

Package ‘MetFns’

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Type Package

Title Analysis of Visual Meteor Data

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Author Kristina Veljkovic

Maintainer Kristina Veljkovic <mackikac@gmail.com>

Description

Functions for selection of visual meteor data, calculations of Zenithal Hourly Rate (ZHR) and population index, graphics of ZHR and magnitude distribution

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MetFns-package	<i>Analysis of Visual Meteor Data</i>
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Description

Visual meteor data, functions for selection of the data, calculations of Zenithal Hourly Rate (ZHR), solar longitude, population index and graphical representation of ZHR and magnitude distribution

Details

Package: MetFns
Type: Package
Version: 1.0
Date: 2014-09-16
License: GPL-2 | GPL-3

Author(s)

Kristina Veljkovic
Maintainer: Kristina Veljkovic <mackikac@gmail.com>

<i>filter</i>	<i>Global filter</i>
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Description

Various data selections for a given visual meteor data. Wrapper function for filters by shower code, time period, date, IMO observer code, observer's name, geographical coordinates, site, country, limiting magnitude, correction factor for clouds, solar longitude, radiant elevation and maximum correction factor.

Usage

```
filter(data, year = NULL, month = NULL, day.beg = NULL, day.end = day.beg,
       shw = NULL, imocode = NULL, long.low = 0, long.up = 180, ew = c("E", "W"),
       lat.low = 0, lat.up = 90, ns = c("N", "S"), name = NULL, fname = NULL,
       site = NULL, country = NULL, mag.low = 2, mag.up = 7.5, F.low = 1, F.up = 3,
       time.low = 0, time.up = 2359, sol.low = 0, sol.up = 359.999,
       Ralpha = NULL, Delta = NULL, h.low = 10, h.up = 90, r = NULL, C = 5)
```

Arguments

<code>data</code>	data frame consisting of visual meteor data (rate or magnitude data).
<code>year</code>	numeric vector of length 4 specifying year.
<code>month</code>	numeric vector specifying month of the year.
<code>day.beg</code>	numeric vector specifying the beginning day.
<code>day.end</code>	numeric vector specifying the ending day. By default, <code>day.end</code> is set to be equal to <code>day.beg</code> .
<code>shw</code>	character string consisting of three capital letters which represent meteor shower code.
<code>imocode</code>	character string consisting of five capital letters which represent IMO observer code.
<code>long.low</code>	numeric vector taking a value between 0 (default) and 180, specifying lower boundary of longitude in degrees.
<code>long.up</code>	numeric vector taking a value between 0 and 180 (default), specifying upper boundary of longitude in degrees.
<code>ew</code>	character vector (E,W), specifying east or west position from the prime meridian.
<code>lat.low</code>	numeric vector taking a value between 0 (default) and 90, specifying lower boundary of latitude in degrees.
<code>lat.up</code>	numeric vector taking a value between 0 and 90 (default), specifying upper boundary of latitude in degrees.
<code>ns</code>	character vector (N,S), specifying north or south position from equator.
<code>name</code>	character string representing observer's last name.
<code>fname</code>	character string representing observer's first name.
<code>site</code>	character string specifying name of the observing site.
<code>country</code>	character string specifying name of the country.
<code>mag.low</code>	numeric vector with value between 2.0 (default) and 7.5, specifying lower boundary of limiting magnitude.

mag.up	numeric vector with value between 2.0 and 7.5 (default), specifying upper boundary of limiting magnitude.
F.low	numeric vector with value between 1.0 (default) and 3.0, specifying lower boundary of correction factor for clouds.
F.up	numeric vector with value between 1.0 and 3.0 (default), specifying upper boundary of correction factor for clouds.
time.low	numeric vector (0-2359) specifying lower boundary of time in hours and minutes.
time.up	numeric vector(0-2359) specifying upper boundary of time in hours and minutes.
sol.low	numeric vector with value between 0 (default) and 359.999, specifying lower boundary of solar longitude in degrees.
sol.up	numeric vector with value between 0 and 359.999 (dafault), specifying upper boundary of solar longitude in degrees.
Ralpha	numeric vector with value between 0 and 360, specifying right ascension of the radiant, in degrees.
Delta	numeric vector with value between -90 and +90, specifying declination of the radiant, in degrees.
h.low	numeric vector with value between 10 (default) and 90, specifying lower boundary of radiant elevation in degrees.
h.up	numeric vector with value between 10 and 90 (default), specifying upper boundary of radiant elevation in degrees.
r	numeric vector specifying population index of a meteor shower.
C	numeric vector specifying maximum correction factor. C=5 is set as a default value.

Details

Depending on the given arguments, the function `filter` calls one or more particular filters for selection of visual meteor data.

Author(s)

Kristina Veljkovic

References

<http://www.imo.net/data/visual>

Rendtel J. and Arlt R., editors (2008). *IMO Handbook For Meteor Observers*. IMO, Potsdam.

See Also

`filter.shw`, `filter.date`, `filter.imocode`, `filter.obsname`, `filter.site`, `filter.country`, `filter.gc`, `filter.time`, `filter.mag`, `filter.F`, `filter.sol`, `filter.h`, `filter.totcor`

Examples

```
## select rate data for observations of Leonids in Serbia, time period 10-20th November 2002
data(rate02)
filter(rate02,shw="LE0", country="Serbia",year=2002, month=11, day.beg=10, day.end=20)
```

filter.country	<i>Selection of visual meteor data by country</i>
----------------	---

Description

Selects data for a given visual meteor dataset and specified country.

Usage

```
filter.country(data, country)
```

Arguments

data	data frame consisting of visual meteor data (rate or magnitude data).
country	character string specifying the name of the country.

Details

List of the countries can be found in the data frame [vmdbsite](#). Data selection is performed using [filter.site](#) which filters data by codes of all sites belonging to the specified country.

Value

filter.country returns data frame with the same number of columns as argument data, containing observations corresponding to the specified country.

Note

Argument data has to consist of the column named "sitecode".

Author(s)

Kristina Veljkovic

References

<http://www.imo.net/data/visual>

Rendtel J. and Arlt R., editors (2008). *IMO Handbook For Meteor Observers*. IMO, Potsdam.

See Also

[filter](#)

Examples

```
## select visual meteor data for the year 2009 from Serbia

## rate data for the year 2009
data(rate09)
filter.country(rate09, country="Serbia")

## magnitude data for the year 2009
data(magn09)
filter.country(magn09, country="Serbia")
```

filter.date	<i>Selection of visual meteor data by date(s)</i>
-------------	---

Description

Selects data for a given visual meteor dataset and specified year, month and day (or days).

Usage

```
filter.date(data, year, month, day.beg, day.end = day.beg)
```

Arguments

data	data frame consisting of visual meteor data (rate or magnitude data).
year	numeric vector of length 4 specifying year.
month	numeric vector specifying month of the year.
day.beg	numeric vector specifying the beginning day.
day.end	numeric vector specifying the ending day. By default, day.end is set to be equal to day.beg.

Details

Day given in meteor datasets corresponds to the beginning of the observing time period. In selection of the data, day corresponding to the middle of the observing time period is used.

If argument day.end is not provided, the function filter.date selects data for a given date, otherwise it selects data for a period of days, bounded by day.beg and day.end.

Value

filter.date returns data frame with the same number of columns as the argument data, containing observations which correspond to the specified date or period of days.

Note

Argument data has to consist of the columns named "year", "month" and "day".

Author(s)

Kristina Veljkovic

References

<http://www.imo.net/data/visual>

Rendtel J. and Arlt R., editors (2008). *IMO Handbook For Meteor Observers*. IMO, Potsdam.

See Also

[filter](#)

Examples

```
## select visual meteor data for the period from 5-15 August 2007

## rate data for the year 2007
data(rate07)
filter.date(rate07, year=2007, month=8, day.beg=5, day.end=15)

## magnitude data for the year 2007
data(magn07)
filter.date(magn07, year=2007, month=8, day.beg=5, day.end=15)
```

filter.F

Selection of visual meteor data by correction factor for clouds

Description

Selects data for a given visual meteor rate dataset and specified correction factor or interval of correction factors for clouds.

Usage

```
filter.F(data, F.low = 1, F.up = 3)
```

Arguments

data	data frame consisting of visual meteor rate data.
F.low	numeric vector with value between 1 (default) and 3, specifying lower boundary of correction factor for clouds.
F.up	numeric vector with value between 1 and 3 (default), specifying upper boundary of correction factor for clouds.

Details

Correction factor for clouds is calculated by the formula $F=1/(1-p)$, where p is a fraction ($0 < p < 1$) of clouds covering observing field of view.

Value

filter.F returns data frame with the same number of columns as the argument data, containing observations with the correction factors for clouds between F.low and F.up.

Note

Argument data has to consist of the column named "F".

Author(s)

Kristina Veljkovic

References

<http://www.imo.net/data/visual>

Rendtel J. and Arlt R., editors (2008). *IMO Handbook For Meteor Observers*. IMO, Potsdam.

See Also

[filter](#), [filter.totcor](#)

Examples

```
## select visual meteor data for the period between 15-30th October 2005 and
## correction factor for clouds below 1.25 (which corresponds to 20% of clouds)

## rate data for the year 2005
data(rate05)
rateOct<-filter.date(rate05,year=2005,month=10,day.beg=15,day.end=30)
filter.F(rateOct,F.up=1.25)
```

filter.gc

Selection of visual meteor data by geographical coordinates

Description

Selects data for a given visual meteor dataset and specified geographical coordinates of the observing site or interval of geographical coordinates.

Usage

```
filter.gc(data, long.low = 0, long.up = 180, ew = c("E", "W"),
          lat.low = 0, lat.up = 90, ns = c("N", "S"))
```

Arguments

data	data frame consisting of visual meteor data (rate or magnitude data).
long.low	numeric vector taking a value between 0 (default) and 180, specifying lower boundary of longitude in degrees.
long.up	numeric vector taking a value between 0 and 180 (default), specifying upper boundary of longitude in degrees.
ew	character vector (E,W), specifying east or west position from the prime meridian.
lat.low	numeric vector taking a value between 0 (default) and 90, specifying lower boundary of latitude in degrees.
lat.up	numeric vector taking a value between 0 and 90 (default), specifying upper boundary of latitude in degrees.
ns	character vector (N,S), specifying north or south position from equator.

Details

If values of arguments `long.low` and `long.up`, as well as `lat.low` and `lat.up`, are the same, `filter.gc` selects data for particular observing site.

`filter.gc` enables one to select data only by longitude or latitude, with geographical coordinates being between given boundaries, less, greater or equal to a boundary.

Value

`filter.gc` returns data frame with the same number of columns as the argument `data`, containing observations corresponding to geographical coordinates with longitude between `long.low` and `long.up` and latitude between `lat.low` and `lat.up`.

Note

Argument `data` has to consist of the columns named "long", "EW", "lat" and "NS".

Author(s)

Kristina Veljkovic

References

<http://www.imo.net/data/visual>

Rendtel J. and Arlt R., editors (2008). *IMO Handbook For Meteor Observers*. IMO, Potsdam.

See Also

[filter](#)

Examples

```
## select visual meteor data for 2004, site with longitude 19.7E and latitude 44.2N

## rate data for the year 2004
data(rate04)
filter.gc(rate04, long.low=19.7, long.up=19.7, ew="E", lat.low=44.2, lat.up=44.2, ns="N")

## magnitude data for the year 2004
data(magn04)
filter.gc(magn04, long.low=19.7, long.up=19.7, ew="E", lat.low=44.2, lat.up=44.2, ns="N")

## select visual meteor data corresponding to sites with latitude 44.2N and above
filter.gc(rate04, lat.low=44.2, ns="N")
filter.gc(magn04, lat.low=44.2, ns="N")
```

filter.h

*Selection of visual meteor data by radiant elevation***Description**

Selects data for a given visual meteor dataset, specified shower and its radiant elevation or interval of radiant elevations.

Usage

```
filter.h(data, shw, Ralpha = NULL, Delta = NULL, h.low = 10, h.up = 90)
```

Arguments

data	data frame consisting of visual meteor data (rate or magnitude data).
shw	character string consisting of three capital letters which represent meteor shower code.
Ralpha	numeric vector with value between 0 and 360, specifying right ascension of the radiant, in degrees.
Delta	numeric vector with value between -90 and +90, specifying declination of the radiant, in degrees.
h.low	numeric vector with value between 10 (default) and 90, specifying lower boundary of radiant elevation in degrees.
h.up	numeric vector with value between 10 and 90 (default), specifying upper boundary of radiant elevation in degrees.

Details

Radiant elevation h is measured from the observer's horizon towards zenith and it takes value between 10 and 90 degrees.

If right ascension and declination of shower radiant are not specified, the values from the data frame [radiant](#) are used.

Value

filter.h returns data frame containing observations corresponding to the radiant elevation between h.low and h.up.

Note

Argument data has to consist of the column named "SPO" in rate data frames (placed before the columns for showers) and columns "zero" and "Shw" in magnitude data frames.

Also, data has to consist of the columns named "long", "EW", "lat", "day", "month", "year".

Author(s)

Kristina Veljkovic

References

<http://www.imo.net/data/visual>

Rendtel J. and Arlt R., editors (2008). *IMO Handbook For Meteor Observers*. IMO, Potsdam.

See Also

[filter](#), [filter.totcor](#)

Examples

```
## select visual meteor data for the elevation of Perseids radiant between 30 and 60 degrees,
## period between 1-20th August 2011
```

```
## rate data for the year 2011
require(astroFns)
data(rate11)
ratePer<-filter.date(rate11,year=2011,month=8,day.beg=1,day.end=20)
filter.h(ratePer,shw="PER", h.low=30,h.up=60)
```

```
## magnitude data for the year 2011
data(magn11)
magnPer<-filter.date(magn11,year=2011,month=8,day.beg=1,day.end=20)
filter.h(magnPer,shw="PER",h.low=30,h.up=60)
```

filter.imocode

Selection of visual meteor data by IMO observer code

Description

Selects data for a given visual meteor dataset and specified IMO observer code.

Usage

```
filter.imocode(data, imocode)
```

Arguments

data	data frame consisting of visual meteor data (rate or magnitude data).
imocode	character string consisting of five capital letters which represent IMO observer code.

Details

IMO observer code is a combination of the first three letters of the last name and the first two letters of the first name. List of IMO observer codes can be found in the dataframe [vmdbpers](#). IMO observer codes are unique, meaning that if 5-letter combination is already used, the observer gets modified IMO code.

Value

filter.imocode returns data frame with the same number of columns as the argument data, containing values corresponding to the observer with specified IMO code.

Note

Argument data has to consist of the column named "IMOCODE".

Author(s)

Kristina Veljkovic

References

<http://www.imo.net/data/visual>

Rendtel J. and Arlt R., editors (2008). *IMO Handbook For Meteor Observers*. IMO, Potsdam.

