



75 years of air quality monitoring

CASANZ Clean Air Conference, Cairns QLD

31 August – 2 September 2026

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Department of Climate Change, Energy the Environment and Water



Department of Climate Change, Energy the Environment and Water acknowledges the traditional custodians of the land and pays respect to Elders past, present and future.

We recognise Australian Aboriginal and Torres Strait Islander peoples' unique cultural and spiritual relationships to place and their rich contribution to society.

Artist and designer Nikita Ridgeway from Aboriginal design agency – Boss Lady Creative Designs, created the People and Community symbol.



**We have come a long way in NSW
since 1951. But our aims remain...**

Understand air quality and its impacts now, how these have changed over time, and how our air may change in the future (and what we might do about it.....)



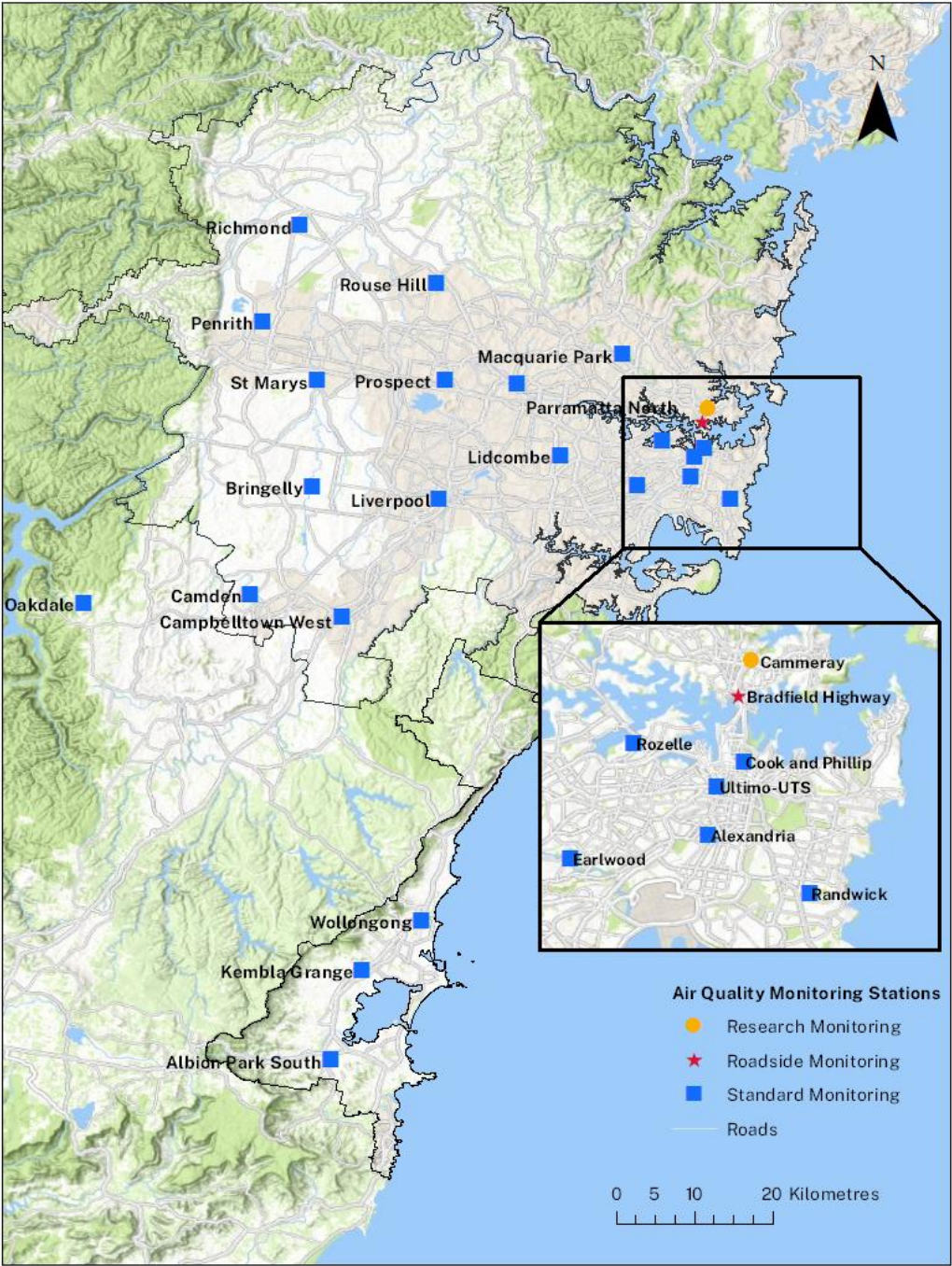
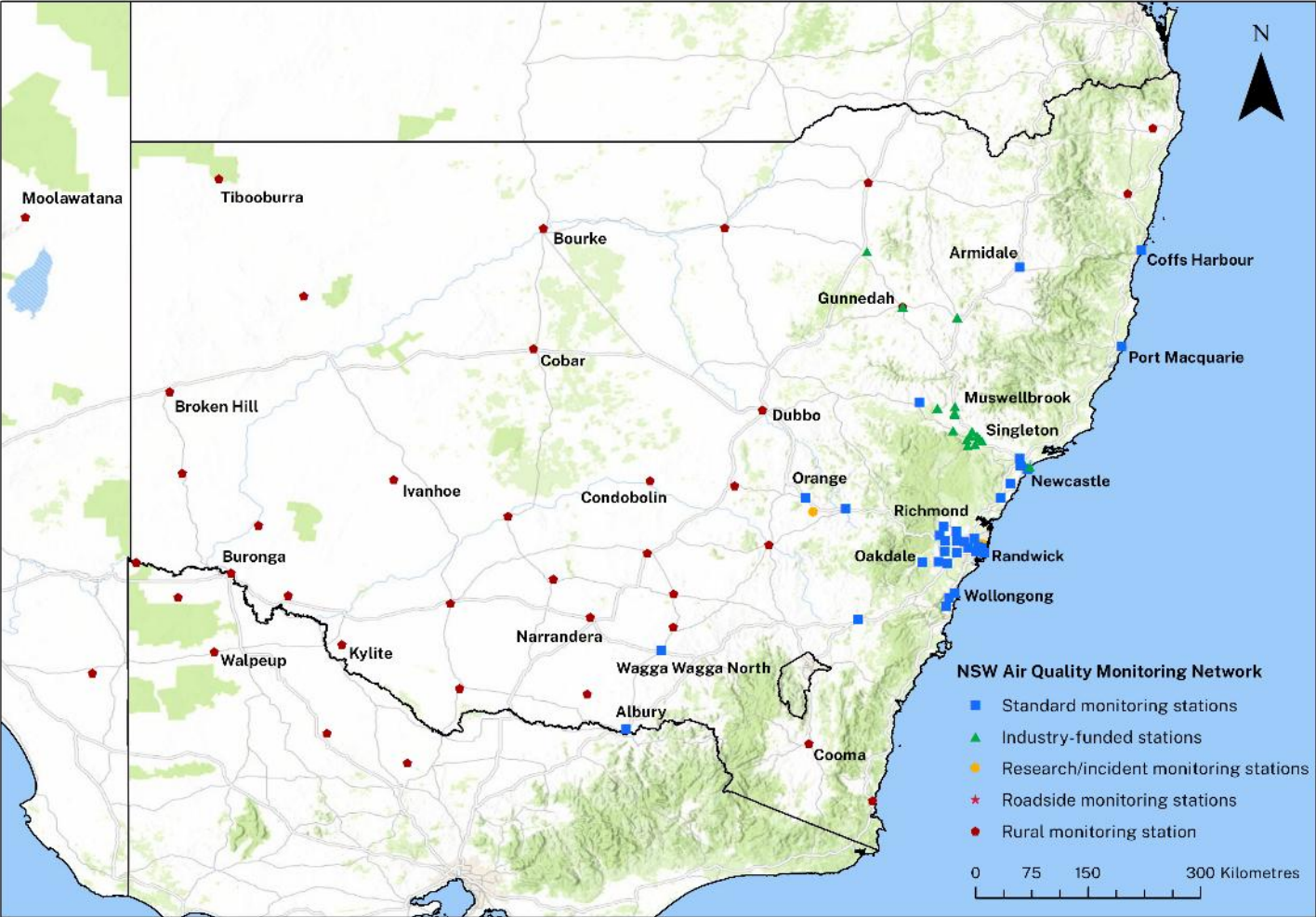
NSW monitoring principles

