**ABSTRACTS**

of the scientific publications submitted by Assist. Prof. Dr. Lilia Ivanova Bocheva, for participation in the competition for academic position "Associate Professor"in professional direction 4.4 Earth Sciences, scientific specialty „Meteorology at group “Meteorological experimental data”, department of Meteorology, National Institute of Meteoroglogy and Hydrology, announced in State newspaper 64/03.08.2021

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| ***Publications under Group C (Bulgarian version – ‘B’)*** |

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| 1. | **Bocheva L., Georgiev Ch. and Simeonov P., 2007. A climatic study of severe storms over Bulgaria produced by Mediterranean cyclones in 1990-2001 period. Atmos. Research, Volume 83, Issues 2-4, pp. 284-293, ISSN 01698095; DOI 10.1016/j.atmosres.2005.10.018**Over south-eastern Europe, severe weather events are often associated with Mediterranean cyclones. This paper presents a climatic study of severe storms over Bulgaria produced by synoptic-scale Mediterranean cyclones, which are the main high-impact weather systems for the region during the winter season. The study is based on a synoptically oriented data set that contains systematic information about the pronounced Mediterranean cyclones including their life and trajectories over the Mediterranean area and the severe storms over Bulgaria produced by them. The definition of a severe storm is a storm in which the wind speed and precipitation exceed thresholds of 15 m/s and 30 mm/24 h, respectively. The observed severe storms were split into two groups by the number of districts where they have caused damages. During the last years a trend of decreasing numbers of initiating synopticscale Mediterranean cyclones has been observed. However, the number of those producing a high-impact weather phenomenon over Bulgaria has increased. In these high-impact cases, the observed paths of the cyclones are connected to the specific circulation conditions over the region. In the most severe cases, almost 80% of the cyclones move through the southernmost parts of Balkan Peninsula and for a large portion of them, this motion is associated with a blocking regime in the mid-level mass field.The development of such Mediterranean cyclone cases has been studied and results are presented here. The results illustrate the synoptic-scale mechanisms for intensification of a feeding flow of Mediterranean air towards the area affected by extremely severeweather. |
| 2. | **Simeonov P., Bocheva L., Marinova T., 2009. Severe convective storms phenomena occurrence during the warm half of the year in Bulgaria (1961-2006). Atmospheric Research, ISSN: 0169-8095, vol. 93(1-3), pp. 490-497**Disastrous events originating from severe convective storms (SCS) like heavy rainfall, hailfall and thunderstormswere analyzed for thewarm half of the year (April–September) using long-term data records from 67 climatological and 26 precipitation stations of the meteorological network of the National Institute of Meteorology andHydrology (NIMH) of Bulgaria. Daily rainfall over 30 mm/24 h measured in 4 or more provinces (from total 27 country provinces) is defined as a threshold for heavy rainfall. Similar approachwas applied to hail and thunderstorm spreading. The analysis of the variation of those phenomena for the period 1961–2006 shows that the number of the days with heavy precipitation increases while the total rainfall as a whole decreases. During the last 16 years (1991–2006) the SCS phenomena and related thunderstorms and hail occurredmore frequently in August and September in contrast to the period 1961–1990. Synoptic analysis shows prevailing cases of SCS associated with cold fronts, cyclonical pressure field and Mediterranean cyclones. |
| 3. | **Bocheva L., I. Gospodinov, P. Simeonov, T. Marinova, 2010. Climatological Analysis of the Synoptic Situations Causing Torrential Precipitation Events in Bulgaria During the Period 1961–2007. Global Environmental Change: Challenges to Science and Society in Southeastern Europe. Alexandrov V., Gajdusek M., Knight C., Yotova A. (eds) Springer, ISBN 978-90-481-8694-5, pp. 97-108, <https://doi.org/10.1007/978-90-481-8695-2_9>** Variations of heavy and extreme precipitation are interesting as these events cause considerable damage and loss of life worldwide each year. The upward tendency of damages caused by natural disasters supports the idea that extreme events, such as torrential precipitations, associated with the effects of climate change, occur with greater frequency. The same tendency is observed in Bulgaria during the last decade of the 20th century. Negative trend in annual and seasonal precipitation total associated with an increase in the contribution of heavy rainfall events to total precipitation is observed in Bulgaria like in some Mediterranean countries.A comparative analysis of some very extreme precipitation events was carried out using all the available data for torrential precipitation (totals ≥ 100 mm/24 h in one station are considered) from the meteorological network of the National Institute of Meteorology and Hydrology (NIMH) for the period 1961-2007. An increase of mean annual number of days with torrential precipitation with about 30 % was obtained for the period 1991-2007 versus those for 1961-1990. |
