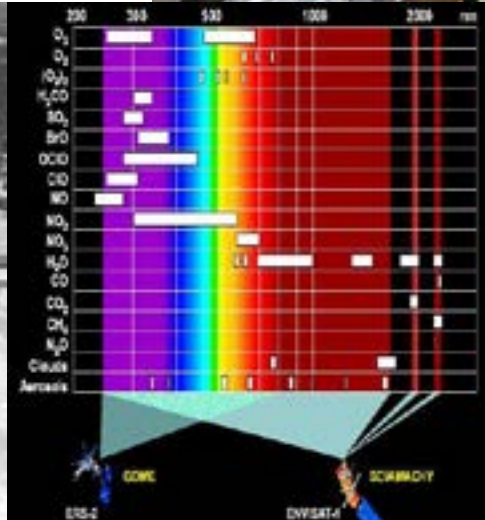


Department of Atmospheric & Oceanic Sciences



Newsletter 2012



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A Message from our Chair

Holiday Newsletter

December | 2012

Welcome to the 2012 Newsletter! The Department of Atmospheric and Oceanic Sciences at McGill has a long tradition of pioneering research and teaching in meteorology

dating from the establishment of first meteorology group in 1856 and 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 is quite diverse and our expertise can provide incoming students the opportunity to learn from experts in wide range of research domains such as physical meteorology, dynamics, radar and satellite remote sensing, physical oceanography, air-sea ice/snow-ocean interactions, atmospheric chemistry and physics as well as air pollution and climate. Research activities in our department are challenging and yet our working is collegial and friendly providing wide opportunities for personal and academic growth.

The Department of Atmospheric and Oceanic Sciences is located in Burnside Hall in the downtown Montreal Campus. The department is equipped with state-of-the-art computational, observational and laboratory facilities. Part of the department's infrastructure also includes the Marshal radar facility in the West Island of Montreal.

Climate change is arguably the most important challenge of our time. There is an urgent need to address Earth system climate uncertainties



with comprehensive data analysis to enhance our quantitative predictions of climate change, extreme weather and air pollution. And, we are addressing such challenges, together.

During this year, we commenced a multidisciplinary research initiative bringing together scientists, engineers, medical researchers, specialists in Weather, Air Quality, Climate and Health; we called it **CANADA WATCH**. It currently includes 19 Quebec and Canadian Universities (and counting), while involving hundreds of partners from governmental, and private sectors both nationally and internationally.

I invite you to kindly take a few minutes to hear from your old friends, meet our new members, hear about our students and faculty achievements, and join us on our journey. I wish you and your loved ones a wonderful holiday season!

Parisa A. Ariya
James McGill Professor and Chair of the Department

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Department News

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Like the atmosphere and the oceans, our department is dynamic and ever changing. We are happy to keep you updated with the newest developments in our department.

We are very excited to announce the inauguration of a new undergraduate laboratory course and teaching laboratory for our undergraduate students. The laboratory will allow our students to gain valuable field experience.

In the past year we also renovated the undergraduate lounges to promote a more collegial atmosphere for our students.

We would also like to express our congratulations to Prof. Pavlos Kollias who was recently promoted to associate professor of Atmospheric and Oceanic Sciences.

Of course, we would also like to congratulate our new graduates:

Ph.D. Degrees

Farid Ait Chaalal
Thomas Milewski
Jasmine Remillard (NSERC)
Arunchandra Chandra



M.Sc. Degrees

Marc-Olivier Brault (FQRNT)
Etienne, Dunn-Sigouin
Jonathan Gadoury
Marcel Rodney
Kevin Bowley

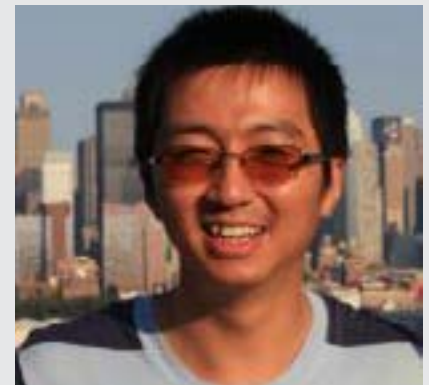
B.Sc Degrees:

