

# Package ‘swephR’

October 14, 2022

**Type** Package

**Title** High Precision Swiss Ephemeris

**Version** 0.3.0

**Description** The Swiss Ephemeris (version 2.08) is a high precision ephemeris based upon the DE431 ephemerides from NASA's JPL. It covers the time range 13201 BCE to 17191 CE. This package uses the semi-analytic theory by Steve Moshier. For faster and more accurate calculations, the compressed Swiss Ephemeris data is available in the 'swephRdata' package. To access this data package, run 'install.packages("swephRdata", repos = "https://rstub.github.io/drat/", type = "source")'. The size of the 'swephRdata' package is approximately 115 MB. The user can also use the original JPL DE431 data.

**License** AGPL | file LICENSE

**Imports** Rcpp (>= 0.12.18)

**LinkingTo** Rcpp

**RoxygenNote** 6.1.1

**Suggests** testthat, swephRdata, knitr, rmarkdown

**Encoding** UTF-8

**URL** <https://github.com/rstub/swephR/>, <https://rstub.github.io/swephR/>,  
<http://www.astro.com/swissep/>

**BugReports** <https://github.com/rstub/swephR/issues/>

**Additional\_repositories** <https://rstub.github.io/drat>

**VignetteBuilder** knitr

**LazyData** true

**Language** en-US

**NeedsCompilation** yes

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LICENSE for details)

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**Repository** CRAN

**Date/Publication** 2019-08-28 14:00:05 UTC

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swephR-package	<i>swephR: High Precision Swiss Ephemeris</i>
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## Description

The Swiss Ephemeris (version 2.08) is a high precision ephemeris based upon the DE431 ephemerides from NASA's JPL. It covers the time range 13201 BCE to 17191 CE. This package uses the semi-analytic theory by Steve Moshier. For faster and more accurate calculations, the compressed Swiss Ephemeris data is available in the 'swephRdata' package. To access this data package, run 'install.packages("swephRdata", repos = "https://rstub.github.io/drat/", type = "source")'. The size of the 'swephRdata' package is approximately 115 MB. The user can also use the original JPL DE431 data.

## Author(s)

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- Victor Reijs
- Authors and copyright holder of the Swiss Ephemeris (see LICENSE for details) [copyright holder]

**See Also**

Useful links:

- <https://github.com/rstub/swephR/>
- <https://rstub.github.io/swephR/>
- <http://www.astro.com/swisseph/>
- Report bugs at <https://github.com/rstub/swephR/issues/>

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SE

*Constants used in swephR*

---

**Description**

- name of variable
- value of the variable

**Usage**

data(SE)

**Format**

A data frame with 217 rows and 2 variables

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Section1

*Section 1: The Ephemeris file related functions*

---

**Description**

Several initialization functions

**Usage**

swe\_set\_ephe\_path(path)

swe\_close()

swe\_set\_jpl\_file(fname)

swe\_version()

swe\_get\_library\_path()

**Arguments**

path	Directory for the sefstars.txt, swe_deltat.txt and jpl files
fname	JPL ephemeris name as string (JPL ephemeris file, e.g. de431.eph)

**Details**

**swe\_set\_ephe\_path()** This is the first function that should be called before any other function of the Swiss Ephemeris. Even if you don't want to set an ephemeris path and use the Moshier ephemeris, it is nevertheless recommended to call `swe_set_ephe_path(NULL)`, because this function makes important initializations. If you don't do that, the Swiss Ephemeris may work, but the results may be not 100% consistent.

**swe\_close()** At the end of your computations this function releases most resources (open files and allocated memory) used by Swiss Ephemeris.

**swe\_set\_jpl\_file()** Set name of JPL ephemeris file.

**swe\_version()** The function provides the version number of the Swiss Ephemeris software.

**swe\_get\_library\_path()** The function provides the path where the executable resides.

**Value**

`swe_version` returns Swiss Ephemeris software version as string

`swe_get_library_path` returns the path in which the executable resides as string

**See Also**

Section 1 in <http://www.astro.com/swissep/swerphrg.htm>. Remember that array indices start in R at 1, while in C they start at 0!

**Examples**

```
## Not run: swe_set_ephe_path("c:\\sweph\\ephe")
swe_close()
swe_set_jpl_file("de431.eph")
swe_version()
swe_get_library_path()
```

**Description**

Functions to support the determination of sidereal information

**Usage**

```
swe_set_sid_mode(sid_mode, t0, ayan_t0)
```

```
swe_get_ayanamsa_name(sid_mode)
```

```
swe_get_ayanamsa_ex_ut(jd_ut, iflag)
```

```
swe_get_ayanamsa_ex(jd_et, iflag)
```

**Arguments**

sid_mode	Sidereal mode as integer
t0	Reference date as double (day)
ayan_t0	The initial latitude value of the ayanamsa as double (deg)
jd_ut	UT Julian day number as double (day)
iflag	Computation flag as integer, many options possible (section 2.3)
jd_et	ET Julian day number as double (day)

**Details**

**swe\_set\_sid\_mode()** Set the mode for sidereal computations.

**swe\_get\_ayanamsa\_name()** Get the mode name for sidereal computations.

**swe\_get\_ayanamsa\_ex\_ut()** It computes ayanamsa using UT.

**swe\_get\_ayanamsa\_ex()** It computes ayanamsa using ET.

**Value**

swe\_get\_ayanamsa\_name returns name of ayanamsa method as string

swe\_get\_ayanamsa\_ex\_ut returns a list with named entries: return status flag as integer, daya ayanamsa value as double and serr error message as string

swe\_get\_ayanamsa\_ex returns a list with named entries: return status flag as integer, daya ayanamsa value as double and serr error message as string

**See Also**

Section 10 in <http://www.astro.com/swiseph/swephprg.htm>. Remember that array indices start in R at 1, while in C they start at 0!

