

## HABILITATION THESIS REVIEWER'S REPORT

### Masaryk University

**Applicant**

Tomáš Kuchovský, Mgr. Ph.D.

**Habilitation thesis**

Anthropogenic impact on the groundwaters between Bohemian Massif and Western Carpathians

**Reviewer**

Monika Ličbínská, doc. Mgr. Ph.D

**Reviewer's home unit, institution**

VŠB-TUO  
Hornicko-geologická fakulta  
17. listopadu 2172/15  
708 00 Ostrava-Poruba

This habilitation thesis focuses on the impact of anthropogenic activities on groundwater, particularly in connection with raw material extraction, groundwater contamination, and the use of geothermal energy. The chosen topic is timely in light of current developments in geological and hydrogeological disciplines and has significant application potential, particularly in the areas of water resource protection, water management, and the assessment of the impacts of human activities on the geological environment.

The thesis presents a summary of the results of the author's long-term professional work in the field of hydrogeology and applied numerical modeling of groundwater flow. The author demonstrates a thorough understanding of groundwater flow issues in various geological environments and the ability to apply modern methodological approaches, particularly numerical modeling and hydrochemical data interpretation. A significant contribution of the work is the systematic use of 3D numerical modeling to quantify changes in the water balance and hydraulic parameters of the rock environment resulting from mining activities, as well as the integration of model calculations with hydrogeological and hydrochemical data.

The author's effort to comprehensively evaluate the processes of contaminant transport and transformation in groundwater and to interpret natural attenuation processes in contaminated aquifers can also be considered a positive aspect. The thesis provides a number of practically applicable insights for assessing the impacts of mining and contamination on the landscape's water regime and for proposing measures in the field of groundwater protection. The section of the thesis devoted to the evaluation of the geothermal potential of deep sedimentary structures is also valuable, where the author appropriately combines hydrochemical, geothermometric, and modeling approaches.

From a scientific standpoint, the thesis is based on appropriate methodological procedures and draws on a relevant body of the author's published results. It is evident that the author possesses sufficient experience in solving complex hydrogeological problems and is capable of independent scientific work. The author's publication record in peer-reviewed journals attests to his active involvement in the professional community.

On the other hand, however, several comments and critical remarks must be noted. The work is distinctly synthetic in nature, and in some parts it appears more as a summary of previously published results than as a comprehensive conceptual study with clearly formulated scientific hypotheses. It would be appropriate to define the main research questions more clearly in the text and to explicitly delineate the new findings that constitute the author's own scientific contribution beyond the application of known methodological procedures.

Another comment concerns the degree of generalization of certain conclusions. In several cases, results obtained at specific locations are interpreted in a broader regional or more general context without always sufficiently discussing the limitations of the models used and the uncertainties of the input parameters. Given that numerical modeling is sensitive to the quality and representativeness of input data, it would be advisable to devote greater attention to the systematic assessment of uncertainties in model calculations and their impact on the interpretation of results.

From a methodological perspective, it would also be beneficial to discuss in greater detail the validation of model scenarios and the sensitivity analysis of key parameters, particularly in cases where model results are used for predictive assessments of future changes in the water balance or the impacts of climate scenarios. Although these aspects are mentioned in the work, elaborating on them would enhance the persuasiveness of the presented conclusions.

Formally, the thesis is clearly structured and written in a professional style consistent with the requirements of the field of geology. Terminology is used correctly, and the text is comprehensible. In some sections, however, the continuity between individual chapters could be improved, and the synthesizing conclusions could be more clearly defined to unambiguously summarize the main scientific contributions of the work.

Overall, it can be stated that the submitted habilitation thesis represents a high-quality scholarly work that documents the author's long-term scientific activity in the field of hydrogeology and applied geology. Despite the above comments, the thesis meets the requirements for habilitation theses in the field of Geology and demonstrates the author's ability to independently address professional and scientific problems in the given field.

**Reviewer's questions for the habilitation thesis defense** (number of questions up to the reviewer)

1. How was the uncertainty of the input parameters for numerical groundwater flow models quantified in individual model studies, and how does this uncertainty affect the interpretation of results, particularly in predictive assessments of future water balance trends?
2. To what extent can results obtained at specific sites (in the environment of flooded mine workings or gravel pits) be generalized to other hydrogeological conditions within the Bohemian Massif or similar geological structures, and what are the main limitations of such generalization?
3. How does the author assess the long-term stability of natural attenuation processes for chlorinated hydrocarbons under conditions of a changing hydrogeochemical environment, particularly with regard to possible changes in redox conditions and the hydraulic regime of the aquifer?
4. What, according to the author, are the key hydrogeological and hydrochemical indicators that should be systematically monitored when assessing the sustainability of geothermal structure utilization, in order to identify the risk of excessive exploitation in a timely manner?

5. How could numerical modeling of groundwater flow be methodologically linked with regional climate change scenarios to achieve greater reliability in predicting impacts on available groundwater resources?

## **Conclusion**

The habilitation thesis entitled ["Anthropogenic impact on the groundwaters between Bohemian Massif and Western Carpathians"] by Mgr. Tomáš Kuchovský, Ph.D. **fulfils – does not fulfil** requirements expected of a habilitation thesis in the field of Geology.

Based on the submitted thesis and its scholarly contribution, I recommend the habilitation thesis for defense, and following a successful habilitation procedure, I recommend the conferral of the academic and pedagogical title of associate professor in the field of Geology.

Date: 15.4. 2026

Signature: