

# CURRICULUM VITAE – IAN GALBALLY

## Ian Edward Galbally

CSIRO Marine and Atmospheric Research

Private Bag No. 1

Aspendale Victoria 3195

+61 (0)3 9239 4684

[ian.galbally@csiro.au](mailto:ian.galbally@csiro.au)



## Research Interests

Natural and human activities that affect the trace composition and chemistry of the atmosphere, particularly those influencing climate and air quality

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# CURRICULUM VITAE – IAN GALBALLY

## 1. Education

Bachelor of Science (Physics), Monash University

Master of Science (Meteorology), University of Melbourne

Doctor of Science (Chemistry), Monash University

## 2. Learned Academy and Professional Societies

Fellow, Australian Academy of Technological Science and Engineering

Fellow, Royal Australian Chemical Institute

Fellow, Clean Air Society of Australia and New Zealand

Member, International Indoor Air Quality and Climate Society

Fellow, Royal Meteorological Society (UK), 1971–1987

## 3. Awards

- 2011 Clean Air Medal, Clean Air Society of Australia and New Zealand  
"For his research, development and promotion of a wide range of air quality issues, particularly in the fields of greenhouse gases and climate change".
- 2010 Honorary Member International Commission on Atmospheric Chemistry and Global Pollution  
"In recognition of his excellence in science and his leadership of the International Atmospheric Chemistry Community".
- 2009 "Atmospheric Solutions" Greenhouse Award for Best Paper in the Field of Greenhouse/Climate Change at the 19th International Clean Air and Environment Conference, Perth, Western Australia, September 2009.
- 2009 CSIRO Light Metals Flagship Team Award  
"In recognition of outstanding multi-disciplinary research into organics removal and air quality assessment", 26 November 2009.
- 2007 UNEP/WMO Recognition Letter for contributing to the award of the Nobel Peace Prize to the IPCC.
- 2007 Finalist, Australian Museum Eureka Prizes People's Choice Scientist.
- 2004 Werner Strauss Lifetime Achievement Award, Clean Air Society of Australia and New Zealand  
"For making a significant contribution to achieving improvements in the quality of the air environment".
- 2004 CSIRO Division of Atmospheric Research - Chief's Exceptional Achievement Award  
"For producing an Authoritative Review that has become the roadmap for the Technical and Scientific Investigation of the Wagerup Air Quality Problem".

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- 2003 CSIRO Division of Atmospheric Research - Chief's Commendation Award "For his excellent efforts in leading the Wagerup Project consultations and negotiations".
- 1982–1983 Invited Guest Researcher, International Meteorological Institute, University of Stockholm.
- 1976–1977 Nuffield Foundation Travelling Fellowship, taken at the Division of Environmental and Medical Science, Atomic Energy Research Establishment, Harwell, UK.
- 1972–1973 Invited Visiting Scientist National Centre for Atmospheric Research, Colorado, USA.

#### **4. Membership of International, National and State Committees and Organiser or Convenor of Major Symposia and Workshops, 1994 – 2013**

- 2014– Program Advisory Committee - Environmental Science of RMIT University
- 2013– Organising committee, Clean Air Society of Australia and New Zealand 2015 Biennial Conference
- 2010– Scientific Advisory Group on Reactive Gases, Global Atmospheric Watch, World Meteorological Organization
- 2010– International Commission on Atmospheric Chemistry and Global Pollution of the International Association of Meteorology and Atmospheric Sciences
- 2010– Ozone Science Group, Department of Sustainability, Environment, Water Population and Communities, Australia
- 1978– Cape Grim Baseline Air Pollution Monitoring Station Working Group, Bureau of Meteorology (formerly Department of Administrative Services & Department of Science)
- 1993– National Greenhouse Gas Inventory Committee, Australia
- 2006–2009 Victorian Committee of the Australian Academy of Technological Sciences and Engineering
- 2005–2009 Wagerup Technical Advisory Panel, Western Australia
- 2007 Convenor, Session on Organics in the Atmosphere, The Federation of Asian Chemical Societies - Asian Chemical Congress (12ACC), Kuala Lumpur, Malaysia, 23–25 August, 2007.
- 2005–2007 Steering Committee, "30/50 The Technological Implications of an Australian population of 30 Million by 2050", A Study for the Scanlon Foundation by the Australian Academy of Technological Sciences and Engineering
- 1997–2006 Scientific Advisory Panel, Environment Protection Authority, Victoria
- 2002–2005 Editorial Board, Intergovernmental Panel on Climate Change (IPCC), Emission Factor Data Base Activity