- measure pollutants of greatest concern
- use scientifically sound monitoring methods
- monitor in appropriate locations
- collect sufficient data and report results transparently
- be geographically diverse
- provide flexibility to ensure that emerging monitoring needs can be met
- make the best use of resources
- support other research activities when possible
- review the network periodically



Current NSW Air Quality Monitoring Network

Over 100 stations



**NATA accredited (since 1998)
air quality laboratory and
monitoring network.**





A woman with blonde hair in a ponytail, wearing a pink long-sleeved shirt, is seated at a laboratory desk. She is operating a blue ozone measurement instrument. To her left is a white box labeled 'MULTI-MAN CALIBRATOR'. A computer monitor to her right displays a software interface with a chromatogram. The background shows laboratory equipment and a whiteboard with handwritten notes.

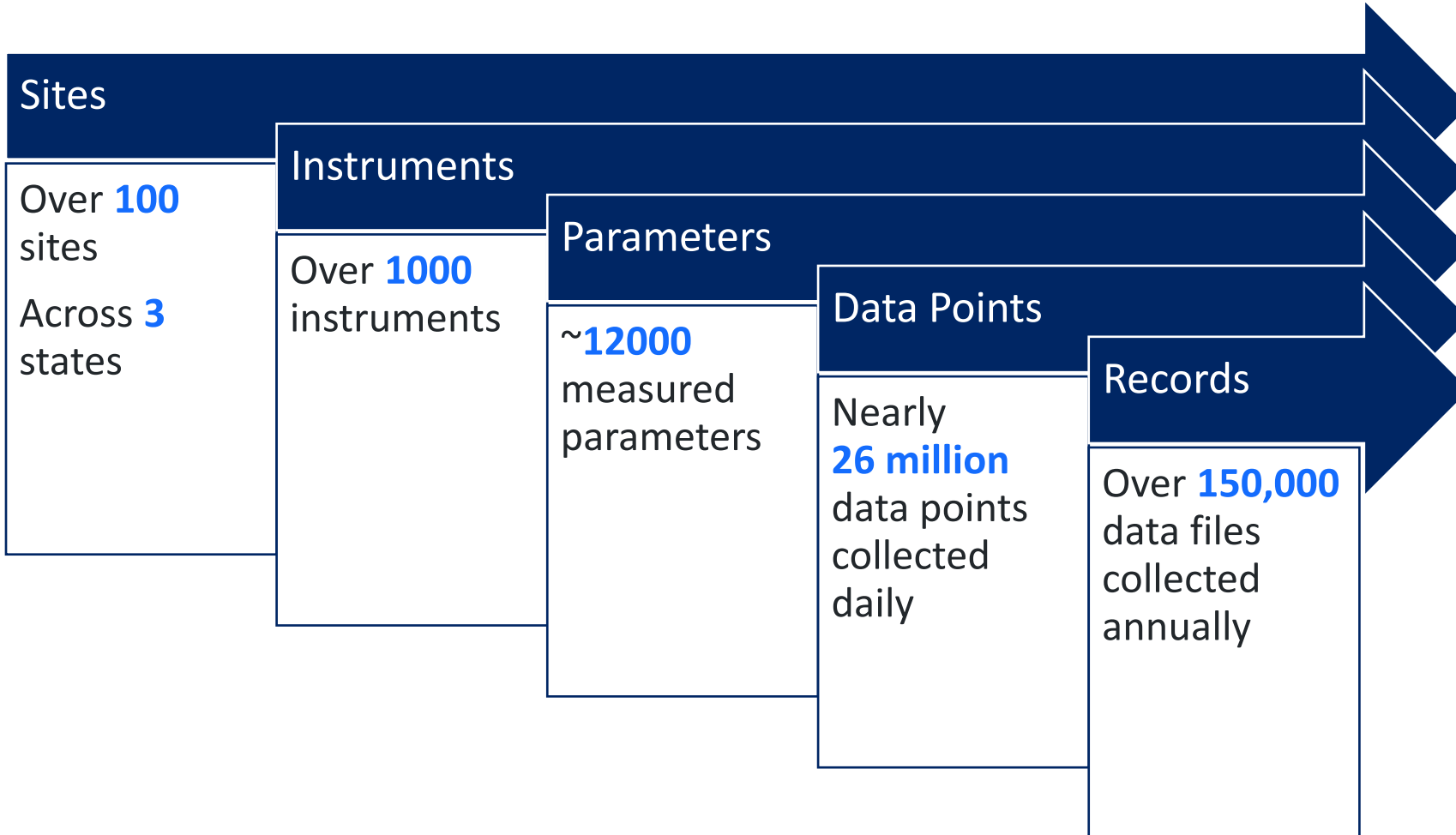
**Australia's designated
measurement institute for ground-
level ozone**



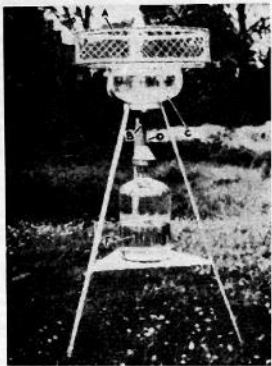
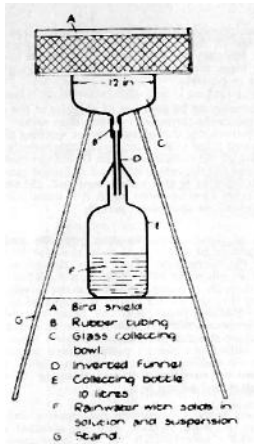
Air quality monitoring supersites

