The Connaught Summer Institute in Arctic Science presents:

2017 Summer School Jamboree

Jamboree Requests

The slides are in alphabetical order by last name beginning with speakers followed by students. Please refer to the program to find your presentation slot and be prepared to begin when the person before you finishes.

You will be given **two minutes** to introduce yourself. Please be courteous to the next speaker and wrap-up promptly when requested.

Please excuse any formatting errors that may have occurred in compiling the slides into one presentation.

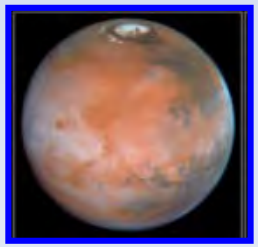
Let’s Start !

02:00

Kimberly Strong
Dept of Physics, University of Toronto
Director, School of the Environment

Remote sounding of atmospheric composition from the ground, balloons, and satellites using UV-VIS-IR spectroscopy

- PAHA Deputy PI and leader of the Composition Measurements theme
- Four instruments at PEARL
- U of T Atmospheric Observatory
- ACE and Odin satellite missions
- Laboratory spectroscopy
- Mars studies



Kanupria Seth

- Undergraduate at University of Toronto Mississauga

Specialist in Biomedical Physics and minor in Statistics.

- Summer research with Prof. Paul Kushner.

- Analyzing snow water equivalent datasets in the Canadian prairies to find relationship between snow and local temperature, relative humidity, winds.
- If these relationships vary at different latitudes.

Transport Implications in the Arctic Air Quality and Meteorology

Atmospheric Boundary Layer, Turbulence, Dispersion, Stability, Mixing, Heterogeneity, and Beyond …

Connaught Summer Institute (2017)

Amir A. Aliabadi

Environmental Engineering, University of Guelph

Ice fields seen in Labrador Current April 6, 2008 from a plane. [Photo Credit: Daniel Schwen]

Lukas U. Arenson

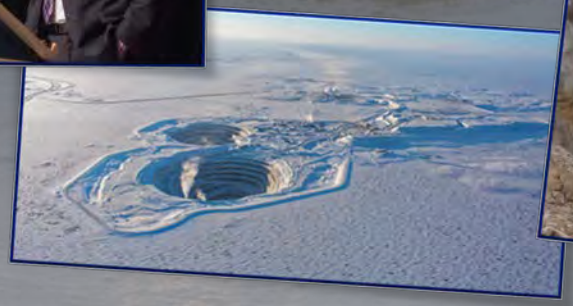
- Geotechnical Engineer - Permafrost
- Cold Regions (Geo) Design and Impact of Climate Change
- BGC Engineering, Vancouver
- Projects in the Arctic, Andes, Greenland, Tien Shan. Rockies Alps, Costal Mountains









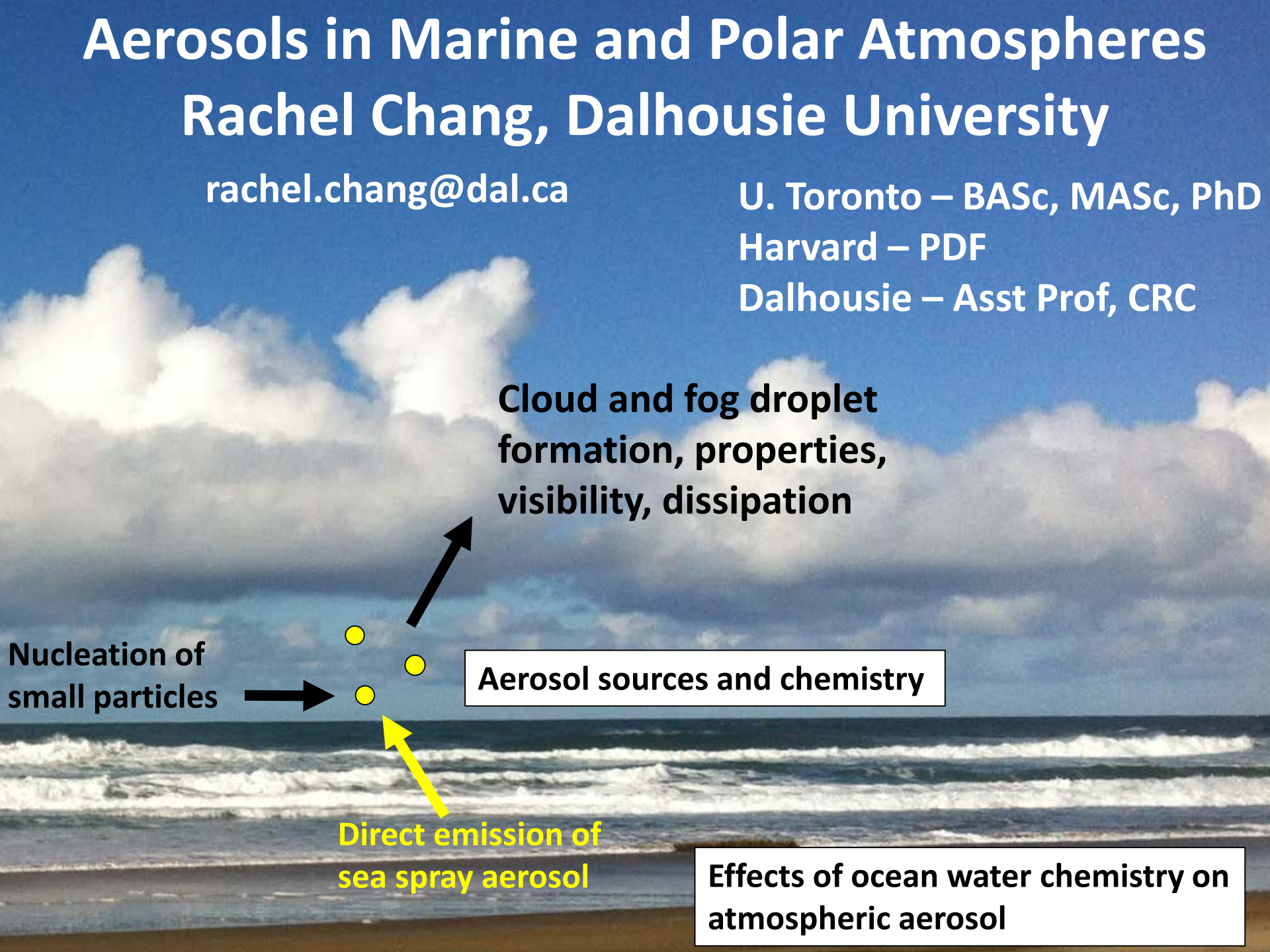



Aerosols in Marine and Polar Atmospheres

Rachel Chang, Dalhousie University

rachel.chang@dal.ca

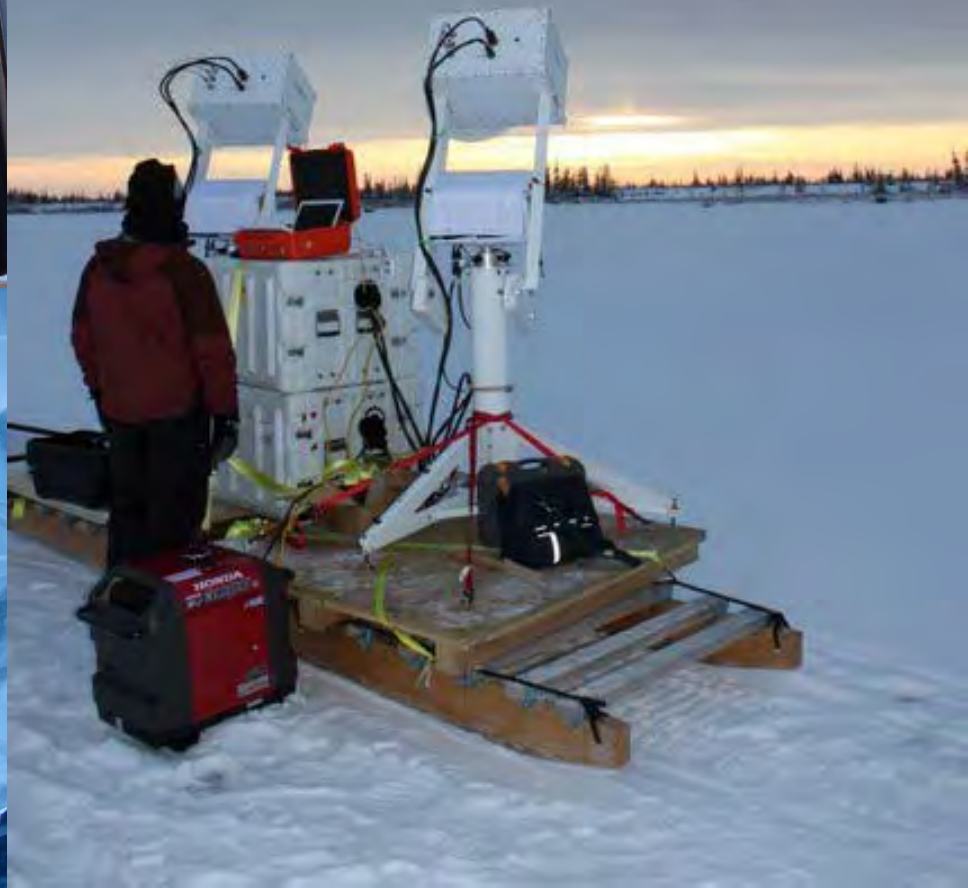
U. Toronto – BASc, MASc, PhD
Harvard – PDF
Dalhousie – Asst Prof, CRC



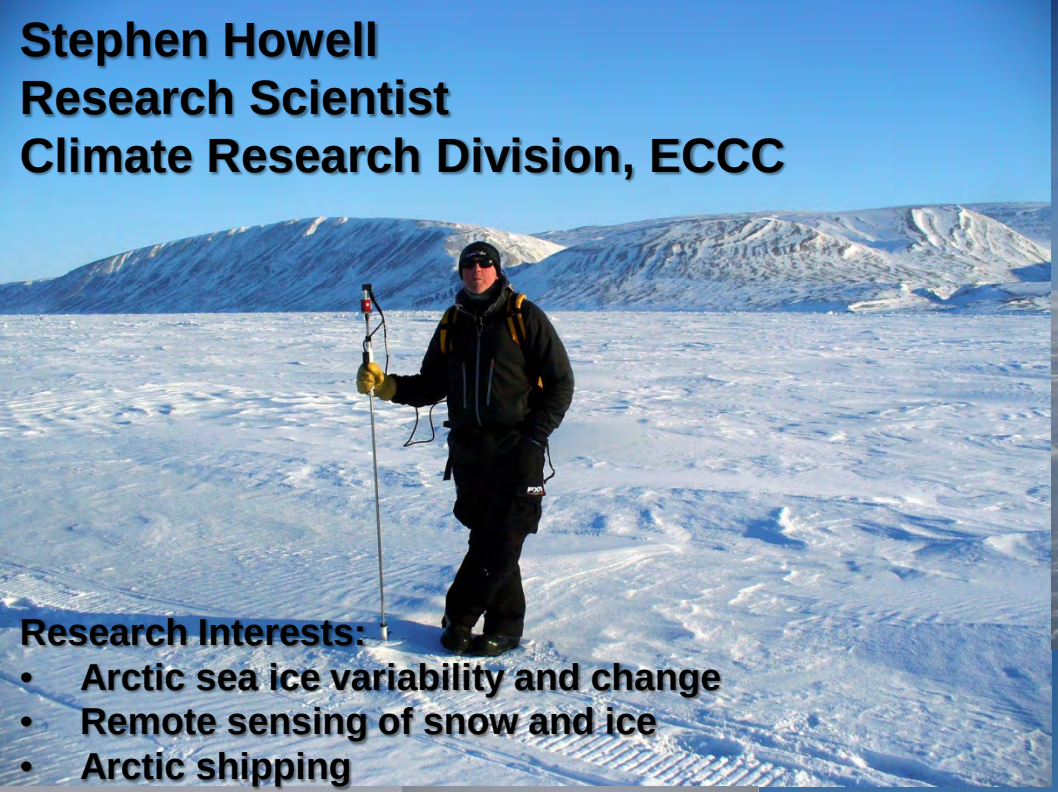
Professor Claude Duguay
University Research Chair in Cryosphere & Hydrosphere from Space
University of Waterloo

