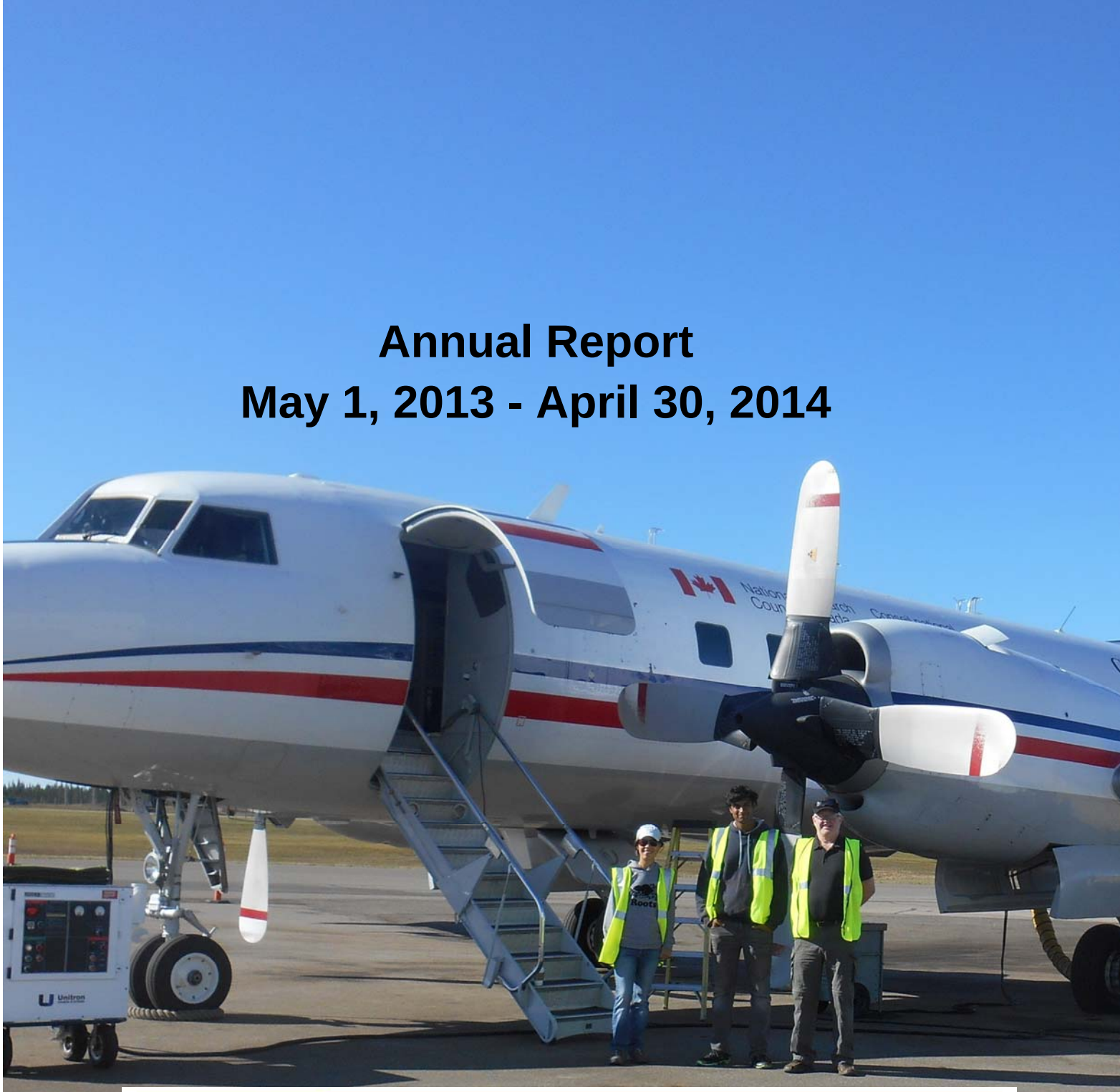
Annual Report
May 1, 2013 - April 30, 2014



Centre for Atmospheric Chemistry
AT YORK UNIVERSITY

Photo: Zoe Davis, Akshay Lobo and Robert McLaren in front of the NRC Convair 580 aircraft during FOSSILS campaign, Fort McMurray, Alberta; August, 2013.

The Centre for Atmospheric Chemistry
Annual Report
May 1, 2013 – April 30, 2014

1. Contact Information

Director	Prof. Robert McLaren
Telephone	416-736-5410
Email	cac@yorku.ca
Campus address	006 Steacie Science and Engineering Bldg.
Admin contact	Carol V Weldon
ORU Website	http://www.cac.yorku.ca

2. Faculty Representation

   Faculty of Science, Chemistry Department

   Lassonde School of Engineering, Earth and Space Science and Engineering

3. Charter dates

   1985 - first Charter; 2009 - last renewal

4. Mandate

   The mandate of the CAC as described in our Charter is:

   - *To provide a forum for collaborative **research** in atmospheric chemistry at York University.*
   - *To provide a link to the wider atmospheric chemistry **research** community in Canada and abroad.*
   - *To **educate** the next generation of atmospheric chemists.*

5. Membership and Governance

   Active Faculty members

   - Harris, Geoffrey W.*
   - Hastie, Donald R.*
   - McConnell, John C. (passed away July, 2013)
   - McLaren, Robert (Director)*
   - Mozurkewich, Michael (transitioned to reduced load in 2012)
   - Rudolph, Jochen*

   *** executive committee members**

   Adjunct Faculty members

   - Li, Shao-Meng, PhD (Environment Canada)
   - Koppmann, Ralf, PhD, Forschungszentrum Juelich
   - Shepson, Paul B., Professor, Purdue University
   - Bottenheim, Jan W., PhD (emeritus member, retired from Environment Canada)

Associate Faculty members

Due to recent passing, retirements and imminent retirements, CAC was encouraged to find new membership by the Board at its last meeting in Sept, 2013. The following people have expressed interest in being members of CAC. For the time being, we will call them associate members, until such time as CAC re-charters and we define the member categories.