Mélany Belzile
Amélie Bertrand
Stephanie Hay
Wan Ting Katty Huang
Eric Notarangelo

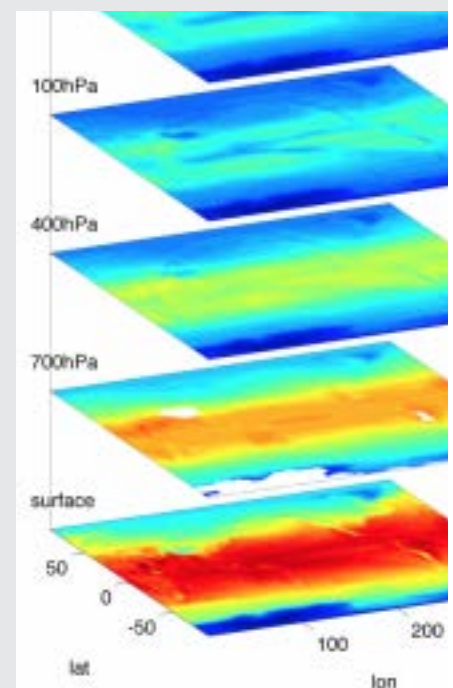
Honors B.Sc.

Stéphanie Potvin
Lisa Simla
Sophie Splawinski

New Faces



Yi Huang (PhD, Princeton) is an atmospheric physicist interested in climate variability and energetics. He uses satellite data and climate models to understand the forcing and feedback mechanisms that drive global and regional climate changes.



Awards and Distinctions



Sophie Splawinski receives the Undergraduate Award in Agricultural & Environmental Sciences category with her paper entitled

“The role of anticyclones in replenishing surface cold air and modulating severe freezing rain event duration.”

Splawinski’s winning paper has been a labour of love almost since her arrival at McGill. “It has been an ongoing project for three years ago when I started working with John Gyakum,” she said. “The idea was trying to figure out a way for meteorologist to better predict the duration of freezing rain because if it lasts an hour there’s not usually much of a problem but if it lasts longer, it can cause a lot of damage – like the big ice storm in 1998.”

Ice storms form when a thin layer of cold air is overlaid by a warmer layer. When snow passes through the warm layer, it melts, only to freeze again as it falls through the cold below. Splawinski says conditions along the St. Lawrence valley are ideal because the shape of the valley will naturally hold the cold layer in place.

As one of the UA winners, Splawinski has been invited to Dublin from Nov. 7-10, to attend the UA Summit where she and the other winners will receive their awards from the President of Ireland, Michael D. Higgins

We are also pleased to announce that **Dr. John Gyakum** has been awarded the 2011 Patterson Medal Award for distinguished service to meteorology in Canada. For over 30 years, Dr. Gyakum has been a leading member in Meteorological research and teaching both here in Canada and internationally. The selection committee for this award was very impressed with the breadth of support for Dr. Gyakum that came equally from academic and government representatives in meteorology. Dr. Gyakum has not only been extremely effective in research, but also in teaching undergraduate and graduate students, and outreach to the general public.

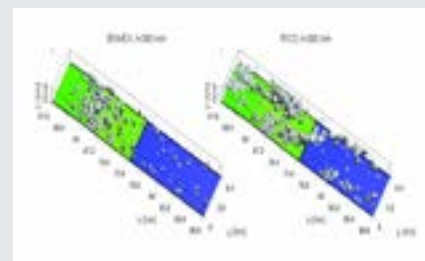
The Patterson Distinguished Service Medal, presented since 1954, is considered the most pre-eminent award recognizing outstanding work in meteorology by residents of Canada.

This prestigious award was presented to Dr. Gyakum on May 30, 2012 during the Annual CMOS Congress in Montreal, Quebec.

