Package 'HYDAT'

February 7, 2017

Type Package

Title An interface to Canadian Hydrometric Data

Version 1.0

Date 2016-02-01

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Description Access to Canadian water level, flow, and sediment data stored
within the HYDAT database.

License GPL-3

Imports reshape2,
lubridate,
DBI

RoxygenNote 5.0.1

R topics documented:

HYDAT-package   *HYDAT*

Description

Access to Canadian Hydrometric Data (HYDAT)

Details

Package:	HYDAT
Type:	Package
Version:	1.0
Date:	2016-02-01
License:	GPL-3

The HYDAT package requires download of the SQLite version of the Canadian hydrometric database (HYDAT) from Environment and Climate Change Canada. The database contains over 1800 active and 7000 discontinued stations. Go to the following URL for more information: https://www.ec.gc.ca/rhc-wsc/default.asp?lang=En&n=9018B5EC-1

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References

Environment and Climate Change Canada (2016)

AnnualHydrometricData   *Get mean annual hydrometric data for selected station(s)*

Description

Gets the mean annual hydrometric series (flow or level) for one or more stations. Flow units in m3/s; water level units in metres.

Usage

```
AnnualHydrometricData(con, get_flow = TRUE, station_number)
```

Arguments

con	An open SQLite database connection to the HYDAT database
get_flow	Logical. If TRUE the function returns mean annual discharge, otherwise the function returns mean annual water level
station_number	A vector of Water Survey of Canada station identifiers

Value

A data frame (station_number, year, mean)

See Also

MonthlyHydrometricData

DailyHydrometricData

AnnualInstantaneousPeakData

Gets the annual max/min instantantaneous data for selected station(s)

Description

Gets the annual max/min instantaneous hydrometric series (flow or level). Data are usually defined to nearest minute in local standard time (see note below).

Usage

```
AnnualInstantaneousPeakData(con, get_flow = TRUE, station_number)
```

Arguments

con   An open SQLite database connection to the HYDAT database

get_flow   Logical. If TRUE the function returns annual max/min instantaneous flow, otherwise the function return annual max/min instantaneous level for each station

station_number A vector of Water Survey of Canada station identifiers

Value

A data frame (station_number, year, peak_code, precision_code, month, day, hour, minute, time-zone, peak).

Note

In some cases, the timing of the instantaneous max/min may be uncertain due to equipment failure (e.g., recorder failure). Event timing may be censored by the hydrographer to reflect this uncertainty. This may lead to NA values for day or hour of occurrence. The precision_code is only valid for water level series and refers to the precision (mm or m) of the water level measurement (see ReportedWaterLevelPrecision).

See Also

AnnualPeakData for annual maximum/minimum hydrometric series. See DataSymbols for information on symbols associated with instantaneous peak values.

AnnualPeakData *Gets the annual max/min daily data for selected station(s)*

Description

Gets the annual maximum and minimum daily mean hydrometric series (flow or level). Flow units in m3/s; water level units in metres.

Usage

```
AnnualPeakData(con, get_flow = TRUE, station_number)
```

Arguments

con	An open SQLite database connection to the HYDAT database
get_flow	Logical. If TRUE the function returns the series of annual max/min daily flow, otherwise the function return the series of annual max/min daily level for each station
station_number	A vector of Water Survey of Canada station identifiers

Value

A data frame (station_number, peak, year, month day, value, flag)

See Also

AnnualInstantaneousPeakData for annual instantaneous records, see DataSymbols for information on symbols associated with peak values.

DailyHydrometricData *Gets mean daily hydrometric data for selected station(s)*

Description

Gets the mean daily hydrometric series (flow or level) for one or more stations. Flow units in m3/s; water level units in metres.

Usage

```
DailyHydrometricData(con, get_flow = TRUE, station_number)
```

Arguments

con	An open SQLite database connection to the HYDAT database
get_flow	Logical. If TRUE the function returns mean daily discharge, otherwise the function returns mean daily water level
station_number	A vector of Water Survey of Canada station identifiers

Value

A data frame (station_number, date, value, symbol)

Note

Symbols associated with mean daily hydrometric series are as follows "A" - manual gauge "B" - ice affected "D" - dry "E" - estimated

See Also

AnnualHydrometricData for mean annual data, MonthlyHydrometricData for mean monthly data, DailySedimentData for mean daily sediment load/concentration, DataSymbols for information on symbols associated with mean daily data, and ReportedWaterLevelPrecision for information on water level precision

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DailySedimentData   *Gets mean daily sediment data for selected station(s)*

Description

Gets the mean daily suspended sediment (concentration or load) for one or more stations. Concentrations are measured in units of mg/L. Load are measured in tonnes (mean daily conc * mean daily flow * 0.0864).

