Appendix A

Summary of Eclipse Observations

This appendix contains a summary of all the eclipse data described in Chapter 3. For each event, all the relavant parameters are listed.

Table A.1. Summary of Eclipse Observations

Obs. #[a]	Phase[b]	b (R_{Io})[c]	Location[d]	W_{D_2} (mÅ)	W_{D_1} (mÅ)	N (cm^{-2})	T (K)[e]
1.0	0.2	2.5	L,N	14 ± 2	6 ± 2	$7 \pm 1 \times 10^{10}$	*thin*
1.1	0.2	2.4	L,N	9 ± 2	17 ± 4	$6 \pm 2 \times 10^{10}$	*thin*
1.2	0.3	2.2	L,N	13 ± 4	9 ± 2	$1.3^{+0.5}_{-0.3} \times 10^{11}$	*undetermined*
1.3	0.3	2.2	L,N	20 ± 4	25 ± 2	$2 \pm 1 \times 10^{11}$	*undetermined*
1.4	0.4	2.1	L,N	24 ± 4	26 ± 2	$2 \pm 1 \times 10^{11}$	*undetermined*
1.5	0.5	2.1	N	25 ± 4	17 ± 5	$2.6^{+1.5}_{-0.8} \times 10^{11}$	< 1200
2.0	-1.9	7.7	A,L,N	3.4 ± 0.5	3.3 ± 0.5	$2.2 \pm 0.3 \times 10^{10}$	*thin*
2.1	-1.5	6.6	A,L,N	6.2 ± 0.5	3.9 ± 0.4	$3.4 \pm 0.3 \times 10^{10}$	*thin*
2.2	-1.1	5.5	A,L,N	10.0 ± 0.6	4.2 ± 0.5	$5.0 \pm 0.3 \times 10^{10}$	*thin*
2.3	-0.6	4.6	A,L,N	13.6 ± 0.6	6.8 ± 0.5	$7.2 \pm 0.3 \times 10^{10}$	*thin*
2.4	-0.2	3.7	A,L,N	22.2 ± 0.6	10.8 ± 0.5	$1.18 \pm 0.06 \times 10^{11}$	*undetermined*
2.5	0.3	3.2	A,L,N	28.4 ± 0.6	16.9 ± 0.4	$2.04 \pm 0.12 \times 10^{11}$	900^{+700}_{-400}
2.6	0.7	3.2	J,T,N	28.6 ± 0.6	16.1 ± 0.4	$1.86 \pm 0.11 \times 10^{11}$	2000^{+2200}_{-900}
2.7	1.2	3.8	J,T,N	20.2 ± 0.6	11.2 ± 0.5	$1.27^{+0.12}_{0.10} \times 10^{11}$	1100^{+4000}_{-800}
2.8	1.6	4.6	J,T,N	12.9 ± 0.6	6.5 ± 0.4	$6.7^{+0.9}_{-0.2} \times 10^{10}$	*undetermined*
2.9	2.1	5.4	J,T,N	9.1 ± 0.6	5.4 ± 0.4	$5.1 \pm 0.3 \times 10^{10}$	*thin*
2.10	2.5	6.5	J,T,N	6.2 ± 0.6	2.4 ± 0.5	$3.0 \pm 0.3 \times 10^{10}$	*thin*
2.11	2.9	7.6	J,T,N	3.3 ± 0.5	1.1 ± 0.4	$1.6 \pm 0.2 \times 10^{10}$	*thin*
2.12	3.3	8.7	J,T,N	3.2 ± 0.6	0.2 ± 0.4	$1.7^{\pm}0.3 \times 10^{10}$	*thin*
3.0	-1.2	> 10	A,S	1.0 ± 0.4	1.4 ± 0.4	$6.7 \pm 2.4 \times 10^{9}$	*thin*
3.1	-1.1	> 10	A,S	1.7 ± 0.4	2.0 ± 0.4	$1.1 \pm 0.2 \times 10^{10}$	*thin*
3.2	-0.9	8.1	A,S	2.0 ± 0.4	1.8 ± 0.4	$1.2 \pm 0.2 \times 10^{10}$	*thin*
3.3	-0.7	7.2	A,S	1.4 ± 0.4	2.0 ± 0.4	$1.0 \pm 0.2 \times 10^{10}$	*thin*
3.4	-0.6	6.4	A,S	4.6 ± 0.5	2.4 ± 0.4	$2.4 \pm 0.2 \times 10^{10}$	*thin*
3.5	-0.4	5.5	A,S	6.1 ± 0.6	3.0 ± 0.4	$3.1 \pm 0.3 \times 10^{10}$	*thin*
3.6	-0.3	4.7	A,S	8.0 ± 0.5	3.8 ± 0.4	$4.1 \pm 0.3 \times 10^{10}$	*thin*
3.7	-0.1	3.8	A,S	11.2 ± 0.5	6.0 ± 0.5	$6.5^{+1.2}_{-0.8} \times 10^{10}$	*undetermined*
3.8	0.0	3.0	A,S	18.8 ± 0.5	10.6 ± 0.5	$1.20^{+0.13}_{-.11} \times 10^{11}$	700^{+2700}_{-500}
3.9	0.1	2.3	A,S	34.8 ± 0.7	21.3 ± 0.6	$2.69^{+0.18}_{-0.17} \times 10^{11}$	1100^{+600}_{-400}
3.10	0.3	1.8	A,S	47.2 ± 0.5	32.0 ± 0.5	$4.66^{+0.18}_{-0.17} \times 10^{11}$	1100 ± 200
3.11	0.4	1.5	A,S	65.9 ± 0.8	49.4 ± 0.7	$8.69^{+0.43}_{-0.40} \times 10^{11}$	1700 ± 200
3.12	0.6	1.5	J,S	74.2 ± 0.6	55.3 ± 0.6	$9.72^{+0.37}_{-0.35} \times 10^{11}$	2300 ± 200

