Illustrated HYPE variable IDs

Some HYPE variables IDs are explained and illustrated below. As a background the overview of the HYPE structure is given (Figure 1).

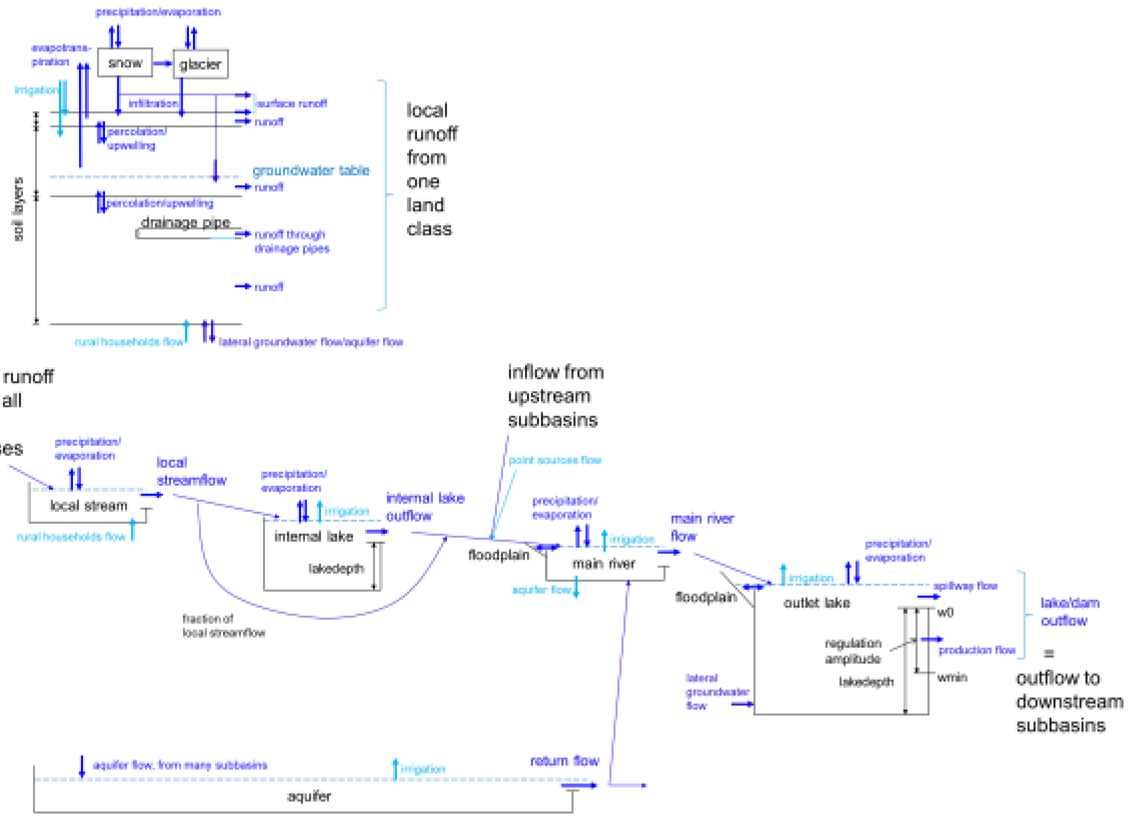

Figure 1. HYPE water stores and flows, illustrated for one subbasin. Note, wetlands in the form of iwet and owet are missing from the picture.