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- 2000–2005 Scientific Advisory Group on Ozone, Global Atmospheric Watch, World Meteorological Organization
- 2003–2004 Technical Program Committee, “Water the Australian Dilemma”, 2003 Annual Symposium of the Australian Academy of Technological Sciences and Engineering
- 2001 Special Review Committee, Scientific Advisory Panel, Environment Protection Authority, Victoria
- 2000 Chair, The 2000 Priestley Lecture & Workshop on the Role of Aerosol in Urban and Regional Air Pollution, CSIRO Atmospheric Research, Aspendale, Australia, 6 December 2000
- 1999 Chair, Expert Group Meeting on Cross-sectoral Methodologies for Uncertainty Estimation and Inventory Quality, Intergovernmental Panel on Climate Change, Culham, UK, 5–7 October 1999
- 1998–2000 Integration and Synthesis Team, International Global Atmospheric Chemistry Project, International Geosphere Biosphere Programme
- 1997–2000 Deputy Chair of the IPCC activity “Managing Uncertainty in National Greenhouse Gas Inventories”
- 1997–1998 Royal Australian Chemical Institute representative on the Consultative Committee for the Air Quality NEPM
- 1994–1997 Project Leader/Co-ordinator “Japan–Australia Co-operation on Global Atmospheric Change”, a collaborative activity to strengthen modelling and measurements re global atmospheric change in both countries

### 5. Membership of Editorial Boards – Scientific Journals

- 2013– Editorial Board, *Elementa – The Science of the Anthropocene*
- 1983– Editorial Board, *Journal of Atmospheric Chemistry*
- 1987–1994 Editorial Board, *Tellus* (journal of the Swedish Geophysical Society)

### Web of Science ResearcherID: E-5852-2011

Citations 2689

h-Index = 26

### Google Scholar: Ian Galbally (publications confirmed)

Citations 4582

h-Index = 34

### 6. Career History

- 2003 – Chief Research Scientist (CSOF8.3) – research scientist role

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|           |  |
|-----------|--|
| 2002      | Senior Principal Research Scientist – research scientist role  |
| 1991–2001 | Program Leader and member of Divisional management committee   |
| 1985      | Senior Principal Research Scientist  |
| 1980      | Principal Research Scientist   |
| 1975      | Senior Research Scientist  |
| 1971      | Research Scientist   |
| 1966      | Experimental Officer Class 1, CSIRO Division of Meteorological Physics (now CSIRO Marine and Atmospheric Research) |
| 1966      | Royal Melbourne Institute of Technology, Lecturer (casual), Applied Physics  |

## 7. Contributions to Science Education

### Lectures, University of Melbourne 1975–1994

From 1975 Ian gave annual lectures and from 1979 to 1986 taught a course annually of 8 x 1-hour lectures Atmospheric Composition and Chemistry to 4<sup>th</sup> Year Students and postgraduate students Department of Meteorology. From 1988 to 1994, he annually taught courses on “Air Pollution Measurements” and “Atmospheric Chemistry” to postgraduate students in Environmental Engineering, University of Melbourne, Department of Chemical Engineering.

**Lectures, CRC for Southern Hemisphere Meteorology, Monash University, 1996, 1997**  
The Composition and Chemistry of the Troposphere (2 lectures each year).