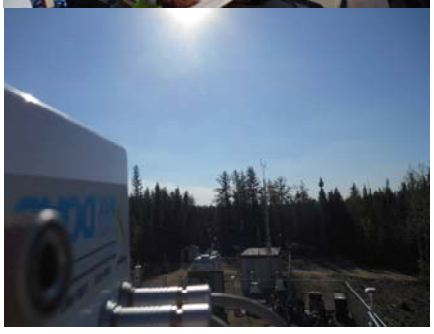
- Whiteway, James; Professor, ESSE
- Chen, Yongsheng; Assistant Professor, ESSE
- Gordon, Mark; Associate Professor, ESSE (starts July 01, 2014)
- Bello, Rick; Associate Professor, Dept. of Geography
- Christian Haas, Professor, ESSE

6. Annual Progress in Fulfilling Mandate

The top accomplishments of CAC over the past year are discussed below.

6.1 Research in the Oil Sands Region of Alberta

Members of CAC participated in the First Oil Sands Summer Investigation of Local Sources (FOSSILS) field study in the oil sands region of Alberta north of Fort McMurray, August-Sept, 2013. The field study was part of the Joint Oil Sands Monitoring Plan (JOSM), a collaboration between Environment Canada and Alberta Environment. CAC's participation was funded by Environment Canada. Research groups of two members (McLaren, Rudolph) and one associate member (Whiteway) in CAC were involved in the study. One faculty and 2 students were in the field for 5 weeks. General goals of the study were to:



a) quantify emissions to the atmosphere from oil sands activities;
b) study the atmospheric transformation of gases and aerosols downwind of primary emission locations and
c) collect ambient data that can be used to validate satellite instrument measurements in the oil sands region.

Members of CAC made measurements of gases and aerosols (NO_2, SO_2, HONO, nitrophenols, PAHs, high molecular weight n-alkanes, CO_2, CH_4, CO, H_2O) at a ground site (AMS 13) north of Fort McMurray, AB; as well as on-board the NRC Convair 580 aircraft. One associate member made LIDAR measurements on board a Twin Otter aircraft during a one week period during the summer intensive.

6.2 IACPES Week 2013

Over the past year, CAC organized and delivered the 2nd IACPES Training Week (June 10-14, 2013). The training week included: i) a full day symposium ii) a 3-day summer course in Atmospheric Chemistry and Physics (ACP) and iii) a student training day. The summer course is open to professional scientists from industry and government. We had 6 such registrants last year. Much time was spent this last year to expand our industrial database and to contact each organization individually. The NSERC CREATE IACPES Mid-Term Report was vetted by the IACPES Program Steering Committee before it was submitted to NSERC in December 2013.

6.2.1 IACPES Symposium Day

Invitations to the IACPES symposium were distributed to all graduate students formally in the IACPES program, as well as to graduate students and faculty from surrounding Universities. Both oral presentations and posters are accepted. Abstracts are published in an abstract book. A poster session followed the oral session. In total, 29 participants registered in 2013, 12 presented talks and 7 posters were presented. 19 participants were York students. All students who made oral presentations received individualized professional assessments of their oral communication skills in the form of a copy of their video-taped presentation, along with a written critique. The process of critiquing was accomplished using two professional members of the York University Career Centre. They attended the live presentations with a critical but constructive eye.

Supplemented with science feedback from the PMC, each student received a written report.

6.2.2 2013 Annual Summer Course in Atmospheric Chemistry and Physics

The 3-day summer course in ACP was advertised widely to universities, government organizations and industries. A poster was created and sent via mail and email; it was also posted on the internet. EVENTBRITE electronic invitations were sent to over 156 people. In 2013, 37 people registered for the course (see figure) – 19 were York students, 12 were from other universities and 6 were professional scientists from Environment Canada and the Ontario Ministry of the Environment. In 2013 the number of hours of instructions was reduced from ~22 hours to ~15 hours (including a 2 hour panel discussion). The reduction in contact lecture hours was in response to feedback received via an on-line feedback survey for the 2012 course. The course was delivered by 12 professional scientists from 5 universities and Environment Canada while the panel discussion on Atmospheric Policy featured 3 policy representatives from Environment Canada, the City of Toronto and Halton Regional Government.

We arranged for collaborators from the OME to bring their mobile monitoring units to campus including their stealth van and the larger mobile truck (see figure). Four OME scientists attended, giving students tours of the air quality instrumentation on-board. Social events during the training week included a dinner banquet, and a pick-up soccer game.

6.2.3 IACPES Training Day

We arranged for a representative (John Weeks) from Wavemetrics to deliver a one day course in the use of Igor Pro, an interactive software environment for experimentation with scientific and engineering data and for the production of publication-quality graphs and page layouts. The training was held in a computer lab in the new Life Sciences Building at York U, where each student had access to a computer and the Igor Pro

software where they completed interactive laboratory exercises. The training was very popular, with attendance reaching the capacity of 24 students, 14 from York U.

