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A detailed grid of evolutionary stellar models during hydrogen burning phases

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Summary. — Extensive stellar evolution calculations are presented with the main object of improving and extending the comparison of empirical stellar data in general with theoretical predictions based on standard but updated physics and, in particular, absolute dimensions derived from the analysis of double-lined eclipsing binaries. Computations were made for five chemical compositions around the Ross-Aller mixture and the most recent opacities from Los Alamos library was used. The present grid of models covers a mass range from 0.6 to 25 solar masses from the zero-age main sequence up to evolutionary phases corresponding to the depletion of hydrogen in the core. A value of 2.0 was adopted for the mixing-length parameter in all calculations. An average of 160 models were generated per evolutionary track for the standard chemical composition and, each of them, includes the computation of around 300 layers inside the star. Small steps in age, as adopted in this paper in contrast to the grid presented by Hejlesen (1980), were found extremely useful in the calculation of isochrones and the interpolation of evolutionary tracks for individual masses not included in the original grid. Internal structure constants (k_j ; $j = 2, 3, 4$) are also presented to permit an interpretation of apsidal motion observations.

Key words: evolutionary models — internal structure — apsidal motion.

1. Introduction.

A detailed comparison of theoretical models with observed stellar parameters, as derived from the study of well-detached eclipsing binaries, has been pursued for a long time. Nowadays available accuracy (Andersen, 1988) indicates the possibility to explore further into the actual internal physics of the stars within the main sequence. This is by no means an obsolete task. First, an accurate knowledge of the main sequence is needed to be able to compute evolved stellar models with some degree of confidence. Second, the size of the convective cores is still controversial according to the proposed existence of "overshooting" and, furthermore, the amount of mass lost by the stars during the main sequence is not well established.

Until recently, the currently adopted reference models were those by Hejlesen (1980a,b) which led Andersen *et al.* (1984) to detect a systematic effect in chemical composition with temperature later discarded as due to the models themselves (Andersen *et al.*, 1988). In fact, Hejlesen adopted opacities from Cox and Stewart (1969) and the use of evolutionary models for late-type stars by Vandenberg (1983, 1985) indicated a clear improvement (Andersen *et al.*, 1988, 1989). Several other theoretical models have been published in the more massive range (Maeder, 1987; Meader and Meynet, 1989b) but a standard grid, with updated physics but no use of overshooting or mass loss, is required to proceed in steps with a detailed comparison between observations and theory. We should point out, nevertheless, that theoretical models including convective overshooting and mass loss within physically reasonable limits, are currently under computation and will be published elsewhere.

The format adopted by Hejlesen in the presentation of his models has proven to be very useful and we have kept it to facilitate the comparison. Furthermore, we have computed internal structure constants to permit the interpretation of observational apsidal motion rates. The only existing modern grids of this important coefficients were published by Hejlesen (1987) with the above mentioned problems and Jeffery (1984) using Carson's opacities. These later opacities seem to be physically unrealistic as discussed by Carson *et al.* (1984) and Magee *et al.* (1984).

Some of the results described in this paper have already been used in several studies (see e.g. Andersen and Clausen, 1989). Details and further material, not given in this paper, can be obtained directly from the authors.

2. Physics of the models.

The stellar models presented in this paper are based upon the standard assumptions that stars can be described by spherically symmetric models, that there is no mass

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loss, that zero-age main sequence (ZAMS) stars are homogeneous, that regions in radiative equilibrium are always stable, while convective zones are fully mixed. The calculations were made with a modified and updated version of the computer code by Kippenhahn *et al.* (1967). The inclusion of pre-main-sequence models to reach the ZAMS, as done by VandenBerg (1985), did not change the results significantly and, the advantage of removing an initial hypothesis concerning homogeneous models is counterbalanced with the uncertainties involved in configurations during contraction phases as well as the currently adopted definition of the ZAMS.

We considered that a detailed comparison of observations with standard-physics models is necessary to isolate special cases and justify the introduction of such complications as diffusion in radiative envelopes, convective overshooting or mass loss, since reliable theories describing these processes are not yet available.

Models were calculated from the ZAMS up to the first stages of helium burning in the core. Opacities were adopted from the most recent library of Los Alamos. Reaction rates were calculated including the revisions by Harris *et al.* (1983). The mixing length parameter has been fixed to 2.0 for all models according to the results by Lebreton and Maeder (1986), Maeder and Meynet (1989a) and Hejlesen (1980a).

The standard chemical composition adopted is the Ross-Aller mixture (Y, Z) = (0.28, 0.02) allowing a direct comparison with the results by Hejlesen (1980b, 1987). Nevertheless, four more chemical compositions were used to permit the study of small changes in helium and metal content as discussed by Andersen *et al.* (1980). These latter compositions are the following: (Y, Z) = (0.32, 0.02), (0.24, 0.02), (0.28, 0.01) and (0.28, 0.03).

3. The grid.

With the adopted physics, we have calculated evolutionary tracks for models with masses ranging from 0.6 to 25 solar masses for the standard chemical composition (X, Z) = (0.70, 0.02), in order to cover the main-sequence band for effective temperatures up to 38000 K ($\log T_e < 4.6$). For the other chemical compositions, the range of masses is nevertheless slightly smaller due to the lack of calculated opacities and goes from 5 to 25 solar masses. Isochrones have been calculated with a step in log age of 0.5. It is important to note that our grid includes about 160 models per evolutionary track, though we only present around 60 in printed form due to space requirements. This allows interpolation as described in section 5. For the non-standard four chemical compositions, only about 60 models were computed for each mass. Readers interested in the complete grid may obtain an ASCII file in disquette from the authors on request.

Internal structure constants have been computed to permit the comparison with observed rates of apsidal motion. Radau's differential equation can be written in the form (Kopal, 1978):

$$a\frac{d\eta_j}{da} + 6\frac{\rho(a)}{\bar{\rho}(a)}(\eta_j + 1) + \eta_j(\eta_j - 1) = j(j+1)$$

where all η_j functions are zero at the star center, $\rho(a)$ is the local density at a distance a from the center, and $\bar{\rho}(a)$ is the mean density within the inner sphere of radius a. In order to obtain the internal structure constants k_j, Radau's equation has been integrated by means of a Runge-Kutta procedure of fourth order. The resulting value of the function $\eta_j(R)$, which satisfies Radau's equation with R being the radius of the configuration, then gives,

$$k_j = \frac{j + 1 - \eta_j(R)}{2(j + \eta_j(R))}$$

For chemical composition (X, Z) = (0.70, 0.02), three diagrams are shown (Figs. 1a, 1b and 1c) : a) An HR diagram, b) a $\log T_e$ – $\log g$ diagram, and c) a $\log g$ – $\log k_2$ diagram. In all the figures, tracks are shown as full drawn and isochrones as dashed lines. Numbers attached to the zero-age lines are values of $\log m/m_\odot$. Labels above refer to log age of the matching isochrone. Special care was taken in drawing the isochrones though difficulties were much diminished, with respect to previous models, because of the small step in age adopted.

Diagram (a) has been included as standard format to allow comparison with young star clusters. The $\log T_e$ – $\log g$ diagram is specifically devoted to the discussion of eclipsing binaries, for which m and $\log g$ may be independently determined with great accuracy for each of the components, while, of course, diagram (c) is useful when a comparison of observed apsidal motion and theoretical predictions is needed. Similar diagrams corresponding to the other chemical compositions can be easily drawn using the tabulated data.

Tables include, for each stellar mass and chemical composition, the following parameters : age, luminosity, surface gravity, effective temperature, and internal structure coefficients (k_2 to k_4). Tables I.1 to I.19 correspond to the standard chemical composition while the others are given as tables II.1 to V.8.

4. Comparison with previous models.

It is not easy to compare our grid of models directly with the latest ones by Vandenberg (1983, 1985) and Meader and Meynet 1989b due to the different assumptions adopted. Nevertheless, we have attempted the comparison of models to check the effects of the input physics differences. Models by Vandenberg are devoted to the study of late-type stars and adopt a slightly different chemical composition – (Y, Z) = (0.25, 0.0169) – than that in our models. He also assumes a mixing length parameter of 1.6 instead of 2.0 and a different method to compute the ZAMS models. On the other hand, models by Meader and Meynet cover a larger mass range but include non-standard physics since they take into account mass loss and convective overshooting. Our

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models are only directly comparable to those by Hejlesen (1980b) since we use the same assumptions and chemical compositions.

For the lower mass range we have plotted, in figure 2, the evolutionary tracks, in the log g – log T_e plane, corresponding to a 1.0 solar mass model. Our models are represented by a full line, those by Vandenberg with a dashed line and those by Maeder and Meynet by a dash-dotted line. The main differences are certainly connected with the adopted physics and chemical compositions but they all agree reasonably well.

In figures 3 and 4, we plot a more detailed comparison of our models and those by Maeder and Meynet in the more massive range. Of course the effect of overshooting in their models is clearly visible as an increase of the stars lifetime in the main sequence. Furthermore, though internal structure models are not yet available with input physics as given by Maeder and Meynet (1989a), it is expected that these models will be more centrally condensed due to the increase in the mass within the core.

A more detailed comparison is made between our models and those published by Hejlesen (1980b, 1987) because of the same assumptions made with respect to standard physics, mixing length parameter and chemical composition (though not in the case of opacities). In figure 5, the effect in temperature detected by Andersen *et al.* (1984), erroneously interpreted in terms of helium content, is clearly seen. Hejlesen's models are systematically hotter than the present ones but an effect in log g is also visible. The differences decrease for more massive stars being almost negligible around log $m = 1.1$.

