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# IMPACT OF ISOLATED AND INTEGRATED RAMP METERING STRATEGIES ON VEHICLE EMISSIONS ALONG FREEWAY SEGMENTS

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## Abstract

Ramp meters could reduce traffic congestions through adjusting ramp traffic flows to minimize the disruptions on mainline traffic flows. While there is plenty of mobility and safety related research on ramp metering, there are relatively fewer studies on the estimation of specific impacts of ramp metering on freeway emissions. The objective of this research is to estimate emissions while driving along mainline freeways with a series of ramps that are controlled by meters. The emissions were estimated based on the instant vehicle speed and acceleration rate, that were measured from a test vehicle driving along the freeway I-45 in Houston, TX, where five on-ramps were placed with three control mode: (1) no metering, (2) isolated metering, and (3) integrated metering. Results show that, the ramp metering control strategy is not always favorable to vehicle emissions. The total mainline freeway emissions estimated under the isolated ramp metering strategy are higher than the no metering strategy. Only when the mobility is significantly improved such as the one in the integrated ramp metering control strategy, the total emissions are tremendously reduced due to the shortened driving durations and queue management along the ramps. Therefore, the integrated ramp metering control strategy is superior to the isolated control strategy, in terms of both mobility and vehicle emissions.

*Key words:* air pollution, integrated control, isolated control, ramp metering

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