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THE FINGER OF GOD
CLIMATE CHANGES AND THE LARGEST CHRISTIAN PLACES

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Abstract

In this paper, we explored the influence of the global climate changes to the Christian Holy places around the world. The catastrophic prediction of devastation can be indicated by resistance of some plants on the Earth. Due to weather forecasting given by the World Meteorological Organization, with help of the multiple criteria of Geographical Information System, we have done climate analysis. For the modelling of climate changes, we also considered agroclimatological parameters for the three most optimal crops; corn, soybean and wheat. In this way, we can give a better connection between the Holy Bible and modern science prognosis.

Keywords: Holy Bible, climate change, Christian places, Geographical Information System, religion

1. Introduction

In the present time, the humankind has a lot of unsolved problems. Some of those problems are still strongly connected with religion. Some questions are still completely unsolved, such as will civilization find a new Earth? Is there a possibility to become transhumance civilization? Will an asteroid impact spell the end of humanity? [1, 2] What will happen if global temperatures increase? One group of scientist believe only in scientifically solution, other in solution with God influence [3, 4].

In 1840s, two scientists Joseph Le Verrier and John Couch Adams calculated the position of the celestial body that might be responsible for the perturbation of the Uranus orbit. Astronomers were searching the area on the sky to identify the new planet, Neptune. The historian Amos Funkenstein was

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dedicated to prove a connection between Science and Theology. As well, the work of Galileo, Descartes, Newton, and Leibniz can be seen as a high point of convergence between Science and religion [5, 6]. In the present time scientists are trying to predict the end of civilization on the Earth. Also, the prediction of climate changes takes main role in scientific discussions [7].

Sometimes scientific observation with theological conclusion can give brilliant results. One of the strongest connections between Science and Theology is the theory about Bing introduced by Russell in 1994 [8, 9]. Most of the scientists thinks that increase of temperature for 1.0 ^{0}C can produce catastrophe on the Earth. This increase of temperatures at global level is maybe the highest in the last 1,000 years. But some theories and postulates can change the view of climate theory.

In the analysis of climate in the past, scientists recorded one period between 1400 and 1900 CE called little ice age or historic minimum [10]. According to this weather conditions, the climate of Northern Europe became mild. For example, in Iceland and Greenland land farming was possible and wine grapes were growing [11]. During this climatological period, minimal sunspot activity of Sun was noted by astronomers and climatologists. Due to this study, the Sun activity may have been from 0.25 to 0.30% weaker than today. Otherwise, most of the scientists consider climate changes as the result of the higher production of greenhouse gasses in the lower layer of the atmosphere. These gasses with industrial activity caused an increase in global temperature. For other scientists climate changes are not in any connection with industrial activity. This group take orbital elements of Earth as an important factor for climate changes. This theory, known as Milankovic's cycle, was introduced by the Serbian scientist Milutin Milankovic [12].

Reduction of the solar energy caused cooling. It is well known that super-volcanism can cause severe eruptions and changes on the whole planet. The interaction between the ocean and the atmosphere causes changes in the current global circulation. Some scientists have studied historical records from long-term events to find the past climate. Some of the valuable evidences of climate changes are listed below:

(1) taxa records of cereals and grape crops,
(2) advances and retreats of mountain glaciers,
(3) paintings of long winter scenes showing frozen lakes and ports for example,
(4) the total number of weeks and days of ice in the sea water.

In many countries of the world, a significant increase of greenhouse gases began with the twentieth century industry growth. In 1900 the world`s population was approximately 1.5 billion, in 2000 about 6.2 billion, in 2100 most likely, the number of human population will be 12 billion. The main greenhouse gases can be doubled or tripled by the end of the 21st century. The world climate will be a subject of temporal changes on the Earth [13].

The climate changes are of essential importance for the growth of plants and primary effect for economic development in the world. The main problem for better predictions of climate changes is the short time interval of the measuring.

Many of the predictions consider increase of temperatures by 2100 and offer the possibility of establishing the fate of some plants, mainly industrial ones.

In our research we used agroclimatological modelling with Geographical Information System (GIS) for the period between 2000s and 2100s with CMIP 30s grid resolution. This grid contains data of 1.5^0C to 4.5^0C temperatures change. For many scientists about 60% of warming is caused by industry, i.e. by CO_2 products into the lower layers of the atmosphere. In 1800s the CO_2 concentration was about 280 ppm (particles per m^2), and till 2006 the concentration increased to 382 ppm (Food and Agricultural Organization 2017) [http://faostat.fao.org/, accessed 08.11.2017].

