OPINION

in a competition for the academic position of ASSOCIATE PROFESSOR
in Professional field 4.4. Earth Sciences
in the scientific specialty "Seismology and Internal Structure of the Earth"
for the needs of the Seismology and Seismic Engineering Section
according to the announcement in SG № 86 of 15.10.2021
with candidate: Plamena Raikova-Tsankova, Senior Research Assistant at the National Institute of Geophysics, Geodesy and Geography at the Bulgarian Academy of Sciences

Prepared by: Prof. Dr. Nikolai Dobrinov Dobrev, Geological Institute, BAS

The scientific jury of the competition was appointed by order № 01-263 / 12.11.2021 of the Director of the National Institute of Geophysics, Geodesy and Geography at BAS. At the meeting of the jury, held on 21.12.2021, I was chosen to prepare an opinion on the competition. This opinion has been prepared in accordance with the Law on the Development of the Academic Staff of the Republic of Bulgaria and the Decision of the Scientific Council of the NIGGG (prot. № 42/12.11.2021).

Brief information about the candidate

The candidate Plamena Raikova-Tsankova was born on September 6, 1988 in the town of Dobrich. She completed his higher education in 2011 at the Faculty of Physics of Sofia University - Master of Geophysics. She started working at NIGGG in 2009, initially as a geophysicist technician, in 2011 as a seismologist, and in 2016 as an assistant. In 2017 she defended her PhD thesis on "Characteristics of foreshock, aftershock and swarm type activity on the territory of Bulgaria and the surrounding area". Since 2018, she is a senior research assistant. She is a member of the Society of Geophysicists in Bulgaria, the European Geophysical Union (EGU) and the Bulletin of the Seismological Society of America (BSSA). In 2017 she received the award for young scientist under 30 "Academician Ivan Evstratiev Geshov".

Publishing activity

The author's works presented for review in the competition for associate professor are 41 in number, which are classified as follows:

1. Scientific publications in journals that are referenced and indexed in world-famous databases with scientific information (Web of Science, Scopus) - 10 issues (indicator group V). According to the Regulations for the Implementation of the Law on the Development of the Academic Staff of the Republic of Bulgaria, the candidate must submit a monograph or at least 10 publications that cover the above criteria, and the number of scores calculated by the criterion and established in the decree must be at least 100. In this case, the scores are 115.02.

2. By group G indicator 7 (scientific publications in journals that are referenced and indexed in world-famous databases with scientific information), the candidate presented 4 titles with a total number of scores is 42.38.

3. By group G indicator 8 (scientific publications in unreferred journals with scientific review or edited collective volumes), Dr. Plamena Raikova-Tsankova presented 27 titles with a total number of scores is 178.87.

4. Thus, the total number of scores in group G becomes 221.25, which exceeds the minimum of 220 scores.

5. The number of points scored by the candidate related to citations of his publications - group D, is a total of 60 of the 15 identified citations.

6. Under item E (participation in projects) the candidate collects a total of 30 scores.

As a summary of the entire publishing activity of the candidate, I can note that the full list of her works contains 48 titles. The main part of her publications is in English - 41 titles, and in Bulgarian there are 7 titles. 25 have been reviewed, 16 of them are titles from proceedings from participations in conferences and other scientific events. Of the proceedings, 7 titles are referred in Scopus (5 titles from SGEM and 2 titles from 8th Balkan Geophysical Congress, Chania, Greece). She has 5 independent publications, 3 of which in the Bulgarian Geophysical Journal, 2 in Problems of Geography. Her participation in scientific events (conferences, etc.) is remarkable including 21 participations, 12 of which abroad.

From the mentioned above it is clear that the scientometric indicators of the candidate fully cover the requirements of the Regulations for the Implementation of the Law on the Development of the Academic Staff of the Republic of Bulgaria, as well as the additional requirements of BAS.

