## 颱風波를 基準으로한 全設計水深의 算定에 關한 硏究

## 李 重 雨

# A Study on the Calculation of Total Design Water Depth from Typhoon Waves

Joong-Woo, Lee\*

...... CONTENTS .....

- 1. INRTODUCTION
- 2. EQUATIONS FOR TYPHOON PARAMETER
  - 2.1. Equation for Pressure Profile Model
  - 2.2. Equations for Prediction of Hurricane Wind Fields
  - 2.3. Equations for Prediction of Hurricane Wave Fields
  - 2.4. Determination of Typhoon Parameters for Typhoon Brenda
- 3. CALCULATION OF THE 100-YEAR DESIGN WAVE PARAMETERS
  - 3.1. Description of Study Area
  - 3.2. Calculation of Typhoon Parmeters
  - 3.3. Analysis of S. S. M. O. and Hogben & Lumb's Wave Data
- 4. CALCULATION OF TOTAL DESIGN WATER DEPTH
- 5. SUMMARY AND DISCUSSIONS

REFERENCES

#### **Abstract**

Various typhoon data near Youngil Bay, Korea from 1961 to 1985 were collected with some criteria and analyzed with the help of the computer. Introducing the pressure profile models and predicting the typhoon wind and wave fields, the 100-year design wave parameters were calculated. Additionally, the wave data at the southeast coast of Korea were statistically analyzed.

The deep water wave climate of this bay indicated that Typhoon Brenda, 1985 had wave

<sup>\*</sup>Member, Department of Port and Transportation Engineering, Korea Maritime University

#### 2 韓國航海學會誌 第13巻 第3號, 1989

characteristics of 100-year return period. Typhoon model and storm surge model studies were made for this typhoon.

These, including other design parmeters, were introduced into the calculation of total design water depth.

#### 要 約

컴퓨터를 이용하여 1961년에서 부터 1985년까지 한국 영일만 부근의 여러 颱風資料를 特定 設定 基準에 따라 수집하여 분석하였다. 壓力 斷面 모델을 도입하여 태풍에 의한 바람과 波浪海域을 예측하고 100년 設計波의 파라메타를 계산하였다. 또한 한국 남동해안의 波浪에 대한 자료를 통계적으로 분석하였다.

영일만에 대한 深海波分析으로는 1985년의 颱風 Brenda가 100년 回歸週期를 가진 것으로 나타나 태풍모델과 暴風海溢 모델을 통해 이를 조사하였다. 다른 設計파라메타와 함께 조사된 자료는 全 設計水深의 算定에 도입되었다.

#### 1. Introduction

There is no doubt as to the destructive character of tropical storms, whereas an even more destructive and significant fraction of total storm damage is the storm generated surge and waves.

Storm surge and its impact of the coastal regions have been of interests to many researchers and engineers for a long time. It is a very inportant factor in producing barrier-island washovers and breaching. Especially, the storm surges have their greatest impacts in the coastal areas that experience such storms and are topographically low lying. During periods of extreme storm activity, low lying coastal areas may be flooded and overwashed by sea water.

The reliable estimates of the water

level changes during the storm conditions are essential to coastal planning and design. However, the decision of water level elevations under storms is a complicate problem which is involved in the interaction between wind, water, differences in atmospheric pressure, and other effects unrelated to the storm.

The purpose of this study is to predict storm wave conditions with a numerical model by the analysis of the past typhoon data and to calculate the total water depth for design of a shore structure at the selected site. The selected site is the Youngil Bay, Korea.

## 2. Equations for Typhoon Parameter

Several references are available for the development of various hurricane models and how to choose a particular model based upon certain hurricane parameters. The important parameters which had shown a good agreement among the various models are: a)  $R_{c'}$ , the radius of maximum cyclostrophic wind, b)  $P_{\rm RC}$ , the pressure at the radius of maximum cyclostrophic wind, and c)  $\left(\frac{rdP}{dr}\right)_{max}$ , the maximum value of gradient of pressure multiplied by r.

## 2. 1. Equation for Pressure Profile Model

There are several pressure profile models from the various sources. Those are proposed by Schloemer (1954), Fujita (1962), Jelenianski (1966), Uji (1975), Schwerdt, Ho and Watkins (1979), Holland (1980), Bretschneider (1981, 1982), and Rosendal (1982), etc.

In general, these can be summarized as two main groups: 1) the modified Rankin Vortex Model by Holland (1980), of which the Hydromet Model is a special case, and 2) the BRET-General Model of which the BRET-X Model, the Fujita model and Jelenianski Model are all special cases.

The mathematical expression of these two groups are:

$$\frac{P_r - P_o}{P_r - P_o} = Ae^{-B\frac{R_c}{r}} \qquad (2.1)$$

and

$$\frac{P_r - P_o}{P_n - P_o} = 1 - \frac{1}{\left\{1 + a\left(\frac{r}{R_c}\right)^2\right\}^b} \cdots (2.2)$$

where.

 $P_r = \text{pressure}$  at radial distance  $r_r$ 

 $P_0 = \text{pressure}$  at the center of hurricane.

 $P_n = \text{pressure at infinite distance}$ ,

 $R_c = \text{radius}$  of maximum

cyclostrophic wind.

The constants  $A = \frac{1}{B}$  and  $a = \frac{1}{b}$  must always be true in order to satisfy the mathematics of the cyclostrophic wind equation. Equation 2.1, proposed by Holland (1980), becomes the original Rankin-Vortex Model when A = B = 1.

Equation 2.2, proposed by Bretschneider (1981) after analysis of the pressure profile data, becomes the BRET-X Model when  $a=\frac{1}{b}=1$  and the same as Fujita model (1962) when  $a=\frac{1}{b}=2$  Table 2.1 presents the theoretical constant K for four hurricane models such as Hydromet Model, NOAA Model-I, Fujita Model-J, and BRET Model-X.

The parameter used to select hurricane models is non-dimensional Rankin-Vortex number,  $N_{CR}$  (Bretschneider and Lo, 1984). The original Hydromet Model is applicable for the low values of  $N_{CR}$  and for the higher values of  $N_{CR}$ , other models might be accepted as shown in Table 2.2. For this study BRET-X Model will be used due to the high latitude of the study site.

## 4 韓國航海學會誌 第13卷 第3號, 1989

Talbe 2.1 Theorectical constants for Four Hurricanse Models

(\*Pa:a:r density)

Model	$K = \frac{\kappa_0}{\sqrt{c_1}}$		C 1	K (mb/inHG)
Hydromet Model-HM	K o √e	19. 26 18. 70	e	11. 68 (68. 00) 11. 34 (66. 00)
NOAA (Report) Model-I	$\frac{K_0}{\sqrt{\pi}}$	19. 26 18. 70	11	10. 87(63, 25) 10. 55(61, 39)
Fujita Model-J	$\frac{K_0}{\sqrt{\frac{2}{3\sqrt{3}}}}$	19. 26 18. 70	$\frac{2}{3\sqrt{3}}$	11. 95 (69. 56) 11. 60 (67. 51)
BRET Model-X	κ <sub>ο</sub> √2	19. 26 18. 70	2	13. 62 (79. 28) 13. 22 (76. 74)

Table 2.2 A suuggested Guide for selection of Model

Hydromet Rankin-Vortex	A = B = 1	0.00< NCR<0.05
Model	A = B = 1.25 (app.)	0.03< NCR<0.08
BRET Models	Fujita (b = 0.5) BRET-X (b = 1)	0. 03< NOR(0. 08 0. 06< NOR(0. 15

Table 2.3 A suggest parameter K for  $\frac{f\mathbf{R}}{U_k}$ 

$\frac{fR}{U_R}$	K Č	$\frac{fR}{U_R}$	K	$\frac{fR}{U_R}$	K <sup>'</sup>	$\frac{fR}{U_R}$	K
0.000	7. 50	0. 065	5. 49	0. 15	4. 50	0. 28	3. 65
0. 005	7. 25	0. 070	5. 42	0. 16	4. 42	0. 29	3. 60
0. 010	7. 05	0. 075	5. 34	0. 17	4. 34	0. 30	3. 55
0. 015	6. 85	0. 080	5. 27	0. 18	4. 28	0. 31	3. 50
0. 020	6. 70	0. 085	5. 20	0. 19	4. 18	0. 32	3. 45
0. 025	6. 55	0. 090	5. 13	0. 20	4. 10	0. 33	3. 40
0. 030	6. 40	0. 095	5. 06	0. 21	4. 03	0. 34	3. 35
0. 035	6. 25	0. 100	5. 00	0. 22	3. 97	0. 35	3. 30
0. 040	6. 10	0. 110	4. 88	0. 23	3. 91	0. 36	3. 26
0. 045	5. 95	0. 120	4. 76	0. 24	3. 85	0. 37	3. 23
0. 050	5. 80	0. 130	4. 66	0. 25	3. 80	0. 38	3. 20
0. 055	5. 70	0. 140	4. 57	0. 26	3. 75	0. 39	3. 17
0. 060	5. 60	0. 150	4. 50	0. 27	3. 70	0. 40	3. 15

#### 5

## Equations for Prediction of Hurricane Wind Fields

With the given parameters, latitude,  $R_c$ ,  $P_o$ ,  $P_n$ , and  $V_f$  the forward speed of the translation of the hurricane, the prediction equation for maximum wind speed in hurricane is derived as follows. The first part of right-hand side is for stationary hurricane and the second for additional term for moving hurricane.

$$V_{max} = (A \sqrt{\triangle P_o} - \sqrt{\triangle P_o^*} + 77.66) + \frac{1}{2} - \frac{A}{K} (V_f - fR_g - 6 \pm 5) + \cdots (2.3)$$
where

 $A = 0.20994102 P_n-197.14532507$ 

 $\triangle P_o =$  the central pressure reduction from normal in inches of mercury,  $P_n - P_0$ 

 $\triangle P_o^* = 0.08723763 \text{ P}_n-81.66318854 \sqrt{mbs},$  K = constant depending on the choiceof model as shown in Table 2.1,

 $V_{i}$  = forward speed of hurricane (knots),

 $f = \text{coriolis parameter}, 0.525 \sin \phi,$  $\phi = 1 \text{ atitude},$ 

 $R_{a}$  = radius of maximum gradient wind.

The first part of the right hand side of Equation 2.3 is based on the analysis of published data from 319 Western Pacific Cyclones from 1971 to 1982 found in the corresponding Mariners Weather Log (1972-1983) and the second part is based on the analysis of 122 U.S. East Coast and Gulf Coast, where  $6\pm 5$  knots are the mean of the values and standard deviation respectively of  $V_TfR_s$ 

Bretschneider (1982) recommended to use the following equation for the determination of most probable radius of maximum gradient wind.

$$R_{\varepsilon} = R^* + \alpha V_{f^-} K_1 B + K_2 C_1 \cdots (2.4)$$
  
where.

 $R^*$  = average value of  $R_s$  from data (n. miles), 18 n. miles,

 $\alpha = 0.72$  (model case = 0.7, worst case = 1.0),

 $B = \tanh\{3.17(\sin 35^{\circ} - \sin \phi)\},$ 

 $C = \triangle P_o e^{-\frac{\pi}{4} (\triangle P_o)^2}$ 

 $K_1 = 22.0$ ,

 $K_2 = 6.0.$ 

The non-dimensional stationary hurricane wind field by the balance of the pressure gradent, Coriolis, and centrifugal forces of the equation of motion is given in the form of ratio between wind speed at radial distances r and R from the hurricane center.

$$\frac{U_{r}}{U_{R}} = -\frac{1fRr}{2U_{R}R} + \sqrt{\left(1 + \frac{fR}{U_{R}}\right)\frac{R}{r}e^{\left(1 - \frac{R}{r}\right)} + \left(\frac{1}{2}\frac{fR}{U_{R}}\frac{r}{R}\right)^{2}},$$
.....(2.5)

where the geostrophic wind speed  $U_R$  and the maximum sustained 10-minute wind speed at the 10-meter reference level  $U_{RS}$  are given by

 $U_R(\text{knots}) = K\sqrt{\triangle P_o} - \frac{1}{2}fR$ , .....(2.6) where,

K = constant varies with latitude from 67 at  $20^{\circ} \sim 25^{\circ}$  Lat. to 63 at 45° Lat. (Bretschneider, 1972),

 $U_{RS} = k^* U_r \text{ (knots)}$ 

 $k^* = 0.865$  (Graham and Nunn, 1959).

For a moving hurricane, the stationary wind field is directly coupled with the corresponding model hurricane wave field and the change in the wind speed component to be corrected as

$$U^*_{RS} = U_{RS} + dU, \cdots (2.7)$$

where dU equals to  $\frac{1}{2}V_f\cos\theta$  and  $\theta$  the angle of wind deflected from the direction of the incurvature angle of the wind speed.

## Equations for Prediction of Hurricane Wave Fields

In general, the wave forecasting or hindcasting can be done either the significant wave method or the wave spectrum mothod. These methods are dedicated by Bretschneider, Burling. Hasselmann (JONSWAP), James. Moskowitz, Montogmery, Munk, Neumann. Pierson, Rossby, Silvester. Sverdrup, Wilson and so on. For this study, the recent Bretschneider's wave forecasting relationships for constant wind speed and direction, developed sea, and deep water will be used. The significant wave height  $H_s$ and significant wave period  $H_s$  are function of wind speed U, fetch length  $F_{i}$  and wind duration t by use of the  $\cdot$ Buckingham's PHI-theory (1914) and the dimensional analysis as follows

$$\frac{gH_s}{U^2} = A_1 \tanh \left\{ B_1 \left( \frac{gF}{U^2} \right)^{m_1} \right\}, \quad \dots (2.8)$$

$$-\frac{gT_s}{2\pi U} = A_2 \tanh \left\{ B_2 \left( \frac{gF}{U^2} \right)^{m_2} \right\}, \quad \dots (2.9)$$

$$t_{min} = 2 \int_{0}^{F_{min}} \frac{1}{C_0} dx, \quad \dots (2.10)$$

where.

$$A_1 = 0.283$$
,  $B_2 = 0.0125$ ,  $m_1 = 0.42$ ,  $A_3 = 1.200$ ,  $B_2 = 0.0770$ ,  $m_2 = 0.25$ ,

U= 10-minute average surface wind speed at 10-meter above the water level.

