

# KIC 009953508

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009953508-01	OBS	No	1.598521	132.438206	6.0	3.517	8.1	2.3	1.69	6683	0.44	5819.81
009953508-02	OBS	No	1.602895	132.534214	12.3	1.000	11.0	2.8	1.69	6683	0.62	5798.64
009953508-03	OBS	No	1.602923	132.527447	38.1	5.177	11.1	4.3	1.69	6683	1.18	5798.51
009953508-04	OBS	No	0.801661	132.091040	9.5	8.482	8.8	4.3	1.69	6683	0.54	14606.49

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009953508-01	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE_ZUMA_TRACKER—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV
009953508-02	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE_SKYE_ZUMA_TRACKER—SWEET_NTL—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—HALO_GHOST
009953508-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE_ZUMA_TRACKER—SWEET_NTL—LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—SAME_NTL_PERIOD
009953508-04	OBS	FP	0.00	1	0	1	0	TRANS_GAPPED—SWEET_NTL—LPP_DV—CENT_FEW_DIFFS—HALO_GHOST

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

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

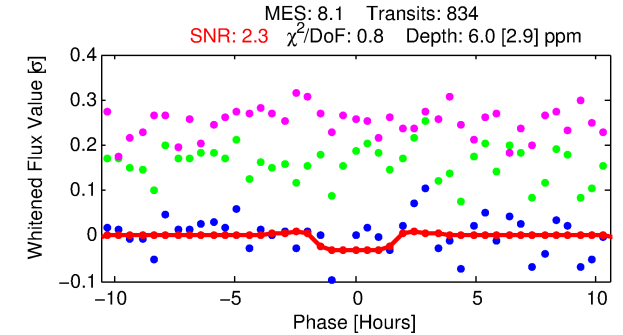
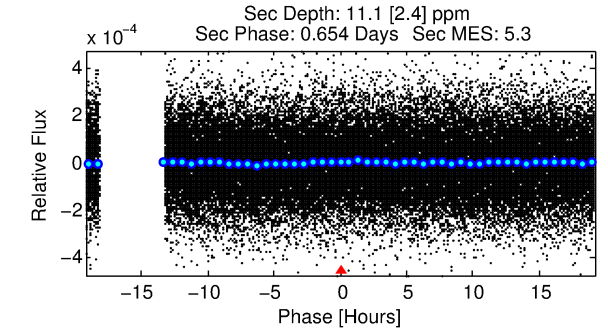
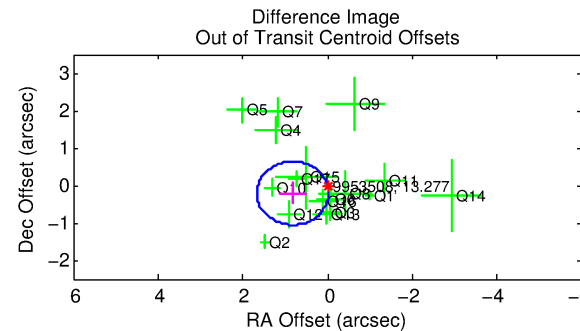
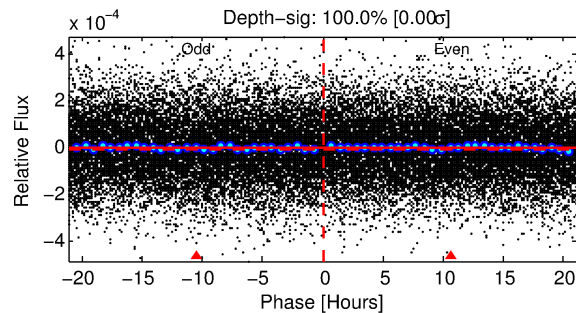
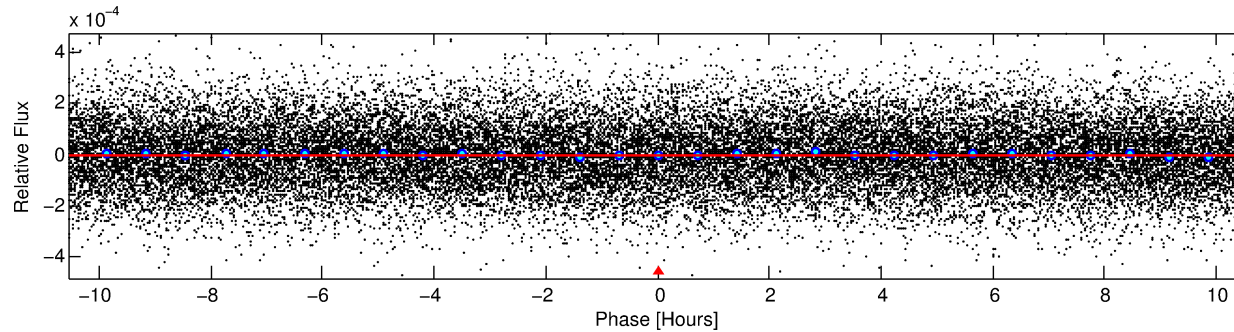
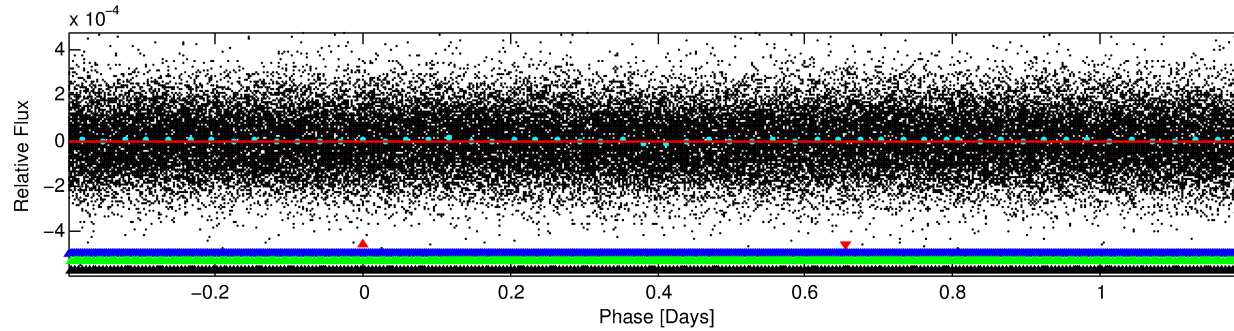
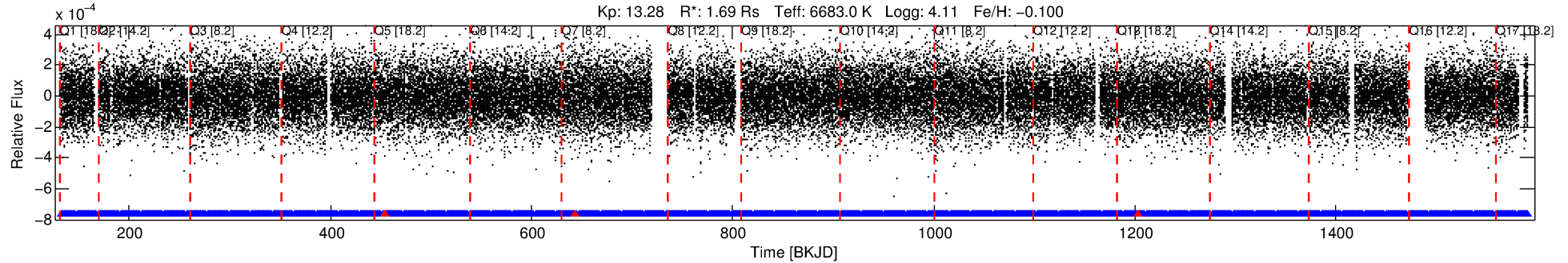
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 009953508-01

No Significant Match Found

# DV One-Page Summary

KIC: 9953508 Candidate: 1 of 4 Period: 1.599 d



## DV Fit Results:

Period = 1.59852 [0.00006] d  
Epoch = 132.4382 [0.0144] BKJD  
Rp/R\* = 0.0024 [0.0009]  
a/R\* = 2.69 [3.49]  
b = 0.68 [1.21]  
Seff = 5819.81 [2391.98]  
Teq = 2227 [229] K  
Rp = 0.44 [0.21] Re  
a = 0.0296 [0.0077] AU  
Ag = 27.71 [23.54] [1.13σ]  
Teffp = 7901 [1531] K [3.67σ]

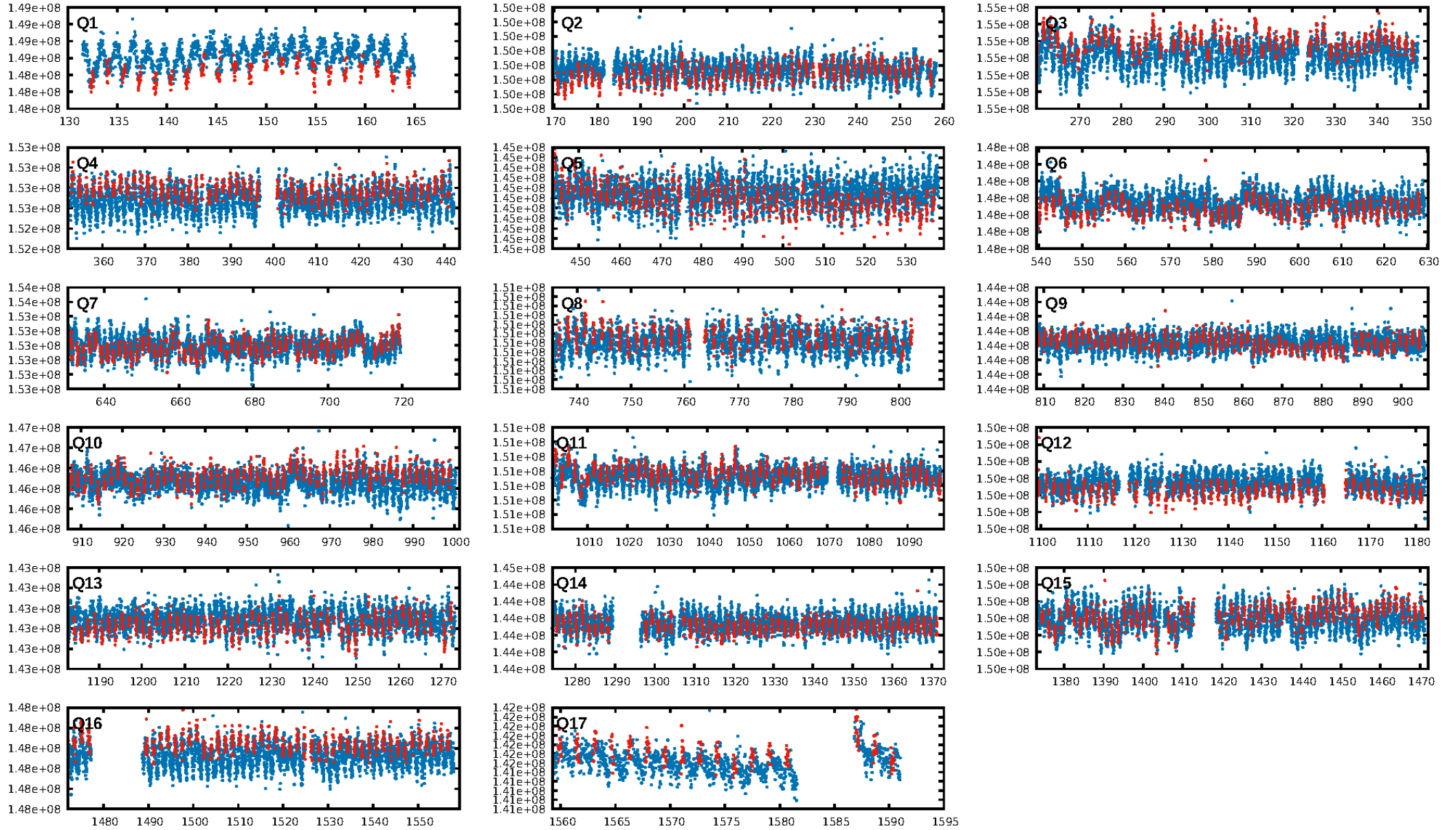
## DV Diagnostic Results:

ShortPeriod-sig: 96.3% [2.08σ]  
LongPeriod-sig: 2.3% [0.03σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [793/796]  
GhostDiagnostic-chr: 0.4547  
Centroid-sig: 11.0%  
Centroid-so: 6.020 arcsec [1.50σ]  
OotOffset-rm: 0.851 arcsec [3.01σ]  
KicOffset-rm: 0.878 arcsec [3.25σ]  
OotOffset-st: 4/4/4/5 [17]  
KicOffset-st: 4/4/4/5 [17]  
DiffImageQuality-fgm: 0.41 [7/17]  
DiffImageOverlap-fno: 0.00 [0/17]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 14:05:54 Z

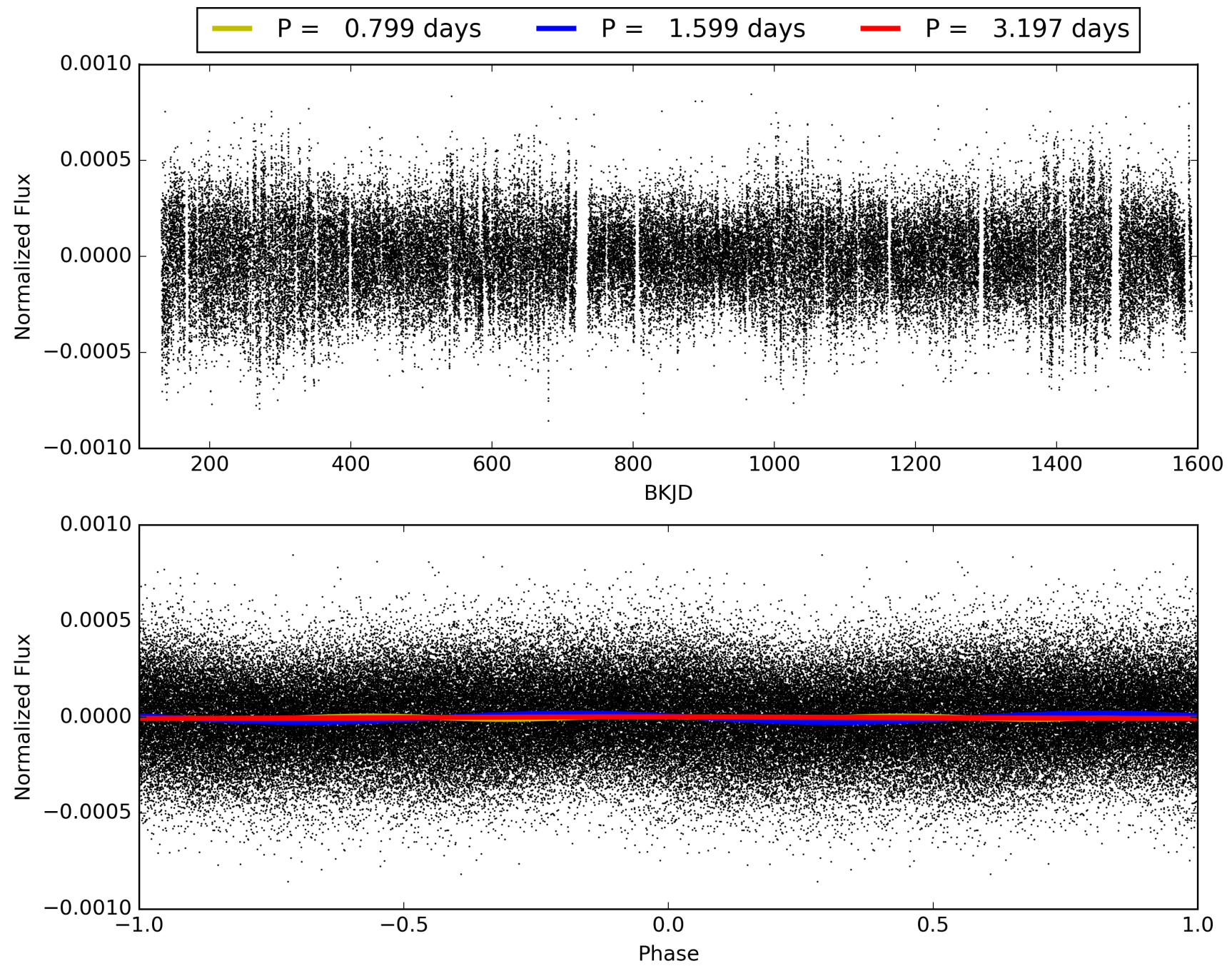
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 009953508-01, PDC Light Curves





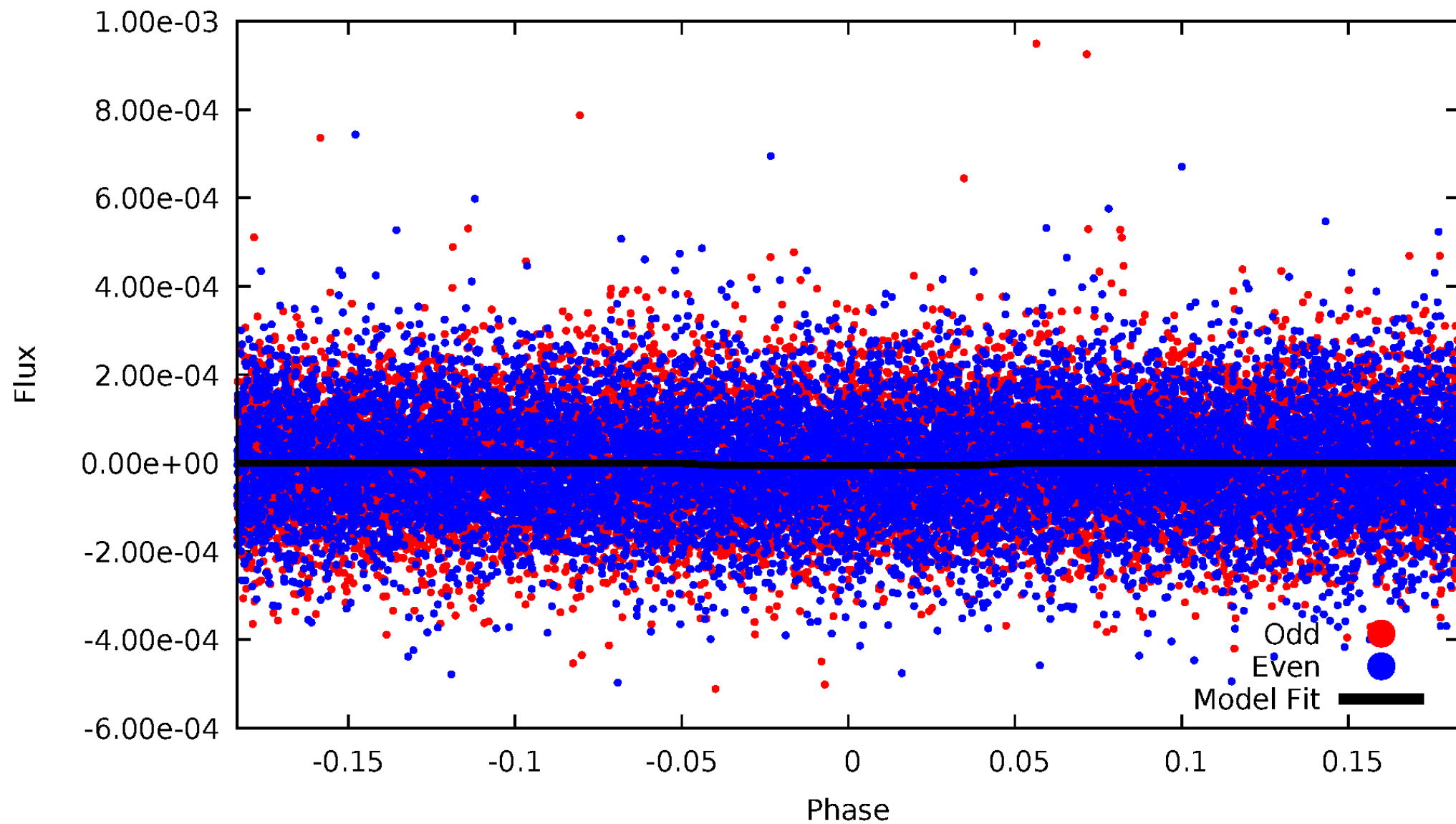
TCE 009953508-01





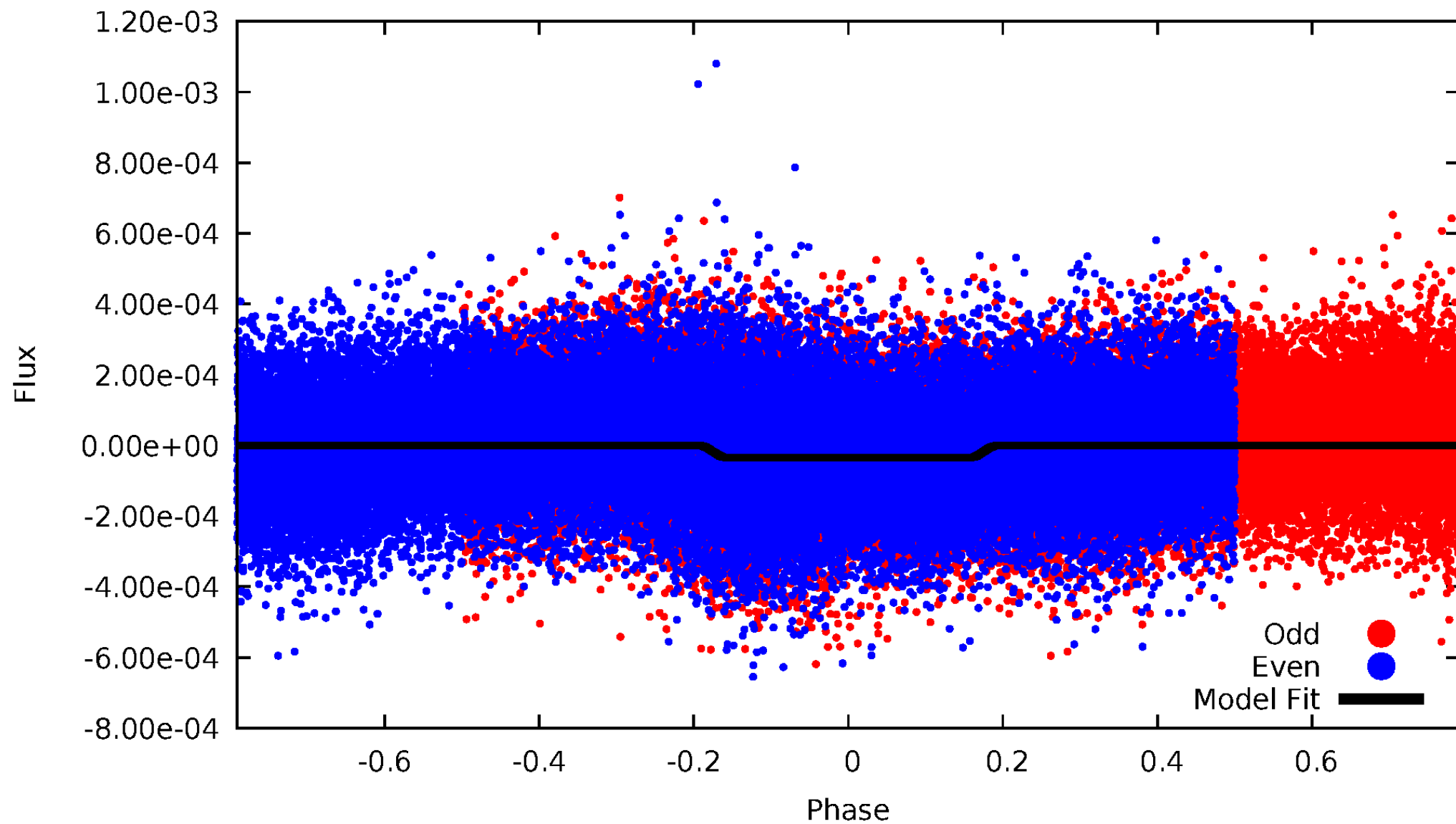
# DV Odd/Even

TCE 009953508-01

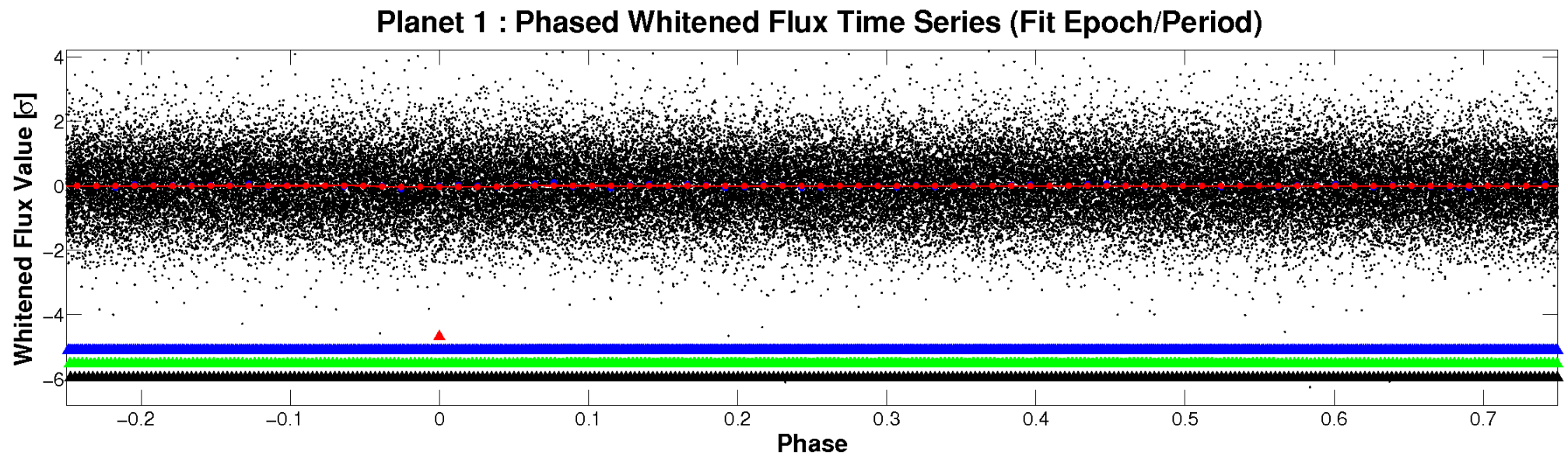
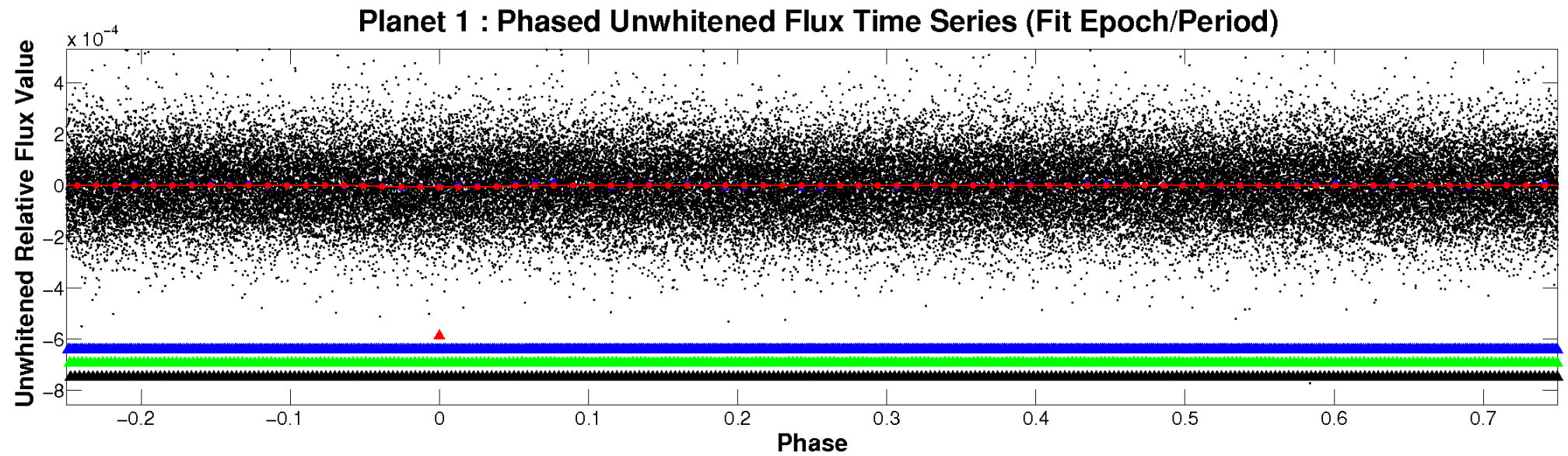


# ALT Odd/Even

TCE 009953508-01



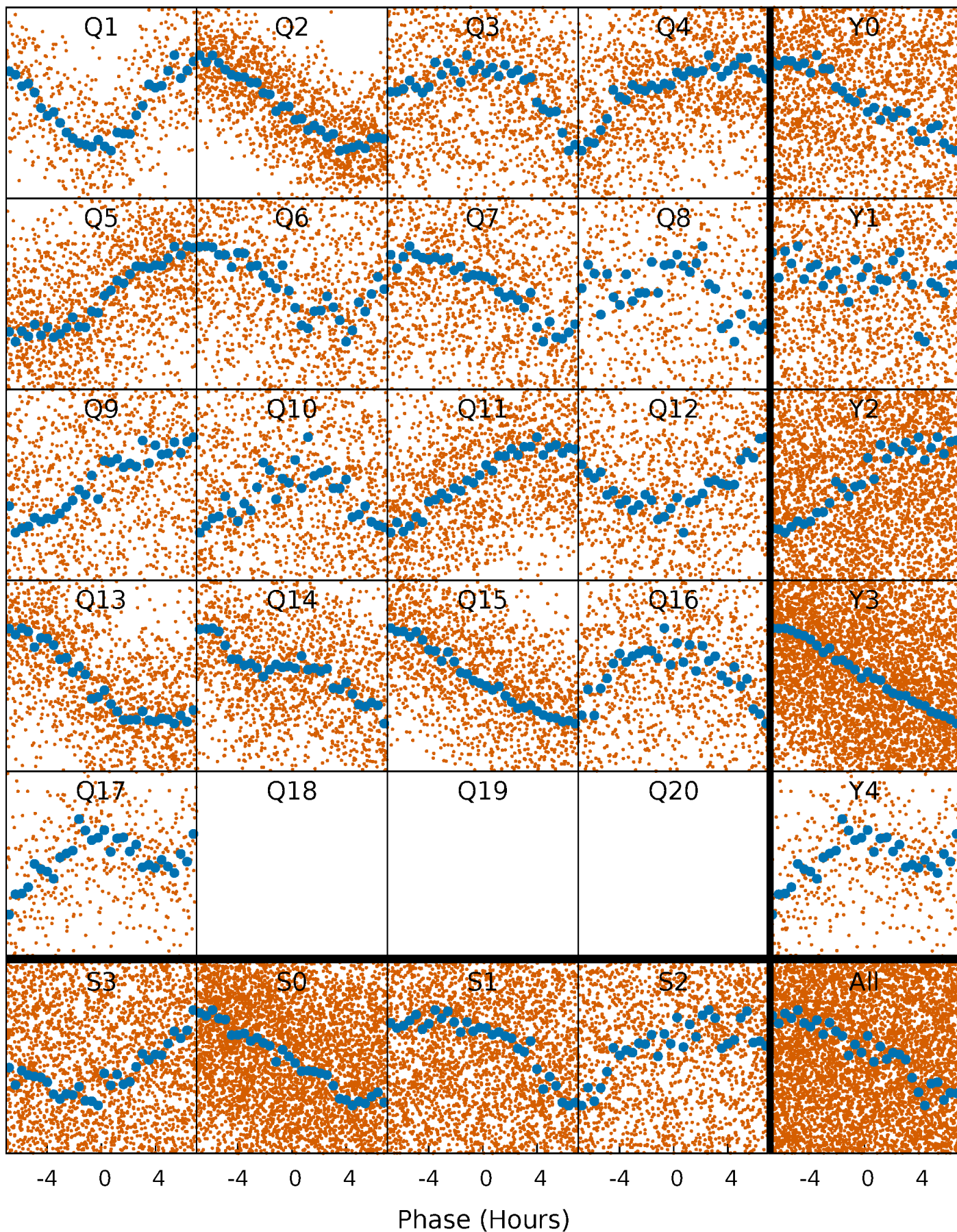
# Non-Whitened Vs. Whitened Light Curve





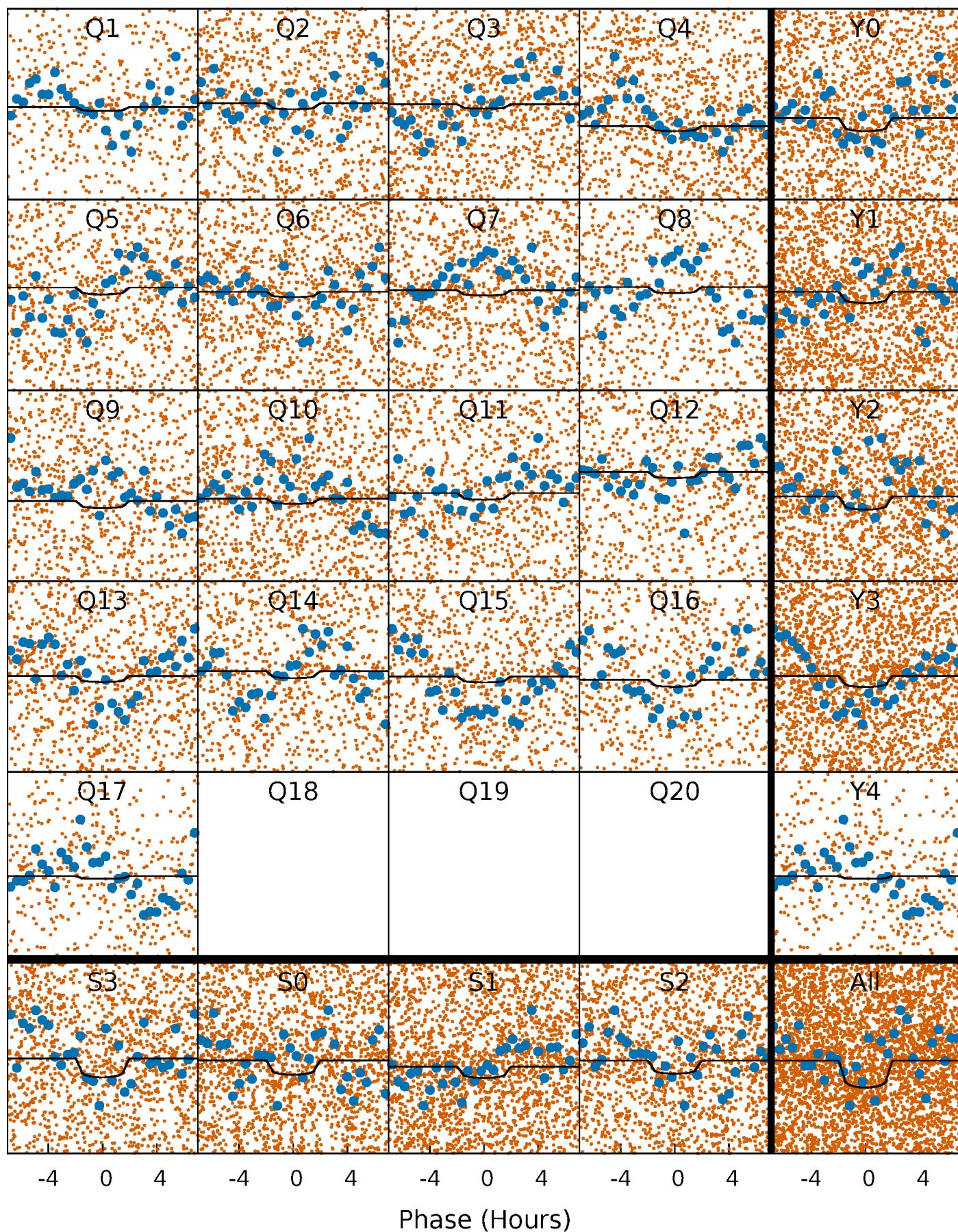
# PDC Quarter-Phased Transit Curves

TCE 009953508-01 P= 1.598521 Days  $T_0=132.438206$  (BKJD)



# DV Quarter-Phased Transit Curves

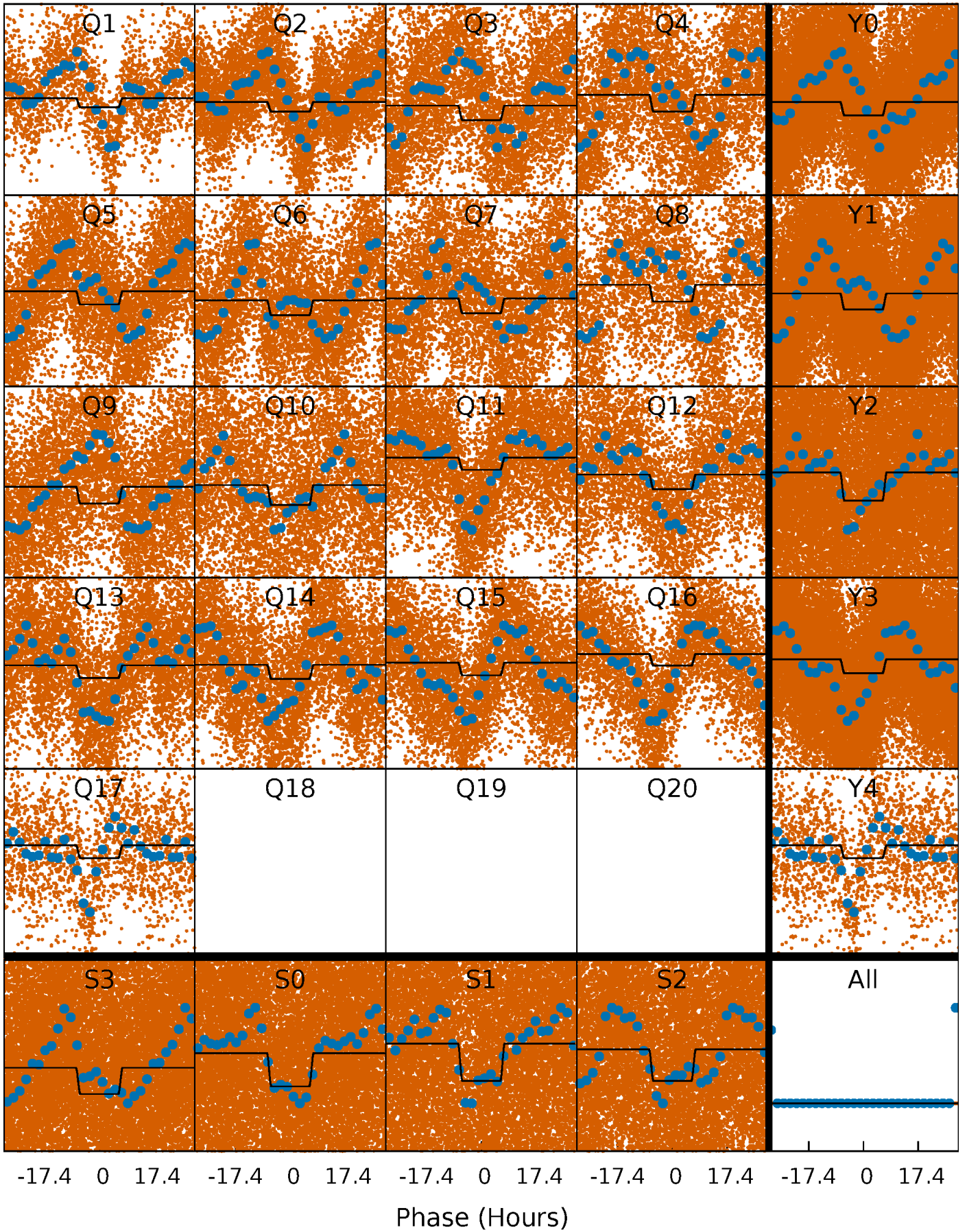
TCE 009953508-01 P= 1.598521 Days  $T_0=132.438206$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

TCE 009953508-01 P= 1.603885 Days  $T_0=132.202373$  (BKJD)

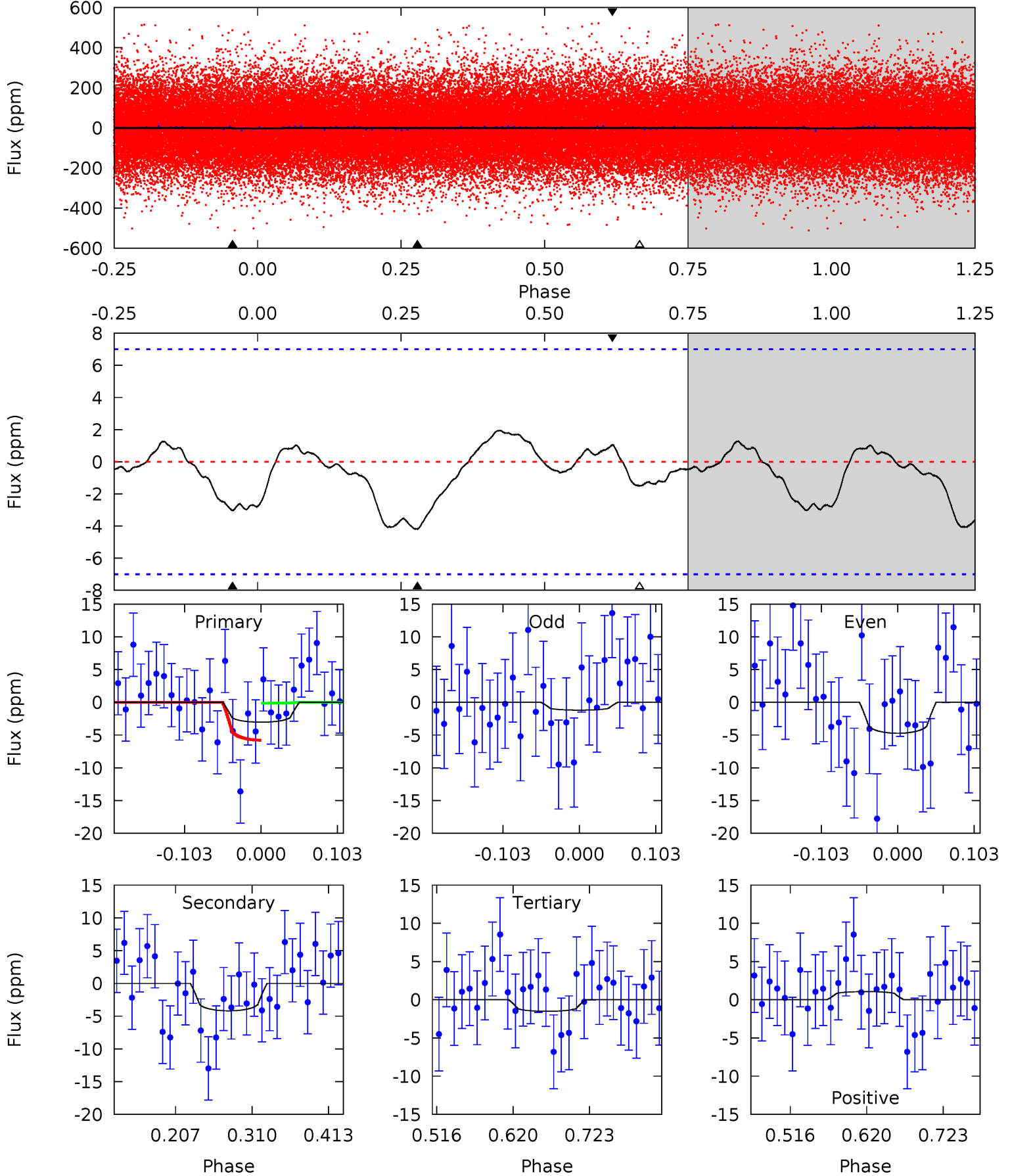




# DV Model-Shift Uniqueness Test

009953508-01, P = 1.598521 Days, E = 130.839685 Days

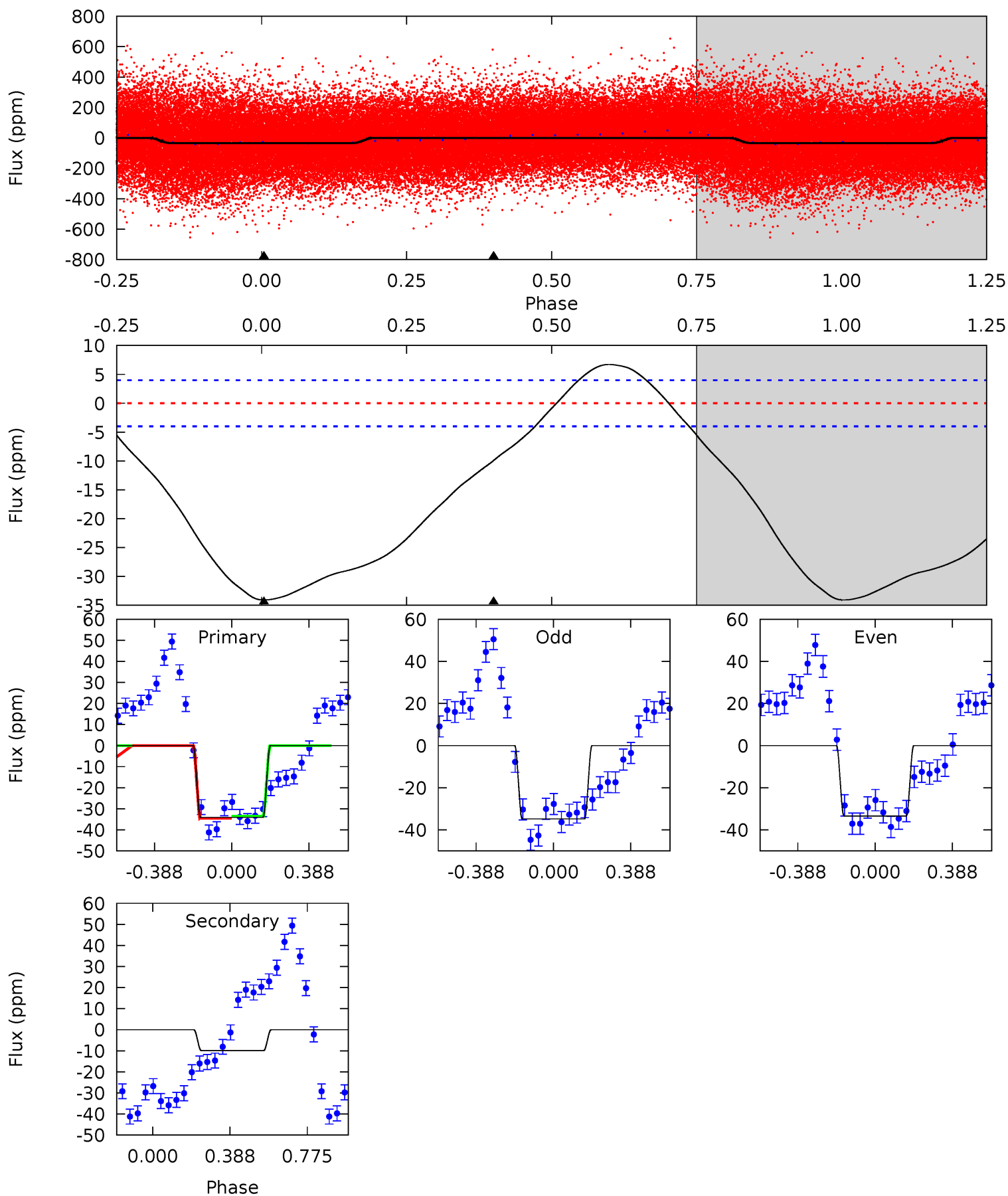
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
1.98	2.73	0.98	0.69	4.56	1.63	0.59	0.99	1.28	1.75	2.04	1.15	0.35	0.32	1.85