6.3 Other Outputs and Accomplishments

Other significant outputs of the Centre are discussed in Appendix 1. Included there is a discussion of the CAC seminar series for graduate students, the The Morris Katz Memorial Lecture in Environmental Research, the Harold I. Schiff Lecture in Atmospheric Chemistry and the awards and scholarships distributed through CAC.

Dissemination of atmospheric chemistry research in the form of publications and external presentations at conferences, universities and other institutional forums by PI's and/or students under their supervision is a major expected activity of members of the Centre. Collectively, the 5 core members of CAC had 11 peer-reviewed journal publications, 3 submitted peer-reviewed publications, and 24 external research presentations.

CAC updated its websites to be website accessible. http://www.cac.yorku.ca; http://www.cac.yorku.ca/iacpes

7. Financial Accountability

(see attached)

8. Objectives for Upcoming Year

IACPES: A major objective for the coming year is continued management and delivery of the NSERC CREATE IACPES program. The PI of IACPES (Rudolph) is a member of CAC. A major portion of the IACPES program management activities also exist within CAC including 2 members of the IACPES Program Management Committee (McLaren, Rudolph). Another CAC member (Hastie) is a co-I on IACPES and contributes to the training program. McConnell was a *co-I on IACPES. In* addition, the CAC administrative coordinator (Carol Weldon) serves as the IACPES Program Coordinator. For the above reasons, IACPES is a major activity that CAC is committed to for the next several years. In the upcoming year we will be focusing more attention on initiating remaining elements of the IACPES program; namely the exchange program for graduate students and the policy component of the program. In addition, we will be holding our third annual IACPES Training week June 9-13, 2014 at York U and preparing for the 4th annual event in spring 2015.

Career Development Symposium

The Career Development Symposium is a “soft skills” symposium that is planned for May 21-22, 2014, York University. The Symposium is the brainchild of one of the CAC graduate students, Zoe Davis, and it is being supported by CAC and IACPES funding.

The Symposium will feature 2 days of panel discussions and workshops devoted to communication skills, writing skills and other career skills. The Symposium will provide an opportunity for science and engineering graduate students to network with professionals in academia, industry and government, as well as to learn and build critical skills, through panels of experts and engaging workshops, necessary for success in their future career ambitions. For more information on the Career Development Symposium, see website, http://iacpes.info.yorku.ca/cdsymposium/.

OME/EC PAN-AM Monitoring station at York University

The director of CAC acted as the internal science liaison for a bid by OME/EC to set up an Air Quality Monitoring Station on Keele campus. As just one of its objectives, the station will monitor air quality and forecast the Air Quality Health Index (AQHI) before, during, and after the PAN-AM games on campus in 2015. OME has expressed strong interest in using this as a permanent station in their AQ network for the longer term. The proposal to establish this station was approved by the York University Board of Governors, however holdups in the final legal agreement between York and OME via Infrastructure Ontario have delayed the start of construction. We are still hopeful that the station will be completed this summer/fall (2014). CAC has negotiated space inside the station to be devoted to research equipment. We plan to use this space, as well as the CAC Air Quality Research Station on the Petrie rooftop for specialized research measurements during the 2015 Pan Am games. At a minimum we are planning on measuring NO_x compounds as well as greenhouse gases (CO_2, CH_4, CO, H_2O). CAC is planning on spearheading a planning meeting in fall 2014 for interested researchers. We also plan on a application to OME ($50K) through their Best in Science Program.

CAC Membership Expansion & Rechartering

Another major objective in the next year is to expand membership in CAC and to recharter CAC. We maintain that a solid core of atmospheric chemistry research will support the overall strength of York as a leading institution within Canada for Atmospheric Science (including planetary atmospheres), which is complemented by Space Science and Engineering. In order to maintain CAC, it will be necessary to have replacement hires in atmospheric chemistry that are supported by the Chemistry Department, the Faculty of Science and the University.

Funding Applications

The Director continues to search for large research funding opportunities.

9. Academic & Administrative Program Review: – Opportunities and Final Comments

The following is taken from CAC's submission as part of the recent AAPR exercise at York U

There are abundant opportunities in the field of atmospheric chemistry now and in the future, in terms of research funding and globally relevant research. We are currently witnessing the fastest rate of atmospheric change that has ever been seen in the history of mankind, including a changing chemical composition of the atmosphere. Searches for new energy sources are having impacts on the atmosphere and ecosystems that are not well understood. Along with chemical change comes climate change, just one end result of a changing atmospheric chemical composition. Sources and trends of major greenhouse gases such as methane are uncertain. Feedbacks with water, clouds, aerosols and changing albedos resulting from ice decline are not understood and are poorly projected. Ice decline will cause changes in the halogen radical chemistry of the arctic atmosphere. An ice free summer arctic will open shipping routes to some of the largest polluting sources that currently exist, major ocean going vessels. Impacts on arctic haze, deposition of black carbon on snow and other chemical changes in the atmosphere are poorly constrained. Simultaneous with these changes is the new technological advances that allow monitoring of the global chemical composition of the atmosphere from spectroscopic instruments on satellites. It is now possible to monitor changes in chemical composition of gases and aerosols in regions otherwise difficult to access (e.g., oil sands, northern energy development, 'ring of fire', remote oceans).

