Cape Grim Baseline Air Pollution Station

Annual Meeting, 1994

Programme

Thursday 3 November

Chair	*John Gras*	
08:50	Meeting opens	General information on arrangements etc.
09:00	Steve Wilson and Bruce Forgan	The Cape Grim Passive Radiation Program
09:55	Ian Galbally	Surface and satellite derived tropospheric ozone over South Eastern Australia
10:15	Tom Clarkson	Benzene in New Zealand air
10:35	**Morning Tea**	
Chair	*Tom Clarkson*	
11:00	Art Downey	The Cape Grim Meteorology/Climatology Program
11:55	John Ivey	Gas chromatographic analysis of atmospheric dimethylsulfide and carbon disulfide at Cape Grim.
12:15	Jill Cainey	Annual variations in the size distributed chemical composition of aerosol at Cape Grim
12:35	**Lunch**	
Chair	*Neil Trivett*	
13:30	Chad Dick	The relationship between MSA concentrations and Baseline air temperature at Cape Grim
13:50	Tony Chaffey	A review of the results from the acid rain performance studies, 1990-93
14:10	Kevin Rosman	Lead isotopes in continental aerosols collected at Cape Grim
14:30	Rob Gillett	Formaldehyde concentrations at Cape Grim (October to December, 1993)
14:50	**Afternoon Tea**	
Chair	*Ed Dlugokencky*	
15:20	Ernst Brunke	The Cape Point trace gas research project
15:50	Steve Ryan	Non-baseline studies at Mauna Loa and American Samoa Observatories
16:10	Mike Esler	Monitoring of baseline CO, CH4, N2O and CO2 using FTIR spectroscopy
16:30	Helen Beggs	Air-sea exchange of CO2 over the Antarctic seasonal sea-ice zone
16:50	Paul Steele	Recent results from measurements of several trace gases (CH4, CO, H2, CO2, and N2O) at Cape Grim
17:10	Close	
18:00	**Dinner**	**Imperial Kingdom Restaurant**

Friday 4 November

Chair	*Ernst Brunke*	
09:00	Roger Francey	New results from the Cape Grim carbon dioxide stable isotope program
09:20	Ed Dlugokencky	Trace Gas Measurements from the CMDL Global Air Sampling Network
09:50	Steve Ryan	The non-baseline CO2 record at Cape Grim
10:10	Roger Dargaville	The 4-dimensional assimilation of global surface CO2 data
10:30	**Morning Tea**	
Chair	*Steve Ryan*	
11:00	Martin Platt and Reinout Boers	The Cape Grim Active Radiation Program
11:55	Neil Trivett	The great methane depression of 1992/93 - fact or fiction
12:15	Tom Clarkson	Ethane and propane in the southern marine troposphere
12:35	**Lunch**	
Chair	*Jane Warne*	
13:30	Wlodek Zahorowski	Design and performance of a novel two-filter radon detector
13:50	Jie Tang	China Global Atmposphere Watch Baseline Observatory and its measurement programs - Total ozone, UV-B and surface ozone
14:10	Stu Whittlestone	The French/Australian radon intercomparison
14:30	Greg Ayers	Marine boundary layer photochemistry at Cape Grim
14:50	**Afternoon Tea**	
Chair	*Chad Dick*	
15:20	David Etheridge	Trends in CO2 and CH4 during this century from air in Antarctic ice and firn
15:40	Paul Fraser	Halocarbon measurements at Cape Grim: trends in total organic chlorine
16:00	**Close of meeting**	

Benzene in New Zealand air

T.S. Clarkson, R.J. Martin and J. Rudolph

Abstract

As a consequence of the progressive removal of lead from motor gasoline in New Zealand during the past ten years, there has been an increasing awareness of emissions of benzene to the atmosphere, through evaporative losses of fuel using aromatics as octane rating enhancers, and as a vehicle exhaust emission. It is likely that benzene concentrations in the New Zealand urban environment are higher than in in the past, and as a result of changes in urban sources we could also expect increases in rural environments. Recent work in New Zealand gives typical concentration values for benzene in the urban, rural and marine environments in the ranges 300-6000, 0-900 and 0-70 ppt respectively.

