TABLE 1
Model Comparison

AICc Qualitative Comparison	Free Parameters	$N_{\rm free}$	$N_{\rm data}$	RMS	$\ln \mathcal{L}$	BIC	AICc	ΔAICc
AICc Favored Model	e_b, K_b, e_c, K_c, e_d, K_d, σ, γ	27	579	6.58	-1837.09	3818.37	3703.36	0.00
Strongly Disfavored	e_b, K_b, K_c, e_d, K_d, σ, γ	25	579	6.57	-1842.51	3816.48	3709.79	6.43
Ruled Out	K_b, e_c, K_c, e_d, K_d, σ, γ	25	579	6.65	-1847.22	3825.90	3719.22	15.86
	e_b, K_b, e_c, K_c, K_d, σ, γ	25	579	6.82	-1849.47	3830.40	3723.71	20.35
	K_b, K_c, e_d, K_d, σ, γ	23	579	6.66	-1853.31	3825.37	3727.05	23.69
	e_b, K_b, K_c, K_d, σ, γ	23	579	6.79	-1854.05	3826.84	3728.51	25.15
	K_b, e_c, K_c, K_d, σ, γ	23	579	6.90	-1863.84	3846.42	3748.10	44.74
	K_b, K_c, K_d, σ, γ	21	579	6.92	-1866.44	3838.91	3748.98	45.62
	e_b, K_b, e_c, K_c, σ, γ	22	579	8.69	-1963.98	4040.33	3946.20	242.84
	e_b, K_b, K_c, σ, γ	20	579	8.72	-1969.79	4039.24	3953.52	250.16
	K_b, e_c, K_c, σ, γ	20	579	8.73	-1973.48	4046.62	3960.90	257.54
	e_b, K_b, e_d, K_d, σ, γ	22	579	7.71	-1973.46	4059.30	3965.17	261.81
	K_b, K_c, σ, γ	18	579	8.77	-1980.51	4047.95	3970.67	267.31
	K_b, e_d, K_d, σ, γ	20	579	7.77	-1982.54	4064.74	3979.02	275.66
	e_b, K_b, K_d, σ, γ	20	579	7.98	-1983.19	4066.03	3980.31	276.95
	K_b, K_d, σ, γ	18	579	8.03	-1994.44	4075.82	3998.54	295.18
	e_b, K_b, σ, γ	17	579	9.65	-2069.90	4220.36	4147.31	443.95
	K_b, σ, γ	15	579	9.66	-2077.23	4222.30	4157.74	454.38
	e_b, K_b, e_c, K_c, e_d, K_d, γ	21	579	6.61	-2315.75	4737.51	4647.58	944.22
	e_b, K_b, e_c, K_c, K_d, γ	19	579	6.97	-2329.05	4751.40	4669.89	966.53
	e_b, K_b, K_c, e_d, K_d, γ	19	579	6.63	-2357.21	4807.71	4726.21	1022.85
	e_b, K_b, K_c, K_d, γ	17	579	6.93	-2370.04	4820.65	4747.60	1044.24
	K_b, e_c, K_c, e_d, K_d, γ	19	579	6.71	-2371.06	4835.41	4753.90	1050.54
	K_b, e_c, K_c, K_d, γ	17	579	7.09	-2395.61	4871.80	4798.75	1095.39
	K_b, K_c, e_d, K_d, γ	17	579	6.75	-2414.92	4910.41	4837.36	1134.00
	K_b, K_c, K_d, γ	15	579	7.12	-2437.94	4943.73	4879.16	1175.80
	e_b, K_b, e_c, K_c, γ	16	579	8.83	-2922.45	5919.12	5850.31	2146.95
	K_b, e_c, K_c, γ	14	579	8.87	-2963.70	5988.90	5928.58	2225.22
	e_b, K_b, K_c, γ	14	579	8.82	-2973.63	6008.74	5948.43	2245.07
	K_b, K_c, γ	12	579	8.88	-3015.38	6079.52	6027.74	2324.38
	e_c, K_c, e_d, K_d, σ, γ	22	579	21.90	-3109.12	6330.62	6236.49	2533.13
	e_b, K_b, e_d, K_d, γ	16	579	7.83	-3303.46	6681.12	6612.31	2908.95
	e_b, K_b, K_d, γ	14	579	8.16	-3306.85	6675.19	6614.88	2911.52
	K_b, e_d, K_d, γ	14	579	8.00	-3399.49	6860.48	6800.16	3096.80
	K_b, K_d, γ	12	579	8.19	-3412.82	6874.40	6822.62	3119.26
	e_c, K_c, K_d, σ, γ	20	579	26.65	-3654.83	7409.31	7323.59	3620.23
	e_c, K_c, σ, γ	17	579	27.65	-3775.76	7632.09	7559.03	3855.67
	e_b, K_b, γ	11	579	9.76	-3981.38	8005.16	7957.65	4254.29
	K_b, γ	9	579	9.74	-4055.65	8140.98	8102.04	4398.68
	K_c, e_d, K_d, σ, γ	20	579	32.43	-4484.31	9068.27	8982.55	5279.19
	K_c, K_d, σ, γ	18	579	32.79	-4530.51	9147.95	9070.66	5367.30
	e_d, K_d, σ, γ	17	579	32.81	-4540.79	9162.14	9089.09	5385.73
	K_c, σ, γ	15	579	32.98	-4565.89	9199.64	9135.07	5431.71
	K_d, σ, γ	15	579	33.15	-4631.22	9330.28	9265.72	5562.36
	σ, γ	12	579	33.76	-4725.26	9499.29	9447.51	5744.15
	e_c, K_c, e_d, K_d, γ	16	579	27.73	-26031.93	52138.08	52069.26	48365.90
	e_c, K_c, K_d, γ	14	579	27.67	-26152.41	52366.31	52306.00	48602.64
	e_c, K_c, γ	11	579	28.63	-27788.05	55618.50	55570.99	51867.63
	K_c, e_d, K_d, γ	14	579	33.75	-39596.61	79254.71	79194.40	75491.04
	e_d, K_d, γ	11	579	32.89	-46756.01	93554.42	93506.91	89803.55

