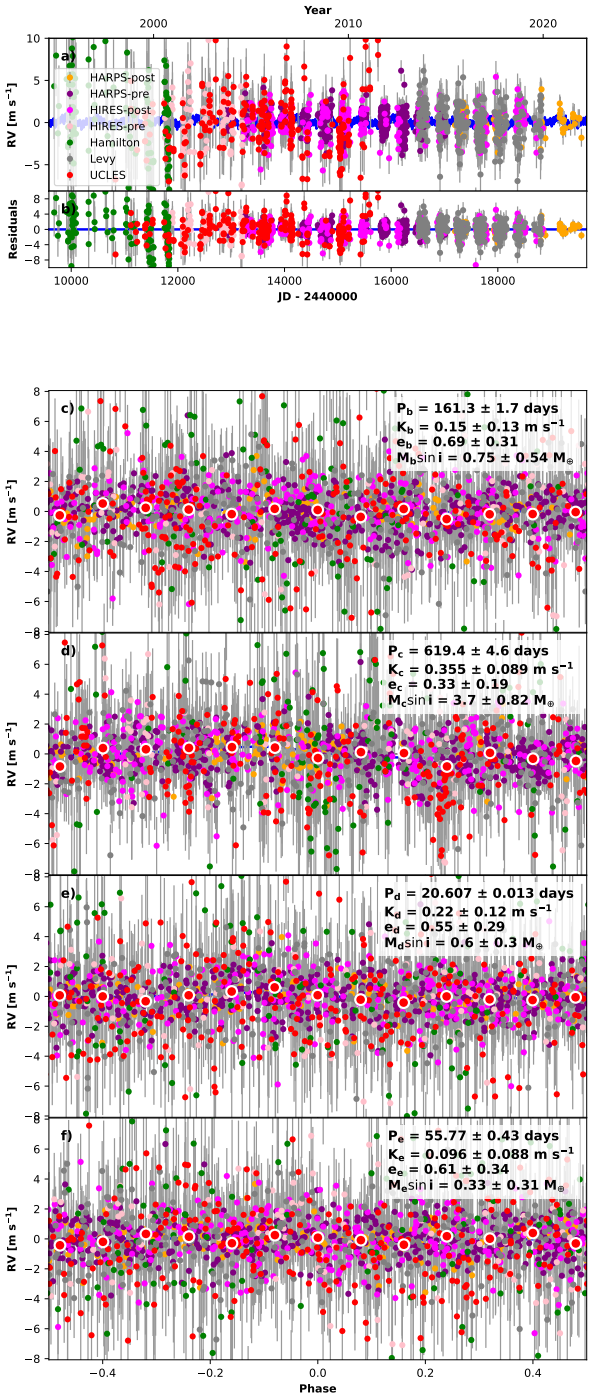

FIG. 1.— Best-fit 4-planet Keplerian orbital model for tau Cet (HD 10700). The maximum likelihood model is plotted while the orbital parameters listed in Table 1 are the median values of the posterior distributions. The thin blue line is the best fit 4-planet model. We add in quadrature the RV jitter term(s) listed in Table 1 with the measurement uncertainties for all RVs. **b)** Residuals to the best fit 4-planet model. **c)** RVs phase-folded to the ephemeris of planet b. The Keplerian orbital models for all other planets (if any) have been subtracted. The small point colors and symbols are the same as in panel **a**. Red circles (if present) are the same velocities binned in 0.08 units of orbital phase. The phase-folded model for planet b is shown as the blue line.