**Examples**

```
data(SE)
swe_set_sid_mode(SE$SIDM_FAGAN_BRADLEY, 0, 0)
swe_get_ayanamsa_name(SE$SIDM_FAGAN_BRADLEY)
swe_get_ayanamsa_ex_ut(2458346.82639, SE$FLG_MOSEPH)
swe_get_ayanamsa_ex(2458346.82639, SE$FLG_MOSEPH)
```

**Description**

Calculate house cusp, ascendant, Medium Coeli, etc. calculations

**Usage**

```
swe_houses_ex(jd_ut, cuspflag, geolat, geolon, hsys)
```

```
swe_houses_armc(armc, geolat, eps, hsys)
```

```
swe_house_name(hsys)
```

**Arguments**

jd_ut	UT Julian day number as double (day)
cuspflag	cusp flag as integer (0 [tropical], SE\$FLG_SIDEREAL, SE\$FLG_RADIANS)
geolat	geographic latitude as double (deg)
geolon	geographic longitude as double (deg)
hsys	house method, one-letter case sensitive as char
armc	right ascension of the MC as double (deg)
eps	ecliptic obliquity as double (deg)

**Details**

**swe\_houses\_ex()** Calculate houses' cusps, ascendant, Medium Coeli (MC), etc.

**swe\_houses\_armc()** Calculate houses' information from the right ascension of the Medium Coeli (MC).

**swe\_houses\_name()** Provide the house name.

**Value**

swe\_houses\_ex returns a list with named entries: return status flag as integer, cusps cusps values as double and ascmc ascendent, MCs. etc. as double.

swe\_houses\_armc returns a list with named entries: return status flag as integer, cusps cusps values as double and ascmc ascendent, MCs, etc. as double.

swe\_house\_name returns the house name as string

**See Also**

Section 13 in <http://www.astro.com/swisseph/swephprg.htm>. Remember that array indices start in R at 1, while in C they start at 0!

**Examples**

```
swe_houses_ex(1234567, 0, 53, 0, 'B')
swe_houses_armc(12, 53, 23, 'B')
swe_house_name('G')
```

---

 Section14

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*Section 14: House position calculations*


---

**Description**

Calculate house position of a given body.

**Usage**

```
swe_house_pos(armc, geolat, eps, hsys, xpin)

swe_gauquelin_sector(jd_ut, ipl, starname, ephe_flag, imeth, geopos,
  atpress, attemp)
```

**Arguments**

armc	right ascension of the MC as double (deg)
geolat	geographic latitude as double (deg)
eps	ecliptic obliquity as double (deg)
hsys	house method, one-letter case sensitive as char
xpin	longitude and latitude of the given body as numeric vector (deg)
jd_ut	UT Julian day number as double (day)
ipl	Body/planet as integer (SE\$SUN=0, SE\$MOON=1, ... SE\$PLUTO=9)
starname	Star name as string (" " for no star)
ephe_flag	Ephemeris flag as integer (SE\$FLG_JPLEPH=1, SE\$FLG_SWIEPH=2 or SE\$FLG_MOSEPH=4)
imeth	Gauquelin method as integer (0, 1, 2, 3, 4 or 5)
geopos	position as numeric vector (longitude, latitude, height)
atpress	Atmospheric pressure as double (hPa)
attemp	Atmospheric temperature as double (Celsius)

**Details**

**swe\_house\_pos()** Calculate house position of given body.

**swe\_gauquelin\_sector()** Compute the Gauquelin sector position of a planet or star.

**Value**

`swe_house_pos` returns a list with named entries: return how far from body's cusp as double, and `serr` error message as string.

`swe_gauquelin_sector` returns a list with named entries: return status flag as integer, `dgsect` for Gauquelin sector as double and `serr` error message as string

**See Also**

Section 14 in <http://www.astro.com/swisseph/swephprg.htm>. Remember that array indices start in R at 1, while in C they start at 0!

**Examples**

```
swe_house_pos(12, 53, 23, 'B', c(0,0))
data(SE)
swe_gauquelin_sector(1234567.5, SE$VENUS, "", SE$FLG_MOSEPH, 0, c(0, 50, 10), 1013.25, 15)
```

---

 Section15

*Section 15: Sidereal time*


---

**Description**

Calculate the sidereal time (in degrees).

**Usage**

```
swe_sidtime(jd_ut)
```

**Arguments**

`jd_ut` UT Julian day number as double (day)

**Details**

`swe_sidtime()` Determine the sidereal time.