Research interests:

- Arctic hydro-climatology
- Lake-atmosphere interactions
- Remote sensing in northern hydrology (freshwater ice, permafrost, snow, water quantity and quality)
- Numerical lake ice modeling



Stephen Howell
Research Scientist
Climate Research Division, ECCC



Research Interests:

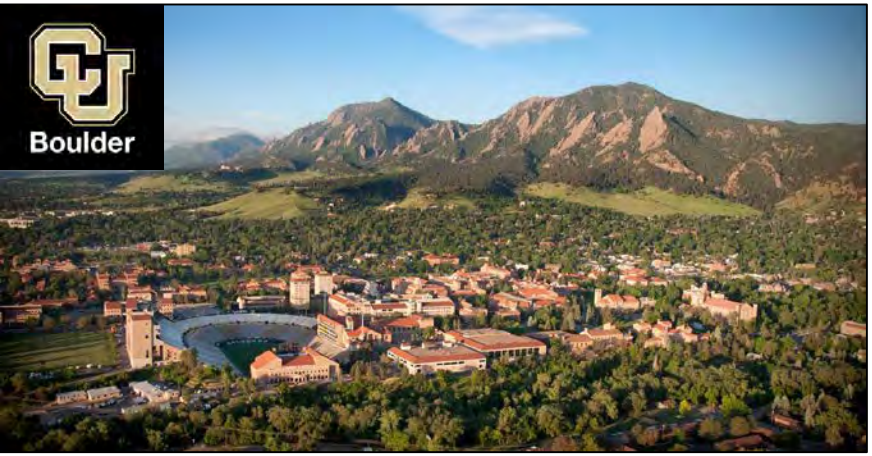
- Arctic sea ice variability and change
- Remote sensing of snow and ice
- Arctic shipping

Alexandra Jahn

Assistant Professor in Atmospheric and Oceanic Sciences at University of Colorado Boulder & Fellow at the Institute of Arctic and Alpine Research

Previously:

- Project Scientist and Postdoc at National Center for Atmospheric Research (NCAR), Boulder, USA
- PhD in Atmospheric and Oceanic Sciences from McGill University, Montreal, Canada
- Diplom in Meteorology from the Free University of Berlin, Germany
- Exchange student at University of Washington in Seattle, USA

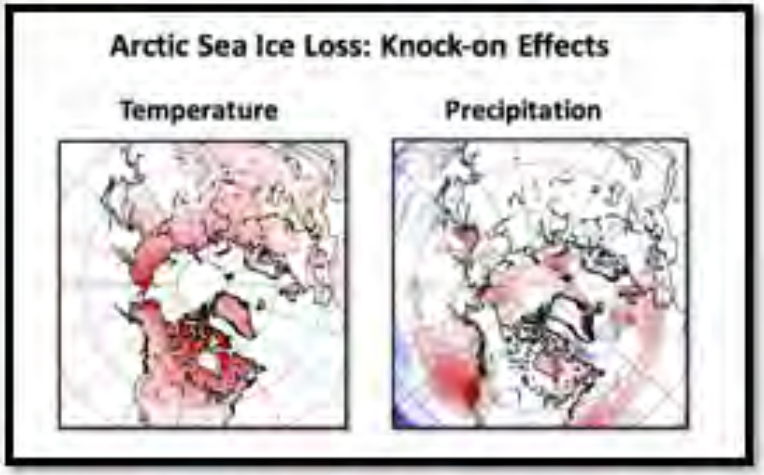


Research Interests:

- Arctic climate variability and change, with focus on sea ice and ocean
- Global Climate modeling
- Isotope and geotracer modeling
- Paleoclimate modeling

Kushner Group: *Atmosphere/Climate Dynamics*

- Large-scale atmospheric dynamics:
  - The jet stream, general circulation, and stratosphere-troposphere linkages.
- Cold climate processes:
  - Snow cover and sea ice
  - Polar linkages with global climate
- Theory:
  - Large-scale waves and stability
  - Wave mean-flow interactions
  - Modes of variability
- Tools:
  - Earth system models and simpler models
  - Mining of observational data and model data



Blackport and Kushner 2017 a,b

Paul Kushner • paul.kushner@utoronto.ca • http://uoft.me/pik

Kerri Pratt

Seyhan Ege Assistant Professor of Chemistry and Earth & Environmental Sciences

- **Arctic halogen chemistry**
- **Arctic aerosols**
- **Mass spectrometry** (Single-particle mass spectrometry (ATOFMS) & Chemical ionization mass spectrometry (CIMS))
- **0-D and 1-D atmospheric modeling** of snowpack halogen chemistry
- **Arctic fieldwork:** ground, sea ice, icebreaker, aircraft

LSA CHEMISTRY
UNIVERSITY OF MICHIGAN

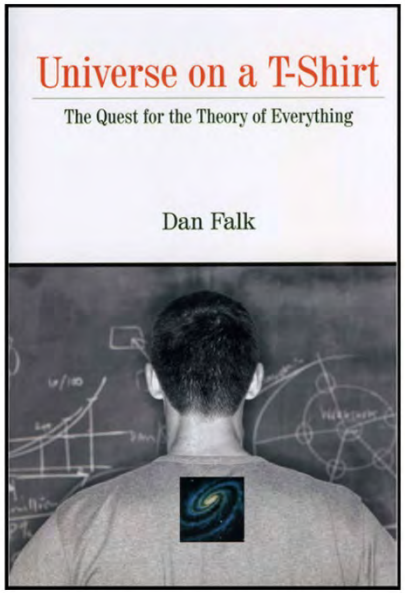
Kim presents missing speakers:
Dan Falk, David Hudak, Kent Moore,
Michael Sigmond, Francis Zwiers

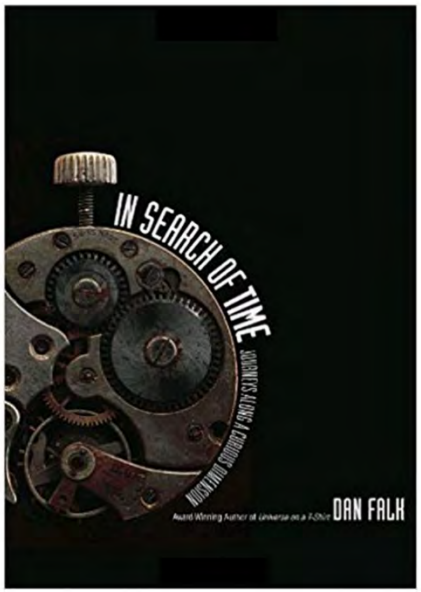
Dan Falk

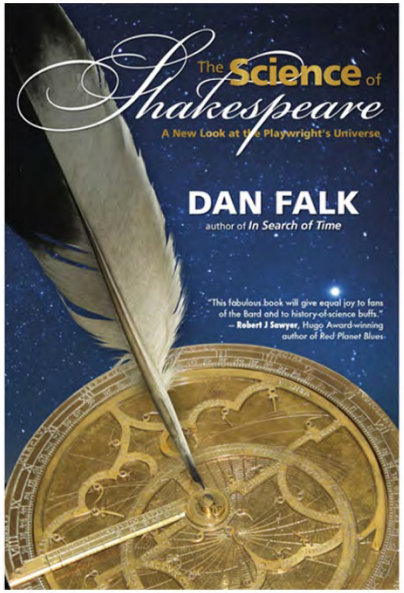
Journalist · Author · Broadcaster

danfalk.ca

@danfalk







Environment and Climate Change Canada

Environnement et Changement climatique Canada

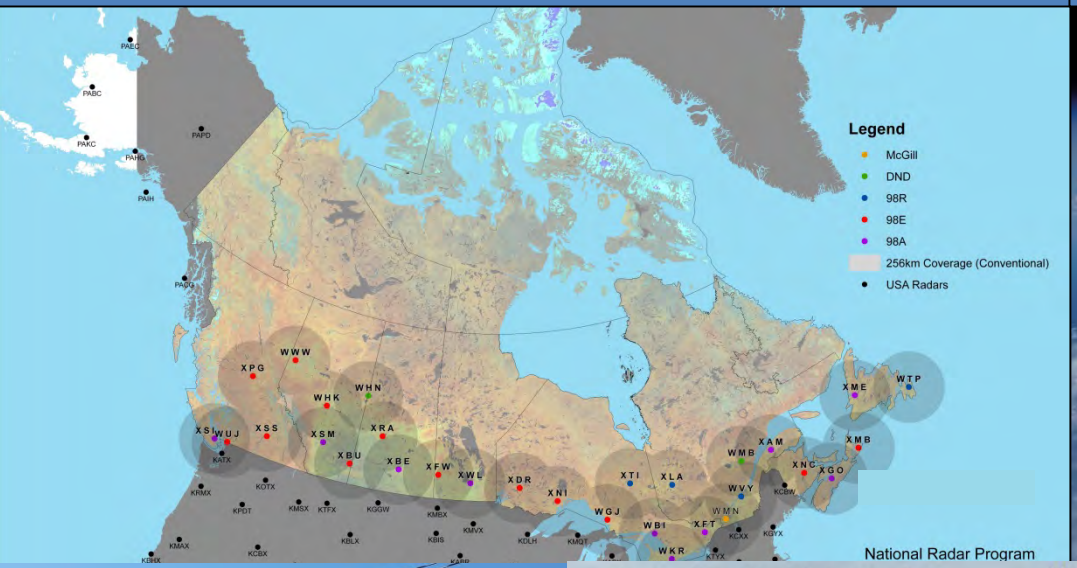
Canada

David Hudak

Research Scientist

Meteorological Research Division

Canadian Weather Radar Replacement Project



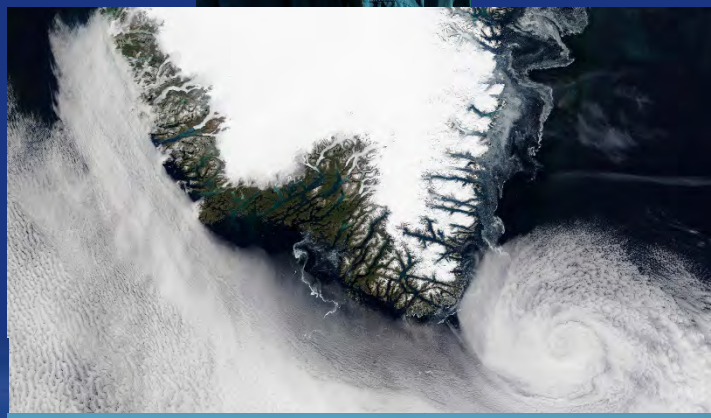
Radars in Space (GPM)