 $C_0$  = wave celerity in deep water. The parameters and constants are based on foot scale.

The model wave height field for stationary hurricane developed by Bretschneider (1972) shows

 $H_c = H_R \left(1 + \frac{1}{2} \frac{V_f \cos \theta}{U_{Rs}}\right)^2$ , .....(2.12) where,  $\theta$  is an angle between the direction of wind and the forward moving direction of hurricane. The model wave period field can be derived as follows after eliminating fetch term F, using the above coefficients and expressing U in knots and g as 32.2  $ft/sec^2$ .

$$T_R = 0.4 U_{Rs} \tanh \left\{ 1.07 \left( \tanh^{-1} 40 \frac{H_R}{U_{Rs}^2} \right)^{0.6} \right\}.$$

Modified significant wave period for moving hurricane shows

$$T_c = T_R \left(1 + \frac{1}{2} \frac{V_f \cos \theta}{U_{Rs}}\right)^2 \cdots (2.14)$$

and the forward speed can vary from  $V_f=0$  to  $V_f=C_s=1.515\,T_c$ , where  $C_s$  is the group velocity of the significant waves. The upper limit of  $V_f=C_s=20$  to 25 knots (Bretschneider, 1986) after the hurricane

moves faster than the waves it has generated, producing very confused seas, and the results might be in doubt. Thus, for calculation by a computer program in this study it is assumed that the forward speed  $V_f = C_f \leq V_{C_s}$  the critical forward speed.

All these calculations for significant typhoons passed by the Korean Peninsula since 1947 were done by the IBM PS/2 386 (20MHz) in order to predict the 100-year typhoon characteristics and results will be discussed later.

## Calculation of the 100-Year Design Wave Parameters

## 3.1. Description of Study Area

Youngil Bay is located at southern part of the east coast of Korean peninsula (36°-03'N, 129°-23'E) and has about 10Km width of bay entrance, an open northeastly to the East Sea (Japan Sea) and 15km length and a concaved form southwestly as shown in Figure 3.1. Inside the bay, there are two harbors, Pohang Old Harbor and Pohang New Harbor. There is a river between these two harbors. This bay includes not only the industrial complex such as the Pohang Steel Company and its sub-industrial companies which are the vital part of the heavy-chemical industry development of Korea but also Songdo Beach which gives a rest place for the civilians and a resort area for the tourists.

The depth is abruptly decreasing from the open sea to the bay. The average depth of the bay is 21m and the distribution of the contour lines is similar to the shape of the bay. Bottom profile at the cross-section A-A' shows Figure The bottom profile had been 3. 2. changed significantly year by year and is still changing due to the dredging work in connection with the construction of a new harbor to assist the industrial complex. Moreover, since 1970 the site has frequently been exposed to beach erosion and damages on the shore structures from severe storms.

#### 3.2. Calculation of Typhoon Parameters

In order to calculate typhoon parmeters typhoon data were collected in three steps:

- a) all typhoons which were within 325 n. miles (CPTT; the Closest Point of Typhoon Track) from the study site between 1961 and 1985 were collected to calculate  $V_C$  and  $R_C$  with models decided by Rankin-Vortex Number ( $N_{CR}$ ) as described in Chapter 2,
- b) pressure  $(P_0)$ , latitude  $(\phi)$ , forward speed  $(V_0)$  and maximum wind  $(V_{OMAX})$  were collected at locations which the closest point to the study area keeping the typhoon intensity, within 350 n. miles (CPTI; the Closest Point of Typhoon Intensity).
- c) to get the worst situation from the data recorded, it is assumed that the typhoon intensity continues to CPTT.

Figures 3. 3 and 3. 4 show the steps a) and b) and the distribution of typhoons is shown in Figure 3. 5. Calculation was performed with the computer program developed and the result shows the relationship between  $H_{\rm S}$  and  $T_{\rm S}$  for the stationary and moving cases in Figure 3. 6. The 100-year design typhoon wave height was predicted from the typhoon data within 110 n. miles of CPTT.

There are several distributions to calculate a return period such as normal, log-normal, Weibull and Gumbel. Gumbel's first asymptotic distribution has been used extensively to forecast the extreme values of certain environmental parameters. Gumbel's first asymptotic distribution is used to determine the return period for this study.

The result of calculation is shown in Figure 3.7. The line of best fit for Gum-bel's distribution by least square method shows

 $H_{\rm S} = 2.405 \, \rm Y + 23.890$ 

Variance of Fit=11.2581,  $\cdots$  (3.1) where,  $Y=-ln\{-ln\,P(H_s \leq h)\}$  and  $P(H_s \leq h)$  is the cumulative probability of being the yearly maximum based on 13 observations in 23 years. As shown in Figure 3.6, typhoon Brenda which has 35.32 ft of significant wave height is close to the 100-year return period typhoon. Thus, all parameters of Brenda are used for the prediction of the 100-year design typhoon wave.

The observed pressure profile data of

typhoon Brenda from the National Weather Service Forecast Office, Honolulu, Hawaii was introduced to draw the pressure profile  $\frac{dP}{dr}$  and  $\frac{dP}{dr}$  profile. The data profiles and the model profiles with Bret-X model are compared in Figure 3.8.  $R_c$  by the Bret-X model is 35.09 n. miles and the observed  $R_c$  is 37.5 n. miles.

The predicted wind, wave height, and wave period fields for the typhoon Brenda from the computer model are shown in Figures 3.9 through 3.11. Figures 3.12 through 3.14 show the cross sectional views at some distance from the typhoon center.

## Analysis of S. S. M. O. and Hogben Lumb's Wave Data

Two sources of wave data were used in this analysis. They were the U.S. Weather Service, "Synoptic Summary of Meteorolgical Observation (S.S.M.O.)", Vol. 9, Area 29 and Hogben and Lumb's "Climatological and Oceanographical Atlas for Mariners", Vol. II, Area 13, 1961. The observed wave height data near the study site (S.S.M.O.; 2745 observations, Hogben & Lumb; 2934 observations for 8 years) were collected. The data were analyzed in terms of all seasonss and all directions.

With some calculations the significant wave height in feet, occurrence per year were derived and plot of this shows

q

Figure 3.15. By Gumbel's first asymptotic distribution the 100-year return wave hight of both data shows Figure 3.16 and the line of best fit for Gumbel's distribution by least square method shows

$$H_S = 2.947Y + 18.010$$

Variance of Fit=84, 3808,  $\cdots$  (3.2)

These are lower than the 100-year design typhoon wave because these data were based upon the observations made by ships in passage and such ships tended to avoid the bad weather when it was possible. Thus, from now on, throughout this study, Typhoon Brenda as an example of the 100-year design typhoon will be used to calculate the design parameters.

## Calculation of Total Design Water Depth

The total design storm water depth at the design area can be determined from the following equation

 $D_t = D_{MLLW} + A_s + S_p + S_x + S_y + S_w \cdots (4.1)$  where,

 $D_t$ =total water depth,

 $D_{MLLW}$ =mean lower water level (MLLW)

A=astronomical tidal range.

 $S_p$ =pressure tide,  $S_p$ =1.12 $R\triangle P$  and R, the response factor,

 $\triangle P$ =atmospheric pressure reduction from normal, in inches of mercury,

 $S_{\star}$ =wind tide (direct wind stress tide),

 $S_{\nu}$ =wind tide (Coriolis tide)

 $S_{w}$ =wave set up.

The factor 1.14 converts in. of mercury into ft. of water and other parameters are in ft. Without various assumptions the above equation can't be solved by linear addition because of a time dependency. Some of the terms coupled with second-order effects that most have with the other terms in shallow water.

## Depth at MLLW $(D_{MLLW})$

We assume that the location of a shore structure at the Youngil Bay is at 5m water depth in reference to a MLLW datum and 300m away from the beach through the investigation of charts.

#### Astronomical Tide (A<sub>s</sub>)

The tidal tables which are published annually by the National Ocean Survey and the Hydrographic Office of Korea are showing that 8.6cm of a mean tidal range and 10.4cm of a spring of tidal range occur at Youngil Bay. Compared with those of the west coast of Korea, these are very low. The 10.4cm of astronomical tide will be used in the design water level computation.

## Pressure Tide $(S_P)$

A general rise in water level caused by atmospheric pressure reduction from normal, due to the typhoon system in this syudy, can be obtained by

$$S_p = 1.14R \triangle P(1 - e^{-\frac{r}{R_c}}), \dots (4.2)$$

where r is 45 n. miles and  $R_c$  is 35.09 n. miles.

In case of the typhoon is moving at a forward speed  $V_{\ell}$ , and for a completely undamped system, the response factor R takes on the following form

$$R = -\frac{gh}{(V^2_f - g\triangle h)} \cdots (4.3)$$

The elevation becomes very great and there is a resonace. But the frictional and damping factors will prevent a complete free resonance. Thus,

$$S_P = 1.14(1)(1-e^{-1.28}) = 0.4 ft (12.19 cm).$$

From the computer simulation for typhoon Brenda this can be derived.

Wind Setup 
$$(S=S_x+S_y)$$

The rise in water level caused by the wind stress component directed perpendicular to the coast, wind tide  $S_{z_0}$  is a function of wind speed, direction and water depth.

The most significant wind direction at Youngil Bay is WSW which is 51.7% of al wind directions. The next one is NNE direction. N, NNE and NE directions are 23.1% and the rest. 25.2%. Among the wind directions over 10m/sec of wind speed, NNE wind is 40.2% of all directions and N, NNE and NE winds, 67.8%. whereas W, WSW and SW winds are only 25.3%.

The rise (or drawdown) of water level due to the wind stress component parallel to the coast. Coriolis tide  $S_{y}$  caused by a current following parallel to the coastline.  $S_{y}$  can exist in the absence of any wind when a hurricane has no wind.

With the assumption for bathystrophic approximation, quasi-steady state (nearly constant wind speed) and constant bottom slope, the following equations for  $S_{x}$  and  $S_{y}$  developed by bretschneider (1967) are applicable to determine the wind setup near the coastline.

$$S_x = kU^2 \frac{\cos \theta'}{g} G_o, \dots (4.4)$$
  
 $S_y = \frac{6}{7} \frac{fUF}{g} \sqrt{\frac{k}{K' \sin \theta'}} D_o^{\frac{1}{6}}, \dots (4.5)$ 

where.

$$G_o = \frac{F}{D_o - (D_c + S)} \ln \left( \frac{D_o}{D_c + S} \right),$$

k = surface wind stress parameter, $3.0 \times 10^{-6} (\text{Saville})$ 

K=bottom friction parameter, 10  $^{\circ}$  (shallow water),

 $\theta^{i}$  =direction of wind, angle from the line perpendicular to the coast,

S=total wind setup,

 $D_0$ =breakoff end of the slope at the edge of the continental shelf,

 $D_c$ =depth at the coast.

 $G_0$  is solved as a function of fetch distance offshore, corresponding water depth, and an arbitrary water depth near the shoreline. Based on the bottom profile as Figure 3.2, it was assumed that  $D_0+S=1.5m$ . computation of  $G_0$  shows Figure 4.1 and a maximum  $G_0$  of 0.232(n. miles/ft) was determined at a distance offshore of 13n. miles corresponding to a water depth  $D_0$  of 66m (216.5ft).

Computer program uses above equations for  $S_x$  and  $S_y$  to calculate the

11

wind setup (S). However, we can use modified equations

$$S_x = 6080 \frac{k}{g} \frac{U^2}{30} \cos \theta G_o$$
$$= 1.456 \frac{U^2}{30} \cos \theta G_o$$

and

$$S_{y} = 0.05490 \frac{U}{30} \sin \phi \ D_{o}^{\frac{1}{8}} \sqrt{\sin \theta}$$

$$= \pm 0.1940 \frac{U}{30} \sqrt{\sin \theta}, \ at \ \phi = 36.0^{\circ}N$$

$$= \pm 0.1719 \frac{U}{30} \sqrt{\sin \theta}, \ at \ \phi = 31.4^{\circ}N.$$

The value of  $S_{\nu}$  differed slightly for two different latitudes and the value for 31.4°N was chosen to calculate wind setup. Calculated manimum wind setups by the computer at 45n miles of CPTT for Brenda are 41.64cm for  $S_{\nu}$  and -7.96cm for  $S_{\nu}$ 

## Wave Setup (Sw)

As deep water waves encounter a sloping shelf, they become short, steep and finally break, while travel forward after breaking. The increase in the mean stil water near the beach due to the effect of breaking waves is known as wave setup. The computer simulation shows the maximum wave setup at the study srea as 137.16cm (4.5ft) as shown in Figure 4.2.

Summary of Total Design Water Depth  $(D_t)$ 

Again the resultant total design water depth is

$$D_t = D_{MLLW} + A_s + S_p + S_x + S_y + S_w;$$

$$= 5. \ 0000 + 0. \ 1040 + 0. \ 1219 + 0. \ 4164$$

$$- 0. \ 0796 + 1. \ 3716 \approx 6. \ 93m.$$

Figure 4.3 shows the observed sea surface fluctuation during the passage of typhoon Brenda. The mean tide level at Youngil Bay is 12.0cm from the datum level. On October 6, the maximum storm surge was recorded with 32.0cm from the mean tide level. If this was recorded at the ebb tide, the maximum will be 42.4cm. This value is very close to the value of the predicted storm surge, 45.1cm. Table 4.1 shows an example of the calculation of the storm surge.

## 5. Summary and Discussions

Various typhoon data since 1961 for the study site were collected and analyzed with some criteria. Derived parmeters were introduced into calculation of total design water depth. The method used in this study for determination of typhoon parameters is limited to a hurricane or typhoon intensity whose moving speed equals to or less than its critical forward speed. Thus, those typhoons faster than this limit need further study.

Storm surge inside the Youngil Bay will be higher than the calculation because of the concaved shape of the bay and the seiche motion.

This study gives the methods for calculating typhoon winds, waves and total design water depth. In order to create a final and optimum design, more study on the environmental condition such as the current and near shore littoral process supported by the hydraulic

model experiment, and a rigorous economic analysis should be followed. Moreover, we need steps for shallow water design wave and wave run up calculations. This is beyond the scope of this study and this will be followed by the next paper.