Air Quality Monitoring Network

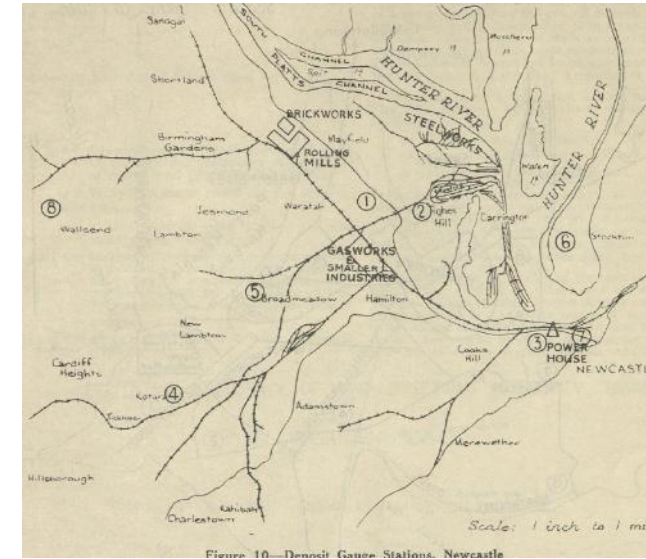
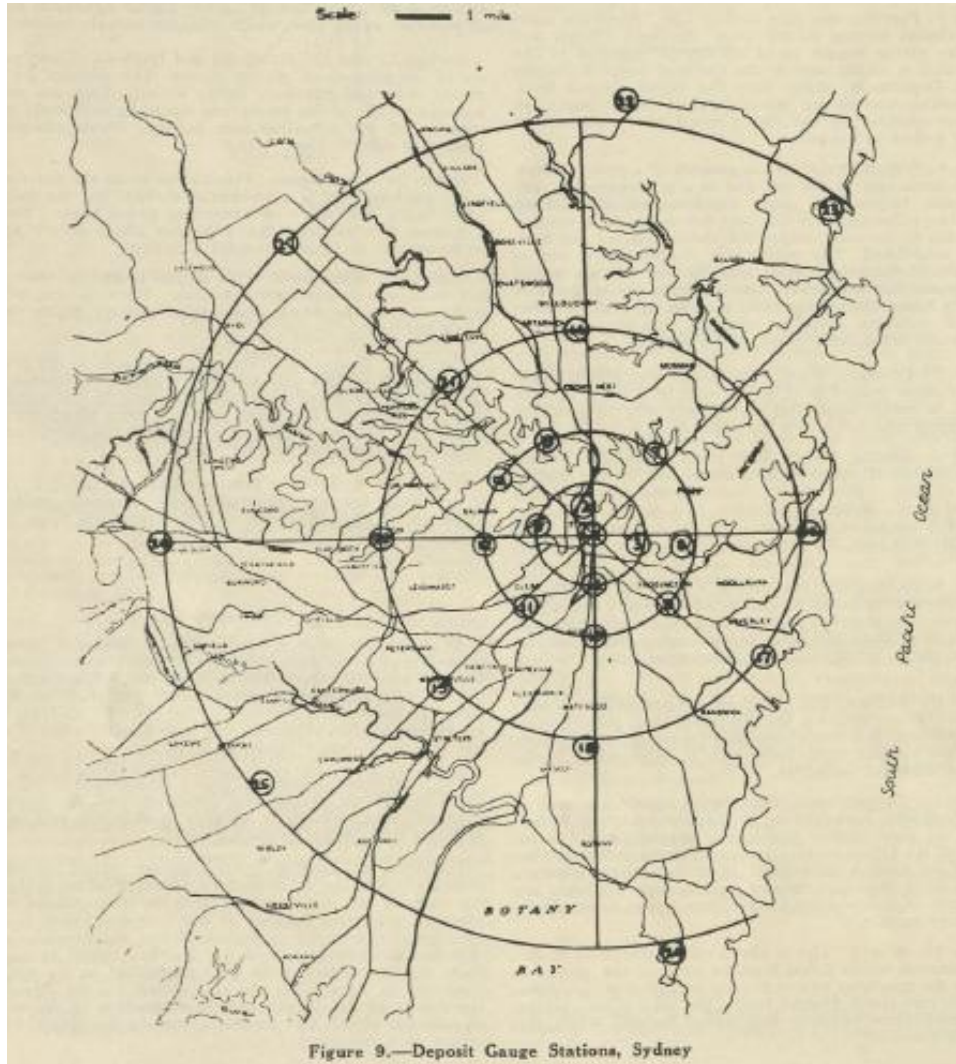
Australia's Largest Air Quality Monitoring Network



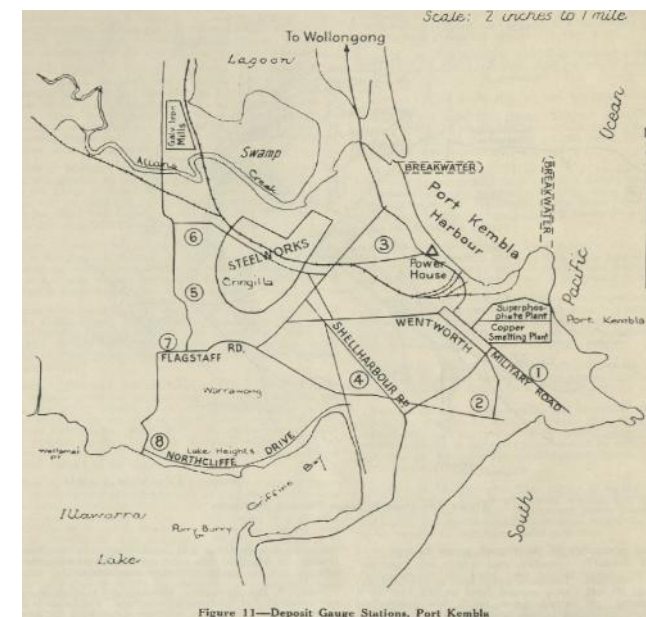
The beginning – Dust deposition gauge networks



