

# KIC 005646176

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
005646176-01	OBS	No	0.998360	131.711809	47.6	6.354	10.0	6.1	1.29	6305	0.96	5853.71
005646176-02	OBS	No	105.455306	189.614921	3300.8	5.660	14.2	9.1	1.29	6305	13.60	11.72
005646176-03	OBS	No	204.697781	203.133079	1748.4	11.405	12.3	7.0	1.29	6305	6.22	4.84
005646176-04	OBS	No	75.961627	171.426607	2640.1	7.047	11.2	8.9	1.29	6305	12.02	18.16
005646176-05	OBS	No	66.679595	189.232216	1425.1	5.625	9.4	6.6	1.29	6305	6.08	21.60
005646176-08	OBS	No	29.414987	139.159990	1189.4	9.687	8.1	8.2	1.29	6305	7.52	64.33
005646176-09	OBS	No	48.339322	177.775979	171.6	6.000	8.2	-1.0	1.29	6305	1.70	33.17

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
005646176-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT
005646176-02	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—HALO_GHOST
005646176-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS
005646176-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
005646176-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
005646176-08	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
005646176-09	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_ALT—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_NOFITS

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

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

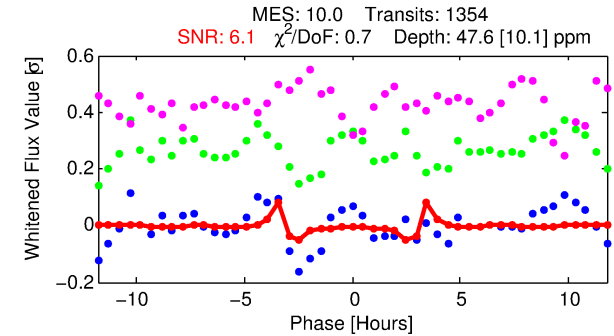
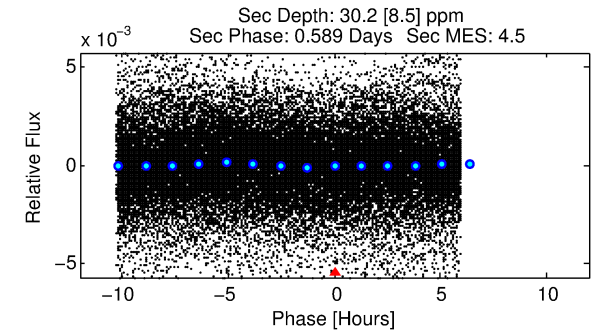
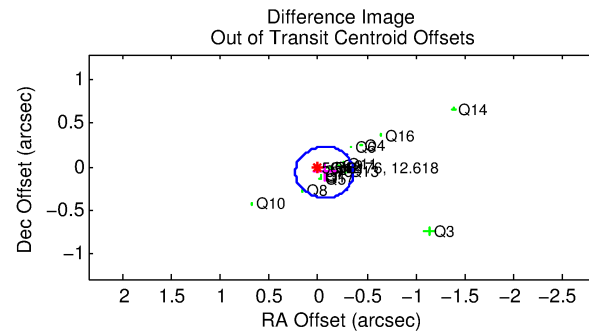
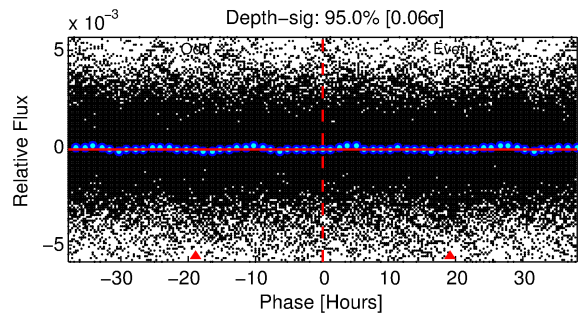
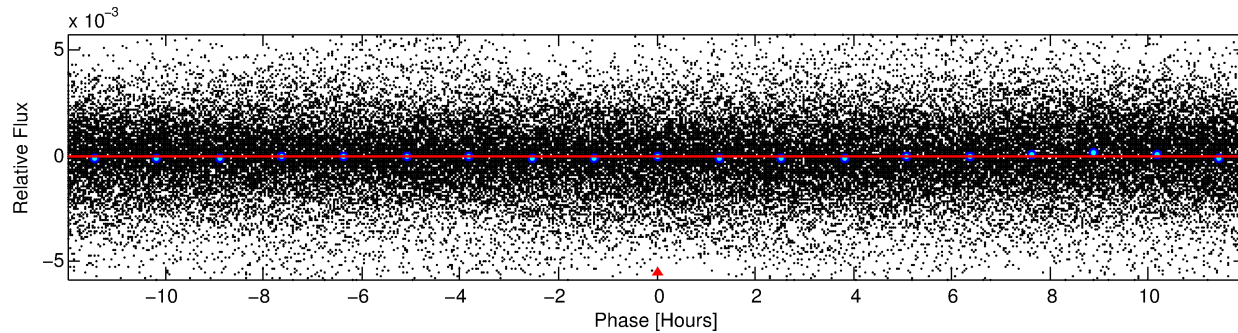
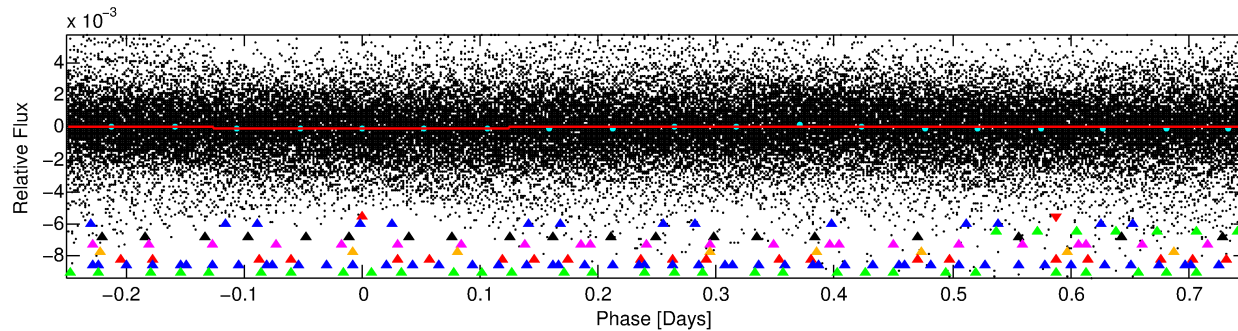
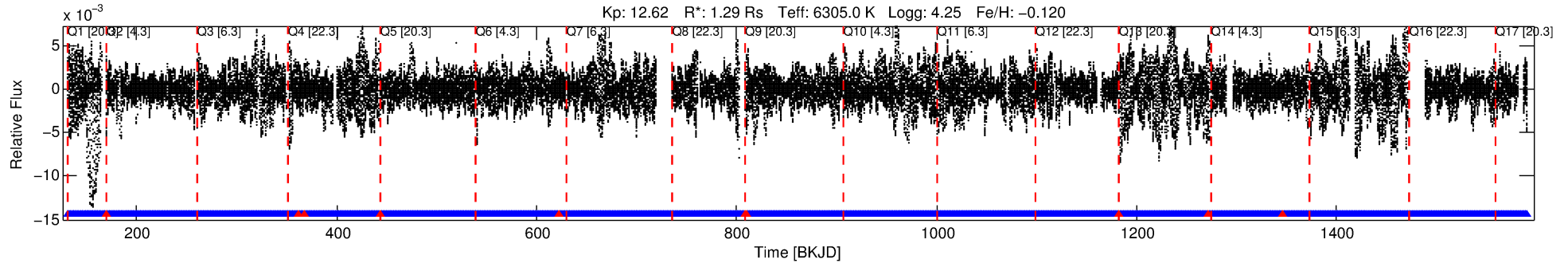
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 005646176-01

No Significant Match Found

# DV One-Page Summary

KIC: 5646176 Candidate: 1 of 9 Period: 0.998 d



## DV Fit Results:

Period = 0.99836 [0.00001] d  
Epoch = 131.7118 [0.0018] BKJD  
Rp/R\* = 0.0068 [0.0020]  
a/R\* = 1.20 [0.56]  
b = 0.71 [1.10]  
Seff = 5853.71 [2224.58]  
Teff = 2230 [212] K  
Rp = 0.96 [0.42] Re  
a = 0.0201 [0.0053] AU  
Ag = 7.35 [5.51] [1.15 $\sigma$ ]  
Teffp = 5679 [949] K [3.55 $\sigma$ ]

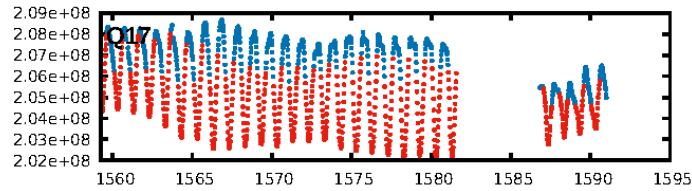
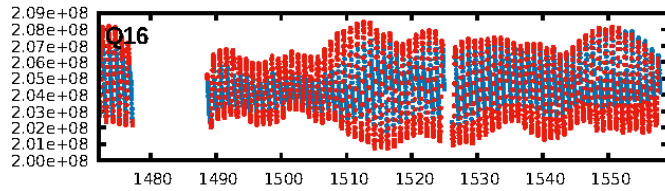
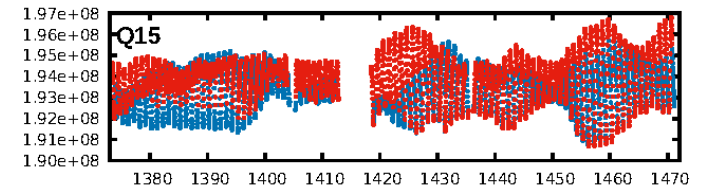
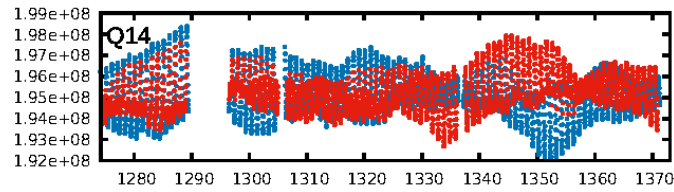
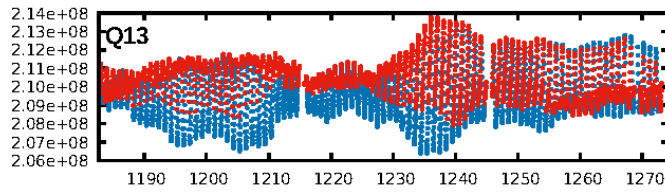
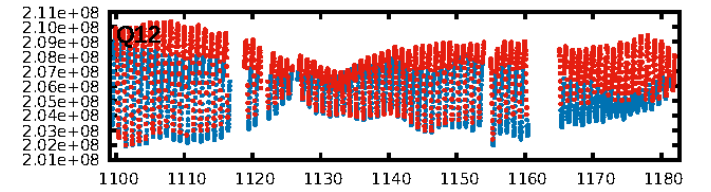
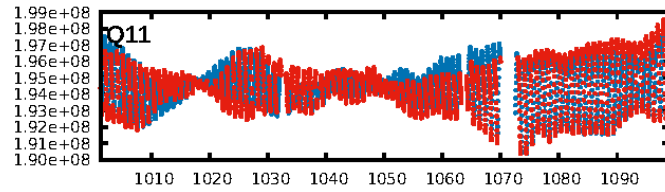
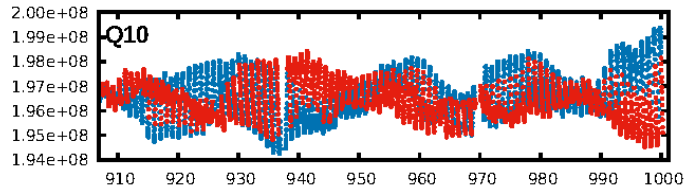
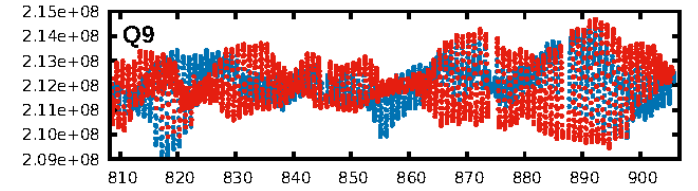
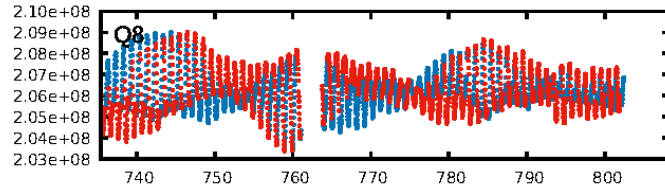
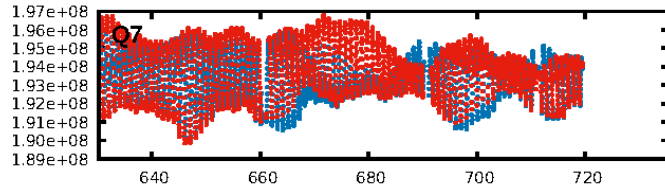
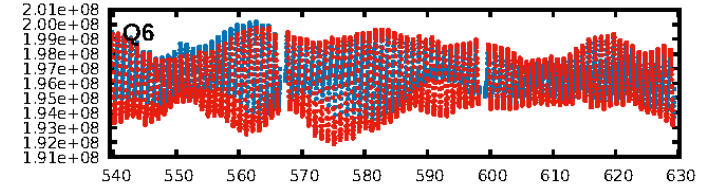
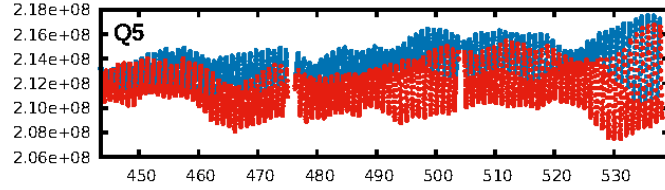
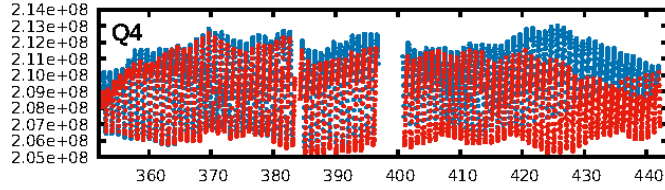
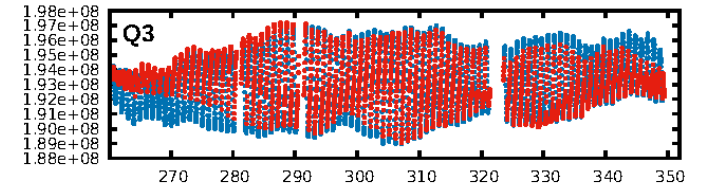
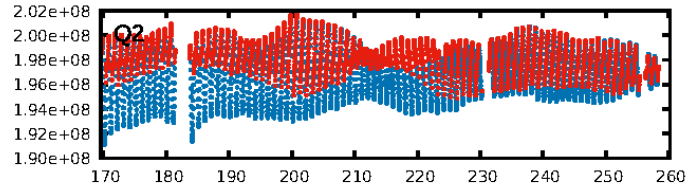
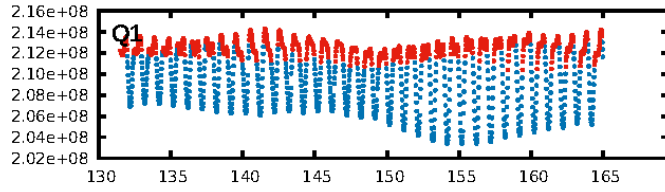
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [58.87 $\sigma$ ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 0.99 [1283/1293]  
GhostDiagnostic-chr: 2.318  
Centroid-sig: 0.0%  
Centroid-so: 1.888 arcsec [2.73 $\sigma$ ]  
OotOffset-rm: 0.092 arcsec [0.93 $\sigma$ ]  
KicOffset-rm: 0.106 arcsec [0.80 $\sigma$ ]  
OotOffset-st: 4/4/4/5 [17]  
KicOffset-st: 4/4/4/5 [17]  
DiffImageQuality-fgm: 0.59 [10/17]  
DiffImageOverlap-fno: 1.00 [17/17]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 16:33:54 Z

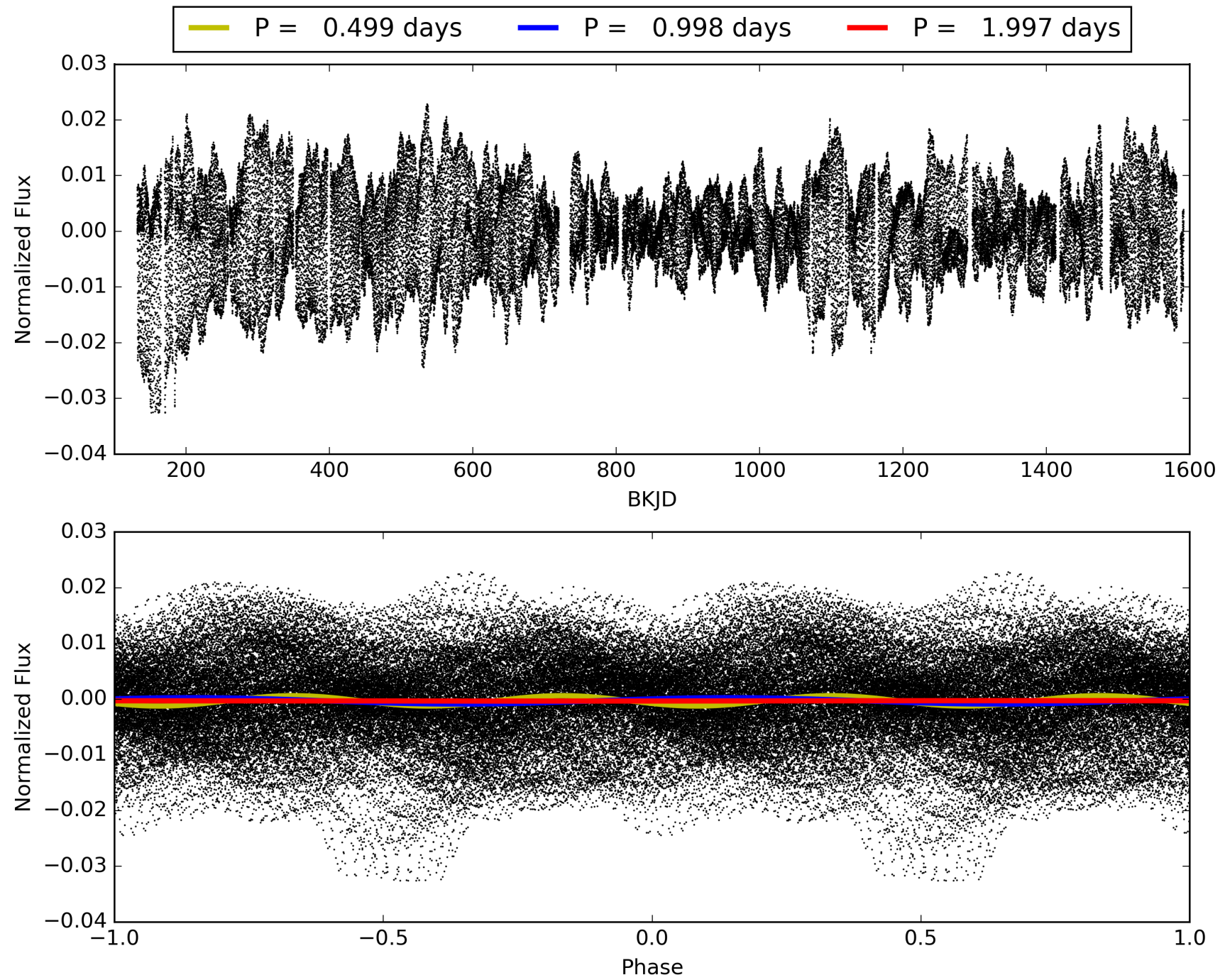
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 005646176-01, PDC Light Curves





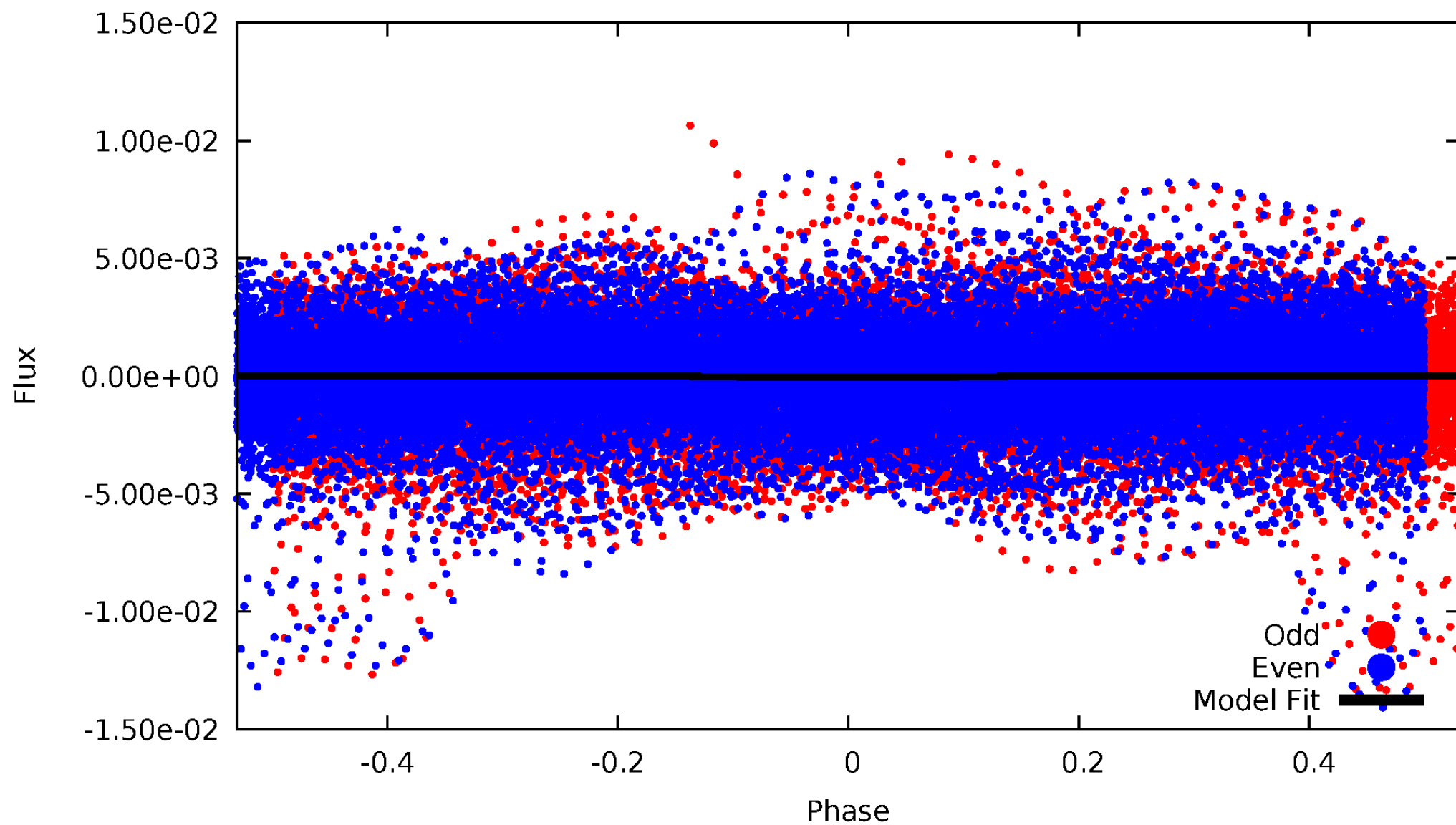
TCE 005646176-01





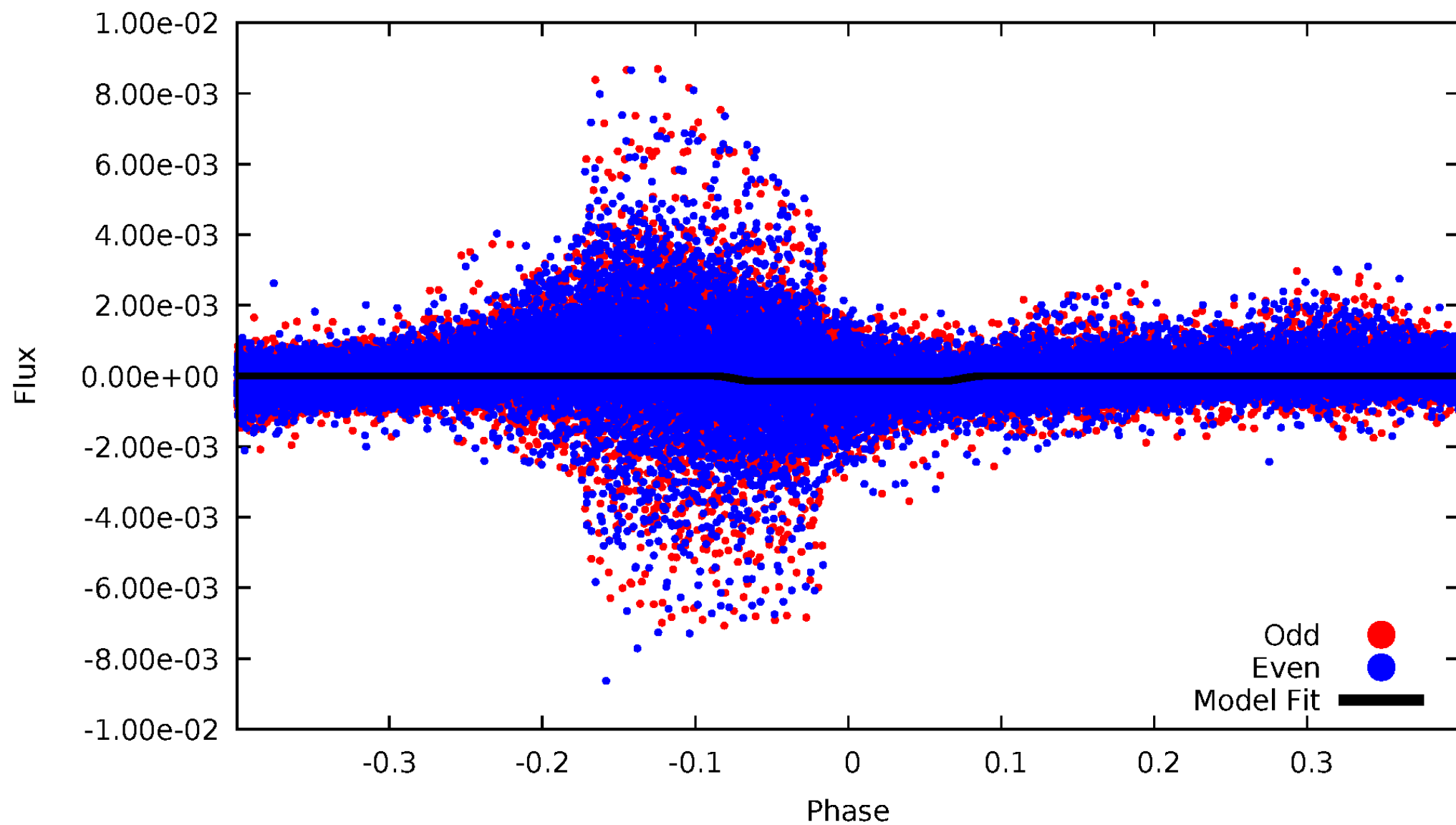
# DV Odd/Even

TCE 005646176-01



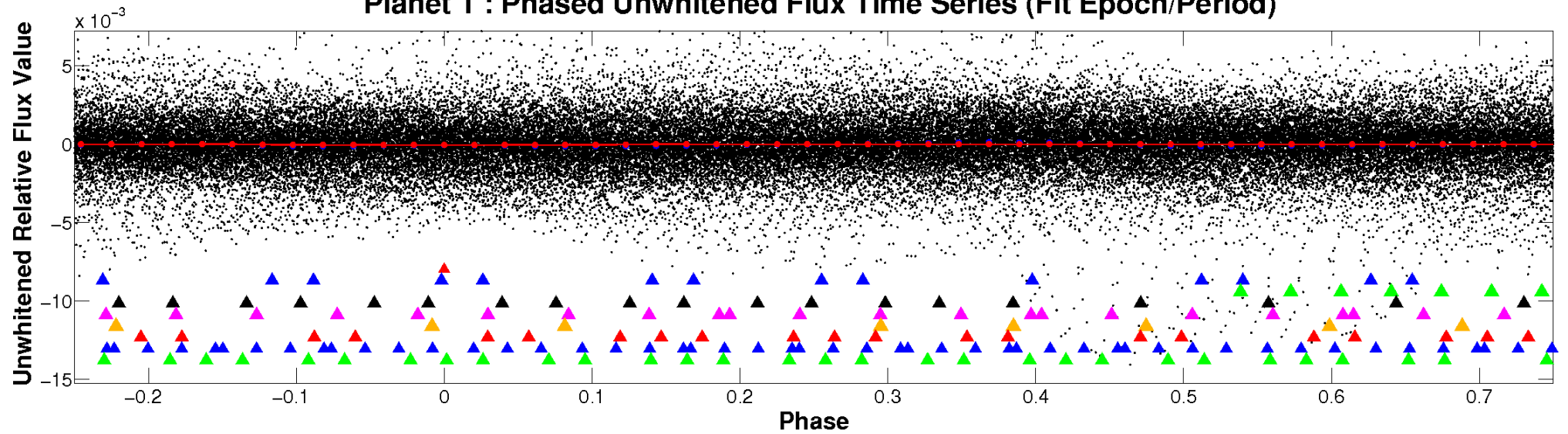
# ALT Odd/Even

TCE 005646176-01

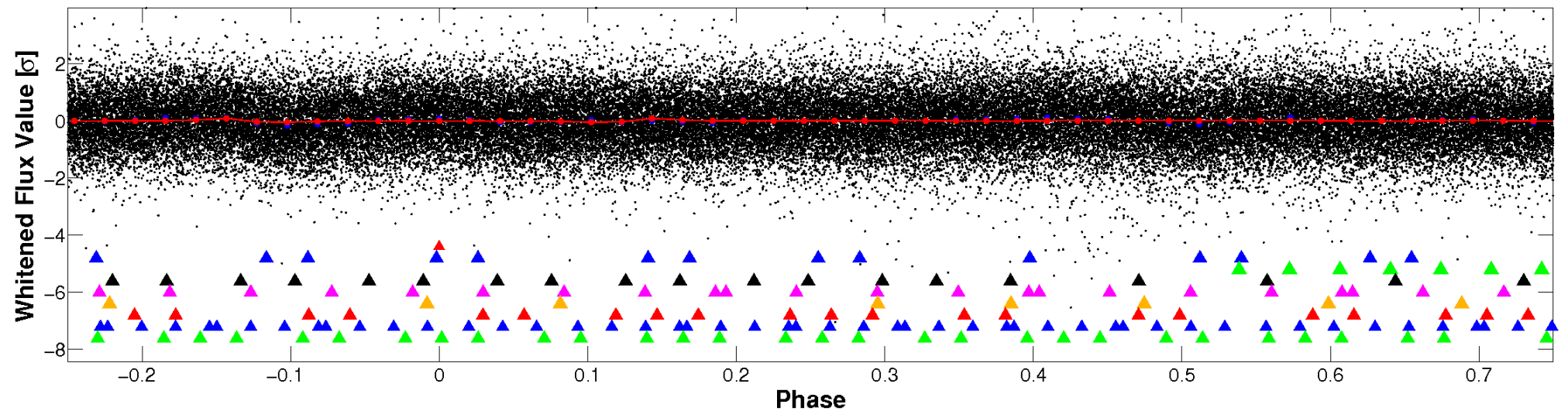


# Non-Whitened Vs. Whitened Light Curve

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



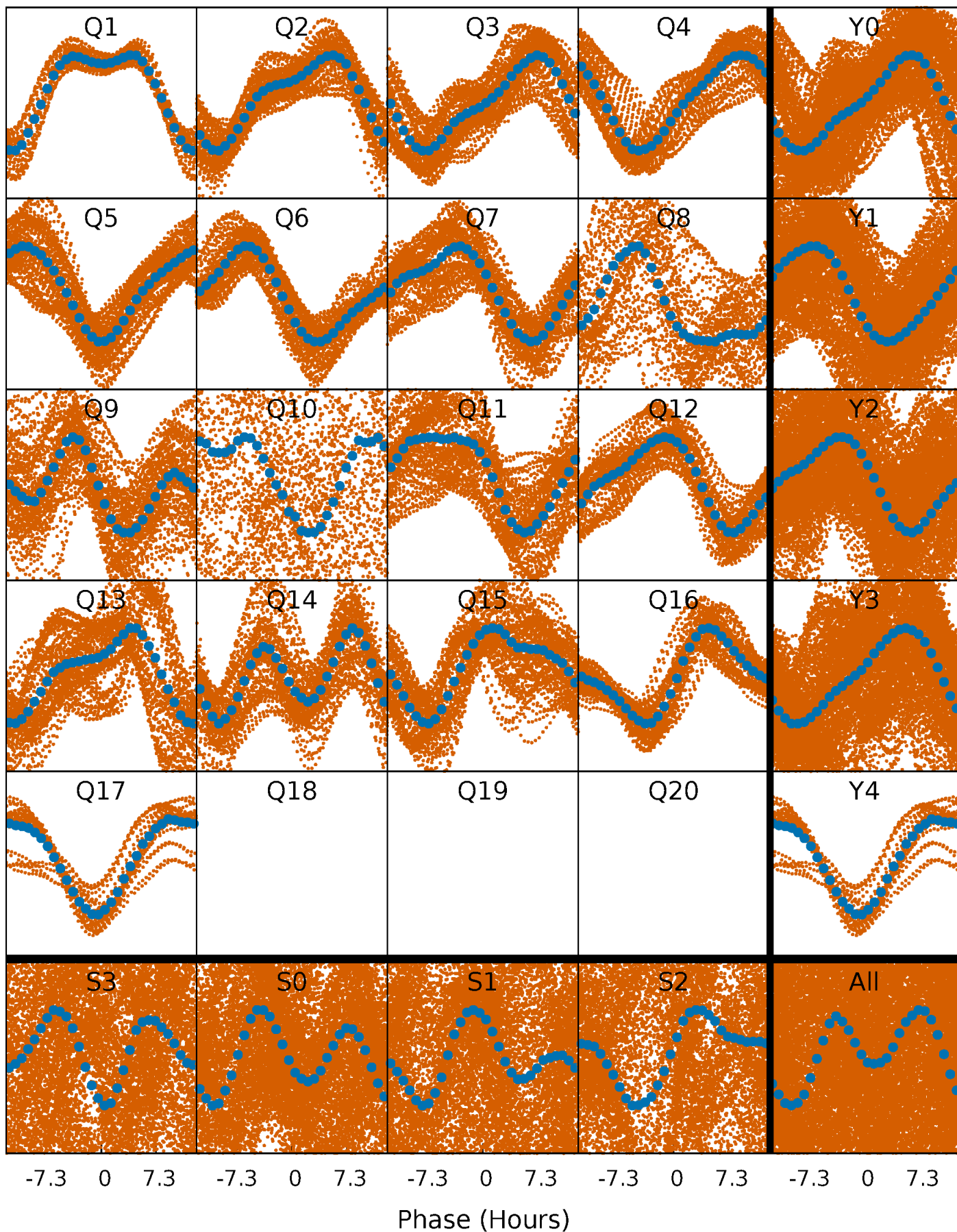
## Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)





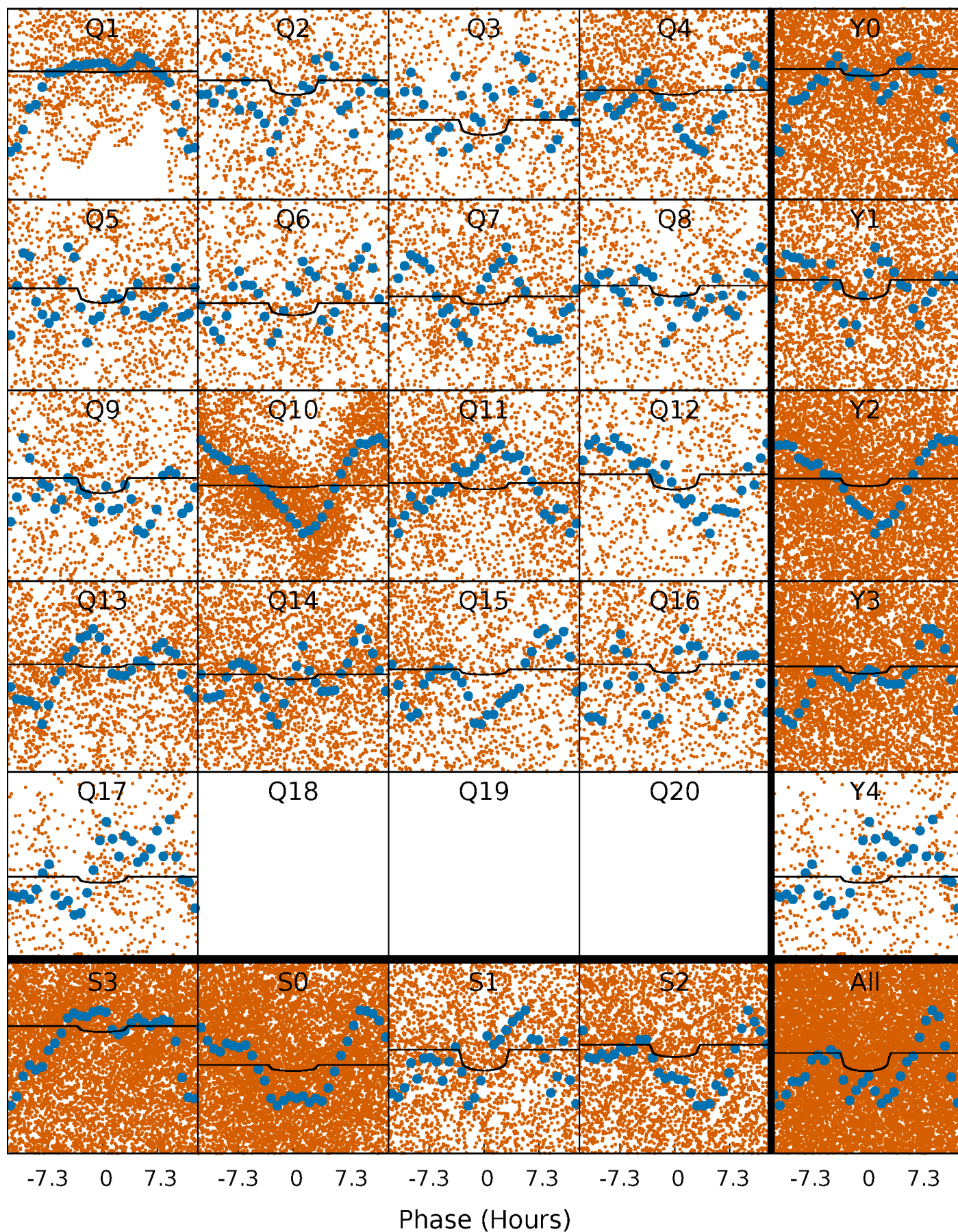
# PDC Quarter-Phased Transit Curves

TCE 005646176-01 P= 0.998360 Days  $T_0=131.711809$  (BKJD)



# DV Quarter-Phased Transit Curves

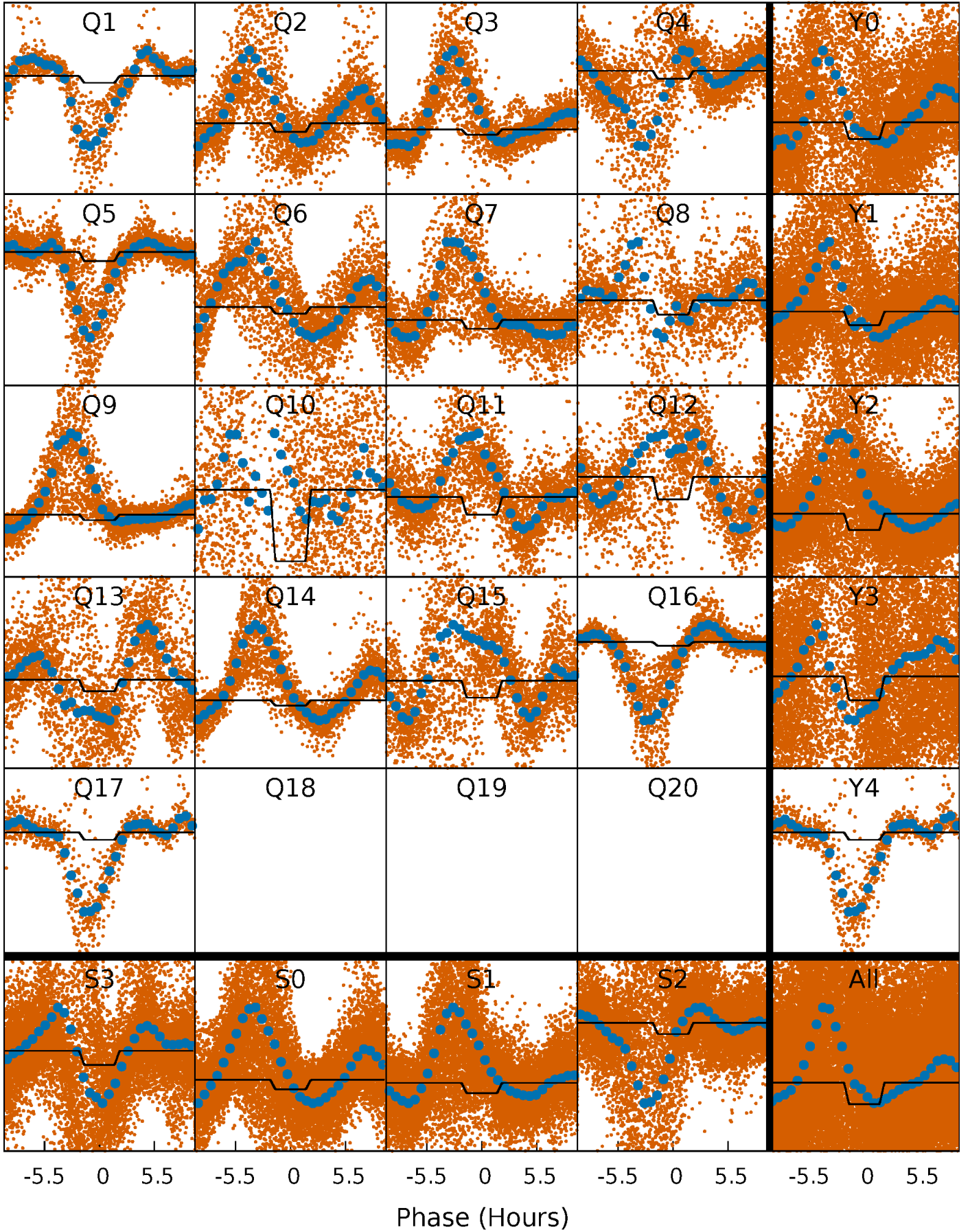
TCE 005646176-01 P= 0.998360 Days  $T_0=131.711809$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

TCE 005646176-01 P= 0.998368 Days  $T_0=131.708540$  (BKJD)

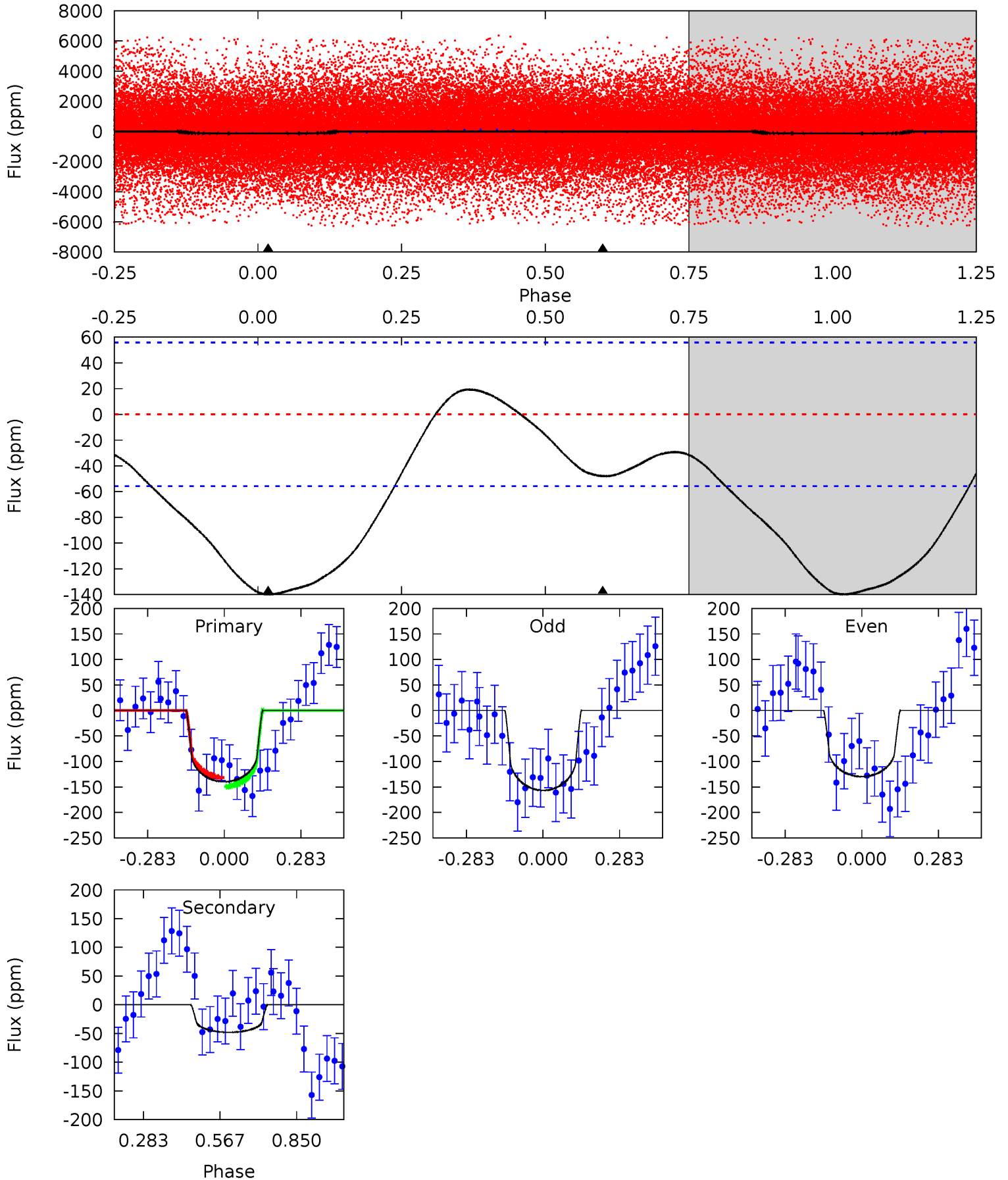




# DV Model-Shift Uniqueness Test

005646176-01, P = 0.998360 Days, E = 130.713449 Days

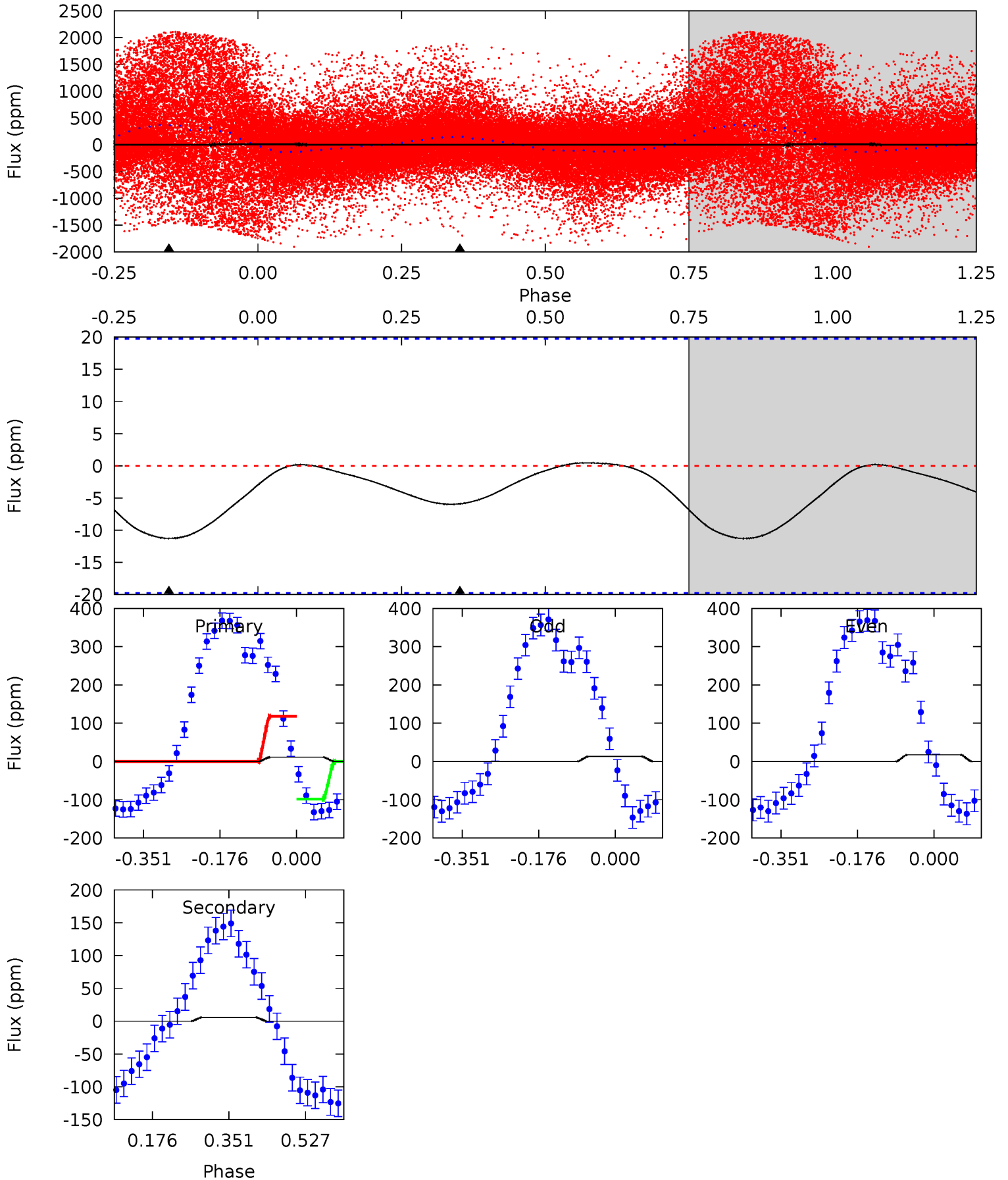
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
10.9	3.74	0	0	4.34	1.07	1.37	10.9	10.9	3.74	3.74	1.06	1.27	0.12	0.70



# Alt Model-Shift Uniqueness Test

005646176-01, P = 0.998368 Days, E = 130.710172 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
2.54	1.33	0	0	4.45	1.35	0.14	2.54	2.54	1.33	1.33	0.50	-1.04	0.04	2.56



### Stellar Parameters For KIC 005646176

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6305^{+151}_{-189}$	$4.252^{+0.153}_{-0.187}$	$-0.120^{+0.250}_{-0.300}$	$1.295^{+0.424}_{-0.261}$	$1.091^{+0.197}_{-0.121}$	$0.707^{+0.542}_{-0.354}$
	+2%/-3%	+4%/-4%	+208%/-250%	+33%/-20%	+18%/-11%	+77%/-50%
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 005646176-01 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-48 \pm 13$	$0.98^{+0.33}_{-0.32}$	$3117^{+227}_{-194}$	$6251^{+1437}_{-920}$	$11^{+13}_{-5}$
Alt.	$-6 \pm 4$	$1.76^{+0.44}_{-0.38}$	$3129^{+232}_{-203}$	$2802^{+721}_{-5851}$	$0.412^{+0.528}_{-0.319}$

$T_{max}$  = 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

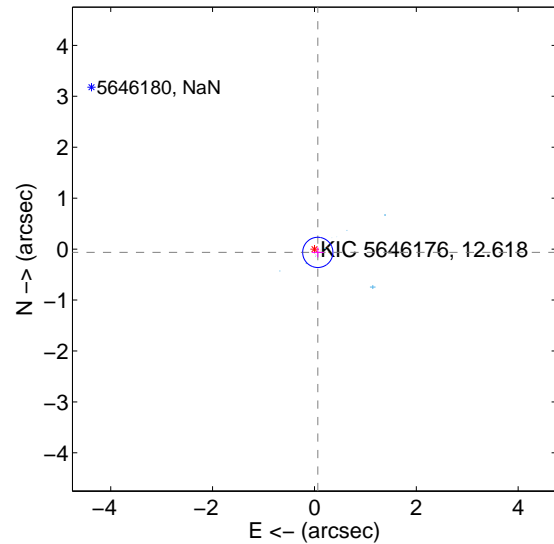
Supplemental centroid analysis for 005646176-01. Kepler magnitude: 12.62. Transit SNR 6.09

There are 10 quarters with good PRF difference image offsets

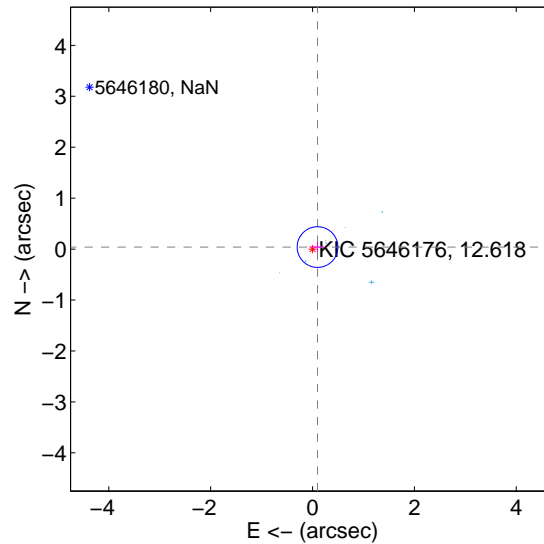
The direct PRF centroid is offset from the target star catalog position by about 0.17 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.092 \pm 0.099$	0.93	$-0.066 \pm 0.119$	$-0.065 \pm 0.097$
PRF-fit source offset from KIC position	$0.106 \pm 0.133$	0.80	$-0.098 \pm 0.128$	$0.040 \pm 0.101$
photometric centroid source offset	$1.89 \pm 0.69$	2.73	$-1.67 \pm 0.51$	$-0.89 \pm 1.11$

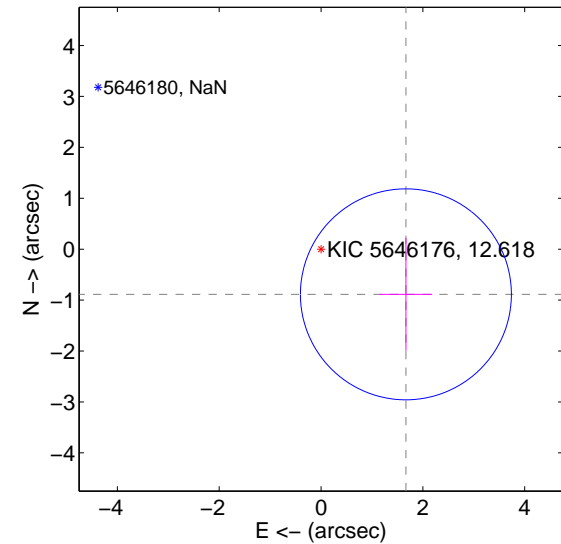
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

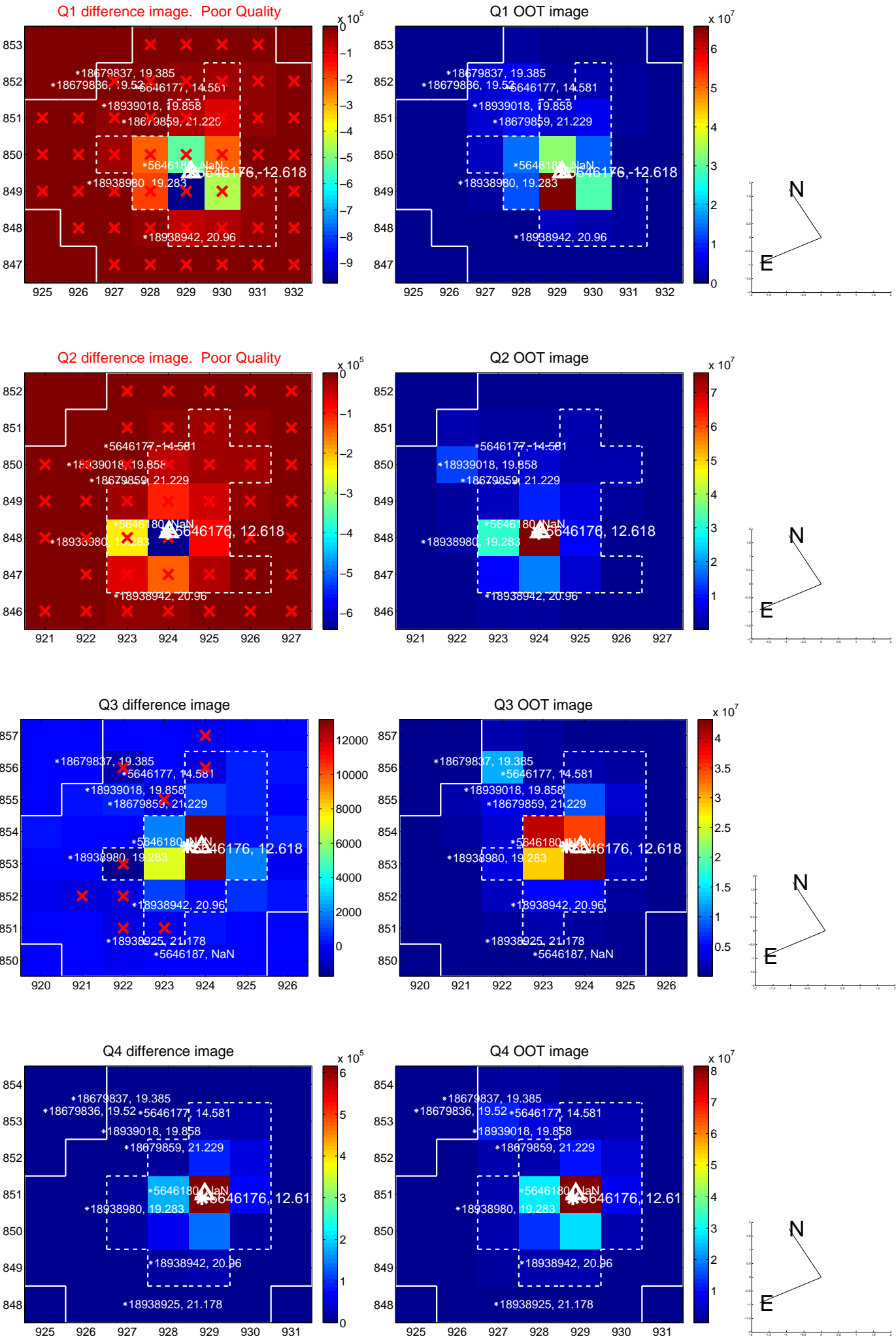


offset from photometric centroids

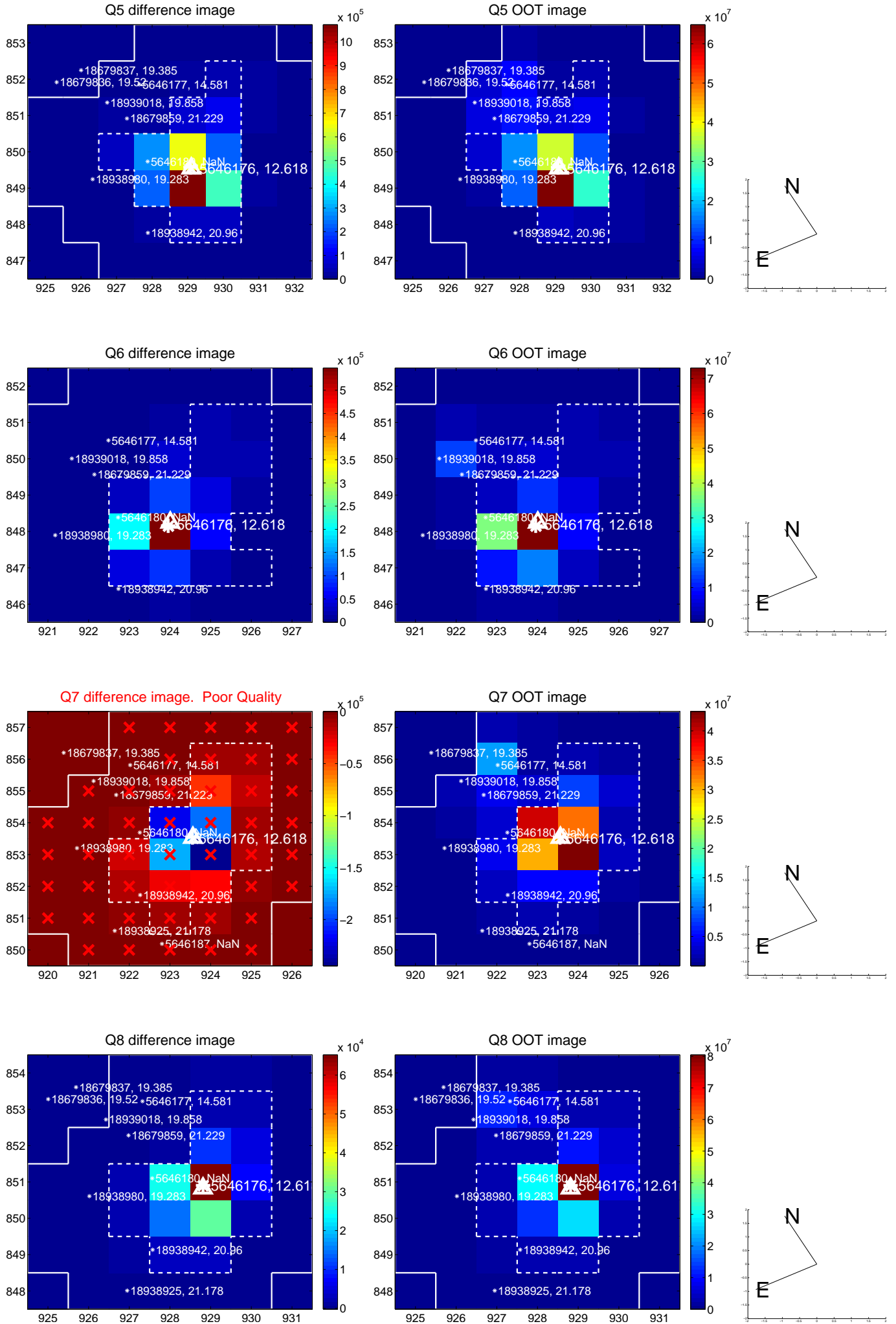


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

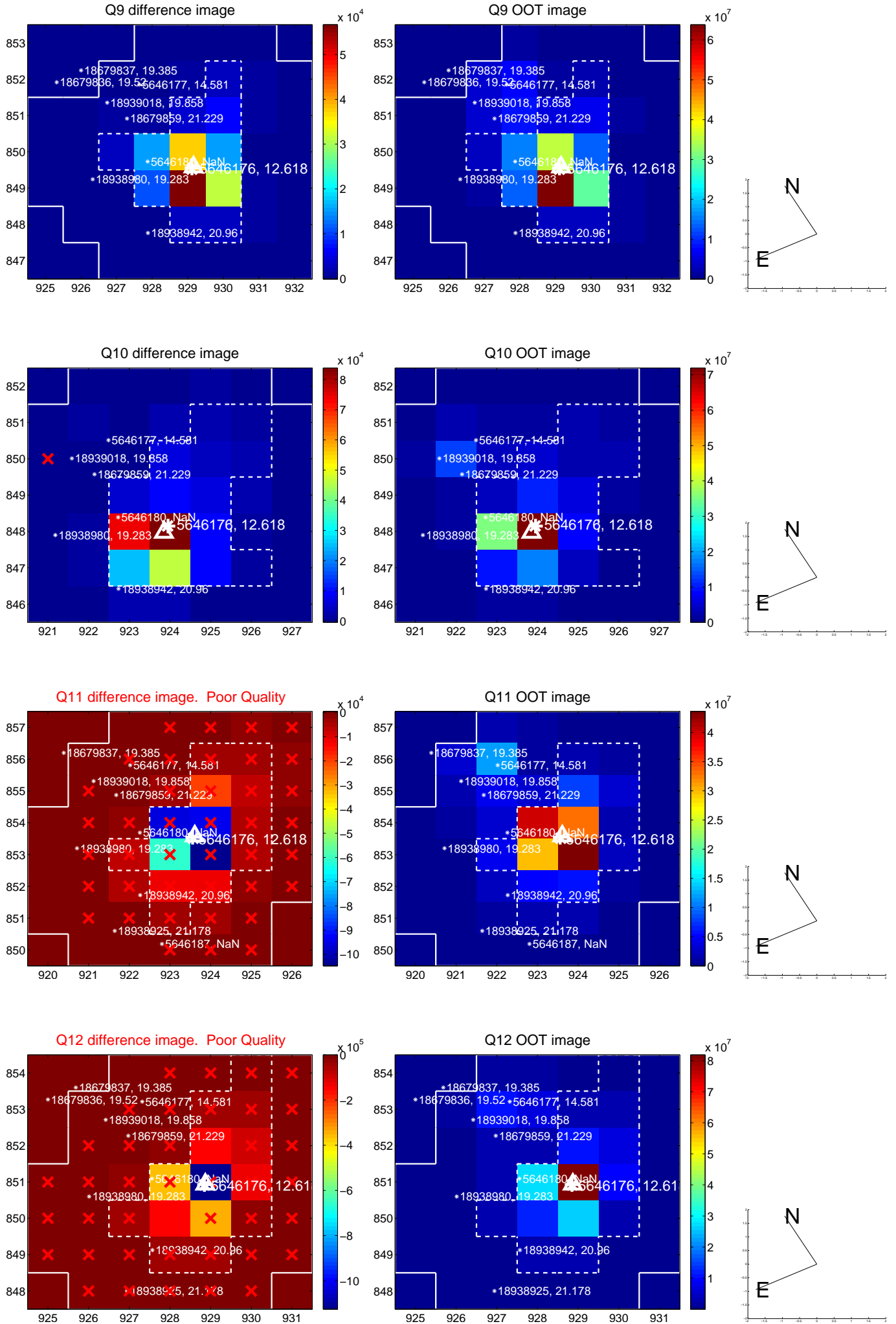


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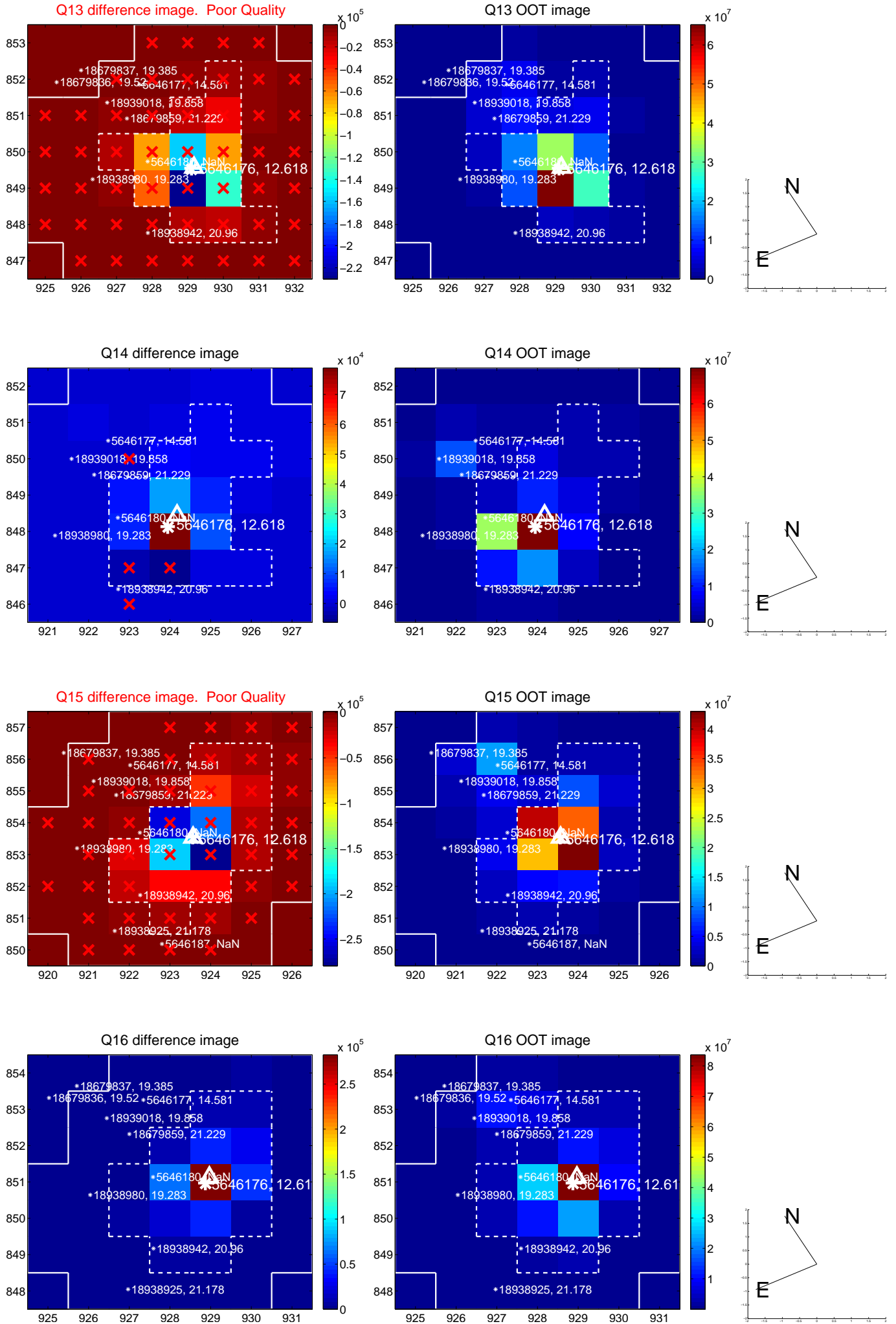




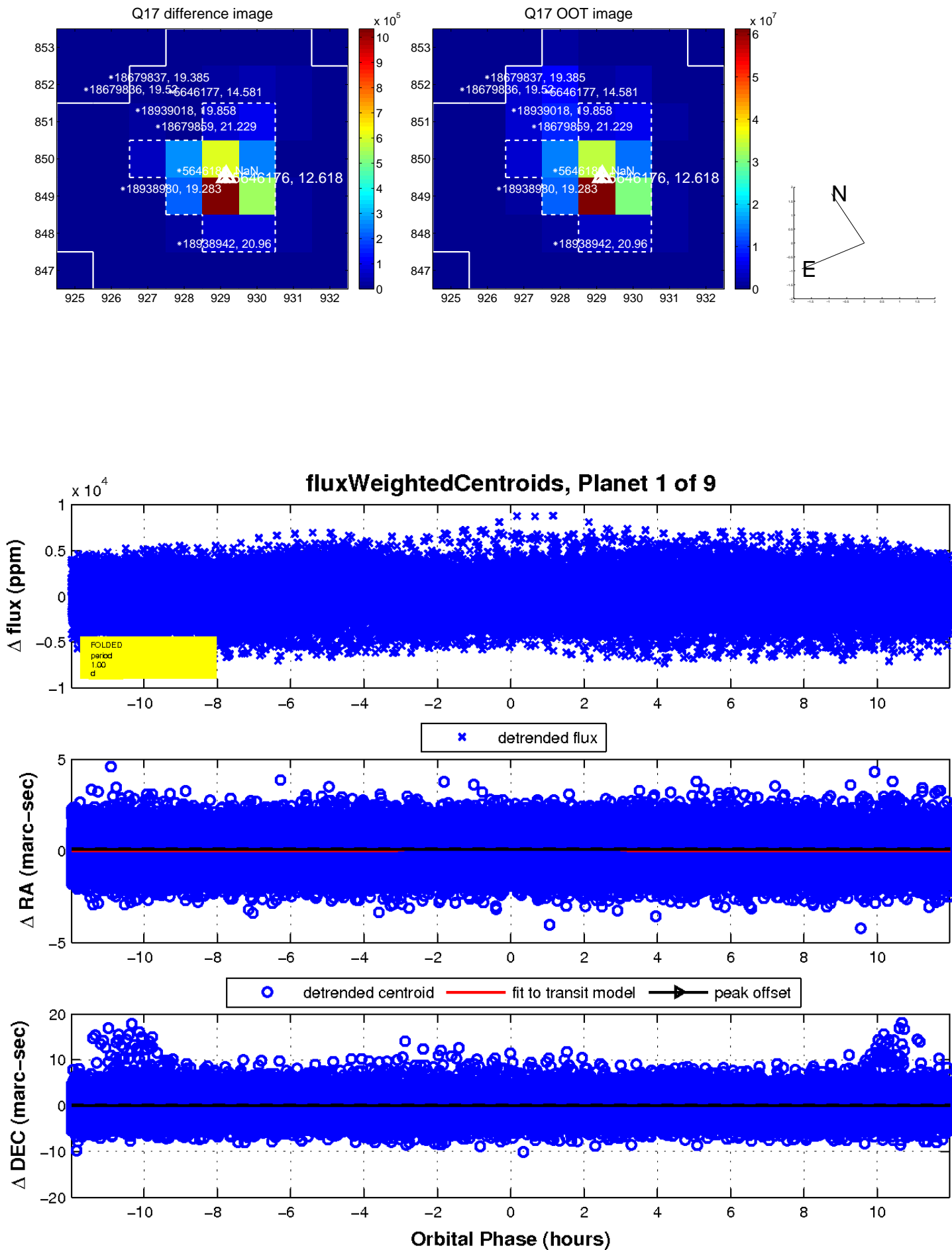
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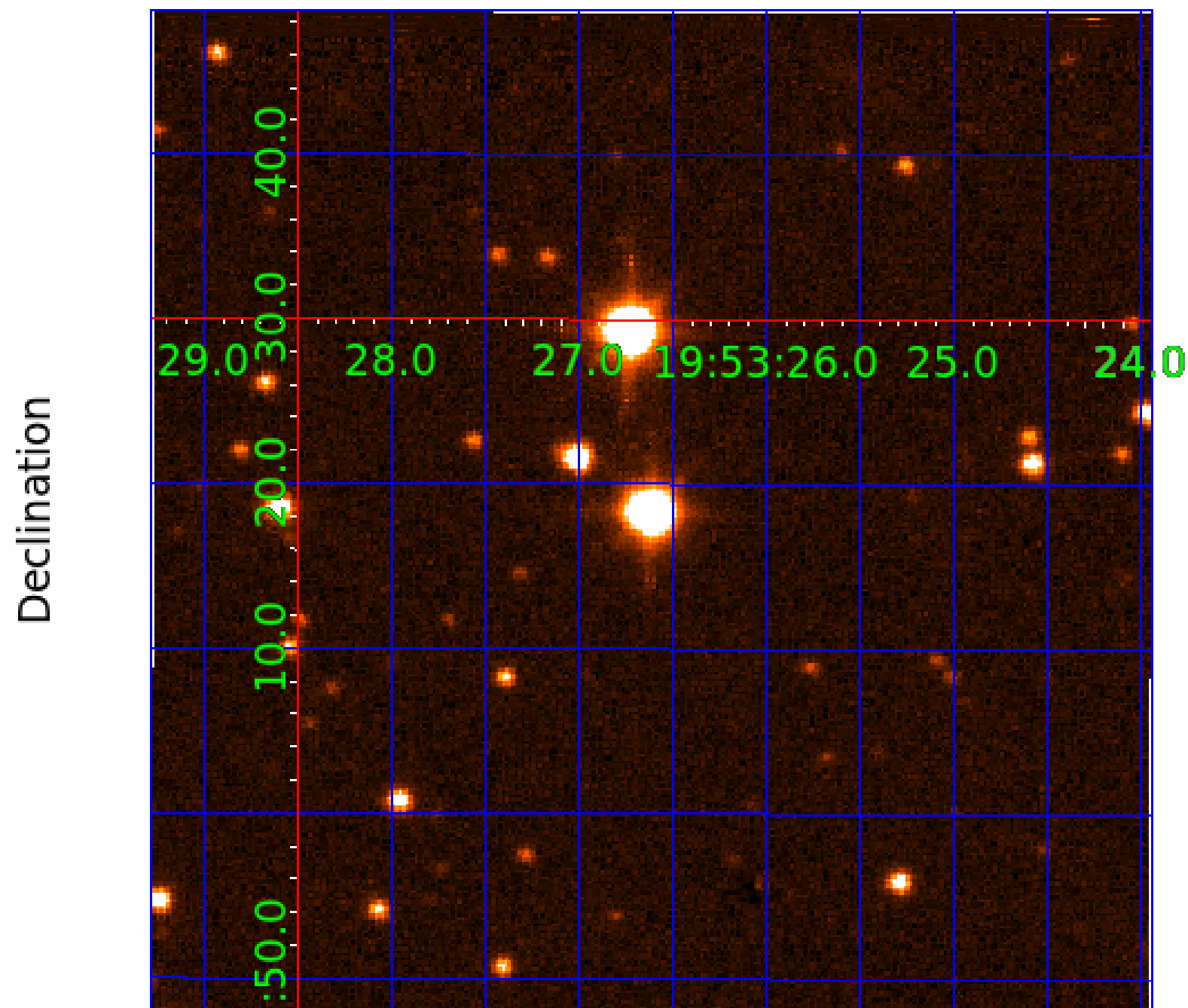
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UKIRT Image





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005646176-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
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N = Not Transit-Like. S = Stellar Eclipse. C = Centroid Offset. E = Ephemeris Match.

