中央氣象署114年第三十九屆天氣分析與預報研討會
39th Conference on Weather Analysis and Forecasting

閃電落雷偵測系統之資料分析及應用

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摘　要

閃電可能直接造成災害，並影響大氣物理及化學變化，閃電資料可以提供災防資訊，並可應用於監測短期劇烈天氣及長期氣候變遷。在短期劇烈天氣，閃電是強烈雷雲電場的直接反應，由強烈的大氣濕對流和冰粒的活躍降水過程而產生，可以幫助監測雷暴的發展狀態。在長期氣候變遷，由於雷電放電會產生雷電氮氧化物，進而產生對流層上層臭氧等溫室氣體，影響空氣品質。在閃電氣候學的相關研究顯示，由於雲冰和對流強度的增加，閃電隨著氣候變遷而增加。整體而言，閃電提供了有關各種大氣過程的有用信息，並為天氣、氣候、大氣化學和閃電物理學等廣泛學科提供了重要的科學見解。此外，雷電本身直接對公共安全造成威脅，有些復發熱點甚至年復一年地被重複擊中。為進行閃電落雷偵測系統資料分析及應用，本研究使用中央氣象署、天氣風險公司及台電公司的閃電資料，分析閃電的時空分布特徵，並探討其與短期天氣及長期氣候之關聯性。

關鍵字：閃電

Data Analysis and Application of Lightning Detection System

Abstract

Lightning can directly cause disasters and affect atmospheric physical and chemical changes. Lightning data can provide disaster prevention information and can be used to monitor short-term severe weather and long-term climate change. In short-term severe weather, lightning is a direct response to the strong thundercloud electric field, which is generated by strong atmospheric moist convection and active precipitation of ice particles, and can help monitor the development of thunderstorms. In long-term climate change, lightning discharges will produce lightning nitrogen oxides, which in turn produce greenhouse gases such as ozone in the upper troposphere, affecting air quality. Related studies in lightning climatology show that lightning increases with climate change due to the increase in cloud ice and convection intensity. Overall, lightning provides useful information about various atmospheric processes and provides important scientific insights into a wide range of disciplines such as weather, climate, atmospheric chemistry, and lightning physics. In addition, lightning itself directly threatens public safety, and some recurring hotspots are even struck repeatedly year after year. In order to analyze and apply lightning strike detection system data, this study uses lightning data from the Central Weather Administration, Weather Risk Corporation, and Taipower Corporation to analyze the spatiotemporal distribution characteristics of lightning and explore its correlation with short-term weather and long-term climate.

Key words : Lightning