The other important gas is methane. About 16% of the current greenhouse warming has come from the methane emission into the atmosphere. Nitrous oxide (NO_2) is another causative factor in the greenhouse effect. Human activity, especially in agriculture, is known to include the use of chemical fertilizers. Ozone is a greenhouse gas situated both in the stratosphere and the lower layer of the atmosphere called troposphere. Ozone is the most effective in absorbing the ultraviolet (UV) radiation which is emitted from the Sun. This gas shields the life from dangerous rays. In the list of greenhouses gases, the last are chlorofluorocarbons (CFCs) [14].

Some of the scientists believe that the present climate changes have an enormous influence on life on the Earth. As the proof, they include significant melting of ice, for example. Finally, the global sea level will rise from 30cm to 120cm [15]. Many lands around the world will become hotter and dryer, and the others will become cooler and wetter. Will this cause the end of all plants on the Earth? This problem can affect the agricultural production; some countries will become better for the food production, some not. The connection between climate changes and the Holly Bible can be found in the commandments and postulates of the God. In these words we can find explanations about ecology, climate changes, climate types and climate properties. Following the canonical Gospels of Matthew, Luke, Mark and John the Christian Church tried to found holy places with the help of the God himself [16].

2. Methods and background of the study area

In this paper we used the locations of the 60 most important Christian Holly places into geo-space. Those churches/cathedrals we sorted including their size and area. All of the objects are the largest church buildings in the Christian world [17]. All positions of the largest Christian buildings in size (cathedrals and churches) are presented in the map of the World (Figure1).

Most of Christian churches/cathedrals are located on the territory of Europe. The others are on the territory of North America and the rest on all other continents, excluding Antarctica. This dispersion was followed with the spreading of the Christianity from origin to the other parts of the world. After selecting the objects, all the coordinates were inputted (longitude and latitude) in the GIS software (Figure 1). In this research we used two special GIS software's,

Quantum Geographical Information System (QGIS) which was used for basic GIS calculations and Geo-information system for mapping and analysing biodiversity data (DIVA-GIS) which is often used for climatological investigations. In order to determine climate-change's effects on plants, we used three the most widespread crops: wheat, soybean and corn.

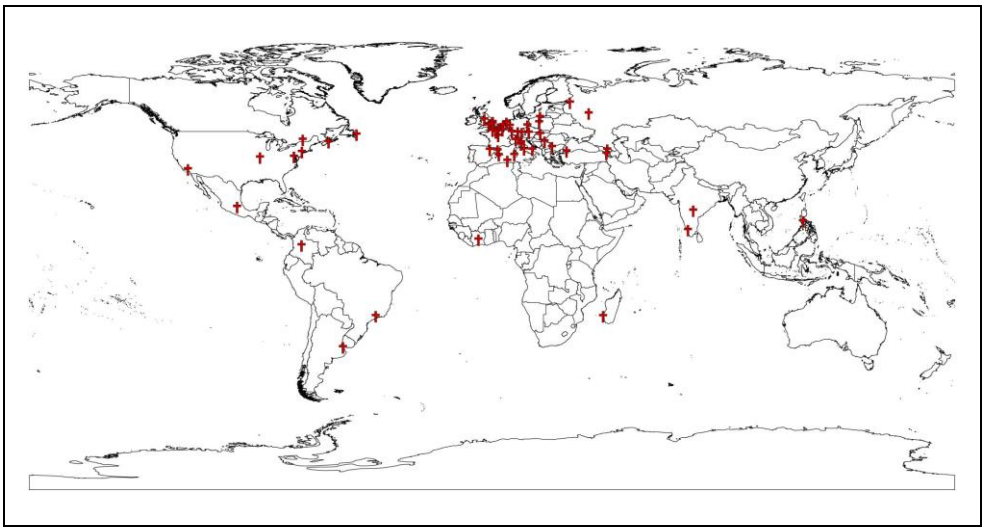

Figure 1. The distribution of the largest churches and cathedrals in the world.

The climate changes have an important influence on the world population, future migration and sustainable development. The influence of climate devastation has been investigated by many scientists, but studies about the effects of climate changes on holy places are very rare [18]. In this research we used the DIVA GIS to determine classes of crops growth on the locations near by the holy places.

3. GIS multi-criteria analysis

GIS and geospatial modelling is very important today. GIS present very powerful tool for calculating numerical data in some area. We used the data of Christian churches locations from the official database of Open Street Maps. This data has a big resolution. The average error of coordinates is 1m [19]. With special kriging methods we calculated agroclimatological parameters. According to the value we divided the land cover in six different classes (Not Situated, Very Marginal, Marginal, Suitable, Very Suitable and Excellent).

