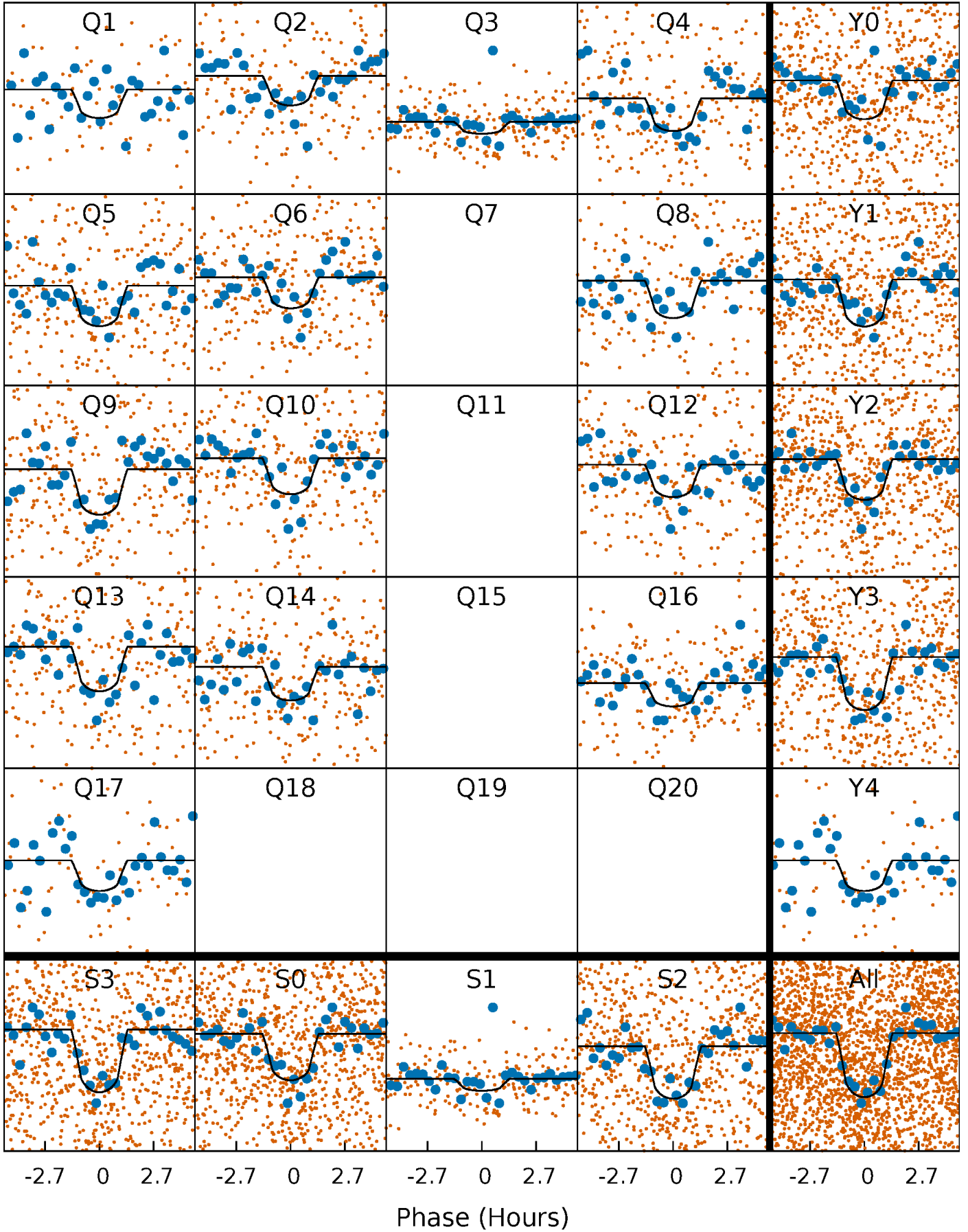
TCE 009962455-02   P= 5.777183 Days    $T_0=137.168973$  (BKJD)





