

run	$M_{\text{tar}}$ [ $M_E$ ]	$M_{\text{imp}}$ [ $M_E$ ]	$\theta$ [ $^\circ$ ]	$v_{\text{imp}}$ [ $v_{\text{esc}}$ ]	impactor [wt% Fe/SiO <sub>2</sub> /H <sub>2</sub> O]	$\delta f_T$	$f_T$	$M_{\text{moon}}$ [ $M_L$ ]	$L_D$ [ $L_{E-M}$ ]	$M_D$ [ $M_L$ ]			$L_{\text{bound}}$ [ $L_{E-M}$ ]	$L_{\text{imp}}$ [ $L_{E-M}$ ]
										SiO <sub>2</sub>	Fe	H <sub>2</sub> O		
cA01	0.90	0.10	30.0	1.35		-18%	77%	0.03	0.02	0.12	0.00	0.00	0.67	1.04
cA02	0.90	0.10	32.5	1.30		-26%	69%	0.05	0.02	0.13	0.01	0.00	0.70	1.07
cA03	0.90	0.10	32.5	1.50		-35%	61%	0.10	0.03	0.18	0.02	0.00	0.57	1.24
cA04	0.90	0.10	35.0	1.30		-36%	60%	0.16	0.05	0.23	0.06	0.00	0.68	1.14
cA05	0.90	0.10	35.0	1.35	30 / 70 / 0	-36%	61%	0.20	0.06	0.26	0.07	0.00	0.64	1.19
cA06	0.90	0.10	35.0	2.00		-31%	68%	0.02	0.01	0.09	0.01	0.00	0.33	1.76
cA07	0.90	0.10	45.0	1.00		-49%	46%	0.53	0.14	0.81	0.00	0.00	0.95	1.08
<b>cA08</b>	<b>0.90</b>	<b>0.10</b>	<b>48.0</b>	<b>1.00</b>		<b>-66%</b>	<b>31%</b>	<b>1.50</b>	<b>0.28</b>	<b>1.27</b>	<b>0.00</b>	<b>0.00</b>	<b>0.97</b>	<b>1.14</b>
cA09	0.90	0.10	50.0	1.00		-66%	32%	0.68	0.15	0.80	0.02	0.00	0.94	1.18
cA10	0.90	0.10	53.0	1.00		-75%	23%	0.89	0.21	0.96	0.15	0.00	0.96	1.23
cB01	0.90	0.15	32.5	1.15		-41%	53%	0.10	0.03	0.23	0.00	0.00	1.06	1.49
cB02	0.90	0.15	35.0	1.15	30 / 70 / 0	-35%	58%	0.23	0.06	0.37	0.01	0.00	1.10	1.59
cB03	0.90	0.15	35.0	1.20		-33%	60%	0.53	0.15	0.86	0.05	0.00	1.06	1.66
<b>cB04</b>	<b>0.90</b>	<b>0.15</b>	<b>40.0</b>	<b>1.10</b>		<b>-41%</b>	<b>53%</b>	<b>1.20</b>	<b>0.27</b>	<b>1.41</b>	<b>0.04</b>	<b>0.00</b>	<b>1.16</b>	<b>1.71</b>
