

McGill

**Department of
Atmospheric & Oceanic
Sciences**

Annual Report 2012

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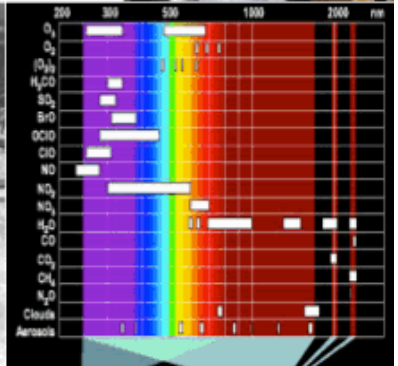
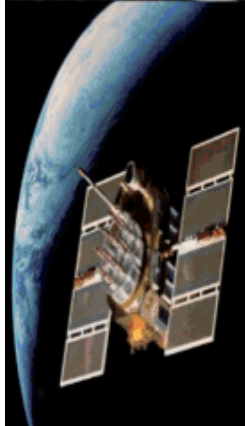
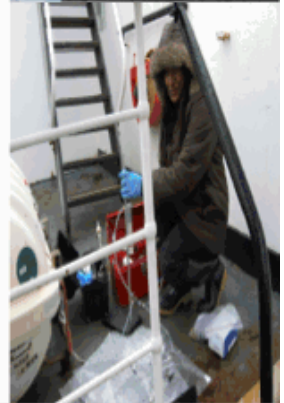


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I. Highlights of AOS in 2012

The Department of Atmospheric and Oceanic Sciences (AOS) at McGill has a long tradition of pioneering research and teaching in meteorology dating from the establishment of the first meteorology group in 1856 and the McGill observatory in 1862 to the great “stormy weather” radar research group who established leading radar research in the midst of the Second World War. Today our department’s research and researchers are quite diverse and our expertise can provide incoming students the opportunity to learn from experts in a wide range of research domains such as physical meteorology, climate, dynamics, radar and satellite remote sensing, physical oceanography, air-sea ice/snow-ocean interactions, atmospheric chemistry and physics as well as green technology and pollution remediation. Research activities in our department are challenging and yet our working environment is collegial and friendly providing wide opportunities for personal and academic growth.

This year has been a most rewarding year for our Department of Atmospheric and Oceanic Sciences, as we started making fundamental changes to our unit in (a) hiring new personnel, (b) enhancement of academic programs, and (c) improvement to existing infrastructure and facilities. Several goals were met. In 2012, we had **134** members in our department: 13 faculty members, 4 emeritus professors, 6 adjunct professors, 20 postdoctoral and research associates, 57 graduate students, 28 undergraduate students (major and minor), and 4 administrative staff (2 full-time and 2 part-time) as well as 2 part-time IT staff. Our department is the largest academic unit in Atmospheric and Oceanic Sciences in Canada. Our research and teaching has always been strong, and based on statistics of post-graduate student graduation, research publications and impacts, are amongst the top 10 in North America. Our graduate program is very strong and continues to flourish: **35%** of students are scholarship holders and three of them are recipients of the most prestigious NSERC graduate awards namely, Alexander Bell. Our research *peer-reviewed publications and patents* are given in the Appendix. The academic renewal, which started in 2011, is continuing to pay substantial dividends in terms of improved teaching as well as continuing to provide broad and rigorous research activities. The highlights of the year include:

- We initiated three successful faculty searches in: (a) climate variability, (b) aerosol-cloud interactions and (c) atmospheric chemistry (joint with the Department of Chemistry). We received record high levels of applications in terms of quality and quantity. It led to the hiring of three excellent young faculty members, Dr. Timothy Merlis, Dr. Andreas Zuend, and Dr. Thomas Preston.
- Two excellent new adjunct and associate professors joined our department, Dr. Eric Galbraith from the Department of Earth and Planetary Science at McGill and Dr. Ashu Dastoor from Environment Canada.
- The total research funding for the year 2012 exceeded the three million dollars’ mark in research grants and contracts, with an average of over \$235,000 dollars for each of the 13 active faculty members (three are research chair holders). The known awards for 2013 are also most encouraging. We thereby contribute substantially to McGill’s financial resources, significantly higher than our department’s annual budget.
- We identified three scientific research clusters: Weather, Air Quality and Climate, as the areas of strategic importance in our department, which also have substantial tangible

economic, political and social impacts for Canada. We created an innovative McGill-led research initiative called “CANADA-Watch” for research on the *interactions* of **Weather, Air quality, Climate** as well as their *feedbacks* with human health. This initiative brings together atmospheric and oceanic scientists with physicists, chemists, biologists, geologists, engineers, health researchers and medical doctors. We attracted over 100 scientists from across the country and over 200 from over 50 universities around the world, including all leading universities in Canada as well as several industries and governmental institutions. Our first workshop is scheduled to take place on **September 20th 2013** at McGill University to foster further collaborations, allowing several focused proposals for future research.

