Undergraduate Student Handbook

DEPARTMENT OF ATMOSPHERIC AND OCEANIC SCIENCES

September 2019

McGill

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INTRODUCTION

The history of meteorology at McGill dates back to the middle of the nineteenth century when the McGill Weather Observatory was established. It has made continuous measurements of meteorological variables for over a century. Following the Second World War, two active atmospheric sciences research groups emerged at McGill. Dr. J. Stewart Marshall led a radar meteorology group in the Physics Department, and Dr. F. Kenneth Hare directed an Arctic meteorology program in the Department of Geography. These two groups united in 1959 to form the Department of Meteorology. Since its creation, the Department has been a Canadian and international leader in the training of many distinguished atmospheric scientists. McGill has awarded over 400 M.Sc. degrees and more than 200 Ph.D. degrees in this field.

The history of oceanographic research at McGill also dates from the 1850's, and was brought into focus in 1963 with the establishment of the Marine Sciences Centre (later the Institute of Oceanography). Under the directorship of Dr. Max J. Dunbar, the Institute offered M.Sc. and Ph.D. degree programs in the areas of physical, geological and biological oceanography.

In 1987 the Institute was closed and a Graduate Program in Oceanography was established to coordinate teaching and research in the marine sciences carried out by faculty members in the Departments of Meteorology, Earth and Planetary Sciences and Biology.

In 1992, the Department of Meteorology became the Department of Atmospheric and Oceanic Sciences (AOS) to demonstrate the broad range of research activities in the atmospheric sciences, physical oceanography and climate studies.

WHY STUDY WEATHER AND CLIMATE?

The undergraduate programs in Atmospheric Science provide students with a background to help solve the challenging problems of short- and long-range weather and climate predictions, as well as global warming and air quality issues. Within this framework, the students will learn about specific phenomena such as severe weather, climate change, the ozone hole, and air-sea interactions.

At the Department of Atmospheric and Oceanic Sciences (AOS), we continue to strengthen our educational leadership in teaching, research, and service on the Canadian and international scene.

A degree in Atmospheric Science can lead to a professional career in government service or private industry. The meteorological service of Canada has traditionally been the main employer of graduating students, but certain provincial governments and environmental consulting and engineering firms also employ graduates trained in atmospheric science.

Graduate students in the field move on to successful careers, such as environmental research and consulting, weather and climate forecasting/analysis, and teaching at the college and university level.

Our research areas include:

- Atmospheric Chemistry
- Geophysical Fluid Dynamics
- Cloud Physics and Dynamics
- Atmospheric Radiation
- Mesoscale Meteorology
- Physical Meteorology
- Sea Ice and Arctic Climate
- Ocean Dynamics
- Remote Sensing
- Physical Oceanography
- Ocean Biogeochemistry
- Stratospheric Dynamics and Chemistry
- Dynamical Meteorology and Climatology
- Global Climate Change and Variability
- Radar Meteorology
- Synoptic Meteorology
- Air-Sea Interactions
- Development of technology for atmospheric observation, pollution remediation

ABOUT OUR PROGRAM

At the undergraduate level, the Department offers a broad range of courses and degree programs. The study of atmospheric science is based largely on physics and applied mathematics. Consequently, all required courses, except those at the introductory level, generally have pre-requisites or co-requisites in physics, mathematics, and atmospheric science. One of the goals of the discipline is to develop the understanding necessary to improve our ability to predict the weather, but atmospheric science is more than weather forecasting. Another important area of study focuses on quantifying the possible fluctuations observed in global climate caused by the changing chemical composition of the atmosphere.

Atmospheric science combines observation and theoretical models of its complex subject to analyze the motion and composition of the air, its thermodynamic behaviour, and its interaction with radiation and with the solid or liquid surface beneath it. The atmosphere may be studied as a large ocean of gas by the methods of fluid mechanics: winds, circulation patterns, turbulence, and energy and momentum exchanges are examples of ideas employed in this approach. Alternatively, we can also study the physics of the atmosphere: how water condenses in the air, how droplets can make rain, how sunlight warms the ground and the ground warms the air above through radiation and convection, and also how the atmosphere and ocean interact to shape the weather and climate. A comprehensive understanding requires undertaking both types of studies and our curriculum reflects this.

The Department offers four main programs in Atmospheric Science: Minor, Major, Honours, and Joint Major Atmospheric Science and Physics. The Department also offers a Liberal program and a special one-year **Diploma** program to B.Sc. graduates.

The **Major** program satisfies the requirements for a professional career as a meteorologist and equips students to undertake post-graduate study in meteorology, atmospheric science, and related sciences such as physical oceanography at any of the leading universities.

The **Honours** program, with courses similar to those in the Major program, provides students the opportunity to specialize their interests further by taking on advanced optional courses. Students who have demonstrated high academic standing with a minimum GPA of 3.30 in all courses, after completion

of the U1 year of the Major program are permitted to enroll in the Honours program. Students having completed their U1 year in another program may be admitted to the Honours program on the recommendation of the Department.

STUDENT LIFE IN OUR DEPARTMENT

Undergraduate students benefit from our Department's small size. Classes are generally small and professors are approachable. Since there are approximately 25 undergraduate students in the Department, you will know everyone in your year and have ample opportunity to meet others at the various social events that are held outside McGill. Throughout the year, tours and trips to various locations are held, including Weather Channel (MétéoMedia) Station, Canadian Meteorological Centre, Quebec Weather Centre, and McGill's J. Stewart Marshall Observatory.

All undergraduate students are part of the Atmospheric and Oceanic Sciences Society of Undergraduates at McGill (AOSSUM). The nine elected students of AOSSUM council are responsible for organizing social activities of the undergraduates. For more information, visit their website at https://web.meteo.mcgill.ca/aossum/.

ADVISING AT McGILL

McGill offers students access to a variety of advisors, mentors and counselors with different skills, expertise, and levels of authority. Your active participation in the advising process is essential for accessing the full range of academic opportunities during your studies. You are encouraged to be proactive in seeking meetings with various advisors, professors, and counsellors to ensure you receive the advice you need to formulate a personal plan of study and meet your academic goals.

Advisors and counsellors will assist you throughout your undergraduate studies. While advisors are there to provide you with guidance, you are ultimately responsible for meeting your degree or diploma requirements. It is your responsibility to learn the rules and regulations of the University, your faculty, and your program.

The following is a brief description of the typical types of advisors available for students:

Faculty Advisors

Each faculty at McGill has its own student affairs office with an advisor specific to that faculty. See section 1.11 (page 121) of the Undergraduate Programs and Courses Calendar 2019-2020 on the https://mcgill.ca/study/2019-2020/ for a detailed description. Faculty advisors are available throughout the calendar year and assist students in various areas. They are experts in the rules, regulations, and requirements pertaining to specific degree programs. They

- Provide ongoing advice and guidance on program selection, course registration, credit load, deadlines, and majors and minors.
- Offer help managing academic situations during periods of personal, financial, or medical difficulties, by working with you to identify various possibilities and strategies for making informed decisions.
- Communicate with other advisors within the University and, with your permission, serve as a direct link to other University resources.
- May assist you in planning for, and applying to, university exchange programs and may also provide, or direct you to, information about scholarships, awards, research fellowships, and opportunities within a given field.