The results of agroclimatological data in this research, obtained by DIVA-GIS, included the changes of global temperatures and precipitation until 2100. The first forecast includes a temperature changes up to 0.5^0C. The second prediction gives results for temperature changes up to 2.0^0C. The case where temperature increases up to 5.0^0C presents a catastrophic scenario. With help of

GIS analysis, average temperatures and average precipitation we found the impact of climate changes on the land around the Holy Christian places.

When the grid was obtained, vector file (shp) is used to determine borders of the world countries. We have selected these classes to explain climate changes and crops surviving. The classes Not Situated, Very Marginal and Marginal show classes with very small or no possibilities for crops growing and they are not good for plant growing. Other classes (Suitable, Very Suitable, Excellent) are good for growing even if the temperatures increase.

4. Results and discussion

After modelling of the agroclimatological data, we used the interaction between climatological elements such as temperatures and precipitations and locations of the Christian churches/cathedrals. The total land area included in this investigation is 126,610,000 km^2. The first prediction concerns temperature and climate changes till 2100 up to 0.5^0C. The second prediction shows a distribution of crops when the temperature changes up to 2.0^0C, and a third one, which can be regarded as catastrophic and where one admits the temperature to be changed up to 5.0^0C. All the temperature changes are connected with precipitation.

After the GIS grid analysis and resolution of 1 km (30 arc seconds), all the area around to the largest Christian churches/cathedrals is divided in six classes, excluding Antarctica. After the GIS multi-criteria analysis, we derived areas of crops dispersion for the whole world and compared with the position of the Christian holy places. From the maps, we found the impact of climate changes on the land around the largest Christian churches/cathedrals (Figure 2).

In this research we compared three classes of crops: corn, wheat and soybean. The results about the soils suitable for corn growing, if the temperatures increasing up to 0.5^0C, 2.0^0C and 5.0^0C, are given in Table 1. The results shows that four of eight churches/cathedrals are in the area with excellent conditions for corn growing on the territory of North America even if temperatures increase up to 5.0^0C (Figure 2a). Churches/cathedrals on the east coast and south-central areas of the North America are in the area with suitable conditions for corn growing even if a temperatures increase up to 5.0^0C. On the territory of South America soil around two of three churches/cathedrals is excellent for corn even temperatures increase up to 5.0^0C.

On the territory of Africa an area around one object is suitable for corn growing. On the territory of Europe soils around four churches/cathedral has excellent conditions for corn growing and on the territory of Asia, only one. On the other side an area around the 43 Christian churches don't have suitable conditions for corn growing. Let's mention that the most of the churches/cathedrals are located higher than 700 m, and this is the main reason for the resistance of the soil in their surroundings to climate changes.

When we talk about soybean the situation is slightly different. The results for resistance of soil for soybean growing, when temperature increase up to 0.5^0C, 2.0^0C and 5.0^0C, are given in Table 1.