5. Interpolated models.

In order to make a detailed comparison between models and observational data of double-lined eclipsing binaries, an important possibility is the computation of specific evolutionary tracks for the observed masses of the individual components. This obviously involves large amounts of computing time but can be easily done through interpolation from previously computed models if the available grid includes enough evolutionary tracks, i.e. the step in computed masses is small enough. Furthermore, it is extremely important to have a large enough number of models during the different evolutionary phases, i.e. the step in log age should be small enough as it is the case of the present grid, which includes around 160 models per mass. We have carried out some tests in different mass ranges for our models in this connection.

For the more massive models, a linear interpolation between models with a step of 0.1 in logarithm of the mass is sufficiently accurate. In figure 6, we show the resulting evolutionary tracks for a configuration of 11 solar masses, both through interpolation in the grid (crosses) and directly computed with the evolutionary code (asterisks). The differences are certainly small for our comparison purposes, specially during the main-sequence phases which are our main interest.

On the other hand, for late-type stars the situation is not so simple. The region where the main source of thermonuclear energy changes from the proton-proton chain to the CNO cycle is critical. Because of this, more models have been calculated for this range in order to avoid interpolation problems and we adopted a step in logarithm of the mass 0.05 instead of the value 0.1 used for the more massive range.

During the rapid phases of evolution, outside the main sequence and during hydrogen burning in a shell, an accurate procedure of interpolation is required rather than linear interpolation and even the number of points has to be artificially increased in the models of the grid before interpolation to avoid a non-smooth behaviour.

6. The internal structure constants.

Apsidal motion constants were calculated using a Runge-Kutta method of 4th order applied to the equation of Radau for the internal structure of the stars, as described in section 3. The results were checked against small changes in the integration step and the three first harmonics of the internal stellar structure were computed (log k_j, $j = 2, 3, 4$). Furthermore, we have calculated internal structure values as derived from the integral equation given by Kopal (1978).

Giving $D(a) = \rho(a)/\bar{\rho}(a)$ where $\rho(a)$ is the actual density at a given layer and $\bar{\rho}(a)$ is the mean density below it, Kopal (1978) demonstrated that if $D << 1$, the apsidal motion constants can be written in the form,

$$R^{2j+1} k_j = \frac{3(j+2)}{2j+1} \int_0^R D a^{2j} da$$

where R denotes the radius of the configuration.

As expected, because of the assumption made by Kopal with respect to the degree of mass condendation, the value of log k_j obtained directly from Radau's equation is systematically larger than that fom the approximation by Kopal. We show, in figure 7, the behaviour *versus* log m of the difference between both ways of calculating log k_2 for ZAMS models. The discrepancy can be up to 0.12 which indicates that the above mentioned approximation is not good enough. Certainly, more evolved models, which become more centrally condensed, show a better agreement between coefficients computed according to Kopal's equation and those from direct integration of that by Radau.

When comparing to previous calculations of the apsidal motion constants, we only have Hejlesen's models available. In this case, it is shown in figure 8 that our models are systematically more centrally condensed in all cases except for the less massive stars. An average difference of 0.05 in log k_j has been detected during the main sequence. This improves the comparison with observational evidences

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(Giménez and Claret, 1988) and is mainly due to the differences in opacities as well as to the methods used to solve the involved differential equations for stellar structure. A careful check of the effect of the number of layers computed for each model showed that this is not an important parameter in the calculation of k_j within the main sequence, provided that a reasonable number is taken. Unfortunately, no calculation of density concentration is available for the models by Maeder and Meynet and Vandenberg. A detailed comparison of apsidal motion constants with non-standard models is highly desirable in light of the observational discrepancies found up to now (Giménez and Claret, 1988).

7. Conclusions.

We present a detailed grid of standard evolutionary models with updated physics covering the range from 0.6 to 25 solar masses and the chemical composition $(X, Z) = (0.70, 0.02)$. Four further grids of models have been calculated for chemical compositions around the given mixture though excluding the cooler configuration due to the lack of updated opacities.

These grids are necessary to carry out a detailed comparison with observational stellar parameters as derived from the study of double-lined eclipsing binaries. In this case, apsidal motion has proved to be an important additional information and internal structure constants have been therefore computed for all models. We show furthermore that the integral approximation by Kopal (1978) is not accurate enough to quantitatively describe the three harmonics of the apsidal motion constant though it may be useful in a qualitative discussion.

The effect of mass loss during the main sequence and "overshooting" in the convective cores is now being investigated with the aim of explaining partly the observed discrepancies in apsidal motion rates for some well-studied binaries whose surface values can be reproduced equally well by models with standard and non-standard physics.

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TABLE I.1.

Log m = - 0.2218

Age	Log L	Log g	Log Teff	LogK2	LogK3	LogK4
0.000000D+00	-1.1839	4.6972	3.5877	-1.1884	-1.6110	-1.8895
4.000063D+08	-1.1817	4.6964	3.5880	-1.1910	-1.6141	-1.8931
1.200019D+09	-1.1771	4.6946	3.5887	-1.1946	-1.6175	-1.8963
2.800044D+09	-1.1689	4.6920	3.5901	-1.2009	-1.6233	-1.9022
6.000095D+09	-1.1528	4.6862	3.5927	-1.2131	-1.6340	-1.9122
1.240020D+10	-1.1193	4.6731	3.5978	-1.2398	-1.6581	-1.9356

TABLE I.2.

Log m = -0.0969

Age	Log L	Log g	Log Teff	LogK2	LogK3	LogK4
0.000000D+00	-0.5502	4.5925	3.6887	-1.4675	-1.8971	-2.1789
4.000063D+08	-0.5451	4.5899	3.6893	-1.4716	-1.9004	-2.1818
1.200019D+09	-0.5345	4.5850	3.6907	-1.4799	-1.9074	-2.1883
2.684829D+09	-0.5142	4.5756	3.6935	-1.4953	-1.9204	-2.2005
4.078912D+09	-0.4946	4.5658	3.6959	-1.5110	-1.9336	-2.2128
5.413168D+09	-0.4749	4.5562	3.6984	-1.5256	-1.9456	-2.2239
6.652625D+09	-0.4551	4.5464	3.7009	-1.5411	-1.9594	-2.2372
7.816876D+09	-0.4360	4.5367	3.7033	-1.5558	-1.9721	-2.2495
8.911107D+09	-0.4170	4.5270	3.7056	-1.5698	-1.9842	-2.2610
9.934477D+09	-0.3995	4.5169	3.7075	-1.5827	-1.9946	-2.2706
1.087689D+10	-0.3828	4.5071	3.7092	-1.5949	-2.0047	-2.2799
1.170000D+10	-0.3674	4.4975	3.7106	-1.6065	-2.0142	-2.2888
1.229330D+10	-0.3555	4.4901	3.7118	-1.6148	-2.0209	-2.2951
1.347992D+10	-0.3306	4.4749	3.7142	-1.6319	-2.0351	-2.3084
1.466653D+10	-0.3044	4.4576	3.7164	-1.6494	-2.0490	-2.3212

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TABLE I.3.

