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The Green Roof in Boa Vista/RR

Epidemics during Grand Solar Minima

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Effect of Flood on Women Farmers

New Results of U-Pb & LA-ICP-MS Studies

Discovering Thoughts, Inventing Future

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By Bayanova T.B., Drogobuzhskaya S.V., Subbotin V.V., Serov P.A., Steshenko E.N., Kunakkuzin E.L. & Borisenko E.S.

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Keywords: baddeleyite; layered intrusions; U-Pb analysis; laser ablation inductively coupled plasma mass spectrometry; fennoscandian shield.

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Significance of Baddeleyite for Paleoproterozoic PGE Deposits with Pt-Pd and Cu-Ni Reefs (North-Eastern Fennoscandian Shield): New Results of U-Pb and LA-ICP-MS Studies

Bayanova T.B. [α], Drogobuzhskaya S.V. [σ], Subbotin V.V. [ρ], Serov P.A. [ω], Steshenko E.N. [¥], Kunakkuzin E.L. [§] & Borisenko E.S. [χ]

Abstract- **Baddeleyite is a significant mineral successfully applied in the U-Pb geochronology for the precise dating of mafic rocks from layered intrusions with the platinum group element (PGE) and Cu-Ni mineralization. The Fennoscandian Shield hosts several layered Pt-Pd, Co-Cr-Ni, and Ti-V occurrences in the Northern (Karelian) and Southern (Karelian-Finnish) belts. The aim of this study is to estimate the content and distribution of rare earth elements (REE) in baddeleyite and to calculate temperatures (T, °C) of the U-Pb system closure and baddeleyite crystallization compared to zircon from Cu-Ni and Pt-Pd deposits in the north-eastern Fennoscandian Shield. For the first time, baddeleyite crystals from Cu-Ni (Monchepluton) and Pt-Pd (Monchetundra) reefs of the Monchegorsk ore area have been studied *in situ* by the laser ablation inductively coupled plasma mass spectrometry (LA-ICP-MS) to measure the U-Pb age of formation and the REE content.**

Keywords: baddeleyite; layered intrusions; U-Pb analysis; laser ablation inductively coupled plasma mass spectrometry; fennoscandian shield.

I. Introduction

Baddeleyite is a valued mineral for the U-Pb dating of PGE deposits (Bayanova, 2006; Mungall et al., 2016). Compared to zircon, it is more reliable for precise U-Pb dating of deposits in the north-eastern Fennoscandian (Baltic) Shield, since it is genetically magmatic. In contrast, zircon can be metamorphic, hydrothermal or occur as xenocrysts. The study of the trace element composition of zircon is a common practice, while geochemical characteristics of baddeleyite are poorly studied and contradictory. Thus, the value of Ce-anomaly varies, and the Eu-anomaly is absent in some analyses (Reischman et al., 1995; Zircon, 2003; Schaltegger et al., 2017). Also, recent studies limelight the crucial role of baddeleyite in the reconstruction of the supercontinents breakup in the history of the Earth's evolution (Bayanova et al., 2009; Bayanova et al., 2017; Bayanova et al., 2019 a; Bayanova et al., 2019 b; Mitrofanov et al., 2019).

In Paleoproterozoic PGE layered intrusions, baddeleyite is found in Pt-Pd and Cu-Ni deposits of the Monchegorsk ore area (Fig. 1).

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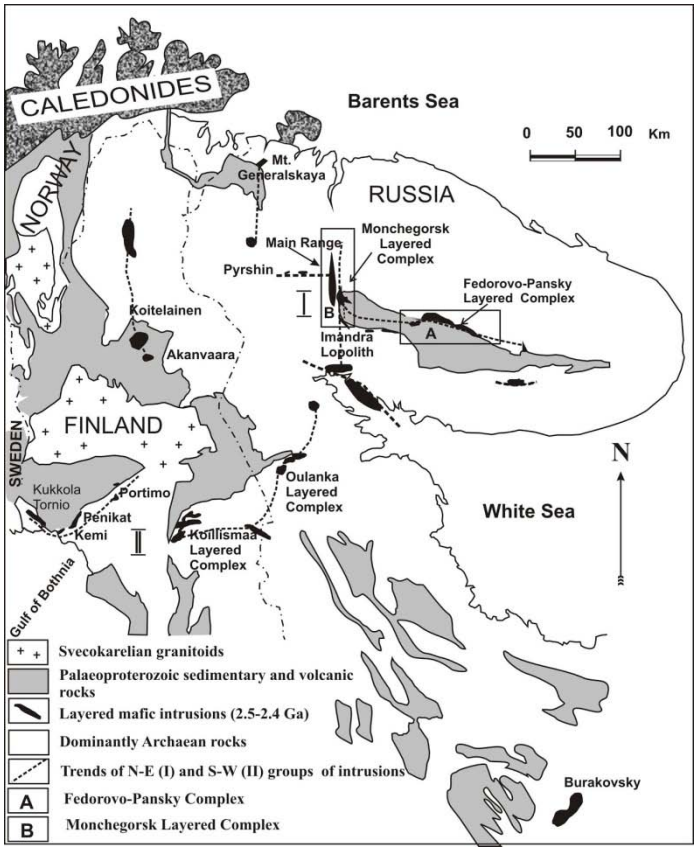


Fig. 1: Generalized geological map of the north-eastern Fennoscandian Shield and location of Paleoproterozoic layered mafic intrusions (Mitrofanov et al., 2005).

The aim of this study is (i) to estimate the REE content and distribution in baddeleyite, (ii) to calculate temperatures (T,°C) of the U-Pb system closure and baddeleyite crystallization compared to zircon from Cu-Ni and Pt-Pd deposits in the Monchegorsk ore area, hosting the recently discovered Pt-Pd Vurechuayvench deposit (north-eastern Fennoscandian Shield, Russia).

II. Resources and Techniques

Baddeleyite was extracted from gabbro-anorthosites with the Pt-Pd mineralization in the middle of the Monchetundra massif (Fig. 1). The age of baddeleyite was estimated (Nerovich et al., 2014) by the U-Pb method at 2476±5 Ma and 2471±3 Ma (Fig. 2, Table 1).

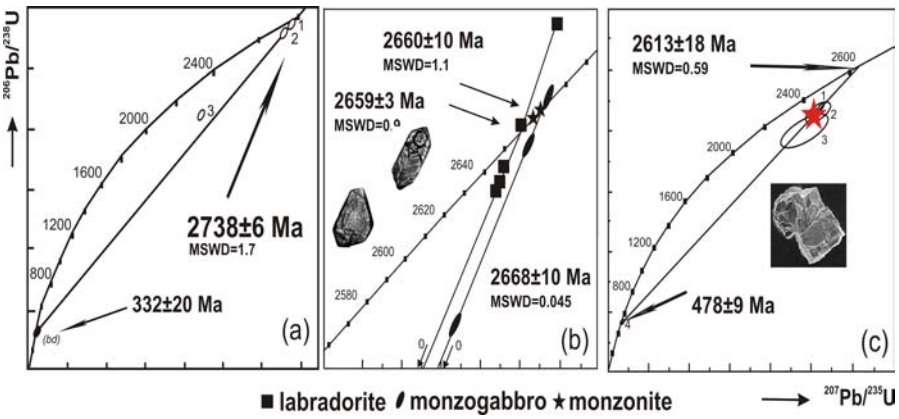


Fig. 2: Isotope U-Pb plots with Concordia for baddeleyite (*bd*) at the western slope of the Monchetundra: *a* – medium- to coarse-grained gabbronorite-anorthosite, partly amphibolite, *b* – medium- to coarse-grained leucogabbronorite.

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Table 1: Isotope U-Pb data on baddeleyite from the Monchetundra massif.

Sample, No.	Weighted sample, mg	Contents, ppm		Isotope composition of Pb*			Isotope ratio and age, Ma**			Rho
		Pb	U	$^{206}Pb/^{204}Pb$	$^{206}Pb/^{207}Pb$	$^{206}Pb/^{208}Pb$	$^{207}Pb/^{235}U$	$^{206}Pb/^{238}U$	$^{207}Pb/^{206}Pb$	
for baddeleyite and gabbronorite-anorthosite (medium- to coarse-grained, partly amphibolized)										
1	0.25	94.48	114.75	86	3.3003	2.2134	9.92226	0.450763	2500	0.70
2	0.20	57.60	123.14	570	5.5602	11.459	9.08165	0.417879	2430	0.93
3	0.25	30.09	67.86	557	5.6496	8.0718	8.19067	0.385383	2392	0.88
for baddeleyite from medium- to coarse-grained gabbronorite-anorthosite										
1	0.50	110.70	244.90	1478	5.9187	23.690	9.504470	0.429716	2460	0.94
2	0.35	152.60	359.10	3510	6.1640	35.011	9.119096	0.413367	2441	0.95
3	0.50	60.479	136.81	830	5.5615	13.663	8.820570	0.400447	2453	0.91
4	0.20	98.025	246.35	1539	6.3461	24.580	8.368770	0.382377	2437	0.83

** The ratios are corrected for blanks of 0.8 ng for Pb and 0.04 ng for U and mass discrimination 0.12 ± 0.04%.*
*** Correction for common Pb is estimated for the age, according to Stacey and Kramers (1975).*

The REE content and distribution in baddeleyite were estimated by the following technique. The method of the electron (LEO-1415) and optic (LEICA OM 2500 P, camera DFC 290) spectroscopy was used to study the morphology of samples. Points for local analyses on baddeleyite crystals were selected based on the study of their back-scattered electron (BSE) and cathodoluminescence (CL) images.

Contents of REE and other elements were estimated *in situ* by ICP-MS on an ELAN 9000 DRC-e (Perkin Elmer) quadrupole mass spectrometer equipped with a 266 nm UP-266 MACRO laser (New Wave Research). LA-ICP-MS was performed using argon with a repetition rate of 10 Hz, pulse duration of 4 ns, the energy density of 14-15 J/cm^2 at a spot with a diameter of 35-100 μm or using scanning "in a line" (length 35-70 μm), monitoring and measuring produced craters. NIST 612 glass with the known concentrations of REE, U, Ti, and Th of 40 ppm was used for external calibration as a multi-point calibration forced through the origin after blank correction (Pearce et al., 1997, Certificate of Analysis, 2012). NIST SRM 610 sample (450 ppm concentration) was used to check the accuracy of estimations (Yuan et al., 2004; Jochum et al., 2011). The laser beam diameter was changed, while the rest parameters were stable: from 35 to 240 μm (point sampling) and from 20 to 155 μm (r = 0.999) (scanning "in a line"). As for calibration standards, measurements of the elements were in the range of 15% relative deviations. Determination limits were within 0.01 ppm, a diameter of the laser beam of 155 μm. It complies with the available data (Yuan et al., 2004). This technique was tested, using analyses of internationally approved standard zircon samples 91500, TEMORA 1, Mud Tank, and inter-laboratory cross-checks (Boynton, 1984).

III. Results

Table 2 and Figure 3 provide new data on the contents of REE and other elements in baddeleyite from Pt-Pd occurrences of the Monchetundra massif.

Baddeleyite from vein pegmatites with the gabbronorite composition from the Monchepluton with Cu-Ni reefs (Mt. Nyud, Terrace deposit) was studied. Its U-Pb age was estimated at 2505±5 Ma (Bayanova, 2006). Figures 4 and 5 display new LA-ICP-MS data on baddeleyite, which was measured along and across its section.

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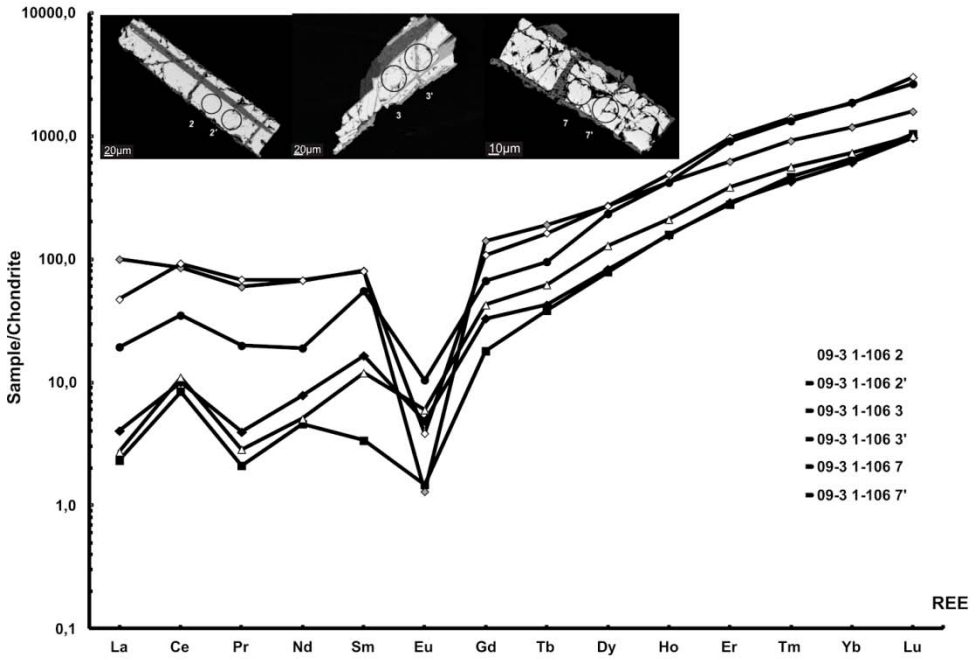


Fig. 3: Chondrite-normalized plots of REE distribution in baddeleyite from medium- to coarse-grained leucogabbronorite of Pt-Pd occurrences, Monchetundra massif (Boynton et al., 1984).

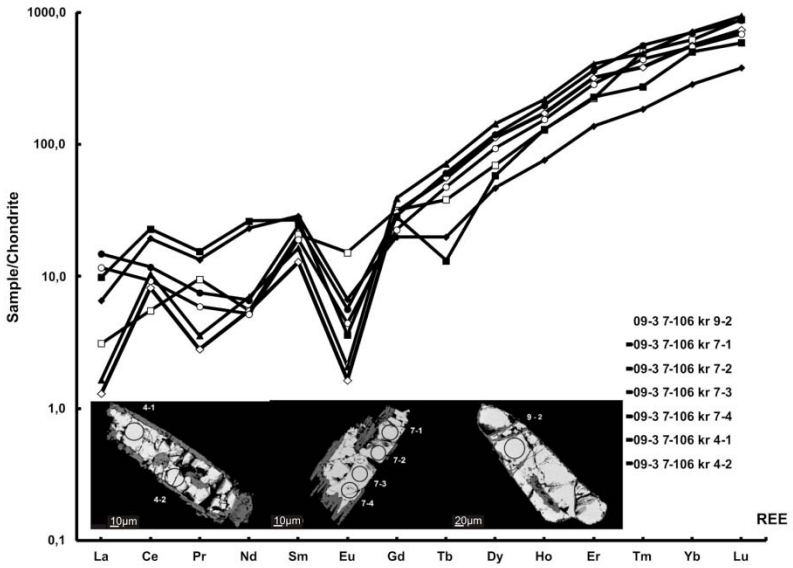


Fig. 4: Chondrite-normalized plots of REE distribution in baddeleyite from gabbronorite-anorthosite of Pt-Pd occurrences, Monchetundra massif (Boynton et al., 1984).

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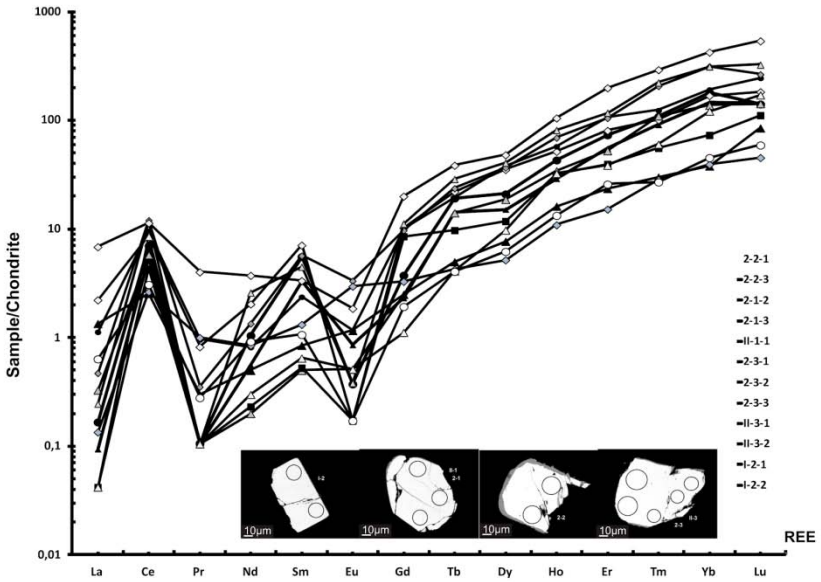


Fig. 5: Chondrite-normalized plots of REE distribution in baddeleyite from vein pegmatites of the gabbronorite composition, Cu-Ni Terrace deposit, Mt. Nyud, Monchetundra massif (Boynton et al., 1984).

Notably, spectra of REE distribution in baddeleyite grains from PGE rocks of the Monchegorsk ore area indicate low concentrations of light elements, high concentrations of heavy ones, steep positive slope with a negative Eu-anomaly and a positive Ce-anomaly. The spectra also reflect the magmatic origin of baddeleyite (Zircon, 2003; Watson et al., 2006).

IV. Conclusion

For the first time, the provided research revealed a direct relation between the REE content in baddeleyite and the formation of Pt-Pd and Cu-Ni reefs. The higher concentrations of HREE in baddeleyite, the higher temperatures of the U-Pb systematics closure and formation are. Pt-Pd reefs are likely to occur under such conditions. Cu-Ni reefs form at lower temperatures of the U-Pb systematics closure and crystallization of accessory minerals. These occurrences display low HREE and a wide range of LREE concentrations (Table 2).

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Table 2: LA-ICP-MS data on contents of REE and other elements in grains of baddeleyite and zircon from Pt-Pd and Cu-Ni reefs of the Monchegorsk ore area.

Contents (average in crystal), *ppm*																						
Sample			Ti	Y	La	Ce	Pr	Nd	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu	Hf	Th	U	Σ REE	T°C
Sample *1*	*Bd*	2	645.2	230. 3	0.75	5.65	0.29	2.90	1.52	0.18	5.23	1.51	20.5	8.90	46.8	11.4	107.4	25.5	461 7	2.82	68.2	238.5	> 1000° C
		3	468. 7	429.5	12.1	29.4	2.96	16.9	7.08	0.21	18.9	4.72	50.9	17.8	83.1	18.8	162.2	32.7	297 0	9.51	212.6	457.8	
		7	1212	848. 5	7.89	39.0	4.19	20.1	10.3	0.41	18.0	4.83	63.8	25.7	155.5	34.9	315.3	72.0	7453	73.8	172.4	771.9	
Sample *2*	*Bd*	4	260.0	108.6	0.38	2.11	0.43	1.60	1.58	0.55	3.46	0.88	11.1	4.80	24.6	8.30	69. 2	14.5	306 0	12.6	58.2	143.5	
		7-1-2	432.2	264. 0	1.54	5.35	0.41	2.50	2.45	0.18	5.47	1.94	26.2	9.30	50.1	10.5	94.6	18.1	1413	25.9	89.4	228.6	
		7-3-4	549. 9	335.9	1.96	6.80	0.53	3.17	3.11	0.22	6.96	2.47	33.4	11.8	63.8	13.4	120.4	23.0	1797	32.9	113.7	291.0	
		9	878.5	155.7	1.95	12.9	1.37	11.5	4.23	0.30	4.94	0.62	11.3	5.85	30.3	5.85	67.1	12.4	5653	31.1	108.1	170.6	
Sample *3*	*Bd*	I 2	1637	21.1	0.09	1.76	0.06	0.41	0.18	0.09	0.54	0.16	1.45	0.69	3.41	0.71	7.22	1.33	6132	2.83	196.5	18.1	
		II 3	2358	38.6	0.01	3.95	0.01	0.06	0.01	0.02	1.00	0.06	2.49	1.82	6.49	1.48	16.6	3.60	5761	3.04	213.8	37.6	
		II 2	3949	132.9	3.88	26.1	0.60	5.96	1.52	2.22	5.58	1.40	14.4	4.19	19.1	4.81	49.1	10.6	10225	27.6	1057	149.5	
		II 1	940. 1	20.4	0.32	1.56	0.03	0.23	0.13	0.07	0.51	0.19	1.96	0.92	3.90	0.77	6.47	2.16	3068	3.51	135.8	19.2	
		2-1	6015	52.4	0.20	4.33	0.03	0.57	0.81	0.03	1.12	0.69	6.06	2.34	11.6	2.56	28.2	3.96	17905	13.5	306.1	62.5	
		1-1	3742	60.6	0.17	4.56	0.04	0.24	0.37	0.14	1.35	0.62	7.18	2.56	12.5	3.04	29.3	4.85	809 6	14.7	185. 8	66.9	
		1-3	4876	108.1	0.60	7.16	0.14	1.20	0.69	0.11	2.81	1.14	10.7	4.84	23.4	6.16	59. 8	9.5 9	175 43	10.6	303. 3	128.3	
	Zr	II 1	51.1	638. 3	0.18	15.6	0.31	5.51	7.77	0.80	32.6	6.63	71.7	20.9	75.5	12.5	96. 6	14.2	900 9	559. 0	242. 5	360.8	aver. 894° C
		II 2	44.6	322. 1	0.13	15.7	0.95	7.47	8.17	1.07	26.7	5.58	43.2	10.4	32.4	4.96	32. 4	3.99	731 1	166. 6	71.9	193.1	
		II 3	35.2	718. 0	0.03	13.4	0.06	0.70	2.03	0.14	15.3	4.66	61.2	22.2	100. 0	18.3	148.5	23.1	913 3	207. 9	121. 9	409.6	
		II 4	37.6	392. 1	0.34	11.9	0.30	3.17	4.54	0.80	16.9	4.16	42.3	11.9	44.3	7.60	60. 7	8.91	8570	346. 2	217.6	217.8	
		III 1	13.1	649. 3	0.22	14.3	0.43	6.13	7.57	0.38	30.8	7.44	74.8	21.6	71.9	11.4	90. 2	10. 7	369 6	325.8	122. 5	347.9	
		III 2	64.1	3112	0.26	69.2	1.43	17.4	31.7	2.45	140. 0	32.0	327. 4	100. 1	386. 3	63.1	524	73.9	837 4	127 1	428.6	1769	
		III 3	118. 4	703. 4	0.13	19.9	0.85	11.2	10.0	2.03	34.7	8.69	81.8	21.9	71.8	13.0	104.6	13. 5	214 22	166 9	664.8	394.1	

Note: 1- baddeleyite from gabbronorite -anorthosite, 2 - baddeleyite from medium- to coarse -grained leucogabbronorite, 3- sample from vein pegmatites of the gabbronorite composition. Temperature of zircon and baddeleyite crystallization is calculated according to [3].

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Emission of CO2 from the Consumption of Electric Power and Fuel in Mato Grosso do Sul: A Data Envelopment Analysis

By Raul Asseff Castelao, Daniel Massen Frainer, Celso Correia De Souza & Joao Bosco Ardues Carneiro Junior
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Abstract- With the progress of humanity, energy production and consumption has gradually increased over the years. In mid-1970, energy production and consumption started to have importance not only to progress and to the society, but also to the environment and, in this case, its impacts on the environment also increased, causing, for example, greenhouse gas emissions. Thus, understanding the relationship between energy consumption and its effects on society and the becomes essential for companies to achieve the goals of sustainable development. In this sense, the objective of this article is to identify the municipalities of the state of Mato Grosso do Sul with greater efficiency in the years 1991, 2000 and 2010 from the data envelopment analysis of 78 municipalities. As a result, only one municipality has very high efficiency regarding the energy consumption, population density, gross domestic product and fuel consumption and observed a reversal of efficiency between the years of 1991, 2000 and 2010 resulting in a worsening in the efficiency of the municipalities in terms of the relationship of energy consumption and its effects on the population and the environment.

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Emission of CO_2 from the Consumption of Electric Power and Fuel in Mato Grosso do Sul: A Data Envelopment Analysis

Raul Asseff Castelao [α], Daniel Massen Frainer [σ], Celso Correia De Souza [ρ] & Joao Bosco Ardues Carneiro Junior [ω]

Abstract- With the progress of humanity, energy production and consumption has gradually increased over the years. In mid-1970, energy production and consumption started to have importance not only to progress and to the society, but also to the environment and, in this case, its impacts on the environment also increased, causing, for example, greenhouse gas emissions. Thus, understanding the relationship between energy consumption and its effects on society and the becomes essential for companies to achieve the goals of sustainable development. In this sense, the objective of this article is to identify the municipalities of the state of Mato Grosso do Sul with greater efficiency in the years 1991, 2000 and 2010 from the data envelopment analysis of 78 municipalities. As a result, only one municipality has very high efficiency regarding the energy consumption, population density, gross domestic product and fuel consumption and observed a reversal of efficiency between the years of 1991, 2000 and 2010 resulting in a worsening in the efficiency of the municipalities in terms of the relationship of energy consumption and its effects on the population and the environment.

I. Introduction

Economic growth and energy are related topics between themselves, in the light of the modifications of the energy matrix from the industrial revolution and, since then, the use of fossil energy in the world has been growing and creating a link of dependency with the productive sector. In addition to this question, higher energy consumption from the decade of 1970 draws attention to the effects on the environment (ANDRADE and MATTEI, 2011).

The energy consumption is an object of great discussions when it comes to the conditions of developing countries. Being the basis of productive activities, inevitably, the energy consumption causes impacts on the environment. Therefore, if in the past the energy was seen only as an input for the production, currently, is at the center of the debate of environmental preservation (MONTEIRO *et al*., 2012).

The study of the relationship among energy development, production and consumption and their effects, including greenhouse gas emission (GHG), it is a topic widely discussed in the national and international literature (DOGAN and SEKER, 2016; LIU, 2017) (GUNEY, 20019).

Some developed studies demonstrate the correlation and even the cause-and-effect relationship among energy consumption and the quality of life and social progress, as is the case mentioned by Palmira *et al*. (2018), they describes that investment in renewable energy use benefits the society allowing, including a reduction in the emission of greenhouse effect gases.

In this sense, it is clear that the global model of production and use of energy, mostly depend on fossil fuels, which in turn emit greenhouse gases causing damage to the environment (HINRICHS and KLEINBACH, 2003).

According to the International Panel on Climate Change (IPCC), the advance of anthropogenic emissions of greenhouse gases is the predominant cause of global warming (LEAL, 2015). In a complementary way, the world energy report, produced by the International Energy Agency (IEA), exposes the report of 2018 that the governments of the major world powers have made clear the message that, about to the promises on the issue of climate change, that the use of fossil fuels, particularly natural gas and oil, will continue to be based on the energy system (IEA, 2018).

Continuous Emissions of GHG will cause more heating and have the potential to seriously damage the natural environment, and affect the global economy becoming the most urgent global threat more in the long term for the prosperity and security of future generations (ZHANG, 2016).

The IEA projections indicate that global demand for energy will pass be 17.3 billion tons of oil equivalent (toe) in 2030. In this case, the demand would be met by the supply of sources that emit greenhouse gases in their majority, resulting in greater participation in the global energy matrix in 2030 (IEA, 2018).

Due to that, the concern with the energy production and use, and their impacts on the environment and society, has gained prominence, allowing the development of actions to improve the energy production and consumption also guaranteeing the reduction of GHG emissions, among them, the CO_2.

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The reduction of CO_2 emissions is seen as one of the items of the Sustainable Development Goals (SDGs) of the United Nations Organization (UNO). Goal 7, which deals with clean and affordable energy, establishes that the reduction of emission levels of CO_2 is fundamental to achieving this goal (UN, 2018).

The ODS has been defined also in terms of identifying the need to work the use of energy related to sustainable development. According to UN data (2016), the use of energy from fossil fuels is responsible for around 60% of total GHG emissions, ratifying the importance of production and use of clean energy in order to mitigate GHG emissions and for sustainable development (APERGIS *et al*., 2018).

Overall there are seventeen Sustainable Development Goals (SDGs) and 169 goals, which range from issues such as, for example, combating poverty through the conservation of biodiversity in rivers, lakes, and oceans (MARCOVITCH, 2016).

In Brazil, the electric energy consumption in 2016 amounted to 460.8 TWh, value 0.9% lower than the one registered in 2015, and the per capita consumption of 2,228 $kWhhab^{-1}$. According to EFE (2017), the sectors that contributed most to this reduction were the industrial (-1.3%), followed by energy (-7.7%) and commercial (-2,4%).

In Mato Grosso do Sul (MS), in the last ten years, the main source of energy was water, however, the largest source of energy consumption by the productive sector was the firewood, with 30% of the total, on average. Still, the energy use increased from 5,077.89 tons of oil equivalent (toe) in 2010 to 5,379.66 in 2015, reaching to consume 7,757.77 PTE in 2014, an increase of 5.94% (BEN-MS, 2016).