Precipitation

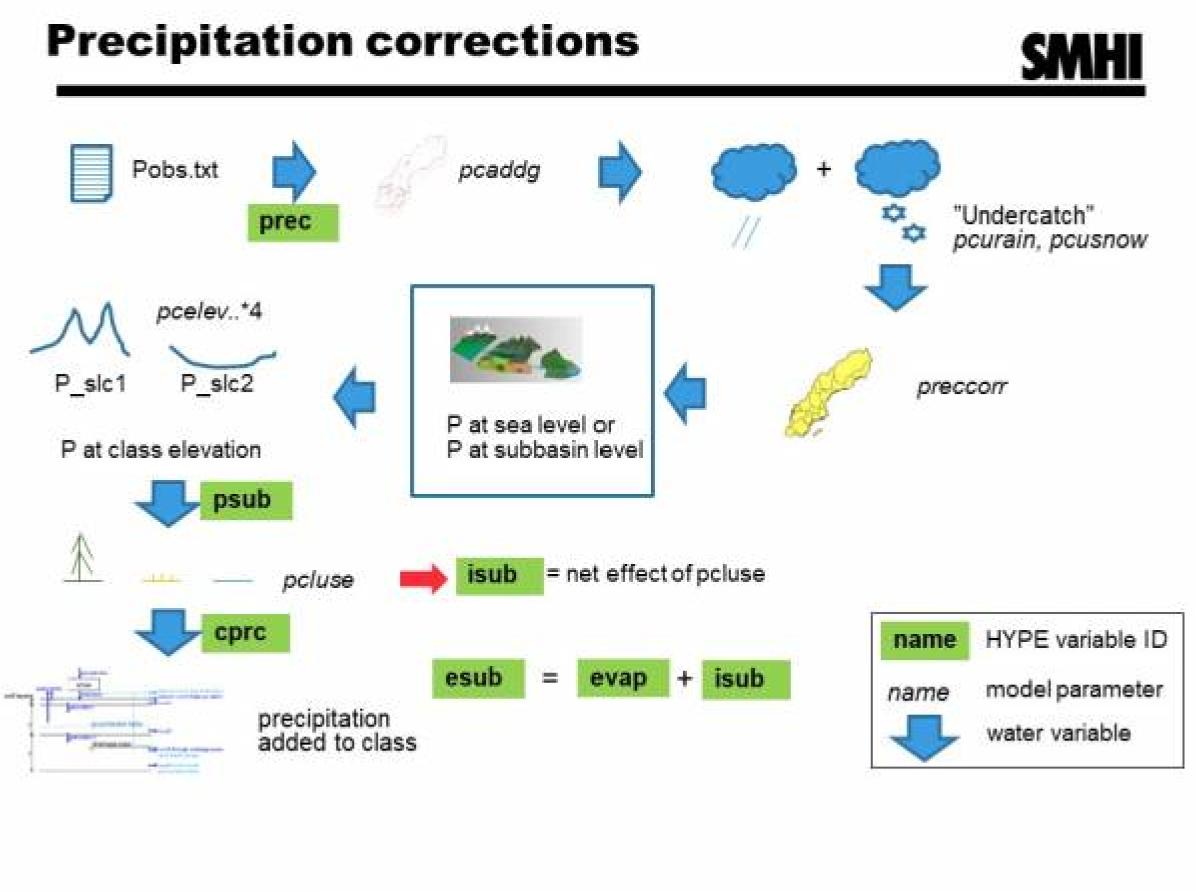

Figure 2. HYPE variable IDs for precipitation and related variables. Precipitation correction possibilities and parameters.

Precipitation options for local water balance output: Local water balance outputs.

