



AUSTRAL

Australia's Urban Supersite neTwork for Research on Air quality

Real time, high temporal and spatial observations of Australia's urban air quality for environmental and health research

AUSTRAL will deliver accessible, high resolution, real-time observations of air and aerosol composition to the public by bringing together experts across universities and government agencies. This data will aid health and emergency agencies, as well as regulatory bodies to provide air information and action plans to save lives.

Urban air quality and health

Australia's air is among the best globally and yet over 3000 Australian's die due to poor air quality each year. With our air being one of the least regulated in the developed world Australians are at risk.

Major sources of air pollution in Australian cities are diesel transport emissions, wood-fire heating, bush-fires, industry, and fossil fuel energy generation. These contribute to particulate matter and toxic gas concentrations. Even low levels of pollution can have severe impacts on respiratory, cardiovascular, mental and reproductive health. Especially impacted are vulnerable populations such as children, the elderly and those with chronic respiratory disease.

The annual cost of premature deaths on Australia's economy is a significant, estimated at \$A17.8 billion, with productivity losses adding an extra ~ \$A4.5 billion. Up to 90% of Australian's live in urban environments, and our population is expected to exceed 35 million by 2050. This will place increased stress on urban air quality due to greater transport and energy demands.

AUSTRAL to provide key link between personal exposure and global satellite products for air quality

Real-time aerosol composition and spatial distributions will enable informed individual and public air quality action planning.

AUSTRAL will provide Australia's major urban environments with nationally consistent, high temporal and spatial real-time air quality observations. Partnering Australian universities, the Australian Bureau of Meteorology, CSIRO and state Environmental Protection Agencies, AUSTRAL will comprise air quality supersites in each capital city. Each supersite will host a range of intentionally standardised instrumentation, augmenting state EPA infrastructure and acting as a sensor test bed for smart city air quality networks. These supersites will provide aerosol composition for real-time source apportionment and ground-truthing for satellite air quality products. These new observations will provide essential, timely information for local agencies and residents to make informed decisions to limit personal exposure to air pollution.

AUSTRAL will contribute to international efforts to enhance our ability to monitor air quality as smart cities. This will include improvement of remote sensing, providing greater spatial and temporal resolution of air quality observations across Australia's cities.

A national network of infrastructure and support

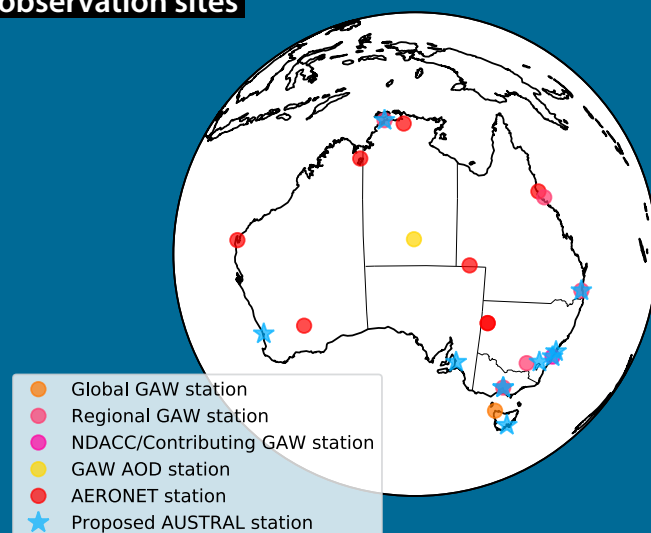
AUSTRAL will include nine standardised supersites in each capital city, providing real-time, high-quality atmospheric urban meteorological and composition observations.

AUSTRAL aims to create a virtual research network to share and integrate quality controlled urban air quality data. The virtual platform will facilitate research and data delivery across multiple national infrastructure programs through the National Collaborative Research Infrastructure Strategy such as AuScope, TERN, AURIN, NCI and Population Health Research Network as well as Earth Observation Australia. AUSTRAL is a long-term infrastructure project supporting the operational, management, rent, technical, governance and analysis costs for urban air quality data delivery.

Key instrumentation:

Instrument	Capability
Aerosol Chemical Speciation Monitor	NO ₃ , SO ₄ , NH ₄ , Cl and organic mass loadings, PM _{2.5} or PM ₁
Particle Into Liquid Sampler	PM _{2.5} , bulk aerosol sampling, SO ₄ , NO ₃ , NO ₂ , Cl, NH ₄ , K, Na, Ca, Mg, acetate, formate, oxalate organic acids, water soluble organic carbon
Proton Transfer Reaction Mass Spectrometry	Volatile organic compounds
Condensation Particle Counter	Number concentration of particles
Scanning mobility particle sizer	Aerosol size distributions, aerosol composition
Nephelometer	Aerosol scattering properties
Filter sampler	Aerosol composition
Sun photometer	Aerosol optical depth
Ceilometer	Aerosol optical depth, cloud properties, boundary layer height
Lidar	3D aerosol optical depth, cloud properties, boundary layer height, wind fields
MAX-DOAS	Boundary layer vertical profiles of NO ₂ , O ₃ , SO ₂ , and aerosols
NO _x , O ₃ , SO ₂ samplers	NO _x , O ₃ , SO ₂
Weather station	Wind, temperature, pressure, humidity, radiation, precipitation

Australia's atmospheric composition observation sites



Internationally recognised

The AUSTRAL supersites will work with the international atmospheric composition, meteorological and satellite communities to contribute data to the World Meteorology Organisation's Global Atmospheric Watch (GAW) Urban program and AERONET observation network. AUSTRAL will validate new geostationary satellite remote sensing of aerosol optical depth and PM2.5 products, enabling personal exposure health studies on fine urban (~1.5km) to regional spatial scales, and short (10 minute) time scales.

Further AUSTRAL applications

Whilst AUSTRAL's priority is to provide real-time, health relevant air quality data, the observations we are proposing have numerous applications to a wide range of industry and research:

- Visibility (aviation)
- Urban meteorology (engineering)
- Agriculture (crop impacts)
- Energy (solar efficiencies)
- Innovation test bed

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