# Alt Model-Shift Uniqueness Test

009953508-01, P = 1.603885 Days, E = 130.598488 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
36.5	10.6	0	0	4.27	0.86	3.50	36.5	36.5	10.6	10.6	0.75	0.95	0.16	0.52



### Stellar Parameters For KIC 009953508

	$T_{\text{eff}} (K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M (M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6683^{+189}_{-259}$	$4.114^{+0.209}_{-0.190}$	$-0.100^{+0.250}_{-0.300}$	$1.689^{+0.519}_{-0.425}$	$1.361^{+0.196}_{-0.261}$	$0.398^{+0.429}_{-0.208}$
	+3%/-4%	+5%/-5%	+250%/-300%	+31%/-25%	+14%/-19%	+108%/-52%
Source	PHO54	PHO54	PHO54	DSEP		

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

### Secondary Eclipse Parameters for KIC 009953508-01 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-4 \pm 2$	$0.43^{+0.19}_{-0.17}$	$3102^{+271}_{-233}$	$6138^{+1964}_{-1118}$	$11^{+19}_{-6}$
Alt.	$-10 \pm 1$	$1.08^{+0.25}_{-0.22}$	$3096^{+242}_{-232}$	$4846^{+442}_{-320}$	$4.089^{+2.164}_{-1.439}$

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



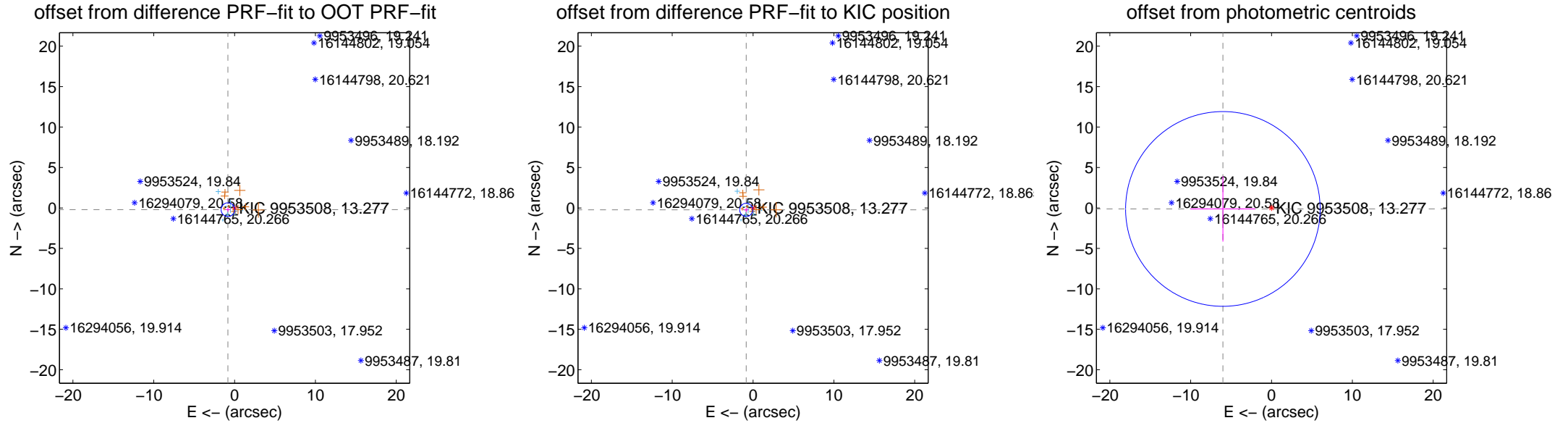
## DV Centroid Data

Supplemental centroid analysis for 009953508-01. Kepler magnitude: 13.28. Transit SNR 2.27

There are 7 quarters with good PRF difference image offsets

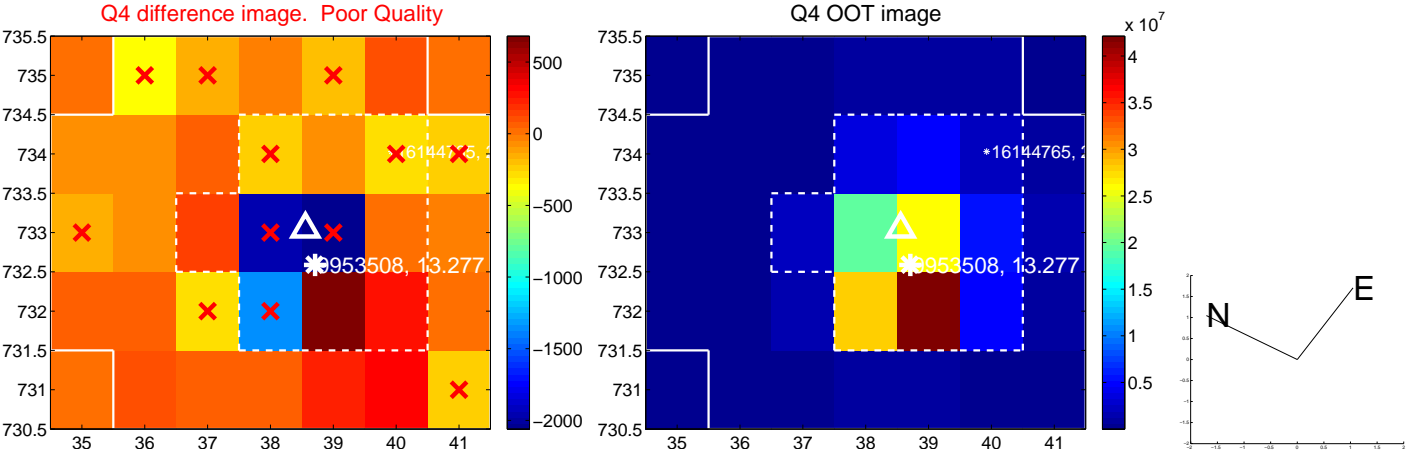
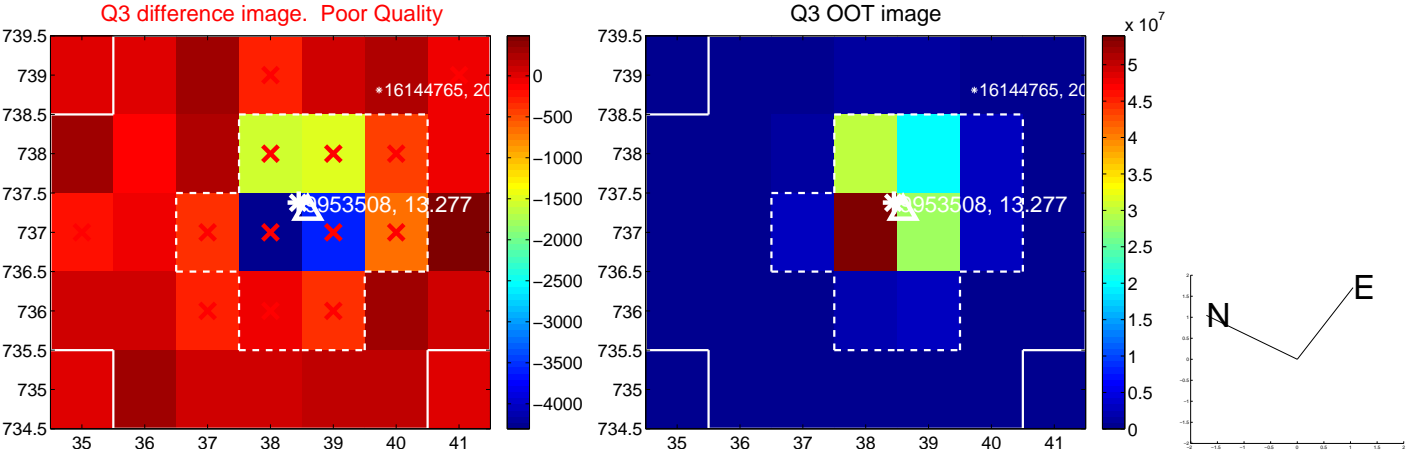
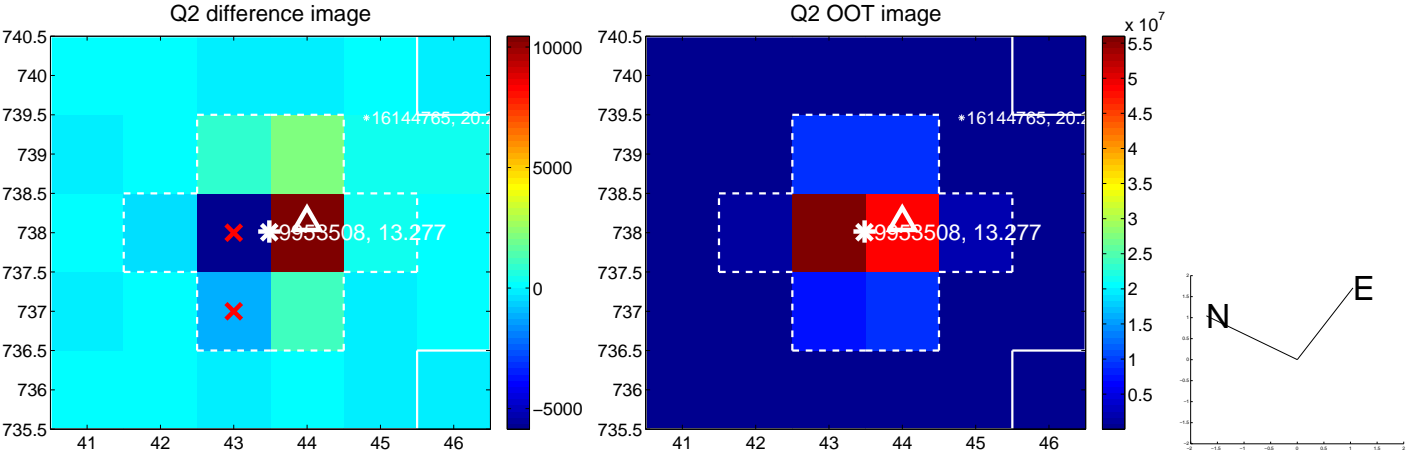
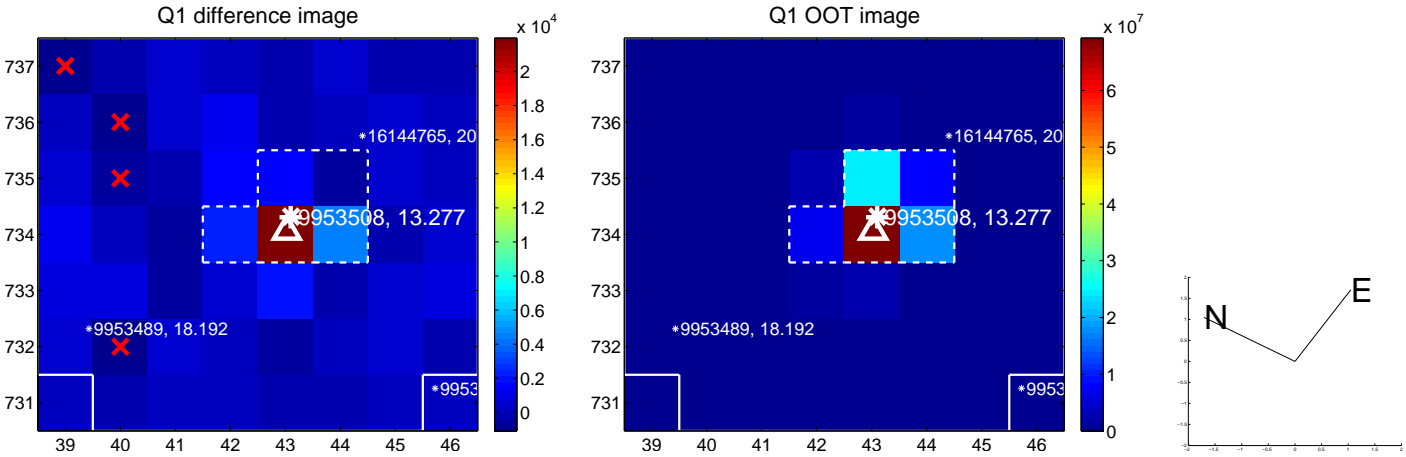
The direct PRF centroid is offset from the target star catalog position by about 0.03 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	<b><math>0.851 \pm 0.282</math></b>	<b>3.01</b>	$0.824 \pm 0.301$	$-0.211 \pm 0.262$
PRF-fit source offset from KIC position	<b><math>0.878 \pm 0.270</math></b>	<b>3.25</b>	$0.846 \pm 0.282$	$-0.234 \pm 0.270$
photometric centroid source offset	$6.02 \pm 4.01$	1.50	$6.02 \pm 4.01$	$-0.12 \pm 4.03$

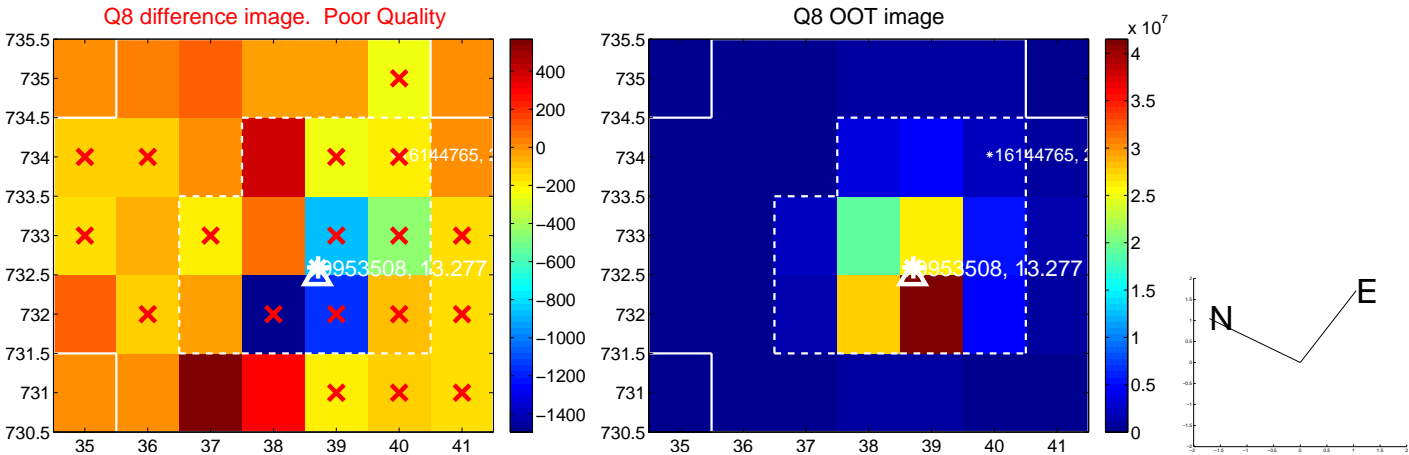
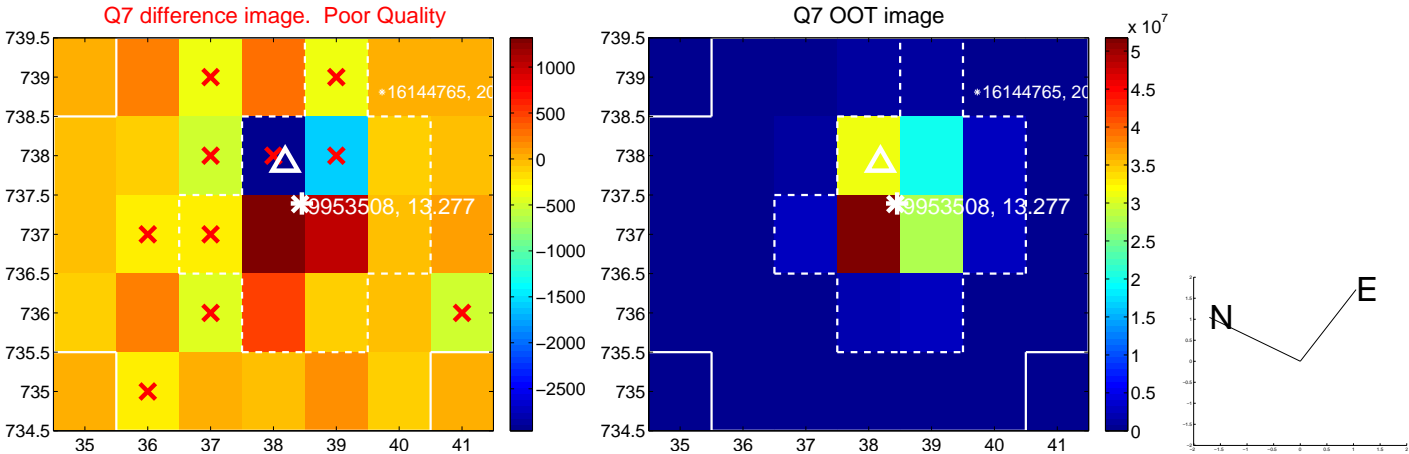
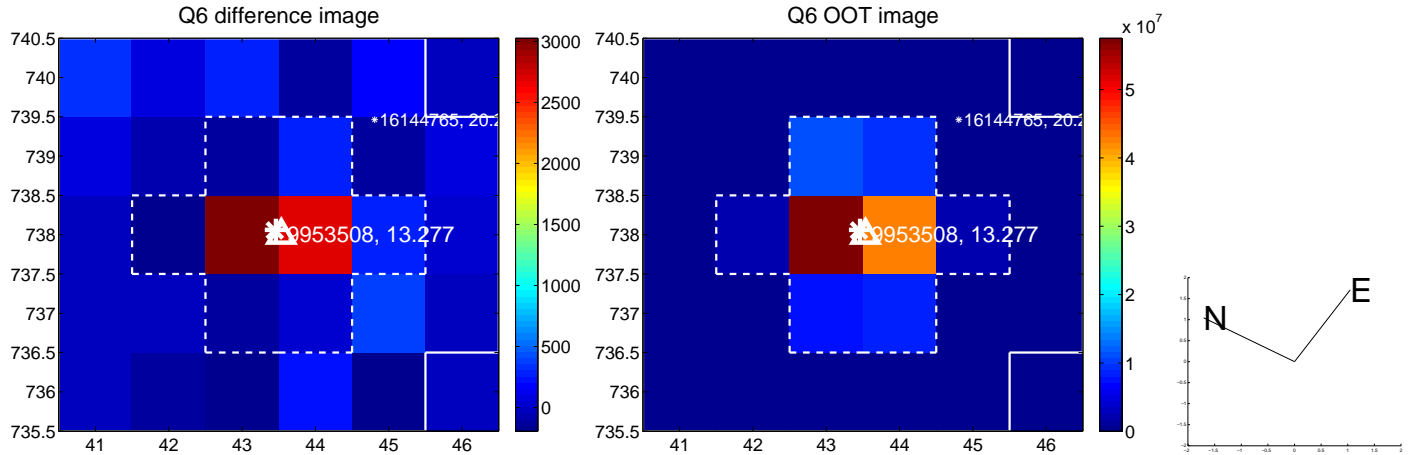
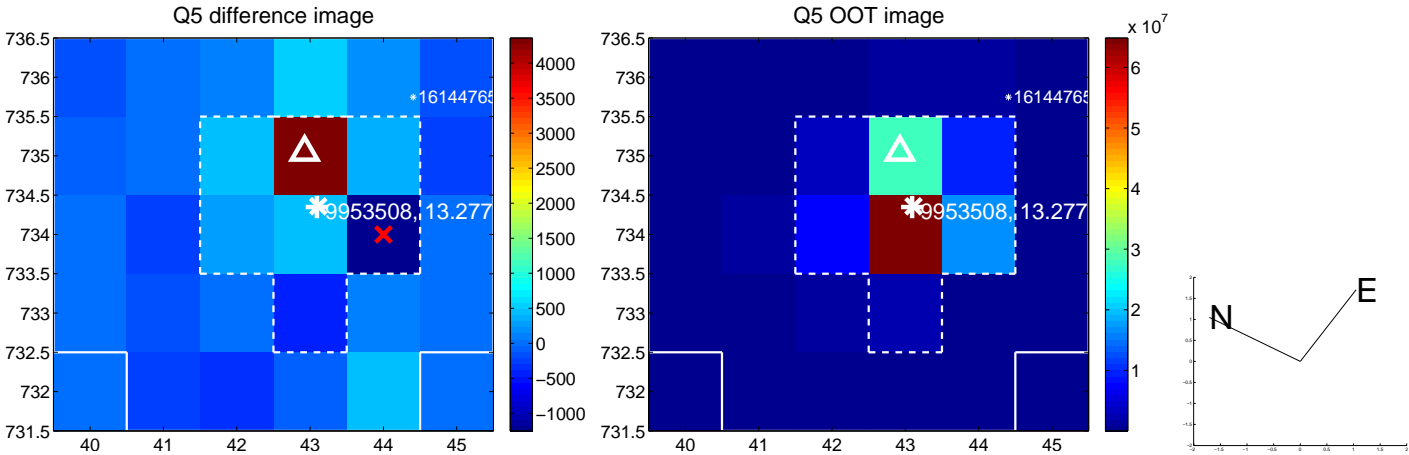


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

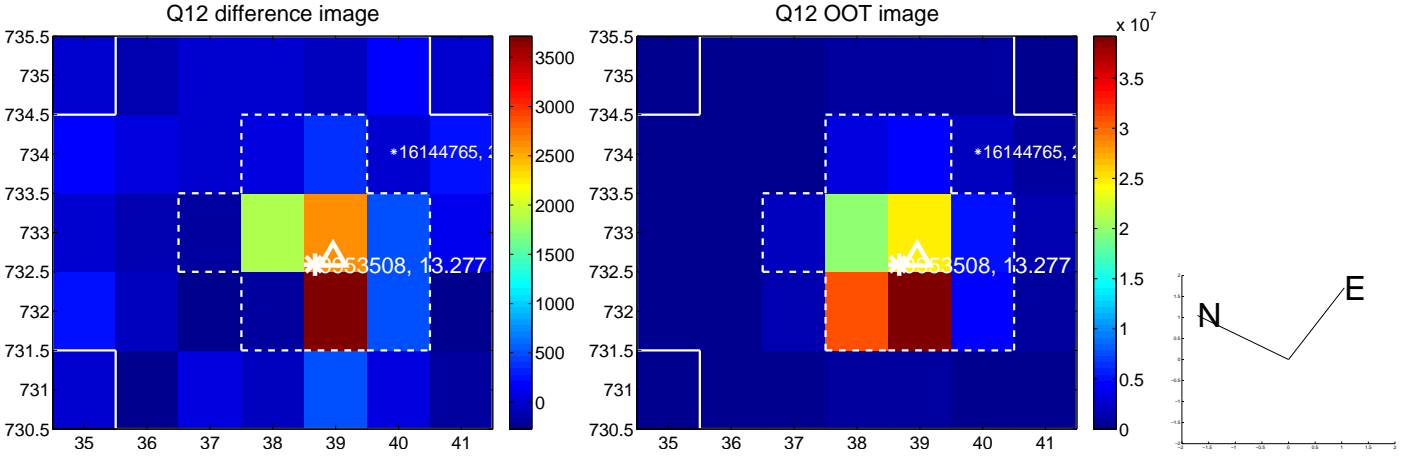
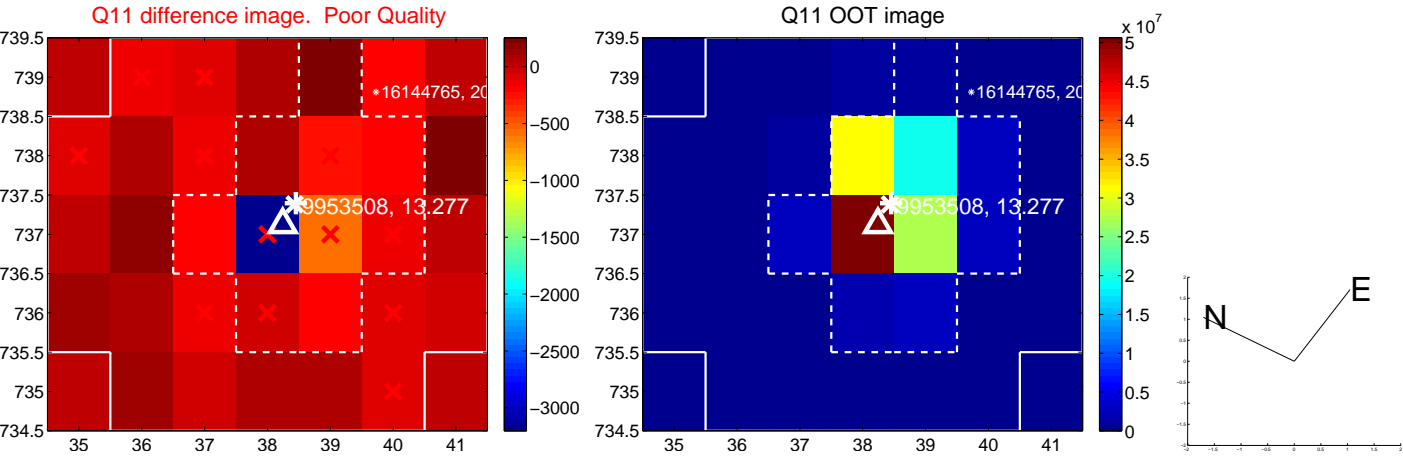
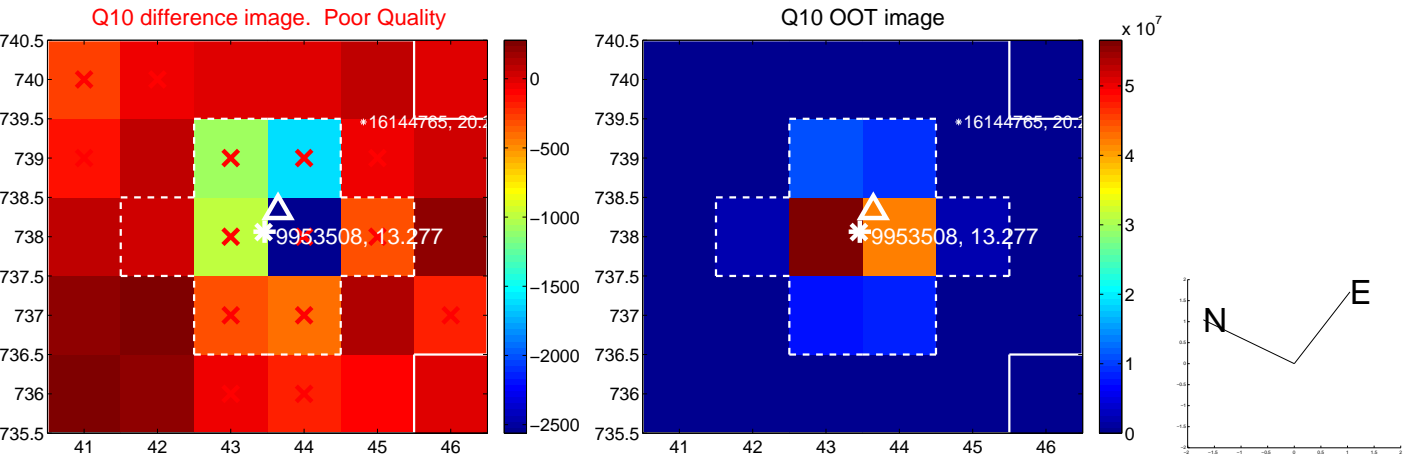
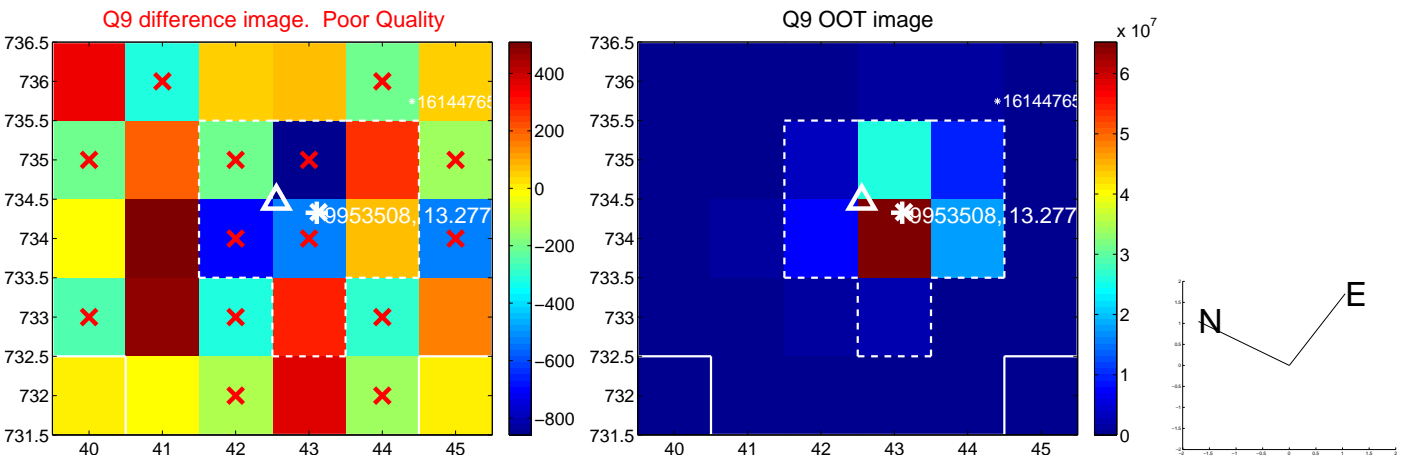


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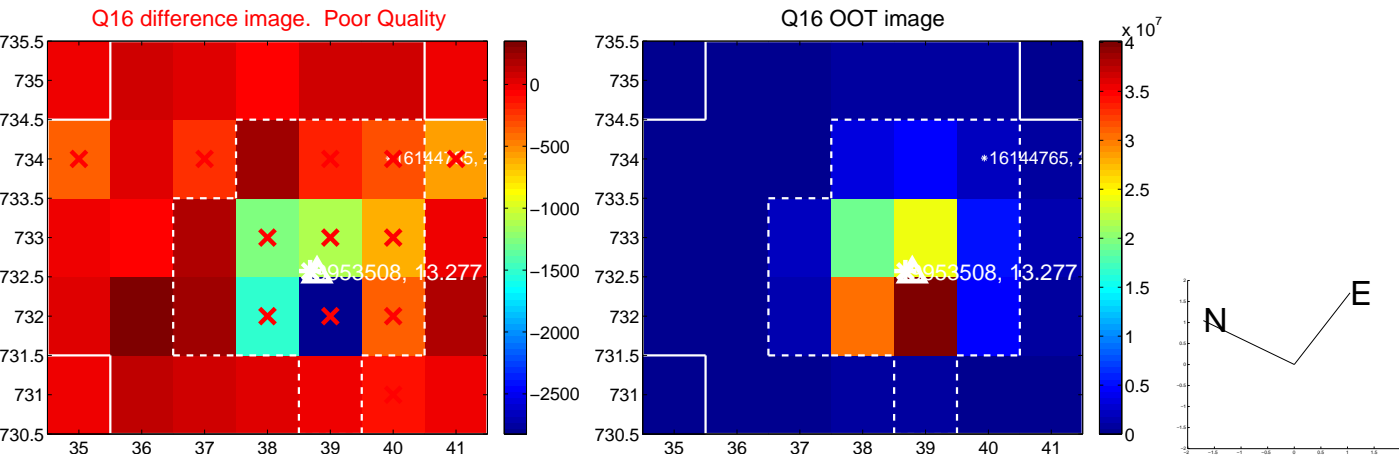
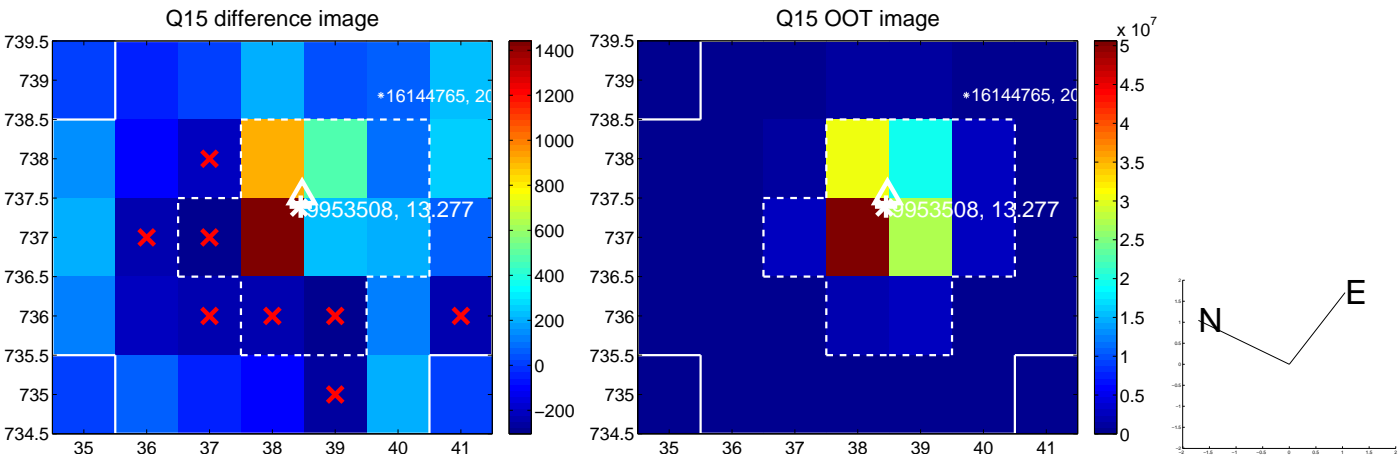
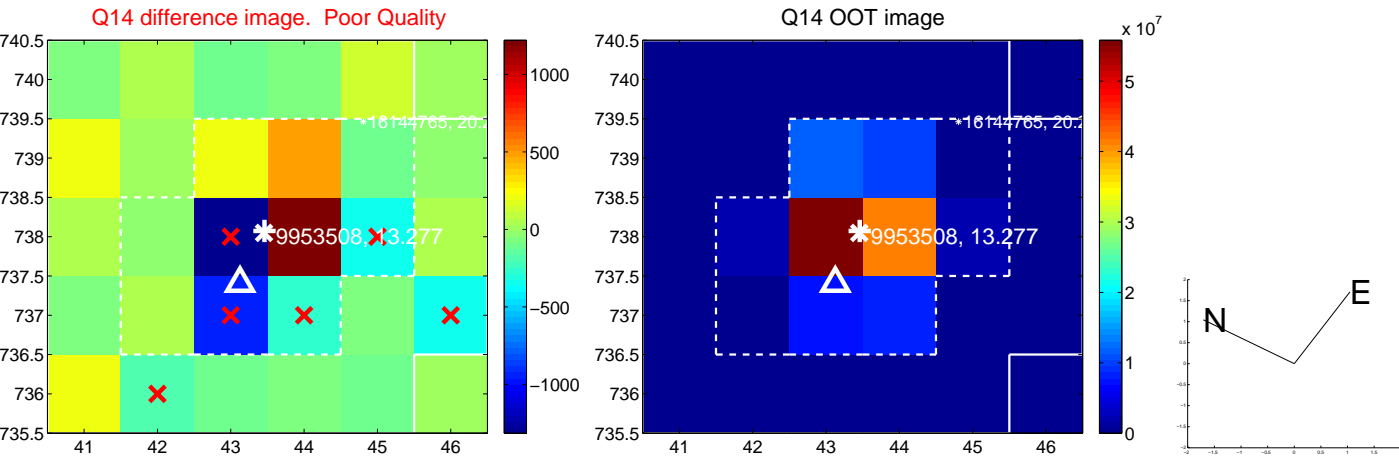
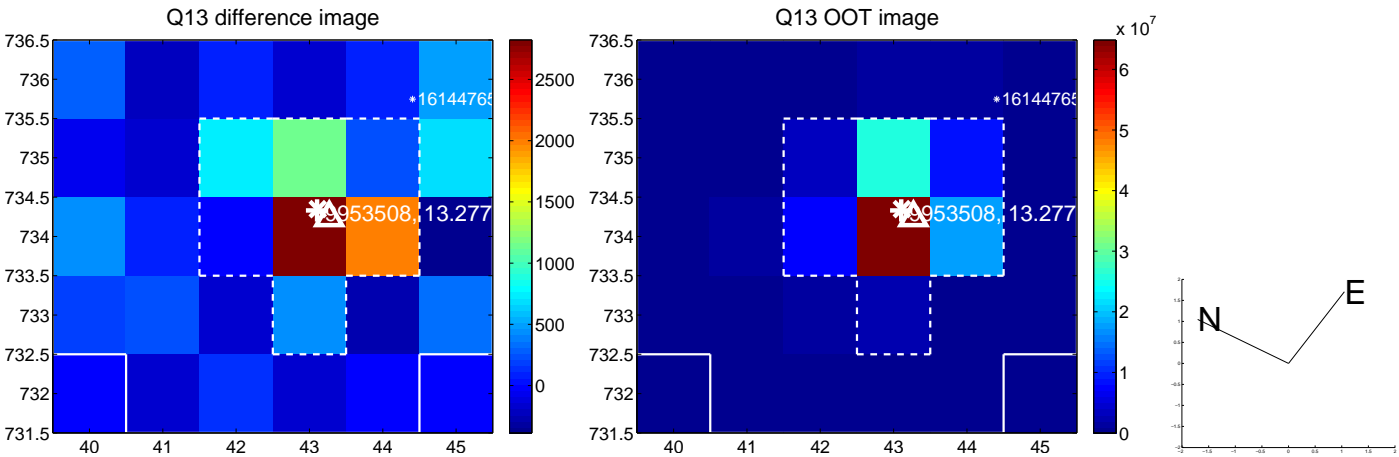




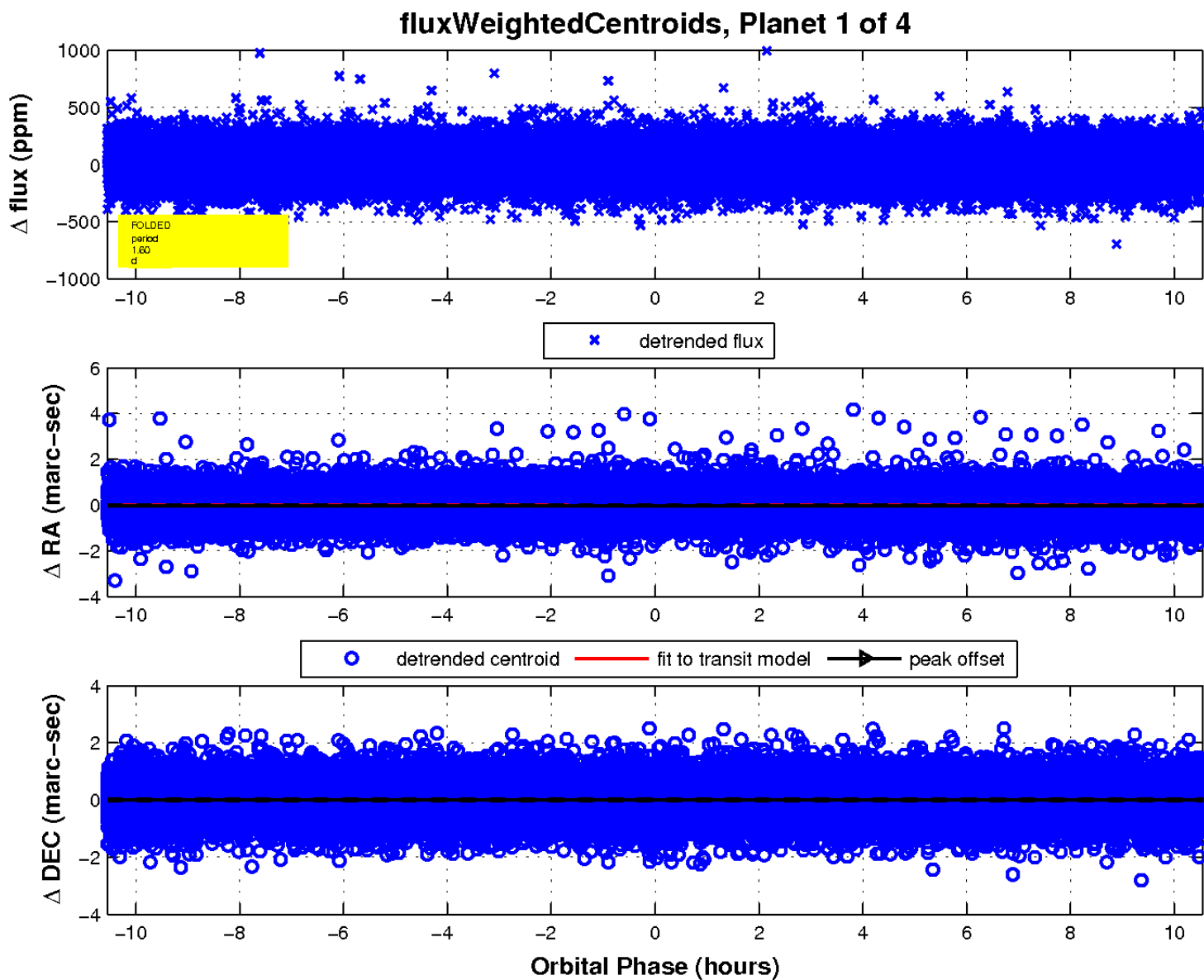
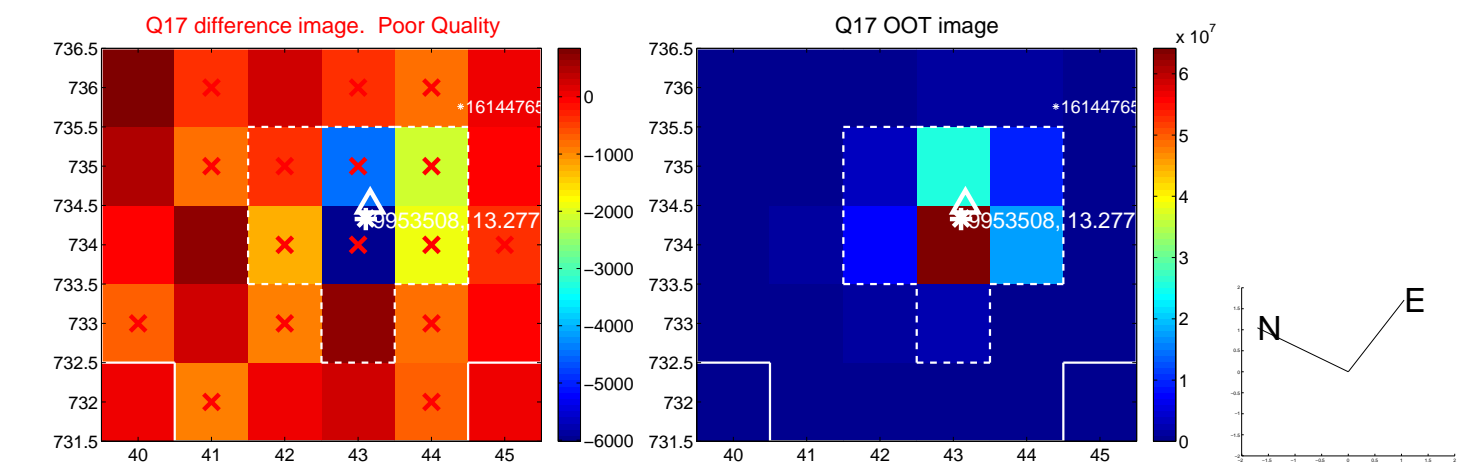
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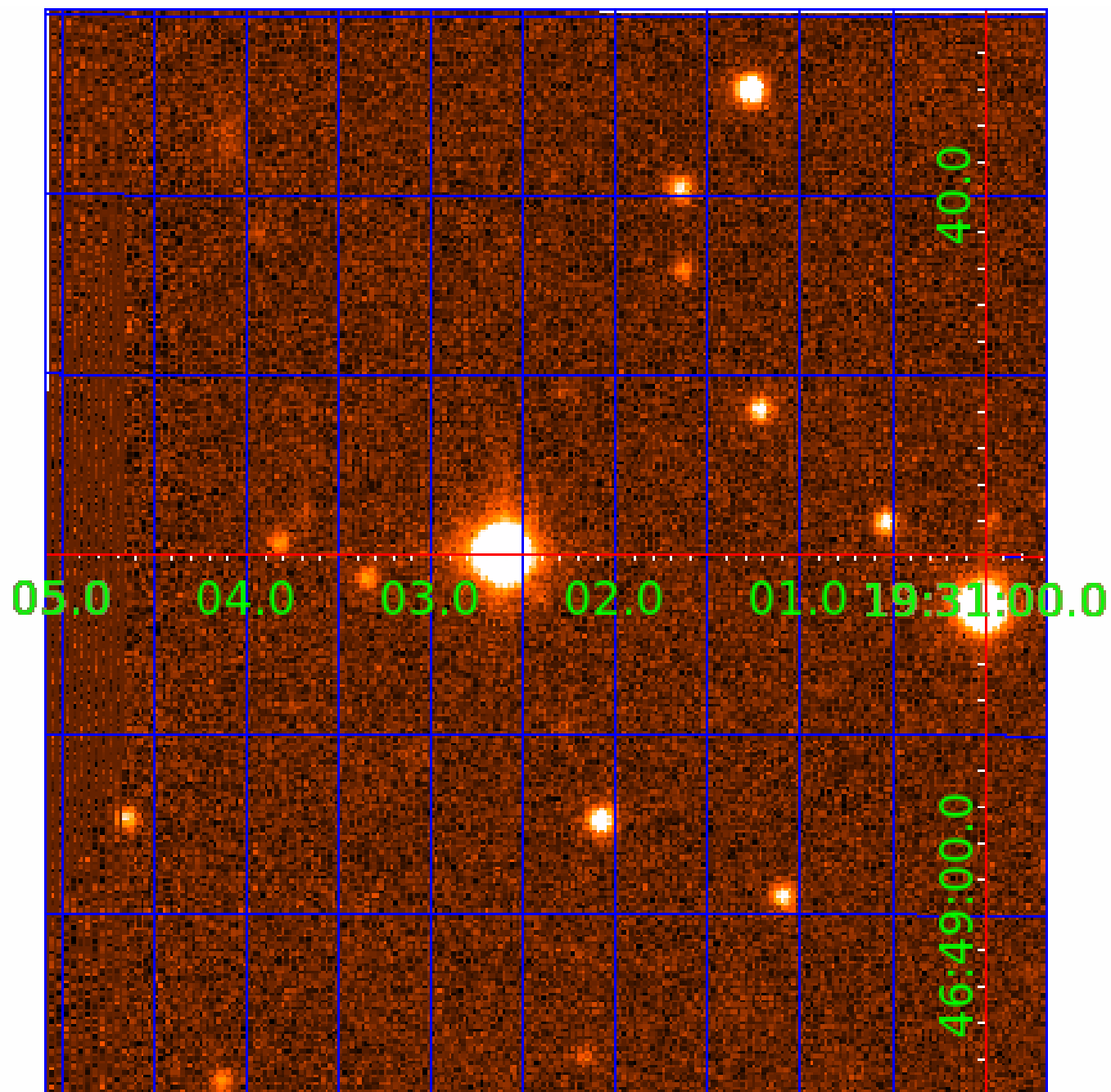