cC01	0.90	0.20	30.0	1.30		-34%	57%	0.52	0.16	1.00	0.06	0.00	1.20	2.18
cC02	0.90	0.20	32.5	1.20		-30%	61%	0.90	0.27	1.63	0.03	0.00	1.40	2.16
<b>cC03</b>	<b>0.90</b>	<b>0.20</b>	<b>32.5</b>	<b>1.25</b>		<b>-37%</b>	<b>54%</b>	<b>1.01</b>	<b>0.27</b>	<b>1.51</b>	<b>0.06</b>	<b>0.00</b>	<b>1.27</b>	<b>2.25</b>
cC04	0.90	0.20	32.5	1.30	30 / 70 / 0	-32%	58%	1.12	0.27	1.39	0.14	0.00	1.30	2.34
cC05	0.90	0.20	35.0	1.15		-36%	54%	1.32	0.35	1.98	0.03	0.00	1.46	2.21
<b>cC06</b>	<b>0.90</b>	<b>0.20</b>	<b>35.0</b>	<b>1.20</b>		<b>-35%</b>	<b>56%</b>	<b>1.24</b>	<b>0.29</b>	<b>1.60</b>	<b>0.01</b>	<b>0.00</b>	<b>1.28</b>	<b>2.31</b>
cC07	0.90	0.20	45.0	1.00		-54%	39%	1.30	0.31	1.61	0.06	0.00	1.74	2.37
cC08	0.90	0.20	50.0	1.00		-76%	20%	3.16	0.65	2.84	0.37	0.00	2.02	2.57
fA01	0.90	0.20	30.0	1.30		-28%	64%	0.95	0.29	1.50	0.37	0.00	1.40	2.16
fA02	0.90	0.20	35.0	1.20		-28%	63%	1.18	0.26	1.20	0.13	0.00	1.55	2.28
fA03	0.90	0.20	32.5	1.25	50 / 50 / 0	-31%	62%	1.16	0.29	1.41	0.25	0.00	1.48	2.23
fA04	0.90	0.20	35.0	1.25		-24%	67%	1.33	0.29	1.22	0.26	0.00	1.57	2.38
fA05	0.90	0.20	40.0	1.10		-33%	59%	1.17	0.29	1.56	0.09	0.00	1.68	2.34
fB01	0.90	0.10	30.0	1.35		-23%	74%	0.03	0.02	0.08	0.05	0.00	0.74	1.01
fB02	0.90	0.10	35.0	1.30		-28%	69%	0.38	0.11	0.37	0.30	0.00	0.78	1.12
fB03	0.90	0.10	40.0	1.10		-25%	73%	0.31	0.10	0.46	0.16	0.00	0.85	1.06
fB04	0.90	0.10	45.0	1.00	70 / 30 / 0	-19%	78%	0.39	0.11	0.59	0.12	0.00	0.89	1.06
fB05	0.90	0.10	48.0	1.00		-33%	64%	0.72	0.18	0.51	0.54	0.00	0.97	1.12
fB06	0.90	0.20	30.0	1.30		-19%	75%	1.48	0.37	1.40	0.68	0.00	1.47	2.13
fB07	0.90	0.20	30.0	1.35		-18%	76%	1.63	0.38	1.38	0.71	0.00	1.48	2.21

