

Revision of the historical Cape Grim atmospheric CO₂ record and expansion of the Australian regional WMO/GAW network

GMAC, Boulder, USA
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www.cawcr.gov.au

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Australian Government
Bureau of Meteorology

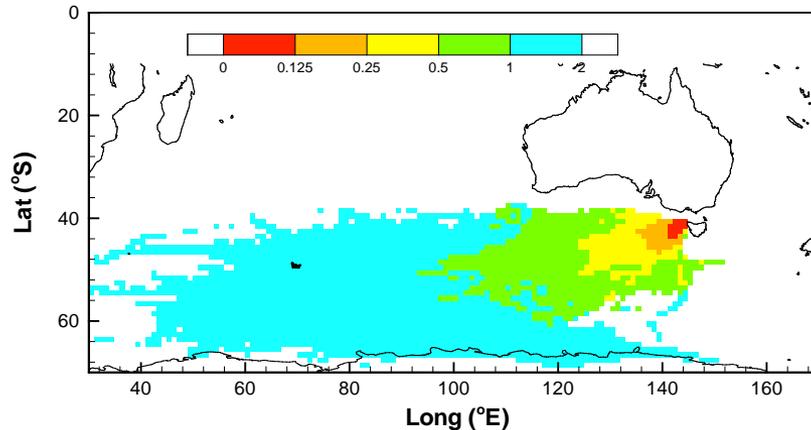
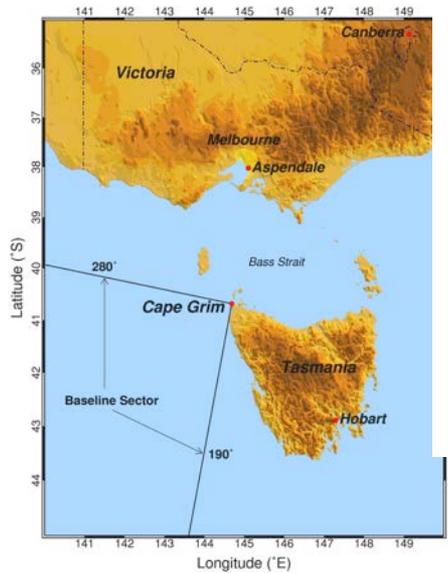
The Centre for Australian Weather and Climate Research
A partnership between CSIRO and the Bureau of Meteorology