**Value**

`swe_sidtime` returns the sidereal time as double (deg)

**See Also**

Section 15 in <http://www.astro.com/swisseph/swephprg.htm>. Remember that array indices start in R at 1, while in C they start at 0!

**Examples**

```
swe_sidtime(2451545)
```



**Description**

Useful functions

**Usage**

```
swe_day_of_week(jd)
```

**Arguments**

jd                    Julian day number as numeric vector (day)

**Details**

**swe\_day\_of\_week()** Determine day of week from Julian day number.

**Value**

swe\_day\_of\_week returns the day of week as integer vector (0 Monday .. 6 Sunday)

**See Also**

Section 16.7 in <http://www.astro.com/swissep/ephprog.htm>. Remember that array indices start in R at 1, while in C they start at 0!

**Examples**

```
swe_day_of_week(1234.567)
```

**Description**

Computing positions of planets, asteroids, lunar nodes and apogees using Swiss Ephemeris.

**Usage**

```
swe_calc_ut(jd_ut, ipl, iflag)
```

```
swe_calc(jd_et, ipl, iflag)
```

**Arguments**

<code>jd_ut</code>	UT Julian day number as double (day)
<code>ipl</code>	Body/planet as integer (SE\$SUN=0, SE\$Moon=1, ... SE\$PLUTO=9)
<code>iflag</code>	Computation flag as integer, many options possible (section 2.3.1)
<code>jd_et</code>	ET Julian day number as double (day)

**Details**

`swe_calc_ut()` It compute positions using UT.

`swe_calc()` It compute positions using ET.

**Value**

`swe_calc_ut` returns a list with named entries: return status flag as integer, xx information on planet position, and serr error message as string.

`swe_calc` returns a list with named entries: return status flag as integer, xx updated star name as string and serr error message as string.

**See Also**

Section 2 in <http://www.astro.com/swissep/sep/sep.htm>. Remember that array indices start in R at 1, while in C they start at 0!

**Examples**

```
data(SE)
swe_calc_ut(2458346.82639, SE$MOON, SE$FLG_MOSEPH)
swe_calc(2458346.82639, SE$MOON, SE$FLG_MOSEPH)
```

---

 Section3

---

*Section 3: Find a planetary or asteroid name*


---

**Description**

Find a planetary or asteroid name.

**Usage**

```
swe_get_planet_name(ipl)
```

**Arguments**

<code>ipl</code>	Body/planet as integer (SE\$SUN=0, SE\$Moon=1, ... SE\$PLUTO=9)
------------------	---

**Details**

`swe_get_planet_name()` Convert object number into object name.

**Value**

`swe_get_planet_name` returns the object's name as string

**See Also**

Section 3 in <http://www.astro.com/swiseph/swephprg.htm>. Remember that array indices start in R at 1, while in C they start at 0!

**Examples**

```
data(SE)
swe_get_planet_name(SE$MOON)
```

---

Section4

*Section 4: Fixed stars functions*

---

**Description**

The following functions are used to calculate positions of fixed stars.

**Usage**

```
swe_fixstar2_mag(starname)

swe_fixstar2(starname, jd_et, iflag)

swe_fixstar2_ut(starname, jd_ut, iflag)
```

**Arguments**

<code>starname</code>	Star name as string ("" for no star)
<code>jd_et</code>	ET Julian day number as double (day)
<code>iflag</code>	Calculation flag as integer, many options possible (section 2.3)
<code>jd_ut</code>	UT Julian day number (day)

**Details**

**`swe_fixstar2_mag()`** Calculate visible magnitude (Vmag) of star.

**`swe_fixstar2()`** Compute information of star using ET.

**`swe_fixstar2_ut()`** Compute information of star using UT

**Value**

swe\_fixstar2\_mag returns a list with named entries: return status flag as integer, starname updated star name as string, mag magnitude of star as double, and serr for error message as string.

swe\_fixstar2 returns a list with named entries: return status flag as integer, starname updated star name as string, xx star phenomena as numeric vector, and serr error message as string.

swe\_fixstar2\_ut returns a list with named entries: return status flag as integer, starname updated star name as string, xx star information as numeric vector, and serr for error message as string.

**See Also**

Section 4 in <http://www.astro.com/swiseph/swephprg.htm>. Remember that array indices start in R at 1, while in C they start at 0!

