1. THE ROSSELAND OPACITY AND THE KAPPA9 CODE

The KAPPA9 program computes Rosseland opacities:

$$1/\kappa_{Ross} = \frac{\int_0^\infty 1/(\kappa_\nu + \sigma_\nu + l_\nu)(dB_\nu/dT)d\nu}{\int (dB_\nu/dT)d\nu}$$

For a given metallicity [M/H] and a given microturbulent velocity ξ, the code produces a table of 2394 κ_{Ross} values corresponding to the 42 gas pressure log Pgas and 57 temparatures T given in table 1. For each Pgas there are 57 kross corresponding to the 57 T.

Each κ_{Ross} table is computed by using as input data the corresponding line Opacity Distribution Function (ODF), which provides the line opacity l_ν. Because, for each metallicity, ODF's are given for five microturbulent velocities 0, 1, 2, 4, and 8 km s^{-1}, the KAPPA9 code computes for each metallicity only the five corresponding κ_{Ross} tables.

To perform the integration over the frequency, the whole frequency range is divided in 426 intervals (table 2). The intervals from 1 to 89 have a width of 0.05 10^{16} sec^{-1} and their central wavelenghts range from 38.61 Å to 89.1 Å. The other intervals 90 – 420 coincide with those used for computing the BIG ODFs. Their central wavelengths range from 90.9 to 1600000.0 Å.

The program gives for each wavelength point, the continous opacity κ_ν, the scattering opacity σ_ν, the line opacity l_ν, the Plank function B_ν and the derivative dB_ν/dT. The line opacity l_ν is extracted from the XXXBIGX.BDF file computed for the same microturbulent velocity X and metallicity XXX of the κ_{Ross} table.

KAPPA9 is a modified version of ATLAS9 and it runs just as if ATLAS9 were computing a model.

The TABLES in the next PAGES:

Table 1. The 57 temperatures and 42 gas pressures used for computing a grid of Rosseland opacities

T/log(T) nt=57									
1995/3.30	2089/3.32	2188/3.34	2291/3.36	2399/3.38	2512/3.40	2630/3.42	2754/3.44	2884/3.46	3020/3.48
3162/3.50	3311/3.52	3467/3.54	3631/3.56	3802/3.58	3981/3.60	4169/3.62	4365/3.64	4571/3.66	4786/3.68
5012/3.70	5370/3.73	5754/3.76	6166/3.79	6607/3.82	7079/3.85	7586/3.88	8128/3.91	8710/3.94	9333/3.97
10000/4.00	11220/4.05	12589/4.10	14125/4.15	15849/4.20	17783/4.25	19953/4.30	22387/4.5	25119/4.40	28184/4.45
31623/4.50	35481/4.55	39811/4.60	44668/4.65	50119/4.70	56234/4.75	63096/4.80	70795/4.85	79433/4.90	89125/4.95
100000/5.00	112202/5.05	125893/5.10	141254/5.15	158489/5.20	177828/5.25	199526/5.30			
log(Pgas) np=42									
-4.0	-3.5	-3.0	-2.5	-2.0	-1.5	-1.0	-0.5	0.0	0.5
1.0	1.25	1.5	1.75	2.0	2.25	2.5	2.75	3.0	3.2
3.4	3.6	3.8	4.0	4.2	4.4	4.6	4.8	5.0	5.2
5.4	5.6	5.8	6.0	6.25	6.5	6.75	7.0	7.25	7.5
7.75	8.0								