TABLE 1
MCMC Posteriors

Parameter	Credible Interval	Maximum Likelihood	Units
Modified MCMC Step Parameters			
P_b	$161.3^{+2.3}_{-1.1}$	163.2	days
$T\mathrm{conj_b}$	2450024^{+43}_{-35}	2450023	JD
$T\mathrm{peri_b}$	2450018^{+52}_{-44}	2450025	JD
e_b	$0.69^{+0.22}_{-0.39}$	0.77	
ω_b	$-0.1^{+1.3}_{-1.0}$	2.4	radians
K_b	$0.15^{+0.16}_{-0.1}$	0.28	m s^{-1}
P_c	$619.4^{+4.8}_{-4.4}$	617.4	days
$T\mathrm{conj_c}$	2449956^{+53}_{-35}	2449964	JD
$T\mathrm{peri_c}$	2449924^{+98}_{-78}	2449925	JD
e_c	$0.33^{+0.2}_{-0.19}$	0.38	
ω_c	$0.82^{+0.75}_{-0.85}$	0.7	radians
K_c	$0.355^{+0.096}_{-0.083}$	0.375	m s^{-1}
P_d	$20.607^{+0.014}_{-0.013}$	20.61	days
$T\mathrm{conj_d}$	2450001.6 ± 4.9	2449999.8	JD
$T\mathrm{peri_d}$	$2449999.5^{+6.8}_{-5.0}$	2449998.9	JD
e_d	$0.55^{+0.26}_{-0.31}$	0.55	
ω_d	0.1 ± 1.2	0.5	radians
K_d	$0.22^{+0.13}_{-0.11}$	0.27	m s^{-1}
P_e	$55.77^{+0.53}_{-0.33}$	55.82	days
$T\mathrm{conj_e}$	2450007^{+38}_{-41}	2450007	JD
$T\mathrm{peri_e}$	2450004^{+44}_{-41}	2450007	JD
e_e	$0.61^{+0.29}_{-0.38}$	0.97	
ω_e	$-0.3^{+2.0}_{-1.5}$	1.1	radians
K_e	$0.096^{+0.11}_{-0.069}$	0.466	m s^{-1}
Orbital Parameters			
P_b	$161.3^{+2.3}_{-1.1}$	163.2	days
$T\mathrm{conj_b}$	2450024^{+43}_{-35}	2450023	JD
$T\mathrm{peri_b}$	2450018^{+52}_{-44}	2450025	JD
e_b	$0.69^{+0.22}_{-0.39}$	0.77	
ω_b	$-0.1^{+1.3}_{-1.0}$	2.4	radians
K_b	$0.15^{+0.16}_{-0.1}$	0.28	m s^{-1}
P_c	$619.4^{+4.8}_{-4.4}$	617.4	days
$T\mathrm{conj_c}$	2449956^{+53}_{-35}	2449964	JD
$T\mathrm{peri_c}$	2449924^{+98}_{-78}	2449925	JD
e_c	$0.33^{+0.2}_{-0.19}$	0.38	
ω_c	$0.82^{+0.75}_{-0.85}$	0.7	radians
K_c	$0.355^{+0.096}_{-0.083}$	0.375	m s^{-1}
P_d	$20.607^{+0.014}_{-0.013}$	20.61	days
$T\mathrm{conj_d}$	2450001.6 ± 4.9	2449999.8	JD
$T\mathrm{peri_d}$	$2449999.5^{+6.8}_{-5.0}$	2449998.9	JD
e_d	$0.55^{+0.26}_{-0.31}$	0.55	
ω_d	0.1 ± 1.2	0.5	radians
K_d	$0.22^{+0.13}_{-0.11}$	0.27	m s^{-1}
P_e	$55.77^{+0.53}_{-0.33}$	55.82	days
$T\mathrm{conj_e}$	2450007^{+38}_{-41}	2450007	JD
$T\mathrm{peri_e}$	2450004^{+44}_{-41}	2450007	JD
e_e	$0.61^{+0.29}_{-0.38}$	0.97	
ω_e	$-0.3^{+2.0}_{-1.5}$	1.1	radians
K_e	$0.096^{+0.11}_{-0.069}$	0.466	m s^{-1}
Other Parameters			
γ_{UCLES}	$-1.69^{+0.24}_{-0.25}$	-1.69	m s-1
γ_{Levy}	-1.27 ± 0.15	-1.26	m s-1
$\gamma_{\mathrm{Hamilton}}$	$0.09^{+0.51}_{-0.52}$	0.13	m s-1
$\gamma_{\mathrm{HIRES-pre}}$	0.73 ± 0.39	0.71	m s-1
$\gamma_{\mathrm{HIRES-post}}$	$-0.22^{+0.14}_{-0.13}$	-0.22	m s-1
$\gamma_{\mathrm{HARPS-pre}}$	$0.239^{+0.068}_{-0.067}$	0.239	m s-1
$\gamma_{\mathrm{HARPS-post}}$	-0.59 ± 0.12	-0.63	m s-1
$\dot{\gamma}$	$\equiv 0.0$	$\equiv 0.0$	m s^{-1} d^{-1}
$\ddot{\gamma}$	$\equiv 0.0$	$\equiv 0.0$	m s^{-1} d^{-2}
σ_{UCLES}	$3.1^{+0.2}_{-0.18}$	3.07	m s^{-1}
σ_{Levy}	$1.58^{+0.16}_{-0.15}$	1.53	m s^{-1}
$\sigma_{\mathrm{Hamilton}}$	$4.23^{+0.57}_{-0.51}$	4.13	m s^{-1}
$\sigma_{\mathrm{HIRES-pre}}$	$3.02^{+0.34}_{-0.3}$	2.9	m s^{-1}
$\sigma_{\mathrm{HIRES-post}}$	$1.715^{+0.11}_{-0.099}$	1.7	m s^{-1}
$\sigma_{\mathrm{HARPS-pre}}$	$1.243^{+0.054}_{-0.05}$	1.225	m s^{-1}
$\sigma_{\mathrm{HARPS-post}}$	$1.046^{+0.092}_{-0.081}$	0.985	m s^{-1}