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination





# KIC 009953508

## Q1-17 DR25 TCE Parameters

TCE	Run Type	KOI?	Period (Days)	Epoch (BKJD)	Depth (ppm)	Duration (Hours)	MES	SNR	$R_{\star}$ ( $R_{\odot}$ )	$T_{\star}$ (K)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
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009953508-04	OBS	No	0.801661	132.091040	9.5	8.482	8.8	4.3	1.69	6683	0.54	14606.49

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009953508-01	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE_ZUMA_TRACKER—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV
009953508-02	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE_SKYE_ZUMA_TRACKER—SWEET_NTL—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—HALO_GHOST
009953508-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE_ZUMA_TRACKER—SWEET_NTL—LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—SAME_NTL_PERIOD
009953508-04	OBS	FP	0.00	1	0	1	0	TRANS_GAPPED—SWEET_NTL—LPP_DV—CENT_FEW_DIFFS—HALO_GHOST

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

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

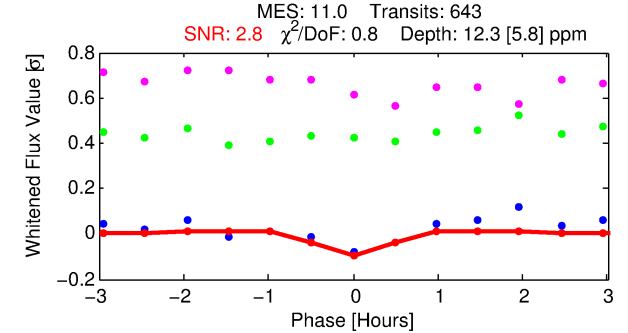
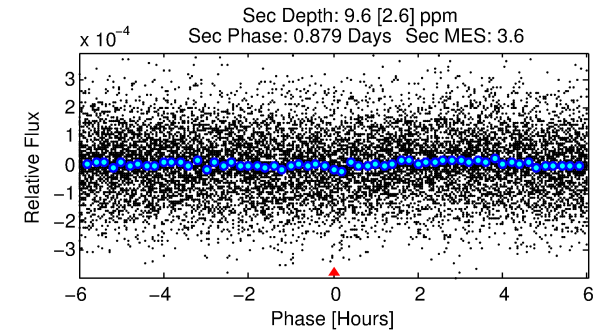
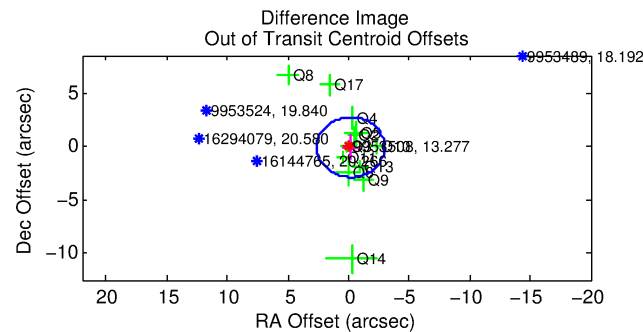
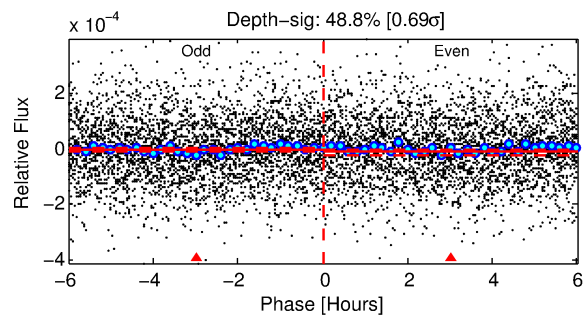
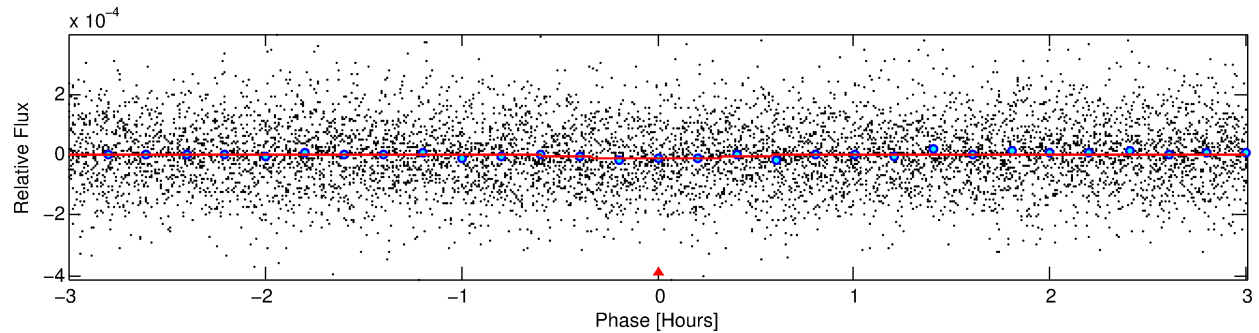
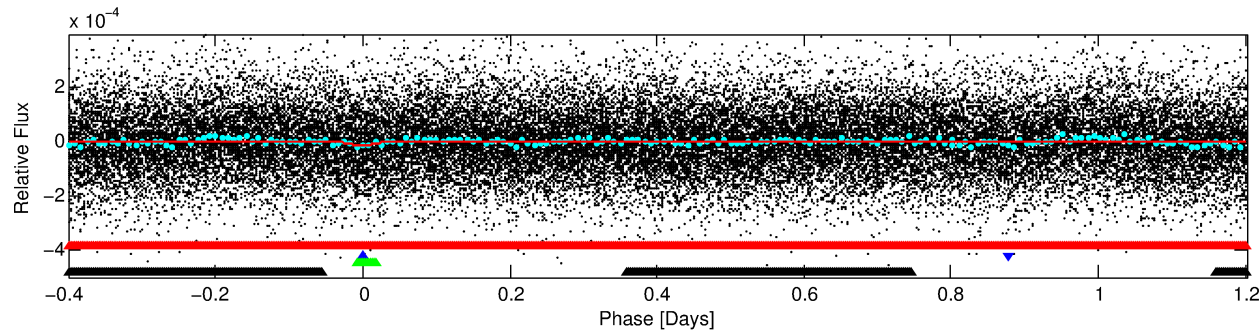
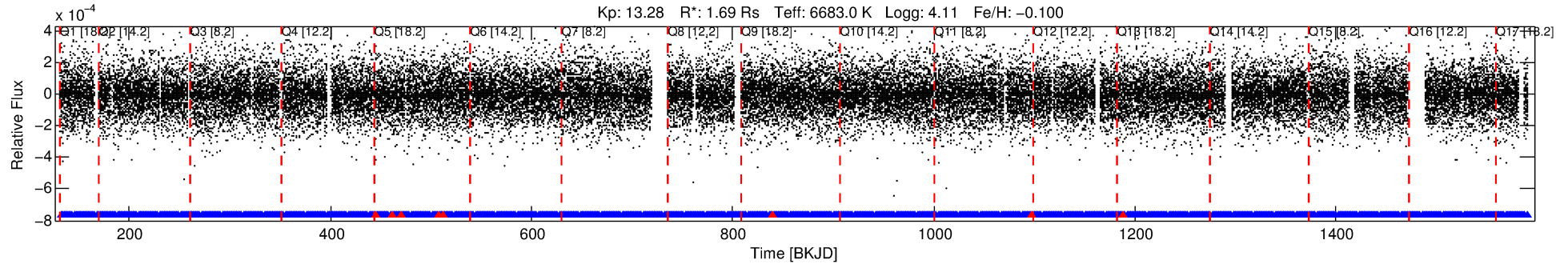
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 009953508-02

No Significant Match Found

# DV One-Page Summary

KIC: 9953508 Candidate: 2 of 4 Period: 1.603 d



## DV Fit Results:

Period = 1.60290 [0.00004] d  
Epoch = 132.5342 [0.0061] BKJD  
Rp/R\* = 0.0034 [0.0020]  
a/R\* = 10.50 [31.25]  
b = 0.52 [4.18]  
Seff = 5798.64 [2383.28]  
Teq = 2225 [229] K  
Rp = 0.62 [0.41] Re  
a = 0.0297 [0.0077] AU  
Ag = 12.11 [15.41] [0.72 $\sigma$ ]  
Teffp = 6418 [1964] K [2.12 $\sigma$ ]

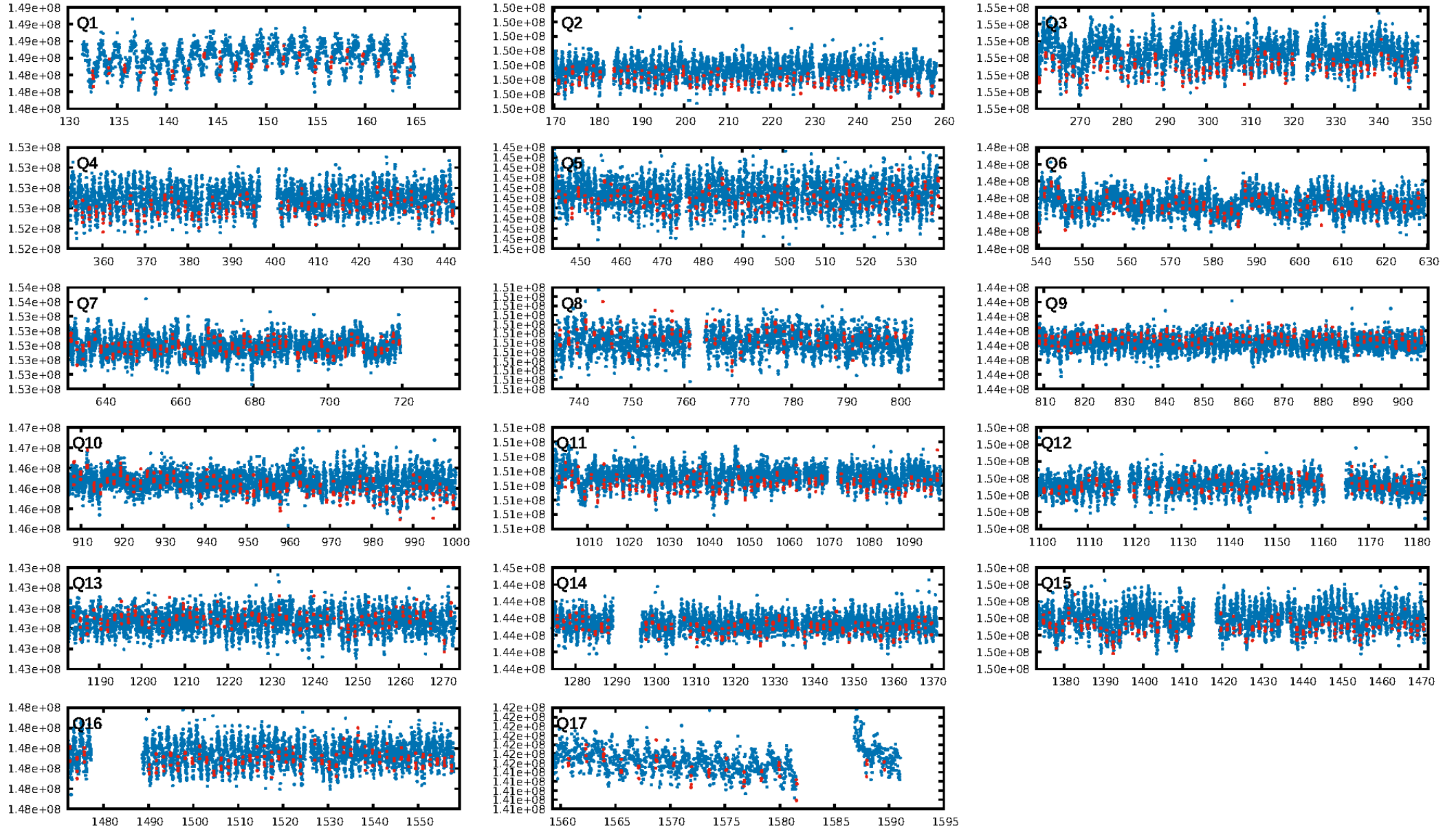
## DV Diagnostic Results:

ShortPeriod-sig: 2.3% [0.03 $\sigma$ ]  
LongPeriod-sig: 0.0% [0.00 $\sigma$ ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 0.99 [619/627]  
GhostDiagnostic-chr: 0.07079  
Centroid-sig: 12.5%  
Centroid-so: 3.944 arcsec [0.98 $\sigma$ ]  
OotOffset-rm: 0.176 arcsec [0.19 $\sigma$ ]  
KicOffset-rm: 0.167 arcsec [0.17 $\sigma$ ]  
OotOffset-st: 4/2/2/4 [12]  
KicOffset-st: 4/2/2/4 [12]  
DiffImageQuality-fgm: 0.58 [7/12]  
DiffImageOverlap-fno: 0.00 [0/17]

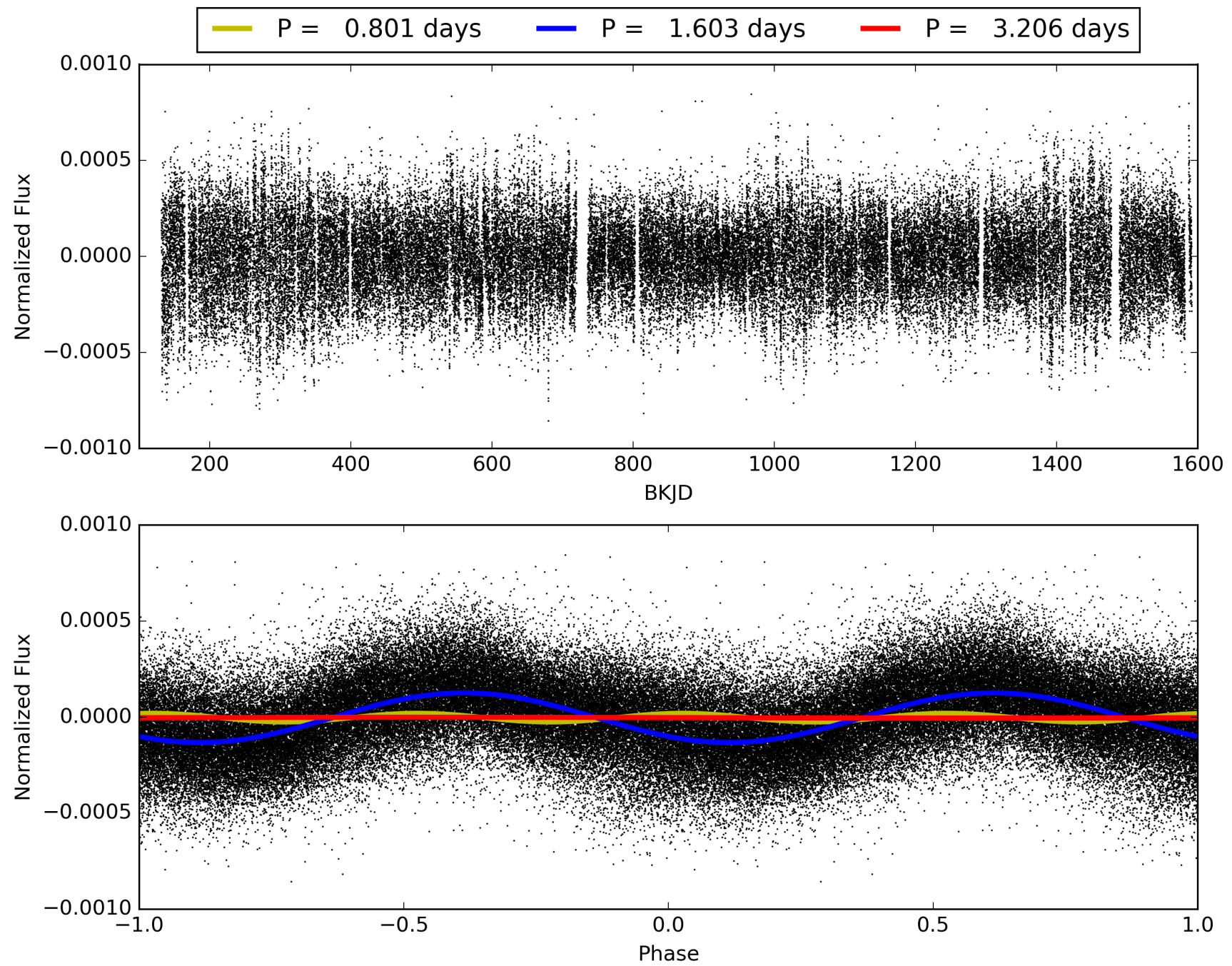
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 14:06:04 Z

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

# TCE 009953508-02, PDC Light Curves



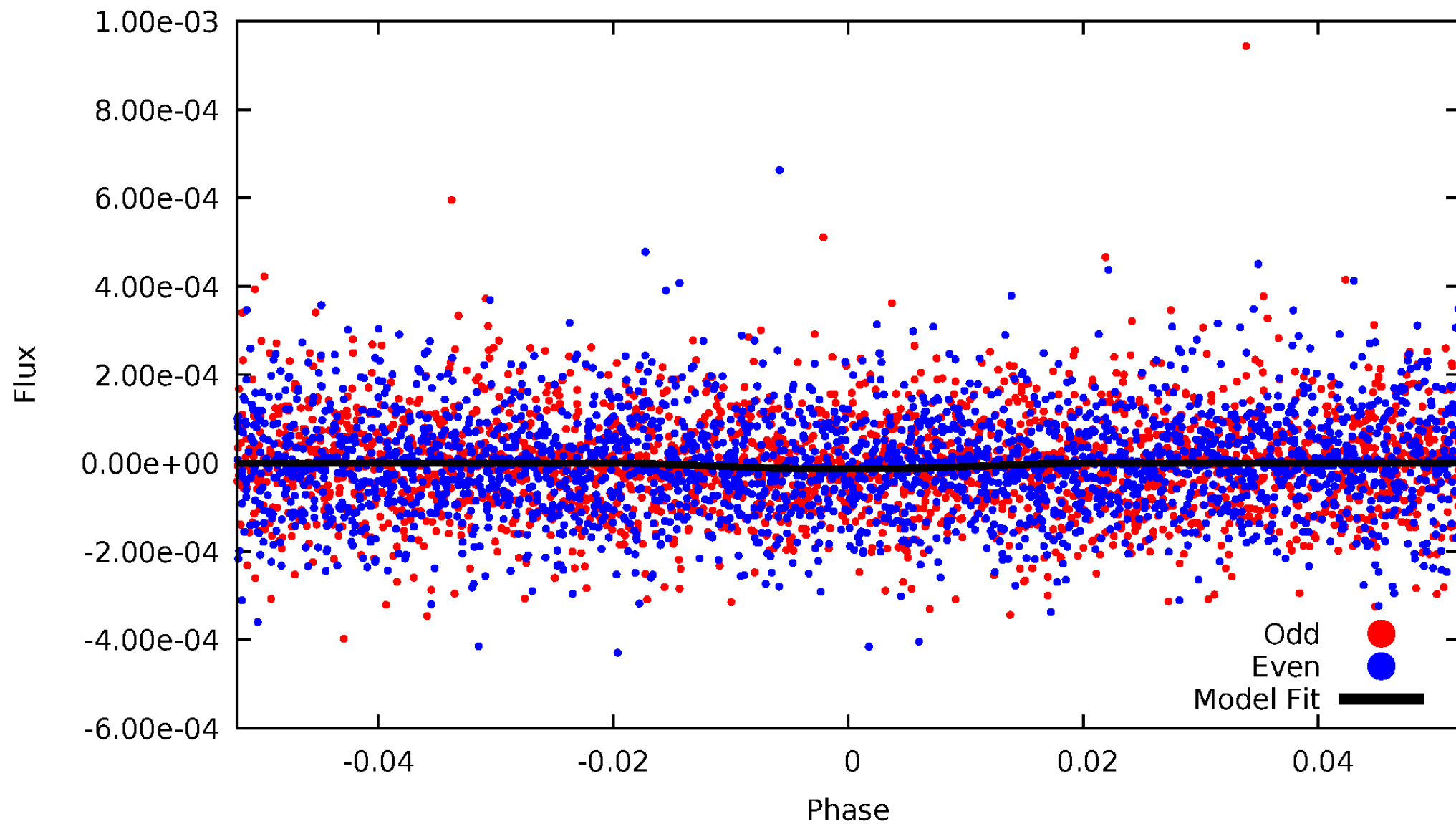
TCE 009953508-02





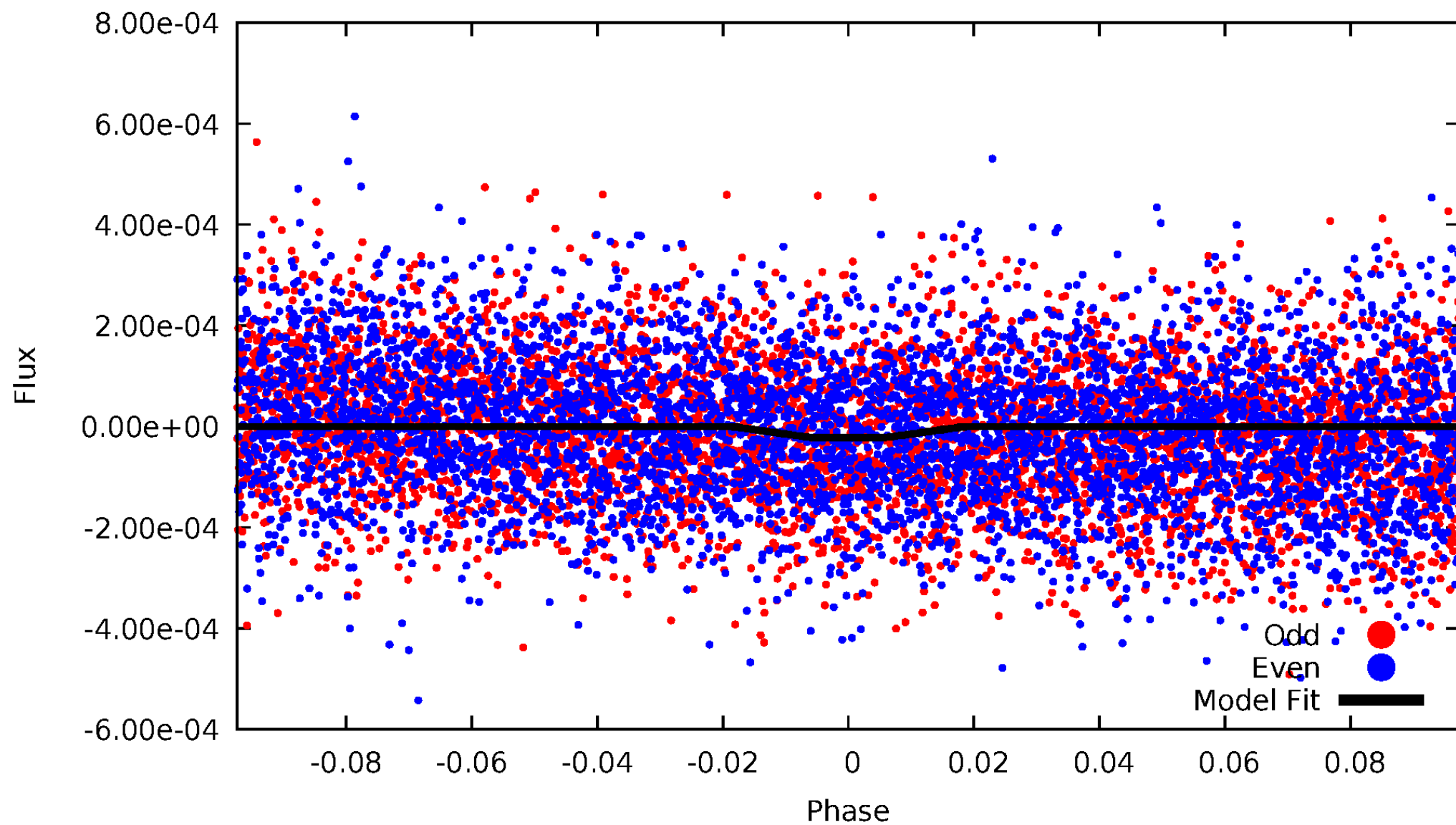
# DV Odd/Even

TCE 009953508-02



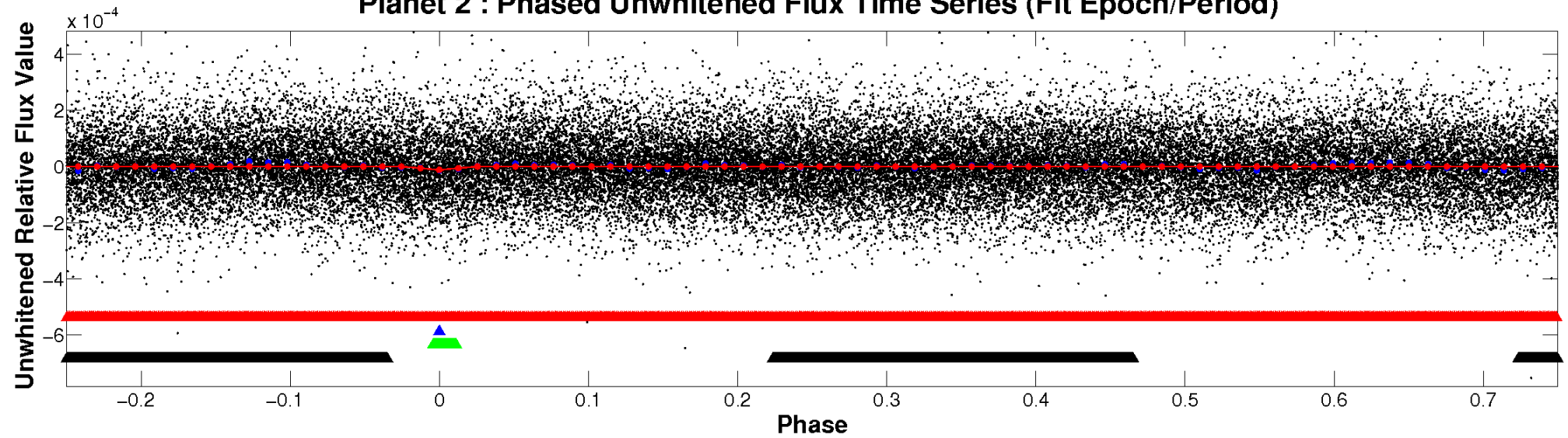
# ALT Odd/Even

TCE 009953508-02

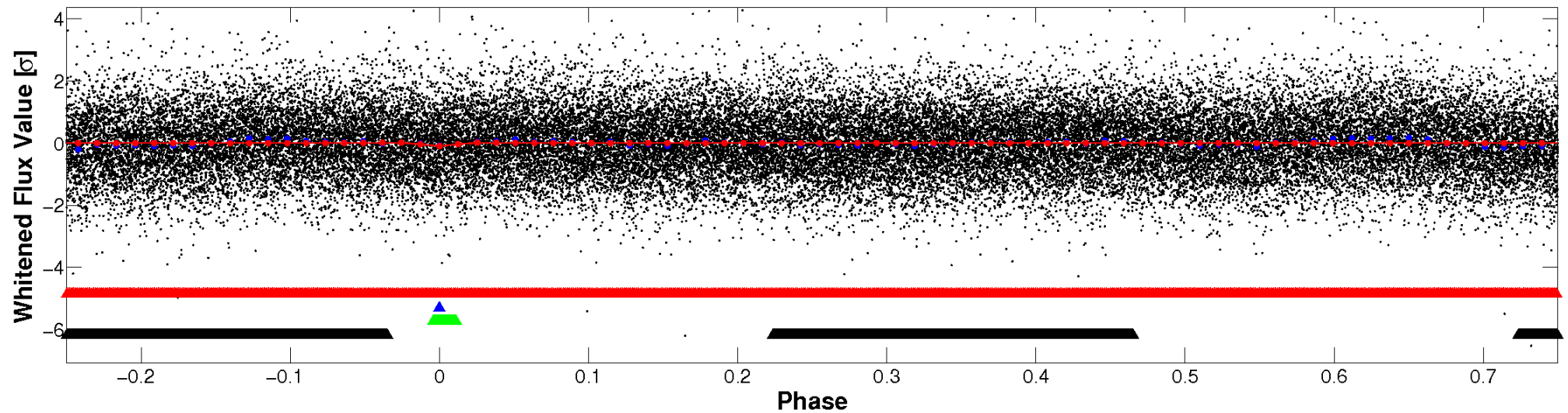


# Non-Whitened Vs. Whitened Light Curve

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

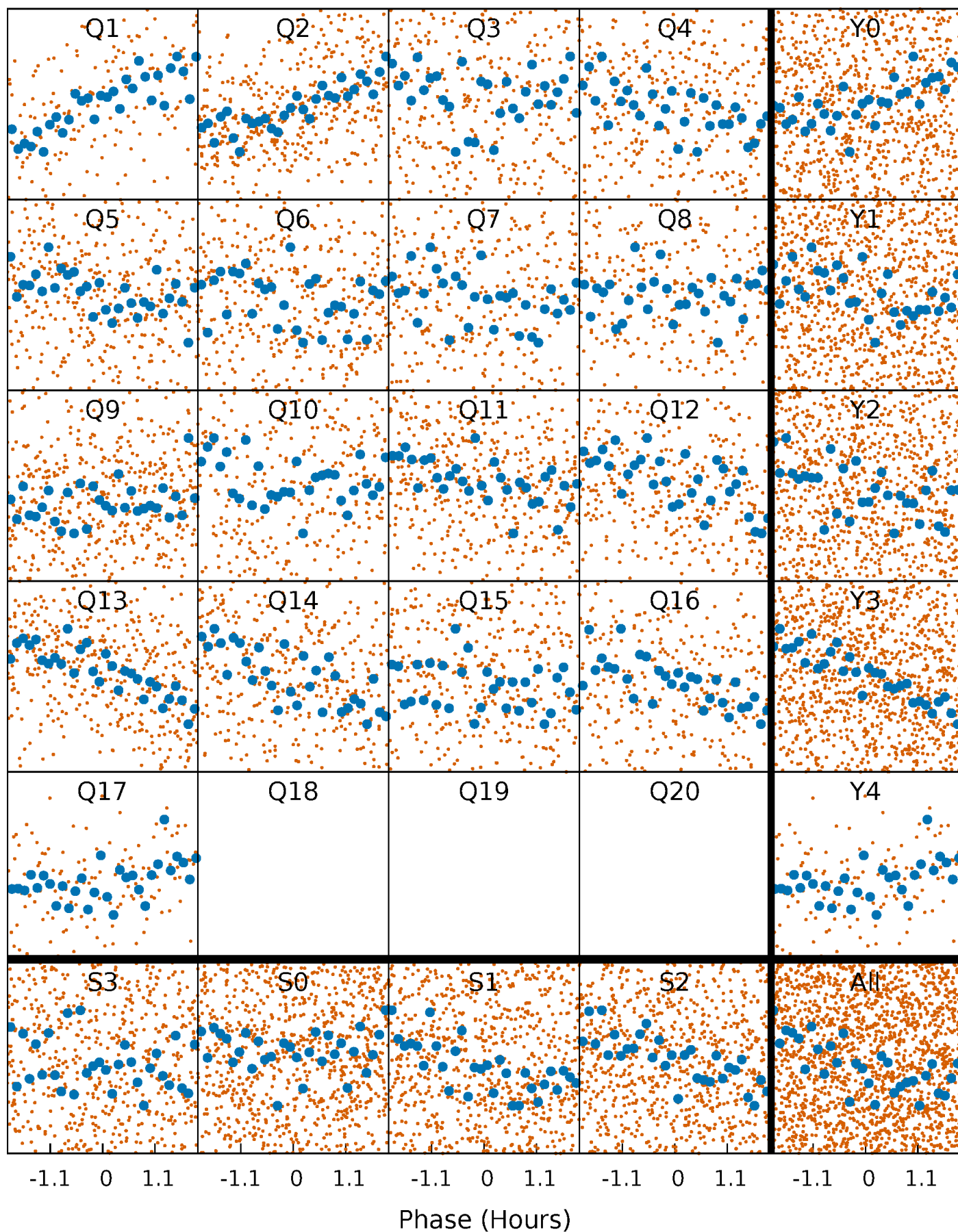


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

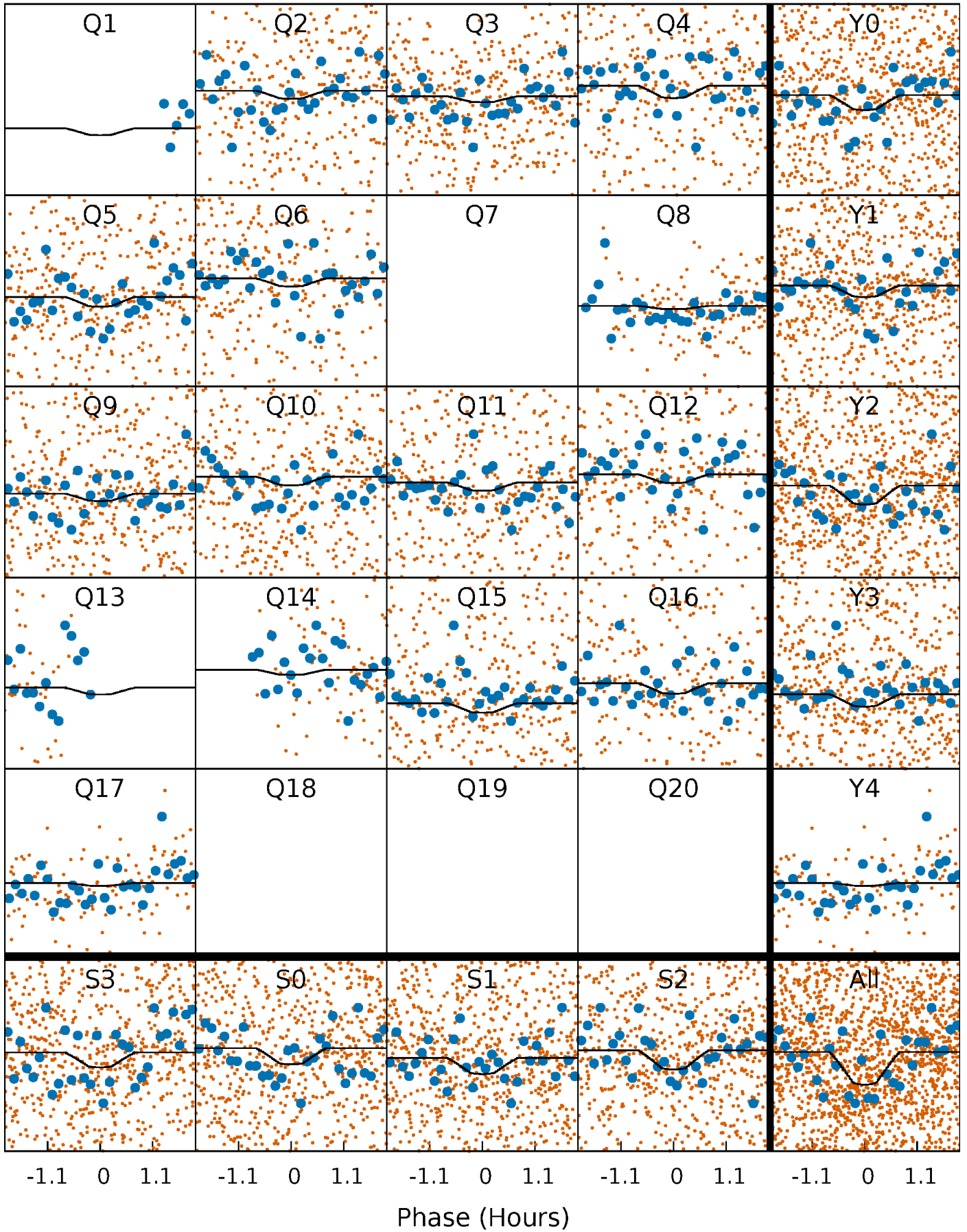
TCE 009953508-02     $P = 1.602895$  Days     $T_0 = 132.534214$  (BKJD)





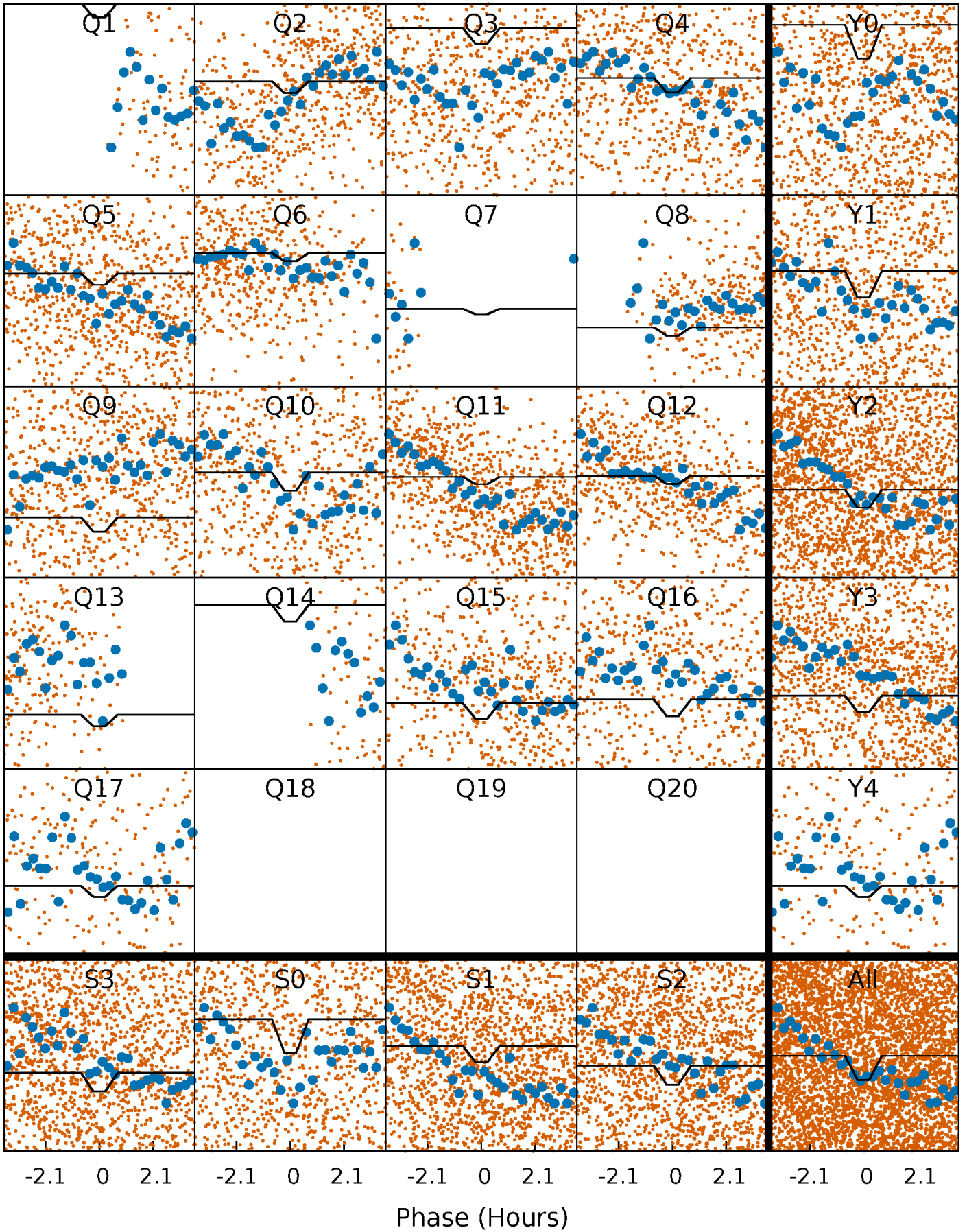
# DV Quarter-Phased Transit Curves

TCE 009953508-02   P= 1.602895 Days    $T_0=132.534214$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

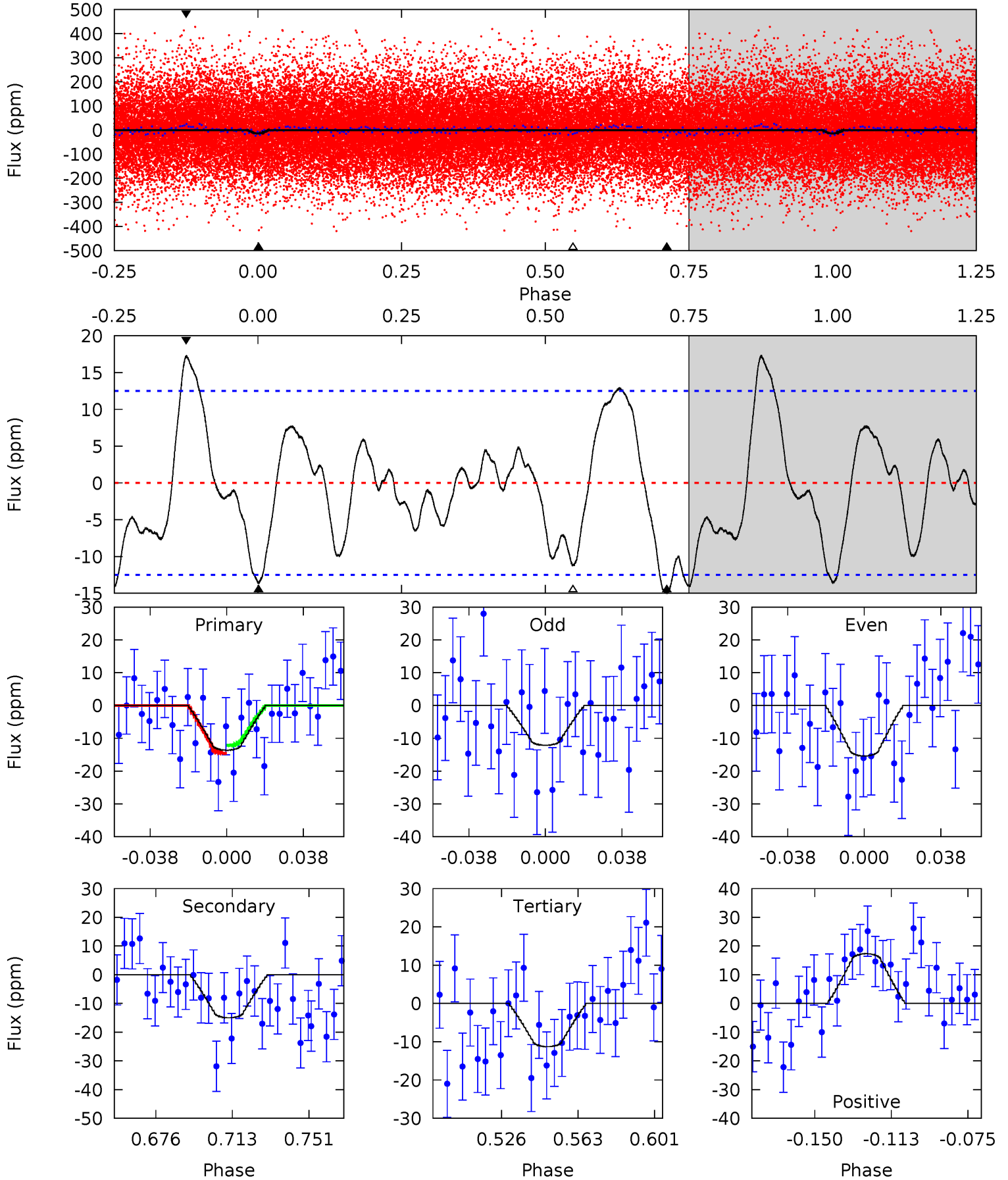
TCE 009953508-02 P= 1.602759 Days  $T_0=132.575636$  (BKJD)