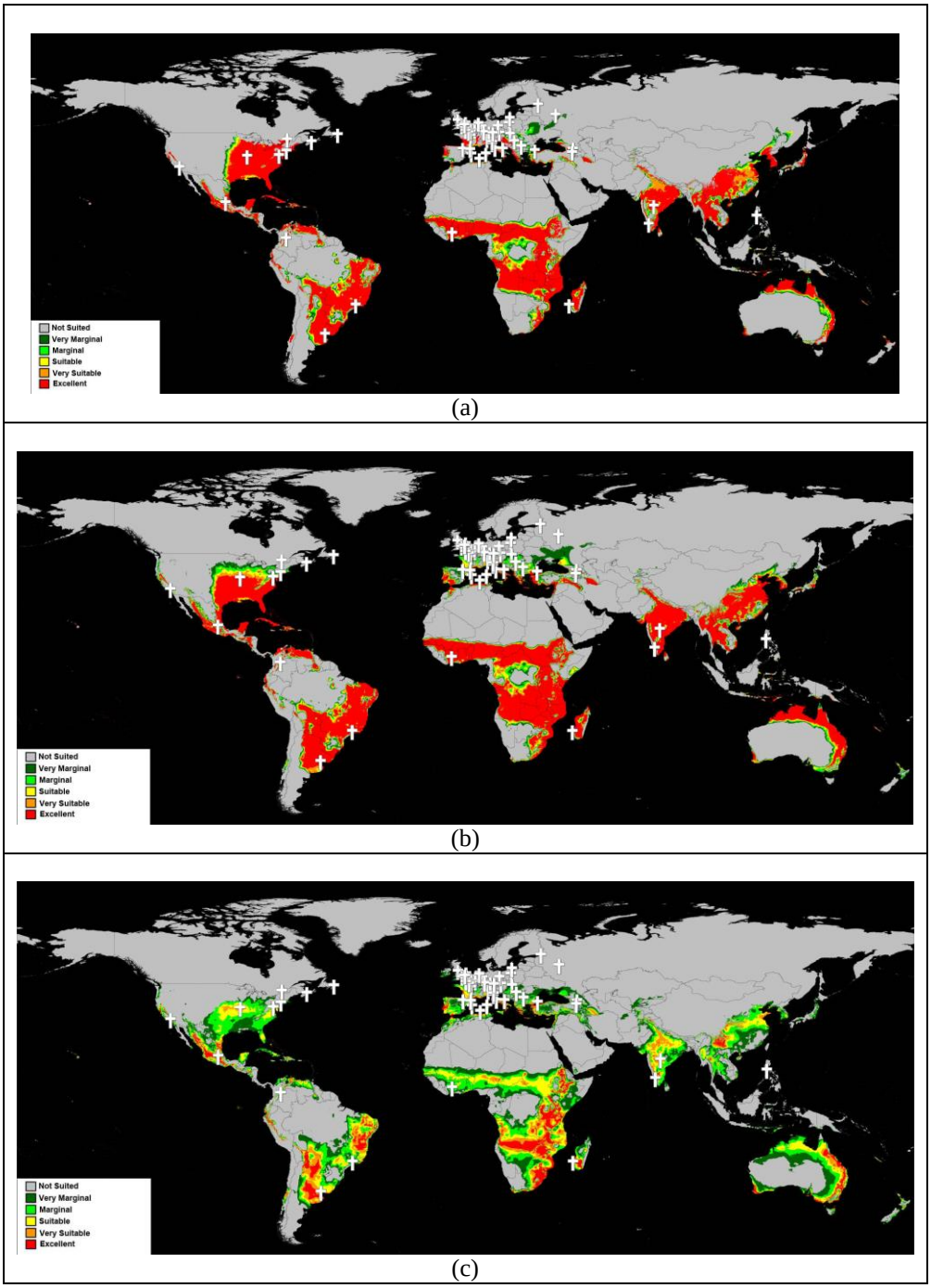

Figure 2. The position of the most significant Christian churches/cathedrals around the world and its connection with six classes of climate changed areas with: (a) corn, (b) soybean, (c) wheat.

Table 1. Distribution of Christian churches/cathedrals due to six climate changes classes.

	Excellent	**Very suitable**	**Suitable**	**Marginal**	**Very marginal**	**Not situated**
Corn						
0.5^0C	19	5	5	0	10	21
2.0^0C	17	3	5	5	12	18
5.0^0C	15	2	0	3	7	33
Soybean						
0.5^0C	17	9	14	10	5	5
2.0^0C	16	6	10	11	7	10
5.0^0C	15	2	3	5	11	24
Wheat						
0.5^0C	4	12	16	15	7	6
2.0^0C	5	6	17	19	8	5
5.0^0C	6	4	9	16	10	15

On the territory of North America around two churches/cathedrals the soils have good conditions for soybean growing (Figure 2b). On the territory of Africa, around one object, in Europe around five churches/cathedrals, in Asia around only one object are soils with suitable conditions for soybean growing. On the territory of Africa better areas are located on the west, in Asia on the south. The minimum average elevation for soybean growing is under 600m.

According to GIS analysis, the results about the soils suitable for wheat growing if the temperatures increase for up to 0.5^0C, 2.0^0C and 5.0^0C are given in the Table 1. In climate changed conditions soil around only one church/cathedral has good conditions for wheat growing on the territory of North America, in Europe around two objects. In South America don't exist church/cathedral in which surroundings is soil with good conditions for wheat growing and in Asia, too.

General results point out that when temperatures increase for 0.5^0C the area around 22.16 % churches/cathedrals have excellent parameters for plant growing. The surrounding areas: 14.43% objects belong to very suitable category, 19.4% to suitable, 11.1% to marginal, 14.93% to very marginal and 17.98% to not situated category. If the temperature increase up to 2.0^0C, the soil around 21.06% churches/cathedrals belong to excellent category, 5% to very suitable, 17.73% to suitable, 19.4% to marginal, 14.96% to very marginal, 22.85% to not situated. In catastrophic scenario when the temperatures increase up to 5.0^0C the territory around almost 20% of churches/cathedrals belong to excellent category, 4.4% to very suitable, 6.6% belong to suitable, 23.3% to marginal, 15.5% to very marginal, 30.2% to not situated category (Figure 3).