AN AUTOMATED INSTRUMENT FOR THE ANALYSIS OF ATMOSPHERIC DIMETHYLSULFIDE AND CARBONDISULFIDE

J.P. Ivey and H.B. Swan
Australian Government Analytical Laboratories
PO Box 84, Kingston, Tasmania, Australia

An automated gas chromatograph (GC) has been developed for the analysis of the atmospheric concentrations of dimethylsufide (DMS) and carbondisulfide (CS_2) at the Australian Baseline Air Pollution Station Cape Grim. The system comprises cryogenic concentration of DMS and CS_2 from 4 litres of air after oxidant and water removal, capillary gas chromatography, and sulfur chemiluminescence detection. Calibration is by injection of a known quantity of methylethysulfide (MES) as an internal standard into the sampled air stream. Detection and quantitation of DMS and CS_2 in the range of 5 to 500 ng/m^3, typical of the annual concentration variation of DMS and CS_2 at Cape Grim, has been achieved with a sampling frequency of 2 samples per hour and a detection limit of 100 pg S per compound. A comparison of results from the automated GC and those obtained by a gold-coated glass wool trapping method with atomic emission detection is presented.

SIZE DISTRIBUTED CHEMICAL COMPOSITION OF CCN AT CAPE GRIM

J. Cainey, G. Ayers and M. Hooper
Division of Atmospheric Research, CSIRO, Australia
Centre for Environmental Science, Monash University, Australia

A micro orifice uniform deposition impactor (MOUDI) was installed at Cape Grim, Tasmania ($40^0 40' 56"$, $144^0 41' 18"$), in September 1993, to monitor the size distributed chemical composition of cloud condensation nuclei.
The MOUDI consists of twelve stages, with cut offs from particle radius of 9 to 0.028μm. It was installed with a heated inlet to bring ambient air to a relative humidity to less than 50%. Sampling criteria were set for a minimum volume of $100m^3$ of baseline air, that is air originating from the remote southern ocean, arriving at Cape Grim in the sector 190^0 to 280^0 and having a CN concentration of less than $600Ncm^{-3}$.
Each of the twelve stages were analysed, using ion chromatography, for cations (sodium, ammonium, calcium, potassium and magnesium), anions (chloride, bromide, nitrate, sulfate and oxalate) and methane sulfonic acid.
The results indicated that sea salt predominated at the larger size ranges and that the non sea salt sulfate maximum occured at a lower size range. Methanesulfonate showed a bimodal distribution, suggesting that particle surface area influences the uptake of methane sulfonate.
The MOUDI results, taken in conjunction with concurrent measurements of CCN number/size distribution, give an insight into the relative importance of sea salt, sulfur species and possibly other compounds, such as organic carbon, in climate modification.

The relationship between MSA concentrations and temperature in marine (baseline) air at Cape Grim

A.L. Dick[1], S. Ryan[2], and G.P. Ayers[3]

[1]Cape Grim Baseline Air Pollution Station, Smithton, Tasmania, Australia
[2] CGBAPS, Smithton, Tasmania, Australia & Mauna Loa Observatory, Hawaii
[3] Division of Atmospheric Research, CSIRO, Aspendale, Australia

If the postulated feedback mechanism by which marine biological activity might control tropospheric temperature does operate, then a relationship should exist between sea-surface temperature and emissions of reduced sulphur gases such as DMS (dimethyl sulphide) from marine organisms. Concentrations of aerosol MSA (methane suphonate), a major oxidation product of DMS, have been measured at Cape Grim (41^0S, 145^0 E) since 1978. This quantity may be used as a surrogate measure of DMS emissions. A continuous detailed record of air temperature at the site allows the separation of marine air temperatures from the "baseline" sector, considered to be a proxy for sea-surface temperature in the region, from the overall averages which include all wind directions. After removal of the mean seasonal cycle for both variables, residual MSA concentrations are compared with the baseline air temperature "anomalies" to test for correlation. An attempt is also made to examine other factors which might influence the relationship, such as wind speed, rainfall amount and air mass trajectories.