Log m = 0.0000

Age	Log L	Log g	Log Teff	LogK2	LogK3	LogK4
0.000000D+00	-0.0809	4.4900	3.7562	-1.7470	-2.1996	-2.4925
3.000000D+08	-0.0727	4.4842	3.7568	-1.7560	-2.2075	-2.5000
1.371568D+09	-0.0422	4.4629	3.7591	-1.7890	-2.2372	-2.5289
2.512371D+09	-0.0073	4.4368	3.7612	-1.8256	-2.2696	-2.5600
3.407330D+09	0.0218	4.4135	3.7627	-1.8542	-2.2941	-2.5833
4.072721D+09	0.0447	4.3945	3.7637	-1.8755	-2.3123	-2.6005
4.583151D+09	0.0630	4.3787	3.7643	-1.8918	-2.3259	-2.6134
5.219502D+09	0.0867	4.3569	3.7648	-1.9107	-2.3408	-2.6270
7.764904D+09	0.1996	4.2409	3.7640	-1.9805	-2.3896	-2.6687
8.173509D+09	0.2203	4.2153	3.7628	-1.9836	-2.3877	-2.6650
8.786416D+09	0.2598	4.1654	3.7602	-1.9856	-2.3803	-2.6543
8.939643D+09	0.2699	4.1513	3.7592	-1.9829	-2.3749	-2.6479
9.041794D+09	0.2759	4.1425	3.7585	-1.9801	-2.3704	-2.6427
9.086485D+09	0.2818	4.1346	3.7580	-1.9792	-2.3681	-2.6400
9.124792D+09	0.2849	4.1300	3.7576	-1.9776	-2.3657	-2.6373
9.278018D+09	0.2915	4.1184	3.7564	-1.9701	-2.3557	-2.6264
9.405707D+09	0.2986	4.1060	3.7550	-1.9617	-2.3449	-2.6147
9.456783D+09	0.3088	4.0909	3.7538	-1.9563	-2.3370	-2.6059
9.507858D+09	0.3117	4.0858	3.7532	-1.9527	-2.3324	-2.6010
9.584472D+09	0.3161	4.0776	3.7523	-1.9464	-2.3245	-2.5925
9.648316D+09	0.3185	4.0717	3.7514	-1.9403	-2.3173	-2.5850
9.661085D+09	0.3229	4.0642	3.7507	-1.9356	-2.3114	-2.5785
9.680238D+09	0.3250	4.0589	3.7498	-1.9291	-2.3037	-2.5705
9.731314D+09	0.3282	4.0526	3.7491	-1.9237	-2.2973	-2.5637
9.782390D+09	0.3314	4.0459	3.7482	-1.9159	-2.2882	-2.5543
9.833465D+09	0.3348	4.0376	3.7470	-1.9045	-2.2751	-2.5406
9.884541D+09	0.3380	4.0289	3.7456	-1.8921	-2.2612	-2.5263
9.903694D+09	0.3394	4.0251	3.7450	-1.8868	-2.2554	-2.5203
9.916463D+09	0.3404	4.0217	3.7444	-1.8818	-2.2499	-2.5146
9.954770D+09	0.3428	4.0135	3.7430	-1.8691	-2.2358	-2.5002
9.993076D+09	0.3448	4.0062	3.7416	-1.8578	-2.2233	-2.4874
1.000924D+10	0.3456	4.0031	3.7411	-1.8526	-2.2176	-2.4815
1.001243D+10	0.3457	4.0026	3.7409	-1.8517	-2.2166	-2.4805
1.001881D+10	0.3460	4.0014	3.7407	-1.8497	-2.2145	-2.4783
1.003158D+10	0.3467	3.9988	3.7403	-1.8455	-2.2099	-2.4736
1.005712D+10	0.3481	3.9935	3.7393	-1.8367	-2.2006	-2.4642
1.021035D+10	0.3468	3.9524	3.7287	-1.7380	-2.0968	-2.3592
1.038998D+10	0.3317	3.8945	3.7104	-1.5650	-1.9230	-2.1867
1.049634D+10	0.3261	3.8482	3.6975	-1.4487	-1.8107	-2.0770
1.057339D+10	0.3357	3.8042	3.6888	-1.3744	-1.7410	-2.0100
1.063543D+10	0.3558	3.7624	3.6834	-1.3270	-1.6976	-1.9687
1.068758D+10	0.3809	3.7229	3.6798	-1.2969	-1.6706	-1.9433
1.073138D+10	0.4072	3.6869	3.6774	-1.2768	-1.6528	-1.9267
1.076968D+10	0.4340	3.6538	3.6758	-1.2636	-1.6414	-1.9163
1.080332D+10	0.4601	3.6232	3.6747	-1.2549	-1.6341	-1.9098
1.090739D+10	0.5552	3.5191	3.6724	-1.2359	-1.6193	-1.8977
1.098113D+10	0.6375	3.4318	3.6712	-1.2302	-1.6161	-1.8965
1.105380D+10	0.7352	3.3272	3.6695	-1.2302	-1.6184	-1.9006
1.106477D+10	0.7520	3.3094	3.6692	-1.2306	-1.6192	-1.9018
1.107497D+10	0.7680	3.2917	3.6688	-1.2314	-1.6203	-1.9031
1.108461D+10	0.7839	3.2754	3.6687	-1.2319	-1.6212	-1.9044
1.109375D+10	0.7994	3.2590	3.6685	-1.2328	-1.6225	-1.9061
1.110213D+10	0.8140	3.2428	3.6681	-1.2339	-1.6238	-1.9076
1.111019D+10	0.8284	3.2267	3.6677	-1.2350	-1.6251	-1.9090
1.111796D+10	0.8426	3.2118	3.6675	-1.2356	-1.6260	-1.9104
1.112552D+10	0.8570	3.1963	3.6672	-1.2367	-1.6274	-1.9121
1.113238D+10	0.8707	3.1816	3.6670	-1.2375	-1.6286	-1.9136
1.113908D+10	0.8839	3.1666	3.6665	-1.2391	-1.6302	-1.9153
1.114569D+10	0.8977	3.1520	3.6663	-1.2398	-1.6314	-1.9169
1.115221D+10	0.9115	3.1367	3.6660	-1.2409	-1.6328	-1.9186

TABLE I.4.

Log m = 0.0492

Age	Log L	Log g	Log Teff	LogK2	LogK3	LogK4
0.000000D+00	0.1512	4.4178	3.7838	-1.9576	-2.4481	-2.7634
3.000000D+08	0.1631	4.4086	3.7845	-1.9717	-2.4611	-2.7761
1.113258D+09	0.1963	4.3814	3.7860	-2.0113	-2.4982	-2.8133
1.806841D+09	0.2258	4.3552	3.7868	-2.0441	-2.5278	-2.8425
2.362632D+09	0.2502	4.3319	3.7871	-2.0677	-2.5477	-2.8615
2.816233D+09	0.2698	4.3108	3.7867	-2.0836	-2.5591	-2.8712
3.179438D+09	0.2861	4.2926	3.7862	-2.0946	-2.5662	-2.8767
3.478200D+09	0.2992	4.2764	3.7855	-2.1012	-2.5685	-2.8771
3.723636D+09	0.3099	4.2622	3.7846	-2.1043	-2.5675	-2.8742
3.923193D+09	0.3187	4.2501	3.7838	-2.1060	-2.5655	-2.8706
4.009288D+09	0.3226	4.2447	3.7834	-2.1065	-2.5644	-2.8687
4.084159D+09	0.3262	4.2397	3.7831	-2.1071	-2.5635	-2.8671
4.153746D+09	0.3298	4.2350	3.7828	-2.1082	-2.5633	-2.8663
4.214051D+09	0.3335	4.2307	3.7826	-2.1101	-2.5643	-2.8669
4.268660D+09	0.3373	4.2267	3.7826	-2.1130	-2.5665	-2.8690
4.363091D+09	0.3462	4.2188	3.7828	-2.1224	-2.5753	-2.8778
4.400210D+09	0.3513	4.2151	3.7832	-2.1294	-2.5826	-2.8855
4.505212D+09	0.3650	4.2043	3.7839	-2.1475	-2.6014	-2.9053
4.604505D+09	0.3736	4.1951	3.7838	-2.1539	-2.6063	-2.9097
5.200265D+09	0.4212	4.1356	3.7808	-2.1705	-2.6097	-2.9073
5.825899D+09	0.4769	4.0506	3.7735	-2.1499	-2.5656	-2.8519
6.234333D+09	0.5131	3.9706	3.7625	-2.0670	-2.4572	-2.7315
6.485940D+09	0.5202	3.9019	3.7471	-1.9078	-2.2766	-2.5422
6.636644D+09	0.4907	3.8511	3.7270	-1.6844	-2.0436	-2.3068
6.686579D+09	0.4728	3.8321	3.7178	-1.5850	-1.9441	-2.2080
6.725706D+09	0.4602	3.8140	3.7101	-1.5076	-1.8687	-2.1340
6.787432D+09	0.4519	3.7771	3.6988	-1.3982	-1.7640	-2.0320
6.835075D+09	0.4611	3.7403	3.6919	-1.3336	-1.7039	-1.9745
6.875441D+09	0.4796	3.7036	3.6874	-1.2939	-1.6679	-1.9405
6.909408D+09	0.5013	3.6706	3.6846	-1.2680	-1.6448	-1.9188
6.953444D+09	0.5370	3.6238	3.6818	-1.2447	-1.6245	-1.9000
7.000464D+09	0.5814	3.5700	3.6794	-1.2273	-1.6099	-1.8870
7.021790D+09	0.6043	3.5439	3.6786	-1.2220	-1.6057	-1.8835
7.031890D+09	0.6155	3.5314	3.6783	-1.2194	-1.6037	-1.8818
7.040981D+09	0.6259	3.5200	3.6780	-1.2175	-1.6022	-1.8805
7.057920D+09	0.6458	3.4980	3.6775	-1.2144	-1.5999	-1.8787
7.074011D+09	0.6656	3.4761	3.6770	-1.2121	-1.5982	-1.8776
7.088377D+09	0.6839	3.4557	3.6765	-1.2098	-1.5965	-1.8762
7.101962D+09	0.7023	3.4358	3.6761	-1.2085	-1.5959	-1.8761
7.114963D+09	0.7203	3.4161	3.6757	-1.2069	-1.5948	-1.8754
7.126767D+09	0.7375	3.3975	3.6753	-1.2061	-1.5945	-1.8754
7.138463D+09	0.7551	3.3782	3.6749	-1.2062	-1.5951	-1.8763
7.149150D+09	0.7718	3.3603	3.6746	-1.2052	-1.5946	-1.8763
7.158982D+09	0.7880	3.3432	3.6744	-1.2052	-1.5951	-1.8771
7.168251D+09	0.8033	3.3262	3.6739	-1.2051	-1.5952	-1.8774
7.177205D+09	0.8189	3.3096	3.6737	-1.2051	-1.5957	-1.8784
7.185577D+09	0.8341	3.2934	3.6734	-1.2057	-1.5968	-1.8799
7.193584D+09	0.8489	3.2775	3.6732	-1.2056	-1.5969	-1.8801
7.201484D+09	0.8636	3.2606	3.6726	-1.2060	-1.5973	-1.8806
7.216827D+09	0.8945	3.2274	3.6720	-1.2078	-1.6001	-1.8843
7.229641D+09	0.9219	3.1971	3.6713	-1.2090	-1.6018	-1.8865
7.246627D+09	0.9609	3.1543	3.6704	-1.2118	-1.6054	-1.8910
7.251962D+09	0.9736	3.1404	3.6701	-1.2126	-1.6065	-1.8923
7.259188D+09	0.9916	3.1201	3.6695	-1.2139	-1.6080	-1.8941
7.274652D+09	1.0328	3.0736	3.6682	-1.2186	-1.6133	-1.9000
7.288216D+09	1.0721	3.0303	3.6672	-1.2213	-1.6169	-1.9047
7.291744D+09	1.0830	3.0180	3.6668	-1.2224	-1.6183	-1.9062
7.304620D+09	1.1245	2.9713	3.6655	-1.2267	-1.6234	-1.9123
7.324611D+09	1.1973	2.8887	3.6631	-1.2352	-1.6333	-1.9239
7.337558D+09	1.2509	2.8270	3.6611	-1.2425	-1.6416	-1.9333

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TABLE I.5.