- **Teaching and learning** is a prime priority of our unit. Our undergraduate curriculum was restructured to improve the simplicity, clarity and flexibility while assuring excellent academic quality. Our honours program was restructured in line with our undergraduate program changes. Our joint undergraduate programs were revised to potentially attract more students to our program.
- We introduced a new undergraduate laboratory course in atmospheric and oceanic sciences to provide hands-on research experience and render our graduates even more attractive to the career market in the academic field and industrial domains.
- We initiated the construction of the first undergraduate laboratory in our department equipped with a suite of observational (onsite & remote), laboratory equipment as well as theoretical and modeling methods. We initiated upgrade and renovations to undergraduate and graduate lounges as well as two meeting rooms. These renovations foster more efficient communications with colleagues worldwide. We promoted more interactions and collegial activities amongst faculty and students by setting aside free coffee and cookie hour each Thursday.
- Our colleagues and students have been *recipients of several national and international honours and awards* in recognition of their research excellence. For instance, our recent undergraduate student and now graduate student, Ms. Sophie Splawinski, received her best paper award from the President of Ireland, and Professor John Gyakum received an award for her supervision and the Patterson medal of Environment Canada.
- We are committed to **community involvement** by serving on several national and international scientific policy committees from the Canadian government to the United Nations in order to protect the environment and promote progressive Earth-friendly policies.
- We have been active in **outreach activities** from going to schools to CEGEPs, to interviews with media in English and French.

II. Evaluation of the academic year 2012 and review of the department’s goals and objectives

Information about our current academic members, administrative and support staff as well as our graduate students and postdoctoral fellows are given in the appendix. We also listed our selected contributions to the university, community and consulting services. Research and publication in

terms of grants and contracts, peer-reviewed papers and books, other publications, collaborations and visitors are also described in the appendix.

It is noteworthy that four of our most productive colleagues retired during the last 5 years (see list of emeritus professors in the appendix), and two non-tenured faculties (one joint with Chemistry) returned to their native lands (South Korea and Switzerland). Both remain as adjunct or affiliated faculty to our department. However, by three recent hires during the last two years, our department transition proceeds smoothly and there are elements of recovery, such as a modest increase in the total external funding and contracts in comparison to 2011. With the new three hires, we are confident that the growth will continue. To achieve our optimum efficiency and placement of AOS amongst the top 10 in the world, an increase of the faculty numbers to 20, is required; the list of our near future hiring priorities is given below in section III.

The Department of Atmospheric and Oceanic Sciences either met its goals over this last year or made very significant progress towards their achievement. Our goals were:

1. To recruit three first-rate faculty members
2. To review and improve all parts of our undergraduate program to improve the quality and quantity of our undergraduate program, as well as student recruitment
3. The introduction of the first atmospheric and oceanic laboratory and the initial design and construction of the AOS undergraduate lab at McGill's Burnside Hall
4. To continue our already successful recruiting at graduate levels
5. To improve efficiency of operations and finances
6. To modernize our non-functional and outdated facilities
7. To accelerate our future research activity by creating novel McGill-based initiatives

1. Recruitment of new faculty

The department was fortunate in being able to recruit 3 excellent new faculty members, out of a pool of nearly 300 candidates world-wide, which was a record high for our unit. Dr. Merlis (PhD (Cal Tech), PDF (Princeton)), Dr. Zuend (PhD (ETH), PDF (UCLA)), and Dr. Preston (PhD (UBC), PDF (Bristol)) all have outstanding records for young scientists and have been repeatedly named as "Leader in aerosol thermodynamics", and "the best climate scientist graduated in the US in the last decade". Dr. Merlis and Zuend will join us in August 2013, while Dr. Preston (joint appointment with Chemistry, NSERC PDF fellow) will join us in August 2014. These recruitments are of key importance.

