

Video Presentation: High-precision Oasis Dataset of China

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Abstract: Oases play a critical role in ecological balance, economic development, and biodiversity conservation in arid regions. China, being the country with the largest distribution of oases globally, is at the forefront of oasis studies. Establishing a high-precision oasis dataset for China is of great significance for scientific research. The “Video on oasis dataset of China” utilizes a multimedia format, combining text, images, and audio, to comprehensively explain the purpose, process, and methodology of constructing this dataset. It highlights the three main advantages of the dataset: high precision, comprehensive coverage, and strong reliability. The spatial characteristics of oasis distribution are demonstrated, revealing regional variations within China’s oases. Furthermore, a management and query system for the oasis data has been established based on the underlying logic of oasis coding, facilitating scientific research and information retrieval related to oases.

Keywords: oasis; China; dataset; spatial distribution; coding

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Dataset Availability Statement:

The dataset supporting this paper was published and is accessible through the *Digital Journal of Global Change Data Repository* at: <https://doi.org/10.3974/geodb.2025.01.10.V1> or <https://cstr.escience.org.cn/CSTR:20146.11.2025.01.10.V1>.

1 Introduction

Oases are non-zonal geographic units formed on desert substrates in arid regions, driven by stable water sources^[1]. They stand in stark contrast to the arid and barren environment due to their abundant water resources, fertile soil, and lush vegetation^[2]. Oases are crucial to agriculture, livestock production, and the livelihood of people in arid regions^[3]. In the

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northwestern arid regions of China, spanning nearly 3 million km²^[4], oases are widely distributed, either independently or in clusters, following the availability of water. These areas exhibit a vast geographical span and diverse types, occupying less than 10% of the region's total area. Yet, they support over 95% of the population in the arid zones and generate more than 90% of the region's social wealth^[5]. As the core of the human-environment system in arid regions^[6], oasis science has been a focal point of research for scholars in arid zone studies since the 1980s. Different researchers, based on various objectives and perspectives, have proposed different definitions of oases.

Overall, an oasis must include the following three characteristics^[7]: (1) it exists in arid and semi-arid regions; (2) it is surrounded or partially surrounded by desert environments; (3) it has a stable water supply, forming a heterogeneous landscape unit with certain vegetation coverage or economic productivity. Due to the relatively late establishment of a clear oasis definition, although numerous studies on oases exist^[8–10], a detailed inventory of oasis distribution in China has yet to be clarified. For instance, the number of oases in China's arid regions, the specific locations and boundaries of each oasis, their topography and geomorphology, and the sources of water that drive them, remain unclear, hindering the in-depth development of oasis science. To address this gap, a team from the Xinjiang Institute of Ecology and Geography and the Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences, spent four years utilizing manual visual interpretation methods to compile the High-precision oasis dataset of China. This dataset includes 42 data collections^[11–52], all of which have been published in the *Digital Journal of Global Change Data Repository* and are freely available for download. The “Video on Oasis Dataset of China”^[53] serves as a detailed description of this dataset, clearly outlining its three main advantages. First, high precision; the dataset was created using the highest accuracy method, manual visual interpretation of high-resolution remote sensing imagery; Second, comprehensive coverage; the dataset covers all oases in China larger than 0.01 km²; Third, strong reliability. the dataset has been verified through field investigations, yielding a Cohen's Kappa coefficient of 0.87, an AUC-ROC (Area Under the Receiver Operating Characteristic Curve) of 0.935, and a 96.27% accuracy rate confirmed through a random hexagonal grid method.

The video provides a detailed demonstration of the construction process of the High-precision oasis dataset of China. Initially, preparatory work was carried out. First, the definition of the oasis was clarified, which is essential for distinguishing it from the surrounding desert background and serves as the basis for extracting oasis boundaries. Second, establish selection criteria for remote sensing imagery, with cloud-free summer images being optimal. Third, the transition zone between oases and deserts was identified, and the attribution of disputed areas was clarified to minimize misclassification of types. Fourth, conduct professional training for oasis extraction personnel to ensure accurate identification of oasis boundaries.

