

12. *Extended Travel-Time Tables for the JMA Standard Model of the Crust and Upper Mantle Structure beneath the Japanese Islands*.*

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Abstract

The travel-time table for the JMA standard model of the crust and upper mantle is extended to include more distant ranges up to 30° by increment of epicentral distance of 0.1° and travel times to the hundredths of a second. Travel times are calculated by the ray theory for very fine increments of take-off angles. Besides the travel times take-off angles at sources, incident angles to the earth's surface, apparent velocities, depths of ray bottom and geometrical spreading factors are also derived. These tables include effects of the 20° -discontinuity without smoothing and are useful for precise location of earthquake hypocenters, precise determination of fault-plane solutions and fine structure of the crust and upper mantle.

The travel times in the present study have differences of less than 0.5 second from those of the ICHIKAWA-MOCHIZUKI table (1971) for the JMA standard model. Differences of travel time between previously proposed tables and models for Japan amount to about 10 seconds. Travel times are also compared with a velocity model accompanying the low-velocity layer in the upper mantle. Contrary to the general acceptance no travel time jumps are observed and receding travel times and apparent velocities with epicentral distances are obtained for the velocity decreasing at the top of the low-velocity layer.

1. Introduction

As a single model in and near the Japanese Islands, ICHIKAWA and MOCHIZUKI (1971) proposed a velocity structure and standard travel-time table for the routine of hypocenter location by the Japan Meteorological

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Agency (JMA). Their velocity structure was constructed in conformity with the recent studies of the crustal velocities by explosions (ASADA and ASANO, 1972) and adopted from the global studies by JEFFREYS (1939) and BULLEN (1959) for the velocities in the upper mantle.

The ICHIKAWA-MOCHIZUKI table may be of use only within local range of epicentral distances due to its representation of horizontal distances in units of kilometers. It is difficult to connect the ICHIKAWA-MOCHIZUKI times to more distant ranges where distances are given by angular distance in degrees. Especially hypocenters of deep-focus earthquakes around Japan may be determined by using the standard travel times covering more distant ranges. The ICHIKAWA-MOCHIZUKI table is given for finer increment of focal depths than the JEFFREYS-BULLEN table (1948). Travel times in the ICHIKAWA-MOCHIZUKI table are given to the tenth of a second, and accurate values are not obtained in the numerical differentiation of travel times with respect to distance and depth. The distance increment may be given by 0.1° to keep the precision of travel times at any distances even by the linear interpolation.

In earlier years the standard tables of travel times were made by WADATI *et al.* (1933) for the P wave and by SAGISAKA and TAKEHANA (1935) for the S wave. It was later revealed that this P-wave table has some systematic discrepancies from the observed travel times in the studies by explosions (AKI, 1965b). Also significant lateral variations of the crust and upper mantle structure beneath the Japanese Islands have been also revealed (UTSU, 1971; ICHIKAWA, 1978; SUZUKI, 1978; MAKI, 1977b, 1981).

In this paper some basic tables will be derived for the velocity structure of the JMA standard models, or tables of travel times, take-off angles at sources, incident angles to the earth's surface, apparent velocities, depths of the deepest point of seismic ray and factors of the geometrical spreading. In the next chapter the proposed travel times and velocity models for the earth's structure in and near the Japanese Islands will be compared.

2. Velocity models of the crust and upper mantle in and near the Japanese Islands

Various velocity models for the crust and upper mantle beneath the Japanese Islands are compared to evaluate the ICHIKAWA and MOCHIZUKI model (1971) as the standard one. The proposed velocity models are tabulated in Appendix I. The first model for the P-wave velocity structure was derived by HONDA (1931) from the travel times of the North Izu Earthquake on Nov. 26, 1930. WADATI *et al.* (1933) obtained the P-wave

travel-time table for the Honda's velocities at depths less than 300 km and the extrapolated ones for deeper parts down to 500 km (broken line in Fig. 1a; Appendix I-1). JEFFREYS (1939) proposed the standard travel time tables for the global velocity model of the P wave (thick line in Fig. 1a) and for the S wave (Appendix I-2 and I-3 by BULLEN, 1959).

Studies of the crustal structure were made for various regions in Japan by the Research Group for Explosion Seismology (ASADA and ASANO, 1972). The old standard table of travel times by WADATI *et al.* (1933) which had been used in the JMA routine of hypocenter location were not consistent with such recent crustal velocities (AKI, 1965b). Travel-times of the shallow earthquakes in Japan were also analyzed by THE RESEARCH GROUP FOR THE TRAVEL TIME CURVE (1967). ICHIKAWA and MOCHIZUKI (1971) proposed a single model for Japan taking into account the recent

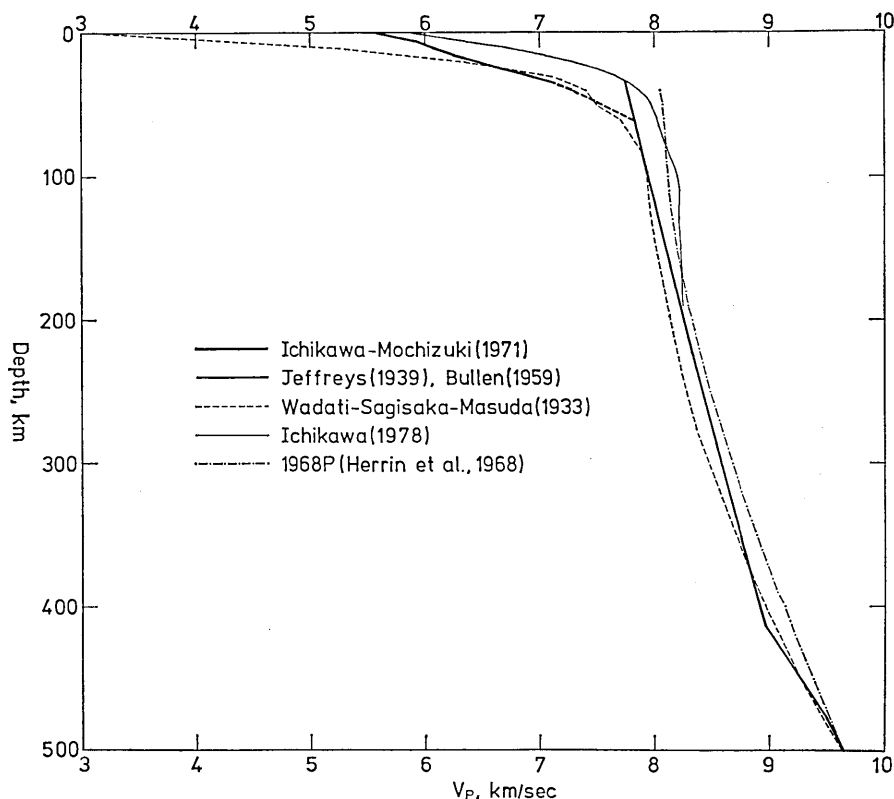


Fig. 1a. P-wave velocity models in and near the Japanese Islands.

- (1) WADATI-SAGISAKA-MASUDA (1933, broken line),
- (2) JEFFREYS (1933, thick line),
- (3) ICHIKAWA and MOCHIZUKI (1971, thick line),
- (4) ICHIKAWA (1978, thin line),
- (5) 1968 P (HERRIN *et al.*, 1968, chain line).

explosion studies (upper thick line in Fig. 1a; Appendix I-4). The velocities in deeper parts than 35 km were smoothly extrapolated to fit the JEFFREYS-BULLEN's model (JEFFREYS, 1939; taken from BULLEN, 1959; lower thick line in Fig. 1a). Thus in the depth range from 35 to 70 km there remain some arbitrariness.

A distinctive high velocity zone exists along the deep seismic zone associated with the descending Pacific lithospheric plate towards the west (UTSU, 1971). Such an anomalous structure of the upper mantle leads to misdetermination of earthquake hypocenters on the Pacific side of North-east Japan, Hokkaido and the Kurile Islands. In order to reduce the systematic discrepancies in the hypocenter locations determined by the JMA and other agencies (ISC and NEIS), ICHIKAWA (1978) gave a regional velocity model (Appendix I-5; thin line in Fig. 1a) and a travel-time table.

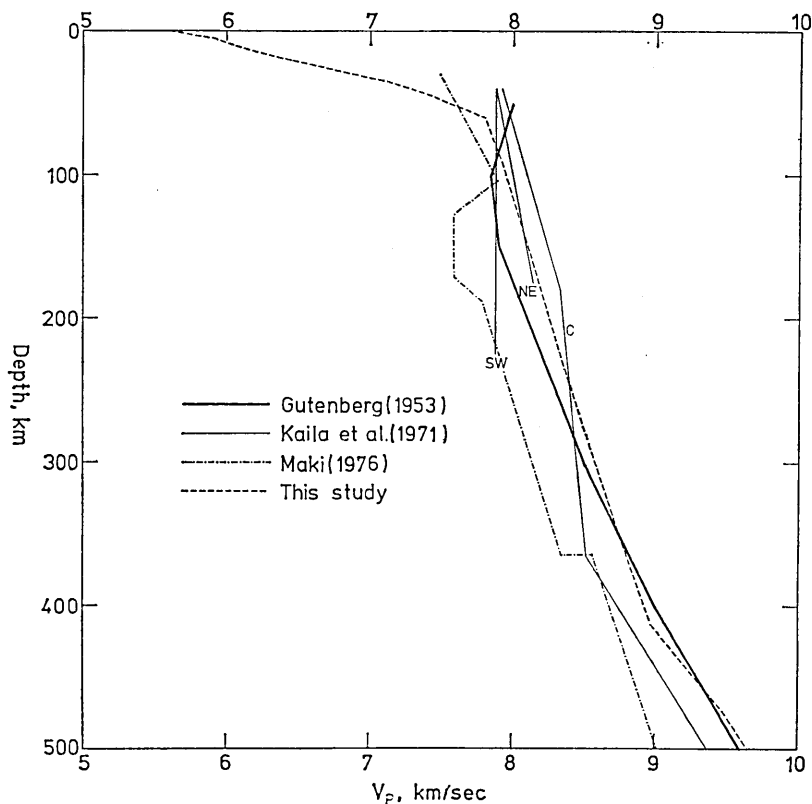


Fig. 1b. Velocity-depth distribution obtained by the GUTENBERG method.

- (1) GUTENBERG (1953, thick line),
- (2) KAILA *et al.* (1971, thin line), "C", "NE" and "SW" denote the velocity variation below the Central, Northeast and Southwest Japan, respectively,
- (3) MAKI (1976, chain line).

The velocities in this model are comparably higher than the recent global model of the 1968 P travel-time table (HERRIN *et al.*, 1968; chain line in Fig. 1a). SUZUKI (1978) also showed the existence of such high velocities on the Pacific side of Northeast Japan. Such a feature along the deep seismic zone was also shown for the attenuation factors (UTSU, 1967). The velocity structure within and around the deep seismic zone has also been studied by TADA (1972), NAGAMUNE (1973), KAKUTA (1973), UTSU (1975) and MAKI (1977b). Contrary to these high velocity models, MAKI (1981) showed the presence of the lower velocities in the crust and uppermost mantle from Pn travel times.

The JMA standard model (broken line) is compared in Fig. 1b with the depth variations of velocity obtained by the Gutenberg method. The Gutenberg method for velocity determination has the advantage of inde-

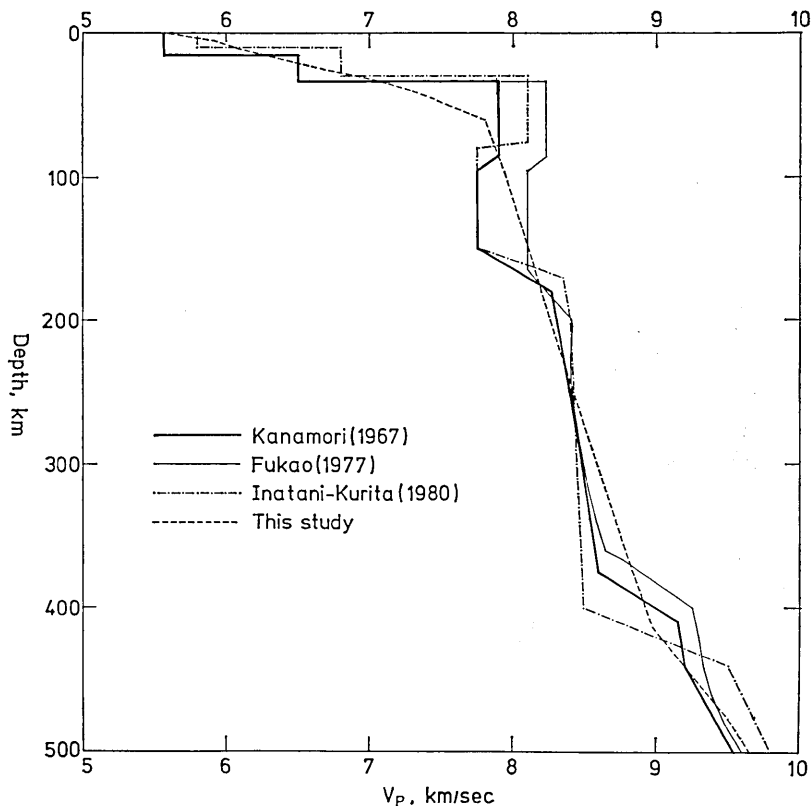


Fig. 1c. Velocity-depth distribution obtained by the method of apparent velocities, $dT/d\Delta$.

- (1) KANAMORI (1967, thick line),
- (2) FUKAO (1977, thin line),
- (3) INATANI and KURITA (1980, chain line).

pendence from shallower velocities. The thick line denotes the velocity structure by GUTENBERG (1953), which is characterized by the presence of a wide low-velocity layer. KAILA *et al.* (1971) obtained the P-wave velocity structure beneath the Japanese Islands by an analytical method. They showed the regional variation of the upper mantle velocities for Central, Southwest and Northeast Japan (thin lines denoted by "C", "SW" and "NE" in Fig. 1b). Further, the existence of the velocity discontinuity at a depth of about 350 km is shown in their model of Central Japan. MAKI (1976) showed the presence of the low-velocity layer at depths from 150 to 170 km and "20°-discontinuity" at a depth of 364 km by the improved Gutenberg method (chain line in Fig. 1b).

The JMA standard model is also compared with the recent fine structure of the upper mantle around the Japanese Islands obtained by using apparent velocities observed at Wakayama Micro-earthquake Observatory (Fig. 1c). KANAMORI (1967) gave the preliminary velocity model for the Japan-Kurile, Izu-Mariana and Kyushu-Taiwan Arc from the apparent velocities ($dT/d\Delta$) of 51 earthquakes (thick line in Fig. 1c). KANAMORI's model is characterized by the presence of a low-velocity zone at depths from 85 to 180 km and the velocity discontinuity at a depth of 375 km. FUKAO (1977) gave the velocity model of the upper mantle from the slowness of first and later arrivals of 69 earthquakes in the Kurile-Kamchatka Arc (thin line in Fig. 1c). His velocity model consists of the high velocity lid of the low-velocity layer and the abrupt velocity increases at depths of 400, 520, 650 and 740 km. INATANI and KURITA (1980) gave the velocity structure for the Ryukyu-Taiwan-Philippine Arc from the travel times and apparent velocities from 53 earthquakes. They mentioned the existence of a velocity jump of 10% at the 650 km discontinuity from the very sharp reflection and another discontinuity at a depth of 420 km (chain line in Fig. 1c). Some differences among these models may suggest some ambiguities in the analyses or regional variation of the upper mantle. In Fig. 1c the JMA standard velocities are recognized as the mean ones by comparing with such fine structure.

The crust and upper mantle velocities beneath the Japanese Islands show the distinctive regional variations and some fine features as the low-velocity layer and 20°-discontinuity. Such features derived by the method of apparent velocity (KANAMORI, 1967; FUKAO, 1977; INATANI and KURITA, 1980) show some differences with respect to depth, thickness and velocity contrast. In the location of earthquake hypocenters, fine features of velocity structure are not so important because of their little effect on first arrivals.

However, regional variations of the crust and upper mantle have more

important effects on hypocenter locations. There are two extreme velocity models, or the ICHIKAWA model (1978) having the highest velocities on the Pacific side of Northeast Japan and Hokkaido, and the MAKI's model (1976) with the lowest velocities beneath the Japanese Islands. The old JMA model by WADATI *et al.* (1933) has velocities near the average.

3. Method of travel-time calculation

Travel times have been calculated using the ray theory (BULLEN, 1961). DOWLING and NUTTLI (1964) obtained the travel times for several types of the low-velocity zones in the upper mantle. AKI (1965a, b) obtained the travel times for the crust and uppermost mantle of Northeast Japan by varying parameters of the power law of velocity distribution. JULIAN and ANDERSON (1968) calculated the travel times, apparent velocities and amplitudes for various models of the upper mantle. MAKI (1981) gave the lower velocity models of the uppermost mantle from the Pn travel times by the ray theory.

Instead of the exact seismic ray theory ICHIKAWA and MOCHIZUKI (1971) calculated the travel times by summing up path lengths and travel times within the constant velocity shells of 2 km thick. This method has an advantage of applicability to any type of depth-velocity variation even with the low-velocity layer. However this method takes a great amount of computing times to obtain accurate results. Travel times at equi-distances of 10 km in their table were obtained by the smoothed interpolation from the calculated times for a given interval of the take-off angle at the source.

For a spherical earth model with gradually increasing velocities with depth, an angular distance and travel time of a ray which propagates from its deepest point (r_d) to the earth's surface (r_0) with the ray parameter of p (Fig. 2) are represented by

$$\Delta = 2p \int_{r_d}^{r_0} \frac{1}{r \sqrt{\eta^2 - p^2}} dr, \quad (1)$$

$$\text{and} \quad T = 2 \int_{r_d}^{r_0} \frac{\eta^2}{r \sqrt{\eta^2 - p^2}} dr, \quad (2)$$

where the apparent velocity at the radial distance (r) from the earth's center are given as

$$\eta = \frac{r}{v}, \quad (3)$$

(BULLEN, 1961).

When the velocity variation within a layer is given by the power law of the radial distance from the earth's center,

$$v = a \cdot r^b, \quad (4)$$

the angular distance and travel time along the ray within the layer are obtained by

$$\Delta = \frac{1}{1-b} \cos^{-1} \left(\frac{a}{r^{1-b}} p \right), \quad (5)$$

$$T = \frac{1}{1-b} \sqrt{\left(\frac{r^{1-b}}{a} \right)^2 - p^2}, \quad (6)$$

(JULIAN and ANDERSON, 1968).

For a multilayering structure of the spherical earth with the velocity distribution of the power law in each layer,

$$v = a_i \cdot r^{b_i}, \quad (7)$$

the angular lengths and travel times through N layers are given by summing up from the deepest point of the ray to the earth's surface or to the focal depth (Fig. 2),

$$\Delta = \sum_{i=1}^N \frac{1}{1-b_i} \cos^{-1} \left(\frac{a_i}{r^{1-b_i}} p \right), \quad (8)$$

and

$$T = \sum_{i=1}^N \frac{1}{1-b_i} \sqrt{\left(\frac{r^{1-b_i}}{a_i} \right)^2 - p^2}. \quad (9)$$

When velocities are given for any depth in the earth, coefficients (a_i and b_i) in the power law of velocity distribution in each layer are determined by

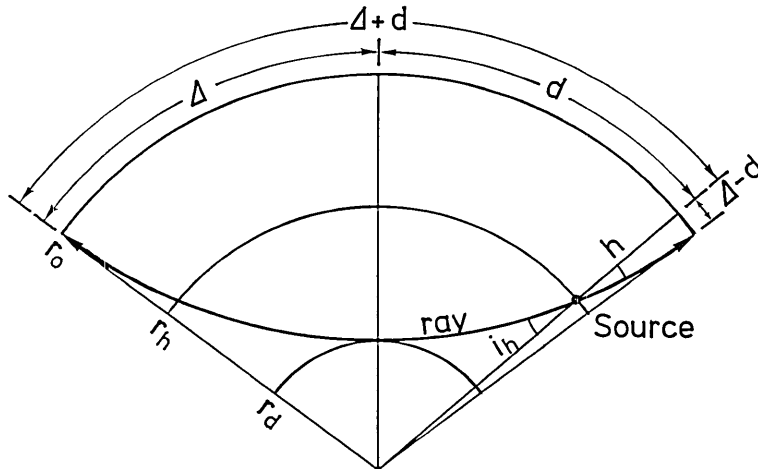


Fig. 2. Illustration of the travel time calculation for the source depth (h , km). Thick lines denote the seismic rays which depart the focus with the take-off angles of i_h . The angular distances $\Delta + d$ and $\Delta - d$ mean the downward and upward rays from the focus, where Δ and d mean the angular distances travelling from the deepest point to the earth's surface and to the depth of the focus.

using the velocities at the top and bottom of the layer.

A ray which departs the source of depth (h) with a take-off angle of i_h has the ray parameter (DOWLING and NUTTLI, 1964)

$$p = \frac{v}{\gamma} \sin i_h, \quad (10)$$

where i_h is measured from the downward vertical. Searching a depth at which the apparent velocity equals the ray parameter given by eq. 10, an interval to be summed is defined. When Δ and T denote angular distance and travel time for the path from the deepest point to the earth's surface, and d and t for the ones from the deepest point to the source depth (Fig. 2), the angular distances and travel times of the seismic ray which departs the earthquake hypocenter downward and upward with the take-off angles

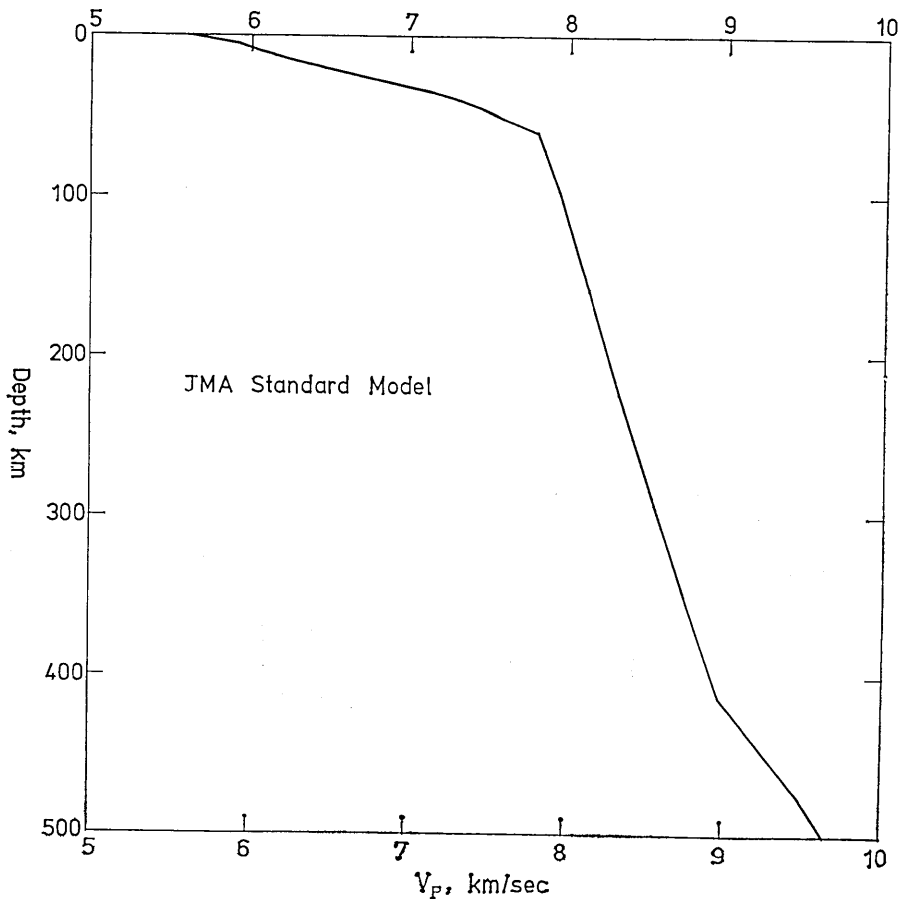


Fig. 3. P-wave velocity used in the present study as the JMA standard model. For depths less than 35 km the velocities are same as those of ICHIKAWA and MOCHIZUKI (1971), and for depths over 96 km the same as JEFFREYS (1939).

i_h are given by (Δ_{maj}, T_{maj}) and (Δ_{min}, T_{min}) , as follows

$$\Delta_{maj} = \Delta \div d,$$

$$T_{maj} = T \div t,$$

$$\Delta_{min} = \Delta - d,$$

and

$$T_{min} = T - t. \quad (11)$$

As the first step travel times are calculated for take-off angles at an interval of 0.01° . Finer increments of take-off angles are tried near the defined distances until angular distances are obtained within the required precision. Such fine increments do not miss later arrivals due to the cusp. Particular searching with further fine increments was made to get rid of missing travel times due to abrupt increasing of distances by the velocity discontinuity. Only the first arrivals are tabulated among several arrivals

Table 1. Velocity model used in this study. Focal depths are given by the fraction of radius, r/r_0 , where $r = r_0 - h$ for the earth's radius $r_0 = 6338.0$ km and focal depth of h km.

r/r_0	Depth km	P-wave velocity km/sec	r/r_0	Depth km	P-wave velocity km/sec
1.0052	0.0	5.60	0.88	793.56	10.99
1.0044	5.0	5.92	0.86	920.32	11.29
1.0036	10.0	6.06	0.84	1047.08	11.50
1.0028	15.0	6.25	0.82	1173.84	11.67
1.0021	20.0	6.46	0.80	1300.60	11.85
1.0013	25.0	6.67	0.78	1427.36	12.03
1.0005	30.0	6.91	0.76	1554.12	12.20
0.9997	35.0	7.13	0.74	1680.80	12.37
0.9989	40.0	7.30	0.72	1807.64	12.54
0.9981	45.0	7.45	0.70	1934.40	12.71
0.9973	50.0	7.55	0.68	2061.16	12.87
0.9957	60.0	7.80	0.66	2187.92	13.02
0.99	96.38	7.936	0.64	2314.68	13.16
0.98	159.76	8.131	0.62	2441.44	13.32
0.97	223.14	8.332	0.60	2568.20	13.46
0.96	286.52	8.539	0.58	2694.96	13.60
0.95	349.90	8.752	0.56	2821.72	13.64
0.94	413.28	8.971	0.55	2885.10	13.64
0.93	476.66	9.50			
0.92	540.04	9.91			
0.91	603.42	10.26			
0.90	666.80	10.55			
0.89	730.18	10.77			

at the same distances. Calculated times match the JEFFREYS travel times (1939; JEFFREYS and BULLEN, 1948) within 0.2 second. The P-wave velocity structure of the JMA standard model used in this study is shown in Fig. 3 and Table 1.

4. Features of the extended travel-time table

Travel times were calculated for an equal interval of epicentral distance of 0.1° by varying the take-off angles at source depths in fine increments from 0.01° to 0.00001° . In order to connect the global range of distances, source depths are represented by the fraction of the earth's radius as in the JEFFREYS table. Besides the travel times of first arrivals, take-off angles at sources, incident angles to the earth's surface, apparent velocities, depths of ray bottom and factors of the geometrical spreading are compiled at equidistances of 0.1° (Appendix II) and their distance variation is shown in Fig. 4 to 9. Distances are extended up to 31.1° for the effective usages.

Appendix II-1 lists the extended travel times for the JMA standard model, and Fig. 4 shows the reduced travel times by $V_p=8.0$ km/sec for the 14 focal depths. Refracted travel times with the velocity of 8.0 km/sec is observed to distances of about 15° for the focal depths of $h=0$ and 33 km. Discontinuous travel times of the first arrival by the velocity discontinuity at the depth of 413 km appear at distances around 20° .

Take-off angles (i_h) at the source are given for the 14 focal depths in Appendix II-2. The take-off angles are measured from the downward vertical as shown by the inset of Fig. 5, which shows the distance variations of the take-off angles for the 14 focal depths. Nearly constant values of the take-off angles over distances from $\Delta=2^\circ$ to 19° for shallow depths are related to the refraction along the Mohorovicic discontinuity. For depths less than 413 km, jumps of take-off angles of 10° to 20° are due to the discontinuous increasing of velocities at the depth of 413 km. Such jumps in the take-off angles are not seen from the smoothed values of HODGSON and STOREY's table (1953). The take-off angles in this study have been used in mechanism determination of earthquakes in and near the Kanto District (MAKI, 1982).

In Appendix II-3 are given incident angles (i_0) to the earth's surface for the 14 focal depths. The incident angles are measured from the downward vertical as shown by the inset of Fig. 6, which shows the distance variations of the incident angles to the earth's surface. Large variations of incident angles are observed at short distances for shallow depths of $h=0$ and 33 km. Apparent velocities or $p=dT/d\Delta$ (in sec/deg) are tabulated in

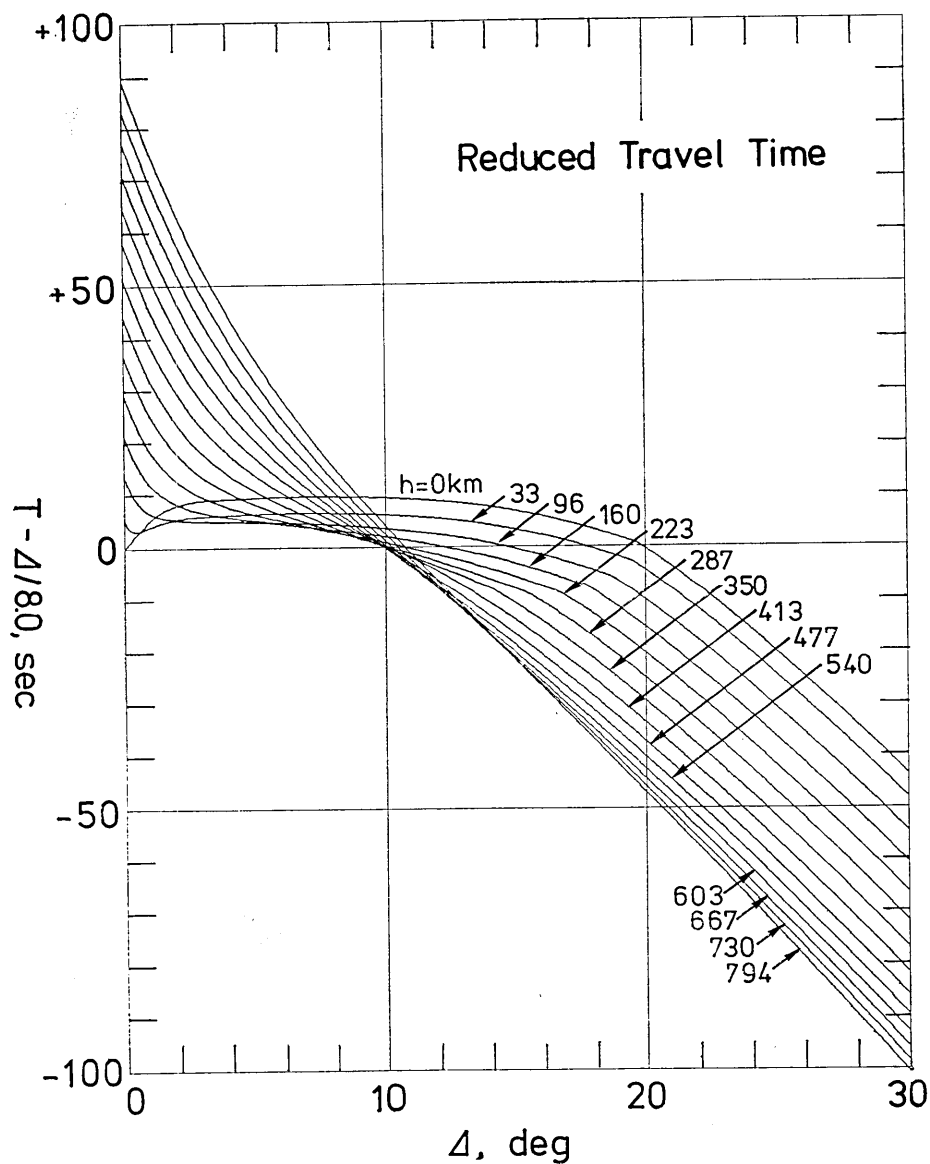


Fig. 4. Reduced travel times for the 14 focal depths. Reference velocity is adopted as 8.0 km/sec.

Appendix II-4, and distance variations of them are shown in Fig. 7. For the first arrivals, an effect of velocity discontinuity on the apparent velocities is observed only as a discontinuous appearance. The crustal velocities can be identified from apparent velocities for the focal depths of $h=0$ and 33 km.

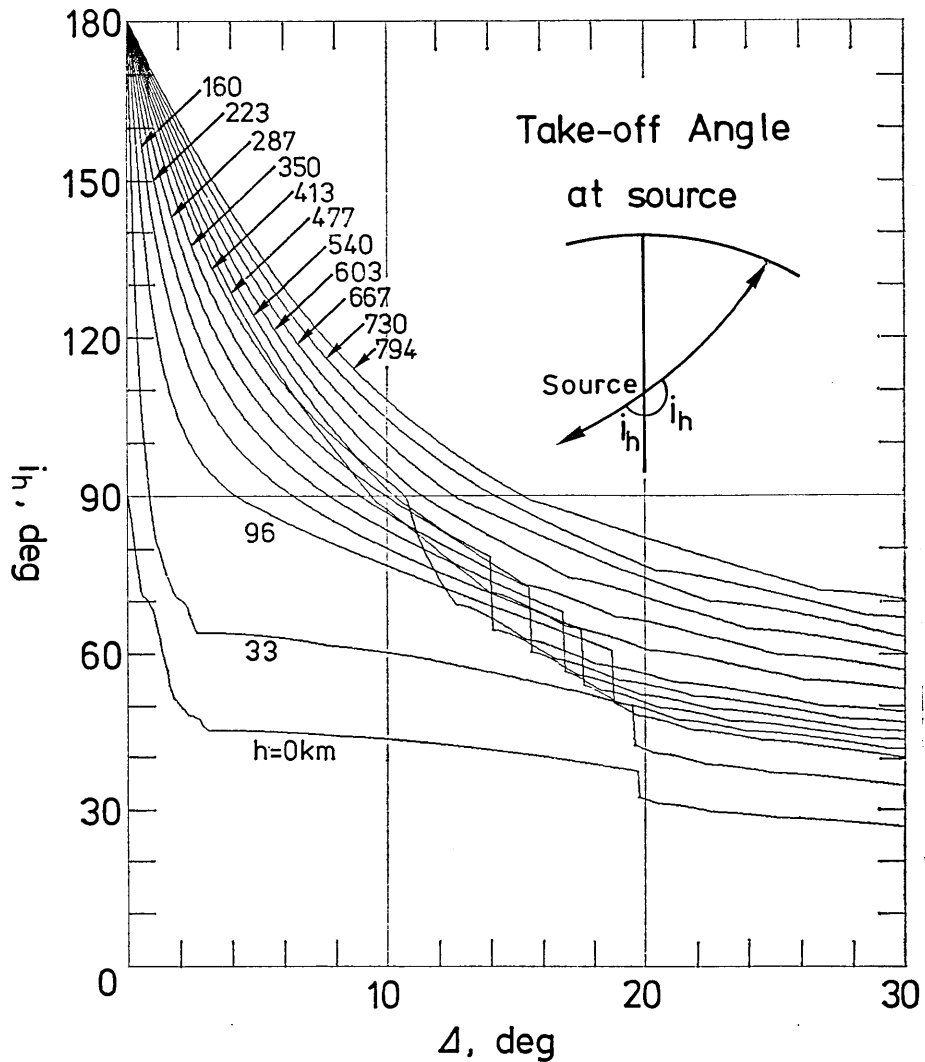


Fig. 5. Take-off angles at sources (i_h) for the 14 focal depths, which are measured from the downward vertical as shown in the inset.

In Appendix II-5 are tabulated depths of the deepest point of seismic rays (h_d), and distance variations of depths of the ray bottom are shown in Fig. 8. Depths to the left of the peak are those at which the apparent velocities are equal to the ray parameter of the upward waves.

The geometrical spreading factor had been given by HONDA and ITO (1940) and ITO (1940) for the HONDA's model (1931). The geometrical spreading factors (G , in km^{-1}) for the recent JMA standard model are listed in Appendix II-6 and shown in Fig. 9 for the depths $h=0$, 33, 96 and 160 km.

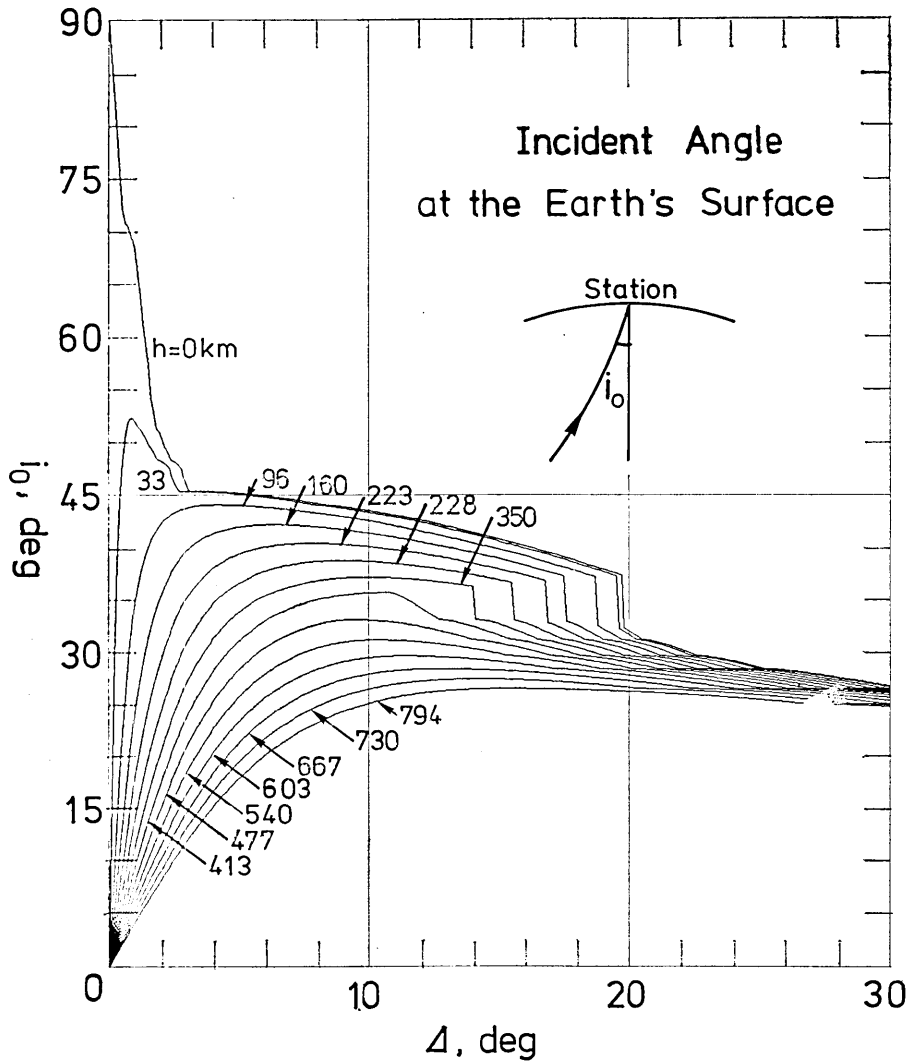


Fig. 6. Incident angles to the earth's surface (i_0) for the 14 focal depths, which are measured from the downward vertical as shown in the inset.

