GeoData.txt

This file contains characteristics of the spatially delineated subbasins in a HYPE model domain. This includes e.g. SUBIDs (subbasin IDs) and SUBIDs of downstream subbasins, fractions of SLC classes (hydrological response units) within each subbasin, different model region (sub-domain) identifiers. As a general rule, information included in *GeoData.txt* is time-invariant within HYPE.

GeoData.txt is a tab-separated file located in the modeldir folder. Subbasins are listed row-wise. The first row contains a column header with variable names. Variable names are not case-sensitive (max. 11 characters, no spaces). Columns with headings unknown to HYPE are skipped while reading the file, but must not longer than eleven characters. Columns containing character strings, e.g. descriptive meta-data, must not exceed a length of 100 characters. The columns may be in any order. A value must exist for every column and row, i.e. empty cells are not allowed.

Subbasins have to be ordered in down-stream sequence in *GeoData.txt*, starting at headwaters and ending at outlet basins. This is because HYPE requires upstream contributions when computing fluxes at each subbasin and subbasin the computation sequence follows *GeoData.txt* rows. Note that bifurcations as given in input file BranchData.txt will create additional upstream areas and the row order in *GeoData.txt* must also take those contributions into account. Note that multibasin lakes are calculated at the last lake basin, and thus all downstream basins of the multibasin lakes outlets (main outlet and possible branched outflow from other lake basins) must be taken located after the last lakebasin in the subbasin order.

Example for a *GeoData.txt* file structure:

```
subid maindown area parreg lakedataid rivlen slc_1 slc_2 slc_3 slc_4 scr_1
...
1      3        5000 1      1          0      0.54  0.23  0.1   0.13  0.1
...
2      3        3000 1      0          0      0.45  0.5   0.05  0
...
3      0        6000 2      2          500    0.45  0     0.25  0.3   0.2
...
...    ...      ...  ...    ...        ...    ...   ...   ...   ...   ...
...
```

All *GeoData.txt* variables are described in the table below. Point source can no longer be given in this file, use input file PointSourceData.txt instead. Atmospheric deposition should no longer be given in this file, use input file AtmdepData.txt instead, see Deprecated variables table below.

Variable ID	Unit	Requirement	Description
area	m^2	mandatory	subbasin area
subid	-	mandatory	id number for subbasins, matched against Qobs.txt, Xobs.txt or Xcgobs.txt column headings, integer $< 10^7$
maindown	-	mandatory	subid of downstream sub-basin, i.e. the one to which the subbasin flows (integer, use 0 for subbasins that don't run to another subbasin, e.g. coastal areas)