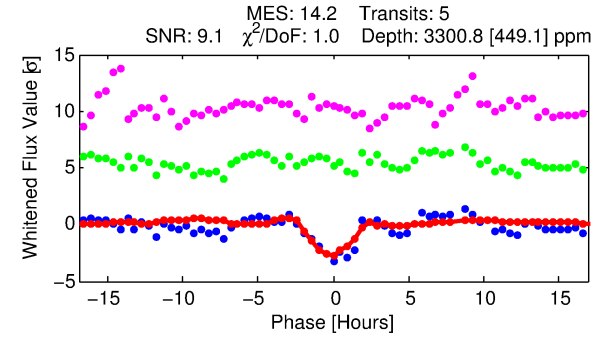
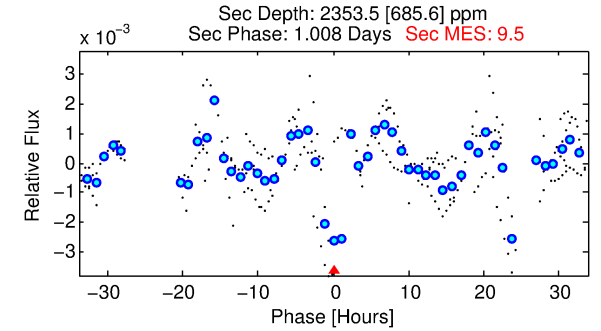
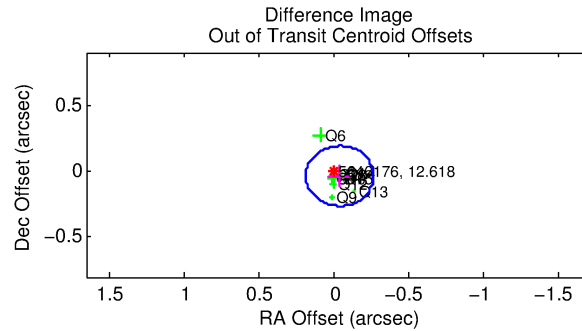
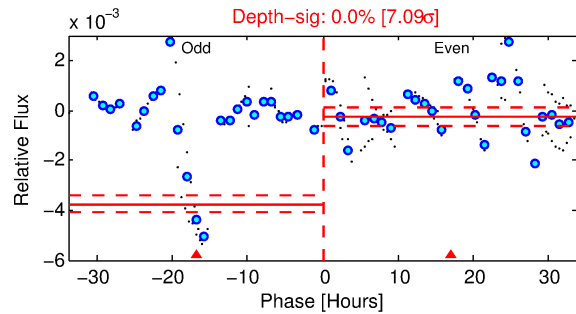
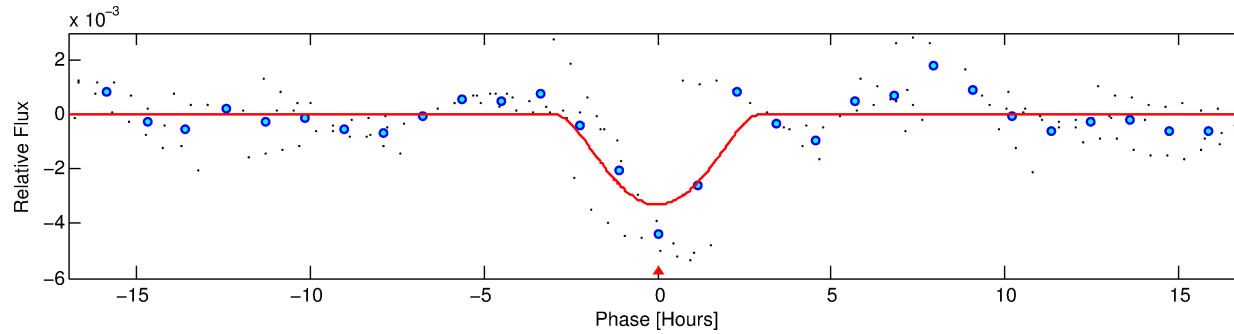
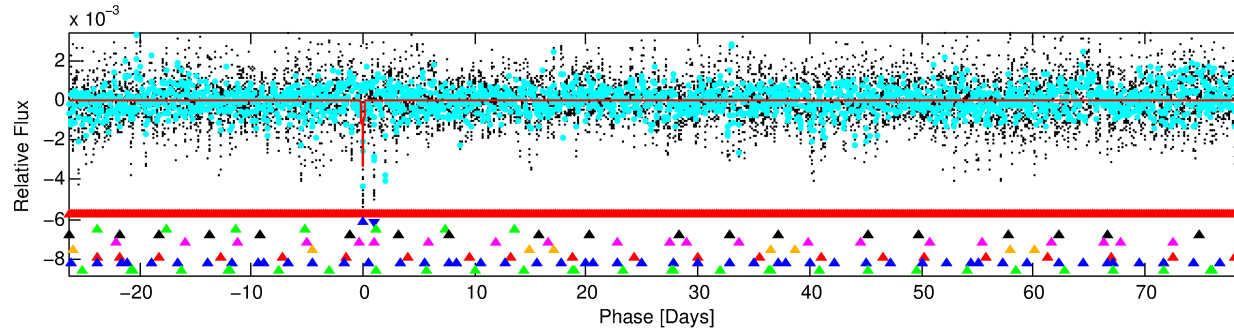
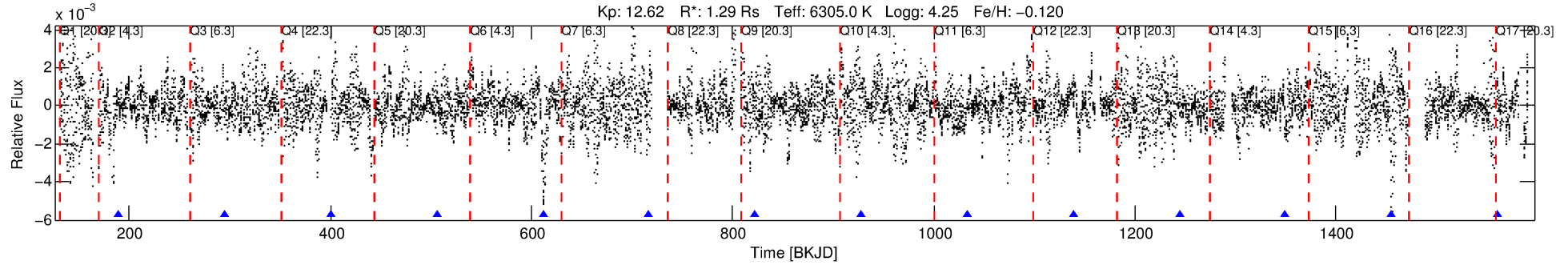
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 005646176-02

No Significant Match Found

# DV One-Page Summary

KIC: 5646176 Candidate: 2 of 9 Period: 105.455 d



## DV Fit Results:

Period = 105.45531 [0.00152] d  
Epoch = 189.6149 [0.0101] BKJD  
Rp/R\* = 0.0962 [0.1929]  
a/R\* = 64.12 [25.96]  
b = 1.00 [0.27]  
Seff = 11.72 [4.46]  
Teq = 472 [45] K  
Rp = 13.60 [27.62] Re  
a = 0.4500 [0.1176] AU  
Ag = 1417.58 [5720.54] [0.25 $\sigma$ ]  
Teffp = 4476 [4500] K [0.89 $\sigma$ ]

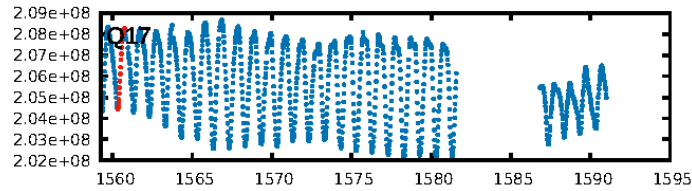
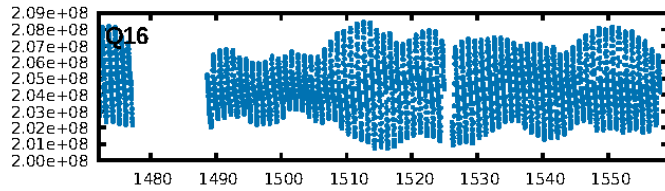
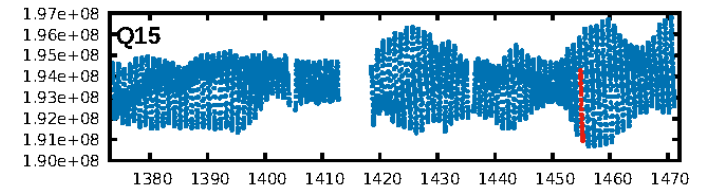
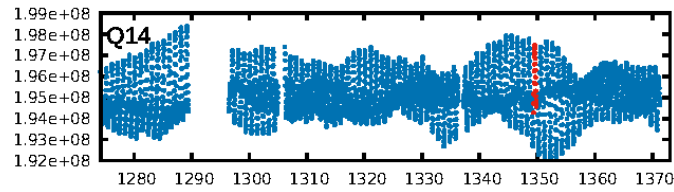
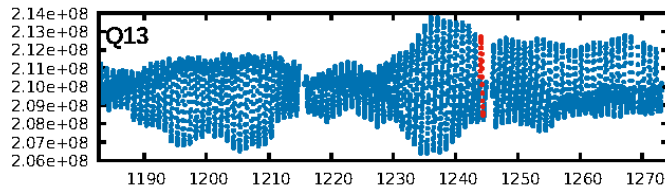
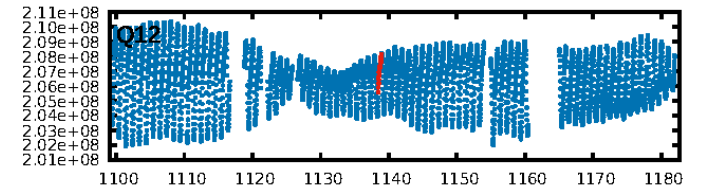
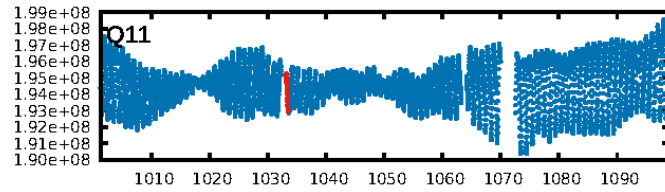
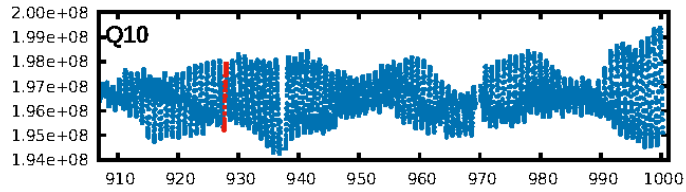
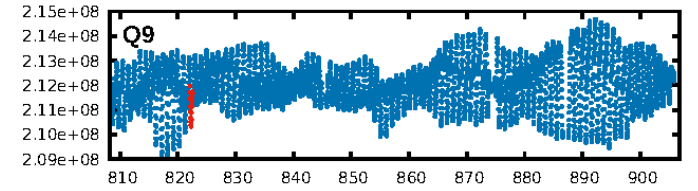
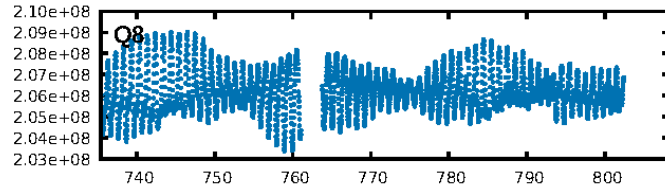
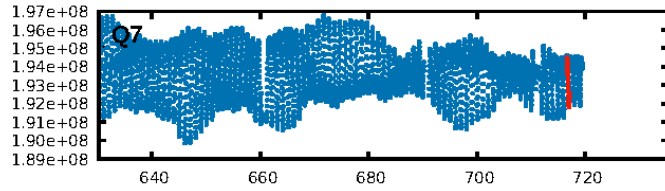
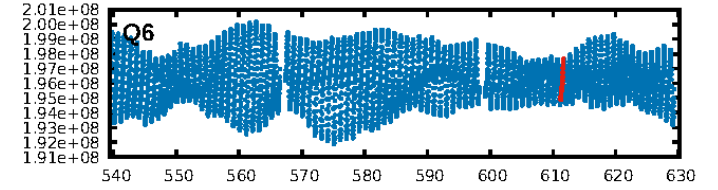
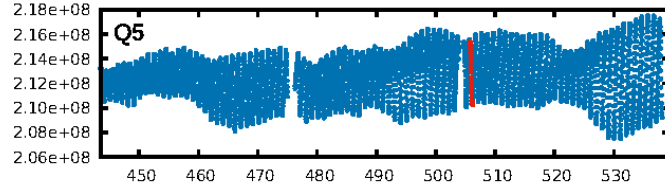
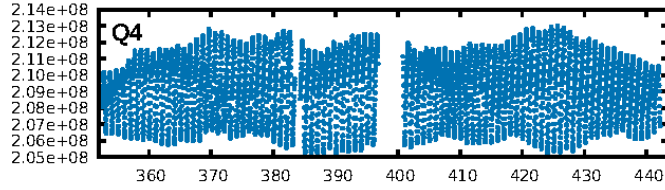
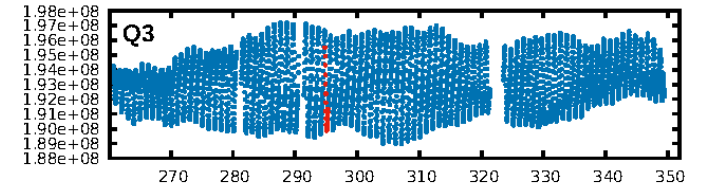
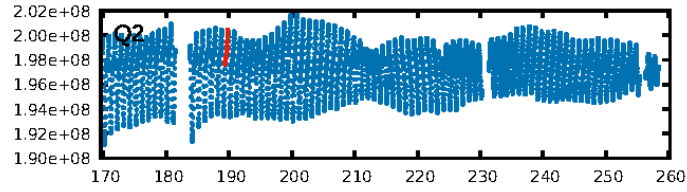
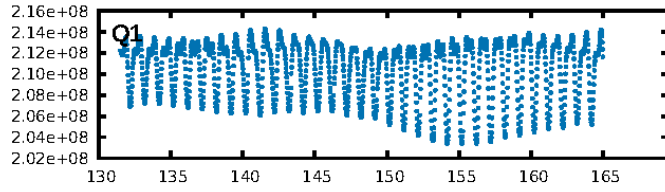
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [78.31 $\sigma$ ]  
LongPeriod-sig: 100.0% [253.10 $\sigma$ ]  
ModelChiSquare2-sig: 0.3%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [5/5]  
GhostDiagnostic-chr: 0.0006231  
Centroid-sig: 31.4%  
Centroid-so: 0.600 arcsec [3.14 $\sigma$ ]  
OotOffset-rm: 0.057 arcsec [0.75 $\sigma$ ]  
KicOffset-rm: 0.079 arcsec [1.12 $\sigma$ ]  
OotOffset-st: 4/3/1/2 [10]  
KicOffset-st: 4/3/1/2 [10]  
DiffImageQuality-fgm: 0.50 [5/10]  
DiffImageOverlap-fno: 0.00 [0/10]

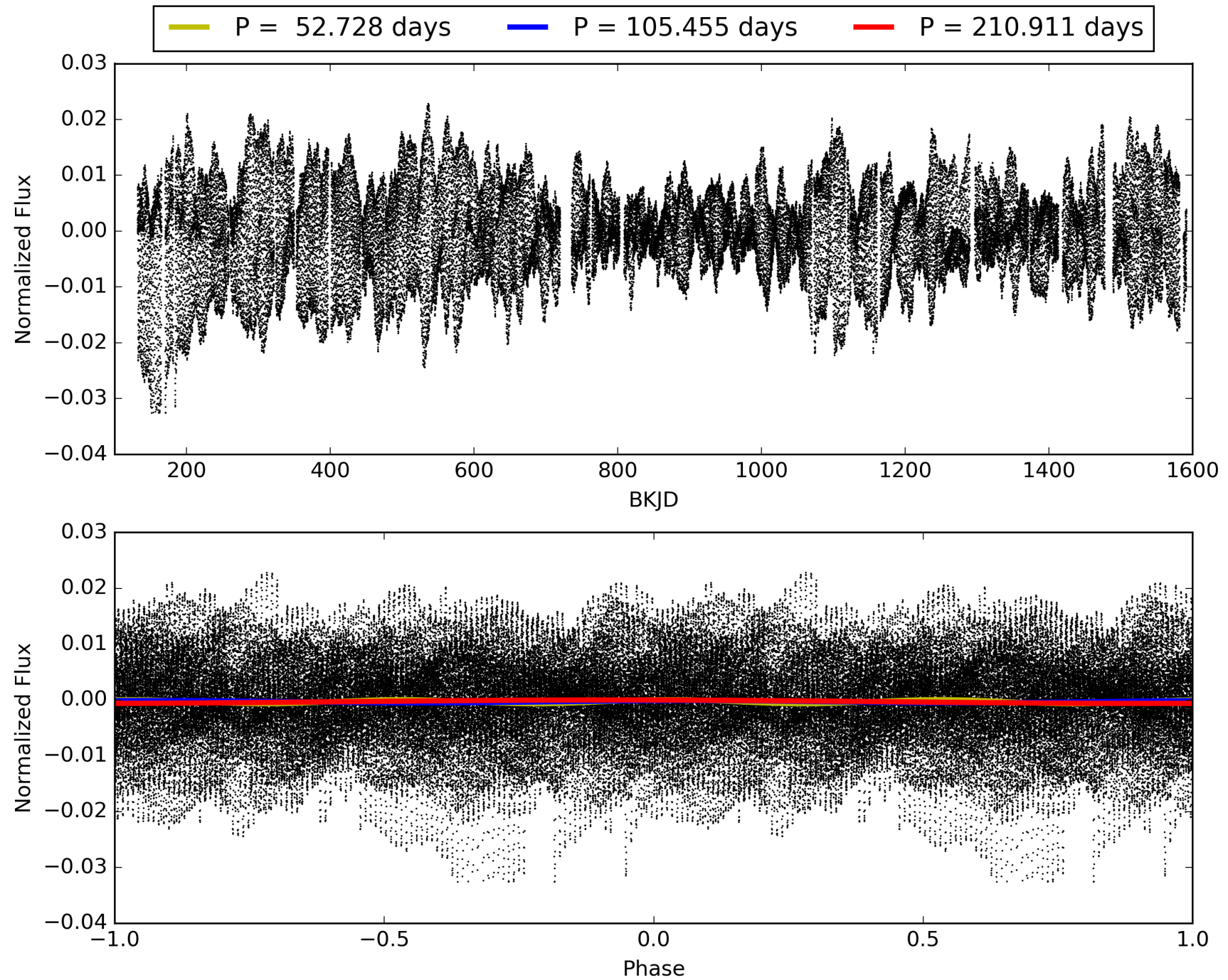
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 16:34:05 Z

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

# TCE 005646176-02, PDC Light Curves

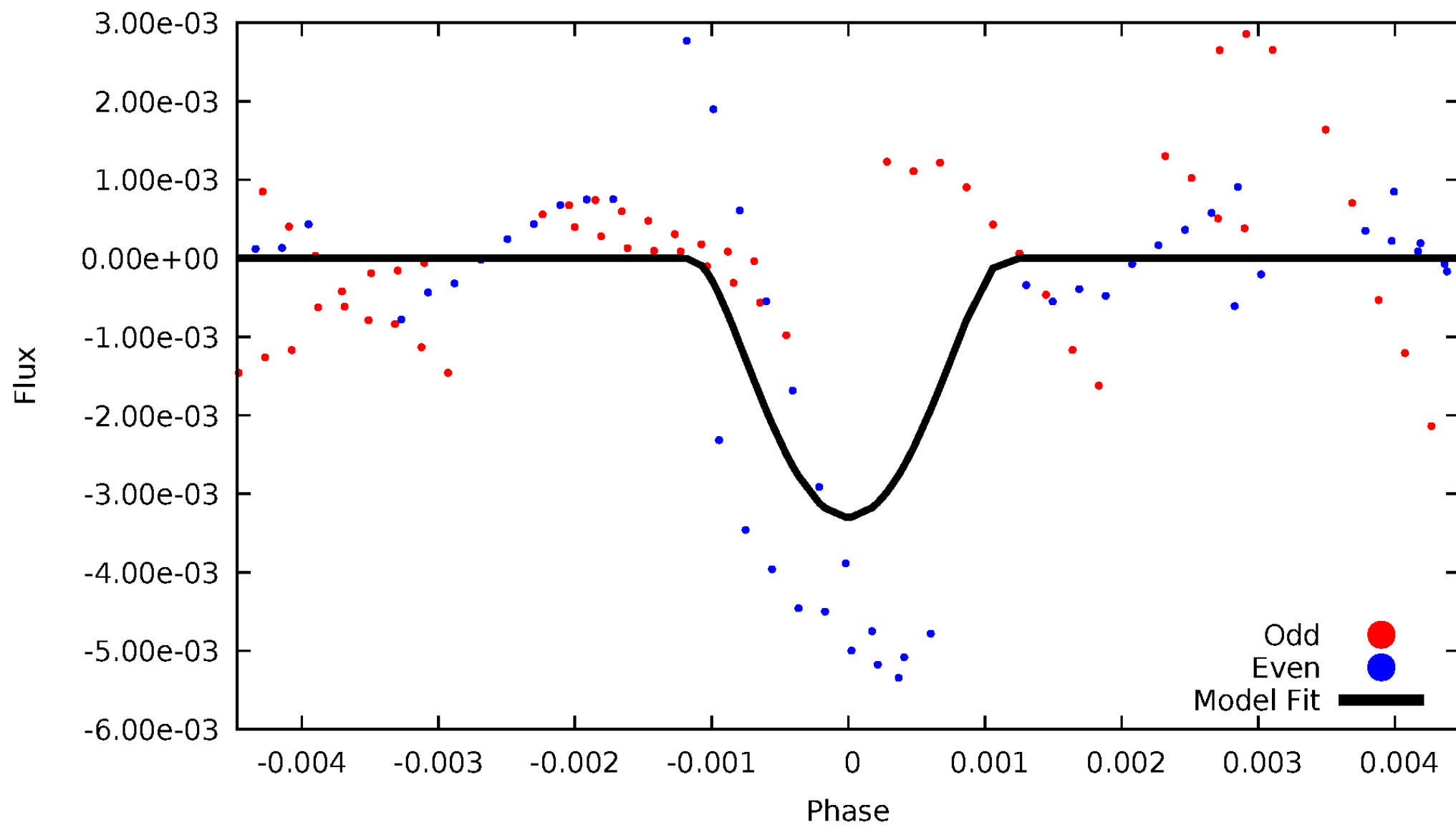


TCE 005646176-02



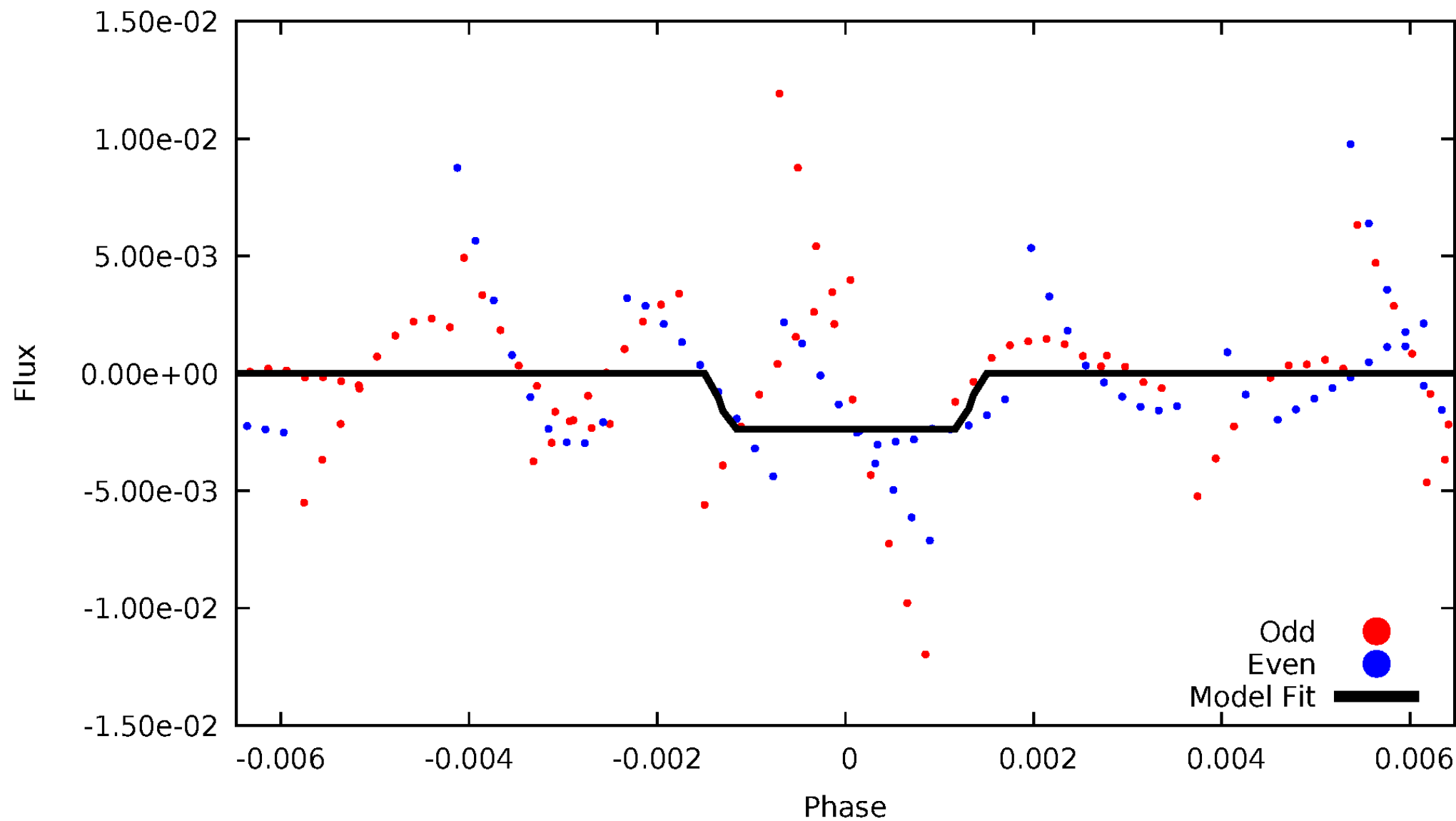
# DV Odd/Even

TCE 005646176-02



# ALT Odd/Even

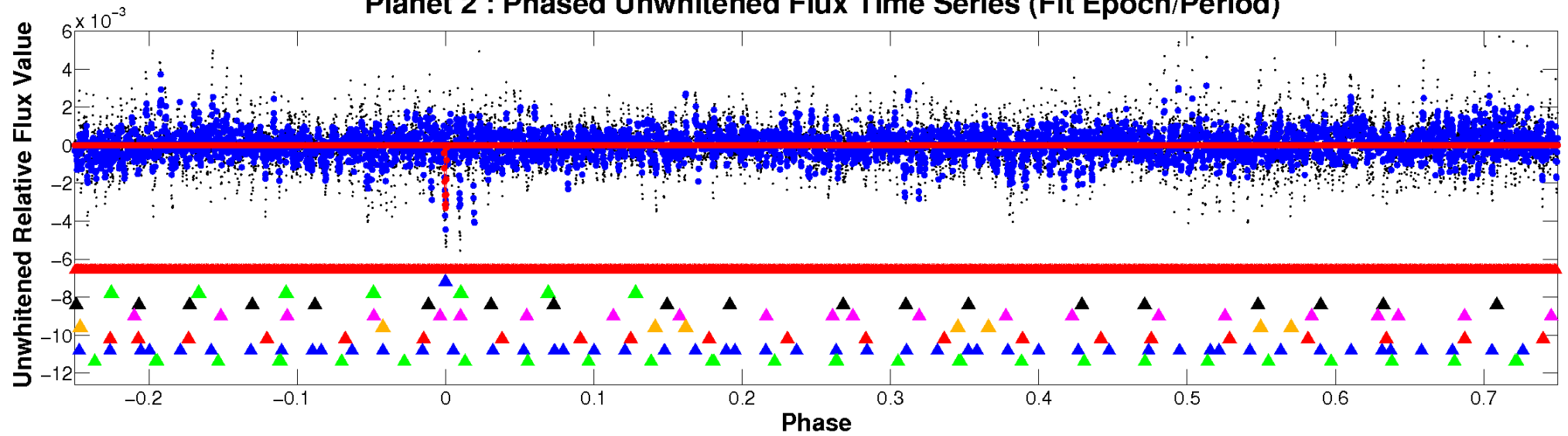
TCE 005646176-02



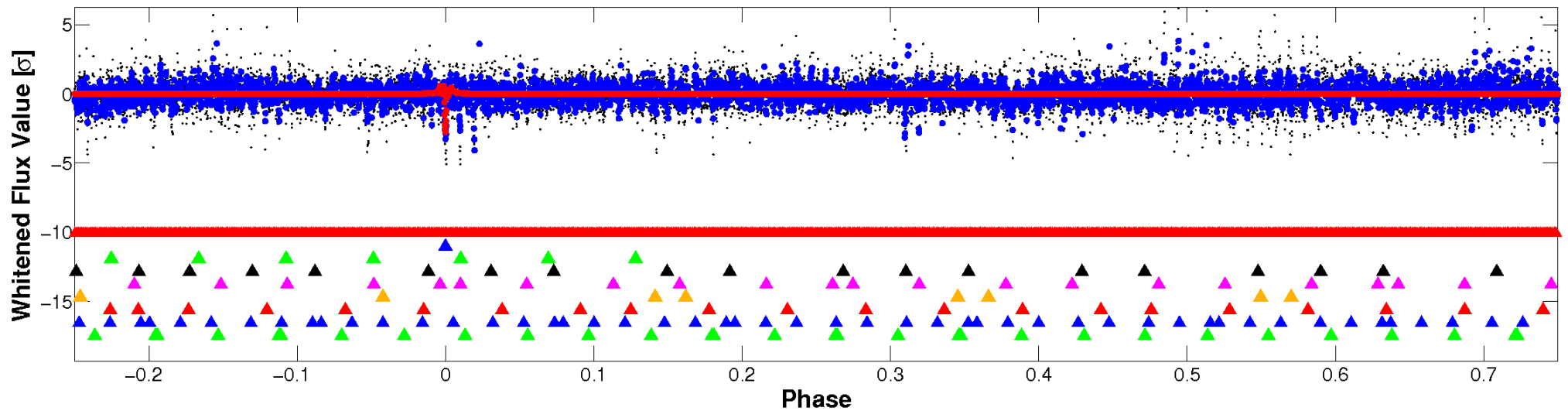


# Non-Whitened Vs. Whitened Light Curve

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

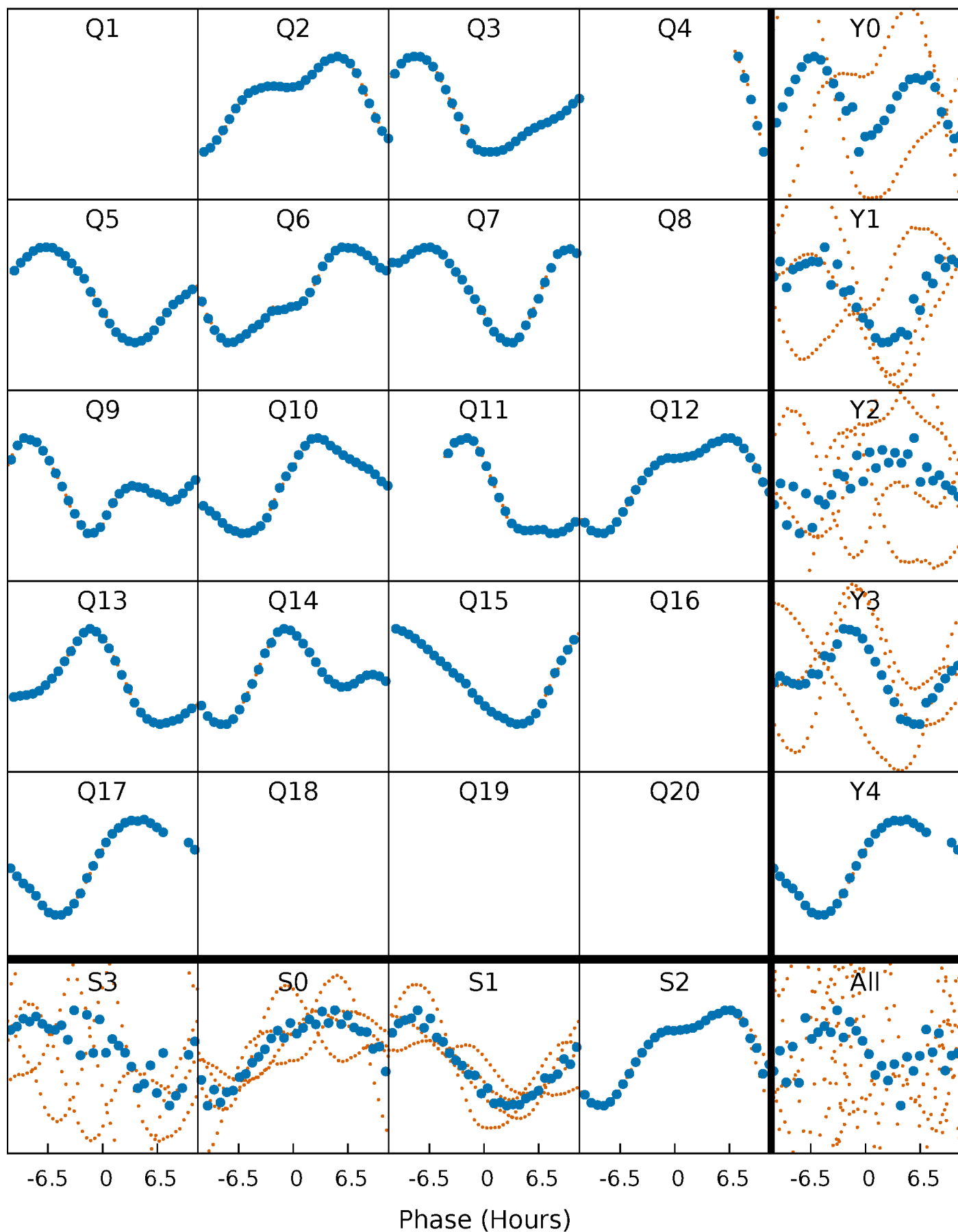


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



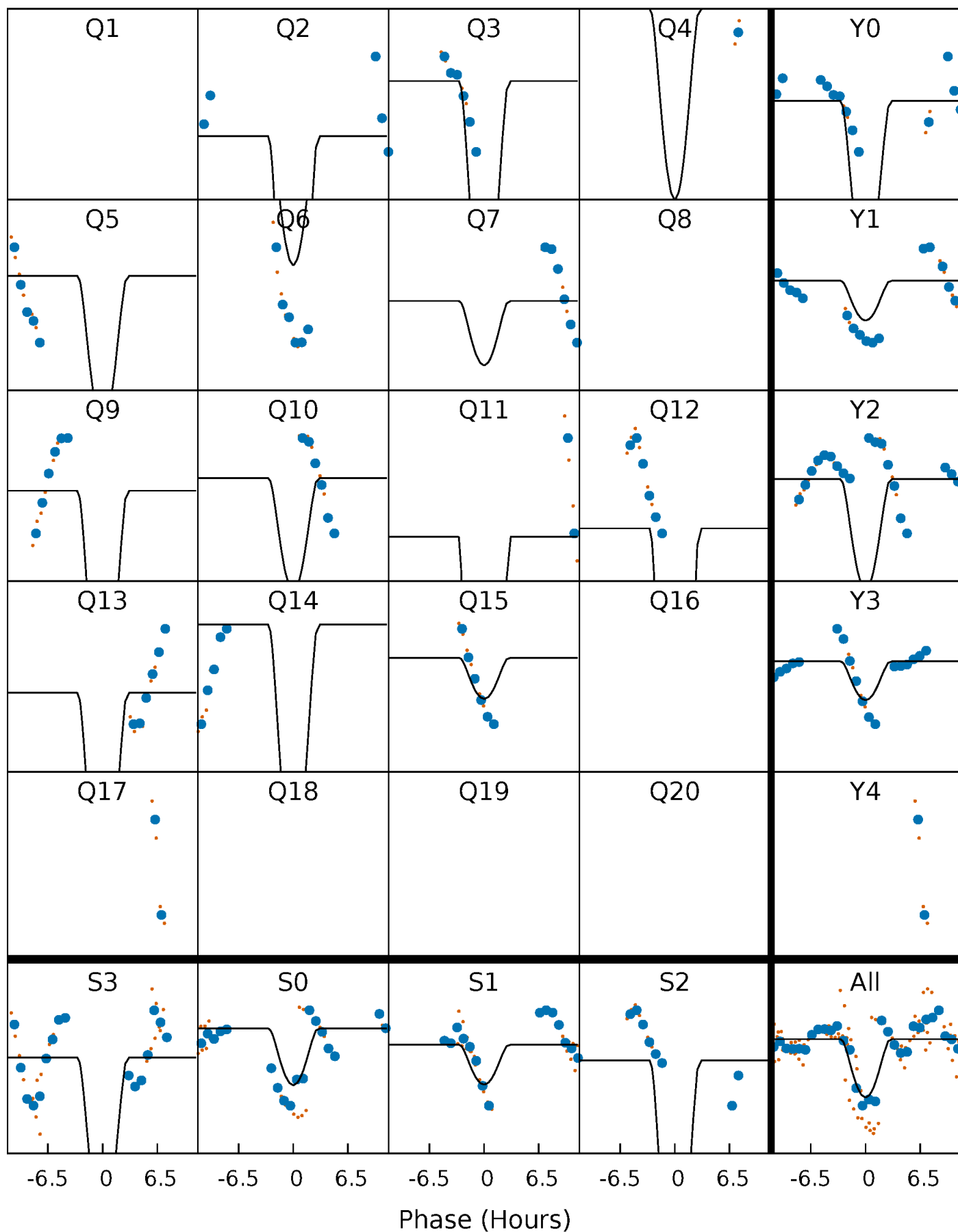
# PDC Quarter-Phased Transit Curves

TCE 005646176-02 P=105.455306 Days  $T_0=189.614921$  (BKJD)



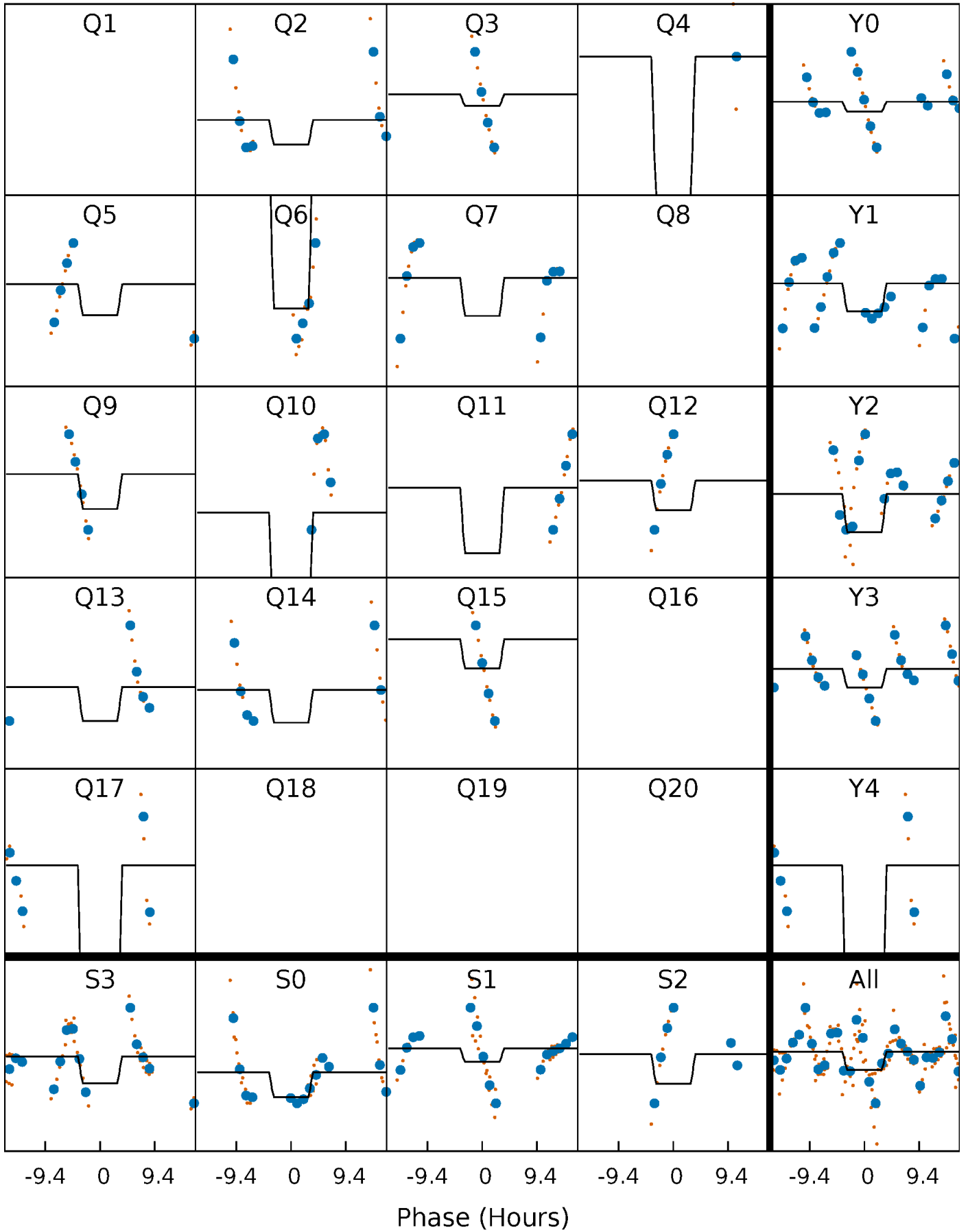
# DV Quarter-Phased Transit Curves

TCE 005646176-02 P=105.455306 Days  $T_0=189.614921$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 005646176-02 P=105.462724 Days  $T_0=189.469933$  (BKJD)

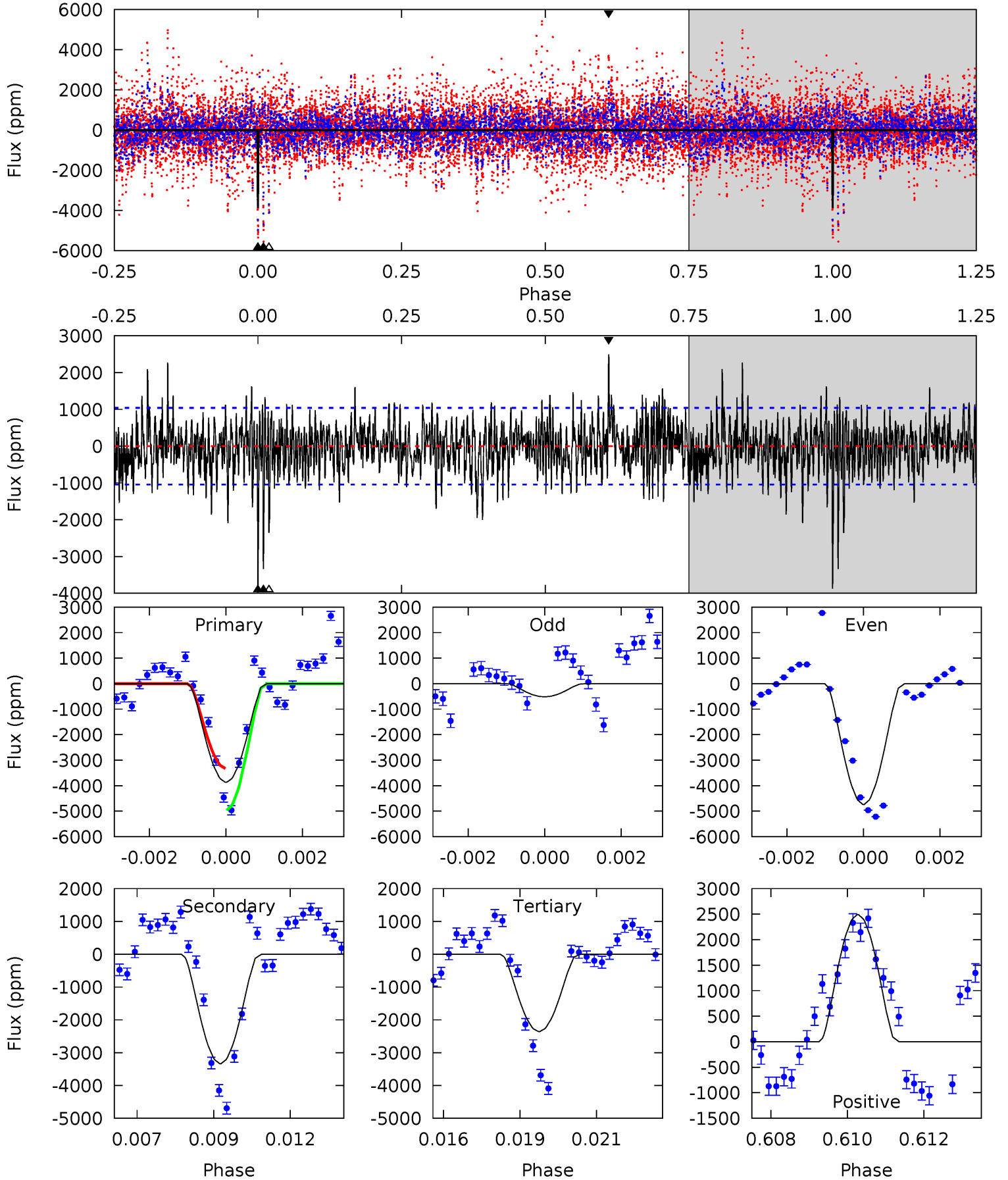




# DV Model-Shift Uniqueness Test

005646176-02,  $P = 105.455306$  Days,  $E = 84.159615$  Days

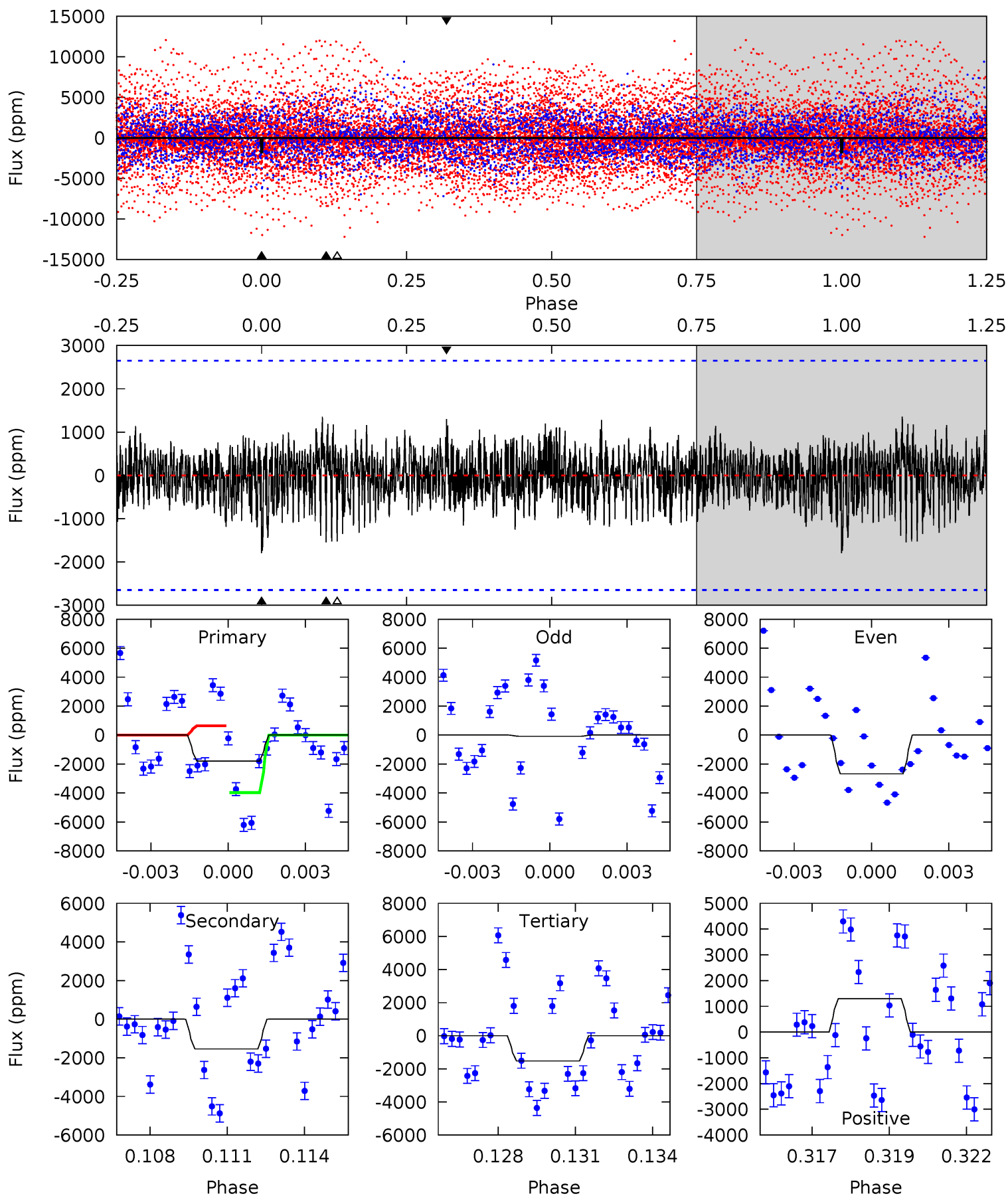
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
19.7	17.0	12.0	12.7	5.30	3.04	2.94	7.69	7.01	4.97	4.29	10.7	1.46	0.39	3.83



# Alt Model-Shift Uniqueness Test

005646176-02,  $P = 105.462724$  Days,  $E = 84.007209$  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
3.56	3.06	3.03	2.58	5.26	2.98	0.89	0.53	0.98	0.03	0.48	2.56	0.85	0.43	3.32



### Stellar Parameters For KIC 005646176

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6305^{+151}_{-189}$	$4.252^{+0.153}_{-0.187}$	$-0.120^{+0.250}_{-0.300}$	$1.295^{+0.424}_{-0.261}$	$1.091^{+0.197}_{-0.121}$	$0.707^{+0.542}_{-0.354}$
	+2%/-3%	+4%/-4%	+208%/-250%	+33%/-20%	+18%/-11%	+77%/-50%
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 005646176-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-3334 \pm 197$	$25.37^{+23.65}_{-17.06}$	$661^{+50}_{-44}$	$3920^{+2329}_{-728}$	$587^{+4721}_{-427}$
Alt.	$-1541 \pm 503$	$21.81^{+21.75}_{-14.97}$	$662^{+50}_{-38}$	$3597^{+2227}_{-663}$	$342^{+3433}_{-257}$

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

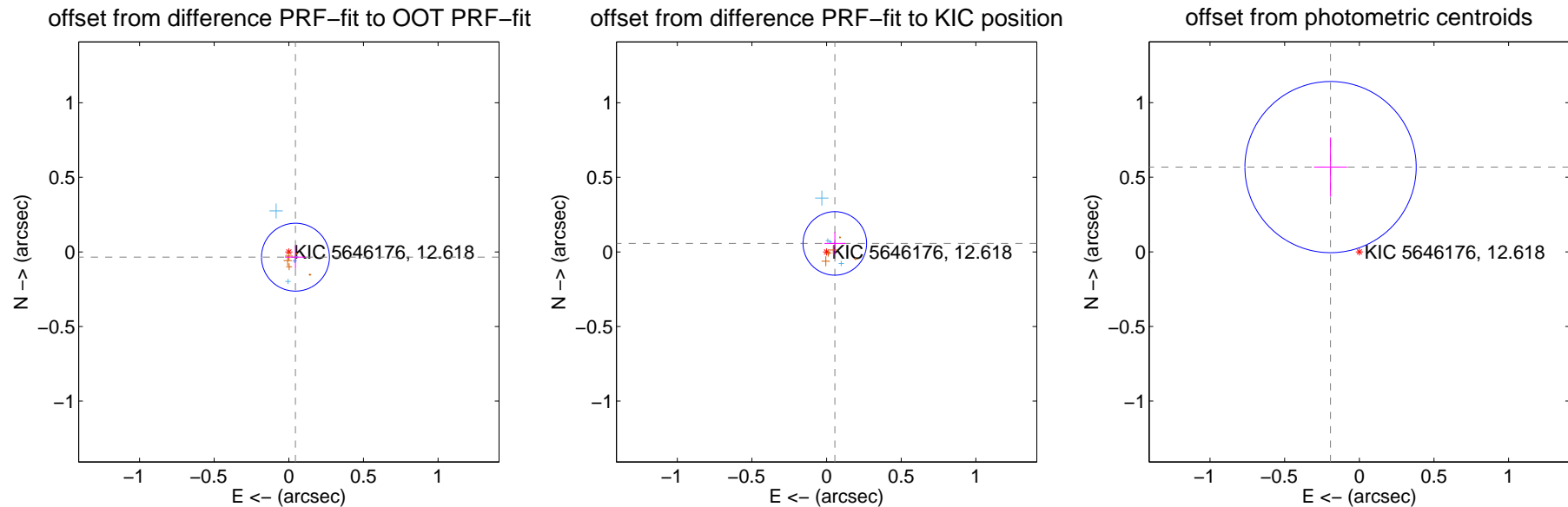
## DV Centroid Data

Supplemental centroid analysis for 005646176-02. Kepler magnitude: 12.62. Transit SNR 9.09

There are 5 quarters with good PRF difference image offsets

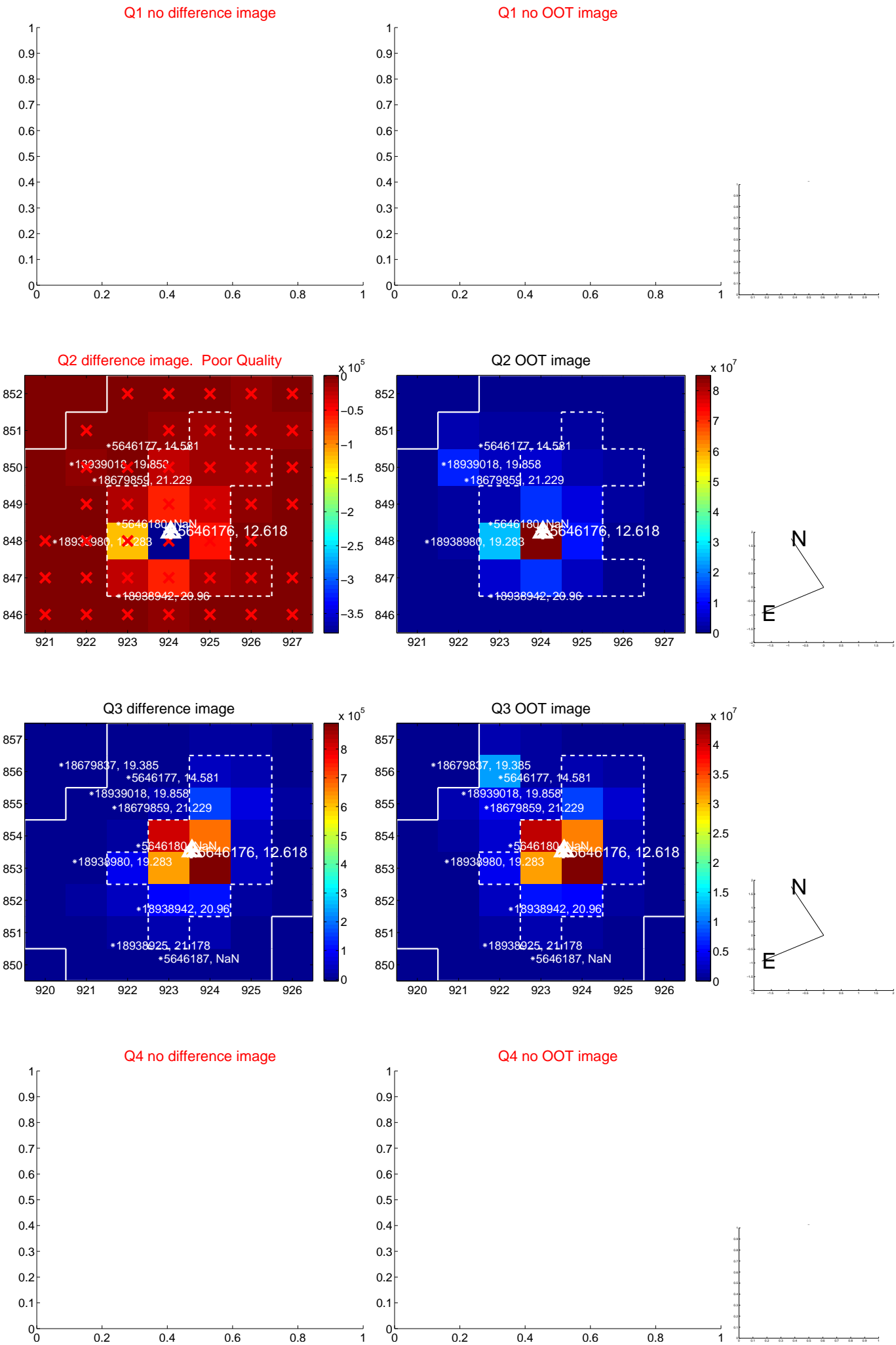
The direct PRF centroid is offset from the target star catalog position by about 0.13 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.057 \pm 0.076$	0.75	$-0.044 \pm 0.070$	$-0.035 \pm 0.077$
PRF-fit source offset from KIC position	$0.079 \pm 0.071$	1.12	$-0.055 \pm 0.070$	$0.057 \pm 0.076$
photometric centroid source offset	$0.60 \pm 0.19$	3.14	$0.19 \pm 0.11$	$0.57 \pm 0.20$



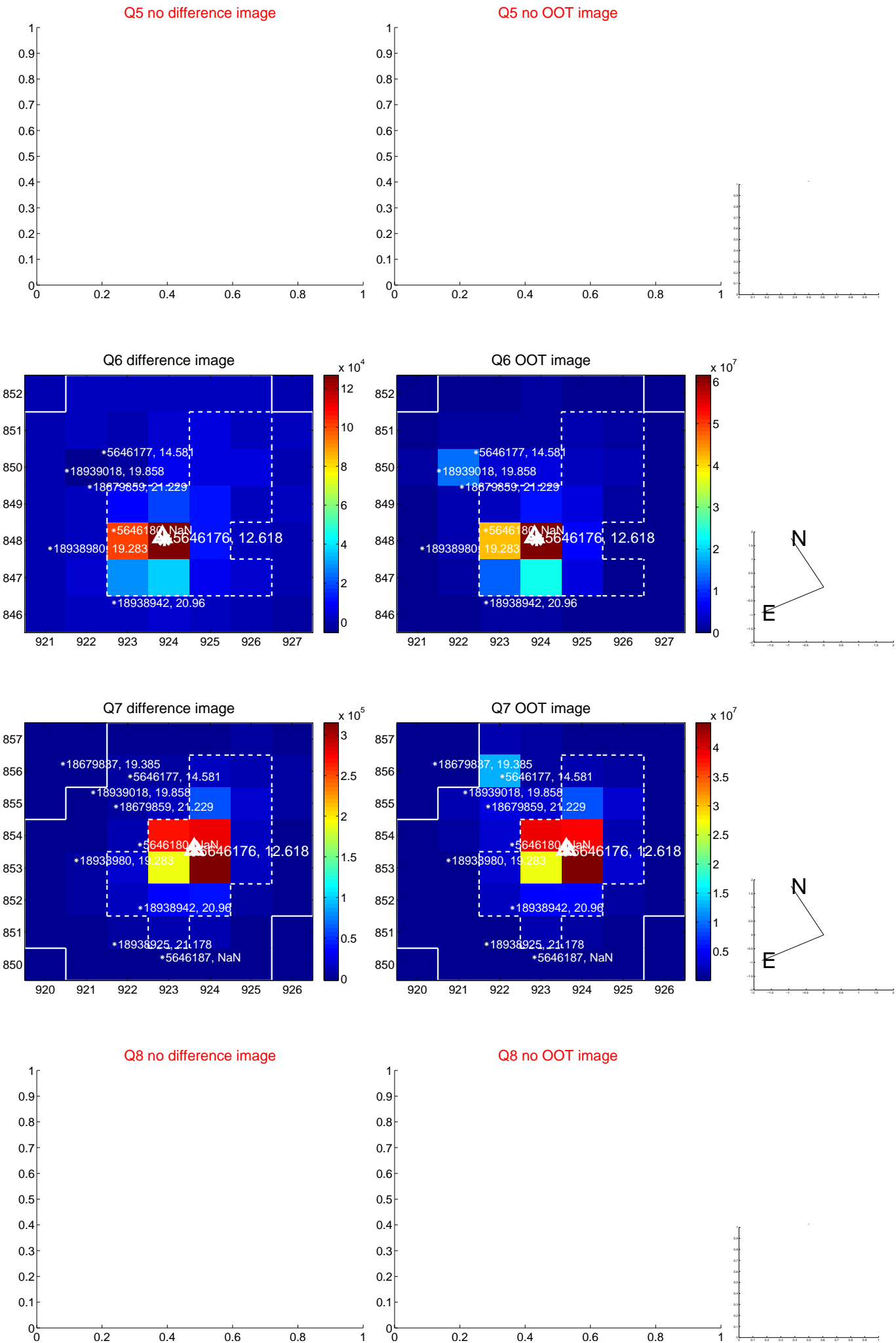
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

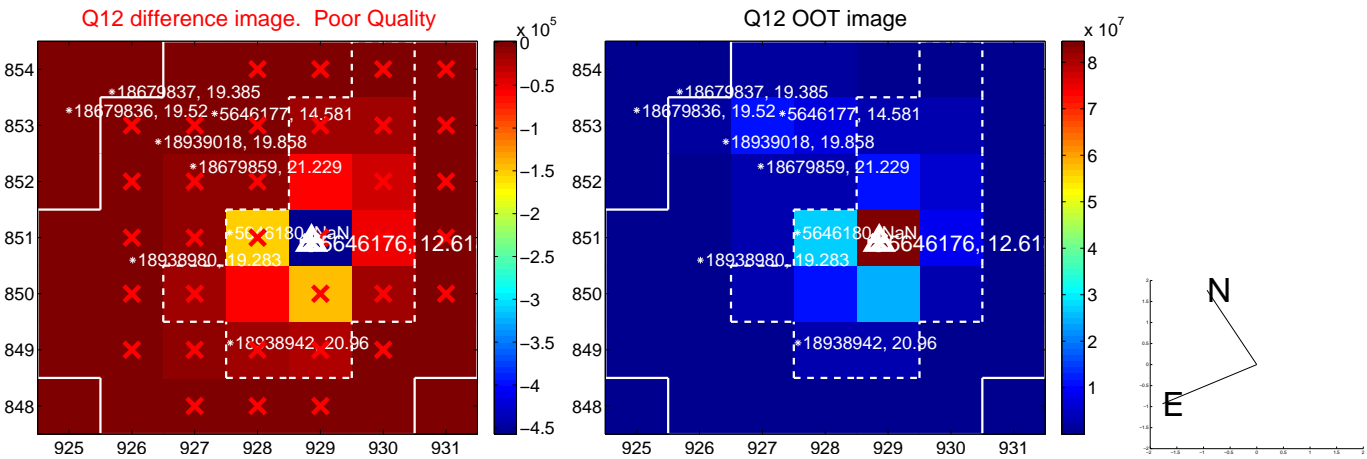
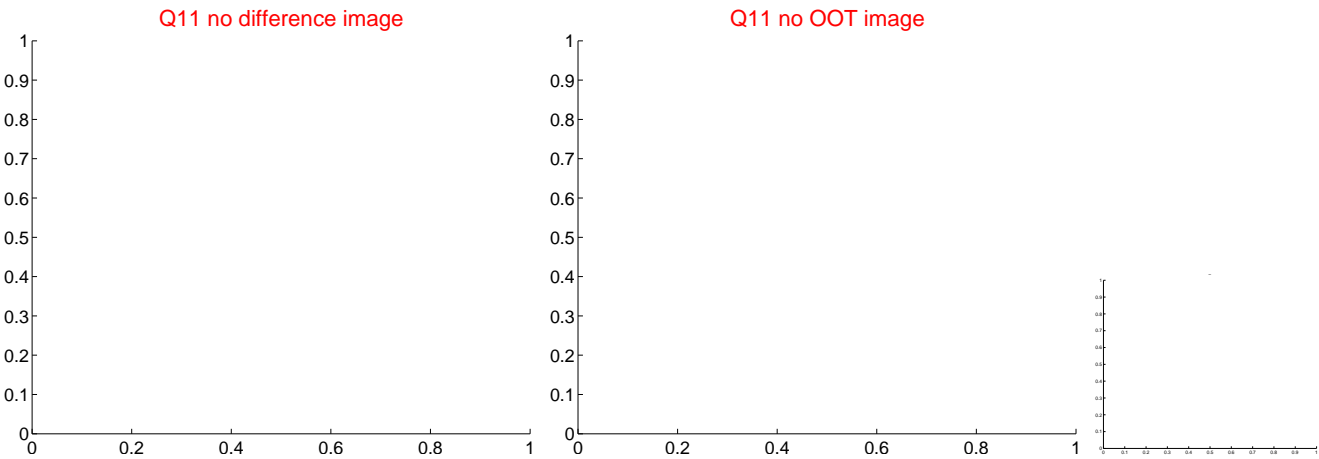
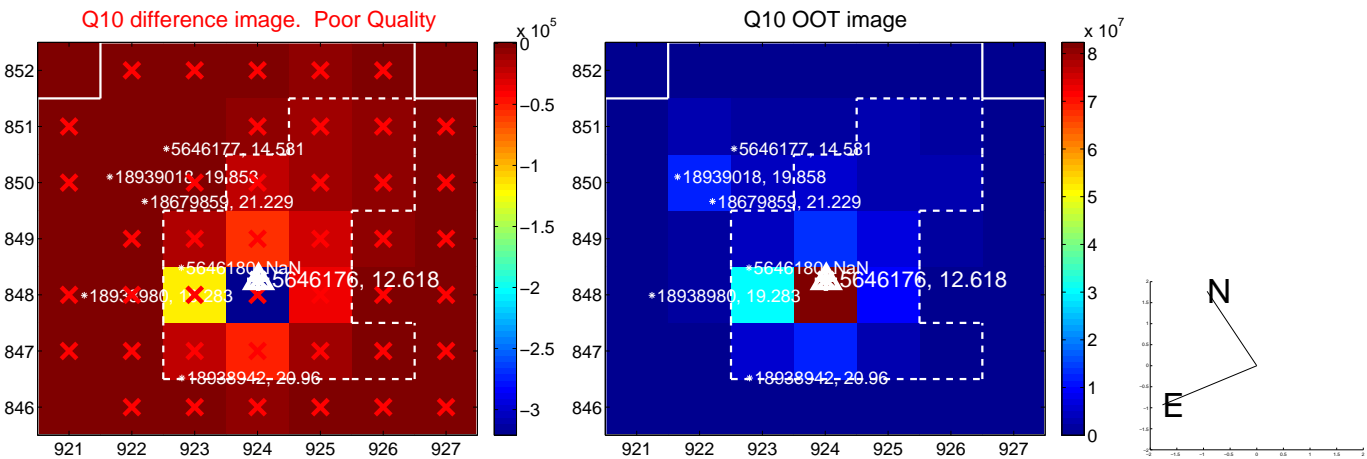
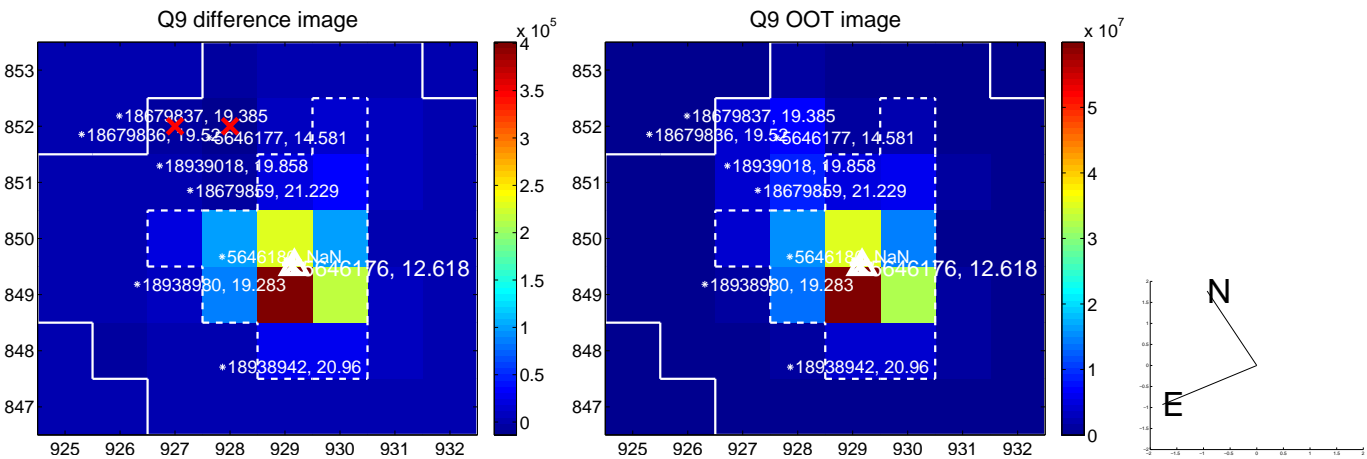




