

Heat transport by turbulent rotating Rayleigh-Bénard convection

Stephan Weiss and Guenter Ahlers

Department of Physics, University of California, Santa Barbara, CA 93106, USA

(Received 12 March 2011)

This document contains data tables corresponding to the above-titled paper.

Run	ΔT (K)	10^{-9}Ra	Nu ($\Omega = 0$)	Ro Ω (rad/s)
E12	0.50	2.269	81.1	0.0311
E13	1.00	4.512	103.2	0.0437
E14	1.99	9.005	126.7	0.0618
E15	3.98	17.978	157.1	0.0874
E16	7.95	35.908	195.0	0.1235
E17a	15.88	71.697	242.77	0.175
E17b	15.88	71.697	246.06	0.175

TABLE 1. Parameters for the experimental runs, and results for Nu without rotation. For all cases, $\text{Pr} = 4.38$, $T_m \equiv (T_b + T_t)/2 = 40.00^\circ\text{C}$, $\text{Ek} \times \Omega = 2.73 \times 10^{-6}$ rad/s, and $\text{Ta}/\Omega^2 = 1.46 \times 10^{11}$ (s/rad)². The last column gives the product ($\text{Ro } \Omega$), which is a constant material parameter for a given experimental run.

run	ΔT (K)	$\text{Ra}/10^9$	Nu
100420	1.005	4.535	103.951
100430	0.999	4.510	102.839
100506	0.997	4.500	102.924
100506	1.993	8.997	126.955
100518	1.993	8.996	126.694
100527	1.993	8.996	126.485
100527	3.984	17.985	157.047
100602	3.984	17.986	157.077
100611	3.982	17.978	157.063
100618	7.955	35.912	195.117
100624	7.955	35.911	194.945
100709	7.956	35.913	195.053
100712	0.503	2.271	80.915
100719	0.506	2.284	81.373
100729	0.505	2.277	80.994

TABLE 2. Nusselt-number results for $\Omega = 0$.

Point	$\Delta T(K)$	$Ra/10^9$	Ro	$Ek \times 10^6$	Nu
1007121	0.503	2.271	∞	∞	80.915
1007131	0.500	2.259	1.644	144.000	82.251
1007141	0.502	2.266	1.411	123.000	82.760
1007151	0.501	2.261	1.233	108.000	82.796
1007161	0.502	2.264	1.097	96.000	83.396
1007162	0.502	2.265	0.987	86.000	83.840
1007171	0.503	2.271	0.899	78.000	84.669
1007172	0.503	2.273	0.824	72.000	84.594
1007181	0.504	2.273	0.761	66.000	85.079
1007182	0.503	2.270	0.706	62.000	84.941
1007191	0.503	2.272	0.618	54.000	85.852
1007192	0.506	2.284	∞	∞	81.373
1007201	0.504	2.277	0.550	48.000	86.828
1007202	0.503	2.270	0.494	43.000	86.912
1007221	0.504	2.274	0.412	36.000	88.175
1007222	0.503	2.272	0.353	31.000	88.318
1007231	0.503	2.271	0.309	27.000	88.496
1007232	0.503	2.271	0.275	24.000	89.335
1007241	0.501	2.263	0.247	22.000	88.951
1007242	0.504	2.273	0.225	20.000	89.202
1007251	0.503	2.273	0.206	18.000	88.786
1007261	0.503	2.269	0.183	16.000	88.225
1007262	0.500	2.257	0.164	14.000	87.537
1007271	0.499	2.251	0.141	12.000	86.132
1007272	0.501	2.260	0.123	11.000	85.963
1007281	0.501	2.263	0.110	10.000	84.566
1007282	0.501	2.260	0.099	9.000	83.628
1007291	0.505	2.277	∞	∞	80.994
1008011	0.503	2.271	4.943	431.000	81.162
1008021	0.504	2.275	3.299	287.000	81.719
1008022	0.503	2.271	2.472	215.000	81.928
1008031	0.504	2.277	1.980	172.000	82.560
1008032	0.509	2.300	0.033	3.000	51.559
1008041	0.503	2.271	0.049	4.000	69.525
1008042	0.502	2.266	0.055	5.000	73.733
1008051	0.502	2.265	0.062	5.000	75.913
1008052	0.502	2.266	0.071	6.000	79.069
1008061	0.501	2.260	0.082	7.000	80.955
1008071	0.500	2.259	0.090	8.000	82.695
1008091	0.500	2.258	0.076	7.000	79.851
1008101	0.502	2.266	0.071	6.000	79.283
1008111	0.505	2.279	0.038	3.000	59.650

TABLE 3. Results for run E12.