Outline of today's talk

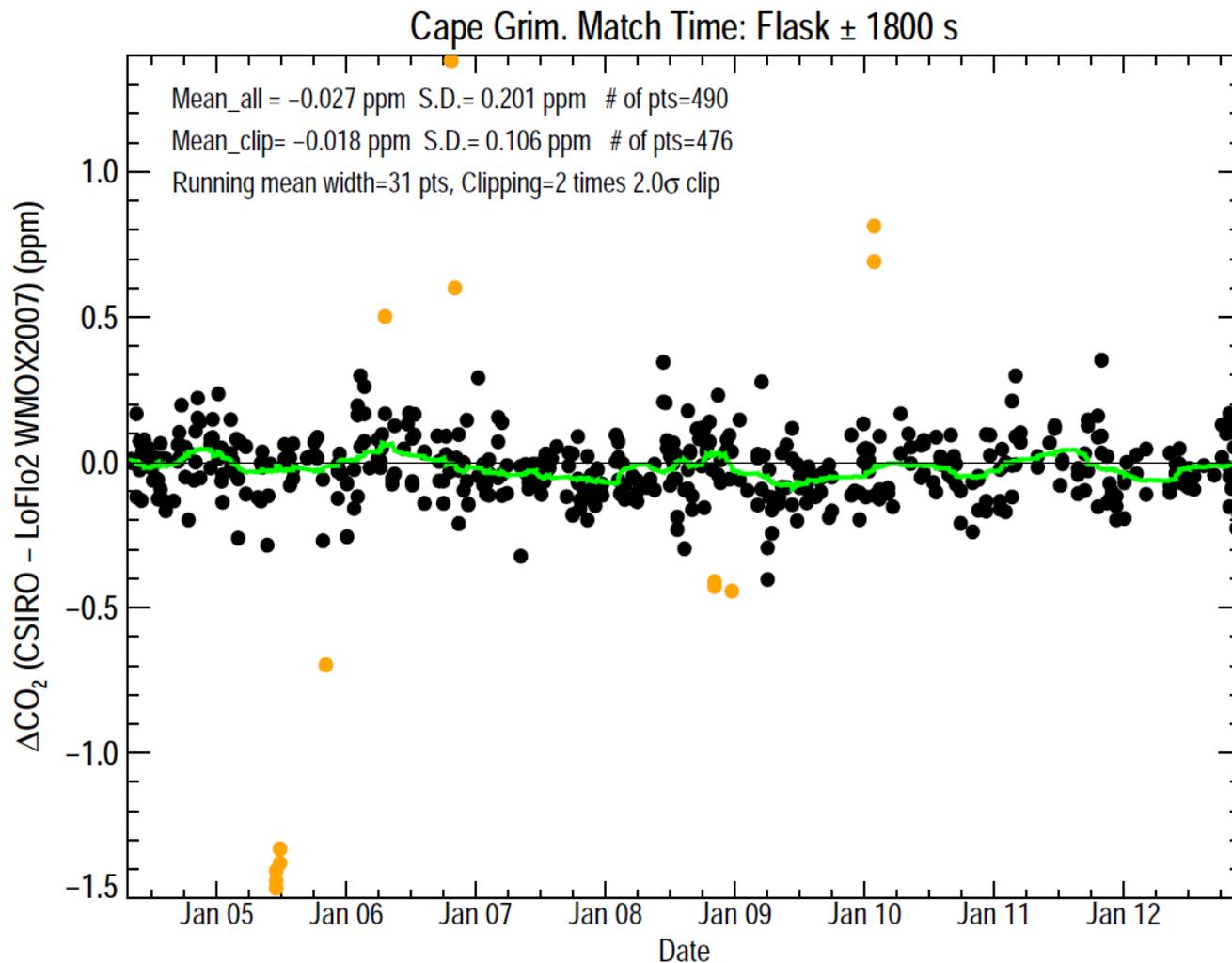


1. Cape Grim *in-situ* CO₂ record revision
2. CSIRO atmospheric network expansion -
 - Southern Ocean high precision CO₂ network
 - Australia's future research vessel (RV Investigator)
 - Southeast Asian – Australian tropical regional GHG observation network



Cape Grim LoFlo2A *in-situ* CO₂ (2004-2013)

Cape Grim *in-situ* CO₂ record revision

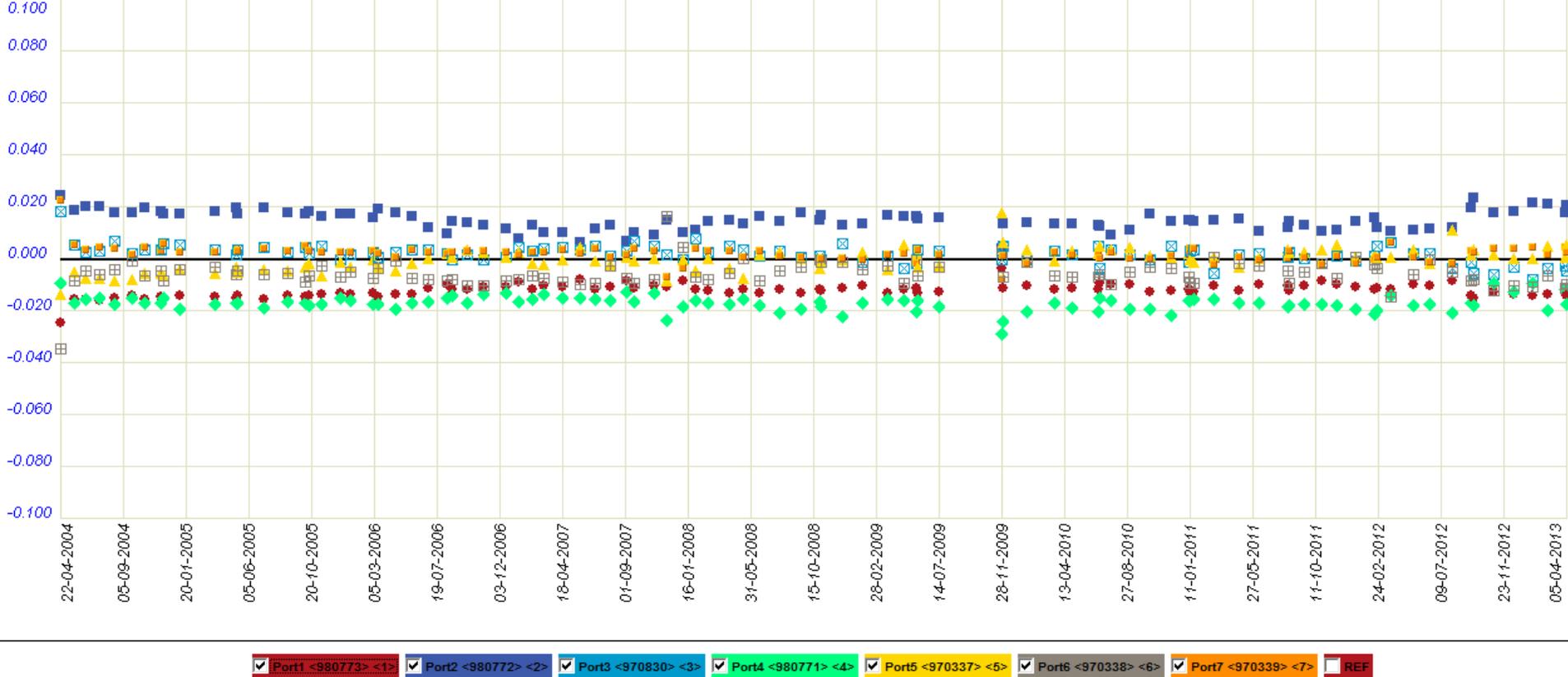


Cape Grim LoFlo2A *in-situ* CO₂ (2004-2013)

Calibration residual history (2004 – 2013)

