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Contributions of biogenic secondary organic aerosol and biomass burning aerosol to PM10 loadings in the airshed of Melbourne, Australia

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It is well established that wood smoke emissions from domestic heating contribute significantly to fine particle loadings during the autumn and winter in the airshed of Melbourne, Australia. However, the assessment of the relationship between direct primary wood smoke emissions and ambient particle concentrations in the region is hindered due to a limited number of chemical and physical measurements available in the region. In order to assess the contribution of residential wood smoke to the particle loadings of the airshed, an intensive winter-time aerosol characterisation campaign was carried out at the CSIRO Bayside Air Quality Station at Aspendale, Melbourne between the July and August 2004 and 2005. Additionally, summer-time aerosols were sampled during the December 2005 and January 2006.

Samples from a PM10 high volume aerosol sampler were analysed using High Performance Liquid Chromatography coupled to Electrospray Ionisation Time of Flight Mass Spectrometory (HPLC/ESI-TOFMS), and the concentrations of woodsmoke tracers and SOA tracers were determined In addition a thermographic method determined the ratio of organic carbon to elemental carbon (OC/EC). Water Soluble Organic Carbon (WSOC) was determined using a Shimadzu TOC analyzer.

Strong influence of maritime aerosol or domestic wood combustion was found on the days with high PM10 loading during both winter 2004 and 2005. Based on the concentrations of the biomass burning tracers and PM10, and back trajectory data, it is estimated that an increase in approximately 100 ngm^{-3} levoglucosan leads to about 2 μgm^{-3} increase in PM10. Extremely high concentrations of PM10 were also found

during the summer 2005 when the region was influenced by bushfires or a stagnant continental air mass. Tracer analysis from these days showed differences between the traces from domestic wood combustion and bushfires and a fingerprint of secondary organic aerosol (SOA) tracers in the summer samples. By combining the tracer, OC/EC, PM10 and back trajectory data the contributions of woodsmoke and SOA to the PM10 loadings of the Melbourne airshed are estimated.