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REVIEW

by Assoc. Prof. Eng. Ivan Dimitrov Genov, PhD – Associate Professor at the Institute of Oceanology "Fridtjof Nansen", Bulgarian Academy of Sciences (BAS), Varna (member of the Scientific Jury under Order No. 299 of 26.09.2025)

of the materials submitted for participation in the competition for the academic position of Associate Professor in the scientific section "Coastal Zone Dynamics" at the Institute of Oceanology – BAS – Varna, in the field of higher education: code 4. "Natural Sciences, Mathematics and Informatics"; professional field: code 4.4. "Earth Sciences"; scientific specialty: "Geology of the Oceans and Seas"; research area: "Geological and Geomorphological Mapping and Monitoring of the Coastal Zone," announced in State Gazette No. 63 / 01.08.2025.

In this competition for the academic position of Associate Professor, the sole candidate is Chief Assistant Dr. Bogdan Kirilov Prodanov from the "Coastal Zone Dynamics" section of the Institute of Oceanology – BAS – Varna.

1. General information about the career and thematic development of the candidate

Chief Assistant Bogdan Kirilov Prodanov graduated in 2012 from the University of Mining and Geology "St. Ivan Rilski" – Sofia with a Master's degree in "Applied Geophysics." From 2009 to 2012, he worked in the Department of Seismology. Between 2012 and 2017, he was employed as a geophysicist and assistant researcher in the "Coastal Zone Dynamics" section of the Institute of Oceanology "Prof. Fridtjof Nansen" – BAS – Varna, during which period he also pursued doctoral studies. In 2016, he obtained the PhD degree in "Geology of the Oceans and Seas", with a dissertation titled: "Geological Basis for Mapping of Benthic Habitats on the Bulgarian Continental Shelf in front of the Avren's Coastal Zone." Since 2017, he has held the position of Chief Assistant at the same section of the Institute of Oceanology – BAS – Varna. Dr. Prodanov completed a second Master's program in Geomorphology at Sofia University "St. Kliment Ohridski," with a thesis titled: "Beach-Dune Forms and Anthropogenic Relief Modifications within the Area of the Kavatzi and Smokini Beaches (Bulgarian Black Sea Coast)." He also serves as a part-time lecturer at the Department of Climatology, Hydrology and Geomorphology of the same university. The candidate declares a good language skills in Russian, German and English, as well as very

good skills in working with computers, specialized equipment and software in the field of geological and geomorphological mapping. He has acquired numerous skills with which he has well fitted into the preparation and implementation of many national and international projects, some of which he has supervised.

2. Statement regarding the presence or absence of plagiarism in the submitted publications

A review of the submitted materials revealed no evidence of plagiarism.

3. Main topics of the candidate's research work and most important scientific contributions

The candidate's self-assessment of scientific contributions is detailed, well-structured, and accurate. The research activity of Chief Assistant Bogdan Kirilov Prodanov is characterized by a strong interest in the application of modern and multidisciplinary research methods and work on current problems of practical importance.

Original scientific contributions:

As a result of the application of highly accurate bathymetric surveys with multibeam echo sounder systems and side-scan sonars, aerial photogrammetric surveys, underwater observations, sediment sampling, lithostratigraphic analyses and geospatial analysis in a GIS environment, detailed, large-scale geomorphological maps and models of the coastal land and part of the littoral zone of the Bulgarian shelf have been constructed, which substantially improve upon the existing regional models defined in small-scale (1:100,000 and 1:200,000) schemes from the 1970s and 1980s in the northern shelf sector of Bulgaria. These maps cover areas of Varna Bay, Avren coast, Strandzha coast and the dunes along the Bulgarian coast. Coastal dunes are classified according to geomorphological characteristics (morphogenetic origin), applying the internationally accepted typology. The classification is comparable to European systems (Natura 2000, EUNIS) and allows for the assessment of the structure and ecological value of the dunes. A spatiotemporal analysis was performed between current and archival orthophotos and aerial photographs to track relief changes over the last 100 years, as well as an initial spatiotemporal assessment of the loss of natural seabed along the entire Bulgarian Black Sea coast as a result of the construction of coastal infrastructure for the period 1970/83–2017, based on a high-precision map base (Scale 1:5,000).

