SuperMAG R Client 0.1

SuperMAG Web Service API R Client Documentation
Package "httr" is required, install through the IDE or command "install.packages("httr")"

◆ content <- SuperMAGGetInventory(logon,start,extent)

R function that returns a list of available stations for a given event.

Parameters

logon	your supermag username
start	start date of event, either in the format 'yyyy-mm-ddThh:mm' or as a list [YYYY, MM, DD, HH, MM]
extent	extent or length of the event in seconds (3600= 1 hour, 86400 = 1 day)

Returns
A list containing the status and a list of stations available for this event

Example Usage

```
start <- [2019,11,15,10,40,00] # alt: "2019-11-15T10:40"
content = SuperMAGGetInventory(logon,start,3600)
print(content$status)
print(content$stations)
```

◆ content =SuperMAGGetData(logon,start,extent,flagstring,station)

R function that retrieves station magnetometer data for a given event and IAGA station code. Can be customized by the flagstrings.

Parameters

logon	your supermag username
start	start date of event, either in the format 'yyyy-mm-ddThh:mm' or as a list [YYYY, MM, DD, HH, MM]
extent	extent or length of the event in seconds (3600= 1 hour, 86400 = 1 day)
station	IAGA code of the requested station in all uppsercase.
flagstring	list in string form of which data items to return and processing flags to use (see below). The full list of data items is either 'all' or 'mlt,mag,geo,decl,sza'. Each element is seperated by a "," and no spaces. Processing flags available are 'delta=start', 'baseline=none', 'baseline=yearly'. Flags are in lowercase.

MLT	(optional) If supplied, The MLT/MCOLAT of the station will be returned in the two dimensional array of length extent/60 specified by MLT.
MAG	(optional) If supplied, The Magnetic coordinates of the station will be returned in the two dimensional array of length extent/60 specified by MAG.
GEO	(optional) If supplied, The Geographic coordinates of the station will be returned in the two dimensional array of length extent/60 specified by GEO.
DECL	(optional) If supplied, The Declination from IGRF Model will be returned in the array of length extent/60 specified by DECL.
SZA	(optional) If supplied, The solar zenith angle will be returned in the array of length extent/60 specified by SZA.
DELTA	(optional) If the keyword DELTA is supplied, The baseline NEZ vector start values will be subtracted from the NEZ vector components in the resulting n, e, and z lists.
BASELINE	(optional) If BASELINE is specified, It must be set to one of three values:

"baseline='all'" (default)	Subtract both the daily and yearly NEZ baselines
"baseline='yearly'"	Subtract the yearly NEZ baseline, but do not subtract the daily NEZ baseline
"baseline='none'"	Do not subtract either the yearly or the daily NEZ baseline

Returns
Structure with all return data. If there was an error, return is the error message. The format of the returns is as follows.

tval	The time of the samples is returned as the structure element tval. The time array is an array of double precision numbers giving the time since 1970-01-01 0:00UTC (This is a standard representation of time on computer systems).
ext	The binned duration for each sample is returned, typically '60' representing the 1-minute bins of standard SuperMAG data
iaga	The 3-letter station code provided is returned in the structure, useful for identification when you have multiple sets of data.
N	The N vector component is returned in the two structure element arrays of length extent/60 specified by N. The second dimension refers to the coordinate system, so 'N.nez' contains the component of the vector in the standard NEZ coordinates, 'N.geo' contains the geographic mapping of the N vector component.
E	The E vector component is returned in the two structure element arrays of length extent/60 specified by E. The second dimension refers to the coordinate system, so 'E.nez' contains the component of the vector in the standard NEZ coordinates, 'E.geo' contains the geographic mapping of the E vector component.
Z	The A vector component is returned in the two structure element arrays of length extent/60 specified by Z. The second dimension refers to the coordinate system, so 'Z.nez]' contains the component of the vector in the standard NEZ coordinates, 'Z.geo' contains the geographic mapping of the Z vector component.
mlt	(optional) If supplied, The MLT/MCOLAT of the station will be returned in the two structure element arrays 'mlt' and 'mcolat' of length extent/60 specified by MLT.
mag	(optional) If supplied, The Magnetic coordinates of the station will be returned in the two structure element arrays 'mlat' and 'mlon' of length extent/60 specified by MAG.
geo	(optional) If supplied, The Geographic coordinates of the station will be returned in the two structure element arrays 'glon' and 'glat' of length extent/60 specified by GEO.
decl	(optional) If supplied, The Declination from IGRF Model will be returned as a structure element array 'decl' of length extent/60 specified by DECL.
sza	(optional) If supplied, The solar zenith angle will be returned as a structure element array 'sza' of length extent/60 specified by SZA.