TABLE 2
MCMC Posteriors

Parameter	Credible Interval	Maximum Likelihood	Units
Modified MCMC Step Parameters			
P_b	$1075.61^{+0.79}_{-0.67}$	1075.62	days
$T\mathrm{conj_b}$	$2458711.6^{+4.7}_{-3.5}$	2458711.6	BJD
$T\mathrm{peri_b}$	2458379^{+46}_{-44}	2458377	BJD
e_b	$0.0312^{+0.0071}_{-0.0073}$	0.0304	
ω_b	$-0.43^{+0.26}_{-0.25}$	−0.44	radians
K_b	$47.31^{+0.5}_{-0.46}$	47.28	m s^{-1}
P_c	2290 ± 11	2290	days
$T\mathrm{conj_c}$	2457902^{+28}_{-17}	2457903	BJD
$T\mathrm{peri_c}$	2457882^{+64}_{-58}	2457881	BJD
e_c	$0.255^{+0.057}_{-0.07}$	0.259	
ω_c	1.5 ± 0.2	1.5	radians
K_c	7.61 ± 0.45	7.64	m s^{-1}
P_d	16288^{+950}_{-340}	16428	days
$T\mathrm{conj_d}$	2451859^{+62}_{-52}	2451855	BJD
$T\mathrm{peri_d}$	2451397^{+280}_{-370}	2451380	BJD
e_d	$0.376^{+0.075}_{-0.081}$	0.377	
ω_d	$1.15^{+0.22}_{-0.21}$	1.14	radians
K_d	$11.87^{+1.0}_{-0.85}$	11.84	m s^{-1}
Orbital Parameters			
P_b	$1075.61^{+0.79}_{-0.67}$	1075.62	days
$T\mathrm{conj_b}$	$2458711.6^{+4.7}_{-3.5}$	2458711.6	BJD
$T\mathrm{peri_b}$	2458379^{+46}_{-44}	2458377	BJD
e_b	$0.0312^{+0.0071}_{-0.0073}$	0.0304	
ω_b	$-0.43^{+0.26}_{-0.25}$	−0.44	radians
K_b	$47.31^{+0.5}_{-0.46}$	47.28	m s^{-1}
P_c	2290 ± 11	2290	days
$T\mathrm{conj_c}$	2457902^{+28}_{-17}	2457903	BJD
$T\mathrm{peri_c}$	2457882^{+64}_{-58}	2457881	BJD
e_c	$0.255^{+0.057}_{-0.07}$	0.259	
ω_c	1.5 ± 0.2	1.5	radians
K_c	7.61 ± 0.45	7.64	m s^{-1}
P_d	16288^{+950}_{-340}	16428	days
$T\mathrm{conj_d}$	2451859^{+62}_{-52}	2451855	BJD
$T\mathrm{peri_d}$	2451397^{+280}_{-370}	2451380	BJD
e_d	$0.376^{+0.075}_{-0.081}$	0.377	
ω_d	$1.15^{+0.22}_{-0.21}$	1.14	radians
K_d	$11.87^{+1.0}_{-0.85}$	11.84	m s^{-1}
Other Parameters			
$\gamma_{\mathrm{Hamilton}}$	$-1.98^{+1.0}_{-0.94}$	−2.07	m s−1
γ_{HRS}	$26.9^{+1.4}_{-1.3}$	27.0	m s−1
γ_{HJS}	11.8 ± 1.6	11.7	m s−1
$\gamma_{\mathrm{HIRES-post}}$	$7.8^{+1.3}_{-1.1}$	7.8	m s−1
γ_{ELODIE}	$11212.9^{+2.3}_{-2.2}$	11212.7	m s−1
γ_{APF}	$25.2^{+1.5}_{-1.3}$	25.1	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}
$\sigma_{\mathrm{Hamilton}}$	$5.29^{+0.48}_{-0.44}$	5.13	m s^{-1}
σ_{HRS}	$5.33^{+0.78}_{-0.71}$	5.15	m s^{-1}
σ_{HJS}	$5.1^{+1.5}_{-1.4}$	4.7	m s^{-1}
$\sigma_{\mathrm{HIRES-post}}$	$2.78^{+0.37}_{-0.31}$	2.62	m s^{-1}
σ_{ELODIE}	$8.65^{+0.95}_{-1.3}$	9.2	m s^{-1}
σ_{APF}	$3.44^{+0.34}_{-0.3}$	3.34	m s^{-1}