See Also

[filter](#), [filter.obsname](#)

Examples

```
## select visual meteor data for 2010. corresponding to the observer with IMO code SAVBR

## rate data for the year 2010
data(rate10)
filter.imocode(rate10, imocode="SAVBR")

## magnitude data for the year 2010
data(magn10)
filter.imocode(magn10, imocode="SAVBR")
```

`filter.mag`*Selection of visual meteor data by limiting magnitude*

Description

Selects data for a given visual meteor dataset and specified limiting magnitude or interval of magnitudes.

Usage

```
filter.mag(data, mag.low = 2, mag.up = 7.5)
```

Arguments

<code>data</code>	data frame consisting of visual meteor data (rate or magnitude data).
<code>mag.low</code>	numeric vector with value between 2.0 (default) and 7.5, specifying lower boundary of limiting magnitude.
<code>mag.up</code>	numeric vector with value between 2.0 and 7.5 (default), specifying upper boundary of limiting magnitude.

Value

`filter.mag` returns data frame with the same number of columns as the argument `data`, containing observations with the limiting magnitudes between `mag.low` and `mag.up`.

Note

Argument `data` has to consist of the column named "lmg".

Author(s)

Kristina Veljkovic

References

<http://www.imo.net/data/visual>

Rendtel J. and Arlt R., editors (2008). *IMO Handbook For Meteor Observers*. IMO, Potsdam.

See Also

[filter](#), [filter.totcor](#)

Examples

```
## select visual meteor data for 13th August 2007, limiting magnitude between 5.5 and 6.5

## rate data for the year 2007
data(rate07)
rate1308<-filter.date(rate07,year=2007,month=8,day.beg=13)
filter.mag(rate1308,mag.low=5.5,mag.up=6.5)

## magnitude data for the year 2007
data(magn07)
magn1308<-filter.date(magn07,year=2007,month=8,day.beg=13)
filter.mag(magn1308,mag.low=5.5,mag.up=6.5)

## select visual meteor data for the 12th August 2007 and limiting magnitude above 5.5
filter.mag(rate1308,mag.low=5.5)
filter.mag(magn1308,mag.low=5.5)
```

filter.obsname	<i>Selection of visual meteor data by observer's first and last name</i>
----------------	--

Description

Selects data for a given visual meteor dataset and specified observer's first and last name.

Usage

```
filter.obsname(data, name, fname)
```

Arguments

data	data frame consisting of visual meteor data (rate or magnitude data).
name	character string specifying observer's last name.
fname	character string specifying observer's first name.

Details

List of observer's names can be found in the data frame [vmdbpers](#).

filter.obsname can be used when one is not certain of IMO observer code (due to possible non-uniqueness of five letter combination).

Value

filter.obsname returns data frame with the same number of columns as the argument data, containing values which correspond to the observer with specified first and last name.

Note

Argument data has to consist of the column named "IMOCODE".

Author(s)

Kristina Veljkovic

References

<http://www.imo.net/data/visual>

Rendtel J. and Arlt R., editors (2008). *IMO Handbook For Meteor Observers*. IMO, Potsdam.

See Also

[filter.imocode](#), [filter](#)

Examples

```
## select visual meteor data for the year 2004 corresponding to Ivana Marjanovic

## rate data for the year 2004
data(rate04)
filter.obsname(rate04,name="Marjanovic",fname="Ivana")

## magnitude data for the year 2004
data(magn04)
filter.obsname(magn04,name="Marjanovic",fname="Ivana")
```

filter.shw

Selection of visual meteor data by shower code

Description

Selects data for a given visual meteor dataset and specified shower code.

Usage

```
filter.shw(data, shw)
```

Arguments

data	data frame consisting of visual meteor data (rate or magnitude data).
shw	character string consisting of three capital letters which represent meteor shower code.

Details

List of meteor shower codes can be found in the dataframe [shw_list](#).

Value

filter.shw returns data frame containing observations which correspond to specified meteor shower.

Note

Argument data has to consist of the column named "SPO" in rate data frames (placed before the columns for showers) and columns "zero" and "Shw" in magnitude data frames.

Author(s)

Kristina Veljkovic

References

<http://www.imo.net/data/visual>

Rendtel J. and Arlt R., editors (2008). *IMO Handbook For Meteor Observers*. IMO, Potsdam.

See Also

[filter](#)

Examples

```
## select visual meteor data for Perseids 2000

## rate data for the year 2000
data(rate00)
filter.shw(rate00,shw="PER")

## magnitude data for the year 2000
data(magn00)
filter.shw(magn00,shw="PER")
```

filter.site

Selection of visual meteor data by observing site

Description

Selects data for a given visual meteor dataset and specified observing site.

Usage

```
filter.site(data, site)
```

Arguments

data data frame consisting of visual meteor data (rate or magnitude data).
site character string specifying name of the observing site.

Details

List of site names can be found in the dataframe [vmdbsite](#).

Value

`filter.site` returns data frame with the same number of columns as the argument data, containing observations which correspond to specified observing site.

Note

Argument data has to consist of the column named "sitecode".

Author(s)

Kristina Veljkovic

References

<http://www.imo.net/data/visual>

Rendtel J. and Arlt R., editors (2008). *IMO Handbook For Meteor Observers*. IMO, Potsdam.

See Also

[filter](#), [filter.country](#)

Examples

```
## select visual meteor data for the year 2009 from Debelo brdo site

## rate data for the year 2009
data(rate09)
filter.site(rate09,site="Debelo brdo")

## magnitude data for the year 2009
data(magn09)
filter.site(magn09,site="Debelo brdo")
```

`filter.sol`

Selection of visual meteor data by solar longitude

Description

Selects data for a given visual meteor dataset and specified solar longitude or interval of solar longitudes.

Usage

```
filter.sol(data, sol.low = 0, sol.up = 359.999)
```

Arguments

data	data frame consisting of visual meteor data (rate or magnitude data).
sol.low	numeric vector with value between 0 (default) and 359.999, specifying lower boundary of solar longitude in degrees.
sol.up	numeric vector with value between 0 and 359.999 (default), specifying upper boundary of solar longitude in degrees.

Value

filter.sol returns data frame with the same number of columns as the argument data, containing observations with solar longitudes between sol.low and sol.up.

Note

Argument data has to consist of the column named "sollong".

Author(s)

Kristina Veljkovic

References

<http://www.imo.net/data/visual>

Rendtel J. and Arlt R., editors (2008). *IMO Handbook For Meteor Observers*. IMO, Potsdam.

See Also

[filter,solar.long](#)

Examples

```
## select visual meteor data for 2005. with solar longitudes between 200 and 215 degrees

## rate data for the year 2005
require(astroFns)
data(rate05)
filter.sol(rate05,sol.low=200,sol.up=215)

## magnitude data for the year 2005
data(magn05)
filter.sol(magn05,sol.low=200,sol.up=215)
```

filter.time	<i>Selection of visual meteor data by time period</i>
-------------	---

Description

Selects data for a given visual meteor dataset and specified time period.

Usage

```
filter.time(data, time.low = 0, time.up = 2359)
```

Arguments

data	data frame consisting of visual meteor data (rate or magnitude data).
time.low	numeric vector (0-2359) specifying lower boundary of time in hours and minutes.
time.up	numeric vector(0-2359) specifying upper boundary of time in hours and minutes.

Value

filter.time returns data frame with the same number of columns as the argument data, containing observations which correspond to the period of time bounded by time.low and time.up.

Note

Argument data has to consist of the columns named "start" and "stop".

Author(s)

Kristina Veljkovic

References

<http://www.imo.net/data/visual>

Rendtel J. and Arlt R., editors (2008). *IMO Handbook For Meteor Observers*. IMO, Potsdam.

See Also

[filter](#), [filter.date](#)

Examples

```
## select visual meteor data for the 12th August 2007, from 2100-2359 UTC.

## rate data for the year 2007
data(rate07)
rate1208<-filter.date(rate07,year=2007,month=8,day.beg=12)
filter.time(rate1208,time.low=2100,time.up=2359)

## magnitude data for the year 2007
data(magn07)
magn1208<-filter.date(magn07,year=2007,month=8,day.beg=12)
filter.time(magn1208,time.low=2100,time.up=2359)
```

filter.totcor

Selection of visual meteor data by total correction factor

Description

Selects data for a given visual meteor rate dataset, specified shower, population index and total correction factor.

Usage

```
filter.totcor(data, shw, Ralpha = NULL, Delta = NULL, r, C = 5)
```

Arguments

data	data frame consisting of visual meteor rate data.
shw	character string consisting of three capital letters which represent meteor shower code.
Ralpha	numeric vector with value between 0 and 360, specifying right ascension of the radiant, in degrees.
Delta	numeric vector with value between -90 and +90, specifying declination of the radiant, in degrees.
r	numeric vector specifying population index of a meteor shower.
C	numeric vector specifying maximum correction factor. C=5 is set as a default value.

Details

Correction factor accounts for all non-ideal observing conditions such as clouds, low radiant, low limiting magnitude.

Correction factor is equal to $C=r^{(6.5-lmg)F/\sin(h)}$, where r is population index, lmg limiting magnitude, F correction factor for clouds, h radiant elevation.

If right ascension and declination of shower radiant are not specified, the values from the data frame [radiant](#) are used.

Value

filter.correct returns data frame containing observations with correction factors upper bounded by argument C.

Note

Argument data has to consist of the columns named "SPO" (placed before the columns for showers), "long", "EW", "lat", "day", "month", "year", "lmg" and "F".

Author(s)

Kristina Veljkovic

References

<http://www.imo.net/data/visual>

Rendtel J. and Arlt R., editors (2008). *IMO Handbook For Meteor Observers*. IMO, Potsdam.

See Also

[filter](#), [filter.F](#), [filter.mag,zhr](#)

Examples

```
## select visual meteor data for the period between 15-30 October 2006 and then
## select observations of Orionids with maximum correction factor equal to 5

## rate data for the year 2006
require(astroFns)
data(rate06)
rateOri<-filter.date(rate06,year=2006,month=10,day.beg=15,day.end=30)
filter.totcor(rateOri,shw="ORI",r=2.5)
```

mag.distr

Graphics of magnitude distribution

Description

Graphical representation of magnitude distribution for a given magnitude dataset, specified meteor shower and period of days.

Usage

```
mag.distr(data,year, month, day.beg, day.end=day.beg, shw)
```

Arguments

data	data frame consisting of visual meteor magnitude data.
year	numeric vector of length 4 specifying year.
month	numeric vector specifying month of the year.
day.beg	numeric vector specifying beginning day.
day.end	numeric vector specifying ending day.
shw	character string consisting of three capital letters which represent meteor shower code.

Details

Summarized magnitude distribution is formed by summing frequencies of all observers for each magnitude value.

Value

Plot of summarized magnitude distribution consisting of histogram and boxplot.

The histogram cells are intervals of the magnitudes of the form [a, b).

Note

Argument data has to consist of the columns named "m6" and "p7".

Author(s)

Kristina Veljkovic

References

<http://www.imo.net/data/visual>

See Also

[pop.index](#)

Examples

```
## select data for observations of Perseids, period 12-14th August 2007
## and make graphics of magnitude distribution
data(magn07)
magnPer<-filter(magn07,shw="PER", year=2007, month=8, day.beg=12, day.end=14)
mag.distr(magnPer,year=2007, month=8, day.beg=12, day.end=14, shw="PER")
```

magn00

*Magnitude data for the year 2000***Description**

Visual meteor magnitude dataset for the year 2000.

Usage

magn00

Format

A data frame with 9311 observations on the following 29 variables.

IMOcode factor IMO observer code

sitcode numeric IMO site code

long numeric Longitude of the observing site in degrees

EW factor East (E) or west (W) position from the prime meridian

lat numeric Latitude of the observing site in degrees

NS factor North (N) or south (S) position from the equator

day numeric Day of the month

month numeric Month of the year

year numeric Year 2000

start numeric Beginning of the observing time period

stop numeric End of the observing time period

sollong numeric Solar longitude of the middle of observing time period

Shw factor Abbreviation of the observed shower

lmg numeric Limiting magnitude

m6 numeric Number of observed meteors of -6 magnitude

m5 numeric Number of observed meteors of -5 magnitude

m4 numeric Number of observed meteors of -4 magnitude

m3 numeric Number of observed meteors of -3 magnitude

m2 numeric Number of observed meteors of -2 magnitude

m1 numeric Number of observed meteors of -1 magnitude

zero numeric Number of observed meteors of 0 magnitude

p1 numeric Number of observed meteors of +1 magnitude

p2 numeric Number of observed meteors of +2 magnitude

p3 numeric Number of observed meteors of +3 magnitude

p4 numeric Number of observed meteors of +4 magnitude

p5 numeric Number of observed meteors of +5 magnitude
 p6 numeric Number of observed meteors of +6 magnitude
 p7 numeric Number of observed meteors of +7 magnitude
 N numeric Total number of observed meteors

Source

Visual Meteor Database, <http://www.imo.net/data/visual>

magn01	<i>Magnitude data for the year 2001</i>
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Description

Visual meteor magnitude dataset for the year 2001.

Usage

magn01

Format

A data frame with 13731 observations on the following 29 variables.

IMOcode factor IMO observer code
 sitecode numeric IMO site code
 long numeric Longitude of the observing site in degrees
 EW factor East (E) or west (W) position from the prime meridian
 lat numeric Latitude of the observing site in degrees
 NS factor North (N) or south (S) position from the equator
 day numeric Day of the month
 month numeric Month of the year
 year numeric Year 2001
 start numeric Beginning of the observing time period
 stop numeric End of the observing time period
 sollong numeric Solar longitude of the middle of observing time period
 Shw factor Abbreviation of the observed shower
 lmg numeric Limiting magnitude
 m6 numeric Number of observed meteors of -6 magnitude
 m5 numeric Number of observed meteors of -5 magnitude
 m4 numeric Number of observed meteors of -4 magnitude
 m3 numeric Number of observed meteors of -3 magnitude

m2 numeric Number of observed meteors of -2 magnitude
 m1 numeric Number of observed meteors of -1 magnitude
 zero numeric Number of observed meteors of 0 magnitude
 p1 numeric Number of observed meteors of +1 magnitude
 p2 numeric Number of observed meteors of +2 magnitude
 p3 numeric Number of observed meteors of +3 magnitude
 p4 numeric Number of observed meteors of +4 magnitude
 p5 numeric Number of observed meteors of +5 magnitude
 p6 numeric Number of observed meteors of +6 magnitude
 p7 numeric Number of observed meteors of +7 magnitude
 N numeric Total number of observed meteors

Source

Visual Meteor Database, <http://www.imo.net/data/visual>

magn04	<i>Magnitude data for the year 2004</i>
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Description

Visual meteor magnitude dataset for the year 2004.

Usage

magn04

Format

A data frame with 12742 observations on the following 29 variables.