Subsequently, the oasis boundary extraction procedure was formally initiated. The delineation process utilized high-resolution remote sensing imagery (<1 m spatial resolution) from Google Earth Pro, with topographic data and vegetation coverage indices as references. Visual interpretation methods were employed to establish control points based on ground truth data using the platform's drawing tools. Subsequently, the extracted oasis boundary data were imported into the geographic information system (GIS), with .kmz format data converted to .shp format, line features transformed into polygons to construct the preliminary high-precision oasis dataset of China. Finally, fundamental geographic information—including climatic, geomorphological, and hydrological data—was incorporated.

The video provides a comprehensive summary of the spatial distribution characteristics of oases in China, offering a detailed explanation of the distribution differences. This study

comprehensively presents the baseline distribution of oases across China in 2020.

(1) Overview: There are 1,466 oases in China, covering a total area of 277,375.56 km². The easternmost point of China's oases is located at the Houtao Plain (109.97°E), the westernmost reaches the Kashgar region (74.13°E), the northernmost extends to the Altai region (48.18°N), and the southernmost is in the Qaidam Basin (35.96°N) (Figure 1).

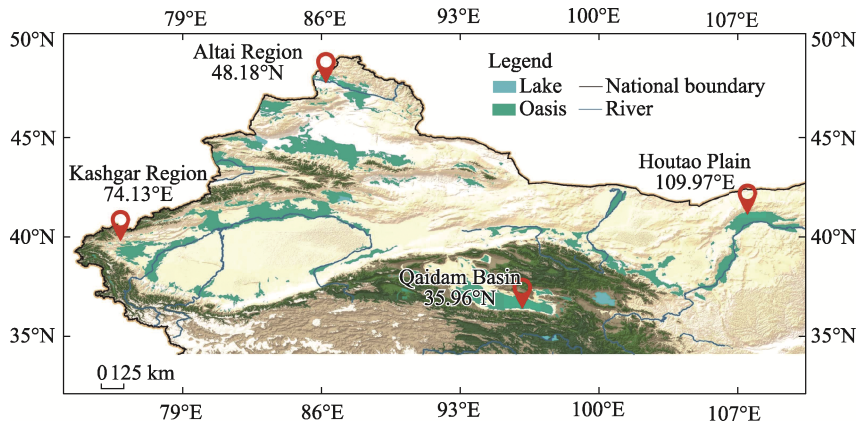


Figure 1 Distribution map of oases in China

(2) Regional classification: the oases of China are divided into 7 major regions, which are the Northern Xinjiang Oasis Region, Southern Xinjiang Oasis Region, Qaidam Basin Oasis Region, Hexi Corridor Oasis Region, Hetao Plain Oasis Region, and Alashan Oasis Region. The Northern Xinjiang Oasis Region includes oases such as the Irtys River Oasis, Ili Oasis, and Hami Oasis; the Southern Xinjiang Oasis Region includes oases such as the Aksu Oasis, Kashgar Oasis, and Ruqiang Oasis; the Qaidam Basin Oasis Region contains only the Qaidam Basin Oasis; the Hexi Corridor Oasis Region includes oases such as the Yangguan Oasis, Shule River Oasis, Heihe Oasis, and Shiyang River Oasis; the Hetao Plain Oasis Region includes oases such as the Ningwei Plain Oasis, Yinchuan Plain Oasis, and Houtao Plain Oasis; the Alashan Oasis Region includes oases such as the Alashan Left and Right Banner Oasis and Ejina Oasis.

From the administrative perspective, China's oases are distributed across 5 provinces and autonomous regions in the Northwestern Arid Region: Xinjiang, Gansu, Qinghai, Ningxia, and Inner Mongolia (Figure 2). Among these, Xinjiang has the largest area and the most oases, with an oasis area of 171,801.06 km², accounting for about 60% of the total oasis area in China, and 1,078 oases. The second-largest oasis area is in Qinghai Province, covering 30,047.08 km² with fewer oases, totaling 25. Gansu Province follows with an oasis area of 29,024.79 km² and 316 oases, most of which are located in the northern part of the Qilian Mountains, an important passage of the ancient Silk Road. Inner Mongolia comes next with an oasis area of 25,201.61 km² and 37 oases. The smallest oasis area is in Ningxia, with 13,301.02 km² and only 10 oases.

