STATISTICAL DISTRIBUTIONS OF PARTICLE NUMBER CONCENTRATIONS OBSERVED IN URBAN TRANSPORT MICROENVIRONMENTS DURING COMMUTING

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DATA COLLECTION:

This poster reports on a small subset of a large observational database on commuting by bus, car, train and bicycle in Christchurch and Auckland. The full study, its aims, location, dates and study design are detailed in Kingham et al. (2011). This poster focuses on data collected on multiple 2-part bus journeys in Christchurch.

Personal measurements of ultrafine partlcles (particle number concentration) were made on multiple journeys between the same journey origin and destination between 26th February 2009 and 26th March 2009. Sampling was conducted during traffic peak hours along two routes consecutively. Journeys included time spent at three bus stops, a pedestrianised city centre street (between bus journeys), and an indoor bus terminus.

Particle number concentration was measured at 1 second resolution using a TSI 3007 portable condensation particle counter sampling via a purpose-made diluter to the design reported by Knibbs et al. (2007). Location was logged at 3 second resolution using a Nokia N82 mobile phone with built-in GPS receiver.

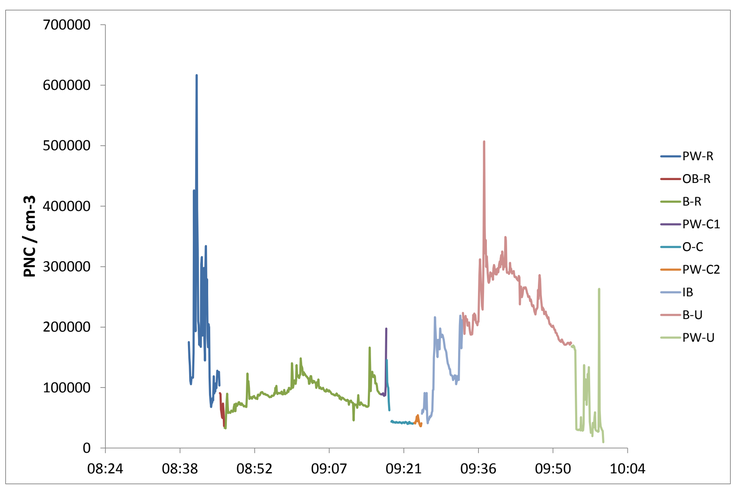
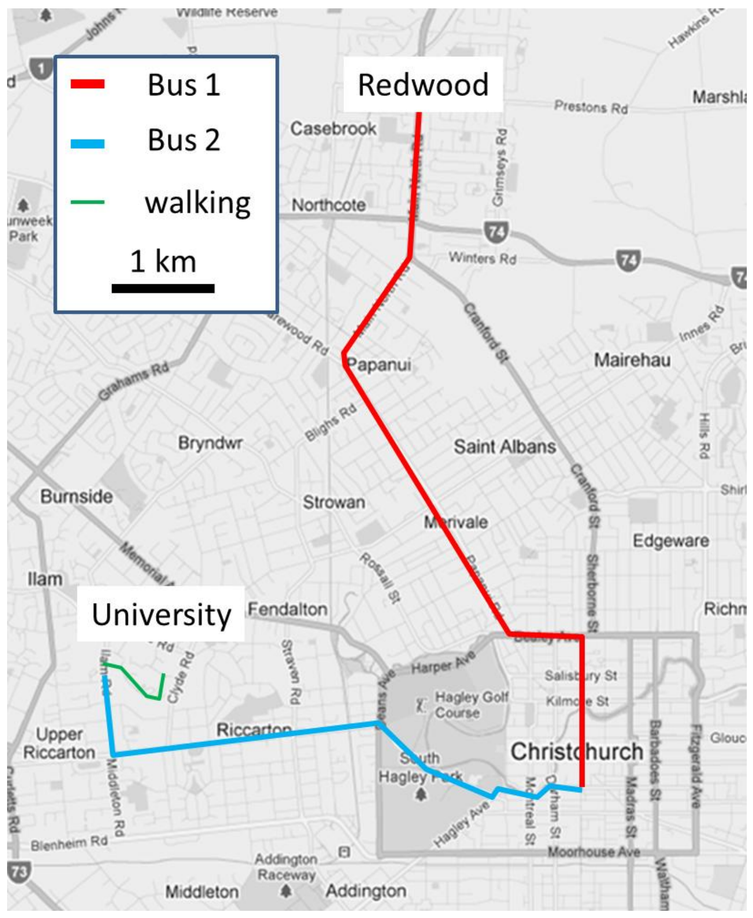
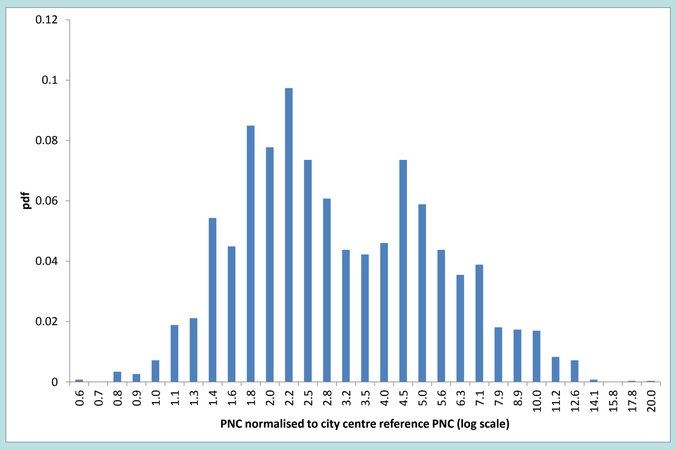


Fig.1: Example time trace from one journey. The day shown was characterised by elevated concentrations of PNC, PM and CO across the city. Each colour shows different legs of the journey. PW = pedestrian walking, OB = outdoor bus stop, B = on bus, IB = indoor bus stop, O-C = outdoors in city centre.