To schedule an appointment with an academic advisor at the Faculty of Science, please contact:

Science Office for Undergraduate Student Advising (SOUSA)

Address	McGill University 853 Sherbrooke Street West Dawson Hall, Room 405 Montreal, Quebec H3A 2T6 Canada
Telephone	(514) 398–5442
Email (New students)	newstudentadvising.science@mcgill.ca
Email	advisor.science@mcgill.ca
Website	www.mcgill.ca/science/student
Opening hours	Monday to Friday: 9:00 am – 4:30 pm Except Wednesdays: 10:00 am – 4:30 pm

Departmental (or School) Academic Advisors

Each department at McGill assigns its own Departmental Academic Adviser (e.g., Undergraduate/Graduate Program Director) and are normally located closer to the offices of professors in your program and may only be available during specific times of the year (e.g., prior to registration for the next session or during the add/drop period) or during regularly scheduled office hours. If you are completing a major or minor in more than one unit, you will likely have an advisor in each unit.

You are strongly encouraged to meet with your Departmental Academic Advisor throughout the academic year and certainly before your final year. See section 1.11 (page 121) and 11.7 (page 1402) of the Undergraduate Programs and Courses Calendar 2019-2020 on the https://mcgill.ca/study/2019-2020/ for more details.

The Departmental Academic Advisor may be either a professor or a member of the administrative staff who will:

- Guide you through course selection to meet the subject matter requirements of the major or minor.
- Consider requests for course equivalencies, recommend prior approval for inter-university transfer credits, or explain the rationale for the design of a department/school program.
- May assist you in planning for, and applying to, university exchange programs, and may also provide, or direct you to, information about scholarships, awards, research fellowships, and opportunities within a given field.
- Provide support, guidance, and appropriate referrals if you experience academic or personal difficulties while studying at McGill.
- Be responsible for confirming that you have met major or minor program requirements for graduation.

To schedule an appointment with the Undergraduate Program Director at the Department of Atmospheric and Oceanic Sciences, please contact:

Dr. Timothy Merlis, Undergraduate Program Director

Telephone	(514) 398–3140
Fax	(514) 398–6115
Email	timothy.merlis@mcgill.ca

Professors/Lecturers

Sometimes Professors/Lecturers may act in a voluntary capacity to mentor you on a personal level as you progress through your program:

- May provide advice on the latest developments in a specific field of study and make recommendations on related advanced readings.
- May discuss opportunities for a student research experience and help you connect with a professor or lecturer who best suits your interests or learning style.

Peer Advisors

The Peer Adviser Program is a joint effort between the Student Affairs Office of the Faculties of Arts & Science, the Arts Undergraduate Society, and the Science Undergraduate Society (SUS). The goal of this program is to complement the services provided by the Student Affairs Office by providing trained senior undergraduate students whom you can consult on an anonymous basis. Peer advisers will be available to help you from September to November, and from January to March, on a drop-in basis. You should contact the Student Affairs Office at the beginning of the fall term for the room location. Please visit the Faculty of Science's Academic Advising page for more information (https://mcgill.ca/science/student/advising).

STUDENT SERVICES – DOWNTOWN CAMPUS

Unless otherwise indicated, all Student Services on the Downtown Campus are located in the William and Mary Brown Student Services Building, 3600 McTavish Street, Montreal, Quebec, H3A 1Y2. Below is a list of some services available in that building. For further information, consult: https://www.mcgill.ca/studentservices/

Campus life and Engagement

To ensure that your transition into the academic and social life at McGill University is as smooth as possible, the Campus life and Engagement office helps newly admitted students prepare for the course registration period on Minerva. To maximize this help, you are strongly encouraged to read the sections in the *Welcome to McGill* book (www.mcgill.ca/newstudents) applicable to your faculty. The FYO staff is always available to provide advice and referrals to the many support mechanisms at McGill.

Address	3600 McTavish Street Brown Student Services Building, suite 3100 Montreal, Quebec H3A 1Y2 Canada
Telephone	(514) 398–6913
Email	firstyear@mcgill.ca
Website	https://www.mcgill.ca/firstyear/

Student Wellness Hub

The Student Wellness Hub is a renovated space that has consolidated and expanded Health Services, Counselling and Psychiatric Services. It features staff, clinicians and medical professionals, for any and all health and wellness needs that a student may have. It is located on the third, fourth and fifth floors of the Brown Building.
All full- and part-time students who have paid student service fees are eligible for services free of charge. 30-minute drop-in counselling appointments are available if you do not have a regular counsellor at the Hub and have a single mental health issue that you think could be addressed in 1 session. Drop-ins with a doctor or nurse are available to anyone starting at 9.00 AM. They can provide emergency care, prescription renewals, referrals and other services.

Address	3600 McTavish Street Brown Student Services Building, 3rd Floor Montreal, Quebec H3A 1Y2 Canada
Telephone	(514) 398–3601
Email	wellness.hub@mcgill.ca
Website	https://www.mcgill.ca/wellness-hub/

The Office for Students with Disabilities (OSD)

The OSD works with students who have documented disabilities, mental health issues, chronic health conditions, or other impairments. These may be temporary, permanent, or episodic. Students must book an appointment with an Access Services Advisor to discuss their barriers and to determine what resources or accommodations will help to make their time at McGill a success. For more information, visit https://mcgill.ca/osd/.

Address	Office for Students with Disabilities (OSD) 1010 Sherbrooke Ouest Suite 410 Montreal, Quebec H3A 2R7 Canada
Telephone	(514) 398–6009
Email	disabilities.students@mcgill.ca.
Website	https://www.mcgill.ca/osd/

Career Planning Service (CAPS)

The Career Planning Service (CAPS) is principally funded by McGill student services fees and receives support from corporate and alumni sponsorships. CAPS assists students in their career development and search for permanent, part-time, and summer jobs, as well as internships, by providing workshops, individual advising, a comprehensive job posting service, and an extensive Career Resource Centre. We serve all full-time students, including graduates, up to one year after the end of their studies.

Employers come to CAPS to look for talented students and graduates with skills that they need for their businesses and organizations. CAPS can provide employers with many services to help them find the best students for their employment needs. Our recruitment services are provided to employers free of charge and are offered year round.

Address	3600 McTavish Street Brown Student Services Building, suite 2200 Montreal, Quebec H3A 1Y2 Canada
Telephone	(514) 398–3304
Email	careers.caps@mcgill.ca
Website	https://www.mcgill.ca/caps/

Scholarships and Student (Financial) Aid Office

McGill offers financial aid in the form of loans (money that needs to eventually be repaid) and bursaries (money that does not need to be repaid) to eligible students who demonstrate financial need. The assistance provided by the Scholarships and Student (Financial) Aid Office is meant to supplement other sources of core funding such as government aid, parental support, part-time work and, in some cases, a student line of credit from the bank. Their mission is to promote accessibility, support retention and

encourage scholarship through financial awards for needy and deserving students in any degree program from any geographic origin.

