

# Baseline

2005-2006

30th Anniversary Edition

Cape Grim



A brief history of the Cape Grim  
Baseline Air Pollution Station

Paul J. Fraser

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## A Brief History of the Cape Grim Baseline Air Pollution Station

*P J Fraser*

CSIRO Marine and Atmospheric Research

### Background

Although observations of background atmospheric composition at Cape Grim commenced 30 years ago in 1976, the impetus for such a program can be traced back to preparations for the International Geophysical Year (1957), when C. D. Keeling of the Scripps Institution of Oceanography (SIO, USA) established the first 'global' network, comprising Mauna Loa, Hawaii (1956) and South Pole, Antarctica (1957), to measure the content and temporal variability of carbon dioxide in the background atmosphere. The value of such an approach to geophysical monitoring was considered doubtful by some, but was clearly demonstrated within a few years, when significant temporal trends and seasonal cycles of carbon dioxide were quantified for the first time and related respectively to combustion of fossil fuels and biological photosynthesis and respiration on a global scale. A few years of careful research and measurement ended 100 years of speculation as to whether it was possible for anthropogenic activities, such as the use of fossil fuels, to affect the composition of the background atmosphere. The answer was a resounding 'yes'.

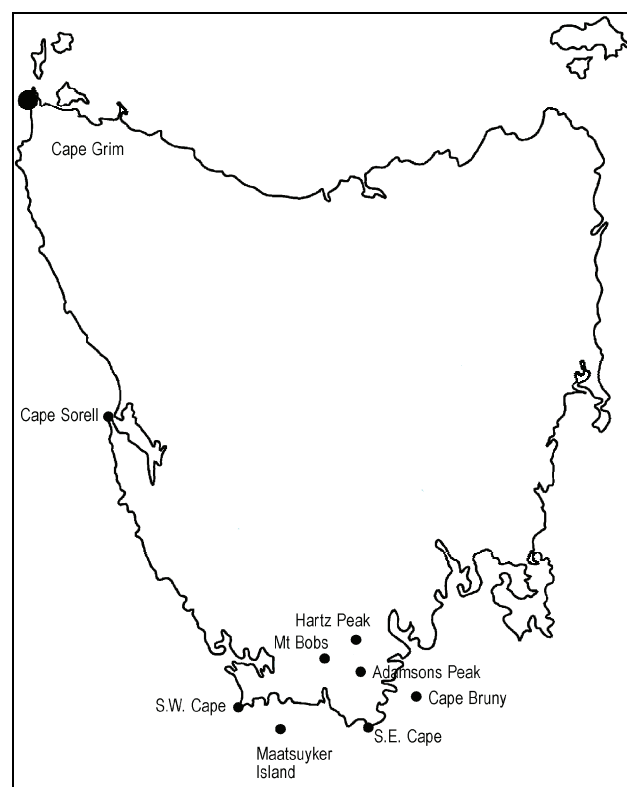
More than a decade later (1969), the World Meteorological Organization (WMO) recommended that member countries establish a global network of remote stations (BAPMoN: Background Air Pollution Monitoring Network) specifically to monitor changes in atmospheric composition which might impact on climate. By this time, relevant activities within the United States were well advanced, and the USA was soon to have established four fully operational stations - Mauna Loa, Hawaii (1956); South Pole, Antarctica (1957); Barrow, Alaska (1971) and Cape Matatula, American Samoa (1973).

### The Australian Baseline Station

Australian scientists (W. Gibb, Bureau of Meteorology; C. Priestley, CSIRO) considered the possibility of observing background atmospheric composition in the Australian region in 1971. In 1972, G. Pearman and J. Garratt (CSIRO) established an aircraft based observational program to measure possible long-term trends of carbon dioxide in the background atmosphere of the south-east Australian region. Also in 1972, the United Nations Conference on the Human Environment followed the WMO in recommending that a global network of atmospheric observatories be established, with a particular emphasis on climate change research. During the next three years, the project to establish a permanent Australian background observing Station, in fulfilment of the Australian commitment made at the 1972 UN conference, was developed.

In September 1972, Australian scientists lead by Pearman reported that the most suitable location for a baseline Station would probably be found in the southern highlands of Tasmania and recommended that surveys be commenced to identify the preferred site. Honey Smith Hill, near the South East Cape, was identified as the preferred location in 1975, and by early 1976 an instrumented caravan was ready to be installed at this site. However, uncertainties about the long-term viability of, and the problems of access to, the South East Cape site resulted in the caravan being installed temporarily on Commonwealth property at Cape Grim, northwest Tasmania, during March 1976, so that field trials could begin, while the search for the preferred site continued.

