A new collaboration to monitor atmospheric changes in the tropics

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CSIRO: ZoE loh, elise – andree guerette, erin dunne, Jason ward, jon schatz

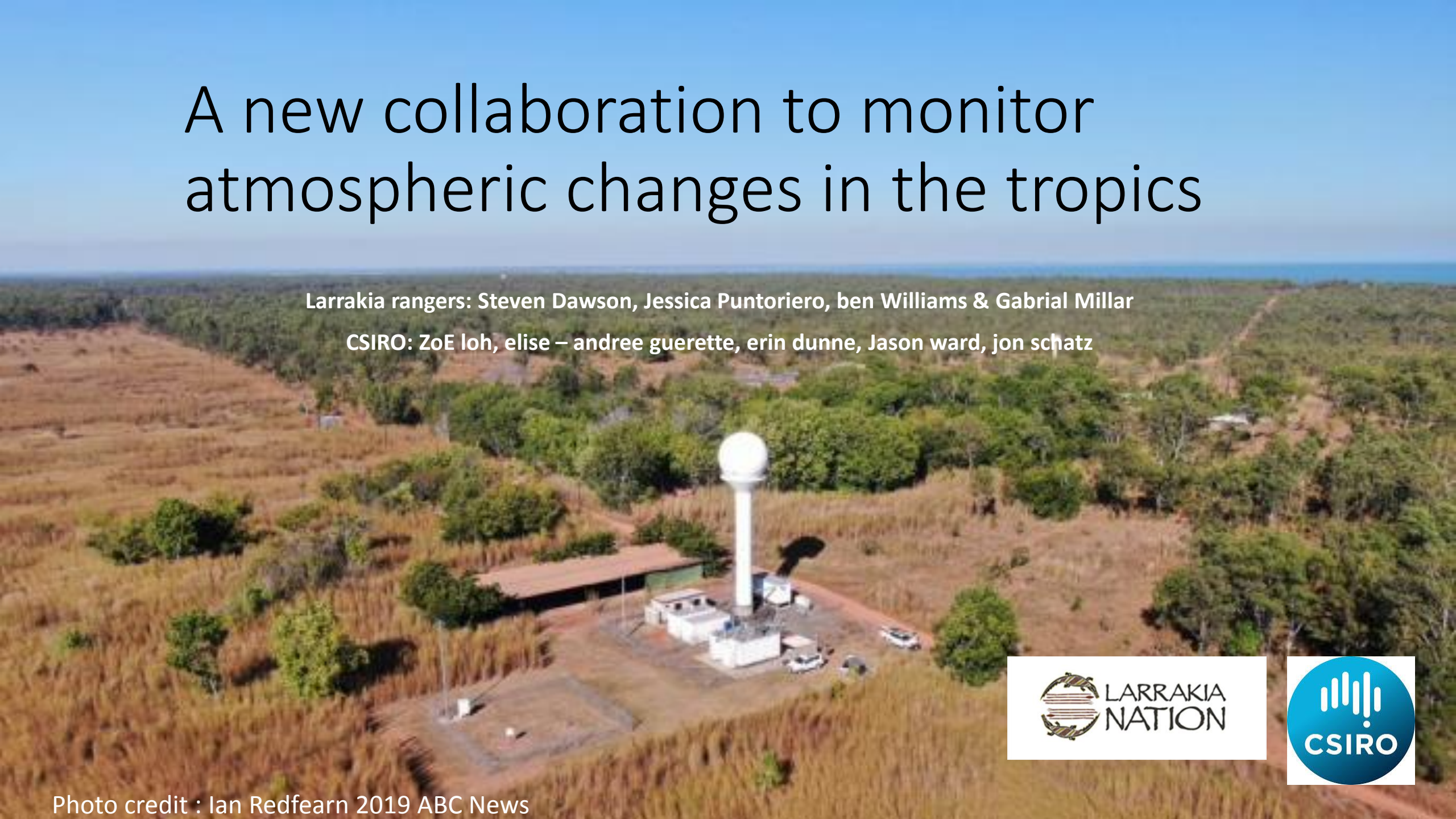
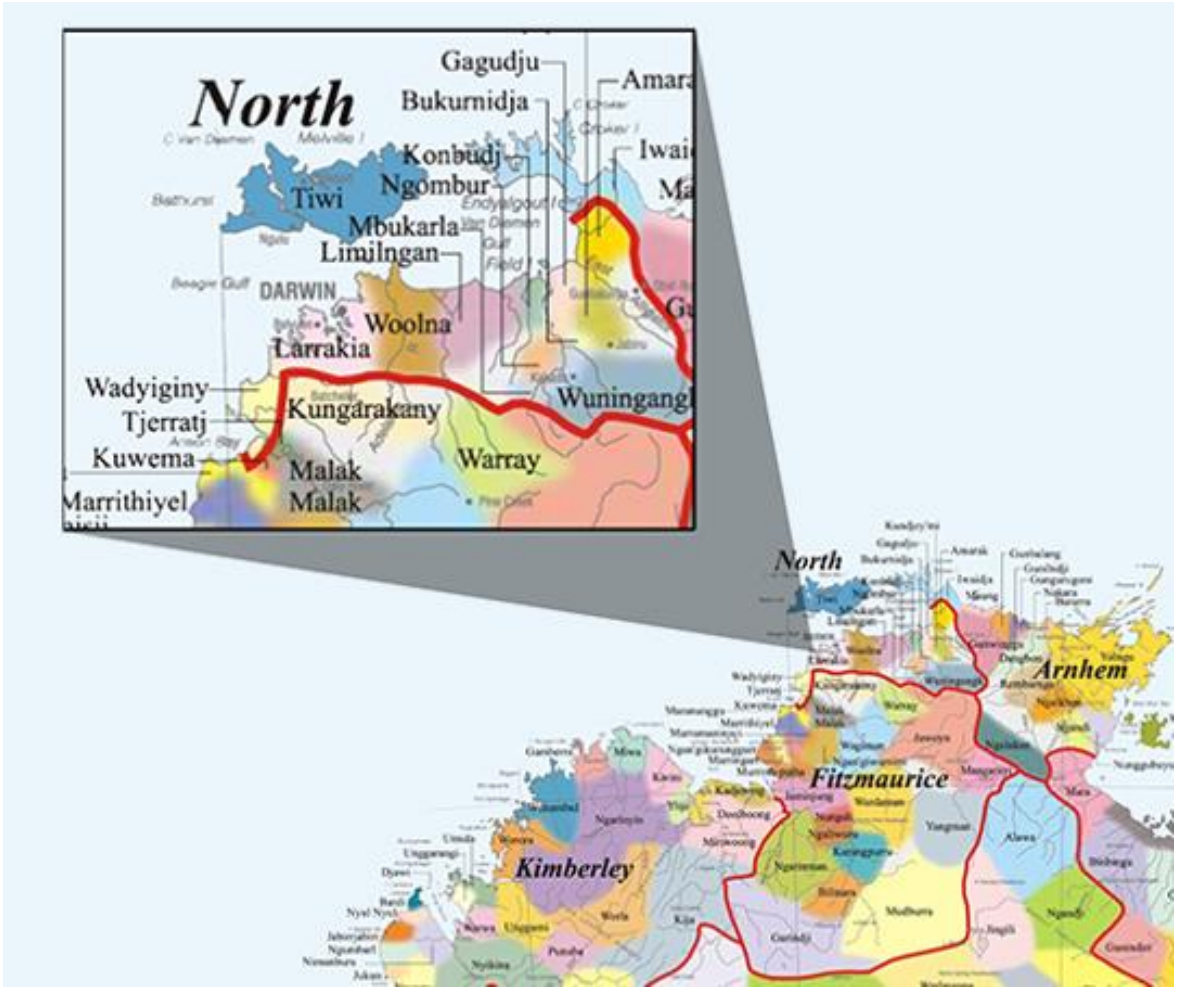