They also administer The Work Study Program. Work study offers students with financial need access to clerical, research, technical, library or other jobs on campus or in some of the McGill-affiliated hospitals and organizations. The program not only helps students financially but can develop career-related skills and experience. A student's acceptance to the program is based primarily on financial need. If you are interested, you can check the eligibility requirements and apply to participate in the program on Minerva. If you are accepted to participate in the Work Study program, you can apply for the Work Study jobs listed on the job postings page online. You apply directly to the employers and get paid by the employers for your work. For more information, visit: https://www.mcgill.ca/studentaid/work-study.

McGill University has a comprehensive scholarship and award program to recognize honour and encourage the outstanding achievements of its undergraduate students at different levels of study. For a comprehensive list of all scholarships and awards with detailed descriptions and eligibility requirements, please consult the Undergraduate Scholarships and Awards Calendar:
https://www.mcgill.ca/studentawards/undergraduate-scholarships-and-awards

Address	3600 McTavish Street Brown Student Services Building, suite 3200 Montreal, Quebec H3A 1Y2 Canada
Telephone	(514) 398–6013
Emails	scholarships@mcgill.ca; student.aid@mcgill.ca
Website	www.mcgill.ca/studentaid
Opening Hours	Monday to Friday: 10-00 am – 4:30 pm

The Student Society of McGill University (SSMU)

Every undergraduate at McGill is a member of the SSMU. They are there to speak out for you and advocate for your interests. On the local university levels, this means being your representation to the McGill administration. Operating within the University Centre, the SSMU oversees a wide array of clubs, services and events. For more information, visit their website at https://ssmu.ca/.

PROGRAMS

The department offers following programs at the undergraduate level:
Minor Atmospheric Science (18 credits)
Liberal Program - Core Science Component Atmospheric and Oceanic Sciences (48 credits)
Major Atmospheric Science (62 credits)
Major Atmospheric Science and Physics (69 credits)
Honours Atmospheric Science (74 credits)

A Diploma in Meteorology (30 credits) is also offered. Atmospheric and Oceanic Sciences (ATOC) Related Programs are also described in this section.

Minor Atmospheric Science (18 credits)

The Minor may be taken in conjunction with any program in the Faculty of Science.

Required Courses (3 credits)
ATOC 214 (3) Introduction: Physics of the Atmosphere
Complementary Courses (15 credits)
3-6 credits selected from:
ATOC 215 (3) Oceans, Weather and Climate
ATOC 219* (3) Introduction to Atmospheric Chemistry
CHEM 219* (3) Introduction to Atmospheric Chemistry
* Note: Students may select ATOC 219 or CHEM 219 but not both.
9-12 credits selected from:
ATOC 309 (3) Weather Radars and Satellites
ATOC 312 (3) Rotating Fluid Dynamics
ATOC 315 (3) Thermodynamics and Convection
ATOC 357 (3) Atmospheric and Oceanic Science Laboratory
ATOC 512 (3) Atmospheric and Oceanic Dynamics
ATOC 513 (3) Waves and Stability
ATOC 515 (3) Turbulence in Atmosphere and Oceans
ATOC 519 (3) Advances in Chemistry of Atmosphere
ATOC 521 (3) Cloud Physics
ATOC 525 (3) Atmospheric Radiation
ATOC 531 (3) Dynamics of Current Climates
ATOC 540 (3) Synoptic Meteorology 1
ATOC 558 (3) Numerical Methods and Laboratory
ATOC 568 (3) Ocean Physics

Liberal Program - Core Science Component Atmospheric and Oceanic Sciences (48 credits)

45-48 credits

Required Courses (21 credits)

ATOC 214 (3) Introduction: Physics of the Atmosphere
ATOC 312 (3) Rotating Fluid Dynamics
ATOC 315 (3) Thermodynamics and Convection
MATH 222 (3) Calculus 3
MATH 223 (3) Linear Algebra
MATH 314 (3) Advanced Calculus
MATH 315 (3) Ordinary Differential Equations

Complementary Courses (27 credits)

24-27 credits:

Note: All students are encouraged to consult with the Undergraduate Adviser for help selecting from among the complementary courses.

3-6 credits selected from:

ATOC 215 (3) Oceans, Weather and Climate
ATOC 219 (3) Introduction to Atmospheric Chemistry

3 credits selected from:

ATOC 357 (3) Atmospheric and Oceanic Science Laboratory
PHYS 257 (3) Experimental Methods 1

3 credits selected from:

PHYS 230 (3) Dynamics of Simple Systems
PHYS 251 (3) Honours Classical Mechanics 1

3 credits selected from:

PHYS 232 (3) Heat and Waves
PHYS 253 (3) Thermal Physics

12-16 credits selected from (at least 6 of which must be ATOC):

ATOC 309 (3) Weather Radars and Satellites
ATOC 512 (3) Atmospheric and Oceanic Dynamics
ATOC 513 (3) Waves and Stability
ATOC 515 (3) Turbulence in Atmosphere and Oceans
ATOC 519 (3) Advances in Chemistry of Atmosphere
ATOC 521 (3) Cloud Physics
ATOC 525 (3) Atmospheric Radiation
ATOC 531 (3) Dynamics of Current Climates
ATOC 540 (3) Synoptic Meteorology 1
ATOC 541 (3) Synoptic Meteorology 2
ATOC 546 (1) Current Weather Discussion
ATOC 558 (3) Numerical Methods and Laboratory
ATOC 568 (3) Ocean Physics

COMP 208 (3) Computers in Engineering
MATH 203 (3) Principles of Statistics 1
MATH 319 (3) Introduction to Partial Differential Equations
PHYS 333 (3) Thermal and Statistical Physics
PHYS 340 (3) Majors Electricity and Magnetism

Major Atmospheric Science (62 credits)

Required Courses (24 credits)
ATOC 214 (3) Introduction: Physics of the Atmosphere
ATOC 312 (3) Rotating Fluid Dynamics
ATOC 315 (3) Thermodynamics and Convection
COMP 208 (3) Computers in Engineering
MATH 222 (3) Calculus 3
MATH 223 (3) Linear Algebra
MATH 314 (3) Advanced Calculus
MATH 315 (3) Ordinary Differential Equations

Complementary Courses (38 credits)
36-38 credits
Note: Students are required to fulfill the core complementary requirements along with one of the four streams listed below. In cases of overlap, each course can only be used once toward the satisfaction of the core complementary courses or the chosen stream.
Core (21 credits)
3-6 credits selected from:
ATOC 215 (3) Oceans, Weather and Climate
ATOC 219* (3) Introduction to Atmospheric Chemistry
CHEM 219* (3) Introduction to Atmospheric Chemistry
* Note: students may select ATOC 219 or CHEM 219 but not both.
3 credits selected from:
ATOC 357 (3) Atmospheric and Oceanic Science Laboratory
PHYS 257 (3) Experimental Methods 1
3 credits selected from:
PHYS 230 (3) Dynamics of Simple Systems
PHYS 251 (3) Honours Classical Mechanics 1
3 credits selected from:
PHYS 232 (3) Heat and Waves
PHYS 253 (3) Thermal Physics
6-9 credits selected from:
CHEM 213 (3) Introductory Physical Chemistry 1: Thermodynamics
CHEM 273 (3) Introductory Physical Chemistry 2: Kinetics and Methods
CHEM 367 (3) Instrumental Analysis 1

CHEM 575 (3) Chemical Kinetics
MATH 203* (3) Principles of Statistics 1
MATH 317 (3) Numerical Analysis
MATH 319 (3) Introduction to Partial Differential Equations
MATH 323 (3) Probability
MATH 324* (3) Statistics
PHYS 333 (3) Thermal and Statistical Physics
PHYS 340** (3) Majors Electricity and Magnetism
PHYS 342*** (3) Majors Electromagnetic Waves
PHYS 350** (3) Honours Electricity and Magnetism
PHYS 352*** (3) Honours Electromagnetic Waves
* Students cannot receive credit for both MATH 203 and MATH 324.
** Students cannot receive credit for both PHYS 340 and PHYS 350.
*** Students cannot receive credit for both PHYS 342 and PHYS 352.

