

# KIC 005991070

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
005991070-01	OBS	7756.01	0.941000	131.926402	23.5	6.497	8.8	10.8	2.41	5766	1.70	13766.75
005991070-03	OBS	No	46.313436	138.044377	776.2	4.591	22.0	5.6	2.41	5766	13.17	76.33
005991070-04	OBS	No	25.055683	149.765335	133.0	14.826	15.0	2.6	2.41	5766	3.01	173.15
005991070-06	OBS	No	23.663450	138.980719	1.9	25.997	9.5	0.0	2.41	5766	0.34	186.86

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
005991070-01	OBS	FP	0.42	1	0	0	0	LPP_DV—CENT_CROWDED
005991070-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_TER_ALT—MOD_POS_ALT—CENT_FEW_DIFFS
005991070-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_ZUMA—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
005991070-06	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT

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

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

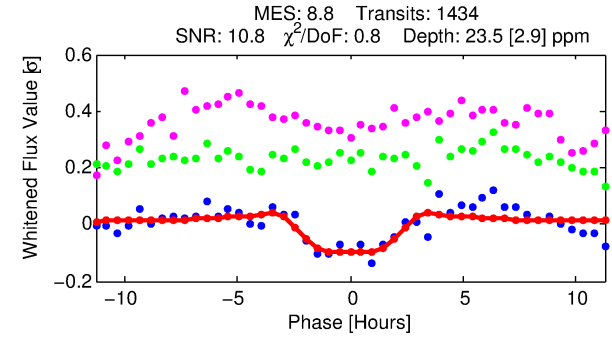
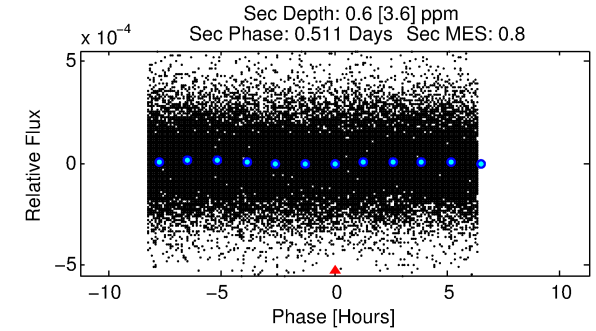
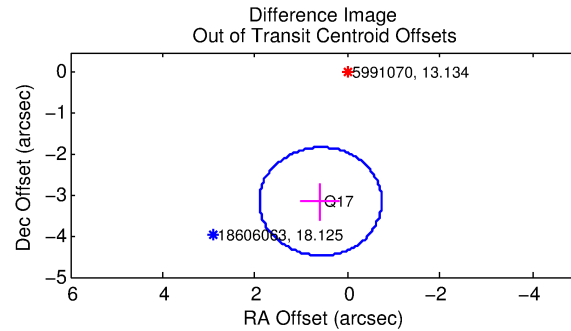
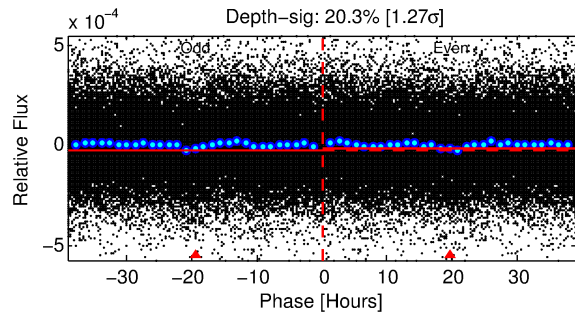
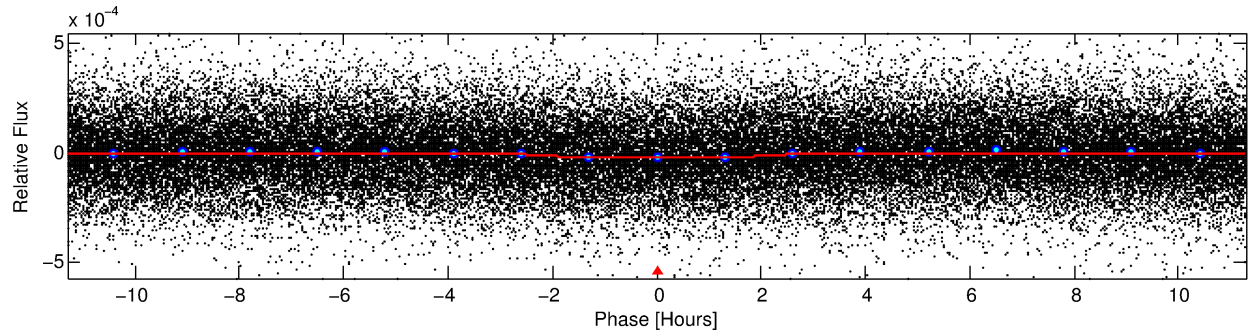
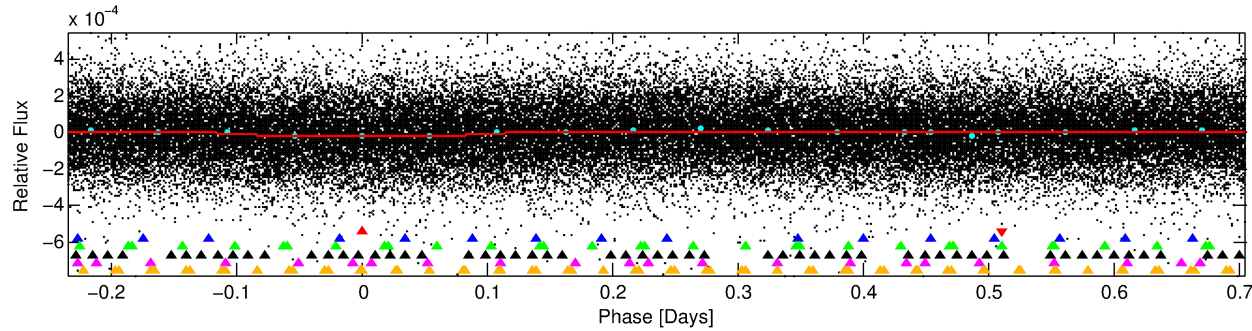
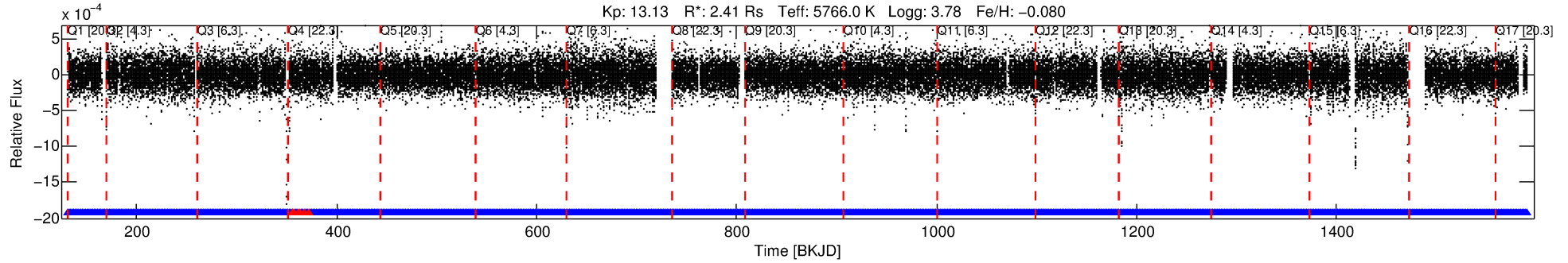
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 005991070-01

No Significant Match Found

# DV One-Page Summary

KIC: 5991070 Candidate: 1 of 6 Period: 0.941 d



## DV Fit Results:

Period = 0.94100 [0.00001] d  
Epoch = 131.9264 [0.0066] BKJD  
Rp/R\* = 0.0065 [0.0005]  
a/R\* = 1.02 [0.00]  
b = 0.99 [0.00]  
Seff = 13766.75 [8091.65]  
Teq = 2762 [406] K  
Rp = 1.70 [0.71] Re  
a = 0.0204 [0.0076] AU  
Ag = 0.05 [0.29] [-3.26 $\sigma$ ]  
Teffp = 2028 [2885] K [-0.25 $\sigma$ ]

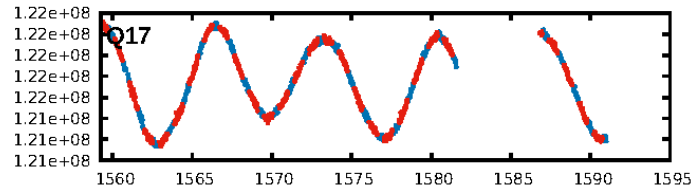
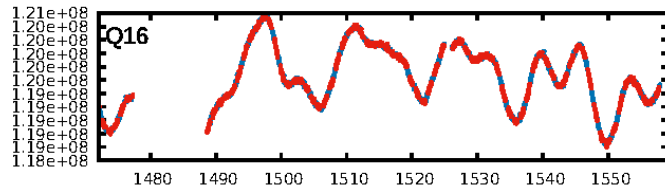
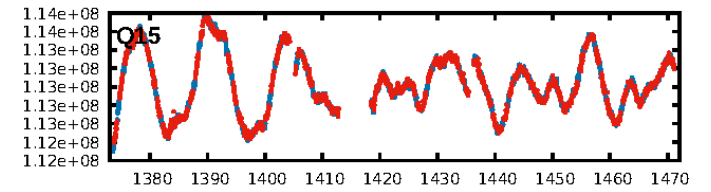
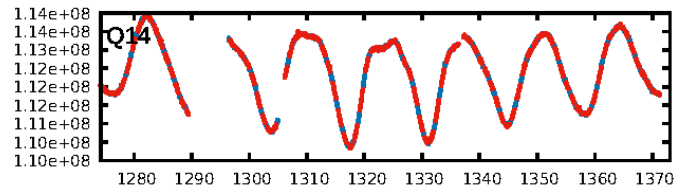
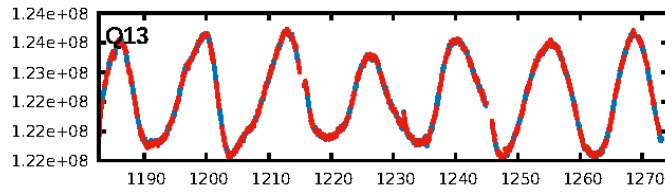
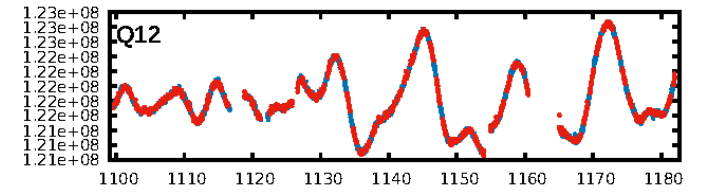
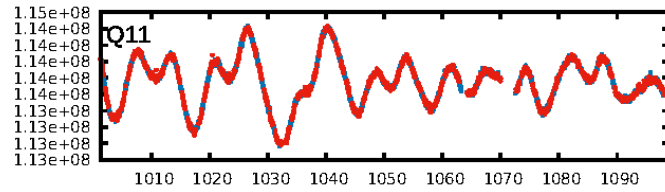
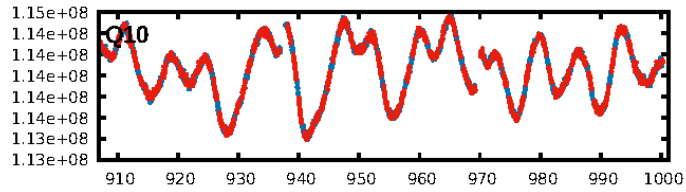
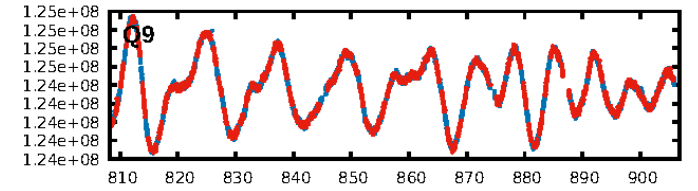
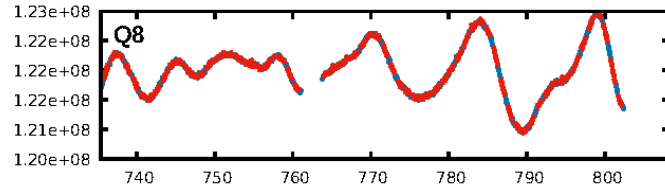
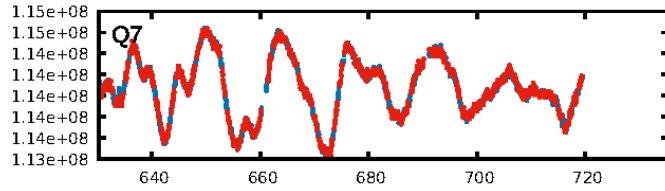
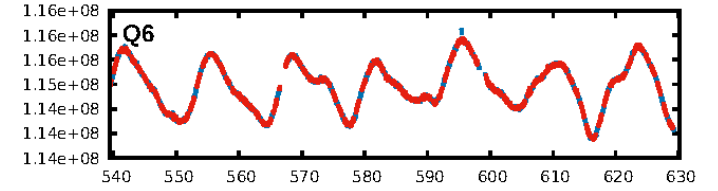
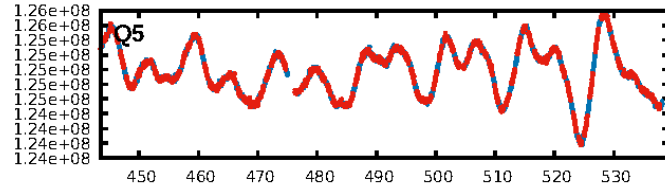
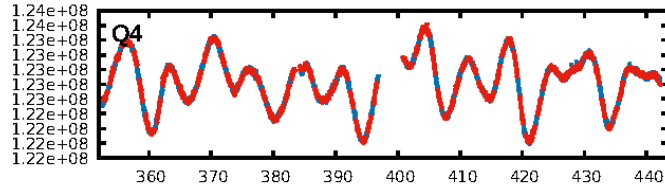
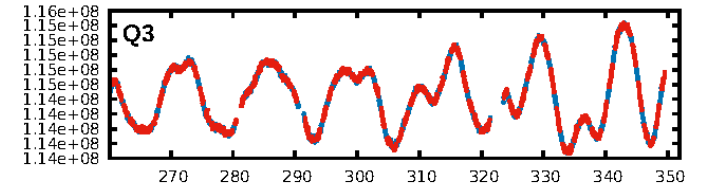
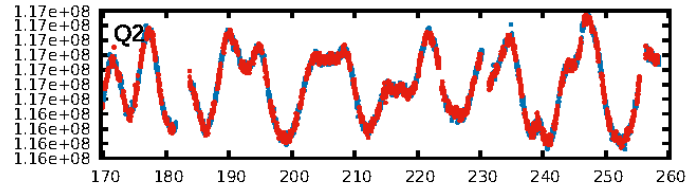
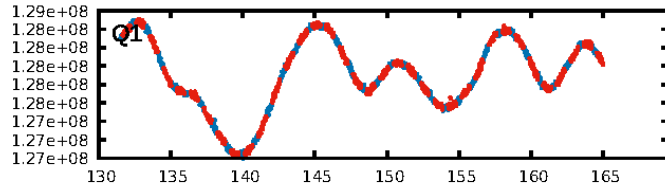
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [20.35 $\sigma$ ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
**Bootstrap-pfa: 8.81e-12**  
RollingBand-fgt: 0.99 [1362/1369]  
**GhostDiagnostic-chr: -0.4544**  
Centroid-sig: 0.0%  
Centroid-so: 3.229 arcsec [3.16 $\sigma$ ]  
OotOffset-rm: 3.208 arcsec [7.27 $\sigma$ ]  
KicOffset-rm: 3.205 arcsec [7.27 $\sigma$ ]  
OotOffset-st: 0/0/0/1 [1]  
KicOffset-st: 0/0/0/1 [1]  
DiffImageQuality-fgm: 0.00 [0/1]  
DiffImageOverlap-fno: 1.00 [17/17]

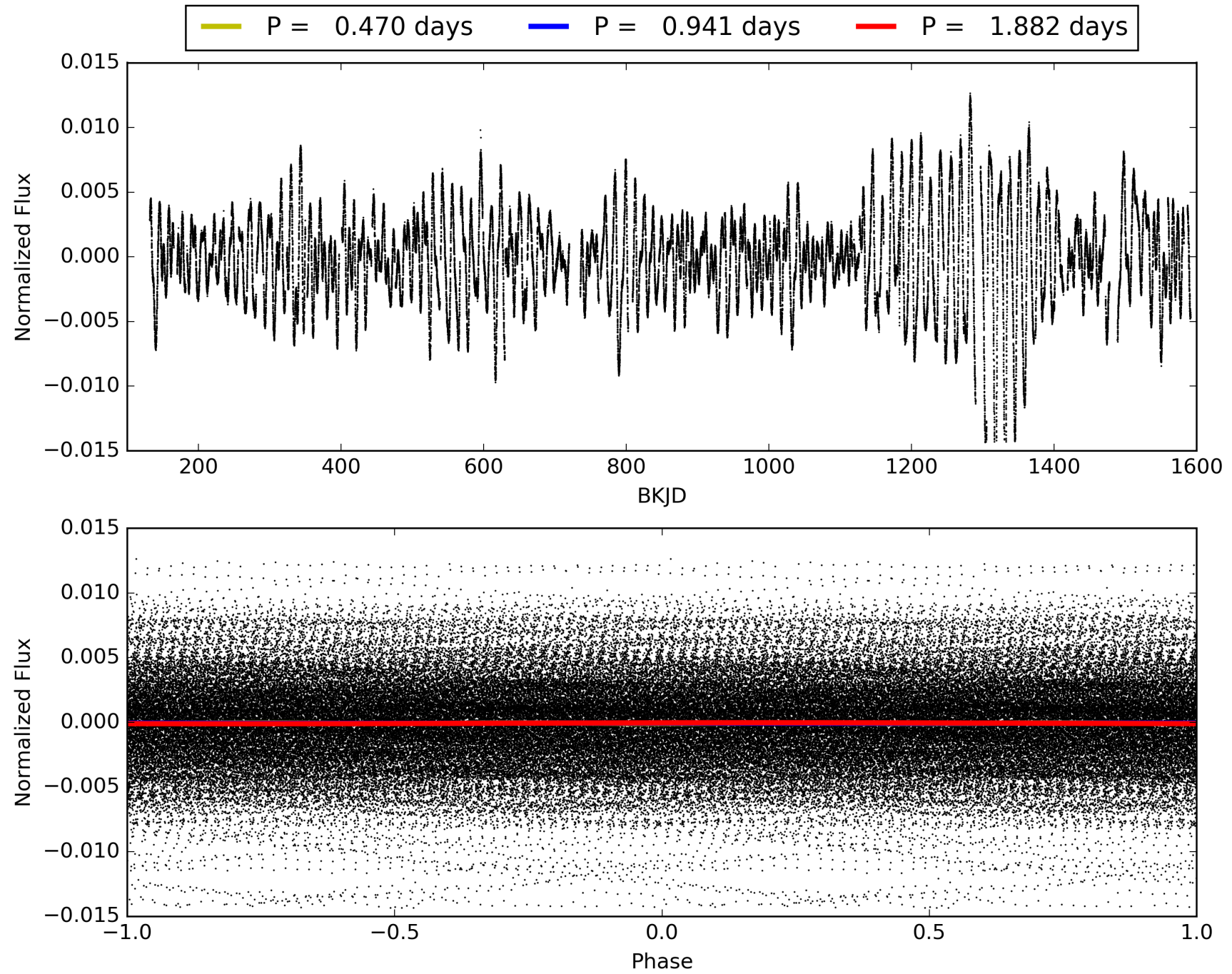
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 08:02:04 Z

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

# TCE 005991070-01, PDC Light Curves



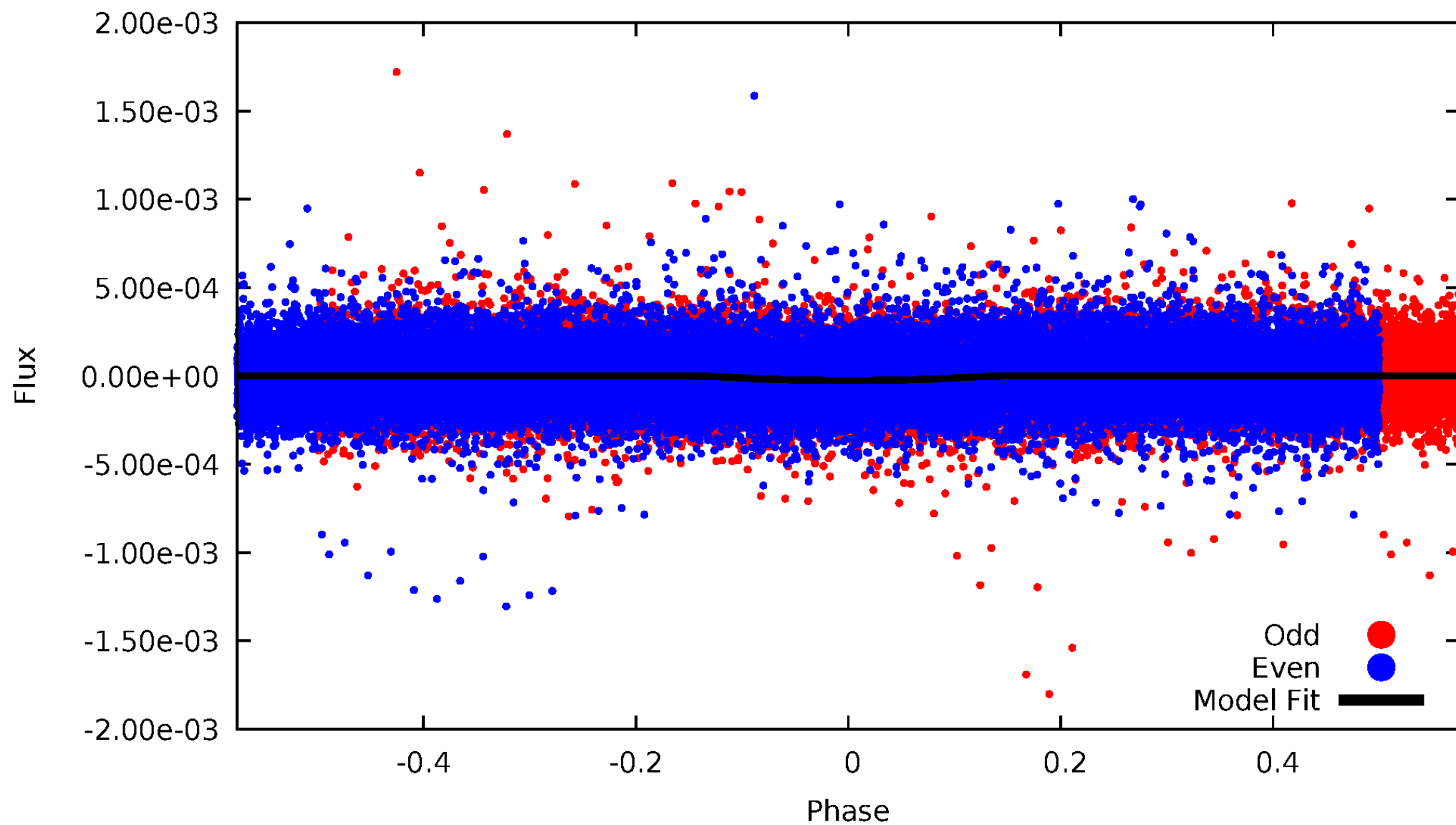
TCE 005991070-01





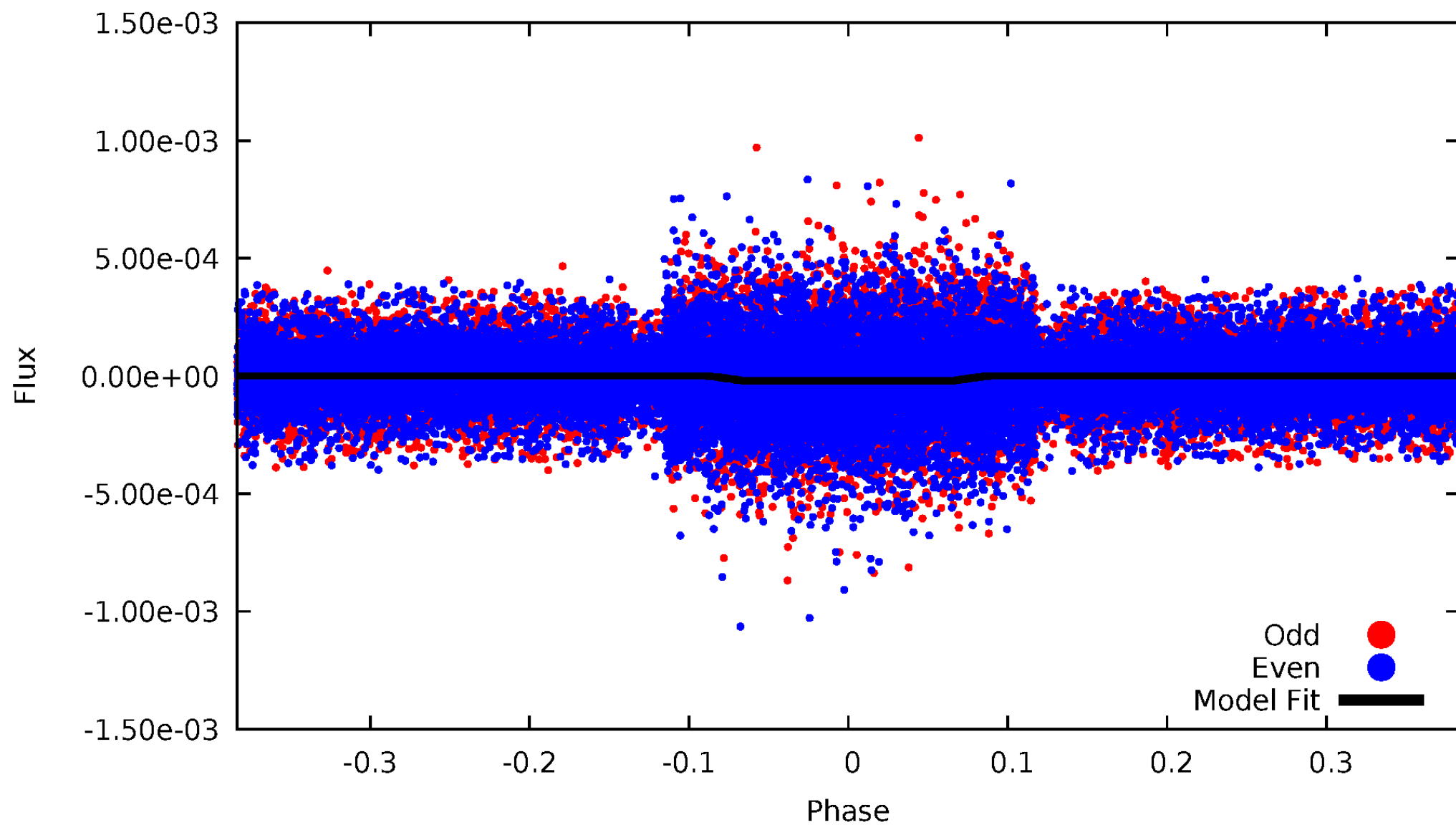
# DV Odd/Even

TCE 005991070-01

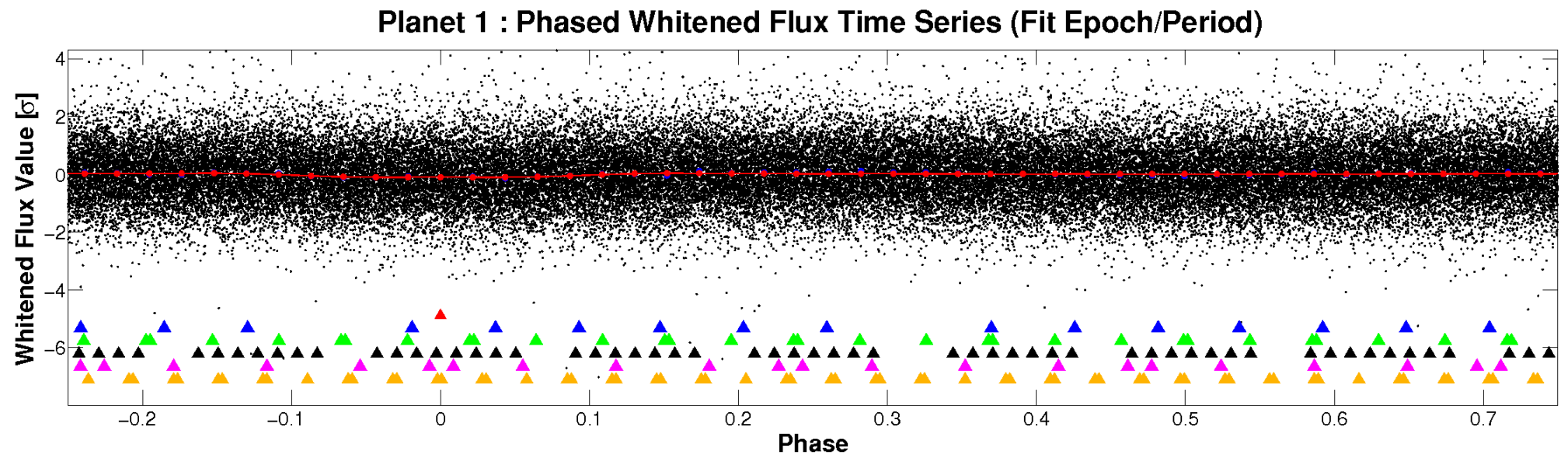
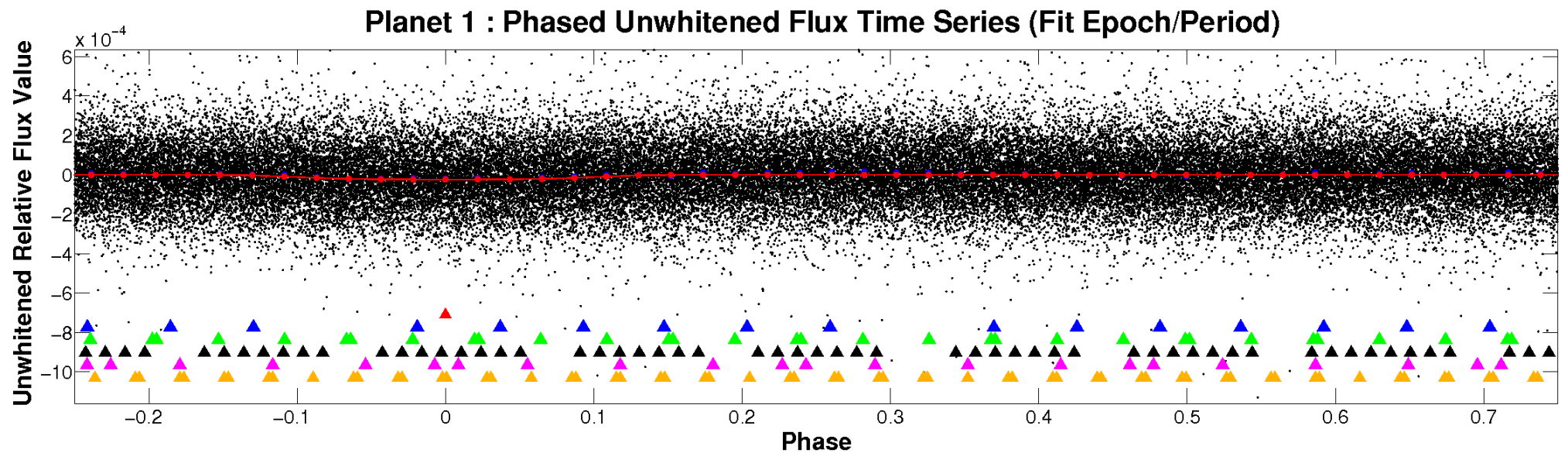


# ALT Odd/Even

TCE 005991070-01

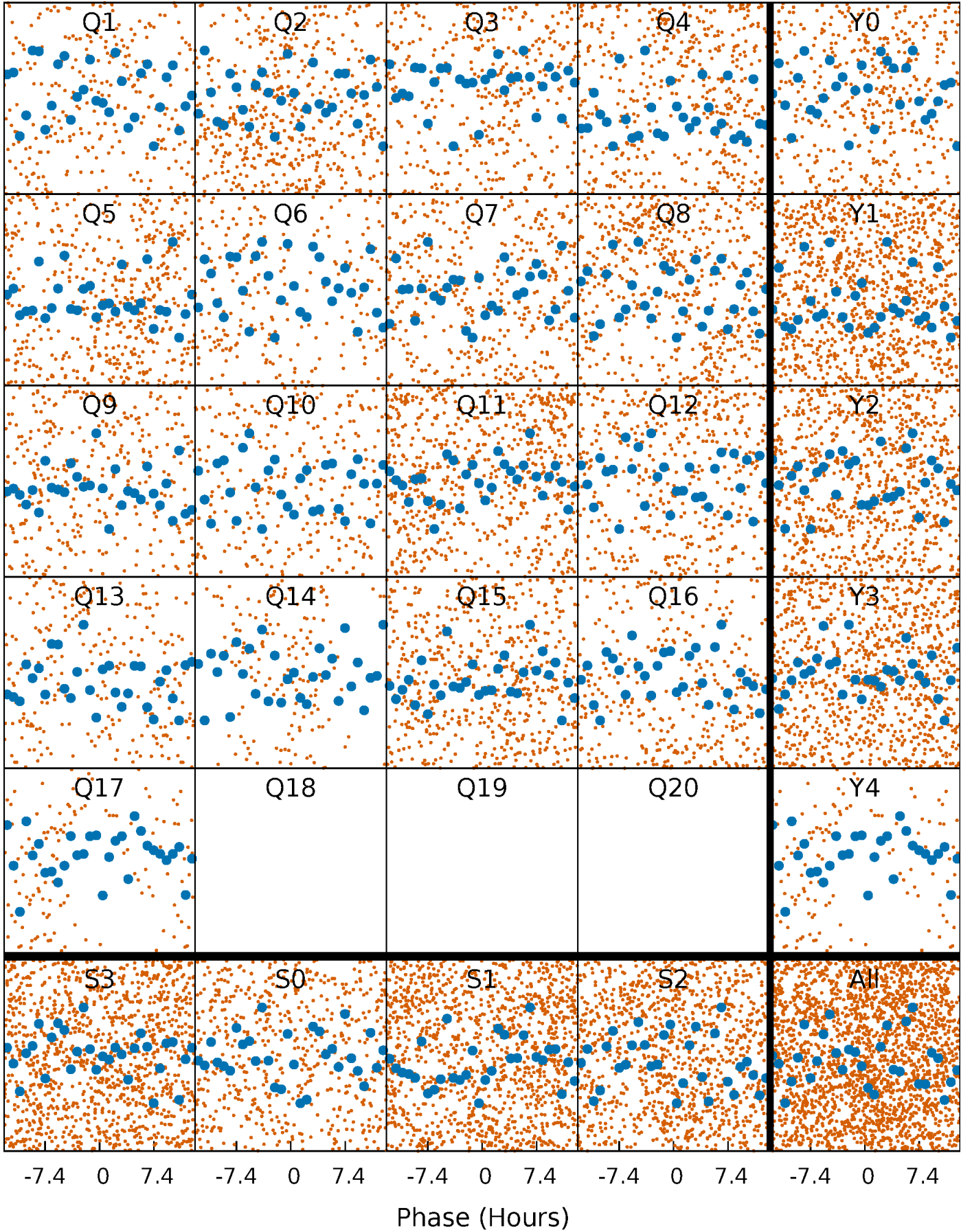


# Non-Whitened Vs. Whitened Light Curve



# PDC Quarter-Phased Transit Curves

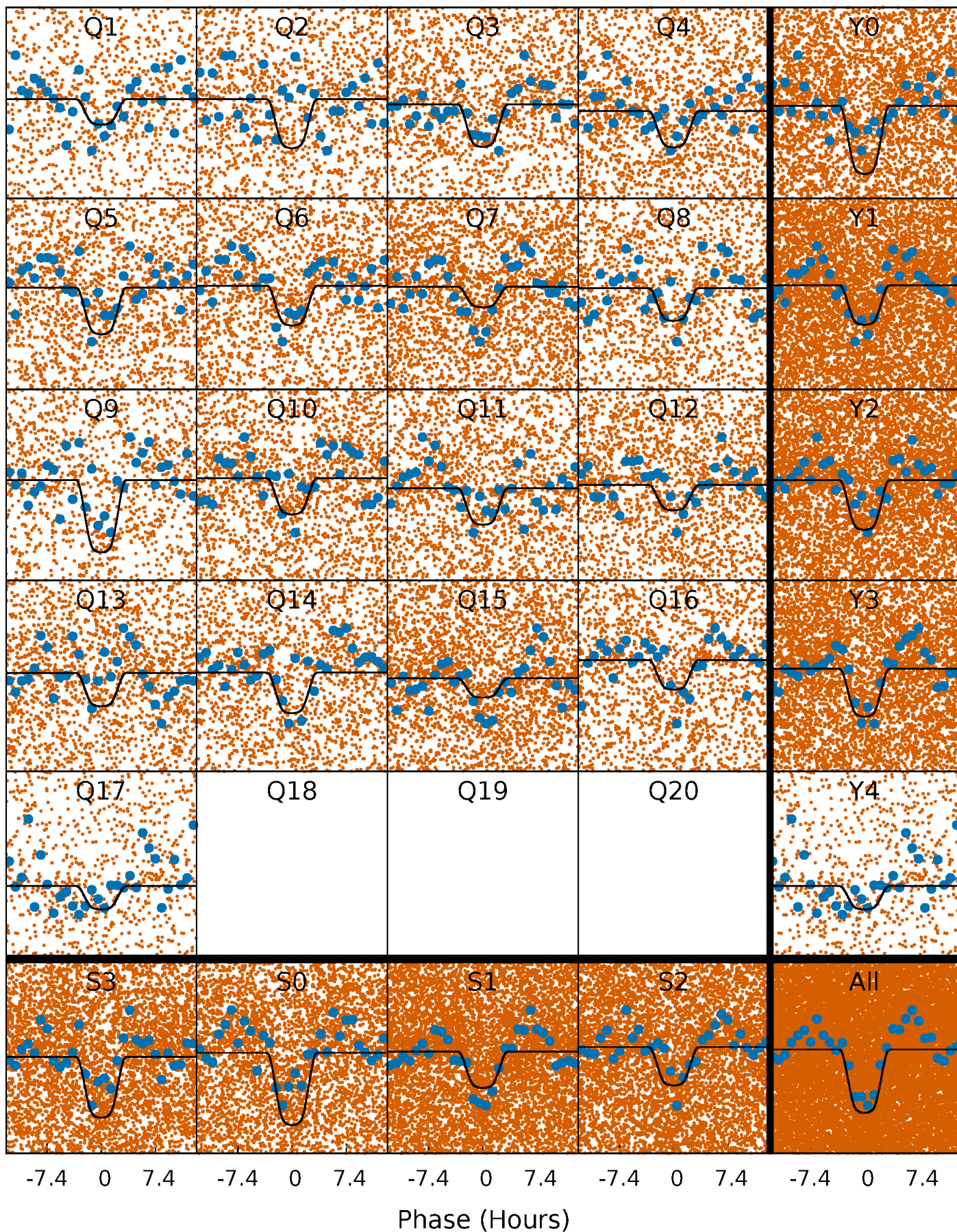
TCE 005991070-01   P= 0.941000 Days    $T_0=131.926402$  (BKJD)





# DV Quarter-Phased Transit Curves

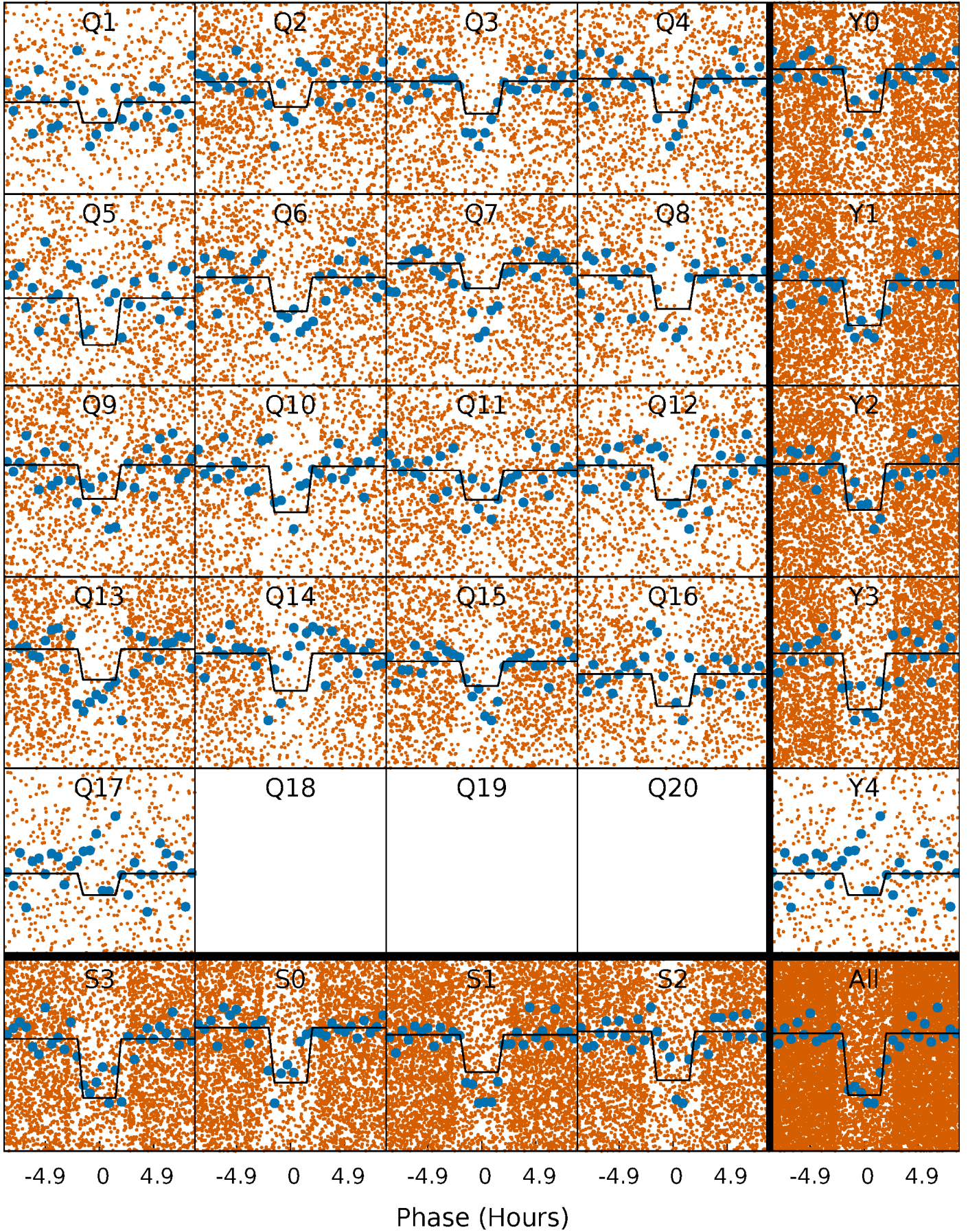
TCE 005991070-01   P= 0.941000 Days    $T_0=131.926402$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

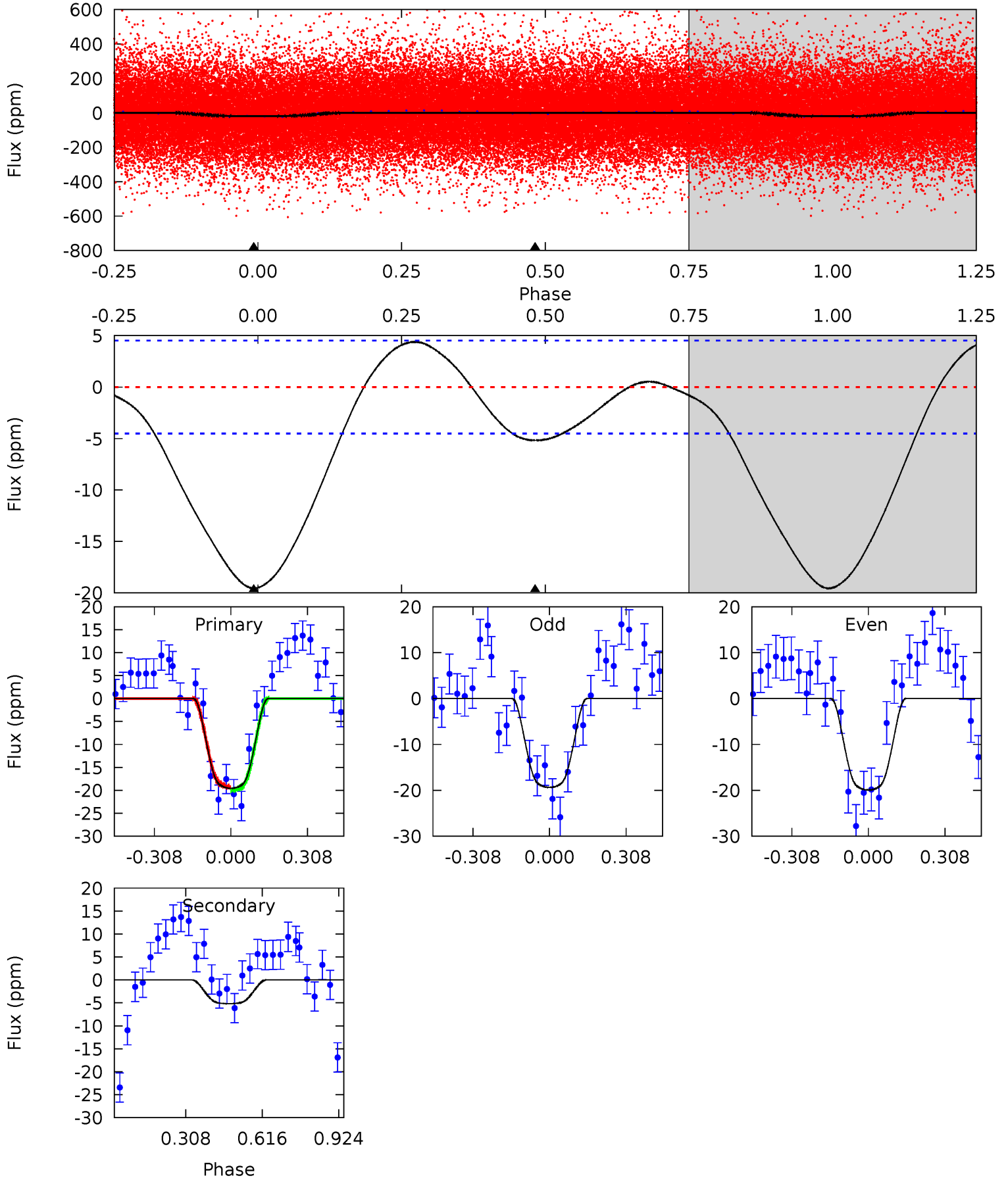
TCE 005991070-01 P= 0.941025 Days  $T_0=131.899441$  (BKJD)



