TO:
THE SCIENTIFIC JURY
RE:
Resolution RD-38-41 of 26.01.2023
of the Rector of Sofia University "St. Kliment Ohridski "

REVIEW

of dissertation thesis for obtaining a PhD in the professional field 4.4. Earth Sciences (Terrestrial and Water Resources Hydrology)

Author of the thesis: Alexander Dimitrov Vassilev

PhD student in the Department of Climatology, Hydrology and Geomorphology

Faculty of Geology and Geography, Sofia University "St. Kliment Ohridski"

Dissertation topic
"HYDROGRAPHIC CHARACTERISTICS OF LAKES IN THE RILA MOUNTAINS"

Reviewer: prof. Nina Nikolova, PhD,

Department of Climatology, Hydrology and Geomorphology
Faculty of Geology and Geography, Sofia University "St. Kliment Ohridski"

The review is in accordance with the requirements of the Law on the Development of the Academic Staff in the Republic of and the Regulations for its implementation, and the Regulations for the Terms and Conditions for Acquiring Scientific Degrees and Holding Academic Positions at SU "St. Kliment Ohridski", Adopted by decision of the Academic Council on 31.10.2018, last change from 13.07.2022.

The review was prepared on the basis of an Order of the Rector of Sofia University "St. Kliment Ohridski" № РД -38-41/26.1.2023 and a decision of the meeting of the scientific jury of 14.02.2023.

Alexander Vassilev has submitted all the necessary documents required for the dissertation defense procedure.

I. INFORMATION ABOUT THE DOCTORAL STUDENT AND COMPLIANCE WITH THE NATIONAL MINIMUM REQUIREMENTS FOR THE OBTAINING PH.D. DEGREE

Alexander Vassilev graduated from a bachelor's program in Geology at the Faculty of Geology and Geography of the University of St. Kliment Ohridski" in 2011. In 2013, he obtained a master's degree in Regional Geoenergy Resources and Strategies. From 01.02.2019, he was enrolled in a full-time doctoral course in Hydrology of Terrestrial and

Water Resources Hydrology in the Department of Climatology, Hydrology and Geomorphology of the GGF, by order of the Rector of SU "St. Kliment Ohridski" N RD 20-139 / 18.01.2019. After successful training, he was dismissed with the right to defense by order N RD 20-449 / 17.02.2022.

The Reference of compliance with the national minimum requirements for obtaining PhD degree shows that the required points are covered for the indicators of Group A (fulfilled 50 points, with the minimum required 50) and Group D (fulfilled 50 points - in the Reference is inaccurately written 45, with a minimum requirement of 30 points).

II. GENERAL CHARACTERISTICS OF THE DISSERTATION

The doctoral dissertation submitted for the review has 169 pages, including a 7 pages appendix and a list of the literature used (11 pages: 46 sources in Bulgarian and 87 in English). The main text of the dissertation includes 63 figures and 54 tables and three photographs. The content is divided into an Introduction and three chapters, and a summary as follows:

- Introduction – 8 pages. In this part, the author presents the researched problem and determines its topicality; the object and the subject of the study are described, the aim and tasks are defined, and the limitations of the field observations and measurements are indicated.
- Chapter 1. Theoretical basis and research methods – 32 pages. Basic concepts used in the dissertation are presented and the methods applied to solve the tasks and achieve the aim of the dissertation are described.
- Chapter 2. General characteristics of the lakes in Rila - 44 pages. A geographical and morphometric description of the lakes is made for the entire studied territory and by mountain sections. Empirical statistically significant relationships between morphometric indicators were derived and analyzed.
- Chapter 3. Hydrographic description of the lakes in Rila by mountain sections and river basins - 64 pages. The content of this chapter is divided into two parts: 3.1. The lakes in Rila by mountain sections (the morphometric characteristics and geographical features of the lakes are described, and the text for each mountain section ends with conclusions) and 3.2. The lakes in Rila by river basins - the lakes in the basins of the Iskar, Maritsa, Mesta and Struma rivers are indicated.
- Summary – 2 pages. The main results of the research are presented here, which are also proof of the contributively nature of the dissertation work

In this structure of the scientific work, 108 pages (ch. 2 and 3.) present the essence of the dissertation work. These two chapters reflect specific results and analyzes on the topic of the dissertation.