Photo credit : Ian Redfearn 2019 ABC News

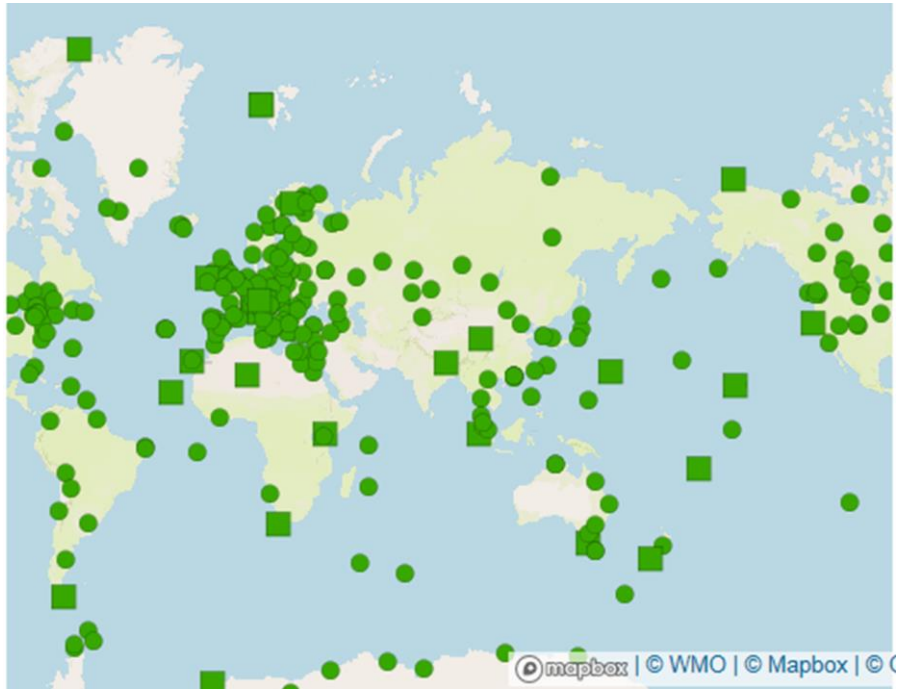
The Northern Territory Baseline Air Pollution Station (NT BAPS) is Situated On Larrakia Country