## REFERENCES

- Bretschneider, C. L., "Storm Surges," Advances in Hydroscience, Vol. 4, Academic Press Inc., N. Y., 1967.
- 2) Bretschneider, C. L., "Revisions to Hurricane Design Wave Practices," Proceedings of Coastal Engineering Conference, Vancouver B. C., Ch. 7, 1972, pp. 167–195.
- 3) Bretschneider, C.L., Cherry, J.M., et al., "Opertational Sea State and Design Wave Criteria for Ocean Thermal Energy Conversion Projects, Vol. 2, Prediction Techniques," U.S. Department of Energy SAN-235P13-39 (Vol. 2), March 1977.
- 4) Bretschneider, C. L. and Lo, J. M., "A Rankin Vortex Number as a Guide to the Selection of a Model Hurricane," 19th Coastal Engineering Conference Proceedings, Houston, Texas, 1984, pp. 147-161.
- 5) Chin, P.C., "Tropical Cyclone Climatology for the China Seas and Western Pacific from 1884 to 1970," Hong Kong Royal Observatory, 1972.
- 6) Chu, K.S., "The Seiches at Pohang

- Harbor," The Journal of the Oceanological Society of Korea, Vol. 11. No. 2. December 1976, pp. 51-56.
- 7) Gopalakrishnan, T.C., Tung, C.C., and Wei, J.S., "Evaluation of the Extent of Hurricane-Induced Flooding on Coastal Urban Areas in North Carolina." UNC Sea Grant College Publication UNC-SG-WP-84-2, September 1983.
- 8) Hogben, N. and Lumb, F.E., "Ocean Wave Statistics: A Statiatical Survey of Wave Characteristcs Estimated usually from Voluntary Observing ships Sailing along the Shipping Routes of the World," Ministry of Technology, National Physical Laboratory, 1967.
- 9) Hydrographic office, Republic of Korea, Techinical Reports Pub. No. 1101–1970. 1972.
- 10) Jelesnianski, C.P.,

  "SPLASH-Special Program to List
  Amplitudes of Surges from Hurricanes:
  I. Landfall Storms," NOAA Technical
  Memorandum, NWS TDL-46, National
  Weather Service, National Oceanic and
  Atmospheric Administration, U.S.
  Department of Commerce, Washington,
  D.C., 1972.
- 11) Jelesnianski, C. P.,

  "SPLASH-Special Program to List
  Amplitudes of Surges from Hurricanes;
  II. General Track and Variant Storm
  Conditions," NOAA Technical Memorandum, NWS TDL-52, National
  Weather Service, National Oceanic and
  Atmospheric Administration, U.S.
  Department of Commerce, Washington,

- D. C., 1974.
- 12) Lau, R., "Evaluating Peak Storm Surge Heights and High Sea Levels from SPLASH Outputs," Hong Kong Royal Observatory, 1980.
- 13) Lau, R., "Storm Surge Investigations and the Use of Vertically Integrated Hydrodynamic Models," Hong Kong Royal Observatory, 1980.
- 14) NOAA, NESDIS, and NODC, "Mariners Weather Log," Washington, D. C., 1970-1986.

- 15) U.S. Army Corps of Engineers, Waterways Experiment Station, "Shore Protection Manual," Vickburg, Vol. I, 1984.
- 16) U.S. Naval Weather Service, "Summary of Synoptic Meteorological Observations; Japanese and Korean Coastal Marine Areas," U.S. Government Printing Offece, Vol. 9, Area 26, 1973.

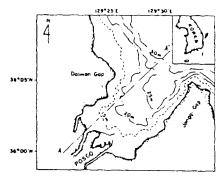


Figure 3.1 Location of the Study Site and Depth Profile

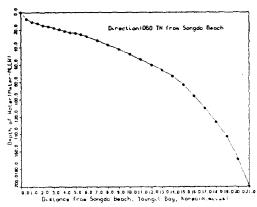


Figure 3.2 Bottom Profile in and Out of Youngil Bay, Korea

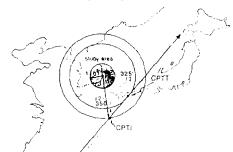


Figure 3.3 Typhoon Data Collection from 1961 to 1985

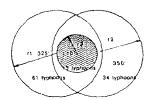


Figure 3.4 Selection of Typhoons to Calculate the Return Period

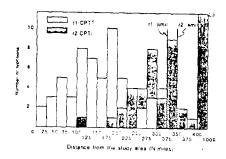


Figure 3.5 Distribution of 61 Typhoons

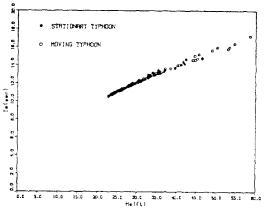


Figure 3.6 Relationship between  $\rm H_{S}$  and  $\rm T_{S}$  for Stationary Case and Moving Case

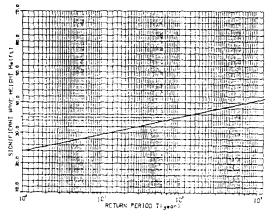


Figure 3.7 Plot of the Significant Wave Height versus Return Period from Analysis of Typhoon Data

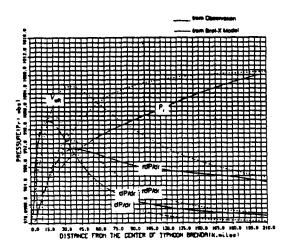


Figure 3.8 Plot of Typhoon Brenda (1985) Parameters from Observation and Bret-X Model

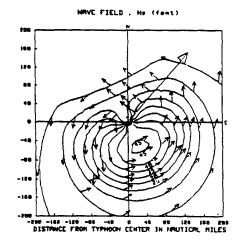


Figure 3.10 Calculated Wave Height Field for Typhoon Brenda

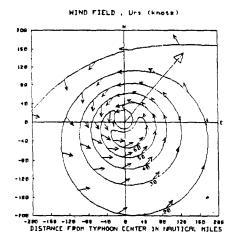


Figure 3.9 Calculated Wind Field for Typhoon Brenda

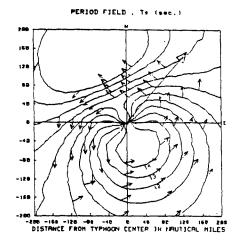


Figure 3.11 Calculated Wave Period Field for Typhoon Brenda

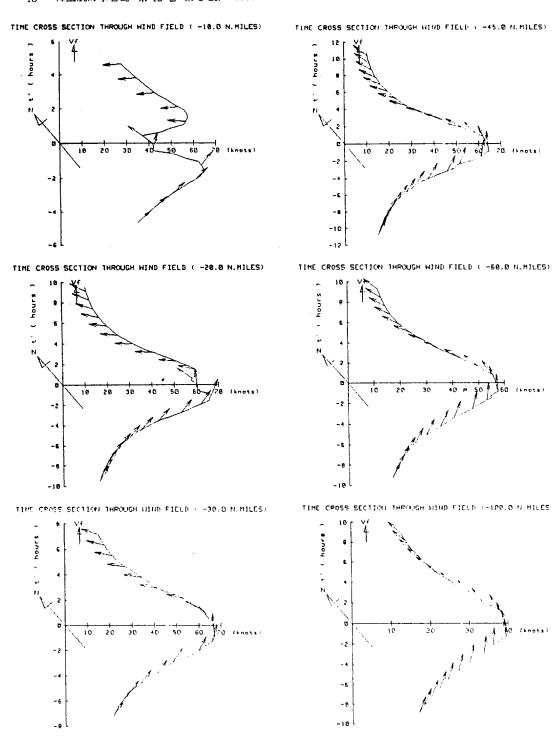


Figure 3,12 Time Cross Sections through the wind Field

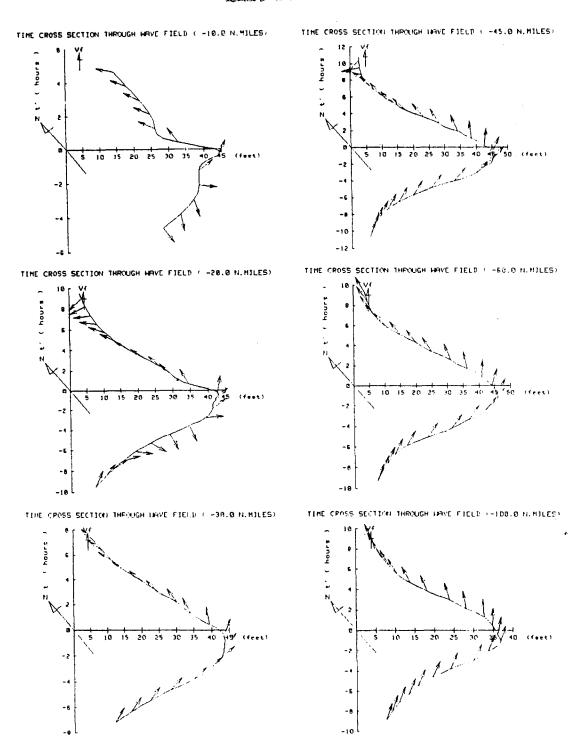


Figure 3.13 Time Cross Sections through the wave Height Field

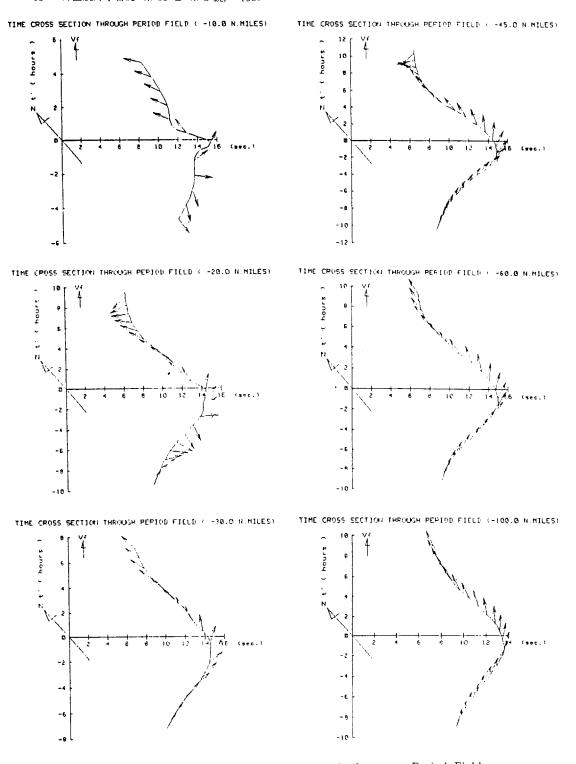


Figure 3.14 Time Cross Sections through the wave Period Field



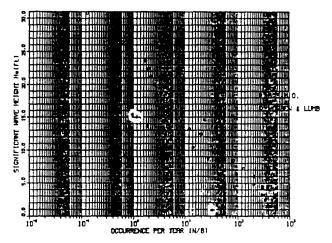


Figure 3.15 Occurrence per Year versus Significant Wave Height from S.S.M.O. and Hogben & Lumb's Data

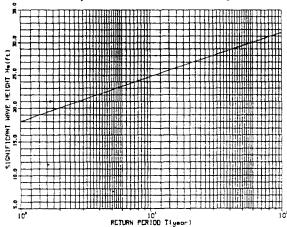


Figure 3.16 Plot of the Significant Wave Height Versus Return Period from S.S.M.O. and Hogben & Lumb's Data

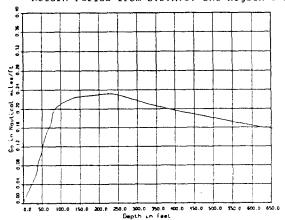
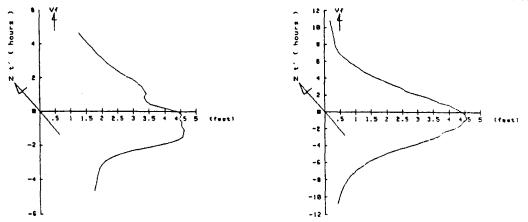
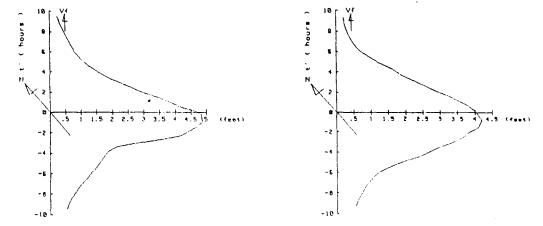


Figure 4.1 Plot of G<sub>0</sub> vr. sus D<sub>0</sub> for the Traverse A-A' of Youngil Bay, Korea

TIME CROSS SECTION THROUGH MAVE SET-UP FIELD ( -18.8 N.MILES TIME CROSS SECTION THROUGH MAVE SET-UP FIELD ( -45.8 N.MILES



TIME CROSS SECTION THROUGH HAVE SET-UP FIELD ( -20.8 N.HILES TIME CROSS SECTION THROUGH HAVE SET-UP FIELD ( -60.8 N.HILES



TIME CROSS SECTION THROUGH MAYE SET-UP FIELD ( -30.8 N.MILES TIME CROSS SECTION THROUGH MAYE SET-UP FIELD (-100.8 N.MILES

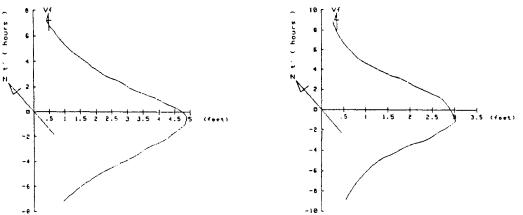


Figure 4.2 Time Cross Sections through the Wave Setup Field

Table 4.1 Storm Surge Calculation

TYPHOON : BRENDA

Lat. = 31.4 deg.; Rc= 35.09 n.mi.; Po= 33.3 mbs; Vf= 23.68 knts; Dir. = 40 deg.