Weather Analysis and Forecasting Stream (17 credits)

(16-17 credits)
13 credits from:
ATOC 309 (3) Weather Radars and Satellites
ATOC 521 (3) Cloud Physics
ATOC 540 (3) Synoptic Meteorology 1
ATOC 541 (3) Synoptic Meteorology 2
ATOC 546 (1) Current Weather Discussion
3-4 credits selected from:
ATOC 404+ (3) Climate Physics
ATOC 512 (3) Atmospheric and Oceanic Dynamics
ATOC 513 (3) Waves and Stability
ATOC 525 (3) Atmospheric Radiation
ATOC 530 (3) Paleoclimate Dynamics
ATOC 531 (3) Dynamics of Current Climates
ATOC 558 (3) Numerical Methods and Laboratory
ATOC 568 (3) Ocean Physics
ESYS 300 (3) Investigating the Earth System
ESYS 301 (3) Earth System Modelling
GEOG 322 (3) Environmental Hydrology
GEOG 372 (3) Running Water Environments
MATH 555++ (4) Fluid Dynamics
PHYS 404+ (3) Climate Physics
PHYS 432++ (3) Physics of Fluids
+ Students cannot receive credit for both ATOC 404 and PHYS 404.
++ Students cannot receive credit for both PHYS 432 or MATH 555.

Climate Science Stream (15 credits)

6 credits from:

ATOC 404+ (3) Climate Physics
ATOC 531 (3) Dynamics of Current Climates
PHYS 404+ (3) Climate Physics
+ Students cannot receive credit for both ATOC 404 and PHYS 404.

9 credits (at least 6 of which must be ATOC) selected from:

ATOC 512 (3) Atmospheric and Oceanic Dynamics
ATOC 513 (3) Waves and Stability
ATOC 519 (3) Advances in Chemistry of Atmosphere
ATOC 521 (3) Cloud Physics
ATOC 525 (3) Atmospheric Radiation
ATOC 530 (3) Paleoclimate Dynamics
ATOC 540 (3) Synoptic Meteorology 1
ATOC 558 (3) Numerical Methods and Laboratory
ATOC 568 (3) Ocean Physics
EPSC 513 (3) Climate and the Carbon Cycle
EPSC 542 (3) Chemical Oceanography
ESYS 300 (3) Investigating the Earth System
ESYS 301 (3) Earth System Modelling
GEOG 322 (3) Environmental Hydrology
GEOG 372 (3) Running Water Environments
MATH 323 (3) Probability

Atmospheric Chemistry and Physics Stream (15 credits)

15 credits from:

ATOC 309 (3) Weather Radars and Satellites
ATOC 404+ (3) Climate Physics
ATOC 519 (3) Advances in Chemistry of Atmosphere
ATOC 521 (3) Cloud Physics
CHEM 213 (3) Introductory Physical Chemistry 1: Thermodynamics
CHEM 273 (3) Introductory Physical Chemistry 2: Kinetics and Methods
PHYS 404+ (3) Climate Physics
+ Students cannot receive credit for both ATOC 404 and PHYS 404.

General Stream (17 credits)

15-17 credits (at least 12 of which must be ATOC) selected from:

ATOC 309 (3) Weather Radars and Satellites
ATOC 404+ (3) Climate Physics
ATOC 512 (3) Atmospheric and Oceanic Dynamics
ATOC 513 (3) Waves and Stability
ATOC 519 (3) Advances in Chemistry of Atmosphere

ATOC 521 (3) Cloud Physics
ATOC 525 (3) Atmospheric Radiation
ATOC 530 (3) Paleoclimate Dynamics
ATOC 531 (3) Dynamics of Current Climates
ATOC 540 (3) Synoptic Meteorology 1
ATOC 541 (3) Synoptic Meteorology 2
ATOC 546 (1) Current Weather Discussion
ATOC 558 (3) Numerical Methods and Laboratory
ATOC 568 (3) Ocean Physics
CHEM 367 (3) Instrumental Analysis 1
CHEM 575 (3) Chemical Kinetics
EPSC 513 (3) Climate and the Carbon Cycle
EPSC 542 (3) Chemical Oceanography
ESYS 300 (3) Investigating the Earth System
ESYS 301 (3) Earth System Modelling
GEOG 322 (3) Environmental Hydrology
GEOG 372 (3) Running Water Environments
MATH 555++ (4) Fluid Dynamics
PHYS 404+ (3) Climate Physics
PHYS 432++ (3) Physics of Fluids
+ Students cannot receive credit for ATOC 404 and PHYS 404.
++ Students cannot receive credit for both PHYS 432 or MATH 555.

Major Atmospheric Science and Physics (69 credits)

This Major provides a solid basis for postgraduate study in meteorology, atmospheric physics, or related fields, as well as the necessary preparation for embarking on a professional career as a meteorologist directly after the B.Sc.
The program is jointly administered by the Department of Physics and the Department of Atmospheric and Oceanic Sciences. Students should consult undergraduate advisers in both departments.

Required Courses (57 credits)
ATOC 214 (3) Introduction: Physics of the Atmosphere
ATOC 215 (3) Oceans, Weather and Climate
ATOC 309 (3) Weather Radars and Satellites
ATOC 312 (3) Rotating Fluid Dynamics
ATOC 315 (3) Thermodynamics and Convection
MATH 222 (3) Calculus 3
MATH 223 (3) Linear Algebra
MATH 314 (3) Advanced Calculus
MATH 315 (3) Ordinary Differential Equations
PHYS 230 (3) Dynamics of Simple Systems
PHYS 232 (3) Heat and Waves

PHYS 241 (3) Signal Processing
PHYS 257 (3) Experimental Methods 1
PHYS 258 (3) Experimental Methods 2
PHYS 331 (3) Topics in Classical Mechanics
PHYS 333 (3) Thermal and Statistical Physics
PHYS 340 (3) Majors Electricity and Magnetism
PHYS 342 (3) Majors Electromagnetic Waves
PHYS 446 (3) Majors Quantum Physics

Complementary Course (12 credits)
At least 6 of the 12 complementary credits must come from ATOC courses
ATOC 357 (3) Atmospheric and Oceanic Science Laboratory
ATOC 404* (3) Climate Physics
ATOC 512 (3) Atmospheric and Oceanic Dynamics
ATOC 513 (3) Waves and Stability
ATOC 515 (3) Turbulence in Atmosphere and Oceans
ATOC 521 (3) Cloud Physics
ATOC 525 (3) Atmospheric Radiation
ATOC 531 (3) Dynamics of Current Climates
ATOC 540 (3) Synoptic Meteorology 1
ATOC 541 (3) Synoptic Meteorology 2
ATOC 558 (3) Numerical Methods and Laboratory
ATOC 568 (3) Ocean Physics
PHYS 339 (3) Measurements Laboratory in General Physics
PHYS 404* (3) Climate Physics
PHYS 432 (3) Physics of Fluids
PHYS 434 (3) Optics
PHYS 439 (3) Majors Laboratory in Modern Physics
PHYS 449 (3) Majors Research Project
* Students cannot take both ATOC 404 and PHYS 404.