Source: https://ihd.cdu.edu.au/location/larrakia-country

NT BAPS - Part of A Global network

NT BAPS is part of the World Meteorological Organizations Global Atmosphere Watch program (WMO-GAW)

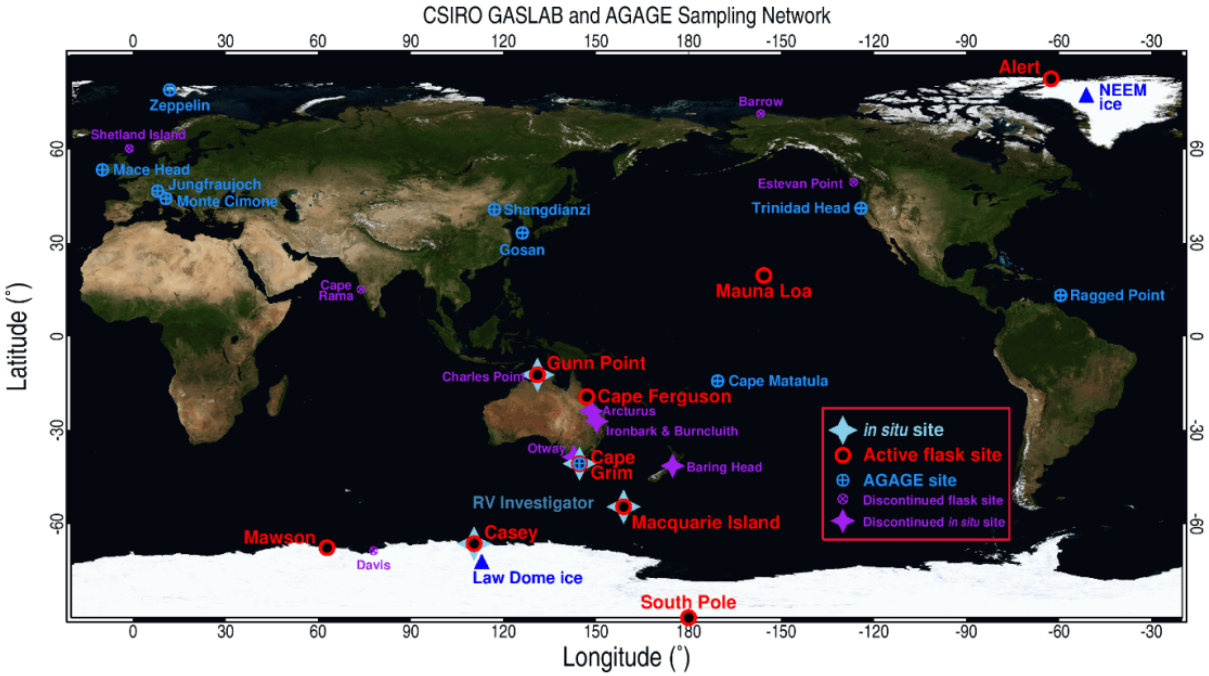


Source:http://www.wmo.int/pages/prog/arep/gaw/gaw_home_en.html


NT BAPS


RV Investigator


Cape Grim, Tas

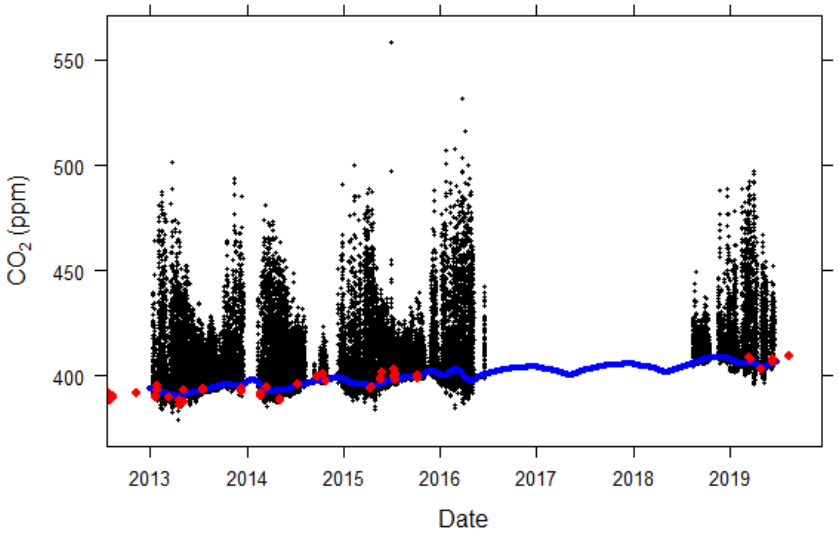


Source: https://research.csiro.au/acc/capabilities/gaslab/

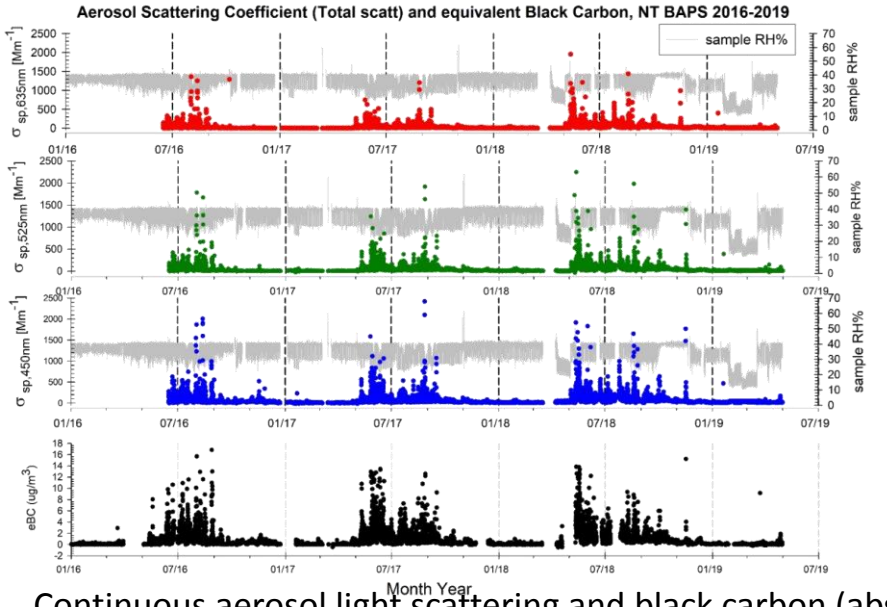
NT BAPS IS ALSO PART OF THE CSIRO'S GLOBAL FLASK SAMPLING NETWORK

MEASUREMENTS AT NT BAPS

- continuous measurements and flask sampling of the major greenhouse gases (GHGs) - Co_2, methane
- Continuous measurements of The Optical properties of air borne particles, (Light absorption, and scattering) – key to understanding their role in climate
- Continuous measurements of other pollutants and trace species - carbon monoxide, ozone, radon, mercury
- Continuous measurements of meteorology via Bom automatic weather station (Temp, humidity, winds, rainfall)
- **Larrakia rangers perform routine checks on GHG and aerosol measurement systems and laboratories at nt baps in addition to collecting flask samples**



Flask sample (red) and continuous CO2 data (black) from NT BAPS with the baseline CO2 concentration shown in blue



Continuous aerosol light scattering and black carbon (absorption) measurements from NT BAPS – note high levels in the dry season associated with smoke.