To tackle meaningful research in these globally relevant themes, CAC sees potential synergies and collaborative opportunities within York with those in ESSE, Lassonde, Geography, and those with an interest in Arctic research. To be successful and competitive, atmospheric chemists and scientists must also look outside York University to interact and collaborate with atmospheric researchers across Canada (UoT, UBC, McGill, UoCalgary, UoAlberta) as well as top international organizations devoted to atmospheric research (i.e.; NOAA, NCAR, UCAR, MaxPlank, Juelich). There are abundant opportunities for enhanced collaboration. It requires young energetic researchers to achieve this. The most critical investment that is now needed to realize the research goals laid out above is the investment in young energetic researchers through replacement and strategic hires. This serves the double purpose of also eliminating the financial deficit of the centre since those researchers will bring extra overhead funding to the centre. We must also be vigilant in continued applications for major infrastructure grants. The field is solid and opportunities abound. Our vision is for a larger, more vibrant, young and rejuvenated CAC; Building on Strength.

CAC has a longstanding national and international reputation for atmospheric chemistry research. This has a positive effect on the university's reputation. Members of CAC are

active in carrying out the CAC's mandate through strong collaborations with other scientists both nationally and internationally. A major NSERC CREATE award emphasizing collaboration between atmospheric chemists and physicists was awarded to the Centre 3 years ago. This was one of the first NSERC CREATEs awarded to York University with total funding of $1.65M over 5 years. The execution of the IACPES CREATE program is currently a major undertaking of this small research centre. Many outside the Centre also benefit from the program. We continue to enhance our reputation through the annual Summer Course, which is gaining in reputation and attracting more professional registrations.

The current figures including FSc overhead show the Centre to be in financial deficit, largely attributed to the partial salary of the university staff member who serves as CAC Coordinator and also formally serves as the IACPES program coordinator. The execution of the IACPES program would be virtually impossible for a faculty member without such assistance. Thus we partially justify the current deficit by offsetting this with the quality of the program we create, by the funding we provide to students and to the university through ICR and other overheads, as well as the reputational considerations. However, we admit that more can be done to minimize the deficit, which we continue to reduce, if not eliminate. The most important factor affecting the future quality of the CAC program is sustained faculty renewal of retiring faculty with young energetic researchers in atmospheric chemistry. We embrace the philosophy that frames the current University Strategic Research Plan; we must build on Strength.

10. Appendix 1 – Additional Information about Progress in Fulfilling Mandate

2013 Annual Harold I Schiff Lecture on Atmospheric Chemistry Research

The 2013 HIS lecture was delivered by Prof. Astrid Kiendler-Scharr (University of Cologne and Forschungszentrum Juelich). The title of her lecture was *"Chemistry climate interactions: Biogenic emissions and their contribution to secondary organic aerosol"*. The lecture was advertised and featured in Y-File. More information on the HIS Lecture series may be found on the CAC website.

2013 Annual Morris Katz Memorial Lecture in Environmental Research.

The 22nd lecture, October 18, 2013, was delivered by Prof. Paul T. Anastas, Yale University. The title of his lecture was *"Sustainability through chemistry: The path forward"*. This lecture is made possible through support of an endowment fund and through sponsorship by CAC and the Ontario Ministry of the Environment.

Both the HIS and the Katz lectures have been video recorded since 1999. As of this year, all lectures have been made available on CAC's website.

Informal CAC Lunch-time Atmospheric Chemistry Discussion Series

A principal role of CAC is to support communication of research results and dissemination of ideas through various seminar functions. CAC's discussion series began in 1989 and continues with great success to focus on student presentation and discussion of research results. Recently, we have made a concerted effort to invite external professional speakers in order to enhance the training opportunities for student members and to foster collaboration. Following is a list of this year's presentations. This list and the abstracts are posted on the CAC website. The talks are usually submitted to the York Events postings as well. They are usually well attended with participants not only from York, but from organizations such as Environment Canada, Ontario Ministry of the Environment, and other universities.

2013-14 CAC Lunch-time Seminars

- Prof. Arthur Chan, University of Toronto, "*Understanding semivolatile organic compounds in remote and urban atmospheres"*
- Amanda Jameer, CAC Grad student, "*Evaluating the utility of an atmospheric pressure chemical ionization mass spectrometer for analyzing organic peroxides"*
- Mehrnaz Sarrafzadeh, CAC Grad Student, "*Measurement of particle density using scanning mobility particle sizer and tapered element oscillating microbalance"*
- Zoe Davis, CAC Grad Student, "*MAX-DOAS observations of NO_2 and SO_2 in the Alberta Sands"*

- Yasamin Hassani, CAC Grad Student, *"Method development for concentration measurements of SVOCs in the atmosphere with a focus on emission from oil sands mining"*
- Kevin Nikelski, CAC Grad Student, *"Combination of active and passive lunar DOAS to determine the verticle chemical profile of NO_x species in the atmosphere"*

CAC Awards and Scholarships

Each year CAC awards three scholarships/awards in Atmospheric Chemistry:

Hiromi Niki Undergraduate Award. Supported by endowment, this award is given to an undergraduate student who achieves the top grade in the 3rd year course: Introductory Atmospheric Chemistry and who shows an interest in research in atmospheric chemistry. In 2013, it was awarded to Peter Holbrook.

The Charles Hantho Awards in Atmospheric Chemistry. These graduate student awards are made possible through an endowment from the donor, Mr. Charles Hantho. In 2012/13, two awards were distributed to Amanda Jameer and Kevin Nikelski. A description of their research work is given to the donor on an annual basis.

The Harold Schiff Graduate Scholarship. This graduate student scholarship is made possible through an endowment. Awarded to an entering graduate student showing excellence in research potential, it was awarded to Zoe Davis.