The factors of geometrical spreading are obtained by

$$G = \frac{1}{r} \sqrt{\frac{\rho v}{\rho_0 v_0}} \cdot \frac{\sin i_h}{\sin \Delta \sin i_0} \cdot \frac{di_h}{d\Delta}, \quad (12)$$

where v_0 , v and ρ_0 , ρ denote P-wave velocities and densities at the earth's surface and source, and i_0 and i_h denote the incident angle to the earth's surface and take-off angle at source, respectively. Values of the density are taken from JEFFREYS (1970) and given in Appendix I-2. The effects of layering structure of the crust and uppermost mantle appear as an

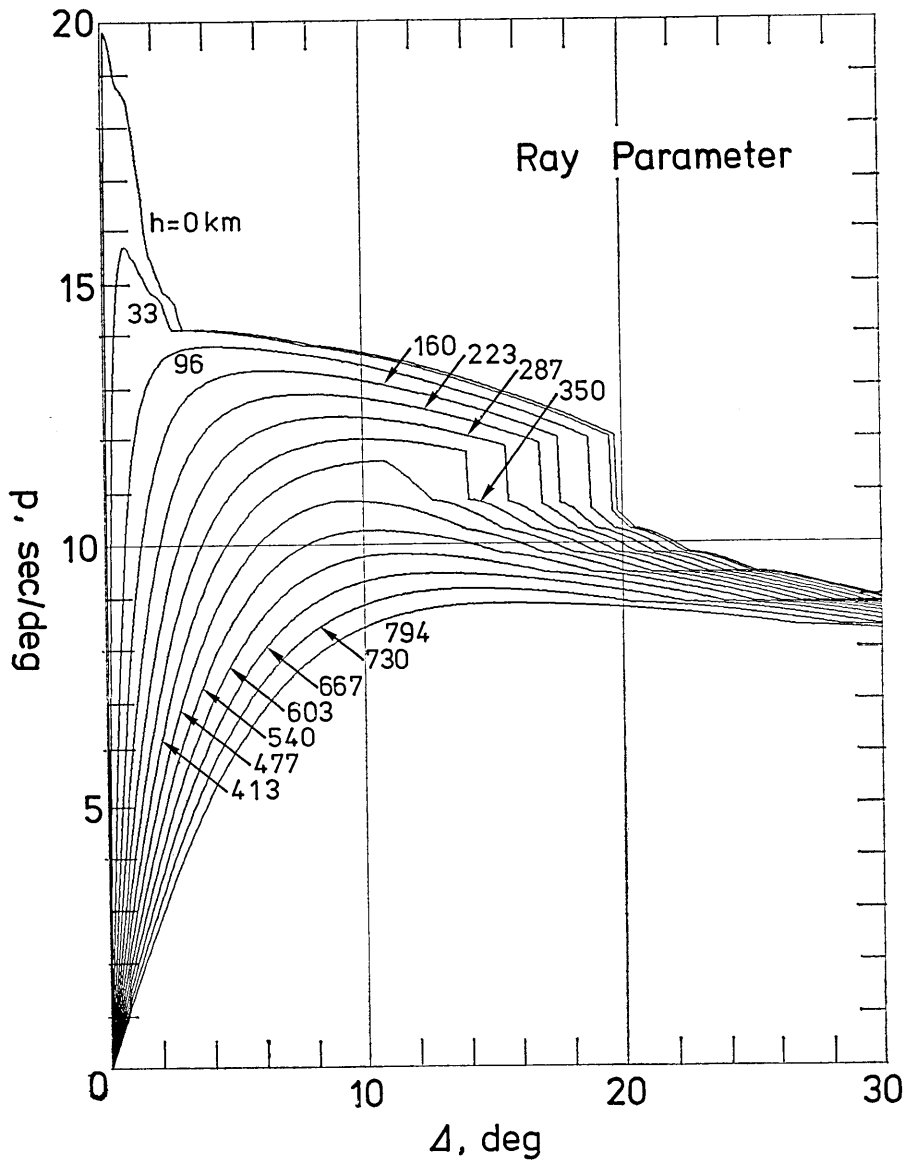


Fig. 7. Apparent velocities, p or $dT/d\Delta$, of the first arrivals for the 14 focal depths.

oscillating form in short distances up to 3° for shallow depths.

Effects of the velocity discontinuity of the upper mantle at the depth of 413 km will be shown in more detail in Figs. 10 to 12, where the travel times, apparent velocities and factors of the geometrical spreading for the surface focus and the depth of 33 km are shown only for the distances from

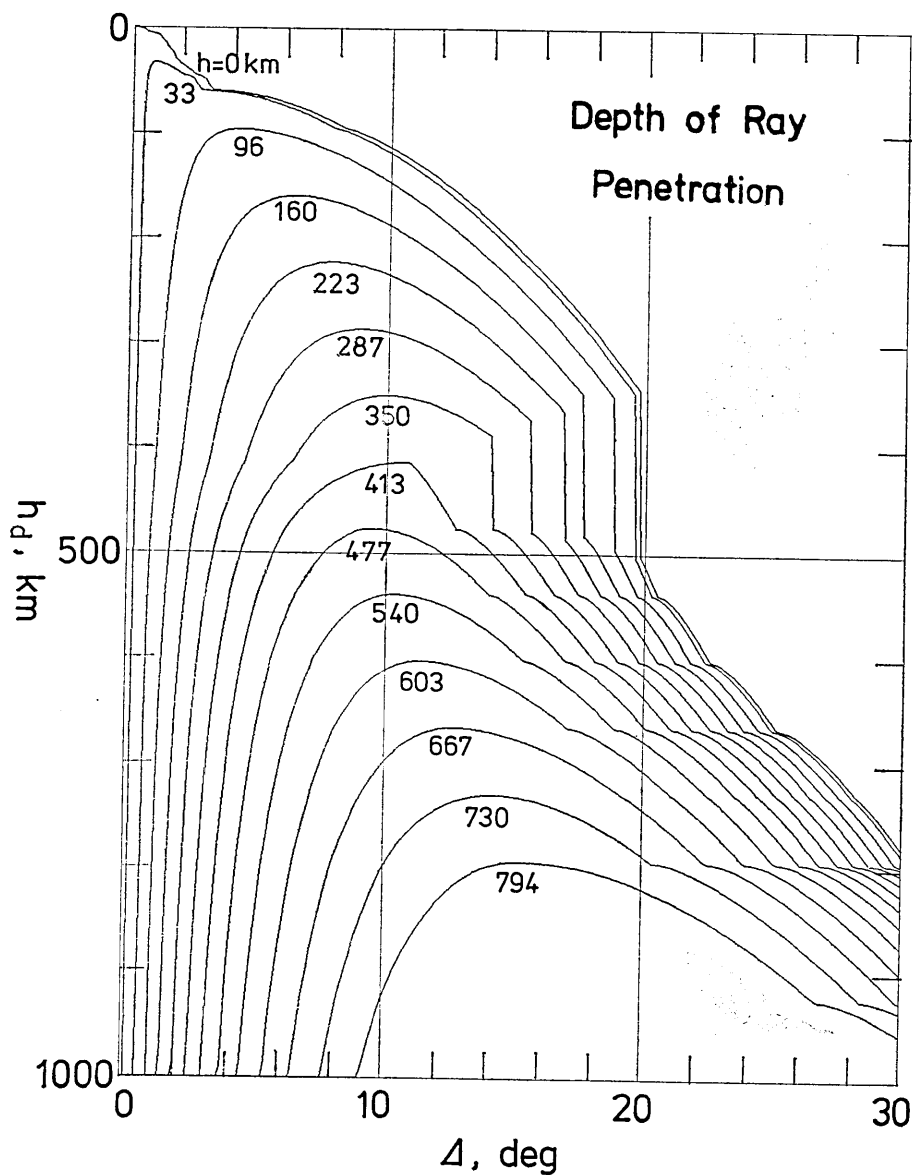


Fig. 8. Depths of the deepest point (h_d) for the 14 focal depths. For the upward rays which are located on the left-hand side of peaks, depths mean those with the same apparent velocities.

15° to 25°. Solid and broken lines denote first and later arrivals, respectively. Some typical distances are shown by "A", "B", "C" and "D". Turning points are denoted by B and C, and "BC" means the receding branches of the cusp.

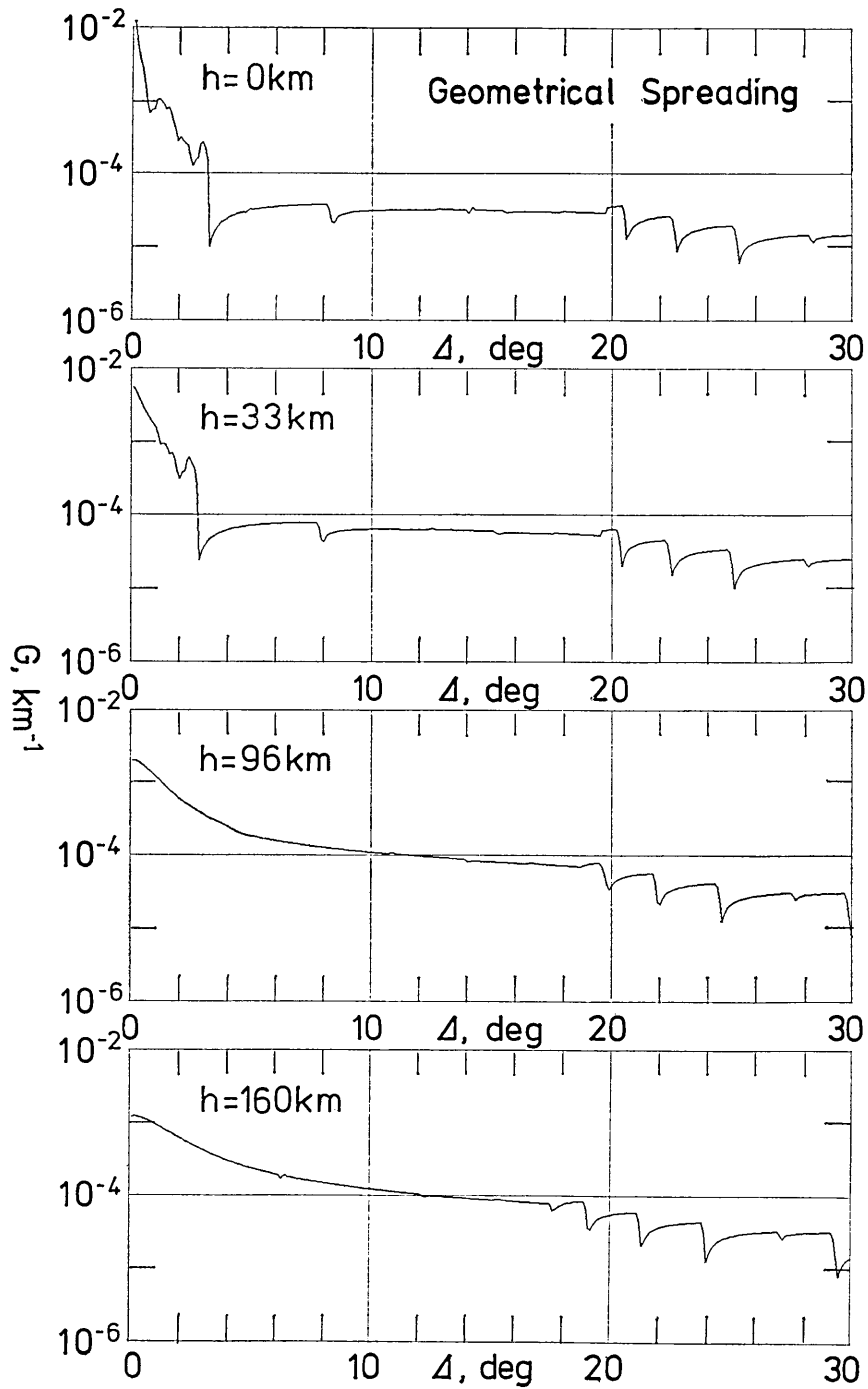


Fig. 9. Factors of the geometrical spreading (G , in km^{-1}) for the focal depths of $h=0$, 33, 96 and 160 km.

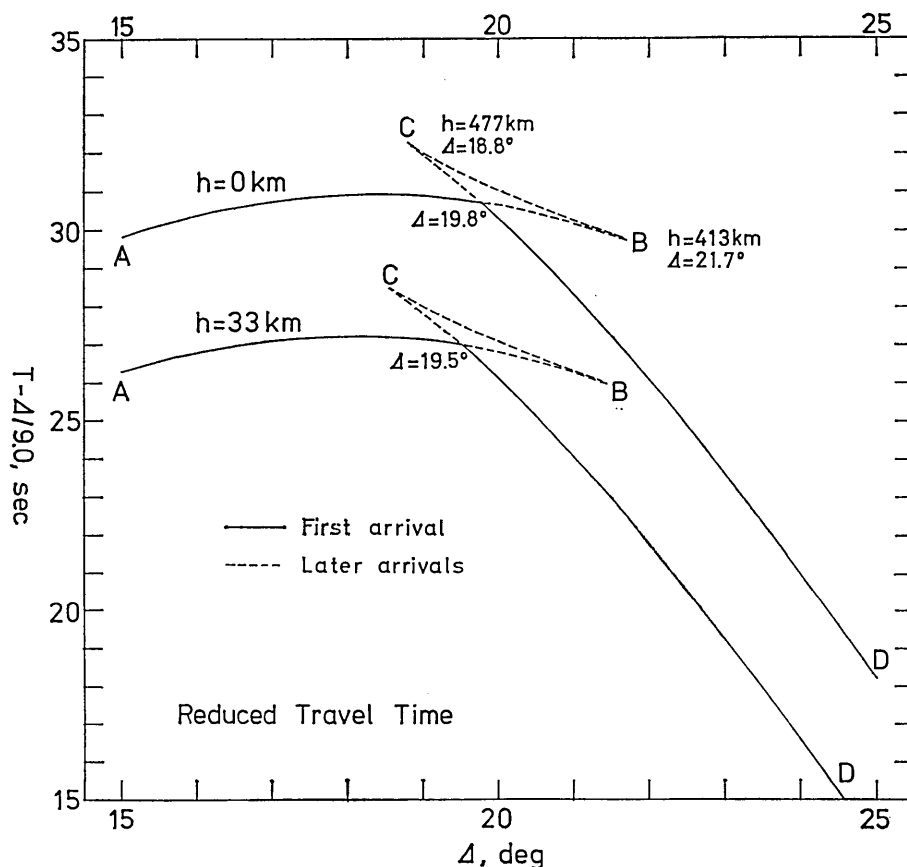


Fig. 10. Fine illustration of reduced travel times ($v=9.0$ km/sec) for the depth of $h=0$ and 33 km, around the distance of 20° . Solid and broken lines denote the first and later arrivals, respectively. Typical distances are denoted by "A", "B", "C" and "D".

In Fig. 10 first arrivals are replaced by deeper penetrating rays at the epicentral distances of $\Delta=19.80^\circ$ and 19.50° for the focal depths of $h=0$ and 33 km, respectively. Distance variations of apparent velocities are shown in Fig. 11. An effect of the 20° -discontinuity appears as a receding branch with respect to distance. More detailed features of 20° -discontinuity may be resolved by distance variations of apparent velocities for shallow earthquakes. In Fig. 12 the factors of geometrical spreading are also shown for the focal depths of $h=0$ and 33 km. Very complicated patterns are observed for the cusps in the distance variation of the geometrical spreading factors. Cusps produced by the velocity discontinuity at the depth of 413 km are distinctively observed in the travel times, apparent velocities and factors of the geometrical spreading. It is difficult to find such a velocity

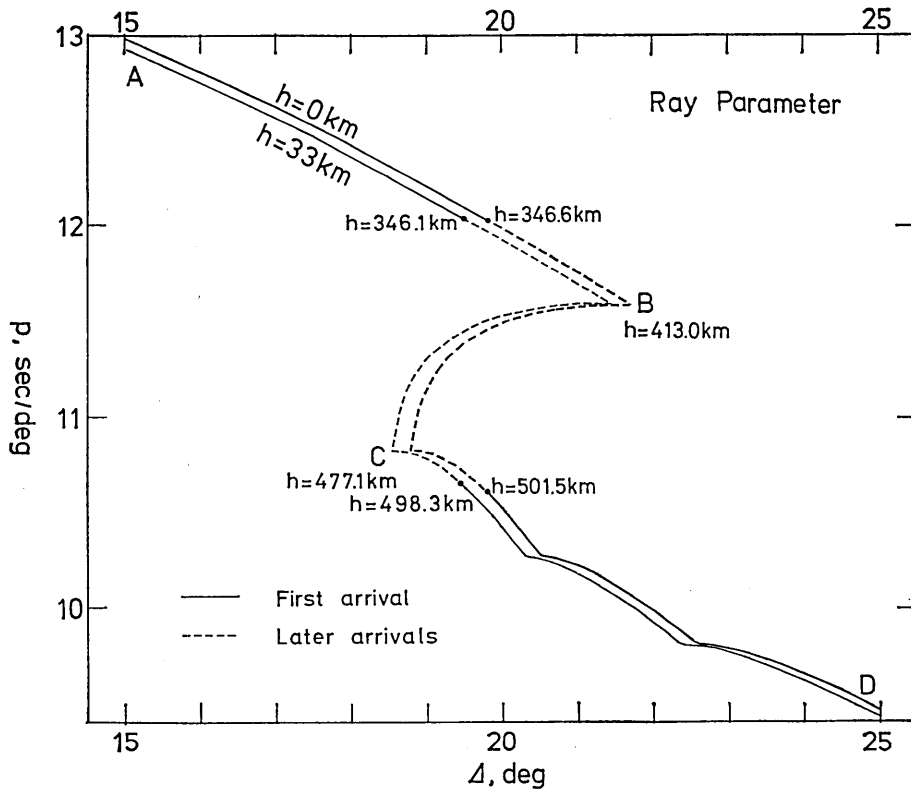


Fig. 11. Fine illustration of apparent velocities around the distance of 20° for the depth of $h=0$ and 33 km. Depths of ray bottom are denoted by dots attached by depth values.

discontinuity from travel times and factors of the geometrical spreading of first arrivals. But in the distance variation of apparent velocities an abrupt decrease of about 1.2 sec/deg is observed for the focal depths of $h=0$ and 33 km.

Fig. 13 and Table 2 show epicentral distances (Δ) at which the horizontally departing rays arrive for various depths (h). There are some undulation at shallow depths, a smooth increase of ray bottom in the depth range down to 400 km and an abrupt decrease of distance at the depth of 413 km.

The travel times proposed previously for the region of the Japanese Islands (surface focus) are compared with those in this study in Table 3 and Fig. 14. Differences of the ICHIKAWA-MOCHIZUKI times from this study show small undulations within 0.5 second (thick line). The variable velocities within the crust produce time differences of as much as about 2 seconds from the Wadati-Sagisaka-Masuda times at short distances (thin

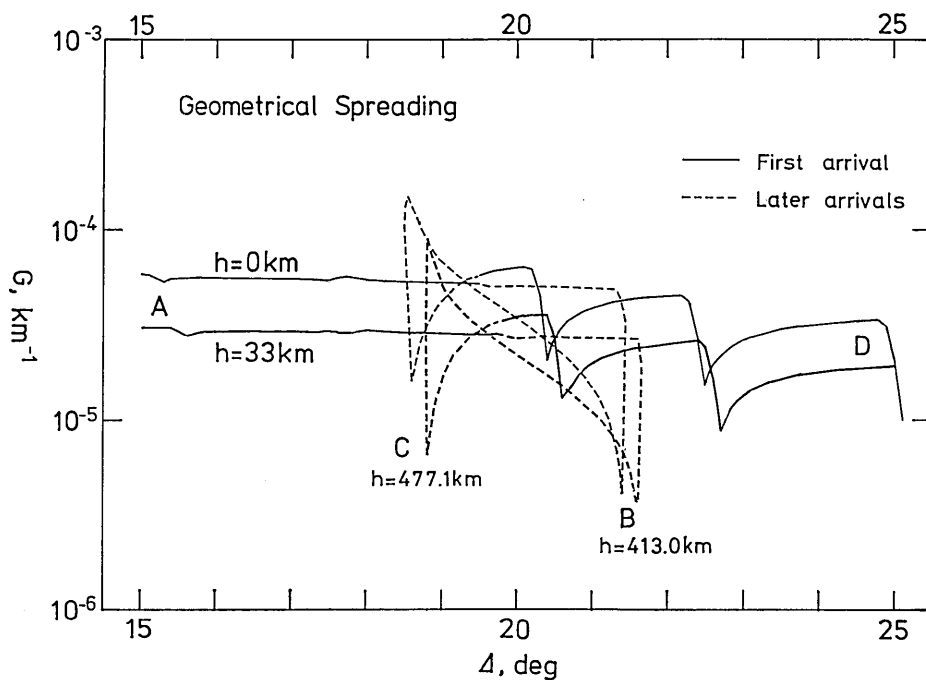


Fig. 12. Fine illustration of factors of the geometrical spreading around the distance of 20° for the depth of $h=0$ and 33 km .

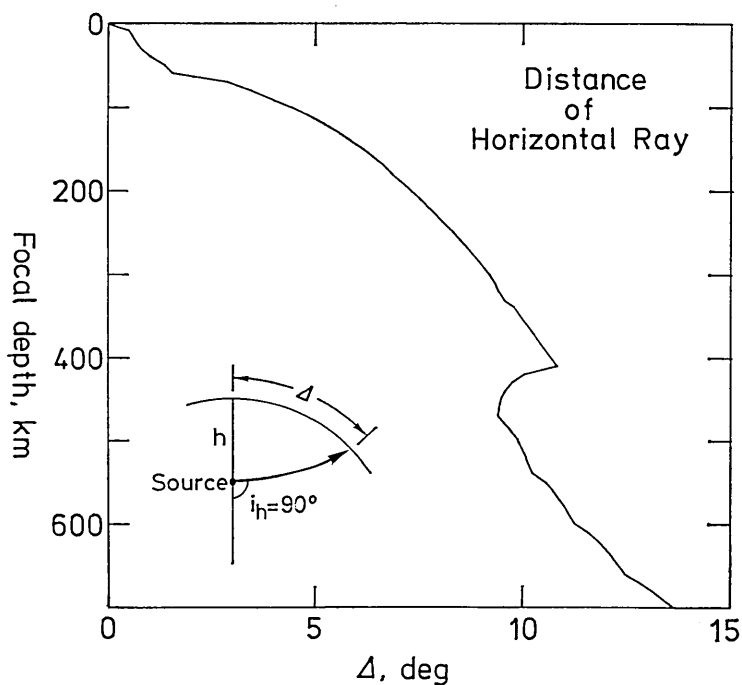


Fig. 13. Epicentral distance of the horizontally departing rays for various depths as shown by the inset.

Table 2. Epicentral distances of horizontally departing rays at various depths.

Depth km	Epicentral distance deg	Depth km	Epicentral distance deg	Depth km	Epicentral distance deg
0.0	0.0	200.0	7.300	400.0	10.672
10.0	0.549	210.0	7.509	410.0	10.807
20.0	0.684	220.0	7.711	420.0	10.047
30.0	0.808	230.0	7.927	430.0	9.747
40.0	1.042	240.0	8.127	440.0	9.590
50.0	1.412	250.0	8.318	450.0	9.497
60.0	1.541	260.0	8.503	460.0	9.440
70.0	2.877	270.0	8.682	470.0	9.407
80.0	3.445	280.0	8.857	480.0	9.570
90.0	3.886	290.0	9.021	490.0	9.759
100.0	4.419	300.0	9.182	500.0	9.884
110.0	4.859	310.0	9.341	510.0	9.988
120.0	5.223	320.0	9.497	520.0	10.082
130.0	5.548	330.0	9.651	530.0	10.170
140.0	5.847	340.0	9.802	540.0	10.254
150.0	6.126	350.0	9.950	550.0	10.568
160.0	6.389	360.0	10.105	560.0	10.737
170.0	6.626	370.0	10.251	570.0	10.881
180.0	6.859	380.0	10.394	580.0	11.012
190.0	7.084	390.0	10.534	590.0	11.134
200.0	7.300	400.0	10.672	600.0	11.249

Table 3. Time differences of the proposed travel-times for the surface focus from this study.

Distance (deg)	JEFFREYS and BULLEN (1948)	1968 P HERRIN <i>et al.</i>	WADATI SAGISAKA MASUDA (1933)	ICHIKAWA and MOCHIZUKI (1971)	ICHIKAWA (1978)
0.0	6.80	0.0	0.0	0.0	0.0
0.500	4.23	-0.50	2.78	0.27	-0.59
1.000	2.00	-0.57	2.47	-0.11	-1.65
1.500	0.29	-0.96	1.49	-0.25	-2.85
2.000	-0.39	-1.43	1.11	0.02	-3.40
2.500	-0.68	-1.56	1.03	0.03	-3.77
3.000	-0.88	-2.00	1.05	-0.05	-4.05
3.500	-0.83	-2.19	1.22	-0.07	-4.08
4.000	-0.80	-2.41	1.25	0.03	-4.27
4.500	-0.75	-2.61	1.24	-0.16	-4.36
5.000	-0.69	-2.80	1.15	-0.33	-4.53
5.500	-0.62	-2.99	1.12	-0.28	-4.69
6.000	-0.64	-3.17	1.09	-0.08	-4.85
6.500	-0.53	-3.33	1.04	-0.15	-4.97
7.000	-0.52	-3.49	0.99	-0.20	-5.10

Table 3. (continued)

Distance (deg)	JEFFREYS and BULLEN (1948)	1968 P HERRIN <i>et al.</i>	WADATI SAGISAKA MASUDA (1933)	ICHIKAWA and MOCHIZUKI (1971)	ICHIKAWA (1978)
7.500	-0.47	-3.61	0.99	-0.28	-5.28
8.000	-0.40	-3.72	1.00	-0.34	-5.44
8.500	-0.30	-3.81	0.97	-0.33	-5.68
9.000	-0.29	-3.89	1.00	-0.30	-5.90
9.500	-0.25	-3.95	1.08	-0.24	-6.10
10.000	-0.20	-4.01	1.17	-0.18	-6.26
10.500		-4.05	1.30	-0.13	-6.43
11.000	-0.12	-4.07	1.34	-0.15	-6.57
11.500		-4.07	1.42	-0.07	-6.67
12.000	-0.02	-4.04	1.46	-0.04	-6.84
12.500		-4.01	1.55	0.01	-6.89
13.000	0.01	-3.92	1.75	0.03	
13.500		-3.82		-0.04	
14.000	-0.02	-3.73		-0.03	
14.500		-3.60		-0.05	
15.000	0.03	-3.49		0.01	
15.500		-3.41		0.10	
16.000	0.14	-3.31		0.08	
16.500		-3.26		-0.22	
17.000	0.12	-3.24		-0.52	
17.500		-3.26		-0.36	
18.000	0.09	-3.33		0.07	
18.500		-3.45			
19.000	0.08	-3.63			
19.500		-3.88			
20.000	-0.20	-3.88			
20.500		-3.50			
21.000	-0.13	-3.16			
21.500		-2.88			
22.000	-0.13	-2.68			
22.500		-2.51			
23.000	-0.09	-2.38			
23.500		-2.32			
24.000	-0.12	-2.31			
24.500		-2.35			
25.000	0.01	-2.40			
25.500		-2.48			
26.000	-0.03	-2.60			
26.500		-2.73			
27.000	-0.18	-2.87			
27.500		-3.02			
28.000	-0.32	-3.14			
28.500		-3.24			
29.000	-0.44	-3.34			
29.500		-3.40			
30.000	-0.43	-3.43			

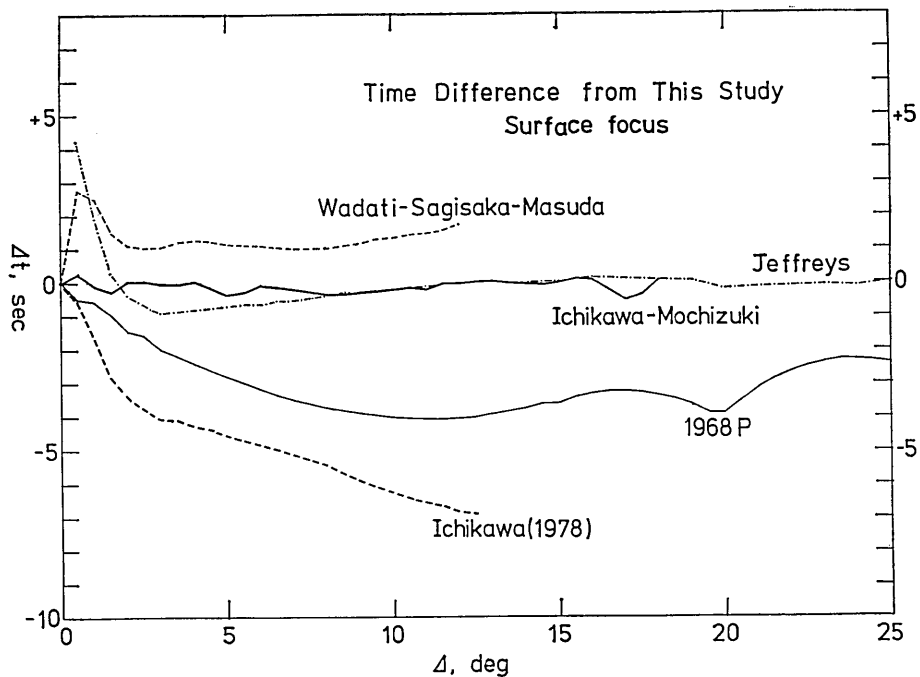


Fig. 14. Time differences of the proposed travel times of the surface focus from this study; ICHIKAWA and MOCHIZUKI (thick line), JEFFREYS (chain line), WADATI, SAGISAKA and MASUDA (thin broken line), ICHIKAWA (thick broken line) and 1968 P by HERRIN *et al.* (thin line).

broken line). Large differences of travel times in the distance range from $\Delta=3^\circ$ to 12° between the old JMA standard times and this study are mainly due to the velocity differences in the uppermost mantle. The high velocity model by ICHIKAWA (1978, thick broken line) shows greater differences than the 1968 P times (thin line), and produces time differences from 4 to 7 seconds. Differences of the Jeffreys times from this study for distances from $\Delta=2^\circ$ to 10° are produced by greater crustal velocities in the Jeffreys model and also by the smoothed effect at distances around $\Delta=20^\circ$.

Differences between the ICHIKAWA (1978) and ICHIKAWA and MOCHIZUKI times (1971) amount to about 7 seconds. Considering the presence of lower velocities in the uppermost mantle (MAKI, 1981), differences in travel times exceeding 10 seconds may be possible. It is also necessary to study the ranges of travel times between the earliest and latest arrivals.

Travel times for the JMA standard model will be compared with the fine structure of the upper mantle having the low-velocity layer and 20° -discontinuity. Travel times for the model of the upper mantle with the

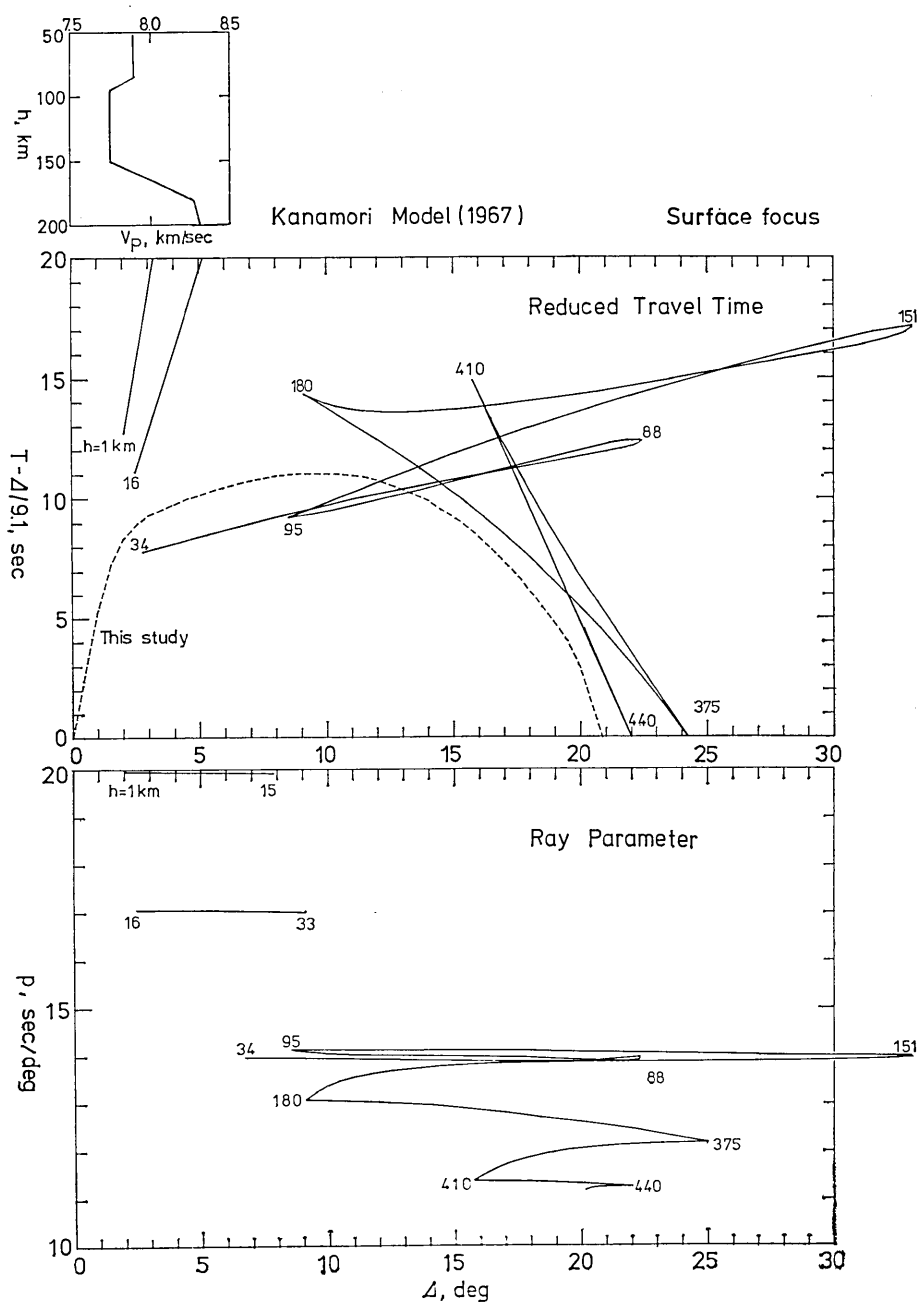


Fig. 15. Reduced travel times and apparent velocities for the surface focus of the fine velocity model with the low-velocity layer. Broken line denotes the reduced times of the first arrivals in this study. Numerals denote depths of the ray penetration.

low-velocity layer are obtained by

$$\Delta = \frac{2}{1-b} \left| \sec^{-1} q \right|_{r_d}^{r_0}, \quad (13)$$

and

$$T = \frac{2}{1-b} \left| p \sqrt{q^2 - 1} \right|_{r_d}^{r_0}, \quad (14)$$

where $q = \eta/p$. The angular distances and travel times are estimated by increasing the depths of foci instead of take-off angles as in chapter 3. Jumps in travel times have been indicated for the structure with the low-velocity layer (KAKUTA, 1963, 1968). But such jumps in travel times are not also observed in this study as pointed out by DOWLING and NUTTLI (1964).

Figure 15 shows reduced travel times and apparent velocities for KANAMORI's preliminary model (1967) obtained by the apparent velocities at the Wakayama Micro-Earthquake Observatory. Numerals in the figure denote typical depths of the ray bottom. In the same figure the travel times of first arrivals for the JMA standard model are also shown by a broken line. Distinctive features of the KANAMORI model are the presence of the low-velocity layer at the depth from 85 to 150 km with the lid structure and recovery at the basement, and the velocity discontinuity in the upper mantle at the depth of 375 km, while the JMA standard model is represented by the gradually increasing velocity with depth.

Decreasing velocity at the depths from 85 to 95 km (upper part of Fig. 15) produces a retrograde branch of travel times and apparent velocities with distance, and such a branch is observed as a later arrival. Waves associated with the high velocity above the low-velocity layer at depths from 35 to 85 km appear as first arrivals and show arrivals 2 seconds earlier than the JMA standard times. Recovery of velocities at the basement at the depths from 150 to 180 km produces large cusps which are observed as later phases at distances from 33° to 9° . The structure of low-velocity layer could not be elucidated without using later phases, and travel times of these later phases have more resolution rather than apparent velocities. The transition zone of velocity discontinuity at depths from 375 to 410 km appears as the second cusp at distances from 24° to 16° . Travel times of the JMA standard table at distances over $\Delta = 14^\circ$ are somewhat shorter than those of the KANAMORI model.

5. Discussion and conclusion

The accurate velocity distribution of the crust and upper mantle is required for studying some seismological problems, such as precise deter-

mination of hypocenter location, earthquake magnitude, focal mechanism and travel time residuals. For shallow earthquakes take-off angles at source depths, or finally fault-plane solutions, are influenced by the crust and uppermost mantle structure.