FLASK SAMPLING AT NT BAPS

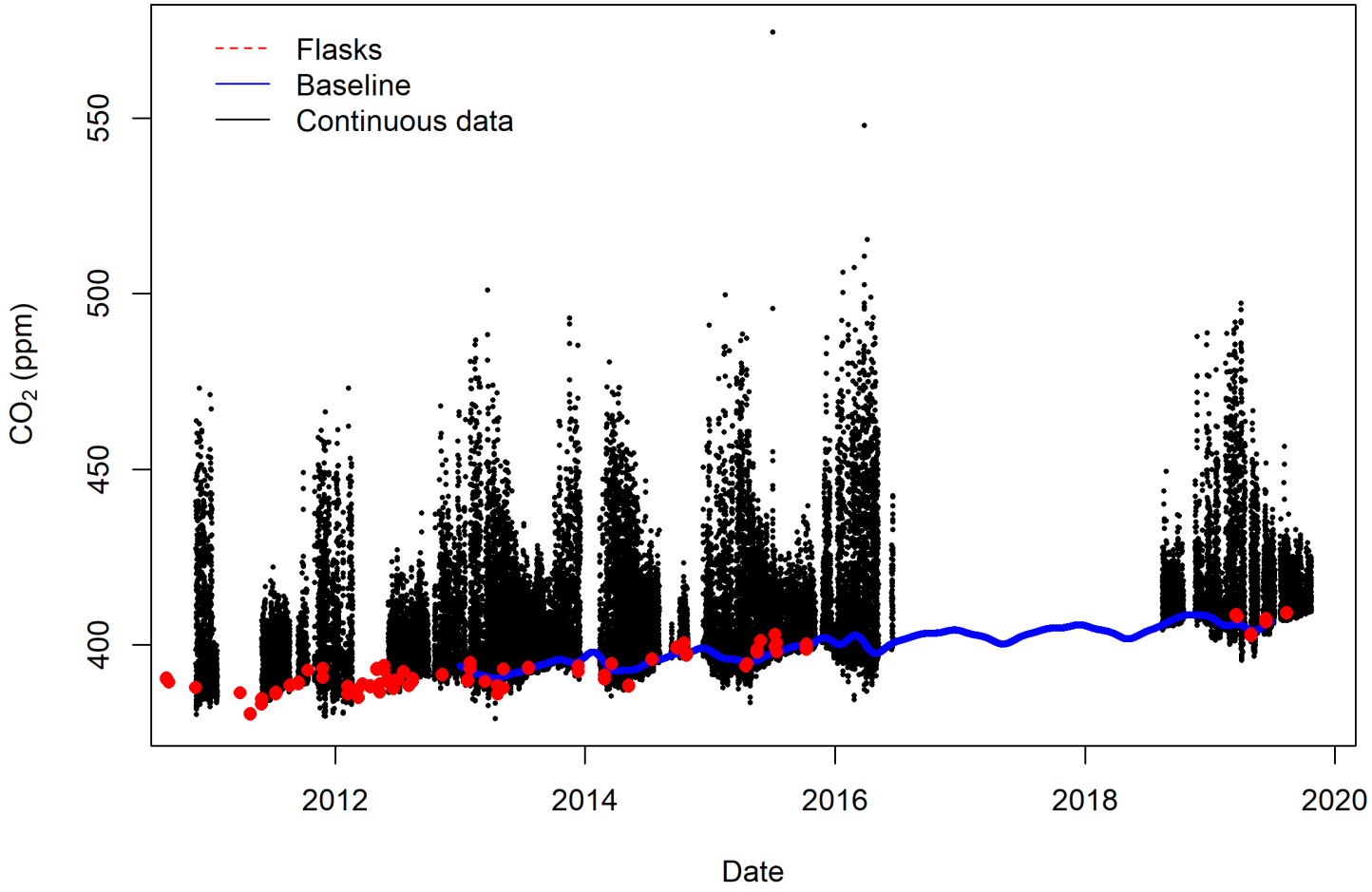
Rangers collecting flask samples at NT BAPS

Rangers at CSIRO GASLAB, Melbourne

- Flask sampling at nt baps was paused in 2016 due to a lack of local capability
- Since 2018 Larrakia rangers have been collecting monthly flask samples which are sent to the CSIRO Climate Science centre in Melbourne for analysis.
- The flasks are analysed for the Major greenhouse gases (CO2, methane, nitrous oxide)
- **larrakia rangers are playing a key role in ensuring this important long-term monitoring program continues**

