



Workshop Program

Flow and Heat Transport Modeling with MODFLOW-USG

Flowpath 2025 - Torino

June 11-13, 2025

Torino - Italy

Event organised by



Politecnico di Torino

Department of Environment,
Land and Infrastructure
Engineering



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DI TORINO**



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Workshops

09-10/06/2025

1. Workshop: How to Create and Use Geodatabases in PostgreSQL / PostGIS



10 June 2025



09:00–13:00 and 14:00–16:00

2. Workshop: Flow and Heat Transport Modeling with MODFLOW-USG



09–10 June 2025



- a. *Day 1:*
 - 09:00–13:00 – Introduction
 - 14:00–17:00 – Closed-loop Systems
- b. *Day 2:*
 - 09:00–13:00 – Closed-loop Systems
 - 14:00–17:00 – Open-loop Systems

Flow and Heat Transport Modeling with MODFLOW-USG

Training Course Overview

This course provides the necessary knowledge for implementing a 3D numerical model of flow and heat transport for closed-loop (Borehole Heat Exchangers – BHE) and open-loop (extraction and reinjection wells) geothermal heat pump systems using MODFLOW-USG. Participants will learn how to:

Assess hydraulic perturbation from wells (open-loop systems).

Evaluate thermal perturbation from geothermal systems.

Identify possible interferences and short-circuiting among BHEs/wells.

Analyze energy performance variations based on layout configurations.

Software

MODFLOW-USG (USGS), Groundwater Vistas v9, Excel – temporary licenses will be provided.

Requirements

Participants should have background in flow modeling and basic understanding of contaminant transport modeling.

Registration

The course is reserved for Flowpath 2025 attendees. Additional registration fees:

IAH Members: €80

Students / PhD students: €50

Maximum number of participants: 20

Instructors

Dr. Luca Alberti (Politecnico di Milano)

Dr. Matteo Antelmi (Politecnico di Milano)

Eng. Sara Barbieri (Tethys s.r.l. – Geokore)

Detailed Programme

Day 1 – Introduction (9:00 – 13:00)

Course introduction

Italian legislation on low-enthalpy geothermal systems

Basic concepts of numerical modeling

Heat transfer parameters in porous media

Groundwater Vistas interface and CLN package

GWV installation

Day 1 – Closed-loop Systems (14:00 – 17:00)

Conceptual model definition

Numerical model setup: grid, map import, spatial discretization

Assign boundary/internal/initial conditions

Thermo-physical properties and temporal discretization

Transient model simulation and results discussion

Day 2 – Closed-loop Systems (9:00 – 13:00)

Multi-BHE modeling

Thermo-physical property variations

Temporal discretization adjustments

Transient model simulation and results discussion

Day 2 – Open-loop Systems (14:00 – 17:00)

Modeling geothermal wells (extraction and reinjection)

Thermo-physical property adjustments

Transient simulation and result analysis