One possible method for precise hypocenter determination in the region with lateral variation of the crust and upper mantle structure is correction of station and path effects for a single model. However it is difficult to construct a single standard model for the complicated structure of the crust and upper mantle beneath the Japanese Islands. Three-dimensional velocity analyses cannot resolve these problems due to the too rough modeling. Crustal effects may be separated as station biases from the entire anomalies of travel times. Effects of the regional variation of the upper mantle structure may be resolved into the path effects of seismic rays from sources to stations.

Extremely large residuals of travel times have been sometimes observed (MAKI, 1977a, b). The systematic differences of the travel times or velocity models have been also proposed for some source regions (ICHIKAWA, 1978; SUZUKI, 1978; MAKI, 1981). Such large variations are produced by the presence of regional and lateral variation of velocities in the crust and upper mantle beneath the Japanese Islands. It is not easy to construct a single best-fit model for all regions. Band representation of travel times and velocity distribution may be appropriate as one possible method. Especially the lower limit of velocities for the upper mantle should be studied in more detail.

Further basic problems to be noticed are the effects of the fine structure of the upper mantle, or the low-velocity layer and velocity discontinuities. These features of the upper mantle structure are more complicated by the presence of the descending lithospheric plates beneath the Japanese Islands. It is necessary to clarify more detailed structures of the low-velocity layer, or its depth, thickness, velocity contrast and reduction and recovery of velocities at the top and basement. The depths of the 20°-discontinuity have been obtained as $h=375$ km by KANAMORI (1967), 365 km by KAILA *et al.* (1971), 364 km by MAKI (1976), 385 km by FUKAO (1977) and 420 km by INATANI and KURITA (1981). A variety of the transition zones of the 20°-discontinuity are also shown by the method of apparent velocities (Fig. 1c). These differences may be produced by the arbitrariness in the analyses or by real regional variations of the 20°-discontinuity. Compared with the recent studies of fine structure, the probable range of velocities of the uppermost mantle may be reevaluated by using both the travel times and apparent velocities.

Several tables of travel times and velocity models proposed previously in Japan have been compared to estimate quantitatively the probable ranges of the velocity variation. The P-wave travel-time table for the JMA standard model has been extended to the distance range up to 30° by the unit of the hundredth of a second and increment of distance in 0.1° . And other related tables for the JMA standard model of the crust and upper mantle have been also prepared for the 14 focal depths, or take-off angles at source, incident angles to the earth's surface, apparent velocities, and factors of the geometrical spreading. These tables are useful for the precise determination of earthquake hypocenters, focal mechanisms and the crust and upper mantle structures in the Japanese region. Finer increments of focal depths are desired for studies of local earthquakes.

The JMA standard model is characterized by the lack of a low-velocity layer and the presence of 20° -discontinuity in the upper mantle. The velocities in the JMA standard model at depths below 200 km are not so low in respect to first arrivals. Effects of the low-velocity layer appear as a branch of later phases. The effects of the 20° -discontinuity at the depth of 413 km by JEFFREYS (1939) are included in the new extended tables, or the discontinuous features in travel times, take-off angles at sources, incident angles at the earth's surface and apparent velocities around $\Delta=20^\circ$. The JMA standard model can be considered as an average velocity structure for the crust and upper mantle beneath the Japanese Islands. Time differences ranging up to 7 seconds are observed between the JMA standard times (ICHIKAWA and MOCHIZUKI, 1971) and the regional travel times on the Pacific side of Northeast Japan (ICHIKAWA, 1978). A larger difference in travel times exceeding 10 seconds may be possible for the lower velocity models (MAKI, 1981).

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12. 日本の標準速度構造の走時表

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気象庁現用の標準地殻・上部マントル構造に対する走時表を波線理論にもとづき、百分の1秒単位で震央距離 0.1° 毎に 30° 迄拡張した。走時の他、震源における射出角、地表への入射角、みかけ速度、波線最深点及び幾何学的減衰についても表を求めた。これらの走時表は“20°-不連続”等の速度構造の特徴が反映されており、高精度の震源・発震機構の決定、地殻・上部マントルの微細構造や地震規模・波形解析に有用である。求められた走時は市川・望月(1971)とは最大0.5秒の差がある。日本附近について発表されてきた速度モデルには最大10秒の走時差が存在する。初動走時に関する限り低速度の影響を考慮しなくともよい。

Appendix I.

Velocity structures in and near the Japanese Islands.

I-1. Old JMA model

Depth km	P-wave velocity (km/sec)	S-wave velocity (km/sec)
	WADATI-SAGISAKA-MASUDA (1933; HONDA, 1931)	SAGISAKA-TAKEHANA (1935)
0	3.20	1.90
10	5.25	3.11
20	6.34	3.73
30	7.11	4.18
40	7.41	4.36
50	7.50	4.41
60	7.71	4.48
80	7.87	4.54
100	7.93	4.56
120	7.96	4.58
140	8.00	4.60
160	8.04	4.62
200	8.14	4.65
240	8.25	4.71
280	8.38	4.77
320	8.57	4.87
360	8.76	4.98
400	8.97	5.10
450	9.27	5.27
500	9.63	5.44

I-2. JEFFREYS-BULLEN model (JEFFREYS, 1939, 1970; JEFFREYS and BULLEN, 1948; BULLEN, 1959)

r/r_0	Depth km	P-wave velocity km/sec	S-wave velocity km/sec	Density g/cc
1.00	33.00	7.75	4.353	3.32
0.99	96.38	7.94	4.444	3.38
0.98	159.76	8.13	4.539	3.43
0.97	223.14	8.33	4.638	3.49
0.96	286.52	8.54	4.741	3.54
0.95	349.90	8.75	4.850	3.59
0.94	413.28	8.97	4.962	3.64
0.93	476.66	9.50	5.227	3.82
0.92	540.04	9.91	5.463	3.99
9.91	603.42	10.26	5.670	4.14
0.90	666.80	10.55	5.850	4.27
0.89	730.18	10.77	5.988	4.38
0.88	793.56	10.99	6.125	4.48
0.86	920.32	11.29	6.295	4.62
0.84	1047.08	11.50	6.395	4.71
0.82	1173.84	11.67	6.483	4.78
0.80	1300.60	11.85	6.564	4.86
0.78	1427.36	12.03	6.637	4.93
0.76	1554.12	12.20	6.706	5.00
0.74	1680.88	12.37	6.770	5.07
0.72	1807.64	12.54	6.833	5.14
0.70	1934.40	12.71	6.893	5.20
0.68	2061.16	12.87	6.953	5.27
0.66	2187.92	13.02	7.012	5.33
0.64	2314.68	13.16	7.074	5.40
0.62	2441.44	13.32	7.137	5.46
0.60	2568.20	13.46	7.199	5.52
0.58	2694.96	13.60	7.258	5.58
0.56	2821.72	13.64	7.314	5.64
0.55	2885.10	13.64	7.304	5.68

I-3. BULLEN (1959, p. 211)

Region	Depth km	P-wave velocity km/sec	S-wave velocity km/sec
—	33	7.75	4.35
	100	7.95	4.45
B	200	8.26	4.60
	300	8.58	4.76
—	413	8.97	4.96
	600	10.25	5.66
C	800	11.00	6.13
—	1000	11.42	6.36
	1200	11.71	6.50
	1400	11.99	6.62
	1600	12.26	6.73
	1800	12.53	6.83
D	2000	12.79	6.93
	2200	13.03	7.02
	2400	13.27	7.12
	2600	13.50	7.21
	2800	13.64	7.30
—	2898	13.64	7.30

I-4. Crustal model of ICHIKAWA
and MOCHIZUKI model (1971)

Depth km	Vp km/sec	Vs km/sec
0	5.60	2.90
5	5.92	3.32
10	6.06	3.54
15	6.25	3.66
20	6.46	3.79
25	6.67	3.83
30	6.91	3.99
35	7.13	4.11

I-5. Velocities for earthquakes in the Kurile region (ICHIKAWA, 1978)

Depth km	Vp km/sec	Vs km/sec	Depth km	Vp km/sec	Vs km/sec
0	5.900	3.391	75	8.076	4.641
5	6.347	3.648	80	8.100	4.655
10	6.726	3.966	85	8.128	4.671
15	7.042	4.047	90	8.156	4.687
20	7.300	4.195	95	8.181	4.702
25	7.507	4.314	100	8.200	4.713
30	7.666	4.406	110	8.215	4.721
35	7.784	4.474	120	8.210	4.718
40	7.870	4.523	130	8.211	4.719
45	7.930	4.557	140	8.220	4.724
50	7.971	4.581	150	8.226	4.728
55	7.999	4.597	160	8.230	4.730
60	8.020	4.609	170	8.235	4.733
65	8.037	4.619	180	8.240	4.736
70	8.055	4.629	190	8.246	4.739

I-6. GUTENBERG model (1953)

Depth km	P-wave velocity km/sec	S-wave velocity km/sec
50	8.0	4.45
100	7.85	4.4
150	7.9	4.35
200	8.1	4.4
250	8.3	4.45
300	8.5	4.6
400	9.0	4.95
500	9.6	5.3
600	10.2	5.65

I-7. P-wave velocities by KAILA *et al.* (1971)

Central Japan		Southwest Japan		Northeast Japan	
Depth km	Vp km/sec	Depth km	Vp km/sec	Depth km	Vp km/sec
40	7.92	40	7.88	40	7.88
—	$7.92 + \frac{0.41}{140}(z-40)$	—	—	—	$7.88 + \frac{0.26}{135}(z-40)$
180	8.33	—	—	175	8.14
—	$8.33 + \frac{0.19}{185}(z-180)$	255	7.88	—	—
365	8.52—9.10	—	—	—	—
—	$9.10 + \frac{0.89}{235}(z-365)$	—	—	—	—
600	9.99	—	—	—	—

I-8. P-wave velocities by MAKI (1976)

Depth km	P-wave velocity km/sec
30	7.48
—	$7.48 + \frac{0.39}{74}(z-30)$
104	7.87
—	$7.87 + \frac{0.29}{24}(z-104)$
128	7.58
—	
171	7.58
—	$7.58 + \frac{0.19}{16}(z-171)$
187	7.77
—	$7.77 + \frac{0.56}{177}(z-187)$
364	8.33
364	8.56
—	$8.56 + \frac{0.78}{236}(z-364)$
600	9.34

Appendix II.

Tables for the Japan Meteorological Agency (JMA) standard model of the P wave velocities.

1. t : Travel times (in second)
2. i_h : Take-off angles at sources (in degree)
3. i_0 : Incident angles at the earth's surface (in degree)
4. p : Ray parameters (in sec/deg)
5. h_d : Depth of ray bottom (in km)
6. G : Geometrical spreading (in km^{-1})

Appendix II-1. Table of travel times (sec) for the 14 focal depths. Distance variations of the reduced travel times by the reference velocity of 8.0 km/sec are shown in Fig. 4. D and H denote epicentral distance and focal depth, respectively.

D / H	0.0	33.0	96.4	159.8	223.1	286.5	349.9	413.2	476.7	540.0	603.4	666.8	730.2	793.6
0.0	0.0	5.23	13.44	21.37	29.06	36.58	43.92	51.06	57.94	64.46	70.75	76.85	82.79	88.62
0.10	1.93	5.51	13.57	21.42	29.10	36.61	43.94	51.08	57.95	64.48	70.76	76.86	82.80	88.63
0.20	3.96	6.30	13.92	21.57	29.20	36.68	44.00	51.13	58.00	64.51	70.79	76.88	82.83	88.65
0.30	5.92	7.41	14.24	21.82	29.37	36.81	44.10	51.21	58.07	64.58	70.85	76.93	82.87	88.69
0.40	7.86	8.72	14.91	22.15	29.61	36.99	44.25	51.33	58.17	64.66	70.92	77.00	82.93	88.74
0.50	9.77	10.16	15.50	22.58	29.91	37.22	44.43	51.49	58.30	64.77	71.02	77.08	83.00	88.81
0.60	11.65	11.66	16.31	23.09	30.28	37.51	44.66	51.67	58.46	64.91	71.14	77.18	83.09	88.89
0.70	13.52	13.21	17.71	23.68	30.70	37.83	44.92	51.89	58.64	65.06	71.27	77.30	83.20	88.98
0.80	15.39	14.77	18.19	24.35	31.19	38.21	45.22	52.14	58.85	65.25	71.43	77.44	83.32	89.09
0.90	17.25	16.36	19.74	25.07	31.73	38.63	45.56	52.42	59.09	65.45	71.61	77.60	83.46	89.22
1.00	19.10	17.93	20.35	25.97	32.32	39.09	45.94	52.74	59.36	65.69	71.81	77.78	83.62	89.36
1.10	20.93	19.49	21.49	26.71	32.96	39.60	46.35	53.09	59.66	65.94	72.03	77.97	83.79	89.51
1.20	22.73	21.04	22.63	27.60	33.65	40.15	46.90	53.46	59.97	66.21	72.27	78.18	83.98	89.68
1.30	24.49	22.58	23.90	28.55	34.38	40.73	47.29	53.87	60.32	66.51	72.53	78.41	84.18	89.86
1.40	26.22	24.11	25.16	29.52	35.16	41.36	47.80	54.31	60.69	66.83	72.81	78.66	84.40	90.06
1.50	27.91	25.64	26.42	30.54	35.97	42.02	48.35	54.77	61.09	67.18	73.11	78.92	84.64	90.27
1.60	29.55	27.15	27.71	31.58	36.81	42.72	48.93	55.26	61.51	67.54	73.43	79.20	84.89	90.49
1.70	31.14	28.65	29.01	32.66	37.69	43.44	49.53	55.77	61.96	67.93	73.77	79.50	85.15	90.73
1.80	32.70	30.15	30.32	33.75	38.60	44.19	50.17	56.32	62.42	68.33	74.12	79.82	85.43	90.98
1.90	34.26	31.63	31.65	34.89	39.54	44.98	50.84	56.89	62.92	68.76	74.50	80.15	85.73	91.25
2.00	35.79	33.11	32.93	36.03	40.51	45.79	51.53	57.48	63.43	69.21	74.89	80.50	86.04	91.53
2.10	37.31	34.59	34.33	37.19	41.49	46.63	52.24	58.10	63.96	69.67	75.30	80.86	86.36	91.82
2.20	38.82	36.06	35.68	38.37	42.50	47.49	52.98	58.73	64.52	70.16	75.73	81.24	86.71	92.13
2.30	40.32	37.53	37.01	39.56	43.53	48.38	53.75	59.39	65.09	70.66	76.18	81.64	87.06	92.45
2.40	41.79	38.98	38.37	40.78	44.59	49.28	54.53	60.08	65.69	71.19	76.64	82.04	87.43	92.78
2.50	43.29	40.42	39.74	42.00	45.65	50.21	55.33	60.78	66.30	71.73	77.11	82.47	87.81	93.12
2.60	44.76	41.95	41.10	43.22	46.73	51.16	56.16	61.50	66.94	72.29	77.61	82.91	88.20	93.48
2.70	46.23	43.24	42.47	44.46	47.83	52.12	57.01	62.25	67.59	72.86	78.12	83.37	88.61	93.85
2.80	47.70	44.69	43.33	45.71	48.95	53.11	57.86	63.45	68.27	73.85	78.65	83.84	89.03	94.23
2.90	49.15	46.09	45.20	46.97	50.08	54.10	58.74	63.78	68.95	74.06	79.19	84.32	89.47	94.62
3.00	50.58	47.49	46.57	48.23	51.22	55.11	59.64	64.58	69.65	74.69	79.74	84.82	89.92	95.03

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D / H	0.0	33.0	96.4	159.8	223.1	286.5	349.9	413.2	476.7	540.0	603.4	666.8	730.2	793.6
3.00	50.58	47.49	46.57	48.23	51.22	55.11	59.64	64.58	69.65	74.69	79.74	84.82	89.92	95.03
3.10	52.98	48.90	47.94	49.51	52.36	56.14	60.55	65.39	70.37	75.32	80.31	85.33	90.37	95.44
3.20	53.40	50.32	49.32	50.79	53.52	57.17	61.48	66.22	71.11	75.98	80.90	85.85	90.85	95.88
3.30	54.81	51.73	50.69	52.09	54.87	58.23	62.42	67.05	71.86	76.65	81.49	86.39	91.33	96.31
3.40	56.23	53.15	52.08	53.36	56.17	59.51	63.39	67.91	72.62	77.33	82.10	86.94	91.83	96.77
3.50	57.63	54.56	53.45	54.65	57.06	60.37	64.34	68.78	73.40	78.03	82.73	87.50	92.34	97.22
3.60	59.05	55.97	54.83	55.94	58.25	61.46	65.33	69.67	74.20	78.74	83.37	88.07	92.86	97.70
3.70	60.46	57.38	56.21	57.24	59.46	62.55	66.31	70.56	75.00	79.46	84.02	88.66	93.39	98.18
3.80	61.87	58.79	57.60	58.55	60.66	63.65	67.33	71.47	75.82	80.24	84.88	89.26	93.93	98.68
3.90	63.29	60.20	58.98	59.85	61.88	64.76	68.34	72.39	76.64	80.94	85.35	89.87	94.49	99.18
4.00	64.70	61.61	60.35	61.17	63.09	65.89	69.36	73.32	77.48	81.71	86.04	90.49	95.05	99.69
4.10	66.11	63.02	61.72	62.49	64.32	67.03	70.39	74.25	78.34	82.47	86.73	91.12	95.62	100.22
4.20	67.52	64.43	63.11	63.79	65.54	68.16	71.43	75.21	79.20	83.25	87.44	91.76	96.20	100.75
4.30	68.93	65.84	64.49	65.11	66.79	69.29	72.49	76.18	80.08	84.04	88.16	92.41	96.80	101.30
4.40	70.34	67.25	65.87	66.43	68.02	70.45	73.55	77.14	80.96	84.84	88.88	93.07	97.41	101.84
4.50	71.75	68.66	67.25	67.74	69.28	71.61	74.61	78.13	81.95	85.66	89.62	93.73	98.01	102.41
4.60	73.16	70.06	68.63	69.07	70.51	72.77	75.69	79.11	82.76	86.48	90.37	94.43	98.64	102.98
4.70	74.57	71.47	70.01	70.38	71.77	73.94	76.76	80.11	83.67	87.32	91.13	95.12	99.27	103.56
4.80	75.97	72.89	71.39	71.71	73.02	75.11	77.85	81.11	84.59	88.15	91.90	95.81	99.91	104.15
4.90	77.39	74.28	72.77	73.05	74.27	76.29	78.95	82.12	85.52	89.00	92.67	96.53	100.56	104.74
5.00	78.79	75.69	74.14	74.36	75.53	77.47	80.05	83.14	86.45	89.85	93.45	97.24	101.22	105.35
5.10	80.20	77.09	75.52	75.71	76.80	78.65	81.16	84.16	87.41	90.72	94.24	97.97	101.88	105.96
5.20	81.61	78.50	76.90	77.04	78.06	79.84	82.26	85.20	88.36	91.59	95.04	98.70	102.56	106.59
5.30	83.01	79.90	78.28	78.36	79.33	81.05	83.58	86.24	89.31	92.47	95.84	99.44	103.24	107.21
5.40	84.41	81.31	79.65	79.69	80.58	82.24	84.91	87.29	90.28	93.36	96.66	100.19	103.93	107.85
5.50	85.82	82.71	81.03	81.01	81.86	83.44	85.62	88.34	91.25	94.25	97.49	100.95	104.63	108.49
5.60	87.23	84.11	82.41	82.36	83.13	84.63	86.77	89.40	92.24	95.15	98.32	101.71	105.33	109.14
5.70	88.63	85.51	83.78	83.68	84.39	85.85	87.89	90.45	93.22	96.06	99.15	102.48	106.04	109.80
5.80	90.03	86.91	85.16	85.02	85.69	87.05	89.03	91.53	94.21	96.97	100.00	103.26	106.76	110.46
5.90	91.44	88.31	86.54	86.35	86.95	88.26	90.18	92.60	95.20	97.90	100.84	104.04	107.49	111.14
6.00	92.84	89.71	87.91	87.67	88.22	89.47	91.32	93.67	96.20	98.82	101.69	104.84	108.22	111.82
6.10	94.24	91.11	89.29	89.01	89.51	90.69	92.48	94.76	97.21	99.76	102.56	105.63	108.96	112.50
6.20	95.66	92.51	90.66	90.34	90.81	91.93	93.63	95.84	98.22	100.69	103.42	106.43	109.70	113.19
6.30	97.03	93.90	92.03	91.69	92.07	93.14	94.79	96.93	99.23	101.63	104.29	107.24	110.45	113.88
6.40	98.44	95.30	93.41	93.02	93.35	94.36	95.94	98.03	100.26	102.58	105.17	108.05	111.21	114.59
6.50	99.83	96.69	94.78	94.34	94.64	95.60	97.12	99.12	101.29	103.54	106.05	108.88	111.96	115.30
6.60	101.23	98.09	96.15	95.68	95.91	96.81	98.27	100.22	102.31	104.49	106.95	109.69	112.74	116.01
6.70	102.63	99.48	97.52	97.01	97.20	98.04	99.44	101.33	103.35	105.45	107.84	110.52	113.51	116.74
6.80	104.03	100.87	98.90	98.35	98.50	99.27	100.61	102.44	104.38	106.41	108.74	111.36	114.29	117.47
6.90	105.42	102.26	100.26	99.68	99.77	100.50	101.78	103.55	105.43	107.38	109.64	112.20	115.08	118.20
7.00	106.82	103.64	101.64	101.01	101.06	101.74	102.97	104.66	106.47	108.35	110.54	113.05	115.85	118.92

D / H	0.0	33.0	76.4	159.8	223.1	286.5	349.9	413.2	476.7	540.0	603.4	666.8	730.2	793.6
7.00	105.82	103.64	101.64	101.01	101.06	101.74	102.97	104.66	106.47	108.35	110.54	113.05	115.85	118.92
7.10	108.71	105.04	103.00	102.34	102.35	102.97	104.13	105.77	107.52	109.33	111.45	113.89	116.66	119.67
7.20	109.60	106.43	104.37	103.68	103.64	104.20	105.31	106.90	108.56	110.30	112.36	114.76	117.45	120.42
7.30	110.99	107.81	105.74	105.01	104.92	105.45	106.51	108.03	109.62	111.29	113.29	115.60	118.25	121.17
7.40	112.38	109.20	107.11	106.34	106.21	106.69	107.67	108.15	110.67	112.27	114.20	116.46	119.05	121.93
7.50	113.77	110.53	108.47	107.67	107.49	107.91	108.86	110.26	111.74	113.27	115.14	117.34	119.87	122.68
7.60	115.16	111.97	109.84	109.00	108.78	109.16	110.04	111.40	112.80	114.27	116.06	118.21	120.68	123.46
7.70	116.54	113.35	111.20	110.33	110.08	110.39	111.23	112.52	113.85	115.26	117.00	119.08	121.51	124.22
7.80	117.93	114.73	112.56	111.66	111.36	111.64	112.42	113.66	114.93	116.26	117.93	119.95	122.32	124.99
7.90	119.31	116.11	113.93	112.99	112.64	112.88	113.60	114.80	115.99	117.26	118.86	120.83	123.16	125.76
8.00	120.70	117.49	115.29	114.32	113.94	114.13	114.79	115.93	117.06	118.26	119.80	121.73	123.98	126.55
8.10	122.07	118.87	116.65	115.65	115.22	115.36	116.00	117.07	118.14	119.27	120.74	122.60	124.82	127.34
8.20	123.46	120.25	118.01	116.97	116.51	116.61	117.20	118.20	119.20	120.27	121.70	123.49	125.66	128.12
8.30	124.84	121.63	119.37	118.30	117.80	117.85	118.38	119.35	120.28	121.27	122.64	124.39	126.49	128.93
8.40	126.22	123.00	120.73	119.63	119.09	119.09	119.58	120.49	121.36	122.29	123.60	125.28	127.35	129.71
8.50	127.60	124.38	122.08	120.95	120.37	120.33	120.76	121.65	122.43	123.31	124.56	126.19	128.19	130.52
8.60	128.97	125.76	123.44	122.28	121.66	121.57	121.96	122.79	123.51	124.31	125.51	127.08	129.04	131.32
8.70	130.35	127.13	124.80	123.60	122.95	122.82	123.16	123.94	124.58	125.33	126.47	128.00	129.89	132.12
8.80	131.73	128.51	126.15	124.93	124.23	124.06	124.37	125.08	125.67	126.35	127.42	128.89	130.75	132.93
8.90	133.11	129.88	127.51	126.25	125.52	125.31	125.55	126.24	126.76	127.37	128.39	129.80	131.60	133.74
9.00	134.49	131.26	128.86	127.57	126.80	126.55	126.75	127.38	127.83	128.39	129.35	130.71	132.47	134.57
9.10	135.87	132.63	130.21	128.89	128.09	127.79	127.95	128.53	128.92	129.41	130.30	131.62	133.34	135.38
9.20	137.24	134.00	131.57	130.21	129.37	129.03	129.17	129.69	130.00	130.44	131.27	132.55	134.21	136.21
9.30	138.61	135.37	132.92	131.53	130.66	130.28	130.37	130.83	131.09	131.46	132.24	133.45	135.07	137.03
9.40	139.93	136.74	134.26	132.85	131.94	131.52	131.55	131.99	132.17	132.48	133.21	134.38	135.95	137.86
9.50	141.35	138.11	135.61	134.17	133.22	132.77	132.75	133.16	133.25	133.50	134.19	135.30	136.82	138.68
9.60	142.73	139.48	136.96	135.49	134.50	134.01	133.95	134.31	134.33	134.52	135.16	136.22	137.70	139.52
9.70	144.10	140.84	138.31	136.80	135.78	135.25	135.15	135.46	135.41	135.56	136.12	137.15	138.57	140.35
9.80	145.46	142.21	139.65	138.12	137.07	136.50	136.35	136.63	136.50	136.58	137.10	138.07	139.45	141.18
9.90	146.84	143.57	141.00	139.43	138.35	137.74	137.55	137.77	137.58	137.61	138.08	139.00	140.33	142.02
10.00	148.20	144.94	142.34	140.74	139.63	138.98	138.77	138.94	138.66	138.62	139.05	139.93	141.22	142.86
10.10	149.57	146.30	143.68	142.06	140.91	140.22	139.95	140.08	139.74	139.67	140.04	140.86	142.09	143.71
10.20	150.93	147.66	145.03	143.37	142.18	141.47	141.16	141.25	140.82	140.68	141.01	141.78	142.98	144.55
10.30	152.30	149.02	146.37	144.68	143.46	142.70	142.36	142.41	141.91	141.71	141.98	142.72	143.87	145.40
10.40	153.66	150.37	147.71	145.99	144.74	143.94	143.56	143.56	142.99	142.73	142.96	143.64	144.76	146.24
10.50	155.02	151.74	149.04	147.30	146.01	145.19	144.76	144.72	144.07	143.76	143.94	144.58	145.66	147.10
10.60	156.39	153.08	150.38	148.60	147.29	146.42	145.96	145.88	145.15	144.79	144.92	145.51	146.55	147.95
10.70	157.74	154.45	151.71	149.91	148.56	147.62	147.16	147.03	146.22	145.82	145.91	146.46	147.44	148.81
10.80	159.10	155.80	153.05	151.21	149.84	148.90	148.36	148.20	147.30	146.84	146.89	147.38	148.33	149.65
10.90	160.46	157.16	154.38	152.52	151.11	150.14	149.56	149.36	148.38	147.87	147.86	148.32	149.23	150.51
11.00	161.82	158.51	155.71	153.82	152.38	151.37	150.76	150.52	149.46	148.90	148.84	149.26	150.13	151.37

(TT-PAGE 3/8)

n / H	0.0	33.0	96.4	159.8	223.1	286.5	349.9	413.2	476.7	540.0	603.4	666.8	730.2	793.6
11.00	161.82	158.51	155.71	153.82	152.38	151.37	150.76	150.52	149.46	148.90	148.84	149.26	150.13	151.37
11.10	163.18	159.86	157.04	155.12	153.65	152.61	151.96	151.67	150.53	149.92	149.82	150.20	151.03	152.24
11.20	164.53	161.21	158.37	156.42	154.92	153.85	153.15	152.82	151.61	150.95	150.81	151.14	151.94	153.10
11.30	165.83	162.55	159.69	157.73	156.19	155.08	154.35	153.97	152.68	151.97	151.79	152.08	152.84	153.97
11.40	167.24	163.90	161.02	159.02	157.46	156.32	155.55	155.11	153.75	153.00	152.77	153.02	153.73	154.83
11.50	168.59	165.25	162.35	160.32	158.73	157.55	156.75	156.25	154.82	154.02	153.75	153.97	154.64	155.69
11.60	169.94	166.60	163.67	161.61	159.99	158.78	157.94	157.38	155.89	155.05	154.73	154.90	155.54	156.56
11.70	171.29	167.94	165.00	162.91	161.26	160.01	159.14	158.51	156.96	156.07	155.71	155.84	156.45	157.43
11.80	172.63	169.28	166.33	164.20	162.52	161.24	160.33	159.64	158.03	157.09	156.69	156.79	157.35	158.30
11.90	173.94	170.62	167.63	165.50	163.78	162.47	161.53	160.76	159.10	158.11	157.67	157.73	158.26	159.18
12.00	175.32	171.96	168.95	166.79	165.05	163.70	162.72	161.88	160.16	159.13	158.65	158.67	159.17	160.04
12.10	176.67	173.30	170.27	168.08	166.30	164.93	163.91	162.99	161.23	160.15	159.63	159.62	160.07	160.92
12.20	178.01	174.64	171.59	169.37	167.57	166.16	165.11	164.10	162.29	161.17	160.61	160.56	160.99	161.78
12.30	179.35	175.97	172.90	170.65	168.82	167.38	166.30	165.20	163.35	162.19	161.59	161.50	161.90	162.67
12.40	180.69	177.30	174.21	171.94	170.08	168.61	167.49	166.30	164.41	163.21	162.57	162.45	162.81	163.53
12.50	182.04	178.64	175.53	173.23	171.34	169.83	168.68	167.40	165.47	164.23	163.55	163.40	163.71	164.40
12.60	183.36	179.97	176.83	174.51	172.59	171.06	169.87	168.49	166.52	165.25	164.53	164.34	164.62	165.28
12.70	184.70	181.30	178.14	175.79	173.84	172.28	171.06	169.57	167.58	166.26	165.51	165.28	165.54	166.16
12.80	186.03	182.62	179.45	177.07	175.10	173.50	172.25	170.66	168.63	167.28	166.48	166.22	166.45	167.04
12.90	187.36	183.96	180.75	178.35	176.35	174.72	173.43	171.74	169.68	168.29	167.46	167.17	167.37	167.93
13.00	188.69	185.28	182.06	179.63	177.60	175.94	174.62	172.82	170.73	169.31	168.44	168.11	168.27	168.81
13.10	190.02	186.60	183.36	180.91	178.85	177.15	175.80	173.90	171.78	170.32	169.42	169.05	169.19	169.67
13.20	191.35	187.93	184.66	182.18	180.10	178.37	176.99	174.98	172.82	171.33	170.39	170.00	170.10	170.56
13.30	192.68	189.24	185.96	183.45	181.35	179.59	178.17	176.06	173.87	172.34	171.37	170.94	171.01	171.44
13.40	194.00	190.57	187.26	184.73	182.59	180.80	179.35	177.14	174.91	173.35	172.35	171.89	171.93	172.32
13.50	195.32	191.88	188.55	186.00	183.83	182.02	180.54	178.21	175.95	174.36	173.32	172.83	172.84	173.20
13.60	196.64	193.20	189.85	187.27	185.07	183.23	181.71	179.29	176.98	175.36	174.29	173.77	173.75	174.10
13.70	197.96	194.51	191.14	188.54	186.32	184.44	182.90	180.36	178.02	176.37	175.27	174.71	174.67	175.07
13.80	199.28	195.83	192.43	189.81	187.56	185.65	184.07	181.43	179.05	177.37	176.24	175.66	175.58	175.86
13.90	200.60	197.14	193.72	191.07	188.79	186.85	185.25	182.49	180.08	178.38	177.21	176.60	176.49	176.73
14.00	201.92	198.45	195.01	192.33	190.03	188.07	186.43	183.56	181.11	179.38	178.19	177.54	177.41	177.62
14.10	203.23	199.75	196.30	193.60	191.27	189.27	187.56	184.62	182.14	180.38	179.16	178.49	178.33	178.50
14.20	204.54	201.06	197.59	194.86	192.50	190.48	188.65	186.69	184.61	182.53	180.38	179.63	179.23	179.39
14.30	205.85	202.36	198.87	196.12	193.73	191.68	189.73	187.65	185.49	183.16	181.30	180.37	180.15	180.27
14.40	207.16	203.67	200.15	197.38	194.96	192.88	190.80	188.65	186.37	183.87	182.07	181.31	181.06	181.15
14.50	208.46	204.97	201.44	198.64	196.20	194.08	191.89	189.65	187.24	184.67	183.04	182.25	181.98	182.05
14.60	209.77	206.27	202.71	199.89	197.42	195.28	192.97	190.51	187.96	185.36	184.01	183.19	182.89	182.93
14.70	211.07	207.57	204.00	201.15	198.65	196.48	194.05	191.46	188.82	186.36	184.98	184.13	183.81	183.82
14.80	212.38	208.86	205.26	202.40	199.87	197.68	195.12	192.40	189.69	187.30	185.94	185.07	184.72	184.70
14.90	213.67	210.15	206.54	203.64	201.10	198.87	196.20	193.45	190.63	188.34	186.91	186.01	185.63	185.58
15.00	214.97	211.45	207.81	204.90	202.32	200.07	197.27	194.49	191.64	189.32	187.87	186.95	186.55	186.47

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D / H	0.0	33.0	96.4	159.8	223.1	286.5	349.9	413.2	476.7	540.0	603.4	666.8	730.2	793.6
15.00	214.97	211.45	207.81	204.90	202.32	200.07	197.27	194.09	191.34	189.32	187.87	186.95	186.55	186.47
15.10	216.27	212.74	209.08	206.14	203.54	201.26	198.34	195.13	192.36	190.31	188.84	187.89	187.46	187.36
15.20	217.57	214.02	210.36	207.39	204.76	202.45	199.41	196.16	193.37	191.30	189.80	188.83	188.37	188.32
15.30	218.86	215.32	211.62	208.63	205.97	203.64	200.48	197.20	194.39	192.28	190.77	189.77	189.29	189.14
15.40	220.15	216.60	212.89	209.88	207.19	204.83	201.54	198.22	195.40	193.26	191.73	190.70	190.20	190.02
15.50	221.45	217.88	214.15	211.11	208.41	206.01	203.66	201.31	198.43	196.20	194.61	193.52	192.94	192.67
15.60	222.73	219.17	215.42	212.35	209.62	207.20	204.83	202.48	199.54	197.11	194.61	192.58	192.03	191.79
15.70	224.01	220.45	216.68	213.59	210.83	208.28	205.71	203.11	200.42	197.64	194.81	192.52	192.94	192.67
15.80	225.30	221.73	217.93	214.82	212.04	209.36	206.71	204.03	201.24	198.34	195.42	193.85	193.85	193.56
15.90	226.58	223.01	219.19	216.06	213.25	210.43	207.61	204.75	201.84	198.84	195.84	193.85	193.85	193.56
16.00	227.86	224.29	220.45	217.29	214.45	211.51	208.57	205.57	202.54	199.54	196.52	193.59	193.59	193.32
16.10	229.14	225.56	221.70	218.52	215.66	212.59	209.40	206.16	202.84	199.43	196.32	193.22	193.22	192.95
16.20	230.42	226.83	222.95	219.75	216.86	213.65	209.94	206.41	202.84	199.33	196.19	193.19	193.19	192.92
16.30	231.70	228.10	224.20	220.98	218.06	214.72	210.97	207.44	203.43	200.34	197.12	194.00	193.99	193.72
16.40	232.97	229.37	225.45	222.20	219.26	215.79	212.01	208.45	204.42	200.34	197.12	194.00	193.99	193.72
16.50	234.24	230.63	226.70	223.42	220.46	216.85	213.04	209.47	205.41	201.24	197.48	194.32	194.32	194.05
16.60	235.51	231.90	227.94	224.64	221.65	217.91	214.06	210.48	206.41	202.25	198.06	194.86	194.86	194.59
16.70	236.78	233.16	229.19	225.86	222.85	218.96	215.08	211.50	207.39	203.20	199.02	195.84	195.84	195.57
16.80	238.05	234.42	230.43	227.08	224.04	220.01	216.11	212.50	208.37	204.14	200.87	197.58	197.58	197.31
16.90	239.31	235.68	231.66	228.29	225.15	221.06	217.14	213.51	210.36	206.64	203.39	200.14	200.14	199.87
17.00	240.58	236.93	232.90	229.50	226.23	222.11	218.16	214.52	211.33	207.60	204.33	201.06	201.06	200.79
17.10	241.84	238.19	234.14	230.72	227.30	223.15	219.18	215.52	212.32	208.54	205.27	202.00	202.00	201.73
17.20	243.10	239.44	235.37	231.93	228.43	224.19	220.20	216.52	213.30	210.81	208.87	207.51	207.51	207.24
17.30	244.35	240.70	236.60	233.13	229.63	225.22	221.22	217.52	214.28	211.77	209.81	208.43	208.43	208.16
17.40	245.61	241.95	237.83	234.34	230.89	226.25	222.24	218.52	215.26	212.74	210.75	209.36	209.36	209.09
17.50	246.87	243.19	239.06	235.54	232.05	227.28	223.26	219.52	216.24	213.70	211.70	210.29	210.29	209.99
17.60	248.11	244.44	240.28	237.07	233.61	229.80	225.78	222.05	218.71	216.17	214.21	212.80	212.80	212.53
17.70	249.36	245.69	241.50	238.15	234.66	230.93	226.93	223.28	219.91	217.34	215.34	213.91	213.91	213.64
17.80	250.61	246.92	242.72	239.23	235.71	232.05	228.29	224.49	221.19	218.58	216.58	215.14	215.14	214.87
17.90	251.86	248.17	243.94	240.30	236.75	233.08	229.30	225.49	222.19	219.58	217.58	216.14	216.14	215.87
18.00	253.11	249.40	245.16	241.37	237.67	233.90	229.99	226.18	222.48	219.87	217.87	216.43	216.43	216.16
18.10	254.34	250.64	246.38	242.43	238.63	234.82	230.88	226.93	223.12	220.51	218.51	217.07	217.07	216.80
18.20	255.58	251.87	247.59	243.50	239.66	235.83	231.93	228.05	224.24	220.43	218.43	216.99	216.99	216.72
18.30	256.82	253.09	248.80	244.55	240.66	236.80	232.88	228.99	225.18	221.37	219.37	217.93	217.93	217.66
18.40	258.05	254.32	250.01	245.61	241.66	237.75	233.78	229.84	225.91	222.00	219.99	218.55	218.55	218.28
18.50	259.29	255.55	251.21	246.66	242.66	238.70	234.70	230.73	226.79	222.84	220.84	219.40	219.40	219.13
18.60	260.52	256.78	252.42	247.71	243.66	239.66	235.66	231.66	227.66	223.66	220.66	219.22	219.22	218.95
18.70	261.74	258.00	253.62	248.75	244.66	240.66	236.66	232.66	228.66	224.66	220.66	219.22	219.22	218.95
18.80	262.97	259.22	254.77	249.79	245.01	240.52	236.27	232.30	228.30	224.30	220.30	218.86	218.86	218.59
18.90	264.20	260.44	255.84	250.82	246.03	241.53	237.26	233.28	229.28	225.28	221.28	219.84	219.84	219.57
19.00	265.42	261.66	256.90	251.85	247.05	242.53	238.24	234.25	230.25	226.25	222.25	220.81	220.81	220.54