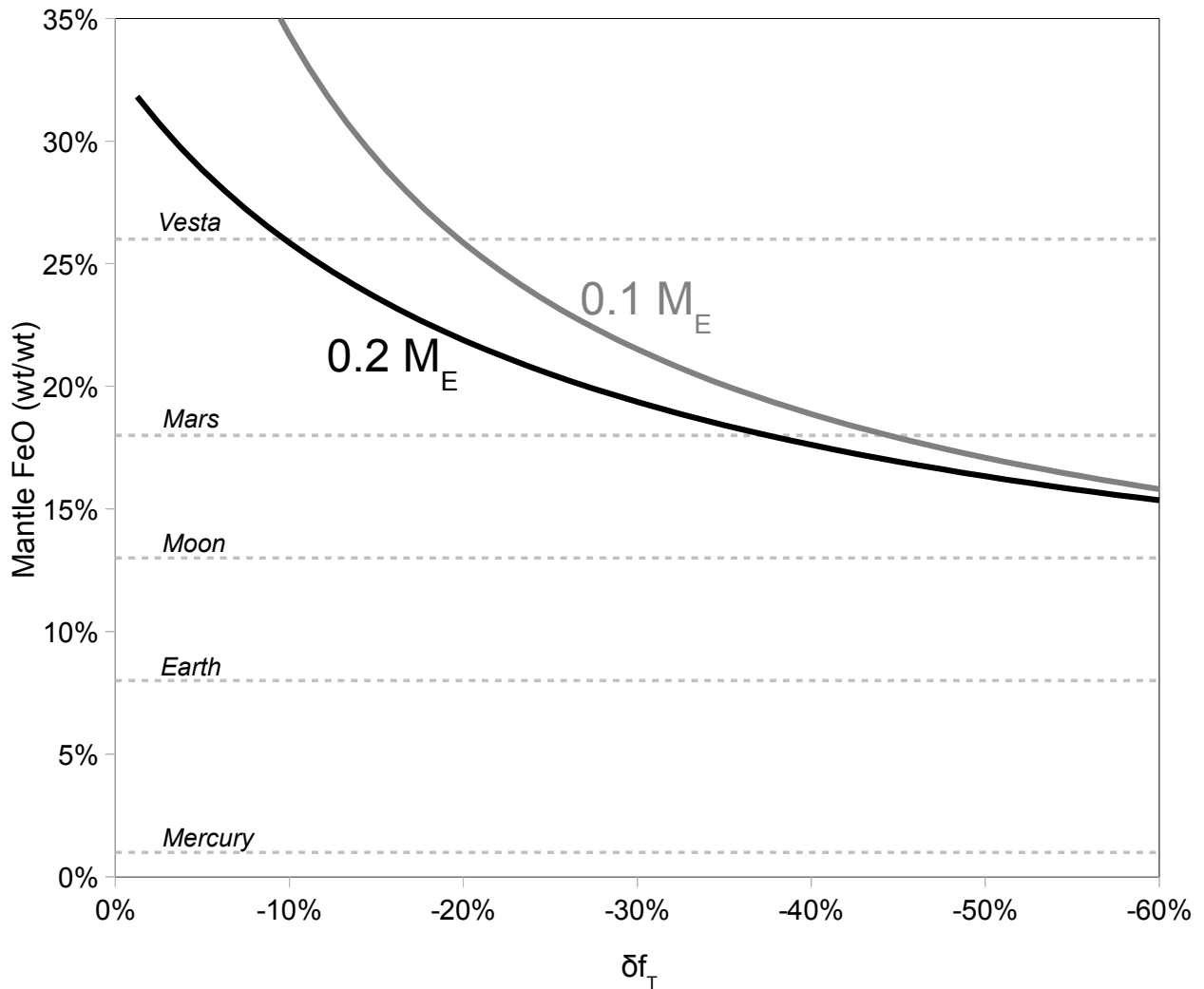
SOM Table 1.: Simulation results. Note that  $L_D$  and  $M_{\text{moon}}$  estimated according to (Kokubo 2000) considers all disk material, including any present iron and water ice. Successful simulations with matching satellite mass, iron depletion and bound angular momentum are printed in bold face.

