tidal constituents with speeds $n = 15°, 30°, 45°, 60°, 90°$ pertaining to the solar constituents S_1, S_2, S_3, S_4, S_6.

It will be noted that these multipliers yield no contributions from an arbitrary datum. This table of multipliers has many uses and it is a simple method of computation, provided that the oscillations are known to be only of the one species.

Though the formulæ are dependent upon n being an exact multiple of 15°, it may be noted that they are usable for oscillations of other periods, by altering the time intervals from mean solar hours to "special hours," that is, if the period of the oscillations is divided into 24 "hours," then the observations of these hours can be treated by the above factors and divisors.

5. Analysis of mixed oscillations

We have supposed that the investigation of the previous article has been restricted to the case of a simple and single oscillation perturbed only by casual errors, and we proceed to examine the problem when there are many species of constituents occurring together. Let the tidal oscillation be denoted by

$$y = A_0 + (A_1 \cos 15°t + B_1 \sin 15°t) + (A_2 \cos 30°t + B_2 \sin 30°t) + \ldots \quad (13.5a)$$

If we apply the multipliers of Table 13.2 to the values of $\cos nt$ and $\sin nt$ given in Table 13.1 we readily verify that the multipliers for $n = 15°$ and $45°$ yield zero result, when applied to the values of $\cos nt$ and $\sin nt$ for $n = 30°, 60°, 90°$. Similarly the multipliers for $n = 30°, 60°, 90°$ yield zero results when applied to the values of $\cos nt$ and $\sin nt$ for $n = 15°$ and $45°$. The reason for this is that the functions for even multiples of 15° repeat themselves without change of sign from hour 12 whereas those for odd multiples of 15° repeat themselves with a change of sign. Hence the products in the group of hours $t = 12$ to 23 simply annul the products in the hours $t = 0$ to 11.

Similarly, because the functions for $n = 60°$ repeat themselves after $t = 5$, whereas those for $n = 30°$ and $90°$ repeat themselves with a change of sign, the multipliers for $n = 30°$ and $90°$ yield zero result when applied to the values of $\cos nt$ and $\sin nt$ for $n = 60°$, and similarly the factors for $n = 60°$ yield zero result when applied to the values of $\cos t\ nt$ and $\sin nt$ for $n = 30°$ and $90°$.

We need only investigate, therefore, the mutual effects of the species with $n = 15°$ and $45°$ and those for $30°$ and $90°$ and on evaluating the sums of the products we get results as shown in Table 13.3, in which X_n denotes the result of applying the multipliers for A_n to the 24 values of y, and Y_n denotes the result of applying the multipliers for B_n to the 24 values of y.

TABLE 13.3

$$15{\cdot}19\,A_1 = X_1 + 4{\cdot}83\,A_3 = X_1 + 0{\cdot}333\,X_3$$
$$15{\cdot}19\,B_1 = Y_1 - 4{\cdot}83\,B_3 = Y_1 - 0{\cdot}333\,Y_3$$
$$14{\cdot}48\,A_3 = X_3$$
$$14{\cdot}48\,B_3 = Y_3$$
$$14{\cdot}93\,A_2 = X_2 + 4{\cdot}00\,A_6 = X_2 + 0{\cdot}333\,X_6$$
$$14{\cdot}93\,B_2 = Y_2 - 4{\cdot}00\,B_6 = Y_2 - 0{\cdot}333\,Y_6$$
$$16{\cdot}00\,A_4 = X_4$$
$$13{\cdot}86\,B_4 = Y_4$$
$$12{\cdot}00\,A_6 = X_6$$
$$12{\cdot}00\,B_6 = Y_6$$

6. Remarks on more elaborate methods

Large volumes have been written upon formulæ for harmonic analysis, and very elaborate schedules have been drawn up for extracting, theoretically, the utmost degree of accuracy from observations. We have made it clear that where there is a real period then two quantities serve to define the constituent, and that the observations can be grouped in any convenient manner in order to diminish the casual error. If different methods yield results whose differences have any degree of importance then it is never wise to attach much significance to either reduction, and the observations should be supplemented by others. More elaborate formulæ only involve computational labour out of all proportion to any possible gain, which is rarely likely in any case to be equivalent to doubling the number of observations. We shall however give a short sketch of the principles used in these methods.

We shall take as an illustration observations denoted by y over a period of 24 hours, that is, at hours 0, 1, 2 . . . 23. These observations may be single observations for each hour or may each represent an average of many observations which can be allocated to that hour. Then as in (13.5a) we have

$$y = A_0 + (A_1 \cos 15°t + B_1 \sin 15°t) + \dots \\ + (A_r \cos 15°rt + B_r \sin 15°rt) + \dots \qquad (13.6a)$$

where r is an integer. Multiply the observations by $\cos 15°st$, where s is an integer, and sum for the hours 0 to 23. Then the effect of this multiplication on the typical terms ($A_r \cos 15°rt + B_r \sin 15°rt$) is to give

$$A_r \cos 15°rt \cos 15°st + B_r \sin 15°rt \cos 15°st$$

which is equal to

$$\tfrac{1}{2} A_r \cos 15°(r+s)t + \tfrac{1}{2} A_r \cos 15°(r-s)t \\ + \tfrac{1}{2} B_r \sin 15°(r+s)t + \tfrac{1}{2} B_r \sin 15°(r-s)t$$

Thus, since r and s are integers, and if r is not equal to s, the sums of these terms for $t = 0, 1, \dots 23$ all vanish. For example, if $r = 2$ and $s = 1$, we have to sum the values of

$$\cos 45°t, \ \cos 15°t, \ \sin 45°t, \ \sin 15°t$$

and the numerical values given in Table 13.1 show that the sum of the 24 quantities is in each case zero.

If, however, $s = r$, then all the sums vanish in the same way except that from

$$\tfrac{1}{2} A_r \cos 15° (r-s)t = \tfrac{1}{2} A_r$$

which gives

$$12 A_r \text{ on summation.}$$

Hence we get

$$12 A_r = \sum_0^{23} y \cos 15°rt \qquad (13.6b)$$

And similarly

$$12 B_r = \sum_0^{23} y \sin 15°rt \qquad (13.6c)$$

Many of the older methods of analysis laboriously perform the multiplications by the cosines, that is, they replace the simple multipliers of Table 13.2 by the entries in Table 13.1. The elaborate forms encountered in some of these analyses arise from the efforts made to minimise the labour of multiplication by utilising the recurrences of factors, with or without change of sign, as noted previously.

It will be noted that the use of the multipliers $\cos rt$ and $\sin rt$ gives the values A and B without the complications of having to correct X_1, Y_1, X_2, Y_2, as noted in Table 13.3, but the advantage of this is more than offset by the labour of the multiplications as against the simple additions and subtractions which are alone required in the method of the preceding article.

We can easily invent a set of simple multipliers which will avoid having to use corrections, so that one species of constituent does not affect another. If we replace $2 \cos rt$, $2 \sin rt$ by multipliers ± 2, ± 1, or 0, whichever is the nearer, we obtain formulæ and divisors as in Table 13.4, which have the advantage referred to.

The theoretical multipliers of (13.6b) and (13.6c) are really based on what is called " the least square rule " and they are supposed to reduce the sum of the squares of the errors to a minimum. The fundamental idea is that large variations are associated with large multipliers, and as the approximations to the multipliers preserve this idea, then the multipliers given in Table 13.4 may be used in preference to those of Table 13.2 by those who attach importance to the " theoretical " accuracy of the formulæ (13.6b) and (13.6c). The formulæ, however, cannot be used without slight modification if fifth and seventh-diurnal oscillations occur, but these hardly ever require consideration in tidal work.

TABLE 13.4

Alternative Multipliers for Harmonic Analyses of Mixed Species

	$n = 15°$		$n = 45°$		$n = 30°$		$n = 60°$		$n = 90°$	
t	A_1	B_1	A_3	B_3	A_2	B_2	A_4	B_4	A_6	B_6
0	2	0	2	0	2	0	2	0	1	0
1	2	1	1	1	2	1	1	2	0	1
2	2	1	0	2	1	2	− 1	2	− 1	0
3	1	1	− 1	1	0	2	− 2	0	0	− 1
4	1	2	− 2	0	− 1	2	− 1	− 2	1	0
5	1	2	− 1	− 1	− 2	1	1	− 2	0	1
6	0	2	0	− 2	− 2	0	2	0	− 1	0
7	− 1	2	1	− 1	− 2	− 1	1	2	0	− 1
8	− 1	2	2	0	− 1	− 2	− 1	2	1	0
9	− 1	1	1	1	0	− 2	− 2	0	0	1
10	− 2	1	0	2	1	− 2	− 1	− 2	− 1	0
11	− 2	1	− 1	1	2	− 1	1	− 2	0	− 1
12 to 23	Repeat with opposite sign.				Repeat with same sign.					
Divisor	24·520	24·520	20·484	20·484	25·856	25·856	24	27·712	12	12

7. The general problem of analysis of tidal constituents

In previous articles we have been considering methods of analysis applicable to a set of constituents whose speeds are exact multiples of the slowest speed, but in tidal analyses we have to consider the vastly more complicated relations of many groups of constituents. While it is true that we have diurnal, semidiurnal, and higher species existing each day, yet the exact periods of each are obviously somewhat variable, since the times of high water do not increase at a steady rate. The multipliers given in Tables 13.2 and 13.4 under such circumstances will not efficiently " isolate " (to use a technical expression) the functions A and B ; that is, instead of giving a simple value of A, for instance, for one species they will give contributions from all species, though these will be smaller than that for the main function. An example of imperfect isolation is given for A, with the multipliers of Table 13.2, since Table 13.3 makes it evident that the combination of observations denoted by X_1 includes a contribution from the third diurnal constituent, and a correction has to be made by using X_3.

While the more elaborate multipliers of Table 13.4 are, of course, a little better in this respect, yet they will inevitably fail to give proper " isolation " when the periods differ from the solar periods ; consequently, the designer of analytical methods has to decide whether the formulæ should be still further elaborated in order to separate the species to the required degree of accuracy, or whether to use corrections for one species on another.

Similar considerations apply, as we shall show, to the analysis for the constituents of any one species. It is impossible to get perfect isolation by one operation for one of the constituents, so that corrections are in any case necessary for all constituents within the species, and the procedure depends simply upon the possibility of handling simultaneously a large number of constituents.

For the very elaborate analyses of a year's observations it is definitely impracticable to cope at one time with all the constituents of all species, since the analyses, at least those carried out by the Liverpool Observatory and Tidal Institute, are made for 18 diurnal and 18 semidiurnal constituents, with, of course, other species in proportion to their importance. In such a case, it is necessary to isolate the species, and groups of observations are taken each day so as to provide pairs of functions X_1, Y_1; X_2, Y_2; . . . to which the main contributions come from the diurnal, semidiurnal and higher species respectively. (These functions, of course, are more elaborately computed than the functions X, Y, referred to in Table 13.3, though the same notation is used for convenience.) In the case of the method given in Admiralty Tide Tables, Part III, for observations covering 15 and 29 days, the number of constituents is so small that they can be handled conveniently together. The object there is to make the grouping of observations as simple as possible, so that all the analytical processes involve only simple additions and subtractions, and appropriate corrections are made at the end. Having decided this point, a little further liberty can be taken with the multipliers either on account of convenience or for ease of checking, and in the method for 15 or 29 days the multipliers are taken as 1 for X_1, Y_1, X_2, Y_2, so differing a little from those given in Table 13.2. The only reason for not having zero multipliers was that it was advantageous to use all the observations so that a check could be provided, in that the sum of the positive and negative parts, but without regard to sign, must be the sum of all the 24 quantities in each case.

8. The determination of daily values of mean sea level

As an example of the difficulties arising from the variable periods, and also in order to bring to notice a valuable formula, we can consider the problem of determining the mean level of the sea. It has been customary to take the mean of 24 observations ($t = 0$ to 23) at intervals of a mean solar hour, or, alternatively, to use 25 observations ($t = 0$ to 24), centered on mean moon. Neither of these methods gives complete satisfaction; the former has no contribution from any of the solar constituents, but the lunar constituents (particularly M_2 and O_1) considerably affect the results. The 25-hour method has a smaller lunar error with an appreciable solar error. The following table gives the errors by the two methods, per unit of amplitude of constituent.

TABLE 13.5

Possible Errors in Determination of Mean Sea Level

Constituent.	Amplitude of Constituent multiplied by :—	
	(a) 24 observations	(b) 25 observations
K_1	0·003	0·042
O_1	0·075	0·032
M_2	0·035	0·006
S_2	0·000	0·040
M_4	0·035	0·006
MS_4	0·018	0·024

Thus, if the amplitude of M_2 is 10·0 ft., its contribution to the error of computed mean sea level from 24 observations may be 0·35 ft., whereas from 25 observations it is 0·06 ft. Of course, on taking a month's observations, these errors are much reduced, for the contribution of M_2 will vary harmonically from day to day. The solar errors, however, will be the same from day to day, which is a strong argument in favour of using the 24-hour grouping. Neither method is ideal.

Let us consider three special groupings of y :—

(a) $y_0 + y_8 + y_{16}$
(b) $y_0 + y_5 + y_{10} + y_{15} + y_{20}$
(c) $y_0 + y_2$

The effect of these on any harmonic constituent of speed n is to multiply its amplitude by $\sin 12n/\sin 4n$ in case (*a*) and by $\sin 12{\cdot}5n/\sin 2{\cdot}5n$ in case (*b*) and by $2\cos n$ in case (*c*), as is shown in any elementary text-book on trigonometry. If the observations are at intervals of a mean solar hour, then $\sin 12n$ is zero when n is an integral multiple of 15°, and the factor then vanishes provided $\sin 4n$ is not also zero, so that the factor vanishes for the constituents S_1, S_2, S_4, S_8, but not for S_3 and S_6. These results, of course, can be tested with the values of $\cos nt$ and $\sin nt$ in Table 13.1. The combination (*c*), however, gives zero result with S_6, and so we can combine the groups (*a*) and (*c*) to give

$$(y_0 + y_2) + (y_8 + y_{10}) + (y_{16} + y_{18})$$

which will give zero results for constituents S_1, S_2, S_4, S_6 and S_8, but not S_3. Since the third-diurnal constituents are always small, we need not give further special attention to them.

The combination (*b*) gives very small results with all the constituents of the lunar series, M_1, M_2, M_3 . . ., and if this can be combined with the preceding combination of (*a*) and (*c*), we shall get a very good formula, as follows :—

$$\begin{aligned}(y_0 + y_2) + (y_8 + y_{10}) + (y_{16} + y_{18})\\ + (y_5 + y_7) + (y_{13} + y_{15}) + (y_{21} + y_{23})\\ + (y_{10} + y_{12}) + (y_{18} + y_{20}) + (y_{26} + y_{28})\\ + (y_{15} + y_{17}) + (y_{23} + y_{25}) + (y_{31} + y_{33})\\ + (y_{20} + y_{22}) + (y_{28} + y_{30}) + (y_{36} + y_{38})\end{aligned}$$

This formula can be expressed as in Table 13.6.

TABLE 13.6

Multipliers for Mean Sea Level

Divisor = 30.

t	Multiplier	*t*	Multiplier	*t*	Multiplier
0	1	12	1	24	0
1	0	13	1	25	1
2	1	14	0	26	1
3	0	15	2	27	0
4	0	16	1	28	2
5	1	17	1	29	0
6	0	18	2	30	1
7	1	19	0	31	1
8	1	20	2	32	0
9	0	21	1	33	1
10	2	22	1	34	0
11	0	23	2	35	0
				36	1
				37	0
				38	1

and its effects on certain constituents are given in Table 13.7, showing its great efficiency :—

TABLE 13.7

The Contributions to Calculated Values of Mean Sea Level by Formula of Table 13.6

Constituent	Amplitude multiplied by
M_2	0·0006
S_2	0·000
M_4	0·003
M_6	0·002
K_1	0·000
O_1	0·002
MO_3	0·007

It will be noted that the formula extends over a *span of 38 hours, and this spreading out over a span exceeding 24 hours is a consequence of the spreading out of the periods. It is inevitable if a " daily " formula is to isolate contributions from a single species of tide (in this case the long-period species). The central value is at hour 19, but if it is desired to have the central value at hour 12, then the multipliers must be used in order for $t = -7$ to $t = 24 + 7$, *i.e.*, seven hours on either side of the day of 24 hours.

It will also be noted that some hourly observations are not used, while others are used twice. Keeping in mind that any formula must adequately perform two duties—(1) isolation of the species of tide, (2) reduction of casual errors—and since it is evident that the first of these duties is efficiently performed by the formula, it only remains to enquire whether the casual errors are properly dealt with.

The discussion of this point would involve the theory of probability, a somewhat arid field for our purposes, but there are certain points which need to be considered in relation to the special problem. The casual errors are of two kinds, apart from errors of observation (that is, due to reading the tide gauge records), which we may ignore, namely, those of very short periods, as in the case of seiche motions apparent in the record, and those of longer periods, anything from six hours to a month, due to meteorological disturbances.

The short period errors are generally reduced by using a mean curve, and since we have a divisor of 30 with the formula, in effect we adequately reduce all such errors. The disturbances covering a longer span will yield the same effects with any formula, and in such cases there is no advantage in using observations for every hour of the day.

In other words, formulæ which have substantially the same divisors will reduce the casual errors to the same degree, and with this proviso the best formula is that which makes really adequate elimination of the unwanted periodic variations.

The discussions of this article are typical of those required for all species of tides, and modern methods are not content simply to diminish casual errors by merely using large numbers of observations, but they pay great attention to the isolation of the tidal constituents; that is, adequate corrections for periodic errors are now a prominent feature of the methods of harmonic analyses.

9. Daily, monthly and annual processes

The methods of analysis used some years ago involved a tremendous amount of computation. A year's observations of tides provides about 9000 observations, and we shall briefly explain how these were dealt with.

The average value of the 365 observations at any fixed hour of the day will be principally due to the solar constituents which repeat themselves at intervals of 24 solar hours. All other constituents will change in phase through multiples of 360°, and will only give small contributions in the result. Therefore we get 24 average values for hours $t = 0, 1, 2, \ldots 23$, which can be regarded as due principally to solar constituents, as the casual errors will be negligibly small. These can be analysed by any of the methods outlined earlier in the chapter, in order to give the solar constituents, S_1, S_2, S_3 . . . .

Now consider such a constituent as M_2. If the observations could be read off again at intervals of a lunar hour, then exactly the same method as above could be used, but this is impracticable. What was done was to " assign " an observation at a solar hour to the nearest lunar hour. All the observations were rewritten (itself a formidable task) according to the rules of assignment, and then the averages taken as outlined above. The series of 24 averages yielded M_1, M_2, M_3. . . . This process was repeated for every constituent and it was obviously a very laborious matter. The only attempt to reduce the systematic errors was to choose a span of observations which reduced the residual error due to M_2.

Later methods have made corrections, but the assignment method is in itself crude, and introduces unnecessary complications and errors.

* The word *span* is introduced to avoid the use of the word period in two senses, that of an interval of time and that of duration of a cycle.

Modern methods are much more economical in labour and much more efficient. The original hourly observations are dealt with by methods of grouping, analogous to those discussed in earlier articles, so as to obtain functions

X_0 for the long period constituents
X_1, Y_1 for the diurnal constituents
X_2, Y_2 for the semidiurnal constituents

and so on. The hourly observations need never be rewritten, and the operations are carried out by putting slips of paper (containing the multipliers) against the observations, multiplying and adding the products automatically on a calculating machine. The multipliers may be ± 1, 0 for the short span of observation (15 or 29 days) and ± 2, ± 1, 0 for the span of a year. In the latter case it is necessary to have the multipliers for this process spreading outside the 24 hours of the day, as in the case of the multipliers discussed in the previous article, in order to isolate the functions. When these functions are obtained we are left with about 360 values of X_2 and 360 values of Y_2, which alone need to be considered for the determination of all the semidiurnal constituents, and similarly for other species of constituents.

Now consider the function X_2, say. It contains contributions from S_2 and these will repeat themselves every day, but the constituent M_2 will give a variable contribution depending upon the phase of M_2 at the central hour of the daily span. In other words, the contribution of M_2 to the function X_2 will vary harmonically with a period of about a fortnight. Suppose, for a moment, that M_2 and S_2 are the only constituents and that we have a month's value of X_2. Let m denote the increment of phase of M_2 per 24 mean solar hours, and let T denote time in units of a mean solar day; then we can write

$$X_2 = A_s + A_m \cos mT + B_m \sin mT$$

where A_s is the contribution of S_2 to X_2 and the rest is due to M_2. Then in much the same way as in Art. 13.4 or Art. 13.5 we can replace $\cos mT$ by ± 1 or 0, or $2 \cos mT$ by ± 2, ± 1, 0 and so obtain multipliers which will give zero result when applied to A_s or to $\sin mT$ and will thus yield simply a multiple of A_m. We denote these multipliers by d_2 when there are two oscillations in a month and the effect upon X_2 is denoted by X_{22}, so that in this case we have

$$X_{22} \text{ a multiple of } A_m.$$

Similarly we can obtain multipliers from $\sin mT$, which we call d_b (b being the second letter of the alphabet, so that d_2 and d_b are associated multipliers) and their application to X_2 gives a function called X_{2b}, which is simply proportional to B_m.

If we want to determine A_s we only need to add the values of X_2 to give a function called X_{20}, but the isolation will not be perfect.

Now all the semidiurnal constituents can be considered in groups whose character is specified by the number of oscillations per month in the functions X_2, Y_2 as follows :—

TABLE 13.8

Group No.	Constituent	Multipliers
0	S_2, K_2, T_2, etc.	d_0
1	L_2, λ_2	d_1, d_a
2	M_2, $2SM_2$	d_2, d_b
3	N_2, ν_2	d_3, d_c
4	μ_2, $2N_2$	d_4, d_d

and it is a simple matter to provide multipliers d_0, d_1, d_2, d_3, d_4 and d_a, d_b, d_c, d_d, which will tend to isolate these groups of constituents, so yielding functions

$X_{20}, X_{21}, \ldots \qquad X_{2a}, X_{2b}, \ldots$
$Y_{20}, Y_{21}, \ldots \qquad Y_{2a}, Y_{2b}, \ldots$

The isolation will not be perfect, but simple methods of correction can be evaluated once for all.

It will be noted that K_2 has the same group number as S_2, so that the function X_{20} contains a large contribution from K_2 as well as S_2. The reason for this is that the two constituents have nearly equal speeds, and though the phase of K_2 changes in the month it does not march through a multiple of 360° like the phases of constituents in the other groups. To separate K_2 and S_2 we must have recourse to an annual process, using the 12 values of X_{20} resulting from the analyses for 12 months. Now the increment of angle of K_2 is about 2° per day, so that in a year it changes phase by 720° relatively to S_2. Thus the 12 values of X_{20} will show a semiannual oscillation which will be due to K_2. Another set of multipliers m_2 and m_b will give quantities which are denoted by X_{202} and X_{20b}, and these contain mainly contributions from K_2.

In a similar way, ν_2 and N_2 are isolated, and many other constituents also. The processes are thus divisible into three: (*a*) daily processes giving species of tides, (*b*) monthly processes separating groups of constituents and (*c*) annual processes separating the constituents of each group.

Similar principles apply to the diurnal and other species, the group numbers for important constituents being as follows, in continuation of Table 13.8.

TABLE 13.9

Group No.				
0	S*a*, S*sa*	K_1, S_1, P_1	S_4, SK_4	..
1	M*m*	J_1, M_1	..	..
2	MS*f*, M*f*	O_1	MS_4, MK_4	$2SM_6$
3	..	Q_1	SN_4	..
4	..	..	M_4	$2MS_6$
5	..	..	MN_4	MSN_6
6	..	..	..	M_6

The multipliers used in the monthly processes are the same for all constituents having the same group number.

This table can be verified from the table given in Art. 7.1, by multiplying the speeds by 24, and subtracting the nearest multiple of 360°, which gives the increments in phase per mean solar day. It will be found that these are approximately equal to ± 12° multiplied by the group numbers given in Tables 13.8 and 13.9.

The results will need correcting, and the designer of the method of analysis provides the proper formulæ. The corrections are simple in character. Theoretically, any function X_{pqr} will contain multiples, large, small or negligibly small, of both A and B for every constituent of the species, but by the proper choice of multipliers the A's and B's are automatically separated, so that the functions X_{pqr} contain A's, say. In Table 13.3 we have a simple illustration, in which the function X_1 contains multiples of A_1 and A_3 and the latter is eliminated by using X_3. In a similar manner, but in a much more complicated way, the designer of a method of analysis works out the final multipliers to be applied to all the functions X_{pqr} in order to isolate the required value of A.

All this is done once for all, and the computer only needs to understand the general principles as outlined above. There are, of course, many possible combinations of multipliers, but the actual choice is a matter for the exercise of much knowledge and skill and is left to the expert. It is clear that whatever system of multipliers is used in the daily, monthly and annual processes the designer can work out exactly what they will yield with any harmonic constituent. He only needs to work out the appropriate tables as in Table 13.1 for the exact speeds, and then to apply the multipliers.

10. The reduction of short lengths of observations

In a large number of cases it is only possible to obtain observations over a span of 15 or 29 days. In such cases it is quite impossible to separate two constituents in the same group, simply because their phases do not separate by a sufficient amount in the course of a month. Thus K_1 and P_1 cannot be separated, and the results of analyses, carried out for the daily and monthly processes, give an apparent constituent made up of both these important constituents. In such a case we must assume the same relationship between K_1 and P_1 as exists between the corresponding equilibrium constituents. This point was discussed fully in Chapter IX in connection with the Admiralty method. The assumption is quite permissible for constituents whose speeds are nearly equal, and it is precisely in such cases where the assumption is needed. Therefore in the schedules of analysis for K_1 and P_1 a factor and phase-correction have to be evaluated, which depend upon the differences in phase between K_1 and P_1 and also upon the value of f and u for K_1. These corrections are made quite simply. Similarly it is necessary to correct the apparent constituent S_2 on account of perturbations by K_2 and T_2, N_2 is corrected for ν_2 and MS_4 is corrected for MK_4.

From short lengths of observations it is inadvisable to attempt to evaluate the smaller constituents because of the casual errors being insufficiently reduced.

When the span of the observations is only 15 days, the assumptions made when dealing with observations over a span of 29 days are exactly the same, and the principles of operation are the same, but two groups of constituents whose group numbers differ only by 1 will only separate by approximately 180° in phase during 15 days, so that the isolation of one group is much more imperfect than in the case of the span of 29 days where the phases of adjacent groups change by about 360° in 29 days. Consequently the corrections are much larger than in the case of the longer span.

The analysis of still shorter lengths of records is dependent upon more assumptions about which it is not always possible to feel great assurance. While it would be possible to obtain by direct analysis results for spans of seven days on much the same lines as for 15 days and 29 days, it may be considered as impracticable to use direct methods for spans shorter than seven days.

When only 24 or 25 hours of observations are available, then direct analyses will only determine the whole tide of any species. The methods of Art. 13.4 will give values of X_0, X_1, Y_1, X_2, Y_2, . . . but to determine by direct analysis the contributions of M_2, S_2, N_2, . . . to the functions X_2, Y_2 is impossible. Under such circumstances, all that can be reasonably done is to assume regional relationships between the principal constituents. Thus if the ratios of amplitudes of S_2 and M_2, together with the difference in the phase-lags, can be assumed to be much the same all over a region, then these quantities, if known, may be used to determine the constituents. The discussion of Art. 9.1 shows that this is normally a reasonable assumption to make. In practice, the Admiralty method automatically assumes also a relationship between N_2 and M_2.

These assumptions fail near an amphidromic point because each constituent has its own amphidromic distribution and the relations between the constituents will vary greatly near such places.

11. Deduction of harmonic constants

Referring back to Art. 13.2, the result of the harmonic analysis is to give the quantities A and B which specify a constituent of speed n as

$$A \cos nt + B \sin nt$$

The origin of time ($t = 0$) is chosen to suit the method of analysis, so it is arbitrary, and it is needful to express the harmonic constituent in a more suitable form. The first stage is to express it in the form

$$R \cos (nt - k)$$

as in (13.2a) with the relations of (13.3b) connecting A, B, R, k.

Since R denotes the amplitude of the constituent as obtained from the span of observations analysed, it is needful to make allowance for the nineteen-yearly variations of the constituent (see Art. 6.7) and the nodal factor, as it is called, being denoted by f, we have

$$R = fH \qquad . \quad . \quad . \quad . \quad . \quad (13.11a)$$

and H is one of the harmonic constants (see Art. 6.8).

The arbitrary time origin is inconvenient and it is desirable to adopt a system of reference, so that all constituents from all analyses, everywhere, can be rendered to the same standard of reference. At one time, in the early days of harmonic analysis, it was thought that the best reference would be to the corresponding constituent of the equilibrium tide at the place, and if this had a phase of $(V + u)$ where V is *uniformly varying with speed n and u is the nodal angular correction*, then by subtracting a phase-lag κ and equating the phases we have

$$nt - k = V + u - \kappa$$

and therefore $$\kappa = V_0 + u + k \quad . \quad . \quad . \quad . \quad (13.11b)$$

where V_0 is the value of V at the origin of time ($t = 0$). The phase-lag κ is one of the harmonic constants (see Art. 6.8).

It was thought that the value of κ, being related to the local tide-generating forces, might have a dynamical significance, but it was found to be a cumbrous procedure to compute V for all places on the earth, and more convenient to tabulate it for the Greenwich meridian, and a simple and logical outcome was to treat the observations as though they had been taken at Greenwich (see Art. 7.3). The observations taken in standard time are now treated as though they were taken at Greenwich, and the phase-lag on the Greenwich equilibrium constituent is defined by g, and related to κ by

$$g = \kappa + jL - nS \quad . \quad . \quad . \quad . \quad . \quad (13.11c)$$

where j is the species number (0 for long periods, 1 for diurnals, etc.)
n is the speed in degrees per mean solar hour
L is the longitude of the place in degrees west of Greenwich
S is the longitude of the time meridian in hours west of Greenwich.

(For a proof of this formula see Art. 7.3.)

One advantage of this method is that all places in a time-zone are related to one another so that the differences in g of M_2, say, divided by the speed (29° for M_2) give the difference in hours of mean solar time between the mean high water times, and another advantage is that if predictions are made for all places as though they were on the Greenwich meridian the predictions are given automatically in standard time.

The phase-lag g is now always used in Admiralty tidal practice, but as the older publications give κ, which constant is also still used by some authorities, the formula (13.11c) is very important.

12. The Admiralty Semi-Graphic Method of Harmonic Tidal Analysis

Although methods of analysis similar to those described in this chapter are still used by the Liverpool Tidal Institute, a new semi-graphic method has been developed in the Admiralty for the analyses of periods of one month. This method is fully described in Admiralty Tidal Handbook No. 1, The Admiralty Semi-Graphic Method of Harmonic Tidal Analysis.

APPENDIX 2

HOURLY HEIGHTS OF TIDES

Ilha Fiscal

(Mar. 19, 1991 - Mar. 18, 1992)

Tidal Height at PORTO DO RIO DE JANEIRO(I.FISCAL)   22.53.8S 43 9.9W

19/ 3/91 - 18/ 3/92

Day \ Time	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
19/ 3	1.78	1.98	2.25	2.52	2.69	2.60	2.40	2.14	1.99	1.89	1.79	1.73	1.72	1.89	2.19	2.53	2.75	2.80	2.63	2.42	2.26	2.15	2.01	1.92
20/ 3	1.88	1.93	2.15	2.41	2.58	2.61	2.48	2.25	2.09	2.02	1.98	1.92	1.89	1.89	2.00	2.29	2.56	2.75	2.72	2.62	2.42	2.32	2.27	2.22
21/ 3	2.16	2.10	2.11	2.25	2.43	2.58	2.54	2.40	2.20	2.12	2.08	2.02	2.02	1.99	2.01	2.16	2.40	2.60	2.70	2.63	2.53	2.49	2.48	2.47
22/ 3	2.40	2.32	2.25	2.28	2.39	2.50	2.52	2.47	2.33	2.28	2.24	2.21	2.23	2.18	2.09	2.04	2.15	2.30	2.50	2.55	2.55	2.51	2.58	2.61
23/ 3	2.69	2.60	2.49	2.39	2.35	2.42	2.45	2.50	2.43	2.40	2.35	2.35	2.40	2.32	2.20	2.10	2.07	2.12	2.28	2.40	2.46	2.50	2.59	2.68
24/ 3	2.77	2.72	2.62	2.49	2.35	2.30	2.29	2.35	2.38	2.35	2.37	2.37	2.35	2.40	2.30	2.18	2.00	1.91	1.90	2.01	2.17	2.32	2.47	2.60
25/ 3	2.70	2.78	2.74	2.60	2.40	2.23	2.17	2.18	2.27	2.35	2.40	2.47	2.50	2.50	2.42	2.30	2.09	1.89	1.80	1.82	1.98	2.16	2.36	2.52
26/ 3	2.69	2.78	2.72	2.61	2.40	2.20	2.05	2.03	2.10	2.26	2.41	2.55	2.63	2.62	2.59	2.46	2.28	2.01	1.88	1.80	1.89	2.10	2.40	2.68
27/ 3	2.85	2.94	2.95	2.86	2.67	2.48	2.28	2.19	2.19	2.31	2.52	2.80	2.91	2.99	2.90	2.77	2.55	2.32	2.09	1.90	1.88	1.98	2.21	2.51
28/ 3	2.80	2.94	2.98	2.88	2.70	2.50	2.27	2.11	2.09	2.11	2.30	2.58	2.86	2.98	2.98	2.87	2.62	2.40	2.15	1.93	1.31	1.82	2.00	2.32
29/ 3	2.67	2.90	2.95	2.90	2.70	2.49	2.27	2.09	1.95	1.99	2.12	2.39	2.70	2.95	3.00	2.90	2.68	2.40	2.17	1.90	1.76	1.66	1.73	2.00
30/ 3	2.30	2.64	2.81	2.79	2.59	2.39	2.13	1.92	1.85	1.79	1.81	2.00	2.31	2.67	2.90	2.91	2.78	2.50	2.20	1.99	1.81	1.71	1.69	1.80
31/ 3	2.06	2.40	2.63	2.72	2.60	2.35	2.10	1.90	1.80	1.70	1.70	1.80	2.02	2.39	2.68	2.80	2.72	2.52	2.28	2.01	1.85	1.73	1.71	1.78
1/ 4	1.92	2.20	2.50	2.67	2.61	2.40	2.15	1.94	1.80	1.72	1.71	1.73	1.90	2.18	2.50	2.79	2.87	2.70	2.49	2.25	2.02	1.97	1.91	1.95
2/ 4	2.00	2.19	2.43	2.65	2.74	2.67	2.46	2.20	2.03	1.95	1.90	1.90	1.99	2.17	2.46	2.75	2.91	2.91	2.72	2.50	2.34	2.23	2.20	2.20
3/ 4	2.21	2.30	2.49	2.70	2.81	2.79	2.60	2.39	2.18	2.10	2.00	2.00	2.00	2.11	2.28	2.55	2.72	2.81	2.70	2.52	2.35	2.22	2.18	2.19
4/ 4	2.18	2.20	2.28	2.42	2.55	2.60	2.50	2.32	2.16	2.00	1.96	1.90	1.92	1.95	2.02	2.18	2.42	2.55	2.61	2.50	2.32	2.20	2.18	2.18
5/ 4	2.21	2.20	2.25	2.30	2.42	2.50	2.55	2.41	2.30	2.15	2.09	2.02	2.09	2.09	2.10	2.19	2.33	2.50	2.63	2.62	2.53	2.45	2.42	2.42
6/ 4	2.49	2.49	2.48	2.48	2.50	2.55	2.59	2.59	2.50	2.42	2.32	2.28	2.25	2.22	2.20	2.20	2.29	2.40	2.52	2.58	2.57	2.50	2.49	2.51
7/ 4	2.52	2.51	2.47	2.39	2.35	2.39	2.40	2.41	2.40	2.35	2.25	2.22	2.20	2.20	2.11	2.04	2.00	2.01	2.10	2.21	2.30	2.31	2.31	2.35
8/ 4	2.35	2.34	2.28	2.20	2.10	2.03	2.08	2.10	2.15	2.19	2.18	2.17	2.18	2.10	2.01	1.88	1.81	1.78	1.83	1.92	2.03	2.13	2.26	2.33
9/ 4	2.40	2.40	2.34	2.18	2.08	1.99	1.99	2.03	2.13	2.20	2.33	2.37	2.44	2.40	2.32	2.16	2.01	1.89	1.86	1.89	2.02	2.21	2.40	2.56
10/ 4	2.66	2.69	2.62	2.54	2.37	2.20	2.12	2.12	2.19	2.33	2.47	2.62	2.68	2.72	2.63	2.48	2.26	2.06	1.96	1.90	2.00	2.19	2.43	2.64
11/ 4	2.77	2.80	2.75	2.62	2.42	2.22	2.03	1.99	2.00	2.18	2.36	2.58	2.69	2.75	2.66	2.52	2.29	2.10	1.82	1.72	1.70	1.85	2.11	2.40
12/ 4	2.62	2.72	2.72	2.60	2.45	2.21	2.03	1.88	1.85	1.92	2.14	2.43	2.70	2.84	2.86	2.72	2.50	2.23	2.00	1.80	1.69	1.76	1.98	2.28
13/ 4	2.60	2.78	2.83	2.77	2.51	2.38	2.17	1.92	1.83	1.90	2.10	2.43	2.75	2.95	2.97	2.83	2.60	2.34	2.08	1.83	1.69	1.70	1.92	2.21
14/ 4	2.59	2.80	2.84	2.73	2.56	2.29	2.10	1.90	1.82	1.76	1.83	2.03	2.38	2.70	2.93	2.99	2.90	2.67	2.40	2.12	1.88	1.71	1.71	1.90
15/ 4	2.20	2.53	2.79	2.82	2.72	2.50	2.30	2.07	1.88	1.78	1.72	1.82	2.10	2.43	2.80	2.97	2.99	2.83	2.60	2.40	2.12	1.91	1.79	1.81
16/ 4	2.00	2.30	2.60	2.72	2.72	2.53	2.28	2.11	1.91	1.81	1.71	1.65	1.81	2.10	2.45	2.72	2.86	2.80	2.60	2.40	2.20	2.00	1.86	1.80
17/ 4	1.85	2.00	2.30	2.51	2.58	2.43	2.21	2.02	1.88	1.77	1.67	1.58	1.62	1.81	2.14	2.49	2.70	2.70	2.58	2.41	2.25	2.14	2.02	1.93
18/ 4	1.92	2.02	2.18	2.40	2.50	2.41	2.28	2.09	1.94	1.89	1.82	1.79	1.69	1.76	1.90	2.22	2.48	2.65	2.63	2.53	2.47	2.40	2.37	2.28
19/ 4	2.15	2.13	2.18	2.32	2.47	2.50	2.48	2.32	2.18	2.11	2.03	2.03	1.98	1.89	1.90	1.99	2.22	2.48	2.60	2.62	2.58	2.57	2.53	2.61

20/ 4	2.59	2.57	2.50	2.50	2.51	2.60	2.63	2.60	2.49	2.42	2.36	2.35	2.31	2.21	2.17	2.15	2.27	2.48	2.62	2.70	2.70	2.70	2.74	2.80
21/ 4	2.81	2.72	2.61	2.52	2.50	2.52	2.59	2.61	2.52	2.50	2.42	2.40	2.39	2.36	2.22	2.11	2.07	2.11	2.28	2.42	2.53	2.57	2.50	2.69
22/ 4	2.70	2.73	2.62	2.48	2.33	2.30	2.36	2.41	2.44	2.41	2.38	2.36	2.35	2.32	2.20	2.05	1.90	1.82	1.90	2.07	2.20	2.30	2.38	2.48
23/ 4	2.50	2.52	2.47	2.32	2.15	2.06	2.03	2.10	2.20	2.35	2.33	2.39	2.35	2.32	2.21	2.11	1.89	1.78	1.70	1.80	1.98	2.19	2.32	2.48
24/ 4	2.52	2.56	2.48	2.37	2.17	2.01	1.98	1.99	2.09	2.28	2.39	2.50	2.52	2.50	2.40	2.22	2.10	1.88	1.73	1.71	1.79	1.99	2.24	2.45
25/ 4	2.58	2.59	2.53	2.40	2.22	2.15	1.95	1.89	1.98	2.12	2.38	2.58	2.70	2.68	2.60	2.41	2.22	2.05	1.88	1.79	1.85	2.00	2.28	2.51
26/ 4	2.68	2.70	2.62	2.47	2.33	2.12	1.99	1.90	1.92	2.04	2.30	2.58	2.70	2.88	2.82	2.65	2.45	2.30	2.02	1.90	1.82	1.90	2.10	2.41
27/ 4	2.68	2.82	2.80	2.67	2.49	2.28	2.12	1.99	1.94	1.97	2.11	2.39	2.69	2.89	2.92	2.82	2.57	2.48	2.17	2.00	1.88	1.86	1.99	2.20
28/ 4	2.43	2.68	2.79	2.70	2.50	2.29	2.12	1.95	1.86	1.88	2.00	2.20	2.53	2.82	2.98	2.95	2.80	2.57	2.38	2.28	2.07	2.03	2.10	2.27
29/ 4	2.51	2.80	2.91	2.90	2.72	2.47	2.22	2.09	1.98	1.94	1.99	2.17	2.43	2.79	2.98	3.06	2.91	2.74	2.50	2.34	2.21	2.18	2.18	2.31
30/ 4	2.50	2.76	2.92	2.98	2.83	2.60	2.34	2.15	2.01	1.91	1.90	1.95	2.10	2.39	2.70	2.91	2.95	2.80	2.59	2.39	2.22	2.12	2.09	2.10
1/ 5	2.19	2.36	2.60	2.76	2.75	2.60	2.35	2.10	1.90	1.81	1.75	1.79	1.89	2.09	2.40	2.66	2.71	2.72	2.51	2.32	2.15	2.05	2.02	2.05
2/ 5	2.10	2.22	2.42	2.59	2.65	2.55	2.35	2.10	1.95	1.82	1.79	1.75	1.80	1.97	2.20	2.42	2.68	2.70	2.58	2.38	2.20	2.12	2.10	2.10
3/ 5	2.11	2.18	2.28	2.42	2.51	2.52	2.35	2.12	1.97	1.85	1.75	1.75	1.75	1.80	1.91	2.15	2.35	2.55	2.52	2.40	2.22	2.15	2.10	2.10
4/ 5	2.10	2.10	2.18	2.29	2.30	2.45	2.40	2.26	2.12	1.99	1.90	1.89	1.85	1.89	1.99	2.10	2.35	2.50	2.52	2.45	2.39	2.30	2.29	2.25
5/ 5	2.25	2.25	2.25	2.30	2.39	2.41	2.45	2.33	2.28	2.18	2.10	2.05	2.01	2.00	2.00	2.05	2.18	2.35	2.48	2.50	2.48	2.45	2.45	2.45
6/ 5	2.45	2.42	2.40	2.38	2.40	2.49	2.53	2.56	2.56	2.51	2.48	2.40	2.39	2.34	2.28	2.25	2.29	2.39	2.50	2.62	2.65	2.65	2.65	2.65
7/ 5	2.65	2.65	2.56	2.45	2.40	2.42	2.50	2.55	2.60	2.55	2.54	2.49	2.44	2.35	2.25	2.14	2.11	2.15	2.20	2.32	2.49	2.55	2.60	2.65
8/ 5	2.64	2.60	2.50	2.35	2.25	2.21	2.30	2.35	2.49	2.52	2.60	2.60	2.55	2.48	2.38	2.22	2.12	2.05	2.10	2.19	2.37	2.50	2.65	2.68
9/ 5	2.72	2.68	2.58	2.41	2.28	2.18	2.15	2.21	2.37	2.49	2.64	2.71	2.71	2.65	2.55	2.39	2.20	2.02	1.99	2.00	2.15	2.35	2.59	2.70
10/ 5	2.75	2.72	2.65	2.50	2.35	2.15	2.05	2.05	2.15	2.38	2.59	2.75	2.82	2.80	2.70	2.50	2.30	2.10	1.93	1.90	2.00	2.20	2.45	2.65
11/ 5	2.79	2.80	2.72	2.60	2.40	2.20	2.05	1.95	2.00	2.20	2.45	2.75	2.91	3.00	2.95	2.85	2.61	2.40	2.15	2.00	1.95	2.06	2.30	2.58
12/ 5	2.79	2.90	2.86	2.75	2.55	2.38	2.15	2.00	1.95	2.03	2.30	2.61	2.90	3.05	3.05	2.95	2.75	2.50	2.25	2.03	1.90	1.95	2.12	2.42
13/ 5	2.70	2.85	2.72	2.55	2.35	2.10	1.90	1.80	1.80	1.80	1.95	2.22	2.55	2.85	3.00	2.95	2.80	2.60	2.36	2.10	1.90	1.80	1.85	2.08
14/ 5	2.35	2.58	2.68	2.63	2.42	2.25	2.05	1.85	1.68	1.65	1.60	1.78	2.10	2.45	2.72	2.85	2.80	2.60	2.42	2.20	2.00	1.82	1.75	1.80
15/ 5	2.00	2.30	2.49	2.58	2.48	2.25	2.09	1.90	1.75	1.60	1.50	1.50	1.70	2.04	2.40	2.65	2.75	2.70	2.55	2.40	2.25	2.03	1.90	1.85
16/ 5	1.90	2.14	2.40	2.58	2.58	2.45	2.30	2.15	2.00	1.85	1.70	1.62	1.68	1.90	2.29	2.60	2.85	2.87	2.80	2.70	2.60	2.50	2.38	2.22
17/ 5	2.20	2.28	2.48	2.69	2.30	2.70	2.55	2.37	2.25	2.15	2.05	1.88	1.82	1.89	2.15	2.45	2.78	2.85	2.80	2.75	2.68	2.60	2.53	2.42
18/ 5	2.30	2.30	2.38	2.55	2.68	2.70	2.57	2.41	2.25	2.20	2.12	2.05	1.90	1.83	1.85	2.05	2.35	2.60	2.65	2.60	2.55	2.50	2.50	2.48
19/ 5	2.36	2.20	2.15	2.20	2.35	2.48	2.48	2.35	2.22	2.11	2.02	2.00	1.90	1.76	1.70	1.72	1.92	2.15	2.31	2.35	2.30	2.28	2.29	2.30
20/ 5	2.30	2.20	2.05	2.05	2.10	2.25	2.30	2.30	2.18	2.13	2.03	2.02	1.95	1.90	1.75	1.65	1.65	1.82	2.00	2.20	2.25	2.20	2.25	2.22
21/ 5	2.28	2.24	2.17	2.00	1.99	2.05	2.15	2.25	2.25	2.20	2.13	2.12	2.07	2.02	1.93	1.80	1.73	1.79	1.92	2.11	2.20	2.26	2.25	2.29
22/ 5	2.31	2.30	2.22	2.11	1.97	2.00	2.12	2.28	2.36	2.42	2.40	2.38	2.32	2.30	2.20	2.12	1.98	1.93	1.91	2.07	2.20	2.37	2.42	2.44
23/ 5	2.46	2.42	2.37	2.23	2.10	2.01	2.05	2.13	2.32	2.45	2.58	2.58	2.54	2.48	2.42	2.30	2.20	2.05	1.98	2.03	2.17	2.36	2.54	2.68
24/ 5	2.62	2.58	2.50	2.40	2.27	2.16	2.07	2.12	2.24	2.40	2.60	2.74	2.77	2.74	2.67	2.53	2.40	2.28	2.14	2.10	2.14	2.33	2.53	2.72
25/ 5	2.78	2.73	2.65	2.50	2.34	2.20	2.05	1.98	2.02	2.20	2.42	2.64	2.76	2.74	2.68	2.53	2.42	2.24	2.10	2.00	1.98	2.05	2.25	2.44