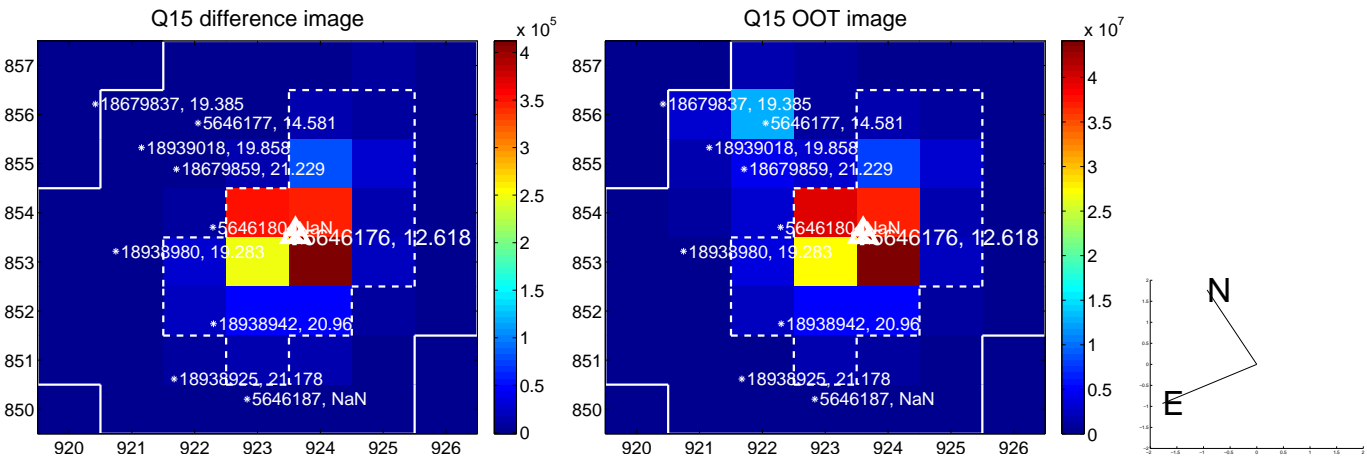
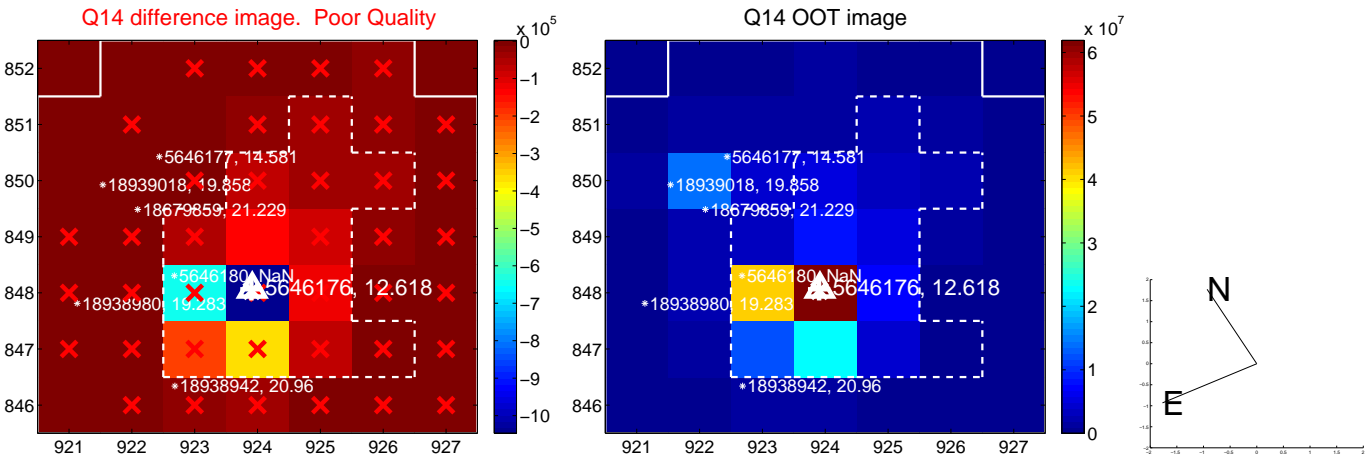
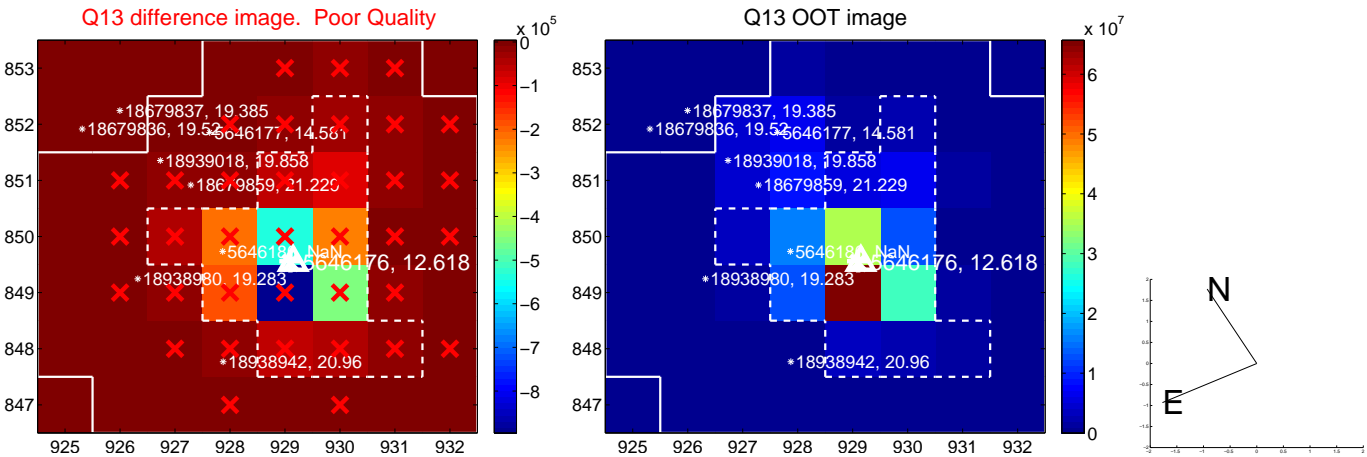
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



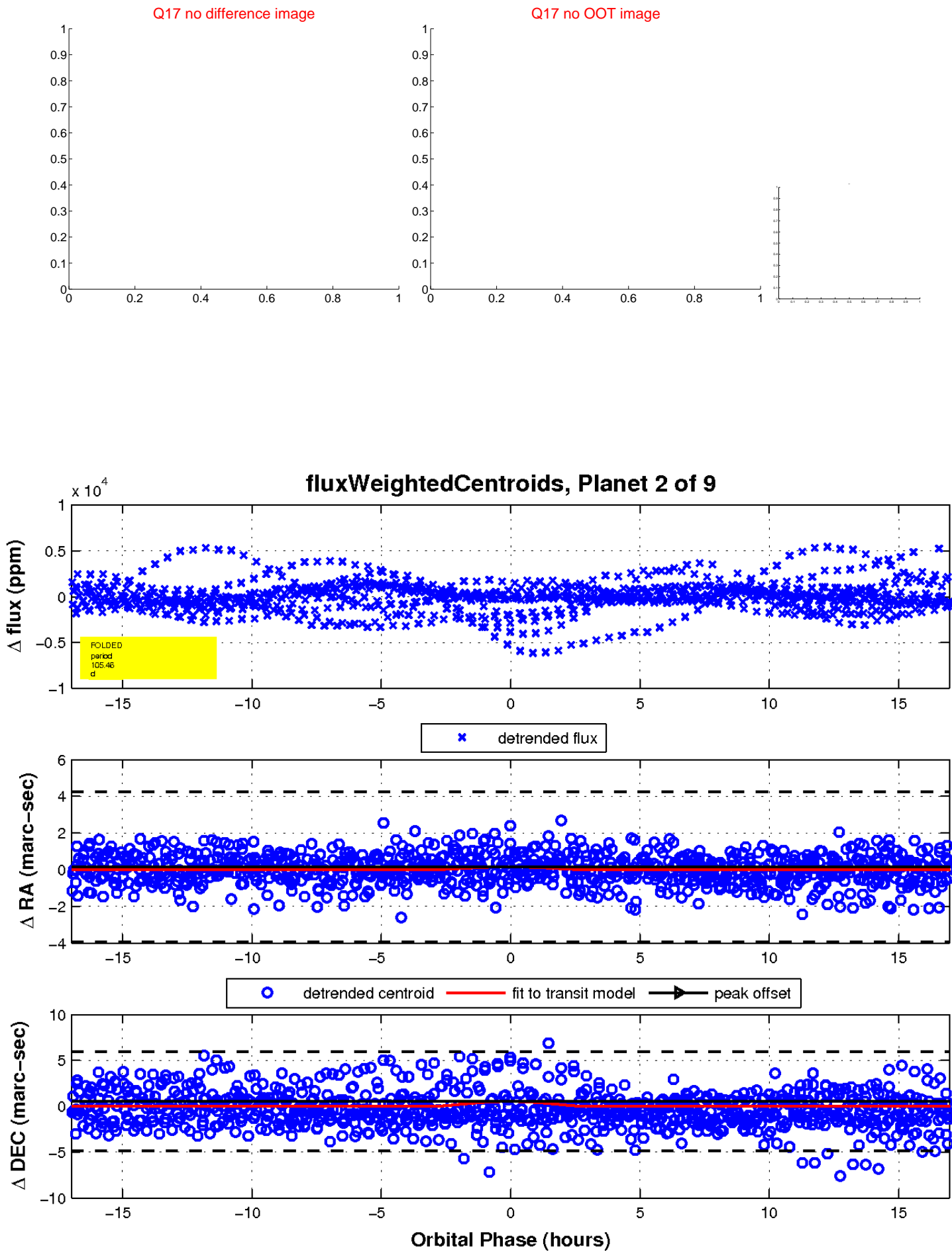
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



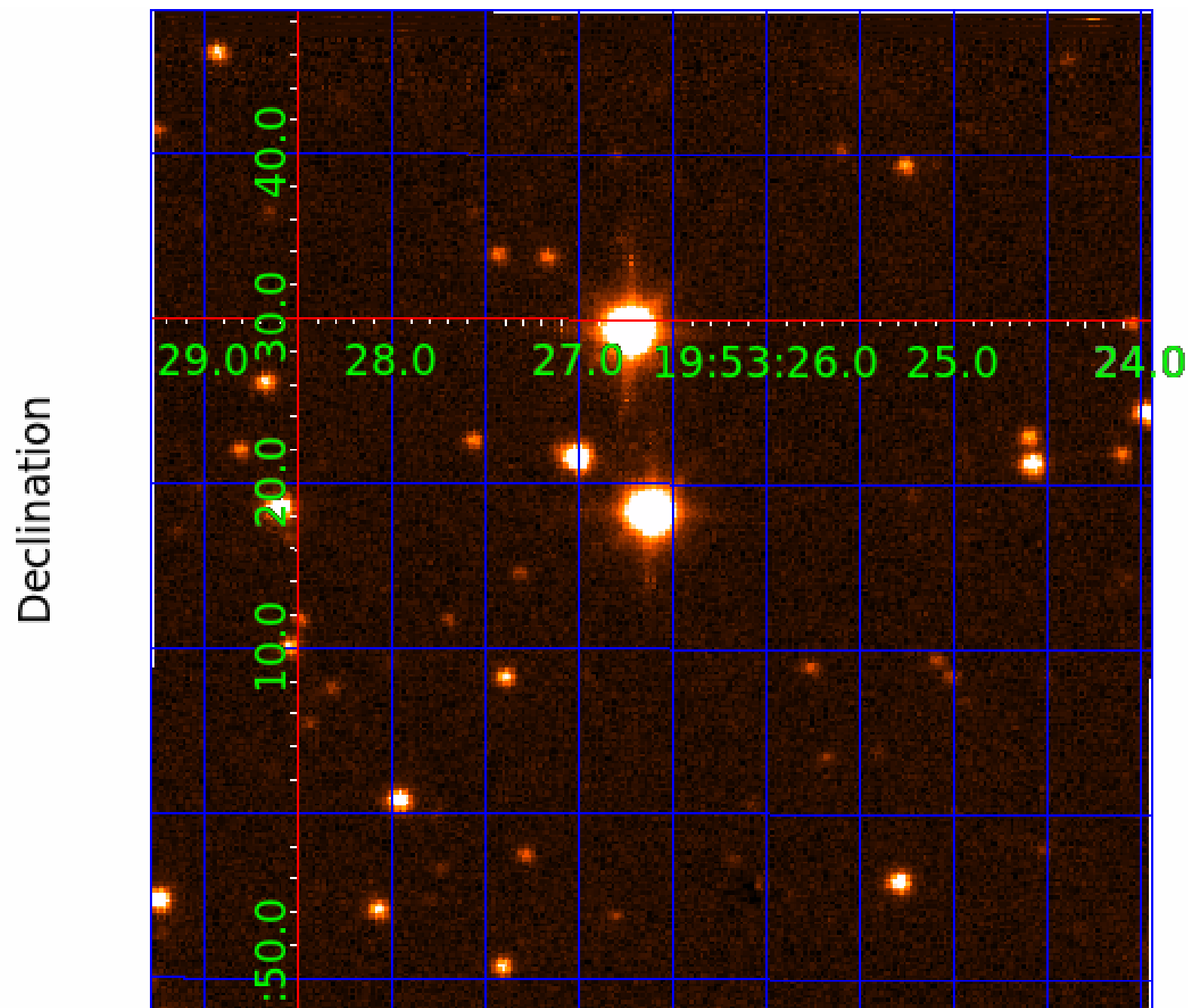
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



UKIRT Image





# KIC 005646176

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
005646176-01	OBS	No	0.998360	131.711809	47.6	6.354	10.0	6.1	1.29	6305	0.96	5853.71
005646176-02	OBS	No	105.455306	189.614921	3300.8	5.660	14.2	9.1	1.29	6305	13.60	11.72
005646176-03	OBS	No	204.697781	203.133079	1748.4	11.405	12.3	7.0	1.29	6305	6.22	4.84
005646176-04	OBS	No	75.961627	171.426607	2640.1	7.047	11.2	8.9	1.29	6305	12.02	18.16
005646176-05	OBS	No	66.679595	189.232216	1425.1	5.625	9.4	6.6	1.29	6305	6.08	21.60
005646176-08	OBS	No	29.414987	139.159990	1189.4	9.687	8.1	8.2	1.29	6305	7.52	64.33
005646176-09	OBS	No	48.339322	177.775979	171.6	6.000	8.2	-1.0	1.29	6305	1.70	33.17

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
005646176-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT
005646176-02	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—HALO_GHOST
005646176-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS
005646176-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
005646176-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
005646176-08	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
005646176-09	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_ALT—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_NOFITS

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

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

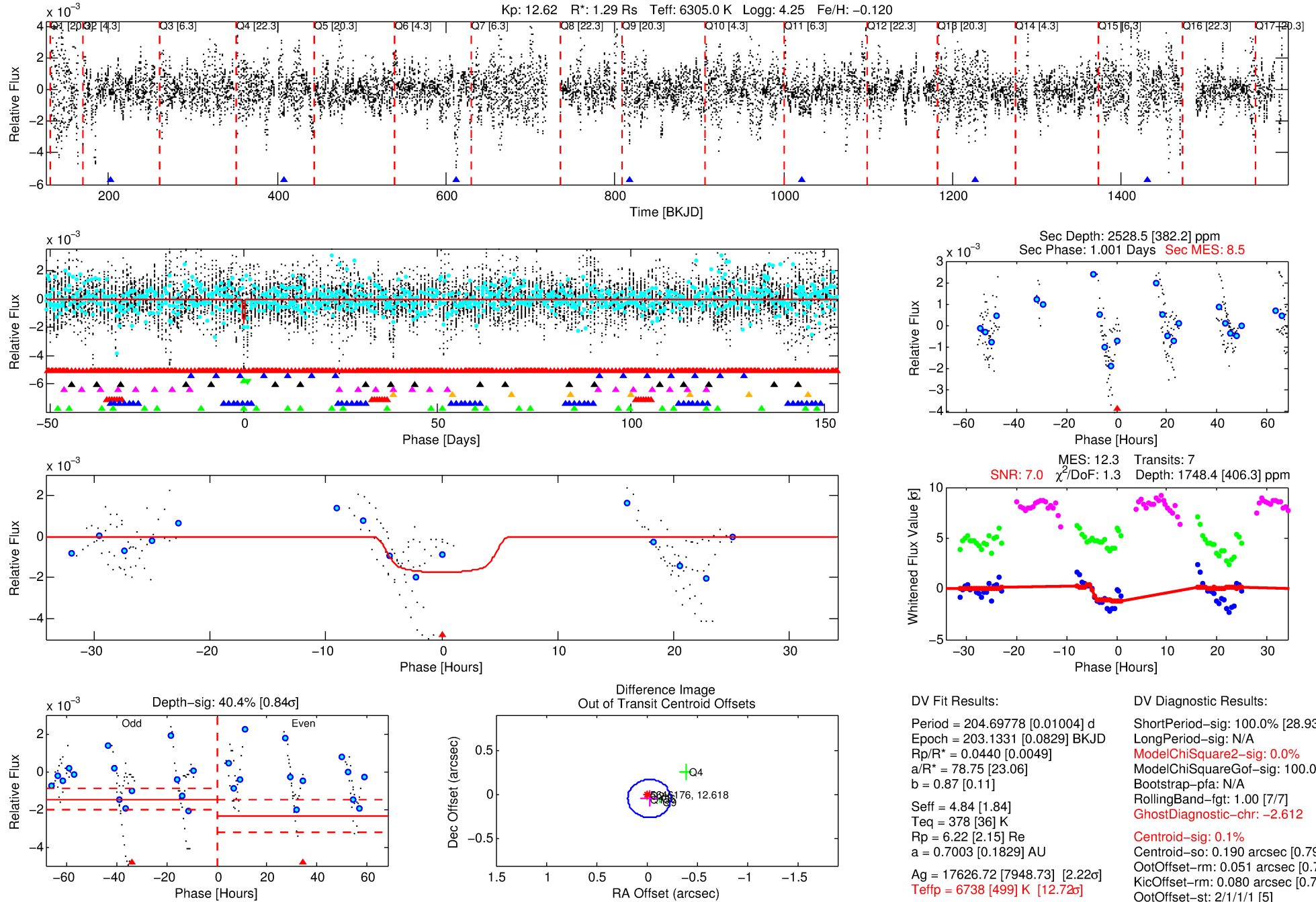
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 005646176-03

No Significant Match Found

# DV One-Page Summary

KIC: 5646176 Candidate: 3 of 9 Period: 204.698 d



## DV Fit Results:

Period = 204.69778 [0.01004] d  
Epoch = 203.1331 [0.0829] BKJD  
Rp/R\* = 0.0440 [0.0049]  
a/R\* = 78.75 [23.06]  
b = 0.87 [0.11]  
Seff = 4.84 [1.84]  
Teq = 378 [36] K  
Rp = 6.22 [2.15] Re  
a = 0.7003 [0.1829] AU  
Ag = 17626.72 [7948.73] [2.22 $\sigma$ ]  
Teffp = 6738 [499] K [12.72 $\sigma$ ]

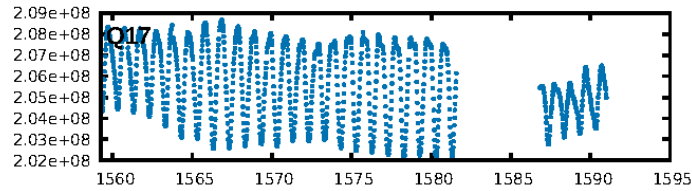
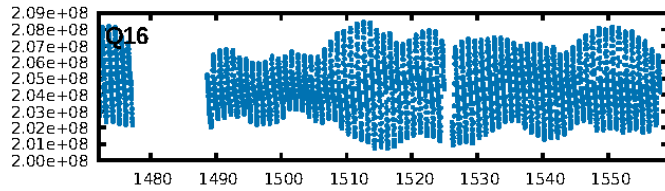
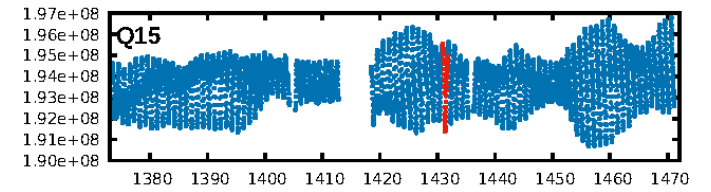
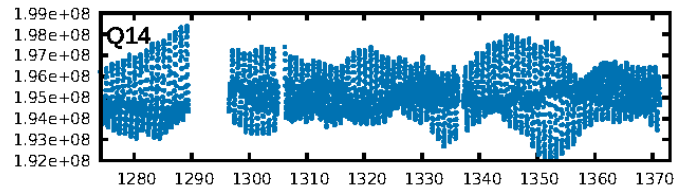
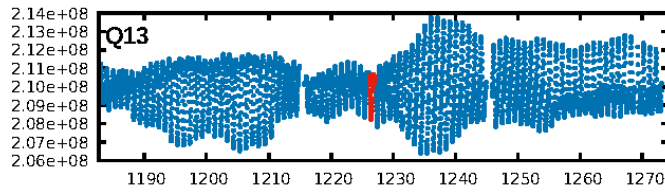
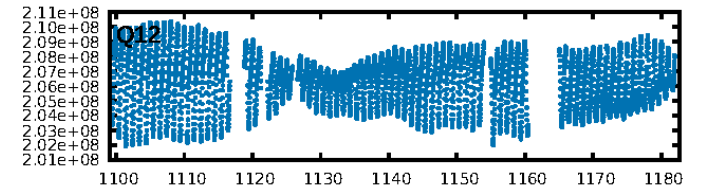
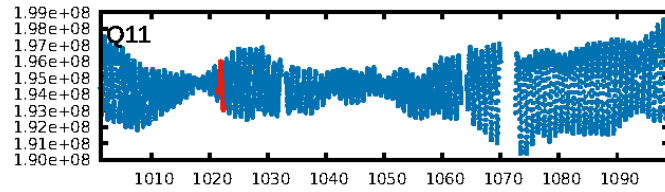
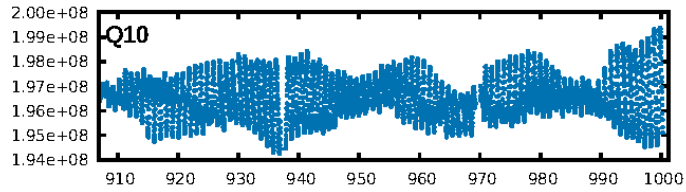
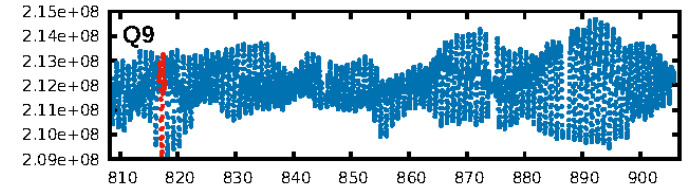
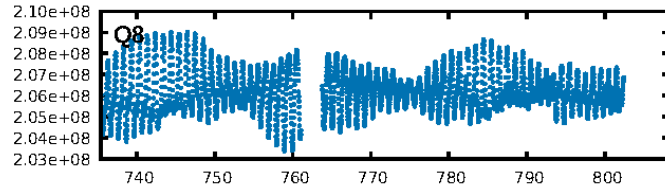
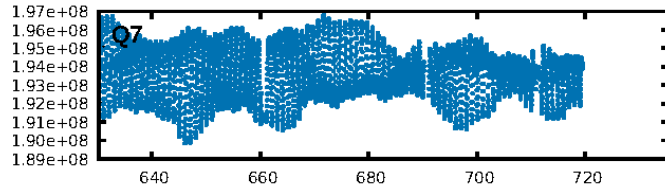
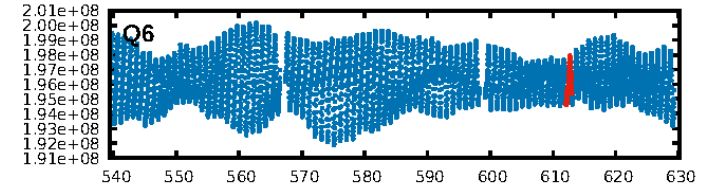
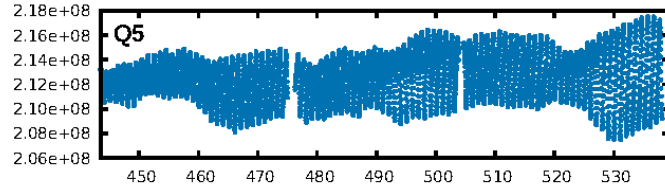
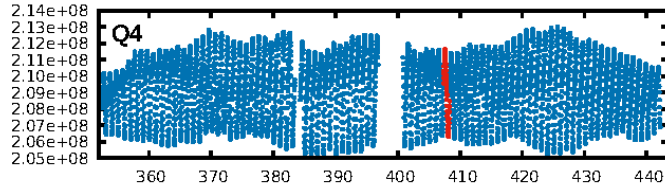
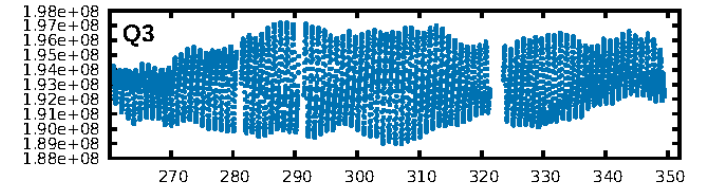
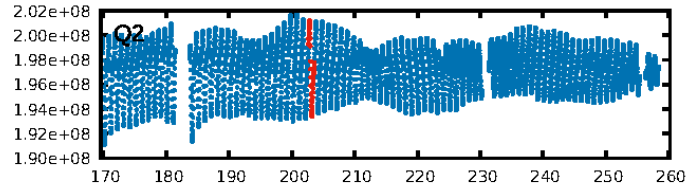
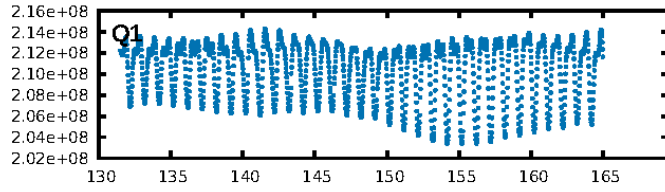
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [28.93 $\sigma$ ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 0.0%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [7/7]  
GhostDiagnostic-chr: -2.612  
Centroid-sig: 0.1%  
Centroid-so: 0.190 arcsec [0.79 $\sigma$ ]  
OotOffset-rm: 0.051 arcsec [0.72 $\sigma$ ]  
OotOffset-st: 2/1/1/1 [5]  
KicOffset-rm: 0.080 arcsec [0.76 $\sigma$ ]  
KicOffset-st: 2/1/1/1 [5]  
DiffImageQuality-fgm: 0.60 [3/5]  
DiffImageOverlap-fno: 0.00 [0/5]

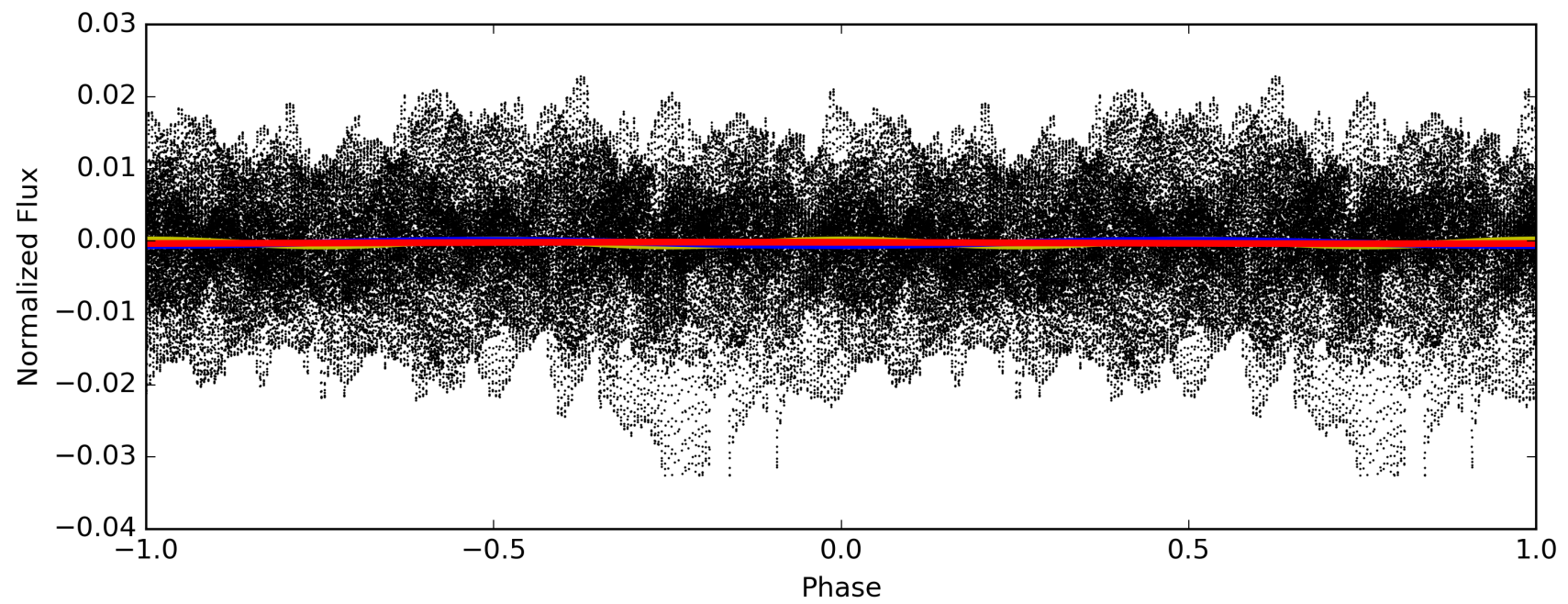
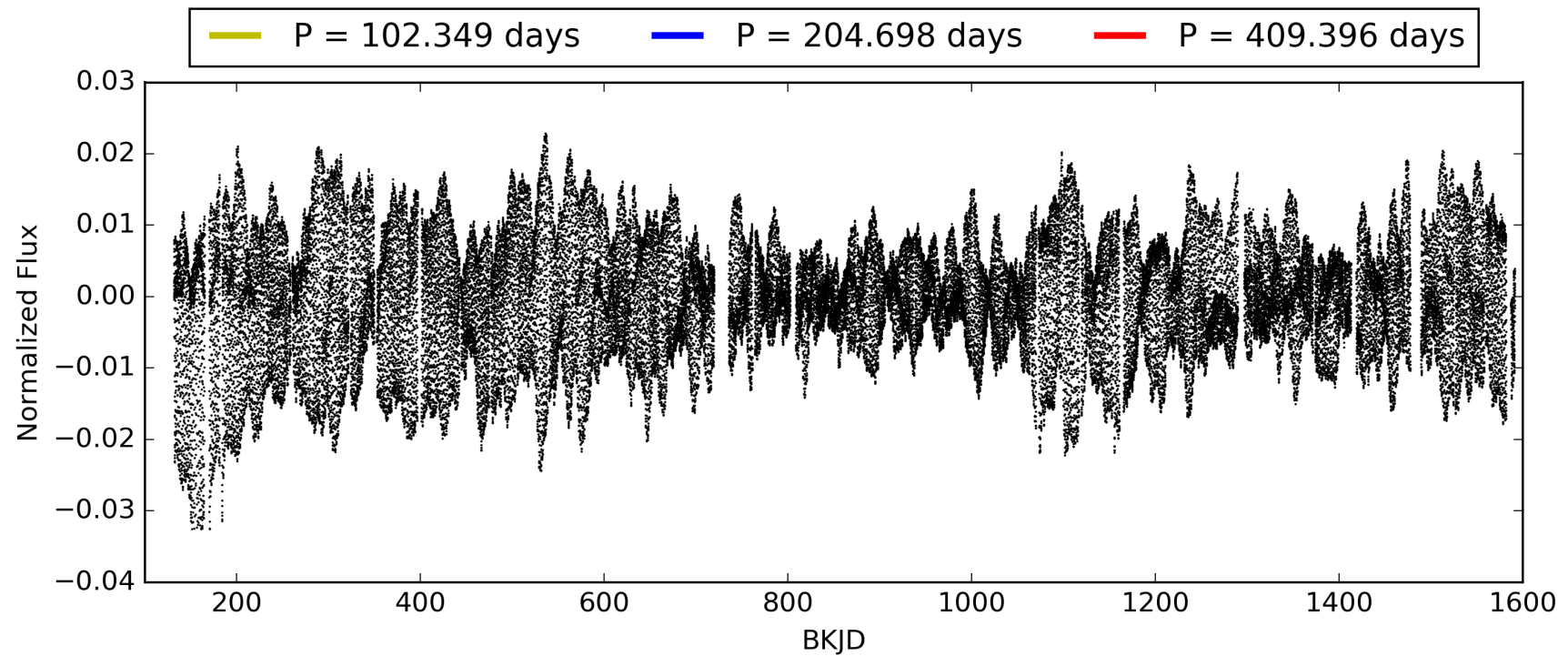
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 16:34:09 Z

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

# TCE 005646176-03, PDC Light Curves

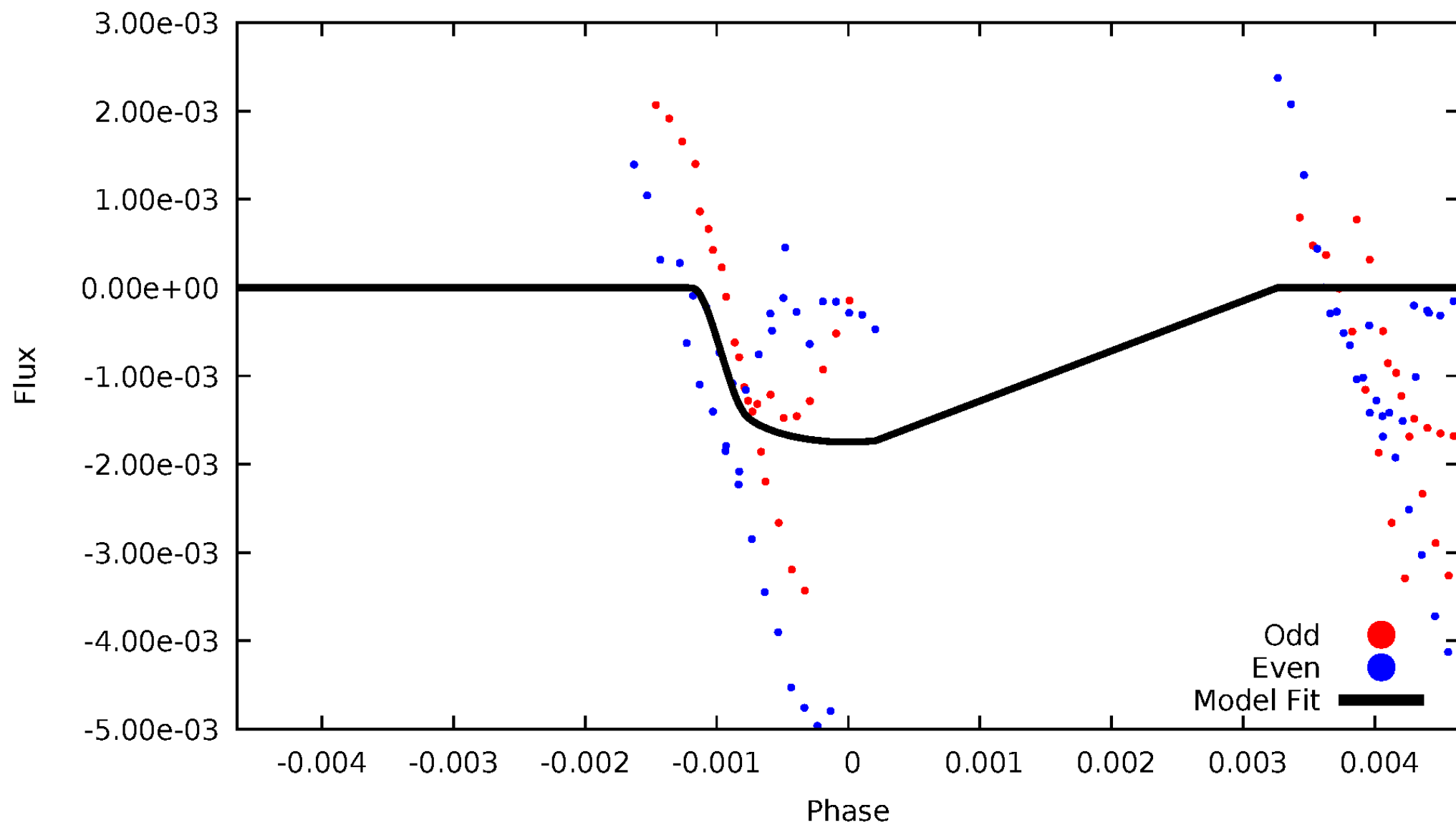


TCE 005646176-03



# DV Odd/Even

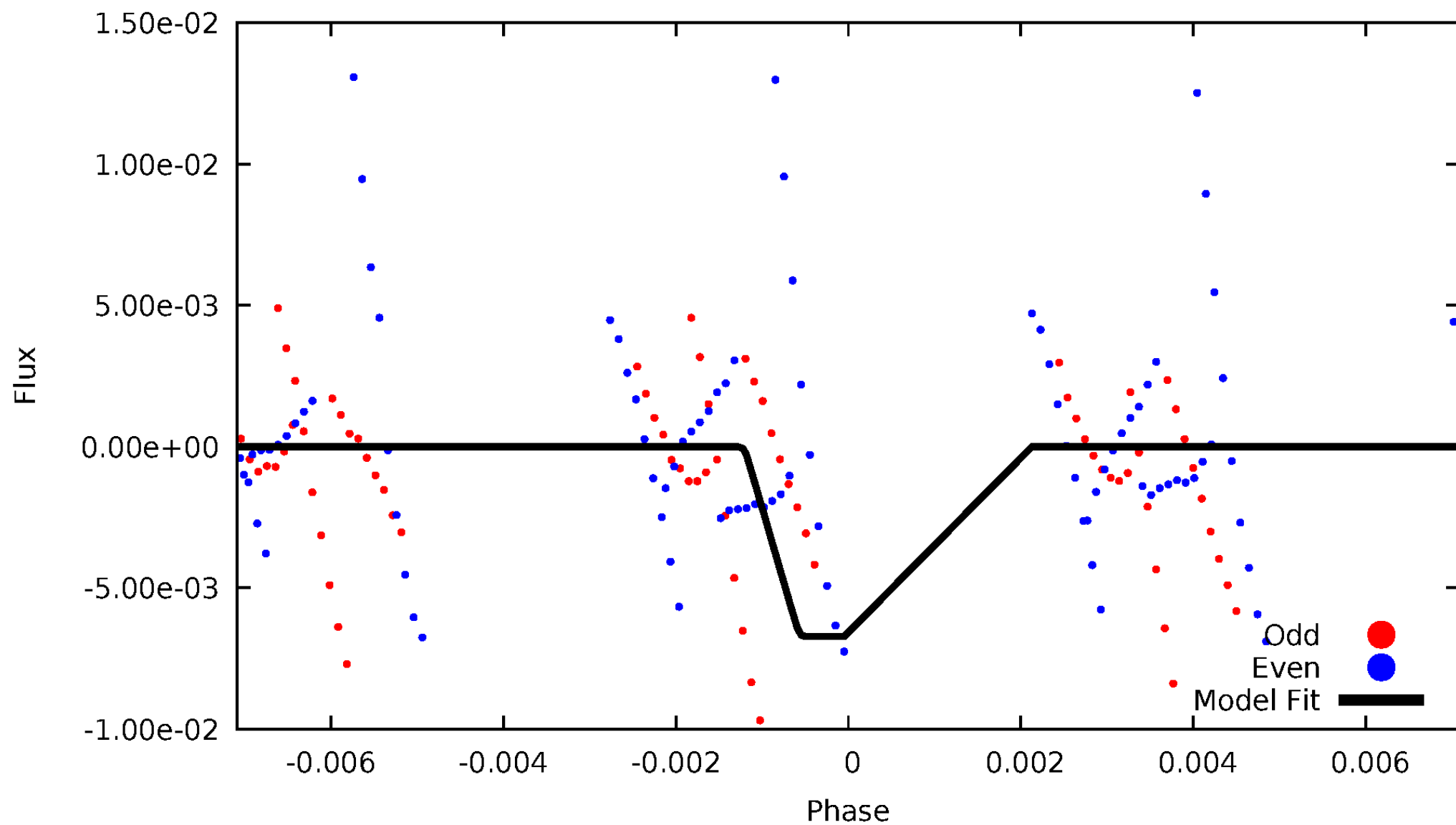
TCE 005646176-03





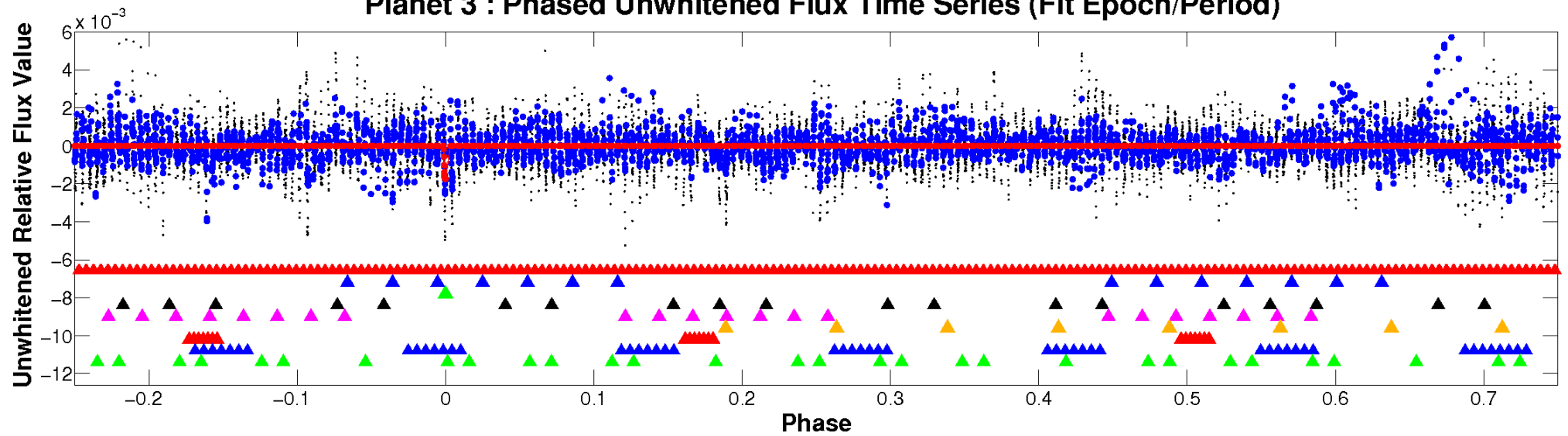
# ALT Odd/Even

TCE 005646176-03

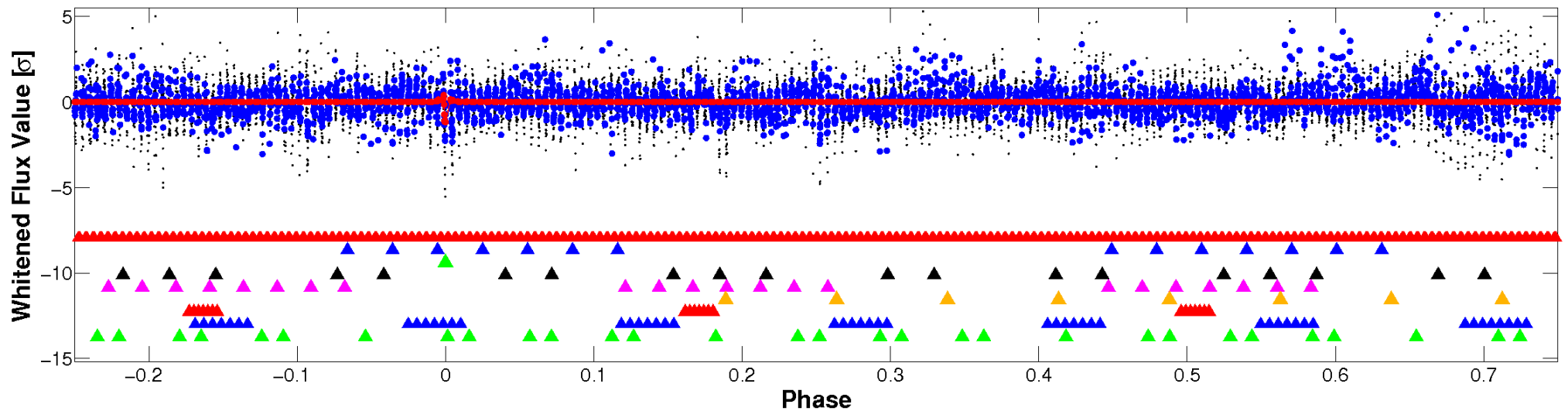


# Non-Whitened Vs. Whitened Light Curve

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

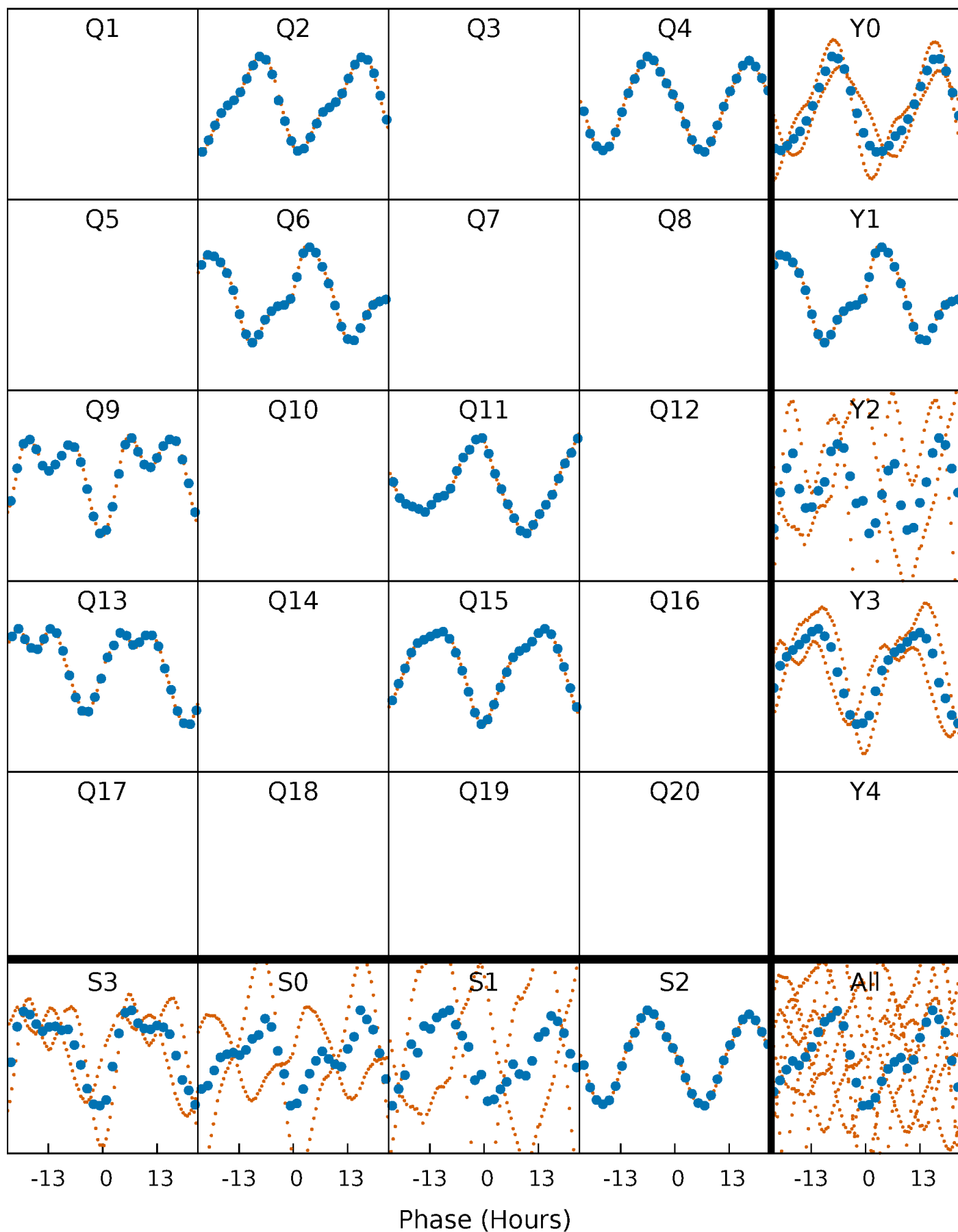


Planet 3 : Phased Whitened Flux Time Series (Fit Epoch/Period)



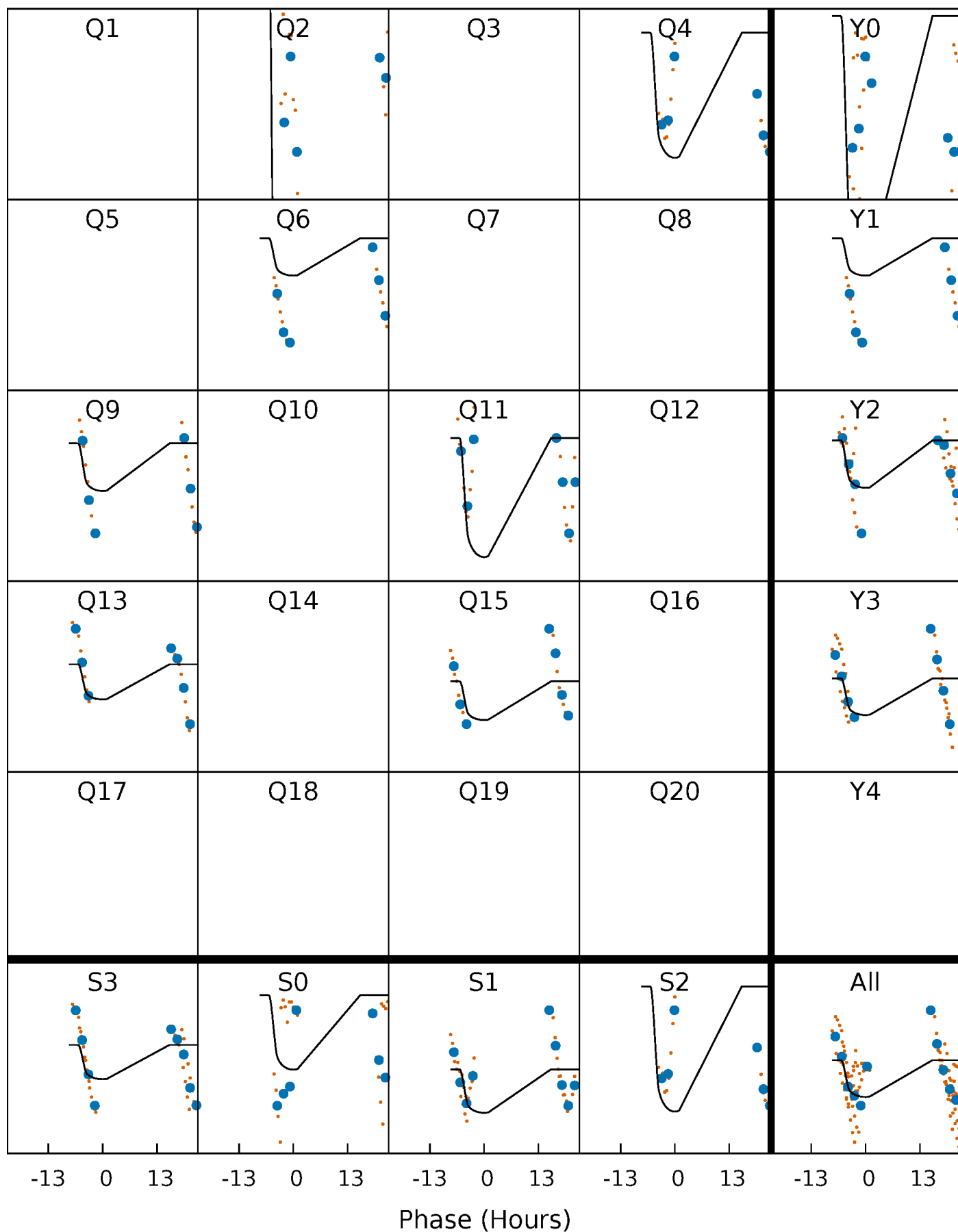
# PDC Quarter-Phased Transit Curves

TCE 005646176-03 P=204.697781 Days  $T_0=203.133079$  (BKJD)



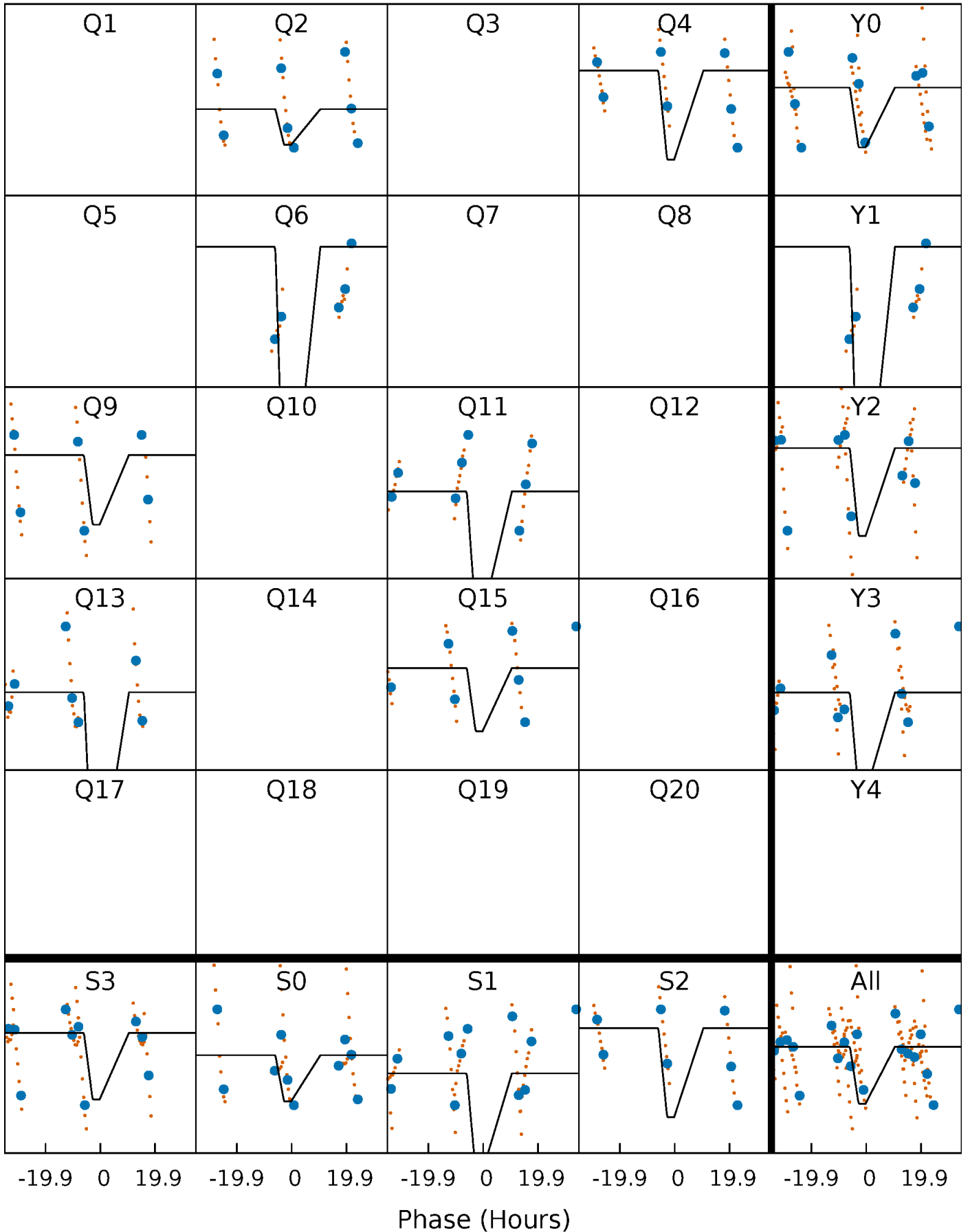
# DV Quarter-Phased Transit Curves

TCE 005646176-03 P=204.697781 Days  $T_0=203.133079$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

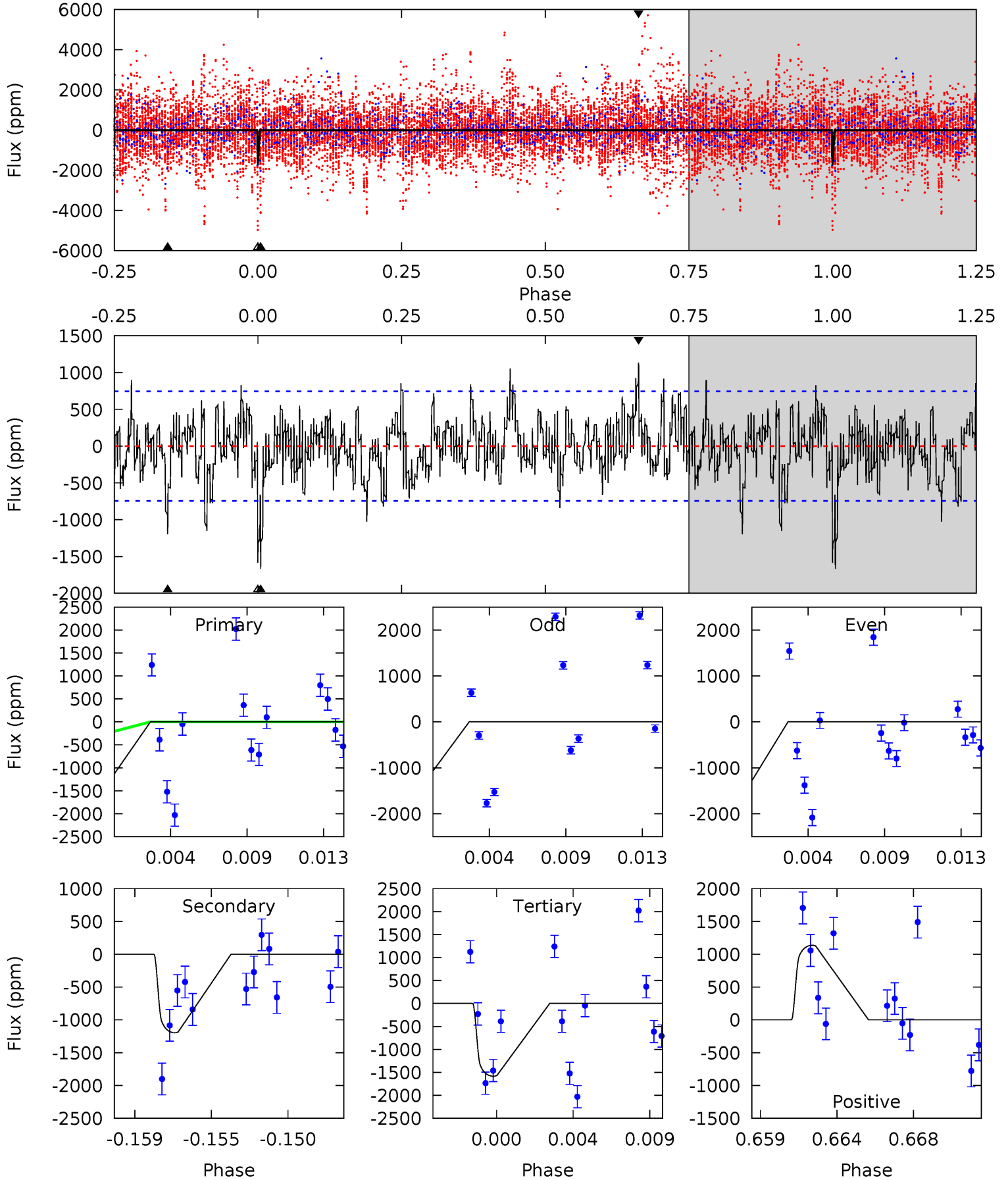
TCE 005646176-03 P=204.727822 Days  $T_0=203.184970$  (BKJD)



# DV Model-Shift Uniqueness Test

005646176-03, P = 204.697781 Days, E = 203.133079 Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
11.6	8.33	11.0	7.91	5.18	2.85	2.19	0.59	3.71	-2.70	0.42	1.13	1.42	0.41	3.05

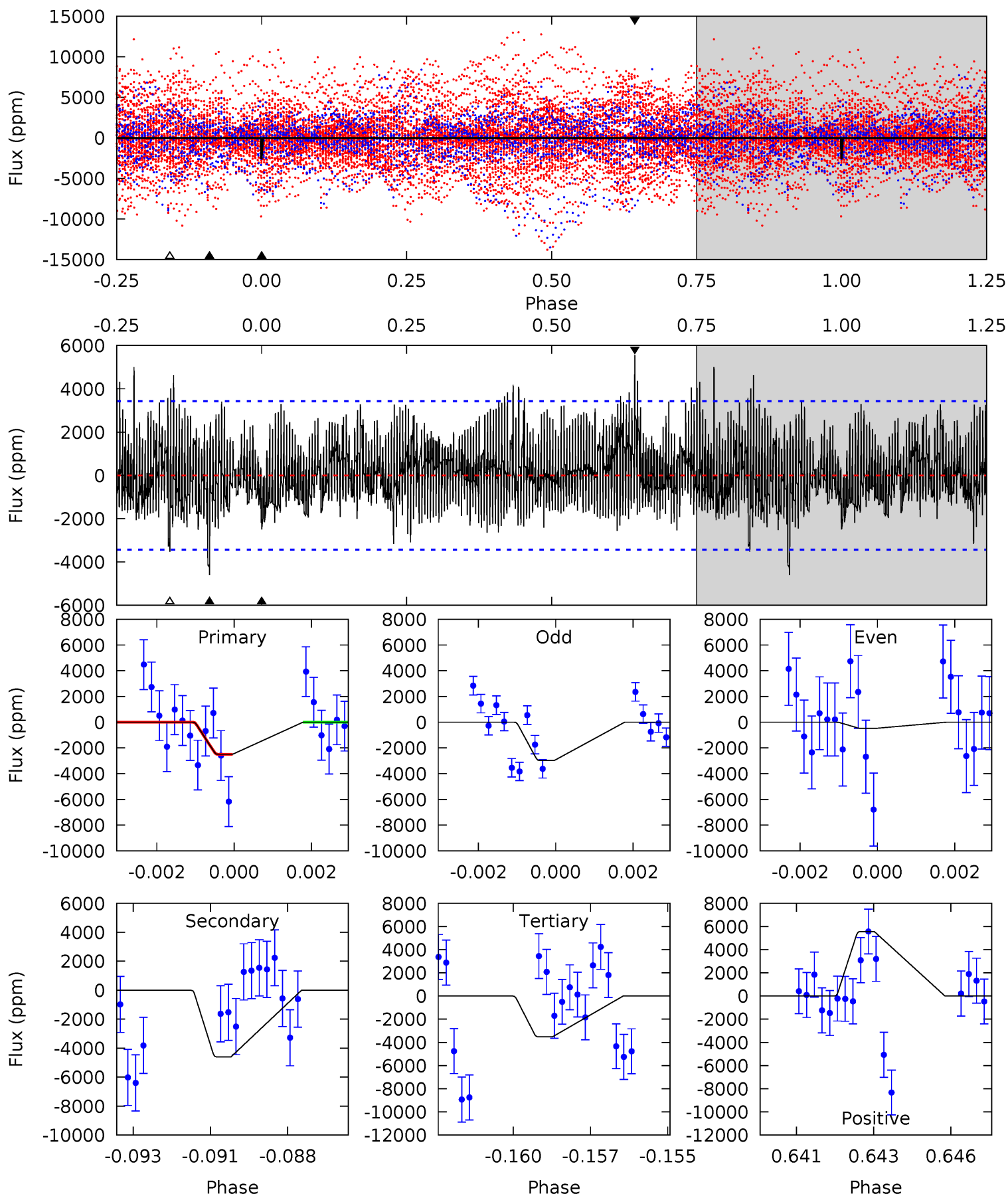




# Alt Model-Shift Uniqueness Test

005646176-03, P = 204.727822 Days, E = 203.184970 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
3.85	7.10	5.42	8.57	5.29	3.04	1.90	-1.57	-4.72	1.67	-1.47	1.97	0	0.55	0



### Stellar Parameters For KIC 005646176

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$\rho_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6305^{+151}_{-189}$	$4.252^{+0.153}_{-0.187}$	$-0.120^{+0.250}_{-0.300}$	$1.295^{+0.424}_{-0.261}$	$1.091^{+0.197}_{-0.121}$	$0.707^{+0.542}_{-0.354}$
	+2%/-3%	+4%/-4%	+208%/-250%	+33%/-20%	+18%/-11%	+77%/-50%
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 005646176-03 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-1196 \pm 144$	$6.35^{+1.29}_{-1.07}$	$531^{+42}_{-34}$	$5610^{+343}_{-371}$	$8129^{+3386}_{-2586}$
Alt.	$-4605 \pm 649$	$11.80^{+2.12}_{-1.57}$	$531^{+40}_{-33}$	$5729^{+302}_{-313}$	$8865^{+3117}_{-2373}$

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

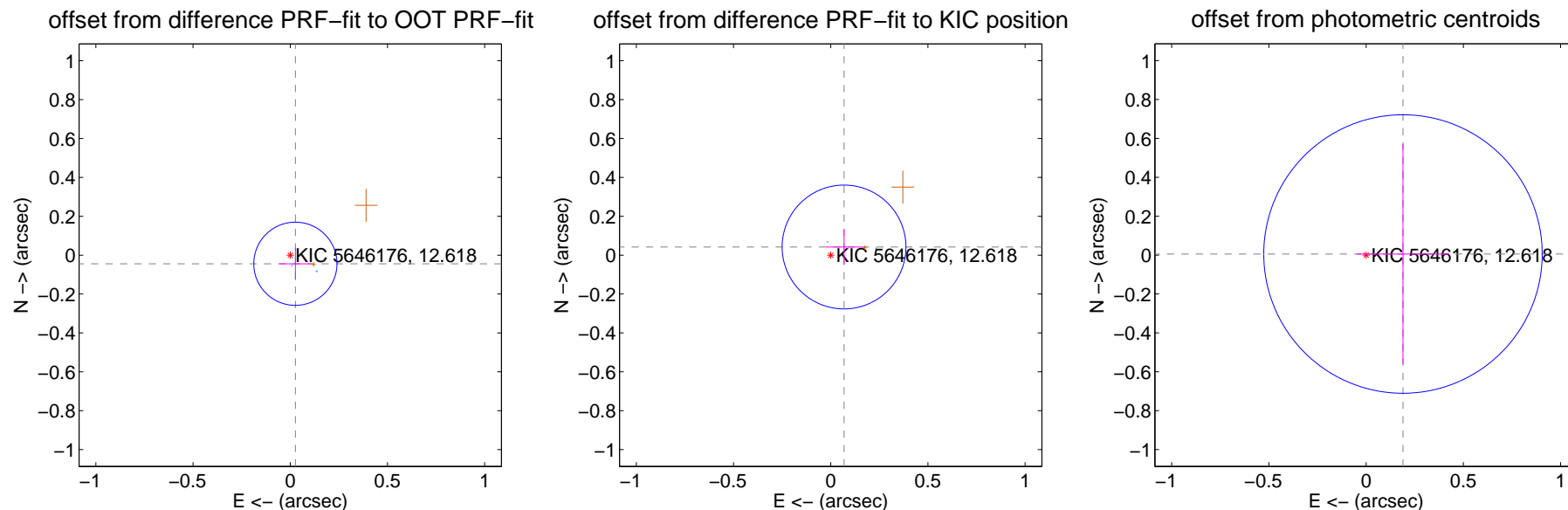
## DV Centroid Data

Supplemental centroid analysis for 005646176-03. Kepler magnitude: 12.62. Transit SNR 7.01