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Reference epoch for γ,$\dot{\gamma}$,$\ddot{\gamma}$: 2452938.3159459997

TABLE 3
Derived Posteriors

Parameter	Credible Interval	Maximum Likelihood	Units
a_b	$2.06^{+0.032}_{-0.033}$	2.036	AU
$M_b \sin i$	2.395 ± 0.079	2.333	M_{Jup}
a_c	$3.407^{+0.054}_{-0.055}$	3.369	AU
$M_c \sin i$	$0.478^{+0.031}_{-0.03}$	0.448	M_{Jup}
a_d	$12.64^{+0.49}_{-0.34}$	13.68	AU
$M_d \sin i$	$1.38^{+0.16}_{-0.13}$	1.39	M_{Jup}

TABLE 4
Summary of Priors

e_b constrained to be < 0.99
e_c constrained to be < 0.99
e_d constrained to be < 0.99
K constrained to be > 0
Bounded prior: $0.0 < \sigma_{\rm ELODIE} < 10.0$
Bounded prior: $0.0 < \sigma_{\rm HJS} < 10.0$
Bounded prior: $0.0 < \sigma_{\rm HRS} < 10.0$
Bounded prior: $0.0 < \sigma_{\rm Hamilton} < 10.0$
Bounded prior: $0.0 < \sigma_{\rm HIRES-post} < 10.0$
Bounded prior: $0.0 < \sigma_{\rm APF} < 10.0$

TABLE 5
Final Convergence Criterion

Criterion	Final Value
minAfactor	40.200
maxArchange	0.012
maxGR	1.008
minTz	3392.031