# DV Model-Shift Uniqueness Test

005991070-01, P = 0.941000 Days, E = 130.985402 Days

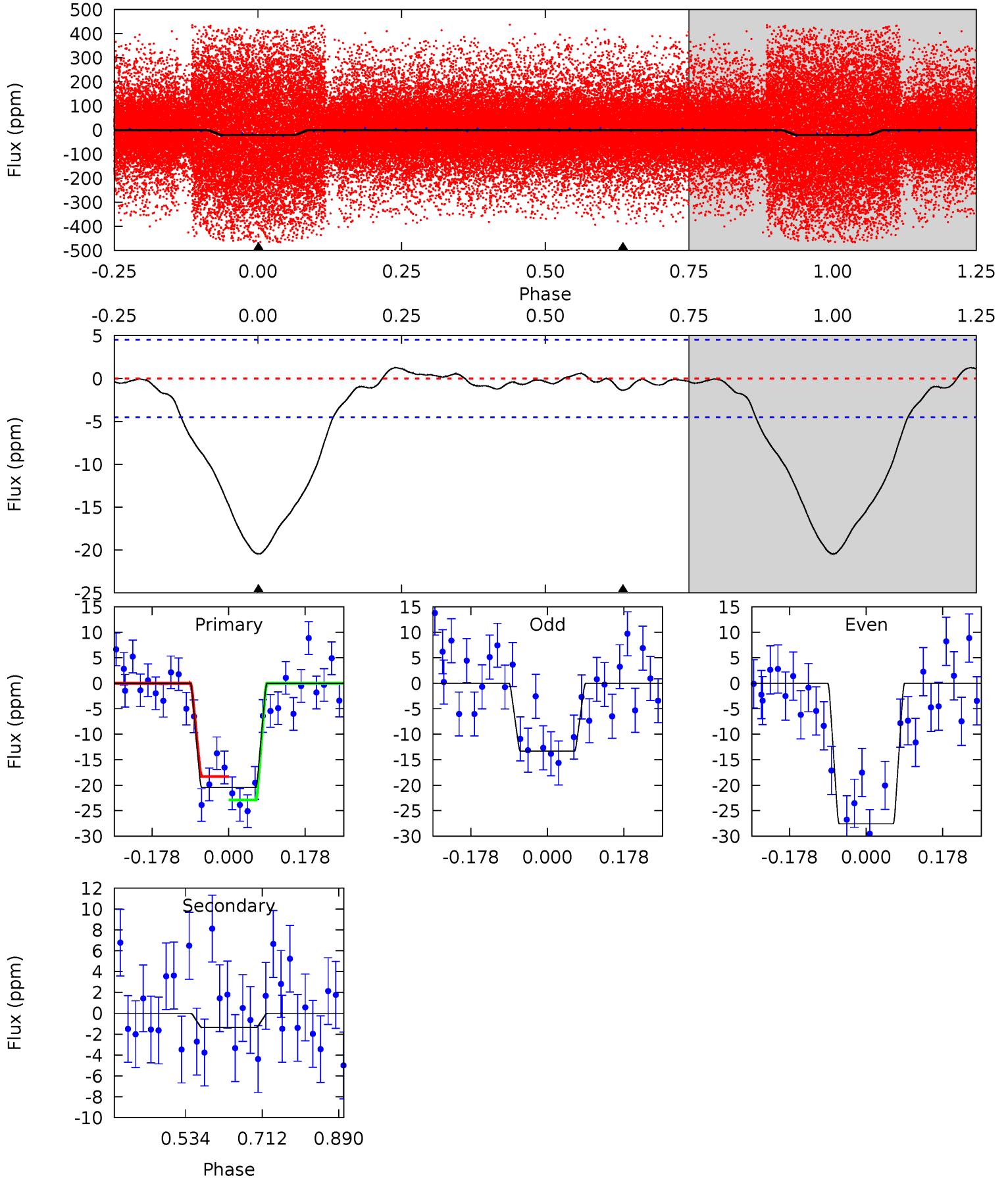
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
18.7	4.96	0	0	4.32	1.02	1.97	18.7	18.7	4.96	4.96	0.27	0.92	0.18	0.35



# Alt Model-Shift Uniqueness Test

005991070-01, P = 0.941025 Days, E = 130.958416 Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
20.1	1.34	0	0	4.44	1.35	0.74	20.1	20.1	1.34	1.34	6.98	1.19	0.06	2.29





### Stellar Parameters For KIC 005991070

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$\rho_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5766^{+173}_{-144}$	$3.783^{+0.330}_{-0.110}$	$-0.080^{+0.350}_{-0.250}$	$2.409^{+0.423}_{-0.986}$	$1.283^{+0.143}_{-0.310}$	$0.129^{+0.312}_{-0.044}$
	+3%/-2%	+9%/-3%	+438%/-312%	+18%/-41%	+11%/-24%	+242%/-34%
Source	PHO1	FLK73	KIC0	DSEP		

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

### Secondary Eclipse Parameters for KIC 005991070-01 / KOI 7756.01

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-5 \pm 1$	$1.63^{+0.26}_{-0.32}$	$3813^{+239}_{-378}$	$3186^{+387}_{-884}$	$0.444^{+0.237}_{-0.134}$
Alt.	$-1 \pm 1$	$1.16^{+0.21}_{-0.24}$	$3815^{+238}_{-339}$	$-2830^{+6050}_{-652}$	$0.240^{+0.251}_{-0.183}$

$T_{\text{max}}$  = Theoretical Maximum Planetary Temperature  
 $T_{\text{obs}}$  = Observed Planetary Temperature (Assuming  $A=0.3$ )  
 $A_{\text{obs}}$  = Observed Albedo (Assuming  $T=0$ )

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

## DV Centroid Data

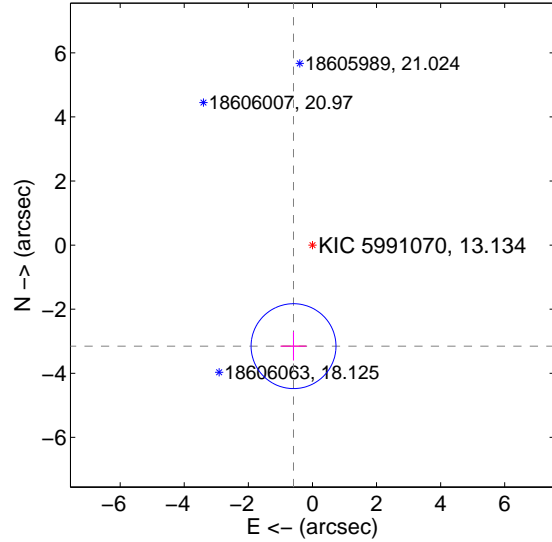
Supplemental centroid analysis for 005991070-01. Kepler magnitude: 13.13. Transit SNR 10.79

There are 0 quarters with good PRF difference image offsets

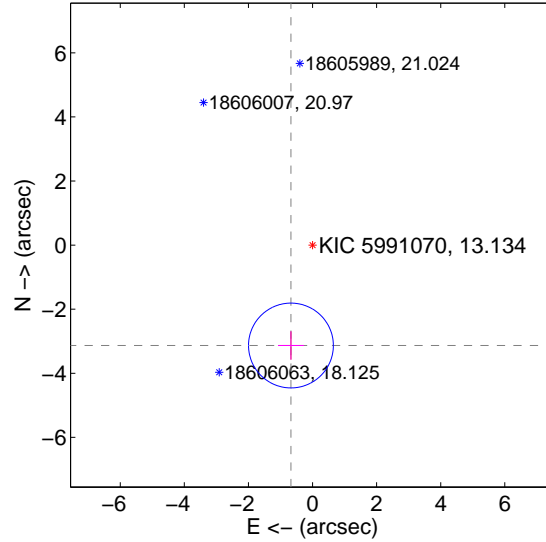
The direct PRF centroid is offset from the target star catalog position by about 0.09 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$3.208 \pm 0.442$	7.27	$0.590 \pm 0.404$	$-3.153 \pm 0.443$
PRF-fit source offset from KIC position	$3.205 \pm 0.441$	7.27	$0.673 \pm 0.404$	$-3.133 \pm 0.443$
photometric centroid source offset	$3.23 \pm 1.02$	3.16	$-2.53 \pm 1.07$	$2.01 \pm 0.94$

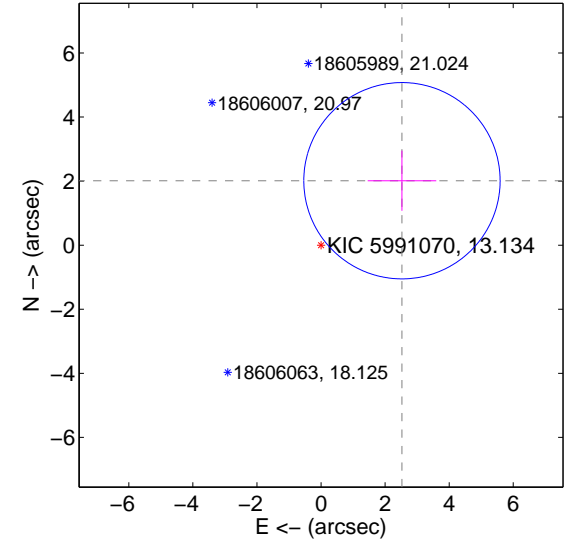
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

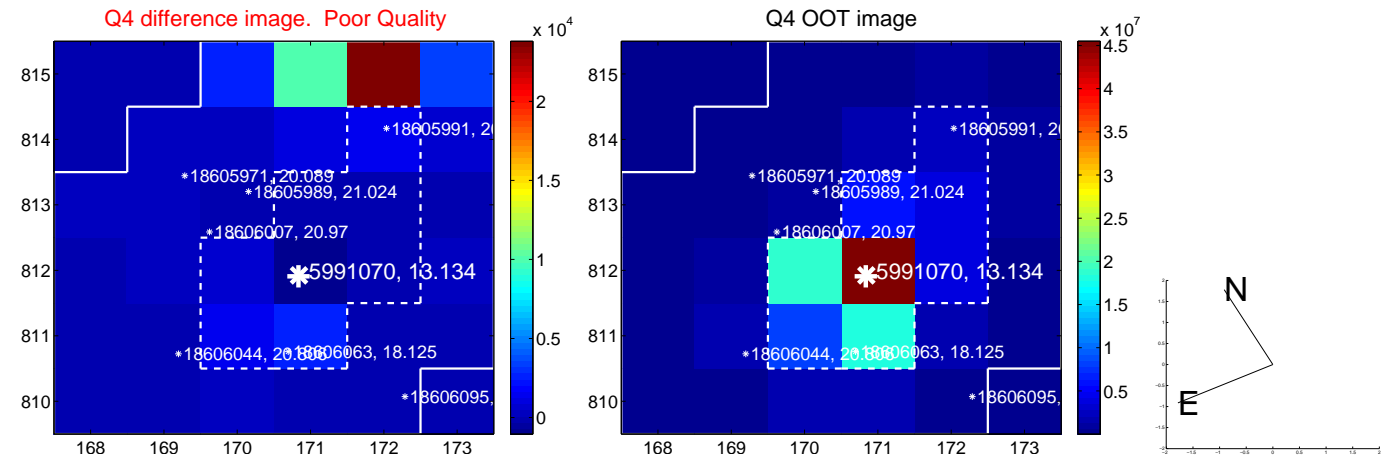
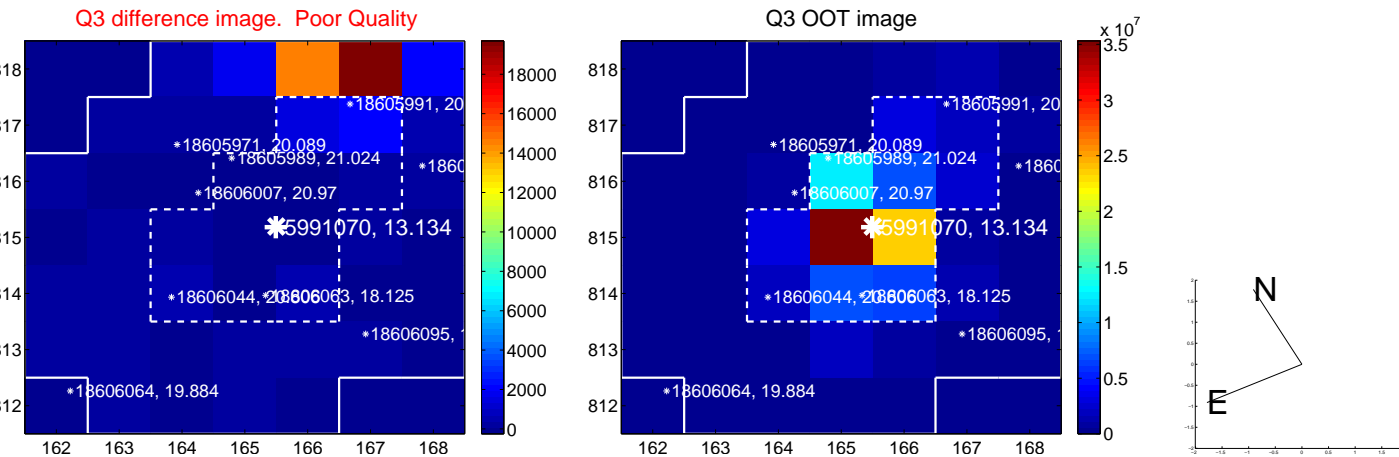
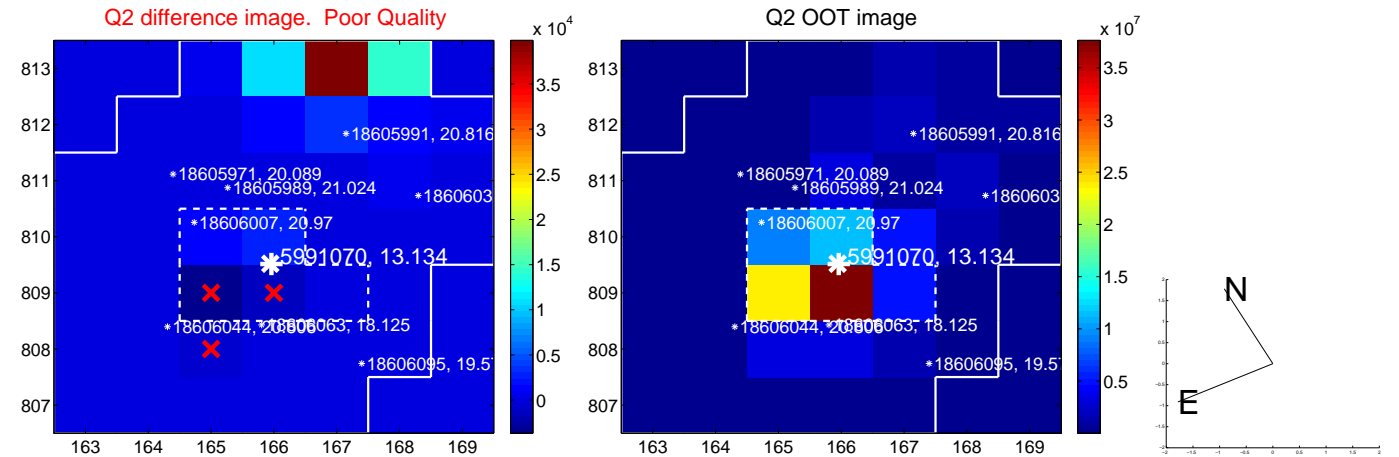
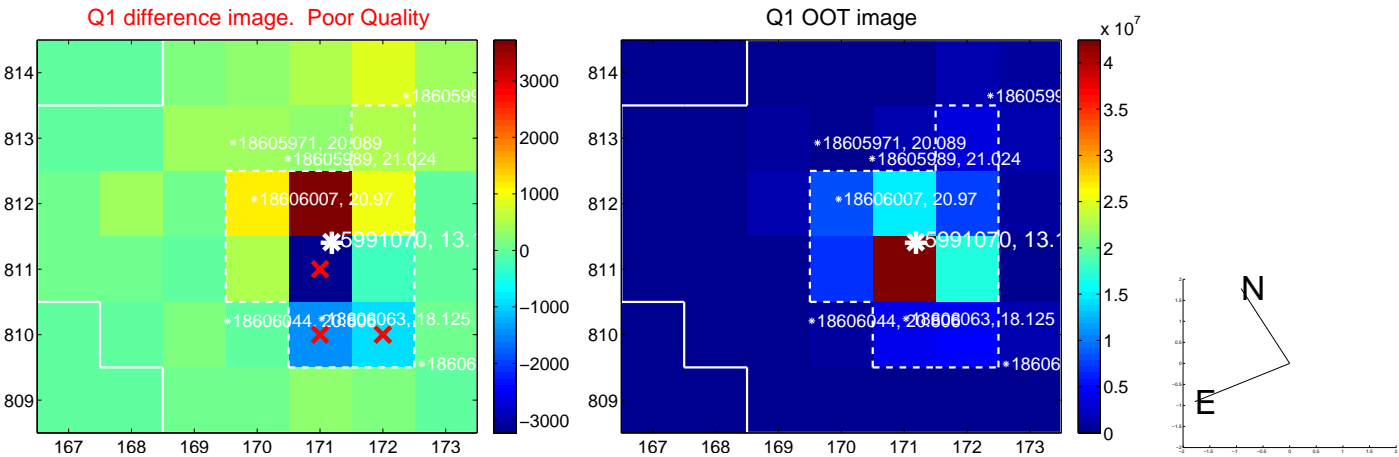


offset from photometric centroids

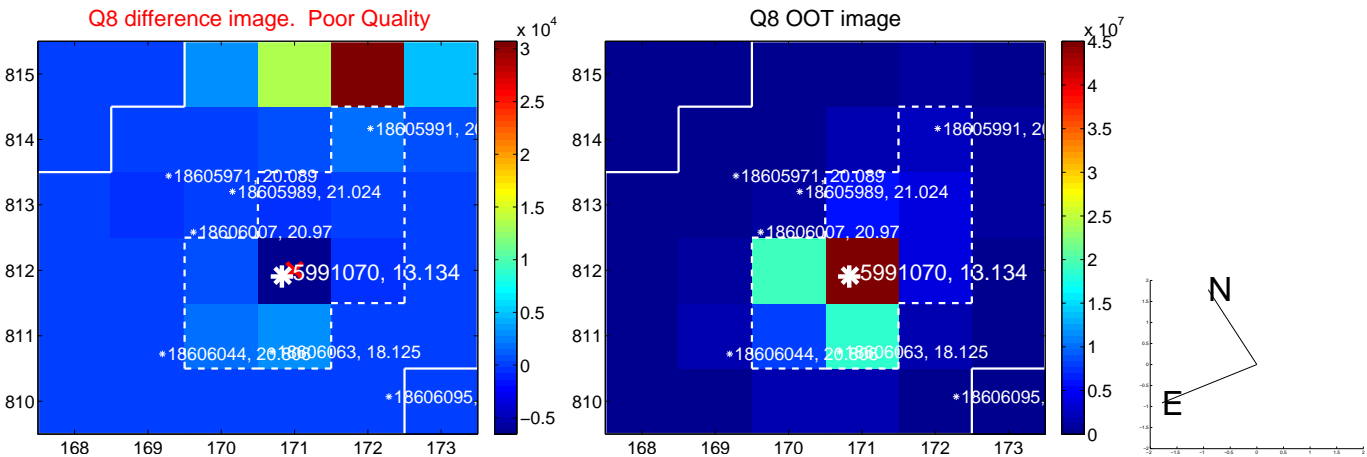
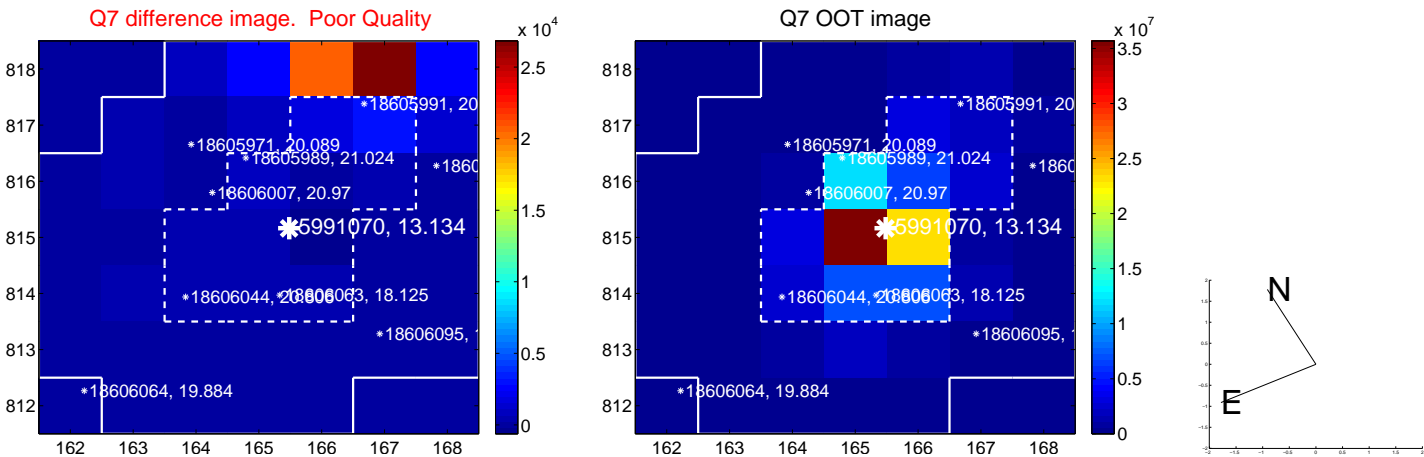
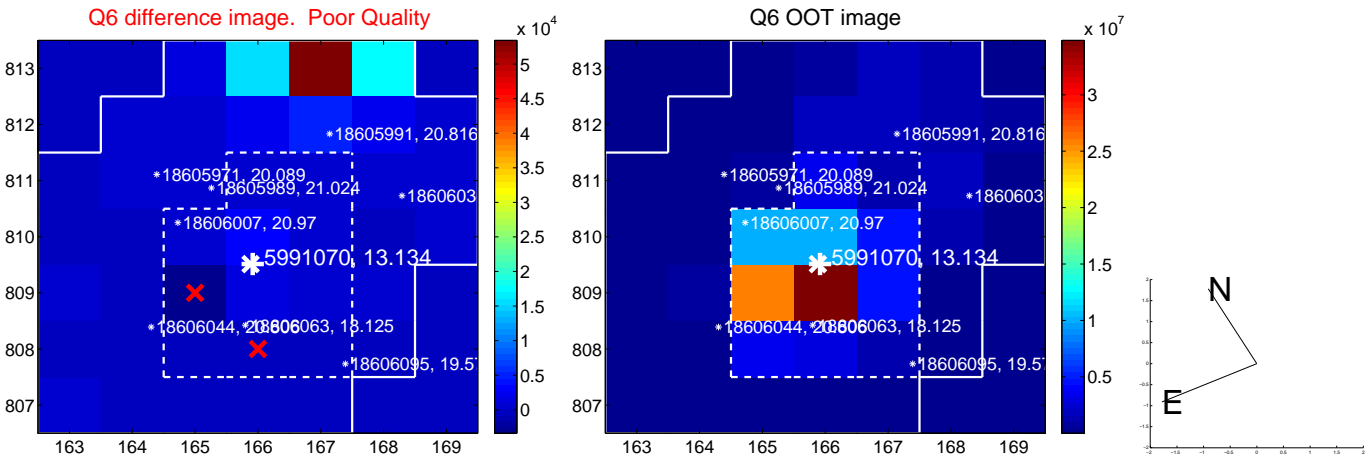
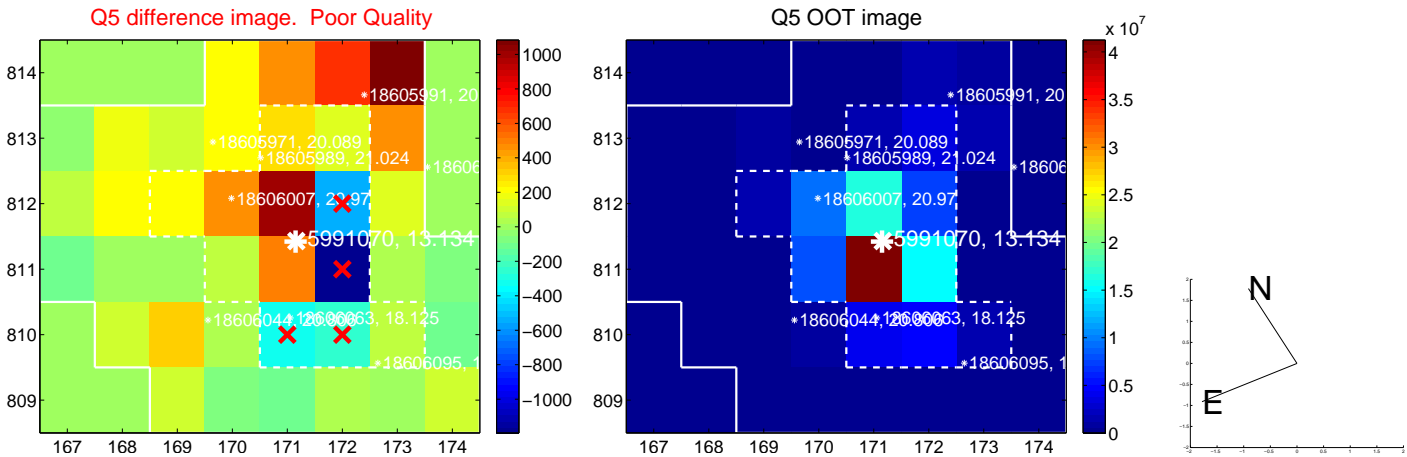


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

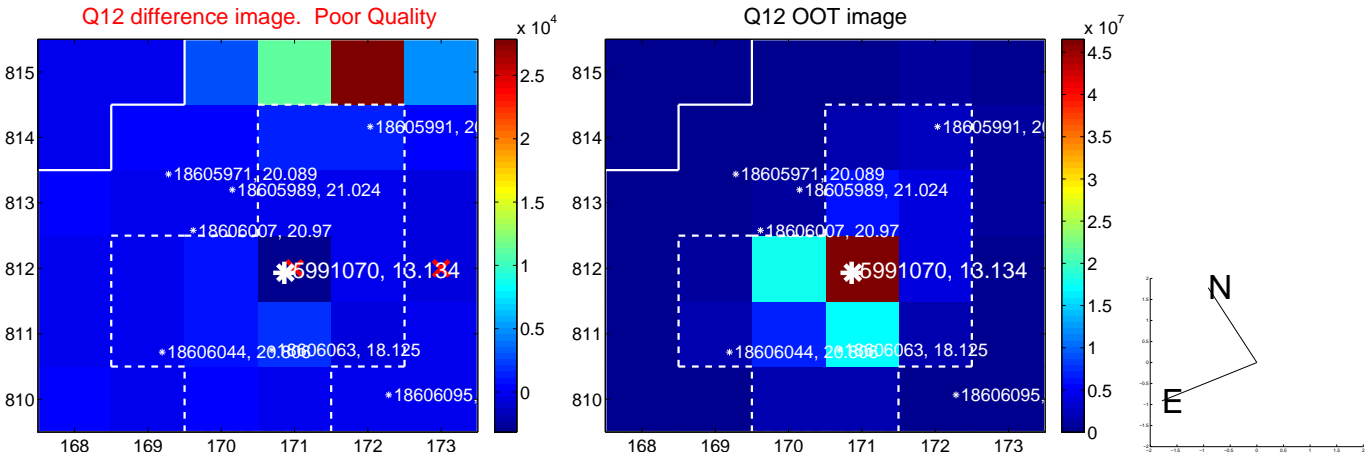
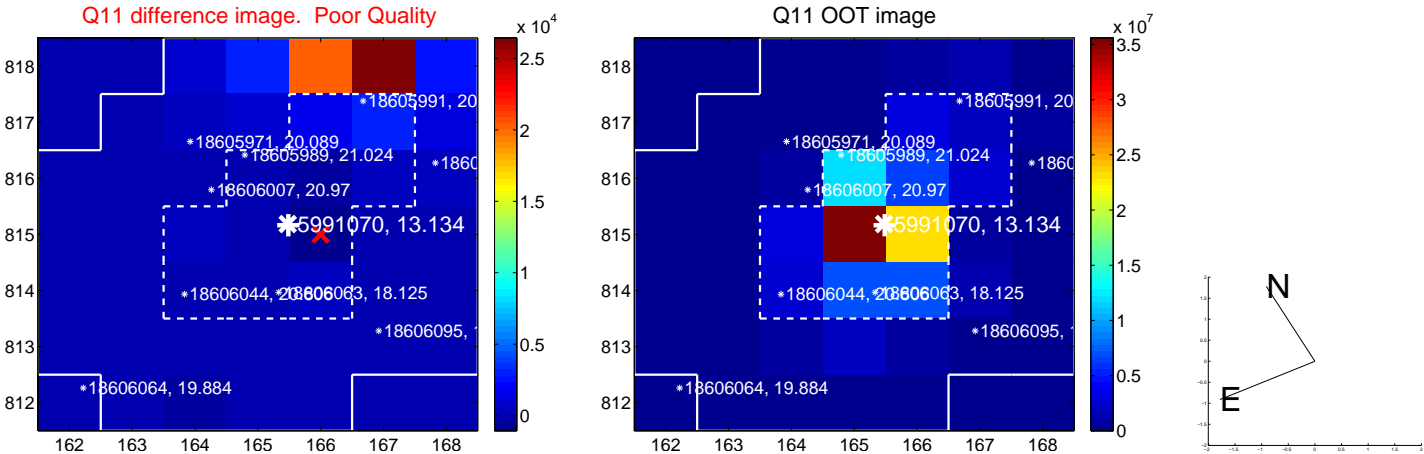
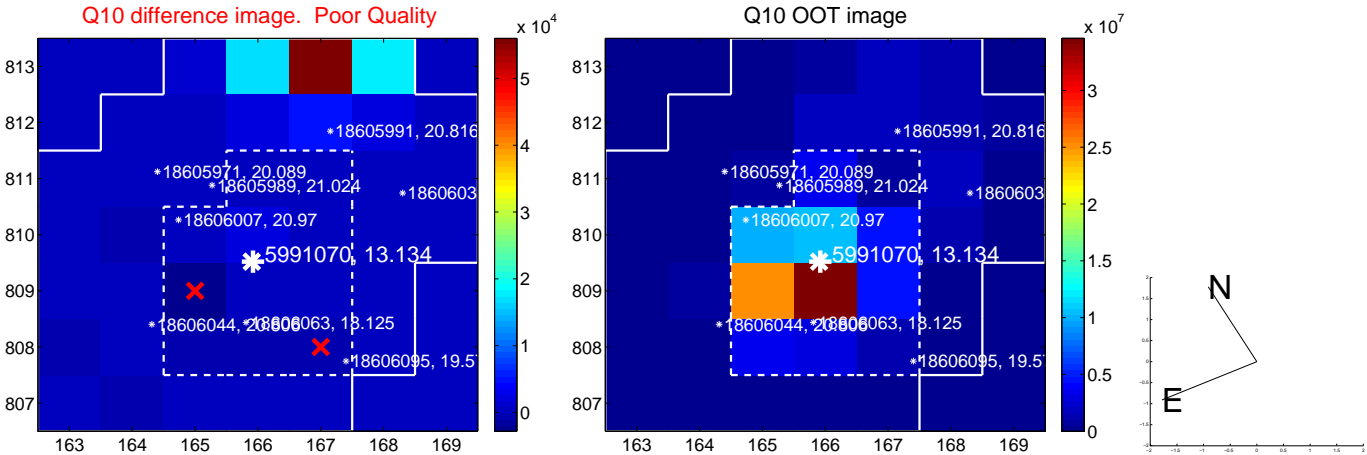
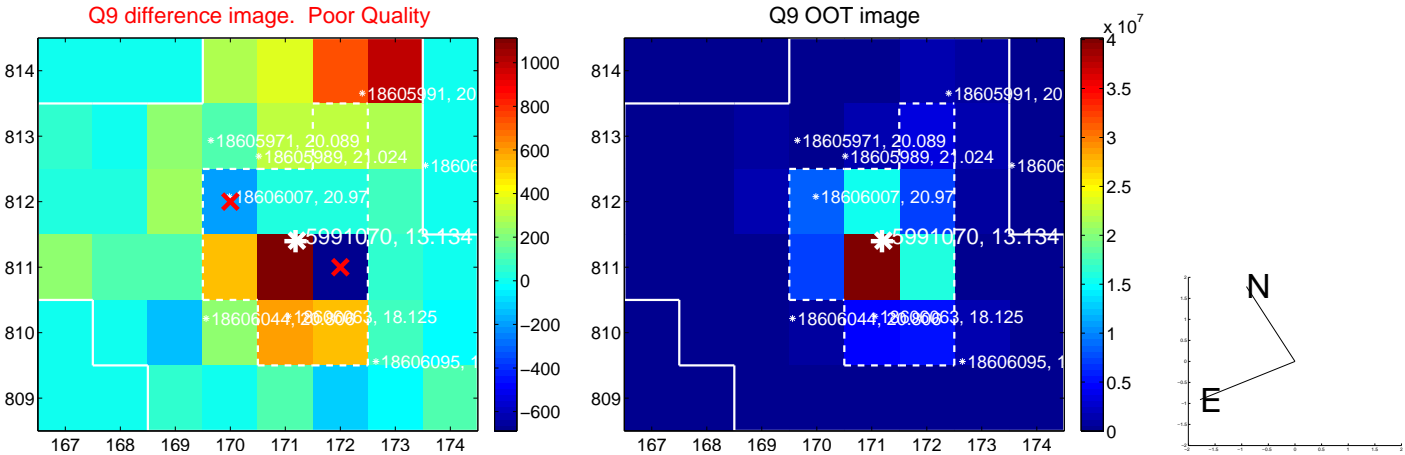


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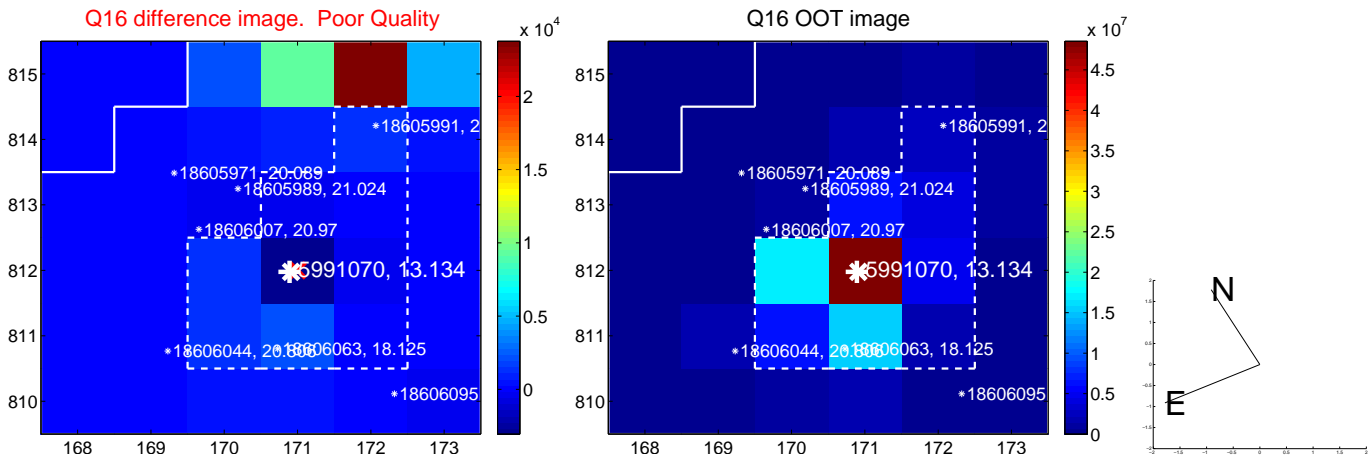
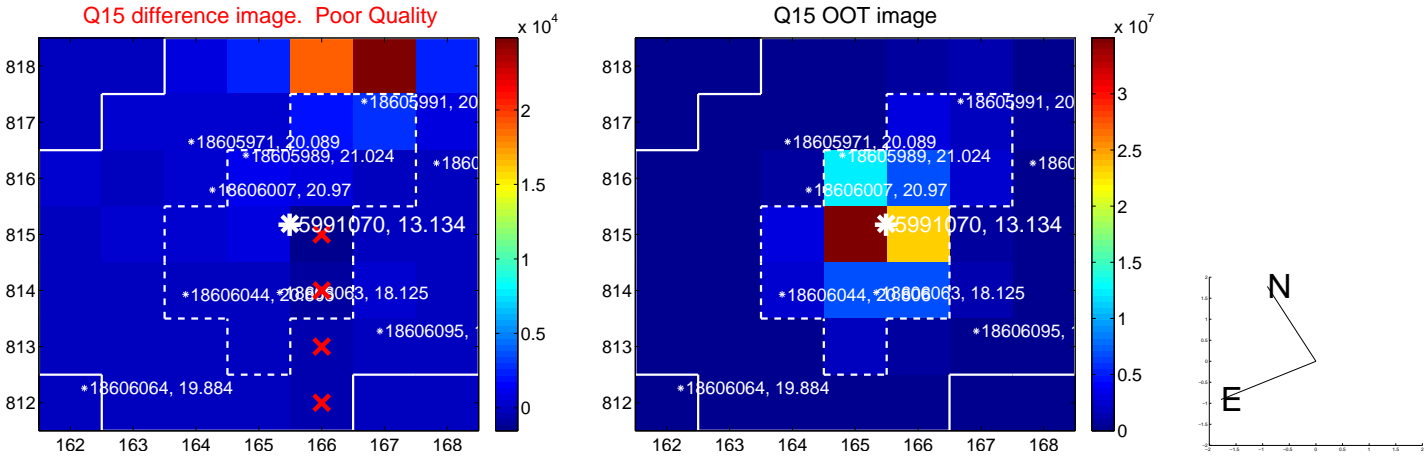
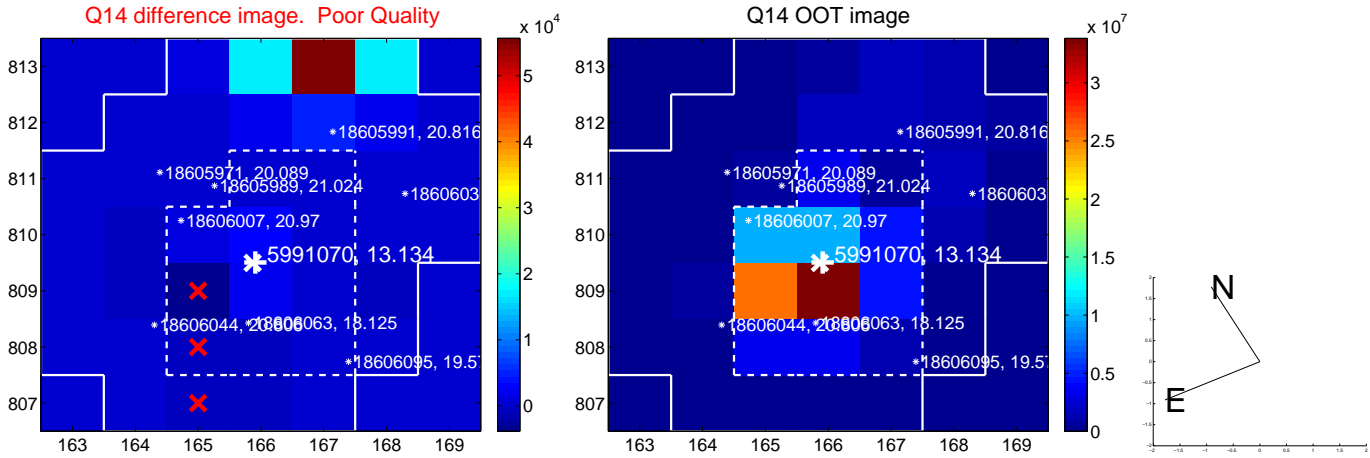
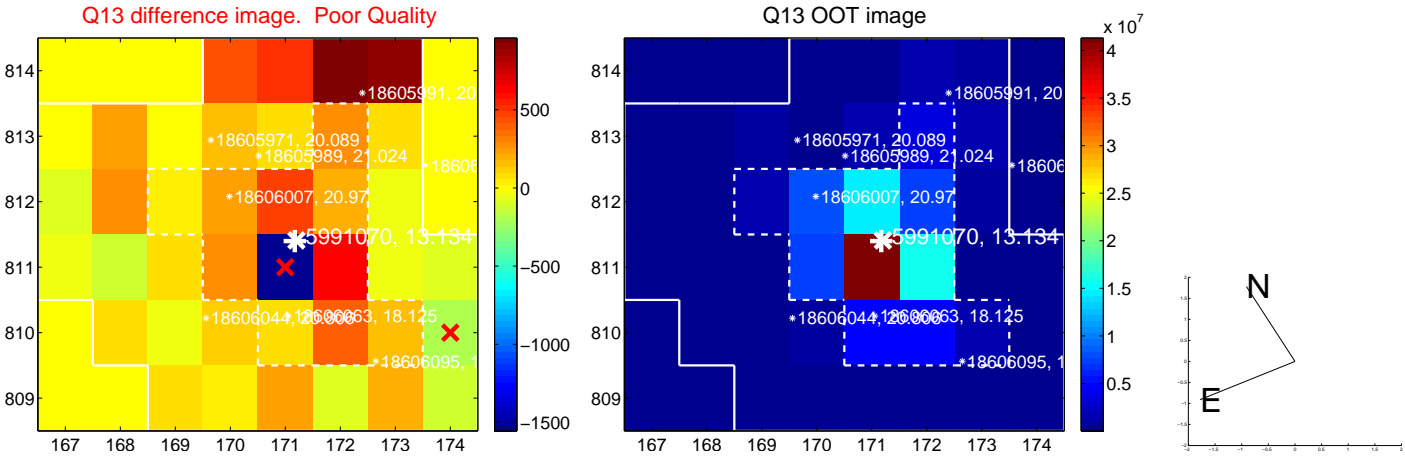