There are 3 quarters with good PRF difference image offsets

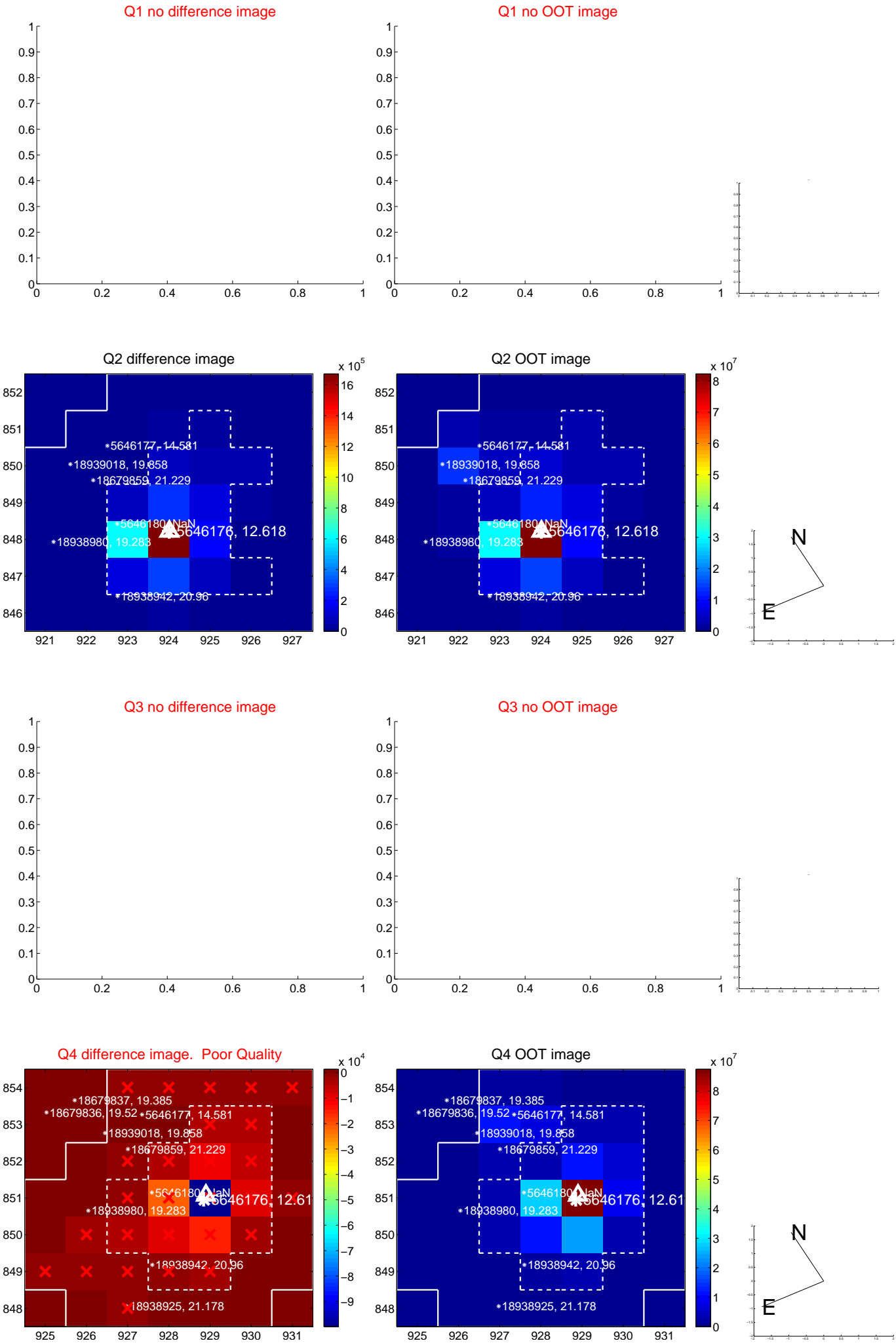
The direct PRF centroid is offset from the target star catalog position by about 0.12 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.051 \pm 0.071$	0.72	$-0.026 \pm 0.083$	$-0.044 \pm 0.083$
PRF-fit source offset from KIC position	$0.080 \pm 0.106$	0.76	$-0.069 \pm 0.093$	$0.042 \pm 0.091$
photometric centroid source offset	$0.19 \pm 0.24$	0.79	$-0.19 \pm 0.24$	$0.01 \pm 0.57$

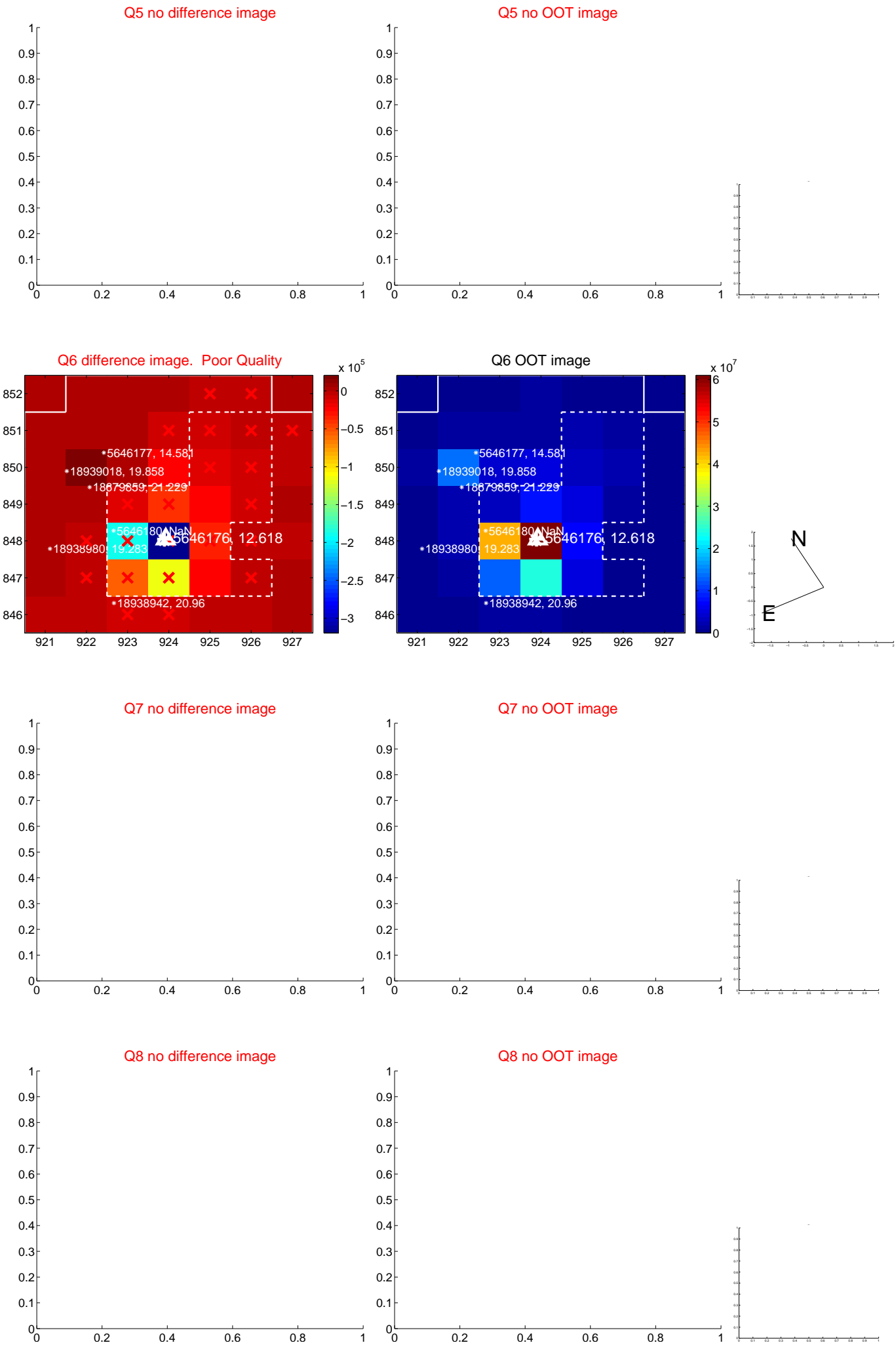


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

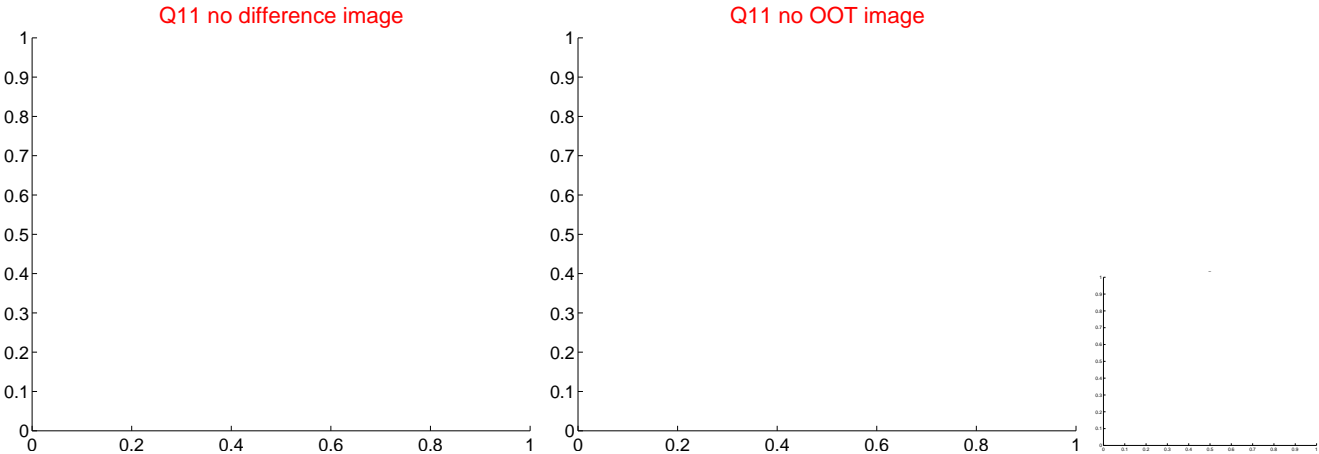
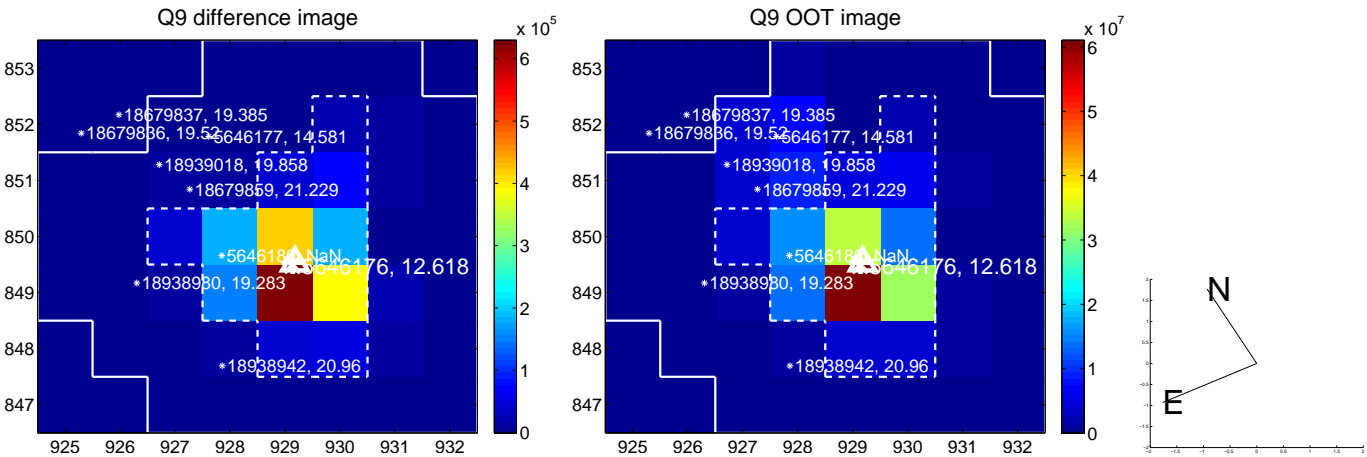
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



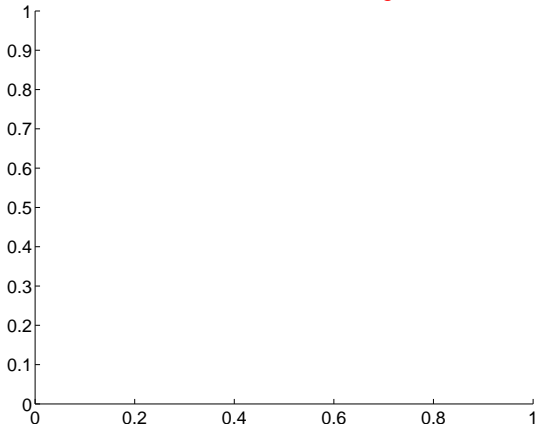
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



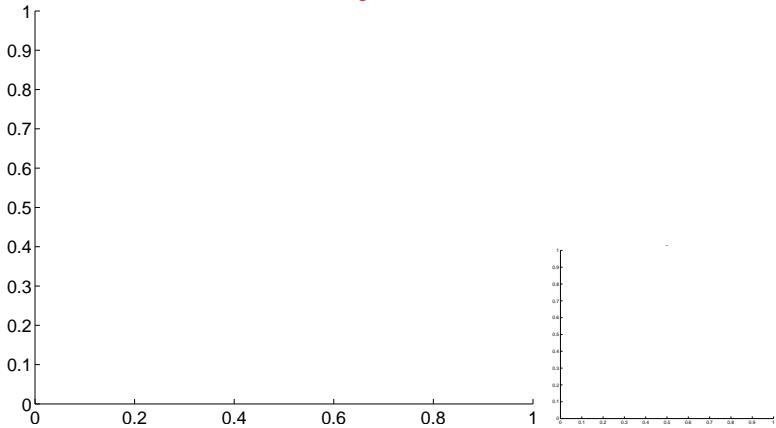


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

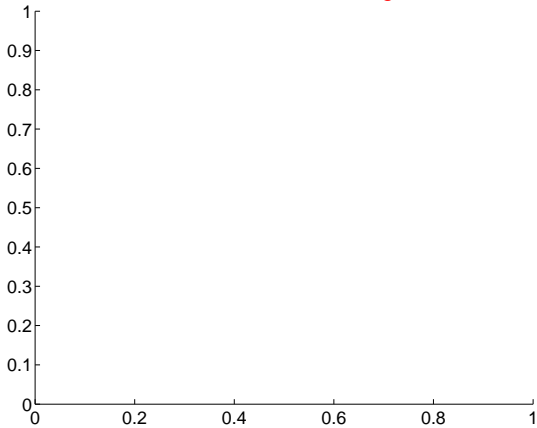
Q13 no difference image



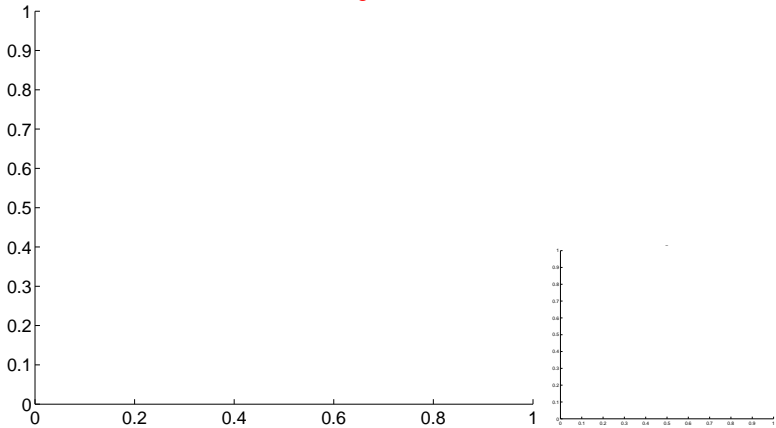
Q13 no OOT image



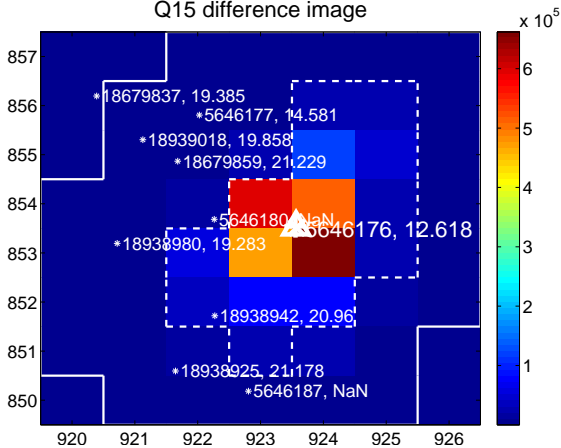
Q14 no difference image



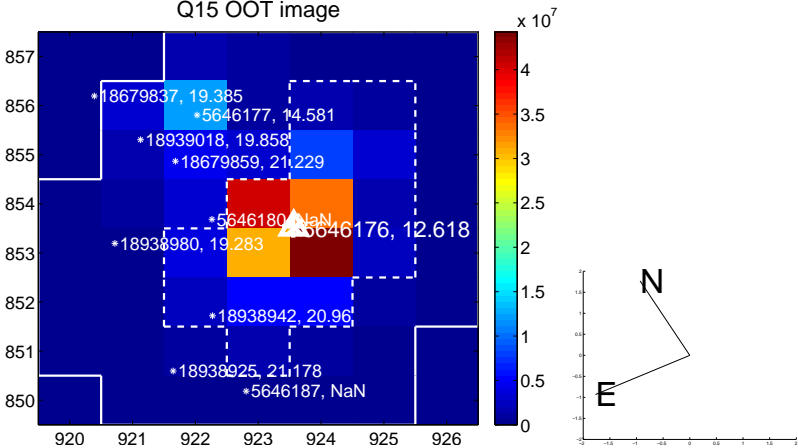
Q14 no OOT image



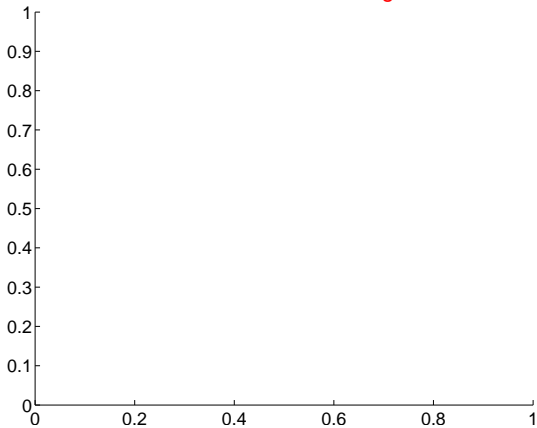
Q15 difference image



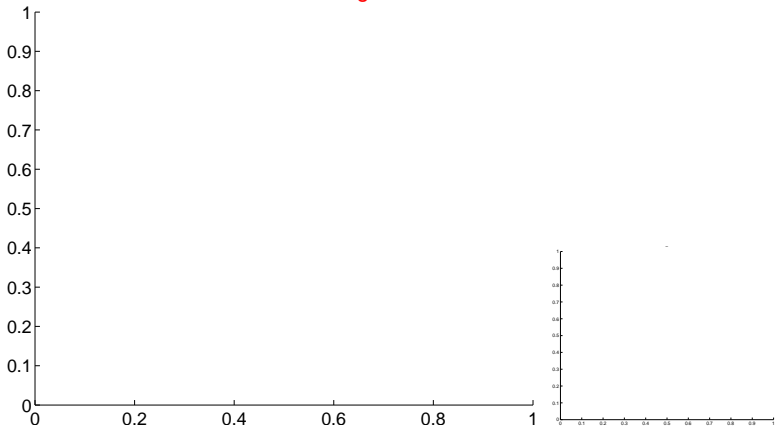
Q15 OOT image



Q16 no difference image



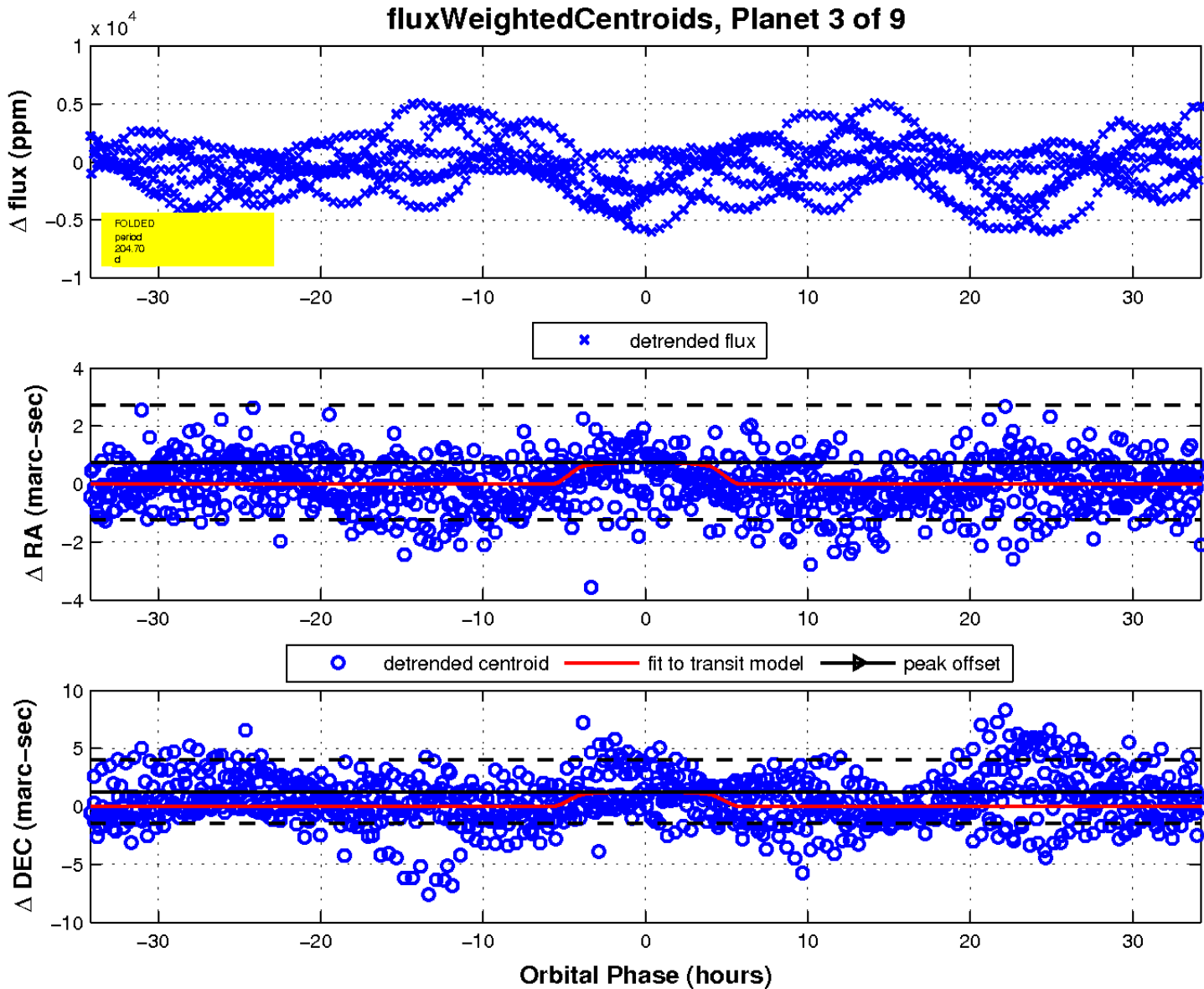
Q16 no OOT image



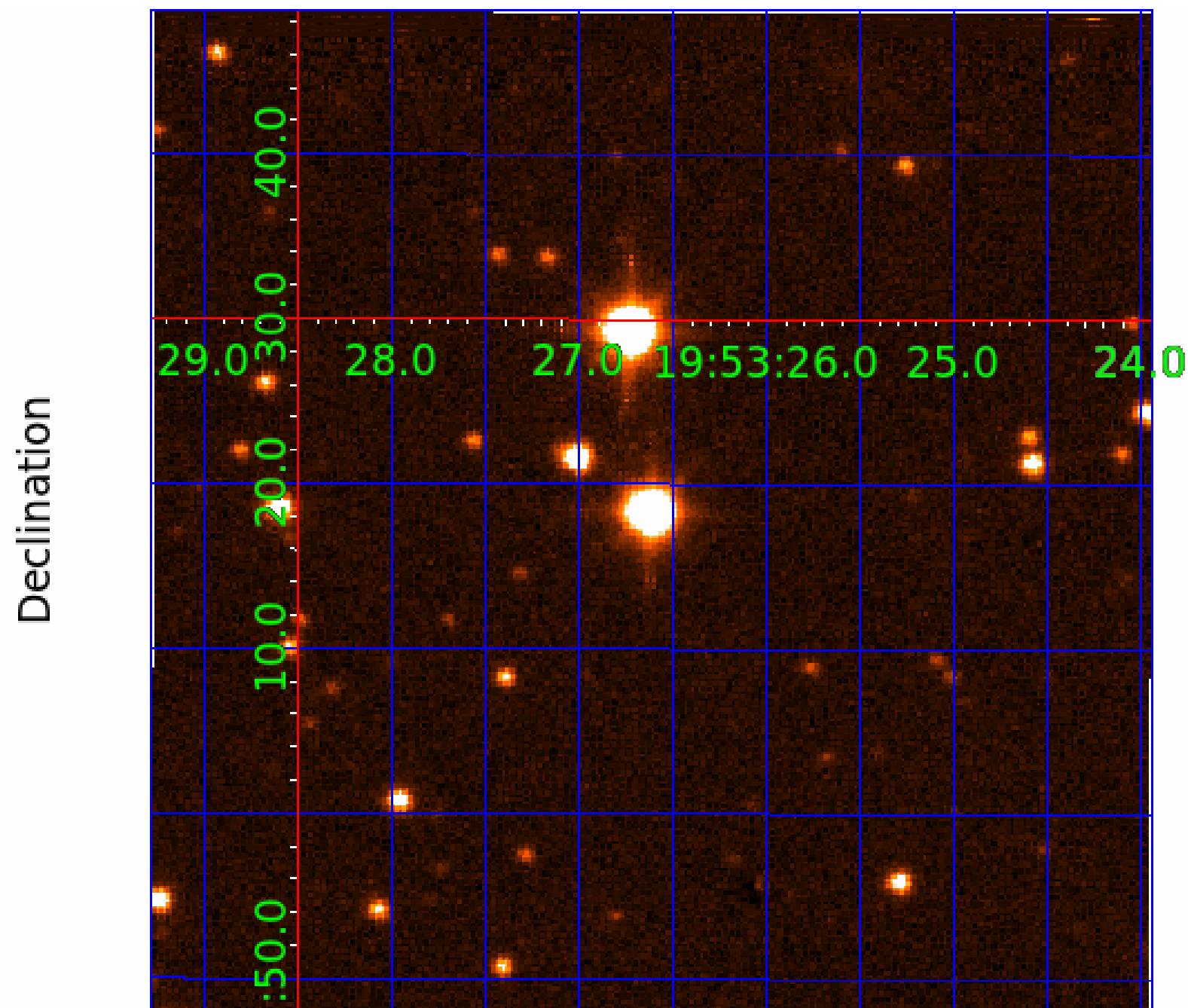
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

Q17 no difference image

Q17 no OOT image



UKIRT Image



# KIC 005646176

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
005646176-01	OBS	No	0.998360	131.711809	47.6	6.354	10.0	6.1	1.29	6305	0.96	5853.71
005646176-02	OBS	No	105.455306	189.614921	3300.8	5.660	14.2	9.1	1.29	6305	13.60	11.72
005646176-03	OBS	No	204.697781	203.133079	1748.4	11.405	12.3	7.0	1.29	6305	6.22	4.84
005646176-04	OBS	No	75.961627	171.426607	2640.1	7.047	11.2	8.9	1.29	6305	12.02	18.16
005646176-05	OBS	No	66.679595	189.232216	1425.1	5.625	9.4	6.6	1.29	6305	6.08	21.60
005646176-08	OBS	No	29.414987	139.159990	1189.4	9.687	8.1	8.2	1.29	6305	7.52	64.33
005646176-09	OBS	No	48.339322	177.775979	171.6	6.000	8.2	-1.0	1.29	6305	1.70	33.17

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
005646176-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT
005646176-02	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—HALO_GHOST
005646176-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS
005646176-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
005646176-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
005646176-08	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
005646176-09	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_ALT—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_NOFITS

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

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

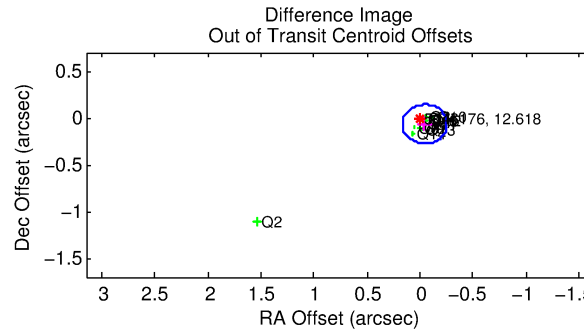
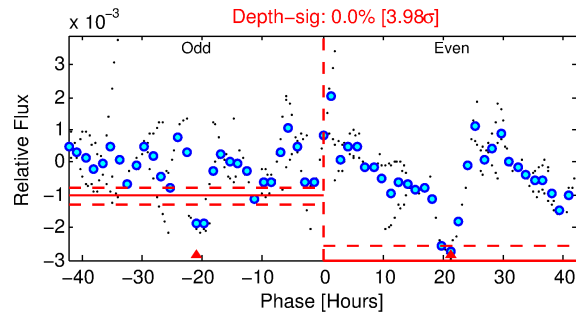
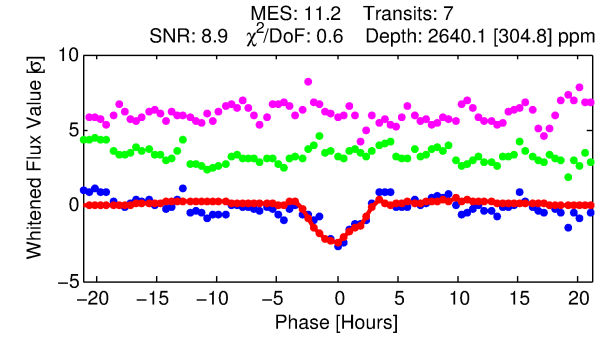
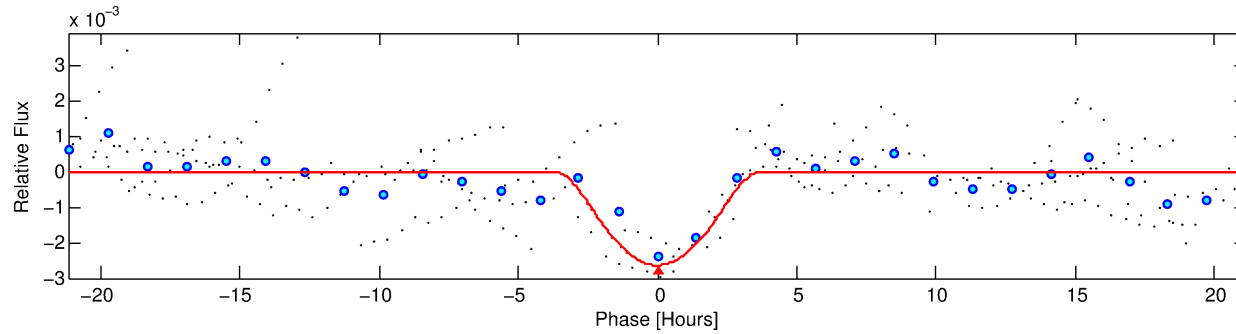
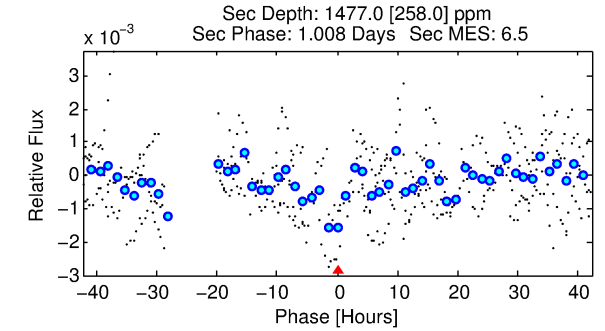
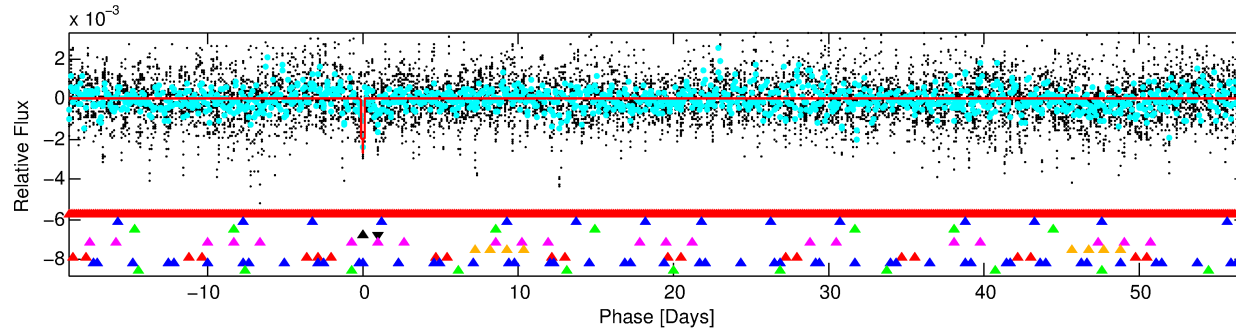
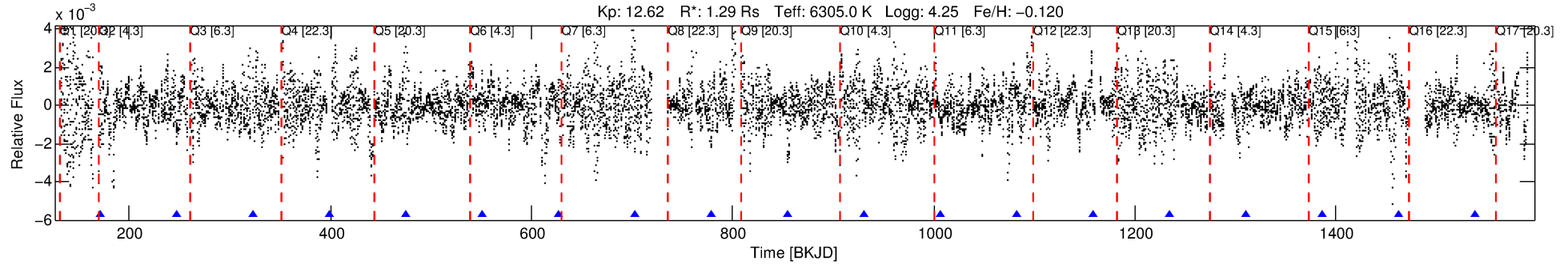
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 005646176-04

No Significant Match Found

# DV One-Page Summary

KIC: 5646176 Candidate: 4 of 9 Period: 75.962 d



## DV Fit Results:

Period = 75.96163 [0.00162] d  
Epoch = 171.4266 [0.0184] BKJD  
Rp/R\* = 0.0850 [0.1488]  
a/R\* = 35.23 [13.01]  
b = 1.00 [0.22]  
Seff = 18.16 [6.90]  
Teff = 526 [50] K  
Rp = 12.02 [21.39] Re  
a = 0.3616 [0.0945] AU  
Ag = 735.86 [2591.79] [0.28σ]  
Teffp = 4239 [3715] K [1.00σ]

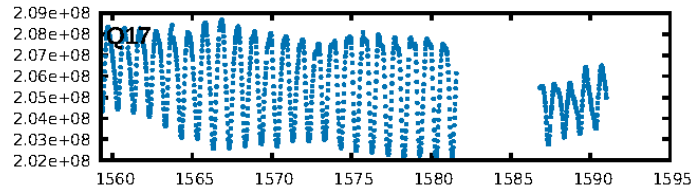
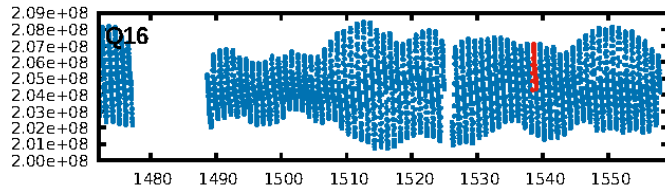
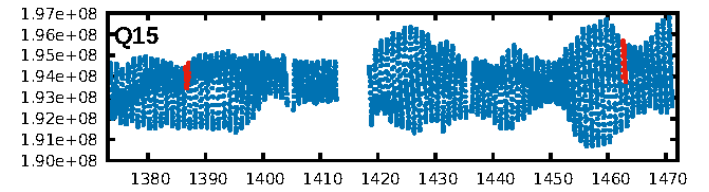
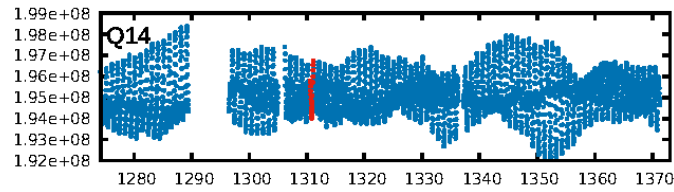
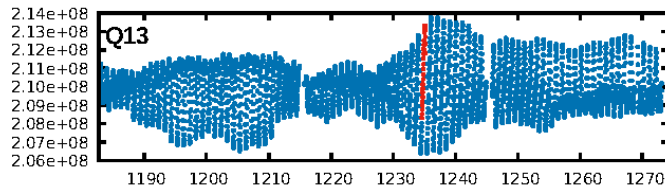
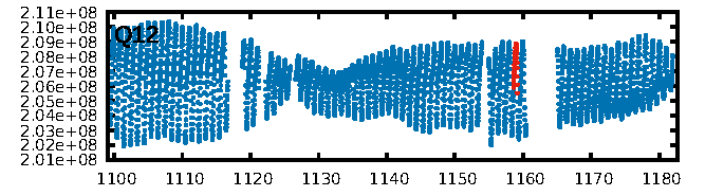
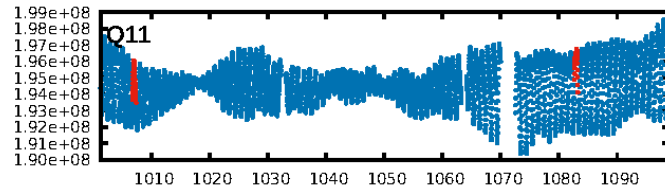
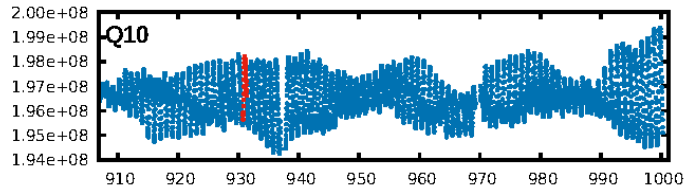
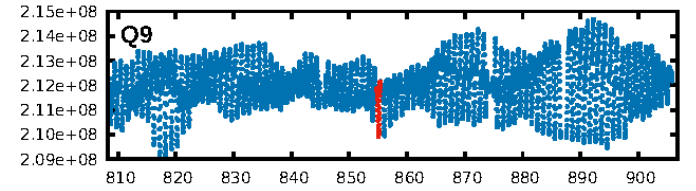
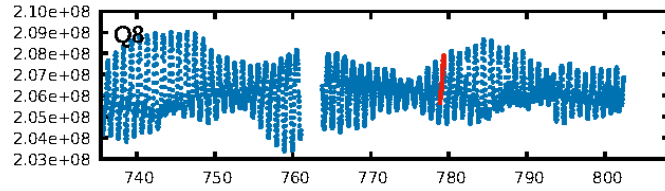
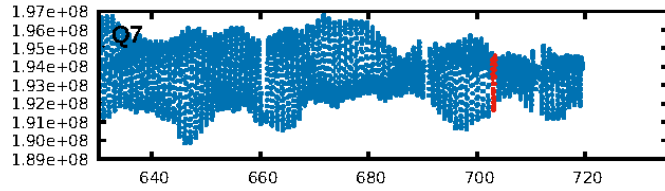
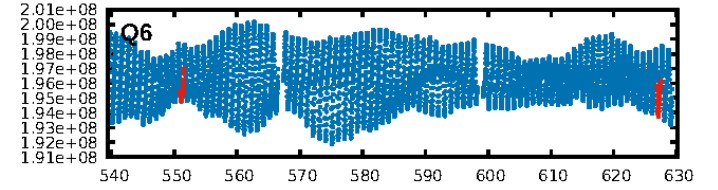
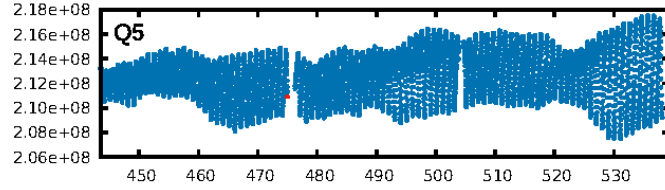
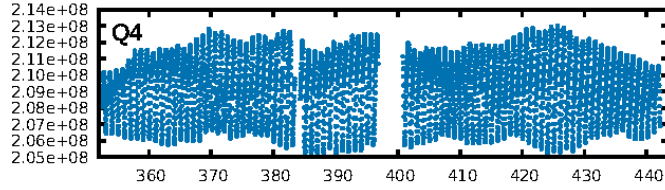
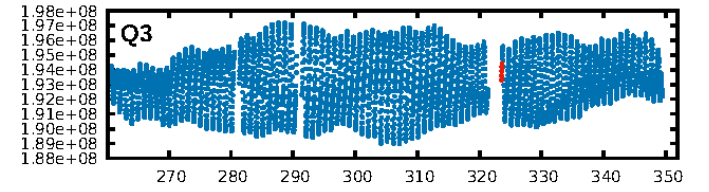
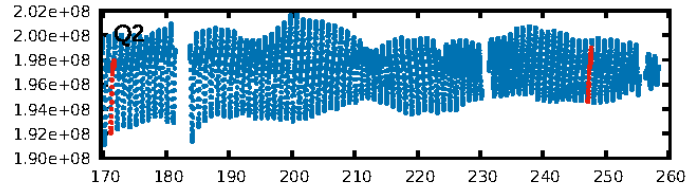
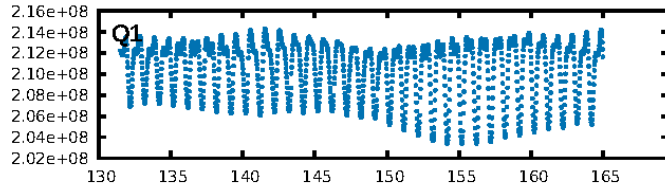
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [13.59σ]  
LongPeriod-sig: 100.0% [78.31σ]  
ModelChiSquare2-sig: 11.4%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [7/7]  
GhostDiagnostic-chr: 0.9516  
Centroid-sig: 53.4%  
Centroid-so: 0.731 arcsec [3.10σ]  
OotOffset-rm: 0.081 arcsec [1.16σ]  
KicOffset-rm: 0.048 arcsec [0.28σ]  
OotOffset-st: 4/3/3/2 [12]  
KicOffset-st: 4/3/3/2 [12]  
DiffImageQuality-fgm: 0.42 [5/12]  
DiffImageOverlap-fno: 0.00 [0/12]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 16:34:13 Z

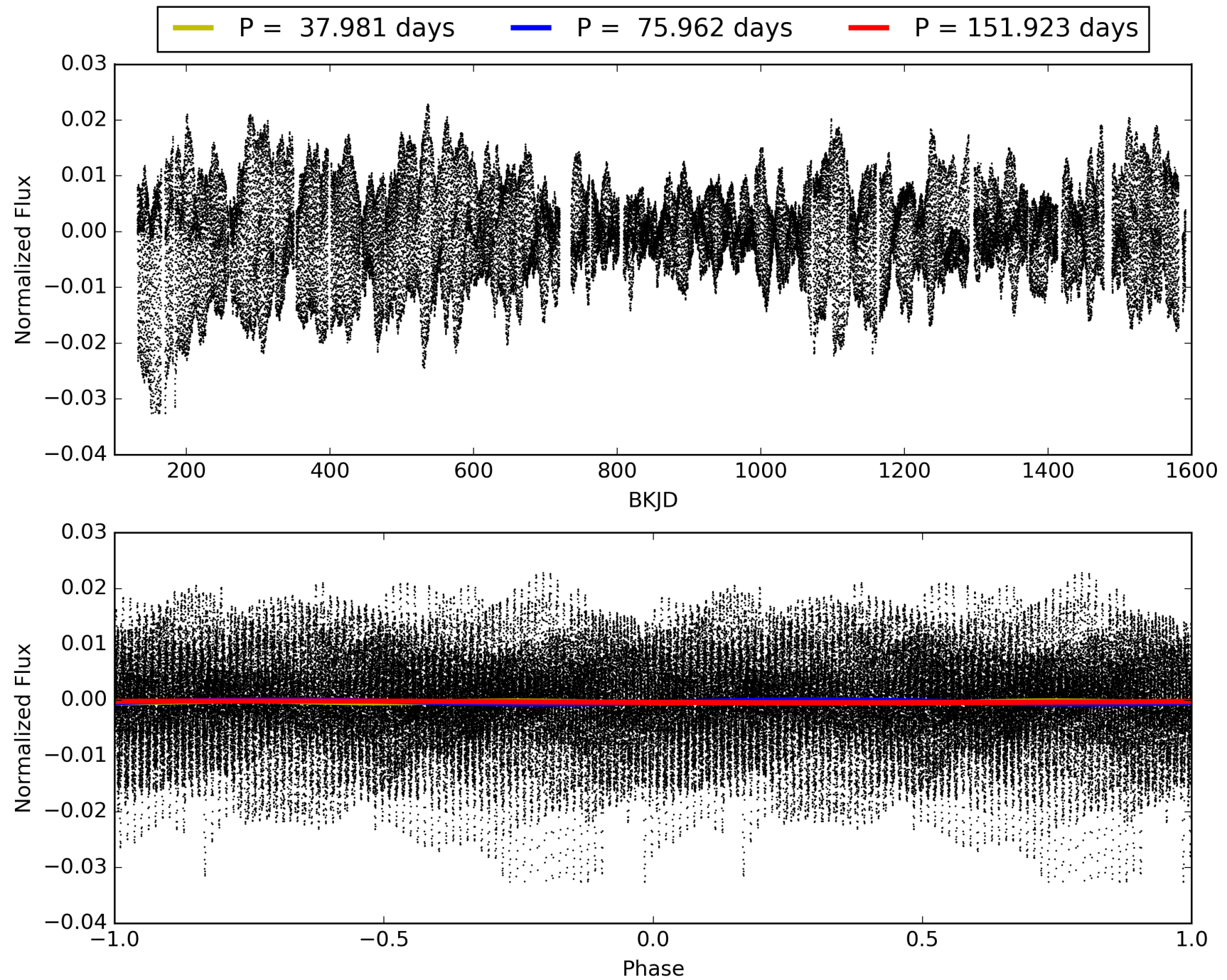
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 005646176-04, PDC Light Curves



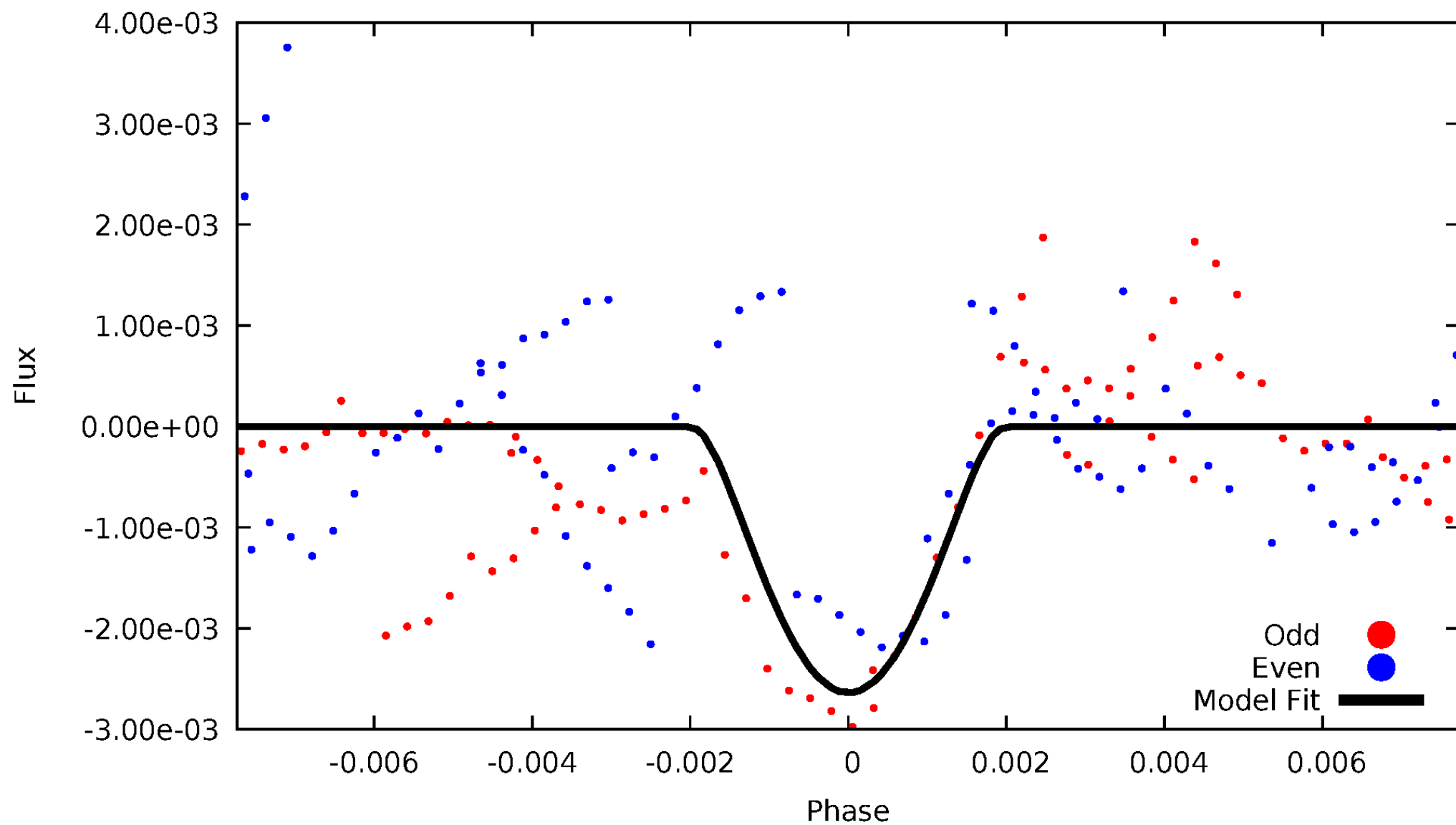


# TCE 005646176-04



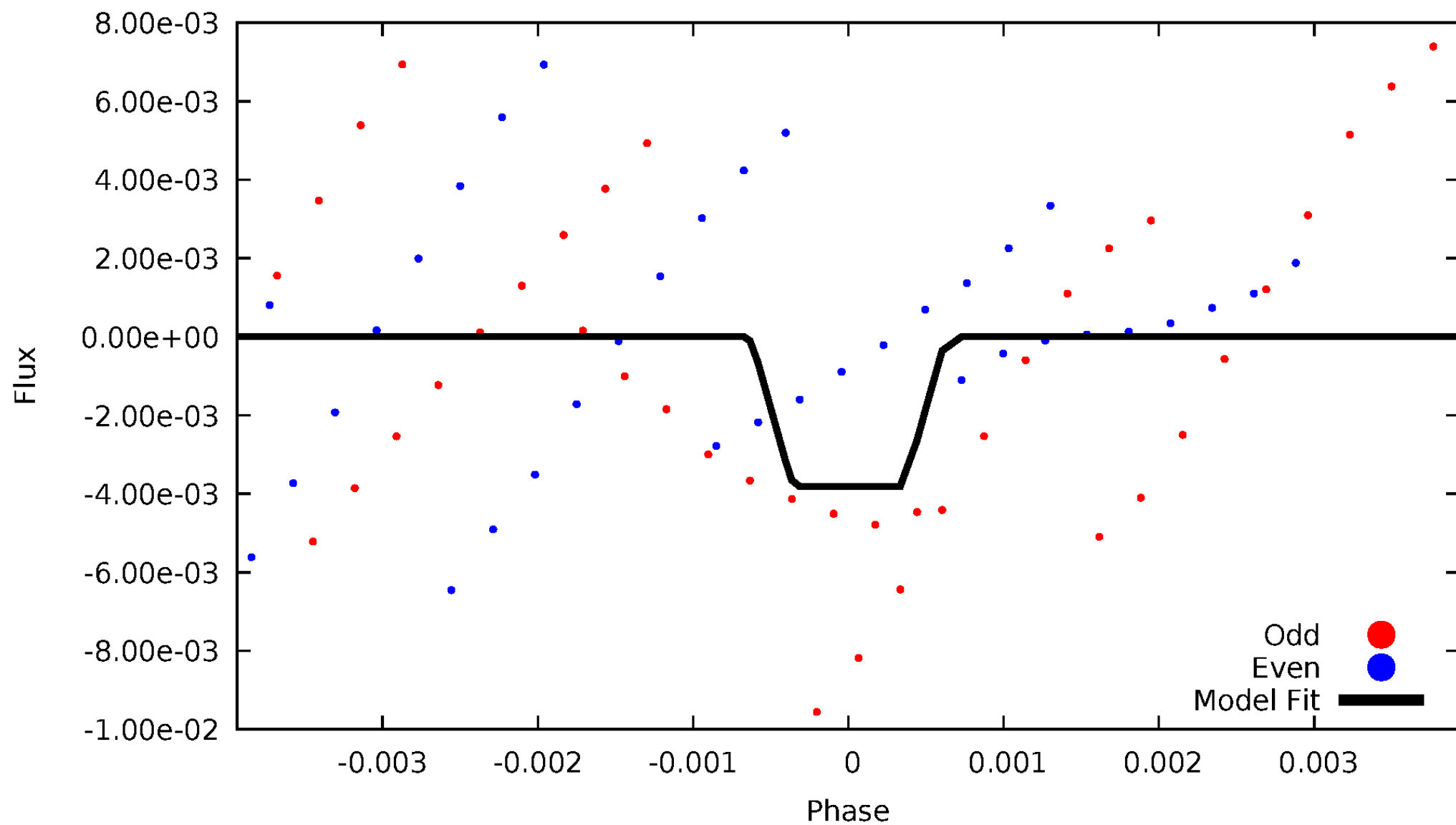
# DV Odd/Even

TCE 005646176-04



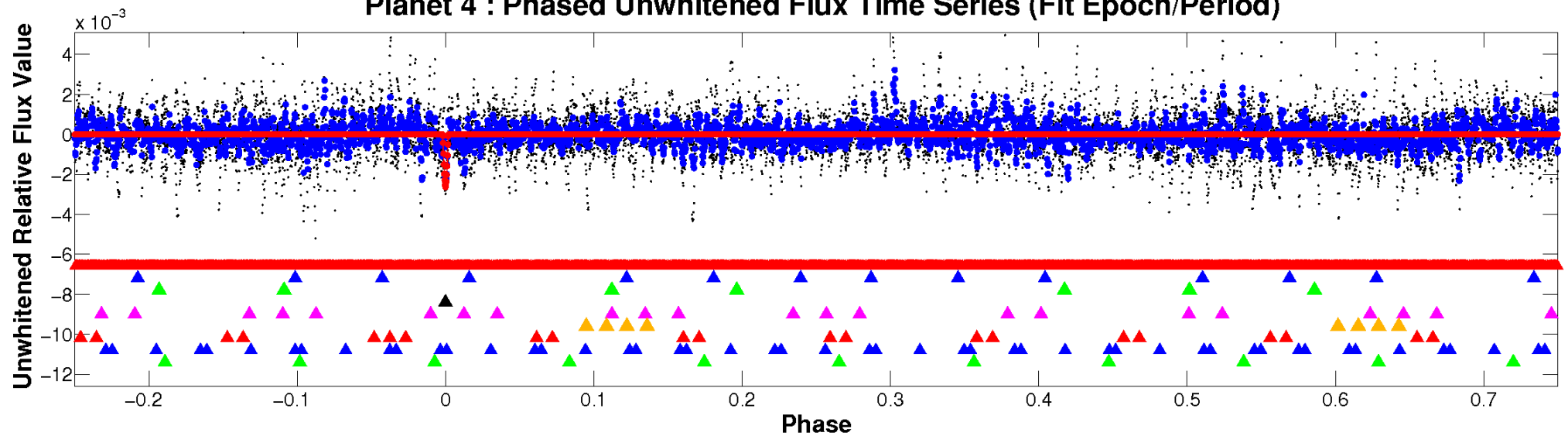
# ALT Odd/Even

TCE 005646176-04

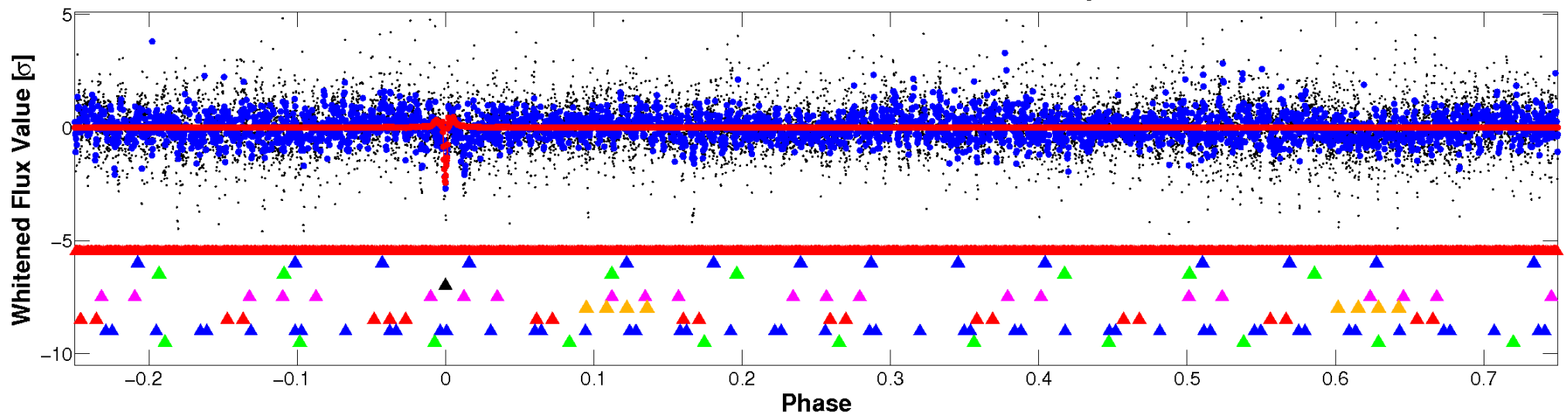


# Non-Whitened Vs. Whitened Light Curve

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

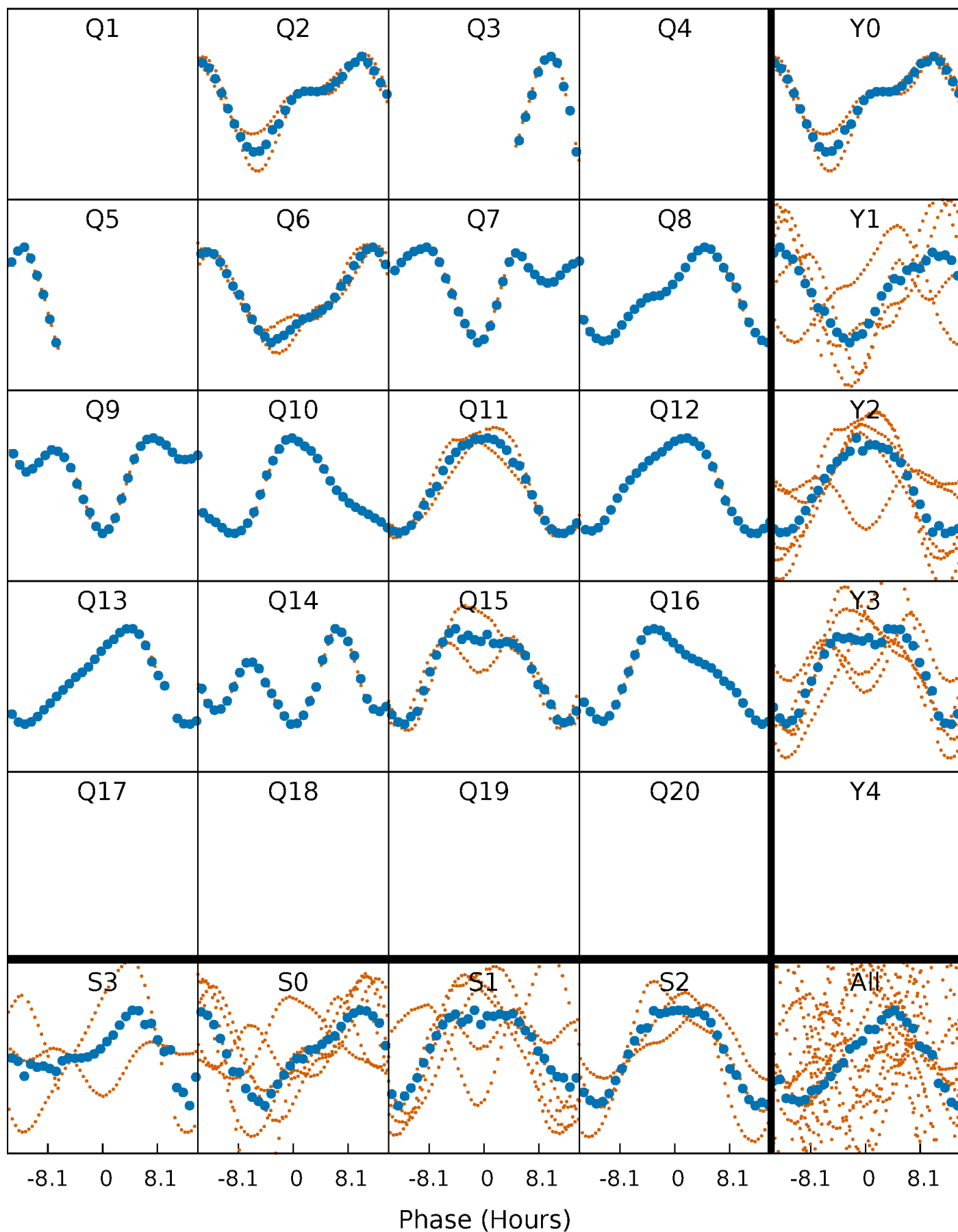


## Planet 4 : Phased Whitened Flux Time Series (Fit Epoch/Period)



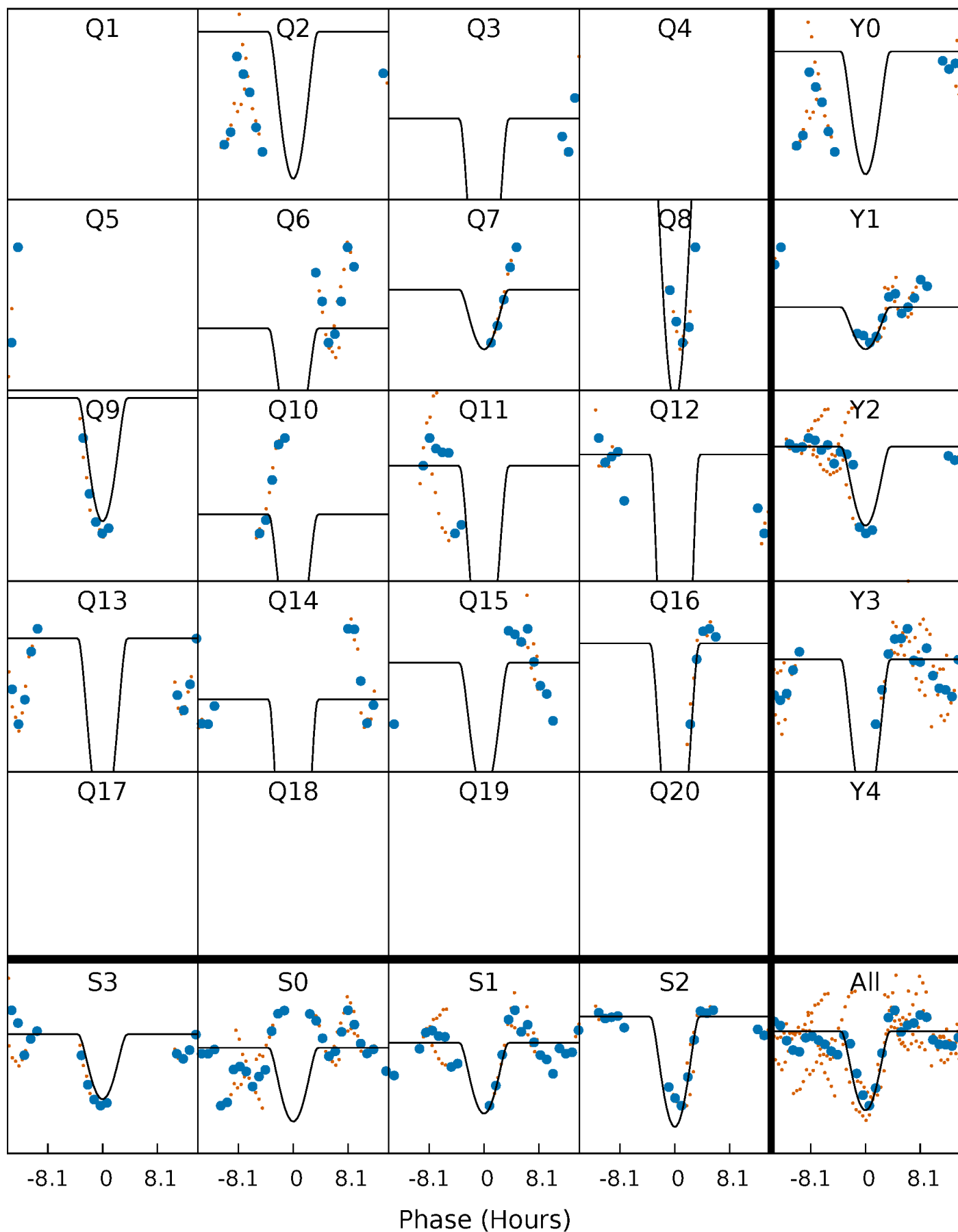
# PDC Quarter-Phased Transit Curves

TCE 005646176-04   P= 75.961627 Days    $T_0=171.426607$  (BKJD)



# DV Quarter-Phased Transit Curves

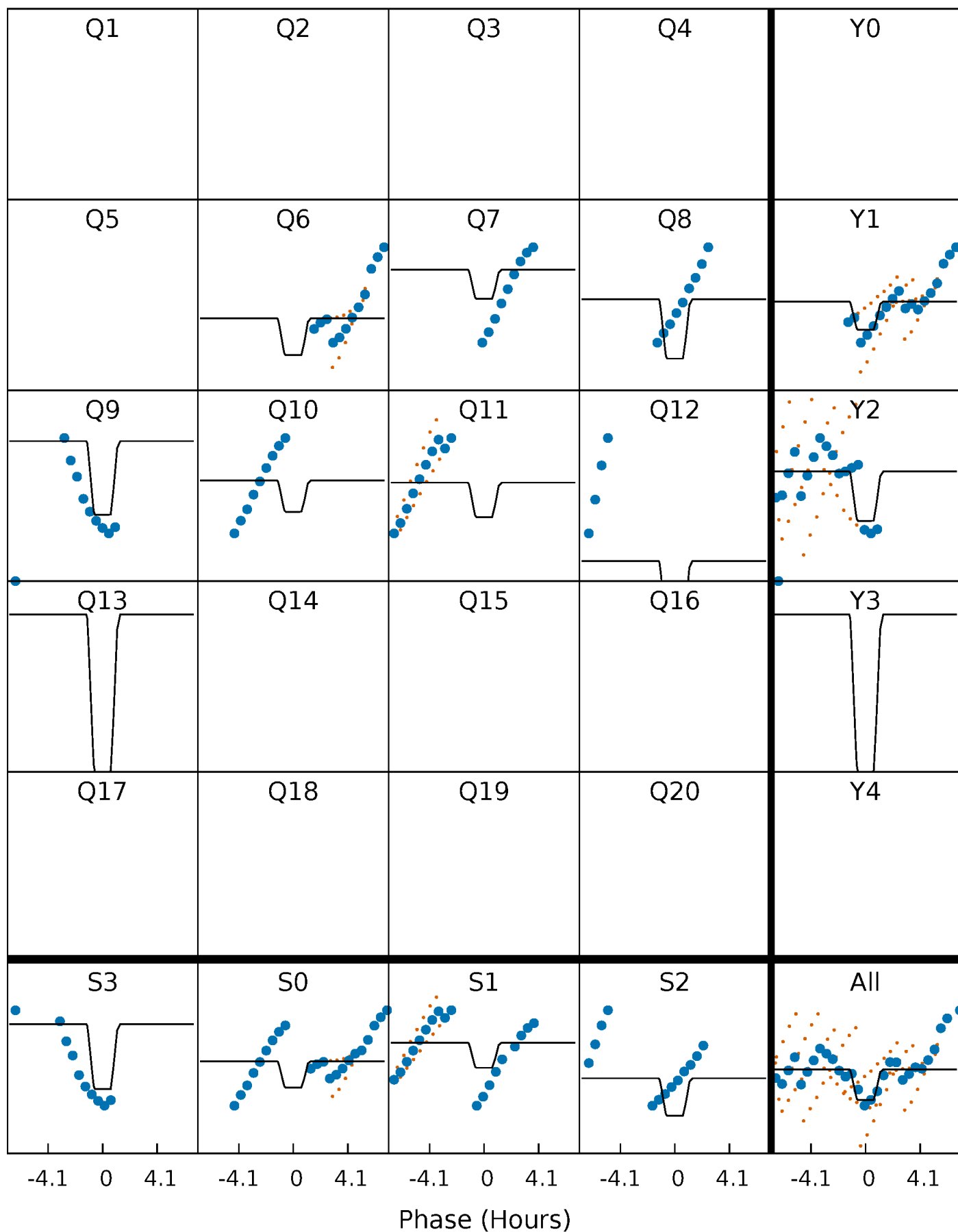
TCE 005646176-04 P= 75.961627 Days  $T_0=171.426607$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