Usage

```
DailySedimentData(con, get_load = TRUE, station_number)
```

Arguments

con   An open SQLite database connection to the HYDAT database

get_load   Logical. If TRUE the function returns mean daily load, otherwise the function returns mean daily concentration.

station_number   A vector of Water Survey of Canada station identifiers

Value

A data frame (station_number, date, value).

Note

Symbols associated with mean daily sediment series are as follows: «need further work here»

See Also

DailyHydrometricData for mean daily hydrometric data,

DataSymbols for information on symbols associated with mean daily data

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DataSymbols   *DataSymbols*

Description

Gets the description of data symbols applied to publication of daily hydrometric (flow,level) and suspended sediment concentrations

Usage

```
DataSymbols(con)
```

Arguments

con   An open SQLite database connection

Value

A data frame (SYMBOL_ID, DESCRIPTION)

MonthlyHydrometricData
                          Get mean monthly hydrometric data for selected station(s)

Description

Gets the mean monthly hydrometric series (flow or levels) for one or more stations. Flow units in m3/s; water level units in metres.

Usage

```
MonthlyHydrometricData(con, get_flow = TRUE, station_number)
```

Arguments

con   An open SQLite database connection to the HYDAT database

get_flow   Logical. If TRUE the function returns mean annual discharge, otherwise the function returns mean annual water level

station_number   A vector of Water Survey of Canada station identifiers

Value

A data frame (station_number, year, month, monthly_mean, monthly_total)

Note

monthly_total is the total of the mean daily flow for each month that has complete data whereas monthly_mean is the average of the mean daily flow for each month that has complete data.

See Also

AnnualHydrometricData

DailyHydrometricData

MonthlySediment   *Get mean monthly sediment data for selected station(s)*

Description

Gets the mean monthly sediment (suspended or bedload) for one or more stations within the Water Survey of Canada hydrometric database (HYDAT). Suspended load measured in units of mg/l. Bedload measured in units of tonnes.

Usage

```
MonthlySediment(con, get_load = TRUE, station_number)
```

Arguments

con   An open SQLite database connection to the HYDAT database

get_load   logical; TRUE to get bedload, FALSE to get suspended load

station_number   a vector of Water Survey of Canada station identifiers

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ParticleSizeDistribution

ParticleSizeDistribution

Description

Gets the particle size distribution (in millimetres) for sediment samples collected at various station locations

Usage

```
ParticleSizeDistribution(con, stationID)
```

Arguments

con   an open SQLite database connection

stationID   A vector of Water Survey of Canada station identifiers

Value

A data frame

PrecisionCodes   *PrecisionCodes*

Description

Gets the description of precision codes of water levels.

Usage

```
PrecisionCodes(con)
```

Arguments

con   An open SQLite database connection

Value

A data frame (PRECISION_CODE, DESCRIPTION)

RealTimeData   *Gets current available data for hydrometric station*

Description

Gets near real-time (within 6 hours) hydrometric data for the past 30 days for a particular hydrometric station operated by the National Hydrological Service of Canada, Water Survey Division.

Usage

```
RealTimeData(base_url = "http://dd.weather.gc.ca/hydrometric", prov_terr_loc,
  station_number)
```

Arguments

base_url   Base URL to access the data mart

prov_terr_loc   Two-digit provincial or territorial abbreviation in which the station is located
                (e.g., "BC")

station_number A seven-digit station identifier (e.g., "08MF005")

Value

A data frame (station_number, date_time, hg, hg_grade, hg_sym, hg_code, qr, qr_grade, qr_sym, qr_code)

Note

Returned date/times are in Universal Time Coordinated (UTC).

See Also

RealTimeNetwork

Examples

```
# get realtime data for Fraser River at Hope (08MF005)
data <- RealTimeData(prov_terr_loc="BC", station_number="08MF005")
plot(
  data$date_time, data$qr,
 type="l", col="blue",
  xlab="DateTime [UTC]", ylab="Discharge")
```

RealTimeNetwork   *Get list of available hydrometric stations with near real-time data*

Description

Gets the current list of hydrometric gauges available in near real-time (within 6 hours) from the National Hydrological Service, Environment and Climate Change Canada.

