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中央氣象署閃電資料分析及應用

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摘　要

閃電除了對人員和基礎設施造成風險外，還可能造成野火，並影響大氣化學的關鍵特徵，例如對流層上層臭氧的產生。廣泛接受的閃電成因機制是基於雷暴中的上升空氣和冰粒碰撞，雲內不同冰粒的碰撞為雷雲充電。在閃電氣候學的相關研究顯示，與許多天氣現像一樣，閃電很可能會對氣候變遷做出反應，在有閃電的日子裡，由於雲冰和對流強度的增加，閃電將會增加。在閃電影響的隨機性中，有些復發閃電熱點甚至年復一年地被重複擊中。對流系統的閃電活動有時是其降水產生的有效指標，人們對降雨率與閃電數量之間的關係進行了大量研究，比較了各種對流系統中不同類型閃電活動的降雨量。降雨率和閃電率在時間序列上顯示出非常相似的特徵，降雨和閃電之間的整體空間相關性也非常一致。研究顯示，對於所有閃電類型來說，相對於負CG閃電，正CG 閃電與更高的雨水量有關，因此引入正閃電的權重係數可顯著改善降雨量和閃電產生之間的相關性。考慮到每種類型閃電的特定貢獻，可以根據每個系統的總閃電活動來估計降雨量，以便得到與雷達測量得出的量有較合理的一致性。本研究使用中央氣象署自2015年至今陸續建置25座閃電落雷偵測站的閃電定位系統(Lightning Location System)所觀測到的閃電資料，以便分析CG和IC閃電的時空分布特徵，並藉以分析其與氣候變化、降水或溫度之間的關聯性。。

關鍵字：閃電

Analysis and application of lightning data from Central Weather Administration

Abstract

In addition to the risk to people and infrastructure, lightning can cause wildfires and affect key features of atmospheric chemistry, such as the production of ozone in the upper troposphere. The widely accepted mechanism for causing lightning is based on the collision of rising air and ice particles in thunderstorms, with the collision of different ice particles within the cloud charging the thundercloud. Related research in lightning climatology shows that, like many weather phenomena, lightning is likely to respond to climate change. On days with lightning, lightning will increase due to increases in cloud ice and convection intensity. Due to the random nature of lightning effects, some recurrent lightning hotspots are even struck repeatedly year after year. The lightning activity of a convective system is sometimes a useful indicator of its precipitation production, and a number of studies have been conducted on the relationship between rainfall rate and lightning number, comparing rainfall amounts for different types of lightning activity in various convective systems. Rainfall rates and lightning rates show very similar characteristics in time series, and the overall spatial correlation between rainfall and lightning is also very consistent. Research shows that for all lightning types, positive CG lightning is associated with higher rainfall relative to negative CG lightning, so introducing a weighting coefficient for positive lightning can significantly improve the correlation between rainfall and

lightning generation. Taking into account the specific contribution of each type of lightning, rainfall can be estimated based on the total lightning activity of each system in order to obtain a reasonable agreement with the quantities derived from radar measurements. This study uses lightning data observed by the Lightning Location System (Lightning Location System), which the Central Meteorological Administration has successively built 25 lightning detection stations since 2015, in order to analyze the spatiotemporal distribution characteristics of CG and IC lightning, and to analyze Correlations with climate change, precipitation or temperature.

Key words : Lightning