N.R.   N.   N.   Pt.   Pt.   Bb   Pt.   Sp   Sx   Sy			•							
N.H.   HOURS   PHOTS   DEG   DEG   PHO   FEET   F	U		He e	Ru	Bb.	Pr	Sp	5.x	\$y	
165.0   -6.969   22.1   25.0   249.7   29.866   .045   .183   .026   .160.0   -6.757   22.8   252.2   250.4   29.876   .047   .196   .023   .150.0   -6.123   .52.2   .250.4   29.876   .047   .196   .023   .150.0   -6.123   .52.2   .250.4   .252.8   .250.8   .047   .196   .023   .150.0   .6123   .52.2   .250.4   .252.8   .250.8   .259   .019   .145.0   -6.123   .52.2   .252.8   .252.8   .252.8   .066   .273   .066   .233   .067   .066   .235   .015   .								FEET		
-150.0 - 6.757 22.8 250.2 250.4 29.876 .047 .196 .023 .155.0 - 6.546 23.6 252.4 251.3 29.876 .050 .209 .019 .159.0 -6.334 24.4 252.6 252.1 29.873 .055 .209 .019 .159.1 -150.0 -6.123 252.2 250.4 29.870 .056 .239 .013 .145.0 -6.123 252.2 250.4 29.867 .060 .2561818 .135.0 -5.912 26.1 252.8 253.6 29.867 .060 .256818 .135.0 -5.701 27.6 252.8 253.4 29.864 .064 .274026 .135.0 -5.701 27.6 252.8 253.4 29.864 .064 .274026 .135.0 -5.490 26.0 252.8 255.1 29.866 .060 .294032 .135.0 -5.490 26.0 252.7 255.8 29.856 .072 .316 .033 .157 .083 .157 .157 .157 .157 .157 .157 .157 .157	н.п.	HUUKS	KHUTS	PEG	DEG				_	
-150.0 - 6.757 22.8 250.2 250.4 29.876 .047 .196 .023 .155.0 - 6.546 23.6 252.4 251.3 29.876 .050 .209 .019 .159.0 -6.334 24.4 252.6 252.1 29.873 .055 .209 .019 .159.1 -150.0 -6.123 252.2 250.4 29.870 .056 .239 .013 .145.0 -6.123 252.2 250.4 29.867 .060 .2561818 .135.0 -5.912 26.1 252.8 253.6 29.867 .060 .256818 .135.0 -5.701 27.6 252.8 253.4 29.864 .064 .274026 .135.0 -5.701 27.6 252.8 253.4 29.864 .064 .274026 .135.0 -5.490 26.0 252.8 255.1 29.866 .060 .294032 .135.0 -5.490 26.0 252.7 255.8 29.856 .072 .316 .033 .157 .083 .157 .157 .157 .157 .157 .157 .157 .157	-165.0	-6.968	22.1	252.8	249.7	29.888	.045	. 183	.026	
-155.0 - 6.546 23.6 252.4 251.3 29.876										
-158.0 -6.334 24.4 252.6 252.1 29.873 .655 .223 .087 .086 .239087 .148.0 -5.912 26.1 252.8 253.6 29.867 .066 .236 -088 .294082 .138.0 -5.912 26.1 252.8 253.6 29.867 .066 .256018 .138.0 -5.701 27.6 252.8 253.6 29.867 .066 .256018 .138.0 -5.490 28.0 252.7 252.4 29.866 .068 .294032 .138.0 -5.490 28.0 252.7 255.8 29.866 .068 .294032 .138.0 -5.490 28.0 252.7 255.8 29.856 .068 .294033 .158.0 -125.0 -5.668 .30.1 252.6 256.4 29.851 .077 .339044 .159.0 -159.0 -6.608 .294032 .159.0 -6.608 .294032 .159.0 -6.608 .294032 .159.0 -6.608 .294 .159.0 -6.608 .159.0 -6.608 .294033 .159.0 -6.608 .159.0 -6.608 .294032 .159.0 -6.608 .159.0 -6.608 .294032 .159.0 -6.608 .159.0 -6.608 .294 .159.0 -6.608 .159.0 -6.608 .294 .159.0 -6.608 .159.0 -6										
-145.0 -6.123 25.2 252.6 252.6 29.806 .056 .239007 .006 .256018 .148.0 -5.701 27.0 252.6 253.6 29.8067 .006 .255018 .135.0 -5.701 27.0 252.0 254.4 29.864 .004 .274025 .130.0 -5.490 28.0 252.0 254.4 29.866 .006 .294032 .125.0 -5.279 29.0 .252.7 255.0 29.856 .002 .316032 .126.0 -5.279 29.0 .252.7 255.0 29.856 .002 .316032 .115.0 -6.868 .301. 252.6 .256.4 29.856 .072 .316033 .115.0 -4.856 .31.2 .252.4 .257.0 29.847 .083 .365051 .115.0 -4.856 .31.2 .252.4 .257.0 29.847 .083 .365051 .116.0 -4.843 .33.9 .251.8 .258.4 .29.835 .006 .427 .0866 .100.0 -4.223 .54.2 .251.4 .259.2 .29.829 .103 .467 .0875 .096 .990.0 -3.0801 .39.2 .250.4 .29.829 .103 .467 .0875 .096 .990.0 -3.0801 .39.2 .250.4 .259.2 .29.829 .103 .467 .0875 .0866 .092 .398 .111 .513 .0866 .096.0 -3.398 .43.5 .248.8 .263.4 .29.795 .111 .513 .0866 .127 .096 .096.0 -3.398 .43.5 .248.8 .263.4 .29.795 .111 .513 .0866 .127 .096 .096.0 -3.398 .43.5 .248.8 .263.4 .29.795 .1131 .626 .1115 .0866 .127 .115 .096 .096 .096 .106.0 -3.598 .41.3 .248.8 .263.4 .29.795 .1154 .706 .1158 .096 .1158 .096 .125 .1158 .096 .										
-140.0 - 5.912 26.1 252.8 253.6 29.867										
	-145.0	-6.123	25.2	252.4	252.8			.239		
-139.6 -5.791 27.6 252.8 254.4 29.864 .864 .274026 .130.6 -5.490 28.6 252.8 255.1 29.866 .866 .272 .316038 .126.6 -5.279 29.6 252.7 255.8 29.856 .872 .316038 .126.6 .274 .856 .872 .339044 .115.6 -4.856 .31.2 252.4 257.6 29.875 .877 .339044 .115.6 -4.856 .31.2 252.4 257.6 29.847 .883 .365051 .116.6 -4.434 .33.9 251.8 256.4 29.835 .896 .427 .066 .185.6 -4.434 .33.9 251.8 256.4 29.835 .896 .427 .066 .427 .066 .185.6 -4.434 .33.9 251.8 256.4 29.835 .896 .427 .066 .427 .066 .990.0 -3.801 .39.2 .250.4 .261.4 29.825 .898 .467 .875 .990.0 -3.598 .41.3 .249.7 .262.5 29.821 .111 .513 .086 .900.0 .358 .41.3 .249.7 .262.5 29.804 .131 .626 .7111 .890.0 -4.556 .425 .425 .425 .425 .425 .425 .425 .425	-140.0	-5.912		252.8	253.6	29.867	.060	. 256	018	
-138.0 - 5.496							.064	.274	026	
-128.0 - 5. 279										
-128. 8 - 5. 068										
-118.0 -4.649 32.5 252.1 257.7 29.841 .099 .394058 -108.0 -4.23 35.4 251.4 259.2 29.829 .103 .467066 -108.0 -4.223 35.4 251.4 259.2 29.829 .103 .467075 -95.0 -4.012 37.2 250.9 269.2 29.829 .103 .467075 -99.0 -3.801 39.2 250.4 261.4 29.813 .120 .557098 .65.0 -3.598 41.3 249.7 262.5 29.804 .131 .626111 .626111 .626 .757 .086 .980 .980 .980 .980 .980 .980 .980 .980										
	-115.0	-4.856								
	-110.0	-4.645	32.5	252.1	257.7	29.841	.099			
	-185.0	-4.434	33.9	251.8	258.4	29.835	.096		066	
-99.0 -4.012 37.2 250.9 260.2 29.821 .111 .513086 .99.0 -3.00 139.2 250.4 261.4 29.013 .120 .5670090 .85.0 -3.001 39.2 250.4 261.4 29.013 .120 .5670090 .85.0 -3.590 41.3 249.7 262.5 29.804 .131 .626111 .600 .93.378 43.5 248.8 263.4 29.795 .142 .600 -1.25 .75.0 -3.167 45.6 247.8 263.9 29.784 .154 .751138 .75.0139 .75.02.956 47.5 246.6 264.0 29.772 .160 .800 -1.49 .650 -1.49 .650 .142 .600 .152 .745 49.0 245.1 263.6 29.758 .102 .852165 .650 .0 -2.753 49.9 243.4 262.7 29.743 .200 .892165 .55.0 -2.323 51.2 241.4 262.1 29.727 .218 .921174 .55.0 -2.111 54.0 239.3 262.3 29.710 .236 1.006 .193 .45.0 -1.900 57.0 257.0 262.3 29.691 .259 1.103 .214 .45.0 1.900 57.0 257.0 262.3 29.691 .259 1.103 .214 .45.0 1.200 .259.2 29.650 .305 1.233 .2241 .300 .832 .241 .300 .832 .241 .300 .259.2 29.650 .305 1.233 .2241 .300 .1265 .255 .305 1.233 .2241 .300 .1266 .1250 .255 .256.8 29.671 .256 .305 1.233 .2241 .300 .1266 .1266 .259 .305 1.233 .2241 .300 .1266 .1266 .259 .305 1.233 .2241 .306 .1266 .12				251.4	259.2	29.829	.103	.467	075	
-86.0 -3.598 41.3 249.7 262.5 29.894 -85.0 -3.598 41.3 249.7 262.5 29.894 -86.0 -3.378 43.5 248.8 263.4 29.795 .142 .688125 -75.0 -3.167 45.6 247.8 263.9 29.784 .151 .626111 -80.0 -3.378 43.5 248.8 263.4 29.795 .142 .688125 -75.0 -3.167 45.6 247.8 263.9 29.784 .154 .751138 -76.0 -2.956 47.5 246.6 264.0 29.772 .168 .809148 -65.0 -2.795 49.0 245.1 263.6 29.758 .193 .854158 -65.0 -2.734 49.0 245.1 263.6 29.758 .193 .854158 -55.0 -2.333 51.2 241.4 262.7 29.727 .218 .921174 -55.0 -2.315 .140 .293.9 262.3 29.718 .292 .1.006 .193 -45.0 -1.900 57.0 257.0 267.3 29.691 .259 1.103 .214 -40.0 -1.689 58.9 294.2 266.5 29.651 .259 1.103 .214 -40.0 -1.669 58.9 294.2 266.5 29.651 .259 1.103 .214 -30.0 -1.067 66.1 231.0 255.2 29.650 .305 1.233 .241 -30.0 -1.067 66.7 223.5 254.8 29.608 .352 1.261259 -20.0845 64.7 229.1 248.8 29.509 .374 1.366261 -10.0 -4.22 64.4 209.2 241.2 29.559 .408 1.320266 -10.0 -4.22 64.4 209.2 241.2 29.559 .408 1.320266 -5.0 -211 64.2 203.9 26.8 29.551 .417 1.297 .271 -5.0 .201 64.2 203.9 236.8 29.551 .417 1.297 .271 -5.0 .201 64.9 28.4 18.2 27.4 29.551 .417 1.297 .271 -5.0 .201 64.9 29.8 29.5 351 .417 1.297 .271 -5.0 .201 64.9 20.4 182.2 218.0 29.559 .408 1.227271 -5.0 .201 64.9 20.4 182.2 218.0 29.559 .408 1.227271 -5.0 .201 64.9 20.4 182.2 218.0 29.559 .408 1.227271 -5.0 .201 64.9 20.4 182.2 218.0 29.559 .408 1.227271 -5.0 .201 64.9 20.4 182.2 218.0 29.559 .408 1.227271 -5.0 .201 64.9 3.4 192.8 27.4 29.551 .417 1.294274 -5.0 .201 64.9 20.3 199.5 29.671 .282 .985 .999 .374 1.172272 -25.0 1.056 59.5 172.9 212.8 29.689 .352 1.019273 -35.0 1.267 58.6 168.7 210.2 29.699 .329 .967273 -35.0 1.267 58.6 168.7 210.2 29.699 .359 1.185274 -4.0 1.900 52.3 159.1 1.198.9 29.691 .329 .997271 -25.0 3.167 40.0 148.7 185.7 29.784 .109 .329 .997271 -35.0 3.167 40.0 148.7 185.7 29.784 .109 .329 .997271 -35.0 3.167 40.0 148.7 185.7 29.860 .305 .309 .906 .105 .105 .105 -10.0 4.223 29.5 146.6 175.2 29.855 .096 .306 .104 .109 .109 .109 .109 .109 .109									886	
-85.0 -3.598 41.3 249.7 262.5 29.804 .131 .626 -1111   -80.0 -3.978 43.5 248.8 263.4 29.795 .142 .688 -125   -75.0 -3.167 45.6 247.8 263.9 29.784 .154 .751 -138   -76.0 -2.956 47.5 246.6 247.8 263.9 29.784 .154 .751 -138   -65.0 -2.745 49.0 245.1 263.6 29.758 .193 .854 -158   -66.0 -2.534 49.9 249.4 262.7 29.763 .103 .854 -158   -66.0 -2.534 49.9 249.4 262.7 29.743 .200 .892 -165   -55.0 -2.323 51.2 241.4 262.1 29.727 .218 .921 -174   -55.0 -2.111 54.0 239.3 262.3 29.710 .238 1.006 -193   -40.0 -1.699 55.9 234.2 260.5 29.691 .259 1.103 .214   -40.0 -1.699 55.9 234.2 260.5 29.671 .262 1.165225   -25.0 -1.476 61.1 231.0 259.2 29.691 .259 1.103 .241   -30.0 -1.267 62.3 227.5 258.4 29.629 .329 1.250 .241   -25.0 -1.056 62.7 223.5 254.8 29.690 .351 .231 .241   -25.0 -1.056 62.7 223.5 254.8 29.690 .351 .261 .259   -20.0 -1.845 64.7 219.1 248.8 29.572 .393 1.336 -1.265   -20.0 -1.845 64.7 219.1 248.8 29.579 .374 1.366 -1.265   -10.0 -1.22 64.4 209.2 241.2 29.559 .408 1.320 -1.265   -10.0 -1.22 64.4 209.2 241.2 29.559 .408 1.320 -1.266   -5.0 -211 64.2 203.9 236.8 29.551 .417 1.297 -271   0.0 0.000 63.8 198.4 222.4 29.551 .417 1.297 -271   0.0 0.000 63.8 198.4 222.4 29.551 .417 1.297 -271   0.0 0.000 63.8 198.4 222.4 29.559 .408 1.227 -273   30.0 1.267 58.6 168.7 219.2 218.0 29.559 .374 1.72 -274   10.0 .422 63.0 187.4 222.6 29.559 .393 1.85 -20.7   27.0 1.656 59.5 172.9 212.8 29.608 .352 1.019 -273   30.0 1.267 58.6 168.7 210.2 29.559 .394 1.85 -274   28.0 .945 62.1 177.2 213.0 29.589 .374 1.772 -272   29.0 .945 63.4 161.9 20.9 29.671 .282 .965 .395 .399 -261   30.0 1.267 58.6 168.7 210.2 29.659 .374 1.372 -272   29.0 .945 63.1 177.2 213.0 29.589 .374 1.372 -273   30.0 1.267 58.6 168.7 210.2 29.659 .395 .399 -261   30.0 1.267 58.6 168.7 210.2 29.659 .395 .399 -261   30.0 1.267 58.6 168.7 210.2 29.659 .395 .399 -261   30.0 1.267 58.6 168.7 210.2 29.659 .395 .399 -261   30.0 1.267 58.6 168.7 210.2 29.659 .395 .399 -261   30.0 1.267 58.6 168.7 29.868 .399 .399 .291   30.0 1.267 58.6 168.7 29.868 .399 .399 .291   30.0										
