Sustainable Urban & Regional Development Studies Quarterly

Volume 7, Issue 1 - Serial Number 23, Spring 2026 **Online ISSN: 2783-0764**
Journal Hompage https://www.srds.ir/
https://www.srds.ir/article_218991.html?lang=en

Tracking and Synoptic Analysis of the Hyperthermia of July 13, 2024 in Khuzestan Province

Aysan Kanzi Hagh[1], Bromand Salahi[2*]
1. Ph.D. Student of Climatology, Department of Physical Geography, Faculty of Social Sciences, University of Mohaghegh Ardabili, Ardabil, Iran
2. Corresponding Author, Professor of Climatology, Department of Physical Geography, Faculty of Social Sciences, University of Mohaghegh Ardabili, Ardabil, Iran.

Received Date: 22 January 2025 **Accepted Date:** 10 April 2025

Abstract

Background and Objective: Climate is a pervasive and important component of the ecosystem, and its changes, although insignificant, can affect other components to varying degrees. Among the most important climatic disasters that bring devastating environmental consequences every year are heat waves. The aim of the present study is to investigate the synoptic heat wave above 50 degrees Celsius on July 13, 2024, in Khuzestan Province.

Methodology: This research was conducted with an environmental perspective on atmospheric circulation, in which, first, the recorded temperatures of Khuzestan province stations and their changes were received from the Meteorological Department of Khuzestan province, and then by receiving data from the upper levels of the atmosphere and analyzing them, the causes of extreme heat were identified. In this research, to analyze the synoptic patterns leading to the heat wave in Khuzestan province, the atmospheric data at the level of 500 hectopascals were extracted from the NOAA website, which included maps of geopotential height, sea level pressure, omega, relative humidity and precipitable water, temperature, wind speed and thickness for the days of July 13-15, 2024.

Results and Findings: The results showed that the penetration of thermal low pressure systems in Pakistan and Saudi Arabia, the establishment of the subtropical Azores high pressure in the southwest and the Siberian high pressure in northern Iran at a level of 500 hectopascals, were the most important influential patterns in creating the heat wave of July 13, 2024 in Khuzestan Province, which began 48 hours ago. The association of this low pressure system located in the region with its topographic pattern (Southern Zagros heights) and its counterclockwise currents from the south and southwest of the province caused the warm advection of the radiant temperature of the hot deserts of Lut, Saudi Arabia, and the Sea of Oman. On the other hand, by passing over the warm waters of the Persian Gulf and the Sea of Oman, it affected this region simultaneously with the onset of the hot season, which resulted in a sharp increase in temperature and provided the necessary synoptic conditions to create heat above 50 degrees Celsius in Khuzestan Province.

Keywords: Heat Wave, Khuzestan Province, STHP, Synoptic Analysis, Thermal Low Pressure.

* **Corresponding Author:** Salahi@uma.ac.ir

Cite this article: Kanzi Hagh,A. and Salahi,B. (2026). Tracking and Synoptic Analysis of the Hyperthermia of July 13, 2024 in Khuzestan Province. *Journal of Sustainable Urban & Regional Development Studies (JSURDS), 7*(1), 415-428.

EXTENDED ABSTRACT

Introduction:
Heat waves are among the most important weather disasters that, among other climatic events, have the highest mortality rate and various negative effects on the lives and comfort of humans and natural environments. In recent years, due to changes in the temperature of the planet due to greenhouse warming, the temperature has been on the rise and the intensity of heat waves has also increased in different regions of the world, especially in Iran. This trend has become more intense in the hot periods of the year and is of great importance. The occurrence of heat waves in a region, especially in the form of weather extremes, is one of the main and obvious causes of climate change. Due to its geographical location and environmental diversity in elevation structures and unevenness, weather diversity, etc., Houthi province has become prone to extreme events and weather extremes such as drought, heat waves, dust storms, etc., which have caused human and financial losses and, as a result, numerous economic and social problems in the region. The purpose of this study is to investigate the synoptic heat wave above 50 degrees Celsius on July 13, 2024 in Khuzestan Province.

Methodology:
This research was conducted with an environmental perspective on atmospheric circulation, in which, first, the recorded temperatures of Khuzestan Province stations and their changes were received from the Khuzestan Province Meteorological Department, and then by receiving and analyzing data from the upper levels of the atmosphere, the causes of extreme heat were identified. In this research, to analyze the synoptic patterns leading to the heat wave in Khuzestan Province, the country's atmospheric data at the level of 500 hectopascals was extracted from the Nova site, which included maps of geopotential height, sea level pressure, omega, relative humidity and precipitable water, temperature, wind speed, and thickness for the days of 21 to 23 July 2024.