**Examples**

```
data(SE)
swe_fixstar2_mag("sirius")
swe_set_topo(0,50,10)
swe_fixstar2("sirius",1234567,SE$FLG_TOPOCTR+SE$FLG_MOSEPH+SE$FLG_EQUATORIAL)
swe_fixstar2_ut("sirius",1234567,SE$FLG_TOPOCTR+SE$FLG_MOSEPH+SE$FLG_EQUATORIAL)
```

---

 Section5

---

*Section 5: Kepler elements, nodes, apsides and orbital periods*


---

**Description**

Functions for: determining Kepler elements, nodes, apsides and orbital periods

**Usage**

```
swe_nod_aps_ut(jd_ut, ipl, iflag, method)
```

```
swe_nod_aps(jd_et, ipl, iflag, method)
```

```
swe_get_orbital_elements(jd_et, ipl, iflag)
```

```
swe_orbit_max_min_true_distance(jd_et, ipl, iflag)
```

**Arguments**

jd_ut	UT Julian day number as double (day)
ipl	Body/planet as integer (SE\$SUN=0, SE\$MOON=1, ... SE\$PLUTO=9)
iflag	Computation flag as integer, many options possible (section 2.3)
method	Method as integer (SE\$NODBIT_MEAN=0, SE\$NODBIT_OSCUN=1,, SE\$NODBIT_OSCU_BAR=4, SE\$NODBIT_FOPOINT=256)
jd_et	ET Julian day number as double (day)

**Details**

**swe\_nod\_aps\_ut()** Compute planetary nodes and apsides (perihelia, aphelia, second focal points of the orbital ellipses).

**swe\_nod\_aps()** Compute planetary nodes and apsides (perihelia, aphelia, second focal points of the orbital ellipses).

**swe\_get\_orbital\_elements()** This function calculates osculating elements (Kepler elements) and orbital periods.

**swe\_orbit\_max\_min\_true\_distance()** This function calculates the maximum possible distance, the minimum possible distance and the current true distance of planet.

**Value**

`swe_nod_aps_ut` returns a list with named entries: `return` status flag as integer, `xnasc` ascending nodes as numeric vector, `xndsc` descending nodes as numeric vector, `xperi` perihelion as numeric vector, `xaphe` aphelion as numeric vector and `serr` error message as string

`swe_nod_aps` returns a list with named entries: `return` status flag as integer, `xnasc` ascending nodes as numeric vector, `xndsc` descending nodes as numeric vector, `xperi` perihelion as numeric vector, `xaphe` aphelion as numeric vector and `serr` error message as string

`swe_get_orbital_elements` returns a list with named entries: `return` status flag as integer, `dret` function results as numeric vector and `serr` error message as string

`swe_orbit_max_min_true_distance` returns a list with named entries: `return` status flag as integer, `dmax` maximum distance as double, `dmin` minimum distance as double, `dtrue` true distance as double and `serr` error message as string

**See Also**

Section 5 in <http://www.astro.com/swissep/sep/hprg.htm>. Remember that array indices start in R at 1, while in C they start at 0!

**Examples**

```
data(SE)
swe_nod_aps_ut(2451545, SE$MOON, SE$FLG_MOSEPH, SE$NODBIT_MEAN)
swe_nod_aps(2451545, SE$MOON, SE$FLG_MOSEPH, SE$NODBIT_MEAN)
swe_get_orbital_elements(2451545, SE$MOON, SE$FLG_MOSEPH)
swe_orbit_max_min_true_distance(2451545, SE$MOON, SE$FLG_MOSEPH)
```

---

 Section6

*Section 6: Eclipses, Risings, Settings, Meridian Transits, Planetary Phenomena*


---

**Description**

Functions for: determining eclipse and occultation calculations, computing the times of rising, setting and meridian transits for all planets, asteroids, the moon and the fixed stars; computing phase, phase angle, elongation, apparent diameter, apparent magnitude for the Sun, the Moon, all planets and asteroids; and determining heliacal phenomenon after a given start date

**Usage**

```
swe_sol_eclipse_when_loc(jd_start, ephe_flag, geopos, backward)
swe_sol_eclipse_when_glob(jd_start, ephe_flag, ifltype, backward)
swe_sol_eclipse_how(jd_ut, ephe_flag, geopos)
swe_sol_eclipse_where(jd_ut, ephe_flag)
swe_lun_occult_when_loc(jd_start, ipl, starname, ephe_flag, geopos,
backward)
swe_lun_occult_when_glob(jd_start, ipl, starname, ephe_flag, ifltype,
backward)
swe_lun_occult_where(jd_ut, ipl, starname, ephe_flag)
swe_lun_eclipse_when_loc(jd_start, ephe_flag, geopos, backward)
swe_lun_eclipse_how(jd_ut, ephe_flag, geopos)
swe_lun_eclipse_when(jd_start, ephe_flag, ifltype, backward)
swe_rise_trans_true_hor(jd_ut, ipl, starname, ephe_flag, rsmi, geopos,
atpress, attemp, horhgt)
swe_pheno_ut(jd_ut, ipl, ephe_flag)
swe_pheno(jd_et, ipl, ephe_flag)
swe_azalt(jd_ut, coord_flag, geopos, atpress, attemp, xin)
swe_azalt_rev(jd_ut, coord_flag, geopos, xin)
swe_refrac(InAlt, atpress, attemp, calc_flag)
```

```
swe_refrac_extended(InAlt, height, atpress, attemp, lapse_rate, calc_flag)

swe_heliacal_ut(jd_utstart, dgeo, datm, dobs, objectname, event_type,
  helflag)

swe_vis_limit_mag(jd_ut, dgeo, datm, dobs, objectname, helflag)

swe_heliacal_pheno_ut(jd_ut, dgeo, datm, dobs, objectname, event_type,
  helflag)

swe_topo_arcus_visionis(jd_ut, dgeo, datm, dobs, helflag, mag, Azi0, Alt0,
  AziS, AziM, AltM)

swe_heliacal_angle(jd_ut, dgeo, datm, dobs, helflag, mag, Azi0, AziS, AziM,
  AltM)
```