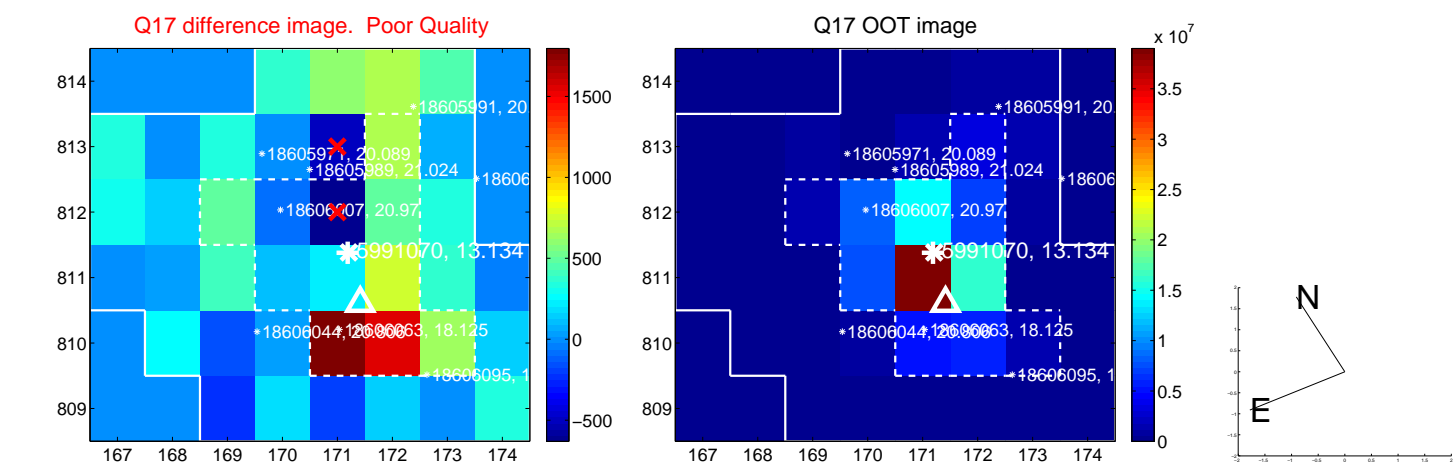
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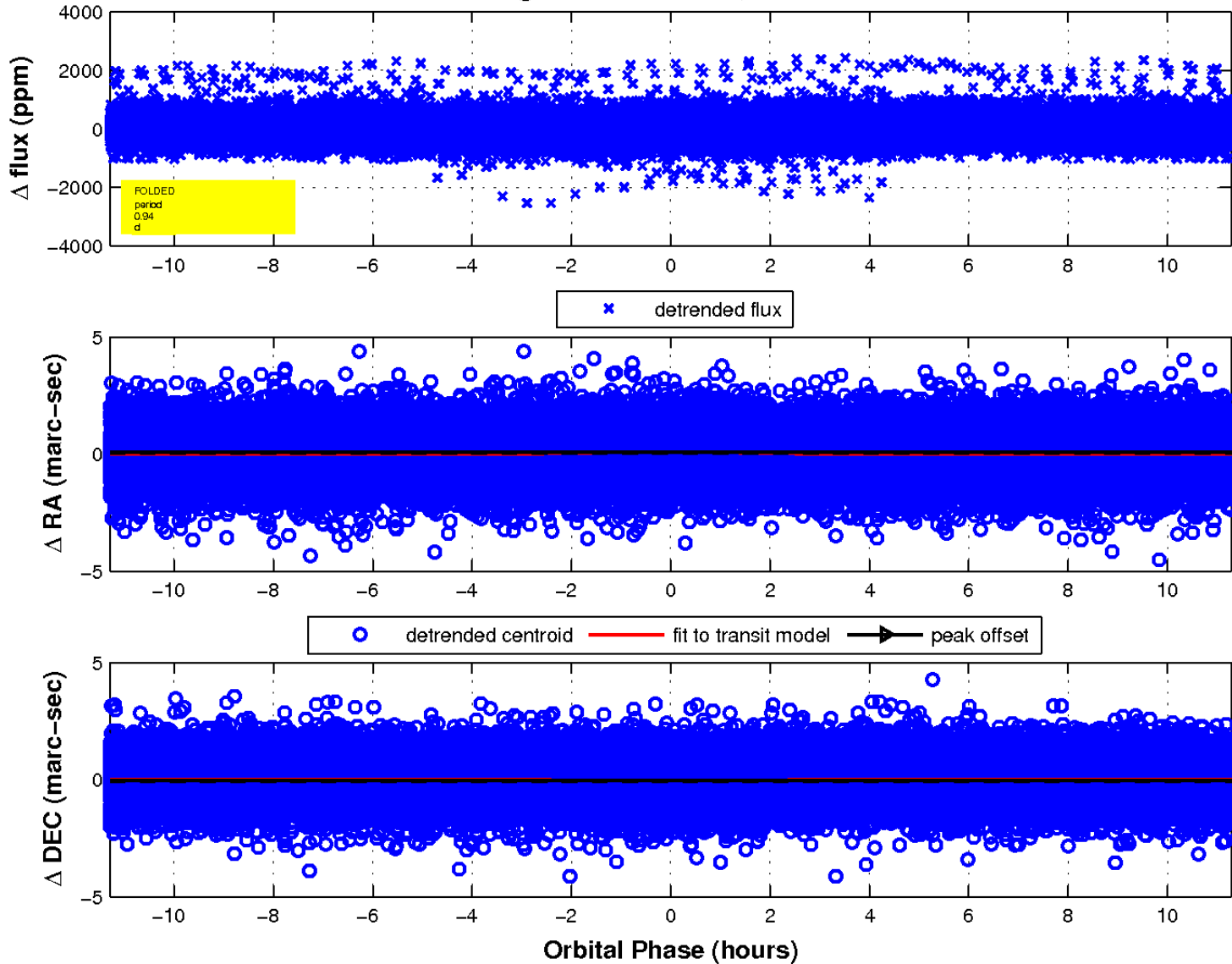
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

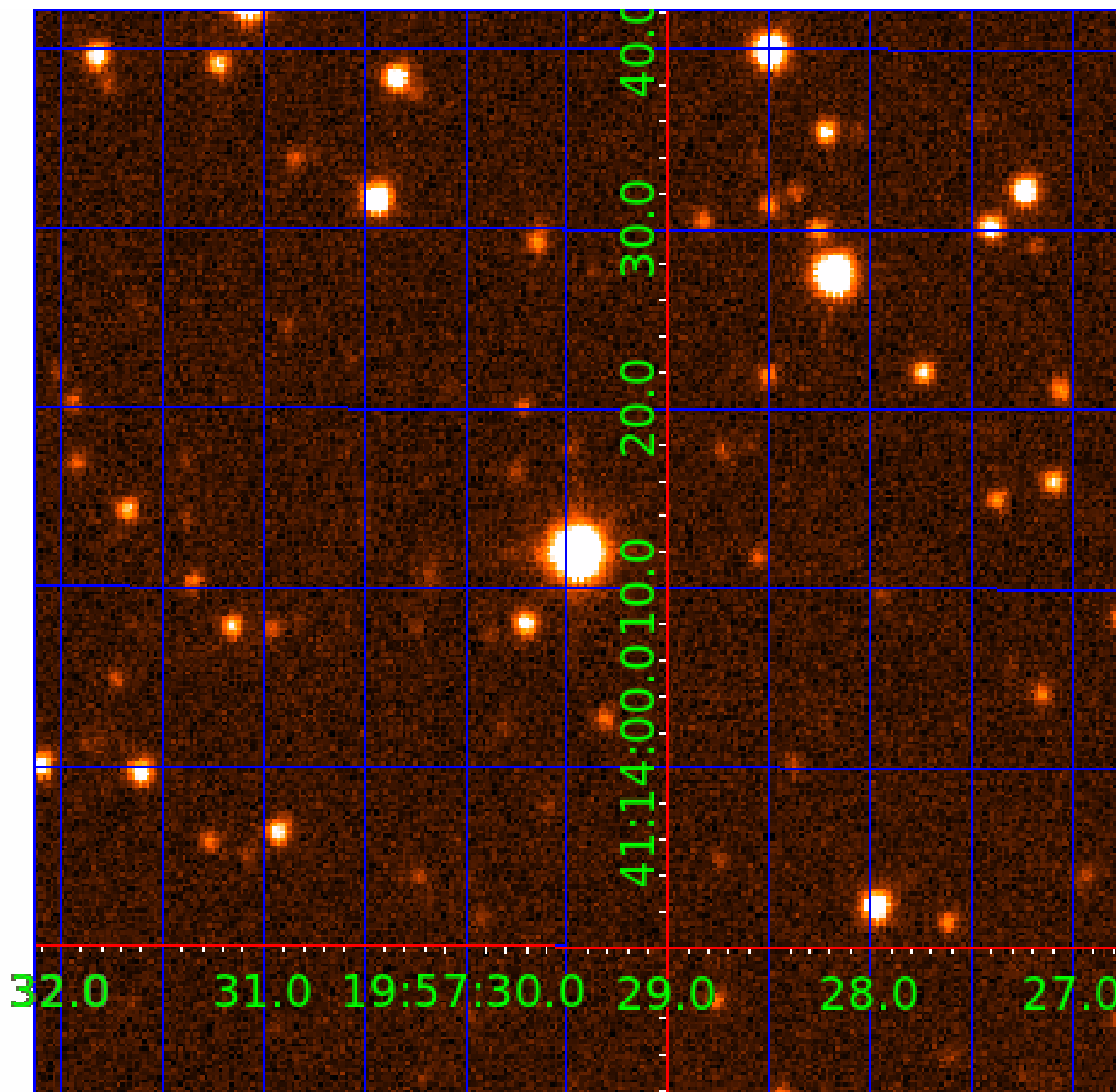


fluxWeightedCentroids, Planet 1 of 6



UKIRT Image

Declination





# KIC 005991070

## Q1-17 DR25 TCE Parameters

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005991070-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_TER_ALT—MOD_POS_ALT—CENT_FEW_DIFFS
005991070-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_ZUMA—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
005991070-06	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT

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

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

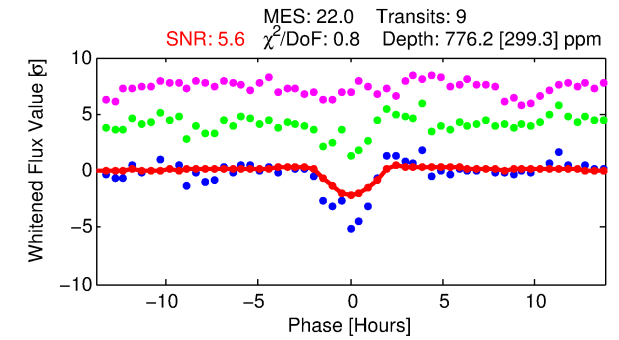
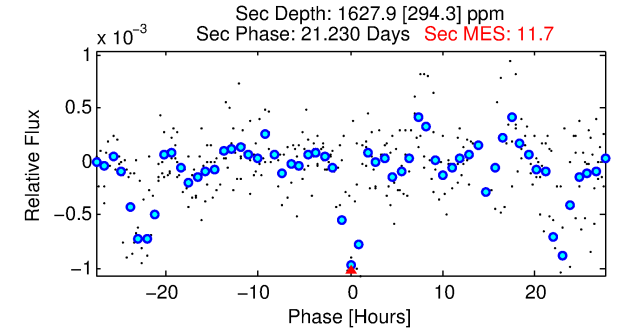
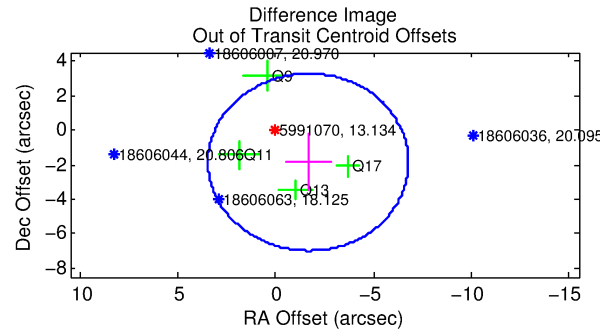
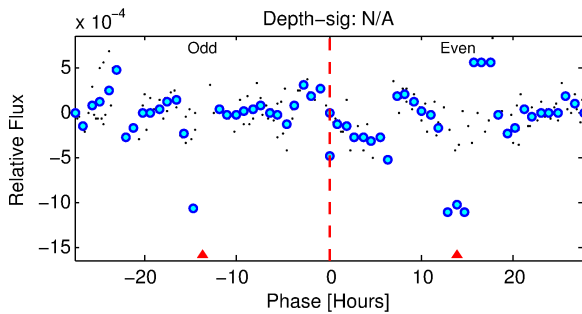
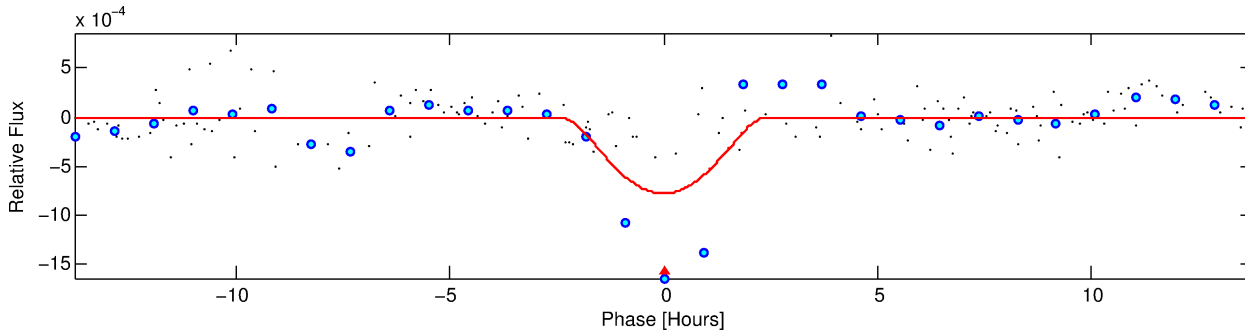
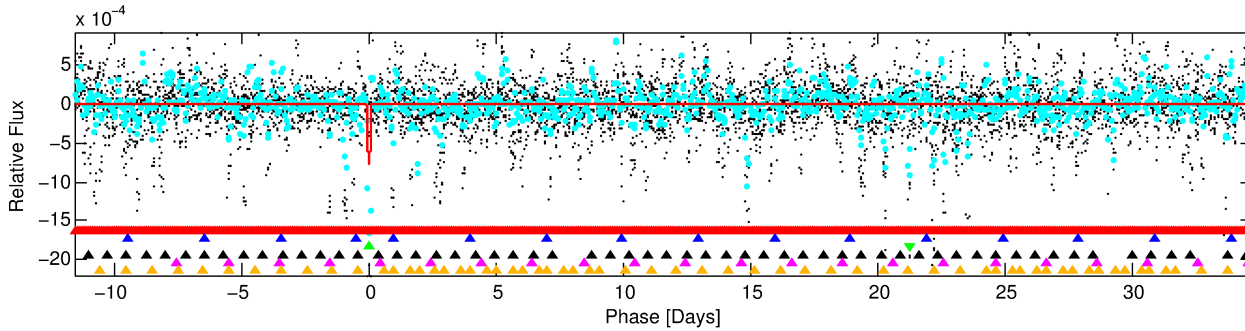
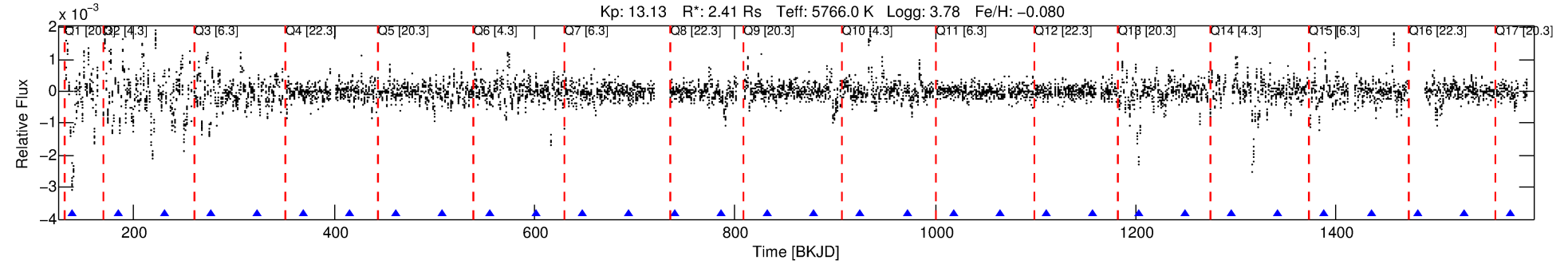
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 005991070-03

No Significant Match Found

# DV One-Page Summary

KIC: 5991070 Candidate: 3 of 6 Period: 46.313 d



## DV Fit Results:

Period = 46.31344 [0.00069] d  
Epoch = 138.0444 [0.0102] BKJD  
Rp/R\* = 0.0501 [0.2142]  
a/R\* = 24.74 [25.68]  
b = 1.00 [0.30]  
Seff = 76.33 [44.86]  
Teq = 754 [111] K  
Rp = 13.17 [56.57] Re  
a = 0.2744 [0.1022] AU  
Ag = 388.58 [3330.37] [0.12] $\sigma$   
Teffp = 5174 [11062] K [0.40] $\sigma$

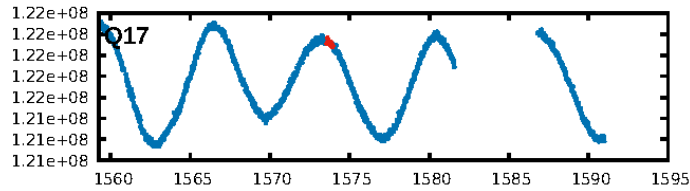
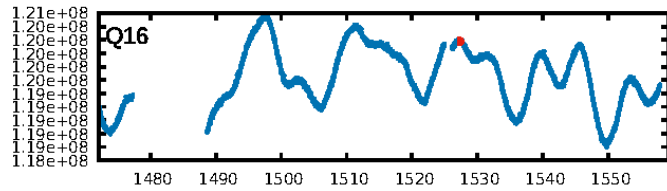
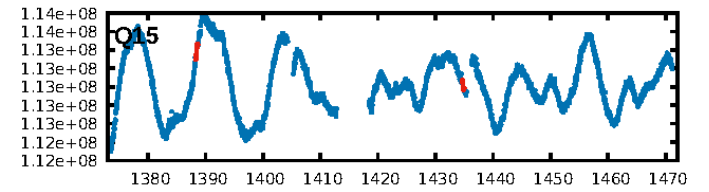
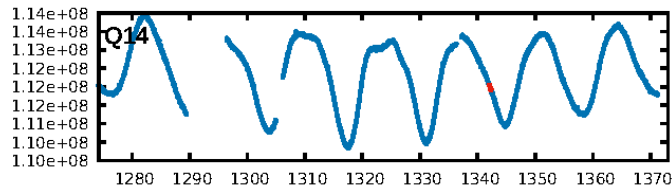
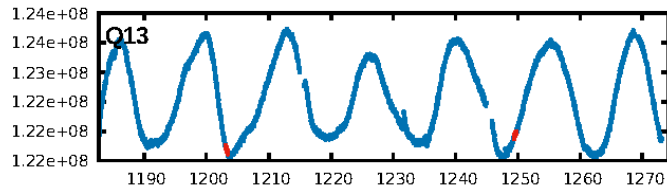
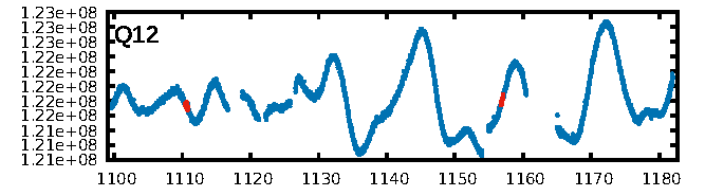
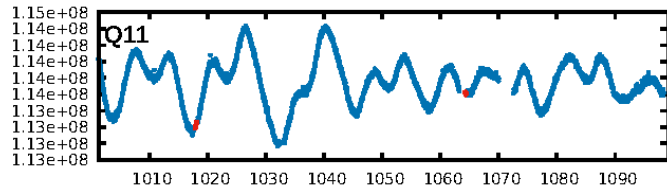
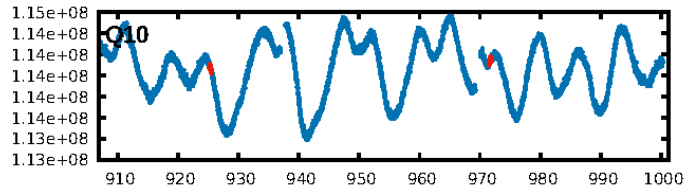
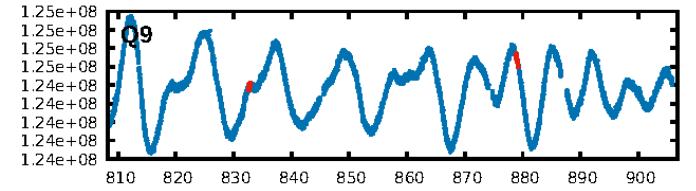
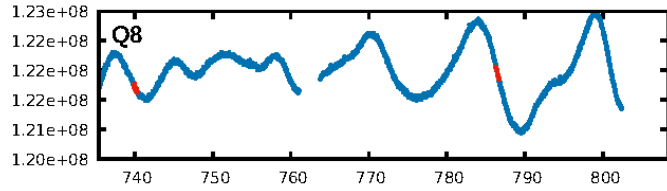
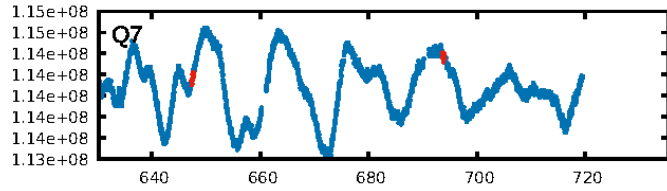
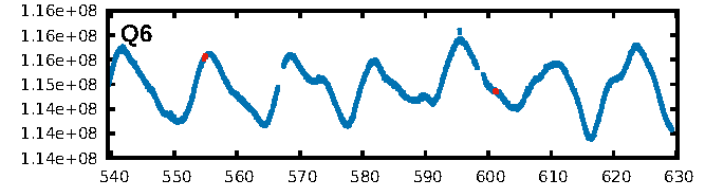
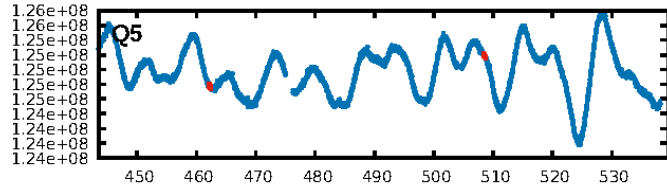
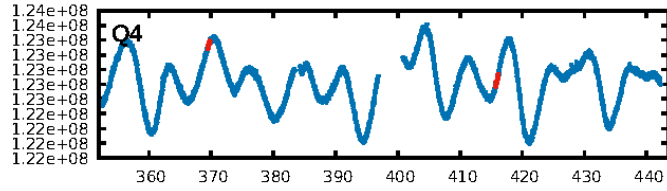
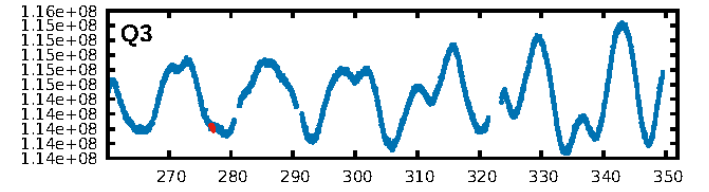
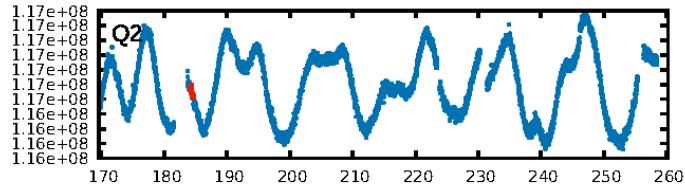
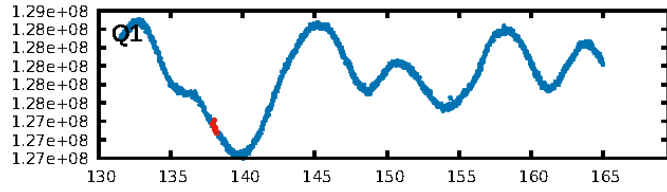
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [32.87] $\sigma$   
LongPeriod-sig: 100.0% [97.57] $\sigma$   
ModelChiSquare2-sig: 0.7%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 2.23e-67  
RollingBand-fgt: 1.00 [8/8]  
GhostDiagnostic-chr: 1.026  
Centroid-sig: 62.1%  
Centroid-so: 0.262 arcsec [0.94] $\sigma$   
OotOffset-rm: 2.495 arcsec [1.46] $\sigma$   
OotOffset-st: 0/1/0/3 [4]  
KicOffset-rm: 2.475 arcsec [1.67] $\sigma$   
KicOffset-st: 0/1/0/3 [4]  
DiffImageQuality-fgm: 0.25 [1/4]  
DiffImageOverlap-fno: 0.00 [0/15]

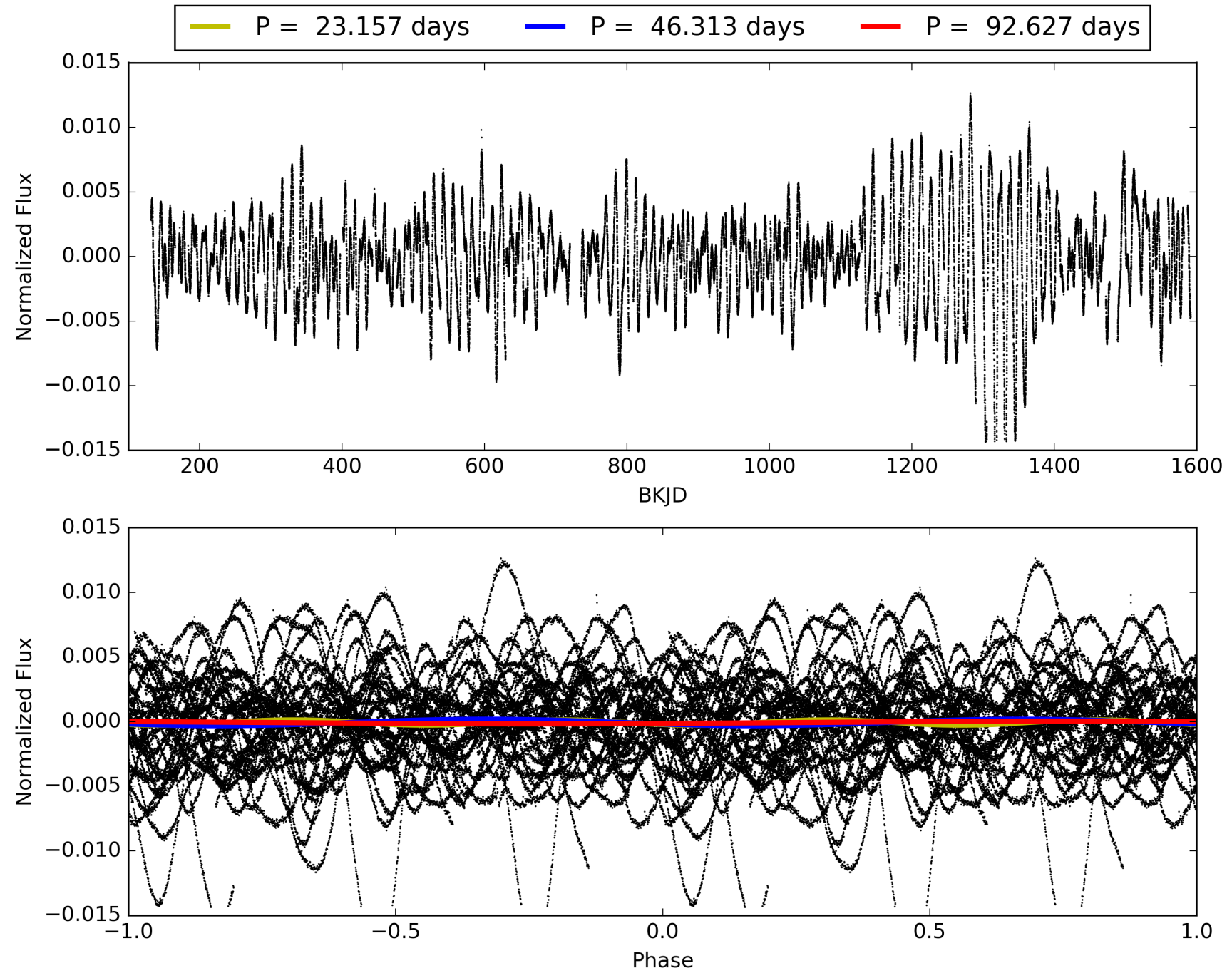
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 08:02:18 Z

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

# TCE 005991070-03, PDC Light Curves

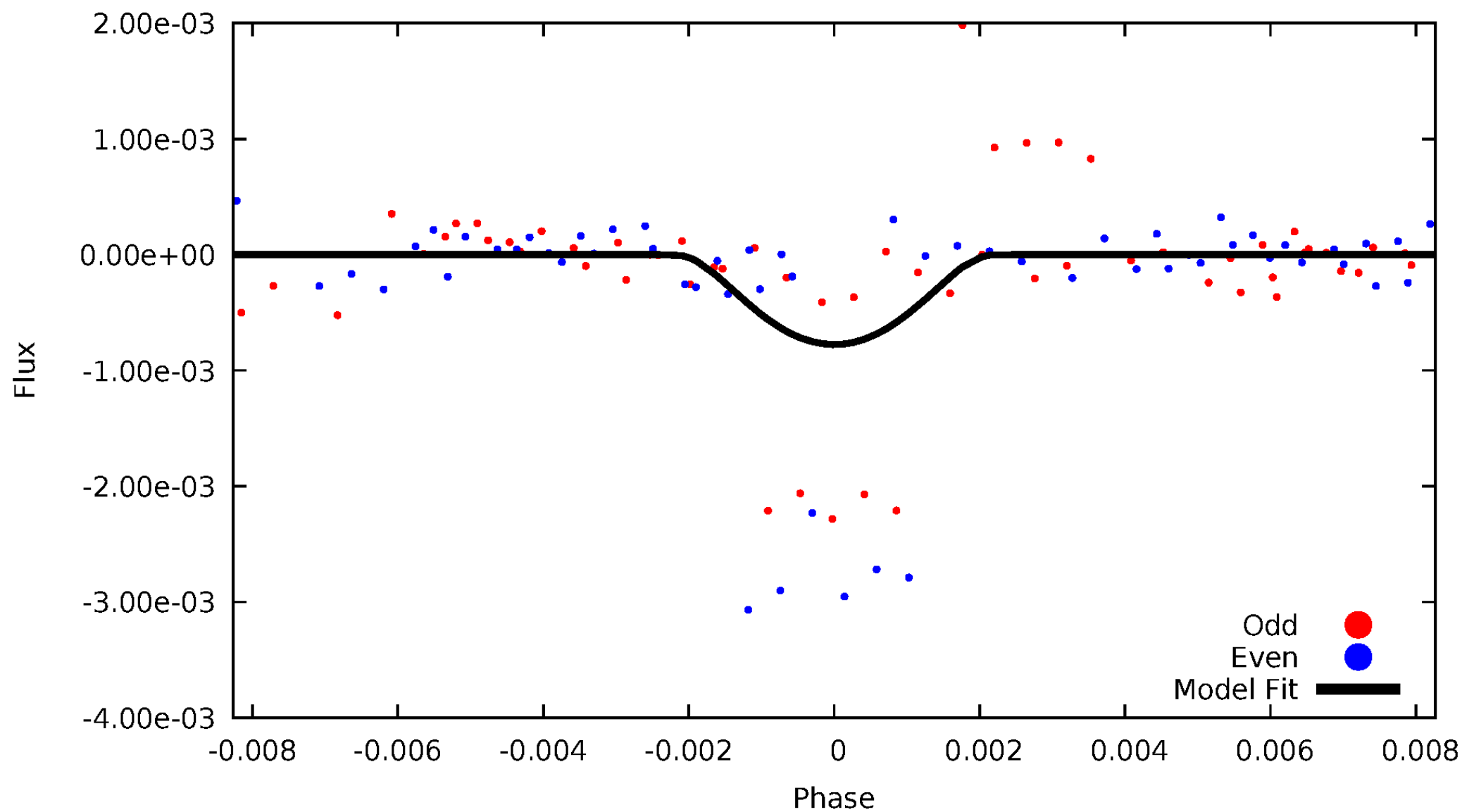


TCE 005991070-03



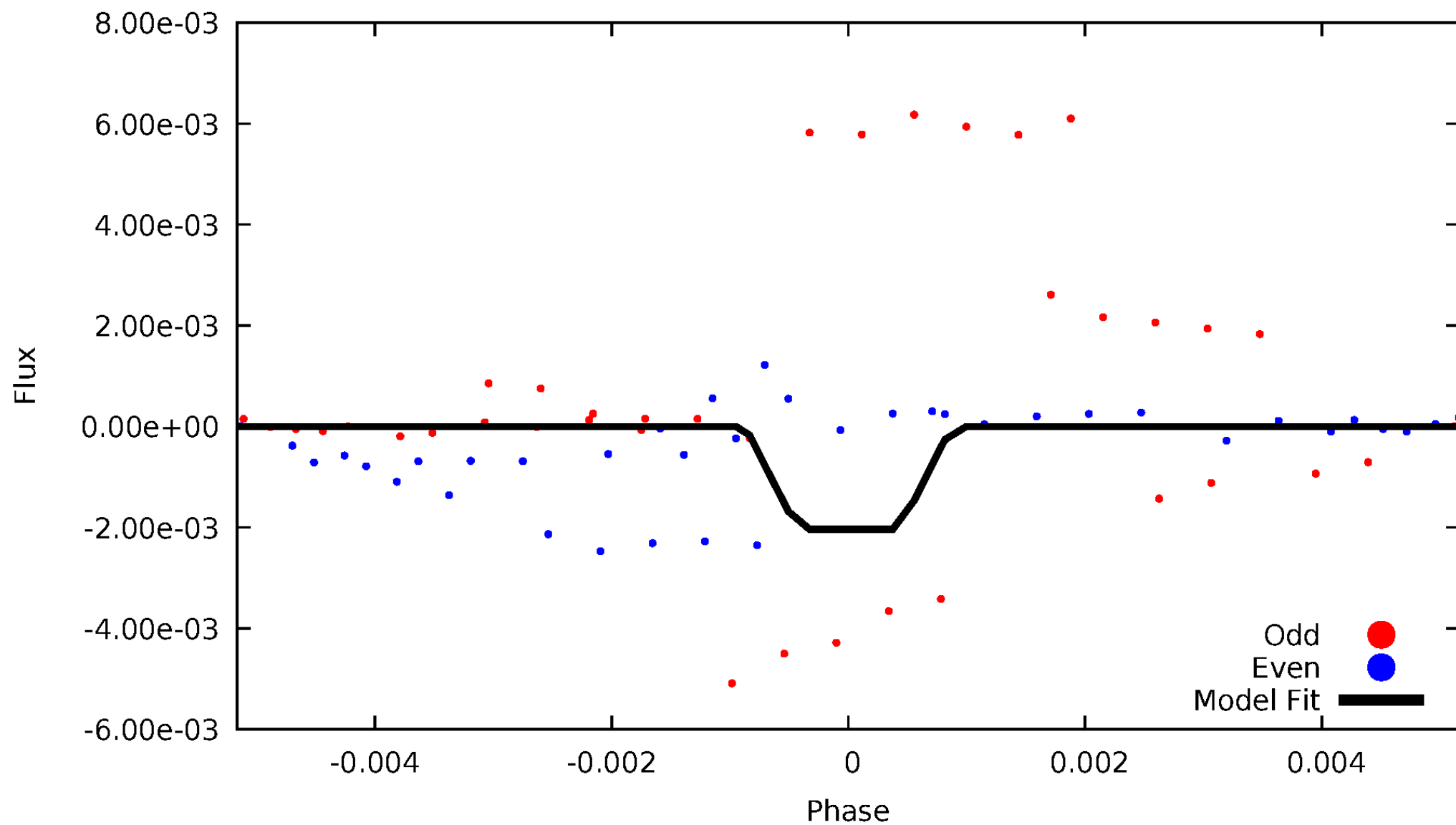
# DV Odd/Even

TCE 005991070-03



# ALT Odd/Even

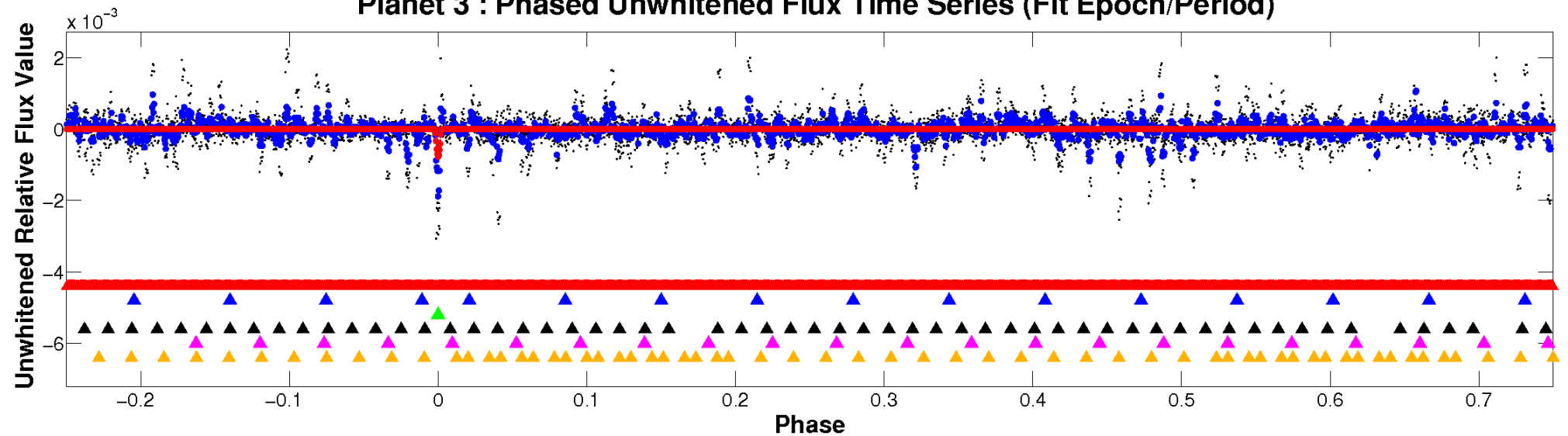
TCE 005991070-03



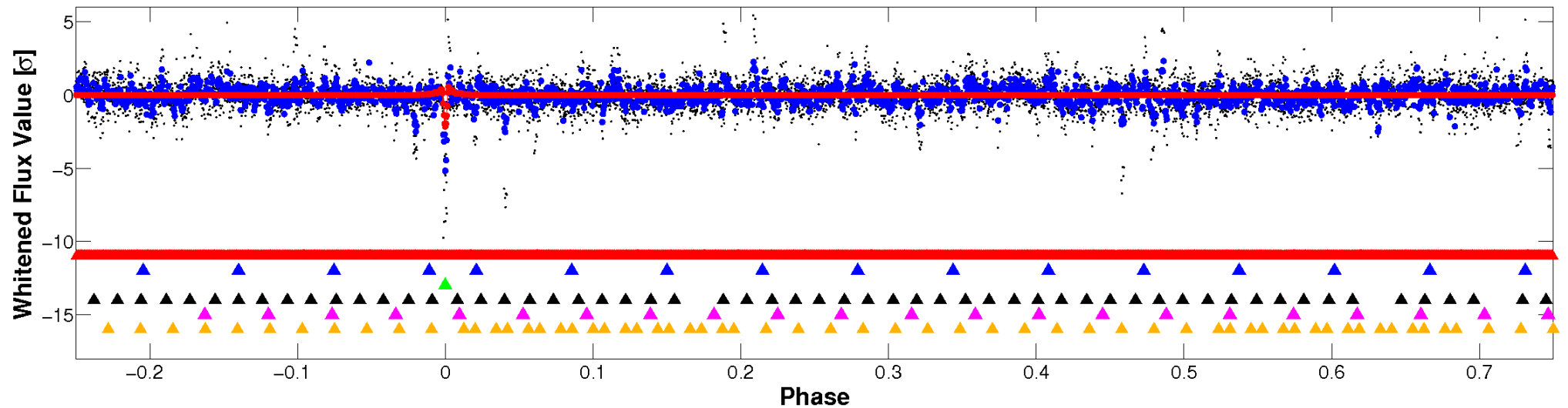


# Non-Whitened Vs. Whitened Light Curve

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

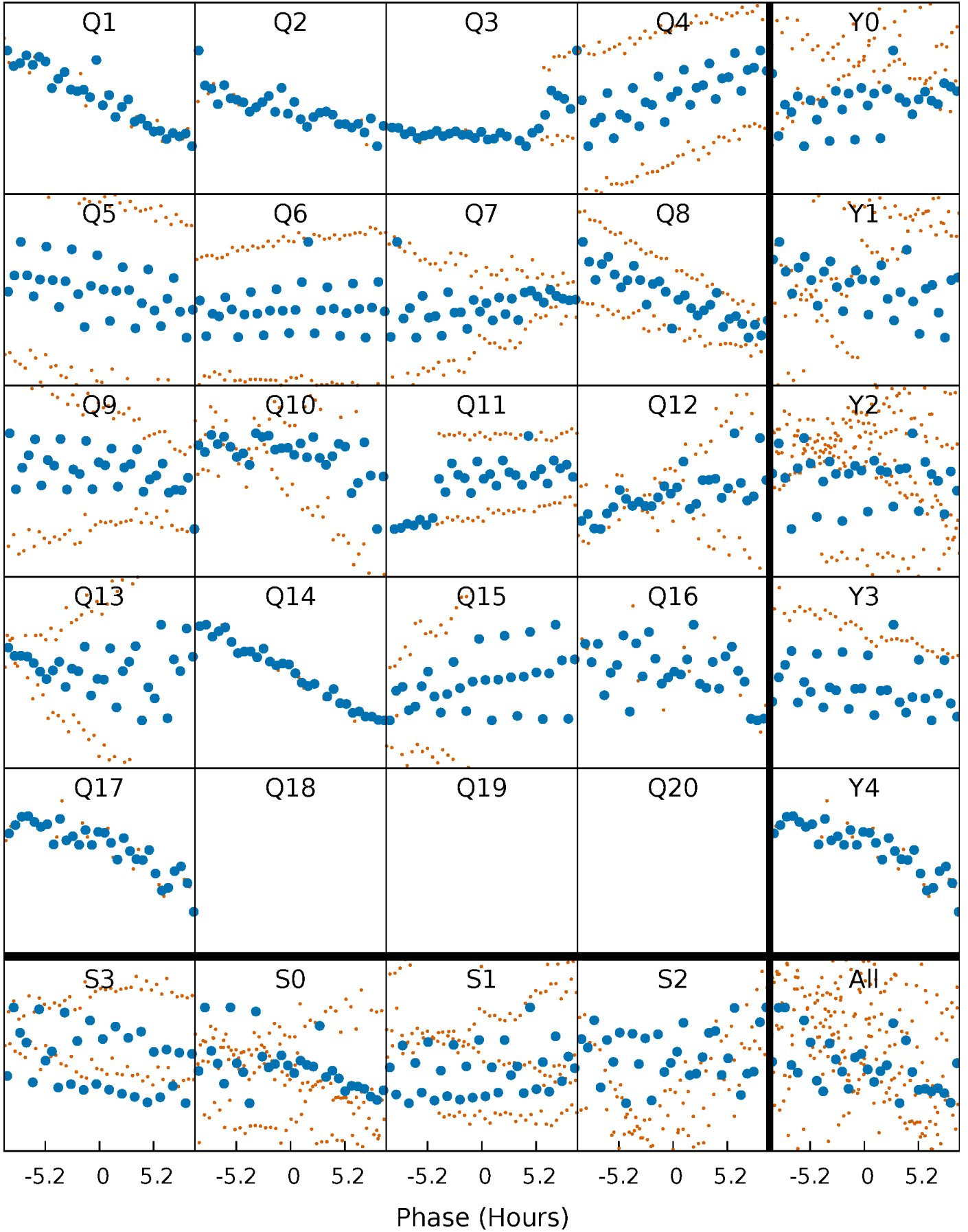


## Planet 3 : Phased Whitened Flux Time Series (Fit Epoch/Period)



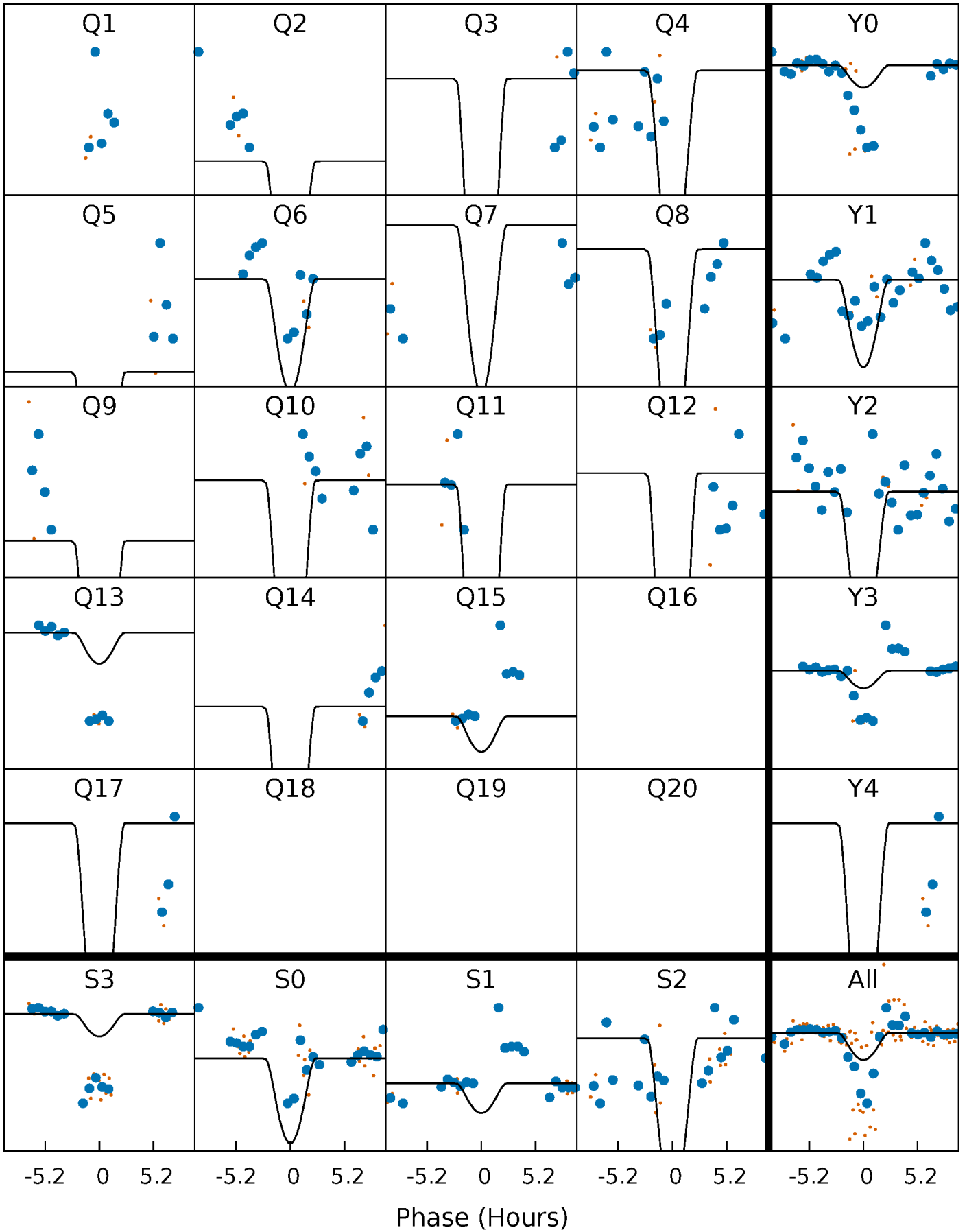
# PDC Quarter-Phased Transit Curves

TCE 005991070-03   P= 46.313436 Days    $T_0=138.044377$  (BKJD)