Membership in University Council for Atmospheric Research (**UCAR)**

The University Council for Atmospheric Research is a predominantly U.S. organization, but is also open to international Universities. On the initiative of ESSE, CAC and CRESS and with support of FSE and the Administration, York U received membership in UCAR in the last decade. York is one of only 3 universities in Canada that are UCAR members. Membership provides further recognition for the quality of atmospheric research at our University. At present Prof. Don Hastie of CAC and Prof. Yongsheng Chen, ESSE are the York representatives to UCAR.

11. Appendix 2 – Individual Member Contributions

Geoffrey Harris

CAC List of Research Contributions May 2013 to May 2014

Present position: Professor of Chemistry, Faculty of Science and Engineering. Sabbatical: January-June 2013

Current graduate students supervised

Zena Rebello, PhD., Jan. 2011 - December 2013 (Incomplete), HONO measurements in combination with 1-dimensional modeling

Kristin Wall, PhD., Sept. 2005-, Investigation of the photo enhanced reduction of nitrogen dioxide on organic films and above soils as the missing source of daytime tropospheric nitrous acid (HONO)

Current graduate student supervisory committees

Mehrnaz Sarrafzadeh, PhD., 2009 -, Online analysis of atmospheric hydrocarbon photo-oxidation products in smog chamber

Research Examination Committee

Christine Facca, MSc., Fall 2011 – August 2013, Development and application of measurement techniques for atmospheric phenols in the gas phase and particulate matter

Marina Saccon, PhD., Sept. 2008 – October 2013, Compound specific concentration and stable isotope ratio measurements of atmospheric POM

Patryk Wojtal, PhD., 2008 – December 2013, Night-time measurements of NO2, NO3, N2O5, and H2O using differential optical absorption spectroscopy

Jamie Halla, PhD., 2005 – June 2013, Trace gas measurements using MAX-DOAS and active long path DOAS in Ridgetown

Erik Poernama, Chem 4000, April 2014, Measurement of NO_2 by differential optical absorption spectroscopy in polluted urban troposphere at York University

Mark Matta, Chem 4000, April 2014, Measuring concentrations of CH_4 , CO, CO_2 and H_2O on York University campus using cavity ring-down spectroscopy (CRDS)

Masud Mubarah, Chem 4000, April 2014, The Development of Ruthenium Complexes for use in Dye-Sensitized Solar Cells

Donald Hastie

CAC List of Research Contributions May 2013 to April 2014

Present position: Professor of Chemistry, Interim Dean Faculty, Faculty of Science

Papers Submitted to Refereed Journals

Irei, Satoshi, Jochen Rudolph, Lin Huang, Janeen Auld, Collin Fabrice, Donald Hastie, March 2014, Stable carbon isotope ratio of phenolic compounds in secondary particulate organic matter formed by photooxidation of toluene, submitted to The Journal of Physical Chemistry.

Current Graduate Students Supervised

Amanda Jameer, MSc., May 2012 - , The effect of ammonia on secondary organic aerosol yield from beta-pinene ozonolysis

Mehrnaz Sarrafzadeh, PhD., Sept. 2009 -, Online analysis of atmospheric hydrocarbon photo-oxidation products in smog chamber

Current graduate student supervisory committees

Yasamin Hassani, MSc. Sept. 2013 - , Method development for concentration measurement of SVOC in the atmosphere with a focus on emission from oil sands mining

Zoe Davis, MSc., Jan. 2013 -, Ground-based measurements of atmospheric NO_2 and SO_2 using multi-axis differential optical absorption spectroscopy in the Alberta oil sands

Kristin Wall, PhD., Sept. 2005-, Investigation of the photo enhanced reduction of nitrogen dioxide on organic films and above soils as the missing source of daytime tropospheric nitrous acid (HONO)

External Research Presentations

M. Sarrafzadeh, D.R. Hastie, "Analysis of Secondary Organic Aerosol Formation from β-pinene Photo-oxidation: Laboratory Chamber Study", Current Research in Engineering, Science, & Technology (CREST) Conference, Apr. 5-6, 2013, Hamilton, Ontario, Canada.

A. Jameer, D.R. Hastie, Analysis of organic hydroperoxides by positive-ion chemical ionization mass spectrometry APCI-MS, NSERC CREATE IACPES Symposium, Toronto, June 10, 2013.

M. Sarrafzadeh, D.R. Hastie, Measurement of particle density using scanning mobility particle sizer and aerosol particle mass, IACPES Symposium, Toronto, June 10, 2013.

M. Sarrafzadeh, D.R. Hastie, A chamber study of aging of secondary organic aerosol formed by photo-oxidation of beta Pinene, IACPES Symposium, Toronto, June 10, 2013. (Poster)

Research Examination Committees

Kelvinder Dhillon, Chem 4000, April 2014, Measurement of tropospheric vertical column densities of NO2 SO2 calibration using MAX-DOAS

Amanda De Filippis, Chem 4000, April 2014, Use of modifiers in iron mobility spectroscopy

John C. McConnell

CAC List of Research Contributions May 2013 to April 2014

Present position: deceased July 2013

Refereed Publications

R. Nassar, C.E. Sioris, D.B.A. Jones and J.C. McConnell, Satellite observations of CO2 from a highly elliptical orbit for studies of the Arctic and boreal carbon cycle, Volume 119, Issue 5, pages 2654–2673, DOI: 10.1002/2013JD020337, 2014.