DDG
Schematic and in
the field



DDG network
Newcastle



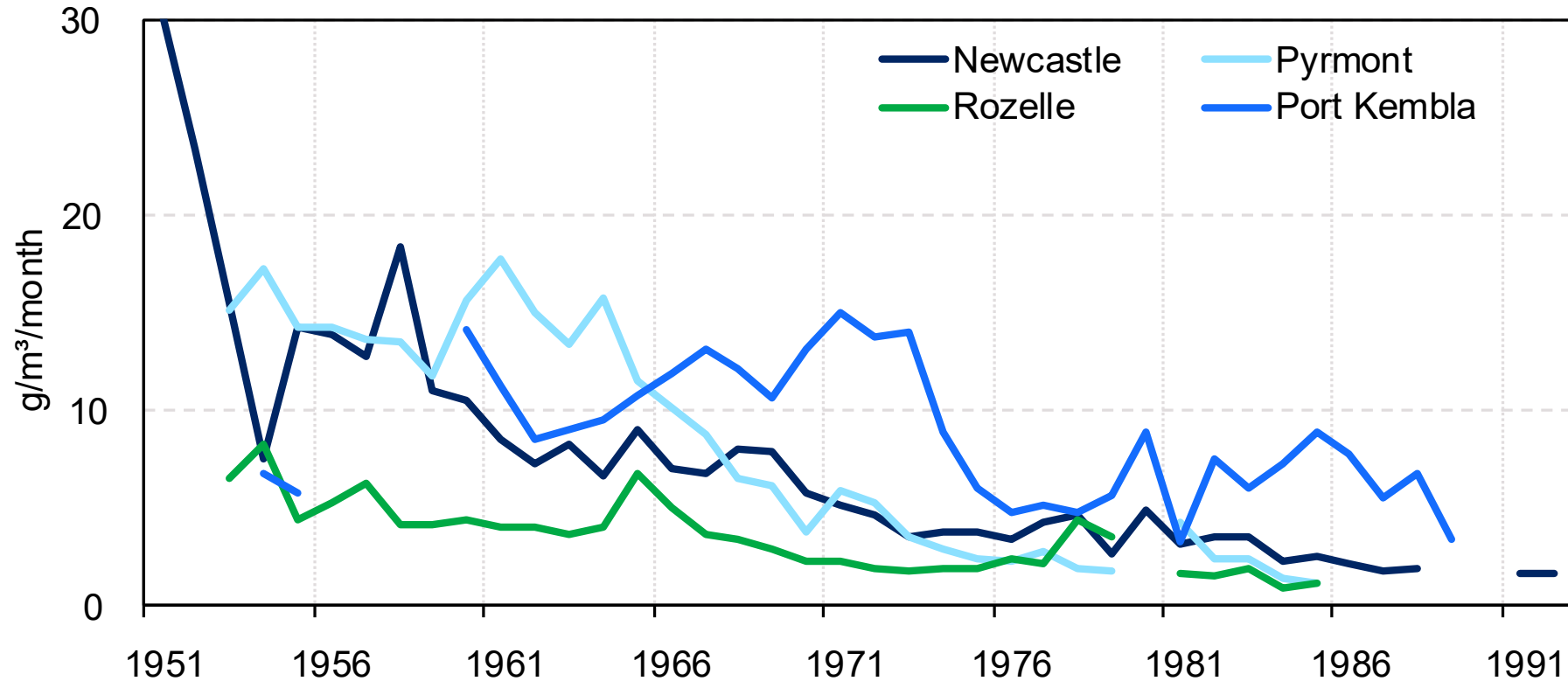
DDG network
Port Kembla

Maps from the 1958 Smoke Abatement Committee report "A survey of air pollution in New South Wales" by Dr J. L. Sullivan
Sydney, Newcastle and Port Kembla



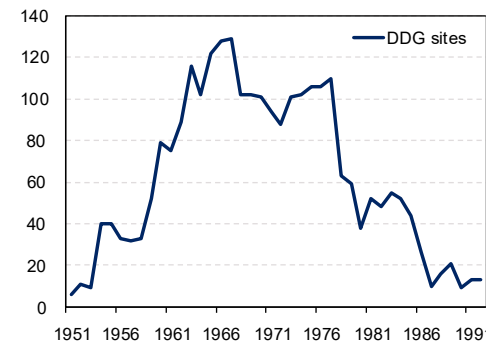
Sydney CBD, 8:00 am, winter 1962

Dust deposition trends



Annual average insoluble dust – selected gauges

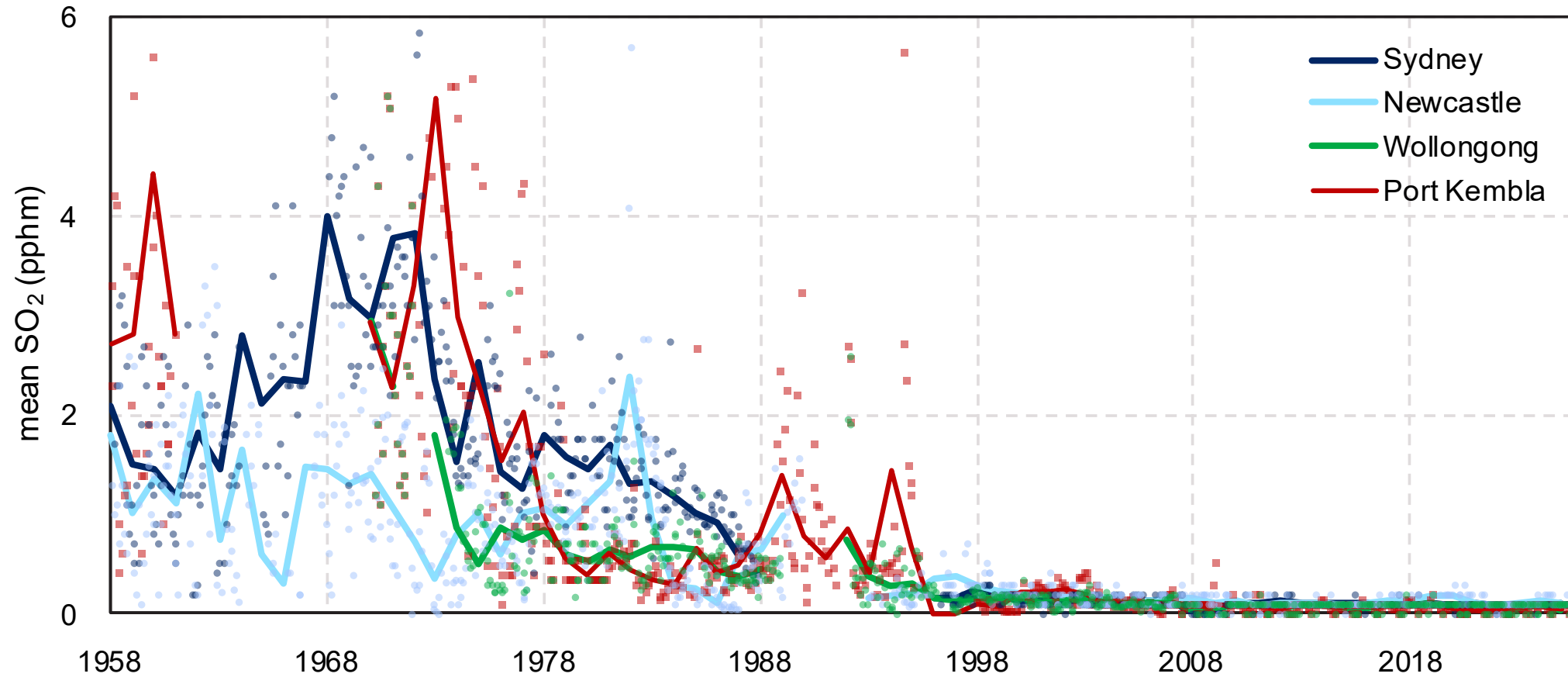
Average of the normalised monthly DDG measurements. Newcastle (Tighes Hill), Port Kembla (Fire Station), Rozelle (Hospital), Pymont (TAFE)



DDG network

Total number of gauges across all regions and campaigns

Sulfur dioxide



Annual (line) and monthly (points) mean sulfur dioxide
Sydney, Newcastle and Wollongong data are composite averages from CBD monitoring stations. Note that prior to 1990 measurements are by wet chemistry, from 1993 all measurements via UV-fluorescence

