

# Package ‘TideTables’

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**Type** Package

**Title** Tide Analysis and Prediction of Predominantly Semi-Diurnal Tides

**Version** 0.0.3

**Date** 2020-12-15

**Description** Tide analysis and prediction of predominantly semi-diurnal tides with two high waters and two low waters during one lunar day (~24.842 hours, ~1.035 days). The analysis should preferably cover an observation period of at least 19 years. For shorter periods, for example, the nodal cycle can not be taken into account, which particularly affects the height calculation. The main objective of this package is to produce tide tables.

**Imports** chron (>= 2.3-54), data.table (>= 1.13.2)

**Depends** R (>= 3.6.0)

**LazyData** true

**License** GPL-3

**RoxygenNote** 7.1.1

**Suggests** testthat (>= 2.1.0)

**NeedsCompilation** no

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<<https://doi.org/10.5194/os-15-1363-2019>>),  
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BuildTT	<i>Builds a TideTable model</i>
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### Description

Builds a TideTable model of class "tidetable".

### Usage

```
BuildTT(
  dataInput,
  otz = 1,
  asdate,
  astime,
  aedate,
  aetime,
  hwi = "99:99",
  sharp_hwi = TRUE
)
```

### Arguments

dataInput	the data frame with observation date, observation time and height.
otz	time zone of the observations. Default is 1 (UTC + 1)
asdate	The start date.Format: "yyyy/mm/dd"
astime	The start time. Format: "hh:mm:ss"
aedate	The end date. Format: "yyyy/mm/dd"
aetime	The end time. Format: "hh:mm:ss"
hwi	The high water interval. Format: "hh::mm"
sharp_hwi	should the hwi computation be sharp? Default is TRUE

### Value

Returns a object of class "tidetable" which contains following elements:

fitting.coeff	Coefficients for the eight fitted linear models used in the synthesis
diff.analyse	Time in days spanning the analysis
omega_t	Return value of FindOmega()

tm24	Internal constant
tplus	Internal constant
tmhwi	Mean high water interval

## References

[https://www.bsh.de/DE/PUBLIKATIONEN/\\_Anlagen/Downloads/Meer\\_und\\_Umwelt/Berichte-des-BSH/Berichte-des-BSH\\_50\\_de.pdf?\\_\\_blob=publicationFile&v=13/](https://www.bsh.de/DE/PUBLIKATIONEN/_Anlagen/Downloads/Meer_und_Umwelt/Berichte-des-BSH/Berichte-des-BSH_50_de.pdf?__blob=publicationFile&v=13/)

<https://doi.org/10.5194/os-15-1363-2019>

## Examples

```
BuildTT(dataInput = observation, asdate = "1991/01/01",  
astime = "12:00:00", aedate = "1992/01/01", aetime = "12:00:00")
```

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ComputeAfunc

*Returns predictor vector for design matrix*

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## Description

Returns predictor vector for design matrix from 39 astronomical angular velocities.

## Usage

```
ComputeAfunc(omega = NULL, xi = NULL)
```

## Arguments

omega	The return value of FindOmega().
xi	Transit index

## Value

A list with the selected angular velocities, their ranks and the predictor vector (values between -1, 1).

EstimateTmhwi      *Calculates tmhwi*

---

**Description**

This functions computes an estimate for the mean high water interval (tmhwi) in UTC

**Usage**

```
EstimateTmhwi(input, strict = TRUE)
```

**Arguments**

input	Should be a data.table object with three columns d_days, high_low and height, where d_days is a vector of fraction of days since 1900/01/01 00:00:00, high_low indicating a high water(1) or a low water(0), height is the corresponding height
strict	If strict is true (default), the computations are more sharp.

**Value**

Returns the mean high water interval in UTC

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FindOmega      *Returns omegas and their ranks.*

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**Description**

Returns omegas and their ranks from 39 astronomical angular velocities.

**Usage**

```
FindOmega(tdiff)
```

**Arguments**

tdiff	Length of input time series.
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**Value**

A list with the selected angular velocities and their ranks.

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Funcs	<i>Returns predictor vector for design matrix</i>
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**Description**

Returns predictor vector for design matrix from 39 astronomical angular velocities.

**Usage**

```
Funcs(tdiff, xi)
```

**Arguments**

tdiff            Length of input time series.

xi                Transit index

**Value**

A list with the selected angular velocities, their ranks and the predictor vector (Values between -1, 1).

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NumCulm	<i>Calculates numm and k4</i>
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**Description**

Calculates transit number (numm) and high (1, 3) or low (2, 4) water number (k4).

**Usage**

```
NumCulm(t, tmhwi)
```

**Arguments**

t                 Time in days after 1900/01/01 00:00:00 UTC.

tmhwi            Mean high water interval (Greenwich meridian).

**Value**

Returns a list containing numm and k4.