26/ 5	2.63	2.62	2.54	2.37	2.20	2.08	1.93	1.86	1.84	1.93	2.12	2.45	2.69	2.80	2.80	2.62	2.50	2.35	2.20	2.06	2.03	2.06	2.22	2.48
27/ 5	2.69	2.79	2.72	2.57	2.35	2.18	2.03	1.90	1.82	1.89	2.12	2.31	2.60	2.72	2.79	2.75	2.60	2.40	2.22	2.03	1.99	2.00	2.13	2.30
28/ 5	2.48	2.60	2.70	2.58	2.37	2.12	1.92	1.80	1.70	1.66	1.73	1.92	2.20	2.50	2.70	2.72	2.60	2.40	2.20	2.09	1.99	1.89	1.90	2.00
29/ 5	2.20	2.42	2.55	2.53	2.36	2.12	1.90	1.72	1.60	1.53	1.51	1.64	1.90	2.21	2.50	2.64	2.62	2.46	2.29	2.10	2.00	1.91	1.90	1.94
30/ 5	2.09	2.31	2.50	2.60	2.51	2.30	2.02	1.88	1.80	1.70	1.62	1.60	1.64	1.80	2.09	2.39	2.60	2.67	2.59	2.39	2.20	2.05	2.00	1.99
31/ 5	2.00	2.08	2.24	2.42	2.53	2.52	2.42	2.18	1.99	1.70	1.62	1.68	1.70	1.90	2.19	2.44	2.61	2.60	2.50	2.30	2.18	2.09	2.03	2.02
1/ 6	2.08	2.16	2.32	2.49	2.59	2.57	2.40	2.19	2.00	1.88	1.78	1.77	1.76	1.90	2.09	2.39	2.59	2.69	2.60	2.43	2.30	2.22	2.19	2.15
2/ 6	2.14	2.20	2.30	2.49	2.60	2.61	2.50	2.34	2.20	2.09	2.00	1.92	1.90	1.94	2.03	2.23	2.50	2.68	2.67	2.53	2.40	2.30	2.27	2.23
3/ 6	2.20	2.19	2.21	2.34	2.45	2.55	2.50	2.40	2.25	2.10	2.02	1.95	1.90	1.85	1.85	1.92	2.10	2.35	2.49	2.48	2.39	2.29	2.20	2.20
4/ 6	2.20	2.09	2.06	2.00	2.05	2.15	2.30	2.35	2.35	2.29	2.21	2.12	2.09	1.99	1.90	1.82	1.83	1.99	2.18	2.29	2.38	2.35	2.35	2.34
5/ 6	2.38	2.30	2.20	2.10	2.09	2.12	2.22	2.39	2.45	2.49	2.48	2.42	2.40	2.30	2.21	2.08	2.03	2.01	2.17	2.30	2.47	2.52	2.59	2.58
6/ 6	2.38	2.30	2.20	2.10	2.08	2.12	2.22	2.39	2.45	2.49	2.48	2.42	2.40	2.30	2.21	2.08	2.03	2.01	2.17	2.30	2.47	2.52	2.59	2.58
7/ 6	2.60	2.52	2.40	2.30	2.19	2.13	2.23	2.38	2.50	2.70	2.72	2.75	2.69	2.63	2.50	2.36	2.20	2.15	2.20	2.32	2.50	2.68	2.75	2.78
8/ 6	2.80	2.73	2.62	2.49	2.33	2.20	2.22	2.32	2.49	2.68	2.82	2.91	2.92	2.90	2.82	2.63	2.49	2.29	2.19	2.19	2.30	2.48	2.66	2.78
9/ 6	2.80	2.80	2.72	2.58	2.42	2.23	2.12	2.12	2.22	2.52	2.80	2.99	3.05	3.05	2.91	2.72	2.43	2.22	2.06	2.04	2.15	2.33	2.55	2.70
10/ 6	2.75	2.70	2.59	2.39	2.19	1.99	1.83	1.80	1.85	1.98	2.21	2.51	2.71	2.83	2.80	2.71	2.55	2.31	2.10	1.90	1.80	1.86	2.06	2.30
11/ 6	2.50	2.59	2.55	2.45	2.24	2.05	1.85	1.65	1.55	1.60	1.71	2.05	2.35	2.60	2.75	2.75	2.66	2.49	2.28	2.05	1.85	1.75	1.80	1.98
12/ 6	2.21	2.41	2.48	2.44	2.29	2.10	1.93	1.75	1.55	1.44	1.50	1.75	2.11	2.45	2.70	2.78	2.78	2.68	2.49	2.29	2.05	1.85	1.85	1.99
13/ 6	2.20	2.43	2.60	2.59	2.49	2.31	2.12	1.98	1.78	1.59	1.49	1.59	1.89	2.21	2.59	2.79	2.82	2.81	2.70	2.59	2.38	2.18	2.00	2.01
14/ 6	2.18	2.40	2.61	2.71	2.66	2.50	2.31	2.19	2.01	1.86	1.67	1.60	1.70	2.05	2.40	2.71	2.88	2.88	2.82	2.75	2.60	2.45	2.30	2.15
15/ 6	2.20	2.33	2.58	2.76	2.81	2.70	2.55	2.36	2.20	2.10	1.98	1.80	1.74	1.80	2.12	2.47	2.74	2.85	2.80	2.72	2.61	2.50	2.40	2.28
16/ 6	2.20	2.21	2.39	2.58	2.70	2.74	2.60	2.42	2.25	2.15	2.05	1.95	1.81	1.75	1.86	2.15	2.45	2.69	2.72	2.61	2.51	2.45	2.42	2.38
17/ 6	2.28	2.20	2.25	2.42	2.61	2.75	2.72	2.58	2.38	2.20	2.15	2.10	2.00	1.92	1.88	1.99	2.25	2.51	2.68	2.65	2.52	2.45	2.42	2.42
18/ 6	2.43	2.35	2.30	2.35	2.50	2.69	2.81	2.78	2.60	2.49	2.35	2.30	2.28	2.23	2.11	2.05	2.15	2.35	2.60	2.68	2.60	2.46	2.40	2.38
19/ 6	2.42	2.40	2.32	2.26	2.30	2.42	2.60	2.68	2.60	2.48	2.32	2.28	2.20	2.23	2.15	2.05	2.01	2.10	2.20	2.48	2.52	2.45	2.30	2.20
20/ 6	2.18	2.24	2.25	2.15	2.08	2.10	2.25	2.42	2.55	2.50	2.39	2.30	2.25	2.20	2.20	2.15	2.00	2.01	2.10	2.20	2.40	2.41	2.39	2.25
21/ 6	2.25	2.20	2.21	2.14	2.10	2.02	2.09	2.18	2.40	2.50	2.45	2.42	2.32	2.34	2.30	2.30	2.22	2.10	2.10	2.15	2.35	2.51	2.60	2.55
22/ 6	2.52	2.42	2.38	2.30	2.28	2.15	2.10	2.19	2.35	2.54	2.70	2.75	2.75	2.70	2.65	2.60	2.54	2.45	2.35	2.35	2.40	2.55	2.70	2.78
23/ 6	2.75	2.65	2.55	2.41	2.30	2.18	2.10	2.12	2.20	2.40	2.61	2.75	2.80	2.72	2.65	2.51	2.42	2.28	2.18	2.14	2.19	2.35	2.50	2.65
24/ 6	2.63	2.55	2.40	2.20	2.10	1.95	1.84	1.84	1.85	1.98	2.19	2.42	2.62	2.72	2.70	2.60	2.45	2.32	2.19	2.10	2.07	2.11	2.22	2.42
25/ 6	2.60	2.60	2.59	2.42	2.22	2.05	1.92	1.80	1.78	1.86	2.08	2.31	2.60	2.78	2.82	2.73	2.60	2.49	2.30	2.20	2.10	2.12	2.22	2.48
26/ 6	2.68	2.80	2.80	2.63	2.42	2.20	2.00	1.82	1.79	1.78	1.82	2.09	2.39	2.62	2.80	2.80	2.69	2.50	2.33	2.19	2.03	2.00	2.02	2.19
27/ 6	2.42	2.62	2.73	2.63	2.48	2.25	2.00	1.82	1.70	1.68	1.70	1.86	2.10	2.42	2.69	2.80	2.70	2.58	2.38	2.20	2.02	2.00	1.98	2.09
28/ 6	2.25	2.48	2.62	2.69	2.55	2.35	2.09	1.89	1.71	1.59	1.55	1.60	1.82	2.13	2.42	2.62	2.68	2.58	2.38	2.15	2.00	1.92	1.90	1.92
29/ 6	2.08	2.28	2.47	2.62	2.60	2.46	2.22	2.00	1.80	1.71	1.69	1.70	1.86	2.09	2.39	2.69	2.83	2.80	2.68	2.43	2.31	2.22	2.09	2.09
30/ 6	2.22	2.40	2.63	2.86	2.92	2.86	2.68	2.46	2.20	2.08	1.95	1.96	1.95	2.17	2.39	2.68	2.86	2.90	2.80	2.60	2.43	2.30	2.22	2.20

1/ 7	2.21	2.31	2.50	2.70	2.82	2.82	2.69	2.48	2.25	2.10	2.00	1.90	1.86	1.91	2.10	2.35	2.62	2.80	2.78	2.62	2.46	2.32	2.25	2.20
2/ 7	2.20	2.20	2.32	2.50	2.70	2.80	2.78	2.62	2.42	2.22	2.10	1.99	1.97	1.90	1.96	2.12	2.40	2.59	2.69	2.55	2.40	2.25	2.20	2.12
3/ 7	2.15	2.10	2.10	2.21	2.40	2.55	2.64	2.55	2.40	2.20	2.11	2.00	1.96	1.92	1.90	1.95	2.15	2.40	2.52	2.51	2.40	2.25	2.19	2.16
4/ 7	2.15	2.10	2.05	2.08	2.23	2.41	2.58	2.55	2.48	2.35	2.28	2.21	2.20	2.10	2.06	2.02	2.18	2.38	2.56	2.65	2.62	2.52	2.46	2.44
5/ 7	2.45	2.41	2.40	2.35	2.40	2.55	2.71	2.81	2.85	2.80	2.76	2.70	2.68	2.59	2.49	2.40	2.41	2.48	2.65	2.74	2.78	2.70	2.65	2.65
6/ 7	2.63	2.57	2.45	2.31	2.26	2.31	2.45	2.60	2.67	2.71	2.70	2.65	2.61	2.55	2.45	2.30	2.20	2.15	2.20	2.32	2.42	2.48	2.45	2.45
7/ 7	2.45	2.40	2.33	2.15	2.00	1.90	1.95	2.08	2.25	2.38	2.50	2.50	2.54	2.50	2.45	2.31	2.19	2.00	1.91	1.95	2.01	2.18	2.25	2.30
8/ 7	2.30	2.31	2.25	2.15	1.95	1.79	1.66	1.70	1.81	2.02	2.21	2.40	2.49	2.58	2.56	2.45	2.30	2.08	1.92	1.85	1.90	2.03	2.20	2.32
9/ 7	2.40	2.41	2.40	2.28	2.13	1.90	1.75	1.63	1.68	1.82	2.10	2.35	2.55	2.68	2.75	2.68	2.55	2.31	2.10	1.90	1.80	1.89	2.05	2.28
10/ 7	2.41	2.45	2.41	2.32	2.14	2.00	1.75	1.52	1.40	1.49	1.70	2.05	2.39	2.62	2.75	2.79	2.72	2.51	2.30	2.03	1.85	1.82	2.00	2.13
11/ 7	2.41	2.54	2.59	2.51	2.42	2.20	2.00	1.71	1.60	1.53	1.62	1.95	2.28	2.60	2.87	2.98	2.99	2.87	2.70	2.44	2.21	2.01	2.04	2.20
12/ 7	2.48	2.68	2.86	2.82	2.74	2.59	2.40	2.15	1.82	1.70	1.67	1.74	2.10	2.47	2.82	3.00	3.11	3.09	2.99	2.80	2.55	2.30	2.18	2.21
13/ 7	2.42	2.70	2.92	3.02	2.99	2.82	2.65	2.43	2.24	1.99	1.81	1.78	1.89	2.25	2.64	2.91	3.07	3.07	2.99	2.85	2.66	2.45	2.29	2.20
14/ 7	2.31	2.52	2.82	3.00	3.02	2.90	2.72	2.50	2.30	2.20	2.00	1.85	1.80	1.95	2.28	2.60	2.88	2.95	2.90	2.75	2.60	2.42	2.29	2.15
15/ 7	2.15	2.25	2.50	2.78	2.93	2.90	2.74	2.51	2.30	2.20	2.05	1.90	1.82	1.85	2.05	2.35	2.66	2.80	2.75	2.60	2.42	2.35	2.30	2.22
16/ 7	2.18	2.18	2.34	2.59	2.82	2.88	2.80	2.59	2.38	2.30	2.15	2.10	2.02	1.94	2.00	2.10	2.45	2.65	2.75	2.61	2.41	2.26	2.21	2.21
17/ 7	2.20	2.16	2.15	2.30	2.46	2.72	2.78	2.67	2.43	2.22	2.08	2.05	2.05	2.02	1.98	2.00	2.12	2.37	2.55	2.55	2.35	2.15	2.05	2.02
18/ 7	2.04	2.05	2.03	2.03	2.15	2.31	2.50	2.54	2.40	2.22	2.06	2.00	2.02	2.05	2.02	1.99	2.00	2.10	2.29	2.35	2.30	2.10	1.95	1.90
19/ 7	1.90	1.92	1.92	1.85	1.85	1.92	2.13	2.21	2.25	2.15	2.05	1.92	1.92	1.99	2.00	1.95	1.95	1.90	2.00	2.12	2.15	2.10	1.98	1.88
20/ 7	1.85	1.85	1.85	1.78	1.72	1.72	1.82	1.98	2.05	2.05	2.00	1.95	1.95	2.00	2.00	1.98	1.90	1.85	1.90	2.00	2.05	2.05	2.01	1.98
21/ 7	1.94	1.91	1.89	1.79	1.70	1.67	1.72	1.85	1.99	2.08	2.15	2.18	2.19	2.21	2.20	2.15	2.11	2.02	1.95	2.00	2.05	2.15	2.20	2.19
22/ 7	2.11	2.09	1.99	1.83	1.75	1.68	1.65	1.65	1.80	1.90	2.05	2.19	2.24	2.25	2.25	2.20	2.10	1.98	1.90	1.85	1.89	2.00	2.11	2.21
23/ 7	2.28	2.21	2.15	2.05	1.89	1.78	1.68	1.64	1.68	1.85	2.07	2.28	2.45	2.50	2.50	2.42	2.37	2.23	2.12	2.02	2.01	2.08	2.26	2.40
24/ 7	2.56	2.57	2.50	2.38	2.20	2.00	1.88	1.75	1.72	1.80	2.00	2.30	2.51	2.71	2.78	2.71	2.62	2.45	2.30	2.18	2.08	2.10	2.20	2.41
25/ 7	2.60	2.75	2.75	2.63	2.47	2.22	2.02	1.88	1.75	1.78	1.89	2.15	2.48	2.72	2.86	2.86	2.75	2.59	2.40	2.20	2.09	2.04	2.10	2.27
26/ 7	2.50	2.68	2.74	2.66	2.48	2.19	1.98	1.76	1.67	1.55	1.61	1.78	2.05	2.40	2.61	2.71	2.62	2.45	2.20	2.00	1.80	1.70	1.70	1.85
27/ 7	2.02	2.29	2.48	2.50	2.40	2.25	1.89	1.60	1.41	1.30	1.30	1.41	1.68	2.00	2.32	2.52	2.53	2.40	2.15	1.94	1.75	1.68	1.63	1.75
28/ 7	1.90	2.20	2.41	2.56	2.48	2.30	2.00	1.74	1.52	1.36	1.30	1.35	1.56	1.82	2.20	2.40	2.51	2.37	2.15	1.90	1.71	1.60	1.60	1.62
29/ 7	1.82	2.05	2.30	2.46	2.45	2.25	2.00	1.71	1.51	1.40	1.33	1.31	1.42	1.65	1.99	2.25	2.47	2.42	2.25	2.00	1.81	1.68	1.63	1.63
30/ 7	1.71	1.85	2.14	2.38	2.51	2.48	2.28	2.00	1.78	1.63	1.52	1.45	1.49	1.61	1.88	2.16	2.41	2.50	2.41	2.20	1.99	1.82	1.79	1.73
31/ 7	1.78	1.85	2.08	2.30	2.50	2.58	2.47	2.21	2.00	1.81	1.75	1.62	1.62	1.68	1.89	2.11	2.40	2.50	2.49	2.28	2.09	1.99	1.92	1.89
1/ 8	1.88	1.90	2.05	2.23	2.49	2.57	2.59	2.43	2.29	2.17	2.06	1.98	1.89	1.90	1.95	2.10	2.30	2.50	2.59	2.50	2.38	2.21	2.18	2.10
2/ 8	2.09	2.08	2.10	2.21	2.40	2.60	2.68	2.65	2.52	2.49	2.39	2.33	2.30	2.26	2.21	2.25	2.40	2.55	2.69	2.70	2.60	2.50	2.45	2.40
3/ 8	2.40	2.35	2.31	2.35	2.44	2.59	2.71	2.80	2.75	2.71	2.65	2.62	2.58	2.52	2.43	2.40	2.40	2.51	2.62	2.69	2.64	2.57	2.51	2.50
4/ 8	2.50	2.45	2.35	2.25	2.25	2.34	2.48	2.60	2.70	2.69	2.66	2.67	2.68	2.65	2.59	2.45	2.35	2.32	2.39	2.45	2.50	2.48	2.41	2.40
5/ 8	2.38	2.40	2.32	2.18	2.02	1.98	2.02	2.18	2.32	2.42	2.49	2.55	2.60	2.65	2.60	2.45	2.28	2.11	2.09	2.11	2.19	2.25	2.30	2.31

6/ 8	2.35	2.32	2.30	2.13	1.93	1.75	1.68	1.75	1.90	2.09	2.22	2.38	2.49	2.60	2.62	2.52	2.32	2.10	1.93	1.90	1.90	2.03	2.15	2.25
7/ 8	2.35	2.40	2.33	2.25	2.05	1.83	1.65	1.58	1.60	1.80	2.02	2.30	2.50	2.70	2.82	2.82	2.62	2.40	2.17	2.00	1.92	2.01	2.20	2.39
8/ 8	2.60	2.55	2.65	2.50	2.45	2.12	1.90	1.65	1.62	1.69	1.91	2.29	2.59	2.83	2.99	3.05	2.93	2.78	2.45	2.22	2.00	2.00	2.17	2.40
9/ 8	2.63	2.82	2.82	2.73	2.58	2.28	2.03	1.80	1.60	1.55	1.63	1.96	2.30	2.69	2.85	2.95	2.90	2.73	2.51	2.20	1.98	1.85	1.92	2.15
10/ 8	2.46	2.68	2.80	2.75	2.60	2.38	2.10	1.82	1.60	1.48	1.45	1.75	2.05	2.45	2.72	2.90	2.89	2.78	2.58	2.35	2.09	1.90	1.85	1.98
11/ 8	2.28	2.58	2.80	2.85	2.72	2.49	2.20	1.95	1.72	1.58	1.42	1.49	1.74	2.15	2.50	2.73	2.79	2.70	2.54	2.38	2.20	2.00	1.90	1.95
12/ 8	2.15	2.45	2.74	2.83	2.92	2.78	2.54	2.31	2.18	1.95	1.80	1.70	1.72	1.99	2.32	2.70	2.89	2.85	2.69	2.46	2.30	2.13	2.02	1.95
13/ 8	2.00	2.19	2.50	2.80	2.93	2.85	2.63	2.32	2.10	1.90	1.80	1.70	1.67	1.78	2.00	2.30	2.58	2.60	2.42	2.15	1.95	1.79	1.75	1.70
14/ 8	1.70	1.80	2.00	2.30	2.52	2.59	2.40	2.13	1.90	1.75	1.65	1.61	1.56	1.57	1.65	1.86	2.18	2.31	2.28	2.00	1.78	1.62	1.60	1.62
15/ 8	1.65	1.68	1.81	2.02	2.30	2.41	2.32	2.10	1.85	1.75	1.65	1.64	1.68	1.70	1.72	1.82	1.92	2.08	2.17	2.09	1.83	1.62	1.49	1.50
16/ 8	1.58	1.60	1.60	1.63	1.80	2.00	2.12	2.08	1.92	1.69	1.58	1.59	1.62	1.65	1.69	1.65	1.78	1.89	1.99	2.00	1.89	1.66	1.50	1.46
17/ 8	1.50	1.58	1.53	1.51	1.57	1.68	1.87	1.90	1.88	1.78	1.68	1.65	1.69	1.76	1.77	1.74	1.72	1.80	1.88	1.92	1.85	1.70	1.58	1.53
18/ 8	1.58	1.60	1.58	1.51	1.50	1.68	1.70	1.81	1.86	1.80	1.76	1.70	1.76	1.79	1.83	1.80	1.80	1.71	1.75	1.78	1.82	1.81	1.74	1.70
19/ 8	1.70	1.68	1.65	1.59	1.50	1.49	1.52	1.63	1.78	1.87	1.90	1.91	1.92	1.99	2.00	1.98	1.89	1.80	1.75	1.80	1.87	1.90	1.92	1.92
20/ 8	1.90	1.92	1.87	1.78	1.62	1.52	1.46	1.50	1.63	1.80	1.90	2.00	2.03	2.11	2.11	2.05	1.98	1.83	1.72	1.70	1.78	1.83	1.97	2.01
21/ 8	2.02	2.01	1.98	1.81	1.66	1.50	1.41	1.40	1.49	1.61	1.80	2.00	2.22	2.38	2.37	2.30	2.15	2.02	1.88	1.79	1.79	1.89	2.03	2.20
22/ 8	2.32	2.31	2.25	2.10	1.91	1.71	1.58	1.48	1.50	1.65	1.88	2.11	2.34	2.49	2.52	2.42	2.29	2.08	1.90	1.80	1.78	1.88	2.05	2.23
23/ 8	2.42	2.50	2.44	2.29	2.01	1.82	1.63	1.52	1.48	1.54	1.70	2.01	2.32	2.58	2.68	2.61	2.42	2.25	2.03	1.91	1.80	1.81	1.92	2.19
24/ 8	2.42	2.62	2.70	2.60	2.37	2.07	1.83	1.63	1.53	1.50	1.68	1.92	2.26	2.52	2.61	2.66	2.49	2.28	2.02	1.84	1.72	1.70	1.80	2.01
25/ 8	2.30	2.57	2.70	2.64	2.40	2.10	1.82	1.61	1.48	1.41	1.47	1.67	2.00	2.37	2.61	2.70	2.59	2.39	2.12	1.95	1.81	1.75	1.80	1.99
26/ 8	2.26	2.58	2.82	2.87	2.72	2.48	2.19	1.93	1.79	1.66	1.62	1.71	1.98	2.31	2.62	2.82	2.81	2.63	2.38	2.17	1.93	1.83	1.81	1.90
27/ 8	2.10	2.40	2.69	2.83	2.81	2.60	2.32	2.00	1.78	1.62	1.55	1.57	1.76	2.02	2.38	2.60	2.70	2.55	2.30	2.08	1.84	1.71	1.66	1.71
28/ 8	1.86	2.12	2.42	2.65	2.72	2.60	2.38	2.02	1.85	1.72	1.62	1.60	1.69	1.90	2.20	2.50	2.68	2.60	2.40	2.19	1.99	1.88	1.82	1.85
29/ 8	1.90	2.10	2.40	2.69	2.82	2.82	2.63	2.40	2.19	2.01	1.90	1.85	1.85	1.97	2.18	2.41	2.61	2.69	2.53	2.32	2.10	1.99	1.89	1.90
30/ 8	1.89	1.99	2.11	2.40	2.60	2.70	2.61	2.41	2.19	2.09	1.99	1.96	1.90	1.92	1.99	2.17	2.32	2.47	2.47	2.30	2.09	1.99	1.92	1.91
31/ 8	1.91	1.88	1.91	2.08	2.31	2.49	2.57	2.49	2.36	2.21	2.13	2.10	2.09	2.02	2.00	2.02	2.22	2.29	2.38	2.30	2.12	2.00	1.92	1.92
1/ 9	1.95	1.90	1.82	1.85	2.00	2.15	2.31	2.35	2.32	2.39	2.37	2.38	2.39	2.38	2.28	2.18	2.17	2.28	2.37	2.44	2.38	2.25	2.18	2.18
2/ 9	2.19	2.20	2.13	2.02	2.00	2.09	2.25	2.36	2.41	2.40	2.39	2.40	2.45	2.45	2.38	2.20	2.09	2.05	2.11	2.18	2.20	2.18	2.11	2.10
3/ 9	2.11	2.11	2.03	1.90	1.74	1.68	1.75	1.89	2.02	2.19	2.22	2.30	2.40	2.46	2.43	2.29	2.09	1.91	1.87	1.89	1.98	2.01	2.06	2.08
4/ 9	2.10	2.10	2.04	1.90	1.69	1.49	1.42	1.49	1.66	1.89	2.01	2.19	2.35	2.42	2.45	2.34	2.11	1.88	1.72	1.70	1.75	1.88	2.00	2.10
5/ 9	2.18	2.20	2.18	2.02	1.85	1.59	1.41	1.31	1.41	1.62	1.90	2.11	2.35	2.50	2.59	2.50	2.31	2.08	1.81	1.68	1.68	1.78	1.98	2.17
6/ 9	2.30	2.37	2.33	2.19	1.99	1.78	1.57	1.35	1.28	1.35	1.61	1.95	2.22	2.45	2.58	2.59	2.43	2.20	1.98	1.70	1.58	1.59	1.78	2.01
7/ 9	2.30	2.44	2.48	2.37	2.15	1.92	1.69	1.46	1.21	1.20	1.28	1.59	1.98	2.30	2.49	2.58	2.50	2.31	2.10	1.84	1.62	1.54	1.58	1.82
8/ 9	2.11	2.40	2.58	2.58	2.41	2.19	1.96	1.70	1.48	1.22	1.28	1.60	1.99	2.31	2.50	2.58	2.41	2.22	2.00	1.80	1.60	1.53	1.61	1.81
9/ 9	2.19	2.50	2.70	2.70	2.50	2.21	2.00	1.79	1.61	1.51	1.50	1.56	1.89	2.27	2.58	2.73	2.70	2.50	2.30	2.09	1.95	1.80	1.74	1.88
10/ 9	2.10	2.48	2.79	2.93	2.89	2.63	2.39	2.12	1.98	1.84	1.73	1.70	1.83	2.12	2.47	2.70	2.76	2.60	2.30	2.10	1.94	1.82	1.78	1.79

11/ 9	1.91	2.19	2.48	2.77	2.80	2.64	2.42	2.18	1.99	1.90	1.82	1.81	1.85	2.01	2.25	2.50	2.68	2.60	2.35	2.08	1.90	1.80	1.79	1.80
12/ 9	1.86	2.01	2.30	2.56	2.76	2.70	2.52	2.25	2.05	1.97	1.90	1.90	1.91	1.99	2.13	2.35	2.52	2.60	2.49	2.20	2.00	1.86	1.81	1.89
13/ 9	1.89	1.93	2.10	2.33	2.58	2.81	2.67	2.48	2.23	2.10	2.09	2.11	2.19	2.20	2.24	2.37	2.50	2.61	2.60	2.39	2.14	2.00	1.91	1.97
14/ 9	1.99	1.99	2.01	2.12	2.34	2.50	2.57	2.47	2.27	2.10	2.10	2.11	2.20	2.21	2.22	2.27	2.33	2.42	2.45	2.36	2.13	2.00	1.90	1.93
15/ 9	2.00	2.01	2.00	2.01	2.10	2.29	2.41	2.45	2.31	2.20	2.11	2.11	2.21	2.27	2.25	2.21	2.19	2.25	2.35	2.38	2.26	2.10	2.00	1.98
16/ 9	2.01	2.05	2.04	2.00	2.02	2.11	2.28	2.39	2.40	2.45	2.41	2.44	2.49	2.59	2.58	2.52	2.48	2.49	2.51	2.59	2.59	2.50	2.44	2.40
17/ 9	2.40	2.40	2.37	2.23	2.18	2.18	2.26	2.38	2.46	2.52	2.51	2.53	2.60	2.60	2.59	2.49	2.38	2.29	2.31	2.32	2.40	2.40	2.38	2.39
18/ 9	2.36	2.36	2.23	2.13	2.01	1.93	1.98	2.05	2.19	2.29	2.38	2.41	2.48	2.51	2.51	2.42	2.27	2.14	2.09	2.08	2.13	2.21	2.30	2.37
19/ 9	2.38	2.30	2.29	2.13	2.01	1.85	1.89	1.85	1.81	2.05	2.25	2.40	2.51	2.52	2.51	2.41	2.30	2.08	2.00	1.96	2.04	2.19	2.37	2.49
20/ 9	2.59	2.58	2.48	2.31	2.11	1.95	1.81	1.79	1.83	1.98	2.14	2.39	2.57	2.70	2.72	2.60	2.42	2.23	2.11	2.01	2.05	2.14	2.32	2.57
21/ 9	2.73	2.80	2.78	2.60	2.36	2.10	1.92	1.79	1.79	1.99	2.20	2.47	2.70	2.88	2.89	2.79	2.58	2.35	2.13	1.99	1.91	2.00	2.19	2.44
22/ 9	2.64	2.82	2.81	2.65	2.40	2.13	1.90	1.71	1.61	1.52	1.64	1.90	2.20	2.45	2.60	2.61	2.44	2.20	2.01	1.79	1.62	1.58	1.70	1.98
23/ 9	2.27	2.49	2.61	2.58	2.40	2.10	1.81	1.61	1.47	1.50	1.57	1.79	2.11	2.41	2.62	2.70	2.55	2.31	2.10	1.90	1.75	1.69	1.70	1.99
24/ 9	2.29	2.60	2.82	2.90	2.79	2.53	2.23	2.00	1.79	1.79	1.66	1.78	2.10	2.40	2.69	2.79	2.73	2.50	2.25	2.02	1.88	1.78	1.78	1.86
25/ 9	2.17	2.49	2.80	2.93	2.91	2.70	2.42	2.20	1.99	1.80	1.75	1.78	2.00	2.31	2.60	2.83	2.82	2.68	2.42	2.18	2.00	1.89	1.81	1.87
26/ 9	2.10	2.35	2.70	2.90	2.99	2.89	2.61	2.39	2.18	2.00	1.90	1.83	1.90	2.08	2.40	2.60	2.72	2.64	2.41	2.13	1.98	1.83	1.77	1.71
27/ 9	1.79	1.99	2.28	2.55	2.70	2.70	2.51	2.30	2.10	1.98	1.86	1.79	1.80	1.90	2.12	2.32	2.50	2.50	2.35	2.10	1.92	1.80	1.70	1.65
28/ 9	1.65	1.70	1.79	2.14	2.40	2.50	2.43	2.30	2.15	2.00	1.90	1.82	1.80	1.79	1.90	2.07	2.21	2.30	2.30	2.10	1.91	1.81	1.70	1.69
29/ 9	1.66	1.67	1.75	1.95	2.20	2.32	2.42	2.36	2.22	2.30	2.23	2.23	2.19	2.12	2.10	2.18	2.30	2.40	2.42	2.30	2.28	2.09	2.10	2.10
30/ 9	2.10	2.01	1.99	2.10	2.28	2.48	2.60	2.65	2.60	2.60	2.60	2.62	2.72	2.63	2.50	2.48	2.50	2.58	2.63	2.61	2.52	2.45	2.43	2.50
1/10	2.50	2.31	2.29	2.29	2.29	2.42	2.55	2.63	2.68	2.73	2.79	2.89	2.90	2.89	2.80	2.60	2.50	2.50	2.51	2.58	2.59	2.58	2.59	2.59
2/10	2.59	2.50	2.32	2.18	2.06	2.10	2.19	2.34	2.48	2.58	2.66	2.79	2.85	2.91	2.81	2.66	2.45	2.32	2.30	2.31	2.40	2.42	2.49	2.53
3/10	2.58	2.60	2.50	2.30	2.10	1.99	1.92	2.08	2.20	2.48	2.60	2.79	2.89	2.95	2.95	2.73	2.50	2.33	2.20	2.20	2.29	2.42	2.58	2.68
4/10	2.72	2.68	2.60	2.40	2.19	1.98	1.83	1.83	2.01	2.23	2.50	2.70	2.83	2.91	2.90	2.78	2.57	2.30	2.12	2.09	2.18	2.37	2.58	2.72
5/10	2.81	2.80	2.70	2.53	2.30	2.08	1.88	1.72	1.73	1.99	2.29	2.52	2.78	2.88	2.83	2.72	2.53	2.29	2.09	1.92	1.93	2.10	2.40	2.63
6/10	2.88	2.89	2.78	2.67	2.40	2.19	1.99	1.78	1.74	1.78	2.00	2.30	2.59	2.82	2.88	2.80	2.61	2.48	2.20	2.00	1.80	1.82	2.00	2.30
7/10	2.62	2.92	2.98	2.82	2.61	2.40	2.12	1.99	1.78	1.72	1.88	2.18	2.49	2.77	2.87	2.83	2.62	2.40	2.20	2.00	1.91	1.90	2.03	2.30
8/10	2.70	2.98	3.10	3.04	2.87	2.60	2.37	2.18	2.02	1.93	1.98	2.10	2.42	2.70	2.94	2.98	2.80	2.55	2.30	2.10	1.99	1.89	1.90	2.05
9/10	2.33	2.70	2.99	2.99	2.83	2.59	2.34	2.17	2.05	1.92	1.89	1.89	2.10	2.36	2.67	2.80	2.72	2.48	2.20	2.00	1.87	1.79	1.79	1.80
10/10	2.00	2.30	2.62	2.82	2.83	2.62	2.40	2.20	2.01	2.00	1.91	1.90	1.95	2.14	2.48	2.68	2.70	2.52	2.23	2.02	1.81	1.72	1.69	1.70
11/10	1.80	2.02	2.34	2.61	2.77	2.69	2.48	2.29	2.12	2.10	2.09	2.09	2.10	2.20	2.41	2.62	2.72	2.67	2.43	2.20	2.01	1.91	1.91	1.91
12/10	1.95	2.06	2.28	2.52	2.73	2.70	2.63	2.42	2.26	2.10	2.09	2.10	2.09	2.09	2.15	2.25	2.39	2.46	2.38	2.12	1.83	1.72	1.68	1.69
13/10	1.69	1.70	1.80	2.00	2.20	2.36	2.39	2.20	2.04	1.90	1.90	1.98	2.00	2.00	2.01	2.09	2.18	2.23	2.20	2.02	1.80	1.65	1.63	1.68
14/10	1.62	1.63	1.64	1.78	1.93	2.10	2.13	2.10	1.93	2.06	2.00	2.08	2.10	2.12	2.08	2.10	2.10	2.19	2.20	2.20	2.02	1.91	1.82	1.81
15/10	1.80	1.80	1.72	1.78	1.81	1.98	2.10	2.20	2.15	2.10	2.08	2.12	2.19	2.20	2.18	2.10	2.03	2.12	2.13	2.20	2.18	2.10	2.02	2.01
16/10	1.99	1.99	1.90	1.82	1.80	1.89	2.01	2.16	2.20	2.29	2.25	2.28	2.30	2.35	2.30	2.20	2.12	2.10	2.13	2.22	2.23	2.23	2.22	2.22

17/10	2.20	2.18	2.05	1.96	1.88	1.89	1.92	2.08	2.19	2.32	2.33	2.42	2.42	2.46	2.42	2.30	2.13	2.09	2.08	2.13	2.22	2.32	2.38	2.39
18/10	2.39	2.30	2.20	2.09	1.90	1.80	1.81	1.90	2.01	2.29	2.41	2.50	2.56	2.55	2.52	2.38	2.26	2.05	2.01	2.00	2.10	2.26	2.43	2.53
19/10	2.58	2.50	2.38	2.20	2.02	1.88	1.80	1.80	1.90	2.10	2.30	2.47	2.53	2.58	2.52	2.42	2.22	2.04	1.90	1.83	1.90	2.10	2.30	2.49
20/10	2.59	2.58	2.50	2.30	2.10	1.90	1.70	1.61	1.70	1.85	2.09	2.33	2.52	2.63	2.60	2.49	2.29	2.10	1.90	1.78	1.72	1.83	2.06	2.31
21/10	2.57	2.70	2.62	2.50	2.28	2.03	1.80	1.65	1.57	1.68	1.91	2.20	2.45	2.61	2.62	2.50	2.30	2.08	1.87	1.70	1.67	1.70	1.92	2.24
22/10	2.57	2.78	2.80	2.68	2.43	2.19	1.97	1.72	1.62	1.67	1.82	2.16	2.41	2.65	2.71	2.62	2.40	2.19	1.92	1.71	1.61	1.61	1.75	2.01
23/10	2.39	2.63	2.81	2.70	2.50	2.23	1.99	1.73	1.55	1.48	1.58	1.80	2.10	2.38	2.51	2.50	2.30	2.09	1.83	1.70	1.51	1.48	1.49	1.71
24/10	2.01	2.40	2.59	2.65	2.54	2.33	2.10	1.90	1.75	1.60	1.53	1.62	1.85	2.12	2.41	2.50	2.43	2.21	1.99	1.80	1.66	1.57	1.54	1.60
25/10	1.80	2.13	2.44	2.70	2.70	2.58	2.36	2.20	2.05	1.90	1.83	1.82	1.97	2.20	2.46	2.62	2.63	2.50	2.25	2.07	1.92	1.82	1.75	1.70
26/10	1.81	2.01	2.37	2.62	2.80	2.72	2.58	2.39	2.29	2.18	2.08	1.98	1.96	2.06	2.29	2.47	2.58	2.49	2.29	2.09	1.98	1.82	1.74	1.68
27/10	1.65	1.75	1.99	2.25	2.50	2.60	2.50	2.42	2.34	2.28	2.20	2.14	2.02	2.01	2.09	2.28	2.41	2.50	2.40	2.21	2.05	1.99	1.93	1.89
28/10	1.78	1.70	1.79	1.99	2.22	2.43	2.51	2.47	2.38	2.37	2.35	2.37	2.28	2.17	2.15	2.22	2.35	2.48	2.46	2.30	2.18	2.10	2.05	2.05
29/10	1.98	1.85	1.80	1.88	2.05	2.29	2.43	2.43	2.42	2.41	2.42	2.48	2.45	2.38	2.22	2.20	2.21	2.31	2.40	2.38	2.25	2.18	2.12	2.11
30/10	2.08	1.99	1.82	1.79	1.82	1.99	2.17	2.30	2.36	2.38	2.40	2.48	2.50	2.49	2.38	2.20	2.15	2.19	2.27	2.37	2.36	2.33	2.25	2.30
31/10	2.22	2.21	2.10	1.92	1.86	1.88	1.98	2.12	2.28	2.36	2.42	2.52	2.61	2.59	2.49	2.34	2.19	2.13	2.19	2.29	2.40	2.48	2.46	2.42
1/11	2.41	2.37	2.28	2.10	1.96	1.84	1.82	1.98	2.20	2.35	2.49	2.59	2.61	2.62	2.55	2.40	2.21	2.06	2.00	2.06	2.21	2.39	2.50	2.55
2/11	2.52	2.44	2.35	2.20	2.00	1.88	1.75	1.75	1.82	2.10	2.30	2.49	2.57	2.58	2.48	2.35	2.17	2.00	1.88	1.82	1.95	2.20	2.32	2.50
3/11	2.58	2.59	2.42	2.30	2.10	1.92	1.79	1.68	1.71	1.92	2.18	2.34	2.47	2.51	2.49	2.45	2.25	2.10	1.90	1.85	1.75	1.88	2.15	2.42
4/11	2.60	2.60	2.48	2.30	2.10	1.95	1.78	1.68	1.62	1.68	1.85	2.14	2.36	2.50	2.48	2.34	2.18	2.00	1.80	1.75	1.59	1.63	1.83	2.15
5/11	2.41	2.63	2.66	2.54	2.37	2.18	1.99	1.82	1.71	1.70	1.85	2.10	2.35	2.54	2.60	2.46	2.23	2.00	1.82	1.68	1.60	1.60	1.74	2.03
6/11	2.35	2.60	2.71	2.62	2.49	2.22	2.00	1.90	1.80	1.75	1.81	1.99	2.21	2.48	2.67	2.60	2.40	2.12	1.90	1.74	1.66	1.61	1.66	1.87
7/11	2.11	2.40	2.62	2.72	2.58	2.40	2.18	2.00	1.90	1.87	1.82	1.90	2.05	2.31	2.51	2.61	2.51	2.29	2.01	1.80	1.63	1.58	1.58	1.63
8/11	1.81	2.11	2.40	2.60	2.68	2.52	2.29	2.09	1.94	1.89	1.90	1.90	2.01	2.21	2.45	2.58	2.57	2.33	2.04	1.83	1.70	1.62	1.61	1.62
9/11	1.78	2.02	2.36	2.59	2.69	2.60	2.40	2.22	2.11	2.08	2.02	2.02	2.03	2.18	2.40	2.60	2.66	2.59	2.35	2.13	2.00	1.91	1.83	1.83
10/11	1.88	2.03	2.31	2.60	2.81	2.88	2.71	2.56	2.39	2.30	2.29	2.28	2.28	2.30	2.44	2.60	2.71	2.72	2.59	2.33	2.18	2.01	1.96	1.97
11/11	1.90	1.92	2.09	2.30	2.52	2.68	2.63	2.49	2.32	2.25	2.22	2.22	2.21	2.21	2.25	2.35	2.48	2.55	2.50	2.30	2.12	1.99	1.90	1.87
12/11	1.85	1.83	1.90	2.00	2.22	2.40	2.50	2.41	2.32	2.19	2.19	2.18	2.18	2.18	2.16	2.20	2.29	2.41	2.41	2.37	2.20	2.10	2.00	1.98
13/11	1.92	1.89	1.89	1.98	2.10	2.29	2.40	2.43	2.41	2.35	2.33	2.33	2.33	2.32	2.30	2.29	2.37	2.48	2.51	2.52	2.49	2.39	2.30	2.29
14/11	2.20	2.15	2.10	2.08	2.12	2.29	2.41	2.49	2.51	2.50	2.48	2.47	2.47	2.41	2.35	2.29	2.28	2.28	2.38	2.40	2.43	2.41	2.39	2.30
15/11	2.23	2.15	2.07	1.98	1.97	2.00	2.10	2.22	2.35	2.38	2.38	2.38	2.37	2.35	2.28	2.16	2.09	2.08	2.11	2.20	2.30	2.35	2.38	2.34
16/11	2.29	2.20	2.12	2.00	1.92	1.91	1.93	2.08	2.18	2.29	2.37	2.38	2.39	2.39	2.32	2.20	2.10	1.99	1.98	2.02	2.17	2.31	2.42	2.48
17/11	2.48	2.40	2.30	2.12	2.00	1.89	1.88	1.89	2.10	2.25	2.41	2.50	2.51	2.45	2.38	2.22	2.08	1.95	1.90	1.91	2.02	2.25	2.45	2.56
18/11	2.58	2.50	2.40	2.21	2.08	1.91	1.82	1.80	1.92	2.12	2.40	2.51	2.61	2.61	2.50	2.39	2.20	2.02	1.91	1.85	1.90	2.10	2.32	2.52
19/11	2.67	2.70	2.58	2.45	2.28	2.02	1.89	1.79	1.80	1.99	2.25	2.42	2.60	2.62	2.59	2.41	2.22	2.00	1.84	1.71	1.71	1.85	2.10	2.38
20/11	2.62	2.78	2.72	2.59	2.41	2.15	2.00	1.80	1.77	1.75	1.97	2.21	2.41	2.60	2.60	2.46	2.28	2.05	1.87	1.70	1.60	1.60	1.79	2.09
21/11	2.40	2.67	2.78	2.75	2.59	2.38	2.18	1.97	1.84	1.79	1.86	2.10	2.35	2.55	2.69	2.62	2.50	2.29	2.09	1.89	1.71	1.62	1.67	1.89