K. Toyota, J. C. McConnell, R. M. Staebler, and A. P. Dastoor, Air-snowpack exchange of bromine, ozone and mercury in the springtime Arctic simulated by the 1-D model PHANTAS – Part 1: In-snow bromine activation and its impact on ozone, Atmos. Chem. Phys., 14, 4101-4133, doi:10.5194/acp-14-4101-2014, 2014.

A. Vidal-Madjar, C. M. Huitson, V. Bourrier, J.-M. Désert, G. Ballester, A. Lecavelier des Etangs, D. K. Sing, D. Ehrenreich, R. Ferlet, G. Hébrard and J. C. McConnell, Astron. Astrophys., 560, A54, p12, doi.org/10.1051/0004-6361/201322234, 2013

Glatthor, N., Höpfner, M., Semeniuk, K., Lupu, A., Palmer, P. I., McConnell, J. C., Kaminski, J. W., von Clarmann, T., Stiller, G. P., Funke, B., Kellmann, S., Linden, A., and Wiegele, A.: Corrigendum to "The Australian bushfires of February 2009: MIPAS observations and GEM-AQ model results" published in Atmos. Chem. Phys., 13, 1637–1658, 2013, Atmos. Chem. Phys., 13, 4373-4373, doi:10.5194/acp-13-4373-2013, 2013.

External Presentations

- a complete list is not currently available. McConnell and his group averaged on the order of at least 10 external presentations per year in his last few years.

Robert McLaren

CAC List of Research Contributions May 2013 to April 2014

Present position: Associate Professor, Department of Chemistry; Director - CAC

Current HQP supervised

Sabour Baray, MSc., IACPES, Jan 2014 - , Sources of CH4 in the oil sands regions of Alberta

Dr. Rez Mani, Research Associate, February-April 2014

Kevin Nikelski, MSc., Sept. 2013 -, Combination of active and passive (Lunar) DOAS for measurement of NO2, NO3 and HONO present in polluted urban atmospheres

Akshay Lobo, Undergraduate Research Assistant, (IACPES), May 2012 -, Improvements to DOAS system, NO_2 SO_2, HONO in oil sands

Zoe Davis, MSc. (IACPES), Jan. 2013 -, Ground-based measurements of atmospheric NO_2 and SO_2 using multi-axis differential optical absorption spectroscopy in the Alberta oil sands

Ibraheem Nuaaman, PhD. student, 2007 -, Carbonyls during the BAQS-Met/Cl chemistry and aerosol formation

Current graduate student supervisory committees

Soudeh Afsharian, Phd., (IACPES), (ESSE), Sept. 2013 - ; Effects of Great Lakes wind farms on air/lake exchange

Omid, MSc., (ESSE), Sept. 2013 - , Stratospheric ozone and ozone climatology

Siwie Ma, Phd., Jan 2013 - , Development of photocatalysts for LSPR enhancement

Nan Miao, MSc., (IACPES), (ESSE), Sept. 2012 - , Carbon data assimilation using an esemble Kalman filter

Amanda Jameer, MSc., May 2012 - , The effect of ammonia on secondary organic aerosol yield from beta-pinene ozonolysis

Zena Rebella, PhD., Jan. 2011- Dec. 2013 (incomplete) , HONO measurements in combination with 1-dimensional modeling

Kristina Somerville, Phd., Sept. 2011-, Setting up the MACOS system with in-line analytics

Research Examination Committees

Erik Poernama, Chem 4000, April 2014, Measurement of NO_2 by differential optical absorption spectroscopy in polluted urban troposphere at York University

Mark Matta, Chem 4000, April 2014, Measuring concentrations of CH_4 , CO, CO_2 and H_2O on York University campus using cavity ring-down spectroscopy (CRDS)

Kelvinder Dhillon, Chem 4000, April 2014, Measurement of tropospheric vertical column densities of NO_2 SO_2 calibration using MAX-DOAS

Patryk Wojtal, PhD., 2008 – Dec. 2013, Night-time measurements of NO2, NO3, N2O5, and H2O using differential optical absorption spectroscopy

Marina Saccon, PhD., Sept. 2008 – October 2013, Compound specific concentration and stable isotope ratio measurements of atmospheric POM

Jamie Halla, PhD. student, 2005 – June 2013, MAX-DOAS measurements of NO_2 and HCHO

Field Study – Organization

Oil Sands 2013 - Aug -Sep, 2013. A 6 week field study devoted to ground and aircraft based measurements of air emissions in the Oil Sands region (Fort McMurray) of Alberta.

Publications in Refereed Journals (bold indicates P.I. or students supervised by PI)

Cappa, C.D., Williams, E.J., Lack, D.A., Buffaloe,G.M., Coffman, D., Hayden, K.L., Lerner, B.M., Li, S.M., Massoli, P., **McLaren, R.**, **Nuaanman, I.**, Onasch, T.B., and Quinn, P.K., A Case Study into the Measurement of Ship Emissions from Plume Intercepts of the NOAA Ship Miller Freeman, Atmos. Chem. Phys., 14, 1337-1352, doi:10.5194/acp-14-1337-2014, 2014.

Edwards, P. M., Young, C. J., Aikin, K., deGouw, J. A., Dubé, W. P., Geiger, F., Gilman, J. B., Helmig, D., Holloway, J. S., Kercher, J., Lerner, B., Martin, R., **McLaren, R.**, Parrish, D. D., Peischl, J., Roberts, J. M., Ryerson, T. B., Thornton, J., Warneke, C., Williams, E. J., and Brown, S. S.: Ozone photochemistry in an oil and natural gas extraction region during winter: simulations of a snow-free season in the Uintah Basin, Utah, Atmos. Chem. Phys., 13, 8955-8971, doi:10.5194/acp-13-8955-2013, 2013.

