

ISSN 2181-9408

Scientific and
technical journal

Sustainable Agriculture

Nº2(18).2023



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In 2019, the journal is included in the list of recommended scientific publications by the Higher Attestation Commission of the Republic of Uzbekistan.

ARCHITECTURE. LANDSCAPE ARCHITECTURE

<i>O.Rozikulova, N.Teshaev</i> Determination of air temperature in agricultural land based on remote sensing and GIS data in the case of Jizzakh region.....	5
<i>A.Jumanov, Sh.Daminova</i> Monitoring of soil erosion in the Yakkabog river basin and its impact on agricultural areas	7
<i>T.Shavazov, A.Ashurov, J.Yoqubov</i> Analysis of the melting of glaciers in the territory of the republic of Tajikistan based on remote sensing technologies	11
<i>A.Jumanov</i> Global consequences of land use.....	13
<i>M.Rajapboev, N.Teshaev, J.Yoqubov</i> Programming of geodetic observations for sediments of engineering structures.....	18
<i>M.Rajapboev, N.Teshaev</i> Determination of the refractive index of air when measuring lines with light sensors in geodetic networks	21

POWER ENGINEERING, ELECTRICAL ENGINEERING, AUTOMATICS. COMPUTING TECHNOLOGY.

<i>P.I.Kalandarov, A.N.Khayitov</i> Stages of automation of grain processing.....	24
<i>D.Kuchkarova, B.Ismatov, Sh.Suyunov</i> Algoritms for using geometric modelling methods in creating project drawings of hydrotechnical constructions.....	27
<i>M.Ismailov, E.Ozodov</i> Development mathematic model of automatic control system of water purification process.....	31
<i>D.Abdullaeva</i> Method of automatic irrigation and control of the root system of growing hydroponic green forage.....	35
<i>A.Sh.Arifjanov., A.A.Abdug'aniyev., A.M.Nig'matov., R.F.Yunusov</i> Intelligent system for monitoring the irrigation process based on the Internet.....	38
<i>A.Nig'matov, D.Yulchiev</i> Automatic monitoring and control of groundwater level.....	42

ENVIRONMENTAL PROTECTION. WATER MANAGEMENT, HYDROLOGY

<i>D.Nazaraliev, J.Hamroqulov, Mkhanna Aaed, Sh.Shoergashova, Sh.Ismoilov</i> Uzbekistan on the territory flood flows and their causes it to come out.....	45
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ECONOMY. ECONOMIC SCIENCE. OTHER BRANCHES OF THE ECONOMY.

<i>N.M.Abdurazakova, A.U.Estekov</i> Logistics and its importance in improving the efficiency of Uzbekistan's foreign trade relations	47
<i>A.Burkhanov</i> New economic relations - increasing the efficiency of production in agriculture	52
<i>I.Yunusov, U.Sadullaev, M.Yaxyayev</i> The role of market infrastructures in the development of walnut production and its selling system.....	56



<i>I.Yunusov</i> Conceptual directions for the development of fisheries	58
<i>A.Suvanov</i> Regional development of beekeeping.....	62
<i>N.Usarova</i> Strategies for enhancing the marketing system in Uzbekistan's agriculture sector.....	65
<i>A.Suvanov, B.Sultanov</i> The importance of a beekeeping to our food supply	68
<i>U. Khabibullaeva</i> Foreign experiences in sphere of citrus production	70
<i>O'.Islomov, M.Inoyatova, N.Abdurazakova</i> Economic efficiency of land use.....	73
<i>M.Ismailov, O.Ismailov, S.Mirzakhililov</i> Remote monitoring of athlete's blood pressure during training or competition based on artificial intelligence algorithms	76
<i>D. Abduvakhobova</i> Study of Babur period in Pakistan (short historiographical analysis).....	79
<i>Sh.A.Mirzaev, Sh.S. Gaziev</i> Features of the islamic financial system and its importance in mitigating the acute political conflict of capitalism.....	81
<i>I.Kamoliddinov</i> Strategic directions for increasing the efficiency of business activity in economic development.....	86
<i>S.S. Khodjaev, M.A.Malikova, K.S.Gerts</i> Elements of "digital technology" in test-based knowledge assessment at higher education institutions of Uzbekistan.....	88
<i>U.Nulloev, G.Eshchanova</i> Improvement of students oral speech through increasing the interest to the overseas culture.....	91

DETERMINATION OF AIR TEMPERATURE IN AGRICULTURAL LAND BASED ON REMOTE SENSING AND GIS DATA IN THE CASE OF JIZZAKH REGION

Rozikulova Oykhumor Shermamatovna - Tashkent institute of irrigation and agricultural mechanization engineers National research university, Associate Professor of Geodesy and GIS department.

Teshaev Nozimjon Nusratovich – Tashkent institute of irrigation and agricultural mechanization engineers National research university, assistant professor of Geodesy and GIS department.