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observation	<i>Sample file of high and low water times and heights</i>
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### Description

A sample dataset containing observation date, time and height of high and low water

### Usage

```
observation
```

### Format

A data frame with 26819 rows and 4 variables

**observation\_date** date of tide, "yyyy/mm/dd" format, character

**observation\_time** time of tide, "hh:mm:ss" format, character

**high\_or\_low\_water** indication whether high (1) or low water (0) was present given date and time, integer

**height** height of the tide, numeric

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SynTT	<i>Synthesizes a tide table</i>
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### Description

Synthesizes a tide table, built with BuildTT().

### Usage

```
SynTT(tmodel = NULL, ssdate, sstime, sedate, setime)
```

### Arguments

tmodel	The model you built with BuildTT()
ssdate	Start date of the synthesis. Format: "yyyy/mm/dd"
ssstime	Start time of the synthesis Format: "hh:mm:ss".
sedate	End date of the synthesis. Format: "yyyy/mm/dd"
setime	End time of the synthesis. Format: "hh:mm:ss"

### Value

Returns a tide table as a data.table, which is identical to c.table computed with TideTable().

## References

[https://www.bsh.de/DE/PUBLIKATIONEN/\\_Anlagen/Downloads/Meer\\_und\\_Umwelt/Berichte-des-BSH/Berichte-des-BSH\\_50\\_de.pdf?\\_\\_blob=publicationFile&v=13/](https://www.bsh.de/DE/PUBLIKATIONEN/_Anlagen/Downloads/Meer_und_Umwelt/Berichte-des-BSH/Berichte-des-BSH_50_de.pdf?__blob=publicationFile&v=13/)  
<https://doi.org/10.5194/os-15-1363-2019>

## Examples

```
## Not run: SynTT(tmodel = tt_model, ssdate = "1991/01/01",
sstime = "12:00:00", sedate = "1992/01/01", setime = "12:00:00")
## End(Not run)
```

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TideTable	<i>Computes a tide table</i>
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## Description

Takes a data frame as input with date time, high water and height information and returns a tide table

## Usage

```
TideTable(
  dataInput,
  otz = 1,
  hwi = "99:99",
  sharp_hwi = TRUE,
  asdate,
  astime,
  aedate,
  aetime,
  ssdate,
  sstime,
  sedate,
  setime,
  stz = 1
)
```

## Arguments

<code>dataInput</code>	A data frame with the columns <code>observation_date</code> , <code>observation_time</code> , <code>high_or_low_water</code> and <code>height</code> . See attached data for correct formats.
<code>otz</code>	The time zone of the observations
<code>hwi</code>	The average of all intervals between the Moon's transit (upper or lower) over the Greenwich meridian and the following high or low waters for all phases of the Moon is known as mean high water lunitidal interval and is abbreviated to high water interval (hwi). Please only supply a value, when you are sure. Otherwise leave the default value "99:99" untouched. hwi is then computed for you.

sharp_hwi	Default is TRUE, which results in a sharp hwi computation. Set on FALSE if you analyze shorter time intervals and EstimateTmhwi function returns NA.
asdate	A string indication the date you want the analysis to start with. Format: "yyyy/mm/dd".
astime	A string indicating the time you want the analysis to start with. Format: "hh:mm:ss"
aedate	A string indication the date you want the analysis to end with. Format: "yyyy/mm/dd".
aetime	A string indicating the time you want the analysis to end with. Format: "hh:mm:ss"
ssdate	Synthesis start date. This indicates the date you want your tide table to start with. Format: See above
sstime	Synthesis start time. The starting time for your tide table. Format: See above
sedate	Synthesis end date. Format: See above
setime	Synthesis end time. Format: See above
stz	Dummy for later extension to modify target time zone.

### Value

Returns a list with elements of the analysis, fitting and the tide table for given data

c.table	The complete synthesis data as a data.table object
tide.table	The tide table as a data.table object
lm.coeff	Coefficients for the eight fitted linear models used in the synthesis
diff.analyse	Time in days spanning the analysis
i.analyse	How many different cases where used in the analysis

### References

Horn, W. (1960) Some Recent Approaches to Tidal Problems. *Int. Hydrogr. Rev.* 37(2), 65-84

Godin, Gabriel (1972) *The Analysis of Tides*. Toronto, 264pp

[https://www.bsh.de/DE/PUBLIKATIONEN/\\_Anlagen/Downloads/Meer\\_und\\_Umwelt/Berichte-des-BSH/Berichte-des-BSH\\_50\\_de.pdf?\\_\\_blob=publicationFile&v=13/](https://www.bsh.de/DE/PUBLIKATIONEN/_Anlagen/Downloads/Meer_und_Umwelt/Berichte-des-BSH/Berichte-des-BSH_50_de.pdf?__blob=publicationFile&v=13/)

<https://doi.org/10.5194/os-15-1363-2019>

### Examples

```
TideTable(dataInput = observation, asdate = "1991/01/01",
astime = "12:00:00",
aedate = "1992/01/01", aetime = "12:00:00", ssdate = "1991/01/01",
sstime = "00:00:00", sedate = "1991/01/31", setime = "21:00:00")
```

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