Conclusion about the structure of the dissertation: in my opinion, the thesis is structured correctly and has the necessary balance between the introduction, the theoretical part, the exposition (analysis of the results), and the conclusion (summary). The text is written in a good scientific style, accessible both to specialists and to a wide group of users.

III. EVALUATION OF THE CONTENT OF THE DISSERTATION

III.1. Relevance of the topic and justification of the need for the research. Accuracy of the formulated object, subject, aim and tasks of the study.

The relevance of the research is determined by the importance of high mountain lakes for the natural environment and the economic activity of people. As proof of the need for such development is the relatively few studies on the topic of the dissertation for Bulgaria and in particular for the Rila mountain.

The doctoral dissertation submitted for review is an in-depth study of the morphometric and geographical features of the lakes in the Rila Mountains.

The object and subject of the research are correctly indicated in accordance with the topic of the dissertation. The aim and tasks are formulated and argued clearly and concretely. Correspondence between the set goals and tasks and the text of the scientific research is established.

III.2. Theoretical background. Research approach and research methods

The theoretical basis of the study is presented in Chapter One and includes a description of the lakes by origin, hydrographic, hydrological, hydrophysical, hydrochemical, hydrodynamic, and hydrobiological description of the lakes. Basic concepts and characteristics of the lakes, which are analyzed in the present dissertation, have been clarified. An important part of the first chapter is the research methodology. The PhD student applies a complex research approach to achieve the research objective. The first chapter presents the methods used - field observations and measurements, classification according to various indicators, statistical methods (descriptive statistics and correlation and regression analysis) and methods for dividing (grouping) lakes into lake systems.

The research is based on data from the doctoral student's own measurements and observations and information from previous publications, with which comparisons are made. The highlights of Chapter 1 with important theoretical and practical importance are the clarified definitions of the used parameters and the descriptions of the field studies and the used measuring devices.

The text in the introductory part and in Chapter 1, as well as the literature reference for the sources used, show that the doctoral student is well acquainted with scientific research in Bulgaria and in other countries on the subject of the dissertation, which is also proven by the correctly chosen methods in relation to the specific features in the studied territory.

III.2. Analysis and interpretation of results. Correctness and validity of the results

173 lakes were studied, 20 of which were not the subject of previous studies. The fact that the author proposes names for 16 of the lakes that have not been named until now has an important applied meaning. On the basis of the doctoral student's own measurements and information from existing scientific publications, a significant amount of quantitative and qualitative information was processed, and in-depth analyzes were made, as a result of which the author presents the most characteristic features in the geographical distribution of lakes in

Rila and their morphometric characteristics. The grouping of the lakes by threshold values (for maximum depth, length and width of the water mirror, and length of the coastline) is very appropriate, as it reflects the specific characteristics of the analyzed objects. Correlation dependences between the considered parameters were calculated and analyzed, which were proven by standard statistical methods. General regularities and regional features in the geographical distribution of the morphometric indicators and the relationships between them have been established. The significance of the research is determined by the detailed regional analyzes that are based on accurate facts and correct presentation.

In the last part of the dissertation - "Summary", the main results of the research are presented in a synthesized form without repeating previous texts from the dissertation. The text demonstrates the doctoral student's ability to synthesize and present the main points of an extensive scientific study.

Based on the entire text of the dissertation, as well as the conclusion, I assume that the tasks set have been solved and the goal of the research has been achieved

IV. SIGNIFICANCE OF RESULTS AND EVALUATION OF CONTRIBUTIONS

The presented dissertation complements and expands with new knowledge the previous studies of the lakes in the Rila Mountains. The results have a theoretical and applied aspect, making an important contribution to regional geographical research. The theoretical-methodological essence of the hydrographic studies of the lakes is derived. Empirical dependences between the morphometric parameters of the lakes in the Rila Mountains have been proven. A detailed geographical analysis of the distribution of lakes by mountain divisions and river basins was made.