A review of the Results from the Acid Rain Performance Studies 1990-93

A.M. Chaffey, J.P. Ivey, T.L. Lewis
Australian Government Analytical Laboratories,
PO Box 84, Kingston, Tasmania, Australia

The results for the studies 1990-93 are discussed.

Results are compared to the WMO Quality Standards.

Results from AGAL for the 1992 & 1993 studies are compared to other participating laboratories by using a ranking test, the comparison is based on analytes routinely measured for BAPS programs.

Improvements in performance are discussed.

Lead Isotopes in Continental Aerosols Collected at Cape Grim.

K.J.R. Rosman*, W. Chisholm* , A Dick[#] and Others.
*Curtin University of Technology, Bentley, W.A.; [#]CGBAPS.

Measurements have been made of the lead on aerosols collected at Cape Grim. Sampling was carried out between 1st March and 3rd May from the Telecom tower using acid-cleaned 0.45 micron acetate filters through which air was pumped at ~0.8 cub m/h. Non-baseline "Northern Exposure" limits were selected to capture aerosols from the Australian mainland. Favourable collection conditions were only experienced for a short time and only a relatively small quantity of aerosol was collected, although the amount was sufficient to give an indication of the average lead concentration. The isotopic composition of the lead was determined on a VG354 TIMS instrument and lead concentrations were measured by Isotope Dilution Mass Spectrometry. The filters were processed in laboratories supplied with HEPA-filtered air and ultra clean procedures were employed.

Also an aerosol sampling network was established with the aid of many helpers ("others"), allowing the isotopic composition of the Australian lead emissions to be determined during the same period. A considerable spread in the isotopic signature was observed reflecting different sources of the alkyl lead additives used in Australian petrol.

Formaldehyde and Peroxide Concentrations During October to December 1993.

R.W.Gillett[1], C. de Serves[2] and G.P. Ayers[1]
[1] CSIRO Division of Atmospheric Research,
Private Bag No.1, Mordialloc, 3195.
[2] Dept. Meteorology, Stockholm University, Sweden.

Abstract

Concentrations of formaldehyde and peroxide were measured during a field campaign from October 21st to December 18th, 1993. The formaldehyde measurement technique is based on the Hansch reaction and some details of this will be discussed. Both Formaldehyde and peroxide show a diurnal cycle in hourly mean baseline concentrations. Formaldehyde concentrations have an amplitude of about 100 pptv with a maximum at about 390 pptv at about 13:00 and a minimum of 295 pptv which occurs at about 02:00 to 06:00. Peroxide concentrations have an amplitude of about 220 pptv with a maximum of about 530 at about 18:00 and a minimum of about 310 occurring at about 08:00. The average diurnal concentration of formaldehyde is about 340 pptv, and this is somewhat higherthan some model results which estimate concentrations of about 200 pptv.

The Cape Point trace gas research project

Ernst-Günther Brunke[1] and Hans-Eckhart Scheel[2]

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[2]Fraunhofer Institute for Atmospheric Environmental Research (IFU), D-82467 Garmisch-Partenkirchen, Germany

The Cape Point trace gas research program was initiated in 1978 in response to the 1976 Stockholm Conference where a call went out to nations to partake in global environmental monitoring. At present, the work conducted at Cape Point (34°S, 18°E), is a collaborative venture between the CSIR (Stellenbosch, South Africa) and the Fraunhofer Institute in Garmisch, Germany.
For the past fifteen years measurements have been made in two historical cottages, which have now become inadequate for this purpose. New laboratory facilities (120 m^2), which are to be completed before the end of this year, are currently being built.
The technical status of the measurement program has been constantly upgraded. This includes the arrival of mains electricity at the site in 1992, the acquisition of the radio mast from the lighthouse authorities and the commissioning of a data retrieval/processing system for GC data in 1993.
Steps are currently also underway to have Cape Point registered as a Global Atmosphere Watch station, which has previously been impossible for political reasons.