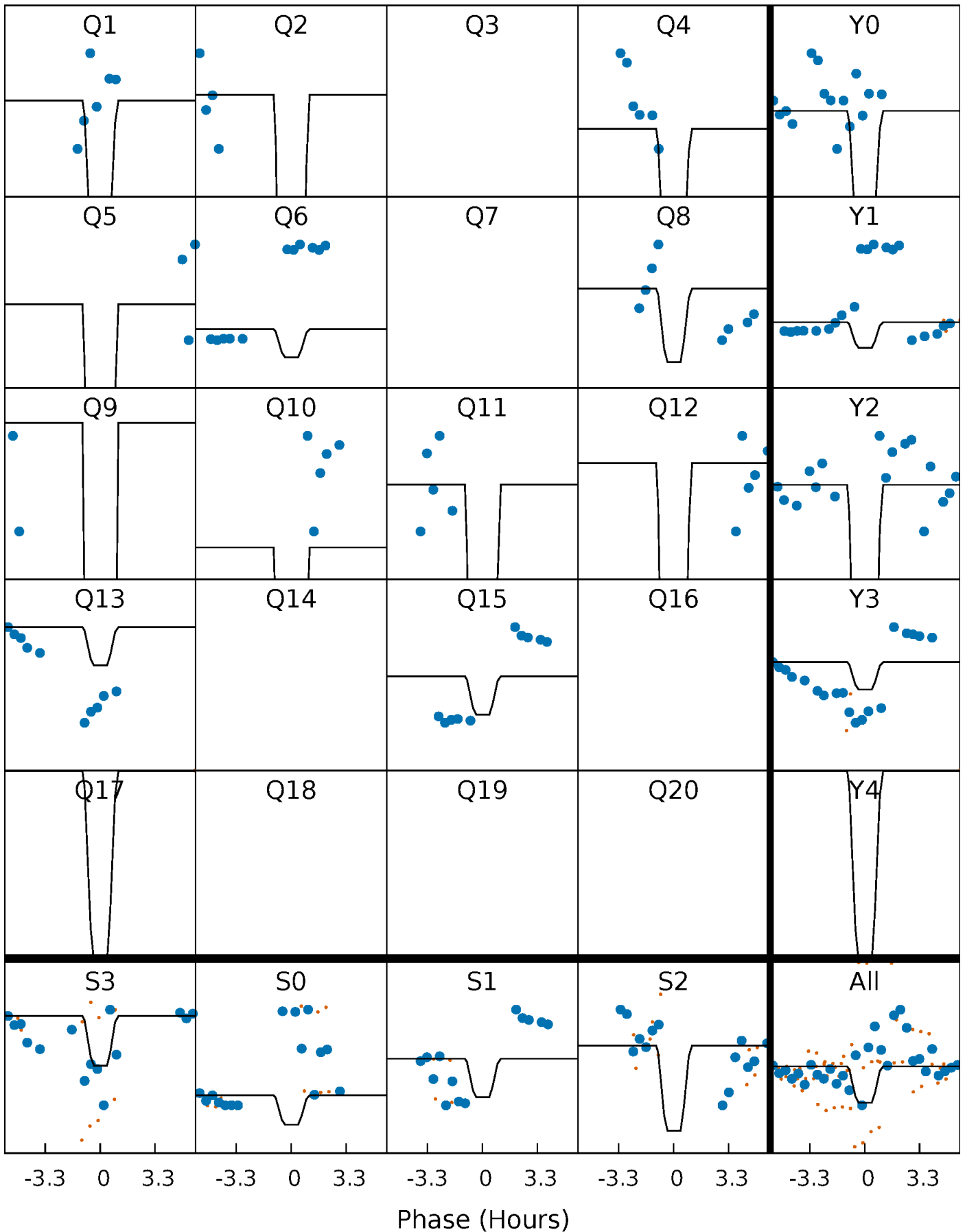
# DV Quarter-Phased Transit Curves

TCE 005991070-03   P= 46.313436 Days    $T_0=138.044377$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

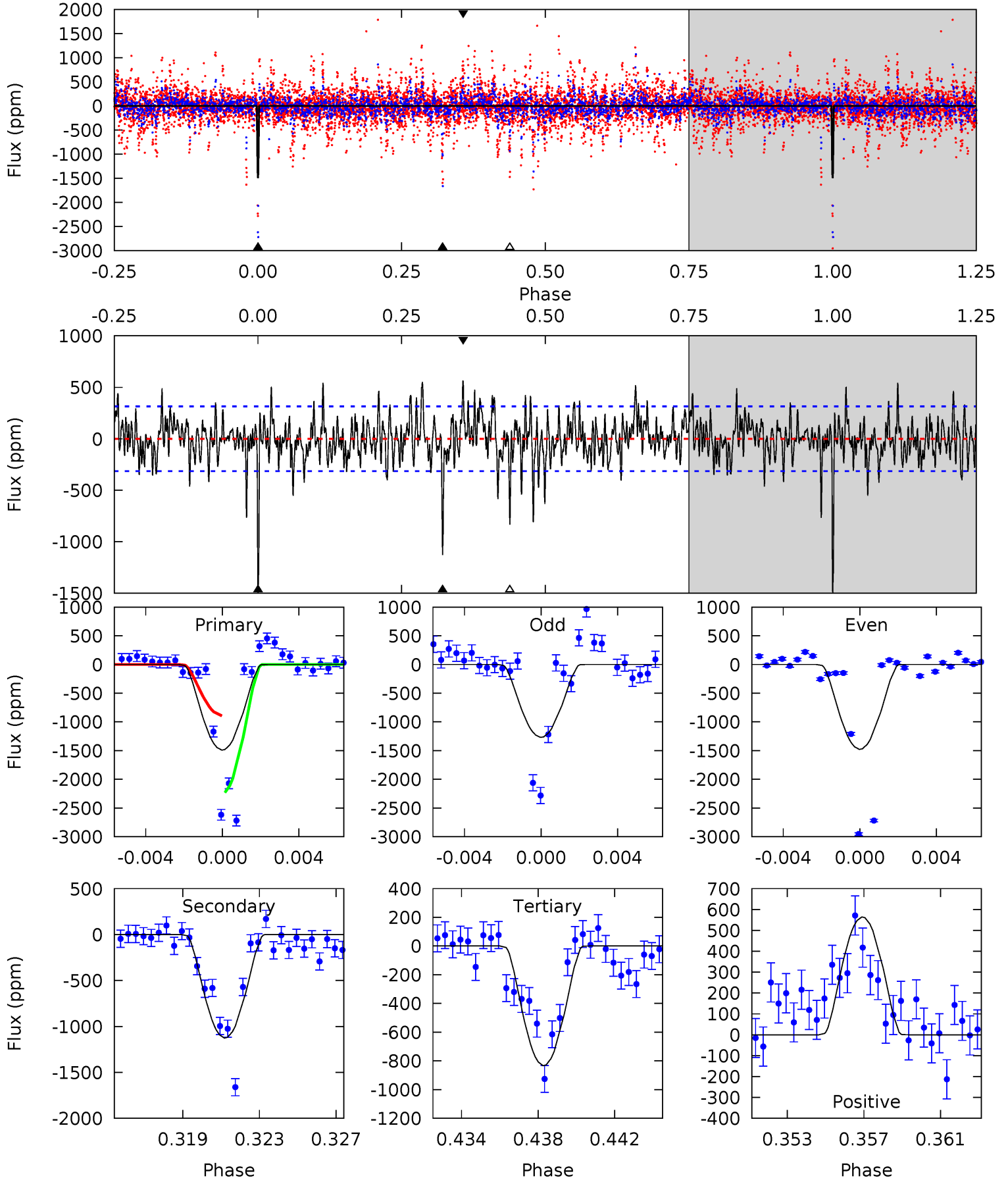
TCE 005991070-03 P= 46.313167 Days  $T_0=138.054031$  (BKJD)



# DV Model-Shift Uniqueness Test

005991070-03, P = 46.313436 Days, E = 91.730941 Days

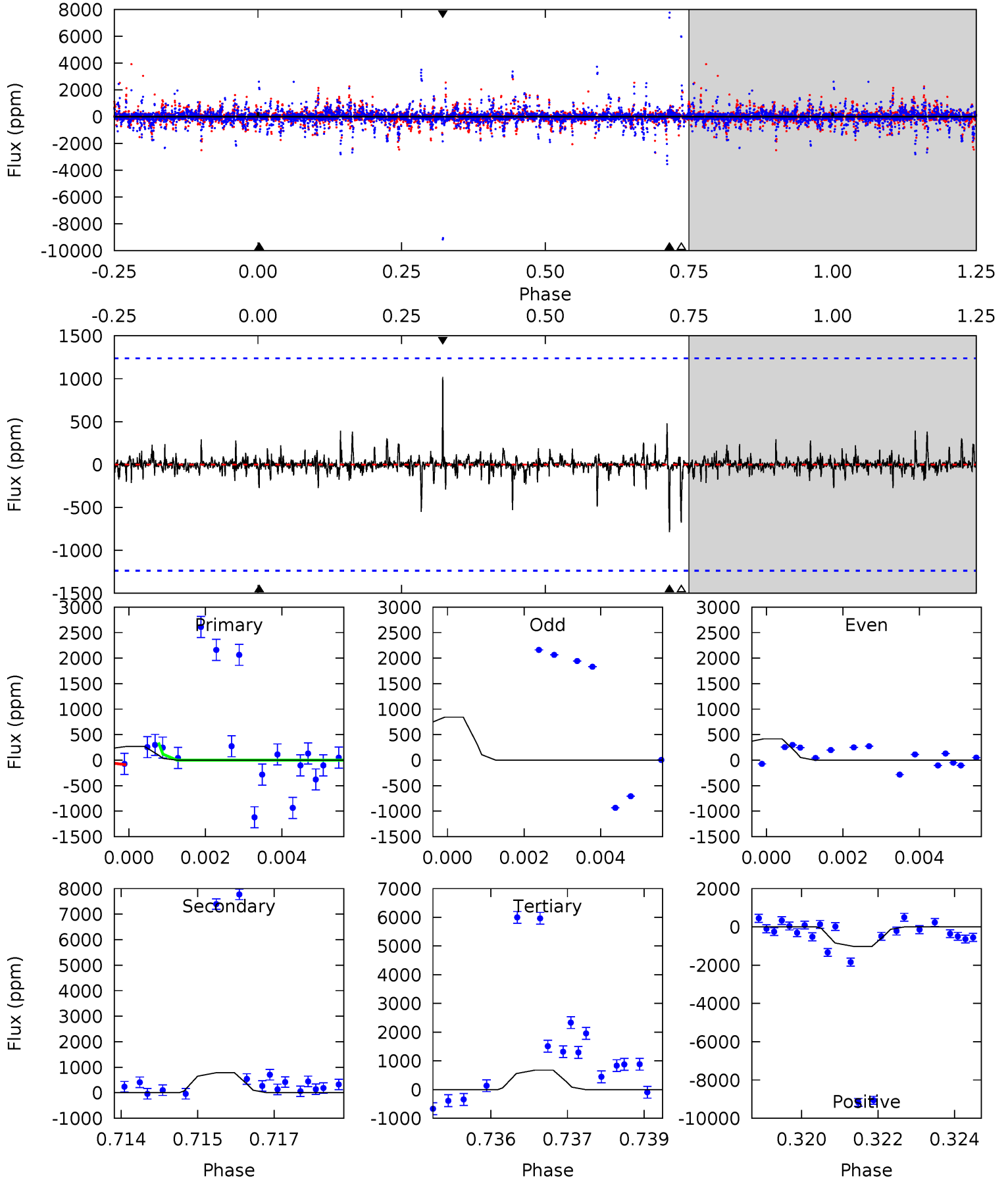
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
24.6	18.6	13.8	9.32	5.19	2.86	2.88	10.9	15.3	4.85	9.29	1.49	-2.80	0.27	10.6



# Alt Model-Shift Uniqueness Test

005991070-03, P = 46.313167 Days, E = 91.740864 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
1.15	3.39	2.92	4.40	5.34	3.12	0.28	-1.77	-3.25	0.47	-1.01	0.59	2.69	0.56	0.40





### Stellar Parameters For KIC 005991070

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M$ ( $M_{\odot}$ )	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5766^{+173}_{-144}$	$3.783^{+0.330}_{-0.110}$	$-0.080^{+0.350}_{-0.250}$	$2.409^{+0.423}_{-0.986}$	$1.283^{+0.143}_{-0.310}$	$0.129^{+0.312}_{-0.044}$
	+3%/-2%	+9%/-3%	+438%/-312%	+18%/-41%	+11%/-24%	+242%/-34%
Source	PHO1	FLK73	KIC0	DSEP		

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

### Secondary Eclipse Parameters for KIC 005991070-03 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{\text{max}}$ (K)	$T_{\text{obs}}$ (K)	$A_{\text{obs}}$
DV	$-1127 \pm 61$	$38.92^{+45.48}_{-27.70}$	$1039^{+69}_{-107}$	$3209^{+1778}_{-622}$	$31^{+326}_{-24}$
Alt.	$-785 \pm 232$	$42.40^{+44.58}_{-30.75}$	$1038^{+67}_{-95}$	$3011^{+1445}_{-544}$	$19^{+202}_{-15}$

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

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

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

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

## DV Centroid Data

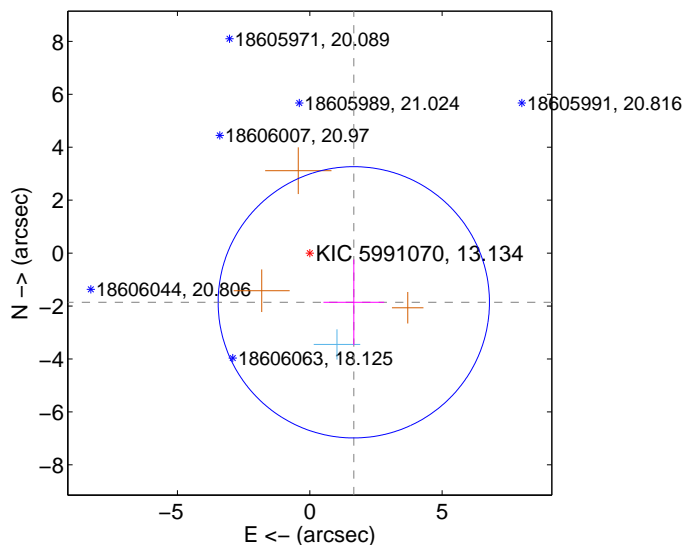
Supplemental centroid analysis for 005991070-03. Kepler magnitude: 13.13. Transit SNR 5.55

There are 1 quarters with good PRF difference image offsets

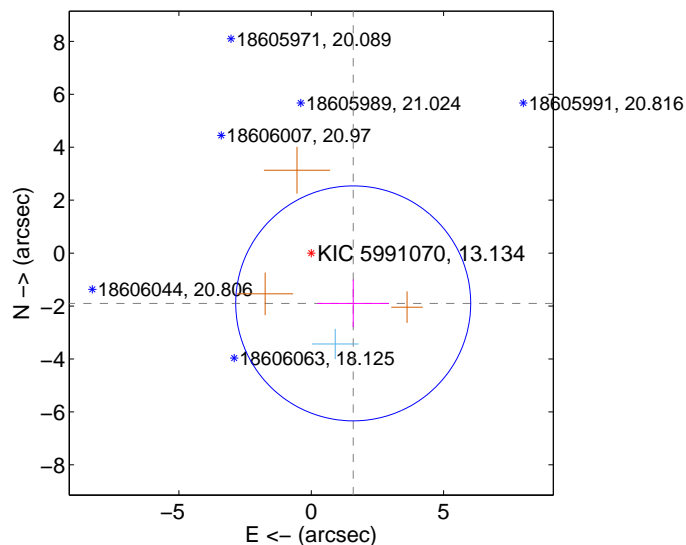
The direct PRF centroid is offset from the target star catalog position by about 0.09 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$2.495 \pm 1.709$	1.46	$-1.664 \pm 1.146$	$-1.860 \pm 1.614$
PRF-fit source offset from KIC position	$2.475 \pm 1.480$	1.67	$-1.586 \pm 1.352$	$-1.901 \pm 0.898$
photometric centroid source offset	$0.26 \pm 0.28$	0.94	$0.09 \pm 0.30$	$-0.25 \pm 0.28$

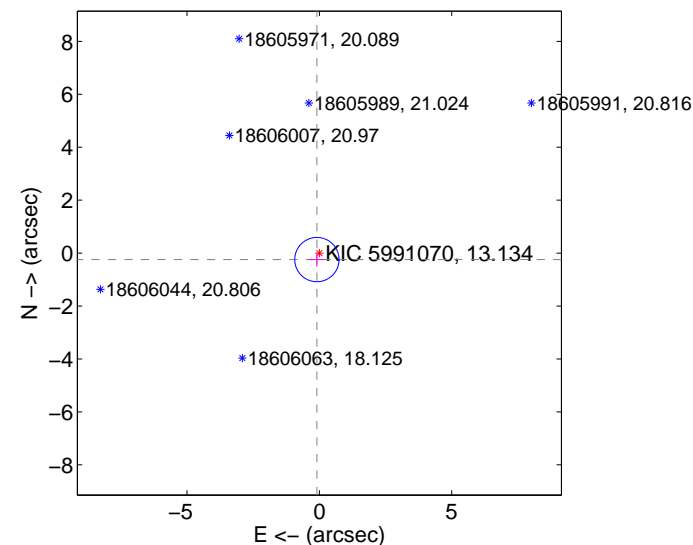
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

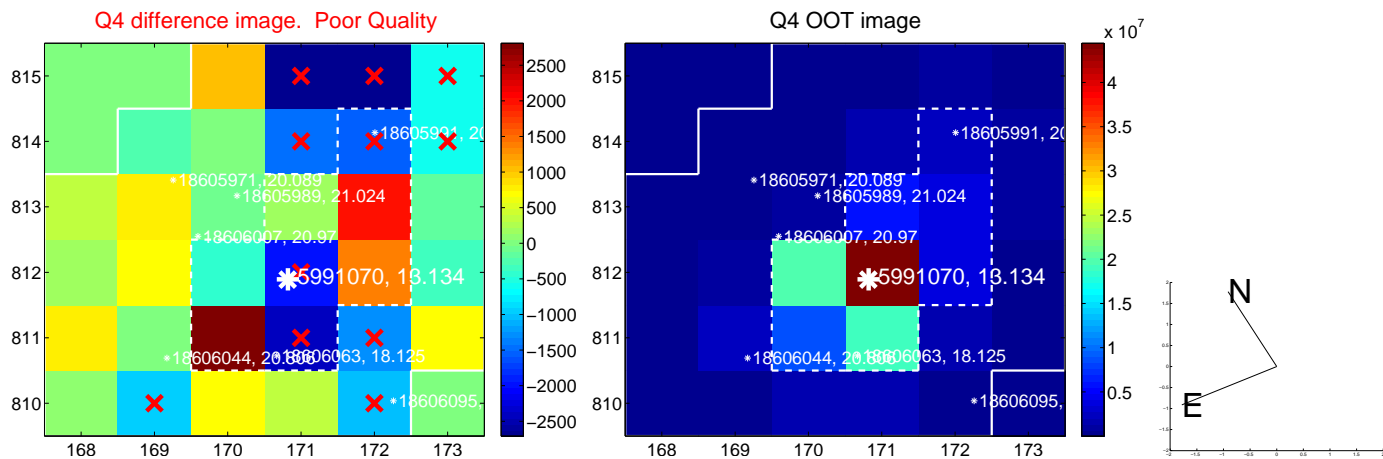
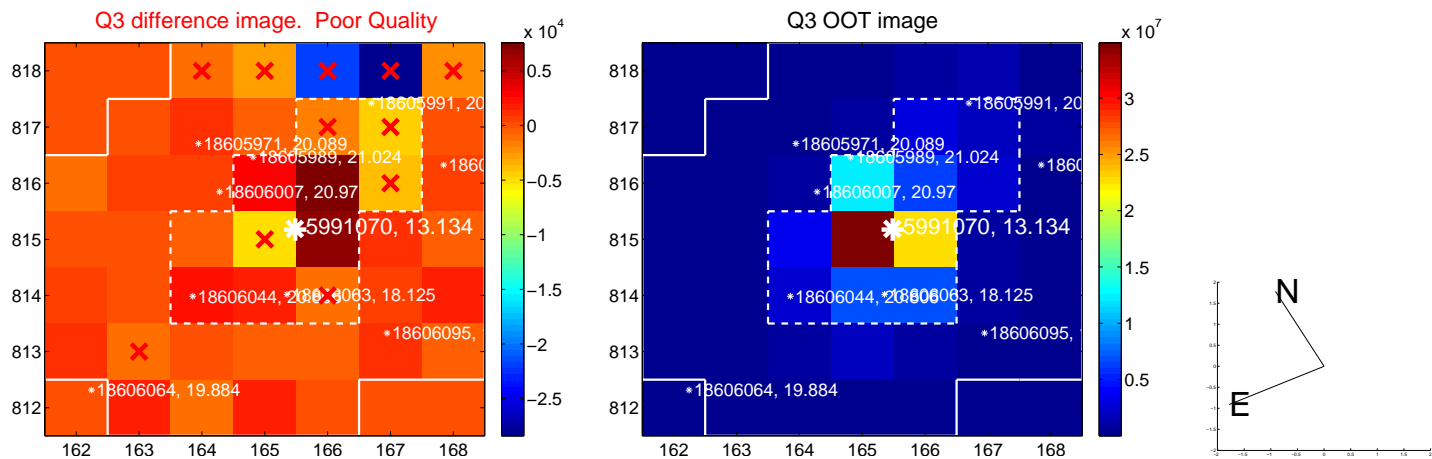
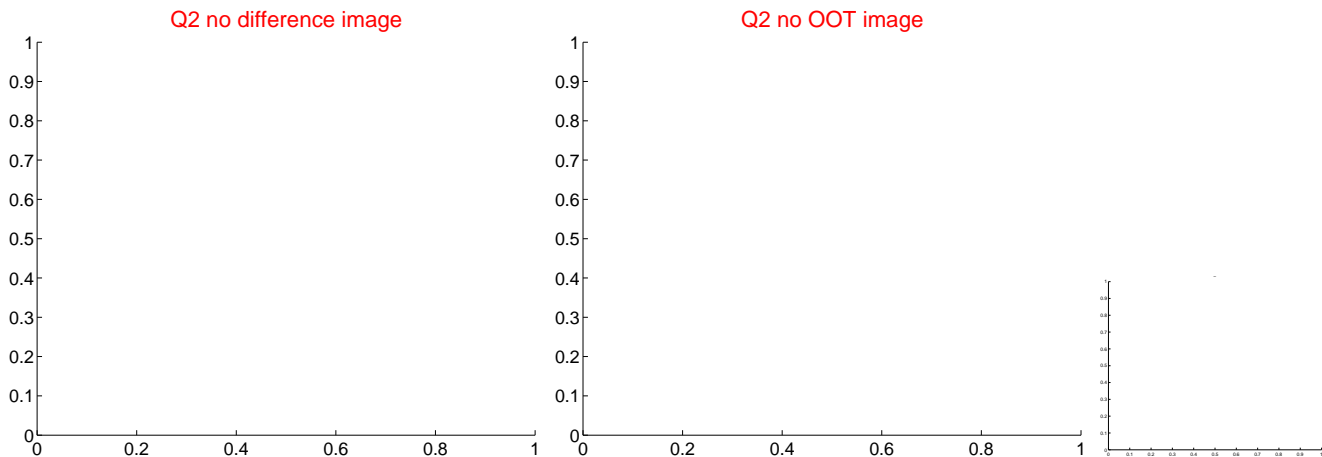
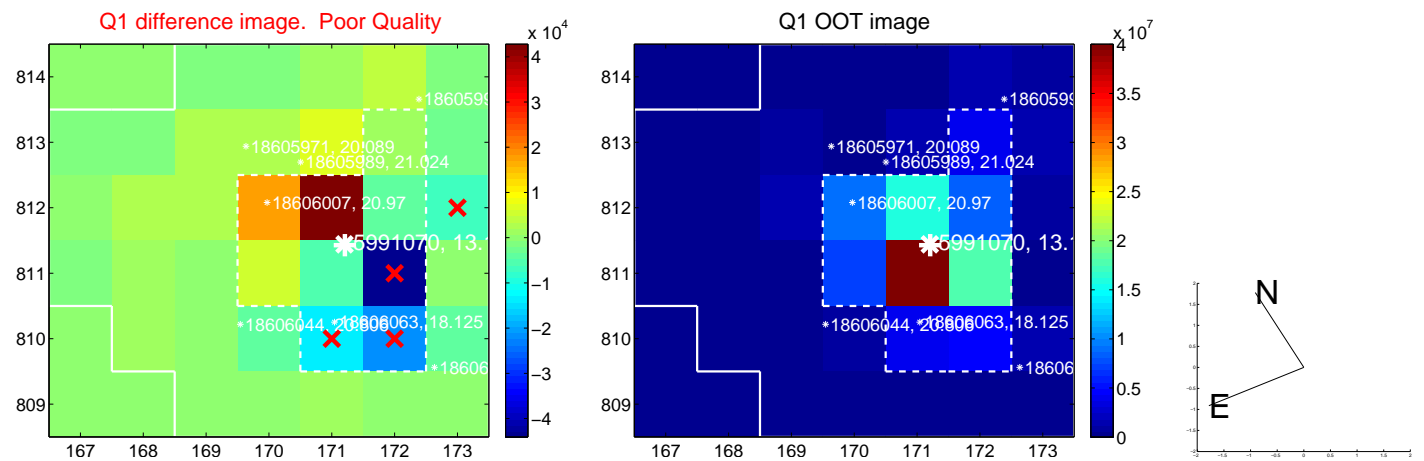


offset from photometric centroids

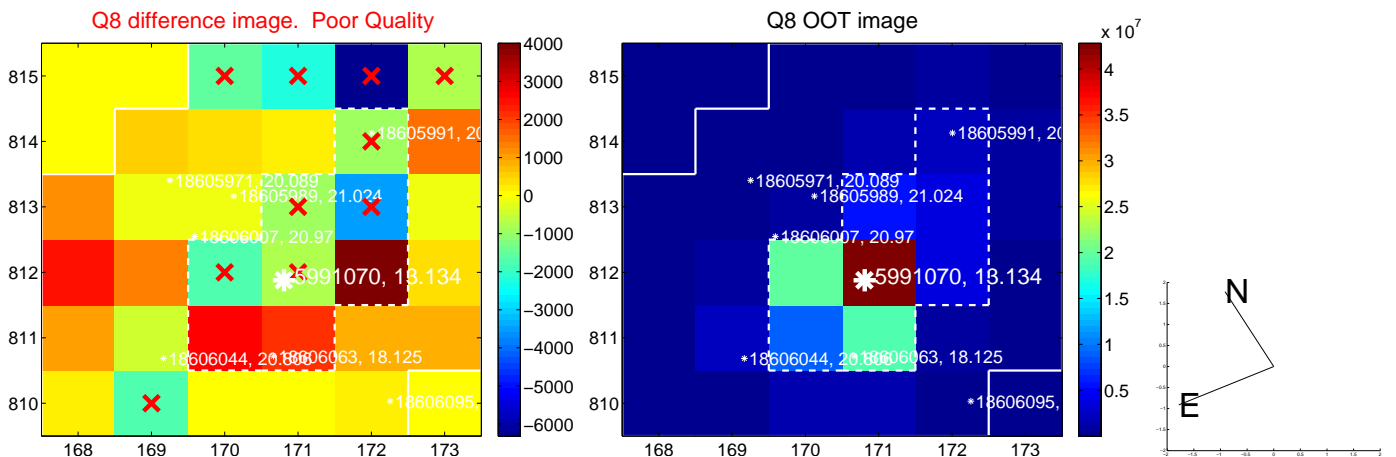
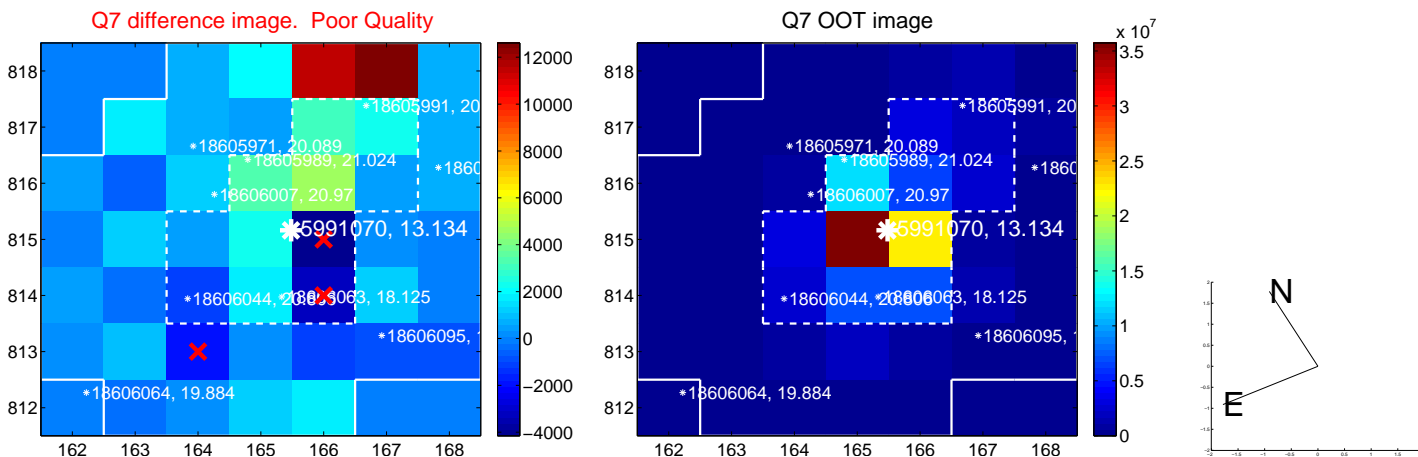
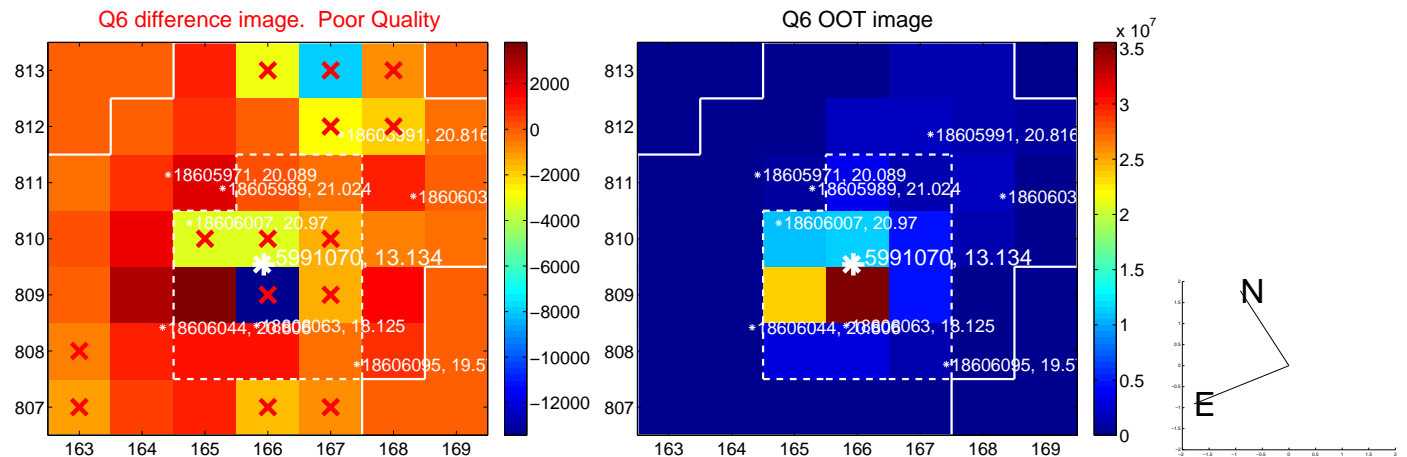
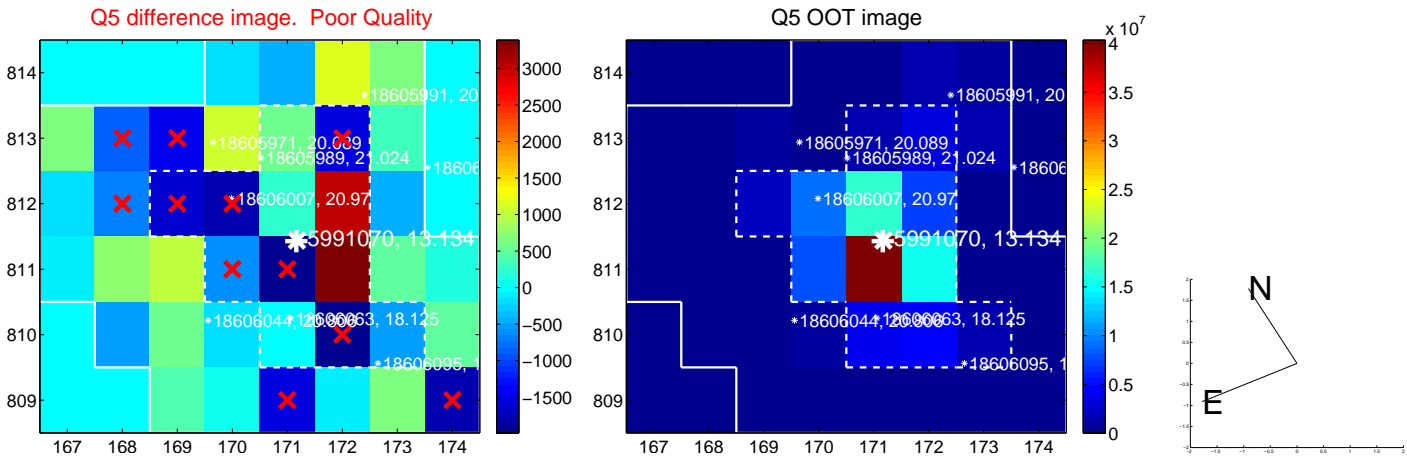


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three- $\sigma$ . Red \*: target star. Blue \*: Other stars. Text next to a star gives its KIC ID and kepmag. KIC IDs > 15,000,000 are from the UKIRT catalog.

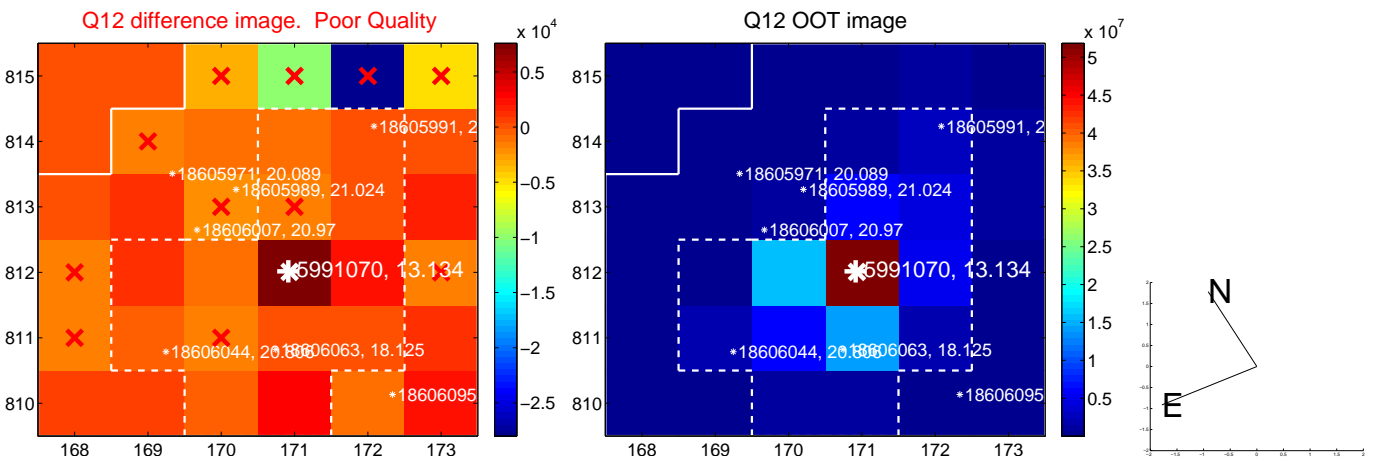
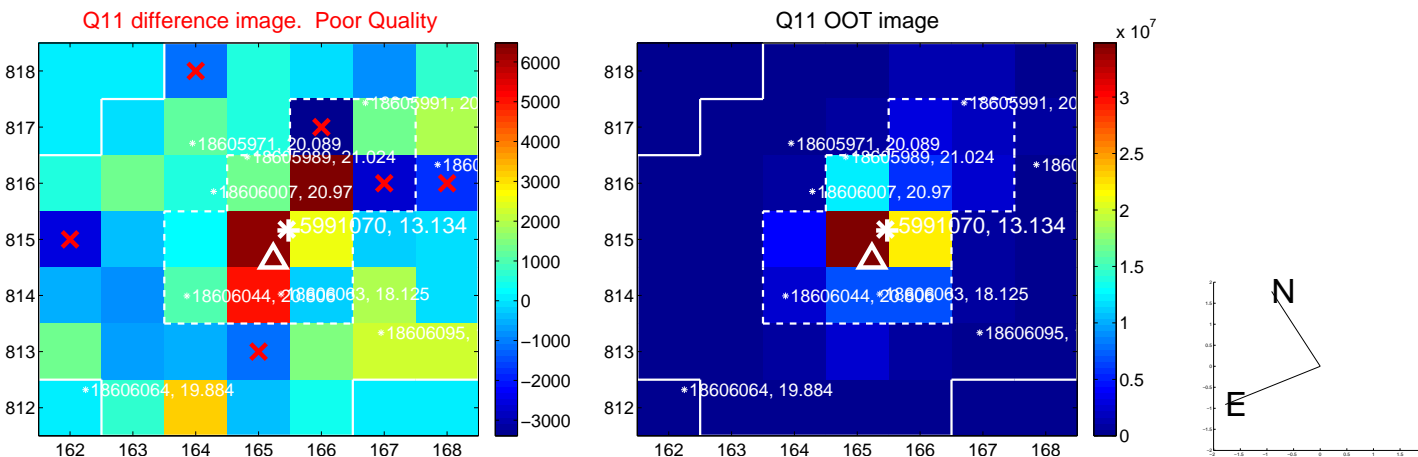
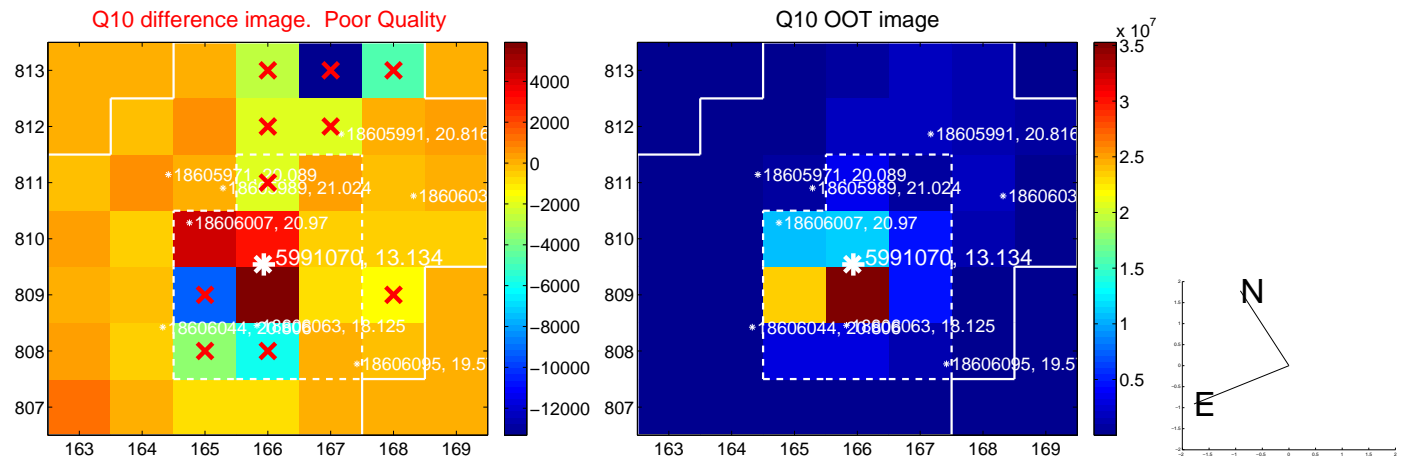
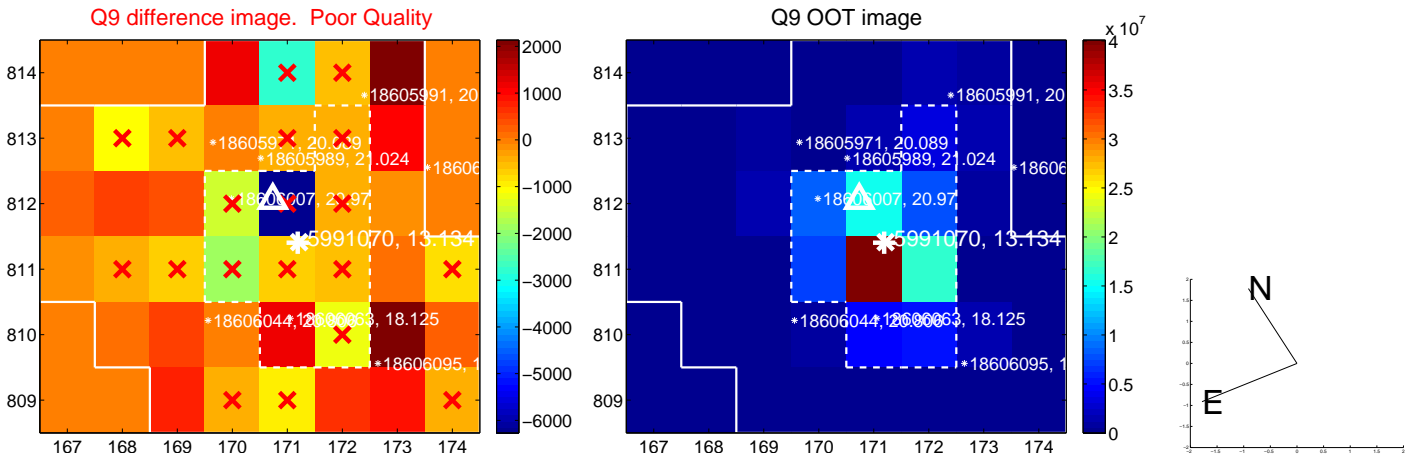
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

