

防災降雨雷達在極短期暴雨系統之先兆辨識應用

Application of Rain Radar on Precursor Recognition in Heavy Rain Systems

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摘要

本研究分析全島防災降雨雷達於極短期暴雨觀測之雙偏極化參數特性，以期建立雙偏極化參數於暴雨之預警閾值。比相位差 K_{DP} 的極值（或是 $> 2^\circ \text{ km}^{-1}$ ）用於即時監測劇烈降雨區的動態和強度，尤其是每2分鐘的低空域快速掃描，對於集水區下游溪流之閃洪，具有事先預警能力。午後雷暴融解層以下出現 $K_{DP} > 2.5 \sim 3.0^\circ \text{ km}^{-1}$ 區域，一至二組體積掃描時間後（7至14分鐘），會出現地面降雨強度 $> 60 \text{ mm h}^{-1}$ （10分鐘雨量 $> 10 \text{ mm}$ ）。鋒前降雨個案中，降雨強度 $> 120 \text{ mm h}^{-1}$ 時， K_{DP} 在一組掃描時間前才出現前導特徵：3公里高度有 $K_{DP} > 3^\circ \text{ km}^{-1}$ 。在強降雨發生前，強 K_{DP} 區域的體積和平均值隨時間增加，而在垂直空間分布上呈現核心區域在15分鐘前下降的過程。未來工作將進一步考慮對流胞分析對預測的影響，討論 K_{DP} 變化與降雨強度之間的關係。

關鍵字：防災降雨雷達、 K_{DP} 、劇烈降雨系統、預警閾值

Abstract

The study analyzes the characteristics of the polarimetric parameters of the C-band disaster prevention rainfall radar in Taiwan in observing very short-term heavy rain systems and tries to establish the early warning threshold using the polarimetric parameters. The extreme values of the specific differential phase K_{DP} ($> 2^\circ \text{ km}^{-1}$) can be used to identify the heavy rainfall region's location, intensity, and movement. For flash floods downstream of the catchment area, there is potentially a priori warning capability. For the afternoon thunderstorm, if there is an area with $K_{DP} > 2.5 \sim 3.0^\circ \text{ km}^{-1}$ below the melting level, there will be a rainfall intensity $> 60 \text{ mm h}^{-1}$ (Rainfall $> 10 \text{ mm}$ in 10 minutes) after one or two volume scanning periods (7 to 14 minutes). In the case of frontal rainfall, when the rainfall intensity is $> 120 \text{ mm h}^{-1}$, K_{DP} appears leading characteristics only before one volume scanning period: $K_{DP} > 3^\circ \text{ km}^{-1}$ at a height of 3 km. Before heavy rainfall, the volume and average values of the high K_{DP} areas increase over time, while their vertical spatial distribution exhibits a process of decreasing core areas 15 minutes before. Future work will further consider the impact of convective cell analysis on predictions and discuss the relationship between K_{DP} changes and rainfall intensity.

Keywords: disaster prevention rainfall radar, specific differential phase K_{DP} , heavy rain systems, warning threshold.