### Arguments

jd_start	Julian day number as double (UT)
ephe_flag	Ephemeris flag as integer (SE\$FLG_JPLEPH=1, SE\$FLG_SWIEPH=2 or SE\$FLG_MOSEPH=4)
geopos	position as numeric vector (longitude, latitude, height)
backward	backwards search as boolean (TRUE)
ifltype	eclipse type as integer (SE\$ECL_CENTRAL=1, SE\$ECL_NONCENTRAL=2, SE\$ECL_TOTAL=4, SE\$ECL_ANNULAR=8, SE\$ECL_PARTIAL=16, SE\$ECL_ANNULAR_TOTAL=32 or 0 for any)
jd_ut	UT Julian day number as double (day)
ipl	Body/planet as integer (SE\$SUN=0, SE\$MOON=1, ... SE\$PLUTO=9)
starname	Star name as string (" " for no star)
rsmi	Event flag as integer (e.g.: SE\$CALC_RISE=1, SE\$CALC_SET=2, SE\$CALC_MTRANSIT=4, SE\$CALC_ITRANSIT=8)
atpress	Atmospheric pressure as double (hPa)
attemp	Atmospheric temperature as double (Celsius)
horhgt	Horizon apparent altitude as double (deg)
jd_et	ET Julian day number as double (day)
coord_flag	Coordinate flag as integer (reference system (SE\$ECL2HOR=0 or SE\$EQU2HOR=1))
xin	Position of body as numeric vector (either ecliptical or equatorial coordinates, depending on coord_flag)
InAlt	object's apparent/topocentric altitude as double (depending on calc_flag) (deg)
calc_flag	Calculation flag as integer (refraction direction (SE\$TRUE_TO_APP=0 or SE\$APP_TO_TRUE=1))
height	observer's height as double (m)
lapse_rate	lapse rate as double (K/m)
jd_utstart	UT Julian day number as double (day)

dgeo	Geographic position as numeric vector (longitude, latitude, height)
datm	Atmospheric conditions as numeric vector (pressure, temperature, relative humidity, visibility)
dobs	Observer description as numeric vector
objectname	Name of fixed star or planet as string
event_type	Event type as integer
helflag	Calculation flag (incl. ephe_flag values) as integer
mag	Object's visible magnitude (Vmag) as double (-)
AziO	Object's azimuth as double (deg)
AltO	Object's altitude as double (deg)
AziS	Sun's azimuth as double (deg)
AziM	Moon's azimuth as double (deg)
AltM	Moon's altitude as double (deg)

### Details

**swe\_sol\_eclipse\_when\_loc()** Find the next solar eclipse for a given geographic position.

**swe\_sol\_eclipse\_when\_glob()** Find the next solar eclipse on earth.

**swe\_sol\_eclipse\_how()** Compute the attributes of a solar eclipse for a given time.

**swe\_sol\_eclipse\_where()** Compute the geographic position of a solar eclipse path.

**swe\_lun\_occult\_when\_loc()** Find the next lunar occultation with planet or star at a certain position.

**swe\_lun\_occult\_when\_glob()** Find the next lunar occultation with planet or star somewhere on the earth.

**swe\_lun\_occult\_where()** Compute the geographic position of an occultation path.

**swe\_lun\_eclipse\_when\_loc()** Find the next lunar eclipse for a given geographic position.

**swe\_lun\_eclipse\_how()** Compute the attributes of a lunar eclipse for a given time.

**swe\_lun\_eclipse\_when()** Find the next lunar eclipse on earth.

**swe\_rise\_trans\_true\_hor()** Compute the times of rising, setting and meridian transits for planets, asteroids, the moon, and the fixed stars for a local horizon that has an altitude.

**swe\_pheno\_ut()** Compute phase, phase angle, elongation, apparent diameter, apparent magnitude for the Sun, the Moon, all planets and asteroids (UT)

**swe\_pheno()** Compute phase, phase angle, elongation, apparent diameter, apparent magnitude for the Sun, the Moon, all planets and asteroids (ET).



**swe\_azalt()** Compute the horizontal coordinates (azimuth and altitude) of a planet or a star from either ecliptical or equatorial coordinates.

**swe\_azalt\_rev()** Compute either ecliptical or equatorial coordinates from azimuth and true altitude. If only an apparent altitude is given, the true altitude has to be computed first with e.g. the function `swe_refrac_extended()`.

**swe\_refrac()** Calculate either the topocentric altitude from the apparent altitude or the apparent altitude from the topocentric altitude.

**swe\_refrac\_extended()** Calculate either the topocentric altitude from the apparent altitude or the apparent altitude from the topocentric altitude. It allows correct calculation of refraction for heights above sea  $> 0$ , where the ideal horizon and planets that are visible may have a negative altitude.

**swe\_heliacal\_ut()** Compute the Julian day of the next heliacal phenomenon after a given UT start date. It works between geographic latitudes 60 South and 60 North.