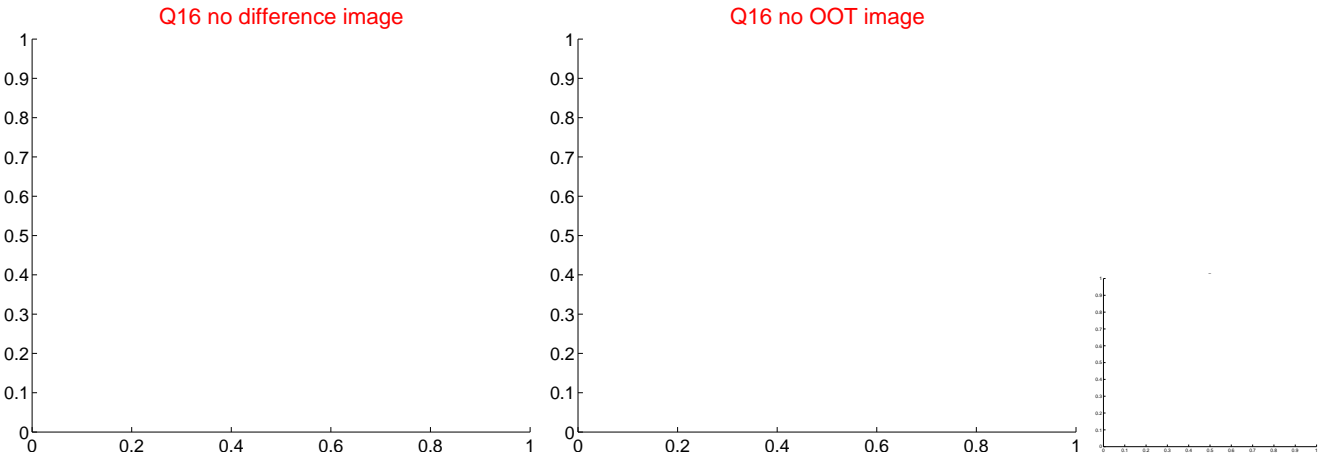
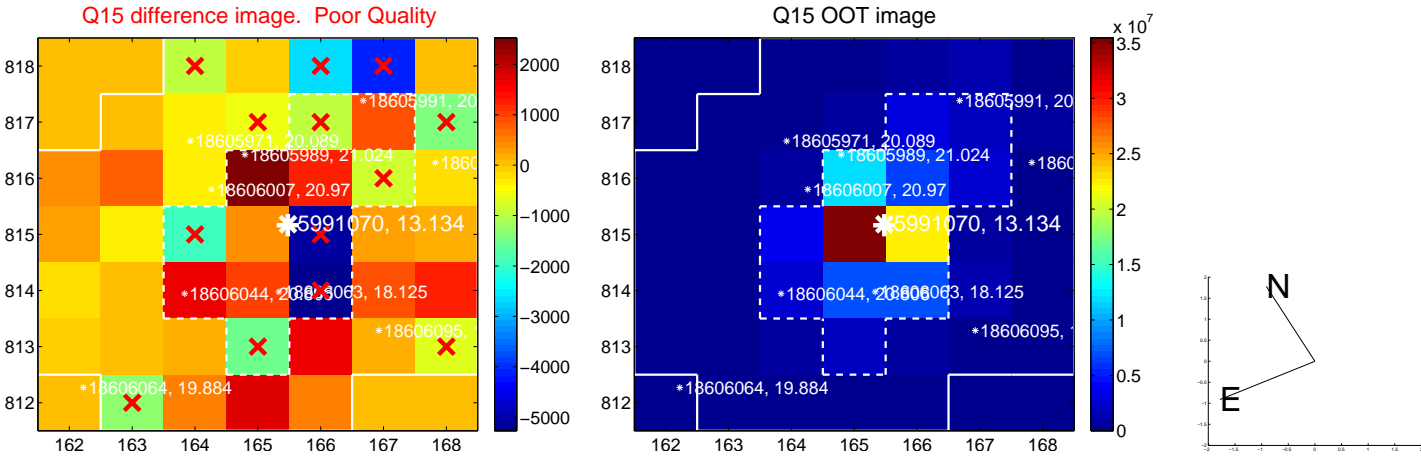
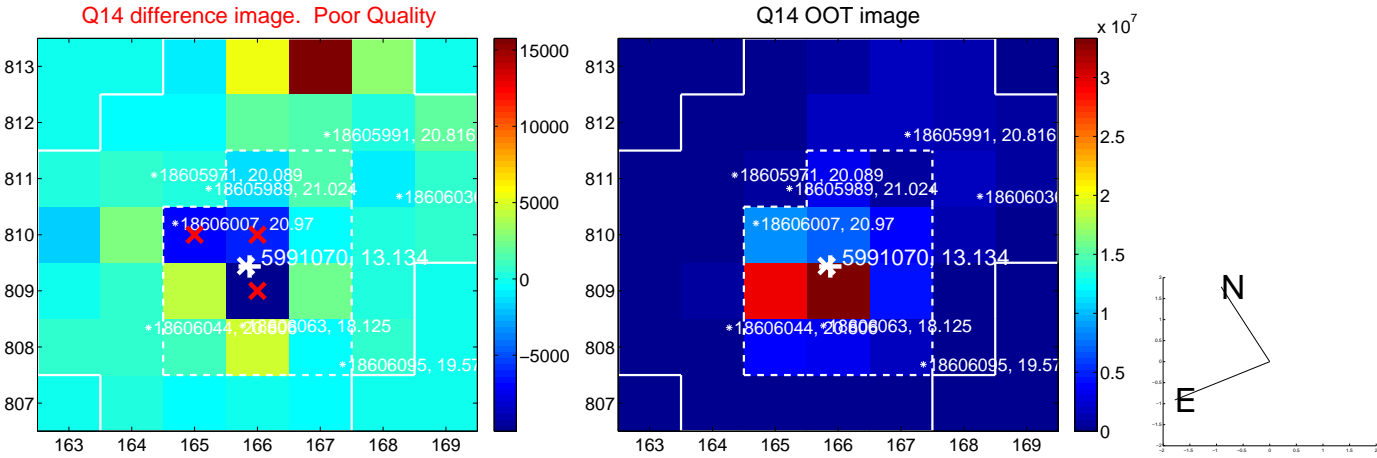
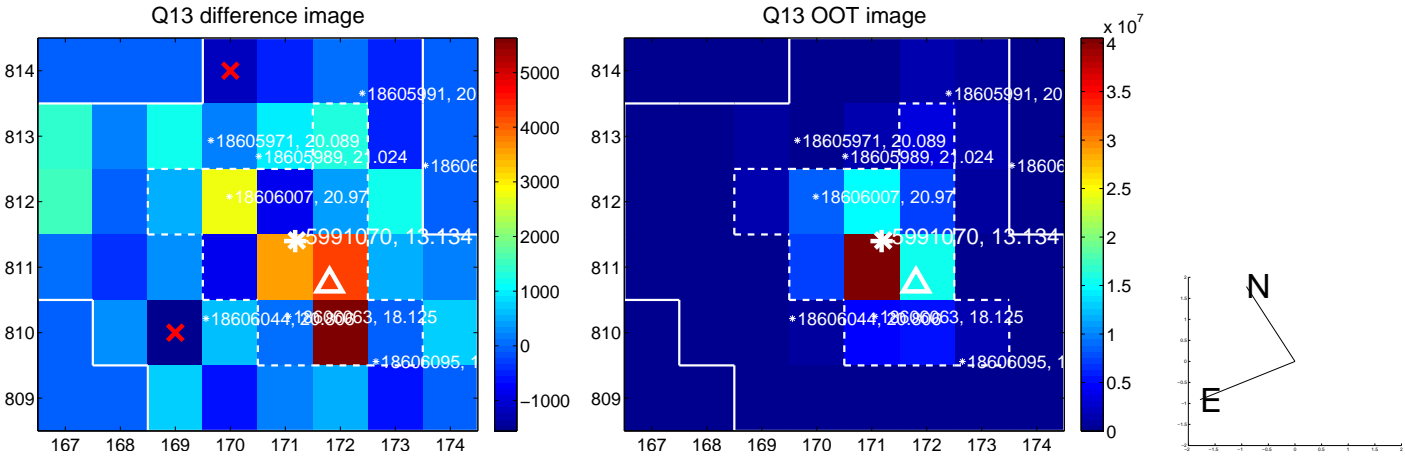


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

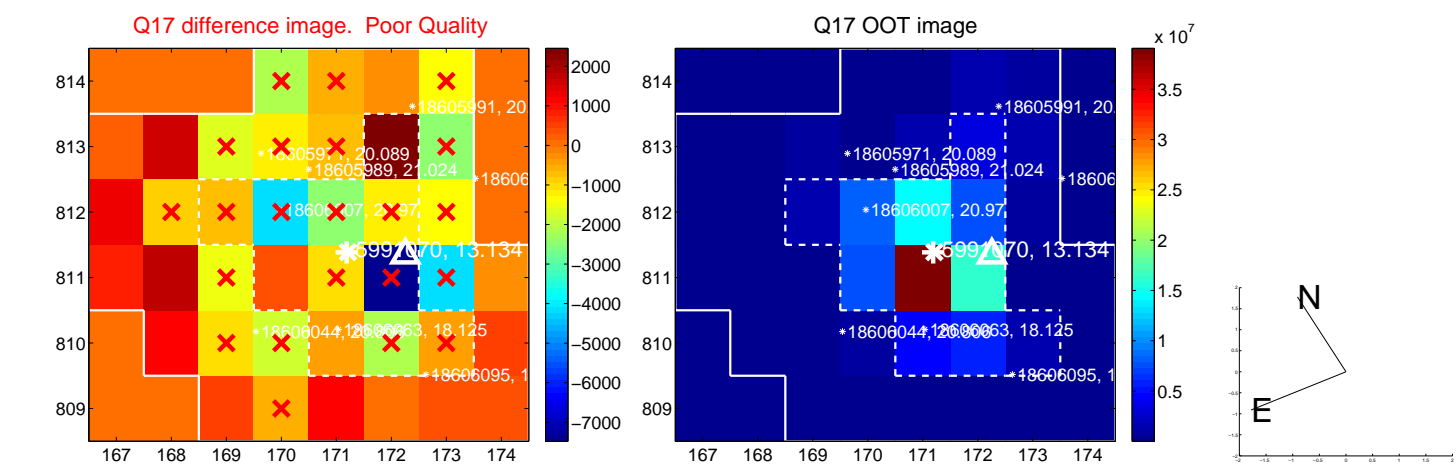




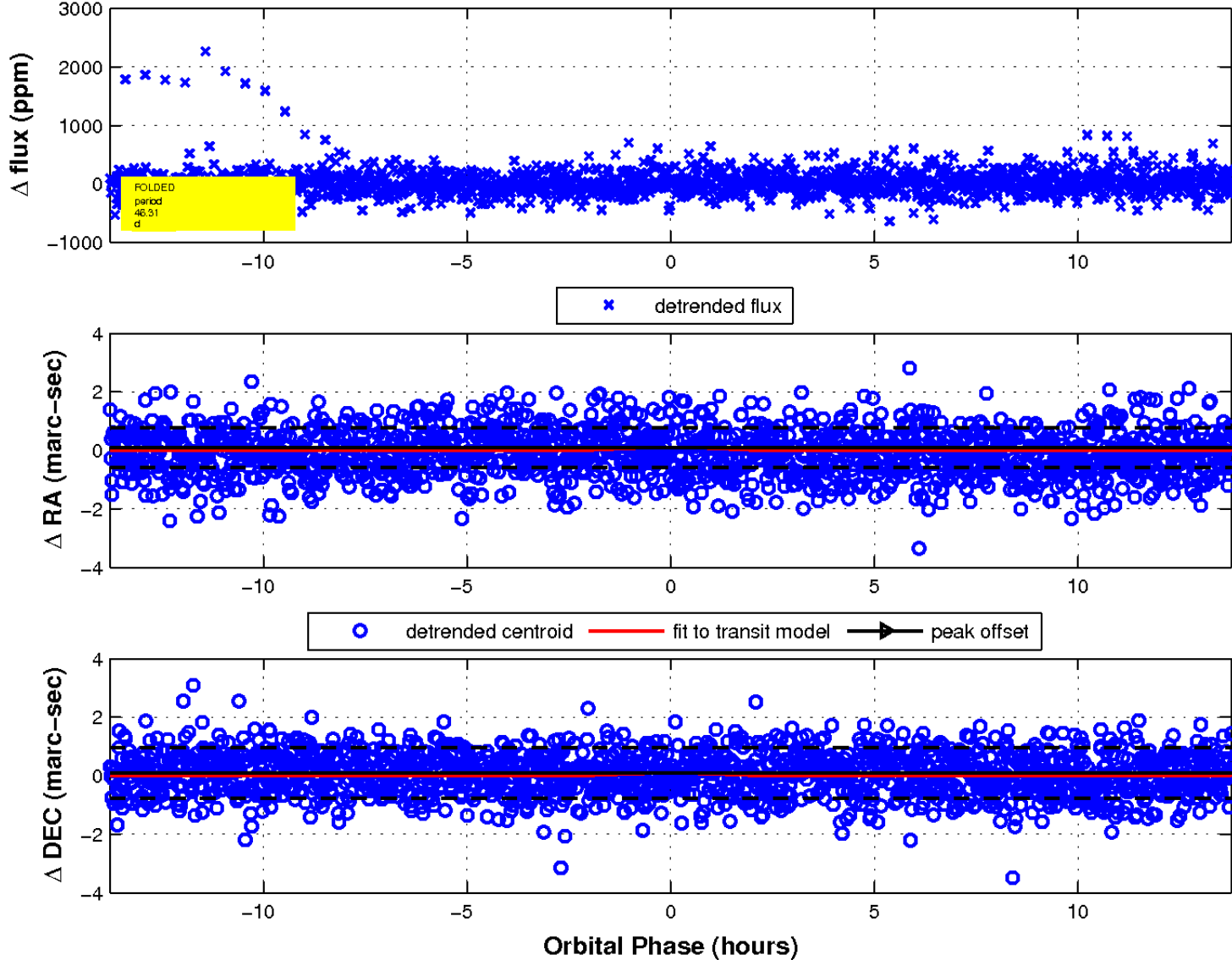
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

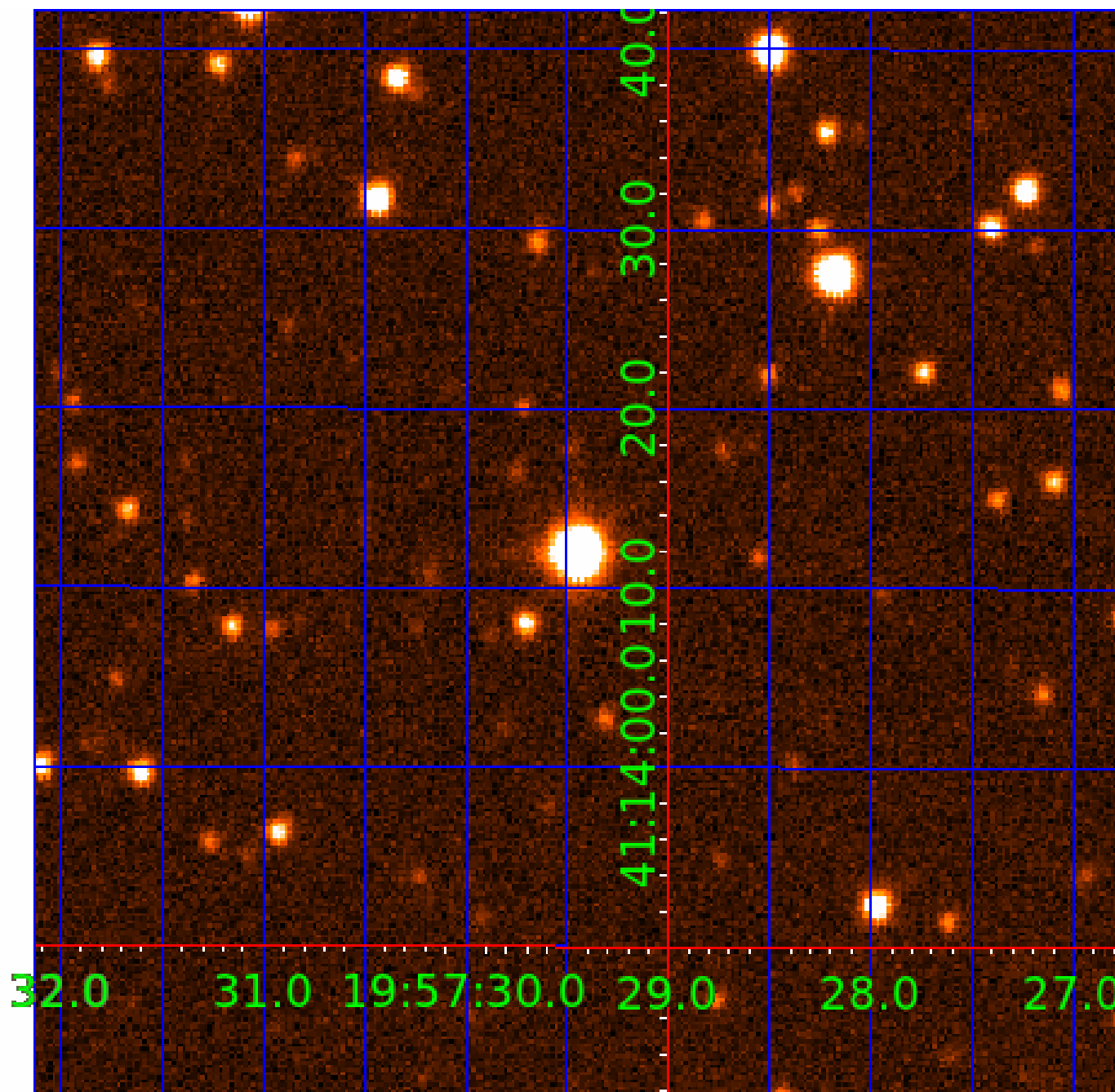


fluxWeightedCentroids, Planet 3 of 6



UKIRT Image

Declination



# KIC 005991070

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
005991070-01	OBS	7756.01	0.941000	131.926402	23.5	6.497	8.8	10.8	2.41	5766	1.70	13766.75
005991070-03	OBS	No	46.313436	138.044377	776.2	4.591	22.0	5.6	2.41	5766	13.17	76.33
005991070-04	OBS	No	25.055683	149.765335	133.0	14.826	15.0	2.6	2.41	5766	3.01	173.15
005991070-06	OBS	No	23.663450	138.980719	1.9	25.997	9.5	0.0	2.41	5766	0.34	186.86

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
005991070-01	OBS	FP	0.42	1	0	0	0	LPP_DV—CENT_CROWDED
005991070-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_TER_ALT—MOD_POS_ALT—CENT_FEW_DIFFS
005991070-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_ZUMA—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
005991070-06	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT

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

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

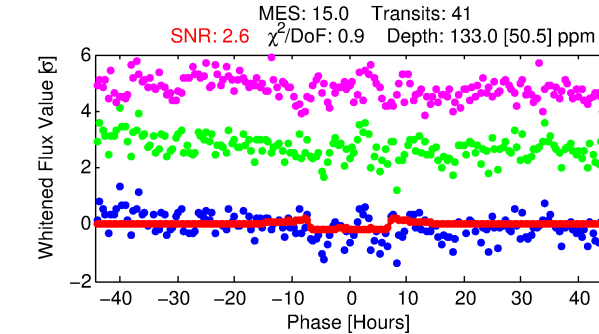
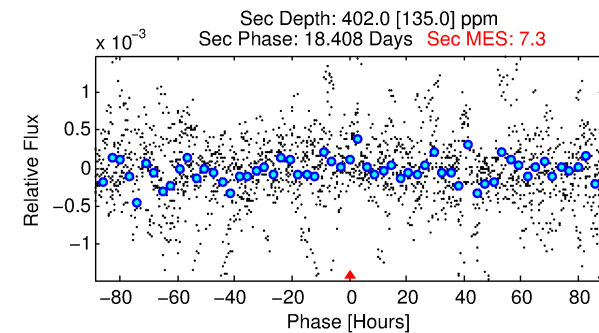
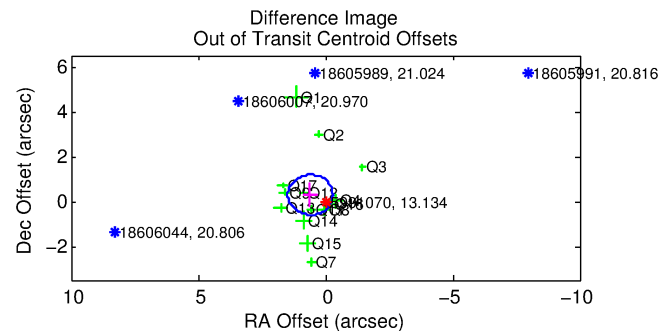
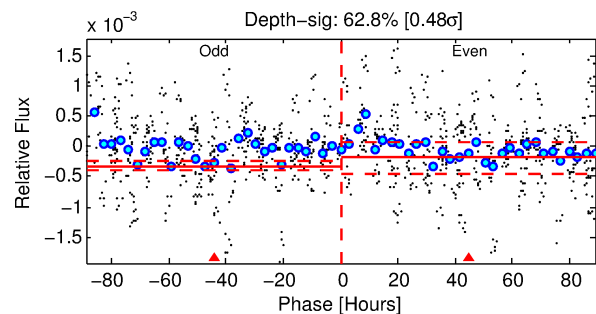
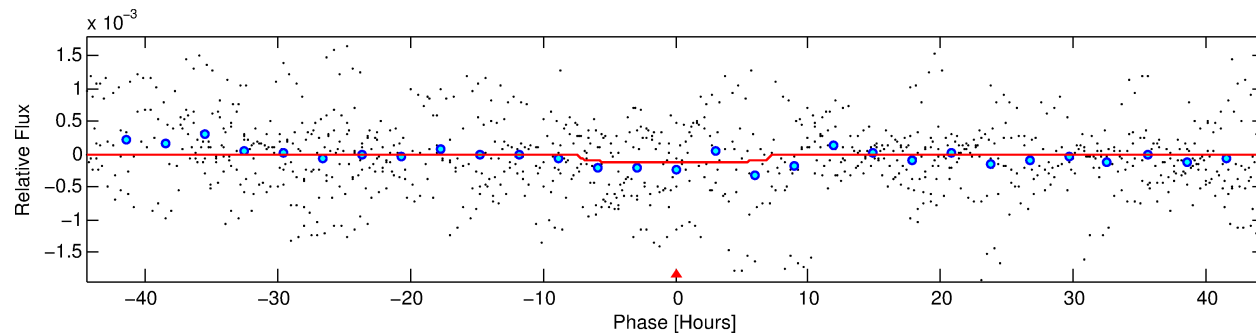
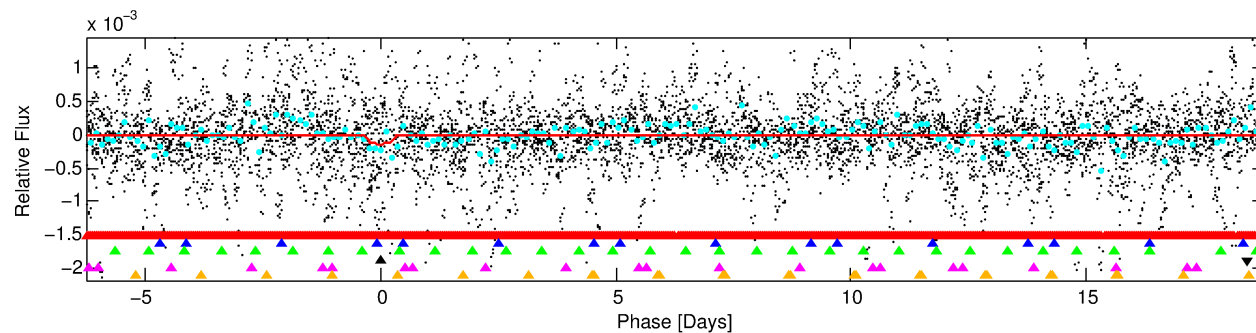
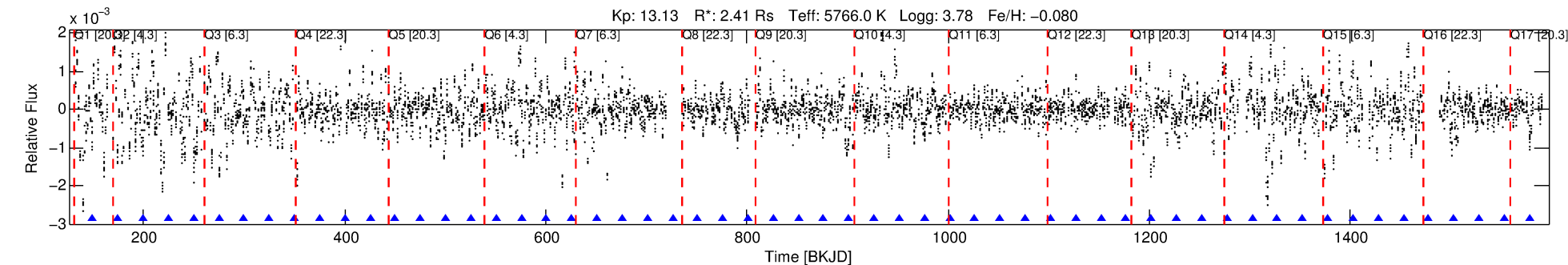
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 005991070-04

No Significant Match Found

# DV One-Page Summary

KIC: 5991070 Candidate: 4 of 6 Period: 25.056 d



## DV Fit Results:

Period = 25.05568 [0.00144] d  
Epoch = 149.7653 [0.0502] BKJD  
Rp/R\* = 0.0115 [0.0081]  
a/R\* = 8.87 [26.51]  
b = 0.75 [1.82]  
Seff = 173.14 [101.77]  
Teff = 925 [136] K  
Rp = 3.01 [2.46] Re  
a = 0.1822 [0.0678] AU  
Ag = 809.57 [1263.98] [0.64 $\sigma$ ]  
Teffp = 7628 [2777] K [2.41 $\sigma$ ]

## DV Diagnostic Results:

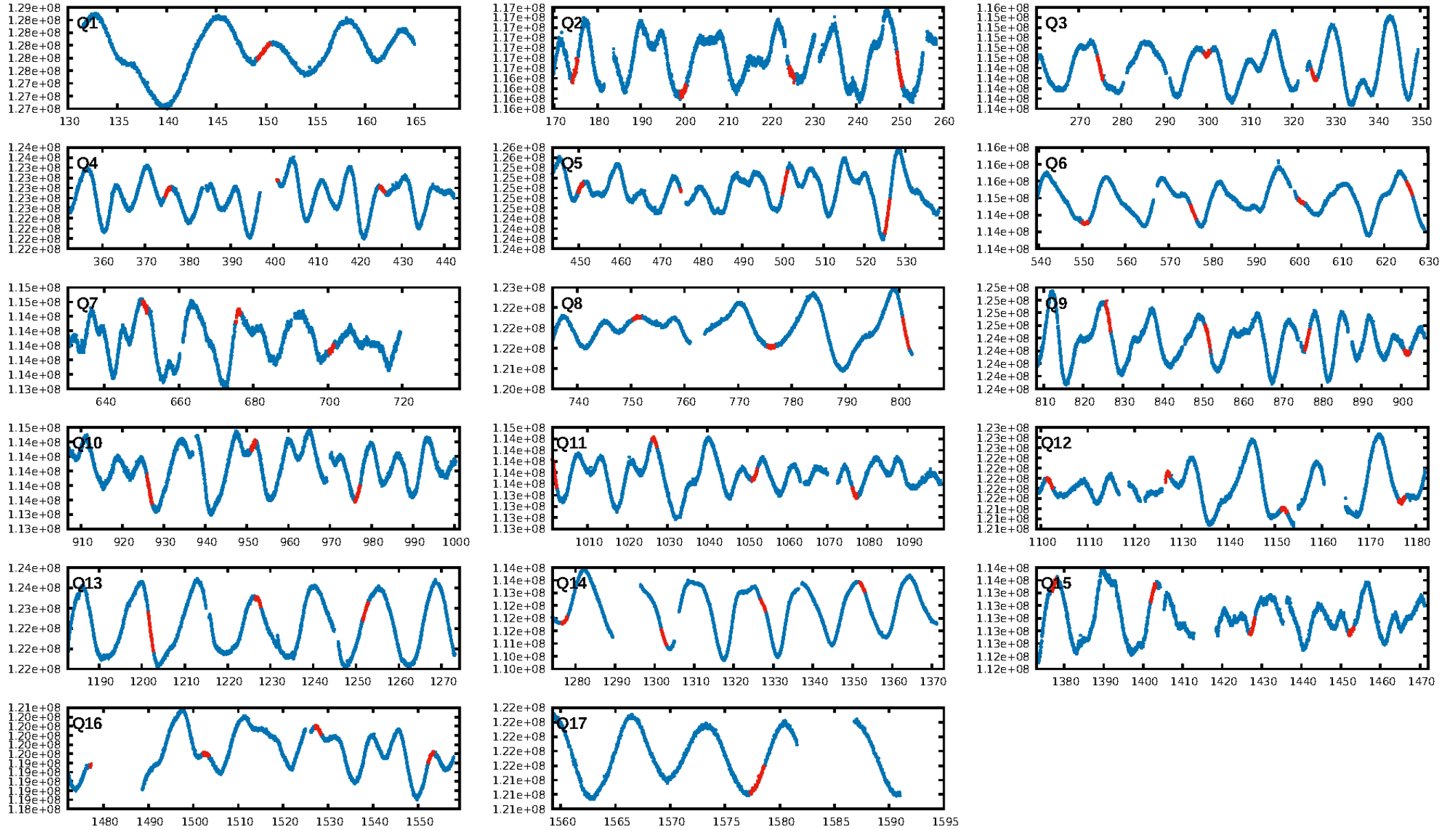
ShortPeriod-sig: 73.6% [1.12 $\sigma$ ]  
LongPeriod-sig: 100.0% [32.87 $\sigma$ ]  
ModelChiSquare2-sig: 0.0%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 3.52e-35  
RollingBand-fgt: 1.00 [40/40]  
GhostDiagnostic-chr: -1.208  
Centroid-sig: 95.1%  
Centroid-so: 0.224 arcsec [0.37 $\sigma$ ]  
OotOffset-rm: 0.662 arcsec [2.23 $\sigma$ ]  
KicOffset-rm: 0.682 arcsec [2.16 $\sigma$ ]  
OotOffset-st: 2/4/4/4 [14]  
KicOffset-st: 2/4/4/4 [14]  
DiffImageQuality-fgm: 0.57 [8/14]  
DiffImageOverlap-fno: 0.00 [0/17]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 08:02:21 Z

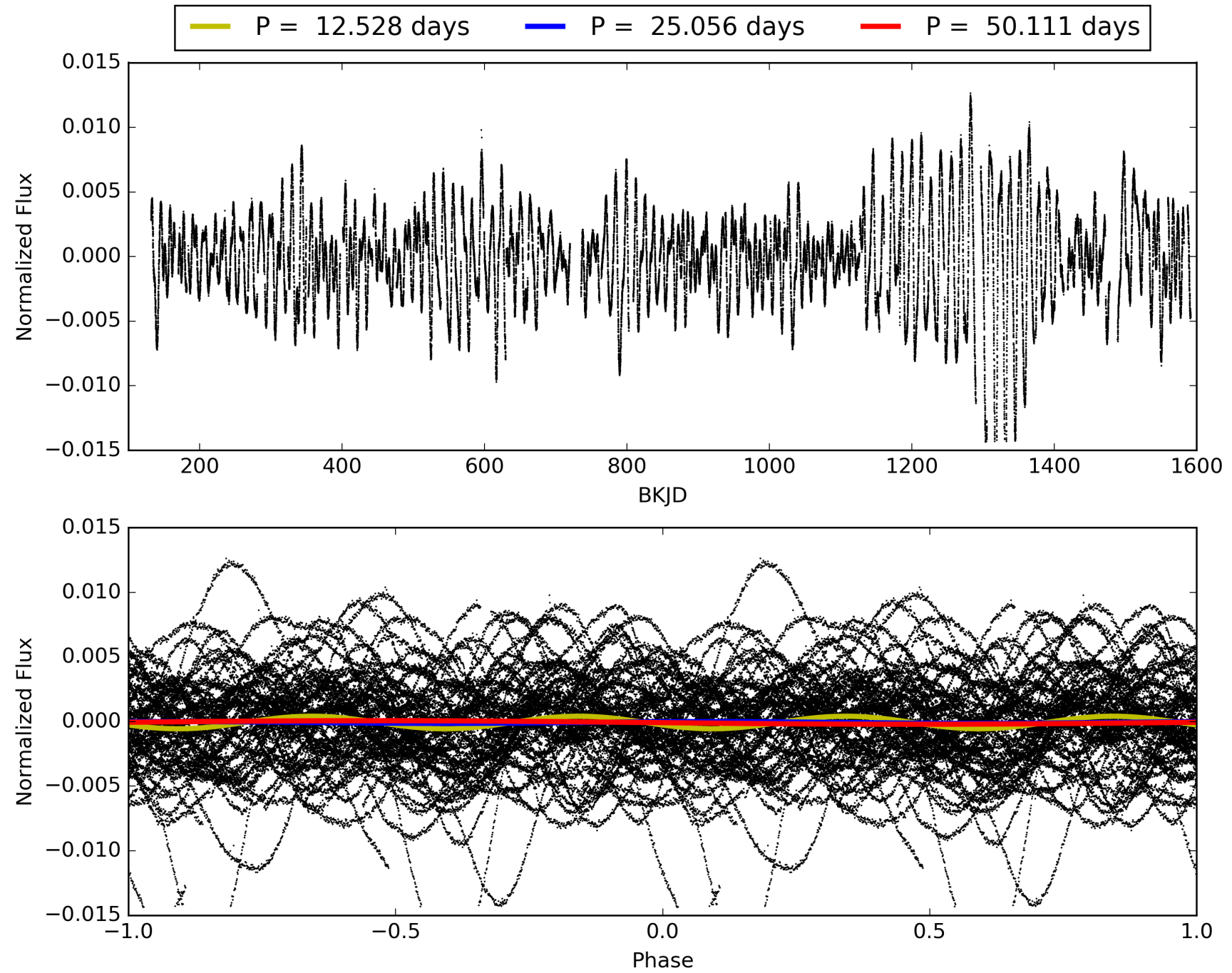
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center



# TCE 005991070-04, PDC Light Curves

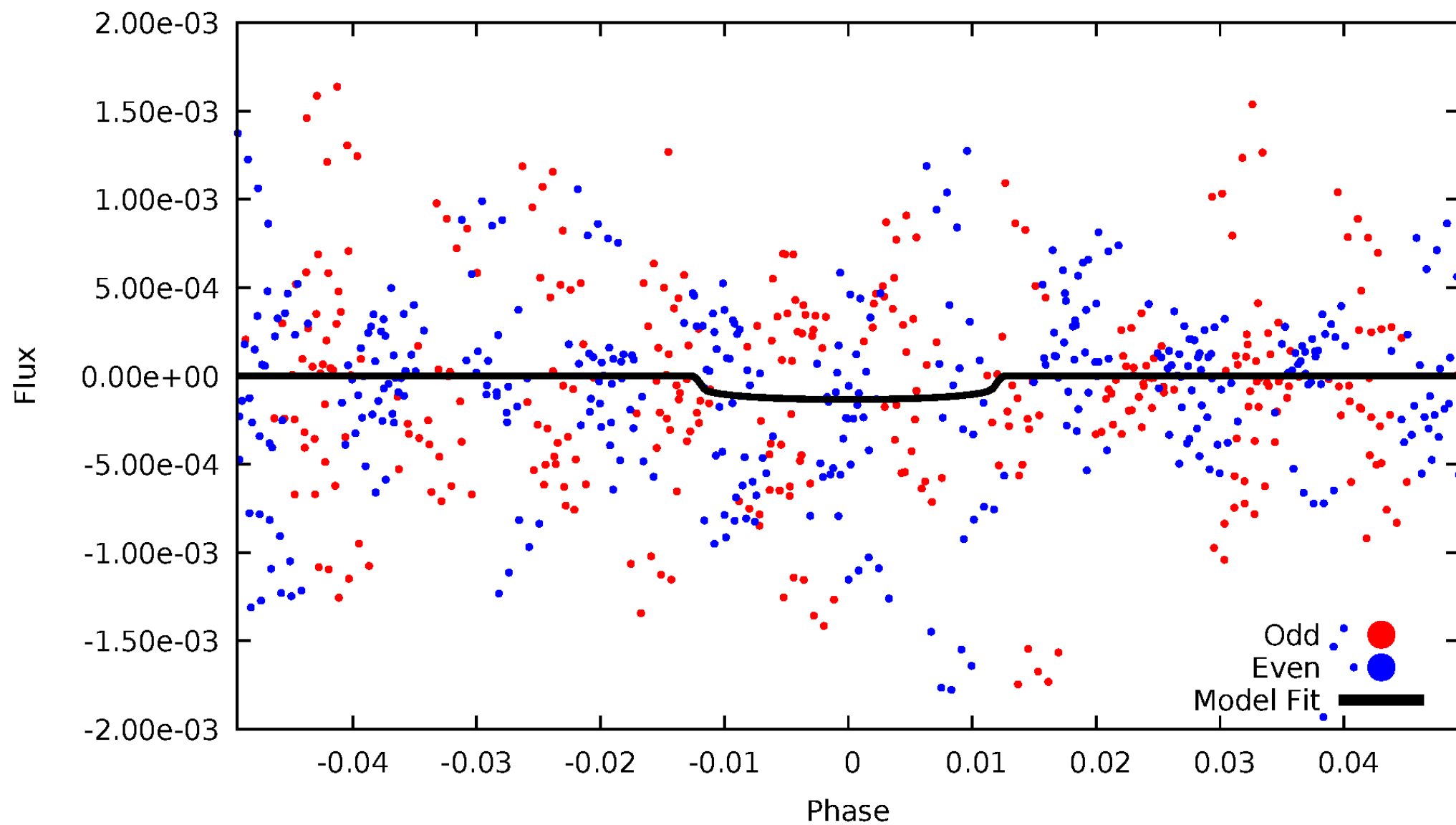


TCE 005991070-04



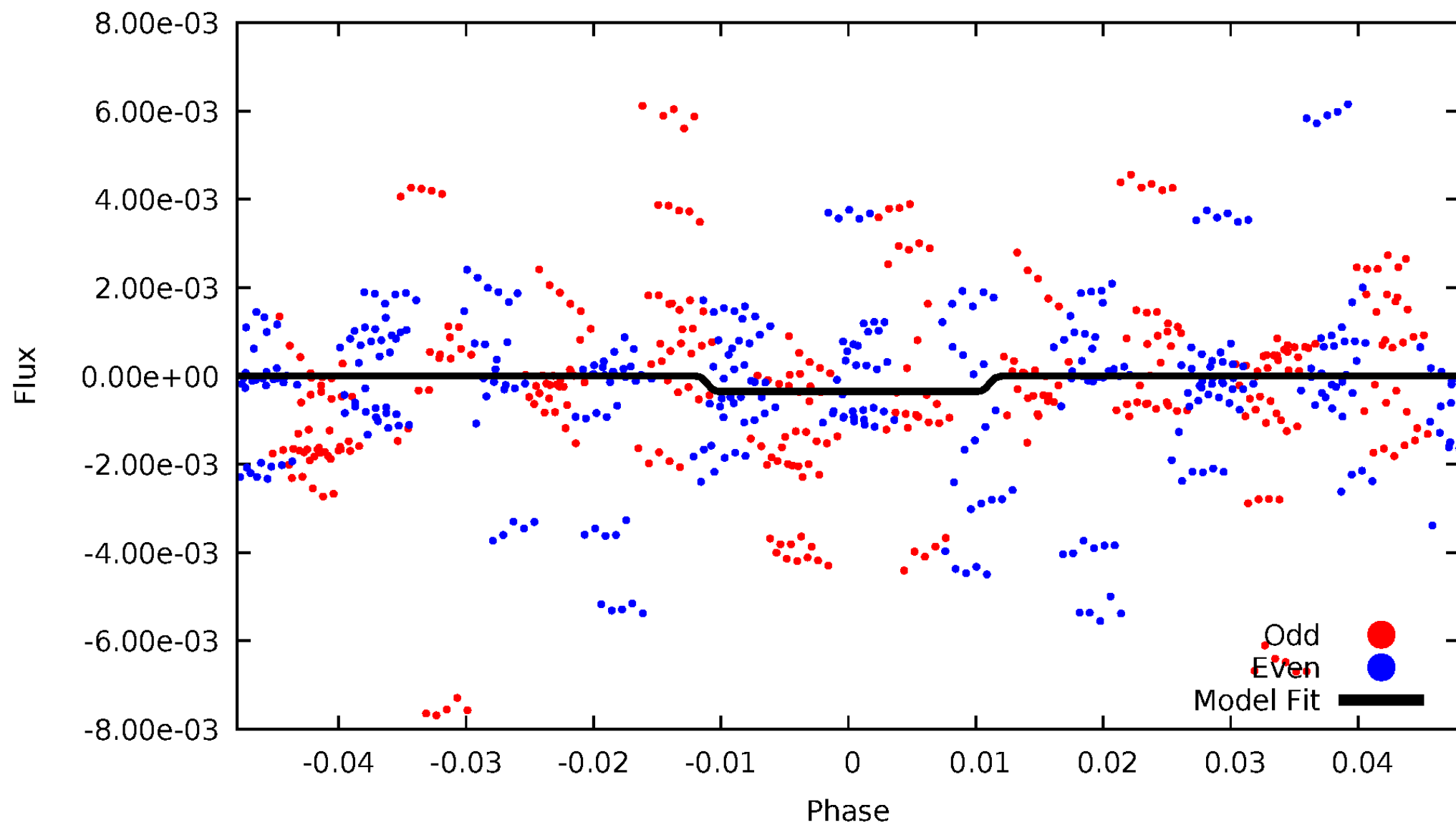
# DV Odd/Even

TCE 005991070-04



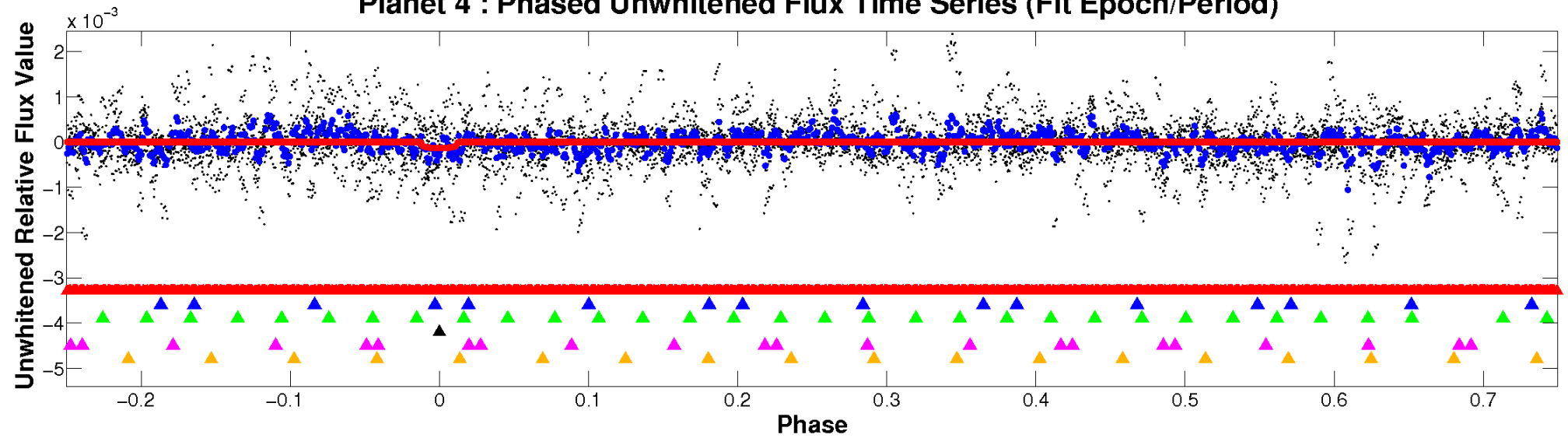
# ALT Odd/Even

TCE 005991070-04

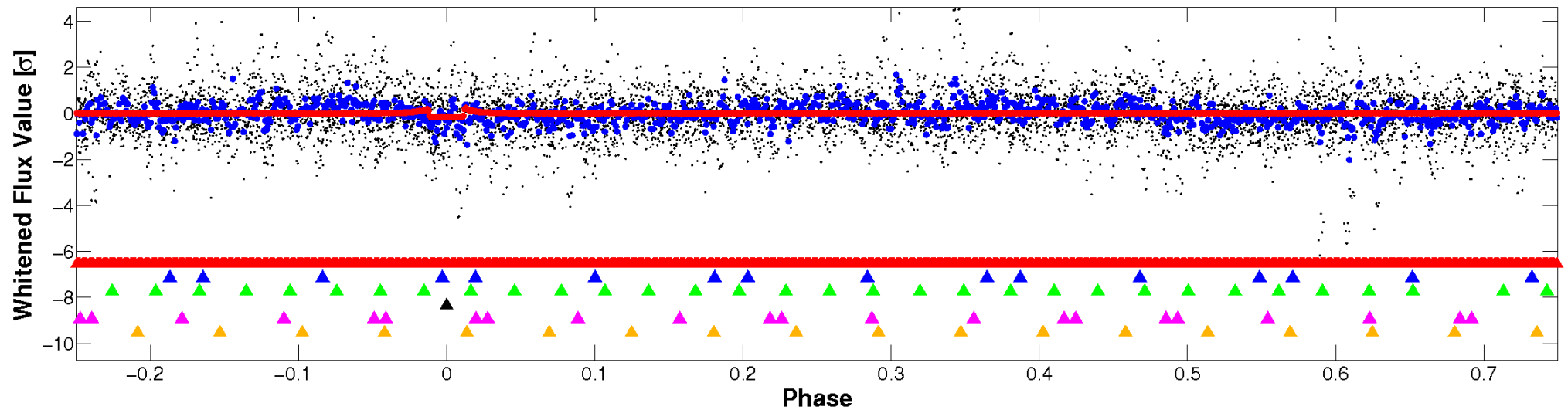


# Non-Whitened Vs. Whitened Light Curve

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

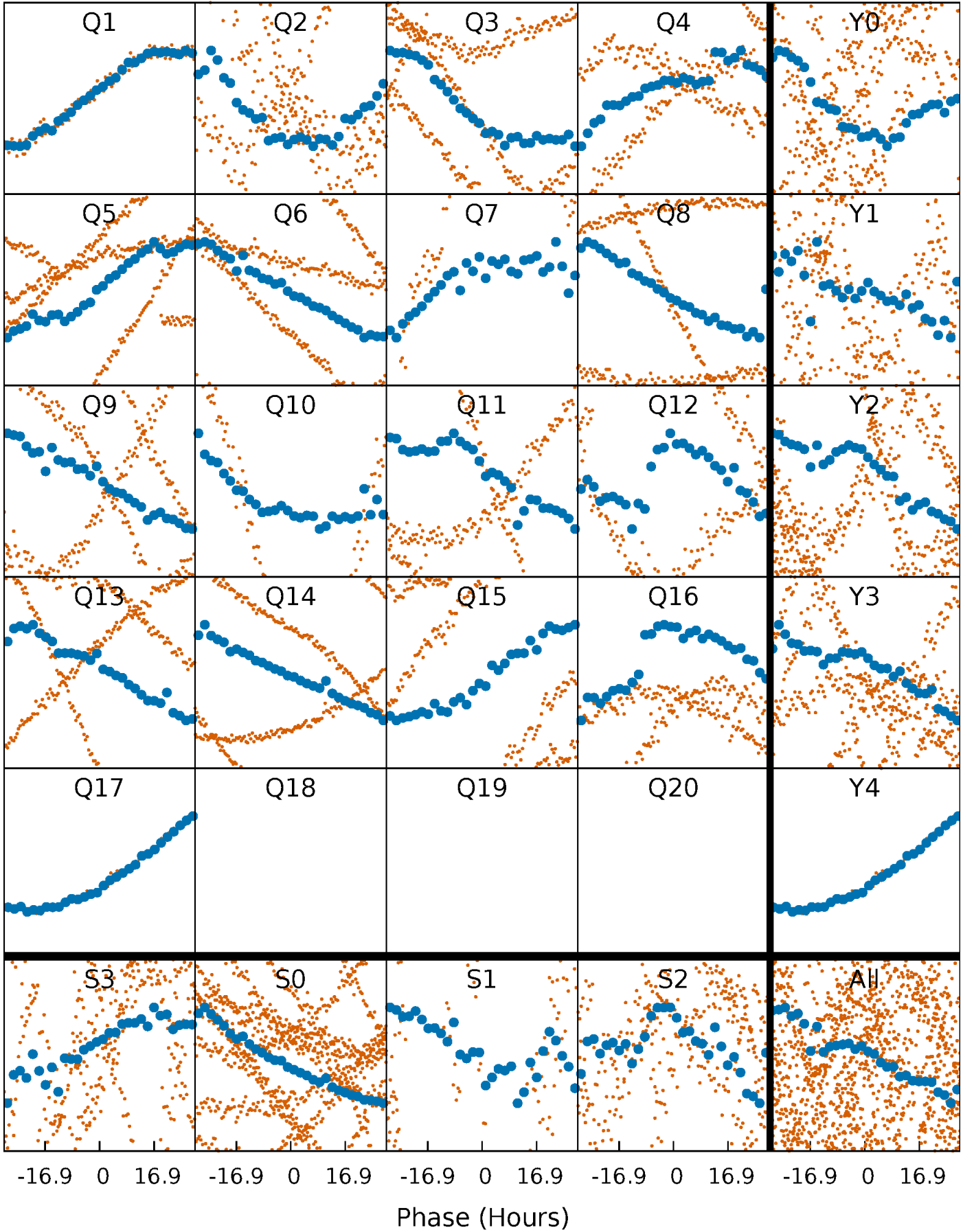


## Planet 4 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

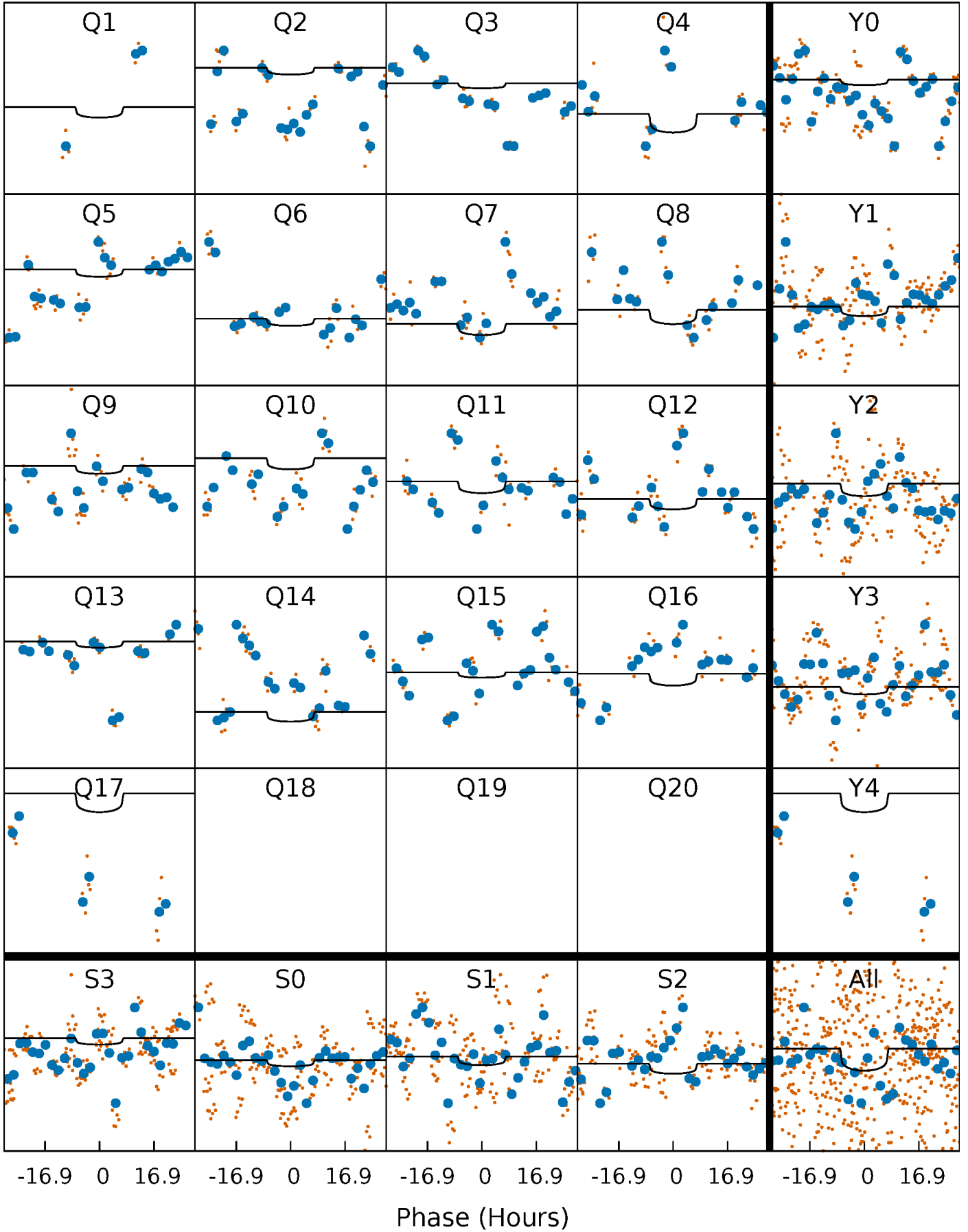
TCE 005991070-04   P= 25.055683 Days    $T_0=149.765335$  (BKJD)