During 1976-1977 initial measurements were made of carbon dioxide, ozone, halocarbons, oxides of nitrogen, particulates, precipitation chemistry, solar radiation and meteorological parameters. After considerable investigation and discussion of a range of possible sites (Figure 1), Cape Grim was chosen as the permanent site for the Australian Station in early 1978 and approved by the Australian Government.



**Figure 1.** Sites evaluated in 1975-1977 for possible location of the Australian Baseline Station

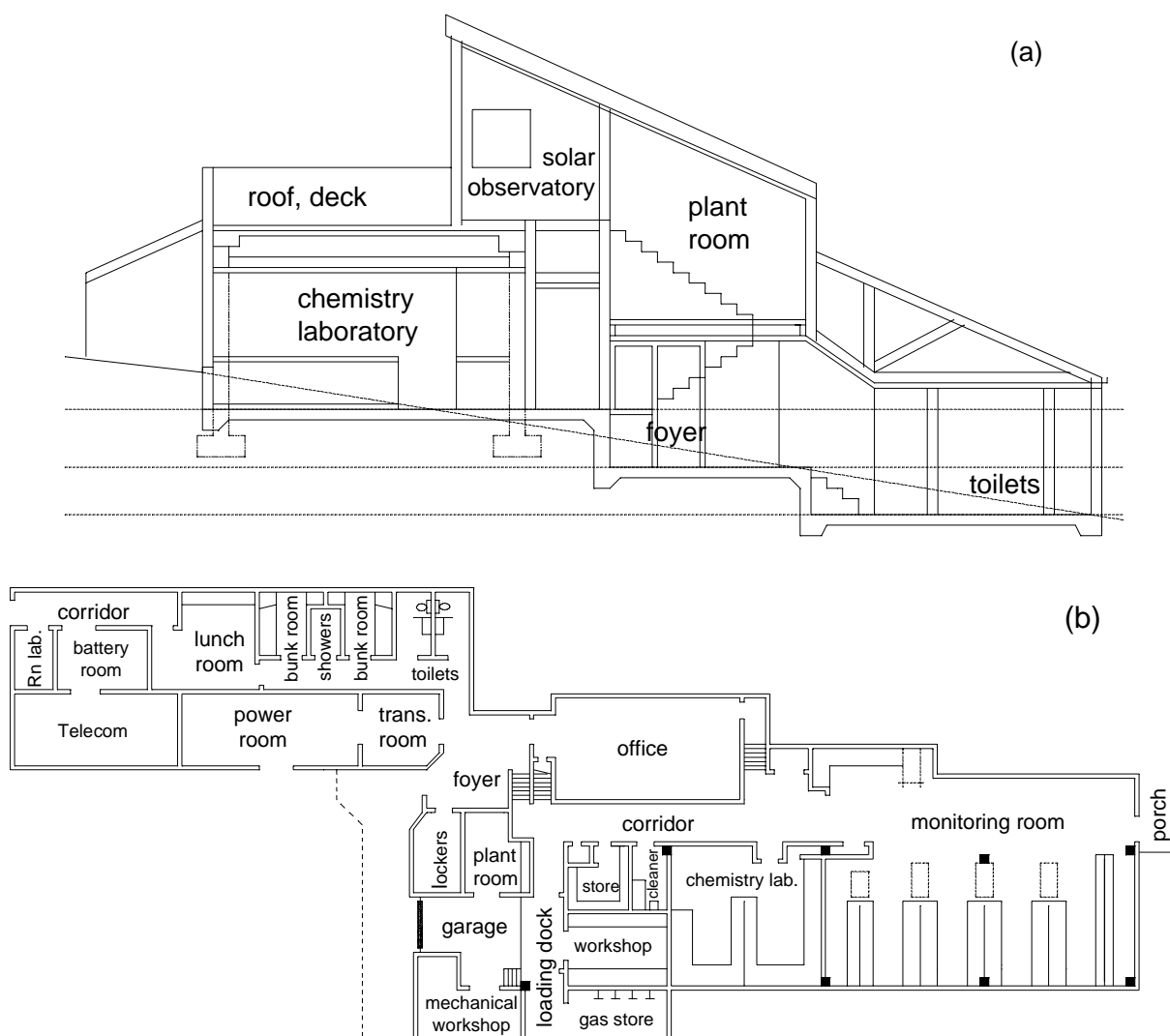
In 1977 the laboratory and accommodation functions of the original caravan were separated with the acquisition of an additional caravan for accommodation. Despite this, it was clear by mid-1978 that the instrument and accommodation caravans were too small to house all the experiments at Cape Grim. In early 1980, the halocarbon gas chromatographs were moved to a separate caravan (about 500 m north-west) in anticipation of possible contamination problems associated with the construction of permanent facilities immediately adjacent to the original caravan site, throughout 1980 (Figure 2). Construction was finished in early 1981 and throughout the rest of that year the original instruments were transferred from the caravans, and new instruments were installed, in the permanent facilities. The Australian BAPMoN Station was officially opened in December 1981.

