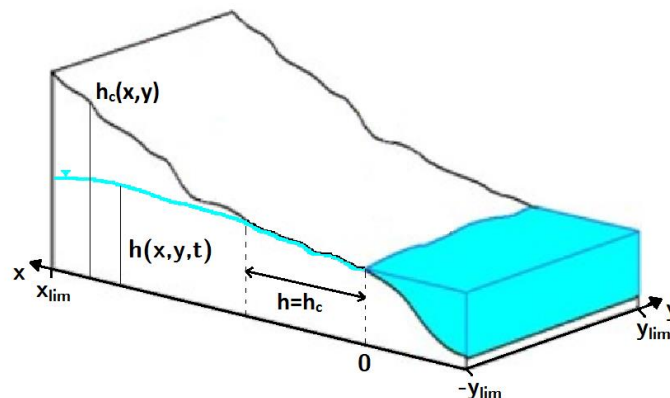


# ModflowModel 1D

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This class was developed based on flopy library to build 1D Hillslope models similar to those created using BoussinesqSimulation. The model is designed to contain 1 layer, 1 column and n rows.

## I-Model Principle



**Figure 1** Schematic representation of the hillslope used in the model

The structure is the same as the one in Boussinesq model : 1D and decomposed along the hillslope in various-sized cells.

Boundary conditions are : imposed head in  $x = 0$  (at the level of the river) and  $Q = 0$  on top of the hillslope ( $x = x_{\max}$ ).

## II-Class structure and use

### II-1-Class attributes

- zbot : bottom elevation of the layer (list or np.array)
- ztop : top elevation of the layer (topographic level) (list or np.array)
- nper : number of time steps (int)
- delr : width of a row (list or np.array or one value to set a continuous width)
- delc : length of a cell (list or np.array or one value to set an homogeneous grid)
- ibound : boundary\_condition (list built by the class)
- bound\_sp : boundary\_conditions (other form)
- hk : hydraulic conductivity along the cells
- sy : kinematic porosity of the layer
- rech : recharge of each cell for each time step (based on either reference value, or continuous value or input np.array)
- strt : initial condition of piezometry
- Ircec : set drain on top of the layer to simulate seepage
- piezo : piezometry in each cell for each time step (result)

- stock : stock for each x-coordinate for each time step ( = piezometry \* porosity \* width)  
(result)

Output are piezo and stock which describe variations of head and stock in each cell over time.

## **II-2- Class methods**

- topo : builds top and bottom levels of the layer base on inputs
- set\_recharge : defines recharge for each each cell on each time step based on input value
- set\_boundaries : sets boundaries downstream and upstream
- set\_drain : builds drains on the top of the layer to simulate seepage
- create\_model : creates the flopy Modflow Model based on each hillslope property definition
- run\_model : runs mudflow models using mudflow 2005
- model\_output : builds model output to save piezometry and stock over time
- model\_comparison : loads BoussinesqSimulation's results and compare them with mudflow model results.