IMOcode factor IMO observer code
 sitecode numeric IMO site code
 long numeric Longitude of the observing site in degrees
 EW factor East (E) or west (W) position from the prime meridian
 lat numeric Latitude of the observing site in degrees
 NS factor North (N) or south (S) position from the equator
 day numeric Day of the month
 month numeric Month of the year
 year numeric Year 2004
 start numeric Beginning of the observing time period
 stop numeric End of the observing time period

sollong numeric Solar longitude of the middle of observing time period
 Shw factor Abbreviation of the observed shower
 lmg numeric Limiting magnitude
 m6 numeric Number of observed meteors of -6 magnitude
 m5 numeric Number of observed meteors of -5 magnitude
 m4 numeric Number of observed meteors of -4 magnitude
 m3 numeric Number of observed meteors of -3 magnitude
 m2 numeric Number of observed meteors of -2 magnitude
 m1 numeric Number of observed meteors of -1 magnitude
 zero numeric Number of observed meteors of 0 magnitude
 p1 numeric Number of observed meteors of +1 magnitude
 p2 numeric Number of observed meteors of +2 magnitude
 p3 numeric Number of observed meteors of +3 magnitude
 p4 numeric Number of observed meteors of +4 magnitude
 p5 numeric Number of observed meteors of +5 magnitude
 p6 numeric Number of observed meteors of +6 magnitude
 p7 numeric Number of observed meteors of +7 magnitude
 N numeric Total number of observed meteors

Source

Visual Meteor Database, <http://www.imo.net/data/visual>

magn05

Magnitude data for the year 2005

Description

Visual meteor magnitude dataset for the year 2005.

Usage

magn05

Format

A data frame with 7271 observations on the following 29 variables.

IMOcode factor IMO observer code

sitocode numeric IMO site code

long numeric Longitude of the observing site in degrees

EW factor East (E) or west (W) position from the prime meridian

lat numeric Latitude of the observing site in degrees

NS factor North (N) or south (S) position from the equator

day numeric Day of the month

month numeric Month of the year

year numeric Year 2005

start numeric Beginning of the observing time period

stop numeric End of the observing time period

sollong numeric Solar longitude of the middle of observing time period

Shw factor Abbreviation of the observed shower

lmg numeric Limiting magnitude

m6 numeric Number of observed meteors of -6 magnitude

m5 numeric Number of observed meteors of -5 magnitude

m4 numeric Number of observed meteors of -4 magnitude

m3 numeric Number of observed meteors of -3 magnitude

m2 numeric Number of observed meteors of -2 magnitude

m1 numeric Number of observed meteors of -1 magnitude

zero numeric Number of observed meteors of 0 magnitude

p1 numeric Number of observed meteors of +1 magnitude

p2 numeric Number of observed meteors of +2 magnitude

p3 numeric Number of observed meteors of +3 magnitude

p4 numeric Number of observed meteors of +4 magnitude

p5 numeric Number of observed meteors of +5 magnitude

p6 numeric Number of observed meteors of +6 magnitude

p7 numeric Number of observed meteors of +7 magnitude

N numeric Total number of observed meteors

Source

Visual Meteor Database, <http://www.imo.net/data/visual>

magn06

*Magnitude data for the year 2006***Description**

Visual meteor magnitude dataset for the year 2006.

Usage

magn06

Format

A data frame with 5801 observations on the following 29 variables.

IMOcode factor IMO observer code

sitcode numeric IMO site code

long numeric Longitude of the observing site in degrees

EW factor East (E) or west (W) position from the prime meridian

lat numeric Latitude of the observing site in degrees

NS factor North (N) or south (S) position from the equator

day numeric Day of the month

month numeric Month of the year

year numeric Year 2006

start numeric Beginning of the observing time period

stop numeric End of the observing time period

sollong numeric Solar longitude of the middle of observing time period

Shw factor Abbreviation of the observed shower

lmg numeric Limiting magnitude

m6 numeric Number of observed meteors of -6 magnitude

m5 numeric Number of observed meteors of -5 magnitude

m4 numeric Number of observed meteors of -4 magnitude

m3 numeric Number of observed meteors of -3 magnitude

m2 numeric Number of observed meteors of -2 magnitude

m1 numeric Number of observed meteors of -1 magnitude

zero numeric Number of observed meteors of 0 magnitude

p1 numeric Number of observed meteors of +1 magnitude

p2 numeric Number of observed meteors of +2 magnitude

p3 numeric Number of observed meteors of +3 magnitude

p4 numeric Number of observed meteors of +4 magnitude

p5 numeric Number of observed meteors of +5 magnitude
 p6 numeric Number of observed meteors of +6 magnitude
 p7 numeric Number of observed meteors of +7 magnitude
 N numeric Total number of observed meteors

Source

Visual Meteor Database, <http://www.imo.net/data/visual>

magn07

Magnitude data for the year 2007

Description

Visual meteor magnitude dataset for the year 2007.

Usage

magn07

Format

A data frame with 5249 observations on the following 29 variables.

IMOcode factor IMO observer code
 sitecode numeric IMO site code
 long numeric Longitude of the observing site in degrees
 EW factor East (E) or west (W) position from the prime meridian
 lat numeric Latitude of the observing site in degrees
 NS factor North (N) or south (S) position from the equator
 day numeric Day of the month
 month numeric Month of the year
 year numeric Year 2007
 start numeric Beginning of the observing time period
 stop numeric End of the observing time period
 sollong numeric Solar longitude of the middle of observing time period
 Shw factor Abbreviation of the observed shower
 lmg numeric Limiting magnitude
 m6 numeric Number of observed meteors of -6 magnitude
 m5 numeric Number of observed meteors of -5 magnitude
 m4 numeric Number of observed meteors of -4 magnitude
 m3 numeric Number of observed meteors of -3 magnitude

m2 numeric Number of observed meteors of -2 magnitude
 m1 numeric Number of observed meteors of -1 magnitude
 zero numeric Number of observed meteors of 0 magnitude
 p1 numeric Number of observed meteors of +1 magnitude
 p2 numeric Number of observed meteors of +2 magnitude
 p3 numeric Number of observed meteors of +3 magnitude
 p4 numeric Number of observed meteors of +4 magnitude
 p5 numeric Number of observed meteors of +5 magnitude
 p6 numeric Number of observed meteors of +6 magnitude
 p7 numeric Number of observed meteors of +7 magnitude
 N numeric Total number of observed meteors

Source

Visual Meteor Database, <http://www.imo.net/data/visual>

magn08	<i>Magnitude data for the year 2008</i>
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Description

Visual meteor magnitude dataset for the year 2008.

Usage

magn08

Format

A data frame with 729 observations on the following 29 variables.

IMOcode factor IMO observer code
 sitecode numeric IMO site code
 long numeric Longitude of the observing site in degrees
 EW factor East (E) or west (W) position from the prime meridian
 lat numeric Latitude of the observing site in degrees
 NS factor North (N) or south (S) position from the equator
 day numeric Day of the month
 month numeric Month of the year
 year numeric Year 2008
 start numeric Beginning of the observing time period
 stop numeric End of the observing time period

solllong numeric Solar longitude of the middle of observing time period
 Shw factor Abbreviation of the observed shower
 lmg numeric Limiting magnitude
 m6 numeric Number of observed meteors of -6 magnitude
 m5 numeric Number of observed meteors of -5 magnitude
 m4 numeric Number of observed meteors of -4 magnitude
 m3 numeric Number of observed meteors of -3 magnitude
 m2 numeric Number of observed meteors of -2 magnitude
 m1 numeric Number of observed meteors of -1 magnitude
 zero numeric Number of observed meteors of 0 magnitude
 p1 numeric Number of observed meteors of +1 magnitude
 p2 numeric Number of observed meteors of +2 magnitude
 p3 numeric Number of observed meteors of +3 magnitude
 p4 numeric Number of observed meteors of +4 magnitude
 p5 numeric Number of observed meteors of +5 magnitude
 p6 numeric Number of observed meteors of +6 magnitude
 p7 numeric Number of observed meteors of +7 magnitude
 N numeric Total number of observed meteors

Source

Visual Meteor Database, <http://www.imo.net/data/visual>

magn09

Magnitude data for the year 2009

Description

Visual meteor magnitude dataset for the year 2009.

Usage

magn09

Format

A data frame with 3486 observations on the following 29 variables.

IMOcode factor IMO observer code
sitecode numeric IMO site code
long numeric Longitude of the observing site in degrees
EW factor East (E) or west (W) position from the prime meridian
lat numeric Latitude of the observing site in degrees
NS factor North (N) or south (S) position from the equator
day numeric Day of the month
month numeric Month of the year
year numeric Year 2009
start numeric Beginning of the observing time period
stop numeric End of the observing time period
sollong numeric Solar longitude of the middle of observing time period
Shw factor Abbreviation of the observed shower
lmg numeric Limiting magnitude
m6 numeric Number of observed meteors of -6 magnitude
m5 numeric Number of observed meteors of -5 magnitude
m4 numeric Number of observed meteors of -4 magnitude
m3 numeric Number of observed meteors of -3 magnitude
m2 numeric Number of observed meteors of -2 magnitude
m1 numeric Number of observed meteors of -1 magnitude
zero numeric Number of observed meteors of 0 magnitude
p1 numeric Number of observed meteors of +1 magnitude
p2 numeric Number of observed meteors of +2 magnitude
p3 numeric Number of observed meteors of +3 magnitude
p4 numeric Number of observed meteors of +4 magnitude
p5 numeric Number of observed meteors of +5 magnitude
p6 numeric Number of observed meteors of +6 magnitude
p7 numeric Number of observed meteors of +7 magnitude
N numeric Total number of observed meteors

Source

Visual Meteor Database, <http://www.imo.net/data/visual>

magn10

*Magnitude data for the year 2010***Description**

Visual meteor magnitude dataset for the year 2010.

Usage

magn10

Format

A data frame with 5426 observations on the following 29 variables.

IMOcode factor IMO observer code

sitcode numeric IMO site code

long numeric Longitude of the observing site in degrees

EW factor East (E) or west (W) position from the prime meridian

lat numeric Latitude of the observing site in degrees

NS factor North (N) or south (S) position from the equator

day numeric Day of the month

month numeric Month of the year

year numeric Year 2010

start numeric Beginning of the observing time period

stop numeric End of the observing time period

sollong numeric Solar longitude of the middle of observing time period

Shw factor Abbreviation of the observed shower

lmg numeric Limiting magnitude

m6 numeric Number of observed meteors of -6 magnitude

m5 numeric Number of observed meteors of -5 magnitude

m4 numeric Number of observed meteors of -4 magnitude

m3 numeric Number of observed meteors of -3 magnitude

m2 numeric Number of observed meteors of -2 magnitude

m1 numeric Number of observed meteors of -1 magnitude

zero numeric Number of observed meteors of 0 magnitude

p1 numeric Number of observed meteors of +1 magnitude

p2 numeric Number of observed meteors of +2 magnitude

p3 numeric Number of observed meteors of +3 magnitude

p4 numeric Number of observed meteors of +4 magnitude

p5 numeric Number of observed meteors of +5 magnitude
 p6 numeric Number of observed meteors of +6 magnitude
 p7 numeric Number of observed meteors of +7 magnitude
 N numeric Total number of observed meteors

Source

Visual Meteor Database, <http://www.imo.net/data/visual>

magn11	<i>Magnitude data for the year 2011</i>
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Description

Visual meteor magnitude dataset for the year 2011.

Usage

magn11

Format

A data frame with 5426 observations on the following 29 variables.

IMOcode factor IMO observer code
 sitecode numeric IMO site code
 long numeric Longitude of the observing site in degrees
 EW factor East (E) or west (W) position from the prime meridian
 lat numeric Latitude of the observing site in degrees
 NS factor North (N) or south (S) position from the equator
 day numeric Day of the month
 month numeric Month of the year
 year numeric Year 2011
 start numeric Beginning of the observing time period
 stop numeric End of the observing time period
 sollong numeric Solar longitude of the middle of observing time period
 Shw factor Abbreviation of the observed shower
 lmg numeric Limiting magnitude
 m6 numeric Number of observed meteors of -6 magnitude
 m5 numeric Number of observed meteors of -5 magnitude
 m4 numeric Number of observed meteors of -4 magnitude
 m3 numeric Number of observed meteors of -3 magnitude

m2 numeric Number of observed meteors of -2 magnitude
 m1 numeric Number of observed meteors of -1 magnitude
 zero numeric Number of observed meteors of 0 magnitude
 p1 numeric Number of observed meteors of +1 magnitude
 p2 numeric Number of observed meteors of +2 magnitude
 p3 numeric Number of observed meteors of +3 magnitude
 p4 numeric Number of observed meteors of +4 magnitude
 p5 numeric Number of observed meteors of +5 magnitude
 p6 numeric Number of observed meteors of +6 magnitude
 p7 numeric Number of observed meteors of +7 magnitude
 N numeric Total number of observed meteors

Source

Visual Meteor Database, <http://www.imo.net/data/visual>

magn84	<i>Magnitude data for the year 1984</i>
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Description

Visual meteor magnitude dataset for the year 1984.

Usage

magn84

Format

A data frame with 81 observations on the following 29 variables.

IMOcode factor IMO observer code
 sitecode numeric IMO site code
 long numeric Longitude of the observing site in degrees
 EW factor East (E) or west (W) position from the prime meridian
 lat numeric Latitude of the observing site in degrees
 NS factor North (N) or south (S) position from the equator
 day numeric Day of the month
 month numeric Month of the year
 year numeric Year 1984
 start numeric Beginning of the observing time period
 stop numeric End of the observing time period

sollong numeric Solar longitude of the middle of observing time period
 Shw factor Abbreviation of the observed shower
 lmg numeric Limiting magnitude
 m6 numeric Number of observed meteors of -6 magnitude
 m5 numeric Number of observed meteors of -5 magnitude
 m4 numeric Number of observed meteors of -4 magnitude
 m3 numeric Number of observed meteors of -3 magnitude
 m2 numeric Number of observed meteors of -2 magnitude
 m1 numeric Number of observed meteors of -1 magnitude
 zero numeric Number of observed meteors of 0 magnitude
 p1 numeric Number of observed meteors of +1 magnitude
 p2 numeric Number of observed meteors of +2 magnitude
 p3 numeric Number of observed meteors of +3 magnitude
 p4 numeric Number of observed meteors of +4 magnitude
 p5 numeric Number of observed meteors of +5 magnitude
 p6 numeric Number of observed meteors of +6 magnitude
 p7 numeric Number of observed meteors of +7 magnitude
 N numeric Total number of observed meteors

Source

Visual Meteor Database, <http://www.imo.net/data/visual>

magn86

Magnitude data for the year 1986

Description

Visual meteor magnitude dataset for the year 1986.

Usage

magn86

Format

A data frame with 816 observations on the following 29 variables.