The gases, which are at present being measured at Cape Point on a continuous basis include CO, CO_2, CH_4, N_2O, O_3 and the CFCs: $CFCl_3$ (F-11), CF_2Cl_2 (F-12), CCl_2F-$CClF_2$ (F-113) as well as CH_3CCl_3 and CCl_4. In addition, meteorological parameters are measured as well as UVB.

During the past three years significant changes have been observed in the growth rates for several of these gases, notably F-11, F-12, CH_3CCl_3, CO_2 and CH_4. Whilst the decline in CFC growth rates have been in response to the successful implementation of the Montreal Protocol, those observed for the major greenhouse gases, CO_2 and CH_4, are not so easy to explain.
The presently observed Cape Point growth rates amount to circa 2 $ppt.yr^{-1}$ for $CFCl_3$; 8,3 $ppt.yr^{-1}$ for CF_2Cl_2; 0,7 $ppm.yr^{-1}$ for CO_2 and 6 $ppb.yr^{-1}$ for CH_4.

Although a general decrease in the concentration levels of tropospheric CO has been noted at several measuring sites around the globe, no long-term trend has to date been established from the Cape Point CO time series. Similarly, no long term trend is evident for lower-tropospheric O_3.

The detrended growth rates for CO, CH_4 and O_3 (1983-93) show similar interannual variations with peaks in 1986/87 and 1991, which correlate with major El Niño events. This observation as well as correlations between the annual amplitudes for CO, CH_4 and O_3 suggest common transport and/or source/sink mechanisms, most probably related to biomass burning from Central Africa.

Non-Baseline Studies at Mauna Loa and American Samoa Observatories

Steve Ryan
CGBAPS & Mauna Loa Observatory

Non-baseline data from two of the NOAA/CMDL stations has been used to investigate the CO2 exchange and photosynthesis of the Samoa tropical forest ecosystem and to define the 34-year outgassing history of Mauna Loa volcano. Both of these studies have provided valuable scientific insight which would have otherwise been unavailable. The Samoa data were used to calculate the diurnal net ecosystem production and photosynthesis curve during a three-day period of steady non-baseline winds in 1988, and to estimate the photosynthetic efficiency of a whole ecosystem. The Mauna Loa data show the quiescent outgassing cycle of CO2 and aerosols which are at a maximuim shortly after each eruption and decline exponentially thereafter. These results show a steady enrichment of aerosols relative to CO2 as the magma body rises to the surface prior to an eruption, and suggest that multiple magma reservoirs can exist. A great deal of valuable science undoubtedly lurks in our non-baseline data sets and needs to be uncovered.

Monitoring of Baseline CO, CH4, N2O and CO2 using FIR spectroscopy

M.Esler, D.Griffith, S.Wilson and P.Steele.

An instrument using Fourier Transform Infrared (FTIR) spectroscopy to measure CO, N2O, CH4 and CO2 concentrations at baseline levels is being developed. The technique is based on the collection of a long path (22m) absorbance spectrum of air in the gas phase. Recently the instrument was taken to CSIRO DAR's GASLAB where their suite of calibration gases was analysed. Results of the comparison of the FTIR and GC techniques are presented.

"Air-sea exchange of CO2 over the Antarctic Seasonal Sea-ice Zone"

Helen Beggs, IASOS and Antarctic CRC, Hobart.
Bronte Tilbrook, CSIRO Oceanography and Antarctic CRC, Hobart.
Roger Francey, CSIRO DAR, Aspendale.

New results will be presented that indicate that the region of the Seasonal Ice Zone south of 60S and between 60E and 150Eis far less of a net sink for atmospheric CO2 during spring and summer than previously supposed. This sink is most pronounced west of 105E, where it is associated with intense phytoplankton blooms. Although the extremely low values of oceanic pCO2 measured during summer in this region appear to have had little impact on atmospheric CO2 concentrations via net exchange, the high marine productivity appears to have had a significant effect on the 13C/12C in atmospheric CO2 measured between 60E and 105E via gross exchange of CO2 with the ocean.