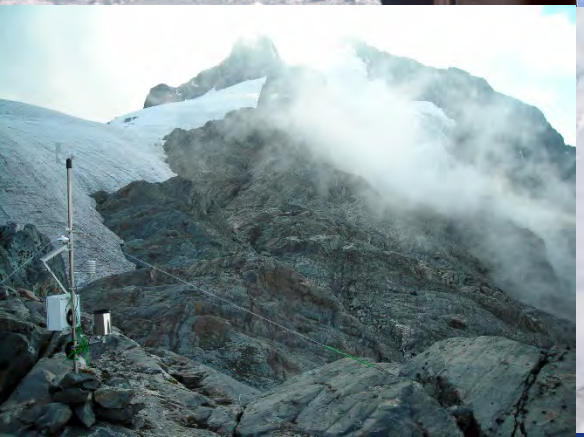
OLYMPEX

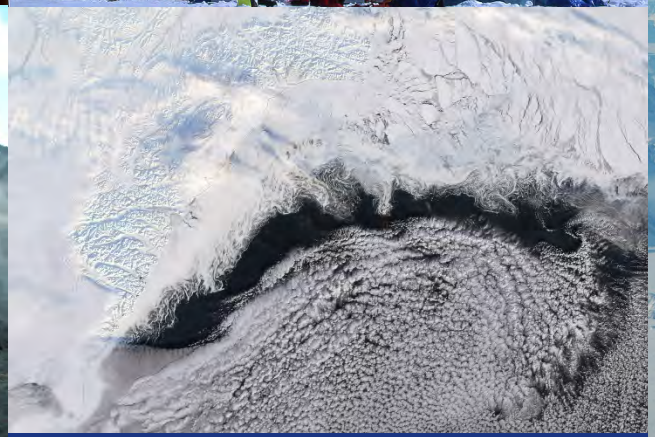
Canadian Arctic Weather Science (Iqaluit)

Kent Moore
Professor of Physics, University of Toronto
2017 Fulbright Chair in Arctic Studies,
University of Washington

- *High-latitude air-sea-ice interaction*
- *Greenland wind systems*
- *Glaciology*
- *Mountain Meteorology*







Michael Sigmond

Michael.sigmond@canada.ca

Research Scientist at Canadian Centre for
Climate Modelling and Analysis (Victoria, BC)
Environment and Climate Change Canada

Understanding, modelling and prediction of climate variability and climate change using climate models

- Seasonal climate predictions (Arctic sea ice, stratosphere)
- Long-term climate projections (Arctic sea ice)
- Impacts of Arctic sea ice decline
- Attribution of recent climate trends (Antarctic sea ice, cooling North American winters)
- Atmospheric large-scale circulation, and implications for regional climate

Francis Zwiers, PCIC, University of Victoria

- Trained as a statistician
- Started as a postdoc with George Boer
- Scientific contributions are in application of statistics to climatology
  - Analysis of variability, predictability
  - Detection and attribution
  - Extremes
- Multiple roles at ECCC
- IPCC author (numerous assessment cycles)
- Currently leads PCIC – a not-for-profit regional climate services provider in BC

ATTENDEES

ACHINI ABAYAKOON

(Master's in Physics-1st year)

Supervised by Prof. R. J. Sica

University of Western Ontario

Research : A New Ceilometer for Routine Measurements of Aerosols in the Troposphere

Médard Noukpo AGBAZO

Education

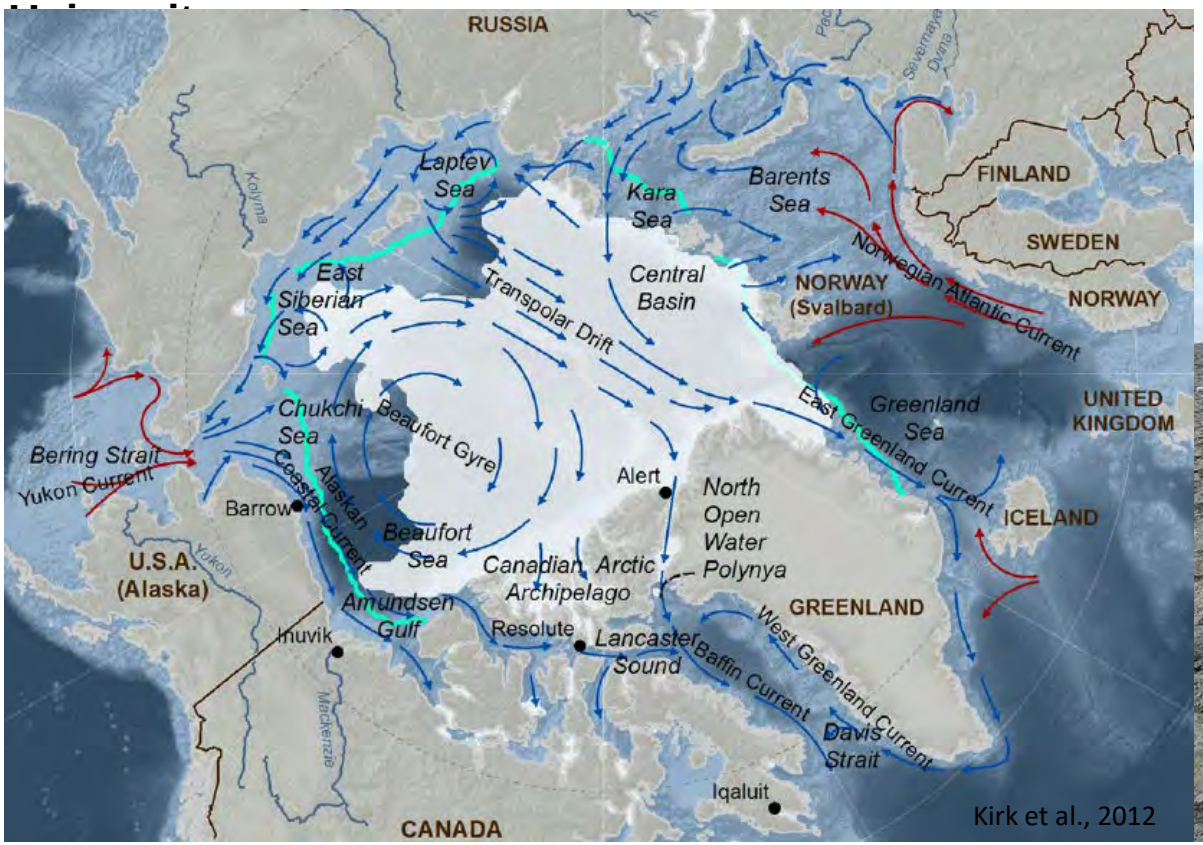
- BSc. & MSc. Physics at university of Benin (West Africa)
- Msc in Hydrometeorology at University of Benin (West Africa)
- Msc in Atmospheric science at University of Quebec in Montreal (Canada)

Research Area

- ❖ Statistical post-processing
- ❖ Bias correction technique
- ❖ Arctic and Africa climatology
- ❖ Atmospheric sciences
- ❖ Multifractal analysis of physical process

Gabriel Auclair

Master's Student, Department of Atmospheric and Oceanic Sciences, McGill University



Kirk et al., 2012

- Research : Impact of ocean heat flux pathway on sea ice decline in the Arctic

- Supervisor : Bruno Tremblay

- Background : BSc. in Physics at Montreal University

Mineral dust in the aftermath of river piracy (Kluane National Park, Yukon)

- Collection of PM_{10} using an MCV high-volume air sampler
- Characterization of mineral dust particles via LA-ICP-MS, Raman Microscopy, Aerodynamic Particle Sizer

By Jill Bachelder (Group of Dr. Patrick Hayes, Université de Montréal)

Whitney Bader Postdoc fellow

U of T, University of Liège

Research interests

Methane

infrared remote sensing

PhD

Increase of CH_4 since 2005 based on FTIR observations and GEOS-Chem tagged simulation

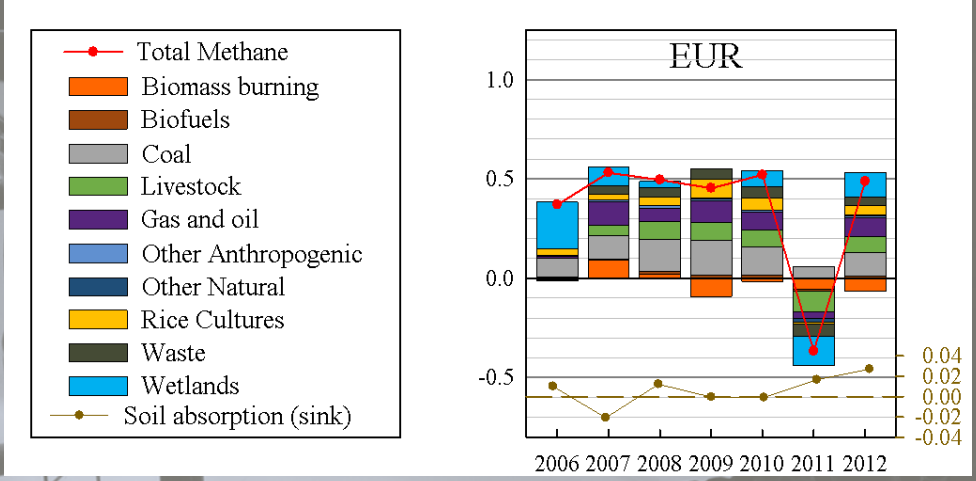
Current project

Increase of CH_4 since 2005 ?