Results and Discussion:
The results showed that the penetration of thermal low-pressure systems in Pakistan and Saudi Arabia, the establishment of the Azores subtropical high pressure in the southwest and the Siberian high pressure in northern Iran at a level of 500 hectopascals, were the most important influential patterns in creating the heat wave of July 13, 2024 in Khuzestan Province, which began 48 hours ago. The association of this low-pressure system located in the region with its topographic pattern (Southern Zagros heights) and its counterclockwise currents from the south and southwest of the province caused the advection of the hot radiation temperature of the hot deserts of Lut, Saudi Arabia, and the Sea of Oman. On the other hand, by passing over the warm waters of the Persian Gulf and the Sea of Oman, this region was affected by its presence in the hot season of the year, which resulted in a sharp increase in temperature and provided the necessary synoptic conditions to create heat above 50 degrees Celsius in Khuzestan Province.

Conclusion:
Climatically, Iran is located in the southern extratropical region and in the northern tropical region, so that during the warm periods of the year, the onset of the activity of the Azores subtropical high pressure causes stable weather and intensifies the hot and dry conditions of the tropical climate. Following the establishment of the Azores subtropical high pressure, which is followed by a clear sky, the sun's vertical and warm rays are sent to the earth's

surface, which, given the amount of salt marsh and sandy lands with the least amount of vegetation, heats up faster. Synoptic survey and synoptic analysis of the increase in temperature in Khuzestan province on the desired date revealed that the occurrence of temperature hazards in the province is one of the characteristic features of the dry regions of Khuzestan, which is influenced by the surrounding geographical factors, including warm water sources (Persian Gulf, etc.), variable latitude, and various unevenness, which, in combination with pressure systems of different seasons, has a high spatial diversity, which has caused long-lasting and persistent warm periods in this province, turning it into one of the hottest places in Iran and perhaps the world. The occurrence of such temperature events causes great damage and losses in the agricultural sectors, farms, gardens, food production, health and well-being of residents, etc. Therefore, recognizing and analyzing the patterns that generate this type of weather hazard at the beginning of its development is important, so that by being aware of them, it is possible to take the necessary measures and decisions to prevent possible damage and increase the quality of life of communities.

Declarations

•**Funding**: There is no funding support for this study.

•**Authors' Contributions**: All authors contributed equally to the conceptualization and writing of the article. The authors approved the manuscript's content and agreed on all aspects of the work.

•**Conflict of Interest:** The authors declare no conflict of interest.

•**Acknowledgments**: The authors extend their gratitude to all scientific consultants who provided invaluable insights during this research.

References

Akbary, M. & Asadolahi, E. (2021). Global warming and changes in atmospheric thickness during the cold period of the year in Iran. Climate Change Research, 2(8), 83-98. doi: 10.30488/ccr.2022.321782.1067 [In Persian].

Beniston, M., Stephenson, D.B., Christensen, O.B., Ferro, A.T., Frei, christoph.,Goyette,s., Halsnaes,K., Holt,T., jyiha,k., koffi, B. (2007). Future extreme events in European climate, an exploration of regional climate model projections, Climatechange, 81,71-95. https://doi.org/10.1007/s10584-006-9226-z

Bettina M. (2003). Fifty-Third Session of The WHO Regional Committee For Europe, Pp 1-12.

Borna, R., Amani, M., Zoohorian, M. (2021). Temperature Hazards Assessment of Khuzestan Province. Journal of Geography and Environmental Hazards, 10(4), 243-260. doi: 10.22067/geoeh.2021.67887.1005 [In Persian].

Boron, A., Zohoriyan Pordel, M., Lashkari, H., Shakiba, A. and mohamadi, Z. (2025). Identifying heat waves in Khuzestan Province and synoptic analysis of the role of Saudi Arabia's high pressure in their creation. Journal of New ideas in geographical sciences, 3(8), 1-20. https://www.ims-jmas.net/article_115309.html

Esmaeil Negad, M., Khosravei, M., Aliganei, B. and Masoodeian, S. (2013). Identifying Heat Waves of Iran. Geography and Development, 11(33), 39-54. doi: 10.22111/gdij.2013.1321 [In Persian].