New Faces



Dr. Kirshbaum earned his Ph.D. in Atmospheric Sciences at the University of Washington. His research focuses on the mechanisms and predictability of convective storms, particularly those that form over complex topography. The principal objectives are to advance the conceptual understanding of these processes and to improve their representation in weather and climate models



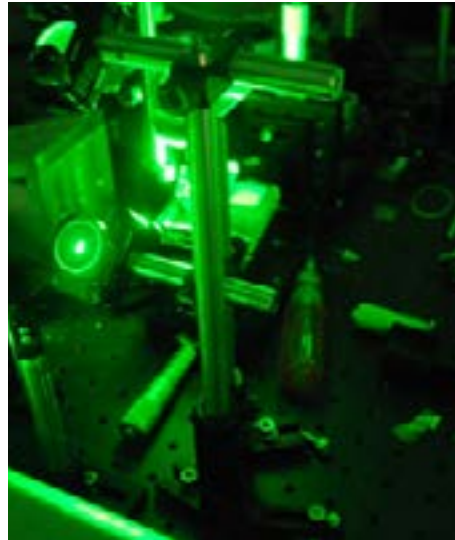
Research Chairs



Prof. Pavlos Kollias' (Canada Research Chair Tier II) remote sensing research focuses on "cloud problem", i.e., the understanding of the microphysical, dynamical and radiative processes that act at the cloud scale and their accurate representation in numerical models is the central theme of my research. In particular, boundary layer clouds, precipitation initiation, cloud entrainment and turbulence are focus areas of current and future research.

Prof. Peter Yau's (NSERC Hydro Quebec) research involves various aspects of cloud physics and dynamics. They have developed simple and complex models to study the interactions of various physical processes in convective clouds. Our recent work includes simulation of the mechanism of mixing, and entrainment in cumulus clouds, the interactions involving radiation and cloud dynamics, and the effects of stochastic condensation and droplet collision in turbulence on the size spectra of cloud droplets.

Prof Parisa Ariya's (James McGill) atmospheric and interfacial chemistry research currently is focused on



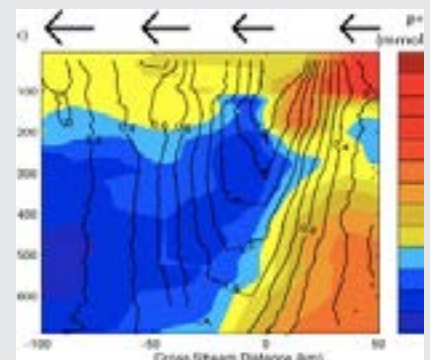
understanding physical and chemical processes involving aerosols. Ongoing research includes aerosol formation processes from gas-phase reactions, gas-particle partitioning, aerosol transformation, aerosol-cloud interactions, cloud nucleation microphysics, development of novel technique for ultra-trace gases and particles using nano and micro-aerosols, and development of green techniques for pollution remediation using particle nano-technology.



New Faces



Jaime Palter (Duke University) is a physical oceanographer who studies the large-scale ocean circulation and its influence on climate and biogeochemistry. She has experience making observations, synthesizing large publicly-available global data sets, and analyzing general circulation models. Her work has shed light on the supply of nutrients to low latitudes and the formation and circulation of water masses, a principal means by which the ocean and global climate system feed back on one another.





Our department is highly respected and influential in the fields of atmospheric and oceanic sciences. Here are a few of such papers