22/11	2.18	2.49	2.72	2.80	2.73	2.59	2.39	2.15	2.00	1.84	1.79	1.87	2.50	2.32	2.50	2.58	2.48	2.28	2.05	1.82	1.65	1.48	1.39	1.47
23/11	1.69	2.02	2.33	2.53	2.57	2.48	2.32	2.13	2.00	1.80	1.62	1.61	1.70	1.95	2.19	2.30	2.38	2.22	2.01	1.81	1.62	1.50	1.33	1.30
24/11	1.30	1.58	1.89	2.18	2.37	2.39	2.30	2.19	2.11	2.00	1.83	1.71	1.68	1.77	1.99	2.15	2.28	2.28	2.08	1.92	1.78	1.61	1.49	1.37
25/11	1.29	1.38	1.61	1.93	2.19	2.31	2.33	2.24	2.28	2.18	2.10	1.98	1.90	1.88	1.98	2.17	2.32	2.38	2.28	2.12	1.98	1.89	1.78	1.68
26/11	1.58	1.54	1.64	1.90	2.19	2.39	2.45	2.43	2.41	2.38	2.37	2.31	2.20	2.15	2.13	2.22	2.40	2.50	2.51	2.42	2.25	2.18	2.13	2.05
27/11	1.98	1.87	1.80	1.89	2.12	2.32	2.50	2.52	2.53	2.48	2.47	2.48	2.39	2.27	2.20	2.18	2.27	2.38	2.47	2.47	2.38	2.28	2.21	2.18
28/11	2.12	2.00	1.87	1.81	1.89	2.09	2.29	2.39	2.44	2.39	2.38	2.40	2.42	2.35	2.27	2.15	2.13	2.22	2.38	2.41	2.40	2.30	2.21	2.19
29/11	2.18	2.10	1.97	1.81	1.80	1.75	2.02	2.15	2.28	2.28	2.28	2.27	2.28	2.24	2.20	2.05	2.00	1.98	2.05	2.19	2.27	2.22	2.21	2.14
30/11	2.12	2.16	2.01	1.87	1.78	1.72	1.80	1.92	2.11	2.21	2.25	2.28	2.26	2.24	2.20	2.03	1.95	1.85	1.89	2.00	2.14	2.28	2.32	2.32
1/12	2.29	2.28	2.20	2.12	2.01	1.90	1.83	1.91	2.10	2.27	2.40	2.44	2.48	2.45	2.42	2.33	2.20	2.10	2.02	2.09	2.25	2.42	2.58	2.63
2/12	2.63	2.61	2.53	2.44	2.30	2.19	2.11	2.10	2.19	2.31	2.50	2.61	2.62	2.55	2.47	2.31	2.20	2.08	1.95	1.90	1.98	2.12	2.32	2.53
3/12	2.62	2.61	2.52	2.40	2.29	2.17	2.08	1.98	1.98	2.04	2.25	2.42	2.55	2.58	2.48	2.32	2.16	2.02	1.91	1.80	1.78	1.88	2.10	2.36
4/12	2.52	2.60	2.59	2.44	2.32	2.18	2.08	1.95	1.90	1.90	2.02	2.20	2.40	2.51	2.52	2.40	2.20	2.01	1.87	1.72	1.65	1.63	1.78	2.02
5/12	2.30	2.51	2.61	2.56	2.42	2.27	2.12	2.00	1.92	1.89	1.92	2.08	2.30	2.49	2.58	2.48	2.29	2.08	1.85	1.70	1.60	1.53	1.55	1.74
6/12	2.00	2.31	2.49	2.55	2.43	2.28	2.10	2.00	1.90	1.72	1.58	1.49	1.60	1.82	2.18	2.42	2.60	2.58	2.52	2.38	2.20	2.00	1.77	1.58
7/12	1.58	1.70	1.90	2.11	2.22	2.23	2.16	2.10	2.00	1.97	1.90	1.90	2.00	2.21	2.40	2.53	2.53	2.49	2.11	1.96	1.79	1.70	1.66	1.65
8/12	1.79	2.05	2.38	2.60	2.70	2.68	2.48	2.22	2.12	2.07	2.01	2.01	2.10	2.30	2.50	2.62	2.68	2.70	2.27	2.05	1.90	1.80	1.75	1.75
9/12	1.82	2.03	2.32	2.59	2.72	2.70	2.53	2.43	2.37	2.22	2.21	2.18	2.18	2.25	2.42	2.60	2.70	2.70	2.52	2.30	2.11	1.99	1.90	1.83
10/12	1.82	1.89	2.10	2.38	2.60	2.70	2.64	2.49	2.35	2.20	2.19	2.12	2.11	2.12	2.20	2.38	2.53	2.60	2.50	2.25	2.10	1.98	1.89	1.84
11/12	1.79	1.79	1.85	2.11	2.31	2.49	2.51	2.41	2.28	2.17	2.10	2.10	2.03	2.08	2.08	2.18	2.31	2.42	2.43	2.32	2.19	2.00	1.90	1.88
12/12	1.82	1.81	1.81	1.89	2.10	2.30	2.47	2.48	2.33	2.20	2.12	2.11	2.10	2.11	2.09	2.12	2.21	2.31	2.38	2.38	2.31	2.18	2.10	2.00
13/12	1.98	1.89	1.88	1.88	1.99	2.18	2.31	2.38	2.38	2.29	2.22	2.20	2.19	2.15	2.10	2.08	2.12	2.21	2.31	2.38	2.32	2.23	2.19	2.12
14/12	2.08	1.99	1.91	1.88	1.91	2.08	2.20	2.30	2.35	2.30	2.26	2.22	2.21	2.18	2.11	2.02	2.02	2.05	2.18	2.28	2.32	2.30	2.28	2.20
15/12	2.18	2.09	2.00	1.90	1.83	1.88	1.98	2.12	2.15	2.19	2.18	2.15	2.16	2.02	2.05	1.96	1.88	1.82	1.90	1.98	2.15	2.18	2.22	2.19
16/12	2.15	2.05	1.98	1.84	1.79	1.72	1.72	1.85	2.12	2.22	2.30	2.32	2.32	2.30	2.23	2.12	2.00	1.92	1.90	1.98	2.10	2.23	2.33	2.40
17/12	2.41	2.35	2.28	2.12	2.00	1.90	1.88	1.85	1.98	2.12	2.28	2.34	2.38	2.38	2.32	2.21	2.08	1.86	1.73	1.71	1.81	2.00	2.20	2.41
18/12	2.48	2.50	2.47	2.33	2.18	2.00	1.86	1.78	1.80	1.91	2.11	2.28	2.32	2.37	2.32	2.22	2.10	1.90	1.68	1.57	1.58	1.78	2.02	2.27
19/12	2.48	2.55	2.58	2.50	2.39	2.18	1.99	1.82	1.78	1.83	2.02	2.22	2.40	2.48	2.50	2.42	2.25	2.03	1.80	1.62	1.52	1.60	1.83	2.17
20/12	2.41	2.60	2.70	2.70	2.61	2.42	2.20	1.95	1.81	1.79	1.85	2.09	2.31	2.46	2.51	2.49	2.37	2.19	1.98	1.73	1.57	1.45	1.58	1.81
21/12	2.19	2.49	2.69	2.78	2.72	2.63	2.42	2.21	2.00	1.89	1.89	2.00	2.22	2.44	2.60	2.63	2.54	2.38	2.13	1.90	1.68	1.52	1.43	1.60
22/12	1.90	2.25	2.58	2.72	2.79	2.72	2.60	2.40	2.12	1.92	1.84	1.88	2.08	2.30	2.49	2.55	2.51	2.38	2.17	1.92	1.78	1.52	1.39	1.40
23/12	1.59	1.90	2.30	2.55	2.65	2.65	2.61	2.43	2.30	2.19	2.03	2.05	2.07	2.10	2.34	2.58	2.60	2.49	2.31	2.14	1.99	1.82	1.69	1.49
24/12	1.43	1.60	1.92	2.30	2.53	2.63	2.61	2.52	2.42	2.40	2.23	2.00	1.99	2.03	2.20	2.43	2.53	2.62	2.52	2.38	2.18	2.00	1.86	1.69
25/12	1.53	1.43	1.72	2.03	2.40	2.53	2.60	2.50	2.46	2.38	2.30	2.22	2.12	2.08	2.14	2.34	2.56	2.63	2.63	2.49	2.31	2.10	2.08	1.80
26/12	1.83	1.65	1.69	1.89	2.20	2.43	2.53	2.49	2.35	2.23	2.23	2.19	2.14	2.03	2.02	2.09	2.29	2.41	2.55	2.51	2.28	2.20	2.03	2.00
27/12	1.99	1.90	1.82	1.82	1.93	2.19	2.40	2.49	2.51	2.40	2.33	2.34	2.33	2.34	2.27	2.32	2.38	2.53	2.67	2.70	2.68	2.57	2.48	2.42

28/12	2.42	2.33	2.30	2.22	2.23	2.40	2.60	2.70	2.58	2.60	2.40	2.40	2.37	2.38	2.32	2.25	2.25	2.32	2.42	2.53	2.59	2.46	2.39	2.29
29/12	2.25	2.20	2.15	2.10	2.02	2.02	2.12	2.20	2.50	2.52	2.43	2.39	2.32	2.30	2.29	2.23	2.14	2.13	2.20	2.35	2.48	2.53	2.49	2.42
30/12	2.37	2.32	2.30	2.28	2.19	2.12	2.11	2.18	2.29	2.40	2.42	2.38	2.28	2.23	2.19	2.14	2.08	2.00	1.93	2.00	2.12	2.32	2.40	2.41
31/12	2.39	2.29	2.24	2.23	2.16	2.10	2.00	2.00	2.03	2.18	2.28	2.36	2.30	2.28	2.18	2.13	2.02	1.95	1.82	1.83	1.88	2.06	2.23	2.39
1/ 1	2.45	2.45	2.41	2.35	2.29	2.22	2.12	2.02	2.12	2.20	2.34	2.49	2.54	2.52	2.44	2.33	2.21	1.99	1.90	1.78	1.80	1.94	2.17	2.39
2/ 1	2.53	2.60	2.59	2.52	2.43	2.34	2.22	2.12	2.06	2.10	2.23	2.44	2.68	2.72	2.64	2.52	2.38	2.19	2.00	1.82	1.80	1.89	2.09	2.30
3/ 1	2.56	2.75	2.79	2.70	2.62	2.48	2.33	2.20	2.12	2.10	2.20	2.40	2.60	2.72	2.72	2.62	2.42	2.20	2.00	1.80	1.70	1.69	1.82	2.10
4/ 1	2.34	2.60	2.73	2.72	2.62	2.43	2.28	2.13	1.90	1.83	1.90	2.08	2.28	2.48	2.59	2.52	2.38	2.10	1.90	1.70	1.58	1.54	1.61	1.80
5/ 1	2.09	2.40	2.61	2.72	2.63	2.50	2.32	2.15	2.00	1.92	1.97	2.09	2.28	2.50	2.70	2.73	2.68	2.50	2.26	2.00	1.82	1.75	1.72	1.88
6/ 1	2.10	2.43	2.70	2.90	2.90	2.80	2.63	2.46	2.38	2.28	2.23	2.30	2.45	2.70	2.90	3.00	3.02	2.88	2.63	2.34	2.17	2.00	1.99	1.98
7/ 1	2.10	2.35	2.65	2.90	2.92	2.90	2.72	2.50	2.49	2.32	2.25	2.22	2.32	2.42	2.68	2.85	2.92	2.82	2.62	2.33	2.12	1.92	1.83	1.80
8/ 1	1.82	2.00	2.23	2.53	2.72	2.75	2.62	2.40	2.29	2.12	2.10	2.10	2.10	2.18	2.39	2.60	2.79	2.72	2.60	2.33	2.12	1.90	1.80	1.72
9/ 1	1.72	1.85	2.05	2.33	2.58	2.67	2.58	2.40	1.91	1.80	1.72	1.70	1.70	1.80	1.92	2.12	2.32	2.39	2.30	2.11	1.90	1.72	1.60	1.54
10/ 1	1.50	1.52	1.68	1.90	2.13	2.32	2.33	2.19	2.02	1.82	1.80	1.73	1.75	1.80	1.80	1.98	2.15	2.23	2.30	2.20	2.02	1.84	1.72	1.62
11/ 1	1.53	1.50	1.58	1.72	1.88	2.10	2.20	2.20	2.22	2.10	2.00	1.92	1.90	1.89	1.90	1.99	2.12	2.28	2.35	2.35	2.28	2.13	2.00	1.90
12/ 1	1.82	1.80	1.80	1.81	1.90	2.08	2.28	2.38	2.30	2.20	2.12	2.09	2.07	2.02	2.00	2.00	2.09	2.22	2.35	2.42	2.43	2.33	2.27	2.22
13/ 1	2.09	2.12	2.10	2.08	2.10	2.20	2.33	2.42	2.48	2.43	2.38	2.33	2.31	2.29	2.25	2.17	2.15	2.18	2.30	2.41	2.49	2.51	2.45	2.42
14/ 1	2.41	2.36	2.30	2.20	2.14	2.10	2.18	2.25	2.39	2.38	2.38	2.35	2.35	2.35	2.30	2.12	2.08	2.00	2.06	2.16	2.33	2.39	2.48	2.50
15/ 1	2.55	2.51	2.48	2.33	2.18	2.11	2.10	2.12	2.20	2.28	2.37	2.40	2.42	2.39	2.35	2.18	2.01	1.90	1.84	1.88	2.01	2.19	2.35	2.48
16/ 1	2.55	2.57	2.52	2.41	2.27	2.10	1.98	1.98	2.05	2.17	2.32	2.41	2.49	2.50	2.50	2.41	2.26	2.09	1.93	1.90	1.97	2.17	2.38	2.62
17/ 1	2.79	2.94	2.96	2.92	2.80	2.60	2.40	2.21	2.20	2.28	2.42	2.61	2.72	2.78	2.80	2.71	2.53	2.32	2.08	1.90	1.82	1.92	2.17	2.47
18/ 1	2.75	2.92	3.02	3.02	2.92	2.73	2.45	2.22	2.03	2.02	2.11	2.36	2.55	2.70	2.70	2.65	2.50	2.30	2.05	1.80	1.57	1.55	1.70	2.02
19/ 1	2.38	2.65	2.85	2.92	2.88	2.75	2.52	2.25	2.12	1.90	1.95	2.10	2.35	2.59	2.72	2.72	2.60	2.40	2.15	1.89	1.62	1.42	1.40	1.58
20/ 1	1.98	2.35	2.62	2.80	2.82	2.75	2.60	2.35	1.95	1.75	1.66	1.76	1.98	2.28	2.48	2.58	2.50	2.31	2.08	1.83	1.60	1.38	1.23	1.28
21/ 1	1.52	1.95	2.30	2.60	2.68	2.60	2.48	2.30	2.12	1.89	1.72	1.70	1.85	2.11	2.41	2.60	2.63	2.48	2.24	2.02	1.80	1.55	1.39	1.26
22/ 1	1.35	1.63	2.02	2.38	2.58	2.58	2.45	2.32	2.20	2.05	1.90	1.81	1.87	2.06	2.40	2.65	2.75	2.65	2.42	2.20	2.02	1.83	1.68	1.50
23/ 1	1.48	1.63	1.96	2.31	2.58	2.62	2.48	2.28	2.38	2.24	2.17	2.08	2.00	2.02	2.21	2.50	2.78	2.85	2.74	2.52	2.31	2.15	2.00	1.91
24/ 1	1.80	1.80	1.88	2.18	2.44	2.67	2.65	2.48	2.37	2.22	2.15	2.11	2.09	2.02	2.09	2.22	2.50	2.64	2.70	2.52	2.28	2.12	2.02	1.99
25/ 1	1.95	1.87	1.83	1.91	2.16	2.39	2.50	2.40	2.27	2.07	2.00	1.99	2.01	2.02	1.98	2.02	2.18	2.38	2.51	2.52	2.39	2.17	2.08	2.02
26/ 1	2.04	2.03	2.00	1.97	2.06	2.20	2.37	2.40	2.18	2.01	1.90	1.88	1.90	1.92	1.91	1.88	1.92	2.02	2.21	2.28	2.23	2.10	1.99	1.95
27/ 1	1.98	2.01	2.01	1.92	1.92	1.99	2.09	2.17	2.33	2.22	2.10	2.02	2.02	2.08	2.09	2.02	1.99	1.99	2.10	2.21	2.31	2.31	2.22	2.18
28/ 1	2.28	2.21	2.29	2.24	2.20	2.12	2.18	2.22	2.28	2.28	2.22	2.13	2.11	2.10	2.10	2.05	1.98	1.90	1.90	2.00	2.12	2.22	2.26	2.24
29/ 1	2.25	2.29	2.31	2.29	2.25	2.12	2.10	2.12	2.20	2.30	2.34	2.31	2.30	2.27	2.26	2.15	2.05	1.97	1.90	1.90	2.02	2.18	2.31	2.40
30/ 1	2.43	2.45	2.49	2.43	2.39	2.26	2.19	2.18	2.25	2.31	2.42	2.50	2.50	2.45	2.43	2.30	2.19	2.01	1.90	1.85	1.90	2.08	2.28	2.47
31/ 1	2.58	2.62	2.61	2.58	2.50	2.39	2.25	2.15	2.21	2.28	2.42	2.57	2.67	2.68	2.60	2.48	2.30	2.10	1.91	1.80	1.80	1.90	2.10	2.32
1/ 2	2.52	2.65	2.68	2.62	2.50	2.36	2.18	2.08	2.02	2.02	2.11	2.29	2.45	2.59	2.60	2.50	2.32	2.10	1.88	1.66	1.56	1.56	1.69	1.92

2/ 2	2.20	2.42	2.58	2.55	2.45	2.30	2.13	1.95	1.71	1.65	1.75	1.90	2.11	2.31	2.42	2.35	2.20	1.95	1.69	1.47	1.30	1.25	1.31	1.55
3/ 2	1.86	2.14	2.38	2.42	2.36	2.18	1.98	1.78	1.78	1.68	1.73	1.90	2.10	2.36	2.53	2.57	2.43	2.21	1.96	1.70	1.52	1.45	1.46	1.61
4/ 2	1.82	2.16	2.42	2.59	2.58	2.42	2.20	2.00	1.87	1.76	1.77	1.88	2.05	2.30	2.52	2.68	2.63	2.42	2.17	1.89	1.63	1.52	1.49	1.58
5/ 2	1.72	2.01	2.32	2.58	2.65	2.51	2.30	2.09	1.79	1.68	1.64	1.70	1.86	2.10	2.39	2.57	2.60	2.46	2.19	1.91	1.68	1.51	1.46	1.45
6/ 2	1.60	1.81	2.17	2.42	2.59	2.51	2.32	2.08	2.09	1.93	1.89	1.89	1.98	2.11	2.40	2.62	2.80	2.79	2.59	2.29	2.02	1.82	1.70	1.67
7/ 2	1.70	1.86	2.12	2.41	2.62	2.70	2.57	2.32	2.11	1.99	1.88	1.88	1.90	2.01	2.21	2.49	2.70	2.76	2.61	2.38	2.12	1.97	1.82	1.78
8/ 2	1.75	1.82	2.00	2.28	2.50	2.63	2.60	2.40	2.20	2.02	1.95	1.92	1.93	2.00	2.10	2.30	2.57	2.68	2.64	2.48	2.23	2.09	1.92	1.88
9/ 2	1.81	1.81	1.90	2.09	2.30	2.45	2.48	2.35	2.18	1.98	1.91	1.88	1.85	1.85	1.90	2.02	2.23	2.40	2.43	2.37	2.20	2.01	1.95	1.89
10/ 2	1.82	1.79	1.80	1.88	2.05	2.20	2.29	2.22	2.12	1.98	1.90	1.89	1.88	1.81	1.81	1.88	2.00	2.19	2.29	2.30	2.20	2.12	2.06	2.01
11/ 2	1.99	1.91	1.85	1.83	1.91	2.01	2.11	2.15	2.12	2.02	1.99	1.98	1.98	1.97	1.89	1.88	1.90	2.00	2.12	2.20	2.20	2.19	2.16	2.17
12/ 2	2.18	2.11	2.01	1.96	1.92	1.98	2.02	2.12	2.12	2.12	2.10	2.10	2.11	2.12	2.08	1.93	1.90	1.90	2.00	2.11	2.23	2.29	2.34	2.40
13/ 2	2.45	2.45	2.39	2.23	2.12	2.03	2.08	2.12	2.20	2.22	2.23	2.29	2.29	2.30	2.23	2.10	1.93	1.81	1.79	1.88	2.00	2.18	2.29	2.42
14/ 2	2.51	2.58	2.53	2.40	2.22	2.09	2.00	1.98	2.05	2.15	2.22	2.32	2.39	2.40	2.37	2.22	2.03	1.82	1.69	1.65	1.71	1.92	2.13	2.37
15/ 2	2.52	2.68	2.69	2.60	2.39	2.19	1.99	1.88	1.85	1.82	1.98	2.11	2.25	2.30	2.29	2.15	1.98	1.69	1.45	1.27	1.27	1.41	1.69	1.98
16/ 2	2.22	2.42	2.52	2.51	2.31	2.08	1.85	1.63	1.59	1.77	1.92	2.17	2.37	2.50	2.52	2.50	2.34	2.10	1.82	1.55	1.38	1.38	1.59	1.90
17/ 2	2.21	2.51	2.71	2.79	2.72	2.58	2.30	2.05	1.83	1.73	1.87	2.10	2.38	2.60	2.73	2.70	2.57	2.31	2.02	1.75	1.50	1.36	1.40	1.67
18/ 2	2.01	2.40	2.69	2.79	2.78	2.61	2.41	2.17	1.95	1.78	1.74	1.90	2.20	2.50	2.75	2.82	2.72	2.50	2.27	1.98	1.70	1.48	1.37	1.45
19/ 2	1.77	2.15	2.50	2.72	2.79	2.63	2.49	2.29	2.10	1.90	1.78	1.82	2.02	2.33	2.68	2.87	2.85	2.69	2.42	2.15	1.92	1.70	1.52	1.47
20/ 2	1.60	1.90	2.29	2.58	2.71	2.61	2.46	2.22	2.11	1.90	1.81	1.70	1.82	2.04	2.40	2.69	2.82	2.72	2.50	2.25	2.00	1.86	1.70	1.60
21/ 2	1.57	1.70	2.00	2.36	2.55	2.57	2.40	2.17	2.00	1.95	1.85	1.80	1.78	1.90	2.15	2.43	2.69	2.73	2.60	2.32	2.11	1.96	1.86	1.81
22/ 2	1.75	1.78	1.90	2.18	2.40	2.58	2.49	2.22	2.02	1.85	1.82	1.82	1.81	1.81	1.91	2.12	2.41	2.59	2.60	2.40	2.15	2.01	1.91	1.92
23/ 2	1.92	1.89	1.90	1.99	2.21	2.40	2.49	2.34	2.10	1.92	1.90	1.95	1.99	1.98	2.00	2.11	2.38	2.56	2.65	2.49	2.30	2.18	2.18	2.20
24/ 2	2.22	2.21	2.19	2.21	2.38	2.51	2.59	2.51	2.35	2.18	2.10	2.10	2.17	2.19	2.15	2.16	2.21	2.40	2.55	2.62	2.49	2.32	2.22	2.28
25/ 2	2.31	2.39	2.38	2.32	2.32	2.40	2.49	2.54	2.45	2.31	2.19	2.13	2.16	2.19	2.20	2.12	2.10	2.18	2.29	2.39	2.40	2.32	2.27	2.27
26/ 2	2.32	2.40	2.41	2.37	2.30	2.30	2.38	2.47	2.44	2.39	2.28	2.21	2.19	2.21	2.21	2.12	2.08	2.02	2.08	2.16	2.29	2.32	2.38	2.34
27/ 2	2.40	2.40	2.45	2.40	2.32	2.28	2.23	2.29	2.30	2.38	2.38	2.35	2.32	2.31	2.28	2.18	2.05	1.99	1.96	2.01	2.11	2.22	2.36	2.35
28/ 2	2.48	2.41	2.42	2.40	2.29	2.20	2.11	2.09	2.12	2.22	2.31	2.39	2.40	2.38	2.31	2.15	2.02	1.90	1.80	1.74	1.83	2.00	2.20	2.39
29/ 2	2.50	2.55	2.52	2.49	2.38	2.21	2.10	2.09	2.10	2.23	2.39	2.49	2.55	2.53	2.47	2.31	2.15	1.98	1.84	1.80	1.89	2.07	2.29	2.49
1/ 3	2.55	2.65	2.68	2.62	2.50	2.36	2.18	2.08	2.02	2.02	2.11	2.29	2.45	2.59	2.60	2.50	2.32	2.10	1.88	1.66	1.56	1.56	1.69	1.92
2/ 3	2.20	2.42	2.58	2.55	2.45	2.30	2.13	1.95	1.71	1.65	1.75	1.90	2.11	2.31	2.42	2.35	2.20	1.95	1.69	1.47	1.30	1.25	1.31	1.55
3/ 3	1.86	2.14	2.38	2.42	2.36	2.18	1.98	1.78	1.78	1.68	1.73	1.90	2.10	2.36	2.53	2.57	2.43	2.21	1.96	1.70	1.52	1.45	1.46	1.61
4/ 3	1.82	2.16	2.42	2.59	2.58	2.42	2.20	2.00	1.87	1.76	1.77	1.88	2.05	2.30	2.52	2.68	2.63	2.42	2.17	1.89	1.63	1.52	1.49	1.58
5/ 3	1.72	2.01	2.32	2.58	2.65	2.51	2.30	2.09	1.79	1.68	1.64	1.70	1.86	2.10	2.39	2.57	2.60	2.46	2.19	1.91	1.68	1.51	1.46	1.45
6/ 3	1.60	1.81	2.17	2.42	2.59	2.51	2.32	2.08	2.09	1.93	1.89	1.89	1.98	2.11	2.40	2.62	2.80	2.79	2.59	2.29	2.02	1.82	1.70	1.67
7/ 3	1.70	1.86	2.12	2.41	2.62	2.70	2.57	2.32	2.11	1.99	1.88	1.88	1.90	2.01	2.21	2.49	2.70	2.76	2.61	2.38	2.12	1.97	1.82	1.78
8/ 3	1.75	1.82	2.00	2.28	2.50	2.63	2.60	2.40	2.20	2.02	1.95	1.92	1.93	2.00	2.10	2.30	2.57	2.68	2.64	2.48	2.23	2.09	1.92	1.88

9/ 3	1.81	1.81	1.90	2.09	2.30	2.45	2.48	2.35	2.18	1.98	1.91	1.88	1.85	1.85	1.90	2.02	2.23	2.40	2.43	2.37	2.20	2.01	1.95	1.89
10/ 3	1.82	1.79	1.80	1.88	2.05	2.20	2.29	2.22	2.12	1.98	1.90	1.89	1.88	1.81	1.81	1.88	2.00	2.19	2.29	2.30	2.20	2.12	2.06	2.01
11/ 3	1.99	1.91	1.85	1.83	1.91	2.01	2.11	2.15	2.12	2.02	1.99	1.98	1.98	1.97	1.89	1.88	1.90	2.00	2.12	2.20	2.20	2.19	2.16	2.17
12/ 3	2.18	2.11	2.01	1.96	1.92	1.98	2.02	2.12	2.12	2.12	2.10	2.10	2.11	2.12	2.08	1.93	1.90	1.90	2.00	2.11	2.23	2.29	2.34	2.40
13/ 3	2.45	2.45	2.39	2.23	2.12	2.03	2.08	2.12	2.20	2.22	2.23	2.29	2.29	2.30	2.23	2.10	1.93	1.81	1.79	1.88	2.00	2.18	2.29	2.42
14/ 3	2.51	2.58	2.53	2.40	2.22	2.09	2.00	1.98	2.05	2.15	2.22	2.32	2.39	2.40	2.37	2.22	2.03	1.82	1.69	1.65	1.71	1.92	2.13	2.37
15/ 3	2.52	2.68	2.69	2.60	2.39	2.19	1.99	1.88	1.85	1.82	1.98	2.11	2.25	2.30	2.29	2.15	1.98	1.69	1.45	1.27	1.27	1.41	1.69	1.98
16/ 3	2.22	2.42	2.52	2.51	2.31	2.08	1.85	1.63	1.59	1.77	1.92	2.17	2.37	2.50	2.52	2.50	2.34	2.10	1.82	1.55	1.38	1.38	1.59	1.90
17/ 3	2.21	2.51	2.71	2.79	2.72	2.58	2.30	2.05	1.83	1.73	1.87	2.10	2.38	2.60	2.73	2.70	2.57	2.31	2.02	1.75	1.50	1.36	1.40	1.67
18/ 3	2.01	2.40	2.69	2.79	2.78	2.61	2.41	2.17	1.95	1.78	1.74	1.90	2.20	2.50	2.75	2.82	2.72	2.50	2.27	1.98	1.70	1.48	1.37	1.45

ILHA FISCAL

(MARCH TO JULY 1992)

Table 3-1(1) Hourly Heights of Tides at Ilha Fiscal (March)

** TIDAL PREDICTION ** HOURLY HEIGHT AT I.FISCAL

MAR. , 1992 LAT. 22- 53.80 S LONG. -43- 9.09 E TIME KEPT 3 H

DATE	HOUR	0	1	2	3	4	5	6	7	8	9	10	11
1	AM	0.95	1.01	0.99	0.91	0.79	0.65	0.50	0.41	0.41	0.52	0.70	0.89
	PM	1.03	1.06	1.00	0.87	0.68	0.48	0.29	0.16	0.14	0.25	0.47	0.73
2	AM	0.95	1.07	1.08	0.99	0.85	0.68	0.51	0.38	0.32	0.38	0.55	0.80
	PM	1.03	1.15	1.14	1.01	0.81	0.59	0.37	0.19	0.09	0.12	0.30	0.58
3	AM	0.88	1.09	1.16	1.09	0.93	0.74	0.55	0.39	0.28	0.27	0.40	0.64
	PM	0.93	1.16	1.24	1.16	0.96	0.72	0.47	0.26	0.11	0.06	0.16	0.40
4	AM	0.73	1.03	1.19	1.18	1.04	0.83	0.61	0.43	0.29	0.23	0.28	0.47
	PM	0.77	1.07	1.26	1.27	1.11	0.86	0.60	0.37	0.19	0.09	0.10	0.25
5	AM	0.55	0.88	1.13	1.22	1.13	0.92	0.69	0.49	0.34	0.24	0.23	0.34
	PM	0.59	0.90	1.18	1.30	1.23	1.01	0.75	0.50	0.31	0.18	0.12	0.18
6	AM	0.39	0.69	1.00	1.18	1.17	1.01	0.77	0.56	0.39	0.29	0.24	0.28
	PM	0.44	0.71	1.01	1.23	1.27	1.13	0.89	0.64	0.45	0.31	0.22	0.21
7	AM	0.31	0.53	0.81	1.06	1.15	1.06	0.85	0.63	0.45	0.34	0.29	0.29
	PM	0.36	0.55	0.81	1.07	1.22	1.19	1.01	0.78	0.58	0.45	0.36	0.31
8	AM	0.33	0.44	0.65	0.89	1.05	1.05	0.91	0.70	0.51	0.40	0.34	0.33
	PM	0.35	0.45	0.63	0.87	1.07	1.15	1.07	0.89	0.71	0.58	0.51	0.46
9	AM	0.43	0.46	0.56	0.73	0.91	0.98	0.93	0.76	0.58	0.45	0.39	0.38
	PM	0.38	0.41	0.50	0.67	0.87	1.01	1.04	0.95	0.82	0.70	0.64	0.61
10	AM	0.58	0.55	0.56	0.64	0.76	0.87	0.89	0.80	0.65	0.52	0.45	0.43
	PM	0.43	0.43	0.45	0.52	0.65	0.81	0.91	0.93	0.87	0.80	0.75	0.74
11	AM	0.73	0.69	0.64	0.63	0.67	0.74	0.80	0.79	0.71	0.60	0.53	0.50
	PM	0.49	0.48	0.45	0.43	0.48	0.58	0.71	0.81	0.84	0.84	0.83	0.85
12	AM	0.86	0.84	0.77	0.69	0.64	0.64	0.69	0.73	0.73	0.69	0.63	0.60
	PM	0.58	0.55	0.50	0.42	0.37	0.39	0.48	0.60	0.72	0.81	0.87	0.92
13	AM	0.95	0.95	0.90	0.79	0.67	0.60	0.59	0.63	0.69	0.73	0.73	0.72
	PM	0.70	0.66	0.59	0.48	0.36	0.28	0.28	0.37	0.52	0.69	0.84	0.95
14	AM	1.02	1.04	1.00	0.90	0.75	0.61	0.52	0.53	0.60	0.70	0.79	0.84
	PM	0.85	0.81	0.72	0.59	0.42	0.26	0.16	0.17	0.29	0.49	0.72	0.91
15	AM	1.04	1.10	1.08	0.99	0.84	0.66	0.51	0.44	0.48	0.61	0.77	0.91
	PM	0.98	0.97	0.89	0.74	0.54	0.34	0.16	0.06	0.10	0.27	0.53	0.80

Table 3-1(2) Hourly Heights of Tides at Ilha Fiscal (March)

** TIDAL PREDICTION ** HOURLY HEIGHT AT I.FISCAL

MAR. . 1992 LAT. 22- 53.80 S LONG. -43- 9.09 E TIME KEPT 3 H

DATE	HOUR	0	1	2	3	4	5	6	7	8	9	10	11
16	AM	1.01	1.13	1.14	1.06	0.92	0.73	0.54	0.40	0.37	0.47	0.66	0.89
	PM	1.06	1.12	1.06	0.92	0.71	0.48	0.25	0.07	0.00	0.09	0.31	0.61
17	AM	0.90	1.10	1.16	1.11	0.97	0.79	0.59	0.41	0.31	0.34	0.50	0.76
	PM	1.02	1.19	1.21	1.10	0.90	0.66	0.41	0.18	0.03	0.00	0.14	0.41
18	AM	0.74	1.01	1.15	1.14	1.02	0.84	0.64	0.45	0.31	0.26	0.35	0.58
	PM	0.88	1.15	1.27	1.24	1.07	0.84	0.59	0.36	0.16	0.05	0.07	0.25
19	AM	0.55	0.86	1.08	1.14	1.05	0.88	0.69	0.51	0.34	0.24	0.25	0.40
	PM	0.68	1.00	1.22	1.29	1.19	0.99	0.76	0.54	0.34	0.19	0.12	0.19
20	AM	0.40	0.70	0.97	1.10	1.07	0.92	0.73	0.55	0.40	0.28	0.23	0.29
	PM	0.48	0.78	1.07	1.24	1.24	1.09	0.88	0.68	0.51	0.37	0.26	0.24
21	AM	0.34	0.56	0.83	1.02	1.06	0.95	0.78	0.60	0.46	0.35	0.27	0.26
	PM	0.35	0.57	0.85	1.09	1.18	1.12	0.96	0.78	0.64	0.53	0.44	0.37
22	AM	0.38	0.50	0.70	0.91	1.01	0.97	0.82	0.65	0.51	0.42	0.35	0.30
	PM	0.32	0.43	0.64	0.88	1.05	1.08	0.98	0.83	0.71	0.64	0.59	0.53
23	AM	0.50	0.52	0.63	0.80	0.93	0.95	0.86	0.70	0.56	0.47	0.43	0.39
	PM	0.36	0.38	0.49	0.67	0.86	0.96	0.94	0.85	0.74	0.69	0.68	0.66
24	AM	0.63	0.60	0.62	0.72	0.83	0.90	0.87	0.76	0.63	0.53	0.50	0.48
	PM	0.45	0.41	0.43	0.52	0.66	0.80	0.85	0.82	0.75	0.71	0.71	0.73
25	AM	0.74	0.70	0.67	0.68	0.74	0.82	0.85	0.80	0.70	0.61	0.56	0.55
	PM	0.54	0.49	0.45	0.44	0.51	0.63	0.72	0.76	0.75	0.72	0.72	0.76
26	AM	0.79	0.78	0.73	0.68	0.68	0.72	0.78	0.79	0.76	0.69	0.65	0.63
	PM	0.62	0.59	0.51	0.44	0.42	0.48	0.57	0.66	0.72	0.73	0.75	0.78
27	AM	0.82	0.83	0.78	0.70	0.64	0.63	0.67	0.73	0.77	0.77	0.75	0.73
	PM	0.72	0.68	0.60	0.49	0.40	0.37	0.43	0.53	0.64	0.73	0.78	0.82
28	AM	0.85	0.86	0.82	0.73	0.63	0.56	0.56	0.62	0.71	0.79	0.83	0.84
	PM	0.82	0.78	0.69	0.57	0.43	0.33	0.31	0.39	0.52	0.68	0.80	0.88
29	AM	0.91	0.91	0.86	0.77	0.64	0.52	0.46	0.49	0.59	0.73	0.86	0.93
	PM	0.95	0.90	0.80	0.66	0.49	0.34	0.25	0.26	0.38	0.56	0.76	0.91
30	AM	0.99	0.99	0.92	0.81	0.67	0.52	0.40	0.37	0.45	0.61	0.81	0.97
	PM	1.05	1.04	0.94	0.78	0.59	0.39	0.24	0.18	0.24	0.41	0.65	0.88
31	AM	1.04	1.08	1.02	0.88	0.71	0.54	0.39	0.30	0.31	0.45	0.67	0.92
	PM	1.10	1.16	1.08	0.92	0.71	0.49	0.30	0.17	0.15	0.26	0.49	0.77

Table 3-2(1) Hourly Heights of Tides at Ilha Fiscal (April)

** TIDAL PREDICTION ** HOURLY HEIGHT AT I.FISCAL

APR. , 1992 LAT. 22- 53.80 S LONG. -43- 9.09 E TIME KEPT 3 H

DATE	HOUR	0	1	2	3	4	5	6	7	8	9	10	11
1	AM	1.01	1.14	1.11	0.98	0.79	0.59	0.41	0.28	0.23	0.30	0.50	0.78
	PM	1.05	1.21	1.22	1.08	0.86	0.62	0.40	0.22	0.13	0.16	0.32	0.60
2	AM	0.90	1.12	1.18	1.09	0.89	0.67	0.46	0.30	0.21	0.21	0.34	0.59
	PM	0.90	1.17	1.28	1.22	1.02	0.77	0.53	0.33	0.19	0.14	0.22	0.43
3	AM	0.72	1.01	1.17	1.16	1.00	0.76	0.53	0.36	0.24	0.19	0.24	0.42
	PM	0.71	1.02	1.24	1.29	1.17	0.93	0.68	0.47	0.31	0.22	0.20	0.31
4	AM	0.55	0.84	1.08	1.16	1.07	0.86	0.62	0.42	0.29	0.21	0.21	0.30
	PM	0.51	0.81	1.10	1.26	1.24	1.07	0.84	0.62	0.46	0.35	0.29	0.30
5	AM	0.43	0.66	0.92	1.09	1.09	0.94	0.71	0.50	0.35	0.27	0.23	0.26
	PM	0.37	0.60	0.88	1.12	1.22	1.15	0.97	0.77	0.61	0.51	0.43	0.39
6	AM	0.42	0.54	0.75	0.95	1.04	0.97	0.79	0.58	0.42	0.33	0.29	0.28
	PM	0.31	0.44	0.65	0.90	1.09	1.13	1.04	0.88	0.74	0.65	0.59	0.54
7	AM	0.50	0.53	0.63	0.80	0.93	0.95	0.84	0.66	0.50	0.40	0.35	0.34
	PM	0.33	0.36	0.47	0.67	0.87	1.01	1.02	0.94	0.84	0.76	0.73	0.70
8	AM	0.65	0.60	0.60	0.68	0.80	0.88	0.85	0.74	0.59	0.48	0.43	0.41
	PM	0.39	0.36	0.38	0.47	0.63	0.80	0.91	0.92	0.88	0.84	0.83	0.82
9	AM	0.79	0.73	0.66	0.64	0.69	0.77	0.81	0.78	0.68	0.58	0.52	0.50
	PM	0.47	0.43	0.37	0.36	0.43	0.56	0.71	0.81	0.86	0.87	0.89	0.91
10	AM	0.91	0.86	0.76	0.67	0.63	0.66	0.72	0.76	0.74	0.69	0.64	0.61
	PM	0.58	0.53	0.43	0.34	0.31	0.36	0.48	0.63	0.76	0.84	0.90	0.95
11	AM	0.98	0.95	0.86	0.73	0.62	0.58	0.61	0.68	0.75	0.77	0.77	0.75
	PM	0.72	0.65	0.55	0.41	0.29	0.23	0.28	0.42	0.59	0.75	0.88	0.97
12	AM	1.02	1.02	0.94	0.81	0.66	0.54	0.51	0.56	0.67	0.78	0.86	0.88
	PM	0.87	0.81	0.70	0.54	0.36	0.22	0.16	0.23	0.39	0.59	0.79	0.95
13	AM	1.03	1.05	1.00	0.88	0.71	0.54	0.44	0.44	0.54	0.70	0.86	0.98
	PM	1.01	0.97	0.86	0.70	0.50	0.30	0.15	0.12	0.21	0.41	0.65	0.87
14	AM	1.02	1.07	1.04	0.92	0.76	0.57	0.42	0.34	0.39	0.55	0.77	0.98
	PM	1.10	1.12	1.03	0.88	0.67	0.44	0.24	0.12	0.11	0.25	0.48	0.75
15	AM	0.97	1.08	1.07	0.97	0.81	0.62	0.43	0.30	0.27	0.38	0.60	0.87
	PM	1.09	1.20	1.18	1.04	0.84	0.62	0.40	0.22	0.12	0.16	0.33	0.60

Table 3-2(2)　Hourly Heights of Tides at Ilha Fiscal (April)