Since that time there has been a steady growth in the observational program, both *in situ* and involving other cooperating agencies. Measurements now include all of those originally made plus isotopologues of carbon dioxide, methane (including isotopologues), carbon monoxide, nitrous oxide (including isotopologues), additional halocarbons (about

thirty), hydrogen (including isotopologues), oxygen/nitrogen ratios, aerosol chemistry including several sulfur species (dimethylsulfide, methanesulfonic acid), other sulphur species (carbonyl sulphide, sulphur hexafluoride, sulfuryl fluoride), several volatile organic compounds (including ethane, ethylene, acetylene, isoprene, benzene, toluene), radon and radon daughters, radionuclides, black carbon and lead isotopes. In addition, more sophisticated technology, often developed by Cape Grim scientists or in partnership with their national and international colleagues, has allowed increases in frequency and accuracy of all these measurements.

In 1984-1985, a 74 m high telecommunications tower (the Telstra tower) was constructed at Cape Grim, which involved associated extensions to the Cape Grim building. This allowed the addition of air intakes at 70 m and meteorological instruments at 30 m and 50 m, to supplement the standard 10 m intake and instruments. It also made available additional laboratory space at the north-east end of the building.

Significant dates and events in the evolution of the Cape Grim facility and observational program are given Table 1.



**Figure 2.** Building plan for the Cape Grim site, (a) the south east elevation (b) the floor plan of the Station.

**Table 2.** Significant dates and events in the evolution of the Cape Grim Baseline Station and Program.

Year	Cape Grim events
1972	Australia informs the UN of its intention to participate in the Earth Watch Programme, including the WMO BAP-MoN program.
1973	Australia informs UNEP of its intention to set up a Southern Hemispheric Baseline Station.
1975	Tasmanian Baseline Station site evaluations conducted by CSIRO (Pearman, Fraser, Helmond, O'Toole) at Hartz Mountains, Cape Bruny, Cape Sorrell, South West Cape, Honey Smith Hill, Adamsons Peak, Mt Bobs and Cape Grim. Original NASA instrument caravan equipped at CSIRO Aspendale. CGBAPS Project Manager appointed (Department of Science). CGBAPS Working Group established. First Australian/international baseline science meeting held at CSIRO Aspendale.
1976	NASA caravan installed at Cape Grim by CSIRO (Pearman, Beardsmore, Fraser, Garratt, Helmond, O'Toole). Two full time CGBAPS staff (Briggs, Wise) appointed. NASA conducts Cape Grim overflights (CV990). First measurements of CO <sub>2</sub> , O <sub>3</sub> , CFC-11, CCl <sub>4</sub> , meteorology, aerosol and precipitation chemistry at Cape Grim.
1977	First measurements of solar radiation (direct, global, diffuse, UV), turbidity, N <sub>2</sub> O and CN. Temporary Smithton depot established. Maatsuyker Island site evaluated.
1978	Scientists (CSIRO, AGAL, DST) recommend, and Australian Government approves, Cape Grim as the Baseline Station site. Funds for capital works of \$1.25M approved. <i>In situ</i> N <sub>2</sub> O, CFC-12 and CH <sub>3</sub> CCl <sub>3</sub> measurements commence; Cape Grim <i>in situ</i> halocarbon and N <sub>2</sub> O measurements incorporated into global network (ALE). Air archive commenced; first issue of <i>Baseline</i> published; first NO <sub>x</sub> measurements made. Air flows around Cape Grim studied. Additional caravan installed to house first short-term international experiment at Cape Grim (aerosol and hydrocarbon measurements, Max Planck Institute); caravan later converted to accommodation/store facility.
1979	Seven Lead Scientists appointed (precipitation - Ayers, Ivey, particulates - Bigg), halocarbons/N <sub>2</sub> O - Fraser), O <sub>3</sub> /NO <sub>x</sub> - Galbally, CO <sub>2</sub> - Pearman, radiation - Platt). High quality surface O <sub>3</sub> measurements begin. Department of Science and Technology assumes administrative responsibility for CGBAPS. CSIRO assumes responsibility to provide long-term scientific leadership/guidance and conduct research in support of CGBAPS.