IMOcode factor IMO observer code
sitecode numeric IMO site code
long numeric Longitude of the observing site in degrees
EW factor East (E) or west (W) position from the prime meridian
lat numeric Latitude of the observing site in degrees
NS factor North (N) or south (S) position from the equator
day numeric Day of the month
month numeric Month of the year
year numeric Year 1986
start numeric Beginning of the observing time period
stop numeric End of the observing time period
sollong numeric Solar longitude of the middle of observing time period
Shw factor Abbreviation of the observed shower
lmg numeric Limiting magnitude
m6 numeric Number of observed meteors of -6 magnitude
m5 numeric Number of observed meteors of -5 magnitude
m4 numeric Number of observed meteors of -4 magnitude
m3 numeric Number of observed meteors of -3 magnitude
m2 numeric Number of observed meteors of -2 magnitude
m1 numeric Number of observed meteors of -1 magnitude
zero numeric Number of observed meteors of 0 magnitude
p1 numeric Number of observed meteors of +1 magnitude
p2 numeric Number of observed meteors of +2 magnitude
p3 numeric Number of observed meteors of +3 magnitude
p4 numeric Number of observed meteors of +4 magnitude
p5 numeric Number of observed meteors of +5 magnitude
p6 numeric Number of observed meteors of +6 magnitude
p7 numeric Number of observed meteors of +7 magnitude
N numeric Total number of observed meteors

Source

Visual Meteor Database, <http://www.imo.net/data/visual>

magn87

*Magnitude data for the year 1987***Description**

Visual meteor magnitude dataset for the year 1987.

Usage

magn87

Format

A data frame with 331 observations on the following 29 variables.

IMOcode factor IMO observer code

sitcode numeric IMO site code

long numeric Longitude of the observing site in degrees

EW factor East (E) or west (W) position from the prime meridian

lat numeric Latitude of the observing site in degrees

NS factor North (N) or south (S) position from the equator

day numeric Day of the month

month numeric Month of the year

year numeric Year 1987

start numeric Beginning of the observing time period

stop numeric End of the observing time period

sollong numeric Solar longitude of the middle of observing time period

Shw factor Abbreviation of the observed shower

lmg numeric Limiting magnitude

m6 numeric Number of observed meteors of -6 magnitude

m5 numeric Number of observed meteors of -5 magnitude

m4 numeric Number of observed meteors of -4 magnitude

m3 numeric Number of observed meteors of -3 magnitude

m2 numeric Number of observed meteors of -2 magnitude

m1 numeric Number of observed meteors of -1 magnitude

zero numeric Number of observed meteors of 0 magnitude

p1 numeric Number of observed meteors of +1 magnitude

p2 numeric Number of observed meteors of +2 magnitude

p3 numeric Number of observed meteors of +3 magnitude

p4 numeric Number of observed meteors of +4 magnitude

p5 numeric Number of observed meteors of +5 magnitude
 p6 numeric Number of observed meteors of +6 magnitude
 p7 numeric Number of observed meteors of +7 magnitude
 N numeric Total number of observed meteors

Source

Visual Meteor Database, <http://www.imo.net/data/visual>

magn94

Magnitude data for the year 1994

Description

Visual meteor magnitude dataset for the year 1994.

Usage

magn94

Format

A data frame with 4856 observations on the following 29 variables.

IMOcode factor IMO observer code
 sitecode numeric IMO site code
 long numeric Longitude of the observing site in degrees
 EW factor East (E) or west (W) position from the prime meridian
 lat numeric Latitude of the observing site in degrees
 NS factor North (N) or south (S) position from the equator
 day numeric Day of the month
 month numeric Month of the year
 year numeric Year 1994
 start numeric Beginning of the observing time period
 stop numeric End of the observing time period
 sollong numeric Solar longitude of the middle of observing time period
 Shw factor Abbreviation of the observed shower
 lmg numeric Limiting magnitude
 m6 numeric Number of observed meteors of -6 magnitude
 m5 numeric Number of observed meteors of -5 magnitude
 m4 numeric Number of observed meteors of -4 magnitude
 m3 numeric Number of observed meteors of -3 magnitude

m2 numeric Number of observed meteors of -2 magnitude
 m1 numeric Number of observed meteors of -1 magnitude
 zero numeric Number of observed meteors of 0 magnitude
 p1 numeric Number of observed meteors of +1 magnitude
 p2 numeric Number of observed meteors of +2 magnitude
 p3 numeric Number of observed meteors of +3 magnitude
 p4 numeric Number of observed meteors of +4 magnitude
 p5 numeric Number of observed meteors of +5 magnitude
 p6 numeric Number of observed meteors of +6 magnitude
 p7 numeric Number of observed meteors of +7 magnitude
 N numeric Total number of observed meteors

Source

Visual Meteor Database, <http://www.imo.net/data/visual>

magn95	<i>Magnitude data for the year 1995</i>
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Description

Visual meteor magnitude dataset for the year 1995.

Usage

magn95

Format

A data frame with 7751 observations on the following 29 variables.

IMOcode factor IMO observer code
 sitecode numeric IMO site code
 long numeric Longitude of the observing site in degrees
 EW factor East (E) or west (W) position from the prime meridian
 lat numeric Latitude of the observing site in degrees
 NS factor North (N) or south (S) position from the equator
 day numeric Day of the month
 month numeric Month of the year
 year numeric Year 1995
 start numeric Beginning of the observing time period
 stop numeric End of the observing time period

sollong numeric Solar longitude of the middle of observing time period
 Shw factor Abbreviation of the observed shower
 lmg numeric Limiting magnitude
 m6 numeric Number of observed meteors of -6 magnitude
 m5 numeric Number of observed meteors of -5 magnitude
 m4 numeric Number of observed meteors of -4 magnitude
 m3 numeric Number of observed meteors of -3 magnitude
 m2 numeric Number of observed meteors of -2 magnitude
 m1 numeric Number of observed meteors of -1 magnitude
 zero numeric Number of observed meteors of 0 magnitude
 p1 numeric Number of observed meteors of +1 magnitude
 p2 numeric Number of observed meteors of +2 magnitude
 p3 numeric Number of observed meteors of +3 magnitude
 p4 numeric Number of observed meteors of +4 magnitude
 p5 numeric Number of observed meteors of +5 magnitude
 p6 numeric Number of observed meteors of +6 magnitude
 p7 numeric Number of observed meteors of +7 magnitude
 N numeric Total number of observed meteors

Source

Visual Meteor Database, <http://www.imo.net/data/visual>

magn97

Magnitude data for the year 1997

Description

Visual meteor magnitude dataset for the year 1997.

Usage

magn97

Format

A data frame with 9208 observations on the following 29 variables.

IMOcode factor IMO observer code
sitecode numeric IMO site code
long numeric Longitude of the observing site in degrees
EW factor East (E) or west (W) position from the prime meridian
lat numeric Latitude of the observing site in degrees
NS factor North (N) or south (S) position from the equator
day numeric Day of the month
month numeric Month of the year
year numeric Year 1997
start numeric Beginning of the observing time period
stop numeric End of the observing time period
sollong numeric Solar longitude of the middle of observing time period
Shw factor Abbreviation of the observed shower
lmg numeric Limiting magnitude
m6 numeric Number of observed meteors of -6 magnitude
m5 numeric Number of observed meteors of -5 magnitude
m4 numeric Number of observed meteors of -4 magnitude
m3 numeric Number of observed meteors of -3 magnitude
m2 numeric Number of observed meteors of -2 magnitude
m1 numeric Number of observed meteors of -1 magnitude
zero numeric Number of observed meteors of 0 magnitude
p1 numeric Number of observed meteors of +1 magnitude
p2 numeric Number of observed meteors of +2 magnitude
p3 numeric Number of observed meteors of +3 magnitude
p4 numeric Number of observed meteors of +4 magnitude
p5 numeric Number of observed meteors of +5 magnitude
p6 numeric Number of observed meteors of +6 magnitude
p7 numeric Number of observed meteors of +7 magnitude
N numeric Total number of observed meteors

Source

Visual Meteor Database, <http://www.imo.net/data/visual>

magn98

*Magnitude data for the year 1998***Description**

Visual meteor magnitude dataset for the year 1998.

Usage

magn98

Format

A data frame with 10520 observations on the following 29 variables.

IMOcode factor IMO observer code

sitcode numeric IMO site code

long numeric Longitude of the observing site in degrees

EW factor East (E) or west (W) position from the prime meridian

lat numeric Latitude of the observing site in degrees

NS factor North (N) or south (S) position from the equator

day numeric Day of the month

month numeric Month of the year

year numeric Year 1998

start numeric Beginning of the observing time period

stop numeric End of the observing time period

sollong numeric Solar longitude of the middle of observing time period

Shw factor Abbreviation of the observed shower

lmg numeric Limiting magnitude

m6 numeric Number of observed meteors of -6 magnitude

m5 numeric Number of observed meteors of -5 magnitude

m4 numeric Number of observed meteors of -4 magnitude

m3 numeric Number of observed meteors of -3 magnitude

m2 numeric Number of observed meteors of -2 magnitude

m1 numeric Number of observed meteors of -1 magnitude

zero numeric Number of observed meteors of 0 magnitude

p1 numeric Number of observed meteors of +1 magnitude

p2 numeric Number of observed meteors of +2 magnitude

p3 numeric Number of observed meteors of +3 magnitude

p4 numeric Number of observed meteors of +4 magnitude

p5 numeric Number of observed meteors of +5 magnitude
 p6 numeric Number of observed meteors of +6 magnitude
 p7 numeric Number of observed meteors of +7 magnitude
 N numeric Total number of observed meteors

Source

Visual Meteor Database, <http://www.imo.net/data/visual>

magn99

Magnitude data for the year 1999

Description

Visual meteor magnitude dataset for the year 1999.

Usage

magn99

Format

A data frame with 13140 observations on the following 29 variables.

IMOcode factor IMO observer code
 sitecode numeric IMO site code
 long numeric Longitude of the observing site in degrees
 EW factor East (E) or west (W) position from the prime meridian
 lat numeric Latitude of the observing site in degrees
 NS factor North (N) or south (S) position from the equator
 day numeric Day of the month
 month numeric Month of the year
 year numeric Year 1999
 start numeric Beginning of the observing time period
 stop numeric End of the observing time period
 sollong numeric Solar longitude of the middle of observing time period
 Shw factor Abbreviation of the observed shower
 lmg numeric Limiting magnitude
 m6 numeric Number of observed meteors of -6 magnitude
 m5 numeric Number of observed meteors of -5 magnitude
 m4 numeric Number of observed meteors of -4 magnitude
 m3 numeric Number of observed meteors of -3 magnitude

m2 numeric Number of observed meteors of -2 magnitude
 m1 numeric Number of observed meteors of -1 magnitude
 zero numeric Number of observed meteors of 0 magnitude
 p1 numeric Number of observed meteors of +1 magnitude
 p2 numeric Number of observed meteors of +2 magnitude
 p3 numeric Number of observed meteors of +3 magnitude
 p4 numeric Number of observed meteors of +4 magnitude
 p5 numeric Number of observed meteors of +5 magnitude
 p6 numeric Number of observed meteors of +6 magnitude
 p7 numeric Number of observed meteors of +7 magnitude
 N numeric Total number of observed meteors

Source

Visual Meteor Database, <http://www.imo.net/data/visual>

pop.index

Calculation of population index

Description

Calculates population index of a meteor shower for a given magnitude data, specified period of days and magnitude values.

Usage

```
pop.index(data, year, month, day.beg, day.end=day.beg, shw, mag=-6:7)
```

Arguments

data	data frame consisting of visual meteor magnitude data.
year	numeric vector of length 4 specifying year.
month	numeric vector specifying month of the year.
day.beg	numeric vector specifying beginning day.
day.end	numeric vector specifying ending day.
shw	character string consisting of three capital letters which represent meteor shower code.
mag	numeric vector specifying range of magnitudes.

Details

Cummulative summarized magnitude distribution $\Phi(m)$ is formed by summing cummulative frequencies of all observers for each magnitude class m .

Using the relationship for population index $r = \Phi(m+1)/\Phi(m)$ and substitutiong $0, 1, \dots, m$ magnitudes, equation $\Phi(m) = \Phi(0)r^m$ (or $\ln(\Phi(m)) = \ln(\Phi(0)) + r \log(m)$ in logarithmic form) can be written. Then, population index r is calculated by the method of least squares, for chosen range of magnitude values.

Standard error of population index is approximated with

$$\sigma_r = r \sqrt{\sum e_i^2 / ((n-2) \sum m_i^2)},$$

where $i=1, 2, \dots, n$, n is number of magnitude values, e_i regression residuals, $i=1, 2, \dots, n$.

Value

Data frame containing following vectors

day factor Day or interval of days

month numeric Month of the year

year numeric Year

mag factor Range of magnitude values

nINT Number of observing time intervals

nSHW Number of observed meteors belonging to the shower

pop.index Population index

sigma.r Standard error of population index

Note

The interval for regression is chosen such that: there is at least 3 meteors per magnitude class, the faintest magnitude classes are not included ($m \leq 4$ or in exceptional cases $m \leq 5$) and there are at least 5 magnitude classes available. All these conditions are fulfilled for the range of magnitude values printed in results.

Argument data has to consist of the columns named "m6" and "p7".

Author(s)

Kristina Veljkovic

References

Koschack R. and Rendtel J. (1990b). Determination of spatial number density and mass index from visual meteor observations (2). *WGN, Journal of the IMO*, 18(4), 119 - 140.

Rendtel J. and Arlt R., editors (2008). *IMO Handbook For Meteor Observers*. IMO, Potsdam.

See Also

[mag.distr,zhr](#)

Examples

```
##select visual meteor data for observation of Perseids, time period 1-20th August 2007
##and calculate population index using magnitudes m<=4
data(magn07)
magnPer<-filter(magn07,shw="PER", year=2007, month=8, day.beg=1, day.end=20)
pop.index(magnPer,year=2007, month=8, day.beg=1, day.end=20, shw="PER",mag=-6:4)
```

radiant

Coordinates of radiants of meteor showers

Description

Coordinates of radiants of meteor showers during the year.

Usage

```
radiant
```

Format

A data frame with 365 observations on the following 58 variables.