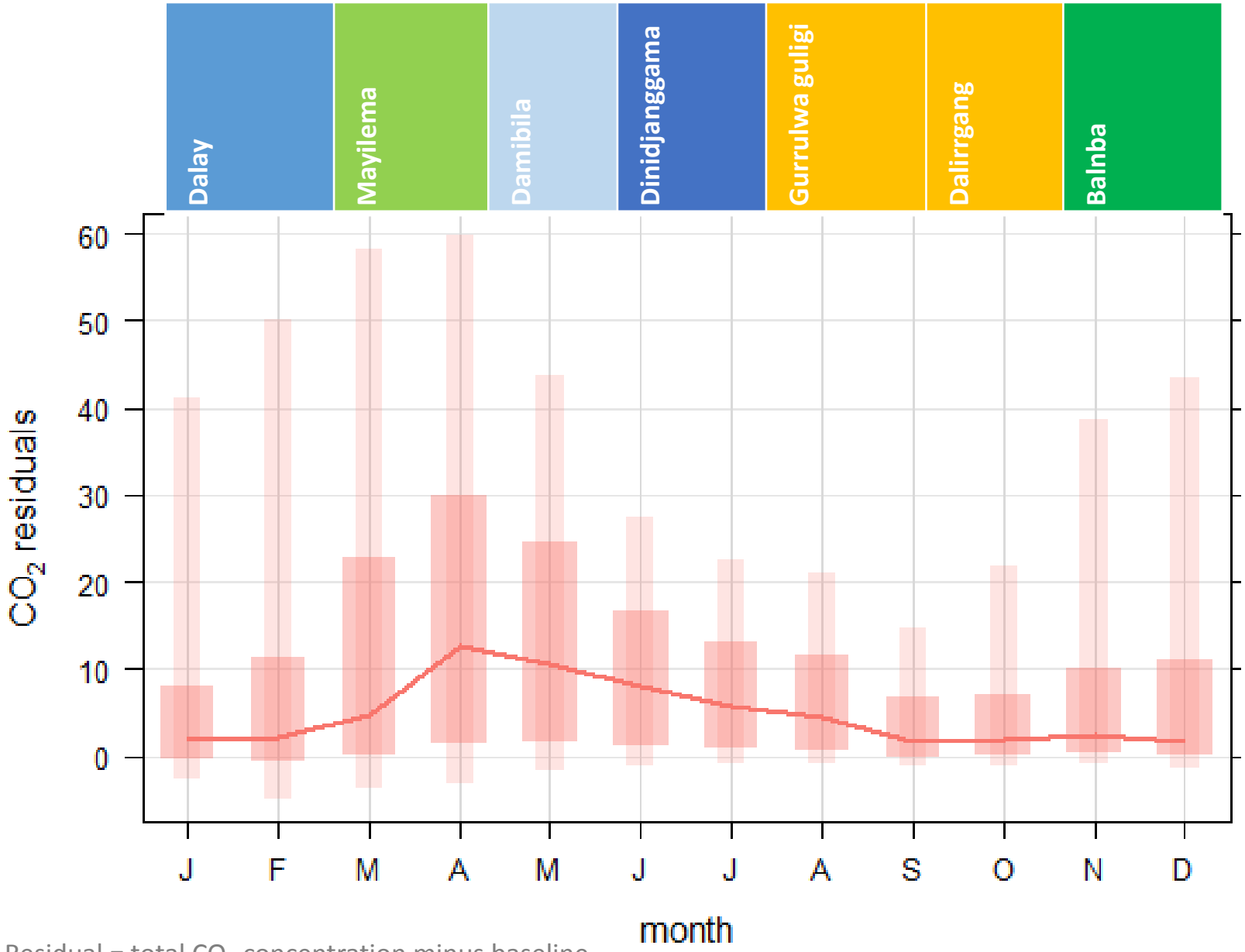
- Photo credit: Ian Redfearn, ABC News

Exploring the CO_2 record from NT BAPS



Local influences can be explored by looking at the residual CO_2 levels – the CO_2 concentration with the baseline subtracted

EXPLORING LOCAL SEASONAL INFLUENCES



Residual = total CO_2 concentration minus baseline

Source: Williams et al (2012)

Dalirrgang, Balnba, Dalay:

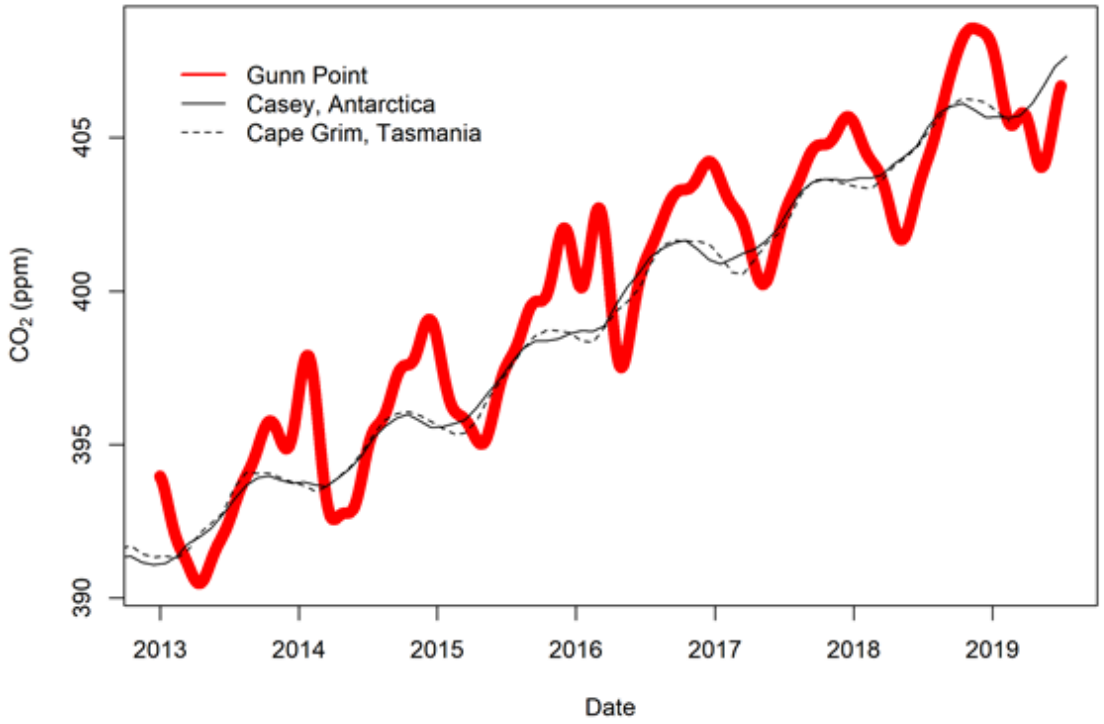
- Build-up, rainy season, monsoon
- Median CO_2 concentrations close to baseline (residual ~ 0)
- West – north westerly winds are bringing cleaner marine air masses from the ocean

Mayilema, Damibila, Dinidjanggama, Gurrulwa guligi:

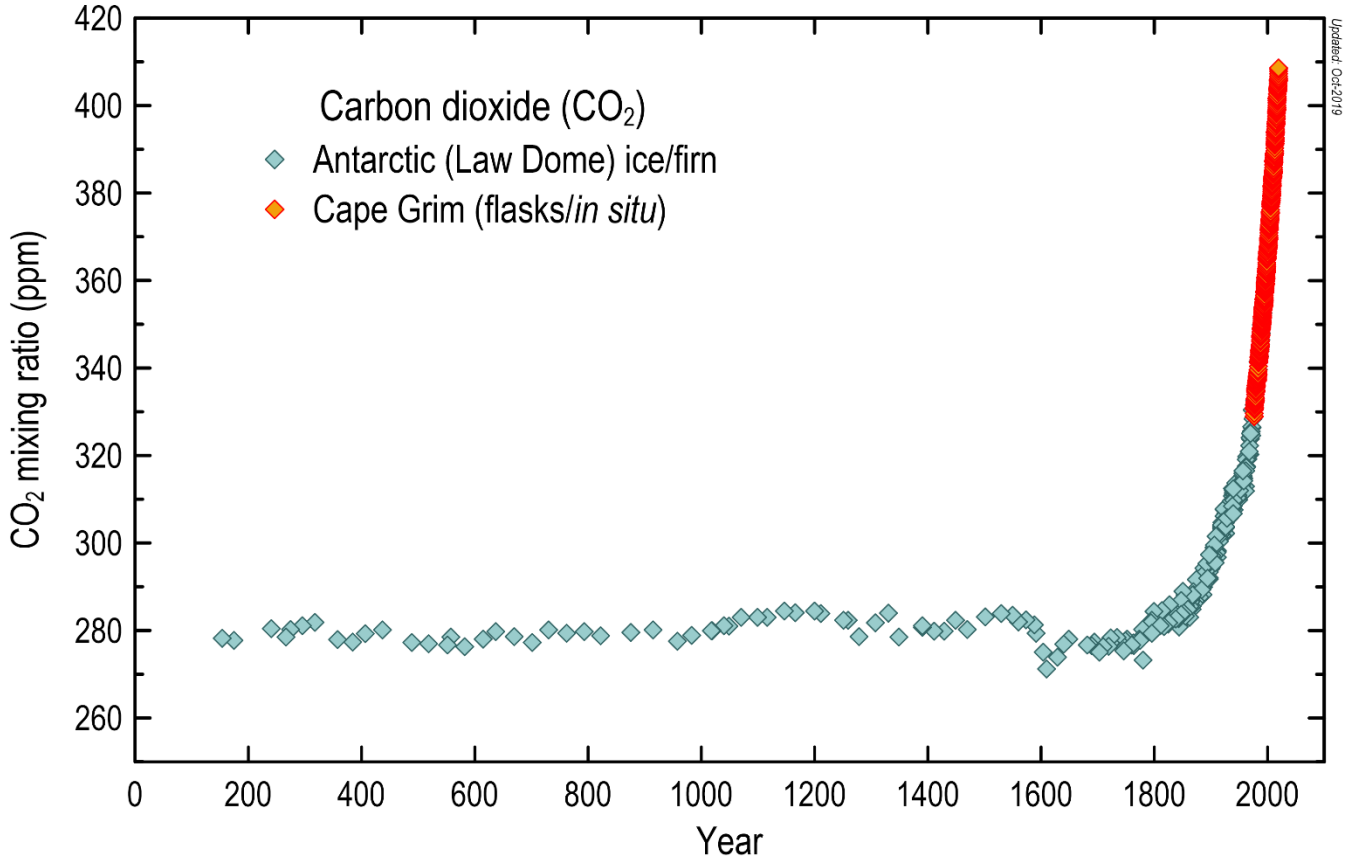
- Dry season, trade winds, burning season
- Median CO_2 residuals peak in April when east - south easterly winds bring air masses from the continent influenced by vegetation, fire, soil