-80.8 -3.178 43.5 248.8 263.4 29.795 .142 .688 -1.125 -775.8 -3.167 45.6 247.8 263.9 29.784 .154 .751 .138 -78.8 -3.167 45.6 247.8 263.9 29.784 .154 .751 .138 -78.8 -2.745 49.0 245.1 263.6 29.758 .183 .854 .158 .899 .149 .158 .158 .158 .158 .158 .158 .158 .158										
-75.0 -3.167 45.6 247.8 263.9 29.784 .154 .751138 .7602.956 47.5 246.6 264.0 29.772 .168 .809 .149 .149 .65.8 -2.745 49.0 245.1 263.6 29.758 .102 .854158 .60.0 -2.534 49.9 243.4 262.7 29.743 .200 .892165 .750.0 -2.111 54.0 23.3 262.3 29.710 .238 1.006 -1.193 .45.0 -1.106 .70.0 25.0 29.671 .259 1.103214 .40.0 -1.609 58.9 234.2 260.5 29.671 .259 1.103214 .40.0 -1.609 58.9 234.2 260.5 29.671 .250 1.105225 .25.0 -1.478 61.1 231.0 259.2 29.659 .305 1.233241 .30.0 -1.267 62.3 227.5 258.4 29.629 .329 1.250256 .25.0 -1.056 62.7 223.5 254.8 29.600 .352 1.261259 .25.0 -1.056 62.7 223.5 254.8 29.600 .352 1.261259 .20.0 -1.267 62.3 227.5 258.4 29.600 .352 1.261259 .20.0 -1.056 62.7 223.5 254.8 29.570 .374 1.366261 .259 .20.0 -1.056 62.7 223.5 254.8 29.570 .374 1.366261 .259 .25.0 -1.00 .36.6 .27 223.2 245.4 29.572 .393 1.336261 .259 .25.0 .20.0 .352 1.261 .259 .25.0 .20.0 .422 64.4 209.2 241.2 29.559 .408 1.320268 .268 .27.1 27.3 245.4 29.572 .393 1.336261 .259 .25.0 .20.1 64.2 203.9 245.8 29.551 .417 1.297271 .20.0 .422 63.8 189.4 232.1 29.559 .408 1.320268 .20.0 .20.0 .422 63.0 187.4 222.6 29.559 .408 1.320268 .20.0 .20.0 .422 63.0 187.4 222.6 29.559 .408 1.320268 .20.0 .20.0 .422 63.0 187.4 222.6 29.559 .408 1.244274 .20.0 .2	-85.0									
-70.0 -2.956 47.5 246.6 264.0 29.772	-80.0	-3.378	43.5	248.8	263.4					
-70.0 -2.956 47.5 246.6 264.0 29.772	-75.0	-3.167	45. <i>6</i>	247.8	263.9	29.784	. 154			
-68.0 -2.745 49.0 245.1 263.6 29.758 .182 .854 -1.158 -68.0 -2.534 49.9 243.4 262.7 29.743 .200 .882 -1.65 -1.55 -2.232 51.2 241.4 262.1 29.727 .218 .921 -1.74 -59.0 -2.111 54.0 29.3 262.3 29.718 .238 1.006 -1.93 -2.14 -40.0 -1.689 58.9 234.2 260.5 29.671 .259 1.103 -2.14 -40.0 -1.689 58.9 234.2 260.5 29.671 .282 1.165 -2.25 -2.50 -1.056 .2.7 223.5 254.8 29.629 .329 1.250 -2.56 -2.50 -1.056 .2.7 223.5 254.8 29.629 .329 1.250 -2.56 -2.50 -1.056 .2.7 223.5 254.8 29.629 .329 1.250 -2.56 -2.50 -2.00 -1.056 .2.7 223.5 254.8 29.629 .329 1.250 -2.56 -2.50 -2.00 -845 .64.7 219.1 248.8 29.550 .374 1.366 -2.61 -1.59 -2.60 -1.056 .2.7 223.5 254.8 29.559 .374 1.366 -2.65 -1.00 -4.22 .64.4 209.2 241.2 29.559 .408 1.320 -2.68 -2.65 -1.0 -4.22 .64.4 209.2 241.2 29.559 .408 1.320 -2.68 -2.65 -1.0 -4.22 .64.4 209.2 241.2 29.559 .408 1.320 -2.68 -2.65 -1.0 -2.11 .64.2 .203.9 .26.8 29.551 .417 1.227 -2.71 .0.0 .000 .38 198.4 .232.1 29.548 .420 1.272 -2.73 .5.0 .211 .63.4 192.8 .27.4 29.551 .417 1.227 -2.71 .0.0 .633 .62.4 182.2 218.0 29.559 .408 1.217 -2.74 .20.0 .845 .62.1 177.2 213.0 29.569 .374 1.172 -2.74 .20.0 .845 .62.1 177.2 213.0 29.569 .374 1.172 -2.74 .20.0 .845 .62.1 177.2 213.0 29.569 .374 1.172 -2.74 .20.0 .845 .62.1 177.2 213.0 29.569 .374 1.172 -2.74 .20.0 .845 .62.1 177.2 213.0 29.569 .374 1.172 -2.74 .20.0 .845 .62.1 177.2 213.0 29.569 .375 1.417 1.227 -2.74 .20.0 .30.6 .42 .63.0 167.4 222.6 .29.559 .408 1.217 -2.74 .20.0 .845 .62.1 177.2 213.0 29.569 .374 1.172 -2.74 .20.0 .30.6 .42 .43 .44 .62 .20.2 .9.560 .305 .399 .261 .40.0 1.689 .54.4 161.9 200.9 29.671 .20.2 .399 1.185 -2.74 .45.0 .			47.5	246.6	264.0	29.772	.168	.809	149	
-60.0 -2.534 49.9 243.4 262.7 29.743 200 .882 -1.65 -55.0 -2.333 51.2 241.4 262.1 29.727 218 .921 -1.74 -55.0 -2.311 54.0 239.3 262.3 29.710 .238 1.006 -1.93 -45.0 -1.900 57.0 257.6 262.3 29.691 .259 1.103 -214 -40.0 -1.689 58.9 244.2 260.5 29.691 .259 1.103 -214 -40.0 -1.689 58.9 244.2 260.5 29.691 .259 1.105225 -35.0 -1.476 61.1 231.0 259.2 29.656 .205 1.233 -241 -30.0 -1.267 62.3 227.5 258.4 29.629 .229 1.250256 -25.0 -1.056 62.7 223.5 254.8 29.600 .352 1.261259 -20.0 -845 64.7 219.1 248.8 29.579 .374 1.366261 -15.0633 64.5 214.3 245.4 29.579 .374 1.366261 -15.0221 64.2 203.9 236.8 29.551 .417 1.297271 -0.0 0.000 63.8 198.4 232.1 29.559 .408 1.320268 -5.0 -2.11 64.2 203.9 236.8 29.551 .417 1.297271 -0.0 0.000 63.8 198.4 232.1 29.548 .420 1.272273 -5.0 0.211 63.4 192.8 227.4 29.551 .417 1.297271 -10.0 .422 63.0 187.4 222.6 29.559 .408 1.217274 -10.0 .633 62.4 182.2 218.0 29.589 .408 1.217274 -10.0 .633 62.4 182.2 218.0 29.589 .408 1.217274 -10.0 .633 62.4 182.2 218.0 29.589 .374 1.172272 -25.0 1.856 59.5 172.9 212.8 29.668 .352 1.919273 -30.0 1.267 58.6 168.7 210.2 29.629 .329 .967273 -30.0 1.267 58.6 168.7 210.2 29.629 .329 .967273 -30.0 1.267 58.6 168.7 210.2 29.629 .329 .967273 -30.0 1.267 43.5 151.2 188.1 29.758 .108 .305 .939261 -45.0 1.990 52.3 159.1 198.9 29.691 .259 .790 .248 -50.0 2.745 43.5 151.2 188.1 29.758 .183 .569187 -75.0 3.167 40.0 148.7 185.7 29.777 .218 .639204 -60.0 2.534 44.6 153.0 191.7 29.777 .218 .639204 -60.0 3.379 37.8 147.9 163.8 29.795 .116 .526187 -75.0 3.167 40.0 148.7 185.7 29.784 .113 .329116 -10.0 4.22 29.5 146.6 173.2 29.895 .096 .261197 -10.0 1.689 54.4 161.9 170.9 29.813 .120 .354199 -110.0 4.23 1.3 146.7 176.4 29.829 .103 .299 .116 -10.0 1.689 54.4 161.9 170.9 29.813 .120 .354199 -10.0 1.689 55.9 147.3 181.5 29.804 .131 .329261 -10.0 1.689 54.4 161.9 170.9 29.879 .096 .011 .197 -10.0 1.680 55.9 147.9 146.6 173.2 29.859 .096 .261197 -10.0 1.680 5.291 147.6 177.6 29.879 .096 .060 .13							. 183		158	
-55.0 -2.323 51.2 241.4 262.1 29.727										
-50.6										
-45, 6 -1,906 57,0 2\$7,6 2\$7,2 2\$7,6 2\$6,3 29,691 .259 1,103214 .40.0 -1,689 58.9 234.2 260.5 29,671 .282 1,165225 .35.6 -1,476 61.1 231.0 259.2 29,650 .305 1,233241 .30.0 -1,267 62.3 227.5 258.4 29,629 .329 1,250256 .25.0 -1,056 62.7 223.5 254.8 29,629 .329 1,250256 .25.0 -1,056 62.7 223.5 254.8 29,629 .329 1,250256 .25.0845 64.7 219.1 248.8 29,579 .374 1,366261 .265 .15.0633 64.5 214.3 245.4 29,572 .393 1,336265 .10.0422 64.4 209.2 241.2 29,559 .408 1,320268 .10.0622 64.4 209.2 241.2 29,559 .408 1,320268 .10.0211 64.2 203.9 236.8 29,551 .417 1,227273 .5.0 .211 63.4 192.8 227.4 29,551 .417 1,247274 .10.0 .422 63.0 187.4 222.6 29,559 .408 1,217274 .10.0 .422 63.0 187.4 222.6 29,559 .408 1,217274 .10.0 .422 63.0 187.4 222.6 29,559 .408 1,217274 .10.0 .422 63.0 187.4 222.6 29,559 .374 1,162274 .274 .10.0 .422 63.0 187.4 222.6 29,559 .374 1,172274 .10.0 .422 63.0 187.4 222.6 29,559 .374 1,172272 .273 .10.0 .422 63.0 187.4 222.6 29,559 .374 1,172272 .274 .10.0 .422 63.0 187.4 22.6 29,559 .374 1,172272 .275 .10.0 .533 62.4 182.2 218.0 29,589 .374 1,172272 .272 .10.0 .533 62.4 182.2 218.0 29,589 .374 1,172272 .272 .10.0 .533 62.4 182.2 218.0 29,589 .374 1,172272 .272 .10.0 .10.5 .1										
-40.0 -1.689 58.9 234.2 260.5 29.671 .282 1.165225 .35.0 -1.475 61.1 231.0 259.2 29.650 .305 1.233241 .30.0 -1.267 62.3 227.5 258.4 29.629 .329 1.250256 .255 .25.0 -1.056 62.7 223.5 254.8 29.608 .352 1.261259 .256 .25.0 -1.056 62.7 223.5 254.8 29.608 .352 1.261259 .256 .25.0 -1.056 62.7 223.5 254.8 29.608 .352 1.261259 .256 .25.0633 64.5 214.3 245.4 29.572 .393 1.336265 .256 .256 .256 .256 .256 .257 23.9 241.2 29.559 .408 1.320268 .256 .256 .256 .256 .256 .256 .256 .256	-50.0	-2.111		233.3			.238			
-40.0 -1.689 58.9 234.2 260.5 29.671 .288 1.165225   -35.0 -1.476 61.1 231.0 259.2 29.650 .305 1.233241   -30.0 -1.267 62.3 227.5 258.4 29.629 .329 1.250256   -25.0 -1.056 62.7 223.5 254.8 29.609 .352 1.261259   -26.0845 64.7 219.1 248.8 29.550 .374 1.366261   -15.0633 64.5 214.3 245.4 29.572 .393 1.336265   -10.0422 64.4 209.2 241.2 29.559 .408 1.320268   -5.0211 64.2 203.9 236.8 29.551 .417 1.297271   0.0 0.00 0.000 63.8 198.4 232.1 29.548 .420 1.272273   5.0 0.211 63.4 192.8 227.4 29.551 .417 1.297271   10.0 .422 63.0 187.4 222.6 29.559 .408 1.217274   10.0 .422 63.0 187.4 222.6 29.559 .408 1.217274   15.0 .633 62.4 182.2 218.0 29.572 .393 1.185274   25.0 1.056 59.5 172.9 212.8 29.609 .352 1.019273   30.0 1.267 58.6 168.7 210.2 29.669 .352 1.019273   35.0 1.478 57.0 165.1 204.7 29.650 .305 .939261   40.0 1.689 54.4 161.9 200.9 29.671 .282 .865248   45.0 1.900 52.3 159.1 198.9 29.691 .259 .790248   45.0 1.900 52.3 159.1 198.9 29.691 .259 .790248   45.0 2.534 44.6 153.0 189.5 29.772 .168 .596 .109   55.0 2.745 43.5 151.2 188.1 29.772 .218 .639204   60.0 2.534 44.6 153.0 189.5 29.772 .169 .526 .187   75.0 3.167 40.0 148.7 185.7 29.784 .154 .478 .569193   95.0 4.434 27.9 146.6 172.4 29.785 .183 .569193   95.0 3.590 35.5 147.3 181.5 29.804 .131 .392116   95.0 3.590 35.5 147.3 181.5 29.804 .131 .392 .116   95.0 3.590 35.5 147.3 181.5 29.804 .131 .392 .116   95.0 3.590 35.5 147.3 181.5 29.804 .131 .392 .116   95.0 3.590 35.5 147.3 181.5 29.804 .131 .392 .116   95.0 4.434 27.9 146.6 172.4 29.851 .007 .198 .009   105.0 4.223 29.5 146.6 172.4 29.847 .083 .216 .005   105.0 5.490 22.1 147.6 172.6 29.851 .007 .006 .124 .005   105.0 6.334 18.5 150.0 177.6 29.873 .053 .114 .009 .207 .110   115.0 6.334 18.5 150.0 177.6 29.864 .064 .150 .008   125.0 5.490 22.1 147.6 172.6 29.866 .068 .164 .004   135.0 6.334 18.5 150.0 177.6 29.873 .053 .114 .009 .006   140.0 6.757 17.0 151.5 178.0 29.870 .056 .124 .005   140.0 6.757 17.0 151.5 178.0 29.870 .056	-45.0	-1.900	57.0	237.0	262.3					