A five-year monitoring (starting in 2018) was carried out in the coastal zone, in which standardized indicators and methodologies for monitoring pollution of beach-dune systems were introduced for the first time, with the possibility of adaptation to European environmental monitoring. The first comprehensive inventory of dune habitats along the Bulgarian Black Sea coast has been carried out, and the studies are in accordance with the requirements of the Black Sea Coast Development Act and Regulation No. 1 of 2015 on the procedure and manner for identifying, classifying and mapping dunes. After identification, the dunes were further classified as natural habitats under the Natura 2000 classification, in accordance with the Biodiversity Act. In addition, a trend towards increasing pressure and vulnerability of coastal habitats has been proven. The quantitative and spatially detailed study of dune habitats along the entire coast of Bulgaria (in and outside protected areas) offers a basis for updating the specialized maps under Regulation No. 1/2008 and formulating proposals for new protected areas under the Protected Areas Act.

Original scientific–applied contributions:

The candidate develops and applies for the first time for the Bulgarian coast an integrated methodology for aerial photogrammetry with unmanned aerial systems (UAS) for mapping the coastline and sea waters. In addition to the traditional mapping of the surface relief, success has been achieved in mapping underwater structures at a depth of up to 4-5 m, depending on the sea water conditions. Photogrammetry is supplemented by control echo sounder measurements (ground control points), through which the standard error and deviations are reduced. The methodology allows for the achievement of a comprehensive digital model of the relief, and drones are used as a substitute for echo sounders in shallow water, where sea vessels cannot operate. The coastline is fully photographed by 2023, with the data being relevant for various geological-geomorphological, ecological and hydrological studies in the context of climate change. Similar to this methodology, the Candidate applies in geoarchaeological research (marine and on land), combining remote sensing (aerial photogrammetry, etc.), geophysical (echo sounding and side-scanning sonar imaging) methods for detecting, locating and interpreting archaeological sites in the coastal zone and shelf.

Multidisciplinary studies have been carried out on key coastal lakes (Durankulak, Varna and Beloslav, Mandra) along the Bulgarian Black Sea coast, as a basis for the overall assessment of the ecological state and the state of the ichthyofauna in coastal waters and

lakes. Geological and geomorphological studies are in addition to biological and ecological criteria. Integrated assessments of lake ecosystems are important in the implementation of scientific research projects and activities under Natura 2000.

Through complex geospatial analysis and long-term wave exposure data, for the first time in the Bulgarian coastal waters of the Black Sea, various "Type-Specific Reference Hydromorphological Conditions" have been identified and systematized, in accordance with the requirements of the Water Framework Directive (WFD 2000/60/EC). 18 areas with disturbed hydromorphology have been identified. The developed spatial data and quantitative indicators support the Ministry of Environment and Water in environmental assessments, marine water management and are applicable in updating the strategic documents under the Water Framework Directive and the Marine Strategy.

A methodology for predicting the impact of extreme sea storms has been developed. The methodology allows for the assessment of the degree of impact on various coastal receptors (restaurants, sports and administrative facilities, parking lots) within the Varna Bay under different climate change scenarios and the implementation of protective measures (quay wall reinforcement, beach nourishment). In parallel, by implementing the INDRA (INtegrated DisRuption Assessment) model, the degree of direct damage to the coastal built environment, including building destruction as a result of high waves and floods, has been assessed. In addition, a critical analysis of the existing empirical relationships between the slope of the beach front and the grain size composition of the sediments has been carried out, based on field measurements and photogrammetric models in the Burgas Bay. The results obtained support the strategic planning of measures for protection against sea floods, adaptation to climate change and spatial management of the coastal zone.

A precise determination of the length of the waterline along the Bulgarian Black Sea coast has been carried out based on direct geodetic surveys, aerial photogrammetry and digitization of orthophotomosaics. The obtained result has practical significance for maritime spatial planning, ecological monitoring and coastal zone management.