| 4. | **Bocheva L., Nikolova Ts., Gospodinov I., Simeonov P., 2015. Large-scale severe storms in Bulgaria: seasonal distribution and severity. 15th International Multidisciplinary Scientific GeoConference SGEM 2015, www.sgem.org, SGEM2015 Conference Proceedings, ISBN 978-619-7105-38-4 / ISSN 1314-2704, June 18-24, 2015, Book4, 827-834**The objective of this work is to give an overview of the spatial and temporal distribution of the occurrence of severe storms simultaneously in a large part of the country. The covered period is 1991-2014. Only days in which there is 24-hour precipitation amount above 60 mm in at least 4 out of 27 administrative regions of the country are selected and analyzed. The choice of 60 mm/24h as a bottom limit is motivated by the fact that for most of the stations in Bulgaria it presents the mean monthly precipitation sum for given station almost for all months. Commonly, the heavy rain episodes are attended by thunderstorm activity or/and strong winds and this “combination” commonly causes big economic losses. More than 70% of all heavy precipitation events belong to this group. These large-scale storm events have become more frequent during the last years in our country. Most of them have also been documented as being the cause of floods and economic loss in the affected regions. They are more often found in Central and East Bulgaria than in the western part of the country. About 80% of them occur in the second half of summer and the first half of autumn. They are mostly associated with stationary frontal systems and Mediterranean cyclones. The analysis of synoptic situations and their seasonal distribution is presented. The brief descriptions for most typical ones for each season are presented with example of reported damages. |
| 5. | **Bocheva L., Simeonov P., 2015. Spatio-temporal variability of hailstorms for Bulgaria during the period 1961-2010. 15th International Multidisciplinary Scientific GeoConference SGEM 2015, www.sgem.org, SGEM2015 Conference Proceedings, ISBN 978-619-7105-38-4 / ISSN 1314-2704, June 18-24, 2015, Book4, 1065-1072**The aim of the study is to present time-space variation of hail events in non-mountainous regions in Bulgaria during the period 1961 - 2010. Differences in distribution of observed hail precipitations in different region of the country are also presented. For this investigation only data from meteorological records of National Institute of Meteorology and Hydrology is used. The annual distribution of number of days with hail-fall has a decreasing trend and the maximum value is in the year 1973. There are two factors responsible for the obtained results: cloud seeding for hail suppression which began in 1972 with protected area of about 15 600 км² and insufficient density of meteorological stations where this type of phenomenon is recorded. The 75% of all hail days is observed in warm half of the year between April and July. For different regions of Bulgaria the comparison of distribution of thunderstorm days during the two periods (1961–1990 and 1991–2010) show statistically insignificant increase in all regions from North and East Bulgaria and the same decrease in South West region. Monthly frequency of mean number of hail-storm days for the two investigated periods does not differ much from each other. More remarkable are the observed growth in some months from cold half of the year and especially in December – about 180 %. For northern regions of the country the maximum in hail-storm activity during the last 10 years (decade 2001–2010) is moved from June to May. |
| 6. | **Bocheva L., Gospodinov I., 2015. Tornado climatology for Bulgaria (2001-2010). Bulgarian Chemical Communications, ISSN 0861-9808, vol. 47, Special Issue B, pp. 405–411**The present work is an attempt to summarize and analyze all documented cases of tornado or waterspouts in Bulgaria between 2001 and 2010. A list of all known tornadoes and waterspouts within the 10-year period has been given. It includes the time and the location of occurrence, the strength and the type of the terrain beneath. Most of the tornadoes in Bulgaria have been classified as F0-F1 of the Fujita scale. The given climatology of the occurrence of tornadoes and waterspouts consists of analysis of its spatial and temporal distribution. By space, tornadoes in Bulgaria tend to occur in the southwestern, southcentral and northestern parts of the country. The frequency of occurrence of tornadoes in Bulgaria appears to be about 0.32 per unit area of 104 km2 per year. The highest probability has been found to be in the administrative regions of Sofia-city and Razgrad. By time, tornadoes tend to occur in the warm half of the year, most often in July, and in the afternoon. The large-scale atmospheric patterns and the thermodynamic parameters and instability indices of the environment associated with the occurrence of tornadoes and water spurts in Bulgaria have also been given. |
