

STATEMENT

by Prof. DrSci in Mathematics Ljuben Mutafchiev, Professor (emeritus) at the American University in Bulgaria, under a competition for the Academic Position of a Professor in the National Meteorology and Hydrology Institute (NMHI) in Professional Direction 4.1 Physical Sciences, Research Specialty: Meteorology (Stochastic Modeling in Meteorology and Hydrology).

This Statement has been made on the grounds of an Order by the General Director of the NMHI No. НД 04-18 of 02.10.2019 and a Decision of the Scientific Jury Session on 18.10.2019. It complies with the requirements of the Republic of Bulgaria Academic Staff Development Law (RBASDL), Regulation for its Implementation (RIRBASDL) and NMHI's Regulation under RBASDL.

1. General Biography Characteristic. In 1976 Assoc. Prof. Neykov was graduated in Mathematics at the Faculty of Mathematics and Mechanics of St. Kliment Ohridski Sofia University (SU) with a specialization in Probability Theory, Mathematical and Applied Statistics. In 1996 he has acquired the Academic Degree of Doctor of Mathematics and in 2000, the qualification of Associate Professor at NMHI. In 2016, Assoc. Prof. Neykov has acquired the Academic Degree Doctor of Mathematical Sciences after a successful defense of his thesis. He had started his service in the Higher Food Industry Institute in the City of Plovdiv, where he was a Part-Time Assistant in 1976-1977. In 1978-1988 Assoc. Prof. Neykov was a research fellow in Central Automation and Biological Experiment Laboratory at the United Biology Center of the Bulgarian Academy of Sciences (BAS). Since 1988 he is employed in the NMHI. He headed the Prognostic Models and Systems Division in Weather Prognostics Department (2000-2017 r.). Since 2017 he is the Head of Specialized Prognostic Group of Prognostics and Information Services Department in the NMHI. Assoc. Prof. Neykov is author or co-author of more than 80 articles and research communications published in scientific journals, scientific digests and conference proceedings. He wrote a monograph (in English with co-author P. Neychev), published in 2019 by Regalia 6 Publishing House, Sofia. Assoc. Prof. Neykov took active part in a number of European Research Projects and collaborations: COST Action – 7 projects within the last 9 years; a project under the 5th European Union Framework Program; common projects with Vienna Technical University (Austria), the University of Göttingen (Germany), Lisbon Technical University (Portugal), and Delft Technical University (Netherlands). He managed 3 project of the NMHI's Research Plan and 2 projects connected with BAS's international scientific collaboration. Assoc. Prof. Neykov has actively collaborated with a big number of experts

from different countries (Austria, England, Bulgaria, Germany, Italy, Poland, Portugal, and Netherlands) on topics of applied and theoretical statistics, meteorology, hydrology and oceanology. He has participated in 9 NMHI agreement projects with external funding. In 2008-12 he was a member of the Board of Directors of International Association for Statistical Computing (IASC). Now he is a member of Bulgarian Statistical Society Coordination Council, a member of the Union of the Physicists in Bulgaria, IASC and of the International Statistical Institute. Assoc. Prof. Neykov has a longtime teaching career at the Faculty of Mathematics and Informatics (FMI of SU, 2006-18), University of Torino (Italy, 2005) and NMHI (2014). He was a supervisor of 7 graduates who have defended their theses in the FMI of the SU (2009-16).

2. General characteristic of the material submitted for the competition. Assoc. Prof. Neykov has submitted 20 research publications, one monograph, 3 technical reports of joint research projects within programs for collaboration between the German Union for Scientific Research and the BAS and a referee report published in Journal of the Royal Statistical Society. All research publications ^{are} of joint authorship. The referee report is published separately. There is a Distribution Note where both co-authors declare that they have equal contribution in the monograph's creation and writing. The research materials submitted to the present competition have not been included in the competition for the academic position of Associate Professor in 2000 as well as into the thesis he has defended to acquire the Academic Degree of Doctor of Mathematical Sciences in 2016. The articles Assoc. Prof. Neykov submitted for the present competition have been published in research journals (10 pieces), conference proceedings (6 pieces) and chapters of books (thematic collections – 4 pieces), 11 of them are in international editions and 9 in Bulgarian ones. 7 of the publications are in editions included into world scientific data bases (Web of Science, Scopus), 2 of the journals where Assoc. Prof. Neykov has published his work are over the first quartile (Q1), one is over the second quartile, and one - over the third quartile (Q2 and Q3, respectively). The publications submitted for the competition have been quoted 56 times in highly renowned international editions. Assoc. Prof. Neykov has attached a list of 49 quotations of his results included in Web of Science and Scopus data bases within the last 3 years. He has also submitted an Information showing that his scientific and research activity covers the minimum national requirements for groups of indicators to occupy the academic position of a Professor. I believe that there are no violations in the procedure and the candidate can be admitted to take part in the competition.

