1 PURPOSE:

TIDHAR calculates a predicted tide for a specified time interval at a specified station. Station harmonic constants for any of the constituents listed in Table 1 can be input at the terminal or from a disk file. The tide prediction is made according to the harmonic method:

\[ \eta(t) = \sum_n h_n \exp i(2\pi f_n t - G_n) \]

The user supplies the constituent amplitudes, \( H_n \), and phases—either the Greenwich epoch, \( G_n \), or the local epoch, \( \kappa_n \), where the two are related according to the equation \( G_n = \kappa_n - K_1 \phi \), where \( K_1 = 0, 1 \) or 2 designates the species and \( \phi \) is the Greenwich East longitude in degrees. If the complex form of the prediction is not desired then only Re \( \{ \eta(t) \} \) is retained. The user can output the predicted series in three components (real or complex) \( \eta_0, \eta_1, \eta_2 \) corresponding to the long period\(^1\), diurnal, and semi-diurnal subsuns (no higher order species). Otherwise the output series contains a single (real or complex) component \( \eta_0 + \eta_1 + \eta_2 + \eta_3 + \eta_4 + \eta_6 + \eta_8 \). The user can limit the number, \( \eta_n \), of constituents to be used for a predicted series by specifying the minimum amplitude \( H_{\text{min}} \) to be considered.

The constituents are designated according to Darwin, which means those separable in a year. The six integers \( \bar{k} (k_1, k_2, k_3, k_4, k_5, k_6) \) appearing before Darwin's symbol determine the constituent frequency \( \bar{k} \cdot \bar{f} \) where \( f_1 \) is cycles per (c.p.) solar day, \( f_2 \) is c.p. month, \( f_3 \) is c.p. year, \( f_4 \) is c.p. lunar perigee, \( f_5 \) is c.p. lunar node, and \( f_6 \) is c.p. solar perigee.

The user can choose to have the program infer the harmonic constants of all equilibrium (linear theory) diurnal and semi-diurnal constituents to augment an incomplete set of supplied harmonic constants. If the O1 and K1 harmonic constants are supplied, a diurnal constituent inference is based on the one closest to the constituent of interest; if only one is supplied, then all diurnal inferences

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\(^1 I(\eta_0) \) is a string of zeroes
will be based on that one; if none then there will be no diurnal constituent inferences. Semidiurnal constituent inferences are based on the M2, N2 and S2 harmonic constants in a similar manner.

If \( H_n < H_{\text{min}} \), then that constituent (whether given or inferred) is omitted from the prediction. In no event are more than \( n_n \) constituents retained. The user is informed which constituents are used for the prediction. For durations of a year or less, the node factor and the phase are computed for the time halfway between the start and end times. The initial phase is then computed by going backward to the start time at the mean frequency of each constituent. If the duration of the series to be generated is larger than one year (=8766 hours), then the program initializes after each year.
TABLE 1

<table>
<thead>
<tr>
<th>Identification</th>
<th>DS*</th>
<th>Identification</th>
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2 EXECUTION:

TIDHAR

TIDHAR: (DATE) (TIME)
LAST UPDATE: (DATE)

WILL THE TIDAL CONSTITUENTS BE TYPED INTO TTY?
ANSWER Y OR N:
-normally no when constituent file is available

DO YOU WANT TO DECOMPOSE THE TIME SERIES INTO ITS LONG-PERIOD, DIURNAL AND SEMIDIURNAL SUBSUMS?
ANSWER Y OR N: normally no

WILL THE OUTPUT SERIES BE COMPLEX?
ANSWER Y OR N: normally no

ARE THE PHASES SUPPLIED IN THE GREENWICH EPOCH?
ANSWER Y OR N:
[Note: TIHARC-generated phases are in
local epoch k, so answer N in that case]

If N:
    INPUT WEST LONGITUDE:
    -enter west long. of station in decimal degrees

ARE NON-SUPPLIED CONSTITUENTS TO BE INFERRED?
ANSWER Y OR N: (normally no)

MINIMUM CONSTITUENT AMPLITUDE TO BE CONSIDERED:
- enter the minimum amplitude in same units (e.g.: 0.01m)

NUMBER OF TERMS GIVEN (25 for TIHARC constant file):
- enter the number of constituents to be supplied. (25 when TIHARC-
produced constituent file is used)

INPUT START, END TIME AND INCREMENT (JULIAN HOURS):
- enter the three numbers separated by commas

START TIME
(GREGORIAN DATE) (JULIAN DATE)

END TIME
(GREGORIAN DATE) (JULIAN DATE)

NAME OF OUTPUT FILE FOR SERIES:
- enter filename

NAME OF CONSTITUENT FILE:
- enter filename

DO YOU WISH TO CHANGE ONLY THE TIME INPUTS?
ANSWER Y OR N:

If Y:
    The program control transfers back to the query concerning time
information and asks for that again and for an output filename.
(This assumes that the same constituent file is being used as input.)

If N:
DO YOU WANT TO INPUT NEW CONSTITUENTS?
ANSWER Y OR N:

If Y:
The program control transfers back to the query about output device option and starts again from that point, assuming that the same input file is used.

If N:
DO YOU WISH TO STOP?
ANSWER Y OR N:

If N: Program returns to beginning

3 OUTPUT:

To terminal screen:
(1) A table indicating the amplitude and local epochs of the constituents supplied by the user.

(2) A table indicating the constituents (given and inferred) actually used in the prediction: Solar Doodson number, Darwin symbol, frequency (cycles per solar day, radius, radius per time increment, and Nyquists).

(3) An output file containing the centered constituents (if this has been done).

(4) An output file containing the predicted series. The HEADER on this series contains the filename, creation time, creation date, start time, end time, the number of terms, time interval between samples, and one of the following codes indicating the number of merged terms depending on specification:
(1) real n; combined L, S, D constituents
(2) complex n; combined L, S, D constituents
(3) real n; 3 component L, S, D
(6) complex n; 3 component L, S, D