Session 1

Groundwater Modelling for Decision Support: Concepts and Fundamentals

Session 1 sets the groundwork for the following sessions. It explores what makes decision-support groundwater modelling unique. It discusses the challenges that it poses. It shows why these challenges must be addressed if decision-support modelling is to achieve its potential.

Numerical simulation of groundwater flow and transport is far from perfect. At the same time, a model’s representation of hydraulic properties is coarse, abstract and upscaled. Despite this, numerical modelling can provide effective decision support if it can express information derived from different sources, and if it can use this information to quantify and reduce the uncertainties of decision-critical predictions. This is the primary task of decision-support modelling. Simulation of natural processes should serve this purpose, rather than the other way around.

This first session also explores how information flows from field measurements to model parameters. It stresses how proper design of the decision-support modelling process, and of the conceptual model that underpins it, can facilitate this flow. It stresses the importance of a considered model design and history matching process in enabling this flow. It then weighs the pros and cons of seeking parameter uniqueness through calibration, against direct implementation of parameter and predictive uncertainty analysis without a calibration step.