**swe\_vis\_limit\_mag()** Determine the limiting visual magnitude in dark skies. If the visual magnitude `mag` of an object is known for a given date (e. g. from a call of function `swe_pheno_ut()`), and if magnitude is smaller than the value returned by `swe_vis_limit_mag()`, then it is visible.

**swe\_heliacal\_pheno\_ut()** Provide data that are relevant for the calculation of heliacal risings and settings. This function does not provide data of heliacal risings and settings itself, just some additional data mostly used for test purposes. To calculate heliacal risings and settings, use the function `swe_heliacal_ut()`.

**swe\_topo\_arcus\_visionis()** Compute topocentric arcus visionis.

**swe\_heliacal\_angle()** Compute heliacal angle.

## Value

`swe_sol_eclipse_when_loc` returns a list with named entries: `return` status flag as integer, `tret` for eclipse timing moments as numeric vector, `attr` phenomena during eclipse as numeric vector and `serr` error message as string

`swe_sol_eclipse_when_glob` returns a list with named entries: `return` status flag as integer, `tret` for eclipse timing moments as numeric vector and `serr` error warning as string

`swe_sol_eclipse_how` returns a list with named entries: `return` status flag as integer, `attr` phenomena during eclipse as numeric vector and `serr` error message as string

`swe_sol_eclipse_where` returns a list with named entries: `return` status flag as integer, `pathpos` geographic path positions as numeric vector, `attr` phenomena during eclipse as numeric vector and `serr` error message as string

`swe_lun_occult_when_loc` returns a list with named entries: `return` status flag as integer, `tret` for eclipse timing moments as numeric vector, `attr` phenomena during eclipse as numeric vector and `serr` error message as string

`swe_lun_occult_when_glob` returns a list with named entries: `return` status flag as integer, `tret` for eclipse timing moments as numeric vector, `attr` phenomena during eclipse as numeric vector and `serr` error message as string

`swe_lun_occult_where` returns a list with named entries: return status flag as integer, pathpos geographic path positions as numeric vector, attr phenomena during eclipse as numeric vector and serr error message as string

`swe_lun_eclipse_when_loc` returns a list with named entries: return status flag as integer, tret for eclipse timing moments, attr phenomena during eclipse and serr error warning as string

`swe_lun_eclipse_how` returns a list with named entries: return status flag as integer, attr phenomena during eclipse as numeric vector and serr error message as string

`swe_lun_eclipse_when` returns a list with named entries: return status flag as integer, tret for eclipse timing moments as numeric vector and serr error warning as string

`swe_rise_trans_true_hor` returns a list with named entries: return status flag as integer, tret for azimuth/altitude info as double and serr error message as string

`swe_pheno_ut` returns a list with named entries: return status flag as integer, attr for phenomenon information as numeric vector and serr error warning as string

`swe_pheno` returns a list with named entries: return status flag as integer, attr for phenomenon information as numeric vector and serr error message as string

`swe_azalt` returns a list with named entries: xaz for azi/alt info as numeric vector.

`swe_azalt_rev` returns a list with named entries: xaz for celestial info as numeric vector.

`swe_refrac` returns the (apparent/topocentric) altitude as double (deg)

`swe_refrac_extended` returns a list with named entries: return status flag as integer, dret refraction results as numeric vector (TopoAlt, AppAlt, refraction)

`swe_heliacal_ut` returns a list with named entries return status flag as integer, dret heliacal results as numeric vector, and serr error message as string.

`swe_vis_limit_mag` returns a list with named entries: return status flag as integer, dret limiting magnitude as double and serr error message as string

`swe_heliacal_pheno_ut` returns a list with named entries: return status flag as integer darr for heliacal details as numeric vector and serr error message as string

`swe_topo_arcus_visionis` returns a list with named entries: return status flag as integer, darr heliacal details as numeric vector and serr error message as string

`swe_heliacal_angle` returns a list with named entries: return status flag as integer, dret heliacal angle as numeric vector and serr error message as string

### See Also

Section 6 in <http://www.astro.com/swiseph/swephprg.htm>. Remember that array indices start in R at 1, while in C they start at 0!