# DV Model-Shift Uniqueness Test

009953508-02, P = 1.602895 Days, E = 130.931319 Days

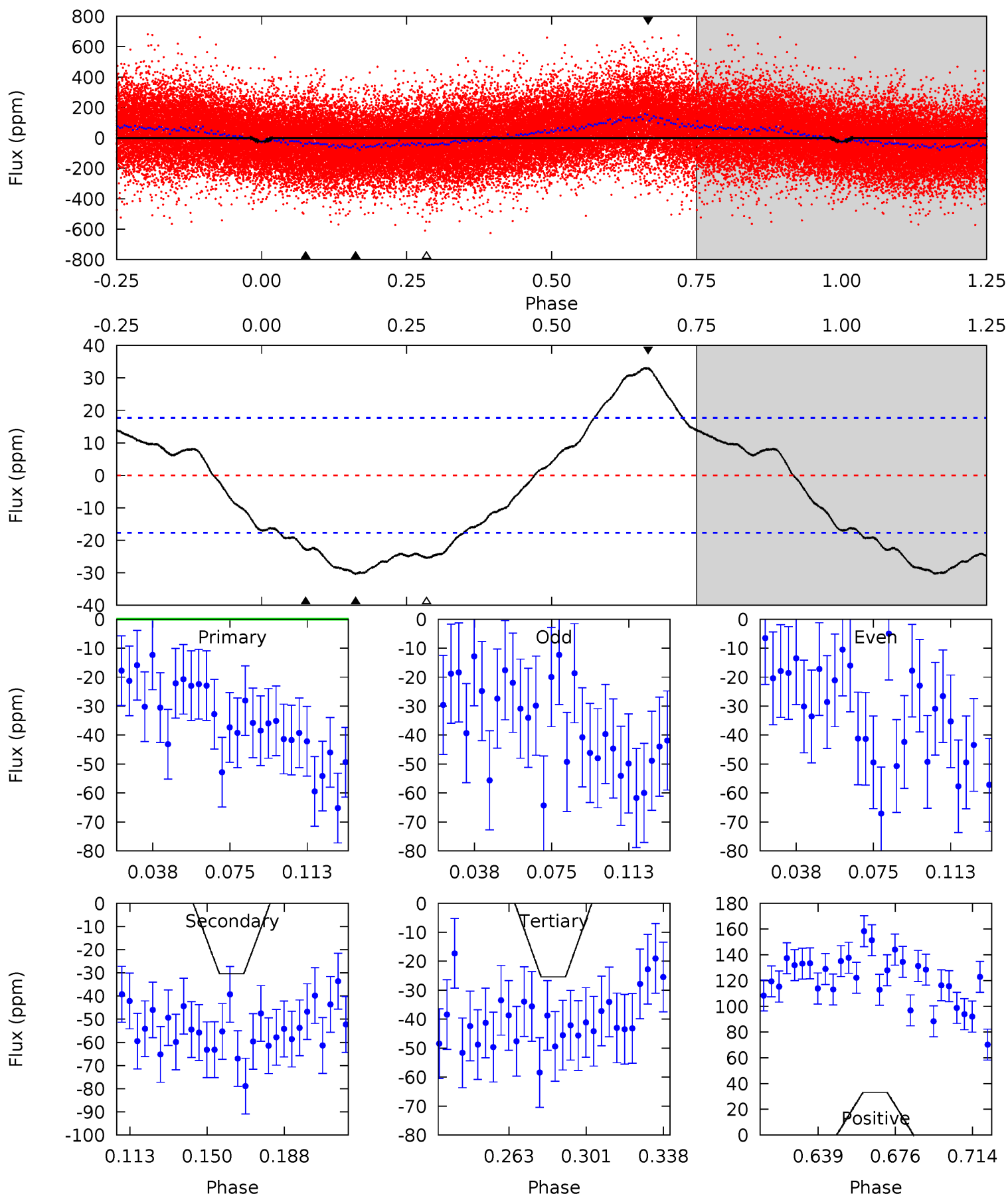
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
5.20	5.71	4.30	6.60	4.77	2.08	2.48	0.90	-1.40	1.41	-0.89	0.63	1.43	0.54	0.47



# Alt Model-Shift Uniqueness Test

009953508-02, P = 1.602759 Days, E = 130.972877 Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
6.13	8.17	6.84	8.89	4.77	2.08	4.77	-0.70	-2.75	1.33	-0.72	0.79	1.12	0.52	0.21



### Stellar Parameters For KIC 009953508

	$T_{\text{eff}} (K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M (M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6683^{+189}_{-259}$	$4.114^{+0.209}_{-0.190}$	$-0.100^{+0.250}_{-0.300}$	$1.689^{+0.519}_{-0.425}$	$1.361^{+0.196}_{-0.261}$	$0.398^{+0.429}_{-0.208}$
	+3%/-4%	+5%/-5%	+250%/-300%	+31%/-25%	+14%/-19%	+108%/-52%
Source	PHO54	PHO54	PHO54	DSEP		

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

### Secondary Eclipse Parameters for KIC 009953508-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-15 \pm 3$	$0.65^{+0.38}_{-0.32}$	$3100^{+268}_{-241}$	$6824^{+4051}_{-1336}$	$17^{+51}_{-10}$
Alt.	$-30 \pm 4$	$0.85^{+0.40}_{-0.38}$	$3093^{+265}_{-244}$	$7202^{+3352}_{-1280}$	$20^{+45}_{-10}$

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



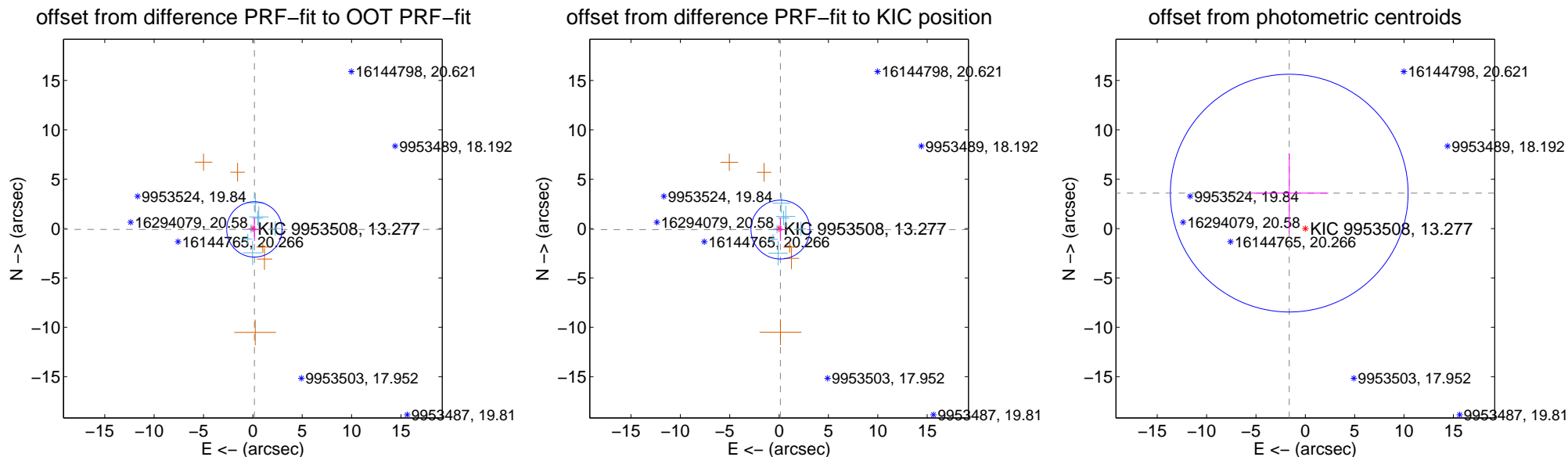
## DV Centroid Data

Supplemental centroid analysis for 009953508-02. Kepler magnitude: 13.28. Transit SNR 2.80

There are 7 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.03 arcsec

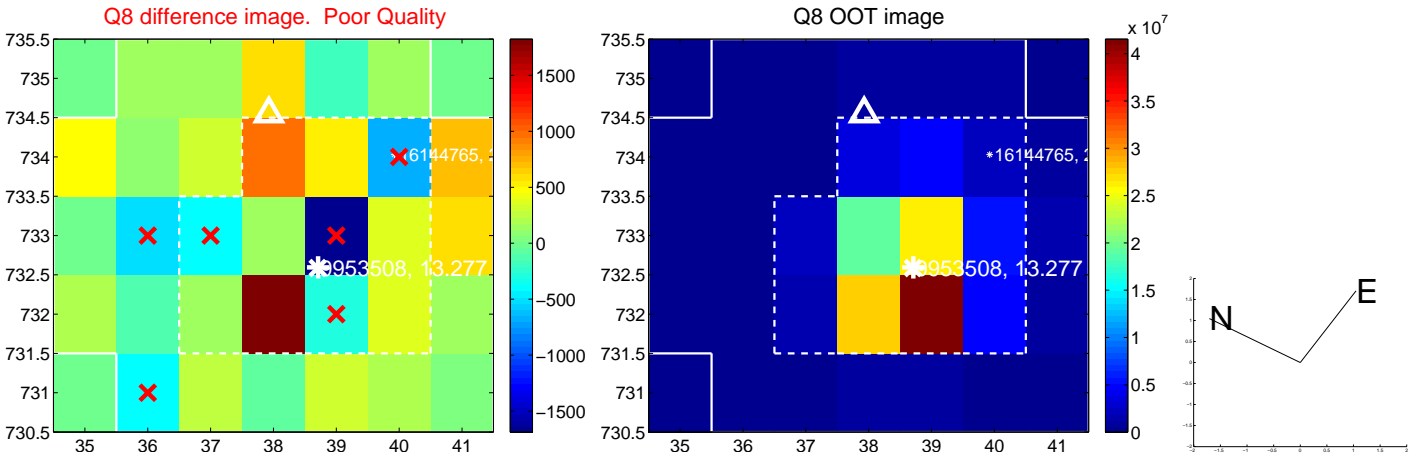
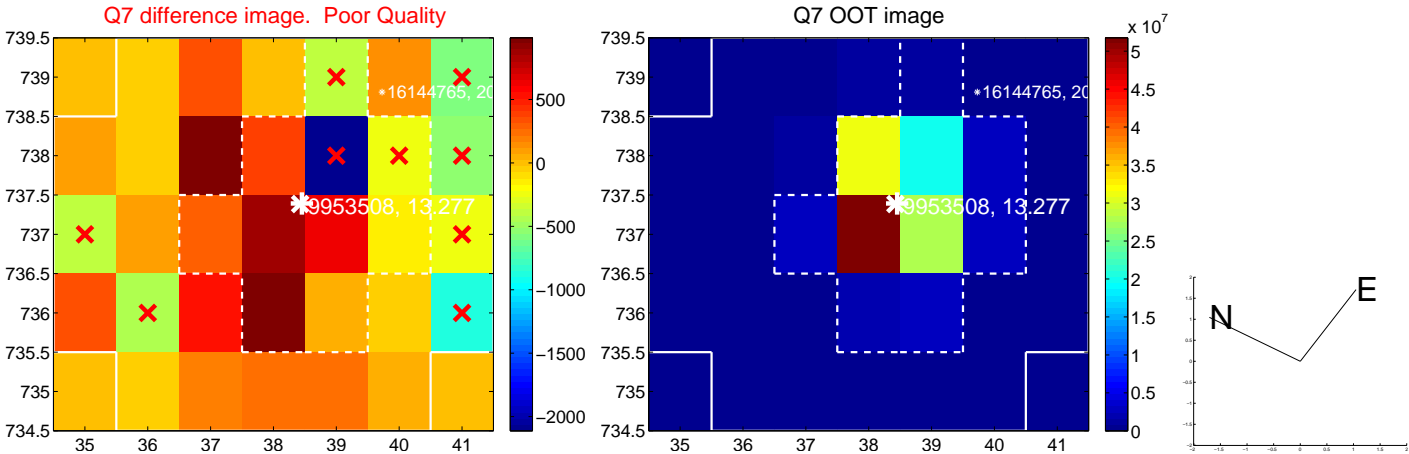
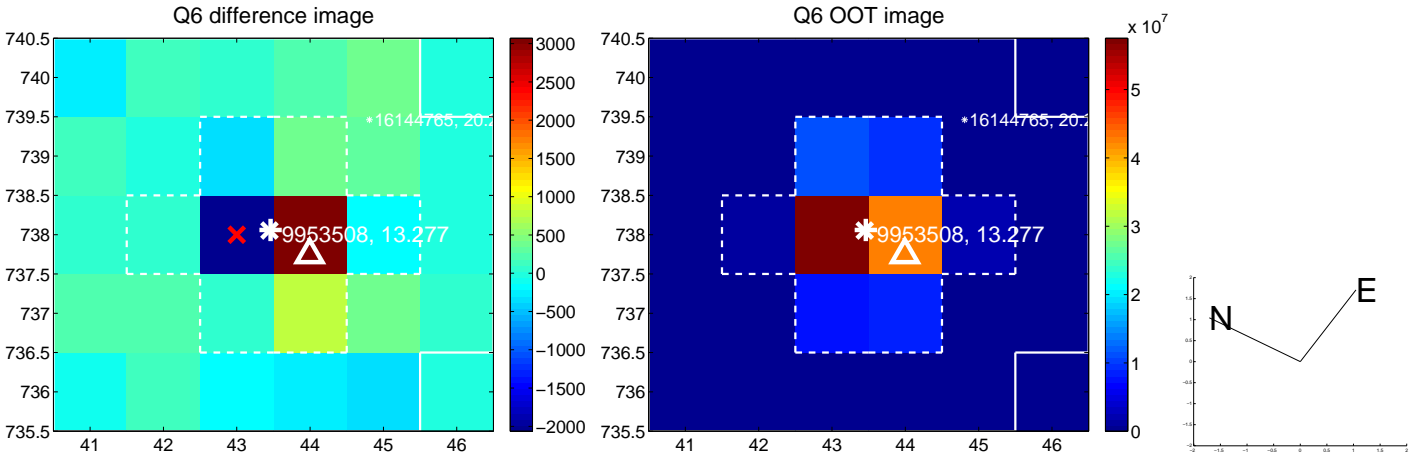
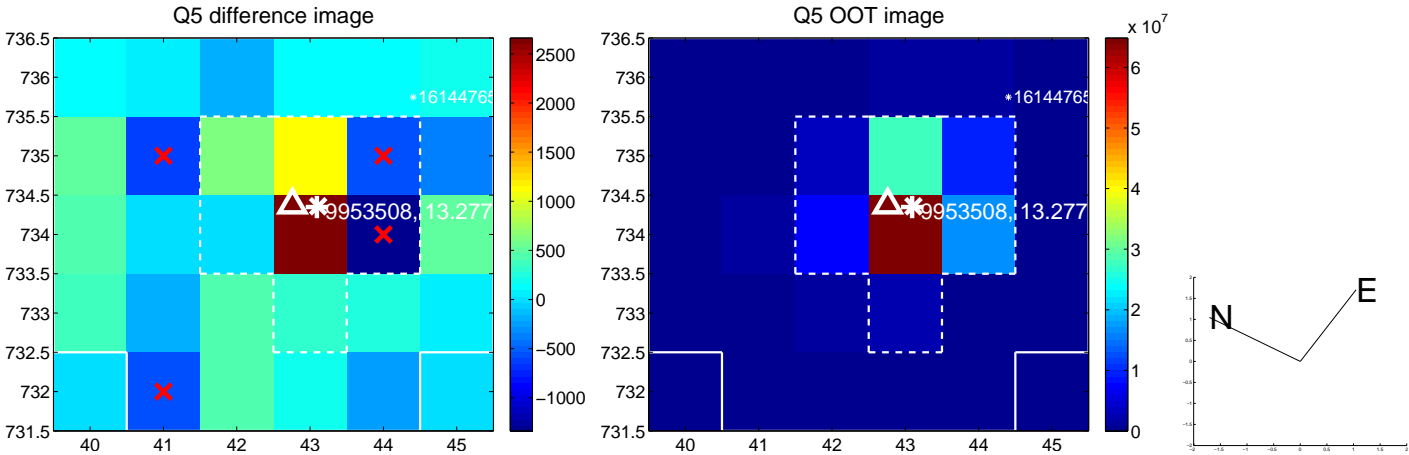
	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.176 \pm 0.934$	0.19	$-0.155 \pm 0.549$	$-0.083 \pm 1.170$
PRF-fit source offset from KIC position	$0.167 \pm 0.994$	0.17	$-0.133 \pm 0.516$	$-0.100 \pm 1.174$
photometric centroid source offset	$3.94 \pm 4.01$	0.98	$1.63 \pm 3.96$	$3.59 \pm 4.02$



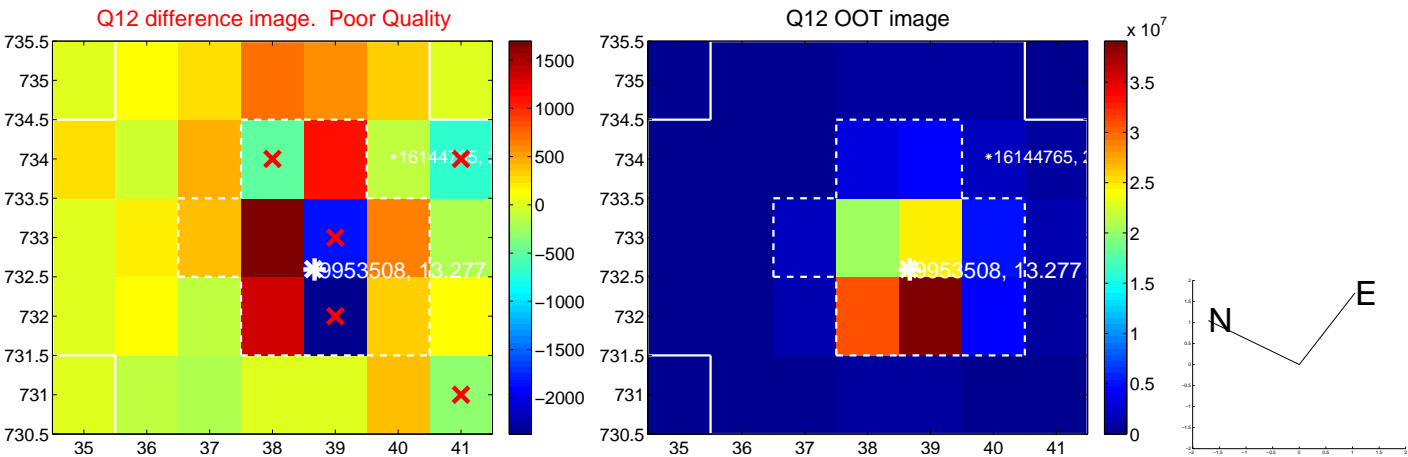
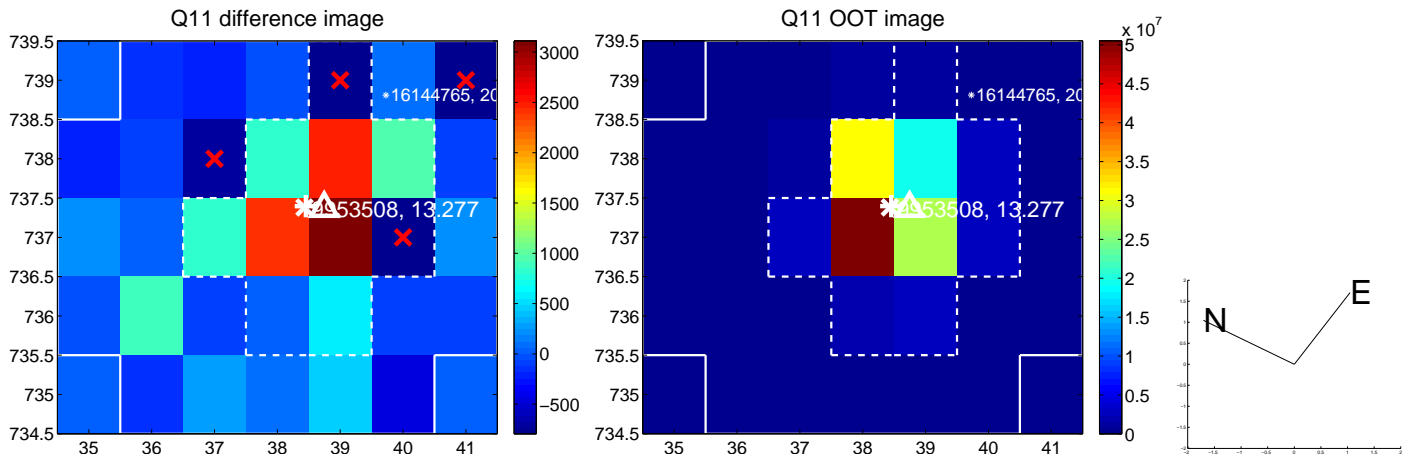
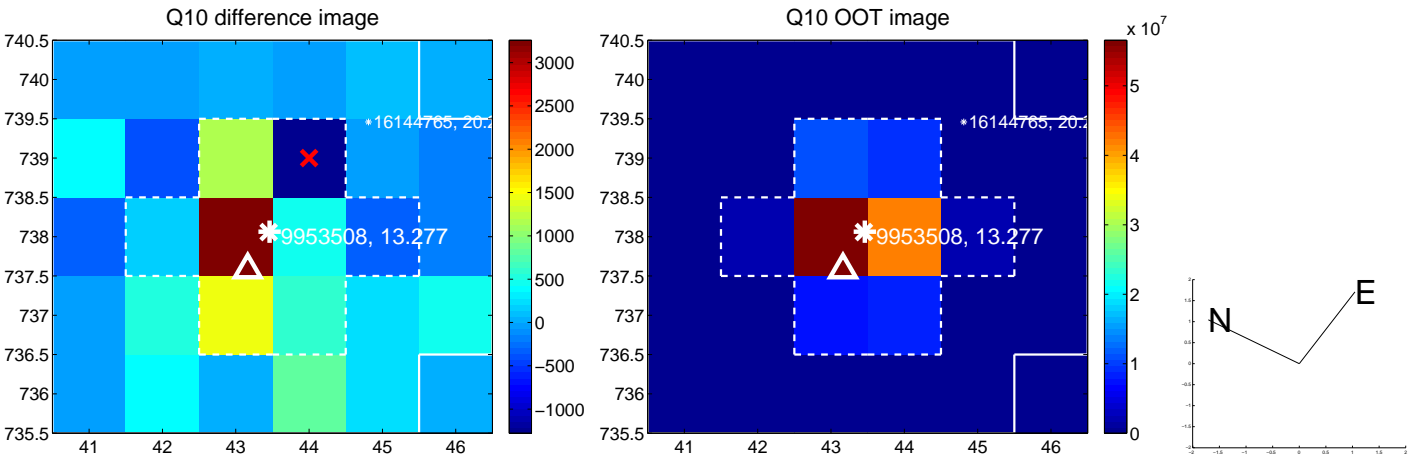
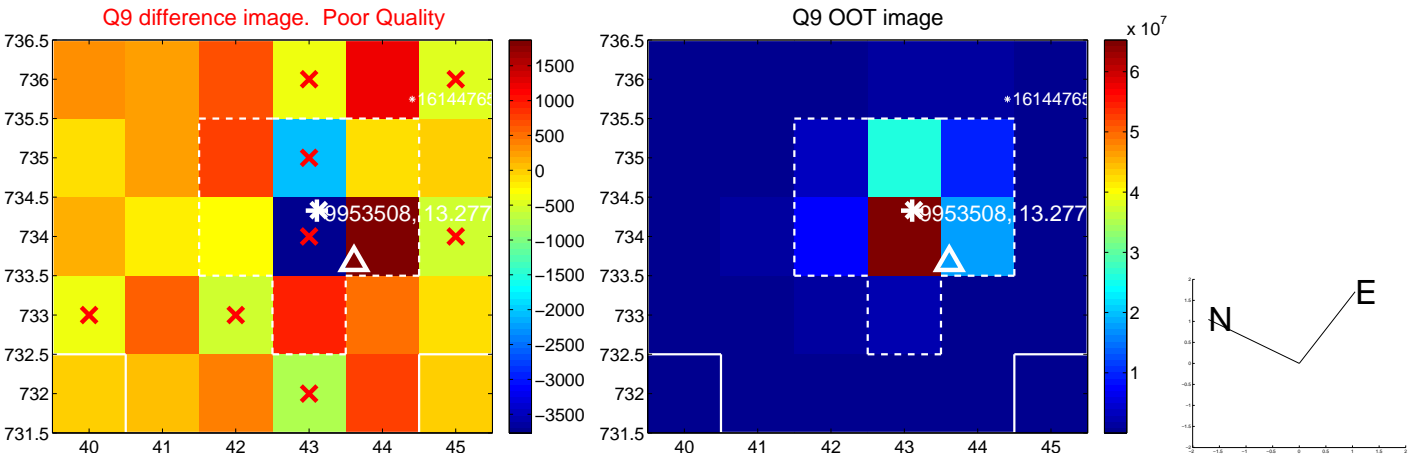
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets**; **Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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



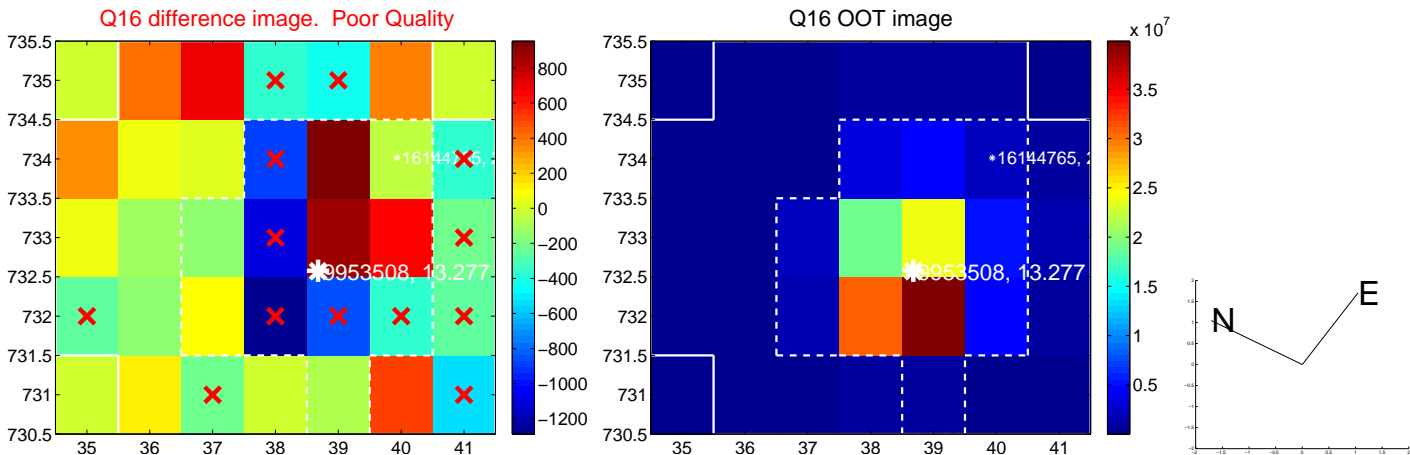
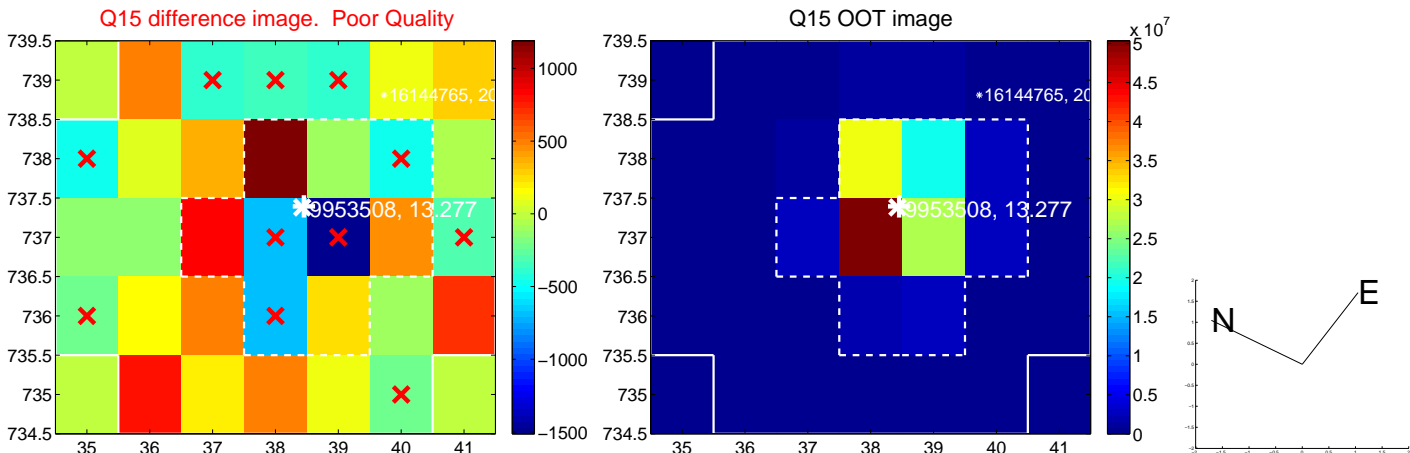
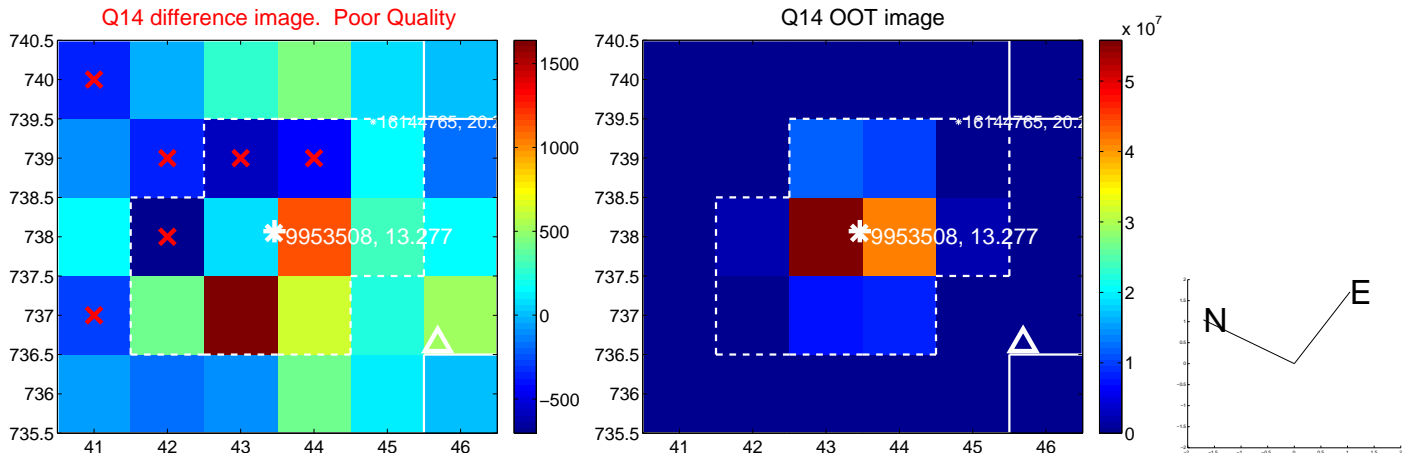
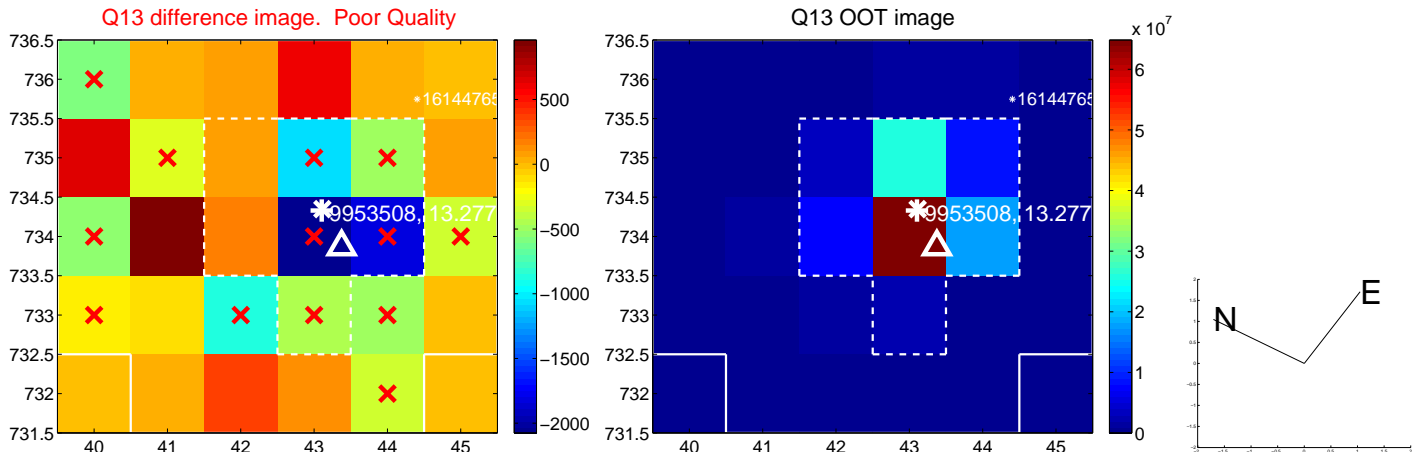
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

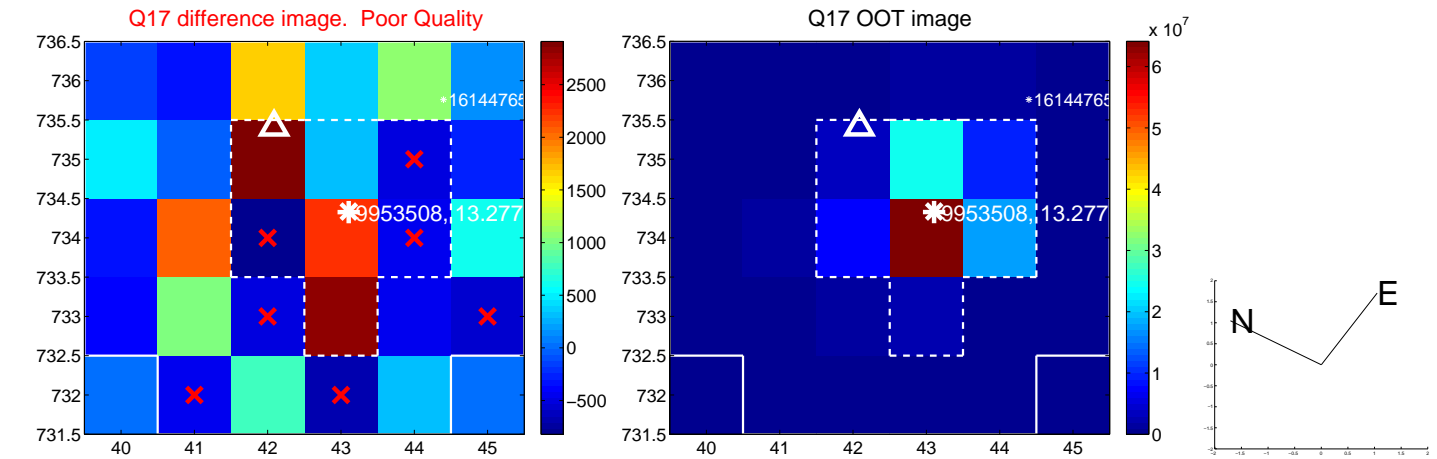


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

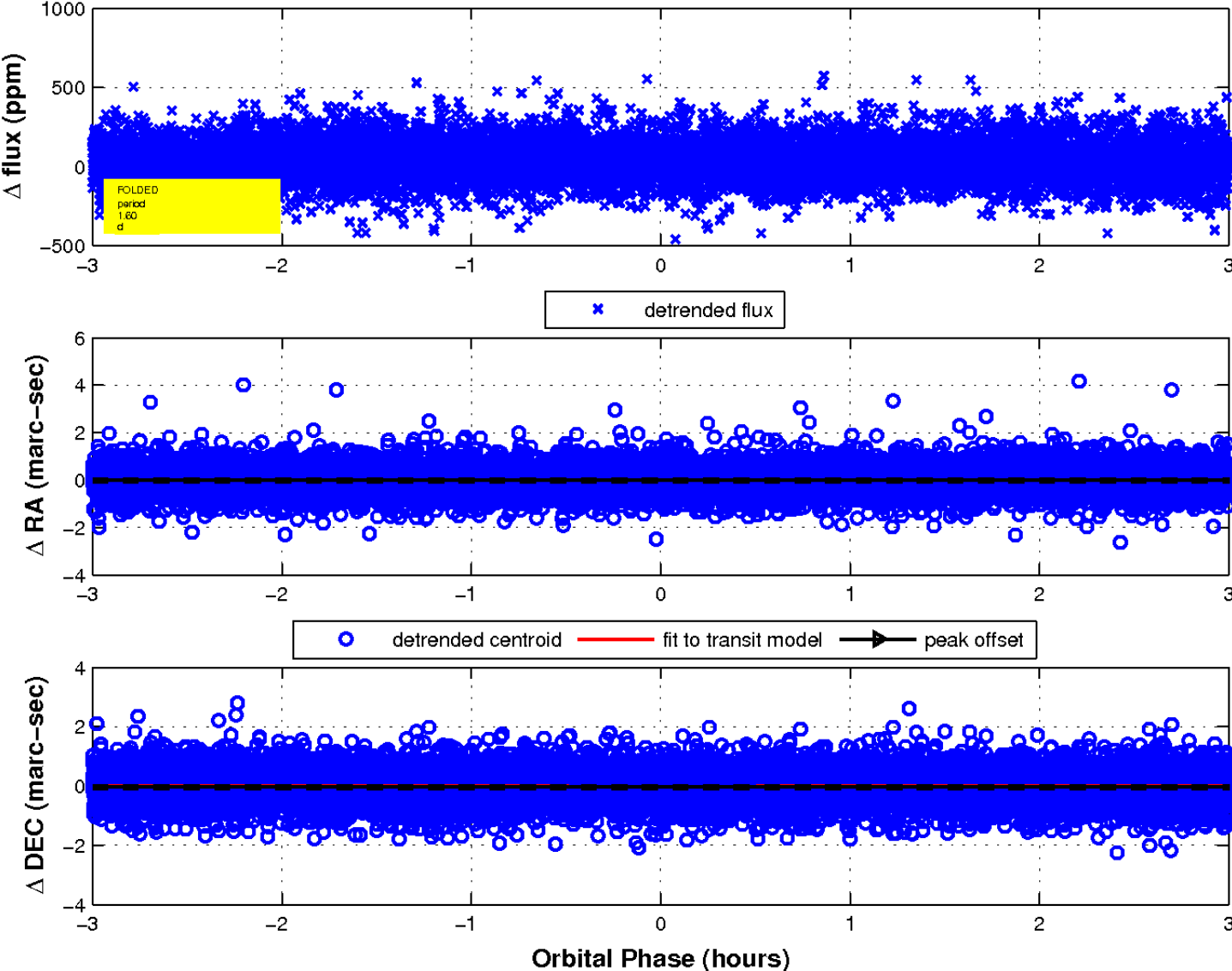




white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

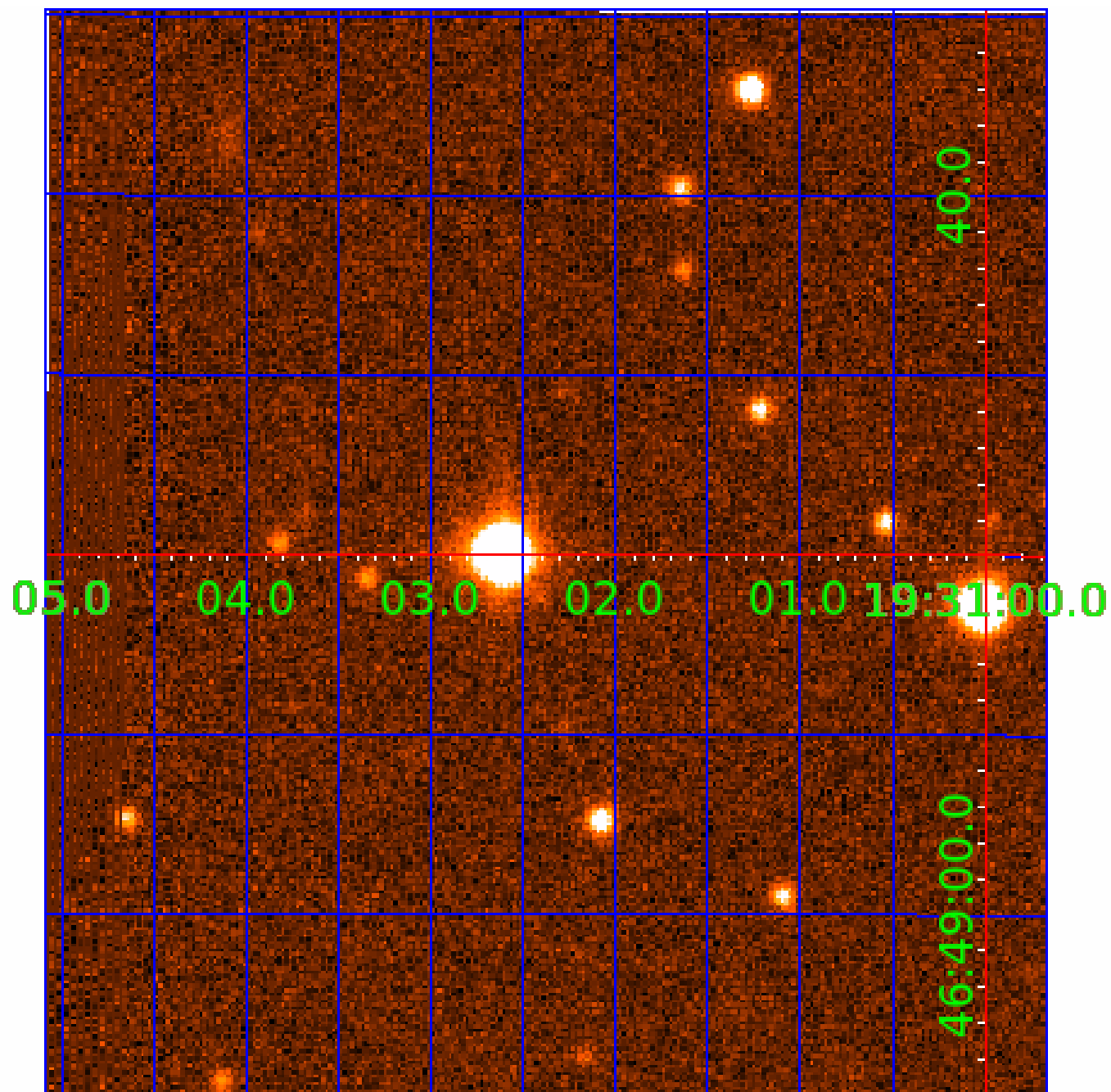


fluxWeightedCentroids, Planet 2 of 4



UKIRT Image

Declination



# KIC 009953508

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009953508-01	OBS	No	1.598521	132.438206	6.0	3.517	8.1	2.3	1.69	6683	0.44	5819.81
009953508-02	OBS	No	1.602895	132.534214	12.3	1.000	11.0	2.8	1.69	6683	0.62	5798.64
009953508-03	OBS	No	1.602923	132.527447	38.1	5.177	11.1	4.3	1.69	6683	1.18	5798.51
009953508-04	OBS	No	0.801661	132.091040	9.5	8.482	8.8	4.3	1.69	6683	0.54	14606.49

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009953508-01	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE_ZUMA_TRACKER—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV
009953508-02	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE_SKYE_ZUMA_TRACKER—SWEET_NTL—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—HALO_GHOST
009953508-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE_ZUMA_TRACKER—SWEET_NTL—LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—SAME_NTL_PERIOD
009953508-04	OBS	FP	0.00	1	0	1	0	TRANS_GAPPED—SWEET_NTL—LPP_DV—CENT_FEW_DIFFS—HALO_GHOST