Contributions

The contributions presented by the candidate are in four directions:

1. *Research and analysis of seismicity and seismogenic processes in seismoactive zones on the territory of Bulgaria and its adjacent lands.*

The contribution is related to the research of the candidate on the spatio-temporal variations of the regional seismicity and the seismic regime. These are publications №№ 1, 2, 5, 9, 10, 11, 14, 21, 22, 29, 36. The zones with the highest level of low to moderate seismic activity and the trend of changing over time low seismicity are analyzed and established (publications 5 and 29). Historical earthquakes (publication 36), for which information is available, have also been analyzed, and a spatial correlation between low to moderate seismic activity and strong historical earthquakes has been demonstrated (publications 11 and 14).

2. *Assessment and analysis of the spatio-temporal distribution of clusters (foreshocks, aftershocks, swarms) on the territory of Bulgaria and its surroundings.*

Publications №№ 3, 6, 8, 17, 24, 33, 38 and 39 are included here. It is based on the candidate's

research on features (characteristics) of the time distribution of earthquakes. The distribution of earthquakes over time, such as the Poisson distribution, is analyzed. The advantages and disadvantages of this method, which describes seismological data (but does not take into account the possibility of earthquakes to be generated in groups) have been clarified. Examples of such groups are foreshocks, aftershock sequences and the swarm type of seismicity, whose spatio-temporal distribution the candidate analyzes. Foreshock events and swarms are a major part of the earthquake generation process, making them a common problem in seismological surveys. It should be noted that aftershock events are a significant part of the realized earthquakes and their effect needs to be reflected in the modeling of the seismic process. It is assumed that these events are the result of the processes of destruction in the epicenter of the main earthquake and redistribution of tensions after its realization. The distribution of foreshock events can be used as a prognostic sign for a major earthquake. Seismic swarms are events of approximately the same magnitude, grouped in a small spatial area that may not be attached to a defined fault structure. This type of activity usually starts and subsides very abruptly over time.

3. *Spectral characteristics of different types of seismic series for the territory of Bulgaria*

The candidate has studied the spectral analysis of seismic waves as the main source of information about the earthquake, the environment of seismic waves and the seismogenic processes taking place in it (publications №№ 19, 23, 33, 34, 35). The Brune model is most often used to study the spectral characteristics of earthquakes (Brune, 1970). Using this model, characteristics related to the source of the earthquake are calculated. A methodology has been developed that follows the widely used Brune model and has been shown to be in good agreement with observations from regions with different tectonic conditions. Displacement spectra for V_P and V_S are generated using the records of the three components (Z-spectra for V_P; Z, N and E-spectra for V_S) of the different stations in order to determine the parameters of the hearth such as: seismic moment M0, reduced stress $\Delta\sigma$, radius of the source and magnitude of seismic moment.

4. *Seismic danger assessment (seismic hazard)*

Here the main contribution is in the development of seismic hazard scenarios in three regional cities in the country - Ruse, Blagoevgrad and Veliko Tarnovo (publ. №№ 30, 32, 40, 41). They are based on the observed maximum macroseismic impacts from already realized strong earthquakes. Maps of seismic hazard in maximum acceleration for different periods of recurrence (95, 475 and 1000 years) have been compiled. The obtained results show that the forecast scenarios are reliable and have application in the urban and emergency plans, as well as in the further assessment of the seismic risk.

The review shows that the scientific activity of Plamena Raikova fully corresponds to the theme of the competition.

Conclusion

In conclusion, I appreciate the highly achieved scientific results and research experience gained by Dr. Plamena Raikova. She has the necessary scientific achievements and qualification for the title of "ASSOCIATE PROFESSOR" and meets the requirements of Law on the Development of the Academic Staff of the Republic of Bulgaria under Art. 2b, para. 5 and the requirements of BAS for the terms and conditions for acquiring scientific degrees for holding academic positions in field 4 - Natural Sciences, Mathematics and Informatics. Therefore, I suggest to the jury to propose to the esteemed Scientific Council of NIGGG-BAS to vote Sen. Res. Assistant Dr. Plamena Raikova-Tsankova to take the academic position of "Associate Professor" in the Professional field 4.4. "Earth Sciences" - scientific specialty "Seismology and Internal Structure of the Earth".

January 17, 2022
Sofia

Prepared the opinion:
(Prof. Dr. Nikolai Dobrev)