



Areal rainfall estimation using moving cars as rain gauges - modeling study and laboratory experiment

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Areal rainfall estimation is still one of the concerns in hydrological analyses. Low density of the conventional rainfall measurement devices as well as the errors in radar data developed the new idea of using moving cars, called raincars, as a possible new source for measuring rainfall. This idea is easily technically feasible if the cars are provided with GPS and a small memory chip for recording the coordinates, car speed and data from the sensors, either for the frequency measurement of the wipers or the optical sensors on cars. According to the modeling study, which is done on the Bode catchment in Germany, a high number of possibly inaccurate sensors, raincars, provide more reliable areal rainfall estimation than a lower number of highly accurate, stationary sensors. In this study, data for the stationary gauges and the cars are extracted from the radar data. A valid relationship between wiper frequency and rainfall with a known error is assumed where the radar data is considered as the reference. Areal precipitation is estimated by different interpolation techniques, ordinary kriging for the stationary stations and indicator kriging for the cars. The results are then compared and evaluated with the reference, radar. After proving the feasibility of the hypothesis in the modeling study, field and laboratory experiment have been arranged. A certain number of cars has been equipped with sensors and in the laboratory, to produce the rainfall as close as possible to nature, sprinkler irrigation system has been designed for producing different rain intensities, from 1 mm/hr to 55 mm/hr. Here, we can develop an empirical approach for the relationship between the wiper frequency and rainfall intensity as well as for the optical sensors on the cars under different rainfall intensities.