| 7. | **Georgieva M., Bocheva L., Mirchev P., Tsankov G., Matova M., Zaemdzhikova G., Hlebarska S., Georgiev G., 2018. Fecundity and egg abortion in two phenological forms of pine processionary moth (Thaumetopea pityocampa) in Bulgaria. Silva Balcanica, ISSN 1311-8706, vol. 19 (1), pp. 79-88**During the period 1991-2017, the fecundity and egg abortion of pine processionary moth (Thaumetopoea pityocampa) were studied in the region of Sandanski (Southwest Bulgaria) and Kirkovo (the Eastern Rhodopes) where two different phenological forms occur. In the region of Sandanski, a typical Mediterranean winter form develops, and in the region of Kirkovo – an early developing summer form.For the entire study period, 766 batches containing 174 132 eggs were collected and analyzed. Both areas are characterized by dry and hot summer. In Sandanski, the number of days with temperatures above 32°C (critical for eggs incubation) in June-August was twice as much as in the region of Kirkovo. In Sandanski, the period of consecutive days with maximum air temperature ≥32°C in some years lasted between 38 and 43 days. In Kirkovo, the average number of consecutive days with such high temperature was 10-12, only in 1998 it was 21 and in 2016 – 20 days. There was a similarity in the average fecundity of pine processionary moth females in Sandanski and Kirkovo (239.9 and 216.3 eggs, respectively). In egg stage, mortality as a result of abortion was significant – 40.4% in Sandanski and 37.0% in Kirkovo. |
| 8. | **Nikolov D., Bocheva L., Marinova T., Malcheva K., Evgeniev R., 2019. Preliminary results of changes in snowfalls and variation of maximum height of snow cover for the territory of Bulgaria. Conference proceedings of 19-th International Multidisciplinary Scientific Geoconference – SGEM 2019, 19, 4.1, ISBN:978-619-7408-83-6, ISSN:1314-2704, DOI:10.5593,1025-1032**Snow cover is an important climatic factor and its changes have a strong influence on water resources and water balance in Bulgaria, as well as on the development of agriculture, tourism, transport and others.The main objective of this study is to analyze the long-term time series of snow cover depth and snow or mixed precipitation types, as well as to summarize the results for each administrative district in Bulgaria. Data from 246 weather stations of the meteorological network of the National Institute of Meteorology and Hydrology for the period 1961-2015 are used. All stations are divided into two groups according to their elevation – lowlands (up to 800 m altitude) and mountainous (above 800 m altitude). The frequency distribution of 24-hour precipitation amounts (snow or mixed types) is calculated in 20 mm increments, and then averaged for each of the 28 administrative districts. The precipitation amounts up to 20 mm have the highest frequency, while only individual cases of snowfall over 80 mm are observed. For lowlands, the mean maximum snow cover depth varies between 19.5 cm and 39.4 cm. In North West Bulgaria, the change of long-term average of the maximum snow cover depth is more smoothed, but the absolute maximums are lower than those for Central North and North East Bulgaria. For South Bulgaria the largest range of variation is observed in some districts of southeastern parts of the country. |
| 9. | **Chipilski, H.G., Tsonevsky, I., Georgiev, S., Dimitrova, T., Bocheva, L., Wang, X., 2019. Analysis of a Case of Supercellular Convection over Bulgaria: Observations and Numerical Simulations. Atmosphere, 10(9), p.486 (ISSN: 2073-4433)**A long-lived supercell developed in Northwest Bulgaria on 15 May 2018 and inflicted widespread damage along its track. The first part of this article presents a detailed overview of the observed storm evolution. Doppler radar observations reveal that the storm acquired typical supercellular signatures and maintained reflectivity values in excess of 63 dBZ for more than 4 h. The thunderstorm was also analyzed through lightning observations that highlighted important characteristics of the overall supercell dynamics. In its second part, the study investigates the predictability of the severe weather outbreak. In the medium forecast ranges, the global European Centre for Medium-RangeWeather Forecasts (ECMWF) ensemble indicated the presence of favorable conditions for the development of deep moist convection 4 days prior to the event. A set of three convection-allowing ensemble simulations also demonstrated that the practical predictability of the supercell was approximately 12 h, which is considerably higher than some previously reported estimates. Nevertheless, the skill of the convective forecasts appears to be limited by the presence of typical model errors, such as the timing of convection initiation and the development of spurious convective activity. The relevance of these errors to the optimal ensemble size and to the design of future convection-allowing numerical weather prediction (NWP) systems is further discussed. |