** TIDAL PREDICTION **　　HOURLY HEIGHT AT　　I.FISCAL

APR. , 1992　LAT. 22- 53.80 S　LONG. -43- 9.09 E　TIME KEPT　3 H

DATE	HOUR	0	1	2	3	4	5	6	7	8	9	10	11
16	AM	0.87	1.05	1.10	1.02	0.86	0.66	0.47	0.31	0.22	0.24	0.40	0.67
	PM	0.97	1.18	1.25	1.17	1.00	0.79	0.57	0.37	0.22	0.17	0.25	0.46
17	AM	0.74	0.98	1.09	1.06	0.92	0.72	0.53	0.36	0.23	0.17	0.25	0.46
	PM	0.76	1.05	1.22	1.24	1.11	0.92	0.72	0.54	0.38	0.27	0.26	0.37
18	AM	0.60	0.86	1.05	1.08	0.98	0.79	0.59	0.42	0.28	0.19	0.18	0.29
	PM	0.53	0.84	1.09	1.21	1.16	1.01	0.83	0.67	0.54	0.42	0.35	0.37
19	AM	0.51	0.73	0.95	1.06	1.02	0.86	0.67	0.49	0.36	0.26	0.20	0.22
	PM	0.36	0.61	0.89	1.09	1.13	1.05	0.90	0.76	0.65	0.57	0.49	0.45
20	AM	0.49	0.63	0.84	0.99	1.03	0.93	0.75	0.57	0.44	0.35	0.28	0.25
	PM	0.28	0.43	0.67	0.90	1.03	1.03	0.92	0.80	0.71	0.66	0.62	0.56
21	AM	0.54	0.59	0.73	0.89	0.99	0.96	0.83	0.66	0.52	0.44	0.39	0.33
	PM	0.31	0.35	0.49	0.70	0.88	0.95	0.91	0.82	0.74	0.70	0.70	0.67
22	AM	0.63	0.61	0.66	0.78	0.90	0.94	0.88	0.74	0.61	0.52	0.48	0.44
	PM	0.39	0.36	0.40	0.53	0.70	0.83	0.87	0.82	0.75	0.72	0.73	0.74
23	AM	0.71	0.66	0.64	0.69	0.78	0.87	0.88	0.80	0.69	0.61	0.56	0.54
	PM	0.49	0.43	0.39	0.43	0.54	0.68	0.78	0.80	0.77	0.74	0.74	0.77
24	AM	0.77	0.72	0.66	0.64	0.67	0.76	0.82	0.83	0.77	0.70	0.65	0.62
	PM	0.59	0.53	0.45	0.40	0.43	0.54	0.66	0.75	0.78	0.77	0.77	0.79
25	AM	0.80	0.77	0.70	0.62	0.59	0.63	0.72	0.79	0.81	0.78	0.75	0.71
	PM	0.68	0.62	0.52	0.43	0.38	0.41	0.52	0.65	0.75	0.80	0.82	0.83
26	AM	0.83	0.80	0.73	0.63	0.55	0.53	0.58	0.68	0.78	0.83	0.84	0.82
	PM	0.78	0.72	0.61	0.49	0.38	0.34	0.39	0.52	0.67	0.80	0.87	0.90
27	AM	0.89	0.84	0.76	0.65	0.53	0.45	0.45	0.54	0.68	0.82	0.91	0.93
	PM	0.91	0.83	0.72	0.57	0.42	0.32	0.29	0.38	0.54	0.72	0.88	0.96
28	AM	0.97	0.92	0.82	0.69	0.54	0.42	0.36	0.40	0.53	0.72	0.89	1.01
	PM	1.03	0.97	0.84	0.68	0.50	0.35	0.26	0.26	0.38	0.59	0.81	0.98
29	AM	1.05	1.01	0.90	0.75	0.58	0.42	0.31	0.29	0.37	0.56	0.79	1.00
	PM	1.11	1.11	1.00	0.82	0.62	0.43	0.28	0.22	0.26	0.42	0.66	0.91
30	AM	1.07	1.10	1.01	0.84	0.65	0.46	0.31	0.23	0.24	0.38	0.62	0.89
	PM	1.11	1.20	1.15	0.99	0.77	0.56	0.37	0.25	0.21	0.29	0.49	0.76

Table 3-3(1)　Hourly Heights of Tides at Ilha Fiscal (May)

** TIDAL PREDICTION **　　HOURLY HEIGHT AT　　I.FISCAL

MAY , 1992　LAT. 22- 53.80 S　LONG. -43- 9.09 E　TIME KEPT　3 H

DATE	HOUR	0	1	2	3	4	5	6	7	8	9	10	11
1	AM	1.00	1.13	1.10	0.95	0.74	0.53	0.35	0.22	0.18	0.24	0.42	0.70
	PM	1.00	1.20	1.26	1.15	0.95	0.72	0.51	0.35	0.25	0.24	0.35	0.58
2	AM	0.85	1.07	1.14	1.05	0.85	0.62	0.41	0.26	0.17	0.16	0.26	0.49
	PM	0.79	1.08	1.26	1.26	1.11	0.89	0.67	0.49	0.36	0.29	0.30	0.44
3	AM	0.67	0.93	1.10	1.10	0.95	0.72	0.50	0.33	0.21	0.16	0.18	0.31
	PM	0.56	0.87	1.13	1.26	1.21	1.04	0.83	0.65	0.52	0.41	0.36	0.39
4	AM	0.53	0.76	0.98	1.08	1.02	0.83	0.60	0.41	0.28	0.20	0.17	0.21
	PM	0.36	0.62	0.91	1.14	1.21	1.13	0.96	0.80	0.67	0.57	0.49	0.45
5	AM	0.48	0.62	0.82	0.99	1.02	0.91	0.71	0.51	0.37	0.28	0.23	0.21
	PM	0.25	0.41	0.66	0.92	1.09	1.12	1.03	0.90	0.79	0.72	0.65	0.58
6	AM	0.54	0.57	0.69	0.85	0.96	0.94	0.80	0.62	0.47	0.37	0.32	0.27
	PM	0.25	0.29	0.44	0.66	0.88	1.01	1.02	0.95	0.87	0.82	0.78	0.73
7	AM	0.65	0.60	0.62	0.73	0.85	0.91	0.86	0.73	0.58	0.48	0.42	0.37
	PM	0.32	0.28	0.31	0.44	0.64	0.82	0.92	0.93	0.90	0.87	0.87	0.85
8	AM	0.78	0.70	0.63	0.65	0.73	0.82	0.86	0.80	0.70	0.60	0.53	0.49
	PM	0.43	0.35	0.29	0.31	0.42	0.59	0.75	0.84	0.88	0.89	0.90	0.91
9	AM	0.88	0.80	0.70	0.62	0.63	0.71	0.79	0.82	0.79	0.72	0.66	0.62
	PM	0.57	0.48	0.37	0.29	0.29	0.39	0.54	0.69	0.80	0.86	0.90	0.93
10	AM	0.94	0.88	0.77	0.65	0.58	0.59	0.67	0.76	0.81	0.82	0.79	0.76
	PM	0.71	0.63	0.51	0.37	0.27	0.26	0.36	0.51	0.67	0.79	0.88	0.93
11	AM	0.96	0.92	0.83	0.69	0.56	0.50	0.53	0.64	0.75	0.85	0.89	0.89
	PM	0.86	0.79	0.67	0.51	0.35	0.25	0.25	0.35	0.52	0.69	0.83	0.93
12	AM	0.97	0.95	0.87	0.74	0.58	0.46	0.42	0.48	0.62	0.78	0.91	0.99
	PM	0.99	0.94	0.83	0.67	0.49	0.32	0.23	0.25	0.37	0.56	0.75	0.90
13	AM	0.98	0.98	0.90	0.78	0.61	0.45	0.34	0.33	0.44	0.63	0.84	1.00
	PM	1.08	1.07	0.98	0.84	0.65	0.46	0.30	0.23	0.27	0.43	0.64	0.85
14	AM	0.98	1.01	0.95	0.82	0.66	0.48	0.32	0.24	0.28	0.43	0.67	0.91
	PM	1.09	1.15	1.11	0.98	0.81	0.62	0.44	0.30	0.25	0.33	0.52	0.75
15	AM	0.95	1.04	1.01	0.89	0.72	0.53	0.35	0.22	0.17	0.25	0.45	0.73
	PM	0.99	1.15	1.18	1.09	0.94	0.76	0.58	0.42	0.32	0.31	0.42	0.63

Table 3-3(2) Hourly Heights of Tides at Ilha Fiscal (May)

** TIDAL PREDICTION ** HOURLY HEIGHT AT I.FISCAL

MAY , 1992 LAT. 22- 53.80 S LONG. -43- 9.09 E TIME KEPT 3 H

DATE	HOUR	0	1	2	3	4	5	6	7	8	9	10	11
16	AM	0.87	1.03	1.07	0.98	0.80	0.61	0.42	0.26	0.15	0.14	0.26	0.50
	PM	0.80	1.05	1.18	1.16	1.04	0.87	0.71	0.56	0.43	0.35	0.38	0.53
17	AM	0.76	0.97	1.09	1.05	0.90	0.70	0.51	0.34	0.20	0.13	0.15	0.31
	PM	0.57	0.87	1.09	1.16	1.09	0.95	0.80	0.67	0.55	0.45	0.41	0.47
18	AM	0.64	0.86	1.04	1.09	1.00	0.81	0.61	0.44	0.30	0.19	0.14	0.19
	PM	0.37	0.65	0.92	1.08	1.09	1.00	0.86	0.74	0.65	0.56	0.49	0.48
19	AM	0.56	0.74	0.94	1.07	1.05	0.91	0.72	0.54	0.40	0.30	0.22	0.19
	PM	0.26	0.46	0.72	0.94	1.04	1.01	0.89	0.78	0.70	0.64	0.59	0.54
20	AM	0.54	0.64	0.81	0.98	1.05	0.98	0.82	0.64	0.50	0.41	0.33	0.26
	PM	0.25	0.34	0.53	0.76	0.93	0.98	0.91	0.81	0.73	0.69	0.66	0.61
21	AM	0.57	0.59	0.69	0.85	0.97	0.99	0.90	0.74	0.60	0.50	0.44	0.37
	PM	0.32	0.31	0.41	0.59	0.79	0.91	0.91	0.83	0.75	0.71	0.70	0.67
22	AM	0.63	0.59	0.62	0.72	0.85	0.94	0.93	0.82	0.69	0.59	0.53	0.48
	PM	0.42	0.36	0.37	0.47	0.63	0.79	0.87	0.85	0.79	0.73	0.72	0.71
23	AM	0.68	0.63	0.59	0.62	0.72	0.83	0.89	0.87	0.78	0.68	0.61	0.57
	PM	0.52	0.45	0.39	0.40	0.50	0.65	0.79	0.84	0.83	0.78	0.75	0.74
24	AM	0.72	0.67	0.60	0.56	0.60	0.69	0.80	0.86	0.84	0.77	0.71	0.66
	PM	0.61	0.54	0.46	0.40	0.42	0.52	0.66	0.78	0.84	0.83	0.80	0.78
25	AM	0.75	0.70	0.63	0.55	0.52	0.56	0.66	0.77	0.84	0.85	0.81	0.76
	PM	0.71	0.64	0.54	0.44	0.39	0.41	0.52	0.67	0.79	0.86	0.87	0.84
26	AM	0.80	0.74	0.66	0.56	0.47	0.45	0.51	0.64	0.77	0.87	0.90	0.88
	PM	0.83	0.75	0.64	0.52	0.41	0.36	0.40	0.52	0.68	0.83	0.91	0.92
27	AM	0.88	0.81	0.71	0.59	0.47	0.39	0.39	0.47	0.63	0.80	0.93	0.98
	PM	0.97	0.89	0.77	0.63	0.48	0.37	0.33	0.39	0.53	0.72	0.88	0.97
28	AM	0.97	0.90	0.78	0.64	0.49	0.37	0.30	0.33	0.45	0.65	0.86	1.02
	PM	1.08	1.04	0.93	0.77	0.60	0.44	0.33	0.31	0.39	0.56	0.77	0.95
29	AM	1.03	1.00	0.89	0.72	0.54	0.38	0.27	0.22	0.28	0.45	0.69	0.94
	PM	1.11	1.16	1.09	0.94	0.75	0.57	0.41	0.31	0.30	0.41	0.61	0.84
30	AM	1.02	1.07	1.00	0.83	0.63	0.44	0.28	0.18	0.16	0.26	0.48	0.76
	PM	1.03	1.20	1.22	1.11	0.92	0.73	0.54	0.40	0.31	0.33	0.46	0.68
31	AM	0.92	1.07	1.08	0.95	0.75	0.53	0.34	0.20	0.12	0.13	0.27	0.52
	PM	0.84	1.11	1.25	1.23	1.09	0.89	0.70	0.54	0.41	0.34	0.37	0.53

Table 3-4(1) Hourly Heights of Tides at Ilha Fiscal (June)

** TIDAL PREDICTION ** HOURLY HEIGHT AT I.FISCAL

JUNE , 1992 LAT. 22- 53.80 S LONG. -43- 9.09 E TIME KEPT 3 H

DATE	HOUR	0	1	2	3	4	5	6	7	8	9	10	11
1	AM	0.76	0.99	1.10	1.05	0.88	0.65	0.43	0.27	0.15	0.09	0.13	0.29
	PM	0.58	0.90	1.16	1.25	1.20	1.04	0.86	0.69	0.55	0.44	0.39	0.44
2	AM	0.61	0.84	1.03	1.09	0.99	0.78	0.55	0.36	0.22	0.13	0.09	0.15
	PM	0.34	0.64	0.95	1.16	1.21	1.13	0.98	0.83	0.70	0.59	0.49	0.45
3	AM	0.52	0.69	0.91	1.05	1.05	0.90	0.69	0.49	0.33	0.22	0.14	0.11
	PM	0.19	0.39	0.68	0.96	1.12	1.13	1.04	0.92	0.81	0.72	0.63	0.55
4	AM	0.52	0.60	0.76	0.94	1.03	0.98	0.82	0.62	0.46	0.34	0.25	0.18
	PM	0.15	0.24	0.44	0.70	0.93	1.05	1.03	0.95	0.87	0.81	0.75	0.67
5	AM	0.59	0.58	0.66	0.81	0.95	0.99	0.91	0.75	0.59	0.47	0.39	0.31
	PM	0.23	0.21	0.29	0.47	0.70	0.88	0.95	0.94	0.89	0.85	0.82	0.77
6	AM	0.70	0.62	0.61	0.69	0.82	0.92	0.93	0.85	0.72	0.60	0.53	0.46
	PM	0.38	0.29	0.26	0.33	0.49	0.68	0.82	0.87	0.86	0.84	0.84	0.83
7	AM	0.78	0.70	0.62	0.61	0.68	0.80	0.88	0.88	0.82	0.73	0.66	0.61
	PM	0.54	0.44	0.34	0.30	0.36	0.49	0.65	0.76	0.81	0.82	0.83	0.84
8	AM	0.83	0.76	0.66	0.58	0.58	0.65	0.76	0.84	0.85	0.82	0.78	0.74
	PM	0.69	0.61	0.50	0.38	0.33	0.38	0.49	0.63	0.73	0.79	0.82	0.84
9	AM	0.84	0.80	0.71	0.59	0.51	0.51	0.59	0.71	0.81	0.86	0.87	0.86
	PM	0.83	0.77	0.66	0.53	0.41	0.35	0.39	0.50	0.63	0.74	0.81	0.85
10	AM	0.86	0.83	0.75	0.62	0.50	0.42	0.43	0.53	0.67	0.80	0.89	0.94
	PM	0.94	0.90	0.82	0.69	0.54	0.41	0.36	0.40	0.52	0.67	0.79	0.87
11	AM	0.89	0.86	0.79	0.67	0.52	0.39	0.32	0.35	0.48	0.66	0.83	0.96
	PM	1.01	1.01	0.94	0.83	0.68	0.52	0.40	0.37	0.43	0.57	0.74	0.87
12	AM	0.94	0.93	0.85	0.73	0.57	0.40	0.27	0.22	0.29	0.46	0.68	0.89
	PM	1.03	1.08	1.04	0.95	0.81	0.65	0.50	0.39	0.38	0.47	0.65	0.84
13	AM	0.97	1.00	0.94	0.81	0.64	0.46	0.29	0.17	0.15	0.26	0.48	0.74
	PM	0.97	1.09	1.11	1.04	0.91	0.76	0.60	0.46	0.38	0.41	0.54	0.75
14	AM	0.95	1.06	1.04	0.93	0.75	0.55	0.36	0.20	0.10	0.12	0.27	0.53
	PM	0.82	1.04	1.13	1.10	0.99	0.85	0.70	0.56	0.44	0.39	0.46	0.63
15	AM	0.86	1.05	1.12	1.04	0.87	0.67	0.46	0.28	0.14	0.07	0.13	0.33
	PM	0.62	0.90	1.09	1.13	1.05	0.92	0.77	0.64	0.52	0.43	0.42	0.52

Table 3-4(2) Hourly Heights of Tides at Ilha Fiscal (June)

** TIDAL PREDICTION ** HOURLY HEIGHT AT I.FISCAL

JUNE , 1992 LAT. 22- 53.80 S LONG. -43- 9.09 E TIME KEPT 3 H

DATE	HOUR	0	1	2	3	4	5	6	7	8	9	10	11
16	AM	0.73	0.97	1.12	1.13	1.00	0.80	0.58	0.39	0.23	0.12	0.09	0.18
	PM	0.42	0.72	0.98	1.11	1.09	0.97	0.83	0.70	0.59	0.49	0.43	0.46
17	AM	0.60	0.83	1.04	1.15	1.09	0.92	0.70	0.51	0.35	0.22	0.13	0.14
	PM	0.27	0.53	0.81	1.02	1.09	1.01	0.87	0.74	0.64	0.56	0.49	0.46
18	AM	0.52	0.69	0.91	1.08	1.12	1.02	0.82	0.62	0.46	0.33	0.24	0.18
	PM	0.22	0.38	0.64	0.89	1.03	1.03	0.92	0.78	0.68	0.61	0.55	0.50
19	AM	0.49	0.58	0.76	0.96	1.08	1.06	0.92	0.73	0.56	0.44	0.35	0.28
	PM	0.25	0.31	0.49	0.73	0.93	1.01	0.95	0.83	0.71	0.64	0.60	0.56
20	AM	0.52	0.53	0.63	0.80	0.97	1.04	0.97	0.82	0.65	0.53	0.45	0.39
	PM	0.34	0.33	0.41	0.58	0.79	0.93	0.95	0.87	0.76	0.67	0.63	0.60
21	AM	0.57	0.54	0.56	0.67	0.82	0.95	0.97	0.89	0.75	0.62	0.54	0.49
	PM	0.44	0.39	0.39	0.48	0.64	0.81	0.91	0.90	0.81	0.72	0.66	0.63
22	AM	0.61	0.57	0.55	0.57	0.68	0.81	0.90	0.91	0.83	0.72	0.64	0.58
	PM	0.54	0.48	0.44	0.44	0.52	0.67	0.80	0.87	0.85	0.78	0.71	0.67
23	AM	0.65	0.61	0.56	0.53	0.56	0.65	0.77	0.86	0.87	0.82	0.74	0.69
	PM	0.64	0.59	0.52	0.46	0.46	0.54	0.66	0.78	0.84	0.83	0.78	0.73
24	AM	0.69	0.65	0.59	0.52	0.48	0.51	0.61	0.73	0.83	0.86	0.85	0.81
	PM	0.76	0.70	0.63	0.53	0.46	0.46	0.52	0.64	0.76	0.83	0.84	0.81
25	AM	0.76	0.70	0.63	0.54	0.45	0.41	0.45	0.56	0.70	0.83	0.91	0.93
	PM	0.90	0.84	0.76	0.64	0.53	0.44	0.43	0.50	0.63	0.76	0.86	0.89
26	AM	0.86	0.79	0.69	0.58	0.45	0.36	0.32	0.37	0.51	0.70	0.87	0.99
	PM	1.03	1.00	0.91	0.78	0.64	0.50	0.41	0.40	0.48	0.63	0.80	0.91
27	AM	0.95	0.90	0.79	0.65	0.50	0.35	0.25	0.22	0.30	0.49	0.72	0.94
	PM	1.09	1.13	1.07	0.95	0.79	0.62	0.47	0.37	0.37	0.48	0.67	0.86
28	AM	0.99	1.01	0.92	0.76	0.58	0.40	0.24	0.14	0.14	0.26	0.49	0.78
	PM	1.04	1.19	1.20	1.11	0.95	0.77	0.59	0.43	0.35	0.37	0.52	0.74
29	AM	0.95	1.06	1.04	0.90	0.70	0.49	0.30	0.14	0.05	0.08	0.25	0.54
	PM	0.86	1.13	1.25	1.23	1.10	0.92	0.73	0.55	0.41	0.35	0.41	0.59
30	AM	0.83	1.04	1.12	1.04	0.85	0.62	0.40	0.21	0.06	0.00	0.06	0.28
	PM	0.60	0.94	1.19	1.27	1.20	1.05	0.87	0.69	0.53	0.41	0.37	0.47

Table 3-5(1) Hourly Heights of Tides at Ilha Fiscal (July)

** TIDAL PREDICTION ** HOURLY HEIGHT AT I.FISCAL

JULY , 1992 LAT. 22- 53.80 S LONG. -43- 9.09 E TIME KEPT 3 H

DATE	HOUR	0	1	2	3	4	5	6	7	8	9	10	11
1	AM	0.68	0.93	1.11	1.14	1.01	0.78	0.54	0.33	0.15	0.03	-0.01	0.09
	PM	0.34	0.68	1.01	1.20	1.23	1.13	0.97	0.81	0.65	0.52	0.42	0.42
2	AM	0.55	0.79	1.02	1.15	1.11	0.93	0.70	0.47	0.29	0.14	0.04	0.03
	PM	0.16	0.42	0.76	1.03	1.17	1.14	1.02	0.88	0.75	0.63	0.53	0.46
3	AM	0.49	0.65	0.88	1.07	1.14	1.05	0.85	0.63	0.44	0.29	0.17	0.09
	PM	0.10	0.25	0.51	0.80	1.01	1.08	1.02	0.91	0.80	0.71	0.63	0.55
4	AM	0.51	0.56	0.73	0.93	1.08	1.09	0.96	0.77	0.59	0.45	0.34	0.24
	PM	0.18	0.20	0.35	0.58	0.82	0.96	0.97	0.89	0.80	0.74	0.69	0.63
5	AM	0.57	0.55	0.62	0.77	0.94	1.03	1.00	0.87	0.71	0.59	0.50	0.42
	PM	0.34	0.29	0.31	0.44	0.63	0.80	0.87	0.85	0.79	0.74	0.71	0.69
6	AM	0.64	0.59	0.57	0.64	0.77	0.90	0.96	0.91	0.81	0.70	0.63	0.59
	PM	0.53	0.45	0.39	0.40	0.50	0.64	0.75	0.79	0.77	0.73	0.71	0.71
7	AM	0.69	0.64	0.58	0.56	0.62	0.73	0.83	0.87	0.84	0.78	0.73	0.71
	PM	0.69	0.63	0.54	0.47	0.47	0.54	0.64	0.71	0.74	0.72	0.71	0.72
8	AM	0.72	0.69	0.61	0.54	0.51	0.56	0.65	0.75	0.80	0.81	0.80	0.80
	PM	0.80	0.78	0.70	0.60	0.52	0.50	0.54	0.62	0.69	0.72	0.74	0.75
9	AM	0.75	0.73	0.66	0.56	0.47	0.43	0.47	0.57	0.68	0.77	0.82	0.86
	PM	0.88	0.89	0.84	0.74	0.62	0.52	0.49	0.54	0.62	0.71	0.77	0.80
10	AM	0.81	0.79	0.72	0.61	0.48	0.37	0.33	0.38	0.50	0.65	0.78	0.88
	PM	0.94	0.96	0.94	0.86	0.73	0.59	0.49	0.47	0.54	0.65	0.77	0.85
11	AM	0.89	0.87	0.80	0.69	0.53	0.37	0.25	0.22	0.30	0.47	0.67	0.84
	PM	0.96	1.02	1.01	0.94	0.83	0.68	0.54	0.45	0.46	0.56	0.72	0.87
12	AM	0.97	0.98	0.92	0.79	0.62	0.43	0.26	0.15	0.15	0.27	0.49	0.74
	PM	0.94	1.05	1.07	1.01	0.90	0.76	0.60	0.46	0.40	0.46	0.61	0.82
13	AM	0.99	1.07	1.04	0.92	0.74	0.53	0.32	0.15	0.07	0.11	0.30	0.57
	PM	0.85	1.04	1.11	1.07	0.96	0.82	0.66	0.50	0.39	0.38	0.49	0.71
14	AM	0.94	1.11	1.15	1.06	0.87	0.65	0.43	0.23	0.08	0.04	0.14	0.38
	PM	0.70	0.97	1.12	1.13	1.03	0.88	0.71	0.56	0.42	0.35	0.39	0.56
15	AM	0.82	1.07	1.20	1.17	1.01	0.79	0.55	0.33	0.15	0.05	0.06	0.22
	PM	0.51	0.83	1.07	1.16	1.09	0.94	0.77	0.61	0.47	0.37	0.35	0.44

Table 3-5(2) Hourly Heights of Tides at Ilha Fiscal (July)

** TIDAL PREDICTION ** HOURLY HEIGHT AT I.FISCAL

JULY , 1992 LAT. 22- 53.80 S LONG. -43- 9.09 E TIME KEPT 3 H

DATE	HOUR	0	1	2	3	4	5	6	7	8	9	10	11
16	AM	0.66	0.94	1.16	1.23	1.13	0.92	0.68	0.45	0.27	0.13	0.07	0.13
	PM	0.35	0.66	0.96	1.13	1.14	1.00	0.82	0.65	0.52	0.42	0.36	0.38
17	AM	0.53	0.78	1.04	1.20	1.20	1.04	0.80	0.57	0.38	0.24	0.14	0.13
	PM	0.25	0.50	0.80	1.04	1.13	1.06	0.89	0.70	0.56	0.47	0.40	0.38
18	AM	0.45	0.62	0.87	1.10	1.19	1.11	0.91	0.68	0.48	0.35	0.25	0.20
	PM	0.24	0.39	0.64	0.90	1.07	1.08	0.95	0.76	0.61	0.51	0.46	0.42
19	AM	0.43	0.53	0.72	0.94	1.10	1.12	0.99	0.78	0.59	0.45	0.36	0.31
	PM	0.29	0.35	0.52	0.74	0.95	1.04	0.98	0.83	0.66	0.55	0.50	0.47
20	AM	0.47	0.50	0.60	0.78	0.96	1.06	1.02	0.87	0.69	0.55	0.46	0.42
	PM	0.39	0.39	0.46	0.61	0.80	0.94	0.97	0.87	0.72	0.60	0.53	0.52
21	AM	0.51	0.51	0.54	0.64	0.79	0.93	0.98	0.92	0.79	0.65	0.57	0.53
	PM	0.50	0.48	0.48	0.54	0.66	0.80	0.89	0.88	0.78	0.66	0.58	0.55
22	AM	0.55	0.54	0.53	0.56	0.64	0.76	0.87	0.90	0.85	0.76	0.68	0.64
	PM	0.62	0.59	0.56	0.54	0.57	0.66	0.76	0.82	0.80	0.73	0.65	0.61
23	AM	0.60	0.58	0.55	0.52	0.53	0.59	0.69	0.79	0.83	0.83	0.79	0.76
	PM	0.74	0.72	0.67	0.60	0.55	0.56	0.62	0.70	0.76	0.76	0.73	0.69
24	AM	0.66	0.63	0.59	0.52	0.46	0.45	0.50	0.61	0.73	0.82	0.86	0.88
	PM	0.88	0.86	0.80	0.71	0.60	0.52	0.51	0.57	0.66	0.74	0.78	0.78
25	AM	0.76	0.71	0.65	0.55	0.44	0.36	0.33	0.40	0.54	0.70	0.85	0.95
	PM	1.00	1.00	0.95	0.84	0.70	0.56	0.47	0.45	0.53	0.65	0.77	0.85
26	AM	0.87	0.83	0.75	0.62	0.48	0.33	0.23	0.21	0.31	0.50	0.73	0.94
	PM	1.07	1.12	1.09	0.99	0.84	0.66	0.50	0.40	0.41	0.52	0.69	0.86
27	AM	0.96	0.97	0.89	0.74	0.56	0.37	0.20	0.09	0.10	0.25	0.51	0.80
	PM	1.05	1.19	1.21	1.13	0.98	0.79	0.59	0.42	0.35	0.39	0.56	0.79
28	AM	0.98	1.08	1.04	0.90	0.69	0.47	0.25	0.07	-0.01	0.04	0.25	0.57
	PM	0.90	1.16	1.27	1.24	1.10	0.92	0.71	0.51	0.36	0.32	0.43	0.65
29	AM	0.92	1.11	1.17	1.07	0.86	0.61	0.36	0.14	-0.02	-0.07	0.04	0.30
	PM	0.67	1.01	1.23	1.28	1.19	1.02	0.82	0.61	0.44	0.33	0.34	0.51
30	AM	0.78	1.05	1.21	1.20	1.04	0.79	0.52	0.28	0.08	-0.06	-0.06	0.10
	PM	0.41	0.78	1.09	1.24	1.23	1.09	0.90	0.71	0.53	0.39	0.33	0.40
31	AM	0.62	0.91	1.16	1.26	1.18	0.96	0.70	0.45	0.23	0.07	-0.03	0.01
	PM	0.21	0.53	0.88	1.12	1.19	1.11	0.94	0.77	0.61	0.48	0.39	0.37

<u>ILHA DE PAQUETA</u>

(JUNE TO JULY 1992)

Table 3-6 Hourly Heights of Tides at Ilha de Paqueta (June)

HOURLY HEIGHT AT PAQUETA

JUN. , 1992 LAT. 22- 45.60 S LONG. -43- 6.50 E TIME KEPT 3 H

DATE	HOUR	0	1	2	3	4	5	6	7	8	9	10	11
13	AM								0.04	0.00	0.14	0.42	0.75
	PM	1.05	1.20	1.23	1.13	0.97	0.83	0.64	0.45	0.33	0.33	0.45	0.65
14	AM	0.85	0.99	1.03	0.94	0.74	0.46	0.15	-0.12	0.05	0.00	0.06	0.32
	PM	0.71	1.01	1.13	1.15	0.97	0.77	0.61	0.43	0.27	0.18	0.18	0.31
15	AM	0.52	0.72	0.85	0.84	0.70	0.46	0.18	-0.10	0.10	-0.01	-0.05	-0.06
	PM	0.47	0.85	1.13	1.24	1.13	0.94	0.70	0.49	0.47	0.31	0.23	0.31
16	AM	0.50	0.80	1.04	1.12	1.01	0.74	0.46	0.22	0.03	-0.03	-0.06	-0.01
	PM	0.17	0.52	0.90	1.18	1.24	1.13	1.01	0.90	0.81	0.70	0.61	0.55
17	AM	0.57	0.74	0.94	1.12	1.14	1.01	0.81	0.58	0.13	0.05	0.01	0.00
	PM	0.09	0.34	0.70	1.05	1.25	1.25	1.14	1.02	0.94	0.89	0.83	0.75
18	AM	0.71	0.79	0.95	1.15	1.26	1.24	1.07	0.86	0.68	0.25	0.16	0.13
	PM	0.14	0.14	0.25	0.65	0.90	1.22	1.11	0.95	0.86	0.82	0.82	0.80
19	AM	0.75	0.74	0.82	1.00	1.17	1.23	1.13	0.93	0.50	0.31	0.20	0.17
	PM	0.16	0.17	0.31	0.61	0.89	1.13	1.07	0.90	0.75	0.69	0.71	0.75
20	AM	0.74	0.70	0.71	0.83	1.02	1.14	1.13	0.98	0.49	0.32	0.22	0.20
	PM	0.19	0.14	0.14	0.35	0.64	0.94	0.95	0.82	0.63	0.50	0.50	0.56
21	AM	0.61	0.60	0.57	0.63	0.76	0.94	1.01	0.94	0.69	0.56	0.38	0.34
	PM	0.32	0.29	0.25	0.28	0.44	0.75	0.85	0.80	0.62	0.44	0.35	0.40
22	AM	0.47	0.50	0.47	0.47	0.55	0.70	0.86	0.88	0.83	0.69	0.52	0.50
	PM	0.47	0.41	0.31	0.29	0.38	0.58	0.75	0.81	0.71	0.54	0.38	0.35
23	AM	0.41	0.47	0.47	0.43	0.43	0.52	0.69	0.82	1.05	0.87	0.75	0.69
	PM	0.67	0.64	0.57	0.50	0.41	0.61	0.75	0.88	0.92	0.81	0.67	0.56
24	AM	0.56	0.60	0.61	0.56	0.50	0.52	0.64	0.82	1.11	1.00	0.93	0.87
	PM	0.85	0.81	0.73	0.63	0.60	0.47	0.55	0.69	0.81	0.85	0.76	0.65
25	AM	0.58	0.57	0.57	0.52	0.43	0.37	0.41	0.56	1.11	1.01	1.00	0.99
	PM	0.95	0.93	0.87	0.80	0.68	0.47	0.44	0.52	0.68	0.80	0.83	0.79
26	AM	0.71	0.67	0.63	0.56	0.44	0.32	0.26	0.34	0.50	0.73	0.89	0.98
	PM	1.00	0.98	0.94	0.86	0.73	0.56	0.44	0.43	0.51	0.65	0.79	0.85
27	AM	0.85	0.80	0.73	0.63	0.50	0.34	0.22	0.17	0.70	0.54	0.68	0.90
	PM	1.05	1.12	1.10	1.02	0.86	0.68	0.49	0.37	0.34	0.44	0.58	0.74
28	AM	0.82	0.85	0.80	0.69	0.55	0.37	0.19	0.06	0.26	0.38	0.55	0.89
	PM	1.17	1.34	1.40	1.38	1.29	1.23	1.01	0.82	0.69	0.69	0.79	0.95
29	AM	1.13	1.25	1.26	1.18	1.03	0.83	0.63	0.47	0.19	0.22	0.44	0.85
	PM	1.21	1.46	1.64	1.67	1.62	1.43	1.26	0.96	0.79	0.67	0.67	0.79
30	AM	1.16	1.38	1.51	1.40	1.22	1.04	0.81	0.56	0.32	0.13	0.08	0.35
	PM	0.65	1.00	1.28	1.43	1.42	1.28	1.10	0.89	0.70	0.55	0.46	0.47

Table 3-7 Hourly Heights of Tides at Ilha de Paqueta (July)

HOURLY HEIGHT AT PAQUETA

JUL. , 1992 LAT. 22- 45.60 S LONG. -43- 6.50 E TIME KEPT 3 H

DATE	HOUR	0	1	2	3	4	5	6	7	8	9	10	11
1	AM	0.63	0.86	1.07	1.16	1.12	0.93	0.69	0.49	0.32	0.17	0.06	0.14
	PM	0.44	0.83	1.32	1.54	1.63	1.59	1.41	1.23	1.05	0.90	0.79	0.73
2	AM	0.79	0.98	1.23	1.42	1.48	1.36	1.13	0.89	0.54	0.38	0.23	0.06
	PM	0.14	0.43	0.99	1.38	1.55	1.59	1.46	1.27	1.12	1.00	0.88	0.80
3	AM	0.77	0.88	1.11	1.37	1.52	1.50	1.33	1.08	0.82	0.64	0.49	0.26
	PM	0.25	0.32	0.55	0.85	1.11	1.22	1.14	0.98	0.81	0.70	0.63	0.56

ILHA DE PAQUETA

(OCTOBER TO NOVEMBER 1992)

Port: | Lat. N. | Long. E. | From 92. 10. 25 | To 92. 11. 24

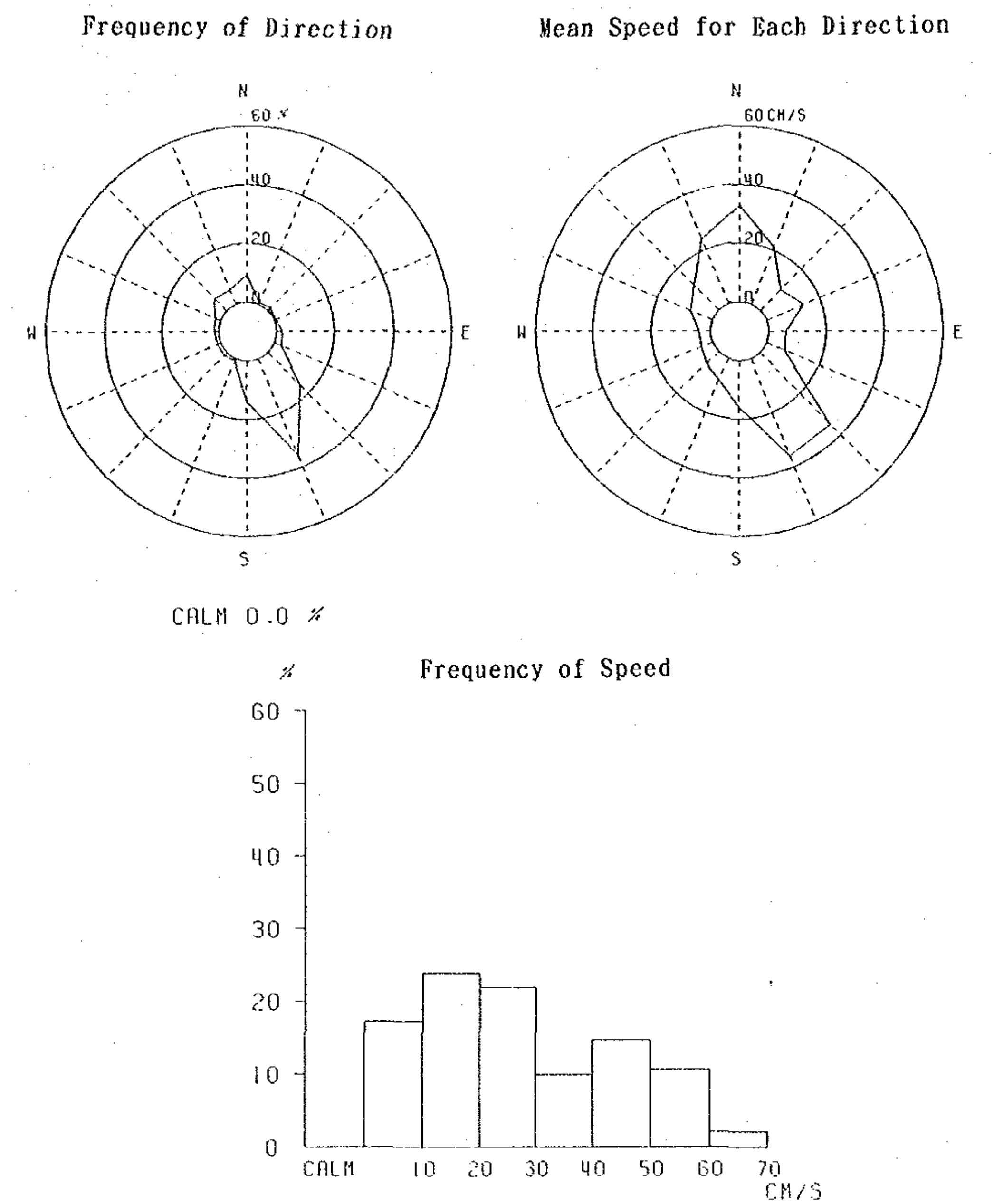
Date	0h	1h	2h	3h	4h	5h	6h	7h	8h	9h	10h	11h	12h	13h	14h	15h	16h	17h	18h	19h	20h	21h	22h	23h	Sum	Mean	H. W.	L. W.	H. W.	L. W.		
	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	h m m	h m m	h m m	h m m	m	mm
25	172	185	186	182	160	136	111	87	71	61	70	104	141	176	188	175	158	133	112	94	77	65	68	99	3031	126.3	1:35 198	8:04 61	14:06 188	21:37 62		
26	182	179	200	197	175	151	129	110	96	83	74	85	123	161	185	197	171	138	110	102	89	75	64	69	3097	129.0	2:22 202	10:10 74	14:30 189	22:26 62		
27	105	154	190	202	194	169	138	122	114	105	92	90	109	144	178	193	185	162	131	111	102	97	86	79	3252	135.5	2:53 202	10:30 88	15:09 199	23:03 79		
28	92	130	175	207	209	193	164	140	132	131	127	119	119	136	169	196	200	181	151	122	109	108	108	98	3516	146.5	3:30 213	11:30 117	15:40 206 [illegible]	20:31 106		
29	98	107	145	189	208	203	178	162	140	142	144	122	135	110	166	191	202	189	169	121	120	117	119	119	3625	151.0	4:14 208 [illegible]	8:14 139 [illegible]	[illegible]	21:10 117		
30	112	111	133	171	204	214	199	176	156	152	158	166	163	158	164	184	201	216	198	174	148	133	130	132	3905	162.4	4:53 214 11:10 166	0:37 109 8:50 152	16:58 210 23:21 137	13:10 158 21:40 129		
31	130	123	124	141	172	193	196	177	150	142	146	151	153	149	142	144	159	172	173	162	140	117	111	114	3582	149.3	[illegible]	[illegible]	17:32 174	[illegible]		
1	118	118	109	107	124	153	173	173	155	138	133	146	162	162	153	145	150	166	180	179	162	143	131	129	3508	146.2	0:31 118 6:38 175	3:40 109 9:40 131	13:30 162 18:21 182	15:30 124 22:50 128		
2	134	136	130	119	119	134	158	170	174	160	148	153	162	167	163	154	145	149	162	171	173	164	151	143	3643	151.8	1:08 136 7:28 174	3:30 118 10:13 107	14:10 168 19:41 170	6:10 144 22:23 142		
3	142	141	134	123	113	116	130	148	159	158	150	128	154	147	152	180	136	123	122	143	153	155	151	128	3396	141.5	0:24 143 8:28 160	4:19 111 10:42 147	12:31 157 20:50 155	16:00 122		
4	115	142	131	118	102	102	109	120	137	151	160	165	168	167	160	149	137	124	124	135	164	169	179	183	3431	143.0	12:30 168	4:30 100	22:57 183	17:33 121		
5	180	178	170	154	136	121	115	124	147	169	183	189	191	190	185	175	157	142	133	134	147	169	190	202	3881	161.7	12:13 191	5:55 115	23:34 203	18:20 132		
6	202	197	185	168	150	137	120	119	134	157	179	196	202	201	197	178	157	138	125	122	128	148	175	198	3903	162.6		6:30 118	12:20 202	18:56 122		
7	212	213	202	181	157	136	118	110	114	130	156	184	202	206	196	179	158	137	120	107	103	115	142	175	3753	156.4	0:30 214	7:13 109	12:42 206	19:56 103		
8	199	209	203	185	159	132	109	93	86	97	119	149	179	194	191	173	150	125	107	93	86	83	108	139	3359	140.0	1:10 208	7:57 86	15:22 195	20:52 82		
9	179	203	208	197	174	149	125	103	92	92	106	135	167	192	201	191	168	140	114	95	83	79	88	117	3398	141.6	1:50 209	8:33 92	14:00 201	20:56 79		
10	154	188	207	206	189	164	136	115	96	86	89	111	142	175	194	193	173	146	118	98	87	77	73	85	3303	137.6	2:30 209	9:20 85	14:23 197	21:50 72		
11	121	162	197	209	200	177	151	129	114	100	91	97	125	160	190	200	188	164	134	110	95	87	80	78	3359	140.0	3:00 209	10:00 91	15:08 200	22:30 77		
12	95	131	173	202	206	194	169	144	126	115	102	99	115	142	172	191	192	177	151	125	108	99	91	83	3402	141.8	3:36 207	10:41 98	15:30 194	23:12 87		
13	87	111	150	189	207	207	188	164	145	139	132	124	121	133	157	184	196	190	171	147	128	115	109	102	3596	149.8	4:26 209	11:59 1.22	16:04 196			
14	92	96	125	162	192	207	197	176	157	150	147	137	126	119	132	162	188	191	176	152	132	122	118	113	3569	148.7	5:00 207	0:27 91	16:43 192	13:01 119		
15	99	87	93	122	158	184	188	172	155	152	153	151	139	124	121	136	160	174	172	159	140	128	122	120	3409	142.0	5:46 189 [illegible]	1:09 84 [illegible]	17:30 175	12:38 120		
16	113	97	86	89	117	149	167	171	162	151	148	154	156	142	126	118	120	154	166	165	156	141	134	137	3323	138.5	6:25 172 [illegible]	2:19 85 [illegible]	18:30 167 [illegible]	15:00 118 [illegible]		
17	134	121	101	89	94	122	150	166	172	169	165	169	177	164	148	135	135	159	167	176	129	173	168	166	3526	146.9	7:30 172 [illegible]	3:19 88 [illegible]	19:32 175	[illegible]		
18	166	160	145	127	115	122	146	172	187	192	193	198	203	201	186	166	159	146	161	181	194	198	195	192	4095	170.6	13:[illegible] 203	4:02 115	20:48 198	16:41 145		
19	191	187	176	156	135	124	130	151	173	189	196	199	202	203	195	177	154	138	136	149	169	186	196	197	4112	171.3	0:09 191 12:34 204	5:04 123	22:30 197	17:40 134		
20	193	188	178	161	138	118	103	106	128	153	172	180	181	179	179	160	138	115	99	95	111	140	161	180	3550	147.9	1:10 181	6:30 101	23:[illegible] 184	18:50 95		
21	189	173	163	152	133	113	92	79	86	112	140	162	170	167	160	149	133	109	89	70	79	106	136	165	3119	130.0	12:09 170	7:06 78		19:03 70		
22	181	183	176	165	140	131	112	91	86	98	125	157	181	189	182	166	148	131	116	95	84	95	127	166	3333	138.9	0:30 183	7:34 85	13:06 189	20:07 84		
23	186	210	210	200	186	168	150	131	116	113	129	160	193	212	212	197	176	155	136	121	106	103	119	151	3850	160.4	1:30 213	8:46 112	13:27 214	20:37 103		
24	191	220	230	223	206	189	170	153	137	125	126	147	179	205	219	213	188	161	141	122	109	100	97	111	3862	161.1	1:51 230	9:30 133	14:10 220	21:47 97		
Sum	4551	4849	5035	5090	4890	4693	4523	4296	4101	4110	4257	4567	4833	5215	5353	5301	5072	4729	4376	4050	3989	3907	3919	4195	109910	152.7						
Mean	151.8	156.4	162.7	164.2	160.6	152.9	150.8	137.0	132.3	122.6	137.1	147.5	158.1	162.2	172.7	171.0	164.6	153.5	141.2	130.6	129.2	122.8	126.4	133.3								

