

(CWA 研討會)康瑞颱風侵襲期間松山機場低空風切與氣

壓大波動之個案分析研究

—西元 2024 年 10 月 31 日

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摘 要

本研究使用台北松山機場低空風切警報系統 (LLWAS-III) 的風切警報資料和機場自動天氣觀測系統的氣壓觀測資料。松山機場在 2024 年 10 月 31 日受中度颱風康雷環流影響期間，本研究分析了「大壓力波動 (LPF)」與「風切警報 (WSA)」之間的關聯性。結果顯示，LPF 與 WSA 在每小時發生次數、強度和時間段上幾乎相同。LPF 能有效偵測颱風期間的輕度至強烈亂流 ($\geq 15\text{kt}$)，且在最高閾值 (≥ 150 次) 時，準確率較高，誤報率較低，假陰性率為 0。各項指標 (準確率、精確率、召回率、F1-Score) 均達 0.7~1.0，顯示兩者具有極佳相關性。因此，使用單一氣壓計測得的 LPF 作為松山機場 WSA 檢測的輔助或附加工具是可行且可靠的，有助於提升全球航空安全。

關鍵字：低空風切預警系統、自動氣象觀測系統、風切預警、氣壓大波動、準確率、誤報率、漏報率和 F1 分數。

The Correlation between Large Pressure Fluctuations and Low-Level Wind Shear Alerts under the Influence of the moderate Typhoon Kang-Rey Circulation on 31 October 2024.

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Abstract

This study uses the wind shear alert data of Taipei Songshan Airport's Low-Level Wind Shear Alert System (LLWAS-III) and air pressure observation data from the airport's automatic weather observation system.

We analyzed the correlation between the occurrences of Large Pressure Fluctuations (LPF) and Wind Shear Alerts (WSA) every hour in number at Songshan Airport under the influence of the moderate Typhoon Kang-Rey circulation on October 31, 2024. The LPFs used a single barometer to collect measurements that can be used to detect the WSAs, which currently relies on the low-level wind-shear alert system (LLWAS). The LPFs and WSAs occurrence times per hour, intensity, and time period are almost the same. LPF can detect mild turbulence to strong turbulence ($\geq 15\text{kt}$) during the typhoon. When LPF and WSA are at the highest threshold (≥ 150 times), accuracy is high and most of the false positive rates are low. In addition, the false negative rate is 0 and the accuracy, precision, recall, and F1-Score all reach 0.7~1.0, and their correlation is very good. The use of large pressure fluctuations has indicators comparable to those of LLWAS-III for observing airport wind shear and LPF. This method detects low-level wind shear at Songshan Airport with a high degree of reliability. It seems reasonable and feasible to use LPF as an auxiliary or additional tool for airport WSA detection, thus making a positive contribution to improving global aviation safety.

Keywords:

Low-Level Wind Shear Alert System, Automatic Weather Observation System, Wind Shear Alert, Large Pressure Fluctuations, Accuracy, False Positive Rate, False Negative Rate and F1-Score.