Abstracts of the monograph work and scientific publications submitted for participation in a competition for the academic position "Associate Professor"

of

Chief assist. Dr. Krasimira Kuneva Kirilova

Monograph

2020 – Issuing: Rehabilitation work – monograph - **„Basic concepts for satellite gravimetry – satellite gravity gradiometry and satellite tracking“**.

Summary: The monograph work examined the coordinate systems used in gradometry and their transformation. In short, the problems of determining Earth's gravitational field by different methods are addressed. The problems of inertial gravimetry, ground and aircraft gradiometry are discussed. The main attention is paid to the problems of studying the Earth's gravitational field using satellite gradiometry and satellite-to-satellite tracking technology. Modern projects are considered for the realization of earth's gravitational field definitions by satellite gradiometry (SG) methods and systems and the satellite-to-satellite tracking system (SST). The advantages and disadvantages of SG and SST methods are analysed.

Publications

1. 2014 – **Kirilova K.,** " Exploration of the effectiveness of gravimetric frames whit MNMS". Yearbook: Technical Sciences. Volume IV E, Shumen, University Publishing House "Konstantin Preslavski University of Shumen", p. 73-84, ISSN: 1311–834X.

Summary: The subject of the study is the evaluation of the effectiveness of gravimetric frames by equalization of gravimetric data in two different methods - standard method and the method including the amendment of drift, as extra unknown in pre-processing of the data. Proposed method of equalization may find application in the practice as creates prerequisites for significant concessions in the overall technology of measurement and processing of gravimetric measurements, provided that zero of the tool retains linear character of offset.

2. 2016 – **Kirilova K.,** "Satellites gravity missions CHAMP, GRACE and GOCE- a new era of satellite gravimetry" Yearbook: Technical Sciences. Volume IV E, Shumen, University Publishing House "Konstantin Preslavski University of Shumen", p. 285-295, ISSN: 1311–834X.

Summary: The subject of the survey are the satellite missions in which the satellites are used like surveiance platforms and for studying different aspects of the Earth, connected with the Geodezy and Geodinamic.

For the first time in satellite geodesy, three gravity missions have the potential of being realized: (1) CHAMP is a low-cost mission, an intermediate step between our present knowledge and the ambitious goals that are formulated by geodesists, solid Earth geophysicists and oceanographers; (2) GRACE is planned as being a more advanced mission, especially aimed at monitoring long wavelength time variations of the gravity field; (3) GOCE will open a completely new range of spatial scales (in order of 100 km) of the geopotential spectrum to research. They deliver data about the fundamental force of nature and they have broad range of applications in Earth sciences.

3. 2019 г. – **Kirilova, K**., "Methodology for establish a local model of geoid (quasigeoid) in mountain and high mountain areas". Yearbook: Technical Sciences. Volume IX E, Shumen, University Publishing House "Konstantin Preslavski University of Shumen", p. 86-91, ISSN: 1311–834X.

Summary: The subject of the study is to develop a methodology for creating a local geoid (quasigeoid) model in extreme regions, and to compute an algorithm for calculating the geometric model of the geoid in mountainous and highland regions for the territory of the Republic of Bulgaria.

The established methodology for local geoid modelling (quasigeoid) allows us to generalize and apply the possibility of the right combination of satellite solutions with terrestrial data to obtain the optimal solution for determining the local geoid in mountainous and highland areas.

4. 2019 – **Kirilova K.,** "Analysis of the accuracy of the Global geopotential models for the Rila territory" Yearbook: Technical Sciences. Volume IX E, Shumen, University Publishing House "Konstantin Preslavski University of Shumen", p. 92-98, ISSN: 1311–834X.

Summary: The subject of the study is to analyze the accuracy of the Global Geopotential Models for the Rila mountain by comparing the values of the Bouguer gravity anomalies interpolated by the gravimetric map for all points where GNSS/levelling measurements were made with the Global Geopotential Models -EGM 2008, EIGEN-6C4.

The analysis of the results obtained for the differences in the values of Bouguer anomalies when working with the global geopotential models, allows to conclude that the accuracy when working with the combined models is insufficient for practical applications in high mountain areas. Global geopotential models may only be used in mountainous and highland areas for research of a global nature.

5. 2019 – **Kirilova, K.,** „Analysis and estimation of the anomalous quantities characterizing the difference between the real and normal gravitational field of the Earth". Yearbook: Technical Sciences. Volume IX E,

Shumen, University Publishing House "Konstantin Preslavski University of Shumen", p. 99-104, ISSN: 1311–834X.

Summary: The object of the study is to analyze and evaluate the anomalous quantities characterizing the difference between the real and normal gravitational field of the Earth.

The gravitational field of an ellipsoid (normal gravitational field) is of fundamental practical importance because it is relatively easy to work with it mathematically. The differences between it and the real Earth's gravitational field are so small that they can be assumed to be linear quantities. The division of the real Earth's gravitational field into normal and anomalous greatly facilitates its determination.