Regarding the emission of GHG emissions, in 2016, the total number of anthropogenic emissions associated with the Brazilian energy matrix reached 428.95 million tons of carbon dioxide equivalent (Mt CO2-eq), being the largest part (194.3 Mt CO2-eq) generated by the transport sector. In 2010, the carbon intensity of the economy was 0.15 kg CO_2 $(US\$ppp)^{-1}$. According to IEA (2014), Brazil remains less intense in carbon about European economies (-11%), North American (-50%), and Chinese (-70%). The Brazilian electrical sector issued, on average, 101.3 kg CO_2 to produce 1 MWh of energy, very low index when compared with countries of the European Union (366.2) (489.2) and China (772.1) (EPE, 2017).

The system of Estimates of Emissions and Removals of Greenhouse Effect Gases (SEEG) produces annual estimates of emissions of greenhouse gases (GHG) in Brazil, according to the guidelines of the Intergovernmental Panel on Climate Change (IPCC). From the data of the platform SEEG, 1.58 billion tons of CO_2, being that the change of land use forest was dumped in the country, an increase of 12% compared to the year 2015.

Historically, 83% of the CO_2 emissions in Mato Grosso do Sul, between 2002 and 2014 occurred in function of the sector of land use change. The energy sector is the second sector that emitted CO_2 the most along the historical series, 15.45%, and the fourth and fifth placings, respectively, industry and waste, with 0.93% and 0.004% (SEEG, 2017).

When disaggregating the MS data of the sectors regarding the emission of CO_2 of the SEEG basis, it is realized that the land use change for farming and other activities represents 83.6% of the total real change of soil, being the main source of induction for the emission of CO_2 in the State. In the case of the energy sector (which belongs to the group of services), the transport activity represents 60.7% of the total of the sector.

The average estimated emission of CO_2, the group land-use change, is approximately 30.76 million tons and the energy sector of 5,690 million tons. Industrial processes and wastes have an average of 342 thousand tons and 1.43 billion tons of CO_2. With the record of emissions in 2015 and 2016, MS is in 14th place in the ranking of Brazilian state emitters of CO_2 (SEEG, 2017).

Due to the emission of GHG emissions in the environment, derived from the production and consumption process, which in turn, demand energy, this article has as objective to identify the municipalities of the state of Mato Grosso do Sul with greater efficiency, being that the interpretation of this efficiency means having good results in the local quality of life with low consumption of electrical energy and fuels.

Thus, the work has sought to describe the effects of GHG emissions in a state that has three biomes (Pantanal, Cerrado and Atlantic Forest), among which two are recognized by UNESCO (2000) as humanity world heritage. Therefore, the relevance of the work consists of identifying the municipalities that best promote quality of life for its citizens with low power consumption, thus ensuring better conservation and maintenance of natural resources existing in the state.

II. Material and Methods

In the present study, the universe considered are 78 cities of Mato Grosso do Sul, where the indicators related to growth and economic development, as well as the consumption of electrical energy in these municipalities will be analyzed. The municipality of Paraíso das Águas was created in 2003 and, therefore, has no data in the same period of research, being thus removed from the survey universe. The historical and comparative statistical methods will serve as auxiliary methods in the search for the identification of the efficiency of the municipal energy consumption.

From the context that energy efficiency can contribute to the environment and the society itself it will

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be carried out, using data envelopment analysis (DEA), based on secondary data, if there is efficiency in the use/consumption of electric energy in the selected municipalities.

The data envelopment analysis (DEA) was developed by Charnes *et al*. (1978) and is based on the use of linear programming for analysis of measures of comparative efficiencies of the so-called decision making units (DMU), which uses the same inputs to generate the same outputs (ANGULO-MEZA *et al*., 2005).

The DMU_0 technical efficiency will be achieved through a PPNL (problem of non-Linear Programming), model (1), in which the technical efficiency is obtained by maximizing the division between the weighted sum of "Outputs" (*outputs*) by the weighted sum of the "inputs" (*inputs*) (FERREIRA and GOMES, 2009).

$$Max\ H_0 = \frac{\sum_{j=1}^{s} u_j y_{j0}}{\sum_{i=1}^{r} v_i x_{i0}} \qquad (1)$$

$$\begin{cases} \dfrac{\sum_{j=1}^{s} u_j y_{jk}}{\sum_{i=1}^{r} v_i x_{ik}} \leq 1 \\ u_j\ ,\ v_i \geq 0 \end{cases}$$

subject to:

$$\forall\ i,\ j\ ,k\quad (i = 1,2,\cdots,r\ ;\ j = 1,2,\cdots,s\ ;\ k = 1,2\ ,\cdots,n)$$

Where: H_0 = efficiency of DMU_0; r = quantity of *inputs*; s = quantity of *outputs*; n = number of DMU; y_{jk} = value of *the dmu output* j_k; x_{ik} = value of the *input* i for the DMU_k; u_j = weight on the *output j*; v_i = weight on the *input* i; y_{j0} = value of the *output* j of the DMU_0 (DMU_0 = DMU observed); x_{i0} = value of the *input* of the DMU_0.

The model (1) involves searching for values for u and v, also called multipliers, which are the weights, to maximize the weighted sum of the outputs (output virtual) divided by the weighted sum of the inputs (input) of the DMU_0 in the present study, subject to the restriction that this ratio is lower than or equal to one, for all the DMU_k. This function is subject to the restriction that when the same set of coefficients of you j input and output v_i are applied to all other units of services that are being compared, no unit will exceed 100% efficiency, or a ratio of 1.00.

In general, there are two models of DEA: BCC and CCR. The DEA -BCC model is based on the condition of scale variable returns, while the DEA-CCR model is based on constant scale returns. The data envelopment analysis also us to be oriented to inputs or outputs. In the case of being oriented to inputs, efficiency means that there should be reduction of resources, maintaining the same level of production, and the version is oriented toward outputs, remains unchanged the inputs (BANKER *et al*., 1984).

The DEA models may produce DMUs falsely v, because, if the DMU's number is too large, the application of the BCC model, usually results in benevolent results due to the characteristics of the mathematical model, which does not happen with the CCR model (ALI, 1993; ANGULO-MEZA *et al.*, 2005).

In order to avoid the false-positive results the reversed border will be used for the analyzes of the results. The reversed border takes into consideration the reversal between input and output, allowing two interpretations: (i) the inefficient border consists of DMUs with the worst managerial practices, and (ii) that these same DMUs have the best practices, considering the opposite bias (SOARES DE MELLO *et al*., 2003).

If a DMU has high efficiency, this must be a result close to 1 in the standard default border and low level about the reversed border. Thus, it is not enough for the DMU to have a result considered efficient in what it is considered the best, but also it may not have poor performance when the analysis is its weak points (PIMENT *et al*., 2004).

In addition to the use of the reversed border, the composed border will be used for data analysis, whose result is through the standard border and the inverted one, using the arithmetical average between the standard efficiency, and the value of the complement of reversed efficiency, equation (2).

$$\text{Composite efficiency} = \frac{\text{Standard efficiency} + (1 - \text{Inverted efficiency})}{2} \qquad (2)$$

Those DMUs with efficiencies equal to 1 at the composed border will be considered with ideal levels of efficiencies. In table 1 the ranges of scales of efficiency for the DMUs in analyzes are described, taking as a reference to the ranges of the results of the Human Development Index (I.D.A.) of UNDP. This scale of outcome is adopted due to dealing with I.D.H. as being one of the most robust and accepted parameters for measuring the development, both human and social of a given locality.

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Table 1: Ranges and levels of efficiencies

Range of efficiency	Level of efficiency in the Standard border	Level of efficiency in the Reversed border
0.0000 – 0.4999	Very low	Fully Efficient
0.5000 – 0.5999	Low	Very High
0.6000 – 0.6999	Medium	High
0.7000 – 0.7999	High	Medium
0.8000 – 0.9999	Very High	Low
1	Fully Efficient	Very low

Source: Adapted from PNUD (2013).

For the analysis of the use of electrical energy in Mato Grosso do Sul, it takes into account that each of the 78 selected municipalities will be a DMU. The array of variables is given in Table 2.

Table 2: Variable, source and function

Variable	Source	Function
Residential consumption of energy	SEMAGRO	Input
Demographic density	IBGE	Input
GDP	IBGE	Output
Fuel Consumption	SEMAGRO	Output

For the calculation of demographic density, it was necessary to calculate year to year, the ratio between the size of the population and the size of the municipality to define this indicator from year to year. For the years 1991, 1995, 1998, 2000 and 2010 the areas of the municipalities are informed and were replicated for the remaining years sequentially. The size of the population of the municipalities, either estimate or census, are made available annually. The consumption of electrical energy, the GDP, and estimation of emission of CO_2 have data for all years.

Due to the data availability, the historical series covers the years 1991, 2000 and 2010. The option for the used variables had as a first criterion to be variables which the UN works on measuring sustainable development through its guide "Sustainable Development Indicators: landmark and methodologies" and second, to be able to describe the variables, population growth and its consequent pressure on the environment, in this case, measured by the CO_2 emission.

Based on the selected variables, it is assumed that these can be considered as primary indicators of CO_2 emission in the cities of Mato Grosso do Sul. Still, the energy consumption and total fuel (petrol, ethanol, diesel and aviation kerosene) remain as proxy variable for the impact on the environment through CO_2 emission.

III. Results and Discussion

After the development of the models application, it was possible to observe that the best model, one that showed the best results was the DEA - BCC model, both directed to inputs and products, therefore, was the one that best represented the production border of the DMU's, in the specific case, the municipalities.

In response to the objective of the study, it was chosen to emphasize to the products-oriented models by adopting the bias to produce better results (maximize production), keeping constant the resources, i.e., it is sought to increase the products without changing the inputs.

The main concept regarding the best assessment, i.e., more efficiency, is not the municipality that holds more volume, but rather, the one uses the best resources that the same has. Therefore, the best municipality is the one that shows more efficient allocation of resources and investments, increasing the products/services offered to the local population, and not the one that holds greater absolute volume of resources.

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From the results obtained in the DEA _BCC, model, it is noted that there is a reversal of efficiency along the historical series (Table 1).

Table 1: Representation % of municipalities and their level of efficiency

Level of efficiency	1991	2000	2010
Fully Efficient	-	-	-
Very High	15%	10%	4%
High	13%	4%	4%
Medium	23%	21%	10%
Low	21%	19%	23%
Very Low	28%	46%	59%

While in 1991, 28% of the 78 cities studied had high and very high efficiencies, in 2010, twenty years later, only 8% reported similar results. Only Jaraguari remained as high efficiency and very high in 1991, 2000 and 2010. In contrast, as the years went by a significant increase of municipalities in the range from very low efficiency was registered, leaving 28% from 78 to 59% of the total.

The year of 1991 can be considered the best of the studied period, because it presents a greater number of municipalities considered of high and very high efficiencies. As hypotheses for these results, the size of the population and the level of economic activity that was relatively minor compared to the year 2000 and 2010, can explain, at least in part, this beneficial effect for the municipalities and the environment.

The municipality of Jaraguari presents itself as the best efficiency considering the historical series, followed by Bandeirantes and Ribas do Rio Pardo. The fact that the ten-best place on efficiency are the municipalities with less than twenty thousand inhabitants, with little dynamic economic matrix.

Regarding the main cities of the State in terms of population, the best place from the geometric mean was Corumbá, in 29th position. Campo Grande, the capital of the State, appears in 43rd position, Dourados in 51st and Três Lagoas in 52nd position.

In the variation among the years considered in the survey, it was noted a significant improvement in the efficiency of the largest municipalities of MS (Table 2).

Table 2: Position of the municipalities in the *ranking* of the State per year.

Municipality	1991	2000	2010
Campo Grande	52nd	50th	30th
Corumbá	43th	51th	22nd
Dourados	53rd	52nd	51th
TrêsLagoas	55th	65th	32nd

In table 3 the position of each municipality of MS for each year studied is exhibited.

Table 3: Ranking of municipalities of MS per year

Locality	1991	2000	2010	Locality	1991	2000	2010
Água Clara	67	7	44	Itaporã	57	32	38
Alcinópolis	70	11	21	Itaquiraí	72	46	11
Amambai	39	24	39	Ivinhema	34	62	25
Anastácio	3	31	62	Japorã	75	70	31
Anaurilândia	38	21	56	Jaraguari	2	4	5
Angélica	45	61	36	Jardim	4	71	70
Antônio João	26	56	42	Jateí	44	66	52
Aparecida do Taboado	20	44	55	Juti	17	28	41
Aquidauana	11	74	61	Ladário	64	77	76

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Aral Moreira	41	60	40	Laguna Carapã	77	8	24
Bandeirantes	1	3	16	Maracaju	69	14	7
Bataguassu	6	12	15	Miranda	5	20	28
Batayporã	32	36	18	Mundo Novo	28	64	57
Bela Vista	21	75	29	Naviraí	71	67	53
Bodoquena	30	43	46	Nioaque	49	57	37
Bonito	24	30	35	Nova Alvorada do Sul	68	10	3
Brasilândia	76	35	34	Nova Andradina	58	25	23
Caarapó	61	27	13	Novo Horizonte do Sul	73	17	63
Camapuã	29	48	20	Paranaíba	19	68	66
Campo Grande	52	50	30	Paranhos	14	69	78
Caracol	33	38	72	Pedro Gomes	13	45	64
Cassilândia	10	18	49	Ponta Porã	18	78	71
Chapadão do Sul	63	1	2	Porto Murtinho	37	37	19
Corguinho	42	33	69	Ribas do Rio Pardo	35	2	4
Coronel Sapucaia	8	59	73	Rio Brilhante	54	41	6
Corumbá	43	51	22	Rio Negro	23	55	74
Costa Rica	51	6	8	Rio Verde de Mato Grosso	15	29	14
Coxim	9	39	33	Rochedo	47	23	60
Deodápolis	27	19	59	Santa Rita do Pardo	78	15	43
Dois Irmãos do Buriti	50	42	48	Sao Gabriel do Oeste	40	5	10
Douradina	74	63	75	Selvíria	31	49	1
Dourados	53	52	51	Sete Quedas	7	76	77
Eldorado	25	58	47	Sidrolândia	65	13	9
Fátima do Sul	62	73	67	Sonora	60	16	27
Figueirão	56	53	26	Tacuru	36	54	54
Glória de Dourados	46	40	68	Taquarussu	48	47	65
Guia Lopes da Laguna	12	22	45	Terenos	16	9	17
Iguatemi	22	26	50	Três Lagoas	55	65	32
Inocência	66	34	12	Vicentina	59	72	58

From these results it is possible to observe the existence of change for lower in most of the municipalities in the passage of the years 1991 to 2010, and soon after, a slight improvement between 2000 to 2010. This result might have been achieved due to improvements in both energy consumption and by part of the population and economic growth.

More abrupt variations also stand out such as, for example, Bandeirantes, Costa Rica, Inocência, Jardim, Miranda, Nova Alvorada do Sul and Sidrolândia which changed the efficiencies more significantly, both for the purpose of better or worse efficiencies.

Regarding the general index calculated based on the efficiency of municipalities, Jaraguari leads the ranking, followed by municipalities Bandeirantes, Ribas do Rio Pardo, Bataguassu and Chapadão do Sul. Ladário, Santa Rita do Pardo, Douradina, Sete Quedas and Paranhos have the lowest efficiency (Table 4).

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Table 4: Ranking of municipalities of MS per year

Locality	Compound	Position	Locality	Compound	Position
Jaraguari	0.86332	1st	Eldorado	0.50262	40th
Bandeirantes	0.797855	2nd	Dois Irmãos do Buriti	0.502114	41st
Ribas do Rio Pardo	0.764601	3rd	Ivinhema	0.501462	42nd
Bataguassu	0.718993	4th	Campo Grande	0.5	43th
Chapadão do Sul	0.699744	5th	Pedro Gomes	0.490507	44th
Terenos	0.697507	6th	Alcinópolis	0.487272	45th
Sao Gabriel do Oeste	0.678401	7th	Rochedo	0.485895	46th
Miranda	0.671448	8th	Nioaque	0.485031	47th
Costa Rica	0.659078	9th	Tacuru	0.478134	48th
Selvíria	0.658475	10th	Aral Moreira	0.475379	49th
Rio Verde de Mato Grosso	0.655793	11th	Angélica	0.467874	50th
Coxim	0.624702	12th	Dourados	0.466595	51th
Nova Alvorada do Sul	0.619682	13th	Três Lagoas	0.448169	52nd
Cassilândia	0.610265	14th	Mundo Novo	0.44206	53rd
Guia Lopes da Laguna	0.606411	15th	Itaquiraí	0.428691	54th
Batayporã	0.598736	16th	Jateí	0.427158	55th
Juti	0.585282	17th	Corguinho	0.426235	56th
Rio Brilhante	0.584991	18th	Taquarussu	0.423118	57th
Porto Murtinho	0.584737	19th	Glória de Dourados	0.417898	58th
Sidrolândia	0.579103	20th	Caracol	0.4122	59th
Bonito	0.574826	21st	Bela Vista	0.404383	60th
Camapuã	0.572985	22nd	Paranaíba	0.396612	61st
Amambai	0.557481	23rd	Aquidauana	0.396234	62nd
Iguatemi	0.556505	24th	Jardim	0.393169	63rd
Anastácio	0.555731	25th	Vicentina	0.365261	64th
Caarapó	0.555245	26th	Coronel Sapucaia	0.356066	65th
Nova Andradina	0.545147	27th	Laguna Carapã	0.346022	66th
Sonora	0.543096	28th	Naviraí	0.336932	67th
Corumbá	0.540953	29th	Rio Negro	0.334412	68th
Inocência	0.534446	30th	Novo Horizonte do Sul	0.317834	69th
Bodoquena	0.533529	31st	Brasilândia	0.30686	70th
Maracaju	0.532483	32nd	Fátima do Sul	0.305024	71st
Água Clara	0.527542	33rd	Ponta Porã	0.29	72nd
Deodápolis	0.527122	34th	Japorã	0.267474	73rd
Aparecida do Taboado	0.526832	35th	Paranhos	0.229639	74th
Anaurilândia	0.520804	36th	Sete Quedas	0.202064	75th
Itaporã	0.514233	37th	Douradina	0.186243	76th
Figueirão	0.510624	38th	Santa Rita do Pardo	0.14476	77th
Antônio João	0.508492	39th	Ladário	0.144015	78th

The general result reveals no municipality with a result considered as being of full efficiency, one where the combination among the development of the population, environment and society itself happens without loss of structural funds for any one of these variables, However, there have been many municipalities considered of low degree of efficiency.

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IV. Conclusion

From the use of the data envelopment analysis, it was possible to identify that only the municipality of Jaraguari is the one that presents better results in terms of efficiency and its relationship with the environment.

The existence of a reversal of efficiency between the years of 1991, 2000 and 2010 was observed regarding a larger number of municipalities with very low degree of efficiency and low in 2010 compared with 1991, i.e., a worsening is depicted in the municipalities efficiency considering the variables of energy consumption, population density, GDP and fuel consumption.

Part of this result can be explained by the increase of population and economic growth (measured by GDP) once when there is an increase of these two variables, the trend, *ceteris paribus*, is that there is greater pressure on the fuel and energy consumption.

Although there are improvements in 2010, the largest cities in the State also presented results of average efficiency, corroborating with the result somewhat positive in terms of emission of greenhouse effect gases in the state of Mato Grosso do Sul.

From this result, the necessity is evident of deepening the construction of public policies and even of the population awareness regarding the use/demand for energy and fuel in order to settle the emission of greenhouse gases, especially carbon dioxide in Mato Grosso do Sul, aiming at the environment and well-being preservation.

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Epidemics during Grand Solar Minima

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Abstract- Historical and geographical study of epidemics that affected the population of the Old World from the Stone Age to the present day shows that their development took place against the background of major anomalies in various geospheres. Obviously, an important role in the spread of pathogenic organisms was played by the situation of solar minima, which reveal a centuries-old cyclical repeatability. The last change in the periods of the 179-year and 1430-year cycles of the Solar system and the biosphere occurred in April 1990. The events of recent years and months follow a General pattern.

Keywords: *epidemics, solar activity, the earth disturbance, cycles.*

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Epidemics during Grand Solar Minima

Alexey Ju. Retejum

Abstract- **Historical and geographical study of epidemics that affected the population of the Old World from the Stone Age to the present day shows that their development took place against the background of major anomalies in various geospheres. Obviously, an important role in the spread of pathogenic organisms was played by the situation of solar minima, which reveal a centuries-old cyclical repeatability. The last change in the periods of the 179-year and 1430-year cycles of the Solar system and the biosphere occurred in April 1990. The events of recent years and months follow a General pattern.**

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HighLights

- Major epidemics in the history of mankind over the past 3-5 thousand years, as a rule, developed against the background of global anomalies in different geospheres.
- A prerequisite for the spread of dangerous infectious diseases is the periodic weakening of solar activity.
- The epidemic process is one of the links in the chain reaction that the planet Earth responds to the disturbance from space.

I. Introduction

In 2017, the journal Astrobiology & Outreach published an article [1] in which a group of scientists from the UK, Sri Lanka, Australia, China and Japan draws our attention to the likely link between the onset of solar lows and pandemics, which can be used as a guide for closer scrutiny of circulating viruses, and monitoring their genetic variations. The question of the influence of space on diseases has a long history. The merit of the first comprehensive study of global conditions for the development of epidemics belongs to Alexander L. Chizhevsky. Generalization of materials on centuries-old observations of doctors allowed him to conclude that "epochs of natural disasters in nature coincide with the development of certain epidemic diseases", and these events "periodically repeat" depending on the state of the Sun. In relation to the mechanism of cosmic influence in those years, it was "all dark", "all unclear", but there was evidence of the role of electrical phenomena as a conductor.

In the 90 years since the publication of the book "Epidemic catastrophes and periodic activity of the Sun" (in Russian), the volume of relevant information has grown immeasurably. Important for solving the problems of the etiology of infectious diseases are information about the relationships of pathogenic organisms with bacteriophages, discovered by Felix d' Hérelle. Genetics made it possible to trace their origin and evolution. Paleoreconstructions opened the way to restore the solar climate and other elements of the human environment and its biocenosis since the Neolithic. The new data require certain adjustments to the existing understanding of the factors of the epidemic process. At the same time, Chizhevsky's approach to elucidating the associated consequences of a cosmos impact certainly retains its cognitive value. First of all, it is necessary to take into account the frequency of external pulses generated by variations in the activity of the Sun (Fig. 1) when it rotates around the barycenter of the Solar system, which is caused by the movement of planets in elliptical orbits.

With the synchronization of the movements of the heavenly bodies is the subordination of the solar cycles, their octal hierarchy: a 22-year cycle, repeated 8 times, forming a 179-year cycle, which, in turn, acts as one of the eight elements 1430-year cycle that is part of the cycle lasting about 11400 years, etc. Cyclical to be not only solar activity but also the speed of rotation of the Earth, as well as many natural processes in geospheres.

The end and beginning of a number of long-term and multi-century solar cycles falls on April 1990. It is important that the years of neighboring phases are usually marked by a decrease in solar activity (Fig. 2).

Taking into account the frequency of near-space impact on the habitat of living organisms, the destruction of cellular structures by ionizing galactic rays, as well as their probable mutagenic potential, it can be assumed that epidemics develop with a significant weakening of solar activity and violations in the functioning of geospheres. The results of testing this hypothesis are shown below.

II. Current Situation

The COVID-19 outbreak was preceded by two coronovirus epidemics – SARS-CoV (caused by the SARS-CoV strain, which in 2002-2004 sickened about 8 thousand people in 29 countries; the death rate was 9.6%) and middle East respiratory syndrome (when infected with the MERS-CoV strain, which infected 2,500 people in 27 countries in 2015-2020, of which about 35% died). In addition, in 2009-2010, humanity was struck by the swine flu pandemic, which affected from

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700 to 1400 million people in 168 countries (with a mortality rate of about 0.03%).

The extremely poor epidemiological situation in the first decades of the twenty-first century, based on the experience of previous centuries, indicates global shifts. Indeed, indicators of the state of many parts of the planetary system are currently characterized by maximum deviations from the norm for the entire period of instrumental observations.

Among the global anomalies, climate change draws particular attention. At the same time, it should be not only about an increase in temperature in the troposphere, but also a synchronous decrease in temperature in the stratosphere (Fig. 3).

The activity of the lithosphere has been unusually high in recent decades (Fig. 4).

The increase in earthquake energy is accompanied by an increase in the depth of the hypocenters (Fig. 5) and their redistribution (Fig. 6 and 7).

The level of the World's ocean is rising at an accelerated rate (Fig. 8).

The planetary scale shifts are indicated by an unprecedented decrease in the amplitude of variation of the Earth's axis (Fig. 9).

Global changes occur against the background of weakening solar activity (Fig. 10).

At the same time, the intensity of the UV radiation flux decreases (Fig. 11), which affects the life of organisms, especially viruses and bacteria.

Obviously, ionization of organic molecules and living matter should have serious environmental consequences for coenoses when the intensity of galactic cosmic rays increases (Fig. 12).

Before us is a situation similar to those that Professor Mikhail A. Bogolepov of Moscow State University once called perturbations of the planet. Regardless of what conclusion is received about the beginning of the circulation of the CAVID-19, we must recognize that the facts indicate the existence of prerequisites for the development of epidemic processes in modern extreme conditions.

III. Epidemics of the Ancient World and Later Analogues

The first epidemic in civilized Europe is known thanks to the book "History of the Peloponnesian War" by Thucydides - a witness to the events of 430-426 BC in Athens, who was infected, but miraculously survived. According to him, "the disease started in Ethiopia, over Egypt. From there it spread to Egypt, Libya, and most of the possessions of the Persian king. Quite suddenly, the disease also broke out in Athens; the first cases of the disease appeared among the population of Piraeus … Later, the disease also spread to the upper city, and many more people began to die... The singularity of this disease, which exceeds any means of expression, was shown not only in the fact that the disease affected people with a force that human nature could not bear, but also in the fact that, unlike everything previously observed, birds and quadrupeds that feed on human corpses did not touch the corpses at all (although many of the dead remained unburied) or, touching them, died… There were no other common diseases at that time. … The disease affected everyone, both strong and weak, without distinction in lifestyle. But the worst part of this disaster was the loss of spirit: as soon as any one felt ill, he was for the most part completely discouraged, and, no longer resisting, fell a victim to the disease; so people died like sheep, infected from one another. And this extreme contagion of the disease was just the main cause of widespread mortality. When people avoided visiting the sick for fear of infection, they died alone (and indeed, people died out in whole houses, since no one cared for them). And if someone visited the sick, he himself fell ill: there were still people who, out of a sense of honor, did not spare themselves, visited the sick, when even relatives, exhausted by the continuous mourning of the dying, at the end completely despaired and retreated before the terrible misfortune. The people who were most concerned with the sick and dying were those who had already suffered from the disease themselves, because they knew the course of the disease and considered themselves safe from secondary infection. Indeed, the disease did not affect anyone a second time… This calamity, which had befallen the Athenians, was aggravated by the influx of refugees from all over the country, and the new arrivals especially suffered from the disease. There were not enough dwellings: in the summer they had to live in stuffy temporary shacks, which caused people to die in complete disorder. The dying lay on top of each other, where they were found dead, or lay in the streets and by wells, half dead from thirst. The shrines themselves, along with the temple sites where refugees sought shelter, were full of corpses, as people died there as well... The disease spread mainly in Athens, and then in other densely populated places."

Among the dead were two adult sons of strategos Pericles, his sister and friends. The Athens epidemic, which lasted five years at a time, is estimated to have claimed between 30 and 100 thousand lives.

The nature of the infection is still unclear. There is no explanation for the unusual nature of the disease and its complete disappearance. The symptoms of the "Athens plague" are similar to Ebola hemorrhagic fever. It is impossible to exclude the case of a mutation of an imported ebolavirus or other pathogen from the filovirus family. The reason for this assumption is the phenomenon of a sharp weakening of solar activity in the years of the pestilence (Fig. 13), which, of course, was accompanied by an increase in the power of ionizing galactic radiation.

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The hypothesis of the mutagenic influence of a calm Sun on microorganisms can be verified by a mental critical experiment. If it is correct, the formation of new strains of a known pathogen should be timed to the next similar phase of weakening of solar activity. A positive test result will also confirm the reality of large solar periods. If we consider 1430-year cycles, we should expect that after the anomaly of the V-IV centuries BC, once again solar activity should have reached a minimum in the XI-XII centuries. At the same time, there was an increase in mutagenesis. The first part of the retrospection is fully justified (Fig. 14).

Materials on the evolution of pathogens help to test the hypothesis of mutagenesis periodicity. Confirmation was found in the results of an analysis of the genetics of Koch's wand (Mycobacterium tuberculosis), published by a team of Chinese scientists [3]. It was found that strains of the causative agent of the largest tuberculosis epidemic on the Earth were formed on the territory of China about 1000 years ago, in a "short window", when the living conditions probably changed. The authors assumption about the role of the environment corresponds to the facts, in particular, data on the annual growth of trees and the Grand eruption of the volcano Paektusan (on the border of China and Korea).

The second epidemic, of which there is historical information, broke out in Rome under Marcus Aurelius Antoninus in the mid-60s of the second century AD. There are conflicting opinions about its origin and scope, due to a lack of information. One source, the notes of doctor Galen, contains a brief description of the contagious disease. Another source – the testimony of the consul Dion Cassius - conveys rather a general impression. In book LXXIII of his work "Roman History "about the catastrophe, it is said literally only that " there was a pestilence, the greatest of all known to me: in one day two thousand people often died in Rome" (meanwhile, several pages are devoted to the acts of the Emperor Commodus on self-aggrandizement). Preserved documents of the Egyptian province indicate the simultaneous occurrence of other natural anomalies, in particular droughts and weak flooding of the Nile. They may be the consequences of a catastrophic eruption of mount Taupo in New Zealand – one of the most powerful in the last two thousand years.

