MODELLING AIRBORNE DISPERSION IN

THE COLLIE BASIN

by

Bradley John Evans

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requirements for the degree of Bachelor of Science (Honours)
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I declare that this thesis is my own account of my research, unless otherwise stated. It contains as its main content work which has not previously been submitted for a degree at any tertiary institution (14500 words).

Bradley John Evans
ABSTRACT

Mesoscale airborne dispersion models are useful tools for predicting the impacts of pollutant gases from industrial emissions. This study uses the Commonwealth Scientific Industrial Research Organisation’s The Air Pollution Model (TAPM) to predict sulphur dioxide (SO$_2$) dispersion in the Collie basin, South West of Western Australia. TAPM, like most mesoscale models, poorly predict light winds ($<2$ms$^{-1}$) under strongly stable atmospheric boundary layer conditions over complex terrain. This study alters TAPM deep soil moisture (DSM) initialisation and uses a strict spatial and temporal point and pattern sensitivity analysis and time relaxed ranked comparison approaches. It was found that modelled DSM did not significantly perturb TAPM meteorological outputs despite patterns indicating enhanced model performance against near surface predictions of temperature and wind direction. The DSM parameterisation resulted in improved prediction of highest and second highest SO$_2$ ground level concentrations at the Collie monitoring site. The TAPM results reproduced aspects previous studies on the region and known limitations.
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