Honours Atmospheric Science (74 credits)

72-74 credits
Students can be admitted to the Honours program after completion of the U1 year of the Major in Atmospheric Science program with a minimum GPA of 3.30. Students having completed a U1 year in a different program with high standing may be admitted to the Honours program on the recommendation of that department.
A minimum GPA of 3.30 in the Honours program courses (taken as a whole) is required to remain in the program. A CGPA of 3.30 on the total program is also required to graduate with honours.

Required Courses (27 credits)

ATOC 214 (3) Introduction: Physics of the Atmosphere
ATOC 312 (3) Rotating Fluid Dynamics
ATOC 315 (3) Thermodynamics and Convection
ATOC 480 (3) Honours Research Project
COMP 208 (3) Computers in Engineering
MATH 222 (3) Calculus 3
MATH 223 (3) Linear Algebra
MATH 314 (3) Advanced Calculus
MATH 315 (3) Ordinary Differential Equations

Complementary Courses (47 credits)

45-47 credits

Note: Students are required to fulfill the core complementary requirements along with one of the four streams listed below. In cases of overlap, each course can only be used once toward the satisfaction of the core complementary courses or the chosen stream.

Core (24 credits)

3-6 credits selected from:

ATOC 215 (3) Oceans, Weather and Climate
ATOC 219* (3) Introduction to Atmospheric Chemistry
CHEM 219* (3) Introduction to Atmospheric Chemistry
* Students may take ATOC 219 or CHEM 219 but not both.

3 credits selected from:

ATOC 357 (3) Atmospheric and Oceanic Science Laboratory
PHYS 257 (3) Experimental Methods 1

3 credits selected from:

PHYS 230 (3) Dynamics of Simple Systems
PHYS 251 (3) Honours Classical Mechanics 1

3 credits selected from:

PHYS 232 (3) Heat and Waves
PHYS 253 (3) Thermal Physics

3 credits selected from:

CHEM 213 (3) Introductory Physical Chemistry 1: Thermodynamics
MATH 319 (3) Introduction to Partial Differential Equations

6-9 credits selected from:

CHEM 273 (3) Introductory Physical Chemistry 2: Kinetics and Methods
CHEM 367 (3) Instrumental Analysis 1
CHEM 575 (3) Chemical Kinetics
MATH 203* (3) Principles of Statistics 1
MATH 317 (3) Numerical Analysis
MATH 319 (3) Introduction to Partial Differential Equations

MATH 323 (3) Probability
MATH 324 (3) Statistics
PHYS 333 (3) Thermal and Statistical Physics
PHYS 340** (3) Majors Electricity and Magnetism
PHYS 342*** (3) Majors Electromagnetic Waves
PHYS 350** (3) Honours Electricity and Magnetism
PHYS 352*** (3) Honours Electromagnetic Waves
* Students cannot receive credit for both MATH 203 and MATH 324.
** Students cannot receive credit for both PHYS 340 and PHYS 350.
*** Students cannot receive credit for both PHYS 342 and PHYS 352.

Weather Analysis and Forecasting Stream (23 credits)

22-23 credits
16 credits from:
ATOC 309 (3) Weather Radars and Satellites
ATOC 512 (3) Atmospheric and Oceanic Dynamics
ATOC 521 (3) Cloud Physics
ATOC 540 (3) Synoptic Meteorology 1
ATOC 541 (3) Synoptic Meteorology 2
ATOC 546 (1) Current Weather Discussion
6-7 credits selected from:
ATOC 404+ (3) Climate Physics
ATOC 513 (3) Waves and Stability
ATOC 515 (3) Turbulence in Atmosphere and Oceans
ATOC 525 (3) Atmospheric Radiation
ATOC 530 (3) Paleoclimate Dynamics
ATOC 531 (3) Dynamics of Current Climates
ATOC 558 (3) Numerical Methods and Laboratory
ATOC 568 (3) Ocean Physics
ESYS 300 (3) Investigating the Earth System
ESYS 301 (3) Earth System Modelling
MATH 555++ (4) Fluid Dynamics
PHYS 404+ (3) Climate Physics
PHYS 432++ (3) Physics of Fluids
+ Students cannot receive credit for both ATOC 404 and PHYS 404.
++ Students cannot receive credit for both PHYS 432 or MATH 555.

Climate Science Stream (22 credits)

21-22 credits
15 credits from:

ATOC 404+ (3) Climate Physics
ATOC 512 (3) Atmospheric and Oceanic Dynamics
ATOC 531 (3) Dynamics of Current Climates
MATH 323 (3) Probability
MATH 324 (3) Statistics
PHYS 404+ (3) Climate Physics
+ Students cannot receive credit for both ATOC 404 and PHYS 404.
Students cannot receive credit for both MATH 203 and MATH 324.
6-7 credits (3 of which must be ATOC) selected from:
ATOC 513 (3) Waves and Stability
ATOC 515 (3) Turbulence in Atmosphere and Oceans
ATOC 521 (3) Cloud Physics
ATOC 525 (3) Atmospheric Radiation
ATOC 530 (3) Paleoclimate Dynamics
ATOC 540 (3) Synoptic Meteorology 1
ATOC 558 (3) Numerical Methods and Laboratory
ATOC 568 (3) Ocean Physics
EPSC 513 (3) Climate and the Carbon Cycle
EPSC 542 (3) Chemical Oceanography
ESYS 300 (3) Investigating the Earth System
ESYS 301 (3) Earth System Modelling
MATH 423 (3) Regression and Analysis of Variance
MATH 555++ (4) Fluid Dynamics
PHYS 432++ (3) Physics of Fluids
+ Students cannot receive credit for both PHYS 432 or MATH 555.

Atmospheric Chemistry and Physics Stream (21 credits)

15 credits from:
ATOC 309 (3) Weather Radars and Satellites
ATOC 519 (3) Advances in Chemistry of Atmosphere
ATOC 521 (3) Cloud Physics
CHEM 213 (3) Introductory Physical Chemistry 1: Thermodynamics
CHEM 273 (3) Introductory Physical Chemistry 2: Kinetics and Methods
6 credits selected from:
ATOC 404+ (3) Climate Physics
ATOC 512 (3) Atmospheric and Oceanic Dynamics
ATOC 513 (3) Waves and Stability
ATOC 519 (3) Advances in Chemistry of Atmosphere
ATOC 525 (3) Atmospheric Radiation
ATOC 530 (3) Paleoclimate Dynamics
ATOC 540 (3) Synoptic Meteorology 1

ATOC 558 (3) Numerical Methods and Laboratory
CHEM 367 (3) Instrumental Analysis 1
CHEM 575 (3) Chemical Kinetics
EPSC 513 (3) Climate and the Carbon Cycle
EPSC 542 (3) Chemical Oceanography
MATH 423 (3) Regression and Analysis of Variance
PHYS 404+ (3) Climate Physics
+ Student cannot receive credit for both ATOC 404 and PHYS 404.

