Calibrating Groundwater Models with Groundwater Vistas & PEST

Webinar

Instructor:
Jim Rumbaugh

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Location:
Your Home or Office!

Cost
Individual: $950
Office: $1,900

Contact Jim Rumbaugh (see above) to Register

Instructor Bio:

Jim Rumbaugh, hydrogeologist and groundwater modeler, has over 25 years of experience in application of groundwater models and in development of groundwater modeling software tools. He is the co-author of the Groundwater Vistas software and is President of Environmental Simulations, Inc., a company that specializes in groundwater modeling. Jim is an active member of the American Society for Testing and Materials (ASTM) where he is a past Chairman of ASTM Subcommittee D18.21 on Groundwater and Vadose Zone Investigations. Subcommittee D18.21 was funded by U.S. EPA to develop standards for groundwater modeling practice. Jim was honored by the National Ground Water Association with the 1999 John Hem Excellence in Science and Engineering Award by NGWA. This award is given to those who have made a significant, recent scientific or engineering contribution to the understanding of groundwater. NGWA also presented Jim with the 2014 Technology Award, which is given to those who have made a significant contribution to the groundwater industry in the development of ideas and tools, along with exemplary service to colleagues throughout the industry in sharing these ideas. Jim teaches groundwater modeling seminars throughout the USA, Europe, Australia, and New Zealand. The Australia and New Zealand seminars are co-taught with John Doherty, author of the PEST calibration software. Jim has an active consulting practice and has worked on hundreds of groundwater modeling projects throughout the world.

Registration:

To register for this seminar, simply send Jim an email at **JRumbaugh@GroundwaterModels.com,** give us a call at (610) 670-3400, or pay by credit card on our web site at www.groundwatermodels.com and click Online Store. Registration is not confirmed until we receive payment for the Webinar.

Webinar Information:

- The Webinar is divided into 6 lectures lasting between 1 and 2 hours. After each lecture, there will be computer exercises that you may work on at your own pace. Help with exercises is provided by email (support@groundwatermodels.com).

- Lectures are live **but will be recorded** in case you cannot attend all of them. There will be periodic question/answer sessions during the lecture. You will call into the Webinar using either VoIP (provided) or telephone. Optional Question & Answer sessions are held on days between the lectures (see dates below).

- Computer exercises are based on the Advanced Version of ESI's Groundwater Vistas Version 6 software. If you do not currently have Groundwater Vistas 6 Advanced or if you have an older version, you may purchase a new license or upgrade with a 20% discount. You must order the software prior to the start of the Webinar to receive the discount.

- ESI reserves the right to cancel the Webinar if there are less than 6 participants

- Each lecture will start at 3:00 pm Eastern Time. Webinar Lectures will be on Monday, Tuesday, and Wednesday for 2 consecutive weeks. Question & Answer sessions will be held on Thursdays. Consult our webinar schedule for exact dates.

Course Description:

Calibrating Groundwater Models with Groundwater Vistas & PEST

PEST is the most advanced calibration tool for groundwater models and Groundwater Vistas supports more features and options in PEST than any other MODFLOW interface. This Webinar will cover the basics of PEST and Groundwater Vistas in calibrating models. These introductory topics will then lead into the more advanced features, including pilot points, SVD, and Null Space Monte Carlo techniques.

The following topics will be covered in the Webinar:

Lecture 1:
Introduction to Calibration in Groundwater Vistas

Groundwater Vistas offers many functions to aid in model calibration. The first lecture describes all of the features in Groundwater Vistas related to calibration, with emphasis on those that facilitate the use of Pest. Topics include:
- Tricks for minimizing model run time
- Types of calibration targets
- Weighting of Targets
- Use of new MODFLOW2000/2005 features that facilitate complex calibrations

Lecture 2:
PEST Basics

Pest can work with just about any type of model. The second lecture describes how Pest interacts with a model, the types of files necessary to run Pest, and how Groundwater Vistas creates these files. The assumptions underlying the Groundwater Vistas approach to using Pest are described and examples are given for simple Pest applications.

Lecture 3:
PEST Calibration with Pilot Points

Pilots points represent a new way of calibrating models whereby the model (Pest) decides where to add heterogeneity to the hydraulic conductivity distribution. The result is a model that will generally match the calibration targets much closer than using zones. The trick is interpreting the results to make sure that the estimated parameters are sensible. Examples are given of pilot point calibrations. Groundwater Vistas' many functions for adding, modifying, and working with pilot points are discussed along with strategies for efficient use of pilot points in groundwater model calibration.

Lecture 4:
PEST with SVD-Assist (Singular Value Decomposition)

One of the problems with pilot point calibrations (or any calibration with many parameters) is the time it takes to make all of the model simulations. Another issue is the relative insensitivity of many of the parameters. Singular Value Decomposition (SVD) is a method for dealing with insensitive parameters and SVD-Assist is a Pest utility that creates a new Pest run based on calibrating a subset of "super-parameters" rather than the full suite of pilot points (or other parameters). This often results in a reduction in run-time of about one order of magnitude. Groundwater Vistas facilitates the use of SVD-Assist. The 4th lecture describes, in general terms, how SVD and SVD-Assist work in Pest and how Groundwater Vistas can be used to efficiently run this type of calibration.

Lecture 5:
Analyzing Uncertainty with Null Space Monte Carlo and other PEST Features

Groundwater models generally include significant uncertainty. Pest offers some advanced techniques for evaluating and quantifying this uncertainty. Null Space Monte Carlo (sometimes called Calibration-Constrained Monte Carlo) is one such technique in which the many instances of the model are calibrated using different parameter combinations. NSMC is very complex but Groundwater Vistas is designed to make it reasonably simple to implement.

Lecture 6:
Using BeoPest and the Cloud for Distributed Calibration Runs

The final lecture describes the new version of Pest called BeoPest, which is designed to replace Parallel Pest when using large numbers of computers to perform the calibration. BeoPest is much easier to use than Parallel Pest but there are certain aspects that require explanation. In addition, BeoPest (and Parallel Pest) requires the user to have some knowledge of the system command prompt. We will explain how to create a BeoPest run, including a brief review of the system command prompt. Using BeoPest on the Cloud will also be discussed.