Run	$\Delta T(K)$	$Ra/10^9$	Ro	$Ek \times 10^6$	Nu
1004201	1.005	4.535	∞	∞	103.951
1004211	1.002	4.523	0.698	43.000	107.052
1004221	1.001	4.517	0.775	48.000	106.558
1004231	1.000	4.516	0.871	54.000	106.347
1004251	1.000	4.514	0.996	62.000	105.721
1004261	0.999	4.508	1.161	72.000	104.631
1004262	1.001	4.518	1.395	86.000	104.821
1004271	0.999	4.511	1.742	108.000	104.586
1004272	0.996	4.497	0.232	14.000	111.053
1004281	0.996	4.497	0.174	11.000	110.164
1004282	0.997	4.501	0.116	7.000	107.215
1004291	1.000	4.513	0.077	5.000	99.854
1004292	1.005	4.537	0.047	3.000	85.111
1004301	0.999	4.510	∞	∞	102.839
1004302	1.005	4.536	2.329	144.000	104.363
1005011	1.001	4.517	1.549	96.000	104.561
1005021	1.000	4.514	1.267	78.000	104.906
1005031	0.999	4.508	1.072	66.000	105.115
1005032	0.996	4.495	0.348	22.000	110.202
1005041	0.997	4.499	0.409	25.000	109.481
1005042	0.996	4.496	0.497	31.000	108.460
1005051	0.996	4.495	0.580	36.000	107.378
1005061	0.997	4.500	∞	∞	102.924
1006161	0.998	4.505	0.054	3.000	88.260
1006162	0.998	4.506	0.063	4.000	93.301
1006181	1.005	4.538	0.087	5.000	100.788
1008112	0.998	4.504	0.054	3.000	88.262
1008121	0.998	4.507	0.066	4.000	94.521
1008122	0.998	4.505	0.070	4.000	95.644
1008131	1.002	4.523	0.100	6.000	103.880
1008161	0.999	4.509	0.066	4.000	94.544
1008132	1.003	4.529	0.199	12.000	109.744

TABLE 4. Results for run E13.

Run	$\Delta T(K)$	$Ra/10^9$	Ro	$Ek \times 10^6$	Nu
1005062	1.993	8.997	∞	∞	126.955
1005111	1.993	8.996	3.280	144.000	127.656
1005121	1.994	9.001	2.461	108.000	127.796
1005122	1.995	9.007	1.969	86.000	128.059
1005131	1.995	9.007	1.641	72.000	128.303
1005132	1.995	9.005	1.406	62.000	128.215
1005141	1.997	9.016	1.231	54.000	128.264
1005142	1.996	9.011	1.094	48.000	128.687
1005151	1.997	9.014	0.985	43.000	129.066
1005152	1.998	9.019	0.821	36.000	129.500
1005161	1.997	9.015	0.704	31.000	130.232
1005171	1.997	9.016	0.657	29.000	131.111
1005181	1.995	9.006	0.579	25.000	131.638
1005182	1.993	8.996	∞	∞	126.694
1005201	1.996	9.009	0.492	22.000	132.680
1005211	1.993	8.995	0.328	14.000	134.597
1005212	1.994	9.003	1.514	66.000	128.113
1005221	1.994	9.001	1.789	78.000	128.189
1005222	1.994	9.003	2.187	96.000	127.751
1005231	1.992	8.993	0.246	11.000	134.547
1005241	1.992	8.993	0.328	14.000	134.141
1005251	1.992	8.993	0.246	11.000	134.334
1005252	1.994	9.000	0.066	3.000	114.925
1005261	1.995	9.005	0.109	5.000	129.259
1005262	1.992	8.993	0.164	7.000	133.711
1005271	1.993	8.996	∞	∞	126.485
1006151	1.993	8.999	0.076	3.000	120.219
1006171	1.996	9.011	0.090	4.000	125.401
1006172	1.994	9.003	0.123	5.000	130.735
1008141	1.998	9.019	0.197	9.000	134.641
1008142	1.997	9.015	0.179	8.000	134.082
1008151	1.998	9.018	0.141	6.000	132.482