General Stream (22 credits)

21-22 credits (at least 15 of which must be ATOC) selected from:
ATOC 309 (3) Weather Radars and Satellites
ATOC 404+ (3) Climate Physics
ATOC 512 (3) Atmospheric and Oceanic Dynamics
ATOC 513 (3) Waves and Stability
ATOC 519 (3) Advances in Chemistry of Atmosphere
ATOC 521 (3) Cloud Physics
ATOC 525 (3) Atmospheric Radiation
ATOC 530 (3) Paleoclimate Dynamics
ATOC 531 (3) Dynamics of Current Climates
ATOC 540 (3) Synoptic Meteorology 1
ATOC 541 (3) Synoptic Meteorology 2
ATOC 546 (1) Current Weather Discussion
ATOC 558 (3) Numerical Methods and Laboratory
ATOC 568 (3) Ocean Physics
CHEM 367 (3) Instrumental Analysis 1
CHEM 575 (3) Chemical Kinetics
EPSC 513 (3) Climate and the Carbon Cycle
EPSC 542 (3) Chemical Oceanography
ESYS 300 (3) Investigating the Earth System
ESYS 301 (3) Earth System Modelling
MATH 423 (3) Regression and Analysis of Variance
MATH 555++ (4) Fluid Dynamics
PHYS 404+ (3) Climate Physics
PHYS 432++ (3) Physics of Fluids
+ Students cannot receive credit for both ATOC 404 and PHYS 404.
++ Students cannot receive credit for both PHYS 432 or MATH 555.

Diploma in Meteorology (30 credits)

The Department offers an intensive, one-year program in theoretical and applied meteorology to B.Sc. or B.Eng. graduates of suitable standing in physics, applied mathematics or other appropriate disciplines, leading to a Diploma in Meteorology.

The program is designed for students with little or no previous background in meteorology who wish to direct their experience to atmospheric or environmental applications, or who need to fulfil academic pre-requisites in meteorology to qualify for employment. For further information, consult the Administrative Officer (Burnside Hall, Room 946).

An exemption of up to 6 credits may be allowed for courses already taken. Students granted such exemptions are required to add complementary courses from an approved list to maintain a total credit count of 30 completed at McGill.

Required Courses (15 credits)

ATOC 512 (3) Atmospheric and Oceanic Dynamics
ATOC 521 (3) Cloud Physics
ATOC 531 (3) Dynamics of Current Climates
ATOC 540 (3) Synoptic Meteorology 1
ATOC 541 (3) Synoptic Meteorology 2

Complementary Courses (15 credits)

6 credits selected from the courses below:
ATOC 309 (3) Weather Radars and Satellites
ATOC 315 (3) Thermodynamics and Convection
ATOC 519* (3) Advances in Chemistry of Atmosphere
CHEM 519* (3) Advances in Chemistry of Atmosphere
* Students take either ATOC 519 or CHEM 519.
9 credits ordinarily selected from:
ATOC 513 (3) Waves and Stability
ATOC 515 (3) Turbulence in Atmosphere and Oceans
ATOC 525 (3) Atmospheric Radiation
ATOC 530 (3) Paleoclimate Dynamics
MATH 317 (3) Numerical Analysis
MATH 319 (3) Introduction to Partial Differential Equations
MATH 555* (4) Fluid Dynamics
PHYS 331 (3) Topics in Classical Mechanics
PHYS 340 (3) Majors Electricity and Magnetism
PHYS 342 (3) Majors Electromagnetic Waves
PHYS 432* (3) Physics of Fluids
* Students take either PHYS 432 or MATH 555.

Atmospheric and Oceanic Sciences (ATOC) Related Programs

A) Internship Year in Science (IYS)

IYS is a pregraduate work experience program available to eligible students and normally taken between their U2 and U3 years. For more information, see section 11.12: Science Internships and Field Studies. The following programs are also available with an internship component:

- Major in Atmospheric Science
- Honours in Atmospheric Science

B) Earth System Science Interdepartmental Major

This program is offered jointly by the Department of Atmospheric and Oceanic Sciences, Earth and Planetary Sciences, and Geography. Students in the Department of Atmospheric and Oceanic Sciences interested in this program should contact Professor Bruno Tremblay (bruno.tremblay@mcgill.ca). For more information, see eCalendar section 11.13.11: Earth System Science (ESYS).

SAMPLE SCHEDULE: MAJOR PROGRAM

The following sample schedule has course numbers for 42 of the 62 credits. Complementary Courses are structured into the following Streams: (i) Weather Analysis and Forecasting, (ii) Climate Science, (iii) Atmospheric Chemistry and Physics, or (iv) General. See course titles in previous section.

	Fall Semester	Winter Semester
U1	ATOC 214 COMP 208 MATH 222 PHYS 230*	ATOC 215 or ATOC 219 MATH 314 ATOC 357* PHYS 232*
U2	ATOC 315 MATH 223 Complementary Courses	ATOC 309* MATH 315 Complementary Courses
U3	ATOC 312 Complementary Courses	Complementary Courses

* Alternatives are available for these courses marked.

UNDERGRADUATE COURSES

Offered in Fall 2019

ATOC 181 Introduction to Atmospheric Science (3 credits)
A survey of the Earth's atmosphere, weather and climate system. Topics include the fundamental processes that determine interactions between the atmosphere, ocean and biosphere; anthropogenic effects such as global warming, the ozone hole and acid rain; a perspective on future climate change.

ATOC 185 Natural Disasters (3 credits)
This course examines the science behind different types of disasters and our ability or inability to control and predict such events. From this course the student will gain an appreciation of natural disasters beyond the newspaper headlines and will better understand how the effects of disasters can be reduced.

ATOC 214 Introduction: Physics of the Atmosphere (3 credits)
An introduction to physical meteorology designed for students in the physical sciences. Topics include: composition of the atmosphere; heat transfer; the upper atmosphere; atmospheric optics; formation of clouds and precipitation; instability; adiabatic charts.

ATOC 312 Rotating Fluid Dynamics (3 credits)
Lagrangian and Eulerian time derivatives. Vorticity, divergence and Helmholtz decomposition. Two-dimensional Navier-Stokes equation for non-divergent flows. Rotating coordinate systems and the shallow water equations. Linear solutions, potential vorticity, and geostrophy in the shallow water context. Shallow-water quasi-geostrophic approximation, including Rossby waves and barotrophic (Rayleigh) instability.

ATOC 315 Thermodynamics and Convection (3 credits)
Buoyancy, stability, and vertical oscillations. Dry and moist adiabatic processes. Resulting dry and precipitating convective circulations from the small scale to the global scale. Mesoscale precipitation systems from the cell to convective complexes. Severe convection, downbursts, mesocyclones.

ATOC 396 Undergraduate Research Project (3 credits)
Independent research project with a final written report.

ATOC 404 Climate Physics (3 credits)
This course covers the essentials of climate physics through the lens of one-dimensional, vertical atmospheric models. This includes shortwave and longwave radiative transfer, convection, phase changes, clouds, greenhouse gases, and atmospheric escape. This is an adequate level of detail for understanding Earth's climate, paleoclimate, anthropogenic climate change, or pursuing studies of Solar System planets and extrasolar planets.

