

## **Exploration of a Dynamic Merging Scheme for Precipitation Estimation over a Small Urban Catchment**

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### **Abstract**

The accuracy of quantitative precipitation estimation is of significant importance for urban areas due to the potentially damaging consequences that can result from pluvial flooding. Improved accuracy could be accomplished by merging rain gauge measurements with weather radar data through different merging methods. Several factors may affect the accuracy of the merged data, and the gauge density used for merging is one of the most important. However, if there are no gauges inside the research area, then a gauge network outside the research area can be used for the merging.

Generally speaking, the denser the rain gauge network is, the better the merging results that can be achieved. However, in practice, the rain gauge network around the research area is fixed, and the research question is about the optimal merging area. The hypothesis is that if the merging area is too small, there are fewer gauges for merging and thus the result would be poor. If the merging area is too large, gauges far away from the research area can be included in merging. However, due to their large distances, those gauges far away from the research area provide little relevant information to the study and may even introduce noise in merging. Therefore, an optimal merging area that produces the best merged rainfall estimation in the research area could exist.

To test this hypothesis, the distance from the centre of the research area and the number of merging gauges around the research area were gradually increased and merging with a new domain of radar data was then performed. The performance of the new merging scheme was compared with a gridded interpolated rainfall from four experimental rain gauges installed inside the research area for validation. The result of this analysis shows that there is indeed an optimum distance from the centre of research area and consequently an optimum number of rain gauges that produce the best merged rainfall data inside the research area. This study is of important and practical value for estimating rainfall in an urban catchment (when there are no gauges available inside the catchment ) by merging weather radar with rain gauge data from outside of the catchment. This has not been reported in any literature before now.