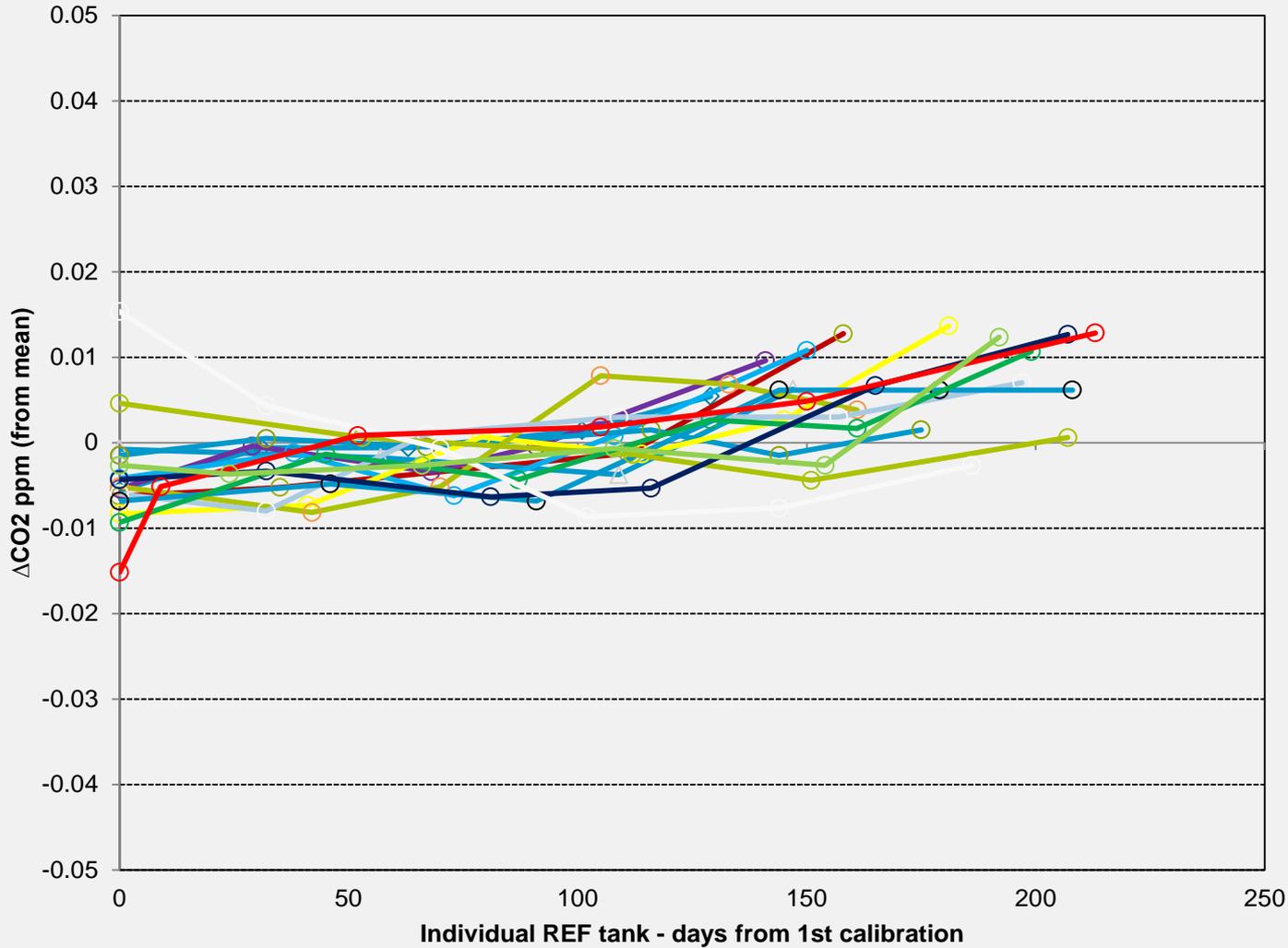


Loflo 2A Residual History from: 2004-04-22 13:11:00.0 - 2013-04-08 13:11:00.0 Scale:WMO-X2007