### Examples

```
data(SE)
swe_sol_eclipse_when_loc(1234567, SE$FLG_MOSEPH, c(0, 50, 10), FALSE)
swe_sol_eclipse_when_glob(1234567, SE$FLG_MOSEPH, SE$ECL_TOTAL+SE$ECL_CENTRAL+SE$ECL_NONCENTRAL, FALSE)
swe_sol_eclipse_how(1234580.19960447, SE$FLG_MOSEPH, c(0, 50, 10))
swe_sol_eclipse_where(1234771.68584597, SE$FLG_MOSEPH)
swe_lun_occult_when_loc(1234567, SE$VENUS, "", SE$FLG_MOSEPH+SE$ECL_ONE_TRY, c(0, 50, 10), FALSE)
swe_lun_occult_when_glob(1234567, SE$VENUS, "", SE$FLG_MOSEPH+SE$ECL_ONE_TRY, SE$ECL_TOTAL, FALSE)
```

```

swe_lun_occult_where(1234590.44756319, SE$VENUS, "", SE$FLG_MOSEPH+SE$ECL_ONE_TRY)
swe_lun_eclipse_when_loc(1234567, SE$FLG_MOSEPH, c(0, 50, 10), FALSE)
swe_lun_eclipse_when(1234567, SE$FLG_MOSEPH, SE$ECL_CENTRAL, FALSE)
swe_lun_eclipse_how(1234580.19960447, SE$FLG_MOSEPH, c(0, 50, 10))
swe_rise_trans_true_hor(1234567.5, SE$SUN, "", SE$FLG_MOSEPH, 0, c(0, 50, 10), 1013.25, 15, 0)
swe_pheno_ut(1234567, 1, SE$FLG_MOSEPH)
swe_pheno(1234567, 1, SE$FLG_MOSEPH)
swe_azalt(1234567, SE$EQU2HOR, c(0, 50, 10), 15, 1013.25, c(186, 22))
swe_azalt_rev(1234567, SE$ECL2HOR, c(0, 50, 10), c(123, 2))
swe_refrac_extended(2, 0, 1013.25, 15, -0.065, SE$TRUE_TO_APP)
swe_heliacal_ut(1234567, c(0, 50, 10), c(1013.25, 15, 50, 0.25), c(25, 1, 1, 1, 5, 0.8), "sirius",
  SE$HELIALCAL_RISING, SE$HELFLAG_HIGH_PRECISION+SE$FLG_MOSEPH)
swe_vis_limit_mag(1234567.5, c(0, 50, 10), c(1013.25, 15, 20, 0.25), c(25, 1, 1, 1, 5, 0.8), 'sirius',
  SE$HELFLAG_HIGH_PRECISION+SE$FLG_MOSEPH)
swe_heliacal_pheno_ut(1234567.5, c(0, 50, 10), c(1013.25, 15, 20, 0.25), c(25, 1, 1, 1, 5, 0.8), 'sirius',
  SE$HELIALCAL_RISING, SE$HELFLAG_HIGH_PRECISION+SE$FLG_MOSEPH)
swe_topo_arcus_visionis(1234567.5, c(0, 50, 10), c(1013.25, 15, 20, 0.25), c(25, 1, 1, 1, 5, 0.8),
  SE$HELFLAG_HIGH_PRECISION+SE$HELFLAG_OPTICAL_PARAMS, -1, 124, 2, 120, 0, -45)
swe_heliacal_angle(1234567.5, c(0, 50, 10), c(1013.25, 15, 20, 0.25), c(25, 1, 1, 1, 5, 0.8),
  SE$HELFLAG_HIGH_PRECISION+SE$HELFLAG_OPTICAL_PARAMS, -1, 124, 120, 0, -45)

```

**Description**

Functions related to calendar and time conversions.

**Usage**

```

swe_julday(year, month, day, hourd, gregflag)

swe_date_conversion(year, month, day, hourd, cal)

swe_revjul(jd, gregflag)

swe_utc_time_zone(year, month, day, houri, min, sec, d_timezone)

swe_utc_to_jd(year, month, day, houri, min, sec, gregflag)

swe_jdet_to_utc(jd_et, gregflag)

swe_jdut1_to_utc(jd_ut, gregflag)

swe_time_equ(jd_ut)

swe_lmt_to_lat(jd_lmt, geolon)

swe_lat_to_lmt(jd_lat, geolon)

```

**Arguments**

year	Astronomical year as integer
month	Month as integer
day	Day as integer
hourd	Hour as double
gregflag	Calendar type as integer (SE\$JUL_CAL=0 or SE\$GREG_CAL=1)
cal	Calendar type "g" [Gregorian] or "j" [Julian] as char
jd	Julian day number as double
houri	Hour as integer
min	min as integer
sec	Second as double
d_timezone	Timezone offset as double (hour)
jd_et	Julian day number (ET) as double (day)
jd_ut	Julian day number (UT) as double (day)
jd_lmt	Julian day number (LMT=UT+geolon/360) as double (day)
geolon	geographic longitude as double (deg)
jd_lat	Julian day number (LAT) as double (day)

**Details**

**swe\_julday()** Convert calendar dates to the astronomical time scale which measures time in Julian day number.

**swe\_date\_conversion()** Convert calendar dates to the astronomical time scale which measures time in Julian day number and checks if the calendar date is legal.

**swe\_revjul()** Compute year, month, day and hour from a Julian day number.

**swe\_utc\_time\_zone()** Convert local time to UTC and UTC to local time.

**swe\_utc\_to\_jd()** Convert UTC to Julian day number (UT and ET).

**swe\_jdet\_to\_utc()** Convert Julian day number (ET) into UTC.

**swe\_jdut1\_to\_utc()** Convert Julian day number (UT1) into UTC.

**swe\_time\_equ()** Calculate equation of time (LAT-LMT).

**swe\_lmt\_to\_lat()** Convert Julian day number (LMT) into Julian day number (LAT).

**swe\_lat\_to\_lmt()** Convert Julian day number (LAT) into Julian day number (LMT).

**Value**

swe\_date\_conversion returns a list with named entries: return status flag as integer, jd Julian day number as double

swe\_revjul returns a list with named entries: year year as integer, month month as integer, day day as integer and hour hour as double.