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D / H	0.0	33.0	96.4	159.8	223.1	286.5	349.9	413.2	476.7	540.0	603.4	666.8	730.2	793.6
19.00	265.42	261.66	256.90	251.85	247.05	242.53	238.24	234.25	230.80	227.99	225.78	224.11	222.80	221.84
19.10	266.63	262.87	257.95	252.98	248.07	243.53	239.22	235.23	231.76	228.93	226.71	225.02	223.70	222.72
19.20	267.86	264.08	259.01	253.91	249.08	244.53	240.20	236.20	232.72	229.88	227.64	225.94	224.59	223.59
19.30	269.07	265.29	260.05	254.93	250.10	245.52	241.18	237.17	233.67	230.82	228.58	226.85	225.49	224.48
19.40	270.28	266.49	261.10	255.96	251.11	246.52	242.16	238.14	234.63	231.76	229.51	227.76	226.38	225.35
19.50	271.49	267.69	262.31	257.08	252.12	247.51	243.14	239.11	235.58	232.70	230.44	228.67	227.27	226.23
19.60	272.70	268.80	263.41	258.00	253.13	248.49	244.12	240.08	236.54	233.64	231.37	229.59	228.17	227.11
19.70	273.91	269.95	264.51	259.02	254.13	249.48	245.09	241.05	237.49	234.58	232.29	230.50	229.06	227.99
19.80	275.08	271.01	265.52	260.04	255.14	250.47	246.08	242.01	238.44	235.52	233.22	231.41	229.95	228.87
19.90	276.14	271.96	266.25	261.06	256.14	251.45	247.05	242.97	239.38	236.46	234.15	232.32	230.84	229.74
20.00	277.20	273.00	267.28	262.07	257.13	252.43	248.02	243.93	240.33	237.40	235.07	233.23	231.73	230.62
20.10	278.24	274.04	268.30	263.08	258.13	253.41	249.00	244.90	241.27	238.34	236.00	234.14	232.62	231.50
20.20	279.29	275.07	269.32	264.09	259.12	254.39	249.96	245.86	242.22	239.28	236.92	235.04	233.50	232.38
20.30	280.33	276.10	270.34	265.10	260.11	255.36	250.94	246.81	243.16	240.21	237.85	235.95	234.39	233.25
20.40	281.36	277.13	271.36	266.10	261.09	256.34	251.90	247.77	244.11	241.15	238.77	236.85	235.27	234.13
20.50	282.40	278.16	272.38	267.10	262.08	257.32	252.87	248.72	245.05	242.09	239.69	237.76	236.16	235.00
20.60	283.42	279.18	273.40	268.10	263.06	258.30	253.84	249.68	245.99	243.01	240.61	238.66	237.05	235.88
20.70	284.45	280.20	274.41	269.10	264.04	259.27	254.80	250.63	246.94	243.95	241.53	239.57	237.93	236.75
20.80	285.48	281.23	275.42	270.10	265.02	260.24	255.77	251.58	247.88	244.88	242.44	240.47	238.82	237.63
20.90	286.50	282.25	276.42	271.09	266.00	261.22	256.73	252.53	248.82	245.81	243.37	241.37	239.70	238.50
21.00	287.53	283.27	277.44	272.08	266.98	262.19	257.69	253.47	249.76	246.75	244.28	242.27	240.58	239.37
21.10	288.54	284.28	278.44	273.06	267.96	263.16	258.60	254.42	250.69	247.67	245.19	243.17	241.47	240.25
21.20	289.56	285.30	279.44	274.05	268.94	264.13	259.60	255.36	251.63	248.60	246.11	244.06	242.36	241.12
21.30	290.57	286.31	280.44	275.03	269.92	265.10	260.56	256.31	252.57	249.53	247.02	244.97	243.24	242.00
21.40	291.59	287.32	281.43	276.01	270.89	266.06	261.51	257.25	253.51	250.46	247.94	245.86	244.13	242.87
21.50	292.60	288.33	282.42	276.99	271.87	267.02	262.46	258.19	254.44	251.38	248.85	246.75	245.05	243.74
21.60	293.62	289.34	283.41	277.96	272.83	267.98	263.41	259.14	255.38	252.31	249.76	247.65	245.89	244.61
21.70	294.63	290.34	284.40	278.95	273.81	268.95	264.36	260.07	256.32	253.23	250.67	248.54	246.78	245.48
21.80	295.63	291.33	285.38	279.92	274.77	269.90	265.31	261.01	257.25	254.15	251.58	249.44	247.65	246.35
21.90	296.63	292.33	286.36	280.90	275.74	270.86	266.25	261.96	258.18	255.08	252.49	250.33	248.54	247.22
22.00	297.63	293.32	287.35	281.88	276.71	271.82	267.20	262.89	259.12	256.01	253.39	251.22	249.42	248.09
22.10	298.63	294.32	288.32	282.85	277.68	272.77	268.14	263.83	260.05	256.91	254.30	252.11	250.30	248.96
22.20	299.62	295.30	289.31	283.82	278.61	273.68	269.03	264.71	260.91	257.75	255.11	253.89	252.06	250.70
22.30	300.62	296.29	290.29	284.80	279.61	274.68	270.03	265.65	262.83	259.67	257.01	254.77	252.94	251.56
22.40	301.60	297.27	291.26	285.77	280.56	275.63	270.97	266.65	263.79	260.58	257.92	255.65	253.82	252.43
22.50	302.59	298.25	292.24	286.74	281.53	276.57	271.91	267.58	264.69	261.50	258.81	256.54	254.70	253.29
22.60	303.56	299.24	293.22	287.70	282.48	277.52	272.85	268.52	265.61	262.41	259.71	257.43	255.58	254.16
22.70	304.55	300.22	294.19	288.67	283.44	278.46	273.79	269.45	266.53	263.32	260.61	258.31	256.46	255.03
22.80	305.53	301.19	295.16	289.64	284.39	279.40	274.73	270.38	267.46	264.23	261.51	259.20	257.34	255.89
22.90	306.51	302.17	296.14	290.59	285.35	280.35	275.67	271.32	267.46	264.23	261.51	259.20	257.34	255.89
23.00	307.49	303.15	297.10	291.56	286.29	281.29	276.61	272.25	268.38	265.15	262.41	260.09	258.22	256.75

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θ / H	0.0	33.0	96.4	159.4	223.1	286.5	349.9	413.2	476.7	540.0	603.4	666.8	730.2	793.6
23.00	307.49	303.15	297.10	291.56	286.29	281.29	276.61	272.25	268.38	265.15	262.41	260.09	258.22	256.75
23.10	308.47	304.12	298.07	292.52	287.24	282.24	277.54	273.19	269.30	266.06	263.31	260.97	259.09	257.62
23.20	309.44	305.10	298.94	293.47	288.19	283.18	278.48	274.11	270.22	266.96	264.20	261.86	259.97	258.48
23.30	310.43	306.08	300.00	294.44	289.13	284.12	279.42	275.04	271.14	267.87	265.09	262.74	260.84	259.35
23.40	311.40	307.05	300.97	295.39	290.07	285.06	280.36	275.96	272.06	268.78	265.99	263.62	261.72	260.21
23.50	312.37	308.01	301.94	296.34	291.02	286.00	281.29	276.89	272.97	269.68	266.88	264.51	262.60	261.07
23.60	313.34	308.94	302.89	297.29	291.97	286.94	282.22	277.82	273.89	270.59	267.77	265.39	263.47	261.93
23.70	314.32	309.96	303.85	298.24	292.91	287.88	283.16	278.74	274.80	271.49	268.66	266.27	264.34	262.79
23.80	315.29	310.93	304.81	299.18	293.85	288.82	283.98	279.66	275.72	272.39	269.55	267.16	265.22	263.65
23.90	316.26	311.89	305.76	300.13	294.79	289.75	284.80	280.58	276.63	273.30	270.43	268.04	266.08	264.51
24.00	317.22	312.85	306.72	301.07	295.73	290.69	285.94	281.51	277.54	274.20	271.32	268.91	266.96	265.37
24.10	318.19	313.81	307.67	302.02	296.67	291.62	286.87	282.43	278.45	275.09	272.21	269.80	267.83	266.23
24.20	319.15	314.77	308.62	302.96	297.61	292.56	287.79	283.34	279.36	275.99	273.09	270.68	268.70	267.09
24.30	320.11	315.73	309.57	303.91	298.55	293.49	288.73	284.26	280.27	276.89	273.98	271.56	269.57	267.95
24.40	321.07	316.68	310.52	304.85	299.49	294.42	289.65	285.17	281.18	277.78	274.86	272.44	270.44	268.80
24.50	322.03	317.64	311.46	305.79	300.43	295.36	290.57	286.09	282.08	278.68	275.75	273.32	271.31	269.66
24.60	322.94	318.59	312.41	306.73	301.36	296.28	291.50	287.00	282.98	279.57	276.63	274.20	272.18	270.51
24.70	323.94	319.54	313.35	307.67	302.30	297.22	292.42	287.91	283.89	280.46	277.52	275.07	273.05	271.37
24.80	324.99	320.49	314.29	308.61	303.23	298.14	293.33	288.83	284.79	281.35	278.40	275.95	273.92	272.22
24.90	325.84	321.44	315.24	309.55	304.17	299.07	294.25	289.74	285.69	282.24	279.29	276.83	274.78	273.08
25.00	326.79	322.38	316.17	310.49	305.10	299.99	295.18	290.65	286.59	283.13	280.17	277.70	275.65	273.93
25.10	327.74	323.32	317.12	311.43	306.03	300.91	296.09	291.56	287.49	284.02	281.05	278.59	276.52	274.79
25.20	328.68	324.27	318.06	312.36	306.96	301.84	297.01	292.47	288.39	284.90	281.94	279.46	277.38	275.64
25.30	329.62	325.21	319.00	313.29	307.89	302.76	297.92	293.37	289.29	285.79	282.82	280.34	278.25	276.49
25.40	330.57	326.16	319.94	314.23	308.82	303.69	298.83	294.28	290.18	286.67	283.69	281.21	279.11	277.34
25.50	331.51	327.10	320.88	315.17	309.74	304.61	299.75	295.18	291.08	287.56	284.58	282.08	279.97	278.19
25.60	332.45	328.04	321.82	316.09	310.68	305.52	300.65	296.09	291.97	288.45	285.46	282.96	280.83	279.04
25.70	333.39	328.98	322.75	317.03	311.60	306.44	301.57	296.99	292.86	289.33	286.34	283.83	281.70	279.89
25.80	334.33	329.92	323.68	317.96	312.53	307.35	302.48	297.89	293.75	290.22	287.22	284.70	282.56	280.73
25.90	335.28	330.86	324.62	318.89	313.44	308.27	303.39	298.79	294.64	291.10	288.10	285.57	283.42	281.58
26.00	336.23	331.80	325.56	319.81	314.37	309.19	304.29	299.69	295.53	291.99	288.98	286.44	284.28	282.43
26.10	337.15	332.73	326.49	320.75	315.29	310.10	305.20	300.58	296.41	292.87	289.86	287.31	285.14	283.28
26.20	338.09	333.67	327.42	321.67	316.21	311.01	306.10	301.48	297.30	293.74	290.74	288.18	286.00	284.12
26.30	339.03	334.60	328.36	322.60	317.13	311.93	307.00	302.37	298.18	294.63	291.61	289.05	286.86	284.97
26.40	339.97	335.54	329.28	323.52	318.04	312.83	307.91	303.26	299.05	295.41	292.49	289.92	287.71	285.81
26.50	340.91	336.47	330.21	324.44	318.96	313.74	308.81	304.16	299.95	296.40	293.36	290.79	288.57	286.65
26.60	341.84	337.41	331.14	325.36	319.87	314.65	309.71	305.04	300.84	297.28	294.24	291.65	289.43	287.49
26.70	342.77	338.34	332.07	326.28	320.79	315.55	310.60	305.93	301.72	298.16	295.11	292.52	290.28	288.34
26.80	343.71	339.28	333.00	327.20	321.69	316.46	311.50	306.82	302.61	299.04	295.99	293.38	291.13	289.17
26.90	344.64	340.20	333.92	328.12	322.60	317.36	312.39	307.72	303.50	299.92	296.86	294.25	291.99	290.03
27.00	345.58	341.14	334.84	329.04	323.52	318.27	313.29	308.60	304.38	300.80	297.74	295.11	292.84	290.86

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D / H	0.0	33.0	96.4	159.8	223.1	286.5	349.9	413.2	476.7	540.0	603.4	666.8	730.2	793.6
27.00	345.58	341.14	334.84	329.04	323.52	318.27	313.29	308.60	304.38	300.80	297.74	295.11	292.84	290.86
27.10	346.50	342.06	335.76	329.95	324.43	319.17	314.18	309.48	305.26	301.68	298.60	295.98	293.69	291.70
27.20	347.43	342.98	336.69	330.86	325.34	320.07	315.07	310.37	306.15	302.56	299.48	296.84	294.55	292.55
27.30	348.35	343.91	337.60	331.78	326.24	320.97	315.97	311.25	307.03	303.44	300.35	297.70	295.39	293.39
27.40	349.28	344.83	338.52	332.69	327.15	321.86	316.85	312.14	307.91	304.31	301.22	298.57	296.25	294.23
27.50	350.22	345.76	339.44	333.60	328.05	322.76	317.74	313.02	308.79	305.19	302.09	299.42	297.09	295.07
27.60	351.13	346.68	340.35	334.51	328.95	323.66	318.63	313.91	309.68	306.06	302.96	300.28	297.94	295.91
27.70	352.05	347.60	341.26	335.42	329.85	324.55	319.52	314.79	310.55	306.95	303.83	301.14	298.79	296.75
27.80	352.98	348.52	342.18	336.33	330.76	325.44	320.40	315.68	311.44	307.82	304.69	302.00	299.64	297.59
27.90	353.90	349.43	343.09	337.24	331.65	326.33	321.28	316.56	312.31	308.69	305.56	302.86	300.48	298.43
28.00	354.82	350.36	344.00	338.14	332.55	327.22	322.17	317.44	313.19	309.57	306.43	303.71	301.33	299.27
28.10	355.73	351.27	344.91	339.04	333.44	328.11	323.05	318.33	314.07	310.44	307.29	304.57	302.17	300.11
28.20	356.64	352.19	345.82	339.94	334.34	329.00	323.94	319.20	314.95	311.31	308.16	305.42	303.02	300.95
28.30	357.56	353.10	346.73	340.84	335.24	329.89	324.83	320.09	315.83	312.18	309.03	306.29	303.86	301.79
28.40	358.48	354.01	347.64	341.74	336.13	330.77	325.71	320.97	316.71	313.06	309.88	307.13	304.71	302.62
28.50	359.39	354.92	348.54	342.64	337.02	331.66	326.59	321.85	317.58	313.93	310.75	307.99	305.54	303.46
28.60	360.30	355.83	349.45	343.54	337.90	332.54	327.48	322.73	318.46	314.80	311.61	308.84	306.39	304.30
28.70	361.21	356.74	350.34	344.43	338.79	333.43	328.36	323.61	319.34	315.67	312.47	309.69	307.23	305.14
28.80	362.12	357.65	351.25	345.33	339.69	334.31	329.24	324.49	320.21	316.53	313.33	310.54	308.07	305.98
28.90	363.03	358.55	352.15	346.22	340.57	335.19	330.13	325.37	321.08	317.40	314.19	311.39	308.91	306.81
29.00	363.94	359.46	353.05	347.11	341.45	336.08	331.01	326.25	321.96	318.27	315.05	312.24	309.75	307.65
29.10	364.84	360.36	353.95	348.01	342.33	336.96	331.89	327.13	322.83	319.13	315.91	313.08	310.59	308.48
29.20	365.75	361.26	354.84	348.89	343.22	337.85	332.77	328.00	323.70	319.99	316.76	313.93	311.44	309.32
29.30	366.65	362.16	355.74	349.79	344.11	338.73	333.65	328.88	324.57	320.86	317.62	314.78	312.28	310.15
29.40	367.55	363.06	356.63	350.67	344.99	339.61	334.53	329.76	325.44	321.72	318.47	315.63	313.12	310.99
29.50	368.46	363.96	357.52	351.55	345.88	340.49	335.41	330.63	326.31	322.59	319.33	316.47	313.95	311.82
29.60	369.35	364.86	358.41	352.43	346.76	341.38	336.29	331.50	327.18	323.45	320.18	317.32	314.80	312.66
29.70	370.25	365.75	359.30	353.32	347.65	342.26	337.17	332.38	328.05	324.31	321.04	318.16	315.64	313.49
29.80	371.15	366.64	360.19	354.21	348.53	343.14	338.04	333.25	328.92	325.17	321.89	319.00	316.47	314.33
29.90	372.04	367.54	361.06	355.09	349.41	344.02	338.92	334.12	329.78	326.03	322.75	319.84	317.31	315.16
30.00	372.93	368.43	361.95	355.97	350.30	344.90	339.80	334.99	330.65	326.89	323.59	320.68	318.15	316.00
30.10	373.83	369.32	362.84	356.86	351.18	345.78	340.67	335.87	331.51	327.75	324.44	321.53	318.99	316.83
30.20	374.71	370.21	363.72	357.74	352.06	346.66	341.55	336.74	332.38	328.61	325.29	322.37	319.83	317.66
30.30	375.61	371.06	364.61	358.63	352.94	347.54	342.42	337.61	333.24	329.46	326.14	323.21	320.67	318.49
30.40	376.49	371.98	365.50	359.51	353.82	348.42	343.29	338.47	334.11	330.32	326.99	324.05	321.50	319.32
30.50	377.41	372.86	366.38	360.40	354.70	349.29	344.17	339.34	334.97	331.17	327.84	324.89	322.33	320.16
30.60	378.27	373.75	367.26	361.27	355.58	350.17	345.04	340.21	335.83	332.03	328.68	325.73	323.18	320.98
30.70	379.15	374.63	368.15	362.16	356.46	351.04	345.91	341.07	336.69	332.88	329.52	326.57	324.01	321.82
30.80	380.03	375.52	369.03	363.04	357.34	351.92	346.78	341.93	337.54	333.74	330.37	327.41	324.85	322.64
30.90	380.92	376.40	369.92	363.92	358.21	352.79	347.65	342.80	338.41	334.59	331.21	328.25	325.68	323.47
31.00	381.81	377.29	370.80	364.80	359.10	353.67	348.52	343.67	339.26	335.44	332.05	329.09	326.52	324.30
31.10	382.68	378.17	371.68	365.68	359.97	354.54	349.39	344.53	340.12	336.29	332.93	329.93	327.36	325.13

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Appendix II-2. Table of take-off angles (deg) for the 14 focal depths. Distance variations of the take-off angles measured from the downward vertical are shown in Fig. 5.

θ / H	0.0	33.0	96.4	159.8	223.1	286.5	349.9	413.2	476.7	540.0	603.4	666.8	730.2	793.6
0.0	90.00	130.00	130.00	130.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00
0.10	86.41	159.29	172.79	175.75	176.95	177.59	178.03	178.32	178.48	178.63	178.76	178.87	178.96	179.04
0.20	82.82	141.69	165.78	171.49	173.97	175.22	176.06	176.63	177.26	177.51	177.73	177.92	178.09	178.23
0.30	79.23	128.19	158.99	167.29	170.87	172.84	174.09	174.94	175.44	175.88	176.26	176.59	176.89	177.13
0.40	75.64	117.89	152.69	163.26	167.89	170.48	172.13	173.26	173.93	174.52	175.02	175.46	175.85	176.17
0.50	72.06	109.77	146.89	159.29	164.95	168.14	170.18	171.59	172.41	173.15	173.78	174.33	174.81	175.22
0.60	70.86	103.19	141.59	155.54	162.08	165.83	168.25	169.93	170.91	171.79	172.54	173.19	173.78	174.26
0.70	70.50	97.64	136.79	151.93	159.27	163.56	166.34	168.28	169.41	170.43	171.31	172.07	172.75	173.31
0.80	69.92	92.89	132.46	148.49	156.54	161.33	164.26	166.35	167.93	169.08	170.08	170.95	171.72	172.36
0.90	69.16	88.69	128.57	145.24	153.89	159.14	162.59	165.03	166.45	167.74	168.85	169.83	170.65	171.41
1.00	68.28	84.95	125.07	142.17	151.34	156.99	160.75	163.42	164.98	166.39	167.63	168.71	169.66	170.46
1.10	65.95	81.50	121.94	139.28	148.88	154.89	158.95	161.84	163.52	165.07	166.42	167.59	168.64	169.52
1.20	63.89	80.12	119.12	136.56	146.49	152.85	157.17	160.27	162.08	163.75	165.21	166.49	167.63	168.58
1.30	61.31	78.54	116.59	133.99	144.22	150.86	155.42	158.73	160.65	162.44	164.01	165.39	166.61	167.64
1.40	59.29	76.75	114.29	131.62	142.03	148.92	153.71	157.19	159.24	161.14	162.81	164.29	165.60	166.71
1.50	57.39	74.88	112.23	129.37	139.93	147.04	152.03	155.69	157.83	159.85	161.63	163.19	164.59	165.78
1.60	54.17	73.84	110.36	127.27	137.92	145.19	150.39	154.22	156.45	158.57	160.45	162.11	163.59	164.85
1.70	52.84	72.60	108.66	125.29	135.99	143.44	148.79	152.77	155.08	157.29	159.28	161.04	162.60	163.92
1.80	51.56	71.21	107.11	123.45	134.15	141.72	147.21	151.34	153.73	156.05	158.12	159.96	161.61	163.01
1.90	51.21	70.57	105.69	121.69	132.39	140.05	145.68	149.93	152.39	154.81	156.97	158.89	160.63	162.09
2.00	50.35	70.30	104.39	120.07	130.69	138.44	144.18	148.55	151.08	153.58	155.83	157.84	159.65	161.18
2.10	49.65	69.88	103.19	118.53	129.09	136.88	142.72	147.19	149.78	152.36	154.69	156.79	158.68	160.27
2.20	49.21	69.36	102.99	117.08	127.55	135.38	141.29	145.57	148.49	151.16	153.57	155.75	157.71	159.37
2.30	48.60	68.76	101.09	115.72	126.08	133.92	139.89	144.57	147.24	149.97	152.46	154.71	156.75	158.48
2.40	48.26	67.01	100.14	114.42	124.66	132.51	138.55	143.29	145.99	148.79	151.36	153.69	155.79	157.59
2.50	48.15	65.84	99.26	113.19	123.31	131.14	137.23	142.04	144.77	147.63	150.27	152.67	154.85	156.70
2.60	47.97	64.70	98.44	112.05	122.02	129.82	135.95	140.81	143.56	146.48	149.19	151.66	153.91	155.82
2.70	47.73	64.01	97.67	110.95	120.78	128.55	134.69	139.64	142.57	145.35	148.12	150.66	152.98	154.95
2.80	47.46	64.01	96.95	109.91	119.58	127.31	133.48	138.44	141.19	144.23	147.06	149.67	152.05	154.08
2.90	46.48	64.70	96.27	108.92	118.44	126.12	132.29	137.29	140.05	143.12	146.02	148.69	151.13	153.22
3.00	45.85	64.00	95.63	107.98	117.34	124.97	131.13	136.16	138.92	142.03	144.98	147.71	150.22	152.36

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D / H	0.0	33.0	96.4	159.8	223.1	286.5	349.9	413.2	476.7	540.0	603.4	666.8	730.2	793.6
3.00	45.45	64.00	95.63	127.98	117.34	124.97	131.13	136.16	138.92	142.03	144.98	147.71	150.22	152.36
3.10	45.33	63.99	95.02	127.08	116.29	123.85	129.01	133.06	137.81	140.96	143.96	146.75	149.32	151.51
3.20	45.33	63.98	94.44	126.27	115.28	122.77	127.81	131.58	136.71	139.89	142.95	145.79	148.42	150.66
3.30	45.33	63.97	93.89	125.40	114.29	121.72	127.84	133.63	138.85	141.95	144.85	147.53	149.83	151.89
3.40	45.33	63.95	93.36	124.62	113.36	120.69	126.79	132.89	138.57	141.91	144.96	147.65	149.99	151.99
3.50	45.32	63.93	92.86	123.87	112.45	119.72	125.79	130.88	136.53	139.79	142.99	145.78	148.17	150.17
3.60	45.31	63.91	92.38	123.15	111.58	118.76	124.79	129.89	135.49	138.79	142.07	144.91	147.35	149.35
3.70	45.31	63.89	91.92	122.46	110.73	117.84	123.84	128.93	134.49	137.81	141.16	144.05	146.54	148.54
3.80	45.30	63.87	91.48	121.79	109.92	116.94	122.89	127.98	133.49	136.81	140.26	143.20	145.73	147.73
3.90	45.30	63.85	91.06	121.15	109.13	116.07	121.98	127.05	132.52	135.81	139.37	142.36	144.93	146.93
4.00	45.29	63.82	90.67	120.53	108.37	115.22	121.09	126.14	131.56	134.89	138.49	141.53	144.14	146.14
4.10	45.28	63.79	90.30	99.93	107.63	114.39	120.27	125.26	130.68	134.03	137.62	140.70	143.35	145.35
4.20	45.27	63.76	89.98	99.36	106.92	113.59	119.37	124.39	129.68	133.03	136.76	139.89	142.57	144.57
4.30	45.25	63.73	89.63	98.80	106.22	112.82	118.54	123.53	128.76	132.56	136.51	139.08	141.80	143.80
4.40	45.24	63.69	89.32	98.26	105.55	112.06	117.73	122.70	127.86	132.22	136.37	139.27	141.04	142.86
4.50	45.23	63.65	89.03	97.74	104.89	111.32	116.94	121.88	127.03	131.69	135.82	139.23	142.28	144.28
4.60	45.21	63.62	88.74	97.23	104.26	110.60	116.17	121.08	126.23	130.96	135.13	138.69	141.52	143.52
4.70	45.19	63.58	88.46	96.74	103.64	109.90	115.42	120.30	125.45	129.92	133.59	136.91	139.78	141.78
4.80	45.18	63.53	88.19	96.26	103.04	109.22	114.68	119.53	124.38	128.73	132.28	135.14	138.04	140.04
4.90	45.16	63.49	87.92	95.79	102.46	108.55	113.96	118.78	123.54	127.89	131.66	134.38	137.31	139.31
5.00	45.14	63.44	87.65	95.34	101.89	107.90	113.25	118.04	122.72	126.96	130.64	133.63	136.58	138.58
5.10	45.12	63.40	87.39	94.89	101.33	107.27	112.56	117.32	122.00	126.24	129.84	132.88	135.87	137.87
5.20	45.10	63.35	87.14	94.46	100.79	106.65	111.89	116.61	121.23	125.04	128.65	132.14	135.15	137.15
5.30	45.08	63.29	86.88	94.04	100.26	106.04	111.23	115.91	120.63	124.26	127.89	131.41	134.45	136.45
5.40	45.05	63.24	86.63	93.63	99.75	105.45	110.58	115.22	119.84	123.48	127.14	130.69	133.75	135.75
5.50	45.03	63.19	86.38	93.23	99.24	104.87	109.95	114.55	119.06	122.71	126.39	129.97	133.06	135.06
5.60	45.00	63.13	86.13	92.83	98.75	104.31	109.32	113.89	118.29	121.95	125.66	129.26	132.38	134.38
5.70	44.98	63.07	85.89	92.45	98.27	103.75	108.72	113.25	117.61	121.20	124.93	128.56	131.70	133.70
5.80	44.95	63.01	85.65	92.07	97.79	103.21	108.12	112.61	116.90	120.46	124.21	127.87	131.03	133.03
5.90	44.92	62.95	85.41	91.70	97.33	102.68	107.53	111.99	116.27	120.03	123.50	127.18	130.36	132.36
6.00	44.90	62.89	85.17	91.34	96.88	102.16	106.96	111.38	115.54	119.01	122.79	126.50	129.70	131.70
6.10	44.87	62.82	84.93	90.98	96.43	101.65	106.39	110.77	114.90	118.29	121.95	125.66	128.83	131.03
6.20	44.84	62.76	84.70	90.63	95.99	101.14	105.84	110.18	114.24	117.59	121.20	124.93	128.17	130.17
6.30	44.80	62.69	84.47	90.28	95.57	100.65	105.29	109.60	113.45	116.89	120.73	124.51	127.77	129.77
6.40	44.77	62.62	84.24	90.05	95.15	100.17	104.76	109.02	112.45	115.89	120.06	123.86	127.13	129.13
6.50	44.74	62.55	84.01	89.61	94.73	99.69	104.23	108.46	111.75	115.52	119.39	123.22	126.51	128.51
6.60	44.71	62.47	83.78	89.29	94.33	99.23	103.72	107.91	111.09	114.84	118.74	122.58	125.89	127.89
6.70	44.67	62.40	83.56	88.95	93.93	98.77	103.21	107.36	110.47	114.17	118.09	121.95	125.27	127.27
6.80	44.63	62.32	83.33	88.63	93.53	98.32	102.71	106.82	109.49	113.51	117.45	121.33	124.66	126.66
6.90	44.60	62.25	83.11	88.31	93.15	97.88	102.22	106.29	109.62	112.86	116.81	120.71	124.06	126.06
7.00	44.56	62.17	82.89	87.99	92.77	97.44	101.73	105.77	109.16	112.22	116.18	120.11	123.47	125.47

(IH-PAGE 2/8)

D / H	0.0	33.0	96.4	159.8	223.1	286.5	349.9	413.2	476.7	540.0	603.4	666.8	730.2	793.6
7.00	44.56	62.17	87.89	87.99	92.77	97.44	101.73	105.77	105.16	108.40	112.22	116.18	120.11	123.47
7.10	44.57	62.09	87.67	87.68	92.39	97.01	101.26	105.26	104.50	107.75	111.58	115.56	119.50	122.88
7.20	44.44	62.01	87.45	87.38	92.02	96.59	100.79	104.75	103.85	107.11	110.95	114.94	118.91	122.29
7.30	44.44	61.92	87.23	87.08	91.66	96.17	100.32	104.25	103.20	106.47	110.32	114.34	118.32	121.71
7.40	44.40	61.84	87.02	86.79	91.30	95.76	99.87	103.76	102.56	105.84	109.71	113.74	117.74	121.14
7.50	44.36	61.75	81.90	86.48	90.95	95.36	99.42	103.28	101.91	105.21	109.09	113.14	117.16	120.58
7.60	44.32	61.67	81.59	86.19	90.60	94.96	98.98	102.80	101.27	104.59	108.49	112.55	116.59	120.01
7.70	44.27	61.58	81.37	85.90	90.26	94.57	98.54	102.33	100.64	103.98	107.89	111.97	116.02	119.46
7.80	44.23	61.49	81.16	85.62	89.92	94.18	98.11	101.86	100.00	103.37	107.30	111.40	115.47	118.91
7.90	44.19	61.45	80.95	85.34	89.59	93.80	97.69	101.40	99.37	102.77	106.72	110.83	114.91	118.37
8.00	44.14	61.42	80.74	85.06	89.26	93.42	97.27	100.95	98.74	102.17	106.14	110.26	114.37	117.83
8.10	44.09	61.39	80.53	84.78	88.95	93.05	96.85	100.50	98.11	101.58	105.57	109.71	113.83	117.29
8.20	44.04	61.35	80.32	84.51	88.63	92.68	96.44	100.06	97.49	101.00	105.00	109.16	113.29	116.77
8.30	44.02	61.30	80.11	84.24	88.32	92.32	96.04	99.62	96.86	100.42	104.44	108.61	112.77	116.24
8.40	44.01	61.25	79.90	83.97	88.01	91.96	95.64	99.19	96.23	99.84	103.88	108.08	112.24	115.73
8.50	43.99	61.20	79.70	83.71	87.70	91.61	95.25	98.76	95.61	99.27	103.33	107.54	111.73	115.21
8.60	43.97	61.14	79.49	83.44	87.40	91.26	94.86	98.34	94.98	98.71	102.79	107.02	111.22	114.71
8.70	43.95	61.09	79.29	83.18	87.10	90.91	94.48	97.92	94.36	98.15	102.25	106.49	110.71	114.21
8.80	43.92	61.02	79.08	82.92	86.80	90.57	94.09	97.51	93.73	97.59	101.72	105.98	110.21	113.71
8.90	43.89	60.96	78.88	82.66	86.50	90.23	93.72	97.10	93.10	97.04	101.19	105.47	109.72	113.22
9.00	43.86	60.90	78.68	82.41	86.21	89.90	93.35	96.70	92.48	96.49	100.67	104.97	109.23	112.73
9.10	43.83	60.83	78.48	82.16	85.92	89.56	92.98	96.30	91.85	95.95	100.16	104.47	108.74	112.25
9.20	43.80	60.77	78.27	81.90	85.63	89.24	92.61	95.90	91.22	95.41	99.65	103.97	108.26	111.77
9.30	43.76	60.70	78.07	81.65	85.35	88.91	92.25	95.51	90.59	94.88	99.14	103.49	107.79	111.30
9.40	43.73	60.63	77.87	81.41	85.07	88.58	91.90	95.12	89.98	94.35	98.64	103.00	107.32	110.83
9.50	43.69	60.56	77.67	81.16	84.79	88.26	91.55	94.73	89.33	93.83	98.14	102.52	106.86	110.37
9.60	43.66	60.48	77.47	80.92	84.51	87.93	91.20	94.35	88.70	93.31	97.65	102.05	106.40	109.91
9.70	43.62	60.41	77.27	80.67	84.24	87.62	90.85	93.97	88.42	92.79	97.17	101.58	105.95	109.46
9.80	43.58	60.33	77.07	80.43	83.96	87.30	90.51	93.59	88.11	92.28	96.69	101.12	105.50	109.01
9.90	43.54	60.26	76.88	80.19	83.69	86.99	90.17	93.22	87.76	91.77	96.21	100.66	105.06	108.57
10.00	43.51	60.18	76.68	79.95	83.42	86.68	89.83	92.84	87.39	91.27	95.74	100.21	104.62	108.13
10.10	43.47	60.10	76.48	79.71	83.15	86.38	89.50	92.47	87.00	90.76	95.27	99.76	104.19	107.69
10.20	43.42	60.03	76.29	79.48	82.89	86.07	89.17	92.09	86.61	90.27	94.81	99.32	103.76	107.26
10.30	43.38	59.95	76.09	79.24	82.62	85.77	88.85	91.71	86.22	89.84	94.36	98.88	103.34	106.83
10.40	43.34	59.87	75.89	79.01	82.36	85.48	88.52	91.33	85.82	89.43	93.91	98.45	102.92	106.41
10.50	43.30	59.78	75.70	78.78	82.10	85.18	88.21	90.92	85.42	89.11	93.46	98.02	102.50	105.99
10.60	43.26	59.70	75.50	78.54	81.84	84.89	87.89	90.47	85.02	88.75	93.02	97.60	102.09	105.58
10.70	43.21	59.62	75.31	78.31	81.59	84.60	87.57	89.91	84.62	88.39	92.58	97.17	101.69	105.16
10.80	43.17	59.53	75.12	78.09	81.33	84.31	87.26	88.97	84.22	88.03	92.15	96.76	101.29	104.76
10.90	43.12	59.45	74.90	77.86	81.08	84.02	86.95	87.19	83.82	87.73	92.15	96.35	100.89	104.36
11.00	43.08	59.36	74.70	77.63	80.82	83.74	86.65	85.29	83.41	87.32	91.32	95.94	100.50	103.96

[IH-PAGE 3/8]