Table A.1 (cont'd)

Obs. #[a]	Phase[b]	b (R_{Io})[c]	Location[d]	W_{D_2} (mÅ)	W_{D_1} (mÅ)	N (cm^{-2})	T (K)[e]
3.13	0.7	1.9	J,S	61.7 ± 0.5	44.0 ± 0.5	$7.02^{+0.23}_{-0.22} \times 10^{11}$	1800^{+200}_{-100}
3.14	0.9	2.4	J,S	47.0 ± 0.5	29.9 ± 0.5	$4.00^{+0.16}_{-0.15} \times 10^{11}$	1800^{+400}_{-300}
3.15	1.0	3.1	J,S	30.0 ± 0.5	17.5 ± 0.4	$2.09^{+0.12}_{-0.11} \times 10^{11}$	1300^{+900}_{-500}
3.16	1.2	3.9	J,S	20.5 ± 0.5	10.4 ± 0.4	$1.08^{+0.10}_{-0.03} \times 10^{11}$	$> 3 \times 10^3$
3.17	1.4	5.5	J,S	9.9 ± 0.5	4.9 ± 0.4	$5.2 \pm 0.3 \times 10^{10}$	*thin*
3.18	1.6	6.3	J,S	6.2 ± 0.5	3.3 ± 0.4	$3.3 \pm 0.3 \times 10^{10}$	*thin*
3.19	1.7	7.1	J,S	5.1 ± 0.6	2.4 ± 0.5	$2.6 \pm 0.3 \times 10^{10}$	*thin*
3.20	1.9	7.9	J,S	4.4 ± 0.6	2.4 ± 0.4	$2.3 \pm 0.3 \times 10^{10}$	*thin*
3.21	2.0	> 10	J,S	3.9 ± 0.5	2.2 ± 0.5	$2.1 \pm 0.3 \times 10^{10}$	*thin*
4.0	-0.7	5.0	A,L,N	9.3 ± 1.5	2.4 ± 1.0	$4.0 \pm 0.6 \times 10^{10}$	*thin*
4.1	-0.2	3.1	A,L,N	19.9 ± 1.6	9.3 ± 1.1	$1.03^{+0.10}_{-0.06} \times 10^{11}$	*undetermined*
4.2	0.0	2.2	A,L,N	36.0 ± 2.5	14.6 ± 1.7	$1.76^{+.25}_{-.11} \times 10^{11}$	*undetermined*
4.3	0.3	1.5	A,L,N	55.5 ± 3.2	34.5 ± 2.2	$4.48^{+0.79}_{-0.65} \times 10^{11}$	3300^{+5400}_{-1700}
4.4	0.5	1.2	N	73.0 ± 4.0	52.4 ± 3.1	$8.5^{+2.1}_{-1.4} \times 10^{11}$	2600^{+1700}_{-1000}
4.5	0.7	1.4	J,T,N	70.7 ± 4.0	53.3 ± 3.1	$9.6^{+2.7}_{-1.7} \times 10^{11}$	2000^{+1100}_{-700}