Table 6.1 - 1 Hourly Tidal Data at Ilha de Paqueta

APPENDIX 3

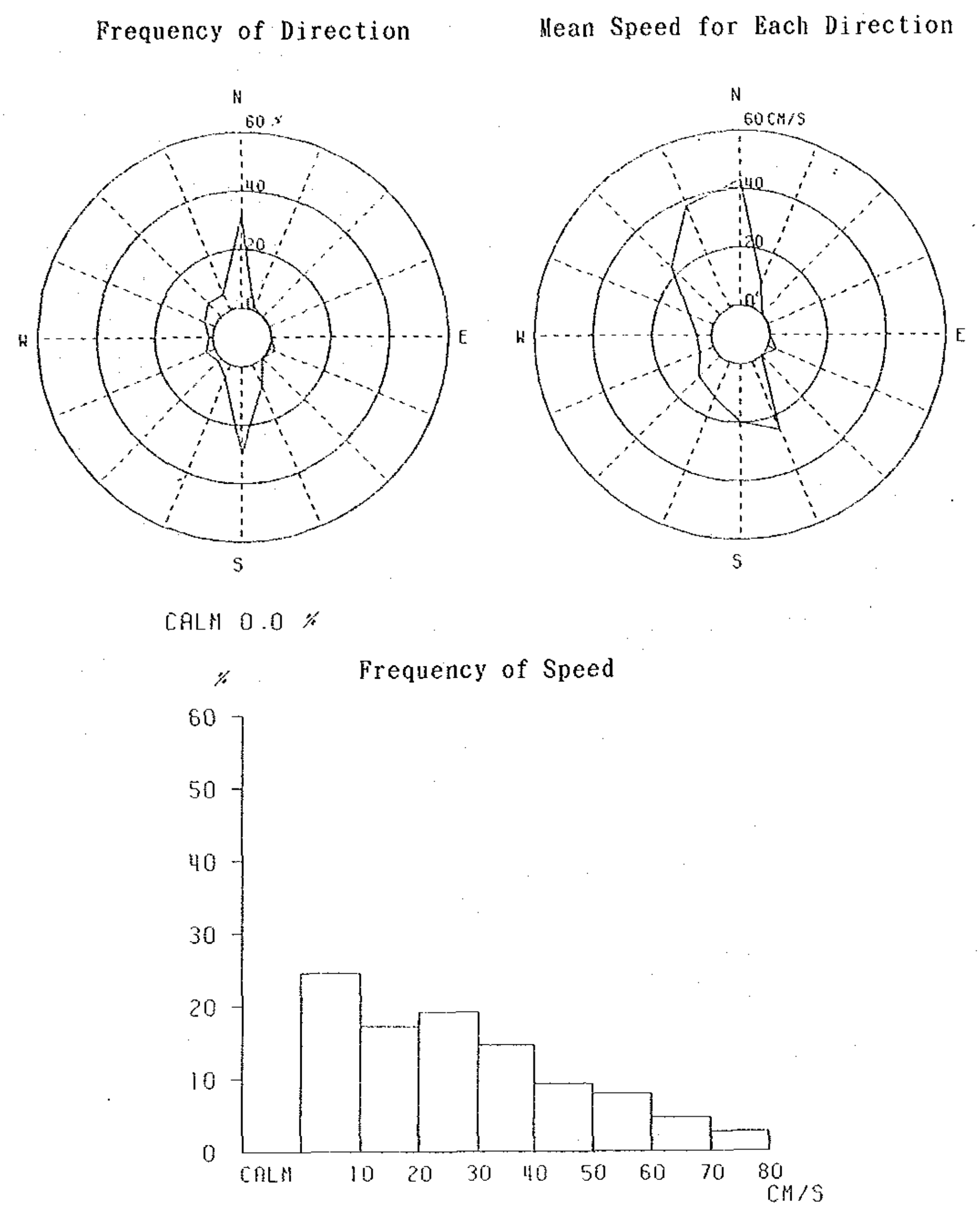
FREPUENDY DISTRIBUTION OF TIDAL CURRENTS

Phase 1



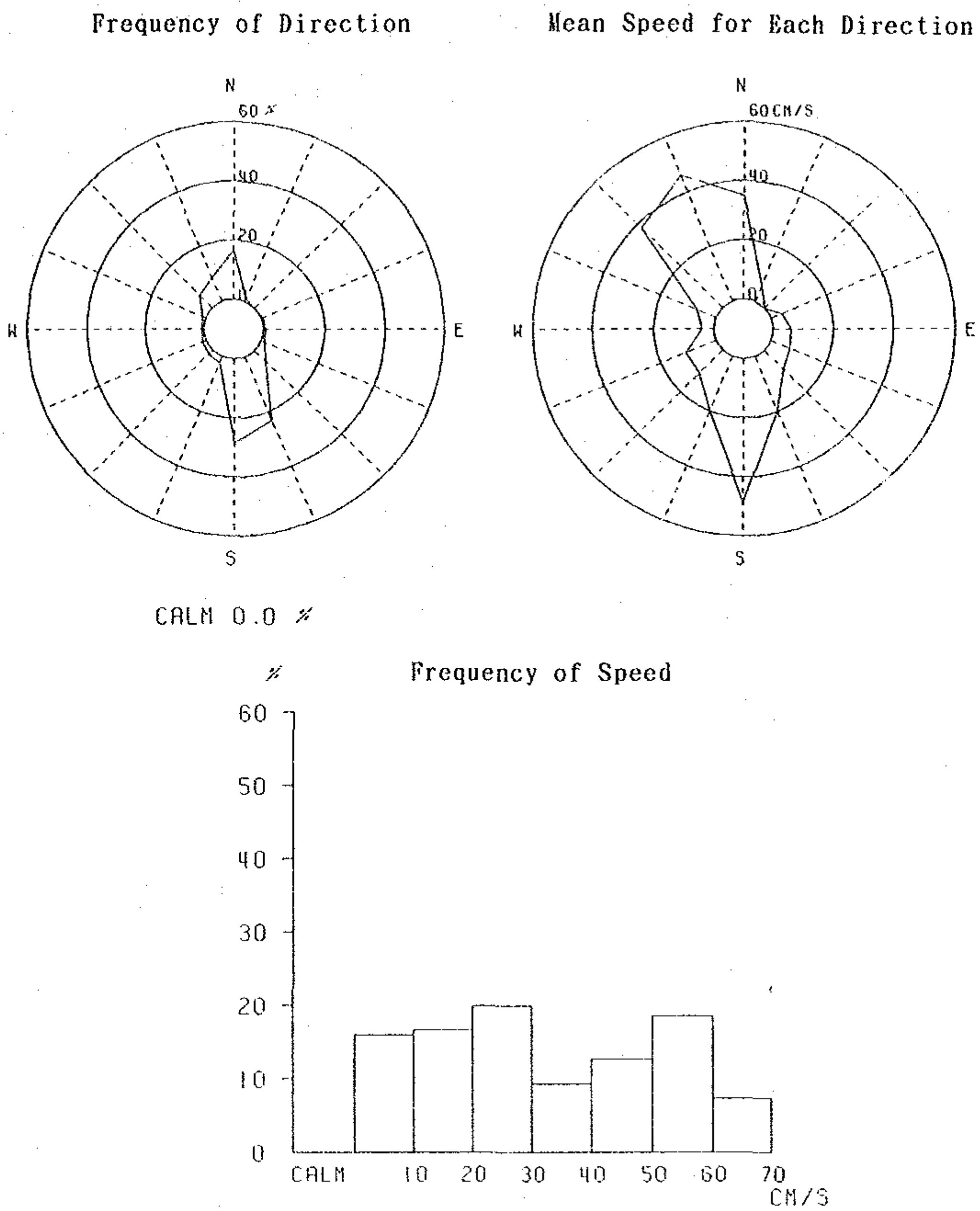
Station : St. A (upper)
Layer : 3meters below sea surface
Period : June 15 to June 16
No. of Data : 151
Mean Speed : 27.0cm/s
Max Speed : 65.0cm/s

Fig. 9-1 Frequency Distribution of Tidal Currents



Station : St. A (lower)
Layer : 5meters above sea bottom
Period : June 15 to June 16
No. of Data : 151
Mean Speed : 27.0cm／s
Max Speed : 75.5cm／s

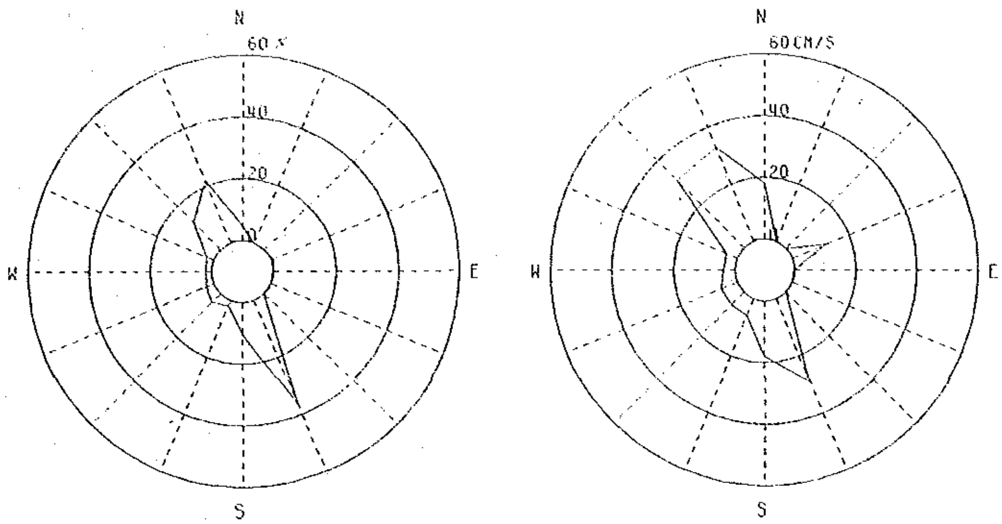
Fig. 9-2 Frequency Distribution of Tidal Currents



Station : St. B (upper)
Layer : 3meters below sea surface
Period : June 15 to June 16
No. of Data : 151
Mean Speed : 32.0cm／s
Max Speed : 68.2cm／s

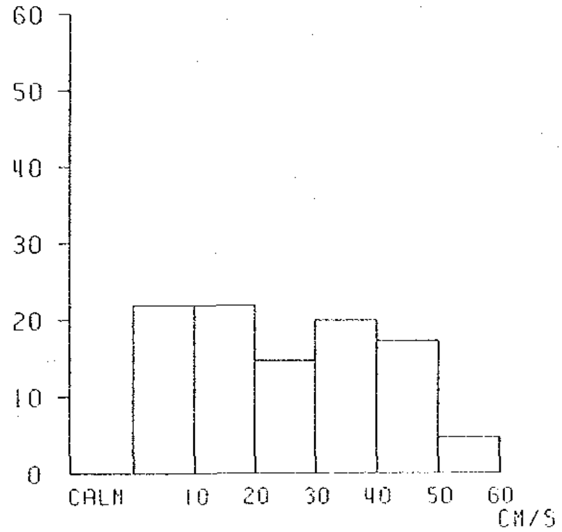
Fig. 9-3 Frequency Distribution of Tidal Currents

Frequency of Direction　　　　Mean Speed for Each Direction



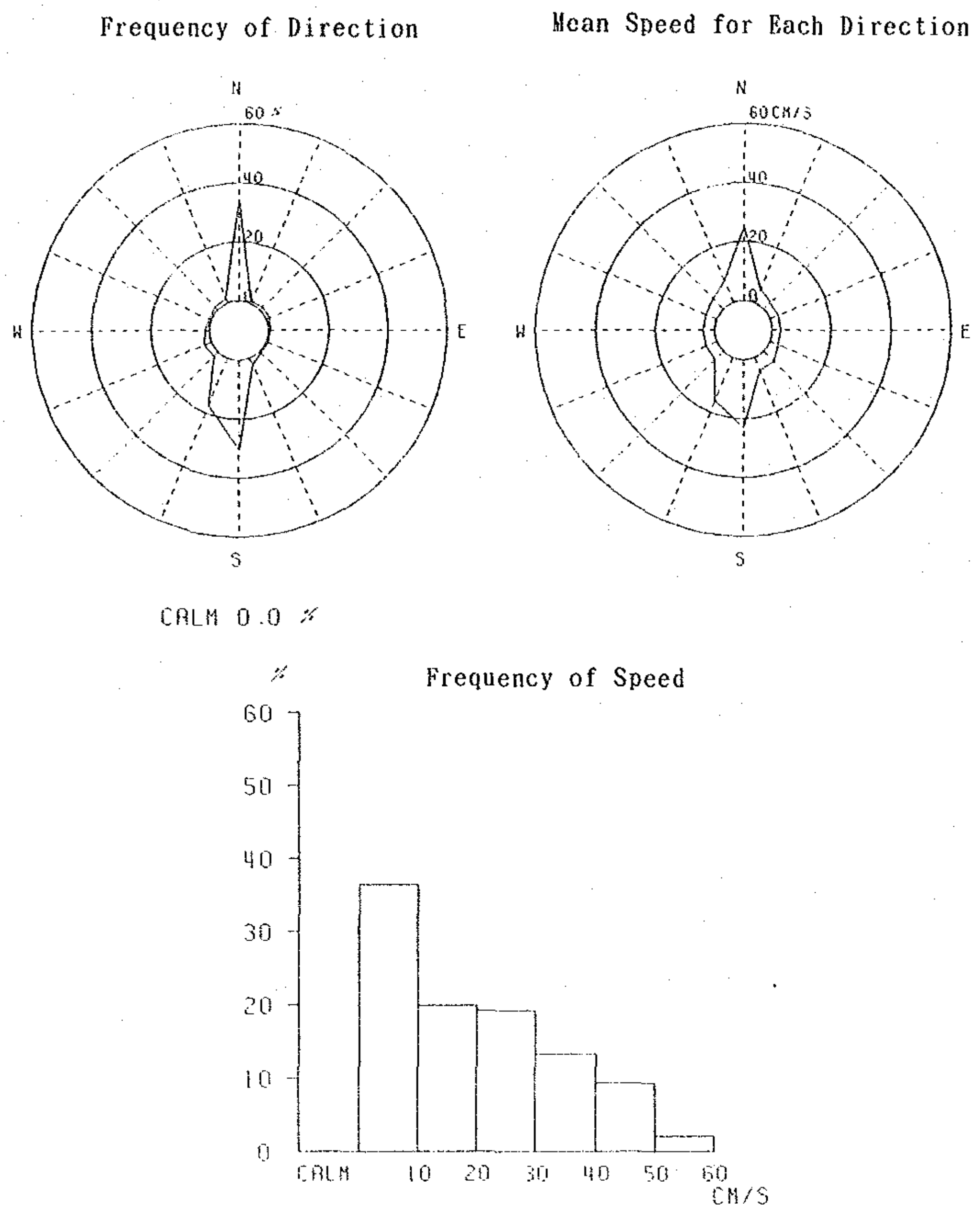
CALM 0.0 %

Frequency of Speed



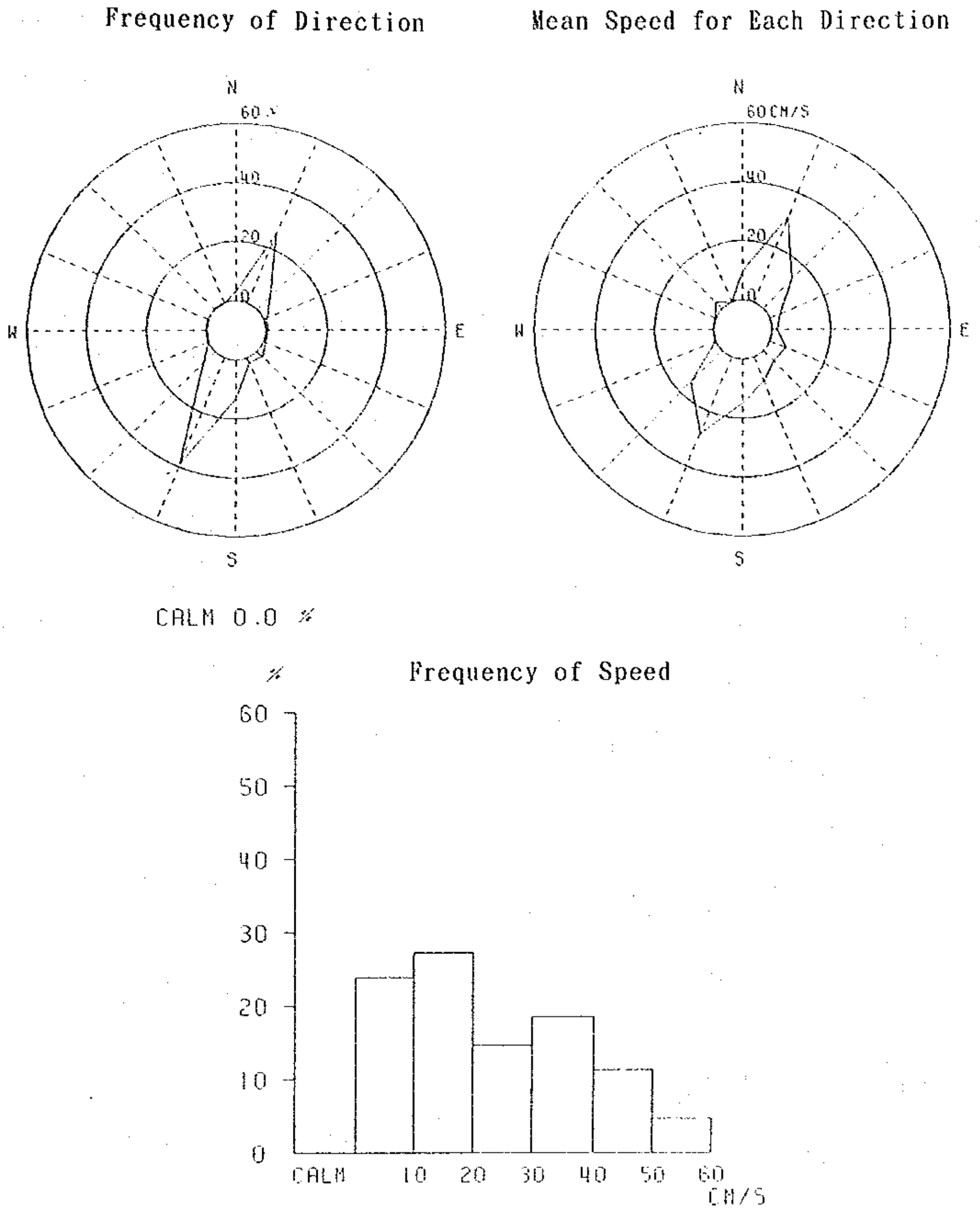
Station : St. B (lower)
Layer : 5meters above sea bottom
Period : June 15 to June 16
No. of Data : 151
Mean Speed : 25.0cm／s
Max Speed : 54.3cm／s

Fig. 9-4　Frequency Distribution of Tidal Currents



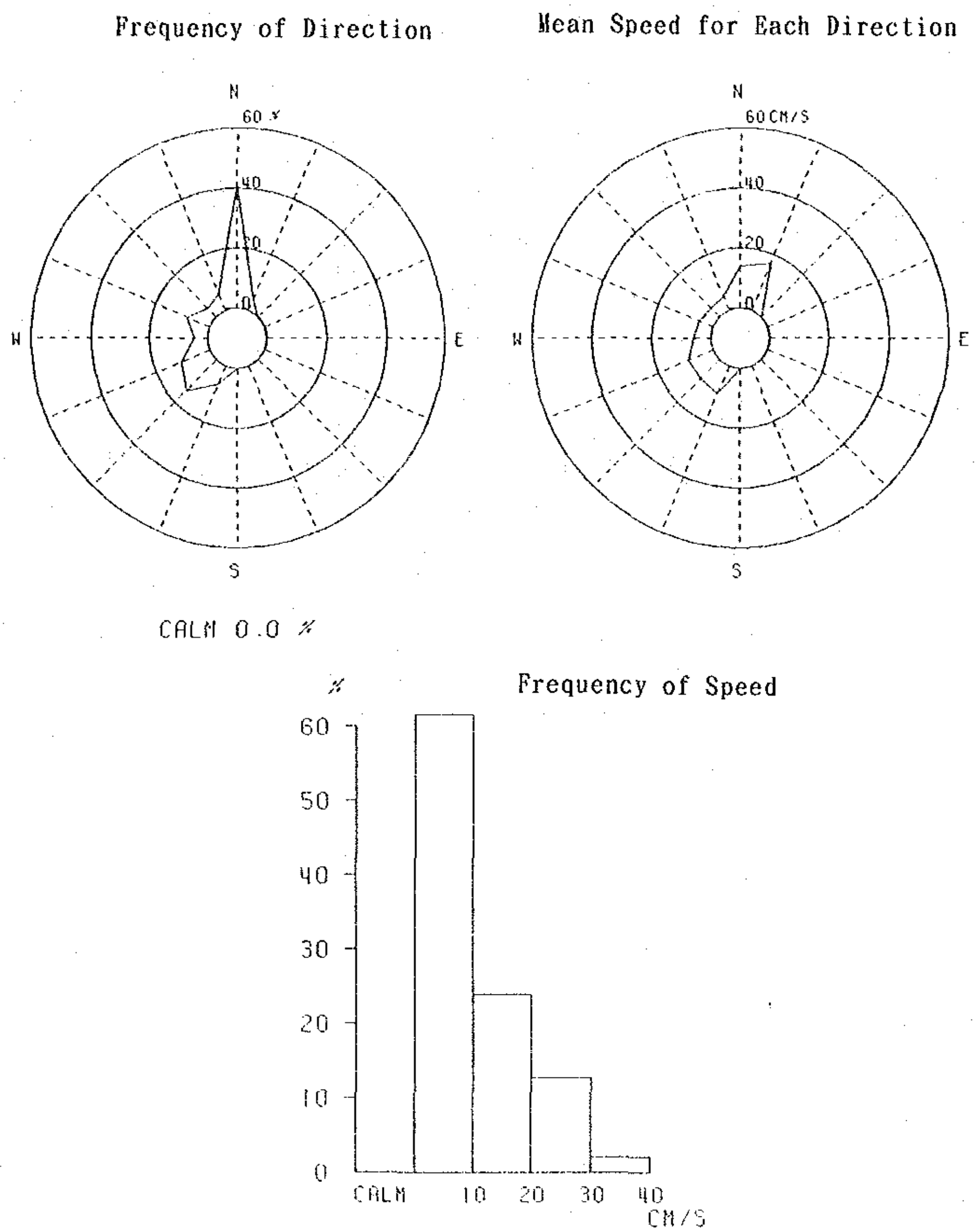
Station : St.C
Layer : 3meters below sea surface
Period : June 16 to June 17
No. of Data : 151
Mean Speed : 19.0cm/s
Max Speed : 51.7cm/s

Fig. 9-5 Frequency Distribution of Tidal Currents



Station : St. D
Layer : 3meters below sea surface
Period : June 16 to June 17
No. of Data : 151
Mean Speed : 23.0cm／s
Max Speed : 56.3cm／s

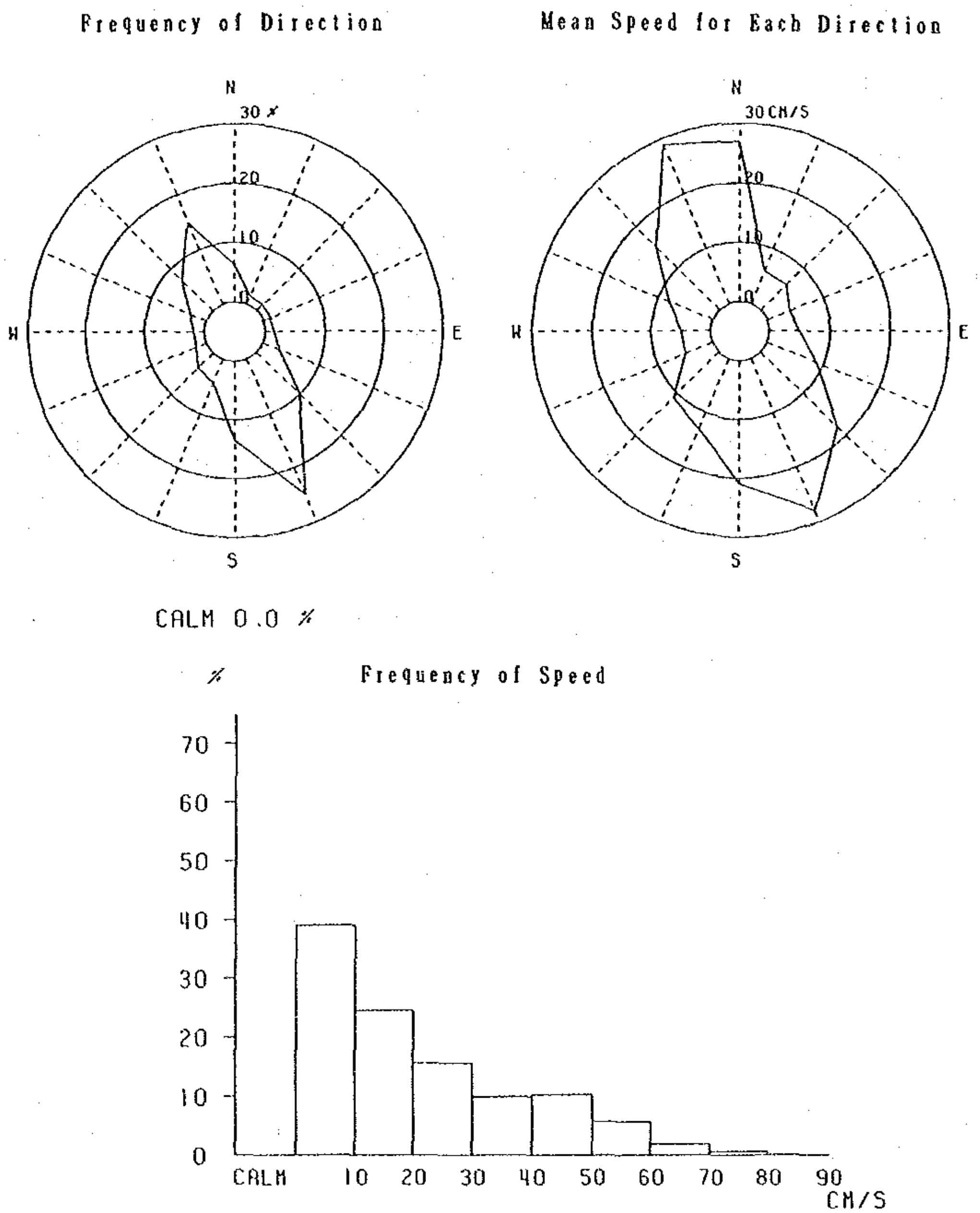
Fig. 9-6 Frequency Distribution of Tidal Currents



Station : St. F
Layer : 3meters below sea surface
Period : June 17 to June 18
No. of Data : 151
Mean Speed : 10.0cm／s
Max Speed : 30.5cm／s

Fig. 9-7 Frequency Distribution of Tidal Currents

Phase 2



Station : A(UPPER)

Layer : 3meters below sea surface

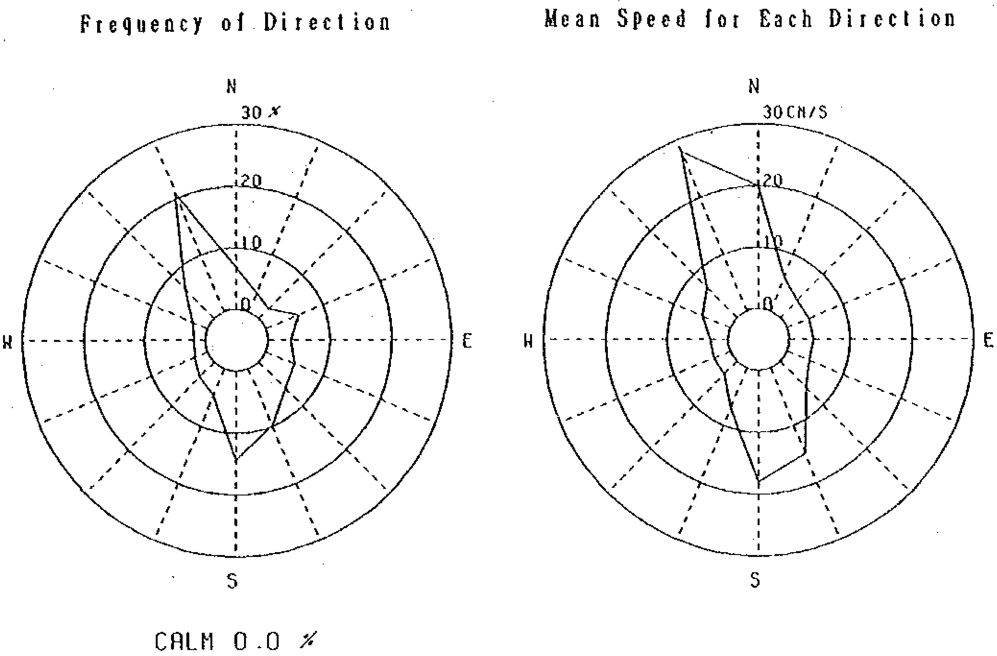
Period : October 28 to November 12

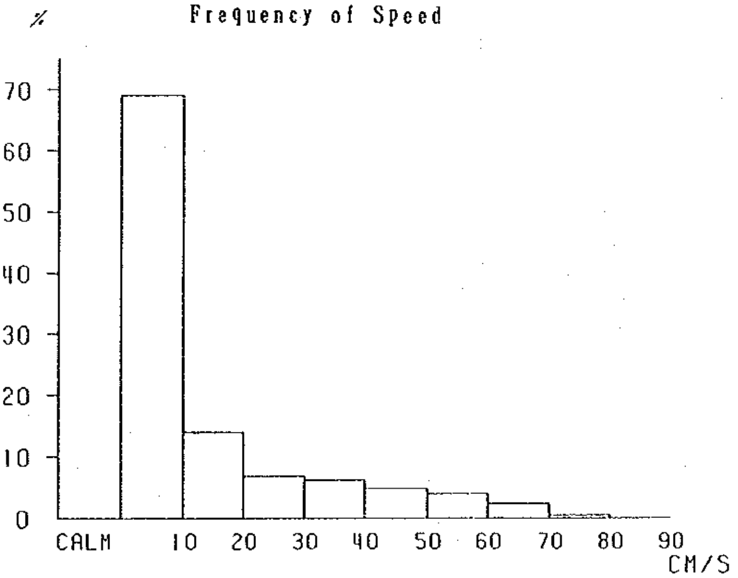
No.of Data : 2265

Mean Speed : 21.0cm/s

Max Speed : 84.5cm/s

Fig.9-8 Frequency Distribution of Tidal Currents





Station : A(LOWER)

Layer : 5meters above sea bottom

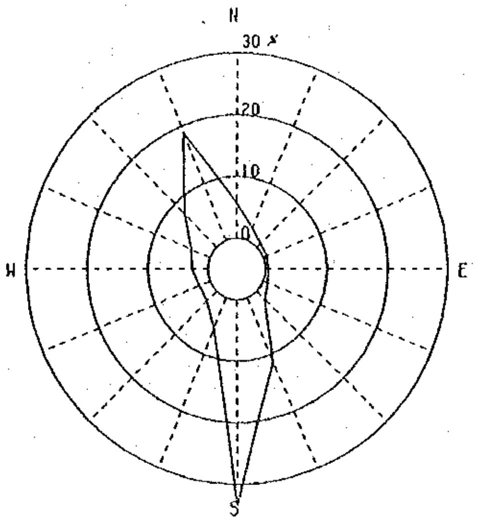
Period : October 28 to November 12

No.of Data : 2265

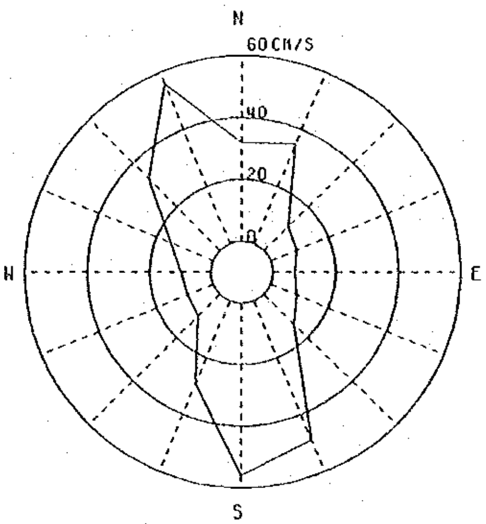
Mean Speed : 14.0cm/s

Max Speed : 89.2cm/s

Frequency of Direction

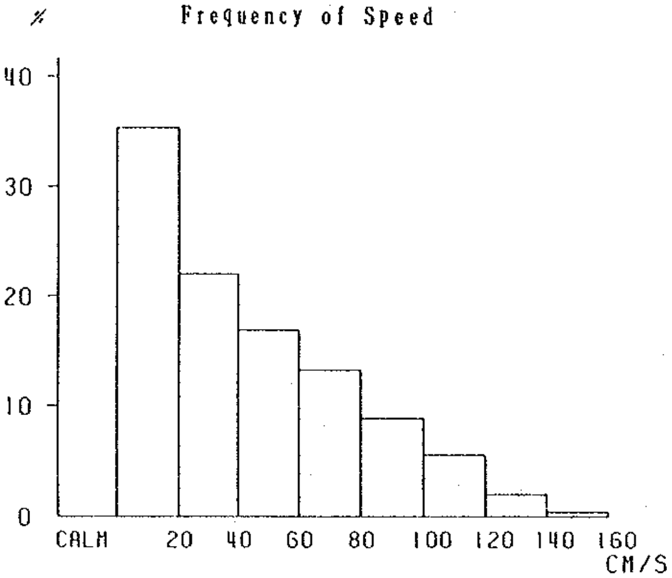


Mean Speed for Each Direction



CALM 0.0 %

Frequency of Speed



Station : B(UPPER)

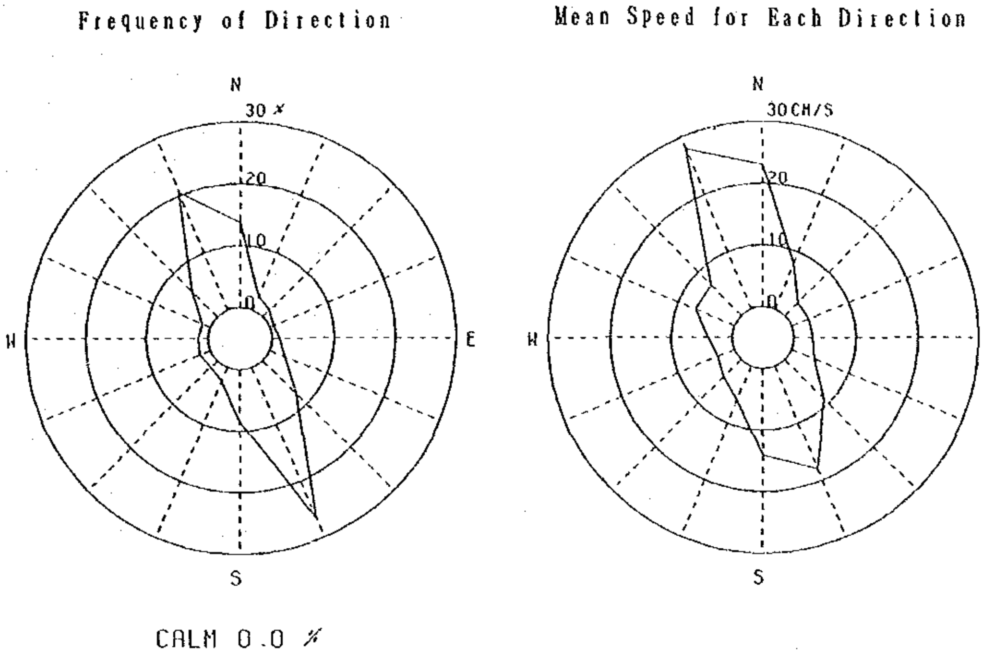
Layer : 3meters below sea surface

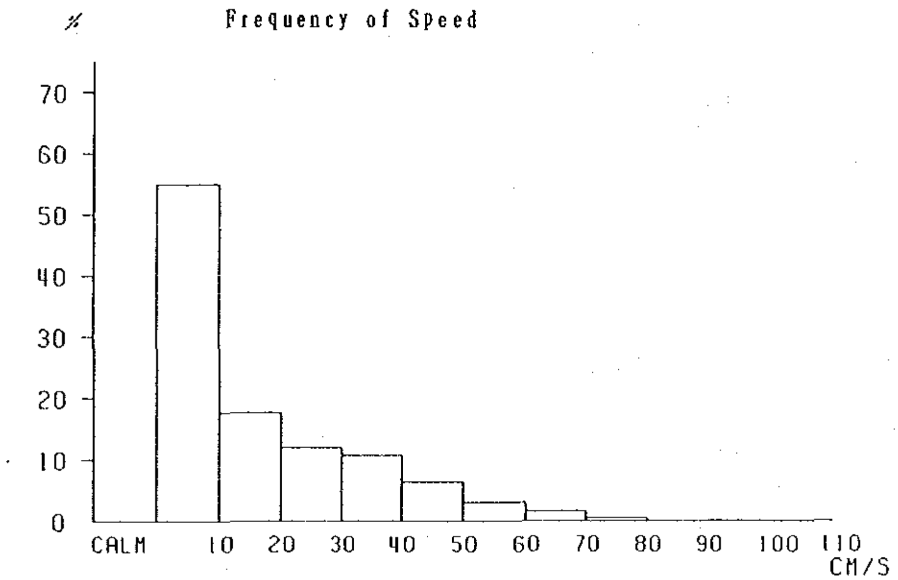
Period : October 28 to November 12

No.of Date : 2265

Mean Speed : 43.0cm/s

Max Speed : 156.3cm/s





Station : B(LOWER)