In the third century AD, the Sun enters a phase of weakening activity (Fig. 15), the climate changes in the direction of cooling.

The middle of the solar minimum period of the third century AD coincides with the beginning of the third epidemic in the ancient world, known as the Cyprian plague. The disease originated in 249 on African soil, and in 251 it reached Europe. For 20 years, its victims were millions of people, which undermined the power of the Roman Empire. In many ways, the pathogen belonged to filoviruses.

We can assume that by analogy with the negative anomaly of the V-IV centuries BC, the minimum of the III century AD had a kind of double, younger than it by 1430 years. Again, the radiation reconstruction data demonstrate that a long periodicity of solar activity actually exists (Fig. 16).

It is quite natural that the relatively short period of the minimum of the XVII-XVIII centuries was marked by an unusually high frequency of epidemics: the Chinese plague (1641-1644), the Great plague of Seville (1647-1652), The Neapolitan plague (1656), the Great plague of London (1665-1666), the French plague (1668), the Maltese plague (1675-1676), the Great plague of Vienna (1679), the Canadian smallpox (1702-1703 years), the Icelandic smallpox (1707-1709), the Baltic plague (1710-1712), the Great plague of Marseilles (1720-1722), and others.

Thus, familiarity with the epidemics of antiquity reveals the parallelism and periodicity of solar and terrestrial anomalies.

IV. The End of Antiquity

In 559, the Sun approached the barycenter of the planetary system at the shortest distance in 1430 years. The movement of the sun with small deviations from the average position during the VI-VIII centuries entailed a long and very significant decrease in the power of its radiation (Fig. 17).

A sharp decrease in solar activity caused a cooling of the climate, which affected the biota of Eurasia (Fig. 18 and 19) and other continents.

Around 540, the first pandemic began, which went down in history as the Justinian plague. It is believed that the causative agent of the disease was of African origin, and its spread across Byzantium and the territories of neighboring countries led to a reduction in the population by 25-50%. In recent years, there has been evidence that the focus of infection was most likely located in the Asian steppes [4], and the idea of the devastating socio-economic consequences of its penetration into the Mediterranean is probably somewhat exaggerated [5].

It is important to emphasize that the duration of the plague was strictly limited by the epoch of the great solar minimum, which ended in 740. In addition to climatic anomalies, the VI century is characterized by high seismic activity: at that time, the number of strong earthquakes was greater than in three centuries combined (Fig. 20). Perhaps the increased degassing of the subsurface contributed to the deterioration of the environmental situation (so thought contemporaries of the events).

Natural prerequisites of the epidemic situation of the VI-VIII centuries. due to the rule of 1430-year periodicity, they must be reproduced again by the planetary system in the XXI-XXIII centuries (Fig. 21).

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In the era of the Justinian plague, due to its unique position in the 1430-year cycle, we see an exceptionally vivid manifestation of the relationship between the state of the biosphere and man with the dynamics of the planetary system.

V. The Plague of the Fourteenth Century

The medieval plague received an initial impulse in Mongolia in the 20s of the XIV century and in 1330-1360, it covered the areas of Asia and Europe, where it killed tens of millions of people. In terms of the scale of losses, the black death pandemic was obviously one of the worst natural disasters in human history.

The epidemic process developed 700 years ago in the conditions of a deep and extensive solar minimum (Fig. 22 and 23).

In the era of the Justinian plague, due to its unique position in the 1430-year cycle, we see an exceptionally vivid manifestation of the relationship between the state of the biosphere and man with the dynamics of the planetary system.

The events of the XIV century follow the general regularities of periodicity and range in our planetary system.

VI. The Minimum of Dalton

About 200 years ago, at the time limit of the penultimate and last periods of the 179-year cycle, there was a significant weakening of solar activity, now known as the Dalton minimum. In addition to reducing the area of sunspots (see Fig. 1), this era saw an intensification of volcanic activity, including the eruption of Tambora on one of the Lesser Sunda Islands, the most powerful in 800 years (after the above-mentioned Paektusan event). Climate cooling has had a negative impact on crop yields and forest growth in Europe (Fig. 24) and other regions.

It is not surprising that the solar minimum of the XIX century gave rise to the first and second largest pandemics of cholera – the deadliest disease of the century, with an area that includes Eurasia, Africa, Australia and North America, and the number of victims exceeding 200 thousand people (Fig. 25).

In addition, the list of major epidemics in the first decades of the nineteenth century includes yellow fever, plague, typhoid, and smallpox.

It can be stated that the XIX century gave new examples of direct and indirect dependence of pathogens on the space climate.

VII. Flu

Over the past 40 years, after the work of E.D. Kilbourne [6], there have been regular reports in the press about the discovery of a link between flu and solar activity [7-11]. However, an objective examination of the grounds for such a conclusion, performed by S. Towers [12], shows, that in all cases, the analyses either had mis-transcriptions of the dates of influenza pandemics listed in the literature, and/or made mistakes in the statistical analyses, and/or the analyses were not robust to arbitrary assumptions made to select the data, or the metrics used to assess the relationship between sunspot activity and the timing of influenza pandemic. This criticism is not shared by the author of a recent study [13] who claims that almost all recorded influenza pandemics have occurred in time frames corresponding to sunspot extremes, or +/- 1 year within such extremes.

The first documented flu epidemic dates back to 1889-1890, when 300 to 900 million people were infected worldwide, and about 1 million of them died. Cases of mass non-seasonal influenza diseases in the twentieth century occurred after the maximum (1918-1919) or during the maximum (1957-1958 and 1968-1969) of the 11-year cycle. How should the last three facts be considered? Most likely, they are not exceptions to the established rule, since we are talking about a multi-year period of increasing solar activity, which began in 1901. It is significant that the last epidemic, which was at the stage of a long-term decline in solar activity, like the flu of 1889-1890, developed just within the solar minimum (Fig. 26).

The epidemiology of influenza, which may have killed about 100 million people, remains largely unclear and requires in-depth study of the role of geophysical factors.

VIII. Prehistoric Events

Genetic and archaeological research in recent years has revealed evidence of the spread of plague across Europe during the Neolithic period [14]. Most often they are 5400-5700 years old. This was obviously a time of disasters, depopulation of settlements, and a change of management methods.

Interestingly, there is a time boundary between the two periods of the 1430-year cycle, which dates back to 3700 BC. Later, as usual, there was an era of rapid weakening of solar activity (Fig. 26). This process could trigger an epidemic.

Another set of facts sheds light on plague diseases in the Bronze Age. The age of the epidemic traces corresponds to the time limit of the later periods of the 1430-year cycle-2300 BC.

The found temporal order of events in the cosmos and the biosphere can be used in reconstructing events of the distant past.

IX. Conclusion

These facts allow us to get a general picture of the cause-and-effect relationships leading to destructive epidemic processes. They originate in the elliptical orbits of the outer planets, which control the activity of the Sun

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and through it determine the functioning of the Earth's system. Some links of this chain reaction have yet to be studied in detail, the main thing is to understand what exactly changes the rate of mutation of pathogenic organisms and the rate of their reproduction. In addition, the mechanism of energy transfer from near space, which causes perturbation of the Earth's body, remains unclear.

Available data on changes in the state of the biosphere and the spread of infectious diseases in the past relate mainly to the Old World. Individual facts from the history of epidemics on the American continents, for example, the development of three terrible epidemics of cocoliztli on the territory of present-day Mexico in the 16th century, do not contradict the general pattern. However, much more needs to be done to fill the gaps in our knowledge at the global level.

Acknowledgment

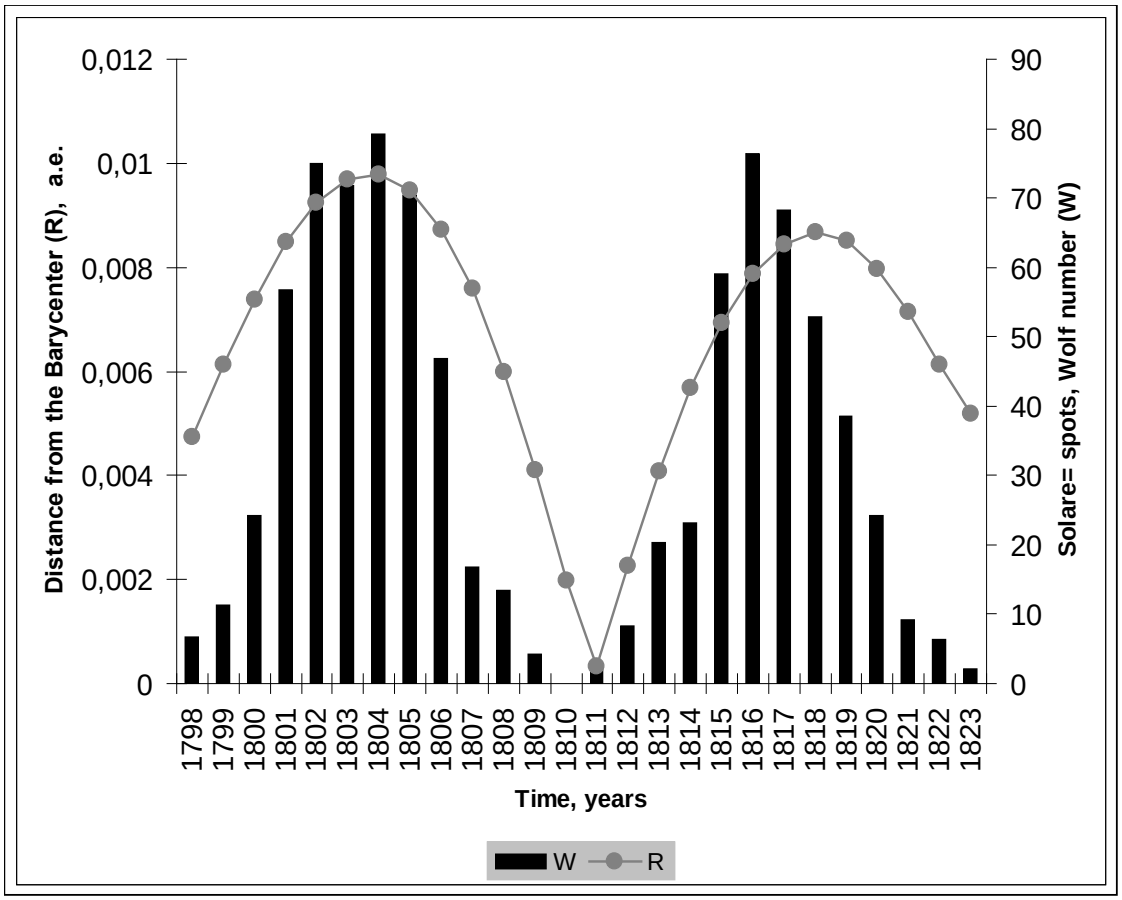
The author is grateful to Dr. A. Shapiro for kindly providing data on the reconstructed values of total solar radiation and to Prof. V. I. Bulatov for information about the performed epidemiological studies.

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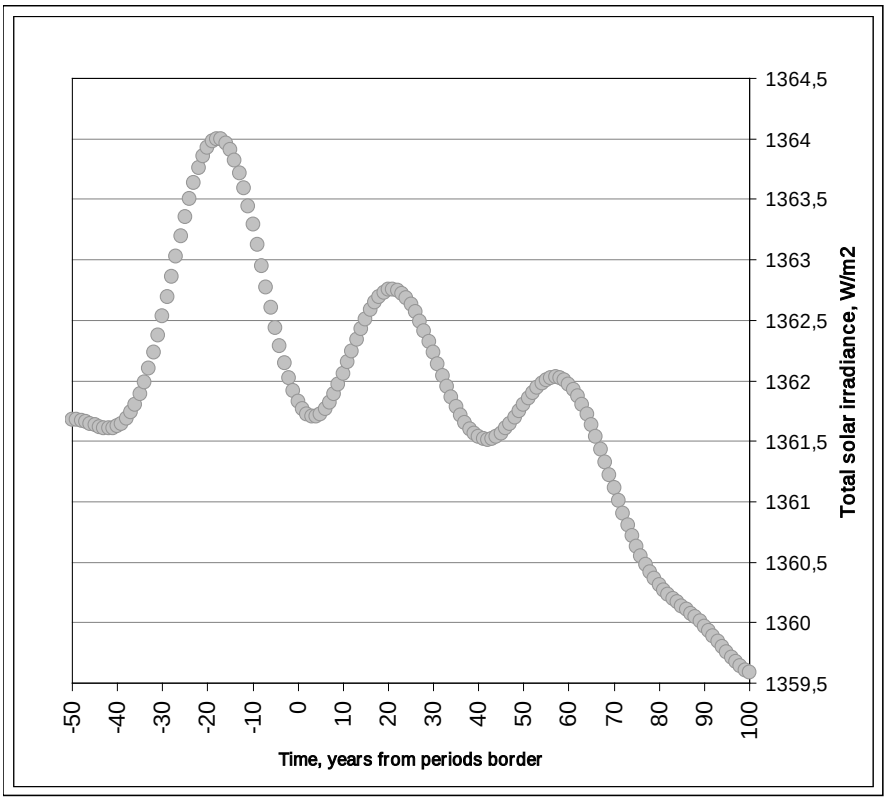
Figure captions



Source: according to the World Data Center for the production, preservation and dissemination of the international sunspot number (http://sidc.oma.be), calculation using the EPOS GAO program

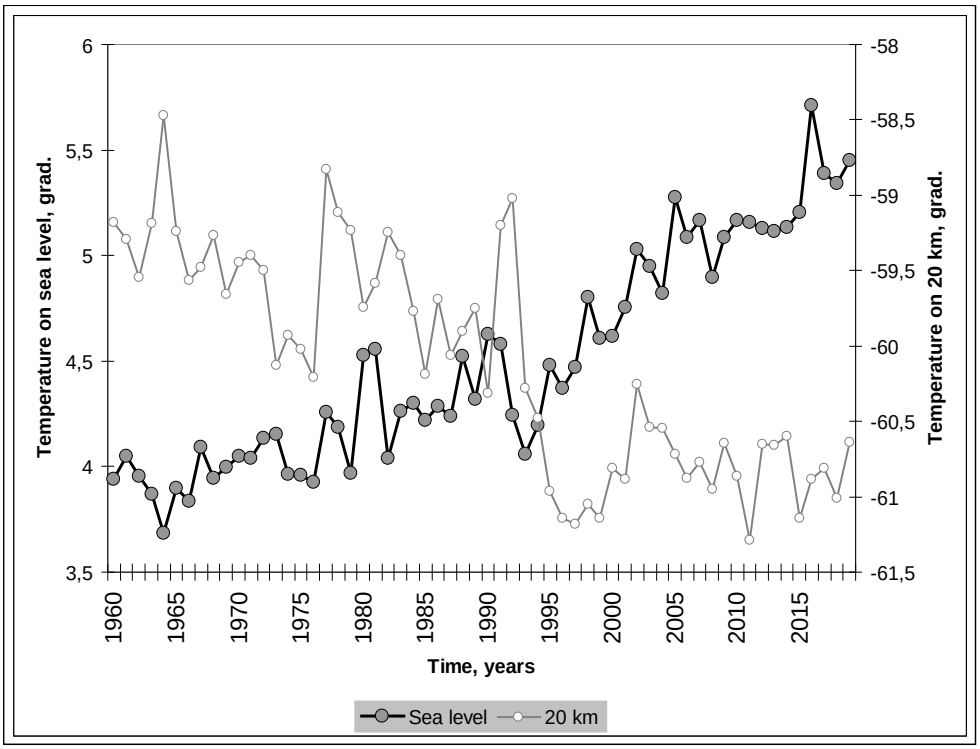
Fig. 1: The Long solar minimum of 1809-1811, due to the approach of the Sun's center to the barycenter of the Solar system by the shortest distance (which occurs once every 179 years)

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Source: calculation based on reconstruction data A. Shapiro et al., 2011 (https://arxiv.org/abs/1102.4763)

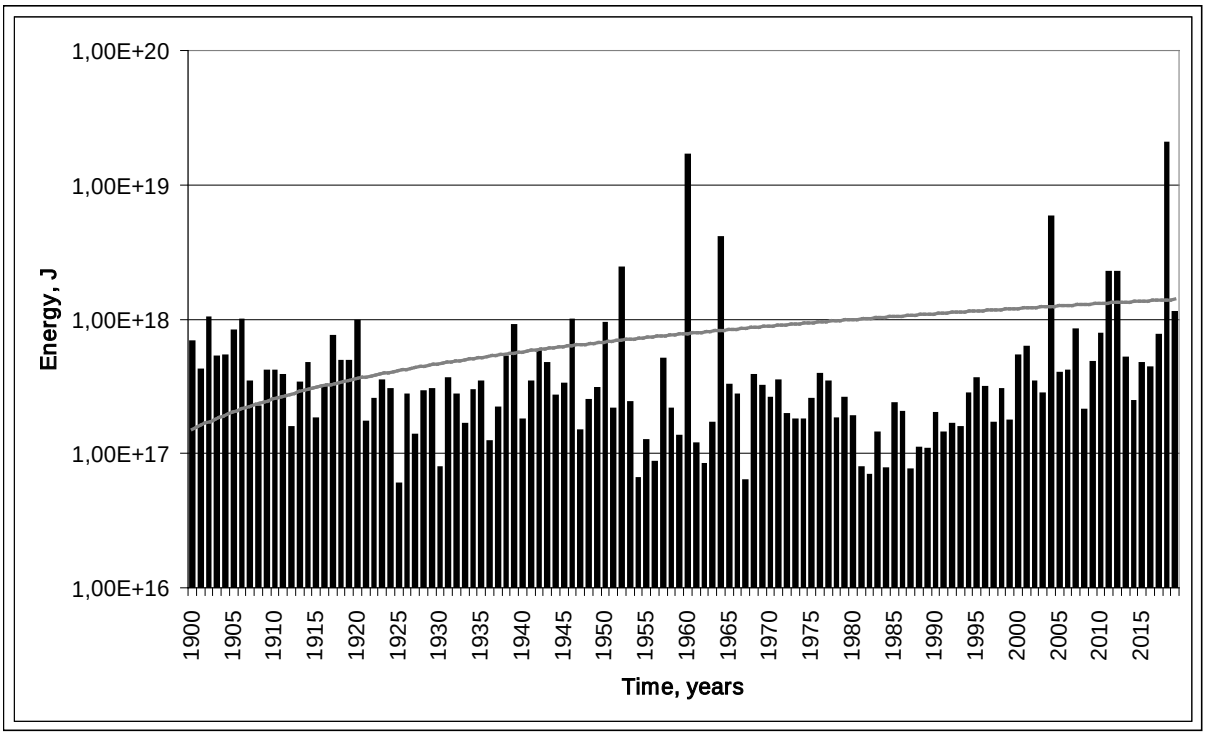
Fig. 2: Change in total solar irradiation at the time boundary of the 1430-year cycle periods (averaging over 9.5 thousand years)



Source: calculation based on Earth System Research Laboratory data (www.esrl.noaa.gov)

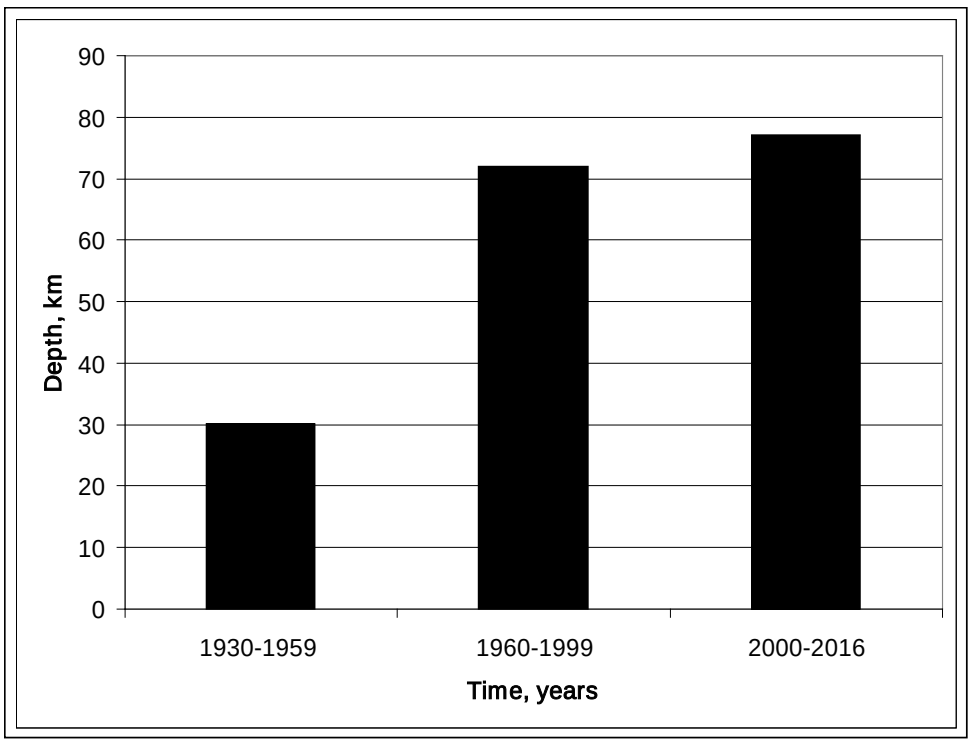
Fig. 3: Average annual air temperature on the globe in the surface layer of the troposphere and in the stratosphere at the surface level of 50 GPa

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Source: calculation according to the International Seismological Centre (http://www.isc.ac.uk/iscbulletin/search/catalogue/)

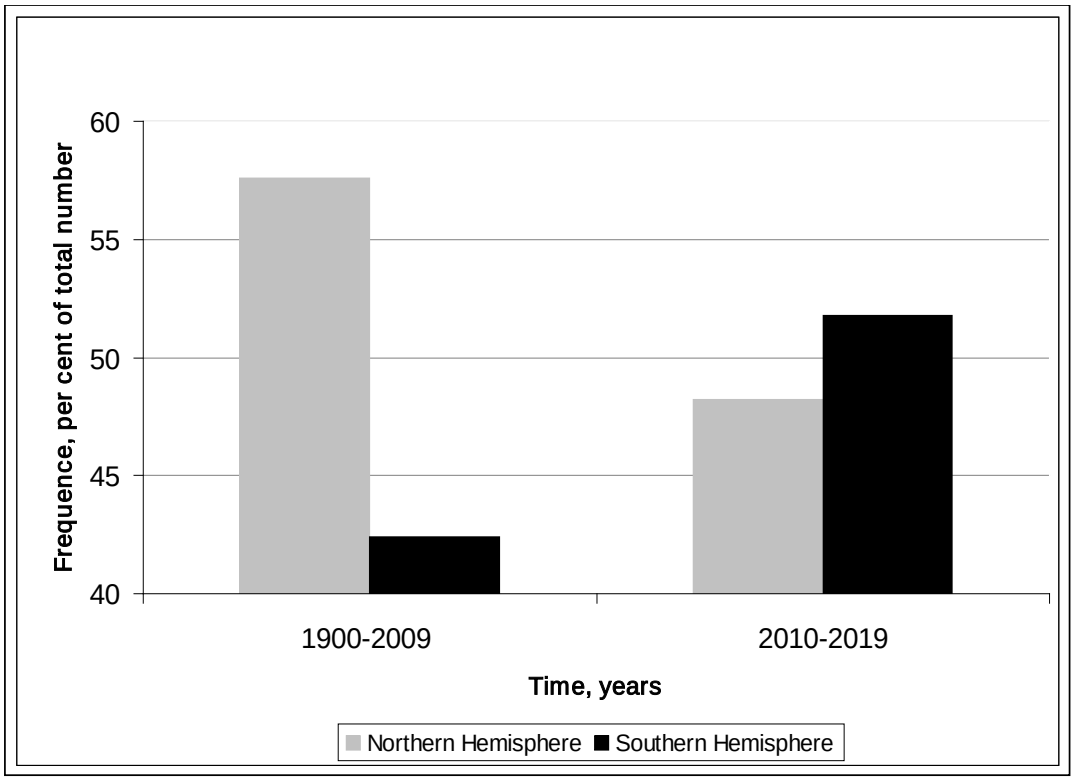
Fig. 4: Growth of the energy of strong earthquakes (Mw ≥ 5). Logarithmic scale



Source: Ibid.

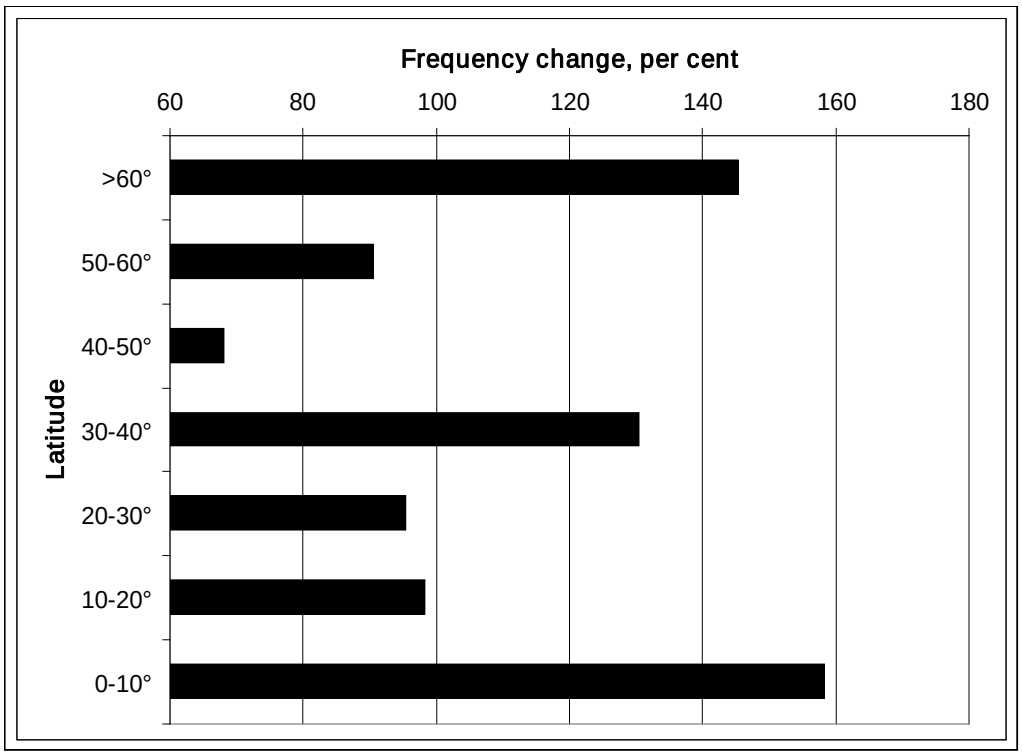
Fig. 5: Depth of hypocenters of strong earthquakes with Mw ≥ 5 in the Northern hemisphere

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Source: Ibid.

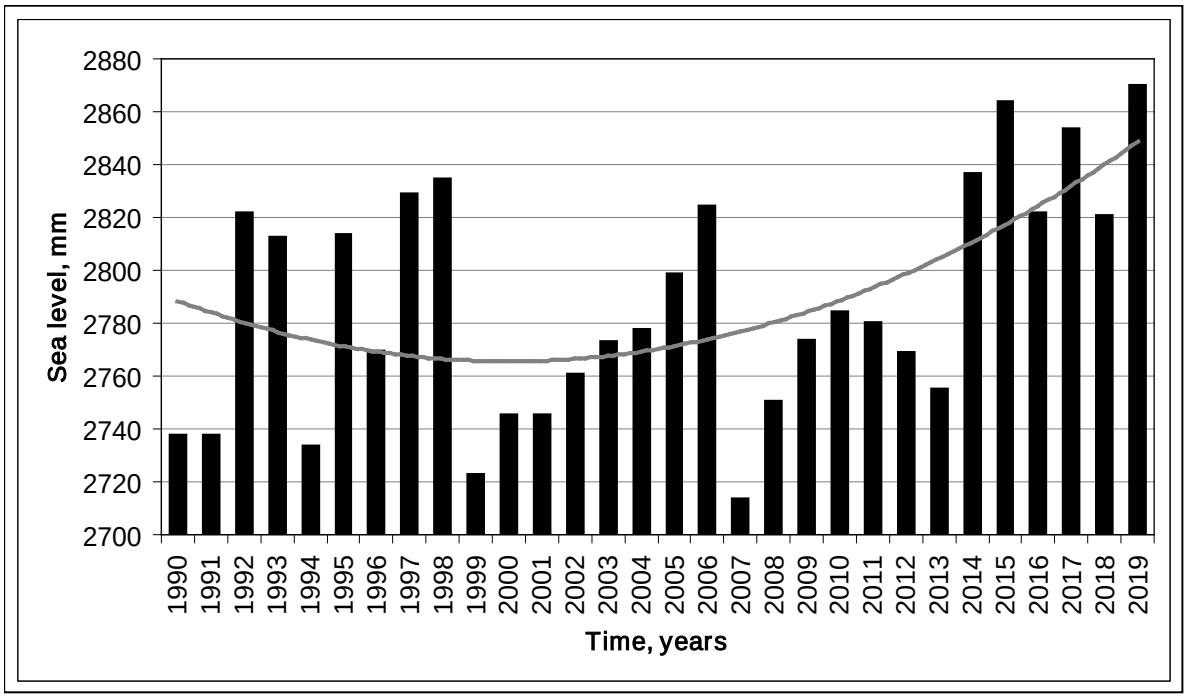
Fig. 6: Sharp changes in seismic activity of the Northern and southern hemispheres of the Earth in the last 10 years compared to the previous 110-year period (averaging events with M ≥ 5)



Source: Ibid.

