

# Initial conditions in Shetran simulations (standard version of Shetran).

See video at: <https://youtu.be/NJToJhIJ7M>

There are three methods for defining the initial conditions in a Shetran simulation.

- 1) The same water table depth (m below ground) for each column.
- 2) A different water table depth (m above sea level) is defined for each soil column
- 3) A head value (m) defined for every cell in every column

For the first simulation of a catchment it is always best to use the easiest option, which is number 1. The problem with this is that in reality the water table will NOT be the same depth below ground everywhere. It is closer to the ground in the valleys and further from the ground on the ridges and at the edge of the catchment. To get round this you can either have a run in period (to allow the water to reach equilibrium) or use options 2) or 3) (more details below).

The Easy setup files use option 1). The Initial condition is specified in the XML (library) file on this line:

```
<InitialConditions>0</InitialConditions> Initial water table depth  
below ground
```

Using the Shetran-prepare executable this sets the initial conditions in the input vsd file.

The important part of a vsd file (standard version\examples\Cobres \input\_cob\_vsd.txt) is shown below:

```
:VS03 integer variables NS,NCSZON,NCRBED,INITYP  
      3      55      0      1  
:VS04 real variables VSIPSD,VSZMIN,VSZMAX,VSWV,VSWL  
      2.0      0      0      1.0      1.0
```

In VS03 INITYP specifies the type of initial condition. A value of 1 means the same water table depth is specified for every column. The value of this is specified in VSIPSD in VS04. A 2.0 means the initial water table in every column is set to be 2m below ground.

Using this option eventually equilibrium will be reached. This can vary considerable from months to many years. The deeper the soil and the lower the conductivities the longer it takes.

When a simulation is completed an output file is produced called “output\_cob\_vsi.txt”. This contains two lots of data from the end of the simulation the “phreatic surface level” and the “Heads at end of simulation”. The “phreatic surface level” can be used for option 2 and the “Heads at end of simulation” for option 3.

To carry out a simulation using **option 2 initial conditions** do the following:

- 1) In VS03 change the value of INITYP from 1 to 2.
- 2) Copy the “phreatic surface levels” data from output\_cob\_vsi.txt to a new file called input\_cob\_vsi.txt. This will start:

phreatic surface level

360.004	376.002	320.005	358.001	301.006	299.005	282.003	287.006	289.004
280.003								
277.003	275.007	275.004	277.002	256.006	271.003	272.003	273.002	267.002
247.005								
260.005	254.009	253.005	263.003	252.002	236.006	251.006	247.010	245.006
258.003								

- 3) Change the rundata file to incorporate the new vsi file:

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input\_cob\_vsi.txt

To carry out a simulation using **option 3 initial conditions** do the following:

- 1) In VS03 change the value of INITYP from 1 to 3.
- 2) Copy the “Heads at end of simulation” data from output\_cob\_vsi.txt to a new file called input\_cob\_vsi.txt. This will start:

Heads at end of simulation

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5.798	5.498	5.298	5.098	4.949	4.849	4.749	4.649	4.549	4.449	
4.349	4.249	4.149	4.049	3.949	3.849	3.749	3.649	3.549	3.450	
3.350	3.250	3.150	3.050	2.950	2.850	2.750	2.650	2.551	2.451	
2.351	2.251	2.151	2.051	1.951	1.851	1.752	1.652	1.552	1.452	

- 3) Change the rundata file to incorporate the new vsi file:

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input\_cob\_vsi.txt