TABLE 6
Radial Velocities

Time (JD)	RV (m s^{-1})	RV Unc. (m s^{-1})	Inst.
2450150.54930	11203.00	7.00	ELODIE
2450207.36480	11175.00	7.00	ELODIE
2450477.60020	11164.00	7.00	ELODIE
2450532.42920	11190.00	2.86	ELODIE
2450557.42350	11196.00	7.00	ELODIE
2450582.35570	11202.00	8.00	ELODIE
2450767.70480	11277.00	7.00	ELODIE
2450821.62420	11273.00	7.00	ELODIE
2450826.64855	11275.50	4.95	ELODIE
2450884.45730	11266.00	7.00	ELODIE
2450911.45005	11272.00	4.95	ELODIE
2450938.35257	11283.30	5.98	ELODIE
2450970.34600	11274.00	7.00	ELODIE
2451174.67280	11224.00	8.00	ELODIE
2451234.48570	11215.00	7.00	ELODIE
2451266.41640	11187.00	8.00	ELODIE
2451324.36630	11185.00	7.00	ELODIE
2451508.69870	11176.00	7.00	ELODIE
2451542.63850	11177.00	7.00	ELODIE
2451587.56440	11190.00	7.00	ELODIE
2451621.44180	11180.00	7.00	ELODIE
2451655.40280	11190.00	7.00	ELODIE
2451690.39780	11194.00	7.00	ELODIE
2451883.70670	11270.00	7.00	ELODIE
2451909.67710	11268.00	8.00	ELODIE
2451950.64790	11270.00	7.00	ELODIE
2452038.42140	11264.00	8.00	ELODIE
2452078.35650	11254.00	7.00	ELODIE
2452249.68300	11231.00	9.00	ELODIE
2452355.50930	11191.00	8.00	ELODIE
2452356.49970	11191.00	8.00	ELODIE
2452614.71200	11164.00	9.00	ELODIE
2452678.57390	11181.00	7.00	ELODIE
2452718.52150	11189.00	7.00	ELODIE
2452747.40110	11188.00	7.00	ELODIE
2452751.40080	11192.00	7.00	ELODIE
2451010.62898	40.50	6.20	HJS
2451212.97474	-10.00	4.50	HJS
2451240.81250	-13.40	4.60	HJS
2451274.78993	-20.50	4.60	HJS
2451326.70558	-36.20	4.90	HJS
2451504.95996	-51.40	5.00	HJS
2451530.01978	-38.70	5.10	HJS
2451555.94972	-27.20	4.80	HJS
2451655.74023	-12.40	4.70	HJS
2451686.75156	-20.50	6.00	HJS
2451750.60418	1.40	5.10	HJS
2451861.01895	42.00	4.90	HJS
2451917.93086	36.50	4.60	HJS
2451987.85527	42.00	6.20	HJS

Note. — Only the first 50 of 579 RVs are displayed in this table. Use `radvel table -t rv` to save the full LaTeX table as a separate file.