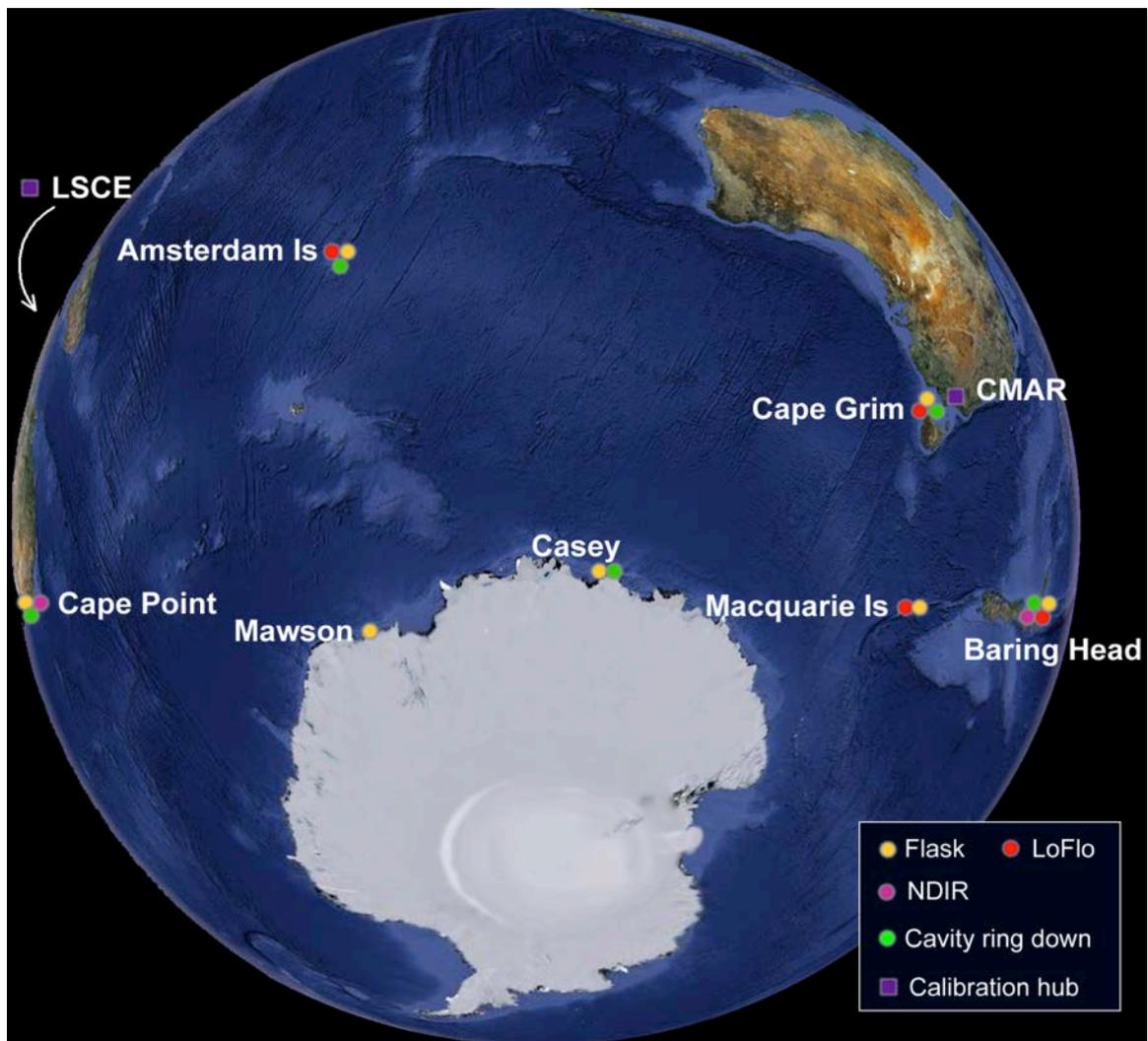
Cape Grim LoFlo2A *in-situ* CO₂ (2004-2013)