Variable ID	Unit	Requirement	Description
latitude	°	optional	latitude in degrees N (-90,90), used for calculation of extraterrestrial radiation in Hargreaves-Samani evapotranspiration model
region	-	optional/mandatory	production region for crops in CropData.txt. All sub-basins must have a non-zero region defined if CropData.txt is used.
parreg	-	optional	region for correction parameters (e.g. evapcorr). An integer 1,2,3,.., default is 1.
wqparreg	-	optional	region for water quality correction parameters (e.g. incorr). An integer 1,2,3,.., default is 1.
lakeregion	-	optional	lake region for watercourse parameter. An integer 1,2,3,.., default is 1.
ilregion	-	optional	lake region for internal lake (ilake) parameters. An integer 1,2,3,.. , default is 1.
olregion	-	optional	lake region for outlet lake (olake) parameters. An integer 1,2,3,.. , default is 1.
elev_mean	m	optional	mean elevation of subbasin
elev_std	m	optional	variation (standard deviation) in elevation in a subbasin
slope_mean	%	optional/mandatory	slope (>= 0%), mandatory for nutrient modelling
slope_std	%	optional	variation (standard deviation) of slope in a subbasin
lake_depth	m	optional	water depth from outflow threshold, below which outlet flow ceases, down to mean depth for outlet lake, used for general lake discharge curve. Can also be defined in LakeData.txt or par.txt. Definition in LakeData takes precedence. Must be > 0, or set to -9999 to use general or region parameter value from par.txt.
lakedataid	-	optional	olake ID, coupled to *lakedataid* in LakeData.txt, 0 if no such coupling exists
icatch	-	optional	fraction of local runoff that goes through the local lake (ilake), the rests runs directly into the main watercourse. To instead use parameter values (gicatch, ilicatch in par.txt) for a single simulation set value to -9999 in GeoData or remove the column completely.
rivlen	m	mandatory	length of main watercourse within subbasin
loc_rivlen	m	optional	length of local watercourse within subbasin, default is square root of land area
slc_nnn	-	mandatory	soil-type/land-use class number *nnn* (soil-landuse-combination class, hydrological response units in HYPE), fraction of the subbasin's area belonging to this class (between 0 and 1). A maximum of 999 SLCs can be defined *nn* matches the first column in GeoClass.txt. Smallest slc fraction allowed is 10^{-7}, i.e. 7 decimals.
scr_nnn	-	optional	fraction of SLC class nn's area that is sown with secondary crop (between 0 and 1)
dhslc_nnn	m	optional	deviation for each class from mean elevation of subbasin (defaults to 0)
grwdown	-	optional	subid for the subbasin to which this subbasin's lateral/regional groundwater flow runs (use 0 for subbasins whose groundwater flow disappears). If column is missing or all zeros it is assumed that the groundwater flows via maindown.

Variable ID	Unit	Requirement	Description
grwolake	-	optional	fraction of groundwater flow from this subbasin that flows to this subbasins olake instead of to subbasin given in grwdown
loc_vol	m^3/d	optional	outflow from rural households (modeloption diffusesource 0). The outflow is given per day regardless of simulation time step.
loc_tp	mg/l	optional	concentration of Tot-P from rural households outflow (loc_vol)
loc_sp	-	optional	fraction of rural household P outlet that is in soluble form
loc_tn	mg/l	optional	concentration of Tot-N from rural households outflow (loc_vol)
loc_in	-	optional	fraction of rural household N outlet that is inorganic
loc_ts	mg/l	optional	concentration of total suspended material from rural households outflow (loc_vol)
loc_ss	-	optional	fraction of rural total suspended material outlet that is is suspended material
loc_t1	$\mu U/L$	optional	concentration of tracer T1 from rural households outflow (loc_vol)
loc_t2	$°C$	optional	temperature of rural households outflow (used for T2 simulation)
loc_si	mg/l	optional	concentration of silica from rural households diffuse source (loc_vol)
loc_ds	-	optional	fraction of rural hoursehold silica outlet that is is dissolved silica
loc_oc	mg/l	optional	concentration of organic carbon from rural households diffuse source (loc_vol)
loc_soil	-	optional	fraction of emission from rural waste water (loc_vol) that is emitted directly to the lowest soil layer (rest goes to the local river). If no column found, the parameter locsoil is used.
locltp	kg/yr	optional	rural household diffuse source in the form of a load added to soil water (used for modeloption diffusesource 1)
loclsp	-	optional	fraction of locltp that is SP
locltn	kg/yr	optional	rural household diffuse source in the form of a load added to soil water (used for modeloption diffusesource 1)
loclin	-	optional	fraction of locltn that is IN
loclts	kg/yr	optional	rural household diffuse source in the form of a load added to soil water (used for modeloption diffusesource 1)
loclss	-	optional	fraction of loclts that is SS
loclt1	U/yr	optional	rural household diffuse source in the form of a load added to soil water (used for modeloption diffusesource 1)
loclt2	$k°C$ $m3/yr$	optional	rural household diffuse source in the form of a load added to soil water (used for modeloption diffusesource 1)
loclsi	kg/yr	optional	rural household diffuse source in the form of a load added to soil water (used for modeloption diffusesource 1)
loclds	-	optional	fraction of loclsi that is dissolved silica (DS)
locloc	kg/yr	optional	rural household diffuse source in the form of a load added to soil water (used for modeloption diffusesource 1)
lrwet_area	m^2	optional	area of local river wetland

