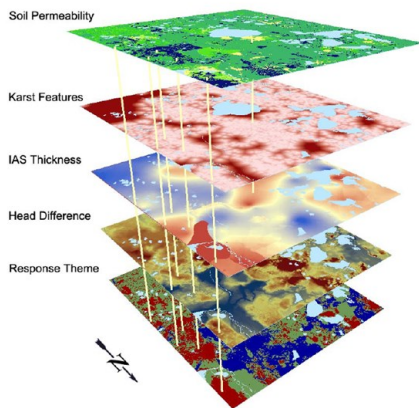


# H2020 ENeRAG project

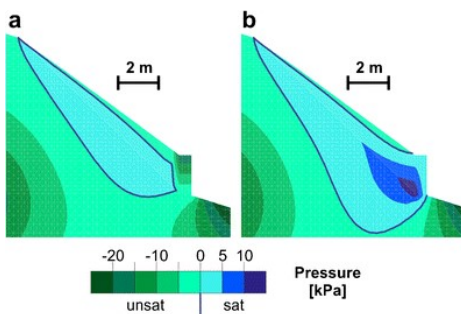
“Excellency Network Building for Comprehensive Research and Assessment of Geofluids”



## Summer school “Enhancing sustainable approach in vadose zone hydrology and groundwater vulnerability”



The ENeRAG summer school class will be composed by 25 participants, selected among MSc students preparing their theses, PhD students and young doctors. Ten seats are reserved to ENeRAG and GEOTWINN project participants. Interested young researchers can send a CV and a letter of interest to the contacts below. Participation to a single-week course may be possible. There are no subscription fees, while participants pay their own travel and accommodation expenses. Please contact us for more information.



**17-21 & 24-28 June 2019**

**Deadline for application: 17 May 2019**

**Dipartimento di Scienze della Terra “A. Desio”**

**Università degli Studi di Milano**

**Via Mangiagalli 34, 20133, Milano (Italy)**



**Contact info (Object: “Summer School-GW”): RSVP to**

**marco.masetti@unimi.it**

**corrado.camera@unimi.it**

**daniele.pedretti@unimi.it**

**[www.unimi.it]**

# H2020 ENeRAG project

## Summer school “Enhancing sustainable approach in vadose zone hydrology and groundwater vulnerability”

### PROGRAMME



#### **Week 1: Vadose zone modelling (17-21 June 2019)**

- Day 1: Examples of modelling, overview of available approaches and codes. Assessment of the peculiarity of groundwater flow in unsaturated media and its impact on groundwater quantity and quality. Overview of geochemical aspects. Support of laboratory and field techniques for measuring unsaturated soil properties and vadose zone monitoring.
- Day 2: Overview and use of analytical solutions for the infiltration problem. Numerical modelling – 1D case. Conceptual model, boundary conditions, calibration techniques and validation. Flow-only problem with rainfall-controlled recharge. Comparison between numerical and analytical solutions for estimating infiltration rate and amount.
- Day 3: Field trip to the vadose zone monitoring site of Pozzuolo Martesana and to the Managed Aquifer Recharge (MAR) structure of Lonate Pozzolo.
- Day 4: Numerical modelling- 2D and 3D cases. Development of a simple model to study the water budget during managed aquifer recharge (MAR) through artificial recharge ponds. Simulations of scenarios with different boundary conditions and aquifer properties. Assessment of the importance of multidimensional analysis.
- Day 5: Reactive transport modelling. Simulation of scenarios with vadose-zone-controlled distribution of pollutants in the subsurface. Assessment of nitrate pollution, arsenic contamination and acid-mine drainage.

#### **Week 2: Aquifer Vulnerability (24-28 June 2019)**

- Day 1: Introduction, overview and purpose of the first week of the summer school. Review of key concepts of groundwater vulnerability. Spatial statistical models (e.g., logistic regression, Weights of Evidence, Random Forest). Pre-processing of raw data for response variable and explanatory variables. Using continuous and categorical variables. optimization of the explanatory variables dataset. Use of combined variables and proxies. Data exploration.
- Day 2: Spatial component, creating the conceptual model. Post probability maps. Calibration techniques. Reclassification methods and validation techniques. Introduction to real case studies.
- Day 3: The time component, creating the conceptual model. The development of predictive scenarios. Introduction to real case studies. Half-day field trip to a monitored groundwater pumping station
- Day 4: Simulation of a spatial groundwater vulnerability analysis (data exploration and final maps).
- Day 5: Combining spatial and temporal components. Simulation of a temporal and a combined spatio-temporal groundwater vulnerability analysis (data exploration and final maps).