TABLE 5. Results for run E14.

Run	$\Delta T(K)$	$Ra/10^9$	Ro	$Ek \times 10^6$	Nu
1005272	3.984	17.985	∞	∞	157.047
1005281	3.983	17.982	4.637	144.000	157.572
1005282	3.982	17.977	3.477	108.000	157.799
1005291	3.982	17.976	3.091	96.000	158.091
1005292	3.982	17.975	2.782	86.000	158.138
1005301	3.982	17.977	2.529	78.000	158.294
1005302	3.982	17.977	2.318	72.000	158.451
1005311	3.982	17.976	2.140	66.000	158.613
1005312	3.982	17.976	1.987	62.000	158.649
1006011	3.982	17.977	1.739	54.000	158.593
1006012	3.982	17.976	1.545	48.000	158.446
1006021	3.984	17.986	∞	∞	157.077
1006022	3.983	17.978	1.391	43.000	158.443
1006031	3.982	17.976	0.927	29.000	159.223
1006032	3.981	17.972	0.695	22.000	160.580
1006041	3.981	17.972	0.556	17.000	162.644
1006042	3.981	17.972	0.464	14.000	163.865
1006051	3.982	17.975	0.397	12.000	164.622
1006061	3.982	17.974	0.348	11.000	164.840
1006071	3.981	17.971	0.278	9.000	164.716
1006081	3.981	17.973	0.232	7.000	164.712
1006091	3.982	17.975	0.174	5.000	163.829
1006101	3.982	17.975	0.139	4.000	161.832
1006111	3.982	17.976	0.126	4.000	160.125
1006112	3.982	17.978	∞	∞	157.063
1006121	3.984	17.983	1.265	39.000	158.332
1006122	3.984	17.984	1.159	36.000	158.163
1006131	3.984	17.983	1.070	33.000	158.550
1006132	3.983	17.980	0.994	31.000	158.631
1006141	3.983	17.979	0.116	4.000	158.986
1006142	3.984	17.983	0.093	3.000	153.947
1006171	3.984	17.983	0.232	7.000	164.591
1006172	3.983	17.981	0.253	8.000	163.138

TABLE 6. Results for run E15.

Run	$\Delta T(K)$	$Ra/10^9$	Ro	$Ek \times 10^6$	Nu
1006182	7.955	35.912	∞	∞	195.117
1006191	7.955	35.911	6.553	144.000	195.171
1006192	7.955	35.910	5.617	123.000	195.175
1006201	7.955	35.910	4.915	108.000	195.310
1006202	7.955	35.911	4.369	96.000	195.360
1006211	7.955	35.909	3.932	86.000	195.445
1006212	7.955	35.909	3.276	72.000	195.789
1006221	7.955	35.909	2.808	62.000	196.055
1006222	7.954	35.908	2.457	54.000	196.028
1006231	7.954	35.907	2.184	48.000	196.234
1006232	7.954	35.908	1.966	43.000	196.367
1006241	7.955	35.911	∞	∞	194.945
1006242	7.954	35.909	1.638	36.000	196.086
1006251	7.955	35.912	1.404	31.000	195.688
1006252	7.955	35.911	1.229	27.000	195.218
1006261	7.955	35.909	1.092	24.000	195.524
1006262	7.955	35.911	0.983	22.000	196.080
1006271	7.954	35.908	0.894	20.000	196.368
1006272	7.954	35.909	0.786	17.000	196.994
1006281	7.955	35.909	0.655	14.000	198.451
1006282	7.954	35.907	0.562	12.000	199.970
1006291	7.953	35.904	0.491	11.000	201.113
1006292	7.955	35.910	0.131	3.000	196.105
1006301	7.954	35.907	0.151	3.000	198.124
1006302	7.954	35.907	0.179	4.000	200.499
1007011	7.954	35.906	0.197	4.000	200.801
1007012	7.954	35.905	0.207	5.000	200.851
1007021	7.953	35.904	0.218	5.000	201.201
1007022	7.953	35.903	0.231	5.000	201.295
1007031	7.953	35.903	0.246	5.000	201.363
1007032	7.954	35.904	0.262	6.000	201.604
1007041	7.953	35.903	0.281	6.000	201.910
1007042	7.953	35.903	0.328	7.000	202.134
1007051	7.953	35.902	0.357	8.000	202.209
1007052	7.954	35.904	0.393	9.000	202.184
1007061	7.954	35.905	0.437	10.000	201.940
1007091	7.956	35.913	∞	∞	195.053
1007101	7.955	35.910	0.140	3.000	197.236
1007111	7.954	35.906	0.164	4.000	199.250