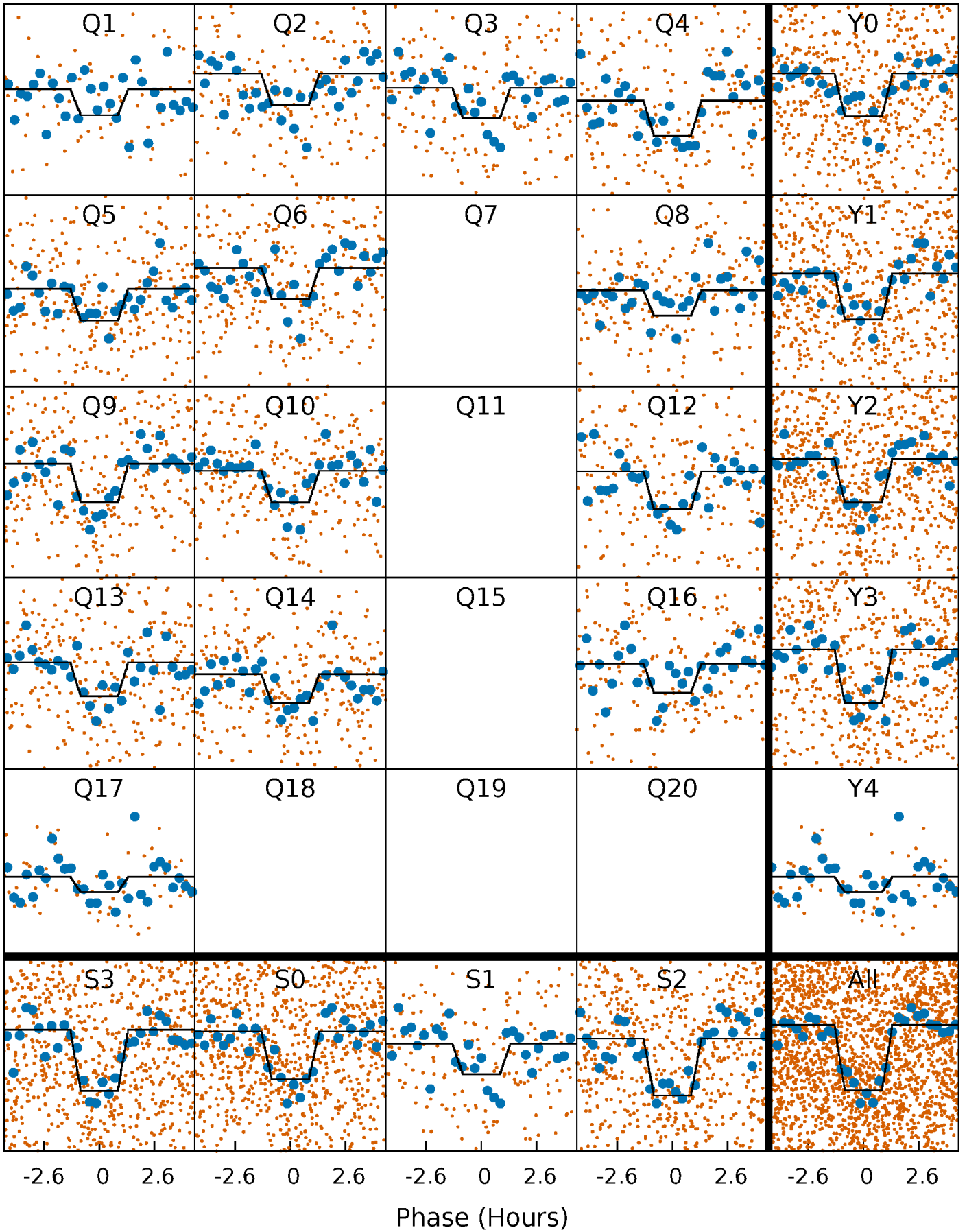
# DV Quarter-Phased Transit Curves

TCE 009962455-02 P= 5.777183 Days  $T_0=137.168973$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

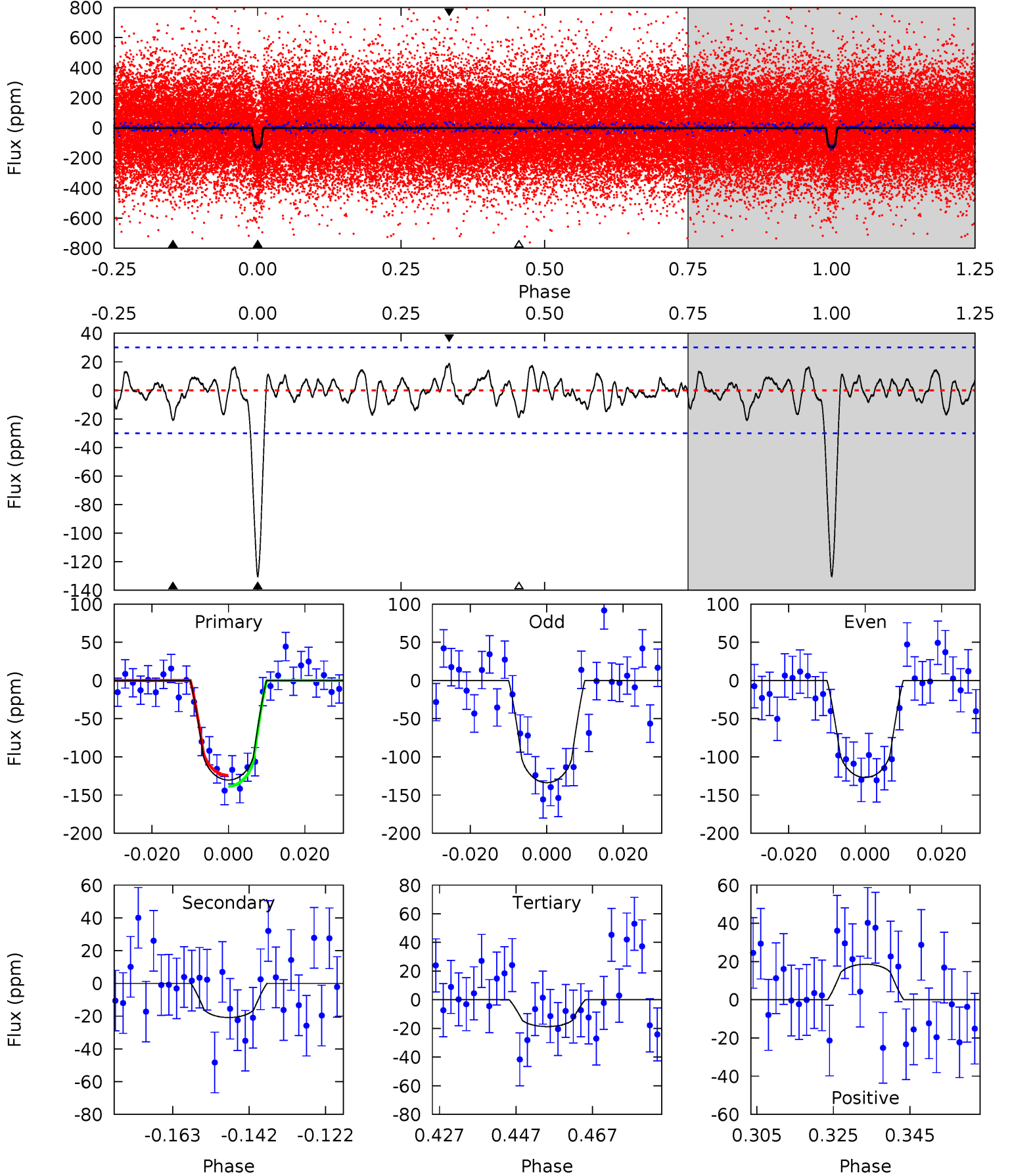
TCE 009962455-02 P= 5.777185 Days  $T_0=137.169971$  (BKJD)