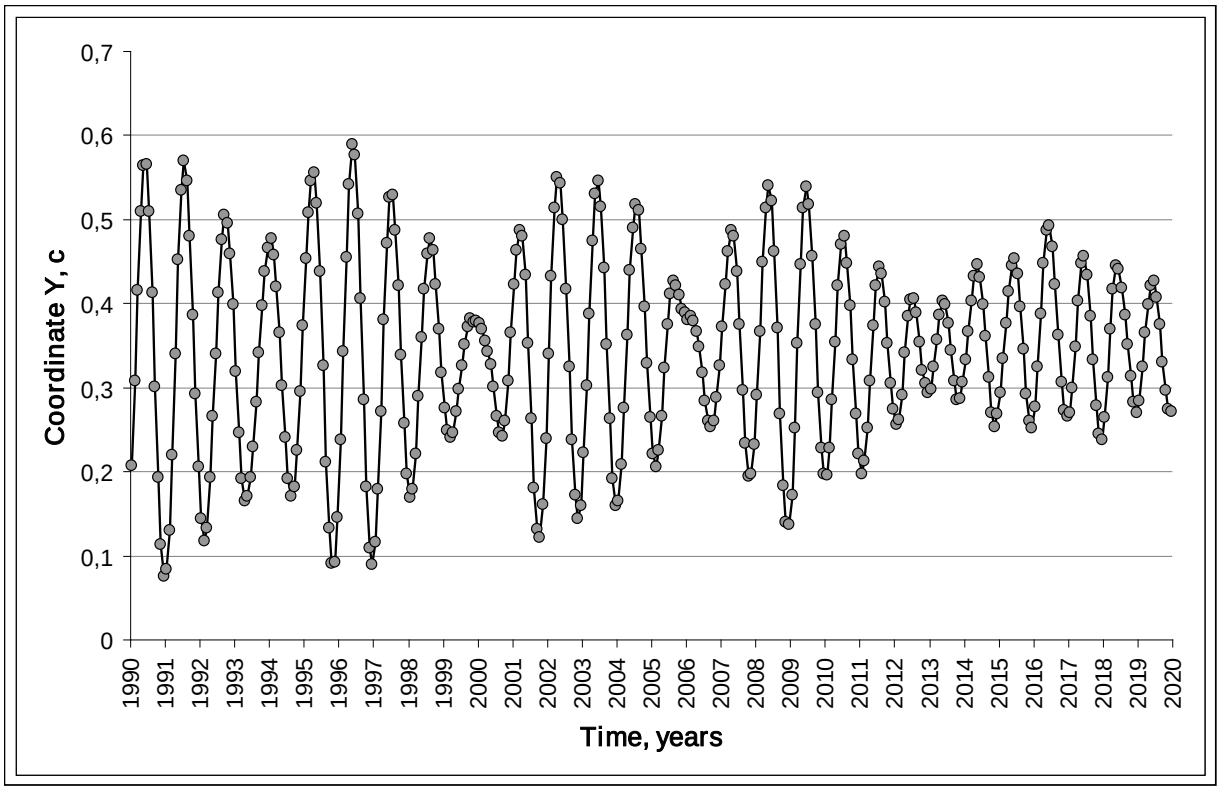
Fig. 7: Increase in the frequency of earthquakes (M ≥ 6) at the "critical" latitudes of the Northern hemisphere in 2000 - 2016 compared to 1904-1999 – at the equator, at the projection of The earth's liquid core and lower mantle at 60-70° and in the Veronnet EPI belt, about 35° (where, in particular, the territory of China is located)

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Source: according to Permanent Service for Mean Sea Level (https://www.psmsl.org/data/obtaining/stations/10.php)

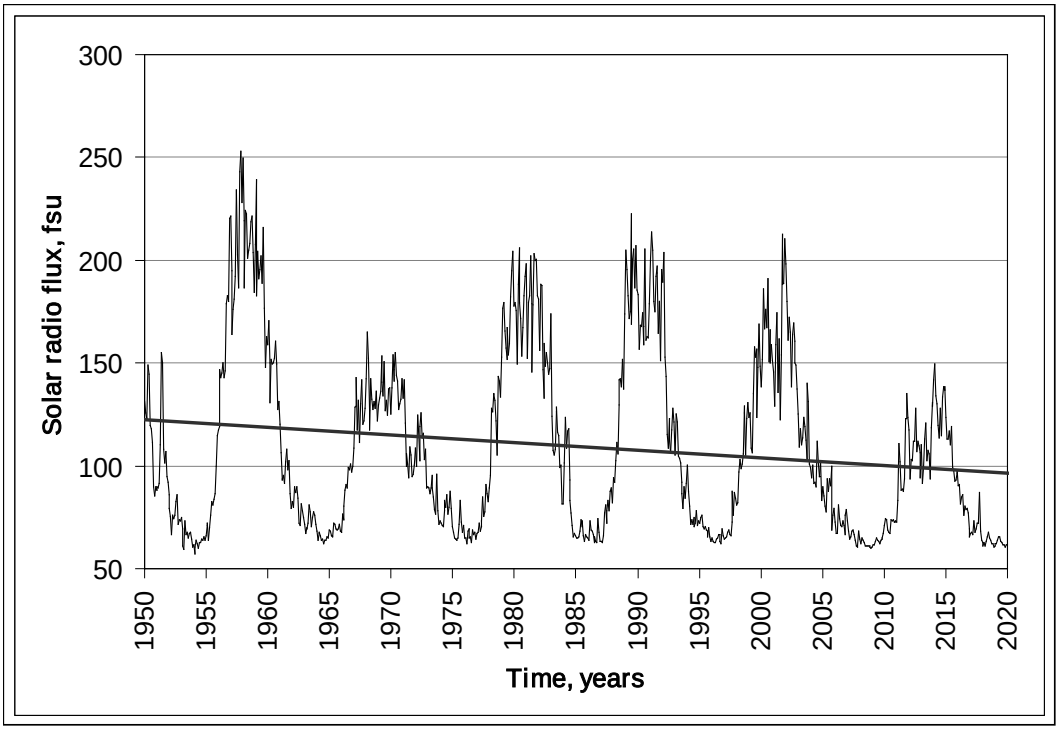
Fig. 8: The sea level rise acceleration (station San Francisco, USA). A polynomial trend is shown



Source: according to International Earth Rotation and Reference Systems Service (https://www.iers.org/IERS/EN/DataProducts/data.html)

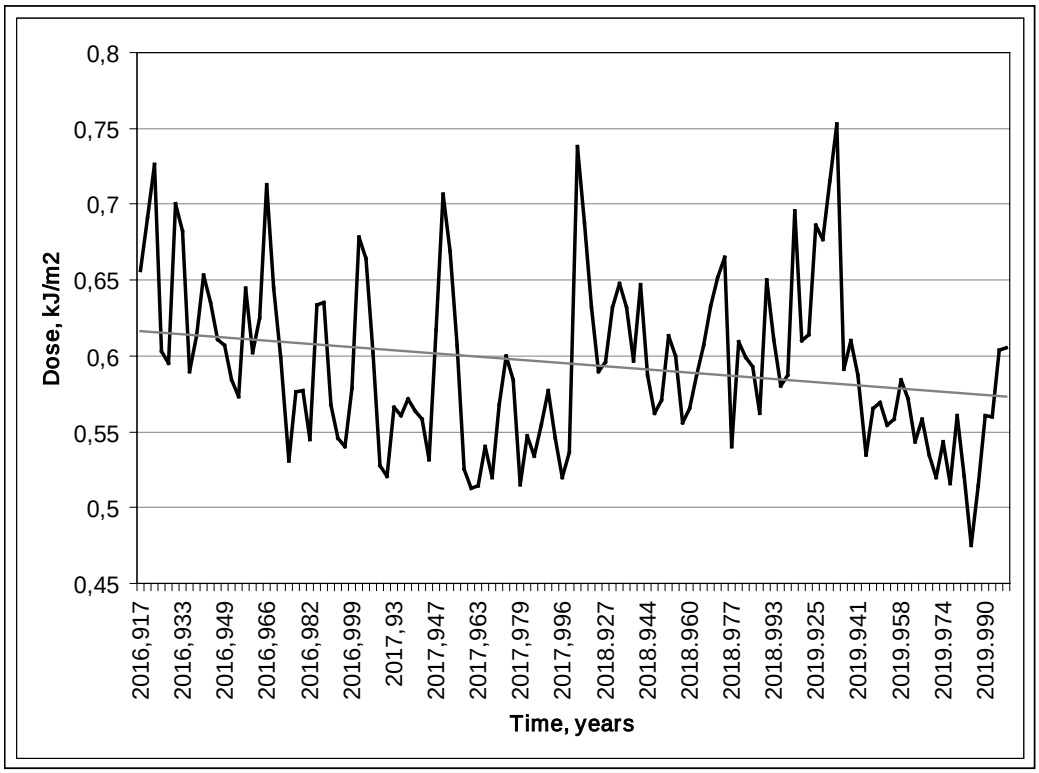
Fig. 9: Movement of the North Geographical Pole

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Source: according to Space Weather Canada (https://www.spaceweather.gc.ca/solarflux/sx-5-en.php)

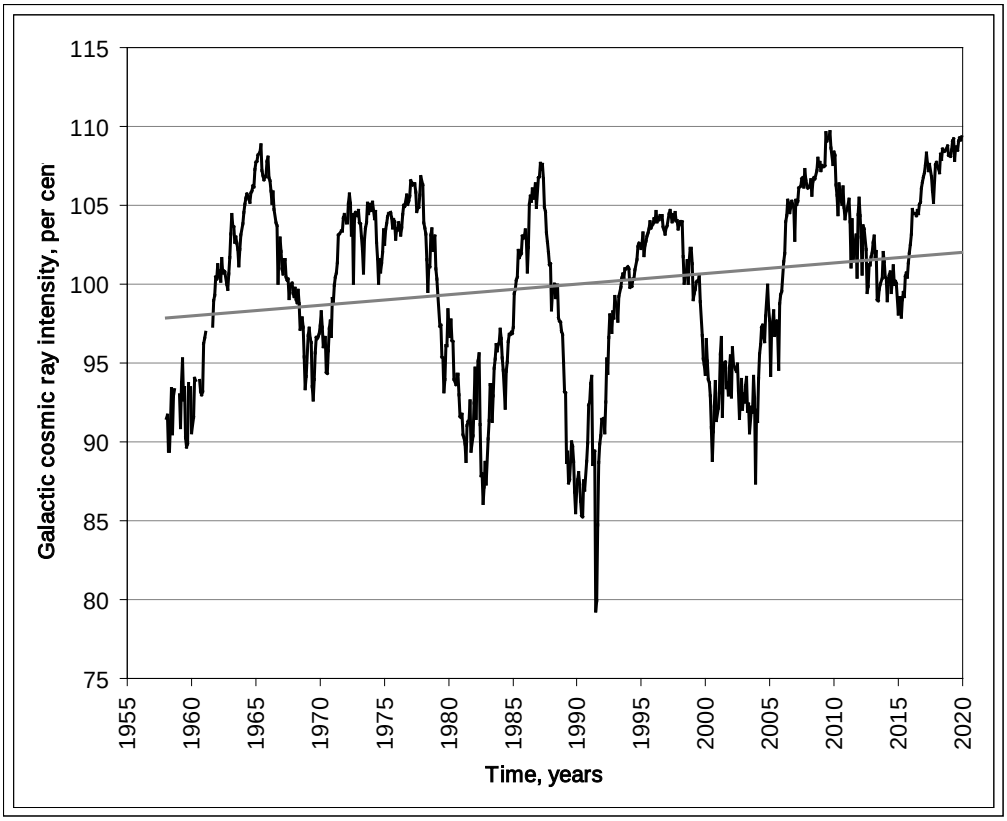
Fig. 10: A long-Term trend towards a decrease in the power of the Sun's radio emission at a wavelength of 10.7 cm (1 sfu = 10-22.m-2.Hz-1). A linear trend is shown



Source: according to Tropospheric Emission Monitoring Internet Service, UV index forecast and archives (http://www.temis.nl/uvradiation/archives/c.2.0/overpass/uv)

Fig. 11: Reduction of UV radiation doses from the Sun in December 2016-2019 (Tianjin, China). A linear trend is shown

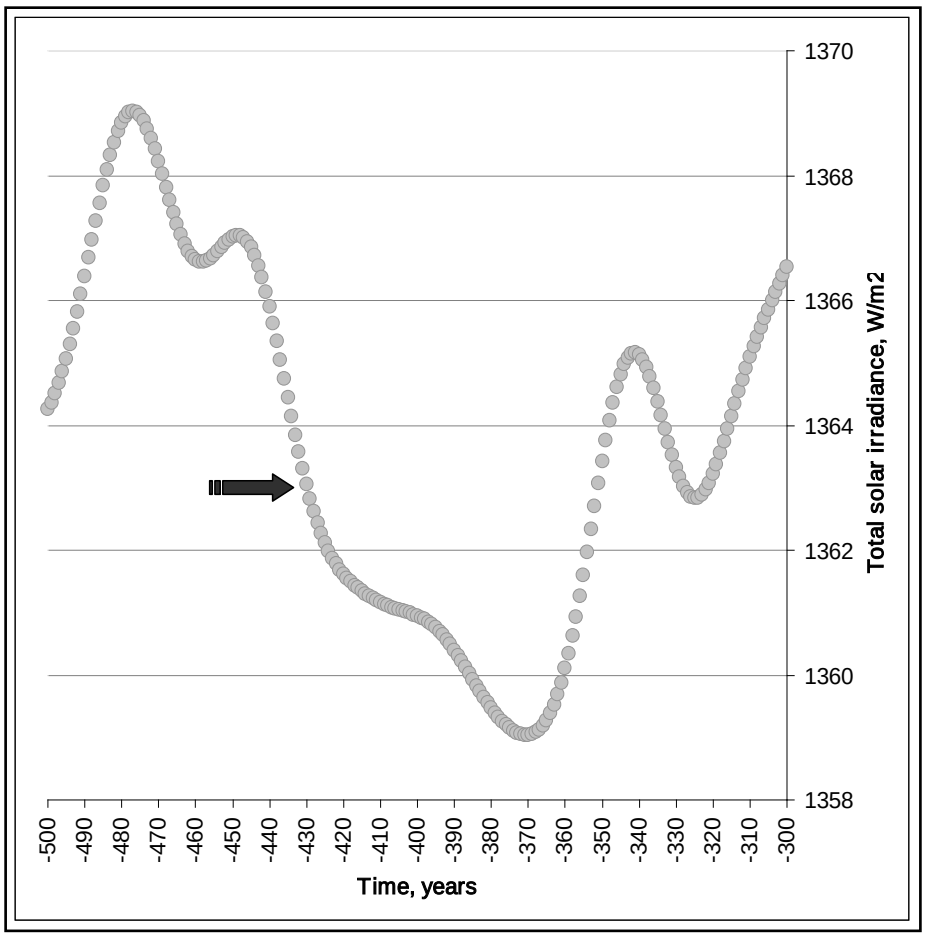
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Source: calculation based on Moscow Neutron Monitor data (http://cr0.izmiran.ru/mosc/)

Fig. 12: The Trend of increasing the intensity of galactic cosmic rays in the period 1958-2019 (Moscow neutron monitor). A linear trend is shown

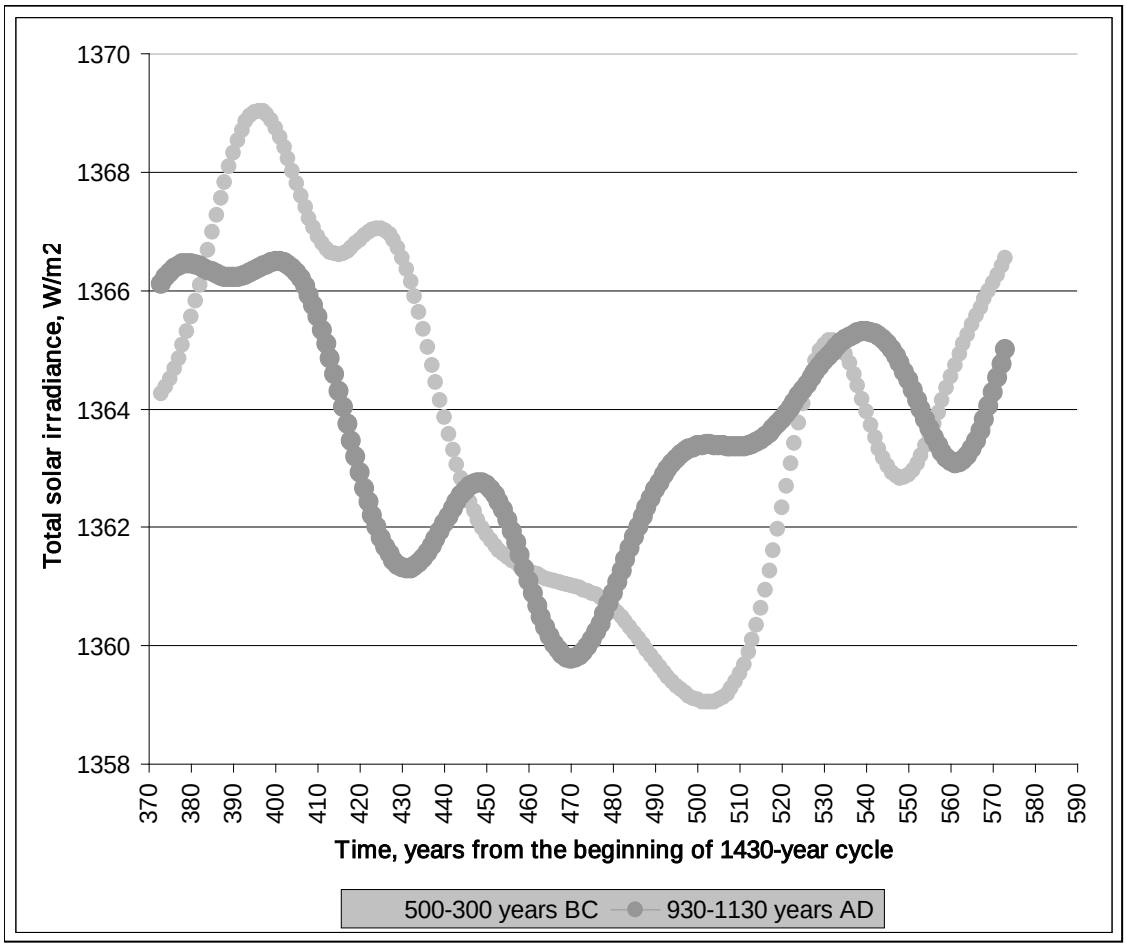
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Source: according to reconstruction data A. Shapiro et al., 2011 [2] (https://arxiv.org/abs/1102.4763)

Fig. 13: Large Sunny low V-IV centuries BC, the time of the Athenian epidemic is marked by an arrow

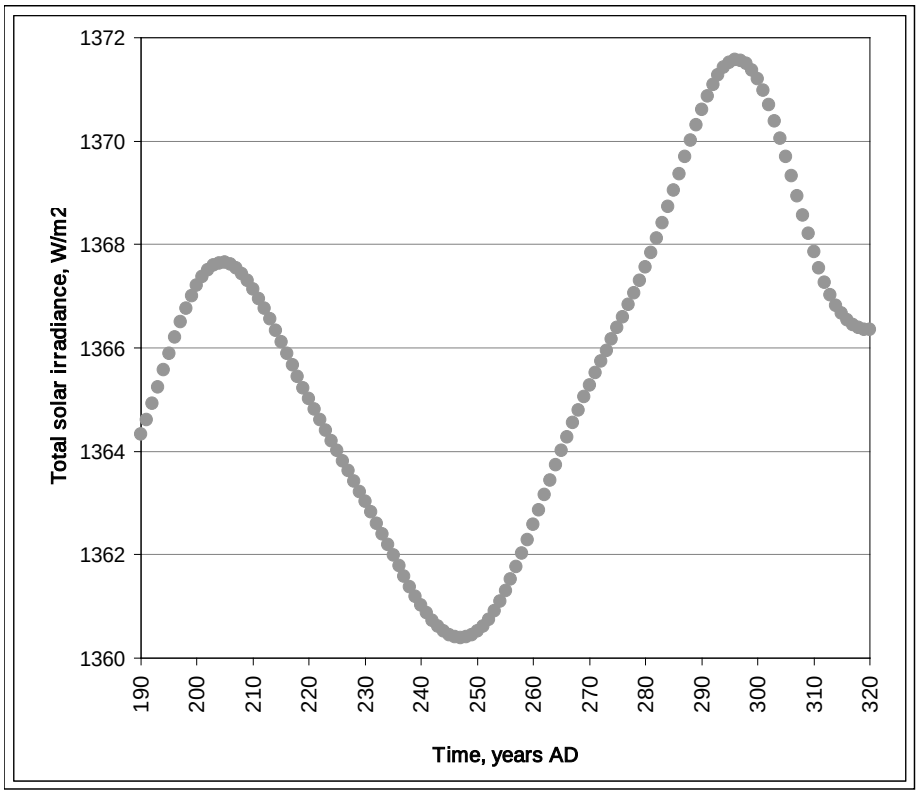
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Source: Ibid., calculation under the EPOS GAO program

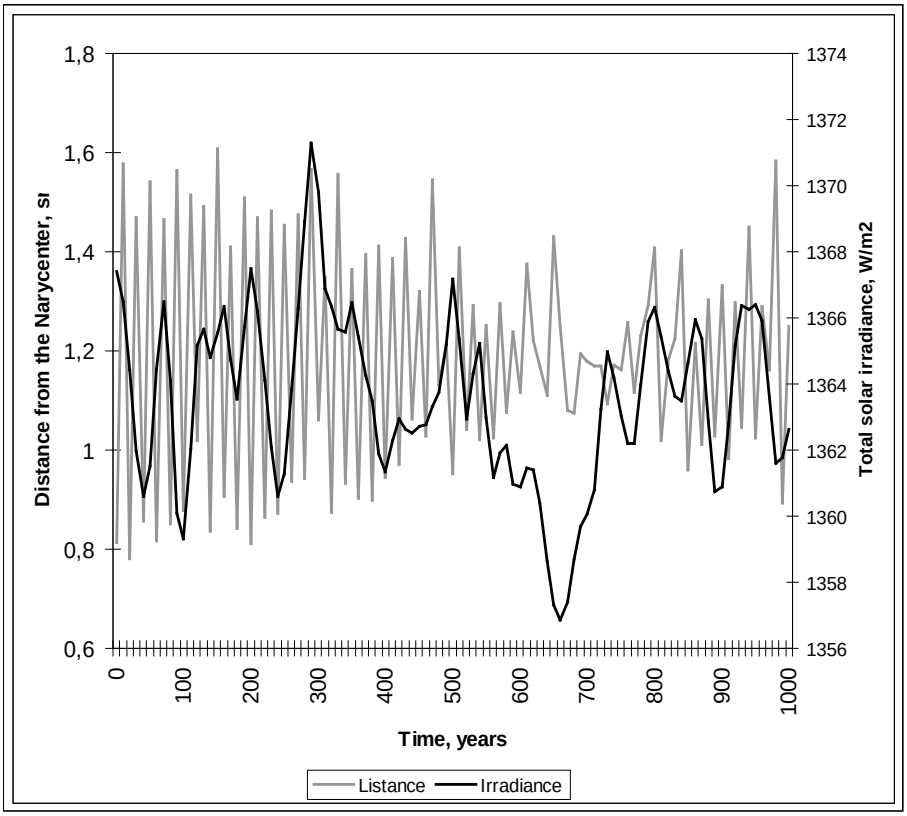
Fig. 14: Similarity of large solar minima separated by a 1430-year interval. The correlation coefficient of the total radiation values for 200 years is 0.57

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Source: Ibid.

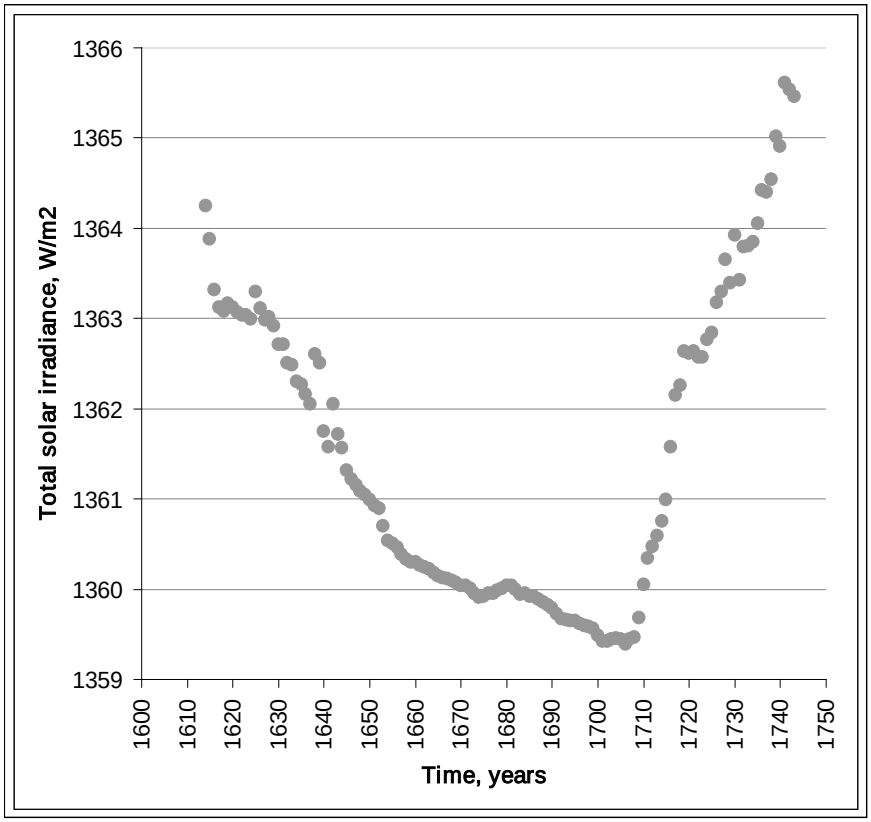
Fig. 15: The solar minimum of the III century AD



Source: Ibid

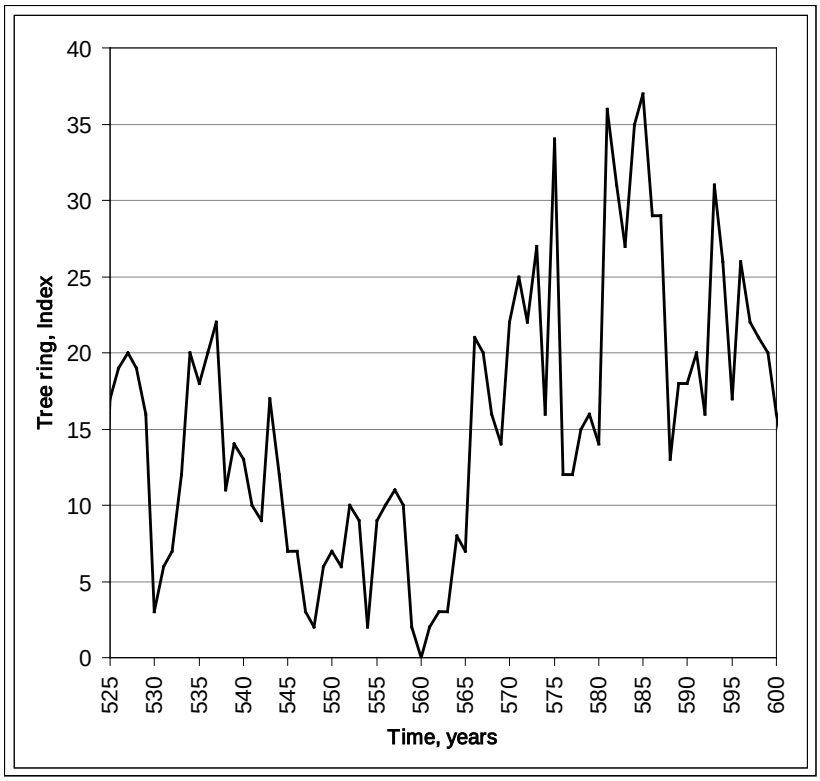
Fig. 16: Minimum solar activity of the XVII-XVIII centuries, which occurred exactly 1430 years after the minimum of the III century AD.