### Lectures, Monash University 2010–2012

Guest lectures on environmental monitoring and measurements to undergraduate students in science and engineering.

**Students (Co-supervised: most undertook their research work under Ian’s direct supervision at CSIRO) and Post-Doctoral Fellows**

### Honours or Graduate Diploma

R. Sekhon, A. Kirkwood, (University of Melbourne), L. Duffy (Latrobe University), L. Kivlinghon (Swinburne University of Technology), E. Dunne (Monash University), R. Fedele (RMIT University), L.S. Kim (RMIT University), B. Grasso (RMIT University)

### Masters of Science

L. Kivlinghon (Latrobe University), R. Perera (RMIT University), W. Kirstine (Monash University)

### Doctor of Philosophy (graduated)

P. Torre (RMIT University)  
W. Kirstine (Monash University)  
D. Turner (University of Melbourne)  
E. Zardin (University of Western Australia)

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R. Gillett (Charles Darwin University)

## Doctor of Philosophy (in progress)

S. Lawson (Queensland University of Technology)

E. Dunne (Monash University)

E. Guerette (University of Wollongong)

## Post-Doctoral Fellows

C. Johansson (IMI Sweden), R. Ye (CSIRO), K. Nguyen (CSIRO)

## 8. Long-term Visitors

- 2005–2006 12-month Senior Fulbright Fellowship visit by Professor Allen Goldstein, Department of Environmental Science, Policy & Management, University of California at Berkeley.
- 1993–1994 12-month study visit by Dr Huang Guo-Hong, Chinese Academy of Sciences, Institute of Applied Ecology, Shenyang, China.
- 1993 6-month sabbatical visit by Professor Don J. McKenney, Department of Chemistry and Biochemistry, University of Windsor, Waterloo, Canada.
- 1991–1992 9-month study visit by Dr Shang Shu-Hui, Chinese Academy of Sciences, Institute of Applied Ecology, Shenyang, China.
- 1990–1991 6-month sabbatical visit by Professor Henning Rodhe, Department of Meteorology, University of Stockholm, Stockholm, Sweden.

## 9. Scientific Achievements

*(Including those with collaborators)*

Ian Galbally's original contributions to atmospheric science have been in several areas of the field of atmospheric composition and chemistry. A chronological sequence of the highlights includes:

- The pioneering study of the micrometeorology of ozone and its destruction at the earth's surface. The assessment of the global contribution of this ozone loss which makes up approximately one fifth of the ozone loss in the troposphere. This process of ozone deposition is now included in all dynamical models of atmospheric chemistry and climate and photochemical air pollution.
- Conducted one of the first studies of photochemical smog in a city outside of the USA, identifying photochemical smog in Melbourne, Australia, in 1969. His work during the late 1960's and early 1970's prompted further urban monitoring of ozone through state agencies and many subsequent studies of photochemical smog in Australia.
- Building the leading ozone and nitrogen oxide instruments (for their time) and pioneering the use of flux chambers that have calibrated boundary layers which allow the transfer of measurements to real world simulations. These instrumental developments were essential for the subsequent ozone uptake and nitrogen oxide emission studies.