A- Retrievals of CH_3D and $^{13}CH_4$ from FTIR observations

B- Development of an isotopic module for GEOS-Chem

C- Comparisons of 3 CH_4 datasets
1) GEOS-Chem CH_4 simulation
2) IASI satellite observations
3) FTIR ground-based observations of
at a global scale



Background

Bsc : chemistry

Msc : climatology

Phd : geophysics

@ULg, Belgium

Natalia Bliankinshtein

McGill

- BSc in Theoretical Physics (2015) at MIPT, Moscow: Field theory
- MSc1 in Applied Maths (2016) at MIPT, Moscow: Statistics of seismic data
- MSc in Atmospheric and Oceanic Sciences at McGill, Montreal

Wikipedia, By Fred the Oyster, CC BY-SA 4.0

Supervisors: Yi Huang & John Gyakum

Interests: synoptic meteorology, atmospheric radiation, extreme weather

Current research: radiation in polar air mass formation and cold air outbreaks

Kevin Bloxam

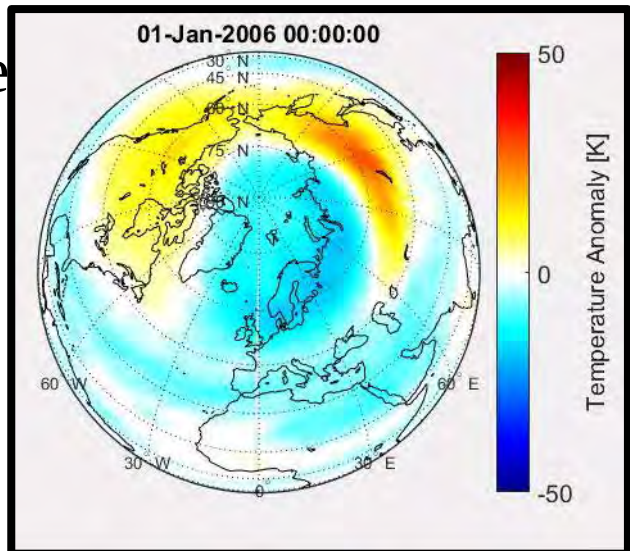
M.Sc. (1st year): *McGill University* –
Atmospheric and Oceanic Sciences

McGill

B.Sc.: *The University of Western Ontario* –
Physics and Astronomy, Environmental Science, and Actuarial Science

Current Research:

- Working with the Atmospheric Radiation Group at McGill under the direction of Dr. Yi Huang
- Quantifying the e-folding timescale of radiative dampening to atmospheric disturbances
- Investigation of sudden stratospheric warming events as a primary example of atmospheric perturbations



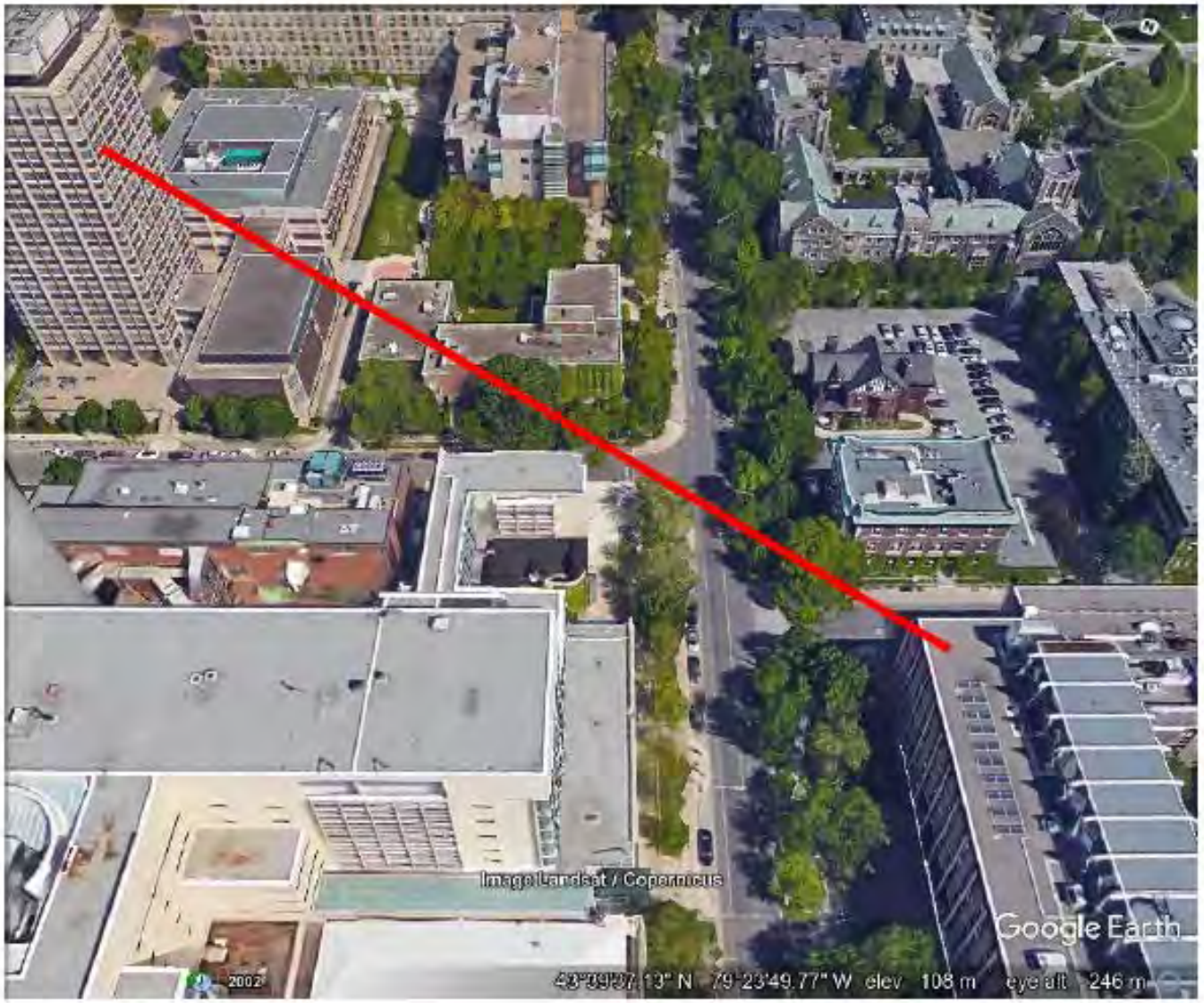
Monitoring trace gases in downtown Toronto using open-path Fourier transform infrared spectroscopy

Brendan Byrne[1], Orfeo Colebatch[1], Pierre Fogal[1], Erik Lutsch[1], Richard Mittermeier[2], Kimberly Strong[1]

[1]Department of Physics, University of Toronto, Toronto, Ontario

[2]Environment and Climate Change Canada, Downsview, Ontario

Contact:
bbyrne@physics.utoronto.ca



Laurence Coursol

M.Sc. Student in Atmospheric Sciences
University of Québec at Montréal
Supervisors: Pierre Gauthier and Jean-Pierre Blanchet

UQÀM

- Member of the TICFIRE (Thin Ice Clouds in Far IR Experiment) satellite mission
- Using the case of FIRR (Far InfraRed Radiometer) to show the added-value of far infrared measurements by radiometers

Joelle Dionne

DALHOUSIE UNIVERSITY

M.Sc. student at Dalhousie University
Supervisors: Dr. Rachel Chang & Dr. Ian Folkins

Current Research:
- radiative and microphysical properties of fog and low cloud in the Arctic
- working with a radiative transfer model and aircraft observations of cloud properties

Background:
- Diploma in Meteorology (Dalhousie)
- B.Sc. Mathematics (UBC)

Ghazal Farhani

I’m working on a lidar in Eureka. I‘m using an optimal estimation method to retrieve the ozone profiles.

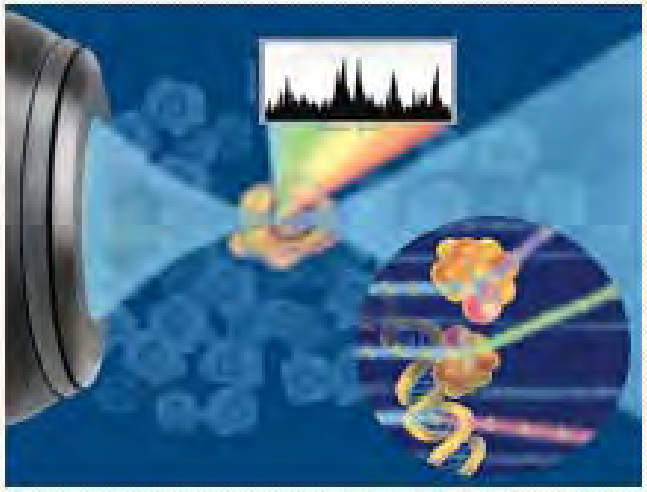
Western

Shayamila Mahagammulla Gamage

PhD in Physics

The University of Western Ontario

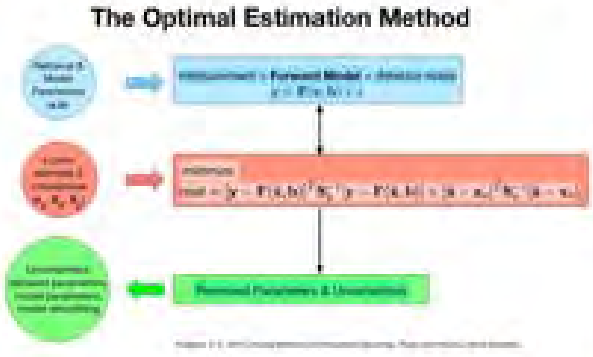
Supervisors : Dr .Robert Sica & Dr. Alexander Haefele



Western

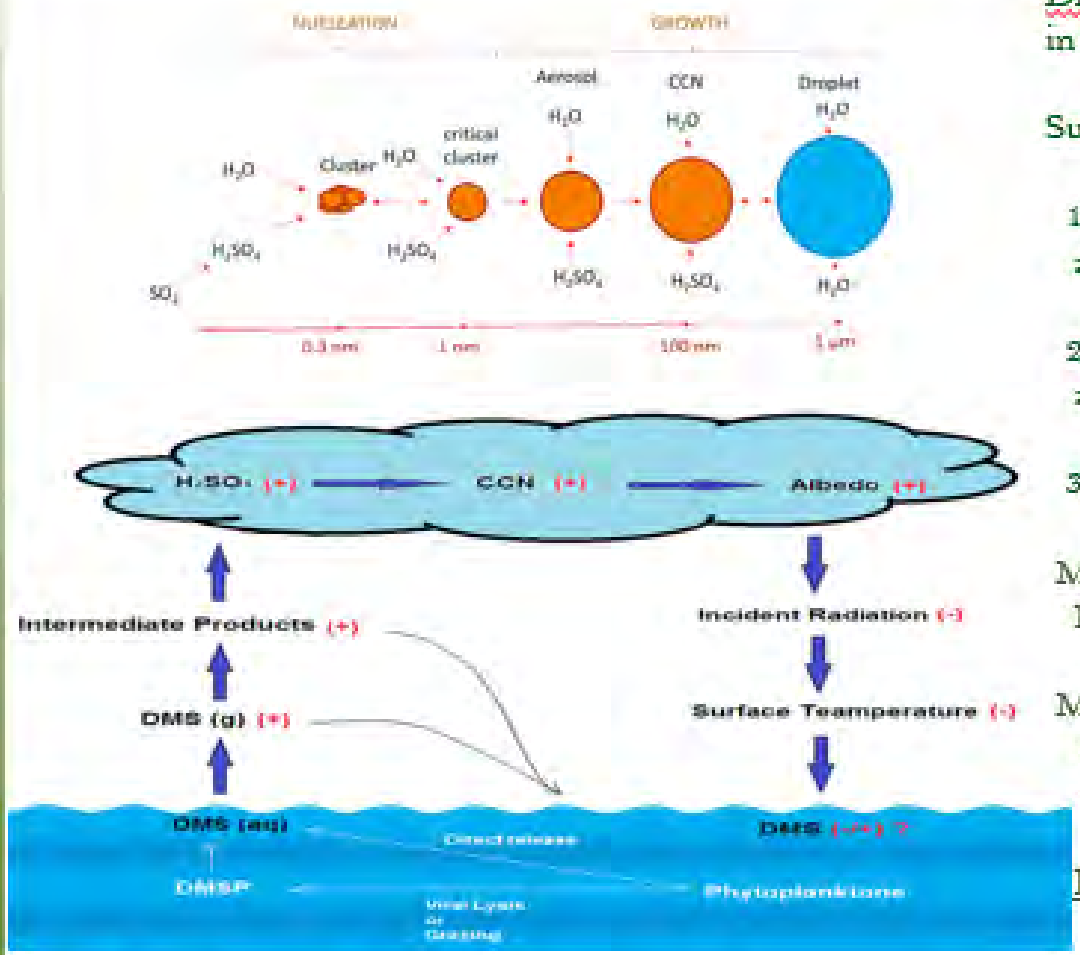
MeteoSwiss

Purple Crow LIDAR



Dimethyl sulfide in the Arctic atmosphere

Roya Ghahreman, Wanmin Gong



DMS$_g$ emissions may play an important role in the Arctic.