Ghavidel Rahimi, Y. & Rezaei, M. (2016). A Query on Identification, Classification and Synoptic Analysis of Heat Waves in Kerman Province. Journal of Geography and Planning, 19 (54), 253-277. https://geoplanning.tabrizu.ac.ir/article_4479.html [In Persian].

Ghavidel Rahimi, Y.,rezaie.M. (2014). The Statistical and Synoptic analysis of super warm temperatures in South East region of Iran. Journal of Arid Regions Geographic Studies, 5(15), 35-52. https://jargs.hsu.ac.ir/article_161352.html [In Persian].

Ghavidel Rahimi,Y. (2011). Identification, Classification and synoptic analysis of Iran super heat. Journal of Arid Regions Geographic Studies, 2(3), 85-100. https://jargs.hsu.ac.ir/article_161274.html [In Persian].

Hooshyar, M., Sobhani, B., & Parvin, N. (2019). Synoptic Analysis of Early Heat Waves in Northwest of Iran, 19(54),185-203. http://jgs.khu.ac.ir/article-1-2780-fa.html [In Persian].

Jamalizade, N., Zohurianepordel, M., Lashkari, H., Shakib,A., & Mohammadi, Z. (2019). Synoptic analysis and dynamic structure of summer patterns in Khuzestan province. Journal of Physical Geography,12(44),17-29. https://journals.iau.ir/article_668789.html [In Persian].

Karampoor, M., Rafiee, J. and Jafari, A. (2017). Identification and Analysis of Synoptic of Heat Waves in West of Iran (Case Study: Ilam, Khouzestan, Lorestan, Kermanshah). Environmental Management Hazards, 4(3), 263-279.doi: 10.22059/jhsci.2018.246557.296 [In Persian].

Khazaee kuhpar, S., Janbaz ghobadi, G. and Motevali, S. (2024). Identification and synoptic analysis of heat waves in Ahvaz metropolis. Geographical Engineering of Territory, 8(3), 193-208. doi: 10.22034/jget.2023.346928.1434 [In Persian].

Khosravi M, Esmaeilnejad M. (2020). Statistical Analysis - Synoptic a Continuity Heat Waves of Iran. Journal of the Geographical Studies of Mountainous Areas, 1 (2), 19-33. doi: 10.29252/gsma.1.2.19 [In Persian].

Khuzestan Province Meteorological Department. (2025). Geographical and climatic characteristics of Khuzestan Province[Website post] Retrieved 2025, January. 20, https://khzmet.ir/rha/ (in Persian) https://khzmet.ir/rha/ [In Persian].

Kyselý, J., (2004). Mortality and displaced mortality during heat waves in the Czech Republic. International journal of biometeorology,49(2), 91-97. DOI:10.1007/s00484-004-0218-2

Lashkari, H., Boron, A., Zohoriyan Pordel, M., Shakiba, A. and mohamadi, Z. (2019). Synoptic Analysis of Saudi Arabian sub-tropical High pressure in Height Waves of Khuzestan Province. Journal of Meteorology and Atmospheric Science, 2(1), 55-67. https://www.ims-jmas.net/article_115309.html [In Persian].

Lashkari, H., Metacan, A., Azadi, M., Mohammadi,Z. (2017). Synoptic analysis of the role of Saudi Arabia subtropical high pressure subtropical and polar jet streams and severe droughts in South and South West of Iran. Researches in Earth Sciences, 8(2), 141-163. https://esrj.sbu.ac.ir/article_96278.html [In Persian].

Mojarrad, F., Masoompour, J. and Rostami, T. (2015). Statistical-Synoptic Analysis of Heat Waves above 40○C in the West of Iran. Journal of Geography and Environmental Hazards, 4(1), 41-57. doi: 10.22067/geo.v4i1.32793

Rezaie, F., Ahmadi, M. & Shakiba, A. (2018). Determining the Temperature Threshold of the Heat Wave during the Warm Period of the Year Based on Global Index in Different Regions of the Country. Journal of Geography and Environmental Hazards, 7(2), 115-132. doi: 10.22067/geo.v7i3.64584 [In Persian].

Roger D., Peng, Jennifer F. Bobb & Francaesca Do., (2011). Towrd a Quantitative Estimate of Future Heat Wave Mortality Under Global Climate Change. Environmental Health Perspectives, National Instituted of Environmental Healthscince. 119(5) 701-706. doi: 10.1289/ehp.1002430

Young Son. J., Jong T, G., Anderson, B., & Michellel. B., (2012). The impact of Heat wave on mortality in seven major cities in Korea Environ Health Percept 120: 566-571. DOI: 10.1289/ehp.1103759