Reference gas *in-situ* calibrations



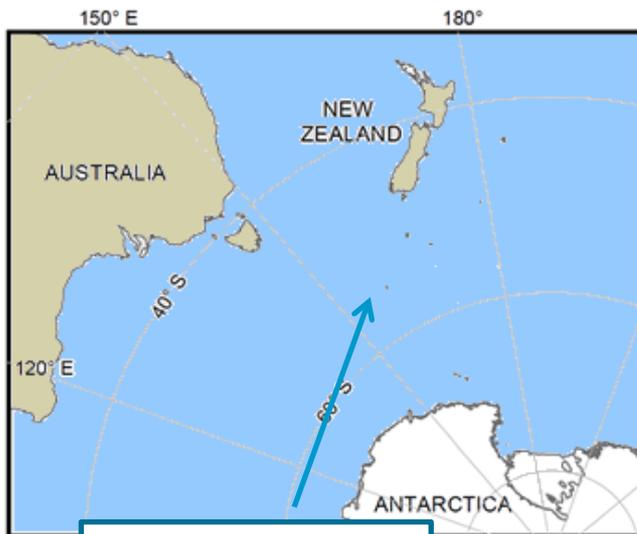
Southern Ocean CO₂ network

Southern Ocean CO₂ sink project



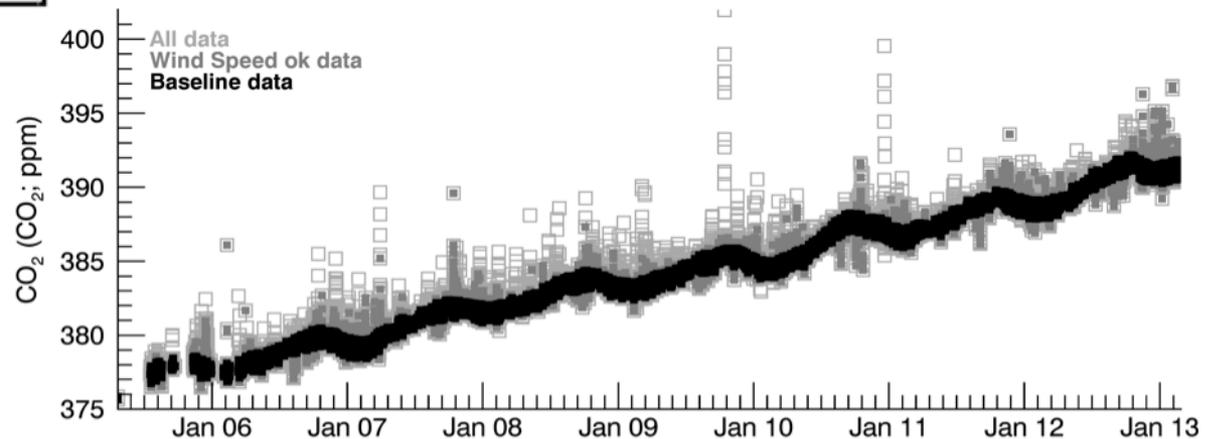
The Macquarie Island CO₂ record

Southern Ocean CO₂ sink project



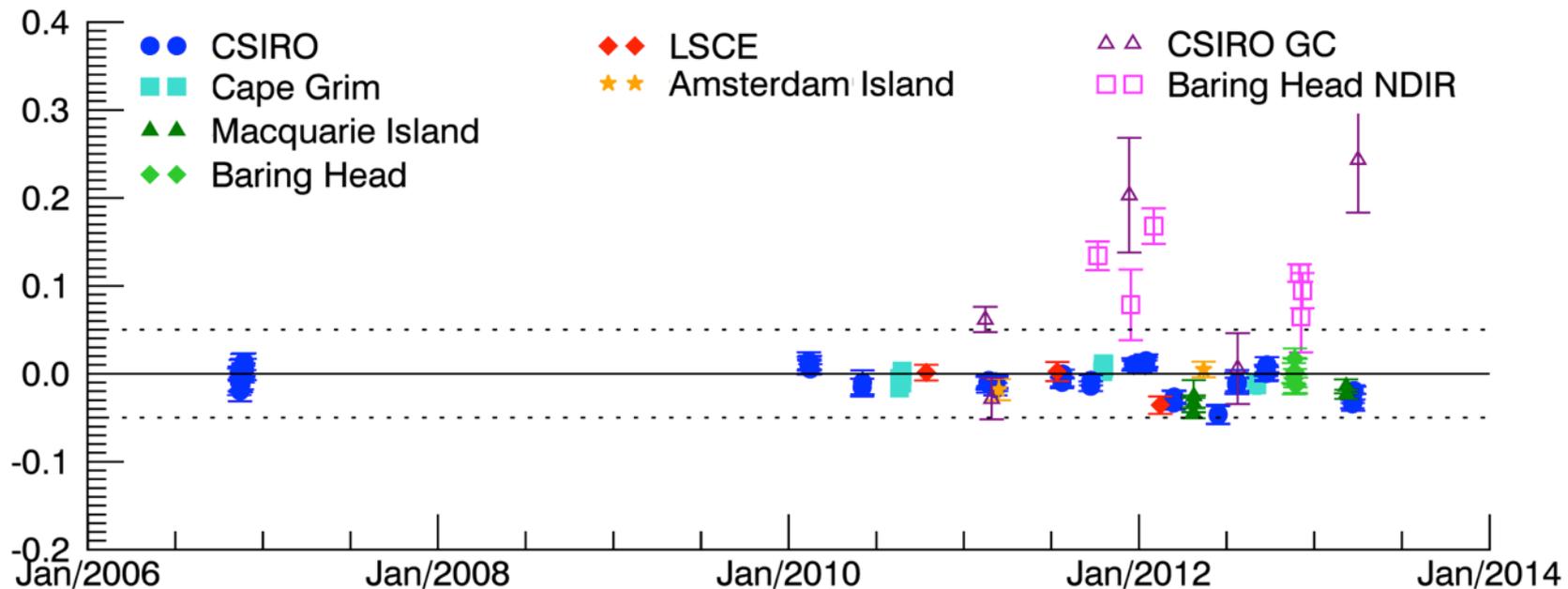
**Macquarie
Island**

- Removing local sources and sinks
- Examining long range transport
- Comparisons to other Southern Ocean locations



