

CHEMICAL CHARACTERISATION AND SOURCE APPORTIONMENT OF FINE PARTICLES IN CHRISTCHURCH, NEW ZEALAND, USING THE POSITIVE MATRIX FACTORISATION MODEL

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Air quality has been a major issue in Christchurch, New Zealand for many years. Particulate matter in the 2.5 and 10 micron (PM_{2.5}, PM₁₀) size fractions are the main contaminants of concern. The primary source of these contaminants, as determined by emission inventory, is residential heating. An air quality management plan was specifically developed to target emissions from these sources. These measures, however, are currently subject to a degree of community resistance. The view that motor vehicles are responsible for elevated emissions, rather than residential heating, is perpetuated by some sectors of the local community. A source apportionment study was initiated in 2001 to address these concerns and provide alternative source information to that supplied by emission inventories. Fine particles and their chemical constituents were measured during the summer of 2001/2002 and the winter of 2002. A receptor model, known as Positive Matrix Factorisation (PMF) was applied to the data to determine major sources and their contributions. The ability of the model to directly attribute concentrations on a source-by-source basis was evaluated, with a view to using the model to monitor effectiveness of air quality strategies on concentrations over time. Five sources were identified including motor vehicles, marine aerosol, wood combustion, secondary particulate and an additional sulphur source. Wood combustion/residential heating was confirmed as the major source of wintertime PM_{2.5}, contributing on average to 90% of PM_{2.5}.