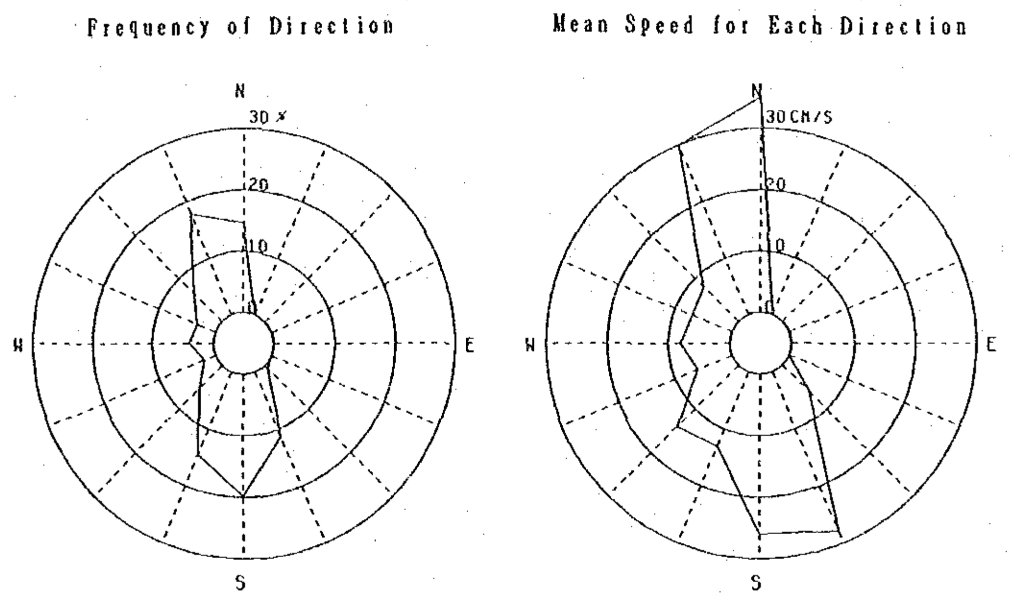
Layer : 5meters above sea bottom

Period : October 28 to November 12

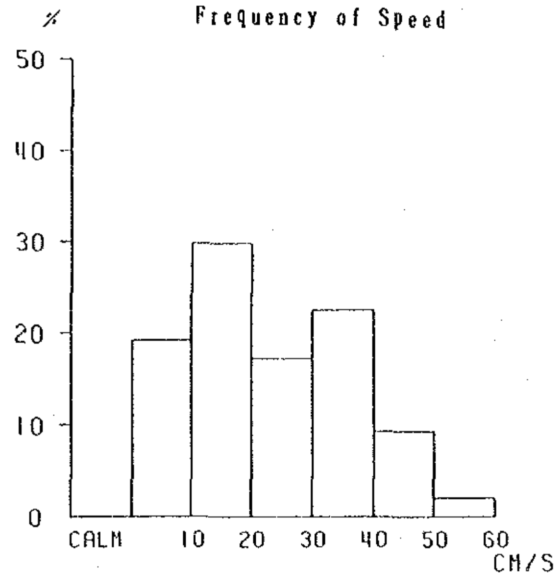
No.of Data : 2265

Mean Speed : 17.0cm/s

Max Speed : 105.1cm/s



CALM 0.0 %



Station : C

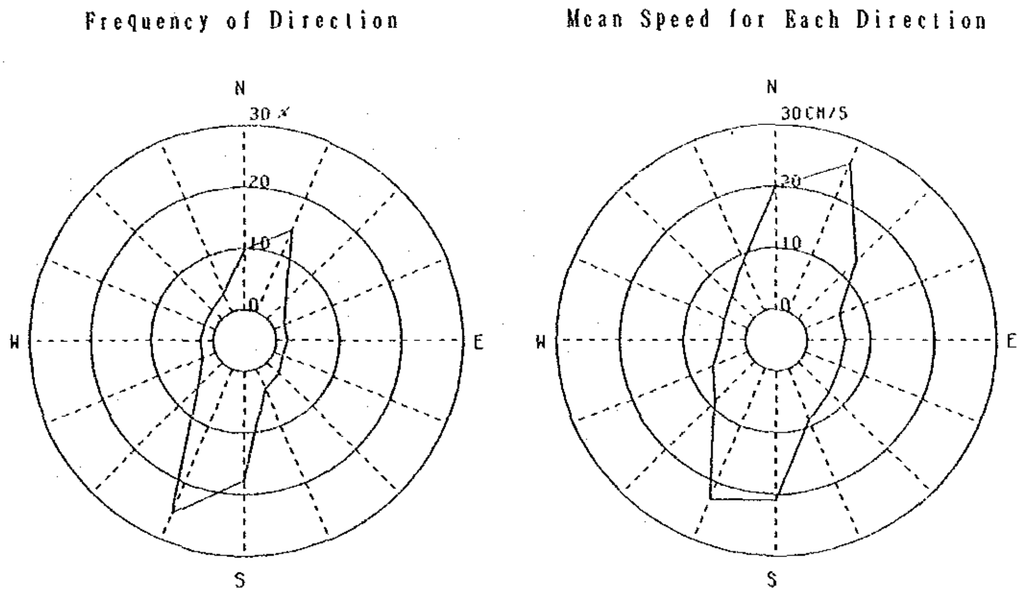
Layer : 3meters below sea surface

Period : October 24 to October 25

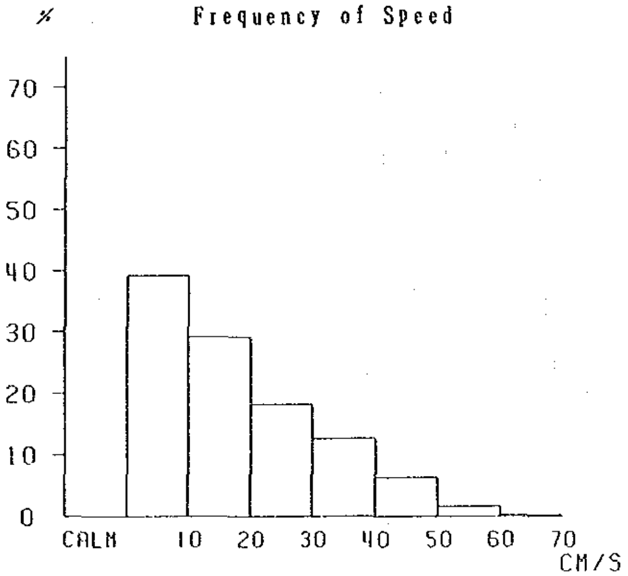
No.of Data : 151

Mean Speed : 23.0cm/s

Max Speed : 54.0cm/s



CALM 0.0 %



Station : D

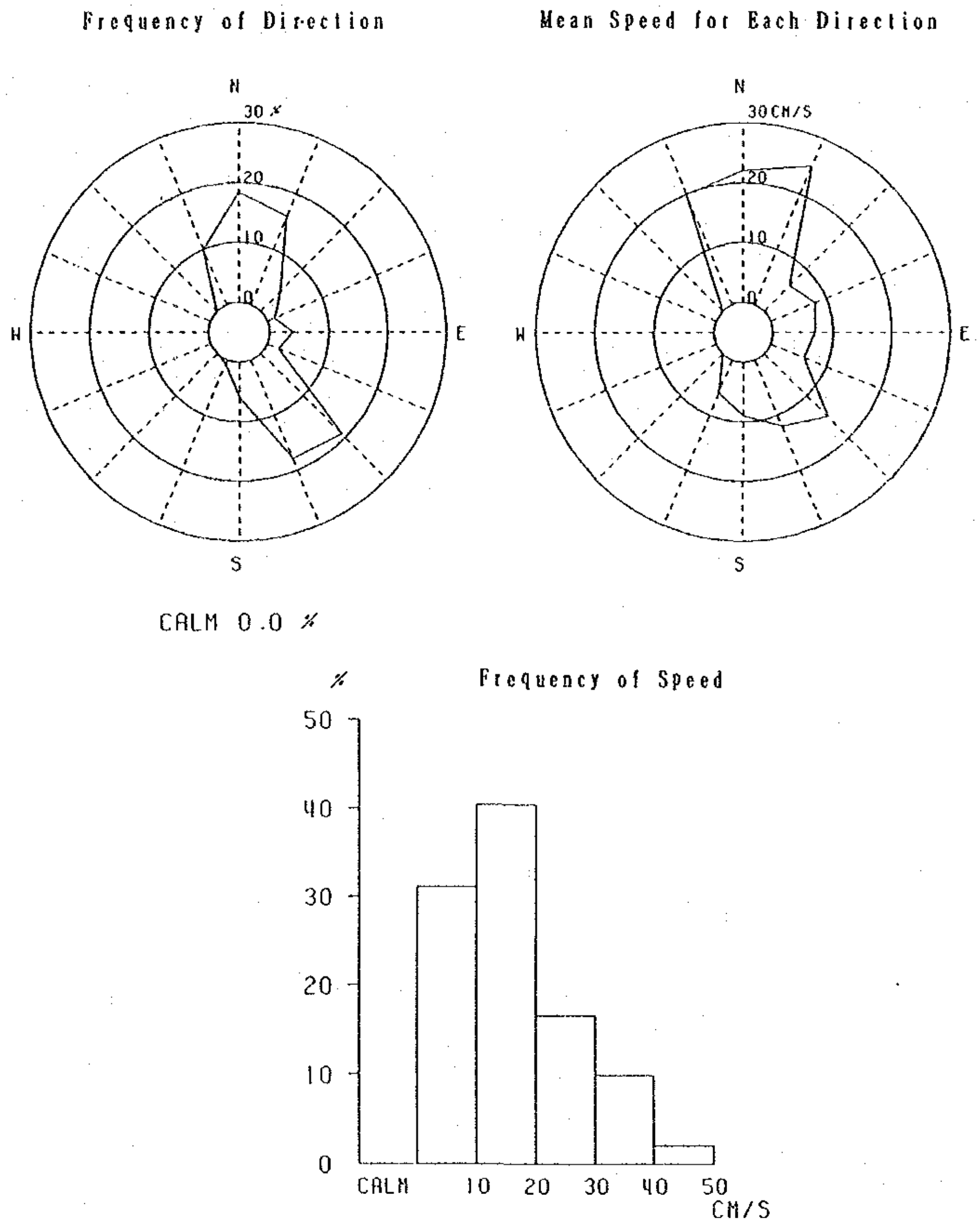
Layer : 3meters below sea surface

Period : October 28 to November 12

No.of Date : 2265

Mean Speed : 18.0cm/s

Max Speed : 62.4cm/s



Station : E

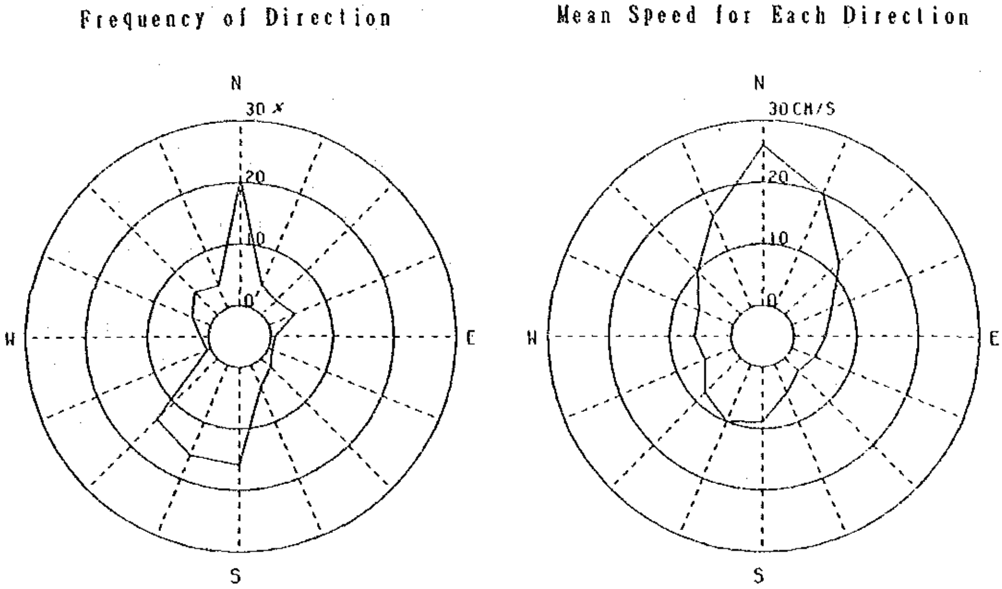
Layer : 3meters below sea surface

Period : October 24 to October 25

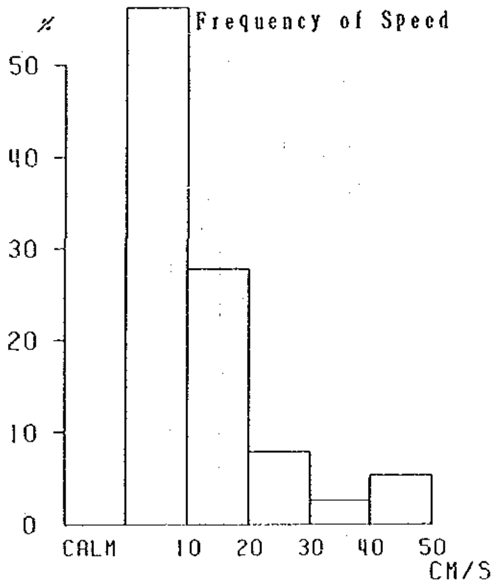
No.of Data : 151

Mean Speed : 16.0cm/s

Max Speed : 42.4cm/s



CALM 0.0 %



Station : F

Layer : 3meters below sea surface

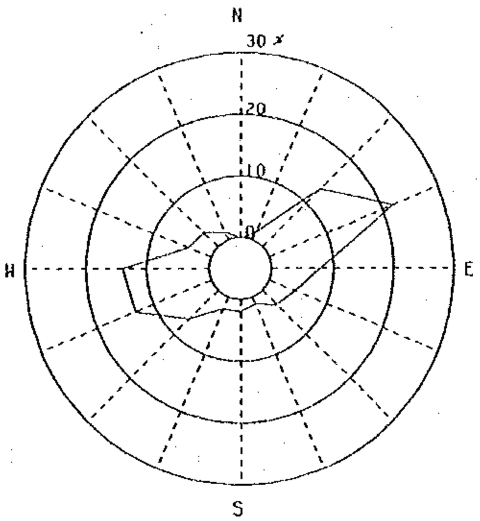
Period : October 24 to October 25

No.of Data : 151

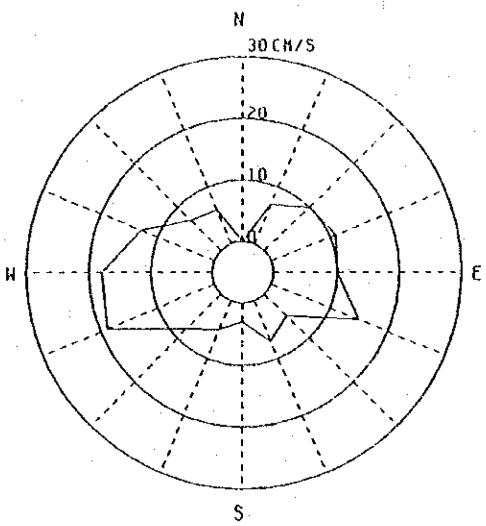
Mean Speed : 13.0cm/s

Max Speed : 47.6cm/s

Frequency of Direction

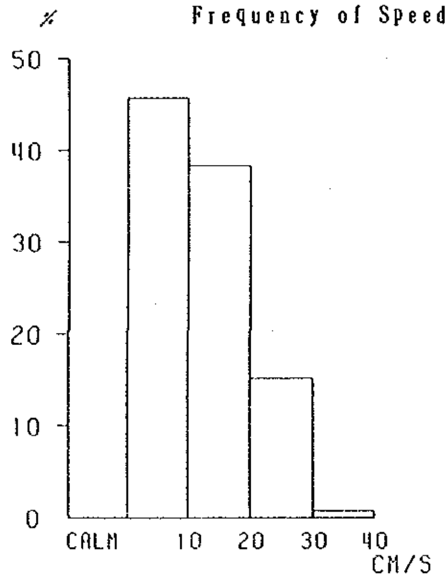


Mean Speed for Each Direction



CALM 0.0 %

Frequency of Speed



Station : G

Layer : 3meters below sea surface

Period : October 24 to October 25

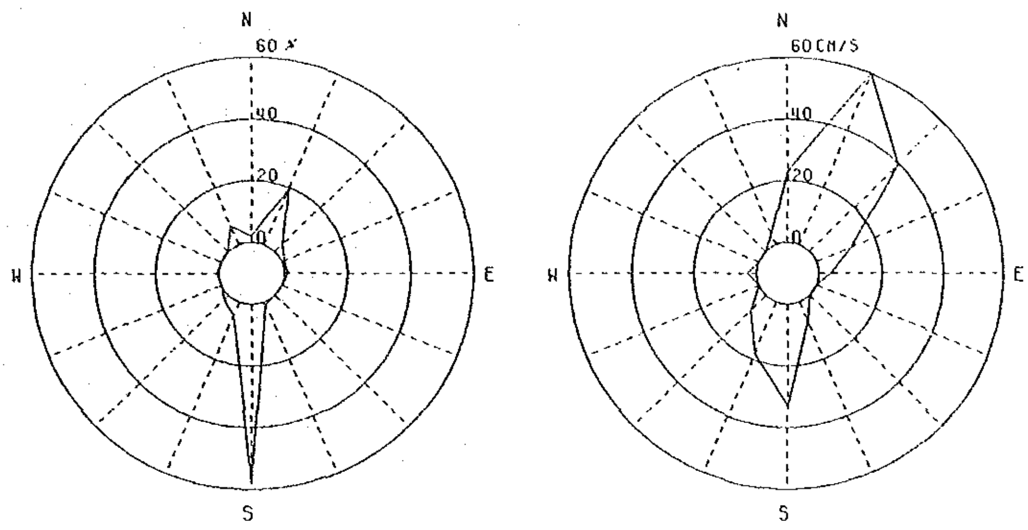
No.of Data : 151

Mean Speed : 12.0cm/s

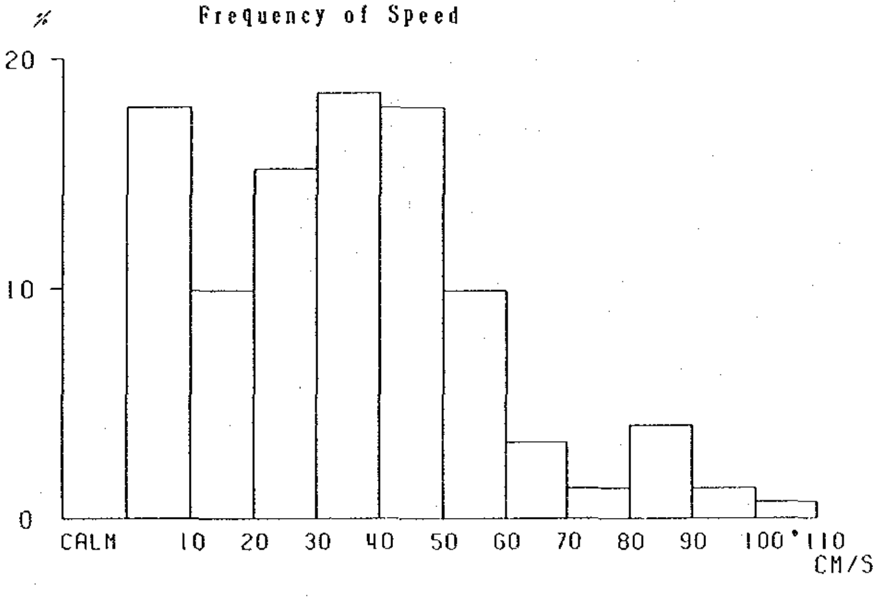
Max Speed : 31.9cm/s

Frequency of Direction

Mean Speed for Each Direction



CALM 0.0 %



Station : H

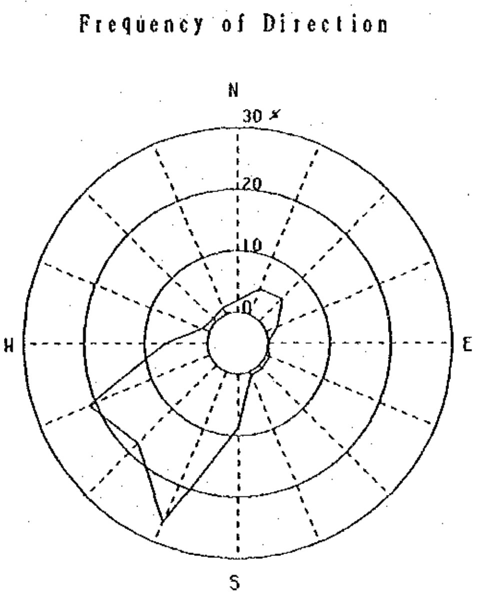
Layer : 3meters below sea surface

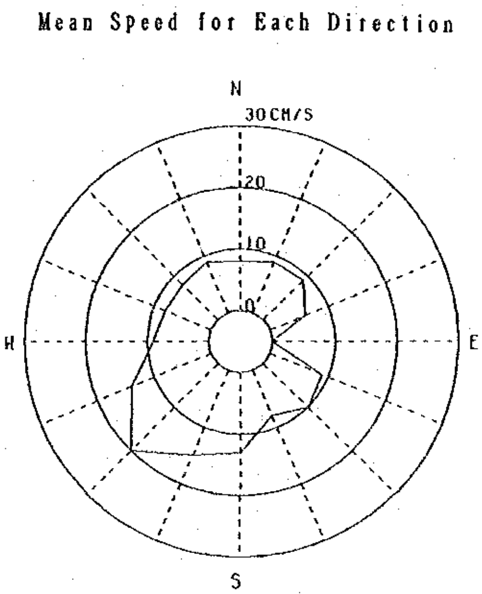
Period : October 24 to october 25

No.of Date : 151

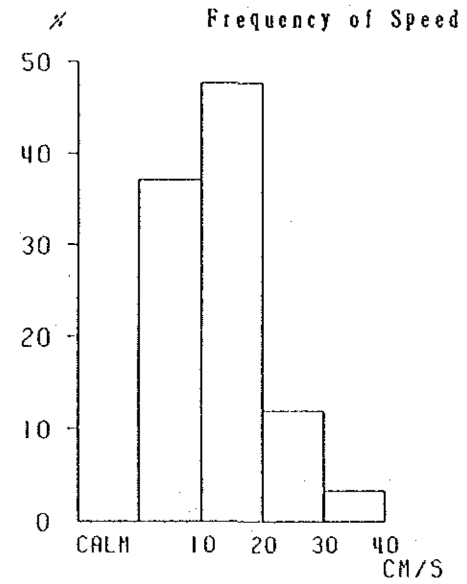
Mean Speed : 34.0cm/s

Max Speed : 100.2cm/s





CALM 0.0 %



Station : 1

Layer : 3meters below sea surface

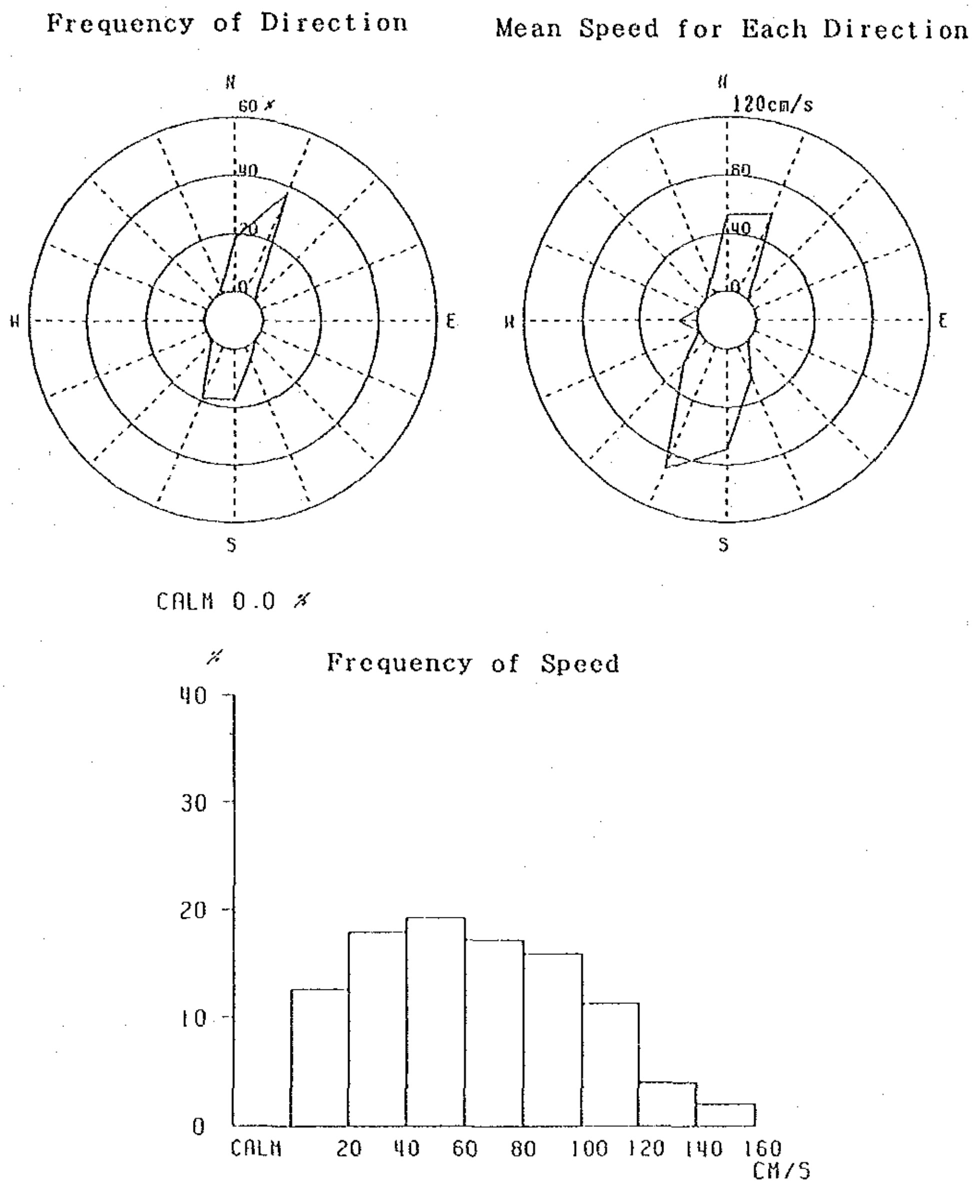
Period : October 24 to October 25

No.of Data : 151

Mean Speed : 14.0cm/s

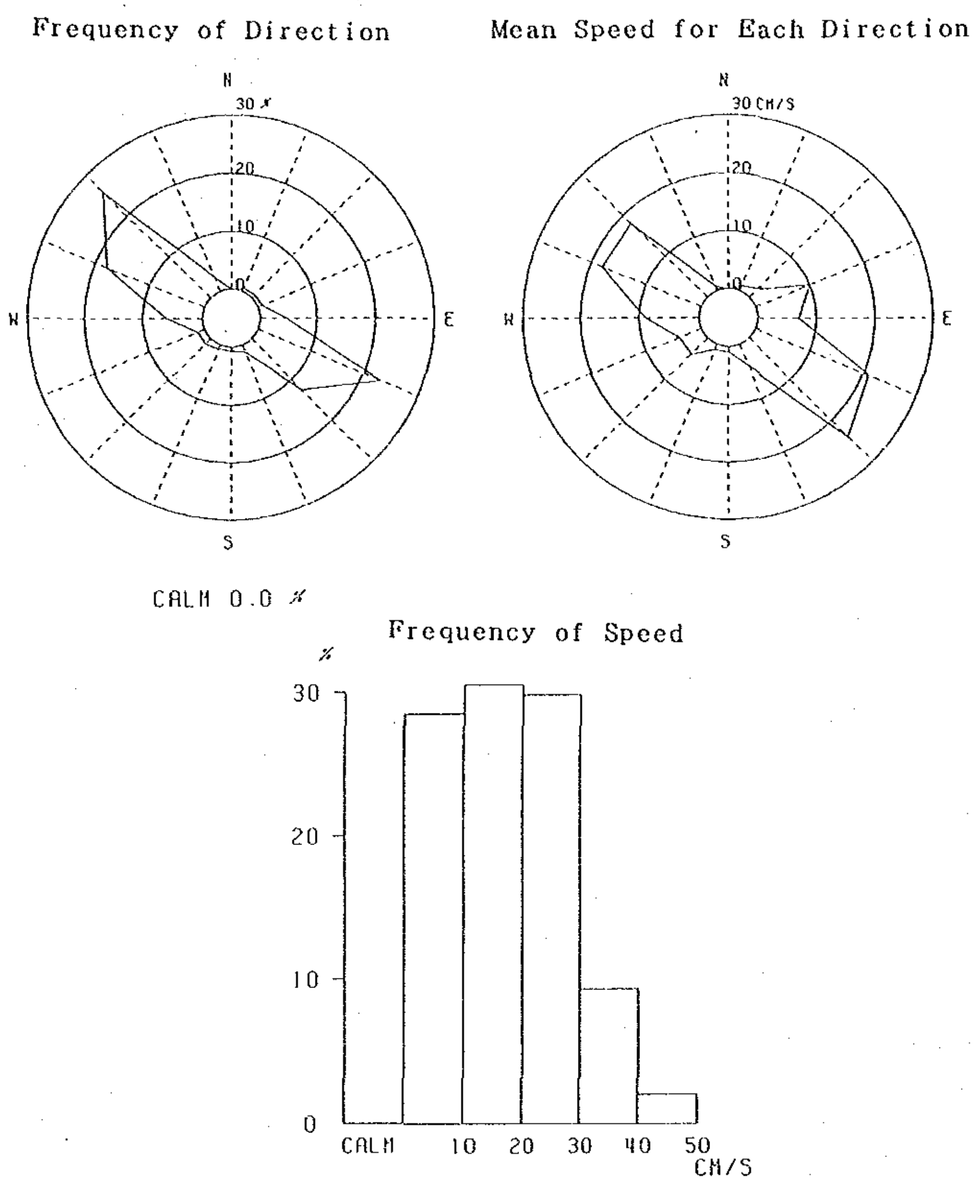
Max Speed : 31.3cm/s

Phase 3



Station : St. H
Layer : 3meters below sea surface
Period : March 23 to March 24
No. of Data : 151
Mean Speed : 63.0cm/s
Max Speed : 156.6cm/s

Fig. 2.3-3(1) Frequency Distribution of Tidal Currents (St. H)



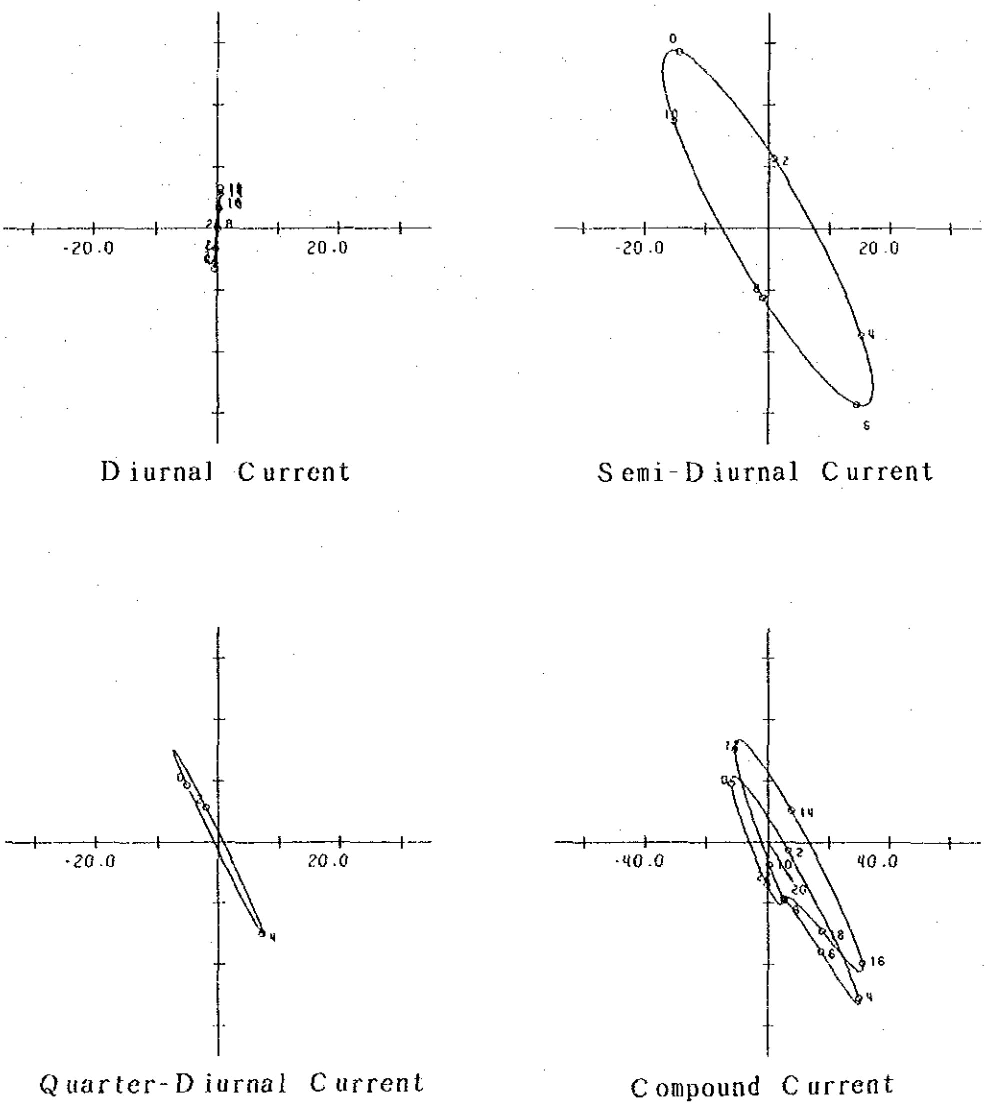
Station : St. J
Layer : 3meters below sea surface
Period : March 23 to March 24
No. of Data : 151
Mean Speed : 17. 0cm/s
Max Speed : 42. 7cm/s

Fig. 2.3-3(2) Frequency Distribution of Tidal Currents (St. J)

APPENDIX 4

TIDAL CURRENT ELLIPSES

Phase 1



St. A(upper) : 3meters below sea surface
Unit : cm/sec

Fig. 10-1 Tidal Current Ellipses

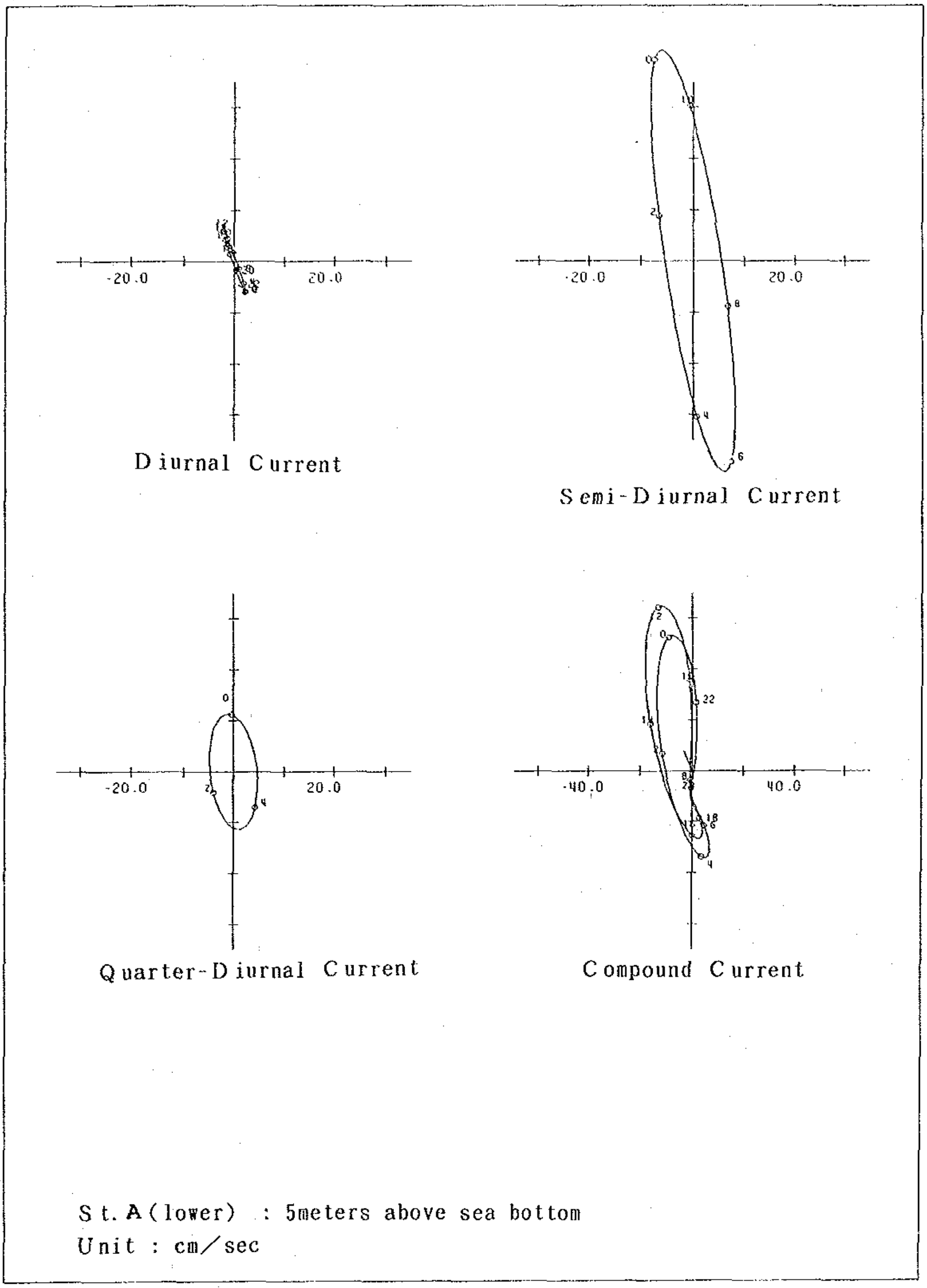
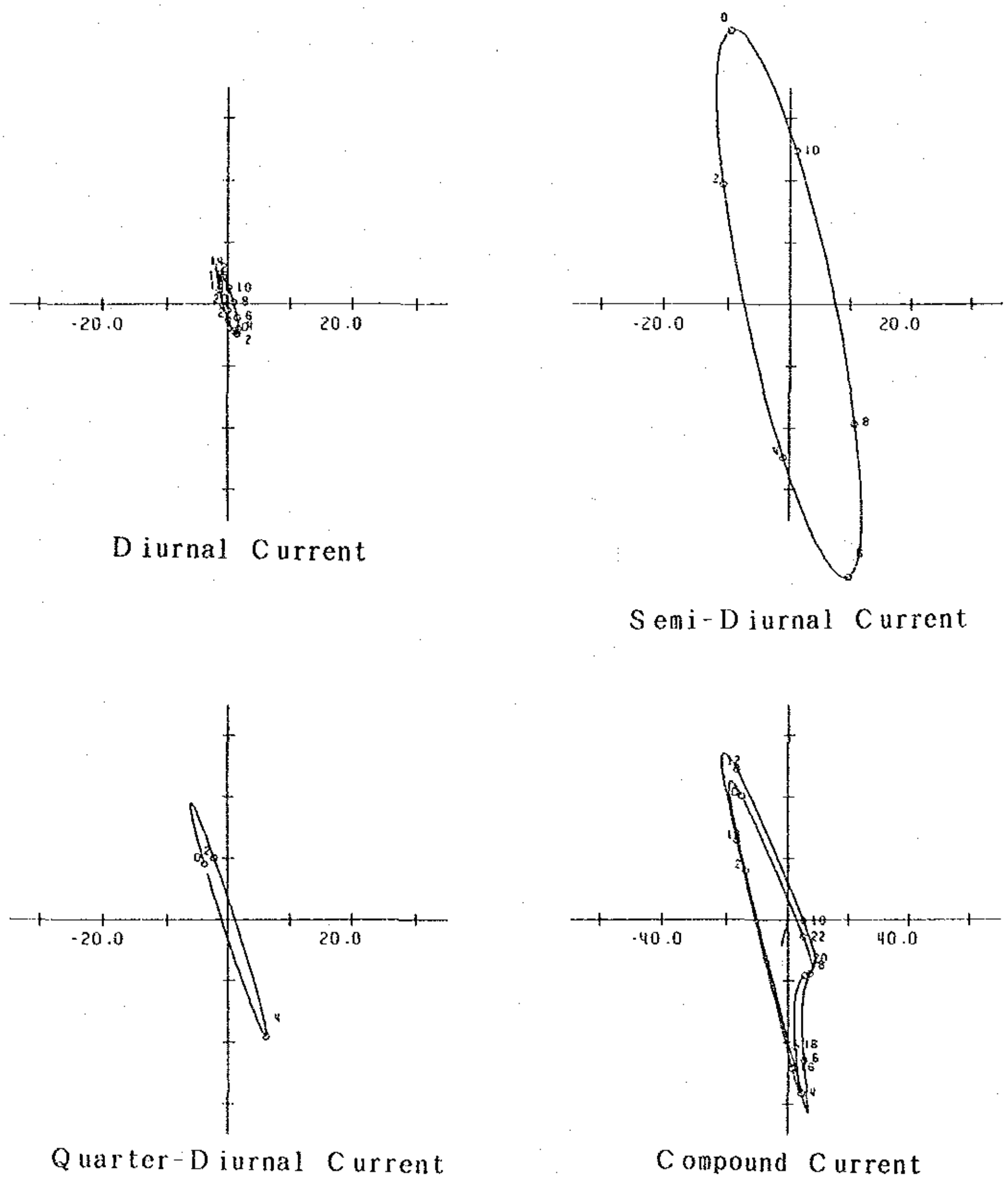


Fig. 10-2 Tidal Current Ellipses



St.B (upper) : 3meters below sea surface
Unit : cm/sec

Fig. 10-3 Tidal Current Ellipses

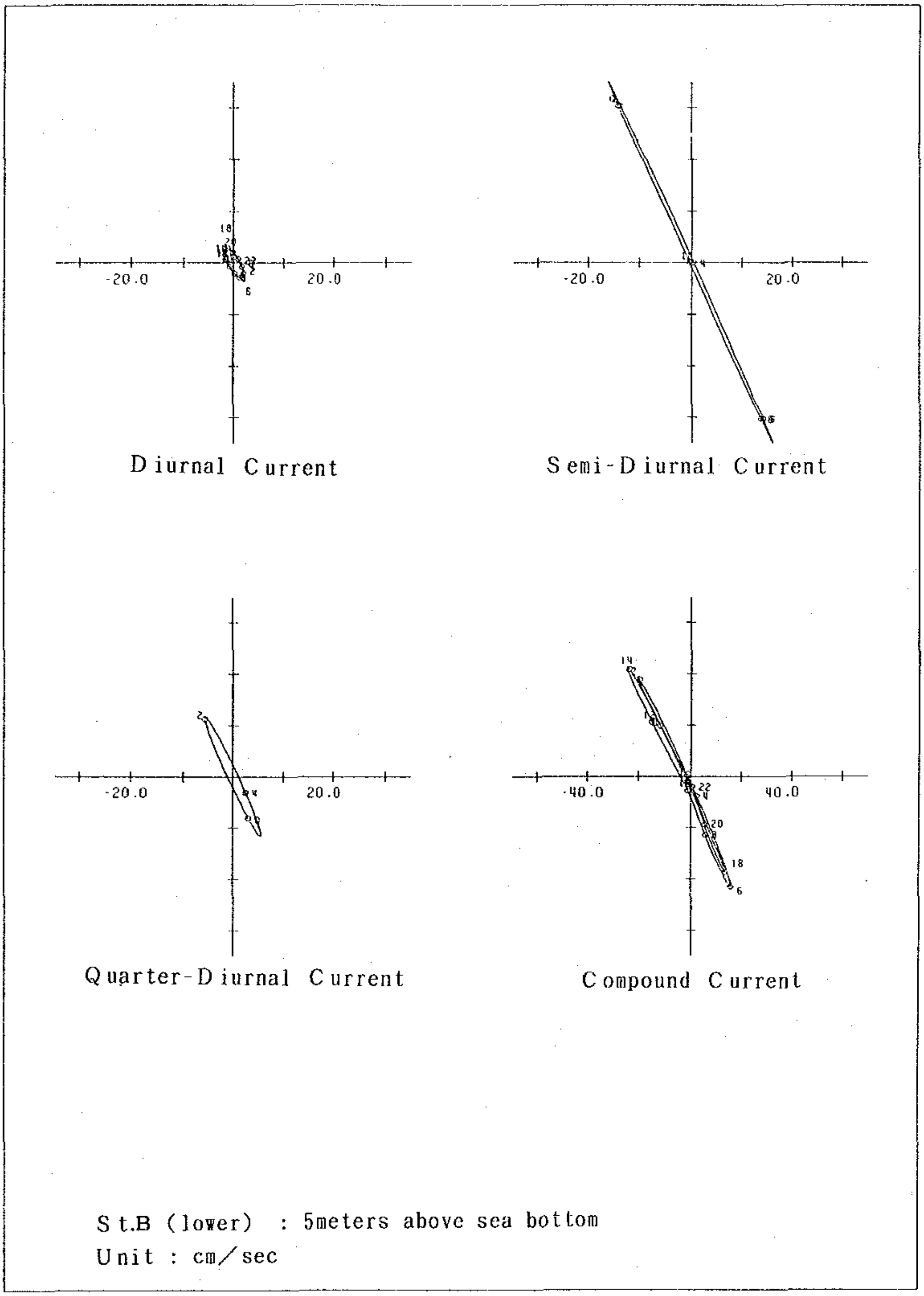
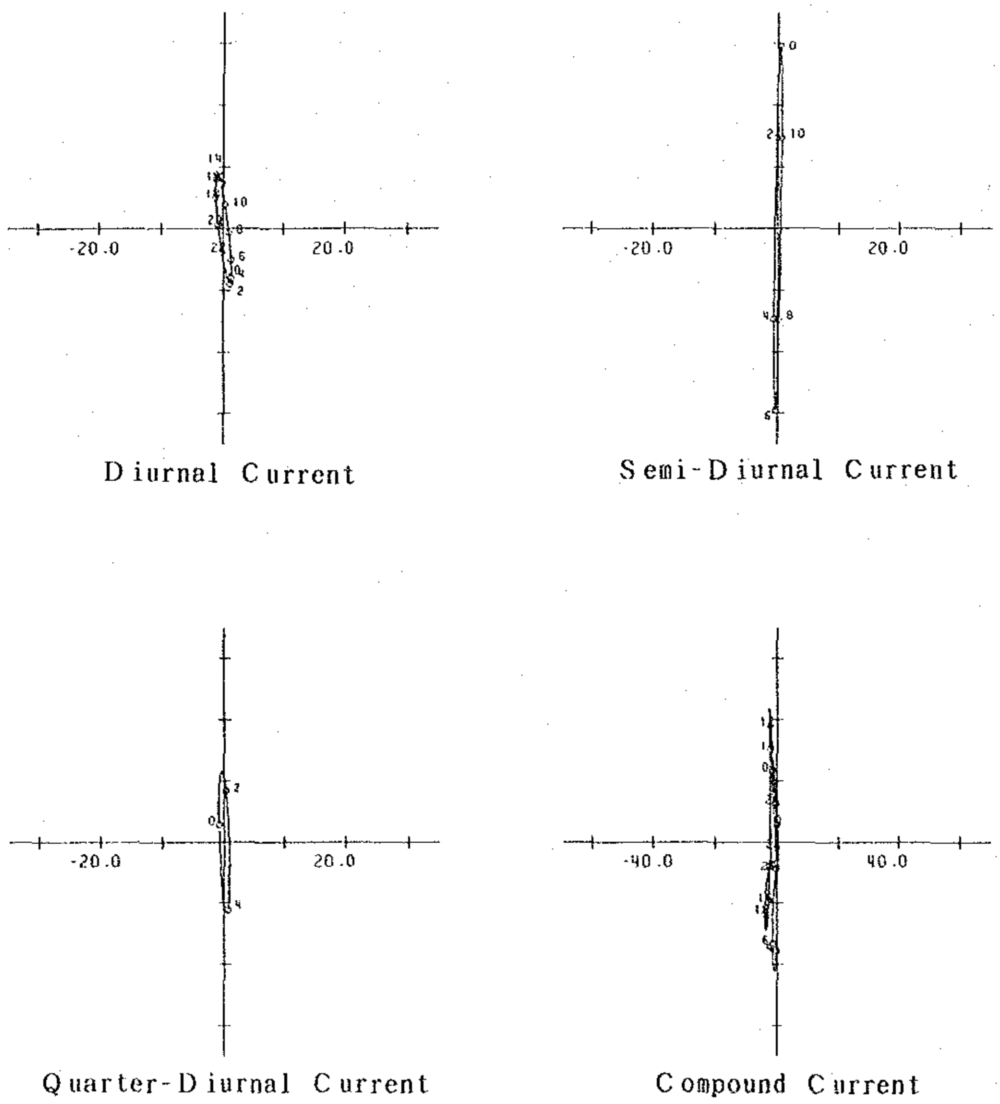
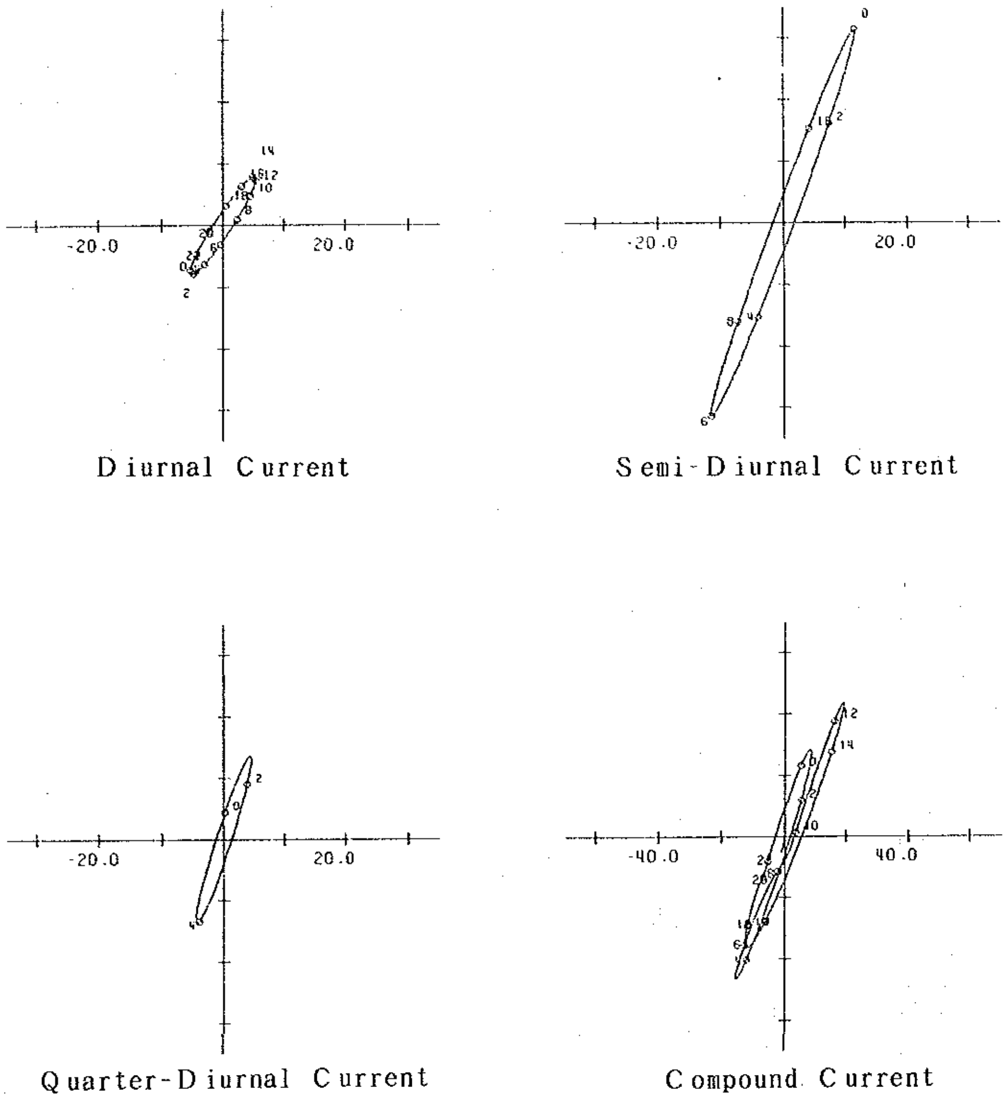