Sulfur compounds, from DMS$_g$ oxidation:

1. may condense on pre-existing aerosols and/or
2. form new particles in the atmosphere, and/or
3. grow large enough to act as CCN.

Measurements:
NETCARE (July 2014 and April 2015)

Modeling:
No presentation of DMS$_g$ in the ECCC's air quality model, GEM-MACH!

Main goal: Adding DMS in GEM-MACH

Matthew Henry

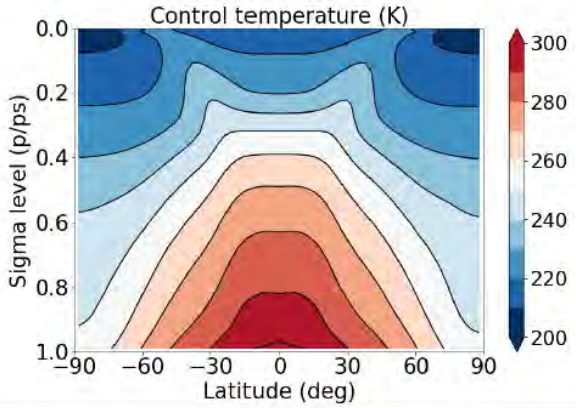
PhD Student at McGill University
Supervisor : **Tim Merlis**
Mathematics (McGill and Paris)

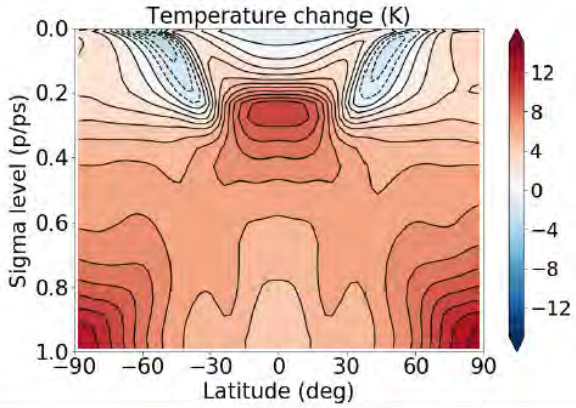
McGill

Research interests

- Effect of σT^4 nonlinearity on structure of temperature change
- Necessary conditions for **arctic amplification** of surface air warming

Idealized model of the atmosphere with aquaplanet surface boundary condition and no sea ice. Gray radiation with no water vapor feedback and no cloud feedback. (Frierson et al. 2006)





Shannon Hicks

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Federal Department of Home Affairs FDHA
Federal Office of Meteorology and Climatology MeteoSwiss

PhD Student in Astronomy/Planetary Sc.
University of Western Ontario

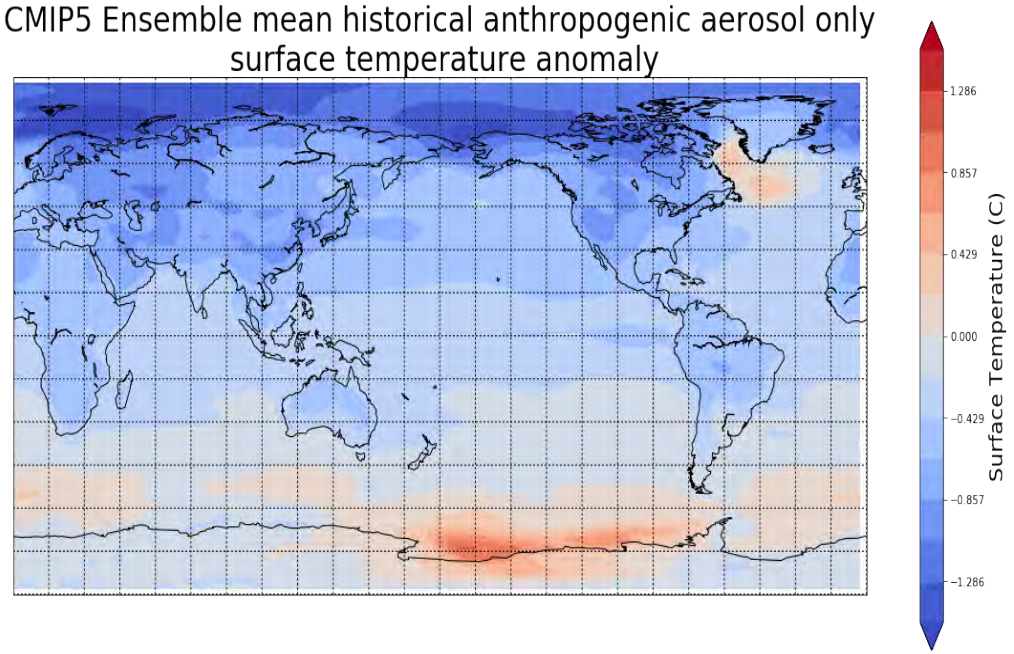
- **Supervisors: Dr. Bob Sica and Dr. Alexander Haefele**
- **Project: Developing a Water Vapour Climatology using the RALMO lidar in Switzerland using OEM.**
- **CREATE TAC Chair and Social Media Coordinator**

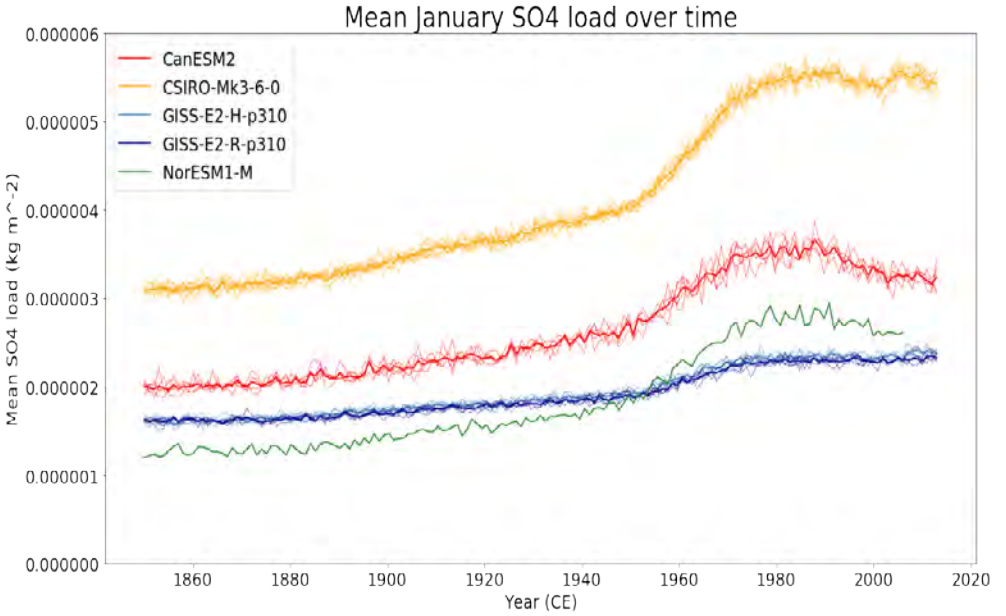
Western

Purple Crow LIDAR

Haruki Hirasawa

- Education:
  - B.Sc. Physics and Applied Mathematics, Memorial University of Newfoundland
  - 1st year Ph.D. student, Dept. of Physics, University of Toronto
- Research:
  - Supervisor: Paul Kushner
  - Spatial patterns of aerosol forcing impacts across CMIP5 models
  - Application of pattern scaling to aerosol forcing impacts





Yukari Hori (Ph.D.)

Post-doctoral Fellow
University of Toronto Scarborough
Supervisor: Prof. William A. Gough

Background

PhD: Physical and Environmental Sciences, UTSC
MRS: Environment and Resource Studies, UWaterloo
BSc: Environmental Studies, Saint Mary's University

Research interests

- Climatology, Climate modeling and simulation
- Climate change adaptation for northern-remote First Nations communities
- Climate change impact assessment: winter/ice roads, clay belt in northern Ontario

UNIVERSITY OF TORONTO SCARBOROUGH

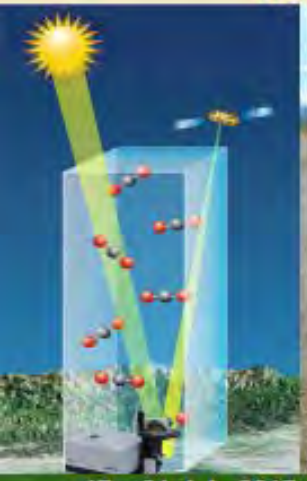
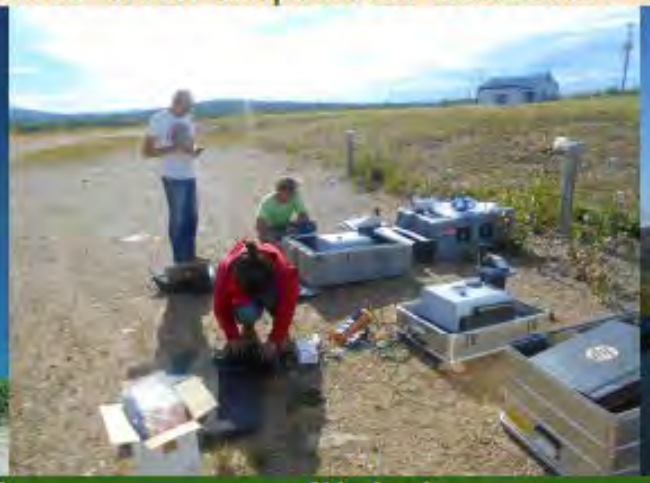
CL @ UT
Climate Lab at UofT