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

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

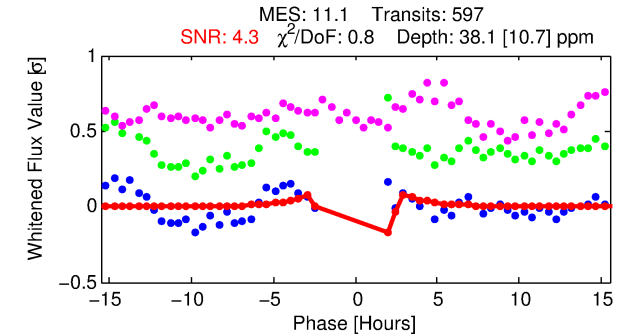
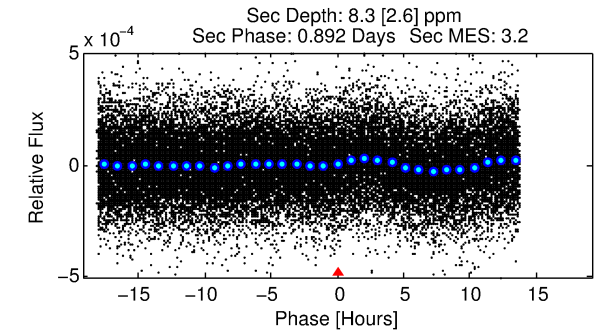
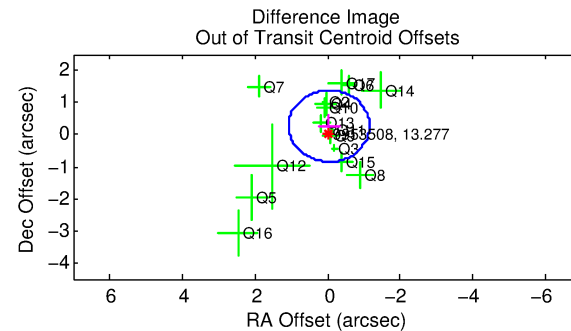
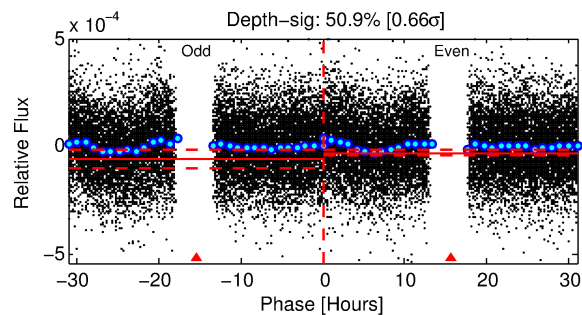
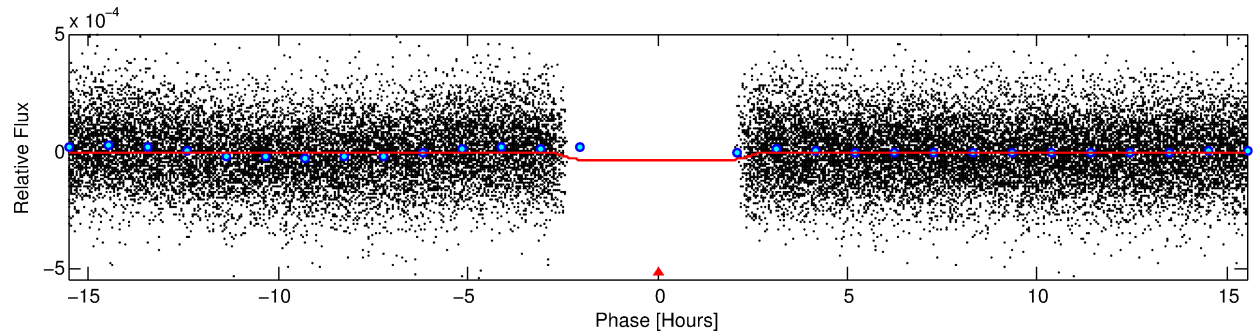
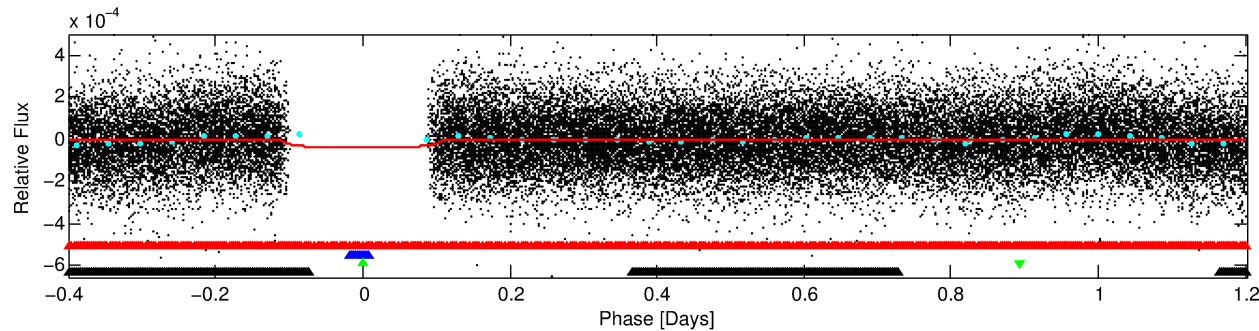
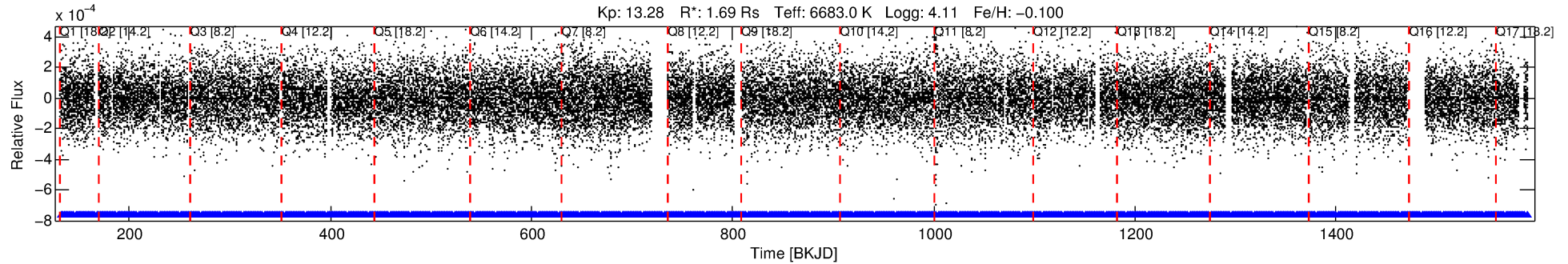
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 009953508-03

No Significant Match Found

# DV One-Page Summary

KIC: 9953508 Candidate: 3 of 4 Period: 1.603 d



## DV Fit Results:

Period = 1.60292 [0.00002] d  
Epoch = 132.5274 [0.0046] BKJD  
Rp/R\* = 0.0064 [0.0021]  
a/R\* = 1.54 [1.43]  
b = 0.86 [0.49]  
Seff = 5798.51 [2383.23]  
Teff = 2225 [229] K  
Rp = 1.18 [0.53] Re  
a = 0.0297 [0.0077] AU  
Ag = 2.86 [2.34] [0.79 $\sigma$ ]  
Teffp = 4473 [829] K [2.61 $\sigma$ ]

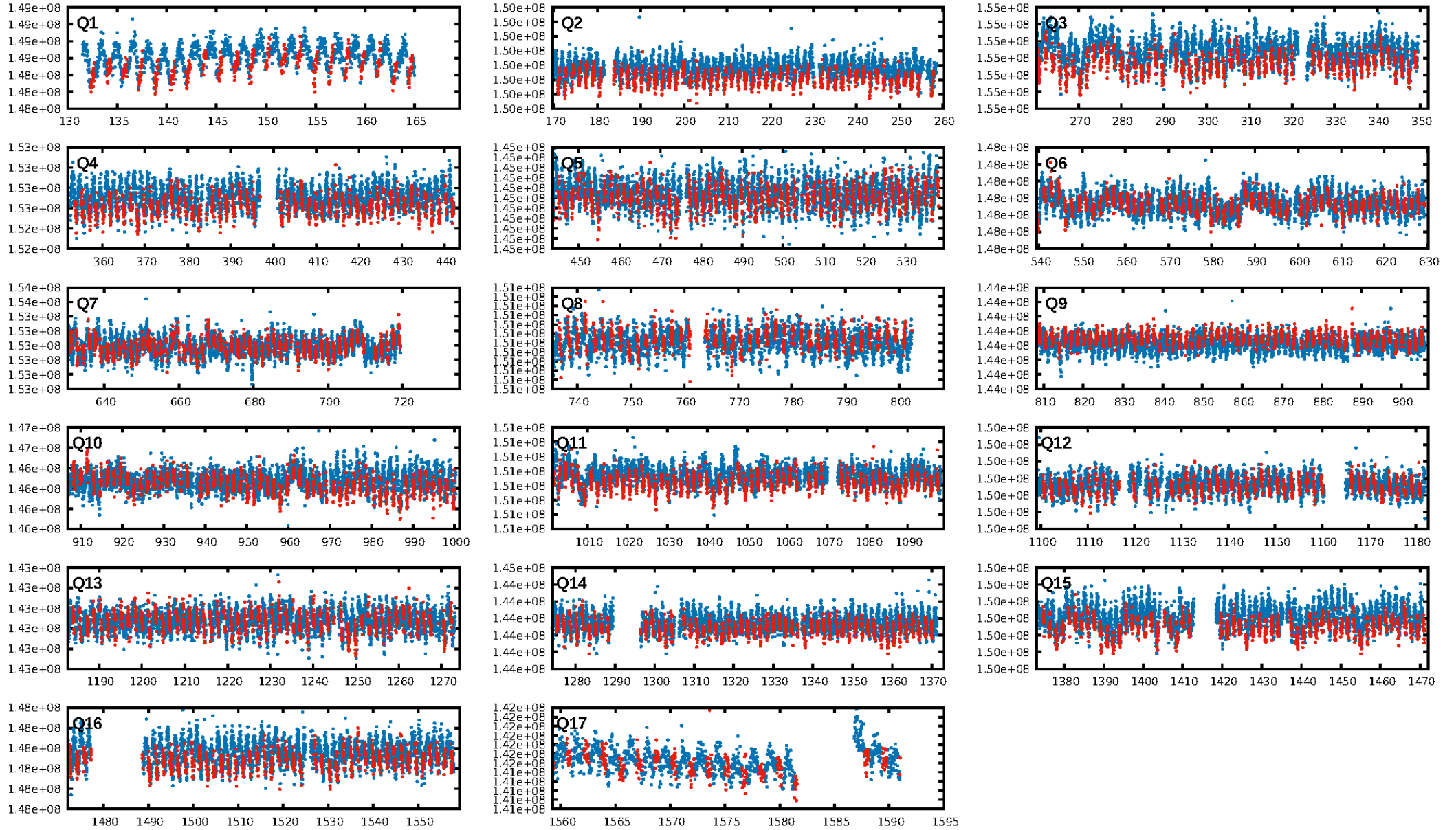
## DV Diagnostic Results:

ShortPeriod-sig: 0.0% [0.00 $\sigma$ ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgm: 1.00 [575/575]  
GhostDiagnostic-chr: -1.529  
Centroid-sig: 80.7%  
Centroid-so: 0.313 arcsec [0.52 $\sigma$ ]  
OotOffset-rm: 0.266 arcsec [0.72 $\sigma$ ]  
KicOffset-rm: 0.235 arcsec [0.71 $\sigma$ ]  
OotOffset-st: 4/4/4/4 [16]  
KicOffset-st: 4/4/4/4 [16]  
DiffImageQuality-fgm: 0.44 [7/16]  
DiffImageOverlap-fno: 0.00 [0/17]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 14:06:12 Z

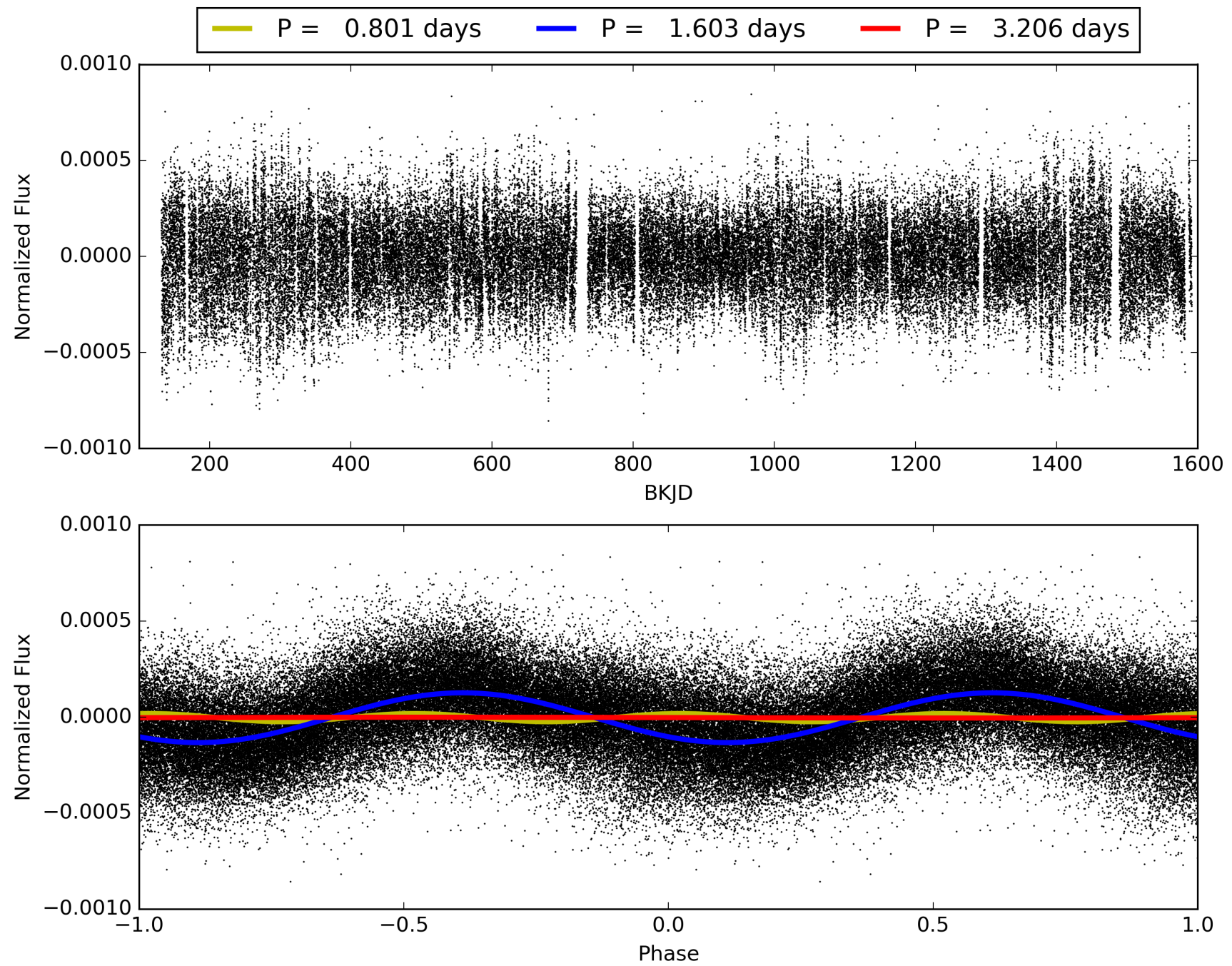
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 009953508-03, PDC Light Curves



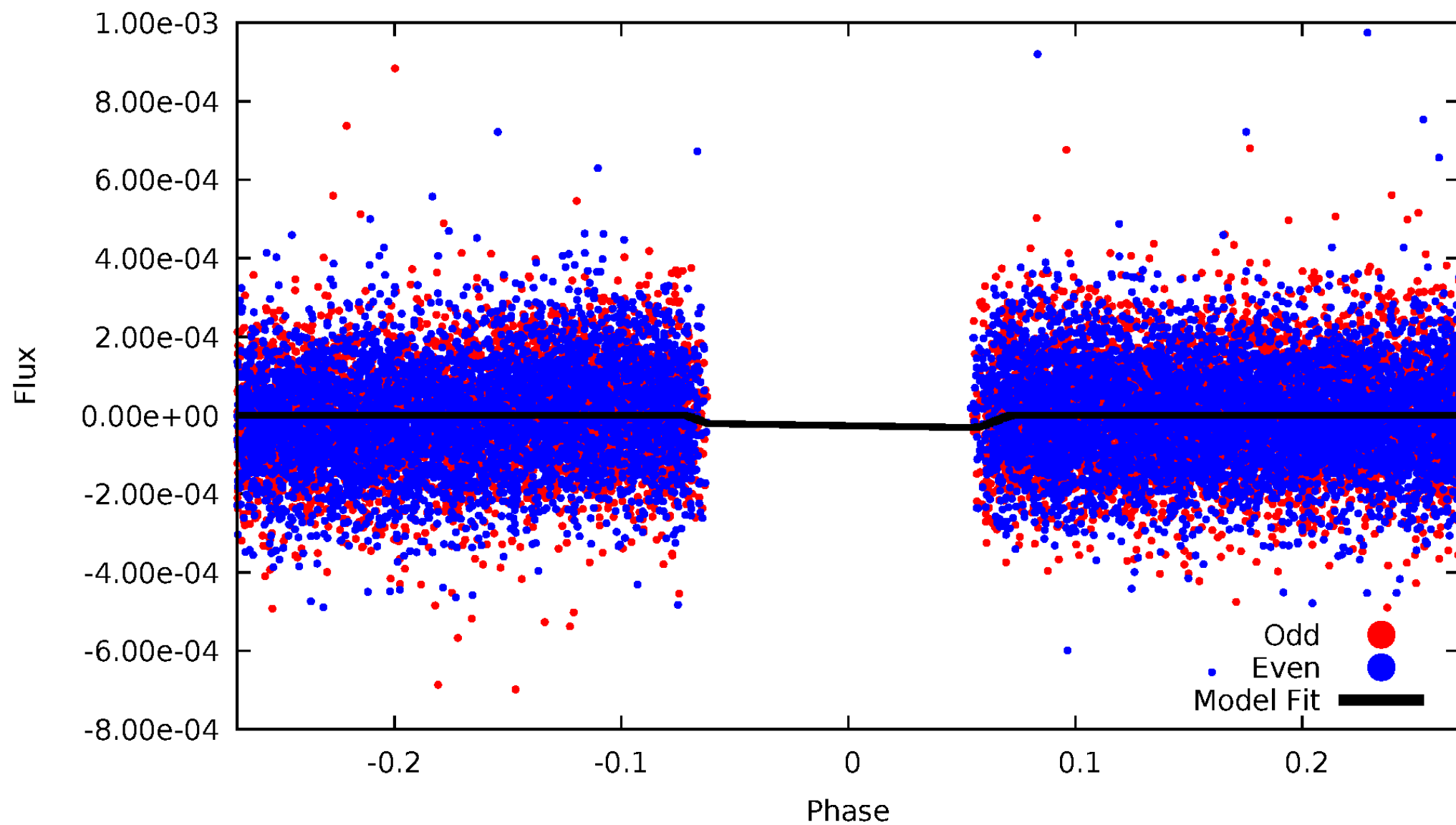


TCE 009953508-03



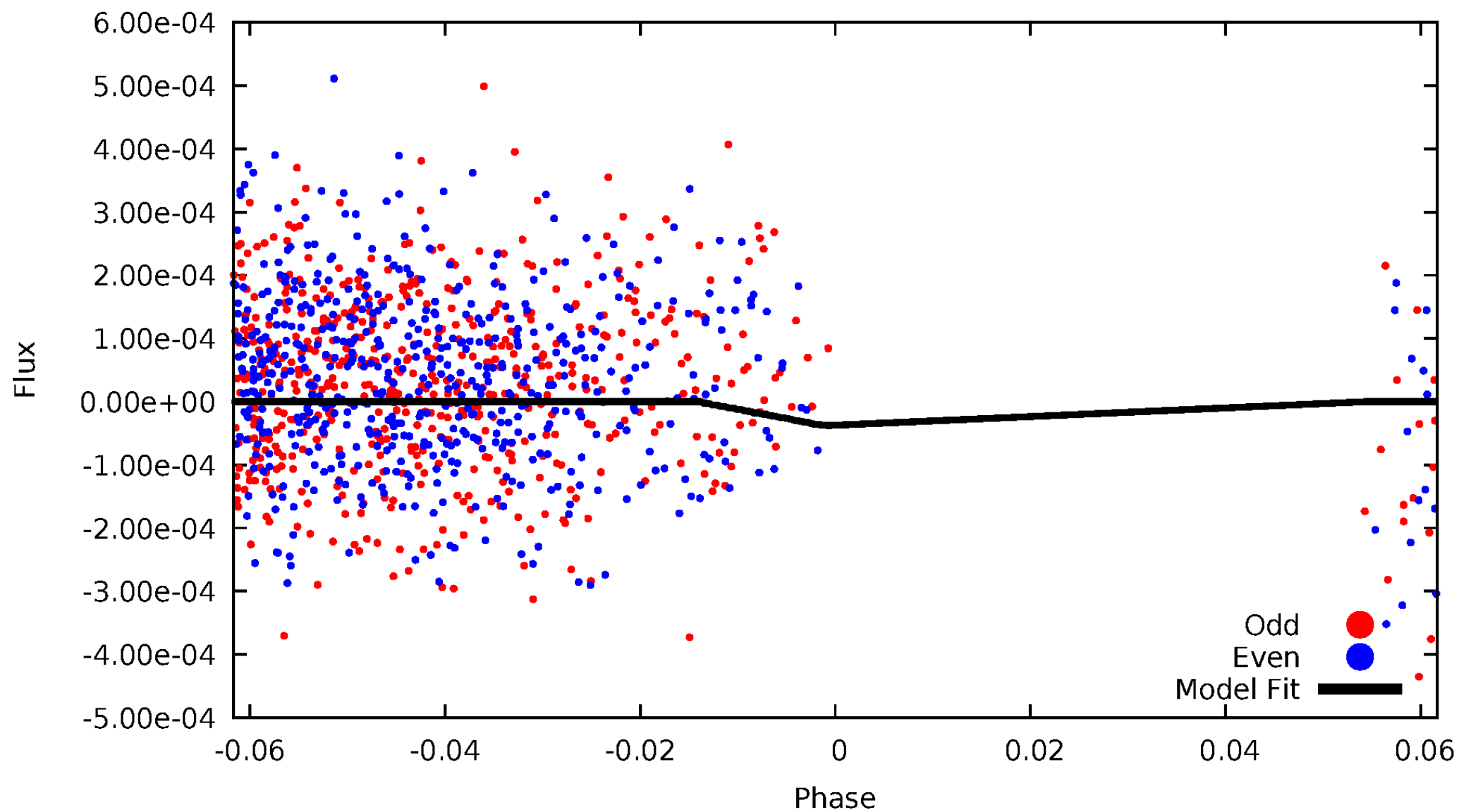
# DV Odd/Even

TCE 009953508-03



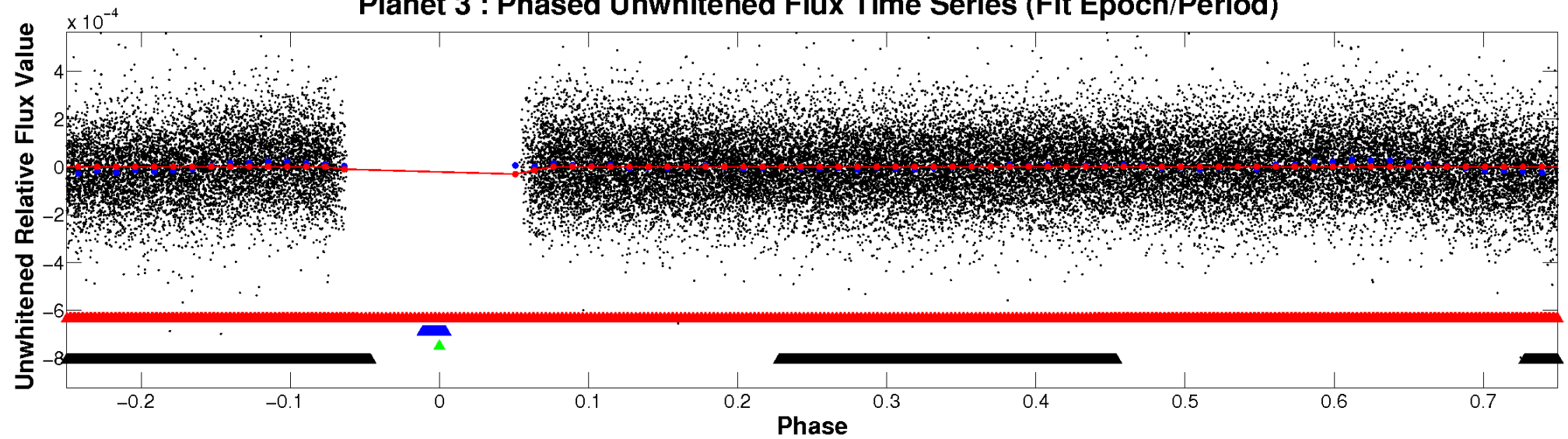
# ALT Odd/Even

TCE 009953508-03

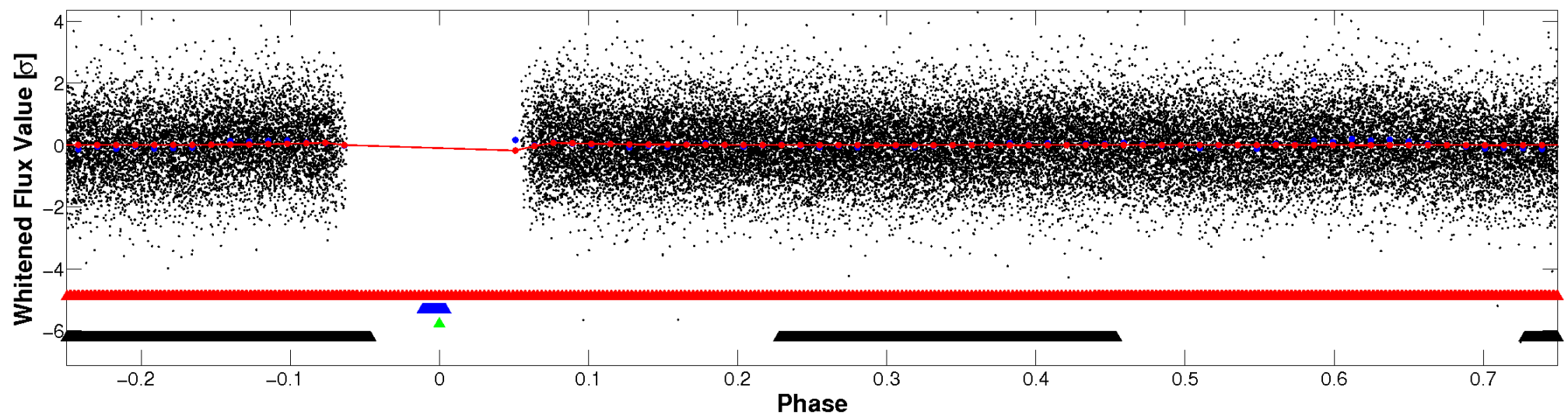


# Non-Whitened Vs. Whitened Light Curve

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



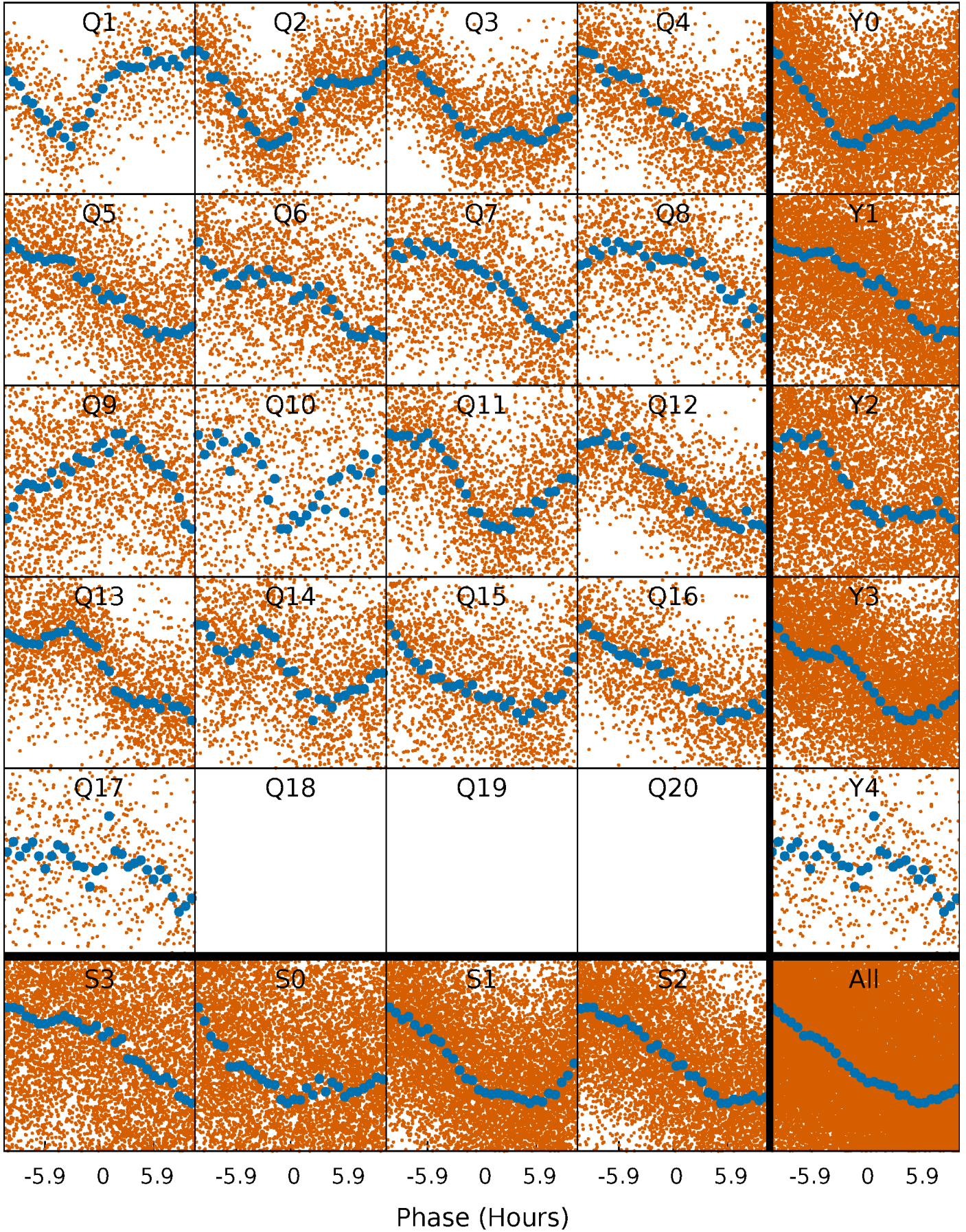
## Planet 3 : Phased Whitened Flux Time Series (Fit Epoch/Period)





# PDC Quarter-Phased Transit Curves

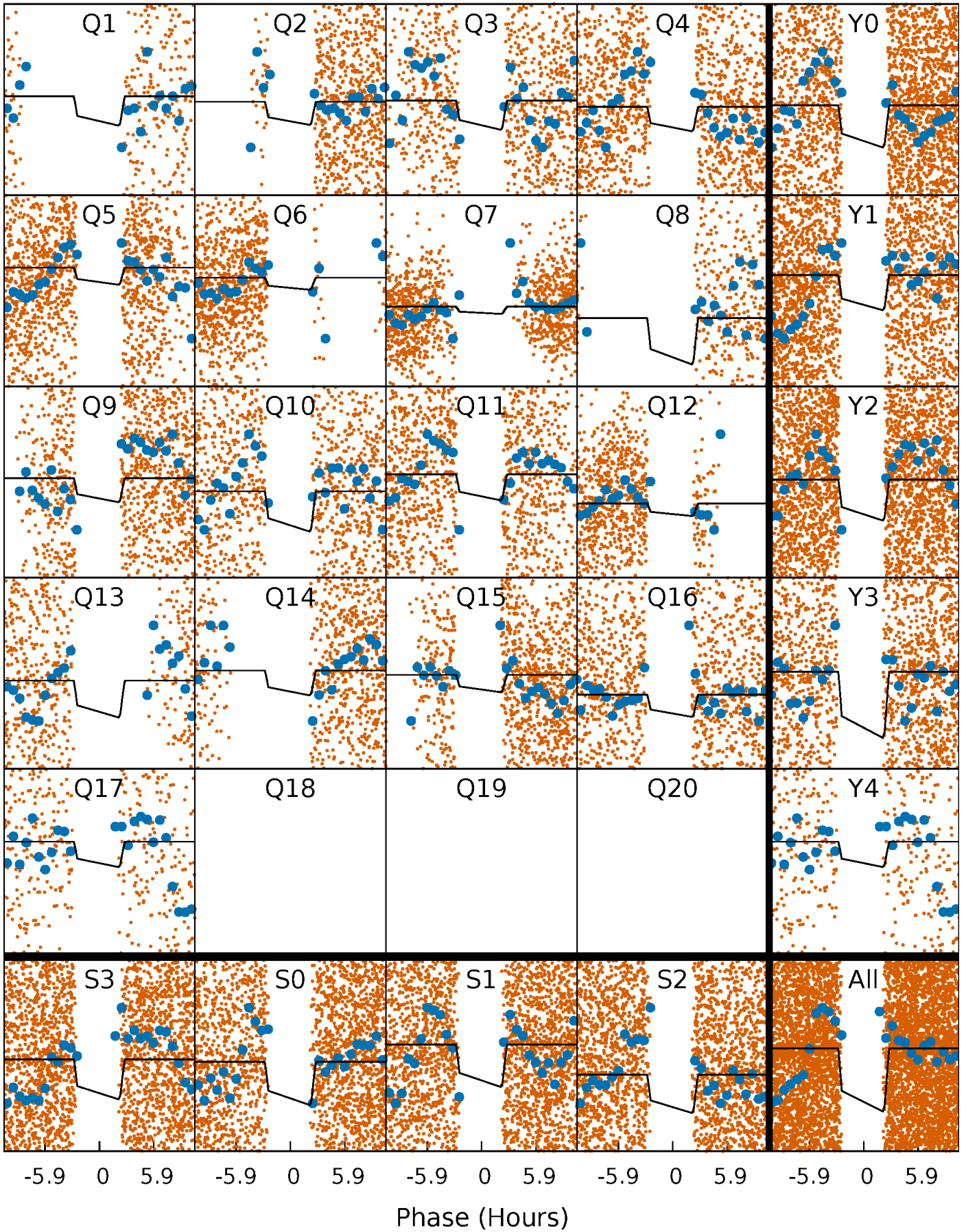
TCE 009953508-03 P= 1.602923 Days  $T_0=132.527447$  (BKJD)





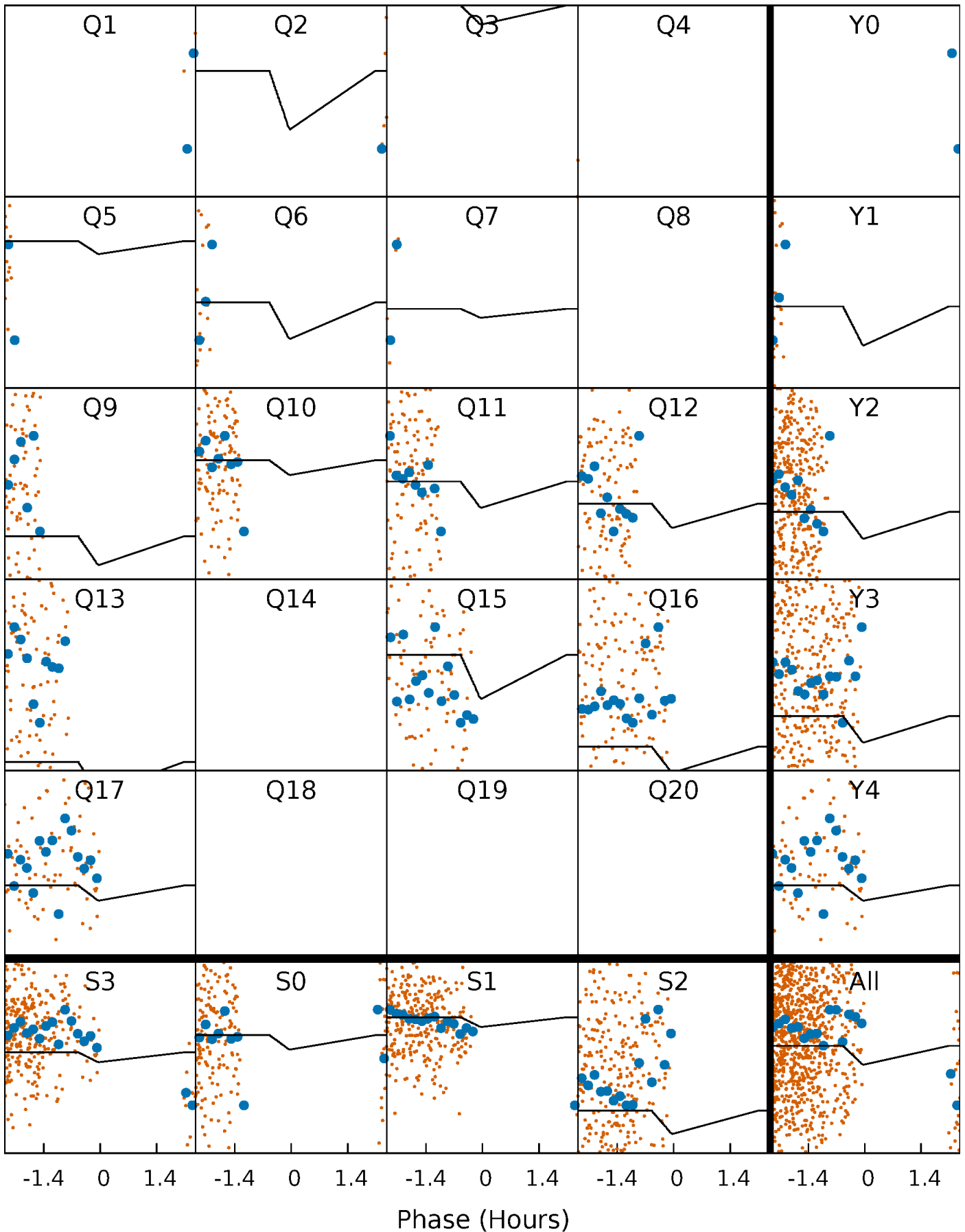
# DV Quarter-Phased Transit Curves

TCE 009953508-03 P= 1.602923 Days  $T_0=132.527447$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

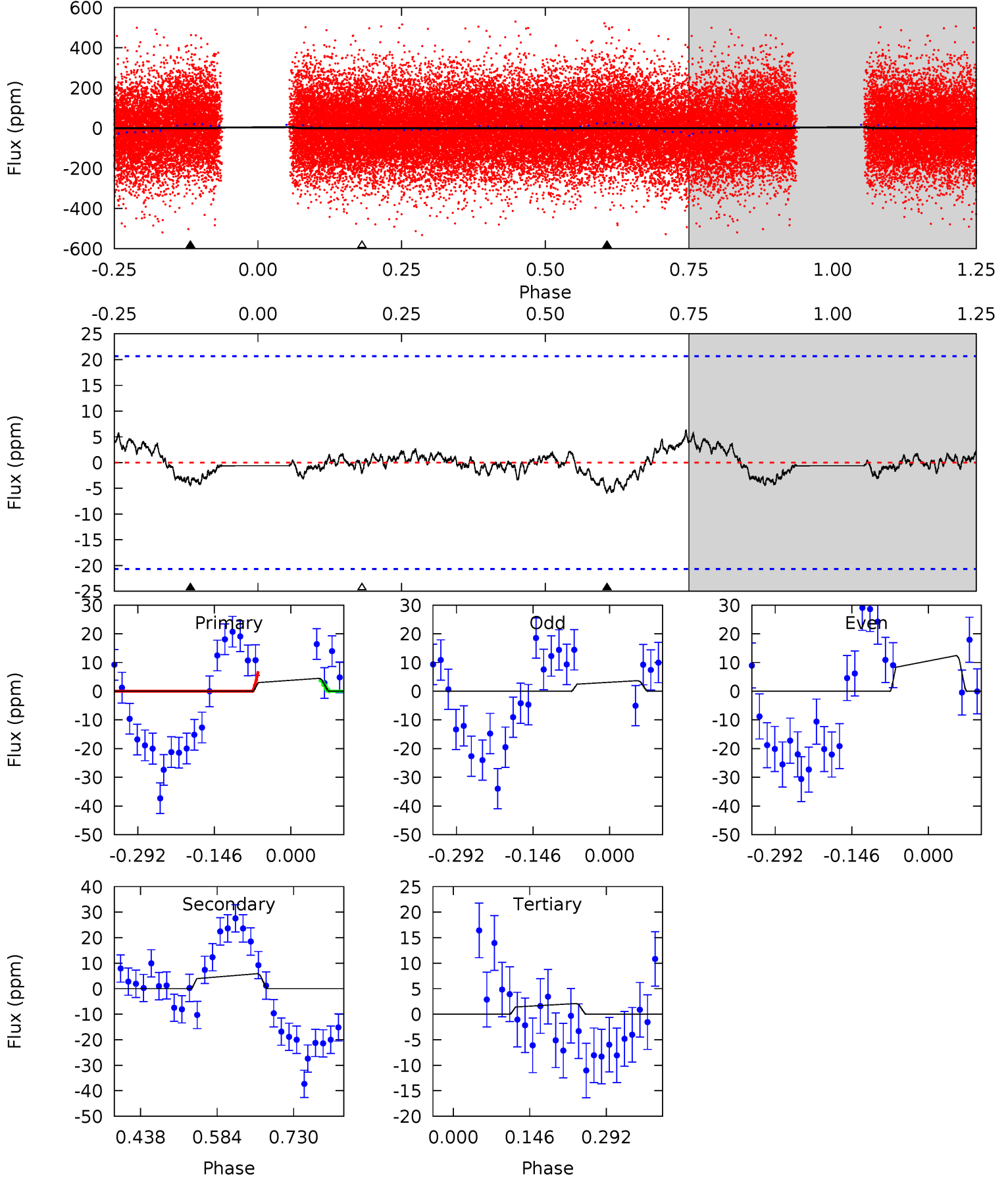
TCE 009953508-03 P= 1.602759 Days  $T_0=132.553492$  (BKJD)



# DV Model-Shift Uniqueness Test

009953508-03, P = 1.602923 Days, E = 130.924524 Days

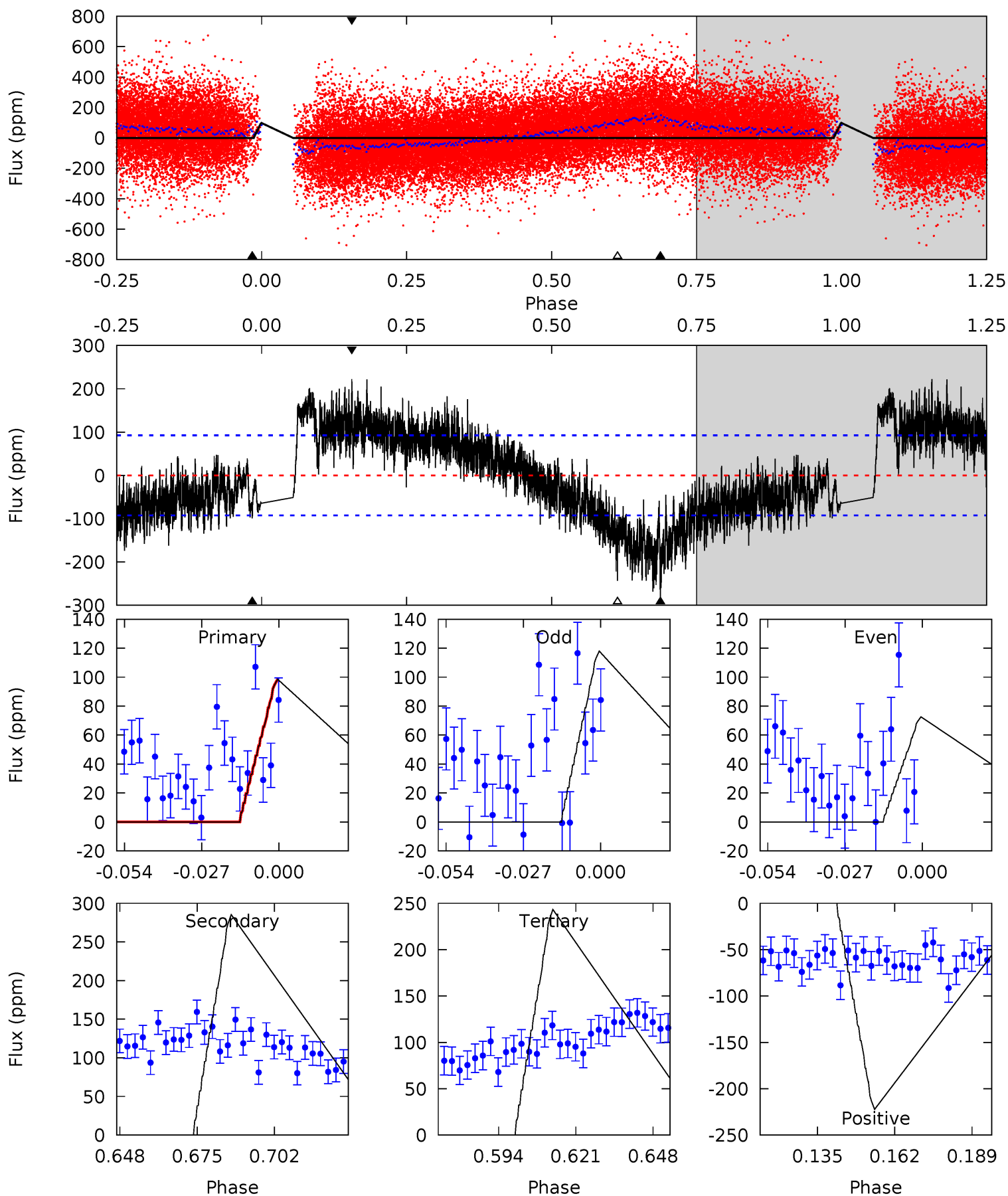
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
0.97	1.28	0.46	0	4.48	1.45	0.25	0.52	0.97	0.82	1.28	0.95	1.27	0.52	0.30



# Alt Model-Shift Uniqueness Test

009953508-03, P = 1.602759 Days, E = 130.950733 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
5.15	14.9	12.7	11.6	4.83	2.21	4.72	-7.56	-6.46	2.20	3.29	1.19	0	0.44	0



### Stellar Parameters For KIC 009953508

	$T_{\text{eff}} (K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M (M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6683^{+189}_{-259}$	$4.114^{+0.209}_{-0.190}$	$-0.100^{+0.250}_{-0.300}$	$1.689^{+0.519}_{-0.425}$	$1.361^{+0.196}_{-0.261}$	$0.398^{+0.429}_{-0.208}$
	+3%/-4%	+5%/-5%	+250%/-300%	+31%/-25%	+14%/-19%	+108%/-52%
Source	PHO54	PHO54	PHO54	DSEP		