D / H	0.0	33.0	96.4	159.8	223.1	286.5	349.9	413.2	476.7	540.0	603.4	666.8	730.2	793.6
11.00	43.08	59.36	74.70	77.63	80.82	83.74	86.65	85.29	83.41	87.32	91.32	95.94	100.50	103.96
11.10	43.03	59.28	74.50	77.40	80.57	83.45	86.34	83.66	83.01	86.96	90.92	95.54	100.11	103.56
11.20	42.98	59.19	74.30	77.18	80.32	83.17	86.04	82.24	82.61	86.61	90.53	95.14	99.72	103.17
11.30	42.94	59.10	74.10	76.95	80.07	82.89	85.74	80.93	82.21	86.26	90.16	94.74	99.34	102.78
11.40	42.89	59.01	73.90	76.73	79.83	82.62	85.44	75.83	81.80	85.91	89.82	94.35	98.97	102.40
11.50	42.84	58.92	73.71	76.51	79.58	82.34	85.14	78.77	81.40	85.56	89.48	93.95	98.60	102.02
11.60	42.79	58.83	73.51	76.29	79.34	82.07	84.85	77.77	80.99	85.21	89.16	93.58	98.23	101.64
11.70	42.74	58.74	73.32	76.07	79.09	81.79	84.56	76.83	80.59	84.87	88.85	93.20	97.87	101.27
11.80	42.69	58.65	73.12	75.85	78.85	81.52	84.27	75.93	80.19	84.52	88.54	92.82	97.51	100.90
11.90	42.64	58.56	72.93	75.63	78.61	81.26	83.98	75.07	79.79	84.18	88.24	92.45	97.15	100.53
12.00	42.59	58.46	72.74	75.41	78.37	80.99	83.69	74.25	79.38	83.84	87.94	92.08	96.80	100.17
12.10	42.54	58.37	72.54	75.19	78.13	80.72	83.41	73.46	78.98	83.49	87.64	91.71	96.45	99.81
12.20	42.49	58.27	72.35	74.93	77.89	80.46	83.12	72.69	78.58	83.15	87.35	91.35	96.10	99.46
12.30	42.43	58.18	72.16	74.80	77.66	80.20	82.84	71.95	78.18	82.81	87.06	90.99	95.76	99.10
12.40	42.38	58.08	71.96	74.61	77.42	79.94	82.56	71.22	77.78	82.47	86.77	90.63	95.42	98.76
12.50	42.33	57.97	71.77	74.41	77.19	79.68	82.28	70.52	77.38	82.14	86.48	90.28	95.09	98.41
12.60	42.27	57.87	71.58	74.21	76.95	79.42	82.01	69.83	76.99	81.80	86.19	89.94	94.76	98.07
12.70	42.22	57.77	71.39	74.00	76.72	79.16	81.73	69.16	76.59	81.46	85.90	89.58	94.43	97.73
12.80	42.16	57.67	71.20	73.80	76.49	78.91	81.46	69.10	76.19	81.13	85.62	89.24	94.11	97.39
12.90	42.10	57.56	71.01	73.60	76.26	78.65	81.19	69.03	75.79	80.80	85.33	89.04	93.78	97.05
13.00	42.04	57.46	70.92	73.40	76.03	78.40	80.91	68.92	75.40	80.46	85.05	88.86	93.47	96.72
13.10	41.98	57.36	70.63	73.19	75.80	78.15	80.65	68.78	75.01	80.13	84.77	88.65	93.15	96.40
13.20	41.93	57.25	70.44	72.99	75.57	77.90	80.38	68.62	74.61	79.80	84.49	88.43	92.84	96.07
13.30	41.87	57.15	70.25	72.79	75.35	77.65	80.11	68.43	74.22	79.47	84.21	88.21	92.53	95.75
13.40	41.81	57.04	70.06	72.59	75.12	77.40	79.85	68.23	73.83	79.14	83.93	87.99	92.22	95.43
13.50	41.75	56.94	69.87	72.38	74.88	77.15	79.58	68.01	73.44	78.82	83.65	87.76	91.92	95.11
13.60	41.69	56.83	69.69	72.18	74.64	76.91	79.32	67.78	73.05	78.49	83.38	87.53	91.62	94.79
13.70	41.63	56.73	69.50	71.98	74.41	76.66	79.06	67.54	72.66	78.16	83.10	87.30	91.32	94.48
13.80	41.56	56.62	69.31	71.78	74.18	76.42	78.80	67.28	72.27	77.84	82.83	87.08	91.03	94.17
13.90	41.50	56.51	69.12	71.59	73.95	76.17	78.54	67.02	71.89	77.52	82.55	86.85	90.74	93.87
14.00	41.44	56.40	68.95	71.38	73.72	75.93	78.28	66.75	71.50	77.19	82.28	86.62	90.45	93.56
14.10	41.40	56.30	68.79	71.18	73.50	75.69	78.01	66.48	71.42	76.87	82.01	86.40	90.16	93.26
14.20	41.32	56.19	68.62	70.98	73.27	75.45	77.75	66.19	71.33	76.53	81.74	86.17	89.90	92.96
14.30	41.25	56.08	68.45	70.78	73.05	75.21	77.51	65.91	71.21	76.23	81.47	85.95	89.62	92.66
14.40	41.19	55.97	68.27	70.53	72.82	74.97	77.24	65.62	71.05	75.91	81.20	85.72	89.35	92.37
14.50	41.13	55.86	68.10	70.33	72.60	74.75	77.04	65.32	70.88	75.59	80.93	85.50	89.08	92.07
14.60	41.06	55.75	67.92	70.18	72.38	74.52	76.83	65.02	70.70	75.27	80.66	85.27	88.82	91.78
14.70	41.00	55.64	67.75	69.98	72.16	74.29	76.58	64.72	70.50	74.95	80.39	85.05	88.56	91.49
14.80	40.93	55.53	67.57	69.78	71.94	74.06	76.39	64.41	70.29	74.64	80.13	84.83	88.30	91.21
14.90	40.87	55.41	67.39	69.59	71.72	73.84	76.18	64.11	70.08	74.32	79.86	84.61	88.04	90.92
15.00	40.80	55.30	67.21	69.39	71.50	73.61	75.95	63.80	69.86	74.01	79.60	84.38	87.79	90.64

(1H-PAGE 4/8)

D / H	0.0	33.0	96.4	159.8	223.1	286.5	349.9	413.2	476.7	540.0	603.4	666.8	730.2	793.6
15.00	40.80	55.30	67.21	69.39	71.50	73.61	63.15	63.80	69.86	74.01	79.60	84.38	87.79	90.64
15.10	40.73	55.19	67.04	69.19	71.29	73.38	62.91	63.49	69.63	73.69	79.33	84.16	87.53	90.36
15.20	40.67	55.07	66.86	68.99	71.07	73.15	62.66	63.18	69.30	73.37	79.01	83.95	87.28	90.06
15.30	40.60	54.99	66.63	68.78	70.85	72.92	62.40	62.86	69.17	73.07	78.81	83.73	87.03	89.81
15.40	40.53	54.88	66.50	68.57	70.64	72.70	62.13	62.55	68.93	72.83	78.54	83.51	86.78	89.53
15.50	40.46	54.79	66.32	68.37	70.42	72.47	61.86	62.38	68.69	72.79	78.28	83.29	86.54	89.26
15.60	40.41	54.67	66.14	68.17	70.21	72.25	61.57	62.34	68.45	72.72	78.02	83.07	86.29	88.98
15.70	40.35	54.57	65.96	67.97	69.99	72.01	61.29	62.25	68.20	72.63	77.76	82.85	86.04	88.84
15.80	40.28	54.46	65.79	67.77	69.78	71.80	61.04	62.00	67.95	72.51	77.50	82.64	85.80	88.74
15.90	40.22	54.35	65.61	67.57	69.57	71.58	60.76	61.70	67.70	72.38	77.24	82.42	85.56	88.61
16.00	40.16	54.24	65.43	67.37	69.35	71.36	60.40	61.89	67.45	72.25	76.99	82.21	85.32	88.46
16.10	40.09	54.12	65.25	67.17	69.14	71.15	60.09	61.75	67.20	72.10	76.73	81.99	85.08	88.31
16.20	40.02	54.01	65.07	66.97	68.93	70.88	59.79	61.59	66.94	71.95	76.47	81.78	84.84	88.15
16.30	39.96	53.90	64.89	66.77	68.73	70.68	59.48	61.43	66.69	71.79	76.21	81.56	84.61	87.99
16.40	39.89	53.79	64.71	66.58	68.53	70.48	59.17	61.26	66.43	71.62	75.96	81.35	84.37	87.83
16.50	39.82	53.67	64.54	66.38	68.33	70.28	58.86	61.09	66.17	71.45	75.70	81.14	84.14	87.67
16.60	39.75	53.56	64.36	66.18	68.12	70.03	58.57	60.91	65.91	71.27	75.45	80.93	83.90	87.50
16.70	39.69	53.44	64.16	65.99	67.92	69.71	58.27	60.72	65.65	71.10	75.19	80.71	83.67	87.34
16.80	39.61	53.33	63.97	65.79	67.71	69.48	58.00	60.53	65.39	70.91	74.94	80.50	83.44	87.17
16.90	39.54	53.21	63.78	65.60	67.58	69.33	57.73	60.34	65.13	70.73	74.69	80.29	83.21	87.01
17.00	39.47	53.10	63.60	65.40	67.38	69.13	57.48	60.15	64.94	70.54	74.43	80.08	82.98	86.84
17.10	39.40	52.98	63.41	65.21	67.17	68.94	57.23	59.95	64.81	70.35	74.18	79.87	82.76	86.68
17.20	39.33	52.86	63.23	65.01	66.94	68.69	56.94	59.75	64.86	70.16	74.13	79.66	82.53	86.51
17.30	39.26	52.74	63.05	64.82	66.78	68.51	56.63	59.54	64.70	69.97	74.09	79.46	82.30	86.34
17.40	39.19	52.63	62.87	64.63	66.55	68.33	56.32	59.34	64.70	69.77	74.04	79.25	82.08	86.18
17.50	39.11	52.51	62.68	64.43	66.33	68.12	56.02	59.13	64.61	69.58	73.96	79.04	81.85	86.01
17.60	39.04	52.39	62.50	64.23	66.13	67.92	55.71	58.92	64.50	69.38	73.88	78.83	81.63	85.85
17.70	38.96	52.26	62.32	64.03	65.94	67.71	55.40	58.71	64.39	69.18	73.78	78.63	81.41	85.68
17.80	38.89	52.13	62.14	63.81	65.73	67.50	55.17	58.49	64.27	68.98	73.68	78.42	81.19	85.52
17.90	38.82	52.01	61.96	63.61	65.54	67.28	54.94	58.28	64.14	68.78	73.57	78.21	80.97	85.35
18.00	38.73	51.88	61.78	63.40	65.34	67.05	54.70	58.06	64.01	68.57	73.46	78.01	80.75	85.19
18.10	38.65	51.76	61.60	63.20	65.14	66.84	54.46	57.85	63.88	68.37	73.34	77.80	80.53	85.02
18.20	38.57	51.63	61.42	63.01	64.96	66.63	54.23	57.64	63.74	68.16	73.21	77.60	80.31	84.86
18.30	38.50	51.51	61.24	62.82	64.78	66.43	54.00	57.43	63.60	67.96	73.09	77.39	80.09	84.70
18.40	38.42	51.38	61.06	62.63	64.60	66.23	53.76	57.22	63.45	67.75	72.96	77.19	79.88	84.53
18.50	38.34	51.26	60.88	62.44	64.41	66.03	53.53	57.01	63.30	67.55	72.82	76.99	79.66	84.37
18.60	38.26	51.13	60.70	62.25	64.22	65.84	53.30	56.80	63.15	67.34	72.68	76.78	79.45	84.21
18.70	38.18	51.01	60.52	62.06	64.03	65.64	53.07	56.59	62.99	67.13	72.55	76.58	79.23	84.04
18.80	38.10	50.88	60.34	61.87	63.84	65.44	52.84	56.38	62.84	66.92	72.40	76.38	79.02	83.88
18.90	38.02	50.75	60.16	61.69	63.65	65.25	52.61	56.17	62.69	66.76	72.26	76.18	78.80	83.72
19.00	37.94	50.63	60.00	61.51	63.46	65.06	52.38	55.94	62.54	66.59	72.12	75.97	78.59	83.56

(IH-PAGE 5/8)

D / H	0.0	33.0	96.4	159.8	223.1	286.5	349.9	413.2	476.7	540.0	603.4	666.8	730.2	793.6
19.00	37.94	50.63	50.08	50.44	52.28	53.65	54.81	57.25	62.51	66.75	72.12	75.97	78.59	83.56
19.10	37.86	50.50	49.82	50.36	52.14	53.46	54.79	57.15	62.35	66.71	71.97	75.77	78.38	83.40
19.20	37.78	50.38	49.55	50.32	51.99	53.28	54.76	57.04	62.19	66.67	71.82	75.60	78.17	83.24
19.30	37.70	50.25	49.27	50.25	51.84	53.09	54.71	56.92	62.02	66.61	71.67	75.46	77.96	83.07
19.40	37.62	50.12	48.98	50.17	51.69	52.90	54.71	56.81	61.85	66.55	71.52	75.30	77.75	82.91
19.50	37.54	49.99	48.89	50.07	51.53	52.70	54.59	56.69	61.68	66.47	71.37	75.14	77.54	82.76
19.60	37.46	49.82	48.39	49.96	51.36	52.51	54.51	56.57	61.51	66.39	71.21	74.96	77.33	82.60
19.70	37.37	49.72	48.20	49.84	51.19	52.31	54.43	56.44	61.34	66.31	71.06	74.79	77.12	82.43
19.80	37.29	49.61	48.08	49.72	51.02	52.11	54.34	56.32	61.17	66.22	70.90	74.61	76.91	82.28
19.90	37.21	49.51	48.04	49.58	50.84	52.07	54.25	56.19	60.99	66.13	70.74	74.43	76.71	82.12
20.00	37.13	49.41	47.97	49.44	50.66	52.04	54.15	56.06	60.82	66.03	70.59	74.26	76.50	81.96
20.10	37.04	49.31	47.89	49.29	50.48	52.00	54.05	55.92	60.64	65.93	70.43	74.08	76.30	81.80
20.20	36.96	49.21	47.79	49.14	50.29	51.95	53.95	55.79	60.59	65.83	70.27	73.90	76.09	81.64
20.30	36.88	49.11	47.68	48.98	50.10	51.89	53.84	55.65	60.57	65.72	70.11	73.72	75.89	81.48
20.40	36.80	49.01	47.57	48.82	49.91	51.82	53.73	55.51	60.54	65.61	69.95	73.54	75.69	81.33
20.50	36.72	48.91	47.44	48.65	49.72	51.74	53.62	55.37	60.50	65.50	69.79	73.35	75.68	81.17
20.60	36.64	48.81	47.31	48.48	49.63	51.66	53.50	55.23	60.45	65.39	69.63	73.17	75.66	81.01
20.70	36.56	48.71	47.17	48.31	49.51	51.57	53.38	55.09	60.39	65.27	69.46	72.99	75.62	80.85
20.80	36.48	48.61	47.03	48.13	49.38	51.48	53.26	54.94	60.33	65.15	69.30	72.81	75.58	80.70
20.90	36.40	48.51	46.98	47.95	49.53	51.39	53.13	54.79	60.27	65.03	69.14	72.63	75.53	80.54
21.00	36.32	48.41	46.82	47.77	49.48	51.29	53.01	54.65	60.20	64.91	68.97	72.44	75.48	80.39
21.10	36.24	48.31	46.72	47.59	49.41	51.19	52.88	54.51	60.12	64.79	68.81	72.26	75.41	80.23
21.20	36.16	48.21	46.60	47.40	49.34	51.08	52.75	54.41	60.04	64.67	68.69	72.08	75.35	80.07
21.30	36.08	48.11	46.48	47.27	49.27	50.97	52.62	54.28	59.96	64.54	68.58	71.90	75.27	79.92
21.40	36.00	48.01	46.36	47.15	49.19	50.86	52.48	54.16	59.88	64.41	68.44	71.72	75.20	79.76
21.50	35.92	47.91	46.24	47.03	49.10	50.75	52.35	54.02	59.79	64.29	68.31	71.54	75.12	79.61
21.60	35.84	47.81	46.12	46.92	49.02	50.64	52.21	53.88	59.71	64.16	68.17	71.35	75.04	79.46
21.70	35.76	47.71	46.00	46.80	48.92	50.52	52.08	53.74	59.61	64.03	68.02	71.17	74.95	79.30
21.80	35.68	47.61	45.88	46.68	48.83	50.40	51.94	53.60	59.52	63.90	67.88	70.99	74.86	79.15
21.90	35.60	47.51	45.76	46.56	48.73	50.28	51.80	53.46	59.43	63.76	67.73	70.81	74.77	78.99
22.00	35.52	47.41	45.64	46.44	48.63	50.15	51.69	53.32	59.33	63.63	67.58	70.63	74.68	78.84
22.10	35.44	47.31	45.52	46.32	48.52	50.03	51.78	53.19	59.23	63.49	67.43	70.44	74.58	78.69
22.20	35.36	47.21	45.40	46.20	48.42	49.90	51.75	53.04	59.13	63.36	67.28	70.26	74.49	78.53
22.30	35.28	47.11	45.28	46.08	48.31	49.77	51.72	52.89	59.03	63.22	67.13	70.08	74.39	78.38
22.40	35.20	47.01	45.16	45.98	48.20	49.64	51.68	52.74	58.92	63.09	66.98	69.90	74.29	78.23
22.50	35.12	46.91	45.04	45.86	48.08	49.51	51.64	52.60	58.82	62.95	66.82	69.80	74.18	78.08
22.60	35.04	46.81	44.92	45.74	47.97	49.41	51.59	52.46	58.71	62.86	66.67	69.79	74.08	77.93
22.70	34.96	46.71	44.80	45.62	47.85	49.34	51.54	52.32	58.60	62.76	66.52	69.77	73.98	77.77
22.80	34.88	46.61	44.68	45.50	47.73	49.23	51.49	52.18	58.49	62.65	66.36	69.74	73.87	77.62
22.90	34.80	46.51	44.56	45.38	47.61	49.11	51.43	52.06	58.38	62.53	66.21	69.71	73.76	77.47
23.00	34.72	46.41	44.44	45.26	47.49	49.03	51.37	51.94	58.27	62.41	66.05	69.67	73.65	77.32

(IH-PAGE 6/8)

θ / H	33.0	96.4	159.8	223.1	286.5	349.9	413.2	476.7	540.0	603.4	666.8	730.2	793.6
23.00	29.54	38.45	44.57	46.08	47.49	49.23	51.37	53.44	58.27	62.41	66.05	69.67	73.32
23.10	29.51	38.40	44.51	45.98	47.36	49.24	51.31	53.36	58.16	62.29	65.89	69.62	73.32
23.20	29.47	38.34	44.49	45.97	47.34	49.21	51.24	53.27	58.05	62.17	65.74	69.57	73.27
23.30	29.44	38.28	44.40	45.76	47.12	49.11	51.17	53.19	57.93	62.05	65.58	69.52	73.27
23.40	29.39	38.22	44.30	45.64	47.11	49.12	51.10	53.10	57.82	61.92	65.42	69.46	73.21
23.50	29.35	38.15	44.20	45.53	47.10	49.07	51.03	53.01	57.70	61.79	65.27	69.40	73.10
23.60	29.30	38.08	44.10	45.41	47.08	49.01	50.96	52.92	57.58	61.66	65.11	69.34	72.99
23.70	29.26	38.01	44.00	45.29	47.05	48.96	50.89	52.83	57.51	61.54	64.95	69.27	72.87
23.80	29.21	37.93	43.89	45.17	47.01	48.90	50.81	52.74	57.43	61.40	64.79	69.20	72.76
23.90	29.15	37.85	43.79	45.05	46.98	48.84	50.73	52.65	57.33	61.27	64.63	69.13	72.64
24.00	29.10	37.77	43.68	44.93	46.84	48.71	50.55	52.55	57.24	61.14	64.53	69.05	72.52
24.10	29.05	37.69	43.57	44.83	46.74	48.58	50.47	52.46	57.13	61.01	64.43	68.98	72.41
24.20	28.99	37.61	43.46	44.71	46.64	48.45	50.39	52.36	56.93	60.88	64.32	68.90	72.29
24.30	28.93	37.53	43.34	44.59	46.54	48.38	50.31	52.26	56.82	60.74	64.24	68.82	72.17
24.40	28.87	37.44	43.23	44.46	46.44	48.31	50.24	52.16	56.82	60.61	64.17	68.74	72.06
24.50	28.81	37.35	43.15	44.32	46.38	48.24	50.15	52.07	56.71	60.47	64.04	68.65	71.94
24.60	28.75	37.26	43.14	44.28	46.33	48.17	50.06	52.02	56.60	60.34	63.91	68.57	71.82
24.70	28.69	37.17	43.13	44.24	46.28	48.10	49.98	51.94	56.49	60.20	63.76	68.48	71.70
24.80	28.62	37.08	43.11	44.20	46.24	48.04	49.91	51.86	56.38	60.06	63.62	68.39	71.58
24.90	28.55	36.99	43.08	44.15	46.19	47.98	49.84	51.78	56.26	59.93	63.47	68.30	71.46
25.00	28.49	36.92	43.05	44.10	46.13	47.91	49.79	51.69	56.15	59.79	63.33	68.21	71.34
25.10	28.42	36.81	43.02	44.05	46.08	47.84	49.70	51.60	56.04	59.65	63.19	68.12	71.22
25.20	28.37	36.70	42.98	44.00	46.02	47.77	49.61	51.51	55.92	59.53	63.05	68.03	71.10
25.30	28.31	36.68	42.94	43.95	45.97	47.70	49.55	51.42	55.80	59.40	62.91	67.94	70.97
25.40	28.26	36.66	42.90	43.90	45.94	47.64	49.49	51.33	55.69	59.29	62.82	67.84	70.85
25.50	28.20	36.64	42.85	43.85	45.91	47.58	49.41	51.23	55.57	59.15	62.73	67.75	70.73
25.60	28.15	36.61	42.80	43.80	45.88	47.52	49.33	51.14	55.45	59.03	62.63	67.65	70.61
25.70	28.10	36.58	42.75	43.75	45.84	47.46	49.25	51.04	55.33	58.90	62.53	67.55	70.49
25.80	28.04	36.55	42.70	43.70	45.81	47.40	49.17	50.95	55.21	58.77	62.43	67.45	70.36
25.90	28.00	36.51	42.65	43.65	45.77	47.34	49.09	50.85	55.10	58.64	62.33	67.36	70.24
26.00	28.25	36.67	42.59	43.60	45.65	47.26	49.00	50.75	54.97	58.49	62.23	67.26	70.12
26.10	28.23	36.64	42.53	43.53	45.57	47.20	48.92	50.65	54.85	58.36	62.13	67.16	69.99
26.20	28.20	36.60	42.47	43.46	45.49	47.13	48.83	50.55	54.73	58.27	62.03	67.05	69.87
26.30	28.17	36.55	42.41	43.39	45.41	47.05	48.74	50.45	54.61	58.17	61.93	66.95	69.74
26.40	28.14	36.51	42.35	43.32	45.33	46.98	48.65	50.35	54.53	58.09	61.83	66.85	69.62
26.50	28.11	36.46	42.29	43.24	45.25	46.90	48.56	50.25	54.41	57.98	61.73	66.75	69.50
26.60	28.08	36.42	42.22	43.17	45.20	46.82	48.47	50.15	54.29	57.85	61.58	66.65	69.37
26.70	28.04	36.37	42.16	43.10	45.14	46.74	48.38	50.04	54.17	57.72	61.43	66.54	69.25
26.80	28.01	36.32	42.09	43.03	45.07	46.66	48.28	49.94	54.04	57.59	61.28	66.44	69.12
26.90	27.98	36.27	42.02	42.96	45.01	46.57	48.19	49.84	53.91	57.46	61.13	66.33	69.00
27.00	27.94	36.22	41.95	42.89	44.93	46.49	48.09	49.74	53.81	57.31	61.03	66.23	68.87

(IH—PAGE 7/8)

D / H	0.0	33.0	96.4	159.8	223.1	286.5	349.9	413.2	476.7	540.0	603.4	666.8	730.2	793.6
27.00	27.94	36.22	41.95	43.36	44.93	46.49	48.09	49.84	54.68	58.91	62.82	66.23	68.87	71.71
27.10	27.99	36.17	41.88	43.29	44.86	46.40	48.00	49.83	54.64	58.85	62.74	66.12	68.75	71.69
27.20	27.87	36.11	41.81	43.24	44.78	46.32	47.90	49.80	54.57	58.79	62.66	66.02	68.62	71.67
27.30	27.83	36.06	41.74	43.19	44.71	46.23	47.80	49.80	54.52	58.72	62.57	65.91	68.50	71.64
27.40	27.79	36.00	41.67	43.12	44.63	46.14	47.71	49.79	54.48	58.66	62.49	65.80	68.37	71.61
27.50	27.75	35.95	41.60	43.06	44.55	46.05	47.61	49.77	54.44	58.60	62.40	65.68	68.24	71.57
27.60	27.71	35.89	41.52	42.99	44.47	45.96	47.53	49.74	54.44	58.53	62.32	65.59	68.12	71.54
27.70	27.67	35.83	41.47	42.92	44.39	45.88	47.52	49.72	54.39	58.47	62.23	65.48	67.99	71.49
27.80	27.63	35.77	41.42	42.85	44.31	45.78	47.52	49.69	54.34	58.40	62.14	65.37	67.87	71.45
27.90	27.59	35.71	41.36	42.77	44.23	45.69	47.51	49.66	54.30	58.33	62.05	65.26	67.74	71.40
28.00	27.54	35.65	41.30	42.70	44.14	45.60	47.49	49.63	54.25	58.26	61.96	65.15	67.62	71.35
28.10	27.50	35.59	41.23	42.62	44.06	45.51	47.48	49.60	54.20	58.19	61.87	65.04	67.49	71.30
28.20	27.46	35.55	41.17	42.55	43.98	45.42	47.46	49.56	54.14	58.12	61.78	64.93	67.36	71.25
28.30	27.41	35.51	41.10	42.47	43.89	45.34	47.43	49.53	54.09	58.05	61.69	64.82	67.24	71.19
28.40	27.39	35.46	41.03	42.39	43.80	45.29	47.41	49.49	54.03	57.98	61.60	64.71	67.11	71.14
28.50	27.35	35.41	40.96	42.31	43.72	45.23	47.38	49.45	53.98	57.90	61.51	64.60	66.98	71.08
28.60	27.32	35.36	40.89	42.23	43.63	45.17	47.36	49.41	53.92	57.83	61.42	64.49	66.96	71.02
28.70	27.28	35.30	40.82	42.15	43.54	45.10	47.33	49.37	53.86	57.76	61.32	64.38	66.95	70.96
28.80	27.24	35.25	40.74	42.07	43.45	45.04	47.30	49.32	53.81	57.68	61.23	64.27	66.94	70.90
28.90	27.20	35.19	40.67	41.99	43.35	44.96	47.26	49.28	53.75	57.60	61.13	64.15	66.92	70.83
29.00	27.16	35.13	40.59	41.91	43.26	44.88	47.23	49.24	53.69	57.53	61.04	64.04	66.90	70.77
29.10	27.12	35.07	40.52	41.82	43.16	44.80	47.19	49.19	53.63	57.45	60.95	63.93	66.88	70.70
29.20	27.08	35.01	40.44	41.74	43.07	44.72	47.16	49.14	53.56	57.37	60.85	63.82	66.85	70.63
29.30	27.03	34.95	40.36	41.66	42.98	44.64	47.12	49.10	53.50	57.29	60.75	63.71	66.82	70.57
29.40	26.99	34.89	40.29	41.62	42.93	44.59	47.08	49.05	53.44	57.21	60.66	63.59	66.79	70.50
29.50	26.95	34.83	40.21	41.62	42.88	44.54	47.04	49.00	53.37	57.13	60.56	63.48	66.75	70.43
29.60	26.90	34.77	40.13	41.61	42.83	44.49	47.00	48.95	53.31	57.05	60.46	63.37	66.71	70.35
29.70	26.85	34.70	40.05	41.60	42.78	44.44	46.96	48.90	53.24	56.97	60.37	63.25	66.67	70.28
29.80	26.81	34.64	39.97	41.59	42.73	44.39	46.92	48.85	53.18	56.89	60.27	63.14	66.63	70.21
29.90	26.76	34.58	39.93	41.58	42.68	44.34	46.87	48.79	53.11	56.81	60.17	63.04	66.59	70.14
30.00	26.72	34.51	39.93	41.56	42.63	44.29	46.83	48.74	53.04	56.73	60.07	63.03	66.54	70.06
30.10	26.67	34.44	39.92	41.54	42.58	44.24	46.78	48.69	52.98	56.64	59.97	63.03	66.49	69.99
30.20	26.62	34.38	39.91	41.52	42.53	44.19	46.74	48.63	52.91	56.56	59.87	63.01	66.44	69.91
30.30	26.57	34.32	39.90	41.50	42.48	44.14	46.69	48.58	52.84	56.48	59.77	63.00	66.39	69.84
30.40	26.52	34.25	39.89	41.47	42.43	44.09	46.64	48.52	52.77	56.39	59.67	62.98	66.34	69.76
30.50	26.49	34.21	39.87	41.45	42.38	44.04	46.59	48.46	52.70	56.31	59.57	62.96	66.29	69.68
30.60	26.43	34.13	39.86	41.42	42.33	43.99	46.54	48.41	52.63	56.22	59.47	62.93	66.24	69.61
30.70	26.43	34.10	39.84	41.39	42.28	43.94	46.49	48.35	52.56	56.14	59.37	62.91	66.18	69.53
30.80	26.43	34.28	39.81	41.37	42.23	43.89	46.44	48.29	52.49	56.05	59.27	62.88	66.13	69.45
30.90	26.47	34.27	39.79	41.34	42.18	43.84	46.39	48.23	52.41	55.96	59.17	62.85	66.07	69.37
31.00	26.47	34.26	39.77	41.30	42.12	43.78	46.34	48.17	52.34	55.88	59.07	62.81	66.01	69.29
31.10	26.46	34.24	39.74	41.27	42.08	43.73	46.29	48.11	52.27	55.79	59.04	62.78	65.95	69.21

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Appendix II-3. Table of incident angles (deg) to the earth's surface for the 14 focal depths. Distance variations of the incident angles measured from the downward vertical are shown in Fig. 6.

θ / H	0.0	33.0	96.4	159.3	223.1	286.5	349.9	413.2	476.7	540.0	603.4	666.8	730.2	793.6
0.0	93.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.10	85.41	16.25	5.00	2.85	1.98	1.51	1.19	0.98	0.83	0.71	0.61	0.54	0.48	0.43
0.20	82.82	29.37	9.83	5.70	3.96	2.99	2.38	1.97	1.66	1.42	1.23	1.08	0.96	0.85
0.30	79.23	38.45	14.43	8.50	5.91	4.48	3.57	2.95	2.49	2.13	1.85	1.62	1.43	1.28
0.40	75.64	44.37	18.59	11.15	7.82	5.95	4.75	3.93	3.31	2.83	2.46	2.16	1.91	1.71
0.50	72.06	48.12	22.31	13.74	9.69	7.40	5.92	4.90	4.13	3.54	3.07	2.69	2.39	2.13
0.60	70.86	50.39	25.58	16.14	11.51	8.92	7.07	5.86	4.94	4.24	3.68	3.23	2.86	2.56
0.70	70.50	51.64	28.41	18.42	13.27	10.21	8.21	6.81	5.75	4.93	4.28	3.76	3.33	2.98
0.80	69.92	52.20	30.94	20.55	14.96	11.57	9.32	7.74	6.55	5.62	4.88	4.29	3.80	3.40
0.90	69.16	52.28	32.91	22.51	16.58	12.89	10.42	8.67	7.34	6.31	5.48	4.81	4.27	3.82
1.00	69.28	52.01	34.66	24.32	18.12	14.17	11.50	9.59	8.13	6.99	6.08	5.34	4.74	4.24
1.10	65.95	51.49	36.13	25.98	19.58	15.42	12.55	10.48	8.90	7.66	6.66	5.86	5.20	4.65
1.20	63.89	51.21	37.38	27.50	20.98	16.61	13.57	11.36	9.66	8.32	7.25	6.37	5.66	5.07
1.30	61.31	50.84	38.42	28.89	22.28	17.76	14.57	12.22	10.41	8.98	7.82	6.89	6.12	5.48
1.40	59.29	50.37	39.30	30.13	23.52	18.87	15.54	13.08	11.15	9.62	8.40	7.39	6.57	5.89
1.50	57.39	49.80	40.03	31.27	24.68	19.93	16.48	13.90	11.88	10.26	8.96	7.90	7.03	6.29
1.60	54.17	49.46	40.45	32.30	25.76	20.95	17.39	14.70	12.59	10.89	9.52	8.40	7.47	6.70
1.70	52.84	49.03	41.17	33.24	26.78	21.91	18.26	15.49	13.29	11.52	10.07	8.88	7.91	7.10
1.80	51.36	48.51	41.61	34.07	27.73	22.84	19.12	16.26	13.97	12.12	10.61	9.37	8.35	7.49
1.90	51.01	48.26	41.99	34.85	28.62	23.72	19.94	17.00	14.64	12.72	11.14	9.86	8.78	7.89
2.00	50.35	48.15	42.30	35.53	29.46	24.56	20.73	17.73	15.30	13.30	11.67	10.33	9.21	8.27
2.10	49.65	47.98	42.57	36.15	30.22	25.35	21.49	18.44	15.94	13.88	12.19	10.80	9.63	8.66
2.20	49.21	47.77	42.80	36.72	30.94	26.10	22.22	19.11	16.57	14.45	12.70	11.26	10.06	9.04
2.30	48.60	47.52	42.99	37.23	31.61	26.82	22.93	19.78	17.17	15.00	13.20	11.72	10.47	9.42
2.40	48.26	46.75	43.16	37.69	32.24	27.50	23.60	20.42	17.77	15.54	13.70	12.16	10.88	9.79
2.50	48.15	46.21	43.30	38.12	32.82	28.15	24.25	21.04	18.34	16.07	14.18	12.60	11.28	10.16
2.60	47.97	45.67	43.42	38.49	33.36	28.76	24.86	21.64	18.91	16.60	14.66	13.04	11.68	10.53
2.70	47.73	45.33	43.52	38.84	33.86	29.34	25.46	22.22	19.46	17.10	15.12	13.47	12.07	10.89
2.80	47.46	45.33	43.61	39.15	34.33	29.88	26.03	22.78	19.99	17.60	15.58	13.89	12.46	11.25
2.90	46.47	45.33	43.59	39.44	34.77	30.40	26.57	23.32	20.50	18.08	16.03	14.30	12.84	11.60
3.00	45.85	45.33	43.75	39.70	35.18	30.89	27.10	23.84	21.01	18.55	16.47	14.71	13.22	11.94

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η / H	0.0	33.0	96.4	159.8	223.1	286.5	349.9	413.2	476.7	540.0	603.4	666.8	730.2	793.6
3.00	45.85	45.33	43.75	39.70	35.18	30.89	27.10	23.84	21.01	18.55	16.47	14.71	13.22	11.94
3.10	45.33	45.32	43.80	39.93	35.55	31.35	27.59	24.35	21.49	19.01	16.90	15.11	13.58	12.29
3.20	44.83	45.32	43.85	40.15	35.90	31.79	28.07	24.83	21.97	19.46	17.32	15.50	13.95	12.63
3.30	44.33	45.31	43.89	40.34	36.24	32.20	28.53	25.29	22.42	19.90	17.73	15.88	14.31	12.96
3.40	43.83	45.30	43.92	40.52	36.54	32.60	28.97	25.75	22.87	20.32	18.13	16.26	14.66	13.29
3.50	43.32	45.29	43.95	40.69	36.83	32.96	29.38	26.19	23.30	20.74	18.52	16.62	15.00	13.61
3.60	42.82	45.28	43.97	40.84	37.09	33.31	29.78	26.60	23.72	21.14	18.91	16.99	15.35	13.93
3.70	42.31	45.27	43.99	40.97	37.34	33.64	30.15	27.00	24.12	21.53	19.28	17.34	15.68	14.24
3.80	41.80	45.26	44.00	41.10	37.57	33.95	30.52	27.39	24.51	21.91	19.65	17.69	16.01	14.55
3.90	41.30	45.25	44.01	41.21	37.79	34.24	30.86	27.76	24.89	22.28	20.00	18.03	16.33	14.85
4.00	40.80	45.24	44.01	41.31	37.99	34.52	31.19	28.12	25.25	22.64	20.35	18.36	16.64	15.15
4.10	40.30	45.23	44.02	41.41	38.18	34.79	31.50	28.46	25.60	22.99	20.69	18.69	16.95	15.44
4.20	39.80	45.22	44.02	41.50	38.35	35.04	31.80	28.79	25.94	23.33	21.02	19.00	17.25	15.73
4.30	39.30	45.21	44.02	41.57	38.52	35.27	32.09	29.11	26.27	23.66	21.34	19.31	17.55	16.02
4.40	38.80	45.19	44.01	41.65	38.67	35.49	32.36	29.42	26.59	23.97	21.65	19.61	17.84	16.29
4.50	38.30	45.18	44.01	41.71	38.81	35.70	32.62	29.71	26.90	24.28	21.95	19.91	18.13	16.56
4.60	37.80	45.17	44.00	41.77	38.94	35.90	32.87	29.99	27.20	24.58	22.25	20.20	18.41	16.84
4.70	37.30	45.16	44.00	41.82	39.07	36.09	33.11	30.26	27.48	24.87	22.54	20.48	18.68	17.10
4.80	36.80	45.15	43.99	41.87	39.18	36.27	33.33	30.52	27.76	25.15	22.82	20.76	18.95	17.36
4.90	36.30	45.14	43.98	41.92	39.29	36.43	33.55	30.77	28.02	25.42	23.09	21.02	19.21	17.61
5.00	35.80	45.13	43.97	41.96	39.39	36.59	33.75	31.01	28.28	25.69	23.35	21.29	19.46	17.86
5.10	35.30	45.12	43.96	41.99	39.49	36.74	33.95	31.23	28.53	25.94	23.61	21.54	19.71	18.10
5.20	34.80	45.11	43.95	42.03	39.57	36.88	34.13	31.45	28.76	26.19	23.86	21.79	19.96	18.34
5.30	34.30	45.10	43.93	42.05	39.66	37.02	34.31	31.67	28.99	26.43	24.10	22.03	20.20	18.57
5.40	33.80	44.95	43.92	42.08	39.73	37.14	34.48	31.87	29.21	26.66	24.33	22.26	20.43	18.80
5.50	33.30	44.92	43.91	42.10	39.80	37.26	34.64	32.06	29.43	26.88	24.56	22.50	20.66	19.02
5.60	32.80	44.89	43.89	42.12	39.87	37.37	34.80	32.25	29.63	27.09	24.78	22.72	20.88	19.24
5.70	32.30	44.86	43.87	42.14	39.93	37.48	34.94	32.43	29.83	27.30	25.00	22.93	21.10	19.46
5.80	31.80	44.83	43.86	42.15	39.98	37.58	35.08	32.60	30.02	27.59	25.20	23.14	21.31	19.67
5.90	31.30	44.80	43.84	42.16	40.03	37.67	35.22	32.76	30.20	27.88	25.40	23.35	21.52	19.87
6.00	30.80	44.77	43.82	42.17	40.08	37.76	35.34	32.92	30.37	28.17	25.60	23.55	21.72	20.08
6.10	30.30	44.74	43.80	42.18	40.13	37.85	35.46	33.07	30.54	28.46	25.79	23.74	21.91	20.27
6.20	29.80	44.70	43.78	42.18	40.17	37.93	35.58	33.22	30.70	28.73	25.97	23.93	22.10	20.46
6.30	29.30	44.67	43.76	42.18	40.20	38.00	35.69	33.36	30.86	28.99	26.14	24.11	22.29	20.65
6.40	28.80	44.63	43.74	42.18	40.24	38.07	35.79	33.49	31.01	29.25	26.31	24.29	22.47	20.84
6.50	28.30	44.60	43.71	42.18	40.27	38.13	35.89	33.62	31.15	29.48	26.48	24.46	22.65	21.01
6.60	27.80	44.56	43.69	42.18	40.29	38.19	35.98	33.74	31.28	29.71	26.64	24.63	22.82	21.19
6.70	27.30	44.52	43.67	42.17	40.32	38.25	36.07	33.85	31.41	29.90	26.79	24.79	22.99	21.36
6.80	26.80	44.48	43.64	42.17	40.34	38.31	36.15	33.96	31.54	30.13	26.94	24.95	23.15	21.53
6.90	26.30	44.44	43.62	42.16	40.36	38.35	36.23	34.07	31.66	30.26	27.08	25.10	23.31	21.69
7.00	25.80	44.40	43.59	42.15	40.38	38.40	36.31	34.17	31.77	30.39	27.22	25.25	23.47	21.85