Nicole (Niki) Jacobs
Supervisor: William R. Simpson

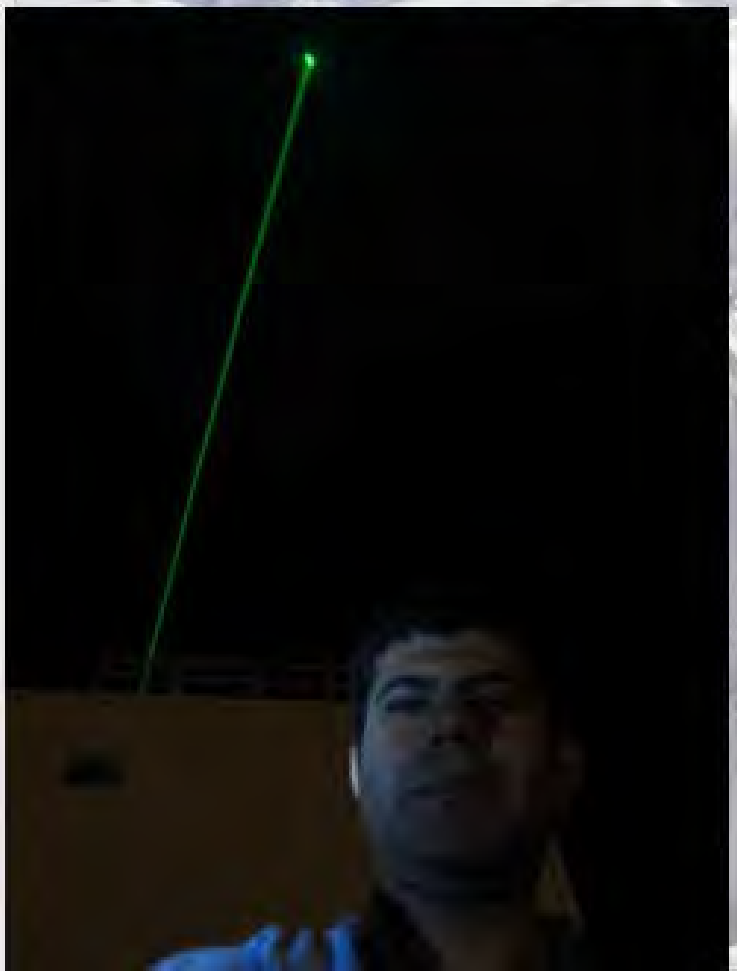
PhD student with the Geophysical Institute
and the Department of Chemistry and Biochemistry
at the University of Alaska Fairbanks

Current Research Objectives

- Total column measurements of CH_4 and CO_2 in interior Alaska's Boreal Forest and northern wetlands.
- Deploying multiple mobile solar-viewing infrared spectrometers (EM27/Sun) to estimate regional fluxes of CH_4 and CO_2.
- Seeking alternative, cost-effective methods to measure regional scale fluxes with improved seasonal coverage.

Ali Jalali



- Background: B.Sc. in Physics, M.Sc. in Meteorology and M.Sc. in Physics
- Currently: Ph.D. student in Physics at University of Western Ontario
- Purple Crow Lidar, RALMO
- Temperature in the Middle Atmosphere

Paul Jeffery

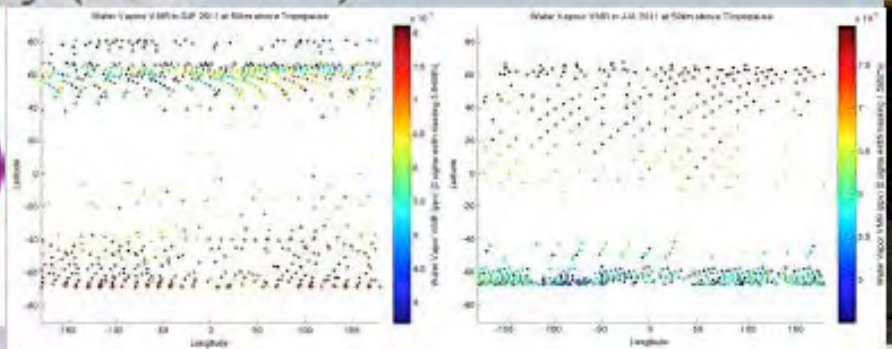
PhD Candidate in Atmospheric Physics
Supervised by Prof. Kaley Walker
Dept. of Physics, University of Toronto

Education and Previous Research

- H.BSc.: Physics and Health Science, minor in Chemistry, University of Toronto Mississauga (2015)
- Biophysics Research: Characterization of cell structures using Second and Third Harmonic Generation Laser Microscopy (2013 - 15)

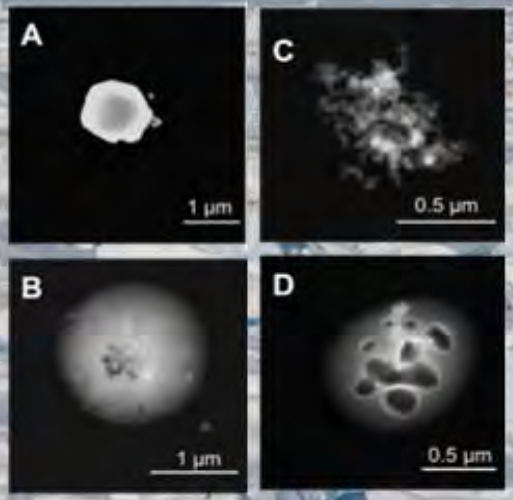
Current Research

- Trends in mesospheric water vapor measured by ACE-FTS
- Development of water vapor and ozone climatologies in the UTLS from ACE-FTS, ACE-MAESTRO, Odin-OSIRIS
- Implementing water vapor retrievals for PARIS-IR



Rachel Kirpes

Ph.D. Student in Chemistry
University of Michigan
PI: Prof. Kerri Pratt



UNIVERSITY OF MICHIGAN

Evolving Sources & Chemistry of Atmospheric Aerosols:
offline analysis of individual particles (microscopic and spectroscopic techniques)

William Knee-Walden

Postdoctoral Fellow in the group of K.A. Walker

Development of a Balloon-borne Laser Absorption Spectrometer

(1) High-altitude ballooning

(2) Electronics, optics, and software

(3) Instrumentation for field research

Physics
UNIVERSITY OF TORONTO

Ph.D. in Physics (Stevens Institute Of Technology, NJ, USA)

B.S., M.S. in Physics (New Mexico Tech, NM, USA)

Slawomir Kowal

UNIVERSITY OF TORONTO SCARBOROUGH
Department of Physical & Environmental Sciences

Background

- PhD Candidate: Department of Physical and Environmental Sciences, University of Toronto at Scarborough
- Supervisor: Professor William A. Gough
- MSc: Department of Geography, University of Toronto
- BSc: Department of Physical and Environment Sciences and Department of Geography, University of Toronto at Scarborough

Research Interests

- Temporal and Spatial Evolution of Arctic Sea Ice in Relation to Climate Change
- The Influence of Climate Change upon the formation and degradation of permafrost generated palsa mounds in Northern Climates
- Climate Change Impact Assessments in Subarctic Regions of Canada

Spatial Patterns of Sea Ice based upon Breakup Cycles from 1971 to 2011 (K-means Method)

Natasha Leclerc

Human-sea ice dynamics in the past with coralline red algae

Archaeology/Earth Sciences
University of Toronto

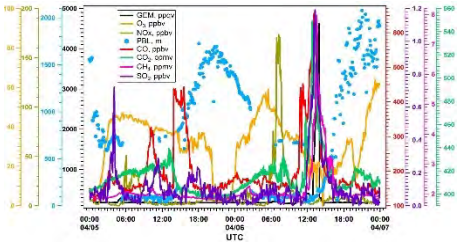
Lei Liu

- **Post-doctoral Fellow**
  - Department of Physics, University of Toronto, Canada
  - Supervisor: Prof. Kimberly Strong

- **Research Interests**

  Extended-range Atmospheric Emitted Radiance Interferometer (the E-AERI):
  - Arctic radiation budgets (clouds / downwelling radiances & fluxes / water vapour & temperature retrievals)
  - Atmospheric composition (trace gas retrievals / total columns / diurnal & seasonal variability)

- **Background**
  - Ph.D. in Atmospheric Sciences, University of Houston, U.S.A.
    Dissertation: *Atmospheric ozone, mercury, methane, and biomass burning characteristics in south-central Texas*
  - B.Sc. in Atmospheric Sciences, Lanzhou University, P.R. CHINA



Erik Lutsch

PhD. Student, University of Toronto

Research interests:

- FTIR measurements at Eureka and Toronto
- Transport models and satellite observations
- Biomass burning emissions and transport

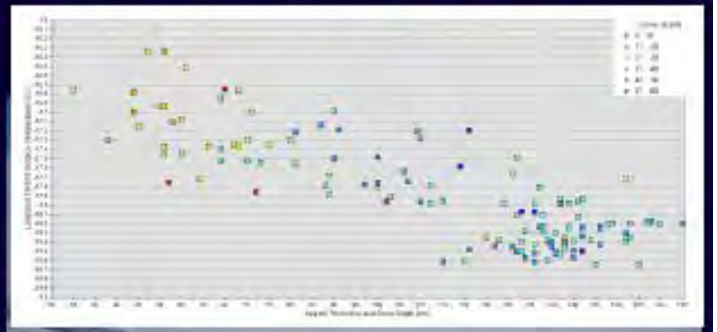
Marzena Marosz-Wantuch

PhD Candidate, York University
Supervisor: Prof. Christian Haas

Research:

Detection and Analysis of the Spatiotemporal Variability of Thin Ice Areas and Polynyas in the Canadian Arctic Archipelago

- *in situ* measurements
- thermal and optical remote sensing
- numerical modeling of energy fluxes



Stephen McNamara

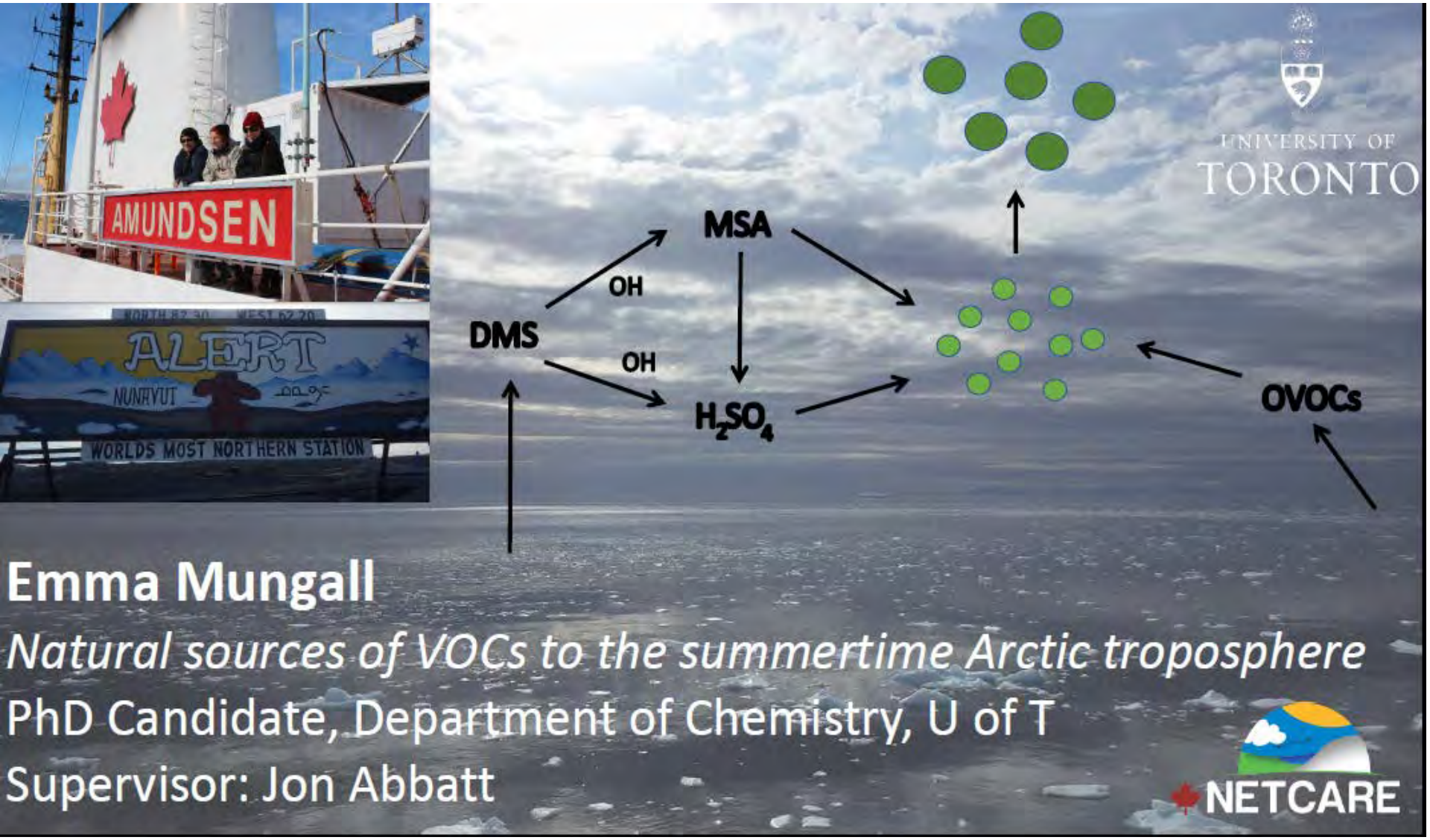
smcnam@umich.edu

- 4th year Chemistry Ph.D. candidate, University of Michigan (Pratt Group)
- B.S. Chemistry 2014, Michigan State University