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- Constructed a novel model of the photolysis of formaldehyde and production of carbon monoxide in rain droplets in the early 1970's. This was probably the first model incorporating photochemical and diffusion processes in a rain droplet.
- Construction of the first global atmospheric model of carbon tetrachloride and identifying it as a global man-made pollutant released between the 1910's and 1970's and still remaining in the atmosphere. Carbon tetrachloride is a source for chlorine in the stratosphere and, because it is a manmade product, is proscribed under the Montreal Protocol.
- Discovery of nitric oxide release from soils. This source of nitric oxide is around one sixth of the total atmospheric sources of nitrogen oxides ( $\text{NO} + \text{NO}_2$ ) and is included in all atmospheric chemistry and air pollution models that have a nitrogen cycle component.
- Worked with agronomists both within and without CSIRO to explore the fate of fertilizer nitrogen applied to crops, including rice, sunflowers and wheat. Farmer's practices were developed which improved the efficiency of fertilizer nitrogen, and increased the protein content of wheat and its baking qualities. In March 1996, the National Institute of Agro-Environmental Sciences, Tsukuba Japan, held an "International Workshop on  $\text{NO}_x$  Emissions from Soils and its Influence on Atmospheric Chemistry", acknowledged as a direct outcome of Ian's original discovery of this important pathway for loss of soil- and fertilizer nitrogen.
- Made the first measurements of gaseous sulfur uptake from the atmosphere by a forest, a key unquantified process in acid rain damage to forests. This was done with an eddy correlation instrument that he developed.
- Developed a model of ascending nuclear fireballs and a separate model which incorporates coagulation, dispersion and rainout of smoke in the atmosphere, from fires ignited by nuclear explosions as a scientific contribution to the Nuclear Winter and Nuclear Weapons Reduction debates.
- Developed of a novel roadway method for measuring fleet average motor vehicle emissions. This technique provided verification of urban vehicle emission inventories in Melbourne, and Perth, providing on-road evidence of the benefit of Australia's billion dollar investment in motor vehicle emission controls and confidence in the inventory estimates. In Hong Kong and Bangkok, in the absence of other information on vehicle emissions, the technique provides the basis for the motor vehicle emission inventories.
- Discovered the emission of organic gases from grass and pasture plants, and the enhancement of these emissions by cutting. This work was taken up by researchers in at least four Institutes in the USA, Germany and Austria within 6 months of the publication of the original paper.
- Within an international team of scientists, undertook experiments and modelling and provided an experimental and theoretical basis for understanding the photochemical control of ozone in the remote marine boundary layer. Knowledge of this is essential for chemical-climate models.

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- Developed the first quantitative model of methanol production in plants and identified the importance of this process in the methanol cycle in the global environment particularly the coupling of plant growth with the concentration of methanol in the global atmosphere. Methanol is, along with ethane and isoprene, one of the most abundant VOCs after methane in the troposphere.
- Demonstrated a framework for the incorporation of systematic and rigorous uncertainty analyses into the reporting framework of national greenhouse gas inventories through a study of the uncertainties in land clearing emissions in Australia.
- Developed the first ever top-down budget of atmospheric organic aerosol. This showed that the contribution of organic aerosol to the atmosphere had been substantially underestimated because of incomplete bottom-up reaction schemes. This revelation has led to an international scientific re-evaluation of organic aerosol. Atmospheric organic aerosol is now accepted as a major component of atmospheric aerosol and has several important roles in the Earth's climate.
- Undertaken the first ever study of the global environmental study of ethanol showing that atmospheric ethanol is a minor appendage to a much larger turnover in soils, wetlands and plants, that the amount of man-made ethanol in storage greatly exceeds the total amount of ethanol in the atmosphere and that the atmospheric turnover of ethanol is much larger than previously estimated. This is essential knowledge for evaluating the possible environmental impacts of ethanol as a bio-fuel.
- Observations of tropospheric ozone led by Ian at Cape Grim, are included in the IPCC 4<sup>th</sup> Assessment of Climate Change and the IPCC AR5 Report because of the role of tropospheric ozone as a greenhouse gas. The long term measurements at Cape Grim contribute to two collaborative papers on tropospheric ozone trends.