Onboard bus

Once normalised by city centre concentrations (see above), concentrations on buses exhibited a bi-modal distribution with 96 % of data falling between 1 and 10 times the background. Further analysis is aimed at determining whether make & model of bus, direction of travel, number/duration of stops were significant determinants of onboard concentrations.



Bus stops

Three bus stops were sampled: Redwood, University and City. The highest concentrations by far overall were consistently observed at and around the Redwood bus stop (e.g. blue trace in Figure 1). This bus stop is located on a busy road with regular peak-time congestions.

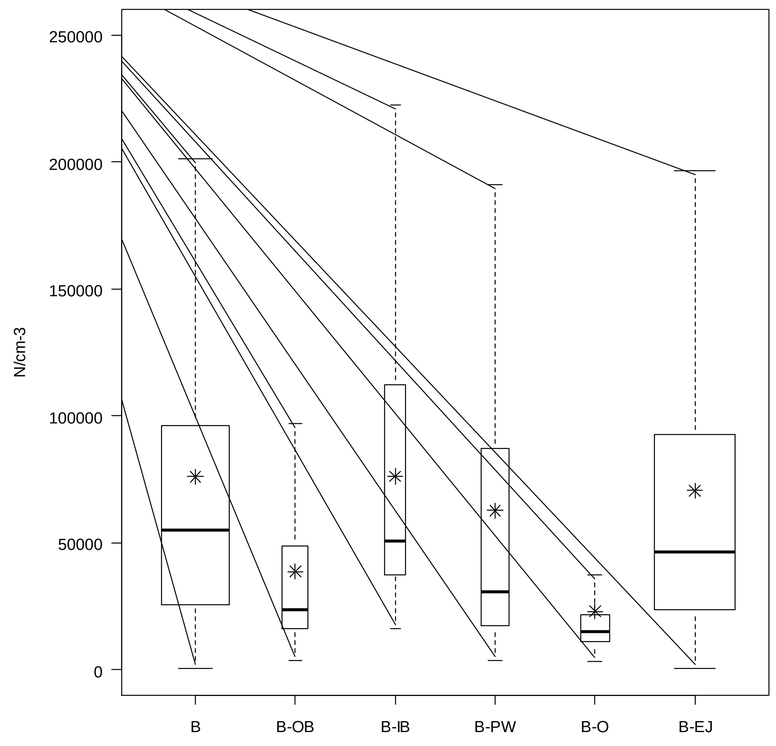
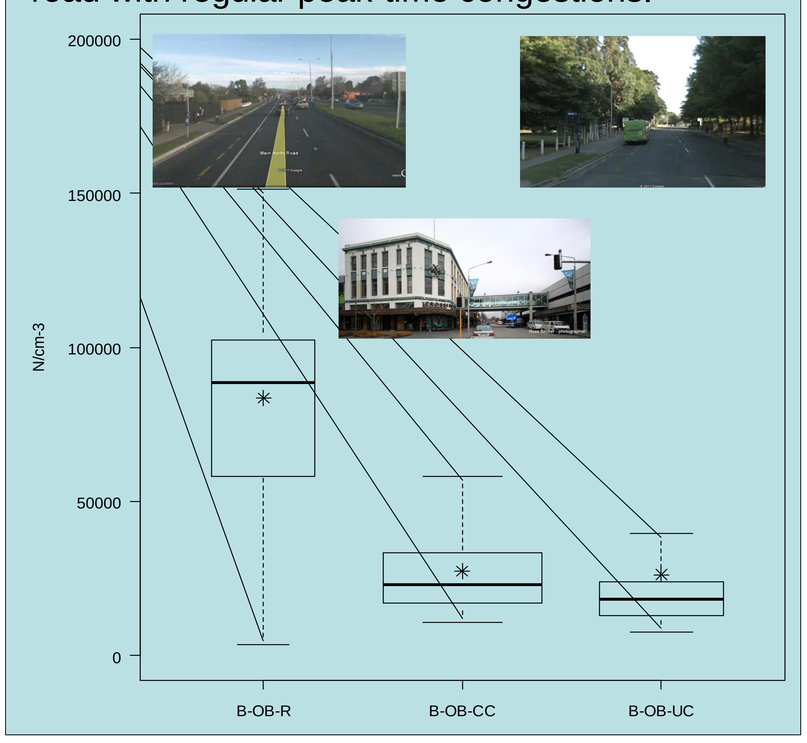


Fig.2: Box plot of PNC for 5 microenvironments. B = on bus, OB = outdoor bus stop, IB = indoor bus stop, PW = pedestrian walking, O = outdoors in city centre



Pedestrian city centre street

The lowest concentrations overall were consistently observed in pedestrianised city centre streets. The data obtained in this microenvironment each day was used to normalise all data to compensate for changes in city-wide particle levels.

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