Research focus:

Use chemical ionization mass spectrometry and 0 & 1-D modeling to investigate tropospheric halogen and reactive nitrogen chemical mechanisms in the Arctic

LSA CHEMISTRY
UNIVERSITY OF MICHIGAN



UNIVERSITY OF TORONTO

Emma Mungall

Natural sources of VOCs to the summertime Arctic troposphere

PhD Candidate, Department of Chemistry, U of T

Supervisor: Jon Abbatt

NETCARE

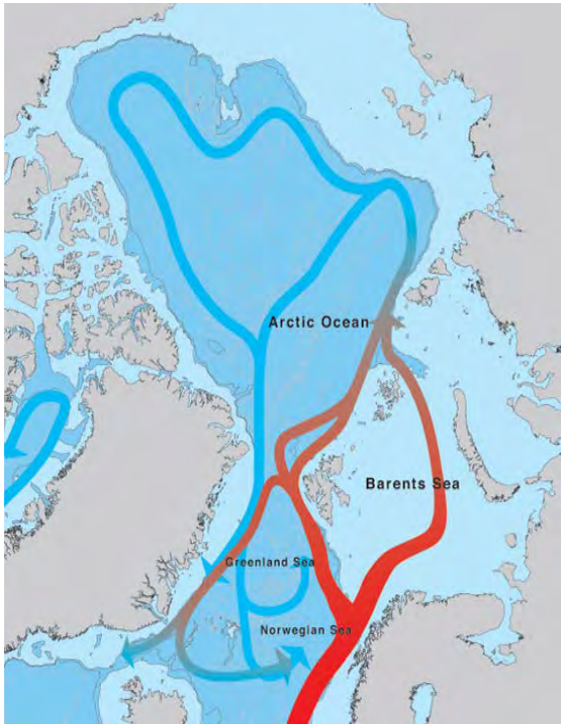
Bimochan Niraula

Origin: Nepal.

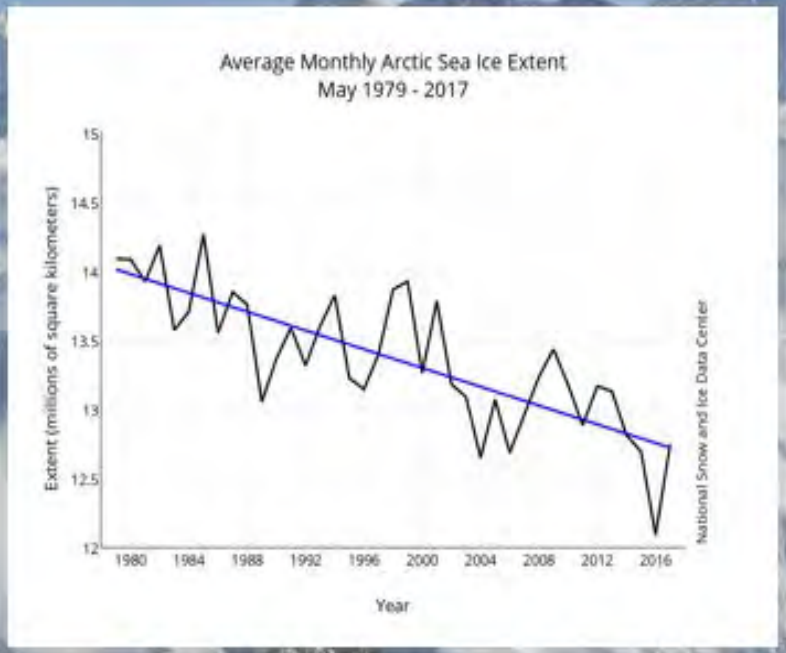
Before: BSc in Physics, McGill

Now: MSc in Atmospheric & Oceanic Sciences, McGill

Research: Arctic Climate, Ocean Heat Flow, Ice and Snow



Thomas Oudar, PostDoc Fellow at the University of Toronto



PhD at Cerfacs: Respective roles of GHG increase and Arctic sea ice loss

- **Large-scale atmospheric circulation response to Arctic sea ice loss**
- **Storm-tracks changes**

PostDoc Project: Role of Anthropogenic Aerosols on the climate

Ludovick S. Pelletier
M.Sc. Student at UQÀM
Prof: Jean-Pierre Blanchet
and Eric Girard

UQÀM

Far Infrared Radiometer radiometric accuracy and observation during the field campaign at Eureka

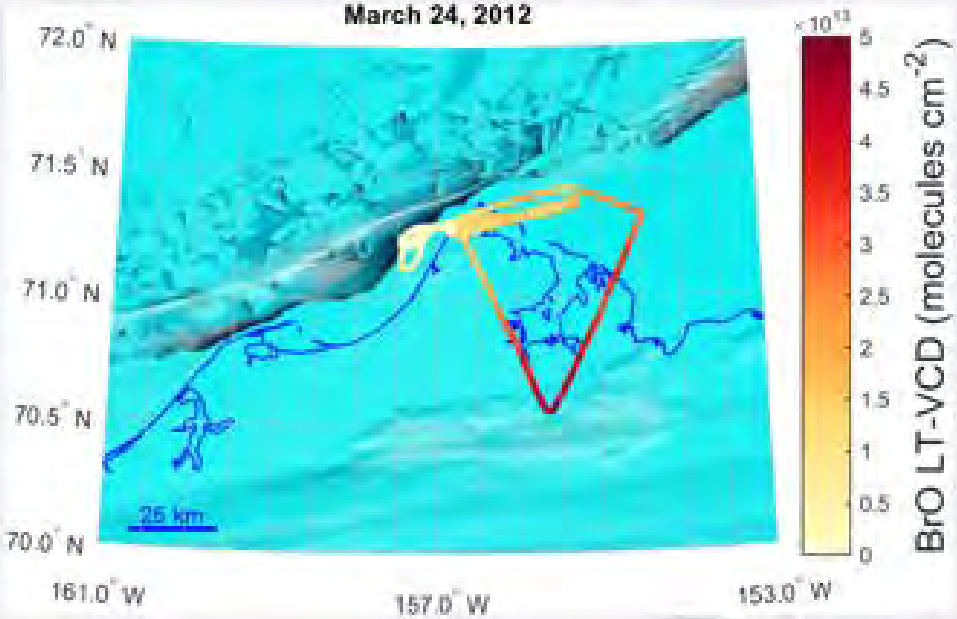
Part of the TICFIRE satellite project
(Thin Ice Cloud Far-InfraRed Experiment)

- Developing a new remote sensing method by using the Far-Infrared to study the water cycle in the arctic
- Test the new technologies for the satellite mission

Photo: Emily McCullough

Peter Peterson

- Postdoc at University of Michigan
  (With Kerri Pratt)
- PhD from University of Alaska Fairbanks
  (Advisor: Bill Simpson)
- Research Interests
  - Differential optical absorption spectroscopy (DOAS)
  - Air Ice Chemical Interactions
  - Tropospheric Halogen Chemistry
- Current Research:
  - Airborne 3-D Imaging of BrO In Northern Alaska
  - Measure spatial distribution of BrO with higher resolution than satellite-based observations
  - Concurrently also measure vertical profile
  - Combine with aerosol measurements, sea ice remote sensing, and 1-D chemical modeling to gain new insights
- **Big Question: How will ongoing rapid changes in sea ice coverage impact chemistry in the overlying atmosphere?**



UNIVERSITY OF CALGARY

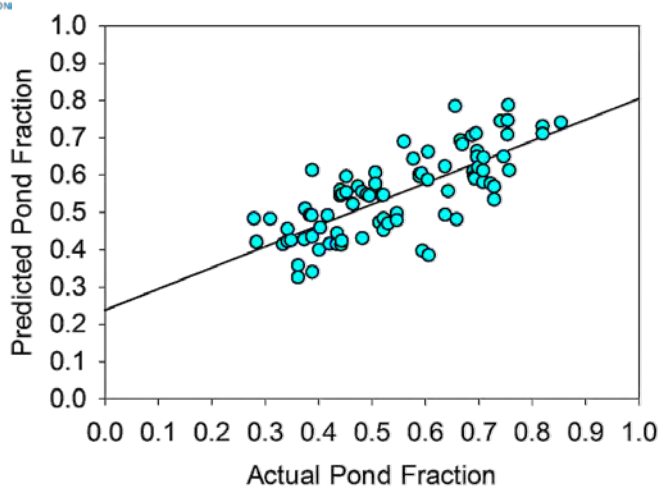
CCRG Cryosphere Climate Research Group

MEOPAR MARINE ENVIRONMENTAL OBSERVATION PREDICTION & RESPONSE NETWORK

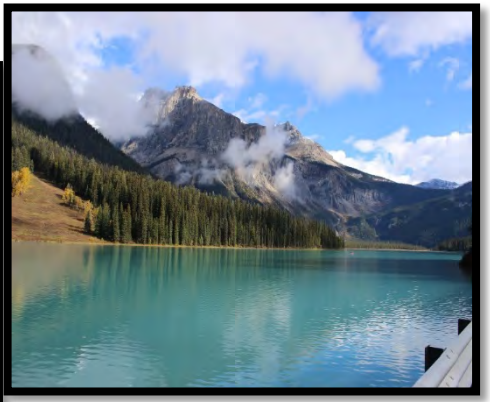
Saroat Ramjan
M.Sc. Student, Dept. of Geography

Research Interests:

- Remote sensing
- Geo-statistical techniques
- Spatio-temporal and physical dynamics of snow cover and sea-ice in the Arctic.



Current Project: Estimation of snow thickness by predicting melt pond fraction.