| 10. | **Bocheva L., Malcheva K., 2020. Climatological assessment of extreme 24-hour precipitation in Bulgaria during the period 1931-2019. Proceedings of 20th International Multidisciplinary Scientific GeoConference SGEM 2020, Vol. 20, Iss. 4.1, pp. 357-364, DOI:10.5593/sgem2020/4.1/s19.045**The object of this study is the variability and trends of extreme 24-hour precipitation in Bulgaria during the period 1931–2019. The regime of potentially dangerous precipitation (≥60 mm/24 h) have been analyzed on the base of available daily data from all stations of the national meteorological network with continuous observations at least in half of the study period. We focused our attention on this type of precipitation because it often causes significant economic damage and human casualties. The advanced tools, embedded in ArcGIS Pro 2.4, have been used to investigate the intra-annual and spatial distribution of extreme precipitation. Also, the number of cases and the number of days with extreme precipitation have been summarized for the regions with different precipitation regimes and compared for three sub-periods (1931-1960; 1961-1990; 1991-2019). In the regions with temperate-continental and transitional-continental climate, which comprise almost 70% of the territory of Bulgaria, the number of days with extreme precipitation remains almost unchanged in the first two periods while in the last period (1991-2019) it increases by 19-42%. The most considerable change in the number of these events is observed in the regions with Transitional-Mediterranean climate and maritime climate (near the Black Sea). In the south-central and eastern parts of the country, the number of days with heavy precipitation is twice more in recent years in comparison with the period 1931-1960, and with 32% higher than those in the period 1961-1990. In contrast, in southwestern Bulgaria, which is also strongly influenced by the Mediterranean air masses, these events have even decreased in recent years – with about 25% compared to 1961-1990.  |
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|  | ***Publications under Group D (Bulgarian version – ‘Г’)*** |
| 1.7 | **Bocheva L., 2015. Comparative analysis of heavy precipitation in non-mountainous regions of Bulgaria. 15th International Multidisciplinary Scientific GeoConference SGEM 2015, www.sgem.org, SGEM2015 Conference Proceedings, ISBN 978-619-7105-38-4 / ISSN 1314-2704, June 18-24, 2015, Book4, 889-896.**The main objective of this study is variability and trends in extreme daily precipitation over non-mountainous regions of Bulgaria during the period 1961 – 2010. The regime of potential dangerous events (totals over 30 mm/24 h are considered as possibly risky for floods) and torrential precipitation (totals ≥60 mm/24 h) is summarized and compared for different regions for two periods: 1961 – 1990 (basic for climatological normals) and 1991 – 2010. Statistically significant increase (about 40%) of torrential 24-hours precipitation is revealed during the second period in central and east parts of the country, while in regions from West Bulgaria these dangerous events decreases with about 10%. The differences in the monthly distribution of extreme precipitation duringthe investigated periods are also presented. Statistically not significant decrease in the number of precipitation days has also been observed for most of the regions in Bulgaria while the number of extreme-precipitation days increases. Changes in daily precipitation totals exceeding various thresholds such as 5, 15, 30 and 60 mm/24 h have also been observed. The statistical significance ofannual variations of extreme precipitation is calculated by the Mann-Kendall test (for the whole period 1961-2010) and ANOVA with Poisson distribution (for the comparison of the two periods 1961-1990 and 1991-2010). |
| 2.7 | **Mirchev, P., Georgiev, G., Georgieva, M., Bocheva, L. 2016. Impact of low temperatures on pine processionary moth (Thaumetopolea pityocampa) larval survival in Bulgaria. Silva Balkanika, ISSN 1311-8706, 17, 1, 51-58.**Thaumetopoea pityocampa winter nests were collected in January 2011 and 2015 from six localities situated in different regions over pest’s range in Bulgaria. In each site, ten winter nests were randomly selected and the larval instar structure and their survival were determined. The ‘silk index’ of winter nests and the level of their building were assessed. Using data about average daily and minimal monthly temperatures from November (2010, 2014) to February (2011, 2015), the number of favourable days for T. pityocampa larvaldevelopment was evaluated. A relationship between the climatic characteristics over the cold period of year and the larval instar structure, survival, adaptability expressed by the level of building winter nests and the time of nest leaving and moving of the larvae into the soil was found out. |
| 3.7 | **Nikolov D., Dimitrov C., Bocheva L., 2018. Snow blizzards and snow drifts in Northeast Bulgaria – assessment and recent tendencies. Conference proceedings of 18-thInternational Multidisciplinary Scientific Geoconference – SGEM 2018, 18, 4.2, SGEM International Multidisciplinary Scientific Geoconference, ISBN:978-619-7408-45-4, ISSN:1314-2704, DOI:10.5593, 591-598.