A section "Coastal Geomorphology" has been developed in the Methodology for Mapping, Determining Boundaries and Types of Sand Dunes, approved by the Minister of Environment and Water in 2024, in accordance with Art.11, para.2 of Regulation No. 1 of 16.09.2008 on the Law on the Arrangement of the Black Sea Coast. Within the framework of this strategic regulatory document, a standardized procedure for geomorphological mapping

of dune landforms has been introduced for the first time, combining remote sensing methods, sedimentary, morphometric analyses and morphogenetic classification (DNR-1), based on the first comprehensive mapping of our Black Sea dunes. The structure and logic of conducting geological and geomorphological mapping created by the author has been adopted as mandatory for all future procedures under the LBSCA by Order No. RD-57/17.01.2024 of the Minister of Environment, thus the contribution has a long-term effect on the policy of protection, registration and sustainable management of sand dunes and related habitats on the Bulgarian Black Sea coast.

4. Significance of the results obtained

I fully accept the presented evidence by Chief Assistant Dr. Bogdan Kirilov Prodanov for meeting the national minimum requirements for the academic position "Associate Professor" in scientific field 4. "Natural Sciences, Mathematics and Informatics"; Professional field: code 4.4. "Earth Sciences." The candidate has acquired PhD in 2017, with 5 scientific publications submitted to the dissertation. The publications in this competition are: 5 with quartile Q2 (Scopus), 1 with quartile Q1 (Scopus), 1 study, 14 referenced and indexed in Scopus or WOS, 19 not indexed and referenced in Scopus or WOS and other scientific works. The candidate has presented 16 citations in publications referenced and indexed in the world-renowned scientific information databases Scopus or WOS. In most groups of scientometric indicators, the minimum required points are exceeded: Group of indicators "A" - 50 points (required 50 points); Group of indicators "B" - 120 points (100 points required); Group of indicators "G" - 264 points (220 points required); Group of indicators "D" - 80 points (60 points required)

The publications and citations submitted for the competition prove the candidate's very good scientific and expert work.

5. Most significant scientific and applied achievements

The main focus of Dr. Bogdan Kirilov Prodanov's scientific work is the study of dune complexes and the development of modern, precise methods in geological-geomorphological mapping. I define the candidate's methodological contributions to the study of dunes and the geological-geomorphological mapping of the Bulgarian Black Sea coastal and littoral zones as the most significant, because they are necessary in the preparation of ecological assessments and the updating of specialized maps.

6. Demonstrated abilities to lead scientific research

Dr. Bogdan Kirilov Prodanov has participated in 17 international and 18 national projects, has led 10 national and 2 international projects, which testifies to the intensive scientific and organizational activity and teamwork skills. His participation in national and international scientific forums helps to actively popularize the results of the conducted research.

7. Profile of the research work

The work of Dr. Bogdan Kirilov Prodanov reflects contemporary original scientific and applied scientific developments, interdisciplinary research methods and comparative approaches, and convincingly presents him as an established specialist with a clearly defined profile in the field of geological-geomorphological mapping and ecological monitoring.

8. Educational and pedagogical activity of the candidate and role in the training of young scientists

Dr. Prodanov teaches as a part-time lecturer at Sofia University "St. Kliment Ohridski" and participates in educational projects, contributing to the training of young researchers.

9. Critical remarks and recommendations

I have no significant critical remarks regarding the materials of the competition and the scientific works of the candidate. For Fig. 2 of publication G7-10 the colors of the sediments in the legend do not correspond exactly to the colors of the map depicted in this figure.

I recommend that the candidate expand his research into the deeper parts of the Bulgarian sector of the Black Sea, where his activity is more limited.

10. Conclusion

The documents and materials submitted by Chief Assistant Dr. Bogdan Kirilov Prodanov fully comply with the requirements of the Law on the Development of the Academic Staff in the Republic of Bulgaria (LDASRB), its Implementing Regulations, and the Regulations of the Institute of Oceanology at the Bulgarian Academy of Sciences - Varna. His results exceed the minimum requirements set by those regulations. He has provided a sufficient number of works published after obtaining his PhD, along with evidence of

citations and participation in important national and international research projects and scientific events. Dr. Prodanov's studies contain original scientific and scientific-applied contributions.

Based on the above, I am firmly convinced that the election of Chief Assistant Dr. Bogdan Kirilov Prodanov to the academic position of Associate Professor in the scientific specialty "Geology of the Oceans and Seas" is well-deserved and fully justified.

I give a positive assessment of his candidacy.

18 November 2025

Varna