Day numeric Day of the month
Month numeric Month of the year
ANT.Alpha numeric Right ascension of Antihelion Source radiant
ANT.Delta numeric Declination of Antihelion Source radiant
QUA.Alpha numeric Right ascension of Quadrantids radiant
QUA.Delta numeric Declination of Quadrantids radiant
DLM.Alpha numeric Right ascension of December Leonis Minorids radiant
DLM.Delta numeric Declination of December Leonis Minorids radiant
ACE.Alpha numeric Right ascension of Alpha-Centaurids radiant
ACE.Delta numeric Declination of Alpha-Centaurids radiant
GNO.Alpha numeric Right ascension of Gamma-Normids radiant
GNO.Delta numeric Declination of Gamma-Normids radiant
LYR.Alpha numeric Right ascension of Lyrids radiant
LYR.Delta numeric Declination of Lyrids radiant
PPU.Alpha numeric Right ascension of Pi-Puppids radiant
PPU.Delta numeric Declination of Pi-Puppids radiant
ETA.Alpha numeric Right ascension of Eta-Aquarids radiant
ETA.Delta numeric Declination of Eta-Aquarids radiant
ELY.Alpha numeric Right ascension of Eta-Lyrids radiant
ELY.Delta numeric Declination of Eta-Lyrids radiant

JBO.Alpha numeric Right ascension of June Bootids radiant
JBO.Delta numeric Declination of June Bootids radiant
CAP.Alpha numeric Right ascension of Alpha-Capricornids radiant
CAP.Delta numeric Declination of Alpha-Capricornids radiant
SDA.Alpha numeric Right ascension of Southern Delta-Aquarids radiant
SDA.Delta numeric Declination of Southern Delta-Aquarids radiant
PER.Alpha numeric Right ascension of Perseids radiant
PER.Delta numeric Declination of Perseids radiant
PAU.Alpha numeric Right ascension of Piscis Austrinids radiant
PAU.Delta numeric Declination of Piscis Austrinids radiant
KCG.Alpha numeric Right ascension of Kappa-Cygnids radiant
KCG.Delta numeric Declination of Kappa-Cygnids radiant
AUR.Alpha numeric Right ascension of Alpha-Aurigids radiant
AUR.Delta numeric Declination of Alpha-Aurigids radiant
SPE.Alpha numeric Right ascension of September Epsilon-Perseids radiant
SPE.Delta numeric Declination of September Epsilon-Perseids radiant
STA.Alpha numeric Right ascension of Southern Taurids radiant
STA.Delta numeric Declination of Southern Taurids radiant
ORI.Alpha numeric Right ascension of Orionids radiant
ORI.Delta numeric Declination of Orionids radiant
DAU.Alpha numeric Right ascension of Delta-Aurigids radiant
DAU.Delta numeric Declination of Delta-Aurigids radiant
EGE.Alpha numeric Right ascension of Epsilon-Geminids radiant
EGE.Delta numeric Declination of Epsilon-Geminids radiant
NTA.Alpha numeric Right ascension of Northern Taurids radiant
NTA.Delta numeric Declination of Northern Taurids radiant
LMI.Alpha numeric Right ascension of Leo Minorids radiant
LMI.Delta numeric Right ascension of Leo Minorids radiant
LEO.Alpha numeric Right ascension of Leonids radiant
LEO.Delta numeric Declination of Leonids radiant
AMO.Alpha numeric Right ascension of Alpha-Monocerotids radiant
AMO.Delta numeric Declination of Alpha-Monocerotids radiant
PHO.Alpha numeric Right ascension of Phoenicids radiant
PHO.Delta numeric Declination of Phoenicids radiant
PUP.Alpha numeric Right ascension of Puppis/Velids radiant
PUP.Delta numeric Declination of Puppis/Velids radiant
GEM.Alpha numeric Right ascension of Geminids radiant
GEM.Delta numeric Declination of Geminids radiant

Details

Coordinates of radiant of meteor showers are given on 5-days intervals on IMO site. Natural spline interpolation was used to calculate radiant coordinates for in-between days.

Source

Meteor Shower Calendar, <http://www.imo.net/calendar>

rate00	<i>Rate data for the year 2000</i>
--------	------------------------------------

Description

Visual meteor rate data for the year 2000.

Usage

rate00

Format

A data frame with 12328 observations on the following 34 variables.

IMOcode factor IMO observer code
 sitecode numeric IMO site code
 long numeric Longitude of the observing site in degrees
 EW factor East (E) or west (W) position from the prime meridian
 lat numeric Latitude of the observing site in degrees
 NS factor North (N) or south (S) position from the equator
 day numeric Day of the month
 month numeric Month of the year
 year numeric Year 2000
 start numeric Beginning of the observing time period
 stop numeric End of the observing time period
 sollong numeric Solar longitude of the middle of observing time period
 fovRA numeric Right ascension of the center of the field of view
 fovDEC numeric Declination of the center of the field of view
 Teff numeric Effective observing time
 F numeric Correction factor for clouds
 lmg numeric Limiting magnitude
 SPO numeric Number of observed sporadics
 Shw1 factor Abbreviation of the first shower

N1 numeric Number of meteors belonging to the first shower
 Shw2 factor Abbreviation of the second shower
 N2 numeric Number of meteors belonging to the second shower
 Shw3 factor Abbreviation of the third shower
 N3 numeric Number of meteors belonging to the third shower
 Shw4 factor Abbreviation of the forth shower
 N4 numeric Number of meteors belonging to the forth shower
 Shw5 factor Abbreviation of the fifth shower
 N5 numeric Number of meteors belonging to the fifth shower
 Shw6 factor Abbreviation of the 6th shower
 N6 numeric Number of meteors belonging to the 6th shower
 Shw7 factor Abbreviation of the 7th shower
 N7 numeric Number of meteors belonging to the 7th shower
 Shw8 factor Abbreviation of the 8th shower
 N8 numeric Number of meteors belonging to the 8th shower

Source

Visual Meteor Database, <http://www.imo.net/data/visual>

rate01	<i>Rate data for the year 2001</i>
--------	------------------------------------

Description

Visual meteor rate data for the year 2001.

Usage

rate01

Format

A data frame with 20244 observations on the following 34 variables.

IM0code factor IMO observer code
 sitecode numeric IMO site code
 long numeric Longitude of the observing site in degrees
 EW factor East (E) or west (W) position from the prime meridian
 lat numeric Latitude of the observing site in degrees
 NS factor North (N) or south (S) position from the equator
 day numeric Day of the month

month numeric Month of the year
year numeric Year 2001
start numeric Beginning of the observing time period
stop numeric End of the observing time period
sollong numeric Solar longitude of the middle of observing time period
fovRA numeric Right ascension of the center of the field of view
fovDEC numeric Declination of the center of the field of view
Teff numeric Effective observing time
F numeric Correction factor for clouds
lmg numeric Limiting magnitude
SPO numeric Number of observed sporadics
Shw1 factor Abbreviation of the first shower
N1 numeric Number of meteors belonging to the first shower
Shw2 factor Abbreviation of the second shower
N2 numeric Number of meteors belonging to the second shower
Shw3 factor Abbreviation of the third shower
N3 numeric Number of meteors belonging to the third shower
Shw4 factor Abbreviation of the forth shower
N4 numeric Number of meteors belonging to the forth shower
Shw5 factor Abbreviation of the fifth shower
N5 numeric Number of meteors belonging to the fifth shower
Shw6 factor Abbreviation of the 6th shower
N6 numeric Number of meteors belonging to the 6th shower
Shw7 factor Abbreviation of the 7th shower
N7 numeric Number of meteors belonging to the 7th shower
Shw8 factor Abbreviation of the 8th shower
N8 numeric Number of meteors belonging to the 8th shower

Source

Visual Meteor Database, <http://www.imo.net/data/visual>

rate02	<i>Rate data for the year 2002</i>
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Description

Visual meteor rate data for the year 2002.

Usage

rate02

Format

A data frame with 13380 observations on the following 34 variables.

IMOcode factor IMO observer code
 sitecode numeric IMO site code
 long numeric Longitude of the observing site in degrees
 EW factor East (E) or west (W) position from the prime meridian
 lat numeric Latitude of the observing site in degrees
 NS factor North (N) or south (S) position from the equator
 day numeric Day of the month
 month numeric Month of the year
 year numeric Year 2002
 start numeric Beginning of the observing time period
 stop numeric End of the observing time period
 sollong numeric Solar longitude of the middle of observing time period
 fovRA numeric Right ascension of the center of the field of view
 fovDEC numeric Declination of the center of the field of view
 Teff numeric Effective observing time
 F numeric Correction factor for clouds
 lmg numeric Limiting magnitude
 SPO numeric Number of observed sporadics
 Shw1 factor Abbreviation of the first shower
 N1 numeric Number of meteors belonging to the first shower
 Shw2 factor Abbreviation of the second shower
 N2 numeric Number of meteors belonging to the second shower
 Shw3 factor Abbreviation of the third shower
 N3 numeric Number of meteors belonging to the third shower
 Shw4 factor Abbreviation of the forth shower

N4 numeric Number of meteors belonging to the forth shower
 Shw5 factor Abbreviation of the fifth shower
 N5 numeric Number of meteors belonging to the fifth shower
 Shw6 factor Abbreviation of the 6th shower
 N6 numeric Number of meteors belonging to the 6th shower
 Shw7 factor Abbreviation of the 7th shower
 N7 numeric Number of meteors belonging to the 7th shower
 Shw8 factor Abbreviation of the 8th shower
 N8 numeric Number of meteors belonging to the 8th shower

Source

Visual Meteor Database, <http://www.imo.net/data/visual>

rate04	<i>Rate data for the year 2004</i>
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Description

Visual meteor rate data for the year 2004.

Usage

rate04

Format

A data frame with 13742 observations on the following 34 variables.

IM0code factor IMO observer code
 sitecode numeric IMO site code
 long numeric Longitude of the observing site in degrees
 EW factor East (E) or west (W) position from the prime meridian
 lat numeric Latitude of the observing site in degrees
 NS factor North (N) or south (S) position from the equator
 day numeric Day of the month
 month numeric Month of the year
 year numeric Year 2004
 start numeric Beginning of the observing time period
 stop numeric End of the observing time period
 sollong numeric Solar longitude of the middle of observing time period
 fovRA numeric Right ascension of the center of the field of view

fovDEC numeric Declination of the center of the field of view
 Teff numeric Effective observing time
 F numeric Correction factor for clouds
 lmg numeric Limiting magnitude
 SP0 numeric Number of observed sporadics
 Shw1 factor Abbreviation of the first shower
 N1 numeric Number of meteors belonging to the first shower
 Shw2 factor Abbreviation of the second shower
 N2 numeric Number of meteors belonging to the second shower
 Shw3 factor Abbreviation of the third shower
 N3 numeric Number of meteors belonging to the third shower
 Shw4 factor Abbreviation of the forth shower
 N4 numeric Number of meteors belonging to the forth shower
 Shw5 factor Abbreviation of the fifth shower
 N5 numeric Number of meteors belonging to the fifth shower
 Shw6 factor Abbreviation of the 6th shower
 N6 numeric Number of meteors belonging to the 6th shower
 Shw7 factor Abbreviation of the 7th shower
 N7 numeric Number of meteors belonging to the 7th shower
 Shw8 factor Abbreviation of the 8th shower
 N8 numeric Number of meteors belonging to the 8th shower

Source

Visual Meteor Database, <http://www.imo.net/data/visual>

rate05

Rate data for the year 2005

Description

Visual meteor rate data for the year 2005.

Usage

rate05

Format

A data frame with 6949 observations on the following 34 variables.

IMOcode factor IMO observer code
 sitecode numeric IMO site code
 long numeric Longitude of the observing site in degrees
 EW factor East (E) or west (W) position from the prime meridian
 lat numeric Latitude of the observing site in degrees
 NS factor North (N) or south (S) position from the equator
 day numeric Day of the month
 month numeric Month of the year
 year numeric Year 2005
 start numeric Beginning of the observing time period
 stop numeric End of the observing time period
 sollong numeric Solar longitude of the middle of observing time period
 fovRA numeric Right ascension of the center of the field of view
 fovDEC numeric Declination of the center of the field of view
 Teff numeric Effective observing time
 F numeric Correction factor for clouds
 lmg numeric Limiting magnitude
 SP0 numeric Number of observed sporadics
 Shw1 factor Abbreviation of the first shower
 N1 numeric Number of meteors belonging to the first shower
 Shw2 factor Abbreviation of the second shower
 N2 numeric Number of meteors belonging to the second shower
 Shw3 factor Abbreviation of the third shower
 N3 numeric Number of meteors belonging to the third shower
 Shw4 factor Abbreviation of the forth shower
 N4 numeric Number of meteors belonging to the forth shower
 Shw5 factor Abbreviation of the fifth shower
 N5 numeric Number of meteors belonging to the fifth shower
 Shw6 factor Abbreviation of the 6th shower
 N6 numeric Number of meteors belonging to the 6th shower
 Shw7 factor Abbreviation of the 7th shower
 N7 numeric Number of meteors belonging to the 7th shower
 Shw8 factor Abbreviation of the 8th shower
 N8 numeric Number of meteors belonging to the 8th shower

Source

Visual Meteor Database, <http://www.imo.net/data/visual>

rate06

*Rate data for the year 2006***Description**

Visual meteor rate data for the year 2006.

Usage

rate06

Format

A data frame with 5066 observations on the following 34 variables.

IMOcode factor IMO observer code

sitcode numeric IMO site code

long numeric Longitude of the observing site in degrees

EW factor East (E) or west (W) position from the prime meridian

lat numeric Latitude of the observing site in degrees

NS factor North (N) or south (S) position from the equator

day numeric Day of the month

month numeric Month of the year

year numeric Year 2006

start numeric Beginning of the observing time period

stop numeric End of the observing time period

sollong numeric Solar longitude of the middle of observing time period

fovRA numeric Right ascension of the center of the field of view

fovDEC numeric Declination of the center of the field of view

Teff numeric Effective observing time

F numeric Correction factor for clouds

lmg numeric Limiting magnitude

SPO numeric Number of observed sporadics

Shw1 factor Abbreviation of the first shower

N1 numeric Number of meteors belonging to the first shower

Shw2 factor Abbreviation of the second shower

N2 numeric Number of meteors belonging to the second shower

Shw3 factor Abbreviation of the third shower

N3 numeric Number of meteors belonging to the third shower

Shw4 factor Abbreviation of the forth shower

N4 numeric Number of meteors belonging to the forth shower
 Shw5 factor Abbreviation of the fifth shower
 N5 numeric Number of meteors belonging to the fifth shower
 Shw6 factor Abbreviation of the 6th shower
 N6 numeric Number of meteors belonging to the 6th shower
 Shw7 factor Abbreviation of the 7th shower
 N7 numeric Number of meteors belonging to the 7th shower
 Shw8 factor Abbreviation of the 8th shower
 N8 numeric Number of meteors belonging to the 8th shower

Source

Visual Meteor Database, <http://www.imo.net/data/visual>

rate07	<i>Rate data for the year 2007</i>
--------	------------------------------------

Description

Visual meteor rate data for the year 2007.

Usage

rate07

Format

A data frame with 4249 observations on the following 30 variables.