# DV Model-Shift Uniqueness Test

009962455-02, P = 5.777183 Days, E = 131.391790 Days

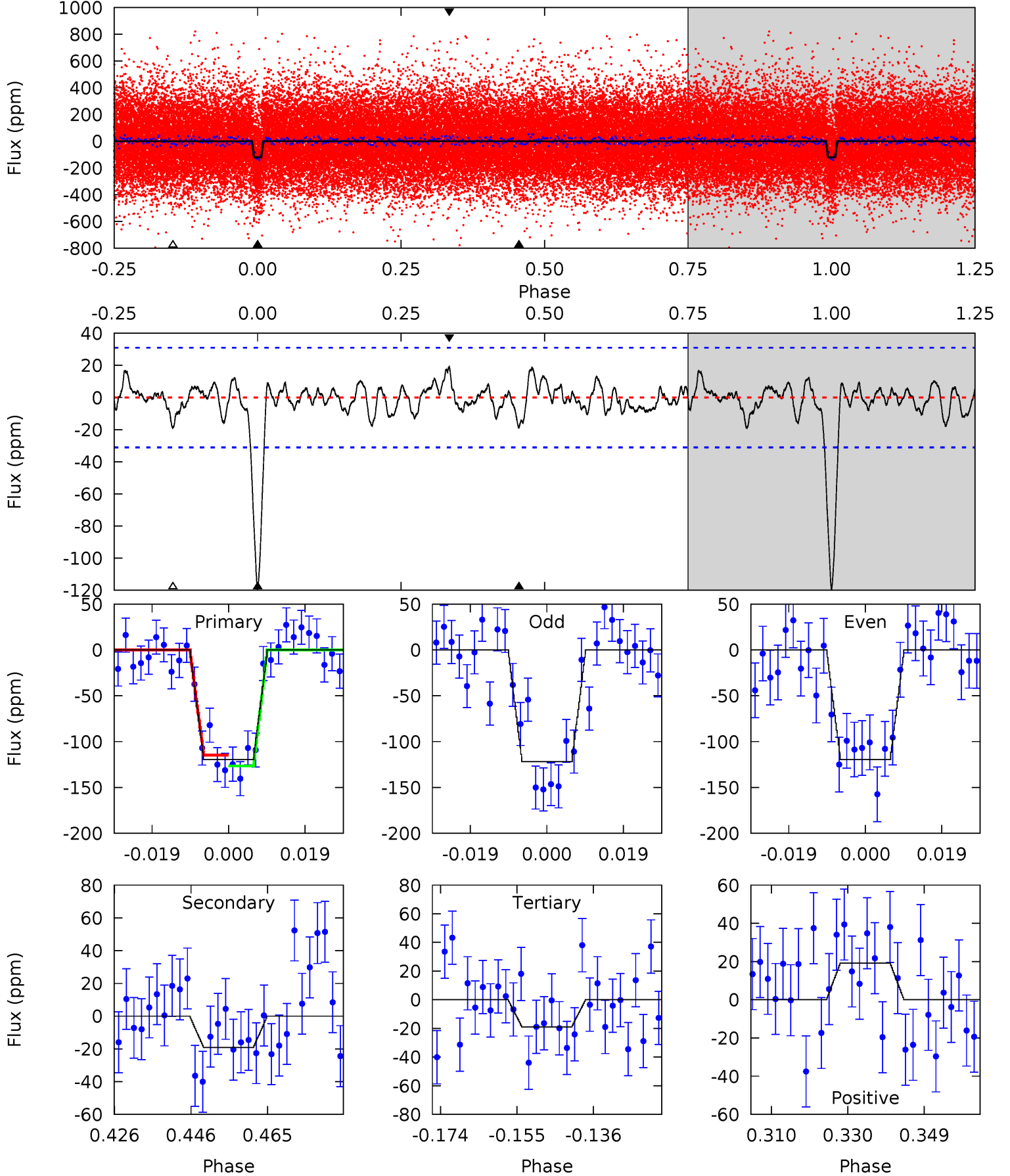
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
21.2	3.39	3.04	3.02	4.89	2.32	1.15	18.1	18.2	0.35	0.37	0.55	0.89	0.12	1.16



# Alt Model-Shift Uniqueness Test

009962455-02, P = 5.777185 Days, E = 131.392786 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
18.9	3.02	2.99	3.04	4.90	2.34	1.08	15.9	15.8	0.03	-0.02	0.19	0.97	0.14	0.93



### Stellar Parameters For KIC 009962455

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5416^{+130}_{-87}$	$3.951^{+0.168}_{-0.112}$	$0.000^{+0.150}_{-0.150}$	$1.756^{+0.344}_{-0.344}$	$1.004^{+0.131}_{-0.081}$	$0.261^{+0.220}_{-0.087}$
	+2%/-2%	+4%/-3%	+inf%/-inf%	+20%/-20%	+13%/-8%	+84%/-33%
Source	SPE57	SPE57	SPE57	DSEP		

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

### Secondary Eclipse Parameters for KIC 009962455-02 / KOI 2748.02

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-21 \pm 6$	$2.15^{+1.46}_{-1.22}$	$1755^{+89}_{-96}$	$3755^{+1340}_{-571}$	$9.648^{+41.041}_{-6.185}$
Alt.	$-19 \pm 6$	$2.19^{+1.28}_{-1.30}$	$1759^{+91}_{-96}$	$3688^{+1437}_{-565}$	$8.421^{+39.306}_{-5.272}$

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

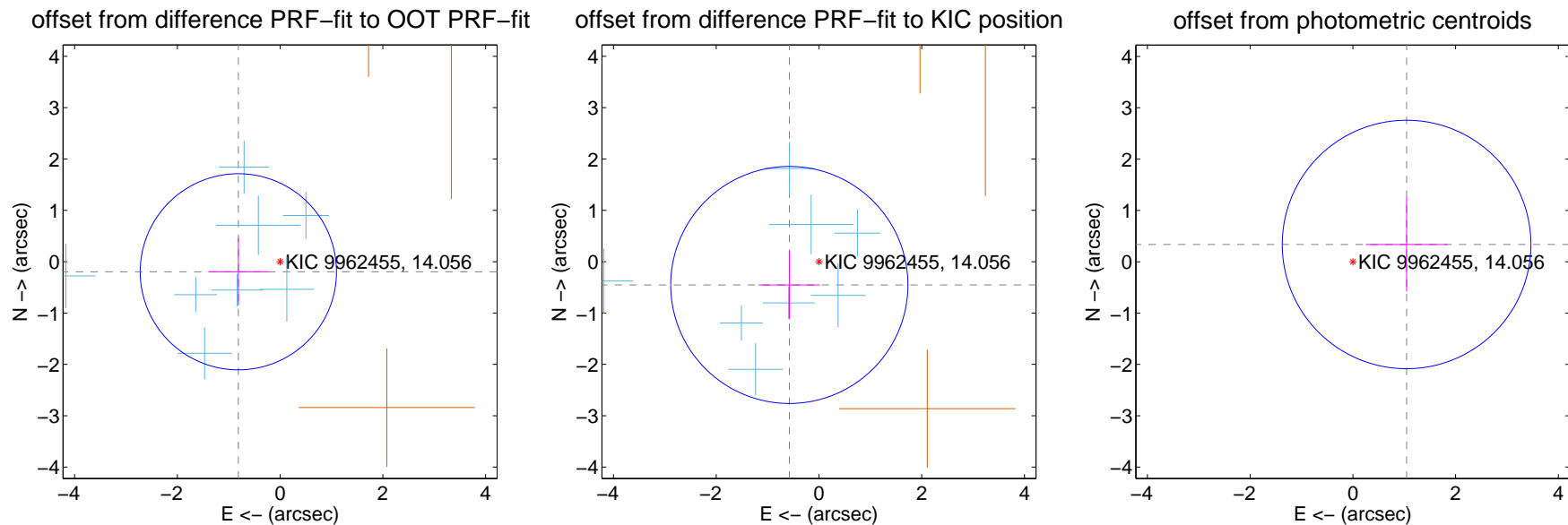
## DV Centroid Data

Supplemental centroid analysis for 009962455-02. Kepler magnitude: 14.06. Transit SNR 15.54

