

Application of Various Dispersion Models to Management of Local and Regional Air Quality in Australia

Paper # 03-A-33-AWMA

Christine A. Killip, Abbie S. Brooke, Peter R. Best

Katestone Environmental, PO Box 2184, Toowong, Queensland, Australia 4066
www.katestone.com.au

ABSTRACT

This paper explores the use of air dispersion models for planning industrial developments within an existing multi-source complex or as part of real-time forecasting tools for intermittent control of emissions. A brief review is given of our recent experience in using TAPM, Calpuff and AERMOD in sub-regional airsheds in coastal locations in Australia, New Caledonia and Vietnam. These studies cover various scenarios of medium-tall stacks with a range of buoyancies in near-coastal terrain ranging from relatively simple plains to moderately complex topography. The focus is on producing a decision-support system for each application that utilises the more sophisticated approaches to the generation of four-dimensional meteorological fields and pollutant dispersion in a quality-controlled manner, yet allow sensitivity studies for conservative pollutants to be undertaken by non-specialist modellers or planning professionals. The meteorological fields have been generated from the CSIRO TAPM model or the Mesolaps high-resolution forecasting scheme run by the Australian Bureau of Meteorology. Dispersion simulations can utilise one of several schemes with emphasis on Calpuff, TAPM and recently AERMOD, depending on the user's requirements for spatial applicability and computational efficiency. The multi-model GUI yields the relevant statistics, time series and contour plots for a wide range of averaging times and is readily generalised to treat stochastic emissions or to undertake a health risk evaluation. In general, there is no preferred modelling scheme for many applications because of the wide range of spatial scales required for air quality management. Some model performance evaluations for the multi-industry sub-region of Gladstone show reasonable accuracy is obtained for the robust extreme statistics.

INTRODUCTION

Air quality modelling of industrial regions

Industrial regions in Australia such as Gladstone, Hunter Valley/Newcastle, Latrobe Valley, Kalgoorlie and Kwinana contain a substantial mix of industries, tourism, agricultural facilities and major residential developments (Best and Stumer 1990¹). Air quality management is required at various planning and operational stages of the industries, and involves:

- Feasibility and planning studies for optimisation of industry location, fuel type, emission control and stack characteristics.
- Regional planning to establish constraints due to cumulative impacts from all pollution sources, strategic transport studies, incentives for control of commercial and