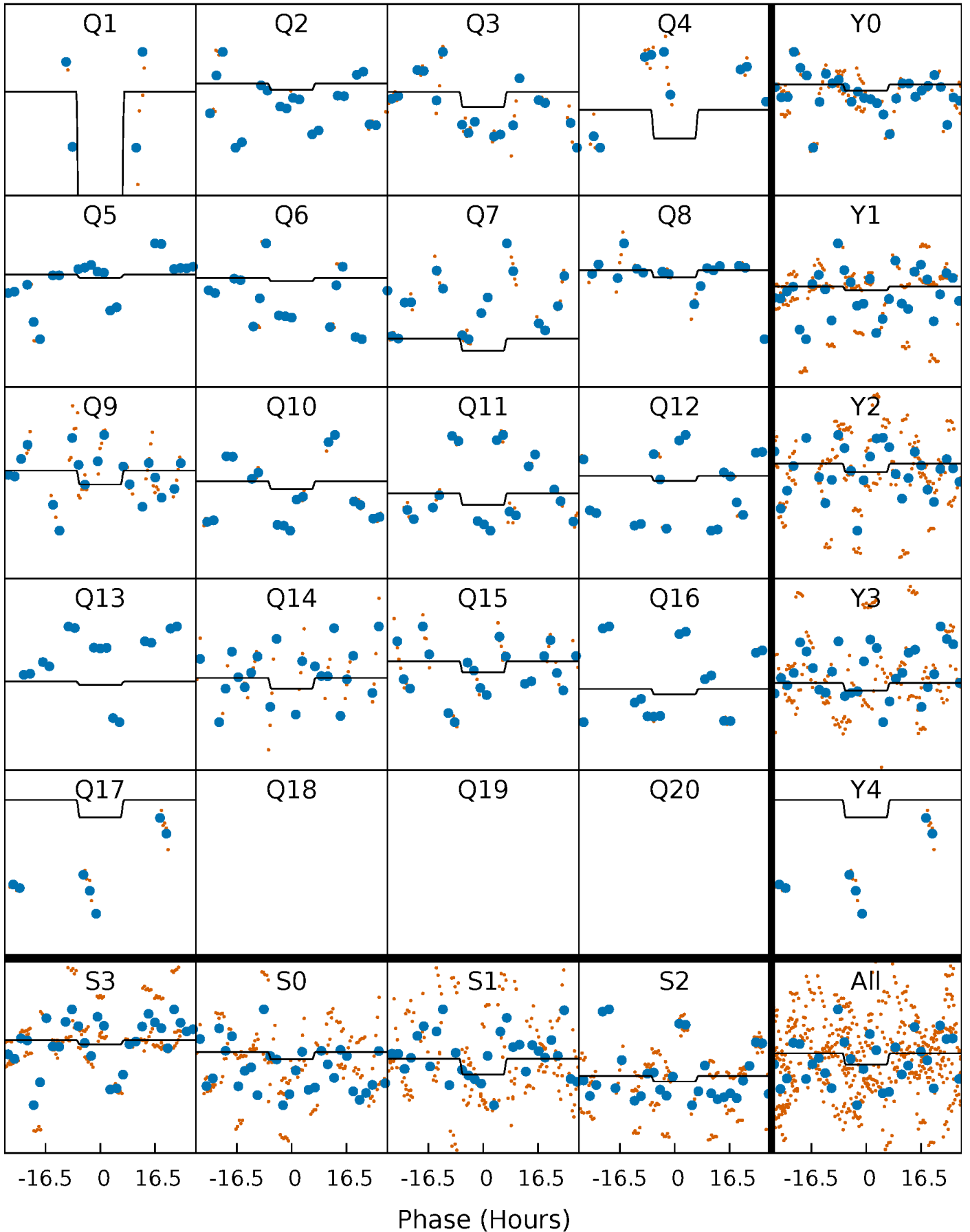
# DV Quarter-Phased Transit Curves

TCE 005991070-04   P= 25.055683 Days    $T_0=149.765335$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

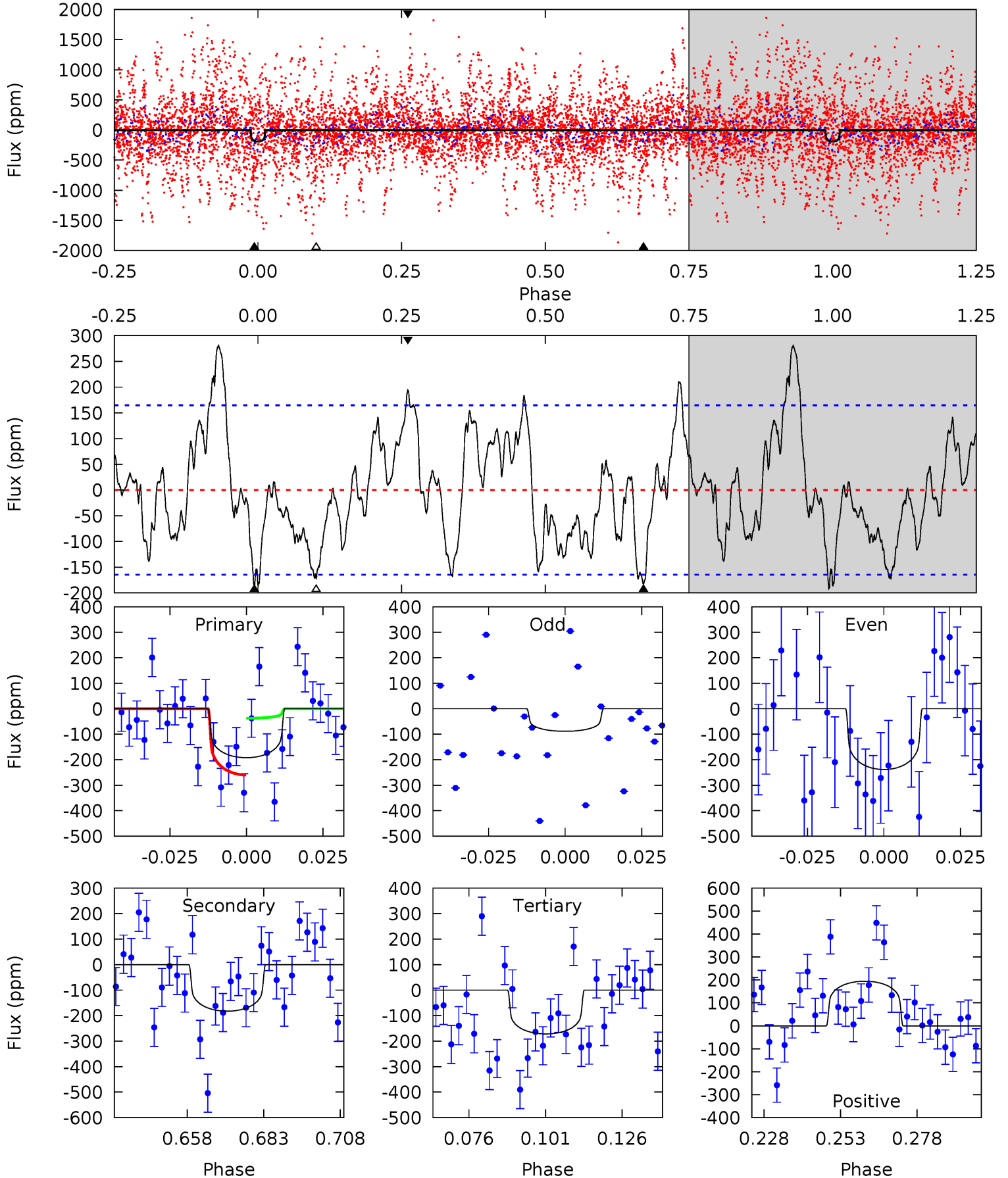
TCE 005991070-04 P= 25.055291 Days  $T_0=149.758551$  (BKJD)



# DV Model-Shift Uniqueness Test

005991070-04,  $P = 25.055683$  Days,  $E = 124.709652$  Days

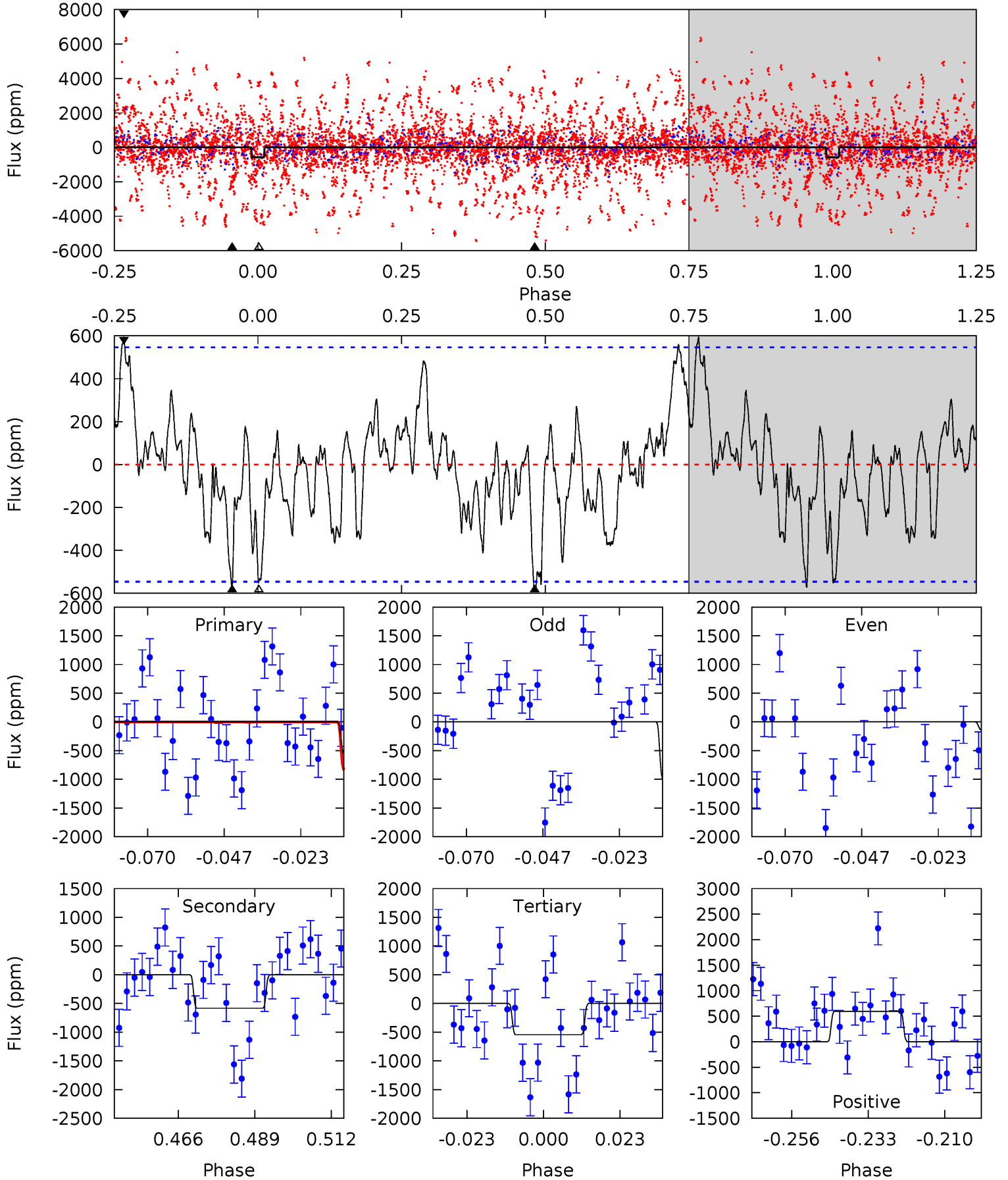
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
5.66	5.38	5.06	5.73	4.85	2.24	2.79	0.60	-0.07	0.32	-0.35	2.19	1.71	0.59	3.29



# Alt Model-Shift Uniqueness Test

005991070-04, P = 25.055291 Days, E = 124.703260 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
5.10	5.19	4.85	5.29	4.86	2.27	1.90	0.25	-0.19	0.35	-0.09	3.77	0.99	0.50	2.79



### Stellar Parameters For KIC 005991070

	$T_{\text{eff}} (K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M (M_{\odot})$	$\rho_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5766^{+173}_{-144}$	$3.783^{+0.330}_{-0.110}$	$-0.080^{+0.350}_{-0.250}$	$2.409^{+0.423}_{-0.986}$	$1.283^{+0.143}_{-0.310}$	$0.129^{+0.312}_{-0.044}$
	+3%/-2%	+9%/-3%	+438%/-312%	+18%/-41%	+11%/-24%	+242%/-34%
Source	PHO1	FLK73	KIC0	DSEP		

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

### Secondary Eclipse Parameters for KIC 005991070-04 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-183 \pm 34$	$3.01^{+2.06}_{-1.83}$	$1268^{+87}_{-118}$	$5975^{+4589}_{-1163}$	$355^{+2004}_{-229}$
Alt.	$-584 \pm 112$	$4.55^{+2.47}_{-1.93}$	$1272^{+82}_{-111}$	$6461^{+2591}_{-1131}$	$491^{+976}_{-287}$

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

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

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

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

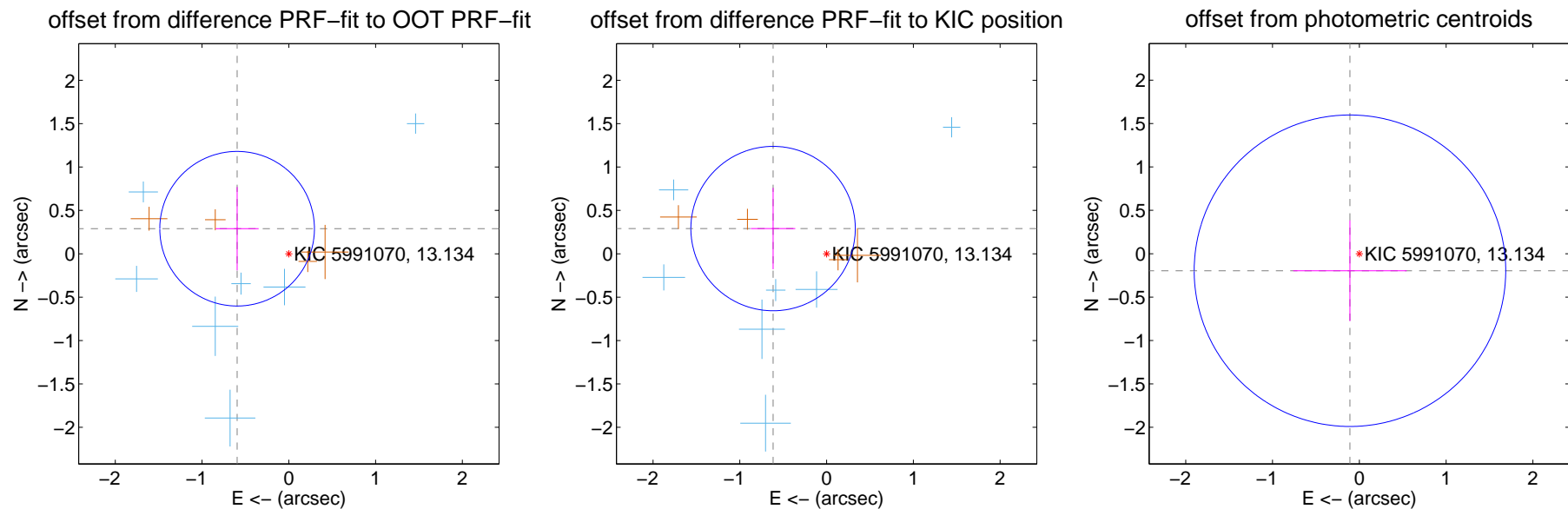
## DV Centroid Data

Supplemental centroid analysis for 005991070-04. Kepler magnitude: 13.13. Transit SNR 2.59

There are 8 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.09 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.662 \pm 0.297$	2.23	$0.596 \pm 0.248$	$0.289 \pm 0.480$
PRF-fit source offset from KIC position	$0.682 \pm 0.316$	2.16	$0.617 \pm 0.256$	$0.291 \pm 0.469$
photometric centroid source offset	$0.22 \pm 0.60$	0.37	$0.11 \pm 0.65$	$-0.20 \pm 0.58$

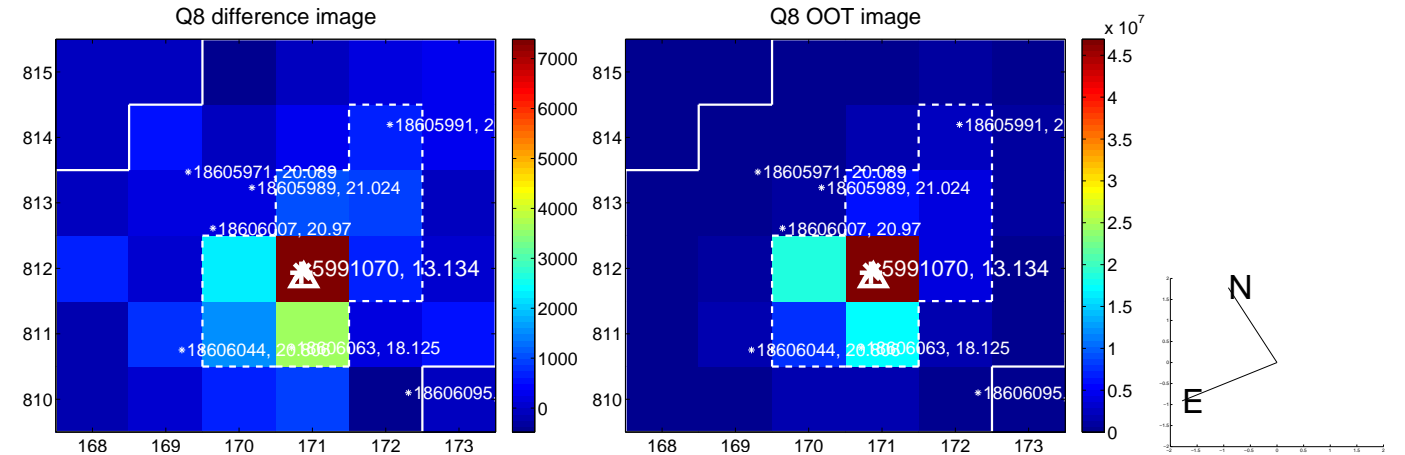
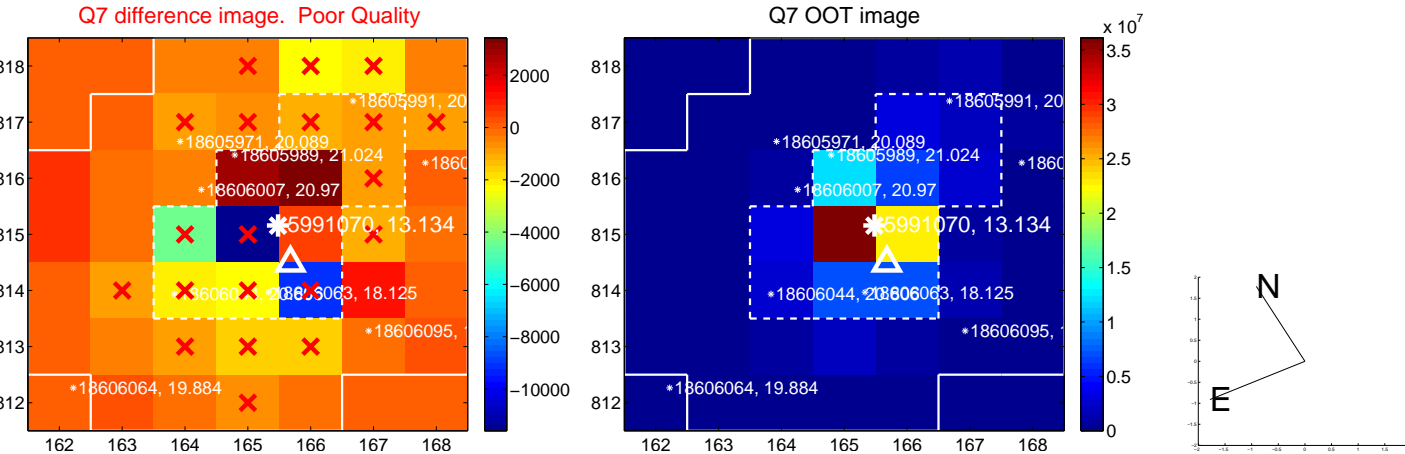
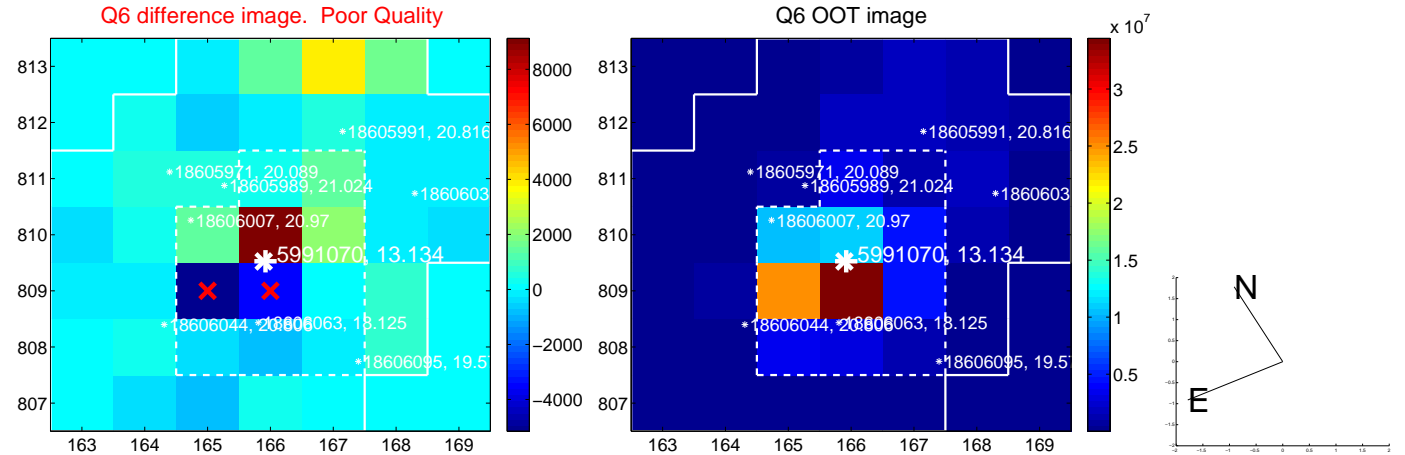
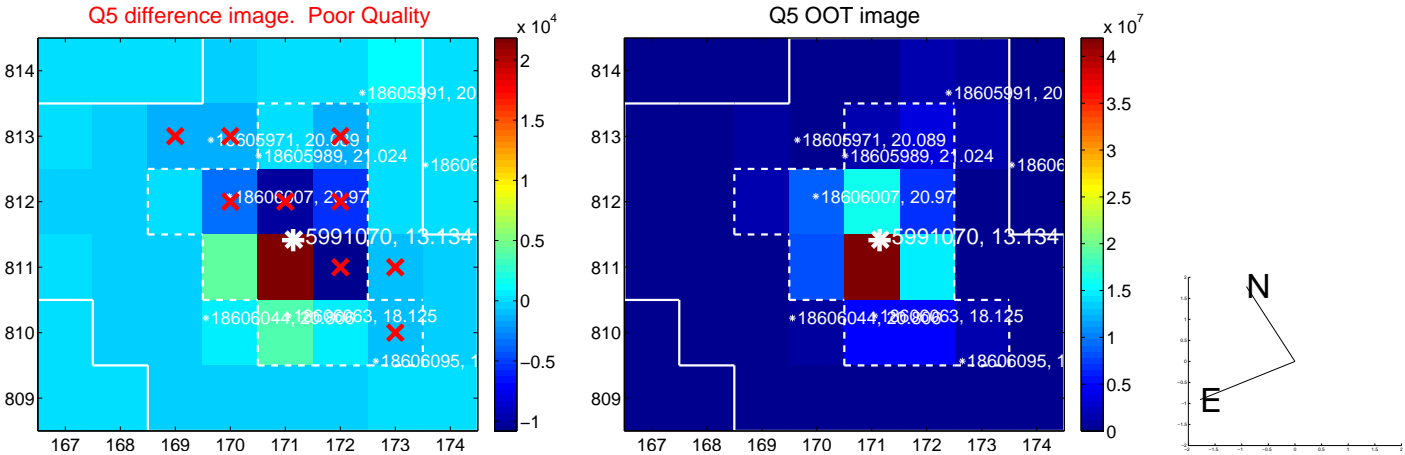


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

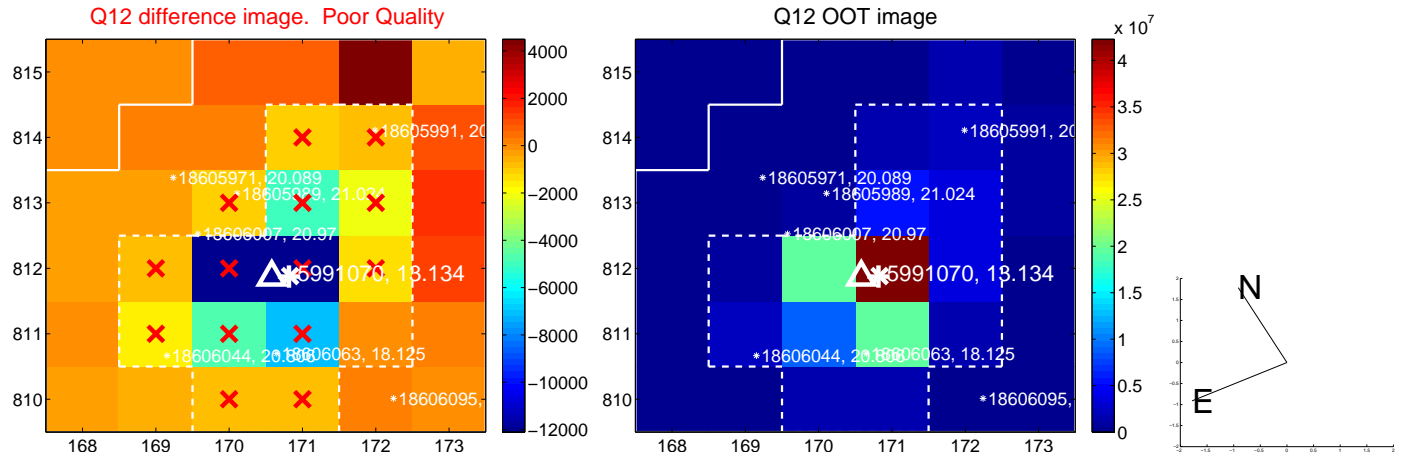
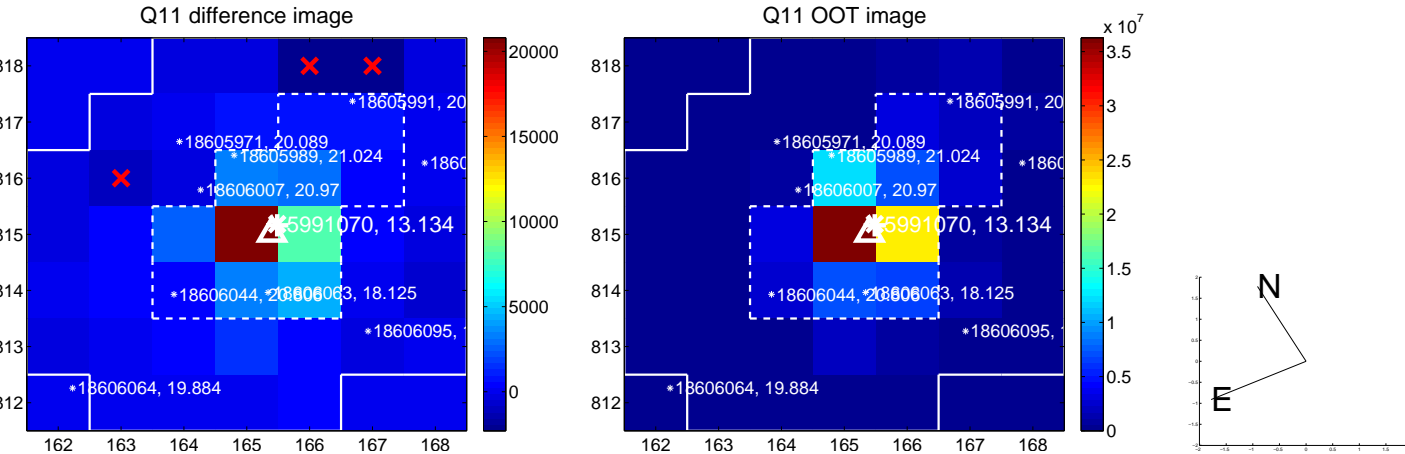
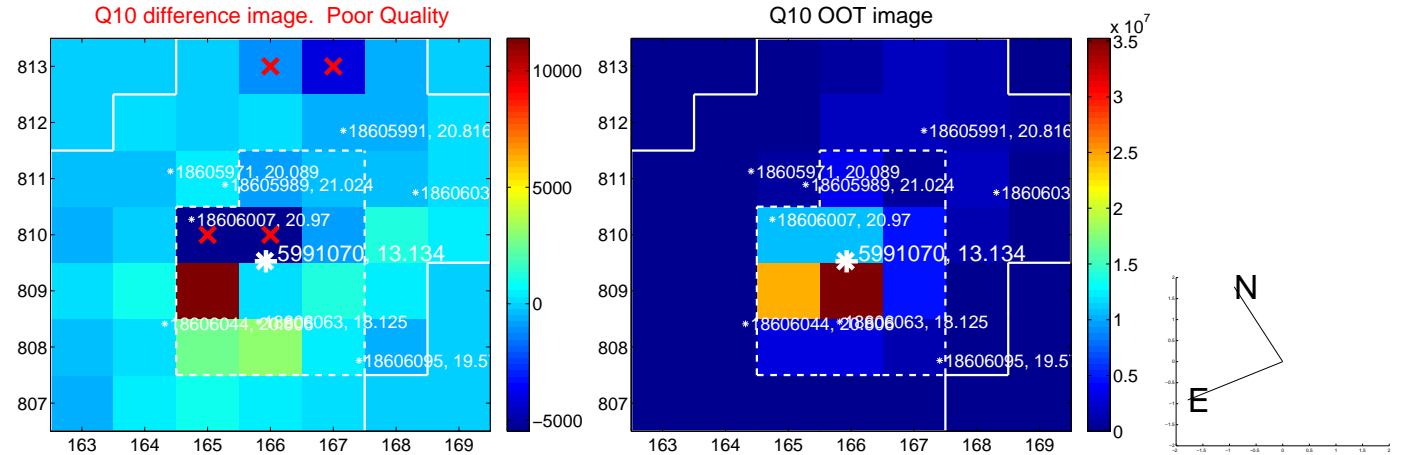
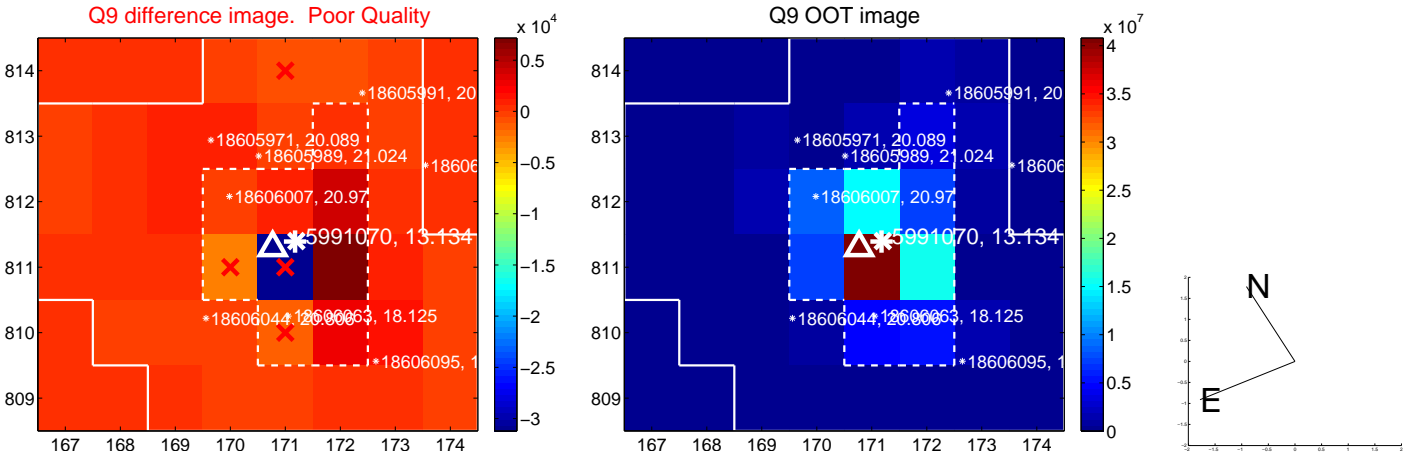




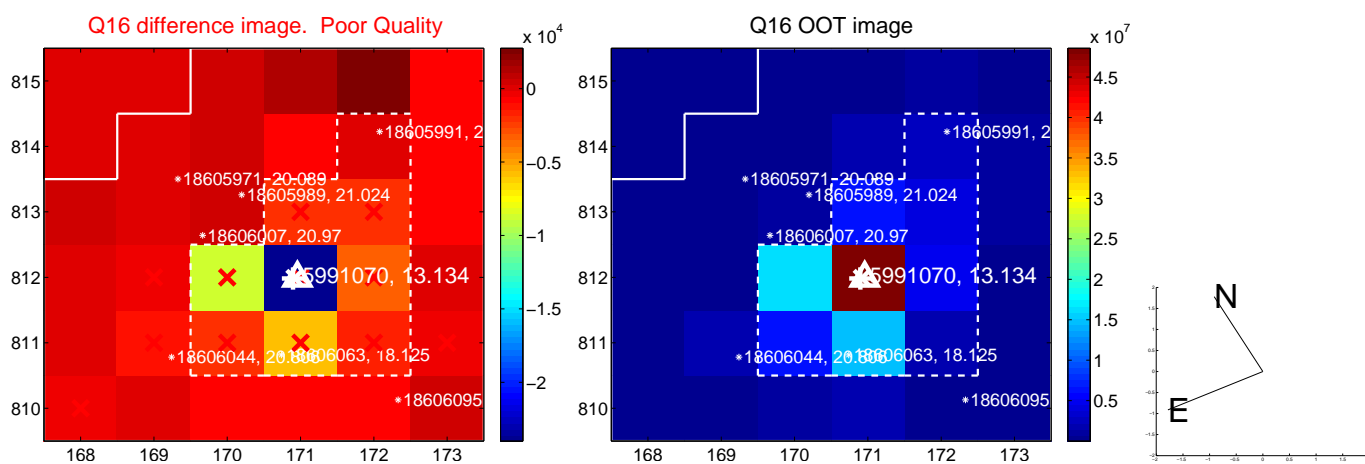
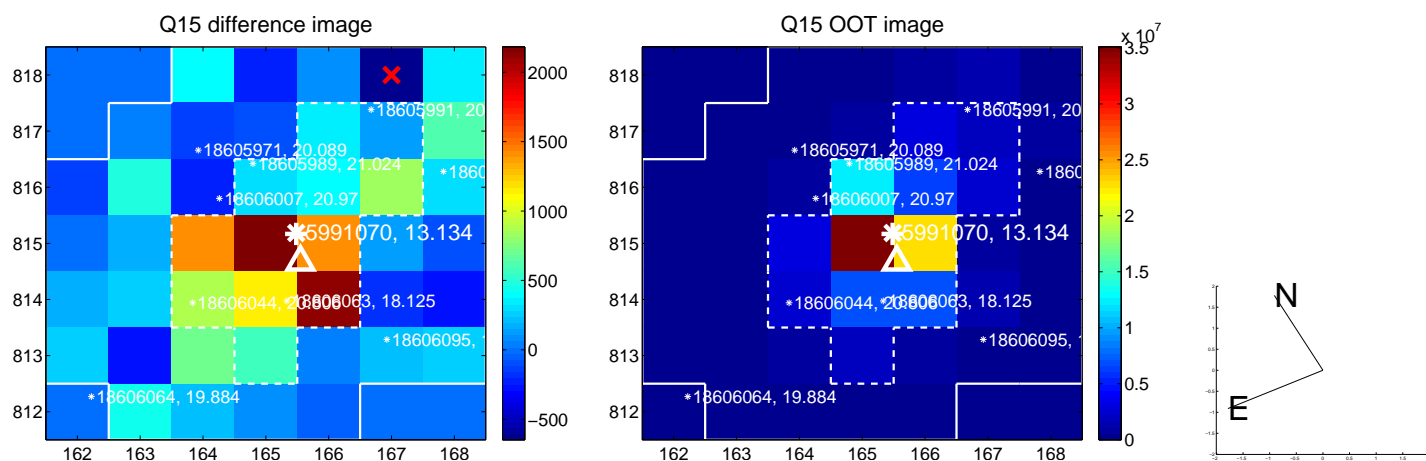
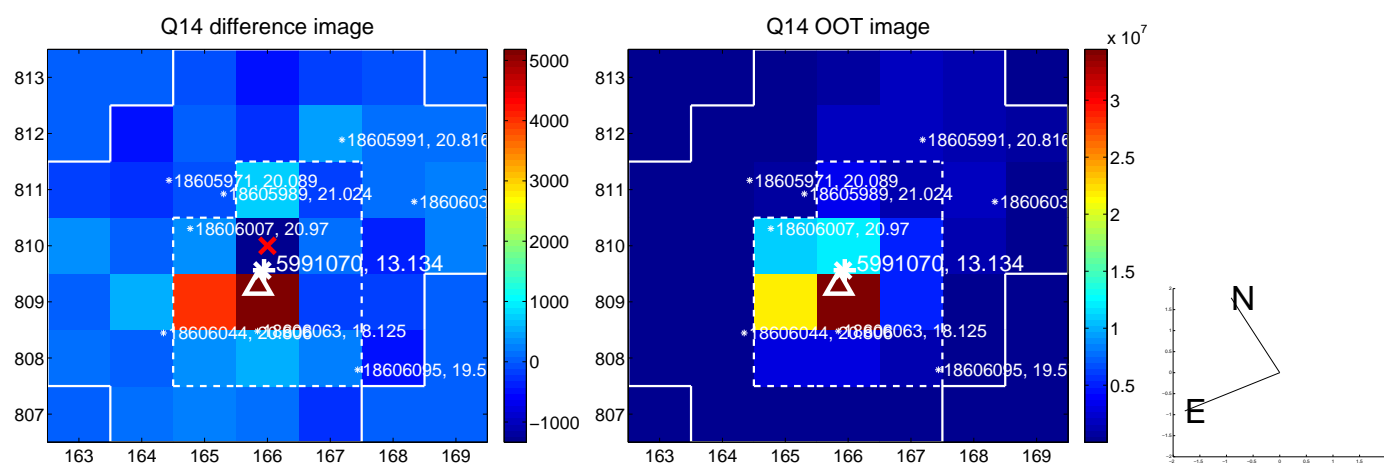
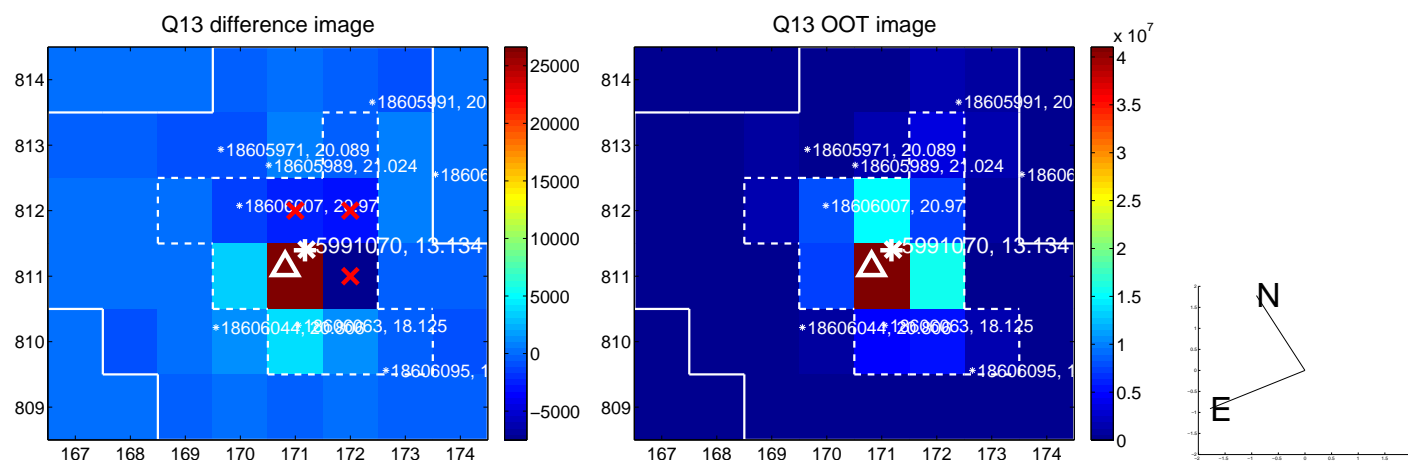
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