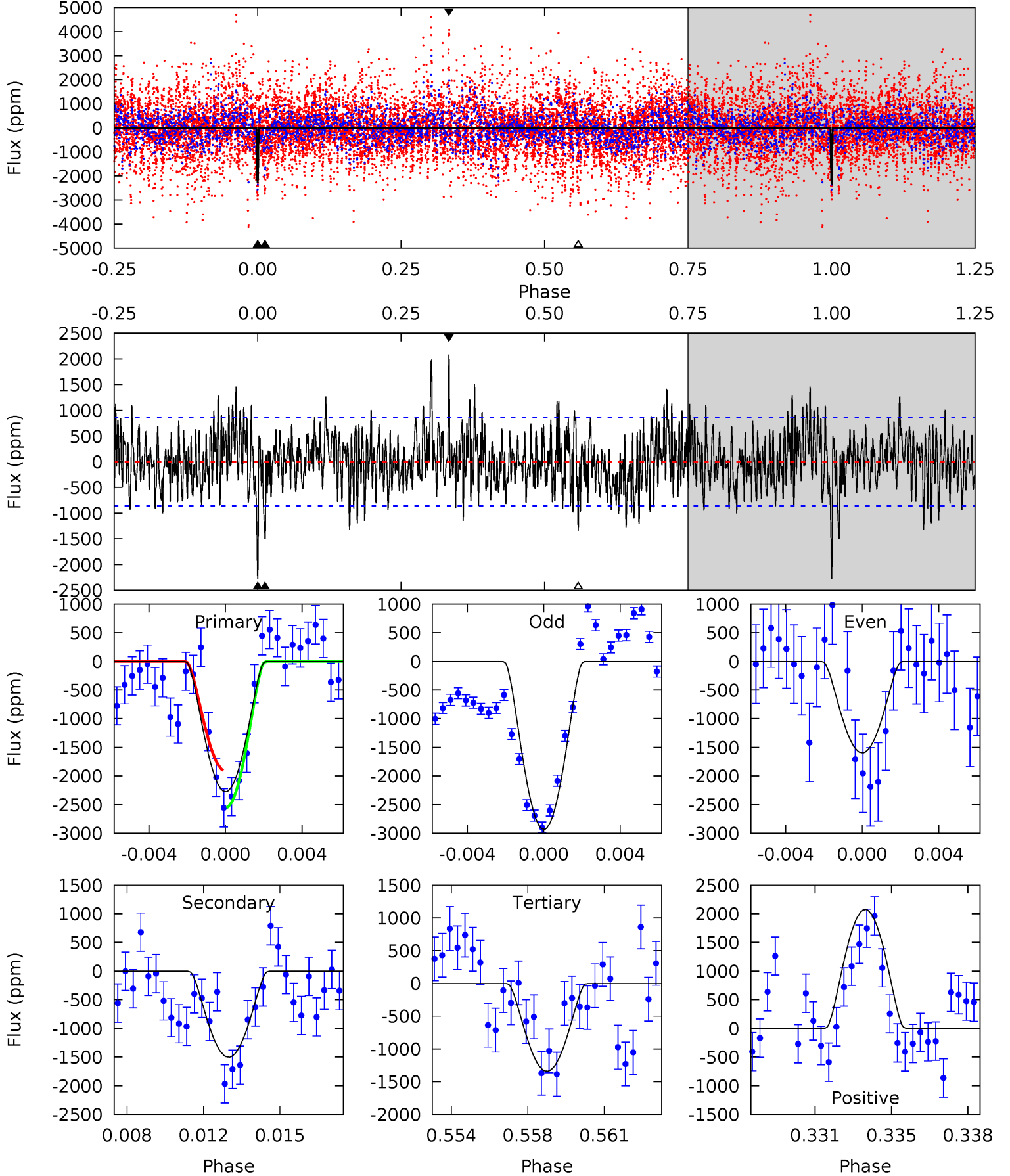
TCE 005646176-04   P= 75.937458 Days    $T_0=171.634945$  (BKJD)



# DV Model-Shift Uniqueness Test

005646176-04, P = 75.961627 Days, E = 95.464980 Days

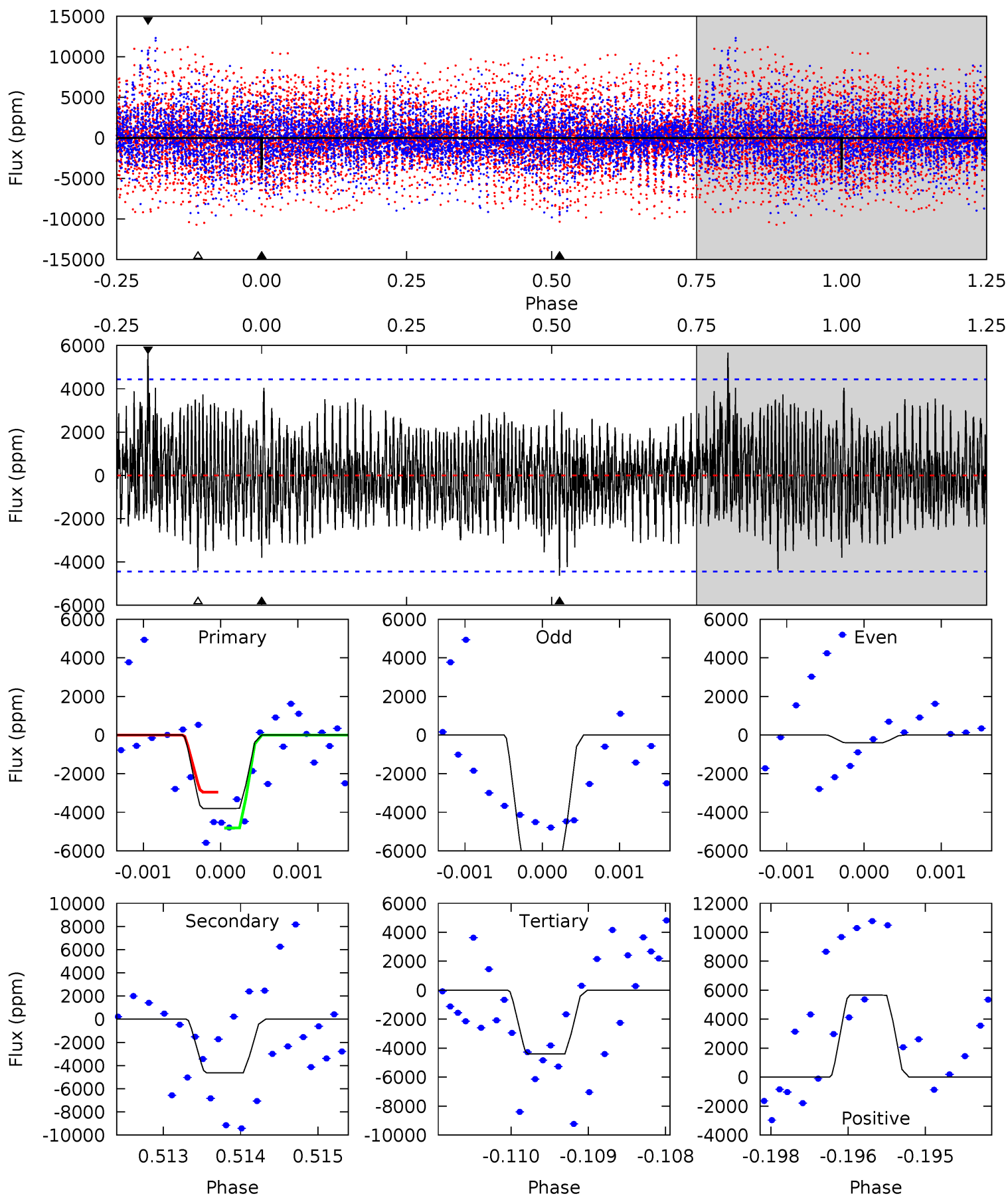
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
13.8	9.09	8.11	12.5	5.21	2.89	2.78	5.65	1.22	0.98	-3.46	3.94	0.01	0.48	1.94



# Alt Model-Shift Uniqueness Test

005646176-04, P = 75.937458 Days, E = 95.697487 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
4.62	5.63	5.35	6.88	5.40	3.20	1.67	-0.73	-2.26	0.28	-1.25	3.64	0.95	0.55	1.14



### Stellar Parameters For KIC 005646176

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6305^{+151}_{-189}$	$4.252^{+0.153}_{-0.187}$	$-0.120^{+0.250}_{-0.300}$	$1.295^{+0.424}_{-0.261}$	$1.091^{+0.197}_{-0.121}$	$0.707^{+0.542}_{-0.354}$
	+2%/-3%	+4%/-4%	+208%/-250%	+33%/-20%	+18%/-11%	+77%/-50%
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 005646176-04 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-1502 \pm 165$	$20.21^{+19.56}_{-13.32}$	$737^{+55}_{-47}$	$3720^{+1960}_{-688}$	$269^{+2198}_{-202}$
Alt.	$-4632 \pm 823$	$19.43^{+18.12}_{-13.60}$	$736^{+61}_{-51}$	$4637^{+3945}_{-968}$	$907^{+8280}_{-667}$

$T_{max}$  = 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

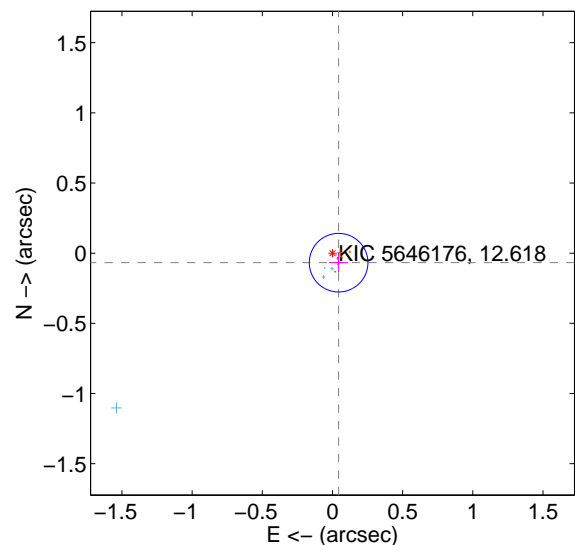
Supplemental centroid analysis for 005646176-04. Kepler magnitude: 12.62. Transit SNR 8.86

There are 5 quarters with good PRF difference image offsets

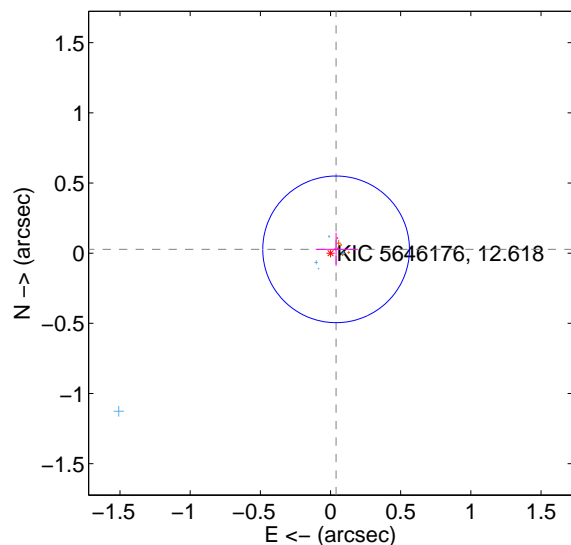
The direct PRF centroid is offset from the target star catalog position by about 0.06 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.081 \pm 0.070$	1.16	$-0.044 \pm 0.069$	$-0.068 \pm 0.070$
PRF-fit source offset from KIC position	$0.048 \pm 0.174$	0.28	$-0.040 \pm 0.145$	$0.027 \pm 0.118$
photometric centroid source offset	$0.73 \pm 0.24$	3.10	$0.14 \pm 0.13$	$0.72 \pm 0.24$

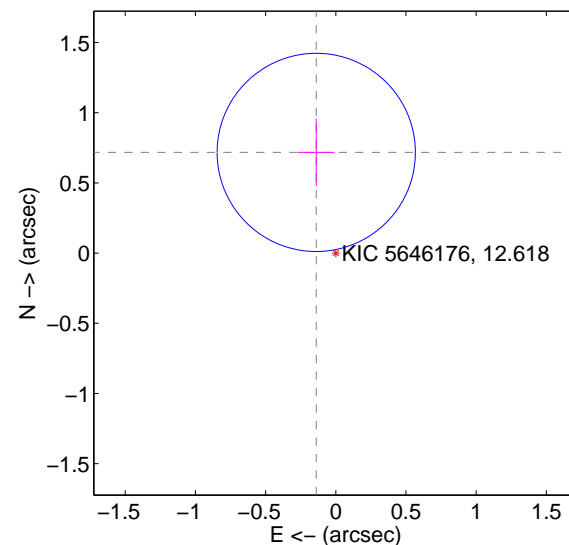
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

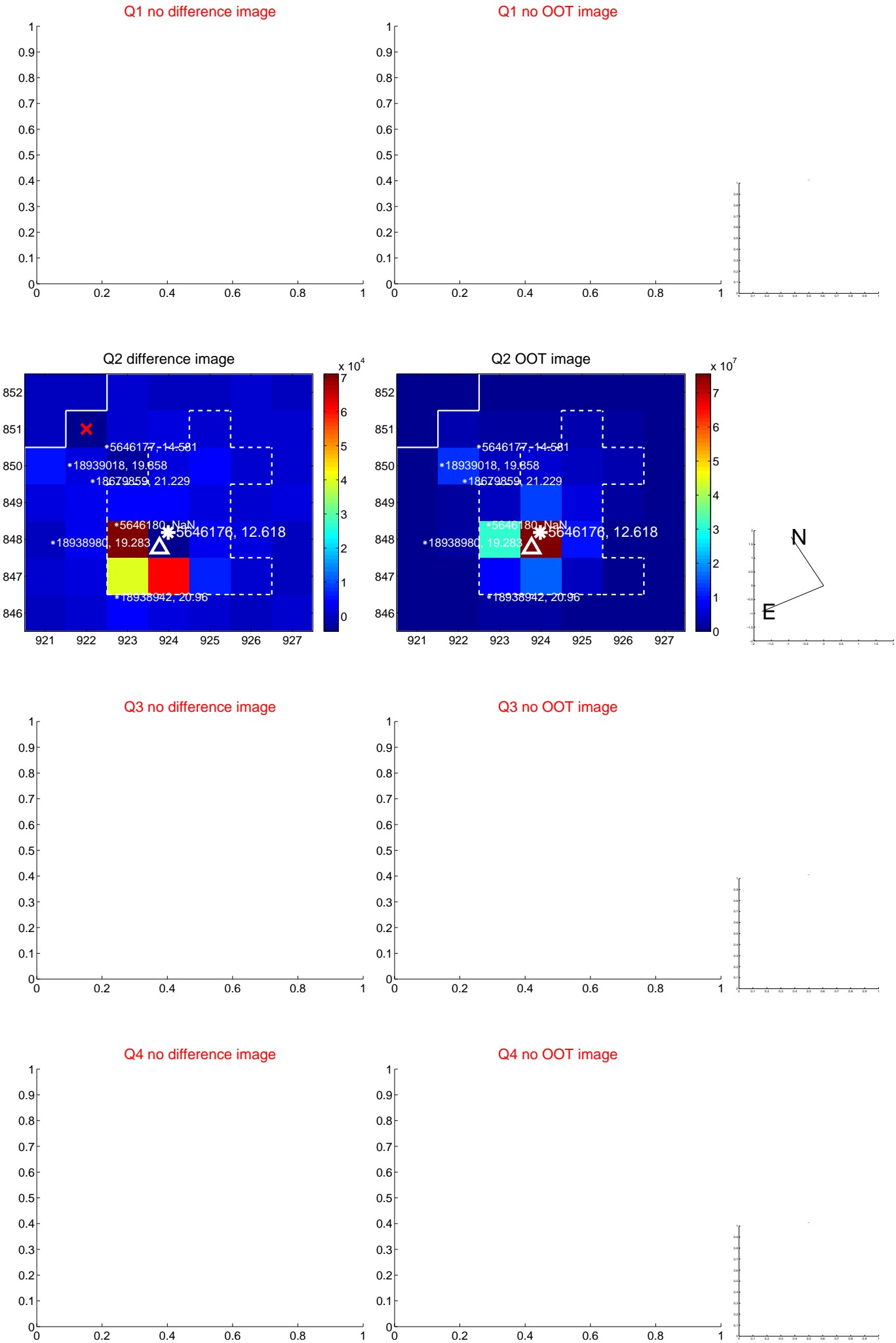


offset from photometric centroids

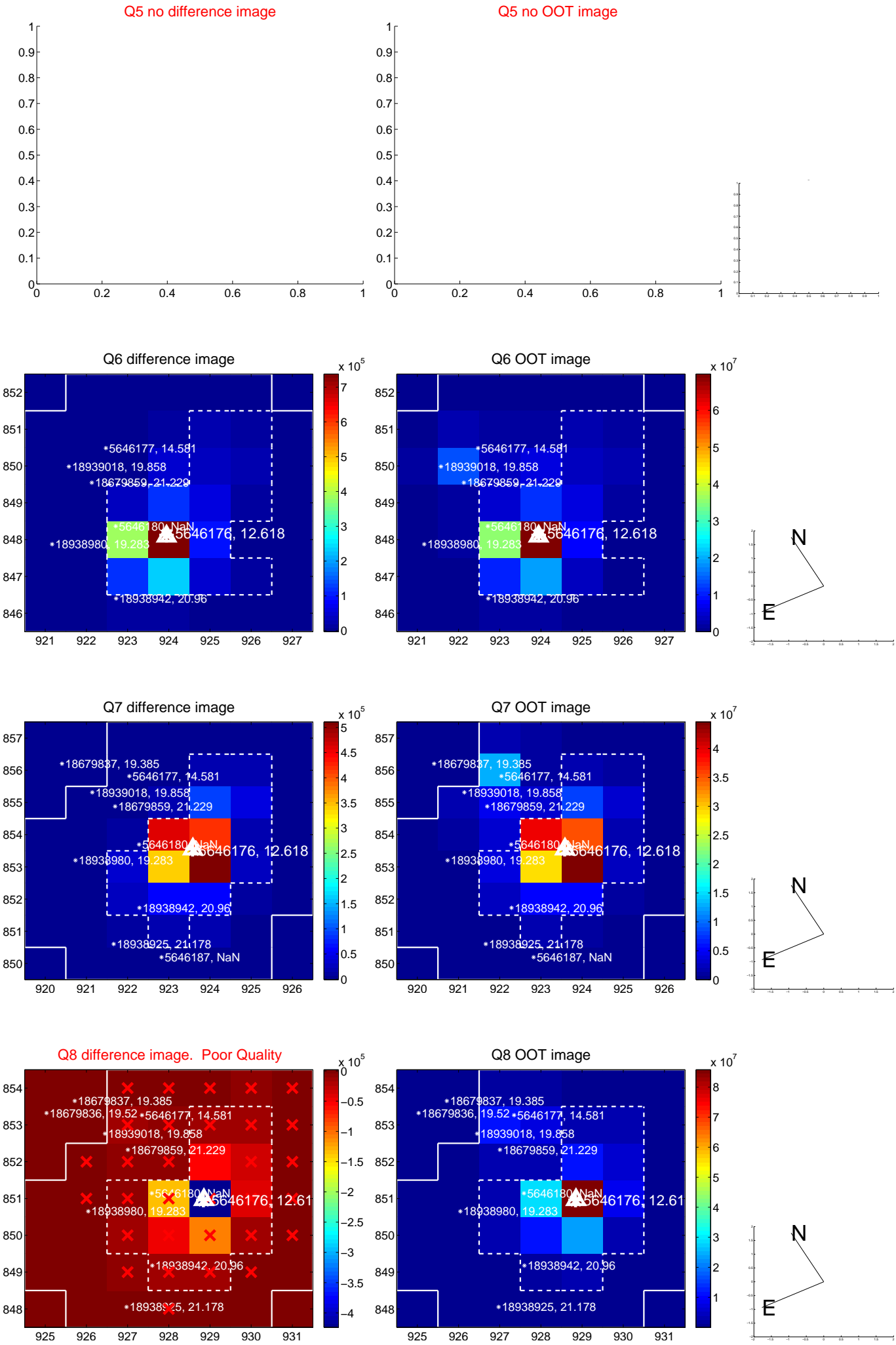


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

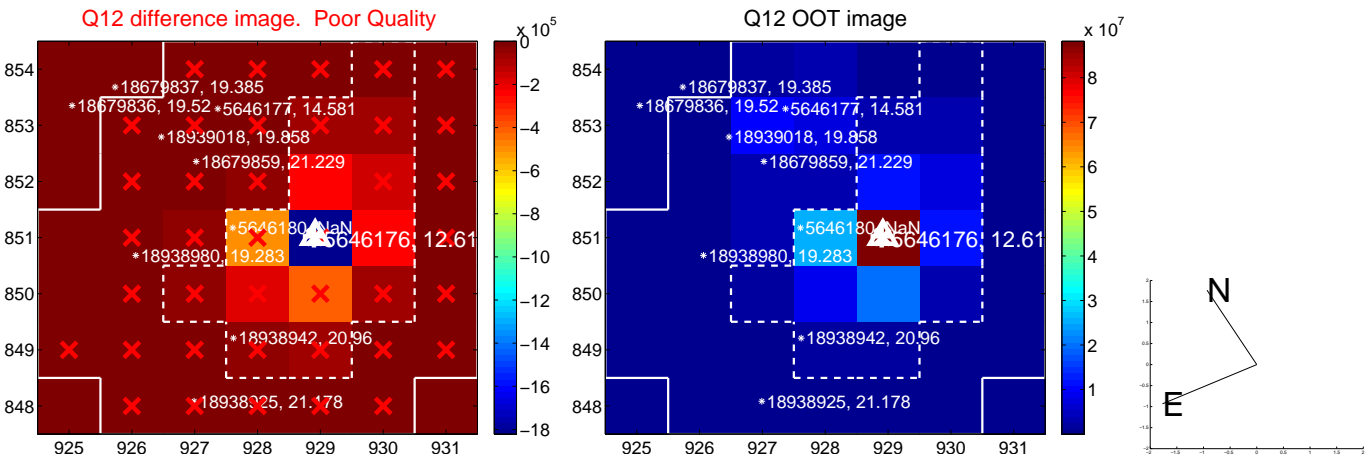
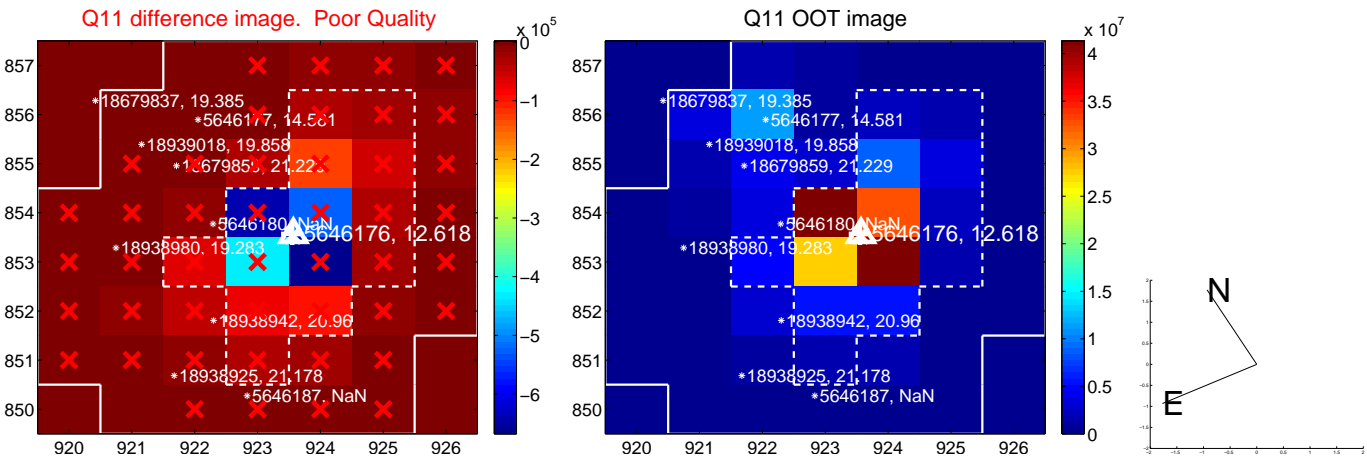
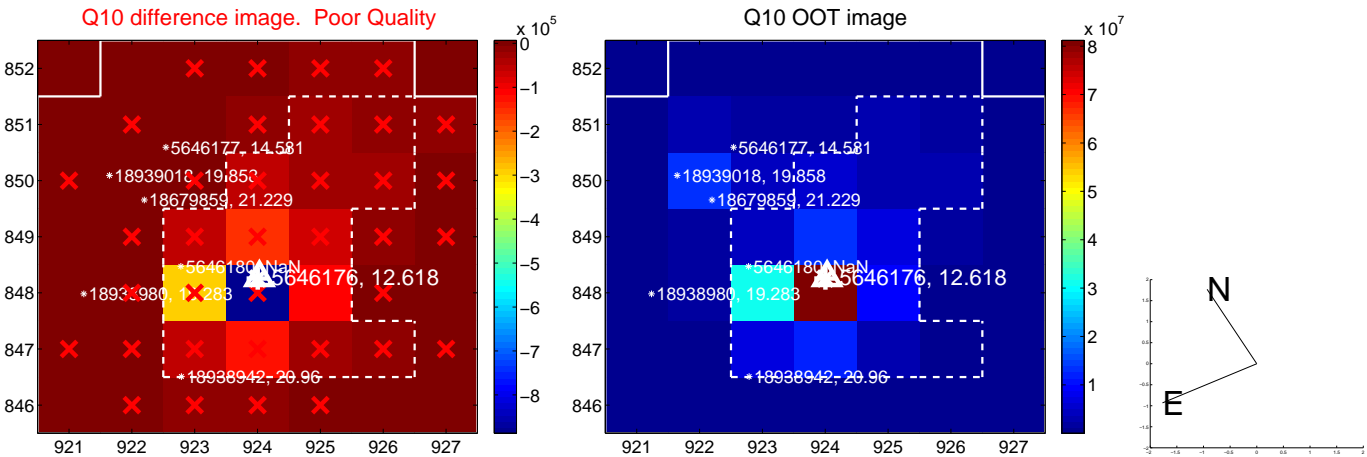
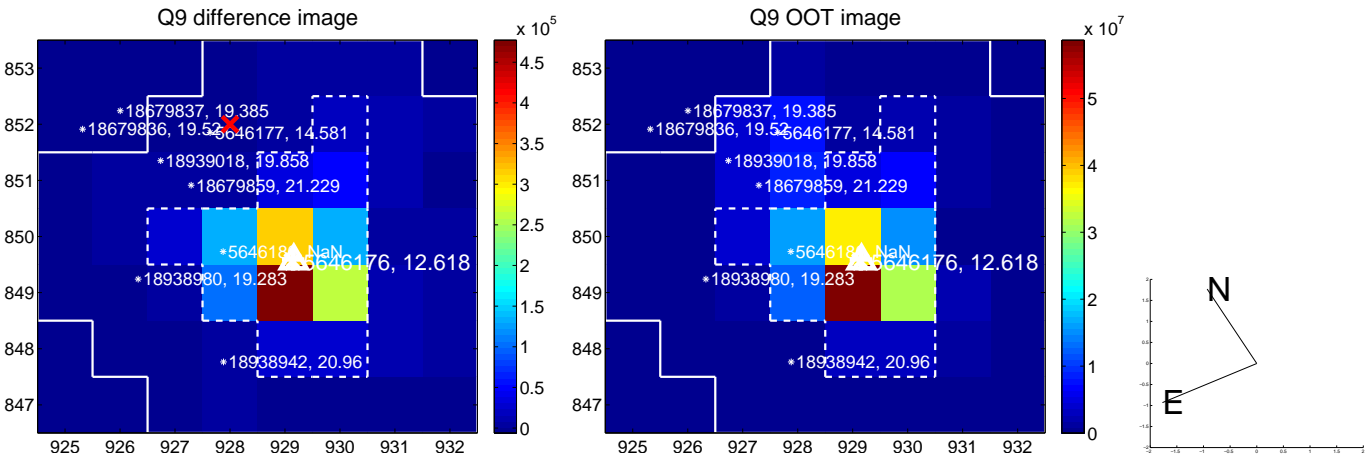


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

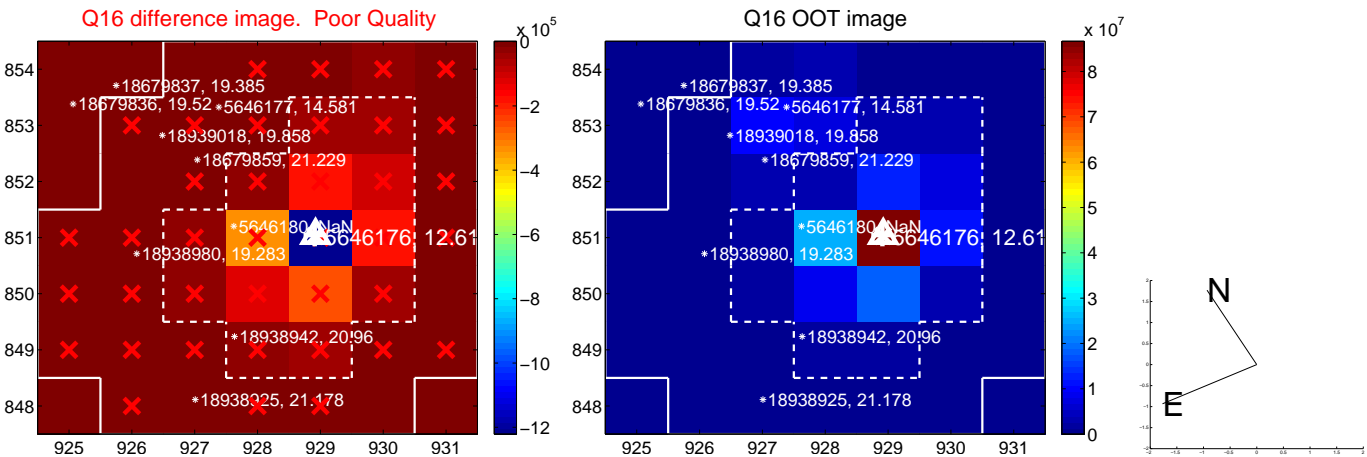
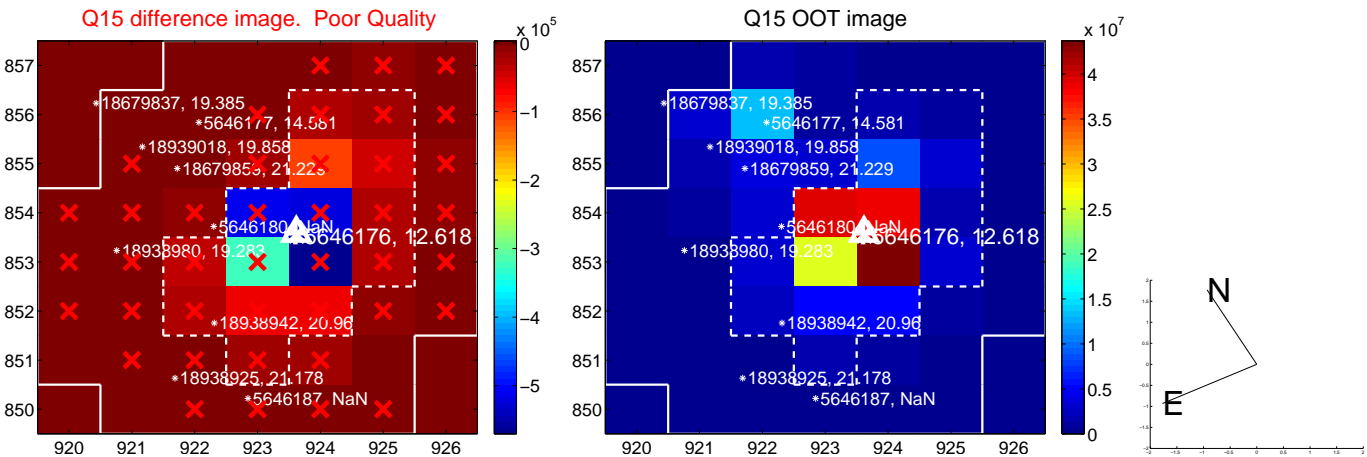
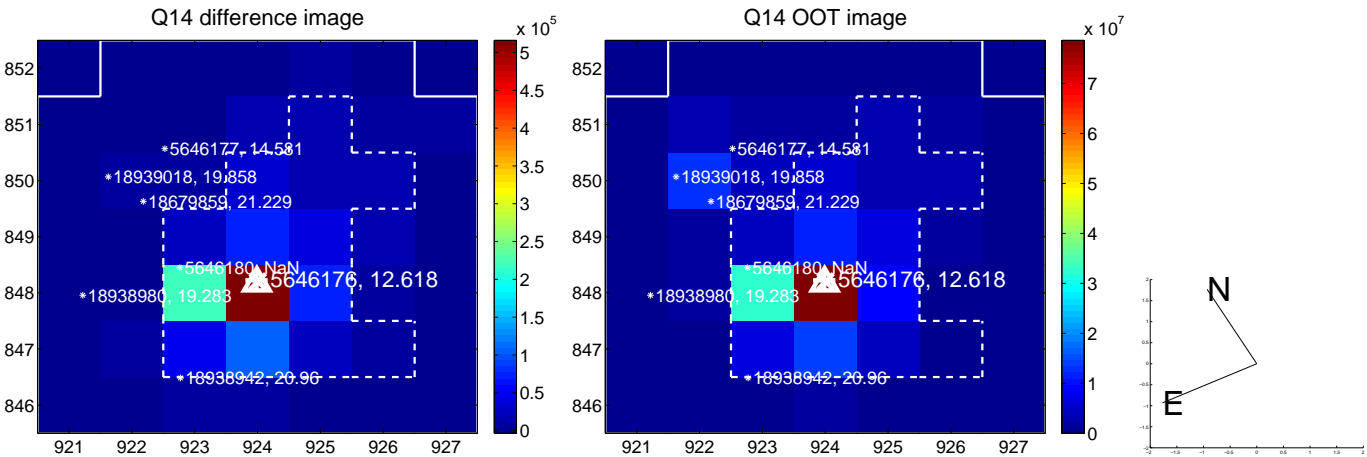
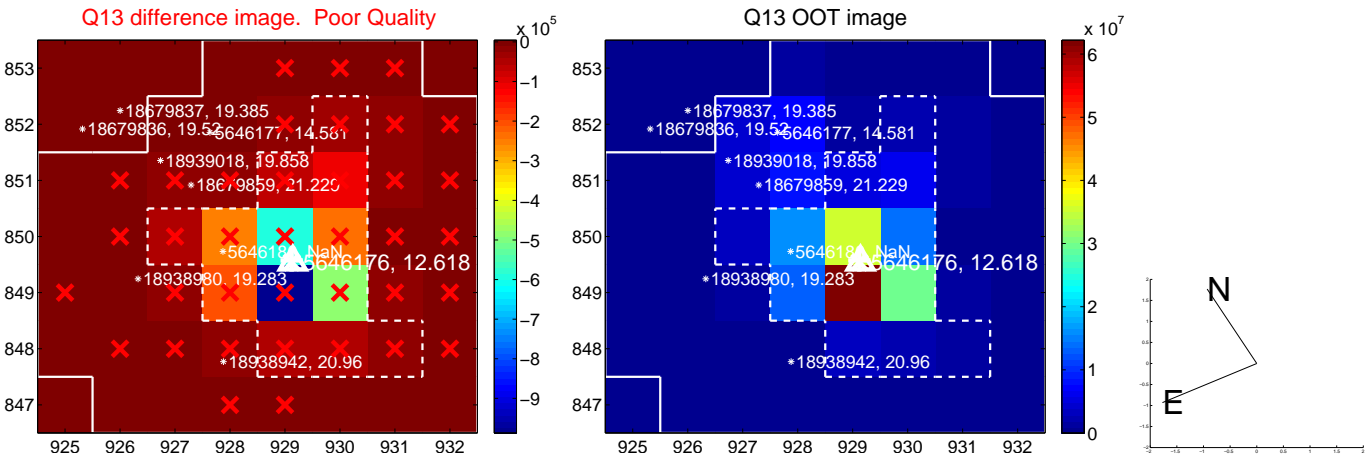




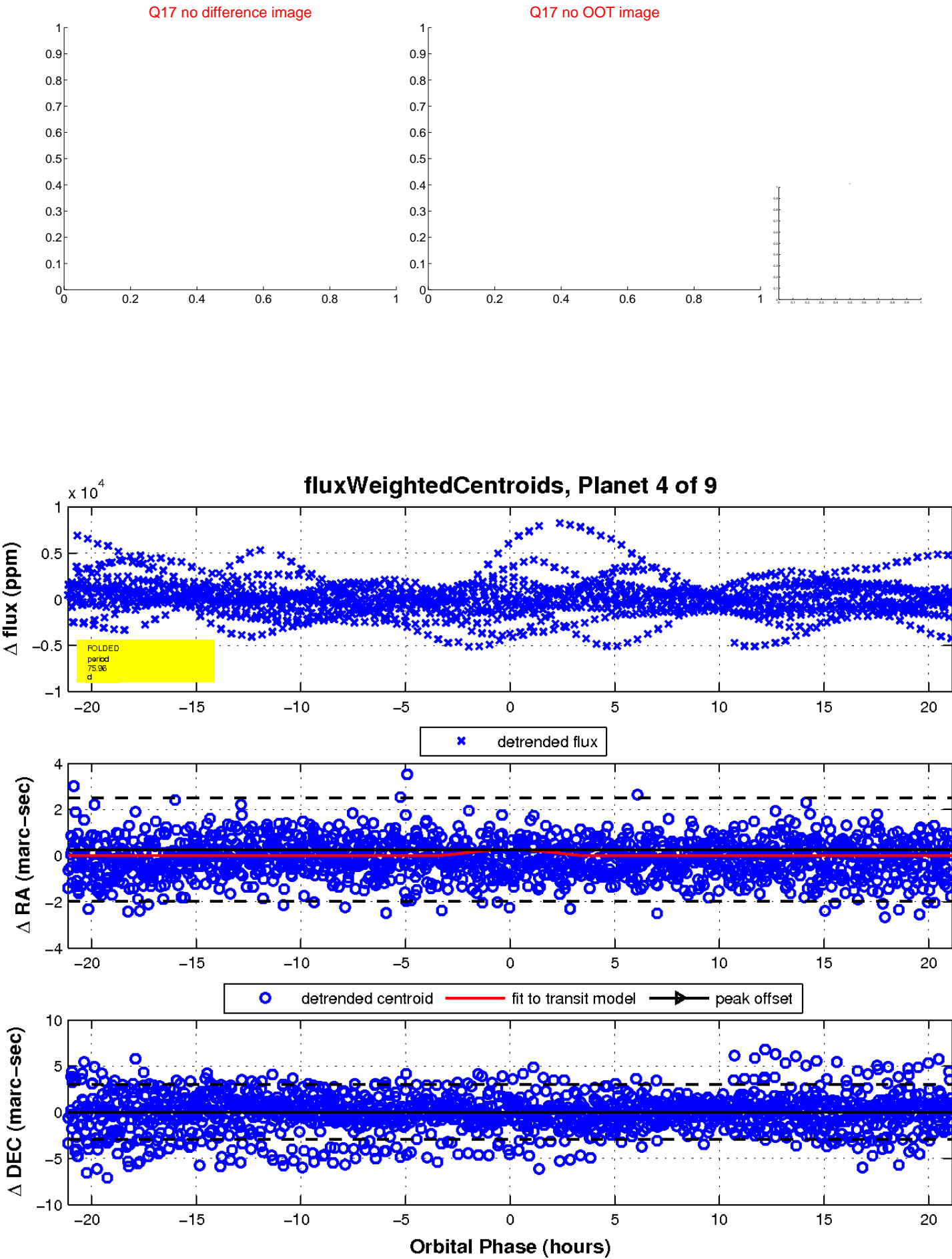
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



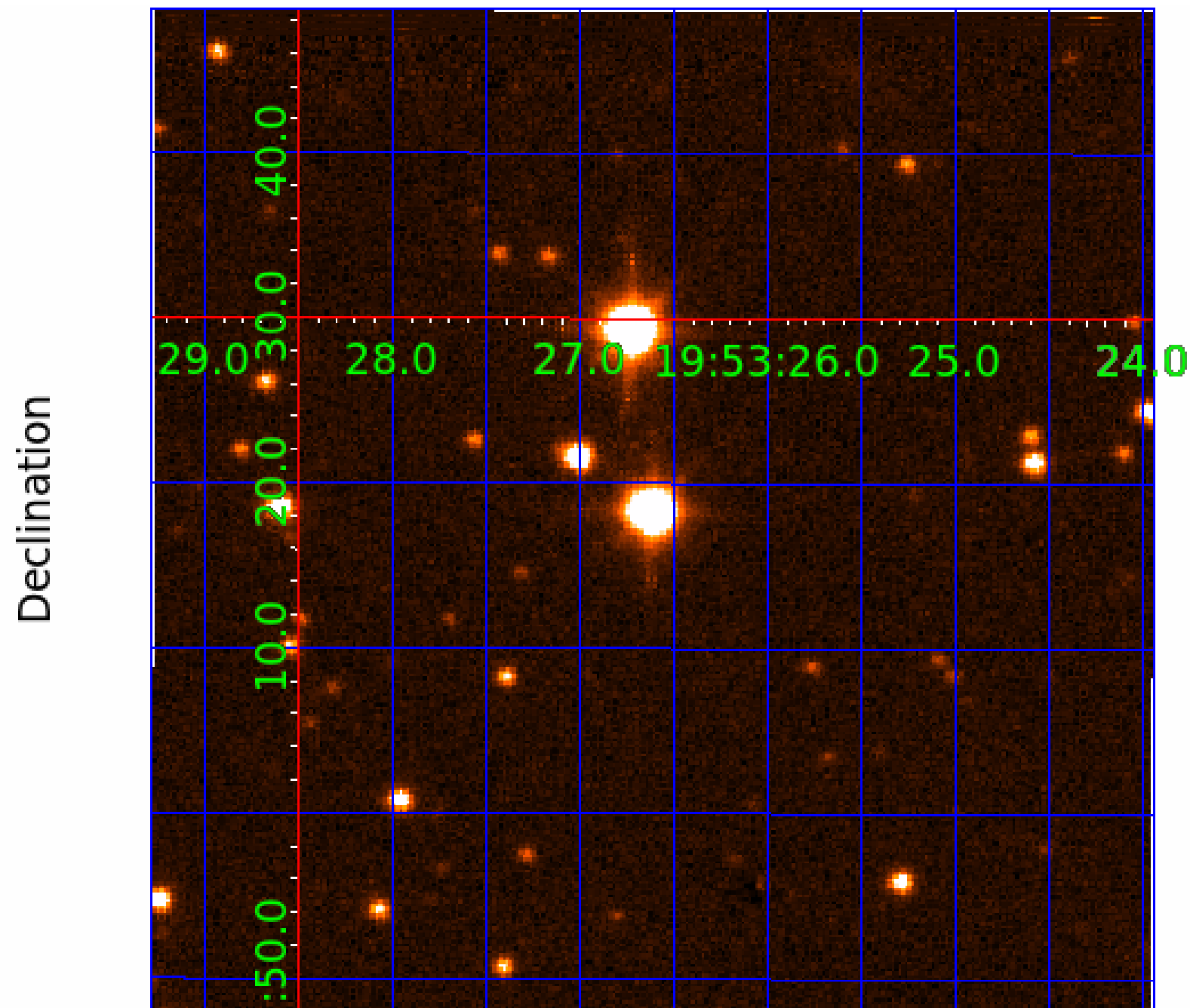
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



UKIRT Image



# KIC 005646176

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
005646176-01	OBS	No	0.998360	131.711809	47.6	6.354	10.0	6.1	1.29	6305	0.96	5853.71
005646176-02	OBS	No	105.455306	189.614921	3300.8	5.660	14.2	9.1	1.29	6305	13.60	11.72
005646176-03	OBS	No	204.697781	203.133079	1748.4	11.405	12.3	7.0	1.29	6305	6.22	4.84
005646176-04	OBS	No	75.961627	171.426607	2640.1	7.047	11.2	8.9	1.29	6305	12.02	18.16
005646176-05	OBS	No	66.679595	189.232216	1425.1	5.625	9.4	6.6	1.29	6305	6.08	21.60
005646176-08	OBS	No	29.414987	139.159990	1189.4	9.687	8.1	8.2	1.29	6305	7.52	64.33
005646176-09	OBS	No	48.339322	177.775979	171.6	6.000	8.2	-1.0	1.29	6305	1.70	33.17

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
005646176-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT
005646176-02	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—HALO_GHOST
005646176-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS
005646176-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
005646176-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
005646176-08	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
005646176-09	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_ALT—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_NOFITS

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

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

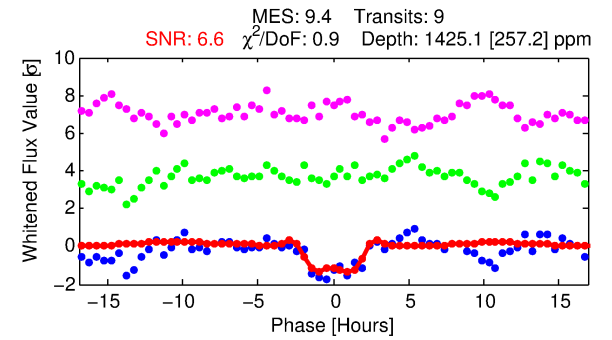
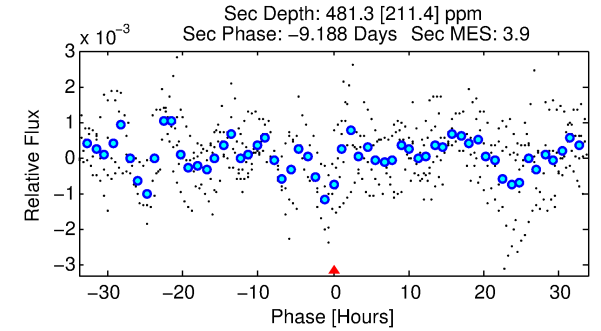
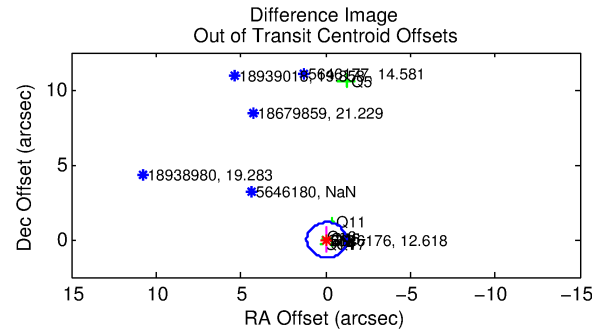
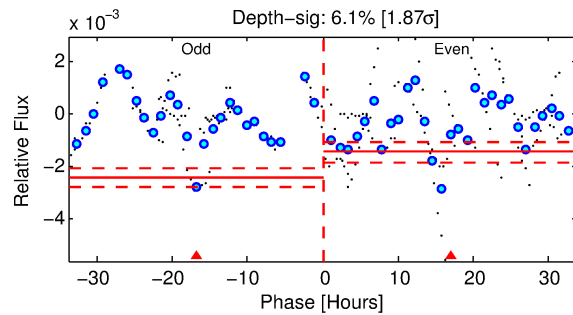
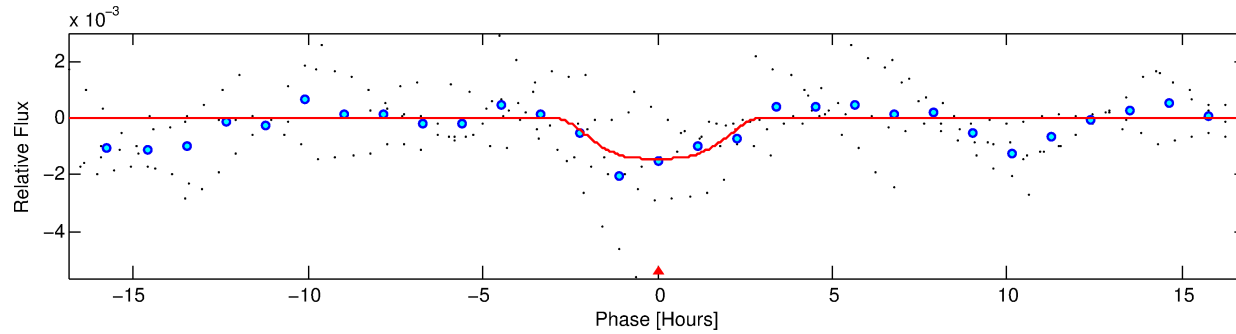
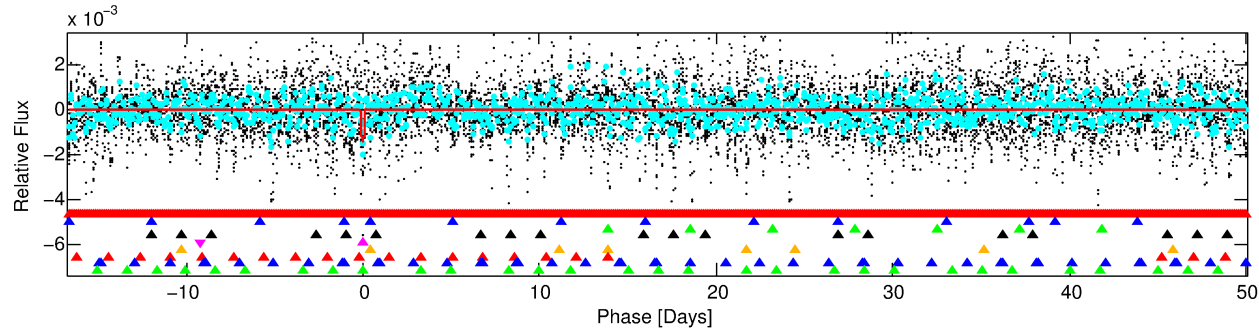
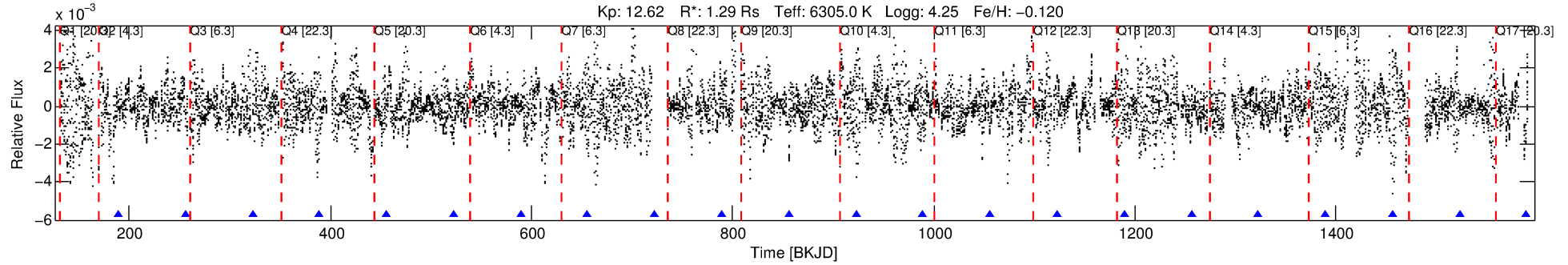
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 005646176-05

No Significant Match Found

# DV One-Page Summary

KIC: 5646176 Candidate: 5 of 9 Period: 66.680 d



## DV Fit Results:

Period = 66.67959 [0.00119] d  
Epoch = 189.2322 [0.0133] BKJD  
Rp/R\* = 0.0431 [0.0046]  
a/R\* = 39.47 [6.10]  
b = 0.95 [0.02]  
Seff = 21.60 [8.21]  
Teq = 550 [52] K  
Rp = 6.09 [2.10] Re  
a = 0.3315 [0.0866] AU  
Ag = 786.01 [477.55] [1.64 $\sigma$ ]  
Teff = 4500 [566] K [6.95 $\sigma$ ]

## DV Diagnostic Results:

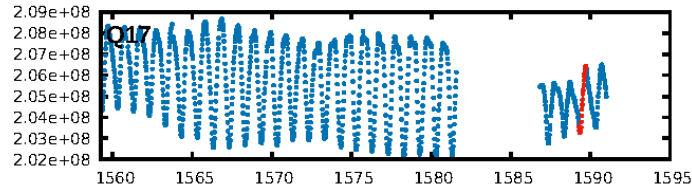
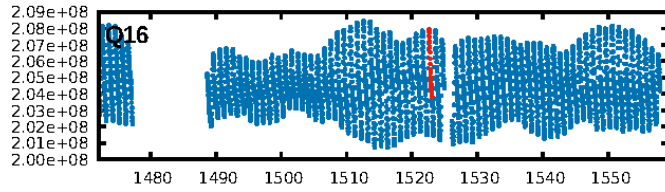
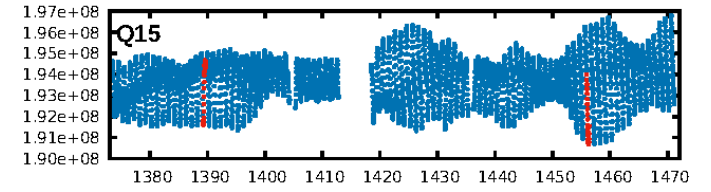
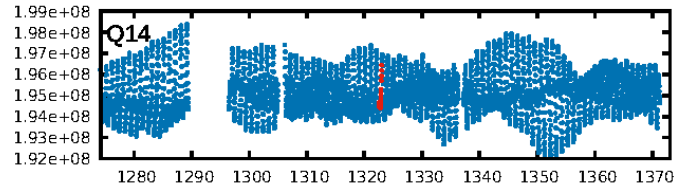
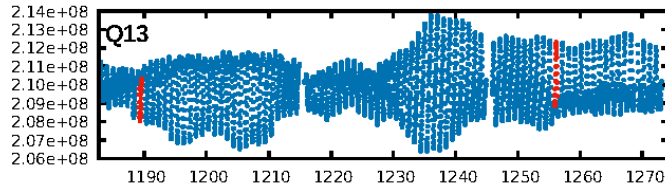
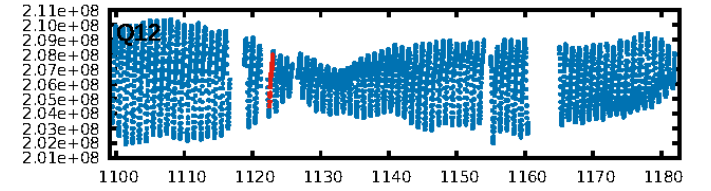
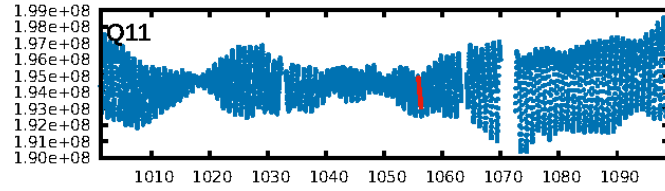
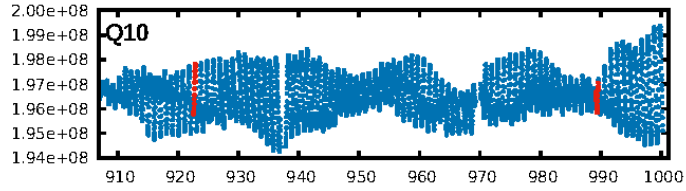
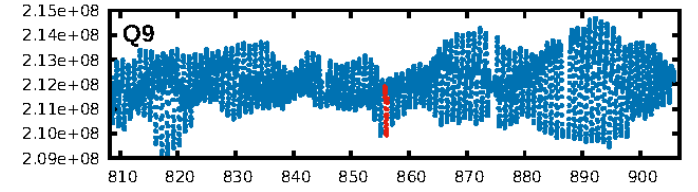
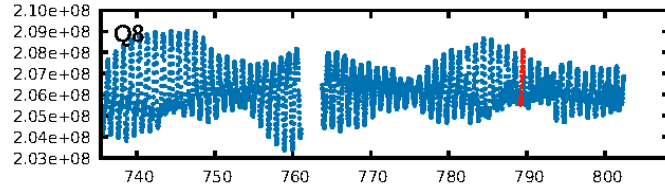
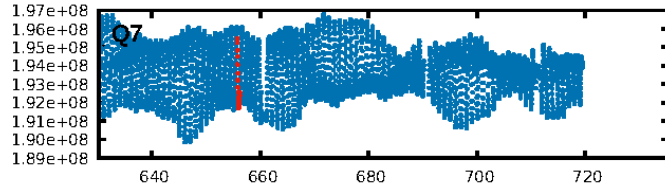
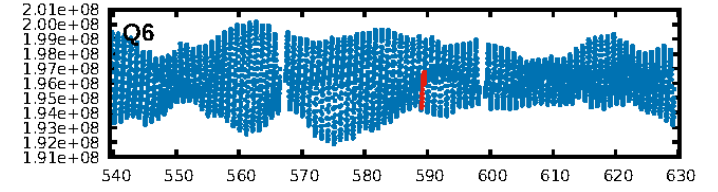
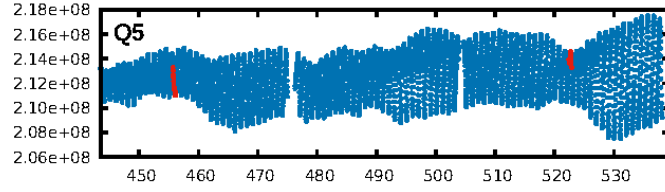
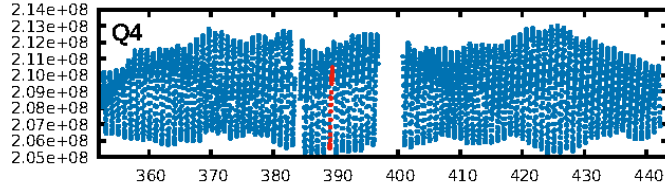
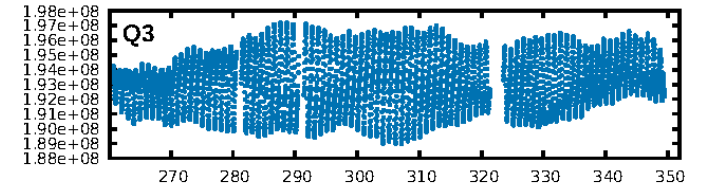
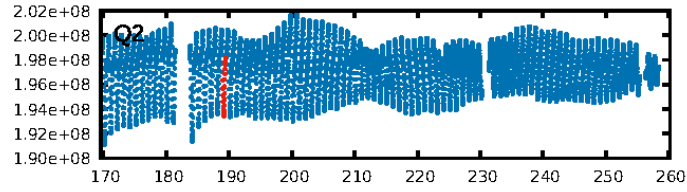
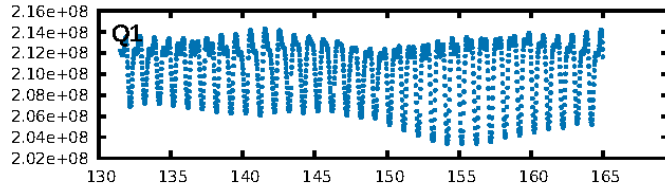
ShortPeriod-sig: 100.0% [53.52 $\sigma$ ]  
LongPeriod-sig: 99.9% [3.37 $\sigma$ ]  
ModelChiSquare2-sig: 0.1%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [9/9]  
GhostDiagnostic-chr: -2.194  
Centroid-sig: 76.9%  
Centroid-so: 0.723 arcsec [2.04 $\sigma$ ]  
OotOffset-rm: 0.062 arcsec [0.16 $\sigma$ ]  
KicOffset-rm: 0.090 arcsec [0.19 $\sigma$ ]  
OotOffset-st: 3/3/4/4 [14]  
KicOffset-st: 3/3/4/4 [14]  
DiffImageQuality-fgm: 0.50 [7/14]  
DiffImageOverlap-fno: 0.00 [0/15]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 16:34:16 Z

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

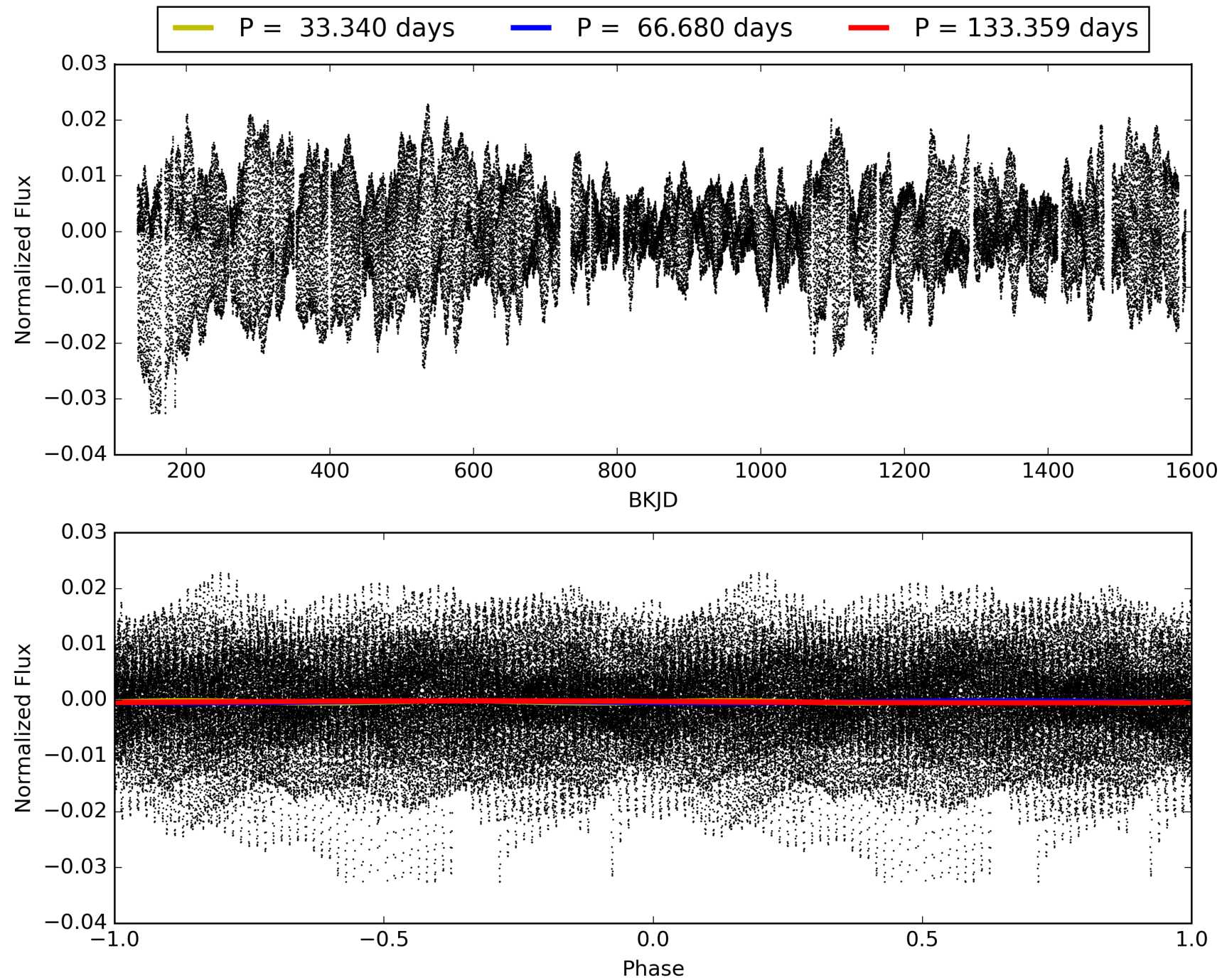


# TCE 005646176-05, PDC Light Curves



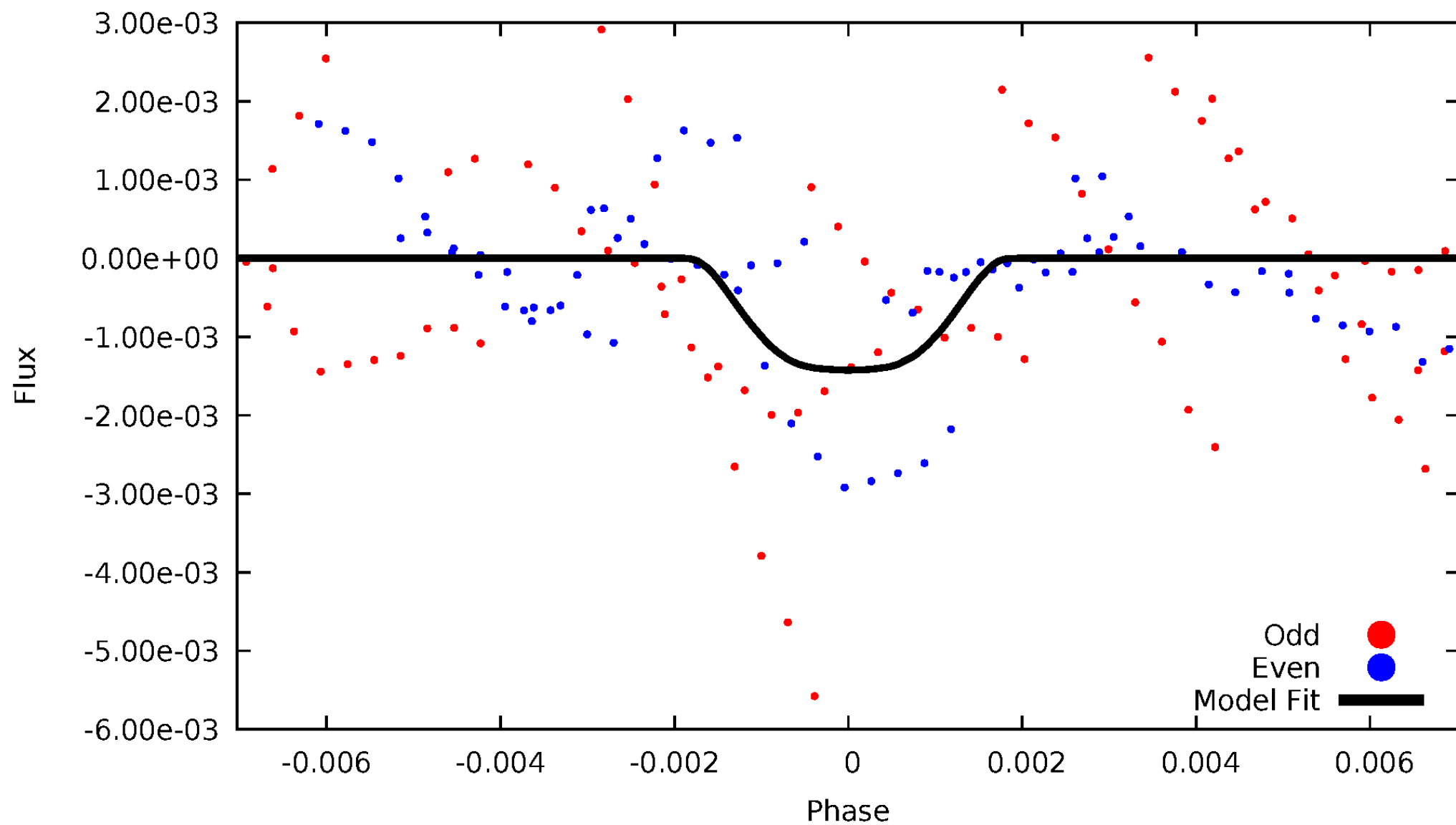


TCE 005646176-05



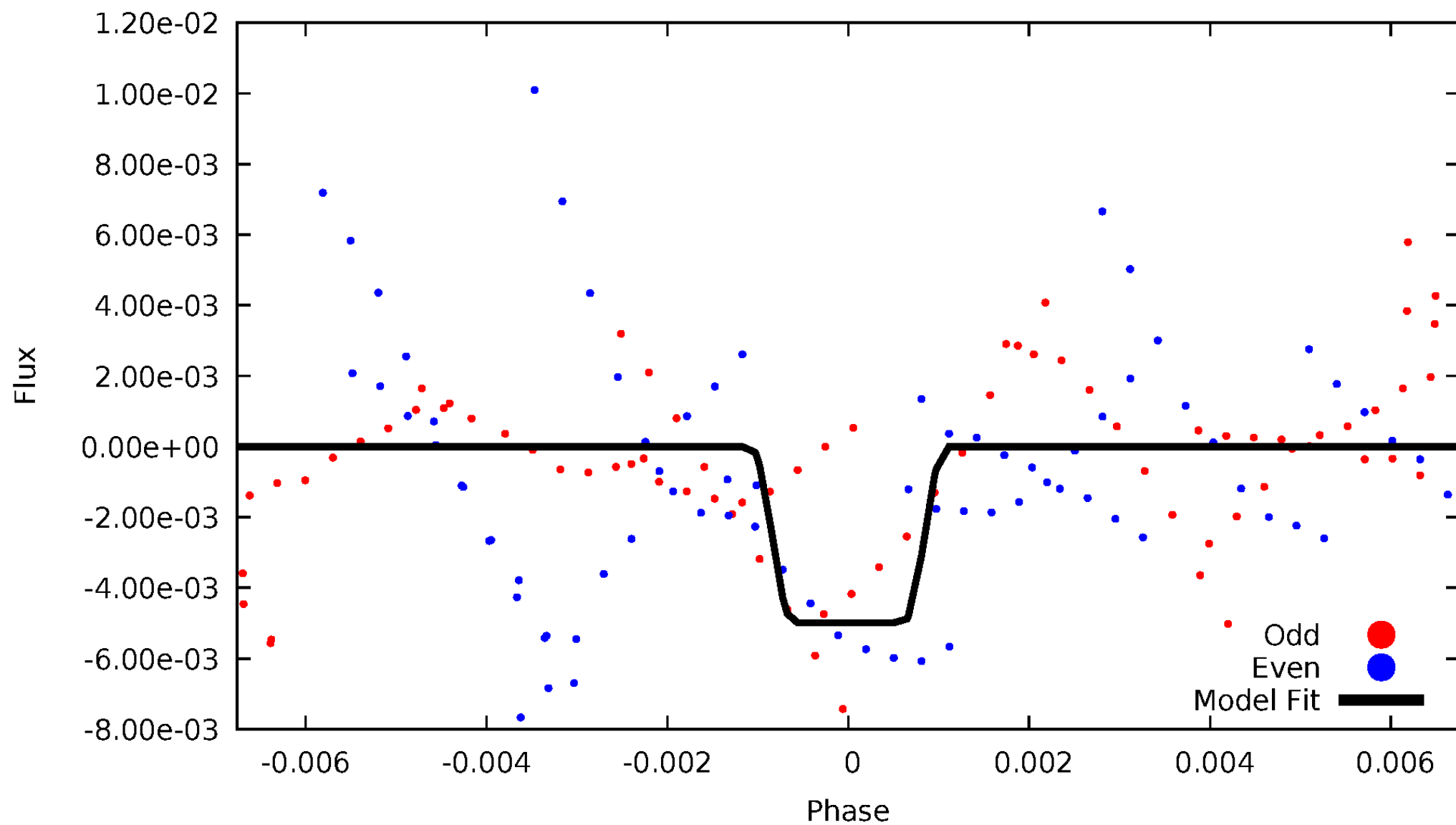
# DV Odd/Even

TCE 005646176-05

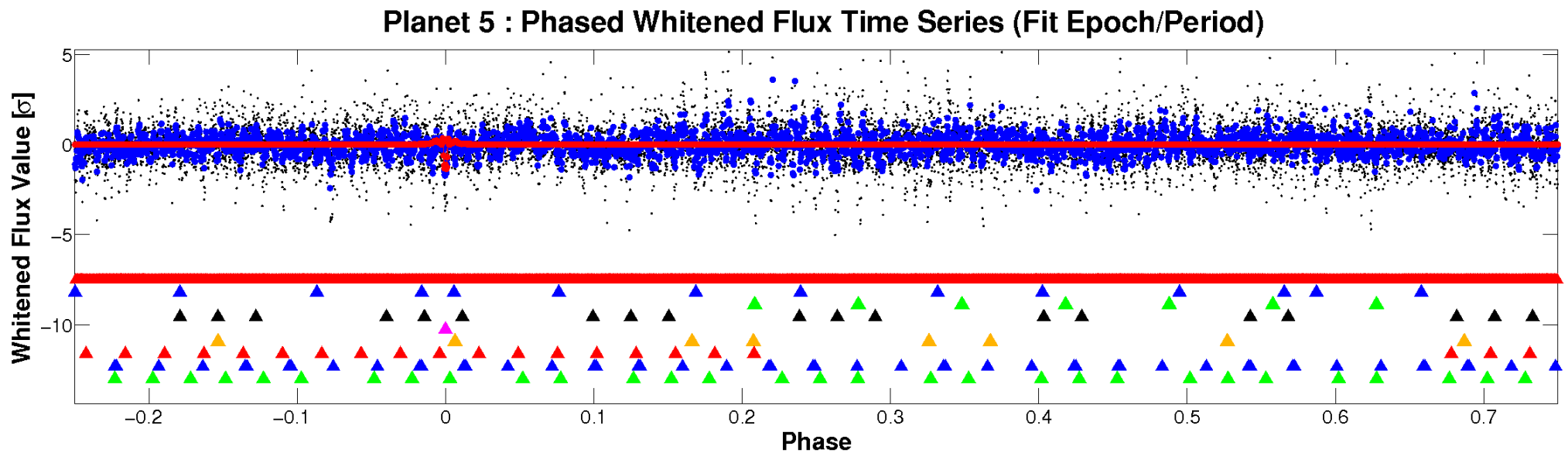
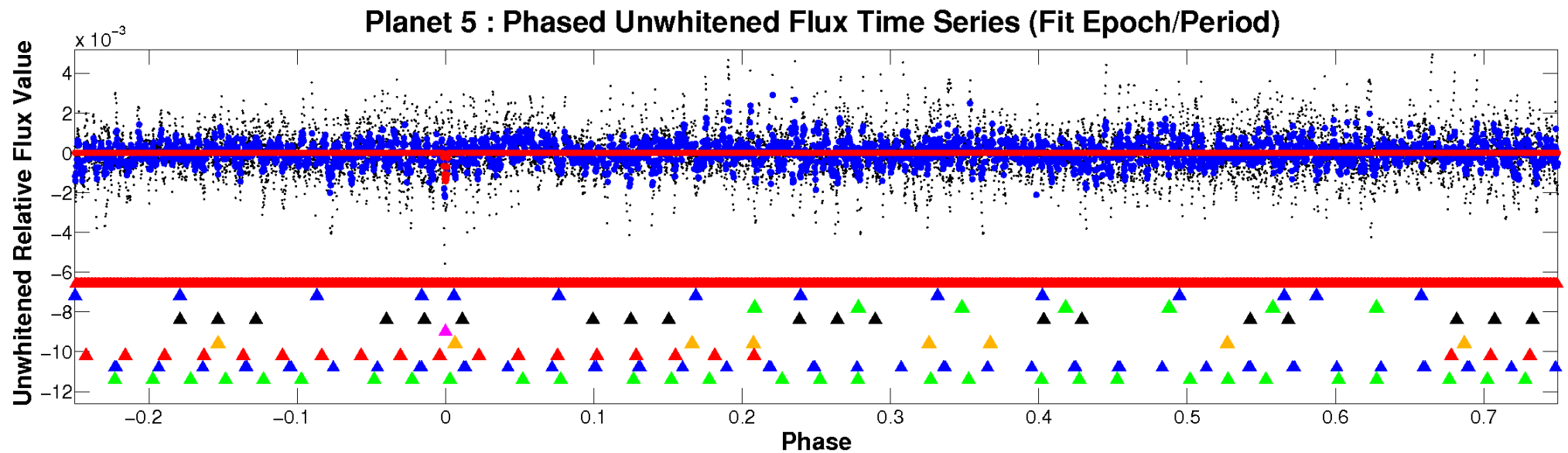