2. Improvement of our undergraduate program, visibility and recruitment: In contrast to a strong graduate program, we acknowledge that our undergraduate enrollment is wanting. A committee was called consisting of five Professors (Fabry, Kirshbaum, Straub, Yau and Ariya (chair)). This committee undertook a complete restructuring of the undergraduate program. Through extensive studies, we simplified, clarified and improved our undergraduate program. We retired options that were not effective, and instead while keeping the academic excellence, we improved our honours, joint programs and diploma. The faculty of science approved all changes to our program.

In parallel to improving our curriculum, we distributed (a) new home-made posters and brochures; (b) had an open house and an open door event, (c) participated in invited lectures to CEGEPs and (d) improved visibility amongst U0 and U1 students. We installed a new monitor at the ground floor of our building with continuous slides and data animation, updated our website, made a page in Wikipedia, and started a blog linked to our undergraduate society site. Since we started most of our advertising activities late in 2012 and most CEGEP visits were performed in early 2013, we suspect that our efforts will produce positive results as early as in academic year

2014-2015, instead of 2013-2014. We intend to continue our assertive efforts with the similar and improved recruitment activities during the next few years.

3. Creation of our first laboratory course and a new undergraduate lab: We actively worked with our undergraduate students and alumni to find the single most important action that we could undertake to improve our undergraduate curriculum. While our students liked very much our program and appreciated the small-size and high one-to-one interactions with faculty members, they wished to have a meteorological laboratory experience. We initiated an undergraduate laboratory course (ATOC 357), which was unanimously approved by the department. We have limited space in Burnside Hall, and thus we had to maximize the usage of available space, by removing storage rooms to allow for the new lab. The construction of this laboratory started in the fall 2012 and equipment and tools were ordered. Radar and atmospheric chemistry facilities will be made available to students for more sophisticated instrumentations. This undergraduate laboratory is the first of its kind in the Department and we are extremely excited to offer hands on laboratory research experience to our undergraduate students, as well as students in Geography, Earth and Planetary Sciences and the Earth System Sciences students. The ATOC 400 course was also resuscitated in order to allow for field research and the hope is that this course will allow our students to travel to experience and understand severe weather events, such as tornadoes, hail storms and other climate phenomena. Some statistics of student enrolments in our programs are given in Table 1. More detailed data are presented in the appendix.

Table 1	2002-2003	2003-2004	2004-2005	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013
Undergraduate	30	38	46	48	35	35	37	42	39	28	27
Graduate	43	43	40	43	44	53	45	55	45	57	52

4. Continue our efforts for a strong graduate program

As depicted in Table 1, our graduate student enrollment shows a consistent increase during the last decade. Our numbers continue to be strong and as of September 2013, we have 60 graduate students in our program. We have always been able to attract the best students in our domains of research and our program is quite competitive internationally.

5. More efficient operations and finances

We are deeply committed to excellence and continuously improving and optimizing the operation efficiency of our units. Our unit’s budget is quite limited in comparison to the funding our professors bring to the university through grants and contacts. Thereby in 2012, we have been very active in revising every single item in all accounts for operation of AOS to eliminate absolutely unnecessary items, while investing more in essentials for maintenance and growth. We worked within the existing complex system of McGill finances, and thus identified our priority areas, within our limited budget. This task allowed us to minimize the financial hardship, while providing the resources for investment in people, knowledge and infrastructure as well as for the new recruits. It is wise for the university to increase the operating budget to assure the sustainable growth of our department, despite the current environment of austerity.

6. Modernization of our non-functional and outdated facilities

Our downtown facilities in Burnside Hall needed rejuvenation and updating. We allocated minor resources released through a more efficient operation and finance system, to initiate the updating of our graduate and undergraduate lounges, renovate our two meeting rooms (BH 812 and 717), and to update the audio-visual and implement remote conferencing capabilities.

7. Acceleration of research activity by creating a novel McGill-led initiative

We actively seek to sustain the excellence of our unit and improve upon its quality. On the one hand, we hired excellent new faculty members, and on the other hand, we initiated a novel pan-Canadian approach called “Canada Watch” (In this province, it will be called Quebec MACS). We identified in our department, our major priority domains of weather, climate and air quality, which are the main breath of the Canada Watch initiative. We have contacted colleagues around Canada and around the globe, and we have a few hundred who are interested in this McGill-based initiative. We intend to apply for a FRQNT team grant. Separate applications for CREATE, NSERC strategic and networks, along with international grants will be initiated. Most AOS faculty members are involved. We increased the number of grant applications at AOS in 2012, particularly for our new recruits. Several of these applications were successful.