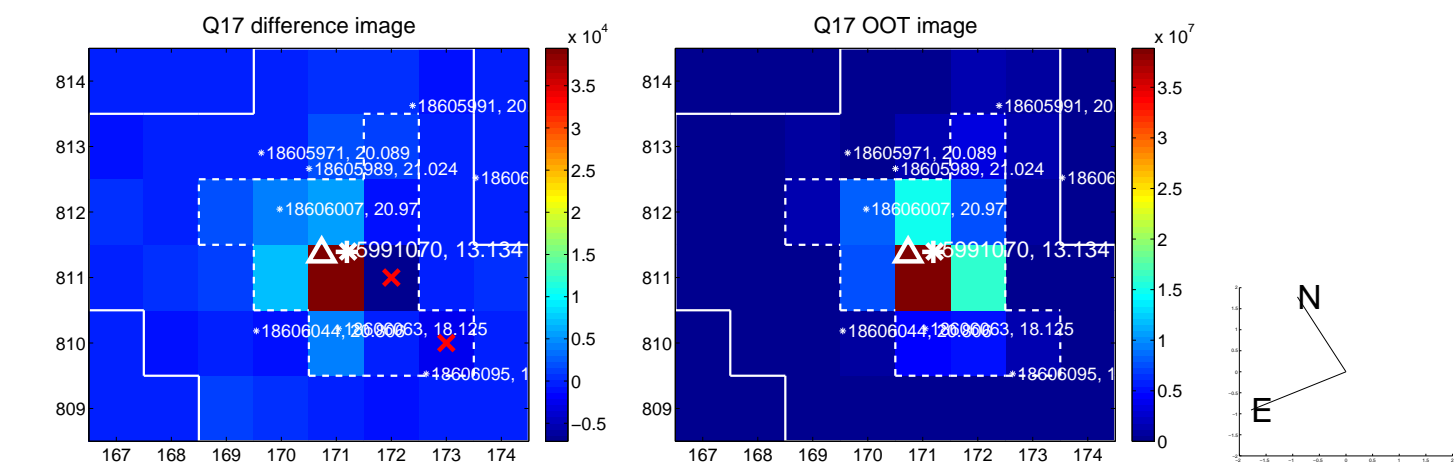
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



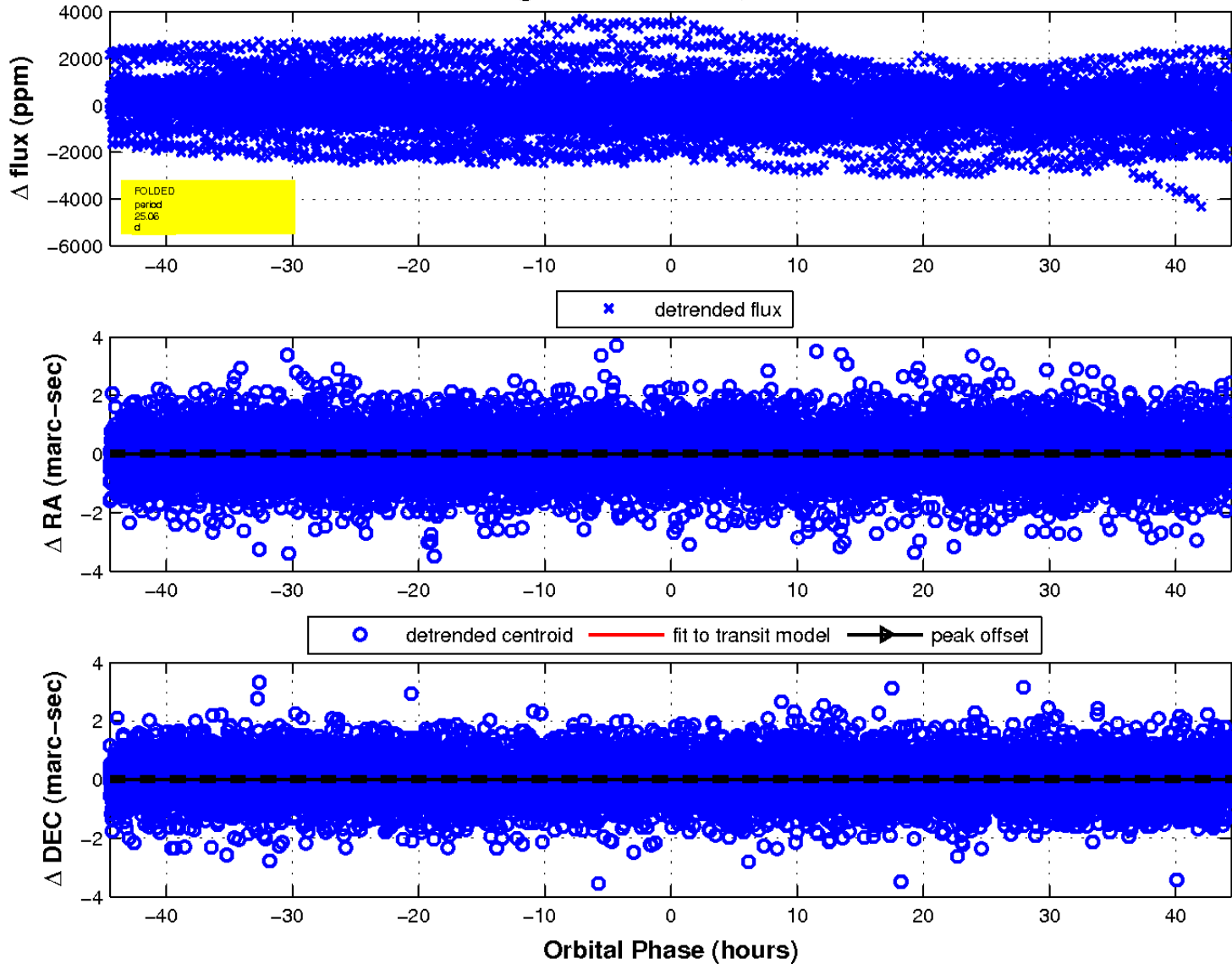
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

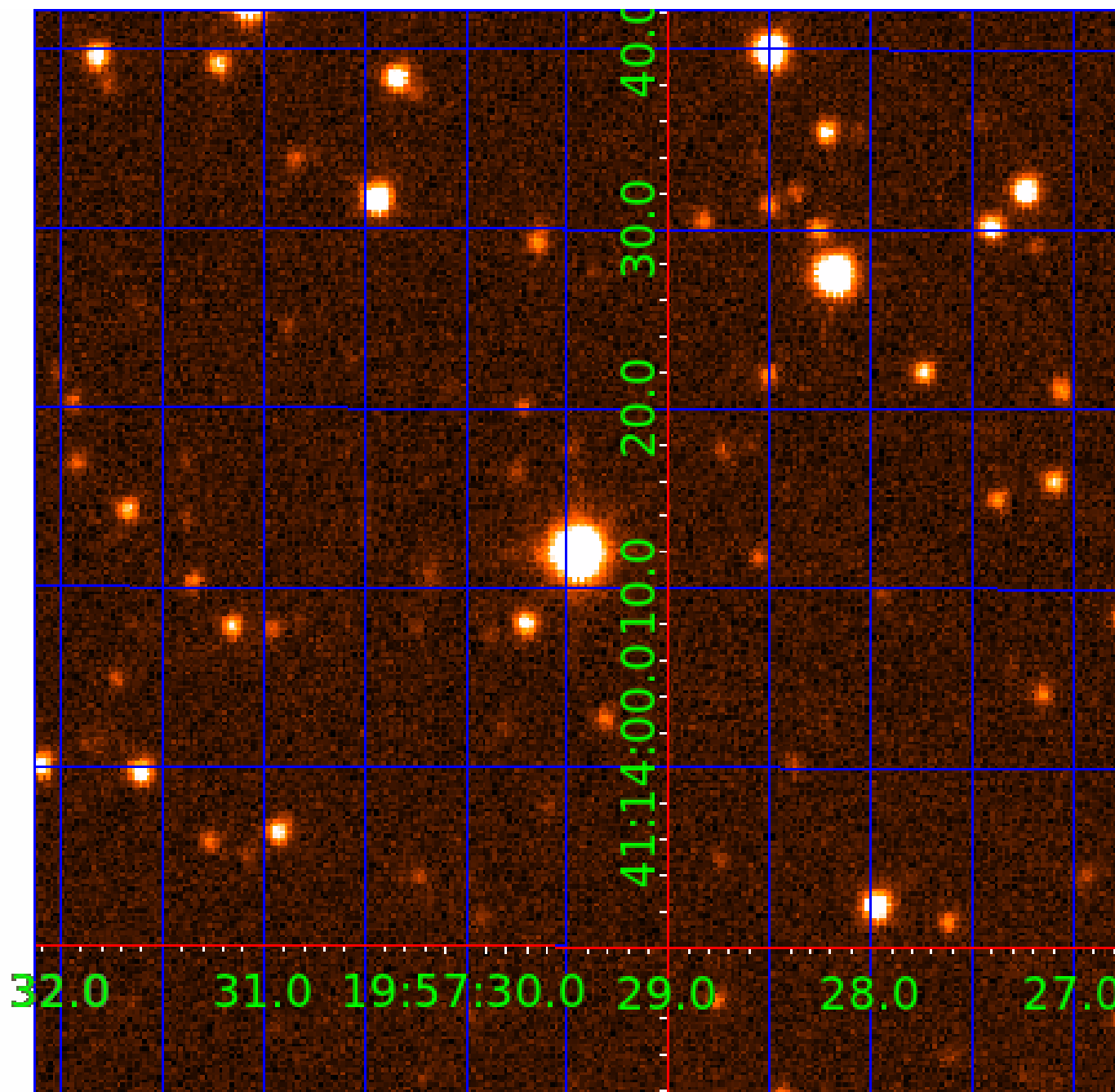


fluxWeightedCentroids, Planet 4 of 6



UKIRT Image

Declination



# KIC 005991070

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
005991070-01	OBS	7756.01	0.941000	131.926402	23.5	6.497	8.8	10.8	2.41	5766	1.70	13766.75
005991070-03	OBS	No	46.313436	138.044377	776.2	4.591	22.0	5.6	2.41	5766	13.17	76.33
005991070-04	OBS	No	25.055683	149.765335	133.0	14.826	15.0	2.6	2.41	5766	3.01	173.15
005991070-06	OBS	No	23.663450	138.980719	1.9	25.997	9.5	0.0	2.41	5766	0.34	186.86

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
005991070-01	OBS	FP	0.42	1	0	0	0	LPP_DV—CENT_CROWDED
005991070-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_TER_ALT—MOD_POS_ALT—CENT_FEW_DIFFS
005991070-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_ZUMA—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
005991070-06	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT

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

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

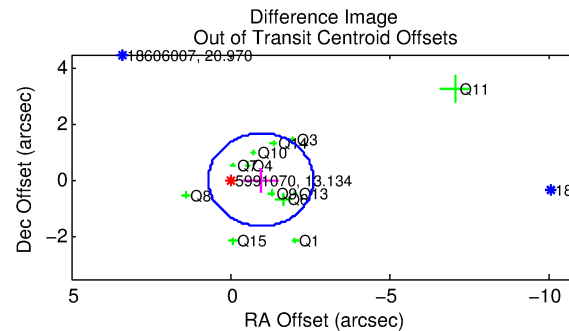
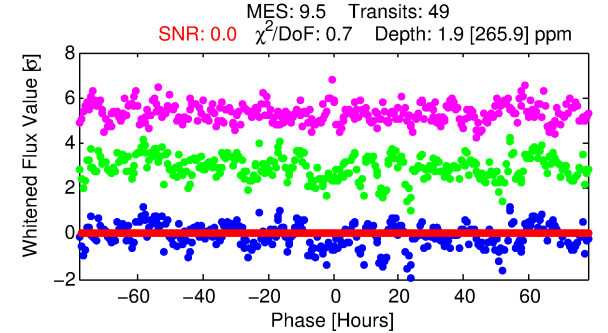
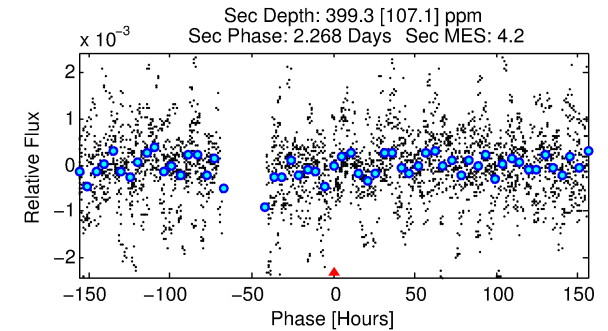
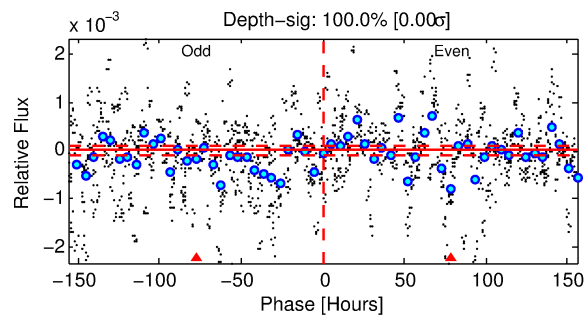
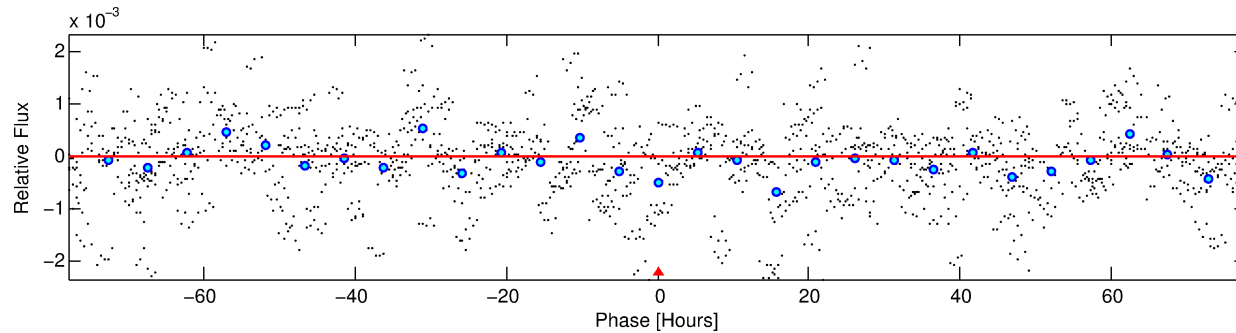
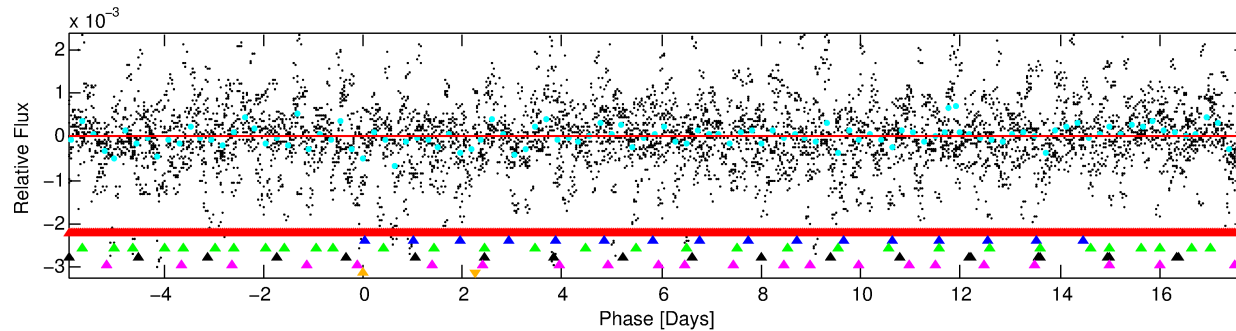
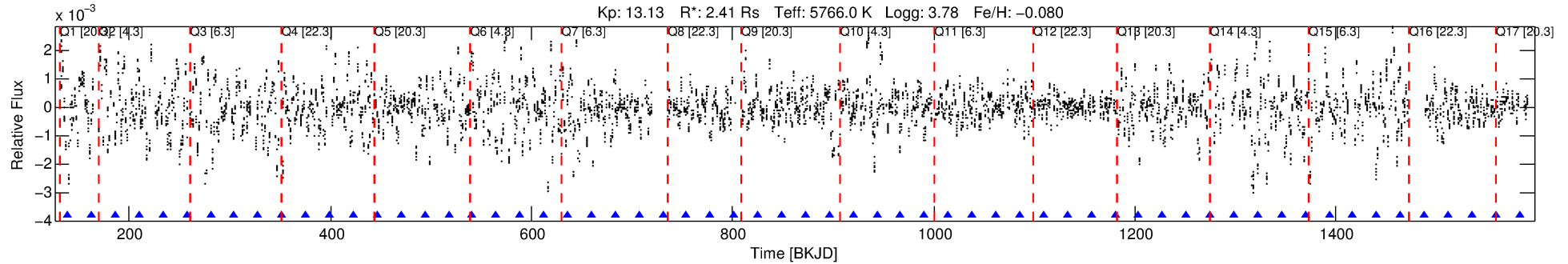
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 005991070-06

No Significant Match Found

# DV One-Page Summary

KIC: 5991070 Candidate: 6 of 6 Period: 23.663 d



## DV Fit Results:

Period = 23.66345 [3.71124] d  
Epoch = 138.9807 [145.6455] BKJD  
Rp/R\* = 0.0013 [0.2695]  
a/R\* = 6.14 [5473.30]  
b = 0.48 [1460.66]  
Seff = 186.86 [116.57]  
Teq = 943 [147] K  
Rp = 0.33 [70.83] Re  
a = 0.1754 [0.0678] AU  
Ag = 60326.06 [25536020.43] [0.00 $\sigma$ ]  
Teffp = 22844 [2417396] K [0.01 $\sigma$ ]

## DV Diagnostic Results:

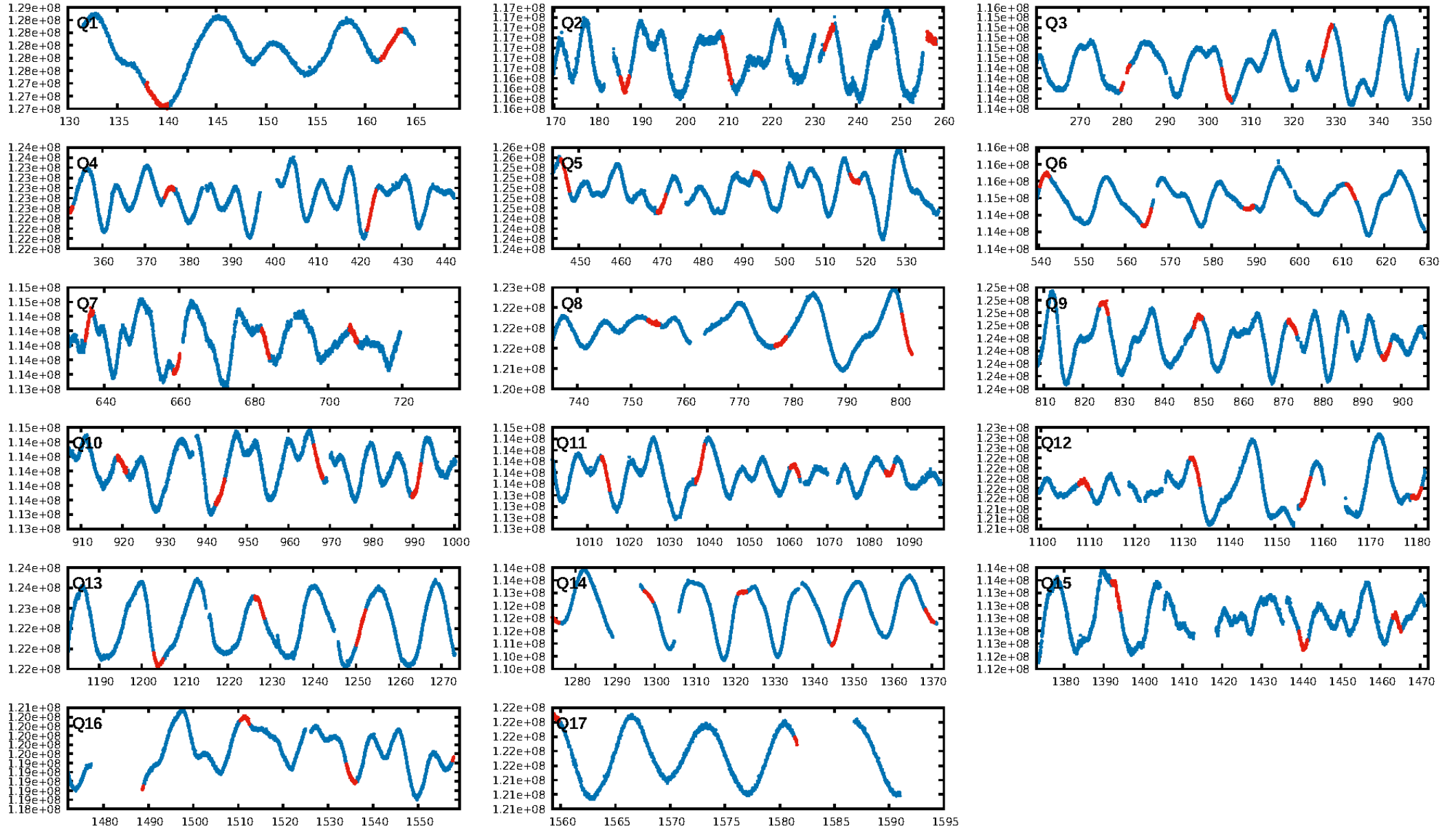
ShortPeriod-sig: 100.0% [20.35 $\sigma$ ]  
LongPeriod-sig: 73.6% [1.12 $\sigma$ ]  
ModelChiSquare2-sig: 0.5%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 2.93e-15  
RollingBand-fgt: 1.00 [48/48]  
GhostDiagnostic-chr: N/A  
Centroid-sig: N/A  
Centroid-so: N/A  
OotOffset-rm: 0.967 arcsec [1.76 $\sigma$ ]  
KicOffset-rm: 0.973 arcsec [1.70 $\sigma$ ]  
OotOffset-st: 3/4/2/3 [12]  
KicOffset-st: 3/4/2/3 [12]  
DiffImageQuality-fgm: 0.42 [5/12]  
DiffImageOverlap-fno: 0.00 [0/14]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 08:02:29 Z

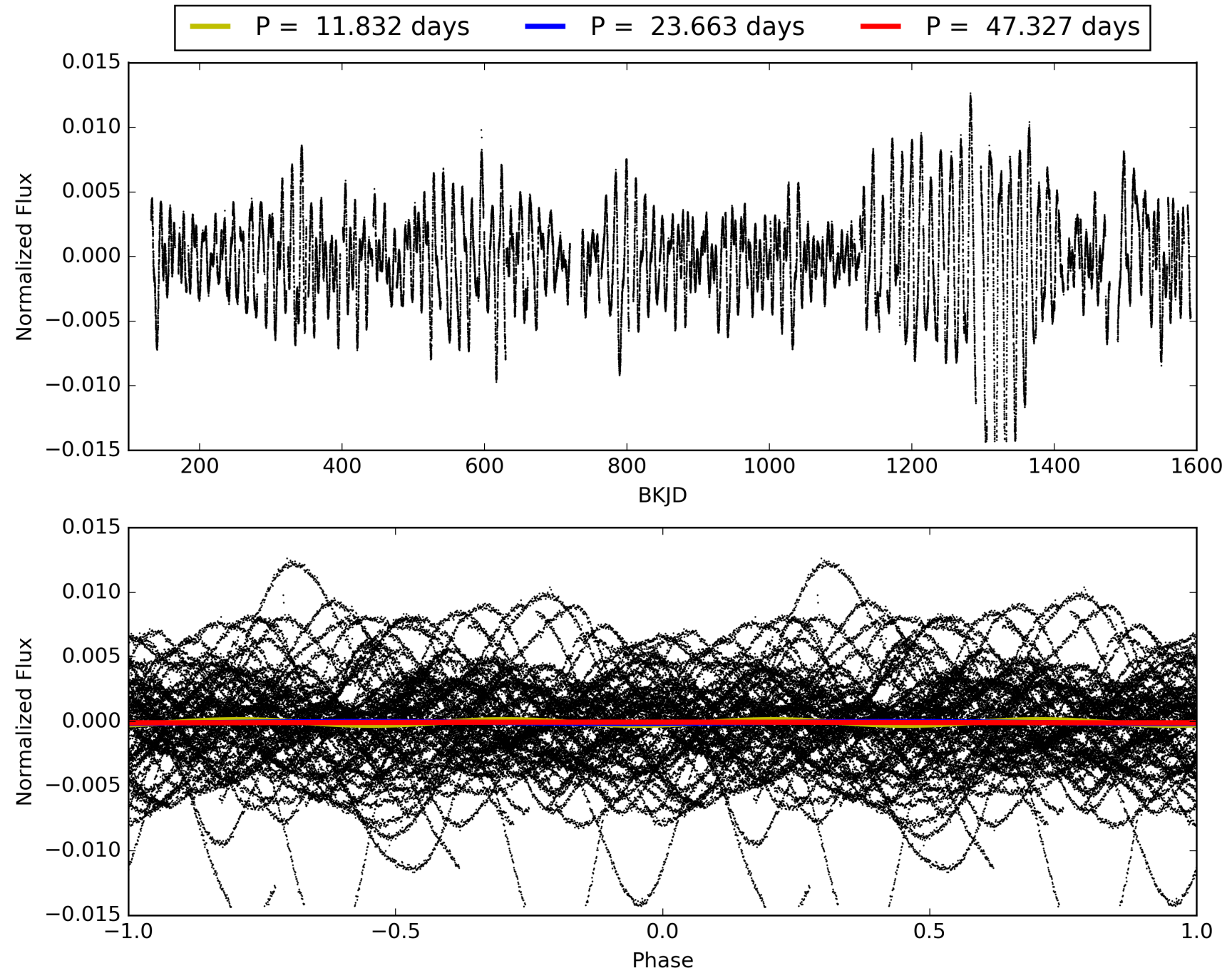
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center



# TCE 005991070-06, PDC Light Curves

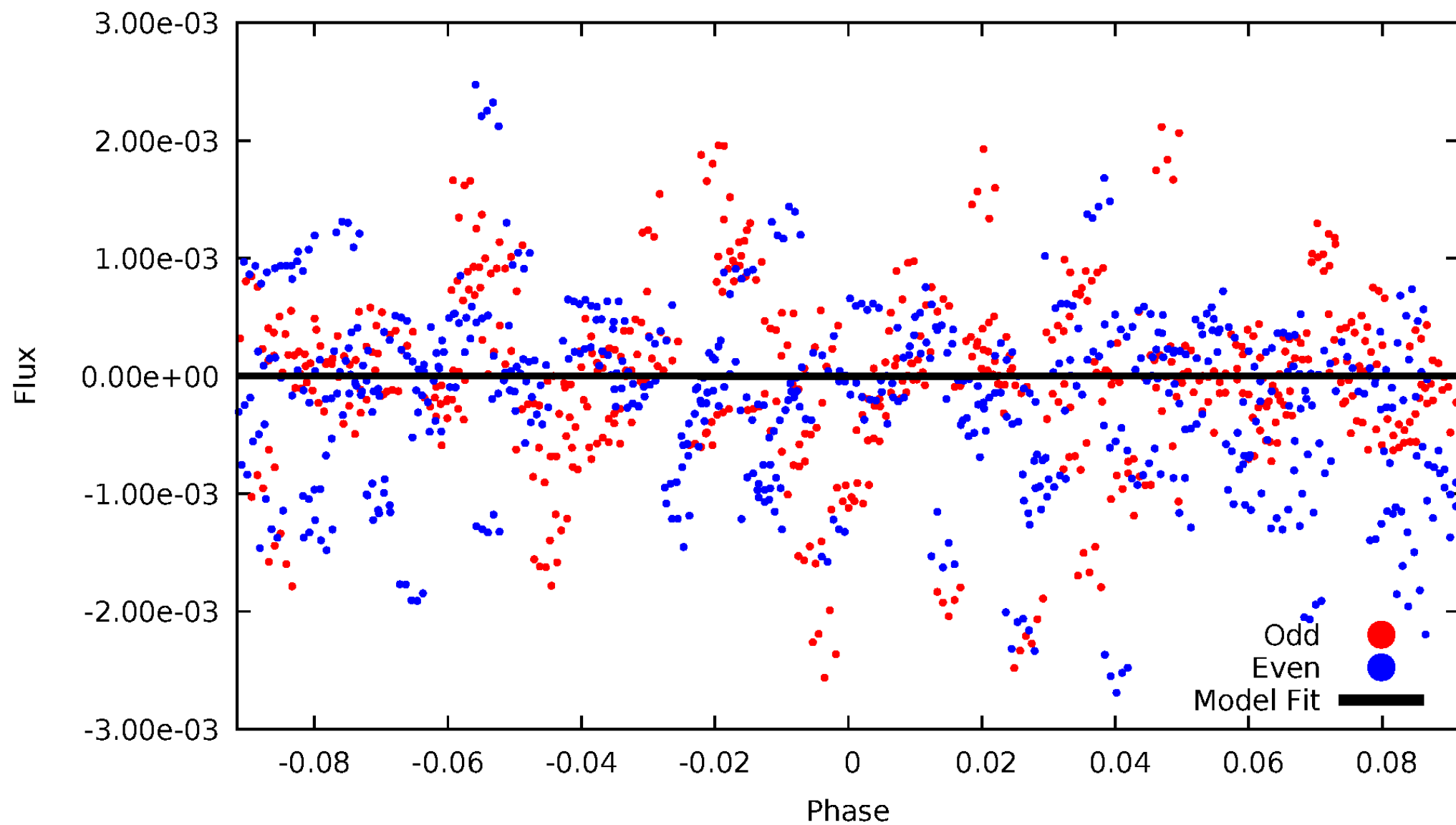


TCE 005991070-06



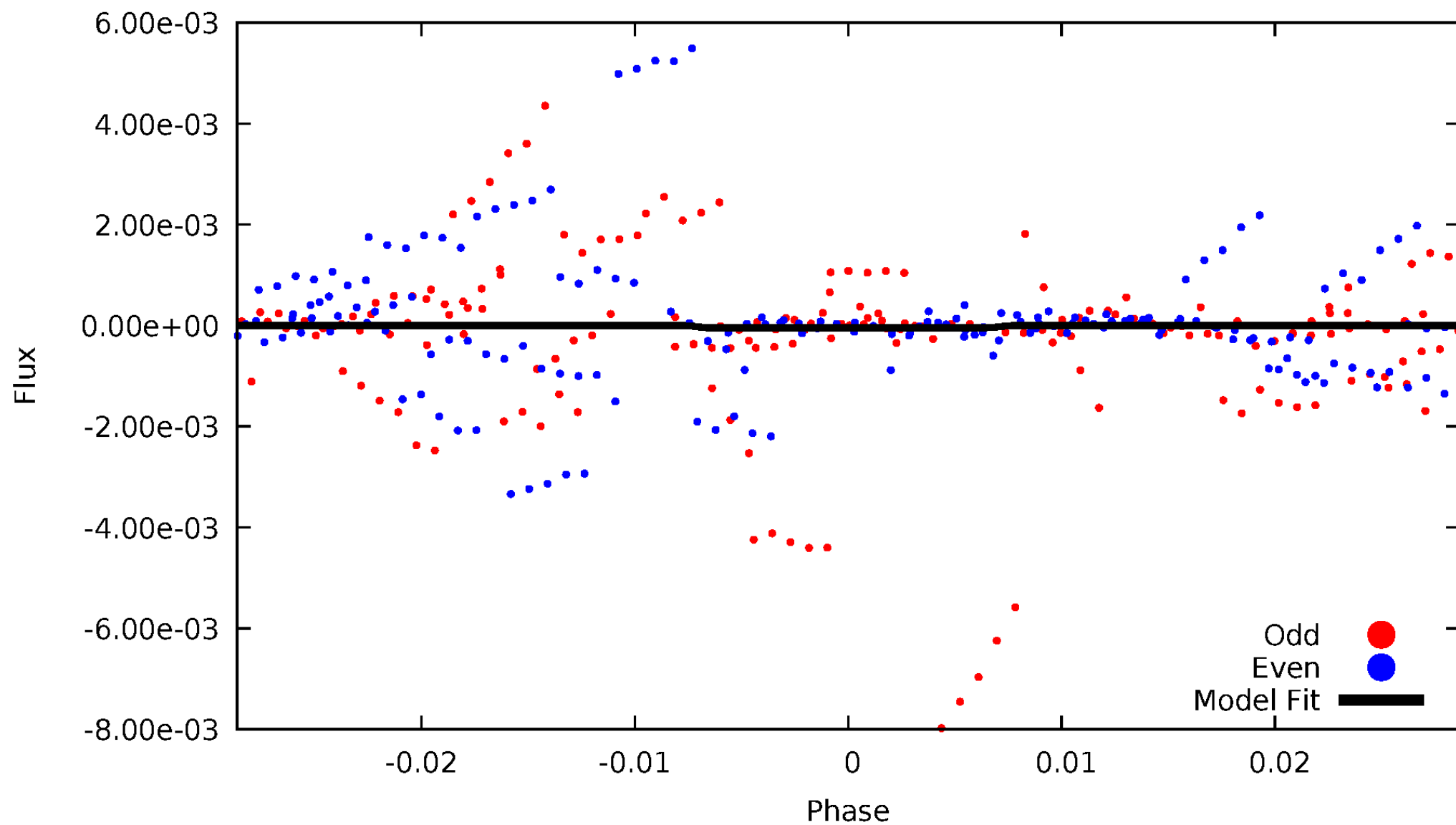
# DV Odd/Even

TCE 005991070-06



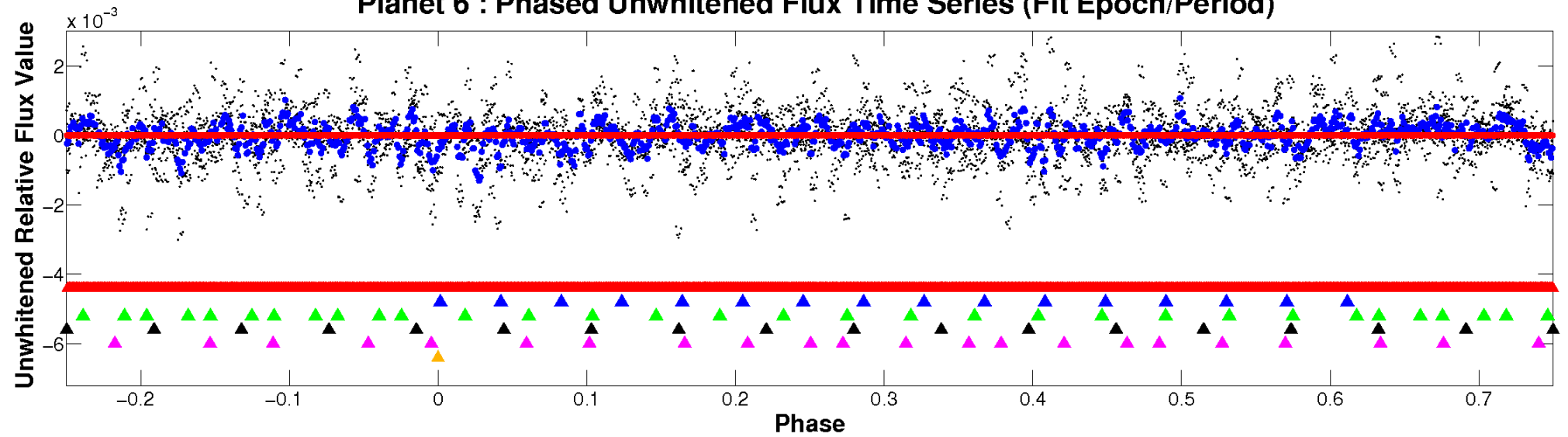
# ALT Odd/Even

TCE 005991070-06

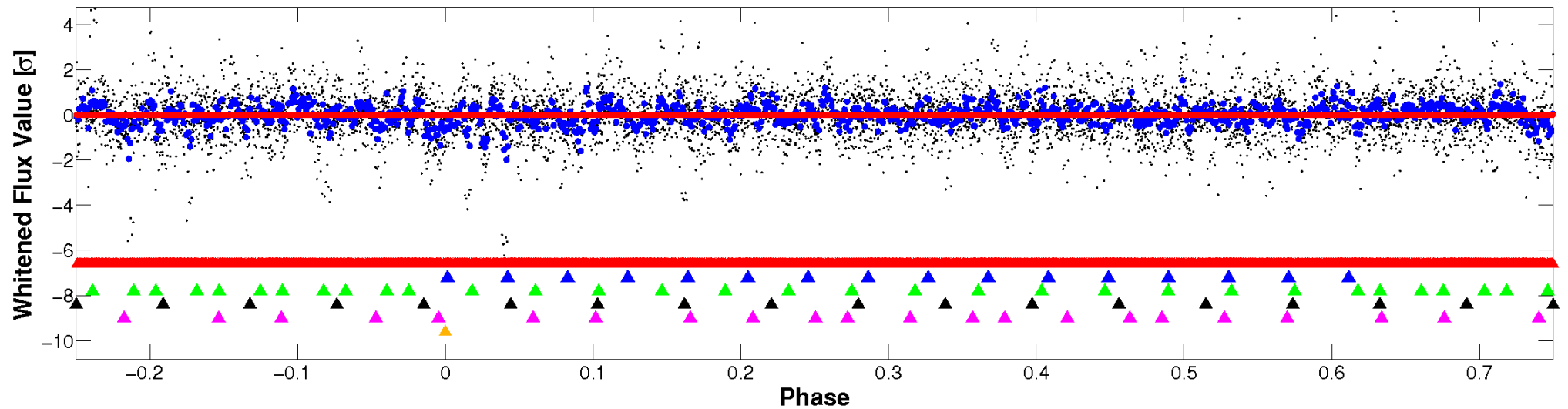


# Non-Whitened Vs. Whitened Light Curve

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

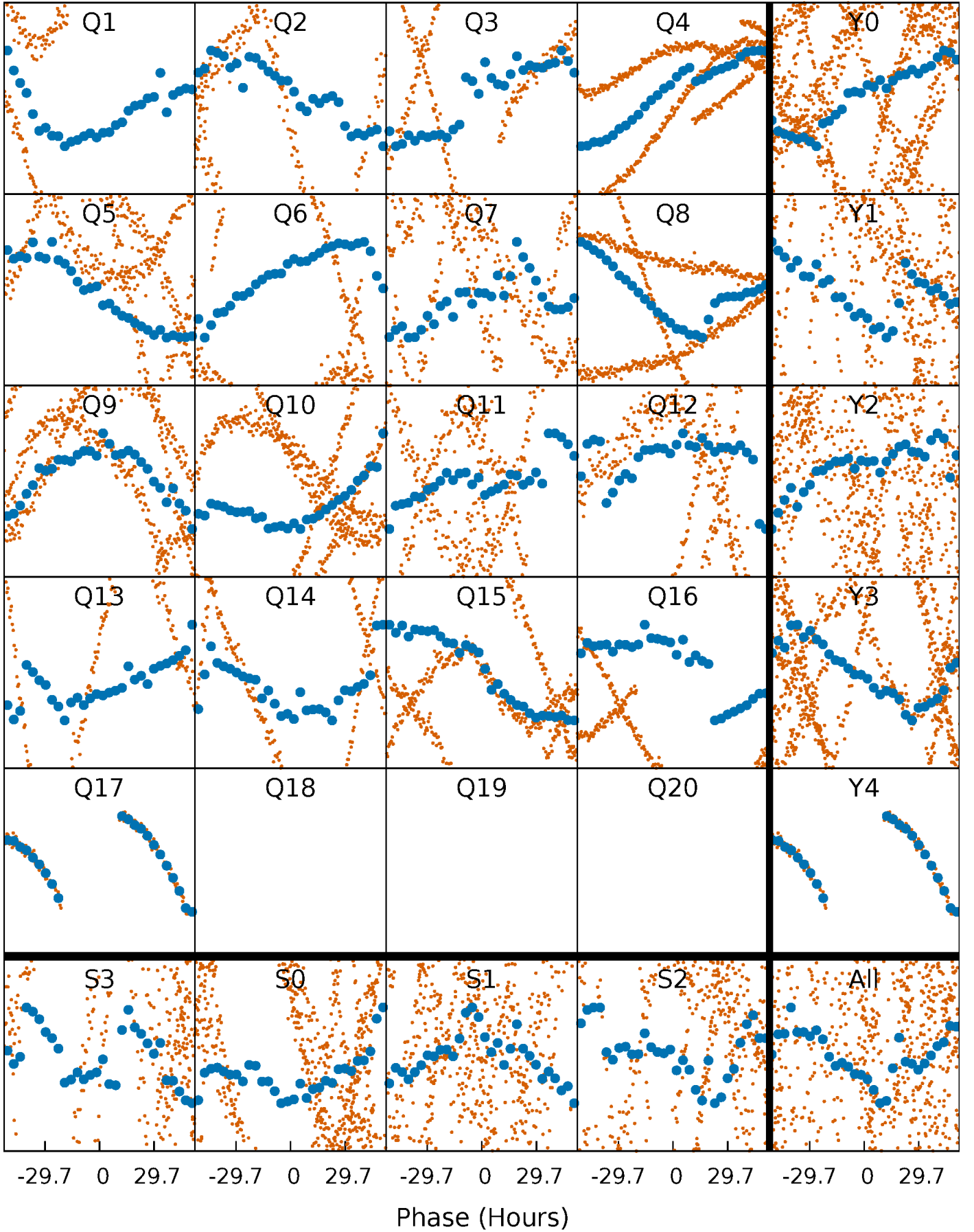


## Planet 6 : Phased Whitened Flux Time Series (Fit Epoch/Period)



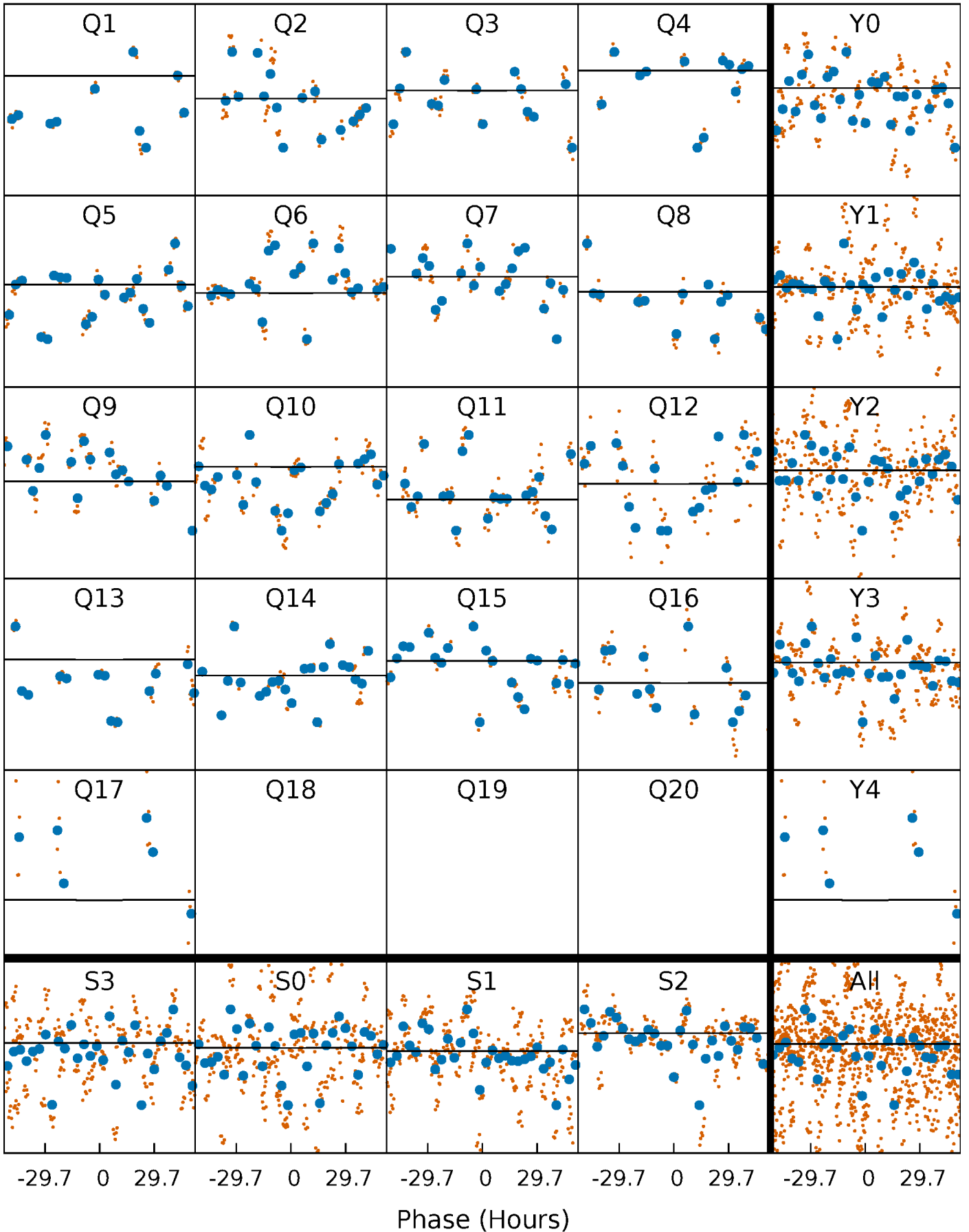
# PDC Quarter-Phased Transit Curves

TCE 005991070-06 P= 23.663450 Days  $T_0=138.980719$  (BKJD)