IM0code factor IMO observer code
 sitecode numeric IMO site code
 long numeric Longitude of the observing site in degrees
 EW factor East (E) or west (W) position from the prime meridian
 lat numeric Latitude of the observing site in degrees
 NS factor North (N) or south (S) position from the equator
 day numeric Day of the month
 month numeric Month of the year
 year numeric Year 2007
 start numeric Beginning of the observing time period
 stop numeric End of the observing time period
 sollong numeric Solar longitude of the middle of observing time period
 fovRA numeric Right ascension of the center of the field of view

fovDEC numeric Declination of the center of the field of view
 Teff numeric Effective observing time
 F numeric Correction factor for clouds
 lmg numeric Limiting magnitude
 SP0 numeric Number of observed sporadics
 Shw1 factor Abbreviation of the first shower
 N1 numeric Number of meteors belonging to the first shower
 Shw2 factor Abbreviation of the second shower
 N2 numeric Number of meteors belonging to the second shower
 Shw3 factor Abbreviation of the third shower
 N3 numeric Number of meteors belonging to the third shower
 Shw4 factor Abbreviation of the forth shower
 N4 numeric Number of meteors belonging to the forth shower
 Shw5 factor Abbreviation of the fifth shower
 N5 numeric Number of meteors belonging to the fifth shower
 Shw6 factor Abbreviation of the 6th shower
 N6 numeric Number of meteors belonging to the 6th shower

Source

Visual Meteor Database, <http://www.imo.net/data/visual>

rate08

Rate data for the year 2008

Description

Visual meteor rate data for the year 2008.

Usage

rate08

Format

A data frame with 1178 observations on the following 30 variables.

IMOcode factor IMO observer code
 sitecode numeric IMO site code
 long numeric Longitude of the observing site in degrees
 EW factor East (E) or west (W) position from the prime meridian
 lat numeric Latitude of the observing site in degrees

NS factor North (N) or south (S) position from the equator
day numeric Day of the month
month numeric Month of the year
year numeric Year 2008
start numeric Beginning of the observing time period
stop numeric End of the observing time period
solllong numeric Solar longitude of the middle of observing time period
fovRA numeric Right ascension of the center of the field of view
fovDEC numeric Declination of the center of the field of view
Teff numeric Effective observing time
F numeric Correction factor for clouds
lmg numeric Limiting magnitude
SP0 numeric Number of observed sporadics
Shw1 factor Abbreviation of the first shower
N1 numeric Number of meteors belonging to the first shower
Shw2 factor Abbreviation of the second shower
N2 numeric Number of meteors belonging to the second shower
Shw3 factor Abbreviation of the third shower
N3 numeric Number of meteors belonging to the third shower
Shw4 factor Abbreviation of the forth shower
N4 numeric Number of meteors belonging to the forth shower
Shw5 factor Abbreviation of the fifth shower
N5 numeric Number of meteors belonging to the fifth shower
Shw6 factor Abbreviation of the 6th shower
N6 numeric Number of meteors belonging to the 6th shower

Source

Visual Meteor Database, <http://www.imo.net/data/visual>

rate09

*Rate data for the year 2009***Description**

Visual meteor rate data for the year 2009.

Usage

rate09

Format

A data frame with 3746 observations on the following 30 variables.

IMOcode factor IMO observer code

sitcode numeric IMO site code

long numeric Longitude of the observing site in degrees

EW factor East (E) or west (W) position from the prime meridian

lat numeric Latitude of the observing site in degrees

NS factor North (N) or south (S) position from the equator

day numeric Day of the month

month numeric Month of the year

year numeric Year 2009

start numeric Beginning of the observing time period

stop numeric End of the observing time period

sollong numeric Solar longitude of the middle of observing time period

fovRA numeric Right ascension of the center of the field of view

fovDEC numeric Declination of the center of the field of view

Teff numeric Effective observing time

F numeric Correction factor for clouds

lmg numeric Limiting magnitude

SPO numeric Number of observed sporadics

Shw1 factor Abbreviation of the first shower

N1 numeric Number of meteors belonging to the first shower

Shw2 factor Abbreviation of the second shower

N2 numeric Number of meteors belonging to the second shower

Shw3 factor Abbreviation of the third shower

N3 numeric Number of meteors belonging to the third shower

Shw4 factor Abbreviation of the forth shower

N4 numeric Number of meteors belonging to the forth shower
 Shw5 factor Abbreviation of the fifth shower
 N5 numeric Number of meteors belonging to the fifth shower
 Shw6 factor Abbreviation of the 6th shower
 N6 numeric Number of meteors belonging to the 6th shower

Source

Visual Meteor Database, <http://www.imo.net/data/visual>

rate10	<i>Rate data for the year 2010</i>
--------	------------------------------------

Description

Visual meteor rate data for the year 2010.

Usage

rate10

Format

A data frame with 5295 observations on the following 32 variables.

IMOcode factor IMO observer code
 sitecode numeric IMO site code
 long numeric Longitude of the observing site in degrees
 EW factor East (E) or west (W) position from the prime meridian
 lat numeric Latitude of the observing site in degrees
 NS factor North (N) or south (S) position from the equator
 day numeric Day of the month
 month numeric Month of the year
 year numeric Year 2010
 start numeric Beginning of the observing time period
 stop numeric End of the observing time period
 sollong numeric Solar longitude of the middle of observing time period
 fovRA numeric Right ascension of the center of the field of view
 fovDEC numeric Declination of the center of the field of view
 Teff numeric Effective observing time
 F numeric Correction factor for clouds
 lmg numeric Limiting magnitude

SP0 numeric Number of observed sporadics
 Shw1 factor Abbreviation of the first shower
 N1 numeric Number of meteors belonging to the first shower
 Shw2 factor Abbreviation of the second shower
 N2 numeric Number of meteors belonging to the second shower
 Shw3 factor Abbreviation of the third shower
 N3 numeric Number of meteors belonging to the third shower
 Shw4 factor Abbreviation of the forth shower
 N4 numeric Number of meteors belonging to the forth shower
 Shw5 factor Abbreviation of the fifth shower
 N5 numeric Number of meteors belonging to the fifth shower
 Shw6 factor Abbreviation of the 6th shower
 N6 numeric Number of meteors belonging to the 6th shower
 Shw7 factor Abbreviation of the 7th shower
 N7 numeric Number of meteors belonging to the 7th shower

Source

Visual Meteor Database, <http://www.imo.net/data/visual>

rate11	<i>Rate data for the year 2011</i>
--------	------------------------------------

Description

Visual meteor rate data for the year 2011.

Usage

rate11

Format

A data frame with 4519 observations on the following 30 variables.

IM0code factor IMO observer code
 sitecode numeric IMO site code
 long numeric Longitude of the observing site in degrees
 EW factor East (E) or west (W) position from the prime meridian
 lat numeric Latitude of the observing site in degrees
 NS factor North (N) or south (S) position from the equator
 day numeric Day of the month

month numeric Month of the year
 year numeric Year 2011
 start numeric Beginning of the observing time period
 stop numeric End of the observing time period
 sollong numeric Solar longitude of the middle of observing time period
 fovRA numeric Right ascension of the center of the field of view
 fovDEC numeric Declination of the center of the field of view
 Teff numeric Effective observing time
 F numeric Correction factor for clouds
 lmg numeric Limiting magnitude
 SP0 numeric Number of observed sporadics
 Shw1 factor Abbreviation of the first shower
 N1 numeric Number of meteors belonging to the first shower
 Shw2 factor Abbreviation of the second shower
 N2 numeric Number of meteors belonging to the second shower
 Shw3 factor Abbreviation of the third shower
 N3 numeric Number of meteors belonging to the third shower
 Shw4 factor Abbreviation of the forth shower
 N4 numeric Number of meteors belonging to the forth shower
 Shw5 factor Abbreviation of the fifth shower
 N5 numeric Number of meteors belonging to the fifth shower
 Shw6 factor Abbreviation of the 6th shower
 N6 numeric Number of meteors belonging to the 6th shower

Source

Visual Meteor Database, <http://www.imo.net/data/visual>

rate84

Rate data for the year 1984

Description

Visual meteor rate data for the year 1984.

Usage

rate84

Format

A data frame with 282 observations on the following 24 variables.

IMOcode factor IMO observer code

sitcode numeric IMO site code

long numeric Longitude of the observing site in degrees

EW factor East (E) or west (W) position from the prime meridian

lat numeric Latitude of the observing site in degrees

NS factor North (N) or south (S) position from the equator

day numeric Day of the month

month numeric Month of the year

year numeric Year 1984

start numeric Beginning of the observing time period

stop numeric End of the observing time period

sollong numeric Solar longitude of the middle of observing time period

fovRA numeric Right ascension of the center of the field of view

fovDEC numeric Declination of the center of the field of view

Teff numeric Effective observing time

F numeric Correction factor for clouds

lmg numeric Limiting magnitude

SPO numeric Number of observed sporadics

Shw1 factor Abbreviation of the first shower

N1 numeric Number of meteors belonging to the first shower

Shw2 factor Abbreviation of the second shower

N2 numeric Number of meteors belonging to the second shower

Shw3 factor Abbreviation of the third shower

N3 numeric Number of meteors belonging to the third shower

Source

Visual Meteor Database, <http://www.imo.net/data/visual>

rate85

*Rate data for the year 1985***Description**

Visual meteor rate data for the year 1985.

Usage

rate85

Format

A data frame with 1468 observations on the following 30 variables.

IMOcode factor IMO observer code

sitcode numeric IMO site code

long numeric Longitude of the observing site in degrees

EW factor East (E) or west (W) position from the prime meridian

lat numeric Latitude of the observing site in degrees

NS factor North (N) or south (S) position from the equator

day numeric Day of the month

month numeric Month of the year

year numeric Year 1985

start numeric Beginning of the observing time period

stop numeric End of the observing time period

sollong numeric Solar longitude of the middle of observing time period

fovRA numeric Right ascension of the center of the field of view

fovDEC numeric Declination of the center of the field of view

Teff numeric Effective observing time

F numeric Correction factor for clouds

lmg numeric Limiting magnitude

SPO numeric Number of observed sporadics

Shw1 factor Abbreviation of the first shower

N1 numeric Number of meteors belonging to the first shower

Shw2 factor Abbreviation of the second shower

N2 numeric Number of meteors belonging to the second shower

Shw3 factor Abbreviation of the third shower

N3 numeric Number of meteors belonging to the third shower

Shw4 factor Abbreviation of the forth shower

N4 numeric Number of meteors belonging to the forth shower
 Shw5 factor Abbreviation of the fifth shower
 N5 numeric Number of meteors belonging to the fifth shower
 Shw6 factor Abbreviation of the 6th shower
 N6 numeric Number of meteors belonging to the 6th shower

Source

Visual Meteor Database, <http://www.imo.net/data/visual>

rate86	<i>Rate data for the year 1986</i>
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Description

Visual meteor rate data for the year 1986.

Usage

rate86

Format

A data frame with 1990 observations on the following 28 variables.

IMOcode factor IMO observer code
 sitecode numeric IMO site code
 long numeric Longitude of the observing site in degrees
 EW factor East (E) or west (W) position from the prime meridian
 lat numeric Latitude of the observing site in degrees
 NS factor North (N) or south (S) position from the equator
 day numeric Day of the month
 month numeric Month of the year
 year numeric Year 1986
 start numeric Beginning of the observing time period
 stop numeric End of the observing time period
 sollong numeric Solar longitude of the middle of observing time period
 fovRA numeric Right ascension of the center of the field of view
 fovDEC numeric Declination of the center of the field of view
 Teff numeric Effective observing time
 F numeric Correction factor for clouds
 lmg numeric Limiting magnitude

SP0 numeric Number of observed sporadics
 Shw1 factor Abbreviation of the first shower
 N1 numeric Number of meteors belonging to the first shower
 Shw2 factor Abbreviation of the second shower
 N2 numeric Number of meteors belonging to the second shower
 Shw3 factor Abbreviation of the third shower
 N3 numeric Number of meteors belonging to the third shower
 Shw4 factor Abbreviation of the forth shower
 N4 numeric Number of meteors belonging to the forth shower
 Shw5 factor Abbreviation of the fifth shower
 N5 numeric Number of meteors belonging to the fifth shower

Source

Visual Meteor Database, <http://www.imo.net/data/visual>

rate87

Rate data for the year 1987

Description

Visual meteor rate data for the year 1987.

Usage

rate87

Format

A data frame with 1307 observations on the following 30 variables.

IM0code factor IMO observer code
 sitecode numeric IMO site code
 long numeric Longitude of the observing site in degrees
 EW factor East (E) or west (W) position from the prime meridian
 lat numeric Latitude of the observing site in degrees
 NS factor North (N) or south (S) position from the equator
 day numeric Day of the month
 month numeric Month of the year
 year numeric Year 1987
 start numeric Beginning of the observing time period
 stop numeric End of the observing time period

sollong numeric Solar longitude of the middle of observing time period
 fovRA numeric Right ascension of the center of the field of view
 fovDEC numeric Declination of the center of the field of view
 Teff numeric Effective observing time
 F numeric Correction factor for clouds
 lmg numeric Limiting magnitude
 SP0 numeric Number of observed sporadics
 Shw1 factor Abbreviation of the first shower
 N1 numeric Number of meteors belonging to the first shower
 Shw2 factor Abbreviation of the second shower
 N2 numeric Number of meteors belonging to the second shower
 Shw3 factor Abbreviation of the third shower
 N3 numeric Number of meteors belonging to the third shower
 Shw4 factor Abbreviation of the forth shower
 N4 numeric Number of meteors belonging to the forth shower
 Shw5 factor Abbreviation of the fifth shower
 N5 numeric Number of meteors belonging to the fifth shower
 Shw6 factor Abbreviation of the 6th shower
 N6 numeric Number of meteors belonging to the 6th shower

Source

Visual Meteor Database, <http://www.imo.net/data/visual>

rate88

Rate data for the year 1988

Description

Visual meteor rate data for the year 1988.

Usage

rate88

Format

A data frame with 4676 observations on the following 30 variables.

IMOcode factor IMO observer code
sitecode numeric IMO site code
long numeric Longitude of the observing site in degrees
EW factor East (E) or west (W) position from the prime meridian
lat numeric Latitude of the observing site in degrees
NS factor North (N) or south (S) position from the equator
day numeric Day of the month
month numeric Month of the year
year numeric Year 1988
start numeric Beginning of the observing time period
stop numeric End of the observing time period
sollong numeric Solar longitude of the middle of observing time period
fovRA numeric Right ascension of the center of the field of view
fovDEC numeric Declination of the center of the field of view
Teff numeric Effective observing time
F numeric Correction factor for clouds
lmg numeric Limiting magnitude
SP0 numeric Number of observed sporadics
Shw1 factor Abbreviation of the first shower
N1 numeric Number of meteors belonging to the first shower
Shw2 factor Abbreviation of the second shower
N2 numeric Number of meteors belonging to the second shower
Shw3 factor Abbreviation of the third shower
N3 numeric Number of meteors belonging to the third shower
Shw4 factor Abbreviation of the fourth shower
N4 numeric Number of meteors belonging to the fourth shower
Shw5 factor Abbreviation of the fifth shower
N5 numeric Number of meteors belonging to the fifth shower
Shw6 factor Abbreviation of the 6th shower
N6 numeric Number of meteors belonging to the 6th shower

Source

Visual Meteor Database, <http://www.imo.net/data/visual>

rate89	<i>Rate data for the year 1989</i>
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Description

Visual meteor rate data for the year 1989.

Usage

rate89

Format

A data frame with 4557 observations on the following 34 variables.