TABLE 2
Derived Posteriors

Parameter	Credible Interval	Maximum Likelihood	Units
a_e	$0.5349^{+0.005}_{-0.0042}$	0.538	AU
$M_e \sin i$	$0.75^{+0.59}_{-0.5}$	1.66	$M_\oplus$
a_f	$1.311^{+0.01}_{-0.011}$	1.304	AU
$M_f \sin i$	3.7 ± 0.82	3.7	$M_\oplus$
a_g	$0.13558^{+0.00069}_{-0.0007}$	0.13496	AU
$M_g \sin i$	$0.64^{+0.28}_{-0.32}$	0.74	$M_\oplus$
a_h	$0.2634^{+0.0021}_{-0.002}$	0.2652	AU
$M_h \sin i$	$0.33^{+0.38}_{-0.24}$	1.16	$M_\oplus$

TABLE 3
Summary of Priors

e_b constrained to be < 0.99
e_c constrained to be < 0.99
e_d constrained to be < 0.99
e_e constrained to be < 0.99
K constrained to be > 0
Bounded prior: $0.0 < \sigma_{\mathrm{HARPS-post}} < 20.0$
Bounded prior: $0.0 < \sigma_{\mathrm{HARPS-pre}} < 20.0$
Bounded prior: $0.0 < \sigma_{\mathrm{HIRES-post}} < 20.0$
Bounded prior: $0.0 < \sigma_{\mathrm{HIRES-pre}} < 20.0$
Bounded prior: $0.0 < \sigma_{\mathrm{Hamilton}} < 20.0$
Bounded prior: $0.0 < \sigma_{\mathrm{Levy}} < 20.0$
Bounded prior: $0.0 < \sigma_{\mathrm{UCLES}} < 20.0$

TABLE 4
Final Convergence Criterion

Criterion	Final Value
minAfactor	23.049
maxArchange	0.007
maxGR	1.008
minTz	3642.238

TABLE 5
Radial Velocities

Time (JD)	RV (m s^{-1})	RV Unc. (m s^{-1})	Inst.
2457196.95506	-0.94	0.57	HARPS-post
2457248.88822	-0.29	0.44	HARPS-post
2457249.90318	-0.29	0.32	HARPS-post
2457250.88719	-3.40	2.85	HARPS-post
2457252.91418	-0.07	0.19	HARPS-post
2457253.88513	-0.85	0.27	HARPS-post
2457255.85244	0.46	0.32	HARPS-post
2457256.89095	0.14	0.31	HARPS-post
2457257.90513	0.69	0.34	HARPS-post
2457258.78090	-0.99	0.32	HARPS-post
2457260.80343	-0.93	0.17	HARPS-post
2457263.80718	-0.69	0.24	HARPS-post
2457264.87500	0.07	0.22	HARPS-post
2457265.81632	-0.28	0.15	HARPS-post
2457268.83465	0.00	0.20	HARPS-post
2457269.83842	-0.09	0.15	HARPS-post
2457270.81249	-0.04	0.10	HARPS-post
2457273.83678	-0.12	0.17	HARPS-post
2457276.76926	-0.07	0.16	HARPS-post
2457277.70024	0.55	0.22	HARPS-post
2457291.81752	-0.78	0.14	HARPS-post
2457292.73832	1.22	0.16	HARPS-post
2457298.81091	-2.04	1.27	HARPS-post
2457299.75895	-0.81	0.16	HARPS-post
2457300.75665	-0.80	0.22	HARPS-post
2457301.63906	-0.50	0.62	HARPS-post
2457302.78662	0.07	0.28	HARPS-post
2457303.79616	0.98	0.19	HARPS-post
2457305.75384	-0.63	0.27	HARPS-post
2457306.81036	0.86	0.31	HARPS-post
2457307.70822	0.83	0.17	HARPS-post
2457308.77747	0.01	0.21	HARPS-post
2457311.73178	0.55	0.23	HARPS-post
2457312.66489	0.69	0.18	HARPS-post
2457324.71894	0.17	0.33	HARPS-post
2457325.69134	0.66	0.12	HARPS-post
2457326.66757	0.25	0.52	HARPS-post
2457327.67217	-0.83	0.24	HARPS-post
2457328.69931	0.46	0.22	HARPS-post
2457349.71104	1.09	0.18	HARPS-post
2457352.66254	1.73	0.29	HARPS-post
2457353.64474	0.87	0.10	HARPS-post
2457354.63130	0.42	0.22	HARPS-post
2457355.63176	0.28	0.25	HARPS-post
2457356.64900	0.74	0.14	HARPS-post
2457357.62002	-0.03	0.16	HARPS-post
2457364.63337	0.13	0.17	HARPS-post
2457365.64641	-0.01	0.23	HARPS-post
2457366.63289	-1.05	0.17	HARPS-post
2457367.64364	0.62	0.15	HARPS-post