New results from the Cape Grim carbon dioxide stable isotope program

R.J. Francey, C.E. Allison, E.D. Welch and R.L. Langenfelds

The Cape Grim record of the d13C of atmospheric CO2 is presented as the best global record available over the last decade. The talk will demonstrate the implications of the record in terms of implied terrestrial (plant) and oceanic uptake of fossil fuel CO2. The history of carbon exchange from this record is greatly different from that previously published. Possible reasons for the discrepancy will be explored.

Trace Gas Measurements from the CMDL Global Air Sampling Network

Ed Dlugokencky, NOAA/CMDL, Boulder, Colorado

The U.S. National Oceanic and Atmospheric Administration (NOAA), Climate Monitoring and Diagnostics Laboratory (CMDL), Carbon Cycle Group operates a global cooperative air sampling network to determine the spatial and temporal variations in atmospheric carbon dioxide and its stable isotopes, methane, and carbon monoxide. The measurements are used to constrain trace gas sources and sinks and determine long-term trends. Methane data reveal that, while this compound's atmospheric burden continues to increase, the rate of increase has slowed over the past decade, and significant interannual variations in the growth rate exist.

In this seminar, an overview of the CMDL methane measurements will be given and possible causes for changes in the methane growth rate will be explored.

The Non-Baseline CO2 Record at Cape Grim

Steve Ryan
CGBAPS & Mauna Loa Observatory

Non-baseline CO2, radon, CN, solar radiation, and meteorological data at Cape Grim are being analysed to define the CO2 exchange and photosynthesis of northwestern Tasmania on timescales from days to decades. The long-term CO2 record, at either 70m or 10m has been used to estimate the baseline differenced CO2. These data show the CO2 cycles of both Tasmania and the mainland. The differential CO2 data between 70m and 10m is used to measure CO2 exchange of the local ecosystem, within 10 km of the station. Both data sets show strong diurnal and seasonal cycles which reflect nearby respiration and photosynthesis. There is a net excess of CO2 coming from all non-baseline directions. Supporting data suggest that the local biosphere is a significant net source of CO2. There is no evidence that excess CO2 is produced during times of high CN, suggesting that combustion is a relatively minor fraction of the total net source. A simple model which relates the nearby and distant diurnal CO2 cycles has been developed to estimate the average surface flux of CO2 to the atmosphere.

Four Dimensional Assimilation of Global Surface CO2 Data

Roger Dargaville and Ian Simmonds
School of Earth Sciences, University of Melbourne

Inverse tracer models are often constrained with zonal (latitude) CO2 distributions determined by mathematical fit to observed data. The longitudinal variation is difficult to determine given the small number of monitoring stations.

Mathematical fitting ignores large amounts of circulation data available which must be a determining factor in the distribution of CO2. To combine the circulation and CO2 observations we assimilate the CO2 data into a GCM. To maintain the natural north-south gradient of CO2 we need surface sources. We use the sources generated from the inverse model as a first approximation. With the new (two dimensional) CO2 distribution generated by the assimilation we constrain the inverse model to produce new sources and so on till a steady state is reached. The final CO2 field is consistent with both the circulation and the CO2 observations.

The great methane depression of 1992/93 - fact or fiction.

Neil Trivett

During the winter of 1992/93 there was a noticeable reduction in the methane growth rate at Alert, NWT. A comparable reduction in the growth rate of carbon dioxide was not as obvious leading to the considerable speculation as to the cause. This presentation examines the timing of growth rate changes and offers further speculations as to possible causes.

Ethane and propane in the southern marine troposphere

T.S. Clarkson, R.J. Martin and J. Rudolph

Abstract

Non-methane hydrocarbons (NMHC) are important participants in the trace gas chemistry of the troposphere, on local and global scales. Knowledge of their distribution on a large scale can be used to improve our understanding of atmospheric oxidation and transport processes. Southern hemisphere data is sparse, although there has been some information on spatial and seasonal distributions for several years. Data collected at Baring Head and Scott Base since 1990 shows consistent lower summer concentrations of ethane (140ppt) and propane (~10 ppt) than previous work suggested, although winter maxima are similar to those reported previously (420 ppt and 100 ppt respectively)

Design and performance of a novel two filter radon detector

Wlodek Zahorowski and Stewart Whittlestone,
ANSTO, Lucas Heights, NSW Australia.