III. Near Future outlook: Our departmental goals for 2013

- a) Administrative and support staff renewal:* As shown in Section III, we have well over 100 students and staff in our department. At the moment, we only have two full-time administrative staff. Due to McGill voluntary retirement policy, we expect our most senior administrative officer to retire. Ms. Cavaliere has always been an outstanding member of our department with a wide range of competencies and has made significant contributions. It is essential for us to have this administrative position in place in our department.
- b) Renewal of radar facility and its transformation into a world-leading Earth observatory:* The Radar building structure is currently unsustainable due to a running down structure regardless of world-class instrumentations. In 2013, we have initiated fundamental renovations to this facility, as our priority during this coming year, to assure the continuous strategic strength in remote sensing research, and a significant funding source to our unit and to McGill University.
- c) Faculty hiring priorities:* We are well positioned to exert its intellectual leadership in research and training expertise in various areas of atmospheric and oceanic sciences in Canada, and internationally. Our department three priority areas for hiring faculty are (a) Ocean-atmosphere interactions; (b) Boundary-layer meteorology and (c) Climate change and extreme weather.
- d) Making Canada Watch a reality:* With the rejuvenation of our department we will require to have sustainable research funding to transform ideas into innovations. We will apply for several grants and our first workshop will be held on September 20, 2013. University support of our proposals is pivotal for the success of Canada Watch.
- e) Increase in undergraduate recruitment:* We are committed to an excellent and larger undergraduate program. We revise and intensify our undergraduate recruitment.
- f) Fundraising activities:* Our facilities still require further upgrades to be internationally competitive. We shall thus take part in fund raising activities not only to help our university, but also our unit. It will allow the Department of Atmospheric and Oceanic Sciences, this McGill treasure of a century and a half, to not only survive, but also to grow to a world-leader in the domain of atmospheric and oceanic sciences, the science of climate, in the 21st century!

IV. Acknowledgments

It is a great pleasure to thank all those who contributed to our department and making the last year such a great one. I am very grateful to many contributions of all active and emeritus colleagues in the Department of Atmospheric and Oceanic Sciences. They supported me and were drivers of fundamental changes that I proposed and implemented: from changes to curriculum and recruitment of graduate and undergraduate students, to faculty hiring, new research initiatives and fundraising, to upgrading facilities and renovations. I would like to thank our bright undergraduate and graduate students who generously shared with us their opinions and their needs, so that we can make things happen. They actively participated in our intense and time-consuming process of new faculty hiring. I would like to cordially thank our support staff, Ms. Paula Domingues, Ms. Jennifer Marleau, Mr. Michael Havas and Ms. Wen (Emily) Yang, for their hard work. I wish to foremost acknowledge the contribution of Ms. Ornella Cavaliere, our administrative assistant, whose outstanding contributions have always been pivotal to our department. I learned much from her and I am so grateful to her. I could not have done it without her. She will be deeply missed by our department faculty members, students and staff.

Selected distinctions, awards and prizes

Professor Parisa Ariya was appointed James McGill Professor of Atmospheric and Oceanic Sciences and Chemistry. She served as a scientific advisor, UN-EPA, Canadian contributors, Helsinki negotiations (2011-2012) and the following international UN-mercury binding treaty of 2013. She was also a scientific advisor for CANADA Clean Air Act (2011-2013).

Professor Peter Bartello was named President of the Canadian Meteorological and Oceanographic Society as well as being named to the Board of Trustees of the Canadian Foundation for Climate and Atmospheric Sciences. He also presented a keynote talk and a pedagogical lecture at the US National Center for Atmospheric Research and the University of Colorado workshop.

Professor John Gyakum was awarded the Patterson Distinguished Service Medal of Environment Canada for ‘distinguished service to meteorology’ at the 2012 CMOS Congress in Montreal. Professor John Gyakum was also awarded a certificate by Jim Barry, Chair of the Undergraduate Awards Committee of the Republic of Ireland ‘In recognition of excellence in lecturing’ for supervising Sophie Splawinski, as the winning student of the Agriculture and Environmental Sciences Category.

Professor Pavlos Kollias is Canada Research Chair (Tier 2) in Radar Applications in Weather and Climate

Professor Daniel Kirshbaum serves on the American Meteorological Society’s Mountain Meteorology Committee.

Professor Bruno Tremblay is editor of Journal of Geophysical Research, Oceans.

Professor M. K. (Peter) Yau is Senior NSERC-Hydro-Quebec Industrial Research Chair holder on “Short-term forecasting of precipitation”.

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