Note. — Only the first 50 of 1538 RVs are displayed in this table. Use `radvel table -t rv` to save the full LaTeX table as a separate file.

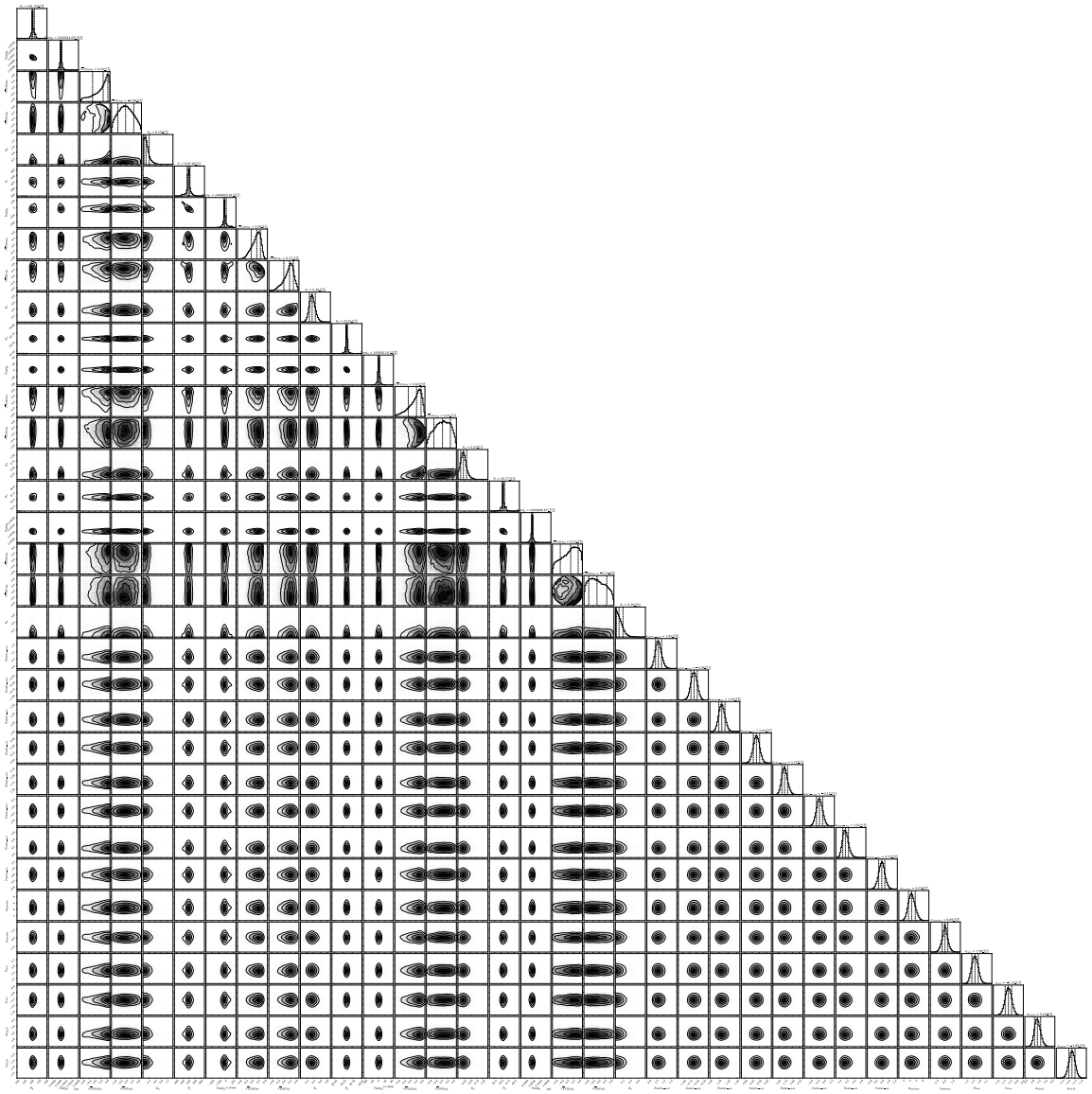

FIG. 2.— Posterior distributions for all free parameters.