**Snow blizzards and snow drifts have recently proven as major winter threat for the road traffic, communications and social life in Northeast Bulgaria. The geographical location of these regions with respect to the tracks of the winter Mediterranean cyclones and cold advections from north and northeast makes them indeed prone to this risk, but one would like to know if there is a significant rise in their number and severity.The main goal of the current study is exactly the investigation of the contemporary tendencies in the regime of the characteristics of the snow cover in northeast Bulgaria. This includes examination and assessment of the following climatic characteristics of the snow cover and their tendencies: mean, maximal, mean maximal snow cover depth, mean monthly and seasonal number of days with snow cover greater than specific height (15 и 30 cm) and the character of the snow cover, i.e. the presence of snow drifts. These climatic characteristics have been assessed for a period of more than 50 years (1961-2015) using 36 station in the following administrative districts: Targovishte, Shumen, Silisstra, Razgrad, Dobrich and Varna. Spatial attention is paid to the recent snow blizzards cases where the wind conditions have been investigated also. This has been done for the period 1991-2015. |
| 4.7 | **Bocheva L., Pophristov V., 2019. Seasonal analysis of large-scale heavy precipitation events in Bulgaria. 10th Jubilee Conference of the Balkan Physical Union (BPU10), August 2018, Sofia, Bulgaria; Editors: T. M. Mishonov and A. M. Varonov, AIP Conference Proceedings 2075, 200017 (2019);** [**https://doi.org/10.1063/1.5099023**](https://doi.org/10.1063/1.5099023)**.**Climate in Bulgaria became not only warmer but also drier at the end of the 20th century. During the last decade however, precipitation totals have increased mainly due to the contribution of heavy rainfall events which caused severe floods and damages in various economic sectors. In this study a seasonal analysis of heavy precipitation events which is registered during the same process in at least 4 districts in Bulgaria is carried out. All data for extreme precipitation (totals ≥60 mm/24 h) from the meteorological network of the National Institute of Meteorology and Hydrology for the period 1991–2017 are used. An increase of the annual number of days with heavy precipitation is found for the investigated period. About 78% of all days are during the summer and autumn. The classification of synoptic situations connected with 122 days of large-scale heavy precipitation events is also presented for each season. They are divided in different synoptic circulation types, taking into account pressure fields at 500 hPa and sea level pressure. For summer and autumn 4 main combinations of circulation types are defined, which present about 65% of all determined types for each season. The brief analysis shows that more than 80% of all observed cases are connected with varying degrees of damage and even human casualties. |
| 1.8 | **Georgiev, Ch., Tomova J., Bocheva L., 1995. Cyclonic Processes over the Eastern Mediterranean Developing in Latitudinal Reorganisation of High Level Mass Field (in “Blocking Regime”). Bulgarian Journal of Meteorology and Hydrology, ISSN: 0861-0762, vol. 6(1-2), pp. 39-49.**The cyclonic processes over the Eastern Mediterranean during the period 1980-1989 is studied and their distribution in connection with the type of atmospheric circulation over the European synoptic region. The cyclones in latitudinal reorganization of high level mass field (LRHLMF) and the associated with them meteorological conditions over Bulgaria are investigated. On the basis of typical cases two types of east Mediterranean cyclones in LRHLMF is presented. Their evolution in connection with the characteristics of atmospheric circulation over the region is examined. The results of the investigation are systematized, summarized and presented in a scheme for their fast and easily use in the analysis and forecast of meteorological conditions over Bulgaria. |
| 2.8 | **Marinova, T., Bocheva L., Sharov V., 2005. On Some Climatic Changes in the Circulation over the Mediterranean Area. Idojaras,**  **ISSN 0324-6329, vol. 109(1), pp. 55-68**Global climate changes affect the atmospheric circulation over the European synoptic region and, in particular, over the Mediterranean. In recent years the activity of cyclogenesis has strongly diminished over the Western Mediterranean and is not typical for the eastern part of the region. The present work is a climatological investigation of synoptic scale Mediterranean cyclones in relation to the number of cyclones originating over the Mediterranean, their paths of movement, and the interannual activity of the Mediterranean center. A study was carried out using surface pressure charts from the Synoptic Archive of the National Institute of Meteorology and Hydrology of Bulgaria for the period 1980-2001. The comparison of the derived results with the results of other authors obtained for previous periods show a well pronounced decrease in the number of Mediterranean cyclones. At the same time, the activity of the Mediterranean center during the course of a year is about two months shorter. After 1990, considerable changes in the regular paths of Mediterranean cyclones were observed. |