ATOC 480 Honours Research Project (3 credits)
The student will carry out a research project under the supervision of a member of the staff. The student will be expected to write a report and present a seminar on the work.

ATOC 512 Atmospheric and Oceanic Dynamics (3 credits)
Introduction to the fluid dynamics of large-scale flows of the atmosphere and oceans. Stratification of atmosphere and oceans. Equations of state, thermodynamics and momentum. Kinematics, circulation, and vorticity. Hydrostatic and quasi-geostrophic flows. Brief introduction to wave motions, flow over topography, Ekman boundary layers, turbulence.

ATOC 525 Atmospheric Radiation (3 credits)
Solar and terrestrial radiation. Interactions of molecules, aerosols, clouds, and precipitation with radiation of various wavelengths. Radiative transfer through the clear and cloudy atmosphere. Radiation budgets. Satellite and ground-based measurements. Climate implications.

ATOC 531 Dynamics of Current Climates (3 credits)
The general circulation of the atmosphere and oceans. Atmospheric and oceanic general circulation models. Observations and models of the El Niño and Southern Oscillation phenomena.

ATOC 540 Synoptic Meteorology 1 (3 credits)
Analysis of current meteorological data. Description of a geostrophic, hydrostatic atmosphere. Ageostrophic circulations and hydrostatic instabilities. Kinematic and thermodynamic methods of computing vertical motions. Tropical and extratropical condensation rates. Barotropic and equivalent barotropic atmospheres.

Offered in Winter 2020

ATOC 100 Extreme-Weather and Climate-Change Physics (3 credits)
This course will provide an overview of extreme weather and climate phenomena, using calculus-based mathematical and physical principles. It will examine the physics and dynamics associated with extreme weather and climate phenomena, including blizzards, heat waves, cold waves, ice storms, tornadoes, and hurricanes. The atmospheric and oceanic observing system will be used to quantify the structure and mechanisms of extreme weather and climate events. The physics of climate change will be interpreted through the natural and anthropogenic changes to Earth's radiation and energy balances. An introduction to climate models (both simple and complex) will illustrate the concepts of forcing, feedbacks, and climate sensitivity, and provide the foundation for understanding future changes in extreme weather.

ATOC 181 Introduction to Atmospheric Science (3 credits)
A survey of the Earth's atmosphere, weather and climate system. Topics include the fundamental processes that determine interactions between the atmosphere, ocean and biosphere; anthropogenic effects such as global warming, the ozone hole and acid rain; a perspective on future climate change.

ATOC 182 Introduction to Oceanic Sciences (3 credits)
Air-sea interaction; oceanic properties; global climate change, carbon cycle; polar oceans, sea ice, polynyas; El Niño; remote sensing of oceans; physical control of biological processes in the sea.

ATOC 184 Science of Storms (3 credits)
Physical processes associated with severe and hazardous weather affecting the Earth. Topics are taught at a fundamental level, without equations, to provide a complete and up-to-date understanding of such extreme events as blizzards, ice storms, tornadoes, hurricanes, floods and droughts.

ATOC 215 Oceans, Weather and Climate (3 credits)
Laws of motion, geostrophic wind, gradient wind. General circulation of the atmosphere and oceans, local circulation features. Air-sea interaction, including hurricanes and sea-ice formation, extra-tropical weather systems and fronts, role of the atmosphere and oceans in climate.

ATOC 219 Introduction to Atmospheric Chemistry (3 credits)
An introduction to the basic topics in atmospheric chemistry. The fundamentals of the chemical composition of the atmosphere and its chemical reactions. Selected topics such as smog chamber, acid rain, and ozone hole will be examined.

ATOC 309 Weather Radars and Satellites (3 credits)
Basic notions of radiative transfer and applications of satellite and radar data to mesoscale and synoptic-scale systems are discussed. Emphasis will be put on the contribution of remote sensing to atmospheric and oceanic sciences.

ATOC 396 Undergraduate Research Project (3 credits)
Independent research project with a final written report.

ATOC 357 Atmospheric and Oceanic Science Laboratory (3 credits)
Students will gain hands-on experience in several fundamental atmospheric and oceanic science topics through practical experimentation. A diverse set of experiments will be conducted, ranging from in situ observations in Montreal, to remote sensing of clouds and radiation, to laboratory chemistry and water-tank experiments. As a background for these experiments, students will receive training on sensor principles and measurement error analysis, as well as the fundamental physical processes of interest in each experiment. They will learn to operate, and physically interpret data from, various sensors for in situ and remote observation of meteorological variables. Their training will also extend to operational weather observations, analysis, and forecasting.

ATOC 480 Honours Research Project (3 credits)
The student will carry out a research project under the supervision of a member of the staff. The student will be expected to write a report and present a seminar on the work.

ATOC 513 Waves and Stability (3 credits)
Linear theory of waves in rotating and stratified media. Geostrophic adjustment and model initialization. Wave propagation in slowly varying media. Mountain waves; waves in shear flows. Barotropic, baroclinic, symmetric, and Kelvin-Helmholtz instability. Wave-mean flow interaction. Equatorially trapped waves.

ATOC 519 Advances in Chemistry of Atmosphere (3 credits)
Selected areas of atmospheric chemistry from field and laboratory to theoretical modelling are examined. The principles of atmospheric reactions (gas, liquid and heterogeneous phases in aerosols and clouds) and issues related to chemical global change will be explored.

ATOC 521 Cloud Physics (3 credits)
Review of dry and moist atmospheric thermodynamics concepts. Atmospheric aerosols, nucleation of water and ice. Formation and growth of cloud droplets and ice crystals. Initiation of precipitation. Severe storms and hail. Weather modification. Numerical cloud models.

ATOC 541 Synoptic Meteorology 2 (3 credits)
Analysis of current meteorological data. Quasi-geostrophic theory, including the omega equation, as it relates to extratropical cyclone and anticyclone development. Frontogenesis and frontal circulations in the lower and upper troposphere. Cumulus convection and its relationship to tropical and extratropical circulations. Diagnostic case study work.

ATOC 548 Mesoscale Meteorology (3 credits)
Theory of meteorologically important mesoscale phenomena including mesoscale instabilities, cumulus convection and its organization (including thunderstorms, squall lines, and other forms of severe weather), internal gravity waves, and topographically forced flows. Application of theory to the physical interpretation of observations and numerical simulations.

FIELD COURSE IN BARBADOS

ATOC 555 is a field studies course that focuses on observing weather, climate, and air quality on tropical Barbados. It facilitates the design of hands-on analyses of field-based observations, analysis and understanding of the climate in the tropics.

Offered during the summer semester, the field course preparations generally start in April and students travel to Barbados for two weeks in May. For summer 2020, the dates of Friday 8 - Friday 22 May 2020 are confirmed for stay at McGill's campus on the beautiful west coast of Barbados- Bellairs Research Institute.

The Bellairs Institute was founded and endowed in 1954 by the late Commander Carlyon W. Bellairs to provide a facility through which staff at McGill might develop a scholarly interest in the tropics. It is Canada's only teaching and research facility in the tropics.