Log m = 0.0969

Age	Log L	Log g	Log Teff	LogK2	LogK3	LogK4
0.000000D+00	0.3713	4.3540	3.8110	-2.1768	-2.7395	-3.1102
3.000000D+08	0.3874	4.3395	3.8114	-2.1970	-2.7590	-3.1306
7.862388D+08	0.4138	4.3145	3.8117	-2.2270	-2.7863	-3.1581
1.271666D+09	0.4404	4.2858	3.8112	-2.2534	-2.8079	-3.1784
1.680127D+09	0.4622	4.2585	3.8098	-2.2700	-2.8175	-3.1846
2.018336D+09	0.4795	4.2331	3.8078	-2.2778	-2.8169	-3.1790
2.301846D+09	0.4932	4.2094	3.8053	-2.2782	-2.8075	-3.1634
2.537258D+09	0.5036	4.1881	3.8026	-2.2731	-2.7927	-3.1422
2.732693D+09	0.5110	4.1692	3.7997	-2.2626	-2.7718	-3.1143
2.894552D+09	0.5163	4.1526	3.7969	-2.2488	-2.7478	-3.0834
3.027141D+09	0.5208	4.1382	3.7944	-2.2359	-2.7263	-3.0562
3.133264D+09	0.5250	4.1265	3.7925	-2.2265	-2.7105	-3.0363
3.217206D+09	0.5303	4.1169	3.7915	-2.2229	-2.7026	-3.0257
3.277137D+09	0.5386	4.1096	3.7917	-2.2325	-2.7121	-3.0357
3.313594D+09	0.5494	4.1043	3.7931	-2.2547	-2.7388	-3.0660
3.335714D+09	0.5616	4.1007	3.7952	-2.2820	-2.7724	-3.1047
3.349153D+09	0.5752	4.0969	3.7977	-2.3132	-2.8113	-3.1499
3.357967D+09	0.5888	4.0927	3.8000	-2.3431	-2.8485	-3.1932
3.364107D+09	0.6008	4.0874	3.8017	-2.3672	-2.8779	-3.2275
3.368787D+09	0.6078	4.0823	3.8022	-2.3771	-2.8890	-3.2400
3.373359D+09	0.6109	4.0788	3.8021	-2.3794	-2.8907	-3.2414
3.380217D+09	0.6128	4.0758	3.8018	-2.3796	-2.8900	-3.2402
3.407649D+09	0.6169	4.0687	3.8011	-2.3787	-2.8865	-3.2349
3.517378D+09	0.6290	4.0465	3.7985	-2.3736	-2.8727	-3.2152
3.845949D+09	0.6649	3.9754	3.7897	-2.3405	-2.8096	-3.1321
4.116056D+09	0.6935	3.8908	3.7757	-2.2351	-2.6600	-2.9547
4.279247D+09	0.6831	3.8176	3.7548	-1.9980	-2.3776	-2.6482
4.370499D+09	0.6232	3.7791	3.7302	-1.6881	-2.0489	-2.3126
4.424574D+09	0.5784	3.7563	3.7133	-1.4877	-1.8510	-2.1172
4.481699D+09	0.5657	3.7097	3.6985	-1.3359	-1.7069	-1.9773
4.511554D+09	0.5780	3.6769	3.6934	-1.2867	-1.6616	-1.9340
4.537135D+09	0.5964	3.6458	3.6902	-1.2564	-1.6346	-1.9088
4.559883D+09	0.6169	3.6165	3.6880	-1.2356	-1.6161	-1.8915
4.580189D+09	0.6379	3.5887	3.6863	-1.2223	-1.6046	-1.8808
4.598938D+09	0.6586	3.5626	3.6850	-1.2118	-1.5956	-1.8725
4.615906D+09	0.6793	3.5379	3.6839	-1.2050	-1.5902	-1.8680
4.631598D+09	0.6994	3.5143	3.6831	-1.1993	-1.5855	-1.8639
4.645460D+09	0.7179	3.4928	3.6823	-1.1951	-1.5822	-1.8610
4.658725D+09	0.7364	3.4713	3.6816	-1.1921	-1.5798	-1.8590
4.670778D+09	0.7540	3.4511	3.6809	-1.1897	-1.5780	-1.8575
4.682251D+09	0.7714	3.4315	3.6804	-1.1880	-1.5770	-1.8570
4.692585D+09	0.7878	3.4136	3.6800	-1.1864	-1.5760	-1.8565
4.702410D+09	0.8037	3.3959	3.6796	-1.1850	-1.5750	-1.8558
4.711822D+09	0.8199	3.3788	3.6793	-1.1835	-1.5742	-1.8556
4.720716D+09	0.8355	3.3617	3.6790	-1.1827	-1.5739	-1.8555
4.729142D+09	0.8509	3.3448	3.6786	-1.1825	-1.5741	-1.8561
4.744494D+09	0.8799	3.3130	3.6779	-1.1819	-1.5743	-1.8569
4.755380D+09	0.9016	3.2892	3.6773	-1.1817	-1.5746	-1.8577
4.768701D+09	0.9296	3.2583	3.6766	-1.1822	-1.5758	-1.8594
4.777387D+09	0.9492	3.2365	3.6761	-1.1828	-1.5768	-1.8608
4.785489D+09	0.9679	3.2156	3.6755	-1.1834	-1.5777	-1.8620
4.793140D+09	0.9861	3.1953	3.6750	-1.1840	-1.5787	-1.8633
4.807183D+09	1.0222	3.1549	3.6739	-1.1859	-1.5812	-1.8665
4.813452D+09	1.0393	3.1361	3.6735	-1.1872	-1.5830	-1.8687
4.840403D+09	1.1203	3.0451	3.6710	-1.1933	-1.5905	-1.8779
4.853665D+09	1.1661	2.9932	3.6695	-1.1976	-1.5957	-1.8840
4.857572D+09	1.1804	2.9768	3.6690	-1.1991	-1.5974	-1.8860
4.861338D+09	1.1946	2.9606	3.6685	-1.2007	-1.5992	-1.8881
4.870478D+09	1.2312	2.9189	3.6672	-1.2046	-1.6039	-1.8935
4.871548D+09	1.2357	2.9138	3.6670	-1.2051	-1.6045	-1.8942

TABLE I.6.

Log m = 0.1492

Age	Log L	Log g	Log Teff	LogK2	LogK3	LogK4
0.000000D+00	0.6013	4.3124	3.8450	-2.3455	-2.9880	-3.4330
3.000000D+08	0.6220	4.2896	3.8445	-2.3675	-3.0059	-3.4498
6.917691D+08	0.6492	4.2552	3.8427	-2.3951	-3.0269	-3.4682
1.028002D+09	0.6715	4.2194	3.8393	-2.4152	-3.0386	-3.4754
1.308450D+09	0.6899	4.1845	3.8352	-2.4277	-3.0414	-3.4721
1.544182D+09	0.7040	4.1512	3.8304	-2.4315	-3.0335	-3.4562
1.742076D+09	0.7148	4.1197	3.8252	-2.4288	-3.0184	-3.4318
1.907806D+09	0.7222	4.0905	3.8198	-2.4196	-2.9958	-3.3988
2.046279D+09	0.7273	4.0648	3.8146	-2.4037	-2.9656	-3.3571
2.160570D+09	0.7302	4.0427	3.8098	-2.3840	-2.9314	-3.3113
2.253066D+09	0.7322	4.0243	3.8057	-2.3639	-2.8984	-3.2680
2.328207D+09	0.7349	4.0093	3.8026	-2.3483	-2.8728	-3.2345
2.386636D+09	0.7391	3.9981	3.8009	-2.3414	-2.8600	-3.2174
2.426716D+09	0.7465	3.9909	3.8009	-2.3491	-2.8677	-3.2255
2.450363D+09	0.7562	3.9873	3.8024	-2.3690	-2.8925	-3.2549
2.464249D+09	0.7678	3.9859	3.8050	-2.3966	-2.9283	-3.2979
2.472694D+09	0.7816	3.9842	3.8080	-2.4274	-2.9683	-3.3465
2.478052D+09	0.7987	3.9861	3.8128	-2.4694	-3.0244	-3.4156
2.481053D+09	0.8127	3.9865	3.8164	-2.4992	-3.0635	-3.4637
2.482928D+09	0.8259	3.9861	3.8196	-2.5238	-3.0952	-3.5023
2.484657D+09	0.8412	3.9850	3.8231	-2.5507	-3.1297	-3.5445
2.485442D+09	0.8455	3.9842	3.8240	-2.5579	-3.1387	-3.5554
2.486043D+09	0.8462	3.9834	3.8240	-2.5587	-3.1394	-3.5561
2.486824D+09	0.8455	3.9809	3.8232	-2.5556	-3.1346	-3.5498
2.489946D+09	0.8510	3.9649	3.8205	-2.5521	-3.1250	-3.5354
2.498274D+09	0.8571	3.9506	3.8185	-2.5521	-3.1212	-3.5286
2.523256D+09	0.8634	3.9328	3.8156	-2.5468	-3.1088	-3.5104
2.623184D+09	0.8811	3.8703	3.8044	-2.5086	-3.0398	-3.4158
2.746661D+09	0.8848	3.7835	3.7836	-2.3533	-2.8156	-3.1371
2.835081D+09	0.8161	3.7128	3.7488	-1.9081	-2.2842	-2.5536
2.874669D+09	0.7361	3.7048	3.7268	-1.6009	-1.9647	-2.2300
2.903469D+09	0.6928	3.6912	3.7126	-1.4259	-1.7932	-2.0610
2.927693D+09	0.6826	3.6664	3.7038	-1.3279	-1.7005	-1.9710
2.948145D+09	0.6896	3.6381	3.6985	-1.2726	-1.6494	-1.9222
2.966995D+09	0.7049	3.6091	3.6951	-1.2384	-1.6186	-1.8932
2.983250D+09	0.7228	3.5825	3.6929	-1.2172	-1.6000	-1.8759
2.997977D+09	0.7411	3.5574	3.6912	-1.2029	-1.5876	-1.8644
3.011454D+09	0.7592	3.5337	3.6898	-1.1921	-1.5783	-1.8558
3.017614D+09	0.7679	3.5226	3.6892	-1.1878	-1.5747	-1.8526
3.035115D+09	0.7939	3.4907	3.6877	-1.1780	-1.5665	-1.8454
3.050965D+09	0.8194	3.4603	3.6865	-1.1718	-1.5615	-1.8411
3.064870D+09	0.8430	3.4334	3.6857	-1.1677	-1.5585	-1.8387
3.077848D+09	0.8659	3.4074	3.6849	-1.1642	-1.5559	-1.8367
3.089656D+09	0.8879	3.3826	3.6842	-1.1616	-1.5542	-1.8355
3.100482D+09	0.9091	3.3588	3.6835	-1.1603	-1.5535	-1.8353
3.110337D+09	0.9291	3.3364	3.6830	-1.1591	-1.5529	-1.8351
3.119551D+09	0.9486	3.3145	3.6824	-1.1581	-1.5524	-1.8349
3.128203D+09	0.9677	3.2933	3.6818	-1.1577	-1.5525	-1.8355
3.136251D+09	0.9859	3.2725	3.6812	-1.1575	-1.5527	-1.8360
3.143861D+09	1.0041	3.2519	3.6806	-1.1580	-1.5536	-1.8371
3.150851D+09	1.0216	3.2330	3.6802	-1.1580	-1.5541	-1.8381
3.157542D+09	1.0389	3.2135	3.6797	-1.1584	-1.5548	-1.8392
3.169790D+09	1.0722	3.1762	3.6787	-1.1594	-1.5566	-1.8416
3.180640D+09	1.1042	3.1400	3.6776	-1.1610	-1.5588	-1.8444
3.190184D+09	1.1338	3.1066	3.6767	-1.1628	-1.5611	-1.8472
3.194753D+09	1.1485	3.0897	3.6761	-1.1637	-1.5622	-1.8485
3.207115D+09	1.1917	3.0405	3.6746	-1.1672	-1.5664	-1.8537
3.210688D+09	1.2051	3.0253	3.6742	-1.1681	-1.5677	-1.8551
3.221651D+09	1.2480	2.9759	3.6726	-1.1719	-1.5721	-1.8604
3.222660D+09	1.2522	2.9711	3.6724	-1.1723	-1.5726	-1.8610

