



Lithuanian Karst Region Hydrogeology: Available Data and Future Research Prospects

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In Northern Lithuania, Biržai and Pasvalys districts, significant karst activity occurs due to gypsum-rich Devonian dolomite formation near the surface. Over time, water dissolves the gypsum, creating underground cavities that cause sinkholes when the ground collapses. The region has more than 11 thousand sinkholes, some densely clustered, with typical dimensions of 10–20 meters in diameter and 5 meters deep.

Groundwater level monitoring in Lithuania's karst regions was conducted in nine wells by the Lithuanian Geological Survey. Monitoring activities began as early as 1965 and have expanded over the decades, with newer installations starting in 2004. The monitored wells vary in depth, ranging from 10.7 to 46 meters in confined and unconfined aquifers.

In addition to water levels, the major ionic composition is analyzed in samples from all wells except Biržai MS (Well No. 35994), providing valuable data on groundwater chemistry and its interaction with karst processes.

Lithuania's karst region is located in a transboundary area shared with Latvia, making it a region of joint environmental and scientific interest. This area is currently a focus of the GRANDE-U (Groundwater Resilience Assessment through Integrated Data Exploration for Ukraine) project, which aims to enhance the understanding and management of groundwater through advanced techniques. One of the key aspects of this project is the modelling of groundwater parameters using machine learning (ML) algorithms, which are further complemented by GRACE (Gravity Recovery and Climate Experiment) satellite data.

Karst systems are hydrogeologically characterized by fractured structures that respond rapidly to groundwater level changes. This sensitivity makes them particularly suitable for observation using gravitational data, as fluctuations in groundwater levels can be detected through variations in the Earth's gravitational field. The transboundary nature of the Lithuanian and Latvian karst regions underscores the importance of collaborative efforts like GRANDE-U to ensure sustainable water management and protect the unique geological and hydrological characteristics of this area.

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