

Funding cuts to agencies such as CSIRO undermines our nation's capacity to observe the climate system and maintain long-term records of atmospheric and oceanic composition and properties in Australia and the Southern Hemisphere. This document briefly explains why maintaining a long-term observing system is essential.

Climate relevance

Atmospheric composition determines the greenhouse gas and aerosol forcing of our climate system. The oceanic composition determines nutrient availability, carbon dioxide uptake and ocean acidification.

Health relevance

- Ozone depleting substances in our atmosphere led to stratospheric ozone destruction, which increased surface UV levels and skin cancer incidence.
- Air quality accounts for ~3000 excess deaths in Australia each year due to respiratory and cardiac stress.
- Mercury, lead, arsenic and persistent organic pollutants are bio-accumulative toxics affecting humans, flora and fauna.



Why the southern hemisphere is special

The southern hemisphere comprises 82% ocean, 18% land mass and 10-12% of the world's population. The Earth is closest to the Sun in the southern hemisphere summer. These properties result in many important features of the southern hemisphere:

- The Southern Ocean links three major ocean basins and redistributes heat, carbon and nutrients around the globe, connecting the deep and upper layers of the global overturning circulation.
- The Southern Ocean is a significant carbon and heat sink. South of 30°S the ocean sequesters 43% of global anthropogenic carbon dioxide (causing ocean acidification) and 75% heat¹: directly impacting vulnerable marine ecosystems.
- The southern hemisphere generally has less anthropogenic aerosols and more natural background aerosols. Combined with sparse observations this results in poor understanding of aerosols, radiation and clouds over the Southern Ocean.
- There is less landmass to transport heat from the tropics to the poles in the stratosphere producing a stable cold polar vortex
- The Antarctic Ozone hole forms every spring due to anthropogenic ozone depleting substances.
- The ozone hole and greenhouse gas increases are equally attributable drivers of southern hemisphere summer climate changes

How Australia contributes to knowledge

Atmospheric and oceanic composition is monitored by key programs of CSIRO, Bureau of Meteorology, Universities, IMOS and AAD at Australian Antarctic stations, Macquarie Island, over the Southern Ocean, Cape Grim Tasmania, and various Australian mainland locations. Data is reported internationally through networks i.e. the Global Atmospheric Watch (GAW) and the Argo ocean profiling float network. Through many programs Australia informs four key international policy instruments on atmospheric and oceanic composition:

- Montreal protocol under the Vienna convention for the protection of the ozone layer
- Stockholm convention on persistent organic pollutants
- Minamata convention on mercury²
- Paris agreement² (previously Kyoto protocol) under the United National Framework Convention on Climate Change (UNFCCC) (greenhouse gases)

State-based EPAs monitor and inform the Australian public about air quality. International reporting soon will be coordinated through GAW².

¹ Fröhlicher et al., 2015, *J. Climate*, 28, 862-886.

² Australia is a signatory but is yet to ratify

³ <http://www.gaw-wdcr.org/>