1980	OiC (Wise) resigns. Commence CH <sub>4</sub> (flask) and CO (flask) measurements. Cape Grim CSIRO overflights begin. Road access to Cape Grim upgraded. Construction of permanent facilities at Cape Grim and Smithton. Separate caravan installed to house halocarbon GCs away from construction site. CGBAPS Management Group established.
1981	CGBAPS permanent staff increased from two to five (4 new appointees: Francey, Harrison, Muir-Wilson, Watson; Briggs resigns). First scientist/OiC and additional Lead Scientist (Francey, C-isotopes, total 8) appointed. Four CGBAPS funded staff appointed to CSIRO-DAR, one to CSIRO-DCP. CCN, Rn and NH <sub>3</sub> measurements commence. GAGE GC installed in new building. Permanent building occupied and officially opened. 10 m air intake commissioned. Review of Commonwealth Functions ('razer gang') recommends that CGBAPS be contracted out to private enterprise.
1982	New permanent CGBAPS staff members (Emmertson, Helmond) appointed, Watson resigns. Measurements of elemental C, CFC-113 ( <i>in situ</i> ) on GAGE GC, high precision δ <sup>13</sup> C and δ <sup>18</sup> O CO <sub>2</sub> and δ <sup>14</sup> CO <sub>2</sub> commence. NASA and GC caravans removed from site. Tenders called for private companies to manage and operate the CGBAPS facility.
1983	OiC (Francey) resigns. Two additional Lead Scientists appointed (Forgan - radiation, Whittlestone - radon, total 10). CGBAPS permanent staff reduced from 5 to 4. Sulfur program commences (SO <sub>4</sub> <sup>2-</sup> , nss-SO <sub>4</sub> <sup>2-</sup> and MSA). New Australian government rejects CGBAPS privatisation proposal.
1984	New OiC (Forgan) appointed. CGBAPS permanent staff increased from 4 to 5 (Sibson, Porter and Walford appointed, Muir-Wilson resigns). <i>In situ</i> CH <sub>4</sub> and CO measurements commence. Air sampling commenced for NOAA-CMDL and OGI. GRIMCO installed at Cape Grim; Telstra tower and building extensions constructed. First SABOAC Meeting. Administrative responsibility for CGBAPS transferred to the Bureau of Meteorology, Department of Science and Technology.
1985	10 <sup>th</sup> year of observations; additional Lead Scientist appointed (particles, total 11). GRIMCO operational. Precipitation chemistry and Hivol sampling frequency increased from monthly to weekly. ALE GC shut down. Construction of Telstra tower completed. Lightning strike causes significant instrument damage.
1986	Lead Scientist resigns (Bigg - particles), new Lead Scientist appointed (Burton - sulfur, total 11). Permanent CGBAPS staff member (Emmertson) resigns. Sampling booms installed on Telstra tower, 70 m air intake installed.
1987	Two additional Lead Scientists appointed (Downey, Jasper - meteorology, climatology, total 13). New CGBAPS staff member (Eisman) appointed, Sibson resigns. Raschig <sup>14</sup> CO <sub>2</sub> , <sup>85</sup> Kr and <sup>13</sup> CH <sub>4</sub> sampling commence.
1988	OiC (Forgan) resigns, new OiC (Wilson) appointed. Price appointed to Working Group. Weekly DMS sampling and Quadropod aerosol sampling commenced. Southwest door porch constructed. Second SABOAC Meeting held. Lead Scientist (Pearman) awarded CSIRO Medal. New CGBAPS staff member (Leonard) appointed.
1989	Lead Scientist resigns (sulfur - Burton, total 12). CGBAPS permanent staff increased from 5 to 6. New CGBAPS staff members (Paterson, Schrank) appointed, Eisman resigns. Cape Grim staff awarded DAS Award for Excellence. Lead Scientist (Pearman) presented UNEP Global 500 Award. COCl <sub>2</sub> (phosgene) measurements begin.
1990	New Lead Scientist appointed (methane - Steele, total 13). New CGBAPS staff member (French) appointed. GASLAB opened at CSIRO-DAR. Lightning strike causes significant instrument damage at Cape Grim. Smithton office wins Keep Australia Beautiful award. The CGBAPS ASM commemorates 15 years of Cape Grim observations, 10 years in the permanent building.
1991	Lead Scientist (radiation - Forgan) resigns.