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Source: Ibid., calculation under the EPOS GAO program

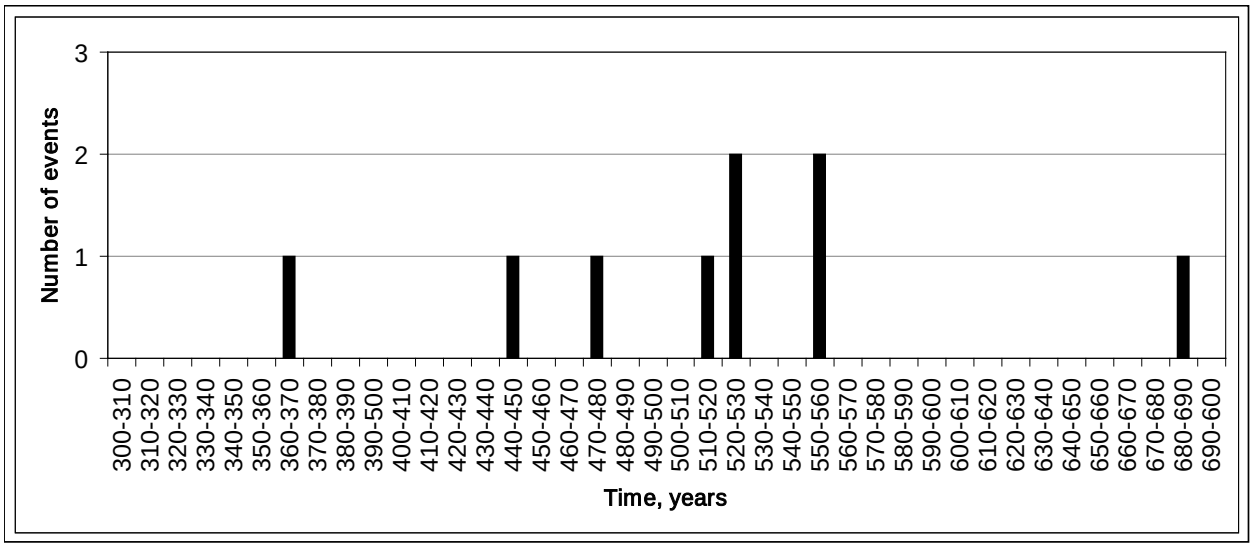
Fig. 17: The movement of the Sun relative to the barycenter of the planetary system and its total irradiation at the border of two periods of the 1430-year cycle (averaging over 10 years)



Source: according to P.Sheppard and L.J.Graumlich (https://www.ncdc.noaa.gov/paleo-search/?dataTypeId=18)

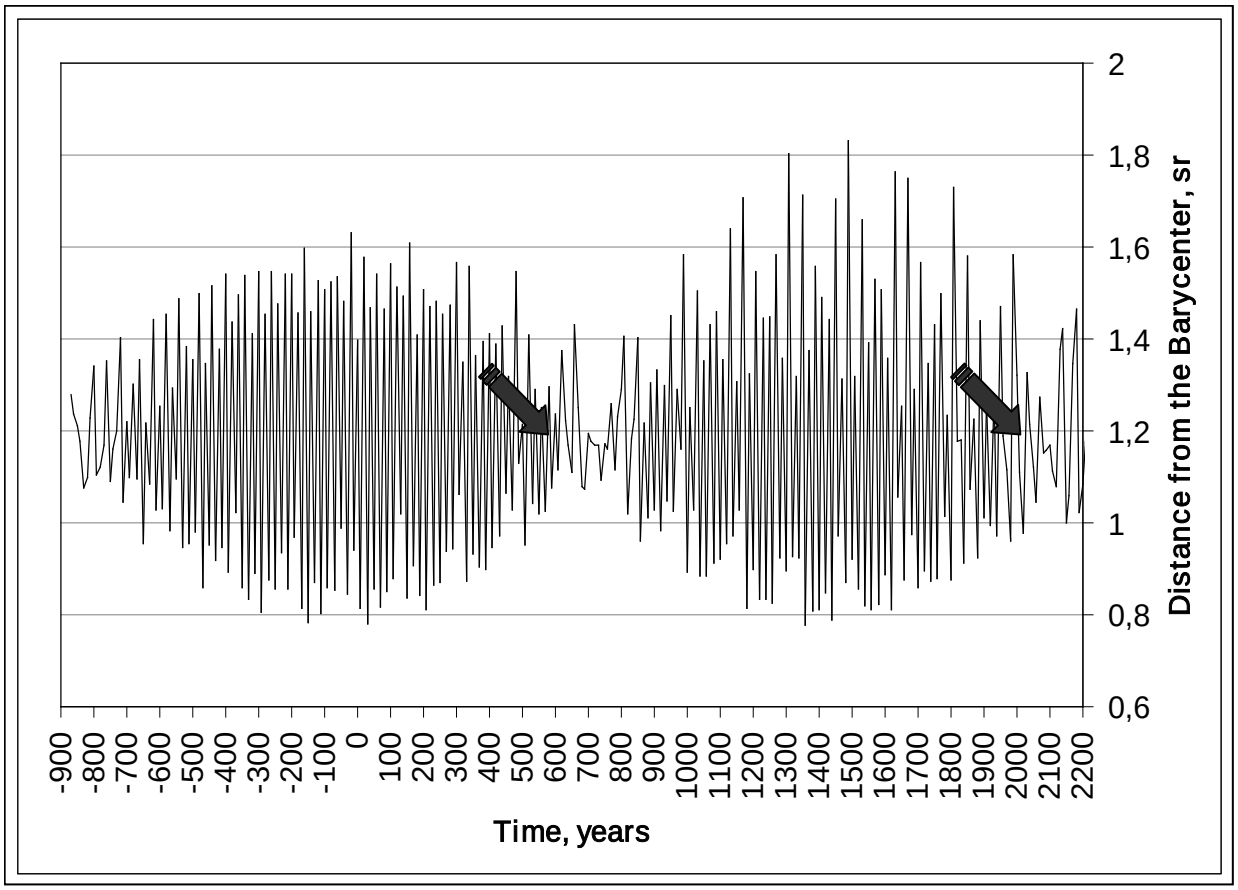
Fig. 18: Deterioration of juniper growth in the middle of the VI century in China (Qianshan mountains)

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Source: according to H. Grudd et al. (https://www.ncdc.noaa.gov/paleo-search/?dataTypeId=18)

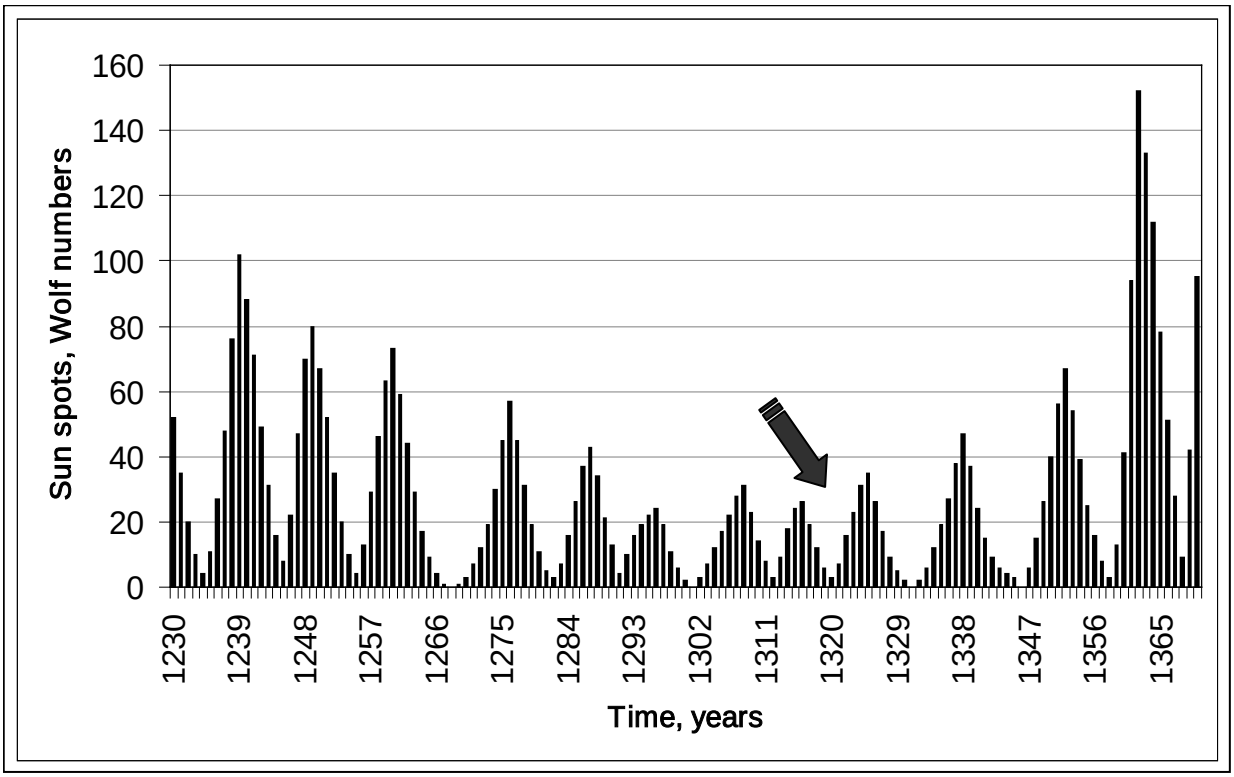
Fig. 19: Decrease in annual growth of pine trees in the middle of the VI century in Scandinavia



Source: according to The Significant Earthquake Database (http://www.ngdc.noaa.gov/nndc/struts/form?t=101650&s=1&d=1)

Fig. 20: Strong earthquakes (M ≥ 7) in the IV-VII centuries.

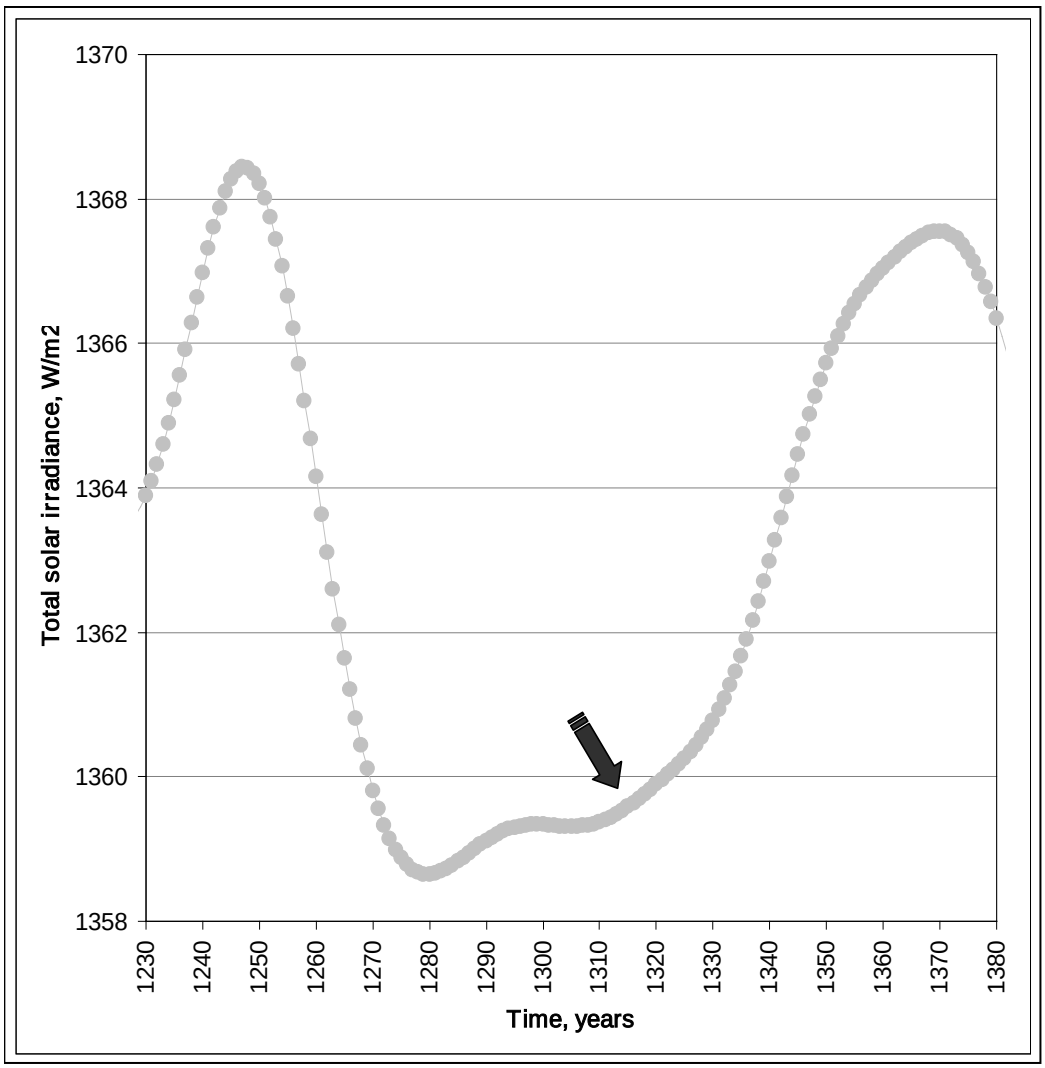
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Source: calculation under the EPOS GAO program

Fig. 21: 1430-year cycle in the movement of the Sun relative to the barycenter of the planetary system (time limits of periods are marked with arrows)

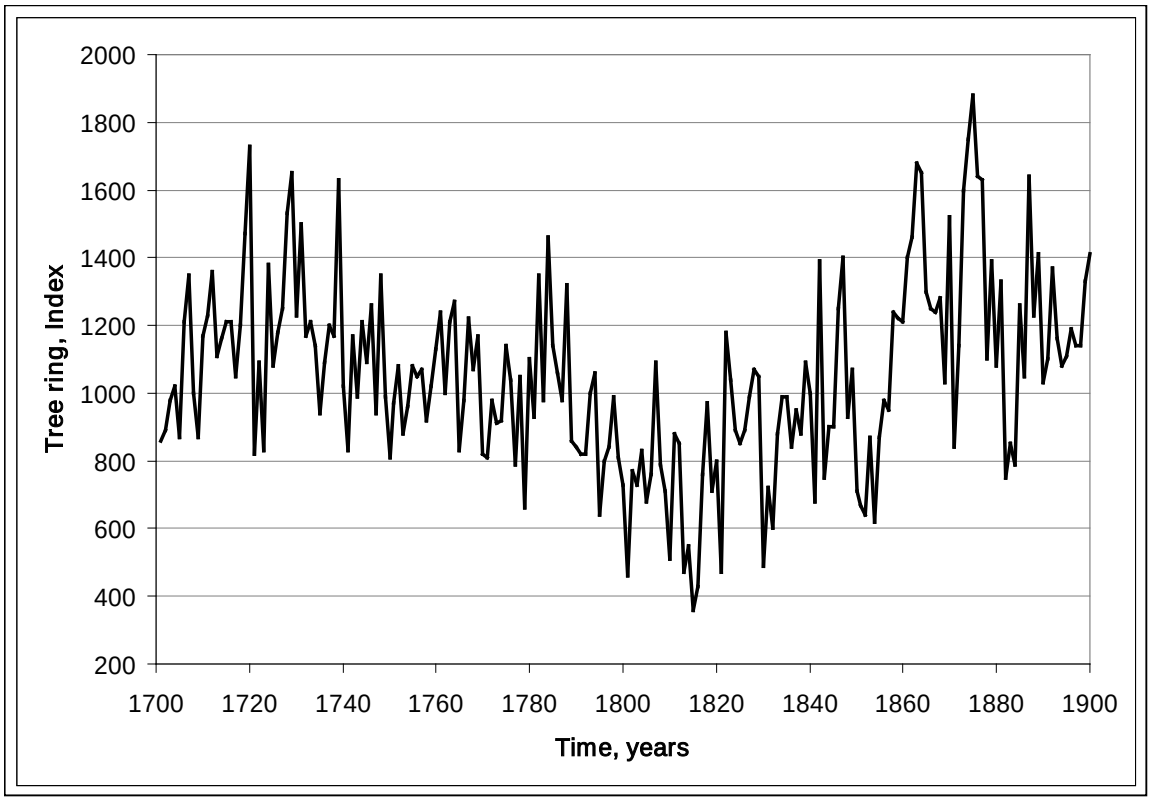
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Source: according to Yu. a. Nagovitsyn (http://www.gao.spb.ru/database/esai/yr_wom.txt)

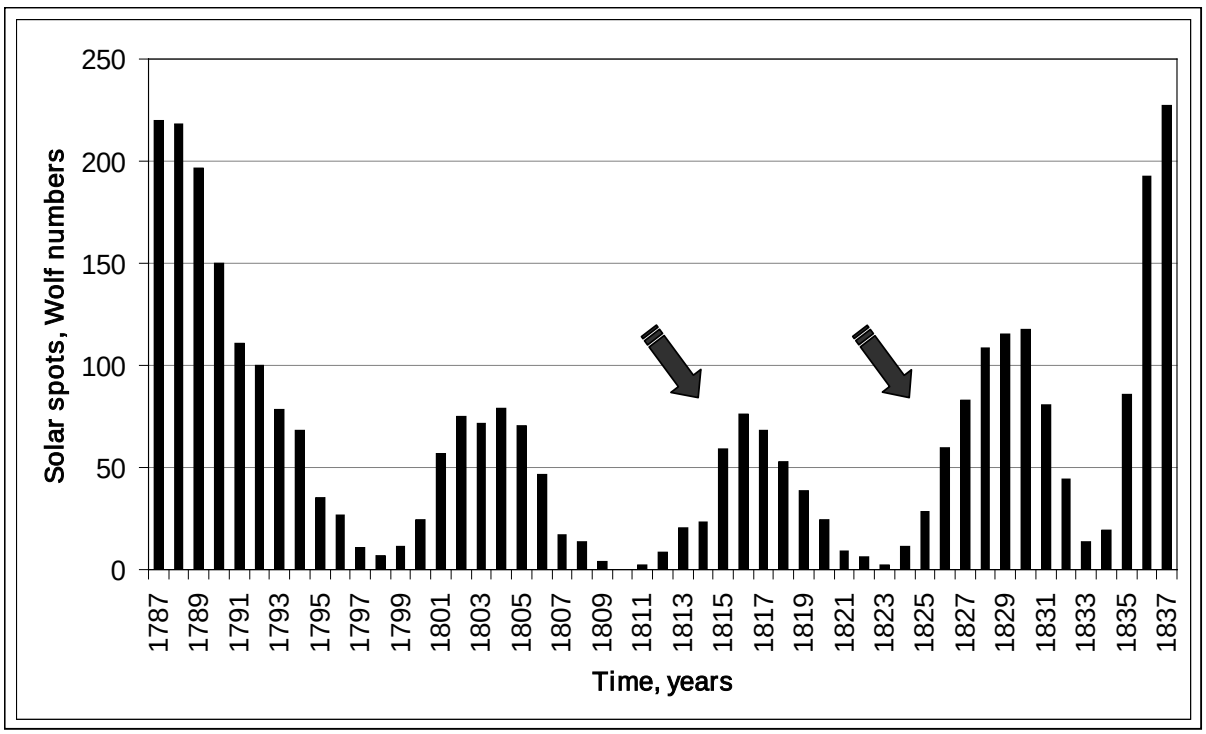
Fig. 22: Solar activity in the XIII-XIV centuries. The moment when the plague started is marked with an arrow.

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Source: according to reconstruction data A. Shapiro et al., 2011 (https://arxiv.org/abs/1102.4763)

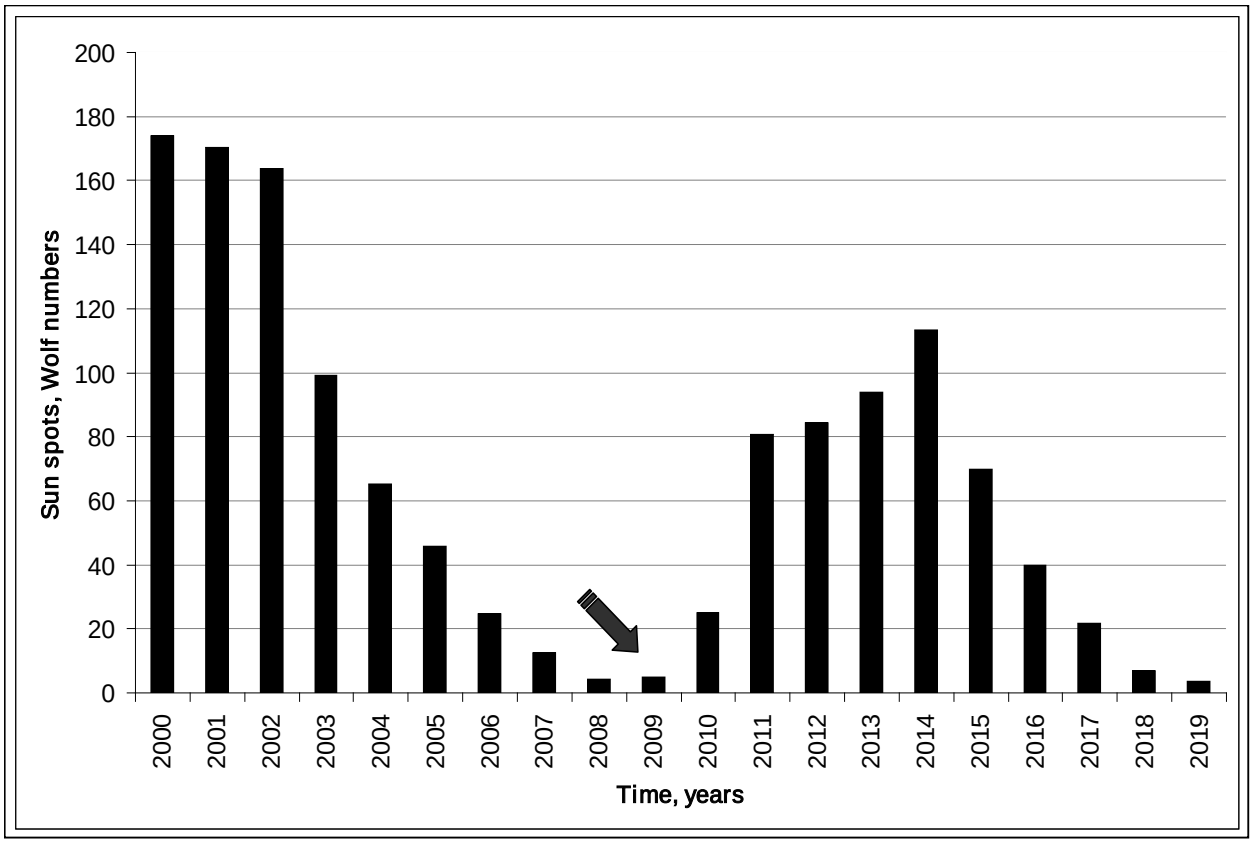
Fig. 23: Negative anomaly of total solar radiation in the XIV century. The Moment of the beginning of the plague epidemic is marked with an arrow



Source: according to W. Huesken (ncdc.noaa.gov/paleo-search/?dataTypeId=18)

Fig. 24: Weakened growth of larch trees in the Italian mountains during the Dalton minimum years

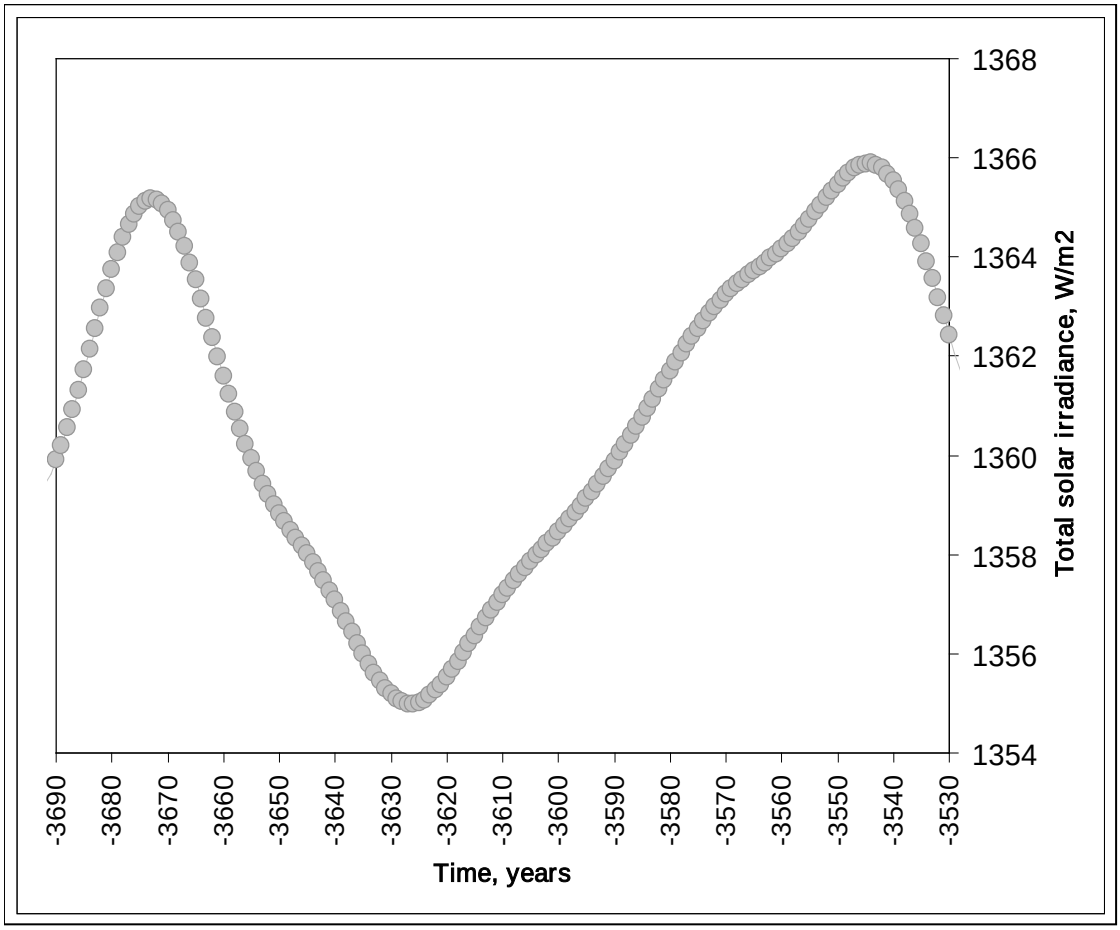
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Source: according to the World Data Center for the production, preservation and dissemination of the international sunspot number (http://sidc.oma.be/silso/datafiles)

Fig. 25: Weakening of solar activity in the first third of the XIX century. The Moments of the beginning of the cholera pandemic are marked with arrows

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Source: Ibid.

Fig. 26: Solar activity in 2000-2019. The moment of the beginning of the flu epidemic is marked with an arrow

Source: according to reconstruction data A. Shapiro et al., 2011 (https://arxiv.org/abs/1102.4763)

Fig. 27: The solar minimum is the time of the Neolithic at the border of two periods 1430-year cycle, which corresponds to the boundary between the stages of the warmer Atlantic and cold climate of Subboreal (scheme Blitt-Sernander)

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Cost Study for Implementing the Green Roof in Boa Vista/RR

By Yara Cristina De Souza Batista, Márcia Teixeira Falcão, Francilene Cardoso Alves Fortes, Emerson Lopes De Amorim, Lucas Matos De Souza & Rodrigo Edson Castro Ávila

University Center Estácio da Amazônia

Abstract- With sustainability as viable and concrete alternatives, the green roof emerges as a successful and technological innovation for civil construction, in order to mitigate the harmful effects to the environment of this industry in Boa Vista/RR. Thus, an analysis of the cost of installing the green roof was established in a prototype built at the Centro Universitário Estácio da Amazônia in Boa Vista/RR. When analyzing the cost of sustainable coverage, it proved to be significant for the State of Roraima, in addition to promoting a socio-environmental quality, with affordable costs for the population of Boa Vista.

Keywords: green roof; surface drainage; sustainability.

GJHSS-B Classification: FOR Code: 040699



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Cost Study for Implementing the Green Roof in Boa Vista/RR

Estudo Do Custo Para Implantação Do Telhado Verde Em Boa Vista/RR

Yara Cristina De Souza Batista [α], Márcia Teixeira Falcão [σ], Francilene Cardoso Alves Fortes [ρ], Emerson Lopes De Amorim [ω], Lucas Matos De Souza [¥] & Rodrigo Edson Castro Ávila [§]

Resume- **With sustainability as viable and concrete alternatives, the green roof emerges as a successful and technological innovation for civil construction, in order to mitigate the harmful effects to the environment of this industry in Boa Vista/RR. Thus, an analysis of the cost of installing the green roof was established in a prototype built at the Centro Universitário Estácio da Amazônia in Boa Vista/RR. When analyzing the cost of sustainable coverage, it proved to be significant for the State of Roraima, in addition to promoting a socio-environmental quality, with affordable costs for the population of Boa Vista.**

Keywords: green roof; surface runoff; sustainability.

Abstract- **Tendo como sustentabilidades como alternativas viáveis e concretas, o telhado verde surge como uma inovação exitosa e tecnológica para a construção civil a fim de amenizar os efeitos nocivos ao meio ambiente desta indústria em Boa Vista/RR. Assim, foi estabelecida uma análise do custo da instalação da cobertura verde em um protótipo construído no Centro Universitário Estácioda Amazônia em Boa Vista/RR. Ao analisar o custo da cobertura sustentável mostrou-se significativo para o Estado de Roraima, além deuma promoção de qualidade socioambiental com custos acessíveis para população boa vistense.**

Keywords: green roof; surface drainage; sustainability.