BASELINE CO_2 AT NT BAPS AND THE LONG TERM RECORD

Recent trends – an increase of CO_2 of over 12-14 ppm at Gunn Pt since 2013. In line with other sites spanning the Southern Latitudes

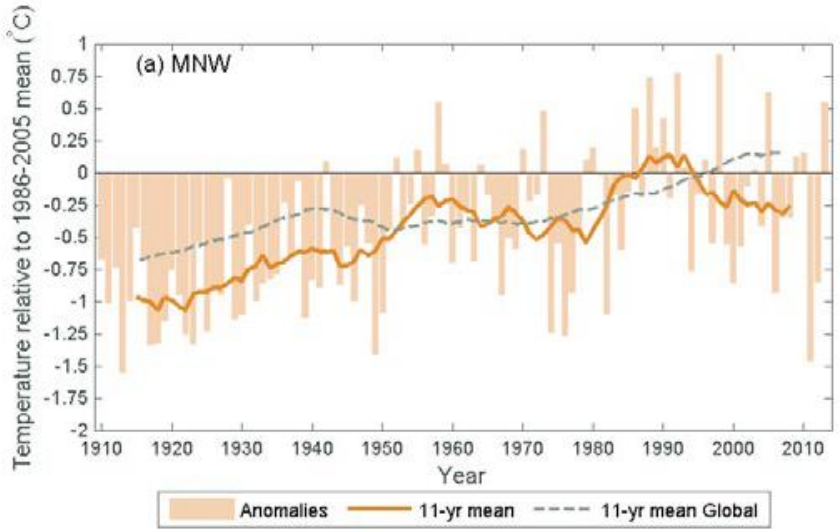


Long-term trends – an increase of CO_2 from 280 ppm in pre-industrial times to over 400 ppm presently.



MONITORING EMISSIONS IN A CHANGING CLIMATE

- TEMPERATURES IN THE MONSOONAL NORTH EAST INCLUDING THE DARWIN REGION HAVE INCREASED ~0.9°C IN THE PERIOD 1910 – 2013



- Under a moderate emission scenario (RCP 4.5) temperatures in Northern Australia are projected to Continue to increase
- E.G. For Darwin, days above 35 degrees is predicted to increase from around 11 per year in the current climate to ~43 by 2030, and to ~265 days by 2090.
- Fewer but possibly more intense cyclones and intense rainfall events are predicted
- Increasing rises in sea level, sea surface temperature and ocean acidity are also forecast

Source: Moise et al (2015)

THROUGH THIS PROJECT AND OUR MANY OTHER LAND & SEA MANAGEMENT PROJECTS IN SHOAL BAY AND THE GREATER DARWIN REGION, LARRAKIA RANGERS ARE PLAYING A KEY ROLE IN OBSERVING AND MANAGING CHANGES IN OUR LAND AND SEAS, AND CONTRIBUTING TO GLOBAL CLIMATE SCIENCE.

REFERENCES

Gulumoerrigin Calendar:

Lorraine Williams, Judith Williams, Maureen Ogden, Keith Risk, Anne Risk and Emma Woodward. 2012. Gulumoerrgin Seasons (calendar): Larrakia, Darwin - Northern Territory. CSIRO Ecosystem Sciences, Darwin, NT.

Available: https://www.csiro.au/en/Research/Environment/Land-management/Indigenous/Indigenous-calendars

Climate projections:

Moise, A. *et al.* 2015, *Monsoonal North Cluster Report*, Climate Change in Australia Projections for Australia's Natural Resource Management Regions: Cluster Reports, eds. Ekström, M. *et al.*, CSIRO and Bureau of Meteorology, Australia.