Table 2. continued....

Year	Cape Grim events
1992	New CGBAPS staff member (Britton) appointed, Schranck resigns. New OiC (Dick) and new Lead Scientist (radiation - Wilson, total 13) appointed. High resolution UV-B measurements commence; new Rn detector installed; GASLAB $^{13}\text{CH}_4$ measurements commence; ASASP measurements initiated; pilot hydroxyl radical program commenced; significant exterior maintenance to Cape Grim building carried out.
1993	New CGBAPS staff member (Torr) appointed. AGAGE GC installed; in situ $\text{H}_2$ measurements begin. Automated DMS measurements by GC commence. MOUDI commenced sampling of size segregated aerosols; sulfur program intensive field experiment; winter phase of SOCEX carried out involving lidar and microwave radiometer. LAN installed. CGBAPS air conditioning upgraded. CGBAPS ASM held at University of Tasmania (Hobart).
1994	Lead Scientist (Jasper, climatology) resigns (total 12). New CGBAPS staff members (Munday, Weymouth) appointed, Patterson resigns. SOAPEX1 background winter phase carried out. GAGE GC shut down. Strategic Review of CGBAPS commissioned by Management Group. CGBAPS ASM held at Monash University (Clayton).
1995	20 <sup>th</sup> year of observations at Cape Grim. Lead Scientist (Pearman, $\text{CO}_2$ ) resigns (total 11). Lead Scientists (Ayers and Fraser) awarded Priestley Medal (AMOS) and Eureka Prize (Australian Museum) respectively. GASLAB $\text{O}_2/\text{N}_2$ measurements begin; field campaigns SOAPEX1 (summer and winter), SOCEX (summer) and ACE-1 carried out. First CGBAPS PhD (University of Melbourne) and summer scholarships (University of Wollongong) awarded. Fire causes damage at Cape Grim. CGBAPS ASM held at Monash University (Clayton).
1996	20 <sup>th</sup> anniversary celebrations held at Cape Grim, distinguished guests: Prof. M. Molina (Nobel Laureate, MIT), Hon. P. McGauran, Dr. M. McIntosh (CSIRO), Dr J. Zillman (Bureau), Dr G. Pearman (CSIRO), Dr J. Miller (WMO). Strategic Review of the Cape Grim Program completed and submitted. Lead Scientists (Ivey – precipitation chemistry, Platt - radiation) resign (total 9). CSIRO PDF (Sturrock) located at Cape Grim to install/run new halocarbon GC-MS. New CGBAPS staff member (Baly) appointed, Munday resigns. Overseas visitors: A. Jackson (U. Lancaster), K. Masarie (NOAA), P. Salameh (SIO), E. Dlugokencky (NOAA). AGAGE team visits Cape Grim. CGBAPS ASM held at Stanley (Tasmania).
1997	Lead Scientist (Boers – radiation) appointed (total 10). New CGBAPS staff member (Gough) appointed. AGAGE GC-MS-ADS installed at Cape Grim to measure minor CFCs, HCFCs, HFCs, halons and halomethanes. GAGE GC-ECD retired. Major upgrade of solar radiation program, with new instrument site 300 m north of the Station. New aerosol sampler installed for the ANSTO program. Overseas visitors: G. Brailsford, D. Ferretti (NIWA, NZ), S. Montzka, J. Butler (NOAA, USA), S. Yonemura, A. Miyata (NIES, Japan). CGBAPS ASM held at CRC for Southern Hemisphere Meteorology, Monash U. CGBAPS ASM held at CRC for Southern Hemisphere Meteorology, Monash University (Clayton).