6. 2020 – Yanchev, K., **Kirilova, K**., "Present studies of the Krupnik geodynamic polygon" Journal of Geodesy, Cartography, Land Management, 1–2'2020 year, Edited by: Union of Surveyors and Land Managers in Bulgaria - FSEU, p. 40–47, ISSN: 0324–1610.

Summary: The subject of the study is to conduct precise GNSS measurements of the Krupnik geodynamic polygon in order to analyze and evaluate the current local geodynamic processes occurring in the fault zones. The study made it possible to define a model of modern local deformations of the crust in the fault zone with appropriate accuracy and representativeness, which will serve as a basis for future studies.

7. 2020 – **Kirilova, K**., Yanchev, K., "Modelling of geoid in extreme areas from the territory of the Republic of Bulgaria - Rila mountain" Journal of Geodesy, Cartography, Land Management, 1–2'2020 year, Edited by: Union of Surveyors and Land Managers in Bulgaria – FSEU, p. 3–20, ISSN: 0324–1610.

Summary: The subject of the study is to create a model of the geoid in local areas from the territory of the Republic of Bulgaria and mainly in the mountainous and highland areas, where topographic effects completely dominate the local variations of the gravitational field. The study made it possible to define a geoid model in mountainous areas with highly rugged terrain with appropriate accuracy and representativity to serve as a height reference surface, as well as a basis for deriving more accurate local geoid models.

8. 2020 – **Kirilova, K.,** "Gravimetric measurments in extremely mountainous region of the territory of South-western Bulgaria-Rila mountain", Journal scientific and applied research, licensed at EBSCO, USA. Volume 18, 2020, ISSN: 1314–6289.

Summary: The subject of the research is to perform gravimetric measurements in local extreme areas of the territory of South-western Bulgaria (S / W), and more precisely the north-western end of the Rila - Rhodope mountain massif - Rila mountain in order to analysis and evaluation the optimal option for practical modelling of the local geoid (quasi-geoid) in the area

limited within the boundaries $41^0 52' 06'' N < \varphi < 42º 21' 22'' N$ and $23^0 01' 11'' E < \lambda < 24º 01' 05'' E$.

The measured force of gravity in 287 gravimetric points an evenly distributed on the study area provides reliable gravimetric information that helps to deduce the surface of the local geoid for the Rila Mountains, where topographic effects completely dominate the local variations of the gravitational field.

9. 2020 – **Kirilova, K.,** "Creation of a digital topographic model in extreme areas on the territory of South-western Bulgaria - Rila mountain", Journal scientific and applied research, licensed at EBSCO, USA. Volume 18, 2020, ISSN: 1314–6289.

Summary: The subject of the research is to create a digital topographic model (DTM) on the territory of Rila Mountain in order to further local modeling of the geoid. The data obtained from this model, in the form of planar and altitude coordinates, are used to determine the terrain correction and calculate the complete Bougue anomalies. The information from the DTM in terms of altitude can serve as an initial value of the normal altitude in the interpolation calculations and determination of the transformation parameters when filling in the data for modelling the geoid (quasi-geoid).

10. 2020 – **Kirilova, K.,** "Optimal geopotential models of the earth's gravitational field for the territory of South-western Bulgaria - Rila mountain ", Journal scientific and applied research, licensed at EBSCO, USA. Volume 19, 2020, ISSN: 1314–6289.

Summary: The subject of the study is to correctly select the most appropriate geopotential models of the Earth's gravitational field for the study area in order to make a more reliable assessment of the accuracy of local modelling of the geoid for the territory of Rila mountain.

11. 2020 **– Kirilova, K.,** GOCE program and the prospects of satellite gradiometry, SocioBrains, Issue 70, June 2020, pp. 97-102, ISSN 2367-5721 (online), www.sociobrains.com, Bulgaria.

Summary: The subject of the study is to discuss the problem with the use of new differential satellite methods for dynamic space geodesy in order to accurate precision in calculating the desired parameters of the geopotential model, as well as its high spatial and temporal resolution.

12. 2020 **– Kirilova, K.,** Comparison of gravimetric data from the Global geopotential models EGM 2008 and EIGEN-6C4 with data from classical gravimetric measurements, SocioBrains, Issue 71, July 2020, pp. 42-46, ISSN 2367-5721 (online), www.sociobrains.com, Bulgaria, 2020.

Summary: The subject of the study is to compare the gravimetric data from the global geopotential models (GGMs) EGM 2008 and EIGEN-6C4 with data from classical gravimetric measurements in order to estimate the possibility of application of values calculated by the specified GGMs for the territory of Southwestern Bulgaria-Rila Mountain.

The global geopotential models EGM2008 and EIGEN-6C4 can only be used in mountainous regions for global research.

Data: 16.10.2020 г.
City of Shumen

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