Prerequisites for this course are **ATOC 214** and **ATOC 215** or permission of the instructor. Lab and fieldwork experience are strongly recommended.

Objectives of the course are to:

1. Develop an understanding of current tropical weather, climate and air quality

2. Develop an understanding of the role of the ocean in tropical weather, climate and air quality processes

3. Introduce students to field methods of research including atmospheric measurements, ocean measurements and data analysis.

We will publish a more accurate timeline under the 'Scientific Program' and the 'How to apply section' in January 2020 of the website: https://www.mcgill.ca/meteo/atoc-555-fieldcourse

DEPARTMENTAL PRIZES

Currently, our Department offers the following awards, prizes, and fellowships to its undergraduate students in recognition of their strong academic records. All graduating students are considered the Department's Awards Committee.

J.S. Marshall Prize

It was established in 1995 by alumni contributions to the Department, in memory of Professor J. Stewart Marshall. The Marshall Prize is awarded annually or at the discretion of the Department, to the student graduating from the undergraduate program who holds the most outstanding academic record. The award is valued at $300.

For information on all awards, prizes and scholarships offered by the university, please see section 1.8 (page 115) of the Undergraduate Programs and Courses Calendar 2019–2020 https://mcgill.ca/study/2019-2020/.

Faculty Members

Faculty Professors
Parisa Ariya Professor, Ph.D. (York) (Joint with Chemistry; James McGill Professor)
Peter Bartello Professor, Ph.D. (McGill) (Joint with Mathematics and Statistics)
Carolina Dufour Assistant Professor, Ph.D. (Grenoble)
Frédéric Fabry Associate Professor, Ph.D. (McGill) (Joint with McGill School of Environment; Director, J. Stewart Marshall Radar Observatory)
John R. Gyakum Professor, Ph.D. (M.I.T.) (Canada Steamship Lines Professor)
Yi Huang Associate Professor, Ph.D. (Princeton)
Daniel Kirshbaum Associate Professor, Ph.D. (U. Washington) (Chair)
Timothy Merlis Associate Professor, Ph.D. (Caltech) (Canada Research Chair, Tier 2; Undergraduate Program Director)
Thomas Preston Assistant Professor, Ph.D. (U.B.C.) (Joint with Chemistry)
David N. Straub Associate Professor, Ph.D. (U. Washington) (Graduate Program Director)
Bruno Tremblay Associate Professor, Ph.D. (McGill)
Man K. (Peter) Yau Professor, Ph.D. (M.I.T.) (NSERC/Hydro-Quebec Industrial Research Chair)
Andreas Zuend Associate Professor, Ph.D. (ETH Zurich)

Faculty Members (con't)

Adjunct Professors
Leonard Barrie Adjunct Professor, Stockholm University
Ashu Dastoor Adjunct Professor Environment Canada
Pavlos Kollias Adjunct Professor Stony Brook University
Hai Lin Adjunct Professor, Ph.D. (McGill) Research Scientist, Meteorological Service of Canada
Louis-Phillippe Nadeau Adjunct Professor, Ph.D. (McGill) Université Québec à Rimouski
Emeritus Professors
Jacques Derome Emeritus Professor, F.R.S.C., Ph.D. (Michigan)
Henry G. Leighton Emeritus Professor, Ph.D. (Alberta)
Lawrence A. Mysak Emeritus Professor, C.M., F.R.S.C., Ph.D. (Harvard) (Canada Steamship Lines Professor)
Isztar Zawadzki Emeritus Professor, F.R.S.C., Ph.D. (McGill)

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Where is our Department on campus?

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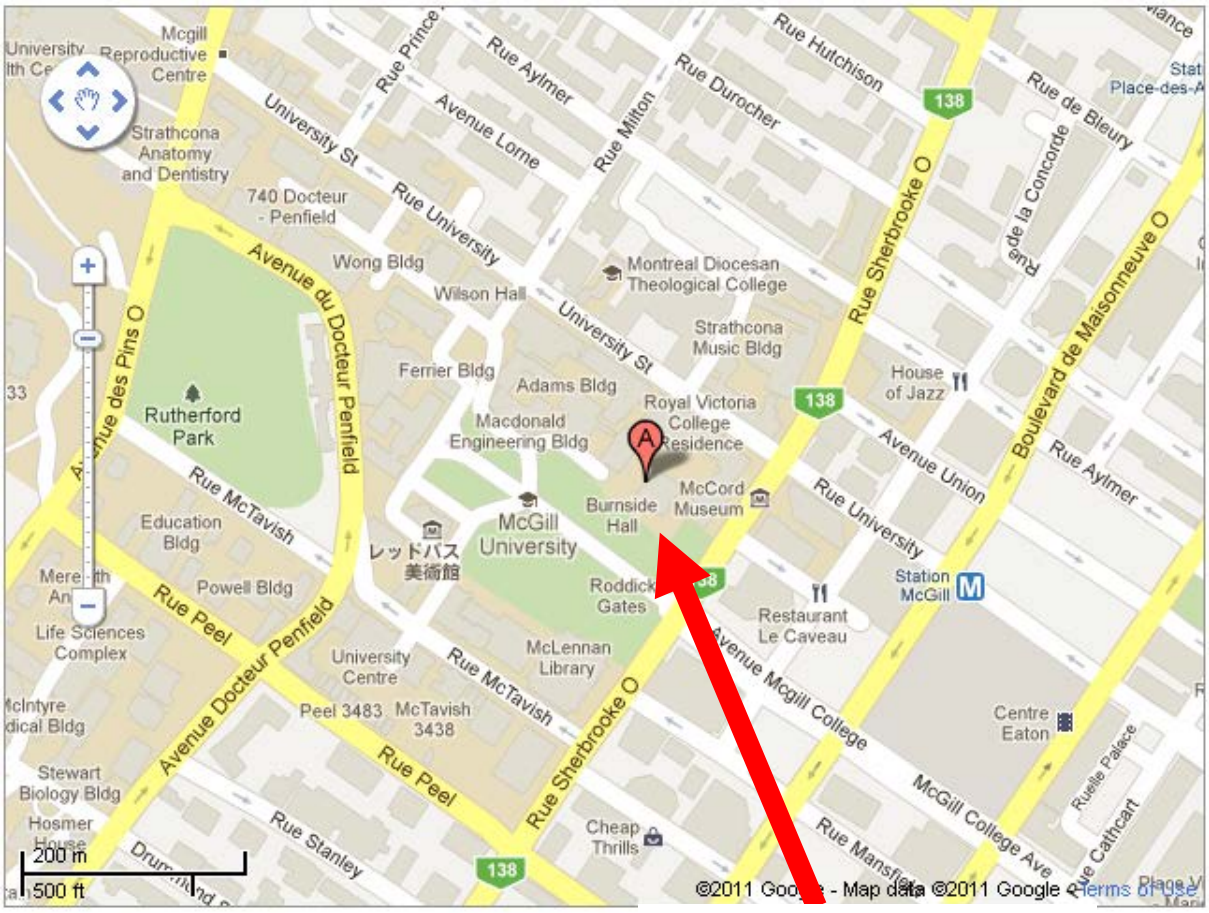

Burnside Hall, 9th Floor, Room 945