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TABLE I.7.

Log m = 0.1987

Age	Log L	Log g	Log Teff	LogK2	LogK3	LogK4
0.000000D+00	0.8072	4.3220	3.8865	-2.3546	-3.0167	-3.4796
2.699322D+08	0.8317	4.2880	3.8841	-2.3818	-3.0378	-3.4986
5.593636D+08	0.8578	4.2433	3.8795	-2.4134	-3.0624	-3.5206
7.992527D+08	0.8787	4.1973	3.8732	-2.4414	-3.0838	-3.5399
9.993891D+08	0.8953	4.1508	3.8657	-2.4656	-3.1014	-3.5553
1.165275D+09	0.9089	4.1056	3.8578	-2.4849	-3.1149	-3.5665
1.304160D+09	0.9182	4.0621	3.8493	-2.4976	-3.1208	-3.5689
1.419856D+09	0.9246	4.0223	3.8409	-2.5024	-3.1171	-3.5598
1.514791D+09	0.9286	3.9877	3.8333	-2.4991	-3.1041	-3.5395
1.593472D+09	0.9305	3.9584	3.8264	-2.4882	-3.0817	-3.5077
1.656533D+09	0.9323	3.9351	3.8211	-2.4740	-3.0563	-3.4729
1.706159D+09	0.9345	3.9168	3.8170	-2.4645	-3.0385	-3.4482
1.744042D+09	0.9388	3.9044	3.8150	-2.4616	-3.0308	-3.4365
1.769590D+09	0.9460	3.8981	3.8152	-2.4696	-3.0392	-3.4458
1.784552D+09	0.9556	3.8970	3.8174	-2.4857	-3.0595	-3.4704
1.793644D+09	0.9672	3.8993	3.8208	-2.5078	-3.0887	-3.5065
1.799185D+09	0.9805	3.9031	3.8251	-2.5337	-3.1234	-3.5497
1.802486D+09	0.9945	3.9088	3.8301	-2.5566	-3.1535	-3.5868
1.804531D+09	1.0090	3.9157	3.8354	-2.5757	-3.1783	-3.6173
1.805821D+09	1.0231	3.9221	3.8405	-2.5912	-3.1978	-3.6407
1.806671D+09	1.0360	3.9278	3.8452	-2.6028	-3.2118	-3.6571
1.807209D+09	1.0457	3.9318	3.8486	-2.6102	-3.2203	-3.6669
1.807593D+09	1.0515	3.9345	3.8507	-2.6139	-3.2243	-3.6713
1.807869D+09	1.0530	3.9362	3.8515	-2.6148	-3.2253	-3.6724
1.808070D+09	1.0521	3.9370	3.8515	-2.6141	-3.2247	-3.6718
1.808323D+09	1.0488	3.9368	3.8506	-2.6120	-3.2224	-3.6693
1.809335D+09	1.0465	3.9211	3.8461	-2.6120	-3.2204	-3.6661
1.813384D+09	1.0583	3.8897	3.8412	-2.6221	-3.2266	-3.6701
1.829579D+09	1.0677	3.8568	3.8353	-2.6276	-3.2268	-3.6666
1.872765D+09	1.0802	3.7763	3.8183	-2.6105	-3.1873	-3.6082
1.915952D+09	1.0616	3.6705	3.7872	-2.4224	-2.9138	-3.2592
1.943106D+09	0.9790	3.6192	3.7538	-1.9830	-2.3729	-2.6493
1.963790D+09	0.8608	3.6243	3.7255	-1.5540	-1.9199	-2.1861
1.979642D+09	0.8170	3.6084	3.7106	-1.3578	-1.7297	-1.9996
1.992124D+09	0.8179	3.5771	3.7030	-1.2713	-1.6491	-1.9220
2.003917D+09	0.8361	3.5413	3.6986	-1.2221	-1.6049	-1.8805
2.014311D+09	0.8586	3.5073	3.6957	-1.1947	-1.5805	-1.8575
2.023758D+09	0.8812	3.4770	3.6938	-1.1782	-1.5664	-1.8447
2.036538D+09	0.9133	3.4359	3.6915	-1.1639	-1.5545	-1.8340
2.048154D+09	0.9438	3.3988	3.6899	-1.1545	-1.5467	-1.8272
2.058275D+09	0.9710	3.3661	3.6885	-1.1490	-1.5425	-1.8236
2.066951D+09	0.9946	3.3385	3.6875	-1.1461	-1.5405	-1.8221
2.074716D+09	1.0164	3.3139	3.6868	-1.1436	-1.5388	-1.8211
2.082141D+09	1.0373	3.2901	3.6860	-1.1418	-1.5377	-1.8205
2.088861D+09	1.0567	3.2681	3.6854	-1.1408	-1.5373	-1.8205
2.095253D+09	1.0755	3.2467	3.6848	-1.1407	-1.5378	-1.8214
2.101016D+09	1.0930	3.2268	3.6842	-1.1403	-1.5379	-1.8218
2.106401D+09	1.1098	3.2076	3.6836	-1.1403	-1.5381	-1.8224
2.116471D+09	1.1427	3.1702	3.6824	-1.1404	-1.5390	-1.8239
2.121109D+09	1.1590	3.1519	3.6819	-1.1410	-1.5400	-1.8252
2.125423D+09	1.1744	3.1340	3.6813	-1.1414	-1.5407	-1.8263
2.133466D+09	1.2049	3.0989	3.6802	-1.1424	-1.5424	-1.8284
2.140681D+09	1.2340	3.0656	3.6791	-1.1441	-1.5446	-1.8312
2.146963D+09	1.2607	3.0349	3.6781	-1.1456	-1.5466	-1.8337
2.152919D+09	1.2872	3.0041	3.6770	-1.1476	-1.5490	-1.8366
2.155706D+09	1.3001	2.9892	3.6765	-1.1486	-1.5502	-1.8381
2.159179D+09	1.3168	2.9699	3.6759	-1.1498	-1.5518	-1.8399
2.164039D+09	1.3409	2.9419	3.6749	-1.1519	-1.5542	-1.8428
2.167849D+09	1.3607	2.9187	3.6741	-1.1534	-1.5560	-1.8450
2.168582D+09	1.3646	2.9143	3.6739	-1.1537	-1.5565	-1.8455

TABLE I.8.

