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Development of a process-oriented vulnerability concept for water travel time in karst aquifers-case study of Tanour and Rasoun springs catchment area.

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The understanding of the groundwater pathways and movement through karst aquifers, and the karst aquifer response to precipitation events especially in the arid to semi-arid areas is fundamental to evaluate pollution risks from point and non-point sources. In spite of the great importance of the karst aquifer for drinking purposes, karst aquifers are highly sensitive to contamination events due to the fast connections between the land-surface and the groundwater (through the karst features) which is makes groundwater quality issues within karst systems very complicated.

Within this study, different methods and approaches were developed and applied in order to characterise the karst aquifer system of the Tanour and Rasoun springs (NW-Jordan) and the flow dynamics within the aquifer, and to develop a process-oriented method for vulnerability assessment based on the monitoring of different multi-spatially variable parameters of water travel time in karst aquifer.

In general, this study aims to achieve two main objectives:
1. Characterization of the karst aquifer system and flow dynamics.
2. Development of a process-oriented method for vulnerability assessment based on spatially variable parameters of travel time.

In order to achieve these aims, different approaches and methods were applied starting from the understanding of the geological and hydrogeological characteristics of the karst aquifer and its vulnerability against pollutants, to using different methods, procedures and monitored parameters in order to determine the water travel time within the aquifer and investigate its response to precipitation event and, finally, with the study of the aquifer response to pollution events.

The integrated breakthrough signal obtained from the applied methods and procedures including the using of stable isotopes of oxygen and hydrogen, the monitoring of multi qualitative and quantitative parameters using automated probes and data loggers, and the development of travel time physics-based vulnerability assessment method shows good agreement as an applicable methods to determine the water travel time in karst aquifers, and to investigate its response to precipitation and pollution events.