### 10. Applications of Science

Ian has always seen the importance of carrying the science undertaken through to useful products. Examples of this work include:

- Demonstrated that for most of the time, the ozone in the industrial Latrobe Valley, Victoria was naturally occurring and was being confused with the products of photochemical smog. This clarified the task of pollution reduction and industrial emissions control measures in this rural/industrial region.
- Established that pre-1986 motor vehicles, when using unleaded petrol as a fuel, produce less air toxics than when run (as designed) on leaded petrol. This clarified a key uncertainty that has been delaying the public acceptance of the further phase-out of leaded petrol in Australia.
- Led two studies in Launceston of woodsmoke, a chronic air pollutant causing health effects. This work provided scientific evidence of the value of the government's woodheater rebate scheme in cleaning up the air in Launceston, and demonstrated via modeling that, with the continuation of existing policies, air quality standards would be met within the decade, which has occurred.
- Addressed an apparently intractable air quality problem involving emissions from alumina refining and the impact on the local community in Wagerup, Western



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Australia. Ian led a scientific review that provided 18 recommendations for work required to understand properly the air quality problem. He led two major field studies to understand the air quality around Wagerup. Refinery VOC emissions have been reduced and the refinery no longer has a production limit in its License. Ian was nominated for and was a Finalist in the Australian Museum Eureka Prizes People's Choice Scientist for this work.

- Provided the first comprehensive study of indoor air quality in the temperate climatic region of Australia. This study, nationally unique in its scope, determined the exposure of occupants to indoor air quality and the effect of factors including increased sealing of buildings on this exposure. The study informed the current cycle of national building design regulations as well as providing practical information to policy makers, environmental managers and the community.
- Led a group of international scientists to produce an authoritative report "Guidelines for Continuous Measurement of Ozone in the Troposphere" for WMO Global Atmospheric Watch. The report brings together aspects of metrology, analytical chemistry and environmental science necessary for improved future tropospheric ozone trend detection and will be used by the WMO GAW and the EU EMEP networks providing critical information to hundreds of monitoring stations worldwide.

### 11. **Invited, Keynote and Plenary Presentations at Major Scientific Meetings, 1994 – 2014**

Ian typically gives 12 seminars/presentations per year. These listed are the sub-set of invited keynote and plenary presentations.

**"Further developments in background VOC monitoring at CSIRO Marine and Atmospheric Research."** Invited presentation at The 5th WMO-GAW Expert workshop on Volatile Organic Compounds, 20 - 22 October 2014, KRISS, Daejeon, Republic of Korea

**"Observations of Atmospheric Acetonitrile in the Mid-Latitudes of the Southern Hemisphere and its Global Distribution Away from Biomass Burning Influences"**. plenary presentation at the 13th Quadrennial iCACGP Symposium and 13th IGAC Open Science Conference on 22-26 September 2014.

**"BVOC research: a personal and historical perspective"** invited plenary talk, The 2014 Biogenic Hydrocarbons and the Atmosphere Gordon Research Conference, Girona, Spain June 24-July 4, 2014

**"Air Quality and Climate Change"**, invited presentation at the Air Quality Australia: Future Research Directions, Workshop, The Centre for Australian Weather and Climate Research, Melbourne Australia 7-8 May 2014.

**"Tropospheric ozone distribution and trends at Cape Grim and in the extra-tropical Southern Hemisphere"** invited presentation, Institute of Environmental Physics, University of Bremen, Germany, 19 November 2013.

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**“Air Quality Priorities in Australian and New Zealand”** invited keynote address at the Advanced Air Quality Management Workshop, Sydney, Australia, 7 September 2013.

**“Atmospheric Particles and Health: Old Problems, New Questions”** invited Guest Lecture, Annual Research Day, RMIT University School of Applied Sciences, Melbourne, Australia, 14 June 2013.

**“Scientific Research and the NPI”** invited presentation, Australian Institute of Environmental Accounting’s 2012 Conference, Melbourne, Australia, 27 November 2012.

**“Long Term Trends in Ozone in the Southern Hemisphere Extra-tropical Boundary Layer and Free Troposphere”** plenary presentation, 12th IGAC Atmospheric Chemistry Conference, Beijing, China, 17–21 September 2012.

**“Developments in background VOC monitoring at CSIRO Marine and Atmospheric Research”** by Skype to The 4th GAW Expert Workshop on Volatile Organic Compounds, York, UK, 11–12 September 2012.