IMOcode factor IMO observer code

sitcode numeric IMO site code

long numeric Longitude of the observing site in degrees

EW factor East (E) or west (W) position from the prime meridian

lat numeric Latitude of the observing site in degrees

NS factor North (N) or south (S) position from the equator

day numeric Day of the month

month numeric Month of the year

year numeric Year 1989

start numeric Beginning of the observing time period

stop numeric End of the observing time period

sollong numeric Solar longitude of the middle of observing time period

fovRA numeric Right ascension of the center of the field of view

fovDEC numeric Declination of the center of the field of view

Teff numeric Effective observing time

F numeric Correction factor for clouds

lmg numeric Limiting magnitude

SPO numeric Number of observed sporadics

Shw1 factor Abbreviation of the first shower

N1 numeric Number of meteors belonging to the first shower

Shw2 factor Abbreviation of the second shower

N2 numeric Number of meteors belonging to the second shower

Shw3 factor Abbreviation of the third shower

N3 numeric Number of meteors belonging to the third shower

Shw4 factor Abbreviation of the forth shower

N4 numeric Number of meteors belonging to the forth shower
 Shw5 factor Abbreviation of the fifth shower
 N5 numeric Number of meteors belonging to the fifth shower
 Shw6 factor Abbreviation of the 6th shower
 N6 numeric Number of meteors belonging to the 6th shower
 Shw7 factor Abbreviation of the 7th shower
 N7 numeric Number of meteors belonging to the 7th shower
 Shw8 factor Abbreviation of the 8th shower
 N8 numeric Number of meteors belonging to the 8th shower

Source

Visual Meteor Database, <http://www.imo.net/data/visual>

rate90

Rate data for the year 1990

Description

Visual meteor rate data for the year 1990.

Usage

rate90

Format

A data frame with 3447 observations on the following 34 variables.

IMOcode factor IMO observer code
 sitecode numeric IMO site code
 long numeric Longitude of the observing site in degrees
 EW factor East (E) or west (W) position from the prime meridian
 lat numeric Latitude of the observing site in degrees
 NS factor North (N) or south (S) position from the equator
 day numeric Day of the month
 month numeric Month of the year
 year numeric Year 1990
 start numeric Beginning of the observing time period
 stop numeric End of the observing time period
 sollong numeric Solar longitude of the middle of observing time period
 fovRA numeric Right ascension of the center of the field of view

fovDEC numeric Declination of the center of the field of view
 Teff numeric Effective observing time
 F numeric Correction factor for clouds
 lmg numeric Limiting magnitude
 SP0 numeric Number of observed sporadics
 Shw1 factor Abbreviation of the first shower
 N1 numeric Number of meteors belonging to the first shower
 Shw2 factor Abbreviation of the second shower
 N2 numeric Number of meteors belonging to the second shower
 Shw3 factor Abbreviation of the third shower
 N3 numeric Number of meteors belonging to the third shower
 Shw4 factor Abbreviation of the forth shower
 N4 numeric Number of meteors belonging to the forth shower
 Shw5 factor Abbreviation of the fifth shower
 N5 numeric Number of meteors belonging to the fifth shower
 Shw6 factor Abbreviation of the 6th shower
 N6 numeric Number of meteors belonging to the 6th shower
 Shw7 factor Abbreviation of the 7th shower
 N7 numeric Number of meteors belonging to the 7th shower
 Shw8 factor Abbreviation of the 8th shower
 N8 numeric Number of meteors belonging to the 8th shower

Source

Visual Meteor Database, <http://www.imo.net/data/visual>

rate91

Rate data for the year 1991

Description

Visual meteor rate data for the year 1991.

Usage

rate91

Format

A data frame with 4169 observations on the following 34 variables.

IMOcode factor IMO observer code
 sitecode numeric IMO site code
 long numeric Longitude of the observing site in degrees
 EW factor East (E) or west (W) position from the prime meridian
 lat numeric Latitude of the observing site in degrees
 NS factor North (N) or south (S) position from the equator
 day numeric Day of the month
 month numeric Month of the year
 year numeric Year 1991
 start numeric Beginning of the observing time period
 stop numeric End of the observing time period
 sollong numeric Solar longitude of the middle of observing time period
 fovRA numeric Right ascension of the center of the field of view
 fovDEC numeric Declination of the center of the field of view
 Teff numeric Effective observing time
 F numeric Correction factor for clouds
 lmg numeric Limiting magnitude
 SP0 numeric Number of observed sporadics
 Shw1 factor Abbreviation of the first shower
 N1 numeric Number of meteors belonging to the first shower
 Shw2 factor Abbreviation of the second shower
 N2 numeric Number of meteors belonging to the second shower
 Shw3 factor Abbreviation of the third shower
 N3 numeric Number of meteors belonging to the third shower
 Shw4 factor Abbreviation of the forth shower
 N4 numeric Number of meteors belonging to the forth shower
 Shw5 factor Abbreviation of the fifth shower
 N5 numeric Number of meteors belonging to the fifth shower
 Shw6 factor Abbreviation of the 6th shower
 N6 numeric Number of meteors belonging to the 6th shower
 Shw7 factor Abbreviation of the 7th shower
 N7 numeric Number of meteors belonging to the 7th shower
 Shw8 factor Abbreviation of the 8th shower
 N8 numeric Number of meteors belonging to the 8th shower

Source

Visual Meteor Database, <http://www.imo.net/data/visual>

rate92	<i>Rate data for the year 1992</i>
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Description

Visual meteor rate data for the year 1992.

Usage

rate92

Format

A data frame with 3794 observations on the following 32 variables.

IMOcode factor IMO observer code

sitcode numeric IMO site code

long numeric Longitude of the observing site in degrees

EW factor East (E) or west (W) position from the prime meridian

lat numeric Latitude of the observing site in degrees

NS factor North (N) or south (S) position from the equator

day numeric Day of the month

month numeric Month of the year

year numeric Year 1992

start numeric Beginning of the observing time period

stop numeric End of the observing time period

sollong numeric Solar longitude of the middle of observing time period

fovRA numeric Right ascension of the center of the field of view

fovDEC numeric Declination of the center of the field of view

Teff numeric Effective observing time

F numeric Correction factor for clouds

lmg numeric Limiting magnitude

SPO numeric Number of observed sporadics

Shw1 factor Abbreviation of the first shower

N1 numeric Number of meteors belonging to the first shower

Shw2 factor Abbreviation of the second shower

N2 numeric Number of meteors belonging to the second shower

Shw3 factor Abbreviation of the third shower

N3 numeric Number of meteors belonging to the third shower

Shw4 factor Abbreviation of the forth shower

N4 numeric Number of meteors belonging to the forth shower
 Shw5 factor Abbreviation of the fifth shower
 N5 numeric Number of meteors belonging to the fifth shower
 Shw6 factor Abbreviation of the 6th shower
 N6 numeric Number of meteors belonging to the 6th shower
 Shw7 factor Abbreviation of the 7th shower
 N7 numeric Number of meteors belonging to the 7th shower

Source

Visual Meteor Database, <http://www.imo.net/data/visual>

rate93

Rate data for the year 1993

Description

Visual meteor rate data for the year 1993.

Usage

rate93

Format

A data frame with 8065 observations on the following 34 variables.

IM0code factor IMO observer code
 sitecode numeric IMO site code
 long numeric Longitude of the observing site in degrees
 EW factor East (E) or west (W) position from the prime meridian
 lat numeric Latitude of the observing site in degrees
 NS factor North (N) or south (S) position from the equator
 day numeric Day of the month
 month numeric Month of the year
 year numeric Year 1993
 start numeric Beginning of the observing time period
 stop numeric End of the observing time period
 sollong numeric Solar longitude of the middle of observing time period
 fovRA numeric Right ascension of the center of the field of view
 fovDEC numeric Declination of the center of the field of view
 Teff numeric Effective observing time

- F numeric Correction factor for clouds
- lmg numeric Limiting magnitude
- SP0 numeric Number of observed sporadics
- Shw1 factor Abbreviation of the first shower
- N1 numeric Number of meteors belonging to the first shower
- Shw2 factor Abbreviation of the second shower
- N2 numeric Number of meteors belonging to the second shower
- Shw3 factor Abbreviation of the third shower
- N3 numeric Number of meteors belonging to the third shower
- Shw4 factor Abbreviation of the forth shower
- N4 numeric Number of meteors belonging to the forth shower
- Shw5 factor Abbreviation of the fifth shower
- N5 numeric Number of meteors belonging to the fifth shower
- Shw6 factor Abbreviation of the 6th shower
- N6 numeric Number of meteors belonging to the 6th shower
- Shw7 factor Abbreviation of the 7th shower
- N7 numeric Number of meteors belonging to the 7th shower
- Shw8 factor Abbreviation of the 8th shower
- N8 numeric Number of meteors belonging to the 8th shower

Source

Visual Meteor Database, <http://www.imo.net/data/visual>

rate94

Rate data for the year 1994

Description

Visual meteor rate data for the year 1994.

Usage

rate94

Format

A data frame with 4631 observations on the following 34 variables.

IMOcode factor IMO observer code
 sitecode numeric IMO site code
 long numeric Longitude of the observing site in degrees
 EW factor East (E) or west (W) position from the prime meridian
 lat numeric Latitude of the observing site in degrees
 NS factor North (N) or south (S) position from the equator
 day numeric Day of the month
 month numeric Month of the year
 year numeric Year 1994
 start numeric Beginning of the observing time period
 stop numeric End of the observing time period
 sollong numeric Solar longitude of the middle of observing time period
 fovRA numeric Right ascension of the center of the field of view
 fovDEC numeric Declination of the center of the field of view
 Teff numeric Effective observing time
 F numeric Correction factor for clouds
 lmg numeric Limiting magnitude
 SP0 numeric Number of observed sporadics
 Shw1 factor Abbreviation of the first shower
 N1 numeric Number of meteors belonging to the first shower
 Shw2 factor Abbreviation of the second shower
 N2 numeric Number of meteors belonging to the second shower
 Shw3 factor Abbreviation of the third shower
 N3 numeric Number of meteors belonging to the third shower
 Shw4 factor Abbreviation of the forth shower
 N4 numeric Number of meteors belonging to the forth shower
 Shw5 factor Abbreviation of the fifth shower
 N5 numeric Number of meteors belonging to the fifth shower
 Shw6 factor Abbreviation of the 6th shower
 N6 numeric Number of meteors belonging to the 6th shower
 Shw7 factor Abbreviation of the 7th shower
 N7 numeric Number of meteors belonging to the 7th shower
 Shw8 factor Abbreviation of the 8th shower
 N8 numeric Number of meteors belonging to the 8th shower

Source

Visual Meteor Database, <http://www.imo.net/data/visual>

rate95	<i>Rate data for the year 1995</i>
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Description

Visual meteor rate data for the year 1995.

Usage

rate95

Format

A data frame with 5924 observations on the following 34 variables.

IMOcode factor IMO observer code
 sitecode numeric IMO site code
 long numeric Longitude of the observing site in degrees
 EW factor East (E) or west (W) position from the prime meridian
 lat numeric Latitude of the observing site in degrees
 NS factor North (N) or south (S) position from the equator
 day numeric Day of the month
 month numeric Month of the year
 year numeric Year 1995
 start numeric Beginning of the observing time period
 stop numeric End of the observing time period
 sollong numeric Solar longitude of the middle of observing time period
 fovRA numeric Right ascension of the center of the field of view
 fovDEC numeric Declination of the center of the field of view
 Teff numeric Effective observing time
 F numeric Correction factor for clouds
 lmg numeric Limiting magnitude
 SPO numeric Number of observed sporadics
 Shw1 factor Abbreviation of the first shower
 N1 numeric Number of meteors belonging to the first shower
 Shw2 factor Abbreviation of the second shower
 N2 numeric Number of meteors belonging to the second shower
 Shw3 factor Abbreviation of the third shower
 N3 numeric Number of meteors belonging to the third shower
 Shw4 factor Abbreviation of the forth shower

N4 numeric Number of meteors belonging to the forth shower
 Shw5 factor Abbreviation of the fifth shower
 N5 numeric Number of meteors belonging to the fifth shower
 Shw6 factor Abbreviation of the 6th shower
 N6 numeric Number of meteors belonging to the 6th shower
 Shw7 factor Abbreviation of the 7th shower
 N7 numeric Number of meteors belonging to the 7th shower
 Shw8 factor Abbreviation of the 8th shower
 N8 numeric Number of meteors belonging to the 8th shower

Source

Visual Meteor Database, <http://www.imo.net/data/visual>

rate96	<i>Rate data for the year 1996</i>
--------	------------------------------------

Description

Visual meteor rate data for the year 1996.

Usage

rate96

Format

A data frame with 7531 observations on the following 34 variables.

IMOcode factor IMO observer code
 sitecode numeric IMO site code
 long numeric Longitude of the observing site in degrees
 EW factor East (E) or west (W) position from the prime meridian
 lat numeric Latitude of the observing site in degrees
 NS factor North (N) or south (S) position from the equator
 day numeric Day of the month
 month numeric Month of the year
 year numeric Year 1996
 start numeric Beginning of the observing time period
 stop numeric End of the observing time period
 sollong numeric Solar longitude of the middle of observing time period
 fovRA numeric Right ascension of the center of the field of view

fovDEC numeric Declination of the center of the field of view
 Teff numeric Effective observing time
 F numeric Correction factor for clouds
 lmg numeric Limiting magnitude
 SP0 numeric Number of observed sporadics
 Shw1 factor Abbreviation of the first shower
 N1 numeric Number of meteors belonging to the first shower
 Shw2 factor Abbreviation of the second shower
 N2 numeric Number of meteors belonging to the second shower
 Shw3 factor Abbreviation of the third shower
 N3 numeric Number of meteors belonging to the third shower
 Shw4 factor Abbreviation of the forth shower
 N4 numeric Number of meteors belonging to the forth shower
 Shw5 factor Abbreviation of the fifth shower
 N5 numeric Number of meteors belonging to the fifth shower
 Shw6 factor Abbreviation of the 6th shower
 N6 numeric Number of meteors belonging to the 6th shower
 Shw7 factor Abbreviation of the 7th shower
 N7 numeric Number of meteors belonging to the 7th shower
 Shw8 factor Abbreviation of the 8th shower
 N8 numeric Number of meteors belonging to the 8th shower

Source

Visual Meteor Database, <http://www.imo.net/data/visual>

rate97

Rate data for the year 1997

Description

Visual meteor rate data for the year 1997.

Usage

rate97

Format

A data frame with 9162 observations on the following 34 variables.