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

### Secondary Eclipse Parameters for KIC 009953508-03 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-6 \pm 5$	$1.17^{+0.45}_{-0.41}$	$3089^{+266}_{-258}$	$4123^{+1091}_{-1231}$	$1.898^{+3.687}_{-1.447}$
Alt.	$-285 \pm 19$	$1.11^{+0.49}_{-0.37}$	$3090^{+257}_{-227}$	$13467^{+6314}_{-3199}$	$114^{+142}_{-60}$

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



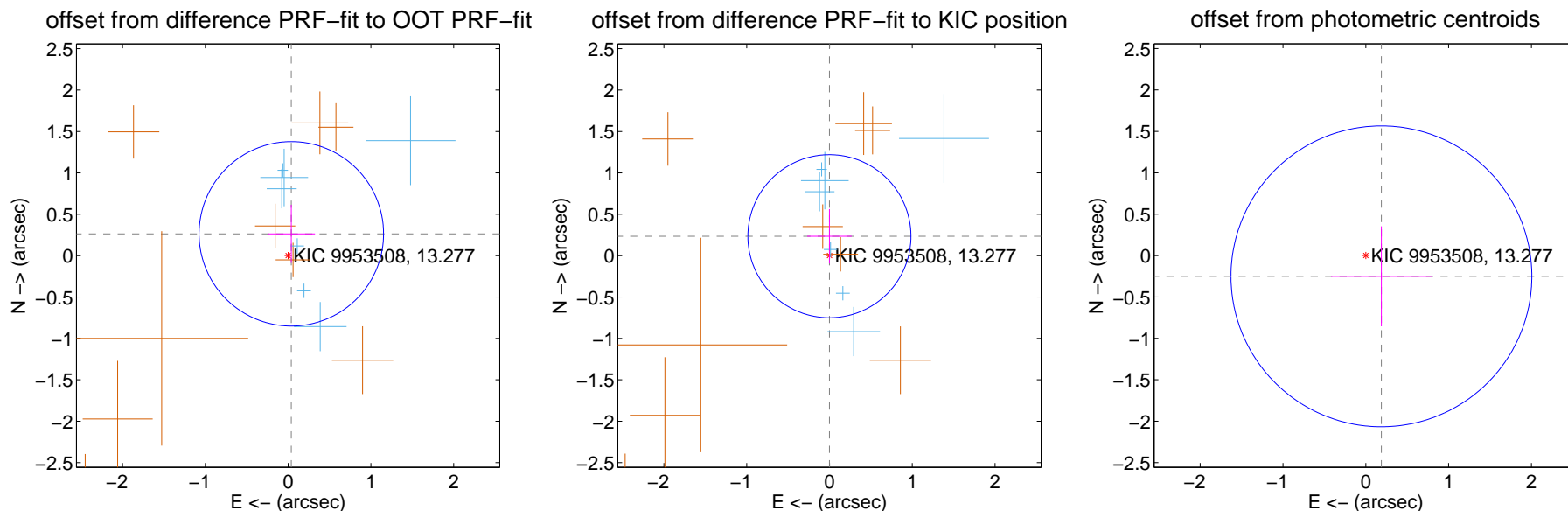
## DV Centroid Data

Supplemental centroid analysis for 009953508-03. Kepler magnitude: 13.28. Transit SNR 4.30

There are 7 quarters with good PRF difference image offsets

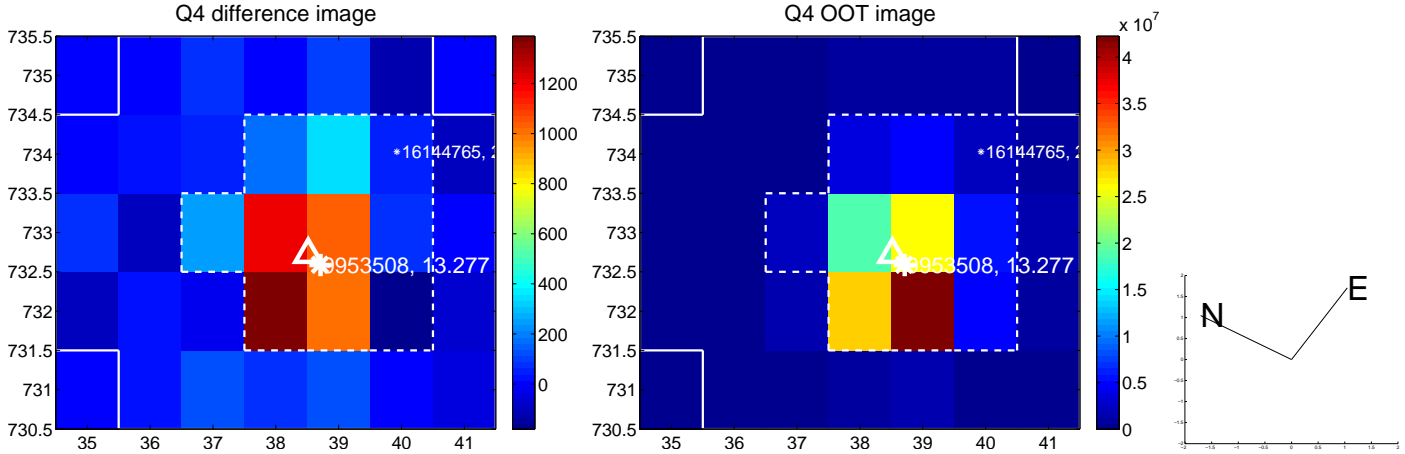
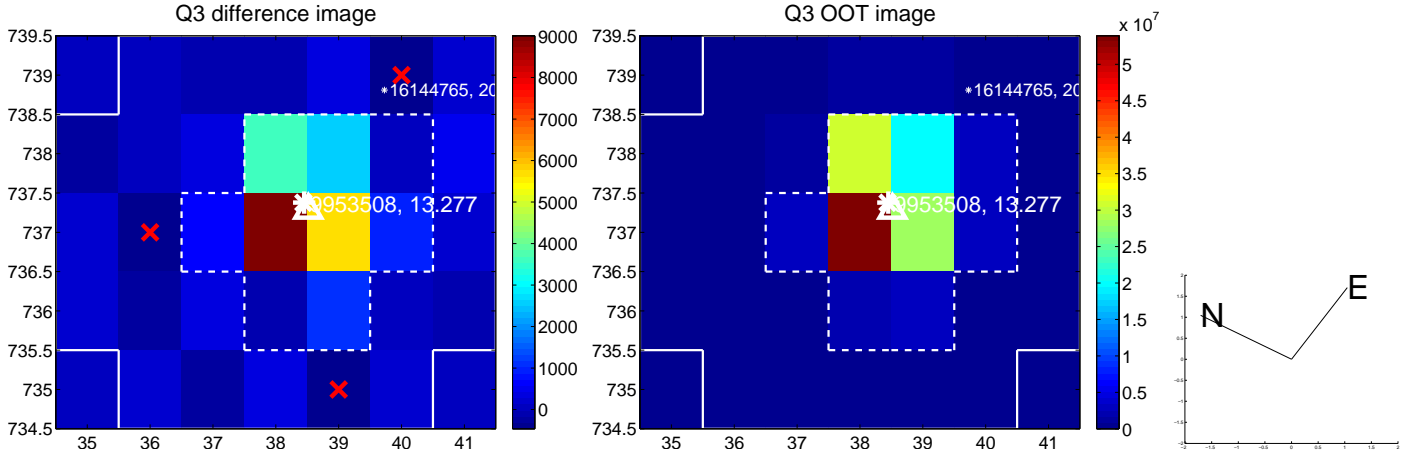
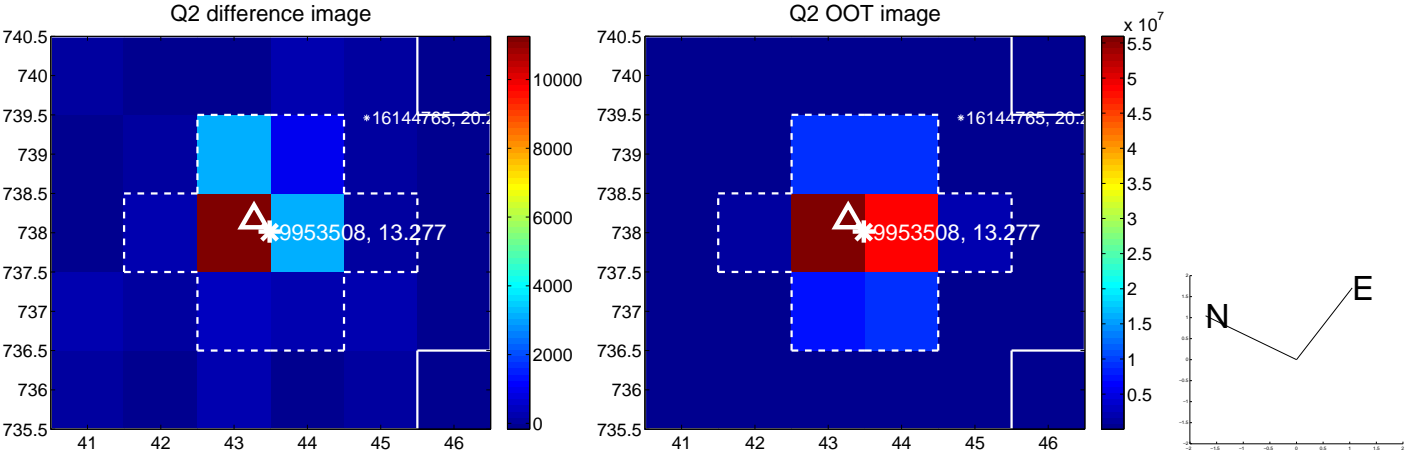
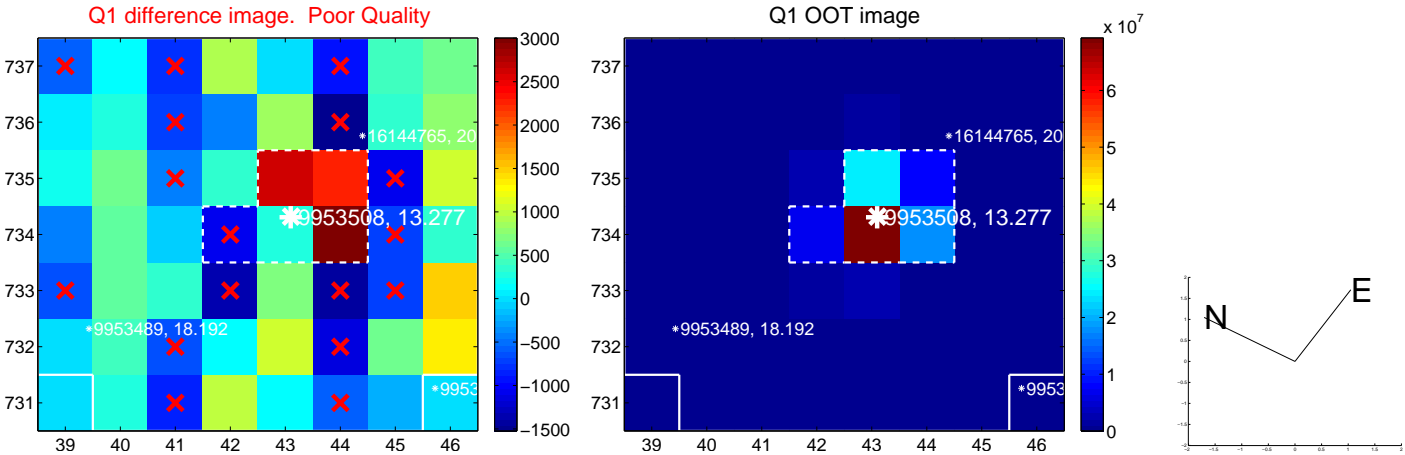
The direct PRF centroid is offset from the target star catalog position by about 0.03 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.266 \pm 0.371$	0.72	$-0.039 \pm 0.287$	$0.263 \pm 0.352$
PRF-fit source offset from KIC position	$0.235 \pm 0.328$	0.71	$0.001 \pm 0.268$	$0.235 \pm 0.329$
photometric centroid source offset	$0.31 \pm 0.61$	0.52	$-0.19 \pm 0.61$	$-0.25 \pm 0.60$

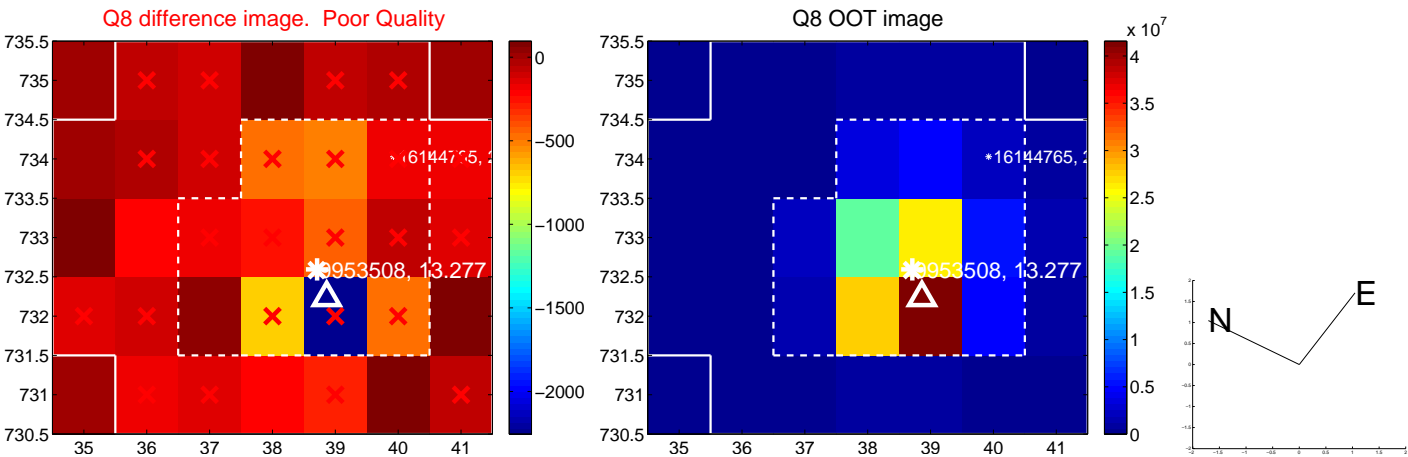
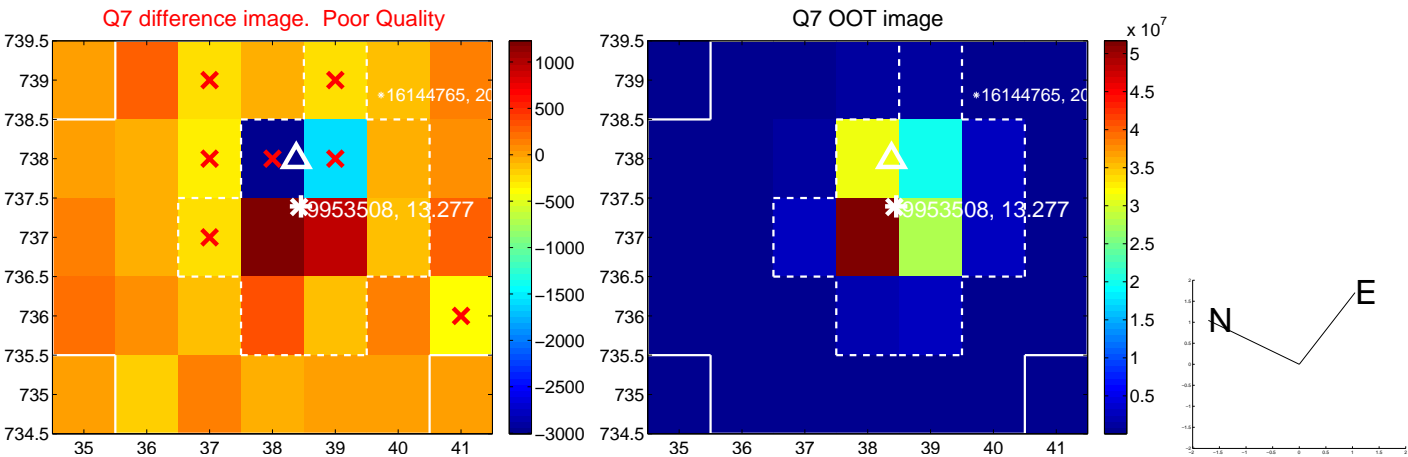
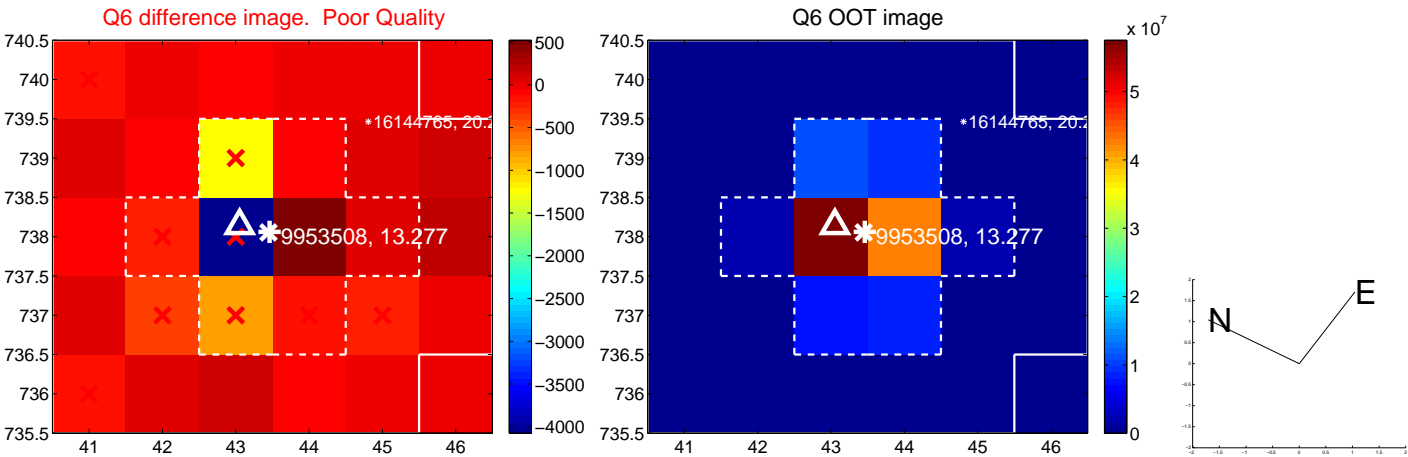
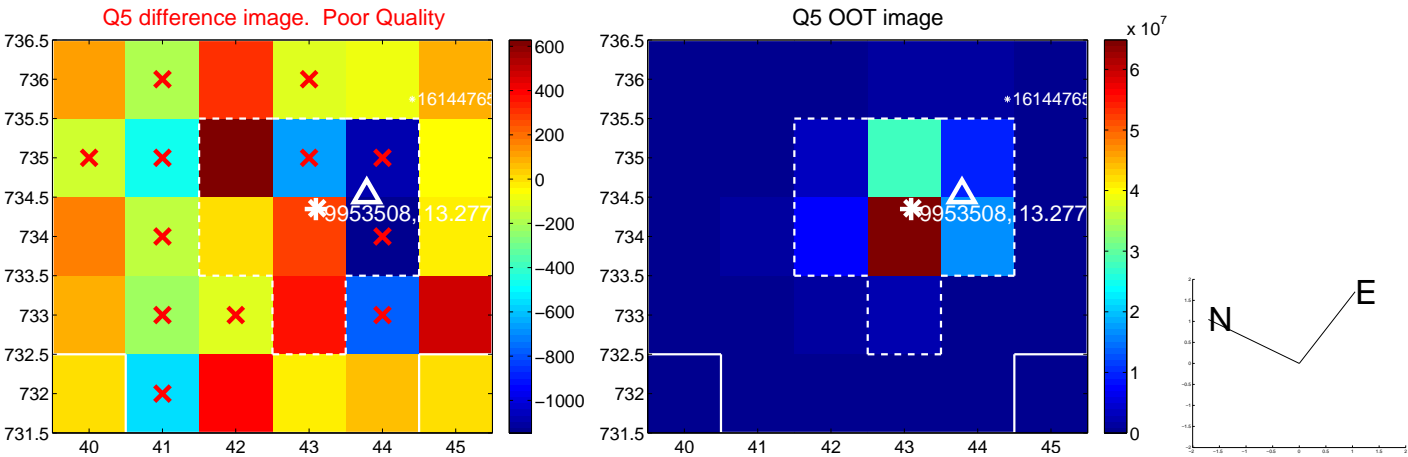


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

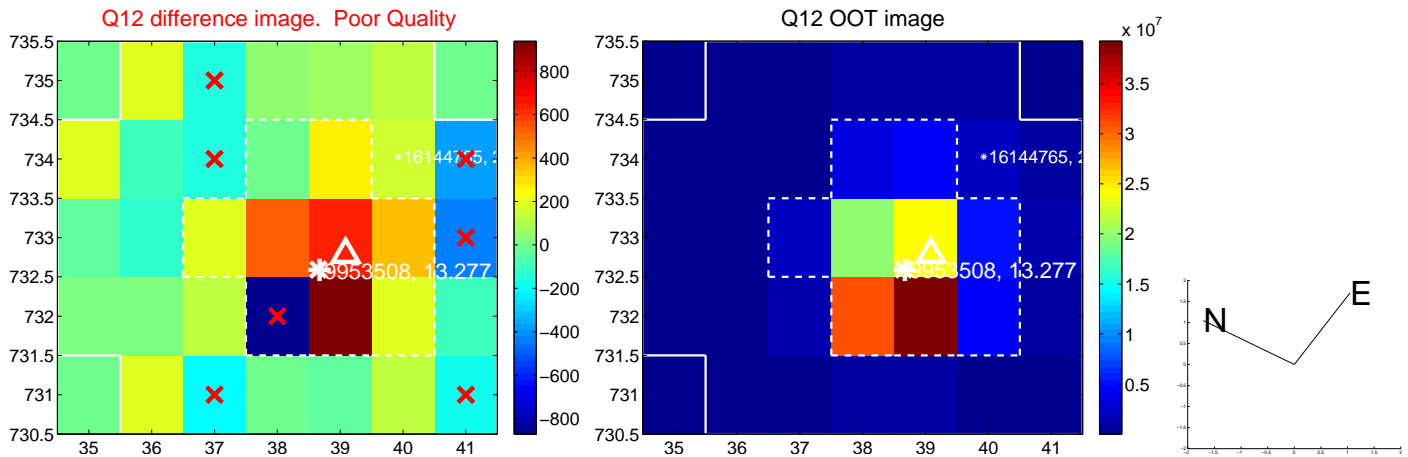
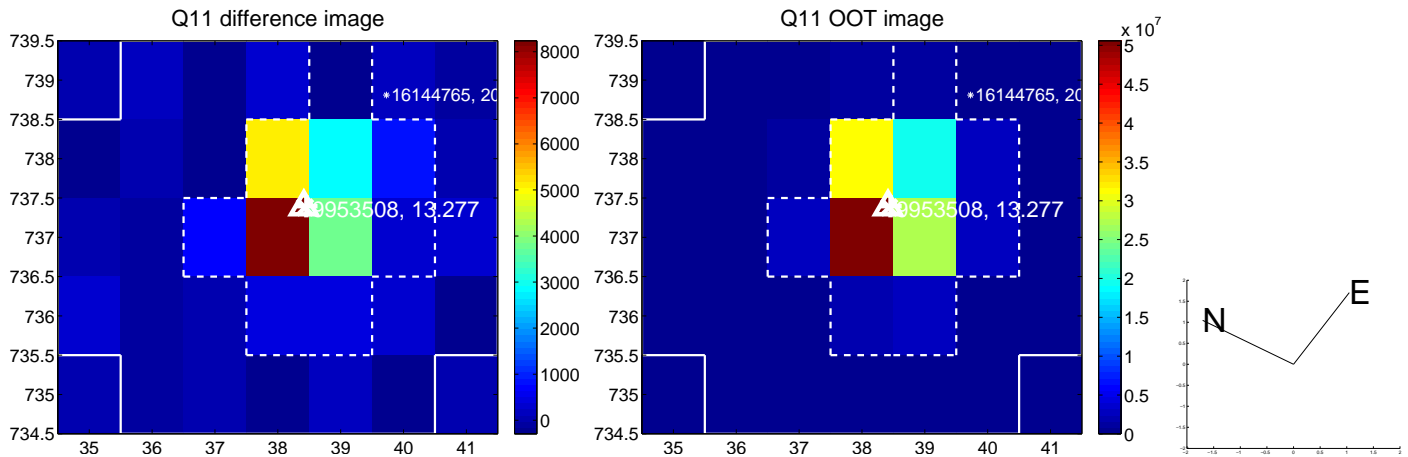
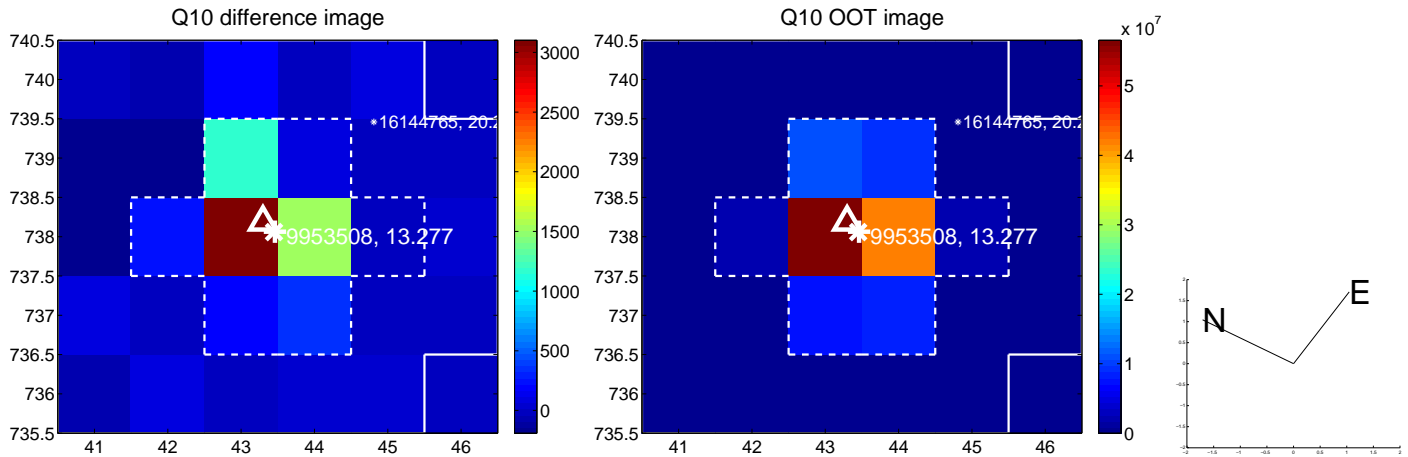
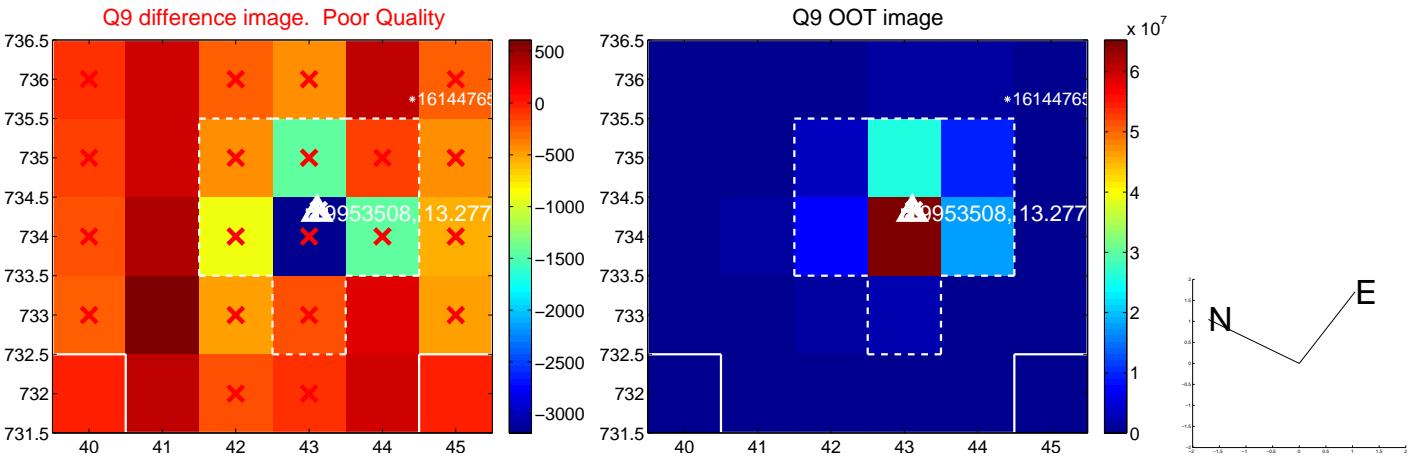
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



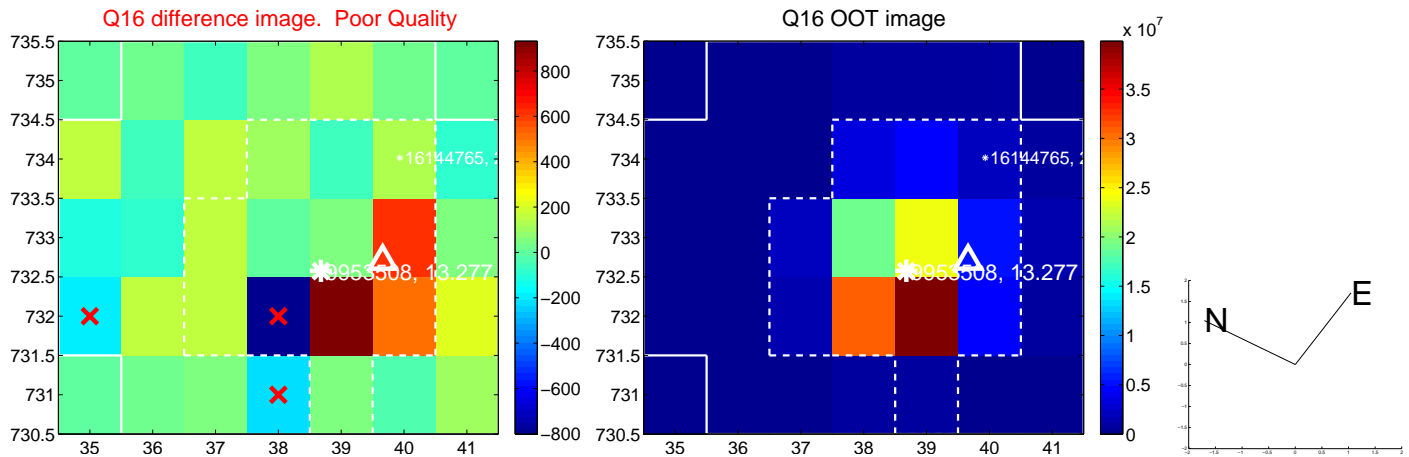
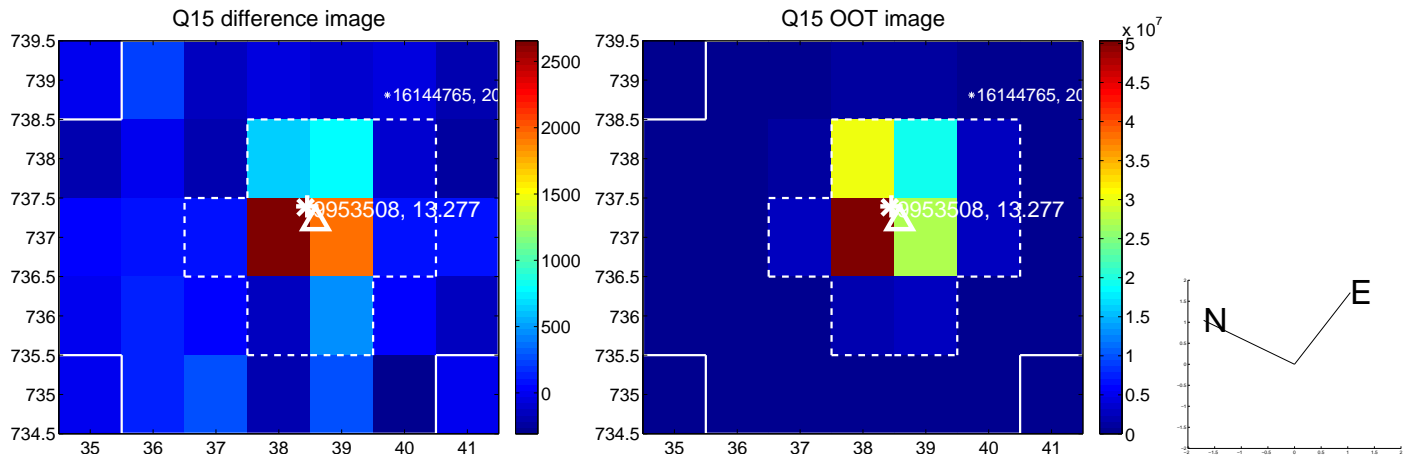
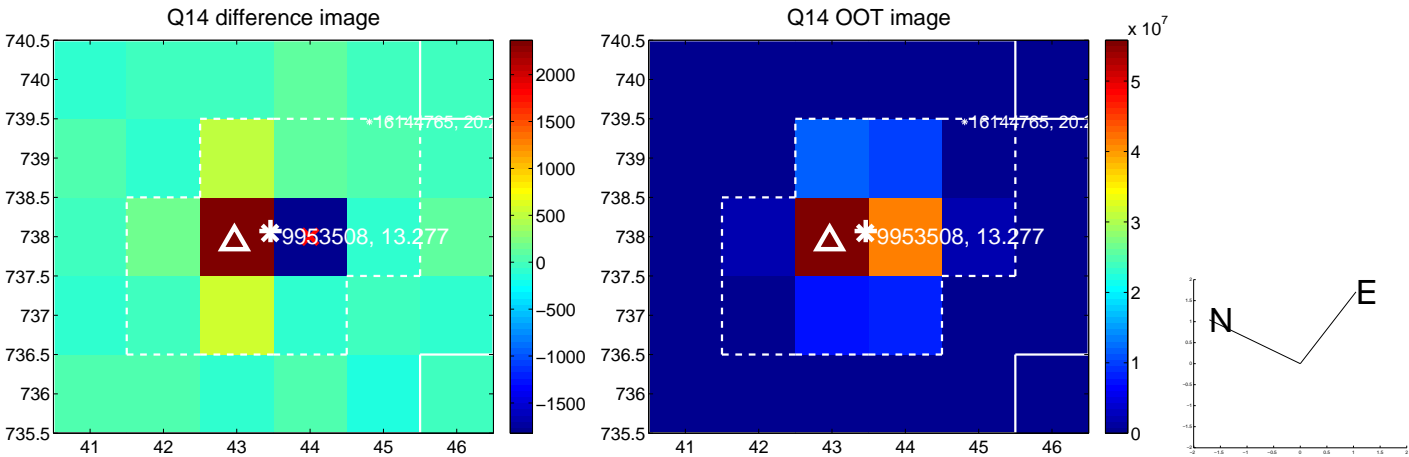
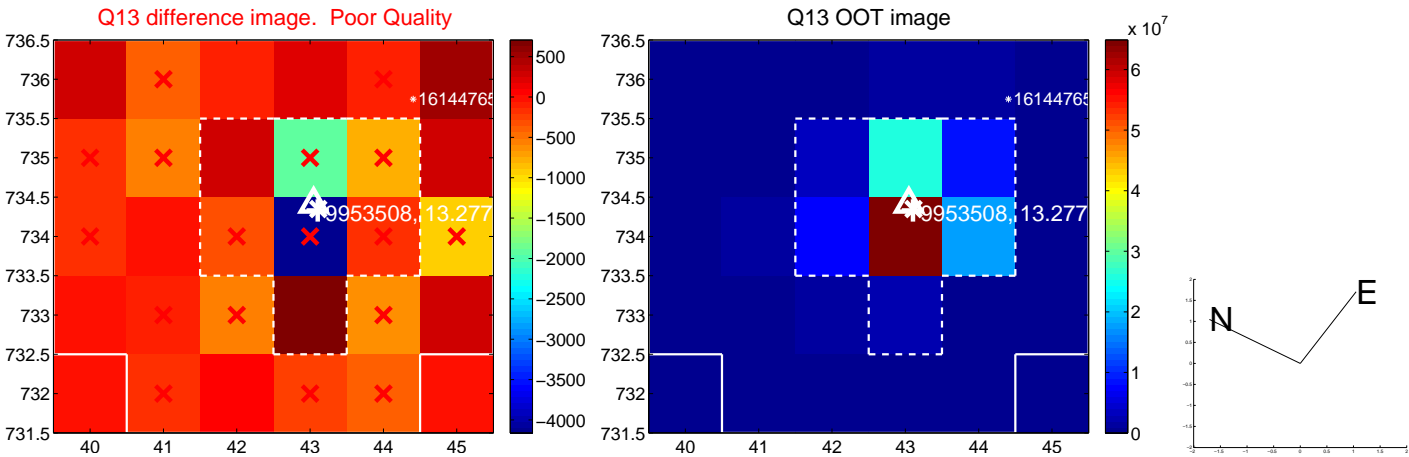
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

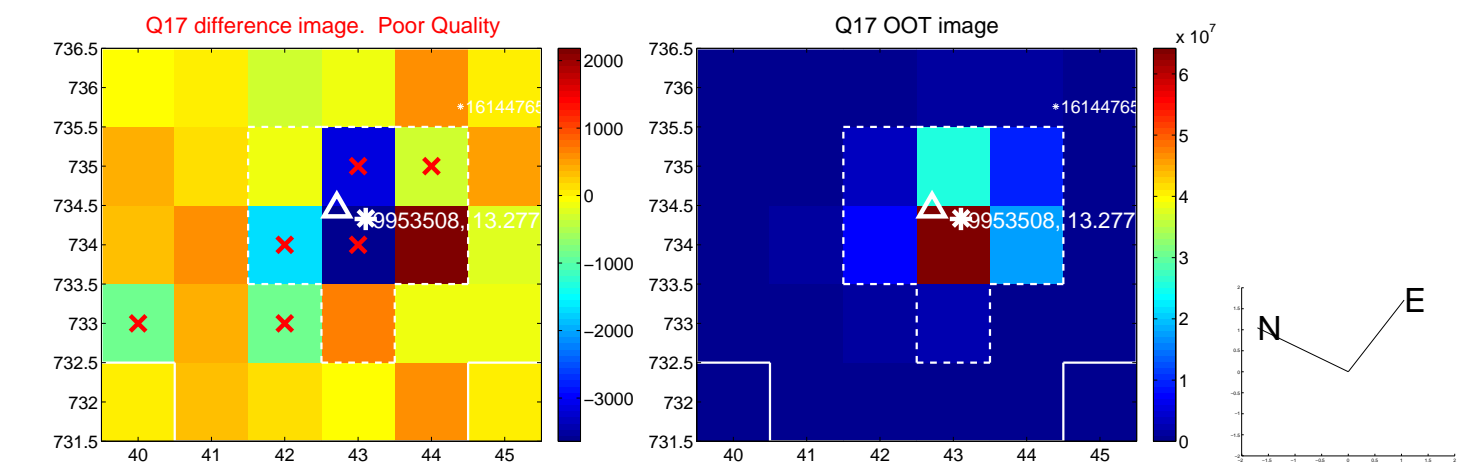


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

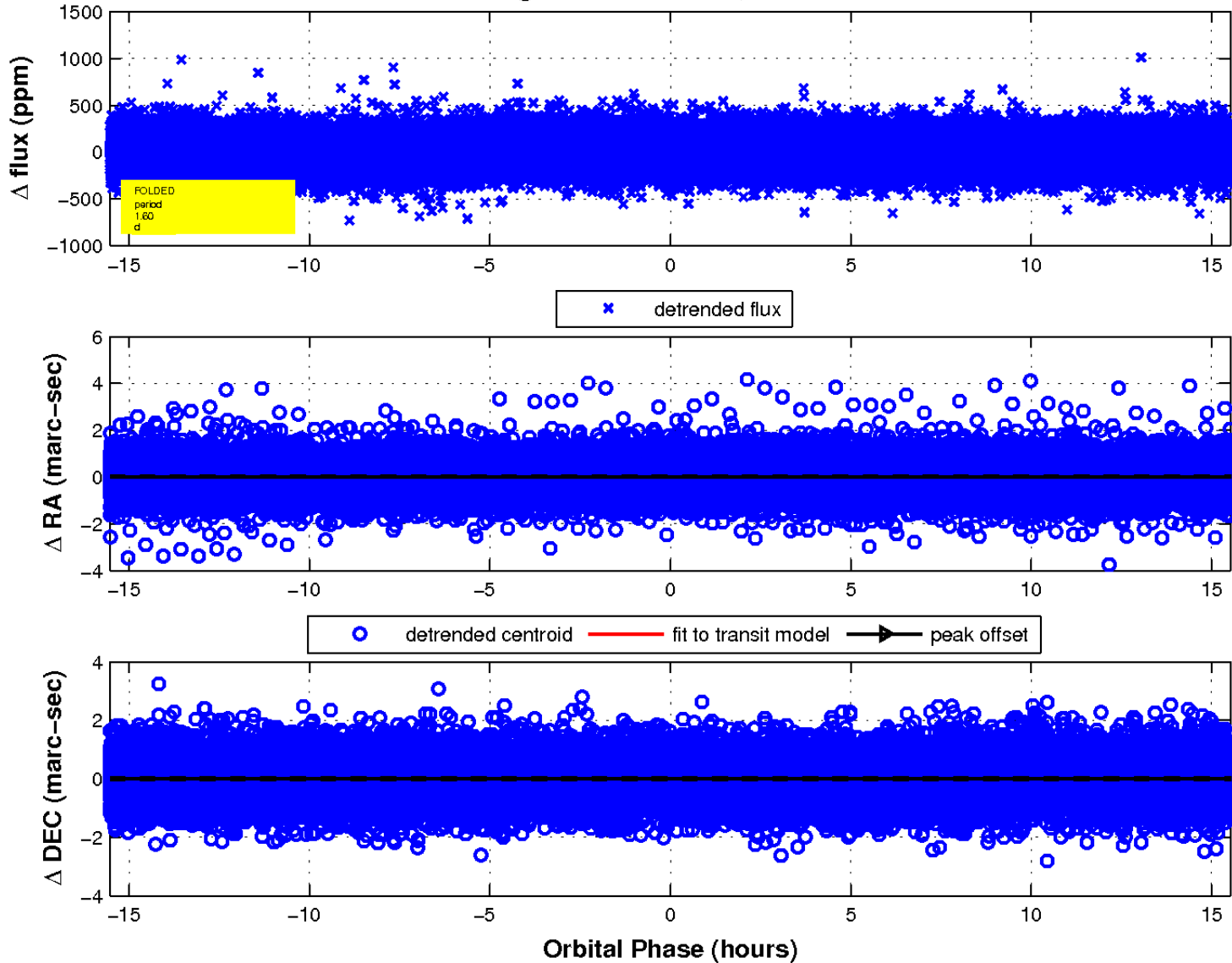




white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

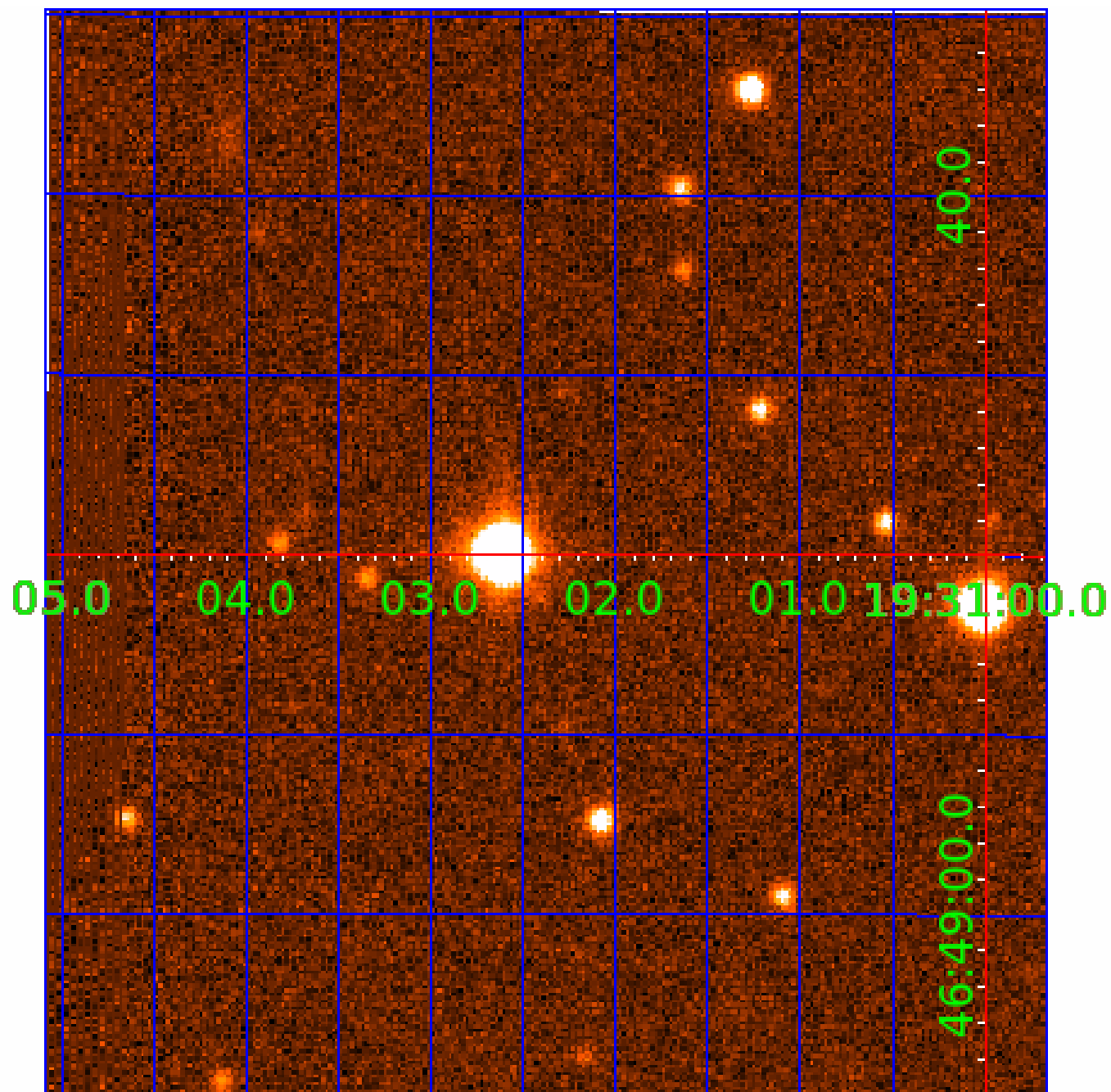


fluxWeightedCentroids, Planet 3 of 4



UKIRT Image

Declination



# KIC 009953508

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009953508-01	OBS	No	1.598521	132.438206	6.0	3.517	8.1	2.3	1.69	6683	0.44	5819.81
009953508-02	OBS	No	1.602895	132.534214	12.3	1.000	11.0	2.8	1.69	6683	0.62	5798.64
009953508-03	OBS	No	1.602923	132.527447	38.1	5.177	11.1	4.3	1.69	6683	1.18	5798.51
009953508-04	OBS	No	0.801661	132.091040	9.5	8.482	8.8	4.3	1.69	6683	0.54	14606.49

