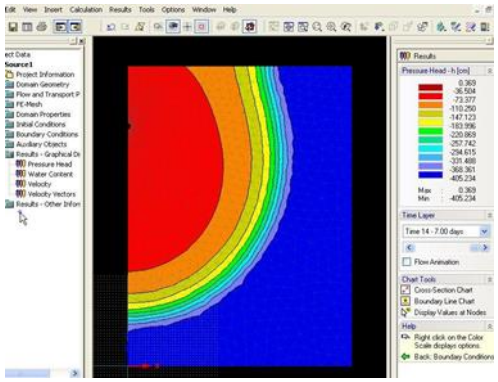
MODELING WATER FLOW AND CONTAMINANT TRANSPORT IN SOILS AND GROUNDWATER USING THE HYDRUS SOFTWARE PACKAGES



DATE: SEPTEMBER 9-11, 2019

VENUE: IIT MANDI HIMACHAL PRADESH

PC-PROGRESS
Engineering software developer

Indian Institute of Technology Mandi

भारतीय प्रौद्योगिकी संस्थान जम्मू
INDIAN INSTITUTE OF TECHNOLOGY JAMMU

COURSE DEVELOPERS

Dr. Jirka Šimůnek is a professor of hydrology in the Department of Environmental Sciences, University of California, Riverside, USA. He received 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 non-equilibrium chemical transport, multicomponent major ion chemistry, field-scale spatial variability, and inverse procedures for estimating the hydraulic properties of unsaturated porous media. He has authored and coauthored over 300 peer-reviewed journal publications, over 20 book chapters, and two books; and according to ISI has an *h*-factor of 62 and over 13,000 citations. His numeric models, HYDRUS-1D, HYDRUS-2D, and HYDRUS (2D/3D), are used by virtually all scientists, students, and practitioners modeling water flow, chemical movement, and heat transport through variably saturated soils. Dr. Šimůnek is a recipient of the Soil Science Society of America's Don and Betty Kirkham Soil Physics Award, Fellow of American Geophysical Union, American Society of Agronomy, American Association for Advancement of Sciences, and Soil Science Society of America.

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, and 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. van Genuchten is a recipient of the Soil Science Society of America's Don and Betty Kirkham Soil Physics Award, and fellow of the Soil Science Society of America, American Society of Agronomy, American Geophysical Union, and American Association for the Advancement of Sciences.

WORKSHOP OVERVIEW

Soil and groundwater pollution is an ever- increasing, worldwide problem. In India the groundwater plays an 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 DESCRIPTION

The course begins with a detailed conceptual and mathematical description of water flow and solute transport processes in the vadose zone, followed by a 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. Additional topics, such as preferential and nonequilibrium water flow and solute transport, coupled movement of water, vapor and energy, and biogeochemical modeling will be also discussed.

WORKSHOP HANDOUTS

Course handouts include lecture notes prepared by the instructor.

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.

NOTE

Registrants are expected to bring their own laptops for hands on exercises with the following minimum system requirements: Operating Systems: 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.

HOW TO REACH

MANDI BY AIR

The most convenient way to travel by air is via Chandigarh airport. It is at the distance of around 200 Kms and takes around 6 hours to reach IIT campus. Two other nearby airports are Dharamshala airport, which is around 150 Kms (4 hrs) and Kullu airport, Bhuntar, at the distance of 50 Kms.

MANDI BY ROAD

The usual travel route to Mandi is via Delhi or Chandigarh. From Chandigarh, buses to Mandi are available from Sector 43 bus stand. The distance between Chandigarh and Mandi is about 200 kms. This distance can be covered in approximately 6 hrs by bus. By taxi, it usually takes around 5 hrs.

IIT CAMPUS FROM MANDI

There are IIT Mandi buses and small vans that ply from Mandi Bus Stand to IIT campus at regular intervals in addition to state and private buses.

REGISTRATION FEE

CANDIDATE TYPE	STUDENTS		OTHERS	
	INDIAN	FOREIGN	INDIAN	FOREIGN
FEE	10,000 INR	15,000 INR	US$ 350	US$ 500

ACCOMODATION

1,000 INR per person per day for a shared accommodation in the guesthouse.

HOSTED BY

IIT MANDI
IIT JAMMU
PC PROGRESS

ORGANISED BY

SCHOOL OF ENGINEERING, IIT MANDI

CIVIL ENGINEERING DEPARTMENT, IIT JAMMU

COURSE PRESENTER

JIRKA SIMUNEK

Introductory remarks and an inaugural lecture will be given via video conferencing by

M. TH. VAN GENUCHTEN

COURSE COORDINATORS

D. SWAMI

N. JOSHI

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