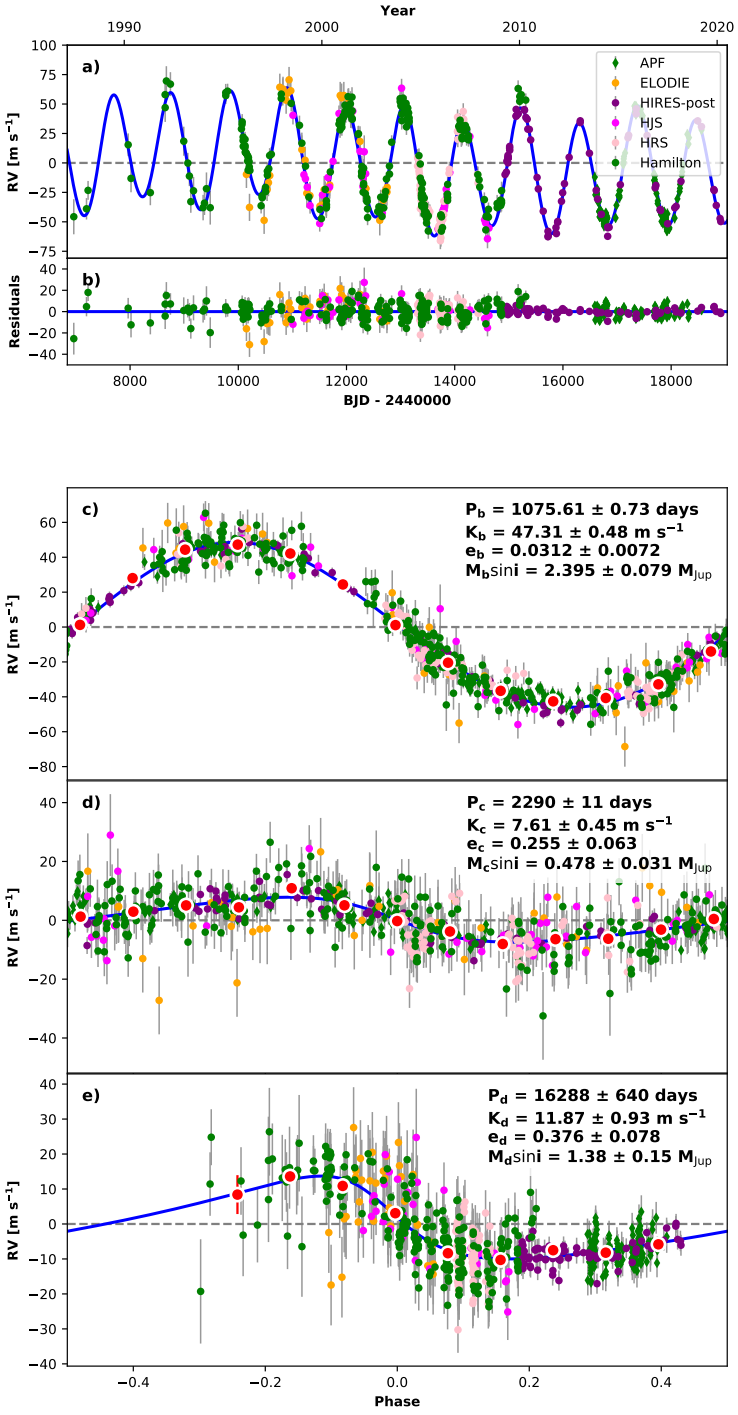

FIG. 1.— Best-fit 3-planet Keplerian orbital model for 47UMa. The maximum likelihood model is plotted while the orbital parameters listed in Table 2 are the median values of the posterior distributions. The thin blue line is the best fit 3-planet model. We add in quadrature the RV jitter term(s) listed in Table 2 with the measurement uncertainties for all RVs. **b)** Residuals to the best fit 3-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.

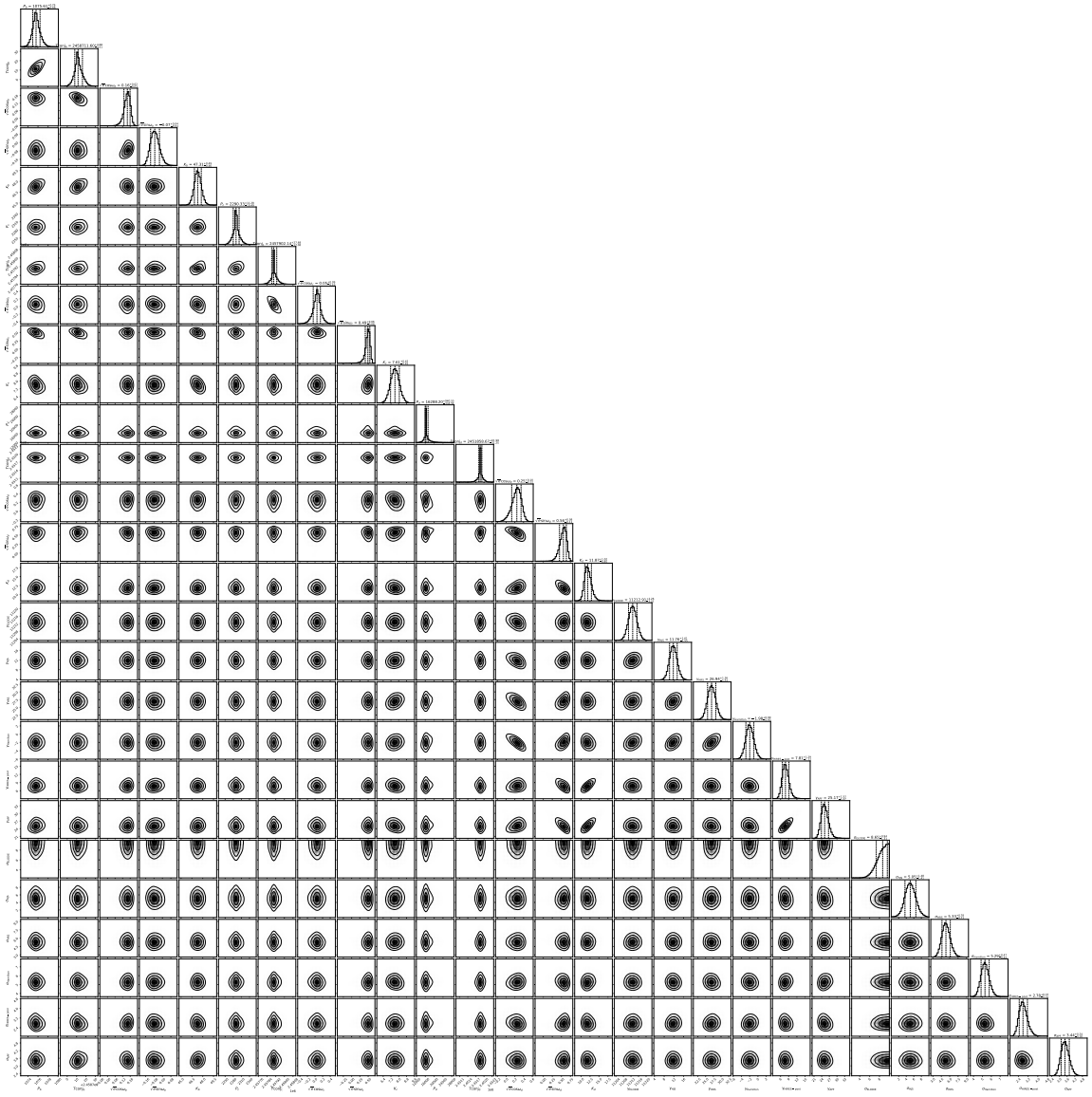

FIG. 2.— Posterior distributions for all free parameters.