# ALT Odd/Even

TCE 005646176-05

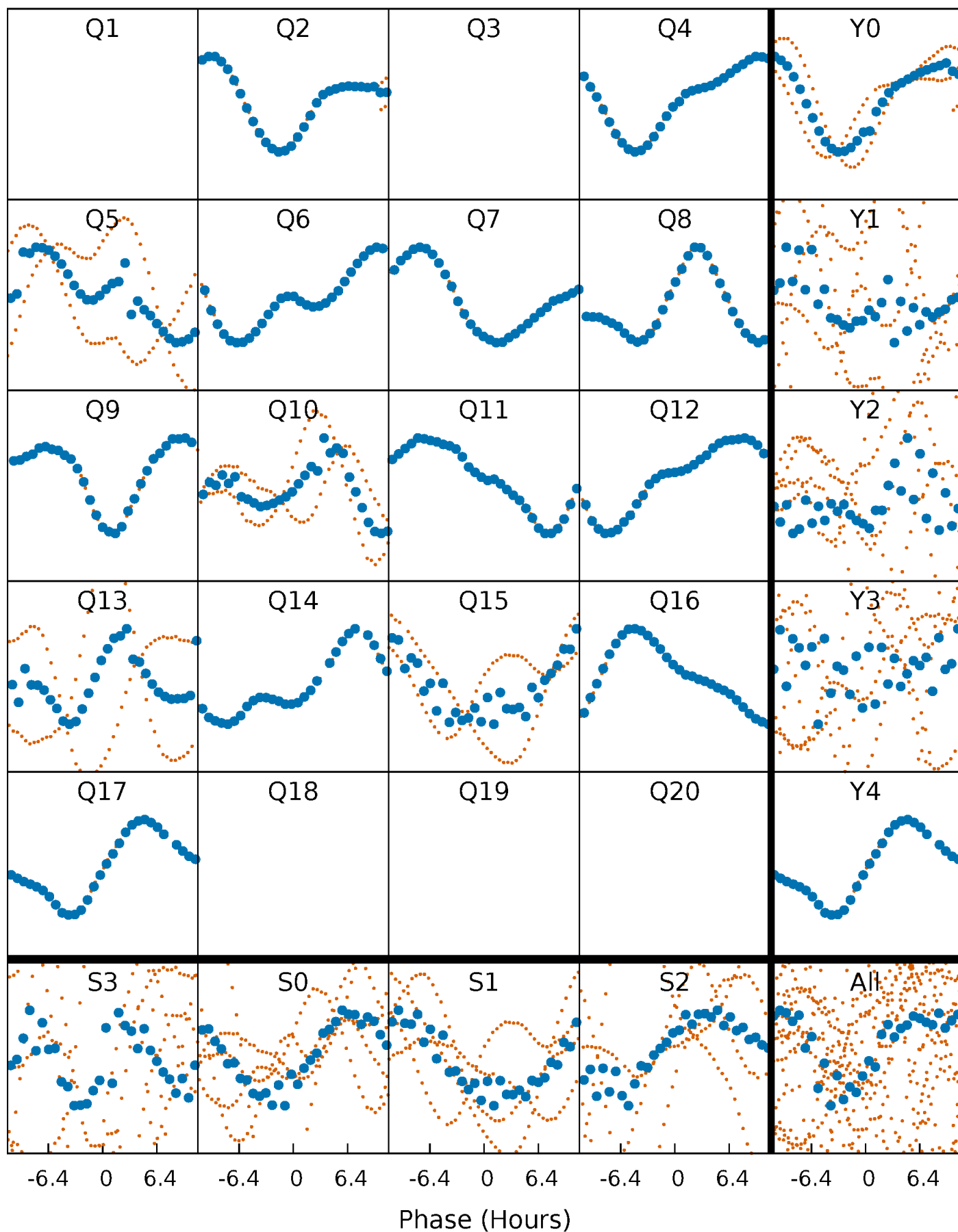


# Non-Whitened Vs. Whitened Light Curve



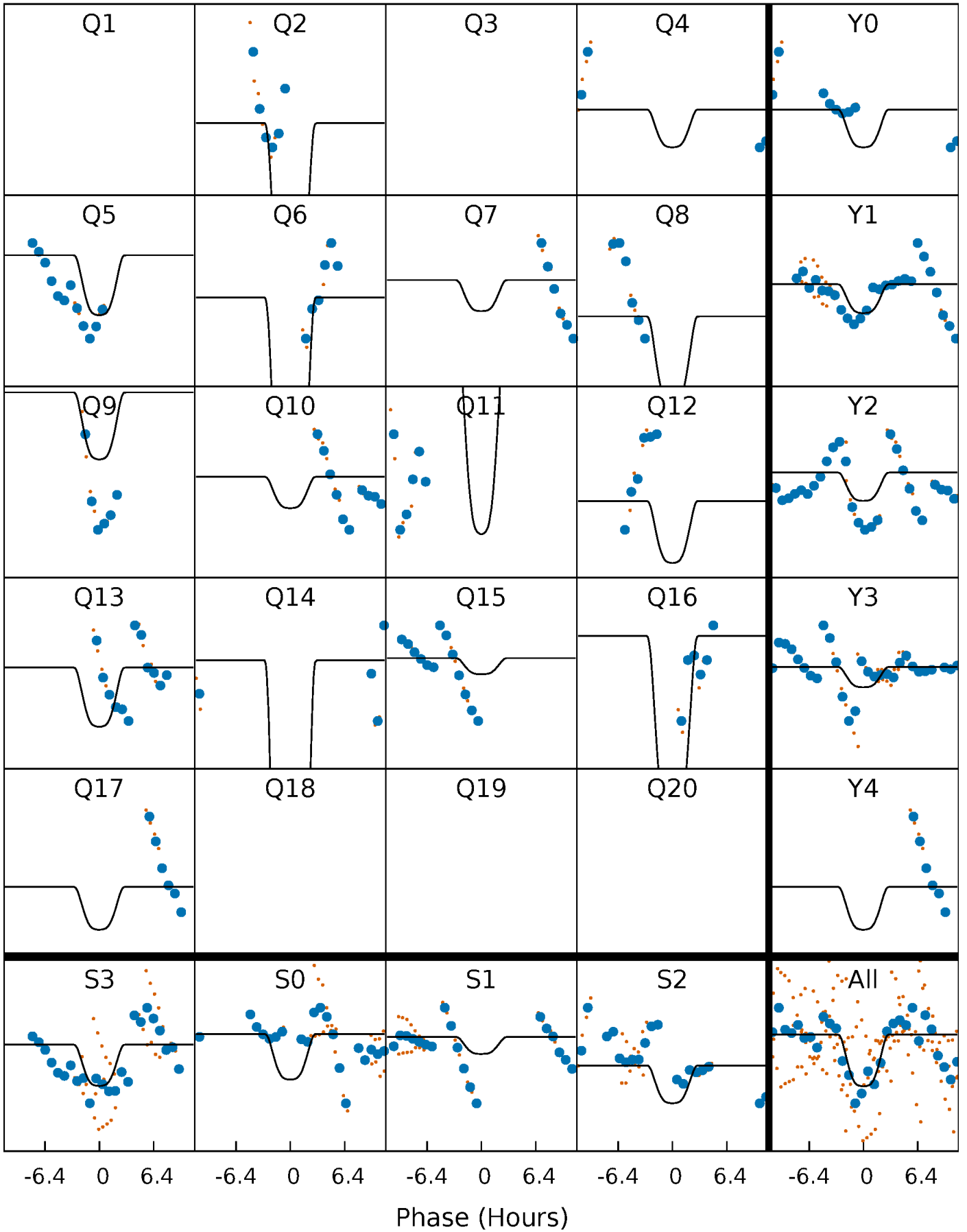
# PDC Quarter-Phased Transit Curves

TCE 005646176-05   P= 66.679595 Days    $T_0=189.232216$  (BKJD)



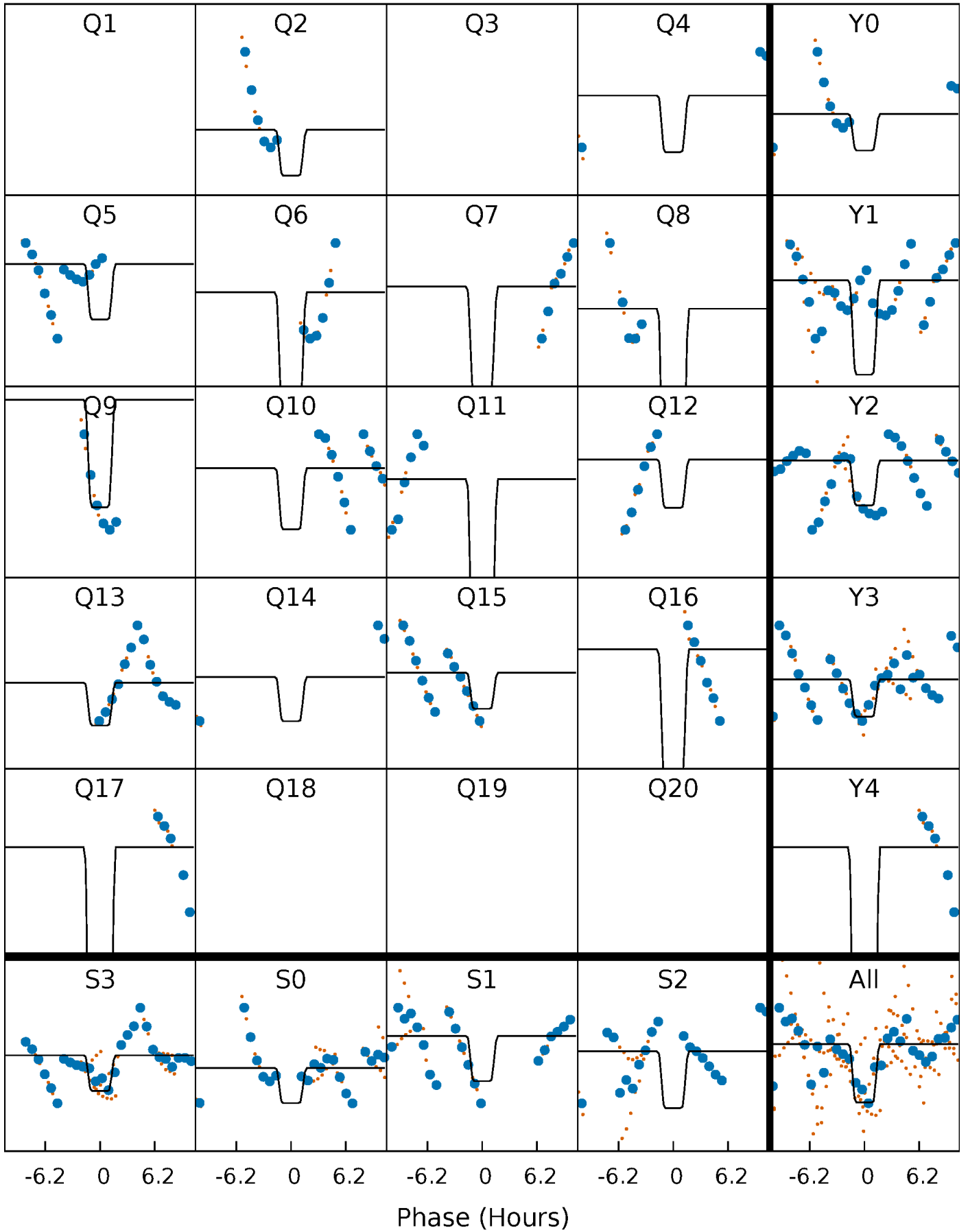
# DV Quarter-Phased Transit Curves

TCE 005646176-05   P= 66.679595 Days    $T_0=189.232216$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 005646176-05   P= 66.676659 Days    $T_0=189.266088$  (BKJD)

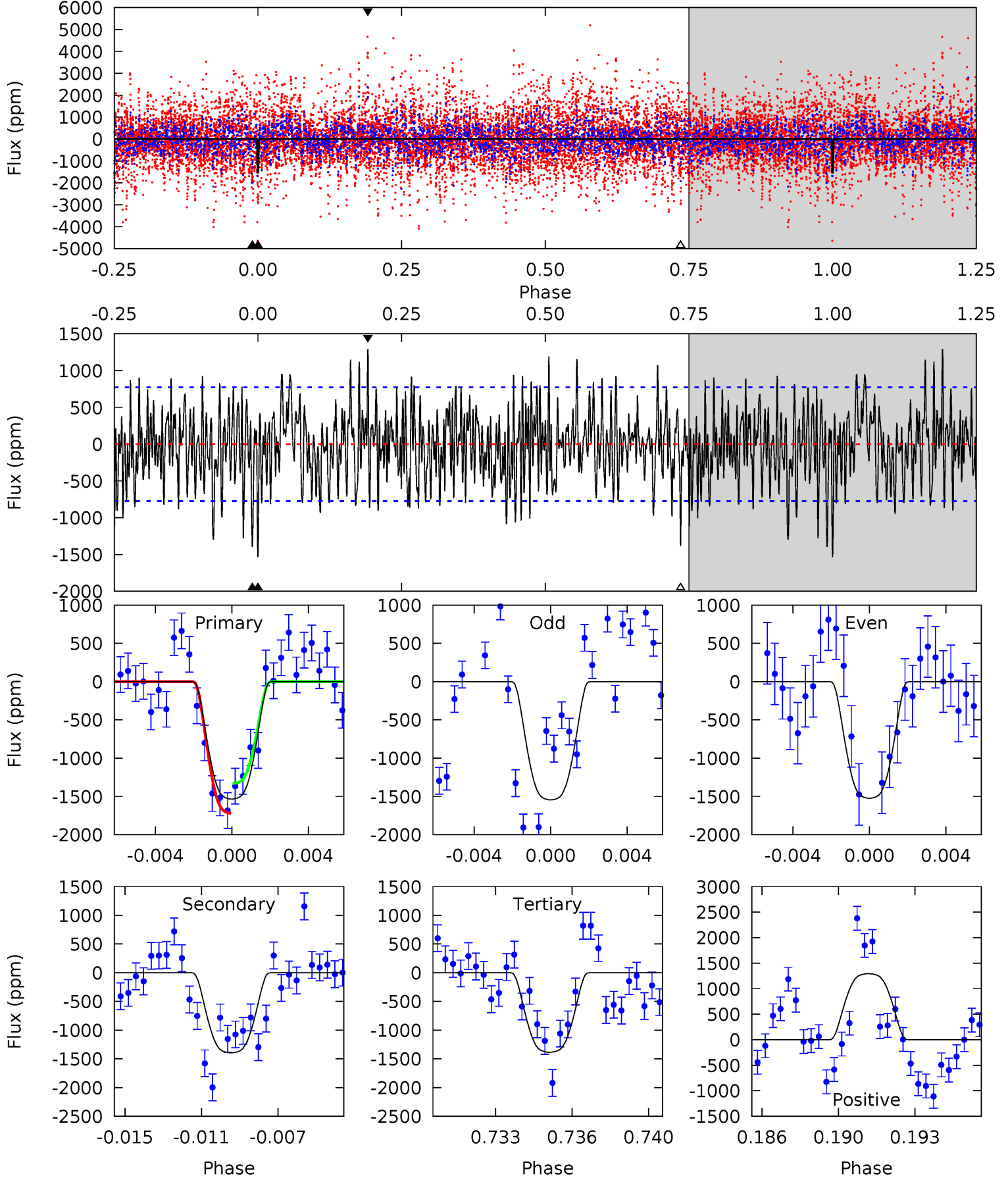




# DV Model-Shift Uniqueness Test

005646176-05, P = 66.679595 Days, E = 122.552621 Days

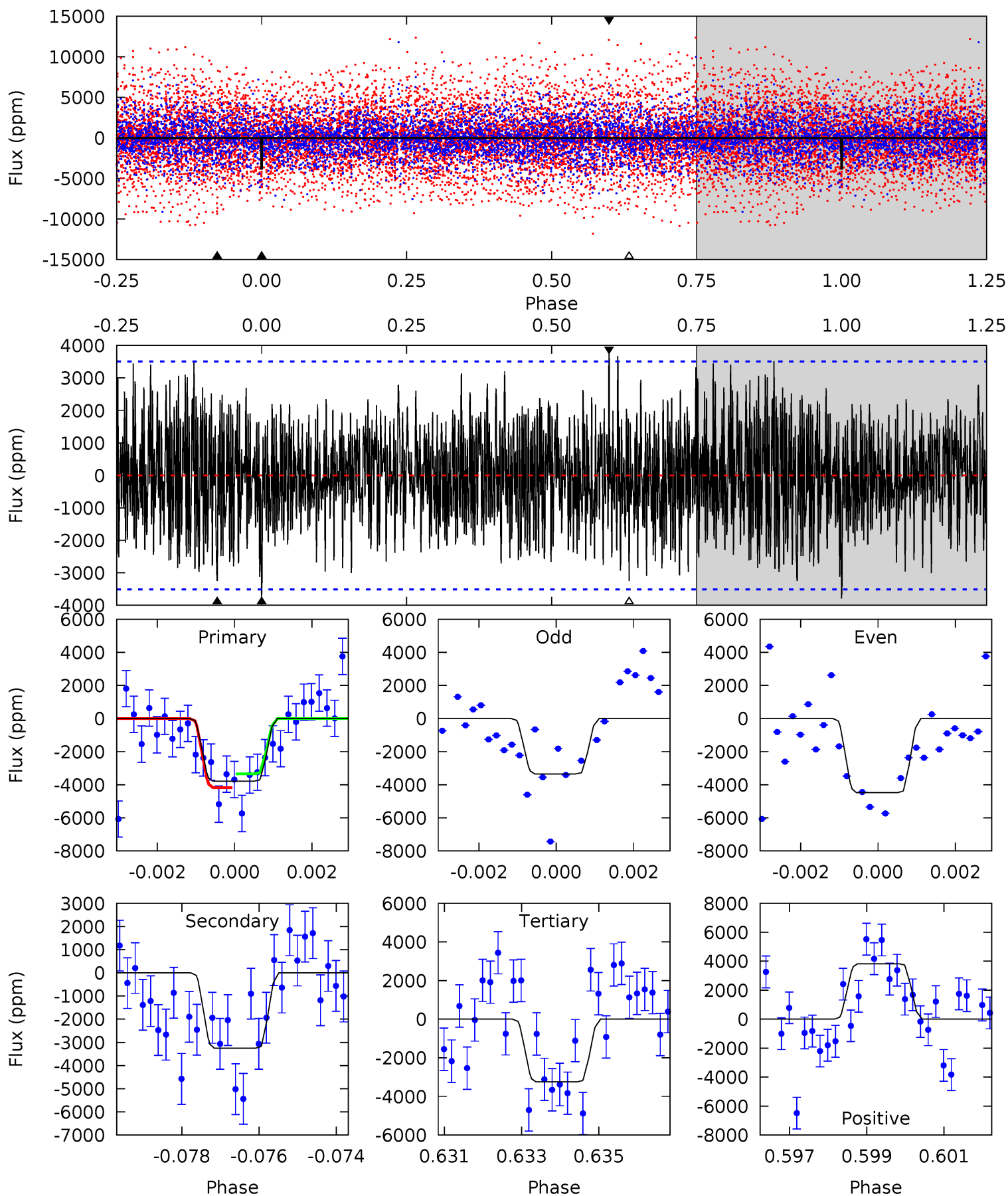
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
10.3	9.39	9.33	8.72	5.21	2.90	2.80	1.01	1.62	0.06	0.67	0.07	1.97	0.46	1.32



# Alt Model-Shift Uniqueness Test

005646176-05,  $P = 66.676659$  Days,  $E = 122.589429$  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
5.75	4.94	4.93	5.82	5.33	3.09	1.89	0.82	-0.06	0.00	-0.88	0.86	0.91	0.50	0.63



### Stellar Parameters For KIC 005646176

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6305^{+151}_{-189}$	$4.252^{+0.153}_{-0.187}$	$-0.120^{+0.250}_{-0.300}$	$1.295^{+0.424}_{-0.261}$	$1.091^{+0.197}_{-0.121}$	$0.707^{+0.542}_{-0.354}$
	+2%/-3%	+4%/-4%	+208%/-250%	+33%/-20%	+18%/-11%	+77%/-50%
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 005646176-05 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-1394 \pm 148$	$6.26^{+1.26}_{-1.06}$	$772^{+59}_{-47}$	$5848^{+379}_{-349}$	$2138^{+976}_{-612}$
Alt.	$-3252 \pm 659$	$10.01^{+1.95}_{-1.27}$	$770^{+58}_{-49}$	$5655^{+365}_{-322}$	$1890^{+786}_{-585}$

$T_{max}$  = 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

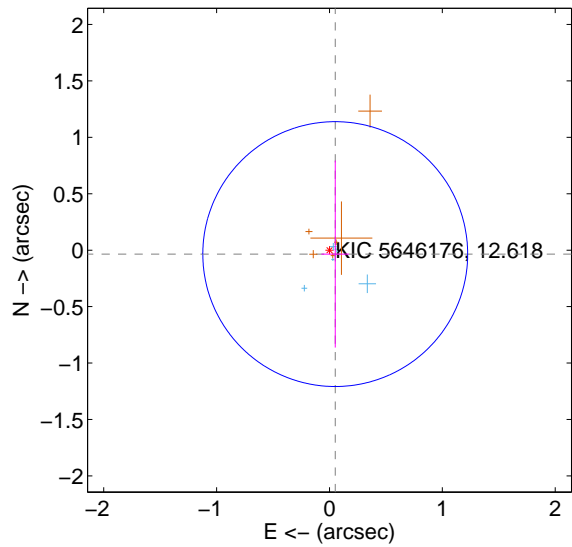
Supplemental centroid analysis for 005646176-05. Kepler magnitude: 12.62. Transit SNR 6.56

There are 7 quarters with good PRF difference image offsets

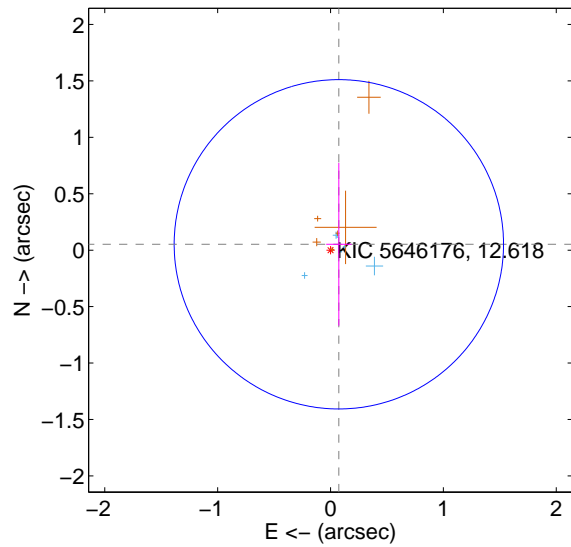
The direct PRF centroid is offset from the target star catalog position by about 0.17 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.062 \pm 0.391$	0.16	$-0.051 \pm 0.122$	$-0.035 \pm 0.828$
PRF-fit source offset from KIC position	$0.090 \pm 0.486$	0.19	$-0.074 \pm 0.112$	$0.052 \pm 0.721$
photometric centroid source offset	$0.72 \pm 0.35$	2.04	$0.14 \pm 0.20$	$0.71 \pm 0.36$

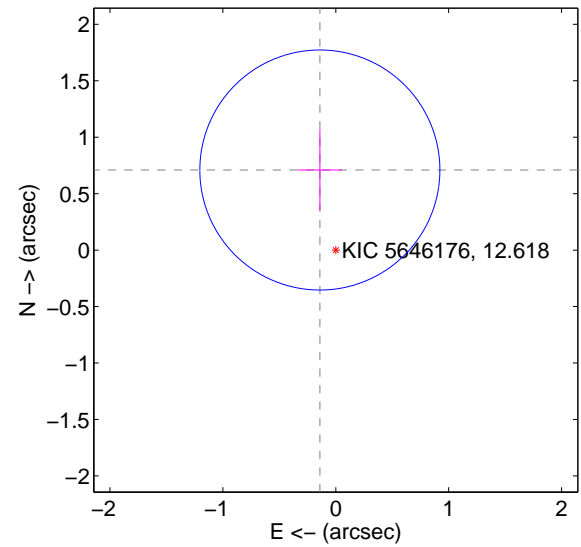
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

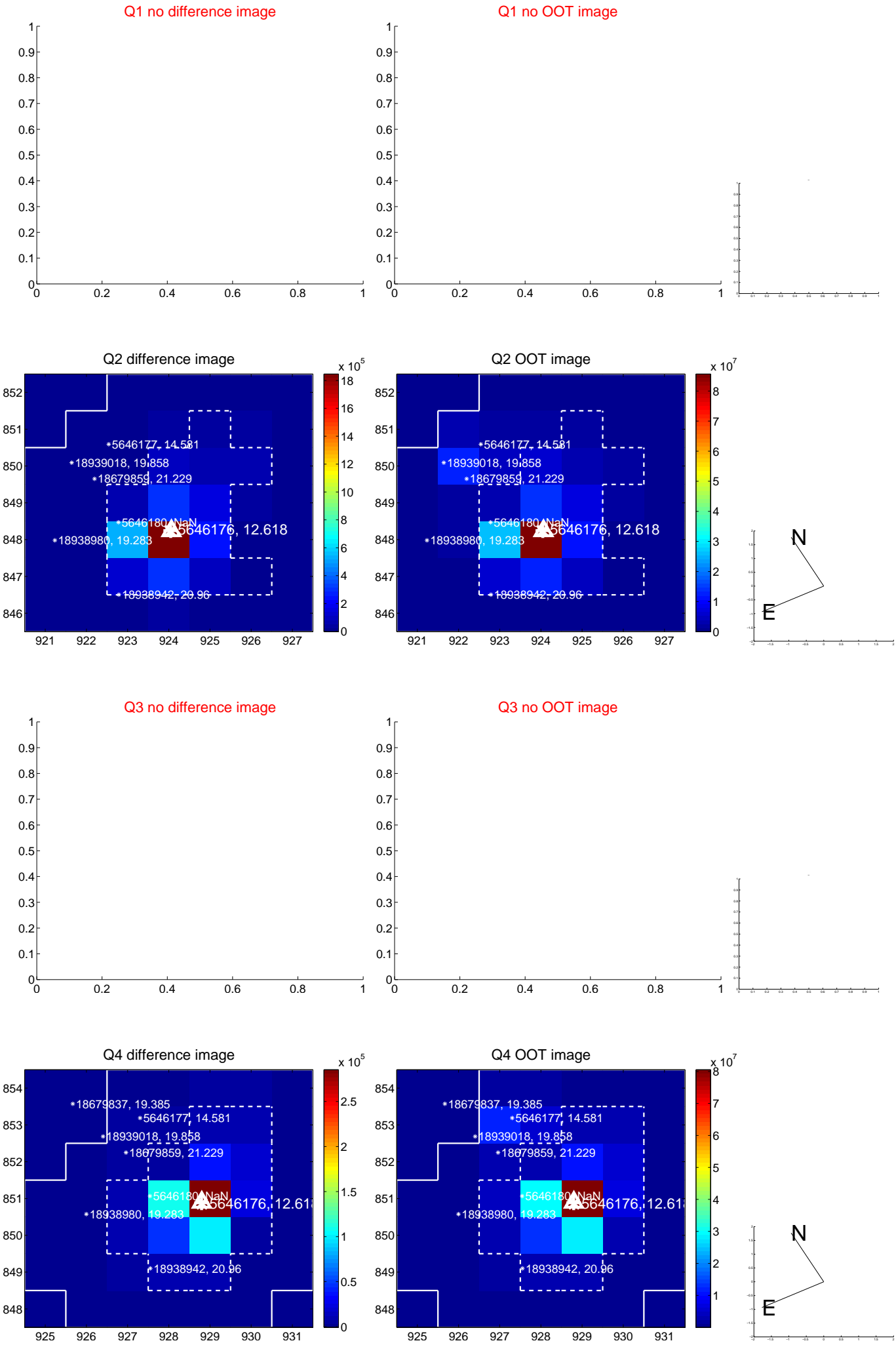


offset from photometric centroids

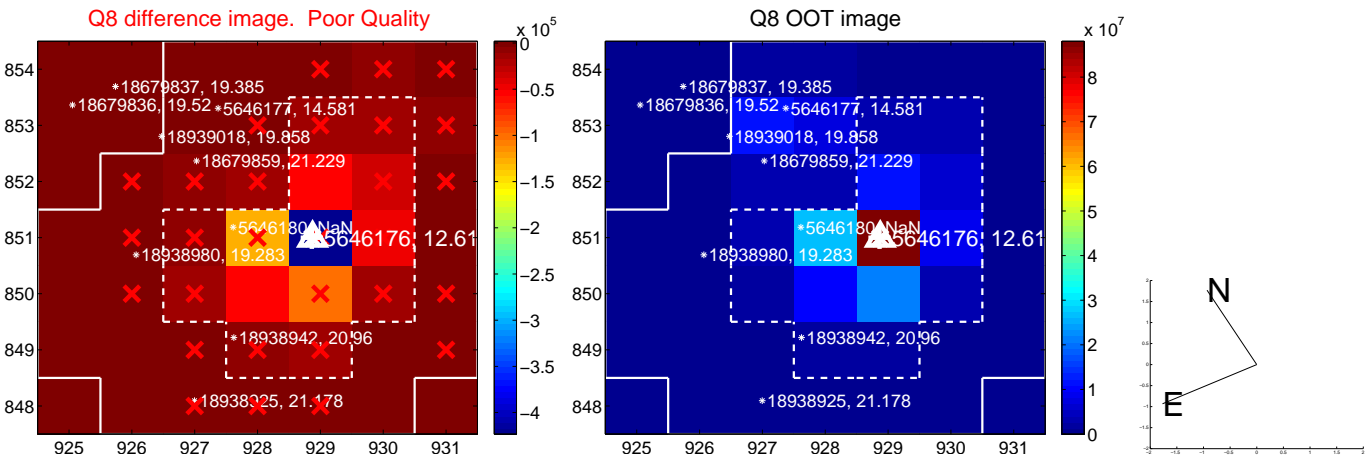
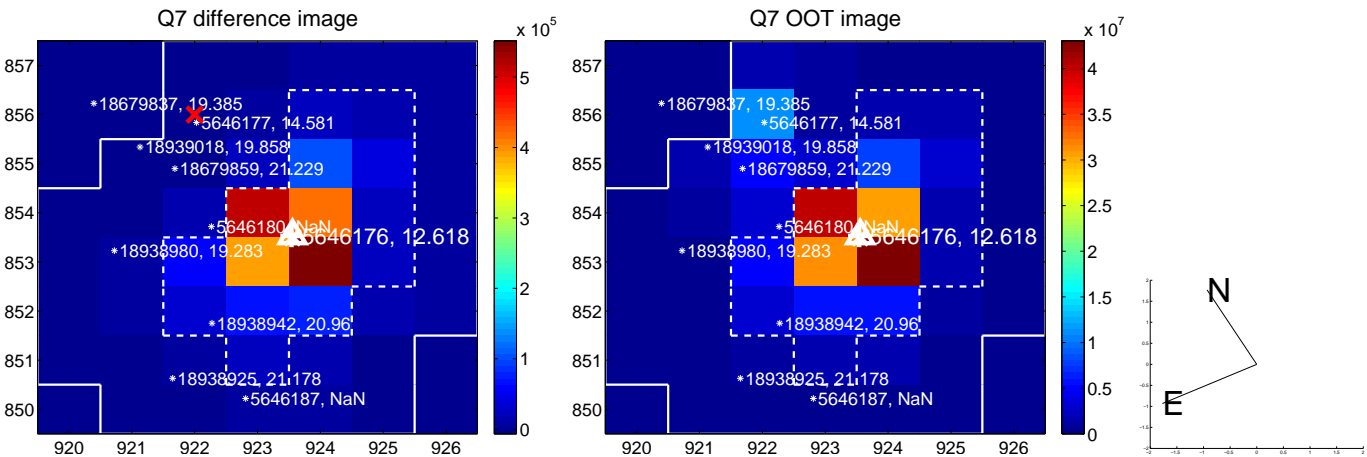
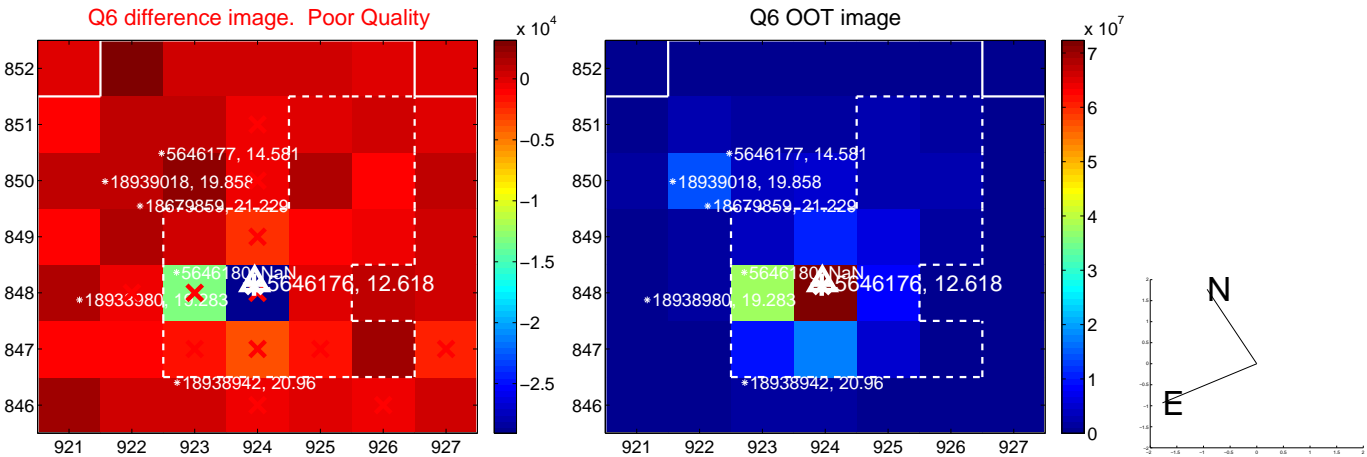
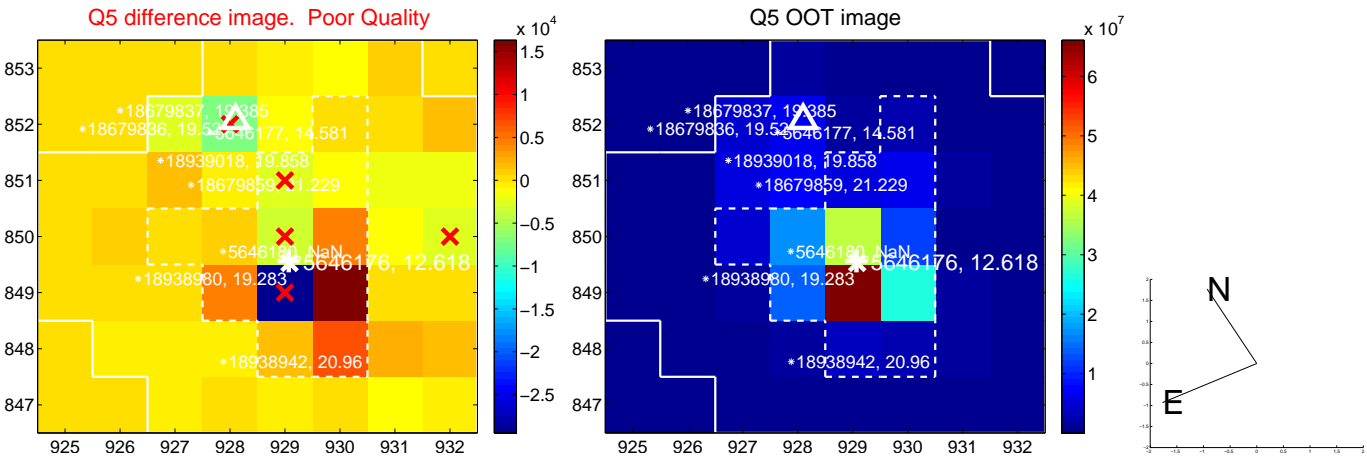


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

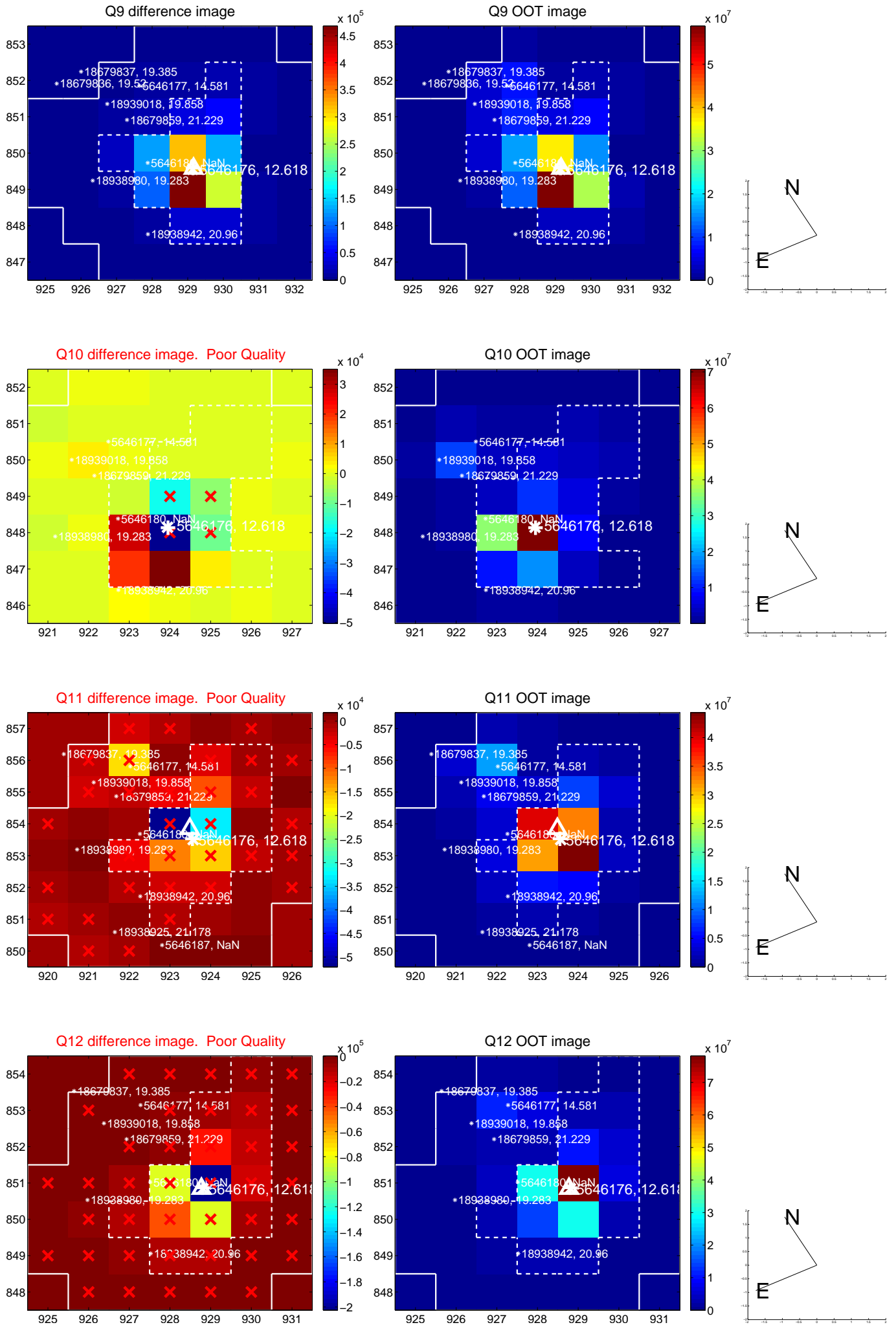
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

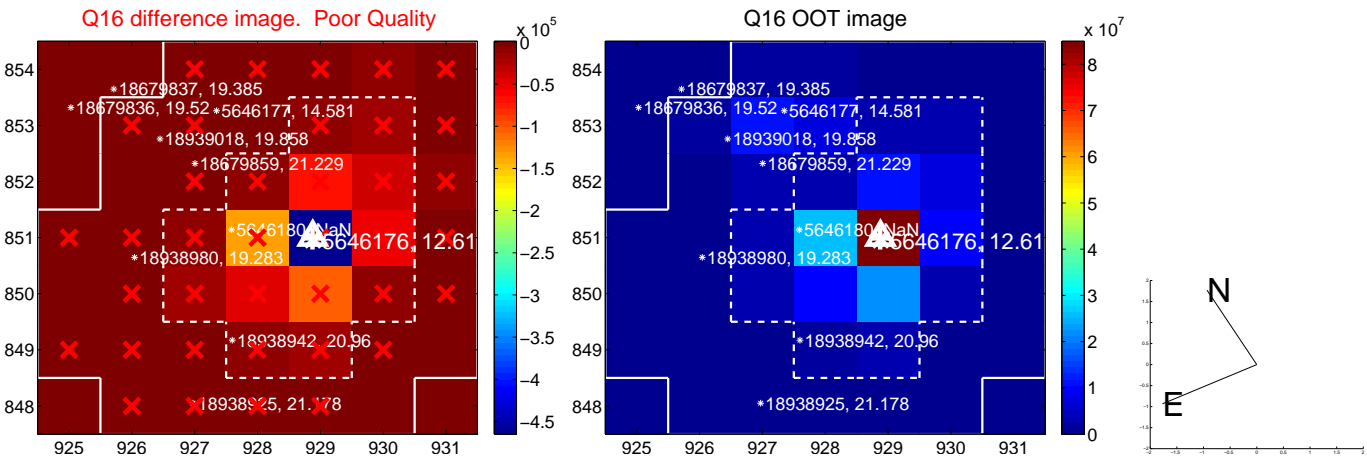
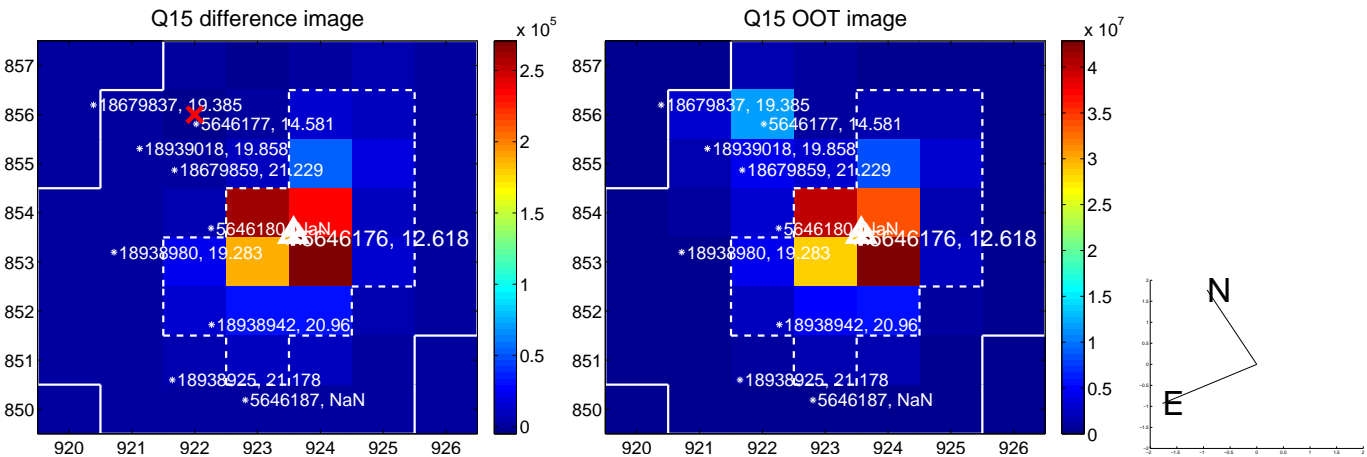
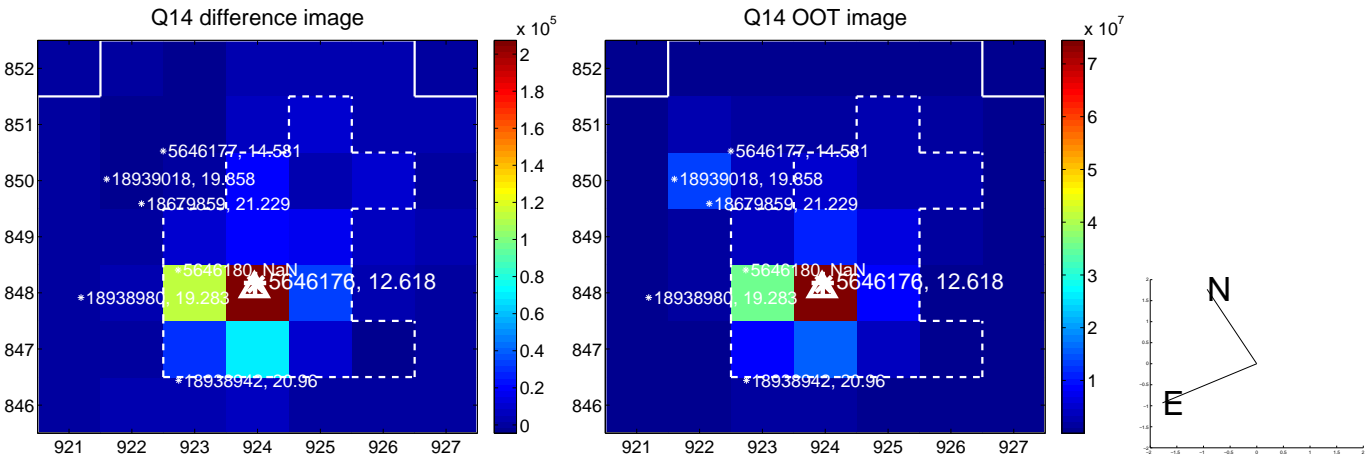
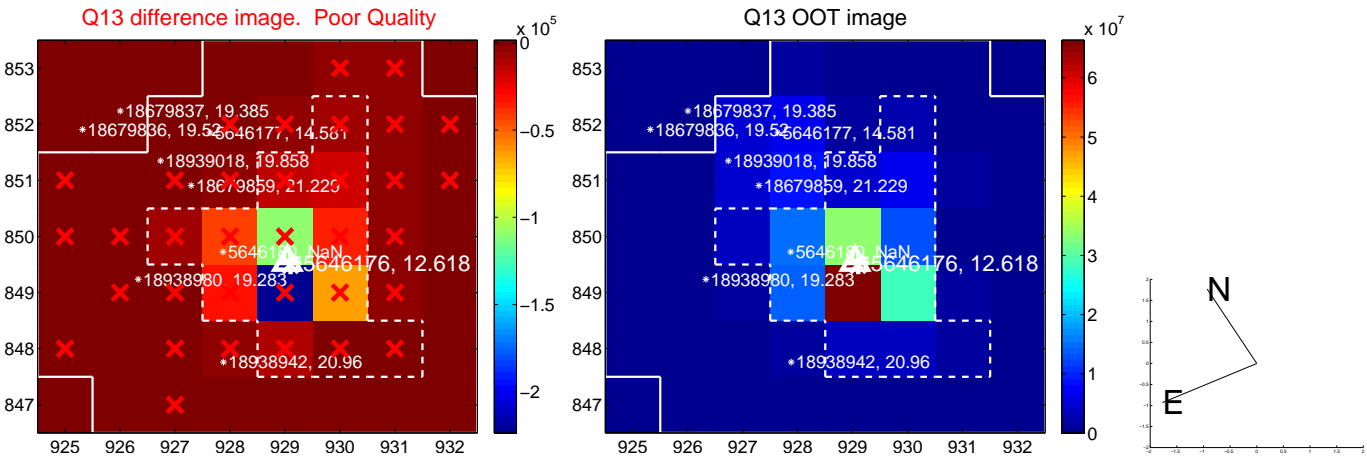


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

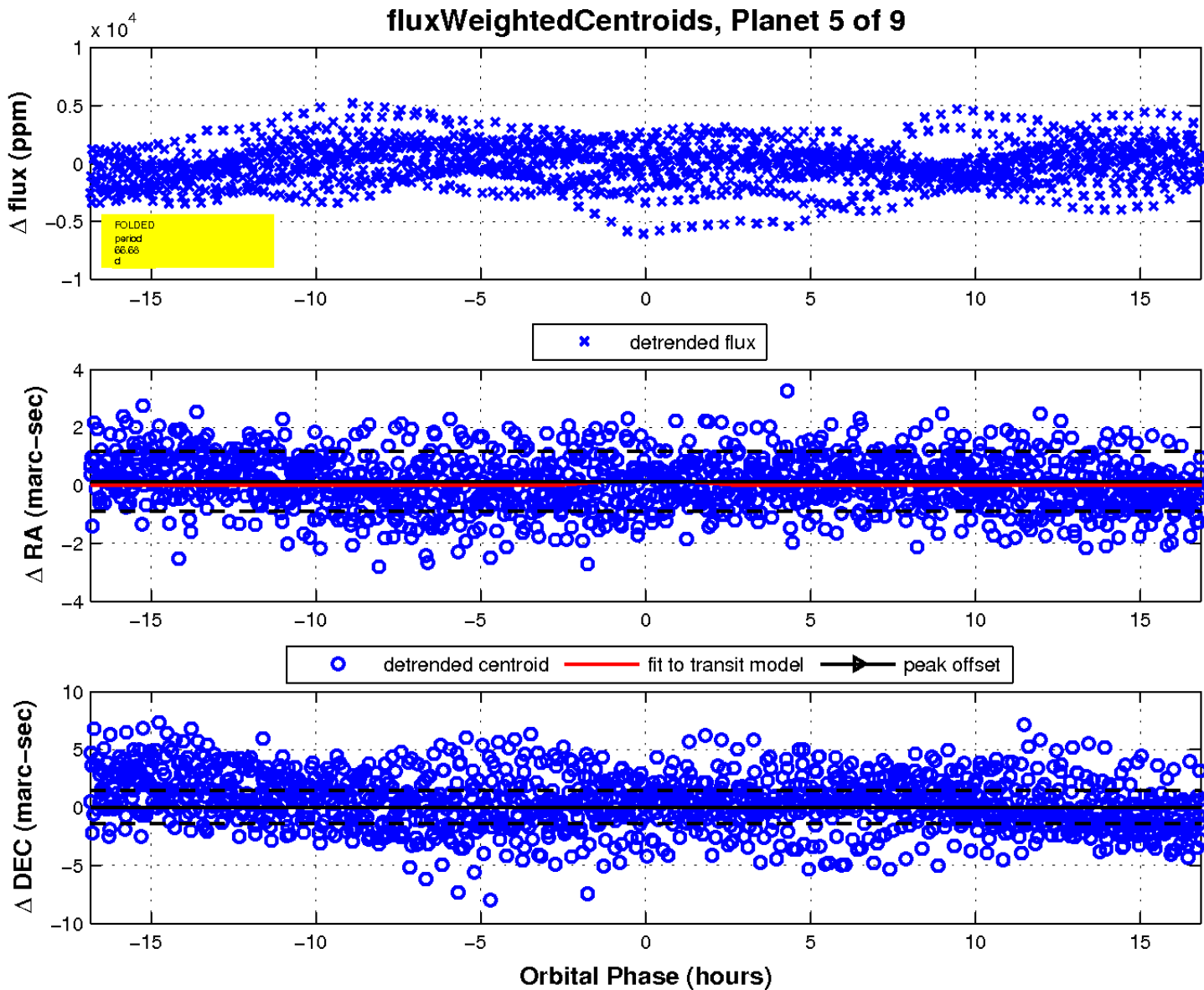
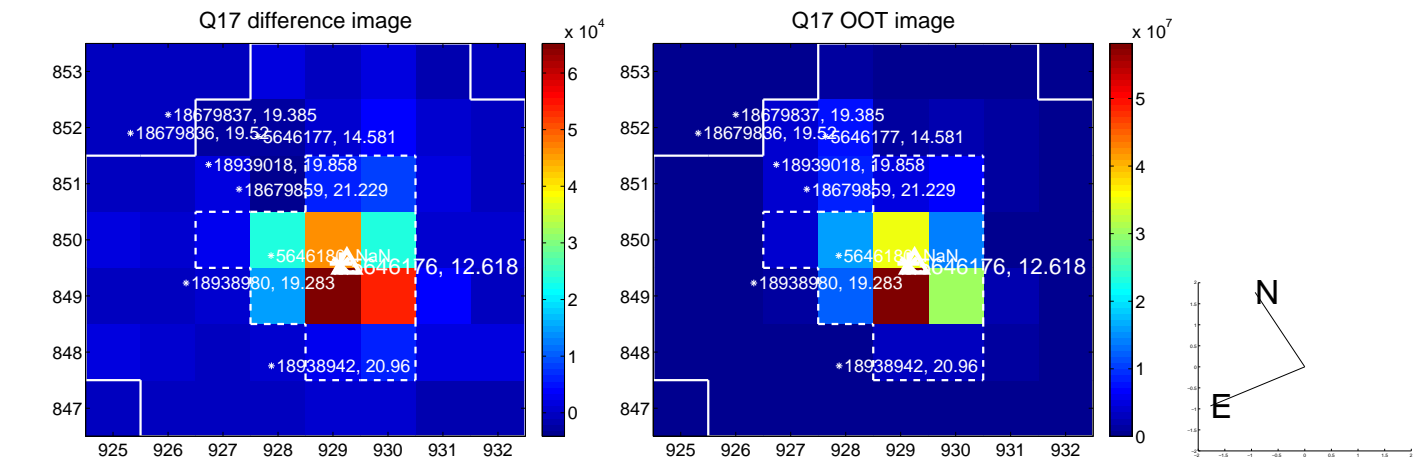




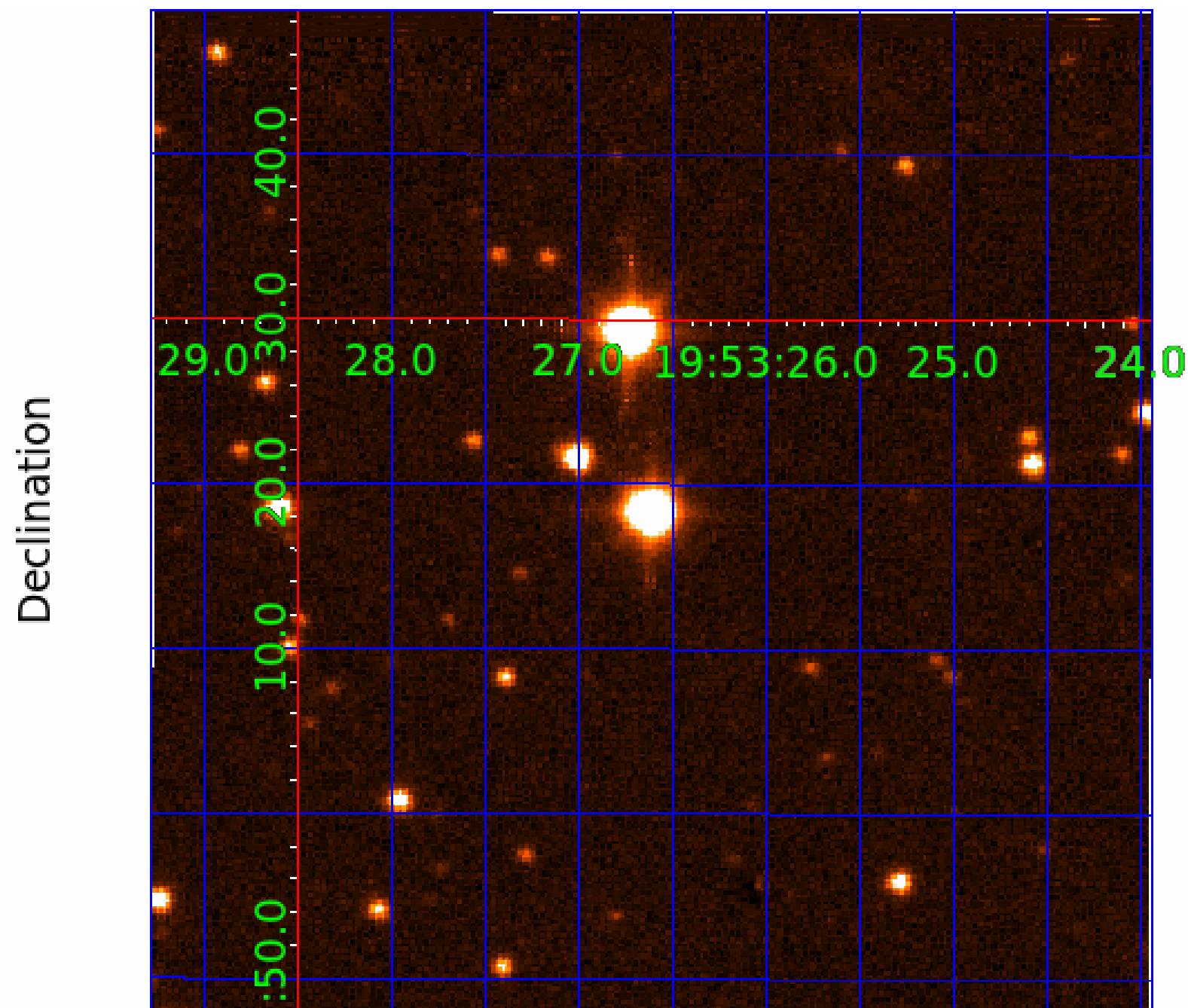
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



UKIRT Image



# KIC 005646176

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
005646176-01	OBS	No	0.998360	131.711809	47.6	6.354	10.0	6.1	1.29	6305	0.96	5853.71
005646176-02	OBS	No	105.455306	189.614921	3300.8	5.660	14.2	9.1	1.29	6305	13.60	11.72
005646176-03	OBS	No	204.697781	203.133079	1748.4	11.405	12.3	7.0	1.29	6305	6.22	4.84
005646176-04	OBS	No	75.961627	171.426607	2640.1	7.047	11.2	8.9	1.29	6305	12.02	18.16
005646176-05	OBS	No	66.679595	189.232216	1425.1	5.625	9.4	6.6	1.29	6305	6.08	21.60
005646176-08	OBS	No	29.414987	139.159990	1189.4	9.687	8.1	8.2	1.29	6305	7.52	64.33
005646176-09	OBS	No	48.339322	177.775979	171.6	6.000	8.2	-1.0	1.29	6305	1.70	33.17

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
005646176-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT
005646176-02	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—HALO_GHOST
005646176-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS
005646176-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
005646176-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
005646176-08	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
005646176-09	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_ALT—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_NOFITS

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

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

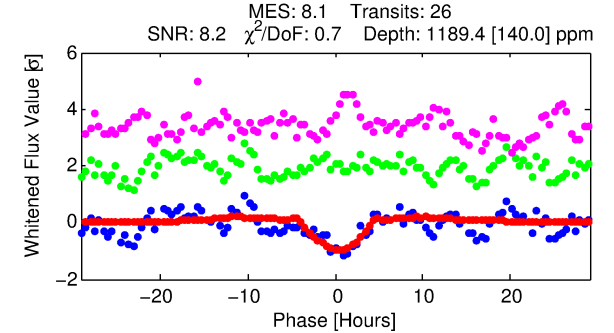
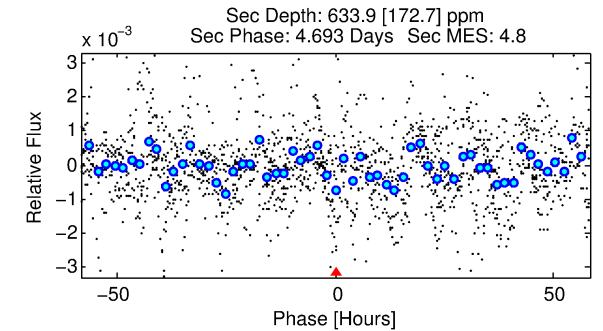
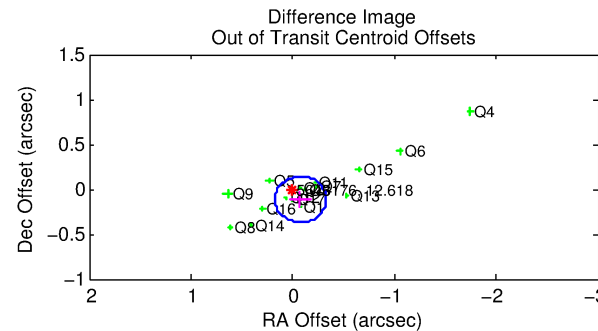
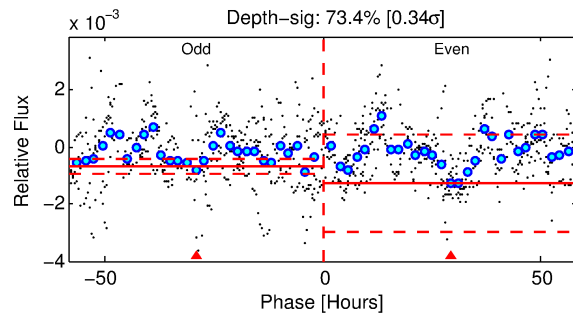
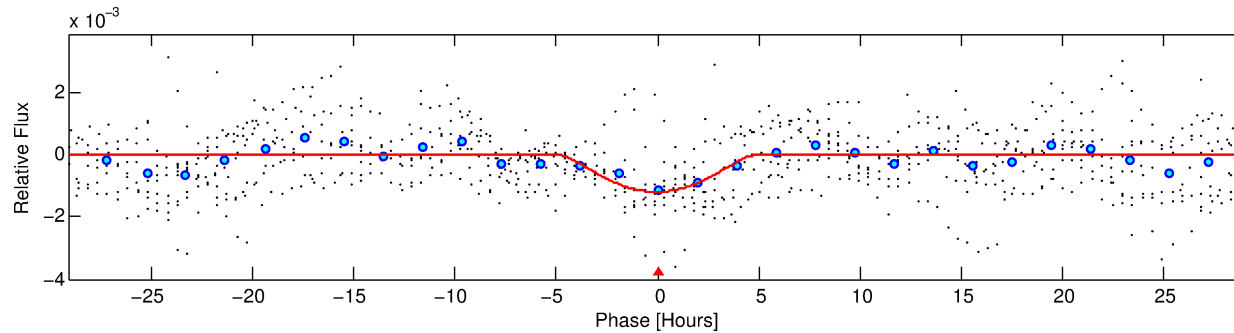
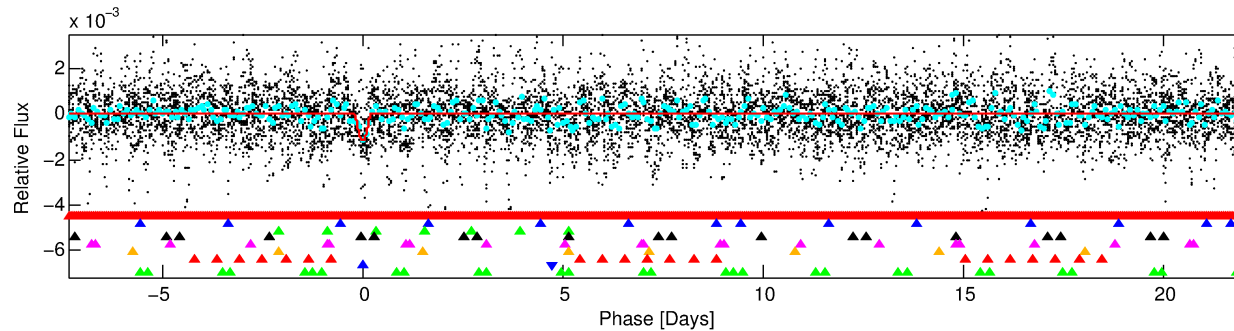
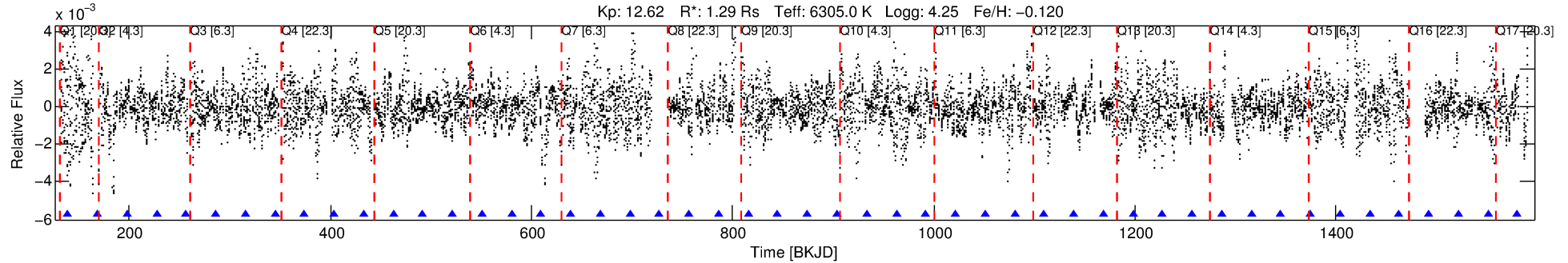
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 005646176-08

No Significant Match Found

# DV One-Page Summary

KIC: 5646176 Candidate: 8 of 9 Period: 29.415 d



## DV Fit Results:

Period = 29.41499 [0.00083] d  
Epoch = 139.1600 [0.0214] BKJD  
Rp/R\* = 0.0532 [0.0828]  
a/R\* = 8.41 [3.45]  
b = 0.99 [0.13]  
Seff = 64.33 [24.45]  
Teq = 722 [69] K  
Rp = 7.52 [11.96] Re  
a = 0.1921 [0.0502] AU  
Ag = 227.48 [715.12] [0.32 $\sigma$ ]  
Teff = 4336 [3388] K [1.07 $\sigma$ ]

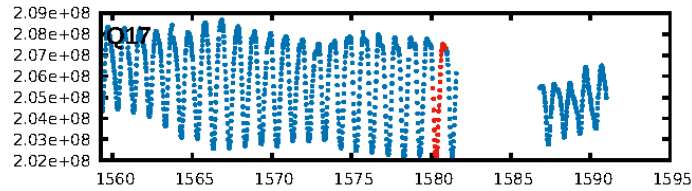
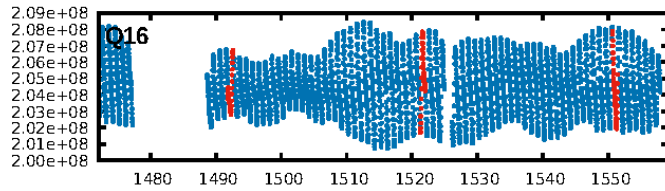
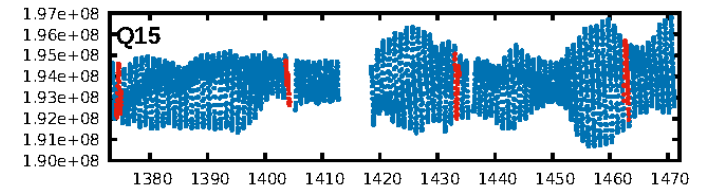
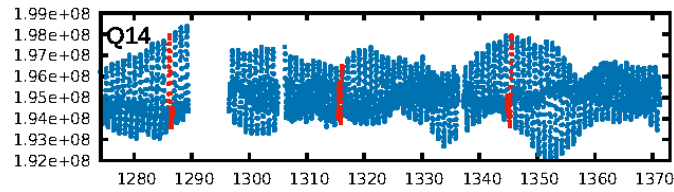
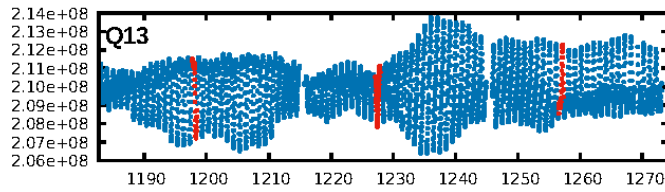
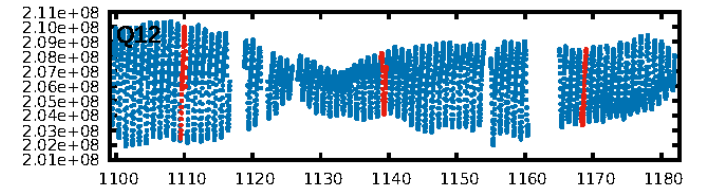
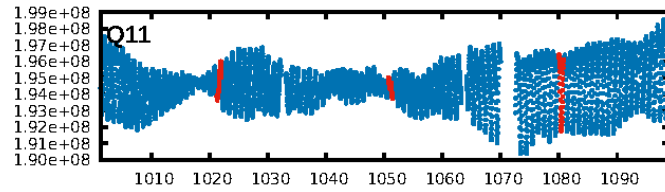
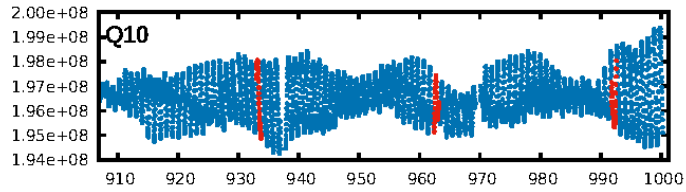
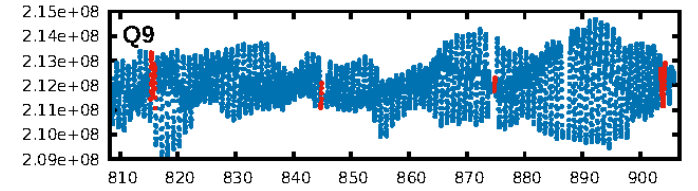
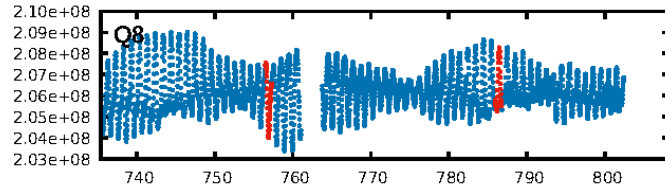
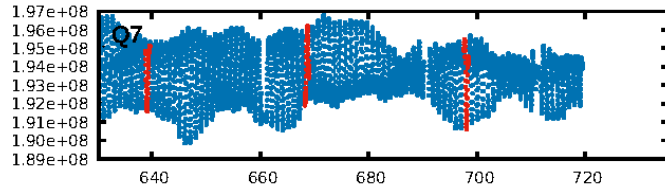
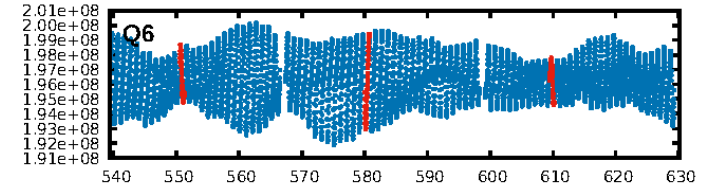
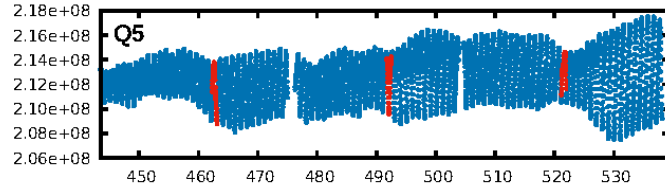
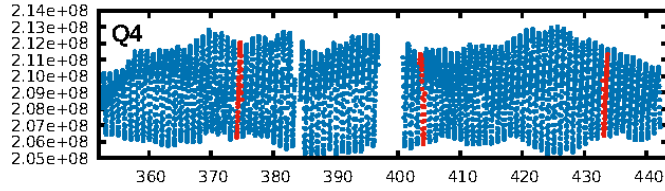
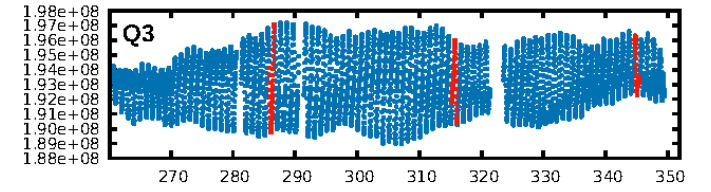
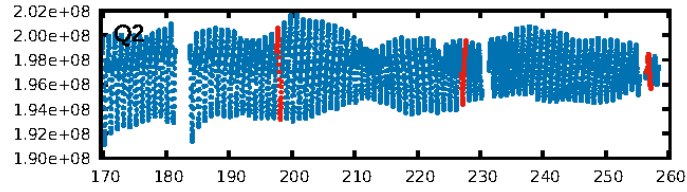
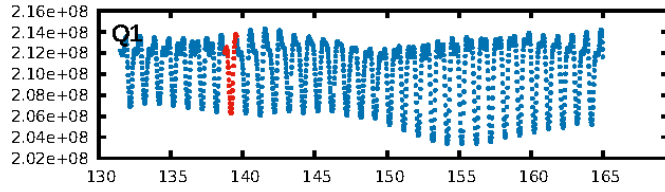
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [58.87 $\sigma$ ]  
LongPeriod-sig: 100.0% [39.86 $\sigma$ ]  
ModelChiSquare2-sig: 15.8%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [25/25]  
GhostDiagnostic-chr: 1.196  
Centroid-sig: 16.3%  
Centroid-so: 0.715 arcsec [1.99 $\sigma$ ]  
OotOffset-rm: 0.138 arcsec [1.62 $\sigma$ ]  
OotOffset-st: 3/4/4/5 [16]  
KicOffset-rm: 0.045 arcsec [0.26 $\sigma$ ]  
KicOffset-st: 3/4/4/5 [16]  
DiffImageQuality-fgm: 0.88 [14/16]  
DiffImageOverlap-fno: 0.00 [0/17]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 16:34:28 Z