Abstract

This article aims to investigate the correlation between land surface temperature (LST) predictions derived from POWER (Prediction of Worldwide Energy Resources) data and the actual measurements obtained from meteorological stations in the Jizzakh region, Uzbekistan. The study focuses on LST 2 meters above the land surface and examines the predictive accuracy for maximum daily temperature and minimum temperature. Through a comprehensive analysis, high correlation coefficients of 0.95 and 0.81 are observed for maximum daily temperature and minimum temperature, respectively. This research provides valuable insights into the utility of remote sensing data for LST prediction and establishes the potential for improving temperature assessments in the Jizzakh region.

Keywords : land surface temperature, POWER data, meteorological station data, Jizzakh region, Uzbekistan, correlation, prediction, remote sensing.

Introduction. The accurate estimation of land surface temperature (LST) is essential for various applications, including climate modeling, agriculture, and urban planning. Land surface temperature (LST) is a critical parameter in understanding the dynamics of Earth's surface and its interactions with the atmosphere. Accurate and reliable assessment of LST is essential for various applications, including climate modeling, environmental monitoring, urban planning, and agricultural management. Traditionally, LST measurements have heavily relied on ground-based meteorological stations, which provide localized data but have inherent limitations in capturing the full spatial and temporal variability of surface temperatures [1].

The aim of this study is to investigate the potential of utilizing POWER data for predicting LST 2 meters above the land surface and compare it with measurements obtained from meteorological stations. The study focuses specifically on the Jizzakh region in Uzbekistan, an area characterized by diverse land cover and significant variations in temperature patterns. By comparing the predicted LST derived from POWER data with the actual measurements from meteorological stations, we aim to evaluate the accuracy and reliability of remote sensing-based LST estimation in this specific region [2].

In this paper, we will present a detailed analysis of the correlation between the LST predictions derived from POWER data and the measurements obtained from meteorological stations in the Jizzakh region, Uzbekistan. We will quantify the strength of the correlation using statistical measures such as the correlation coefficient (r-square) and examine the spatial and temporal patterns of the datasets. Furthermore, we will discuss the implications of the observed correlation and explore the potential applications of remote sensing-based LST prediction in the Jizzakh region [3-5].

2. Data Sources and Methodology

2.1 POWER Data

The Prediction of Worldwide Energy Resources (POWER) project, developed by NASA's Langley Research Center, provides a comprehensive database of satellite-based data, including land surface temperature (LST) measurements. The POWER dataset encompasses a wide range of meteorological and climatic parameters, derived from various satellite sensors and models, and covers

global spatial coverage with temporal resolutions varying from hourly to monthly [7].

The POWER data offers several advantages for LST prediction and analysis. It combines multiple satellite observations, including those from MODIS (Moderate Resolution Imaging Spectroradiometer), CERES (Clouds and the Earth's Radiant Energy System), and MERRA-2 (Modern-Era Retrospective analysis for Research and Applications, Version 2), to provide accurate and reliable LST information. The satellite sensors capture thermal radiance emitted from the land surface, which is then processed and converted into LST using advanced algorithms and calibration techniques [6].

2.2 Study area

Jizzakh Region is one of the regions of Uzbekistan. It is located in the center/east of the country. It borders with Tajikistan to the south and south-east, Samarqand Region to the west, Navoiy Region to the north-west, Kazakhstan to the north, and Sirdaryo Region to the east. It covers an area of 21,210 km². The population is 1,443,408 (2022 estimate) with 53% living in rural areas.

The regional capital is Jizzakh (pop. 179,200, 2020). Other major towns include Do'stlik, Gagarin, G'allaorol, Paxtakor, and Dashtobod. Jizzakh Region was formerly a part of Sirdaryo Region but was given separate status in 1973.



Figure 1. The location of Jizzakh region.

The climate is a typically continental climate, with mild winters and hot, dry summers. The Zaamin National Park, formerly Guralash Reserve, on the western slopes of the Turkestan Range and known for its unique fauna and

flora, is also within the region. Wildlife is extremely rich here; in spring and in summer, alpine meadows are with a multitude of colors: bright-red tulips and snow-white acacias. In autumn the hills are magnificently decorated with the gold-colored domes of the hazelnut trees, columns of birch-trees, towering plane trees, and green thickets. High in the mountains, in the upper part of the Guralashsoy gorge, is a nesting-place of black storks. These rare birds are the pride and joy of Uzbekistan. They are written down in the "Redbooks" in many countries as an endangered species. Early in the spring when the Arnasoy depression is flooded, flocks of ducks, wild geese, pelicans and grey herons are found here. This territory serves as a nesting place for rose-coloured starlings, shrikes, and sandpipers.