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D / H	0.0	33.0	96.4	159.8	223.1	286.5	349.9	413.2	476.7	540.0	603.4	666.8	730.2	793.6
7.00	44.56	44.40	43.59	42.15	40.38	38.40	36.31	34.17	31.77	29.39	27.22	25.25	23.47	21.85
7.10	44.52	44.36	43.57	42.14	40.39	38.44	36.38	34.27	31.88	29.51	27.35	25.39	23.62	22.00
7.20	44.48	44.32	43.54	42.13	40.40	38.48	36.44	34.36	31.98	29.62	27.48	25.53	23.76	22.16
7.30	44.44	44.27	43.51	42.12	40.41	38.52	36.51	34.45	32.08	29.73	27.60	25.66	23.91	22.31
7.40	44.40	44.23	43.48	42.10	40.42	38.56	36.57	34.53	32.17	29.84	27.72	25.79	24.04	22.45
7.50	44.36	44.19	43.45	42.09	40.43	38.59	36.63	34.61	32.26	29.94	27.83	25.92	24.18	22.59
7.60	44.32	44.14	43.42	42.07	40.43	38.62	36.68	34.69	32.34	30.03	27.94	26.04	24.31	22.73
7.70	44.27	44.09	43.39	42.05	40.43	38.64	36.73	34.76	32.42	30.12	28.04	26.15	24.44	22.86
7.80	44.23	44.05	43.36	42.03	40.43	38.67	36.78	34.83	32.49	30.21	28.14	26.27	24.56	22.99
7.90	44.18	44.03	43.33	42.01	40.43	38.69	36.82	34.90	32.56	30.29	28.24	26.37	24.68	23.11
8.00	44.14	44.01	43.30	41.99	40.43	38.71	36.86	34.96	32.63	30.37	28.33	26.48	24.79	23.24
8.10	44.09	44.00	43.27	41.97	40.42	38.72	36.90	35.02	32.69	30.44	28.42	26.58	24.90	23.36
8.20	44.04	43.97	43.23	41.95	40.42	38.74	36.94	35.08	32.74	30.51	28.50	26.68	25.01	23.47
8.30	44.02	43.95	43.20	41.92	40.41	38.75	36.97	35.13	32.79	30.57	28.58	26.77	25.12	23.59
8.40	44.01	43.92	43.17	41.90	40.40	38.76	37.00	35.18	32.84	30.64	28.66	26.86	25.22	23.70
8.50	43.99	43.89	43.13	41.87	40.39	38.77	37.03	35.23	32.88	30.69	28.73	26.95	25.32	23.81
8.60	43.97	43.86	43.10	41.84	40.38	38.78	37.05	35.27	32.92	30.75	28.80	27.03	25.41	23.91
8.70	43.95	43.83	43.06	41.82	40.37	38.78	37.08	35.32	32.95	30.79	28.87	27.11	25.51	24.01
8.80	43.92	43.80	43.02	41.79	40.36	38.79	37.10	35.35	32.98	30.84	28.93	27.19	25.59	24.11
8.90	43.89	43.77	42.99	41.76	40.34	38.79	37.12	35.39	33.01	30.88	28.99	27.26	25.68	24.20
9.00	43.86	43.73	42.95	41.73	40.33	38.79	37.14	35.43	33.02	30.92	29.04	27.33	25.76	24.30
9.10	43.83	43.70	42.91	41.70	40.31	38.79	37.15	35.46	33.04	30.96	29.10	27.40	25.84	24.39
9.20	43.80	43.66	42.87	41.67	40.29	38.78	37.16	35.49	33.05	30.99	29.15	27.47	25.92	24.48
9.30	43.76	43.63	42.83	41.64	40.27	38.78	37.18	35.52	33.06	31.02	29.19	27.53	26.00	24.56
9.40	43.73	43.59	42.79	41.60	40.25	38.77	37.19	35.54	33.06	31.04	29.24	27.59	26.07	24.64
9.50	43.69	43.55	42.75	41.57	40.23	38.77	37.19	35.57	33.06	31.07	29.28	27.64	26.14	24.72
9.60	43.66	43.51	42.71	41.53	40.21	38.76	37.20	35.59	33.05	31.09	29.32	27.70	26.21	24.80
9.70	43.62	43.47	42.67	41.50	40.19	38.75	37.21	35.61	33.05	31.10	29.35	27.75	26.27	24.88
9.80	43.58	43.43	42.63	41.46	40.16	38.74	37.21	35.63	33.04	31.12	29.38	27.80	26.33	24.95
9.90	43.54	43.39	42.59	41.43	40.14	38.72	37.21	35.64	33.03	31.13	29.41	27.85	26.39	25.02
10.00	43.51	43.35	42.55	41.39	40.11	38.71	37.21	35.66	33.02	31.14	29.44	27.89	26.45	25.09
10.10	43.47	43.31	42.50	41.35	40.08	38.70	37.21	35.67	33.01	31.14	29.47	27.93	26.51	25.15
10.20	43.42	43.27	42.46	41.32	40.06	38.68	37.21	35.68	33.01	31.14	29.49	27.97	26.56	25.22
10.30	43.38	43.22	42.41	41.28	40.03	38.66	37.20	35.69	33.00	31.14	29.51	28.01	26.61	25.28
10.40	43.34	43.18	42.37	41.24	40.00	38.64	37.20	35.70	32.96	31.14	29.53	28.04	26.66	25.34
10.50	43.30	43.13	42.32	41.20	39.97	38.63	37.19	35.70	32.94	31.14	29.55	28.08	26.71	25.40
10.60	43.26	43.09	42.28	41.16	39.94	38.61	37.18	35.71	32.92	31.14	29.56	28.11	26.75	25.45
10.70	43.21	43.04	42.23	41.12	39.91	38.58	37.17	35.71	32.90	31.13	29.57	28.14	26.79	25.51
10.80	43.17	43.00	42.19	41.07	39.88	38.56	37.16	35.70	32.87	31.12	29.58	28.16	26.84	25.55
10.90	43.12	42.95	42.13	41.03	39.84	38.54	37.15	35.66	32.84	31.12	29.59	28.19	26.88	25.61
11.00	43.08	42.90	42.08	40.99	39.81	38.51	37.14	35.57	32.81	31.11	29.60	28.21	26.91	25.66

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D / H	0.0	33.0	96.4	159.8	223.1	286.5	349.9	413.2	476.7	540.0	603.4	666.8	730.2	793.6
11.00	43.08	42.90	42.08	40.99	39.81	38.51	37.14	35.57	32.81	31.11	29.60	28.21	26.91	25.66
11.10	43.03	42.86	42.03	40.94	39.78	38.49	37.12	35.46	32.75	31.10	29.60	28.23	26.95	25.70
11.20	42.98	42.81	41.98	40.90	39.74	38.46	37.11	35.33	32.75	31.08	29.60	28.25	26.98	25.75
11.30	42.94	42.76	41.93	40.86	39.71	38.44	37.09	35.20	32.72	31.07	29.61	28.27	27.02	25.79
11.40	42.89	42.71	41.88	40.81	39.67	38.41	37.07	35.06	32.68	31.06	29.61	28.29	27.05	25.83
11.50	42.84	42.66	41.83	40.77	39.63	38.38	37.05	34.92	32.64	31.04	29.60	28.30	27.08	25.87
11.60	42.79	42.61	41.78	40.72	39.59	38.35	37.03	34.78	32.60	31.02	29.60	28.32	27.10	25.91
11.70	42.74	42.56	41.73	40.67	39.56	38.32	37.01	34.63	32.56	31.01	29.60	28.33	27.13	25.95
11.80	42.69	42.51	41.68	40.63	39.52	38.29	36.99	34.48	32.52	30.99	29.60	28.34	27.15	25.98
11.90	42.64	42.46	41.62	40.58	39.48	38.26	36.97	34.33	32.47	30.97	29.59	28.35	27.18	26.02
12.00	42.59	42.40	41.57	40.53	39.44	38.22	36.95	34.18	32.42	30.94	29.58	28.36	27.20	26.05
12.10	42.54	42.35	41.52	40.48	39.40	38.19	36.92	34.02	32.38	30.92	29.58	28.36	27.22	26.08
12.20	42.49	42.30	41.46	40.43	39.35	38.15	36.90	33.86	32.32	30.90	29.57	28.37	27.24	26.11
12.30	42.43	42.24	41.41	40.39	39.31	38.12	36.87	33.70	32.27	30.87	29.56	28.37	27.26	26.14
12.40	42.38	42.19	41.35	40.35	39.27	38.08	36.84	33.54	32.22	30.85	29.55	28.38	27.28	26.16
12.50	42.33	42.13	41.30	40.30	39.23	38.05	36.82	33.38	32.16	30.82	29.54	28.38	27.29	26.19
12.60	42.27	42.07	41.24	40.25	39.18	38.01	36.79	33.22	32.11	30.79	29.53	28.38	27.31	26.21
12.70	42.22	42.01	41.19	40.20	39.14	37.97	36.76	33.05	32.05	30.76	29.52	28.38	27.32	26.24
12.80	42.15	41.95	41.13	40.15	39.09	37.93	36.73	33.04	31.99	30.73	29.51	28.38	27.33	26.26
12.90	42.10	41.89	41.07	40.10	39.05	37.89	36.70	33.02	31.93	30.70	29.50	28.37	27.34	26.28
13.00	42.04	41.84	41.02	40.05	39.00	37.85	36.67	33.00	31.86	30.67	29.48	28.37	27.35	26.30
13.10	41.98	41.78	40.96	40.00	38.96	37.81	36.63	32.96	31.80	30.63	29.47	28.37	27.36	26.32
13.20	41.93	41.72	40.90	39.95	38.91	37.77	36.60	32.92	31.73	30.60	29.46	28.37	27.37	26.34
13.30	41.87	41.66	40.84	39.90	38.86	37.73	36.57	32.87	31.67	30.56	29.44	28.36	27.38	26.35
13.40	41.81	41.60	40.78	39.85	38.81	37.69	36.53	32.82	31.60	30.53	29.42	28.36	27.39	26.37
13.50	41.75	41.54	40.72	39.79	38.76	37.64	36.50	32.76	31.53	30.49	29.41	28.35	27.39	26.38
13.60	41.69	41.48	40.67	39.74	38.71	37.60	36.46	32.70	31.45	30.45	29.39	28.35	27.40	26.40
13.70	41.63	41.41	40.61	39.68	38.66	37.56	36.42	32.64	31.38	30.41	29.37	28.34	27.40	26.41
13.80	41.56	41.35	40.54	39.63	38.61	37.51	36.39	32.57	31.31	30.37	29.35	28.34	27.40	26.42
13.90	41.50	41.29	40.48	39.57	38.56	37.47	36.35	32.50	31.23	30.33	29.33	28.33	27.41	26.43
14.00	41.44	41.23	40.43	39.52	38.50	37.42	36.31	32.43	31.15	30.29	29.31	28.32	27.41	26.44
14.10	41.38	41.16	40.38	39.46	38.45	37.37	36.26	32.35	31.14	30.24	29.29	28.32	27.41	26.45
14.20	41.32	41.10	40.32	39.41	38.40	37.33	36.23	32.27	31.12	30.20	29.27	28.31	27.41	26.46
14.30	41.25	41.04	40.26	39.35	38.34	37.28	36.18	32.19	31.09	30.15	29.25	28.30	27.41	26.47
14.40	41.19	40.97	40.20	39.29	38.29	37.23	36.13	32.11	31.06	30.11	29.22	28.29	27.41	26.47
14.50	41.13	40.91	40.14	39.24	38.23	37.18	36.08	32.03	31.03	30.06	29.20	28.28	27.41	26.48
14.60	41.06	40.84	40.08	39.18	38.18	37.14	36.04	31.94	30.99	30.01	29.18	28.27	27.40	26.48
14.70	41.00	40.78	40.02	39.12	38.12	37.09	35.99	31.85	30.95	29.96	29.15	28.26	27.40	26.49
14.80	40.93	40.71	39.96	39.06	38.07	37.04	35.94	31.76	30.90	29.91	29.12	28.25	27.40	26.49
14.90	40.87	40.65	39.90	39.00	38.01	36.99	35.89	31.67	30.86	29.86	29.10	28.24	27.39	26.49
15.00	40.80	40.58	39.84	38.94	37.95	36.94	35.85	31.58	30.81	29.81	29.07	28.23	27.39	26.49

(IS-PAGE 4/8)

D / H	0.0	33.0	96.4	159.8	223.1	286.5	349.9	413.2	476.7	540.0	603.4	666.8	730.2	793.6
15.00	40.90	40.58	39.84	38.94	37.95	36.94	32.65	31.58	30.81	29.81	29.07	28.23	27.39	26.49
15.10	40.73	40.51	39.78	38.88	37.90	36.89	32.57	31.48	30.76	29.76	29.04	28.22	27.38	26.50
15.20	40.67	40.44	39.71	38.82	37.84	36.84	32.49	31.39	30.71	29.71	29.02	28.21	27.38	26.50
15.30	40.60	40.39	39.65	38.75	37.78	36.79	32.41	31.29	30.65	29.65	28.99	28.19	27.37	26.50
15.40	40.53	40.33	39.59	38.69	37.72	36.73	32.32	31.19	30.60	29.61	28.96	28.17	27.36	26.50
15.50	40.46	40.27	39.52	38.62	37.66	36.68	32.22	31.14	30.55	29.61	28.96	28.18	27.35	26.49
15.60	40.41	40.20	39.46	38.56	37.61	36.63	32.13	31.13	30.49	29.59	28.90	28.15	27.35	26.49
15.70	40.35	40.14	39.39	38.50	37.55	32.93	32.03	31.10	30.43	29.58	28.87	28.14	27.34	26.49
15.80	40.28	40.07	39.33	38.43	37.49	32.87	31.93	31.07	30.37	29.56	28.84	28.12	27.33	26.49
15.90	40.22	40.01	39.26	38.37	37.43	32.80	31.83	31.03	30.31	29.53	28.81	28.11	27.32	26.49
16.00	40.16	39.94	39.19	38.30	37.36	32.73	31.72	30.98	30.25	29.51	28.77	28.09	27.31	26.49
16.10	40.09	39.87	39.13	38.24	37.30	32.65	31.62	30.94	30.19	29.48	28.74	28.08	27.30	26.48
16.20	40.02	39.81	39.06	38.17	37.24	32.56	31.51	30.89	30.13	29.45	28.71	28.06	27.29	26.48
16.30	39.96	39.74	38.99	38.10	37.18	32.47	31.40	30.84	30.06	29.42	28.67	28.04	27.28	26.48
16.40	39.89	39.67	38.92	38.04	37.12	32.37	31.28	30.78	30.00	29.39	28.64	28.03	27.27	26.48
16.50	39.82	39.60	38.86	37.97	37.06	32.27	31.17	30.72	29.94	29.36	28.60	28.01	27.25	26.47
16.60	39.75	39.53	38.79	37.90	37.00	32.16	31.14	30.66	29.87	29.33	28.57	27.99	27.24	26.47
16.70	39.69	39.46	38.71	37.83	36.94	32.05	31.12	30.60	29.80	29.29	28.53	27.97	27.23	26.47
16.80	39.61	39.39	38.64	37.77	36.88	31.94	31.09	30.54	29.73	29.26	28.49	27.95	27.21	26.46
16.90	39.54	39.32	38.56	37.70	32.77	31.83	31.05	30.48	29.67	29.22	28.46	27.94	27.20	26.46
17.00	39.47	39.25	38.49	37.63	32.69	31.71	31.01	30.41	29.61	29.19	28.42	27.92	27.19	26.45
17.10	39.40	39.18	38.42	37.56	32.60	31.59	30.96	30.34	29.61	29.15	28.38	27.90	27.17	26.45
17.20	39.33	39.10	38.35	37.49	32.50	31.46	30.91	30.28	29.59	29.11	28.37	27.88	27.16	26.44
17.30	39.26	39.03	38.27	37.42	32.39	31.34	30.86	30.21	29.57	29.07	28.37	27.86	27.14	26.44
17.40	39.18	38.96	38.20	37.35	32.28	31.21	30.80	30.14	29.55	29.03	28.36	27.84	27.13	26.43
17.50	39.11	38.89	38.13	37.28	32.17	31.14	30.74	30.06	29.53	28.99	28.35	27.82	27.11	26.43
17.60	39.04	38.81	38.05	37.23	32.05	31.13	30.67	29.99	29.50	28.95	28.33	27.79	27.09	26.42
17.70	38.96	38.73	37.98	37.13	31.92	31.10	30.61	29.92	29.47	28.91	28.32	27.77	27.08	26.42
17.80	38.89	38.65	37.90	37.05	31.79	31.06	30.54	29.84	29.43	28.87	28.30	27.75	27.06	26.41
17.90	38.82	38.57	37.83	36.98	31.66	31.02	30.47	29.77	29.40	28.82	28.29	27.73	27.04	26.40
18.00	38.73	38.50	37.75	36.90	31.53	30.97	30.40	29.69	29.36	28.78	28.27	27.70	27.02	26.40
18.10	38.65	38.42	37.68	36.83	31.43	30.92	30.33	29.61	29.33	28.74	28.25	27.68	27.00	26.39
18.20	38.57	38.34	37.60	36.75	31.33	30.86	30.25	29.61	29.33	28.74	28.25	27.68	27.00	26.39
18.30	38.50	38.26	37.53	36.68	31.24	30.80	30.25	29.61	29.33	28.74	28.25	27.68	27.00	26.39
18.40	38.42	38.18	37.45	36.60	31.14	30.73	30.18	29.60	29.33	28.74	28.25	27.68	27.00	26.39
18.50	38.34	38.11	37.37	36.53	31.04	30.67	30.13	29.58	29.33	28.74	28.25	27.68	27.00	26.39
18.60	38.26	38.03	37.30	36.45	30.94	30.60	30.06	29.53	29.33	28.74	28.25	27.68	27.00	26.39
18.70	38.18	37.95	37.22	36.37	30.85	30.53	29.99	29.53	29.33	28.74	28.25	27.68	27.00	26.39
18.80	38.10	37.87	37.14	36.29	30.76	30.45	29.91	29.50	29.33	28.74	28.25	27.68	27.00	26.39
18.90	38.02	37.79	37.06	36.21	30.67	30.38	29.78	29.47	29.33	28.74	28.25	27.68	27.00	26.39
19.00	37.94	37.71	36.98	36.13	30.58	30.30	29.62	29.40	28.94	28.37	28.04	27.49	26.84	26.32

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D / H	0.0	33.0	96.4	159.8	223.1	286.5	349.9	413.2	476.7	540.0	603.4	666.8	730.2	793.6
19.00	37.94	37.71	32.20	31.18	30.86	30.30	29.62	29.40	28.94	28.37	28.04	27.46	26.82	26.32
19.10	37.86	37.63	32.07	31.14	30.80	30.22	29.61	29.36	28.90	28.36	28.02	27.43	26.80	26.31
19.20	37.78	37.55	31.92	31.12	30.73	30.14	29.60	29.32	28.85	28.35	27.99	27.41	26.78	26.30
19.30	37.70	37.47	31.77	31.08	30.66	30.06	29.58	29.28	28.80	28.34	27.97	27.39	26.76	26.29
19.40	37.62	37.39	31.62	31.04	30.59	29.97	29.56	29.24	28.75	28.32	27.94	27.37	26.73	26.28
19.50	37.54	37.30	31.46	30.99	30.51	29.89	29.53	29.19	28.70	28.31	27.91	27.35	26.71	26.27
19.60	37.46	37.22	31.30	30.94	30.44	29.80	29.50	29.15	28.65	28.29	27.89	27.32	26.69	26.26
19.70	37.37	37.11	31.14	30.88	30.36	29.72	29.47	29.10	28.60	28.27	27.86	27.30	26.66	26.25
19.80	37.29	37.01	31.00	30.81	30.27	29.63	29.43	29.06	28.55	28.25	27.83	27.27	26.64	26.24
19.90	37.21	36.93	30.85	30.75	30.19	29.61	29.39	29.01	28.50	28.23	27.80	27.25	26.62	26.23
20.00	37.13	36.85	30.70	30.67	30.11	29.60	29.35	28.96	28.44	28.20	27.77	27.22	26.59	26.22
20.10	37.05	36.77	30.56	30.62	30.02	29.58	29.31	28.91	28.39	28.18	27.74	27.20	26.57	26.20
20.20	36.97	36.69	30.41	30.52	29.93	29.56	29.27	28.86	28.37	28.15	27.71	27.17	26.54	26.19
20.30	36.89	36.61	30.26	30.44	29.84	29.53	29.23	28.81	28.37	28.13	27.68	27.14	26.52	26.18
20.40	36.81	36.53	30.11	30.36	29.75	29.50	29.18	28.75	28.36	28.10	27.65	27.12	26.49	26.17
20.50	36.73	36.45	30.00	30.27	29.66	29.47	29.13	28.70	28.35	28.07	27.62	27.09	26.49	26.16
20.60	36.65	36.37	29.89	30.21	29.61	29.43	29.09	28.65	28.33	28.05	27.59	27.06	26.49	26.15
20.70	36.57	36.29	29.78	30.18	29.60	29.39	29.04	28.59	28.31	28.02	27.56	27.03	26.48	26.13
20.80	36.49	36.21	29.67	30.09	29.59	29.35	28.99	28.54	28.29	27.99	27.53	27.00	26.47	26.11
20.90	36.41	36.13	29.56	29.91	29.56	29.31	28.93	28.48	28.25	27.93	27.46	26.95	26.46	26.10
21.00	36.33	36.05	29.45	29.82	29.54	29.26	28.88	28.43	28.23	27.90	27.43	26.92	26.46	26.08
21.10	36.25	35.97	29.34	29.72	29.51	29.22	28.83	28.37	28.23	27.87	27.40	26.89	26.45	26.07
21.20	36.17	35.89	29.23	29.62	29.47	29.17	28.77	28.31	28.21	27.84	27.38	26.86	26.44	26.06
21.30	36.09	35.81	29.12	29.61	29.44	29.12	28.72	28.36	28.18	27.84	27.38	26.86	26.44	26.06
21.40	36.01	35.73	29.01	29.60	29.40	29.07	28.66	28.35	28.15	27.81	27.35	26.83	26.43	26.04
21.50	35.93	35.65	28.90	29.58	29.36	29.02	28.61	28.34	28.13	27.77	27.33	26.80	26.42	26.03
21.60	35.85	35.57	28.79	29.55	29.31	28.97	28.55	28.32	28.10	27.74	27.30	26.77	26.41	26.01
21.70	35.77	35.49	28.68	29.52	29.27	28.91	28.49	28.31	28.07	27.71	27.27	26.73	26.39	26.00
21.80	35.69	35.41	28.57	29.49	29.22	28.86	28.43	28.29	28.04	27.67	27.24	26.70	26.37	25.99
21.90	35.61	35.33	28.46	29.46	29.17	28.80	28.37	28.26	28.01	27.64	27.20	26.67	26.34	25.96
22.00	35.53	35.25	28.35	29.42	29.12	28.75	28.37	28.24	27.98	27.60	27.17	26.64	26.36	25.96
22.10	35.45	35.17	28.24	29.38	29.07	28.69	28.36	28.22	27.95	27.57	27.14	26.61	26.34	25.94
22.20	35.37	35.09	28.13	29.36	29.02	28.63	28.35	28.19	27.92	27.53	27.11	26.58	26.33	25.93
22.30	35.29	35.01	28.02	29.34	29.02	28.63	28.35	28.19	27.89	27.50	27.08	26.54	26.32	25.91
22.40	35.21	34.93	27.91	29.32	28.96	28.57	28.34	28.17	27.85	27.46	27.04	26.51	26.30	25.90
22.50	35.13	34.85	27.80	29.29	28.91	28.51	28.32	28.14	27.82	27.43	27.01	26.49	26.29	25.88
22.60	35.05	34.77	27.69	29.27	28.85	28.45	28.31	28.11	27.81	27.40	26.98	26.49	26.28	25.87
22.70	34.97	34.69	27.58	29.24	28.80	28.39	28.29	28.08	27.79	27.38	26.94	26.48	26.26	25.85
22.80	34.89	34.61	27.47	29.22	28.74	28.37	28.26	28.05	27.75	27.35	26.91	26.48	26.25	25.83
22.90	34.81	34.53	27.36	29.20	28.68	28.37	28.24	28.02	27.72	27.32	26.87	26.47	26.23	25.82
23.00	34.73	34.45	27.25	29.18	28.62	28.36	28.22	27.99	27.68	27.32	26.84	26.47	26.21	25.80

(IS-PAGE 6/8)

D / H	0.0	33.0	96.4	159.8	223.1	286.5	349.9	413.2	476.7	540.0	603.4	666.8	730.2	793.6
23.00	29.54	29.47	29.24	28.93	28.56	28.34	28.19	27.96	27.64	27.28	26.84	26.47	26.21	25.80
23.10	29.51	29.44	29.19	28.87	28.50	28.33	28.16	27.92	27.61	27.25	26.80	26.46	26.20	25.79
23.20	29.47	29.39	29.14	28.81	28.43	28.31	28.14	27.89	27.57	27.22	26.77	26.45	26.18	25.77
23.30	29.44	29.35	29.09	28.75	28.37	28.29	28.11	27.86	27.53	27.18	26.73	26.43	26.17	25.75
23.40	29.39	29.31	29.03	28.69	28.33	28.27	28.08	27.82	27.50	27.15	26.70	26.42	26.15	25.73
23.50	29.35	29.26	28.98	28.63	28.36	28.25	28.05	27.79	27.46	27.11	26.66	26.42	26.13	25.72
23.60	29.30	29.21	28.92	28.57	28.35	28.22	28.02	27.75	27.42	27.08	26.62	26.40	26.12	25.70
23.70	29.26	29.16	28.86	28.51	28.34	28.20	27.98	27.72	27.40	27.04	26.59	26.39	26.10	25.68
23.80	29.21	29.10	28.80	28.44	28.32	28.17	27.95	27.68	27.37	27.01	26.55	26.38	26.08	25.66
23.90	29.15	29.05	28.74	28.38	28.30	28.14	27.92	27.64	27.33	26.97	26.51	26.37	26.06	25.65
24.00	29.10	28.99	28.68	28.37	28.28	28.11	27.88	27.60	27.30	26.93	26.49	26.35	26.05	25.63
24.10	29.05	28.93	28.61	28.36	28.26	28.08	27.85	27.57	27.27	26.90	26.49	26.34	26.03	25.61
24.20	29.00	28.87	28.55	28.35	28.24	28.05	27.81	27.53	27.24	26.86	26.48	26.32	26.01	25.59
24.30	28.93	28.81	28.48	28.34	28.21	28.02	27.78	27.49	27.20	26.82	26.48	26.31	26.01	25.57
24.40	28.87	28.75	28.42	28.32	28.18	27.99	27.74	27.45	27.16	26.78	26.47	26.29	25.97	25.56
24.50	28.81	28.69	28.37	28.30	28.16	27.95	27.70	27.41	27.13	26.74	26.47	26.29	25.97	25.54
24.60	28.75	28.62	28.37	28.28	28.13	27.92	27.66	27.39	27.09	26.71	26.46	26.26	25.94	25.52
24.70	28.68	28.56	28.36	28.26	28.10	27.88	27.62	27.36	27.05	26.67	26.45	26.24	25.92	25.50
24.80	28.62	28.49	28.35	28.24	28.07	27.85	27.59	27.32	27.02	26.63	26.44	26.22	25.90	25.48
24.90	28.55	28.42	28.33	28.21	28.03	27.81	27.55	27.29	26.98	26.59	26.43	26.21	25.88	25.46
25.00	28.49	28.37	28.32	28.18	28.00	27.77	27.51	27.26	26.94	26.55	26.41	26.19	25.86	25.44
25.10	28.42	28.37	28.30	28.16	27.97	27.74	27.47	27.22	26.90	26.51	26.40	26.17	25.84	25.42
25.20	28.37	28.36	28.28	28.13	27.93	27.70	27.43	27.18	26.86	26.49	26.39	26.15	25.82	25.40
25.30	28.37	28.35	28.25	28.10	27.90	27.66	27.40	27.15	26.82	26.49	26.37	26.13	25.80	25.38
25.40	28.36	28.34	28.23	28.07	27.86	27.62	27.37	27.11	26.78	26.48	26.36	26.12	25.78	25.36
25.50	28.35	28.32	28.20	28.03	27.83	27.58	27.34	27.07	26.74	26.48	26.34	26.10	25.76	25.34
25.60	28.33	28.30	28.17	28.00	27.79	27.54	27.30	27.03	26.70	26.47	26.33	26.08	25.74	25.32
25.70	28.32	28.28	28.14	27.97	27.75	27.50	27.27	26.99	26.66	26.46	26.31	26.06	25.71	25.30
25.80	28.30	28.25	28.11	27.93	27.71	27.46	27.23	26.95	26.62	26.45	26.30	26.04	25.69	25.28
25.90	28.27	28.23	28.08	27.89	27.67	27.42	27.19	26.91	26.58	26.44	26.28	26.02	25.67	25.26
26.00	28.25	28.20	28.05	27.86	27.63	27.39	27.16	26.87	26.53	26.43	26.26	26.00	25.65	25.24
26.10	28.22	28.17	28.02	27.82	27.59	27.36	27.12	26.83	26.49	26.42	26.25	25.98	25.63	25.22
26.20	28.20	28.14	27.99	27.78	27.55	27.33	27.08	26.79	26.49	26.41	26.23	25.96	25.61	25.19
26.30	28.17	28.11	27.95	27.74	27.51	27.29	27.04	26.75	26.49	26.40	26.21	25.94	25.59	25.17
26.40	28.14	28.08	27.91	27.70	27.47	27.26	27.00	26.70	26.48	26.38	26.19	25.91	25.56	25.15
26.50	28.11	28.05	27.87	27.66	27.43	27.22	26.96	26.66	26.48	26.37	26.17	25.89	25.54	25.13
26.60	28.08	28.02	27.84	27.62	27.40	27.18	26.92	26.62	26.47	26.35	26.15	25.87	25.52	25.11
26.70	28.04	27.98	27.80	27.58	27.37	27.14	26.87	26.58	26.46	26.34	26.13	25.85	25.50	25.09
26.80	28.01	27.95	27.76	27.54	27.33	27.10	26.83	26.53	26.45	26.32	26.11	25.83	25.47	25.06
26.90	27.98	27.91	27.72	27.50	27.30	27.06	26.79	26.49	26.44	26.30	26.09	25.81	25.45	25.06
27.00	27.94	27.87	27.68	27.46	27.26	27.02	26.75	26.49	26.43	26.29	26.07	25.78	25.43	25.06

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D / H	0.0	33.0	96.4	159.8	223.1	286.5	349.9	413.2	476.7	540.0	603.4	666.8	730.2	793.6
27.00	27.94	27.87	27.68	27.46	27.26	27.02	26.75	26.49	26.43	26.29	26.07	25.78	25.43	25.06
27.10	27.90	27.83	27.54	27.41	27.22	26.98	26.70	26.49	26.42	26.27	26.05	25.76	25.41	25.06
27.20	27.87	27.80	27.60	27.39	27.18	26.94	26.66	26.48	26.40	26.25	26.03	25.74	25.38	25.06
27.30	27.83	27.76	27.56	27.36	27.15	26.90	26.62	26.48	26.39	26.23	26.01	25.71	25.36	25.05
27.40	27.79	27.72	27.51	27.32	27.10	26.85	26.57	26.47	26.38	26.21	25.99	25.69	25.34	25.05
27.50	27.75	27.68	27.47	27.29	27.06	26.81	26.53	26.46	26.36	26.20	25.97	25.67	25.31	25.04
27.60	27.71	27.63	27.43	27.25	27.02	26.77	26.49	26.45	26.34	26.18	25.94	25.65	25.29	25.03
27.70	27.67	27.59	27.40	27.21	26.98	26.72	26.49	26.44	26.33	26.16	25.92	25.62	25.26	25.03
27.80	27.63	27.55	27.37	27.17	26.94	26.68	26.49	26.43	26.31	26.14	25.90	25.60	25.24	25.02
27.90	27.59	27.51	27.33	27.13	26.90	26.63	26.48	26.41	26.29	26.12	25.88	25.57	25.22	25.01
28.00	27.54	27.46	27.30	27.09	26.85	26.59	26.47	26.40	26.28	26.09	25.85	25.55	25.19	25.01
28.10	27.50	27.42	27.26	27.05	26.81	26.54	26.47	26.39	26.26	26.07	25.83	25.53	25.17	25.00
28.20	27.45	27.39	27.22	27.00	26.76	26.50	26.46	26.37	26.24	26.05	25.81	25.50	25.14	24.99
28.30	27.41	27.36	27.18	26.96	26.72	26.49	26.45	26.36	26.22	26.03	25.78	25.48	25.12	24.98
28.40	27.39	27.33	27.14	26.92	26.67	26.49	26.44	26.34	26.20	26.01	25.76	25.45	25.09	24.97
28.50	27.35	27.29	27.10	26.87	26.63	26.48	26.43	26.33	26.18	25.99	25.73	25.43	25.07	24.96
28.60	27.32	27.25	27.05	26.83	26.58	26.48	26.41	26.31	26.16	25.96	25.71	25.40	25.06	24.95
28.70	27.28	27.21	27.01	26.79	26.54	26.47	26.40	26.29	26.14	25.94	25.69	25.38	25.06	24.94
28.80	27.24	27.17	26.97	26.74	26.49	26.46	26.39	26.27	26.12	25.92	25.66	25.35	25.06	24.93
28.90	27.20	27.13	26.93	26.69	26.49	26.45	26.37	26.25	26.10	25.89	25.64	25.32	25.06	24.92
29.00	27.15	27.08	26.88	26.65	26.49	26.44	26.35	26.23	26.08	25.87	25.61	25.30	25.05	24.91
29.10	27.12	27.04	26.84	26.60	26.48	26.43	26.34	26.22	26.05	25.85	25.59	25.27	25.05	24.90
29.20	27.08	27.00	26.79	26.56	26.48	26.42	26.32	26.20	26.03	25.82	25.56	25.25	25.04	24.89
29.30	27.03	26.95	26.74	26.51	26.47	26.40	26.30	26.18	26.01	25.80	25.53	25.22	25.03	24.88
29.40	26.99	26.91	26.70	26.49	26.46	26.39	26.29	26.15	25.99	25.77	25.51	25.19	25.03	24.87
29.50	26.94	26.87	26.65	26.49	26.45	26.37	26.27	26.13	25.96	25.75	25.48	25.17	25.02	24.86
29.60	26.90	26.82	26.60	26.43	26.44	26.36	26.25	26.11	25.94	25.72	25.46	25.14	25.01	24.85
29.70	26.85	26.77	26.56	26.43	26.43	26.34	26.23	26.09	25.92	25.70	25.43	25.11	25.01	24.83
29.80	26.81	26.73	26.51	26.47	26.41	26.33	26.21	26.07	25.89	25.67	25.40	25.09	25.00	24.82
29.90	26.76	26.68	26.49	26.46	26.40	26.31	26.19	26.05	25.87	25.65	25.38	25.06	24.99	24.81
30.00	26.72	26.63	26.49	26.45	26.39	26.30	26.17	26.02	25.84	25.62	25.35	25.06	24.98	24.80
30.10	26.67	26.58	26.44	26.44	26.37	26.27	26.15	26.00	25.82	25.59	25.32	25.06	24.97	24.78
30.20	26.62	26.54	26.44	26.43	26.36	26.25	26.13	25.98	25.79	25.57	25.30	25.06	24.96	24.77
30.30	26.57	26.49	26.47	26.42	26.34	26.23	26.11	25.95	25.77	25.54	25.27	25.05	24.95	24.76
30.40	26.52	26.49	26.46	26.41	26.32	26.21	26.08	25.93	25.74	25.51	25.24	25.05	24.94	24.75
30.50	26.49	26.49	26.45	26.39	26.30	26.19	26.06	25.90	25.72	25.49	25.21	25.04	24.93	24.73
30.60	26.49	26.48	26.44	26.38	26.29	26.17	26.04	25.88	25.69	25.46	25.19	25.04	24.92	24.72
30.70	26.49	26.48	26.43	26.36	26.27	26.15	26.01	25.86	25.67	25.43	25.16	25.03	24.91	24.71
30.80	26.43	26.47	26.42	26.34	26.25	26.13	25.99	25.83	25.64	25.41	25.13	25.03	24.89	24.69
30.90	26.47	26.46	26.41	26.33	26.23	26.11	25.97	25.81	25.61	25.38	25.10	25.02	24.88	24.68
31.00	26.47	26.45	26.39	26.31	26.21	26.09	25.94	25.78	25.59	25.35	25.07	25.01	24.87	24.66
31.10	26.45	26.44	26.38	26.29	26.19	26.06	25.92	25.75	25.56	25.32	25.06	25.00	24.86	24.65