Outlet lakes

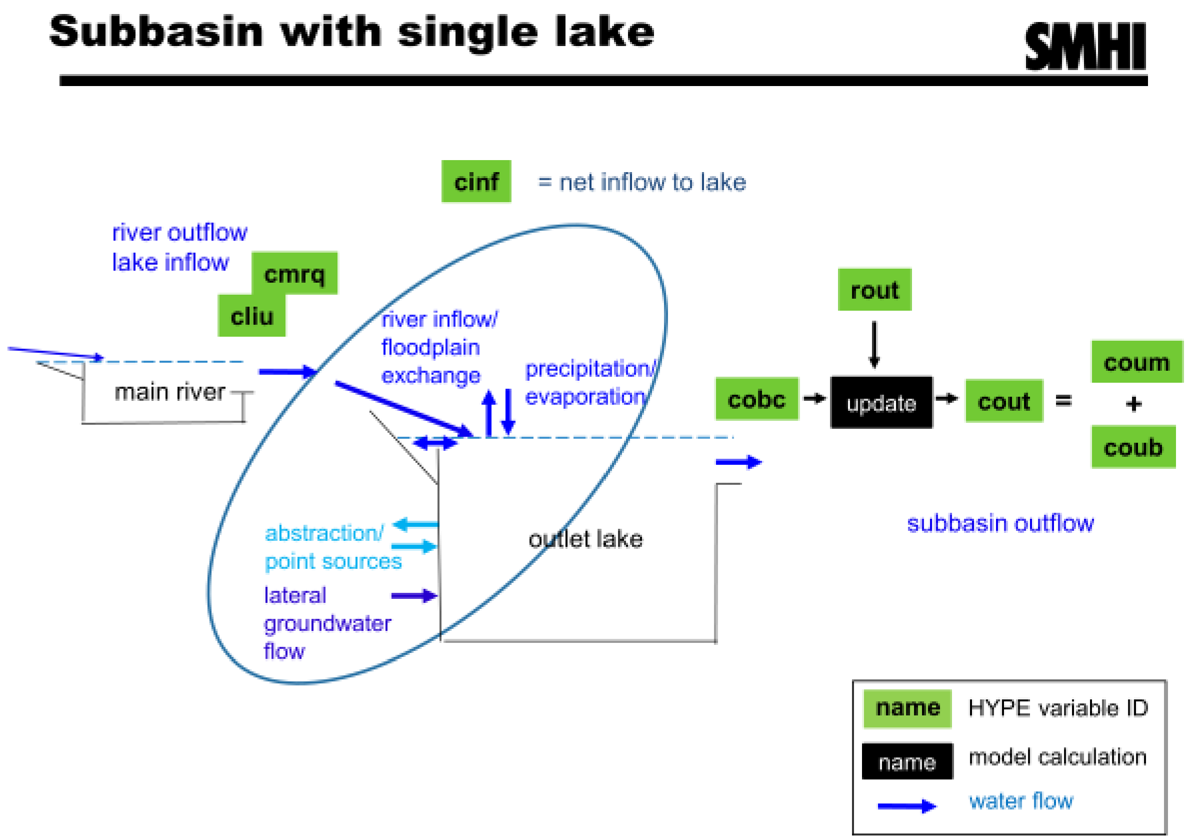

Figure 3. HYPE variable IDs for a subbasin with a single outlet lake.

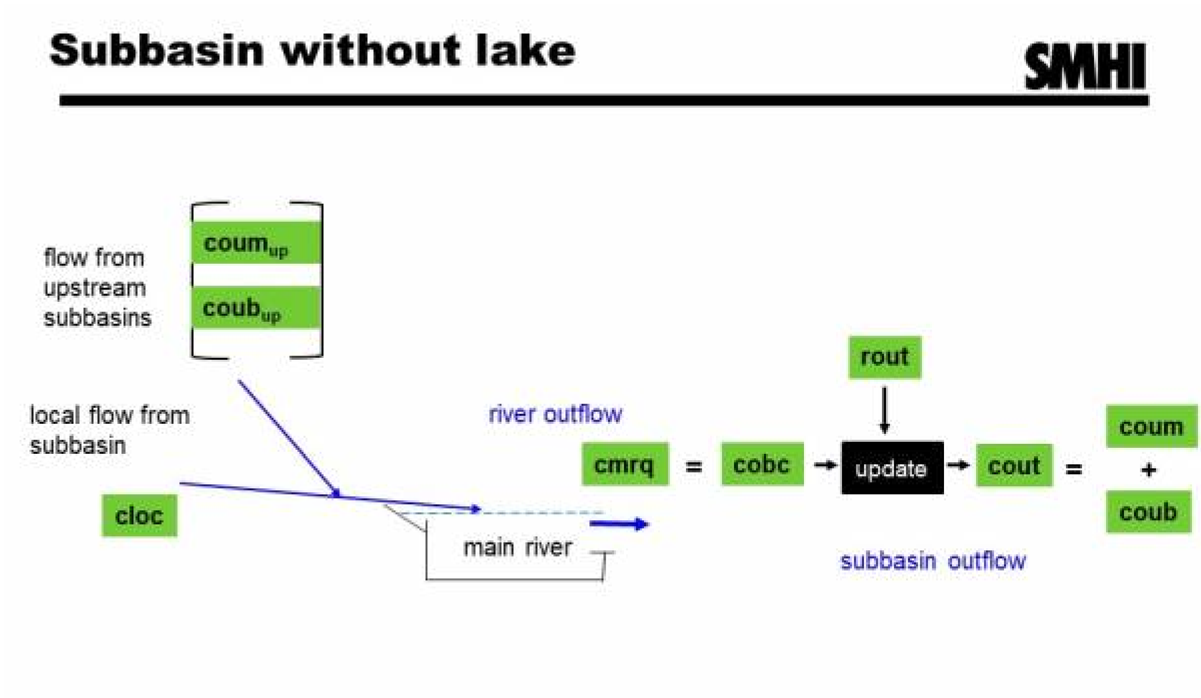

Figure 4. HYPE variable IDs for a subbasin without outlet lake.