ANSTO has developed a new baseline radon detector which is better suited to remote sites than the type at Cape Grim. I combines the properties of inherent simplicity, insensitivity to environmental conditions, low power consumption and improved time resolution. Measurements made with a prototype at Cape Grim are compared to radon concentrations obtained from the main radon detector. The new detector has met its design specification.

China Global Atmosphere Watch Baseline Observatory and its Measurement Programs - Total Ozone, UV-B and Surface Ozone

Tang Jie, Guo Song, Zheng Xiang Dong
Chinese Academy of Meteorological Sciences, Beijing

Zhu Qingbin, Zhang Xiao Chun, Zhao Yu Cheng
Qinghai Meteorological Bureau, Xining

China Global Atmosphere Watch Baseline Observatory, jointly funded by Chinese government and GEF (Global Environment Facility) is located in the north-east part of Qinghai-Tibetan plateau, Qinghai province of China. It was opened in September 17, 1994. An overview of the Observatory is given. The result obtained in the investigative observations for total column ozone and UV-B started from August of 1991, by using a Brewer spectrometer and for surface ozone started from December of 1993, by using TECO photometric analyzer, is analysed.

The French/Australian radon intercomparison

Stewart Whittlestone, ANSTO, Menai, NSW 2234, Australia
and
Georges Polian,
CFR/CNRS, Gif-sur Yvette, France

ABSTRACT

A radon daughter detector belonging to the Centre des Faibles Radiations (France) has been operating at Cape Grim since March 1994. The purpose is firstly to prepare the instrument for operation at Macquarie Is next year, and secondly to learn more about the relationship between radon and radon daughter concentrations. It is shown that the behaviour of the radon daughter equilibrium factor is complex, with strong indications that radon daughters sometimes initiate particle growth. This is a possible explanation of the high equilibrium factor sometimes observed in the absence of condensation nuclei.

Marine boundary layer photochemistry at Cape Grim

Greg Ayers, Henry Granek and Reinout Boers

Recent efforts to develop a photochemcical model applicable to the marine boundary layer encountered at Cape Grim will be described in this talk. Progress to date and ideas for the future will be illustrated by a comparision between some initial model output and observational data on a few key chemical species.

TRENDS IN ATMOSPHERIC CO2 AND CH4 CONCENTRATIONS DURING THIS CENTURY FROM AIR IN ANTARCTIC ICE AND FIRN.

D.M. ETHERIDGE, L.P. STEELE, R.J. FRANCEY, R.L. LANGENFELDS,
I.G. ENTING, C. TRUDINGER, P.J. FRASER AND C.E. ALLISON
CSIRO, Division of Atmospheric Research

J.-M. BARNOLA,
CNRS Laboratoire de Glaciologie et
Geophysique de l'Environnement
and
M. MAISS,
Institut fur Umweltphysik, Der Universitat
Heidleberg

Ice core records of the atmosphere have usually been associated with long timescales such as pre-industrial and glacial times. We have investigated more recent changes in the atmospheric concentrations of CO2 and CH4 by measuring air from the ice and firn on Law Dome, Antarctica. The high rate of snow accumulation results in a fast bubble close-off process, which reduces the age spread of the enclosed air. Measurements of concentration profiles in the permeable firn layer demonstrate the link of the ice core air with the atmosphere. The ice core and firn air results are interpreted by using a model that incorporates the effects of air diffusion through the firn and bubble close-off at the firn-ice transition. The most recent ice core air (about 1980 AD) overlaps with modern, direct atmospheric measurements (such as at CG BAPS). The narrow air-age spread has allowed measurement of significant, decadal-term changes to the growth rates of CH4 and CO2 earlier this century.