-35. 8 -1.476 61.1 231.0 259.2 29.650 .305 1.233241 .300 -1.267 62.3 227.5 258.4 29.629 .329 1.250256 .256 .20.0 -1.056 62.7 223.5 254.8 29.608 .352 1.261259 .20.0633 64.5 214.3 245.4 29.579 .374 1.366261 .265 .265 .20.0633 64.5 214.3 245.4 29.579 .374 1.366265 .265 .20.0422 64.4 209.2 241.2 29.559 .408 1.320268 .25.0 .211 64.2 203.9 26.8 29.551 .417 1.297271 .265 .20.0 .211 64.2 203.9 26.8 29.551 .417 1.297271 .265 .20.0 .20.0 .63.8 198.4 232.1 29.548 .420 1.272273 .50.0 .211 63.4 192.8 227.4 29.551 .417 1.247274 .274 .20.0 .60.0 .422 63.0 187.4 222.6 29.559 .408 1.217274 .274 .20.0 .60.3 62.4 182.2 218.8 29.572 .393 1.185274 .274 .20.0 .60.5 62.1 177.2 213.6 29.589 .374 1.172272 .274 .20.0 .845 62.1 177.2 213.6 29.589 .374 1.172273 .30.0 1.267 58.6 168.7 210.2 29.629 .329 .967273 .30.0 1.267 58.6 168.7 210.2 29.629 .329 .967273 .30.0 1.267 58.6 168.7 210.2 29.629 .329 .967273 .30.0 1.478 57.0 165.1 204.7 29.650 .305 .939261 .40.0 1.669 54.4 161.9 200.9 29.671 .282 .865248 .40.0 1.699 54.4 161.9 200.9 29.671 .282 .865248 .40.0 1.699 54.4 161.9 200.9 29.671 .282 .865248 .40.0 1.990 52.3 159.1 198.9 29.691 .259 .790 .200 .601197 .255 .200 .2111 49.0 156.9 195.3 29.710 .259 .790 .2240 .2011 49.0 156.9 195.3 29.710 .250 .707221 .201 .201 .201 .201 .201 .201 .201			58.9	234.2	260.5	29.671	.282	1.165	225	
-30.0 -1.267 62.3 227.5 258.4 29.629 .229 1.250256 -25.0 -1.056 62.7 223.5 254.8 29.608 .352 1.261259 -20.0845 64.7 219.1 248.8 29.572 .393 1.366261 -15.0633 64.5 214.3 245.4 29.572 .393 1.366265 -10.0422 64.4 209.2 241.2 29.559 .408 1.320268 -5.0211 64.2 203.9 236.8 29.551 .417 1.297271 -0.0 0.000 63.8 199.4 232.1 29.548 .420 1.272273 -5.0 .211 63.4 192.8 227.4 29.551 .417 1.272273 -10.0 .422 63.0 187.4 222.6 29.559 .408 1.217274 -10.0 .422 63.0 187.4 222.6 29.559 .408 1.217274 -10.0 .633 62.4 182.2 218.0 29.572 .393 1.185274 -10.0 .633 62.4 182.2 218.0 29.572 .393 1.185274 -10.0 .845 62.1 177.2 213.0 29.589 .374 1.172272 -10.0 .845 62.1 177.2 213.0 29.589 .374 1.172273 -10.0 .845 62.1 177.2 213.0 29.589 .374 1.172273 -10.0 .845 62.1 177.2 213.0 29.589 .374 1.172273 -10.0 .845 62.1 177.2 213.0 29.589 .374 1.172274		-1.478						1.233	241	
-25.0 -1.056 62.7 223.5 254.8 23.608 .052 1.261259										
-20.0845 64.7 219.1 248.8 29.570 .374 1.366261 .15.0633 64.5 214.3 245.4 29.572 .393 1.336265 .261 .201422 64.4 209.2 241.2 29.559 .408 1.320268 .201 64.2 203.9 236.8 29.551 .417 1.297271 .0.0 0.00 63.8 198.4 232.1 29.584 .420 1.272273 .5.0 .211 63.4 192.8 227.4 29.551 .417 1.244274 .10.0 .422 63.0 187.4 222.6 29.559 .408 1.217274 .10.0 .422 63.0 187.4 222.6 29.559 .408 1.217274 .10.0 .633 62.4 182.2 218.0 29.559 .408 1.217274 .20.0 .845 62.1 177.2 213.0 29.589 .374 1.172272 .25.0 1.056 59.5 172.9 212.8 29.608 .352 1.019273 .30.0 1.267 58.6 168.7 210.2 29.629 .329 .967273 .30.0 1.267 58.6 168.7 210.2 29.629 .329 .967273 .35.0 1.478 57.0 165.1 204.7 29.650 .305 .939261 .40.0 1.689 54.4 161.9 200.9 29.671 .282 .865248 .45.0 1.900 52.3 159.1 1.198.9 29.691 .259 .790240 .50.0 2.111 49.0 156.9 195.3 29.710 .238 .707221 .55.0 2.323 46.1 155.0 191.7 29.727 .218 .639204 .60.0 2.534 44.6 153.0 189.5 29.743 .200 .601197 .55.0 2.754 43.5 151.2 188.1 29.758 .183 .569193 .70.0 2.564 .201 .49.8 187.0 29.772 .168 .526187 .50.0 3.590 35.5 147.3 181.5 29.784 .154 .478178 .80.0 3.379 37.8 147.9 163.8 29.772 .168 .526187 .199 .90.0 3.091 33.3 146.9 178.9 29.813 .120 .354139 .90.0 3.801 33.3 146.9 178.9 29.813 .120 .354139 .90.0 3.801 33.3 146.9 178.9 29.813 .120 .354139 .90.0 3.801 33.3 146.7 176.4 29.821 .111 .320116 .100.0 4.223 .29.5 146.6 173.2 29.835 .096 .261107 .100.0 4.223 .29.5 146.6 173.2 29.835 .096 .261107 .100.0 5.29 .29.1 147.2 172.8 29.847 .098 .216087 .100.0 5.490 .221 147.6 173.6 29.869 .068 .164 .084 .100.0 5.490 .221 147.6 173.6 29.869 .068 .164 .084 .100.0 5.912 .20 .148.6 173.2 29.860 .068 .164 .084 .100.0 5.912 .20 .21 147.6 173.6 29.860 .068 .164 .084 .100.0 5.912 .20 .21 147.6 173.6 29.860 .068 .164 .084 .100.0 5.912 .20 .21 147.6 173.6 29.860 .068 .164 .084 .100.0 5.912 .20 .21 147.6 173.6 29.860 .068 .164 .084 .100.0 5.912 .20 .21 147.6 173.6 29.860 .068 .164 .084 .100.0 5.912 .20 .21 147.6 173.6 29.860 .06										
-15.0										
-10.0422 64.4 209.2 241.2 29.559 .408 1.32026850	-20.0						. 3 : 4	1.366		
-5.0	-15.0	633	64.5	214.3	245.4			1.336		
-5.0	-10.0	422	64.4	209.2	241.2	29.559				
0.0         0.000         63.8         198.4         23C.1         29.548         .420         1.272         -273           5.0         .211         63.4         192.8         227.4         29.551         .417         1.244         -274           10.0         .422         63.0         187.4         222.6         29.559         .408         1.217         -274           15.0         .633         62.4         182.2         218.8         29.572         .393         1.185         -2274           20.0         .845         62.1         177.2         213.0         29.589         .374         1.172         -2272           25.0         1.856         59.5         172.9         212.8         29.608         .352         1.019         -273           30.0         1.476         57.0         165.1         204.7         29.650         .305         .939         -261           40.0         1.689         54.4         161.9         200.9         29.671         .282         .865         -248           45.0         1.900         52.3         159.1         198.9         29.691         .259         .797         -2221           55.0		211	64.2	203.9	236.8	29.551	.417	1.297	271	
5.0         .211         63.4         192.8         227.4         29.551         .417         1.244        274           10.0         .422         63.0         187.4         222.6         29.5559         .408         1.217        274           15.0         .633         62.4         182.2         218.8         29.572         .392         1.185        274           20.0         .845         62.1         177.2         213.0         29.589         .374         1.172        272           25.0         1.856         59.5         172.9         212.8         29.608         .352         1.019        273           30.0         1.267         58.6         168.7         210.2         29.629         .329         .967        273           35.0         1.478         57.0         165.1         204.7         29.650         .305         .939        261           40.0         1.689         54.4         161.9         200.9         29.671         .282         .865        248           45.0         1.900         52.3         159.1         198.7         29.727         .218         .639        221           55.0							.420	1.272	273	
10.0										
15.0										
20.0       .845       62.1       177.2       213.0       29.589       .374       1.172      272         25.0       1.056       59.5       172.9       212.8       29.608       .352       1.019      273         30.0       1.267       58.6       168.7       210.2       29.629       .329       .967      273         35.0       1.478       57.0       165.1       204.7       29.650       .305       .939      261         40.0       1.689       54.4       161.9       200.9       29.671       .282       .865      248         45.0       1.900       52.3       159.1       198.9       29.691       .259       .790      248         45.0       1.900       52.3       159.1       198.9       29.691       .259       .790      248         45.0       1.900       52.3       159.1       198.9       29.671       .282       .865      248         45.0       1.900       155.9       191.7       29.727       .218       .639      204         60.0       2.534       44.6       153.0       189.5       29.743       .200       .601      197										
25.0       1.056       59.5       172.9       212.8       29.608       .352       1.019      273         30.0       1.267       58.6       168.7       210.2       29.629       .329       .967      273         35.0       1.478       57.0       165.1       204.7       29.650       .305       .939      261         40.0       1.689       54.4       161.9       200.9       29.671       .282       .865      248         45.0       1.900       52.3       159.1       198.9       29.691       .259       .790      240         50.0       2.111       49.0       165.9       195.3       29.710       .238       .797      221         55.0       2.323       46.1       155.0       191.7       29.727       .218       .639      204         60.0       2.534       44.6       153.0       189.5       29.743       .200       .601      197         70.0       2.745       43.5       151.2       188.1       29.758       .183       .569      193         70.0       3.167       40.0       148.7       185.7       29.784       .154       .478      17	15.0		62.4							
25.0	20.0	. 845	62.1	177.2	213.0	29.589				
30.0 1.267 58.6 168.7 210.2 29.629 329 .967273 35.0 1.478 57.0 165.1 204.7 29.650 .305 .939261 40.0 1.689 54.4 161.9 200.9 29.671 .282 .865248 45.0 1.900 52.3 159.1 198.9 29.691 .259 .790240 50.0 2.111 49.0 156.9 195.3 29.710 .230 .707221 55.0 2.323 46.1 155.0 191.7 29.727 .216 .639204 60.0 2.534 44.6 153.0 189.5 29.743 .200 .601197 65.0 2.745 43.5 151.2 188.1 29.758 .183 .569193 70.0 2.956 42.0 149.0 187.0 29.772 .168 .526187 75.0 3.167 40.0 148.7 185.7 29.774 .154 .470170 88.0 3.378 37.8 147.9 183.8 29.795 .142 .433166 85.0 3.590 35.5 147.9 183.8 29.795 .142 .433166 85.0 3.590 35.5 147.9 181.5 29.804 .131 .392153 90.0 3.801 33.3 146.7 176.4 29.821 .111 .320153 95.0 4.012 31.3 146.7 176.4 29.821 .111 .320126 100.0 4.223 29.5 146.6 172.4 29.821 .111 .320126 100.0 4.223 29.5 146.6 172.4 29.835 .096 .261107 110.0 4.665 25.3 146.7 176.4 29.821 .111 .320126 100.0 4.283 29.5 146.6 172.4 29.841 .089 .237100 115.0 4.856 25.3 146.7 176.4 29.821 .111 .320126 100.0 4.283 29.5 146.6 172.4 29.841 .089 .237100 115.0 5.068 .24.1 146.9 172.2 29.855 .096 .261107 110.0 5.912 20.2 148.6 173.6 29.860 .060 .136087 130.0 5.490 22.1 147.6 173.6 29.860 .060 .164 -087 130.0 5.490 22.1 147.6 173.6 29.860 .060 .136087 130.0 5.490 22.1 147.6 173.6 29.860 .060 .136087 140.0 5.912 20.2 148.6 175.0 29.870 .050 .105081 140.0 5.912 20.2 148.6 175.0 29.870 .050 .105081 140.0 5.912 20.2 148.6 175.0 29.870 .050 .136078 145.0 6.334 18.5 150.0 177.6 29.873 .053 .114072 155.0 6.546 17.8 150.0 177.6 29.873 .055 .114075 150.0 6.334 18.5 150.0 177.6 29.873 .055 .114075 150.0 6.334 18.5 150.0 177.6 29.873 .055 .114075 150.0 6.334 18.5 150.0 177.6 29.873 .056 .050 .105069 160.0 6.757 17.0 151.5 178.0 29.876 .050 .105069 160.0 6.757 17.0 151.5 178.0 29.876 .050 .105069 160.0 6.757 17.0 151.5 178.0 29.876 .050 .050 .105069 160.0 6.757 17.0 151.5 178.0 29.876 .050 .047 .098 1.045 .098 1.045 .098 1.098 1.098 1.006 .006 .006 .006 .006 .006 .006 .00	25.0	1.856	59.5	172.9	212.8					