Log m = 0.2989

Age	Log L	Log g	Log Teff	LogK2	LogK3	LogK4
0.000000D+00	1.2047	4.3458	3.9668	-2.2866	-2.9526	-3.4177
3.000000D+05	1.2047	4.3458	3.9668	-2.2866	-2.9526	-3.4177
7.000000D+05	1.2047	4.3458	3.9668	-2.2866	-2.9526	-3.4177
3.100000D+06	1.2050	4.3451	3.9667	-2.2870	-2.9530	-3.4180
1.270000D+07	1.2066	4.3425	3.9664	-2.2885	-2.9538	-3.4185
5.110000D+07	1.2129	4.3319	3.9654	-2.2966	-2.9603	-3.4245
1.889168D+08	1.2364	4.2898	3.9607	-2.3266	-2.9841	-3.4460
3.371991D+08	1.2617	4.2355	3.9535	-2.3610	-3.0107	-3.4700
4.579523D+08	1.2828	4.1818	3.9453	-2.3913	-3.0342	-3.4914
5.560341D+08	1.2993	4.1289	3.9362	-2.4174	-3.0540	-3.5094
6.366704D+08	1.3122	4.0777	3.9266	-2.4398	-3.0713	-3.5252
7.029001D+08	1.3214	4.0284	3.9166	-2.4590	-3.0859	-3.5386
7.578499D+08	1.3276	3.9815	3.9064	-2.4751	-3.0980	-3.5498
8.029943D+08	1.3321	3.9385	3.8968	-2.4882	-3.1080	-3.5590
8.392313D+08	1.3347	3.9004	3.8880	-2.4991	-3.1164	-3.5668
8.684117D+08	1.3373	3.8691	3.8808	-2.5078	-3.1230	-3.5729
8.916327D+08	1.3403	3.8455	3.8756	-2.5146	-3.1281	-3.5774
9.096445D+08	1.3456	3.8315	3.8734	-2.5210	-3.1336	-3.5828
9.209464D+08	1.3531	3.8289	3.8747	-2.5258	-3.1378	-3.5870
9.276114D+08	1.3624	3.8343	3.8783	-2.5306	-3.1428	-3.5922
9.319105D+08	1.3733	3.8447	3.8837	-2.5345	-3.1469	-3.5964
9.344326D+08	1.3855	3.8579	3.8900	-2.5387	-3.1514	-3.6012
9.360139D+08	1.3986	3.8719	3.8968	-2.5439	-3.1572	-3.6071
9.370102D+08	1.4122	3.8857	3.9036	-2.5488	-3.1625	-3.6126
9.376216D+08	1.4260	3.8972	3.9100	-2.5544	-3.1682	-3.6184
9.379975D+08	1.4388	3.9060	3.9154	-2.5593	-3.1730	-3.6232
9.382533D+08	1.4493	3.9127	3.9197	-2.5647	-3.1785	-3.6288
9.384168D+08	1.4564	3.9169	3.9225	-2.5678	-3.1817	-3.6320
9.385303D+08	1.4587	3.9199	3.9238	-2.5685	-3.1823	-3.6325
9.386083D+08	1.4586	3.9216	3.9242	-2.5680	-3.1819	-3.6321
9.386670D+08	1.4570	3.9227	3.9241	-2.5669	-3.1809	-3.6311
9.388325D+08	1.4464	3.9225	3.9214	-2.5612	-3.1753	-3.6257
9.394943D+08	1.4463	3.8890	3.9130	-2.5688	-3.1808	-3.6307
9.412590D+08	1.4612	3.8486	3.9066	-2.5862	-3.1959	-3.6454
9.465531D+08	1.4690	3.8119	3.8994	-2.5988	-3.2068	-3.6560
9.645749D+08	1.4723	3.6535	3.8606	-2.6307	-3.2321	-3.6793
9.735802D+08	1.4451	3.5067	3.8171	-2.6193	-3.2069	-3.6425
9.803341D+08	1.3500	3.3979	3.7661	-2.2340	-2.6870	-3.0035
9.863846D+08	1.1481	3.4162	3.7202	-1.4560	-1.8269	-2.0959
9.904183D+08	1.1581	3.3394	3.7035	-1.2334	-1.6163	-1.8923
9.944399D+08	1.2401	3.2241	3.6952	-1.1651	-1.5569	-1.8375
9.976284D+08	1.3125	3.1346	3.6909	-1.1451	-1.5411	-1.8240
1.000183D+09	1.3700	3.0654	3.6880	-1.1377	-1.5361	-1.8206
1.004200D+09	1.4570	2.9608	3.6836	-1.1333	-1.5346	-1.8210
1.006560D+09	1.5053	2.9029	3.6812	-1.1332	-1.5358	-1.8233
1.008584D+09	1.5450	2.8550	3.6792	-1.1334	-1.5371	-1.8255
1.010335D+09	1.5777	2.8158	3.6775	-1.1347	-1.5392	-1.8282
1.011939D+09	1.6088	2.7784	3.6760	-1.1358	-1.5410	-1.8307
1.013432D+09	1.6387	2.7421	3.6744	-1.1369	-1.5428	-1.8332
1.014763D+09	1.6658	2.7093	3.6729	-1.1384	-1.5450	-1.8359
1.015987D+09	1.6907	2.6794	3.6717	-1.1396	-1.5469	-1.8385
1.018115D+09	1.7334	2.6274	3.6694	-1.1423	-1.5506	-1.8431
1.019982D+09	1.7711	2.5812	3.6672	-1.1452	-1.5543	-1.8476
1.021603D+09	1.8037	2.5419	3.6656	-1.1476	-1.5574	-1.8515
1.023044D+09	1.8331	2.5062	3.6640	-1.1505	-1.5610	-1.8558
1.024353D+09	1.8593	2.4739	3.6625	-1.1530	-1.5641	-1.8596
1.025567D+09	1.8837	2.4437	3.6610	-1.1556	-1.5673	-1.8634
1.026679D+09	1.9065	2.4157	3.6597	-1.1586	-1.5710	-1.8678
1.027699D+09	1.9270	2.3903	3.6585	-1.1602	-1.5728	-1.8698
1.028023D+09	1.9336	2.3823	3.6581	-1.1612	-1.5740	-1.8713

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TABLE I.9.

Log m = 0.3997

Age	Log L	Log g	Log Teff	LogK2	LogK3	LogK4
0.000000D+00	1.5923	4.3505	4.0396	-2.2159	-2.8831	-3.3487
3.000000D+05	1.5922	4.3504	4.0396	-2.2159	-2.8831	-3.3487
1.500000D+06	1.5925	4.3499	4.0396	-2.2163	-2.8834	-3.3490
6.300000D+06	1.5941	4.3472	4.0393	-2.2189	-2.8860	-3.3517
2.550000D+07	1.6004	4.3366	4.0382	-2.2268	-2.8923	-3.3574
9.791797D+07	1.6251	4.2931	4.0335	-2.2576	-2.9169	-3.3797
1.775318D+08	1.6531	4.2358	4.0262	-2.2947	-2.9463	-3.4064
2.410667D+08	1.6761	4.1800	4.0180	-2.3271	-2.9719	-3.4298
2.923698D+08	1.6950	4.1259	4.0092	-2.3551	-2.9937	-3.4498
3.342610D+08	1.7100	4.0734	3.9998	-2.3798	-3.0134	-3.4682
3.678711D+08	1.7215	4.0237	3.9903	-2.4005	-3.0297	-3.4834
3.958402D+08	1.7300	3.9767	3.9806	-2.4180	-3.0433	-3.4962
4.185837D+08	1.7364	3.9339	3.9715	-2.4330	-3.0553	-3.5076
4.369473D+08	1.7411	3.8957	3.9632	-2.4453	-3.0649	-3.5166
4.520986D+08	1.7456	3.8637	3.9563	-2.4555	-3.0731	-3.5245
4.640577D+08	1.7502	3.8397	3.9514	-2.4637	-3.0799	-3.5311
4.729640D+08	1.7558	3.8258	3.9494	-2.4705	-3.0856	-3.5366
4.787012D+08	1.7637	3.8240	3.9509	-2.4755	-3.0904	-3.5414
4.844200D+08	1.7824	3.8410	3.9598	-2.4824	-3.0974	-3.5486
4.862094D+08	1.7990	3.8620	3.9692	-2.4877	-3.1031	-3.5544
4.870750D+08	1.8177	3.8838	3.9793	-2.4944	-3.1104	-3.5616
4.875010D+08	1.8361	3.9014	3.9883	-2.5015	-3.1176	-3.5689
4.877117D+08	1.8512	3.9125	3.9949	-2.5080	-3.1241	-3.5754
4.878238D+08	1.8590	3.9184	3.9983	-2.5108	-3.1267	-3.5781
4.878880D+08	1.8599	3.9214	3.9993	-2.5107	-3.1266	-3.5780
4.879434D+08	1.8557	3.9232	3.9987	-2.5079	-3.1239	-3.5753
4.881566D+08	1.8407	3.9071	3.9909	-2.5038	-3.1193	-3.5705
4.896488D+08	1.8680	3.8320	3.9790	-2.5370	-3.1484	-3.5990
5.013295D+08	1.8566	3.4902	3.8907	-2.5980	-3.1994	-3.6485
5.046727D+08	1.7603	3.2135	3.7974	-2.5475	-3.1267	-3.5539
5.063443D+08	1.5807	3.1614	3.7395	-1.8731	-2.2754	-2.5590
5.080159D+08	1.5107	3.0872	3.7034	-1.2594	-1.6421	-1.9185
5.100219D+08	1.6778	2.8595	3.6883	-1.1584	-1.5550	-1.8390
5.116161D+08	1.8043	2.7022	3.6806	-1.1465	-1.5481	-1.8355
5.127007D+08	1.8852	2.6013	3.6756	-1.1456	-1.5497	-1.8391
5.135833D+08	1.9507	2.5199	3.6716	-1.1455	-1.5516	-1.8425
5.143427D+08	2.0066	2.4507	3.6683	-1.1449	-1.5531	-1.8455
5.149699D+08	2.0522	2.3936	3.6654	-1.1456	-1.5552	-1.8489
5.155220D+08	2.0919	2.3440	3.6629	-1.1466	-1.5576	-1.8523
5.159894D+08	2.1249	2.3021	3.6607	-1.1479	-1.5599	-1.8554
5.164091D+08	2.1546	2.2646	3.6588	-1.1497	-1.5626	-1.8589
5.167895D+08	2.1817	2.2303	3.6570	-1.1514	-1.5650	-1.8621
5.171328D+08	2.2059	2.2001	3.6555	-1.1532	-1.5677	-1.8655
5.174430D+08	2.2280	2.1722	3.6540	-1.1545	-1.5694	-1.8675
5.177346D+08	2.2486	2.1459	3.6526	-1.1563	-1.5719	-1.8708
5.180017D+08	2.2675	2.1218	3.6513	-1.1579	-1.5741	-1.8734
5.180877D+08	2.2735	2.1141	3.6509	-1.1585	-1.5749	-1.8743
5.183386D+08	2.2914	2.0912	3.6496	-1.1602	-1.5770	-1.8769
5.185775D+08	2.3082	2.0695	3.6484	-1.1619	-1.5791	-1.8794
5.187956D+08	2.3237	2.0497	3.6473	-1.1638	-1.5816	-1.8825
5.190055D+08	2.3378	2.0315	3.6463	-1.1650	-1.5830	-1.8841
5.191782D+08	2.3493	2.0167	3.6455	-1.1662	-1.5845	-1.8858
5.192795D+08	2.3520	2.0132	3.6453	-1.1667	-1.5849	-1.8862
5.193444D+08	2.3423	2.0258	3.6460	-1.1661	-1.5841	-1.8852
5.194255D+08	2.2773	2.1098	3.6507	-1.1618	-1.5778	-1.8771
5.195878D+08	2.1761	2.2387	3.6576	-1.1557	-1.5684	-1.8649
5.199123D+08	2.0911	2.3468	3.6634	-1.1512	-1.5613	-1.8557
5.204122D+08	2.0249	2.4301	3.6677	-1.1489	-1.5571	-1.8498
5.216131D+08	1.9719	2.4970	3.6712	-1.1480	-1.5544	-1.8456
5.218533D+08	1.9681	2.5018	3.6714	-1.1480	-1.5542	-1.8453

TABLE I.10.