I. Introduction

The city of Boa Vista/RR has been going through a process of disordered urban growth, there is a great degradation caused by real estate subdivisions due to the collapse of the riparian forest, causing silting and damaging the water sources in Permanent Preservation Area (APP), damaging the flora, fauna and the well-being of the population of Boa Vista.

It's essential that the impacts arising from the actions of the civil construction industry need to be minimized, adapting the way of acting, to achieve greater sustainability. This article has been gaining greater prominence in recent years in the area of civil construction, since, according to Righi et al (2016), the sector is responsible for consuming 2/3 of natural wood and about 50% of natural resources, being a large part of non-renewable resources.

In this context, the technique of green roofs becomes an alternative that helps both in the thermal comfort of homes and in addition to mitigating the effects that this change brings to the environment. That can be applied to roofs and slabs having as pre-requirements waterproofing the surface, dimensioned drainage, minimum slope of 2% and maximum of 35% (up to 75% with locking and barriers) and structure that supports overload (KIST, 2011).

A major obstacle in the use of alternative technologies with sustainable materials is related to durability and costs. In view of the aforementioned problem, the proposal to analyze costs when implementing a green roof was considered.

The importance of this project is noted since during the research there were no studies on the comparison of budgets for the implementation of a Green Roof in Boa Vista/RR. This project also seeks to promote the proposed technique to be carried out in the city's dwellings in an accessible way, that is, low cost, advantages generated for the citizens in addition to contribution to public infrastructure, with a view to less rainwater discharge into the urban drainage.

One of these problems is well punctuated in the data from the Single Registry of the Ministry of Citizenship - CadÚnico (2019) which show the increase in extreme poverty in Roraima and already reaches 47 thousand people. In the last seven years, more than 4 thousand people have been in extreme poverty in the state, an increase of 10.5%. Thus, this proposal is even more justified by seeking the application of successful and accessible alternatives, since it contributes to the

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quality of life and well-being of citizens, and to reducing the flow of rainwater.

This study aimed to analyze the implementation of the green roof in a prototype built at the Centro Universitário Estácio da Amazônia in Boa Vista/RR. As well as checking the material costs of the sustainable roof built in the experiment comparing it with the Green Roof of the author of the literature (Nascimento, 2019); point out the benefits in a sustainable way in the construction of an ecological roof; expose the costs of this solution, built with French fiber-cement and ceramic tiles, in addition to promoting the reuse of rainwater to irrigate the built vegetation cover.

II. Theoretical Reference

a) Allotment and environmental impacts

With urban growth, buildings and urban infrastructure works such as streets, public sidewalks, parking lots and others, significantly alter the land cover and topography. In addition to the direct impacts on terrestrial and aquatic ecosystems, the urban climate is modified (TASSI et al 2014).

According to Setrabes (2019) many families have poor conditions, that is, they are between low income and extreme poverty, with 42% of the population in the state of Roraima. Another point is the absence of vegetation in the homes, causing a high sensation of heat in the homes, as the internal part of their houses is influenced by the external climate. Thus, it is necessary to use alternative methodologies to solve or reduce these problems (FERREIRA; COSTA, 2010).

Therefore, it is evident that buildings with green roofs, since ancient people, have been providing excellent thermal performance. This is due to the function of the layer between the soil and vegetation, which in hot climates environments, prevents the passage of heat into the buildings and in cold climates it retains the heat inside the buildings for a longer time (ARAUJO, 2007).

In view of this, the relevance of this study is even more justified, as it aims at alternatives for sustainable buildings that make conscious actions possible, meeting the current demand, contributing to the environment and meeting housing needs, promoting a sustainable society and thinking about the future.

According to Caixa Econômica Federal (2008), norms related to the environment and society were created for popular houses, whose purpose was to mitigate the consequences in the place, taking advantage of the resources of nature through the saving of water and energy. Medeiros (2012) reports that the market on this sustainable issue, appears with more focus on enterprises, due to changes in the law. But, that these products are not well received by society, due to the high price.

b) Definition, Advantages and Disadvantages of the Green Roof

According to Araújo (2007), the use of the Green Roofs technique provides great comfort both in and around homes, as vegetation helps to improve the region's climate as well as protect the roof from solar radiation, with the purpose of cooling the environment on hot days.

For Vacilikio (2011, p. 15), in addition to the Green Roof keeping the air fresh on hot days, it also has the capacity to store heat inside homes during the winter, and can then be installed in both cold and hot regions.

Another advantage is that it also provides a much cooler environment than other roofs, keeping the building protected from extreme temperatures, especially in the summer, reducing by up to 3 ° C, thus minimizing energy costs with heating or cooling, consequently saving energy. In extremely artificial environments such as the urban, they promote environmental rebalancing, bringing the benefits of vegetation to public health and biodiversity, when using native plants of the place. Sometimes, green roofs have solar panels that further reduce electricity consumption (NASCIMENTO, 2014).

For Castro and Goldenfum (2010), in addition to the advantage of reducing the speed of rainwater flow on the roof, increasing the retention of this water, it also reduces the thermal amplitude, among others. However, some disadvantages may arise with the implementation of green roofs, such as: cost of implementation, infiltration problems and increased load on the structure of the property.

c) Conventional roofs

To determine the choice of these roofs, the most used in Boa Vista / RR were considered as an alternative to cover buildings due to the cost of implementation. For construction of buildings with fiber cement tiles follows NBR 7.196/2014 - Sheet of Corrugated Fiber Tile: procedure. As for the use of French type ceramic tile, its execution is standardized by NBR 8.039/1983 - Design and Execution of Roofs with French Type Ceramic Tiles.

d) Costs and Comparison with the author Nascimento (2014)

Always thinking of the lowest cost and return on investment, Oliveira et al. (2009, p. 28), addresses even in the face of the mishaps about the cost of sustainable roof arises if we consider the entire life cycle, and the duration is on average twice the time of the conventional option. It is unlikely that such a solution will last more than 20 years without maintenance, since the green roof lasts 2x longer, in addition to protecting the roof, it can with stand temperature differences (BONI, 2015).

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To analyze the cost of implementing this roof under study, it was compared with the cost of the green roof built by the author Nascimento (2014) who budgeted for implementation in the housing units of the Minha Casa Minha Vida program in the city of Campo Mourão, PR.

III. Methodology

The study was carried out in two prototypes built on the premises of the Centro Universitário Estácio da Amazônia which have the dimensions of 1.40 mx 1.40 m in its internal part. The research was bibliographic, descriptive, qualitative, quantitative and field, where initially the ideal class for its use on the Green Roof in the municipality of Boa Vista/RR was studied, after a literary survey in articles, theses and newspapers, among others.

In order to present the composition of the Ecological Roof layers, literary articles were analyzed, as well as checking the plants of the region with the best adaptation. After looking for literary information in order to seek more accessible materials in a sustainable way for the implantation of the green roof, aiming at the population with less purchasing power in Boa Vista/RR, the layers were assembled. Emphasizing that both units were built with the same materials, with the exception of the tiles that in one used fiber cement and in the other tiles, with a distance of 2m, the same situations were subjected and the intention was to build the green roof.

In order to raise the costs of the materials of the green roof built, a comparison was made with a study already carried out in the literature, through a search in databases of the virtual library on monographs, published in the last 06 years. In sequence, the values for the layers were determined as follows: the waterproofing layer, two companies were used (A and B); for the draining layer and pipe for draining and reusing water in three different companies (C, D and E); for the filtering layer, two companies (F and G) linked in the fabric business; for the substrate layer, two locations (H and I); linked to the landscaping sector, the vegetation that two companies were used (J and K); also linked to the landscaping business, and finally two companies (L and M) to analyze the cost of the reservoir, companies A, B, C, D and E that are linked to the civil construction sector and all companies from A to M are located in Boa Vista/RR, and also two companies (N and O) in the landscaping business as a source of research for expanded clay and three companies (P, Q and R) to consult the cost of the geotextile blanket. Only companies P, Q and R are not located in Boa Vista, since the material was not found for sale in the state.

In step 2, the costs of each Roof (fiber cement tile and ceramic tile) were raised and compared with the inclusion of the built Green Roof, this solution aims at the composition of the economic viability, and the use of the technique, using the same companies (C, D and E) to consult the wooden structure and the fiber cement tile, and the company (C and N) to consult the ceramic tile.

It is noteworthy that the choice of tile types was due to being the most used in roofing in buildings, due to its low cost of implementation. To demonstrate the feasibility of the project, two water outlets were made from the system to drain the excess rainwater to obtain the drainage volume, thus promoting the reuse of water.

IV. Results and Discussion

With regard to its applicability according to the company website Ecotelhado (2010), it can be installed on practically any type of structure including waterproofed concrete slabs, asbestos-cement, ceramic or metallic roofs and wooden decks, with a slope of at least 5° which will contribute to the drainage of the waters, and whose estimated weight of the finished vegetation cover is about 50 kg/m^2.

Initially the green roof was appliedin two environments built on the premises of Estácio da Amazônia/RR, with a roof area of 4.5m^2 and a 5% slope for drainage. Therefore, we opted for the extensive class, as according to Mendonça and Melo (2017) it is a simple system, has low irrigation requirements, requires little maintenance, subsoil height 60 to 200 mm, and weight 60 to 150 kgf/m^2, with small plants and low execution cost.

The waterproofing layer, serving as a block and/or barrier preventing the water from overtaking into the building, and Nascimento (2014) used the asphalt blanket Figure 1 (A). In this study, the white liquid blanket, Figure 1 (B), was used, because this blanket, in addition to being more affordable than the asphalt blanket, is also recommended for fiber cement and ceramic tiles that are exposed to the sun.

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Source: Nascimento (2014). *Source: Author (2019).*

Figure 1: A -Asphalt blanket; B - Fibrocement Tile Waterproofing; C - Ceramic

Nascimento (2014) in his study carried out the price analysis in 3 companies presented in Table 1, however to calculate the costs of the author's green roof, the same area of the 4.5m² roof was adopted, so that he can compare the values found for each technique, and the values of R $ 90.00 for 4.5m² were obtained for the author's asphalt blanket. In the Table 2 experiment, the value was R $ 47.14 for the net blanket.

Table 1: Price of the asphalt blanket.

Empresas	Área da manta (m²)[6]	Preço/m²	Área do Telhado (m²)	Preço Total
Empresa A	10	20,00	61,60	1.232,00
Empresa B	10	25,00	61,60	1.540,00
Empresa C	10	25,00	61,60	1.540,00

Source: Nascimento (2014).

Table 2: Price of waterproofing the experiment.

White Liquid Blanket 2.25kg				
Company	Price (UN)	Yield / m²	Roof Area (m²)	Total price
Company A	47.14	4.5	4.5	**47.14**
Company B	48.50	4.5	4.5	**48.50**

Source: Author (2019).

For waterproofing, Savi (2015) states that the most common way to waterproof reinforced concrete slabs is the asphalt blanket. However, based on the results presented in this experiment, it was preferable to use the white liquid blanket, both in terms of value and location, in addition to having the same waterproofing functions.

Regarding the anti-root protection layer, it sought to separate the waterproofing membrane from the vegetation layer and protect the roof from possible damage that could occur with the penetration of roots and microorganisms (Heneine, 2008). Thus, Nascimento (2014) used the resistant black plastic tarpaulin Figure 2 (A). In the experiment, the blue plastic canvas was used, Figure 2 (B).



Source: Nascimento (2014). *Source: Author (2019).*

Figure 2: A -resistant black plastic canvas; B - blue plastic canvas experiment.

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In table 3, considering the same roof area of 4.5m² in the work Nascimento (2014), the result was R $ 3.38 the total price of black canvas. The price found for the blue canvas in the experiment was R $ 3.96.

Table 3: Price of resistant black plastic canvas.

Empresas	Área da lona (m²)[5]	Preço/m²	Área do Telhado (m²)	Preço Total
Empresa A	600	0,80	61,60	49,28
Empresa B	600	0,75	61,60	46,20
Empresa C	600	1,20	61,60	73,44

Source: Nascimento (2014).

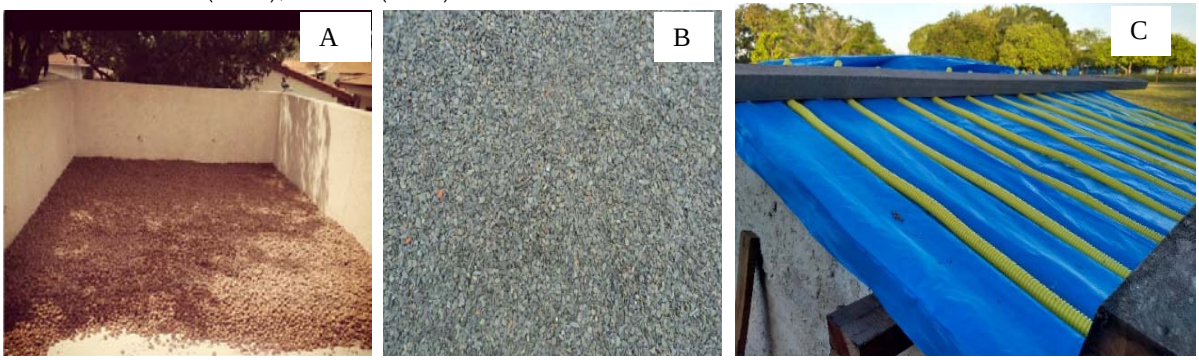
Table 4: Price of blue plastic canvas.

Item	Consumption	Unit Price (C)	Unit Price (D)	Unit Price (E)	Total Price (C)	Total Price (D)	Total Price (E)
Canvas (m²)	4.50	1.63	0.88	1.25	**7.33**	**3.96**	**5.63**

Source: Author (2019).

Nascimento (2014) does not mention the reasons in his work for the use of this tarpaulin, he probably followed the same reasoning with the lowest cost in the city. Note that when comparing the values, the difference was R $ 0.58, the value was more accessible than that found in the experiment.

Regarding the drainage layer, in the works carried out Heneine (2008), Savi (2015) and the websiteANDcoefficients(2017)expanded clay was used, as they are the most porous, they absorb more water. However, Nascimento (2014) used gravel # 0, Figure 3 (A) to remove excess water and prevent waterlogging. In the experiment, Figure 3 (B) used 20mm conduits, with holes in its length for the water to drain and the canvas to help in the process.



Source: AND coefficients(2017) *Source: Nascimento (2014).* *Source: Author (2019).*

Figure 3: A -Draining layer; B - Draining layer of the experiment.

Adopting the same area of the 4.5m² roof, the cost obtained by Nascimento (2014) in table 5 was R $ 13.86, however, Company C does not sell the product. In the experiment, the price was R $ 33.54, Table 6.

Table 5: Price of gravel nº 0

Empresas	Espessura (m)	Área do Telhado (m²)	Quantidade (m³)	Preço/m³	Preço Total
Empresa A	0,07	61,60	4,312	50	215,60
Empresa B	0,07	61,60	4,312	44	189,73

Source: Nascimento (2014).

Table 6: Price of the Draining Layer of the experiment.

Item	Consumption	Unit Price (C)	Unit Price (D)	Unit Price (E)	Total Price (C)	Total Price (D)	Total Price (E)
Conduit (m)	26.00	1.29	1.40	1.30	**33.54**	**36.40**	**33.80**

Source: Author (2019).

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However, when comparing the values, the price of Nascimento (2014) was more accessible than that of the experiment, this may have occurred because the State of Roraima is located far from large centers. However, the use of the conduit was due to the lower weight compared to gravel, thus reducing the weight on the roof.

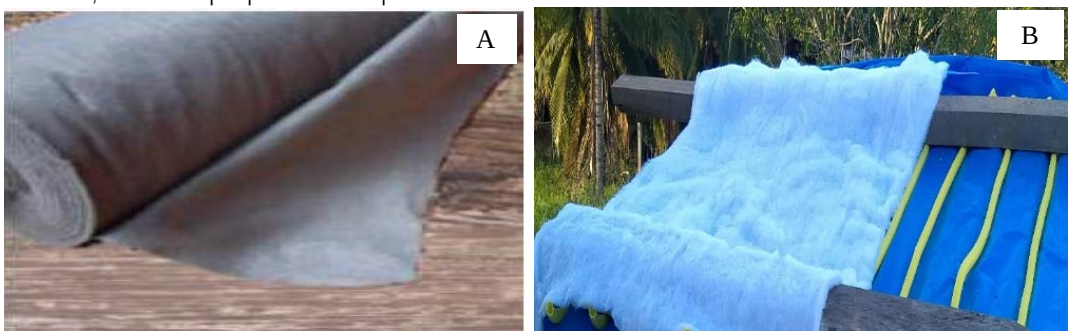
It is worth mentioning the difficulty of availability of expanded clay in Boa Vista / RR, which raises the price of the material in the region according to Table 7. And when comparing the price of expanded clay with the experiment, the difference is R $ 63.60. Thus, the conduit became more accessible to the low-income population, which is the main focus of the work.

Table 7: Price of Expanded Clay in Boa Vista / RR.

Expanded Clay - 20 kg					
Company	Thickness (m)	Roof Area (m²)	Quantity (kg / m²)	Price / kg	Total price
Company N	0.07	4.50	4.44	5.00	**100.00**
Company O	0.07	4.50	4.44	7.50	**150.00**

Source: Author (2019).

And to prevent the soil from being drained by the rains, Nascimento (2014) used a Figure 4 (A) geotextile blanket in the filter layer, a product made with polypropylene fibers, whose purpose is rapid water percolation. In the experiment, however, he used Figure 4 (B) silicone fiber as it is a material that is easy to locate and can be reused if you already have it at home.



Source: Nascimento (2014). *Source: Author (2019).*

Figure 4: A -Geotextile blanket ; B -Silicone fiber in the experiment.

However in table 8,the data ofNascimento (2014), adopting the same area of the 4.5m² roof, was R $ 9.54. Already in Table 9the experiment data was R $ 43.75 for the silicon fiber. When comparing the values, there is a very high cost, but the material was not found in the city, so there was a need to use materials that could replace it and fulfill the same functions as the silicon fiber.

Table 8: Price of the geotextile blanket

Empresas	Área da manta (m²)[7]	Preço/m²	Área do Telhado	Preço Total
Empresa D	215	2,12	61,60	130,59
Empresa E	215	2,45	61,60	150,92

Source: Nascimento (2014).

Table 9: Price of silicon fiber.

Silicon Fiber				
Company	Consumption (kg / m²)	Price / m²	Roof area (m²)	Total price
Company F	0.28	10.83	**4.5**	**48.75**
Company G	0.28	9.72	**4.5**	**43.75**

Source: Author (2019).

However, in Table 10, there is the price of the geotextile blanket outside the State, it is noted that it would add the freight cost for the use of the material, due to the logistics problem in the State of Roraima.

Not to mention the difficulty with supplying supplies due to the delay in arriving the material in the State of Roraima, due to the means of transport, the conditions of the transport routes, and mainly the non-

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existence of a producer market that meets the local demand and its supply from suppliers in other regions of the country.

Thus, the cost of silicon fiber for the experiment was more affordable.

Table 10: Price of Geotextile Blanket outside the State

BIDIM blanket				
Company	Price / m²	Consumption (m²)	Roof Area (m²)	Total price
Company P	10.99 (+ 89.00 shipping)	4.5	4.5	**138.46**
Company Q	3.51 (+ 79.90 shipping)	4.5	4.5	**96.70**
Company R	5.90 (+ 86.92 shipping)	4.5	4.5	**113.45**

Source: Author (2019).

For the vegetation to develop, Nascimento (2014) used a 7 cm thick soil layer, containing sheep manure, vegetal soil, sand and normal soil, Figure 5 (A). And in the experiment, he used a compound containing: black earth, cattle manure, rice straw, sawdust and lime, its thickness is 2 cm, figure 5 (B). Remembering that this manure was made manually with the remains of organic residues existing in the residence.



Source: Birth (2019).



Source: Author (2019).

Figure 5: A–Substrate ; B - Substrate of the experiment.

In Table 11, it is noted that the values are high in the study by Nascimento (2014), remembering that the fertilizer is sold in 40 kg bags. However, the author costs the same area of 4.5 m², was R $ 78.92. And in the experiment the cost was R $ 15.00, according to Table 12.

Table 11: Substrate Price

Empresas	Espessura (m)	Área do (m²)	Quantidade (kg/m²)	Preço/Kg	Preço Total
Empresa F	0,07	61,60	70,15	0,25	1.080,31
Empresa G	0,07	61,60	70,15	0,32	1.382,79

Source: Nascimento (2014).

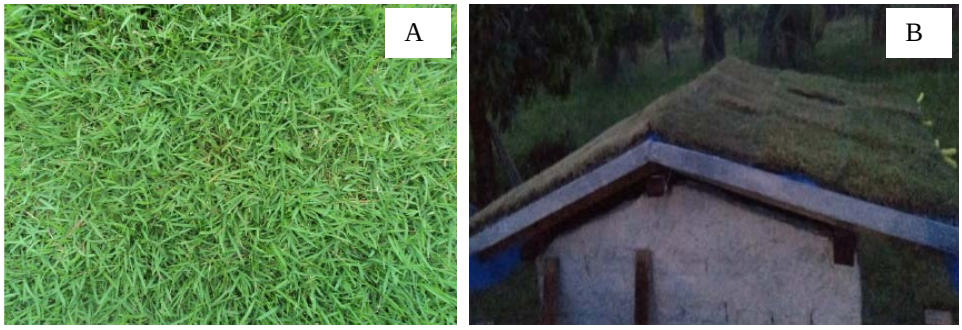
Table 12: Substrate price in the experiment.

Prepared Substrate - 30kg					
Company	Thickness (m)	Roof Area (m²)	Quantity (kg / m²)	Price / kg	Total price
Company H	0.02	4.5	6.66	0.50	**15.00**
Company I	0.02	4.5	6.66	0.66	**20.00**

Source: Author (2019).

And to finish the construction of the green roof, Nascimento (2014) used emerald grass in the vegetation, Figure 6 (A) scientific name zoysia japonica. This vegetation adapts easily to the hot climate, has little maintenance and a maximum height of 15 cm. In line with this experiment, Figure 6 (B) also used Esmeralda grass for its price, ease of installation and because it is common in Boa Vista/RR.

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Source: Birth (2019). Source: Author (2019).

Figure 6: A -Emerald grass; B - Emerald grass in the experiment.

In Table 13, Nascimento's costs (2014) when adopting the same 4.5m² roof area, was R $ 24.75. And in the experiment, the cost of the grass was R $ 36.00, Table 14. When comparing the results, the difference was R $ 11.25 cheaper than the experiment, this may be due to the location of the State of Roraima.

Table 13: Price of emerald grass

Empresas	Quantidade de Grama (m²)[8]	Preço/m²	Preço Total
Empresa F	61,60	5,50	338,80
Empresa G	61.60	5.50	338.80

Source: Nascimento (2014).

Table 14: Price of emerald grass in the experiment.

Emerald Grass			
Company	Consumption (m²)	Price / m²	Total price
Company J	4.50	8.00	**36.00**
Company K	4.50	8.50	**38.25**

Source: Author (2019).

When observing Table 15, the result of the total cost of the two green roofs studied is noted that even with the replacement of some materials, but that maintained the same functions due to their absence in Boa Vista/RR, the roof of the experiment remained 18.64% cheaper than the roof of the studied literature.

Table 15: Total Cost of Green Roofs

Green Roof Birth (2014)		Green roof of the experiment	
Material	Total price	Material	Total price
Asphalt Blanket	90.00	White liquid blanket	47.14
Canvas	3.38	Canvas	3.96
Gravel nº 0	13.86	Conduit	33.54
Geotextile blanket	9.54	Silicone fiber	43.75
Substrate	78.92	Substrate	15.00
Emerald Grass	24.75	Emerald Grass	36.00
Total for 4.5m²	R $ 220.45	Total for 4.5m²	R $ 179.39
Cost / m²	**R $ 48.99**	**Cost / m²**	**R $ 39.86**

Source: Author (2019).

In view of the results, and in order to carry out the implantation of this green roof in the residences in Boa Vista, this work according to Oliveira et al. (2009, p. 28) always thinks about the lowest cost and return on the return on investment made.

And in order to mitigate the impacts, Baldessar (2012) reports that there has been a great growth in the use of green roofs, as they help to control the greenhouse effect, reduce heat islands and reduce air pollution. In addition, I also emphasize that with the ecological awakening, the proposal seeks greater integration with nature, because through concerns about the greenhouse effect, the energy crisis, CO2 emissions, and the rationalization of water, they were already in alarming levels, immediate improvements were thought of.

In view of this report, the costs of the green roof constructed with fiber cement and ceramic tiles are presented, not considering the structure of the studied site, calculations of the wooden structure and the fiber

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cement and ceramic roof constructed at work, considering the area of 4, 5m², which are described in tables 18.

Table 18: Wood Structure

	Fiber cement roof							Ceramic Roof						
Item	With juice	Unit Price (C)	Unit Price (D)	Unit Price (E)	Total Price (C)	Total Price (D)	Total Price (E)	With juice	Unitá Price river (C)	Unitá Price River D)	Unitá Price river (E)	Total Price (C)	Total Price (D)	Total Price (E)
Clapboard (m)	15	2.16	2.00	1.70	**32.40**	**30.00**	**25.50**	22	2.16	2.00	1.70	**47.52**	**44.00**	**37.40**
Lame Leg (m)	11	4.66	5.42	3.90	**51.26**	**59.62**	**42.90**	13	4.66	5.42	3.90	**60.58**	**70.46**	**50.70**
Nail (kg)	0.5	10.00	9.42	10.00	**5.00**	**4.73**	**5.00**	0.5	10.00	9.42	10.0 0	**5.00**	**4.73**	**5.00**

Source: Author (2019).

Tables 19 and 20 show the cost for fiber cement and ceramic tiles and Table 21 shows the total cost for the roofs above.

Table 19: Fiber cement roofing

FIBROCIMENTO							
Item	Consumo	Preço Unitário (C)	Preço Unitário (D)	Preço Unitário (E)	Preço Total (C)	Preço Total (D)	Preço Total (E)
Telha fibrocimento (UN)	8	6,69	7,70	6,30	**53,52**	**61,60**	**50,40**
Capote Fibrocimento (UN)	5	7,50	3,83	6,00	**37,50**	**19,15**	**30,00**

Source: Author (2019).

Table 20: Ceramic roofing

TELHADO CERÂMICO					
Item	Consumo	Preço Unitário (C)	Preço Unitário (N)	Preço Total (C)	Preço Total (N)
Telha Cerâmica (UN)	126	1,13	0,80	**142,38**	**100,80**
Capote Cerâmica (UN)	5	12,00	8,00	**60,00**	**40,00**

Source: Author (2019).

Table 21: Ceramic Roof

Fiber cement roof		Ceramic Roof	
Material	Total price	Material	Total price
Clapboard (m)	25.50	Clapboard (m)	37.40
Lame Leg (m)	42.90	Lame Leg (m)	50.70
Nail (kg)	4.73	Nail (kg)	4.73
Fiber cement tile (UN)	50.40	Ceramic Tile (UN)	100.80
Fiber-cement cloak (UN)	19.15	Ceramic Cloak (UN)	40.00
Total for 4.5m²	R $ 142.68	Total for 4.5m²	R $ 233.63
Cost / m²	**R $ 31.71**	**Cost / m²**	**R $ 51.92**

Source: Author (2019).

Below, Table 22 presents a summary of the cost/m² of all types of roofs studied in the article.

Table 22: Summary of Total Cost

ROOF	Green Roof Built	Green Roof of Birth (2014)	Fiber cement roof	Ceramic Roof
COST / M²	R $ 39.86	R $ 48.99	R $ 31.71	R $ 51.92

Source: Author (2019).

In view of the above context, it sought to strengthen the idea and/or encourage the adoption of this proposal by the population of Boa Vista, as among the benefits of the green roof, promoting and/or disseminating the reuse of rainwater to irrigate or use it for other purposes. Thus began the construction of the gutter, Figure 7 (A), whose importance is to carry the precipitated water to the reservoir, which can later be

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reused. The materials used were 100mm PVC tubes, the value of which is more accessible than the zinc gutter that would cost an average of R $ 35.00/m, that is, for the green roof built it would be an expense of R $ 129.50 with the gutters.



Source: Author (2019).

Figure 7: A - gutter construction; B - Reservoir and Piping

Figure 7 (B), on the other hand, used a 30L reservoir to store rainwater and a collection system was made with 50mm PVC pipes for water to be conducted to the reservoir, which was used to irrigate the roof in the experiment. This is in line with Garrido Neto (2012) who reused water by directing it into a reservoir or cistern, using gutters and conductors.

As for prices, the price of the reservoir and piping used in the research reuse system in companies is shown in Tables 15 and 16.

Table 15: Reservoir price

RESERVOIR - 30 Liters	
Company	Total price
Company L	37.00
Company M	27.00

Source: Author (2019).