35.0			58.6	168.7	210.2	29.629	.329	. 967	273	
40.0 1.689 54.4 161.9 200.9 29.671 .282 .865248 45.0 1.900 52.3 159.1 198.9 29.691 .259 .790240 50.0 2.111 49.0 156.9 198.3 29.710 .259 .797221 55.0 2.323 46.1 155.0 191.7 29.727 .218 .639204 60.0 2.534 44.6 153.0 189.5 29.743 .200 .601197 65.0 2.745 43.5 151.2 188.1 29.758 .183 .569193 70.0 2.956 42.0 149.8 187.0 29.772 .168 .526187 75.0 3.167 40.0 148.7 185.7 29.784 .154 .478178 68.0 3.378 37.8 147.9 183.8 29.795 .142 .433166 85.0 3.590 35.5 147.3 181.5 29.804 .131 .392153 90.0 3.801 33.3 146.9 178.9 29.813 .120 .354139 95.0 4.012 31.3 146.7 176.4 29.821 .111 .320153 90.0 3.801 33.3 146.9 178.9 29.813 .120 .354139 95.0 4.012 31.3 146.7 176.4 29.821 .111 .320126 100.0 4.223 29.5 146.6 174.5 29.829 .103 .289116 105.8 4.434 27.9 146.6 173.2 29.835 .096 .261107 110.0 4.645 26.5 146.6 172.4 29.841 .869 .237100 115.0 4.866 25.3 146.7 176.1 29.847 .88 .216095 120.0 5.068 24.1 146.9 172.2 29.851 .077 .198090 125.0 5.279 23.1 147.2 172.8 29.856 .072 .180087 130.0 5.490 .22.1 147.6 173.6 29.860 .068 .164084 135.0 5.701 21.1 148.1 174.7 29.864 .064 .150081 140.0 5.912 20.2 148.6 175.8 29.860 .068 .164084 135.0 5.701 21.1 148.1 174.7 29.864 .064 .150081 140.0 5.912 20.2 148.6 175.8 29.870 .056 .124075 150.0 6.334 18.5 150.0 177.6 29.873 .055 .114072 155.0 6.546 17.8 150.7 178.0 29.873 .055 .114072 155.0 6.546 17.8 150.7 178.0 29.876 .050 .105069 160.0 6.757 17.0 151.5 178.0 29.876 .050 .105069 160.0 6.757 17.0 151.5 178.0 29.876 .050 .105069 160.0 6.757 17.0 151.5 178.0 29.876 .050 .047 .098 .0651							.305	.939	261	
45.0 1.900 52.3 159.1 198.9 29.691 .259 .790248 50.0 2.111 49.0 156.9 195.3 29.710 .230 .707221 55.0 2.323 46.1 155.0 191.7 29.727 .218 .639204 60.0 2.534 44.6 153.0 189.5 29.743 .200 .601197 65.0 2.745 43.5 151.2 188.1 29.758 .183 .569193 70.0 2.956 42.0 149.0 187.0 29.772 .168 .526187 75.0 3.167 40.0 149.0 187.0 29.772 .168 .526187 75.0 3.167 40.0 149.0 187.0 29.772 .168 .526187 95.0 3.370 35.5 147.9 183.8 29.795 .142 .433166 95.0 3.590 35.5 147.3 181.5 29.804 .131 .392153 90.0 3.801 33.3 146.9 178.9 29.813 .120 .354139 95.0 4.012 31.3 146.7 176.4 29.821 .111 .320126 100.0 4.223 29.5 146.6 174.5 29.829 .103 .289116 105.0 4.434 27.9 146.6 173.2 29.835 .096 .261107 110.0 4.645 26.5 146.6 172.4 29.841 .089 .237100 115.0 4.856 25.3 146.7 176.1 29.847 .096 .261107 120.0 5.068 .24.1 146.9 172.2 29.851 .096 .261095 120.0 5.068 .24.1 146.6 172.4 29.841 .089 .237100 115.0 4.856 .25.3 146.7 176.1 29.847 .096 .261095 120.0 5.068 .24.1 146.6 172.2 29.851 .072 .180087 130.0 5.490 .22.1 147.6 173.6 29.860 .068 .164084 135.0 5.701 .21.1 148.1 174.7 29.864 .064 .150081 140.0 5.912 20.2 140.6 175.0 29.860 .068 .164084 135.0 6.123 19.3 149.3 176.8 29.870 .056 .124075 150.0 6.334 10.5 150.0 177.6 29.873 .053 .114072 155.0 6.546 17.8 150.0 177.6 29.873 .055 .114075 150.0 6.334 10.5 150.0 177.6 29.873 .055 .114075 150.0 6.546 17.8 150.0 177.6 29.873 .055 .114075 150.0 6.757 17.0 151.5 178.0 29.876 .050 .105069 160.0 6.757 17.0 151.5 178.0 29.876 .050 .105069 160.0 6.757 17.0 151.5 178.0 29.876 .050 .047 .0980665 .006								. 865		
50.0       2.111       49.0       156.9       195.3       29.710       .236       .797      221         55.0       2.323       46.1       155.0       191.7       29.727       .218       .639      204         60.0       2.534       44.6       153.0       189.5       29.743       .200       .601      197         65.0       2.745       43.5       151.2       188.1       29.758       .183       .569      193         70.0       2.956       42.0       149.8       187.0       29.772       .168       .526      187         75.0       3.167       48.0       148.7       185.7       29.784       .154       .479      176         88.0       3.378       37.8       147.9       183.8       29.795       .142       .433      166         85.0       3.590       35.5       147.3       181.5       29.804       .131       .392      153         90.0       3.801       33.3       146.7       176.4       29.821       .111       .320      126         100.0       4.223       29.5       146.6       177.5       29.829       .103       .287      11									- 240	
55.0 2,323 46.1 155.0 191.7 29.727 .218 .639204 60.0 2,534 44.6 153.0 189.5 29.743 .200 .601197 65.0 2,745 43.5 151.2 188.1 29.758 .183 .569193 70.0 2,956 42.0 149.8 187.0 29.772 .168 .526187 75.0 3.167 40.0 148.7 185.7 29.784 .154 .478178 88.0 3.378 37.8 147.9 183.8 29.795 .142 .433166 85.0 3.590 35.5 147.3 181.5 29.804 .131 .392153 90.0 3.601 33.3 146.9 178.9 29.813 .120 .354139 95.0 4.012 31.3 146.7 176.4 29.821 .111 .320153 100.0 4.223 29.5 146.6 174.5 29.821 .111 .320116 105.8 4.434 27.9 146.6 173.2 29.835 .096 .261107 110.0 4.645 26.5 146.6 172.4 29.841 .089 .237100 115.0 4.645 25.3 146.7 172.1 29.847 .083 .216095 120.0 5.068 24.1 146.9 172.2 29.851 .096 .261107 130.0 5.490 22.1 147.6 173.6 29.860 .068 .164087 130.0 5.490 22.1 147.6 173.6 29.860 .068 .164084 135.0 5.701 21.1 148.1 174.7 29.864 .064 .150081 140.0 5.912 20.2 148.6 175.8 29.867 .060 .136078 145.0 6.123 19.3 149.3 176.8 29.870 .056 .124075 150.0 6.334 18.5 150.0 177.6 29.873 .053 .114072 155.0 6.546 17.8 150.7 178.0 29.873 .055 .114075 150.0 6.334 18.5 150.0 177.6 29.873 .055 .114072 155.0 6.546 17.8 150.7 178.0 29.876 .050 .105069 160.0 6.757 17.0 151.5 178.0 29.878 .044 .098065										
60.0 2.534 44.6 153.0 189.5 29.743 200 601197 65.0 2.745 43.5 151.2 188.1 29.758 183 569193 70.0 2.956 42.0 149.8 187.0 29.772 168 526187 75.0 3.167 48.0 148.7 185.7 29.784 154 478178 88.0 3.378 37.8 147.9 183.8 29.795 142 433166 85.0 3.590 35.5 147.3 181.5 29.804 131 392153 90.0 3.801 33.3 146.9 178.9 29.813 120 354 139 95.0 4.012 31.3 146.7 176.4 29.821 111 320 126 100.0 4.223 29.5 146.6 172.4 29.821 111 320 126 100.5 4.434 27.9 146.6 173.2 29.835 096 261 107 110.0 4.645 26.5 146.6 172.4 29.841 089 216 107 115.0 4.856 25.3 146.7 176.1 29.847 083 216 095 120.0 5.068 24.1 146.9 172.2 29.851 077 198 090 125.0 5.279 23.1 147.2 172.8 29.856 072 180 087 130.0 5.490 22.1 147.6 173.6 29.860 068 164 084 135.0 5.701 21.1 148.1 174.7 29.864 060 136 078 145.0 6.123 19.3 149.3 176.8 29.870 060 136 078 145.0 6.123 19.3 149.3 176.8 29.870 050 124 075 150.0 6.334 10.5 150.0 177.6 29.873 053 114 072 155.0 6.546 17.8 150.7 178.0 29.876 050 105 069 160.0 6.757 17.0 151.5 178.0 29.878 0447 098 065	50.0	2.111	49.0							
60.0 2.534 44.6 153.0 189.5 29.743 .200 .601197 65.0 2.745 43.5 151.2 188.1 29.758 .183 .569193 70.0 2.956 42.0 149.8 187.0 29.772 .168 .526187 75.0 3.167 40.0 148.7 185.7 29.784 .154 .478178 80.0 3.378 37.8 147.9 183.8 29.795 .142 .433166 85.0 3.590 35.5 147.9 183.8 29.795 .142 .433166 85.0 3.590 35.5 147.9 181.5 29.804 .131 .392153 90.0 3.801 33.3 146.9 178.9 29.813 .120 .354139 95.0 4.012 31.3 146.7 176.4 29.821 .111 .320126 100.0 4.223 29.5 146.6 174.5 29.829 .103 .289116 105.0 4.434 27.9 146.6 173.2 29.835 .096 .261107 110.0 4.645 26.5 146.6 172.4 29.841 .869 .237100 115.0 4.866 25.9 146.7 172.1 29.847 .883 .216095 120.0 5.068 24.1 146.9 172.2 29.851 .077 .198090 125.0 5.279 23.1 147.2 172.8 29.856 .072 .180087 130.0 5.490 22.1 147.6 173.6 29.860 .064 .164084 135.0 5.701 21.1 148.1 174.7 29.864 .064 .150081 140.0 5.912 20.2 148.6 175.8 29.860 .064 .164084 135.0 5.701 21.1 148.1 174.7 29.864 .064 .150081 140.0 5.912 20.2 148.6 175.8 29.870 .056 .124075 150.0 6.334 10.5 150.0 177.6 29.873 .053 .114072 155.0 6.546 17.8 150.7 178.0 29.876 .050 .105069 160.0 6.757 17.0 151.5 178.0 29.876 .047 .098065 .006 .066 .066 .066 .066 .066 .066	55.0	2.323	46.1	155.0	191.7					
65.0         2.745         43.5         151.2         188.1         29.758         .183         .569        193           78.0         2.956         42.0         149.6         187.0         29.772         .168         .526        187           75.0         3.167         40.0         148.7         185.7         29.784         .154         .470        176           80.0         3.370         37.8         147.9         183.8         29.795         .142         .433        166           95.0         3.590         35.5         147.3         181.5         29.804         .131         .392        153           90.0         3.801         33.3         146.7         176.4         29.821         .111         .320        126           100.0         4.223         29.5         146.6         174.5         29.829         .103         .289        116           105.0         4.434         27.9         146.6         172.4         29.829         .103         .289        116           115.0         4.645         26.5         146.6         172.4         29.841         .869         .237        100           115.0	60.0	2.534	44.6	153.0	189.5	29.743	.200	. 601		
70.0 2.956 42.0 149.0 187.0 29.772 168 526187 75.0 3.167 48.0 148.7 185.7 29.784					188.1		.183	. 569	193	