IMOcode factor IMO observer code
 sitecode numeric IMO site code
 long numeric Longitude of the observing site in degrees
 EW factor East (E) or west (W) position from the prime meridian
 lat numeric Latitude of the observing site in degrees
 NS factor North (N) or south (S) position from the equator
 day numeric Day of the month
 month numeric Month of the year
 year numeric Year 1997
 start numeric Beginning of the observing time period
 stop numeric End of the observing time period
 sollong numeric Solar longitude of the middle of observing time period
 fovRA numeric Right ascension of the center of the field of view
 fovDEC numeric Declination of the center of the field of view
 Teff numeric Effective observing time
 F numeric Correction factor for clouds
 lmg numeric Limiting magnitude
 SP0 numeric Number of observed sporadics
 Shw1 factor Abbreviation of the first shower
 N1 numeric Number of meteors belonging to the first shower
 Shw2 factor Abbreviation of the second shower
 N2 numeric Number of meteors belonging to the second shower
 Shw3 factor Abbreviation of the third shower
 N3 numeric Number of meteors belonging to the third shower
 Shw4 factor Abbreviation of the forth shower
 N4 numeric Number of meteors belonging to the forth shower
 Shw5 factor Abbreviation of the fifth shower
 N5 numeric Number of meteors belonging to the fifth shower
 Shw6 factor Abbreviation of the 6th shower
 N6 numeric Number of meteors belonging to the 6th shower
 Shw7 factor Abbreviation of the 7th shower
 N7 numeric Number of meteors belonging to the 7th shower
 Shw8 factor Abbreviation of the 8th shower
 N8 numeric Number of meteors belonging to the 8th shower

Source

Visual Meteor Database, <http://www.imo.net/data/visual>

rate98

*Rate data for the year 1998***Description**

Visual meteor rate data for the year 1998.

Usage

rate98

Format

A data frame with 12141 observations on the following 34 variables.

IMOcode factor IMO observer code

sitcode numeric IMO site code

long numeric Longitude of the observing site in degrees

EW factor East (E) or west (W) position from the prime meridian

lat numeric Latitude of the observing site in degrees

NS factor North (N) or south (S) position from the equator

day numeric Day of the month

month numeric Month of the year

year numeric Year 1998

start numeric Beginning of the observing time period

stop numeric End of the observing time period

sollong numeric Solar longitude of the middle of observing time period

fovRA numeric Right ascension of the center of the field of view

fovDEC numeric Declination of the center of the field of view

Teff numeric Effective observing time

F numeric Correction factor for clouds

lmg numeric Limiting magnitude

SPO numeric Number of observed sporadics

Shw1 factor Abbreviation of the first shower

N1 numeric Number of meteors belonging to the first shower

Shw2 factor Abbreviation of the second shower

N2 numeric Number of meteors belonging to the second shower

Shw3 factor Abbreviation of the third shower

N3 numeric Number of meteors belonging to the third shower

Shw4 factor Abbreviation of the forth shower

N4 numeric Number of meteors belonging to the forth shower
 Shw5 factor Abbreviation of the fifth shower
 N5 numeric Number of meteors belonging to the fifth shower
 Shw6 factor Abbreviation of the 6th shower
 N6 numeric Number of meteors belonging to the 6th shower
 Shw7 factor Abbreviation of the 7th shower
 N7 numeric Number of meteors belonging to the 7th shower
 Shw8 factor Abbreviation of the 8th shower
 N8 numeric Number of meteors belonging to the 8th shower

Source

Visual Meteor Database, <http://www.imo.net/data/visual>

rate99	<i>Rate data for the year 1999</i>
--------	------------------------------------

Description

Visual meteor rate data for the year 1999.

Usage

rate99

Format

A data frame with 22137 observations on the following 34 variables.

IM0code factor IMO observer code
 sitecode numeric IMO site code
 long numeric Longitude of the observing site in degrees
 EW factor East (E) or west (W) position from the prime meridian
 lat numeric Latitude of the observing site in degrees
 NS factor North (N) or south (S) position from the equator
 day numeric Day of the month
 month numeric Month of the year
 year numeric Year 1999
 start numeric Beginning of the observing time period
 stop numeric End of the observing time period
 sollong numeric Solar longitude of the middle of observing time period
 fovRA numeric Right ascension of the center of the field of view

fovDEC numeric Declination of the center of the field of view
 Teff numeric Effective observing time
 F numeric Correction factor for clouds
 lmg numeric Limiting magnitude
 SP0 numeric Number of observed sporadics
 Shw1 factor Abbreviation of the first shower
 N1 numeric Number of meteors belonging to the first shower
 Shw2 factor Abbreviation of the second shower
 N2 numeric Number of meteors belonging to the second shower
 Shw3 factor Abbreviation of the third shower
 N3 numeric Number of meteors belonging to the third shower
 Shw4 factor Abbreviation of the forth shower
 N4 numeric Number of meteors belonging to the forth shower
 Shw5 factor Abbreviation of the fifth shower
 N5 numeric Number of meteors belonging to the fifth shower
 Shw6 factor Abbreviation of the 6th shower
 N6 numeric Number of meteors belonging to the 6th shower
 Shw7 factor Abbreviation of the 7th shower
 N7 numeric Number of meteors belonging to the 7th shower
 Shw8 factor Abbreviation of the 8th shower
 N8 numeric Number of meteors belonging to the 8th shower

Source

Visual Meteor Database, <http://www.imo.net/data/visual>

read.magn	<i>Read magnitude data</i>
-----------	----------------------------

Description

Reads magnitude data from IMO site or saved file.

Usage

```
read.magn(data)
```

Arguments

data the name of the file or connection to read from.

Details

Argument data represents path to the file to be opened or a complete URL.

Value

A data frame containing a representation of the data in the file.

Author(s)

Kristina Veljkovic

References

<http://www.imo.net/data/visual>

See Also

[read.rate](#)

Examples

```
## read magnitude data for the year 2011 from IMO site
read.magn("http://www.imo.net/files/data/vmdb/MAGN_11.TXT")
```

read.rate

Read rate data

Description

Reads rate data from IMO site or saved file.

Usage

```
read.rate(data)
```

Arguments

data the name of the file or connection to read from.

Details

Argument data represents path to the file to be opened or a complete URL.

Value

A data frame containing a representation of the data in the file.

Author(s)

Kristina Veljkovic

References

<http://www.imo.net/data/visual>

See Also

[read.magn](#)

Examples

```
## read rate data for the year 2011 from IMO site
read.rate("http://www.imo.net/files/data/vmdb/RATE_11.TXT")
```

shw_list

List of meteor showers

Description

The data consists of a list of visual meteor showers.

Usage

```
shw_list
```

Format

A data frame with 33 observations on the following 11 variables.

Shw factor Three-letter shower code

Name factor Shower name

Activity.beg factor The beginning of the activity period

Activity.end factor The end of the activity period

Max factor The date of maximum activity

Sollong numeric Solar longitude of the date of maximum

Alpha numeric Right ascension of radiant at date of maximum

Delta numeric Declination of radiant at date of maximum

V numeric Geocentric velocity of the stream

r numeric Population index of a meteor shower

ZHR numeric Zenithal Hourly Rate of meteor shower during maximum activity

Source

Meteor Shower Calendar, <http://www.imo.net/calendar>

`solar.long`*Calculation of solar longitude*

Description

Calculates solar longitude with respect to the equinox of 2000.0 for given year, month, day and time.

Usage

```
solar.long(year, month, day, time)
```

Arguments

year	numeric vector of length 4 specifying year.
month	numeric vector specifying month of the year.
day	numeric vector specifying day.
time	numeric vector specifying time in hours.

Value

`solar.long` returns numeric vector with a value between 0 and 359.999.

Author(s)

Kristina Veljkovic

References

Steyaert C. (1991). Calculating the Solar Longitude 2000.0, *WGN, Journal of the IMO*, 19:2, 31-34.

See Also

[filter.sol](#)

Examples

```
## calculate solar longitude for June 22, 2006, at 4h UT.  
require(astroFns)  
solar.long(year=2006,month=6,day=22,time=4)
```

vmdbpers	<i>List of observers</i>
----------	--------------------------

Description

The data consists of a list of observers.

Usage

vmdbpers

Format

A data frame with 5920 observations on the following 4 factor variables.

Obsvr IMO observer code

Name Observer's last name

Firstname Observer's first name

Country Observer's country

Source

Visual Meteor Database, <http://www.imo.net/data/visual>

vmdbsite	<i>List of observing sites</i>
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Description

The data consists of a list of observing sites.

Usage

vmdbsite

Format

A data frame with 2911 observations on the following 11 variables.

Site numeric IMO site code

Name factor Name of the site

Country factor Country of the observing site

long.deg numeric Degrees component of longitude of the observing site

long.min numeric Minutes component of longitude of the observing site

long.sec numeric Seconds component of longitude of the observing site
 ew factor East (E) or west (W) position from the prime meridian
 lat.deg numeric Degrees component of latitude of the observing site
 lat.min numeric Minutes component of latitude of the observing site
 lat.sec numeric Seconds component of latitude of the observing site
 ns factor North (N) or south (S) position from the equator

Source

Visual Meteor Database, <http://www.imo.net/data/visual>

zhr	<i>Calculates zenithal hourly rate (ZHR)</i>
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Description

Calculation of average zenithal hourly rate of a meteor shower for a given rate data, specified shower, period of days, population index, length of time interval and ZHR correction.

Usage

```
zhr(data,year, month, day.beg,day.end,shw, r=NULL, Ralpha=NULL, Delta=NULL, k,c=1)
```

Arguments

data	data frame consisting of visual meteor rate data.
year	numeric vector of length 4 specifying year.
month	numeric vector specifying month of the year.
day.beg	numeric vector specifying beginning day.
day.end	numeric vector specifying ending day.
shw	character string consisting of three capital letters which represent meteor shower code.
r	numeric vector specifying population index of a meteor shower.
Ralpha	numeric vector with value between 0 and 360, specifying right ascension of the radiant, in degrees.
Delta	numeric vector with value between -90 and +90, specifying declination of the radiant, in degrees.
k	numeric vector specifying length of time interval in hours.
c	numeric vector specifying value of ZHR correction. By default, it is equal to 1.

Details

Average zenithal hourly rate is calculated by the formula

$$ZHR=(c+\sum_i n_i)/(\sum_i T_{eff,i}/C_i), i=1,2,\dots,k$$

where k is the number of observing periods, n_i - the raw number of meteors seen by each observer in observing period i , $T_{eff,i}$ - the effective time or amount of time an observer actually scans the sky for meteors during observing period i , and C_i - a correction factor that accounts for all the imperfections in the observing period i such as clouds, low radiant, low limiting magnitude.

Correction factor is equal to

$$C_i=r^{(6.5-lmg_i)}F_i/\sin(h_i),$$

where r is population index, lmg_i limiting magnitude, F_i correction factor for clouds, h_i radiant elevation for each observer in observing period i .

In the numerator, c is included to correct for the asymmetric high and low end possibilities in a Poisson distribution (distribution of number of observed meteors).

Standard error of the average zenithal rate is calculated by the formula

$$\sigma=ZHR/\sqrt{c+\sum_i n_i}.$$

The spatial number density of meteoroids producing meteors of magnitude at least 6.5 is (per 10^9km^3)

$$\rho=(10.65r-12.15)ZHR/(3600\ 178700r^{(-1.82)}V),$$

where V is stream's geocentric velocity.

Standard error of spatial number density is approximated with

$$\sigma_{\rho}=\sigma\rho/ZHR.$$

If right ascension and declination of shower radiant are not specified, the values from the data frame [radiant](#) are used.

Day is divided in subintervals of k hours. For example, if $k=12$, subintervals are $[0,12)$ and $[12,24)$. Zenithal hourly rate is calculated for each subinterval in the following manner: If middle of observing time period belongs to the subinterval, corresponding data values are used in calculation of ZHR.

Value

Data frame containing following numeric vectors

day Day of the month

month Month of the year

year Year

start Left bound of time subinterval

stop Right bound of time subinterval

sollong Solar longitude corresponding to the middle of time subinterval

nINT Number of observing time intervals

nSHW Number of observed meteors. String SHW is replaced with the code of meteor shower.

ZHR Zenithal Hourly Rate

st.err Standard error of ZHR
density Spatial number density
dens.err Standard error of spatial number density

Author(s)

Kristina Veljkovic

References

Rendtel J. and Arlt R., editors (2008). *IMO Handbook For Meteor Observers*. IMO, Potsdam.
 Koschack R. and Rendtel J. (1990a). Determination of spatial number density and mass index from visual meteor observations (1). *WGN, Journal of the IMO*, 18(2), 44 - 58.
 Bias, P.V. (2011). A Note on Poisson inference and extrapolations under low raw data and short interval observation conditions. *WGN, Journal of the IMO*, 39:1, 14-19.

See Also

[zhr.graph,pop.index](#)

Examples

```
## select visual meteor data for observation of Orionids,period 20-24th October 2006,
## 12hrs time intervals, and calculate ZHR
data(rate06)
rateOri<-filter(rate06,shw="ORI",year=2006, month=10, day.beg=20,day.end=24)
zhr(rateOri,year=2006,month=10,day.beg=20,day.end=24,shw="ORI",r=2.5,k=12)
```

zhr.graph

Graphic of zenithal hourly rate (ZHR)

Description

Graphical representation of average zenithal hourly rate of a meteor shower with error bars for a given rate dataset, specified shower, period of days, population index, length of time interval, ZHR correction and type of x-axis display.

Usage

```
zhr.graph(data,year,month, day.beg, day.end=day.beg,shw, r=NULL, Ralpha=NULL,
          Delta=NULL, k,c=1,type=c("UTC","sol"))
```

Arguments

data	data frame consisting of visual meteor rate data.
year	numeric vector of length 4 specifying year.
month	numeric vector specifying month of the year.
day.beg	numeric vector specifying beginning day.
day.end	numeric vector specifying ending day.
shw	character string consisting of three capital letters which represent meteor shower code.
r	numeric vector specifying population index of a meteor shower.
Ralpha	numeric vector with value between 0 and 360, specifying right ascension of the radiant, in degrees.
Delta	numeric vector with value between -90 and +90, specifying declination of the radiant, in degrees.
k	numeric vector specifying length of time interval in hours.
c	numeric vector specifying value of ZHR correction. By default, c=1.
type	character string taking a value "UTC" or "sol", specifying the notation on x-axis of the graphic.

Details

For type="UTC", tick marks on x-axis represent coordinated universal time (UTC), set k distance apart, with labels specifying date (at 00:00 UTC). For type="sol", tick marks and labels on x-axis represent solar longitude, corresponding to above mentioned time in UTC.

Value

xy plot of Zenithal Hourly Rate, with time (UTC) or solar longitude on x-axis and ZHR on y-axis. ZHR is represented with black filled circles with 68% confidence intervals/one sigma error bars.

Author(s)

Kristina Veljkovic

References

<http://www.imo.net>

See Also

[zhr](#)

Examples

```
## select data for observations of Orionids, period 16-30th October 2006,  
## 12hrs time intervals, and make a graphic of ZHR  
data(rate06)  
require(plotrix)  
rateOri<-filter(rate06,shw="ORI",year=2006, month=10, day.beg=16, day.end=30)  
zhr.graph(rateOri,year=2006,month=10,day.beg=16,day.end=30,shw="ORI",r=2.5,k=12,type="UTC")
```

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