| 3.8 | **Simeonov, P., Bocheva, L., Marinova, T., 2006. Risk assessment for dangerous meteorological phenomena, produced by convective storms during the warm half of the year. National scientific-practical conference on emergency management and protection of the population: November 10. 2005, Sofia, Center for Population Research at BAS, 2006, pp. 88-96, ISBN-10:954-91827-1-1; ISBN-13:978-954-91827-1-2**The powerful convective storms (PCS) connected with such dangerous weather phenomena as intense and abundant precipitation, thunderstorms, mass hail and strong wind on the territory of 4 and more districts in the country have been studied. The deviations from the monthly norms have been assessed and the probabilities for occurrence of situations of dangerous and catastrophic weather by periods and days have been obtained. The obtained results are useful both for the development of the methods for long-term forecasting of PCS and in the assessment of the most probable damages from them. |
| 4.8 | **Simeonov P., Gospodinov I., Bocheva L., Petrov R., 2011. Analysis of the severe convective storms, connected with several tornado events in Bulgaria (2006 – 2009).** **Bulgarian Journal of Meteorology and Hydrology, ISSN: 0861-0762, vol. 16(1), pp. 78-85**Short analyses of six storms with tornados between 2006 and 2009 are presented. The information include pictures of tornados taken from ground, radar images, synoptic maps and upper-air sounding data. The documented tornado events occurred in different parts of the country. The analyzed cases enrich the database of NIMH for severe storm events and can be used for further improvement of techniques and practices for severe weather warning as well as for studying the climate variability of such severe weather phenomena. |
| 5.8 | **Bocheva L., Gospodinov I., Simeonov P., Marinova T., 2011. On change in precipitation regime with assessment of extremes in Bulgaria (1961 – 2007).****Bulgarian Journal of Meteorology and Hydrology, ISSN: 0861-0762, vol. 16(3-4), pp. 1-15**The main objectives of this study are climatic variations in total precipitation, number of wet days, and especially in torrential (totals ≥60 mm/24 h in one station are considered) precipitation amounts in different parts of Bulgaria. The regime of such extreme precipitation events is compared to those of total rain/snow amounts for two periods: 1961 – 1990 and 1991 – 2007. Significant increase (about 30-50%) of days with torrential 24-hours is revealed during the second period in the central and east parts of the country, while in West Bulgaria (especially in the southwest) these dangerous events decreases with about 20-35%. We focus our attention to this group of torrential precipitation, because daily amounts ≥60 mm/24 h often causes significant economic damage and loss of life. They are usually connected with severe convective storms.Changes in daily precipitation totals exceeding various thresholds such as 5, 15, 30 and 60 mm/24 h have been observed. Statistically not significant decrease in the number of precipitation days has also been observed while the number of extreme-precipitation days increases.We also attempt to explain the nature of the torrential precipitation events in Bulgaria. A classification of synoptic situations for different parts of Bulgaria is shown and some of the most typical ones are detailed. |
| 6.8 | **Bocheva L., Marinova T., Nikolova Ts., 2014. Comparative analysis of severe storms, connected with extreme precipitation in Bulgaria (1951-2010). Journal of International Scientific Publications: Ecology and Safety, Volume 8, 461-468, ISSN 1314-7234 (Online), Published at: <http://www.scientific-publications.net>.**During the last years there is an evident upward tendency of damages caused by natural disasters. Much of them are caused by extreme events such as torrential precipitation associated with thunderstorms or/and wind storms and they tend to increase.A comparative analysis of some very extreme precipitation events was carried out using all the available data for torrential precipitation (totals over 100 mm/24 h) from the meteorological network of the National Institute of Meteorology and Hydrology for the period 1951–2010. The annual distribution of extreme precipitation events over different parts of Bulgaria is presented. For the territory of the country as whole an increase of the mean annual number of days with torrential precipitation was found recently. This increment was statistically significant in Eastern Bulgaria and Black sea coast where the number of flood rain events has increased especially during the pick of active tourist season. |
| 7.8 | **Bocheva, L., Nikolova, Ts.. 2016. Spatio-temporal characteristics of some convective induced extreme events in Bulgaria. Bulgarian Journal of Meteorology and Hydrology, ISSN: 0861-0762, vol. 21(1-2), pp. 2-9**Severe convective storms produce dangerous weather phenomena especially during the warm half of the year like heavy and very intense rainfall, thunderstorms and hail-fall. They are оften associated with strong to violent wind gusts and sometimes even with such dangerous events like squall or tornado.The objective of this work is to present the spatial and temporal distribution of torrential convective precipitations during the period 1991-2014 in different regions of Bulgaria. Only days in which there is thunderstorm activity combined with 24-hour precipitation amount above 60 mm are selected and analyzed. The choice of 60 mm/24h as a bottom limit is motivated by the fact that for 90% of all meteorological stations in Bulgaria it is equal or above the climatological monthly precipitation normal. The regional inter-monthly distribution of such extreme events is also presented and results for two 12–year periods 1991–2002 and 2003–2014, are compared and statistically estimated. Second part of the study summarizes general features of the tornado and waterspouts occurrence in Bulgaria (2001-2014) such as the geographical, monthly and diurnal distributions. Characteristics concerning tornado intensity are also presented. |