**“Alumina Refining and Air Quality: VOCs and Odour”** plenary presentation at the 9<sup>th</sup> International Alumina Quality Workshop, Perth, Western Australia, 18–23 April 2012.

**“Tropospheric Ozone and the Montreal Protocol”** invited presentation at the workshop ‘Unanswered Questions in Ozone Research’, School of Earth Science, University of Melbourne, 2–4 April 2012.

**“CSIRO Indoor Air Project”** invited talk at the MADD5 Conference, Woolcock Institute for Medical Research, Sydney, Australia, 8–9 November 2011.

**“Trends in ozone concentration in the Southern Hemisphere mid-latitude marine boundary layer during the last 3 decades, what causes them?”** invited talk at the Institute of Energy and Climate Research, Forschungszentrum Juelich, Germany, 9 December 2011.

**“Trends in Ozone in the Marine Boundary Layer over the Southern Ocean and in the Southern Hemisphere Troposphere”** invited talk at IUGG 2011 General Assembly, Melbourne, Australia, 28 June–7 July 2011.

**“From Robert Boyle to IGAC: a history of the discovery of atmospheric composition and chemistry”** an invited plenary talk at 12th Symposium for the International Commission on the Atmospheric Chemistry and Global Pollution (iCACGP) and the 11th Science Conference of the International Global Atmospheric Chemistry (IGAC) Project, Halifax, Canada, July 2010.

**“The Discovery of Soil and Plant – Atmosphere Exchange of Nitrogen Compounds”** invited talk, Clean Air Society of Australia and New Zealand – Australian Soil Science Institute Joint Workshop, Melbourne, 2 September 2010.

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**“Indoor air in dwellings in Australia, today and under climate change”** 19th International Clean Air and Environment Conference: Plenary (Award winning presentation), 6–9 September 2009.

**“VOCs in the Australian Region of the Southern Hemisphere”**, plenary presentation IGAC 10th Conference “Bridging the Scales”, Annecy, France, 7–12 September 2008.

**“VOCs in the Australian Region of the Southern Hemisphere”** invited presentation Atmospheric Science Seminar Series, University of California, Berkley, California, USA, 16 September 2008.

**“Sources of ozone precursors and atmospheric chemistry in a typical Australian city”** invited presentation Clean Air Research Program Workshop, DEWHA, Canberra, Australia, 16 October 2008.

**The Cape Grim Reactive Gases Program**, special presentation, Cape Grim Annual Science Meeting, Aspendale, Australia, December 2007.

**“Links between air quality and climate change and predicted impacts”**, invited presentation, NSW Clean Air Cool Climate Forum, NSW Government, Sydney, Australia, 23 November 2007.

**“Volatile Organic Compounds and Secondary Organic Aerosol in the Earth’s Atmosphere”**, invited presentation, The Federation of Asian Chemical Societies - Asian Chemical Congress (12ACC), Kuala Lumpur, Malaysia, 23–25 August, 2007.

**“Wagerup Winter Study 2006”**, invited presentation, Wagerup Tripartite Group, Yarloop, Western Australia, 13 April 2007

**“Atmospheric Composition, the Environment and Society”**, invited presentation, INTERACT 2006: air, water & earth, RACI, CASANZ and Australasian Society for Ecotoxicology, Perth, Western Australia, 24–28 September 2006.

**“Are there win-win strategies for minimising greenhouse gas emissions from agriculture?”**, Climate change, carbon and plants briefing, CRC for Greenhouse Accounting Final Briefing to Stakeholders, Sydney, Australia, 13 June 2006.

**“Air quality and agriculture: the role of global drylands and arid zones”**, invited keynote presentation, Ecological Society of America, Workshop on agricultural air quality: state of the science, Potomac, Maryland, USA, 5–8 June, 2006.