TABLE 7. Results for run E16.

Run	$\Delta T(K)$	$Ra/10^9$	Ro	$Ek \times 10^6$	Nu
1008181	15.885	71.712	∞	∞	242.734
1008182	15.885	71.710	27.780	434.324	242.857
1008191	15.886	71.714	13.890	217.162	242.833
1008192	15.886	71.713	9.260	144.767	242.864
1008201	15.886	71.713	6.945	108.577	242.940
1008211	15.885	71.711	5.556	86.862	242.973
1008212	15.885	71.710	4.630	72.385	243.049
1008221	15.886	71.715	3.969	62.045	243.207
1008222	15.885	71.709	3.472	54.289	243.448
1008231	15.885	71.710	3.087	48.257	243.480
1008232	15.885	71.711	2.778	43.431	243.689
1008241	15.886	71.715	∞	∞	242.585
1008242	15.885	71.710	1.389	21.716	242.870
1008251	15.885	71.710	0.926	14.477	242.983
1008261	15.884	71.706	0.694	10.858	244.921
1008271	15.883	71.701	0.556	8.686	247.181
1008301	15.885	71.712	∞	∞	242.801
1009032	15.886	71.715	2.526	39.483	243.956

TABLE 8. Results for run E17a. The experiments were conducted with the same apparatus and sidewall as that used for the previous runs.

Run	$\Delta T(K)$	$Ra/10^9$	Ro	$Ek \times 10^6$	Nu
1102101	15.885	71.708	∞	∞	246.071
1102151	15.873	71.692	2.777	43.000	246.150
1102161	15.879	71.688	1.389	22.000	246.139
1102171	15.881	71.696	1.852	29.000	247.218
1102181	15.876	71.681	1.111	17.000	245.658
1102191	15.882	71.699	0.926	14.000	246.303
1102201	15.875	71.676	0.694	11.000	248.230
1102211	15.877	71.679	0.555	9.000	250.155
1102231	15.872	71.665	0.463	7.000	251.417
1102241	15.873	71.667	0.397	6.000	251.993
1102242	15.877	71.679	0.347	5.000	252.021
1102251	15.875	71.675	0.309	5.000	251.433
1102252	15.876	71.679	0.278	4.000	250.253
1102261	15.882	71.698	∞	∞	246.041
1102262	15.879	71.689	2.315	36.000	247.344
1102271	15.880	71.690	1.984	31.000	247.316
1102272	15.878	71.687	1.736	27.000	247.116
1103011	15.878	71.686	1.262	20.000	245.787
1103061	15.878	71.688	1.157	18.000	245.545
1103071	15.879	71.689	1.068	17.000	245.505
1103081	15.879	71.691	0.992	15.000	245.803
1103091	15.879	71.688	9.258	143.996	246.033
1103101	15.878	71.685	3.968	61.997	246.506

TABLE 9. Results for run E17b. The apparatus had been taken apart and was re-assembled prior to this run, and a new sidewall was used.