Beneficiaries of the presented research will be researchers working in the field of limnology and ecology, as well as geography students. The results of this type of research are particularly useful not only in analyzing the characteristics of the natural environment but also in preparing plans and programs for the protection and management of lake water resources.

V. DISSERTATION-RELATED PUBLICATIONS

The results of the scientific research on the dissertation have been published in three articles - two in the proceedings of the conferences "Climate, atmosphere and water resources in the conditions of climate change" - CAWRI-BAN, 2019 and 2021 and one in the Yearbook of SU, GGF, 114 (2), 2022

VI. CORRESPONDENCE OF THE ABSTRACT WITH THE DISSERTATION

The structure of the abstract meets the requirements and correctly reflects the results of the dissertation work.

VII. CRITICAL COMMENTS, QUESTIONS AND RECOMMENDATIONS

The dissertation is written correctly, precise definitions of concepts are given, and a very good scientific style is used, but some technical (printing) errors were made, which generally do not significantly affect the research.

My notes are mainly related to visualizing the research results. The map diagrams in Figures 37, 47, 54 and 63 are small-scale and difficult to read, they make it difficult for the reader to orientate themselves in the location of the described mountain ranges and lakes. The second note is about the presentation of the regression models in figures with numbers from 30 to 36 – it would be easier to perceive the information if the regression equation was also given in the figure, and not only in the text to it.

I have the following questions for the PhD student:

1) When describing Urdini lakes, two numbers are given for some of the parameters, e.g. on page 109 - "Dry Lake, with coordinates 42°17′ N. and 23°32′ E, is developed 1560 m southeast of Damga village, at an altitude of 2375 m (MAFF, 2384 m measured with a Suunto ambit 3 watch)… coastline length 356.0 m (according to Google Earth, 340 m by Suunto ambit 3 watch)'. Which of the values does the doctoral student accept as more accurate?

   In cases of such data discrepancies, it is recommended to take a new measurement or seek information from a third source. It does not appear from the text of the dissertation that this was done.

2) Why, when determining the threshold values for the classification of the lakes according to some of the indicators, percentiles were chosen at unequal intervals - e.g. for the five classes according to the length of the coastline, the cut-off values are determined by the 25th, 50th, 75th and 95th percentiles

My recommendation for the future work of the doctoral student is to further develop the research by focusing on the morphometric characteristics–weather–climate relationship. Analyzes in relation to climate change will greatly increase the theoretical and practical significance of the study Here I would like to say that I do not agree with what was written on page 151 that the results of the study suggest "relative stability of the natural conditions in Rila". A characteristic feature of the multi-year course of precipitation in the mountains in Bulgaria is the negative trend - the data from station Musala for the period 1961-2020 show a trend of winter precipitation -33 mm/10 years, and -44 mm/10 years for the annual precipitation totals. Do these changes in precipitation and temperature not affect the values of the morphometric parameters?

VIII. CONCLUSION

The presented dissertation is an original and complex scientific study on the hydrographic characteristics of the lakes in the Rila Mountains. The results show that the set tasks have been solved and the aim of the dissertation has been achieved. The doctoral student knows the problem in depth and has the necessary knowledge and skills for independent scientific work. A significant volume of information has been processed and analyzed, which is also important for updating and supplementing existing knowledge.

The remarks made are mainly recommendations for the future research of the doctoral student

On the basis of the merits of the presented work – the topicality of the problem, the correct presentation of the information, the performed field research, calculations and analyses, the conclusions drawn, and the significance of the results, I give a positive assessment of the doctoral student's work and propose to the respected scientific jury to vote for awarding the degree of PhD to Alexander Dimitrov Vassilev in professional field 4.4. Earth Sciences (Terrestrial and Water Resources Hydrology).

20.04.2023 г. Signature:.....

prof. Nina Nikolova, PhD

Member of Scientific Jury