run	$M_{\text{tar}}$ [ $M_E$ ]	$M_{\text{imp}}$ [ $M_E$ ]	$\theta$ [ $^\circ$ ]	$v_{\text{imp}}$ [ $v_{\text{esc}}$ ]	impactor [wt% Fe/SiO <sub>2</sub> /H <sub>2</sub> O]	$\delta f_T$	$f_T$	$M_{\text{moon}}$ [ $M_L$ ]	$L_D$ [ $L_{E-M}$ ]	$M_D$ [ $M_L$ ] SiO <sub>2</sub> Fe H <sub>2</sub> O			$L_{\text{bound}}$ [ $L_{E-M}$ ]	$L_{\text{imp}}$ [ $L_{E-M}$ ]
iA01	0.90	0.20	15.0	1.50		-6%	84%	-0.13	0.02	0.21	0.00	0.08	0.75	1.35
iA02	0.90	0.20	25.0	1.30		-26%	66%	0.17	0.09	0.47	0.00	0.19	1.12	1.92
iA03	0.90	0.20	25.0	1.35		-23%	69%	0.15	0.08	0.41	0.00	0.18	1.08	1.99
iA04	0.90	0.20	25.0	1.50		-16%	76%	0.07	0.07	0.47	0.00	0.16	0.92	2.21
iA05	0.90	0.20	25.0	1.75		-24%	71%	0.17	0.07	0.38	0.01	0.11	0.60	2.58
iA06	0.90	0.20	30.0	1.00		-20%	71%	0.20	0.10	0.20	0.00	0.52	1.28	1.74
iA07	0.90	0.20	30.0	1.15		-52%	43%	0.76	0.21	0.62	0.00	0.65	1.36	2.01
iA08	0.90	0.20	30.0	1.20		-62%	34%	0.91	0.23	0.75	0.00	0.59	1.35	2.09
iA09	0.90	0.20	30.0	1.25		-20%	72%	0.36	0.11	0.33	0.00	0.35	1.15	2.18
iA10	0.90	0.20	30.0	1.30		-10%	81%	0.60	0.17	0.73	0.00	0.33	1.12	2.27
iA11	0.90	0.20	30.0	1.32		-14%	78%	0.26	0.09	0.26	0.00	0.37	1.00	2.30
iA12	0.90	0.20	30.0	1.35		-10%	82%	0.32	0.11	0.45	0.00	0.30	0.96	2.36
iA13	0.90	0.20	32.5	1.25		-15%	77%	0.71	0.19	0.56	0.00	0.56	1.01	2.34
iA14	0.90	0.20	32.5	1.30	15 / 35 / 50	-23%	70%	1.08	0.23	0.79	0.00	0.36	1.09	2.44
iA15	0.90	0.20	32.5	1.35		-54%	42%	2.19	0.45	1.50	0.26	0.48	1.06	2.53
iA16	0.90	0.20	35.0	1.00		-60%	36%	1.35	0.32	0.70	0.00	1.03	1.51	2.00
iA17	0.90	0.20	35.0	1.10		-30%	63%	1.61	0.37	0.92	0.00	1.07	1.42	2.20
iA18	0.90	0.20	35.0	1.15		-60%	36%	3.03	0.59	1.50	0.00	1.23	1.57	2.30
iA19	0.90	0.20	35.0	1.20		-60%	36%	2.89	0.52	1.23	0.00	0.95	1.55	2.40
iA20	0.90	0.20	35.0	1.25		-56%	40%	2.26	0.50	1.73	0.16	0.74	1.23	2.50
iA21	0.90	0.20	35.0	1.30		3%	98%	-0.01	0.00	0.02	0.00	0.02	0.48	2.60
iA22	0.90	0.20	40.0	1.15		-70%	27%	8.14	1.39	2.80	0.80	1.97	2.03	2.58
iA23	0.90	0.20	45.0	1.00		-67%	30%	2.04	0.49	1.28	0.01	1.39	1.71	2.47
iA24	0.90	0.20	45.0	1.15		-61%	37%	0.09	0.04	0.09	0.00	0.19	1.14	2.84
iA25	0.90	0.20	45.0	1.20		-1%	97%	0.01	0.01	0.03	0.00	0.05	0.35	2.96
iA26	0.90	0.20	45.0	1.25		-10%	89%	0.01	0.01	0.03	0.00	0.04	0.35	3.08
iA27	0.90	0.20	60.0	1.00		-73%	24%	0.96	0.28	0.75	0.01	0.99	1.41	3.02
iA28	0.90	0.20	60.0	1.15		0%	100%	0.00	0.00	0.01	0.00	0.02	0.16	3.48

SOM Table 1. (continued)

## Impactor Mantle FeO

vs. target material depletion in disk



SOM Figure 1: The FeO content of the impactor's mantle (in wt%), if the Moon's content of 13wt% FeO is a mixture of Earth mantle (fixed at 8wt% FeO) and impactor mantle material, for an impactor of 0.2 (black line) and 0.1 (gray line) Earth masses. Note that an impactor with FeO = 18wt% (equal to Mars) yields a  $\delta f_T$  of -35% to -40%, a typical outcome of simulations as presented here. The mantle compositions of Mercury, Earth, Moon, Mars and Vesta are shown for comparison (Richter et al., 2006).