4.6	0.9	2.0	J,T,N	55.9 ± 3.0	36.1 ± 2.1	$4.94^{+0.84}_{-0.68} \times 10^{11}$	2400^{+2600}_{-1100}
4.7	1.2	2.9	J,T,N	31.8 ± 1.9	17.2 ± 1.3	$1.89^{+0.34}_{-0.18} \times 10^{11}$	$> 10^3$
4.8	1.4	3.8	J,T,N	19.2 ± 1.5	11.5 ± 1.3	$1.43^{+0.43}_{-0.32} \times 10^{11}$	$< 10^4$
4.9	1.6	4.8	J,T,N	13.8 ± 1.3	8.3 ± 1.2	$1.02^{+0.60}_{-0.28} \times 10^{11}$	*undetermined*
4.10	1.8	5.7	J,T,N	10.5 ± 1.1	3.5 ± 0.9	$5.0 \pm 0.6 \times 10^{10}$	*thin*
4.11	2.1	6.6	J,T,N	7.9 ± 0.9	5.4 ± 0.9	$4.5 \pm 0.5 \times 10^{10}$	*thin*
4.12	2.3	7.6	J,T,N	9.4 ± 1.1	2.2 ± 1.0	$4.3 \pm 0.6 \times 10^{10}$	*thin*
4.13	2.5	8.5	J,T,N	3.6 ± 0.9	3.6 ± 1.1	$2.1 \pm 0.6 \times 10^{10}$	*thin*
5.0	-3.0	5.5	A,N	13.2 ± 2.3	5.2 ± 1.5	$6.4 \pm 1.0 \times 10^{10}$	*thin*
5.1	-2.4	4.7	A,N	11.6 ± 2.1	5.4 ± 1.9	$6.0 \pm 1.2 \times 10^{10}$	*thin*
5.2	-1.7	3.8	A,N	17.4 ± 2.5	10.1 ± 1.8	$1.20^{+0.63}_{-0.34} \times 10^{11}$	*undetermined*
5.3	-1.1	3.1	A,N	23.6 ± 2.1	10.9 ± 1.7	$1.21^{+0.19}_{-0.10} \times 10^{11}$	$> 10^3$
5.4	-0.5	2.6	A,N	35.8 ± 2.4	22.4 ± 2.0	$2.91^{+0.74}_{-0.56} \times 10^{11}$	900^{+3800}_{-700}
5.5	0.1	2.2	A,N	40.6 ± 2.6	20.8 ± 1.9	$2.26^{+0.54}_{-0.15} \times 10^{11}$	$> 3 \times 10^3$
5.6	0.7	2.1	J,N	42.5 ± 2.7	26.9 ± 2.1	$3.55^{+0.74}_{-0.61} \times 10^{11}$	1400^{+3300}_{-900}
5.7	1.2	2.4	J,N	43.4 ± 2.5	22.7 ± 2.0	$2.43^{+0.49}_{-0.07} \times 10^{11}$	$> 3 \times 10^3$
5.8	1.8	2.9	J,N	35.4 ± 2.3	17.0 ± 1.8	$1.89 \pm 0.40 \times 10^{11}$	$> 8 \times 10^3$

Table A.1 (cont'd)