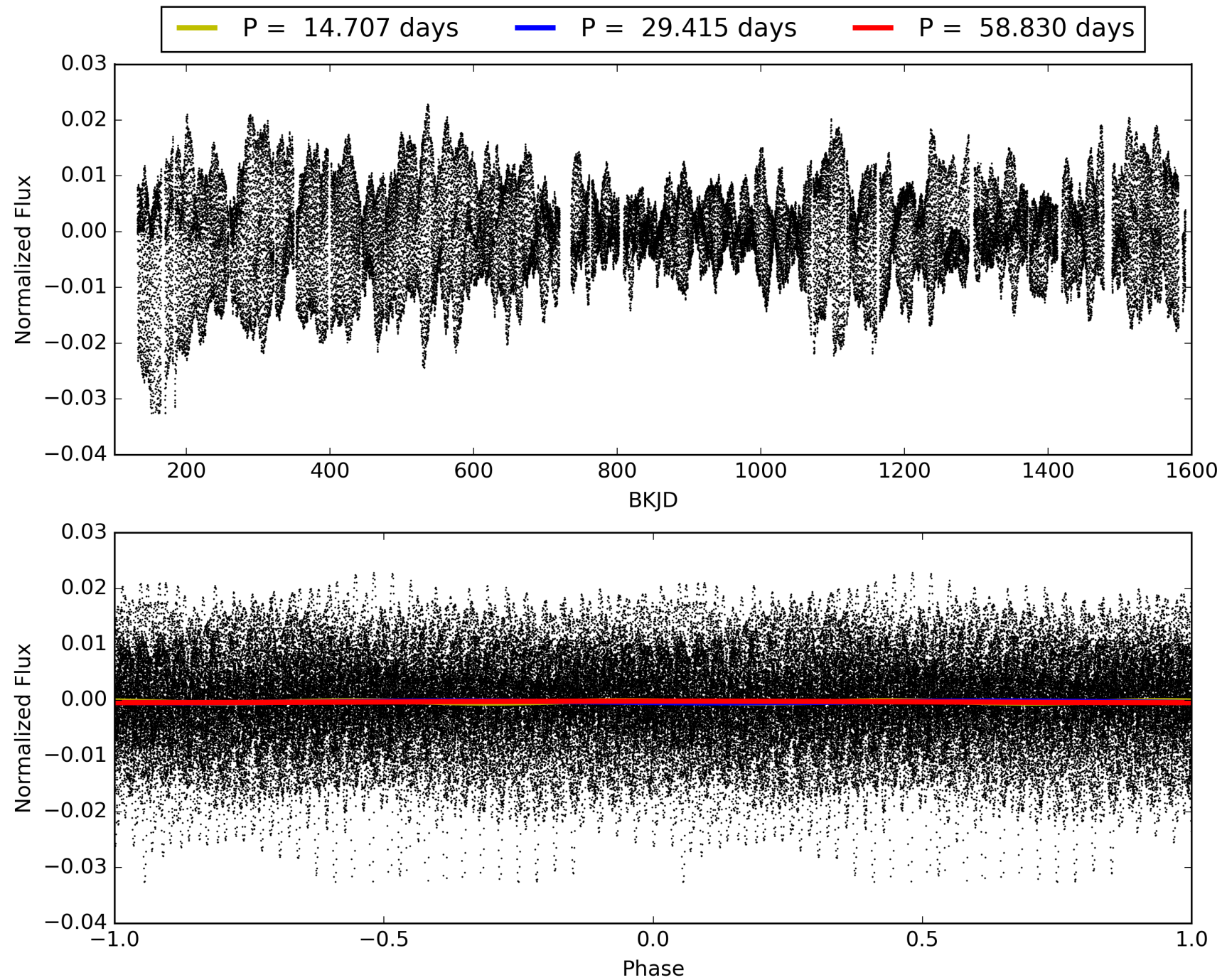
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 005646176-08, PDC Light Curves





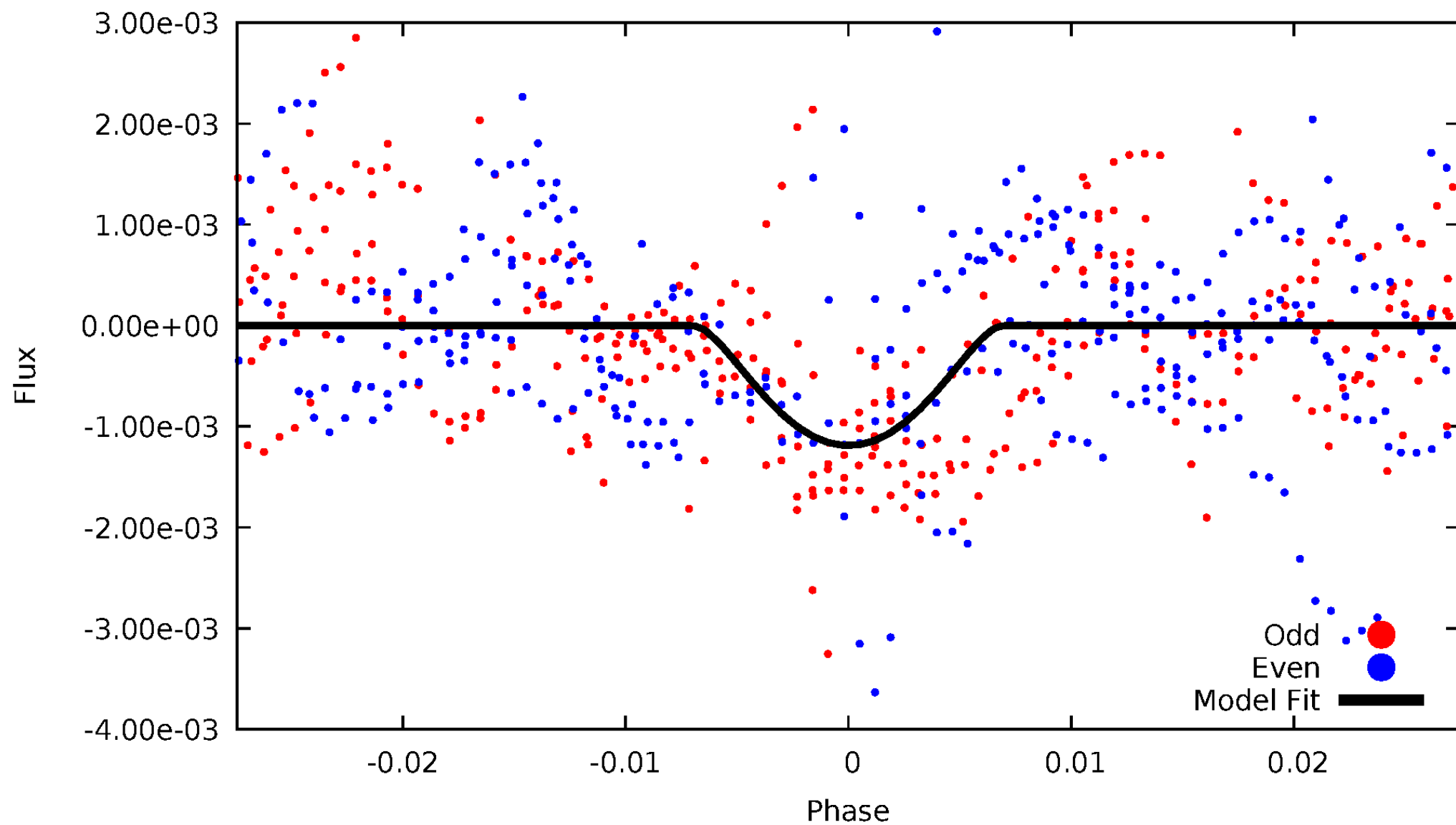
TCE 005646176-08





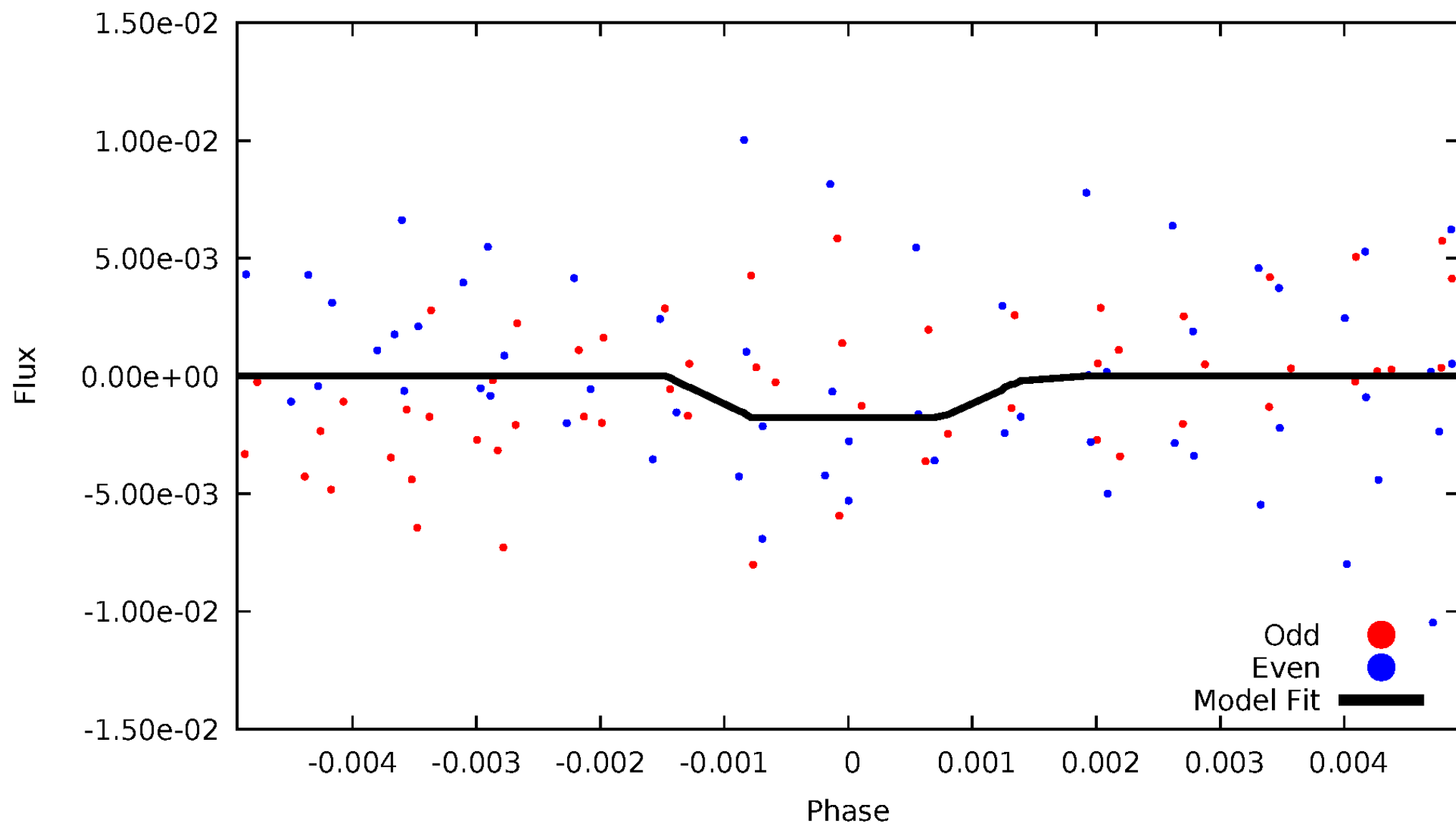
# DV Odd/Even

TCE 005646176-08



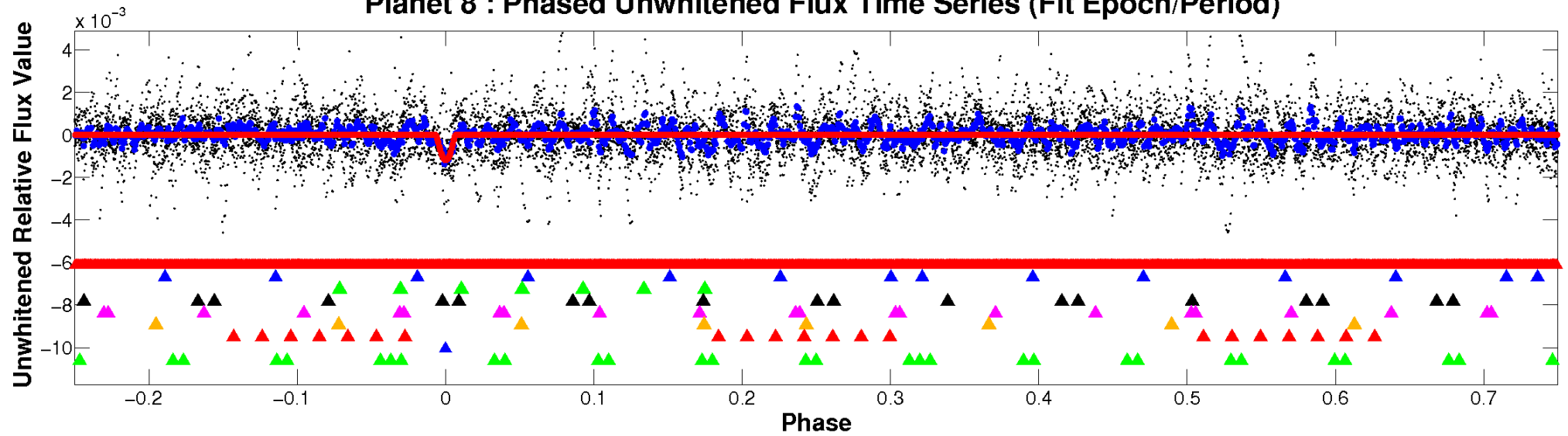
# ALT Odd/Even

TCE 005646176-08

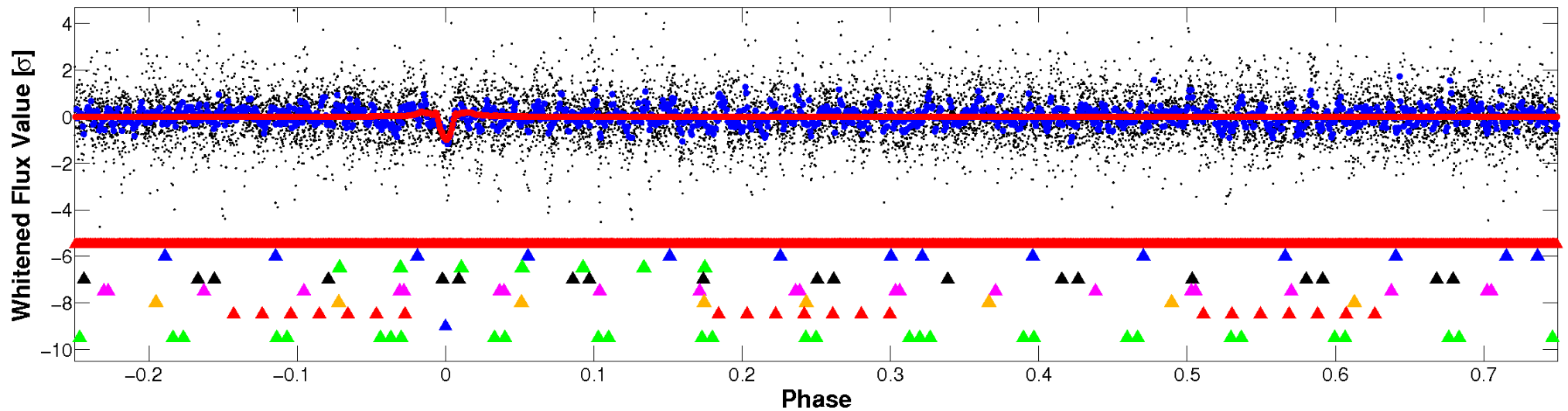


# Non-Whitened Vs. Whitened Light Curve

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

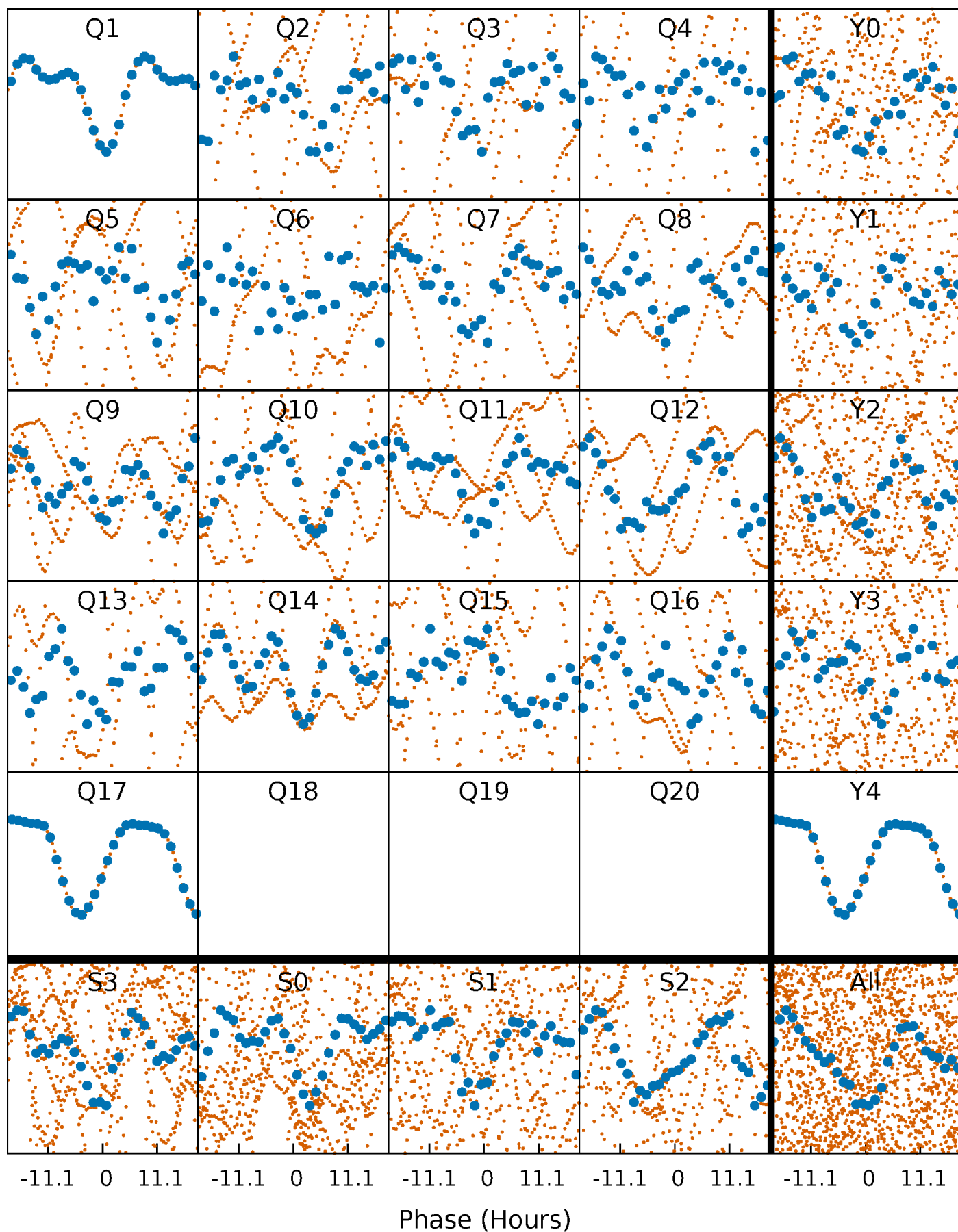


## Planet 8 : Phased Whitened Flux Time Series (Fit Epoch/Period)



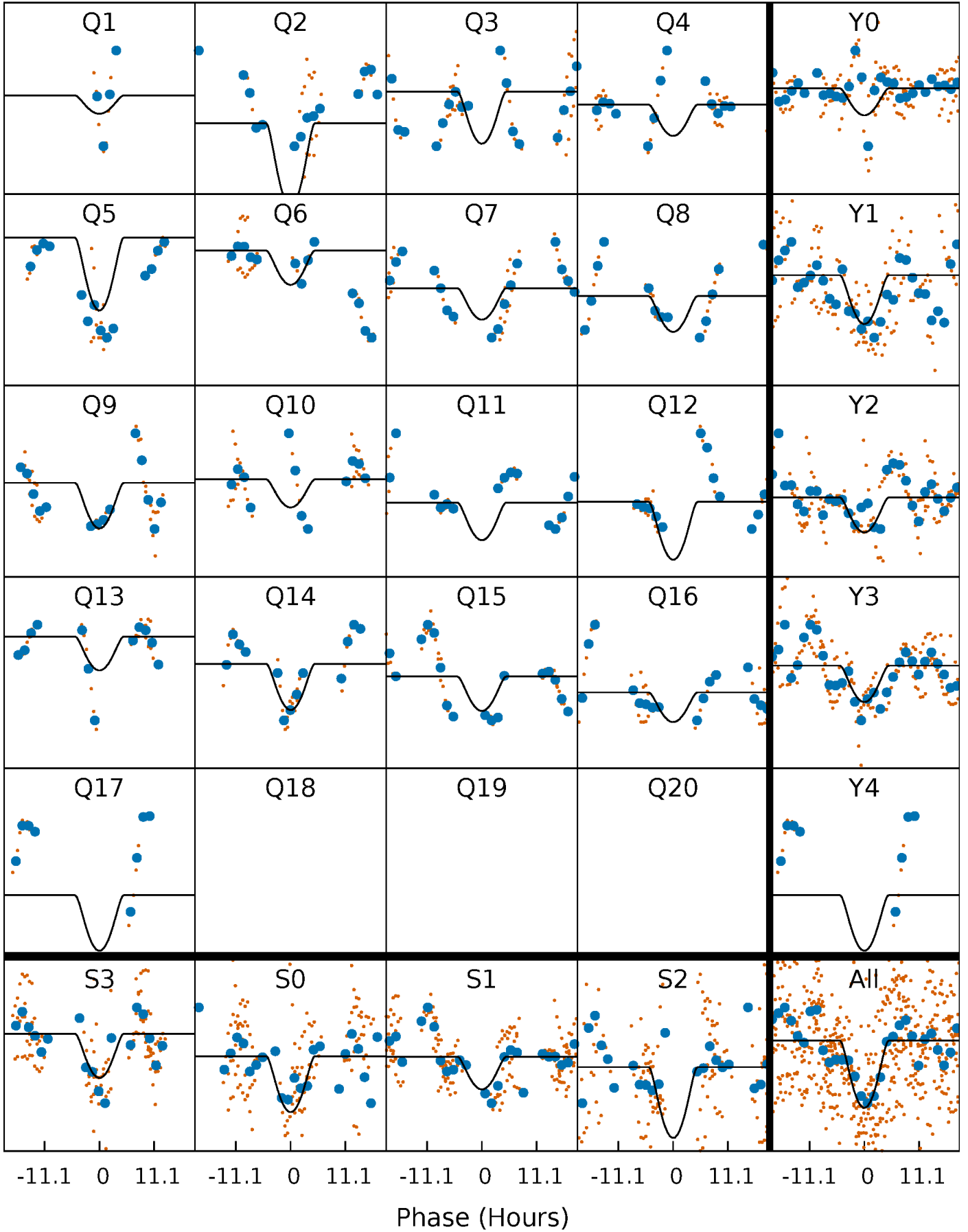
# PDC Quarter-Phased Transit Curves

TCE 005646176-08 P= 29.414987 Days  $T_0=139.159990$  (BKJD)



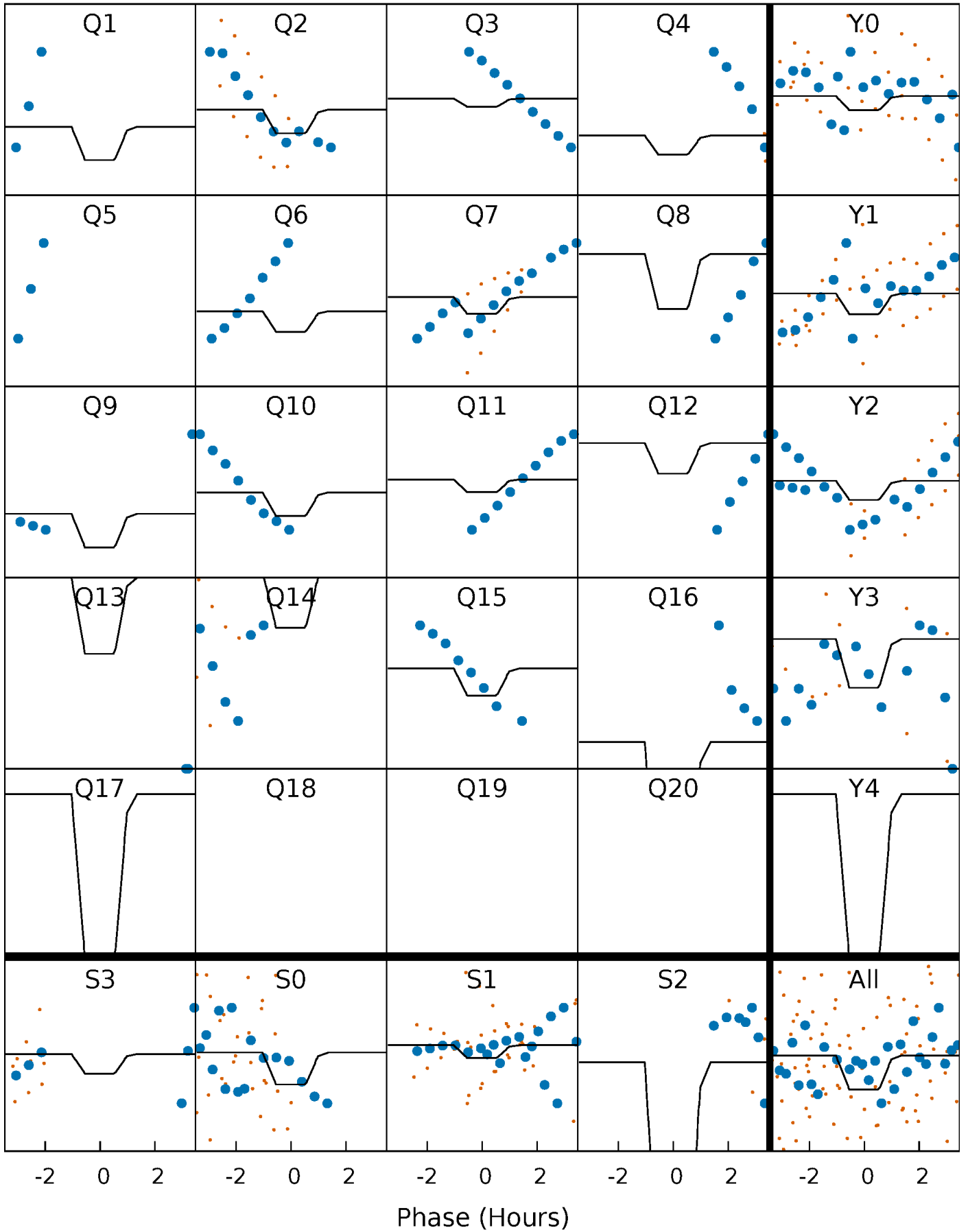
# DV Quarter-Phased Transit Curves

TCE 005646176-08   P= 29.414987 Days    $T_0=139.159990$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

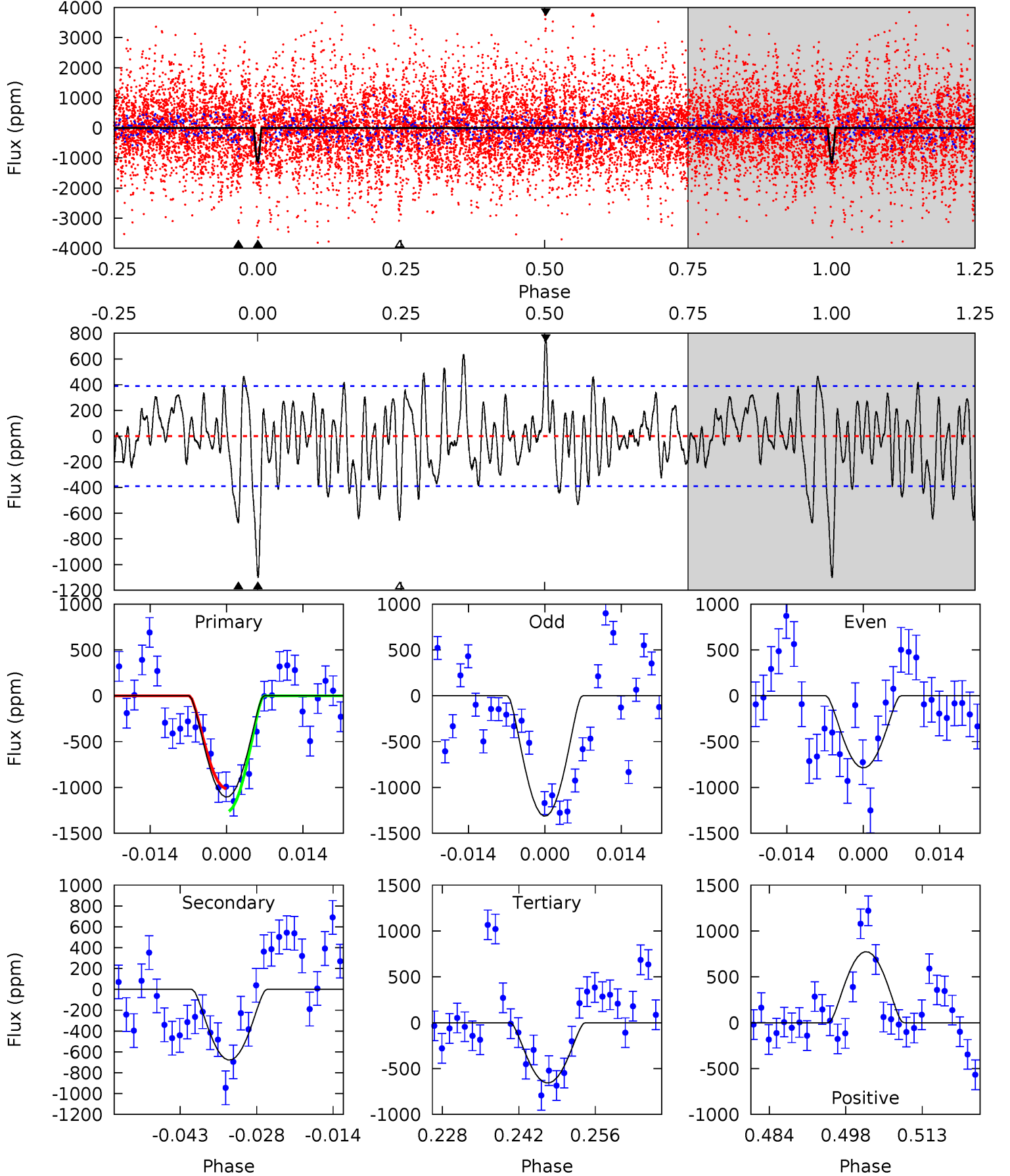
TCE 005646176-08 P= 29.413172 Days  $T_0=139.368490$  (BKJD)



# DV Model-Shift Uniqueness Test

005646176-08, P = 29.414987 Days, E = 109.745003 Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
14.1	8.64	8.37	9.86	4.96	2.45	2.81	5.70	4.21	0.27	-1.22	3.26	2.21	0.41	1.57

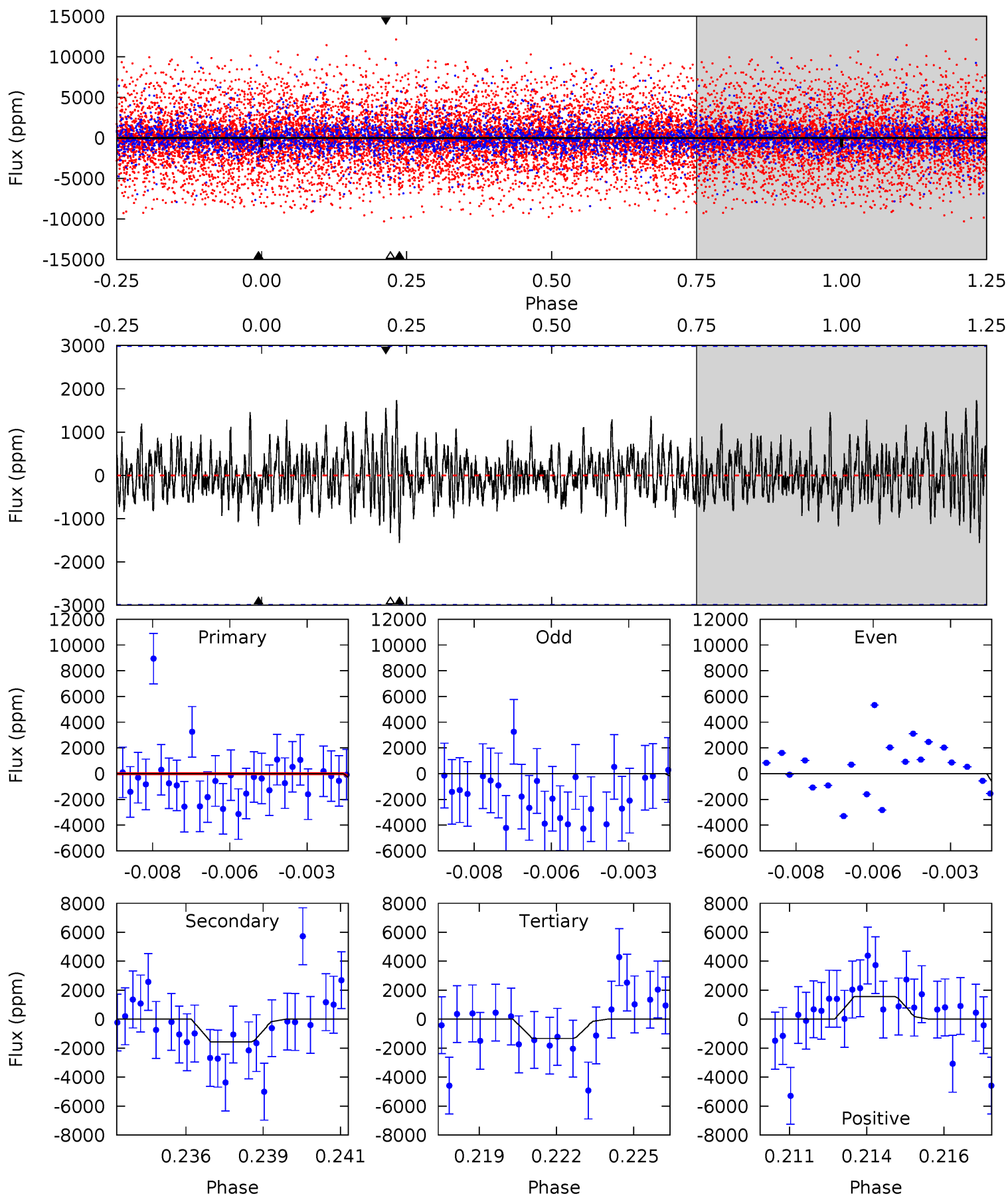




# Alt Model-Shift Uniqueness Test

005646176-08, P = 29.413172 Days, E = 109.955318 Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
1.85	2.75	2.35	2.74	5.27	2.99	0.78	-0.50	-0.89	0.40	0.01	1.37	0.50	0.53	0.49



### Stellar Parameters For KIC 005646176

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6305^{+151}_{-189}$	$4.252^{+0.153}_{-0.187}$	$-0.120^{+0.250}_{-0.300}$	$1.295^{+0.424}_{-0.261}$	$1.091^{+0.197}_{-0.121}$	$0.707^{+0.542}_{-0.354}$
	+2%/-3%	+4%/-4%	+208%/-250%	+33%/-20%	+18%/-11%	+77%/-50%
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 005646176-08 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-678 \pm 79$	$11.35^{+10.96}_{-7.16}$	$1014^{+75}_{-71}$	$3927^{+2047}_{-741}$	$108^{+653}_{-80}$
Alt.	$-1559 \pm 568$	$11.11^{+9.82}_{-7.62}$	$1009^{+75}_{-63}$	$4582^{+3597}_{-921}$	$238^{+2262}_{-173}$

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

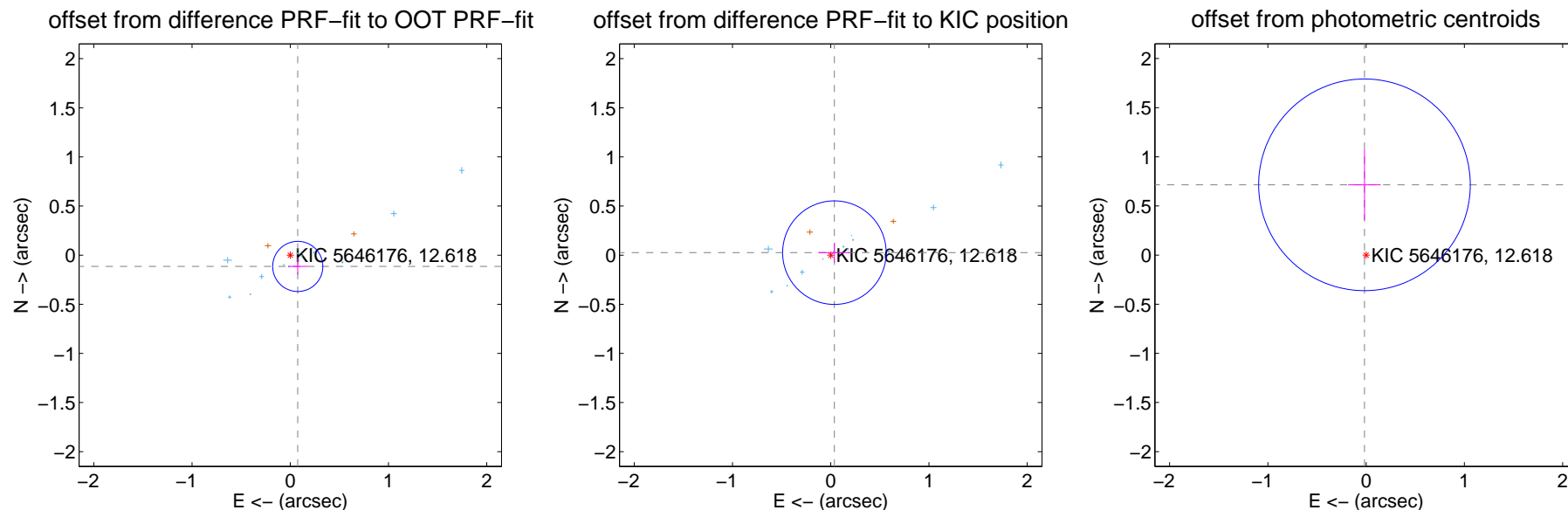
## DV Centroid Data

Supplemental centroid analysis for 005646176-08. Kepler magnitude: 12.62. Transit SNR 8.21

There are 14 quarters with good PRF difference image offsets

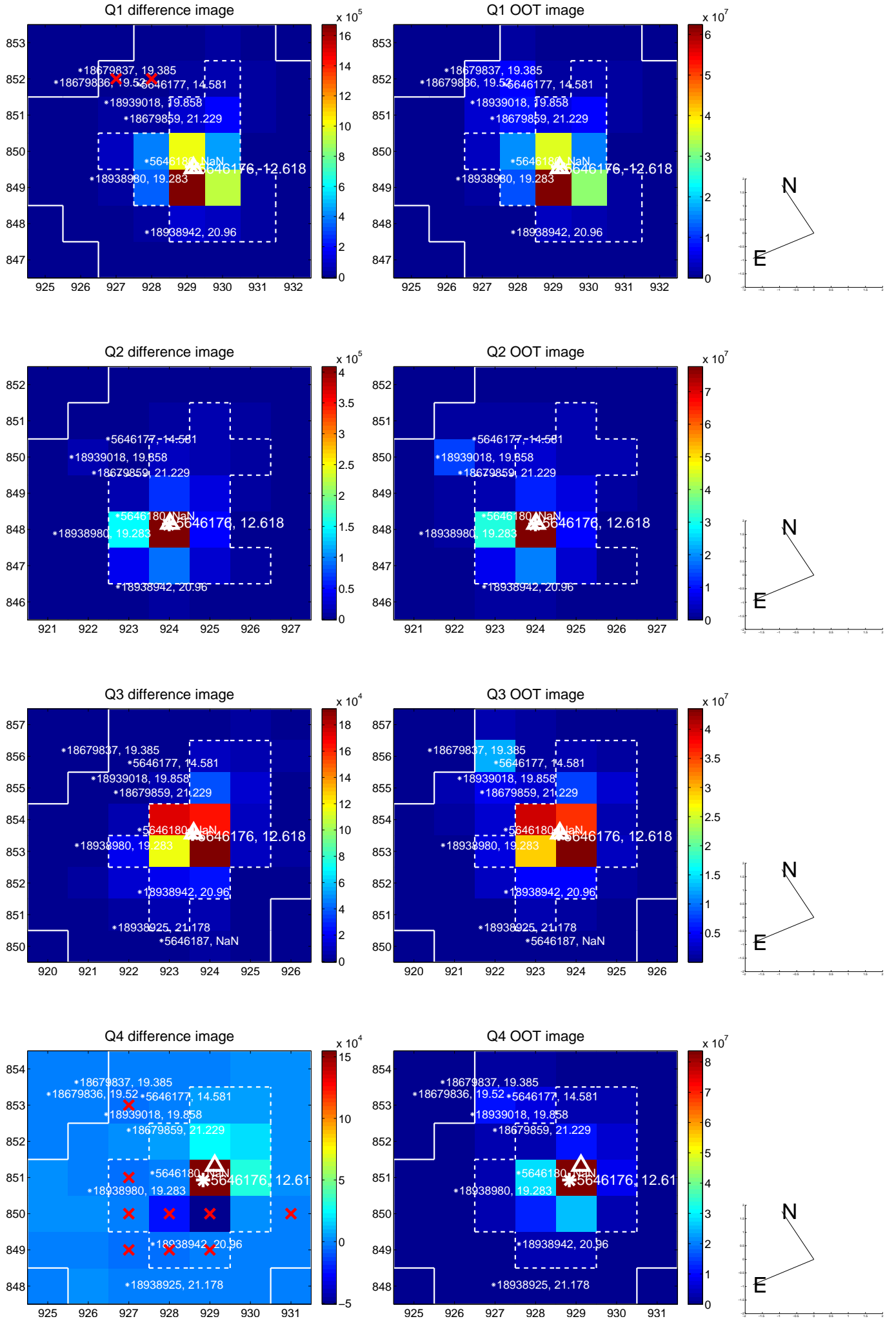
The direct PRF centroid is offset from the target star catalog position by about 0.16 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.138 \pm 0.085$	1.62	$-0.076 \pm 0.096$	$-0.115 \pm 0.080$
PRF-fit source offset from KIC position	$0.045 \pm 0.176$	0.26	$-0.037 \pm 0.165$	$0.026 \pm 0.100$
photometric centroid source offset	$0.72 \pm 0.36$	1.99	$0.02 \pm 0.17$	$0.72 \pm 0.36$

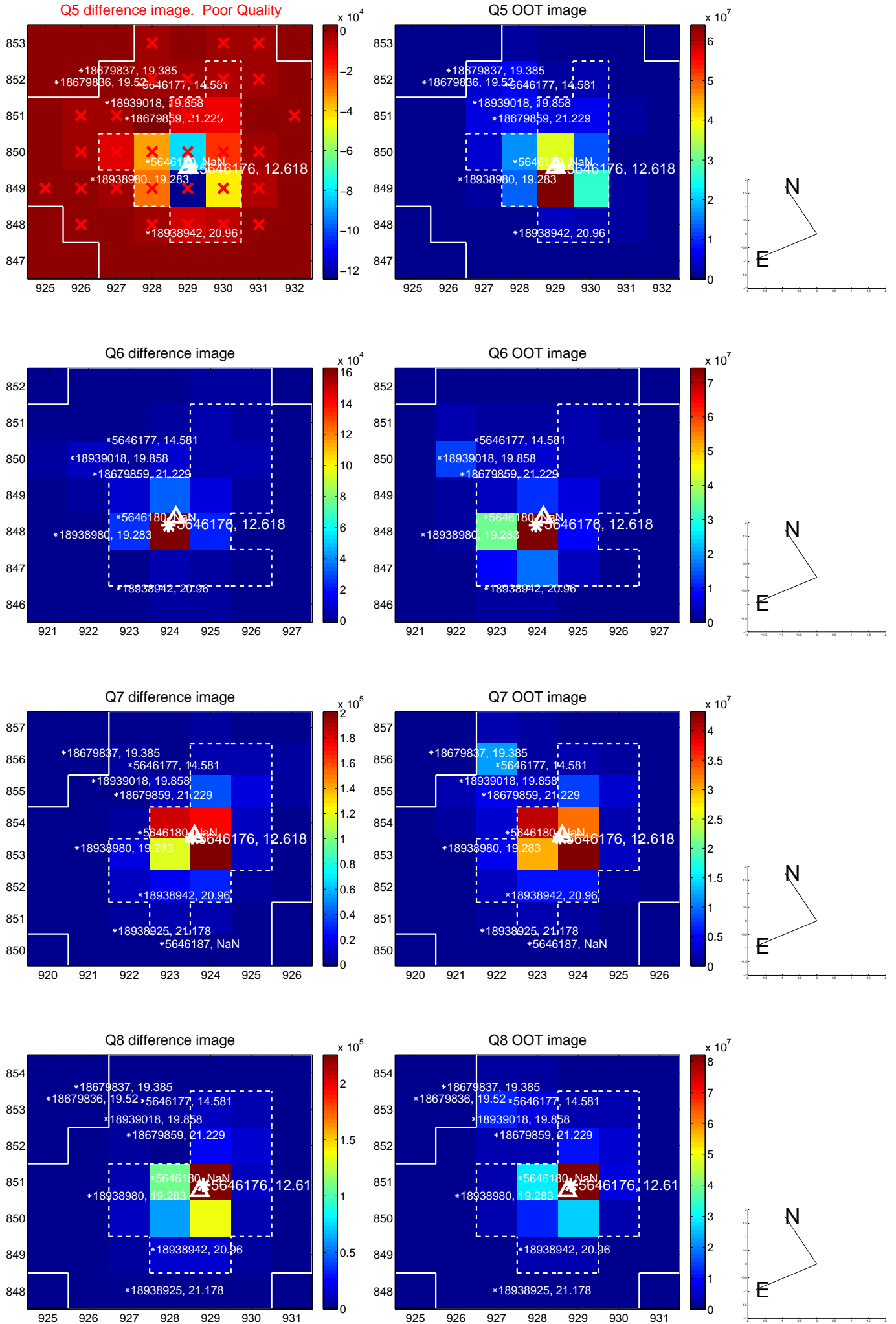


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

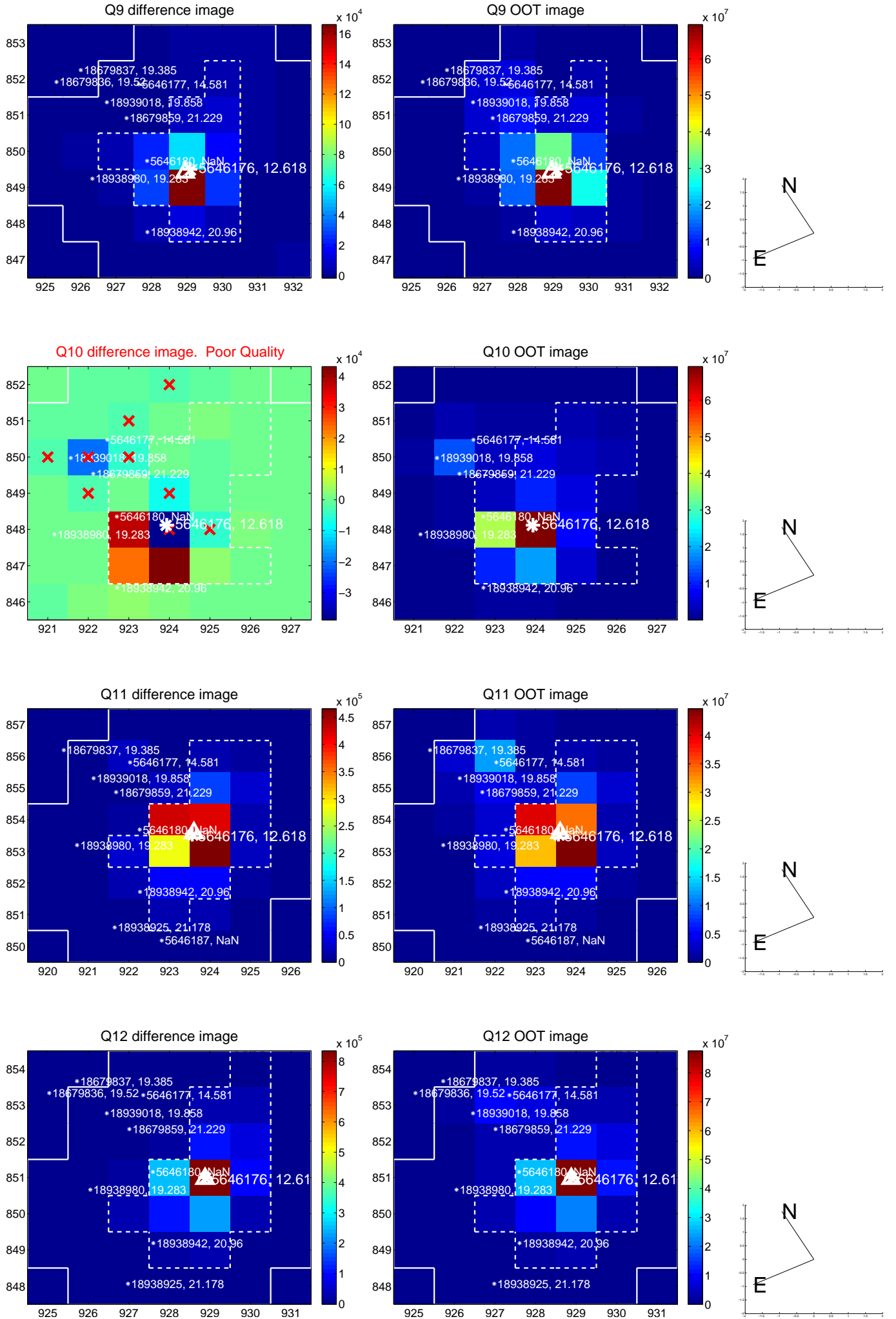
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



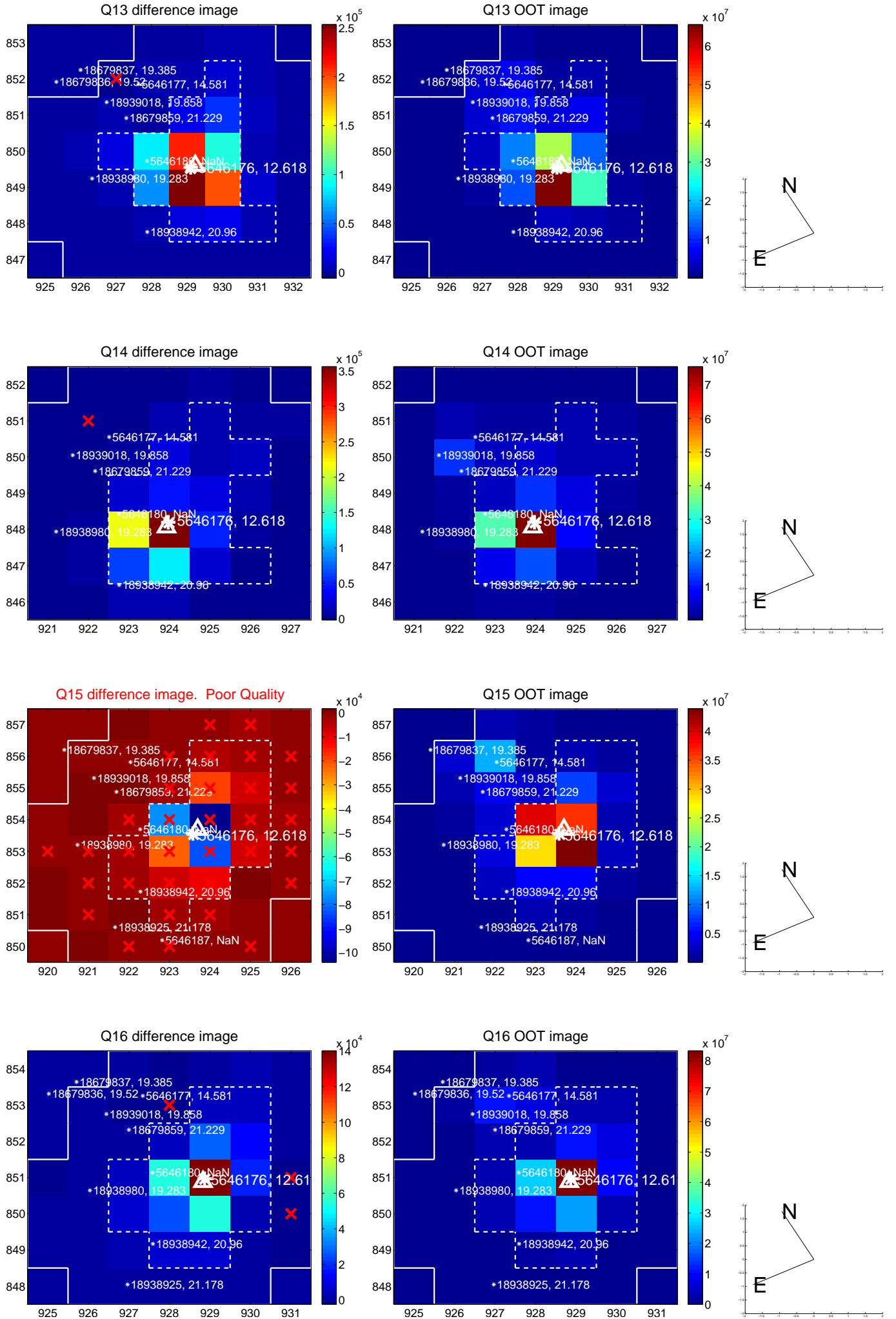
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

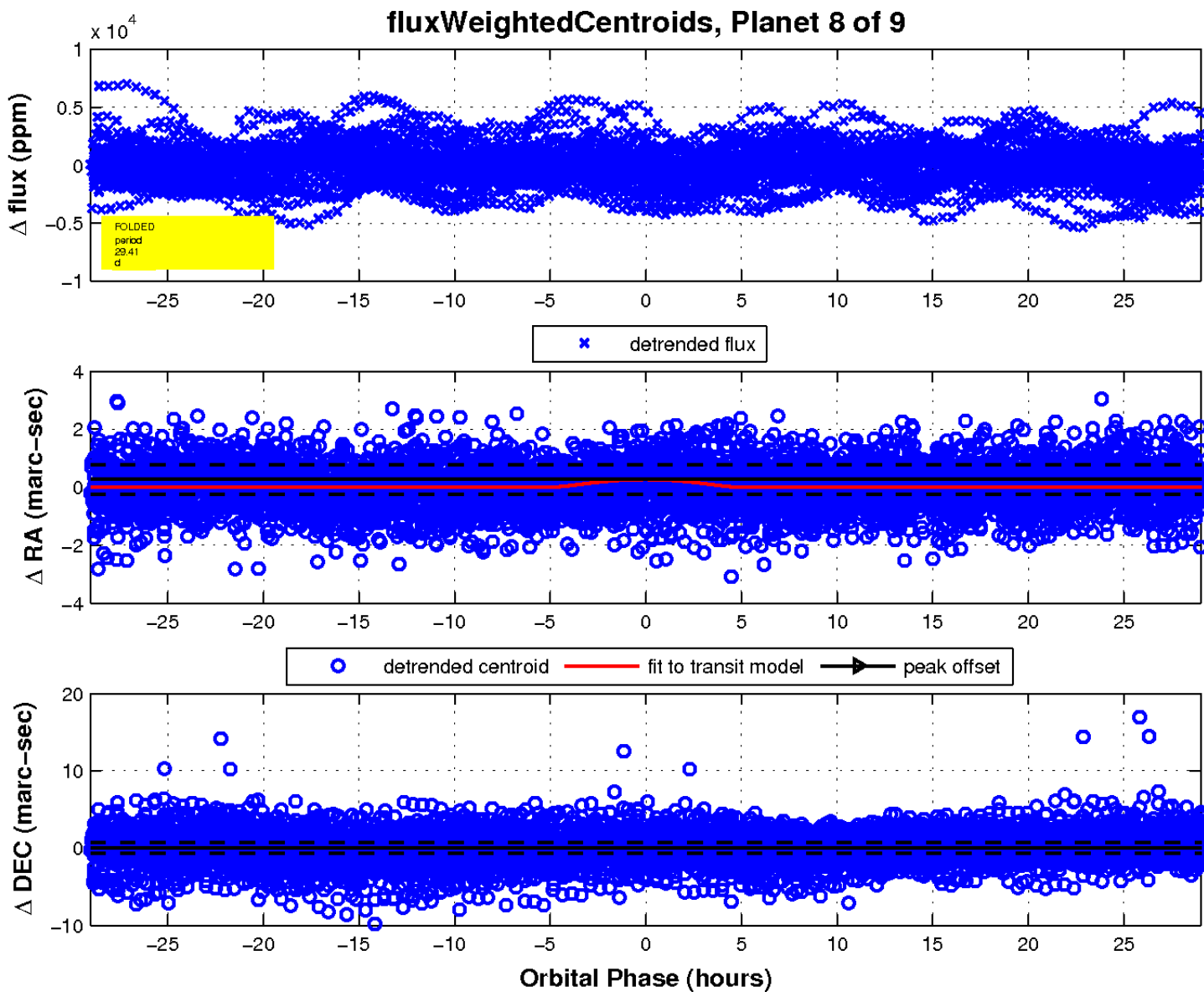
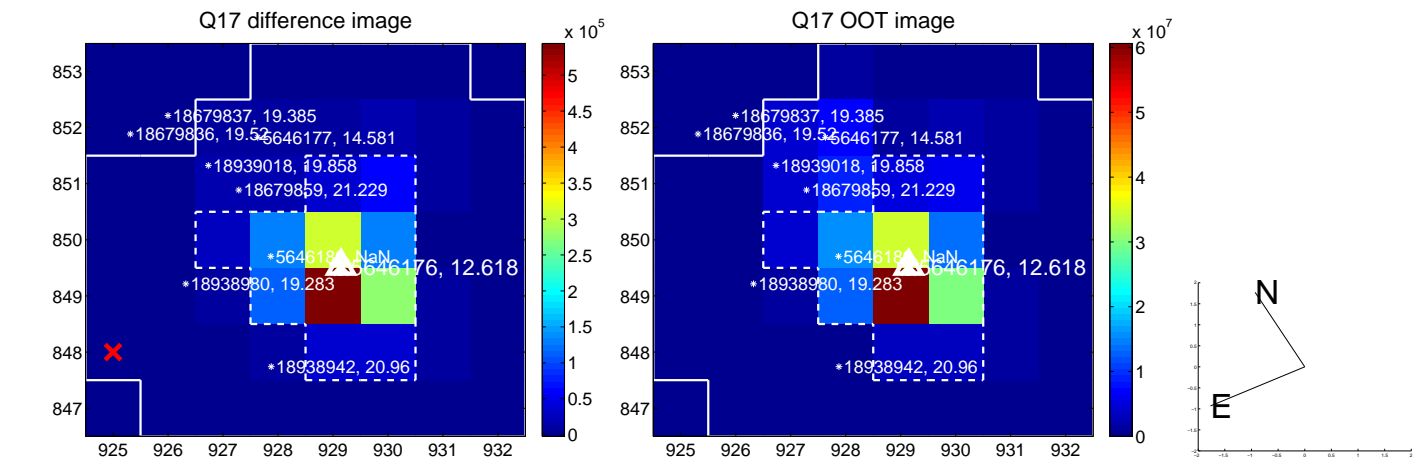


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

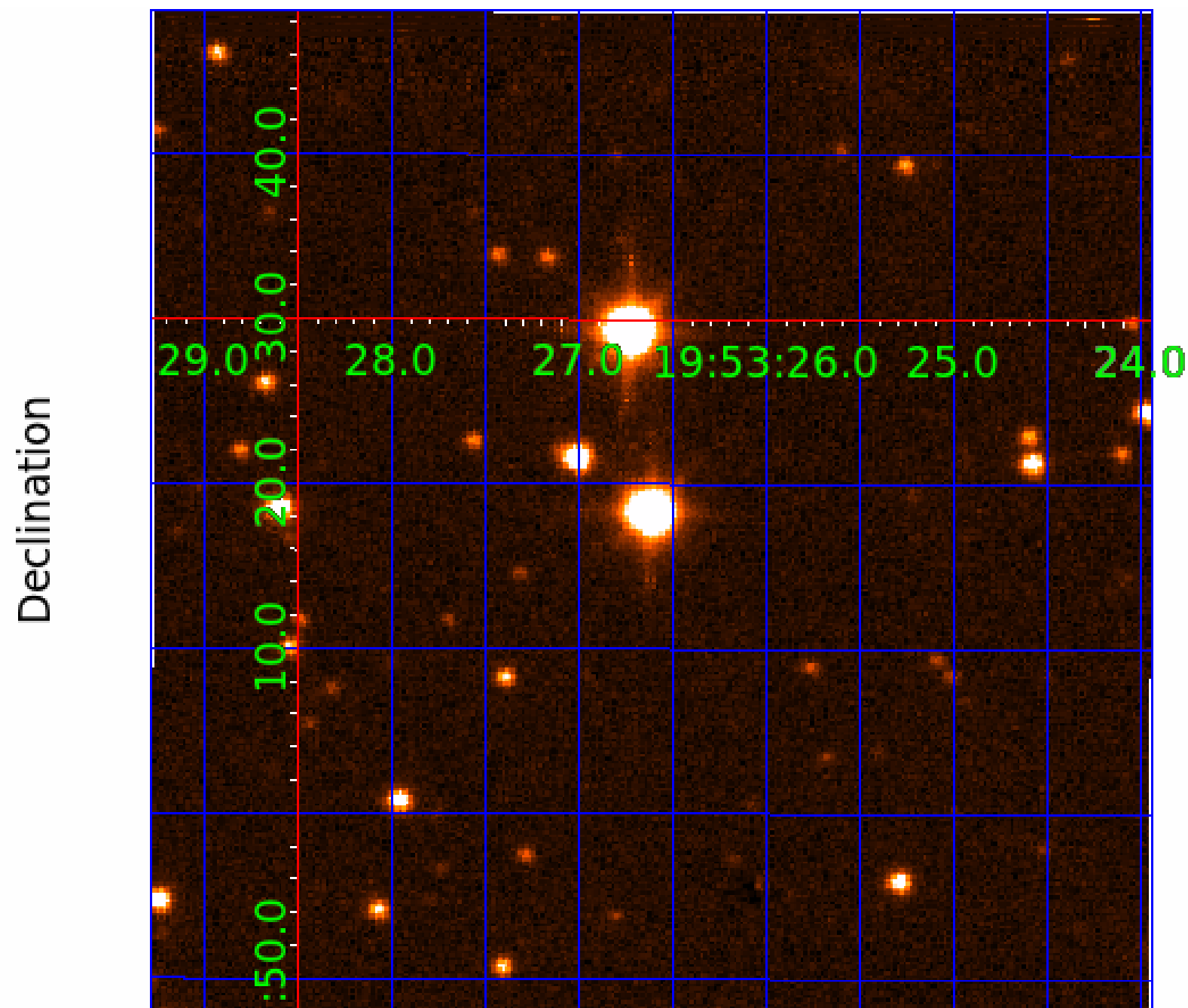




white ×: KIC target position; +: OOT centroid; △: difference centroid. red ×: large negative pixel value.