2.3 Correlation Analysis

To assess the relationship between the predicted land surface temperature (LST) derived from POWER data and the measured LST from meteorological stations, a correlation analysis was conducted. The correlation coefficient, commonly represented by "r" or the coefficient of determination (r-square), quantifies the strength and direction of the linear relationship between two variables [2].

$$r = \frac{n(\sum xy) - \sum x \sum y}{\sqrt{[n(\sum x^2 - (\sum x)^2)] * [n(\sum y^2 - (\sum y)^2)]}} \quad (1)$$

r = The Correlation coefficient

n = number in the given dataset

x = first variable in the context

y = second variable

$$R^2 = \frac{[n(\sum xy) - (\sum x)(\sum y)]^2}{[n(\sum x^2 - (\sum x)^2) * n(\sum y^2 - (\sum y)^2)]} \quad (2)$$

3. Results and Discussion

In this study, a high correlation coefficient of 0.95 was observed for the maximum daily temperature, indicating a strong positive linear relationship between the predicted LST from POWER data and the measured LST from meteorological stations. Results showed a nice correlation between two datasets. All statistical analysis was done in Microsoft Excel program.

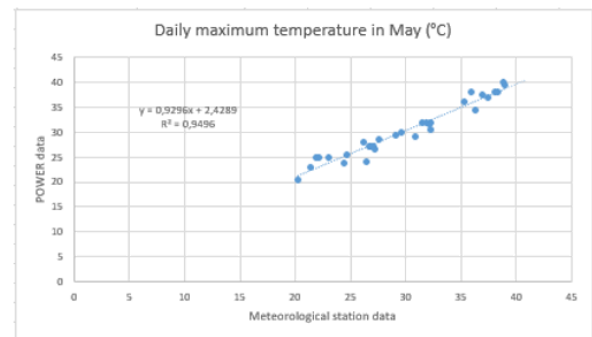


Figure 2: Daily maximum temperature in May

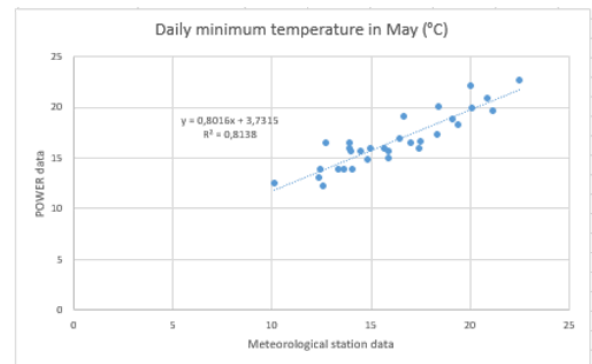


Figure 3: Daily minimum temperature in May

4. Conclusion

By conducting this research, we aim to contribute to the growing body of knowledge on remote sensing-based LST estimation and its practical applications. The findings of this study will not only enhance our understanding of LST dynamics in the Jizzakh region but also provide valuable insights for future LST monitoring and prediction efforts in similar regions worldwide. The article concludes by summarizing the main findings, emphasizing the strong correlation coefficients observed between the predicted LST derived from POWER data and the measured LST from meteorological stations in the Jizzakh region, Uzbekistan. The research demonstrates the potential of remote sensing data as a valuable tool for LST prediction and highlights its significance for temperature monitoring and assessment.

Acknowledgments

The authors would like to acknowledge the support and contributions of the POWER project team and the meteorological station data providers.

References:

1. Kawashima, S.; Ishida, T.; Minomura, M.; Miwa, T. Relations between surface temperature and air temperature on a local scale during winter nights. *J. Appl. Meteorol. Climatol.* 2000, 39, 1570–1579.
2. Vancutsem, C.; Ceccato, P.; Dinku, T.; Connor, S. Evaluation of MODIS land surface temperature data to estimate air temperature in different ecosystems over Africa. *Remote Sens. Environ.* 2010, 114, 449–465.
3. Cresswell, M.; Morse, A.; Thomson, M.C.; Connor, S. Estimating surface air temperatures, from Meteosat land surface temperatures, using an empirical solar zenith angle model. *Int. J. Remote Sens.* 1999, 20, 1125–1132.
4. Florio, E.; Lele, S.; Chi, Y.; Sterner, R.; Glass, G. Integrating AVHRR satellite data and NOAA ground observations to predict surface air temperature: A statistical approach. *Int. J. Remote Sens.* 2004, 25, 2979–2994.
5. Cristóbal, J.; Ninyerola, M.; Pons, X.; Pla, M. Improving air temperature modelization by means of remote sensing variables. In *Proceedings of the 2006 IEEE International Symposium on Geoscience and Remote Sensing*, Denver, CO, USA, 31 July–4 August 2006; Volume 1, pp. 2251–2254.
6. Zhao, D.; Zhang, W.; Shijin, X. A neural network algorithm to retrieve nearsurface air temperature from landsat ETM+ imagery over the Hanjiang River Basin, China. In *Proceedings of the 2007 IEEE International Geoscience and Remote Sensing Symposium*, Barcelona, Spain, 23–28 July 2007; Volume 1, pp. 1705–1708.
7. <https://power.larc.nasa.gov/data-access-viewer/>