Mongolian Plateau Desertification Distribution Dataset

Data Documentation

I. Dataset/atlas content features

i. Abstract

The Mongolian Plateau, representing one of the most significant arid regions in the contemporary Northern Hemisphere, is a typical area highly sensitive and vulnerable to global change while simultaneously playing a crucial role in establishing ecological security buffers for northern China and the broader expanse of northern Asia, where desertification stands as one of the most severe ecological and environmental challenges, with Mongolia itself being a global hotspot for this process. Under the combined pressures of climate change and unsustainable anthropogenic activities—including overgrazing and unregulated mining—grassland degradation and land desertification within the plateau have intensified markedly in recent decades, a trend underscored by the escalating frequency and severity of transboundary sand and dust storms (SDS) affecting both Mongolia and China, which have once again brought the desertification crisis into sharp focus. Therefore, this study utilized the Google Earth Engine (GEE) platform as the primary tool for processing remote sensing data, leveraging multi-source Earth Big Data and employing a feature-based framework coupled with machine learning techniques to conduct a refined desertification analysis, enabling the acquisition of detailed, spatially explicit desertification grade distribution maps for the Mongolian Plateau spanning 1990 to 2023 with a spatial resolution of 30 meters and a temporal interval of 5 years. This research holds substantial scientific significance and practical implications for combating desertification, enhancing ecological security, fostering cross-border cooperation, and supporting the green and sustainable socio-economic development of the Mongolian Plateau region.

ii. Elements (content fields)

The data files adhere to the naming convention "XXXX_Mongolian_Plateau_Desertification_30m_Raster.tif", where "XXXX" denotes the year. The raster data product features pixel values ranging from 0 to 5, with each value representing a specific classification: 0 corresponds to water bodies, 1 indicates potential desertification, 2 signifies light desertification, 3 represents moderate desertification, 4 denotes high desertification, and 5 designates severe desertification.

iii. Temporal cover

1990 - 2023

iv. Spatial cover

87° 43′ ~126° 04′ E, 37° 22′ ~53° 20′ N.

II. Subject/industry scope of dataset/atlas

i. Subject scope

Earth science, remote sensing, etc.

ii. Industry scope

Geographical information services, remote sensing surveying and mapping services, etc.;

iii. Other classifications (optional)

III. Accuracy of dataset/atlas

i. Time frequency

5-year interval

ii. Spatial reference, accuracy, and granularity

Spatial reference: GCS_WGS_1984;

Spatial resolution: 30 m.

IV. Dataset/atlas storage management

i. Data quantity

2.72 GB

ii. Type format

TIF

iii. Update management

Irregular updating

V. Quality control of the dataset/atlas

i. Production mode

Using Landsat 5\7\8 series image data and DEM to construct the feature bands, the desertification feature system was analyzed with machine learning matching to obtain a fine-graded dataset of desertification on the Mongolian Plateau from 1990 to 2023. The data processing environment mainly includes Python, Google Earth Engine.

ii. Data sources (condition selection)

Landsat 5\7\8 images and NASA DEM data

iii. Methods of the data acquisition and processing (condition selection)

With the support of the GEE cloud platform and based on Landsat remote sensing images, the NDVI maximum synthesis method is used to obtain high-quality images with the best annual vegetation status. Typical vegetation indicators (vegetation cover (FVC), normalized vegetation index (NVI), modified soil adjusted vegetation index (MSAVI), etc.) and soil indicators (topsoil granularity index (TGSI), surface albedo, etc.) needed for desertification assessment are automatically calculated online.

Combine topographic features and Landsat raw spectral bands to build a desertification monitoring feature indicator library. Construct a variety of machine learning models for desertification monitoring (e.g., random forest, decision tree, support vector machine, gradient boosting tree, maximum-minimum distance method, etc.) to obtain the best model for desertification monitoring in the Mongolian Plateau. Combining the image characteristics of desertification on the Mongolian Plateau and field surveys, we have established a hierarchical interpretation marker for the degree of desertification, classified the desertified land into five grades, namely, extremely desertified, severely desertified, moderately desertified, mildly desertified and potentially desertified, and completed a 30-metre map of desertification on the Mongolian Plateau for the period 1990-2023, so as to analyse the spatial and temporal distribution pattern of desertification and the process of its evolution.

VI. Sharing and usage method of the dataset/atlas

i. Sharing methods and restrictions

Fully opened sharing

ii. Contact information of the sharing service (condition selection)

Online link address:

Contact Information for Service：

Name: Service group of Disaster Risk Reduction Knowledge Service System of IKCEST

Address：11A, Datun Road, Chaoyang District, Beijing, 100101, China, Institute of Geographic Sciences and Natural Resources Research, CAS.

Zip Code：100101
E-mail: ikcest-drr@lreis.ac.cn

iii. Conditions and methods of usage

The dataset can be read by ArcGIS and ENVI software.

VII. Intellectual property rights of the dataset/atlas

i. Property rights (optional)

The property of the dataset belongs to the Institute of Geographic Sciences and Resources, Chinese Academy of Sciences.

ii. Reference method of the dataset/atlas

Mongolian Surface Water Distribution Dataset. Disaster Risk Reduction Knowledge Service of International Knowledge Centre for Engineering Sciences and Technology (IKCEST) under the Auspices of UNESCO, 2025.06

iii. Usage contacts of the datasets/atlas

Name: Service group of Disaster Risk Reduction Knowledge Service System of IKCEST
Address：11A, Datun Road, Chaoyang District, Beijing, 100101, China, Institute of Geographic Sciences and Natural Resources Research, CAS.
Zip Code：100101
E-mail: ikcest-drr@lreis.ac.cn

VIII. Others (optional)

In addition to the above, other information must also be explained.

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