Intercomparisons

Southern Ocean CO₂ sink project





Future Research Vessel Project

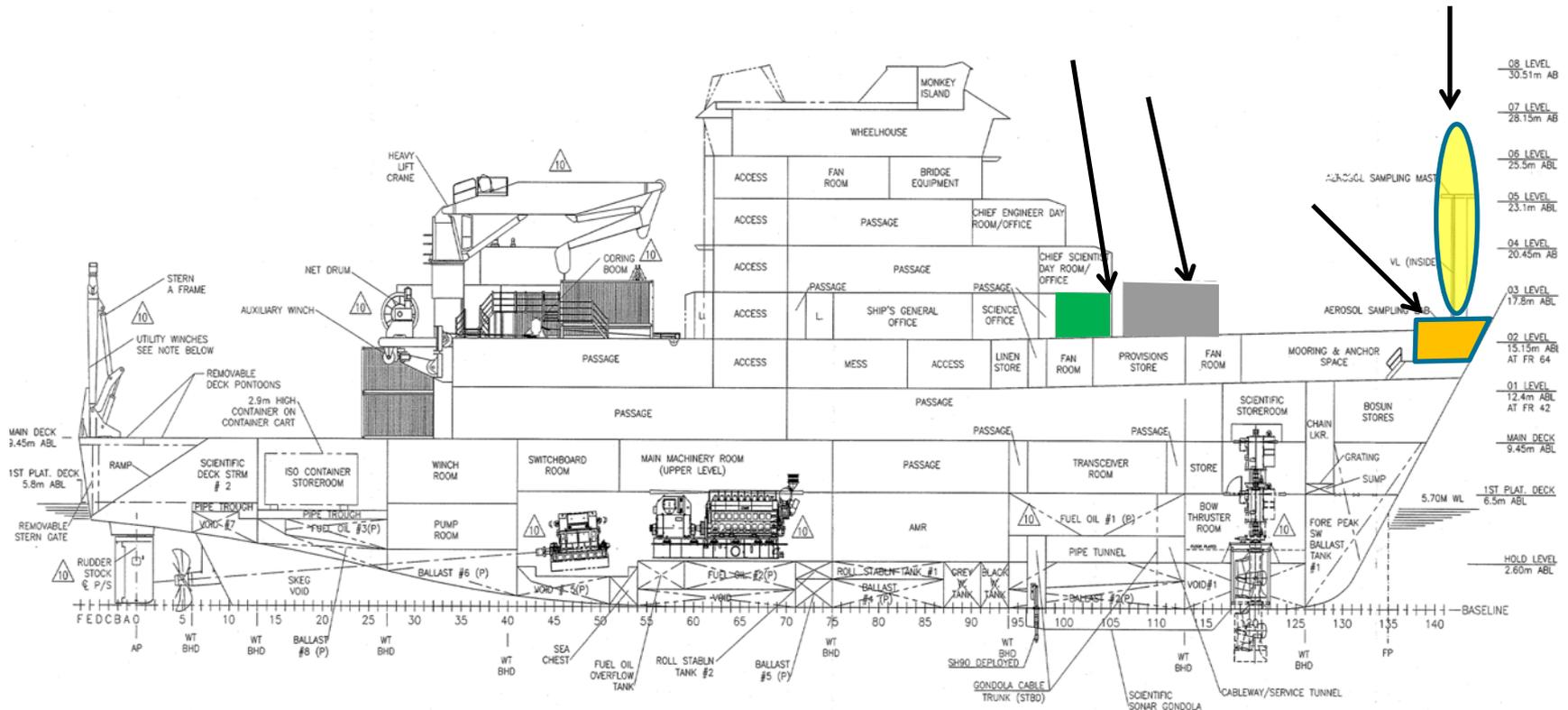
RV Investigator – a new era in marine and atmospheric research for Australian scientists

- FUTURE RESEARCH VESSEL PROJECT

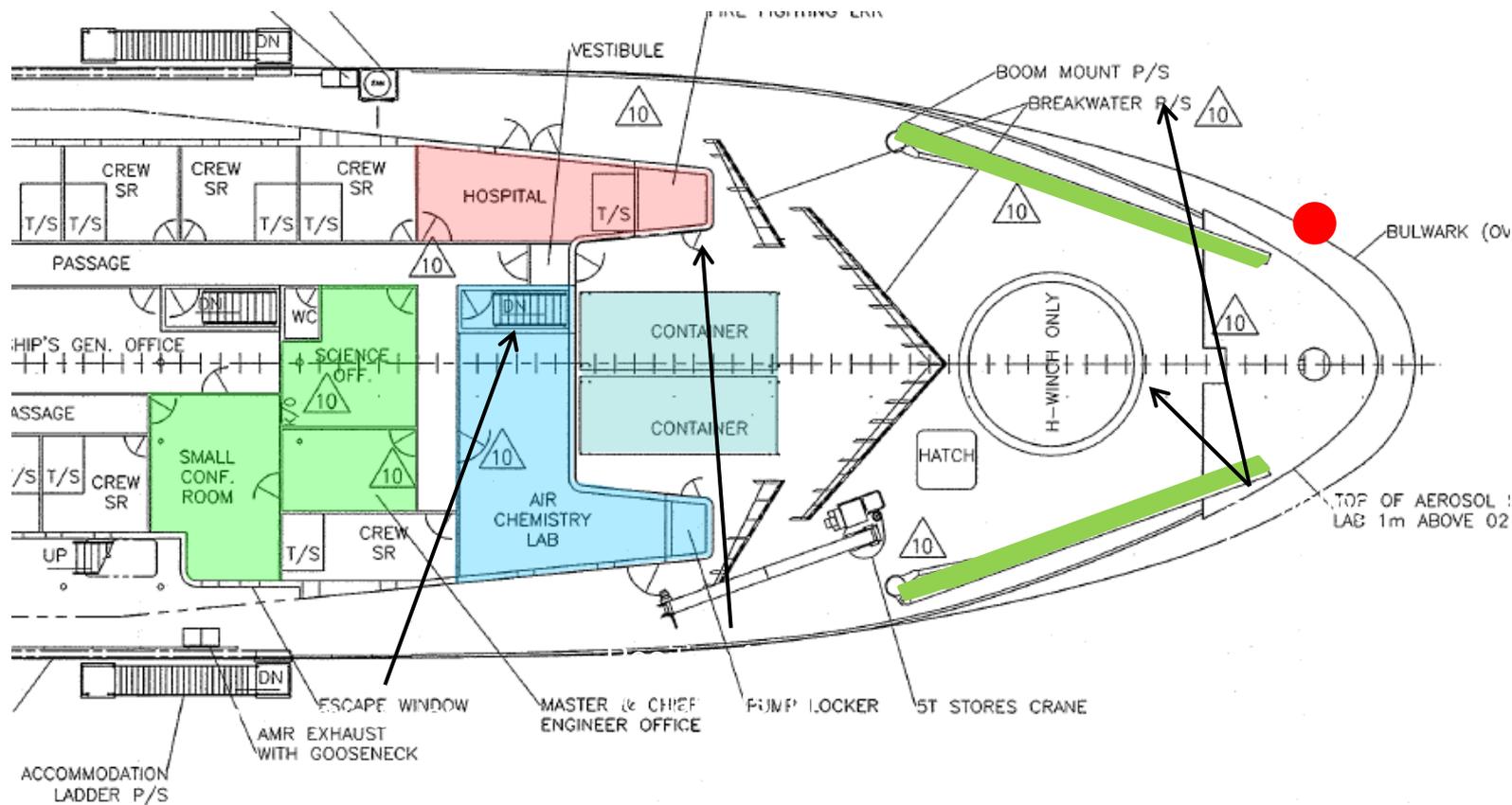
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Location of atmospheric chemistry labs and position of specialist containers.