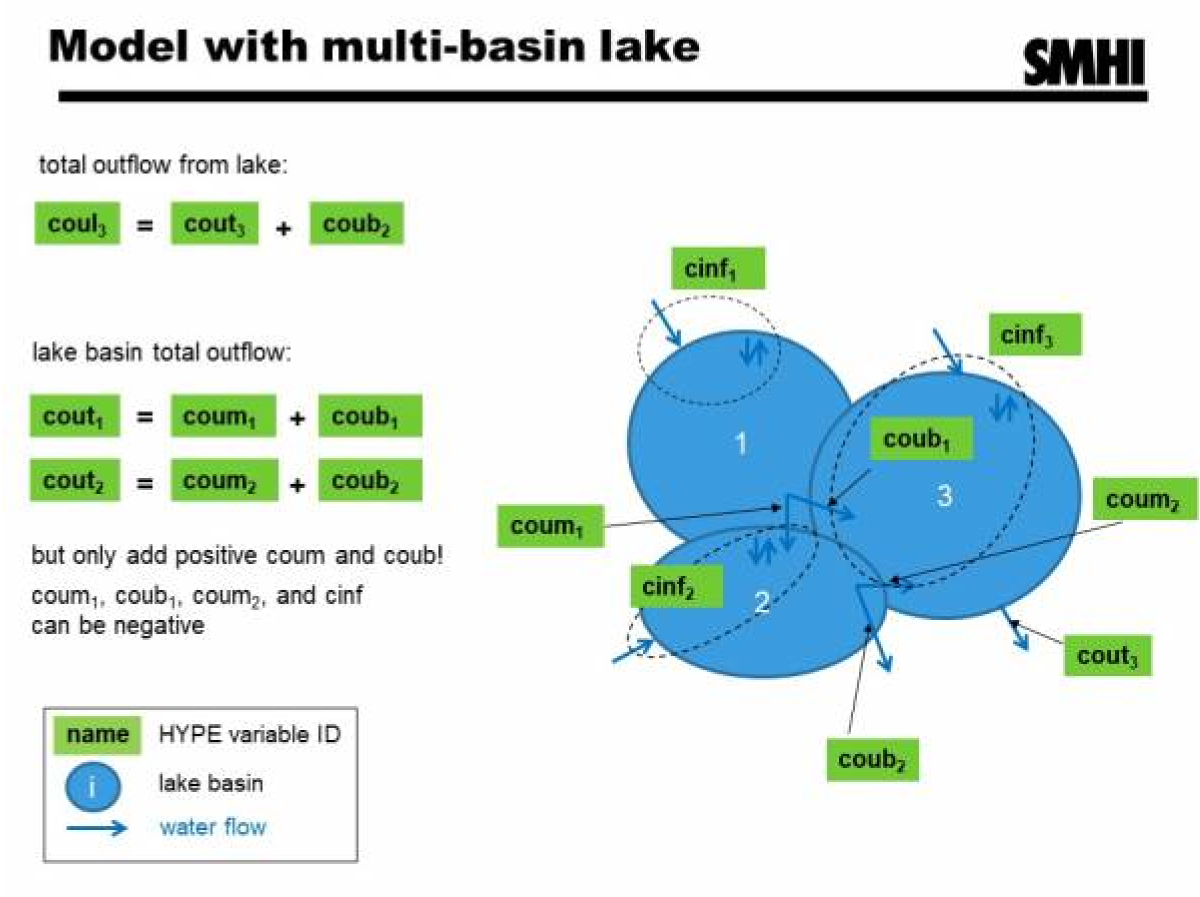

Figure 5. HYPE variable IDs for multi-basin lake.

Local inflow to a reservoir

A special regional output variable has been defined in HYPE with the purpose of calculating “reservoir local inflow” to a water power reservoir. The “reservoir local inflow” is the net contribution of precipitation and evaporation on the reservoir's water surface plus the runoff from the local catchment to the reservoir. Here only additions of runoff from areas downstream of other upstream reservoirs are made. The region is thus defined as the subbasins downstream of that other reservoir. The variable is defined this way because you want to compare with observed “reservoir local inflow”, and the inflow to the current reservoir from upstream reservoirs is not included in the calculation of observed “reservoir local inflow” from observations of flow and water levels of the reservoir.