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009953508-01	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE_ZUMA_TRACKER—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV
009953508-02	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE_SKYE_ZUMA_TRACKER—SWEET_NTL—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—HALO_GHOST
009953508-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE_ZUMA_TRACKER—SWEET_NTL—LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—SAME_NTL_PERIOD
009953508-04	OBS	FP	0.00	1	0	1	0	TRANS_GAPPED—SWEET_NTL—LPP_DV—CENT_FEW_DIFFS—HALO_GHOST

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

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

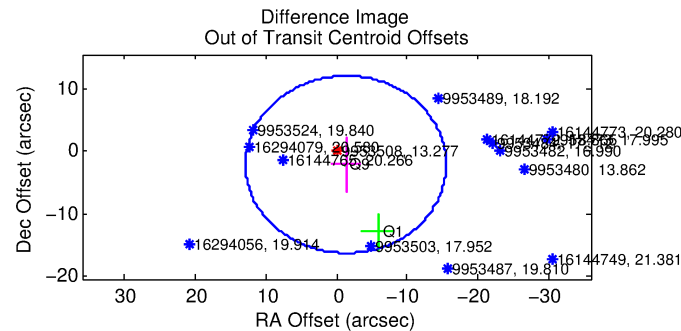
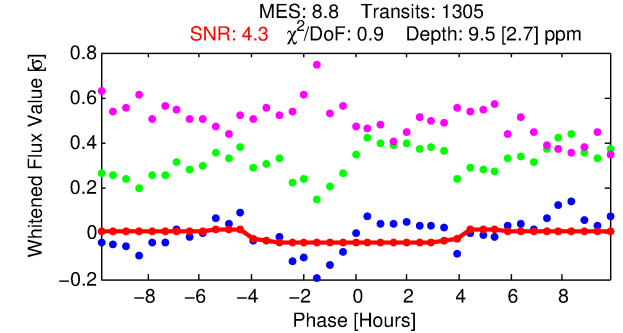
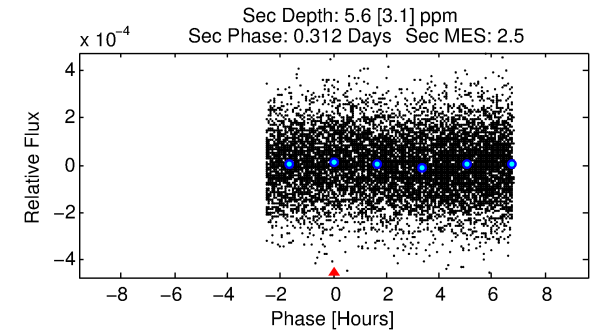
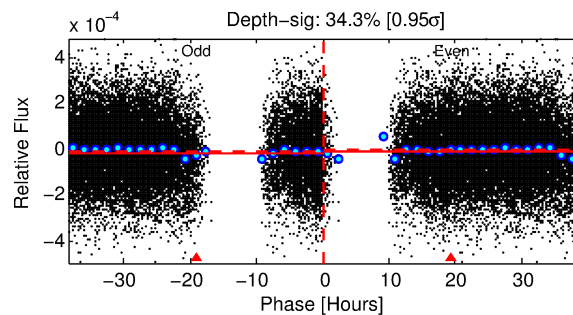
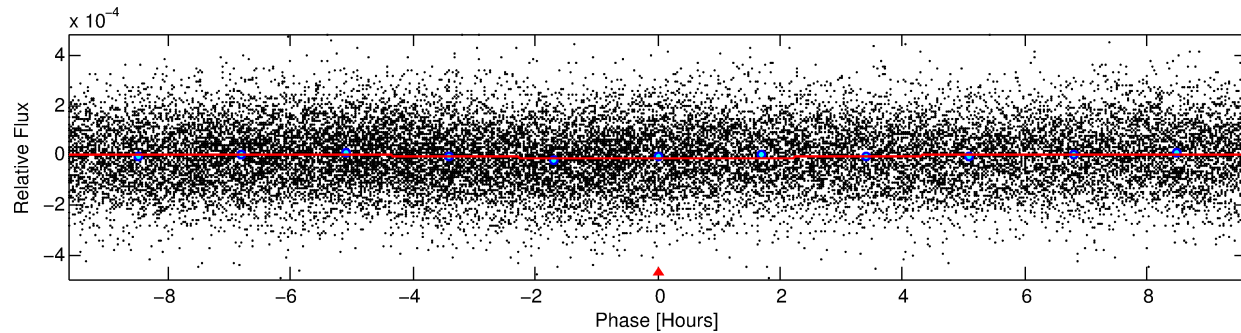
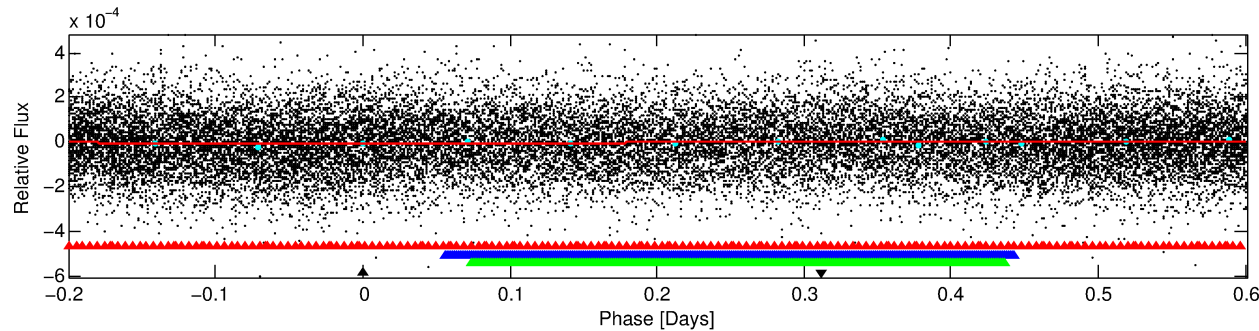
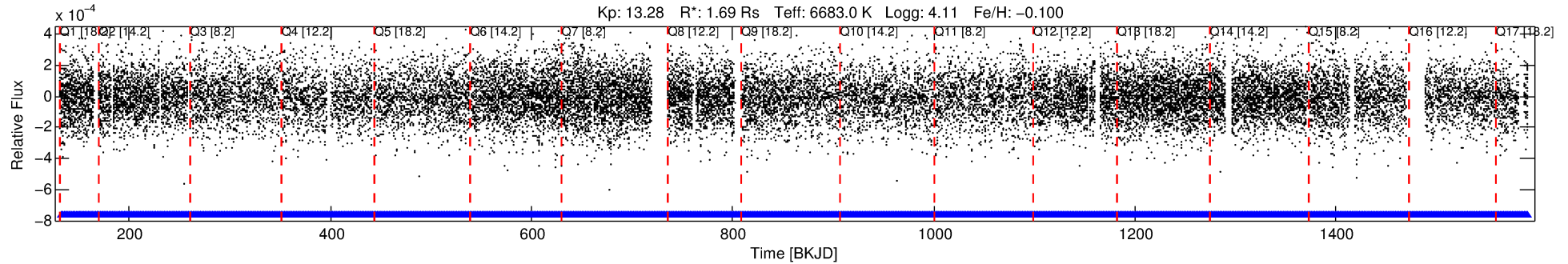
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 009953508-04

No Significant Match Found

# DV One-Page Summary

KIC: 9953508 Candidate: 4 of 4 Period: 0.802 d



## DV Fit Results:

Period = 0.80166 [0.00003] d  
Epoch = 132.0910 [0.0128] BKJD  
Rp/R\* = 0.0029 [0.0043]  
a/R\* = 1.02 [0.25]  
b = 0.52 [11.79]  
Seff = 14606.49 [6003.37]  
Teq = 2803 [288] K  
Rp = 0.54 [0.81] Re  
a = 0.0187 [0.0049] AU  
Ag = 3.74 [11.30] [0.24 $\sigma$ ]  
Teffp = 6027 [4524] K [0.71 $\sigma$ ]

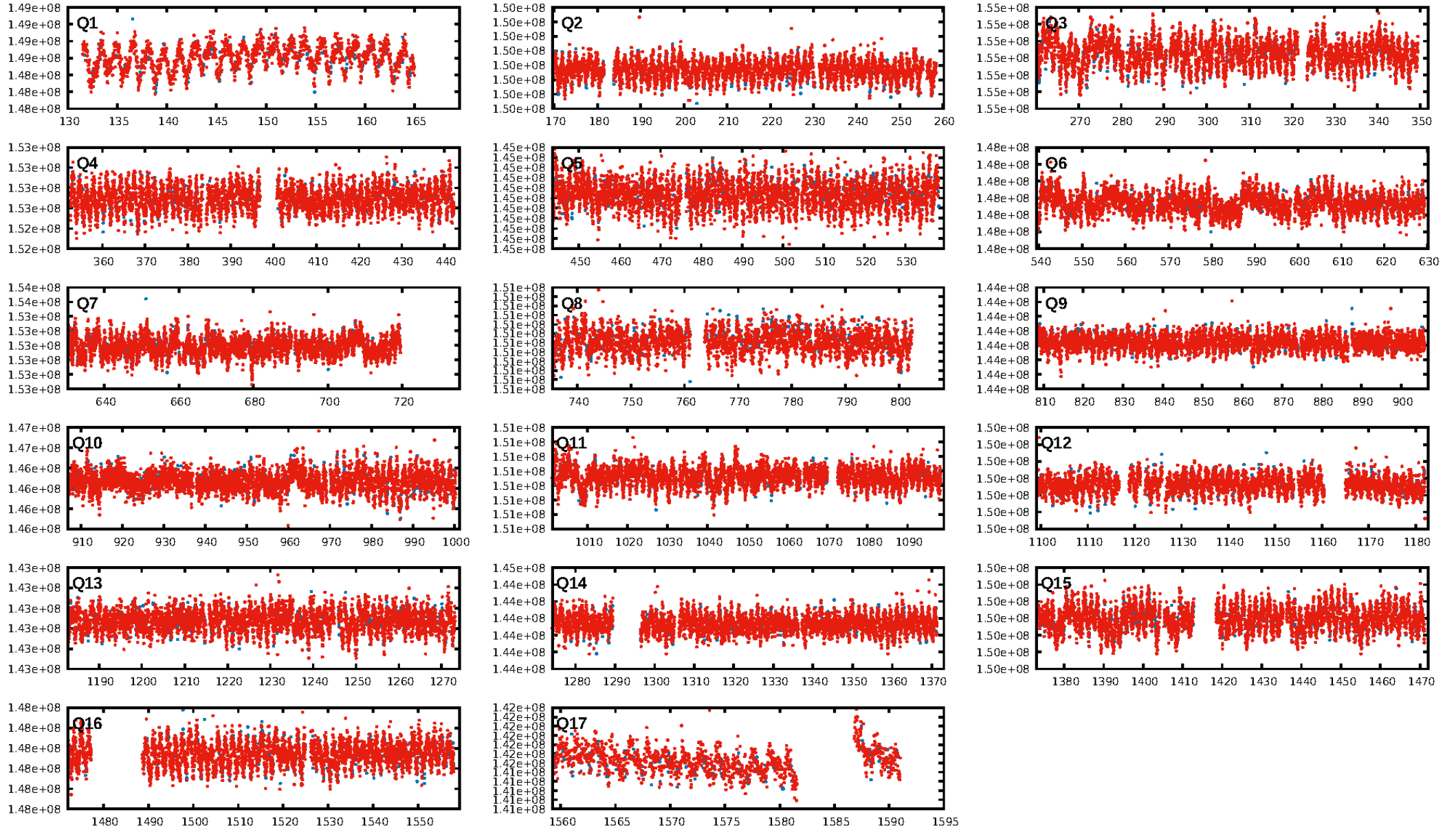
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 96.3% [2.08 $\sigma$ ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [1259/1259]  
GhostDiagnostic-chr: 0.05455  
Centroid-sig: 0.0%  
Centroid-so: 3.789 arcsec [2.94 $\sigma$ ]  
OotOffset-rm: 2.533 arcsec [0.54 $\sigma$ ]  
KicOffset-rm: 2.516 arcsec [0.87 $\sigma$ ]  
OotOffset-st: 0/0/0/2 [2]  
KicOffset-st: 0/0/0/2 [2]  
DiffImageQuality-fgm: 0.00 [0/2]  
DiffImageOverlap-fno: 0.06 [1/17]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 14:06:25 Z

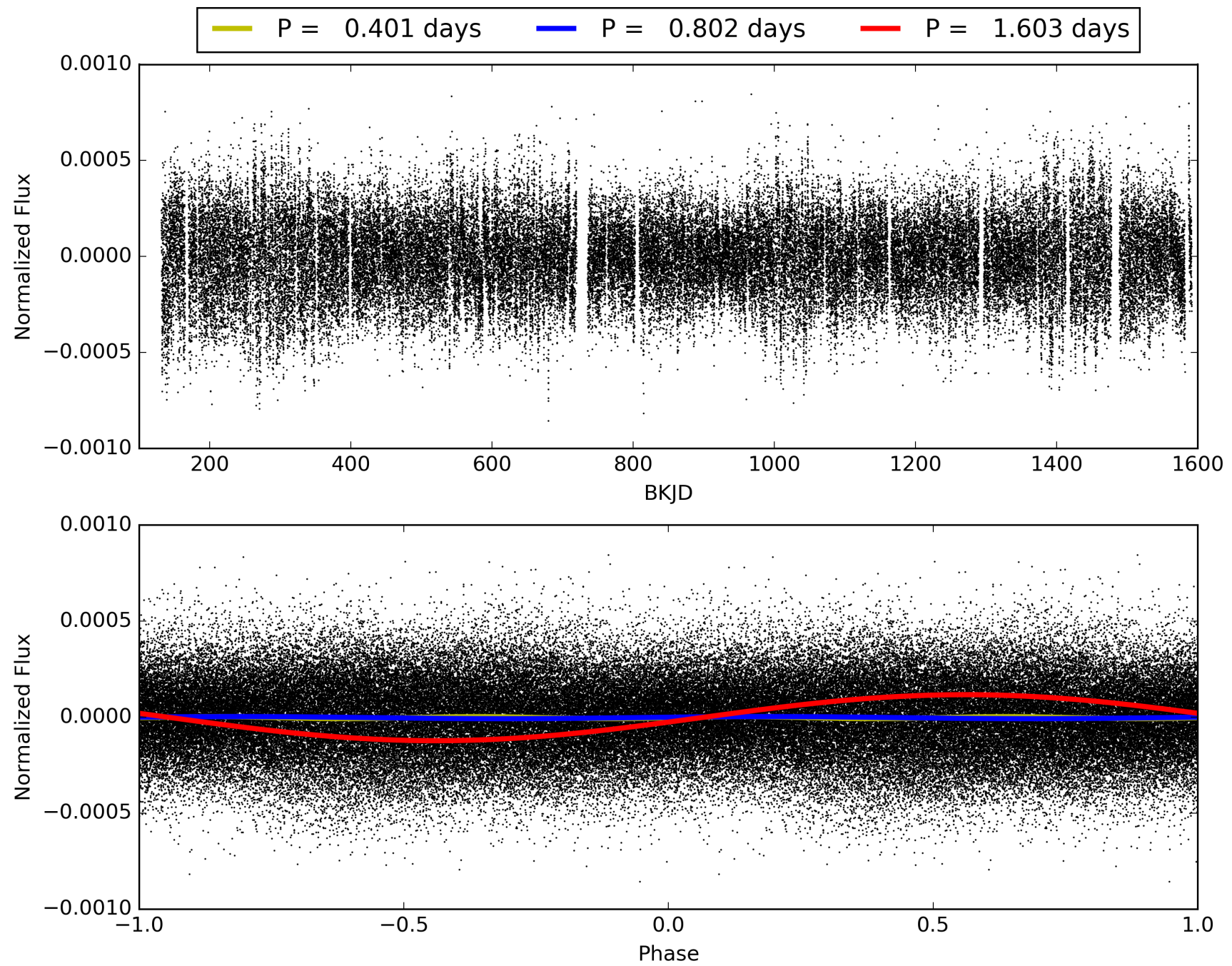
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 009953508-04, PDC Light Curves



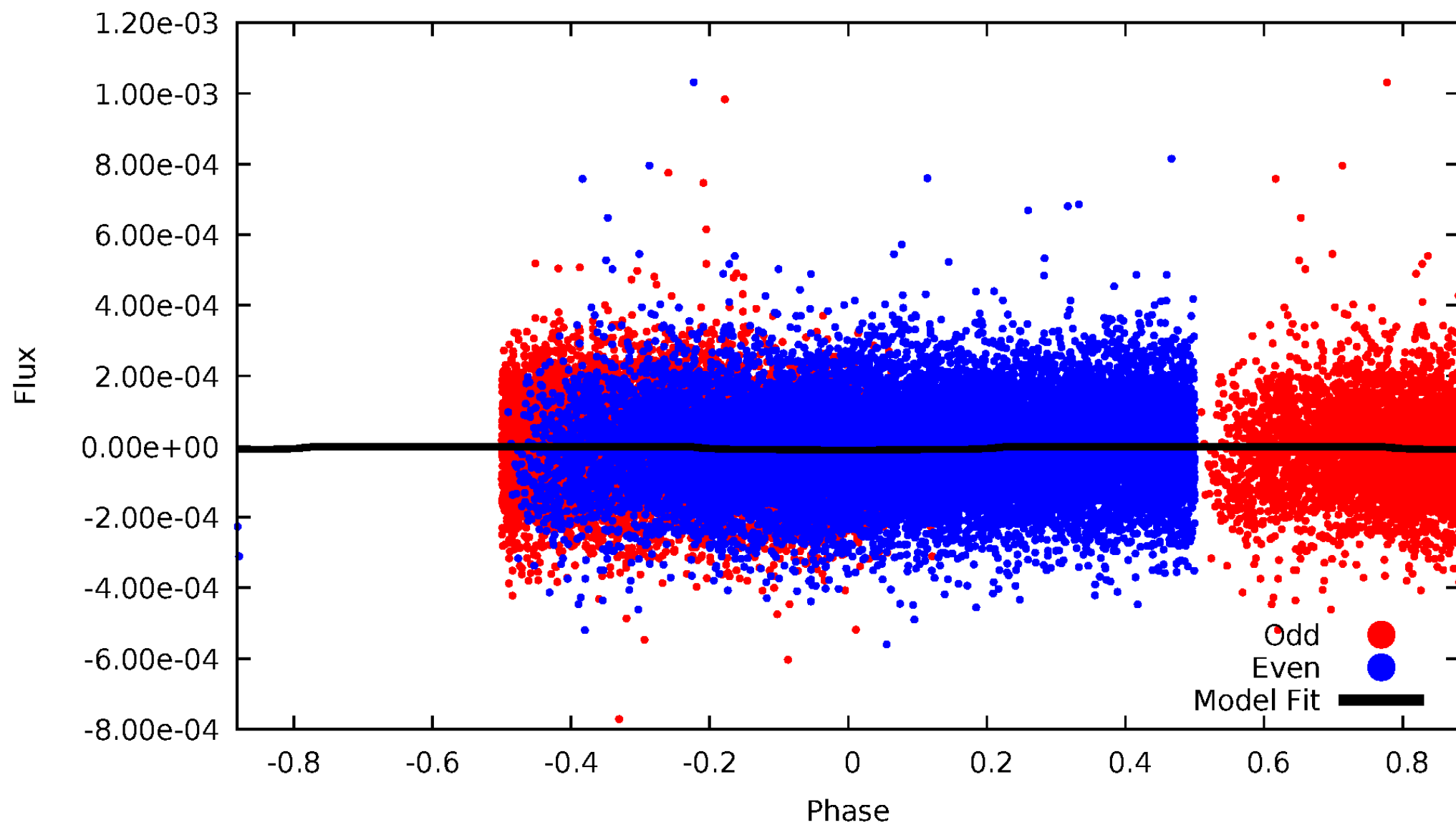


TCE 009953508-04



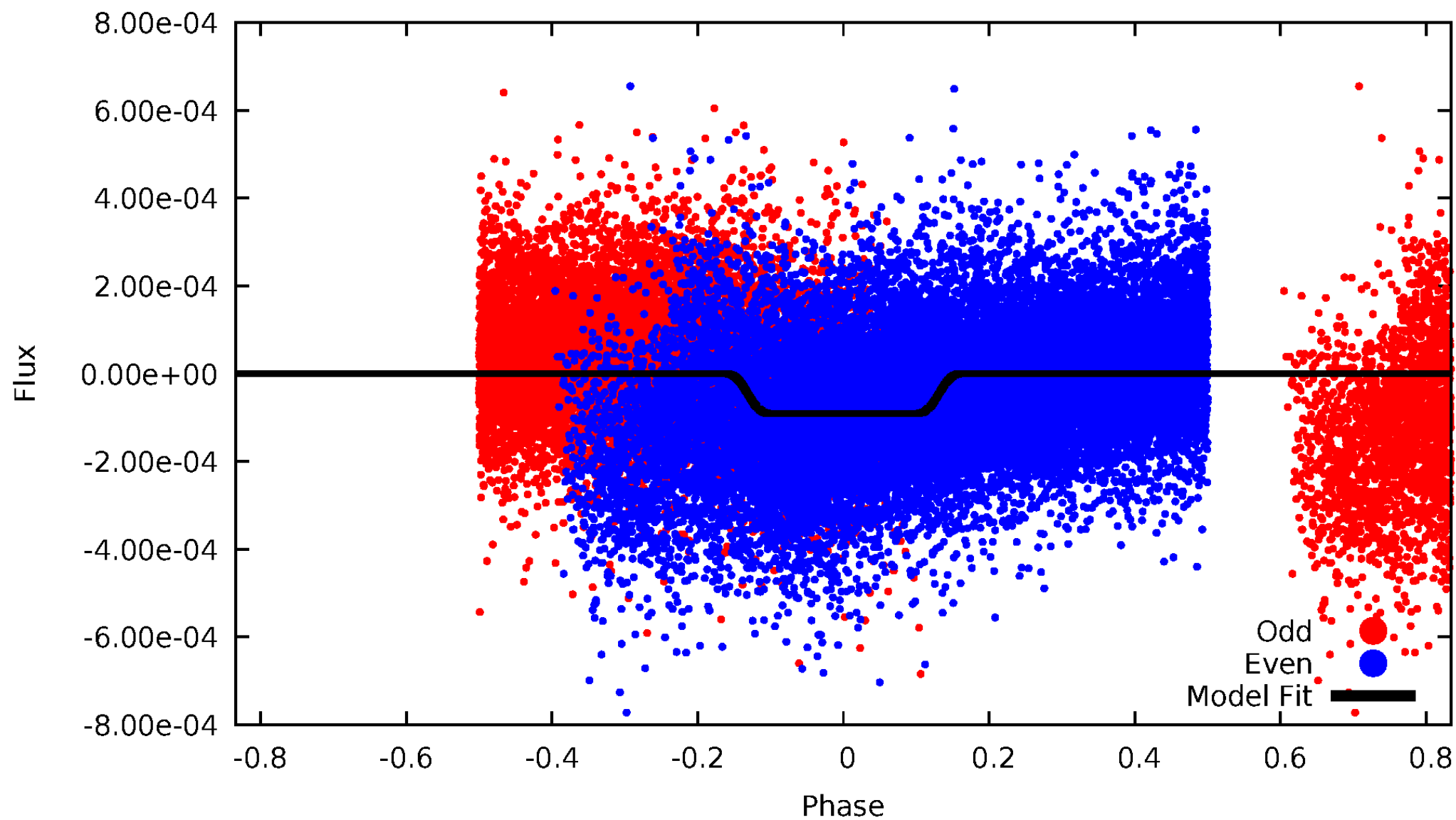
# DV Odd/Even

TCE 009953508-04



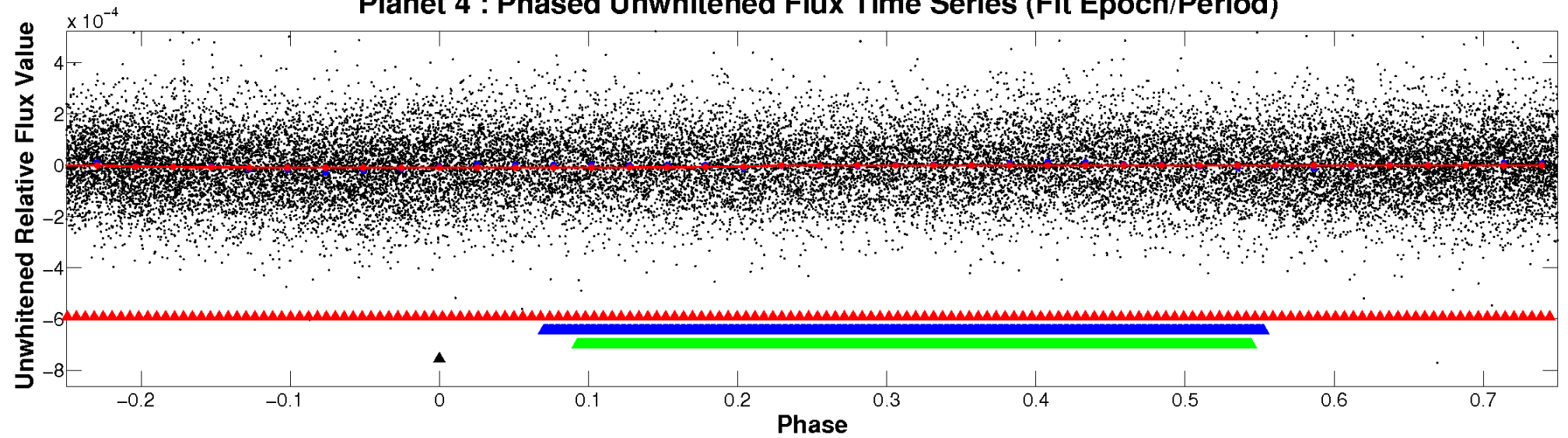
# ALT Odd/Even

TCE 009953508-04

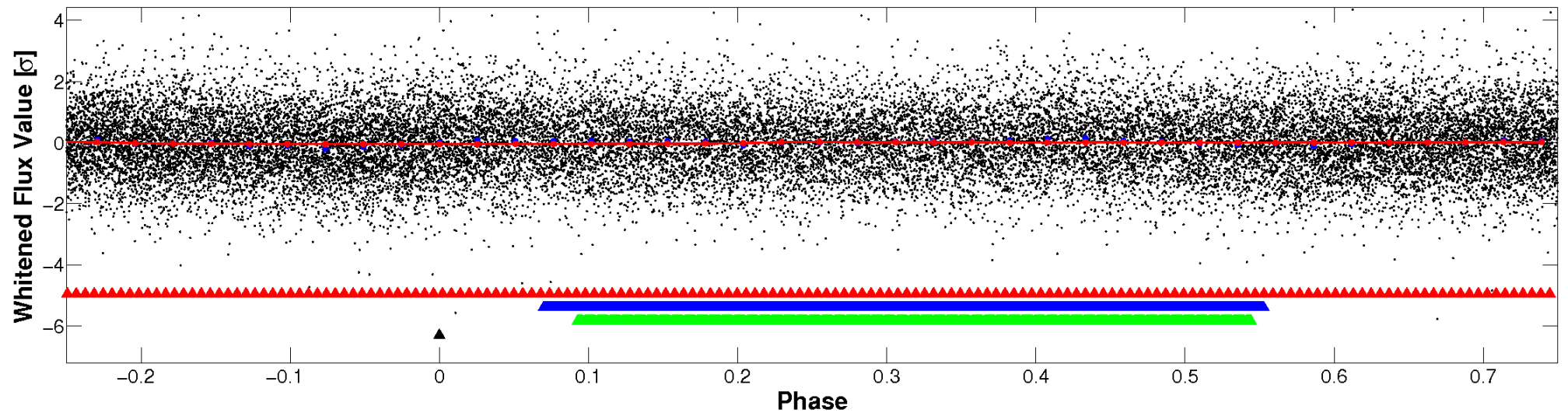


# Non-Whitened Vs. Whitened Light Curve

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



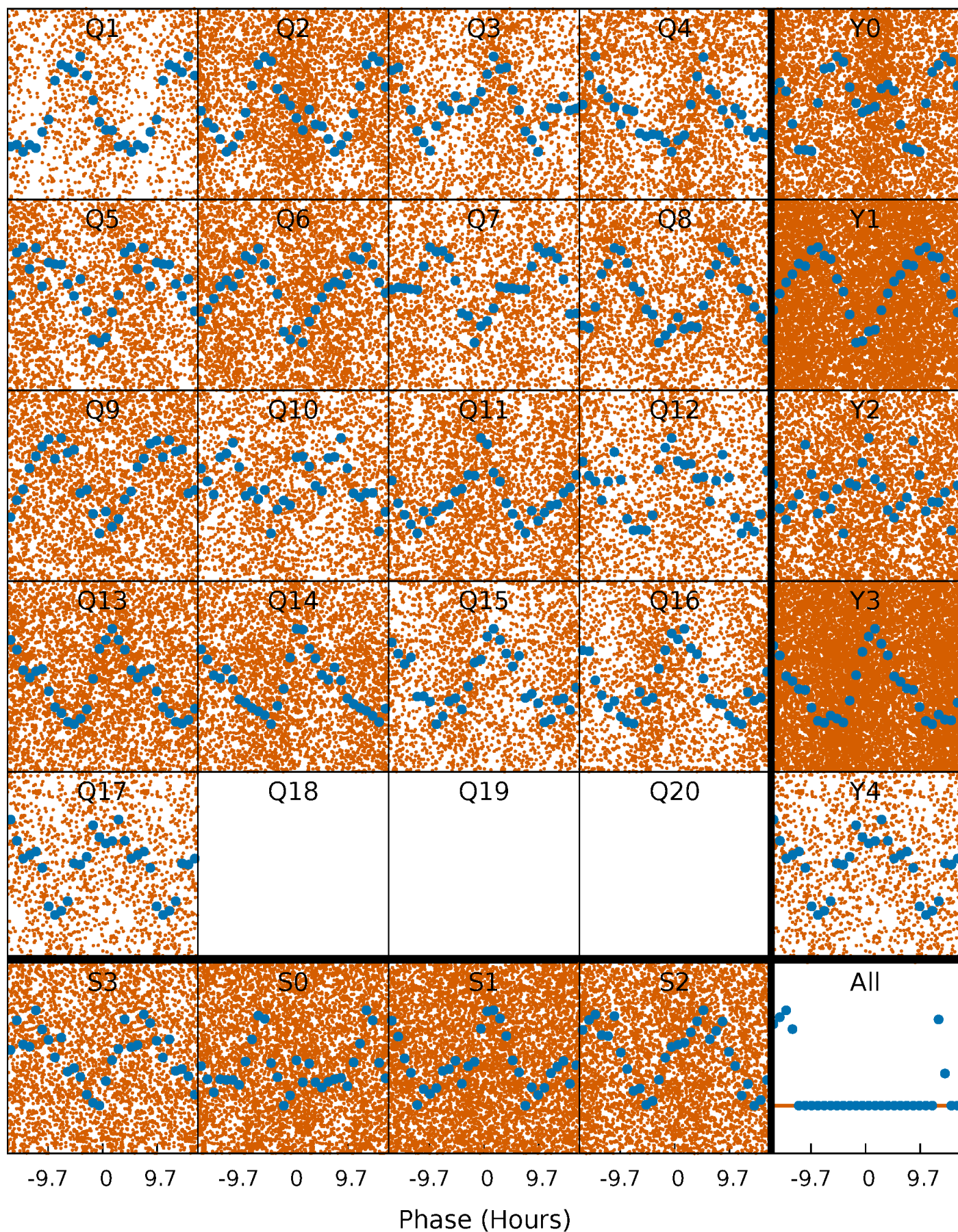
Planet 4 : Phased Whitened Flux Time Series (Fit Epoch/Period)





# PDC Quarter-Phased Transit Curves

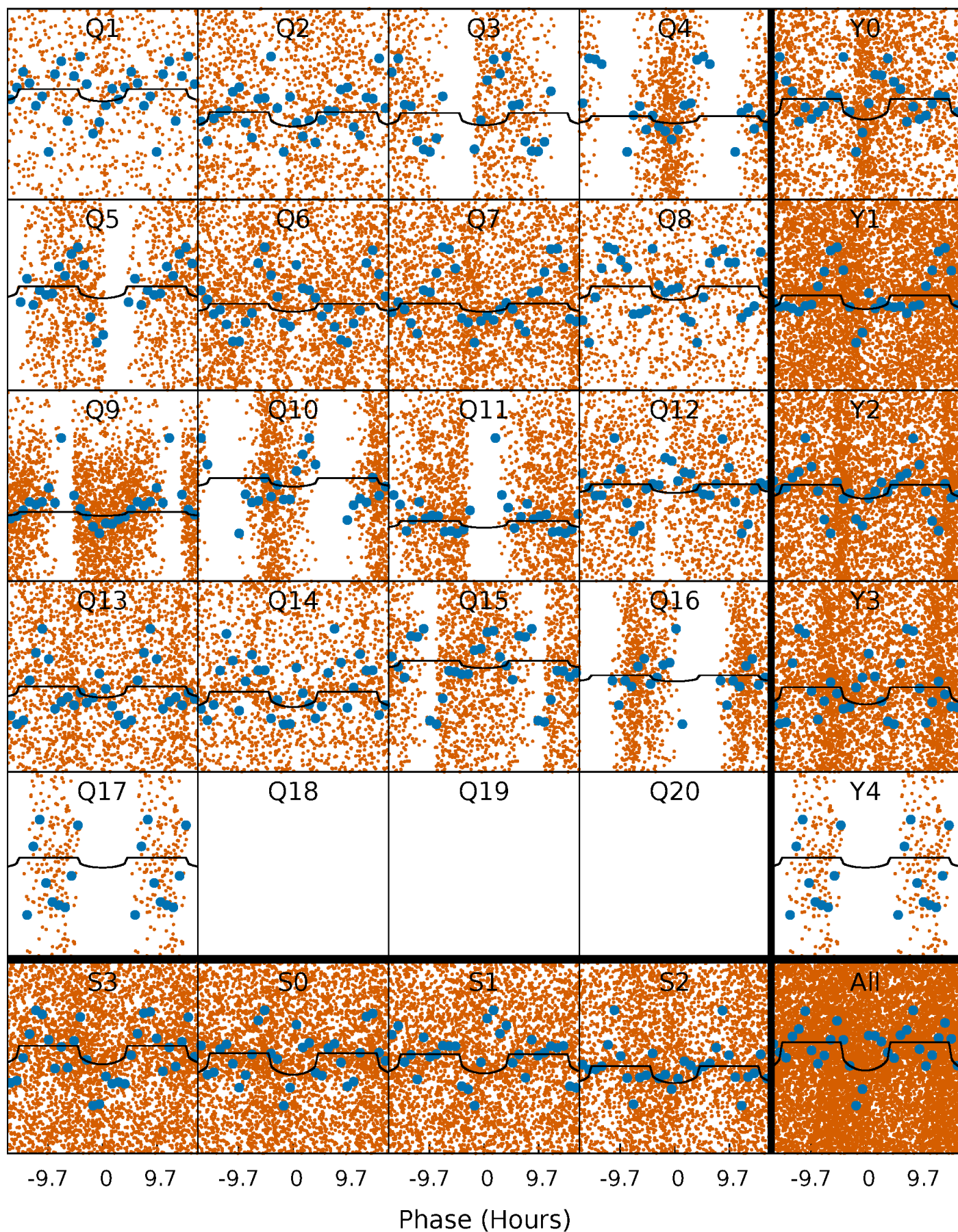
TCE 009953508-04 P= 0.801661 Days  $T_0=132.091040$  (BKJD)





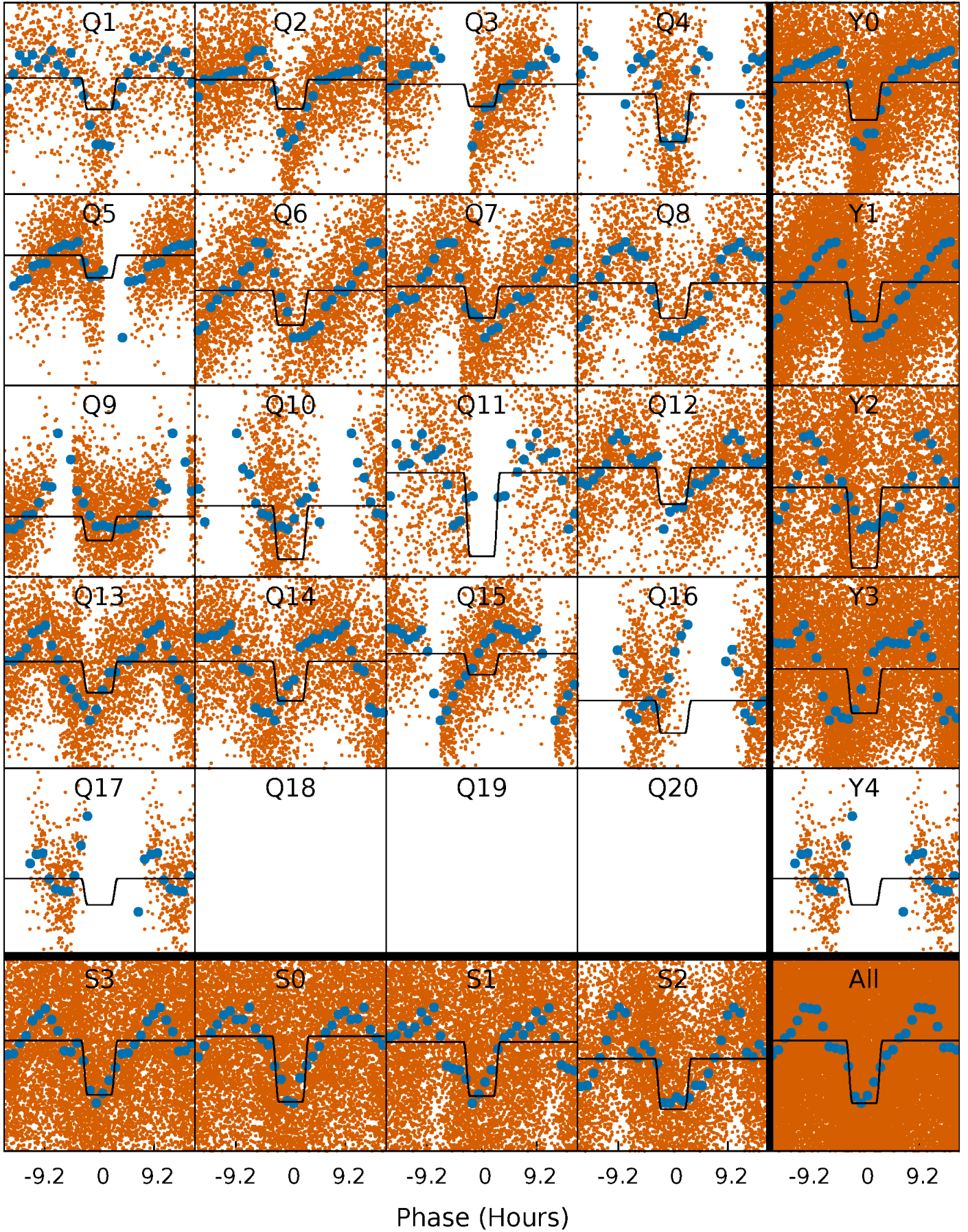
# DV Quarter-Phased Transit Curves

TCE 009953508-04 P= 0.801661 Days  $T_0=132.091040$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 009953508-04 P= 0.801612 Days  $T_0=132.102997$  (BKJD)

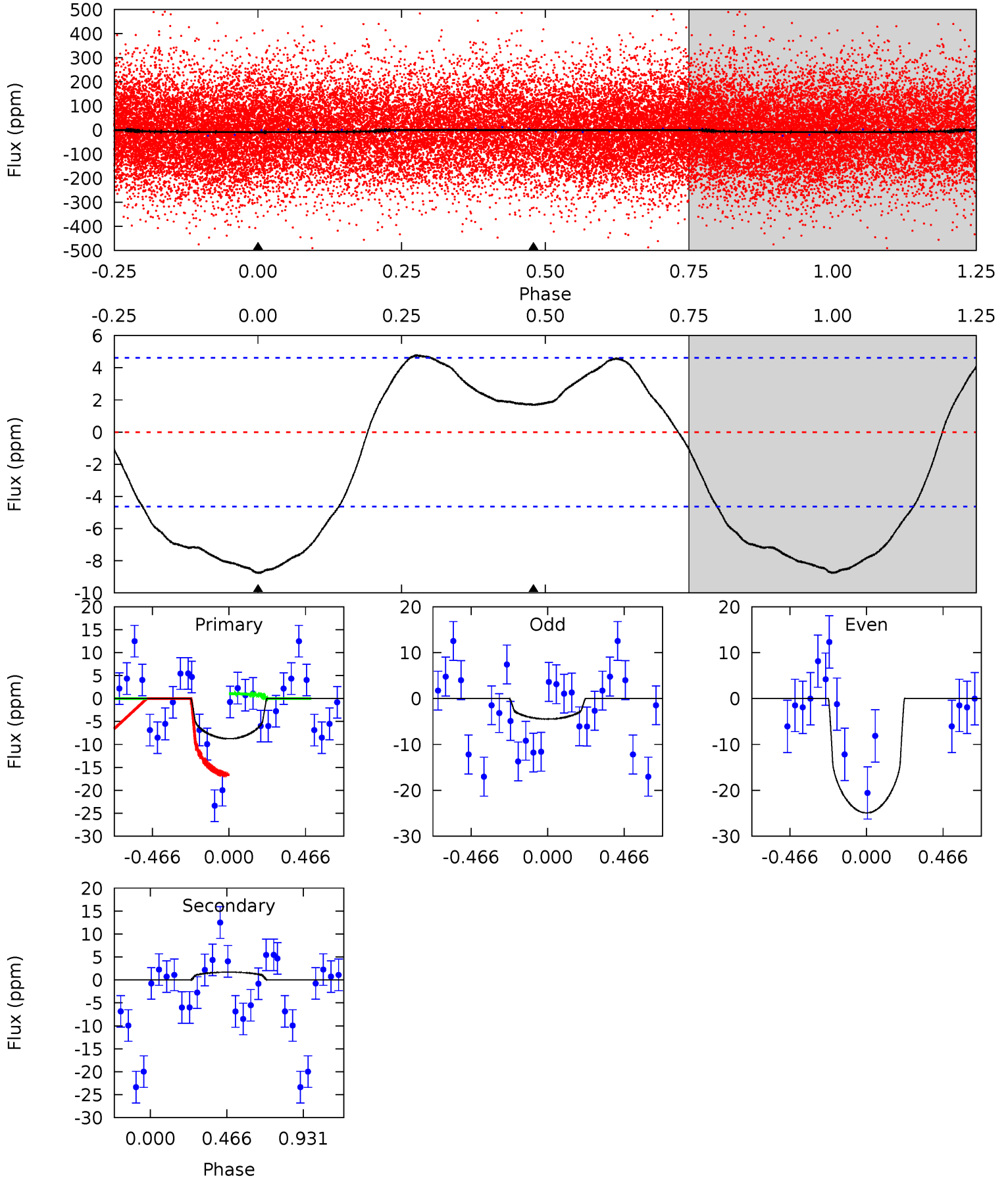




# DV Model-Shift Uniqueness Test

009953508-04, P = 0.801661 Days, E = 131.289379 Days

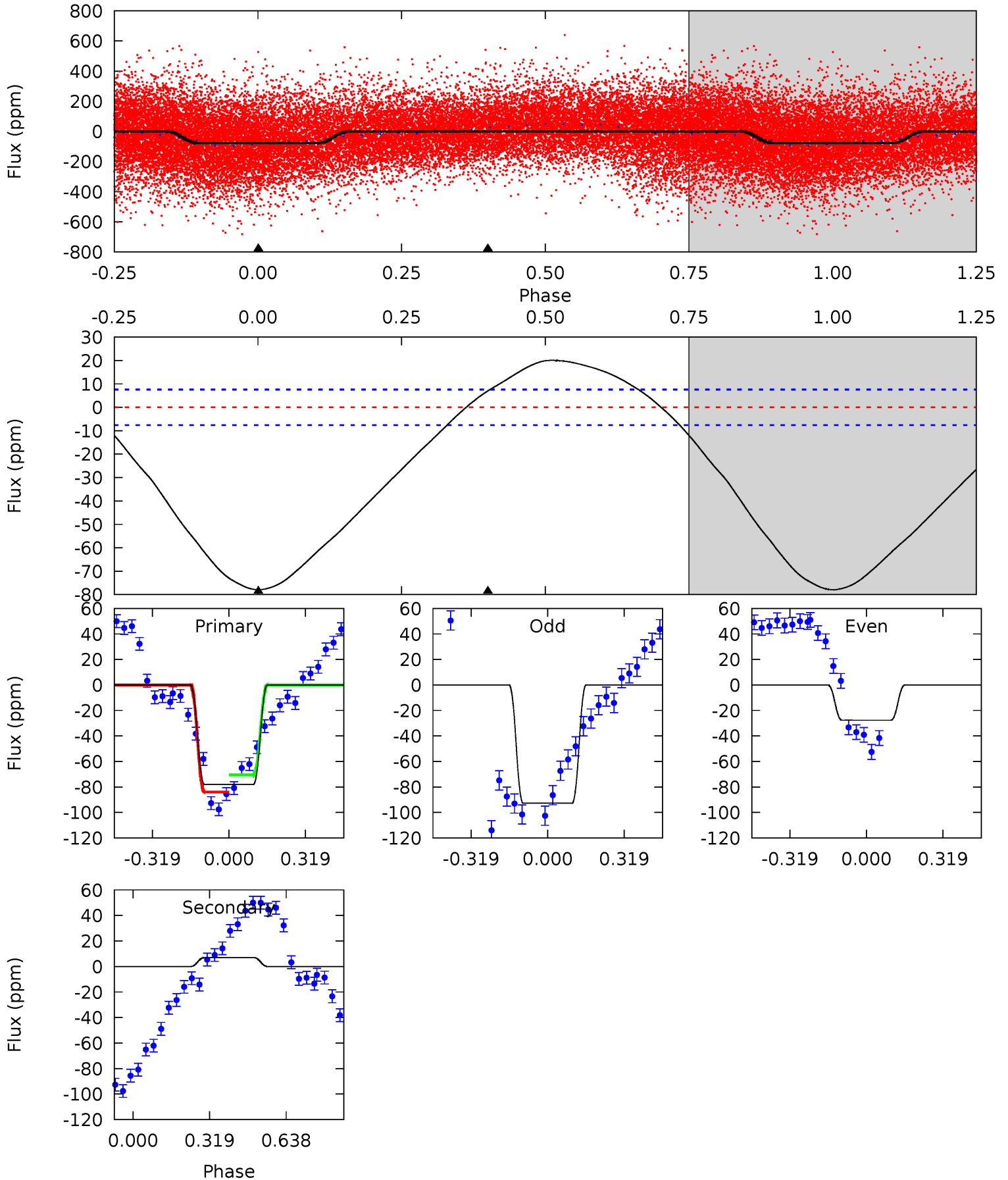
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
8.01	-1.55	0	0	4.23	0.73	1.85	8.01	8.01	-1.55	-1.55	7.64	0.91	0.35	6.86