3. Field of research interests and a description of the contributions. Assoc. Prof. Neykov's research interests are in the probabilistic and statistical analysis of data and its applications in hydrology and meteorology. The publications Assoc. Prof. Neykov takes part with in this competition are thematically distributed in the following topics: (a) stochastic models describing changes in daily precipitation amounts in Bulgaria (important results of this topic are given in the monograph [1], see also articles [7] with 7 quotations and [8] with 2 quotations); (b) hydrogeology data analysis (for example, see article [12] with 3 quotations); (c) statistical analysis of extreme values and applications (for example, see articles [14] with 11 quotations, [18] with 2 quotations, and [19] with 25 quotations); (d) stochastic models of air pollutants (article [10]); (e) behavioral and biochemical experiments data analysis (for example, see article [11] with 6 quotations); (f) robust estimates in statistics (see articles [18-20]). Assoc. Prof. Neykov has serious contributions in each of these fields. Below, I will briefly discuss on the most important research contributions in the publications the candidate participates in the present competition.

1. Based on data from 1960-2000 period, a two-dimensional non-stationary Markov random process with dependent components has been analyzed, with one of the components having a Bernoulli distribution, while the other one is a gamma distributed random process. Stochastic models of daily precipitation amounts changes in Bulgaria have been created using for predictors several atmosphere values, conditionally upon the precipitation and its quantity during the previous day. In the computations are used finite Fourier series.
2. Using the data for the time period in 1., for the NMHI Kneza Station, Assoc. Prof. Neykov has created the so called *weather generator*, which is a stochastic model including not only the daily precipitation amounts but also the daily minimum and maximum temperatures, taking into consideration the dependence on other atmospheric indexes (clouds and precipitation forming conditions characteristics for the correspondent region) as well.
3. A hybrid model has been suggested combining the Weibull distribution with the tail of the generalized Pareto distribution that allowed to model the entire spectrum of daily precipitation values amounts including also the extreme ones. For this purpose data from Ihtiman Station for the period 1960-2007 have been used.
4. Comparison analyses have been made for the distributions, quintiles and other statistical quantities computed using the measured and the model's daily precipitation amounts values which shows the relevance of the stochastic models suggested in points 1-3.
5. Spatial precipitation model has been created and investigated. It is based on a Markov process with non-implicit (hidden) number of states from 40 meteorological stations situated uniformly on the Bulgarian territory. The matrix of the transition probabilities

depends functionally on a re-analysis of indices characterizing the atmospheric circulation over the Atlantic and the European Region. Data for the period 1960-2000 have been used. The results explain the causal link of precipitation amounts in Bulgaria during the cold six months. Generated sufficiently long series of model precipitations is used to assess the risk of drought in the examined region. 6. A robust analogue of Wilks' Statistical Test has been suggested to discover incoherent triplets of the type (L-coefficient of variation, L-skewness, L-kurtosis). It was aimed to facilitate the identification of homogeneous groups of synoptic stations that could serve to assess the unknown parameters of extreme value distributions for which was applied the widely used hydrology regional method. Imitative modeling was used to investigate the reliability of the suggested robust test. 7. A statistical model of the nitrogen dioxide hourly concentrations in Sofia City air has been suggested. Generalized Tweedie distributed linear models with meteorological predictors (temperature, humidity, wind speed and direction, etc.) have been used. The fact that the Tweedie distributed random variable is a random sum of gamma distributed random variables whose number is Poisson distributed has been essentially used. 8. The degree of sea disturbance close to coastal Synoptic Stations in Shabla, Emine Cap, and Ahtopol has been characterized using data of numerical simulations with the SWAN Model for the period 1901-2010. For flood sea water risk assessment, the generalized extreme value distribution has been used.

4. Conclusion. The materials Assoc. Prof. Neyko Neykov has submitted for this competition cover the requirements of RBASDL, RIRBASDL, and NMHI's Regulation under RBASDL to occupy the academic position of a Professor. I am convinced that Assoc. Prof. Neykov is an established expert in the field of stochastic modeling in meteorology and hydrology. I do assess positively his longtime work on this field. I suggest to the respected Scientific Jury to suggest to NMHI's Scientific Council to elect Assoc. Prof. Neyko Mateev Neykov as a Professor in the Professional Direction 4.1 Physical Sciences, Scientific Specialty of Meteorology (Stochastic Modeling in Meteorology and Hydrology).

09.11.2019

Signature: _____

Prof. DrSci in Mathematics, Ljuben Mutafchiev