Obs. #[a]	Phase[b]	b (R_{Io})[c]	Location[d]	W_{D_2} (mÅ)	W_{D_1} (mÅ)	N (cm^{-2})	T (K)[e]
5.9	2.4	3.4	J,N	25.9 ± 2.0	13.4 ± 1.6	$1.41^{+0.40}_{-0.15} \times 10^{11}$	*undetermined*
5.10	3.0	4.1	J,N	22.0 ± 1.9	10.5 ± 1.7	$1.16^{+0.23}_{-0.25} \times 10^{11}$	$> 10^3$
5.11	3.6	4.9	J,N	17.0 ± 1.6	9.8 ± 1.6	$1.15^{+0.49}_{-0.30} \times 10^{11}$	*undetermined*
5.12	4.2	5.6	J,N	15.0 ± 1.7	6.0 ± 1.6	$7.6^{\pm}1.0 \times 10^{10}$	*thin*
6.0	-0.5	5.7	A,S	3.2 ± 1.9	3.9 ± 1.7	$2.2 \pm 1.0 \times 10^{10}$	*thin*
6.1	-0.3	4.9	A,S	7.4 ± 2.0	5.3 ± 2.3	$4.1 \pm 1.3 \times 10^{10}$	*thin*
6.2	-0.2	3.9	A,S	14.8 ± 2.3	5.6 ± 1.7	$7.2 \pm 1.1 \times 10^{10}$	*thin*
6.3	0.0	3.1	A,S	16.5 ± 1.9	10.3 ± 1.4	$1.33^{+0.54}_{-0.38} \times 10^{11}$	$< 8 \times 10^3$
6.4	0.1	2.3	A,S	28.4 ± 2.4	21.8 ± 2.3	$4.1^{+3.1}_{-1.3} \times 10^{11}$	100^{+100}_{-40}
6.5	0.3	1.9	A,S	39.3 ± 3.0	31.5 ± 3.0	$6.3^{+7.3}_{-1.9} \times 10^{11}$	200^{+300}_{-100}
6.6	0.4	1.6	A,S	44.9 ± 5.2	39.1 ± 5.6	$1.0^{+\,\mathrm{inf}}_{-0.6} \times 10^{12}$	$< 10^3$
6.7	0.6	1.7	J,S	61.6 ± 4.5	42.3 ± 4.1	$6.3^{+2.1}_{-1.5} \times 10^{11}$	2100^{+3500}_{-1100}
6.8	0.7	2.0	J,S	55.5 ± 4.4	36.2 ± 4.1	$5.0^{+1.8}_{-1.3} \times 10^{11}$	2300^{+7500}_{-1400}
6.9	0.9	2.5	J,S	37.4 ± 3.9	28.6 ± 3.3	$5.2^{+6.6}_{-1.6} \times 10^{11}$	200^{+600}_{-100}
6.10	1.0	3.2	J,S	30.9 ± 4.1	17.8 ± 3.3	$2.1^{+1.2}_{-0.6} \times 10^{11}$	*undetermined*
6.11	1.2	4.0	J,S	15.9 ± 3.2	7.3 ± 2.3	$8.2 \pm 1.6 \times 10^{10}$	*thin*