1998	OiC (Dick) resigns, new OiC (Tindale) appointed. Lidar installed at Cape Grim. CSIRO flask air sampling for VOC analyses commenced. Maintenance work carried out on Telstra tower. Record wind recorded at Cape Grim: $177 \text{ km hr}^{-1}$ with some Station damage. Overseas visitors: L. Carpenter, N. McArdle, W. Broadgate, T. Elsayed, D. Oram (UEA, UK), S. O'Doherty (U. Bristol, UK), A. Lewis (U. Leeds, UK). CGBAPS ASM held at CRC for Southern Hemisphere Meteorology, Monash University (Clayton).
1999	SOAPEX2 hosted at Cape Grim. Smithton office sold into private ownership. International visitors: many SOAPEX2 scientists (U. Leeds, U. Leicester, UEA, UK), B. Suhardi and U. Nasrullah (Indonesian GAW staff), P. Hoan and N. Huong (Hydrometeorological Service of Vietnam), L. Peng and I Neo (Malaysia), R. Turco (U. California, USA), J. Elkins (NOAA, USA), J. Ju (Chinese Ministry for Science and Technology). CGBAPS ASM held at CSIRO Atmospheric Research, Aspendale.
2000	Lead Scientist (Whittlestone - radon) resigns (total 9). New CGBAPS staff member (Wheaton) appointed, Gough resigns. Lidar and LWR ceased operation. NIES (Japan) flask air sampling commences, particularly for short-lived halocarbon species. BoM/CSIRO/UEA seawater sampling and analysis (methyl halides) commences. UCSD flask air sampling for N isotopes commenced. New CSIRO $\text{CO}_2$ analyser (LoFlo) installed. VDL celebrates 175 anniversary. International visitors: K. Mace (Texas A&M U., USA). CGBAPS ASM held at CSIRO Atmospheric Research (Aspendale).
2001	Lead Scientist (Zahorowski – radon) appointed, (Ayers – multi-phase atmospheric chemistry) resigns and (Boers – radiation) resigns (total 8). Price resigns from Working Group. CGBAPS staff member (Weymouth) resigns. Lead Scientists (Francey, Steele) awarded the Victoria Prize. CGBAPS staff member L. Porter achieves 30 years service with the Bureau. Station struck by lightning. AGAGE GC-ECD $\text{SF}_6$ analyser installed. Phase 1 Woolnorth wind farm constructed. International visitors: K. Suda (JMA, Japan), G. Sturrock (UEA, UK), C. Lindley (CalTech, USA), B. Hall and P. Sheriden (NOAA, USA), C. Simmonds (Bowdoin College, USA), M. Hitoski and Dr Katsumoto (NIES, Japan). CGBAPS ASM held at Antarctic CRC, University of Tasmania (Hobart).
2002	OiC (Tindale) resigns. Lead Scientist (Francey – C isotopes) resigns (total 7). Forgan appointed to Working Group. CGBAPS permanent staff reduced from 6 to 5. CGBAPS staff member L. Porter awarded National Australia Day Medal. Lead Scientist (Galbally) elected to Australian Academy of Technological Sciences and Engineering (ATSE). Lead Scientist (Fraser) awarded US EPA Stratospheric Ozone Protection Award. ANU rainwater sampling and UCSD air sampling for N isotopes closed down. $\text{NO}_x$ analyser turned off. International visitors: C. Zellweger and S. Reimann (EMPA, Switzerland). CGBAPS ASM held at CSIRO Atmospheric Research (Aspendale).
2003	OiC (Cainey) appointed. CGBAPS permanent staff increased from 5 to 6 (Quartararo appointed and later resigns). CSIRO flask sampling for $\text{O}_2/\text{N}_2$ terminated. Telstra tower refurbishment commenced. Phase 2 of Woolnorth wind farm commenced. International visitors: B. Bryson (author), C. Leck (U. Stockholm, Sweden), J. Petersen (NZ), H. Jansen (centre for Isotope Research, The Netherlands), J. Elkins (NOAA, USA). CGBAPS AGM held at CSIRO Atmospheric Research (Aspendale).