Example Usage

```
start <- [2019,11,15,10,40,00] # alt: "2019-11-15T10:40"
content <- SuperMAGGetData(logon,start,3600,"mlt,mag","VIC")
print(content$status)
print(content$data)
```

◆ content <- SuperMAGGetIndices(logon,start,extent,flagstrings)

R function that retrieves a set of magnetic indices for a given event and returns them as a list.

Parameters

logon	your supermag username
start	start date of event, either in the format 'yyyy-mm-ddThh:mm' or as a list [YYYY, MM, DD, HH, MM]
extent	extent or length of the event in seconds (3600= 1 hour, 86400 = 1 day)
flagstring	list in string form of which data items to return and processing flags to use (see below). The full list of data items is either 'all' or any subset, e.g. ['sme, sunsme, darksme'. "darksme"]. Several flags have alternative names which you are free to use (these are derived from the set of tags the SuperMAG web server uses natively.) Flags should be in lowercase.

SME	(optional) If supplied, the SME indice will be returned in the structure array '.SME' (See definition of SME indice)
SML	(optional) If supplied, the SML indice will be returned in the structure array '.SML' (See definition of SML indice)
SMU	(optional) If supplied, the SMU indice will be returned in the structure array '.SMU' (See definition of SMU indice)
NUM	(optional) If supplied, the number of stations used to compute SME indices will be returned in the structure array '.SMEnum'
(optional) the following options return additional data items, but only if SME, SML and/or SMU is set (for SME, returns both .SMU and .SML entries; for SMU, only .SMU entries; for SML, only .SML entries)	
MLAT	(optional) If supplied, the magnetic latitude of the SME indice will be returned in the structure array '.SMLmlat' and '.SMUmlat'
MLT	(optional) If supplied, the magnetic local time of the SME indice will be returned in the structure array '.SMLmlt' and '.SMUmlt'
GLAT	(optional) If supplied, the geographic latitude of the SME indice will be returned in the structure array '.SMLglat' and '.SMUglat'
GLON	(optional) If supplied, the geographic longitude of the SME indice will be returned in the structure array '.SMLglon' and '.SMUglon'
STID	(optional) If supplied, the IAGA station codes of the stations used to compute the SME indices will be returned in the structure array '.SMLstid' and '.SMUstid'
baseall	(optional) If supplied, is the equivalent of the set of 'sme,sml,smu,mlat,mlt,glat,glon,stid,num'
SUNSME (alt: smes)	(optional) If supplied, the Sunlit SME indice will be returned in the structure array '.SMEs' (See definition of Sunlit SME indice)
SUNSML (alt: smls)	(optional) If supplied, the Sunlit SML indice will be returned in the structure array '.SMLs' (See definition of Sunlit SML indice)
SUNSMU (alt: smus)	(optional) If supplied, the Sunlit SMU indice will be returned in the structure array '.SMUs' (See definition of Sunlit SMU indice)
SUNNUM (alt: nums)	(optional) If supplied, the number of stations used to compute the Sunlit SME indices will be returned in the structure array '.sunnum'
(optional) the following options return additional data items, but only if SMEs, SMLs and/or SMUs is set (for SMEs, returns both .SMUs and .SMLs entries; for SMUs, only .SMUs entries; for SMLs, only .SMLs entries)	
SUNMLAT (alt: mlats)	(optional) If supplied, the magnetic latitude of the Sunlit SME indice will be returned in the structure array '.SMLsmlat' and '.SMUsmlat'
SUNMLT (alt: mlts)	(optional) If supplied, the magnetic local time of the Sunlit SME indice will be returned in the structure array '.SMLsmlt' and '.SMUsmlt'
SUNGLAT (alt: glats)	(optional) If supplied, the geographic latitude of the Sunlit SME indice will be returned in the structure array '.SMLsglat' and '.SMUsglat'
SUNGLON (alt: glons)	(optional) If supplied, the geographic longitude of the Sunlit SME indice will be returned in the structure array '.SMLsglon' and '.SMUsglon'
SUNSTID (alt: stids)	(optional) If supplied, the IAGA station codes of the stations used to compute the Sunlit SME indices will be returned in the structure array '.SMLstid' and '.SMUstid'
sunall	(optional) If supplied, is the equivalent of the set of 'smes,smls,smus,mlats,mlts,glats,glons,stids,nums'
DARKSME (alt: smed)	(optional) If supplied, the Dark SME indice will be returned in the structure array '.darksme' (See definition of Dark SME indice)
DARKSML (alt: smld)	(optional) If supplied, the Dark SML indice will be returned in the structure array '.darksml' (See definition of Dark SML indice)
DARKSMU (alt: smud)	(optional) If supplied, the Dark SMU indice will be returned in the structure array '.darksmu' (See definition of Dark SMU indice)
DARKNUM (alt: numd)	(optional) If supplied, the number of stations used to compute the Dark SME indices will be returned in the structure array '.darknum'
(optional) the following options return additional data items, but only if SMEd, SMLd and/or SMUd is set (for SMEd, returns both .SMUd and .SMLd entries; for SMUd, only .SMUd entries; for SMLd, only .SMLd entries)	