7.0	-0.2	2.3	A,N	42.3 ± 2.8	23.3 ± 2.0	$2.64^{+0.54}_{-0.37} \times 10^{11}$	$> 10^3$
7.1	0.0	2.1	A,N	48.7 ± 3.8	28.1 ± 2.3	$3.35^{+0.73}_{-0.58} \times 10^{11}$	*undetermined*
7.2	0.2	1.9	A,N	51.9 ± 3.2	32.1 ± 2.5	$4.14^{+0.87}_{-0.71} \times 10^{11}$	2900^{+7300}_{-1600}
7.3	0.4	1.9	A,N	58.6 ± 4.0	40.9 ± 2.9	$6.3^{+1.6}_{-1.2} \times 10^{11}$	1700^{+1800}_{-800}
7.4	0.6	1.9	J,N	65.0 ± 4.9	39.0 ± 2.8	$4.9^{+1.0}_{-0.8} \times 10^{11}$	6300^{+24500}_{-3800}
7.5	0.8	2.0	J,N	61.1 ± 3.5	38.1 ± 2.8	$5.0^{+1.0}_{-0.8} \times 10^{11}$	3900^{+7300}_{-2000}
7.6	1.0	2.2	J,N	63.2 ± 4.4	38.4 ± 2.5	$4.87^{+0.96}_{-0.77} \times 10^{11}$	$\lesssim 10^4$
7.7	1.3	2.5	J,N	52.9 ± 3.9	34.1 ± 2.6	$4.6^{+1.1}_{-0.8} \times 10^{11}$	2200^{+4300}_{-1300}
7.8	1.6	3.1	J,N	38.2 ± 2.9	25.9 ± 2.8	$3.7^{+1.5}_{-0.9} \times 10^{11}$	500^{+1700}_{-300}
7.9	1.9	3.6	J,N	32.5 ± 2.8	20.5 ± 2.4	$2.7^{+1.1}_{-0.6} \times 10^{11}$	600^{+5900}_{-400}
8.0	-0.8	7.3	L,J,N	7.7 ± 1.4	5.0 ± 1.1	$4.4 \pm 0.7 \times 10^{10}$	*thin*
8.1	-0.5	5.9	L,J,N	8.4 ± 1.5	4.0 ± 1.4	$4.3 \pm 0.8 \times 10^{10}$	*thin*
8.2	-0.1	3.6	L,J,N	22.4 ± 1.6	13.0 ± 1.4	$1.55^{+0.47}_{-0.33} \times 10^{11}$	$< 5 \times 10^4$
8.3	0.1	2.4	L,J,N	45.8 ± 2.7	29.6 ± 2.0	$4.02^{+0.76}_{-0.63} \times 10^{11}$	1400^{+2300}_{-800}
8.4	0.4	1.7	L,J,N	66.0 ± 3.6	48.5 ± 2.7	$8.2^{+1.9}_{-1.3} \times 10^{11}$	1800^{+1100}_{-700}
8.5	0.6	1.8	T,A,N	49.5 ± 2.9	35.6 ± 2.3	$5.7^{+1.3}_{-0.9} \times 10^{11}$	900^{+800}_{-400}