**“Cutting Edge Technology: The Proton Transfer Reaction Mass Spectrometer”**, invited presentation to the West Australian Branch Clean Air Society of Australia and New Zealand, Perth, Western Australia, 21 June 2005.

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**“A study of environmental and management drivers of non-CO<sub>2</sub> greenhouse gas emissions in Australian agro-ecosystems”**, plenary presentation, Fourth International Symposium on Non-CO<sub>2</sub> Greenhouse Gases (NCGG-4): Science, Control, Policy and Implementation. Utrecht, The Netherlands, 4–6 July 2005.

**“Trends in near-surface ozone at Cape Grim and in the Southern Hemisphere Troposphere”** invited presentation NOAA Climate Monitoring and Diagnostics Laboratory 2005 Annual Meeting, Boulder, Colorado, USA.

**“Air Toxics in Launceston during Summer and Winter 2003”** invited presentation Workshop on Cleaning the Air, Launceston, Tasmania, 25–26 May 2004.

**“The Production of Methanol by Flowering Plants and the Global Cycle of Methanol”** plenary presentation at CACGP/IGAC 2002 Conference: "Atmospheric Chemistry within the Earth System: From Regional Pollution to Global Change" Heraklion, Crete, 18–25 September 2002.

**“Scaling from plant biochemical processes to the global scale for methanol and ethanol”**, invited presentation at the Gordon Conference on *Biogenic Hydrocarbons and the Atmosphere*, Queens College, Oxford, UK, 1–5 September, 2002.

**“Uncertainty and the Australian National Greenhouse Gas Inventory”** invited presentation, *Clean Air and Environment 2000*, Conference Workshop, Clean Air Society of Australia and New Zealand, Sydney, Australia, November 2000.

**“Ozone in near surface air at four stations in the Southern Hemisphere”** invited keynote presentation at the *International Symposium on Tropospheric Ozone in East Asia and Its Potential Impacts on Vegetation*, Japan Science and Technology Corporation, Tokyo, Japan, 30 November–1 December, 1998.

**“Tropospheric Ozone Science: 150 Years in the Making”**, invited presentation, Priestley Symposium CSIRO Division of Atmospheric Research Aspendale, Australia, November 1998.

**“Atmospheric Verification of Emissions Inventories”** invited presentation National Carbon Accounting System (NCAS) Workshop, Canberra, Australia, 23–25 June 1998.

**“The In-traffic Measurement of Motor Vehicle Emissions in Melbourne”** an invited public lecture hosted by the Environmental Protection Authority Victoria, 10 March 1998.

**“Biomass Burning and Greenhouse Gas Emissions”** an invited paper for the *IPCC Experts Meeting on Biomass Burning and Land Use Change*, Rockhampton, Australia, September 1997.

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**“The Emissions of VOCs (primarily oxygenates) from Pasture”** presented at the *Department of Evolutionary Biology, Rice University Houston, Texas, USA, 28 February 1997.*

**“Ozone and NO<sub>x</sub> in the Southern Ocean Marine Boundary Layer”** invited presentation at a *Workshop on measurement of ozone in EastAsia/West Pacific, Tokyo, Japan, 14–15 November 1996.*

**“Nitrogen Oxide (NO<sub>x</sub>) Emissions and the Nitrogen Cycle”**, invited presentation at the *“International Workshop on NO<sub>x</sub> Emissions from Soils and Its Influence on Atmospheric Chemistry”* at the National Institute of Agro-Environmental Sciences, Tsukuba, Japan, 4–6 March 1996.

**“Greenhouse Gases Sources and Sinks – the globe, developed countries and projections”**, invited presentation, National Academies Forum on *Australians and Our Changing Climate*, Canberra, Australia, 25 November 1996.

**“Measurement and Modelling of Nitrous Oxide Emissions from Grazed Legume Pasture in Australia”** invited presentation *WMO-IGAC Conference on Measurement and Assessment of Atmospheric Composition Change*, Beijing, China, 9–14 October 1995.