Log m = 0.4997

Age	Log L	Log g	Log Teff	LogK2	LogK3	LogK4
0.000000D+00	1.9722	4.3460	4.1085	-2.1483	-2.8155	-3.2812
3.000000D+05	1.9722	4.3458	4.1085	-2.1483	-2.8156	-3.2812
1.500000D+06	1.9730	4.3446	4.1084	-2.1492	-2.8163	-3.2819
6.300000D+06	1.9761	4.3397	4.1079	-2.1530	-2.8194	-3.2847
2.550000D+07	1.9888	4.3194	4.1060	-2.1683	-2.8318	-3.2960
7.444449D+07	2.0227	4.2612	4.0999	-2.2099	-2.8661	-3.3277
1.132942D+08	2.0508	4.2039	4.0926	-2.2464	-2.8950	-3.3537
1.439195D+08	2.0741	4.1488	4.0847	-2.2787	-2.9215	-3.3786
1.686909D+08	2.0935	4.0957	4.0762	-2.3063	-2.9433	-3.3986
1.885495D+08	2.1091	4.0451	4.0675	-2.3304	-2.9627	-3.4169
2.044490D+08	2.1211	3.9977	4.0587	-2.3511	-2.9797	-3.4331
2.176334D+08	2.1304	3.9533	4.0499	-2.3689	-2.9941	-3.4469
2.283023D+08	2.1382	3.9138	4.0419	-2.3842	-3.0071	-3.4595
2.368468D+08	2.1443	3.8796	4.0349	-2.3962	-3.0167	-3.4688
2.438246D+08	2.1502	3.8528	4.0297	-2.4065	-3.0253	-3.4772
2.492573D+08	2.1566	3.8345	4.0267	-2.4148	-3.0325	-3.4842
2.531041D+08	2.1637	3.8268	4.0266	-2.4211	-3.0381	-3.4897
2.555198D+08	2.1714	3.8283	4.0289	-2.4255	-3.0422	-3.4938
2.569803D+08	2.1801	3.8370	4.0332	-2.4288	-3.0455	-3.4971
2.579000D+08	2.1893	3.8501	4.0388	-2.4313	-3.0482	-3.4998
2.584476D+08	2.1999	3.8651	4.0452	-2.4346	-3.0519	-3.5032
2.587933D+08	2.2103	3.8799	4.0515	-2.4370	-3.0543	-3.5057
2.590137D+08	2.2213	3.8936	4.0577	-2.4411	-3.0586	-3.5099
2.590893D+08	2.2269	3.8994	4.0605	-2.4424	-3.0597	-3.5109
2.591958D+08	2.2375	3.9089	4.0656	-2.4474	-3.0649	-3.5160
2.592652D+08	2.2458	3.9158	4.0693	-2.4509	-3.0683	-3.5194
2.593114D+08	2.2508	3.9202	4.0717	-2.4531	-3.0705	-3.5215
2.593413D+08	2.2531	3.9227	4.0729	-2.4538	-3.0712	-3.5223
2.593628D+08	2.2525	3.9243	4.0732	-2.4531	-3.0705	-3.5216
2.593788D+08	2.2507	3.9252	4.0729	-2.4519	-3.0693	-3.5204
2.594232D+08	2.2403	3.9238	4.0700	-2.4463	-3.0637	-3.5148
2.595120D+08	2.2344	3.9053	4.0639	-2.4477	-3.0640	-3.5151
2.598674D+08	2.2581	3.8499	4.0560	-2.4749	-3.0883	-3.5390
2.608151D+08	2.2713	3.8032	4.0476	-2.4937	-3.1050	-3.5556
2.636581D+08	2.2840	3.6898	4.0224	-2.5264	-3.1342	-3.5852
2.662691D+08	2.2558	3.4155	3.9468	-2.5637	-3.1672	-3.6188
2.673427D+08	2.1753	3.1466	3.8594	-2.5601	-3.1605	-3.6091
2.678795D+08	2.0544	2.9239	3.7735	-2.4388	-2.9999	-3.4061
2.683268D+08	1.8633	2.8943	3.7183	-1.6109	-1.9965	-2.2716
2.688636D+08	1.9699	2.6694	3.6888	-1.2174	-1.6075	-1.8889
2.694793D+08	2.1310	2.4565	3.6758	-1.1697	-1.5696	-1.8568
2.700584D+08	2.2610	2.2901	3.6667	-1.1636	-1.5683	-1.8590
2.704845D+08	2.3525	2.1725	3.6602	-1.1620	-1.5701	-1.8633
2.707685D+08	2.4105	2.0980	3.6561	-1.1604	-1.5709	-1.8659
2.709176D+08	2.4338	2.0684	3.6545	-1.1598	-1.5712	-1.8667
2.711019D+08	2.4295	2.0741	3.6549	-1.1599	-1.5711	-1.8665
2.713784D+08	2.3999	2.1121	3.6570	-1.1597	-1.5699	-1.8646
2.719314D+08	2.3599	2.1643	3.6600	-1.1599	-1.5686	-1.8621
2.728268D+08	2.3322	2.2005	3.6621	-1.1621	-1.5696	-1.8624
2.737223D+08	2.3111	2.2278	3.6637	-1.1637	-1.5701	-1.8621
2.744685D+08	2.2953	2.2486	3.6649	-1.1651	-1.5708	-1.8623
2.750431D+08	2.2836	2.2637	3.6658	-1.1661	-1.5710	-1.8620
2.756810D+08	2.2718	2.2794	3.6668	-1.1673	-1.5716	-1.8623
2.763189D+08	2.2602	2.2946	3.6677	-1.1688	-1.5728	-1.8633
2.775948D+08	2.2393	2.3220	3.6693	-1.1713	-1.5739	-1.8635
2.783375D+08	2.2264	2.3390	3.6703	-1.1731	-1.5751	-1.8642
2.802422D+08	2.1969	2.3775	3.6726	-1.1782	-1.5787	-1.8671
2.811945D+08	2.1822	2.3968	3.6737	-1.1810	-1.5807	-1.8687
2.827817D+08	2.1574	2.4294	3.6757	-1.1865	-1.5846	-1.8716
2.840514D+08	2.1331	2.4619	3.6777	-1.1936	-1.5901	-1.8761

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TABLE I.11.