Figure 6 shows a reservoir with its local catchment. The definition of reservoir water surface includes main rivers and upstream outlet lakes within the region/catchment. The example in the figure has no upstream reservoir. The “reservoir local inflow”, `rgqcin`, is the sum of the small arrows in the figure representing runoff, precipitation and evaporation.

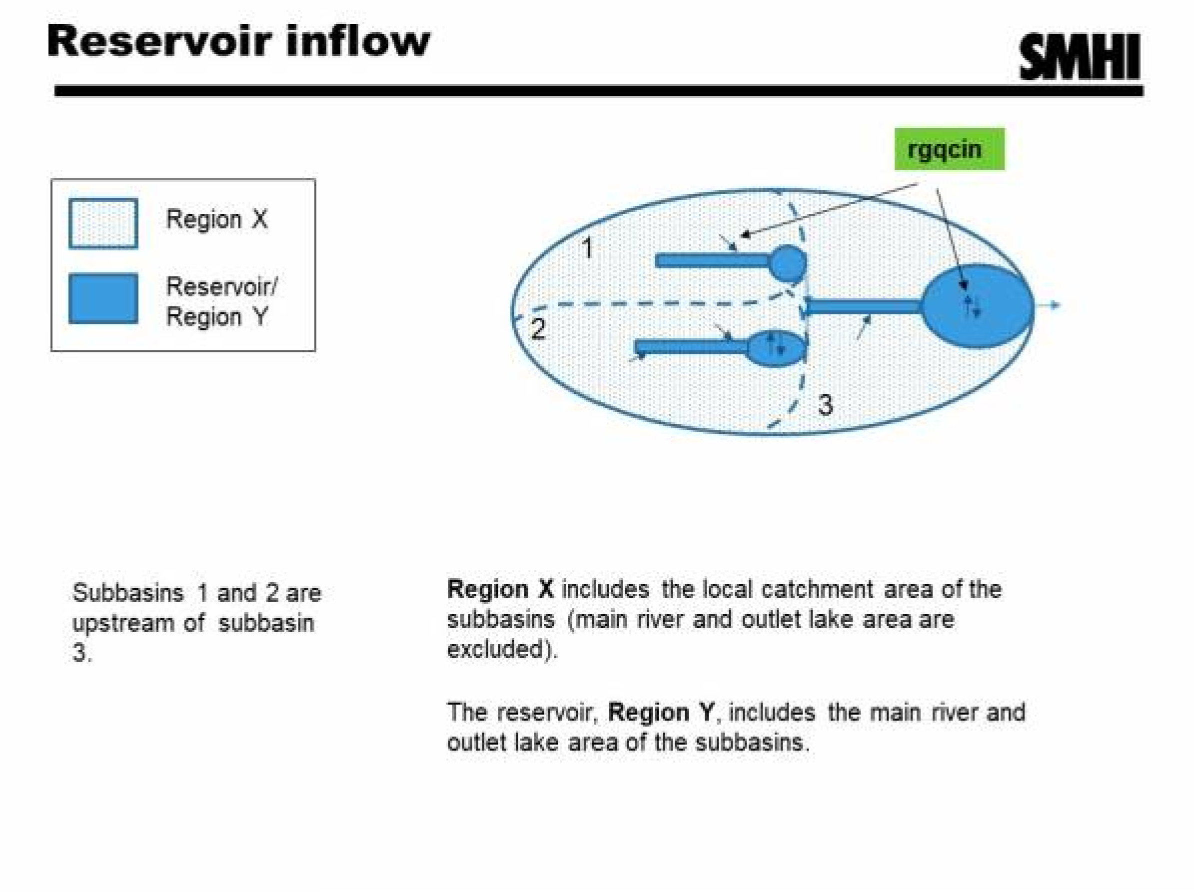

Figure 6. HYPE “reservoir local inflow”.

