Knowledge Graph Analysis of Domestic Drought Remote Sensing Monitoring Based on CiteSpace Postprint

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Date: 2019-01-11T00:00:00+00:00

Abstract

Visual analysis was conducted using CiteSpace software on 642 literature entries concerning drought remote sensing monitoring research from the CNKI databases of "SCI Source Journals", "EI Source Journals", "Core Journals", and "CSSCI Source Journals" spanning 1995 to 2017, generating a knowledge graph. The results demonstrate that domestic research has progressed through three distinct stages: traditional station-based drought monitoring, small-scale experimental drought remote sensing monitoring, and large-scale drought remote sensing monitoring and application. Drought remote sensing monitoring primarily encompasses research directions including "drought monitoring", "remote sensing monitoring", "Temperature Vegetation Drought Index (TVDI)", "soil moisture", "land surface temperature", and "Normalized Difference Vegetation Index (NDVI)". The principal publishing authors include Wang Pengxin, Zhang Shuyu, and Zhang Qiang, while key publishing institutions comprise the Chinese Academy of Sciences, China Meteorological Administration, and China Agricultural University. Critical future directions for domestic drought monitoring research include: integrated drought monitoring models based on multi-source information, large-scale drought monitoring, assessment, early warning, and decision support systems, application of drought remote sensing monitoring technology in social services, and strengthened collaboration and exchange among domestic scholars and institutions.

Full Text

Preamble

DOI: 10.12118/j.issn.1000-6060.2019.01.18
Journal: Arid Land Geography (ChinaXiv Cooperative Journal)

This study employs CiteSpace software with visual analysis for knowledge graphing to analyze 642 academic papers on drought monitoring using remote sensing technology published between 1995 and 2017. The papers were retrieved from the "SCI Journals," "EI Journals," "Core Journals," and "CSSCI Journals" databases in CNKI (China National Knowledge Infrastructure). The search strategy incorporated terms including "drought monitoring," "remote sensing monitoring," "precipitation anomaly percentage (PAP)," "Standardized Precipitation Index (SPI)," "Temperature Vegetation Dryness Index (TVDI)," "Water Deficit Index (WDI)," "Vegetation Temperature Condition Index (VTCI)," and "Perpendicular Drought Index (PDI)." The analysis covers three distinct stages of drought monitoring research development in China.

2. Methods

2.1 Data Collection

The literature search was conducted in the CNKI database, which includes journals indexed in SCI, EI, Core Journals, and CSSCI. The time span was set from 1995 to 2017, with search terms encompassing "drought monitoring," "remote sensing monitoring," and related drought index terminology. A total of 642 papers were identified for analysis. The data export from CNKI included fields for Title, Abstract, Author Keywords, and Keyword Plus.

2.2 Research Methods

CiteSpace 5.1.R8 was utilized for bibliometric analysis and visualization. The software enables co-occurrence network analysis of authors, institutions, keywords, and citations. Key parameters were configured as follows: time slice length, node type selection, and threshold settings for network pruning. The analysis focused on identifying research hotspots, author collaboration patterns, and institutional contributions in drought remote sensing monitoring.

2.3 Network Analysis

The study constructed knowledge maps to visualize the evolution of research themes. Network metrics including betweenness centrality, co-occurrence frequency, and clustering coefficients were calculated. The keyword co-occurrence network was pruned using pathfinder algorithms to highlight significant thematic clusters.

2.4 Visualization Parameters

Visualization settings included threshold adjustments for node display, time slice partitioning, and clustering resolution parameters. The resulting knowledge maps display temporal trends in drought monitoring research, with node sizes representing frequency of occurrence and connecting lines indicating co-occurrence relationships.

3. Results and Discussion

The analysis reveals three developmental stages in China' s drought remote sensing monitoring research: (1) traditional site-based monitoring, (2) small-scale remote sensing applications, and (3) large-scale integrated monitoring and operational application. Key research perspectives include "Drought Monitoring," "Remote Sensing Technology," "Temperature Vegetation Dryness Index (TVDI)," "Soil Moisture," "Land Surface Temperature," and "Normalized Difference Vegetation Index (NDVI)."

The most prolific authors in this field are Wang Pengxin, Zhang Shuyuan, and Zhang Qiang, who have made substantial contributions to drought index development and remote sensing methodology. The leading research institutions are the Chinese Academy of Sciences, China Meteorological Bureau, and China Agricultural University, which form the core of national collaboration networks.

Future research directions should emphasize: (1) development of multi-source comprehensive drought monitoring models, (2) large-scale drought assessment and early warning systems, (3) decision support system integration, (4) expanded social service applications of remote sensing monitoring technology, and (5) enhanced domestic and international academic collaboration.

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Note: Figure translations are in progress. See original paper for figures.