DARKMLAT (alt: mlatd)	(optional) If supplied, the magnetic latitude of the Dark SME indice will be returned in the structure array '.SMLdmlat' and '.SMUdmlat'
DARKMLT (alt: mltd)	(optional) If supplied, the magnetic local time of the Dark SME indice will be returned in the structure array '.SMLdmlt' and '.SMUdmlt'
DARKGLAT (alt: glatd)	(optional) If supplied, the geographic latitude of the Dark SME indice will be returned in the structure array '.SMLdglat' and '.SMUdglat'
DARKGLON (alt: glond)	(optional) If supplied, the geographic longitude of the Dark SME indice will be returned in the structure array '.SMLdglon' and '.SMUdglon'
DARKSTID (alt: stidd)	(optional) If supplied, the IAGA station codes of the stations used to compute the Dark SME indices will be returned in the structure array '.SMLdtid' and '.SMUdtid'
darkall	(optional) If supplied, is the equivalent of the set of 'smed,smld,smud,mlatd,mltd,glatd,glond,stidd,numd'
REGIONALSME (alt: smer)	(optional) If supplied, the Regional SME indice will be returned in the structure array '.SMEr' (See definition of Regional SME indice)
REGIONALSML (alt: smlr)	(optional) If supplied, the Regional SML indice will be returned in the structure array '.SMLr' (See definition of Regional SML indice)
REGIONALSMU (alt: smur)	(optional) If supplied, the Regional SMU indice will be returned in the structure array '.SMUr' (See definition of Regional SMU indice)
REGIONALNUM (alt: numr)	(optional) If supplied, the number of stations used to compute the Regional SME indices will be returned in the structure array '.SMErnum'
(optional) the following options return additional data items, but only if SMEr, SMLr and/or SMUr is set (for SMEr, returns both .SMUr and .SMLr entries; for SMUr, only .SMUr entries; for SMLr, only .SMLr entries)	
REGIONALMLAT (alt: mlatr)	(optional) If supplied, the magnetic latitude of the Regional SME indice will be returned in the structure array '.SMLsmlat' and '.SMUsmlat'
REGIONALMLT (alt: mltr)	(optional) If supplied, the magnetic local time of the Regional SME indice will be returned in the structure array '.SMLsmlt' and '.SMUsmlt'
REGIONALGLAT (alt: glatr)	(optional) If supplied, the geographic latitude of the Regional SME indice will be returned in the structure array '.SMLsglat' and '.SMUsglat'
REGIONALGLON (alt: glonr)	(optional) If supplied, the geographic longitude of the Regional SME indice will be returned in the structure array '.SMLsglon' and '.SMUsglon'
REGIONALSTID (alt: stidr)	(optional) If supplied, the IAGA station codes of the stations used to compute the Regional SME indices will be returned in the structure array '.SMLstid' and '.SMUstid'
regall	(optional) If supplied, is the equivalent of the set of 'sme,sml,smu,mlat,mlt,glat,glon,stid,num'
SMR	(optional) If supplied, the SMR indice will be returned in the structure array '.smr' (See definition of SMR indice)
LTSMR	(optional) If supplied, the SMR LT indices will be returned in the structure arrays '.smr00','.smr06','.smr12','.smr18' (See definition of SMR LT indice)
LTNUM	(optional) If supplied, the number of stations used to compute the SMR LTN indice will be returned in the structure arrays '.smrnum00','.smrnum06','.smrnum12','.smrnum18'
NSMR	(optional) If supplied, the number of stations used to compute the SMR indices will be returned in the structure array '.nsmr'
plusall	(optional) If supplied, is the equivalent of the set of 'sme,sml,smu,mlat,mlt,glat,glon,stid,num'
all	(optional) If supplied, is the equivalent to all the above, 'baseall,sunall,darkall,regall,plusall' (but not the swi and imf keys below)
BGSE	(optional) If supplied, the Solar Wind B field (GSE) parameter will be returned in the structure array '.bgse'
BGSM	(optional) If supplied, the Solar Wind B field (GSM) parameter will be returned in the structure array '.bgsm'
VGSE	(optional) If supplied, the Solar Wind V (GSE) parameter will be returned in the structure array '.vgse'
VGSM	(optional) If supplied, the Solar Wind V (GSM) parameter will be returned in the structure array '.vgsm'
imfall	(optional) If supplied, is the equivalent of the set of 'sme,sml,smu,mlat,mlt,glat,glon,stid,num'
PDYN	(optional) If supplied, the Solar Wind Dynamic Pressure parameter will be returned in the structure array '.pdyn'
EPSILON	(optional) If supplied, the Solar Wind ε Parameter parameter will be returned in the structure array '.epsilon'
NEWELL	(optional) If supplied, the Solar Wind Newell parameter will be returned in the structure array '.newell'
CLOCKGSE	(optional) If supplied, the IMF Clock Angle (GSE) parameter will be returned in the structure array '.clockgse'
CLOCKGSM	(optional) If supplied, the IMF Clock Angle (GSM) parameter will be returned in the structure array '.clockgsm'
DENSITY	(optional) If supplied, the Solar Wind Plasma Density parameter will be returned in the structure array '.density'
swiall	(optional) If supplied, is the equivalent of the set of 'sme,sml,smu,mlat,mlt,glat,glon,stid,num'