Sébastien Roche

BSc. & MSc. Physics (Lyon 1, France)
Ph.D. candidate at UoT

Research:
- CO_2 profile retrievals from NIR TCCON spectra
- NIR measurements with the Bruker 125HR at PEARL

Photo credit : Erik Lutsch

Housseyni Sankaré

PhD candidate UQÀM

Supervisor: Jean-Pierre Blanchet

UQÀM

CENTRE ESCER

POUR L'ÉTUDE ET LA SIMULATION DU CLIMAT À L'ÉCHELLE RÉGIONALE

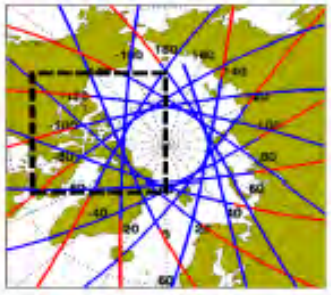
Background

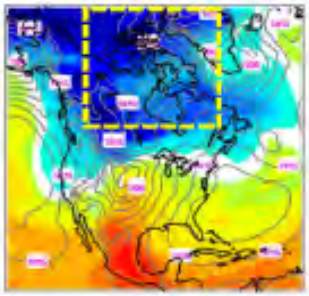
- M.Sc in atmospheric sciences at Université du Québec à Montéal.
- B.Sc in Meteorology at Institute of Meteorology (IHFR), Algeria

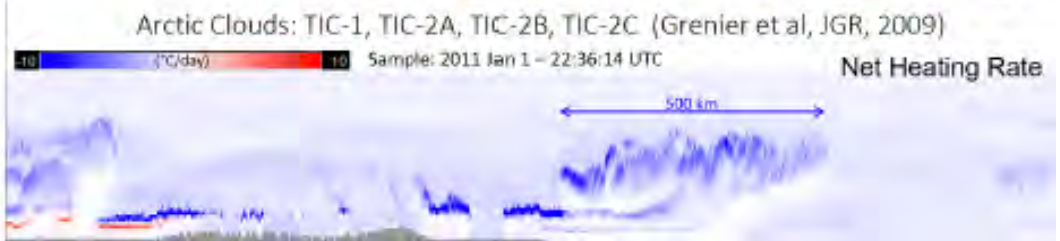
Current research

- Diagnostic of Arctic atmosphere energy budget during the polar night.
- Quantifying the role of thin ice clouds (TIC) in the energy generation.

$$\frac{\partial \theta}{\partial t} + \vec{V}.\vec{\nabla}\theta + \omega \frac{\partial \theta}{\partial p} = J$$







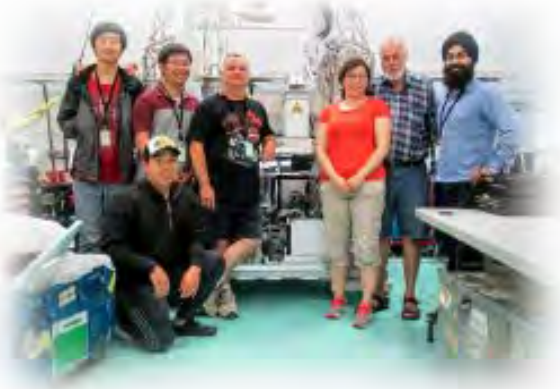
Gurpreet Singh

Background:

- BSc. Hons Space Science, York University, Toronto, Canada
- MSc. Candidate Earth and Space Science, York University, Toronto, Canada; Supervisor: Tom McElroy

Research interests:

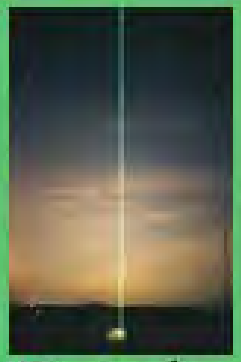
- Imaging Fourier Transform Spectrometry (iFTS)
- Diffraction grating spectrometer
- Lasers and optics



LASSONDE SCHOOL OF ENGINEERING | YORK UNIVERSITÉ UNIVERSITY

Department of Earth & Space Science & Engineering

creative passionate rational confident ingenious



Jeff VanKerkhove

- PhD student from UWO (Purple Crow Lidar group)
- Work:
  - Lidar henchman
  - Why are our water vapor measurements so wet?
  - Lidar/MWR comparison

Shoma Yamanouchi

UNIVERSITY OF TORONTO

- BSc. Joint Honours Physics & Mathematics,
  McGill University
- PhD research in Atmospheric Physics,
  University of Toronto
  Supervisor: Professor Kimberly Strong

Research Interests

- Working at TAO (University of Toronto Atmospheric Observatory)
- FTIR spectroscopy (Bomem DA8 pictured on the left)
- Retrieval and analysis of data
- Current interest is in ozone

Our Location:
43.66N, 79.40W, 174 masl
(Downtown Toronto)

Field measurements on ice-covered Lake Simcoe

Bernard Yang, Ph.D. Student at Department of Physics, University of Toronto

Mathew Wells

Bernard Yang

Yuan You

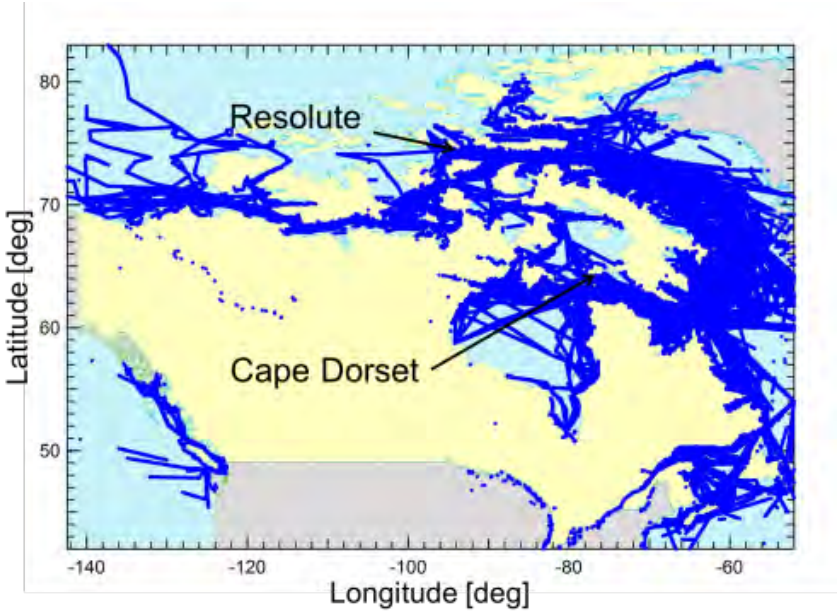
Postdoctoral Fellow

@ Environment and Climate Change Canada
Supervisor: Dr. Ralf Staebler

PhD @ University of British Columbia
Atmospheric Aerosols

Current Research Interest:

- Air pollution in the Arctic
- Emission and dispersion of air pollution from highway traffic



Interpolated shipping traffic data in the summer 2015

Photo source: Amir Aliabadi

Kedong Zhang
Ph.D. student (Geography)
University of Manitoba

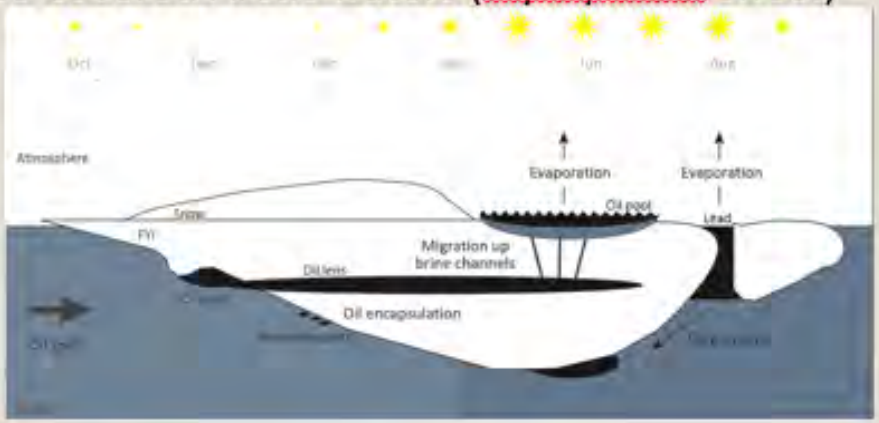
M. Eng. (Civil), Memorial University
B.Eng. (EnvE), Ocean U of China

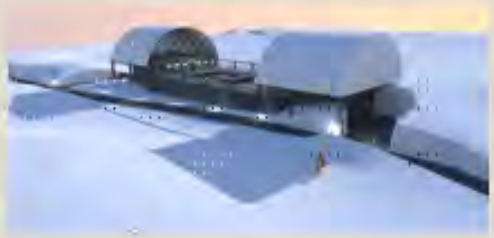
- Generation of Shrimp waste-based dispersant for Newfoundland's offshore oil spill response

UNIVERSITY OF MANITOBA

Ph.D. research:

- Photochemical study of oil related contaminants in ice-covered Arctic waters (cryospheric effect)

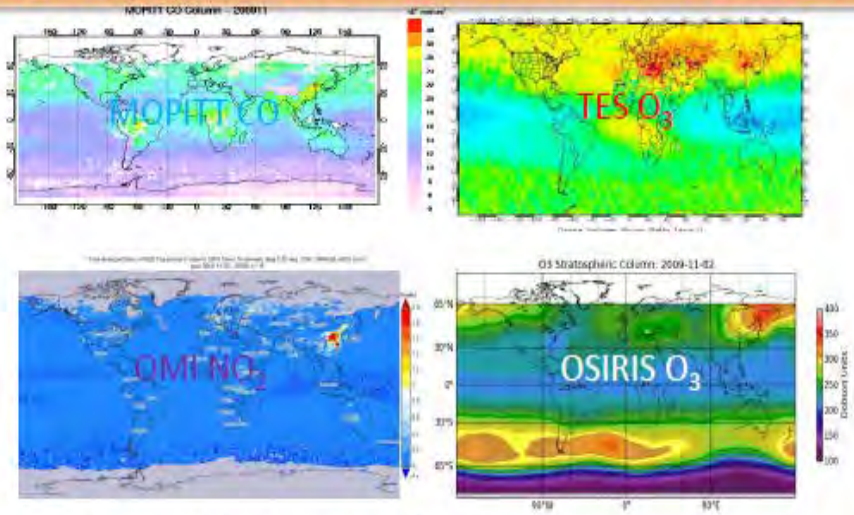




Sea-ice Environmental Research Facility
Winnipeg, MB

Churchill Marine Observatory
Churchill, MB

Quantifying emissions of CO and NOx in northern mid-latitudes using satellite observations from multiple chemical species



Contributed by: Xuesong Zhang,

Dylan B. A. Jones, Martin Keller, Thomas W Walker, Zhe Jiang, Daven K Henze, Adam E Bourassa, D A Degenstein and Yves J Ronchon

UNIVERSITY OF TORONTO

GEOS-Chem adjoint model V35 is used with 4D-var data assimilation.

Studies	Model Setup
CTM	GEOS-Chem ($4^o \times 5^o \times 47L$)
Assimilation period	Nov 2009 and July 2010
DA scheme	4D-Var: AW=2 weeks
Observation combinations	MOPITT CO, TES O_3, OMI NO_2, OSIRIS O_3
Optimized emissions	CO, NOx and LNOx emissions
Opt. initial conditions	O_3