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應用氣象衛星影像於臺灣中部山區小型集水區進行雨量預報之可行性研究

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摘　　要　本研究利用美國 GOES-9 同步氣象衛星之雲頂溫度，配合相對應之地面雨量站紀錄，發展可應用於中小型集水區之雨量預報模式。研究區域選定南投縣臺大實驗林溪頭營林區之北勢溪上游集水區，並分析 2004 年 7 月之敏督利及同年 8 月之艾利颱風兩場事件之美國 GOES-9 衛星資料及相對地面 5 個測站之時雨量紀錄，而集水區之平均降雨量則由區塊克利金法逐時加以推估。結果顯示區域內五個雨量測站時雨量及集水區平均雨量與雲頂溫度呈現中度相關，其迴歸係數介於 0.5 與 0.7 之間，其相關性隨測站海拔高度之增加而降低；測站未來 2 至 6 小時之累積時雨量與雲頂溫度之相關性隨時間尺度之增加而減少。研究中並使用卡門濾波法對集水區進行小時雨量預報，兩場颱風其推估值與觀測值之相關係數及平均推估誤差分別爲 0.619、0.478 及 6.488 mm、8.722 mm。研究結果顯示使用衛星影像結合地面降雨資訊，應用於山區小集水區之雨量預報是可行的，惟受限於雨量時空分佈之高度變異特性，雨量預報之時間尺度仍建議以小時紀錄爲宜。

關鍵詞：氣象衛星影像、雲頂溫度、雨量預報、區塊克利金法、卡門濾波法。

Rainfall Forecasting Using Weather Satellite Imagery in a Small Watershed Located in a Mountainous Area of Central Taiwan

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ABSTRACT　This study devises a new scheme to predict rainfall of a small upstream watershed by combing GOES-9 geostationary weather satellite imagery and grod rainfall records, which can be applied for local quantitative rainfall forecasting during periods of typhoon and heavy rainfall. Imagery of two typhoon events in 2004 and five matching ground rain gauge records of Sitou Forest Recreational Area, which is located in the upstream region of Bei-Shi river were analyzed in this study. Basin-wide Average Rainfall (BAR) in the study area was estimated by block kriging. Cloud Top Temperature（CTT）from satellite imagery and ground hourly rainfall records were medium correlated. The regression coefficient ranges from 0.5 to 0.7 and the value decreases as the altitude of the gauge site increases. The regression coefficient of CCT and the next 2 to 6 hour collected BAR

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decrease as the time scale increases. The rainfall forecasting for BAR were analyzed by Kalman Filtering Technique. The correlation coefficient and average hourly deviations between the estimated and noted values of BAR for two typhoon events were 0.619, 0.478 and 6.488 mm, 8.722mm respectively. The preliminary result shows that the scheme proposed in this study can be used in mountainous areas for operational rainfall forecasting. The suggested time interval for rainfall forecasting should be one hour due to high variation in spatial and temporal scale.

Key words: weather satellite imagery, Cloud Top Temperature (CCT), rainfall forecasting, block kriging, Kalman Filtering Technique.