Table 16: Piping Price

Item	Consumption	Unit Price (C)	Unit Price (D)	Unit Price (E)	Total Price (C)	Total Price (D)	Total Price (E)
Tube 100mm (m)	3.7	6.45	7.50	7.00	23.87	27.75	25.90
Tube 50mm (m)	4.2	4.67	5.14	4.67	19.61	21.59	19.61
Knee 100mm (UN)	2	4.50	5.89	4.00	9.00	11.78	8.00
Knee 50mm (UN)	1	2.00	2.36	2.50	2.00	2.36	2.50
Reducing bushing 100mm / 50mm (UN)	2	4.50	8.24	4.50	9.00	16.48	9.00
CAP 100mm (UN)	2	4.00	7.65	4.50	8.00	15.30	9.00
Knee 50mm 45° (UN)	1	2.50	3.65	3.00	2.50	3.65	3.00
Tap	1	3.00	3.00	3.00	3.00	3.00	3.00

Source: Author (2019).

According to Quiza (2017) apud Zatta (2018) a small cistern of 200 or 500 liters has a very simple structure, depending on the needs of each residence, it can be built or bought ready, its cost varies between R $ 200.00 and R $ 300.00 .

Thus, according to Table 17, the total cost of the water reuse system is R $ 102.98, using reusable materials that fulfill the established functions and at a lower cost.

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Table 17: Total cost of the water reuse system

Water Reuse System	
Material	Total price
Reservoir	27.00
Tube 100mm (m)	23.87
Tube 50mm (m)	19.61
Knee 100mm (UN)	8.00
Knee 50mm (UN)	2.00
Reducing bushing 100mm / 50mm (UN)	9.00
CAP 100mm (UN)	8.00
Knee 50mm 45º (UN)	2.50
Tap	3.00
Total cost	**R $ 102.98**

Source: Author (2019).

In view of the results found, it is suggested that further research be carried out on the subject, as it was observed that there is a difference in the prices of materials, so it is necessary to seek new reusable materials, further reducing the cost found in this study. And also build a sustainable pump to capture water and subsequently irrigate the roof.

It is also suggested incentives for the use of green cover with partial exemption from property tax and urban land - IPTU, according to incentives that occurred in Santa Catarina, São Paulo, Rio Grande do Sul, according to law 01-0622/2008.

Tax incentives are recommended for people who use the Green Roof, in order to expand the vegetation of Boa Vista/RR, reducing the thermal sensation and improving the quality of air and life.

Incentives are proposed, such as the reduction in the tax of civil companies that use ecological materials, called IPI (Tax on Industrialized Products). Another suggestion would be the IPTUGREEN, which focuses on a 3% discount for taxpayers whorestructure and/or build your homes using this system presented here.

Thus, theintroduction of special taxes for rainwater management in Boa Vista/RR, since according to Igra (2013) apud Vieira (2018) a large number of cities in Germany have adopted this practice. According to the author above, green coverage areas with high water retention capacity are rewarded with
rates up to 50%.

V. Conclusion

It is concluded that the construction of the green roof was efficient and it can be said that the environmental damage was minimal, due to the reuse of materials, not to mention the cost-benefit for the population of Boa Vista.

Also through this work it was possible to build an efficient Green Roof with reused materials, so it can be said that with these results presented here this technique can be developed for low-income people.

In addition, the total cost of the water reuse system was affordable, in addition to using reusable materials that fulfill the functions established by the standard and with less burden.

In this context, the implantation of this proposal in popular houses is a viable alternative for the population of Boa Vista, which seeks to improve the quality of life, in addition to helping to reduce water consumption through its reuse, promoting a more sustainable society.

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Effect of Flood on Women Farmers Activities in Flood Prone Areas in Ibadan Metropolis, Oyo State, Nigeria

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Abstract- The study aimed to assess the effect of the flood on women farmers' activities in flood- prone areas in Ibadan Metropolis, Oyo State, Nigeria. Sampling technique was multi-stage, data were collected with the aid of a questionnaire using an interview format to eighty-one respondents. Descriptive and inferential analyses were used to analyse the data obtained. The result revealed that livestock production was the most engaging activities and findings showed that 90.1% of the respondents were into poultry production. Also, the result revealed that the level of the flood was high (61.73) among the women farmers, which mean that the flood-affected virtually all aspects of agricultural activities in the study area. Significant relationship between respondents' agricultural activities and effect of flood ($r = -0.151$, $p \leq 0.05$). The study concluded that flood had an adverse effect on women farmers despite engaging in various agricultural activities to minimize the effect in the study area.

Keywords: *flood, agriculture, women, farmers, and activities.*

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Effect of Flood on Women Farmers Activities in Flood Prone Areas in Ibadan Metropolis, Oyo State, Nigeria

Aluko, O.J. [α], Orishani, S.O. [σ], Oloba, O.G. [ρ], Shaib-Rahim, H.O. [ω] & Eniola, O[¥]

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Keywords: flood, agriculture, women, farmers, and activities.

I. Introduction

In the past, Agriculture was the most significant sector in Nigeria. The environment was so conducive to farming and other related activities with the support of the government. Agricultural proceeds have been used to develop the country since the independence. The agriculture sector was doomed in Nigeria in the year 1970, the end of the Biafran war, which coincided with the rise in the world oil price. The country was able to benefit from the boom, which made the government neglect the agricultural sector. According to the National Bureau of Statistics (2012), the oil and gas industry have taken over the farming segment of Nigeria's economy as a result of the world oil boom in the 70s.

Surprisingly a nation with over 70% of the population employed in agricultural sector is still playing second fiddle to the oil and gas sector. It was so bad to the extent that that about 84 million hectares of Nigeria's total land area, which has potential for agriculture, only about 40% of this is under cultivation (FMARD, 2012). Also, the few lands under cultivation are facing issues ranging from natural disasters to human afflicted problems, thereby preventing the nation from achieving its full potential in the agricultural related activities.The vision of Nigeria to be among the first top twenty nations in the agricultural production could be a mirage if agricultural farmlands are not safe from the frequent occurrence of environmental disasters in the country.

Floods are major environmental disasters affecting agricultural activities in Nigeria. European Union (2007) sees it as a covering of land by water that is not covered by water before the incidence. According to the United Nations (UN) report of 1998, 23 million people were affected as a result of flooding in Xian, China (UNFCCC, 2007). Furthermore, severe floods also killed over two hundred people in India and Bangladesh and left millions homeless (Erekpokeme, 2015). Odufewa *et al. (*2012) report that floods are the most occurring, widespread, disastrous and frequent natural hazards of the world.

It is on record that Ibadan the capital city of Oyo State Nigeria, has recorded varying degrees of flooding. For instance, there were flooding in the watersheds of Ogunpa and Kudeti streams (one of the two major streams in Ibadan) in 1955, 1960, 1961, 1963, 1969, 1978, 1980 and the recent flood in Ibadan occurred in 2011. The 2011 floods which occurred in Ibadan between august to October, 2011 was one of the most devastating in the city. According to Erekpokeme, (2015), the flood incidence in Ibadan in the year 2011 claimed lives and properties which include farmland, farmproduce, and animals (Onwuemele, 2012).

It is a pity that agriculture tends to suffer the most when there is a flood in Nigeria properly due to the sensitivity and fragility of its natural environment as well as its high dependence on environment-based livelihoods. Women farmers are not left out in this overwhelming disaster, and many of them were unable to recover up to date. It is disheartening that agricultural policies on the whole still do not address the needs of women farmers adequately after floods incidence in their domain. Agricultural development programs might be misinterpreted in the long run if the roles and needs of women farmers are not recognized in policy. Therefore there is a need to critically look at the effect of floods on women activities with the intention to

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encourage the policy makers to gives adequate attention to women farmers and their needs.

The aim of the study, therefore is to assess the effect of flood on women farmers' activities in the flood-prone area in Ibadan Metropolis, Oyo State, Nigeria. The study also identified the types of farming activities engaged by the women as well as the relationship between the farming activities and the effect of floods in the study areas.

II. Methodology

The study area was Oluyole Local Government Area of Ibadan, Oyo State, Nigeria. It shares boundaries with four Local Government Area, i.e. Ibadan South-West, South-East, Ona –Ara and Ido within Ibadan Metropolis, and lies between latitude 7°25' N and longitude 3°5'. (NPC, 2007). Data were collected through interviews with the aid of a well- structured questionnaire and directed towards women farmers. Oluyole Local Government was purposively selected for the study. This is because the area is prone to flood occurrence during the raining season.

The sampling technique was multi-staged. Four out of the 10 wards in Oluyole Local Government were purposively selected which was the first stage. In contrast, the second stage involved a random selection of the villages from the wards. The wards selected were 4, 8, and 9, which contained two villages respectively, and ward 5 had three villages. Random selection of one village respectively from each selected wards was carried out based on the history of floods destruction to farm produce on farmlands in the wards selected. The villages selected across the wards are Abanla, Busogboro, Odo-Ona Elewe, and Idi Ayunre.

In the last stage, farmers (women) counting was carried out to obtain a population in each village using the PRA technique. 20% of the population obtained was then used to select the respondents in list that ensue. Below is an illustration of the sampling procedure and sample size

Table 1: Sampling Size

Village	Population of women farmers	Respondents Selected (50% S.P)	Retrieved Questionnaires
Aba-eemo	100	20	20
Apete	150	30	30
Odoona-elewe	60	12	12
Idi-Ayunre	130	26	22

Note the Total Number of Retrieved Questionnaires =81

The data were analyzed using descriptive and inferential analyses. The descriptive statistics used include frequency distributions and percentages, mean, while the relationship between agricultural activities and effect of the flood on women farmer's activities in the study area was examined using inferential statistics such as PPMC were used to examine

a) Measurement of variable

A five-point scale of a "strongly agree," "agree," "uncertain," "disagree," and "strongly disagree" was used to measure the effect of the flood on women farmers, which is the dependent variable. A score of 5 was assigned to "strongly agree," 4 to "agree," 3 to "uncertain," 2 to "disagree," and 1 to "strongly disagree. The highest score obtainable was 50, and the lowest is 10. The effects were categorized as high and low. A two-point scale of yes and No was used to measure the second variable (agricultural activities). A score of 2 was assigned to yes, 1 to no. Thirteen questions were asked. Hence the highest score obtained was 26 and the lowest was 13. The reasons were categorized to high, and low.

III. Result and Discussion

Table 2: Agricultural Activities Practice by Woman Farmers in the Study Area

Variable	Yes	No
Crop production		
Arable crop	42(51.9%)	39(48.1%)
Cash crop	53(65.4%)	28(34.6%)
Vegetable production	68(84.0%)	13(16.0%)
Horticulture	28(34.6%)	53(65.4%)
Livestock production		
Sheep production	40(49.4%)	41(50.6%)
Piggery production	13(16.0%)	68(84.0%)

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Cattle production	32(39.5%)	49(60.5%)
Goat production	45(55.6%)	36(44.4%)
Domesticated cane rat	17(21.0%)	64(79.0%)
Rabbitary production	15(18.5%)	66(81.5%)
Fish production	10(12.3%)	71(87.7%)
Domesticated snail production	22(27.2%)	59(72.8%)
Poultry production	73(90.1%)	8(9.9%)
Total	81	100.0%

Source: Field survey, 2016.

The table above indicates that the majority of the respondents (90.1%) engaged in poultry production. The respondent's engagement in this activity constituted the major proportion of participation in agricultural activities in the study area. This implies that the respondents possess a very large amount of poultry in the study area. The assertion is in aligns with Okitoil *et al*. (2007), who reported that women in rural areas are majorly interested in poultry production. Also, it was revealed that 84.0% of the respondents were into vegetable production. The involvement of the respondents might be attributed to the fact that vegetables can be grown even with little space available in the study area, thereby contributing to their source of livelihood. It is in line with Nakwe *et al.,* (2018). They reported that the chief occupation of most women living in rural areas is agriculture, and they produce most of the vegetables consumed in rural areas. This table above revealed that 65.4% of the respondents in the study area also engaged in cash crop production. Furthermore, it was revealed that more than half (51.9%) of the respondents were into arable crops production. The involvement of the respondents in the culttivation implies that the respondents generally make good use of available land that is accessible to them, especially for backyard farming and all the agricultural practices mentioned above. This finding is in line with Ekesionye and Okolo (2012), who found that women were actively involved in economic activities.

Table 3: Effect of Flood on Women Farmers in the study area.

Variable	SA	A	U	D	SD
Low nutrient of soil	52(64.2)	29(35.8)	0(0.00)	0(0.00)	0(0.00)
Migration	40(49.4)	32(39.5)	2(2.5)	1(1.2)	6(7.4)
Income of farmers.	39(48.1)	42(51.9)	0(0.00)	0(0.00)	0(0.00)
Reduction in labour	22(27.2)	40(49.4)	2(2.5)	8(9.9)	9(11.1)
Loss of crops and Livestock	36(44.4)	37(45.7)	8(9.9)	0(0.00)	0(0.00)
Lack of motivation	3(3.7)	52(64.2)	2(2.5)	7(8.6)	17(21.0)
Reduction in yield produce	31(38.3)	50(61.7)	0(0.00)	0(0.00)	0(0.00)
Reduces the quality of Produce .	33(40.7)	43(53.1)	5(6.2)	0(0.00)	0(0.00)
Reduction in the standard of living	35(43.2)	36(44.4)	6(7.4)	4(4.9)	0(0.00)
Outbreak of diseases	36(44.4)	36(44.4)	3(3.7)	2(2.5)	4(4.9)

Source: Field Survey, 2016 NB: Percentage in parenthesis,

SA= Strongly agree, A=agree, U=undecided, D=disagree, SD=strongly disagree.

The result showed that 64.2% of the respondents strongly agreed that the effect of the flood on their farms resulted in low nutrient in the soil. This implies that when a flood occurs, the nutrients are leached off. Corroborating this, Akpoveta el at., (2014) opined that flood occurrence significantly decreased the nutrients in the soil. Also, 61.7% of the respondents agreed that the flood negatively affects the yield on the farm. The report could be because flood destroyed most of the farm produce, which also included the farm produce stored in the storage facilities. This assertion supported the findings of Aluko et al (2020), who reported destructions of stable crops in flood-prone areas in Oyo State Nigeria. The declaration implies that

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the incidence of water flood in the study area left the farmers with little or nothing to hold on to. Furthermore, 51.9% of the respondents agreed that, whenever flood occurs it affect family income, and revenue available at their disposal. The statement implies that the flood issue in the study area may reduce the income earned at the end of each farming season drastically. Also, 49.4% of the respondents reported that flood resulted in migration (moving from one place to another) to less flood-prone areas. The affirmation, by the respondents implies that respondents migrated from the flooded affected areas to non-affected flood areas for the safety of lives and properties.

Based on the results from the table above, flood affects ways of leaving of the people with the majority either agreed or strongly agreed that it led to reduction in labor used for farming activities, loss of crops and livestock on the farm, decline in the standard of living as well as the outbreak of diseases in the study area.

Table 4: Categorization of the level of effect of flood among the respondents in the study area

Level	Frequency	Percentage
Low	31	38.27
High	50	61.73
Total	**81**	**100**

From the table above, the level of the flood was high (61.73) among the respondents in the study area. The assertion implies that overflow of water had severe negativity in the farming activities of the respondents in the study area.

Table 5: Relationship between Agricultural Activities and the Effect of Flood

Variable	r-value	p-value	Decision
Agricultural Activities and Effect of Flood	- 0.151	0.0179	NS

Source: Field Survey, 2016

The correlation analysis on Table 5 shows that there is a significant relationship between respondents' agricultural activities and the effect of the flood ($r=-0.151$, $p \leq 0.05$). The negative correlation suggests that the nature of farming activities practiced by the respondents also contributed to the effect of flood in the study area. The statement could be attributed to the fact that most of the respondents preferred lands closer to the river boundary which could have a negative impact on their activities as a result of high risk to flood during the raining.

IV. Conclusion

The study revealed that flood hurt the respondents resulting to the migration, the reduced yield of the produce, reduction in quality of output, and loss of nutrients in the soil in the area. Farmers, especially women, are vulnerable to flood due to warmer climate and a higher rate of evaporation, which is contributing to an increase in the average annual amount of rain.

Despite engaging in various agricultural activities to minimize the effect on their activities and way of life, the finding revealed that the level of the flood was high (61.73%) among the respondents in the study area.

V. Recommendation

The following are recommendations made based on the findings of this study.

- The government should construct drainages in flood-affected areas and diversify a means of storing up excess water, to avoid the damage caused by flood yearly.
- The government should plant trees and encourage farmers to plant trees that could prevent washing away from farmland.
- Farmers should be encouraged to construct flood diversion channels that involve the artificial construction of channels along main river channels to divert part of the discharge during flood flows.

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Dowsing the 'Vital Energy' of the Planets and their Moons

By John F. Caddy

Abstract- An experimental dowsing of the planetary and lunar bodies of the solar system suggests that all planetary and lunar names evoke some degree of energetic excitation reflecting that of the bodies themselves. The highest values of pranic energy were found for Jupiter and the other large distant planets, and for moons close to their planet which are subject to gravitational forces and show volcanic activity. The Earth, Venus and Mars show similar moderate-high levels of pranic energy, but the low-moderate scores for pranic energy shown by Mercury and the Sun seem to verify that subtle energy production is incompatible with high production or high levels of conventional photonic radiation. A short discussion of the implications of these observations follows.

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Dowsing the 'Vital Energy' of the Planets and their Moons

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Abstract- An experimental dowsing of the planetary and lunar bodies of the solar system suggests that all planetary and lunar names evoke some degree of energetic excitation reflecting that of the bodies themselves. The highest values of pranic energy were found for Jupiter and the other large distant planets, and for moons close to their planet which are subject to gravitational forces and show volcanic activity. The Earth, Venus and Mars show similar moderate-high levels of pranic energy, but the low-moderate scores for pranic energy shown by Mercury and the Sun seem to verify that subtle energy production is incompatible with high production or high levels of conventional photonic radiation. A short discussion of the implications of these observations follows.

I. Introduction

That planet Earth emanates a form of energy detectable by its inhabitants with minimal training, is described in many ancient traditions. This form of energy has a variety of regional names: (e.g., prana, chi, mana), and with minimal training is detectable by the hands, or by dowsing. Detecting prana has been practiced for millennia before scientific investigation was begun. It is now necessary for Science to recognize this phenomenon and its associated practice. My first attempt to test the validity of the dowsing system I learned in Sardinia was to see if it provided believable results. It gained credibility after assessing the vital energy of physical objects of sentimental importance, religious icons and items of vocabulary which described positive emotions (high scores), physical objects (usually with moderate scores), and negative sentiments (low scores)- Caddy (2011). The definition I've used for what is referred to as pranic energy, or often nowadays the biofield, comes from https://www.Ayurvedum.com/what-is-prana/. This site defined Prana as "The Sanskrit word for the cosmic energy that is the essence of our existence". Prana or chi are terms used in Eastern philosophy and practice to describe the energy functions both of the human body and of our planetary environment (e.g. Senner). To refer to prana as 'cosmic energy' implies that this form of energy exists throughout the cosmos. This definition thus implies that the presence of prana precedes the development of life and is not only present where life already exists. Such a clarification is necessary in order to make sense of the results described here. It seems logical to enquire whether other planetary bodies have similar pranic energy levels to the Earth, and I believe that a logical enquiry is possible, whether or not living organisms are present on them. In this study I take advantage of the capacity of dowsing to assess the energy level of distant items.

Before dowsing an object or concept, I ask the dowsing procedure to measure the level of prana energy associated with the item being assessed. Dowsing intensity is determined by the number of rotations of the wand (Fig 1). While holding the dowsed name in the conscious mind I ask the subconscious mind what level of pranic energy this name evokes. When the test score is reached, it is impossible to further rotate the wand, and the number of rotations up to this point is the score for the name in question. Dowsing is performed automatically in a light trance state with an empty mind. The minimal conscious attention is confined to recording the number of rotations. The names of planetary and lunar bodies were tested one after the other with a brief pause between them.

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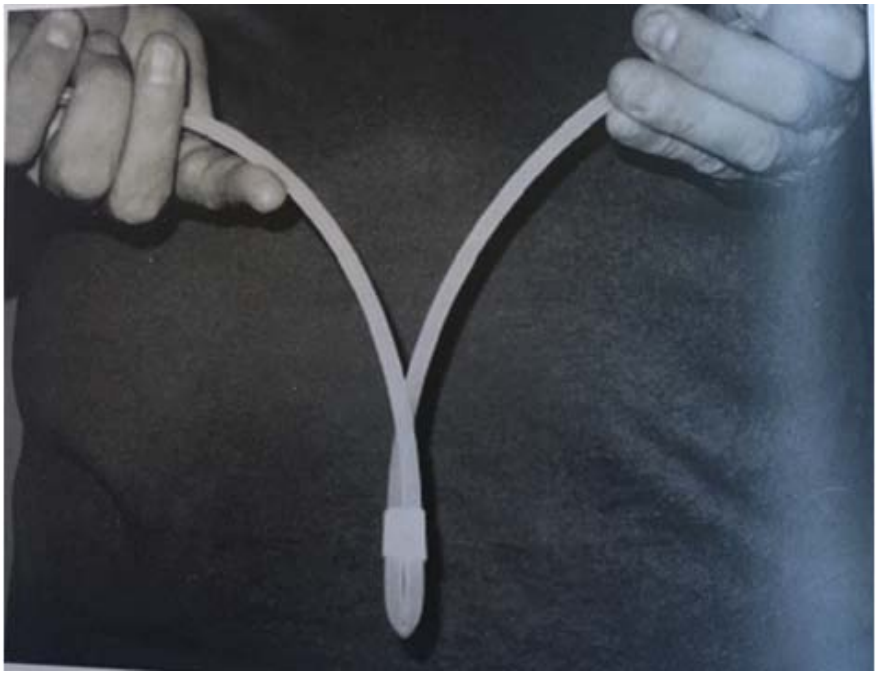


Fig. 1: Dowsing with a rotating wand of stiff plastic tubing. After asking for the level of pranic energy of an object, the y-fork is forced upwards and completes a revolution automatically, which is counted. This exercise is repeated until it is blocked – no further revolutions are then physically possible. That last counted rotation is the number sought.

One category of objects having spiritual significance since ancient times for humans, are the planets. My first trial in 1997 was to see what scores were elicited by the names of planets, the sun and the moon, and to compare the results with the published dimensions of these bodies and their distances from the sun (Table 1). When I first dowsed a planet's name, Jupiter, for vital energy and got a high score, this aroused my curiosity, and led me to dowse the other planetary names. Fig 2 shows the results plotted for the planets and our moon. In 2007 I became aware of a relevant data base on Wikepedia for the moons rotating around the other planets of the solar system. The data base on Wikipedia: "List of Solar System objects by size", provides information on their distance from the sun, and the diameters of all planets and moons. Prana energy scores for the moons circulating around them was obtained in a similar way to the planets. (The distance from the sun of the moons was set equal to that for the planet they circulated around).

The results of these tests are summarized in Table 2 and Fig 5. The X-axis of Figs 3, 4 and 5 is the natural logarithm of the distance from the sun, and the Y-axis the number of rotations of the wand that resulted from focusing on the name of the lunar body. (7-8 rotations are characteristic of neutral pranic level: higher values imply more vital energy or prana: low values imply low energy).

The analysis consisted of ordering the planetary bodies and their moons by size (taking the natural logarithm of their diameters), or distance from the sun, and plotting their ranked values against the corresponding values of the dowsing scores.

II. Results

Table 1: Basic data used in the planetary analysis and dowsed values

Solar system bodies	Distance from sun (AU)	Diameter (km)	Dowsed score (No. rotations)
The Sun	0	1392000	14
Mercury	0,39	3031	7
Venus	0,72	7521	21
Earth	1	7926	**23**
Mars	1,52	4222	19
Jupiter	5,20	88729	41

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Saturn	9,54	74600	31
Uranus	19,18	32600	26
Neptune	30,06	30200	16
Pluto	39,53	1413	11

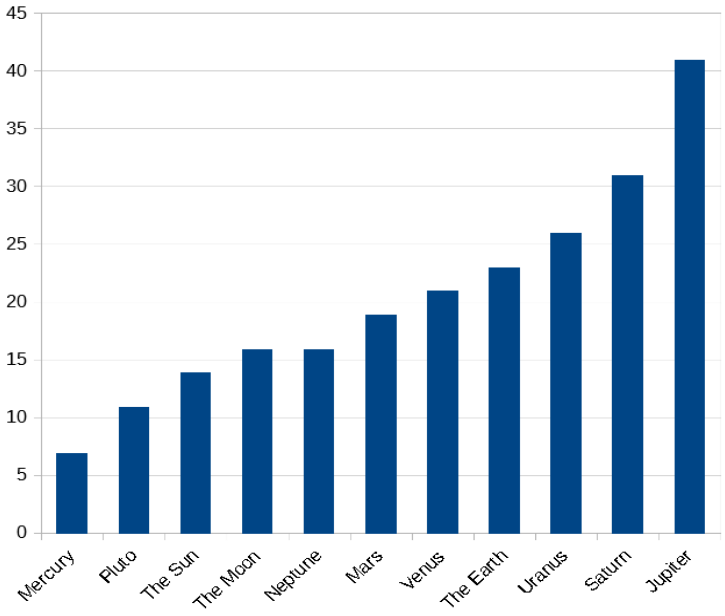


Fig. 2: Ranked planetary scores (number of revolutions of the wand) for the prana energy score.

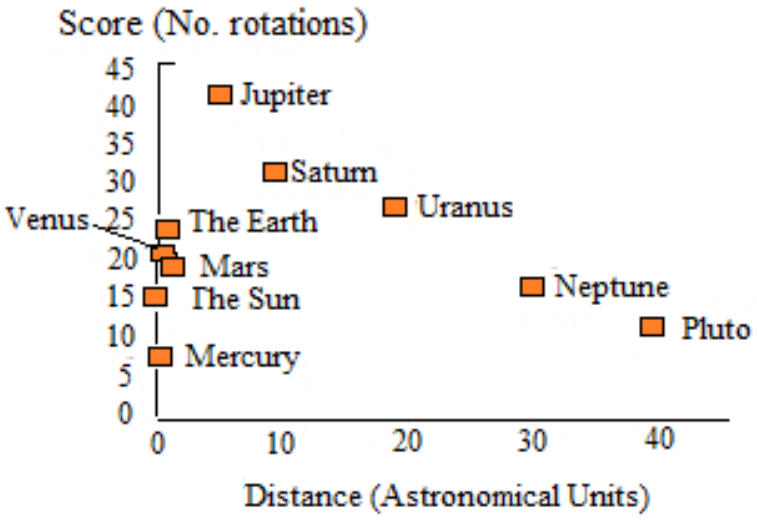


Fig. 3: Pranic energy (No. rotations), as a function of distance from the sun.

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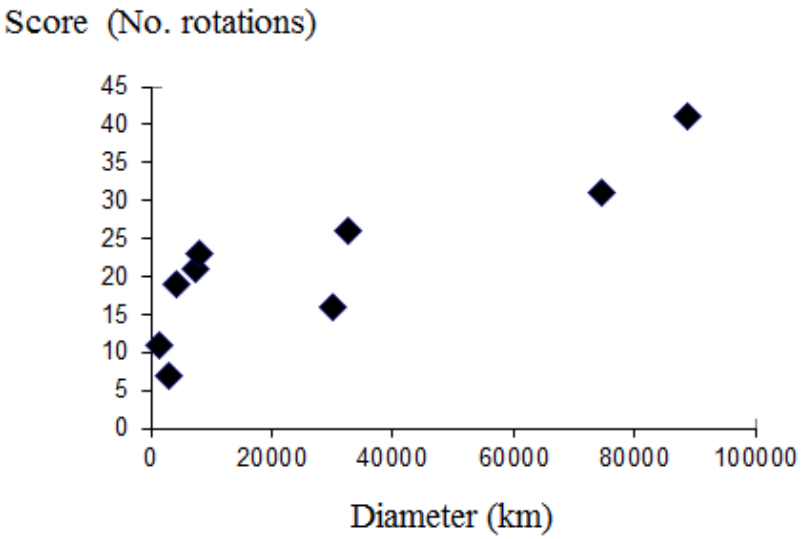


Fig. 4: Pranic energy (No. rotations), as a function of the diameter of the planet.

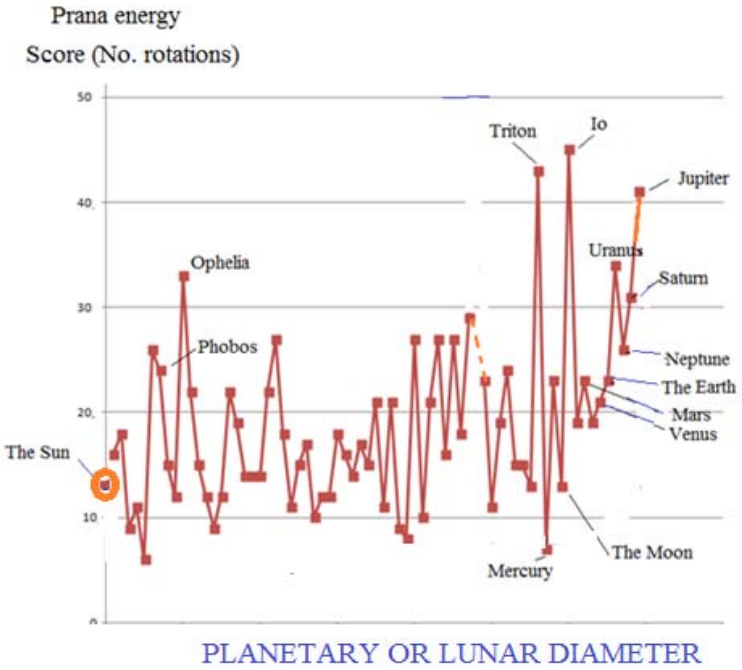


Fig. 5: Ranked diameters of planets and their moons showing the number of wand rotations the names elicited.

