



Associazione **ACQUE
SOTTERRANEE**



5th Edition of FLOWPATH
the National Meeting on Hydrogeology
Napoli, 1-3 December 2021
Conference Proceedings Book

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Preface

The Italian Chapter of the International Association of Hydrogeologists (IAH) is pleased to present you the abstracts submitted to the 5th Edition of FLOWPATH, the National Meeting on Hydrogeology. The congress take place on 1-3 December 2021 in the Monumental Complex of Saints Marcellino and Festo (Historical Centre of Naples).

Following the tradition of the previous editions of FLOWPATH, the conference is an opportunity for hydrogeologists and professionals to exchange ideas and discuss different issues on groundwater resources.

The preparation of the 5th Edition of FLOWPATH hardly involved the Organizing Committee, with the full-time effort of the Chairs and the Local Organizing Committee, testified by numerous meetings (more than monthly, since 2020) and activities.

The objectives of the conference are:

- to promote dialogue and exchange of scientific knowledge among young hydrogeologists;
- to deepen the theoretical and practical aspects of our understanding of groundwater in a changing climate;
- to update all the stakeholders, researchers and professionals on recent challenges in the hydrogeological sciences;
- to encourage researchers, professionals and administrators to contribute to the improvement of a sustainable water resources management.

The congress has been structured into four sessions, i.e.:

Session 1 - Climate change and groundwater

Session 2 - Groundwater Resource and Sustainability

Session 3 - Geothermal, Urban and Contaminant Hydrogeology

Session 4 - Groundwater flow and hydrogeochemical features in volcanic, karst and coastal plain aquifers

Each session starts with a Keynote lecture, held by international experts. The members of the Scientific Committee and the Chairs of the four sessions actively contributed to this successful Congress.

This Conference Proceedings book, including one keynote lecture for each session and 116 total abstracts, represents the final step of this Congress. All these abstracts underwent a rigorous peer-review process by the Scientific Committee members and were assigned to oral (44) or poster (72) presentation. The Authors come from Universities, Public Bodies, Private Companies of Italy and some other countries.

In summary, this congress, with more than 160 participants, testified the interest in groundwater resources and their protection with a view to future challenges in the hydrogeological sciences.

We would thank especially the sponsors and the Organizations offering their patronage, with particular mention to the prestigious UNESCO-IHP, but our thanks are addressed to all people that directly or indirectly contributed to this successful edition of FLOWPATH.

On behalf the organizing committee

Daniela Ducci

Chair of the IAH Italian Chapter

Session 2

Groundwater Resource and Sustainability

Keynote Lecture:

Groundwater Resources on the United Nations Agenda: Cross-border groundwater cooperation

Alice Aureli (UNESCO IHP)

Conveners

Tullia Bonomi (Università degli Studi di Milano – Bicocca)

Antonio Menghini (Aarhus Geofisica S.r.l.)

Maria Filippini (Alma Mater Studiorum - Università di Bologna)

Hydrogeological study of the Venafro Mts. (central-southern Italy) carbonate aquifer: numerical analysis and management scenarios

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Key words: central Apennines; hydrogeological conceptual model; karst; MODFLOW.

Carbonate fractured aquifers represent strategic water resources of Italy, supplying major cities and villages. These aquifers coincide with the Apennines mountain ridges and are characterized by water springs with a steady flow rate. The lack of alternative water sources, drought occurrence and increasing human water abstraction make compelling the detail characterization of these groundwater systems. In this study, the Venafro Mts. (central-southern Italy) carbonate aquifer (370 km²), has been investigated. Selected area is relevant for water supply of Naples and its hinterland, and it is exploited by the WCW (Western Campania Water-works). Via a collection of geological and hydrogeological data (Saroli et al., 2019; Lancia et al., 2020 and references therein), a groundwater conceptual model for the aquifer is built. The definition of the lithological units and tectonic lineaments together with piezometric data, spring flow rates, and WCW abstraction rates are the basis for the setup of a numerical model via USGS-MODFLOW. The UZF (Unsaturated Zone Flow) package with an NWT-UPW (Newton Solver-Upstream Weighting) configuration allows better numerical convergence in mountain areas (Lancia et al. 2019). Steady-state simulation validates the conceptual model and the literature budgets. A further transient model, calibrated by rain gauge station data, between 2010 and 2018 years, simulates the spring flow rates during the dry and wet periods. Simulation analysis suggests Venafro Mts. aquifer is affected by stress enhanced during drought conditions. Water springs located at higher elevations show larger flow rate variations, suffering the rainfall decreases and water abstractions. Management scenarios comprehending a drastic water abstraction cut-off are also considered. Studied aquifer shows a slow response, with recovery time estimated at the decennial scale, testifying its limited resilience to natural and human pressures. Detailed studies at long-term scale are suggested to assess the sustainability of water abstraction throughout the carbonate aquifers of the Italian peninsula.

Lancia, M., Zheng, C., Yi, S., Lerner, D., Andrews, C. 2019. Analysis of groundwater resources in densely populated urban watersheds with a complex tectonic setting: Shenzhen, southern China *Hydrogeo J*, 27, 183-194.

Lancia, M., Petitta M., Zheng, C., Saroli, M. 2020. Hydrogeological insights and modelling for sustainable use of a stressed carbonate aquifer in the Mediterranean area: From passive withdrawals to active management, *J Hydrol-Reg Stud*, 32, 100749.

Saroli, M., Lancia, M., Petitta, M. 2019. The geology and hydrogeology of the Cassino plain (Central Italy): redefining the regional groundwater balance. *Hydrogeo J*, 27, 1563-1579.

The full paper is published on: [Lancia, M., Petitta M., Zheng, C., Saroli, M. 2020. Hydrogeological insights and modelling for sustainable use of a stressed carbonate aquifer in the Mediterranean area: From passive withdrawals to active management, J Hydrol-Reg Stud, 32, 100749.](#)