Fig. 10-4 Tidal Current Ellipses



St.C : 3meters below sea surface
Unit : cm/sec

Fig. 10-5 Tidal Current Ellipses



St. D : 3meters below sea surface
Unit : cm/sec

Fig. 10-6 Tidal Current Ellipses

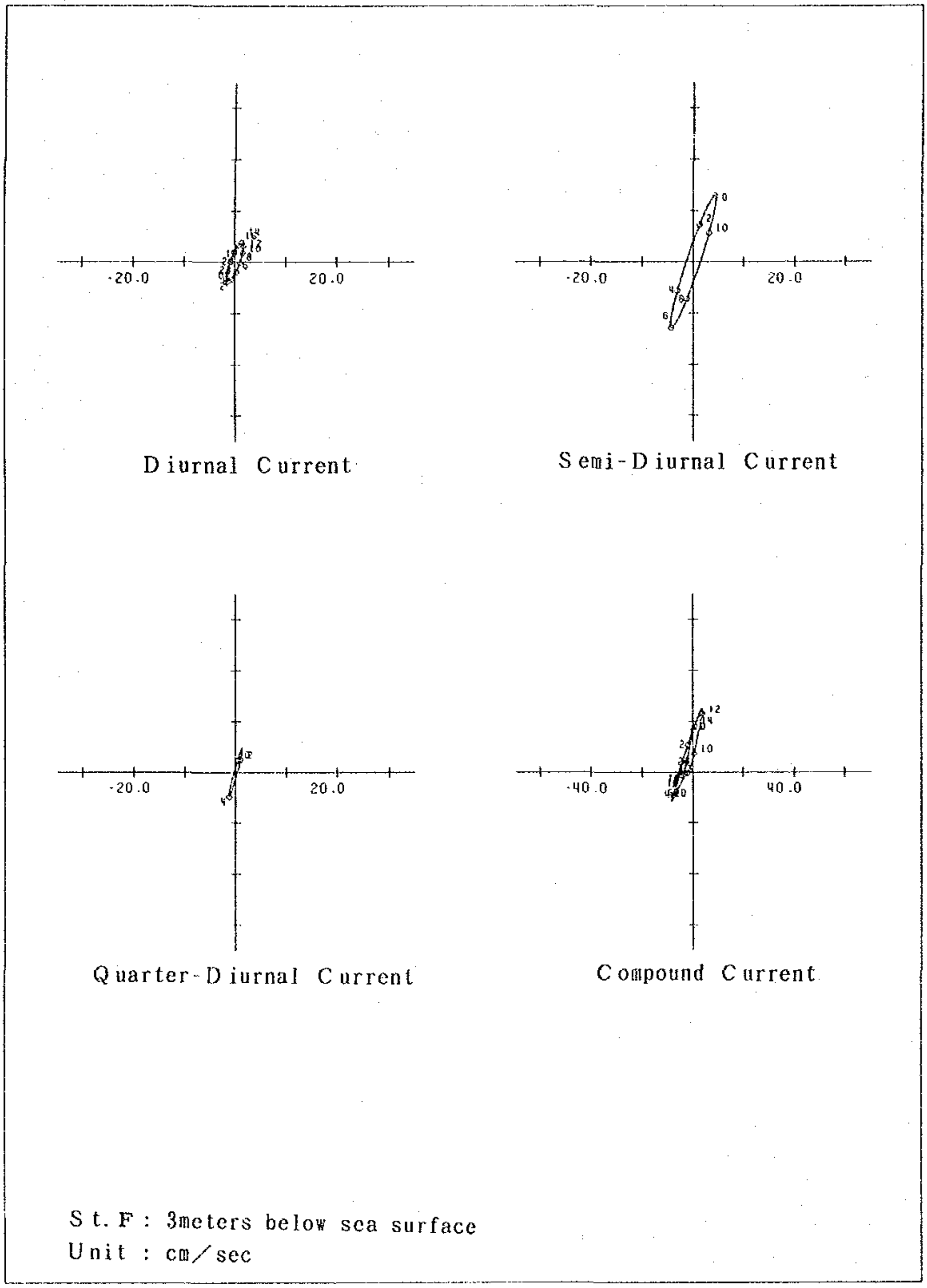
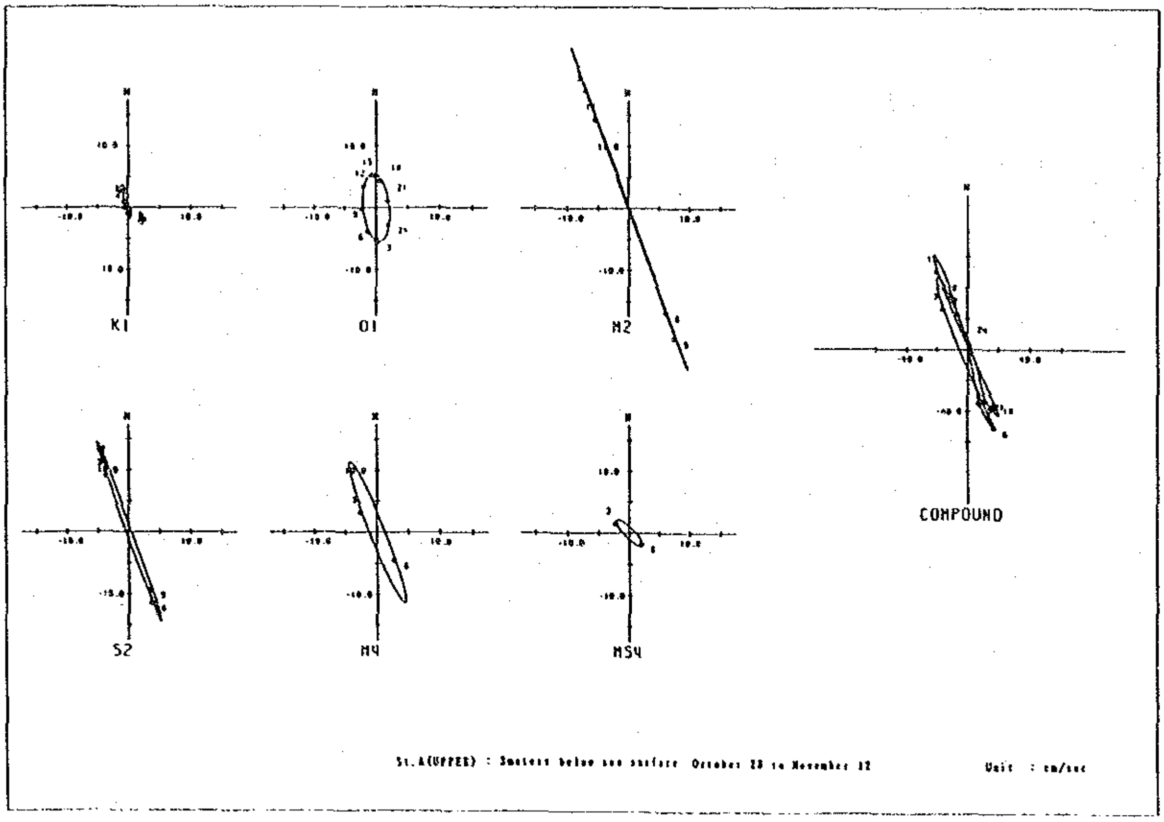


Fig. 10-7 Tidal Current Ellipses

Phase 2



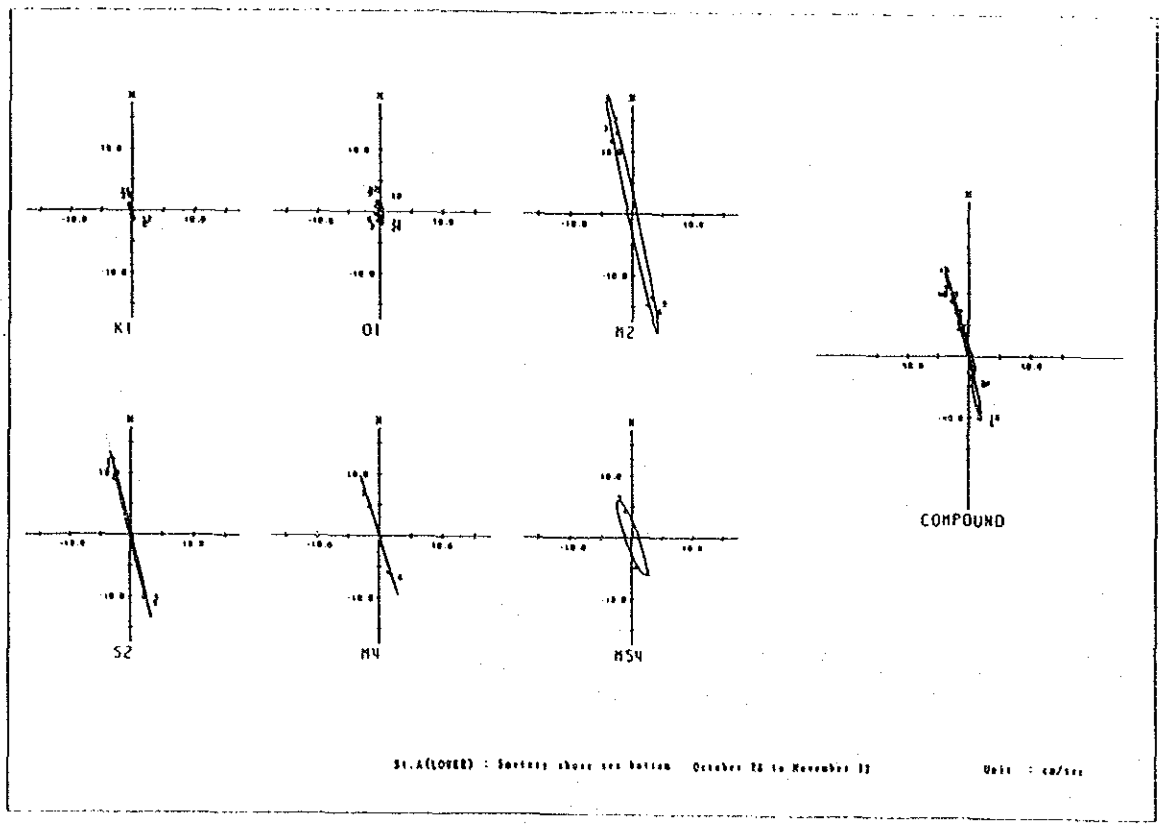
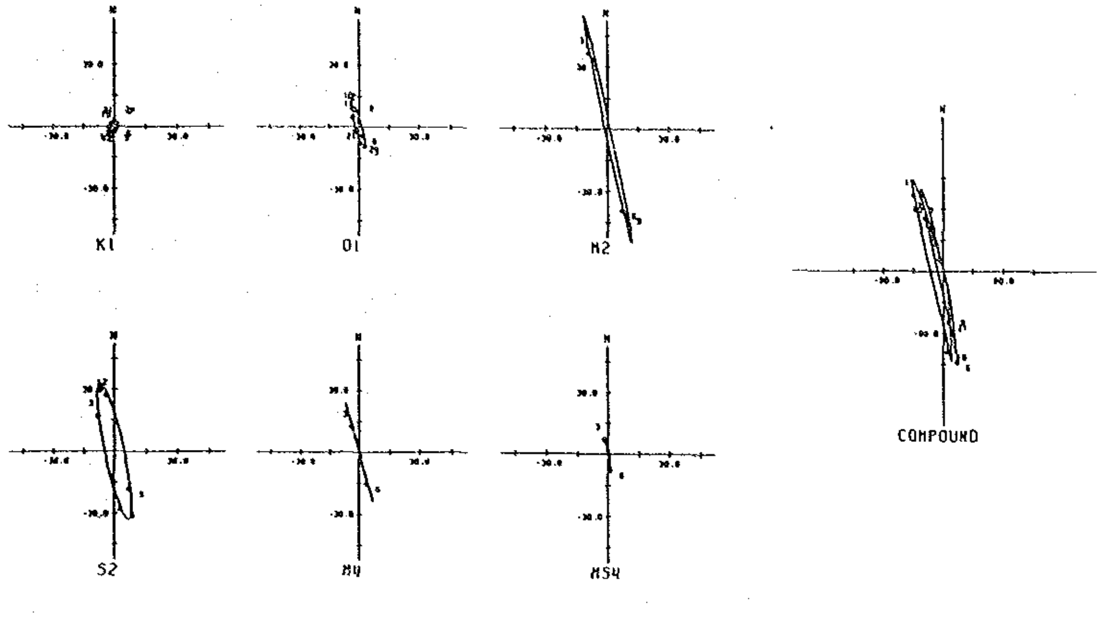
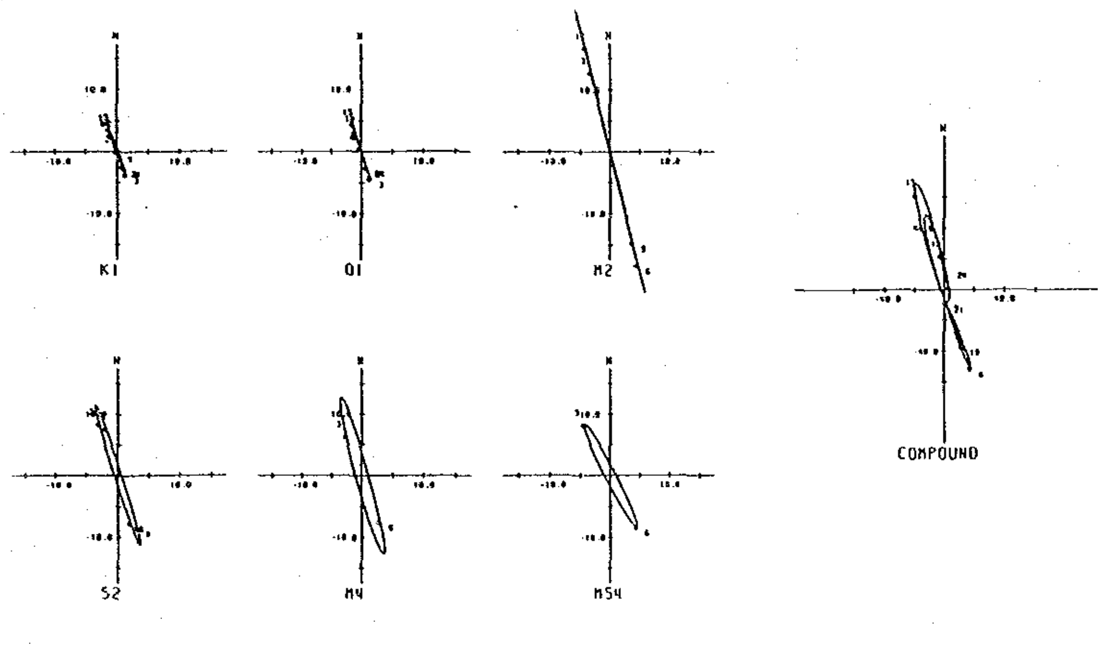


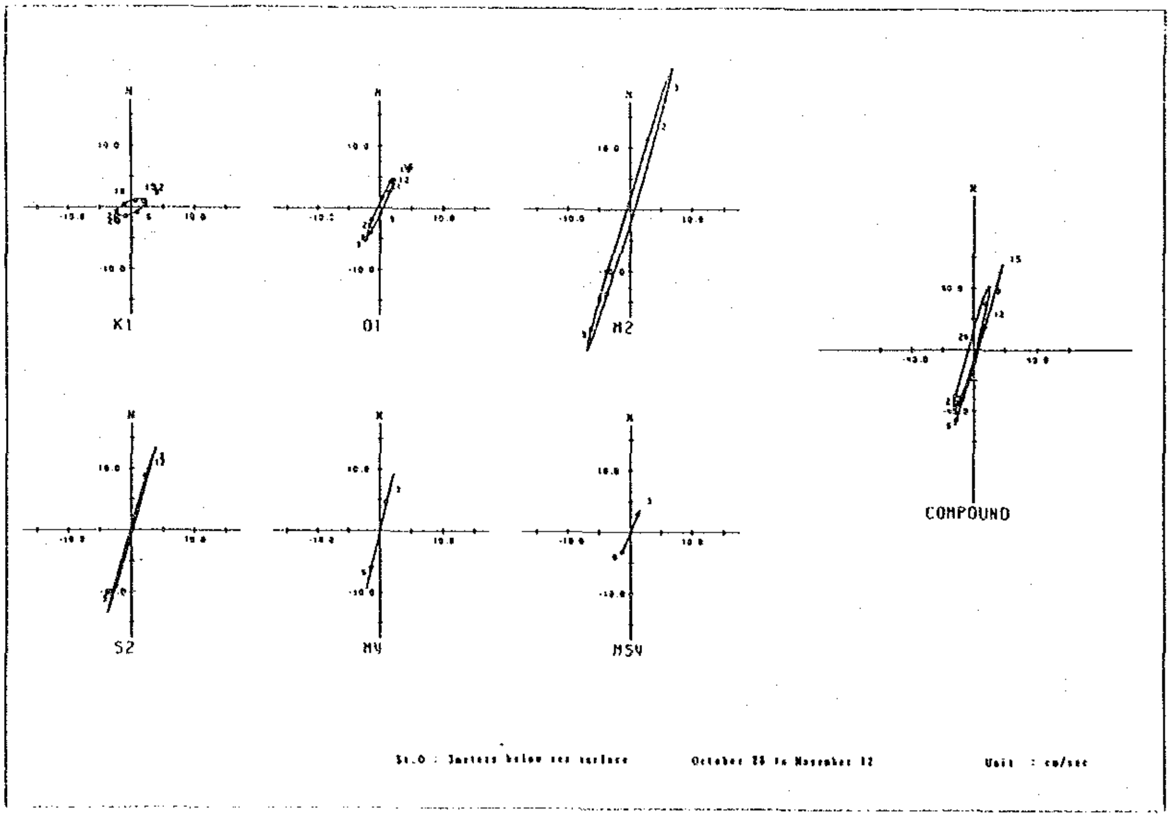
Fig. Tidal Current Ellipses

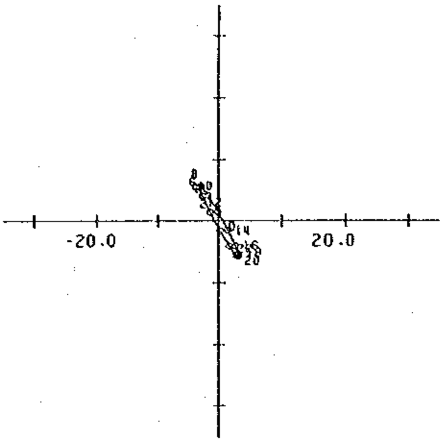


St.B(UPPER) : 3meters below sea surface October 28 to November 12 Unit : cm/sec

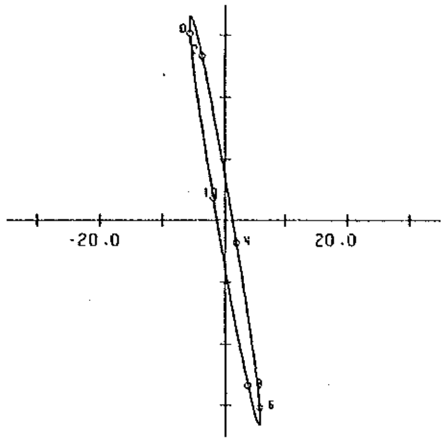


St.B(LOWER) : 5meters above sea bottom October 28 to November 12 Unit : cm/sec

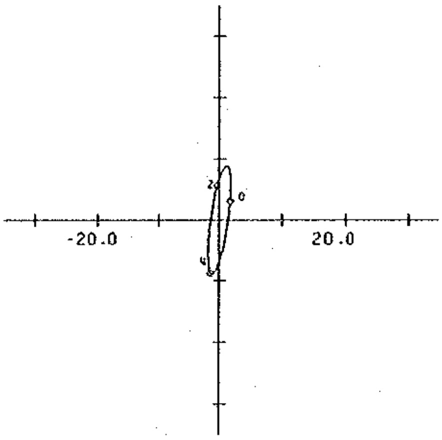

K1
O1
M2
S2
M4
MS4
COMPOUND
Unit : cm/sec



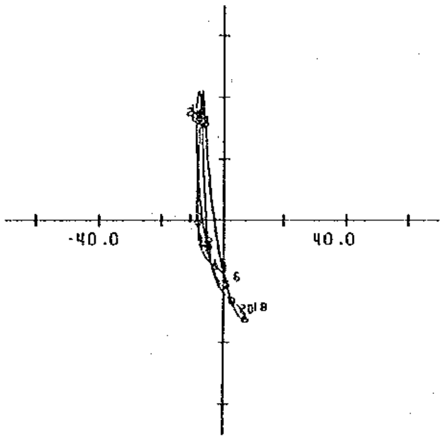
Diurnal Current



Semi-Diurnal Current



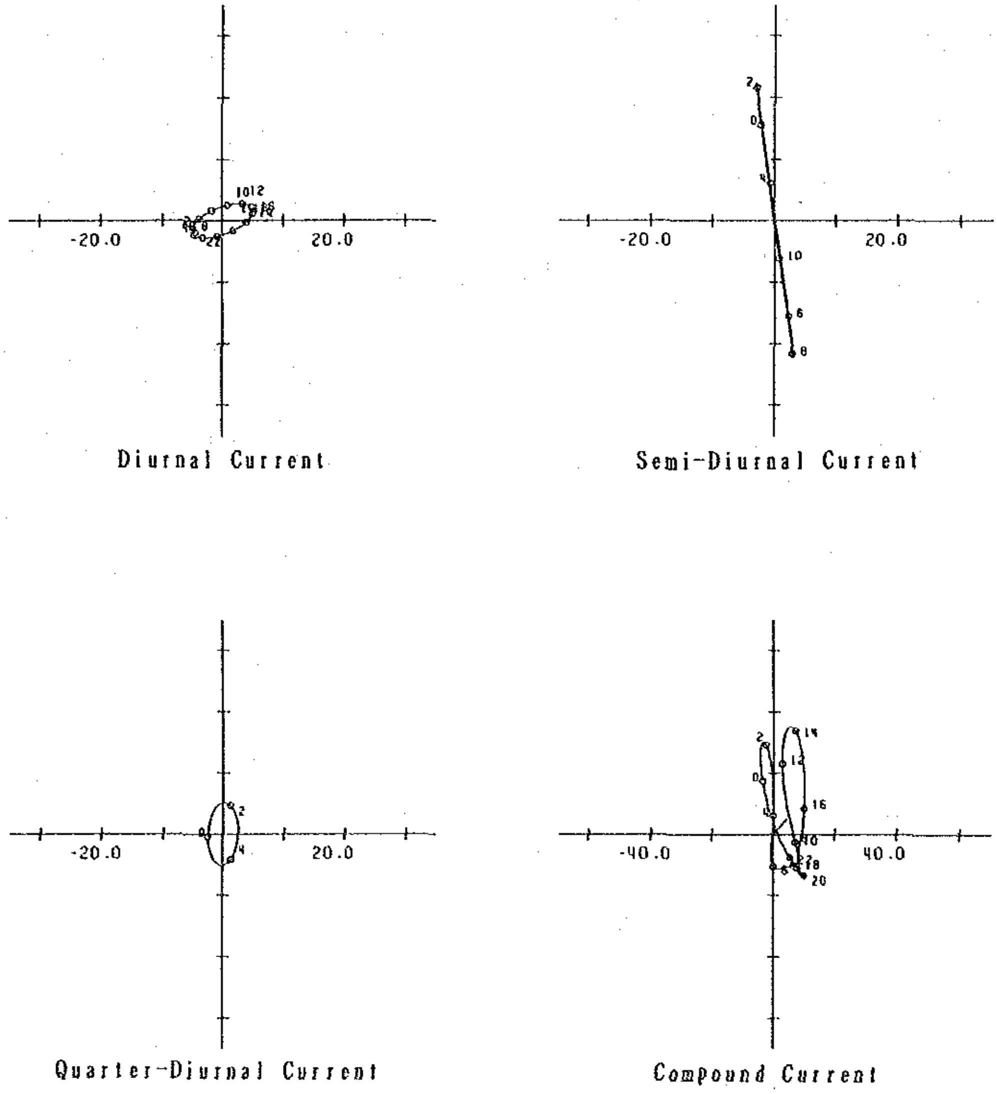
Quarter-Diurnal Current



Compound Current

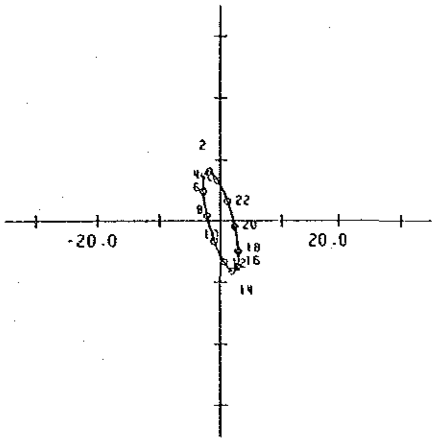
St.C : 3meters below sea surface

Unit : cm/sec

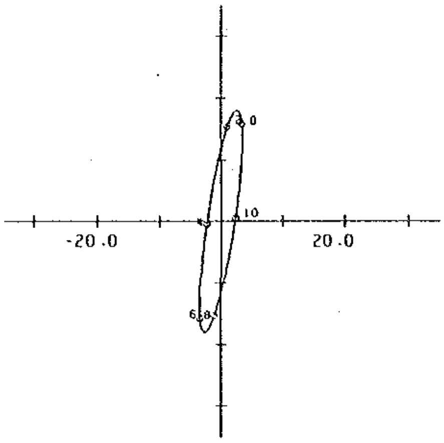


St.E : 3meters below sea surface

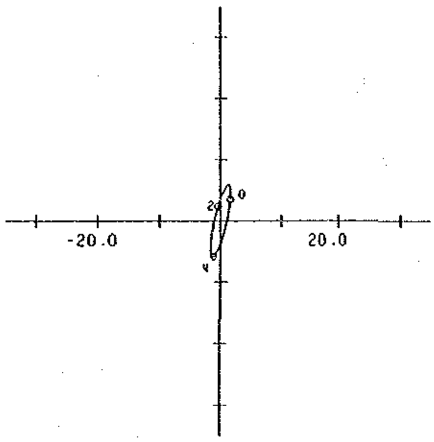
Unit : cm/sec



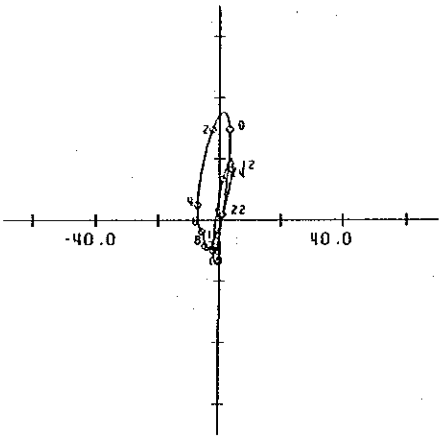
Diurnal Current



Semi-Diurnal Current



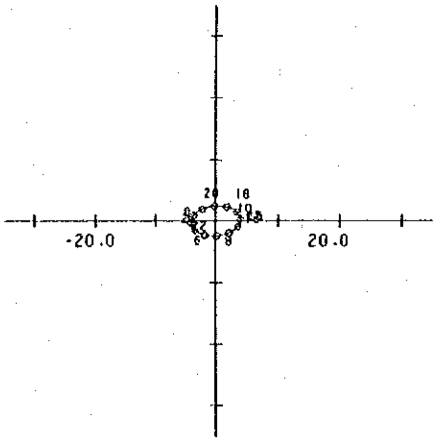
Quarter-Diurnal Current



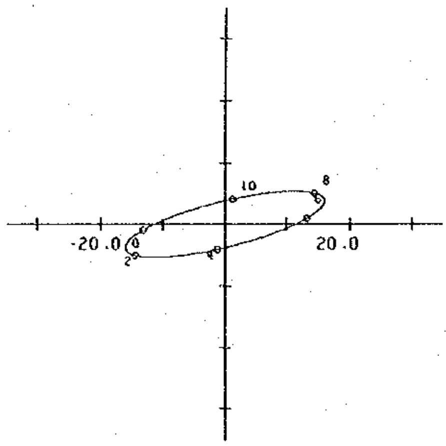
Compound Current

St.F : 3meters below sea surface

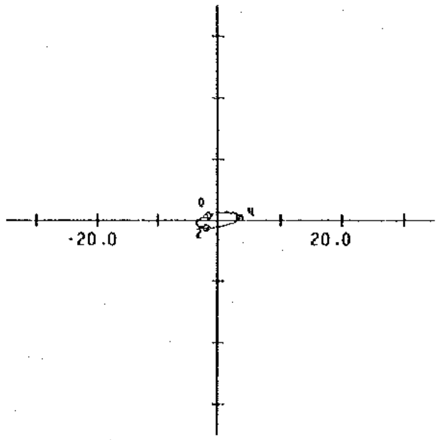
Unit : cm/sec



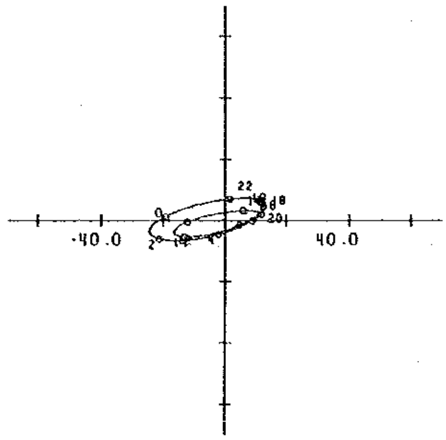
Diurnal Current



Semi-Diurnal Current



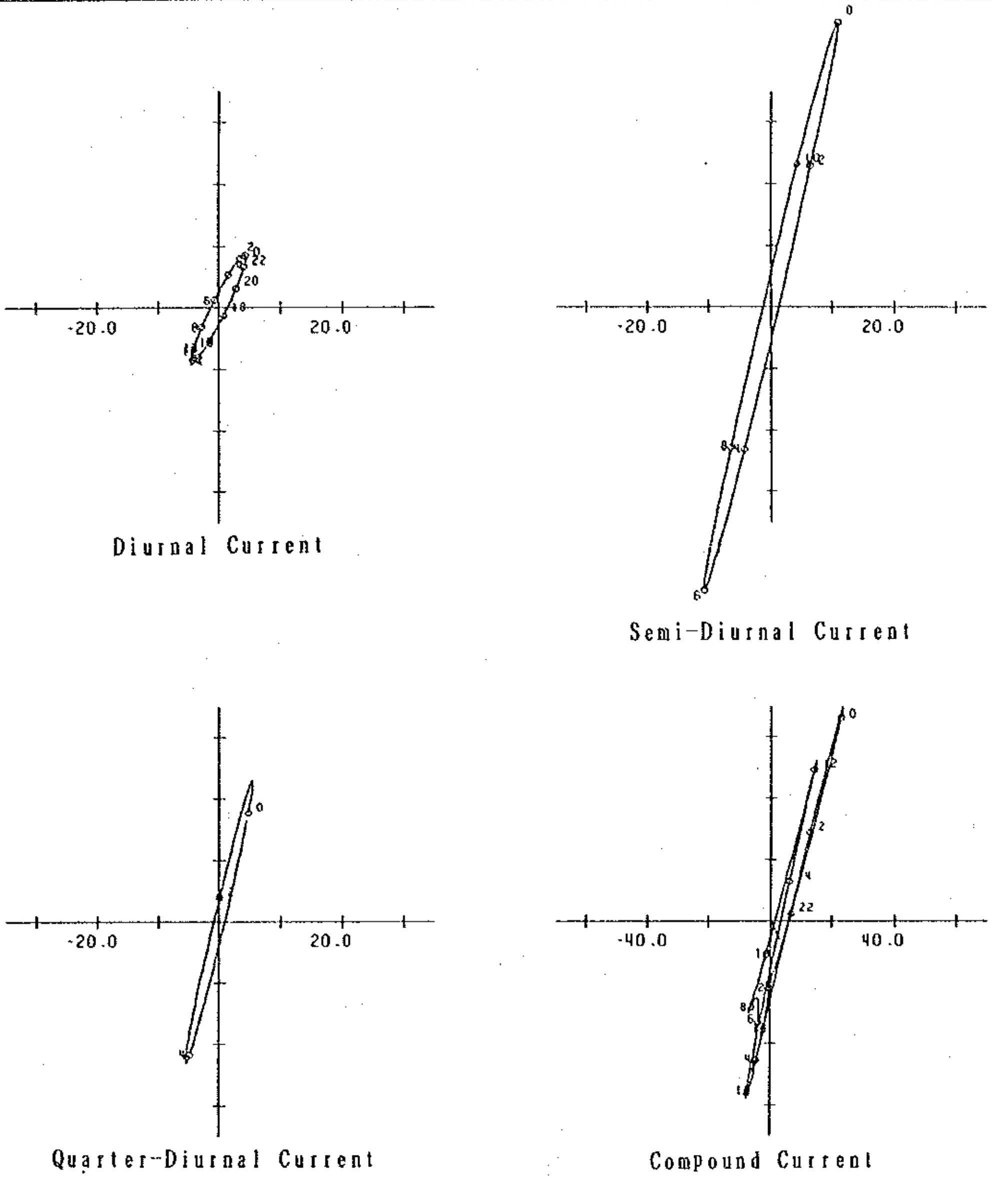
Quarter-Diurnal Current



Compound Current

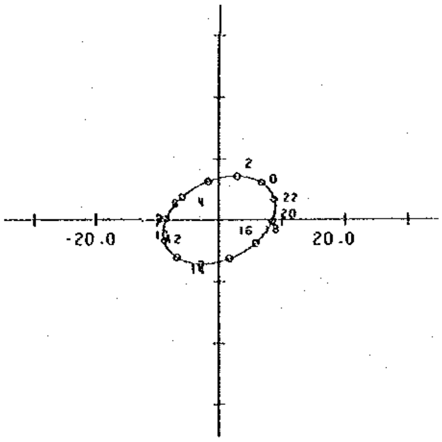
St.G : 3meters below sea surface

Unit : cm/sec

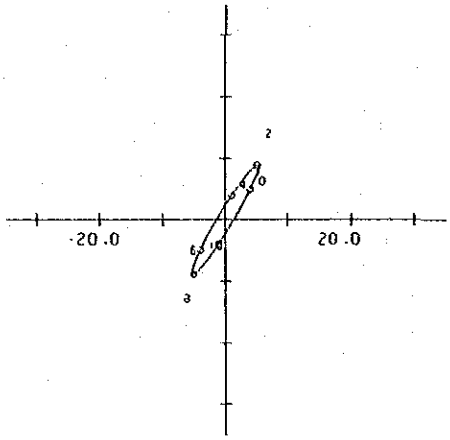


St.H : 3meters below sea surface

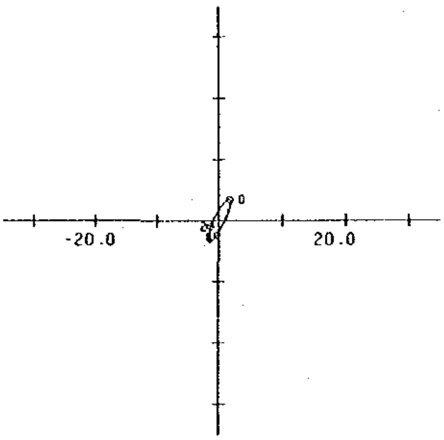
Unit : cm/sec



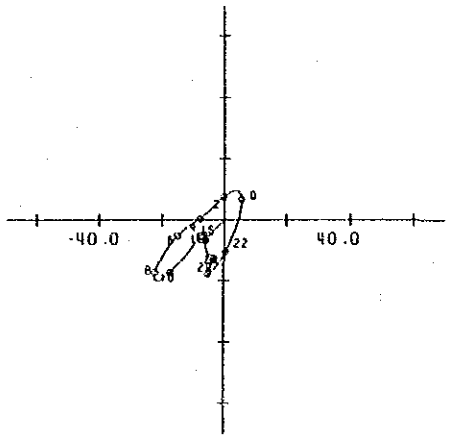
Diurnal Current



Semi-Diurnal Current



Quarter-Diurnal Current



Compound Current

St.1 : 3meters below sea surface

Unit : cm/sec

Phase 3

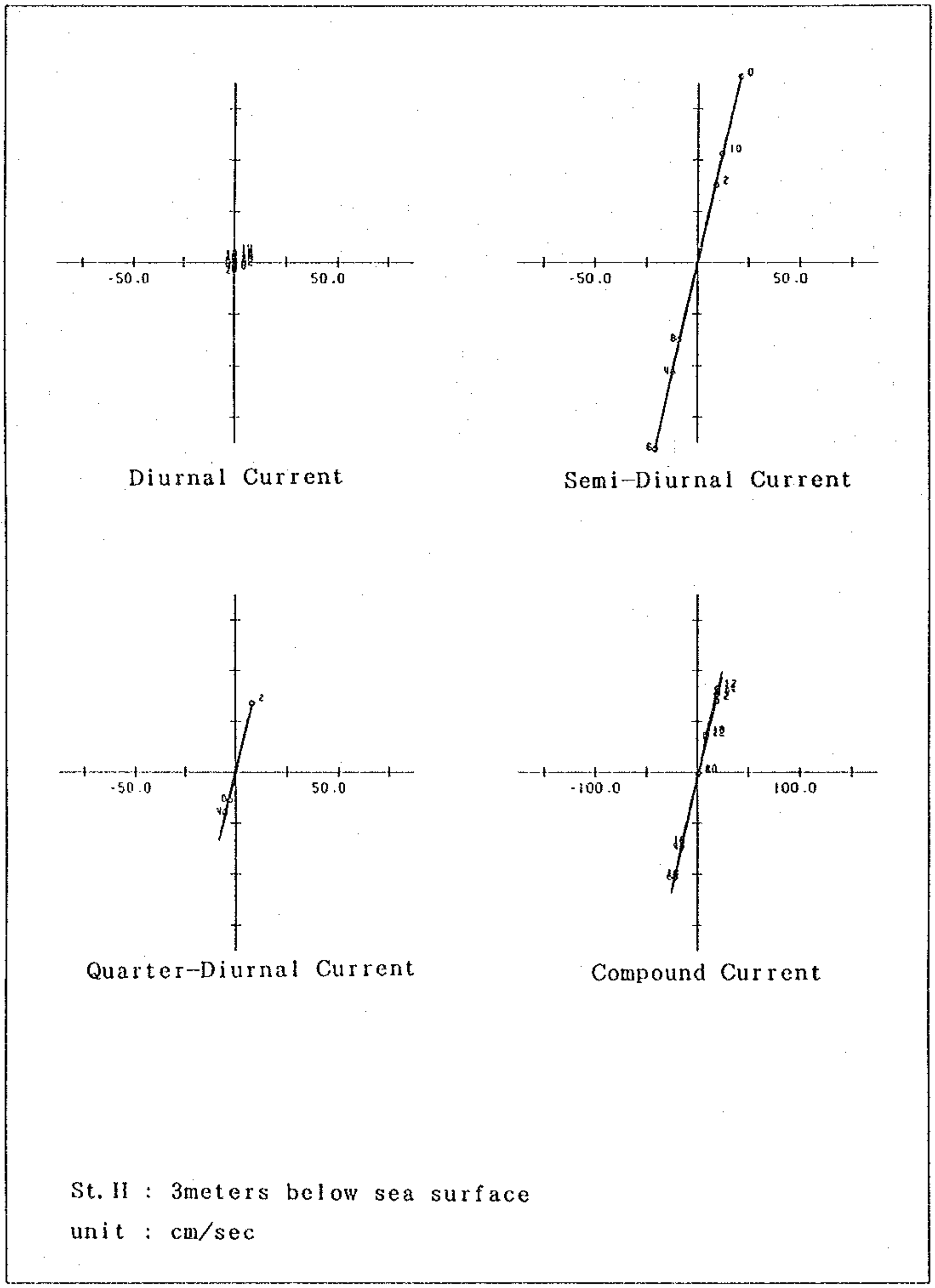
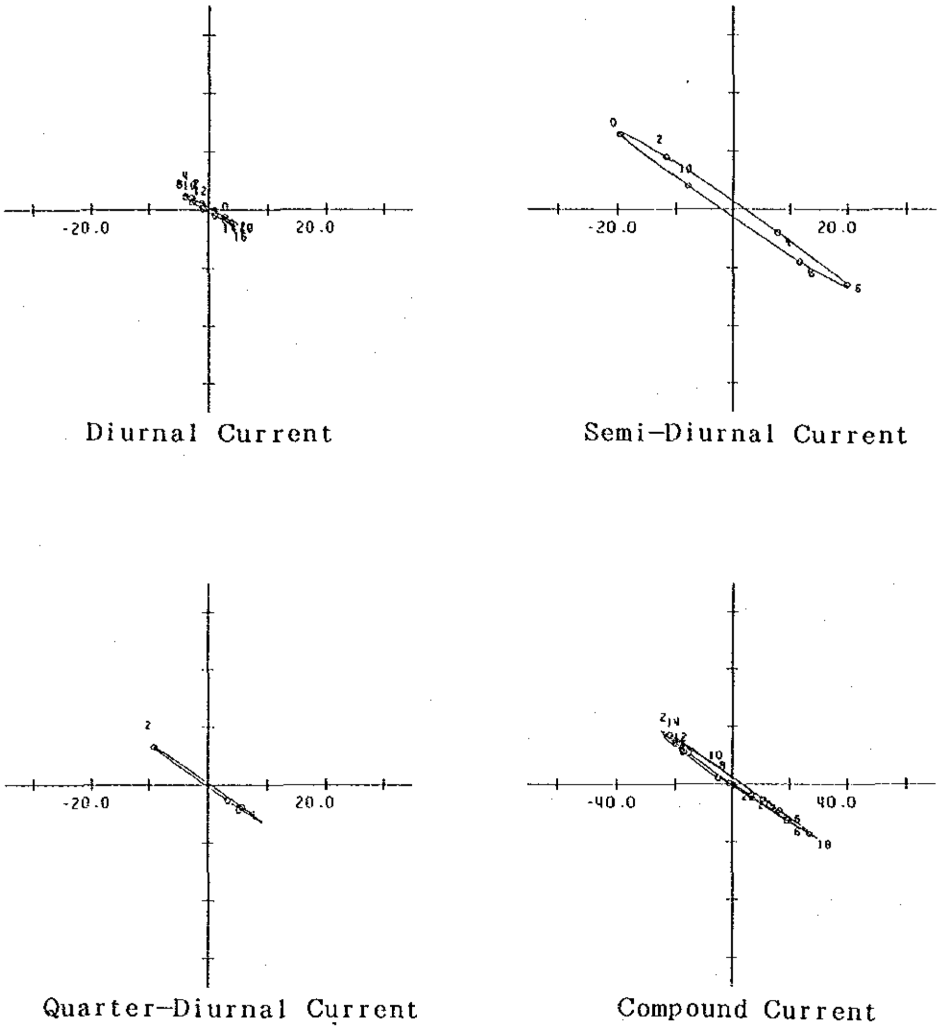


Fig. 2.3-4(1) Tidal Current Ellipses (St. II)



St. J : 3meters below sea surface
unit : cm/sec

Fig.2.3-4(2) Tidal Current Elllipses (St. J)

APPENDIX 5

PREDICTION OF TIDAL CURRENTS

TABLE SPRING AND NEAP TIDES IN SEVERAL SEASONS(ST.A(Upper))

SPRING AND NEAP TIDES IN SEVERAL SEASONS

AREA ** RIO DE JANEIRO STATION ** NO.STAU
POSITION ** 0 DEGREE, 0.00 KM FROM RIO
GEODETIC CO-ORDINATE ** LAT. ** - 54.33 N, LONG. -43 - 9.32 E
DEPTH ** 3.0 M BELOW SEA SURFACE

SPRING TIDAL CURRENT IN THE SPRING (FLOOD + , EBB -)

0	1	2	3	4	5	6	7	8	9	10	11	12
-0.381	-0.519	-0.439	-0.174	0.144	0.378	0.474	0.472	0.435	0.374	0.244	0.011	-0.278

13	14	15	16	17	18	19	20	21	22	23	24
-0.494	-0.512	-0.311	0.002	0.271	0.400	0.398	0.343	0.282	0.192	0.021	-0.230

* NEAP TIDAL CURRENT IN THE SPRING * (FLOOD + , EBB -)

0	1	2	3	4	5	6	7	8	9	10	11	12
0.075	-0.001	0.037	0.126	0.145	0.038	-0.130	-0.228	-0.175	-0.020	0.109	0.121	0.040

13	14	15	16	17	18	19	20	21	22	23	24
-0.020	0.027	0.155	0.250	0.216	0.068	-0.075	-0.100	0.003	0.135	0.182	0.123

SPRING TIDAL CURRENT IN THE SUMMER (FLOOD + , EBB -)

0	1	2	3	4	5	6	7	8	9	10	11	12
-0.372	-0.509	-0.447	-0.215	0.062	0.257	0.329	0.325	0.312	0.299	0.232	0.065	-0.169

13	14	15	16	17	18	19	20	21	22	23	24
-0.350	-0.359	-0.176	0.101	0.327	0.416	0.388	0.323	0.271	0.202	0.051	-0.187

* NEAP TIDAL CURRENT IN THE SUMMER * (FLOOD + , EBB -)

0	1	2	3	4	5	6	7	8	9	10	11	12
0.163	0.115	0.158	0.229	0.214	0.065	-0.139	-0.257	-0.206	-0.035	0.122	0.163	0.102

13	14	15	16	17	18	19	20	21	22	23	24
0.043	0.070	0.159	0.204	0.121	-0.063	-0.221	-0.235	-0.096	0.087	0.191	0.181

* MEAN SPRING TIDAL CURRENT * STANDERD PORT ** I.FISCAL

TIME	0	1	2	3	4	5	6	7	8	9	10	11
N-COMP	0.297	-0.012	-0.266	-0.363	-0.345	-0.313	-0.307	-0.264	-0.098	0.179	0.427	0.482
E-COMP	-0.134	-0.002	0.113	0.152	0.126	0.091	0.084	0.085	0.047	-0.049	-0.157	-0.198
VEL.	0.326	0.013	0.288	0.394	0.368	0.326	0.318	0.277	0.108	0.186	0.455	0.521
DIR.	335	191	157	157	159	163	164	162	154	344	339	337

TIME ** LUNER TIME AFTER H.W. OR FLOOD MAX. AT STANDERD PORT.