Air chemistry lab, containers and booms

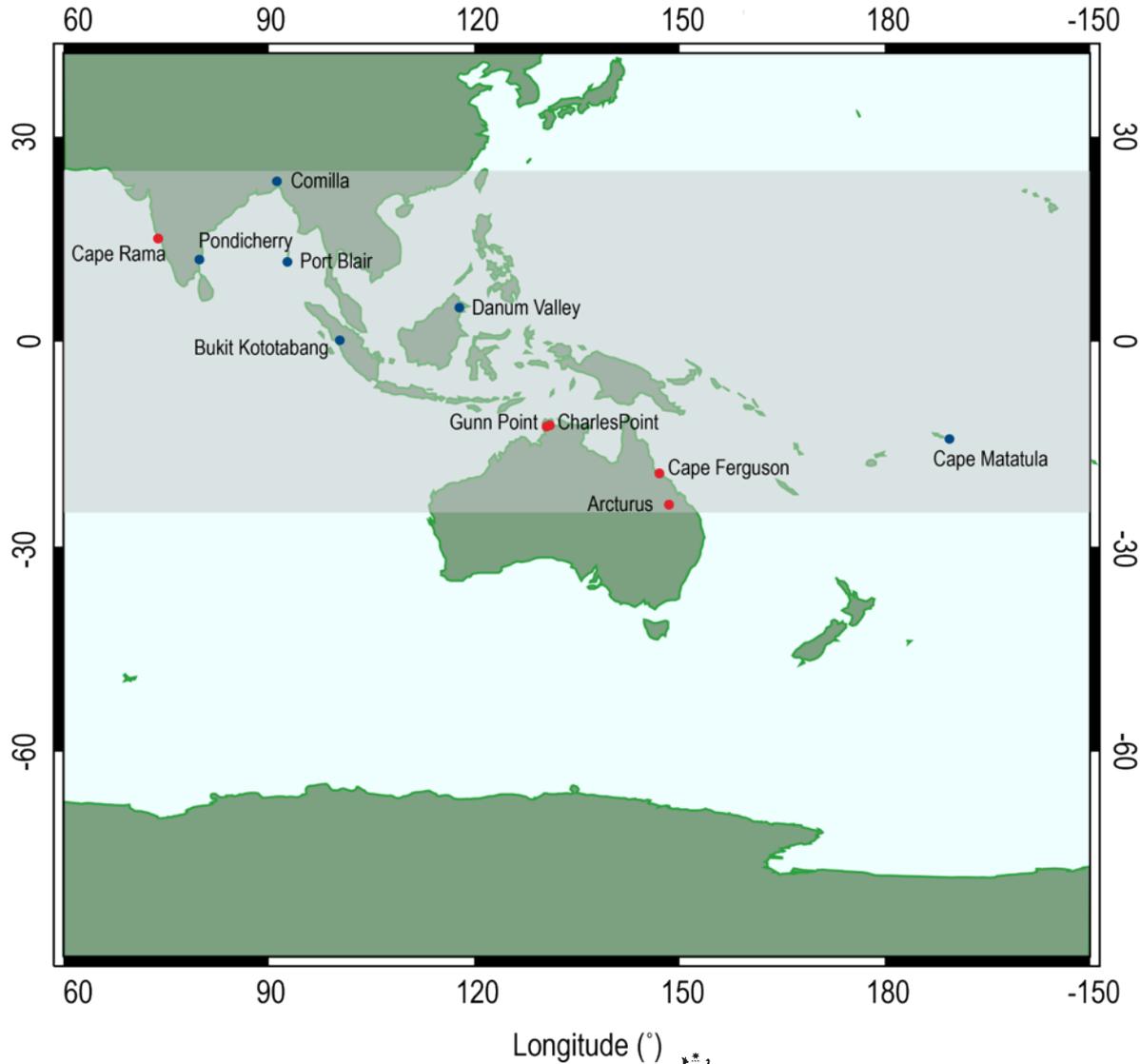


02 LEVEL
15.15m ABL

RV Investigator



Tropical Southeast Asia-Australian regional network



Gunn Point Pilot Tropical Atmospheric Research Station



- **Latitude :** 12.2°S
- **Longitude :** 131.0°E
- **Elevation:** 25 m
- **Road Access**
 - 1-2 hours from Darwin (70 km road)
 - 4WD
 - 35 km unsealed road subject to wet season flooding
- **Site History**
 - Ex-prison farm (closed 1990)
 - Radar Site - Bureau of Meteorology lease since 2004
 - Atmospheric Radiation Measurement Site (ARM funded US Department of Energy)
- **Power**
 - Town power (generally reliable but does fail in storms)
 - Backup generator for essential applications (~3 days)
- **Communications**
 - Land line and mobile next G reception