# Alt Model-Shift Uniqueness Test

009953508-04, P = 0.801612 Days, E = 131.301385 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
44.2	-3.99	0	0	4.32	1.00	3.18	44.2	44.2	-3.99	-3.99	18.3	1.02	0.21	4.16



### Stellar Parameters For KIC 009953508

	$T_{\text{eff}} (K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M (M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6683^{+189}_{-259}$	$4.114^{+0.209}_{-0.190}$	$-0.100^{+0.250}_{-0.300}$	$1.689^{+0.519}_{-0.425}$	$1.361^{+0.196}_{-0.261}$	$0.398^{+0.429}_{-0.208}$
	+3%/-4%	+5%/-5%	+250%/-300%	+31%/-25%	+14%/-19%	+108%/-52%
Source	PHO54	PHO54	PHO54	DSEP		

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

### Secondary Eclipse Parameters for KIC 009953508-04 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$2 \pm 1$	$0.73^{+0.74}_{-0.49}$	$3905^{+315}_{-319}$	$-4308^{+524}_{-2195}$	$-0.465^{+0.383}_{-4.708}$
Alt.	$7 \pm 2$	$1.78^{+0.86}_{-0.82}$	$3906^{+322}_{-284}$	$-4262^{+325}_{-747}$	$-0.407^{+0.226}_{-1.079}$

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



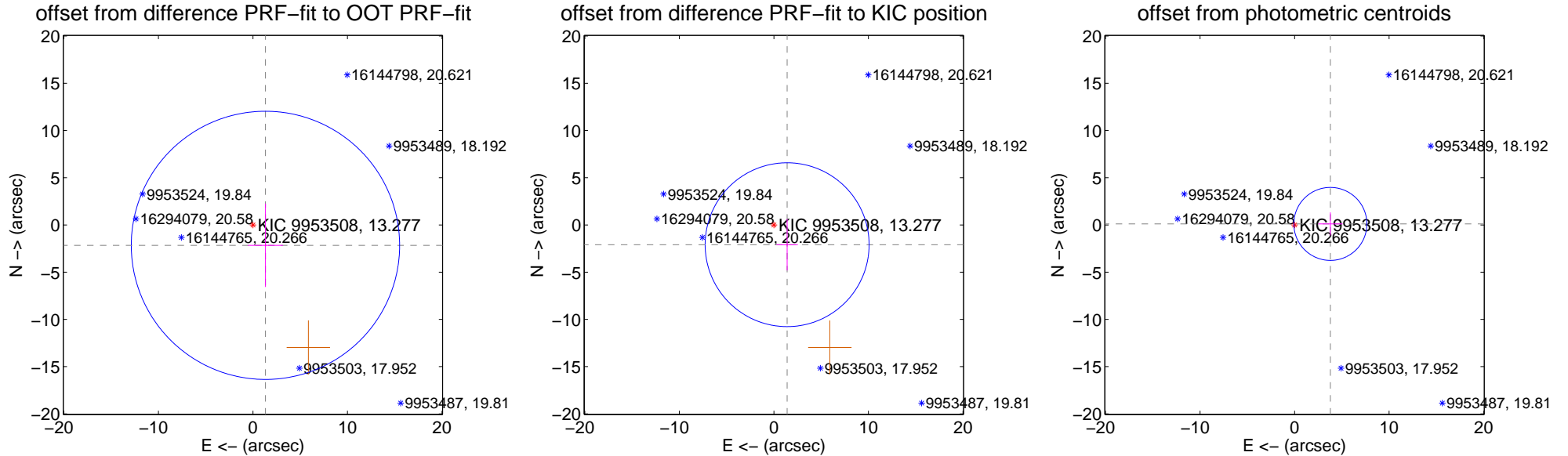
## DV Centroid Data

Supplemental centroid analysis for 009953508-04. Kepler magnitude: 13.28. Transit SNR 4.29

There are 0 quarters with good PRF difference image offsets

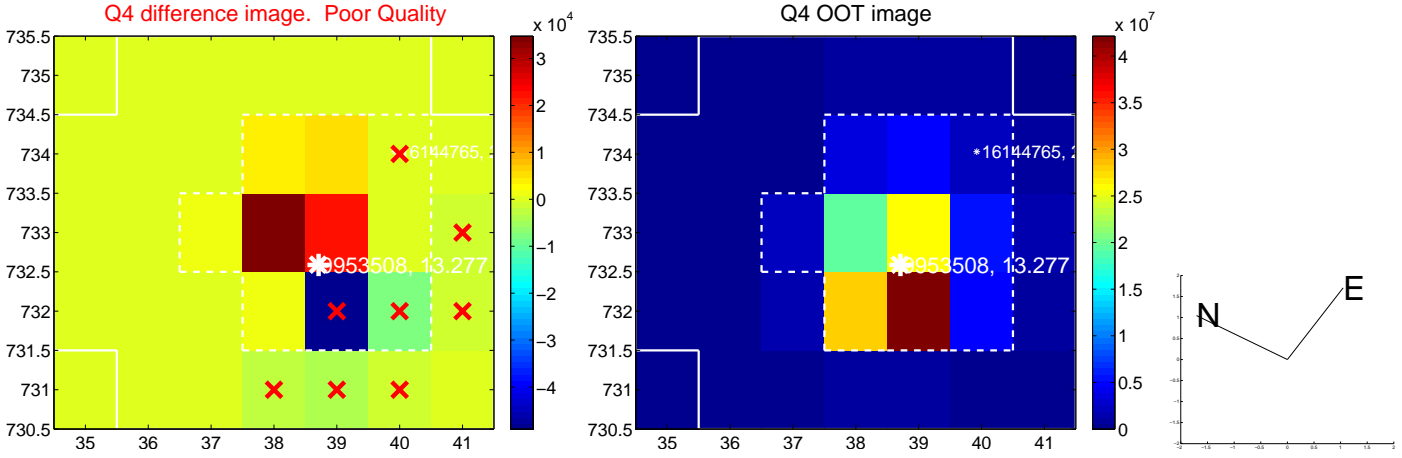
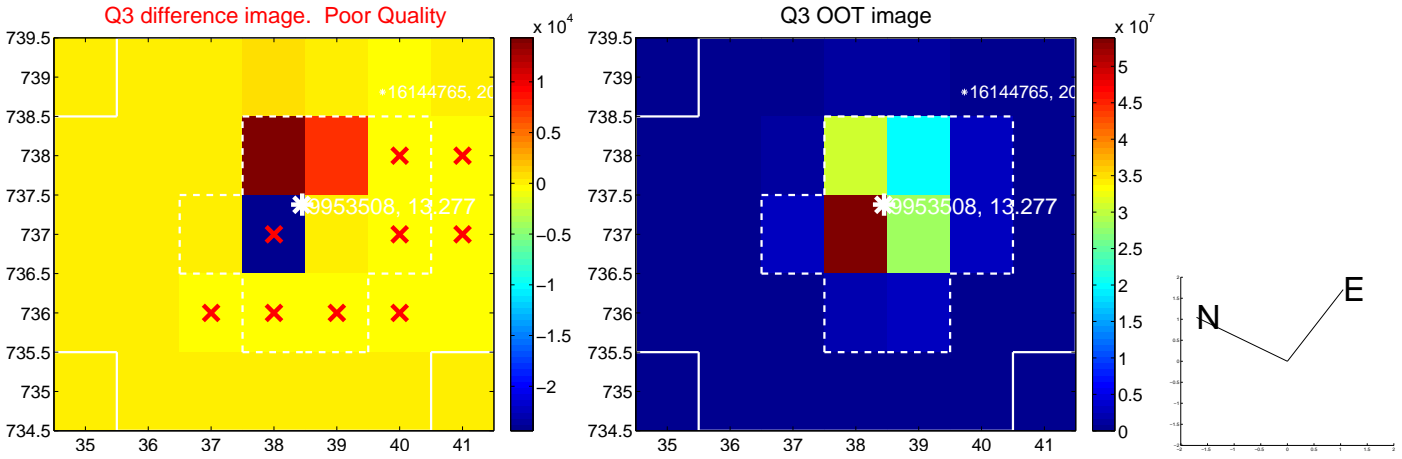
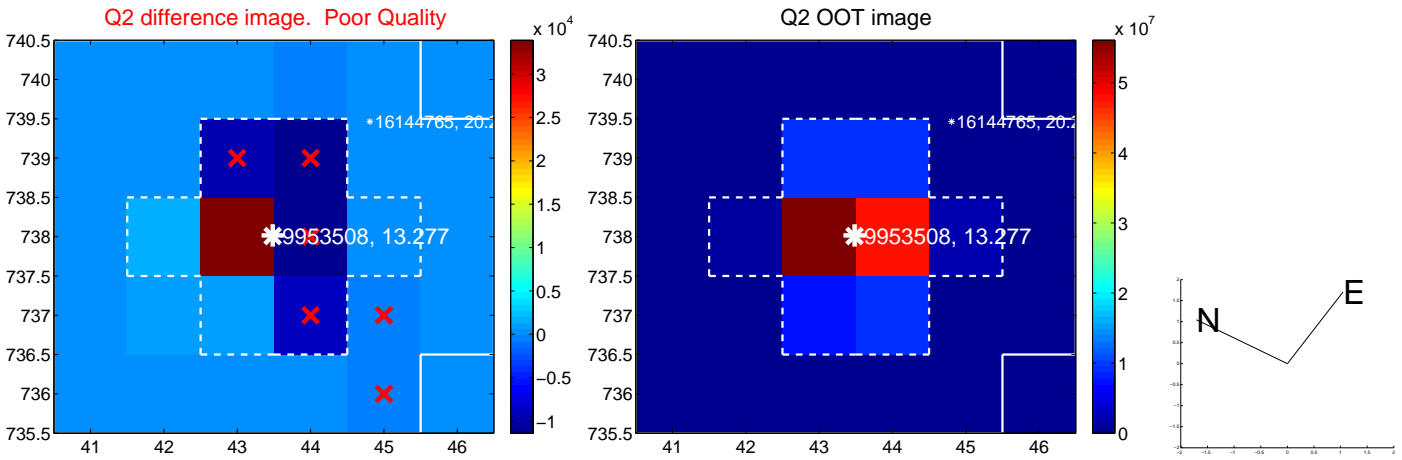
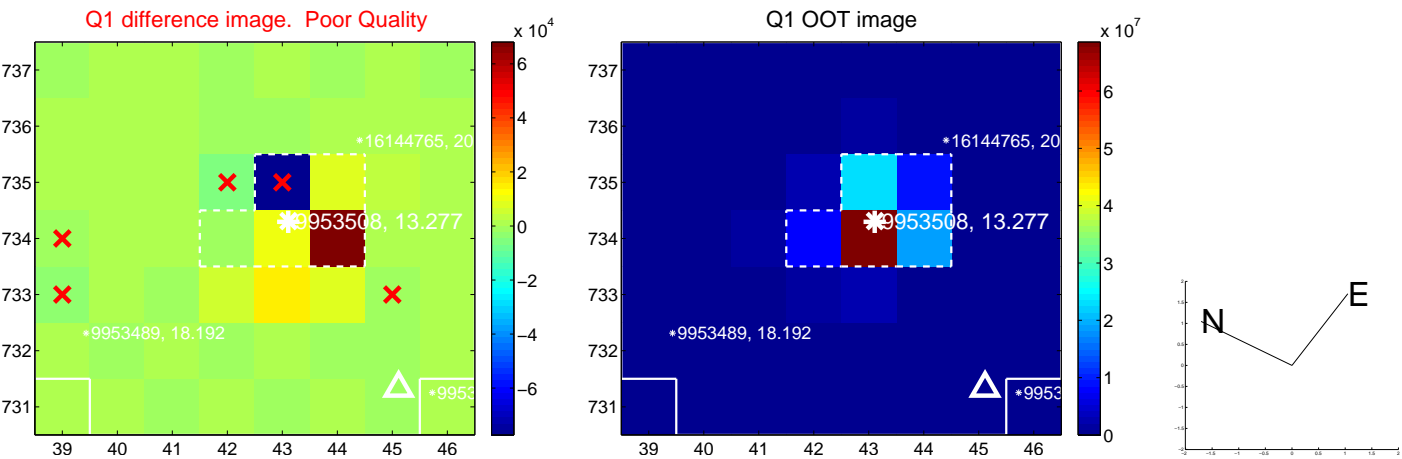
The direct PRF centroid is offset from the target star catalog position by about 0.10 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$2.533 \pm 4.732$	0.54	$-1.324 \pm 1.855$	$-2.159 \pm 4.415$
PRF-fit source offset from KIC position	$2.516 \pm 2.891$	0.87	$-1.399 \pm 1.132$	$-2.092 \pm 2.722$
photometric centroid source offset	$3.79 \pm 1.29$	2.94	$-3.79 \pm 1.29$	$0.11 \pm 1.22$

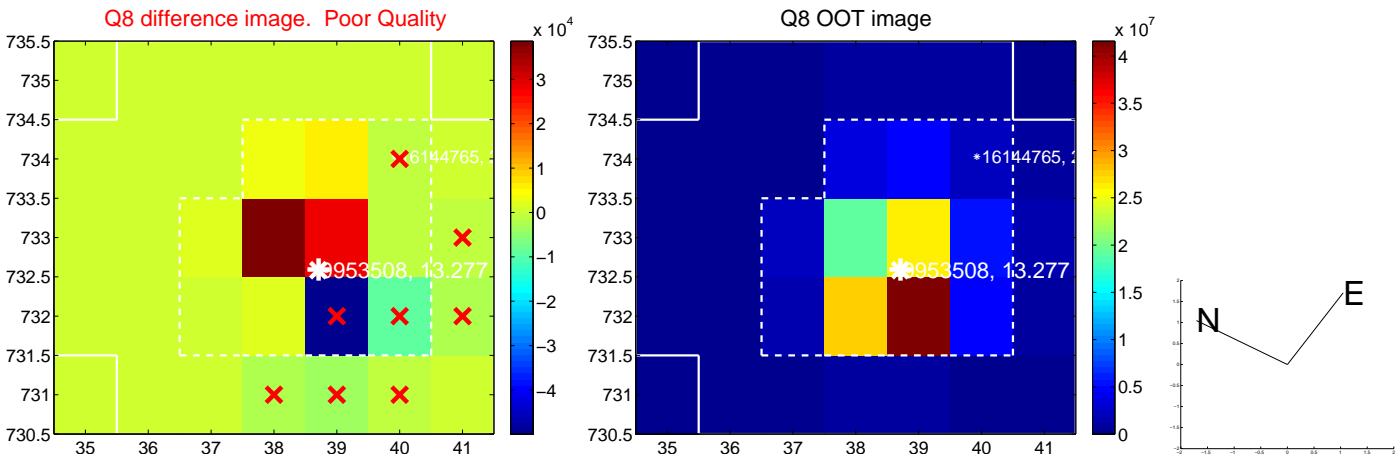
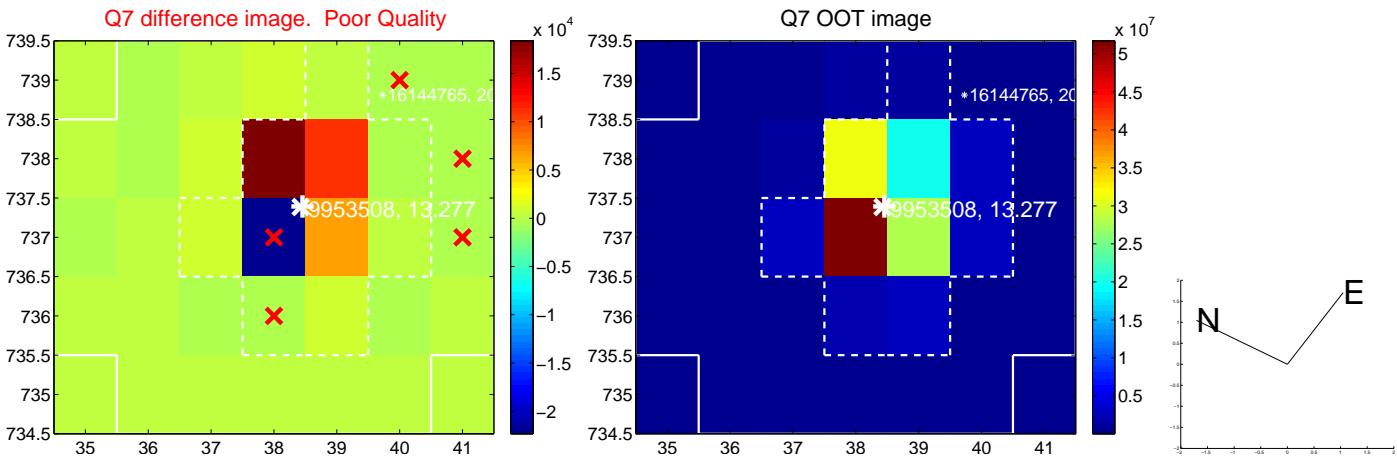
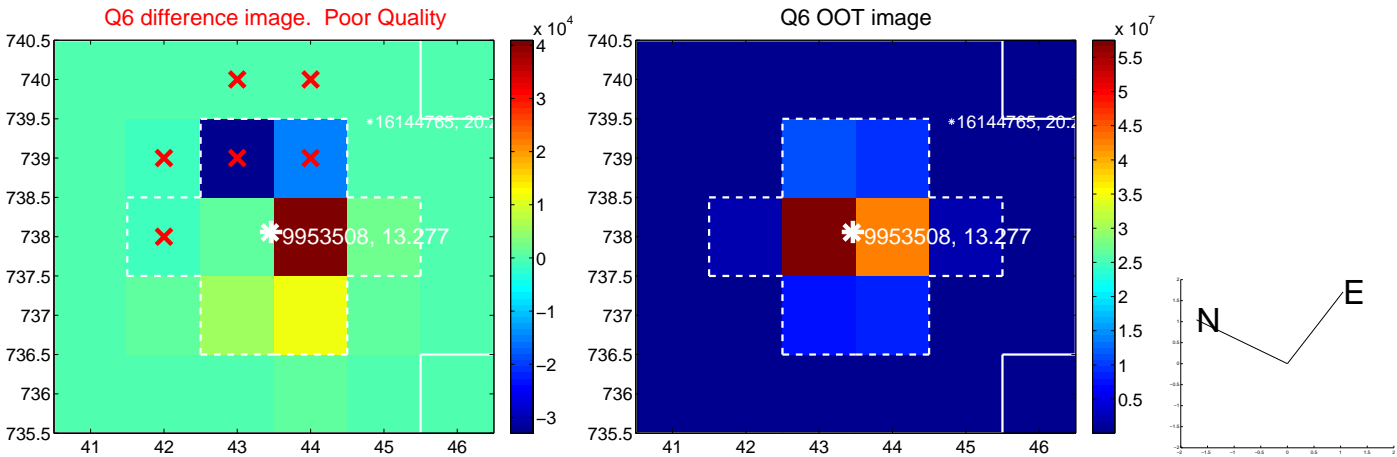
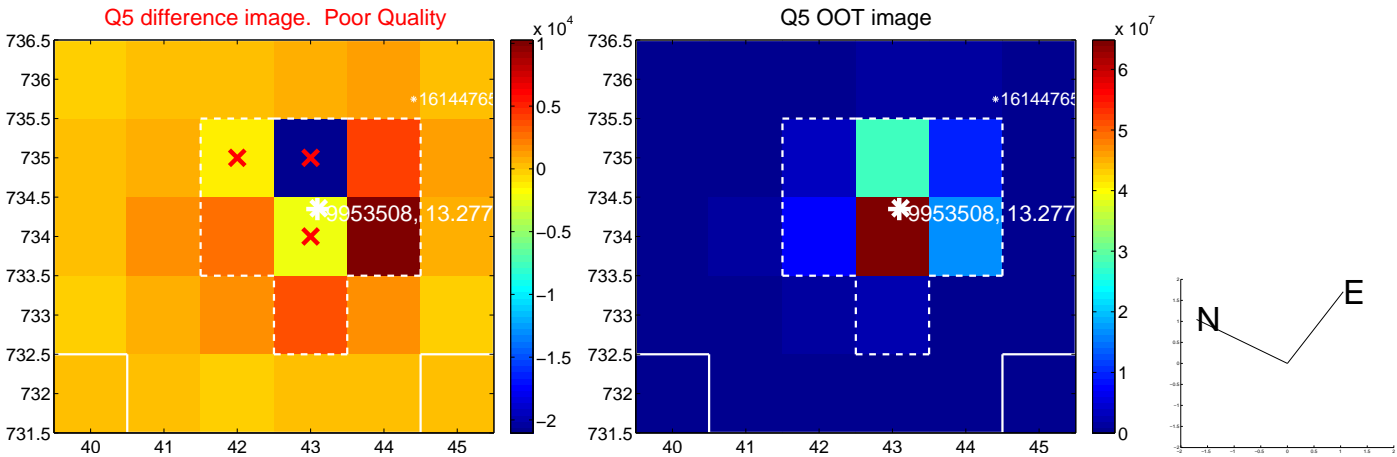


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

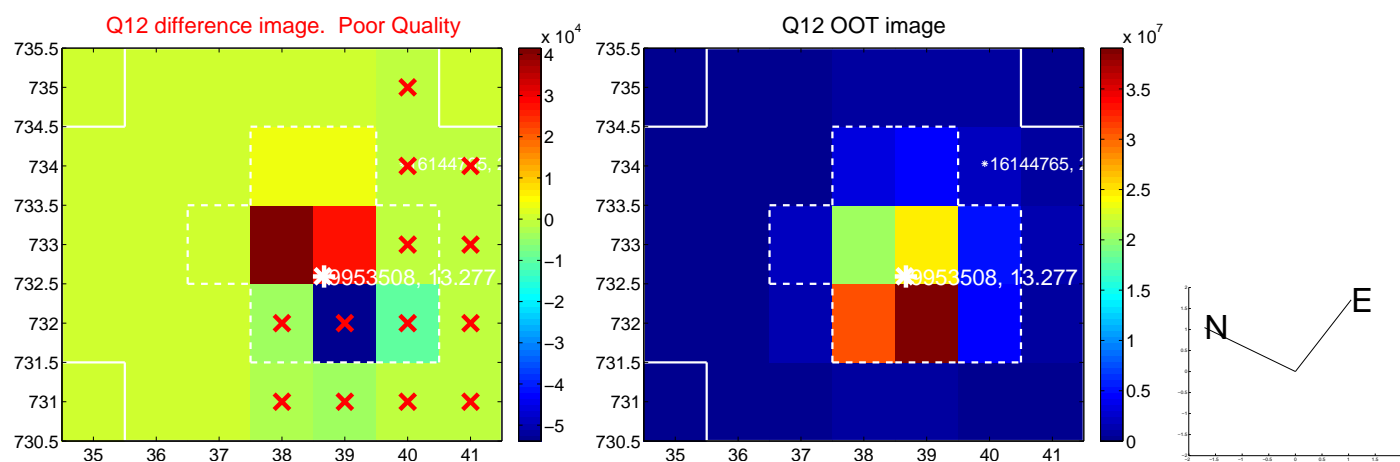
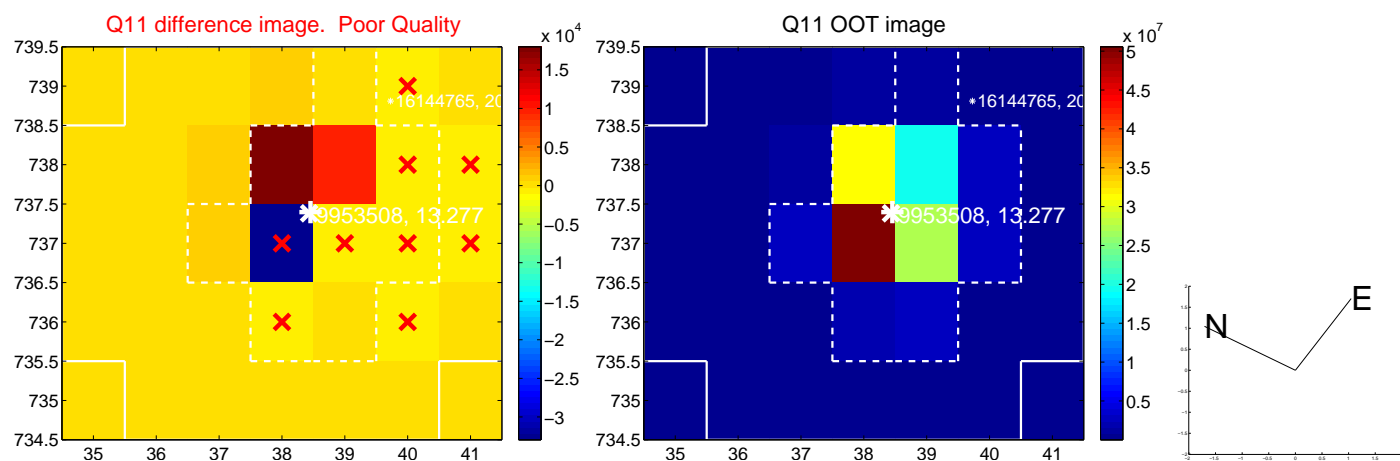
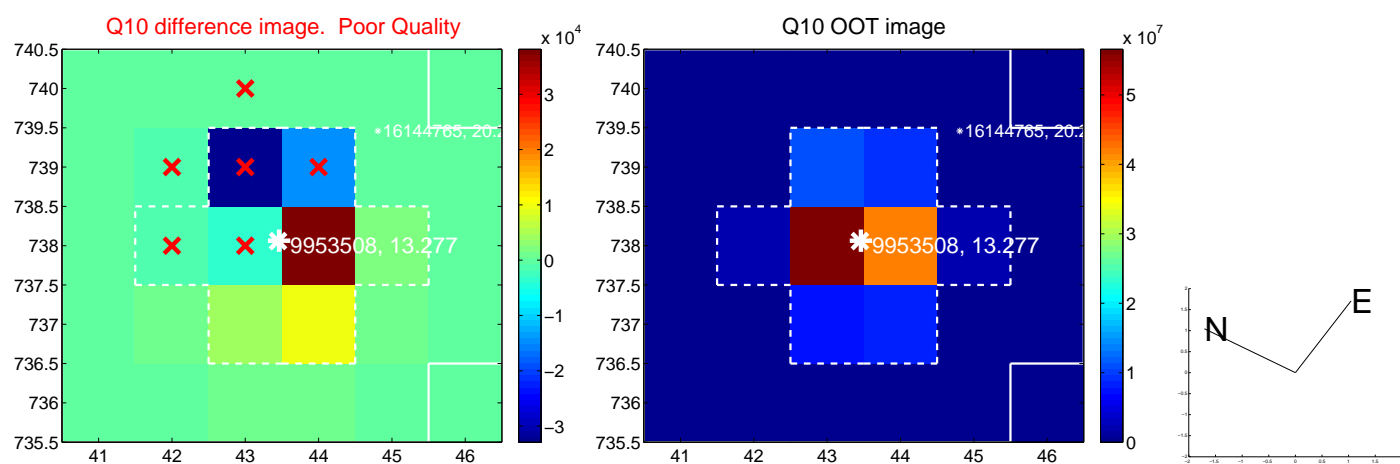
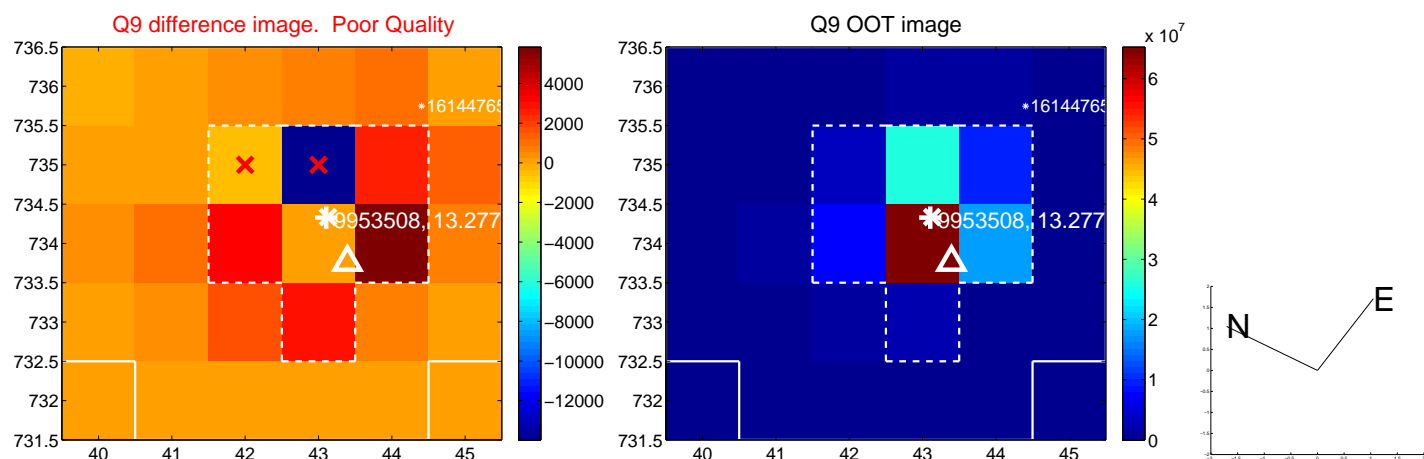
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



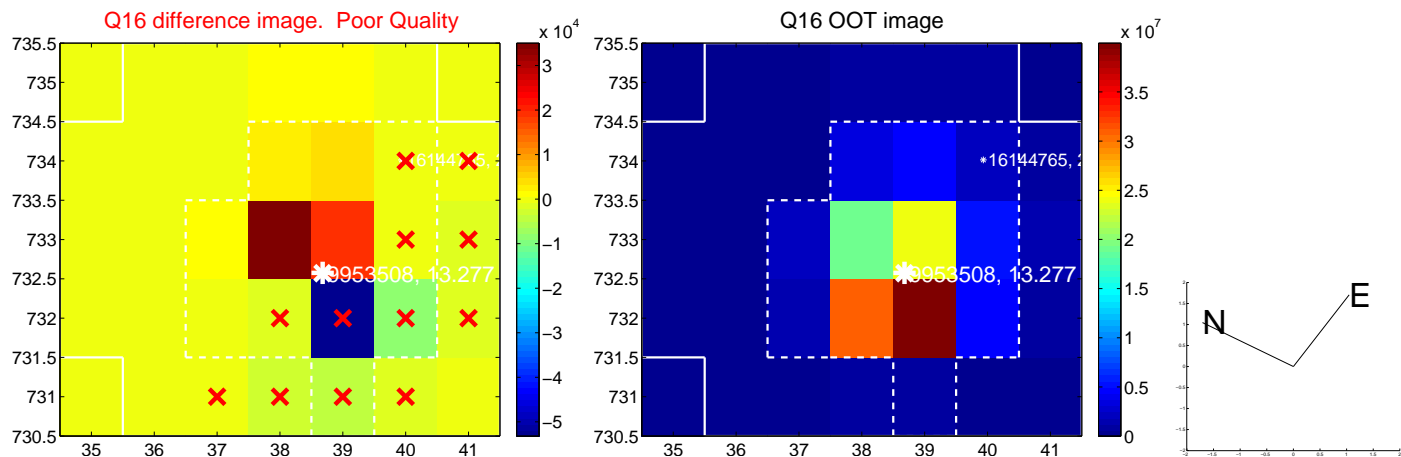
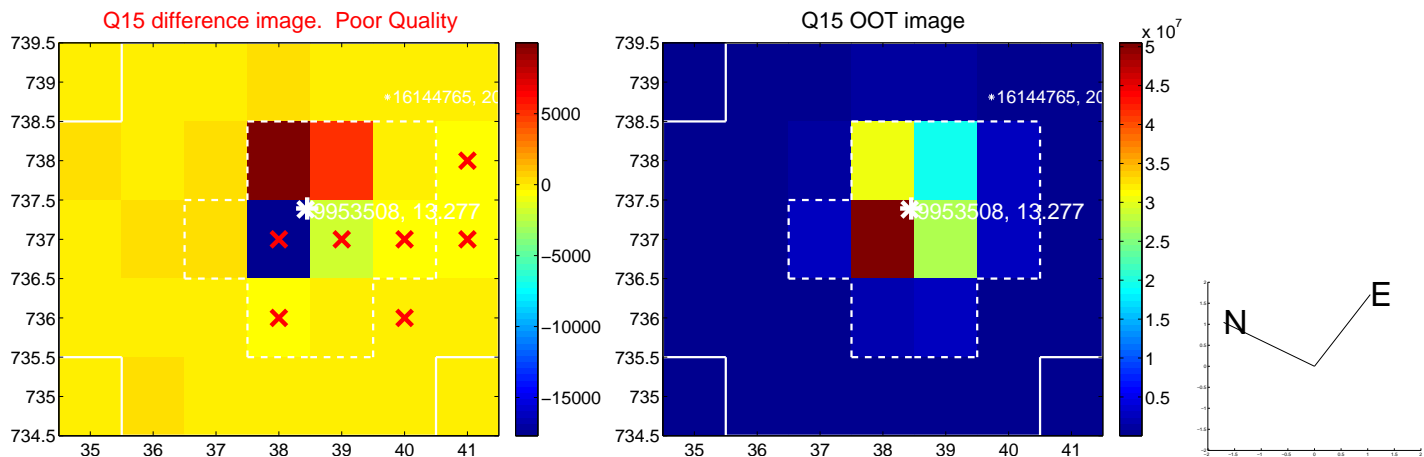
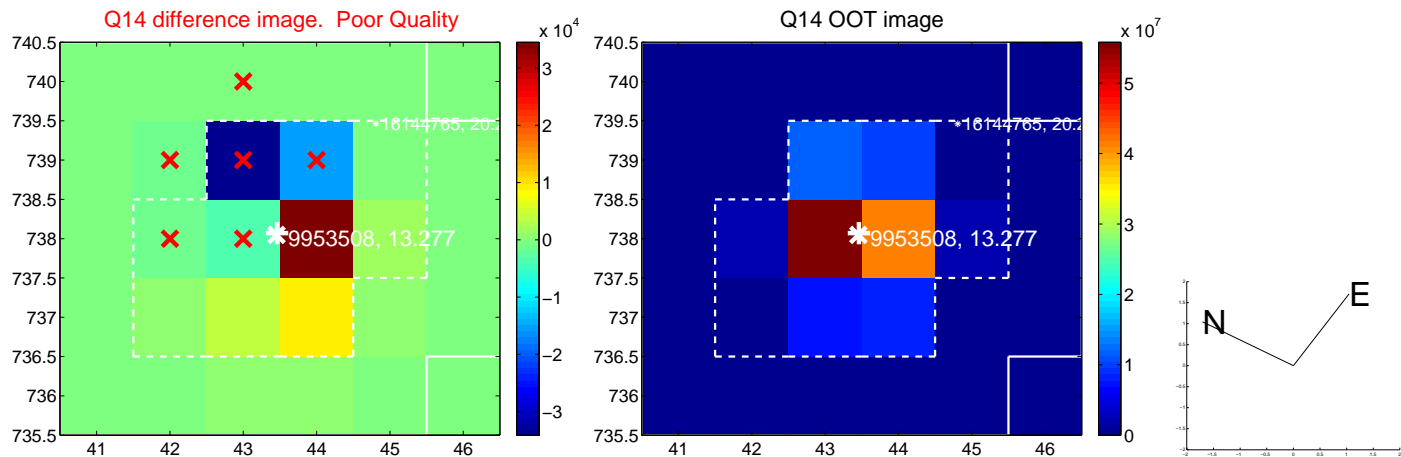
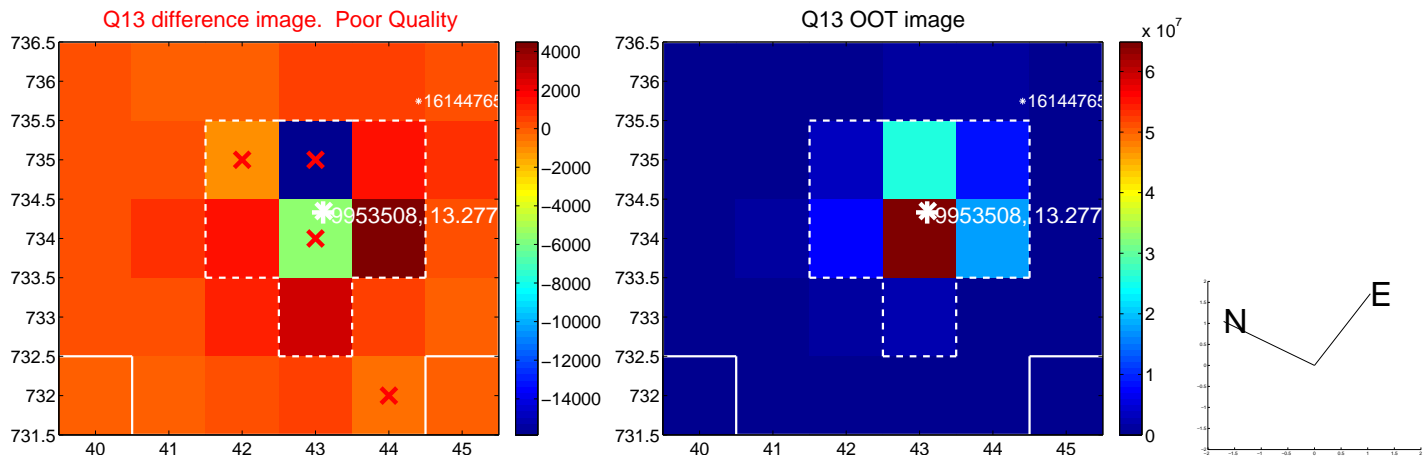
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

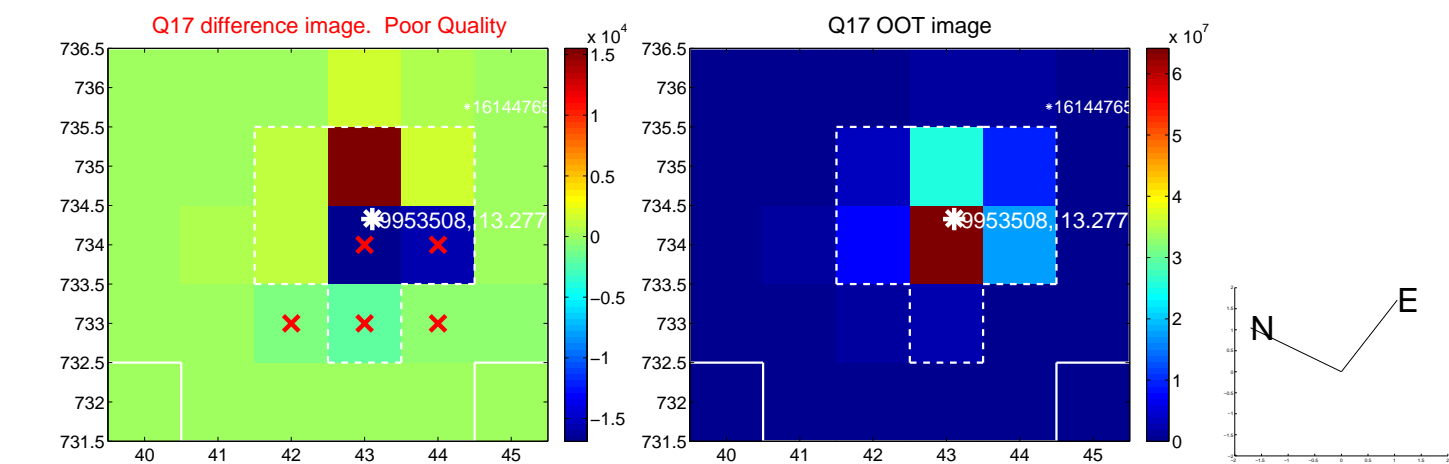


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

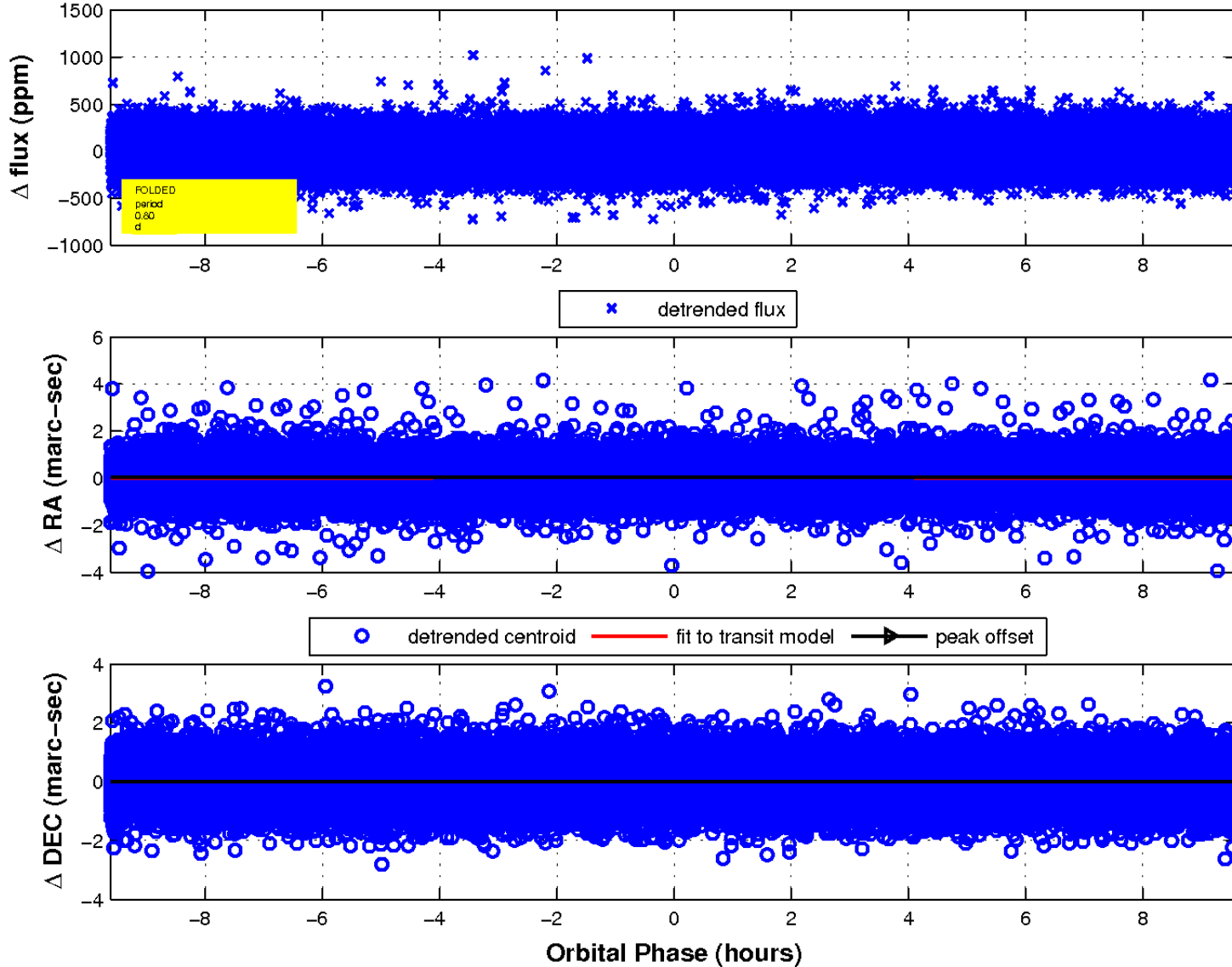




white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



fluxWeightedCentroids, Planet 4 of 4



UKIRT Image

