



# Monitoring on-road air quality and measuring vehicle emissions with remote sensing in an urban area



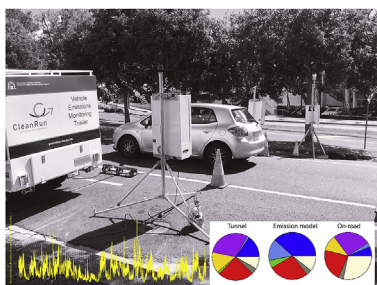
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## GRAPHICAL ABSTRACT



## ARTICLE INFO

### Keywords:

Motor vehicle  
Emissions  
Road traffic  
On-road air quality  
VOCs  
Remote sensing  
Tunnel  
COPERT  
Ozone  
NO<sub>2</sub>

## ABSTRACT

Simultaneous day-time measurement (8 a.m.–5 p.m.) of on-road air quality and emissions (remote sensing) on an urban road with traffic volumes varying between approximately 400–800 vehicles per hour and an average speed of about 40 km/h has been used to compare multiple measurement techniques and assess on-road air quality. It was found that observed daytime concentration levels of CO, NO<sub>x</sub>, NO<sub>2</sub>, O<sub>3</sub>, PM<sub>10</sub> and PM<sub>2.5</sub> are below current WHO health based guideline values, varying from a few percent (CO) to above 60% (O<sub>3</sub> and PM<sub>2.5</sub>) of the guideline values. NO<sub>2</sub> to NO<sub>x</sub> ratios were about a factor of two higher than measured in a previous tunnel study, which indicates that about half of measured NO<sub>2</sub> concentrations are due to urban background levels. Statistical analysis suggest that on-road NO<sub>2</sub> and ozone concentrations are largely driven by atmospheric chemistry processes, and not significantly affected by variation in local traffic volume and fleet mix. A significant positive weighted correlation ( $r = 0.71$ – $0.74$ ) between remote sensing and air concentration monitoring is observed for CO in calm conditions. Speciated VOC measurements on the road show large discrepancies with current COPERT (Australia) vehicle emission factors, confirming the results from an earlier tunnel study. The weight of evidence suggests that the current (EU based) VOC speciation in COPERT Australia is likely not appropriate for the Australian on-road fleet.

## 1. Introduction

Motor vehicles are a major source of air pollution and greenhouse gas (GHG) emissions in urban areas around the world. Several studies

have linked proximity to busy roads with adverse health effects, including asthma and other respiratory symptoms, birth and development effects, premature mortality, cardiovascular effects and cancer (e.g. Baldauf et al., 2008; Karner et al., 2010; Hood et al., 2018; Wang et al.,

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<https://doi.org/10.1016/j.atmosenv.2019.116978>

Received 11 April 2019; Received in revised form 10 September 2019; Accepted 12 September 2019

Available online 13 September 2019

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