The calculations of “reservoir local inflow” are based on three variables defined on subbasin level; clrf, clrp, and clre (Figure 7):

- `clrf` - local runoff in mm/timestep (normalized from cloc (m3/s) by local basin area upstream main river and outlet lake)
- `clrp` - calculated precipitation on lakes and rivers, mm/timestep
- `clre` - calculated evaporation from lakes and rivers, mm/timestep

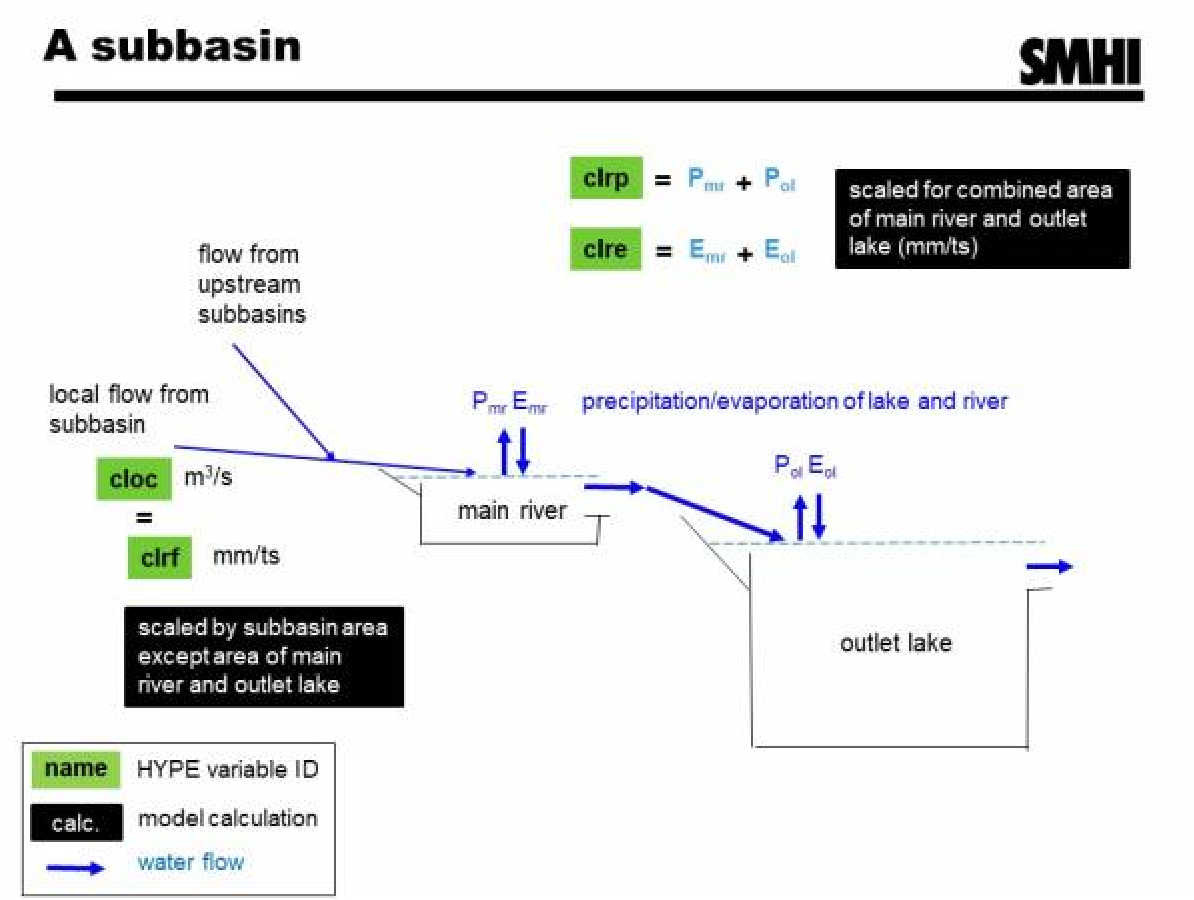

Figure 7. HYPE variable IDs for a subbasin, used for calculation of “reservoir local inflow”.

The HYPE variable IDs for “reservoir local inflow”, qcin and qrin, is only defined as regional outvar, ie. `rgqcin` and `rgqrin`. They are not calculated for subbasins. The observed “reservoir local inflow”, rgqrin can be given in Xoregobs.txt. The simulated “reservoir local inflow” is calculated by weighting together different output variables from different subbasins (Figure 8).