Log m = 0.5999

Age	Log L	Log g	Log Teff	LogK2	LogK3	LogK4
0.000000D+00	2.3477	4.3366	4.1750	-2.0839	-2.7509	-3.2167
3.000000D+05	2.3479	4.3362	4.1749	-2.0842	-2.7511	-3.2169
1.500000D+06	2.3494	4.3341	4.1748	-2.0859	-2.7525	-3.2182
6.300000D+06	2.3555	4.3253	4.1741	-2.0932	-2.7590	-3.2245
2.550000D+07	2.3807	4.2867	4.1708	-2.1228	-2.7836	-3.2470
4.990205D+07	2.4133	4.2315	4.1651	-2.1619	-2.8158	-3.2764
6.900933D+07	2.4418	4.1758	4.1583	-2.1980	-2.8450	-3.3030
8.426361D+07	2.4662	4.1221	4.1510	-2.2303	-2.8719	-3.3284
9.657796D+07	2.4864	4.0702	4.1431	-2.2583	-2.8944	-3.3491
1.066359D+08	2.5036	4.0204	4.1349	-2.2841	-2.9162	-3.3699
1.147194D+08	2.5178	3.9736	4.1268	-2.3051	-2.9330	-3.3856
1.210554D+08	2.5289	3.9313	4.1190	-2.3241	-2.9493	-3.4015
1.262956D+08	2.5384	3.8935	4.1119	-2.3390	-2.9613	-3.4130
1.304121D+08	2.5463	3.8619	4.1060	-2.3528	-2.9734	-3.4248
1.337311D+08	2.5539	3.8378	4.1018	-2.3635	-2.9826	-3.4339
1.362791D+08	2.5615	3.8240	4.1003	-2.3713	-2.9895	-3.4407
1.379404D+08	2.5687	3.8215	4.1015	-2.3768	-2.9944	-3.4455
1.389652D+08	2.5761	3.8276	4.1048	-2.3805	-2.9979	-3.4489
1.396111D+08	2.5839	3.8391	4.1097	-2.3820	-2.9992	-3.4501
1.400144D+08	2.5922	3.8534	4.1153	-2.3841	-3.0015	-3.4524
1.402658D+08	2.6014	3.8691	4.1215	-2.3868	-3.0049	-3.4558
1.404190D+08	2.6107	3.8837	4.1275	-2.3894	-3.0077	-3.4586
1.405141D+08	2.6203	3.8961	4.1330	-2.3920	-3.0099	-3.4607
1.405755D+08	2.6293	3.9059	4.1377	-2.3961	-3.0143	-3.4651
1.406151D+08	2.6360	3.9128	4.1411	-2.3993	-3.0174	-3.4681
1.406410D+08	2.6402	3.9170	4.1432	-2.4011	-3.0192	-3.4698
1.406578D+08	2.6417	3.9194	4.1442	-2.4016	-3.0196	-3.4703
1.406697D+08	2.6414	3.9206	4.1444	-2.4013	-3.0192	-3.4699
1.406786D+08	2.6401	3.9211	4.1442	-2.4004	-3.0183	-3.4690
1.406878D+08	2.6374	3.9212	4.1436	-2.3987	-3.0167	-3.4674
1.407248D+08	2.6249	3.9112	4.1379	-2.3934	-3.0108	-3.4615
1.408729D+08	2.6453	3.8506	4.1279	-2.4211	-3.0353	-3.4855
1.411690D+08	2.6629	3.8009	4.1198	-2.4433	-3.0553	-3.5054
1.436117D+08	2.6630	3.3806	4.0148	-2.5329	-3.1380	-3.5913
1.440886D+08	2.6034	3.1401	3.9398	-2.5404	-3.1459	-3.6002
1.443866D+08	2.4808	2.8267	3.8308	-2.5108	-3.1116	-3.5572
1.445655D+08	2.3098	2.5958	3.7303	-2.0757	-2.5352	-2.8522
1.447145D+08	2.2863	2.4520	3.6885	-1.3466	-1.7301	-2.0076
1.448933D+08	2.4680	2.1911	3.6687	-1.2114	-1.6075	-1.8936
1.451607D+08	2.6239	1.9828	3.6556	-1.1871	-1.5910	-1.8820
1.453155D+08	2.7018	1.8798	3.6493	-1.1847	-1.5913	-1.8843
1.454770D+08	2.7297	1.8433	3.6472	-1.1835	-1.5913	-1.8851
1.456626D+08	2.7191	1.8575	3.6481	-1.1850	-1.5922	-1.8856
1.458482D+08	2.7050	1.8765	3.6493	-1.1863	-1.5928	-1.8858
1.460338D+08	2.6937	1.8917	3.6503	-1.1875	-1.5935	-1.8861
1.462788D+08	2.6828	1.9066	3.6512	-1.1894	-1.5948	-1.8870
1.465536D+08	2.6721	1.9211	3.6522	-1.1907	-1.5952	-1.8869
1.468283D+08	2.6623	1.9344	3.6531	-1.1931	-1.5972	-1.8888
1.471031D+08	2.6535	1.9462	3.6538	-1.1950	-1.5985	-1.8896
1.473778D+08	2.6452	1.9575	3.6546	-1.1970	-1.5999	-1.8907
1.477500D+08	2.6345	1.9720	3.6555	-1.2001	-1.6023	-1.8927
1.481709D+08	2.6235	1.9870	3.6565	-1.2036	-1.6050	-1.8950
1.485918D+08	2.6139	2.0002	3.6574	-1.2068	-1.6074	-1.8971
1.494336D+08	2.5971	2.0233	3.6590	-1.2139	-1.6128	-1.9015
1.499208D+08	2.5878	2.0365	3.6600	-1.2188	-1.6168	-1.9051
1.511589D+08	2.5694	2.0628	3.6619	-1.2309	-1.6270	-1.9143
1.517780D+08	2.5617	2.0739	3.6628	-1.2368	-1.6317	-1.9184
1.531899D+08	2.5453	2.0980	3.6647	-1.2525	-1.6452	-1.9307
1.549083D+08	2.5297	2.1220	3.6669	-1.2717	-1.6616	-1.9457
1.560539D+08	2.5195	2.1382	3.6683	-1.2873	-1.6752	-1.9581

TABLE I.12.

Log m = 0.6998

Age	Log L	Log g	Log Teff	LogK2	LogK3	LogK4
0.000000D+00	2.7138	4.3276	4.2393	-2.0212	-2.6880	-3.1544
3.000000D+05	2.7143	4.3269	4.2392	-2.0218	-2.6885	-3.1548
1.500000D+06	2.7172	4.3232	4.2390	-2.0248	-2.6911	-3.1573
6.300000D+06	2.7276	4.3074	4.2377	-2.0379	-2.7018	-3.1669
2.043202D+07	2.7636	4.2560	4.2338	-2.0785	-2.7363	-3.1985
3.333292D+07	2.7989	4.1984	4.2282	-2.1210	-2.7726	-3.2326
4.342125D+07	2.8288	4.1426	4.2218	-2.1584	-2.8037	-3.2614
5.126635D+07	2.8539	4.0894	4.2148	-2.1910	-2.8310	-3.2869
5.749334D+07	2.8748	4.0387	4.2073	-2.2194	-2.8545	-3.3089
6.248586D+07	2.8919	3.9911	4.1997	-2.2443	-2.8752	-3.3285
6.657415D+07	2.9067	3.9464	4.1922	-2.2667	-2.8944	-3.3469
6.987213D+07	2.9188	3.9058	4.1851	-2.2848	-2.9094	-3.3612
7.251241D+07	2.9291	3.8705	4.1788	-2.3013	-2.9236	-3.3750
7.465389D+07	2.9382	3.8415	4.1738	-2.3145	-2.9350	-3.3861
7.634741D+07	2.9465	3.8209	4.1708	-2.3252	-2.9444	-3.3953
7.758778D+07	2.9543	3.8114	4.1703	-2.3329	-2.9512	-3.4020
7.835963D+07	2.9614	3.8126	4.1724	-2.3375	-2.9555	-3.4063
7.883444D+07	2.9682	3.8212	4.1763	-2.3404	-2.9583	-3.4090
7.914159D+07	2.9751	3.8340	4.1812	-2.3423	-2.9603	-3.4109
7.932617D+07	2.9825	3.8489	4.1868	-2.3434	-2.9615	-3.4121
7.944780D+07	2.9901	3.8643	4.1925	-2.3455	-2.9638	-3.4145
7.952252D+07	2.9985	3.8782	4.1981	-2.3480	-2.9666	-3.4173
7.956982D+07	3.0067	3.8898	4.2031	-2.3512	-2.9700	-3.4206
7.959944D+07	3.0139	3.8983	4.2070	-2.3537	-2.9722	-3.4229
7.961970D+07	3.0194	3.9042	4.2098	-2.3563	-2.9747	-3.4253
7.963262D+07	3.0224	3.9075	4.2114	-2.3578	-2.9760	-3.4266
7.964136D+07	3.0233	3.9093	4.2121	-2.3581	-2.9763	-3.4269
7.964753D+07	3.0228	3.9102	4.2122	-2.3577	-2.9758	-3.4264
7.965175D+07	3.0219	3.9104	4.2120	-2.3571	-2.9752	-3.4258
7.966314D+07	3.0135	3.9082	4.2093	-2.3521	-2.9701	-3.4208
7.969350D+07	3.0067	3.8812	4.2009	-2.3554	-2.9719	-3.4223
7.978459D+07	3.0357	3.8116	4.1907	-2.3904	-3.0035	-3.4534
8.002751D+07	3.0553	3.7368	4.1769	-2.4211	-3.0314	-3.4811
8.075625D+07	3.0677	3.4834	4.1167	-2.4827	-3.0882	-3.5401
8.112062D+07	3.0190	3.1176	4.0131	-2.5253	-3.1330	-3.5898
8.124113D+07	2.9534	2.8885	3.9394	-2.5252	-3.1348	-3.5916
8.130091D+07	2.8945	2.7178	3.8820	-2.5131	-3.1204	-3.5721
8.137563D+07	2.7712	2.3710	3.7645	-2.4587	-3.0426	-3.4641
8.147277D+07	2.7611	1.9831	3.6650	-1.3085	-1.6950	-1.9761
8.151761D+07	2.8811	1.8118	3.6521	-1.2411	-1.6363	-1.9227
8.162423D+07	3.0007	1.6472	3.6409	-1.2156	-1.6172	-1.9073
8.174848D+07	3.0289	1.6090	3.6384	-1.2158	-1.6181	-1.9087
8.187254D+07	3.0195	1.6222	3.6393	-1.2191	-1.6206	-1.9108
8.214350D+07	2.9967	1.6542	3.6417	-1.2264	-1.6263	-1.9157
8.233609D+07	2.9880	1.6665	3.6426	-1.2310	-1.6301	-1.9190
8.252868D+07	2.9814	1.6761	3.6433	-1.2349	-1.6332	-1.9217
8.272128D+07	2.9757	1.6846	3.6440	-1.2391	-1.6366	-1.9248
8.296834D+07	2.9696	1.6937	3.6447	-1.2443	-1.6410	-1.9287
8.324263D+07	2.9640	1.7020	3.6454	-1.2501	-1.6458	-1.9331
8.351692D+07	2.9595	1.7090	3.6461	-1.2558	-1.6506	-1.9375
8.379122D+07	2.9556	1.7151	3.6466	-1.2615	-1.6555	-1.9420
8.397408D+07	2.9533	1.7189	3.6470	-1.2653	-1.6588	-1.9450
8.431521D+07	2.9484	1.7267	3.6477	-1.2733	-1.6656	-1.9514
8.468785D+07	2.9434	1.7349	3.6485	-1.2823	-1.6734	-1.9585
8.493627D+07	2.9399	1.7406	3.6490	-1.2888	-1.6791	-1.9637
8.518470D+07	2.9365	1.7464	3.6496	-1.2956	-1.6850	-1.9693
8.543312D+07	2.9340	1.7508	3.6501	-1.3021	-1.6908	-1.9747
8.568155D+07	2.9323	1.7541	3.6505	-1.3077	-1.6956	-1.9792
8.597921D+07	2.9302	1.7582	3.6510	-1.3155	-1.7025	-1.9856
8.615266D+07	2.9294	1.7599	3.6512	-1.3196	-1.7061	-1.9890

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