CZECH TECHNICAL UNIVERSITY IN PRAGUE
Faculty of Civil Engineering
Department of Landscape Water Conservation
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Doc. Ing. Michal Sněhota Ph.D.

Referee's report on doctoral thesis

Ph.D. candidate: Mgr. Jakub Mareš

Supervisor: doc. RNDr. Jiří Bruthans, Ph.D.
Consultants: Mgr. Martin Slavík, Ph.D.
Mgr. et Mgr. Tomáš Weiss, Ph.D.

The doctoral thesis offers a comprehensive investigation into the dynamics, distribution, and sources of moisture within porous rocks, particularly examining its impact on material degradation and weathering. The candidate's work aligns well with research themes established at their home department. The thesis builds upon and extends current understanding of moisture dynamics in rock formations, offering new insights particularly through use of broad range of experimental methods.

Based on three well-regarded journal articles published in *Geomorphology* (Elsevier, IF 3.1, Q2 in Physical Geography and Geosciences) and *Earth Surface Processes and Landforms* (Wiley, IF 2.8, Q2 in Physical Geography and Geosciences), this research analyzes moisture fluxes in rock outcrops with distinct cavernous weathering forms: coastal honeycombs in Italy, humid climate tafoni near Kralupy nad Vltavou in Czechia, and carbonate notches transitioning to tafoni in Israel. Key findings reveal a shallow evaporation front within caverns, contributing to elevated evaporation rates and salt precipitation, which in some cases accelerates rock weathering. As an outlook, the author notes that a similar methodology could be applied to buildings and the preservation of cultural heritage.

The thesis is presented as a concise summary, capturing the core findings of the three articles; however, it should be noted that the electronic version distributed to referees did not include the full articles themselves. It is somewhat unusual that, after summarizing the entire research, the thesis provides a summary of each individual paper, leading to a certain level of duplication, but this may be a standard thesis format at the author's department.

Although the research employs rigorous and reliable methods, some methodological inconsistencies are observed across the three study sites. Different measurements were conducted at each location, introducing some incoherence in the study design, as only the evaporation front and infiltration rate were measured consistently across all sites as

Table 1 suggests. Budget limitations were cited as a constraint of limited number of methods used on some sites.

The candidate acted as the first author of all three journal articles on which the thesis is based and has appropriately acknowledged the roles of co-authors. From this description, as well as from the articles, it can be deduced that the majority of the fieldwork in three countries and laboratory work was performed by the candidate. I would like to emphasize that a considerable extent of demanding experimental work was clearly conducted to achieve the thesis objectives.

References throughout the thesis are accurate; however, I recommend citing the three primary articles at the first mention in the Introduction (line 3, page 7) for clarity.

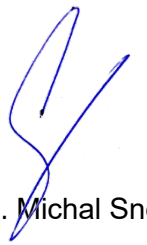
A few specific minor remarks are noted below:

- Page 9, line 1: Water exists in the surface layer not only in vapor form but also as hygroscopic water.
- Figure 14: It would be beneficial to include data from the Israel site in this, otherwise highly illustrative graph.
- Page 22, lines 6-7: When analyzing ions, the technique is conventionally termed Ion Chromatography (IC), rather than HPLC.

Questions for the Candidate:

1. What were the criteria for selecting specific measurement techniques for each individual site?

In summary, I am pleased to recommend this thesis for defense. The candidate has demonstrated strong research abilities and has produced a robust body of work with a commendable publication record. This research contributes valuable insights into weathering processes and water dynamics in porous sedimentary rocks, marking a significant advancement in the field.



In Prague 14.10.2024 doc. Ing. Michal Sněhota Ph.D.