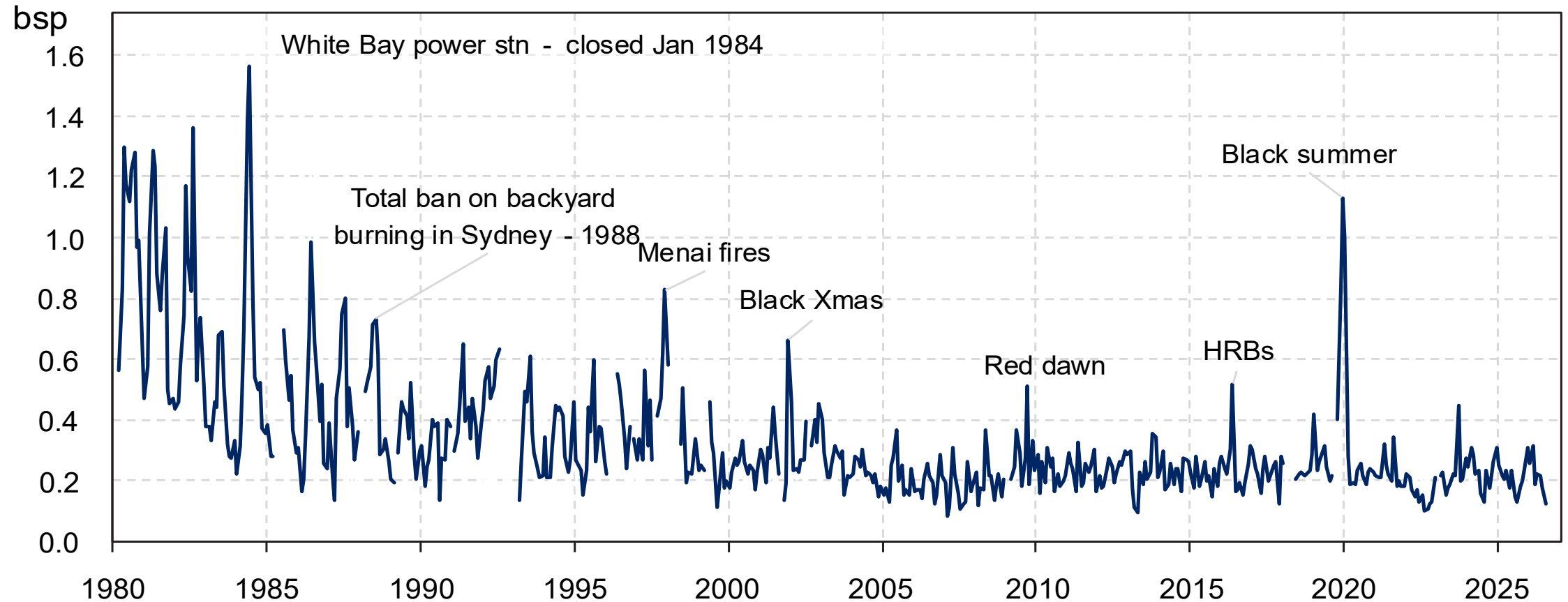


Industrial sources
Copper and steel
production, Port Kembla.
Photo: [Maksym Kozlenko](#)





Monthly mean visibility



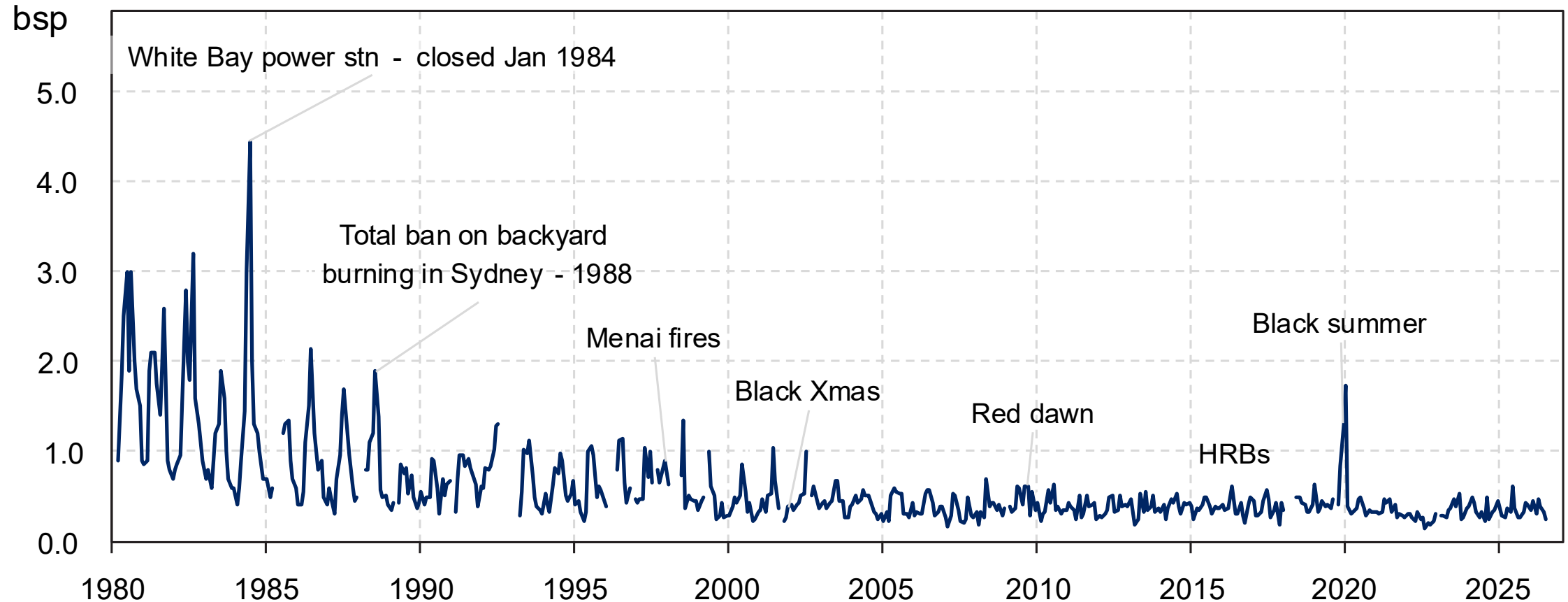
Monthly mean visibility

Long-term monitoring from [Rozelle](#) nephelometers.

Department of Climate Change, Energy the Environment and Water



Monthly median of the daily minimum visibility

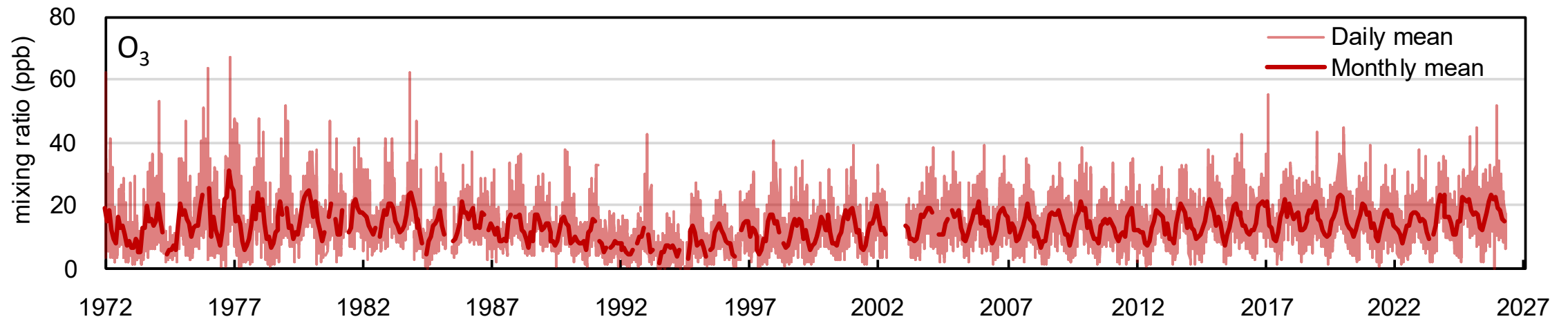


Monthly mean of the daily minimum visibility

Long-term monitoring from [Rozelle](#). Monthly data constructed from the daily maximum bsp measurements by nephelometer.