There are 8 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.11 arcsec

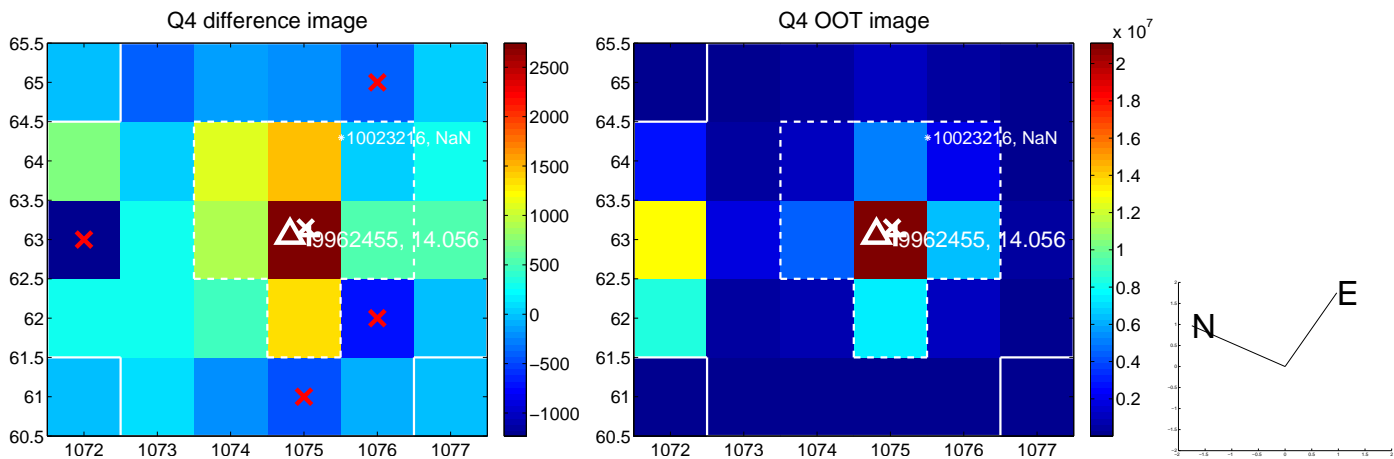
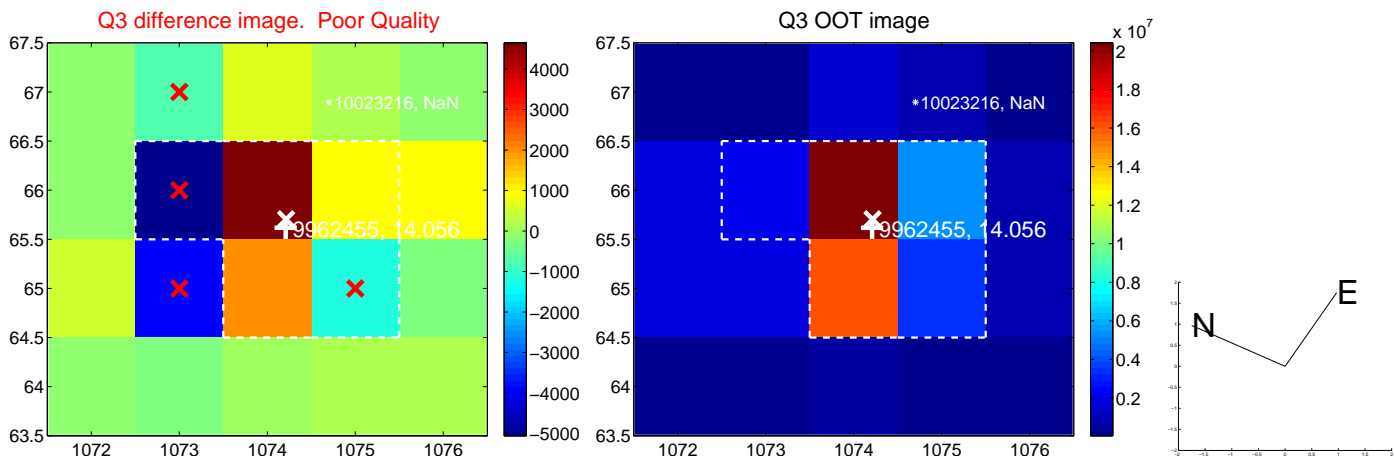
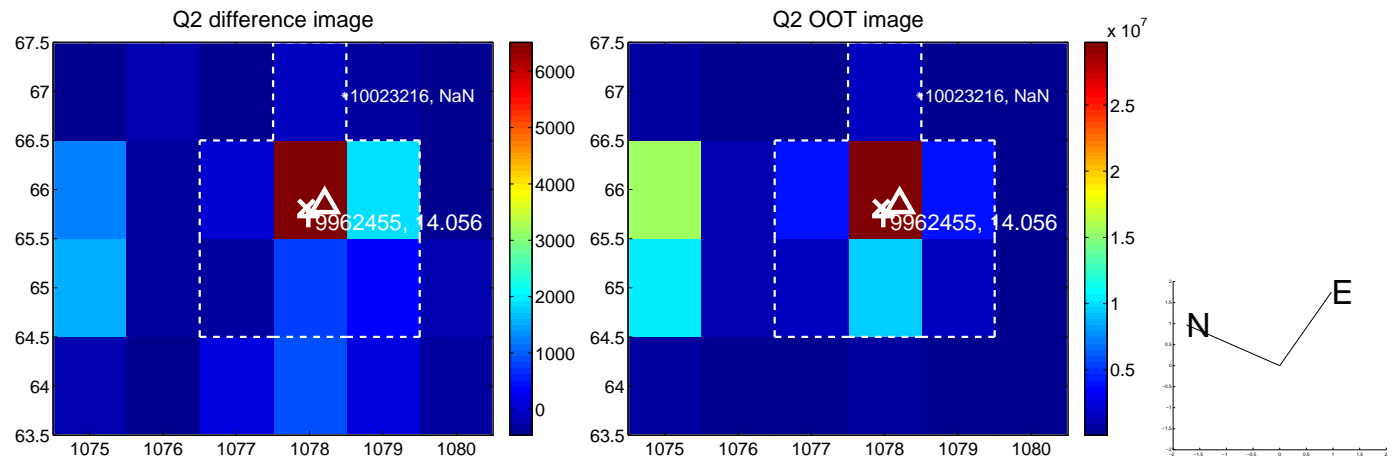
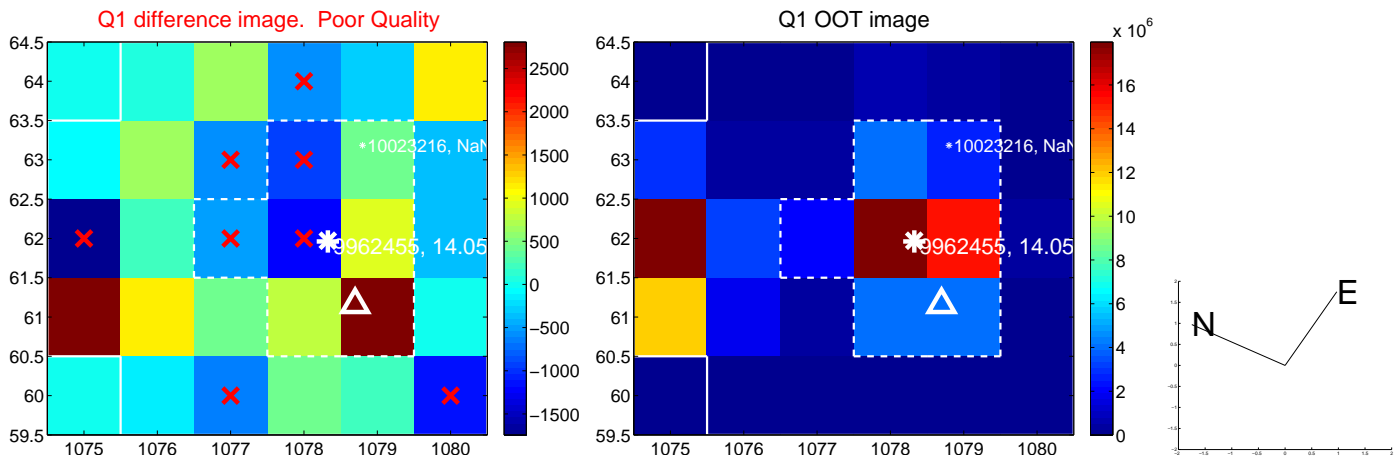
	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.836 \pm 0.637$	1.31	$0.813 \pm 0.583$	$-0.196 \pm 0.659$
PRF-fit source offset from KIC position	$0.734 \pm 0.769$	0.95	$0.577 \pm 0.595$	$-0.453 \pm 0.666$
photometric centroid source offset	$1.10 \pm 0.81$	1.36	$-1.05 \pm 0.79$	$0.34 \pm 0.91$