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Appendix II-4. Apparent velocities, $p=dt/dJ$ (sec/deg), for the 14 focal depths. Dis-
tance variations of the apparent velocities are shown in Fig. 7.

n/H	0.0	33.0	96.4	159.8	223.1	286.5	349.9	413.2	476.7	540.0	603.4	666.8	730.2	793.6
0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.10	19.82	5.56	1.73	0.99	0.69	0.52	0.41	0.34	0.29	0.25	0.21	0.19	0.17	0.15
0.20	19.70	9.74	3.39	1.97	1.37	1.04	0.82	0.68	0.57	0.49	0.43	0.37	0.33	0.30
0.30	19.51	12.35	4.95	2.93	2.04	1.55	1.24	1.02	0.86	0.74	0.64	0.56	0.50	0.44
0.40	19.24	13.89	6.33	3.84	2.70	2.06	1.64	1.36	1.15	0.98	0.85	0.75	0.66	0.59
0.50	19.89	14.78	7.54	4.72	3.34	2.56	2.05	1.69	1.43	1.23	1.06	0.93	0.83	0.74
0.60	18.76	15.30	9.57	5.52	3.96	3.05	2.44	2.03	1.71	1.47	1.27	1.12	0.99	0.89
0.70	13.72	15.57	9.45	6.27	4.56	3.52	2.84	2.35	1.99	1.71	1.48	1.30	1.15	1.03
0.80	18.65	15.69	10.18	6.97	5.13	3.98	3.22	2.68	2.27	1.94	1.69	1.48	1.32	1.18
0.90	18.55	15.71	10.79	7.60	5.67	4.43	3.59	2.99	2.54	2.18	1.90	1.67	1.48	1.32
1.00	18.45	15.65	11.29	8.18	6.18	4.86	3.96	3.31	2.81	2.42	2.10	1.85	1.64	1.47
1.10	18.13	15.54	11.71	8.70	6.66	5.28	4.31	3.61	3.07	2.65	2.30	2.03	1.80	1.61
1.20	17.83	15.48	12.05	9.17	7.11	5.68	4.66	3.91	3.33	2.87	2.50	2.20	1.96	1.75
1.30	17.42	15.40	12.34	9.59	7.53	6.06	4.99	4.20	3.59	3.10	2.70	2.38	2.12	1.90
1.40	17.07	15.29	12.58	9.97	7.92	6.42	5.32	4.49	3.84	3.32	2.90	2.56	2.27	2.04
1.50	16.73	15.17	12.77	10.31	8.29	6.77	5.63	4.77	4.09	3.54	3.09	2.73	2.43	2.18
1.60	16.10	15.09	12.94	10.61	8.63	7.10	5.93	5.04	4.33	3.75	3.28	2.90	2.58	2.31
1.70	15.82	14.99	13.07	10.88	8.95	7.41	6.22	5.30	4.56	3.97	3.47	3.07	2.73	2.45
1.80	15.51	14.88	13.19	11.13	9.24	7.71	6.50	5.56	4.79	4.17	3.66	3.23	2.88	2.59
1.90	15.43	14.81	13.28	11.35	9.51	7.99	6.77	5.81	5.02	4.37	3.84	3.40	3.03	2.72
2.00	15.29	14.79	13.36	11.54	9.76	8.25	7.03	6.05	5.24	4.57	4.02	3.56	3.18	2.86
2.10	15.13	14.75	13.43	11.71	9.99	8.50	7.27	6.28	5.45	4.76	4.19	3.72	3.32	2.99
2.20	15.03	14.70	13.49	11.87	10.21	8.74	7.51	6.50	5.66	4.95	4.37	3.88	3.47	3.12
2.30	14.90	14.64	13.54	12.01	10.41	8.96	7.74	6.72	5.86	5.14	4.54	4.03	3.61	3.25
2.40	14.82	14.46	13.58	12.14	10.59	9.17	7.95	6.93	6.06	5.32	4.70	4.18	3.75	3.38
2.50	14.73	14.33	13.62	12.26	10.76	9.37	8.15	7.13	6.25	5.50	4.86	4.33	3.89	3.50
2.60	14.75	14.20	13.65	12.36	10.92	9.55	8.35	7.32	6.43	5.67	5.02	4.48	4.02	3.63
2.70	14.69	14.12	13.67	12.45	11.06	9.73	8.54	7.51	6.61	5.84	5.18	4.62	4.15	3.75
2.80	14.63	14.12	13.70	12.54	11.20	9.89	8.71	7.69	6.79	6.00	5.33	4.77	4.28	3.87
2.90	14.49	14.12	13.72	12.61	11.32	10.05	8.88	7.86	6.95	6.16	5.48	4.90	4.41	3.99
3.00	14.25	14.12	13.73	12.68	11.44	10.19	9.04	8.03	7.12	6.32	5.63	5.04	4.54	4.11

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D / H	0.0	33.0	96.4	159.8	223.1	286.5	349.9	413.2	476.7	540.0	603.4	666.8	730.2	793.6
3.00	14.25	14.12	13.73	12.69	11.44	10.19	9.04	8.03	7.12	6.32	5.63	5.04	4.54	4.11
3.10	14.12	14.12	13.74	12.74	11.55	10.33	9.20	8.19	7.27	6.47	5.77	5.18	4.66	4.23
3.20	14.12	14.12	13.76	12.80	11.64	10.46	9.34	8.34	7.43	6.62	5.91	5.31	4.79	4.34
3.30	14.12	14.12	13.77	12.85	11.74	10.58	9.48	8.48	7.57	6.76	6.05	5.43	4.91	4.45
3.40	14.12	14.11	13.77	12.90	11.82	10.70	9.62	8.63	7.72	6.90	6.18	5.56	5.02	4.56
3.50	14.12	14.11	13.78	12.94	11.90	10.80	9.74	8.76	7.85	7.03	6.31	5.68	5.14	4.67
3.60	14.12	14.11	13.78	12.98	11.98	10.90	9.86	8.89	7.99	7.16	6.43	5.80	5.26	4.78
3.70	14.12	14.11	13.79	13.02	12.04	11.00	9.97	9.02	8.11	7.29	6.56	5.92	5.37	4.88
3.80	14.11	14.10	13.79	13.05	12.11	11.09	10.08	9.14	8.24	7.41	6.68	6.03	5.48	4.99
3.90	14.11	14.10	13.80	13.08	12.17	11.17	10.19	9.25	8.36	7.53	6.79	6.15	5.58	5.09
4.00	14.11	14.10	13.80	13.11	12.22	11.25	10.28	9.36	8.47	7.65	6.90	6.26	5.69	5.19
4.10	14.11	14.10	13.80	13.13	12.27	11.33	10.38	9.46	8.58	7.76	7.02	6.36	5.79	5.29
4.20	14.10	14.09	13.80	13.16	12.32	11.40	10.46	9.56	8.69	7.86	7.12	6.47	5.89	5.38
4.30	14.10	14.09	13.80	13.18	12.36	11.47	10.55	9.66	8.79	7.97	7.23	6.57	5.99	5.48
4.40	14.10	14.08	13.80	13.19	12.41	11.53	10.63	9.75	8.89	8.07	7.32	6.66	6.08	5.57
4.50	14.10	14.08	13.80	13.21	12.44	11.59	10.70	9.84	8.98	8.17	7.42	6.76	6.18	5.66
4.60	14.09	14.07	13.79	13.23	12.48	11.64	10.78	9.93	9.07	8.26	7.52	6.86	6.27	5.75
4.70	14.09	14.07	13.79	13.24	12.51	11.70	10.85	10.01	9.16	8.35	7.61	6.95	6.36	5.84
4.80	14.08	14.06	13.79	13.25	12.55	11.74	10.91	10.08	9.25	8.44	7.70	7.04	6.45	5.92
4.90	14.08	14.06	13.79	13.27	12.57	11.79	10.97	10.16	9.33	8.52	7.79	7.12	6.53	6.01
5.00	14.07	14.05	13.79	13.28	12.60	11.84	11.03	10.23	9.41	8.61	7.87	7.21	6.62	6.09
5.10	14.07	14.05	13.78	13.28	12.63	11.88	11.09	10.30	9.48	8.69	7.95	7.29	6.70	6.17
5.20	14.06	14.04	13.78	13.29	12.65	11.92	11.14	10.36	9.56	8.76	8.03	7.37	6.78	6.25
5.30	14.06	14.03	13.78	13.30	12.67	11.95	11.19	10.42	9.62	8.84	8.11	7.45	6.85	6.32
5.40	14.05	14.03	13.77	13.31	12.69	11.99	11.24	10.48	9.76	8.98	8.25	7.60	7.01	6.47
5.50	14.05	14.02	13.77	13.31	12.71	12.02	11.29	10.54	9.82	9.04	8.32	7.67	7.08	6.54
5.60	14.04	14.01	13.77	13.32	12.73	12.05	11.33	10.60	9.86	9.11	8.39	7.74	7.15	6.61
5.70	14.03	14.01	13.76	13.32	12.74	12.08	11.37	10.65	9.88	9.17	8.46	7.81	7.22	6.68
5.80	14.03	14.00	13.76	13.32	12.76	12.11	11.41	10.70	9.93	9.23	8.52	7.87	7.28	6.75
5.90	14.02	13.99	13.75	13.33	12.77	12.14	11.45	10.75	9.99	9.28	8.58	7.93	7.35	6.82
6.00	14.02	13.98	13.75	13.33	12.78	12.16	11.49	10.79	10.04	9.34	8.64	7.99	7.41	6.88
6.10	14.01	13.98	13.74	13.33	12.80	12.18	11.52	10.84	10.09	9.39	8.69	8.06	7.47	6.94
6.20	14.00	13.97	13.74	13.33	12.81	12.20	11.55	10.88	10.14	9.44	8.75	8.11	7.53	7.00
6.30	13.99	13.96	13.73	13.33	12.82	12.23	11.58	10.92	10.18	9.49	8.80	8.17	7.59	7.06
6.40	13.98	13.95	13.73	13.33	12.83	12.24	11.61	10.96	10.23	9.54	8.85	8.22	7.65	7.12
6.50	13.98	13.94	13.72	13.33	12.83	12.26	11.64	10.99	10.27	9.58	8.90	8.27	7.70	7.18
6.60	13.97	13.93	13.72	13.33	12.84	12.28	11.66	11.03	10.31	9.63	8.95	8.33	7.76	7.23
6.70	13.96	13.92	13.71	13.33	12.85	12.29	11.69	11.06	10.35	9.67	9.00	8.38	7.81	7.29
6.80	13.95	13.91	13.70	13.33	12.85	12.31	11.71	11.09	10.42	9.71	9.04	8.42	7.86	7.34
6.90	13.94	13.90	13.70	13.33	12.86	12.32	11.74	11.12	10.46	9.74	9.08	8.47	7.91	7.39
7.00	13.93	13.89	13.69	13.32	12.86	12.33	11.76	11.15	10.45					

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D / H	0.7	33.0	95.4	159.8	223.1	285.5	349.9	413.2	476.7	540.0	603.4	666.8	730.2	793.6
7.00	13.93	13.89	13.69	13.32	12.86	12.33	11.76	11.15	10.45	9.74	9.08	8.47	7.91	7.39
7.10	13.92	13.98	13.69	13.32	12.87	12.35	11.78	11.18	10.49	9.78	9.12	8.51	7.96	7.44
7.20	13.91	13.87	13.68	13.32	12.87	12.36	11.81	11.21	10.52	9.81	9.16	8.56	7.99	7.49
7.30	13.90	13.86	13.67	13.32	12.87	12.37	11.81	11.23	10.55	9.85	9.20	8.60	8.05	7.54
7.40	13.89	13.85	13.66	13.31	12.87	12.38	11.85	11.26	10.57	9.88	9.23	8.64	8.09	7.58
7.50	13.88	13.84	13.66	13.31	12.88	12.38	11.85	11.28	10.60	9.91	9.27	8.68	8.13	7.63
7.60	13.87	13.83	13.65	13.30	12.88	12.39	11.86	11.30	10.62	9.94	9.30	8.72	8.17	7.67
7.70	13.86	13.82	13.64	13.30	12.88	12.40	11.88	11.32	10.65	9.97	9.34	8.75	8.21	7.71
7.80	13.85	13.81	13.63	13.29	12.88	12.41	11.88	11.34	10.67	9.99	9.37	8.79	8.25	7.76
7.90	13.84	13.80	13.63	13.29	12.88	12.41	11.90	11.36	10.69	10.02	9.40	8.82	8.29	7.80
8.00	13.83	13.80	13.62	13.28	12.88	12.42	11.91	11.38	10.71	10.04	9.42	8.85	8.33	7.83
8.10	13.82	13.79	13.61	13.28	12.88	12.42	11.92	11.40	10.72	10.06	9.45	8.89	8.36	7.87
8.20	13.80	13.79	13.60	13.27	12.87	12.43	11.93	11.41	10.74	10.08	9.48	8.91	8.40	7.91
8.30	13.80	13.78	13.59	13.27	12.87	12.43	11.94	11.43	10.75	10.10	9.50	8.94	8.43	7.95
8.40	13.80	13.77	13.58	13.26	12.87	12.43	11.95	11.44	10.77	10.12	9.52	8.97	8.46	7.98
8.50	13.79	13.77	13.57	13.25	12.87	12.43	11.96	11.45	10.78	10.14	9.55	9.00	8.49	8.02
8.60	13.79	13.76	13.57	13.25	12.86	12.44	11.97	11.47	10.79	10.15	9.57	9.02	8.52	8.05
8.70	13.78	13.75	13.56	13.24	12.86	12.44	11.98	11.48	10.80	10.17	9.59	9.05	8.55	8.08
8.80	13.77	13.74	13.55	13.23	12.86	12.44	11.98	11.49	10.81	10.18	9.60	9.07	8.58	8.11
8.90	13.77	13.74	13.54	13.22	12.85	12.44	11.99	11.50	10.82	10.19	9.62	9.10	8.60	8.14
9.00	13.76	13.73	13.53	13.22	12.85	12.44	11.99	11.51	10.82	10.20	9.64	9.12	8.63	8.17
9.10	13.75	13.72	13.52	13.21	12.85	12.44	11.99	11.52	10.83	10.21	9.66	9.14	8.66	8.20
9.20	13.74	13.71	13.51	13.20	12.84	12.44	11.99	11.53	10.83	10.22	9.67	9.16	8.68	8.23
9.30	13.73	13.70	13.50	13.19	12.84	12.44	12.00	11.53	10.83	10.23	9.69	9.18	8.70	8.25
9.40	13.73	13.69	13.49	13.18	12.83	12.44	12.00	11.54	10.83	10.24	9.70	9.20	8.73	8.28
9.50	13.72	13.68	13.48	13.18	12.82	12.43	12.00	11.55	10.83	10.25	9.71	9.21	8.75	8.31
9.60	13.71	13.67	13.47	13.17	12.82	12.43	12.01	11.56	10.83	10.25	9.72	9.23	8.77	8.33
9.70	13.70	13.66	13.46	13.16	12.81	12.43	12.01	11.56	10.83	10.26	9.73	9.24	8.79	8.35
9.80	13.69	13.65	13.45	13.15	12.81	12.43	12.01	11.57	10.83	10.26	9.74	9.26	8.81	8.38
9.90	13.68	13.64	13.44	13.14	12.80	12.42	12.01	11.57	10.82	10.27	9.75	9.27	8.83	8.40
10.00	13.67	13.63	13.43	13.13	12.79	12.42	12.01	11.57	10.82	10.27	9.76	9.29	8.85	8.42
10.10	13.66	13.62	13.41	13.12	12.79	12.41	12.01	11.58	10.82	10.27	9.77	9.30	8.86	8.44
10.20	13.65	13.61	13.40	13.11	12.78	12.41	12.01	11.58	10.81	10.27	9.77	9.31	8.88	8.46
10.30	13.64	13.60	13.39	13.10	12.77	12.40	12.01	11.58	10.81	10.27	9.78	9.32	8.89	8.48
10.40	13.63	13.59	13.38	13.09	12.76	12.40	12.00	11.59	10.80	10.27	9.79	9.34	8.91	8.50
10.50	13.62	13.58	13.37	13.08	12.76	12.40	12.00	11.59	10.80	10.27	9.79	9.35	8.92	8.52
10.60	13.61	13.56	13.36	13.07	12.75	12.39	12.00	11.59	10.79	10.27	9.80	9.35	8.94	8.53
10.70	13.60	13.55	13.35	13.06	12.74	12.38	12.00	11.59	10.78	10.27	9.80	9.36	8.95	8.55
10.80	13.58	13.54	13.33	13.05	12.73	12.38	11.99	11.59	10.78	10.27	9.80	9.37	8.96	8.57
10.90	13.57	13.53	13.32	13.03	12.72	12.37	11.99	11.57	10.77	10.26	9.81	9.38	8.98	8.58
11.00	13.56	13.52	13.31	13.02	12.71	12.36	11.99	11.55	10.76	10.26	9.81	9.39	8.99	8.60

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D / H	0.0	33.0	96.4	159.8	223.1	286.5	349.9	413.2	476.7	540.0	603.4	666.8	730.2	793.6
11.00	13.56	13.52	13.31	13.02	12.71	12.36	11.99	11.55	10.76	10.26	9.81	9.39	8.99	8.60
11.10	13.55	13.51	13.30	13.01	12.70	12.35	11.98	11.52	10.75	10.26	9.81	9.39	8.99	8.61
11.20	13.54	13.49	13.28	13.00	12.69	12.34	11.98	11.48	10.74	10.25	9.81	9.40	9.01	8.63
11.30	13.53	13.48	13.27	12.99	12.69	12.34	11.98	11.45	10.73	10.25	9.81	9.40	9.02	8.64
11.40	13.51	13.47	13.26	12.98	12.68	12.33	11.97	11.41	10.72	10.24	9.81	9.41	9.03	8.65
11.50	13.50	13.45	13.24	12.97	12.66	12.33	11.97	11.37	10.71	10.24	9.81	9.41	9.04	8.66
11.60	13.49	13.44	13.23	12.95	12.65	12.32	11.96	11.33	10.70	10.23	9.81	9.42	9.05	8.68
11.70	13.48	13.43	13.22	12.94	12.65	12.31	11.95	11.28	10.69	10.23	9.81	9.42	9.06	8.69
11.80	13.46	13.42	13.20	12.93	12.64	12.30	11.95	11.24	10.67	10.22	9.81	9.43	9.06	8.70
11.90	13.45	13.40	13.19	12.92	12.62	12.29	11.94	11.20	10.66	10.22	9.81	9.43	9.07	8.71
12.00	13.44	13.39	13.18	12.90	12.61	12.28	11.94	11.15	10.65	10.21	9.80	9.43	9.08	8.72
12.10	13.43	13.38	13.16	12.89	12.60	12.28	11.93	11.11	10.63	10.20	9.80	9.43	9.08	8.73
12.20	13.41	13.36	13.15	12.88	12.59	12.27	11.92	11.06	10.62	10.20	9.80	9.44	9.09	8.74
12.30	13.41	13.35	13.13	12.87	12.58	12.26	11.91	11.02	10.60	10.19	9.80	9.44	9.09	8.75
12.40	13.40	13.34	13.12	12.85	12.57	12.25	11.91	10.97	10.59	10.18	9.79	9.44	9.10	8.76
12.50	13.37	13.32	13.10	12.84	12.56	12.24	11.90	10.93	10.57	10.17	9.79	9.44	9.10	8.76
12.60	13.36	13.30	13.09	12.83	12.55	12.23	11.89	10.88	10.55	10.16	9.79	9.44	9.11	8.77
12.70	13.34	13.29	13.08	12.82	12.53	12.22	11.88	10.83	10.54	10.16	9.78	9.44	9.11	8.78
12.80	13.33	13.27	13.06	12.80	12.52	12.21	11.88	10.83	10.52	10.15	9.78	9.44	9.12	8.78
12.90	13.31	13.26	13.05	12.79	12.51	12.20	11.87	10.82	10.50	10.14	9.78	9.44	9.12	8.79
13.00	13.31	13.24	13.03	12.78	12.50	12.19	11.86	10.81	10.48	10.13	9.77	9.44	9.12	8.80
13.10	13.29	13.23	13.02	12.76	12.48	12.17	11.85	10.80	10.46	10.12	9.77	9.44	9.13	8.80
13.20	13.27	13.21	13.00	12.75	12.47	12.16	11.84	10.79	10.44	10.11	9.76	9.43	9.13	8.81
13.30	13.25	13.20	12.99	12.74	12.46	12.15	11.83	10.78	10.42	10.10	9.76	9.43	9.13	8.81
13.40	13.24	13.18	12.97	12.72	12.45	12.14	11.82	10.76	10.40	10.09	9.76	9.43	9.13	8.82
13.50	13.22	13.17	12.95	12.71	12.43	12.13	11.81	10.75	10.38	10.07	9.75	9.43	9.14	8.82
13.60	13.20	13.15	12.94	12.69	12.42	12.11	11.80	10.73	10.36	10.06	9.74	9.43	9.14	8.83
13.70	13.19	13.14	12.92	12.68	12.40	12.10	11.79	10.71	10.34	10.05	9.74	9.43	9.14	8.83
13.80	13.17	13.12	12.91	12.66	12.39	12.09	11.78	10.69	10.32	10.04	9.73	9.43	9.14	8.84
13.90	13.16	13.10	12.89	12.65	12.38	12.08	11.77	10.67	10.30	10.03	9.73	9.42	9.14	8.84
14.00	13.14	13.09	12.88	12.64	12.36	12.07	11.76	10.65	10.27	10.01	9.72	9.42	9.14	8.84
14.10	13.13	13.07	12.86	12.62	12.35	12.05	10.84	10.63	10.26	9.99	9.71	9.42	9.14	8.85
14.20	13.11	13.05	12.85	12.60	12.33	12.04	10.83	10.60	10.25	9.97	9.70	9.41	9.14	8.85
14.30	13.09	13.04	12.83	12.59	12.32	12.03	10.82	10.58	10.25	9.96	9.69	9.41	9.14	8.85
14.40	13.08	13.02	12.82	12.57	12.30	12.01	10.81	10.56	10.24	9.95	9.69	9.41	9.14	8.85
14.50	13.06	13.00	12.80	12.56	12.29	12.00	10.80	10.53	10.23	9.95	9.69	9.41	9.14	8.85
14.60	13.04	12.99	12.79	12.54	12.27	11.99	10.79	10.51	10.22	9.92	9.67	9.40	9.14	8.85
14.70	13.03	12.97	12.77	12.53	12.26	11.97	10.77	10.48	10.21	9.92	9.67	9.40	9.14	8.86
14.80	13.01	12.95	12.75	12.51	12.24	11.96	10.75	10.45	10.20	9.90	9.66	9.40	9.14	8.86
14.90	12.97	12.93	12.74	12.50	12.23	11.95	10.73	10.43	10.18	9.89	9.66	9.40	9.14	8.86
15.00	12.97	12.92	12.72	12.48	12.21	11.93	10.71	10.43	10.17	9.87	9.65	9.39	9.13	8.86

(P - PAGE 4/8)

D / H	0.0	33.0	96.4	159.8	223.1	286.5	349.9	413.2	476.7	540.0	603.4	666.8	730.2	793.6
15.00	12.97	12.92	12.72	12.48	12.21	11.93	10.71	10.40	10.17	9.97	9.65	9.39	9.13	8.86
15.10	12.96	12.90	12.70	12.46	12.20	11.92	10.69	10.37	10.15	9.86	9.64	9.39	9.13	8.86
15.20	12.94	12.88	12.69	12.45	12.18	11.90	10.67	10.34	10.12	9.84	9.63	9.39	9.13	8.86
15.30	12.92	12.87	12.67	12.43	12.16	11.89	10.64	10.31	10.10	9.82	9.62	9.38	9.13	8.86
15.40	12.90	12.85	12.65	12.41	12.15	11.88	10.61	10.28	10.11	9.81	9.61	9.38	9.13	8.86
15.50	12.89	12.83	12.64	12.40	12.13	11.86	10.59	10.27	10.09	9.81	9.60	9.37	9.12	8.86
15.60	12.87	12.82	12.62	12.38	12.12	11.84	10.56	10.26	10.07	9.81	9.60	9.37	9.12	8.86
15.70	12.85	12.80	12.60	12.36	12.10	11.82	10.53	10.26	10.06	9.80	9.59	9.36	9.12	8.86
15.80	12.84	12.78	12.58	12.34	12.08	11.80	10.50	10.25	10.04	9.80	9.58	9.36	9.12	8.86
15.90	12.82	12.77	12.57	12.32	12.07	11.76	10.47	10.23	10.02	9.79	9.57	9.35	9.11	8.86
16.00	12.80	12.75	12.55	12.31	12.05	11.74	10.44	10.22	10.00	9.78	9.56	9.35	9.11	8.85
16.10	12.79	12.73	12.53	12.29	12.03	11.71	10.41	10.21	9.98	9.77	9.55	9.35	9.11	8.85
16.20	12.77	12.71	12.51	12.27	12.02	11.69	10.38	10.19	9.97	9.76	9.54	9.34	9.10	8.85
16.30	12.75	12.69	12.49	12.25	12.00	11.66	10.34	10.18	9.95	9.76	9.53	9.34	9.10	8.85
16.40	12.73	12.68	12.48	12.23	11.98	11.63	10.31	10.16	9.93	9.74	9.52	9.33	9.10	8.85
16.50	12.72	12.66	12.46	12.22	11.97	11.60	10.28	10.14	9.91	9.74	9.51	9.32	9.09	8.85
16.60	12.70	12.64	12.44	12.20	11.95	11.57	10.27	10.13	9.89	9.73	9.49	9.32	9.09	8.85
16.70	12.69	12.62	12.42	12.18	11.93	11.54	10.26	10.11	9.87	9.72	9.48	9.31	9.09	8.85
16.80	12.66	12.60	12.40	12.16	11.92	11.51	10.25	10.09	9.85	9.70	9.47	9.31	9.08	8.85
16.90	12.64	12.58	12.38	12.14	11.90	11.47	10.24	10.07	9.83	9.69	9.46	9.30	9.08	8.85
17.00	12.62	12.56	12.36	12.12	11.88	11.44	10.23	10.05	9.81	9.68	9.45	9.30	9.07	8.85
17.10	12.60	12.54	12.34	12.10	11.84	11.40	10.22	10.03	9.81	9.67	9.44	9.29	9.07	8.84
17.20	12.59	12.52	12.32	12.09	11.82	11.36	10.20	10.01	9.81	9.66	9.44	9.28	9.06	8.84
17.30	12.56	12.50	12.30	12.07	11.80	11.33	10.18	9.99	9.80	9.65	9.43	9.28	9.06	8.84
17.40	12.55	12.48	12.28	12.05	11.77	11.29	10.17	9.97	9.79	9.64	9.43	9.27	9.05	8.84
17.50	12.53	12.47	12.26	12.03	11.75	11.27	10.15	9.95	9.78	9.62	9.43	9.27	9.05	8.84
17.60	12.51	12.44	12.24	12.01	11.73	11.24	10.13	9.93	9.78	9.61	9.42	9.26	9.04	8.84
17.70	12.49	12.42	12.22	11.99	11.71	11.21	10.11	9.90	9.77	9.60	9.42	9.25	9.04	8.83
17.80	12.47	12.40	12.20	11.97	11.69	11.19	10.09	9.88	9.76	9.59	9.41	9.24	9.03	8.83
17.90	12.45	12.38	12.18	11.95	11.66	11.16	10.07	9.86	9.75	9.57	9.41	9.24	9.03	8.83
18.00	12.42	12.36	12.16	11.93	11.64	11.14	10.05	9.84	9.74	9.56	9.40	9.23	9.02	8.83
18.10	12.40	12.34	12.14	11.91	11.62	11.12	10.03	9.81	9.73	9.55	9.40	9.22	9.02	8.82
18.20	12.38	12.32	12.12	11.89	11.60	11.10	10.01	9.81	9.71	9.53	9.39	9.22	9.01	8.82
18.30	12.36	12.30	12.10	11.87	11.58	11.07	9.98	9.81	9.71	9.52	9.39	9.21	9.00	8.82
18.40	12.34	12.27	12.07	11.85	11.56	11.05	9.96	9.80	9.69	9.51	9.38	9.20	9.00	8.82
18.50	12.32	12.25	12.05	11.83	11.54	11.03	9.94	9.79	9.68	9.49	9.37	9.19	8.99	8.82
18.60	12.30	12.23	12.03	11.81	11.52	11.01	9.91	9.79	9.66	9.48	9.36	9.19	8.99	8.81
18.70	12.27	12.21	12.01	11.79	11.50	10.99	9.89	9.78	9.65	9.46	9.36	9.18	8.98	8.81
18.80	12.25	12.19	11.99	11.77	11.48	10.96	9.86	9.77	9.64	9.45	9.35	9.17	8.97	8.81
18.90	12.23	12.17	11.97	11.75	11.46	10.94	9.84	9.76	9.62	9.44	9.34	9.16	8.97	8.81
19.00	12.21	12.15	11.95	11.73	11.44	10.92	9.81	9.75	9.61	9.44	9.34	9.16	8.96	8.80

(P -PAGE 5/8)

η / H	0.0	33.0	96.4	159.8	223.1	286.5	349.9	413.2	476.7	540.0	603.4	666.8	730.2	793.6
19.00	12.21	12.15	10.58	10.28	10.19	10.02	9.81	9.75	9.61	9.44	9.34	9.16	8.96	8.80
19.10	12.19	12.12	10.54	10.27	10.17	9.99	9.81	9.73	9.60	9.43	9.33	9.15	8.95	8.80
19.20	12.16	12.10	10.50	10.26	10.15	9.97	9.81	9.72	9.58	9.43	9.32	9.14	8.95	8.80
19.30	12.14	12.08	10.45	10.25	10.13	9.94	9.80	9.71	9.57	9.43	9.31	9.14	8.94	8.79
19.40	12.12	12.06	10.41	10.24	10.10	9.92	9.80	9.70	9.55	9.42	9.30	9.13	8.93	8.79
19.50	12.10	12.03	10.36	10.23	10.08	9.90	9.79	9.69	9.54	9.42	9.30	9.12	8.93	8.79
19.60	12.07	12.00	10.32	10.21	10.06	9.87	9.78	9.67	9.52	9.41	9.29	9.11	8.92	8.78
19.70	12.05	10.56	10.27	10.19	10.03	9.84	9.77	9.66	9.51	9.40	9.28	9.11	8.91	8.78
19.80	12.01	10.51	10.27	10.17	10.01	9.82	9.76	9.64	9.49	9.40	9.27	9.10	8.90	8.77
19.90	10.57	10.46	10.26	10.15	9.98	9.81	9.74	9.63	9.47	9.39	9.26	9.09	8.90	8.77
20.00	10.52	10.42	10.25	10.13	9.96	9.81	9.73	9.61	9.46	9.38	9.25	9.08	8.89	8.77
20.10	10.43	10.37	10.23	10.11	9.93	9.80	9.72	9.60	9.44	9.38	9.24	9.07	8.88	8.77
20.20	10.33	10.32	10.22	10.08	9.91	9.80	9.71	9.58	9.44	9.37	9.23	9.07	8.87	8.77
20.30	10.33	10.27	10.20	10.06	9.88	9.79	9.69	9.57	9.43	9.36	9.22	9.06	8.86	8.76
20.40	10.33	10.27	10.19	10.03	9.85	9.78	9.68	9.55	9.43	9.35	9.22	9.05	8.86	8.76
20.50	10.27	10.26	10.16	10.01	9.82	9.77	9.67	9.54	9.43	9.35	9.20	9.04	8.86	8.75
20.60	10.27	10.25	10.14	9.98	9.81	9.76	9.65	9.52	9.42	9.34	9.20	9.03	8.86	8.75
20.70	10.26	10.23	10.12	9.96	9.81	9.74	9.64	9.50	9.42	9.33	9.19	9.02	8.85	8.75
20.80	10.25	10.22	10.10	9.93	9.80	9.73	9.62	9.49	9.41	9.32	9.18	9.02	8.85	8.74
20.90	10.24	10.20	10.07	9.90	9.80	9.72	9.61	9.47	9.41	9.31	9.17	9.01	8.85	8.74
21.00	10.22	10.18	10.05	9.87	9.79	9.71	9.59	9.45	9.40	9.30	9.16	9.00	8.85	8.73
21.10	10.20	10.16	10.02	9.84	9.78	9.69	9.57	9.44	9.39	9.29	9.15	8.99	8.85	8.73
21.20	10.13	10.14	9.99	9.81	9.77	9.68	9.56	9.44	9.39	9.28	9.14	8.98	8.84	8.73
21.30	10.16	10.11	9.96	9.81	9.76	9.66	9.54	9.43	9.38	9.27	9.13	8.97	8.84	8.72
21.40	10.14	10.09	9.94	9.81	9.75	9.65	9.52	9.43	9.37	9.26	9.12	8.96	8.84	8.72
21.50	10.12	10.06	9.91	9.80	9.73	9.63	9.51	9.43	9.36	9.25	9.11	8.95	8.83	8.71
21.60	10.09	10.04	9.88	9.79	9.72	9.62	9.49	9.42	9.35	9.24	9.11	8.94	8.83	8.71
21.70	10.07	10.01	9.85	9.78	9.71	9.60	9.47	9.41	9.34	9.23	9.10	8.93	8.83	8.70
21.80	10.04	9.98	9.82	9.74	9.69	9.58	9.45	9.41	9.34	9.22	9.09	8.92	8.82	8.70
21.90	10.01	9.95	9.81	9.77	9.68	9.57	9.44	9.40	9.33	9.21	9.08	8.91	8.82	8.70
22.00	9.93	9.92	9.81	9.75	9.66	9.55	9.44	9.40	9.32	9.20	9.07	8.90	8.82	8.69
22.10	9.95	9.89	9.80	9.74	9.65	9.53	9.43	9.39	9.31	9.19	9.06	8.89	8.81	8.69
22.20	9.93	9.86	9.79	9.73	9.63	9.52	9.43	9.38	9.30	9.18	9.05	8.88	8.81	8.68
22.30	9.90	9.83	9.79	9.71	9.62	9.50	9.43	9.37	9.29	9.17	9.04	8.87	8.80	8.68
22.40	9.85	9.81	9.78	9.70	9.60	9.48	9.42	9.36	9.28	9.16	9.03	8.86	8.80	8.67
22.50	9.83	9.81	9.77	9.69	9.58	9.46	9.41	9.36	9.27	9.15	9.02	8.86	8.80	8.67
22.60	9.81	9.80	9.75	9.67	9.56	9.44	9.41	9.35	9.26	9.14	9.01	8.86	8.79	8.66
22.70	9.81	9.80	9.74	9.65	9.55	9.44	9.40	9.34	9.25	9.13	9.00	8.85	8.78	8.66
22.80	9.81	9.79	9.73	9.64	9.53	9.43	9.40	9.33	9.23	9.12	8.99	8.85	8.78	8.65
22.90	9.80	9.78	9.71	9.62	9.51	9.43	9.39	9.32	9.22	9.11	8.98	8.85	8.78	8.65
23.00	9.79	9.77	9.70	9.60	9.49	9.43	9.38	9.31	9.21	9.10	8.97	8.85	8.77	8.64

(P -PAGE 6/8)

D / H	0.0	33.0	96.4	159.3	223.1	286.5	349.9	413.2	476.7	540.0	603.4	666.8	730.2	793.6
23.00	3.79	9.77	9.70	9.60	9.49	9.43	9.38	9.31	9.21	9.10	8.97	8.85	8.77	8.64
23.10	9.78	9.76	9.63	9.59	9.47	9.42	9.37	9.30	9.20	9.09	8.95	8.85	8.77	8.64
23.20	9.77	9.75	9.67	9.57	9.45	9.42	9.36	9.29	9.19	9.08	8.94	8.84	8.76	8.63
23.30	9.76	9.73	9.65	9.55	9.44	9.41	9.35	9.28	9.18	9.07	8.93	8.84	8.76	8.63
23.40	9.75	9.72	9.64	9.54	9.44	9.40	9.35	9.27	9.17	9.06	8.92	8.84	8.75	8.62
23.50	9.73	9.70	9.62	9.52	9.43	9.40	9.34	9.26	9.16	9.05	8.91	8.83	8.75	8.62
23.60	9.72	9.69	9.60	9.50	9.43	9.39	9.33	9.25	9.14	9.04	8.90	8.83	8.74	8.61
23.70	9.70	9.67	9.58	9.48	9.43	9.38	9.32	9.23	9.13	9.03	8.89	8.83	8.73	8.60
23.80	9.69	9.66	9.57	9.46	9.42	9.37	9.31	9.22	9.13	9.02	8.88	8.82	8.73	8.60
23.90	9.67	9.64	9.55	9.44	9.41	9.36	9.30	9.21	9.12	9.01	8.86	8.82	8.72	8.59
24.00	9.66	9.62	9.53	9.44	9.41	9.36	9.29	9.20	9.11	8.99	8.86	8.81	8.72	8.59
24.10	9.64	9.61	9.51	9.43	9.40	9.35	9.27	9.19	9.10	8.98	8.86	8.81	8.71	8.58
24.20	9.62	9.59	9.49	9.43	9.39	9.34	9.26	9.18	9.09	8.97	8.85	8.80	8.71	8.58
24.30	9.60	9.57	9.47	9.43	9.39	9.33	9.25	9.16	9.06	8.96	8.85	8.80	8.70	8.57
24.40	9.59	9.55	9.45	9.42	9.38	9.32	9.24	9.15	9.06	8.95	8.85	8.80	8.70	8.57
24.50	9.57	9.53	9.44	9.41	9.37	9.31	9.23	9.14	9.05	8.94	8.85	8.79	8.69	8.56
24.60	9.55	9.51	9.44	9.41	9.36	9.30	9.22	9.13	9.04	8.92	8.85	8.78	8.68	8.55
24.70	9.53	9.49	9.43	9.40	9.35	9.29	9.21	9.13	9.03	8.91	8.84	8.78	8.68	8.55
24.80	9.51	9.47	9.43	9.39	9.34	9.27	9.19	9.11	9.02	8.90	8.84	8.77	8.67	8.54
24.90	9.49	9.45	9.42	9.39	9.33	9.26	9.18	9.10	9.01	8.89	8.84	8.77	8.67	8.54
25.00	9.47	9.44	9.42	9.38	9.32	9.25	9.17	9.09	9.00	8.87	8.83	8.76	8.66	8.53
25.10	9.45	9.44	9.41	9.37	9.31	9.24	9.16	9.08	8.98	8.86	8.83	8.76	8.65	8.52
25.20	9.44	9.43	9.41	9.36	9.30	9.23	9.15	9.07	8.97	8.86	8.82	8.75	8.65	8.52
25.30	9.44	9.43	9.40	9.35	9.29	9.22	9.14	9.06	8.96	8.86	8.82	8.75	8.64	8.51
25.40	9.43	9.42	9.39	9.34	9.28	9.21	9.13	9.05	8.95	8.85	8.82	8.74	8.64	8.51
25.50	9.43	9.42	9.38	9.33	9.27	9.19	9.12	9.04	8.93	8.85	8.81	8.73	8.63	8.50
25.60	9.42	9.41	9.38	9.32	9.26	9.18	9.11	9.02	8.92	8.85	8.81	8.73	8.62	8.49
25.70	9.42	9.41	9.37	9.31	9.24	9.17	9.10	9.01	8.91	8.85	8.80	8.72	8.61	8.49
25.80	9.41	9.40	9.36	9.30	9.23	9.16	9.09	9.00	8.90	8.85	8.80	8.72	8.61	8.48
25.90	9.41	9.39	9.35	9.29	9.22	9.14	9.07	8.99	8.88	8.84	8.79	8.71	8.60	8.47
26.00	9.40	9.38	9.34	9.28	9.21	9.14	9.06	8.98	8.87	8.84	8.79	8.70	8.60	8.47
26.10	9.39	9.38	9.33	9.27	9.20	9.13	9.05	8.96	8.86	8.84	8.78	8.70	8.59	8.46
26.20	9.38	9.37	9.32	9.26	9.18	9.12	9.04	8.95	8.86	8.83	8.77	8.69	8.58	8.45
26.30	9.37	9.36	9.31	9.24	9.17	9.10	9.03	8.94	8.86	8.83	8.77	8.68	8.57	8.45
26.40	9.36	9.35	9.30	9.23	9.16	9.09	9.01	8.92	8.85	8.82	8.76	8.68	8.57	8.44
26.50	9.35	9.34	9.28	9.22	9.15	9.08	8.99	8.91	8.85	8.82	8.76	8.67	8.56	8.43
26.60	9.35	9.33	9.27	9.21	9.14	9.07	8.99	8.90	8.85	8.81	8.75	8.66	8.56	8.43
26.70	9.34	9.32	9.26	9.19	9.13	9.06	8.98	8.88	8.85	8.81	8.75	8.66	8.55	8.42
26.80	9.32	9.31	9.25	9.18	9.12	9.05	8.96	8.87	8.84	8.80	8.74	8.65	8.54	8.41
26.90	9.31	9.29	9.24	9.17	9.11	9.03	8.95	8.86	8.84	8.80	8.73	8.64	8.53	8.41
27.00	9.30	9.28	9.22	9.15	9.10	9.02	8.94	8.86	8.84	8.79	8.73	8.64	8.53	8.41