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Long-term ozone monitoring at Lidcombe

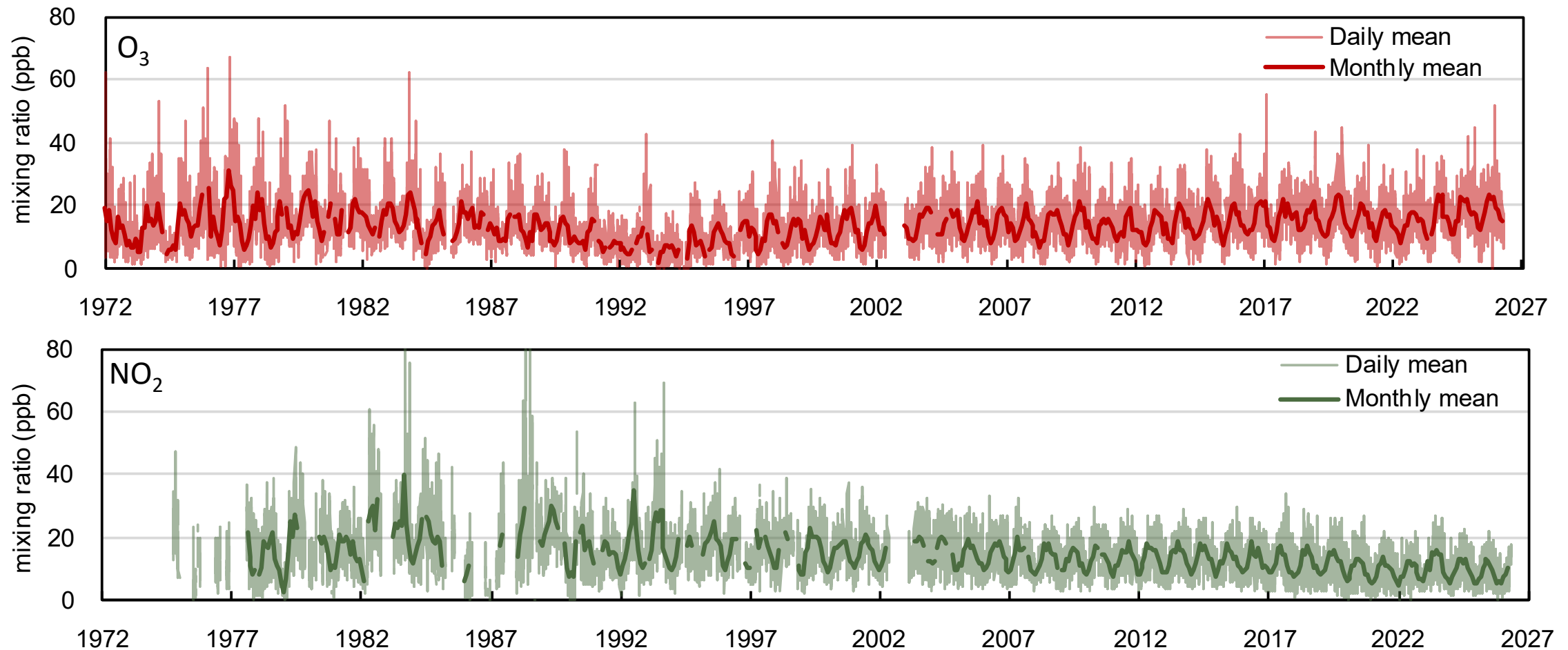


Daily and monthly means of ozone at Lidcombe (composite)

Data is a composite time series from the Lidcombe, Chullora and Lidcombe (TAFE) stations



Long-term ozone and NO₂ trends at Lidcombe

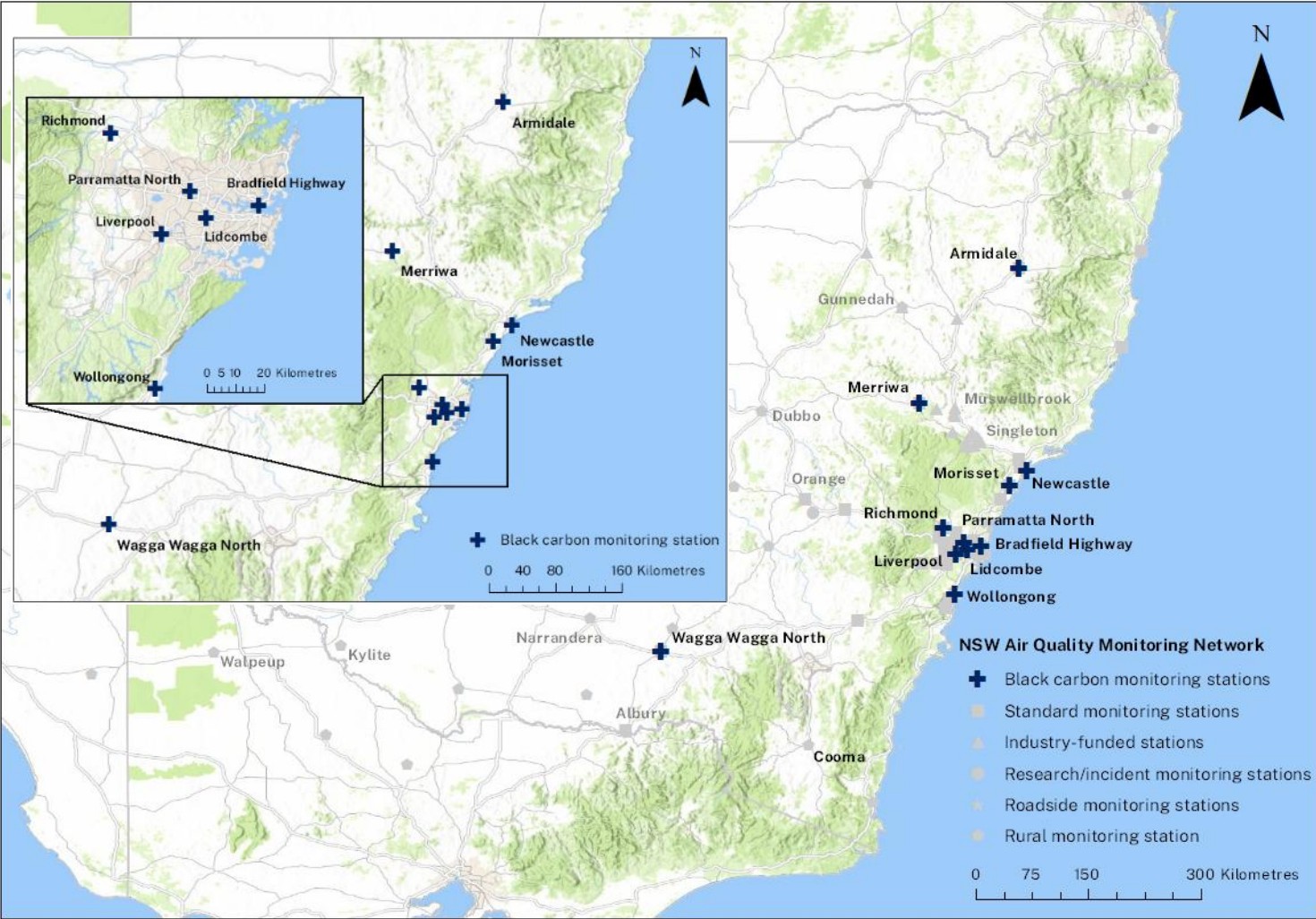


Daily and monthly means of ozone and nitrogen dioxide at Lidcombe (composite)