| 8.8 | **Bocheva L., Gospodinov I., Simeonov P., 2015. The comparative study of cases of “winter” and “summer” tornado in Bulgaria. Bulgarian Journal of Meteorology and Hydrology, ISSN: 0861-0762, vol. 20(5), pp. 3-12 (in Bulgarian)**Rarely, in situations with the development of powerful convective storms, tornadoes are formed - in our country most often over rugged mountainous terrain or over the sea area. This is a dangerous phenomenon that is difficult to predict without specialized equipment. The tornado is often confused with the so-called "falling" wind or gusty wind. In order to distinguish it and determine the strength of the tornado, it is important to know not only physical and spatio-temporal characteristics, but also data on the nature this phenomenon as well as extent of the damage. In the present study, a detailed comparison is made of tornadoes developing over a flat surface: two typically “summer” on the same day in northwestern Bulgaria and one “winter” in central southern Bulgaria, for which there is a full air sounding, radar, satellite and weather information. |
| 9.8 | **Bocheva L., Simeonov P., 2016. Cases of tornado in Bulgaria, registered since the beginning of the 21st century - database development and analysis. In: Proceedings of the 3rd Bulgarian National Congress on Physical Sciences, Sofia, Bulgaria, Sep. 29 - Oct. 02, 2016, S06.16-1-9 [DVD: ISBN 978-954-580-364-2] Heron Press: Sofia( in Bulgarian)**In present work all confirmed cases of tornado or waterspouts in Bulgaria between 2001 and September 2016 are summarized. It included the time and the location of occurrence, the strength and the type of the terrain beneath. Most of the tornadoes in Bulgaria have been classified as F0-F1 of the Fujita scale. The frequency of occurrence of tornadoes in Bulgaria appears to be about 0.33 per unit area of 104 km2 per year. The highest probability has been found to be in the administrative regions of Sofia-city and Razgrad. Some instability indices of the environment associated with the occurrence of tornadoes in Bulgaria have been given. |
| 10.8 | **Bocheva, L., Marinova, T. 2016. Recent trends of thunderstorms over Bulgaria – climatological analysis. Journal of International Scientific Publications: Ecology and Safety, 10, ISSN:1314-7234, 136-144**Commonly the severe convective storms are not only attended by heavy rain events, but also by hail and thunderstorm activity, which on their own account cause material damages and life loses. According to Bulgarian Agency of Civil Defense and media the mean annual numbers of victims of thunders increased during the last years are about 10 people/per year.The aim of the study is to present time-space variations of thunderstorm events in Bulgaria during the period 1961-2010. Visual thunderstorm observations at 42 meteorological stations with altitude below 800 m are used in a study. By the orographic and climatic features the territory of Bulgaria are divided into 6 parts and thunderstorms annual, decadal and monthly distribution and variability is presented for each of them. The comparison of two investigated periods (1961–1990, 1991–2010) show that the mean number of registered thunderstorm days increase during the second period. This growth is statistically significant only in NE Bulgaria and partially in SC Bulgaria. The 75% of all thunderstorm days is observed in warm half of the year between May and August. In the same time the significant increase of thunderstorm events in all regions from North Bulgaria during the winter months December, January and February after 1991 is established. The regime of wide-spread stormy fays for 10-days period during the warm half of the year (April-September) is compared for the two periods: 1961-1990 and 1991-2010. The increase in number of those hazardous events during the months from the end of the summer is received. |
| 11.8 | **Marinova, T., Malcheva, K., Bocheva, L., Trifonova, L, 2017. Climate profile of Bulgaria in the period 1988-2016 and brief climatic assessment of 2017. BJMH, 22, 3-4, National Institute of Meteorology and Hydrology, ISSN: 0861-0762, 2-15.** With regard to national and international obligations of the National Institute of Meteorology and Hydrology at the Bulgarian Academy of Sciences (NIMH-BAS), climate profile of Bulgaria in the period 1988-2016 as well as brief climatic assessment of 2017 are prepared on the basis of monthly and annual data, provided by the Meteorological database of the NIMH-BAS, for 115 meteorological stations on the territory of Bulgaria and the obtained results are presented. |