What emerges from inspection of these results is a general increase in energy reading with moon/planet diameter, and also that the trend in scores generally increases with distance from the sun. The sun, its closest planet Mercury, and the most distant planet, Pluto, are low-scoring bodies for prana energy, The Earth, Mars and Venus evoke a moderate to high score, and the distant large gaseous planets (Jupiter, Uranus, Saturn and Neptune) give very high scores.

III. High Scoring Moons

One of the highest-scoring moons, Io, is the innermost moon of Jupiter. By a subsequent literature search it was found to be the most geologically active moon, and its orbit lies within a high energy belt of radiation. It may not be surprising if for example, gravity is associated with pranic energy, in that the closest moons to the planet are subject to strong gravitational forces and are also the highest in prana energy. The

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other high-scoring moons, researched after dowsing was complete, are:

Ophelia, the nearest moon to Uranus; it 'shepherds' the brightest ring around this planet.

Triton, the largest moon of Neptune, is the only moon in the solar system which rotates in a retrograde orbit, as well as being one of the moons that is geologically active with surface geysers.

Table 3: Moons speculated to have oceans below their surface (Perkins 2020).

MOON	PRANA SCORE	PLANET & MOON SEQU.
TRITON	43	Neptune I
CALLISTO	23	Jupiter IV
EUROPA	23	Jupiter II
TITAN	19	Saturn VI
ENCELADUS	16	Saturn III
GANYMEDE	13	Jupiter III

From the above ranked scores, as an indicator of prana, Triton looks the most positive moon for fluid content that would contribute to mass movement within it, followed by Callisto and Europa. Whether the scores are due to the presence of life, or (more probably) a result of tidal flexing (enhanced movement of liquids below the moon's surface) remains to be seen.

(COMMENT: Nonetheless, these results I believe, validate the method used!)

A second consideration is to investigate whether a high prana score is in part due to tidal flexing, and this suggests to consider the scores for moons closest to their home planet where gravitational pull is most extreme. Some examples are given in Table 4:

Table 4: Moons closest to their mother planet as ranked by their prana score.

MOON	PRANA SCORE	PLANET
IO	45	Jupiter
TRITON	43	Neptune
CHARON	23	Pluto
PHOBOS	24	Mars
THE MOON	13	The Earth

Proximity to the adjacent planet seems an important factor (see Fig 6 below for Jupiter's moons). The fact that our moon has a relatively low score (13) could be due to a lack of liquid strata, no rapid rotation, and/or a relatively low mass. That both Charon and Phoebe have relatively high scores for tiny moons rotating close to the mother planet is interesting.

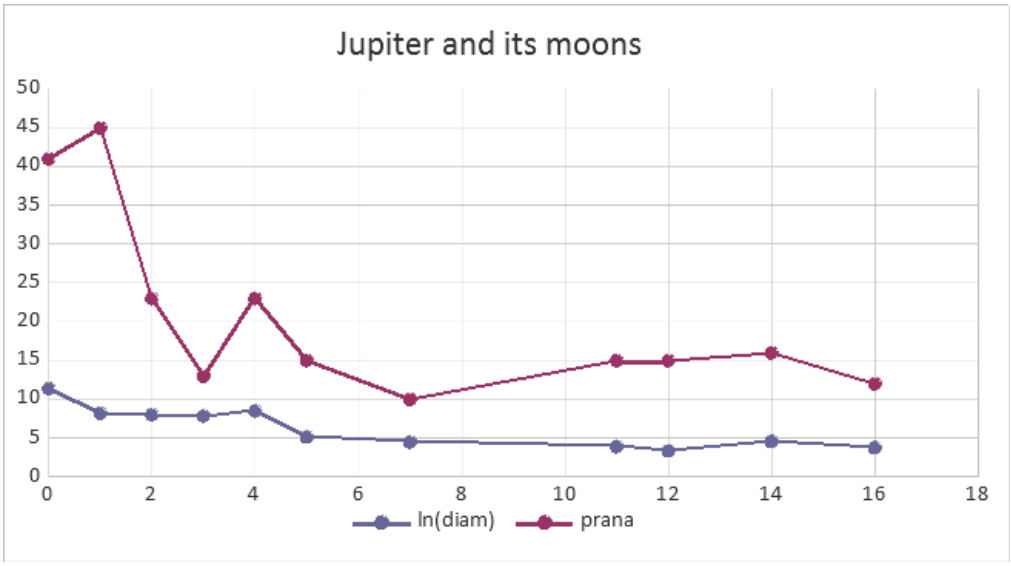


Fig. 6: Prana scores and the natural logs of the diameters of Jupiter and its moons, listed in sequence outwards from the planet.

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IV. A Tentative Interpretation

I had no preliminary information on the moons before dowsing, but if these results have any meaning, this would have to be suggested by systematic, explainable, and non-random interrelationships between the dowsing scores and the planet's and moon's physical dimensions and distances from the sun. I leave it to the reader to judge if this is the case. It would also imply a fundamental increase in the capacity of the human subconscious to access distant information beyond the range of action of the conventional senses, either directly, or as stored in a cosmic data base, as suggested by several authors.

The suggested significance of these results may be that the outer large planets either receive or generate the high level of pranic energy suggested by dowsing their names. From the results obtained I conclude that the level of prana for cosmic bodies is higher for those (like the gas giants) where much of the mass consists of mobile gases or fluids, or is subject to gravitational shocks from adjacent larger bodies inducing volcanic eruptions. Small planets or moons, especially those close to the sun, are generally characterized by a lower level of pranic energy, and the relatively modest levels of prana shown by the Earth despite its life forms, may be due to a substantial portion of its geology consisting of relatively inert rock strata.

The impact of some form of galactic radiation is another possible cause, and it may be relevant that the outer planets are closer to the termination shock wave (Fig 6) generated by the leading edge of the solar system while spiraling along its galactic arm around the center of the galaxy (ibex.swri.edu).

V. Conclusion

Perhaps as suggested by experts on pranic energy, subtle energy emission declines when increased levels of conventional energy are emitted from the same location as photons? I'm not assuming here that these scores are evidence for the presence of life forms on other planets or moons, which can only be confirmed for planet Earth. At the moment we lack data on living life forms for other planets. At the same time, this exercise appears to confirm that it is the body itself that is being scored by this method, not just a noun in the English language.

A conclusion from this and other experiments with dowsing, is that this is a methodology for accessing information available to the subconscious mind. It seems reasonable to conclude that the subconscious can access information on distant objects in time and space in a manner analogous to distant viewing (Mandelbaum 2000, Tiller 2007, Targ 2012). Whether this is achieved by the personal subconscious directly accessing the object being dowsed, or whether there is access to a 'cosmic library' extending throughout the cosmos where such information is stored, are two possible hypotheses. It is clear however that accepting that such information is in some way valid, poses unresolved questions for the conventional methodology of Science, but could provide useful clues for key factors affecting life forms.

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Unless specified in the notification, the Editorial Board's decision on publication of the paper is final and cannot be appealed before making the major change in the manuscript.

Acknowledgments

Contributors to the research other than authors credited should be mentioned in Acknowledgments. The source of funding for the research can be included. Suppliers of resources may be mentioned along with their addresses.

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Preparing your Manuscript

Authors can submit papers and articles in an acceptable file format: MS Word (doc, docx), LaTeX (.tex, .zip or .rar including all of your files), Adobe PDF (.pdf), rich text format (.rtf), simple text document (.txt), Open Document Text (.odt), and Apple Pages (.pages). Our professional layout editors will format the entire paper according to our official guidelines. This is one of the highlights of publishing with Global Journals—authors should not be concerned about the formatting of their paper. Global Journals accepts articles and manuscripts in every major language, be it Spanish, Chinese, Japanese, Portuguese, Russian, French, German, Dutch, Italian, Greek, or any other national language, but the title, subtitle, and abstract should be in English. This will facilitate indexing and the pre-peer review process.

The following is the official style and template developed for publication of a research paper. Authors are not required to follow this style during the submission of the paper. It is just for reference purposes.

Manuscript Style Instruction (Optional)

- Microsoft Word Document Setting Instructions.
- Font type of all text should be Swis721 Lt BT.
- Page size: 8.27" x 11'", left margin: 0.65, right margin: 0.65, bottom margin: 0.75.
- Paper title should be in one column of font size 24.
- Author name in font size of 11 in one column.
- Abstract: font size 9 with the word "Abstract" in bold italics.
- Main text: font size 10 with two justified columns.
- Two columns with equal column width of 3.38 and spacing of 0.2.
- First character must be three lines drop-capped.
- The paragraph before spacing of 1 pt and after of 0 pt.
- Line spacing of 1 pt.
- Large images must be in one column.
- The names of first main headings (Heading 1) must be in Roman font, capital letters, and font size of 10.
- The names of second main headings (Heading 2) must not include numbers and must be in italics with a font size of 10.

Structure and Format of Manuscript

The recommended size of an original research paper is under 15,000 words and review papers under 7,000 words. Research articles should be less than 10,000 words. Research papers are usually longer than review papers. Review papers are reports of significant research (typically less than 7,000 words, including tables, figures, and references)

A research paper must include:

a) A title which should be relevant to the theme of the paper.
b) A summary, known as an abstract (less than 150 words), containing the major results and conclusions.
c) Up to 10 keywords that precisely identify the paper's subject, purpose, and focus.
d) An introduction, giving fundamental background objectives.
e) Resources and techniques with sufficient complete experimental details (wherever possible by reference) to permit repetition, sources of information must be given, and numerical methods must be specified by reference.
f) Results which should be presented concisely by well-designed tables and figures.
g) Suitable statistical data should also be given.
h) All data must have been gathered with attention to numerical detail in the planning stage.

Design has been recognized to be essential to experiments for a considerable time, and the editor has decided that any paper that appears not to have adequate numerical treatments of the data will be returned unrefereed.

i) Discussion should cover implications and consequences and not just recapitulate the results; conclusions should also be summarized.
j) There should be brief acknowledgments.
k) There ought to be references in the conventional format. Global Journals recommends APA format.

Authors should carefully consider the preparation of papers to ensure that they communicate effectively. Papers are much more likely to be accepted if they are carefully designed and laid out, contain few or no errors, are summarizing, and follow instructions. They will also be published with much fewer delays than those that require much technical and editorial correction.

The Editorial Board reserves the right to make literary corrections and suggestions to improve brevity.

Format Structure

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The title page must carry an informative title that reflects the content, a running title (less than 45 characters together with spaces), names of the authors and co-authors, and the place(s) where the work was carried out.

Author details

The full postal address of any related author(s) must be specified.

Abstract

The abstract is the foundation of the research paper. It should be clear and concise and must contain the objective of the paper and inferences drawn. It is advised to not include big mathematical equations or complicated jargon.

Many researchers searching for information online will use search engines such as Google, Yahoo or others. By optimizing your paper for search engines, you will amplify the chance of someone finding it. In turn, this will make it more likely to be viewed and cited in further works. Global Journals has compiled these guidelines to facilitate you to maximize the web-friendliness of the most public part of your paper.

Keywords

A major lynchpin of research work for the writing of research papers is the keyword search, which one will employ to find both library and internet resources. Up to eleven keywords or very brief phrases have to be given to help data retrieval, mining, and indexing.

One must be persistent and creative in using keywords. An effective keyword search requires a strategy: planning of a list of possible keywords and phrases to try.

Choice of the main keywords is the first tool of writing a research paper. Research paper writing is an art. Keyword search should be as strategic as possible.

One should start brainstorming lists of potential keywords before even beginning searching. Think about the most important concepts related to research work. Ask, “What words would a source have to include to be truly valuable in a research paper?” Then consider synonyms for the important words.

It may take the discovery of only one important paper to steer in the right keyword direction because, in most databases, the keywords under which a research paper is abstracted are listed with the paper.

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Numerical methods used should be transparent and, where appropriate, supported by references.

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Authors must list all the abbreviations used in the paper at the end of the paper or in a separate table before using them.

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Authors are advised to submit any mathematical equation using either MathJax, KaTeX, or LaTeX, or in a very high-quality image.

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Tables: Tables should be cautiously designed, uncrowned, and include only essential data. Each must have an Arabic number, e.g., Table 4, a self-explanatory caption, and be on a separate sheet. Authors must submit tables in an editable format and not as images. References to these tables (if any) must be mentioned accurately.

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Figures are supposed to be submitted as separate files. Always include a citation in the text for each figure using Arabic numbers, e.g., Fig. 4. Artwork must be submitted online in vector electronic form or by emailing it.

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Although low-quality images are sufficient for review purposes, print publication requires high-quality images to prevent the final product being blurred or fuzzy. Submit (possibly by e-mail) EPS (line art) or TIFF (halftone/ photographs) files only. MS PowerPoint and Word Graphics are unsuitable for printed pictures. Avoid using pixel-oriented software. Scans (TIFF only) should have a resolution of at least 350 dpi (halftone) or 700 to 1100 dpi (line drawings). Please give the data for figures in black and white or submit a Color Work Agreement form. EPS files must be saved with fonts embedded (and with a TIFF preview, if possible).

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Tips for writing a good quality Social Science Research Paper

Techniques for writing a good quality homan social science research paper:

1. Choosing the topic: In most cases, the topic is selected by the interests of the author, but it can also be suggested by the guides. You can have several topics, and then judge which you are most comfortable with. This may be done by asking several questions of yourself, like "Will I be able to carry out a search in this area? Will I find all necessary resources to accomplish the search? Will I be able to find all information in this field area?" If the answer to this type of question is "yes," then you ought to choose that topic. In most cases, you may have to conduct surveys and visit several places. Also, you might have to do a lot of work to find all the rises and falls of the various data on that subject. Sometimes, detailed information plays a vital role, instead of short information. Evaluators are human: The first thing to remember is that evaluators are also human beings. They are not only meant for rejecting a paper. They are here to evaluate your paper. So present your best aspect.

2. Think like evaluators: If you are in confusion or getting demotivated because your paper may not be accepted by the evaluators, then think, and try to evaluate your paper like an evaluator. Try to understand what an evaluator wants in your research paper, and you will automatically have your answer. Make blueprints of paper: The outline is the plan or framework that will help you to arrange your thoughts. It will make your paper logical. But remember that all points of your outline must be related to the topic you have chosen.

3. Ask your guides: If you are having any difficulty with your research, then do not hesitate to share your difficulty with your guide (if you have one). They will surely help you out and resolve your doubts. If you can't clarify what exactly you require for your work, then ask your supervisor to help you with an alternative. He or she might also provide you with a list of essential readings.

4. Use of computer is recommended: As you are doing research in the field of homan social science then this point is quite obvious. Use right software: Always use good quality software packages. If you are not capable of judging good software, then you can lose the quality of your paper unknowingly. There are various programs available to help you which you can get through the internet.

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7. Revise what you wrote: When you write anything, always read it, summarize it, and then finalize it.

8. Make every effort: Make every effort to mention what you are going to write in your paper. That means always have a good start. Try to mention everything in the introduction—what is the need for a particular research paper. Polish your work with good writing skills and always give an evaluator what he wants. Make backups: When you are going to do any important thing like making a research paper, you should always have backup copies of it either on your computer or on paper. This protects you from losing any portion of your important data.

9. Produce good diagrams of your own: Always try to include good charts or diagrams in your paper to improve quality. Using several unnecessary diagrams will degrade the quality of your paper by creating a hodgepodge. So always try to include diagrams which were made by you to improve the readability of your paper. Use of direct quotes: When you do research relevant to literature, history, or current affairs, then use of quotes becomes essential, but if the study is relevant to science, use of quotes is not preferable.

10. Use proper verb tense: Use proper verb tenses in your paper. Use past tense to present those events that have happened. Use present tense to indicate events that are going on. Use future tense to indicate events that will happen in the future. Use of wrong tenses will confuse the evaluator. Avoid sentences that are incomplete.

11. Pick a good study spot: Always try to pick a spot for your research which is quiet. Not every spot is good for studying.

12. Know what you know: Always try to know what you know by making objectives, otherwise you will be confused and unable to achieve your target.

13. Use good grammar: Always use good grammar and words that will have a positive impact on the evaluator; use of good vocabulary does not mean using tough words which the evaluator has to find in a dictionary. Do not fragment sentences. Eliminate one-word sentences. Do not ever use a big word when a smaller one would suffice.

Verbs have to be in agreement with their subjects. In a research paper, do not start sentences with conjunctions or finish them with prepositions. When writing formally, it is advisable to never split an infinitive because someone will (wrongly) complain. Avoid clichés like a disease. Always shun irritating alliteration. Use language which is simple and straightforward. Put together a neat summary.

14. Arrangement of information: Each section of the main body should start with an opening sentence, and there should be a changeover at the end of the section. Give only valid and powerful arguments for your topic. You may also maintain your arguments with records.

15. Never start at the last minute: Always allow enough time for research work. Leaving everything to the last minute will degrade your paper and spoil your work.

16. Multitasking in research is not good: Doing several things at the same time is a bad habit in the case of research activity. Research is an area where everything has a particular time slot. Divide your research work into parts, and do a particular part in a particular time slot.

17. Never copy others' work: Never copy others' work and give it your name because if the evaluator has seen it anywhere, you will be in trouble. Take proper rest and food: No matter how many hours you spend on your research activity, if you are not taking care of your health, then all your efforts will have been in vain. For quality research, take proper rest and food.

18. Go to seminars: Attend seminars if the topic is relevant to your research area. Utilize all your resources.
Refresh your mind after intervals: Try to give your mind a rest by listening to soft music or sleeping in intervals. This will also improve your memory. Acquire colleagues: Always try to acquire colleagues. No matter how sharp you are, if you acquire colleagues, they can give you ideas which will be helpful to your research.

19. Think technically: Always think technically. If anything happens, search for its reasons, benefits, and demerits. Think and then print: When you go to print your paper, check that tables are not split, headings are not detached from their descriptions, and page sequence is maintained.

20. Adding unnecessary information: Do not add unnecessary information like "I have used MS Excel to draw graphs." Irrelevant and inappropriate material is superfluous. Foreign terminology and phrases are not apropos. One should never take a broad view. Analogy is like feathers on a snake. Use words properly, regardless of how others use them. Remove quotations. Puns are for kids, not grunt readers. Never oversimplify: When adding material to your research paper, never go for oversimplification; this will definitely irritate the evaluator. Be specific. Never use rhythmic redundancies. Contractions shouldn't be used in a research paper. Comparisons are as terrible as clichés. Give up ampersands, abbreviations, and so on. Remove commas that are not necessary. Parenthetical words should be between brackets or commas. Understatement is always the best way to put forward earth-shaking thoughts. Give a detailed literary review.

21. Report concluded results: Use concluded results. From raw data, filter the results, and then conclude your studies based on measurements and observations taken. An appropriate number of decimal places should be used. Parenthetical remarks are prohibited here. Proofread carefully at the final stage. At the end, give an outline to your arguments. Spot perspectives of further study of the subject. Justify your conclusion at the bottom sufficiently, which will probably include examples.

22. Upon conclusion: Once you have concluded your research, the next most important step is to present your findings. Presentation is extremely important as it is the definite medium though which your research is going to be in print for the rest of the crowd. Care should be taken to categorize your thoughts well and present them in a logical and neat manner. A good quality research paper format is essential because it serves to highlight your research paper and bring to light all necessary aspects of your research.

.

Informal Guidelines of Research Paper Writing

Key points to remember:

- Submit all work in its final form.
- Write your paper in the form which is presented in the guidelines using the template.
- Please note the criteria peer reviewers will use for grading the final paper.

Final points:

One purpose of organizing a research paper is to let people interpret your efforts selectively. The journal requires the following sections, submitted in the order listed, with each section starting on a new page:

The introduction: This will be compiled from reference matter and reflect the design processes or outline of basis that directed you to make a study. As you carry out the process of study, the method and process section will be constructed like that. The results segment will show related statistics in nearly sequential order and direct reviewers to similar intellectual paths throughout the data that you gathered to carry out your study.

The discussion section:

This will provide understanding of the data and projections as to the implications of the results. The use of good quality references throughout the paper will give the effort trustworthiness by representing an alertness to prior workings.

Writing a research paper is not an easy job, no matter how trouble-free the actual research or concept. Practice, excellent preparation, and controlled record-keeping are the only means to make straightforward progression.

General style:

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To make a paper clear: Adhere to recommended page limits.



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Mistakes to avoid:

- Insertion of a title at the foot of a page with subsequent text on the next page.
- Separating a table, chart, or figure—confine each to a single page.
- Submitting a manuscript with pages out of sequence.
- In every section of your document, use standard writing style, including articles ("a" and "the").
- Keep paying attention to the topic of the paper.
- Use paragraphs to split each significant point (excluding the abstract).
- Align the primary line of each section.
- Present your points in sound order.
- Use present tense to report well-accepted matters.
- Use past tense to describe specific results.
- Do not use familiar wording; don't address the reviewer directly. Don't use slang or superlatives.
- Avoid use of extra pictures—include only those figures essential to presenting results.

Title page:

Choose a revealing title. It should be short and include the name(s) and address(es) of all authors. It should not have acronyms or abbreviations or exceed two printed lines.

Abstract: This summary should be two hundred words or less. It should clearly and briefly explain the key findings reported in the manuscript and must have precise statistics. It should not have acronyms or abbreviations. It should be logical in itself. Do not cite references at this point.

An abstract is a brief, distinct paragraph summary of finished work or work in development. In a minute or less, a reviewer can be taught the foundation behind the study, common approaches to the problem, relevant results, and significant conclusions or new questions.

Write your summary when your paper is completed because how can you write the summary of anything which is not yet written? Wealth of terminology is very essential in abstract. Use comprehensive sentences, and do not sacrifice readability for brevity; you can maintain it succinctly by phrasing sentences so that they provide more than a lone rationale. The author can at this moment go straight to shortening the outcome. Sum up the study with the subsequent elements in any summary. Try to limit the initial two items to no more than one line each.

Reason for writing the article—theory, overall issue, purpose.

- Fundamental goal.
- To-the-point depiction of the research.
- Consequences, including definite statistics—if the consequences are quantitative in nature, account for this; results of any numerical analysis should be reported. Significant conclusions or questions that emerge from the research.

Approach:

- Single section and succinct.
- An outline of the job done is always written in past tense.
- Concentrate on shortening results—limit background information to a verdict or two.
- Exact spelling, clarity of sentences and phrases, and appropriate reporting of quantities (proper units, important statistics) are just as significant in an abstract as they are anywhere else.

Introduction:

The introduction should "introduce" the manuscript. The reviewer should be presented with sufficient background information to be capable of comprehending and calculating the purpose of your study without having to refer to other works. The basis for the study should be offered. Give the most important references, but avoid making a comprehensive appraisal of the topic. Describe the problem visibly. If the problem is not acknowledged in a logical, reasonable way, the reviewer will give no attention to your results. Speak in common terms about techniques used to explain the problem, if needed, but do not present any particulars about the protocols here.

The following approach can create a valuable beginning:

- Explain the value (significance) of the study.
- Defend the model—why did you employ this particular system or method? What is its compensation? Remark upon its appropriateness from an abstract point of view as well as pointing out sensible reasons for using it.
- Present a justification. State your particular theory(-ies) or aim(s), and describe the logic that led you to choose them.
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Approach:

Use past tense except for when referring to recognized facts. After all, the manuscript will be submitted after the entire job is done. Sort out your thoughts; manufacture one key point for every section. If you make the four points listed above, you will need at least four paragraphs. Present surrounding information only when it is necessary to support a situation. The reviewer does not desire to read everything you know about a topic. Shape the theory specifically—do not take a broad view.

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This part is supposed to be the easiest to carve if you have good skills. A soundly written procedures segment allows a capable scientist to replicate your results. Present precise information about your supplies. The suppliers and clarity of reagents can be helpful bits of information. Present methods in sequential order, but linked methodologies can be grouped as a segment. Be concise when relating the protocols. Attempt to give the least amount of information that would permit another capable scientist to replicate your outcome, but be cautious that vital information is integrated. The use of subheadings is suggested and ought to be synchronized with the results section.

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Materials:

Materials may be reported in part of a section or else they may be recognized along with your measures.

Methods:

- Report the method and not the particulars of each process that engaged the same methodology.
- Describe the method entirely.
- To be succinct, present methods under headings dedicated to specific dealings or groups of measures.
- Simplify—detail how procedures were completed, not how they were performed on a particular day.
- If well-known procedures were used, account for the procedure by name, possibly with a reference, and that's all.

Approach:

It is embarrassing to use vigorous voice when documenting methods without using first person, which would focus the reviewer's interest on the researcher rather than the job. As a result, when writing up the methods, most authors use third person passive voice.

Use standard style in this and every other part of the paper—avoid familiar lists, and use full sentences.

What to keep away from:

- Resources and methods are not a set of information.
- Skip all descriptive information and surroundings—save it for the argument.
- Leave out information that is immaterial to a third party.



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Results:

The principle of a results segment is to present and demonstrate your conclusion. Create this part as entirely objective details of the outcome, and save all understanding for the discussion.

The page length of this segment is set by the sum and types of data to be reported. Use statistics and tables, if suitable, to present consequences most efficiently.

You must clearly differentiate material which would usually be incorporated in a study editorial from any unprocessed data or additional appendix matter that would not be available. In fact, such matters should not be submitted at all except if requested by the instructor.

Content:

- Sum up your conclusions in text and demonstrate them, if suitable, with figures and tables.
- In the manuscript, explain each of your consequences, and point the reader to remarks that are most appropriate.
- Present a background, such as by describing the question that was addressed by creation of an exacting study.
- Explain results of control experiments and give remarks that are not accessible in a prescribed figure or table, if appropriate.
- Examine your data, then prepare the analyzed (transformed) data in the form of a figure (graph), table, or manuscript.

What to stay away from:

- Do not discuss or infer your outcome, report surrounding information, or try to explain anything.
- Do not include raw data or intermediate calculations in a research manuscript.
- Do not present similar data more than once.
- A manuscript should complement any figures or tables, not duplicate information.
- Never confuse figures with tables—there is a difference.

Approach:

As always, use past tense when you submit your results, and put the whole thing in a reasonable order.

Put figures and tables, appropriately numbered, in order at the end of the report.

If you desire, you may place your figures and tables properly within the text of your results section.

Figures and tables:

If you put figures and tables at the end of some details, make certain that they are visibly distinguished from any attached appendix materials, such as raw facts. Whatever the position, each table must be titled, numbered one after the other, and include a heading. All figures and tables must be divided from the text.

Discussion:

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Position your understanding of the outcome visibly to lead the reviewer through your conclusions, and then finish the paper with a summing up of the implications of the study. The purpose here is to offer an understanding of your results and support all of your conclusions, using facts from your research and generally accepted information, if suitable. The implication of results should be fully described.

Infer your data in the conversation in suitable depth. This means that when you clarify an observable fact, you must explain mechanisms that may account for the observation. If your results vary from your prospect, make clear why that may have happened. If your results agree, then explain the theory that the proof supported. It is never suitable to just state that the data approved the prospect, and let it drop at that. Make a decision as to whether each premise is supported or discarded or if you cannot make a conclusion with assurance. Do not just dismiss a study or part of a study as "uncertain."

Research papers are not acknowledged if the work is imperfect. Draw what conclusions you can based upon the results that you have, and take care of the study as a finished work.

- You may propose future guidelines, such as how an experiment might be personalized to accomplish a new idea.
- Give details of all of your remarks as much as possible, focusing on mechanisms.
- Make a decision as to whether the tentative design sufficiently addressed the theory and whether or not it was correctly restricted. Try to present substitute explanations if they are sensible alternatives.
- One piece of research will not counter an overall question, so maintain the large picture in mind. Where do you go next? The best studies unlock new avenues of study. What questions remain?
- Recommendations for detailed papers will offer supplementary suggestions.

Approach:

When you refer to information, differentiate data generated by your own studies from other available information. Present work done by specific persons (including you) in past tense.

Describe generally acknowledged facts and main beliefs in present tense.

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Topics	Grades		
	A-B	**C-D**	**E-F**
Abstract	Clear and concise with appropriate content, Correct format. 200 words or below	Unclear summary and no specific data, Incorrect form Above 200 words	No specific data with ambiguous information Above 250 words
Introduction	Containing all background details with clear goal and appropriate details, flow specification, no grammar and spelling mistake, well organized sentence and paragraph, reference cited	Unclear and confusing data, appropriate format, grammar and spelling errors with unorganized matter	Out of place depth and content, hazy format
Methods and Procedures	Clear and to the point with well arranged paragraph, precision and accuracy of facts and figures, well organized subheads	Difficult to comprehend with embarrassed text, too much explanation but completed	Incorrect and unorganized structure with hazy meaning
Result	Well organized, Clear and specific, Correct units with precision, correct data, well structuring of paragraph, no grammar and spelling mistake	Complete and embarrassed text, difficult to comprehend	Irregular format with wrong facts and figures
Discussion	Well organized, meaningful specification, sound conclusion, logical and concise explanation, highly structured paragraph reference cited	Wordy, unclear conclusion, spurious	Conclusion is not cited, unorganized, difficult to comprehend
References	Complete and correct format, well organized	Beside the point, Incomplete	Wrong format and structuring

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