Usage

```
RealTimeNetwork(base_url = "http://dd.weather.gc.ca/hydrometric/doc",
  master_file = "hydrometric_StationList.csv")
```

Arguments

base_url	Base URL to access data mart documentation
master_file	Filename containing the list of available real-time stations

Value

A data frame (station_number, name, latitude, longitude, prov_terr_loc, timezone)

See Also

RealTimeData

Examples

```
network <- RealTimeNetwork()
# show top 50 stations
head(network, 50)
```

ReportedWaterLevelPrecision

ReportedWaterLevelPrecision

Description

Returns stated precision of water level (cm or mm) for each year of published record for a given hydrometric station.

Usage

```
ReportedWaterLevelPrecision(con, stationID)
```

Arguments

con   an open SQLite database connection

stationID   A vector of Water Survey of Canada station identifiers

Value

A data frame

SedimentSamples   *Get miscellaneous sediment data*

Description

Gets sediment samples collected by Water Survey of Canada staff at various station locations. Sediment samples are categorized based on the sampling method (Environment Canada, 1988).

Depth-Integrating (DI) Method: Suspended sediment load estimated from 'n' equal-discharge segments in which sediment is sampled vertically through the water column at a uniform rate.

Point-Integating (PI) Method: Suspended sediment load estimated from graphical methods.
Bed Material (BM): Samples of bed material often taken in same sampling verticals as suspended sediment or at waters edge. The total

obtained by either (1) Depth-Integrating Method or (2) Single Suspended

Usage

```
SedimentSamples(con, stationID)
```

Arguments

con   an open SQLite database connection

stationID   a vector of Water Survey of Canada station identifiers

Value

A data frame

References

Environment Canada, 1988. Miscellaneous Sediment Data 1966-1983, Inland Waters Directorate, Water Resources Branch, Water Survey of Canada, Ottawa, Canada. 248 p.

StationDataCollection   *Gets data collection operations for selected hydrometric station(s)*

Description

Gets information on the station data collection schedules for one or more station(s). This includes observation (recorder/manual) and operation (seasonal/continuous) schedules for each variable recorded at each station.

Usage

```
StationDataCollection(con, station_number)
```

Arguments

con   An open SQLite database connection to the HYDAT database

station_number A vector of Water Survey of Canada station identifiers

Value

A data frame (station_number, year_from, year_to, data_type, measurement, operation)

StationDataTypes   *Gets list of variables available for hydrometric station(s)*

Description

Gets information on the variables (water level, flow, and sediment) collected at a station.

Usage

```
StationDataTypes(con, station_number)
```

Arguments

con   An open SQLite database connection to the HYDAT database

station_number A vector of Water Survey of Canada station identifiers

Value

A data frame (station_number, data_type, sed_data_type, year_from, year_to, record_length, data_type_name, sed_data_type_name)

StationMetadata   *Gets relevant metadata for hydrometric station(s)*

Description

Gets relevant station metadata such as location, current operating status, real-time, and whether station is part of the Reference Hydrometric Basin Network (RHBN).

Usage

```
StationMetadata(con, station_number)
```

Arguments

con   An open SQLite database connection to the HYDAT database

station_number   A vector of Water Survey of Canada station identifiers

Value

A data frame (station_number, station_name, prov_ter_loc, hydrometric_status, sediment_status, latitude, longitude, drainage_area_gross, drainage_area_effective, rhbn, real_time, regional_office, contributor, operator, datum)

StationRegulation   *Gets regulation history for hydrometric station(s)*

Description

Extracts information on flow regulation history affecting a hydrometric station.

Usage

```
StationRegulation(con, station_number)
```

Arguments

con   An open SQLite database connection to the HYDAT database

station_number   A vector of Water Survey of Canada station identifiers

Details

A hydrometric station is deemed regulated if the natural flow regime is modified more than X

Value

A data frame (station_number, year_from, year_to, regulated) which outlines the period of regulation. If unregulated, then year_from will be an NA value.

StationRemarks   *Gets ancillary remarks regarding hydrometric station data*

Description

Provides further clarification on data stored in HYDAT database. Remarks are somewhat variable, but can provide further clarification on hydrometric series.

Usage

```
StationRemarks(con, station_number)
```

Arguments

con   An open SQLite database connection to the HYDAT database

station_number A vector of Water Survey of Canada station identifiers

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Version   *Gets current version of the HYDAT database*

Description

Determines the version and publication date of the HYDAT database

Usage

```
Version(con)
```

Arguments

con   An open SQLite database connection to the HYDAT database

Value

A data frame (version, date)

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