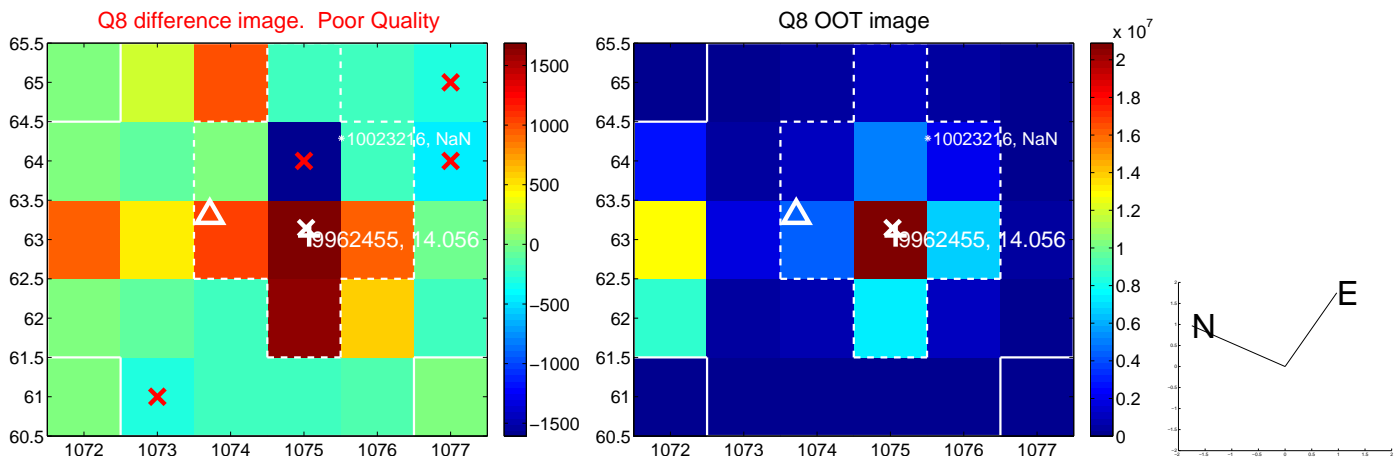
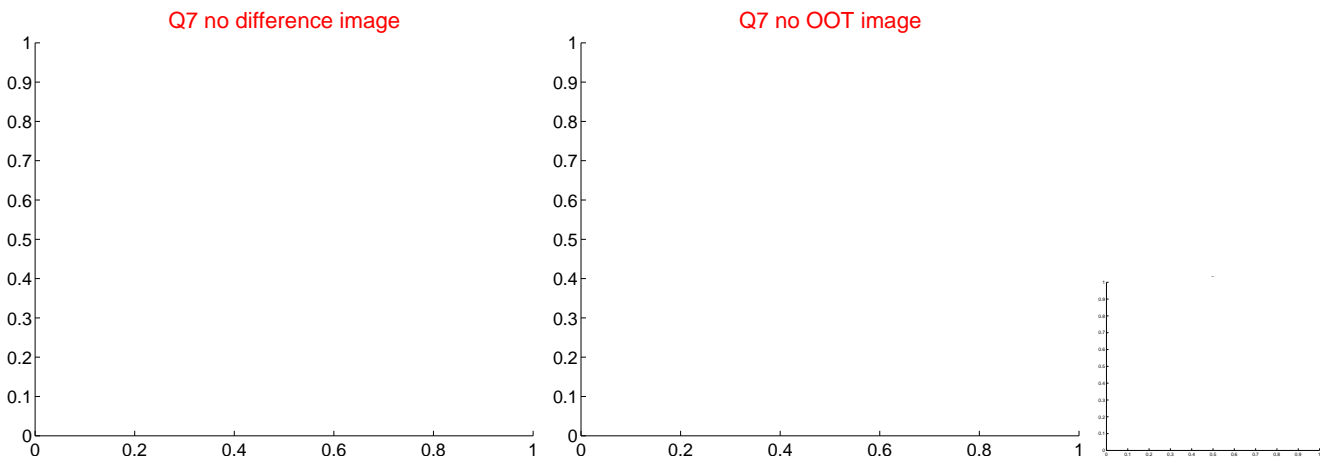
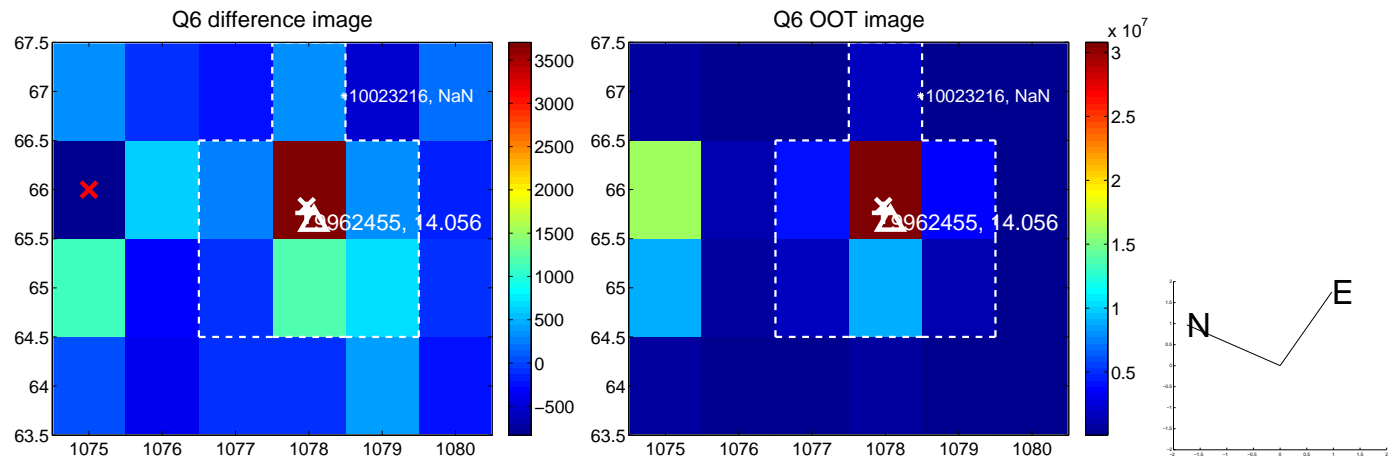
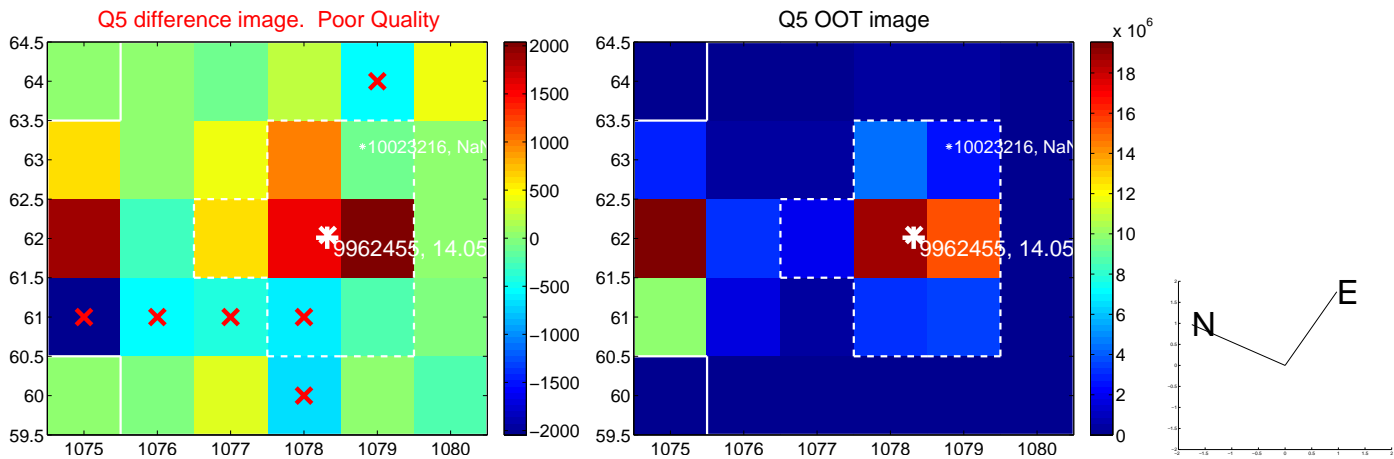
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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



