

Computer Session 1

The purpose of this Computer Session is to give users hands-on experience with the HYDRUS-1D software package (version 4). Examples are given to familiarize users with the major parts and modules of HYDRUS-1D (e.g., the project manager, Profile and Graphics modules), and with the main concepts and procedures of pre- and post-processing (e.g., domain design, finite element discretization, initial and boundary conditions specification, and graphical display of results).

The first example represents the direct problem of infiltration into a 1-meter deep loamy soil profile. The one-dimensional profile is discretized using 101 nodes. Infiltration is run for one day. Pondered infiltration is initiated with a 1-cm constant pressure head at the soil surface, while free drainage is used at the bottom of the soil profile. The example is divided into three parts: (A) first, only water flow is considered, after which (B) solute transport is added. Several other modifications are suggested in part (C). These include (1) a longer simulation time, (2) accounting for solute retardation, and (3) using a two-layered soil profile. Users in this example become familiar with most dialog windows of the main module, and get an introduction into using the external graphical Profile module with which one specifies initial conditions, selects observation nodes, and so on.

A. Infiltration of Water Into a One-Dimensional Soil Profile

Project Manager

Button "New"

Name: Infiltr1

Description: Infiltration of water into soil profile

Button "OK"

Main Processes

Heading: Infiltration of water into soil profile

Button "Next"

Geometry Information

Button "Next"

Time Information

Final Time: 1

Initial Time Step: 0.0001

Minimum Time Step: 0.000001

Button "Next"

Print Information

Number of Print Times: 12

Button "Select Print Times"

Button "Next"

Water Flow - Iteration Criteria

Button "Next"

Water Flow - Soil Hydraulic Model

Button "Next"

Water Flow - Soil Hydraulic Parameters

Catalog of Soil Hydraulic Properties: Loam

Button "Next"

Water Flow - Boundary Conditions

Upper Boundary Condition: Constant Pressure Head

Lower Boundary Condition: Free Drainage

Button "Next"

Soil Profile - Graphical Editor

Menu: Conditions->Initial Conditions->Pressure Head

or **Toolbar:** red arrow

Button "Edit condition", select with *Mouse* the first node and specify 1 cm pressure head.

Menu: Conditions->Observation Points

Button "Insert", Insert nodes at 20, 40, 60, 80, and 100 cm

Menu: File->Save Data

Menu: File->Exit

Soil Profile - Summary

Button "Next"

Execute HYDRUS

OUTPUT:

Observation Points

Profile Information

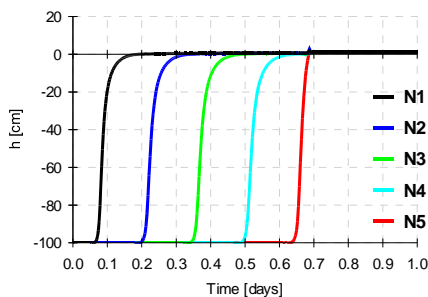
Water Flow - Boundary Fluxes and Heads

Soil Hydraulic Properties

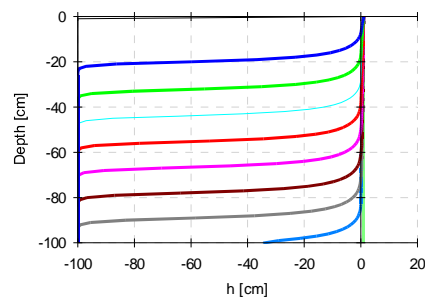
Run Time Information

Mass Balance Information

Observation Nodes: Pressure Heads



Profile Information: Pressure Head



Close Project

B. Infiltration of Water and Solute Into a One-Dimensional Soil Profile

Project Manager

Click on **Infiltr1**

Button "Copy"

New Name: Infiltr2

Description: Infiltration of Water and Solute into Soil Profile

Button "OK", "Open"

Main Processes

Check "Solute Transport"

Button "Next"

Solute Transport - General Information

Button "Next"

Solute Transport - Transport Parameters

Disp. = 1 cm

Button "Next"

Solute Transport - Reaction Parameters

Button "Next"

Solute Transport - Boundary Conditions

Upper Boundary Condition: 1

Lower Boundary Condition: Zero Gradient

Button "Next"

Execute HYDRUS

OUTPUT:

Observation Points

Profile Information

Solute Transport - Boundary Actual and Cumulative Fluxes

C. Possible Modifications

1. Longer simulation time:

Project Manager

Click on **Infiltr2**
 Button "Copy"
 New Name: Infiltr3
 Button "OK", "Open"

Time Information:

Final Time: 2.5 d

Print Information

Button "Select Print Times"
 Button "Default"
 Button "Next"

2. Retardation:

Solute Transport - Reaction Parameters

$K_d = 0.5$

3. Two Soil Horizons:

Geometry Information

Number of Soil Materials: 2

Water Flow - Soil Hydraulic Parameters

1. line - Silt

Solute Transport - Reaction Parameters

$K_d = 0$

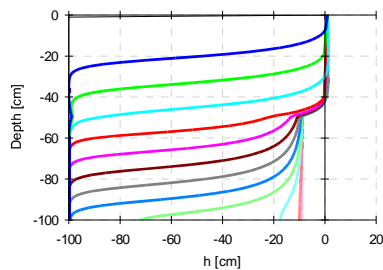
Soil Profile - Graphical Editor

Button "Edit condition", select with *Mouse* the lower 50 cm and specify Material
 2.

Menu: File->Save Data

Menu: File->Exit

Profile Information: Pressure Head



Observation Nodes: Water Content