Data is a composite time series from the Lidcombe, Chullora and Lidcombe (TAFE) stations

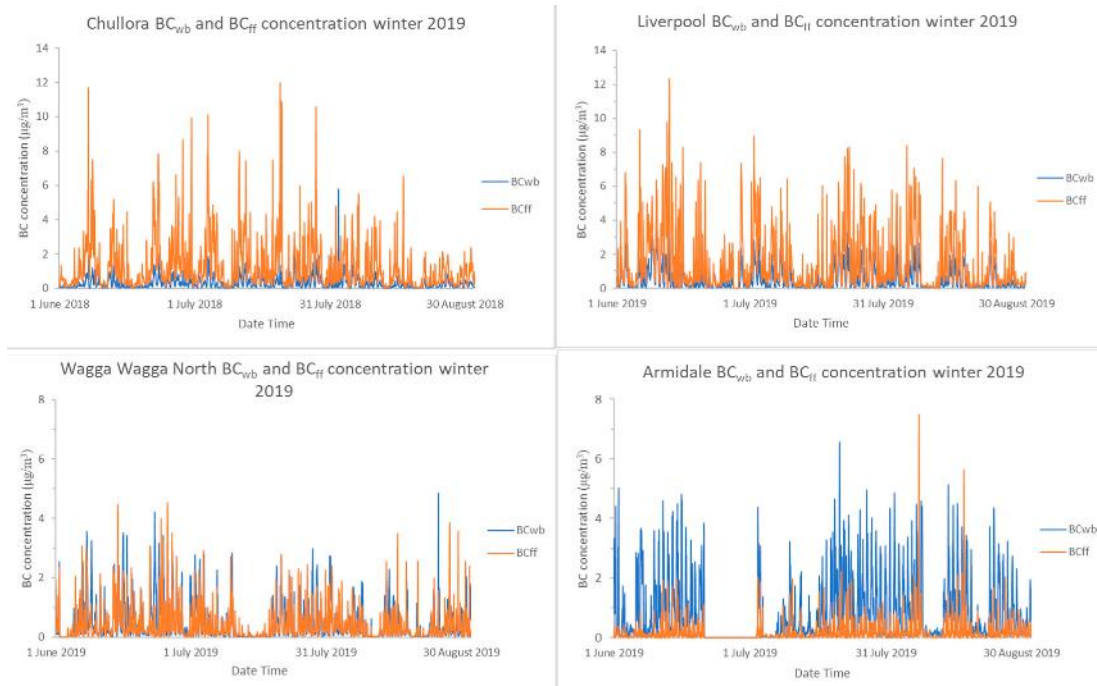
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Black carbon (eBC) measurements

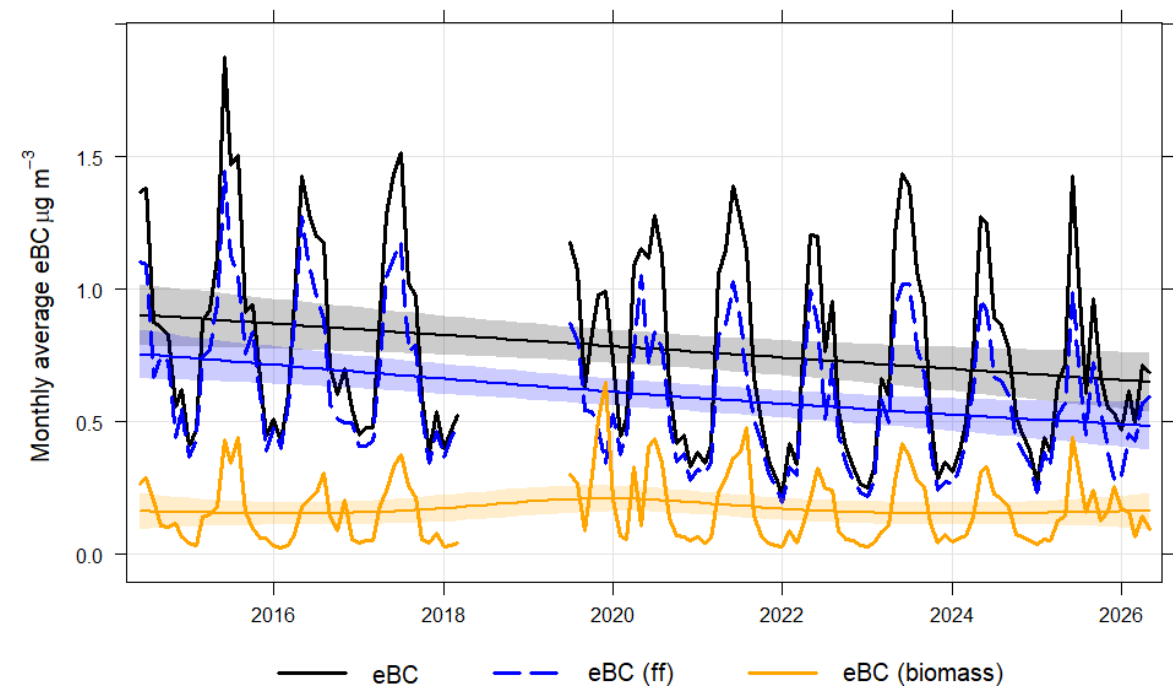
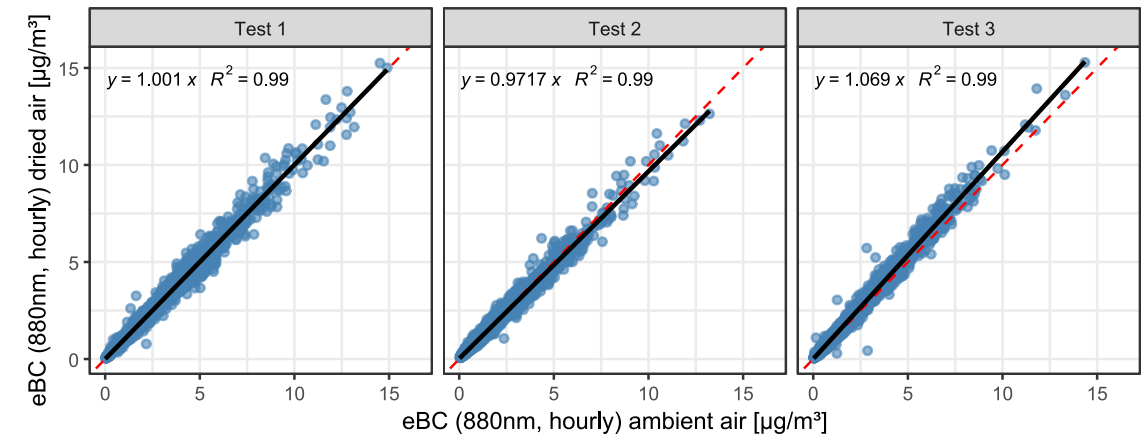