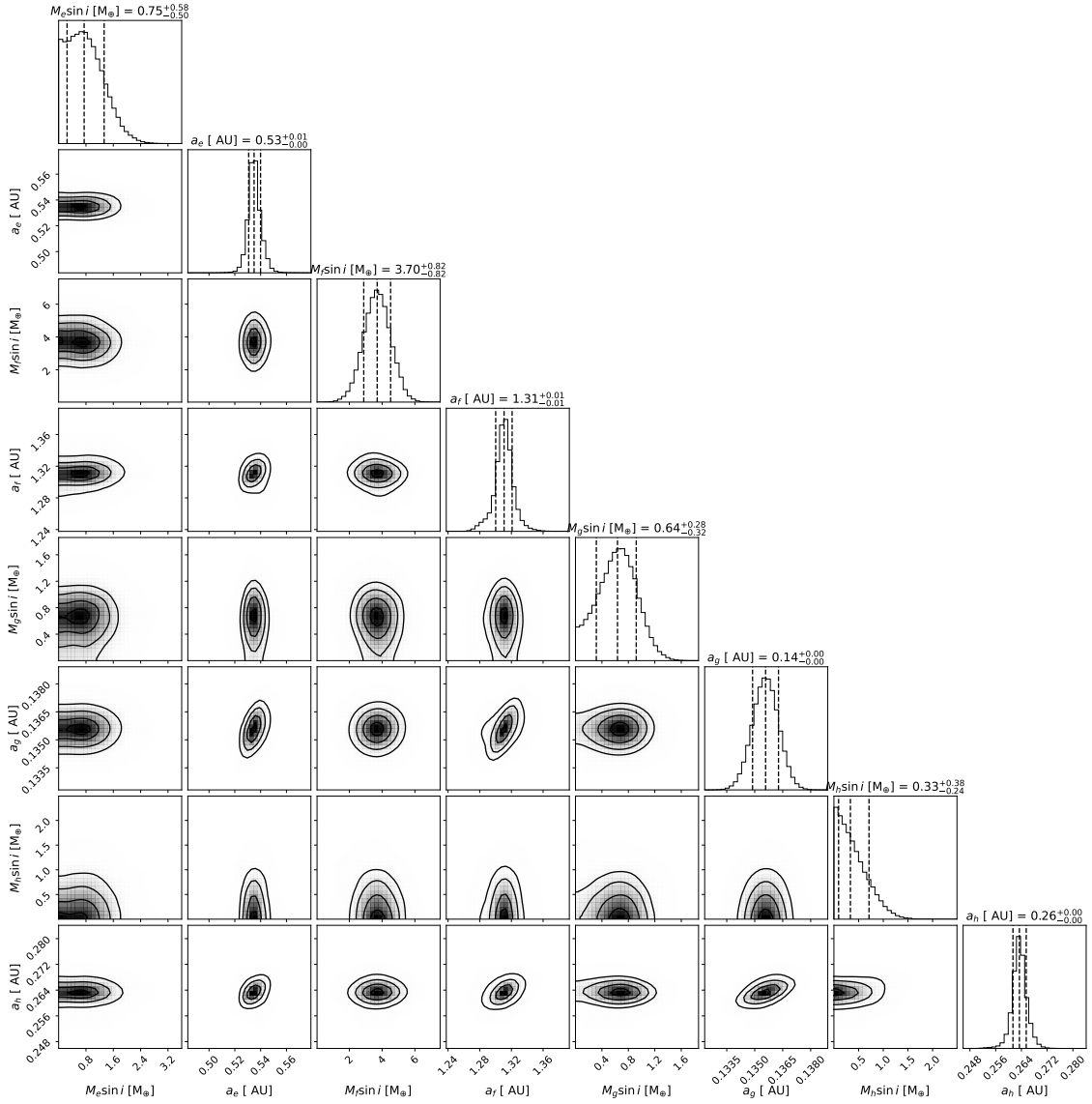

FIG. 3.— Posterior distributions for all derived parameters.