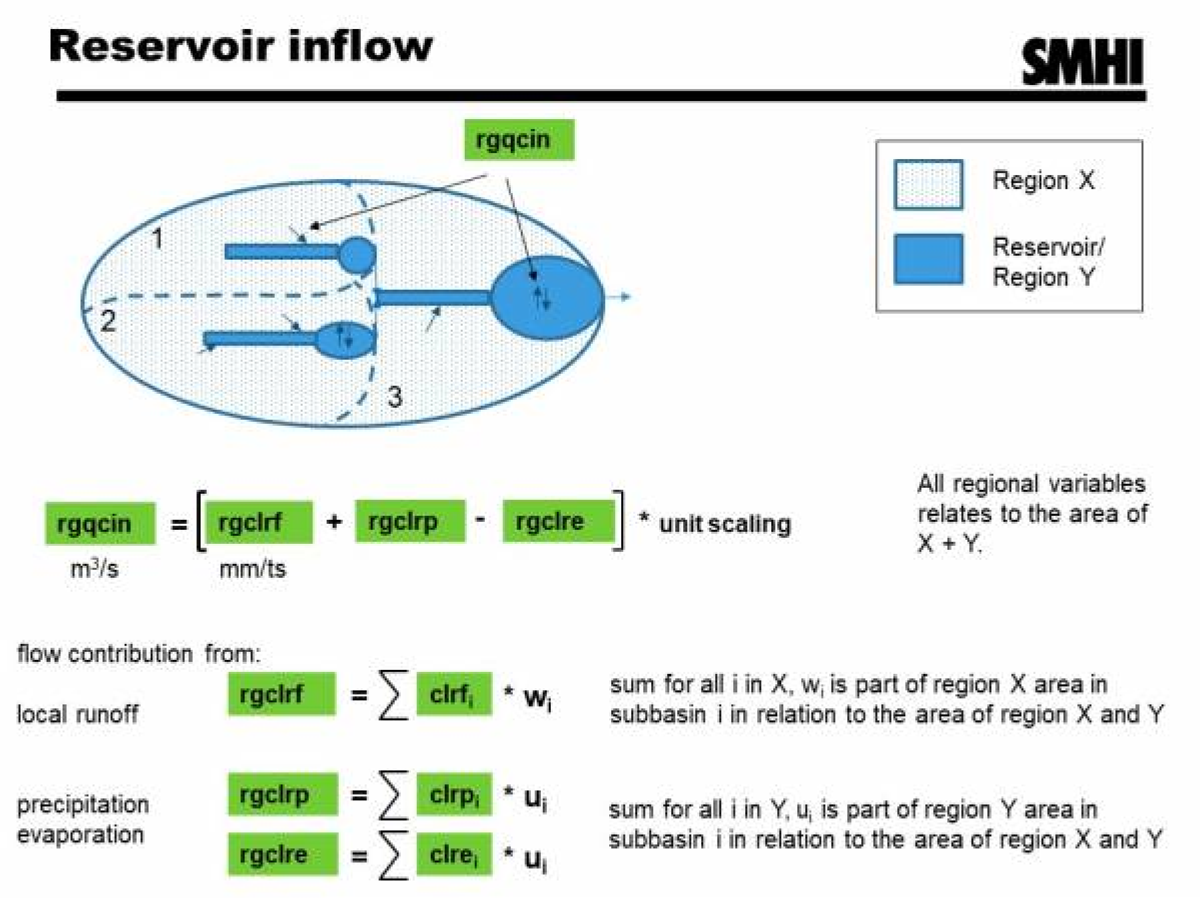

Figure 8. Definition of HYPE variable IDs for “reservoir local inflow”.

The regions X and Y denote the local catchment of the reservoir and the actual water surface of the reservoir. These need to be defined in the HYPE Outregions.txt file. In this file the weights that is used to add the different variables are set. The weights give the relative area of each subbasin included in the region. Each of the two regions are defined separately. A third region is also needed. It is the combination of region X and region Y. It is for this region the “reservoir local inflow” is calculated. The weights need to be chosen carefully for the end result to be correct. In the example of Figure 8, the weight of region X and Y will be 1 for each to calculate the rgqcin of the combined region. This because the weights of the respective regions X and Y was based on the combined area of the two regions. If instead the weight for calculating rgclrf, rgclrp and rgclre was based on the respective area X and Y, the weights of region X and Y to calculate rgqcin is based on the relation of areas of X and Y to the combined area.