Returns
Structure with all return data. If there was an error, return is the error message. The format of the returns is as follows.

The following data structure arrays are returned, dependent on which optional flags you requested. Note that no data is returned unless flags are specified, there is no 'default dataset'.

tval	The time of the samples is returned as the structure element tval. The time array is a list of double precision numbers giving the time since 1970-01-01 0:00UTC (This is a standard representation of time on computer systems).
decl	(optional) If supplied, The Declination from IGRF Model will be returned as a structure element array 'decl' of length extent/60 specified by DECL.
Base data:	Structure elements as defined above and named: .SME, .SML, .SMLmlat, .SMLmlt, .SMLglat, .SMLglon, .SMLstid, .SMU, .SMUmlat, .SMUmlt, .SMUglat, .SMUglon, .SMUstid, .SMEnum
Sunlit data:	Structure elements as defined above and named: .SMEs, .SMLs, .SMLsmlat, .SMLsmlt, .SMLsglat, .SMLsglon, .SMLsstid, .SMUs, .SMUsmlat, .SMUsmlt, .SMUsglat, .SMUsglon, .SMUsstid, .SMEsnum
Dark data:	Structure elements as defined above and named: .SMEd, .SMLd, .SMLdmlat, .SMLdmlt, .SMLdglat, .SMLdglon, .SMLdstid, .SMUd, .SMUdmlat, .SMUdmlt, .SMUdglat, .SMUdglon, .SMUdstid, .SMEdnum
Regional data:	Structure elements as defined above and named: .SMEr, .SMLr, .SMLrmlat, .SMLrmlt, .SMLrglat, .SMLrglon, .SMLrstid, .SMUr, .SMUrmlat, .SMUrmlt, .SMUrglat, .SMUrglon, .SMUrstid, .SMErnum
Plus data:	Structure elements as defined above and named: .smr, .smrnum00, .smrnum06, .smrnum12, .smrnum18
IMF data:	Structure elements as defined above and named: .bgse, .bgsm, .vgse, .vgsm
SWI data:	Structure elements as defined above and named: .clockgse, .clockgsm, .density, .dynpres, .epsilon, .newell

Example Usage

```
start <- [2019,11,15,10,40,00] # alt: "2019-11-15T10:40"
content <- SuperMAGGetIndices(userid,start,3600,'swiall,density,darkall,regall,smes')
print(content$status)
print(content$indices)
```