Package 'TideTables'

December 15, 2020

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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Repository CRAN

Date/Publication 2020-12-15 19:30:02 UTC

R topics documented:

`BuildTT` *Builds a TideTable model*

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://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")
```

ComputeAfunc *Returns predictor vector for design matrix*

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

`FindOmega` *Returns omegas and their ranks.*

Description

Returns omegas and their ranks from 39 astronomical angular velocities.

Usage

```
FindOmega(tdiff)
```

Arguments

`tdiff`	Length of input time series.

Value

A list with the selected angular velocities and their ranks.

Funcs *Returns predictor vector for design matrix*

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).

NumCulm *Calculates numm and k4*

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.

observation *Sample file of high and low water times and heights*

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

SynTT *Synthesizes a tide table*

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"
sstime	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://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)
```

TideTable *Computes a tide table*

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

dataInput	A data frame with the columns observation_date, observation_time, high_or_low_water and height. See attached data for correct formats.
otz	The time zone of the observations
hwi	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://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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