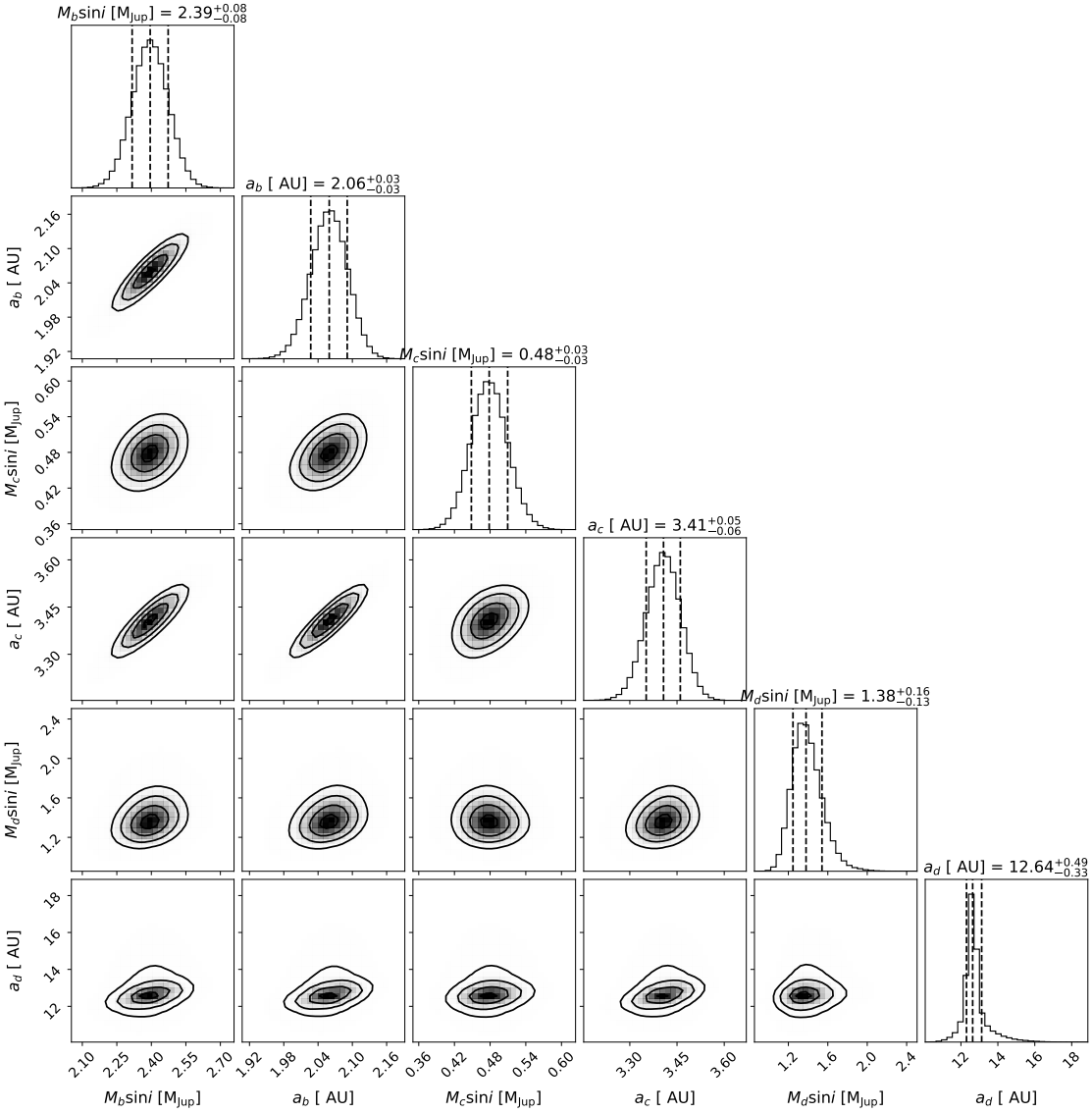

FIG. 3.— Posterior distributions for all derived parameters.