# DV Quarter-Phased Transit Curves

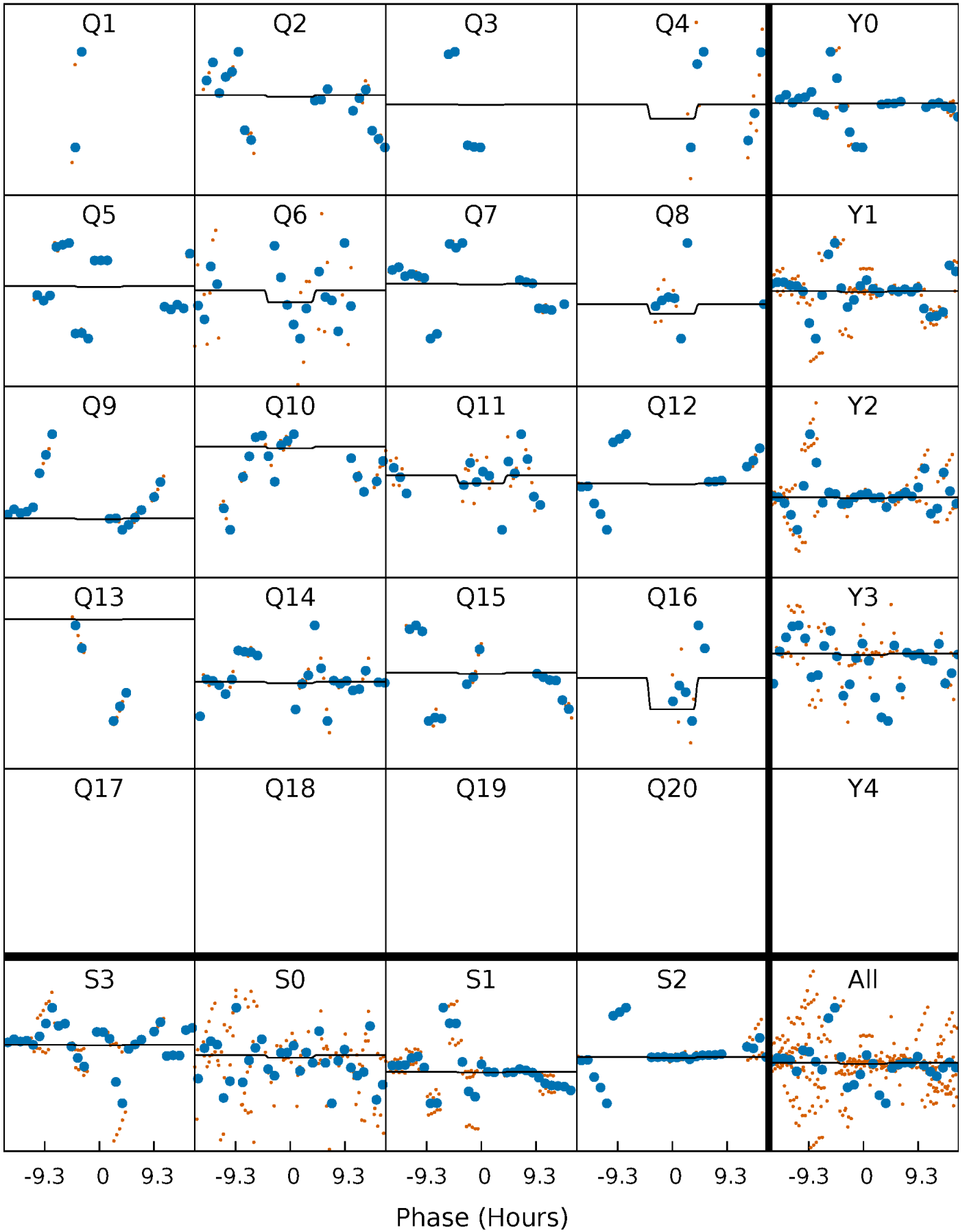
TCE 005991070-06 P= 23.663450 Days  $T_0=138.980719$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

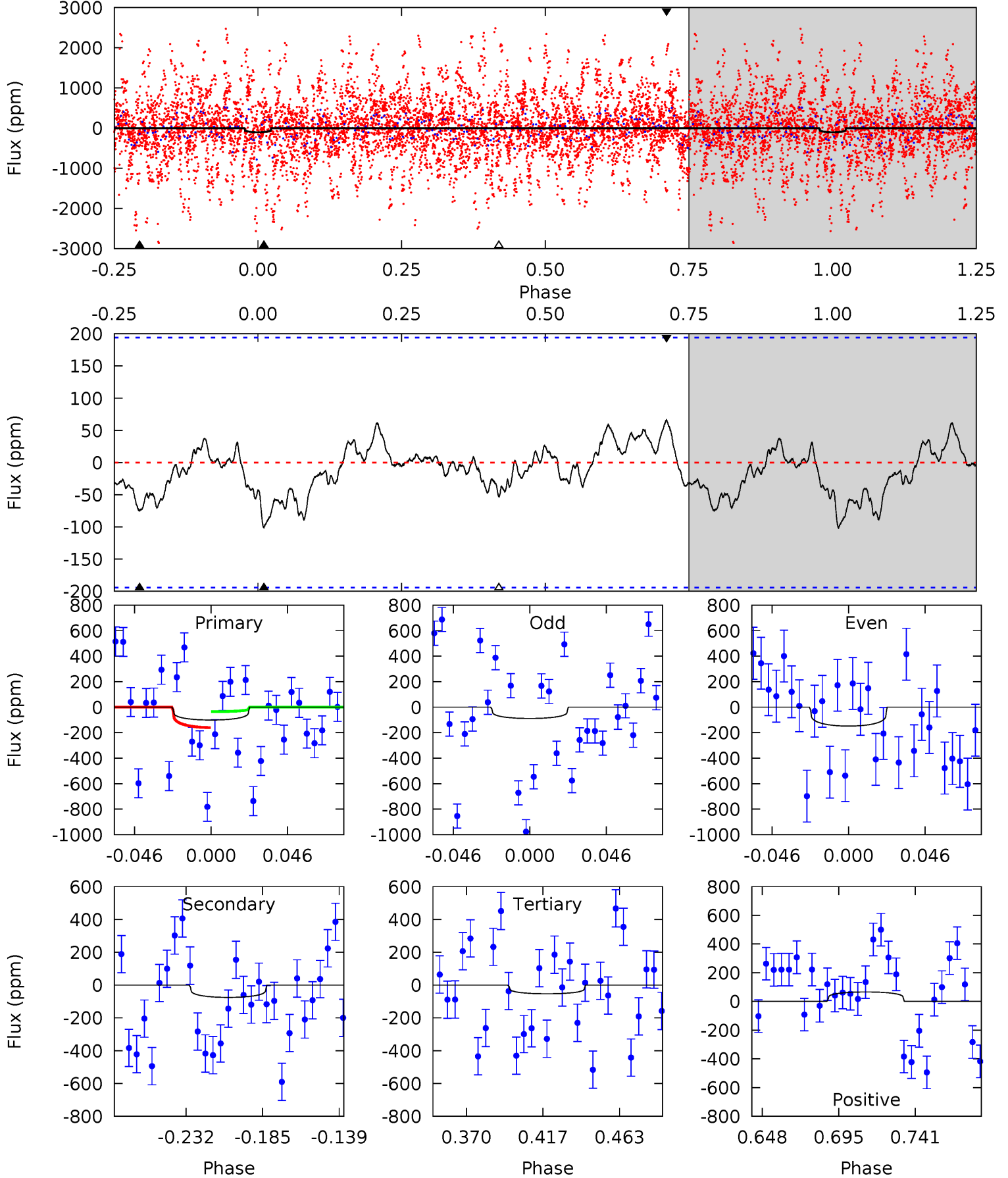
TCE 005991070-06 P= 23.667855 Days  $T_0=138.994483$  (BKJD)



# DV Model-Shift Uniqueness Test

005991070-06,  $P = 23.663450$  Days,  $E = 115.317269$  Days

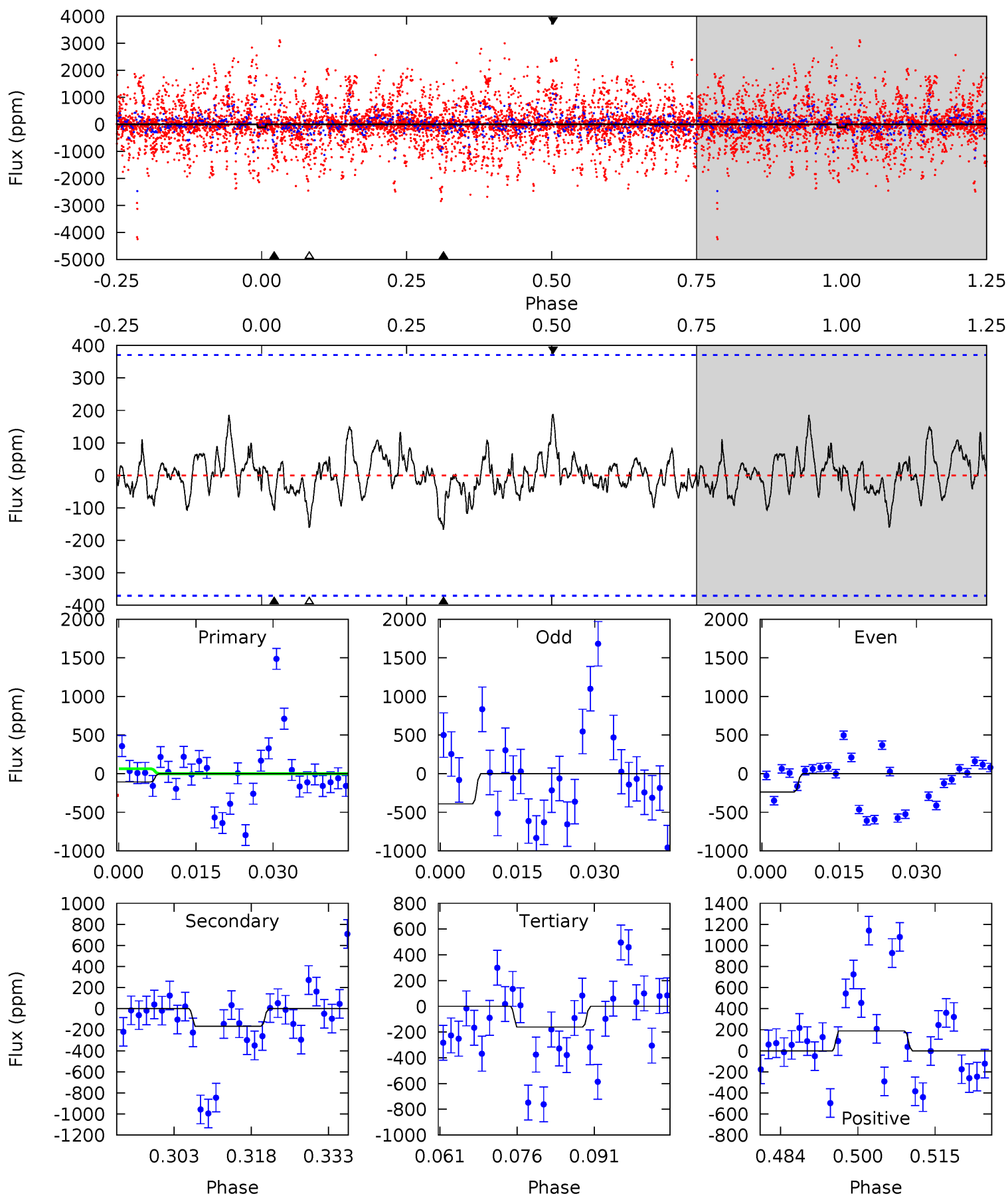
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
2.46	1.83	1.29	1.61	4.72	1.99	0.69	1.17	0.85	0.54	0.22	0.72	1.53	0.40	1.52



# Alt Model-Shift Uniqueness Test

005991070-06, P = 23.667855 Days, E = 115.326628 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
1.43	2.22	2.15	2.52	4.95	2.43	0.70	-0.72	-1.09	0.07	-0.30	0.80	10.7	0.53	1.49



### Stellar Parameters For KIC 005991070

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M$ ( $M_{\odot}$ )	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5766^{+173}_{-144}$	$3.783^{+0.330}_{-0.110}$	$-0.080^{+0.350}_{-0.250}$	$2.409^{+0.423}_{-0.986}$	$1.283^{+0.143}_{-0.310}$	$0.129^{+0.312}_{-0.044}$
	+3%/-2%	+9%/-3%	+438%/-312%	+18%/-41%	+11%/-24%	+242%/-34%
Source	PHO1	FLK73	KIC0	DSEP		

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

### Secondary Eclipse Parameters for KIC 005991070-06 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{\text{max}}$ (K)	$T_{\text{obs}}$ (K)	$A_{\text{obs}}$
DV	$-75 \pm 41$	$43.42^{+48.85}_{-29.79}$	$1298^{+124}_{-130}$	$2021^{+914}_{-3989}$	$0.556^{+5.808}_{-0.443}$
Alt.	$-166 \pm 75$	$43.89^{+52.92}_{-30.56}$	$1303^{+113}_{-143}$	$2311^{+1090}_{-4072}$	$1.286^{+13.977}_{-1.045}$

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

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

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

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

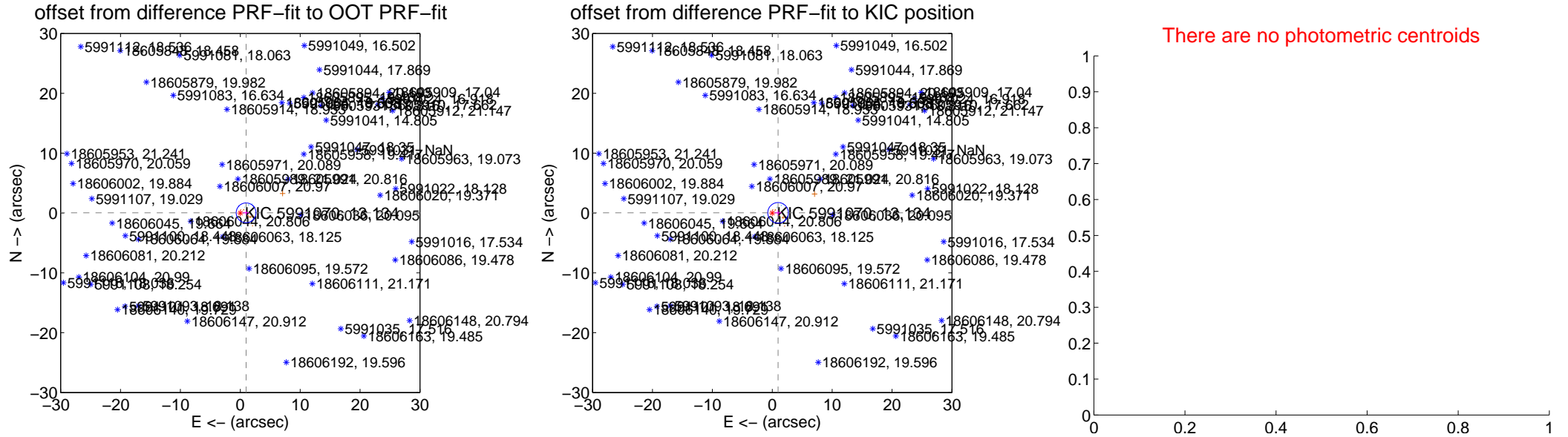
## DV Centroid Data

Supplemental centroid analysis for 005991070-06. Kepler magnitude: 13.13. Transit SNR 0.01

There are 5 quarters with good PRF difference image offsets

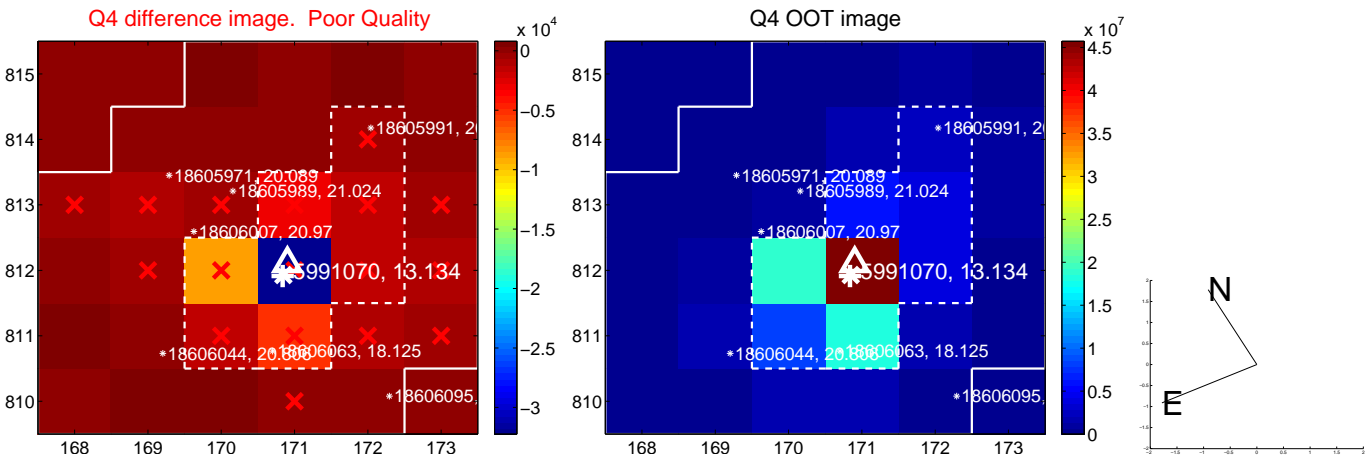
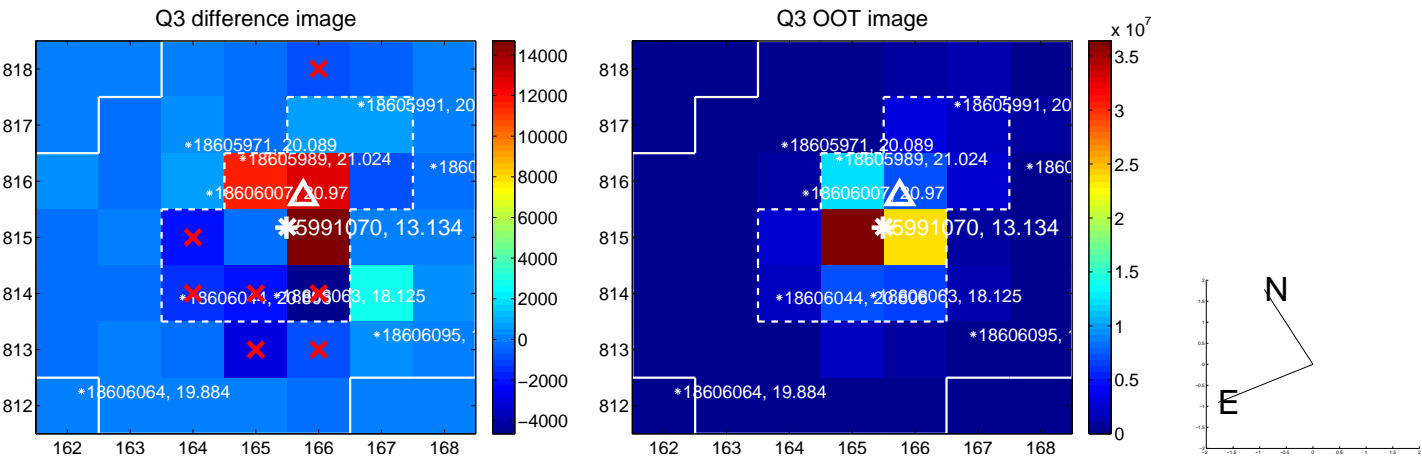
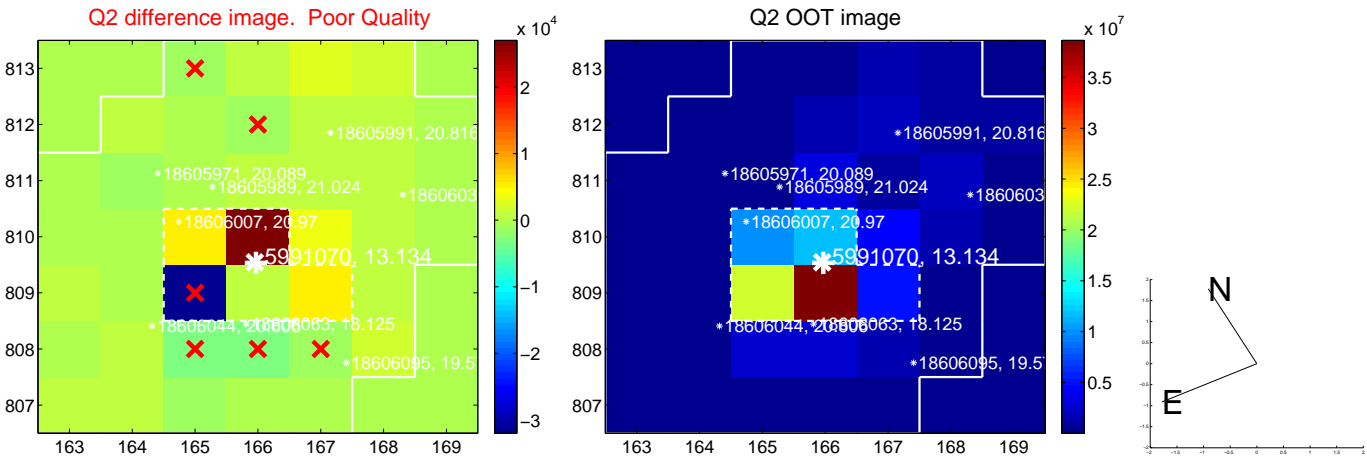
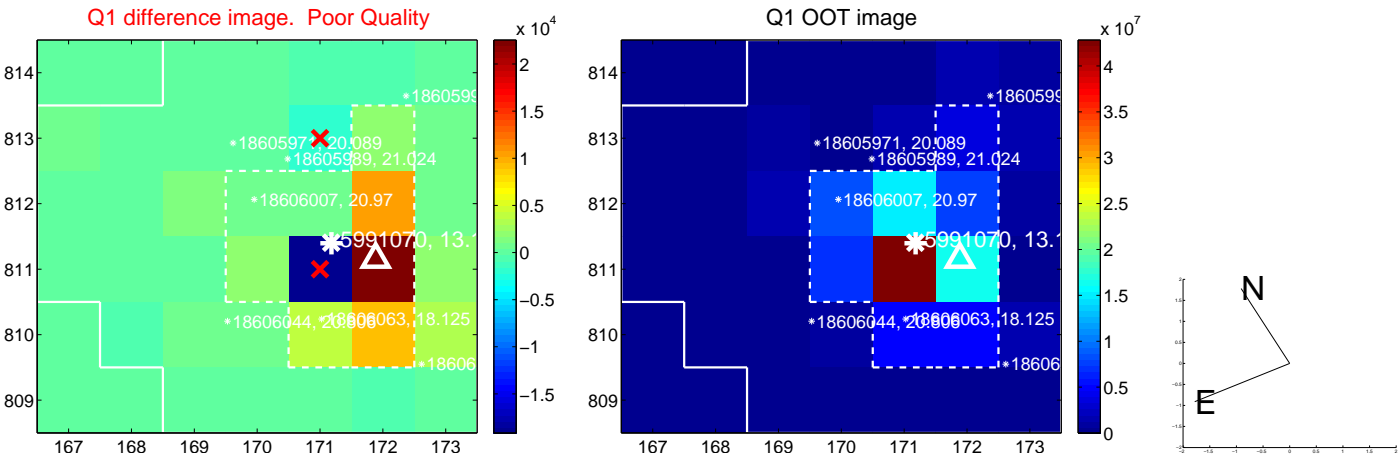
The direct PRF centroid is offset from the target star catalog position by about 0.10 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.967 \pm 0.550$	1.76	$-0.967 \pm 0.544$	$0.033 \pm 0.400$
PRF-fit source offset from KIC position	$0.973 \pm 0.573$	1.70	$-0.973 \pm 0.566$	$0.030 \pm 0.422$
photometric centroid source offset	—	—	—	—

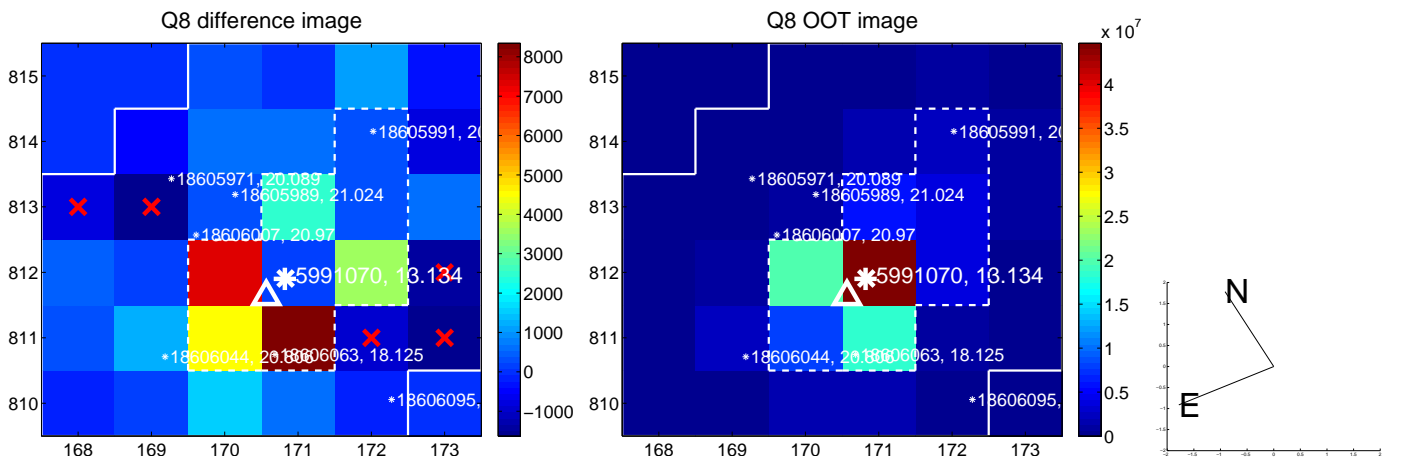
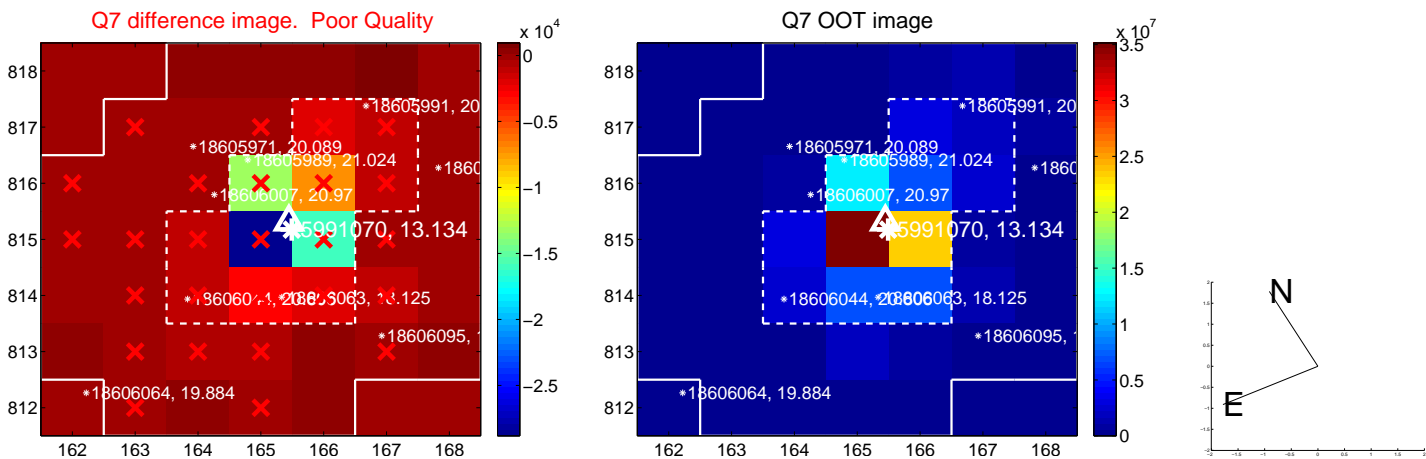
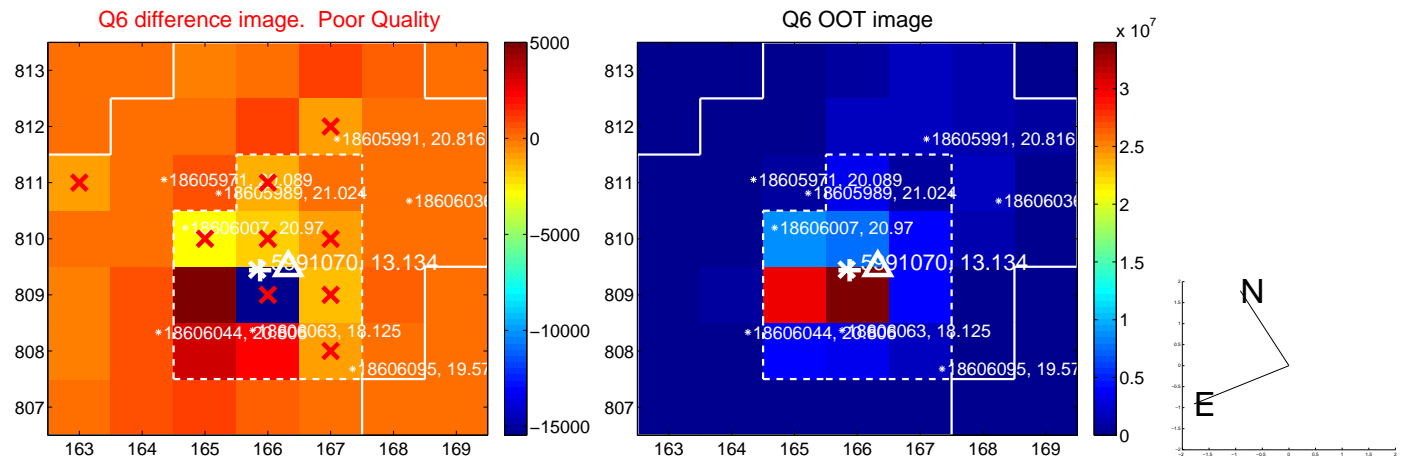
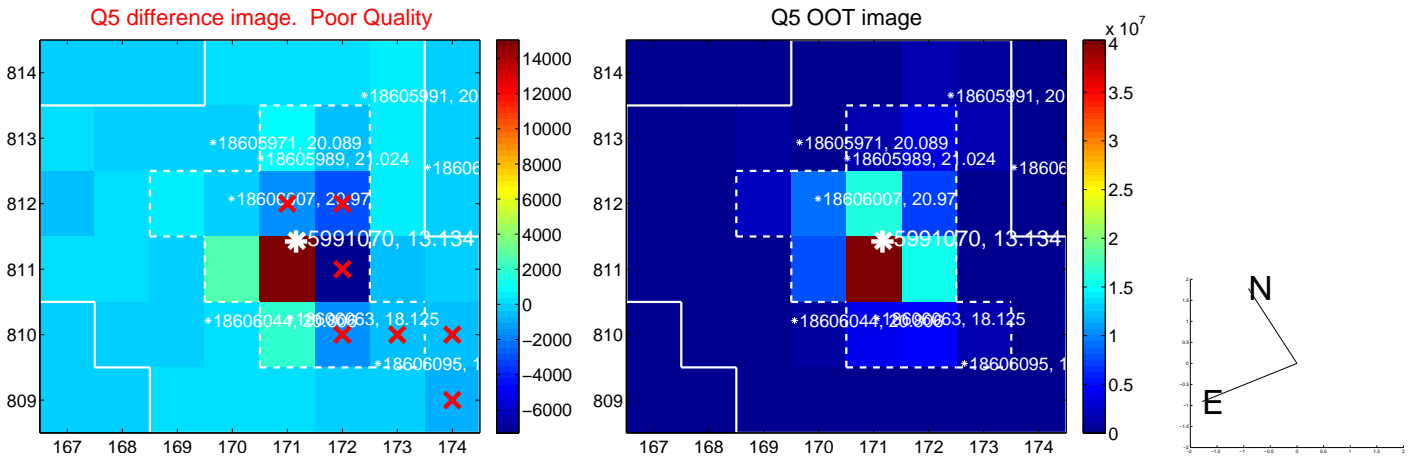


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

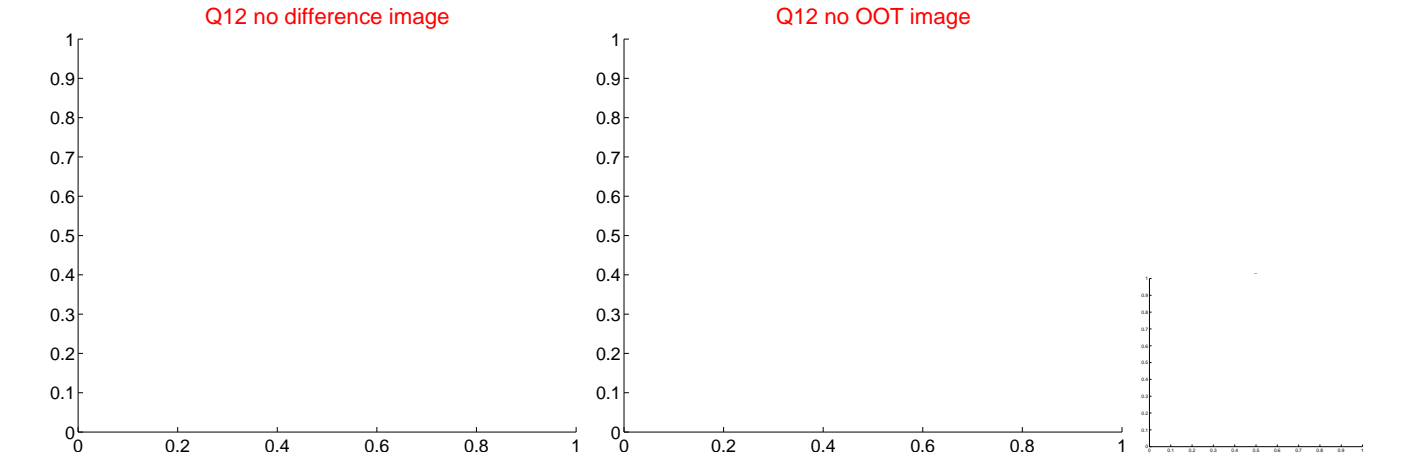
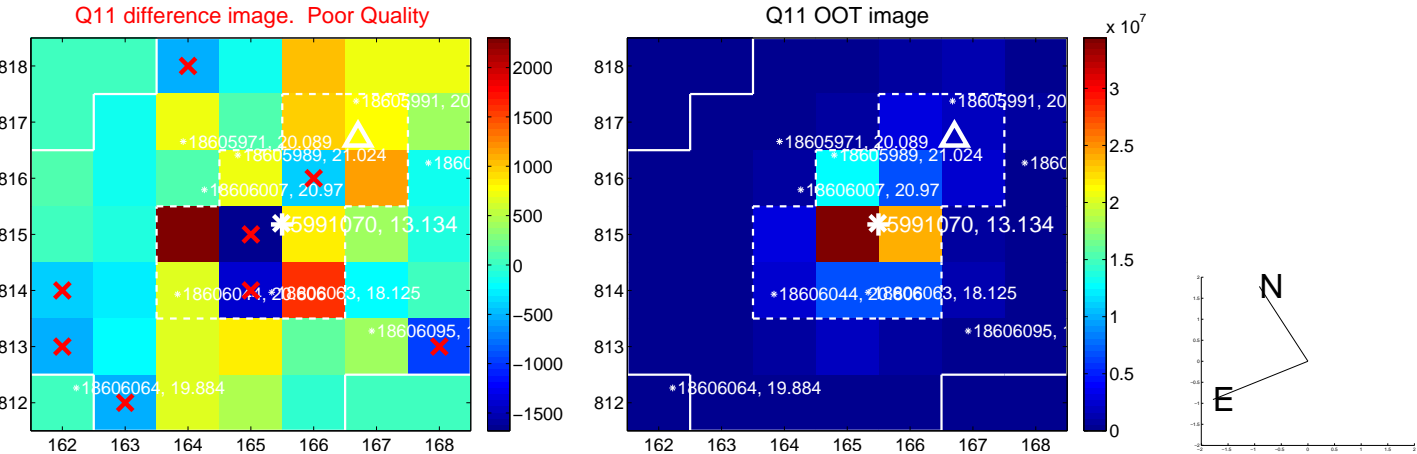
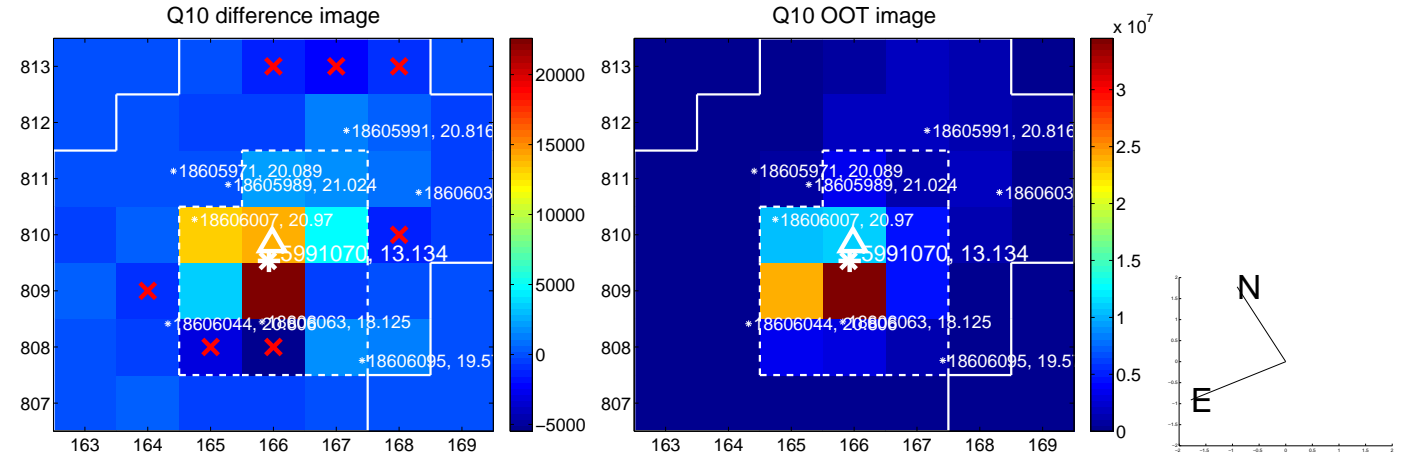
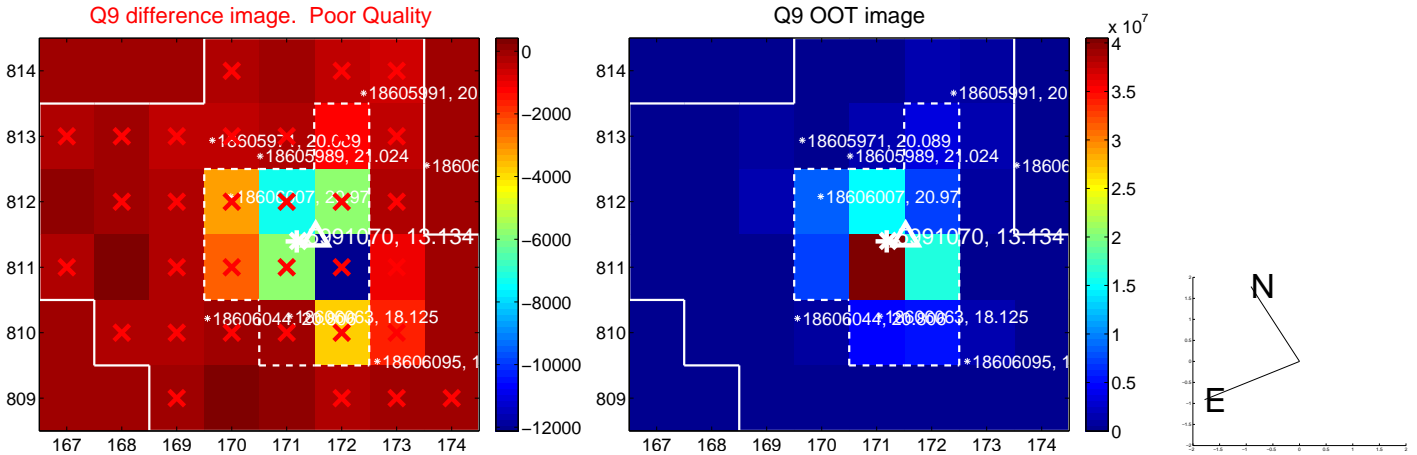


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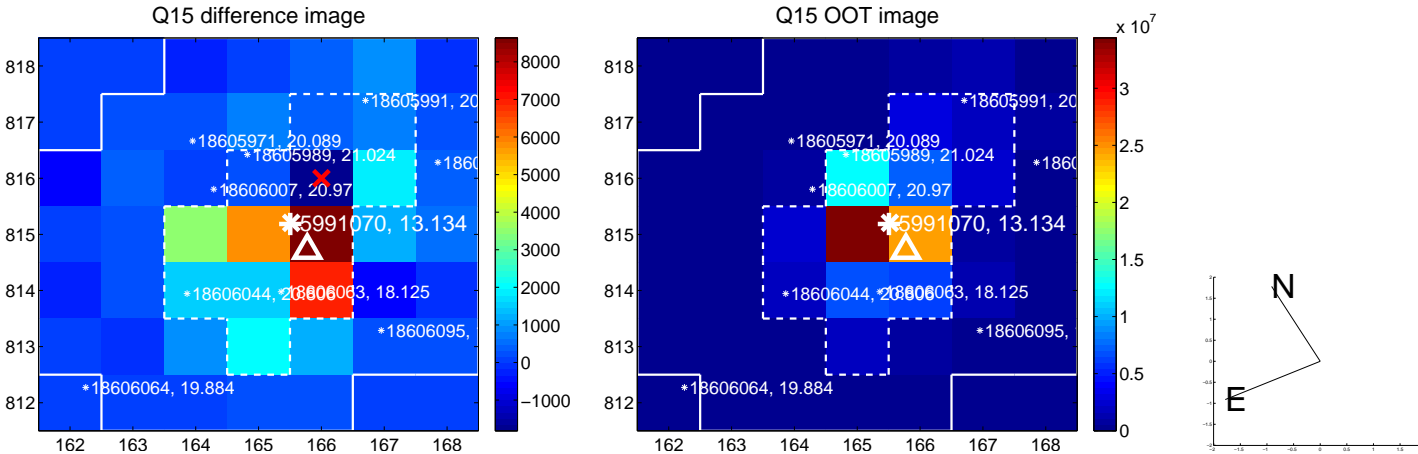
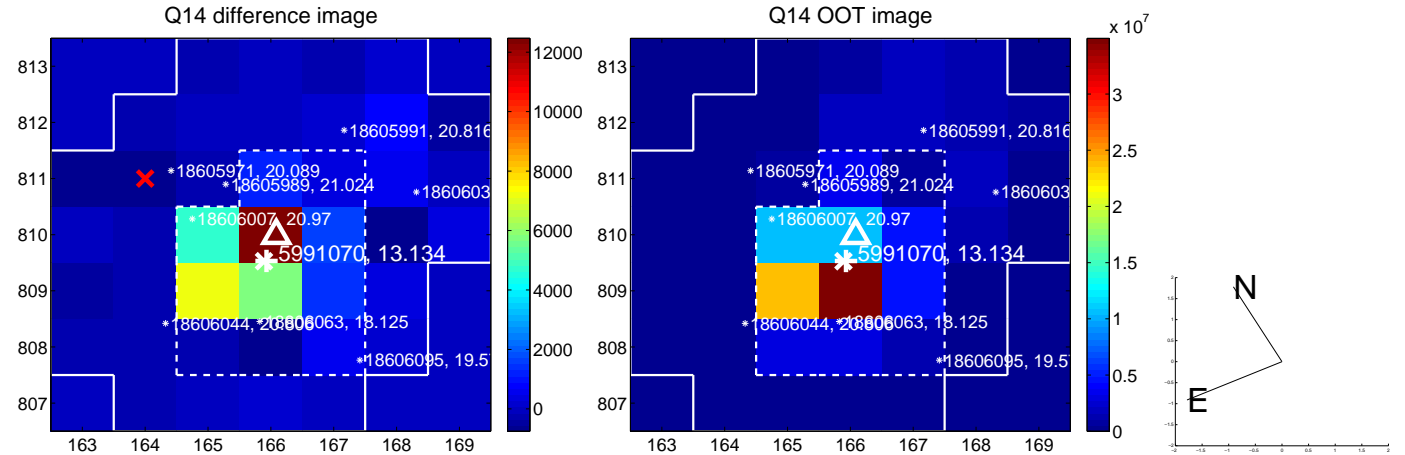
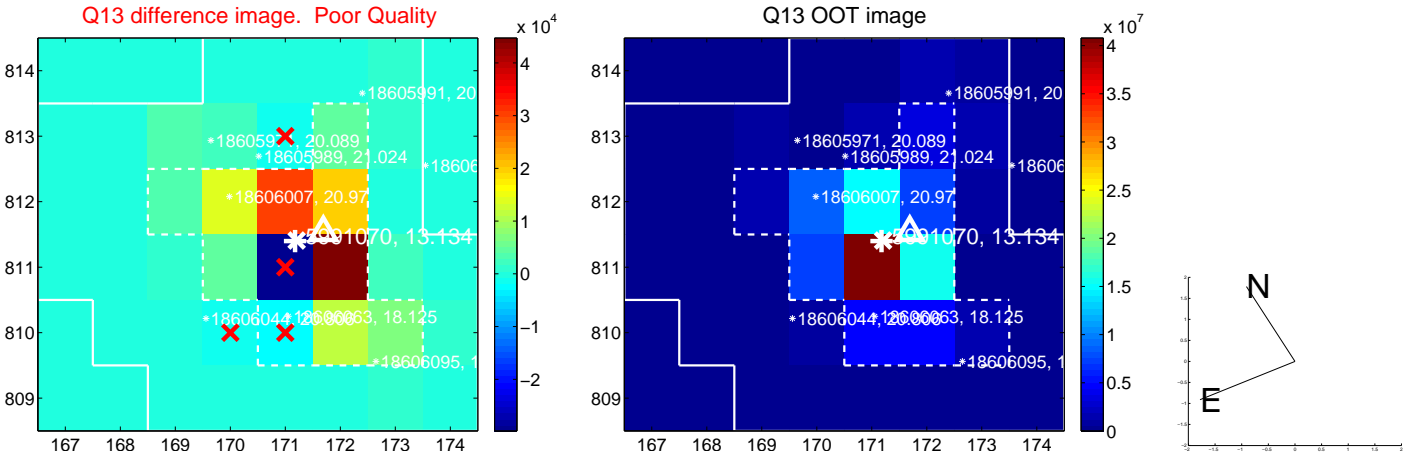




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folded centroid time series figure for this object.

UKIRT Image

Declination