**Table 2.** continued....

Year	Cape Grim events
2004	Lead Scientists (Gorman – meteorology, Krummel – CO <sub>2</sub> and non-CO <sub>2</sub> GHGs, Keywood – multi-phase atmospheric chemistry) appointed (total 10). New CGBAPS staff members (Hood, Rickard, McEwan) appointed, Britton, Wheaton resigns. Lead Scientist (Galbally) awarded the CASANZ Werner Strauss achievement Award. Lead Scientist (Fraser) awarded CSIRO Lifetime Achievement Award. Rn instrument HURD-1 and CO <sub>2</sub> analyser BASGAM shut down after 24 years and 14 years operation respectively. AGAGE GC-MS Medusa installed and PFC measurements commence. AWS, new O <sub>3</sub> instrument CN counter (TSI 3010) installed. Six new air inlets installed on Telstra tower at 70 m. Phase 2 of Woolnorth wind farm commences operation. International visitors: R. Weiss, B. Miller (SIO, U. California at San Diego, USA), J. Duplissey (U. Claremont-Ferrand, France), D. Moller (Brandenburg Institute of Technology, Germany), A. Hirsch (NOAA, USA), N. Hayati (Indonesian Baseline Station, Indonesia), R. Moss (NIWA, NZ); AGAGE scientists visit Cape Grim. CGBAPS ASM held at CSIRO Atmospheric Research (Aspendale).
2005	30 <sup>th</sup> year of observations at Cape Grim. Former Lead Scientist (Pearman) and Lead Scientist (Fraser) elected to Australian Academy of Technological Sciences and Engineering (ATSE). Station struck by lightning, damaging several instruments. New gas cylinder store constructed, kitchen and bedrooms upgraded. Ceilometer, four-stage impactor aerosol sampler (U. Colorado, 50m) installed. Second Telstra tower refurbishment commenced. Precursors to Particles 2005 campaign. International visitors: N. Cassar (Princeton U., USA), G. Jennings (National U. Ireland, Ireland), R. Derwent (U. Bristol, UK), D. Moller (Brandenburg Technical U., Germany). CGBAPS ASM held at CSIRO Marine and Atmospheric Research (Aspendale).
2006	30 <sup>th</sup> anniversary celebrations held at Cape Grim. Visitors included Dr L. Barrie (GAW, WMO, Switzerland), Dr G. Foley (Bureau), Dr G. Ayers (CSIRO). Management Group member and former Lead Scientist (Ayers) elected to ATSE. CGBAPS permanent staff member Porter seconded to CSIRO. Precursors to Particles 2006 campaign. Telstra tower refurbishment completed. Monthly rain sampler (CSIRO), O <sub>2</sub> /N <sub>2</sub> instrument (CSIRO) and sea state camera installed. Construction of Stage 3 of Woolnorth wind farm. International visitors: D. Shallcross (U. Bristol, UK), A. Gomez, M. Harvey, P. Johnston, T. Hay, A. Fraser (NIWA, NZ), T. Stein, O. Ibrahim (U. Heidelberg, Germany), A. Goldstein (U. California, Berkeley, USA), Z. Lingxi (CMA, China), N. Hayati (BMG, Indonesia), L. See Fook (Malaysian Met. Service, Malaysia), C. Labuschagne, J. Mpepya (S. African Weather Service, S. Africa). CGBAPS ASM held at CSIRO Marine and Atmospheric Research (Hobart).

## Publications

Appendix A. (p. 95-145) details the publications listed or contained in *Baseline*, the annual/biennial report of activities in the Cape Grim program. *Baseline* records that, up to 2006, 202 papers have been published by Lead Scientists (lead or co-author) or other Australian scientists reporting and interpreting Cape Grim data in peer-reviewed international journals, including 15 in *Nature/Science* (average 1 every 2 years), 62 in the *Journal of Geophysical Research* (2 per year), 27 in the *Journal of Atmospheric Chemistry* (1 per year), 19 in *Tellus*, 16 in *Geophysical Research Letters* and 13 in *Atmospheric Environment*. The average peer-reviewed international journal publication rate is 7 per year; the peak year for these publications was 1998 with 22 papers, including 13 in the *Journal of Geophysical Research*.

Up to 2006, *Baseline* contained 409 research reports and data summaries, about 20 per *Baseline* issue and typically 30 per issue in the past 5 issues of *Baseline*. *Baseline* also details about 600 conference papers reporting Cape Grim activities, authored/co-authored by Australian scientists involved in the Cape Grim Program.

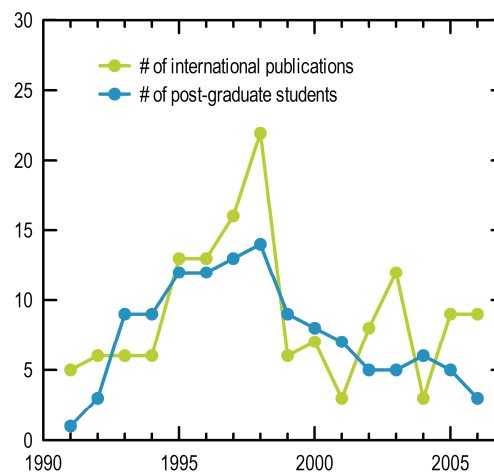
## Personnel

Appendix B. (p. 146-151) lists personnel involved in the Cape Grim program since 1975, including members of the Management Group, the Working Group, Lead Scientists, CGBAPS on-site staff, off-site staff and post-graduate students.