Prof. Parisa Ariya

- G. Kos, A. Ruzhkov, A. Dastoor, J. Narayan, A. Steffen, P. A. Ariya, and L. Zhang, Evaluation of discrepancy between measured and modeled oxidized mercury, *Atmospheric Chemistry and Physics Discussion*, 12, 17245-17293, (2012)
- J. Sun, H. Leighton, P. Yau, P. A. Ariya, Numerical evidence for cloud droplet nucleation at the cloud-environment interface, *Atmospheric Chemistry and Physics Discussion*, 12, 17723-17774, (2012)
- N. Eltouny, P. A. Ariya, Fe₃O₄ Nanoparticles and Carboxymethyl Cellulose: A Green Option for the Removal of Atmospheric BTEX, *Industrial & Engineering Chemistry Research (ACS journal)*, 51 (39), pp 12787–12795 (2012)
- J. Sun, P. A. Ariya, H. Leighton, M. K. Yau., "Modelling Study of Ice Formation in Warm-Based Precipitating Shallow Cumulus Clouds", *Journal of Atmospheric Sciences*, in press (doi: 10.1175/JAS-D-11-0344.1) (2012)
- Didier Voisin, Jean-Luc Jaffrezo, Stéphan Houdier, Manuel Barret, Julie Cozic, Martin D. King, James L. France, Holly J. Reay, Amanda Grannas, Gregor Kos, Parisa A. Ariya, Harry J. Beine, Florent Domine, "Humic Like Substances (HULIS) in Arctic snowpack during OASIS field campaign in Barrow", *Journal of Geophysical Research*. doi:10.1029/2011JD016181 (2012)
- G. Snider and P. A. Ariya, "Homogenous and heterogeneous reactions of NO_x, SO_x, H₂O reactions with elemental mercury on TiO₂ nanosurfaces", air pollution, in press (2012)
- VF McNeill, AM Grannas, JPD Abbatt,

- M Ammann, P Ariya, T Bartels-Rausch, F Domine, DJ Donaldson, MI Guzman, D Heger, TF Kahan, P Klán, S Masclin, C Toubin, and D Voisin. "Organics in Environmental Ices: Sources, Chemistry, and Impacts" *Atmos. Chem. Phys. Discuss.*, 12, 8857-8920 (2012)
- P. Shepson, P. A. Ariya, C. Deal, D. J. Donaldson, T. A. Douglas, B. Loose, T. Maykym, P. Matrai, L. M. Russell, B. Saenz, J. Stefels, N. Steiner,, "Ocean-Atmosphere-Sea Ice-Snowpack Interactions, Changes, and Feedbacks in Polar Regions: A Scientific Challenge for the 21st Century", *EOS, TRANSACTIONS AMERICAN GEOPHYSICAL UNION*, VOL. 93, NO. 11, PAGE 117, 2012
- Mahamud Subir, Parisa A. Ariya, Ashu P. Dastoor, A review of uncertainties in atmospheric modeling of mercury chemistry I. Uncertainties in existing kinetic parameters – Fundamental limitations and the importance of heterogeneous chemistry, *Atmospheric Environment*, Volume 45, Issue 32, , Pages 5664-5676 (2012)
- P. A. Ariya, "Method and system for adsorbing pollutants and/or contaminants", US patent issued (registered 2012).

Prof. Peter Bartello

- Devenish, B.J., P. Bartello, J.-L. Brenguier, L.R. Collins, W.W. Grabowski, R.H.A. IJzermans, S.P. Malinowski, M.W. Reeks, J.C. Vassilicos and Z. Warhaft, 2012, Droplet growth in warm turbulent clouds, *Q. J. Roy. Met. Soc.* DOI: 10.1002/qj.1897
- Ait-Chaalal, Farid; Bourqui, Michel S.; Bartello, Peter: Fast chemical reaction in two-dimensional Navier-Stokes flow: Initial regime, *PHYSICAL REVIEW E* DOI: 10.1103/PhysRevE.85.046306 Published:

Funding Sources

A Special thanks to our funding sources for 2012

- Aboriginal Affairs & Northern Development Canada
- Arctic Research Program Support
- Canada Space Agency
- Canadian Foudation for Innovation (CFI)
- Natural Science and Engineering Research (operating, strategic, idea-to-innovation)
- Council of Canada (NSERC)
- École Polytechnique/ NSERC
- Concondia University / NSERC
- Environment Canada
- European Space Agency
- Fonds de recherche Nature et technologies (FQRNT)
- Hydro Quebec
- Ouranos Inc.
- TriCouncil(NSERC-ArcticNet)
- TriCouncil(NSERC-MITACS)
- UCAR
- US Department of Energy
- World Wildlife Fund Canada

