Revision of the historical Cape Grim atmospheric CO$_2$ record and expansion of the Australian regional WMO/GAW network

GMAC, Boulder, USA
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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

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Cape Grim LoFlo2A in-situ CO₂ (2004-2013)
Calibration residual history (2004 – 2013)

Cape Grim LoFlo2A *in-situ* CO$_2$ (2004-2013)

Reference gas *in-situ* calibrations

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Southern Ocean CO$_2$ network
Southern Ocean CO$_2$ sink project
The Macquarie Island CO$_2$ record
Southern Ocean CO$_2$ sink project

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

Macquarie Island
Intercomparisons
Southern Ocean CO₂ sink project

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Future Research Vessel Project

RV Investigator – a new era in marine and atmospheric research for Australian scientists
Location of atmospheric chemistry labs and position of specialist containers.
Air chemistry lab, containers and booms
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* $^{13}$CO2/$^{12}$CO2 (CRDS)*
  - Flask CO$_2$, CH4,$^{13}$CO2/$^{12}$CO2, N2O, CO, H2
  - Radon (ANSTO)
  - 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$_{2.5}$/PM$_{10}$
  - 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 (Savanah) research (CSIRO, Charles Darwin University)