TABLE SPRING AND NEAP TIDES IN SEVERAL SEASONS(ST. A(Lower))

SPRING AND NEAP TIDES IN SEVERAL SEASONS

AREA ** RIO DE JANEIRO STATION ** NO. STAL
POSITION ** 0 DEGREE, 0.00 KM FROM RIO
GEODETIC CO-ORDINATE ** LAT. ** - 54.33 N, LONG. -43 - 9.32 E
DEPTH ** 5.0 M ABOVE SEA BOTTOM

SPRING TIDAL CURRENT IN THE SPRING (FLOOD + , EBB -)

0	1	2	3	4	5	6	7	8	9	10	11	12
-0.338	-0.517	-0.475	-0.216	0.106	0.310	0.329	0.239	0.165	0.149	0.116	-0.031	-0.289

13	14	15	16	17	18	19	20	21	22	23	24
-0.519	-0.557	-0.351	-0.019	0.244	0.318	0.242	0.145	0.114	0.107	0.017	-0.197

* NEAP TIDAL CURRENT IN THE SPRING * (FLOOD + , EBB -)

0	1	2	3	4	5	6	7	8	9	10	11	12
-0.033	-0.073	-0.058	-0.028	-0.031	-0.076	-0.124	-0.126	-0.071	0.003	0.042	0.022	-0.031

13	14	15	16	17	18	19	20	21	22	23	24
-0.066	-0.054	-0.012	0.017	0.004	-0.041	-0.077	-0.072	-0.031	0.009	0.017	-0.010

SPRING TIDAL CURRENT IN THE SUMMER (FLOOD + , EBB -)

0	1	2	3	4	5	6	7	8	9	10	11	12
-0.307	-0.475	-0.441	-0.206	0.080	0.247	0.237	0.137	0.075	0.090	0.104	0.006	-0.208

13	14	15	16	17	18	19	20	21	22	23	24
-0.413	-0.447	-0.259	0.039	0.260	0.298	0.199	0.098	0.078	0.097	0.036	-0.157

* NEAP TIDAL CURRENT IN THE SUMMER * (FLOOD + , EBB -)

0	1	2	3	4	5	6	7	8	9	10	11	12
0.043	0.018	0.026	0.030	-0.013	-0.102	-0.188	-0.211	-0.157	-0.063	0.011	0.030	0.011

13	14	15	16	17	18	19	20	21	22	23	24
-0.005	0.007	0.030	0.027	-0.023	-0.097	-0.146	-0.136	-0.070	0.007	0.055	0.060

* MEAN SPRING TIDAL CURRENT * STANDERD PORT ** I.FISCAL

TIME	0	1	2	3	4	5	6	7	8	9	10	11
N-COMP	0.318	0.005	-0.248	-0.311	-0.222	-0.120	-0.094	-0.095	-0.010	0.202	0.428	0.493
E-COMP	-0.098	-0.009	0.058	0.065	0.032	0.007	0.018	0.040	0.027	-0.037	-0.115	-0.144
VEL.	0.333	0.011	0.255	0.318	0.224	0.120	0.095	0.103	0.029	0.205	0.443	0.514
DIR.	342	296	166	168	171	176	169	157	109	349	345	343

TIME ** LUNER TIME AFTER H.W. OR FLOOD MAX. AT STANDERD PORT.

TABLE SPRING AND NEAP TIDES IN SEVERAL SEASONS(ST.B(Upper))

SPRING AND NEAP TIDES IN SEVERAL SEASONS

AREA ** RIO DE JANEIRO STATION ** NO.STBU
POSITION ** 0 DEGREE, 0.00 KM FROM RIO
GEODETIC CO-ORDINATE ** LAT. ** - 54.32 N, LONG. -43 - 8.45 E
DEPTH ** 3.0 M BELOW SEA SURFACE

SPRING TIDAL CURRENT IN THE SPRING (FLOOD + , EBB -)

0	1	2	3	4	5	6	7	8	9	10	11	12
-0.745	-1.037	-0.909	-0.357	0.367	0.930	1.144	1.057	0.848	0.634	0.375	-0.028	-0.554

13	14	15	16	17	18	19	20	21	22	23	24
-0.994	-1.076	-0.688	-0.003	0.634	0.941	0.890	0.657	0.429	0.233	-0.041	-0.457

* NEAP TIDAL CURRENT IN THE SPRING * (FLOOD + , EBB -)

0	1	2	3	4	5	6	7	8	9	10	11	12
0.117	-0.063	0.006	0.212	0.301	0.130	-0.191	-0.395	-0.307	0.000	0.269	0.301	0.130

13	14	15	16	17	18	19	20	21	22	23	24
-0.020	0.041	0.285	0.486	0.438	0.151	-0.150	-0.228	-0.043	0.220	0.332	0.230

SPRING TIDAL CURRENT IN THE SUMMER (FLOOD + , EBB -)

0	1	2	3	4	5	6	7	8	9	10	11	12
-0.655	-0.950	-0.868	-0.399	0.225	0.696	0.849	0.751	0.588	0.469	0.334	0.060	-0.361

13	14	15	16	17	18	19	20	21	22	23	24
-0.740	-0.813	-0.465	0.148	0.702	0.942	0.855	0.627	0.438	0.300	0.079	-0.310

* NEAP TIDAL CURRENT IN THE SUMMER * (FLOOD + , EBB -)

0	1	2	3	4	5	6	7	8	9	10	11	12
0.399	0.262	0.316	0.454	0.442	0.161	-0.254	-0.516	-0.440	-0.104	0.221	0.313	0.183

13	14	15	16	17	18	19	20	21	22	23	24
0.038	0.064	0.237	0.352	0.224	-0.111	-0.413	-0.438	-0.155	0.232	0.466	0.460

* MEAN SPRING TIDAL CURRENT * STANDERD PORT ** I.FISCAL

TIME	0	1	2	3	4	5	6	7	8	9	10	11
N-COMP	0.663	-0.061	-0.695	-0.938	-0.829	-0.633	-0.537	-0.460	-0.186	0.343	0.881	1.046
E-COMP	-0.242	-0.071	0.077	0.129	0.102	0.064	0.061	0.061	0.002	-0.132	-0.276	-0.329
VEL.	0.706	0.094	0.700	0.947	0.835	0.637	0.540	0.463	0.186	0.368	0.923	1.097
DIR.	339	229	173	172	173	174	173	172	179	338	342	342

TIME ** LUNER TIME AFTER H.W. OR FLOOD MAX. AT STANDERD PORT.

TABLE SPRING AND NEAP TIDES IN SEVERAL SEASONS(ST.B(Lower))

SPRING AND NEAP TIDES IN SEVERAL SEASONS

AREA ** RIO DE JANEIRO STATION ** NO.STBL
POSITION ** 0 DEGREE, 0.00 KM FROM RIO
GEODETIC CO-ORDINATE ** LAT. ** - 54.32 N, LONG. -43 - 8.45 E
DEPTH ** 5.0 M ABOVE SEA BOTTOM

SPRING TIDAL CURRENT IN THE SPRING (FLOOD + . EBB -)

0	1	2	3	4	5	6	7	8	9	10	11	12
-0.297	-0.503	-0.505	-0.259	0.101	0.363	0.406	0.284	0.151	0.104	0.097	0.007	-0.220

13	14	15	16	17	18	19	20	21	22	23	24
-0.476	-0.571	-0.397	-0.040	0.284	0.396	0.295	0.132	0.051	0.055	0.020	-0.154

* NEAP TIDAL CURRENT IN THE SPRING * (FLOOD + . EBB -)

0	1	2	3	4	5	6	7	8	9	10	11	12
0.012	-0.061	-0.026	0.028	-0.007	-0.147	-0.290	-0.315	-0.189	-0.006	0.100	0.071	-0.031

13	14	15	16	17	18	19	20	21	22	23	24
-0.088	-0.043	0.051	0.090	0.021	-0.101	-0.165	-0.104	0.041	0.157	0.164	0.080

SPRING TIDAL CURRENT IN THE SUMMER (FLOOD + . EBB -)

0	1	2	3	4	5	6	7	8	9	10	11	12
-0.340	-0.543	-0.553	-0.324	0.012	0.252	0.283	0.165	0.056	0.052	0.101	0.070	-0.104

13	14	15	16	17	18	19	20	21	22	23	24
-0.325	-0.407	-0.243	0.085	0.366	0.435	0.297	0.111	0.020	0.026	0.000	-0.167

* NEAP TIDAL CURRENT IN THE SUMMER * (FLOOD + . EBB -)

0	1	2	3	4	5	6	7	8	9	10	11	12
0.032	-0.013	0.035	0.086	0.034	-0.129	-0.293	-0.329	-0.201	-0.001	0.131	0.129	0.049

13	14	15	16	17	18	19	20	21	22	23	24
-0.002	0.031	0.095	0.091	-0.026	-0.190	-0.282	-0.229	-0.071	0.075	0.121	0.075

* MEAN SPRING TIDAL CURRENT * STANDERD PORT ** I.FISCAL

TIME	0	1	2	3	4	5	6	7	8	9	10	11
N-COMP	0.332	-0.045	-0.330	-0.366	-0.215	-0.072	-0.057	-0.101	-0.038	0.197	0.467	0.547
E-COMP	-0.116	0.006	0.115	0.137	0.078	0.009	-0.006	0.025	0.039	-0.014	-0.108	-0.162
VEL.	0.352	0.045	0.350	0.391	0.228	0.073	0.058	0.104	0.054	0.198	0.480	0.570
DIR.	340	172	160	159	160	172	185	165	134	355	346	343

TIME ** LUNER TIME AFTER H.W. OR FLOOD MAX. AT STANDERD PORT.

SPRING AND NEAP TIDES IN SEVERAL SEASONS

AREA ** RIO DE JANEIRO STATION ** NO.STD
POSITION ** 0 DEGREE, 0.00 KM FROM RIO
GEODETIC CO-ORDINATE ** LAT. ** - 49.95 N. LONG. -43 - 9.25 E
DEPTH ** 3.0 M BELOW SEA SURFACE

SPRING TIDAL CURRENT IN THE SPRING (FLOOD + , EBB -)

0	1	2	3	4	5	6	7	8	9	10	11	12
0.295	0.453	0.444	0.253	-0.032	-0.282	-0.412	-0.428	-0.388	-0.330	-0.235	-0.067	0.166

13	14	15	16	17	18	19	20	21	22	23	24
0.377	0.449	0.326	0.065	-0.201	-0.356	-0.374	-0.313	-0.238	-0.158	-0.030	0.169

* NEAP TIDAL CURRENT IN THE SPRING * (FLOOD + , EBB -)

0	1	2	3	4	5	6	7	8	9	10	11	12
-0.079	0.002	-0.017	-0.085	-0.103	-0.017	0.122	0.204	0.161	0.029	-0.083	-0.094	-0.025

13	14	15	16	17	18	19	20	21	22	23	24
0.032	-0.001	-0.107	-0.192	-0.175	-0.064	0.047	0.065	-0.020	-0.126	-0.162	-0.109

SPRING TIDAL CURRENT IN THE SUMMER (FLOOD + , EBB -)

0	1	2	3	4	5	6	7	8	9	10	11	12
0.290	0.442	0.441	0.275	0.024	-0.189	-0.293	-0.300	-0.274	-0.251	-0.209	-0.098	0.083

13	14	15	16	17	18	19	20	21	22	23	24
0.258	0.317	0.205	-0.027	-0.254	-0.371	-0.361	-0.289	-0.220	-0.158	-0.052	0.128

* NEAP TIDAL CURRENT IN THE SUMMER * (FLOOD + , EBB -)

0	1	2	3	4	5	6	7	8	9	10	11	12
-0.127	-0.087	-0.126	-0.194	-0.193	-0.078	0.091	0.193	0.155	0.013	-0.119	-0.153	-0.098

13	14	15	16	17	18	19	20	21	22	23	24
-0.040	-0.052	-0.119	-0.152	-0.081	0.074	0.210	0.227	0.117	-0.035	-0.126	-0.125

* MEAN SPRING TIDAL CURRENT * STANDERD PORT ** I.FISCAL

TIME	0	1	2	3	4	5	6	7	8	9	10	11
N-COMP	0.320	0.037	-0.222	-0.335	-0.316	-0.267	-0.253	-0.234	-0.117	0.117	0.362	0.455
E-COMP	0.103	0.025	-0.050	-0.085	-0.085	-0.076	-0.076	-0.072	-0.038	0.032	0.106	0.138
VEL.	0.336	0.044	0.227	0.345	0.327	0.277	0.264	0.244	0.123	0.121	0.377	0.476
DIR.	17	34	192	194	195	195	196	197	197	15	16	16

TIME ** LUNER TIME AFTER H.W. OR FLOOD MAX. AT STANDERD PORT.

TABLE PREDICTION OF THE TIDAL CURRENT(ST.C)

PREDICTION OF THE TIDAL CURRENT

AREA ** RIO DE JANEIRO STATION ** NO. STC
DEPTH ** 3.0 M BELOW SEA SURFACE
DURATION ** 25 HOURS FROM 1992-10-24 TO 10-25

PREDICTED HOURLY VELOCITY OF EACH CONSTITUENTS

T	DIURNAL		SEMI-DIUR.		QUARTER-DIUR.		COMPOUND			
	N	E	N	E	N	E	N	E	VEL.	DIR.
0	-0.015	0.002	0.303	-0.057	0.031	0.018	0.322	-0.071	0.330	347
1	-0.001	-0.006	0.329	-0.054	0.088	0.014	0.419	-0.081	0.427	349
2	0.014	-0.014	0.267	-0.038	0.056	-0.004	0.341	-0.089	0.352	345
3	0.028	-0.021	0.133	-0.011	-0.031	-0.018	0.133	-0.083	0.157	328
4	0.040	-0.026	-0.036	0.019	-0.088	-0.014	-0.081	-0.055	0.098	214
5	0.049	-0.030	-0.196	0.044	-0.056	0.004	-0.200	-0.017	0.201	184
6	0.055	-0.032	-0.303	0.057	0.031	0.018	-0.214	0.009	0.214	177
7	0.057	-0.031	-0.329	0.054	0.088	0.014	-0.181	0.003	0.181	178
8	0.056	-0.028	-0.267	0.038	0.056	-0.004	-0.152	-0.028	0.155	190
9	0.050	-0.024	-0.133	0.011	-0.031	-0.018	-0.111	-0.064	0.129	210
10	0.041	-0.017	0.036	-0.019	-0.088	-0.014	-0.007	-0.084	0.085	265
11	0.029	-0.010	0.196	-0.044	-0.056	0.004	0.172	-0.084	0.192	333
12	0.015	-0.002	0.303	-0.057	0.031	0.018	0.353	-0.075	0.361	348
13	0.001	0.006	0.329	-0.054	0.088	0.014	0.421	-0.068	0.426	350
14	-0.014	0.014	0.267	-0.038	0.056	-0.004	0.312	-0.061	0.318	348
15	-0.028	0.021	0.133	-0.011	-0.031	-0.018	0.077	-0.041	0.087	331
16	-0.040	0.026	-0.036	0.019	-0.088	-0.014	-0.161	-0.003	0.161	180
17	-0.049	0.030	-0.196	0.044	-0.056	0.004	-0.299	0.043	0.302	171
18	-0.055	0.032	-0.303	0.057	0.031	0.018	-0.325	0.072	0.332	167
19	-0.057	0.031	-0.329	0.054	0.088	0.014	-0.296	0.065	0.303	167
20	-0.056	0.028	-0.267	0.038	0.056	-0.004	-0.263	0.028	0.265	173
21	-0.050	0.024	-0.133	0.011	-0.031	-0.018	-0.211	-0.017	0.212	184
22	-0.041	0.017	0.036	-0.019	-0.088	-0.014	-0.089	-0.050	0.102	209
23	-0.029	0.010	0.196	-0.044	-0.056	0.004	0.114	-0.064	0.131	330
MEAN							0.003	-0.034	0.034	275

T .. LUNAR TIME AFTER MOON,S TRANSIT

PREDICTED HOURLY VELOCITY AT MEAN SPRING TIDES

T	0	1	2	3	4	5
VEL.	0.116	0.129	0.245	0.251	0.206	0.174
DIR.	327	194	178	171	171	180

T	6	7	8	9	10	11
VEL.	0.152	0.089	0.136	0.315	0.405	0.323
DIR.	196	229	328	347	350	347

T .. LUNAR TIME AFTER H.W. AT ST. PORT

TABLE PREDICTION OF THE TIDAL CURRENT(ST. E)

PREDICTION OF THE TIDAL CURRENT

AREA ** RIO DE JANEIRO STATION ** NO. STE
DEPTH ** 3.0 M BELOW SEA SURFACE
DURATION ** 25 HOURS FROM 1992-10-24 TO 10-25

PREDICTED HOURLY VELOCITY OF EACH CONSTITUENTS

T	DIURNAL		SEMI-DIUR.		QUARTER-DIUR.		COMPOUND			
	N	E	N	E	N	E	N	E	VEL.	DIR.
0	-0.028	-0.033	0.155	-0.022	-0.005	-0.025	0.174	-0.037	0.178	347
1	-0.026	-0.042	0.214	-0.030	0.042	-0.013	0.282	-0.043	0.285	351
2	-0.023	-0.048	0.216	-0.030	0.046	0.011	0.292	-0.024	0.293	355
3	-0.018	-0.051	0.160	-0.022	0.005	0.025	0.199	-0.006	0.199	358
4	-0.012	-0.050	0.061	-0.007	-0.042	0.013	0.060	-0.002	0.060	357
5	-0.005	-0.046	-0.054	0.009	-0.046	-0.011	-0.053	-0.007	0.054	187
6	0.003	-0.039	-0.155	0.022	-0.005	-0.025	-0.105	0.001	0.105	179
7	0.010	-0.029	-0.214	0.030	0.042	-0.013	-0.111	0.029	0.115	165
8	0.016	-0.018	-0.216	0.030	0.046	0.011	-0.102	0.066	0.121	147
9	0.022	-0.005	-0.160	0.022	0.005	0.025	-0.082	0.084	0.117	134
10	0.025	0.009	-0.061	0.007	-0.042	0.013	-0.025	0.071	0.076	109
11	0.028	0.021	0.054	-0.009	-0.046	-0.011	0.087	0.043	0.098	26
12	0.028	0.033	0.155	-0.022	-0.005	-0.025	0.230	0.028	0.232	6
13	0.026	0.042	0.214	-0.030	0.042	-0.013	0.334	0.040	0.337	6
14	0.023	0.048	0.216	-0.030	0.046	0.011	0.338	0.071	0.345	11
15	0.018	0.051	0.160	-0.022	0.005	0.025	0.235	0.096	0.254	22
16	0.012	0.050	0.061	-0.007	-0.042	0.013	0.084	0.098	0.129	49
17	0.005	0.046	-0.054	0.009	-0.046	-0.011	-0.044	0.086	0.096	116
18	-0.003	0.039	-0.155	0.022	-0.005	-0.025	-0.110	0.079	0.135	144
19	-0.010	0.029	-0.214	0.030	0.042	-0.013	-0.130	0.088	0.157	145
20	-0.016	0.018	-0.216	0.030	0.046	0.011	-0.134	0.101	0.168	142
21	-0.022	0.005	-0.160	0.022	0.005	0.025	-0.125	0.093	0.156	143
22	-0.025	-0.009	-0.061	0.007	-0.042	0.013	-0.076	0.054	0.094	144
23	-0.028	-0.021	0.054	-0.009	-0.046	-0.011	0.032	0.001	0.032	1
MEAN							0.052	0.042	0.067	38

T .. LUNAR TIME AFTER MOON,S TRANSIT

PREDICTED HOURLY VELOCITY AT MEAN SPRING TIDES

T	0	1	2	3	4	5
VEL.	0.214	0.083	0.064	0.106	0.114	0.123
DIR.	13	38	141	160	152	139

T	6	7	8	9	10	11
VEL.	0.123	0.080	0.055	0.185	0.291	0.304
DIR.	133	125	25	358	359	4

T .. LUNAR TIME AFTER H.W. AT ST. PORT

TABLE PREDICTION OF THE TIDAL CURRENT(ST.F)

PREDICTION OF THE TIDAL CURRENT

AREA ** RIO DE JANEIRO STATION ** NO. STF
DEPTH ** 3.0 M BELOW SEA SURFACE
DURATION ** 25 HOURS FROM 1992-10-24 TO 10-25

PREDICTED HOURLY VELOCITY OF EACH CONSTITUENTS

T	DIURNAL		SEMI-DIUR.		QUARTER-DIUR.		COMPOUND			
	N	E	N	E	N	E	N	E	VEL.	DIR.
0	0.066	-0.004	0.158	0.034	0.035	0.015	0.297	0.034	0.299	6
1	0.076	-0.011	0.180	0.026	0.058	0.011	0.351	0.015	0.352	2
2	0.082	-0.018	0.153	0.011	0.023	-0.004	0.295	-0.022	0.296	355
3	0.081	-0.023	0.086	-0.008	-0.035	-0.015	0.168	-0.057	0.178	341
4	0.075	-0.026	-0.005	-0.024	-0.058	-0.011	0.049	-0.072	0.087	304
5	0.064	-0.028	-0.094	-0.033	-0.023	0.004	-0.016	-0.068	0.070	256
6	0.049	-0.028	-0.158	-0.034	0.035	0.015	-0.038	-0.058	0.069	236
7	0.030	-0.026	-0.180	-0.026	0.058	0.011	-0.055	-0.052	0.076	223
8	0.009	-0.022	-0.153	-0.011	0.023	-0.004	-0.084	-0.048	0.097	209
9	-0.012	-0.017	-0.086	0.008	-0.035	-0.015	-0.096	-0.036	0.103	200
10	-0.033	-0.010	0.005	0.024	-0.058	-0.011	-0.049	-0.009	0.050	190
11	-0.051	-0.003	0.094	0.033	-0.023	0.004	0.057	0.023	0.062	22
12	-0.066	0.004	0.158	0.034	0.035	0.015	0.164	0.043	0.170	14
13	-0.076	0.011	0.180	0.026	0.058	0.011	0.199	0.037	0.202	10
14	-0.082	0.018	0.153	0.011	0.023	-0.004	0.132	0.013	0.132	5
15	-0.081	0.023	0.086	-0.008	-0.035	-0.015	0.006	-0.012	0.013	298
16	-0.075	0.026	-0.005	-0.024	-0.058	-0.011	-0.101	-0.020	0.103	191
17	-0.064	0.028	-0.094	-0.033	-0.023	0.004	-0.145	-0.012	0.145	184
18	-0.049	0.028	-0.158	-0.034	0.035	0.015	-0.135	-0.002	0.135	180
19	-0.030	0.026	-0.180	-0.026	0.058	0.011	-0.115	0.000	0.115	179
20	-0.009	0.022	-0.153	-0.011	0.023	-0.004	-0.103	-0.004	0.103	182
21	0.012	0.017	-0.086	0.008	-0.035	-0.015	-0.072	-0.002	0.072	181
22	0.033	0.010	0.005	0.024	-0.058	-0.011	0.017	0.012	0.020	35
23	0.051	0.003	0.094	0.033	-0.023	0.004	0.159	0.030	0.162	10
MEAN							0.037	-0.011	0.039	343

T .. LUNAR TIME AFTER MOON.S TRANSIT

PREDICTED HOURLY VELOCITY AT MEAN SPRING TIDES

T	0	1	2	3	4	5
VEL.	0.088	0.056	0.088	0.078	0.067	0.077
DIR.	336	235	205	199	198	198

T	6	7	8	9	10	11
VEL.	0.078	0.023	0.096	0.220	0.267	0.207
DIR.	195	186	13	9	5	358

T .. LUNAR TIME AFTER H.W. AT ST. PORT

TABLE PREDICTION OF THE TIDAL CURRENT(ST.G)

PREDICTION OF THE TIDAL CURRENT

AREA ** RIO DE JANEIRO STATION ** NO. STG
DEPTH ** 3.0 M BELOW SEA SURFACE
DURATION ** 25 HOURS FROM 1992-10-24 TO 10-25

PREDICTED HOURLY VELOCITY OF EACH CONSTITUENTS

T	DIURNAL		SEMI-DIUR.		QUARTER-DIUR.		COMPOUND			
	N	E	N	E	N	E	N	E	VEL.	DIR.
0	0.009	-0.036	-0.010	-0.132	0.008	-0.016	0.012	-0.194	0.194	273
1	0.003	-0.039	-0.035	-0.160	-0.005	-0.035	-0.031	-0.244	0.246	262
2	-0.004	-0.040	-0.050	-0.145	-0.012	-0.019	-0.061	-0.214	0.223	254
3	-0.010	-0.038	-0.053	-0.091	-0.008	0.016	-0.065	-0.123	0.139	242
4	-0.015	-0.034	-0.041	-0.012	0.005	0.035	-0.046	-0.021	0.051	204
5	-0.020	-0.027	-0.018	0.069	0.012	0.019	-0.020	0.052	0.056	111
6	-0.023	-0.018	0.010	0.132	0.008	-0.016	0.000	0.088	0.088	90
7	-0.024	-0.008	0.035	0.160	-0.005	-0.035	0.011	0.106	0.107	84
8	-0.024	0.002	0.050	0.145	-0.012	-0.019	0.019	0.117	0.119	81
9	-0.022	0.012	0.053	0.091	-0.008	0.016	0.027	0.109	0.112	75
10	-0.019	0.022	0.041	0.012	0.005	0.035	0.031	0.060	0.067	62
11	-0.015	0.030	0.018	-0.069	0.012	0.019	0.021	-0.030	0.036	304
12	-0.009	0.036	-0.010	-0.132	0.008	-0.016	-0.006	-0.122	0.122	267
13	-0.003	0.039	-0.035	-0.160	-0.005	-0.035	-0.037	-0.166	0.170	257
14	0.004	0.040	-0.050	-0.145	-0.012	-0.019	-0.054	-0.134	0.144	247
15	0.010	0.038	-0.053	-0.091	-0.008	0.016	-0.046	-0.047	0.065	225
16	0.015	0.034	-0.041	-0.012	0.005	0.035	-0.016	0.046	0.049	109
17	0.020	0.027	-0.018	0.069	0.012	0.019	0.019	0.105	0.107	79
18	0.023	0.018	0.010	0.132	0.008	-0.016	0.045	0.125	0.133	70
19	0.024	0.008	0.035	0.160	-0.005	-0.035	0.059	0.123	0.136	64
20	0.024	-0.002	0.050	0.145	-0.012	-0.019	0.067	0.113	0.131	59
21	0.022	-0.012	0.053	0.091	-0.008	0.016	0.072	0.084	0.111	49
22	0.019	-0.022	0.041	0.012	0.005	0.035	0.070	0.016	0.071	12
23	0.015	-0.030	0.018	-0.069	0.012	0.019	0.050	-0.090	0.103	299
MEAN							0.005	-0.010	0.011	296

T .. LUNAR TIME AFTER MOON,S TRANSIT

PREDICTED HOURLY VELOCITY AT MEAN SPRING TIDES

T	0	1	2	3	4	5
VEL.	0.094	0.033	0.077	0.099	0.103	0.105
DIR.	236	148	88	76	71	69

T	6	7	8	9	10	11
VEL.	0.098	0.061	0.061	0.146	0.197	0.175
DIR.	63	40	305	272	260	251

T .. LUNAR TIME AFTER H.W. AT ST. PORT

TABLE PREDICTION OF THE TIDAL CURRENT(ST.H)

PREDICTION OF THE TIDAL CURRENT

AREA ** RIO DE JANEIRO STATION ** NO. STH
DEPTH ** 3.0 M BELOW SEA SURFACE
DURATION ** 25 HOURS FROM 1992-10-24 TO 10-25

PREDICTED HOURLY VELOCITY OF EACH CONSTITUENTS

T	DIURNAL		SEMI-DIUR.		QUARTER-DIUR.		COMPOUND			
	N	E	N	E	N	E	N	E	VEL.	DIR.
0	0.085	0.043	0.461	0.108	0.178	0.047	0.663	0.228	0.702	18
1	0.085	0.040	0.398	0.100	0.217	0.047	0.640	0.217	0.676	18
2	0.080	0.033	0.229	0.065	0.039	0.000	0.288	0.129	0.316	24
3	0.069	0.025	-0.002	0.013	-0.178	-0.047	-0.170	0.020	0.171	173
4	0.053	0.015	-0.232	-0.043	-0.217	-0.047	-0.455	-0.046	0.457	185
5	0.034	0.004	-0.400	-0.087	-0.039	0.000	-0.464	-0.054	0.467	186
6	0.013	-0.007	-0.461	-0.108	0.178	0.047	-0.330	-0.038	0.332	186
7	-0.010	-0.018	-0.398	-0.100	0.217	0.047	-0.251	-0.041	0.254	189
8	-0.031	-0.028	-0.229	-0.065	0.039	0.000	-0.281	-0.063	0.288	192
9	-0.051	-0.036	0.002	-0.013	-0.178	-0.047	-0.286	-0.065	0.294	192
10	-0.067	-0.041	0.232	0.043	-0.217	-0.047	-0.111	-0.015	0.112	187
11	-0.079	-0.043	0.400	0.087	-0.039	0.000	0.223	0.074	0.235	18
12	-0.085	-0.043	0.461	0.108	0.178	0.047	0.494	0.142	0.514	16
13	-0.085	-0.040	0.398	0.100	0.217	0.047	0.470	0.138	0.490	16
14	-0.080	-0.033	0.229	0.065	0.039	0.000	0.129	0.062	0.143	25
15	-0.069	-0.025	-0.002	0.013	-0.178	-0.047	-0.308	-0.030	0.309	185
16	-0.053	-0.015	-0.232	-0.043	-0.217	-0.047	-0.561	-0.076	0.567	187
17	-0.034	-0.004	-0.400	-0.087	-0.039	0.000	-0.533	-0.062	0.536	186
18	-0.013	0.007	-0.461	-0.108	0.178	0.047	-0.356	-0.023	0.357	183
19	0.010	0.018	-0.398	-0.100	0.217	0.047	-0.232	-0.004	0.232	181
20	0.031	0.028	-0.229	-0.065	0.039	0.000	-0.218	-0.007	0.218	181
21	0.051	0.036	0.002	-0.013	-0.178	-0.047	-0.185	0.006	0.185	178
22	0.067	0.041	0.232	0.043	-0.217	-0.047	0.023	0.066	0.070	71
23	0.079	0.043	0.400	0.087	-0.039	0.000	0.380	0.160	0.412	22
MEAN							-0.060	0.030	0.067	153

T .. LUNAR TIME AFTER MOON,S TRANSIT

PREDICTED HOURLY VELOCITY AT MEAN SPRING TIDES

T	0	1	2	3	4	5
VEL.	0.243	0.520	0.491	0.301	0.180	0.208
DIR.	181	187	186	183	182	186

T	6	7	8	9	10	11
VEL.	0.241	0.092	0.266	0.572	0.576	0.232
DIR.	187	170	23	18	17	23

T .. LUNAR TIME AFTER H.W. AT ST. PORT

TABLE PREDICTION OF THE TIDAL CURRENT(ST. I)

PREDICTION OF THE TIDAL CURRENT

AREA ** RIO DE JANEIRO STATION ** NO. STI
DEPTH ** 3.0 M BELOW SEA SURFACE
DURATION ** 25 HOURS FROM 1992-10-24 TO 10-25

PREDICTED HOURLY VELOCITY OF EACH CONSTITUENTS

T	DIURNAL		SEMI-DIUR.		QUARTER-DIUR.		COMPOUND			
	N	E	N	E	N	E	N	E	VEL.	DIR.
0	0.060	0.068	0.049	0.041	0.034	0.018	0.068	0.057	0.089	39
1	0.068	0.050	0.079	0.054	0.024	0.004	0.095	0.038	0.103	21
2	0.071	0.029	0.088	0.052	-0.011	-0.014	0.073	-0.003	0.073	357
3	0.069	0.006	0.074	0.036	-0.034	-0.018	0.033	-0.045	0.056	306
4	0.063	-0.017	0.039	0.011	-0.024	-0.004	0.003	-0.080	0.080	271
5	0.052	-0.039	-0.006	-0.018	0.011	0.014	-0.019	-0.113	0.114	260
6	0.038	-0.059	-0.049	-0.041	0.034	0.018	-0.053	-0.152	0.161	250
7	0.021	-0.074	-0.079	-0.054	0.024	0.004	-0.111	-0.194	0.224	240
8	0.002	-0.085	-0.088	-0.052	-0.011	-0.014	-0.172	-0.221	0.280	232
9	-0.016	-0.090	-0.074	-0.036	-0.034	-0.018	-0.200	-0.214	0.292	226
10	-0.033	-0.088	-0.039	-0.011	-0.024	-0.004	-0.172	-0.173	0.244	225
11	-0.049	-0.081	0.006	0.018	0.011	0.014	-0.108	-0.119	0.161	227
12	-0.060	-0.068	0.049	0.041	0.034	0.018	-0.053	-0.079	0.095	236
13	-0.068	-0.050	0.079	0.054	0.024	0.004	-0.041	-0.063	0.075	237
14	-0.071	-0.029	0.088	0.052	-0.011	-0.014	-0.069	-0.062	0.093	221
15	-0.069	-0.006	0.074	0.036	-0.034	-0.018	-0.106	-0.058	0.121	208
16	-0.063	0.017	0.039	0.011	-0.024	-0.004	-0.123	-0.046	0.132	200
17	-0.052	0.039	-0.006	-0.018	0.011	0.014	-0.123	-0.034	0.128	195
18	-0.038	0.059	-0.049	-0.041	0.034	0.018	-0.128	-0.035	0.133	195
19	-0.021	0.074	-0.079	-0.054	0.024	0.004	-0.152	-0.046	0.159	196
20	-0.002	0.085	-0.088	-0.052	-0.011	-0.014	-0.177	-0.051	0.184	196
21	0.016	0.090	-0.074	-0.036	-0.034	-0.018	-0.168	-0.034	0.171	191
22	0.033	0.088	-0.039	-0.011	-0.024	-0.004	-0.105	0.004	0.105	178
23	0.049	0.081	0.006	0.018	0.011	0.014	-0.011	0.042	0.044	104
MEAN							-0.076	-0.070	0.103	222

T .. LUNAR TIME AFTER MOON,S TRANSIT

PREDICTED HOURLY VELOCITY AT MEAN SPRING TIDES

T	0	1	2	3	4	5
VEL.	0.073	0.095	0.102	0.121	0.165	0.211
DIR.	231	224	224	226	223	218

T	6	7	8	9	10	11
VEL.	0.218	0.164	0.073	0.014	0.029	0.037
DIR.	214	211	212	296	328	264

T .. LUNAR TIME AFTER H.W. AT ST. PORT

PREDICTION OF THE TIDAL CURRENT

AREA ** RIO DE JANEIRO STATION ** NO. ST.H
DEPTH ** 3.0 M BELOW SEA SURFACE
DURATION ** 25 HOURS FROM 1993- 3-23 TO 3-24

PREDICTED HOURLY VELOCITY OF EACH CONSTITUENTS

T	DIURNAL		SEMI-DIUR.		QUARTER-DIUR.		COMPOUND			
	N	E	N	E	N	E	N	E	VEL.	DIR.
0	-0.029	0.000	0.906	0.209	-0.137	-0.029	0.764	0.200	0.790	14
1	-0.033	0.000	0.739	0.172	0.198	0.053	0.929	0.245	0.961	14
2	-0.035	0.000	0.375	0.089	0.335	0.082	0.699	0.191	0.725	15
3	-0.034	-0.001	-0.090	-0.017	0.137	0.029	0.036	0.032	0.048	41
4	-0.031	-0.001	-0.531	-0.119	-0.198	-0.053	-0.737	-0.152	0.753	191
5	-0.026	-0.001	-0.830	-0.190	-0.335	-0.082	-1.167	-0.252	1.194	192
6	-0.019	-0.001	-0.906	-0.209	-0.137	-0.029	-1.038	-0.219	1.061	191
7	-0.011	-0.001	-0.739	-0.172	0.198	0.053	-0.528	-0.100	0.538	190
8	-0.002	-0.001	-0.375	-0.089	0.335	0.082	-0.018	0.012	0.021	146
9	0.007	-0.001	0.090	0.017	0.137	0.029	0.258	0.066	0.266	14
10	0.015	-0.001	0.531	0.119	-0.198	-0.053	0.372	0.087	0.382	13
11	0.023	-0.001	0.830	0.190	-0.335	-0.082	0.541	0.128	0.556	13
12	0.029	0.000	0.906	0.209	-0.137	-0.029	0.822	0.200	0.846	13
13	0.033	0.000	0.739	0.172	0.198	0.053	0.994	0.245	1.024	13
14	0.035	0.000	0.375	0.089	0.335	0.082	0.768	0.192	0.792	14
15	0.034	0.001	-0.090	-0.017	0.137	0.029	0.104	0.033	0.109	17
16	0.031	0.001	-0.531	-0.119	-0.198	-0.053	-0.675	-0.150	0.691	192
17	0.026	0.001	-0.830	-0.190	-0.335	-0.082	-1.115	-0.250	1.143	192
18	0.019	0.001	-0.906	-0.209	-0.137	-0.029	-1.000	-0.216	1.023	192
19	0.011	0.001	-0.739	-0.172	0.198	0.053	-0.506	-0.098	0.515	190
20	0.002	0.001	-0.375	-0.089	0.335	0.082	-0.013	0.014	0.019	133
21	-0.007	0.001	0.090	0.017	0.137	0.029	0.244	0.068	0.254	15
22	-0.015	0.001	0.531	0.119	-0.198	-0.053	0.341	0.088	0.353	14
23	-0.023	0.001	0.830	0.190	-0.335	-0.082	0.495	0.129	0.512	14
MEAN							0.024	0.021	0.031	40

T .. LUNAR TIME AFTER MOON,S TRANSIT

PREDICTED HOURLY VELOCITY AT MEAN SPRING TIDES

T	0	1	2	3	4	5
VEL.	0.015	0.779	1.157	0.979	0.484	0.042
DIR.	86	192	192	191	190	172
T	6	7	8	9	10	11
VEL.	0.185	0.318	0.562	0.902	1.056	0.745
DIR.	15	13	13	14	14	14

T .. LUNAR TIME AFTER H.W. AT ST. PORT

PREDICTION OF THE TIDAL CURRENT

AREA ** RIO DE JANEIRO STATION ** NO. ST.J
DEPTH ** 3.0 M BELOW SEA SURFACE
DURATION ** 25 HOURS FROM 1993- 3-23 TO 3-24

PREDICTED HOURLY VELOCITY OF EACH CONSTITUENTS

T	DIURNAL		SEMI-DIUR.		QUARTER-DIUR.		COMPOUND			
	N	E	N	E	N	E	N	E	VEL.	DIR.
0	-0.001	0.010	0.129	-0.198	-0.027	0.034	0.107	-0.155	0.188	304
1	0.005	-0.001	0.126	-0.183	0.038	-0.058	0.175	-0.241	0.298	306
2	0.011	-0.011	0.090	-0.118	0.065	-0.091	0.171	-0.221	0.279	307
3	0.016	-0.021	0.029	-0.023	0.027	-0.034	0.077	-0.077	0.109	315
4	0.020	-0.029	-0.040	0.079	-0.038	0.058	-0.052	0.108	0.120	115
5	0.022	-0.035	-0.098	0.160	-0.065	0.091	-0.134	0.216	0.254	121
6	0.023	-0.039	-0.129	0.198	-0.027	0.034	-0.127	0.192	0.230	123
7	0.023	-0.040	-0.126	0.183	0.038	-0.058	-0.060	0.085	0.104	125
8	0.021	-0.039	-0.090	0.118	0.065	-0.091	0.002	-0.011	0.011	280
9	0.017	-0.034	-0.029	0.023	0.027	-0.034	0.021	-0.045	0.050	295
10	0.013	-0.028	0.040	-0.079	-0.038	0.058	0.021	-0.049	0.053	292
11	0.007	-0.019	0.098	-0.160	-0.065	0.091	0.046	-0.088	0.099	297
12	0.001	-0.010	0.129	-0.198	-0.027	0.034	0.110	-0.174	0.206	302
13	-0.005	0.001	0.126	-0.183	0.038	-0.058	0.166	-0.239	0.291	304
14	-0.011	0.011	0.090	-0.118	0.065	-0.091	0.150	-0.198	0.249	307
15	-0.016	0.021	0.029	-0.023	0.027	-0.034	0.046	-0.035	0.058	322
16	-0.020	0.029	-0.040	0.079	-0.038	0.058	-0.091	0.166	0.189	118
17	-0.022	0.035	-0.098	0.160	-0.065	0.091	-0.179	0.286	0.338	121
18	-0.023	0.039	-0.129	0.198	-0.027	0.034	-0.174	0.270	0.321	122
19	-0.023	0.040	-0.126	0.183	0.038	-0.058	-0.105	0.165	0.196	122
20	-0.021	0.039	-0.090	0.118	0.065	-0.091	-0.040	0.066	0.077	121
21	-0.017	0.034	-0.029	0.023	0.027	-0.034	-0.013	0.023	0.027	119
22	-0.013	0.028	0.040	-0.079	-0.038	0.058	-0.005	0.006	0.008	128
23	-0.007	0.019	0.098	-0.160	-0.065	0.091	0.032	-0.049	0.059	302
MEAN							0.006	0.000	0.006	0

T .. LUNAR TIME AFTER MOON,S TRANSIT

PREDICTED HOURLY VELOCITY AT MEAN SPRING TIDES

T	0	1	2	3	4	5
VEL.	0.061	0.172	0.290	0.254	0.136	0.043
DIR.	322	118	121	122	123	123
T	6	7	8	9	10	11
VEL.	0.014	0.009	0.088	0.223	0.314	0.259
DIR.	137	255	299	303	305	307

T .. LUNAR TIME AFTER H.W. AT ST. PORT

JICA