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PhD Thesis: Using in-sewer sensors for accurate weather radar adjustment: Department of Civil Engineering, Aalborg. Unpublished.

Abstract: This PhD project is affiliated with Storm- and Wastewater Informatics which is a Strategic Danish Research Project with the overall aim of optimizing the control of drainage systems by using real-time based control systems which focuses on predictions of rain events. These predictions will be based on data from advanced weather models as well as several types of weather radars (X-band and C-band) and therefore, data of high quality is a prerequisite to ensure precise predictions. This requires a good calibration of the weather radar so what is measured, and later used in the real-time based control systems, actually corresponds to the real rain quantity. So far, this calibration has focused on getting measurements from weather radars to correspond with measurements from rain gauges – typically tipping bucket rain gauges. A lot of conditions have an effect when measuring rain with radars, why it is necessary to calibrate the weather radar against several rain gauges in order to get satisfactory measurement results. The precision of this calibration increases with the number of rain gauges. However, it is not always the case that several rain gauges are positioned within the measuring range of the weather radar. Furthermore, they are not always positioned in a desirable way. A second problem is the fact that rain gauges typically measures at 0.02 m² while weather radars measures over areas at 10.000-4.000.000 m². It is therefore far from certain that the point measurement from the rain gauge is representative for the weather radar measurement.

Previous studies show that great differences can occur when using data from rain gauges and calibrated data from weather radars in drainage modeling. From a scientific point of view this is far from desirable, when one wishes to use data from weather radars in drainage modeling. The purpose of this PhD study is therefore, to develop a method for calibrating weather radars against measurements in the drainage system. This will use the drainage system as an integrated rain gauge and the expectations for this method is that greater coherence between measurements and model results will be created when using weather radar data, as the radar is calibrated against measurements from sensors within the drainage system.

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