`swe_utc_time_zone` returns a list with named entries: `year_out` year as integer, `month_out` month as integer, `day_out` day as integer, `hour_out` hour as integer, `min_out` minute as integer, `sec_out` second as double,

`swe_utc_to_jd` returns a list with named entries: `return` status flag as integer, `dret` Julian day number as numeric vector and `serr` for error message as string.

`swe_jdet_to_utc` returns a list with named entries: `year_out` year as integer, `month_out` month as integer, `day_out` day as integer, `hour_out` hour as integer, `min_out` minute as integer, `sec_out` second as double,

`swe_jdut1_to_utc` returns a list with named entries: `year_out` year as integer, `month_out` month as integer, `day_out` day as integer, `hour_out` hour as integer, `min_out` minute as integer, `sec_out` second as double,

`swe_swe_time_equ` returns a list with named entries: `return` status flag as integer, `e` equation of time (day) as double and `serr` for error message as string.

`swe_lmt_to_lat` returns a list with named entries: `return` status flag as integer, `jd_lat` Julian day number (LAT) (day) as double and `serr` for error message as string.

`swe_lat_to_lmt` returns a list with named entries: `return` status flag as integer, `jd_lmt` Julian day number (LMT) (day) as double and `serr` for error message as string.

### See Also

Section 7 in <http://www.astro.com/swiseph/swephprg.htm>. Remember that array indices start in R at 1, while in C they start at 0!

### Examples

```
data(SE)
swe_julday(2000,1,1,12,SE$GREG_CAL)
swe_date_conversion(2000,1,1,12,"g")
swe_revjul(2452500,SE$GREG_CAL)
swe_utc_time_zone(2000,1,1,12,5,1.2,2)
swe_utc_to_jd(2000,1,1,0,12,3.4,SE$GREG_CAL)
swe_jdet_to_utc(2452500,SE$GREG_CAL)
swe_jdut1_to_utc(2452500,SE$GREG_CAL)
swe_time_equ(2452500)
swe_lmt_to_lat(2452500,0)
swe_lat_to_lmt(2452500,0)
```

### Description

Functions related to DeltaT and tidal acceleration

**Usage**

```
swe_deltat_ex(jd_ut, ephe_flag)

swe_deltat(jd_ut)

swe_set_tid_acc(t_acc)

swe_get_tid_acc()

swe_set_delta_t_userdef(delta_t)
```

**Arguments**

jd_ut	Julian day number (UT) as numeric vector (day)
ephe_flag	ephemeris flag as integer (SE\$FLG_JPLEPH=1, SE\$FLG_SWIEPH=2 or SE\$FLG_MOSEPH=4)
t_acc	Tidal acceleration as double (arcsec/century <sup>2</sup> )
delta_t	DeltaT (day)

**Details**

**swe\_deltat\_ex()** Determine DeltaT from Julian day number for a specific ephemeris.

**swe\_deltat()** Determine DeltaT from Julian day number for a used ephemeris. This function is only safe if:

- your software consistently uses the same ephemeris flag
- if software consistently uses the same ephemeris files (with SE\$FLG\_SWIEPH and SE\$FLG\_MOSEPH)
- if `swe_set_ephe_path()` is first called (with SE\$FLG\_SWIEPH) and `swe_set_jpl_file()` (with SE\$FLG\_JPLEPH)

**swe\_set\_tid\_acc()** Set the tidal acceleration.

**swe\_get\_tid\_acc()** Get the present configured tidal acceleration.

**swe\_set\_delta\_t\_userdef()** Allows the user to set a fixed DeltaT value that will be returned by `swe_deltat()` or `swe_deltat_ex()`.

**Value**

`swe_deltat_ex` returns a list with named entries: `deltat` for DeltaT as double (day) and `serr` for error message as string.

`swe_deltat` returns the DeltaT as double (day)

`swe_get_tid_acc` returns the tidal acceleration as double (arcsec/century<sup>2</sup>)

**See Also**

Section 8 in <http://www.astro.com/swiseph/swephprg.htm>. Remember that array indices start in R at 1, while in C they start at 0!

**Examples**

```
data(SE)
swe_deltat_ex(1234.567, SE$FLG_MOSEPH)
swe_deltat(1234.567)
swe_set_tid_acc(1.23)
swe_get_tid_acc()
swe_set_delta_t_userdef(0.23)
```

---

Section9

*Section 9: The function for calculating topocentric planet position*

---

**Description**

Function for topocentric planet positions

**Usage**

```
swe_set_topo(longitude, lat, height)
```

**Arguments**

longitude	Geographic longitude as double (deg)
lat	Geographic latitude as double (deg)
height	Height as double (m)

**Details**

**swe\_set\_topo()** Set the topocentric location of the observer.

**See Also**

Section 9 in <http://www.astro.com/swissep/sep/hprog.htm>. Remember that array indices start in R at 1, while in C they start at 0!

**Examples**

```
swe_set_topo(0,50,10)
```

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