Brook, J.R., Makar, P.A., Sills, D.M.L., Hayden, K.L., **McLaren, R.**, Exploring the nature of air quality over southwestern Ontario: main findings from the Border Air Quality and Meteorology Study, Atmos. Chem. Phys., 13, 10461-10482, doi:10.5194/acp-13-10461-2013, 2013.

External Presentations (bold indicates PI or students supervised by PI)

Zoe Davis, Akshay Lobo and Robert McLaren, Max-DOAS measurements at AMS13 during Oil Sands Field Study, Oil Sands Data Workshop I, Environment Canada, Toronto, ON, Jan 24, 2014.

Robert McLaren, **Akshay Lobo** and **Zoe Davis**, Active-DOAS Measurements at AMS-13, Oil Sands Data Workshop I, Environment Canada, Toronto, ON, Jan 24, 2014.

Robert McLaren, Richard Mittermeier, Kathy Hayden, Doug Worthy, Sabour Baray, Picarro CRDS (Iceman) Measurements of CH_4, CO_2, CO at AMS13, Sands Data Workshop I, Environment Canada, Toronto, ON, Jan 24, 2014.

Robert McLaren, Kathy Hayden, Richard Mittermeyer, Doug Worthy, Aircraft Picarro CRDS (Maverick) Measurements of CH_4, CO_2, CO, H_2O , Oil Sands Data Workshop I, Environment Canada, Toronto, ON, Jan 23, 2014.

P. Veres, J. Roberts, B. Yuan, P. Edwards, R. Wild, S. Brown, T. Bates, P. Quinn, **R. McLaren**, J. Kercher, J. Thornton, E. Williams, J. De Gouw, C. Warneke and J. Holloway, Measurements of Nitryl Chloride and Acyl Peroxynitrates (PANs) in the Uintah Basin, Utah during the 2012 and 2013 Uintah Basin Winter Ozone Study (UBWOS 2012, 2013), Session: A53A-0139 Atmospheric Impacts of Oil and Gas Development III AGU Annual Conference, Dec, 2013.

J. Roberts, B. Yuan, P. Veres, C. Warneke, J. De Gouw, F. Geiger, S. Brown, P. Edwards, R. Wild, K. E. Min, T. Bates, P. Quinn, R. Banta, R. Zamora, **R. McLaren**, C. Young, J. Kercher, J. Thornton and E. Williams, Radical Sources in the Uintah Basin during 2013 Winter Ozone Episodes, Session: A53A-0144 Atmospheric Impacts of Oil and Gas Development III AGU Annual Conference, Dec. 2013.

R. McLaren, P. Wojtal and P. Taylor, The relationship between nighttime formation of gaseous HONO and nocturnal stability in an urban environment, invited talk, Geophysical Research Abstracts, Vol. 16, EGU 2014-15440, 2014, EGU General Assembly, Vienna, Austria.

Robert McLaren; Radical Precursors - Recent atmospheric measurements, AQRD Seminar, Environment Canada, March 28, 2013. **Invited**.

Conference/Symposium/Workshop Organization

Organizer and Chair, IACPES Symposium & Summer School, York University, June 2013 (~ 40 attendees).

Michael Mozurkewich

CAC List of Research Contributions May 2013 to April 2014

Present position: Professor of Atmospheric Chemistry (reduced load)

Current graduate student supervisory committees

Kristin Wall, PhD., Sept. 2005-, Investigation of the photoenhanced reduction of nitrogen dioxide on organic films and above soils as the missing source of daytime tropospheric nitrous acid (HONO)

Research Examination Committee
Patryk Wojtal, PhD., Sept. 2008-Dec. 2013, Night-time measurements of NO2, NO3, N2O5, and H2O using differential optical absorption spectroscopy

Statement of current external activities, paid or unpaid

I am working on a project at Zelenidyne Research, in Albuquerque, New Mexico. The work is currently unpaid and unfunded. We are developing a method for the thermodynamically efficient and economically feasible extraction of concentrated carbon dioxide from the atmosphere. The anticipated application is the solar thermal conversion of CO_2 and water into synthesis gas and oxygen. There exist proven large-scale processes for the conversion of synthesis gas into a variety of products, including gasoline.

Jochen Rudolph

CAC List of Research Contributions May 2012 to April 2013

Present position: Professor of Chemistry, Chair, Department of Chemistry, Faculty of Science and Engineering; Sabbatical, July 1, 2013 – June 30, 2014

Papers in Refereed Journals (bold indicates students)

Satoshi Irei, Jochen Rudolph and Lin Huang, 2013, Compound-specific stable carbon isotope ratios of phenols and nitrophenols derivatized with N,O-bis (trimethylsilyl)trifluoroacetamide, Analytica Chimica Acta., 786, 95-102. *Source of funding: NSERC, CFCAS* PDF

M. Saccon, **R. Busca**, **C. Facca**, L. Huang, **S. Irei**, **A. Kornilova**, D., Lane and J. Rudolph, 2013, Method for the determination of concentration and stable carbon isotope ratios of atmospheric phenols, Atmos. Meas. Tech., 6, 2965-2974, 2013 www.atmos-meas-tech.net/6/2965/2013/ doi:10.5194/amt-6-2965-2013. *Source of funding: NSERC* PDF

