Spatiotemporal Distribution Characteristics and Classification of Snow Disasters in Xinjiang: Postprint

Authors: Wang Yong, Zhao Zhancheng

Date: 2020-11-24T00:00:00+00:00

Abstract

Utilizing snow disaster data from Xinjiang spanning 1954–2018, this study analyzes the spatiotemporal characteristics of these disasters. Temporally, snow disaster damage intensity increased significantly after the 1990s, exhibiting a characteristic jump increase in 2010. Spatially, snow disaster damage intensity in Xinjiang demonstrated a pattern of being higher in the west than in the east, higher in the north than in the south, and higher in mountainous regions than in basins or plains. A multi-indicator comprehensive analysis methodology was employed to objectively construct a damage index, incorporating snow disaster occurrence frequency, number of collapsed houses, number of collapsed livestock sheds, number of damaged greenhouses, number of livestock deaths, affected area, and economic losses. The damage index, which conforms to the [Γ distribution, combined with the F distribution function, can objectively delineate snow disaster grades, which are divided into four levels: general, relatively severe, severe, and extremely severe. According to the constructed snow disaster classification, extremely severe snow disaster areas in Xinjiang are concentrated in the Tianshan Mountains and regions north thereof, with only the Kashgar area being an extremely severe disaster area in southern Xinjiang.

Full Text

Spatial and Temporal Distribution Characteristics and Classification of Snow Disasters in Xinjiang

WANG Yong[1], ZHAO Zhan-cheng[2], YAN Jun[3], TANG Ye[4], CAI Yun-tong[5]

[1] Xinjiang Ecological Meteorology and Satellite Remote Sensing Center, Urumqi 830002, Xinjiang, China
[2] Bazhou Meteorological Bureau of Xinjiang, Korla 841000, Xinjiang, China

[3] Xinjiang Weather Modification Office, Urumqi 830002, Xinjiang, China
[4] Xinjiang Meteorological Observatory, Urumqi 830002, Xinjiang, China
[5] Urumqi Tianshan District Meteorological Bureau, Urumqi 830000, Xinjiang, China

Abstract

Located at the center of Eurasia, Xinjiang covers a vast area of 1.66 million square kilometers, accounting for one-sixth of China' s total territory. The region' s topography can be roughly summarized as "three mountains sandwiched between two basins," with the Kunlun, Altun, and Tianshan Mountains surrounding the Tarim and Junggar basins. The Tianshan Mountains traverse the central part of Xinjiang, where snow persists year-round at the peaks and the environment is extremely harsh with frequent disasters. This paper analyzes the temporal and spatial characteristics of snow disasters using 403 effective sample sequences from snow disaster statistics spanning 1954 to 2018. A disaster index is constructed using multi-index comprehensive analysis methods, incorporating parameters such as the number of snowstorms, collapsed houses, collapsed livestock sheds, damaged sheds, dead animals, affected area, and economic losses, thereby excluding subjective factors. The disaster index, consistent with a combination of the Γ distribution and F distribution functions, can objectively depict snow disaster risk. This risk can be divided into four levels: general, heavier, serious, and extra-heavy. The intensity of snow disasters has increased significantly since the 1990s, showing a particularly sharp rise after 2010. Spatially, snow disaster intensity is higher in western Xinjiang than in the east, higher in the north than in the south, and higher in mountainous areas than in basins or plains. According to the calculated snow disaster intensity, disaster-prone areas in Xinjiang are concentrated in the Tianshan Mountains and their northern foothills. The Kashgar Prefecture in southern Xinjiang is also a disaster-prone region. Grave disasters account for only approximately 10% of all snow disasters, while around 50% are classified as general-level events, and heavier and severe snow disasters each constitute about 20%.

Keywords: Snow disaster; Characteristics; Districts; Disaster loss index; Assessment

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