75. 0 3.167 40. 0 148.7 185.7 29.784 .154 .478178 88.0 3.378 37.8 147.9 183.8 29.795 .142 .433166 95.0 3.590 35.5 147.3 181.5 29.804 .131 .392153 90.0 3.801 33.3 146.9 178.9 29.813 .120 .354139 95.0 4.012 31.3 146.7 176.4 29.821 .111 .320126 100.0 4.223 29.5 146.6 173.2 29.835 .096 .261107 110.0 4.645 26.5 146.6 172.4 29.825 .096 .261107 110.0 4.645 26.5 146.6 172.4 29.841 .089 .237100 115.0 4.856 25.3 146.7 176.1 29.847 .083 .216095 120.0 5.068 24.1 146.9 172.2 29.851 .07 .190090 125.0 5.279 23.1 147.2 172.3 29.856 .072 .180087 130.0 5.490 22.1 147.6 173.6 29.860 .060 .164087 130.0 5.490 22.1 147.6 173.6 29.860 .060 .164087 130.0 5.490 22.1 147.6 173.6 29.860 .060 .164084 135.0 5.701 21.1 148.1 174.7 29.864 .064 .150081 140.0 5.912 20.2 148.6 175.8 29.870 .060 .136078 145.0 6.123 19.3 149.3 176.8 29.870 .056 .124075 150.0 6.334 10.5 150.0 177.6 29.873 .053 .114072 155.0 6.546 17.8 150.7 178.0 29.876 .050 .105069 160.0 6.757 17.0 151.5 178.0 29.876 .047 .098065 .006								. 526	187	
88.8 3.378 37.8 147.9 183.8 29.795 .142 .433166 85.0 3.590 35.5 147.3 181.5 29.804 .131 .392153 90.0 3.801 33.3 146.9 178.9 29.813 .120 .354139 95.8 4.012 31.3 146.7 176.4 29.821 .111 .320126 100.0 4.223 29.5 146.6 174.5 29.829 .103 .289116 105.8 4.434 27.9 146.6 173.2 29.835 .096 .261107 110.0 4.645 26.5 146.6 173.2 29.835 .096 .261107 110.0 4.645 26.5 146.6 172.4 29.841 .089 .237100 115.0 4.856 25.3 146.7 172.1 29.847 .083 .216095 120.0 5.068 24.1 146.9 172.2 29.851 .077 .198090 125.0 5.279 23.1 147.2 172.8 29.856 .072 .180087 130.0 5.490 22.1 147.6 173.6 29.860 .068 .164084 135.0 5.701 21.1 148.1 174.7 29.864 .064 .150081 140.0 5.912 20.2 148.6 175.8 29.870 .066 .136078 145.0 6.123 19.3 149.3 176.8 29.870 .056 .124075 150.0 6.334 18.5 150.0 177.6 29.873 .050 .105069 160.0 6.757 17.0 151.5 178.0 29.878 .047 .098065										
85.0 3.590 35.5 147.3 181.5 29.804 .131 .392153 .90.0 3.801 33.3 146.9 178.9 29.813 .120 .354139 .95.0 4.012 31.3 146.7 176.4 29.821 .111 .320126 .100.0 4.223 29.5 146.6 174.5 29.829 .103 .289116 .105.0 4.434 27.9 146.6 173.2 29.835 .096 .261107 .110.0 4.645 26.5 146.6 173.2 29.835 .096 .261107 .110.0 4.645 26.5 146.6 172.4 29.841 .089 .237100 .115.0 4.856 25.3 146.7 172.1 29.841 .089 .237100 .115.0 5.068 24.1 146.9 172.2 29.851 .077 .198096 .125.0 5.279 23.1 147.2 172.8 29.856 .072 .180087 .130.0 5.490 .22.1 147.6 173.6 29.860 .068 .164084 .135.0 5.701 21.1 148.1 174.7 29.864 .064 .150081 .140.0 5.912 20.2 148.6 175.8 29.870 .060 .136078 .145.0 6.123 19.3 149.3 176.8 29.870 .056 .124075 .150.0 6.334 18.5 150.0 177.6 29.873 .053 .114072 .155.0 6.546 17.8 150.7 178.0 29.870 .050 .105069 .160.0 6.757 17.0 151.5 178.0 29.878 .047 .098 .065 .104 .098 .065										
90.0 3.801 33.3 146.9 178.9 29.813 .120 .354139 95.0 4.012 31.3 146.7 176.4 29.821 .111 .320126 100.0 4.223 29.5 146.6 174.5 29.829 .103 .289116 105.0 4.434 27.9 146.6 173.2 29.835 .096 .261107 110.0 4.645 26.5 146.6 172.4 29.841 .869 .237100 115.0 4.856 25.3 146.7 172.1 29.847 .883 .216095 120.0 5.068 24.1 146.7 172.1 29.847 .883 .216095 120.0 5.068 24.1 146.9 172.2 29.851 .077 .198090 125.0 5.279 23.1 147.2 172.8 29.856 .072 .180087 130.0 5.490 22.1 147.6 173.6 29.860 .068 .164084 135.0 5.701 21.1 148.1 174.7 29.864 .064 .150081 140.0 5.912 20.2 148.6 175.8 29.867 .060 .136078 145.0 6.123 19.3 149.3 176.8 29.870 .056 .124075 150.0 6.334 18.5 150.0 177.6 29.873 .053 .114072 155.0 6.546 17.8 150.7 178.0 29.876 .050 .105069 160.0 6.757 17.0 151.5 178.0 29.878 .047 .098065										
95.8 4.012 31.3 146.7 176.4 29.821 .111 .328126 100.0 4.223 29.5 146.6 174.5 29.829 .103 .289116 105.8 4.434 27.9 146.6 173.2 29.835 .096 .261107 110.0 4.645 26.5 146.6 172.4 29.841 .089 .237100 115.8 4.856 25.3 146.7 172.1 29.847 .083 .216095 120.0 5.068 24.1 146.9 172.2 29.851 .077 .198090 125.0 5.279 23.1 147.2 172.8 29.856 .072 .180087 130.0 5.490 22.1 147.6 173.6 29.860 .068 .164084 135.0 5.701 21.1 148.1 174.7 29.864 .064 .150081 140.0 5.912 20.2 148.6 175.8 29.867 .060 .136078 145.0 6.123 19.3 149.3 176.8 29.870 .056 .124075 150.0 6.334 18.5 150.0 177.6 29.873 .053 .114072 155.0 6.546 17.8 150.7 178.0 29.878 .047 .098065 160.0 6.757 17.0 151.5 178.0 29.878 .047 .098065	85.0	3.590								
95.8 4.012 31.3 146.7 176.4 29.821 .111 .320 -1.126 100.0 4.223 29.5 146.6 174.5 29.829 .103 .289 -1.116 105.8 4.434 27.9 146.6 173.2 29.835 .096 .261 -1.07 110.8 4.645 26.5 146.6 172.4 29.841 .869 .237 -1.100 115.8 4.956 25.3 146.7 172.1 29.847 .883 .216 -0.895 120.8 5.068 24.1 146.9 172.2 29.851 .077 .198 -0.690 125.0 5.279 23.1 147.2 172.8 29.856 .072 .180 -0.87 130.8 5.490 22.1 147.6 173.6 29.860 .868 .164 -0.84 135.8 5.701 21.1 148.1 174.7 29.864 .864 .150 -0.81 140.0 5.912 20.2 148.6 175.8 29.867 .864 .864 .150 -0.81 140.0 5.912 19.3 149.3 176.8 29.870 .856 .124 -0.075 155.8 6.546 17.8 150.0 177.6 29.873 .953 .114 -0.072 155.8 6.546 17.8 150.7 178.8 29.876 .950 .105 -0.869 160.8 6.757 17.0 151.5 178.8 29.878 .047 .098 -0.656	90.0	3.801	33.3	146.9						
100.0 4.223 29.5 146.6 174.5 29.829 .102 .289116 105.8 4.434 27.9 146.6 173.2 29.835 .096 .261107 110.8 4.645 26.5 146.6 172.4 29.841 .089 .237100 115.8 4.856 25.3 146.7 172.1 29.847 .083 .216095 120.8 5.068 24.1 146.9 172.2 29.851 .077 .198090 125.0 5.279 23.1 147.2 172.8 29.856 .072 .180087 130.8 5.490 22.1 147.6 173.6 29.860 .068 .164084 135.0 5.701 21.1 148.1 174.7 29.864 .064 .150081 140.0 5.912 20.2 148.6 175.8 29.867 .060 .136078 145.0 6.123 19.3 149.3 176.8 29.870 .056 .124075 150.8 6.334 18.5 150.0 177.6 29.873 .053 .114072 155.0 6.546 17.8 150.7 178.0 29.878 .047 .098065 160.8 6.757 17.0 151.5 178.0 29.878 .047 .098065		4.812	31.3	146.7	176.4	29.821		.329		
105.8 4.434 27.9 146.6 173.2 29.835 .096 .261107 110.8 4.645 26.5 146.6 172.4 29.841 .089 .237100 115.8 4.856 25.3 146.7 172.1 29.847 .083 .216095 120.8 5.068 24.1 146.9 172.2 29.851 .077 .198090 125.0 5.279 23.1 147.2 172.8 29.856 .072 .180087 130.8 5.490 22.1 147.6 173.6 29.860 .068 .164084 135.8 5.701 21.1 148.1 174.7 29.864 .064 .150081 140.0 5.912 20.2 148.6 175.8 29.867 .060 .136078 145.0 6.123 19.3 149.3 176.8 29.870 .056 .124075 150.8 6.334 18.5 150.0 177.6 29.873 .053 .114072 155.8 6.546 17.8 150.7 178.8 29.876 .050 .105069 160.8 6.757 17.0 151.5 178.8 29.878 .047 .098065				146.6		29.829	.103			
110.0 4.645 26.5 146.6 172.4 29.841 .069 .237100 115.0 4.856 25.3 146.7 172.1 29.847 .083 .216095 120.0 5.068 24.1 146.9 172.2 29.851 .077 .198090 125.0 5.279 23.1 147.2 172.8 29.856 .072 .180087 130.0 5.490 22.1 147.6 173.6 29.860 .068 .164084 135.0 5.701 21.1 148.1 174.7 29.864 .064 .150081 140.0 5.912 20.2 148.6 175.8 29.867 .060 .136078 145.0 6.123 19.3 149.3 176.8 29.870 .056 .124075 150.0 6.334 18.5 150.0 177.6 29.873 .053 .114072 155.0 6.546 17.8 150.7 178.0 29.876 .050 .105069 160.0 6.757 17.0 151.5 178.0 29.878 .047 .098065							.096	. 261	107	
115.8							. 889	. 237		
120.8 5.868 24.1 146.9 172.2 29.851 .077 .198090 125.0 5.279 23.1 147.2 172.8 29.856 .072 .180087 130.0 5.490 22.1 147.6 173.6 29.860 .068 .164084 135.0 5.701 21.1 148.1 174.7 29.864 .064 .150081 140.0 5.912 20.2 148.6 175.8 29.867 .060 .136078 145.0 6.123 19.3 149.3 176.8 29.870 .056 .124075 150.0 6.334 18.5 150.0 177.6 29.873 .053 .114072 155.0 6.546 17.8 150.7 178.0 29.876 .050 .105069 160.0 6.757 17.0 151.5 178.0 29.878 .047 .098065								.216	895	
125.0 5.279 23.1 147.2 172.8 29.856 .072 .180087 130.0 5.490 22.1 147.6 173.6 29.860 .068 .164084 135.0 5.701 21.1 148.1 174.7 29.864 .064 .150081 140.0 5.912 20.2 148.6 175.8 29.867 .060 .136078 145.0 6.123 19.3 149.3 176.8 29.870 .056 .124075 150.0 6.334 18.5 150.0 177.6 29.873 .053 .114072 155.0 6.546 17.8 150.7 178.0 29.876 .050 .105069 160.0 6.757 17.0 151.5 178.0 29.878 .047 .098065									- 090	
130.0 5.490 22.1 147.6 173.6 29.860 .068 .164084 .135.0 5.701 21.1 148.1 174.7 29.864 .064 .150081 .140.0 5.912 20.2 148.6 175.8 29.867 .060 .136078 .145.0 6.123 19.3 149.3 176.8 29.870 .056 .124075 .150.0 6.334 18.5 150.0 177.6 29.873 .053 .114072 .155.0 6.546 17.8 150.7 178.0 29.876 .050 .105069 .160.0 6.757 17.0 151.5 178.0 29.878 .047 .098065	120.0									
130.8 5.490 22.1 147.6 173.6 29.860 .868 .164884 .135.8 5.701 21.1 148.1 174.7 29.864 .864 .150881 .140.0 5.912 20.2 148.6 175.8 29.867 .860 .136078 .145.0 6.123 19.3 149.3 176.8 29.870 .856 .124075 .150.0 6.334 18.5 150.0 177.6 29.873 .853 .114872 .155.0 6.546 17.8 150.7 178.0 29.876 .850 .185069 .160.0 6.757 17.0 151.5 178.0 29.878 .847 .898865	125.0	5.279	23.1	147.2	172.8					
135.0 5.701 21.1 148.1 174.7 29.864 .064 .150081 140.0 5.912 20.2 148.6 175.8 29.867 .060 .136078 145.0 6.123 19.3 149.3 176.8 29.870 .056 .124075 150.0 6.334 18.5 150.0 177.6 29.873 .053 .114072 155.0 6.546 17.8 150.7 178.0 29.876 .050 .105069 160.0 6.757 17.0 151.5 178.0 29.878 .047 .098065				147.6	173.6					
140.0 5.912 20.2 148.6 175.8 29.867 .060 .136078 145.0 6.123 19.3 149.3 176.8 29.870 .056 .124075 150.8 6.334 18.5 150.0 177.6 29.873 .053 .114072 155.0 6.546 17.8 150.7 178.0 29.876 .050 .105069 160.0 6.757 17.0 151.5 178.0 29.878 .047 .098065					174.7	29.864				
145.0 6.123 19.3 149.3 176.8 29.870 .056 .124075 150.0 6.334 18.5 150.0 177.6 29.873 .053 .114072 155.0 6.546 17.8 150.7 178.0 29.876 .050 .105069 160.0 6.757 17.0 151.5 178.0 29.878 .047 .098065		5 912	20 2				.060	. 136		
150.0 6.334 18.5 150.0 177.6 29.873 .053 .114072 155.0 6.546 17.8 150.7 178.0 29.876 .050 .105069 160.0 6.757 17.0 151.5 178.0 29.878 .047 .098065								.124	075	
155.0 6.546 17.8 150.7 178.0 29.876 .050 .105069 160.0 6.757 17.0 151.5 178.0 29.878 .047 .098065										
160.0 6.757 17.0 151.5 178.0 29.878 .047 .098065						27.013				
169.6 0.101 1.101 1.00	155.8	6.546								
00 000 045 091 - 961	169.9	6.757	17.0	151.5						
*****					177.4	29.880	.045	. 091	061	
	.00.0	-1,700								