Selected Peer-Reviewed Publications

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APR 11 2012

Prof. Michel Bourqui

- Muncaster R., M. S. Bourqui, S. Chabrilat, S. Viscard, S. M. L. Melo and P. Charbonneau; A simple framework for modelling the photochemical response to solar spectral irradiance variability in the stratosphere; *Atmos. Chem. and Phys.*, 12, 7707–7724, 2012.
- Bolduc C., P. Charbonneau, V. Dumoulin, M. S. Bourqui, and A. D. Crouch; A fast model for the reconstruction of spectral solar irradiance in the near- and mid-ultraviolet; *Solar Physics*, DOI 10.1007/s11207-012-0019-4, June 2012.
- Ait Chaalal F., Bourqui M. S. and Bartello P.; “Fast chemical reaction in two-dimensional Navier-Stokes flow: Initial regime”; *Physical Review E*, DOI: 10.1103/PhysRevE.85.046306, April 2012.
- Bourqui M. S., A. Yamamoto, D. Tarasick, M. Moran, L-P. Beaudoin, I. Beres, J. Davies, A. Elford, W. Hocking, M. Osman, and R. Wilkinson; A new global real-time Lagrangian diagnostic system for stratosphere-troposphere exchange: Evaluation during a balloon sonde campaign in eastern Canada; *Atmos. Chem. and Phys.*, 12, 2661-2679, 2012.

Prof. Jacques Derome

- Yao, W., H. Lin and J. Derome, 2011: Submonthly forecasting of winter surface air temperature in North America based on tropical organized convection. *Atmosphere-Ocean*, 49, 51-60, DOI 10.1080/07055900.2011.556882.

Prof. John Gyakum

- Milrad, S. M., E. H. Atallah, and J. R. Gyakum, 2012: Precipitation modulation by the Saint Lawrence Valley in association with transitioning tropical cyclones. *Wea. Forecasting*.
- Turner, J. K., J. R. Gyakum, and S. M.



- Milrad, 2012: A thermodynamic analysis of an intense North American arctic air mass. *Mon. Wea. Rev.* 4618-4633.
- Splawinski, S., J. R. Gyakum, and E. H. Atallah, 2012: The role of anticyclones in replenishing surface cold air and modulating freezing rain duration. *McGill Science Undergraduate Research Journal*, 7, 54-60.
- Ressler, G. M., S. M. Milrad, E. H. Atallah, and J. R. Gyakum, 2012: Synoptic-scale analysis of freezing rain events in Montreal, Quebec. *Wea. Forecasting*, 27, 362-378.
- Razy, A., S. M. Milrad, E. H. Atallah, J. R. Gyakum, 2012: Synoptic-scale environments conducive to orographic impacts on cold-season surface wind regimes at Montreal, Quebec. *J. Climatology and Appl. Meteorology*, 51, 598-616.

Prof. Yi Huang

- Huang, Y., S. Leroy, and R. Goody (2011), Discriminating between climate observations in terms of their ability to improve an ensemble of climate predictions, *PNAS*, 108, 10405-10409, doi:10.1073/pnas.1107403108

Prof. Daniel Kirshbaum

- Hanley, K. E., D. J. Kirshbaum, N. M. Roberts, and G. Leoncini, 2012: Sensitivities of a squall line over central Europe in a convective-scale ensemble. *Mon. Wea. Rev.*, in press, DOI: 10.1175/MWR-D-12-00013.1.
- Smith, R. B., A. Nugent, J. Minder, D. Kirshbaum, R. Warren, N. Lareau, P. Palany, A. James, and J. French, 2012: Orographic precipitation in the tropics:



- the Dominica Experiment. *Bull. Amer. Meteor. Soc.*, in press, DOI: 10.1175/BAMS-D-11-00194.1.
- Kirshbaum, D. J. and A. L. M. Grant, 2012: Invigoration of cumulus cloud fields by mesoscale ascent. *Q. J. R. Meteor. Soc.*, in press, DOI: 10.1002/qj.1954.
- Cannon, D. J., D. J. Kirshbaum, and S. L. Gray, 2012: Under what conditions does embedded convection enhance orographic precipitation? *Q. J. R. Meteorol. Soc.*

Prof. Pavlos Kollias

- Giangrande, Scott E., Edward P. Luke, Pavlos Kollias, 2012: Characterization of Vertical Velocity and Drop Size Distribution Parameters in Widespread Precipitation at ARM Facilities. *J. Appl. Meteor. Climatol.*, 51, 380–391

Prof. Henry Leighton

- J. Sun, P. A. Ariya, H. Leighton, M. K. Yau., “Modelling Study of Ice Formation in Warm-Based Precipitating Shallow Cumulus Clouds”, *Journal of Atmospheric Sciences*, in press (doi: 10.1175/JAS-D-11-0344.1) (2012)

Prof. Lawrence Mysak

- Simmons, CT, and Mysak LA. Medieval stained glass and climate change: how are they connected? *Atmosphere-Ocean*, 50, 219-240.
- Damyanov, NN, Matthews, HD, and Mysak, LA. Observed decreases in the Canadian outdoor skating season due to recent winter warming. *Environmental Research Letters*, 7, 014028.

Prof. Jaime Palter

- Palter JB, Sarmiento JL, Marinov I, Gruber N. Large scale nutrient fronts of the world ocean: impacts on biogeochemistry. In press for a book

Selected Peer-Reviewed Publications



entitled Chemical Oceanography of Frontal Zones. Springer Publishing. Ed: Igor Belkin.

- Palter, J. B., M. S. Lozier, J. L. Sarmiento, and R. G. Williams (2011), The supply of excess phosphate across the Gulf Stream and the maintenance of subtropical nitrogen fixation, *Global Biogeochem. Cycles*, 25, GB4007, doi:10.1029/2010GB003955.

Prof. Seok-Woo Son

- Dunn-Sigouin, E., S.-W. Son and H. Lin, 2012: Evaluation of Northern Hemisphere blocking climatology in the Global Environment Multiscale (GEM) model*, *Monthly Weather Review*.
- Kim, J. and S.-W. Son, 2012: Tropical Cold-Point Tropopause: Climatology, Seasonal Cycle and Intraseasonal Variability Derived from COSMIC GPS Radio Occultation Measurements*, *Journal of*



Climate. 5343-5360.

- Gerber, E. P., A. Butler, N. Calvo, A. Charlton-Perez, M. Giorgetta, E. Manzini, J. Perlwitz, L. M. Polvani, F. Sassi, A. Scaife, T. Shaw, S.-W. Son, and S. Watanabe, 2012: Assessing and Understanding the Impact of Stratospheric Dynamics and



Variability on the Earth System*, *Bulletin of the American Meteorological Society*, 93, 845-859.

- Purich, A., and S.-W. Son, 2012: Impact of Antarctic ozone depletion and recovery on Southern Hemisphere precipitation, evaporation and extreme changes*, *Journal of Climate*, 25, 3145-3154.
- Seo, K.-H. and S.-W. Son, 2012: The Global Atmospheric Circulation Response to Tropical Diabatic Heating Associated with the Madden-Julian Oscillation during Northern Winter*, *Journal of the Atmospheric Sciences*, 69, 79-96.

