HYPEtools v1.0.0 Reference Card

by René Capell, SMHI, rene.capell@smhi.se. Short reference of functions included in the R package *HYPEtools*.

Hypetools provides functions to work with the hydrological model HYPE. HYPE and HYPEtools are projects developed and maintained by the Swedish Meteorological and Hydrological Institute (SMHI).

HYPEtools is available for download from *github.com/rcapell/HYPEtools*. Installation instructions on the wiki pages there.

Import

ReadAllsim(filename) Read 'allsim.txt' files

ReadAquiferData(filename) Read 'AquiferData.txt' files

ReadBasinOutput(filename) Read Basin Output files

ReadBranchData(filename) Read 'BranchData.txt' files

ReadCropData(filename) Read 'CropData.txt' files

ReadDamData(filename) Read ‘DamData.txt' files

ReadDescription(filename) Read 'description.txt' files

ReadForcKey(filename) Read ‘ForcKey.txt’ files

ReadGeoClass(filename) Read 'GeoClass.txt' files

ReadGeoData(filename) Read 'GeoData.txt' files

ReadGlacierData(filename) Read ‘GlacierData.txt’ files

ReadInfo(filename) Read ‘info.txt’ files

ReadLakeData(filename) Read 'LakeData.txt' files

ReadMapOutput(filename) Read Map Output files

ReadMgmtData(filename) Read 'MgmtData.txt' files

ReadObs(filename) Read HYPE indata files, see also ReadXobs()

ReadOptpar(filename) Read 'Outregions.txt' files

ReadOutregions(filename) Read 'optpar.txt' files

ReadPar(filename) Read 'par.txt' files

ReadPmsf(filename) Read 'pmsf.txt' files

ReadPointSourceData(filename) Read 'PointSourceData.txt' files

ReadSimass(filename) Read 'simass.txt' files

ReadSubass(filename) Read 'subassX.txt' files

ReadTimeOutput(filename) Read Time Output files

ReadUpdate(filename) Read Time Output files

ReadWsOutput(filename) Read optimisation simulation results

ReadXobs(filename) Read 'Xobs.txt' multi-variable observation files

Export

WriteAquiferData(x) Write 'AquiferData.txt' files

WriteBasinOutput(x) Write basin output '[SUBID].txt' files

WriteBranchData(x) Write 'BranchData.txt' files

WriteCropData(x) Write ‘CropData.txt’ files

WriteDamData(x) Write ‘DamData.txt’ files

WriteForcKey(x) Write ‘ForcKey.txt’ files

WriteGeoClass(x) Write 'GeoClass.txt' files

WriteGeoData(x) Write 'GeoData.txt' files

WriteLakeData(x) Write 'LakeData.txt' files

WriteMapOutput(x) Write Map Output files

WriteMgmtData(x) Write 'MgmtData.txt' files

WriteObs(x) Write HYPE indata files, see also WriteXobs()

WriteOutregions(x) Write 'Outregions.txt' files

WriteOptpar(x) Write 'optpar.txt' files

WritePar(x) Write 'par.txt' files

WritePmsf(x) Write 'pmsf.txt' files

WritePointSourceData(x) Write ‘PointSourceData.txt’ files

WriteTimeOutput(x) Write Time Output files

WriteXobs(x) Write 'Xobs.txt' multi-variable observation files

Hype file manipulation

CleanSLCClasses(gd, gcl) Clean Soil-Landuse classes (SLCs) from small fractions in an imported GeoData file gd according to area thresholds or specific rules

CreateOptpar(x, pars) Create optpar lists (for parameter calibration)

merge(x, y) merge new columns to a GeoData data frame with sensible defaults, HypeGeoData method

MergeXobs(x, y) Merge two Xobs data frames

RescaleSLCClasses(gd) Rescale SLC class fractions in a GeoData data frame gd

SortGeoData(gd) Sort a GeoData data frame in downstream order

Information extraction

AllDownstreamSubids(subid, gd) Find All Downstream SUBIDs of a target subid

AllUpstreamSubids(subid, gd) Find SUBIDs of all upstream subbasins

CompareFiles(x, y, type) Compare imported HYPE files for differences, typically used in quality control