Monitoring Site	Latitude (South)	Longitude (East)	Elev. (m)	BC Installed
Armidale	30°30'30"	151°39'41"	979	12/04/2018
Bradfield Hwy	33°50'36"	151°12'41"	36	23/11/2020
Lidcombe	33°52'53"	151°02'48"	39	2/12/2020
Liverpool	33°55'58"	150°54'21"	25	9/05/2019
Merriwa	32°07'33"	150°27'33"	406	13/08/2020
Morisset	33°06'29"	151°33'09"	51	22/11/2020
Newcastle	32°55'57"	151°45'30"	19	9/12/2015
Parramatta North	33° 47' 58"	150° 59' 52"	16	01/03/2025
Richmond	33°37'06"	150°44'45"	23	30/04/2019
Wagga Wagga	35°06'16"	147°21'37"	181	3/04/2019
Wollongong	34°25'01"	150°53'14"	15	12/04/2018

Black carbon (eBC) measurements



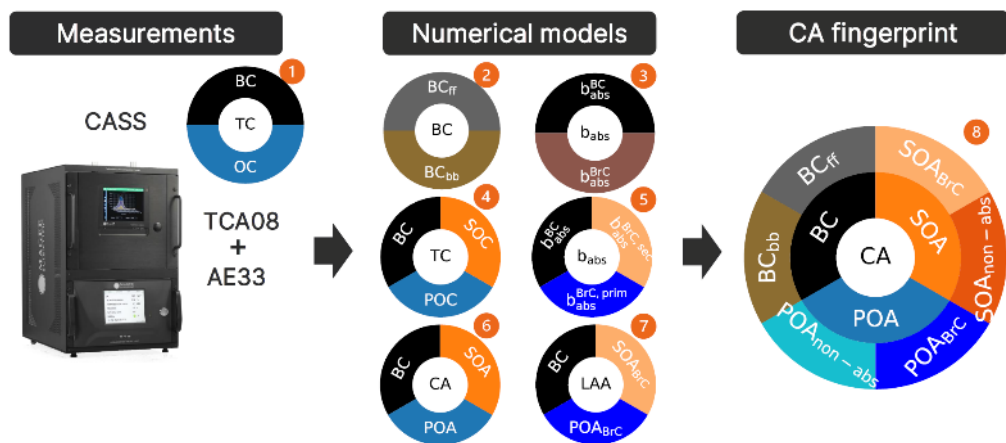
Duc et al, 2020. Spatial-Temporal Pattern of BC Emission from Biomass Burning and Anthropogenic Sources in NSW, Australia. <https://doi.org/10.3390/atmos11060570>



Black carbon (eBC) measurements

Aethalometers are great but are only telling part of the black carbon story:

Advanced TC-BC_{7λ} method

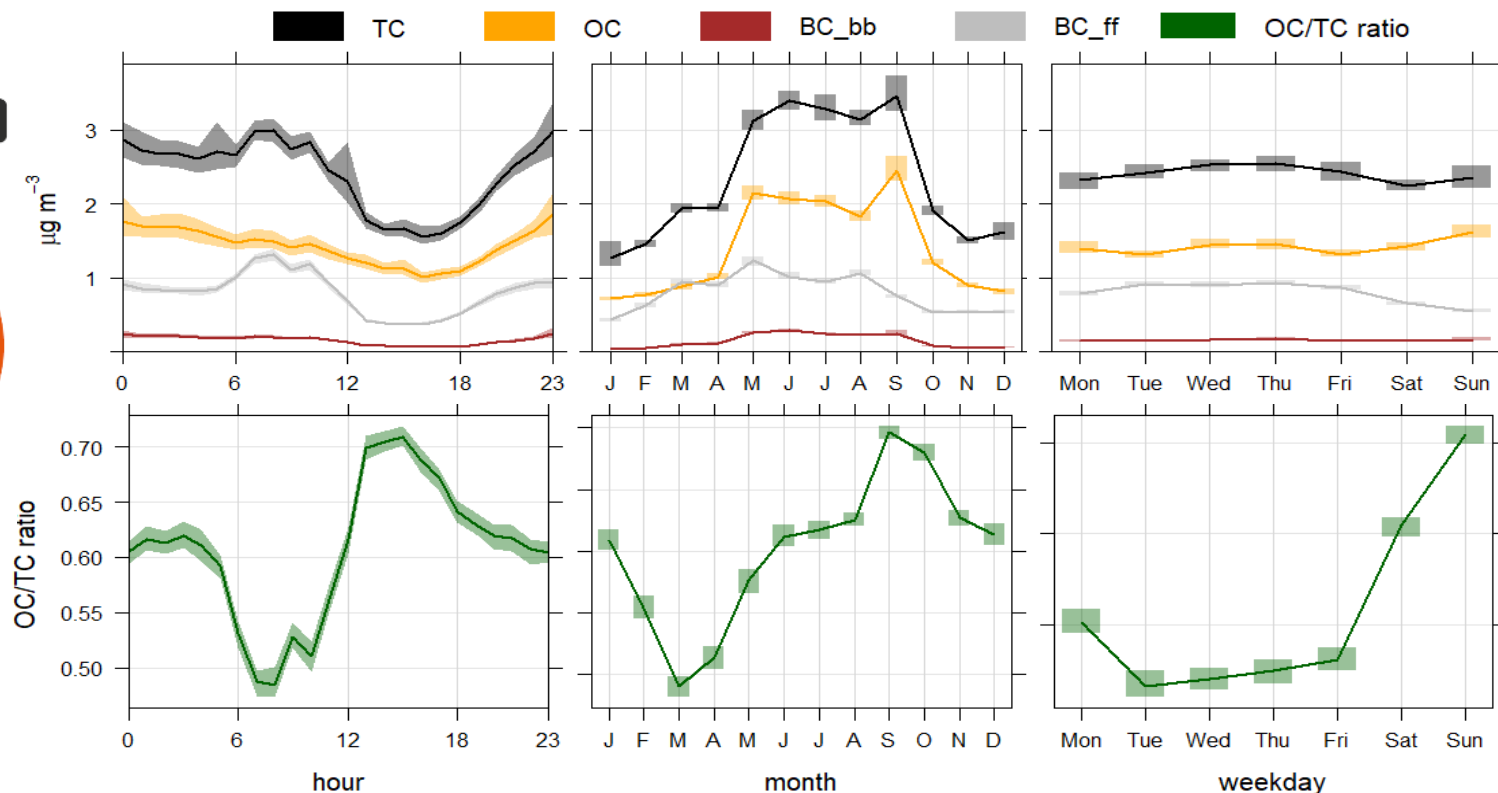


CA = Carbonaceous aerosol
BC = Black carbon

Lidcombe test – Starting March 2023

Diurnal and seasonal variations, weekend effect

More work to apportion OC to POA and SOA





Principles

- measure pollutants of greatest concern (and meteorology)
- use scientifically sound monitoring methods (NATA, AS, WMO, NASA)
- monitor in appropriate locations (urban, peri-urban, rural, background)
- collect sufficient data and report results transparently (long term)
- be geographically diverse (coastal, urban, rural, background)
- provide flexibility to ensure that emerging monitoring needs can be met (including climate change, urban expansion, etc.)
- make the best use of resources (rationalisation and partnerships)
- support other research activities when possible (varied)
- review the network periodically (every 5 years, annual updates)

Understand current air quality and its impacts, how it has changed over time, and how our air may change in the future (and, importantly, what we might do about it.....)



Thank you