Ente di Formazione Accreditato

School of hydrogeological modelling & Project-related strategies

Italian Chapter

Field Hydrogeology Course

The first "run" of a numerical model
is actually a walk... in the field!

Onsite sessions: Viterbo, October 20th-22nd, 2025
Online sessions: October 13th, October 30th, 2025

SYMPLE proposes a comprehensive, applied, internet-based School of Hydrogeological Modelling. Through undertaking the courses, participants can acquire practical knowledge of effective model deployment in different decision-making contexts. Anyway, no modeller can disregard the fact that *no matter how sophisticated her/his model is,* the bottleneck of the whole process is the *quality and quantity of field data.* Low-quality investigations are often not recognized as a major source of uncertainty, yet they can be easily contained.

1. "Errors" in field measurements can have repercussions at different stages of the process, easy to understand if we enquire what "errors" means in modelling context:
2. Simple mistakes in reading or reporting measured values, swapping ID numbers between points, incorrect assignment of coordinates, etc.
3. Lack of knowledge of technical details influencing the measurement (e.g., well depth, screen elevations, screen clogging, ground elevation a.s.l.).
4. Lack of knowledge of boundary conditions affecting the measurement (e.g., nearby pumping, aquifer interconnections, active dewatering systems, leakage from pipes, channels, ponds, etc.).

> *"While all 'standard' textbooks on hydrogeology discuss the theoretical principles that underlie the hydraulic head, few of them provide a comprehensive discussion about how it should be measured. Given that hydraulic head measurements form the basis of most, if not all, hydrogeologic studies, this lack of treatment is somewhat surprising."*
>
> *Post & von Asmuth, 2013*

A simple example (covering points 1–3): imagine measuring the water level in a well while a nearby well is unknowingly pumping. The measured level would be lower than the undisturbed one. If this measurement is used to calibrate the parameters of a numerical model, we might increase the hydraulic conductivity value until the simulated head matches the observation. This parameter value would then be higher than it should be. Using such a "perfectly calibrated model" for prediction would mean working from incorrect premises.

Point 4 is even more insidious. You might collect a full set of professionally taken hydraulic head measurements, with all quality-control checks ticked, yet completely overlook the existence of a nearby river draining the aquifer. Without at least a rough estimate of the aquifer discharge to the river, your head data may be easy to match, but the resulting parameter estimates would be quite pointless.

Course Objective

Hydrogeological field methods are essential for the training of hydrogeologists and modellers. Groundwater projects rely on data, and understanding how these data are collected is imperative. This course aims to develop the critical thinking needed to identify the uncertainties and pitfalls hidden in data collection. Each single measurement should be considered in its broader context. The monitoring strategy should be designed to capture the information needed to solve the problem at hand, and we must understand how the collected numbers will constrain parameter values in numerical models or analytical calculations. If that number is incorrectly recorded, the "information flow" is distorted, producing inconsistencies and rendering all subsequent efforts useless at best, and misleading at worst.

Trainers

Francesca Lotti (SYMPLE), Elisabetta Preziosi (CNR-IRSA), Thomas Reimann (TU Dresden), Luigi Lana (Kataclima).

The Site

The investigation site is a landfill located at northwest of Viterbo, virtuously managed by the company Ecologia Viterbo srl, that also conducts a nearby treatment (TMB) and composting plant.
The landfill covers approximately 0.5 km^2 and is divided into three lots, one of them currently cultivated. The monitoring network is constituted by 25 piezometers, intercepting an unconfined aquifer hosted in pyroclastic rocks, part of the Vulsini hydrogeological system.

Useful Documentation

- Videos from the iNUX Project: a variety of short videos and interactive material covering hydrogeological investigation theory and practice are suggested as integration of the on-site course.
- Techniques of Water-Resources Investigations Reports: USGS reports divided in 9 books, covering collection techniques, instrumentation, analysis and processing of field data.
- Additional video-lessons about basics of GIS, Geostatistics, well construction and pumping tests.

Books

- Sanders, L.L. (1998). A Manual of Field Hydrogeology.
- Weight, Willis D., ed. (2001). Manual of Applied Field Hydrogeology. 1st ed. New York: McGraw-Hill.
- Moore, J.E. (2011). Field Hydrogeology: A Guide for Site Investigations and Report Preparation, Second Edition (2nd ed.). CRC Press. https://doi.org/10.1201/b11056
- Kennedy, G.W., 2022, Water Well Record Databases and Their Uses. The Groundwater Project, Guelph, Ontario, Canada.

Programme

		Activity	
Online	*October 13* *3 pm – 6 pm*	• *Overview of investigation methods.* • *Types of boreholes, construction details.*	• *Site description, analysis of site material, GIS and available data.*
Day 1	October 20 9 am – 6 pm	• Measurement of boreholes elevation, position and depth. • Video inspection of boreholes to define screen elevations. • Manual head monitoring. • Pressure transducers set up and installation.	• Vertical logging of EC and temperature. • Planning of the pumping test, preparation and check of the devices and data forms.
Day 2	October 21 9 am – 6 pm	• Pumping test start, troubleshooting, pumping test execution, troubleshooting, various attempts… etc. • Level monitoring in wells and piezometers.	• Discharge monitoring through different methods. • End of pumping, automatic monitoring of recovery during the night.
Day 3	October 22 9 am – 7 pm	• Manual check of the levels. • Slug tests (when are they meaningful?) • Removal of the divers. Homework: *Organization of the measurements.*	• Measurement of river flow with flowmeter and other devices.
Online	*October 30* *9 am – 6 pm*	• *Processing of the data according to different methods and comparison of results.*	• *Discussion about parameters, role of heterogeneity and how to transfer the acquired information into different project deployment.*

Extras: Self-learning video lessons and tutorials on GIS, geostatistics, well construction, and pumping test interpretation.

Registration

Attendance

The site is nearby the medieval town of Viterbo, Italy. We are arranging accommodation agreements for the whole group (ask for details before booking). Trips to and from the site/classes are organized by SYMPLE. The course is in English and Italian.

Purchase

The course can be purchased on the SYMPLE Store at the price of 1200 € (VAT-exempt).
SYMPLE is an Accredited Training Organization (EFA). Prices are VAT-exempt under article 10 of Presidential Decree 633/72.

What is included in the Course fee:

- Transportation to the field sites
- Light lunches & coffee breaks
- Didactic material
- Access to the e-learning platform with didactic material, field forms, recordings of main operations, participants forum/chat
- Extra video-lessons covering the basics of GIS, Geostatistics, Well construction, Pumping test interpretation

Cancellation policy

For a full refund, written cancellations must be received 20 days prior to the start date of the training. Cancellations received 10 days prior to the start date of the training are entitled to a 50% refund. Cancellations received less than 10 days prior to the start date are not entitled to a refund. This policy is due to the high level of customization involved in our trainings, which is based on the number of people that have registered as well as space limitations. If the program is cancelled by SYMPLE, a full refund will be provided.
In case of bad weather, the course is not cancelled. In case of VERY bad weather, the daily timetable might be re-arranged. But be prepared to get wet and enjoy a muddy walk!

On request:

- Pickup service from Fiumicino Airport or Orte train station.