Table A.1 (cont'd)

Obs. #[a]	Phase[b]	b (R_{Io})[c]	Location[d]	W_{D_2} (mÅ)	W_{D_1} (mÅ)	N (cm^{-2})	T (K)[e]
8.6	0.9	2.7	T,A,N	28.5 ± 1.9	21.0 ± 1.5	$3.6^{+1.4}_{-0.8} \times 10^{11}$	120^{+120}_{-40}
8.7	1.2	4.3	T,A,N	9.0 ± 1.0	4.1 ± 0.9	$4.6 \pm 0.5 \times 10^{10}$	*thin*
8.8	1.4	5.5	T,A,N	3.5 ± 1.2	2.8 ± 1.2	$2.1 \pm 0.7 \times 10^{10}$	*thin*
8.9	1.6	7.0	T,A,N	4.4 ± 1.0	1.8 ± 0.8	$2.2 \pm 0.5 \times 10^{10}$	*thin*
9.0	-1.7	> 10	L,N	0.9 ± 0.4	1.6 ± 0.6	$5.9 \pm 3.4 \times 10^{9}$	*thin*
9.1	-1.5	> 10	L,N	0.6 ± 0.5	2.7 ± 0.5	$7.8 \pm 3.1 \times 10^{9}$	*thin*
9.2	-1.3	9.1	L,N	0.9 ± 0.4	1.1 ± 0.6	$5.5 \pm 3.4 \times 10^{9}$	*thin*
9.3	-1.1	8.4	L,N	1.3 ± 0.6	0.8 ± 0.6	$6.8 \pm 3.6 \times 10^{9}$	*thin*
9.4	-0.9	7.5	L,N	2.1 ± 0.8	1.0 ± 0.7	$1.1 \pm 0.4 \times 10^{10}$	*thin*
9.5	-0.7	6.4	L,N	4.7 ± 1.2	3.9 ± 0.9	$2.9 \pm 0.5 \times 10^{10}$	*thin*
9.6	-0.4	5.3	L,N	7.4 ± 0.9	2.8 ± 0.5	$3.5 \pm 0.4 \times 10^{10}$	*thin*
9.7	-0.2	4.2	L,N	13.6 ± 1.2	6.4 ± 0.9	$7.1 \pm 0.6 \times 10^{10}$	*thin*
9.8	0.0	3.1	L,N	22.6 ± 1.5	14.3 ± 1.2	$1.91^{+0.47}_{-0.37} \times 10^{11}$	200^{+800}_{-100}
9.9	0.2	2.3	L,N	36.7 ± 2.2	28.6 ± 1.7	$5.5^{+2.6}_{-1.2} \times 10^{11}$	200^{+200}_{-100}
9.10	0.4	2.0	L,N	46.0 ± 2.6	31.7 ± 1.8	$4.69^{+0.87}_{0.68} \times 10^{11}$	900^{+1000}_{-400}
9.11	0.7	2.1	T,N	35.6 ± 2.2	22.3 ± 1.5	$2.88^{+0.55}_{-0.43} \times 10^{11}$	900^{+2400}_{-600}
9.12	0.9	2.8	T,N	21.5 ± 1.7	12.2 ± 1.0	$1.41^{+0.33}_{-0.24} \times 10^{11}$	$< 6 \times 10^{4}$
9.13	1.1	3.8	T,N	7.9 ± 1.0	7.2 ± 1.0	$4.9 \pm 0.6 \times 10^{10}$	*thin*
9.14	1.3	4.8	T,N	4.8 ± 0.9	3.6 ± 0.9	$2.7 \pm 0.5 \times 10^{10}$	*thin*
9.15	1.5	5.9	T,N	2.6 ± 0.9	2.6 ± 0.8	$1.7 \pm 0.5 \times 10^{10}$	*thin*
9.16	1.7	7.1	T,N	0.7 ± 0.7	0.9 ± 0.5	$5.6 \pm 3.3 \times 10^{9}$	*thin*
9.17	1.9	8.2	T,N	0.8 ± 0.7	1.3 ± 0.7	$6.2 \pm 4.2 \times 10^{9}$	*thin*
9.18	2.2	8.9	T,N	0.7 ± 0.8	-2.0 ± 0.9	$3.7^{+4.3}_{-3.7} \times 10^{9} x$	*thin*
9.19	2.4	9.4	T,N	0.5 ± 1.0	0.9 ± 1.0	$3.6^{+6.0}_{-5.0} \times 10^{9}$	*thin*
10.1	-0.9	6.1	A,L,S	8.3 ± 1.0	< 5	$4.4 \pm 0.6 \times 10^{10}$	*thin*
10.2	-0.3	3.7	A,L,S	17.8 ± 1.5	11.1 ± 1.5	$1.44^{+0.56}_{-0.40} \times 10^{11}$	$< 10^{4}$
10.3	0.2	1.6	A,L,S	39.4 ± 4.0	24.3 ± 10.0	$3^{+8}_{-1} \times 10^{11}$	*undetermined*
10.4	0.7	1.5	J,T,S	21.8 ± 4.0	15.7 ± 2.0	$2.5^{+2.4}_{-0.9} \times 10^{11}$	$< 10^{3}$

[a]Observation number is in the form X.Y where X is the eclipse number as given in Table 3.1 and Y is the number of the spectrum taken in the event series.

[b]The eclipse phase of an observation is defined as the fraction of the event completed at the midpoint of the observation. Negative eclipse phase refers to observations made before penumbral contact; phases greater than 1 refer to observations after final contact.

[c]The uncertainties in the impact parameter are $\lesssim 0.1$ R_{Io}.

[d]Location sampled relative to Io. L=leading hemisphere, T=trailing hemisphere, J=sub-Jupiter hemisphere, A=Anti-Jupiter hemisphere, N=North of Io, S=South of Io

[e]Approximate coronal temperature. *thin*=optically thin, no temperature estimate possible, *undetermined*=optically thick, but no temperature estimate possible due to poor data quality