UKIRT Image



# KIC 005646176

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
005646176-01	OBS	No	0.998360	131.711809	47.6	6.354	10.0	6.1	1.29	6305	0.96	5853.71
005646176-02	OBS	No	105.455306	189.614921	3300.8	5.660	14.2	9.1	1.29	6305	13.60	11.72
005646176-03	OBS	No	204.697781	203.133079	1748.4	11.405	12.3	7.0	1.29	6305	6.22	4.84
005646176-04	OBS	No	75.961627	171.426607	2640.1	7.047	11.2	8.9	1.29	6305	12.02	18.16
005646176-05	OBS	No	66.679595	189.232216	1425.1	5.625	9.4	6.6	1.29	6305	6.08	21.60
005646176-08	OBS	No	29.414987	139.159990	1189.4	9.687	8.1	8.2	1.29	6305	7.52	64.33
005646176-09	OBS	No	48.339322	177.775979	171.6	6.000	8.2	-1.0	1.29	6305	1.70	33.17

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
005646176-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT
005646176-02	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—HALO_GHOST
005646176-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS
005646176-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
005646176-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
005646176-08	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
005646176-09	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_ALT—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_NOFITS

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

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

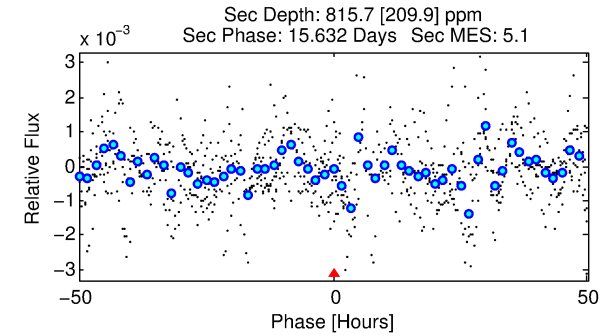
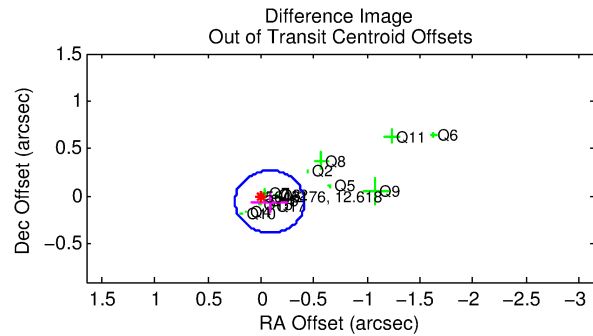
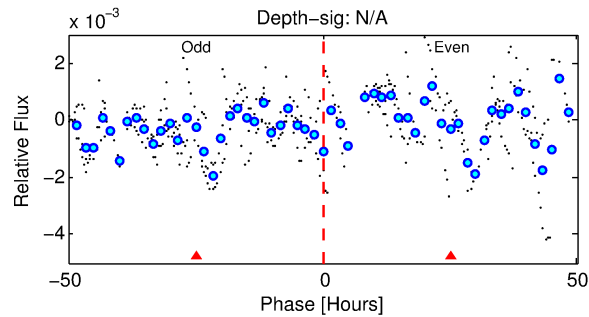
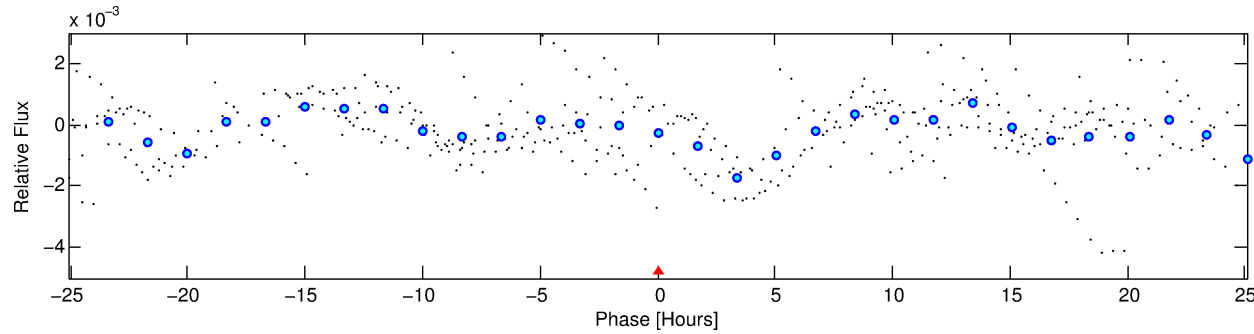
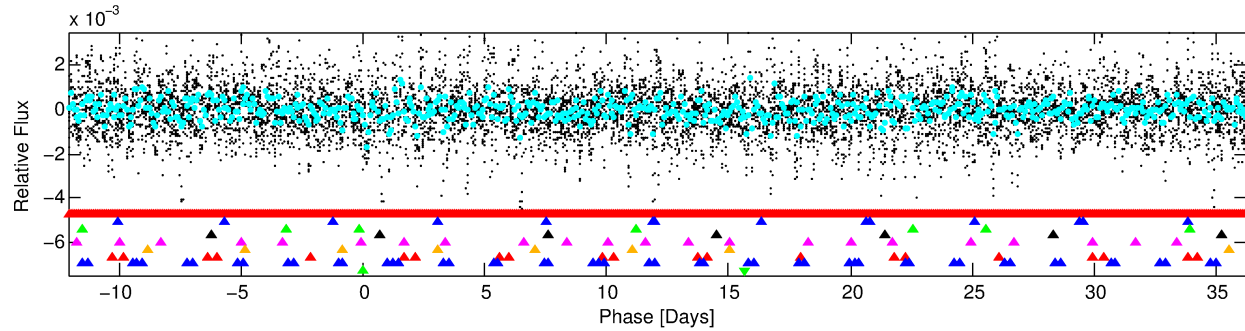
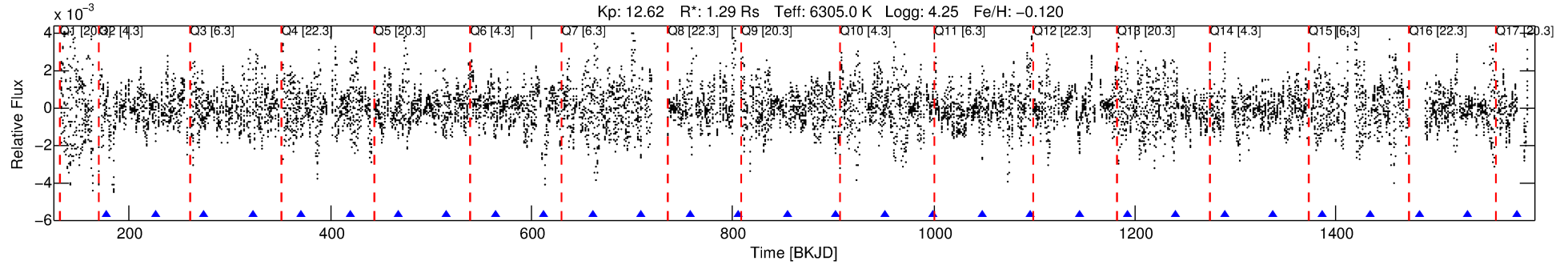
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 005646176-09

No Significant Match Found

# DV One-Page Summary

KIC: 5646176 Candidate: 9 of 9 Period: 48.339 d



## TPS TCE Results:

Period = 48.33932 d  
Epoch = 177.7760 BKJD

DV fit results are unavailable

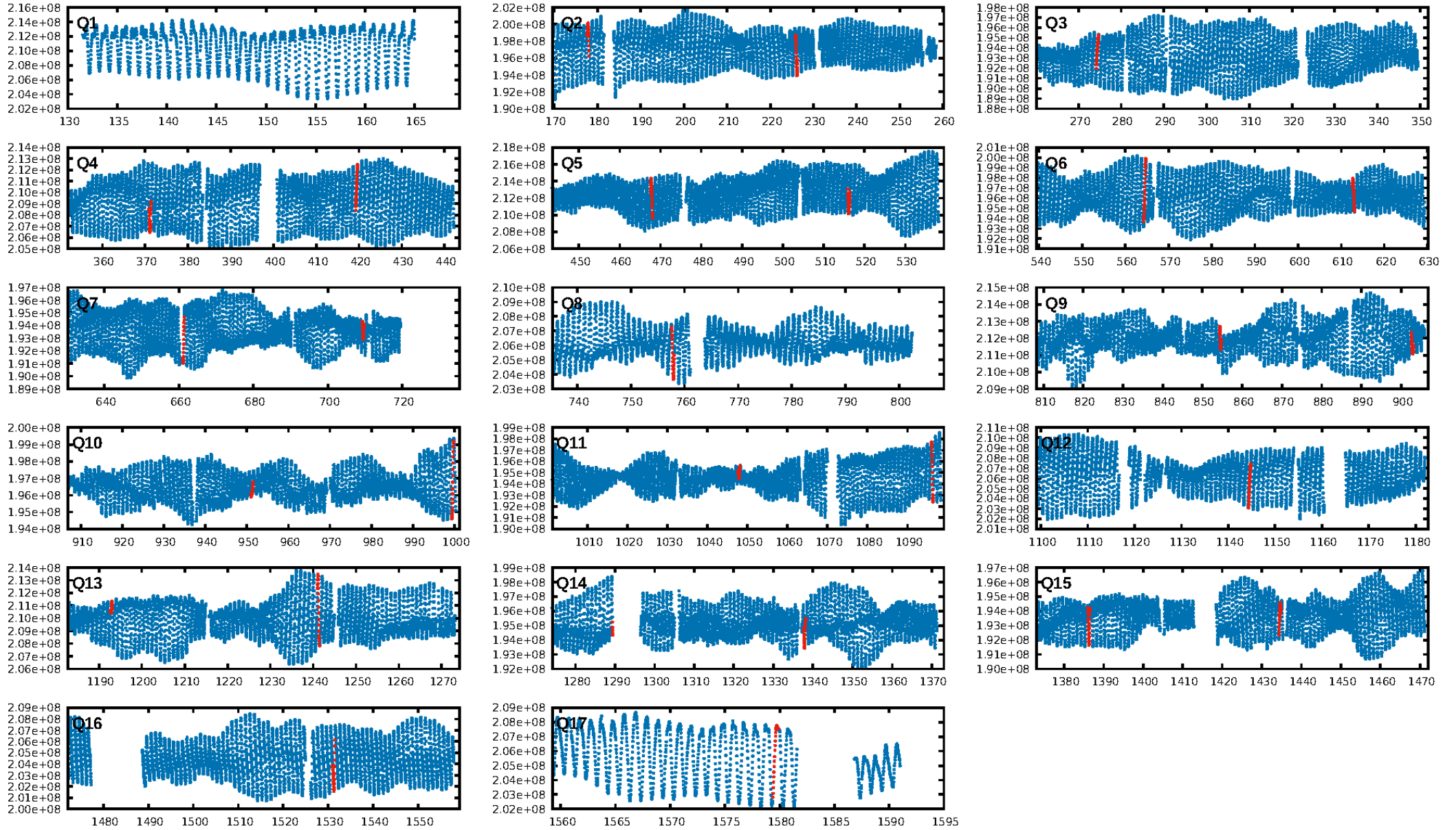
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [39.86 $\sigma$ ]  
LongPeriod-sig: 100.0% [53.52 $\sigma$ ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [12/12]  
GhostDiagnostic-chr: -0.9558  
Centroid-sig: 65.3%  
Centroid-so: 0.694 arcsec [3.13 $\sigma$ ]  
OotOffset-rm: 0.100 arcsec [0.92 $\sigma$ ]  
KicOffset-rm: 0.111 arcsec [0.75 $\sigma$ ]  
OotOffset-st: 3/4/4/3 [14]  
KicOffset-st: 3/4/4/3 [14]  
DiffImageQuality-fgm: 0.64 [9/14]  
DiffImageOverlap-fno: 0.00 [0/14]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 16:34:31 Z

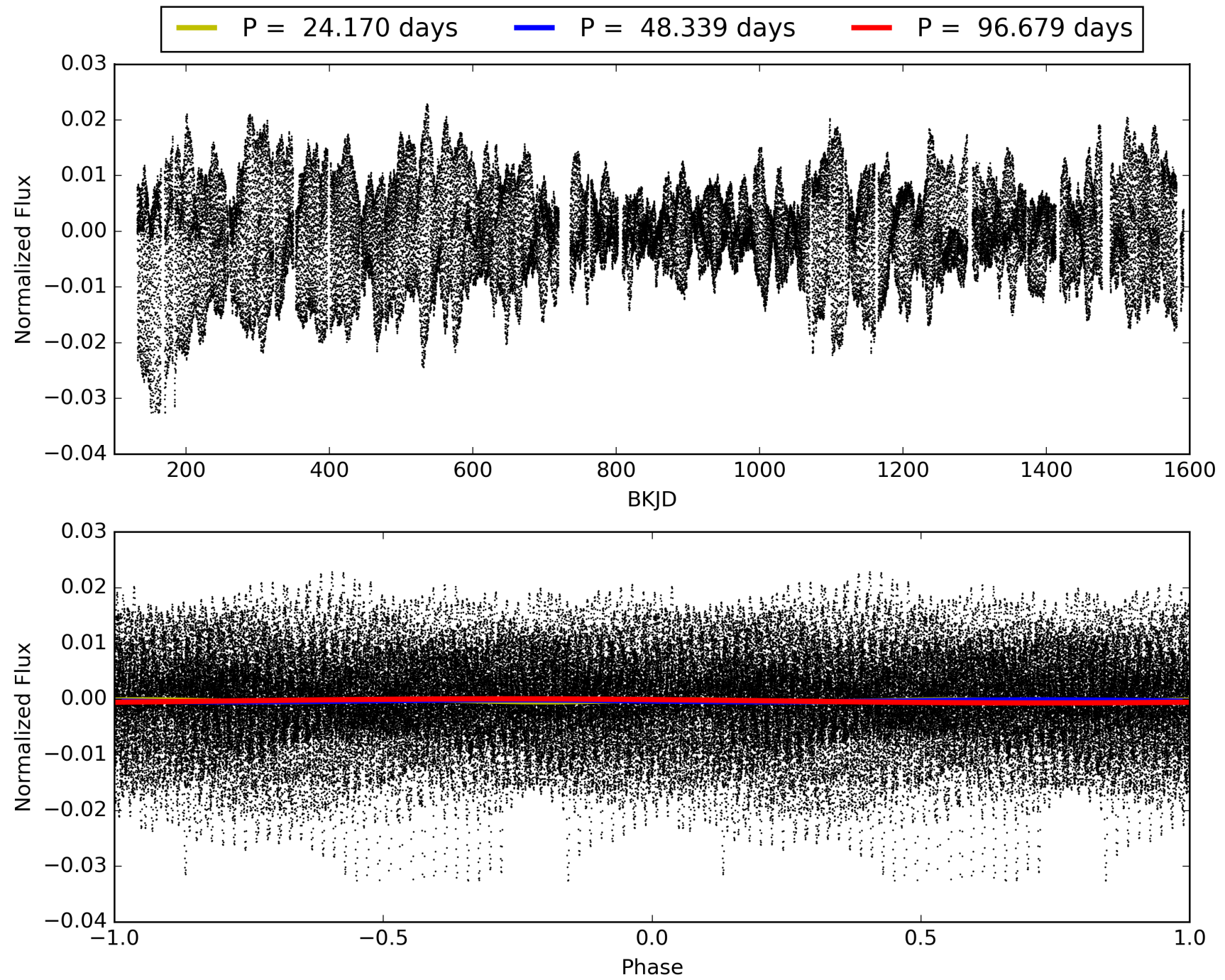
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 005646176-09, PDC Light Curves



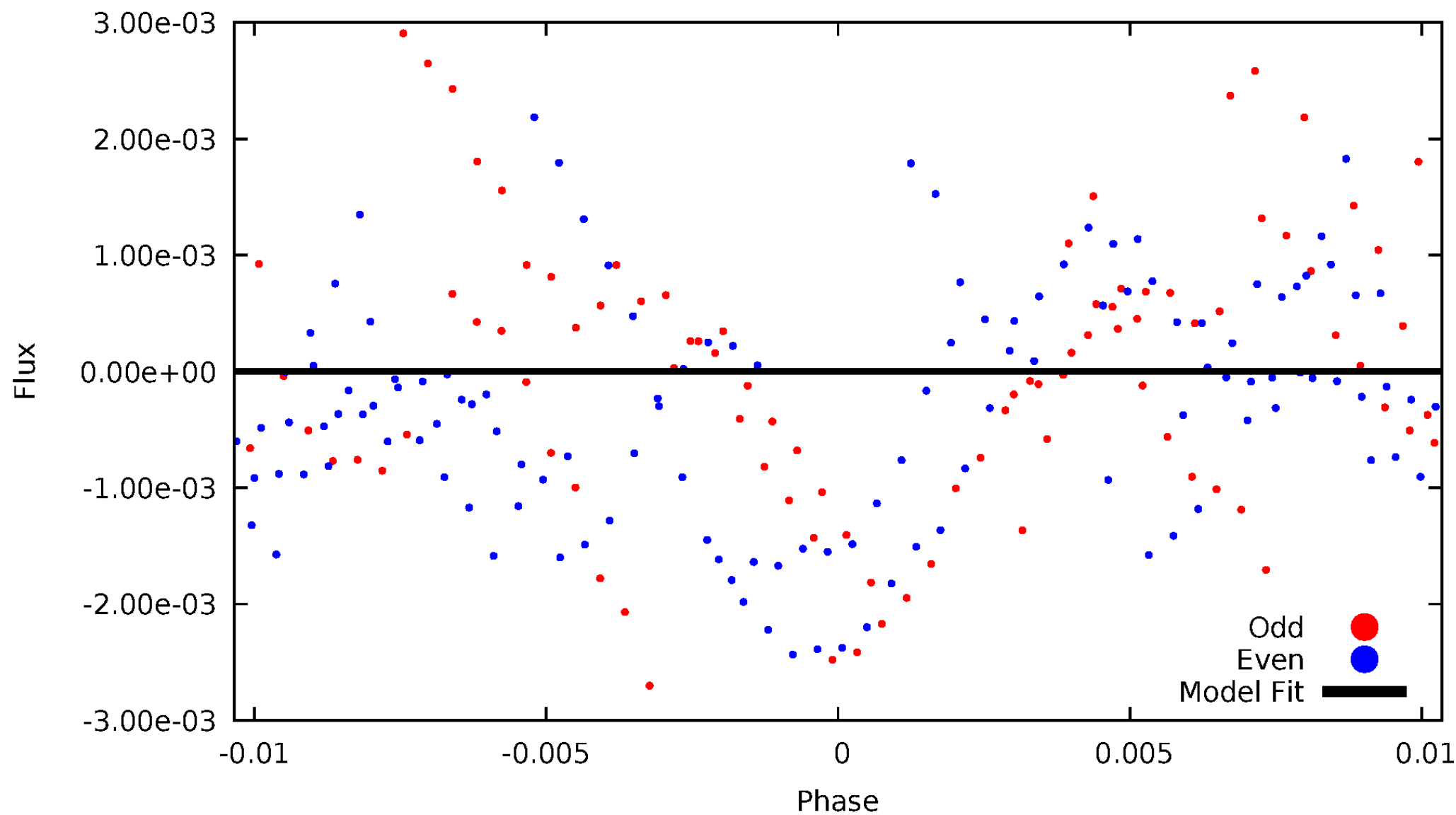


# TCE 005646176-09



# DV Odd/Even

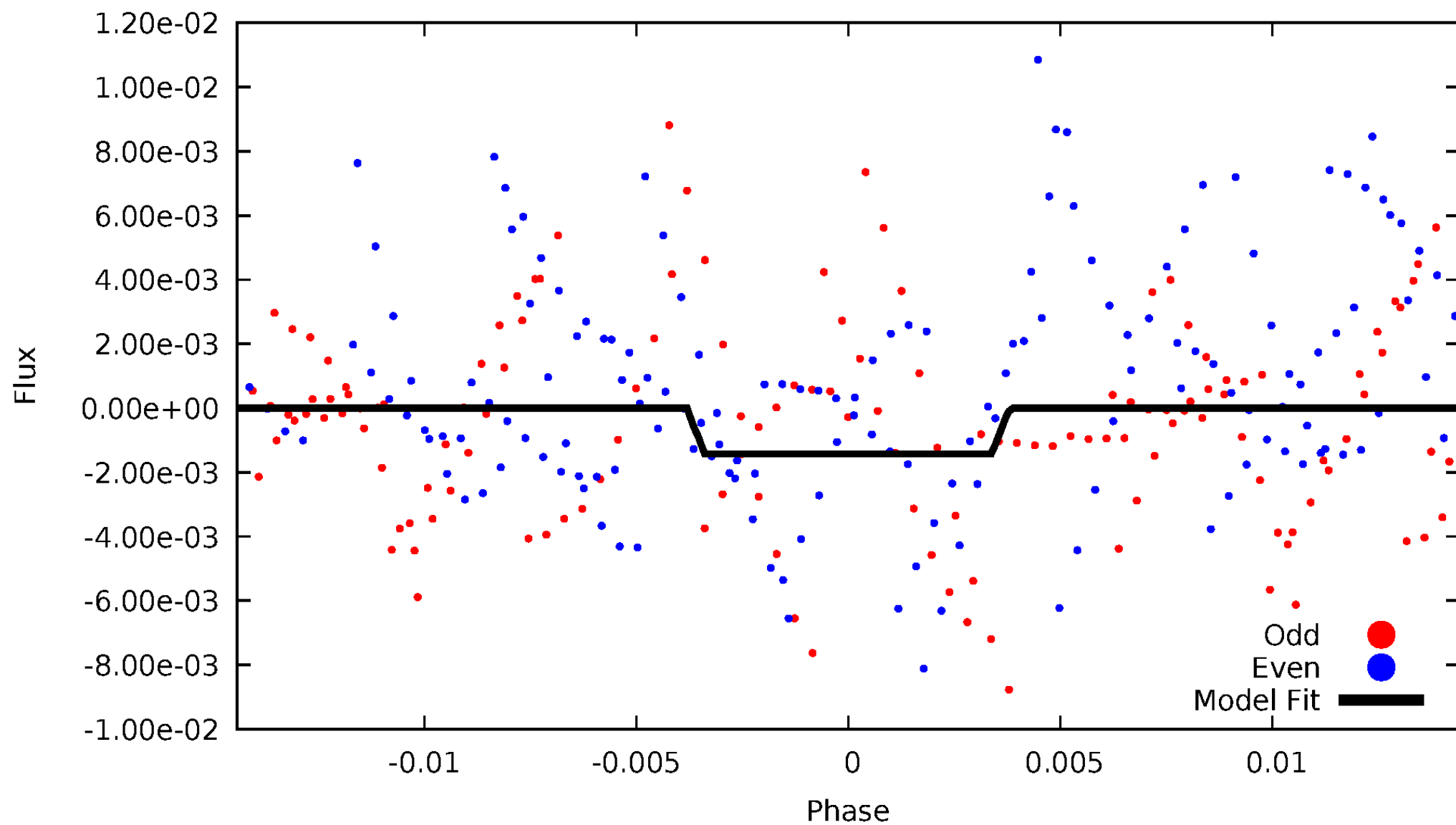
TCE 005646176-09



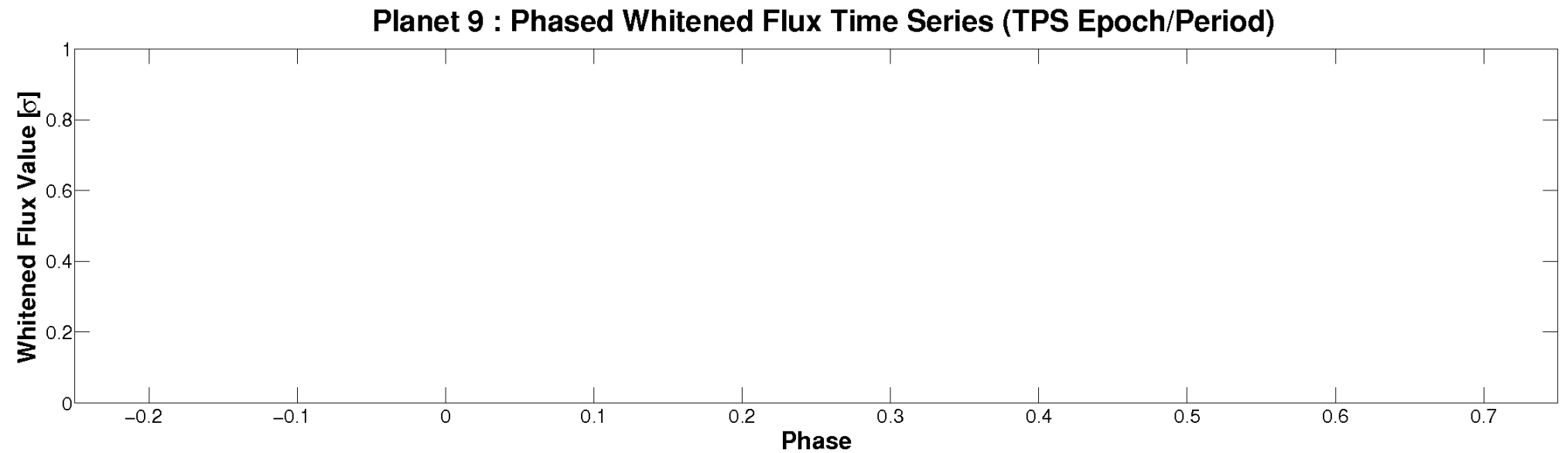
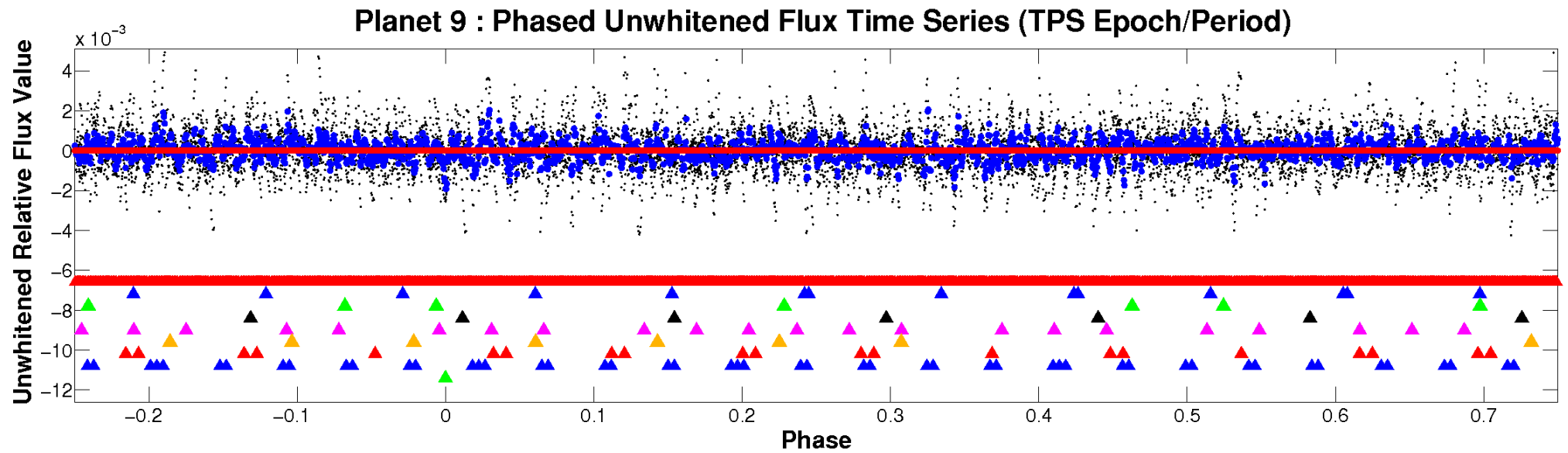


# ALT Odd/Even

TCE 005646176-09

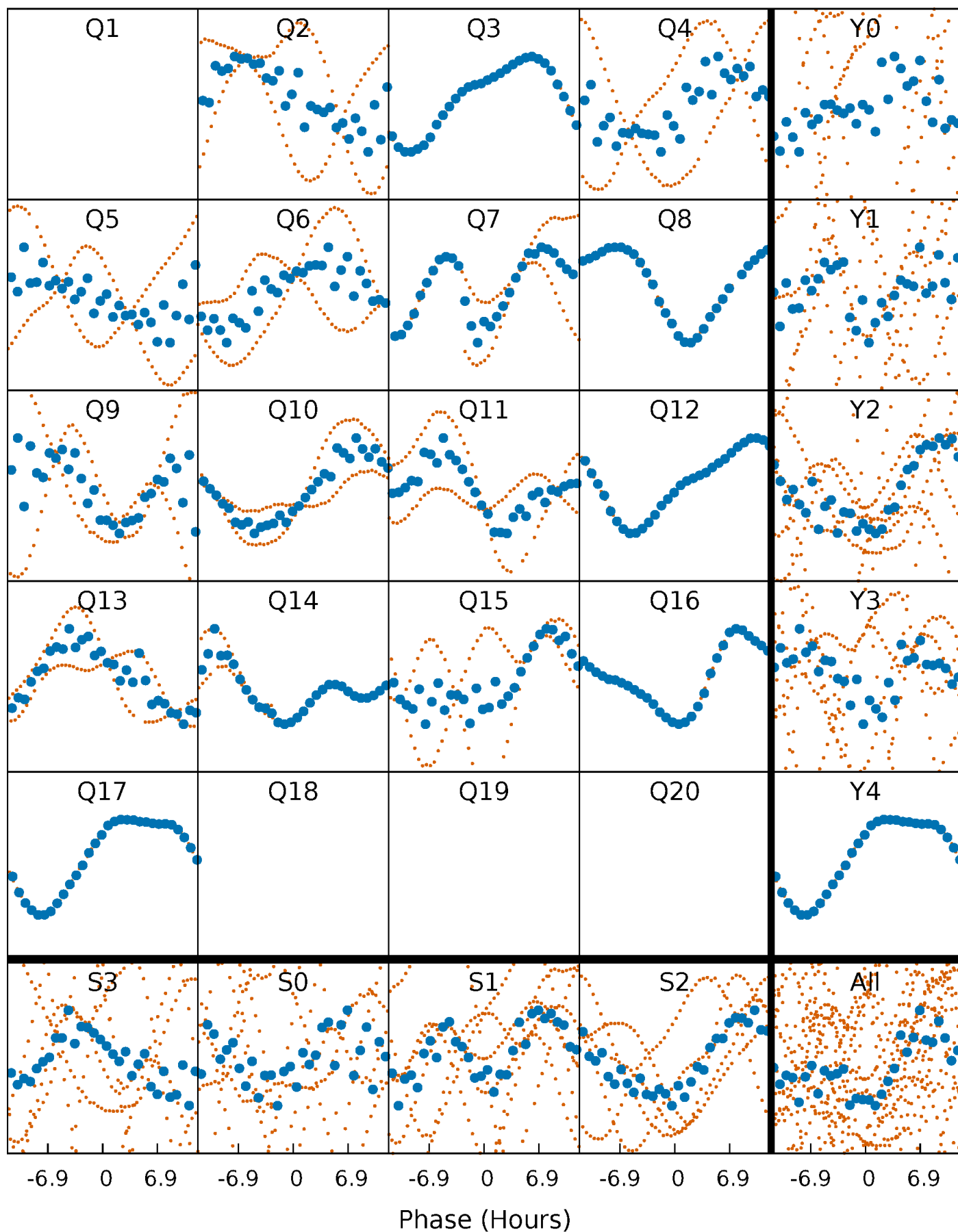


# Non-Whitened Vs. Whitened Light Curve



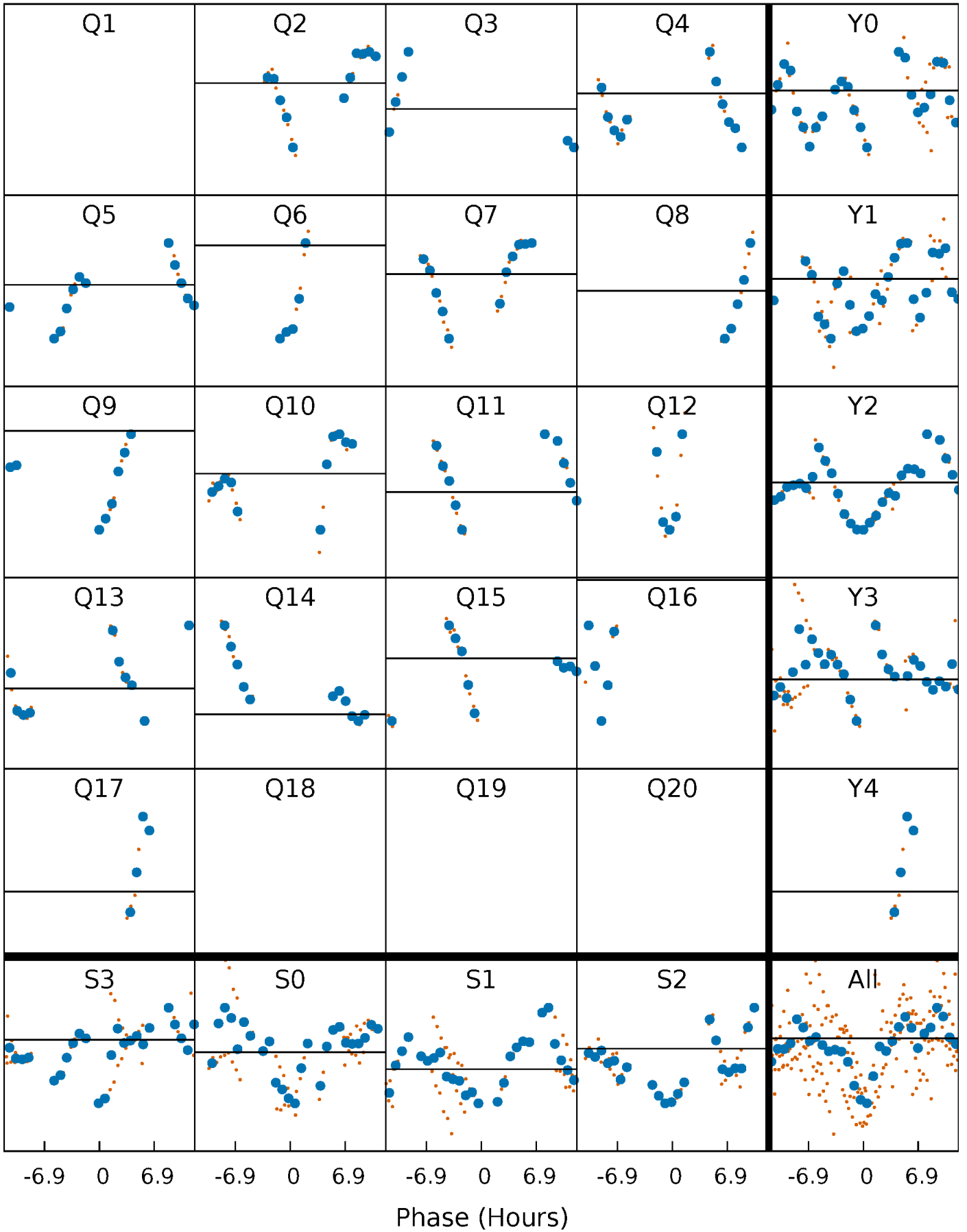
# PDC Quarter-Phased Transit Curves

TCE 005646176-09   P= 48.339322 Days    $T_0=177.775979$  (BKJD)



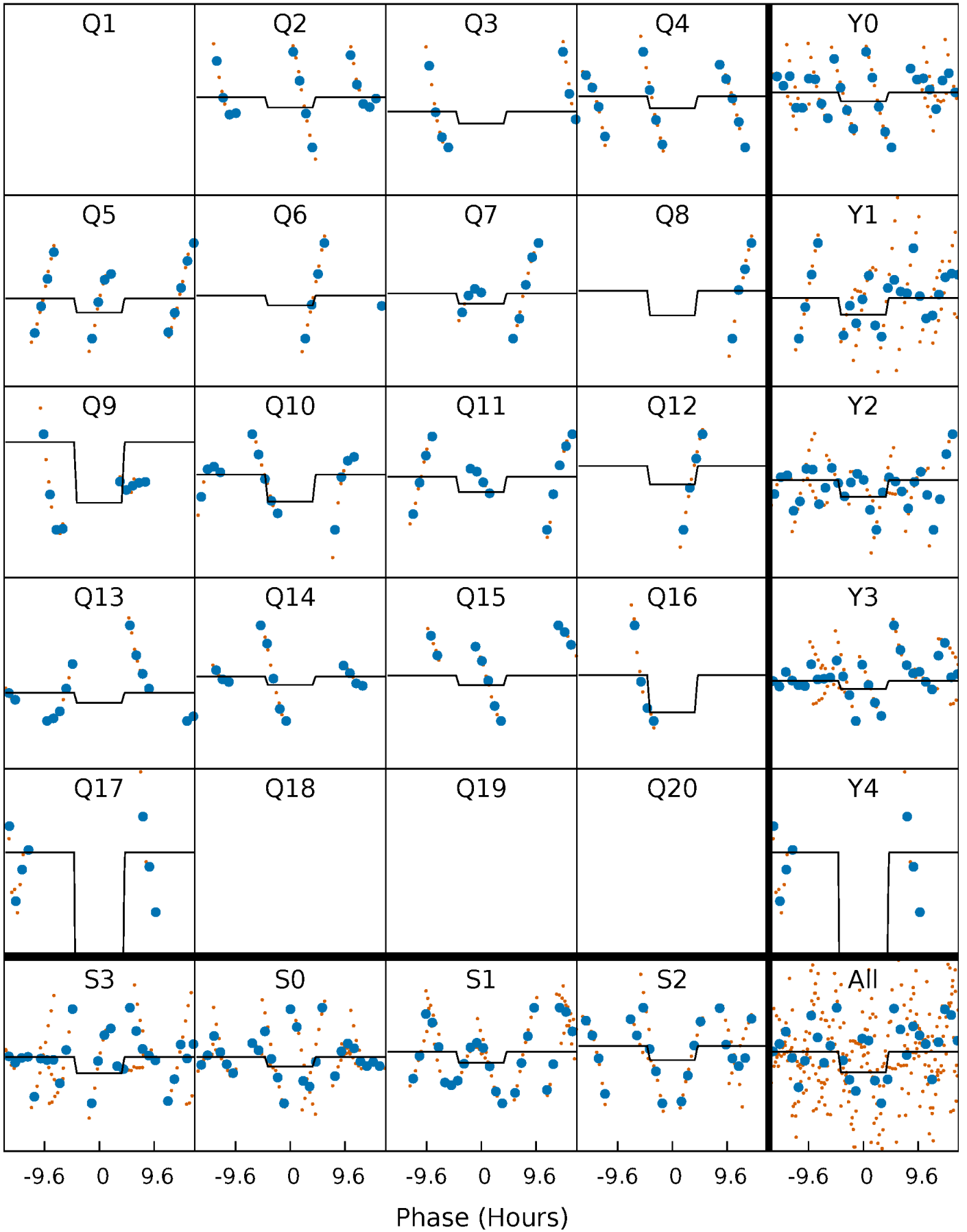
# DV Quarter-Phased Transit Curves

TCE 005646176-09   P= 48.339322 Days    $T_0=177.775979$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

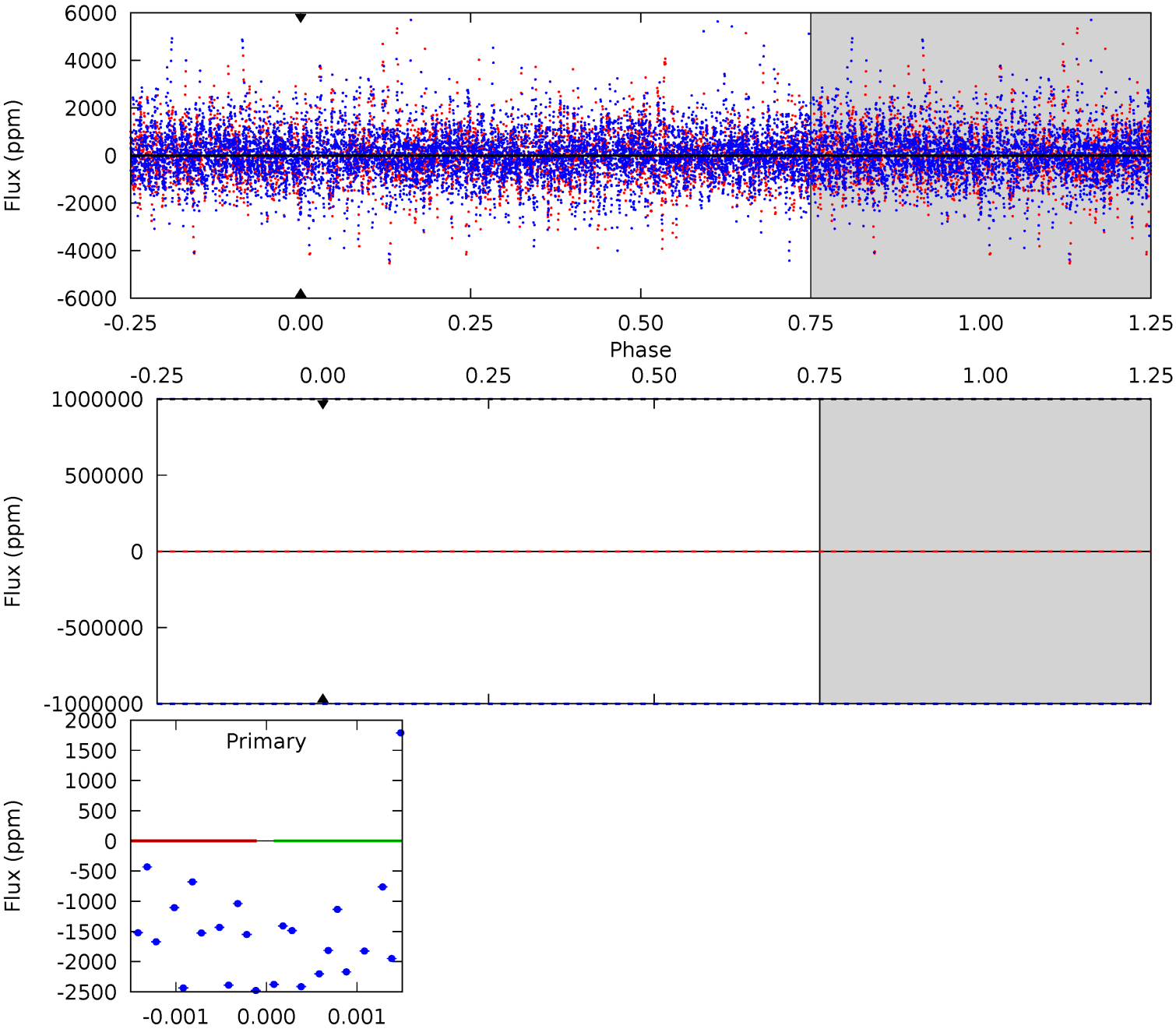
TCE 005646176-09   P= 48.339322 Days    $T_0=177.620135$  (BKJD)



# DV Model-Shift Uniqueness Test

005646176-09, P = 48.339322 Days, E = 129.436657 Days

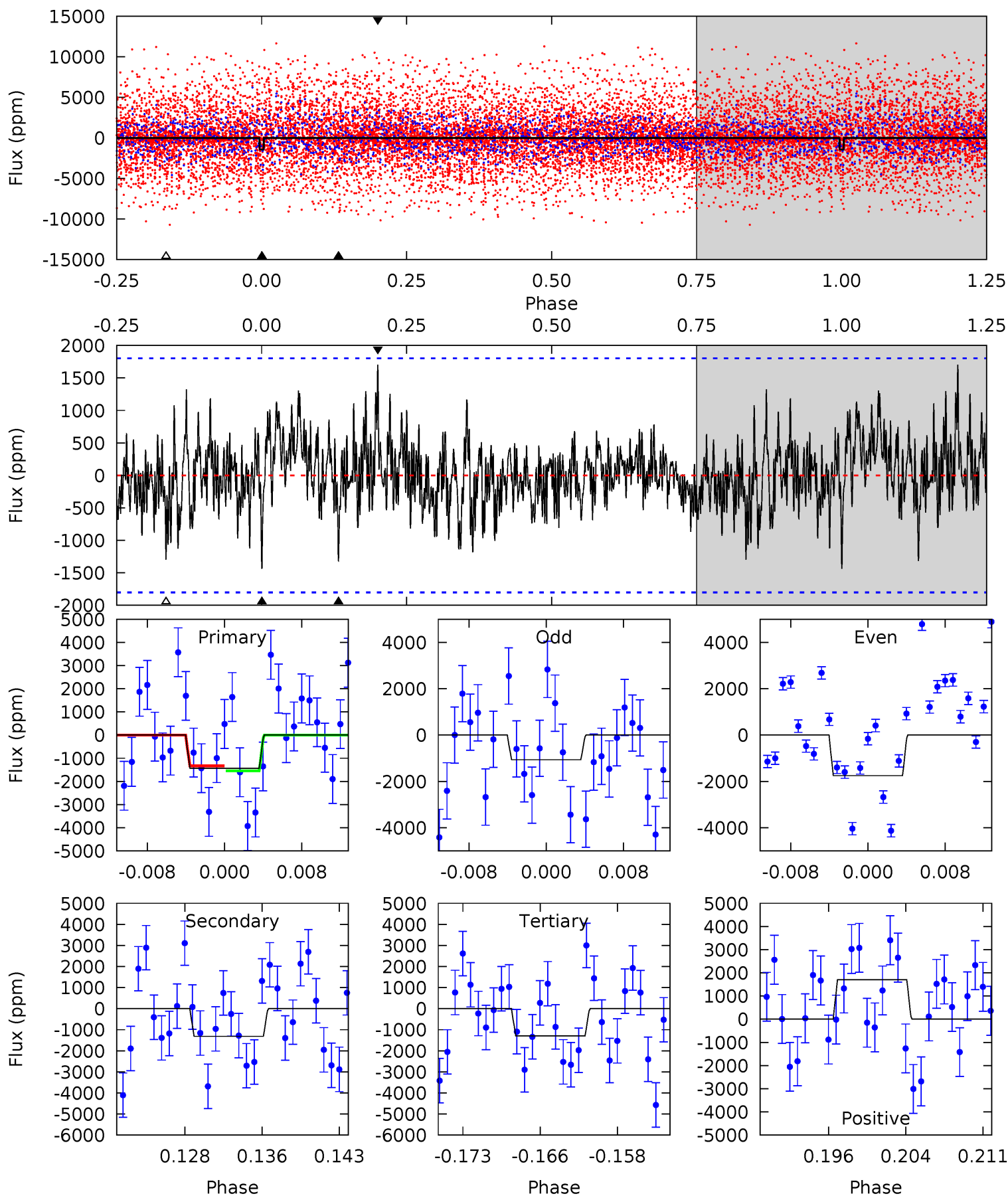
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
0	0	0	0	1.00	1.00	1.00	0	0	0	0	0	0	0	0



# Alt Model-Shift Uniqueness Test

005646176-09, P = 48.339322 Days, E = 129.280813 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
4.04	3.71	3.65	4.80	5.08	2.67	1.21	0.39	-0.76	0.06	-1.09	0.96	1.15	0.54	0.31





### Stellar Parameters For KIC 005646176

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6305^{+151}_{-189}$	$4.252^{+0.153}_{-0.187}$	$-0.120^{+0.250}_{-0.300}$	$1.295^{+0.424}_{-0.261}$	$1.091^{+0.197}_{-0.121}$	$0.707^{+0.542}_{-0.354}$
	+2%/-3%	+4%/-4%	+208%/-250%	+33%/-20%	+18%/-11%	+77%/-50%
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 005646176-09 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$0 \pm 1000000$	$10.17^{+10.56}_{-7.10}$	$856^{+66}_{-52}$	$-5673^{+32994}_{-20998}$	$-1090.185^{+69063.959}_{-61859.997}$
Alt.	$-1316 \pm 355$	$11.62^{+12.12}_{-8.22}$	$858^{+65}_{-55}$	$4408^{+3536}_{-966}$	$383^{+3942}_{-296}$

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

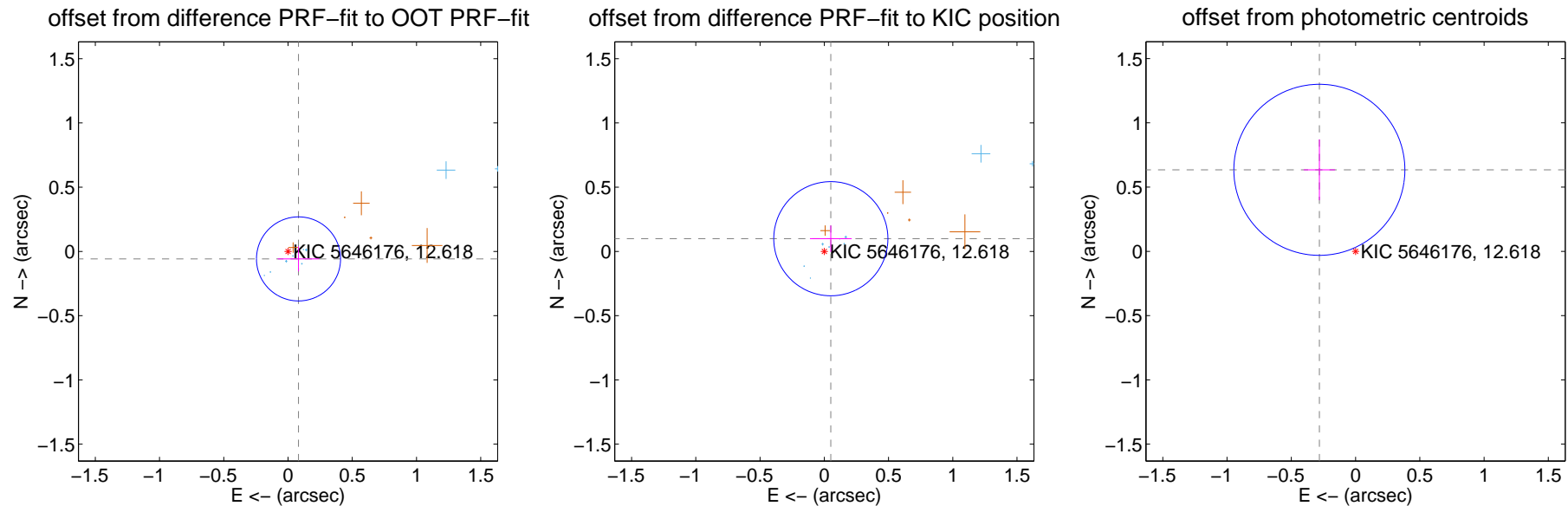
## DV Centroid Data

Supplemental centroid analysis for 005646176-09. Kepler magnitude: 12.62. Transit SNR -1.00

There are 9 quarters with good PRF difference image offsets

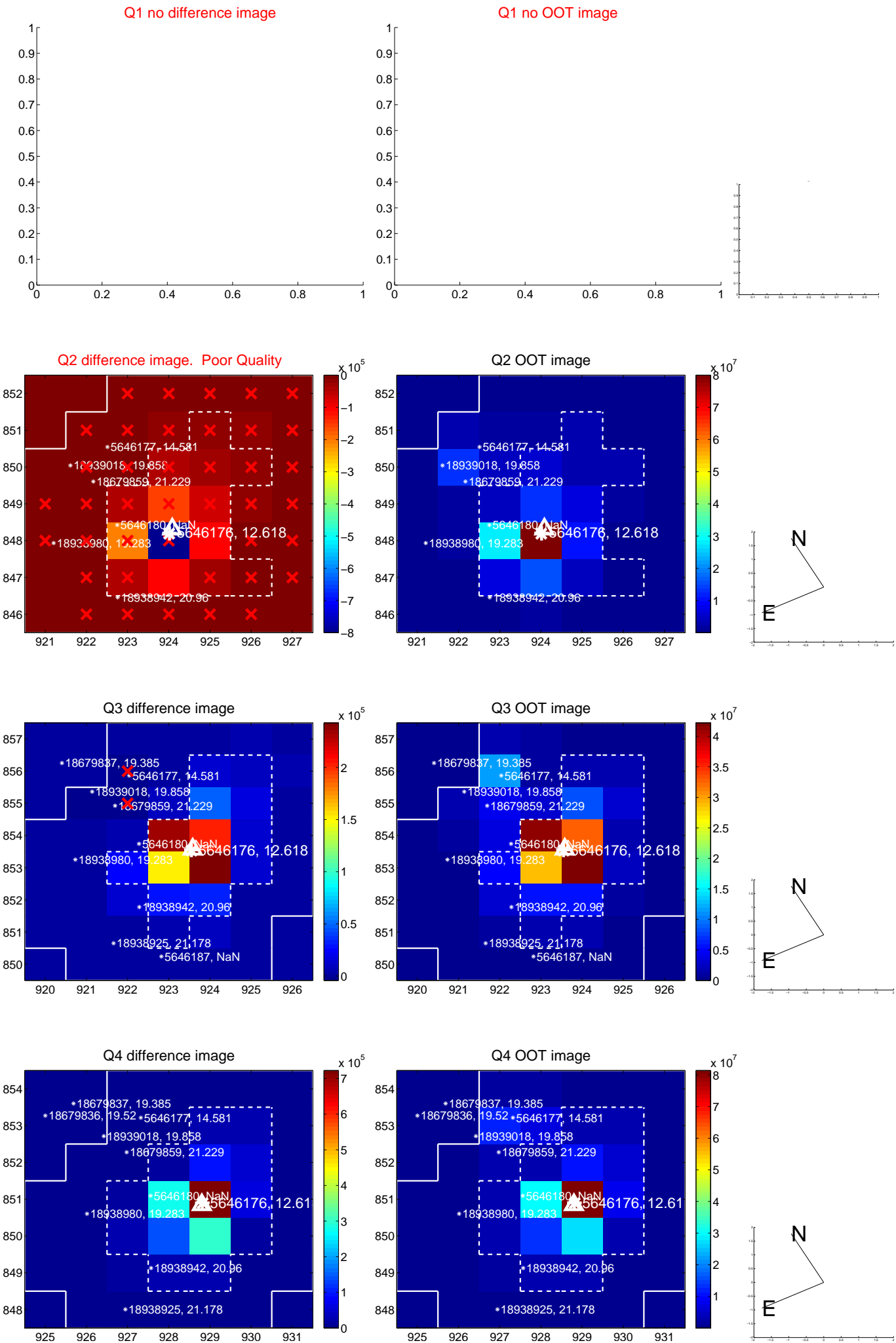
The direct PRF centroid is offset from the target star catalog position by about 0.16 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.100 \pm 0.109$	0.92	$-0.082 \pm 0.162$	$-0.058 \pm 0.098$
PRF-fit source offset from KIC position	$0.111 \pm 0.148$	0.75	$-0.051 \pm 0.163$	$0.099 \pm 0.103$
photometric centroid source offset	$0.69 \pm 0.22$	3.13	$0.28 \pm 0.12$	$0.63 \pm 0.24$

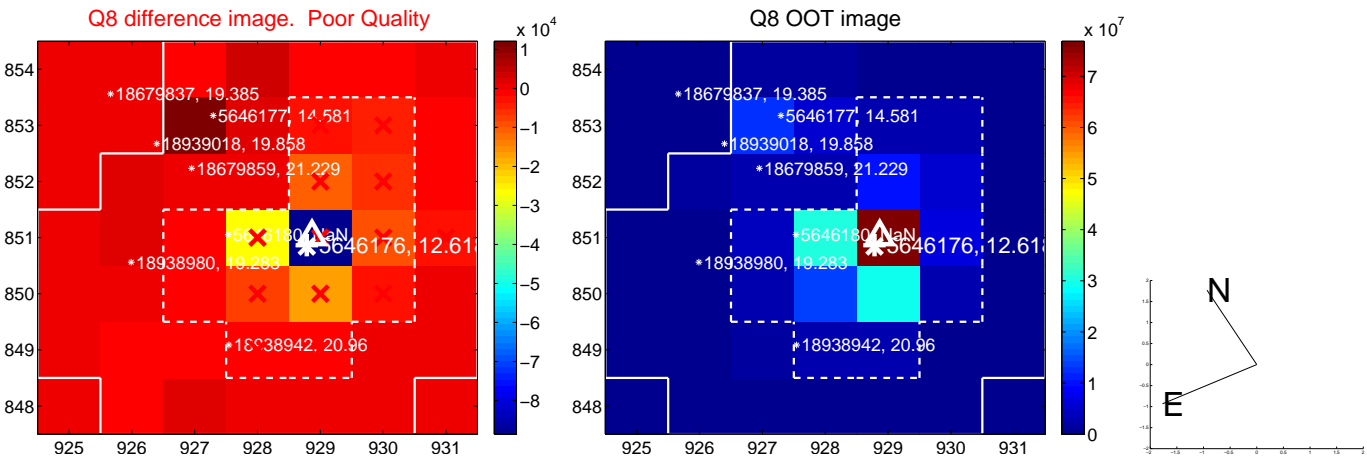
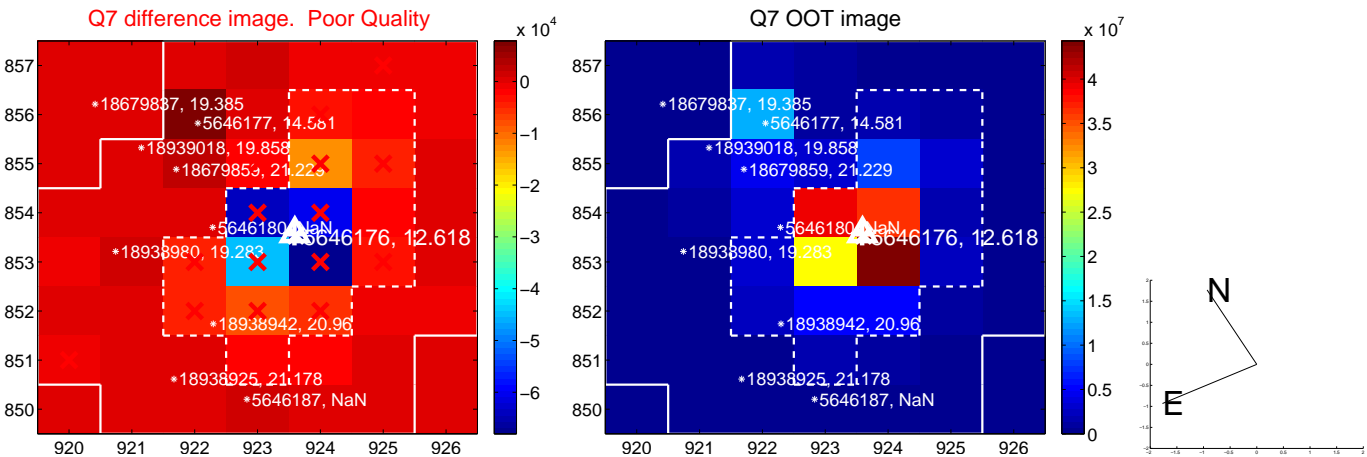
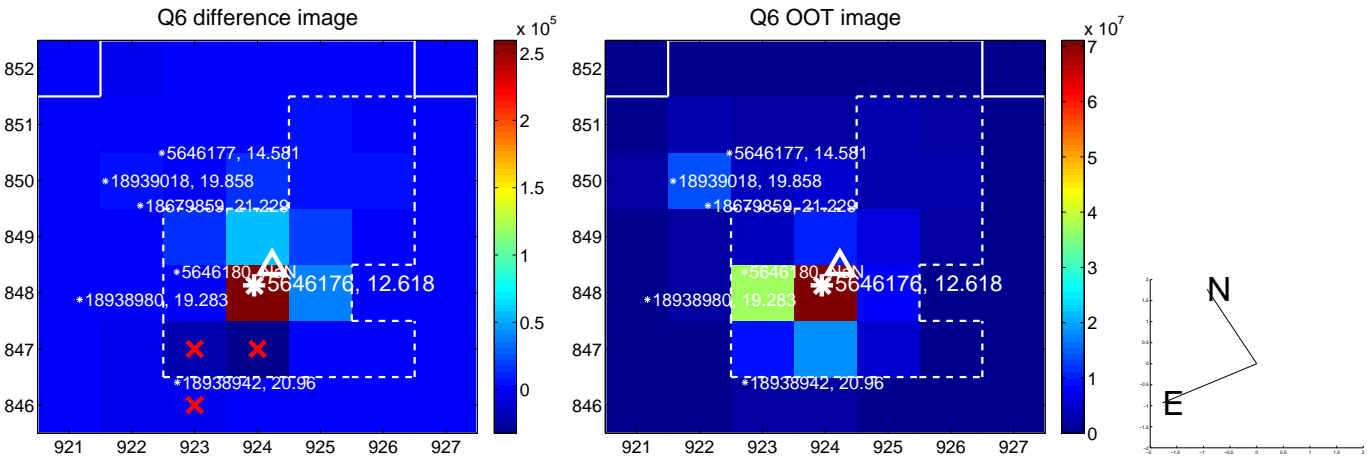
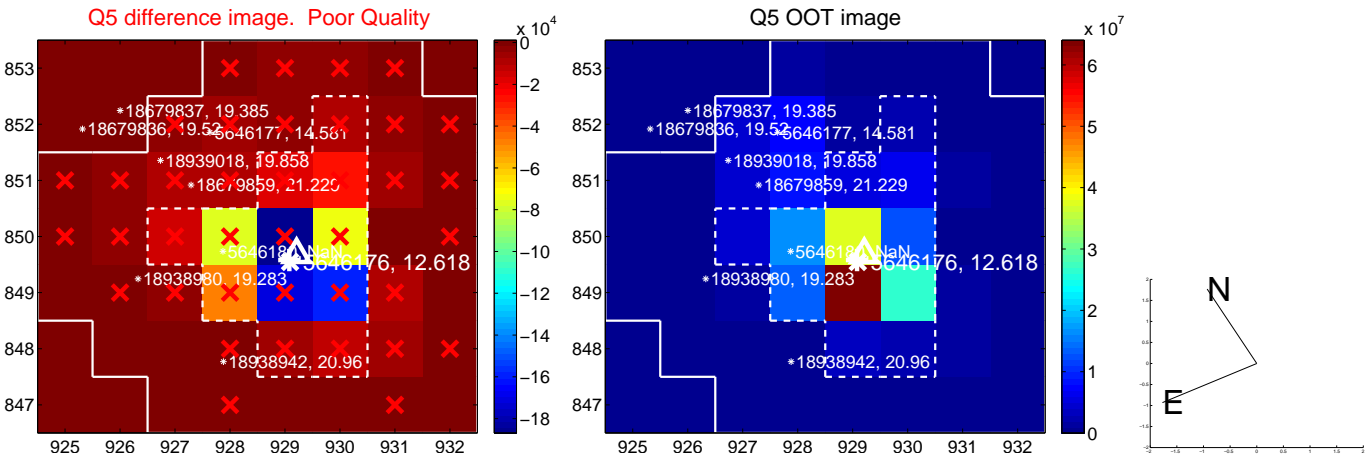


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

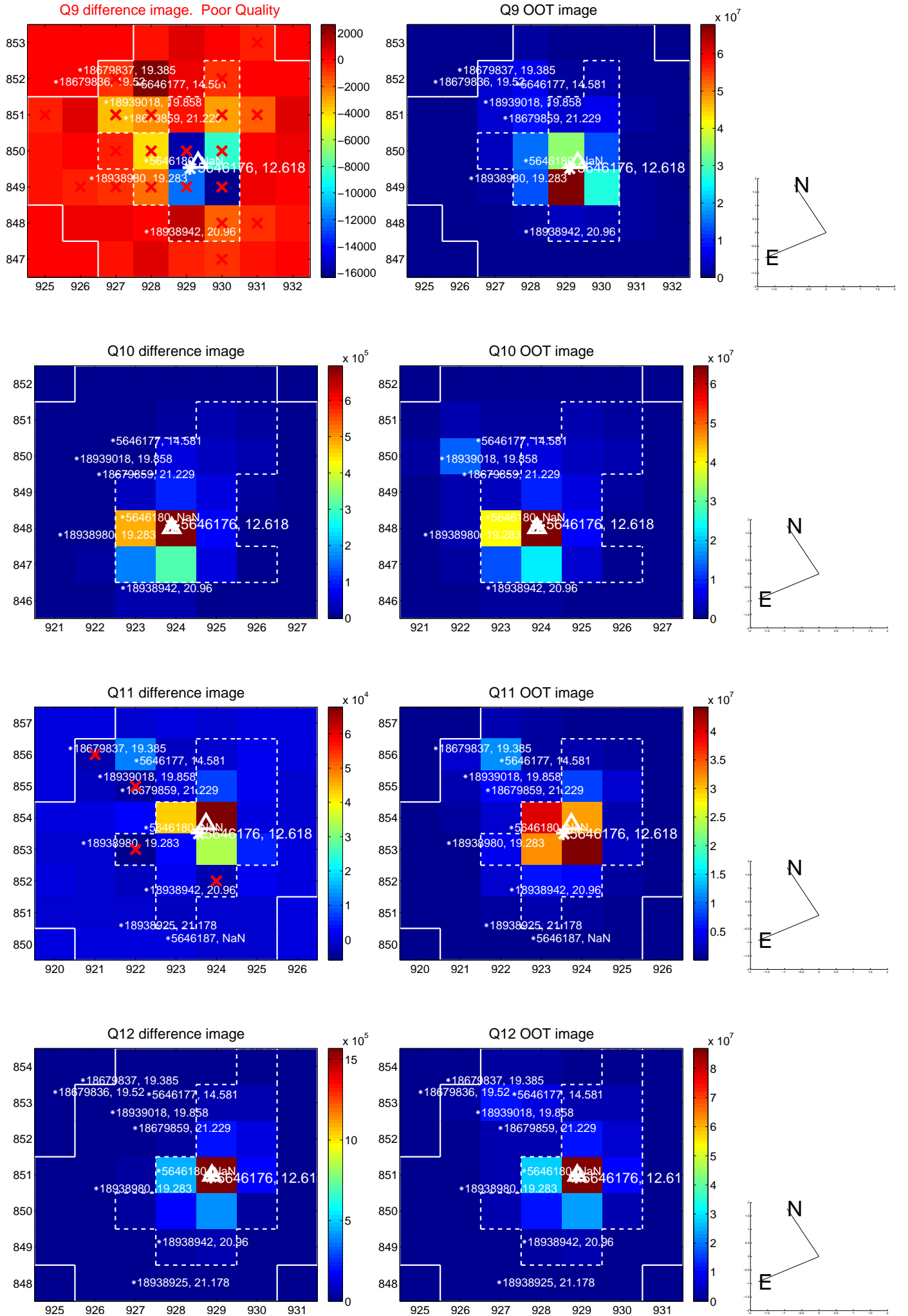
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



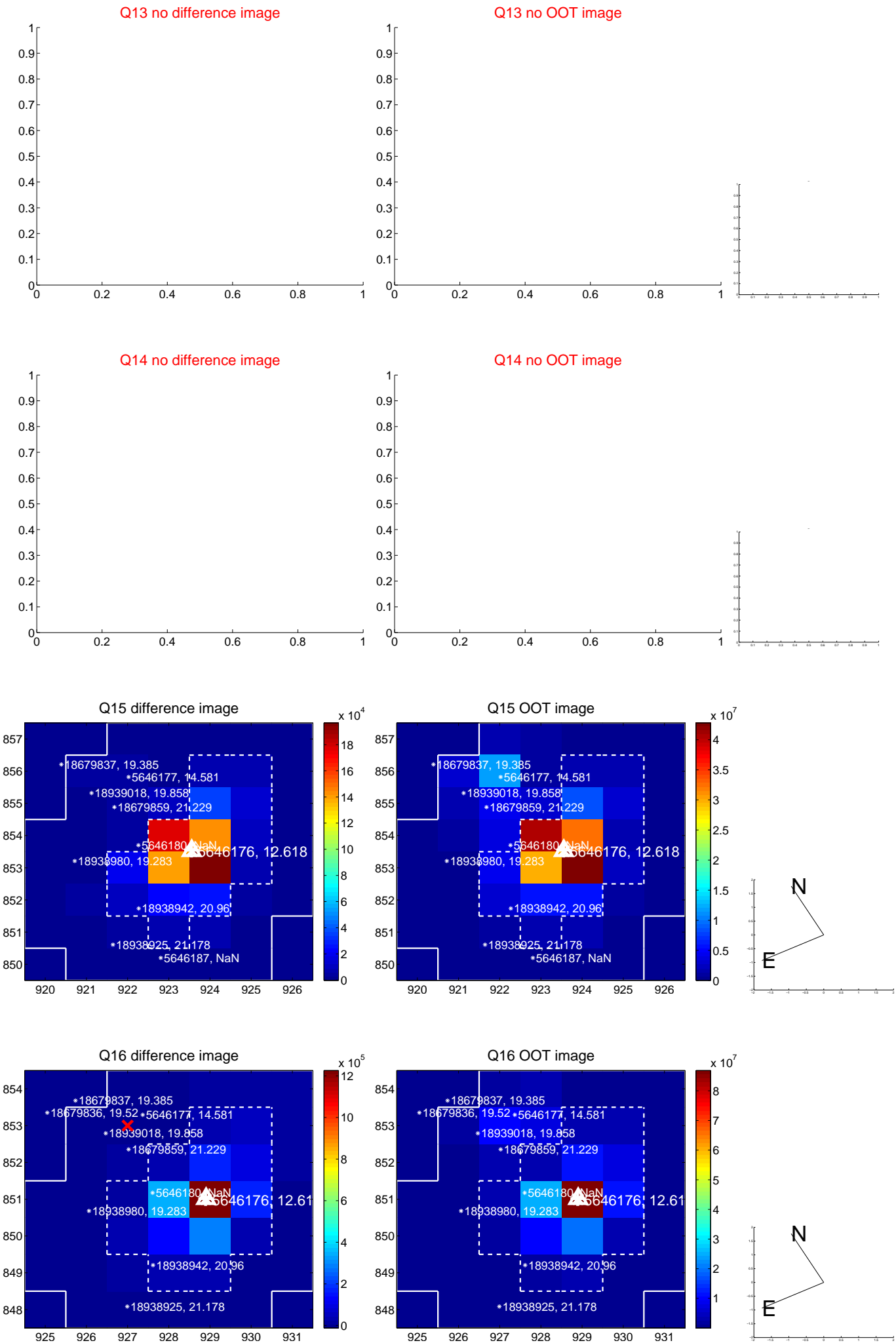
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



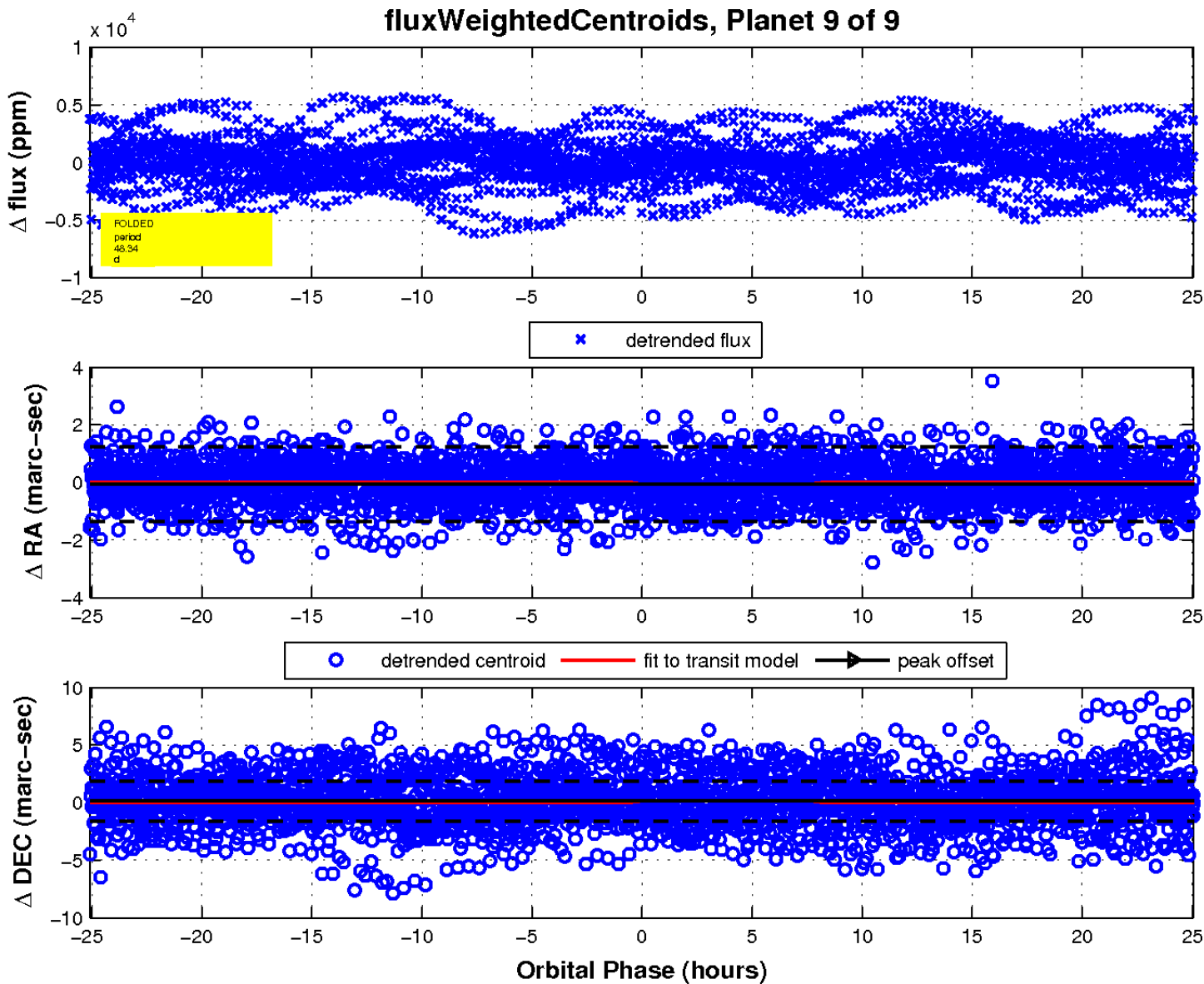
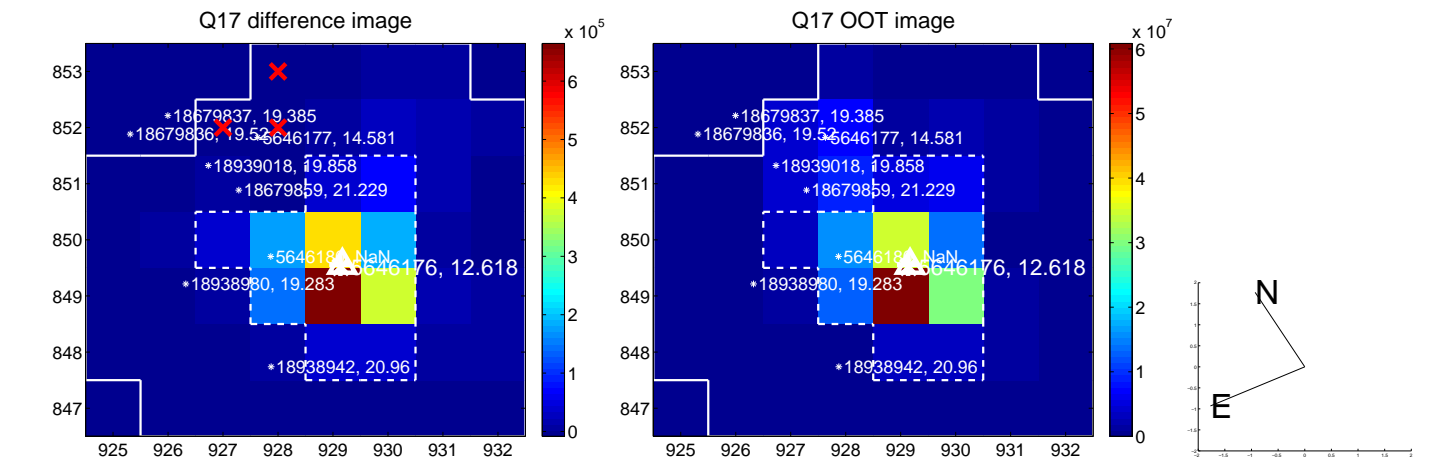
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

