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Development of a window correlation matching method for improved radar rainfall estimation

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Abstract. The present study develops a method called window correlation matching method (WCMM) to reduce collocation and timing errors in matching pairs of radar measured reflectivity, Z_e , and gauge measured rainfall intensity, R , for improving the accuracy of the estimation of Z_e-R relationships. This method was compared with the traditional matching method (TMM), the probability matching method (PMM) and the window probability matching method (WPMM). The calibrated relationship $Z_e=18.05 R^{1.45}$ obtained from 7×7 km of space window and both present and 5 min previous time of radar observation for time window (S77T5) produces the best results for radar rainfall estimates for orographic rain over the Mae Chaem Watershed in the north of Thailand. The comparison shows that the Z_e-R relationship obtained from WCMM provide more accuracy in radar rainfall estimates as compared with the other three methods. The Z_e-R relationships estimated using TMM and PMM provide large overestimation and underestimation, respectively, of mean areal rainfall whereas WPMM slightly underestimated the mean areal rainfall. Based on the overall results, it can be concluded that WCMM can reduce collocation and timing errors in Z_e-R pairs matching and improve the estimation of Z_e-R relationships for radar rainfall. WCMM is therefore a promising method for improved radar-measured rainfall, which is an important input for hydrological and environmental modeling and water resources management.

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