All the parameters obtained from the GIS analysis give a conclusion that the areas around the Christian churches/cathedrals have good point of resistance if the temperatures increase up to 5.0^0C. The area around Christian churches/cathedrals with excellent resistance can be found on the Apennines (Italy), eastern coast of the United Sates, while the south-east territories of Europe are with more resistance than the other. We also divided two belts with average

altitudes. The first belt is situated between 500 and 1000m, the second is between 1000 and 2000m. The areas around 70% of Christian churches/cathedrals are situated into the first belt and with good resistance on climate changes if the temperatures increase up to 2.0^0C.

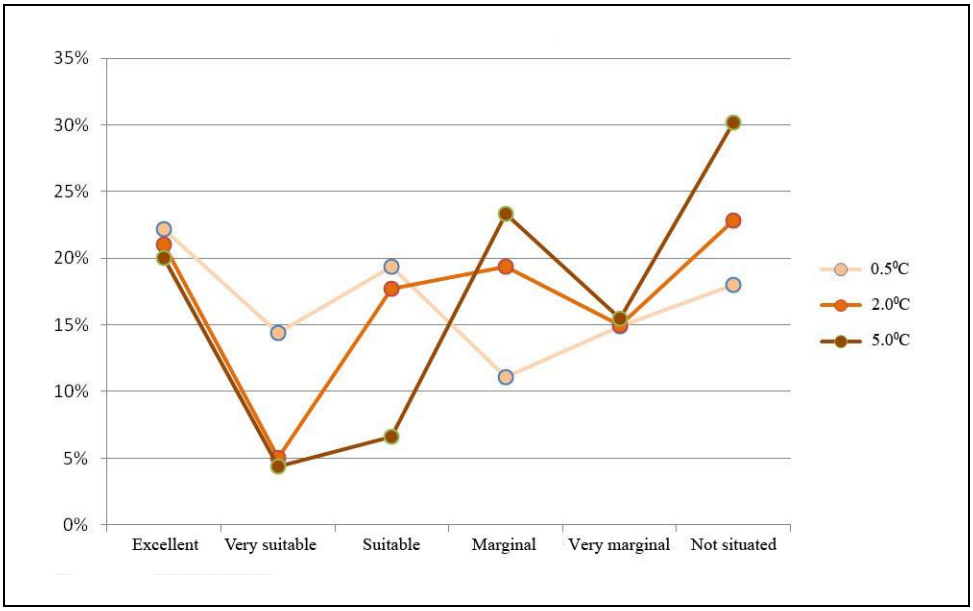

Figure 3. General results of climate changes.

The first theory about the connection between plants and climate properties was presented by the German scientist Koppen (climate classification). The Koppen climate classification is one of the most widely used climate classification systems. The Koppen climate scheme divides climate belts into five main groups: A - tropical, B - dry, C - temperate, D - continental, E - polar. This division originates from the time when the climate change did not exist because the climatological data for the first map of Koppen used from 1900. In the present study, we used data from official web-page of World Climatological Data from 2000 to the 2100 year. Our maps may be labelled as refreshed Koppen classification maps for three edible plants. The possible development of events in future seems to show that there is a finger of God, stronger than the humankind influence.

5. Conclusions

In this study, we investigated an impact of climate changes on three types of edible crops (corn, wheat, soybean) growing. Also, we have calculated future climate changes and compared with the positions of the central and the most important Christian churches/cathedrals. This numerical GIS analysis gives a prediction of future crops growing on the land around the Christian churches/cathedrals if the temperatures increase. Six land classes were formed by

the quality of potential growth for the three edible crops. Our analysis shows also the quality of crops and climate changes itself. The position of the largest churches/cathedrals (latitude, longitude, and elevation) indicates their resistance.

Sustainable developments, as well and human progress for the planet depends on climate change. Use of modern methods and techniques such as GIS and climate models makes it is possible to reconstruct the areas of crops. These methods are successful in obtaining the maximum information from crops fields in comparison with churches/cathedrals. In this way, we recover data, in particular, the density of quality of crops areas. Future research could explore ways to explain better qualitative and quantitative properties of crops areas. This study in future research can be extended with more crops and for longer periods of climate data. Also, the study should further contribute to the development of new sub-science named 'Religion-climatology'. The global population must be active in spreading out of the debate between scientists and religious persons. This knowledge of Science and religion must together answer many questions. Although this study only covered less numbers of crops, it is a good introduction to a more detailed future study assessing all of the worlds.

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