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Thank you

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Gunn Point – atmospheric measurement



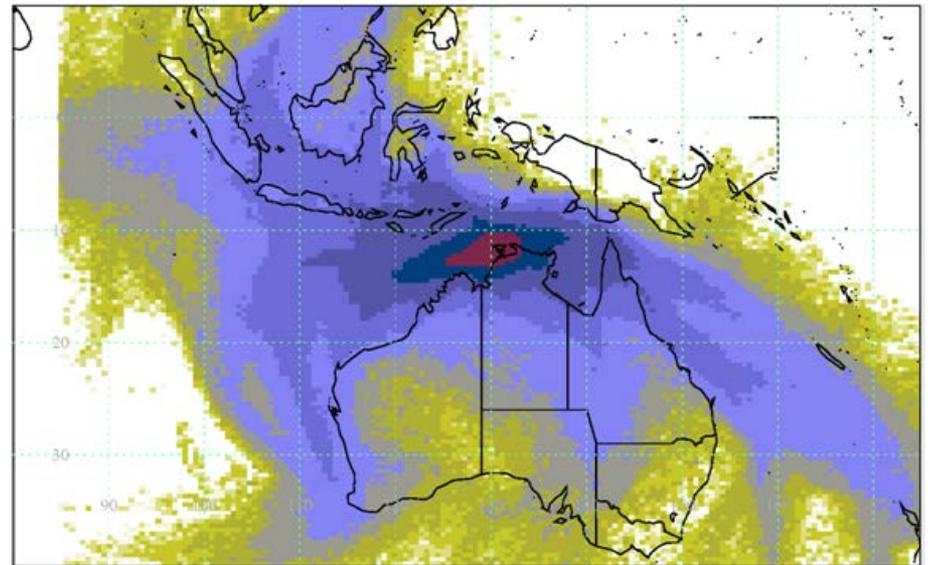
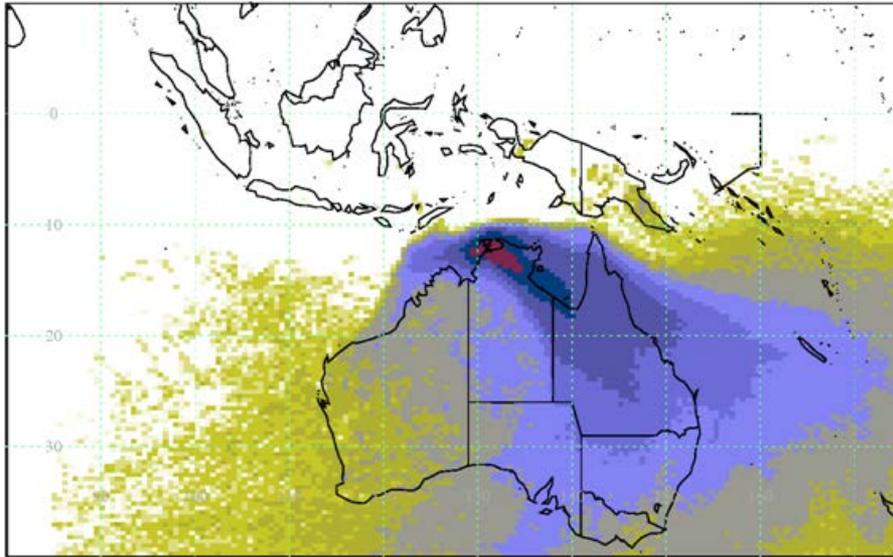
• Current (May 2013)

- *In-situ* CO₂ & CH₄ (CRDS)
- *In-situ* ¹³CO₂/¹²CO₂ (CRDS)*
- Flask CO₂, CH₄, ¹³CO₂/¹²CO₂, N₂O, CO, H₂
- Radon (ANSTO)
- Short-lived halocarbons (CHBr₃/CH₂Br₂/CHCl₃/C₂Cl₄/CH₂CCl₃/CCl₄..): GC-ECD (N. Harris, U. Cambridge, UK) (May 2013)
- O₃ (UV spectrometry) / CO (NDIR) /NO/NOX (*chemiluminescence*)
- *Aetholometer and nephelometer*

• Proposed measurement program

- *In-situ* CO/N₂O (LGR) (Sep 2013)
- AWS (June 2013)
- PM_{2.5}/PM₁₀
- Aerosols+VOCs (dry season campaign completed June 2010)

Air mass origin maps Gunn Point (courtesy Alistair Manning UK Met Office)



Gunn Point (NT) – New tropical Australian monitoring site



- Wet / Dry season air masses giving continental coverage with Cape Grim station, clean Indian Ocean air & SE Asian air masses
- Based at existing research radar site at Gunn Point (BoM)
- Unique opportunity to combine existing **physical** atmospheric research facilities currently in Darwin (BoM / US DoE Atmospheric Radiation Measurement program) with **chemical** atmospheric measurements
 - Regular field campaigns (Mctex, TRMM, Dawex, TWPICE...)
- TCCON network site at Darwin (FTS) for satellite validation (GOSAT, SCHIAMACHY) since September 2005 (University of Wollongong/Caltech)
- Extensive tropical ecosystem (Savannah) research (CSIRO, Charles Darwin University)