Since 1984, the Management Group (2) has consisted of senior appointments from the Bureau of Meteorology and CSIRO. Working Group members have varied from 9 to 17, typically 13.

Since 1979 Lead Scientist numbers have varied from 7 to 13, typically 10. Since 1976 CGBAPS permanent on-site staff numbers have varied from 2 to 6, having remained at 6 since 1989.

Post-graduate students involved at Cape Grim commenced in 1991 (1), reached peak numbers in 1998 (14), gradually declining to 3 in 2006. Not surprisingly, there is a significant correlation between numbers of post-graduate students and peer-reviewed papers in international journals, the latter peaking at 22 in 1998 (Figure 3).

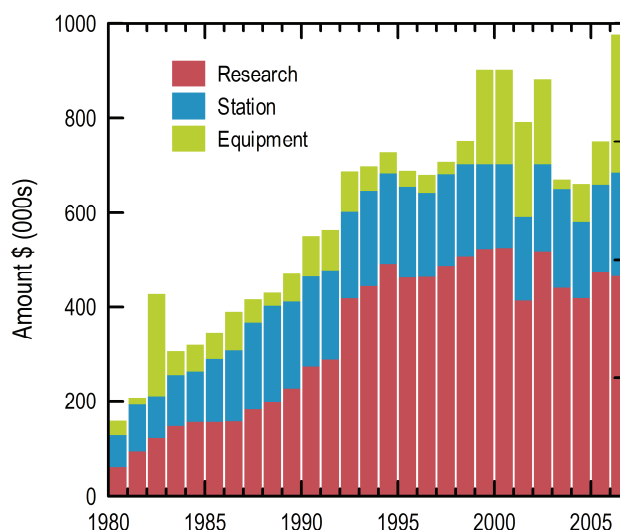


**Figure 3.** Cape Grim international peer-reviewed publications and post-graduate student numbers 1991-2006.

## Budget

The evolution of the Cape Grim budget since 1980 is shown in Table 2 and Figure 4.

From 1980 to 1995 the Cape Grim budget grew by 11-12% per year and since 1995 the research and station budget has remained stable at close to \$700,000 per year. The equipment budget has varied significantly, averaging about \$50,000 per year for most years except 1982-1983, 1999-2003 and 2006-2007, in which equipment expenditure averaged about \$200,000 per year.



**Figure 4.** DST/Bureau of Meteorology Cape Grim budget, 1980 – 2006.

**Table 2.** DST/Bureau of meteorology Cape Grim budget (1980-2007): research, Station (operational) and equipment

Period	Research	Station	Equipment	Total	Period	Research	Station	Equipment	Total
1980/1981	61,500	66,500	30,000	158,000	1994/1995	491,000	191,800	44,200	727,000
1981/1982	94,000	98,000	15,000	207,000	1995/1996	461,800	193,100	33,100	688,000
1982/1983	122,250	87,750	217,000	427,000	1996/1997	463,000	179,000	38,000	680,000
1983/1984	147,100	107,945	50,955	306,000	1997/1998	487,000	194,000	26,000	707,000
1984/1985	155,700	106,900	56,900	319,500	1998/1999	507,200	194,800	50,000	752,000
1985/1986	155,500	133,844	56,896	346,240	1999/2000	522,270	179,730	200,000	902,000
1986/1987	156,700	151,000	82,100	389,800	2000/2001	524,310	177,690	200,000	902,000
1987/1988	181,750	185,448	46,645	415,843	2001/2002	413,447	177,000	201,000	791,447
1988/1989	198,700	203,800	27,500	430,000	2002/2003	517,260	184,000	178,000	880,000
1989/1990	226,500	184,600	58,900	470,000	2003/2004	440,000	210,000	20,000	670,000
1990/1991	273,300	190,400	86,300	550,000	2004/2005	418,366	161,634	81,000	661,000
1991/1992	288,200	188,700	86,000	562,900	2005/2006	474,184	185,000	90,000	749,184
1992/1993	418,200	183,300	85,500	687,000	2006/2007	464,500	220,000	292,000	976,500
1993/1994	443,450	202,950	51,100	697,500					