Variable ID	Unit	Requirement	Description
mrwet_area	m^2	optional	area of main river wetland
lrwet_dep	m	optional	mean depth of local river wetland
mrwet_dep	m	optional	mean depth of main river wetland
lrwet_part	-	optional	part of local river flow through river wetland
mrwet_part	-	optional	part of main river flow through river wetland
iwetcatch	-	optional	fraction of subbasin area that are catchment area of the internal wetland (iwet)
buffer	-	optional	fraction of watercourse through agricultural land that has a buffer zone (between 0 and 1), mandatory for phosphorus simulation
close_w	-	optional	fraction of agricultural land that lies near watercourse and which leakage therefore is affected by the buffer zone (between 0 and 1), mandatory for phosphorus simulation
eroindex	-	optional	erosion index given per subbasin, used for erosion model 1 (defaults to 1)
suspchannel	-	optional	river channel erodability/vegetation cover modification factor of resuspension (0-1), used for sedresusp model 2
sand	-	optional	sand soil fraction, used for siltation model
silt	-	optional	silt soil fraction, used for siltation model
clay	-	optional	clay soil fraction, used for siltation model
petmodel	-	optional	defines with alternative potential evapotranspiration model should be used for each subbasin. Default is temperature dependence or use of observations (0), alternatives are temperature dependent (1), modified Jensen-Haise/McGuinness (2), modified Hargreaves-Samani (3), Priestly-Taylor (4), and FAO Penman-Monteith reference crop evapotranspiration (5). Note: will override petmodel given in info.txt
ws_nn_d		optional	Winstral coefficient for each class number *nn* and direction *d*
cloud_nnn	-	optional	monthly cloudiness climatology (fraction). *nnn* is the first three letters of the month.
weight_sub	-	optional	weight of (trust in) subbasin in calculation of average model performace criteria and objective function
lks_num	-	optional	number of lake section of ilake (maximum 99)
lks_dp_N	m	optional	lake section N threshold above lake depth at outlet, N=1,2,..
lks_fi_N	-	optional	lake section N fraction of icatch, N=1,2,..
lks_fa_N	-	optional	lake section N fraction of ilake area, N=1,2,..
tilefrac_n	-	optional	optional fraction of tile drained area for the classes of this tile group, n=1-10
xcoord	m	optional	X/Y coordinate in meter, used for snowfall distribution
ycoord	m	optional	X/Y coordinate in meter, used for snowfall distribution
hds_depth	m	optional	maximum lake depth of HDS connectivity model

Table. Deprecated variables from HYPE version 5.17.0.

Variable ID	Unit	Description	Replacement
wetdep_n	*µg/l*	wet deposition of inorganic nitrogen, concentration of precipitation	Replaced by column IN_WD in AtmdepData.txt. Note the unit change to *mg/L*.
drydep_n1	*kg/(km² d)*	dry deposition of inorganic nitrogen on vegetation type 1 (open)	Replaced by column IN_DD_V1 in AtmdepData.txt
drydep_n2	*kg/(km² d)*	dry deposition of inorganic nitrogen on vegetation type 2 (forest)	Replaced by column IN_DD_V2 in AtmdepData.txt
drydep_n3	*kg/(km² d)*	dry deposition of inorganic nitrogen on "vegetation" type 3 (water)	Replaced by column IN_DD_V3 in AtmdepData.txt.
deploadn1 - deploadn12	*kg/(km² d)*	total deposition of inorganic nitrogen on water, January - December	Replaced by adding as dry deposition in AtmdepData.txt; columns IN_DD_M1_V3 … IN_DD_M12_V3.