KARMA

Karst **A**quifer **R**esources availability and quality in the **M**editerranean **A**rea

"White paper" describing MEDKAM

Deliverable 5.5

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Date: 15. February 2023

This project has received funding from the European Union's PRIMA research and innovation programme

Technical References

Project Acronym	**KARMA**
EU Programme, Call and Topic	PRIMA, Multi-topic 2018, Water resources availability and quality within catchments and aquifers
Project Title	Karst Aquifer Resources availability and quality in the Mediterranean Area
Project Coordinator	Prof. Dr. Nico Goldscheider, Karlsruhe Institute of Technology (KIT), nico.goldscheider@kit.edu
Project Duration	September 2019 – February 2023
Deliverable No., Name	Deliverable 5.5 “White paper” describing MEDKAM
Dissemination Level*	PU (public)
Work Package	WP 5: MEDKAM & Database
Task	Task 5.2 Principal karst aquifer map and geodatabase
Lead beneficiary	Karlsruhe Institute of Technology (KIT)
Contributing beneficiary/ies	Bundesanstalt für Geowissenschaften und Rohstoffe (BGR), University of Malaga (UMA), University of Montpellier (UM), Sapienza University of Rome (URO), Ecole nationale d’Ingenieurs de Tunis (ENIT), American University of Beirut (AUB)
Due Date	Month 36
Actual Submission Date	Month 42

* PU = public

CO = Confidential, only for members of the consortium (including the Commission Services)

RE = Restricted to a group specified by the consortium (including the Commission Services)

Version History

Version	Date
1.0	February 2023

Project Partners

(Coordinator)

Participant No *	**Organisation**	**Country**
1 **(Coordinator)**	Karlsruhe Institute of Technology (KIT)	Germany
2 **Partner 1**	Federal Institute for Geosciences and Natural Resources (BGR)	Germany
3 **Partner 2**	University of Malaga (UMA)	Spain
4 **Partner 3**	University of Montpellier (UM)	France
5 **Partner 4**	University of Rome (URO)	Italy
6 **Partner 5**	American University of Beirut (AUB)	Lebanon
7 **Partner 6**	Ecole National d'Ingénieurs de Tunis (ENIT)	Tunisia

Executive Summary

Karst aquifers constitute important freshwater resources, but are challenging to manage and to protect, because of their unique structure and hydraulic behaviour, representing continuous challenges for research and development. Karstified carbonate rocks occur on 15.2% of the global land surface (Goldscheider et al. 2020) and are widespread in the Mediterranean region, where groundwater from karst contributes to the freshwater supply of most countries and many big cities, such as Rome, Montpellier, and Beirut. Groundwater resources in karst aquifers are often hydraulically connected over large areas and particularly vulnerable to contamination. Rapid and turbulent groundwater flow in a network of conduits and caves often results in variable spring discharge and water quality. The Mediterranean Karst Aquifer Mapping and Database (MEDKAM) project is creating a unique map of karst aquifers in the Mediterranean at a scale of 1:1.5 million and providing additional data on karst springs, caves, and on karst groundwater dependent ecosystems.

Comment

The text in this deliverable is almost identical to the text on the printed MEDKAM map. A detailed publication is in preparation and is expected to be submitted in the summer of 2023 to Hydrogeology Journal with the provisional reference:

Xanke J, Goldscheider N, Bakalowicz M, Barberá JA, Chen Z, Ghanmi M, Hartmann A, Jourde H, Liesch T, Mudarra M, Petitta M, Ravbar N, Stevanovic Z (2022) Carbonate Rocks and Karst Water Resources in the Mediterranean region. (in preparation)

Table of Content

Introduction

The preparation of the Mediterranean Karst Aquifer Map and Database (MEDKAM) generally followed the workflow used for the World Karst Aquifer Map (WOKAM; Chen et al. 2017). The topographic basis for MEDKAM is the digitized version of the International Hydrogeological Map of Europe (IHME; BGR & UNESCO 2019) and its recently digitized extension to North Africa. To complete missing parts in the North African countries and the Arabian Peninsula, the digital versions of the Quantitative maps of groundwater resources in Africa from the British Geological Survey (MacDonald et al. 2012) and the Bedrock geology of the Arabian Peninsula from the United States Geological Survey (Pollastro 1998) were used.

IHME is a series of general hydrogeological maps with 30 map sheets at a scale of 1:1,500,000 compiled by hydrogeologists and national experts in related sciences under the auspices of the International Association of Hydrogeologists (IAH). A new lithological classification has been developed for MEDKAM, similar to that of WOKAM, which groups the geological units into four meaningful hydrogeological units.

1. Karst aquifers in sedimentary and metamorphic carbonate rocks
2. Karst aquifers in evaporite rocks
3. Various hydrogeological settings in other sedimentary and volcanic formations (karst aquifers are possibly present at depth)
4. Local, poor and shallow aquifers in other metamorphic rocks and igneous rocks (no karst aquifers present at depth)

Map preparation and editing

Julian Xanke, Nico Goldscheider (project leader)

Project associates and scientific advisory board (in alphabetical order)

Michel Bakalowicz, Juan Antonio Barberá, Stefan Broda, Zhao Chen, Mohamed Ghanmi, Andreas Günther, Andreas Hartmann, Hervé Jourde, Tanja Liesch, Matías Mudarra, Marco Petitta, Nataša Ravbar & Zoran Stevanović

Cartographic editing and technical support:

Martin Krombholz, Stefanie Richter

Spatial data sources:

Natural Earth 1:10m Cultural Vectors, modified in accordance to the United Nations Clear Map (2018) (national borders); NOAA National Centers for Environmental Information. 2022: ETOPO 2022 15 Arc-Second Global Relief Model. NOAA National Centers for Environmental Information. DOI: 10.25921/fd45-gt74. Accessed 2022-10-19 (hillshade & sea floor); WHYMAP (rivers and cities)

Map projection:

ETRS 1989 UTM Zone 33N (WKID: 25833) The data and information on this map were collected and prepared by the Federal Institute for Geosciences and Natural Resources (BGR) and Karlsruhe Institute of Technology (KIT).

Project Consortium

The Mediterranean karst aquifer map and database (MEDKAM) was developed within the framework of the Karst Aquifer Resources availability and quality in the Mediterranean Area (KARMA) project. KARMA is implemented under the umbrella of the Partnership for Research and Innovation in the Mediterranean Area (PRIMA), which aims to develop new R&I approaches to improve water availability and sustainable agriculture production in a region heavily distressed by climate change, urbanisation and population growth. The PRIMA programme is an Art.185 initiative supported and funded under Horizon 2020, the European Union's Framework Programme for Research and Innovation. MEDKAM is a contribution to the World-wide Hydrogeological Mapping and Assessment Programme (WHYMAP) of the UNESCO Intergovernmental Hydrological Programme (IHP).

Bibliographic reference MEDKAM

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MEDKAM Download - BGR Geoportal

https://geoportal.bgr.de/mapapps/resources/apps/geoportal/index.html?lang=en#/datasets/portal/65f58412-4a78-4808-9ef6-6b6d9182db8f

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Main references

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