Prof. David Straub

- Nadeau, Louis-Philippe; Straub, David N. Influence of Wind Stress, Wind Stress Curl, and Bottom Friction on the Transport of a Model Antarctic Circumpolar, *JOURNAL OF PHYSICAL OCEANOGRAPHY* DOI: 10.1175/JPO-D-11-058.1 Published: JAN 2012

Prof. Bruno Tremblay

- Lemieux, Jean-Francois ; Knoll, Dana A; Tremblay, Bruno; Holland, David M; Losch, Martin: A comparison of the Jacobian-free Newton-Krylov method and the EVP model for solving the sea ice momentum equation with a viscous-plastic formulation: A serial algorithm study *JOURNAL OF COMPUTATIONAL PHYSICS* DOI: 10.1016/j.jcp.2012.05.024 Published: JUL 1 2012

Prof. M.K. (Peter) Yau

- Lavaysse, C., M. Carrera, S. Belair, N. Gagnon, R. Frenette, M. Charron, and M.K. Yau, 2012: Impact of surface parameter uncertainties within the Canadian Regional Ensemble Prediction System. *Mon. Wea. Rev.*
- Menelaou, K., M.K. Yau, and Y. Martinez, 2012b: Impact of asymmetric dynamical processes on the structure and intensity

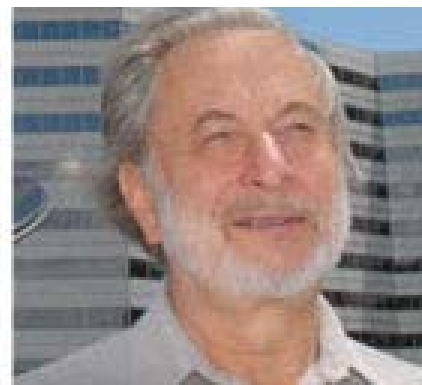


change of two-dimensional hurricane-like annular vortices *J. Atmos. Sc.*

- Sun, J., P.A. Ariya, H.G. Leighton, and M.K. Yau, 2012: Modelling study of ice formation in warm-based precipitating shallow cumulus clouds. *J. Atmos. Sci.* DOI: 10.1175/JAS-D-110344.1
- Yip, Z.K., and M.K. Yau, 2012: Application of artificial neural networks on North Atlantic tropical cyclogenesis potential in climate change. *J. Atmos. Oceanic Technol.*, 29, 1202-1220.
- Menelaou, K., M.K. Yau, and Y. Martinez, 2012a: On the dynamics of the secondary eyewall genesis in Hurricane Wilma (2005), *Geophys. Res. Lett.*, 39, L04801, doi:10.1029/2011GL050699.

Prof. Isztar Zawadzki

- Berenguer, Marc; Surcel, Madalina; Zawadzki, Isztar; Xue, Ming; Kong, Fanyou: The Diurnal Cycle of Precipitation from Continental Radar Mosaics and Numerical Weather Prediction Models. Part II: Intercomparison among Numerical Models and with Nowcasting Source: *MONTHLY WEATHER REVIEW* DOI: 10.1175/MWR-D-11-00181.1 Published: AUG 2012



Opportunities to Give

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Professor Lawrence Mysak has provided a generous endowed graduate fellowship, in memory of his parents. This fellowship offers a stipend to a graduate student in atmospheric or oceanic sciences every year

The awards within the Department of Atmospheric and Oceanic Sciences were made possible by the private philanthropic support of alumni, faculty and staff, as well as friends of the University. Private support is responsible for the majority of McGill's student awards.

If you wish to contribute to the Department of Atmospheric and Oceanic Sciences, please visit the McGill Development and Alumni Relations secure online form at:

<https://www.alumni.mcgill.ca/aoc/online-giving/>

Please make sure that you write a note that your donation is to Department of Atmospheric and Oceanic Sciences.

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If you are interested in establishing a named award, please contact Toby Moneit at (514) 398-8894 for more information. **Donations, regardless of size, are very much appreciated. Please make sure that you write a note that your donation is to Department of Atmospheric and Oceanic Sciences.**

Key People in Our Department



Mrs. Ornella Cavaliere
Administrative Officer



Mrs Paula Domingues
Administrative and Student Affairs Coordinator



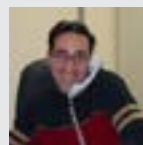
Mrs Jennifer Marleau
Research Accounts Administrator



Mrs. Emily Wen Cui Yang
Accounts Administrator



Mr. Michael Havas
Systems Administrator



Mr. Joseph Vacirca
Network Technician



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