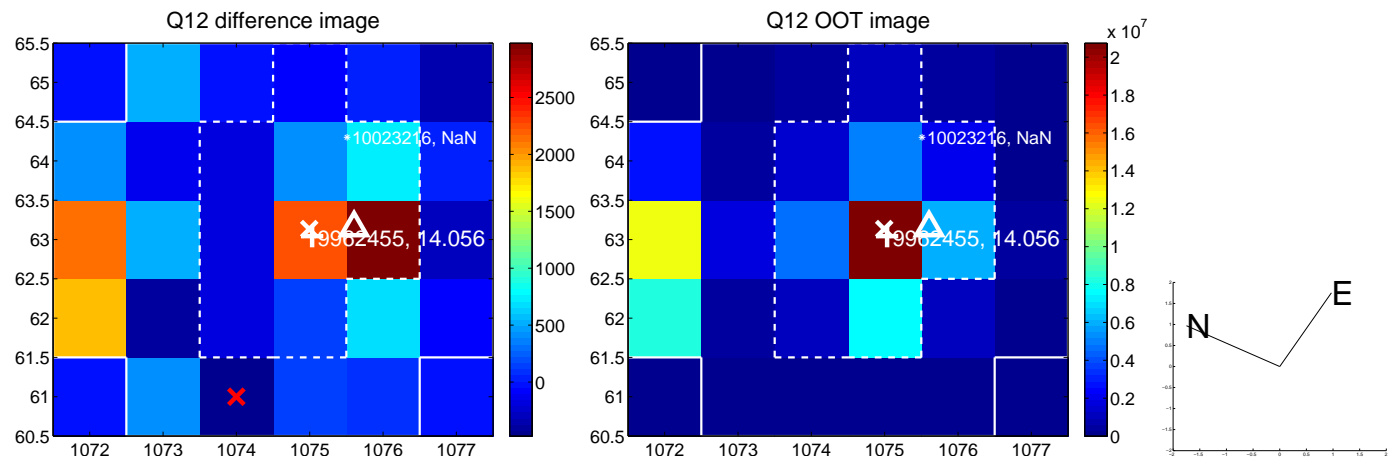
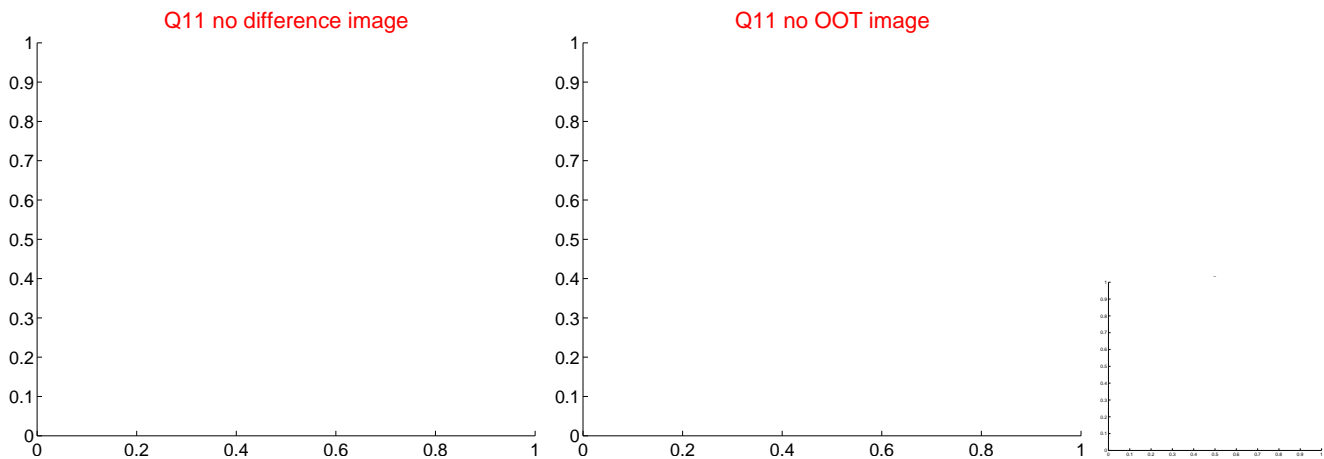
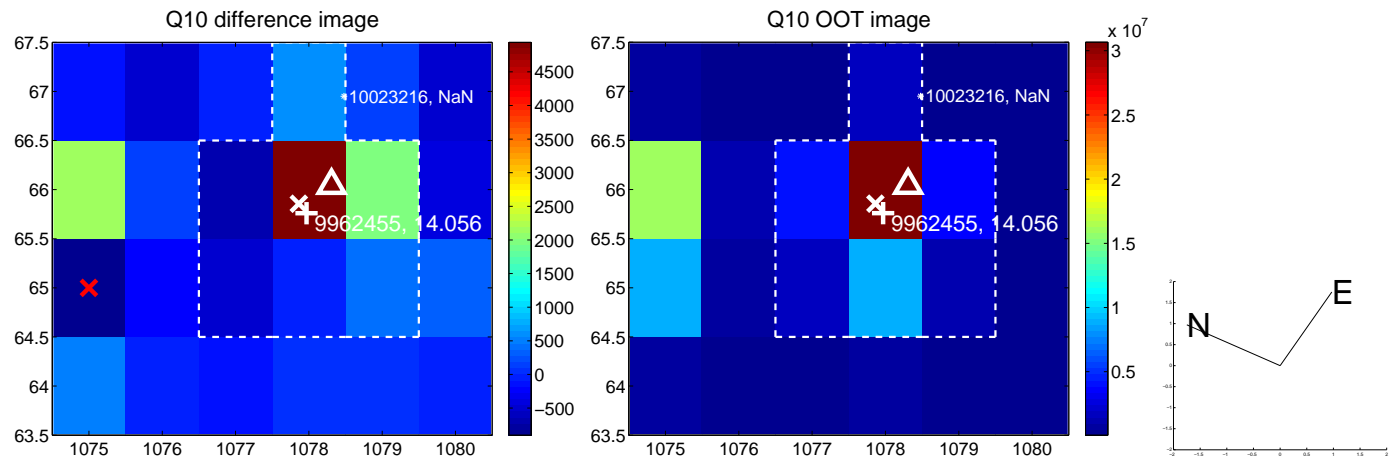
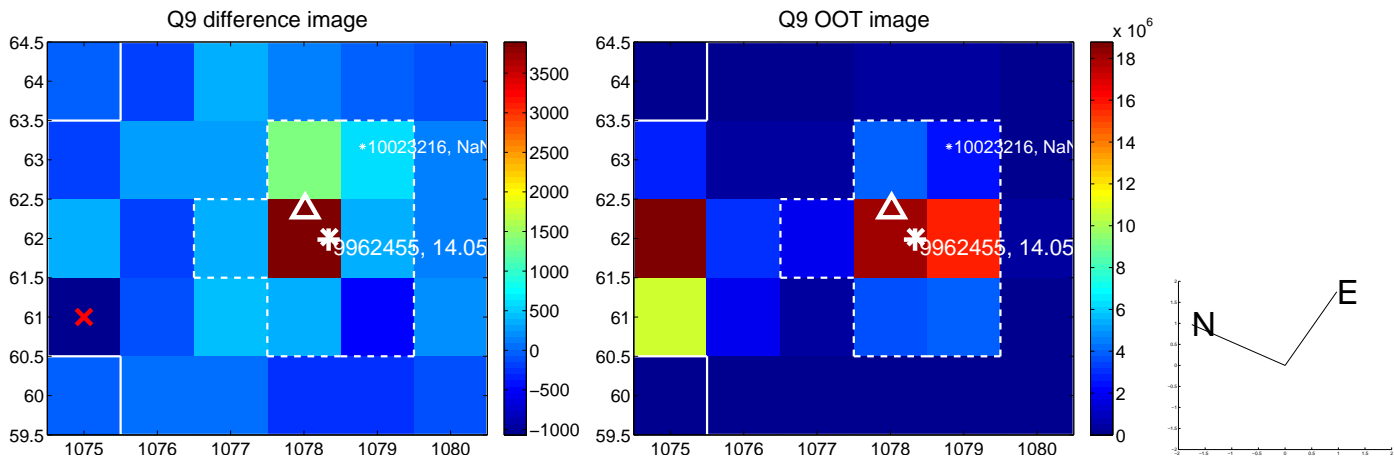
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