A. Kornilova, M. Saccon, J.M. O'Brien, L. Huang & J. Rudolph, 2013, Stable carbon isotope ratios and the photochemical age of atmospheric volatile organic compounds, Atmosphere Ocean, DOI: 10.1080/07055900.2013.822787. Link Location: http://dx.doi.org/10.1080/07055900.2013.822787 *Source of funding: NSERC, CFCAS* PDF

Iulia Gensch, Astrid Kiendler-Scharr and Jochen Rudolph, 2014, Isotope ratio studies of atmospheric organic compounds: Principles, methods, applications and potential, International Journal of Mass Spectrometry, http://dx.doi.org/10.1016/j.ijms.2014.02.004. Link Location: http://www.sciencedirect.com/science/article/pii/S1387380614000591 *Source of funding: NSERC.*

Papers Submitted to Refereed Journals

Irei, Satoshi, Jochen Rudolph, Lin Huang, Janeen Auld, Collin Fabrice, Donald Hastie, March 2014, Stable carbon isotope ratio of phenolic compounds in secondary particulate organic matter formed by photooxidation of toluene, submitted to The Journal of Physical Chemistry.

Jochen Rudolph and Olaf Stein, August 2012, Tropospheric chemistry and composition, aliphatic hydrocarbons, invited contribution submitted to Encyclopedia of Atmospheric Sciences

Presentations *(bold indicates students)*

Christine Facca, Jochen Rudolph, Gas/particle partitioning of nitrophenols in the atmosphere, NSERC CREATE IACPES Symposium, York University, Toronto, Ontario, June 10, 2013.

Marina Saccon, Jochen Rudolph, Concentration & stable carbon isotope ratio measurements of atmospheric phenols, NSERC CREATE IACPES Symposium, York University, Toronto, Ontario, June 10, 2013.

Current graduate students and HQP

Yasamin Hassani, MSc., Sept. 2013, (IACPES), Method development for concentration measurement of SVOC in the atmosphere with a focus on emission from oil sands mining

Marina Saccon, Phd., Feb. 2014 –

Current graduate student supervisory committees

Kevin Nikelski, MSc., Sept. 2013 - , Combination of active and passive (Lunar) DOAS) for measurement of NO_2, NO_3 and HONO present in polluted urban atmospheres

Amanda Jameer, MSc., May 2012 - , The effect of ammonia on secondary organic aerosol yield from beta-pinene ozonolysis

Ibraheem Nuaaman, Phd., 2006 -, Investigations of long range transport and lake breeze effects on gaseous carbonyls

Undergraduate Chem 4000 and research assistants

Yasmin Hassani, IACPES Research Assistant, Summer 2013, Measurement of gas and particle phase nitrophenols in the atmosphere using high-volume filter sampling.

Nicolas Lever, IACPES Research Assistant, Summer 2013, Study of the distribution of nitrophenols between atmospheric particulate matter and the gas phase

Research Examination Committee

Jamie D. Halla, Phd., York University (Chemistry), The application of MAX-DOAS to the measurement of tropospheric gases and aerosols in marine and continental environments, June 25, 2013. Examiner

Christine Facca, MSc., Development and application of measurement techniques for atmospheric phenols in the gas phase and particulate matter, August 2013

Marina Saccon, PhD., Compound specific concentration and stable isotope ratio measurements of atmospheric POM, October 2013

Cumulative Financial Statement

ORU: Centre for Atmospheric Chemistry								
Cost Centre: 111800								
					3 Year Rolling Budget			
Account Description	**2011-12 Actuals**	**2012-13 Actuals**	**2013-14 Actuals**	**Comments**	**2014-15**	**2015-16**	**2016-17**	**Comments**
Revenue:								
Base Allocation from Central		66759	67508		67445			
VPRI support								
Faculty support								
Endowment Revenue								
Indirect Costs (Overhead)		1500	1500		1500			
Support from Grants and Contracts								
Other Internal Revenue								
Other External Revenue								
TOTAL REVENUE		68259	69008		68945			
Expenses:								
Total Faculty Admin. Sal & Ben		6427	6427		7200			
Total Research Staff Sal & Ben								
Total Support Staff Sal & Ben		55689	58159		58162			
Total Operating expenses		6301	4772		5689			
Total Taxes & Utilities								
TOTAL EXPENSES		68417	69358		71051			
Total Revenue Less Total Expenses		-158	-350		-2106			
Carryforward from Previous Year			5584					
Carryforward to Next Year			5234					

ORU: Centre for Atmospheric Chemistry								
Cost Centre: 111850								
					3 Year Rolling Budget			
Account Description	**2011-12 Actuals**	**2012-13 Actuals**	**2013-14 Actuals**	**Comments**	**2014-15**	**2015-16**	**2016-17**	**Comments**
Revenue:								
Base Allocation from Central								
VPRI support								
Faculty support								
Endowment Revenue								
Indirect Costs (Overhead)								
Support from Grants and Contracts		9400	3334		6934			
Other Internal Revenue								
Other External Revenue								
TOTAL REVENUE			3334		6934			
Expenses:								
Total Faculty Admin. Sal & Ben								
Total Research Staff Sal & Ben								
Total Support Staff Sal & Ben								
Total Operating expenses		406	2699		4270			
Total Taxes & Utilities								
TOTAL EXPENSES			2699		2664			
Total Revenue Less Total Expenses			635					
Carryforward from Previous Year								
Carryforward to Next Year			635					