DirectUpstreamSubids(gd) Find direct upstream SUBIDs

HeadwaterSubids(gd) Find all headwater SUBIDs of a model domain

IsHeadwater(x, gd), IsOutlet(x, gd) Query vectors of

HYPE SUBIDs to identify subbasin properties

OptimisedClasses(x) Get optimised classes from an imported optpar.txt file

OutletIds(gd) Find Outlet IDs

OutletNearObs(gd, qobs, xobs, variable) Find outlet-near observations in HYPE observation data files

OutletSubids(gd) Find all Outlet SUBIDs of a model domain

VariableInfo(variable), **VariableSearch(search)** Look up information (e.g. Name, Units) for a specific HYPE variable ID, or find HYPE variable information for a search term

Data processing and aggregation

AnnualRegime(x) Calculate annual regimes

ConvertDischarge(q, area) Calculate Specific runoff from volumetric discharge and vice versa

EquallySpacedObs(x, timestep) Create an equally spaced time series from irregular observations

ExtractFreq(data) Extract quantiles for use in a frequency distribution plot, e.g. a flow duration curve

ExtractStats(x, FUN, ...) Extract statistics from time output file

GroupSLCClasses(gd) Calculate grouped sums for SLC classes in a GeoData file

GwRetention(nfrz, nfs3, gts3, gd, par) Calculate groundwater retention of nutrients

MapRegionalSources(data, map) Map regional irrigation source connection as spatial lines

NSE(sim, obs) Nash-Sutcliffe Efficiency, HypeSingleVar method

p**bias(sim, obs)** Percent bias, HypeSingleVar method

r(sim, obs) Pearson product-moment correlation coefficient r, HypeSingleVar method

SumSLCClasses(gd) Calculate sums of SLC classes in a GeoData file

SumUpstreamArea(gd) Calculate upstream area sums

UpstreamGeoData(gd) Calculate upstream sums and averages of selected GeoData contents

UpstreamGroupSLCClasses(gd) Calculate area-weighted upstream averages of grouped SLC class fractions

UpstreamPointSources(gd, psd) Summarize point source emissions of all upstream areas

UpstreamSLCClasses(gd) Calculate SLC class fractions of all upstream areas

Plotting

BarplotUpstreamClasses(x) Bar plots of upstream-averaged classes of HYPE sub-basins

BoxplotSLCClasses(gd, gcl) Box plots of SLC distributions

PlotAnnualRegime(x) Plot annual regimes

PlotBasinOutput(x, filename) Plot a suite of evaluation plots from a HYPE basin output file

PlotBasinSummary(x, filename) Plot a summary of model results for a single sub-basin

PlotDurationCurve(freq) Plot duration curves

PlotMapOutput(x, map) Plot function for HYPE map results

PlotMapPoints(x, sites) Plot function for mapped point information

PlotSimObsRegime(x, sim, obs) Plot annual regimes of simulated and observed variables

PlotSubbasinRouting(map) Plot routing of subbasins for a HYPE model on an interactive map

S3 classes

HypeGeoData HypeGeoData data frames

HypeMultiVar HypeMultiVar arrays

HypeSingleVar HypeSingleVar arrays

HypeXobs HypeXobs data frames

Service functions

CustomColors Custom color ramp palettes with n colours: **ColBlues(n)**, **ColDiffGeneric(n)**, **ColDiffTemp(n)**, **ColGreens(n)**, **ColNitr(n)**, **ColPhos(n)**, **ColPrec(n)**, **ColPurples(n)**, **ColQ(n)**, **ColReds(n)**, **ColTemp(n)**, **ColYOB(n)**

HypeAttrAccess Quickly query and set HYPE-specific attributes of an imported file x: **datetime(x), hypeunit(x), obsid(x), outregid(x), subid(x), timestep(x), variable(x)**

summary.HypeGeoData(x) Summary method for imported GeoData files