Table 2. The 426 wavelengths (Å) used for the opacity determination

1	38.609	51	56.944	101	117.8	151	328.0	201	1220.0	251	4150.0	301	9250.0
2	38.860	52	57.490	102	121.3	152	338.0	202	1260.0	252	4250.0	302	9350.0
3	39.113	53	58.046	103	124.8	153	348.0	203	1300.0	253	4400.0	303	9450.0
4	39.370	54	58.613	104	127.1	154	357.0	204	1340.0	254	4550.0	304	9550.0
5	39.630	55	59.192	105	128.4	155	366.0	205	1380.0	255	4650.0	305	9650.0
6	39.894	56	59.782	106	130.5	156	375.0	206	1420.0	256	4750.0	306	9750.0
7	40.161	57	60.384	107	132.4	157	385.0	207	1460.0	257	4850.0	307	9850.0
8	40.432	58	60.999	108	133.9	158	395.0	208	1500.0	258	4950.0	308	9950.0
9	40.706	59	61.626	109	136.6	159	405.0	209	1540.0	259	5050.0	309	10125.0
10	40.985	60	62.266	110	139.8	160	414.0	210	1600.0	260	5150.0	310	10375.0
11	41.267	61	62.919	111	143.3	161	422.0	211	1650.0	261	5250.0	311	10625.0
12	41.553	62	63.586	112	147.2	162	430.0	212	1690.0	262	5350.0	312	10875.0
13	41.843	63	64.268	113	151.0	163	441.0	213	1730.0	263	5450.0	313	11125.0
14	42.137	64	64.964	114	155.2	164	451.0	214	1775.0	264	5550.0	314	11375.0
15	42.435	65	65.676	115	158.8	165	460.0	215	1820.0	265	5650.0	315	11625.0
16	42.737	66	66.403	116	162.0	166	470.0	216	1860.0	266	5750.0	316	11875.0
17	43.044	67	67.147	117	166.0	167	480.0	217	1905.0	267	5850.0	317	12125.0
18	43.355	68	67.907	118	170.3	168	490.0	218	1950.0	268	5950.0	318	12375.0
19	43.671	69	68.685	119	173.4	169	500.0	219	2000.0	269	6050.0	319	12625.0
20	43.992	70	69.481	120	176.8	170	506.0	220	2045.0	270	6150.0	320	12875.0
21	44.317	71	70.296	121	180.2	171	514.0	221	2085.0	271	6250.0	321	13125.0
22	44.647	72	71.130	122	181.7	172	530.0	222	2125.0	272	6350.0	322	13375.0
23	44.982	73	71.984	123	186.1	173	550.0	223	2175.0	273	6450.0	323	13625.0
24	45.322	74	72.858	124	191.0	174	567.0	224	2225.0	274	6550.0	324	13875.0
25	45.667	75	73.754	125	193.9	175	585.0	225	2275.0	275	6650.0	325	14125.0
26	46.017	76	74.673	126	198.4	176	605.0	226	2325.0	276	6750.0	326	14420.0
27	46.373	77	75.615	127	201.8	177	625.0	227	2375.0	277	6850.0	327	14670.0
28	46.735	78	76.581	128	205.0	178	645.0	228	2425.0	278	6950.0	328	14875.0
29	47.102	79	77.572	129	210.5	179	663.0	229	2480.0	279	7050.0	329	15125.0
30	47.475	80	78.588	130	216.2	180	680.0	230	2530.0	280	7150.0	330	15375.0
31	47.854	81	79.632	131	219.8	181	700.0	231	2575.0	281	7250.0	331	15625.0
32	48.239	82	80.704	132	223.0	182	716.0	232	2625.0	282	7350.0	332	15875.0
33	48.630	83	81.805	133	226.8	183	730.0	233	2675.0	283	7450.0	333	16200.0
34	49.028	84	82.937	134	230.0	184	750.0	234	2725.0	284	7550.0	334	16600.0
35	49.432	85	84.100	135	234.0	185	770.0	235	2775.0	285	7650.0	335	17000.0
36	49.843	86	85.296	136	240.0	186	790.0	236	2825.0	286	7750.0	336	17400.0
37	50.261	87	86.527	137	246.5	187	810.0	237	2875.0	287	7850.0	337	17800.0
38	50.686	88	87.794	138	252.4	188	830.0	238	2950.0	288	7950.0	338	18200.0
39	51.118	89	89.099	139	256.8	189	850.0	239	3050.0	289	8050.0	339	18600.0
40	51.557	90	90.9	140	260.0	190	870.0	240	3150.0	290	8150.0	340	19000.0
41	52.004	91	93.5	141	264.0	191	890.0	241	3250.0	291	8250.0	341	19400.0
42	52.460	92	96.1	142	268.5	192	906.0	242	3350.0	292	8350.0	342	19800.0
43	52.923	93	97.7	143	273.5	193	926.0	243	3450.0	293	8450.0	343	20250.0
44	53.394	94	99.6	144	278.5	194	960.0	244	3550.0	294	8550.0	344	20750.0
45	53.874	95	102.0	145	284.0	195	1000.0	245	3620.0	295	8650.0	345	21250.0
46	54.362	96	103.8	146	290.0	196	1040.0	246	3670.0	296	8750.0	346	21750.0
47	54.859	97	105.6	147	296.0	197	1080.0	247	3750.0	297	8850.0	347	22250.0
48	55.366	98	107.7	148	301.0	198	1115.0	248	3850.0	298	8950.0	348	22650.0
49	55.882	99	110.4	149	308.0	199	1145.0	249	3950.0	299	9050.0	349	22900.0
50	56.408	100	114.0	150	318.0	200	1180.0	250	4050.0	300	9150.0	350	23250.0

Table 2. cont. The 426 wavelengths (Å) used for the opacity determination

351	23750.0	401	67000.0
352	24250.0	402	69000.0
353	24750.0	403	71000.0
354	25250.0	404	73000.0
355	25750.0	405	75000.0
356	26250.0	406	77000.0
357	26750.0	407	79000.0
358	27250.0	408	81000.0
359	27750.0	409	83000.0
360	28250.0	410	85000.0
361	28750.0	411	87000.0
362	29250.0	412	89000.0
363	29750.0	413	91000.0
364	30250.0	414	93000.0
365	30750.0	415	95000.0
366	31250.0	416	97000.0
367	31750.0	417	99000.0
368	32400.0	418	100000.0
369	33400.0	419	200000.0
370	34500.0	420	400000.0
371	35500.0	421	600000.0
372	36500.0	422	800000.0
373	37500.0	423	1000000.0
374	38500.0	424	1200000.0
375	39500.0	425	1400000.0
376	40500.0	426	1600000.0
377	41500.0		
378	42500.0		
379	43500.0		
380	44500.0		
381	45500.0		
382	46500.0		
383	47500.0		
384	48500.0		
385	49500.0		
386	50500.0		
387	51500.0		
388	52500.0		
389	53500.0		
390	54500.0		
391	55500.0		
392	56500.0		
393	57500.0		
394	58500.0		
395	59500.0		
396	60500.0		
397	61500.0		
398	62500.0		
399	63500.0		
400	65000.0		