It is particularly worth noting that the video also presents the scientific achievements of the oasis cataloging in China. Cataloging geographic units is fundamental to geographical work. Compared to previously cataloged geographical units such as lakes, wetlands, and glaciers—especially glaciers, which have undergone two rounds of cataloging—oasis cataloging is still in its early stages. Establishing a baseline for oases is essential to the cataloging process.

Building on the oasis dataset, the video introduces the underlying logic of oasis coding in China. 5 key attributes that best represent oases—administrative regions, climate zones, landforms, rivers, and area—were selected (Figure 3) for tiered coding. This approach led to

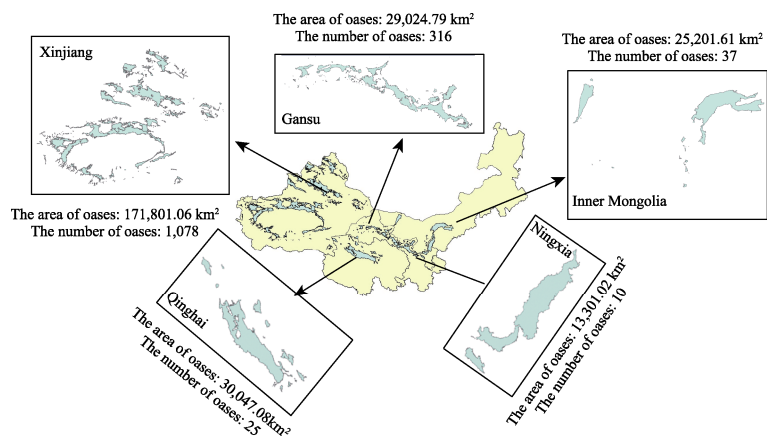


Figure 2 Map of number and area of oases in each province (autonomous region)

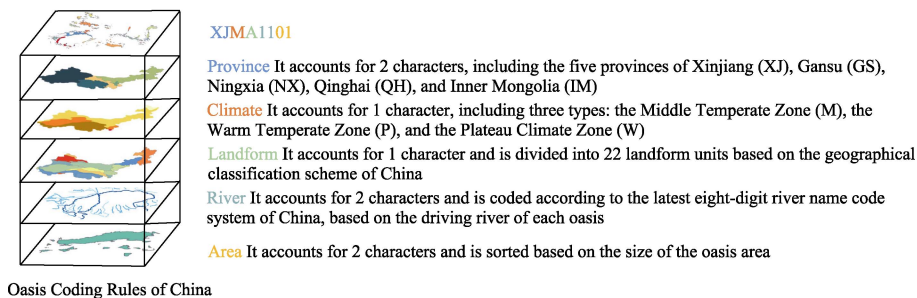


Figure 3 Oasis coding rules of China

the successful coding of 1,466 oases in China, assigning each oasis a unique “academic identifier”. Establishing this oasis coding system allows for the integration and comparison of oasis data, provides effective methods for precise search, monitoring, and management of oases, and promotes the quantitative and systematic advancement of oasis research in China. This represents a pioneering contribution to the field of oasis science.

The “Video on oasis dataset of China” has a duration of 4 minutes and 45 seconds, with the MP4 format and a size of 672 MB. It is available in both Chinese and English versions. This is the first panoramic video to academically present and publicly publish information about China’s oases. The video is of significant reference value to scholars engaged in research related to natural geography, economic geography, and ecology in arid regions. It has also become a trusted source of knowledge for the general public to better understand the oases of China.

Author Contributions

Liu, C. and Gui, D. W. were responsible for the overall design of the dataset; Lin, J. W. collected, processed, and validated the data; Gui, D. W. and Lin, J. W. wrote the data-related papers.

Conflicts of Interest

The authors declare no conflicts of interest.

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