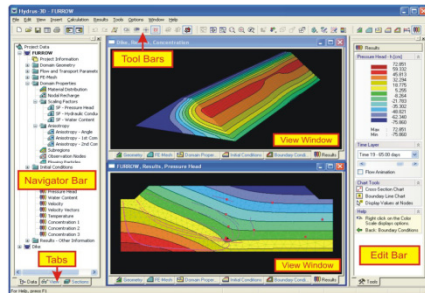


# WORKSHOP ON HYDRUS

## On MODELING WATER FLOW AND CONTAMINANT TRANSPORT IN SOILS AND GROUNDWATER USING THE HYDRUS SOFTWARE PACKAGES

DATE: FEBRUARY 4 – 5, 2012



### Hosted by

UTRECHT UNIVERSITY, THE NETHERLANDS  
and  
INDIAN INSTITUTE OF SCIENCE, BANGALORE

### Organised by

DEPARTMENT OF CIVIL ENGINEERING, IISc  
&  
KARNATAKA STATE COUNCIL FOR SCIENCE AND  
TECHNOLOGY

### Course presenter

Jirka Simunek

### Course coordinators

S Majid Hassanizadeh  
M S Mohan Kumar



[www.kscst.org.in](http://www.kscst.org.in)

## WORKSHOP OVERVIEW

Soil and groundwater pollution is an ever-increasing, worldwide problem. In India the groundwater plays a important role with 80 % of rural population and 50% of urban population depending on it. Along with intensive use of groundwater, unscientific development projects and insufficient knowledge of groundwater dynamics is creating long-term problems. Most subsurface pollution problems stem from activities involving the unsaturated (vadose) zone between the soil surface and the groundwater table. The unsaturated zone hence provides the best opportunities to limit or prevent groundwater pollution. Once contaminants enter groundwater, pollution is essentially irreversible, or can be remediated only with extreme costs.

Numerical modeling is becoming an increasingly important tool for analyzing complex problems involving water flow and contaminant transport in the unsaturated zone. This course is designed to familiarize participants with the principles and mathematical analysis of variably-saturated flow and transport processes, and the application of state-of-the-art numerical codes to site-specific subsurface flow and transport problems.

## WORKSHOP LOCATION

The workshop will be held at Indian Institute of Science, Bangalore, the garden city of India. The workshop is scheduled for two days, 4<sup>th</sup> and 5<sup>th</sup> February 2012.

## WORKSHOP DESCRIPTION

The course begins with a detailed conceptual and mathematical description of water flow and solute transport processes in the vadose zone, followed by an brief overview of the use of finite element techniques for solving the governing flow and transport equations. Special attention is given to the highly nonlinear nature of the governing flow equation. Alternative methods for describing and modeling the hydraulic functions of unsaturated porous media are also described.

"Hands-on" computer sessions will provide participants an opportunity to become familiar with the Windows-based HYDRUS-1D and HYDRUS (2D/3D) software packages. Emphasis will be on the preparation of input data for a variety of applications, including flow and transport in a vadose zone, variably-saturated flow and transport during irrigation, flow and transport to a tile drain, and two-dimensional leachate migration from a landfill through the unsaturated zone into groundwater. Calibration will be discussed and demonstrated by means of a one-dimensional inverse problem.

## WORKSHOP HANDOUTS

Course handouts include lecture notes prepared by the instructors.

Registrants are expected to bring their own laptops for hands on exercises with minimum system requirements: Operating Systems: Windows XP / Windows Vista (32 or 64bit) / Windows 7 (32 or 64bit), X86 CPU with 2 GHz, 2 GB RAM, 10 GB total hard disk capacity with about 500 MB reserved for installation, Graphic card with a resolution of 1024 x 768 pixels. No separate computational facility will be provided

## SOFTWARE

The course introduces a new generation of Windows-based numerical models for simulating water, heat and/or contaminant transport in variably-saturated porous media. These include the HYDRUS-1D and HYDRUS (2D/3D) codes for one-, two- and three-dimensional simulations, and the Rosetta code for estimating the soil hydraulic properties (and their uncertainty) from soil texture and related data. HYDRUS-1D and HYDRUS (2D/3D) are supported by interactive graphics-based interfaces for data-preprocessing, generation of unstructured as well as structured finite element grid systems, and graphic presentation of the simulation results. Except for HYDRUS (2D/3D), all software packages are in the public domain.

## COURSE DEVELOPERS

**Dr. Martinus Th. van Genuchten** is a renowned soil physicist and visiting professor, Department of Mechanical Engineering, COPPE/LTTC, Federal University of Rio de Janeiro, UFRJ Rio de Janeiro, Brazil. He received a B.S. and M.S. in irrigation and drainage from the Agricultural University of Wageningen, The Netherlands, and a Ph.D. in soil physics from New Mexico State University. He has published widely on variably-saturated flow and contaminant transport processes in the subsurface, analytical and numerical modeling, nonequilibrium transport, preferential flow, characterization and measurement of the unsaturated hydraulic functions, and root-water uptake.

**Dr. Jirka Simunek** is a professor of hydrology in the Department of Environmental Sciences,

University of California, Riverside, USA. He received an M.S. in Civil Engineering from the Czech Technical University, Prague, Czech Republic, and a Ph.D. in Water Management from the Czech Academy of Sciences, Prague. His expertise is in numerical modeling of subsurface water flow and solute transport processes, equilibrium and nonequilibrium chemical transport, multicomponent major ion chemistry, field-scale spatial variability, and inverse procedures for estimating the hydraulic properties of unsaturated porous media.

## REGISTRATION FEES

**Students :INR 5,000**  
**Others :INR 10,000**

### Registration Includes

Course materials, Lunch, Evening Tea / snacks

### Registration Excludes

Boarding and Lodging

Options for accommodation are available on request

For Accommodation in Bangalore and any further assistance please contact

**N. Sashikumar**

**Karnataka State Council for Science and Technology**

**Indian Institute of Science, Bangalore 560012**

**Email: sashikumar.n@gmail.com**

**Mobile: +91 9845091083**

## REGISTRATION FORM

### **MODELING WATER FLOW AND CONTAMINANT TRANSPORT IN SOILS AND GROUNDWATER USING THE HYDRUS SOFTWARE PACKAGES**

**FEBRUARY 4 – 5, 2012**

Name \_\_\_\_\_

Affiliation \_\_\_\_\_

Date of Birth \_\_\_\_\_

Address \_\_\_\_\_

City / State \_\_\_\_\_

Pin code \_\_\_\_\_

Phone \_\_\_\_\_

Email \_\_\_\_\_

DD no \_\_\_\_\_

Date: \_\_\_\_\_ (Signature)

Demand Draft (DD) should be drawn in favour of 'Secretary, KSCST, Bangalore' payable at Bangalore. Please write your name on backside of your DD.

Registration form can also be downloaded at [www.kscst.org.in](http://www.kscst.org.in)

Please post registration form along with DD to N. Sashikumar, Karnataka State Council for Science and Technology, Indian Institute of Science, Bangalore 560012.

**Last date to receive registration form along with DD is 20<sup>th</sup> January 2012**