Halocarbon measurements at Cape Grim: trends in total organic chlorine

P.Fraser, N.Derek and R.Langenfelds, CSIRO Division of Atmospheric Research, Aspendale, Victoria,
Australia
L.Porter, Bureau of Meteorology-Cape Grim Baseline Air Pollution Station, Smithton, Tasmania, Australia
D.Oram and S.Penkett, University of East Anglia-School of Environmental Sciences, Norwich, UK
R.Weiss and B.Miller, Scripps Institution for Oceanography, University of California at San Diego, La Jolla,
California, USA
S.Montzka, J.Butler and J.Elkins, National Oceanic and Atmospheric Administration-Climate Monitoring
and Diagnostics Laboratory, Boulder, Colorado, USA
R.Prinn, Center for Global Change Science, Massachusetts Institute of Technology, Cambridge,
Massachusetts, USA
D.Cunnold and F.Alyea, School of Geophysical Sciences, Georgia Institute of Technology, Atlanta,
Georgia, USA

Total organic chlorine in the background atmosphere is composed of a number of natural and anthropogenic chlorine-containing species such as the long-lived perhalogenated examples: CFC-11 (CCl3F), CFC-12 (CCl2F2), CFC-13 (CClF3), H-1211 (CBrClF2), CFC-113 (CCl2FCClF2), CFC-114 (CClF2CClF2), CFC-115 (CClF2CF3), carbon tetrachloride (CCl4), and the shorter lived hydrogenated species: HCFC-22 (CHClF2), HCFC-123 (CHCl2CF3), HCFC-141B (CH3CCl2F), HCFC-142B (CH3CClF2), methyl chloride (CH3Cl), dichloromethane (CH2Cl2), chloroform (CHCl3), methyl chloroform (CH3CCl3), trichloroethylene (CHClCCl2) and perchloroethylene (CCl2CCl2). All of these species have been detected in the background atmosphere at Cape Grim by either GC-ECD (in situ or air archive) or GC-MS (air archive) techniques. A brief summary of available data on the abundance and trends of these species at Cape Grim (or if not at Cape Grim then elsewhere in the Southern Hemisphere) will be given. The data have been collected in situ at Cape Grim by GC-ECD or from Cape Grim air samples in stainless steel flasks by GC-ECD or GC-MS techniques in three laboratories in the USA (University of California-Scripps Institution of Oceanography, National Oceanic and Atmospheric Administration-Climate Monitoring and Diagnostics Laboratory and the Oregon Graduate Institute) and one in the UK (University of East Anglia-School of Environmental Sciences).

Since all of these species have measurable abundances in the troposphere they are sources of stratospheric chlorine. Growing levels of stratospheric chlorine play major roles in the observed stratospheric ozone depletion at mid-latitudes and in polar regions. The Montreal Protocol is designed to control the emissions of all the major, long-lived organochlorine species as well as the most significant anthropogenic hydrogenated species. The aim of the Protocol is to first stabilise and then reduce total organic chlorine in the stratosphere. Cape Grim is one of the few locations in the world where most, if not all, of the important organochlorine species have been measured on decadal time scales. It is expected that total organochlorine levels in the troposphere will stabilise soon. The data collected at Cape Grim will be examined to see if, or possibly when, tropospheric chlorine levels will stabilise.

THE CAPE GRIM PASSIVE RADIATION PROGRAM

Stephen Wilson

Department of Chemistry, University of Wollongong, Wollongong, NSW 2522

Bruce Forgan

Bureau of Meteorology, Melbourne, Victoria 3001

Abstract

Not available

SURFACE AND SATELLITE DERIVED TROPOSPHERIC OZONE OVER SOUTH EASTERN AUSTRALIA

Ian Galbally

CSIRO Division of Atmospheric Research, Aspendale, Victoria 3195

Abstract

Not available

THE CAPE GRIM METEOROLOGY/CLIMATOLOGY PROGRAM

Arthur Downey

Bureau of Meteorology, Melbourne, Victoria 3001

Abstract

Not available

RECENT RESULTS FROM MEASUREMENTS OF SEVERAL TRACE GASES (CH_4, CO, H_2, CO_2, AND N_2O) AT CAPE GRIM

Paul Steele

CSIRO Division of Atmospheric Research, Aspendale, Victoria 3195

Abstract

Not available

THE CAPE GRIM ACTIVE RADIATION PROGRAM

Martin Platt and Reinout Boers

CSIRO Division of Atmospheric Research, Aspendale, Victoria 3195

Abstract

Not available