**“The Photochemistry of Ozone in the Southern Ocean Atmospheric Boundary Layer”**, keynote presentation at the *4th Environmental Chemistry Conference*, Royal Australian Chemical Institute, Darwin, Australia, 9–14 July 1995.

**“Greenhouse Gas Emissions”**, invited presentation, *Greenhouse '94*, CSIRO & NIWA, Auckland, New Zealand, 9–14 October 1994.

**“Australian participation in IGAC”** invited presentation, *A Symposium on International and Australian Activities in Global Change and ENSO: a major factor in the environment of the Australasian region*, Australian Academy of Science. Canberra, Australia, 1994.

### PUBLICATIONS

#### 12. Refereed Scientific Papers

1. Lawson, S. J., Selleck, P. W., Galbally, I. E., Keywood, M. D., Harvey, M. J., Lerot, C., Helmig, D., and Ristovski, Z.: Seasonal in situ observations of glyoxal and methylglyoxal over the temperate oceans of the Southern Hemisphere, *Atmos. Chem. Phys.*, 15, 223-240, doi:10.5194/acp-15-223-2015, 2015. <http://www.atmos-chem-phys.net/15/223/2015/>
2. Cooper, O. R., D. D. Parrish, J. Ziemke, N. V. Balashov, M. Cupeiro, I. E. Galbally, S. Gilge, L. Horowitz, N. R. Jensen, J.-F. Lamarque, V. Naik, S. J. Oltmans, J. Schwab, D. T. Shindell, A. M. Thompson, V. Thouret, Y. Wang, R. M. Zbinden (2014) *Global*

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- distribution and trends of tropospheric ozone: An observation-based review *Elementa: Science of the Anthropocene*, 2, 000029, doi: 10.12952/journal.elementa.000029  
<http://elementascience.org/article/info:doi/10.12952/journal.elementa.000029>
- Oltmans, S.J., A.S. Lefohn, D. Shadwick, J.M. Harris, H.E. Scheel, I. Galbally, D.A. Tarasick, B.J. Johnson, E.-G. Brunke, H. Claude, G. Zeng, S. Nichol, F. Schmidlin, J. Davies, E. Cuevas, A. Redondas, H. Naoe, T. Nakano, T. Kawasato (2013) Recent Tropospheric Ozone Changes – A Pattern Dominated by Slow or No Growth, *Atmospheric Environment*, 67, 331–351.  
<http://dx.doi.org/10.1016/j.atmosenv.2012.10.057>
  - Kirstine, W. and Galbally, I.E.: (2012) The global atmospheric budget of ethanol  revisited, *Atmospheric Chemistry and Physics*, 12, 545–555, doi:10.5194/acp-12-545-2012. [www.atmos-chem-phys.net/12/545/2012/](http://www.atmos-chem-phys.net/12/545/2012/)
  - Dunne, Erin, Galbally, Ian E., Lawson, Sarah, and Patti, Antonio (2012) Interference in the PTR-MS measurement of acetonitrile at m/z 42 in polluted urban air– a study using switchable reagent ion PTR-MS, *International Journal of Mass Spectrometry*, 319–320: 40–47. <http://dx.doi.org/10.1016/j.ijms.2012.05.004>
  - Lawson, Sarah; Keywood, Melita; Galbally, Ian; Weeks, Ian; Bentley, Simon; Gras, John; et al. Biomass burning emissions - Robbins Island, Cape Grim Australia, 41° S. *IGAC Newsletter*. 2012; 48: 19–21.
  - Kirstine, W. and Galbally, I.E.: (2012) Ethanol in the environment - a critical review of its roles as a natural product, a biofuel and a potential environmental pollutant, *Crit. Rev. Environ. Sci. Technol.*, 42(16): 1735–1779. [DOI:10.1080/10643389.2011.569874](https://doi.org/10.1080/10643389.2011.569874)
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