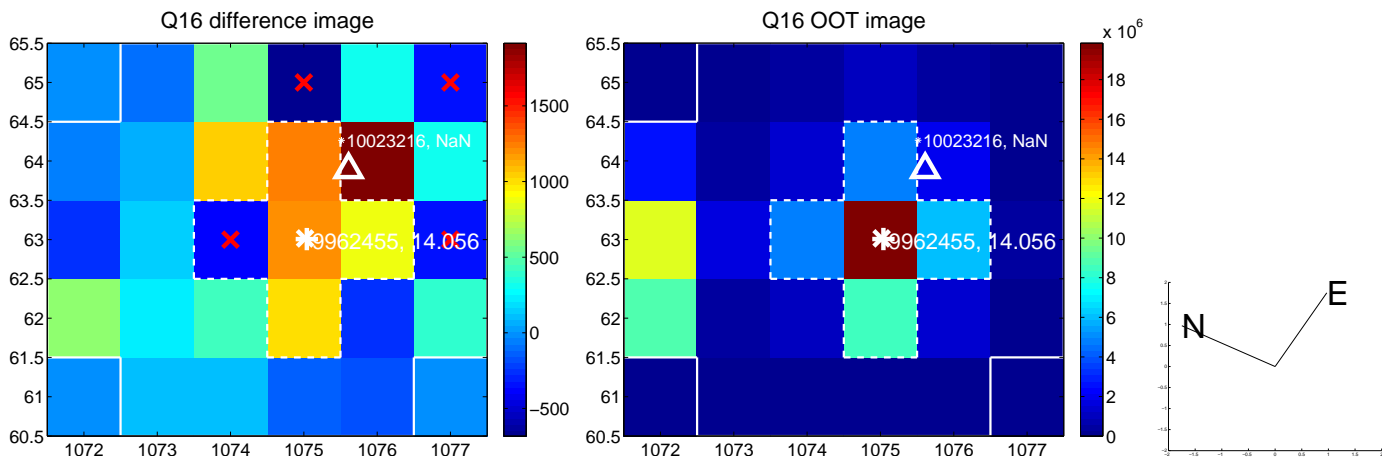
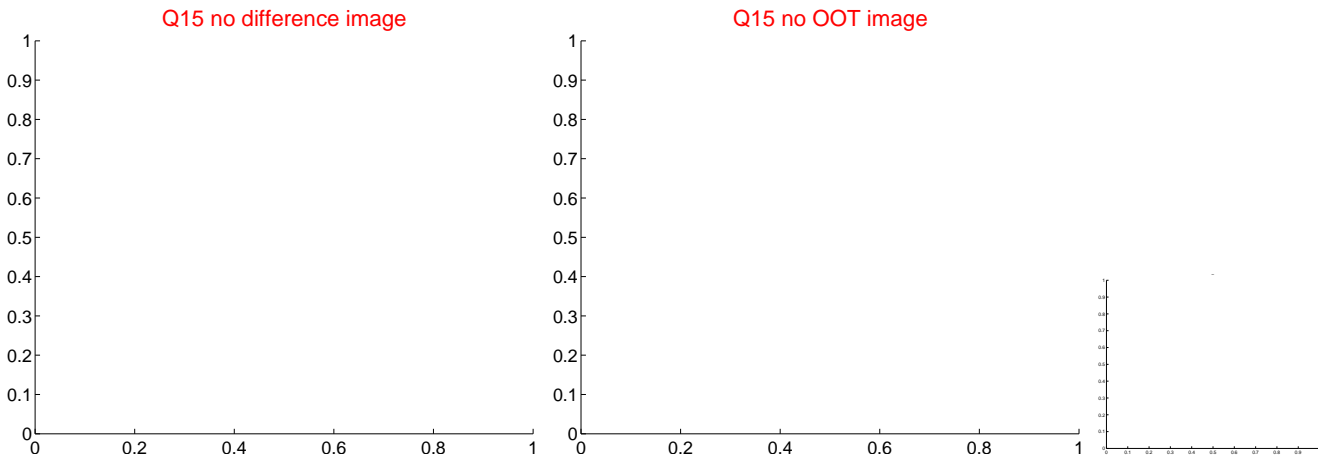
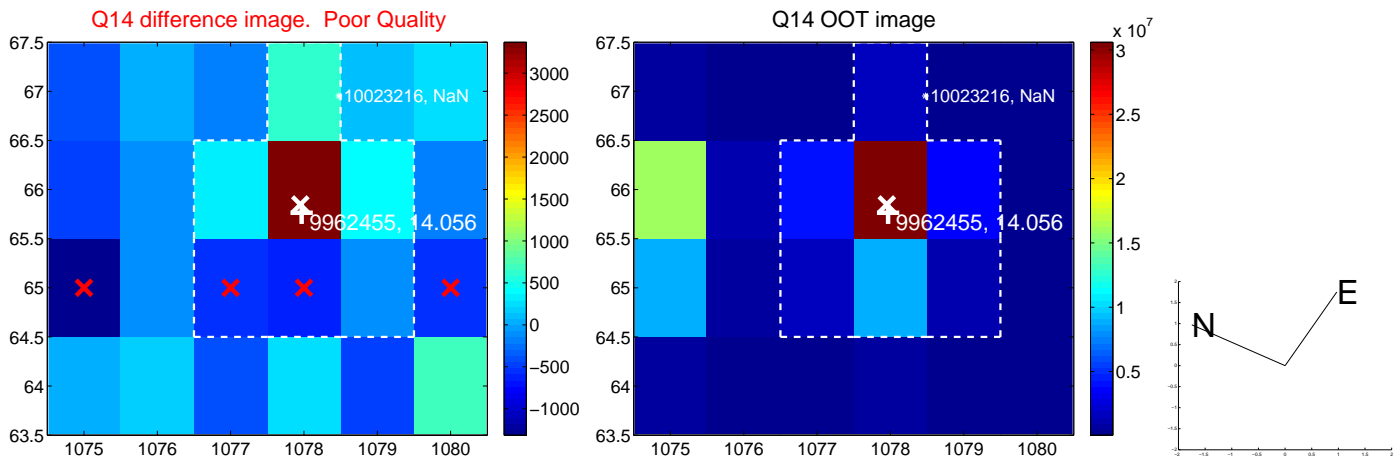
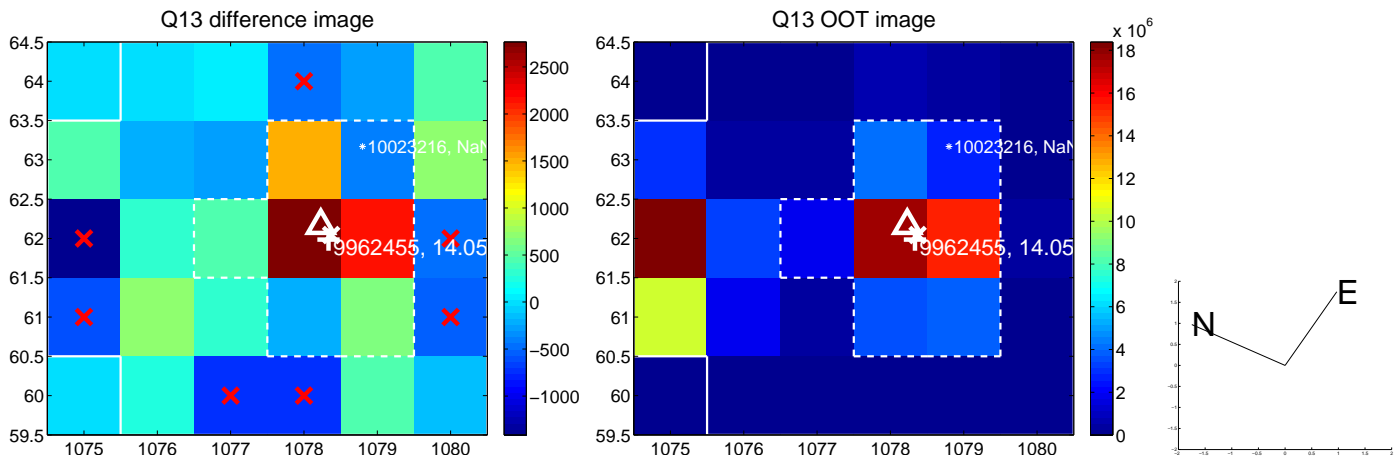
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