(p -PAGE 7/8)

D / H	0.0	33.0	96.4	159.8	223.1	286.5	349.9	413.2	476.7	540.0	603.4	666.8	730.2	793.6
27.00	9.30	9.28	9.22	9.15	9.10	9.02	8.94	8.86	8.84	8.79	8.73	8.64	8.53	8.41
27.10	9.29	9.27	9.21	9.14	9.08	9.01	8.92	8.86	8.83	8.79	8.72	8.63	8.52	8.41
27.20	9.28	9.26	9.20	9.14	9.07	8.99	8.91	8.85	8.83	8.78	8.71	8.62	8.51	8.41
27.30	9.27	9.25	9.19	9.13	9.06	8.98	8.90	8.85	8.83	8.78	8.71	8.61	8.50	8.41
27.40	9.26	9.23	9.17	9.11	9.05	8.97	8.88	8.85	8.82	8.77	8.69	8.60	8.49	8.40
27.50	9.24	9.22	9.16	9.10	9.03	8.96	8.87	8.85	8.82	8.76	8.69	8.60	8.49	8.40
27.60	9.23	9.21	9.15	9.09	9.02	8.94	8.86	8.84	8.81	8.76	8.69	8.59	8.48	8.40
27.70	9.22	9.20	9.14	9.08	9.01	8.93	8.86	8.84	8.81	8.75	8.68	8.59	8.48	8.40
27.80	9.21	9.18	9.13	9.07	8.99	8.91	8.85	8.84	8.80	8.75	8.67	8.58	8.47	8.40
27.90	9.19	9.17	9.12	9.06	8.98	8.90	8.85	8.83	8.80	8.74	8.67	8.57	8.46	8.40
28.00	9.18	9.16	9.11	9.04	8.97	8.89	8.85	8.83	8.79	8.73	8.66	8.56	8.45	8.39
28.10	9.17	9.14	9.09	9.03	8.95	8.87	8.85	8.82	8.78	8.72	8.65	8.56	8.44	8.39
28.20	9.15	9.14	9.08	9.02	8.94	8.86	8.85	8.82	8.78	8.72	8.64	8.55	8.44	8.39
28.30	9.14	9.13	9.07	9.00	8.93	8.86	8.84	8.82	8.77	8.71	8.64	8.54	8.43	8.39
28.40	9.13	9.11	9.06	8.99	8.93	8.86	8.84	8.81	8.77	8.71	8.63	8.53	8.42	8.38
28.50	9.12	9.10	9.05	8.98	8.90	8.85	8.84	8.81	8.76	8.70	8.62	8.52	8.41	8.38
28.60	9.11	9.09	9.03	8.96	8.89	8.85	8.83	8.80	8.75	8.69	8.61	8.51	8.41	8.37
28.70	9.10	9.08	9.02	8.95	8.87	8.85	8.83	8.80	8.75	8.69	8.61	8.51	8.41	8.37
28.80	9.09	9.07	9.01	8.93	8.86	8.85	8.82	8.79	8.74	8.68	8.60	8.50	8.41	8.37
28.90	9.08	9.05	8.99	8.92	8.86	8.85	8.82	8.78	8.73	8.67	8.59	8.49	8.41	8.37
29.00	9.06	9.04	8.98	8.91	8.86	8.84	8.81	8.78	8.73	8.66	8.58	8.48	8.41	8.36
29.10	9.05	9.03	8.96	8.89	8.85	8.84	8.81	8.77	8.72	8.66	8.57	8.48	8.41	8.36
29.20	9.04	9.01	8.95	8.88	8.85	8.83	8.80	8.77	8.71	8.65	8.57	8.47	8.40	8.36
29.30	9.02	9.00	8.94	8.86	8.85	8.83	8.80	8.76	8.71	8.64	8.56	8.46	8.40	8.35
29.40	9.01	8.99	8.92	8.86	8.85	8.82	8.79	8.75	8.70	8.63	8.55	8.45	8.40	8.35
29.50	9.00	8.97	8.91	8.86	8.84	8.82	8.79	8.75	8.69	8.63	8.54	8.44	8.40	8.35
29.60	9.93	8.96	8.89	8.84	8.82	8.79	8.78	8.74	8.69	8.62	8.53	8.44	8.40	8.34
29.70	8.97	8.94	8.88	8.85	8.84	8.81	8.78	8.73	8.68	8.61	8.53	8.43	8.39	8.34
29.80	8.96	8.93	8.86	8.85	8.83	8.81	8.77	8.73	8.67	8.60	8.52	8.42	8.39	8.34
29.90	8.94	8.91	8.86	8.85	8.83	8.80	8.76	8.72	8.66	8.59	8.51	8.41	8.39	8.33
30.00	8.93	8.90	8.86	8.85	8.82	8.80	8.76	8.71	8.66	8.59	8.50	8.41	8.39	8.33
30.10	8.91	8.89	8.85	8.84	8.82	8.79	8.75	8.70	8.65	8.58	8.50	8.41	8.38	8.32
30.20	8.90	8.87	8.85	8.84	8.81	8.78	8.74	8.70	8.64	8.57	8.48	8.41	8.38	8.32
30.30	8.88	8.86	8.85	8.84	8.81	8.78	8.74	8.69	8.63	8.56	8.48	8.41	8.38	8.32
30.40	8.87	8.86	8.85	8.83	8.80	8.77	8.73	8.68	8.62	8.55	8.47	8.41	8.37	8.31
30.50	8.86	8.85	8.84	8.83	8.80	8.77	8.72	8.68	8.62	8.54	8.46	8.41	8.37	8.31
30.60	8.85	8.84	8.83	8.82	8.79	8.76	8.72	8.67	8.61	8.54	8.45	8.40	8.37	8.30
30.70	8.85	8.85	8.84	8.82	8.79	8.75	8.71	8.66	8.60	8.53	8.44	8.40	8.36	8.30
30.80	8.85	8.85	8.84	8.82	8.78	8.74	8.70	8.65	8.59	8.52	8.43	8.40	8.36	8.30
30.90	8.85	8.85	8.83	8.81	8.77	8.74	8.69	8.64	8.58	8.51	8.42	8.40	8.35	8.29
31.00	8.85	8.84	8.83	8.80	8.77	8.73	8.69	8.64	8.57	8.50	8.41	8.40	8.35	8.29
31.10	8.85	8.84	8.82	8.80	8.76	8.72	8.68	8.63	8.57	8.49	8.41	8.39	8.35	8.28

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Appendix II-5. Table of depths (km) of the ray bottom for the 14 focal depths. Distance variations of the depths of ray bottom are shown in Fig. 8.

D / H	0.0	33.0	96.4	159.3	223.1	286.5	349.9	413.2	476.7	540.0	603.4	666.8	730.2	793.6
0.0	6370.9	6370.9	6370.9	6370.9	6370.9	6370.9	6370.9	6370.9	6370.9	6370.9	6370.9	6370.9	6370.9	6370.9
0.50	4.5	45.9	1274.3	2599.6	3664.3	4236.0	4616.0	4886.2	5092.7	5256.7	5388.0	5495.4	5583.6	5658.7
1.00	8.6	33.6	437.7	1014.4	1896.2	2612.0	3228.8	3650.2	4052.0	4339.6	4575.6	4768.6	4928.3	5063.2
1.50	23.9	39.6	238.3	535.6	971.4	1613.0	2178.0	2666.4	3138.8	3526.2	3845.6	4108.9	4330.5	4519.3
2.00	38.0	45.8	155.5	417.4	611.0	985.9	1495.1	1960.7	2395.6	2802.8	3188.4	3510.4	3782.8	4015.1
2.50	45.7	55.7	120.3	313.2	434.4	681.6	1023.5	1449.6	1860.9	2251.6	2610.6	2967.8	3280.9	3550.0
3.00	57.4	69.2	105.4	251.2	425.5	550.4	751.7	1073.2	1454.4	1826.7	2179.3	2506.8	2824.1	3123.3
3.50	60.3	61.0	98.8	213.7	365.8	479.9	615.1	821.6	1143.4	1491.4	1831.7	2151.5	2445.6	2728.8
4.00	61.2	62.6	96.6	190.8	318.3	441.0	538.5	683.4	907.6	1229.2	1550.6	1857.8	2148.6	2422.5
4.50	62.9	64.3	96.7	176.6	285.6	413.4	490.7	599.0	765.5	1018.9	1322.0	1615.2	1895.6	2162.3
5.00	55.2	67.7	98.0	167.8	262.9	375.7	459.6	545.6	673.2	867.1	1136.2	1414.5	1682.1	1939.3
5.50	68.2	71.2	100.1	162.7	247.1	347.8	438.1	509.1	612.5	766.9	985.1	1249.0	1505.1	1751.4
6.00	71.9	75.4	103.1	160.3	236.4	327.4	421.7	481.1	571.3	699.3	875.4	1110.8	1354.5	1551.0
6.50	76.2	80.1	106.6	159.9	229.4	312.4	405.7	463.0	539.9	649.5	795.3	997.0	1228.4	1453.3
7.00	81.2	85.6	110.8	160.9	225.3	301.8	387.7	449.4	518.8	614.4	743.5	907.8	1121.6	1336.5
7.50	86.7	91.6	115.5	163.3	223.4	294.4	374.3	438.8	502.6	589.4	702.4	846.1	1031.6	1236.8
8.00	92.9	96.5	122.8	166.6	223.3	289.7	364.4	430.6	490.6	571.5	669.9	795.0	957.5	1151.2
8.50	97.2	100.5	126.6	170.9	224.6	287.2	357.5	424.3	482.4	558.3	648.3	762.0	901.3	1078.1
9.00	101.6	105.9	132.9	175.9	227.1	286.5	353.0	419.7	477.8	548.9	632.1	735.4	860.1	1017.1
9.50	107.3	112.2	139.7	181.6	230.7	287.4	350.6	416.5	476.8	543.1	620.1	714.6	825.8	965.7
10.00	113.7	119.1	147.0	188.0	235.2	289.6	349.9	414.4	477.9	540.4	611.7	698.6	797.6	922.8
10.50	120.8	126.5	154.8	195.1	240.6	292.9	350.8	413.4	480.5	540.2	606.4	686.4	778.8	894.0
11.00	128.5	134.5	163.3	202.6	246.7	297.4	353.0	416.4	484.6	541.5	603.9	677.5	764.5	870.0
11.50	136.7	143.0	172.2	210.8	253.6	302.7	356.4	431.5	490.2	544.2	603.5	671.5	753.2	850.2
12.00	145.4	152.0	181.6	219.5	261.1	308.9	360.8	449.3	497.3	548.1	604.5	668.1	744.6	834.1
13.00	154.7	161.8	191.4	228.1	269.3	315.9	366.2	468.7	505.8	553.1	606.5	666.9	738.3	821.2
13.50	164.8	172.1	201.6	237.5	278.1	323.7	372.6	478.7	515.8	559.3	609.6	667.2	733.9	811.2
14.00	175.3	182.8	212.3	247.4	287.5	332.9	379.7	486.2	527.1	566.6	613.6	668.3	731.4	803.7
14.50	186.2	194.0	223.3	257.9	297.8	341.3	387.7	497.1	539.7	574.9	618.4	670.2	730.3	798.5
15.00	197.6	205.6	234.0	269.0	308.4	351.0	400.0	510.3	544.8	584.3	624.1	672.9	730.5	795.2
209.6	217.7	245.7	280.5	319.6	361.1	409.8	525.3	553.6	630.7	676.4	731.7	793.7		

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D / H	0.0	33.0	96.4	159.8	223.1	286.5	349.9	413.2	476.7	540.0	603.4	666.8	730.2	793.6
15.00	209.6	217.7	245.7	280.5	319.6	361.1	489.8	525.3	553.6	594.6	630.7	676.4	731.7	793.7
15.50	222.0	229.3	257.9	293.0	331.3	372.0	503.8	540.1	564.3	603.4	638.0	685.3	733.9	793.8
16.00	233.6	241.7	270.6	305.8	343.6	487.3	520.5	547.0	585.5	615.9	655.1	690.7	740.5	795.6
16.50	246.4	254.8	283.9	319.1	356.0	503.3	535.4	569.8	603.0	624.8	664.7	703.4	745.5	797.4
17.00	259.9	268.5	298.3	332.8	488.6	521.0	545.4	584.2	607.5	634.9	668.8	706.7	750.8	799.7
17.50	273.9	282.7	312.8	347.0	505.7	547.0	570.2	599.8	615.7	645.8	674.0	710.6	756.8	802.6
18.00	288.7	298.0	327.7	493.9	527.0	547.0	570.2	599.8	615.7	645.8	674.0	710.6	756.8	802.6
18.50	304.3	313.6	343.2	514.4	541.6	559.3	585.8	606.0	625.9	657.6	680.7	718.5	763.4	805.9
19.00	320.2	329.6	358.5	538.9	551.4	574.4	602.8	614.0	637.3	667.3	688.4	726.9	770.7	809.8
19.50	336.6	346.1	375.1	558.1	565.6	591.4	603.8	616.2	636.5	678.2	706.3	743.0	786.9	818.8
20.00	511.3	523.2	542.9	559.1	582.4	603.8	616.2	636.5	663.5	678.2	706.3	743.0	786.9	818.8
20.50	539.5	541.5	554.5	575.6	601.2	610.6	627.5	649.9	668.9	686.5	716.2	752.2	794.1	824.1
21.00	546.7	552.1	570.6	594.5	606.9	620.9	640.5	664.3	674.9	695.9	726.8	762.1	796.5	829.7
21.50	560.8	568.1	589.7	604.9	616.1	633.3	654.8	669.3	683.0	706.2	736.0	772.6	800.7	835.8
22.00	579.1	587.4	603.8	612.9	628.1	647.4	667.2	675.6	692.5	717.2	746.4	783.5	806.0	842.4
22.50	600.1	603.5	610.9	624.4	642.0	662.9	671.4	684.1	703.1	729.0	757.7	794.1	812.1	849.3
23.00	606.9	610.1	622.0	638.1	657.4	669.0	678.9	694.1	714.6	738.8	769.6	796.2	819.0	856.6
23.50	616.4	621.2	635.6	653.5	667.7	675.3	688.3	705.2	726.9	750.5	782.0	800.7	826.4	864.3
24.00	629.2	634.9	651.1	667.2	672.9	684.1	699.0	717.3	737.4	763.0	794.0	806.6	834.3	872.4
24.50	644.3	650.6	667.0	671.5	681.1	694.4	710.9	730.1	749.5	776.2	796.2	813.5	842.6	881.0
25.00	661.2	667.0	670.7	679.3	691.2	706.1	723.7	740.7	762.6	790.0	800.9	821.2	851.5	889.9
25.50	668.7	670.7	678.3	689.2	702.7	718.9	735.1	753.6	776.5	795.1	807.2	829.6	860.7	899.1
26.00	675.1	678.3	683.1	700.6	715.4	731.3	747.6	767.4	791.0	799.1	814.6	838.7	870.4	908.8
26.50	684.2	688.1	699.5	713.3	729.1	743.3	761.4	782.0	795.3	805.0	822.9	848.2	880.5	918.8
27.00	695.2	699.7	712.3	727.1	740.4	756.9	776.0	794.1	799.6	812.3	831.9	858.3	890.9	925.2
27.50	707.7	712.6	726.1	738.6	754.0	771.6	791.4	796.8	805.8	820.7	841.6	868.8	901.8	927.7
28.00	721.4	726.7	737.9	752.3	768.7	787.1	795.4	802.9	813.4	829.9	851.9	879.8	913.0	931.8
28.50	734.0	738.5	751.7	767.1	784.4	794.7	799.9	808.9	822.0	839.8	862.8	891.2	924.6	943.0
29.00	747.3	752.5	766.7	782.9	794.4	798.5	806.2	817.1	831.5	850.4	874.2	903.0	926.4	943.0
29.50	762.2	767.8	782.7	794.3	797.7	804.5	814.1	826.3	841.8	861.6	886.0	915.2	930.0	949.7
30.00	778.2	784.1	794.3	797.4	803.4	812.1	823.0	836.3	852.8	873.3	898.3	925.0	935.1	956.9
30.50	794.0	794.4	797.4	803.0	810.9	820.8	832.9	847.1	864.4	885.5	911.0	927.2	941.1	964.6
31.00	796.3	797.8	803.0	810.3	819.5	830.6	843.6	858.6	876.5	898.2	924.1	931.4	948.0	972.7

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Appendix II-6. Table of factors of the geometrical spreading (km^{-1}) for the 14 focal depths. Distance variations of the geometrical spreading factors are shown in Fig. 9 only for depths of $h=0, 33, 96$ and 160 km.

θ / H	0.0	33.3	96.4	159.8	223.1	286.5	349.9
0.0	0.62638E+00	0.20079E-01	0.69751E-02	0.40859E-02	0.29199E-02	0.22968E-02	0.46263E-04
0.50	0.19074E-02	0.29650E-02	0.17023E-02	0.11363E-02	0.85609E-03	0.69271E-03	0.58667E-03
1.00	0.99663E-03	0.15707E-02	0.12077E-02	0.95986E-03	0.77812E-03	0.65322E-03	0.56251E-03
1.50	0.81111E-03	0.78325E-03	0.83687E-03	0.77628E-03	0.68185E-03	0.59868E-03	0.52930E-03
2.00	0.31819E-03	0.32167E-03	0.60167E-03	0.62134E-03	0.86668E-03	0.53663E-03	0.48959E-03
2.50	0.12676E-03	0.50903E-03	0.45161E-03	0.50452E-03	0.50158E-03	0.47850E-03	0.44777E-03
3.00	0.21998E-03	0.36328E-03	0.35633E-03	0.41746E-03	0.43200E-03	0.42430E-03	0.40802E-03
3.50	0.17799E-04	0.52496E-04	0.29315E-03	0.35159E-03	0.37514E-03	0.37714E-03	0.37113E-03
4.00	0.24514E-04	0.61525E-04	0.24193E-03	0.30296E-03	0.32900E-03	0.33904E-03	0.33775E-03
4.50	0.28543E-04	0.67219E-04	0.19248E-03	0.26433E-03	0.29196E-03	0.30460E-03	0.30830E-03
5.00	0.31251E-04	0.71041E-04	0.17981E-03	0.26433E-03	0.26196E-03	0.27506E-03	0.28315E-03
5.50	0.33169E-04	0.73621E-04	0.16632E-03	0.21221E-03	0.23671E-03	0.25057E-03	0.26046E-03
6.00	0.34477E-04	0.75396E-04	0.15529E-03	0.19288E-03	0.21610E-03	0.23025E-03	0.24033E-03
6.50	0.35510E-04	0.76532E-04	0.14624E-03	0.19091E-03	0.19886E-03	0.21268E-03	0.22282E-03
7.00	0.36264E-04	0.77175E-04	0.13847E-03	0.16636E-03	0.18476E-03	0.19804E-03	0.20803E-03
7.50	0.36850E-04	0.77485E-04	0.13165E-03	0.15560E-03	0.17172E-03	0.18422E-03	0.19457E-03
8.00	0.37238E-04	0.77813E-04	0.12567E-03	0.14640E-03	0.15965E-03	0.17299E-03	0.18362E-03
8.50	0.37820E-04	0.77729E-04	0.12042E-03	0.13840E-03	0.15044E-03	0.16258E-03	0.17243E-03
9.00	0.38453E-04	0.60949E-04	0.11569E-03	0.13151E-03	0.14267E-03	0.15398E-03	0.16358E-03
9.50	0.29891E-04	0.62191E-04	0.11154E-03	0.12552E-03	0.13577E-03	0.14792E-03	0.15537E-03
10.00	0.30490E-04	0.62690E-04	0.10754E-03	0.12023E-03	0.12958E-03	0.14023E-03	0.14793E-03
10.50	0.30904E-04	0.62789E-04	0.10403E-03	0.11537E-03	0.12404E-03	0.13387E-03	0.14052E-03
11.00	0.31118E-04	0.62734E-04	0.10304E-03	0.11111E-03	0.11912E-03	0.12810E-03	0.13469E-03
11.50	0.31177E-04	0.62527E-04	0.98865E-04	0.10708E-03	0.11145E-03	0.12291E-03	0.12929E-03
12.00	0.31169E-04	0.62139E-04	0.95750E-04	0.10347E-03	0.11040E-03	0.11825E-03	0.12421E-03
12.50	0.31171E-04	0.64366E-04	0.92915E-04	0.96861E-04	0.10667E-03	0.11401E-03	0.11974E-03
13.00	0.31809E-04	0.61919E-04	0.90334E-04	0.95183E-04	0.10320E-03	0.11003E-03	0.11554E-03
13.50	0.31419E-04	0.61193E-04	0.87981E-04	0.92776E-04	0.10283E-03	0.10631E-03	0.11159E-03
14.00	0.28593E-04	0.60487E-04	0.80213E-04	0.90359E-04	0.98091E-04	0.10306E-03	0.56417E-03
14.50	0.31017E-04	0.59802E-04	0.81143E-04	0.87933E-04	0.94894E-04	0.97344E-04	0.72798E-04
15.00	0.30824E-04	0.59136E-04	0.79933E-04	0.85814E-04	0.92025E-04	0.95984E-04	0.92732E-04

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D / H	0.0	33.0	96.4	159.8	223.1	286.5	349.9
15.00	0.30824E-04	0.59136E-04	0.79833E-04	0.85814E-04	0.92025E-04	0.95984E-04	0.92732E-04
15.50	0.29253E-04	0.55925E-04	0.78231E-04	0.82349E-04	0.87422E-04	0.8924E-03	0.99146E-04
16.00	0.29374E-04	0.56155E-04	0.76581E-04	0.82436E-04	0.87111E-04	0.81549E-04	0.10050E-03
16.50	0.29427E-04	0.55726E-04	0.74993E-04	0.80303E-04	0.83522E-04	0.91020E-04	0.79671E-04
17.00	0.29303E-04	0.55178E-04	0.74555E-04	0.79363E-04	0.76068E-04	0.93406E-04	0.61210E-04
17.50	0.29113E-04	0.54520E-04	0.72637E-04	0.40181E-03	0.85403E-04	0.54497E-04	0.69710E-04
18.00	0.30059E-04	0.54745E-04	0.70976E-04	0.7448E-04	0.87552E-04	0.57579E-04	0.72730E-04
18.50	0.29078E-04	0.53863E-04	0.69373E-04	0.81213E-04	0.40435E-04	0.64621E-04	0.73769E-04
19.00	0.28711E-04	0.52899E-04	0.74237E-04	0.64907E-04	0.56098E-04	0.67332E-04	0.55104E-04
19.50	0.28412E-04	0.28675E-03	0.77433E-04	0.47164E-04	0.61005E-04	0.68266E-04	0.42425E-04
20.00	0.34394E-04	0.63058E-04	0.38120E-04	0.54800E-04	0.29822E-04	0.27912E-04	0.49425E-04
20.50	0.27234E-04	0.26856E-04	0.48279E-04	0.57827E-04	0.54478E-04	0.41925E-04	0.52402E-04
21.00	0.20095E-04	0.38878E-04	0.53336E-04	0.59118E-04	0.34591E-04	0.46699E-04	0.53932E-04
21.50	0.23721E-04	0.43044E-04	0.55021E-04	0.27619E-04	0.41367E-04	0.48937E-04	0.54781E-04
22.00	0.25253E-04	0.44910E-04	0.21382E-04	0.36719E-04	0.44535E-04	0.50200E-04	0.15840E-04
22.50	0.23666E-04	0.15611E-04	0.32930E-04	0.40377E-04	0.46099E-04	0.50932E-04	0.30690E-04
23.00	0.13494E-04	0.26292E-04	0.36994E-04	0.42415E-04	0.46997E-04	0.24274E-04	0.35359E-04
23.50	0.16464E-04	0.30002E-04	0.39118E-04	0.43457E-04	0.17970E-04	0.30972E-04	0.37908E-04
24.00	0.17924E-04	0.31926E-04	0.40443E-04	0.12902E-04	0.27079E-04	0.34021E-04	0.39403E-04
24.50	0.18736E-04	0.33132E-04	0.24781E-04	0.23859E-04	0.30661E-04	0.35757E-04	0.40330E-04
25.00	0.19283E-04	0.21129E-04	0.21388E-04	0.27802E-04	0.32594E-04	0.36848E-04	0.40926E-04
25.50	0.85932E-05	0.17397E-04	0.25486E-04	0.27893E-04	0.33944E-04	0.37610E-04	0.36802E-04
26.00	0.11363E-04	0.20809E-04	0.27681E-04	0.31257E-04	0.34763E-04	0.30444E-04	0.38773E-04
26.50	0.12683E-04	0.22653E-04	0.29004E-04	0.32025E-04	0.37799E-04	0.35438E-04	0.39364E-04
27.00	0.13457E-04	0.23802E-04	0.29846E-04	0.32695E-04	0.32650E-04	0.36403E-04	0.39693E-04
27.50	0.13998E-04	0.24585E-04	0.30515E-04	0.30011E-04	0.33579E-04	0.36768E-04	0.38240E-04
28.00	0.14349E-04	0.25130E-04	0.27845E-04	0.31155E-04	0.34071E-04	0.36895E-04	0.15573E-04
28.50	0.12700E-04	0.23029E-04	0.29080E-04	0.31754E-04	0.34329E-04	0.12307E-04	0.20441E-04
29.00	0.13701E-04	0.24023E-04	0.29611E-04	0.32013E-04	0.98058E-05	0.17936E-04	0.22999E-04
29.50	0.14069E-04	0.24522E-04	0.29906E-04	0.82269E-05	0.16036E-04	0.20728E-04	0.24624E-04
30.00	0.14279E-04	0.24767E-04	0.76615E-05	0.14603E-04	0.18891E-04	0.22419E-04	0.25775E-04
30.50	0.86095E-05	0.70127E-05	0.13568E-04	0.17339E-04	0.20616E-04	0.23582E-04	0.26544E-04
31.00	0.59782E-05	0.11446E-05	0.16191E-04	0.19051E-04	0.21794E-04	0.37060E-04	0.27140E-04

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D / H	413.2	476.7	540.0	603.4	666.8	730.2	793.6
0.0	0.43222E-04	0.39365E-04	0.36095E-04	0.33861E-04	0.31777E-04	0.29927E-04	0.28223E-04
0.50	0.51266E-03	0.48886E-03	0.46086E-03	0.43799E-03	0.40805E-03	0.38148E-03	0.35926E-03
1.00	0.49827E-03	0.47881E-03	0.45402E-03	0.43279E-03	0.40423E-03	0.37872E-03	0.35686E-03
1.50	0.47525E-03	0.46306E-03	0.44200E-03	0.41910E-03	0.39681E-03	0.37327E-03	0.35253E-03
2.00	0.44931E-03	0.44229E-03	0.42716E-03	0.40840E-03	0.38656E-03	0.36536E-03	0.34688E-03
2.50	0.41941E-03	0.42029E-03	0.40956E-03	0.39420E-03	0.37656E-03	0.35590E-03	0.33573E-03
3.00	0.39920E-03	0.39643E-03	0.39021E-03	0.37928E-03	0.36414E-03	0.34593E-03	0.33115E-03
3.50	0.35998E-03	0.37461E-03	0.37111E-03	0.36372E-03	0.35019E-03	0.33547E-03	0.32123E-03
4.00	0.33212E-03	0.35145E-03	0.35248E-03	0.34682E-03	0.33685E-03	0.32371E-03	0.31194E-03
4.50	0.30775E-03	0.33086E-03	0.33449E-03	0.33147E-03	0.32317E-03	0.31166E-03	0.30237E-03
5.00	0.28458E-03	0.31116E-03	0.31639E-03	0.31498E-03	0.30927E-03	0.29935E-03	0.29062E-03
5.50	0.26442E-03	0.29444E-03	0.30017E-03	0.30032E-03	0.29521E-03	0.28790E-03	0.27964E-03
6.00	0.24654E-03	0.27886E-03	0.28499E-03	0.28564E-03	0.28206E-03	0.27531E-03	0.26959E-03
6.50	0.22899E-03	0.26451E-03	0.27092E-03	0.27189E-03	0.26886E-03	0.26367E-03	0.25839E-03
7.00	0.21481E-03	0.25331E-03	0.25798E-03	0.25842E-03	0.25675E-03	0.25201E-03	0.24820E-03
7.50	0.20217E-03	0.24423E-03	0.24623E-03	0.24699E-03	0.24572E-03	0.24142E-03	0.23908E-03
8.00	0.19082E-03	0.23544E-03	0.23469E-03	0.23468E-03	0.23374E-03	0.22981E-03	0.22594E-03
8.50	0.19074E-03	0.22863E-03	0.22335E-03	0.22356E-03	0.22280E-03	0.21942E-03	0.21980E-03
9.00	0.17117E-03	0.22289E-03	0.21420E-03	0.21260E-03	0.21220E-03	0.21097E-03	0.21077E-03
9.50	0.16381E-03	0.21966E-03	0.20429E-03	0.20391E-03	0.20270E-03	0.20076E-03	0.20181E-03
10.00	0.15779E-03	0.16452E-03	0.19654E-03	0.19436E-03	0.19335E-03	0.19164E-03	0.19392E-03
10.50	0.16479E-03	0.16484E-03	0.16244E-03	0.18491E-03	0.18447E-03	0.18354E-03	0.18557E-03
11.00	0.32617E-03	0.16141E-03	0.15700E-03	0.17266E-03	0.17627E-03	0.17495E-03	0.17844E-03
11.50	0.24107E-03	0.15739E-03	0.15208E-03	0.15218E-03	0.16836E-03	0.16721E-03	0.17116E-03
12.00	0.20611E-03	0.15319E-03	0.14725E-03	0.14184E-03	0.16170E-03	0.15979E-03	0.16389E-03
12.50	0.18470E-03	0.14883E-03	0.14297E-03	0.13667E-03	0.15274E-03	0.15237E-03	0.15763E-03
13.00	0.15734E-04	0.14441E-03	0.13872E-03	0.13238E-03	0.11296E-03	0.14611E-03	0.15100E-03
13.50	0.10000E-03	0.13993E-03	0.13466E-03	0.12848E-03	0.11960E-03	0.14008E-03	0.14656E-03
14.00	0.10740E-03	0.10531E-03	0.13094E-03	0.12505E-03	0.11728E-03	0.13512E-03	0.14072E-03
14.50	0.10926E-03	0.90574E-04	0.12735E-03	0.12173E-03	0.11441E-03	0.12705E-03	0.13602E-03
15.00	0.10875E-03	0.99031E-04	0.12375E-03	0.11852E-03	0.11166E-03	0.12253E-03	0.13139E-03

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D / H	413.2	476.7	543.0	603.4	666.8	730.2	793.6
15.00	0.10875E-03	0.99031E-04	0.12373E-03	0.11852E-03	0.11166E-03	0.12253E-03	0.13139E-03
15.50	0.62519E-04	0.10111E-03	0.50617E-04	0.11553E-03	0.10911E-03	0.11858E-03	0.12689E-03
16.00	0.70172E-04	0.10110E-03	0.80265E-04	0.11273E-03	0.10653E-03	0.11499E-03	0.92241E-04
16.50	0.77189E-04	0.10023E-03	0.86901E-04	0.11012E-03	0.10415E-03	0.11171E-03	0.95398E-04
17.00	0.79665E-04	0.77738E-04	0.88984E-04	0.10739E-03	0.10185E-03	0.10865E-03	0.94629E-04
17.50	0.80450E-04	0.60177E-04	0.89452E-04	0.10519E-04	0.10589E-03	0.10589E-03	0.93159E-04
18.00	0.79907E-04	0.68063E-04	0.89181E-04	0.70950E-04	0.97573E-04	0.10333E-03	0.91487E-04
18.50	0.44369E-04	0.71284E-04	0.88366E-04	0.75185E-04	0.95571E-04	0.10083E-03	0.89881E-04
19.00	0.53290E-04	0.72554E-04	0.29863E-04	0.76855E-04	0.93631E-04	0.98503E-04	0.88241E-04
19.50	0.56964E-04	0.73145E-04	0.51774E-04	0.77486E-04	0.84608E-04	0.96358E-04	0.86649E-04
20.00	0.58728E-04	0.73021E-04	0.58287E-04	0.77588E-04	0.85784E-04	0.94258E-04	0.85102E-04
20.50	0.59554E-04	0.36337E-04	0.61377E-04	0.77243E-04	0.85005E-04	0.25163E-04	0.83730E-04
21.00	0.58453E-04	0.45478E-04	0.62865E-04	0.76556E-04	0.83991E-04	0.49333E-04	0.82263E-04
21.50	0.30193E-04	0.49414E-04	0.63714E-04	0.69611E-04	0.82683E-04	0.56883E-04	0.80820E-04
22.00	0.37250E-04	0.51693E-04	0.64007E-04	0.71094E-04	0.81393E-04	0.60675E-04	0.79568E-04
22.50	0.40614E-04	0.52879E-04	0.58659E-04	0.70988E-04	0.44981E-04	0.62445E-04	0.78205E-04
23.00	0.42463E-04	0.53472E-04	0.59013E-04	0.70677E-04	0.38418E-04	0.63621E-04	0.77003E-04
23.50	0.43623E-04	0.53895E-04	0.60104E-04	0.70026E-04	0.46070E-04	0.64010E-04	0.75831E-04
24.00	0.44325E-04	0.49177E-04	0.60209E-04	0.39634E-04	0.50047E-04	0.64230E-04	0.74684E-04
24.50	0.38714E-04	0.50759E-04	0.60166E-04	0.31768E-04	0.52364E-04	0.64157E-04	0.73564E-04
25.00	0.41426E-04	0.51213E-04	0.59892E-04	0.38631E-04	0.53713E-04	0.63949E-04	0.72465E-04
25.50	0.42381E-04	0.51401E-04	0.23002E-04	0.42330E-04	0.54565E-04	0.63478E-04	0.71392E-04
26.00	0.42798E-04	0.51348E-04	0.30961E-04	0.44469E-04	0.55067E-04	0.63141E-04	0.70465E-04
26.50	0.42972E-04	0.20170E-04	0.34946E-04	0.45807E-04	0.55266E-04	0.62684E-04	0.69434E-04
27.00	0.49308E-05	0.26553E-04	0.37377E-04	0.46747E-04	0.55315E-04	0.62113E-04	0.21474E-04
27.50	0.19442E-04	0.29969E-04	0.38871E-04	0.47395E-04	0.55224E-04	0.61547E-04	0.34306E-04
28.00	0.23442E-04	0.31875E-04	0.39943E-04	0.47792E-04	0.55128E-04	0.60995E-04	0.39766E-04
28.50	0.27373E-04	0.33254E-04	0.40658E-04	0.48066E-04	0.54904E-04	0.46250E-04	0.42795E-04
29.00	0.28709E-04	0.34279E-04	0.41151E-04	0.48191E-04	0.54557E-04	0.25535E-04	0.44745E-04
29.50	0.28234E-04	0.34931E-04	0.41507E-04	0.48181E-04	0.54333E-04	0.32127E-04	0.45882E-04
30.00	0.28990E-04	0.35446E-04	0.41836E-04	0.47931E-04	0.11793E-04	0.35580E-04	0.46679E-04
30.50	0.29597E-04	0.35764E-04	0.41897E-04	0.47906E-04	0.24292E-04	0.37837E-04	0.47186E-04
31.00	0.29962E-04	0.35935E-04	0.41947E-04	0.38996E-04	0.29102E-04	0.39343E-04	0.47533E-04

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