| 12.8 | **Bocheva, L., Markova, B., 2017. Cold season tornadoes in Bulgaria – brief analysis. BJMH, 22, 3-4, 32-41. ISSN: 0861-0762**From the beginning of 21st century 58 confirmed cases of tornadoes and waterspouts were registered in Bulgaria. In the list of documented tornadoes there are 5 “winter” cases which occurred within the cold half of year: 4 of which in southern Bulgaria and 1 - in northeastern Bulgaria. According to synoptic analysis they were associated with strong thunderstorms which developed along cold fronts introducing cold and moist air masses in Bulgaria after a period of unseasonably warm and dry weather. Some thermodynamic parameters and four instability indices have been calculated. All received values are close to those favorable for development in our country of summer type convective storms. |
| 13.8 | **Malcheva, K., Trifonova, L, Marinova, T., Bocheva, L., Dimitrov C., Nikolov, D., Pophristov, V., Ivanov, K., Evgeniev, R., Maneva, V., Neikova, R., 2017. Seasonal climate assessment of the winter 2016-2017. BJMH, 22, 5, 38-60, ISSN: 0861-0762.**Severe weather conditions in January 2017 in South East Europe have sparked intense media interest and renewing of the debate on global warming and climate change. In the present study, the severity of winter 2016-2017 in Bulgaria is evaluated on the basis of indicative climatic characteristics and temperature indices established from the European project STARDEX (Statistical and Regional Downscaling of Extremes). Daily data for months December, January and February in the period 1961-2017 from the meteorological network of the National Institute of Meteorology and Hydrology at the Bulgarian Academy of Sciences (NIMH-BAS) are used for revealing the spatio-temporal peculiarities of climatic conditions during the winter season. Despite prolonged cold spell and heavy snowfall in January, the winter 2016-2017 can be ranked as a moderate-severe. |
| 14.8 | **Bocheva, L., 2018. Long-Term Variation and Analysis of Hail Precipitation in Sofia Region. Science and technologies, ISSN:1314-4111, vol. 8(2): Nautical and Environmental Studies, pp. 44-49**Bulgaria is one of the most hail-stormy countries in Europe because of its geographical location and diverse terrain. Climate studies show a notable territoriality of hail precipitation in Bulgaria. According to some researches, the number of days with hail was more frequent in the southwestern mountainous part of the country, especially in districts Sofia and Blagoevgrad. The Sofia-city district is the smallest one among another 27 districts in Bulgaria but is the most densely populated area in the country. From the beginning of 21st century the values of reported damages caused by hail precipitation in Sofia increased. According to insurance data, only severe hailstorm on 8 July 2014, which hit mainly central parts of the city, caused damages for more than 123 million euro. The aim of the study is to present spatial and temporal variation of hail events in Sofia-city district during the period 1917 - 2016. According to meteorological station data 963 hail days are registered during the 100 year period of investigation and 72% of them is observed in warm half of the year between April and July. All hail precipitation events are also classified by duration and severity and most powerful of them are analyzed. For estimation of these hazardous cases the available information from media and insurance companies are used. |
| 15.8 | **Malcheva, K., Bocheva, L., Marinova, T., 2019. Mapping temperature and precipitation climate normals over Bulgaria by using ArcGIS Pro 2.4. Bulgarian Journal of Meteorology and Hydrology, ISSN: 0861-0762, vol. 23(2), pp. 62-77**Regardless its small territory, Bulgaria has over 20 different climatic regions, so specifying the temperature and precipitation climate normals for the whole territory of the country, including the areas without meteorological monitoring, is an important task. For this purpose, monthly temperature and precipitation normals (1961-1990) for 158 synoptic and climatological stations, and 220 precipitation stations of the meteorological network of the National Institute of Meteorology and Hydrology have been calculated based on thoroughly analyzed archive data. The advanced tools, embedded in ArcGIS Pro 2.4, have been used to elaborate accurate maps of temperature and precipitation climate normals. Some topographic and other climate-related factors that play an essential role in the temperature and precipitation modeling have been explored. |
| 16.8 | **Gospodinov, I., Bocheva, L., Malcheva, K., Tsenova, B., Trifonova, L., 2020. Weather and climate facts for year 2019 in Bulgaria (Review paper). Bulgarian Journal of Meteorology and Hydrology, 24/2, 114-136, ISSN: 0861-0762**This is a review paper describing climate and weather facts for year 2019 in Bulgaria. They are based on meteorological data from the National Institute of Meteorology and Hydrology (NIMH), which is its national weather service, but also from other sources of data and information. The paper is an adapted text from the Annual hydro-meteorological bulletin of NIMH, published in March 2020. Target readers are the wider meteorological scientific community in Bulgaria and around the world. The measurements and analyses discussed here reveal that 2019 is the warmest in Bulgaria since 1930 and the annual precipitation amounts are around or below normal. |